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Report to the Scientific Director

HIGH-RESOLUTION SPECTROSCOPY AT IVY COMPARED WITH PREVIOUS TESTS

Carl A. Beck

Naval Research Laboratory
Washington, DC

February 1955

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The high-resolution ultraviolet and visible spectra of typical test nuclear detonations up to and including Operation Ivy have been analyzed and compared. Topics studied include the types of atomic and molecular material observed (with calculations, in some cases, of the relative quantities involved), the ultraviolet cutoff, and rotational temperatures. Variation of these quantities with the radiochemical yield of the bomb is indicated.

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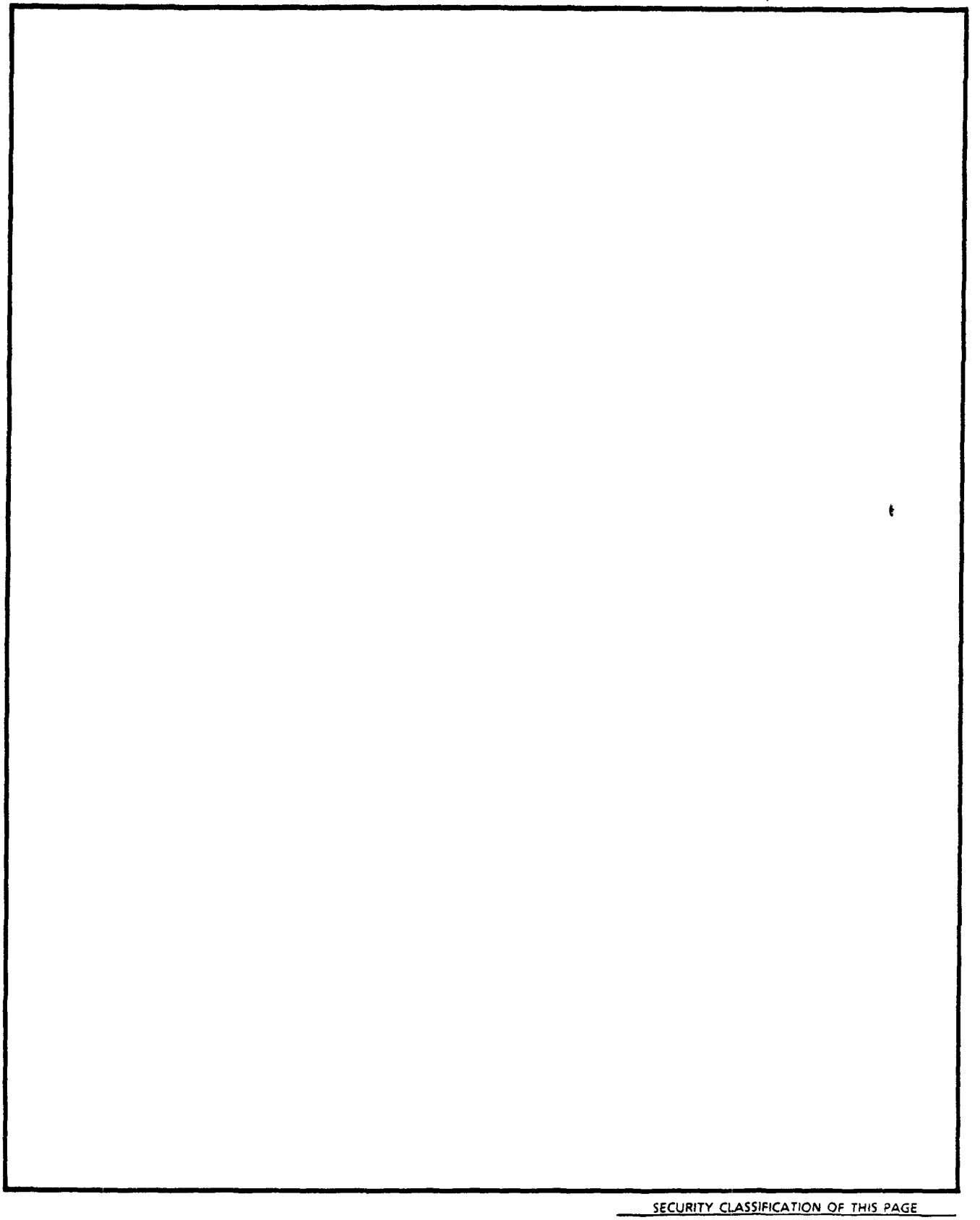

FOREWORD

Classified material has been removed in order to make the information available on an unclassified, open publication basis, to any interested parties. The effort to declassify this report has been accomplished specifically to support the Department of Defense Nuclear Test Personnel Review (NTPR) Program. The objective is to facilitate studies of the low levels of radiation received by some individuals during the atmospheric nuclear test program by making as much information as possible available to all interested parties.

The material which has been deleted is either currently classified as Restricted Data or Formerly Restricted Data under the provisions of the Atomic Energy Act of 1954 (as amended), or is National Security Information, or has been determined to be critical military information which could reveal system or equipment vulnerabilities and is, therefore, not appropriate for open publication.

The Defense Nuclear Agency (DNA) believes that though all classified material has been deleted, the report accurately portrays the contents of the original. DNA also believes that the deleted material is of little or no significance to studies into the amounts, or types, of radiation received by any individuals during the atmospheric nuclear test program.

ABSTRACT

The high-resolution ultraviolet and visible spectra of typical test nuclear detonations up to and including Operation Ivy have been analyzed and compared. Topics studied include the types of atomic and molecular material observed (with calculations, in some cases, of the relative quantities involved), the ultraviolet cutoff, and rotational temperatures. Variation of these quantities with the radiochemical yield of the bomb is indicated.

PREFACE

This report is concerned with the high-dispersion spectral characteristics of the devices fired at Operation Ivy and the comparison of these characteristics with those of other nuclear explosions recorded in Operations Greenhouse, Buster-Jangle, and Tumbler-Snapper.

All the work reported here was done at the request of the Los Alamos Scientific Laboratory (LASL) and under the supervision of the J-Division of that laboratory. At Greenhouse, the Optics Division participation (which included the spectroscopic work) was part of the Naval Research Laboratory (NRL) program headed by Wayne C. Hall of the Electricity Division. For the remaining operations, spectroscopic work has been part of the Optics Division commitment directly to LASL.

The spectrographic observations were made at Greenhouse and Buster-Jangle by Joseph A. Curcio, who, with Louis F. Drummeter, was also responsible for the original identification of many of the spectral features which are common to nuclear explosions.

The observations and the preliminary data reduction at Tumbler-Snapper and Ivy were made by Carl A. Beck and John H. Campbell.

The data analysis reported here was done in collaboration with Dorothy E. Buttrey, who also aided materially in the assembling of the final text.

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CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE

The primary object of this report is to present the results of measurements of high-resolution spectra photographed for the Mike and King shots at Operation Ivy and to compare these results with similar data from previous operations.

1.2 BACKGROUND

Optical spectra at dispersions ranging from 2.5 A/mm to 8.3 A/mm have been photographed for most of the explosions at Operations Greenhouse, Buster-Jangle, Tumbler-Snapper, and Ivy. The wavelength region covered is from about 3000 A, where the spectrum is cut off by some absorbing process, to an instrumental limit near 7800 A. The spectrograms vary in exposure time and wavelength coverage. They also vary in the time during the life of the fireball at which the exposure was made. Table 1.1 gives information pertinent to the shots discussed in this report. It includes for each shot the yield of the weapon in kilotons of TNT, the spectral region photographed, the spectral region measured, the time limits of the exposure, and the prominent atoms and molecules observed in the spectra.

In most of the spectra considered here, the exposure at a particular wavelength is the result of the integration of light on a photographic plate over a relatively long period of time and from a wide region of space. The degree of space and of time integration is determined by the exposure technique used.

The bomb spectra which have been photographed always show a continuous background, as in the case of the photosphere of the sun. This serves as a background for absorption spectra due to excitation of certain atoms and molecules near the surface of the fireball. In some cases the emission spectra of certain atoms and molecules have been obtained.

This report includes a table of the wavelengths and the estimated strengths of the lines and bands observed between 3000 and 5000 A on some of the spectrographic plates obtained at Greenhouse, Buster-Jangle, Tumbler-Snapper, and Ivy (see Appendix A).

Most of the measured wavelengths have been identified as to the atomic or molecular agents responsible. The intensity estimates are included because intensities can give indications of the amount of an agent present and the degree of its excitation.

1.3 THEORY

In general, an electronic molecular spectrum can be either of a broad continuous nature or have structure, i.e., consist of sharp rotational lines, or bands which may or may not show a resolved rotational structure. A spectrum which inherently consists of sharp separated

Table 1.1—COMPILATION OF DATA ON THE COMPARED SHOTS

Shot	Yield, kt	Exposure time	Spectral region photographed, A	Spectral region measured, A*	Prominent components observed	Iron appearance	Burst location
Greenhouse						Absorption above	Tower
Dog		Total	3000–5000	4350–4950	Ba, O_2, N_2^+	4200 A	
Buster-Jangle							
Charlie	14.0	0–20 msec	3000–5000	3200–3950	NO_2, HNO_2, O_2	Not present	Air
Baker	3.49	Total	3000–5000	3000–5000	Ba, Al, AlO	Prominent absorption	Air
Tumbler-Snapper							
2	1.17	Total	3000–5000	3200–5100	Ba, Al, AlO_2	Prominent absorption	Air
3	30.7	Total	3000–5000	3150–4670	Ba, Al, AlO(em), N_2^+, O_2, O	Emission above 4000 A	
4	19.2	0.6–5 sec	4000–6000	4000–5000	Ba(em), Al, AlO(em), N_2^+(em), O_2	Emission	Air
7	14.6	0–100 μsec	3000–5000	3000–5000	NO_2, HNO_2, N_2^+, O_2	Not present	Tower
Ivy							
Mike	10,000	Total	3000–7700	4000–4500	O, N, NO_2, O_2 N_2^+ (difficult region to see)	Not observed	Surface
King	540	Total	4000–7800	3950–4020 4060–4700 4900–5100	O, N, NO_2, N_2, O_2	Not observed	Air
		1.0–1.1 sec	3000–5000	3280–4470 4900–5000	N_2^+, O_2	Not observed	
		1st max.	4300–8000	4330–4960	O, N, NO_2, N_2^+, O_2	Not observed	

* Please note the spectral regions measured so that, in the use of the table in Appendix A, a blank region will not be misconstrued. In some regions it is difficult to decide between absorption and emission.

lines will appear as such if the spectrograph is of sufficiently high resolving power. Sometimes rotational lines are so close together that they are not inherently resolved because of the finite width of the individual lines involved. As is well known, line broadening can be attributed not only to the nature of the molecule but also to external causes such as temperature, pressure, and external electric or magnetic fields.

The intensity of a spectral line depends on both the population of the initial energy level associated with the optical transition and on the transition probability. This holds for emission and absorption, the initial state being of higher energy in emission and of lower energy in absorption.

In an ideal case, two intensity distributions can be obtained from molecular spectra—that of the intensities of the rotational lines in a v-v, or vibration band, and that of sums of these rotational line intensities taken for many v-v transitions. The first would give an effective rotational temperature and the second an effective vibrational temperature. These temperatures have little meaning if equilibrium conditions do not exist. They also lose significance if the intensities or the sums of intensities represent averages taken over too much time or space. This is the situation in nearly all the experiments described in the present report. Consequently, intensity distributions are given which cannot always be interpreted in terms of temperature.

However, by using intensity distributions of certain oxygen band systems, approximate values of the rotational temperatures were calculated for three of the shots in two ways:

1. In a particular band, the line of maximum intensity was found, and the corresponding total angular momentum of the initial quantum state (J value) was noted. An approximate theoretical expression for line intensity in terms of J and T (temperature) was maximized so that by substitution of the J value of the line of maximum intensity the value of T was found.

2. Temperatures of the same shots were calculated also from the slope of the graph of $\log_e [I/(2J + 1)]$ vs the rotation energy E, where I is the intensity of the line, $(2J + 1)$ is the degeneracy factor, and E is the rotational energy appropriate to the value of J of the initial or lower level in absorption. The slope of this graph is $1/KT$, where K is the Boltzmann factor and T is the temperature.

Spectra at high dispersion are not well suited for measurements of the frequency distribution of a continuous spectrum; hence such distributions are outside the scope of this report. The transmission of the atmosphere is not considered in this report since it does not affect the relative strength of absorption lines or bands, nor does it affect appreciably the relative strengths of observed emission lines.

CHAPTER 2

EXPERIMENTAL PROCEDURE

2.1 RECORDING OF SPECTRA

The shots at Greenhouse, Buster-Jangle, and Tumbler-Snapper, as well as the King shot (1.0 to 1.1 sec exposure) at Ivy, were studied with a Baird 2-meter, concave grating spectrograph. The first-order spectrum, at a dispersion of 8.3 A/mm, was photographed in each case in the 3000 to 5000 A wavelength region. The slit width was always 0.030 mm, and the average aperture of the spectrograph was f/24, which in most cases included a large enough solid angle of space to see all of the fireball.

A Jarrell-Ash, 21-ft Wadsworth-mount, grating spectrograph was used for the Mike and King shots at Operation Ivy. This instrument had two gratings, one directly above the other, each having 15,000 lines/in. The grating in the upper deck illuminated one set of plates and was used in the first order to cover wavelengths from about 4000 to 7000 A with a dispersion of 5 A/mm. The second-order spectrum was photographed in the lower deck on a second set of plates so as to cover the 3000 to 4200 A region at a dispersion of 2.5 A/mm. Eastman II-0 spectroscopic plates were used for the second order, and Eastman II-F and I-N plates were used in the first order. Each deck of the spectrograph had an average aperture of about f/40 and was pointed somewhat above shot center in order to include as much of the fireball as possible.

No lens or mirror was used between the slit and the bomb in any of the described cases except in Tumbler-Snapper 6 and 7 and with the Baird spectrograph at King shot. Step wedges were used in all cases except Tumbler-Snapper 6 and 7 in order to obtain proper exposure. These were not always the proper ones to obtain a good plate characteristic curve; therefore an approximate H and D curve was used. This seemed justifiable for comparison of intensities between different plates and also on the same plate.

2.2 REDUCTION OF DATA

A Mann comparator was used for measuring wavelengths, and two sets of readings were made on each plate. The wavelength determinations were accurate to about 0.1 A except in the cases of the Mike and the King plates, where a shift of the iron comparison spectrum occurred, and the case of Tumbler-Snapper 7, where the iron calibration lines did not touch the absorption spectrum. In these cases the accuracy was about 0.2 A. Density traces were taken on a JACO recording microphotometer using a slit width of 0.015 mm. This was narrow enough to record all the structure observable on the plates.

The total strength of any spectral line in emission is directly related to the area under the curve in a plot of intensity vs frequency. In absorption the strength, or intensity, is given by measuring the area under the whole absorption peak, provided the optical density due to the

absorbing atom or molecule is plotted against frequency. The absorption intensities in the individual tables were obtained by taking heights off the microphotometer curve recorded on logarithmic paper and correcting these heights with a photographic characteristic curve to give very approximate values of the optical density associated with the absorbing material. These values can be used as an indication of the distribution of intensities in a band. The width and height of the microphotometer slit was kept the same for all traces.

CHAPTER 3

RESULTS

Wavelength measurements and microphotometer traces have been made for certain selected spectral regions shown in column 5 of Table 1.1. It was not considered necessary for this report to measure the spectra of all shots already taken up to Ivy. For example, are almost exact duplicates, as are Tumbler-Snapper 1 and 3. agrees well with Tumbler-Snapper 2 below 4000 A except that it does not have as strong Schumann-Runge bands of oxygen there.

The regions studied for the various plates lie, in general, between 3000 and 5000 A. Measurements were not extended above 5000 A because of the great agreement between absorption structure observed there and the absorption spectrum of the atmosphere. An absorption continuum, possibly due to ozone, blotted out the spectrum below about 3000 A.

The bulk of the line and band structure appears in absorption (hence nearly all measurements concern absorption), but emission is also present in some cases. For example, the structure of the Tumbler-Snapper 4 spectrum at its long-wavelength end is almost completely in emission. Sometimes it was difficult to distinguish between emission and absorption since both seemed to exist side by side on the plate.

Many wavelengths have been identified, and the materials contributing prominently to the observed structure are listed for the various shots in column 6 of Table 1.1. The main contribution comes from the Schumann-Runge system of oxygen; other more or less prominent molecules observed were NO_2, HNO_2, OH, and N_2^+. Spectral lines of several atoms were found, iron being the one found most often. Its presence is attributed to the casing of the bomb or to tower materials and is not held to be of first importance in this report. However, column 7 of Table 1.1 gives an indication of the appearance of iron in the spectra for various shots. For example, iron lines are quite prominent in Buster Baker and Tumbler-Snapper 2 and not observed in Mike or King.

Prints of the actual spectra in the 3000 to 4000 A region for several shots are shown in Fig. 3.1. With the exception of Mike, the spectra are positive prints; i.e., an emission line is bright and an absorption line is dark. The reverse is true for Mike. In some cases a comparison spectrum of iron is shown — as for Tumbler-Snapper 2 — to show coincidences. The wavelengths of the heads of selected bands are identified in order to facilitate visual comparison of the strengths of the bands in various shots.

Figure 3.1 shows that the S-R 3516 (0-15) band of O_2 in Tumbler-Snapper 4 has about a dozen lines. In Tumbler-Snapper 3 this band is considerably longer and somewhat stronger, extending as far as the head of the S-R band at 3673 A.

A comparison of Mike and Tumbler-Snapper 7 in the region above 4200 A is also shown in Fig. 3.1. The absorption peaks in Mike are broad and fuzzy compared with the other spectra.

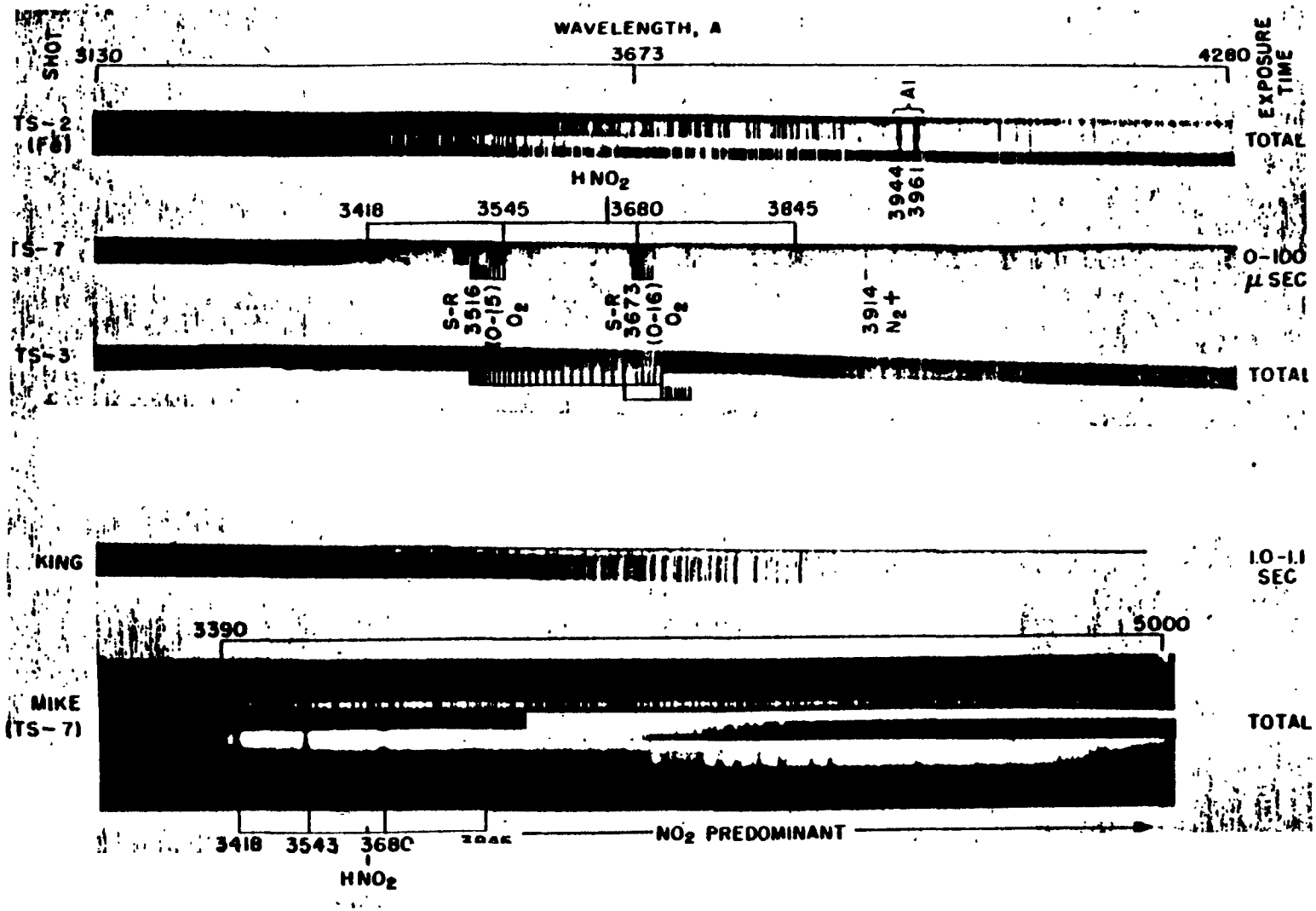


Fig. 3.1 — Typical bomb spectra in the 3000 to 4000 A region.

This is at least partly due to much stronger absorption by O_2 and probably also by the strength of the NO_2 absorption spectrum. This effect is seen better on the original plates.

Appendix A is a composite tabulation of measured wavelengths for the various shots. The names of the shots head all but the first and the last columns. The first column contains identifications for each Schumann-Runge line. The branch and transition are designated by "P" or "R" followed by the rotational quantum number, J, for the final (lower) state.[1] The true wavelength and the member of the band system are also given. For other molecules and for atoms, the true wavelengths and chemical symbols are given in the first column. Other identifications are made immediately to the left of the measured wavelengths for various shots, and rough visual estimates of the absorption or emission strengths in many cases are given immediately to the right of the measured wavelength. Where there is no intensity number given, it can be taken to mean that the corresponding line is relatively weak. Emission is designated by the letters "em"; all other structure is absorption. For convenience, the last column to the right marked "Fe" gives true wavelengths of iron as taken directly from the MIT Wavelength Tables.

A notation in Appendix A does not necessarily establish a sure identification since there may be superposition of something else, such as unreported lines of NO_2, at that position. Of the lines not identified, some, no doubt, are lines of S-R O_2 or NO_2 missed in the present study or not reported in the literature. The extremely broad bands around 3500 A attributed to HNO_2 (see Fig. 3.1) are not included in the table. The table can be used profitably in a negative manner to indicate the exclusion of a suspected material.

For completeness Appendix B is given. It is comprised of negative prints of all the original plates exposed at Operation Ivy. However, there is much in the originals that is lost in these prints since all regions on the originals give information except parts in Figs. B.1 and B.4.

The Baird spectrograph was used at Mike to try to record the very early spectrum, but only a meager bit of information in the form of a line showed on the plate. This may be the head of the 4278 A N_2^+ band, but, since it is not certain, it is not indicated in the results.

CHAPTER 4

ANALYSIS OF DATA

4.1 GENERAL COMMENTS

There are several points of interest in the following discussion of tables and results. These are ultraviolet cutoff, certain compared strengths of absorption in the spectra, the various atoms and molecules present in the several shots, and the rotational temperatures of the molecules.

4.2 ULTRAVIOLET CUTOFF

All the spectra studied for this report show a fairly abrupt cutoff of ultraviolet radiation centered above 3000 A (Table 4.1). This cutoff cannot be attributed, in any of the cases

Table 4.1 — APPROXIMATE ULTRAVIOLET CUTOFF VALUES

Shot	Exposure time	Yield, kt	Cutoff, A
Greenhouse Dog	Total		3600
Buster Baker	Total	3.49	3600
Buster Charlie	0–20 msec	14.0	3450
Tumbler-Snapper 2	Total	1.17	3450
Tumbler-Snapper 3	Total	30.7	3350
Tumbler-Snapper 7	0–100 μsec	14.6	3300
Mike	Total	10,000	>3600
King	1.0–1.1 sec (also total)	540.0	>3600

studied, to the normal atmosphere between the bomb and the spectrograph. It must be the result of an attenuating medium surrounding the weapon and created by the explosion; but, from the spectra described in this report, the identity of such an absorber is not apparent.

However, recent observations with low-dispersion spectrographs at Operation Upshot-Knothole appear to have established the existence of ozone in equivalent thicknesses of several centimeters around the bomb during the time up to the minimum. It would be informative to attempt to describe the cutoff in terms of the intensity distribution of the ozone absorption spectrum, but the well-known wavy form of the spectral curve of ozone was not detected. This may be due to the presence of many bands in the cutoff region, such as those of the S-R system.

Table 4.1 gives for the spectra studied the exposure time, the total yield in kilotons, and the wavelength of the cutoff, e.g., the wavelength at which the optical density fell to one-tenth of that at about 4100 A. A trend in this cutoff toward longer wavelengths with an increase in yield seems to be present over the whole yield range studied, but it is doubtful that a scaling law can be established at present. In the second column of Table 4.1, the exposure times referred to as "total" cover the entire life of the fireball; appropriate designations of times of exposure are made for shots where only a portion of the life of the fireball was observed.

4.3. COMPARISON OF SPECTRAL INTENSITIES FOR O_2, NO_2, AND N_2^+

The second very prominent feature in the comparison of these spectra is that the larger the effective kilotonnage of the bomb, the stronger are the absorption lines or bands, i.e., for spectra of comparable exposure times. This is very evident in the Schumann-Runge system of oxygen from about 4600 A to the cutoff. These lines are relatively strong in Mike and King and are considerably weaker for bombs of smaller yield. The lines are close together, with many overlappings at the dispersion used, and, of course, since the intensities of the individual lines are different for the different shots, the appearances of the spectra are not always the same.

In order to show an important difference between total-time shots and those taken at an early interval, Table 4.2 gives intensity values for the Schumann-Runge 0-13 band system in Buster Charlie and also for the same system in Tumbler-Snapper 3; Fig. 4.1 shows the microphotometer traces for this region. [The Buster Charlie trace in Fig. 4.1 is taken from the report by J. Curcio, Atlas of High Dispersion Spectra Recorded at Buster-Jangle, NRL Report 4386 (RD 408), p. 20.] The exposure at Buster Charlie covered the first 20 msec of the explosion, and Tumbler-Snapper 3 was a total-time exposure. The rotational transition number "J" indicated for each wavelength is that of the R-branch. The peak intensity for Buster Charlie occurs around J = 15 and for Tumbler-Snapper 3 at about J = 41. The intensity distribution of this rotational structure in Buster Charlie corresponds to a much lower temperature than it does in the total-time Tumbler-Snapper 3. The effective rotational temperatures range from a few hundred degrees Kelvin in Buster Charlie to several thousand degrees in Tumbler-Snapper 3.

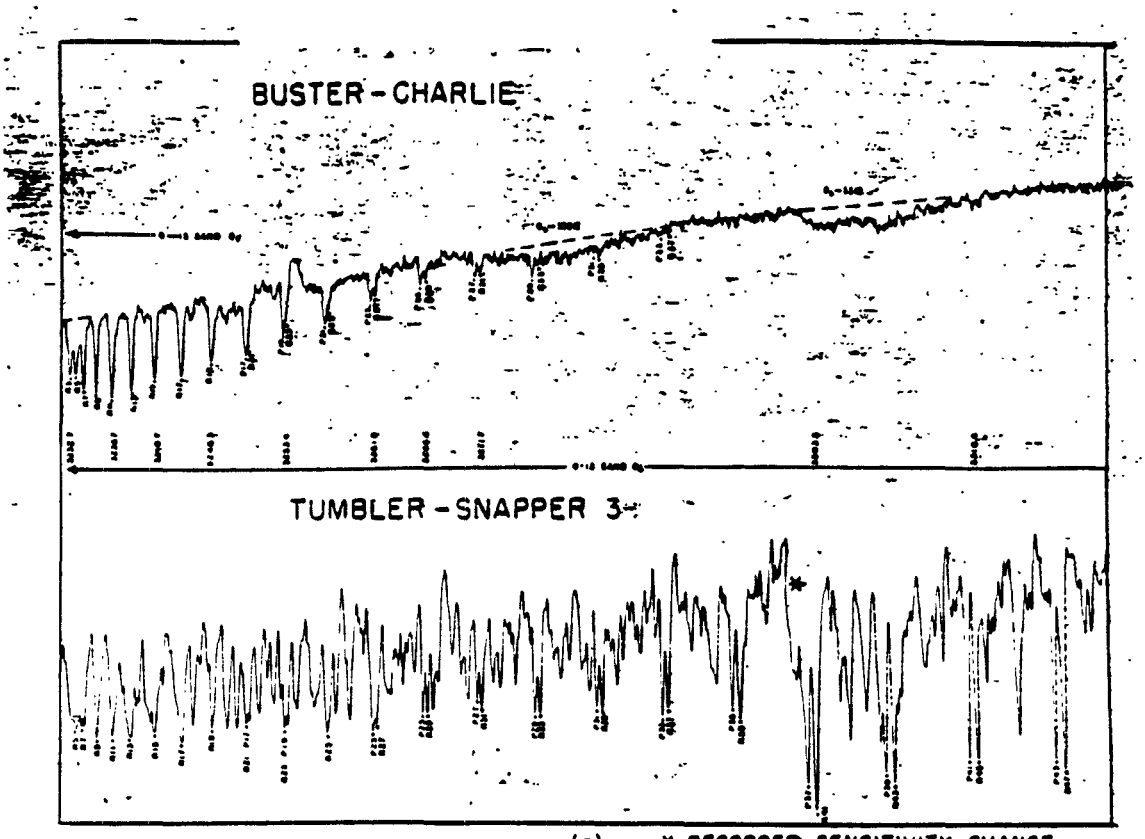
Table 4.3 shows a comparison of intensities of the lines of the S-R 0-15 band (head at 3516 A) found in Tumbler-Snapper 3 (total), King (1.0 to 1.1 sec), Tumbler-Snapper 7 (0 to 100 μsec), and Buster Charlie (0 to 20 msec). A plot of intensities of the peaks given in this table for King and Tumbler-Snapper 3 is shown in Fig. 4.2. In this plot no distinction is made between P and R branches; however, one can see that all points for King are about twice as high on the intensity scale as are corresponding points for Tumbler-Snapper 3. The irregularities in the intensities for King around 3700 A are probably due to overlappings by the S-R 0-16 system. Microphotometer traces showing the S-R 0-15 band for the four shots are presented in Fig. 4.3. It is of interest to note that in comparing the two short-time exposures (Buster Charlie and Tumbler-Snapper 7), the very early Tumbler-Snapper 7 exposure shows the band more strongly than does the 20-msec Buster Charlie exposure. This suggests that the band was excited by an early radiation surge. It should be noted, however, that the casing material in Buster Charlie was about(than in Tumbler-Snapper 7. The two large jumps in the Tumbler-Snapper 7 trace are due to HNO_2 absorption. For the most part, everything else seen in these four traces is due to S-R O_2 absorption.

From the Mike plates it was difficult to obtain good intensities for the rotational distribution of any Schumann-Runge v-v transition because of the superposition of the NO_2 spectrum and the great breadth of the lines. The latter fuzziness is probably due to broadening conditions present in the explosion. In order to give some idea, however, of the way Mike compares with King (total), Greenhouse Dog, and Tumbler-Snapper 3, the intensities of two selected spectral ranges have been compared for the four shots in Table 4.4. These intensity values are only approximate, mainly because of the overlappings of other bands. Microphotometer traces of absorption bands around this region (4000 to 4200 A) are shown in Fig. 4.4 for Mike, King, and Tumbler-Snapper 3.

Table 4.2—COMPARISON OF SPECTRAL INTENSITIES FOR THE S-R 3233 (0-13) BAND OF BUSTER CHARLIE (14 KT, 0 TO 20 MSEC) AND OF TUMBLER-SNAPPER 3 (30.7 KT, TOTAL)

Rotational transition for R-branch, J	S-R 3233 (0-13) band*			
	Buster Charlie		Tumbler-Snapper 3	
	Measured wavelength, A	Intensity (see Sec. 2.2)	Measured wavelength, A	Intensity (see Sec. 2.2)
3	3232.9	0.10	----- 3232.7	0.24
5	33.5	0.12	----- 33.8	0.30
7	34.2	0.13	----- 34.2	0.30
9	35.4	0.15	----- 35.4	0.42
11	36.9	0.16	----- 36.8	0.35
13	38.8	0.18	38.4 38.7	0.43
15	41.1	0.19	----- 40.8	0.36
17	43.7	0.17	42.9 43.5	0.46
19	46.5	0.13	----- 46.4	0.34
21	49.8	0.11	49.3 49.7	0.39
23	53.4	0.09	53.1 53.5	0.38
25	57.0	0.08	57.2 57.5	0.44
27	61.9	0.04	61.5 62.0	0.45
29	66.5	0.05	66.7	0.39
31	71.9		71.9	0.35
33	77.1		77.4	0.41
35			83.2	0.37
	Total	1.70		
37			89.5	0.36
41			3303.3	0.42
43			10.8	0.32
45			18.6	0.33
47			26.9	0.39
			Total	9.04

* For all of Buster Charlie and up to R = 27 of Tumbler-Snapper 3, the intensity values include the intensity of superimposed P-branch members.



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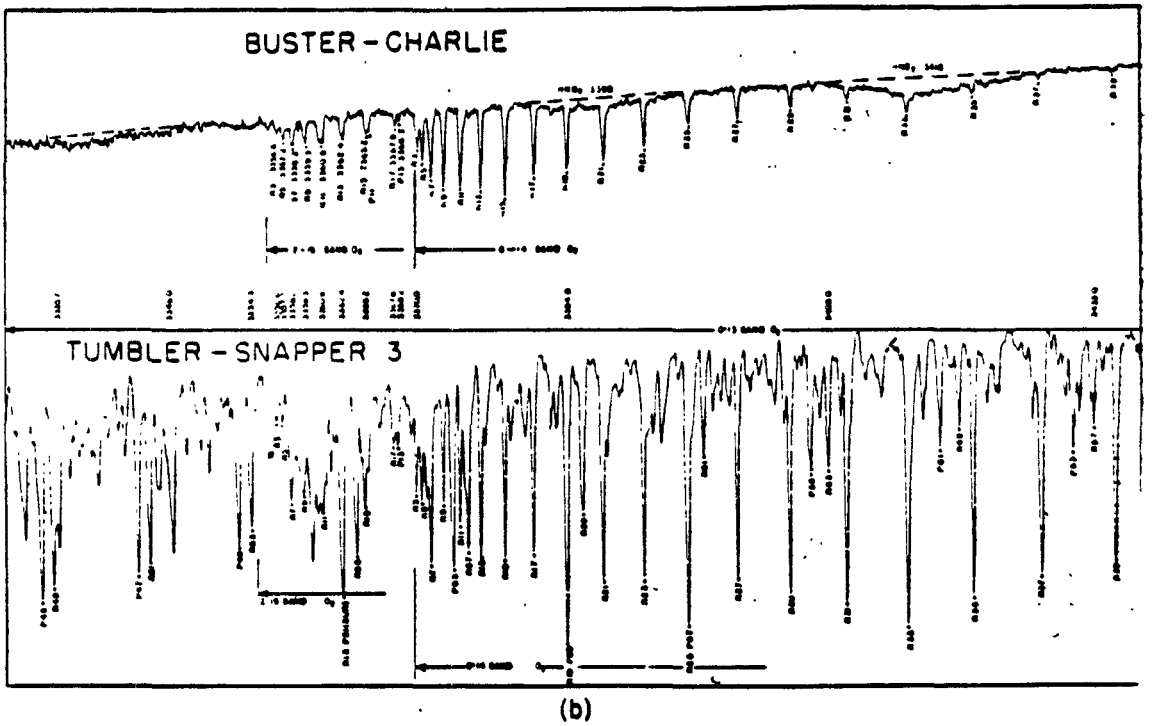

(b)

Fig. 4.1 — Microphotometer traces of S-R 0-13 band O_2 in Buster Charlie and Tumbler-Snapper 3.

Table 4.3—COMPARISON OF SPECTRAL INTENSITIES FOR THE S-R 3516 (0-15) BAND OF BUSTER CHARLIE, TUMBLER-SNAPPER 3, TUMBLER-SNAPPER 7, AND KING

Rotational transition for R-branch, J	S-R 3516 (0-15) band				
		Intensity (see Sec. 2.2)			
	Wavelength,* A	Buster Charlie (14 kt, 0–20 msec)	Tumbler-Snapper 3 (30.7 kt, total)	Tumbler-Snapper 7 (14.6 kt, 0–100 μsec)	King (540 kt, 1.0–1.1 sec)
7	3517.8	0.09	0.31	0.24	0.42
9	19.0				
11	20.6	0.09	0.17	0.24	0.39
13	22.6	0.10	0.15	0.24	0.28
15	25.0	0.06	0.19	0.20	0.35
17	27.8	0.03	0.19	0.20	0.35
	31.0	0.12	0.21	0.18	0.35
	34.6	0.06	0.17	0.15	0.36
	38.6	0.04	0.17	0.12	0.37
25	43.0	0.04	0.21	0.08	0.36
27	48.0	0.07	0.17	0.08	0.38
	52.5		0.22	0.05	0.41
	58.9		0.17		0.30
	65.0		0.22		0.41
35	70.5		0.22		0.38
37	78.3		0.48		0.45
	84.7		0.25		0.50
	93.2		0.24		0.39
	3601.3		0.24		0.62
45	09.8		0.25		0.57
47	18.8		0.26		0.56
	28.4		0.20		0.50
	38.2		0.24		0.61
	48.7		0.20		0.52
55	59.6		0.16		0.50
57	70.9		0.20		0.57
	82.4		0.26		0.84
	95.1		0.20		0.40
	3708.0				0.65
65	21.4		0.22		0.76
67	35.2		0.28		0.59
	49.2		0.20		0.50
71	64.6		0.20		0.52
	Total	0.70	6.46	0.78	15.16

* These wavelengths are taken from the table of reference 1. These values are given for the R-branch, but actually the intensity values have a contribution from the P-branch because of overlapping.

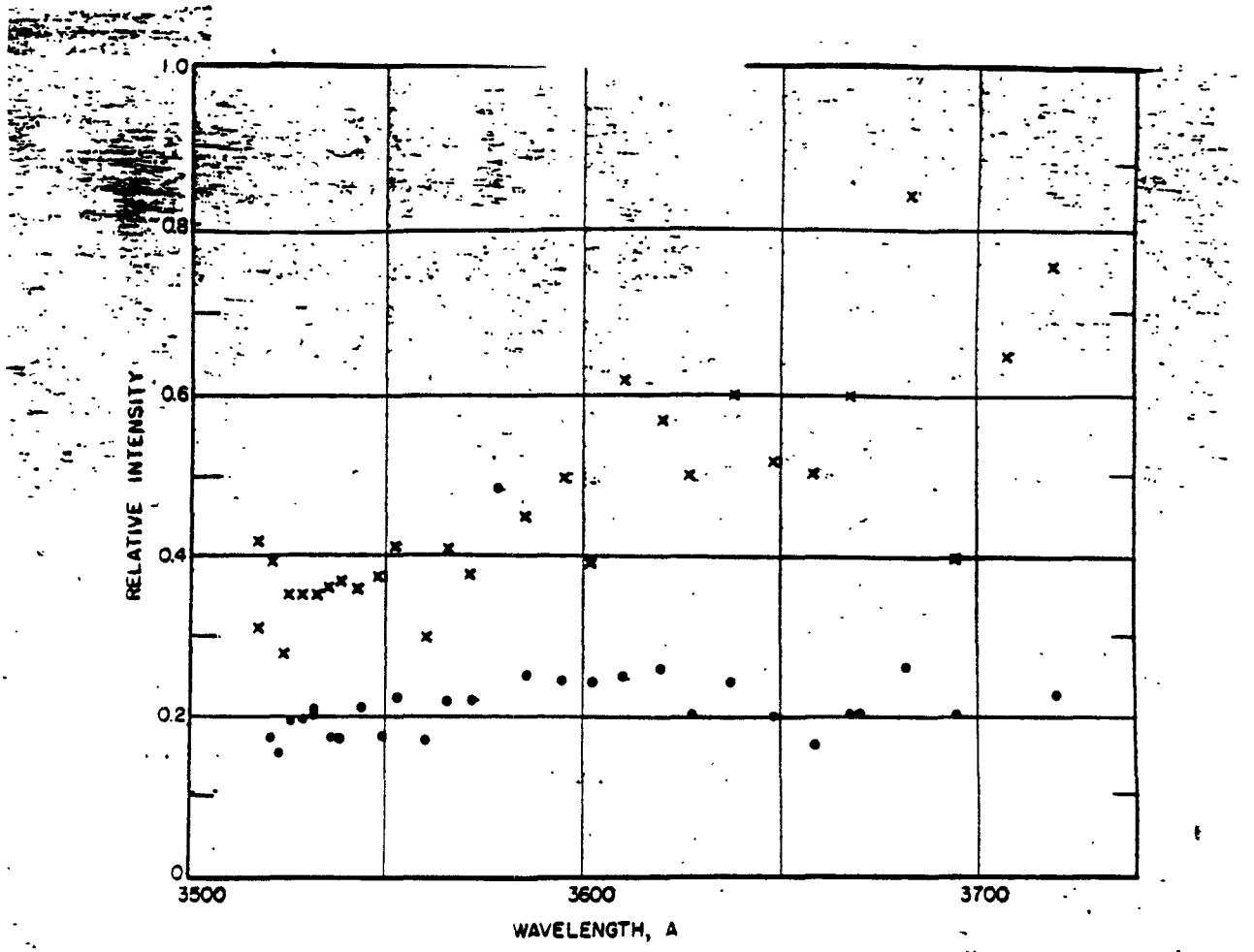

Fig. 4.2 — Relative intensity vs wavelength for the S-R 0-13 band O_2 in Tumbler-Snapper 3 and King (0.1 to 1.1 sec). ×, King. ●, Tumbler-Snapper 3.

The foregoing comparisons of intensities center for the most part around the Schumann-Runge bands of O_2. In addition to these, bands of N_2^+, NO_2, and the broad bands of HNO_2 appear in the spectra for the various explosions.

There is an interesting behavior of the NO_2 absorption spectrum. For the total-time shots, it is only in the Mike spectrum that NO_2 appears prominently. King shows it markedly for the first maximum exposure, but the exposure conditions were not favorable to judge its strength in the total-time exposure. The NO_2 bands in the spectra of Mike and King (first maximum) appear to be very roughly of the same strength as in the early-times Tumbler-Snapper 7 spectrum. The lower part of Fig. 3.1 shows the appearance of NO_2 in the spectrum of Tumbler-Snapper 7 and Mike.

The blackening in the King (1.0 to 1.1 sec) exposure was too great to judge the presence of NO_2 effectively.

The behavior of N_2^+ in several shots is described in Table 4.5. The intensity distribution in the 4278 A band of N_2^+ is shown in Table 4.6 for King (total) and Tumbler-Snapper 3. N_2^+ is not evident in Buster Charlie, but the 3914 A (0,0) band is present in Tumbler-Snapper 7 (see Fig. 3.1). Identifications were made with the help of a table by Fassbender.[3]

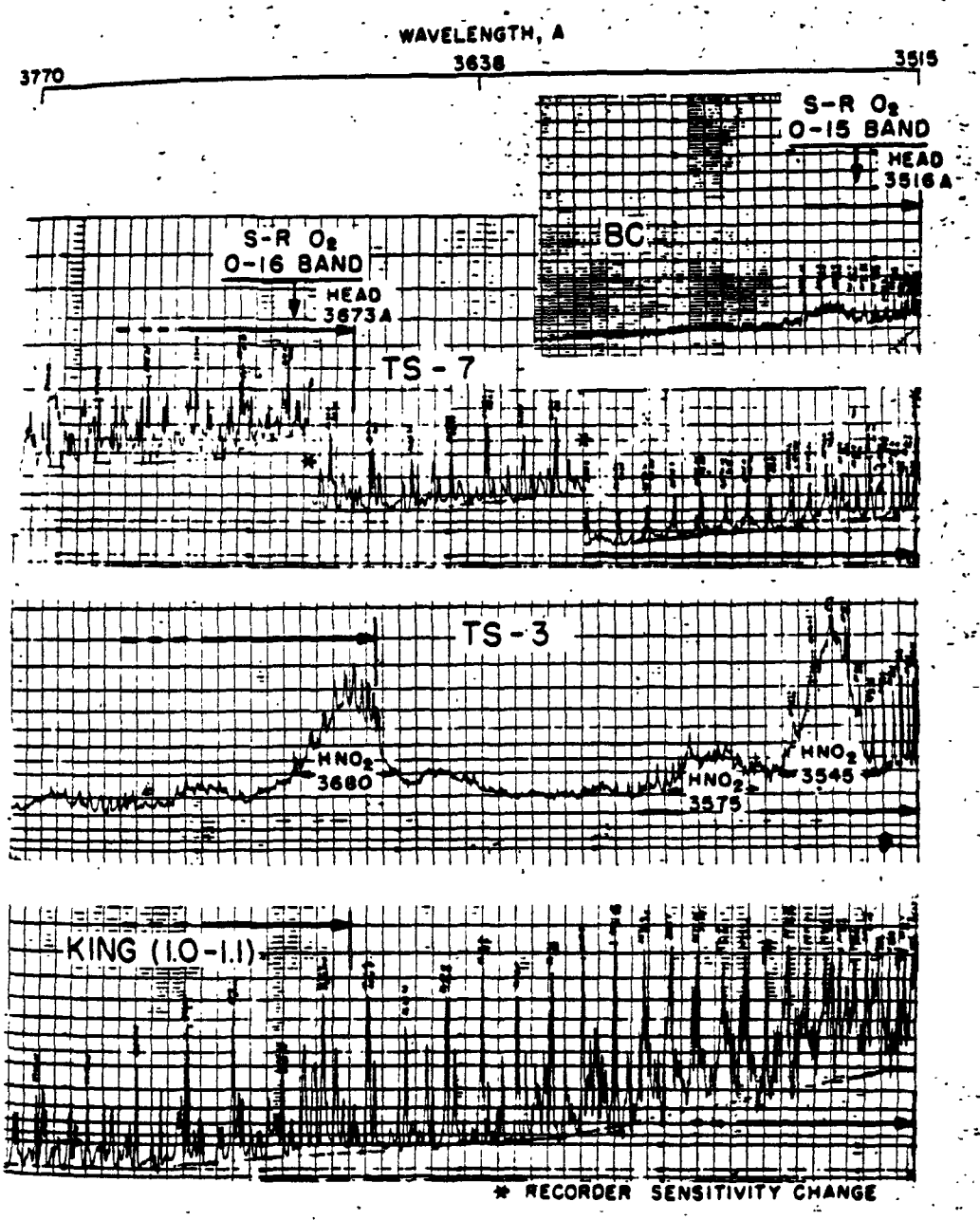

Fig. 4.3 — Microphotometer traces of S-R 0-15 band O_2 in Buster Charlie, Tumbler-Snapper 3, Tumbler-Snapper 7, and King (1.0 to 1.1 sec).

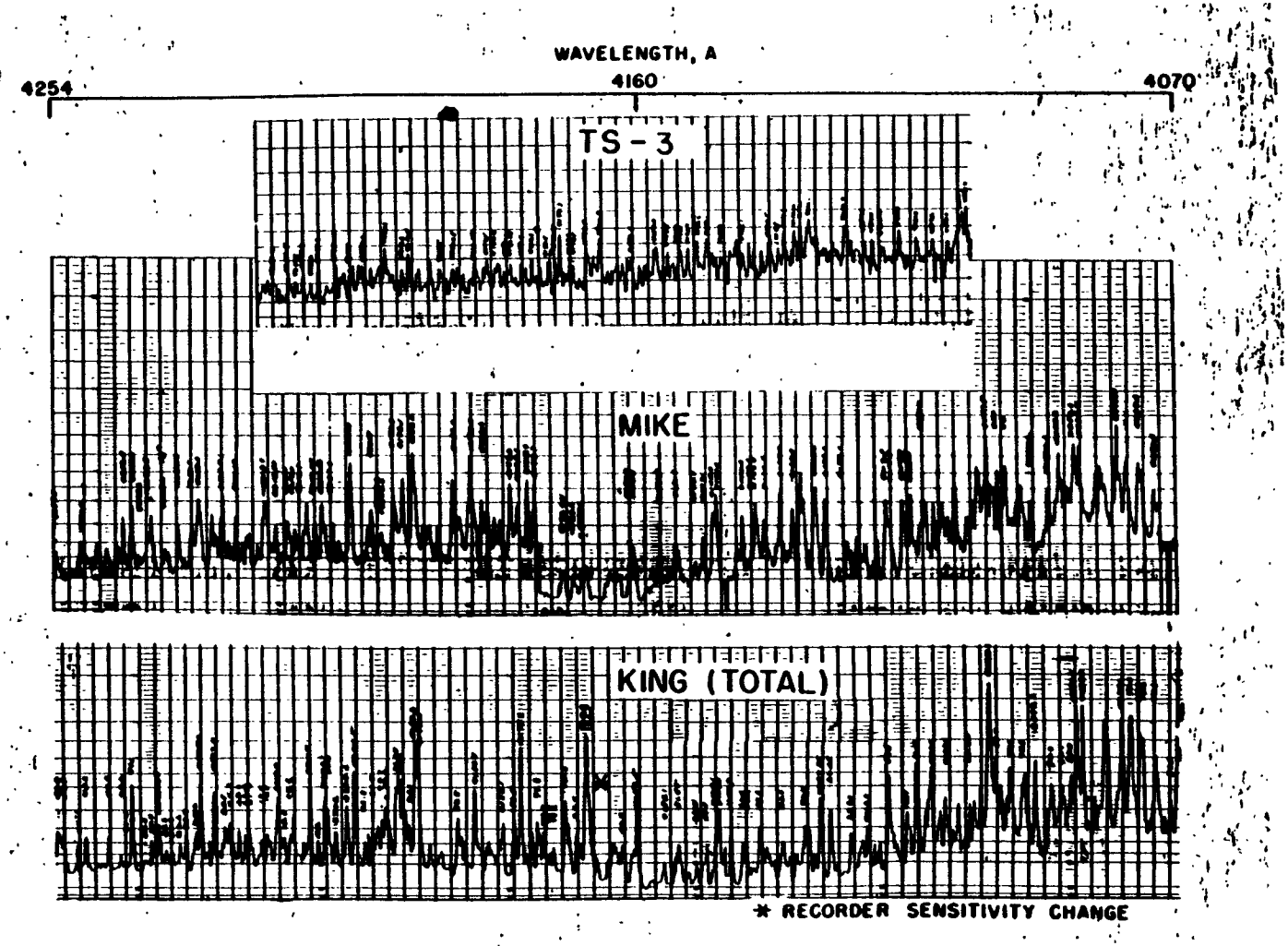

Fig. 4.4—Microphotometer traces of 4000 to 4200 A region in Tumbler-Snapper 3, Mike, and King (total).

Table 4.4—COMPARISON OF SPECTRAL INTENSITIES FOR SELECTED REGIONS IN GREENHOUSE DOG, TUMBLER-SNAPPER 3, MIKE, AND KING

Wavelength at peak, A	Identification	Intensity (see Sec. 2.2) Greenhouse Dog total)	Tumbler-Snapper 3 (30.7 kt, total)	Mike (10 Mt, total)	King (540 kt, total)
4057.9	R55 S-R 0-16		0.05	0.40	
59.2	P63 S-R 0-16		0.05	0.40	
60.9	R53 S-R 1-18		0.04	0.35	
4144.7	R75 S-R 0-17 R31 S-R 1-19		0.08	0.39	0.43
45.3	P61 S-R 1-18		0.06	0.35	0.38
47.5	R49 S-R 0-18		0.06	0.28	0.23
48.5	?		0.07	0.14	0.12
50.0	?		0.05	0.09	0.08
52.6	?		0.12	0.35	0.30
54.2	P29 S-R 1-19			0.33	0.19
58.7	R51 S-R 0-17		0.07	0.40	0.35
59.3	R35 S-R 1-19		0.07	0.31	0.17

Table 4.5—COMPARISON OF ABSORPTION BY N_2^+ IN VARIOUS SHOTS

Wavelength of N_2^+ bandhead, A	Buster Charlie (14 kt, 0–20 msec)	Tumbler-Snapper 2 (1.17 kt, total)	Tumbler-Snapper 3 (30.7 kt, total)	Tumbler-Snapper 7 (14.6 kt, 0–100 μsec)	Mike (10 Mt, total)	King (540 kt, total)	King (540 kt, 1.0–1.1 sec)
4278	Not evident	Negligible	Has many members	Not evident	Negligible	Many rotational lines	Probably strong only at head
3914	Not evident	Negligible	Has many members	Present	Not recorded	Not recorded	Strong only at head

Table 4.6—COMPARISON OF SPECTRAL INTENSITIES FOR THE N_2^+ BAND AT 4278 A ON TUMBLER-SNAPPER 3 AND KING

Half quantum number R_m	Wavelength, A (measured for Tumbler-Snapper 3)	Intensity (see Sec. 2.2) Tumbler-Snapper 3 (30.7 kt, total)	King (540 kt, total)
	4278.1		
8.5	66.4	0.06	0.16
9.5	64.8	0.05	0.18
10.5	63.7	0.07	0.13
11.5	62.3	0.06	0.16
12.5	61.0	0.05	0.10
13.5	59.5	0.06	0.13
(Superposition	58.0	0.06	0.12
of bands)	55.1	0.07	0.16
	53.6	0.06	0.14
18.5	49.2	0.08	0.19
19.5	47.5	0.09	0.15
20.5	45.2	0.09	0.18
21.5	43.2	0.14	0.23
23.5	41.2	0.08	0.25
	Total	1.08	2.27

4.4 DISCUSSION OF OTHER STRUCTURE

4.4.1 General

It is principally absorption due to molecules either produced or excited by the action of the bomb that gives the characteristic features of the spectra. The conspicuous molecules are O_2, N_2^+, NO_2, and HNO_2. These are products and by-products of the disturbed air close to the fireball. In addition, molecules formed from the combination of atoms of the casing and those of the atmosphere would be expected, especially when case materials are observed. Indeed, aluminum monoxide (AlO) absorption bands are observed very prominently in Tumbler-Snapper 2 and weakly in emission in Tumbler-Snapper 3 and Tumbler-Snapper 4. Cyanogen (CN) appears to be present in Tumbler-Snapper 4, and it may be present in Tumbler-Snapper 3. When atomic lines of barium, aluminum, and iron appear, they may be accounted for by the presence of these materials in the high explosive, the bomb case, or the tower. However, these atomic lines are not always seen though the material may be present.

There are many wavelengths not yet identified, especially at both ends of the table. Some of these lines may be due to molecular transitions not yet recorded in the literature. Because of the choppy nature of the spectra near the ultraviolet cutoff, measurements and identifications were very difficult in this region. There is also considerable structure at long wavelengths left unidentified at present.

Whether one says the spectra of the various bombs are alike or not depends on the point of view taken. Many of the same wavelengths will appear in different shots under corresponding conditions of space and time. On the other hand, the general appearance can be quite different from shot to shot. Some of this difference can be attributed to overlapping of bands and changes in their intensity. For example, an increase of intensity of absorption in Mike gives a spectrum which looks unusual below 4000 A, but even here the molecular spectrum agrees roughly in contour with those of total-time bombs of lower yield.

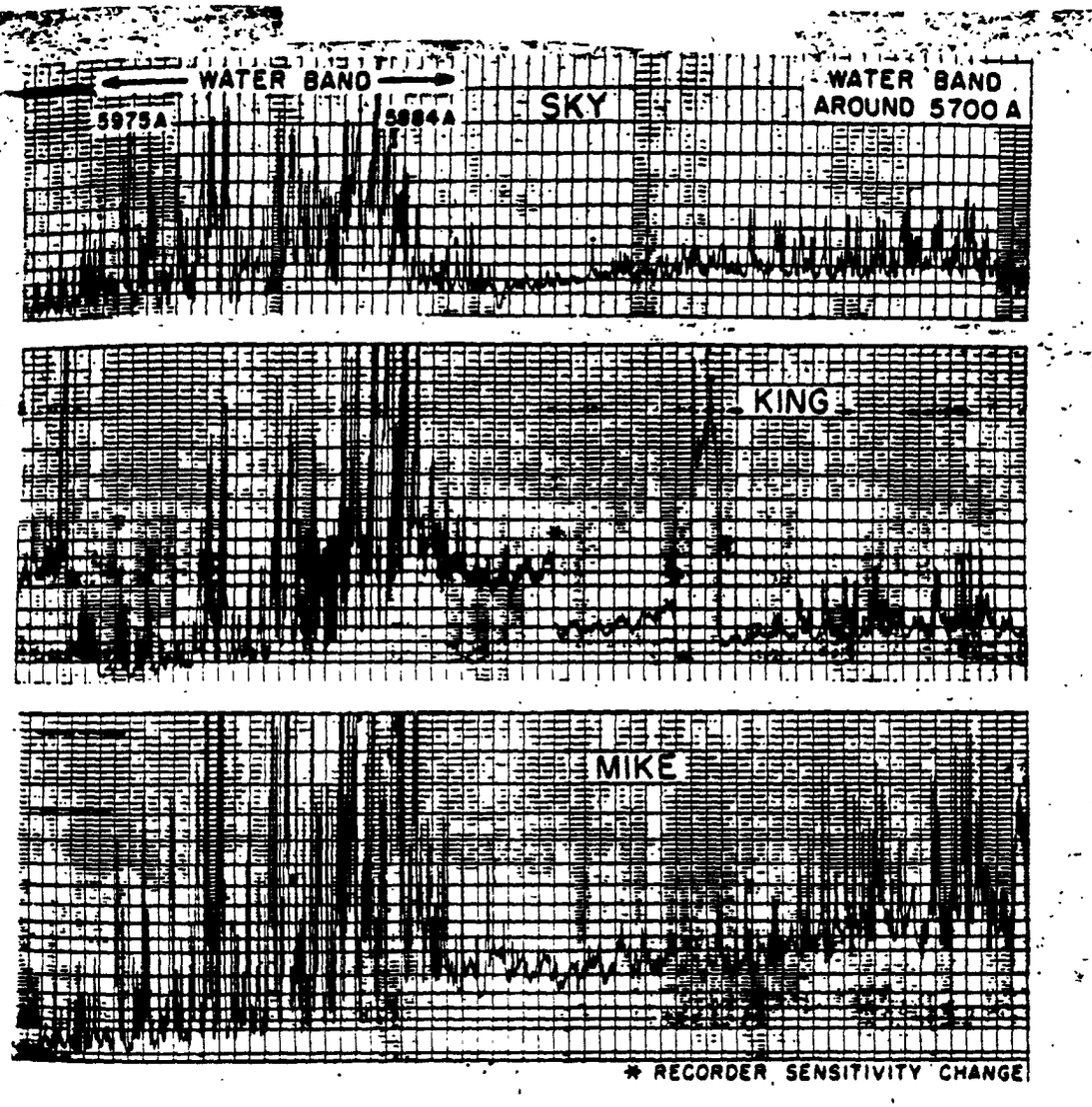

Fig. 4.5— Agreement of Mike and King (total) spectra with sky spectrum in 5925 A region.

4.4.2 Mike and King

Above about 5200 A, the observed absorption spectra of bombs can be accounted for almost entirely by the absorption of the normal atmosphere between the explosion and the point of observation. The absorption structure is mainly due to water vapor and oxygen molecules. This is easily seen by examining the plates with an eyepiece; but to make the comparison more quantitative, microphotometer traces of the long-wavelength region (up to about 6500 A) of a sky spectrum taken during the Ivy tests have been compared with traces of Mike (total) and King (total and first maximum). Figure 4.5 shows how these traces agree in the region of 5925 A. Except for some oxygen I lines at 5328, 6156, 6155, and 6158, 7771, 7774, and 7775 A and very probably nitrogen I lines at 5357, 5281, and 5369 A on the Ivy plates, a comparison of the Ivy and sky plates shows them all to be the same in this region. At about 5450 A, Mike appears to have an open structure band not found in the sky or King.

There is a group of absorption lines in the neighborhood of 5040 A which appears in Mike and King but does not appear exactly the same in the spectrum of the sky. It cannot be identi-

fied at present. It may be due to an unreported band of water vapor or NO_2. It does not, however, have the appearance of a typical NO_2 section of spectrum.

With regard to atomic spectra present in Mike and King, no atomic lines are prominent below 4800 A. However, since every single line in this region has not yet been identified, some might be present. The three atomic oxygen lines at 7771, 7774, and 7775 A, observed in the total King and in the King first-maximum spectra, are very broad. A further study of their appearance is suggested. This region in Mike was blackened by accident, and measurements were impossible.

Sodium lines at 5890 and 5896 A are observed in Mike and King but are of no special interest here.

4.5 ROTATIONAL AND VIBRATIONAL TEMPERATURES

Information on temperature is rather meager, especially for the Ivy shots. It was not possible to obtain any value from the Mike spectra and only one value for King.

Rotational temperatures were calculated by both the maximum method and the slope method using the measured intensities and J values for the R-branch of the S-R 0-13 and S-R 0-15

Table 4.7—APPROXIMATE ROTATIONAL TEMPERATURES

Shot	Yield, kt	Exposure time	S-R O_2 band	$J_{max.}$	Temp. by max. method, °K	Temp. by slope method, °K
Buster Charlie	14.0	0–20 msec	0-13	11	700	600
Tumbler-Snapper 3	30.7	Total	0-13	37	8,000	2,500
Buster Charlie	14.0	0–20 msec	0-15	9	400	
Tumbler-Snapper 3	30.7	Total	0-15	40	10,000	5,000
Tumbler-Snapper 7	14.6	0–100 μsec	0-15	11	700	
King	540.0	1.0–1.1 sec	0-15	40	10,000	10,000

bands as given in Tables 4.2 and 4.3. These temperatures are listed in Table 4.7. The graphs of $\log_e [I/(2J + 1)]$ vs E from which the "slope" temperatures were determined are shown in Figs. 4.6 and 4.7. In these graphs the rotational energy is that of the lower state and is plotted in wave numbers (cm^{-1}). (See Sec. 1.3 for comment on the maximum method.)

Theoretically, the same temperature should be arrived at by both methods for a certain shot; but, as seen in Table 4.7, the 0-13 S-R band of Buster Charlie gave about 600°K by the slope method as compared with 700°K by the maximum method. Similar variations were obtained for the other shots, except in the case of King where both methods gave roughly 10,000°K. The slope method is considered more reliable for obtaining rotational temperatures since more points were used in the determination. Both methods are affected by large error due to overlapping of branches and rotational components themselves.

The vibrational temperature of the early-time spectra is very high in comparison with the rotational temperature, as is evidenced by the existence of transitions from a very high vibrational level (v ranging in O_2 from 21 or so, upward). Calculation of this type of temperature is not possible at present because of lack of good data on transition probabilities, and, also, the experimental data which are measurable do not cover a wide enough energy range of the initial quantum state. Although it is true that thermal excitation does not produce these high vibrational levels at the early stage, it does seem that the levels could be thermally excited in the later stages. Before this can be verified, reliable transition probabilities over a wide range of observed frequencies should be determined.

An electronic temperature for O_2, for example, cannot be calculated because of lack of observation of different electronic levels from which transitions take place.

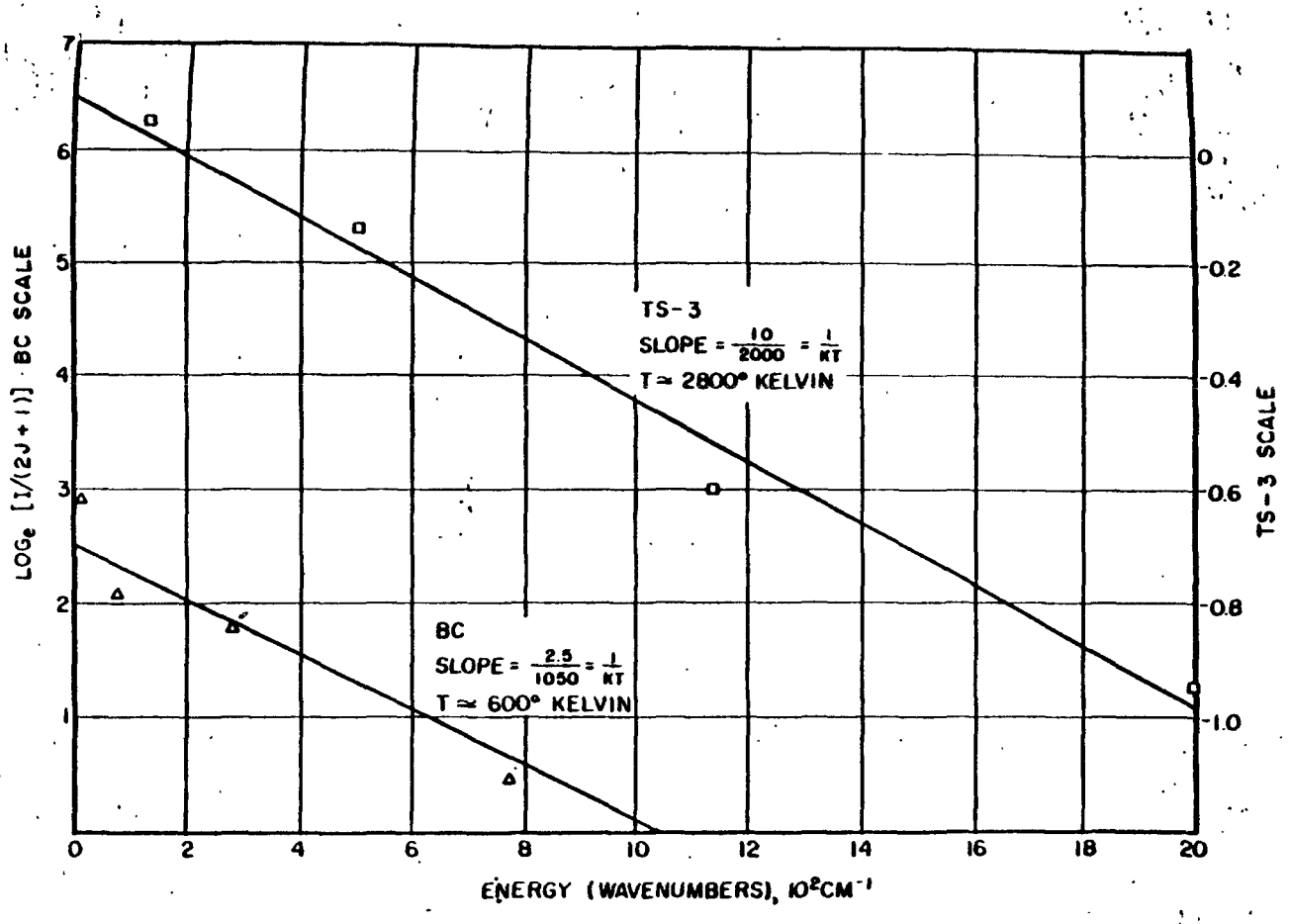

Fig. 4.6— Graph of rotational energy vs $\log_e [1/(2J + 1)]$ for S-R 0-13 band O_2 of Tumbler-Snapper 3 and Buster Charlie.

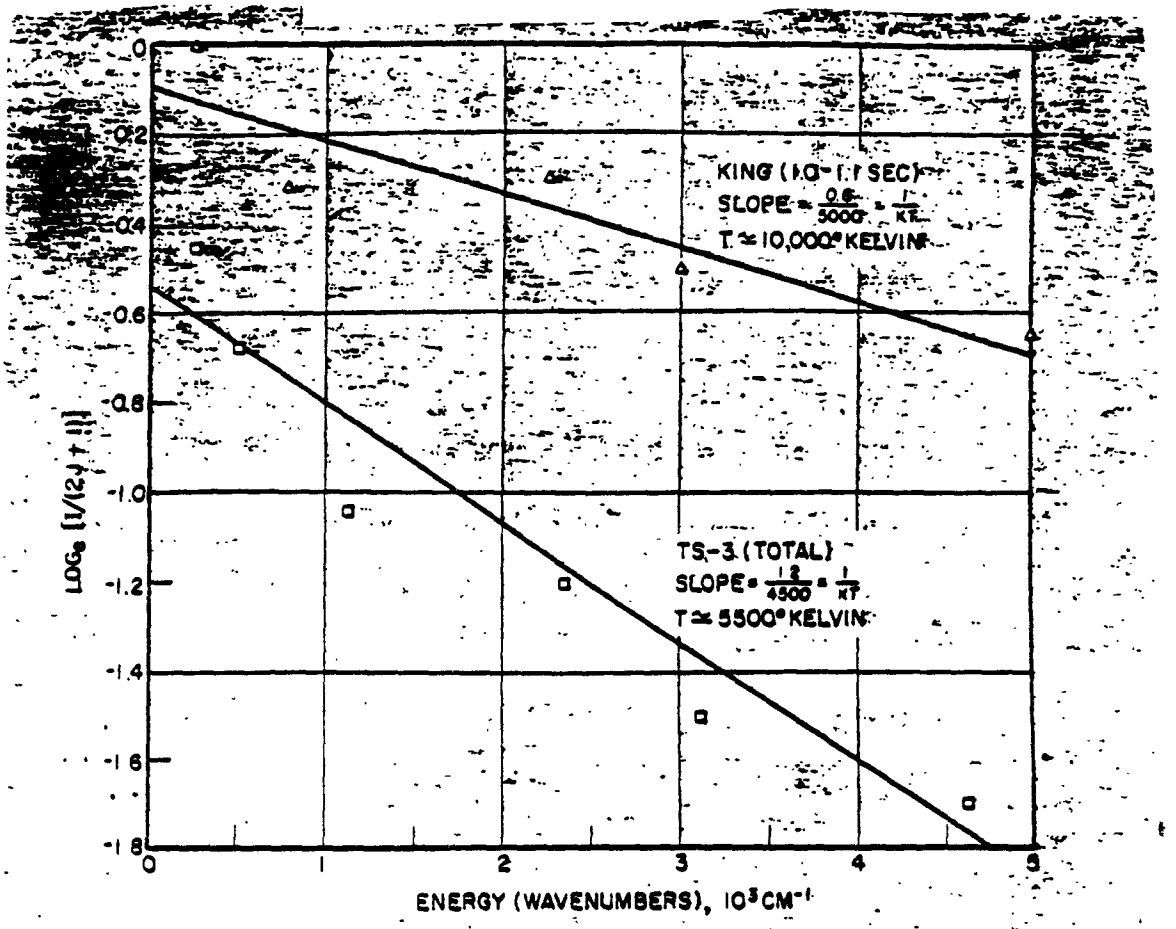

Fig. 4.7—Graph of rotational energy vs $\log_e [1/(2J+1)]$ for S-R 0-15 band O_2 of Tumbler-Snapper 3 and King.

The excitation of atomic oxygen to the high electronic level necessary for absorption by the triplet at about 7770 A is very large and may involve mechanism different from thermal excitation. However, these lines may have a relatively large intrinsic transition probability.

4.6 AMOUNT OF ABSORPTION

As already presented, Tables 4.2, 4.3, 4.4, and 4.6 give comparison of the strengths of absorption for various molecules, and, by totaling the intensities given, it is possible to compare the amounts or yields of absorbing materials excited to the initial vibrational and rotational levels for the various shots.

4.6.1 Oxygen

Table 4.2 shows the much greater yield of absorbing O_2 for a total-time shot like Tumbler-Snapper 3 compared to the early-timed Buster Charlie. Table 4.3 shows that King from 1.0 to 1.1 sec produced more than twice as much absorbing O_2 in the 0-15 band as did Tumbler-Snapper 3 over the life of the fireball. In Table 4.4, if the rough absorption values for three shots are compared for the same J value, it is shown that in Mike the values are greatest whereas in Tumbler-Snapper 3 they are the least.

4.6.2 Nitrogen Dioxide

NO_2 is known to be produced early in the life of an explosion. This is evidenced by its marked presence in the 0 to 20 msec plate from Buster Charlie and by its presence in greater strength in the 0 to 100 μsec plate from Tumbler-Snapper 7. The spectrum of Tumbler-Snapper 7 from about 4000 A higher is essentially that of NO_2, and below 4000 A there is a superposition of short S-R bands on the NO_2 plus broad bands of HNO_2. NO_2 appears fairly prominently in the Mike spectrum. It is interesting to note that NO_2 does not appear measurable in Tumbler-Snapper 3 or loom prominently in Tumbler-Snapper 3. A value of about 4 mm at STP has been roughly calculated for NO_2 in Tumbler-Snapper 7, and a value probably not too much in excess of this holds for Mike.

4.6.3 Ionized Nitrogen

At present there is no explanation for the spectral behavior of N_2^+. It is not easy to observe its presence in Mike, but in King (total) it is quite evident, as it is in Tumbler-Snapper 3. In the early-time shots, its presence in Tumbler-Snapper 7 and its absence in Buster Charlie are noteworthy. In Tumbler-Snapper 7 it is only the 3914 A band which appears; this is the 0-0 band due to a transition in which the molecule is initially in the vibrationless ground state. This points to a correspondingly low vibrational temperature. The rotational temperature for the same band was roughly calculated to be 4000°K, and in view of this high rotational temperature, it is hard to understand why the 1-0 transition band at 4278 A is not also in Tumbler-Snapper 7. This behavior differs from that of early O_2 for the same plate. The O_2 rotational temperature was only about 400°K, and yet so many high vibrational states are present.

Table 4.6 shows for the 4278 A band that there is a greater N_2^+ production in King (total) than in Tumbler-Snapper 2 (total). The 3914 A band occurs in both of these spectra also, but overlappings prevented intensity measurements of any value. It is difficult to say whether the rotational temperature for the N_2^+ shown in King (total) is higher than in Tumbler-Snapper 7. It is interesting that in the early first-maximum exposure for King the N_2^+ does not definitely appear. The foregoing statements give the observations, and, for lack of more detailed data, no explanation can be given here.

4.6.4 Iron

The appearance of iron is noted very briefly in Table 1.1 as well as in the composite wavelength table (Appendix A). Its presence or absence and its approximate cutoff value are given. The cutoff is an interesting and currently inexplicable phenomenon. It may be due to the superposition in time of many spectra to give a cutoff effect.

4.7 SUMMARY

There is a marked difference between early or first-maximum exposures and later or total-time exposures. The first-maximum spectrum in the 3000 to 4500 A region is considerably simpler than that of the second maximum since no casing material shows and the S-R bands have fewer rotational lines.

It can be considered in this report that four orders of magnitude of yield are being treated: Tumbler-Snapper 2 (yield 1.17 kt), Tumbler-Snapper 3 (30.7 kt), King (540 kt), and Mike (10,000 kt). The main features are material observed, amounts of absorbing material, the cutoff frequency, and temperatures. The spectra of these four shots plus that of Tumbler-Snapper 4 are summarized here.

4.7.1 Tumbler-Snapper 2 (1.17 kt, Airdrop, Total Time)

It shows aluminum and barium in absorption, also AlO. Iron in absorption is very prominent over the whole range. In fact, the S-R spectrum of O_2 is masked by the presence of the

iron lines. The spectral cutoff is given as 3450 A. No intensities or temperatures were measured here because of overlapping. (Tumbler-Snapper 1 is essentially the same.)

4.7.2 Tumbler-Snapper 3 (30.7 kt, Airdrop, Total)

AlO appears in emission. Barium and aluminum appear in absorption. One of the barium lines (4934 A) appears to show self-reversal with a broad emission shape. Iron begins at 4000 A and appears above this in emission. Calculations of the quantity of vibrationally excited O_2 and N_2^+ are given in relative terms. From a comparison of this with other shots, there is an indication of the scaling of the quantity of these with variance of yield. Rotational temperatures were calculated, and the best value seems to be about 2500°C.

4.7.3 Tumbler-Snapper 4 (19.2 kt, Airdrop, 0.6 to 5 Sec)

Iron covers the whole 4000 to 6000 A region in emission. Barium appears in emission as does AlO. This was not a good plate for line measurements; thus no temperatures or quantities of absorbers were calculated. N_2^+ and probably NO_2 are seen in absorption.

4.7.4 Mike (10,000 kt, Surface, Total Time)

O(I) and N(I) appear in absorption. No casing material shows. N_2^+ is surprisingly not very evident, but the production of excited O_2 molecules for the S-R absorption is increased beyond that in the lower yield shots. NO_2 appears fairly prominently. The high cutoff value here could not be measured accurately because of plate fogging, but it can be stated that it is at a higher wavelength than for any shot measured up to the present. It seems to lie around 3800 A.

4.7.5 King (540 kt, Airdrop, First Maximum and 0.1 to 1.1 Sec)

Casing material does not show here. O(I) and N(I) appear in absorption. The wavelength of the cutoff in King (1.0 to 1.1 sec) seems higher than in Tumbler-Snapper 3, an exact measurement being impossible. A higher cutoff would be consistent with a greater production of absorbing material. From the data for King (1.0 to 1.1 sec), a rather high rotational temperature of about 9000°C was obtained from an S-R band. This is a very rough value. This temperature seems high for this time which is beyond breakaway. Some calculations of the relative amount of absorbing material were made, and these show the trend of a moderate rise with increase of yield.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The spectra studied show, in a general way, what pattern of spectrum is to be expected. There is a hope of scaling the detailed spectrum in time and space as a function of the size of bomb. This will require many exposures taken at a great resolution and at relatively short intervals of time. At the same time the whole "volume" of the bomb and its surroundings should be scanned. This was the aim for Castle. From these measurements it would be hoped that quantitative values of the production and excitation of molecules and atoms responsible for absorption could be obtained, and thus the energy changes could be followed in fair detail over the life of the bomb.

REFERENCES

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2. R. B. King and A. S. King, Relative f-values for Lines of FeI and TiI, Astrophys. J., 87: 24 (1938).
3. M. Fassbender, Untersuchungen über das Negative Stickstoffbandenspectrum, Z. Physik, 30: 73 (1924).

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APPENDIX A

COMPOSITE TABLE OF WAVELENGTHS MEASURED

This composite wavelength table covers the wavelength region from the ultraviolet cutoff of the spectra in question up to approximately 5000 A. This limit was set because at the time it was concluded that practically all the characteristic parts of the spectra of atomic explosions were found below this value. Data for all explosions prior to Operation Ivy are not included but only those which were considered to be fairly typical.

The "iron" spectrum is given in detail for the Buster Baker shot. The values for iron are not given in all possible situations. They are not given above about 3500 A for Tumbler-Snapper 2 except in some cases where the notation "co" for coincidence (with standard iron spectrum) is used. The absence of wavelength values in Tumbler-Snapper 3 above about 4600 A indicates that only some very weak coincidences with the iron comparison spectrum are detected. (Please refer to the text for the regions which have been measured.)

The presence of an identification does not always mean that it is taken to be certain that the line is due to this material. A line of another material may be superimposed at this point. This may be true of OH, which was identified only by wavelength coincidence.

There are gaps in the identifications due partly to incomplete original research data, e.g., in the case of the S-R O_2 bands and NO_2 bands.

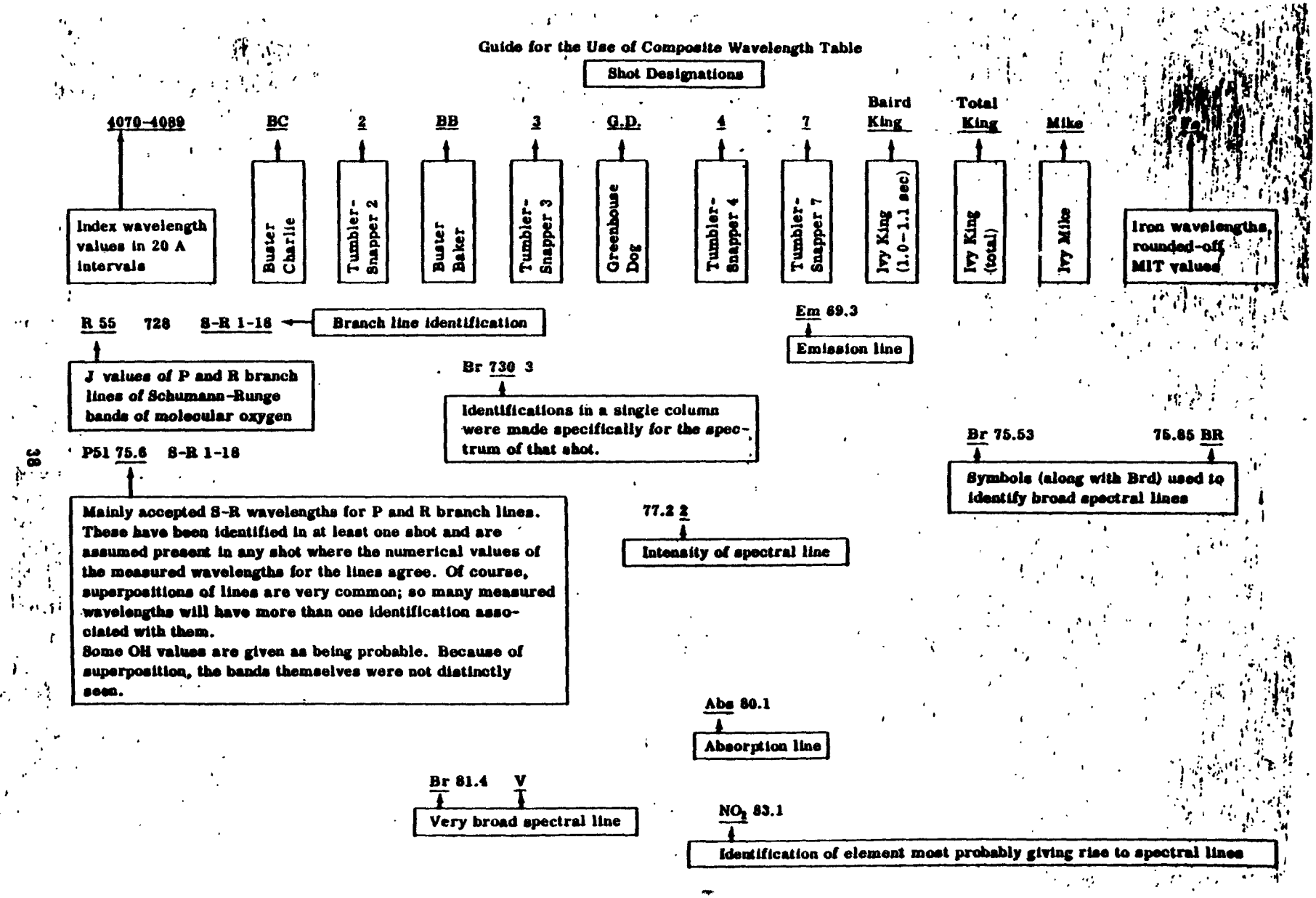
"Em" stands for emission, and "Br" or "Brd" either before or after the number stands for broad. "Dv" and "dr" mean degraded to the violet and red, respectively.

The numbers after the wavelength values are very rough relative estimates of the visual intensity. If no numbers are given, this indicates a rather weak intensity.

Brackets include a region of broad spectral absorption, or emission if specifically marked "em," and the intensity numbers generally refer to the region as a whole and should not be read separately.

All peaks have not been measured. Some wavelength values of weak lines hence are not given, e.g., in King (Baird) where measurements were not easy. The microphotometer traces of a forthcoming atlas will then be particularly useful.

Some irregularities have crept into the typing.


Guide for the Use of Composite Wavelength Table
Shot Designations
4070-4089
BC
2
BB
3
G.D.
4
7
Baird King
Total King
Mike
Fe
Index wavelength values in 20 A intervals
Buster Charlie
Tumbler-Snapper 2
Buster Baker
Tumbler-Snapper 3
Greenhouse Dog
Tumbler-Snapper 4
Tumbler-Snapper 7
Ivy King (1.0-1.1 sec)
Ivy King (total)
Ivy Mike
Iron wavelengths, rounded-off MIT values
R 55 728 S-R 1-16
Branch line identification
Em 69.3
Emission line
J values of P and R branch lines of Schumann-Runge bands of molecular oxygen
Br 730 3
Identifications in a single column were made specifically for the spectrum of that shot.
Br 75.53
75.85 BR
Symbols (along with Brd) used to identify broad spectral lines
P51 75.6 S-R 1-16
Mainly accepted S-R wavelengths for P and R branch lines. These have been identified in at least one shot and are assumed present in any shot where the numerical values of the measured wavelengths for the lines agree. Of course, superpositions of lines are very common; so many measured wavelengths will have more than one identification associated with them.
Some OH values are given as being probable. Because of superposition, the bands themselves were not distinctly seen.
77.2 2
Intensity of spectral line
Abs 80.1
Absorption line
Br 81.4 V
Very broad spectral line
NO2 83.1
Identification of element most probably giving rise to spectral lines

		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3050-3069												
				3051.40								
				56.05								
			Tl	58.05								3057.45
	60.43											
41	3060.62 S-R 0-11			60.45								60.99
	64.96 OH			64.95								65.31
	65.976 OH			66.00	Mn							66.48
	66.114 OH											
	68.60 OH		Fe	68.60	Pb							68.17
3070-3089												
	70.318 OH			3070.30								
	70.392 OH			71.00								
	70.478 OH											
	71.145 OH			71.45								
	72.009 OH			72.05	Zn							
	72.063 OH											
	72.107 OH											
	73.028 OH			73.00	TiII							
			Ce	73.65								
			Fe	74.25								3074.15
				75.10								
P45	75.79 S-R 0-11		Fe	75.75								75.72
P45	75.98 S-R 0-11											
			Fe	76.35								
	77.028 OH			77.00	Ca							77.17
R49	3077.77 S-R 0-11			77.85								77.64
R49	78.373 OH			78.35	NaII							
	79.951 OH			80.00	Fe							80.11
	80.006 OH											
	81.255											
	81.541 OH			81.60	Fe							81.66
	83.278 OH			83.30	CuII							83.03
												83.15
	84.05 OH											
P47	3084.05 S-R 0-11			84.05								
P47	84.23 S-R											83.74
	85.20 OH			85.20								85.20
	86.23 OH											
R51	3086.33 S-R 0-11			86.30								86.56
	87.35 OH			87.35								87.35
	87.45 OH											
												88.35
	89.01 OH			88.70								88.80
	89.75 OH			89.70								89.39
												89.61
												89.74

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fg
3090-3109											
	3090.38 OH		3090.38								3090.21
	90.49 OH										
	91.21 OH		91.20								91.19
	91.37 OH										91.58
P49	92.60 S-R 0-11		92.40								92.44
											92.76
	93.722 OH		93.70								93.36
											93.80
											93.84
	94.618 OH		94.55								94.32
											94.63
											94.90
	96.124 OH		96.10 Cr								96.21
	96.32 OH		96.40								96.04
			96.80								96.38
			97.90								96.83
	98.59 OH		98.65								97.81
	99.58 OH		99.55								98.58
											98.42
			Fe	3100.35 2							98.90
P51	3100.7 S-R 0-11			00.65 3							3100.38
	01.24 OH		01.25								99.87
											99.94
P51	01.70 S-R 0-11		01.65								01.88
	02.15 OH		02.35								
											02.14
											02.36
											02.64
											02.87
	03.28 OH		03.30								
											03.77
R55	04.05 S-R 0-11		04.20								03.94
R3	04.16 S-R 0-12										04.17
R55	04.27 S-R 0-11		04.60								
R5	04.60 S-R 0-12										
R7	05.38 S-R 0-12		05.35								
	05.68 OH		05.70								05.89
	06.03 OH		06.05								06.01
P6	06.30 S-R 0-12		06.35								
R9	06.51 S-R 0-12		06.60								
	07.46 OH		07.50 10								07.33
R11	07.97 S-R 0-12		07.90 10								07.98
			CuMn	08.65 1							08.06
			Ti	09.10 2							09.07

	BC	2	BD	3	G.D.	4	7	Solid King	Total King	Miles	Fe
3090-3109											
	09.33 OH										
P9	09.45 S-R 0-12		09.40 5								
R13	09.77 S-R 0-12		09.80 2								09.84
											09.98
3110-3129											
	3110.25 OH		3110.25 3								
											3110.10
		CoTi	10.60 2								10.28
			11.05 3								10.71
11	11.57 S-R 0-12		11.65 5								10.84
											11.68
15	11.92 S-R 0-12		12.15 10								11.82
	13.1 OH		13.15 1								12.08
	13.30 OH										
57	13.37 S-R 0-11		13.45 2								13.37
57	13.60 S-R 0-11										13.59
13	14.01 S-R 0-12		14.00 3								
17	14.4 S-R 0-12		14.35 10								14.29
	14.63 OH		14.80 10								14.68
	14.78 OH										14.78
		Till	15.10 1								15.36
		Calc	15.55 1								15.66
	16.26 OH	Ti	16.25 1								16.25
15	16.78 S-R 0-12		16.80 5								16.59
											16.63
											16.98
	17.20 OH		17.20 5								17.19
19	17.22 S-R 0-12										
	17.89 OH	Ti	17.85 10								17.64
											17.76
											17.89
		Ti	18.90 5								
	19.68 OH										19.49
											19.67
17	19.91 S-R 0-12		19.80 5								
21	20.41 S-R 0-12		20.50 5								20.23
											20.43
	20.60 OH										20.87
55	20.95 S-R 0-11		21.00 5								
55	21.13 S-R 0-11		21.80 5								21.77
	22.22 OH										22.30
	22.57 OH	Fe	22.45 5								22.55
		Ti	23.05 2								
P19	23.38 S-R 0-12		23.40 3								23.35
											23.55

	BC 2	BB 3	G.D. 4	7	Sand King	Total King	Mike	Fe
3110-3129								
R23	23.81 S-R 0-12	23.94 4						23.96
	24.92 OH	24.95 3						24.98
	25.33 OH	25.35 2						24.89
		Fe 25.65 1						25.27
	26.62 OH	26.55 10						25.65
R59	26.8 S-R 0-11							26.17
P21	27.20 S-R 0-12	27.20 5						26.78
R25	27.7 S-R 0-12							
R25	27.81 S-R 0-12	27.80 5						27.49
	28.10 OH							
	28.29 OH	28.25 5						28.29
	28.52 OH	28.65						
		Fe 28.90 3						28.90
		29.60 1						29.10
								29.33
3130-3149								
	30.27 OH	3130.30 5						30.37
	30.57 OH	30.60 2						30.54
		30.90 1						
P23	31.38 S-R 0-12	31.40 10						31.46
	31.45 OH							31.71
R27	31.93 S-R 0-12							
R27	32.06 S-R 0-12	Ca 32.10 10						32.61
		Fe 32.55 2						32.68
	33.22 OH	33.30 2						33.06
		Ni						33.23
R27	34.06 S-R 0-12	Fe 34.10 10						34.11
	34.34 OH	OH 34.35 10						34.49
		Ti 34.65 10						
		35.00 1						35.36
								35.46
								35.68
P25	35.9 S-R 0-12	35.95 2						35.88
	36.20 OH	36.25 1						
R29	36.5 S-R 0-12							36.49
R29	36.83 S-R 0-12	36.85 5						36.89
		Co 37.00 5						
		BaPb 37.90 10						37.70
		AgFe 38.00 1						38.41

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	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3130-3140											
	39.17 OH		39.16 5								39.16
			Co 39.65 5								39.65
											39.90
	40.503 OH		40.55								40.30
	40.731 OH										40.73
P27	40.67 S-R 8-12										
P27	40.78 S-R 8-12		40.70 5								
			Ca 41.20 1								
R31	41.44 S-R 8-12										
R31	41.58 S-R 8-12		41.60 5								
	41.909 OH		41.95 10								41.88
			Fe 42.50 3								42.45
	43.02 OH		43.00 4								42.88
			43.45 5								43.24
			Ti 43.75 5								
	43.797 OH		43.95								43.98
	44.284 OH										
	44.424 OH		44.40 5								44.49
			FeII 44.80								44.78
			FeCr 45.10 3								45.05
	45.53 OH		45.55 3								45.51
P29	45.91 S-R 8-12										
P29	46.02 S-R 8-12		46.00 3								
	46.60 OH		46.60 10								46.47
R33	46.70 S-R 8-12		46.80 3								46.74
R33	46.9 S-R 8-12										
			Ba 46.95 3								
	47.27 OH		FeCr 47.25 10								47.29
	47.45 OH		47.45 10								47.60
											47.79
	48.44 OH		Cr 48.45 3								48.41
			Fe 48.90 1								48.91
	48.95 OH		49.95 10								49.84
3160-3169											
			Fe 3150.30 1								50.30
	51.01 OH		51.05 3								51.00
31	51.48 S-R 8-12										51.35
31	51.5 S-R 8-12										
31	51.61 S-R 8-12		51.60 3								51.86
33	52.39 S-R 8-12		52.40 10								52.02
33	52.54 S-R 8-12		Fe 53.20 9								53.20
											53.36
											53.74

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3150-3169											
		Fe	54.30 1								
	54.50 OH		54.60 10								
		Fe	55.10 1								
		Fe	56.25 5	3156.25 0							
	56.85 OH		56.90 3								
	57.11 OH	Fe	57.15 3	57.10 0							
P33	57.43 S-R 0-12										
P33	57.58 S-R 0-12		57.55 10								
		Fe	57.95								
P37	58.45 S-R 0-12										
P37	58.58 S-R 0-12		58.56 10								
P37	58.807 OH										
		Ca	58.95 1	58.80 0							
			59.15 1								
		Ni	59.55 1	59.50 0							
		Cr	59.85 1								
	60.067 OH	Cu	60.05 3	60.25 0							
	60.80 OH		60.85 3								
				61.00 0							
	61.89 OH	Fe	61.90 10	61.85 0							
		Ti	62.55 2	62.65 0							
	63.22 OH	Fe	63.25 2	63.05 0							
				63.40 0							
R35	63.76 S-R 0-12										
R35	63.91 S-R 0-12	Fe	63.90 3	64.00 0							
	64.85 OH		64.55 10	64.60 0							
R39	64.83 S-R 0-12										
R39	65.0 S-R 0-12		64.95 10								
				65.30 0							
				65.25 3							
	66.34 OH		66.40 10								
				66.70							

	BC	2	99	3	G.D.	4	7	Sated King	Total King	Mike	Fe
3150-3169											
	67.18 OH		67.20 1	67.25							
		Fe									
			67.95 2	67.75							67.86
											67.92
				68.15							68.15
				68.50							
	68.668 OH		68.75 1								68.85
			69.10 3	69.05							
	68.982 OH			69.11							
	69.813 OH	CrCu	69.70 2	69.55							69.61
	69.864 OH		69.90 1								
3170-3189											
				3170.15							70.34
P37	70.45 S-R 0-12										
P37	70.6 S-R 0-12		70.60 5	70.70							
R41	71.59 S-R 0-12	Fe	71.40 1	71.55							71.35
R41	71.76 S-R 0-12		71.75 10	71.80							71.66
		Fe	72.05 1								72.06
			72.35 1								
	72.99 OH		73.05 2								
	73.21 OH		73.25 2	73.20							73.41
	73.816 OH	Fe	73.80 1	73.95 3							73.61
											73.68
	74.38 OH										
	74.49 OH		74.45 10	74.50							74.96
		Fe	75.10 7	75.20							75.03
											75.08
		Fe	75.40 7	75.60							75.44
											75.98
		Fe	76.05 1	76.15							
		Fe	76.45 1								76.36
				76.80							
P39	77.53 S-R 0-12	FeII	77.45 1	77.50							77.53
	77.68 OH										77.67
P39	77.7 S-R 0-12		77.65 5								
		Fe	78.10 2	78.05							78.01
				78.30							
R43	78.77 S-R 0-12										78.54
R43	78.92 S-R 0-12		78.90 2								78.98
				79.10							
		Ca	79.35 1	79.40							79.50
			79.65 1								
	80.01 OH		80.05 5	80.05							80.16
		Fe	80.30 5								80.22
	80.49 OH		80.55 5	80.45							

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3170-3189											
			Fe 80.70 1	80.95							80.75
			Fe 81.55								
	81.645 OH		Ni 81.75 5	81.75							81.52
											81.85
											81.90
											82.06
			Sr	82.30							
	82.965 OH		Fe 83.05 5	83.00 3							82.97
				83.10							83.10
	83.509 OH		Fe 83.50 2								83.57
			Ti 84.00 1	84.00							84.10
			Fe 84.80	84.75							84.96
P41	85.00 S-R 0-12		85.00 10								
P41	85.14 S-R 0-12										
			FeII 85.20	85.30							85.31
	85.795 OH		85.80 1								
	86.11 OH		86.15 10	86.00							
R45	86.33 S-R 0-12										
R45	86.5 S-R 0-12		86.45 10	86.55							86.74
			Fe 86.85 1								
			Fe 87.15 1	87.15							87.16
											87.29
				87.45							
			87.80 1	87.80							87.68
	88.01 OH		88.15 2	88.25 brd							88.02
											88.57
			Fe 88.85 2								88.92
				89.00 shp							
	89.312 OH		89.35 1	89.35 shp							
			89.70 1	89.75 shp							
			Fe 89.95 1								
3190-3209											
	90.28 OH		90.25 1	90.35 brd							90.01
	90.802 OH		TiII 90.80 1								90.65
											90.81
			FeCo 91.20 1	91.30 brd							91.11
	91.784 OH		91.80 2	91.90							91.65
			CoII 92.20 2								92.06
	92.356 OH		Fe 92.45 2	92.45							92.40
											92.50
P43	92.83 S-R 0-12		92.90 10	93.05							92.80
											92.92
P43	93.01 S-R 0-12										
	93.06 OH										

		SC	S		SD	S	G.D.	Baird King	Total King	Mike	Fe
3190-3200											
				Fe	93.40 1						93.23
											93.30
				Ba	93.90 1	93.90 brd					93.80
											93.97
B47	94.25 S-R 0-12										
B47	94.43 S-R 0-12			Fe	94.45 3	94.40					94.42
											94.50
	94.845 OH				94.95 2	94.95					
				Ba	95.15 2						
					95.35 2	95.30					95.23
	95.554 OH				95.60 2	95.65					
				Fe	96.10 2	96.10					96.07
											96.12
						96.55					
				Fe	97.00 2						96.93
											96.99
					97.65 1	97.70 shp					97.51
					97.95 1						
						98.10					
					98.55 1	98.50					98.26
											98.48
	99.14 OH				99.10 5	99.15					
				Fe	99.50 5	99.60					99.52
						3200.10					
					00.35						00.47
				Fe	00.55 5	00.60					00.78
	00.96 OH										
P45	01.08 S-R 0-12				01.05						
P45	01.24 S-R 0-12	01.0 O_2?			01.25 3	01.20 brd					
				Ti	01.65 1	01.80 brd					
					01.95 1						
B49	02.48 S-R 0-12			TiFe	02.40 2	02.30 shp					02.56
	02.70 OH										
B49	02.78 S-R 0-12				02.75 6	02.85 shp					02.85
											03.05
					03.30 1	03.20					
						03.54					
	03.98 OH				03.95 2	04.05 3					
						04.45					
						04.60					
				Fe	05.40 3	05.20					05.40
				Ti	05.75 3	05.75 brd					
	06.24 OH				06.30	06.30					
	06.518 OH				06.60 2	06.60					
	06.76 OH				06.75 2	06.85 brd					
					07.20 1						07.08

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3190-3209											
		Fe	07.70 1	07.65							07.65
			08.15	08.15							
	08.7 OH	Till	08.60 2	08.60 0							08.47
				08.85 0							
	09.433 OH	Fe	09.25								09.29
P47	09.71 S-R 0-12		09.45 5	09.55 0							
P47	09.89 S-R 0-12		09.90 5								
3210-3227											
	10.04 OH			10.10 brd							10.23
	10.50 OH		10.55 5	10.50 brd							10.45
	10.72 OH										10.65
	10.78 OH	Fe	10.80 5	10.85							10.83
B51	11.32 S-R 0-12										
B51	11.51 S-R 0-12	Fe	11.50 5	11.55							11.48
											11.60
											11.80
	11.95 OH										11.90
	12.10 OH	Fe	12.05 5	12.15 brd							12.17
		Ca	12.50 3								
	12.65 OH	Ba	12.70 3	12.65 brd							
	12.83 OH										
	12.93 OH		12.95 3	13.05 brd							
	13.470 OH		13.55 3	13.50 shp							13.31
	13.740 OH		13.85 3	13.80 shp							
	13.99 OH	Fe	14.10 3	14.15 shp							14.04
	14.490 OH		14.50 3	14.50 0							14.39
		Ti	14.90								
	15.009 OH		15.05 3	15.05 wide							15.22
											15.41
				15.55 0							
	16.09 OH	Fe	15.95 3	15.90 0							15.94
				16.30							
	16.532 OH		16.60 1	16.65 shp							
	17.08 OH		17.10 3	17.15							
		Fe	17.40 3								17.38
	17.83 OH			17.70							
	18.06 OH		18.20 3	18.15							
				18.80							
P49	18.74 S-R 0-12		18.90 3	19.00							
P49	18.9 S-R 0-12										
	19.435 OH	Fe	19.55 2	19.50 brd							19.56

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3210-3227													
				Fe	19.80	20.00							19.81
R53	20.49 S-R 0-12				20.55 5	20.70							
R53	20.7 S-R 0-12				20.70 5								
	21.13 OH				21.20 1	21.30 shp							
	21.627 OH				21.65 2	21.75 shp							21.93
				Fe	22.10 4	22.15 shp							22.08
	22.75 OH					22.50							
					22.80 2	22.90							
		3222.93 0											
	23.37 OH		3223.45		23.40 2	23.45 shp							23.26
													23.45
	23.75 OH			Fe	23.80 1	23.90							23.84
				Ca	24.25 2								
		24.20	24.40			24.40							
	24.88 OH				24.95 1	24.95							24.93
	25.09 OH												
	25.16 OH												
	25.25 OH				25.25 4	25.35							
					25.55 4								
			25.80	Fe	25.80 4								25.78
					26.05 1	26.25							26.02
	26.443 OH			Co	26.50 4	26.55 2							26.38
					26.80 2	26.95 2							26.72
		26.85 1		Fe	27.10 2								27.06
	27.44 OH					27.25 2							
	27.2 03					27.60 1							
P51	28.18 S-R 0-12	28.09 OH		Fe	27.80	27.95 1							27.74
													27.80
													27.99
3228-3249													
P51	28.42 S-R 0-12			Fe	28.30 5	28.40							28.25
	28.89 OH			Fe	28.75 3	28.80							28.59
													28.90
		28.75 0											
				Fe	29.10 3	29.20							29.12
						29.70							29.59
													29.79
R55	30.03 S-R 0-12	30.0 OH		Fe	30.15 10	30.10 2							29.87
													29.99
R55	30.26 S-R 0-12												30.21
						30.45 2							
	30.73 OH				30.80 5	30.90 brd							30.96

		PC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Pe
3228-3249												
				31.00 3								
	31.20 OH	31.10 0			31.30 2							
	31.47 OH				31.50 2							31.50
												31.71
					31.95 0							
					32.55 2							
R3	32.74 S-R 0-13	32.70 0		32.85 3								32.78
	32.97 OH											
R5	33.22 S-R 0-13			33.15	33.00 2							33.05
		33.30 1		Fe 33.30 6								
					33.45 2							
	33.65 OH											
	33.75 OH			33.80 4	33.80 2							33.97
	33.96 OH											
R7	34.0 S-R 0-12	33.95		Fe 34.05 6	34.20 2							
				34.60 1								34.61
P5	35.10 S-R 0-13			35.20 6								
P5	35.18 S-R 0-13											
R9	35.20 OH	35.25 1	35.30		35.35 3							
				35.55 1								35.59
												35.83
				Fe 36.25 1								36.32
P7	36.50 S-R 0-13	36.70 1		36.65 6	36.75 2							37.22
R11	36.73 S-R 0-13											37.40
												37.61
	36.93 OH				37.15 1							
	37.57 OH				37.70 1							
P9	38.41 S-R 0-13	38.55 1		38.50 6	38.45 1							
	38.54 OH											
R13	38.58 S-R 0-13		38.70		38.65 1							
	38.89 OH											
	39.17 OH			39.05 3	39.05 1							39.03
				Fe 39.35 3	39.35 1							39.43
R57	39.99 S-R 0-12			39.70 3	39.80 1							
R57	40.22 S-R 0-13			40.15 3	40.25 1							40.01
	40.67 S-R 0-13	40.85	40.75	40.70 6	40.85 3							
	40.72 S-R 0-13											
	40.74 OH											
	41.46 OH		41.55	41.45 1	41.60 2							41.58
			42.15	42.10 1	42.25 1							42.37
	42.81 OH				42.80 2							
P13	43.18 S-R 0-13		43.30	43.30 10								43.18
P13	43.196 OH	43.45 1			43.50 2							43.40
												43.78

		BC	S		SS	S	G.D.	4	7	Baird King	Total King	Mike	Fe
3228-3249													
	44.34 OH		44.25	Fe	44.30 8	44.45 shp							
					44.90 1								
	45.06 OH					45.15 1							
						45.75 1							45.98
P15	46.10 S-R 0-13				46.20								
R19	46.27 S-R 0-13												
R19	46.37 S-R 0-13	46.35 1			46.40 10	46.40 3							46.48
						46.95 ½							46.96
	47.61 OH			Cu	47.55 10	47.50 2							47.17
													47.21
P55	48.32 S-R 0-12												47.27
													47.38
P55	48.54 S-R 0-12					47.80 2							48.20
P17	49.4 S-R 0-13		48.45		48.50 6	48.60 3							49.03
R21	49.45 S-R 0-13				49.40 5	49.30 3							49.19
R21	49.58 S-R 0-13	49.60	49.55		49.65 5	49.70 3							49.55
													49.85
3250-3269													
R59	50.42 S-R 0-12				50.50 4								50.39
R59	50.73 S-R 0-12		50.65		50.70 5	50.70 3							50.62
	51.36 OH		51.25		51.30 4								51.23
	51.60 OH					51.50 3							
			51.75		51.95 4								
						52.10 3							
	52.60 OH		52.50		52.55 4								52.43
P19	52.96 S-R 0-13					52.75 2							52.92
P19	53.04 S-R 0-13				53.00 6	53.10 2							
R23	53.23 S-R 0-13												
R23	53.35 S-R 0-13	53.25 1			53.35 6	53.55 2							
				Fe	53.70 1								53.60
	54.08 OH			Fe	53.95 4	54.10 1							53.63
													53.94
				Fe	54.25 4	54.40 1							54.36
			54.80		54.70 1	54.85 ½							54.73
	55.49 OH					55.30 ½							
			55.55		55.70 1	55.85 1							
	55.92 OH		56.10		55.90 3								55.89
						56.45 1							56.89
P21	56.97 S-R 0-13	56.80 1			57.05 4	57.15 2							57.11
P21	57.06 S-R 0-13												
R25	57.26 S-R 0-13		57.45	Fe	57.35 4	57.50 2							57.24
R25	57.41 S-R 0-13												57.59
				NaII	57.90 3	58.15 3							57.89

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Miles	Fe
3260-3280													
P57	59.05 S-R 0-12				59.90	59.85 1							59.77
P57	59.23 S-R 0-12		59.25		59.20 4	59.40 3							59.04
	59.97 OH												
	60.10 OH		60.10	Fe	60.05 1	60.10 1							60.09
				Fe	60.25 1								60.20
	60.46 OH					60.50 1							
						60.85 1							
R81	61.29 S-R 0-12												
R81	61.40 S-R 0-12		61.35		61.45 15	61.50 2							61.33
P35	61.68 S-R 0-13												
P35	61.83 S-R 0-13	61.85 1			61.80 5								
						62.00 2							62.01
	62.70 OH					62.70 1							62.26
	63.11 OH					63.20 1							
					63.45	63.50 1							63.07
													63.36
	63.83 OH				63.80 1	63.95 1							
	64.18 OH												
	64.30 OH				64.35 1	64.35 0							64.61
	64.8 OH			Fe	64.85 1	64.75 0							64.71
	65.2 OH		65.10	Fe	65.05 1	65.25 0							65.04
			65.55	Fe	65.55 1	65.50 2							65.61
P25	66.04 S-R 0-13												
P25	66.15 S-R 0-13		66.20		66.10 2	66.20 2							
R29	66.43 S-R 0-13												
R29	66.59 S-R 0-13	66.25 1			66.50 2								66.83
	66.85 OH					66.70							
	67.06 OH												
	67.26 OH		67.10		67.10 2	67.15 2							67.03
			67.70		67.60 1	67.70				67.6			
			68.25	Fe	68.30 1								68.22
						68.55							
				Co	68.90 1								68.59
	69.04 OH					69.12 2							
	69.80 OH				69.75 2	69.80 2							69.23
													69.77
													69.95
3270-3280													
					70.35 2	70.50 2							
P27	71.14 S-R 0-13		71.30	Fe	71.15 3	71.35 2							71.01
P27	71.34 S-R 0-13												
R31	71.58 S-R 0-13	71.55 0	71.50	Fe	71.55 2	71.55 2							71.48
R31	71.74 S-R 0-13												71.60

		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3270-3269												
R31	72.23 OH			72.10 1	72.30 1							
			72.70	72.70 2								72.59
												72.70
				72.85	72.95 2							
				73.45 2								73.49
	73.74 OH			73.75	73.65 2							
	74.20 OH			Fe 74.05 5	74.20 1							
	74.51 OH			74.55 1	74.65 1							74.45
	74.88 OH		74.95	74.90 1								
	75.22 OH				75.15 1							
				75.65 1	75.80 1							
	76.24 OH											
	76.49 OH				76.40 1							
R29	76.62 S-R 0-13		76.75	76.75 5	76.85 3							76.46
												76.60
R33	77.10 S-R 0-13	76.90 0										
R33	77.26 S-R 0-13		77.30	77.25 5	77.35 3							77.34
	77.33 OH											
			77.8	77.70 1								
	78.00 OH				77.95 1							
					78.25 1							
	78.60 OH			78.50								
	78.80 OH			Fe 78.75	78.65 1							78.73
	79.13 OH		79.35	79.20 2	79.35 2							79.14
			79.85	79.80 2	79.75 1							79.65
												79.73
	80.16			Fe 80.20 2	80.35 2							80.26
			80.80	80.75 1	80.90							
				81.35 3	81.25 1							81.30
					81.55 1							
				81.90 3								
			82.05		82.10 2½							
P31	82.5 S-R 0-13											
P31	82.64 S-R 0-13		82.60	82.55 4	82.70 2½							82.44
R35	83.02 S-R 0-13		83.25	83.05 4	83.25							82.89
R35	83.2 S-R 0-13											83.42
	83.52 OH				83.70							83.54
	83.90 OH				84.05							
	84.49 OH		84.60	Fe 84.55 2	84.45 2							84.58
	85.03 OH				84.90 1							
			85.35	85.20 1	85.30 0							85.20
					85.80 1							85.41
	86.24 OH											86.02
	86.59 OH				86.35 1							86.44
				Fe 86.75 8	86.75 1							86.75

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3270-3289													
	87.29 OH				87.25 1	87.45 1							87.11
	87.73 OH		87.70		87.70 1	87.90 1							87.67
	88.12 OH												
P33	88.73 S-R 0-13		88.25		88.20 1								
P33	88.88 S-R 0-13												88.85
	88.80 OH		88.90		88.80 10	88.95 3							88.96
R37	89.32 S-R 0-13												89.34
R37	89.5 S-R 0-13		89.45		89.40 10	89.55 3							89.43
3290-3309													
					90.35	90.55 1				90.10			90.04
						90.95 1							90.71
					91.05								90.98
	91.26 OH				91.30	91.35 1							
	91.51 OH				91.85	91.80 1							
	91.67 OH		92.05	Fe	92.10 2	92.25 1							92.02
	92.58 OH		92.55	Fe	92.55 2	92.60 1							92.59
						93.10 1							
	93.57 OH				93.50 2	93.60 1							93.14
			94.05		93.95 5	94.10 2							
						94.70 1							
						95.10 1							
P35	95.37 S-R 0-13												
P35	95.51 S-R 0-13		95.45		95.50 5	95.65 2							95.42
	95.62 OH		96.05										95.81
R39	96.11 S-R 0-13												
R39	96.2 S-R 0-13		96.20		96.20	96.30 2							
	96.24 OH												
	96.32 OH		96.45		96.55 5								96.46
	96.37 OH												
			96.80		96.80 2	96.75 1½							96.80
					97.10	97.25							
					97.45 1	97.60 1							
			97.90		97.90	97.95 1							97.89
	98.32 OH		98.10		98.20 1								98.13
					98.50 1	98.45 1							
	98.7 N_2^+				98.75 1	98.80 1							
	99.39 OH		99.25		99.40 1	99.45							99.07
						3300.00							
						00.40							
	00.86 OH					00.80 1							

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3290-3309													
			3301.25		01.20 2	01.25 1							01.22
					01.40								01.42
	01.86 OH		01.90		01.90 1								
P37	02.39 S-R 0-13		02.40 Na			02.25							
P37	02.55 S-R 0-13		02.65		02.50 10	02.60 3							02.85
R41	03.11 S-R 0-13												03.47
R41	03.28 S-R 0-13		03.35		03.25 10	03.30 3							03.56
					04.00	04.05 ½							
					04.30 1	04.45 ½				3304.30			
	04.74 OH		04.80		04.80 1	04.90 1							
			05.30		05.25 1	05.35 1							05.13
	05.64 OH				05.70 5	05.70 1							
	06.00 OH			Fe	05.95 5	06.00 1							05.97
						06.12 1							
				Fe	06.40 5	06.45 1							06.35
				Fe	06.55 5								
	06.72 OH				06.85	06.75 1							
					07.20 1					07.30			07.01
													07.14
													07.23
			07.70			07.55 0							
	08.0 N_2												
	08.10 OH				07.95 1	07.90 0							
	08.34 OH		08.40			08.20 2							
						08.60				08.8			
						09.30 0							08.74
P39	09.79 S-R 0-13		09.50		09.45 3	09.60 2							
P39	09.86 S-R 0-13		09.90		09.90 3								
3310-3329													
			10.00			10.00 2							
R43	10.6 S-R 0-13		10.55	Fe	10.60 3								10.34
													10.48
R43	10.76 S-R 0-13		10.75			10.75 2							
R43	11.14 OH		11.20		11.10 1	11.20 1							
			11.50	Fe	11.40 1	11.55 1							11.45
	11.9 OH				11.70 ½								
	12.05 OH					12.10 0							
			12.35	Ni	12.35 1	12.55				12.75			12.22
													12.70
						13.00 0							
			13.55 Br		13.40	13.60 1							13.72
						14.05 0							
			14.40			14.45 0							

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3310-3329													
			14.70	Fe	14.65 1								14.07
													14.44
				Fe	14.75 2	14.95 2							14.74
	15.48 OH		15.60		15.45 1								
	15.50												
										16.05			
	16.4 OH				16.40 1	16.4							
					16.65 1	16.85 1							
			17.10	Fe	17.10 1								17.12
P41	17.61 S-R 0-13		17.60			17.40 3							
P41	17.79 S-R 0-13		17.80		17.70 3	17.85 3							
			18.00										
	18.37 OH												
R45	18.44 S-R 0-13		18.45										
R45	18.64 S-R 0-13		18.70		18.55 3	18.60 3							
	19.05 OH					19.15 1							
			19.30	Fe	19.30 1	19.45 1							19.24
			19.60		19.55 1	19.65 1							
					19.95 1								
				Ni	20.20 1	20.15 1							
			20.70	MnFe	20.65 1	20.55 0							20.65
					20.95 1	20.75 1							20.77
						21.20 0							
			21.55 4		21.60 1	21.60				21.65			
						22.20 0							
	22.48 OH			Fe	22.50 5	22.50 3							22.47
			22.95 4		22.85 2								
						23.10 1							23.06
			23.75	Fe	23.70 2	23.55 1							23.73
						24.00 1							
			24.55	Fe	24.50 2	24.60 1				24.60 1			24.36
													24.53
					24.90 1	25.00 1							24.78
					25.10 1	25.20 1							
			25.50	Fe	25.45 1	25.60 1							25.46
P43	25.83 S-R 0-13		25.84		25.95 5								
P43	26.03 S-R 0-13		26.05			26.05 3							
R47	26.73 S-R 0-13		26.80		26.80 5								
R47	26.94 S-R 0-13		26.95			26.95 3				27.60			
			27.50	NiFe	27.45 1	27.55 1							27.49
				Fe	28.00	28.00 1							27.95
				Cr	28.30 1	28.45							28.86
			28.85	Fe	28.90 3	29.05 2							29.05
	29.64 OH		29.60 1	NiCo	29.45 2	29.65 2							29.53

		BC	S		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3330-3349													
			3330.00		3330.00 1								30.31
			30.30			30.30 1							
			30.65		30.65	30.80 1							
					31.10 1	30.95 1							
						31.30 1							
			31.70	Fe	31.65 1					31.70			31.61
					31.95 1	31.95 1							31.77
			32.25										
					32.45 1	32.60 2							
			32.95		32.85 1	33.05 2							
			33.60		33.55 ½								
						33.80 1							
				Fe	34.20 2	34.20 1							34.21
P45	34.44 S-R 0-13		34.45		34.50 3								
P45	34.65 S-R 0-13		34.60			34.65 3							
R49	35.42 S-R 0-13		35.15		35.35 1					35.15			35.51
R49	35.65 S-R 0-13		35.65		35.65 3	35.70 3							35.76
						36.00 1							
	36.23 OH		36.30	Fe	36.15 2	36.25 2							36.25
	36.74 OH		36.70		36.75 1	36.90 1							
					37.10 1	37.30 1							
			37.65 Fe	Fe	37.65 1	37.65 1							37.66
	38.00 OH					38.15 1							
			38.60	Fe	38.55 1	38.50 1							38.51
						38.90 1							38.83
			39.15	Fe	39.20 1								39.19
			39.65	Fe	39.60 1	39.55 1							39.58
				CrCo	39.80 1	39.95 1							39.89
					40.20	40.25 1							
				FeTi	40.85 1	41.00 1							40.56
				Ti	41.80 1	41.85 1							41.90
				Fe	42.25 1	42.45 1							42.21
													42.29
										43.00 NH			
P47	43.51 S-R 0-13		43.55		43.60	43.65 3			43.4 1				43.24
P47	43.70 S-R 0-13		43.70		43.70 3								43.67
					44.15								
R51	44.54 S-R 0-13		44.60						44.6 1				
R51	44.77 S-R 0-13		44.75		44.80 3	44.80 3							
	44.84 OH												
			45.65 Br		45.65 3	45.55 1							45.58
						45.85 1			45.8 1				
					46.35 1	46.35 1							
	46.6 OH		46.70			46.75 1			46.7 1				
			47.00	Fe	46.95 3	47.05 1							46.93

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		BC		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3330-3349														
						47.45 1	47.65			47.8 1	47.60 1			47.50
				47.90 Fe		47.75 1								47.92
					Fe	48.00 2								
						48.30 2	48.30 1				48.65 1 NH			
				49.05	Ti	49.10 3	49.10 1							
	49.62 OH			49.45	Ti	49.55 1				49.7 2				49.73
3350-3369														
				50.30		50.40 1	50.40 1							50.28
	51.13 OH					51.25	51.20 1							
				51.45						51.11				
			Fe	51.65		51.70 1	51.85 1			51.9 0				51.52
														51.74
						52.30 1	52.25 1							
P49	[illegible]			52.90		53.05 3								52.93
P49	[illegible]			53.20		53.25 3	53.15 3							53.26
						53.55 1								
						53.80	53.75 1			53.9 3				
R53	54.09 S-R 0-13		Fe	54.05	Fe	54.14 3								54.06
R53	54.32 S-R 0-13			54.35		54.35 3	54.30 3							
				54.65	Ti	54.75 1	54.80 1							
					Fe	55.30 1	54.25 1				55.25 2			55.22
					Fe	55.55 1	55.50			55.4 0				
						55.95 1	56.00 2							
			Fe	56.40	Fe	56.35 1								56.26
														56.40
			Fe	56.45			56.45 2							
		56.63 0			Fe	56.75 1								56.69
	56.82 OH					56.90	56.85 1			56.9 2	57.05			
		57.29 0				57.25 1	57.35 1			57.3				
						57.75 1	57.80 2							57.56
		58.19 1				58.10 2	58.10 2							58.25
							58.60 1							
							58.90							
		59.23 1				59.25 2	59.30							58.90
										59.6				59.49
	59.89 OH					59.80 2	59.75							59.81
	60.07 OH			60.05		60.15 2	60.25 2			60.3				60.10
	60.60 OH					60.65 1	60.70							60.31
														60.92
		61.06 1		61.05			61.10 1							
				61.20		61.25 2				61.3				
							61.45 1							
				61.90 0		61.85 1	61.90 1			62.0				61.95

		BC		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3350-3369														
				62.20 0		62.25 1								62.27
							62.50 1							
P51	62.84 OH													
P51	62.85 S-R 0-13			62.85 2						63.0 1				
P51	63.06 S-R 0-13	63.00 1		63.05 2		63.00 3	63.05 3							
						63.45 1								
	63.62 OH					63.65	63.65 ½				63.60			
R55	64.08 S-R 0-13					63.90 1								63.81
R55	64.32 S-R 0-13			64.30 2		64.30 3	64.30 3				64.55			64.27
														64.40
				64.75		64.75 1	64.80 1							
P11	65.00 S-R 2-15			65.00		65.001	65.05 1							
R15	65.33 S-R 2-15	65.20 1		65.35		65.35 1	65.30			65.2 2				
						65.80 1	65.65				65.90			
				66.15 2		66.30 1	66.20 1							
				66.80 2	Fe	66.85 3	66.65 1							66.78
														66.86
														66.96
				67.05 00			67.20							67.16
P13	67.71 S-R 2-15			67.65		67.70 2	67.80							
R17	68.11 S-R 2-15	68.05 0		68.05		68.15 2	68.25			68.0				68.16
							68.80			69.4 0				69.14
														69.34
	69.36 OH		Fe	69.50		69.55 2	69.30			70.0 0				69.54
							69.50 1							
R3	69.92 S-R 0-14			69.85		69.90 2								
3370-3389														
		70.00					70.00 2							
R5	70.4 S-R 0-14	70.35		70.40 2		70.40 2	70.45 2							
							70.70			70.60 0				
P15	70.82 S-R 2-15	70.60			Fe	70.80 2	70.85 2							70.78
R7	71.17 S-R 0-14			71.20		71.30 2	71.35 2			71.2 1				
		71.30		71.40										
							71.85 1							
				72.00	Fe	72.05 1	72.10 1							72.08
P5	72.40 S-R 0-14			72.35		72.45 2	72.55 2			72.4 2				72.35
P5	72.42 S-R 0-14													
	72.59 OH	72.45 1		72.80 1		72.85 2								72.86
P53	73.18 S-R 0-13			73.20 1		73.20	73.25 3							
P53	73.4 S-R 0-13			73.40 1		73.40 2	73.60 3			73.5 00				73.87
R11,P7	73.97 S-R 0-14			73.95										
						74.00 3	74.15 2			74.0 2				74.22
R57	74.50 S-R 0-13	74.10		74.45 1		74.50 2	74.50 2							74.45

		BC		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3370-3389														
R57	74.76 S-R 2-15													
	0-13			74.75 1		74.80 2	74.90 2			74.8 00				
R57	75.23 OH						75.20 1			75.4 00	75.25			
R13	75.81 S-R 0-14	76.00 2		75.90		75.95 5	76.00 2			75.8 2				
P9	75.91 S-R 0-14		Br	76.50		76.45 2	76.45 1							76.50
							76.85 1							
			Br	77.05										
				77.60		77.55 2	77.60			77.8 2				77.20
P19	78.22 S-R 2-15			78.25		78.30 5	78.35 2							
P11	78.25													
	78.26 OH													
R23	78.72 S-R 2-15	78.15 2		78.65										
						78.85 3	78.80							78.68
				78.95			78.95							
						79.40 2								79.02
				80.05	Fe	80.20 5	80.00							80.11
				80.50			80.40							
P13	80.96 S-R 0-14			80.90 2		80.95 5								80.99
							81.00 2			81.0 2				
		81.05 2									81.65			
				81.90			81.80 ½							
							82.10			82.1 00				81.33
R21	82.51 S-R 2-15		Fe	82.40		82.55 3	82.60 1				82.60 1			82.40
				82.90										
P25	83.11 S-R 2-15					83.05 3	83.15 1							83.69
				83.60			83.75							83.98
P55	83.93 S-R 0-13		Fe	84.00	Fe	84.05 10				84.2 2	84.05 1			
P55	84.10 S-R 0-13	84.15 2												
R19	84.0 S-R 0-14						85.00 0							
R59	85.35 S-R 0-13			85.40							85.45 1			
R59	85.62 S-R 0-13			85.65		85.55 10	85.65 2½							85.44
														85.55
				85.95										
							86.30							
P23	87.17 S-R 2-15						86.80							
R21,P17	87.35 S-R 0-14		Fe	87.45 2	Fe	87.50 10	87.50 2			87.5 2	87.55 Br			87.41
R21,P17	87.49 S-R 0-14													87.63
R27	87.65 S-R 2-15	87.55 2		87.90 0		87.85 3	87.80 1							
						88.20 1	88.25							
						88.75 1	88.85 1				88.90			88.62
						89.05 1								88.96
						89.30	89.30 1							
					Fe	89.80 1	89.95 1							89.74

		SC	2		88	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3390-3409													
						3390.50 1							90.08
						90.85 0							
P19	91.18 S-R 0-14		3391.25		3391.30 10	91.35 2			91.3 2	3391.50 Br			
P19	91.29 S-R 0-14												
					91.80 1	91.75 1							
			92.00	Fe	92.00 5								92.01
P25	92.22 S-R 2-15			Fe	92.30 5	92.30 1							92.31
R29	92.94 S-R 2-15			Fe	92.75 5								92.65
					93.00 5	93.00 1				93.15			93.38
			00			93.55 1							
			94.00 Br		93.95 2								
			94.55 1	Fe	94.60 3	94.65							94.08
													94.58
P21,R25	95.38 S-R 0-14		95.45 3		95.45 10	95.50 3			95.6 2	95.55 0			95.32
P21,R25	95.50 S-R 0-14	95.60 1											
R61	96.66 S-R 0-13		96.00	Fi	95.95 2	96.00 1							95.94
R61	96.95 S-R 0-13	Fe	96.95 1		96.75 1	96.95 2				96.80			96.38
													96.97
R61	97.27 S-R 2-15			Fe	97.00 3								97.21
			97.60	Fe	97.65 2	97.80 1							97.56
													97.84
						98.15							
R31	98.5 S-R 2-15					98.55							
						99.15							98.22
		Fe	99.35 2	Fe	99.30 10	99.35				99.30			99.23
													99.33
						99.45							
R23,R27	99.95 S-R 0-13		00.052		00.05 10	00.15 $2\frac{1}{2}$			00.2 2	00.10			
R23,R27	00.09 S-R 0-14	00.20 1											
						00.95 1							
										01.20			
		Fe	01.50	Fe	01.60 2	01.40 1							01.52
		Fe	02.20 0	Fe	02.20 2	02.10 1				02.00			02.26
					02.90 1	02.90 $\frac{1}{2}$							
			03.25 00	Fe	03.35 2	03.15 1				03.30 Br			03.32
P29	03.57 S-R 2-15				03.60 2	03.60							
R33	04.45 S-R 2-15			Fe	04.35 10	04.50 $2\frac{1}{2}$							04.30
													04.35
R29,P25	04.93 S-R 0-14		05.05 3		05.05	05.10 $2\frac{1}{2}$			05.1 2	04.75			04.75
R29,P25	05.08 S-R 0-14	05.20 1		Fe	05.60								05.57
			05.70 Br	Fe	05.75 2	05.75							05.83
										05.85			
					06.10 1	06.20							
				Fe	06.40 2								06.44

		BC		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3390-3409														
P59	06.81 S-R 0-13				Fe	06.85 5	06.90 1							06.80
P59	07.07 S-R 0-13					07.05 4	07.15 1				07.00			
					Fe	07.50 5	07.65 1							07.46
				07.90 Br		07.85 4								
							08.05 1							
R63	08.56 S-R 0-13			08.55 1		08.55 5	08.60 1				08.60			
R63	08.72 S-R 0-13			08.85 1		08.75 5	08.90 1							
											09.05			
					Fe	09.20 2	09.35 1							09.20
						09.60 1								
P31	09.83 S-R 2-15						09.90 1							
3410-3429														
P27,R31	10.29 S-R 0-14					10.00 1								10.17
P27,R31	10.44 S-R 0-14		Br	10.45 2		10.40	10.55 3			10.4 1	10.45			
R36	10.72 S-R 2-15	10.60 1		10.90 00		10.90 2	10.90							10.90
						11.20 1					11.25			11.13
					Fe	11.40 1								11.35
						11.80								
							12.15				12.00			
						12.90 2					12.80			12.64
					Fe	13.10 10								13.13
						13.40 3	13.45 1				13.55 Br			13.48
						13.70 3								
						14.20 1								
				14.75		14.75 3								
						15.05 1								
					Fe	15.50 2								15.53
R29	16.06 S-R 0-14			16.20 2		16.15 10								16.02
P29	16.15 S-R 0-14													
R33	16.16 S-R 0-14						16.25 3			16.3 1	16.25			
R33	16.27 S-R 0-14	16.25 1				16.55 2								16.29
														16.67
P33	16.51 S-R 2-15					17.60 2	17.50 1				17.60			17.16
														17.26
R37	17.57 S-R 2-15		Fe	17.80	Fe	17.85 3	17.85 1							17.84
				18.20			18.00 1							
					Fe	18.25 1								18.17
					Fe	18.55 2								18.51
P61	18.93 S-R 0-13					18.90 2								18.88
P61	19.2 S-R 0-13			19.00		19.20 2	19.15 2				19.15			19.15
				19.80										19.69
				20.40		20.35 2	20.25 1				20.60 Br			

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3410-3429													
P65	20.71 S-R 0-13		20.75		20.75 3	20.90 2							
P65	21.0 S-R 0-13				21.05 3								
P31	22.17 S-R 0-14		21.90			21.75 1							22.14
R35, P31	22.21 S-R 0-14		22.30 2		22.40 10	22.35 3			22.4 0	22.25			22.49
R35	22.42 S-R 0-14	22.30	22.60										22.66
P35	23.65 S-R 2-15			Ni	23.65 2	23.55 1				23.50			
			24.25 0	Fe	24.25 2								24.28
R39	24.78 S-R 2-15					24.65				24.50			
			24.95	Fe	24.85 2								25.01
													25.58
				Fe	26.40 5								26.32
													26.38
				Fe	26.65 5	26.65 1							26.63
				Fe	27.10 5					26.95			27.01
													27.12
	28.1 OH				28.00 5	27.95				27.95			
P33	28.70 S-R 0-14		28.25	Fe	28.20 5								28.19
R37, P33	28.94 S-R 0-14		28.95		28.85 10				28.9 0	28.80			28.75
R37	29.0 S-R 0-14				29.60 1								
3430-3449													
			30.45		30.35 1					30.35			
R37	31.15 S-R 2-15		31.05		31.10 1								
P63	31.54 S-R 0-13		31.60		31.60 5					31.35			
P63	31.82 S-R 0-13	Fe	31.90	Fe	31.80 5				31.2 00 Br				31.81
	32.38 S-R 2-15		32.50		32.40 1								
					32.80 1					32.70			
R67	33.45 S-R 0-13		33.10	Fe	33.00 1								33.04
R67	33.75 S-R 0-13		33.60		33.55 5				33.4	33.65 1			
					33.75								
			34.20	Fe	34.05 1				34.0				34.02
					34.60 1				34.8	34.55 0			
					35.05								
P35	35.65 S-R 0-14		35.70										
R39, P35	35.81 S-R 0-14		35.90		35.90 10				36.0 0	35.90 4			36.11
R39	35.95 S-R 0-14		36.05 2										
			37.10	Fe	37.10 2					37.10 0			37.05
									37.7 0				
			37.95	Fe	37.90 2								37.95
										38.10 0			
			38.40	Fe	38.30 2								38.30
P39	39.10 S-R 2-15				39.00 2					39.15 0			
				Fe	39.80 2				39.5 0				39.87
										40.25 0			

		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3430-3449												
				Fe 40.60 15				40.8 0				40.61
												40.99
				Fe 41.05 10								
				Cr 41.45 2					41.30 1			
				Mnll 42.00 2				42.0 0				
				Fe 42.30 2	42.55 1				42.40 0			42.23
												42.36
												42.67
P37	43.18 S-R 0-14			43.25 10	43.40 3			43.3 0	43.25 4			
P37	43.37 S-R 0-14											
				Fe 43.90 7								43.65
												43.87
				44.40 1								
P65	44.64 S-R 0-13			44.70 3	44.85 1			44.8 00	44.90 VBR			
P65	44.91 S-R 0-13			45.00 3								
		Fe	45.15 1	Fe 45.20 3	45.20 1							45.15
				Fe 45.80 1								45.77
				46.00 1	46.11 1							
				Ni 46.25 1					46.50			
R69	46.66 S-R 0-13			46.75 2	46.85 1							46.79
R69	46.99 S-R 0-13			47.05 2								
				Fe 47.30 2	47.35 1							47.28
P41	47.48 S-R 2-15			47.60 1				47.9 00				
				Ci 47.85 1	47.75 1							
R45	48.92 S-R 2-15			Fe 48.85 2	48.75				48.80			
		Co	49.20		49.05							
			49.50	49.55 1					49.55 00			
					49.80							
3450-3469												
				Fe 50.30 2	50.35				50.30			50.33
P39	50.78 S-R 0-14		50.85									
P39	50.97 S-R 0-14		51.05	51.05 10					51.10 5			
R43	51.19 S-R 0-14		51.25	51.20	51.20 3			51.4 00				51.22
			51.70	Fe 51.60 1								51.61
				Fe 51.96 2	52.15 ½							51.91
				Fe 52.25 2								52.27
				Ni 52.95 2	53.10 ½			52.9 Br	52.75 00			
			53.60 2	Co 53.55 2	53.50 ½							53.02
									53.80 2			
					54.95							
									55.15 1			
			55.30 0	55.45 2				55.4 VBR				55.23

	BC	S		SS	S	G.D.	4	T	Solid King	Total King	Mike	Fe
3450-3469												
									56.10 1			
		56.35 0 Sh	Fe	56.25 2	56.30							
			Ti	56.65 1								56.93
		57.15 0	Fe	57.05 2	57.20				57.10 2			57.08
		57.70		57.80 2								57.51
					57.90				57.80 0			
P67	58.2 S-R 0-13	Fe 58.45	Fe	58.30	58.40							58.30
P67	58.5 OH											
P67	58.51 S-R 0-13			58.50 10	58.65				58.55 1			
P41	58.98 S-R OH	59.05		59.05 7	59.20 3							
P41	59.18 S-R 0-14	59.30		59.25 10	59.35 3				59.40 1			
R45	59.43 S-R 0-14			59.45	59.55 3							59.42
			Fe	59.90 2								59.74
												59.91
					60.15 1							
R71	60.40 S-R 0-13			60.40 2	60.60 1				60.55 3			
R71	60.74 S-R 0-13	60.80		60.75 2	60.90 1							
			Co	61.10 1								
		Ni 61.65	NiTi	61.60 2	61.60							
				62.15 1								
			Fe	62.40 1								62.36
			Co	62.90 2					62.95 2			
				63.15 2	63.20 shp							63.30
					63.70							
			Fe	64.10 2								
		64.50		64.50 3	64.65 1							64.49
			Fe	65.00 1								64.91
P45	65.56 S-R 2-15			65.55 3	65.55				65.55 1			
		Fe 65.85	Fe	65.90 10								65.86
			Fe	66.30 2	66.20							
			Fe	66.55 2					66.4 00			66.50
			Fe	66.85 2								66.89
				67.10 1	67.10							
				67.35 1								
P43	67.59 S-R 0-14	67.65		67.70 3								
P43,R47	67.80 S-R 0-14			67.90 10	67.95 2				67.8 10			
R47	68.07 S-R 0-14	68.15 2		68.15 3	68.25 1							
			Fe	68.85 2	68.95							68.67
												68.84
		69.70	Fe	69.60 2	69.70 1				69.5 1			69.01
												69.38
												69.60
												69.83

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3470-3489													
					70.25 1								
					70.55 1	70.50 1							
					71.05 1	71.10 1				70.9 0			
			71.35	Fe	71.35 3								71.27
													71.34
				Fe	71.85 1	71.85							71.91
P69	72.27 S-R 0-13		72.35		72.30 3	72.45 2				72.4 3			72.03
													72.36
P69	72.64 S-R 0-13		72.65		72.60 5	72.75 2							
					72.95 1								
				Fe	73.20 2	73.40 1							73.30
			73.65	Cr	73.60 2					73.6 1			73.50
													73.68
			74.10	Co	74.00 2	73.90 1							
			74.45	Fe	74.45 2	74.55 1							74.40
R73	74.66 S-R 0-14		74.75		74.70 2	74.85 1				74.9 4			
R73	75.01 S-R 0-14				75.05 3	75.15 1							
P47	75.26 S-R 2-15			Fe	75.45 10								75.45
													75.65
		FeBr	75.85			76.00 1							75.88
P45	76.63 S-R 0-14			Fe	76.75 10					76.6 5			76.34
													76.70
P45	76.83 S-R 0-14					76.90 3							76.85
R49	77.07 S-R 0-14												
R49	77.19 S-R 0-14		77.25		77.15 7	77.10 3							77.00
					77.50 1	77.40 3				77.6 5			
					77.85 1								77.85
					78.20 1	78.05 1							78.37
				Fe	78.65 1	78.45							78.62
													78.78
					79.15 1	79.05							
				Fe	79.60 1	79.45				79.4 2			79.68
			79.70		79.85								
					80.15 1	79.95 1							80.34
						80.35 1				80.3 00			
			80.55										
					81.00 1	81.05				81.0 1			
					81.90 1	82.05 1				81.9 00			81.56
													81.86
					82.85 2	82.70 1							
			83.05 1			83.10 1				83.00 1			
						83.35							
			83.85		83.90 2								83.01
					84.25 1	84.20				84.1 1			

		BC	2		88	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3470-3489					84.95 2				84.8 Br				84.85
P49	85.45 S-R 2-15			Fe	85.35 2	85.55				85.4			85.34
			86.20		86.20 4	86.25				86.2			
P47	86.33 S-R 0-14		86.40		86.40 4	86.55 2							86.55
P51	86.50 S-R 0-14		86.65	Fe	86.75 4								
P71	86.75 S-R 0-13		86.90			86.95 2							
R51	86.75 S-R 0-14		87.25		87.25 4	87.35 2							
					87.95					87.6			87.99
			88.75	Mn	88.65 2	88.60				88.5 2			
					89.10 1								
R75	89.37 S-R 0-13		89.35		89.40								
R75	89.71 S-R 0-13			Fe	89.70 2	89.80				89.9 2			89.67
3490-3509													
						90.15							
				Fe	90.55 15	90.65 1							90.57
						91.20 1				91.15 00			
					91.50								
						91.75 1				91.9 1			
					92.10 1	92.13 1			92.3				
			93.05	Ni	93.00 1	93.10 1				93.0 1			
					93.40 1								93.29
													93.47
				Fe	93.75 1								93.69
				Fe	94.10 1	94.10				94.1			94.17
				Fe	94.65 1	94.50 1							94.67
		Fe	95.30	Fe	95.25 2				95.3 0	95.1			95.28
					96.65 1								
P49	96.00 S-R 0-14			Fe	95.90 1					95.9			95.89
P51	96.05 S-R 2-15				96.10 5	96.10 2							
P49	96.24 S-R 0-14		96.30		96.30 5	96.30 2			92.3				
P49,R53	96.44 S-R 0-14		96.45										
R53	96.70 S-R 0-14				96.75 4	96.85 1				96.8			
				Fe	97.15 3								97.10
					97.50 1	97.65 ½							
			97.80	Fe	97.85 10					97.9			97.84
					98.20 1	98.10 ½							98.75
		98.62				98.60							
					99.50 1	99.65			99.3 0	96.6			
					99.85 1				00.0 0				99.87
		00.69		Fe	00.55 1	00.55			00.6 0	00.55 00			00.56
													00.86
	01.12 Ba		01.15 5	Ba	01.10 5	01.10				01.5			
					01.85 1								

		BC	2		88	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3490-3509													
		01.92				01.80 1			01.9				
P73	02.27 S-R 0-13		02.40		02.25 3	02.35 1				02.4			
					02.75								02.63
					03.05 1								
R11	03.50 S-R 2-16	03.58			03.55 2	03.40			03.5 0	03.6 0			03.47
					03.95 1								
R77	04.69 S-R 0-13			Br	04.85 3	04.75 1				04.8 2			04.85
R77	05.06 S-R 0-13					05.15 1							
		05.62			05.50 1	05.60 1			05.7 0				05.06
					05.75 1								
P51	06.39 S-R 0-14		06.35							06.45			
P51	06.6 S-R 0-14		06.60	Fe	06.50 10	06.60 2							06.49
R55	07.14 S-R 0-14				07.00 8	07.15 2				07.1 2			07.17
				Fe	07.45 1								07.39
				Ni	07.70 1	07.75 1							
		08..			08.10 1	08.30 1			08.2 0	08.15 1			
				Fe	08.50 1								08.21
													08.48
													08.53
				Fe	09.00								
			09.20		09.20 1	09.15 1				09.25 1			09.13
				Co	09.80 1								09.86
3510-3529													
						10.20 1							
			10.40		10.40 1								10.44
		11.04			10.80 1	10.90 1			11.0 60	10.7 1			
					11.70 1	11.80 1							11.74
			12.20	Fe	12.10 1					12.0 0			12.08
													12.22
			Fe 12.70	Co	12.65 1	12.70 1							
				Fe	13.00								12.95
													13.06
			Fe 13.10			13.25 1				13.1 0			
				Co	13.50								
				Fe	13.85 10								13.82
						14.25 1⅛			14.2 0	14.1 2			
				Fe	14.70 ⅛	14.90							14.62
				Ni	15.10 1								
					15.45 1	15.40							
					15.65 1					15.6 1			
					16.10 1								
R3	16.35 S-R 0-15	16.48		Fe	16.40 4	16.50 1			16.35 1	16.4 0			16.42
													16.55

		SC		Z		SS		G.D.	4	T	Paired Ring	Total Ring	Miles	Be
3510-3529														
R9	16.87 S-R 0-15	16.87		16.90		16.85 3	16.95			16.8 1				
R5	16.95 S-R 0-15						17.00 1							
PS3	17.17 S-R 0-14			17.20		17.20 3	17.20 1				17.2 3			
PS3	17.42 S-R 0-14			17.55		17.50 3	17.50 2							
	17.67 S-R 0-14													
R7	17.67 S-R 0-15													
R7	17.85 S-R 0-15	17.85		17.80		17.80 3	17.80 2			17.8 1				
P67	18.00 S-R 0-14					18.05 4	18.05 2							
P17	18.03 S-R 2-16			18.15							18.25 3			
R9,P3	18.05 S-R 0-15						18.70				18.85 3			
R21	18.95 S-R 2-16	19.01			Fe	18.95 5	19.10 2			19.0 1				18.88
														18.98
						19.50 1								
						19.90 1	19.70 1				19.8 1			
						20.10 1	20.15 1							
R11	20.6 S-R 0-15	20.67		20.50		20.65 5				20.6 2				20.85
P7	20.7 S-R 0-15						20.80 2				20.9 4			
					Fe	21.25 5	21.35 0							21.26
					Fe	21.85 2	21.80 0				21.9 1			21.84
R13	22.6 S-R 0-15				Fe	22.30 2	22.30 1							22.27
P9	22.7 S-R 0-15	22.70		22.70		22.75 5	22.75 2			22.7 2	22.7 1			22.89
					Fe	23.30 2	23.50 1							23.31
					Fe	24.00 2	24.05 1				24.0 1			24.07
					Fe	24.25 2								24.24
					Ni	24.50 2								
R15	25.0 Ba													
R15	25.0 S-R 0-15	25.10	Ba	*25.05 2		25.05 5	25.20 2			25.15 2	25.05 4			
P11	25.2 S-R 0-15				Fe	26.10 10	26.00 1							26.04
														26.16
					Fe	26.45 3					26.3 3			26.36
														26.46
					Fe	26.70 2	26.65 1							26.67
							27.20 1							
R17	27.8 S-R 0-15				Fe	27.80 7	27.85 2				27.9 2			27.79
P13	28.0 S-R 0-15	28.16				28.00 4				28.0 2				
P65	28.33 S-R 0-14			28.50		28.55 3	28.70 2				28.7 2			
P65	28.45 S-R 0-14			28.80		28.75 2	28.80							
				29.00		29.10 1								
R19	29.28 S-R 0-14			29.15			29.30 2							
R19	29.68 S-R 0-14			29.50		29.45 2					29.4 2			29.53
				29.80	Fe	29.50 2								29.82

		BC		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3530-3549														
				30.40	Fe	30.40 2	30.40 1							30.38
											30.6 4			
R19	31.00 S-R 0-15			31.00		30.90	31.05 2			31.15 2				
P16	31.25 S-R 0-15	31.21		31.35		31.25 2	31.25							31.44
											31.6 4			
					Mn	32.00 1								
					Fe	32.50 ½	32.60 2				32.6 1			32.57
					Fe	33.10 2								33.01
					Fe	33.25 2								33.20
						33.60	33.55 ½							
						33.80 ½	33.85 1				33.8 4			
						34.15 1	34.35 1							
R21	34.60 S-R 0-15		Fe	34.55	Fe	34.50 2	34.60 2			34.75 2				34.52
P17	34.90 S-R 0-15	34.89	Fe	34.85	Fe	34.85 2	35.00 2				34.9 4			34.91
					Ti	35.40 1								
					Fe	35.65 1	35.60 ½				35.7 00			
							36.15 ½							
R29	36.72 S-R 2-16		Fe	36.45		36.55 4	36.65 1				36.6 1			36.18
														36.55
						36.85 1								
					Ni	37.25 1	37.05 1				37.1 00			
					Fe	37.50 1	37.45 1							37.49
			Fe	37.85	Fe	37.75 1	37.75 ½							37.73
					Fe	37.90 1								37.89
	38.3 N_2						38.20 ½							
R23	38.6 S-R 0-15					38.50 3	38.65 2				38.6 4			38.29
														38.55
P19	38.9 S-R 0-15	38.90		38.80		38.80 3	39.00 2			38.85 2				38.79
	39.25 CN					39.25 1								39.20
						39.50 1	39.45							
P57	40.2 S-R 0-14					40.19 5	40.00							40.11
P57	40.4 S-R 0-14					40.55 5	40.45 3				40.45			40.71
R61	40.93 S-R 0-14						40.75			40.85 00				
R61					Fe	41.10 10	41.10 2							41.08
R61	41.22 S-R 0-14						41.45 2				41.35 3			
					Fe	42.05 8								42.07
														42.23
											42.3 3			
							42.70 1							
R25	43.00 S-R 0-15			43.05		42.95 5	43.15 2			43.10 2				
P21	43.30 S-R 0-15	43.17		43.25		43.25 5	43.45 2				43.4 3			43.39
					Fe	43.70 1								43.67
	44.89 CN				Cu	44.05 1								
					Fe	44.65 2					44.4 1			44.63

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3530-3549													
				Fe	44.65 2					44.4 1			44.63
					45.00 1								
			Fe	45.65	Fe 45.70 3				45.45	45.7			45.64
													45.83
						45.90 1							
						46.40 0							
					46.10 1								46.22
					47.10 1	47.05 0			47.25				47.19
				Mn	47.80 10					47.55 2			
				MnFe	48.10 10	47.95 2							48.02
													48.08
						48.30 2			48.30				
	48.9 Ne			Br	48.75 1	48.70 1				48.6 2			
					49.45 1								
			49.85	Fe	49.80 1	49.80 1				49.7 1			49.87
3550-3569													
						50.10 1							
	50.60 Co		50.70	Co	50.55 1								
						50.80				50.9 2			
					51.00 1	51.15 1							51.12
				Ni	51.50 1	51.60 1							
				Fe	52.00 1	52.05 1							52.11
P59	52.44 S-R 0-14		52.50	Fe	52.45 1								
P59	52.72 S-R 0-14			Fe	52.85 10	52.65 1				52.6 5			52.83
R63	53.52 S-R 0-14	53.48	53.35			53.45 2			53.1 1 Br	53.4 5			
R63	53.11 S-R 0-14			Fe	53.65 5								53.74
P25	0-15												
						53.95 3							
			54.10	Fe	54.20 3	54.20 1				54.25 0			54.12
				Fe	54.55 2								54.51
				Fe	54.95 10								54.92
					55.40 2	55.15 1				55.3 2			55.47
			55.50			55.60 1							
					56.55 2	56.65 0			55.7	56.5 2			56.69
				Fe	56.90 5								56.88
	57.37 CN			Cn	57.40 1								57.29
	57.88 CN			Cn	57.85 1				Br				
	58.08 CN			Fe	58.15 1	58.25 1			58.1 00				58.10
P27	58.35 S-R 0-15												
				Fe	58.55 10	58.70 2							58.51
R31	58.80 S-R 0-15	59.00			58.95 2	59.05 2			Br	58.8 5			
R31	58.90 S-R 0-15				59.35 1				59.0 00				59.08

		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3550-3569												
			59.50	Fe 59.55 1	59.50 ½							59.50
				60.00 1	60.05 ½				59.9 00			
				Fe 60.65 2	60.75 1			60.5	60.7 00			60.69
												60.86
	61.28 CN			CN 61.25 1								
		Ba	61.85	Ni 61.80				61.7	61.8 1			61.81
	62.10 Co											
	62.25 S-R 2-16	Fe	61.90	Co 62.05 1				61.9 00				
	62.55											
	62.71 Co			CN 62.60 1					62.5 1			
				Co 62.90 1				62.8 00				
	63.93 Co			63.00 1					63.75 1			
	63.9 Ni			CN 63.95 1				63.9 0				
				Fe Ti 64.55 10					64.6			64.11
												64.53
R33	64.85 S-R 0-15				64.80 2							
R33	65.00 S-R 0-15		65.07	65.05 10	65.15 2			65.0 00				
P61	65.09 S-R 0-14											
P61,P29	65.42 S-R 0-15			Fe 65.40 15	65.55 2							65.38
												65.58
				66.10 1								66.14
R37	65.67 S-R 2-16			66.35 2	66.40 2				66.35 5			66.31
												66.58
R65	66.34 S-R 0-14			66.90	66.95 ½							
R65	66.05 S-R 0-14											
				Fe 67.05 1				67.0 00				67.03
				Fe 67.35 1								67.38
				67.80 1				67.8 00				67.72
					68.05 1				68.15 1			
				Fe 68.30 1	68.45 1							68.42
				Fe 68.95 1	68.90 1			69.0 00				68.82
												68.97
				Mn 69.50 1					69.3 1			
P35	69.75 S-R 2-16											
3570-3589												
				Fe 70.15					70.00			70.09
R39	70.38 S-R 2-16				70.25			70.4 0 Br				70.25
R35	70.50 S-R 0-15			CN 70.60 15								
R31	71.2 S-R 0-15			CN 71.05 2	71.15 3				71.1 6			
R35	72.45 S-R 0-15		71.50 0	71.50 2				71.5 0				71.22
												71.68
P31	71.85 S-R 0-15			Fe 72.00 2	71.75 3							71.99

		BC	2		88	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3870-3889													
						72.35 1			72.3 0				
				Zn	72.65 1								
	70.5												
	71.2			Fe	73.10	73.15 1							
				Fe	73.40 1								73.40
				Fe	73.90 2								73.83
													73.88
					74.45 1				74.3 1	74.25 3			
						74.65 1							
				Fe	75.25 2	75.35 1			75.3				75.11
													75.25
													75.37
				Fe	76.00 2	76.10 1							75.98
				Fe	76.70	77.65			76.8 0	76.55 2			76.76
	77.15 Ca				77.15 2	77.20							
P37	77.60 S-R 2-16				77.40								
R37	78.06 S-R 0-15												
R41	78.06 S-R 2-16				77.96	78.00 3			77.6 0	77.8 3			77.75
P33	78.25 S-R 0-15		78.25		78.35 10								78.38
R37	78.30 S-R 0-15					78.50 3			78.7 0	78.6 3			
R83	78.35 S-R 0-14												
R83,P33	78.65 S-R 0-15				78.70	78.80							
R83	78.68 S-R 0-14	Fe	79.55		79.40 10								79.55
R67	79.65 S-R 0-14				79.70 3	79.65 2				79.6 3			79.82
									79.90 Br				
						80.55 1				80.5 00			
				Fe	81.23	81.35 1			81.8 1				81.19
				Fe	81.80 1								81.84
	82.1 N_2^+			Fe	82.20 1								81.81
				Fe	82.70				82.2 1				82.20
	83.00 S-R 1-16	83.17			83.00	83.15 1				83.05 0			82.68
R5	83.26 S-R 1-16			Fe	83.35 1				83.3 0				83.34
	83.91 CN												
R7	84.18 S-R 1-16	85.15		CN	83.90 1				84.1 0	84.0 0			83.89
						84.50 1							
	84.70 S-R 0-15			Fe	84.70 2	84.60 1							84.66
													84.79
R39	85.30 S-R 0-15			Fe	85.00 2					84.9 6			84.96
R9	85.30 S-R 1-16												
P35,R39	85.50 S-R 0-15	85.32		Fe	85.30 10	85.40 3			85.35 1				85.32
P6	85.50 S-R 1-16												
	85.9 CN												
P35	85.91 S-R 0-15			Fe	85.70 10	85.80 3							85.70

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3570-3589													
B43	86.40			Fe	86.15 3	86.35 2				86.3 6			86.11
			Fe 86.75 1										86.74
P7,R11	87.16 S-R 1-16			Fe	87.00 6	87.15 2			87.0 1	87.10 4			86.96
					87.35 1								87.24
				Fe	87.75 1								87.42
			88.20 00							88.25 00			87.75
				Fe	88.60 2	88.45							88.90
													88.61
		88.84		Fe	89.05 2	89.05				89.0 0			88.91
													89.16
P9,R13	89.23 S-R 1-16			Fe	89.55 1				89.2 1				89.45
													89.89
	89.90 CN			Mn	89.99	89.85 1				89.9 2			
3590-3609													
	90.4 CN				90.30 1					90.4 1			90.08
				Fe	90.75 1								90.50
				Fe	91.00	91.05 1							91.00
P11,R15	91.8	91.46		Fe	91.40 1	91.80 1½			91.7 1				91.34
													91.48
P66	92.03 S-R 0-14				92.10 1								92.20
P66	92.36 S-R 0-14				92.35 1	92.30 2				92.3 1			92.48
			92.80	Cu	92.75 1								92.00
					92.95 1								92.80
B41	92.98 S-R 0-15					93.05 3				93.2 2 Br			
B41	93.25												
P37	93.40 S-R 0-15	94.37			93.40 5	93.55 3							93.33
P37	93.80 S-R 0-15		Fe	94.60	Br 94.55 2	94.55 2				94.4			94.63
B39	93.92 S-R 0-14												
P13,R17	94.8 S-R 2-16								94.6 0	95.1 00			
P13,R17	94.6 S-R 1-16												
					95.25 1	95.35							95.20
						95.80 1							95.85
				Fe	96.10 1	96.30 1			96.20 Br	96.1 1			96.10
				Fe	97.05 1	97.10 1							97.05
P15,R19	97.89 S-R 1-16	97.55			97.70 1	97.85 2			97.9 0	97.7 3			
			98.55	Fe	98.75 1	98.75 1				98.6 2			98.72
													98.90
				Fe	99.15 1								99.14
			99.65	Fe	99.60 1	99.75 1							99.62
													99.97

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3590-3609													
					00.05 ½								
					00.30 ½	00.45 1							
R21,P39	01.5 S-R 0-15												
R43	01.05 S-R 0-15									00.8			
R43	01.30 S-R 0-15		01.10		01.20 3	01.25 3			01.6 0				
P17,P39	01.70 S-R 0-15	01.52	01.60		01.55 3	01.65 3				01.6			
P17	01.71 S-R 0-16												
P17	01.71 S-R 1-16												
	02.07 CO			Fe	02.05 2					02.25 00			02.08
				Fe	02.55 2	02.35							02.46
													02.56
	CN?					02.95							
				Fe	03.25 2								03.20
													03.57
										03.5 1			
P43	03.74 S-R 0-16			Fe	03.80 1	03.80 2							03.82
													03.94
R47	04.43 S-R 2-16			Fe	04.40 1	04.55 2				04.6 1			04.27
													04.38
				Fe	04.75 1								
923	05.67 S-R 1-16	05.76		Fe	05.50 5				05.7 00	05.5 2			05.21
													05.45
													05.90
P57	06.39 S-R 0-14					06.50 2				06.4 2			
P57	06.70 S-R 0-14			Fe	06.65 5								06.68
P19	06.85 S-R 1-16												
R71	07.61 S-R 0-14			Fe	07.60 1	07.65 2				07.7 2			
R71	07.95 S-R 0-14				07.90 1	08.00 2							
				Fe	08.30 1								08.16
						08.65 1				08.6 2			
				Fe	08.90 10	09.05 1							08.86
R45	09.59 S-R 0-15				09.65 1					09.5 3			
R45	09.8 S-R 0-15				09.80 1	09.90 3							
3610-3629													
P41	10.00 S-R 0-15												
R25	10.03 S-R 1-16			Fe	10.20 10	10.25 3			10.3 00	10.1			10.16
P21	10.26 S-R 1-16			Fe	10.75 1								10.70
P41	10.26 S-R 0-15												
			11.00		11.00 ½	11.10 1							
					11.45 ½								
					11.80 ½	11.90 1							
		Fe	12.05	Fe	12.10 1								12.07
													12.50

		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3610-3629												
				Fe 13.00 1	13.15 1							12.94
												13.14
									13.25			
				Fe 13.50 1								13.45
												13.60
				Fe 14.10 1	14.00 1							14.11
									14.25 0			
				Fe 14.65 1								14.56
												14.71
												14.87
				Fe 15.15 1	15.30 2			15.3 00	15.1 2			15.20
												15.35
				Fe 15.75 1	15.95 ½							15.66
				16.20 1					16.1 00			16.14
												16.32
				Fe 16.55 1	16.50 ½							16.57
				Fe 17.30 1					17.45 1			17.09
												17.31
				Fe 17.80 1	17.60 1							17.78
R47	18.57 S-R 0-15			Fe 18.40 5					18.4 5			18.30
												18.38
R47	18.8 S-R 0-15			Fe 18.80 10	18.75 3							18.76
P43	19.0 S-R 0-15			19.15 5	19.05 3				19.2 5			19.39
												19.77
					19.37 2							
					19.80							
R29	20.47 S-R 1-16			20.30 5					20.4 2			20.22
P25	20.65 S-R 1-16			20.60 2	20.75 2							20.47
												20.78
P69	21.15 S-R 0-14			21.05 2	21.15 2				21.2 2			21.10
P69	21.36 S-R 0-14			21.30								21.27
				Fe 21.45 2	21.45							21.46
												21.71
				Fe 22.00 2								22.00
R73	22.37 S-R 0-14			22.35 ½								
R73	22.73 S-R 0-14			22.65 ½	22.65				22.5 2			
				Fe 23.15 2	23.25							23.18
P47	23.46 S-R 2-16			Fe 23.45 2								23.44
R51	23.82 S-R 2-16			MnFe 23.75 2	23.65 1				23.6 2			23.77
				Fe 24.20 ½								24.05
												24.30
				Fe 24.75 1								24.81
												24.89
			Fe 25.09 0									25.14

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3610-3629													
B31	26.20 S-R 1-16			Fe	26.20	26.40 2				26.2 2			26.17
P27	26.46 S-R 1-16				26.65								26.71
				Fe	27.06 1								27.04
													27.66
													27.78
										27.3 00			
B49	28.03 S-R 0-15		28.05	Fe	28.10 2	28.05 2							28.00
P45	28.1 S-R 0-15												
B49	28.3 S-R 0-15				28.30 2					28.4 6			
P45	28.4 S-R 0-15				28.50								
					28.75 2								28.81
													29.01
3630-3649													
		Fe	30.25	Fe	30.35 1								30.34
	30.65 Ba		30.60		30.75 1								
				Fe	31.20 2								31.08
				Fe	31.50 10								31.46
				Fe	32.05 1								32.04
B33	32.45 S-R 1-16			Fe	32.50 1	32.50 2				32.45 6			32.56
P29	32.62 S-R 1-16			Fe	33.00 1	32.85 2							33.07
					33.45					33.- 00			
				Fe	33.80 1	33.70 1							33.63
				Fe	34.30	34.40 1				34.2 1			34.33
	34.70 CO				34.65 1								34.68
				Fe	35.10 1								35.10
			35.45	Tl	35.40 1	35.50				35.4 1			
P71	36.28 S-R 0-14			Fe	36.25 2								36.18
													36.23
P71	36.6 S-R 0-14			Fe	36.65 2	36.65				36.6 1			36.48
													36.65
													36.76
				Fe	37.05 ½								36.90
B76	37.77 S-R 0-14			Fe	37.90 6								37.26
B76	37.98 S-R 0-14												37.66
B61	37.98 S-R 0-15												
B61	38.2 S-R 0-15				38.25 10	38.10				38.2 7			38.29
P47	38.6 S-R 0-15		38.50		38.55 1	38.45 3							
						38.80 2							
B35	39.10 S-R 1-16				39.00					39.2 2			
P31	39.32 S-R 1-16		39.60	Pb	39.50 1								
		Fe	40.35	Fe	40.35 2								40.39
					41.00 1								
					41.35 1	41.3 1				41.3 00			

		BC	2		88		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3630-3649														
	41.79 CO				41.75 1						42.3 00			
			42.70	Ti	42.60 1									42.81
				Fe	43.10 1									43.11
				Fe	43.70 2	Br	43.7 2				43.4 1			43.62
														43.71
														43.81
														44.18
														44.58
														44.79
				Fe	45.00 1									45.08
														45.22
				Fe	45.50 1						45.46 Br			45.49
				Fe	45.80 1									45.82
R37	46.28 S-R 1-16				46.15 1		46.3 4				46.2 5			
P33	46.43 S-R 1-16				46.50 1									
											47.4 00			
				Fe	47.85 15									47.42
														47.84
R53	48.35 S-R 0-15		48.30		48.25 1									
R53	48.7 S-R 0-15	Br	48.65		48.60 2						48.6 10			
					48.85 1		48.9 2							
P49	49.00 S-R 0-15		49.00		49.00		49.1 2							
					49.30									49.30
					49.50									49.50
							49.85 1				49.7 00			
3650-3669														
				Fe	50.05									50.03
				Fe	50.30 2									50.28
														50.53
			51.15								51.3 00			
				Fe	51.50 2									51.10
														51.46
P73	52.08 S-R 0-14				52.00 1									
		Br	52.25				53.3 2				52.2 4			
					52.40 1		52.45 2							52.47
														52.73
			53.50											
R77	53.71 S-R 0-14			Fe	53.80 2	Br	53.85 2				53.8 5			53.76
														53.97
R39	54.03 S-R 1-16						54.11							54.66
			54.65											54.90
				Fe	55.55 2	Br	55.5 0				55.5 0			55.46
														55.67

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3650-3669														
				Fe	56.15 1									56.22
												56.80		
	38.56 CaO			Br	57.00 1	Br	57.00 0							57.13
														57.43
			57.35											
					58.00 1		58.2 1				58.1 1			57.90
														58.02
														58.55
R55	59.55 S-R 0-15			Fe	59.55 3		59.60 2				59.6 5			59.52
P51	59.90 S-R 0-15				59.85 3									59.75
							60.00 2							
				Fe	60.35 1									60.33
														60.80
				Fe	61.35 1									61.37
R41	61.70 S-R 1-16				61.75 1	Br	61.9 2				61.7 2			
P37	61.89 S-R 1-16													
			62.45											
				Fe	62.90 2									62.84
				Fe	63.35 2						63.5 1			63.26
														63.45
				Fe	63.95 1									63.95
											64.00 1			
			64.55	Fe	64.60 2									64.54
														64.69
											65.1 0			
				Fe	66.20 2									66.24
														66.78
														66.94
				Fe	67.30 2	Br	67.2 0				67.4 00			67.26
				Fe	68.05 1									67.99
														68.21
P75	68.46 S-R 0-14				68.55 1									
P75	68.66 S-R 0-14			Fe	68.85 1	Br	68.7 2				68.7 4			68.89
				Fe	69.20 2									69.15
					69.60 2									69.52
														69.75
											69.9 10			
3670-3689														
B43	70.22 S-R 1-16			Fe	70.10 4		70.00							70.02
B43	70.58 S-R 1-16													70.07
B79	70.89 S-R 0-14		70.50											
				Fe	70.75 4									70.81

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3670-3689														
R57,P53	70.9 S-R 0-15						71.0				70.1			
P53	71.2 S-R 0-15		71.20		71.25 2									
				Fe	71.60 1									71.52
														71.70
					72.10 1									
				Fe	72.70 1						72.7 0			72.71
R3	72.99 S-R 0-16	73.05		Fe	73.05 2		73.05 0			73.0 1				73.08
R5	73.44 S-R 0-16	73.62					73.45 0			73.5 1	73.4			
				Fe	73.95 2									73.90
														74.04
R7	74.3 S-R 0-16			Fe	74.40 2		74.4 1			74.4 1	74.4 2			74.41
		74.77		Fe	74.80 2		74.9 1							74.76
R9	75.59 S-R 0-16				75.60 2	Br	75.7 1			75.7 1	75.7 2			
P5	75.83 S-R 0-16	75.85			75.85 2									75.73
				Fe	76.35 2									76.31
				Fe	76.90 ½									76.87
R11	77.28 S-R 0-16			Fe	77.35 5		77.40 1			77.2 1	77.4 1			77.30
														77.47
P7	77.6 S-R 0-16	77.72			77.60 5		77.7 1			77.7 1				77.63
R45	78.00 S-R 1-16			Fe	78.90 3									78.86
														78.98
														79.00
R13	79.39 S-R 0-16					Br	79.2 2			79.4 1	79.3 6			
R13	79.4 S-R 1-16			Fe	79.50 1									
P9	79.77 S-R 0-16	79.79		Fe	79.95 5					79.9 1				79.91
					80.40 1									80.38
				Fe	80.80 2									80.67
														80.79
				Fe	81.25 1									81.22
R15	81.89 S-R 0-16			Fe	81.85 2		81.9 1			81.8 1	89.9 1			81.66
R59,P11	82.4 S-R 0-16			Fe	82.30 5		82.5 1			82.4 1				82.20
R59	82.74 S-R 0-15	82.60			82.80 5						82.7 8			
P55	83.0 S-R 0-15			Fe	83.10 5	Br	83.1							83.05
			83.45	PbFe	83.55 1									83.61
R17	84.41 S-R 0-16		84.10	Fe	84.15 2									84.11
			84.65		84.80 2		84.7 1			84.8 1	84.8 2			
P13	85.35 S-R 0-16	85.29	85.20	Till	85.20 4					85.3 1				
P77	85.35 S-R 0-14				85.45 4		85.45 1				85.6 3			
					85.85 5		85.9 0				85.6 3			
				Fe	86.10 5									86.00
				Fe	86.25									86.25
R81	87.35 S-R 0-14													
R81	87.78 S-R 0-14		87.70	Fe	87.50 10						87.6 00			87.10
														87.45
														87.66

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3670-3680														
R47	88.13 S-R 1-16				88.15 2		88.15 2			88.15 1	88.00 0			
R19	88.16 S-R 0-16		88.45											
R47	88.70 S-R 1-16													
P15	88.71 S-R 0-16	88.64			88.60 2		88.75 2			88.8 1	88.6			88.47
					89.45 2									89.46
				Fe	89.90 2									89.89
3690-3700														
				Fe	90.45 1						90.30 Br			90.45
					90.75 1									90.73
							91.0 15							
					91.35 1									91.15
														91.33
R21	91.9 S-R 0-16		91.75		91.90 1					91.9 0	91.7 1			
							91.95 25							
P17	92.17 S-R 0-16		92.10							92.6 0				
		92.48			92.55 1		92.6 25				92.6 1			92.65
					93.00 1									93.03
					93.45 1									
											93.7 00			
					94.05 10									94.01
R61	95.08 S-R 0-15			Fe	95.10	Br	95.1 1				95.1 10			95.05
P57	95.25 S-R 0-15													95.51
														95.65
R23	95.88 S-R 0-16			Fe	95.85 3		95.85 25			95.1 0	95.1 3			95.92
P18	95.77 S-R 0-16	95.73			95.90 3		95.75 25			95.8 0	95.8 3			
				Fe	97.50 5									97.43
														97.53
				Ti	98.15 2									98.15
P45,R49	98.28 S-R 1-16				98.30 2		98.35 0				98.35 2			
				Fe	98.85 2									98.80
	99.02 CO				98.95 2		98.9 0							
				Fe	99.15 2									99.14
			99.95	Br	99.95									
R25	00.66 S-R 0-16		00.55		00.65 10		00.60 35			00.6 0	00.6 2			
				Fe	01.05 10									01.00
P21	01.41 S-R 0-16	01.44			01.40 10		01.40 35			01.5 0	01.45 2			
				Mn	01.80 2									
				Fe	02.05 2									02.03
				Fe	02.50 2									02.49
					02.75 2		02.85 15							
P19	02.93 S-R 0-14				03.00 2						03.05 1 Br			
P19	03.03 S-R 0-14				03.10 2		03.25 15							

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3690-3709														
				Fe	03.70 10									03.55
														03.60
														03.82
				Fe	04.50 4									04.02
														04.46
B83	05.09 S-R 0-14				05.00 2									
B83	05.48 S-R 0-14			Fe	05.00 15		05.55 25			05.6 0	05.5 2			05.56
B27	05.60 S-R 0-16													
P23	06.48 S-R 0-16				06.45 1	Br	06.50 3		06.8	06.4 0	06.6 2			
				Fe	07.05 2									07.04
														07.45
														07.56
B83	07.93 S-R 0-16			Fe	07.90 10									07.82
														07.92
P59	08.11 S-R 0-16					Br	08.05 4				08.1 6			
B51	08.12 S-R 0-16													
P47	08.50 S-R 1-16			Fe	08.60 2									08.60
				Fe	09.30 10									09.24
														09.53
														09.66
3710-3729														
							10.50 0							
B29	11.09 S-R 0-16			Fe	11.20 5		11.05 15			11.15 0	11.1 2			11.22
														11.41
P25	11.97 S-R 0-16		11.90	Fe	11.90 3		11.90 15			12.1 0				
											12.0 2			
					12.35 1									
				Mn	12.85 2									12.96
					13.00									
					13.90 2									
					14.10 2	Br	14.0 0							
					14.40 2						14.50 Br			
					14.70 1									
					14.90 1									
					15.20 1									
		16.00 0	15.84	Fe	15.95 5					15.9				15.91
				Fe	16.45 5									16.44
B31	16.77 S-R 0-16				16.80 2									
B31	16.96 S-R 0-16				16.80 2		16.90 15				17.0 2			
P27	17.73 S-R 0-16		17.75		17.85 2		17.75 15			17.9				
P27	17.96 S-R 0-16			Fe	18.35 2					Cen. of ext. broad reg.	18.0 2			18.40
P49,B53	19.3 S-R 1-16										19.3 2			

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3710-3729														
				Fe	19.95 15		19.90 00							19.93
										20.6 VVBr				
k65	21.44 S-R 0-15			Fe	21.45 10		21.4 6				21.4 6			21.19
														21.27
														21.39
														21.51
														21.61
				Fe	21.90 2					21.9 0				21.92
				Fe	22.10 2		22.20 05							
				Fe	22.65 10									22.56
R33	23.01 S-R 0-16													
R33	23.23 S-R 0-16			Bd	23.10 3	Br	23.25			22.9 Br	23.2 2			
					23.85 2					23.9 1				23.88
P29	24.25 S-R 0-16		24.25	Fe	24.40 5		24.2 Br				24.2 2			24.36
				CNNi	24.80 2									
				Ti	25.15 2					25.25 0				
		25.79 0		Fe	25.60 24									25.49
					26.20 2		26.10 Br							
				Fe	27.00 10		27.00 Br			27.0 1				26.93
														27.09
		27.76 0		Fe	27.65 10									27.62
														27.81
					28.25 1									
				Fe	28.55 1									
					28.65 1						28.8 0			28.66
	29.07 CN			CN	29.10 1									
R35	29.76 S-R 0-16													
R35	29.95 S-R 0-16		29.90 1		29.85 2					29.3 1	29.8 2			
3730-3749														
		30.00				Br	30.0 2							
				Fe	30.40 2									30.39
P31	30.83 S-R 0-16													
P31	31.05 S-R 0-16			Fe	30.95 2		31.0 2V			30.9 0	30.9 2			30.94
				Fe	31.35 2									31.37
										31.9 1				31.91
						Br	32.2 0				32.2 00			
		32.45 0		Fe	32.45 2									32.39
				Fe	33.35 3	Br	33.3			33.4	33.5 0			33.31
P63	34.96 S-R 0-15			Fe	34.90 15					34.9 Br				34.86
							35.0 3							
R37	35.25 S-R 0-15			Fe	35.30 5		35.25 3				35.25 10			35.33
		35.59 0												
R37	36.9 S-R 0-16													
R37	37.11 S-R 0-16			Fe	37.15 15		37.1 25				37.2 2			37.13

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3730-3749														
P33	38.03 S-R 0-16													
P33	38.2 S-R 0-16				38.15 4		38.2 1							
				Fe	38.30 4					38.5	38.3 2			38.30
				Fe	38.45 3									38.12
														38.31
P83	39.75 S-R 0-14						39.75 005							39.53
											40.1 1			
P83	40.17 S-R 0-14			Fe	40.25 3									40.06
														40.25
			41.90	Ti	41.05 2		40.9							41.48
														41.70
R3	41.95 S-R 1-17									41.95 1				
R3	42.36 S-R 0-14					Br	42.4 0			42.4 1	42.45 10			
R5	42.36 S-R 1-17	42.89 1		Fe	42.05 2									42.02
P3	43.36 S-R 1-17	43.37 1		Fe	43.40 5		43.50 15				43.55 1			43.36
														43.48
														43.70
R9	44.52 S-R 1-17													
R39	44.52 S-R 0-16			Fe	44.05 2									44.10
R39	44.73 S-R 0-16	44.95			44.60	Br	44.7 3			44.7 1	44.80 4			
R5	44.73 S-R 1-17													
P35	45.69 S-R 0-16			Fe	45.55 15									45.56
P35	45.88 S-R 0-16			Fe	45.90 10	Br	45.9 2				45.9 1			45.90
R11	46.42 S-R 1-17			Fe	46.50 2					46.4 1				46.48
		46.83 1		Fe	46.95 2						46.91 Br			46.92
				Fe	46.30 10									46.26
														46.49
R13	48.6 S-R 1-17	48.91 1								48.5 1	48.70			48.96
R69	49.33 S-R 0-15			Fe	49.55 15		49.65 4			49.7 00	49.65 6			49.48
R69	49.69 S-R 0-15													
3750-3769														
R15	51.12 S-R 1-17													
P11	51.57 S-R 1-17	51.80				Br	51.40			51.0 1	51.4 1			51.86
										51.5 1				51.82
														52.05
														52.42
R41	52.8 S-R 0-16		52.75				52.75 2				52.7 1			
P37	53.79 S-R 0-16				53.60 2									53.15
														53.61
P37	54.0 S-R 0-16				54.00 2		54.05 15			54.0 1	54.0 2			
R17	54.32 S-R 1-17			CN	54.40 2									54.50
P13	54.52 S-R 1-17	54.74 1			54.95 1	Br	55.00			54.7 1				

3780-3769													
				Co	56.45 1								
				Fe	56.00 1								56.07
	56 CN				56.25 1								
					56.60 1								
					56.90 2								56.94
R19	57.63 S-R 1-17					Br	57.50			57.4	57.5 2		57.45
P13	58.15 S-R 1-17	58.15 1		Fe	58.30 15	Br	58.40			58.1	58.3 0		58.23
P85	59.14 S-R 0-14			Fe	59.15 3								59.15
													59.46
P85	59.57 S-R 0-14					Br	59.50				59.35 2		
				Fe	60.00 3								60.05
				Fe	60.55 3								60.53
R43	61.09 S-R 0-16			Fe	61.05 3								
R43	61.35 S-R 0-16				61.35 4	Br	61.35 3			61.3 0	61.40 2		61.40
R21	61.53 S-R 1-17												
P17	62.04 S-R 1-17				62.00 4					62.0 0			
	62.34 S-R 0-15												
	62.35 S-R 0-14	62.26 1		Fe	62.25 4	Br	62.35				62.35 3		62.20
													62.91
				Fe	63.80 10								63.79
	64.27 S-R			CN	64.25 4								
R71	64.60 S-R 0-15			CN	64.60 4	Br	64.50				64.55 4		
	64.92 CN				64.95 1								
R23	65.80 S-R 1-17			Fe	65.55 5	Br	65.70			65.8	65.75 1		65.03
													65.54
													65.70
	66.33 CN												
	66.46 CN												
P19	66.42 S-R 1-17	66.41 0			66.40 2		66.4 15			66.4	66.55 1		66.08
													66.66
				Fe	67.25 10	Br	67.3 1				67.35 0		67.19
				Fe	68.05 4								68.02
											68.40		
					68.80 4								
					69.05 4	Br	69.10			69.2 00	69.2 Br		
					69.35 4								
3770-3789													
													69.99
R45	70.05 S-R 0-16			Fe	70.05 6		70.35 0			70.45	70.40 4		70.30
R45	70.31 S-R 0-16			Fe	70.35 6								
P21	70.33 S-R 1-17												70.41
P4	71.3 S-R 0-16												
P4	71.56 S-R 0-16		71.50	BrFe	71.40 4	Br	71.55 0			71.2 00	71.40 0		71.49

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3770-3789														
					72.15 2	Br	72.30							
					72.55 2									
					73.00 2									
				Fe	73.70 3					73.5 Br				73.36
														73.69
					74.10 2									
					74.70 2									
				Fe	74.90 2									74.82
					75.15 2		75.2 00							
R27	75.78 S-R 1-17						75.8 15				75.80 2			
					76.00					76.0 2 Br				75.86
P19	76.44 S-R 1-17			Fe	76.45 2						76.40 2			76.45
				Fe	77.10 2									77.06
				Fe	77.40 2									77.44
					77.65 2									
					77.85 2									
							78.0 0				78.0 00			
				Fe	78.51 2									78.32
														78.51
				Fe	78.70 2									78.70
					79.15 2		79.2 05							
				Fe	79.50 3					79.5 Br				79.44
														79.48
			79.70		79.75 3		79.8 2				79.90 10			
					80.10 2	Br	80.0 2							
					80.50 2									
					80.90 2									
				Fe	81.15 2		81.1			81.1 00	81.20 5			81.19
					81.65 2									81.93
				Br	82.20 3		82.30 1			82.0 Br	82.20 2			82.13
														82.45
														82.61
					83.10 1									
					83.50 2						83.40 Br			83.34
			83.85		83.85 2		83.65 1							
					84.40 1									
					85.35 4		85.4 1				85.35 1			
				Fe	85.95 5									85.71
														85.96
				Fe	86.70 5									86.17
														86.67
R31	87.35 S-R 1-17				87.15 5									87.16
														87.42
							87.4 1				87.35 1			

3790-3799													
			Fe	87.90						87.9 VVBR			87.88
						88.3 1					88.20 1		
			Fe	89.15 10									89.17
													89.43
R49	89.58 S-R 0-16												
R49	89.67 S-R 0-16		Fe	89.65		89.7 5					89.65 1		89.57
3790-3809													
			Fe	90.10 4									90.01
													90.09
													90.06
P45	90.74 S-R 0-16												
P45	90.97 S-R 0-16		Fe	90.90 4							90.90 4		90.76
						91.0 1							
			Fe	91.45 2						91.5 VVBR			91.38
													91.50
				91.80 2		91.85 1							91.73
			Fe	92.15 2									92.16
				92.55 2									
			Fe	92.80 2									92.83
			Fe	93.45 5									93.36
													93.48
R33	93.85 S-R 1-17		Fe	93.80 5	Br	93.9 1					93.95 3		93.87
			Fe	94.40 5						94.4 0			94.34
P29	94.70 S-R 1-17				Br	94.9 0					94.70 3		
			Fe	95.00 10									95.00
R75	95.96 S-R 0-16			95.90 1									95.53
P71,R75	96.25 S-R 0-15			96.20 4		96.00 15					96.05 6		96.00
				96.60 1						96.7 0 BR			
				96.90 2									
			Fe	97.55 5									97.51
			Fe	97.95 2							97.9 00		97.94
						98.00 15							
			Fe	98.55 10						98.3 VVBR	98.7 00		98.51
B51	99.73 S-R 0-16		Fe	99.80 10									99.54
B51	00.01 S-R 0-16			00.00 2		00.2 VBR					00.00 2		
P47	01.01 S-R 0-16										01.05 1		
P17	01.01 S-R 1-17												
P47	01.36 S-R 0-16			01.40 5	Br	01.40 4							01.33
P31	01.36 S-R 1-17												
P31	01.67 S-R 1-17		Fe	01.65 5						01.64 BR	01.65 5		01.68
													01.80
													01.96
				02.75 2							02.7 0		02.28
				02.95		02.9 05							
				03.15 2									

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3790-3809					03.55 1									
				Fe	04.05 2		04.2 1				04.0			04.01
					04.65 2									
				Fe	05.30 3									05.34
					05.85 1									
				Fe	06.20 2									06.21
				Fe	06.65 2									06.69
				Ni	07.20 1	Br	07.10							
			07.45	Fe	07.60 2						07.4 00			07.53
R37	07.91 S-R 1-17				07.95 2									
R37	08.18 S-R 1-17			Fe	08.20 2	Br	08.1				08.15 2			08.28
P33	08.88 S-R 1-17			Fe	08.70 2									08.73
P33	09.16 S-R 1-17			Fe	09.10 2		09.05 1				09.10 2			09.04
														09.15
					09.50 2									09.57
					09.75 2									
3810-3829														
					10.05 1		10.1 2			10.0				
R53	10.59 S-R 0-16				10.65 2									
R53	10.87 S-R 0-16				10.95 2		10.8 2				10.90 2			10.76
			11.30		11.35 2									11.89
							11.95 Br 3							
P49	12.03 S-R 0-16													
P73	12.25 S-R 0-15				12.05 3D									
R77	12.53 S-R 0-15				12.60 2						12.40 6			
R77	12.90 S-R 0-15			Fe	12.95 10					13.0				12.96
				Fe	13.60 2									13.05
														13.63
				Fe	13.95 2					13.9				13.89
					14.50 2		14.40 1 sh							14.52
														14.78
											14.60 6			
							15.1 05							
R39	15.77 S-R 1-17			Fe	15.85 15	Br	15.9							15.84
R39	16.03 S-R 1-17			Fe	16.0 2					16.0 0	16.10 2			16.34
P35	16.77 S-R 1-17						16.85 1				16.95 2			
P35	17.00 S-R 1-17			Fe	17.00 1									
			17.55	Fe	17.70 2	Br	17.6 0			17.6 VVBR				17.65
					18.10 1									
					18.65 1	Br	18.9 3							18.62
											19.10 0			
							19.75 1 sh							

3810-3829												
				Fe	20.40 15		20.4 1 sh					19.90
												20.42
				Fe	20.85 2							
				Fe	21.20 2							21.17
							21.50 1			21.60 2		
R55	21.96 S-R 0-16			Fe	21.90 2				21.8 VVBR			21.83
R55	22.37 S-R 0-16				22.30 2		22.30 1			22.30 2		
					23.00 1							
P51	23.40 S-R 0-16											
P51	23.65 S-R 0-16				23.55 2D		23.65			23.65 2		
R41	24.36 S-R 1-17			Fe	24.45 10		24.45		24.6	24.40 2		24.07
												24.30
												24.44
P37	25.35 S-R 1-17				25.25 2		25.25			25.45 2		25.40
				Fe	25.90 10							25.88
					26.00 2							26.04
						Br	27.0 3		27.3 VBR	27.1 BR		
				Fe	27.85 10							27.57
												27.82
					28.20 1							
					28.50 1					28.60		28.50
					28.85 1							
P75	29.4 S-R 0-15				29.40 3							29.12
												29.45
P75	29.71 S-R 0-15				29.70 3	Br	29.8 4		29.7 VBR	29.80 6		29.77
3830-3849												
					30.05 2							
					30.30 2							
					30.70 2							30.76
												30.86
					31.00 2							
					31.75 2							
			32.25	Fe	32.35 3		32.25 1 sh			32.40 0		
					32.50				32.5 VBR			
					33.05 2		33.05 1 sh			33.05 1		
R43	33.26 S-R 1-17				33.30 2							33.31
P39	33.84 S-R 1-17											
R57	33.84 S-R 0-16			Fe	33.85 2							
R57	34.18 S-R 0-16			Fe	34.20 15		34.00 1			34.15 5		34.22
P39	34.18 S-R 1-17				34.90 2							
P53	35.26 S-R 0-16				35.20 2		35.2 2					
P53	35.50 S-R 0-16				35.50 2				35.3 VBR	35.45		
				Fe	36.40 2D					35.45		36.33

		BC	2		BS		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3830-3849														
				Fe	37.05 2									37.14
					37.55 2		37.60 1							
					37.95 2					37.9 VVBR	37.90 00			
			38.20		38.30									38.03
					38.75 2									
				Fe	39.20		39.15 0				39.10 00			39.26
				Fe	39.78 1									39.63
							40.25 2							
R3	40.74 S-R 0-17			Fe	40.50 10					40.8 0				40.43
R3	41.19 S-R 0-17			Fe	41.10 10					41.2 0				41.05
R5	41.23 S-R 0-17	41.24 0			41.45 1		41.3							
					41.70 1									
R45	42.14 S-R 1-17													
R7	42.14 S-R 0-17									42.05 0	42.25 3			
P3	42.46 S-R 0-17	42.31 1			42.45 1	Br	42.6			42.4 0				42.85
				Fe	43.00 2									43.88
														43.97
	43.19 S-R 1-17			Fe	43.30 2					43.3 1				43.25
P41,R9	43.50 S-R 0-17				43.70 2					43.6 0	43.5 4			
P41,R9	43.50 S-R 1-17													
		43.93 1			43.85 1	Br	43.8							
					44.15 1									44.28
R11	45.22 S-R 0-17				45.05 2		45.15 1			45.1 1	45.2 2			45.17
		45.65 1	45.45											
P7	45.73 S-R 0-17			Fe	45.95 1					46.7 0				45.70
R59	46.55 S-R 0-16			Fe	46.45 2		46.55 1				46.60 2			46.00
														46.41
				Fe	46.80 2									46.89
P77	47.03 S-R 0-15													
R81	47.40 S-R 0-15	47.46 1			47.35 2		47.4 2			47.3 1	47.40 3			
R13	47.40 S-R 0-17													
P55	47.63 S-R 0-16													
P9	47.96 S-R 0-17		47.95		47.95 2		47.95 2							
R81	47.97 S-R 0-15													
P65	49.98 S-R 0-16									48.0 0				
		48.24 1									48.00 3			
					48.95 1		48.9 0							48.29
					49.50									
R15	49.98 S-R 0-17	50.00 1		Fe	50.00 10	Br	49.8			49.8 1	49.95 3			49.96
3850-3869														
					50.60 5	Br	50.6							
P11	50.7 S-R 0-17	50.80 1		Fe	50.80 5					50.8 1	50.80 3			50.82
														50.97

		[illegible]		[illegible]		[illegible]		[illegible]	G.D.	4	7	Baird King	Total King	Mike	Fe
[illegible]															51.58
						51.40 2									
						51.70 2		51.60 1							
						52.15 1									
					Fe	52.55 2									52.57
P43	53.02 S-R 1-17														
R17	53.02 S-R 0-17				Br	53.05 2		53.15 1			52.9 0	53.20 4			
P43	53.28 S-R 1-17				Br	53.45 2									53.48
P13	53.87 S-R 0-17	53.84 0				53.85 2					53.9 0	53.90 0			53.82
						54.10 2									
					Fe	54.35 2									
	54.7 CN					54.80 2	Br	54.75 2			54.9 00	54.80 1			
						55.30 2									55.32
						55.70 2		55.55 15							55.86
						56.05 2						55.90 00			
R19	56.40 S-R 0-17				Fe	56.45 15	VBR	56.5			56.7 0	56.50 2			56.37
						57.05 2					56.9 0				
P15	57.46 S-R 0-17	57.32 0				57.35 2					57.5 0	57.45 2			
	57.9 N_2^+					57.90 2									
						58.25 2									
						58.65 2									
R61	59.03 S-R 0-16														
R61	59.41 S-R 0-16					59.20 3		59.25			59.1 00	59.35 2			59.21
								59.5							
					Fe	59.95 15									59.91
P57	60.42 S-R 0-16														
R21	60.43 S-R 0-17					60.50 2		60.5			60.2 00				60.97
P57	60.81 S-R 0-16	60.96 0						60.75 2				60.75 4			
R21	61.43 S-R 0-17					61.45 2		61.45			61.3 2	61.50 4			61.34
															61.60
			Ba	61.90											
R49	62.44 S-R 1-17					62.40 2	Br	62.5 1				62.50 3			
						62.80 1									
						63.05 1									
P45	63.52 S-R 1-17					63.50 2		63.45 15			63.45 1				63.41
						63.70 2						63.60 2			63.74
					Fe	64.05 1									
						64.40									64.30
R23	64.70 S-R 0-17					64.60 1		64.7 05			64.7 00	64.80 2			64.76
						65.15 1									
P19	65.3 S-R 0-17														
P79	65.3 S-R 0-15				Fe	65.50 10					65.4				65.52
P79	65.80 S-R 0-15					65.95 1	Br	65.9 4			65.9	65.90 5			
						66.15 1									
						66.45 1									
						66.95 2									

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		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3850-3869														
				Fe	67.25 2		67.4 15			67.6 0				67.21
					67.75 2						67.90 0			67.92
					68.05 2									68.24
					68.60 2D		68.55 05							68.62
					69.10 2									
R25	69.26 S-R 0-17													
R25	69.46 S-R 0-17				69.35 1					69.5 1				
					69.60 3		69.55 2							69.56
					70.00 1									
					70.21 1									
P21	70.76 S-R 0-17				70.80 2		70.6			70.8 0	70.80 2			70.81
	71.56 N_2^+				71.35 2		Br 71.4				71.40 1			
					71.70 2					71.6 0				71.75
					72.40 2									
R63	72.46 S-R 0-16			Fe	72.55 10									72.50
R63	72.81 S-R 0-16				72.80 2		72.8 15			73.4 0	72.90 2			72.92
R51	73.81 S-R 1-17													
P59	73.9 S-R 0-16			Fe	73.75 2									73.76
														73.84
R27	74.22 S-R 0-17													
P59	74.22 S-R 1-17			Fe	74.10 2		Br 74.1				74.30 2			74.05
P59	74.23 S-R 0-16													
R27	74.66 S-R 0-17				74.80 2		74.8							74.69
			75.05											
	75.44 N_2^+		75.40		75.35 2		Br 75.5			75.3 00				75.38
					75.65 1									
P23	76.04 S-R 0-17			Fe	76.00 2						75.90 1			76.04
					76.40 2									76.37
					76.55		76.6							76.67
					76.90 2									
	77.28 N_2^+				77.40 2		Br 77.2 2			77.3 1	77.35 0			77.51
	77.23 N_2^+													
				Fe	78.05 10									78.02
				Fe	78.60 10									78.57
														78.67
														78.73
	79.08 N_2^+				79.20 1		Br 79.0			79.05 0	79.05 0			79.27
	79.03 N_2^+													
					79.65 1									79.65
	80.12 S-R 0-17				80.05 1		Br 80.1							
	80.40 S-R 0-17				80.40 1						80.35 2			80.22
					80.75 1									
	80.84 N_2^+				80.95 1		81.0			80.7 1				80.78
					81.25 1									81.01

		BC		S		MB		S	G.D.	4	T	Baird King	Total King	Mike	Fe
3870-3889						81.45 1									81.96
															82.48
P25	81.78 S-R 0-17							81.8				81.95 2			
								83.0			82.5	83.20 2			
	83.43 CN	Fe	83.40	CN		83.45 1									83.28
	84.23 N_2^+			Fe		84.35 2	Br	84.3			84.1	84.50 2			84.36
															84.66
P61	84.66 S-R 0-15														
R55	85.13 S-R 1-17			Fe		85.10 1									85.15
R55	85.13 S-R 0-15														
R55	85.46 S-R 1-17			Fe		85.50 2	Br	85.6 1			85.8	85.65 2			85.51
R55	85.47 S-R 0-15					85.95 1									
R31	86.18 S-R 0-17														
R31	86.38 S-R 0-17			Fe		86.35 10									86.28
R65	86.37 S-R 0-16														
R65	86.72 S-R 0-16											86.60 2			
				Fe		87.05 2									87.05
	87.48 N_2^+						Br	87.6			87.4				
P61	87.76 S-R 0-16														
P61	87.78 S-R 0-17														
P27	88.03 S-R 0-17											88.15 2			
P61	88.03 S-R 0-16			Fe		88.55 5									88.51
	88.98 N_2^+			Fe		88.90 2		89.05 15			88.9	89.05 00			88.82
	89.32 BA	Fe	89.36			89.25 2									
				Tl		89.85 1						89.95 00			89.92
3890-3909															
	90.48 N_2^+			Fe		90.45 1		90.45 15				90.60 10			90.23
															90.39
				Fe		90.85 1									90.84
				Ba		91.80 10									
								92.10							
R33	92.72 S-R 0-17														
R33	92.96 S-R 0-17	Fe	92.75	Fe		92.80 2									
	93.33 N_2^+			Fe		93.35 2	Br	93.4				93.20 2			
				Fe		93.95 2									93.91
															94.01
P29	94.48 S-R 0-17														
P29	94.66 S-R 0-17			Mn		94.70 2		94.80 2				94.75 2			
R55	95.82 S-R 1-17			Fe		95.65 10									95.14
															95.23
															95.65
R55	96.15 S-R 1-17							96.05 1				96.20 3			

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3890-3909														
P51	97.22 S-R 1-17			Fe	97.35 2		97.40 15				97.35 3			97.44
							97.7							
				Fe	97.96 5									97.89
	98.50 N_2^+			Tl	98.50 1		98.5							98.01
				Fe	98.95 2		99.0							99.01
														99.03
R35	99.75 S-R 0-17			Fe	99.75 10									99.70
R35	99.99 S-R 0-17						00.05 25				00.00 1			
				Fe	00.50 1									00.51
R67	00.87 S-R 0-16				00.85 1									
R67	01.26 S-R 0-16				01.10 1	Br	01.00				01.10 1			
P31	01.59 S-R 0-17				01.40 1									
P31	01.78 S-R 0-17													
	01.93 N_2^+						01.95							
P63	02.26 S-R 0-16													
P63	02.60 S-R 0-16			Fe	02.95 10						02.75 1			02.94
	02.96 N_2^+						03.15							
				Fe	03.95 2									03.90
	03.98 N_2^+													
	04.14 N_2^+													
	04.19 N_2^+						04.1				04.3			
			04.80		04.90									04.63
	05.05 N_2^+													
	05.14 N_2^+			Fe	05.25 1		05.05				05.25 Br			
			05.60		05.60 2									
					05.90 1									
	05.99 N_2^+													
	06.04 N_2^+				06.10		06.00							06.03
				Fe	06.50 5									06.48
	06.89 N_2^+													
	06.84 N_2^+			Fe	06.75 2		06.8							06.75
	07.24 S-R 0-17													
	07.71 N_2^+			Fe	07.55 2		07.65				07.60 1			07.47
														07.67
	07.65 N_2^+													07.93
				Fe	08.00 2									
	08.42 N_2^+													
	08.46 N_2^+													
	08.47 S-R 1-17				08.40 2		08.45				08.45 1			
	09.19 N_2^+													
	09.14 N_2^+				09.20 2	Br	09.2							
P53	09.17 S-R 1-17													
P33	09.17 S-R 0-17													

		BC	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3890-3909													
P33	09.36 S-R 0-17									09.45 1			
P53	09.38 S-R 1-17												
	09.86 N_2^+			Fe	09.75 5	09.9							09.86
													09.83
3910-3929													
	10.44 N_2^+				10.35 2	10.4							
				Fe	10.85 2								10.84
	11.00 N_2^+												
	11.55 N_2^+				11.50 2	11.5							11.00
													11.09
					11.95 2								
R3	12.5 S-R 1-18				12.45 2								12.05
													12.44
R5	12.9 S-R 1-18	12.98 0		Fe	12.80 2								
					13.20 1								13.21
				Fe	13.00 5								13.03
	14.34 N_2^+ Head	14.30 1		Fe	14.20 5	14.3			14.35 1	14.3 2			14.28
R39	15.09 S-R 0-17												
R9	15.20 S-R 1-18			Fe	15.25 5				15.4 0				
R39	15.32 S-R 0-17	15.57 1		Fe	15.45 1	15.45 15			15.8 0	15.45 1			
R89	15.76 S-R 0-16				15.75 1								
P6	15.76 S-R 1-18												
					15.95 1								
					16.25 1					16.40 00			
P65	17.19 S-R 0-16			Fe	16.75 1				17.2 0				16.73
R11	17.15 S-R 1-18	17.42 1		Fe	17.20 2								17.18
P36	17.29 S-R 0-17												
P7	17.85 S-R 1-18					Sr 17.65 2			17.7 0	17.55 5			
				Fe	18.35 2								18.32
													18.42
P65	18.69 S-R 0-16			Fe	18.60 2								18.64
P7	18.89 S-R 1-18												
				Fe	19.10 2								19.07
R13	19.35 S-R 1-18					19.45 15			19.35 0	19.35 0			
		19.74 1											
P9	20.00 S-R 1-18			Fe	20.25 10				20.00 0				20.26
				Fe	20.90 1								20.84
				Fe	21.30 1								21.18
													21.38
R15	22.05 S-R 1-18	22.37 1		Fe	22.15 1	22.10 15			22.15 0	22.20 2			
P55	22.35 S-R 1-17												
R16	22.75 S-R 1-18			Fe	22.95 10				22.9 0				22.91

		BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3910-3929												
R41	23.60 S-R 0-17											
R41	23.83 S-R 0-17			23.95 1	23.8 p			24.0 00	23.80 2			23.97
												24.17
R17	25.25 S-R 1-18		Fe	25.20 2	25.35 15			25.3 0				25.20
P37	25.7 S-R 0-17		Fe	25.70 2					25.80 0			25.64
												25.94
									25.90 3			
P37	25.95 S-R 0-17	25.92 1	Fe	26.00 2	26.0 2			26.1 0				26.83
			Fe	27.95 10								27.92
												28.08
R19	28.80 S-R 1-18							28.8 0	28.80 0			
			Fe	29.20 1	Br 29.0 1							29.12
												29.21
		29.42 1										
P15	29.7 S-R 1-18				29.9 15			29.8 0	29.90 00			
3930-3949												
			Fe	30.35 10								30.29
			Fe	31.15 1								31.12
					31.80							
R71	31.99 S-R 0-16			32.05 1					32.05 00			32.27
R43	32.48 S-R 0-17		Fe	32.65 2								32.63
P67	32.81 S-R 0-16		Fe	32.90 2	32.95 1			32.7 0	32.80 2			32.92
P17	33.85 S-R 1-18	33.30 0	Ca	33.65 5				33.9 1	33.70 0			33.60
					33.90 1							34.23
P39	34.67 S-R 0-17											
P39	34.67 S-R 1-17								34.80 0			
P39	34.90 S-R 0-17											
	35.78 S-R 1-17		BaFe	35.75 3								35.30
												35.81
												35.95
					Br 36.7							
R23	37.30 S-R 1-18		Fe	37.30 1	37.4			37.3 1	37.3			37.33
		37.23 0		37.85 1								
P19	38.40 S-R 1-18			38.40 1	38.60 15			38.5 1	38.50 0			38.02
												38.96
			Fe	40.85 1								40.64
												40.88
			Fe	41.30 1								41.28
R25	42.10 S-R 1-18			42.10 2	42.20 25				42.15 4			
R45	42.12 S-R 0-17		Fe	42.40 2				42.4 00				42.44
												43.34
												43.69

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
3930-3949											
P21	43.45 S-R 1-18			43.60 1			43.4 1	43.40 1			
P41	44.1 S-R 0-17										
	44.03 Al	Al 44.05	Al 44.05 20								44.75
											44.89
P41	44.35 S-R 0-17			44.45 1				44.40 1			45.12
			Fe 46.95 1								47.00
R73	47.67 S-R 0-16										
R27	47.65 S-R 1-18		Fe 47.55 1	47.60 2	Br		47.5 00	47.50 1			47.39
											47.53
R73	48.16 S-R 0-16		Fe 48.15 1								48.10
R83	48.28 S-R 1-17		Fe 48.75 1								48.77
P69	49.0 S-R 0-16										
P23	49.00 S-R 1-18		Fe 49.10 ½	49.3	Br		48.9 0	49.15 2 Br			49.15
P69	49.0 S-R 1-17										
3950-3969											
			50.00 1								49.95
			Fe 51.20 1								51.16
R47	51.98 S-R 0-17		Fe 51.90 ½	52.0	Br			51.90 2			
			Fe 52.60 1								52.60
											52.70
			Fe 53.10 1								53.15
R29	53.45 S-R 1-18		53.40 1	53.5 1	Br			53.40 0			
			Fe 53.85 ½								53.86
			54.20 ½								54.71
P43	54.05 S-R 0-17										
P43	54.32 S-R 0-17			54.4 2				54.40 1			
P25	54.85 S-R 1-18			54.9 2			54.6 2 BR				
						55.0		55.00 1			
			Fe 55.35 1								55.35
			Fe 56.00 ½								55.96
			Fe 56.50 2								56.46
			Fe 56.75 2								56.68
			59.95 1				56.9				57.03
											58.40
				57.3 5							58.74
											60.28
											60.89
					Br						
R31	59.75 S-R 1-18			59.5 1				59.80 2	59.70 0		
							60.5 VBR				
P27	61.25 S-R 1-18							61.30 2			
		Al 61.50	Al 61.55 20	61.4 4					61.40 0		61.14

		BC	2		BB		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3950-3969														
														62.35
														62.72
R65	62.04 S-R 1-17													
R49	62.04 S-R 0-17													
R49	62.33 S-R 0-17										62.45 0			
				Fe	63.10 1					63.10 VBR				63.10
	63.61 S-R 1-17				63.80 1							63.75 0		
	64.07 S-R 1-17													
P45	64.51 S-R 0-17			Fe	64.55 1									64.52
P45	64.75 S-R 0-17						64.8 3				64.80 3	64.70 0		
	65.03 CO			Co	65.05 1									
					65.65 1									65.51
R33	66.25 S-R 1-18			Fe	66.05 2							66.25 0		66.06
R33	66.55 S-R 1-18													
	66.58 S-R 0-15			Fe	66.60 2		66.5 1			66.5 Dv	66.50 3			66.51
														66.62
							66.7							
				Fe	67.45 1							67.20 0		67.42
				Fe	67.95 2									67.96
P29	68.15 S-R 1-18					Br	68.2 3			68.2 Dv	68.25 3	68.35 0		
				Ca	68.50 2									68.37
				Fe	69.30 5									69.28
							69.9 5			69.8 Dv				
3970-3989														
												70.05 0		69.63
				Fe	70.30									70.26
														70.39
												71.15 0		
				Fe	71.30									71.32
														71.81
							72.10 0			72.20 VBR		72.10 0		
	73.22 S-R 0-17									73.4 VBR	73.2	73.35 0		
						Br	73.5							
R35	73.80 S-R 1-18			Fe	73.70						73.9			73.26
														73.65
														74.39
														74.76
	75.34 S-R 0-18													
R31	75.30 S-R 1-18		75.3		75.30					75.2 1		75.30 0		75.21
P47	75.65 S-R 0-17				75.55		75.6 1				75.6 3			75.84
				Fe	76.80							76.55 0		76.39
														76.56
														76.61
														76.95

		BC	2		3	G.D.	4	7	Baird King	Total King	Mike	Fe
3970-3989												
P67	77.65 S-R 1-17			Fe	77.75					77.60 0		77.74
P67	78.1 S-R 1-17											
P63	78.6 S-R 1-17			Fe	78.40	78.60 05		78.8 1	78.40 BR			78.46
				Fe	79.55					79.65 0		79.64
R37	81.26 S-R 1-18								81.35 0	81.20 1		
R37	81.55 S-R 1-18					81.50						
				Fe	81.75							81.10
												81.77
								82.2		82.25 0		
						Br 83.3			83.35 4	83.25 1		
R53	84.2 S-R 0-17			Fe	83.95							83.96
R53	84.57 S-R 0-17								84.6 0	84.40 1		84.93
	84.6 CN					Br 84.8						
				Fe	85.25			85.4 0				85.38
				Fe	86.15							86.17
	86.85 S-R 2-19				86.80			86.6 0		86.90 2		
P49	87.1 S-R 0-17				87.05	87.0 1		87.4 0	87.0 2			
R5	87.33 S-R 2-19						87.3 0					
							88.2 0	88.5 0				
					88.95							89.01
						Br 89.3	89.2 0				89.25	
									89.6 2	89.45 2		
R39	89.75 S-R 1-18			Fe	89.75			89.8 0				89.88
P5	89.75 S-R 2-19											
3990-4009												
				Fe	90.35		90.2	90.15 0				90.37
P35	91.55 S-R 1-18					Br 91.50		91.6 0	91.6 2	91.55 2		
							92.2	92.2 0			92.38	
										93.15 1		
	93.40 Ba		93.40	Ba	93.40							93.10
												94.12
										93.70 1		
R13	94.10 S-R 2-19					Br 94.2	94.3	93.9 0	94.2 BR	94.15 1		
P9	94.63 S-R 2-19							94.4 0		94.50 1		
											94.9	
				Fe	95.20		95.2					95.20
			95.7		95.65							
				Fe	95.90							95.98
R55	96.12 S-R 0-17											
R55	96.45 S-R 0-17					Br 96.3		96.7 0	96.4 BR	96.25 2		
R15	96.90 S-R 2-19			Fe	96.9							96.97
				Fe	97.35					97.30 1	97.15	97.39

	BC	2		88		3	G.D.	4	7	Baird King	Total King	Mike	Fe
4010-4029													
								Abs 14.00				14.15	
			Fe	14.40									14.27
										15.3 00	15.40 1		14.53
			Fe	16.35								16.05	16.42
R45	16.86 S-R 1-18		Fe	17.05							16.85		17.09
													17.15
R45	17.20 S-R 1-18								17.6 00	17.3 1 BR			
												17.95	
			Fe	18.10									18.27
P41	19.0 S-R 0-16		Fe	18.95	BR	19.0 V				19.0 3			
P41	19.0 S-R 1-18												
								19.6					
									18.9 00			19.85	
				20.10									20.48
R3	20.73 S-R 0-18								20.8 00			20.55	
R5	21.3 S-R 0-18				Br	21.5 0			21.3 00	21.5 00			
R59	21.68 S-R 0-17		Fe	21.75									21.61
													21.87
R7	22.10 S-R 0-18							22.3	22.2 00				
P3	22.59 S-R 0-18		Fe	22.60							Omitted by exp. accident		22.74
R9	23.45 S-R 0-18												
R11	23.67 S-R 0-18							23.8	23.5 00				
	24.03 S-R 0-18												
P5	24.09 S-R 0-18		Fe	24.05									24.10
P23	24.4 S-R 2-19		Ti	24.55		24.5 00			24.2 00	24.4 00			
P55	24.4 S-R 0-17												
			Fe	24.75				Abs 24.75 CO				24.95	24.73
									25.3 00				
				25.70								25.85	
P7	26.10 S-R 0-18		MnFe	26.35					26.0 00				
R47	26.98 S-R 1-18							26.8				26.75	
R47	27.40 S-R 1-18					27.6 Dv			27.5 00	27.5 Dv			
								27.8					
												28.05	
									28.5 00				
P43	29.25 S-R 1-18												
R29	29.25 S-R 2-19							29.45 2					
P43	29.5 S-R 1-18		Fe	29.65	VBR	29.7 3							28.77
													29.63
4030-4049													
												30.15 5	30.19
													30.49

	BC	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	Fe
4030-4049											
R15	30.50 S-R 0-18		Mn 30.70	EmFe 30.7			30.3 0	30.50 00			
P25	30.50 S-R 2-19										
			Mn 31.75				31.3 0	31.7			31.24
											31.96
			Fe 32.00								
			Fe 32.60								32.46
											32.63
R17	33.40 S-R 0-18		Mn 33.10				32.9 00	33.3 00			
							33.4				
										33.95 2	
R61	34.71 S-R 0-18										
	34.70 S-R 2-19		Mn 34.50	EmFe 34.5			34.6				
				34.9							
R61	35.02 S-R 0-17							35.0 0			
P13	35.02 S-R 0-18										
			Mn 35.70							35.65 2	
R31	35.7 S-R 2-19										
			36.45							36.25 2	
										36.75 2	
R19	37.05 S-R 0-18		37.10	37.1			37.0 1	37.1			
P27	37.05 S-R 2-19										
P57	37.57 S-R 0-17					37.3				37.45 4	
R49	37.57 S-R 0-18										
P57	38.05 S-R 0-17							38.1 10		Br 38.05 10	
R49	38.05 S-R 0-18										
				38.3							
P15	38.75 S-R 0-18		Fe 38.75				NO_2 38.6 1				38.80
						39.1					
			Fe 39.95								40.09
P45	40.25 S-R 1-18							40.25 3		40.45 4	
			Fe 40.65	40.7							40.64
R21	41.05 S-R 0-18		Mn 41.30				41.0 1				41.28
										41.55 2	
						42.1					
R17	42.65 S-R 0-18					Em 42.6 0	42.8 1	42.7			
R33	42.65 S-R 2-19			Br 43.00 VV							
										43.25 2	
			43.90								43.90
P29	44.20 S-R 2-19		44.25					44.3			
			Fe 44.60			Em 44.4				44.55 2	44.61
										45.20 5	
							45.3				
			Fe 45.80					45.8			45.81
						Abs 46.9					

		BC	2	BB	3	G.D.	4	7	Baied King	Total King	Mike	Fe
4030-4049												
P19	47.35 S-R 0-18							47.4 0	47.40			
											47.55 5	
								48.1 2				
R63	48.77 S-R 0-17			48.75								47.31
R53	48.77 S-R 1-18				48.9		Em 48.9 1					
R63	49.15 S-R 0-17		Fe	49.20	49.3			49.3 2	49.20 4			49.33
							Abs 49.5 1				Br 49.65 5	

		2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4050-4069												
R25	50.55 S-R 0-18		50.00				50.4 0					49.87
			Fe 50.45			Abs 50.8				50.85		
P47	51.55 S-R 1-18					51.45	51.6 0					
P59	51.58 S-R 0-17											
P59	51.95 S-R 0-17		Fe 51.80	VV				51.84 4				51.91
P21	52.45 S-R 0-18		Fe 52.30	Br 52.1 BR		Abs 52.3	NO_2 52.3 VBR					
			Fe 53.10				NO_2 53.2 VBR					
				54.2		Abs 54.0						
			Fe 54.75				Br 54.7 1					54.83
			Mn 55.35							55.25		55.04
R27	56.0 S-R 0-18			55.5								
R27	55.8 S-R 0-18					Abs 55.8	Br 56.1					
								56.2 00		56.25		
				57.0								
		Br 57.8					57.5 1					57.35
		57.75				Em 57.9						
R85	58.15 S-R 0-16		58.05					58.20 0		58.25 3		58.23
P23	58.15 S-R 0-18											
				58.4								
			Fe 58.70									58.76
P81	59.0 S-R 0-16					Abs 59.0						
										59.25 1		
			Fe 59.55									59.72
						Em 60.0				60.05		
R53	60.78 S-R 1-18											
R53	60.90 S-R 1-18		60.75 0	60.9 25		60.7		60.85 0				
						Abs 61.2 BR	61.0 1			Br 61.25 3		
R29	61.7 S-R 0-18											
R29	61.9 S-R 0-18		MnFe 61.70				61.6 1					61.96
			Fe 62.30					62.20		62.25		62.44
				63.1								
R65	63.3 S-R 0-17											
P49	63.3 S-R 1-18		Fe 63.40 5			63.6		63.40 3				63.28
R65	63.70 S-R 0-18									Br 63.95 10		
P25	64.1 S-R 0-18											
							64.7 1					
			Fe 65.25			65.1	65.0					65.39
P61	66.23 S-R 0-17		Fe 66.45	66.5				66.6 2	66.40 1			66.59
P61	66.8 S-R 0-17		Fe 66.75				66.4			66.85 5		66.98
			Fe 67.05									67.27
						Abs 67.3						
			Fe 67.80									67.98
R31	68.05 S-R 0-18			68.0								
								68.25 1	68.15 1			

													Baird King	Total King	Mike	King 1st max.	Fe
4060-4069																	
R31	68.25 S-R 0-18																
P36	69.25 S-R 2-19																
					68.90												
					69.30	Br	69.3 2		Em 69.3					69.25			
									69.7								69.88
4070-4089																	
P27	70.65			Fe	70.65								70.70	70.60 1	70.75 2		70.78
				Fe	71.50									71.45 0			71.74
														72.25 1			72.51
R55	72.8 S-R 1-18																
R55	73.2 S-R 1-18					Br	73.0 3						73.10 1	73.00 0			
									Abs 73.4 00						73.45 3		73.45
				Fe	73.80												73.78
R33	74.85 S-R 0-18			Fe	74.80				Abs 74.7 00								74.79
R33	75.1 S-R 0-18													75.15 2			
							75.4					Br	75.5 3				
P61	75.6 S-R 1-18			Fe	75.85									75.75 2	75.85 SR		75.94
																	76.22
				Fe	76.55									76.55 1			76.50
																	76.64
																	76.90
							77.2 2							77.30 3			
P29	77.65 S-R 0-18	Sa	77.6 5		77.55				Em 77.5				77.50 0				
P37	77.40 S-R 2-19																
P29	77.41 S-R 0-18														77.90 SR		
R67	78.14 S-R 0-16		78.3 00		78.20						NO_3 78.3 1SR			78.30 0			78.36
R67	78.14 S-R 0-17																
R67	78.85 S-R 0-17												78.8	78.80 2			
R67	78.88 S-R 0-17				79.10								79.1		79.15 SR		
					79.65						NO_3 79.4 2SR				79.75 2		79.85
				Fe	80.05				Abs 80.1								80.22
				Fe	80.75												80.89
				Fe	81.10									81.15 2			
						Br	81.4 V		81.5			Br	81.5	81.30 2			
P63	81.76 S-R 0-17				81.85									81.60 2	81.75 2		
R35	82.18 S-R 0-18			Fe	82.20									82.40 0			82.12
R35	82.40 S-R 0-18																
				Mn	82.80		82.9 1							82.8 0	82.75		
											NO_3 83.1			83.20 1			
				Mn	83.45												
				Fe	84.30		84.1 1				84.3			84.10			83.78
			84.65														

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		2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4070-4089												
			Fe 84.80			Fe 84.9 em	NO_3					84.50
P31	85.10 S-R 0-18		Fe 85.10				NO_3 85.4	85.1	85.05 2	85.25 2		85.01
P31	84.99 S-R 0-18											85.32
R57	86.05 S-R 1-18		Fe 85.95	Br 86.0 2				86.1	86.00 2			86.00
R57	85.6 S-R 1-18									86.35 2		
		CO 87.00	Fe 86.90				87.1		87.05 1			87.10
									88.05 1			
						Fe 88.3 em		88.3 2		88.25 BR		
P53	88.45 S-R 1-18		Fe 88.40						88.4 1			88.58
							89.0		88.85 1			
			Fe 89.00									89.22
R37	89.97 S-R 0-18		Fe 89.95			Fe 89.9 em						90.08
4090-4109												
R37	90.2 S-R 0-18						NO_3 90.2	90.35 2	90.05 2	90.35		
			Fe 90.70	Br 90.80 VV					90.70 1			
			Fe 91.35									91.56
						Abs 91.6						
	92.40 CO	92.15	Co 92.20									92.29
	92.75 CO		Co 92.70						92.90 3			
P33	92.83 S-R 0-18			93.00 2s				93.0 00		93.15 2		
P33	93.06 S-R 0-18											
						Abs 93.5						
									93.96 1			
R69	93.9 S-R 0-17											
R69	94.54 S-R 0-17		94.50									
				Br 94.8 4				BR 94.8 0	94.80 2	94.75 2BR		
R3	95.15 S-R 1-19		95.20									
R5	95.5 S-R 1-19					Abs 95.7 0	NO_3 95.8 1			95.75		
			Fe 96.00									95.98
P3	96.0 S-R 1-19		Fe 96.95	96.8			NO_3 96.1 1			96.75		96.97
	97.10 S-R 0-17					Abs 97.2	97.1	97.3 2	97.00 1			97.12
	97.45 S-R 0-17								97.55 1	97.65		
R7	97.80 S-R 1-19					Abs 97.9						
R39	98.29 S-R 0-18											
R9	98.3 S-R 1-19		Fe 98.20				98.4 1					98.19
P5	98.45 S-R 1-19					Abs 98.6		98.6	98.45 2	98.65 1		
R39	98.45 S-R 0-18											
			98.95									
			99.10				99.0 1		99.05 2			
									99.65 1	99.55 1		
R11	00.20 S-R 1-19		Fe 00.15				00.2 0					00.17
			00.40			00.3 em		00.3	00.25 3	00.45 1		

		2		00	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4090-4109													
			Fe	00.75	Abs 00.7						00.75		00.74
P7	00.70 S-R 1-19		Fe	01.25				01.1 0		01.45 1			01.27
P35	01.25 S-R 0-18		Fe	01.25									
P35	01.45 S-R 0-18			01.60									
P55	01.45 S-R 1-18												
	01.85 S-R 1-18								01.85				
				02.25							02.05		
R13	02.55 S-R 1-19			02.80 7D				NO_3 02.5 1		02.65 1	02.85 1		
				03.40									
				03.65 7D			Abs 03.7	NO_3 03.5 1			03.75 1		
			Fe	04.15						04.25 1			04.13
							BR 04.6 abs						
				05.05					05.20				04.96
R15	05.35 S-R 1-19							NO_3 05.2		05.30 2	05.45 3		
							BR 05.8 abs						
P11	06.40 S-R 1-19		Fe	06.40				NO_3 06.5		06.45			06.27
													06.44
R41	06.95 S-R 0-18										06.65 1		
R41	07.25 S-R 0-18												
			Fe	07.45					07.5	07.60 1	07.55		07.49
R17	08.6 S-R 1-19									08.05 1	08.75 2		
			Fe	09.00			Br 09.1 cm	NO_3 08.6					09.07
P13	09.80 S-R 1-19		Fe	09.80				NO_3 09.8	09.8	09.9 2			09.81
4110-4129													
P37	10.15 S-R 1-18								10.0 dr				
P37	10.35 S-R 0-18	10.30		10.40						10.30 2	10.50 4		
R71	10.8 S-R 0-17			10.80						10.90 1			
				11.85									
R19	12.30 S-R 1-19		Fe	12.25			12.3	12.2 0	12.2	12.20 4			12.36
											12.55 3		
			Fe	12.95			12.8						12.97
P15	13.7 S-R 0-17						13.5 cm			13.55 3			
P15	13.75 S-R 1-19							13.6	13.75		13.95 BR		
					14.0								
			Fe	14.30									14.45
			Fe	14.80									14.96
		15.05 BR											
R57	15.75 S-R 1-18			15.65			15.8 cm						
R43	16.24 S-R 0-18	16.45	Br	16.35				16.3 0					
R43	16.5 S-R 0-18												
R21	16.5 S-R 1-19												
							16.7	16.6 0	16.6	16.50 2	16.75 BR		
							Abs 17.1						

		2		88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4110-4129													
			Fe	17.65			17.7 cm						17.66
				17.90				18.1 0	18.1 0	17.95 1			
				18.4			18.4 cm				18.25 1		18.55
					18.9						18.85		18.90
			Fe	19.15									19.39
P39	19.80 S-R 0-18			19.70					19.8 0	19.85 1			
				20.00							20.05 2		
													20.21
	20.6 Head		Fe	20.55	Br 20.5 3		20.7 cm			20.90 1			
R23	21.15 S-R 1-19			21.00				21.2 00	21.10	21.25 0			
				21.60									
			Fe	22.00	Br 22.1 3								21.81
			Fe	22.35			22.4 cm			22.35 1			
			Fe	22.55									22.51
P19	22.85 S-R 1-19							22.8 0	22.8 0	22.80 2			
											23.05 4		
			Fe	23.55						23.75 0			23.75
								24.3 00		24.15 0	24.25 2		
					24.8 2S					24.95 1			
				25.45				25.5 1			25.3 1		
			Fe	25.70									25.62
R45	26.01 S-R 0-18		Fe	25.95									25.88
R45	26.25 S-R 0-17				26.3 1S			26.3 1	26.25 1	26.25 3			26.19
											26.45 BR		26.88
R63	27.70 S-R 1-18	27.54	Fe	27.50						27.85 3			27.61
R63	27.75 S-R 0-15												
					28.1						28.05 3		27.80
P21	28.1 S-R 1-19						28.6	28.3 0		28.80 1			28.73
					29.2						29.05 1S		29.22
P41	29.43 S-R 0-18						29.4						
P41	29.7 S-R 0-18									29.75 2			
4130-4149													
R59	30.25 S-R 1-18							30.3 0	30.0				30.04
			Ba	30.45			30.4			30.35 1	30.35 3		
P69	30.7 S-R 0-17	30.60 5							30.6 1BR				
					Br 30.9 2		Abs 31.0 2	31.6 0					
R27	31.85 S-R 1-19		Fe	31.90					31.85 0BR	31.80 1			32.06
											32.15 3BR		
		32.40 1		32.40									
P23	32.85 S-R 1-19			32.90						32.80 1			
				33.40	33.2								
			Fe	33.80				NO_3 33.6 2	33.80 2BR	33.90			33.86

	2	BB	3	G.D.	4	7	King	King	Miles	1st man.	
4130-4149											
	Fe	34.50	34.4 3								34.34
	Mn	35.10			Abs 35.1			35.25 1			35.04
R47 36.2 S-R 0-18			36.2 1					36.25 1			
R47 36.5 S-R 0-17		36.65					36.50 00				
								36.90 1	36.75 2		
	Fe	37.00	37.1 1								37.06
R29 37.68 S-R 1-19											
R29 37.9 S-R 1-19			Br 37.7			37.7 1	37.90 00	37.75 2			
									38.05 2		
								38.90 1			
			39.6 0					39.40 1			
P43 39.85 S-R 0-18											
P43 40.10 S-R 0-18					40.3 em	40.6 1BR	40.15 2	40.15 2	40.35 2		39.92
P25 40.10 S-R 1-19											
			40.7 2		40.8 em			40.80 2			
		41.20									
		41.55							41.45 1BR		
	Fe	41.90									41.67
		42.30									
	Tl	42.55			42.5 2 em	42.5 1		42.65 2			
R65 42.85 S-R 1-18		42.85	42.7 1				42.70 0		42.75 2		
	Fe	43.50						43.45 0			43.42
	Fe	43.90						44.05 0			43.87
					44.3 em BR	44.3	44.55 2	44.55 2			
R75 44.94 S-R 0-17		44.75 2	44.7 2						44.75 3		
	Fe	45.15	45.3 2					45.15 2			
P61 45.35 S-R 1-18					Abs 45.6 BR		45.45 2		45.55 3		
		45.90						45.95 1			46.07
		46.45			46.5						
R49 46.8 S-R 0-18	Cr	46.70					46.9	46.90 2			
P27 46.79 S-R 1-19											
R49 47.3 S-R 0-18		47.30	47.5 1						47.05 2		
	Fe	47.65						47.50 1			47.67
P71 48.15 S-R 0-17		48.25									
		48.55	48.5 1					48.40 1	48.55 0		
		48.80	48.8								
	Fe	49.15	49.5		49.6			49.00 0			49.37
								49.70 0	49.85		
4150-4169											
	Fe	50.10									
		50.40						50.30 0			50.26

		2		BB	3	G.D.	4	7		Baird King	Total King	Mike	King 1st max.	Fe
4150-4169														
P45	51.05 S-R 0-18										51.10			
R33	51.50 S-R 1-19			51.40					Br	51.55 2	51.55 2			
					51.7 3							51.75 2BR		
			Fe	51.95	52.0 3		52.0	52.4			52.15 1			51.96
														52.17
					53.3 0			53.4 0			53.40 0			
			Fe	53.75	53.8									53.41
														53.91
P29	54.15 S-R 1-19				54.1						54.15 1			54.11
			Fe	54.5 1								54.35 3		54.50
			Fe	54.6										54.81
					55.0						55.20 0			
				55.45			Abs 55.3	55.4 0						
				55.80										
				56.10							56.05 1			
			Fe	56.55	56.5						56.40 1			56.68
							Abs 57.0							
			Fe	57.70 0				NO_3 57.6 00			57.95 1			57.79
R51	58.32 S-R 0-18													
R51	58.6 S-R 0-18			58.55 0	58.3 2						58.50 1			58.80
R37	58.8 S-R 1-18													
R35	59.05 S-R 1-19						Abs 58.9 00		Br	58.8		58.85		61.08
								NO_3 59.2 00				59.25		61.49
					59.4 1						59.25	59.35		63.67
											59.50 1			
							Abs 60.1 BR							
P63	61.00 S-R 1-18				60.8 BR						60.90 1			
										61.2		61.25		
P31	61.65 S-R 1-19							NO_3 61.8 00			61.75	61.85		
P47	62.45 S-R 0-18				62.5 BR									
P47	62.16 S-R 0-18									62.7	62.55 0	62.75		
	63.3 S-R 0-17				63.1			NO_3 63.0 00						
							63.6				63.40 0	63.85 BR		
											64.40 0			
					64.7									
			Ba	65.85			65.7	NO_3 65.7 00						65.42
		65.95 3												
P73	66.33 S-R 0-17			66.40							66.55			
					66.8 6			NO_3 66.7 00	Br	66.80 0	66.90 3			
R37	67.05 S-R 1-19						Abs 67.3					67.35 4		
				67.60			67.6				67.70 1			67.86
														67.96
					68.1 0									
			Fe	68.35							68.50 1			68.94
												68.65 4		68.77

4150-4169													
P33	69.8 S-R 1-19					Abs 69.6							
									Br	69.35 1	69.55 2		
				69.6 BR									
4170-4189													
R53	70.09 S-R 0-18						NO_3 70.3		Br	70.05 1	70.25 2		
R53	70.46 S-R 0-18			70.5		70.6						70.65	
		Fe	70.85										70.90
				71.1 0							71.40 0		
		Fe	71.90								72.10 0		71.70
			72.35										72.12
R3	72.7 S-R 2-20	Fe	72.55				72.6 0				72.80 0		72.65
													72.75
R5	73.25 S-R 2-20	Fe	73.20										73.32
													73.47
				73.5 1			73.2 0						
		Fe	73.75								73.70 1		73.92
			74.15				74.2 0						
										74.5 00	74.35 1		
		Fe	74.70	74.7 0			74.7 0					74.65 3	74.91
R89	75.6 S-R 1-18	Fe	75.50	75.4 0			75.6 0						75.64
R39	75.6 S-R 1-19												
R9	75.8 S-R 2-20												
										75.7 00	75.70 1		
							76.2 0			76.1 1			
P6	76.29 S-R 2-20	Fe	76.30	76.4 0							76.40 1		76.57
												76.85	
	77.25 S-R 1-18		77.20	77.3 1			77.4				77.30 2		
R11	77.65 S-R 2-20		77.50			Abs 77.4				77.45 0			77.59
			77.80										78.05
				78.15 2		78.1	78.2						78.86
P35	78.48 S-R 1-19										78.50	78.45 2	
P7	78.48 S-R 2-20												
										78.65 00		78.65 2	
		79.35 2	79.15			79.0							
						79.6							
R13	80.05 S-R 2-20			80.0 1			77.9 0				80.05 2		
												80.25 1	
P9	80.9 S-R 2-20		80.75	80.5 1			80.9 0			80.35	80.60 1		
	81.0 CN					Abs 81.0 2					81.30 1		
		Fe	81.65										81.75
R56	82.44 S-R 0-18	Fe	82.25								82.35 1		82.38
									Br	82.55			
R55	82.85 S-R 0-18		82.80	82.8 1		82.8 cm	82.9 0				82.95 1	82.75 BR	
R15	82.85 S-R 2-20												

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4170-4189													
				83.40									
				83.60	83.7 1								
P11	83.93 S-R 2-20			83.95				83.8 0		83.85 1			
				84.15									
R41	84.28 S-R 1-19			84.30									
R41	84.6 S-R 1-19			85.50									
			Fe	84.75 5	84.90 1				84.80 1	84.80 2			84.89
										85.85 1	85.05 BR		
								86.0 1			86.25		
P51	86.90 S-R 0-18		Fe	86.90						86.95 1			87.04
P51	86.59 S-R 0-18												
P13	87.4 S-R 2-20		Fe	87.60	87.5 1			87.4 1	87.55	87.50			87.58
													87.80
P37	87.6 S-R 1-19										87.95 3BR		
				88.55						88.95 0			
				89.40			Abs 89.3 BR						89.56
					89.5 9					89.60 0			
				89.90									
4190-4209													
									90.10 1				
R19	90.1 S-R 2-20			90.25	90.25 0			90.0 0		90.25 0	90.35 1		
										91.10 0			
P15	91.45 S-R 2-20		Fe	91.35	91.2 1			91.4 00					91.43
													91.68
									91.5 1				92.51
											91.85 0		
					92.1 2					92.00 1			
							Abs 92.6 BR	92.8					
										92.70	92.85 00		
				93.30	93.4 2					93.45			
R43	94.1 S-R 1-19			94.10				94.3 00	94.3 3	94.30 2			
R21	94.45 S-R 2-20				94.4 2						94.60 10		
R57	95.31 S-R 0-18		Fe	95.20	95.2 0					95.30 1			95.33
				95.55									95.62
R57	95.8 S-R 0-18			95.75	95.9 0				95.9 0	95.75 1			
				96.05				96.1 2			96.15 1		
			Fe	96.25	96.4 0					96.40 1			96.21
				96.70									96.53
P39	97.04 S-R 1-19			96.95	96.9 0			97.0 0		96.95 1			
P39	97.3 S-R 1-19				97.5 0				97.5 1	97.50 1	97.55 1		
	97.2 CN						Abs 97.7 2						
			Fe	98.20									98.31

		2		88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4190-4209													
				98.60						98.50 0			98.64
			Fe	98.85				99.1 0	99.1 0	99.20 1			
R23	99.25 S-R 2-20			99.40	99.4 0						99.55 0		99.09
P53	99.62 S-R 0-18			99.75									
P53	99.85 S-R 0-18				00.0 0					99.95 1			
		00.50		00.60							00.55 0		
P19	00.9 S-R 2-20		Fe	00.85	00.7 0			00.7 00		00.80			00.92
		01.15									01.30		
				01.40	01.5				01.40 0	01.45 1			
			Fe	01.90							01.75 0		
		02.10 Fe											
		02.55		02.45									02.03
			Fe	02.65									02.75
				03.00	03.0 1					02.90 1			
				03.55	03.6 00					03.65 0			03.57
R45	03.92 S-R 1-19		Fe	03.90									03.98
R45	04.25 S-R 1-19			04.20			04.20		04.40 3				
R25	04.5 S-R 2-20				04.50 1					04.55 2	04.65		
		05.80 0	Fe	05.45			05.4			05.75 2			05.54
P21	06.30 S-R 2-20			06.20	06.05 2			06.3 00					
				06.55						06.40 0			06.70
			Fe	06.95									
P41	07.23 S-R 1-19		Fe	07.20			07.3		07.50 1	07.40 1			07.13
P41	07.45 S-R 1-19			07.55									
					07.6 1						07.65 2		
			Fe	08.5	08.9		08.3	NO_2 08.2 1		08.55 0			08.61
R59	09.2 S-R 0-18			09.05			09.2		09.25 1	09.10 1	09.35 BR		
4210-4229													
			Fe	10.25			10.1	10.1 1		10.20 0			10.35
R27	10.35 S-R 2-20	10.40 0							10.5	11.00 0	10.55 2		
				11.50	11.55 25		11.35						
									11.8 3	11.65 2			
								BR 11.9 0					
					12.5 0					12.65 0	12.45 2		
P55	13.21 S-R 0-18									13.35 0			
R3	13.21 S-R 0-19												
P55	13.55 S-R 0-18		Fe	13.55						13.60 0			13.65
R5	13.55 S-R 0-19												
											13.95 0		
							14.1						
R47	14.5 S-R 1-19								14.7 0BR				
R47	14.45 S-R 1-19												
R7	14.45 S-R 0-19									14.35 1			
R7	14.65 S-R 1-19									14.80 1			

		2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4210-4229												
		15.60	15.45									15.42
	42.16	16.10				Abs 16.1			15.90 1			15.97
												16.18
P5,R9	16.62 S-R 0-19							16.9 00BR		16.75 1		
				17.0 BR		17.0 em			17.00 2			
			Fe 17.45				NO_3 17.7 0					17.56
P43	17.89 S-R 1-19					Abs 17.7 1						
P43	18.30 S-R 1-19							18.4 2	18.30 1			
							NO_3 18.6					
P7,R11	18.75 S-R 0-19			18.9 0		Abs 19.0 0			18.90	18.95 4BR		
			Fe 19.25									19.36
							19.5		19.60 1			
			Fe 20.20	20.0 0					20.35			20.34
						Abs 20.5 3		20.6 0BR				
			20.8			20.9	21.1 00		21.15 1			
R13	21.09 S-R 0-19					BR 21.4 em						
P9	21.60 S-R 0-18								21.60 1	21.75 BR		
			Fe 22.10									22.22
									22.30 1	22.45 0		
	23.56 N_2^+		23.05 1	23.2 2					23.20 1			
R61	23.3 S-R 0-18						23.8	23.5 0BR		23.55 0		
R15	24.0 S-R 0-19		24.05						24.20 0			
			Fe 24.30									24.17
												24.51
										24.75 00		
				24.9 2			25.1 00		24.85 1			
	25.39 N_2^+											
P11	25.6 S-R 0-19		Fe 25.35						25.45 1			25.46
R49	25.6 S-R 1-19											
P27	25.6 S-R 2-20											
			Fe 25.85					25.7 1		25.75 3		25.95
			26.40									26.43
			Ca 26.60			Co 26.5 em			26.65 0			
				26.9 0						26.95		
P57	27.36 S-R 0-18		Fe 27.35				27.5 00	27.4 1BR				27.43
R17	27.36 S-R 0-19											
P57	27.75 S-R 0-18									27.60		
	28.30 N_2^+					28.3 em			28.40 3			
	28.59 N_2^+								28.50 1			
	29.62 N_2^+		Fe 29.50	29.5 0				29.5 2	29.60 3			29.76
	29.76 N_2^+					BB 29.9 em				29.85		

		2		80	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4230-4240					30.2 0								
				30.35									
	30.6 N_2^+									30.55 1			
R19	31.08 S-R 0-19	30.7					30.8 1	NO_2 30.6 1VVBR			30.95		
				31.85			31.8 em	31.9 1					31.70
					32.1 1					32.05 3			32.73
P15	32.90 S-R 0-19	32.80 2BR							32.80 1BR		32.85 2		
P29	32.90 S-R 2-20												
	33.20 N_2^+						33.4 em	NO_2 33.1 1		33.20 3			
	33.89 N_2^+		Fe	33.50	Fe	33.7 abs				33.95			33.16
													33.61
				34.20				34.3 1					
	34.53 N_2^+												
	34.89 N_2^+				34.6 15		34.5			34.60 2			
P21	35.25 S-R 0-19		Mn	35.15							35.20 2		
							35.5	35.4 1					
	35.91 N_2^+		Fe	35.90						35.85 2			35.94
	36.65 N_2^+												
	36.80 N_2^+				36.80 5		36.6 em	NO_2 36.4 1BR		36.65 3			
P17	37.43 S-R 0-19												
R51	37.43 S-R 1-19												
R63	37.43 S-R 0-18												
R51	37.75 S-R 1-19						37.6 em	NO_2 37.7	37.70 3BR	37.60 1			
P63	37.7 S-R 0-18		Fe	37.95							37.85		37.16
													38.03
	38.45 S-R 2-20									38.30 1			
								NO_2 38.7			38.55 3		
			FeII	38.80			38.9						38.82
					39.2 0					39.00 2			
R23	39.71 S-R 0-19												
R23	39.90 S-R 0-19		Mn	39.75				39.9 00					39.73
													39.84
										40.05 0	40.15 0		
			Fe	40.30									40.37
P31	40.90 S-R 2-20			40.90			N_2^+ 40.9 2 em						
P47	41.40 S-R 1-19		Fe	41.10	41.2 2				41.15 2	41.10 5	41.25 4		41.11
P19	42.40 S-R 0-18												
P59	42.40 S-R 0-19												
							42.4 2			42.40 2			
	CH_2O		Fe	42.55					42.50 1		42.65 1		42.58
													43.36
					43.2 2		43.15 2			43.15 2	43.25		
R25	44.78 S-R 0-19								44.95 0BR	44.80 3			
R25	45.15 S-R 0-19				45.15 2		45.2 2						

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4230-4249													
			Fe	45.20									45.26
											45.45		
			Fe	46.00									46.09
										46.30 0			
		46.8 S-R 2-20							46.8 BR		46.95		
			Fe	47.30			47.2 2			47.15 0			47.43
					47.5 2			NO_3 47.7 2					
			Fe	48.15									48.22
				49.00	49.15 3		49.05	49.0 00		49.20 4			
		49.35 S-R 2-20							49.5 BR		49.45		
4250-4269													
		49.85 S-R 1-19	Fe	50.10				49.9 00	50.00	50.00	50.15		50.13
R27		50.39 S-R 0-19					50.4						
R27		50.7 S-R 0-19	Fe	50.75			50.8 Fe		50.85	50.85	50.85		50.79
								NO_3 51.1 0					53.93
										52.00 0			
		52.54 CO			52.5 BR								
		52.95 S-R 0-18					52.9 BR			52.90 2			
		52.87 S-R 1-19							53.5 OBR				
P23		53.65 S-R 0-19			53.6 BR					53.60 2			
											53.85		
			Cr	54.35			54.3 Co						54.93
										54.80 2	54.95 5		55.49
					55.1 0					55.50 SR			55.85
													56.22
		55.55 S-R 2-20						NO_3 55.8 0	55.7 OBR		55.85 2		56.15
					56.2 BR		56.2						56.32
R29		56.89 S-R 0-19											56.61
R29		56.62 S-R 0-19								56.55 2			56.95
R29		57.7 S-R 0-18											
							57.9	57.8 BR					
					58.0 BR					58.0 2			
		58.25 S-R 2-20							58.25 OBR		58.45		
					59.5		59.4			59.50 2			
P25		59.95 S-R 0-19											
			Fe	60.15					60.0				60.00
													60.13
			Fe	60.45									60.47
							60.9 00						
					61.0			61.0		61.05 2			
		62.2 S-R 1-19		62.35	62.25		62.2 2 em		62.4 1	62.45 2			
								63.3			62.85 2		
R31		63.26 S-R 0-19											
R31		63.50 S-R 0-19			63.7		63.6			63.80 2			

		2		89	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4250-4269													
				63.8									
			Fe	64.20							64.05 2		64.21
		64.75 S-R 2-20	Fe	64.75			64.85	64.6 0					64.74
		64.9 S-R 2-20			64.9								
				65.15						65.05 2	65.20 2		
		66.12 S-R 1-19											
		66.10 N_2^+					66.1 BR	66.0 0					
		66.55 S-R 1-19			66.4					66.40 2			
			Fe	66.85							66.80 2		66.96
		67.47 N_2^+		67.40	67.4		67.3						
		67.7 S-R 2-20	Fe	67.85						67.75 2	67.90 2		67.63
		68.3 S-R 0-18											
		68.42 N_2^+											
		68.58 N_2^+			68.5		68.4 Co						
		68.75 S-R 0-18	Fe	68.70						68.75 2			68.75
				69.20							69.00 1		
		69.49 N_2^+			69.5		69.4 3		VVBR 69.6				
		69.70 N_2^+		69.65				69.8 0		69.70 2			
											69.95 0		
4270-4289													
								NO_2 70.21					
	B33	70.30 S-R 0-19											
	B33	70.6 S-R 0-19			70.6		70.5		70.7	70.80 2			
		70.70 N_2^+	Fe	71.20							70.05		71.16
					71.5								
		71.63 N_2^+	Fe	71.80			71.7			71.65			71.76
								72.1 0					73.31
		72.51 N_2^+			72.5		72.4			72.60 2			73.87
		73.11 S-R 0-18											
		73.31 N_2^+			73.2		73.15						76.67
													79.48
	P63	73.55 S-R 0-18						73.5	73.6	73.45 2			
							73.9						
	P29	74.17 S-R 0-19								74.20 2			
			Cr	75.85						74.90 2	74.95 0		
		75.37 N_2^+						NO_2 75.3		75.50 2			
	B57	75.9 S-R 1-19					75.9						
		76.17 N_2^+											
		76.23 N_2^+							76.0	76.10 1	76.15 1		
		76.31 N_2^+											
		76.42 N_2^+								76.40			
		76.76 N_2^+								76.80			
		77.13 N_2^+								77.20			

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4270-4289													
R35	77.7 S-R 0-19						77.7 1	77.3 0					
P39	77.7 S-R 2-20												
	78.1 N_2^+ Head				78.0				78.0	78.00 8	78.05 5		
R35	78.2 S-R 0-19							NO_2 78.6 1					
P63	79.52 S-R 1-19						79.7 00						
P53	80.0 S-R 1-19								79.9	79.85 2			
											80.15		
								NO_2 80.3 1					
								NO_2 80.6 1					
P31	81.95 S-R 0-19						81.7 em						
		82.40 Co	Fe	82.40									82.40
		83.10 SBA	Ca	83.05			83.0						
							83.9	NO_2 83.8 1					
								NO_2 84.8 1					
							85.0		85.0 3				
			Fe	85.45						85.40	85.45		85.44
		86.0								86.05			
R37	86.3 S-R 0-19										86.25		
			Fe	86.95				87.0					86.43
													86.88
					87.4		87.2						86.99
										87.70 2			
P41	88.2 S-R 2-20		Fe	88.10					88.0	88.30			88.96
							88.7						
P65	89.05 S-R 0-18		Fe	89.00									
R59	89.05 S-R 1-19												
							89.5	89.6		89.50			
			Cr	89.75									
4290-4309													
			Tl	90.20					90.0	90.20	90.15 6		90.38
R59	89.95 S-R 1-19												90.86
P65	89.95 S-R 0-18												
P33	90.3 S-R 0-19	91.1											91.46
							91.4						92.29
R3	91.90 S-R 1-20							91.7 00		91.90			
R7	93.44 S-R 1-20								93.5				
R7	93.90 S-R 1-19												
P55	93.90 S-R 1-19						93.9			93.95			
		94.10 Fe	Fe	94.10							94.25 2		94.12
													96.58
R39	94.9 S-R 0-19									95.00	95.10 BR		
R9	94.95 S-R 1-20												
P5	95.65 S-R 1-20	95.8 BR											

		2		ms	3	G.D.	4	7	Baird King	Total King	Mihc	King 1st max.	Fe
4290-4309													
										96.15	96.15		
							96.4 00 em						
R11	96.70 S-R 1-20									96.90	96.95		
R47	96.10 S-R 2-20												
			Fe	98.05									98.04
P35	99.2 S-R 0-19		Fe	99.20			99.0 Co		99.1				99.24
P43	99.2 S-R 2-20												
R13	99.2 S-R 1-20												
										99.30	99.45 4		
		00.5 BR											
		01.2 BR						01.6 00					
							01.9		01.9				
R15	02.00 S-R 1-20	02.1 00	Fe	02.20						02.20 BR	02.25 1		02.19
R74	02.03 S-R 0-18	02.5 BR											
			Fe	03.10			Abs(?) 03.1						03.16
P11	03.5 S-R 1-20						Abs(?) 03.7	03.6 1	03.7	03.55 2			
R41	03.8 S-R 0-19												
R61	04.1 S-R 1-19												
R61	04.3 S-R 1-19						Abs(?) 04.5	NO_2 05.1 1		04.35 2	04.45 2		
					04.9								
P17	05.35 S-R 1-20		Fe	05.50						05.30 5	05.55 2		05.45
		05.8 0											
P67	06.6 S-R 0-18							07.0 1	06.85				
P67	07.05 S-R 0-18									07.20 0			
P13	07.05 S-R 1-20												
P57	08.2 S-R 1-19		Fe	07.90									07.90
P37	08.5 S-R 0-19							NO_2 08.5 1	08.7		08.65 2		
P19	09.2 S-R 1-20		Fe	09.00									09.03
			Fe	09.40							09.35 BR		09.36
4310-4329													
								10.1 0					
		10.4 05											
P15	10.9 S-R 1-20						10.9 1 em			10.95 2			
P45	10.9 S-R 2-20												
											11.25 2		
								13.1 1BR		12.65 0			
P43	13.55 S-R 0-19						13.4			13.50 2			
R21	13.55 S-R 1-20												
											13.75 3		
													14.28
			Fe	15.10									15.08
								NO_2 15.6 0		15.65 1			19.71
			Ti	16.75							15.90 1		

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4310-4329													
										17.30 1			
P39	18.01 S-R 0-19												
P39	18.35 S-R 0-19			18.46				18.4 0		18.20 2			
R23	18.35 S-R 1-20												
											18.75 1		
R63	19.09 S-R 1-19						19.2			19.40 3			
R51	19.35 S-R 2-20												
R63	19.40 S-R 1-19										19.80 2		
R73	19.65 S-R 0-18			20.70						20.70 2			20.84
P19	20.7 S-R 1-20	20.8 Co						20.6 0			20.95 2		
			Fe	21.85									21.80
								NO_2 22.1 1					
							22.6			22.85 3			
P47	23.1 S-R 2-20	23.1 15											
							23.6		23.5	23.60 3			
P45	23.65 S-R 0-19							NO_2 24.0 1			23.95 2		
R25	23.65 S-R 1-20												
P59	23.65 S-R 1-19												
P69	24.17 S-R 0-18				24.0								
P69	24.75 S-R 0-18									24.80			
							25.6						
			Fe	25.80									25.76
								NO_2 26.0		26.15 3			26.76
													27.09
											26.50 0		
								NO_2 26.9					
										26.60 0			
P41	28.75 S-R 0-19						Abs 28.9 VBR						
							29.0 1BR						
R27	29.5 S-R 1-20									29.50 2	29.70 0		
4330-4349													
										30.00 2			
		30.7									30.70 0		
													30.15
													30.95
					32.0					32.30 4			
P23	32.35 S-R 1-20										32.45 3		
		32.8 2BR							32.7				
P47	34.55 S-R 0-19									34.50 4			
R65	34.57 S-R 1-19										34.75 1		
R65	35.10 S-R 1-19									35.20 4		35.25 1	
									35.6 BR	35.75 2			
R29	35.80 S-R 1-20										35.95 1		
							36.0						

		2		88	3	G.D.	4	7	Baird King	Total King	Mike	King jet max.	Fe
4330-4349													
								NO_3 37.1		36.60 0			
			Fe	37.05						37.20 0			37.04
R75	37.34 S-R 0-18						37.4 15 cm						
R75	37.65 S-R 0-16										37.85	37.80	
										38.10 0			
P61	38.93 S-R 1-19												
									38.7	38.70 2			
P25	38.95 S-R 1-20						39.25 cm				39.05		
								BR		39.55 2	39.65		
P61	39.4 S-R 1-19							NO_3 39.4 VV		40.30 1			
P43	39.65 S-R 0-19												
P71	42.62 S-R 0-18												
R31	42.60 S-R 1-20						42.4 cm		42.5	42.45 4			
					42.7 0						42.75 BR		
			Fe	43.35								43.40	43.25
							43.8						43.70
							44.1						
			Cr	44.50									
							45.0						
R49	45.5 S-R 0-19				45.6 0				45.6	45.40 5			
R55	45.5 S-R 2-20												
R49	45.85 S-R 0-19						45.8						
P27	45.90 S-R 1-20										46.05 BR		
			CrFe	46.60									46.55
										47.15 1BR			
			Fe	47.85			47.7	NO_3 47.4 2				47.85	47.85
										48.25 1			
			Fe	48.85				NO_3 48.6 2		48.95 1			48.93
P51	49.1 S-R 2-20											49.05	
					49.9					49.95 2			
4350-4369													
		50.40	Fe	50.45	50.3			NO_3 50.0 2			50.35 2BR	50.40	
P45	50.75 S-R 0-19												
R67	51.39 S-R 1-19									51.20	51.40		
R67	51.14 S-R 1-19		Fe	51.65									51.55
													51.76
												52.50	
			Fe	52.75				NO_3 52.9 1					52.73
					53.2 0		53.5	NO_3 53.5 1		52.40 0			
P29	53.45 S-R 1-20									53.20 3	53.70 4	53.80	

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4350-4369													
P63	55.31 S-R 1-19									55.60 VBR	55.40 1		
P63	55.75 S-R 1-19										56.15 1		
R77	56.7 S-R 0-18									56.75	56.85 1		
								57.7		57.80			
			Fe	58.50			58.5						57.57
													58.50
R51	57.65 S-R 0-19							58.8			57.85 2		
R57	59.35 S-R 2-20									59.10 0	59.45 VBR		
							60.0						
								60.8		60.35			
P31	61.5 S-R 0-18												
P31	61.5 S-R 1-20				61.55 VVBR						61.65 4		
								62.1		61.95			
							62.8			63.00 2	63.15 1		
							63.3 2	63.7 OBR					
							64.0 00						
								65.1 OBR					
			Fe	65.80									
R37	66.1 S-R 1-20						66.1 0			66.00 2	66.15		
								66.6					
										67.15 0			
			Fe	67.50									67.58
													67.80
B69	67.71 S-R 1-19						67.8 cm						
B69	68.2 S-R 1-19				68.15 6					68.20 4			
	68.3 Ol										68.40		
								69.3					
R53	69.95 S-R 0-19		Fe	69.80						69.95 2			69.77
P33	69.95 S-R 1-20												
4370-4389													
											70.10 1		
P65	72.14 S-R 1-19						72.4 cm	NO_3 72.15 0					
P66	72.65 S-R 1-19							NO_3 72.6 0		72.70 2	72.85		
R3,R5	72.65 S-R 2-21												
							73.5 cm						
R7	73.6 S-R 2-21		Fe	73.60				73.7 1		73.65 1			73.56

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4370-4389													
											73.85		
P3	74.15 S-R 2-21							74.1 00					
R39	75.00 S-R 1-20						75.0 cm	75.0 0		75.15 2BR	75.15 2		
R9	75.00 S-R 2-21												
P49	75.6 S-R 0-19												
			Fe	75.95	75.5 Fe		75.9 cm	75.8 0					75.93
													76.78
P5	75.85 S-R 2-21												
R11	77.04 S-R 2-21						77.1 cm	77.0 0					
P65	77.4 S-R 2-20									75.35 5BR	77.55 BR		
P7	78.05 S-R 2-21							78.0 0					
											78.55		
P35	79.15 S-R 1-20						78.7 1	79.5 0		79.10 2BR			
R13	79.54 S-R 2-21										79.55		
P9	80.75 S-R 2-21						80.9 0BR	80.7 0		80.90 0BR			
										81.80 0			
R55	82.45 S-R 0-19							82.45 0		82.65 5			
R15	82.45 S-R 2-21												
					83.2								
			Fe	83.55			83.5			83.55 5BR			82.77
													83.54
P11	83.95 S-R 2-21							83.9 0					84.69
													85.38
R41	84.35 S-R 1-20									84.45 5BR	84.45 1BR		
R71	85.22 S-R 1-19				85.4 VVBR					85.45 1			
										85.90 3			
R71	85.9 S-R 1-19							85.9 1	86.0		86.05 1	86.00	
R17	85.9 S-R 2-21												
							86.3 cm			86.45 0			
P13	87.65 S-R 2-21		Fe	87.90				87.65 1		87.70 BR	87.85 0		87.89
					88.2							88.00	
			Fe	88.40	88.5 BR				88.3 1	88.45 2			88.41
													89.24
P51	88.7 S-R 0-19						88.7				88.95 1		
R19	89.91 S-R 1-19												
R19	89.9 S-R 2-20						89.9 00	NO_2 89.9 2		89.80 2			
4390-4409													
									90.15 3		90.05	90.20	
P67	90.3 S-R 1-19				90.3 0		90.5 00						
										90.55 2			90.95
							91.9	91.8 0		91.80 2			
P15	91.85 S-R 2-21				92.2 BR				92.1 0		92.05		

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4390-4409													
P57	92.45 S-R 2-20							93.5		92.65 2BR	92.75		
												93.45	
							94.2 BR		94.3	94.15 2			
R43	94.35 S-R 1-20							94.5			94.55		
			Ti	95.10						95.30 1BR			95.28
R57	96.25 S-R 0-19									96.35 2			
R81	96.50 S-R 0-18						96.7	96.5 0	96.5		96.65 2	96.45	
P17	96.50 S-R 2-21												
										97.00 2			
							97.8			97.85 0			
P39	98.85 S-R 1-20				98.9			NO_3 99.0 1	98.9	98.75 5			
							99.2					99.15	
R23	99.35 S-R 2-21									99.50 5	99.65		
										00.40 2BR		00.45	
							00.8 0	NO_3 00.5 0					
			Fe	01.40									00.35
													01.45
P77	01.70 S-R 0-18						01.7 0	NO_3 01.7 1	01.8	01.95 2BR	01.95		
P49	01.70 S-R 2-21												
P53	02.3 S-R 0-19						02.3 0					02.15	
				02.60							02.65 1		
										03.25 2	03.25 2		
								04.0 00					
R45	04.8 S-R 1-20		Fe	04.75					04.8				04.75
								05.1 00		05.13 2			
P21	07.4 S-R 2-21							07.4 1					
										07.05 1			
			Fe	07.70						07.50 1			07.71
										08.10 0			
P59	08.65 S-R 2-20		Fe	08.45						08.60	08.55 BR		08.41
P41	09.5 S-R 1-20												
										09.55 1			
							09.75 0 cm				09.85 0		
4410-4429													
							10.7 0 cm			10.80 1BR			10.71
								10.8			11.15 0		
										11.80 1			
							12.4 00 cm			12.35 1			

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		2	20	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4410-4429												
						13.5 00 cm	13.5		13.60 5			
									14.55 0			
						15.0				14.85 1		
			Fe	15.15								15.12
						15.7						16.81
												19.54
									16.0 5	16.15 1		
R55	16.55 S-R 0-19						16.5					
						17.3			17.15 4			
										17.55 2		
							17.6					
									18.15 0			
						19.1			19.0 3			
									19.9 0			
P25	20.3 S-R 2-21					20.1						
									20.35 2	20.45 3		
P43	20.7 S-R 1-20						NO_3 20.7 0					
				21.3					21.55 0			
									22.10 1			
			Fe	22.60		22.7 BR	NO_3 22.3 0					22.57
P79	22.7 S-R 0-18								22.90 1	22.85 2		
R75	22.7 S-R 1-19											
			Fe	23.90								
R31	24.3 S-R 2-20											
						24.5 BR	24.5 VBR		24.4 2	24.55 1		
									25.25 0			
										25.45 0		
									26.15 5			
							NO_3 26.7			26.35 1	26.35	
R49	27.3 S-R 1-20		Fe	27.30				27.15				27.31
P27	27.3 S-R 2-21								27.65 5	27.65 2		
				28.20			NO_3 28.0					
						28.9 00 cm						
										29.85 00	29.75	
4430-4449												
			Fe	30.15								30.20
			Fe	30.62			30.3 VVBR					30.61
33	31.9 S-R 2-21	31.85 3BA		31.90		31.7 0						
45	32.75 S-R 1-20				37.7 0	32.6 0			32.88	32.65 1BR		

		2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4430-4449													
			Fe	33.25									32.57
													33.22
													33.78
			Ti	34.00				33.7 0					
							34.8 1			34.26 0			
				35.15	35.2 0					35.16 10			35.16
P29	35.29 S-R 2-21						35.5 1				35.45 2		36.93
													38.35
													39.88
										36.50 0			
							37.2 0					36.90	
							38.0 0						
		38.25 0								38.60 0			
R51	39.65 S-R 1-20												
							39.9 0			39.80 6			
R35	39.95 S-R 2-21										40.05 1		
										41.85 1			
							42.1 1				42.25 1		
			Fe	42.35									42.34
								42.8 1				42.95	
P31	43.55 S-R 2-21		Fe	43.25						43.6 1		43.20	43.19
											43.85 05		
P47	44.8 S-R 1-20									44.9 2			
										45.8 1			
							46.3 0	NO_3 45.9 1				46.35	
			Fe	46.85						46.7 2			46.84
											47.45 2		
			Fe	47.75			47.7						47.72
										48.1 5		48.20	
R37	48.55 S-R 2-21				48.4			NO_3 47.9 1	48.5 VBR				
							48.7				48.85 1VBR		
		49.15 00	Ti	49.15						49.1 5			49.21
								NO_3 49.1				49.65	
											49.95 1		
4450-4469													
			Ti	50.40				49.8					50.31
		50.85					50.8				50.95 1BR		
										51.02			
			Mn	51.60						51.75 0			51.54
R53	52.10 S-R 1-20						52.2		52.4	52.30 5			
R53	52.40 S-R 2-21										52.55 0BR	52.70	

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	2		88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4450-4469												
	53.15 BR	Mn	53.05				53.2		53.3 0			54.38
												55.03
												55.25
												58.10
	54.2					54.7			54.5 0			
	55.3										55.10	
				55.7 00			55.0 00		55.5 0	55.65 1	55.60	
									56.3 1			
							56.5					
						57.6			57.6 3			
								57.9			57.95	
										58.05 2		
									58.8 0			
		Fe	59.15			59.3 1	57.6					59.12
							58.8		59.55 2			
						60.2 1	59.8		60.3 0			
									61.15 3			
		Fe	61.35								61.35	61.22
		Fe	61.70			61.5	NO_2 61.1 0					61.65
		MnFe	62.00									
						62.6 1						
							62.5 00		63.0			
									63.90 0	63.9 1		
											64.05	
							63.7			64.35		
		MnCrFe	64.70						64.70 0			64.77
						65.15 0						
									65.50 0			
							65.5		66.40 3	66.05 00		
		Fe	66.55									66.55
										66.95 00		66.94
	67.2					67.3	67.0		67.30 3			
										67.65 2		
									68.25 1			
	68.4						68.0					
	69.20 4	Fe	69.40									69.38
			69.65						69.60 2			
							69.1 00 BR					
4470-4489												
											70.10	
	70.45					70.80 em			70.50			

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4470-4489												
							70.6 00BR		71.65 2BR			
										71.75		
	72.70	Fe	72.75									72.72
											72.80	
							72.7 BR		73.20 2			
									74.30 2			
							74.6		75.40 0BR			
						75.2 cm						
		Fe	76.05								76.05	76.02
						76.3			76.40 5			
							76.0				76.75	
						77.6						
									77.60 1BR	77.85		
										78.25		
											79.20	
		Fe	79.55				NO_2 78.7 2		79.53 1VBR			79.62
		Fe	80.15			80.2						80.14
									80.92 1VBR		80.75	
							NO_2 80.3 1			81.15		
						81.8						
							81.6 1		82.1 1VBR	82.15	81.95	
		Fe	82.30									82.17
												82.25
	82.6	Fe	82.75							82.65		82.75
						83.4 BR					83.35	
							83.1 1			83.85		
		Fe	84.25									84.22
							83.9 0					
				85.0 BR		85.2 BR			85.2 2		84.90	
		Fe	85.70							85.65		85.68
							85.1 0		85.9 2BR			88.13
												88.91
												89.18
												89.74
									87.33 0			
						88.2	NO_2 87.3 1					
				88.4 BR					88.35 3	88.55	88.60	
	89.00 BA											
							NO_2 88.5 1					
4490-4509												
									90.3 1BR		90.50	90.08
												90.76

	2		89	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4490-4509												
							89.9 0					91.40
									91.6 0			
				92.5 BR			91.1 0					
						92.8			92.7 1			
							93.2		94.0 1	94.15		
	94.5	Fe	94.60			94.7 1			95.5 1			94.56
		Fe	95.85				94.8 00					95.96
									96.2 1			
						97.3	96.1 00		97.25 2	97.15		
							97.2 0					
		CrMn	98.75									
									99.1 3			
						99.7 2BR						
									99.95 3	00.45 2		
									00.90 2			
	NH? 4502					01.0						
							00.4 00		02.00 1			
						02.3						
							NO_3 01.7 00		02.70 1			
							NO_3 03.0 00		03.60 0			
						04.5			04.55 5			02.59
		Fe	04.80									04.84
							NO_3 04.1 00			06.15 2		
	BR								05.55 2			
	05.85 10		05.90									
							05.4 00		06.25 2			
		TiCr	06.85						06.95 2			
							06.3 00			07.35		
		Fe	08.05			08.0			08.00 2			08.28
							07.2 00					
									08.74 0			
			09.35						09.20 2			
4510-4529												
						09.9			10.10 1			
							08.8 00					
						10.7			10.90 2			
							09.6 00					
						11.8			11.70 2			
							11.5 00					
			13.35						13.45 3			
	14.00 Fe					14.1						
		Fe	14.25				13.0 1		14.45 2			

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4510-4529												
		Fe	15.30			15.3			15.50 0			15.34
												17.53
				16.0			15.0 0		16.20 2			
	16.40					16.5						
									16.90 1			
									17.80 2			
		Ti	18.75			18.9			18.80 2			
							NO_2 18.3					
		Cr	19.85									
		Fe	20.20						20.0 2		20.15	20.23
							NO_2 21.0		21.50 2			
		Ti	22.70						22.55 2			22.63
	23.0 5BR	Fe	23.20						23.25 1			
						24.8	NO_2 23.5		24.15 4BR			
	24.9 BR											
	25.00 Fe	Fe	25.00									25.14
												26.41
									25.80 1BR			
	25.9										25.95	
	26.5 Fe								26.55 1			
	27.2								27.50 1		27.35	
	27.8											
									28.15 0			
		Fe	28.65						28.80 0			28.61
							NO_2 28.2		29.20 1			
		CrTiFe	29.65									29.56
												29.67
4530-4549						Many close lines						
	30.05 1 cm											
									30.20 0			
	31.1 00 cm	Fe	31.20						30.90 1			31.51
												31.65
												34.16
	31.6 cm						30.2 00		31.6 4			
											31.85	
	32.3 3 cm											
							31.3 0					
		Ti	33.40			33.4			33.50 2		33.45	
	33.8 3											
							NO_2 33.0 1		34.70 2			
											34.80	

	2	sp	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4530-4549											
					35.6						
35.5 N_2						NO_2 34.4		35.95 2			
	36.2 2										
					36.6 00					36.80	
								36.85 2			
	37.25 3					NO_2 35.8 1					
								37.50			
					37.9 BR						
								38.35			
								38.96 2			
										39.50	
								39.80 2			
								40.65 2			
										41.05	
								41.35 2			
								42.60 2			
	43.0 Abs					42.0 1					
					43.8 BR			43.70 3			
								44.90 0			
										45.15	
						44.0 0					
	45.95										
					46.5 BR						
								46.95 4BR		46.90	
	47.85										
								47.90 3BR		48.10	
						47.7		49.00 1			
								49.85 1			
						48.4					
4550-4569											
	50.25 0									50.10	
								50.90 2		50.95	
											41.52
											42.42
											47.02
											47.85
											49.47
	51.8 DBR										
					51.9			51.80 2			50.79
						NO_2 50.7					52.54
											55.89
											56.12

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	2	BS	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4550-4569											
								53.30 0			
	53.95 20		53.9		53.9						
54.04 BaII		Ba 54.10						54.45 2BR		54.10	
						52.6					
						53.4		55.50 2			
	56.10 Co										
								56.45 2			
								57.00 2			
	Abs 57.65 1					56.5					
										58.60	
						NO_3 58.0 BR		59.0			
								59.7			
					60.2	NO_3 59.4 VBR				60.35	
								61.2 1			
	61.8 cm										
								62.0 2		62.00	
						NO_3 61.4 VBR					
								62.95 2			
					63.6 cm			63.65 1BR		63.75	
						63.4		64.35 1BR		64.20	
								65.15 0			
					65.5						
								65.95 0			
			66.2								
					66.2						
								66.60			
								67.60 1			
					68.3			68.35 1			
	68.8										
										69.25	
4570-4589											
	70.2				70.0			69.15 2			
								70.05 2			
	70.9				71.0			70.85 2		70.70	69.99
											65.32
											65.66
	71.6										66.52
								72.1 0			68.77
											74.50
											74.72
	72.7										76.33

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4570-4589												
	72.9								72.9 2			
	73.8	Ba	73.95			74.0 BR						
74.0 N0												
74.3 N2				74.6								
									75.00 5		74.95	
							74.2		76.30 1			
	76.6											
									76.95 2			
	77.3											
									77.90 2			
									78.60 2			
											78.90	
	79.6	Ba	79.70						79.50 3			
							NO_2 77.8 BR					
				80.1							80.20	
									80.35 1			
						81.0	NO_2 79.3 2		81.1 1			
	81.4 Fe											
									82.01 BR		82.00	
									82.8 1			
				83.5 Fe		83.4						
		Fe	83.80						83.65 6			80.60
												81.52
												82.83
												83.84
							82.6					84.82
												87.13
											84.80	
									85.05 1			
									85.75 2			
	86.35 1					86.0 cm						
									86.65 2			
						87.6						
						88.5			88.40 2BR		88.40	
	89.7 1			89.9		89.8			89.75 3		79.85	
590-4609												
							86.4					
	90.6					90.6			90.90 3			
	91.6 2										91.80	
						92.2			92.00 1BR			

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4590-4609												
	92.6	Fe	92.70			92.6	NO_3 90.3 0					92.55
									92.90 2BR			
				93.3 0								
							NO_3 91.5 1					
	94.05 1BR								94.25 0			
											94.60	
							NO_3 93.1		95.10 1			
				95.6 0		95.5						
			95.85						95.75 4			95.36
												96.06
	96.00											
											96.40	
						96.5	94.5		96.60 3			
	97.5					97.6			97.30 0		97.45	
									97.90 0			
		Fe	98.00				95.8 1VBR					98.13
				98.5		98.7			98.60 5		98.30	
									99.20 2			
99.1 N_i		BaFe	99.85			99.6	97.8 1					
									00.05 2			
									00.80 0			
				01.2		01.3					01.30	
							99.5 0		01.50 4			
						02.6						
							01.8 00					
		Fe	02.90									02.01
												02.94
						03.9 BR	NO_3 03.8 1					
				04.1								
									04.30 3VBR		04.45	
	04.9 1BR											
							06.1					
				06.8		06.8			06.80 3		06.75	
	07.4 10	Cr	07.40			07.3	NO_3 07.4		07.5			07.65
							NO_3 08.3		08.7 2		08.70	
				09.0		09.0						
									09.50 2			
						09.6						
4610-4639												
		Fe	11.25									11.28
				11.8					11.72			

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4610-4639												
									12.20			
		Fe	13.15						13.10 3			13.21
							11.1 1BR					
				14.2					14.0		14.15	
							13.3 0		14.6 2			
									15.3 2			
						15.4						
	16.2 1						16.0 00					
				16.7					16.8 5			
						16.9						
	17.3 1											
									17.95 1			
									19.05 3BR			
		Fe	19.35									18.75
												19.29
19.98 Bal	20.0 BR											
						21.3			21.35 2			
							22.1 00		22.70			
	23.2											
									24.25 1			
	25.10 Fe	Fe	25.10				25.0					25.05
						25.7 BR			25.55 4			
							26.0				26.30	
	26.5 BR								26.51 1			
									27.70 3			
											28.00	
	28.35 4											
									28.70 0		28.70	
		Ti	29.30			29.3						29.32
	29.45								29.50 3			
											29.70	
4630-4649												
							27.5 1					
							NO_2 28.4 2				30.60	
						31.3	NO_2 29.4 2		35.3			
						32.7						30.12
		Fe	32.90									32.91
							31.3		33.20 2BR			35.32
												35.85
						34.5					33.65	

	2		88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4630-4649												
									34.80 2			
	35.2 VBR											
						36.5			36.40 3			
	36.50 VBR											
	37.4 BR											
		Fe	37.75									37.51
												38.01
	38.0 BR					38.0			38.15 3			
							37.1					
	39.2								39.35 2			
						39.4						
							38.4		40.55 2			
	40.8 0					40.7						
									42.0 1			
							40.9					
		Fe	43.40									43.47
	43.70											
									44.8 1			
						46.2			46.30 1			
									47.10 1			
		Fe	47.45									47.43
									48.1 1			
48.2 Al 0	48.25 0		48.40				46.7					
4650-4669												
									50.1 2		50.10	
							48.4					
	51.2	Cr	51.15						51.15 2			
				52.3		52.1			52.05 5			
									54.0 0			
						54.3						
		Fe	54.65									54.50
												54.62
						55.9						
									56.0 1BR			
									56.95 1			
						57.4						
									59.0 0			

	2	88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4650-4669					59.8						
								60.2 3BR			
			60.3							60.40	
								60.85 3BR			
								61.7 3BR			
								62.65		62.65	
			63.1					63.20			
										63.65	
					64.5			64.50 2			
					66.9					66.60	61.53
								67.15 head			61.97
		Fe 67.45									67.45
		Fe 68.10				NO_2 66.2 VVBR		68.15 1			68.14
		Fe 68.95									69.18
										69.45	
								69.90 10			
4670-4689											
						68.5				70.45	
								71.05 1BR			
										71.55	
72.2 Al 0	72.0 10					70.0					
					72.5 BR cm			72.90 2			
		Fe 73.15									73.17
	73.4 10					71.3					
						72.8					
								75.30 0		75.20	
						75.0 1		77.25 1			
										77.60	
								78.70 1			78.85
		Fe 79.85									
										79.15	
					79.3 OBR	77.5 1					
		Fe 80.20				NO_2 79.1 1				80.80	80.30
											83.56
								81.55 2			
					82.2 0			82.35 2		82.30	
						NO_2 80.6 1					
								83.80 2			
					84.2 0	NO_2 82.1 1		84.40 2			
					85.8 0			85.65 2			

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4670-4689												
									86.30 2			
							84.6 1					
									87.8 2VBR			
	88.2						86.2					
4690-4709												
						90.0						
							88.6					
									89.95 2VBR		91.15	
	91.4	Fe	91.55									90.14
												91.41
	91.9 2BR								91.55 1VBR			
	92.35						90.6 VVBR					
						93.0 0						
	93.30		93.10						93.1 1VBR			
	94.15 00											
	94.85 2	Fe	94.75			94.8			94.75 2			
							93.5 VVBR					
	96.05 1											
									96.50 2VBR			
											97.15	
							95.7					
									97.80 1			
	98.65 15											
									99.05 1			
						99.6 abs-em						
							97.9 1		00.25 1			
									01.45 1			
									02.55 1			
						03.1 BR-abs	00.7 1					
											03.55	
									03.65 1			
									04.50 1			
		Fe	04.90									01.05
												04.96
												05.46
									05.40 1			
						05.8 BR-abs	03.8 BR					
									06.20 1			
	07.30	Fe	07.25									07.28
												07.46
												08.96

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4690-4709												
09.2 N_3^+		Fe	09.10						09.30 head(?)			09.09
	09.8 cm											
4710-4729												
	10.1	Fe	10.20									10.28
												14.07
						11.0 1 abs						
		Fe	11.65									
	13.7 cm											
	14.4 cm											
	15.2						14.7					
	16.2 2BR											
	18.1 1BR											
	19.2											
							17.8 0VBR					
	22.0		22.05								22.20	
	23.0											
	24.7 1BR					24.4 cm	21.7					
						25.4 abs						
	26.3	Ba	26.35									
		Fe	27.35									27.40
												28.56
											27.60	29.69
											29.45	
4730-4749												
	30.25 1BR											
							26.5 VVBR					
		Fe	31.40									31.49
Al H						31.9 abs						
	32.1											
	32.6										32.40	
		Fe	33.45									33.59
	33.6					33.9						
							31.3 1					
											34.05	
			34.75			34.9 cm						
	35.0					35.2 abs						

	2	BB	3	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4730-4749										
	35.9 10BR	Fe 35.90							35.90	35.84
		Fe 36.75								36.78
	37.55				35.0 1					
				38.1 BR-abs					38.90	
					NO_3 37.0					
									40.35	
				40.5 BR	NO_3 38.0					
									41.30	
	43.3				NO_3 40.0 VBR				45.10	
				44.1 BR					44.10	
	44.4									
	45.2				42.2					
		Fe 45.75								41.53
										45.80
									46.15	47.48
				46.5 BR						
					NO_3 44.0 1				47.40	
	48.5				NO_3 45.6 1					
				49.1 BR						
	49.5								49.45	
					NO_3 46.4 1					
4750-4769										
	50.7									
	51.6			Em(?)	48.3 BR				51.50	
AlH 52.5										
	52.8									
	53.8				50.0				53.80	
		Mn 54.05								
	55.1				51.4				55.20	
				55.8 em						
					52.5				56.05	
	57.1									
					53.9					
										57.58

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4750-4769												
	59.0										59.10	
							56.1					
	60.4											
											61.30	
	61.5	Mn	61.60									
						62.0 em						
							58.7					
	62.50 1Fe	Mn	62.45									
							59.9					
						63.9						
	65.2 OBR										65.40	
		Mn	66.40			66.4 em					66.55	
	66.7						62.9					
							63.9					
	68.3											
		Fe	68.45								68.50	68.34
												68.39
						69.4	65.4					
	69.7 BR											
4770-4789												
							66.7					
						em						
	71.5	Fe	71.65				68.0					
		Fe	72.75									72.81
	73.50					73.0						
						73.6 abs						
											75.50	
	76.2 OBR	Fe	76.00									
						76.5 abs						
						77.7 2 em					77.65	
	78.1 OBR						78.2					
											79.25	
	79.9 0											
						80.1 em						
						80.5 abs						
	82.0 1											
		Mn	83.40								83.35	

	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4770-4789											
	84.3 1										
										84.95	
					85.3 0 cm						
										86.30	
		Ni 86.55									86.81
	86.8 0 Fe										
	88.0										
										88.65	
	88.85 Co										
	89.65 1	Fe 89.80									88.75
											89.65
4790-4809											
	91.0 1										
						92.2 BR					91.24
	92.6 1	TiCr 92.40									
										93.70	
	94.6 1										
										95.10	
					96.0 BR-cm						
						96.2 BR				96.00	
	96.4										
						97.1 BR					
										97.75	
		Fe 98.20			98.0 cm						
	98.45										
					Abs(?)					98.90	
											00.65
		Fe 00.70								02.55	
		Fe 02.95									02.88
										03.70	
					04.7 cm					05.05	
	05.5 BR				06.1 cm						
	07.9 VBR										
										08.10	

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4810-4829												
						09.1						
	10.45 1		10.55			10.3						
	11.9	Fe	11.95									
							NO_3 12.0					
						12.4 abs					12.30	
											13.35	
											15.00	
											16.15	
											18.70	
											20.85	
												21.04
		Mn	23.50									
											23.90	
	26.4 0										26.30	
						29.10 BR-cm(?)						
	29.5 0										29.45	
4830-4849												
											31.75	
	32.1 0											
						33.9 cm						
	34.4 BR											
	35.9 BR	Fe	35.80									38.86
						36.1						
	37.3 0											
	38.6 BR	Fe	38.55									39.54
	40.4											
						42.0						
42.1 Al 0	42.3											
		Fe	42.65									43.15
												44.01
	43.00 0 Al											45.65
		Ca	47.50									

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4830-4849												
											31.75	
	32.1 0											
						33.9 cm						
	34.4 BR											
	35.9 BR	Fe	35.80									35.86
						36.1						
	37.3 0											
	38.6 BR	Fe	38.55									39.54
	40.4											
						42.0						
42.1 Al 0	42.3											
		Fe	42.65									43.15
												44.01
	43.00 Al											45.65
		Ca	47.50									
		Fe	48.15									
4850-4869												
											50.71	
											55.80	
											59.50	55.68
		Be	59.75									59.74
	60.3											
											60.60	
		Fe	61.10									
			61.95									
		Fe	62.55									
											63.35	
		Fe	63.80									63.65
			64.60									
		Ti	65.40									
Al 0	66.4 2	Ni	66.45			66.5		66.6				
	67.25 1											

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4850-4869												
	68.2	Ti	68.30			68.3		68.4				
											69.10	
			69.30									
4870-4889												
		Ti	70.25									
												71.32
		Fe	71.35									
		Fe	72.30									72.14
						73.4						
								74.4				
											75.10	
		CaFe	78.20									78.21
						79.2 abs						
											81.30	
								81.7				
							82					
		Fe	82.30									81.72
						82.9						
							83				83.30	
			83.60									
								84.4 BR			84.45	
							84					
											86.10	
							85.5					
						87.2						
						87.4 head(?)		87.4 BR				
											87.95	
						87.8	87				89.10	
						88.5 BR						
	89.1 BR	Fe	88.90									85.43
												86.34
												88.65
												89.00
4890-4909												
											90.10	
		Fe	90.95									90.76

	2		88	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4890-4909												
		Fe	91.50			91.6					91.45	91.49
								92.0 5			92.20	
						92.5					92.70	
							92.9					
								94.1 2			94.25	
	95.1 1							95.7			95.70	
	96.2 1					96.0 0						
						96.8 0		96.6			96.80	
	97.2 1											
	98.0 1											
								98.4				
	99.3 1										99.45	
4899.97 Ba						99.8 2 Ba						
	00.3		00.20									
								00.5				
											01.25	
											02.25	
											03.15	
	03.3 3	Fe	03.40									03.31
												05.18
	04.8 2							05.0				
							06.4					
	06.3 2VBR					06.5						
								07.6				
	08.0 2	Fe	08.00									07.74
												09.39
								09.9				
	09.6 2											
4910-4929												
												10.02
												10.32
	10.7 1VBR							10.6				10.57
								11.3				11.50
	11.9											
	12.8										12.95	
						13.5 BR						
								14.0			14.05	
	14.4 1											
	15.8					15.7		15.8				15.80
						17.0						
	17.4							17.6				
	18.4											

4910-4929												
	18.8											
	19.1	Fe	19.00									17.26
												18.90
											19.75	
		Fe	20.45									20.50
	20.8											
22.29 CN		Cu	22.30									
	22.8					22.4						
	24.5											
	26.1											
	27.9	Fe	27.70									23.72
												23.91
												24.77
												25.29
												27.44
												27.87
									28.6			
	29.6		29.50									
4930-4949												
	30.4											
	31.3											
									32.2			
											33.25	
34.10 BaII	34.10	Ba	34.00			33.9 6 cm						30.33
												33.34
												33.62
												34.02
									34.8	35.0 2		
											35.85	
											36.65	
	37.10 0									37.1		
											37.60	
									37.7			
						38.0 abs						
		Fe	38.75									38.18
												38.81
												39.24
												39.69
						40.5			40.4			

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4930-4949											
		42.20									
	42.6 1										
										42.90	
										43.65	
							43.9				
					44.2 head(?)						
	44.4										
	45.3						45.3				
										45.65	
	46.2	Fe 46.35									46.40
											46.63
										46.75	
								46.8			
	47.5										
										47.85	
	48.4 1				48.3 em		48.4				
										49.85	
4950-4969											
		Fe 50.10									50.10
	50.3 1				50.2 5						
							51.3				
		Fe 52.25									52.64
	52.5 1									52.45	
							53.2				
										53.95	
	54.3 BR										
		Fe 54.55									
							55.1				
	55.7 BR						56.4				
										56.65	
					57.3 Co						
		Fe 57.45								57.65	57.30
											57.60
										58.45	
							59.1				
										59.75	
					60.3						
	60.7 0										
	61.0						60.9				
										62.00	61.91
		62.25									62.56
	62.6 3				62.8 em						
										63.30	

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	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4950-4969												
											64.35	
	64.7 2					64.6 em						
						65.3 abs						
	66.1	Fe	66.10									66.09
	V edge								66.5			
						67.1 abs						
		Fe	68.00					68.0 head(r)				68.70
	68.6											69.92
4970-4989												
	70.1 0	Fe	70.05									70.49
	73.2 0	Fe	73.10									73.10
								74.5 em(r)				
	75.8 0VBR											
						76.7						
								77.2 em(r)				
		Fe	77.75									
	78.3 0BR					78.0 1 em						
		NaFe	78.55									78.60
	80.2 0					80.4 0		80.4 em(r)				
		Ti	81.80									
	82.5 0	Fe	82.45									82.50
								82.9 em				
		Fe	83.85									83.25
												83.85
									82.9			
	85.5 0	Fe	85.35									85.26
												85.55
								86.9 em(r)				
	87.6 BR											
		Fe	88.95									88.96
	89.3 BR											
4990-5009												
								90.0 em(r)				
	91.3	TiFe	91.25									90.46
												91.27
						92.8						
		Fe	93.85									94.13
												95.62
	94.2 0							94.0 em(r)				
			96.20									97.80

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
4990-5009												
	97.0 0											
	97.9											
		Ti	99.25									99.11
	99.5 IBR											
						01.2						
	01.9 1	Fe	01.80						01.3(?)			01.87
												02.80
								02.2(?)	02.3			
	04.1 BR											
		Fe	05.80									04.79
												04.99
												05.72
	06.2 Co	Fe	06.20					06.4(?)				06.13
	07.6		07.65									07.28
	09.9											
5010-5029												
								10.0				10.2
												10.85
	12.2 Co	Fe	12.00									11.31
												12.07
								12.3				
	14.4											
	15.1	Fe	14.95						15.15			14.95
	17.0											
		Fe	18.50									18.44
								19.1				
						19.7 VBR-abs			19.4 1			
	19.9 BR											
	22.2											
								24.4	24.4 2			
								25.9	26.2 IBR			
	27.1 4											
	28.2 00											
									28.7 3			
	29.7 00											
5030-5090												
		Fe	12.10									11.31
												12.07
		Fe	15.00									14.95
		Fe	18.40									18.44

	2		BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
5030-5090												
		Fe	21.75									
		Fe	22.35									22.25
												23.47
		Fe	27.00									27.13
		Fe	27.35									27.21
		Fe	28.05									28.13
			28.75									
		Fe	29.55						29.5			30.78
								30.1				
								31.2	31.25 0			
								33.0	33.05 0			
						34.3		34.5	34.54 2			
									35.8 2			
								36.2				
	36.5 BR								36.4 0			
								37.3	37.3 4			
		Ti	38.40						37.8 4			
		Fe	39.25					39.	38.4 0			
									38.9 1			39.26
									39.7 1			
	41.1	Fe	41.00						40.40 1			41.08
		Fe	41.80						41.30 1			41.75
	42.10								42.95 6			
								43.6	44.0 3			
	44.3 1	Fe	44.20									44.22
								44.7	45.70 BR			
		Fe	48.45						46.5 0			48.45
	48.8 0								47.60 VBR			
		Fe	49.80						48.50 VBR			49.82
	50.0 1											
	51.8 1	Fe	51.65						52.3 3			51.63
			53.50			54.4			53.8 0			
		Fe	54.80									54.64
	55.1 2								55.3 0			
								55.8	56.4 3			
								58.4	57.1 3			
	60.3 00							60.1	58.25 3			
								62.0	59.0			
									60.02			60.07
	65.1 0BR	Fe	64.95						61.1 2			65.01
												65.20
	67.2 2Co	Fe	67.20						65.4 0			
								67.9	65.95 5			70.95
	68.7 2Co	Fe	68.85			68.7		68.9	67.15 5			
	72.4 BR					BR-em region			68.9 4			

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	2	BB	3	G.D.	4	7	Baird King	Total King	Mike	King 1st max.	Fe
5030-5090											
	74.7 BR										
	76.4						75.2				
	79.6				81.5						
							82.1				
	83.5										
							89.0				
	90.8										
					96.2 BR-abs						
					99.4 BR-abs						
					01.2 BR-abs						
					05.5 edge(?)						
					12.2 BR-abs(?)						
					23.4 edge(?)						
								70.15 0			
								71.15 2			
								72.20 0			
								72.90 3			
								75.8 1			
								76.4 5			
								77.4 1			
								78.45 0			
								79.25 3 Al 0			
								81.70(?)			
								84.0			
								86.45 2VBR			
								87.7(?)			
								92.4 2VBR			
								94.1 3VBR			
								96.0 2VBR			
								02.5 Al 0			

APPENDIX B

NEGATIVE PRINTS OF ALL PLATES EXPOSED AT OPERATION IVY

Following are negative prints of all plates exposed at Operation Ivy. On each print, the following information is given as a legend:

Shot viewed
Instrument used
Position of plate (JACO spectrograph)
Wavelength range
Exposure type of plate

As an aid to the location of any particular print, the following list indicates the figure numbers for all plates used in the JACO spectrograph in the two shots.

Mike: B.1 (upper deck, high wavelength region)
B.2 (upper deck, middle wavelength region)
B.3 (upper deck, low wavelength region)
B.4 (lower deck, high wavelength region)
B.5 (lower deck, middle wavelength region)
B.6 (lower deck, low wavelength region)

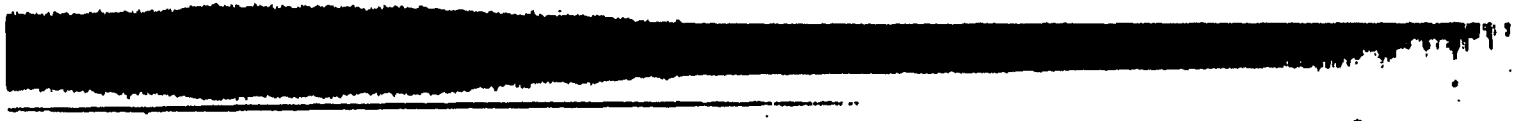
King: B.8 (upper deck, high wavelength region)
B.9 (upper deck, middle wavelength region)
B.10 (upper deck, low wavelength region)
B.11 (lower deck, high wavelength region)
B.12 (lower deck, middle wavelength region)
B.13 (lower deck, low wavelength region)

7785 A 6490 A

Fig. B.1 — Mike, JACO spectrograph, 21 ft, upper deck, high wavelength region (6490 to 7785 A; total, I N).

6490 A 5195 A

Fig. B.2 — Mike, JACO spectrograph, 21 ft, upper deck, middle wavelength region (5195 to 6490 A; total, II F).



5195 A

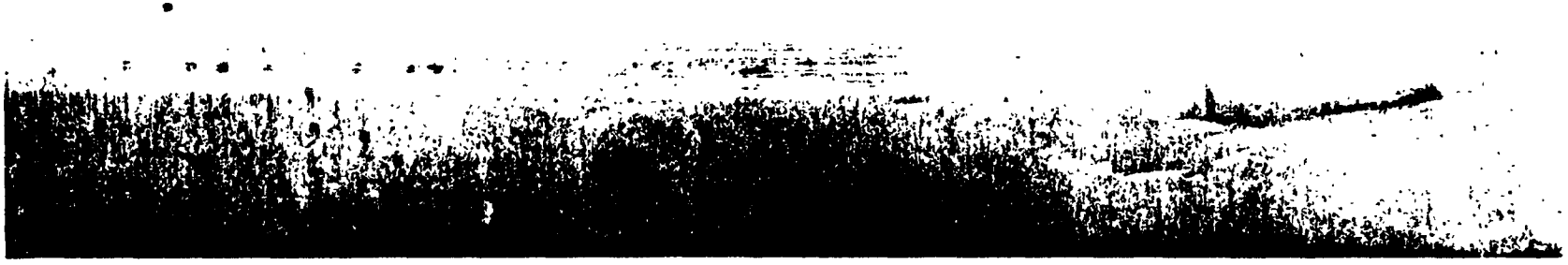
3900 A

Fig. B.3—Mike, JACO spectrograph, 21 ft, upper deck, low wavelength region (3900 to 5195 A; total, II F).

4120 A

3485 A

Fig. B.4—Mike, JACO spectrograph, 21 ft, lower deck, high wavelength region (3485 to 4120 A; second order; total, II O).



3485 A

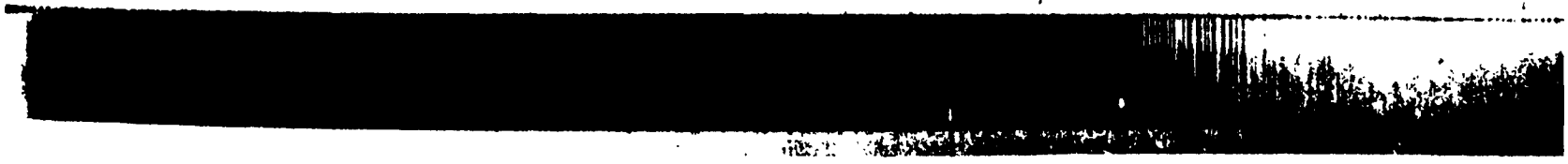
2795 A

Fig. B.5—Mike, JACO spectrograph, 21 ft, lower deck, middle wavelength region (2795 to 3485 A; second order; total, II O).

5595 A

4315 A

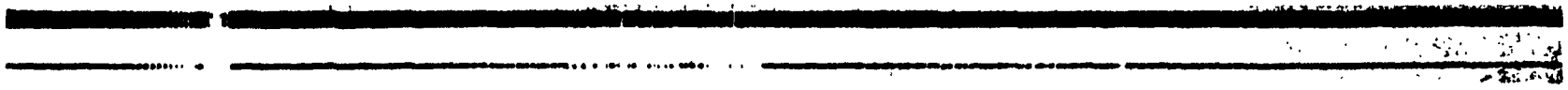
Fig. B.6—Mike, JACO spectrograph, 21 ft, lower deck, low wavelength region (4315 to 5595 A; first order; total, II O).



5000 A

3000 A

Fig. B.7—King, Baird, 2 meter (3000 to 5000 A, 1.0 to 1.1 sec; II O). Black part has been measured.



7785 A

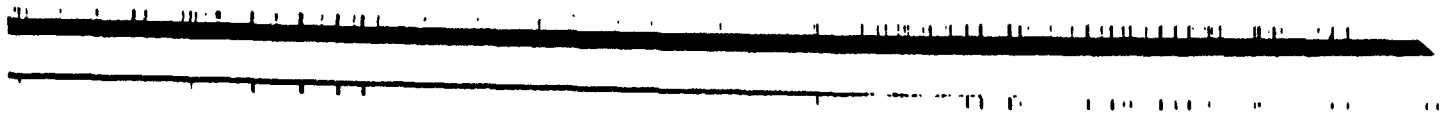
Fig. B.8—King, JACO spectrograph, 21 ft, upper deck, high wavelength region (6490 to 7785 A; total, I N).

6490 A

6490 A

Fig. B.9—King, JACO spectrograph, 21 ft, upper deck, middle wavelength region (5195 to 6490 A; total, II F).

5195 A



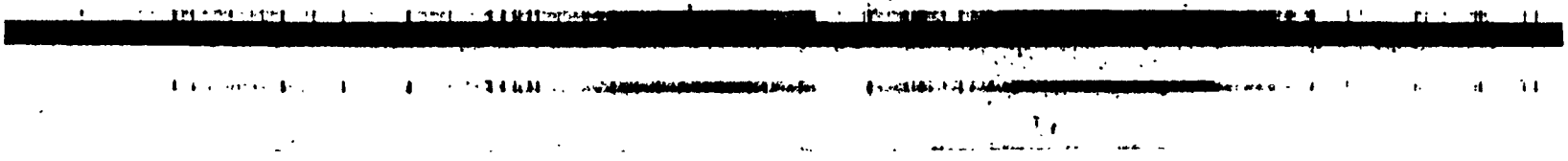
5195 A

Fig. B.10—King, JACO spectrograph, 21 ft, upper deck, low wavelength region (3900 to 5195 A; total, II F).

3900 A

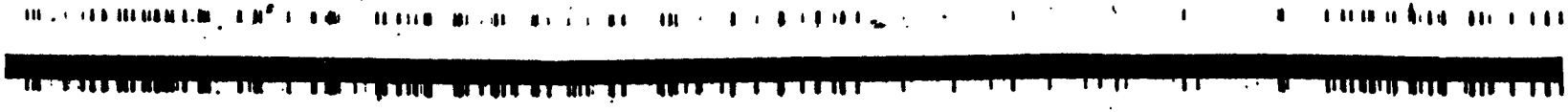
8245 A — 6970 A

Fig. B.11 — King, JACO spectrograph, 21 ft, lower deck, high wavelength region (6970 to 8245 A; first maximum, I N).



970 A — 5595 A

Fig. B.12 — King, JACO spectrograph, 21 ft, lower deck, middle wavelength region (5595 to 6970 A; first maximum, II F).



595 A — 4315 A

Fig. B.13 — King, JACO spectrograph, 21 ft, lower deck, low wavelength region (4315 to 5595 A; first maximum, II F).