

Helwan Observatory

SEISMOLOGICAL BULLETIN

- 1969 -

Name : Helwan Seismic Station (HLW) .  
Location : Lat. = 29° 51' N , Long. = 31° 20' E , h = 115 m .  
Bed Rock : Limestone .  
Instruments : Benioff Short Period (Z, NS, ES) ,  $T_s = 1.0$  sec ,  
 $T_g = 0.74$  sec , Magnification = 50,000 .  
Sprengnether Long Period (Z, NS, EW) ,  $T_s = 15$  sec ,  
 $T_g = 100$  sec , Magnification = 3000 .

HELWAN MAGNITUDE SCALE :

1- Near Earthquake Magnitude :

$$mPn(HLW) = \log A/T + 1.9 \log \Delta - 2.68$$

$$mPg(HLW) = \log A/T + 1.83 \log \Delta - 2.65$$

$$mP^+(HLW) = \log A/T + 1.43 \log \Delta - 1.58$$

$300 \text{ km} \leq \Delta \leq 1200 \text{ km}$ ,  
A in millimicrons .

2- Regional Earthquake Magnitude :

$$M(HLW) = \log (A_N^2 + A_E^2)^{1/2} + 2.51 \log \Delta - 2.37 ; 300 \text{ km} \leq \Delta \leq 2000 \text{ km}.$$

3- Total Duration Magnitude :

$$Mt(HLW) = 0.085 \Delta + 1.16 \log t + 3.05 ; 300 \text{ km} \leq \Delta \leq 1200 \text{ km}, t \text{ is the total duration in minutes .}$$

4- Distant Earthquake Magnitude :

$$MB = \log A/T + Q ; \text{Body wave magnitude}$$

$$MS = \log A/T + 1.66 \log \Delta + 3.3 ; \text{Surface wave magnitude}$$

where A is the ground amplitude in microns, T is the corresponding period in seconds, in case of surface wave magnitude  $T = 20 \pm 2$  sec;  $\Delta$  is the epicentral distances in kilometers .

Address ;

Seismological Section  
Helwan Observatory  
Helwan, Cairo, Egypt.

Date	Comp.	Phase	G.M.T.			Period T sec	Amplitude			Distance $\Delta$ Km	Remarks
			h	m	s		$A_B$ $\mu$	$A_N$ $\mu$	$A_Z$ $\mu$		
1969 Jan.											
1	Z	i(P)	09	44	37						V. Weak .
1	Z	iPn	21	43	47.5				766		C.
	N	iSn		45	28						
2	Z	eP	00	46	32						V. Weak
2	Z	i(P)	09	10	55.8						C.
2	Z	iPg	15	14	16						C.
	NE	iSg			17						
2	Z	i(P)	16	22	18						D., V. Weak
3	Z	iP	03	21	46						D
	N	iS		26	00						
	Z	M		30	0						
3	Z	iPg	11	18	25.5						D
	NE	iSg			26.5						
5	Z	iPg	10	46	34						C, V. Weak
	E	iSg			36						
5	Z	iPg	12	09	41						
	NE	iSg			42.5						
5	Z	iPn	13	45	40						C, Severe E
	NE	iSn		47	36						Lines Overlapping
6	Z	iPg	09	00	42						D, V. Weak
	E	iSg			44.5						
6	Z	iP	14	58	16						C. Lines Over-
			15	00	24						lapping
6	Z	eP	23	53	33						
	N	iS		55	43						
8	Z	iPn	03	06	44						D
	NE	iSn		08	10						
8	Z	M	06	20	0						

10	Z	M	04 15.0		
10	Z	iP	04 35 04.5		C
	E	iS	37 19		
10	Z	iPn	04 39 06		C
	E	iSn	40 03		
11	Z	e(Pn)	10 24 38		
	E	eSn	26 43		
11	Z	eP	12 08 54		
	N	eS	16 50		
	Z	M	31.5		
13	Z	ePn	05 49 19		
	NE	eSn	51 15		
13	Z	M	07 54.2		
13	Z	iPn	07 58 49.5		M(HLW)=4.8
	Z	ipP	54.5		
	NE	iSn	08 00 03.5		
14	Z	iPn	23 13 40.5	727	D <sub>1</sub>
	Z	ipP	45		M(HLW)=6.0
	NE	iSn	14 45		
14	Z	ePn	23 33 40		
	E	eSn	34 45		
15	Z	ePn	02 21 25		
	E	eSn	22 30		
15	Z	ePn	03 17 45		
	E	eSn	18 50		
15	Z	e(P)	13 15 35		
	E	ee(S)	24 04		
	Z	M	53.7		
15	Z	eePn	14 48 25		
16	Z	iPg	10 00 15.5		Blast
16	Z	eiPn	19 46 32		D
	E		47 41.8		



17	NE	eSn	04 47 40	
17	Z	iPg	09 57 15	Blast
17	Z	iPg	13 04 09	Blast
18	Z	iP	03 16 45	
	NE	i	26 31	
	N	i(SKS)	27 05	
	NE	i(S)	45	
	Z	M	59.5	
19	Z	iPn	00 17 45.5	C
	NE	iSn	18 53	
19	Z	iPn	07 14 09	C
	NE	iSn	15 38	
19	Z	M	08 58.0	
19	Z	HP	19 10 04	C
	NE	iS	13 32	
19	N	i(S)	19 42 02	
20	Z	eP	12 46 10	
	Z	i	16	
	Z	i	34	
	Z	i	47 24	
	Z	M	13 29.0	
20	Z	iP	14 32 56	C
	Z	M	15 08.0	
21	Z	M	08 40.0	
21	Z	iPn	11 35 04	C
	NE	iSn	59	
22	Z	iPg	09 59 50	Blast
22	Z	iPg	13 13 57.5	Blast
22	Z	i(P)	17 27 25	D
26	Z	iPn	06 58 16	C
	NE	iSn	59 39	



26	Z	e	14 31 13	
	N	M	48.2	
26	Z	i	15 33 09	
	N	M	16 03.0	
27	Z	e(P)	13 29 08	
	E	e	42 15	
29	Z	ePg	09 59 19	Blast
29	Z	ee	18 04 52	
	Z	e	58	
	Z	e	05 03.5	
	Z	e	25	
	Z	M	19 33.5	
30	Z	ePn	00 22 23	
	E	iSn	23 41	
30	Z	iP	10 42 48	C
	Z	ipP	43 00	h=36
	E	e(SKS)	53 03	
	E	iS	30	
31	Z	iP	00 57 28	
	Z	i	46	
	Z	i	58 26	
	Z	i(PP)	01 01 12	
	E	iS	08 00	
	Z	M	15.5	
31	Z	ePg	11 24 45	
	N	eSg	49	
31	Z	ePg	12 01 28	Blast
31	Z	eP	14 01 38	
	Z	e	04 30	
	Z	e	05 08	
	E	e(S)	12 10	
	E	e	12 50	
	Z	M	51.2	
31	Z	ePn	14 41 34	
	N	eSn	42 39	

31	Z	eP	15 18 52	
	Z	i	19 00	
	Z	i	10	
31	Z	e	23 50 20	
	Z	e	28	
	Z	e	44	
Feb.				
1	Z	M	20 41.0	
2	Z	M	00 34.0	
2	Z	iP	01 51 59.5	C
	Z	i	55 46	
	E	iS	02 02 32	
	Z	M	20.0	
2	Z	iPn	02 42 30.0	C
	E	iSn	43 35	
2	Z	iPg	12 28 14.0	C, Very Weak
	NE	iSg	17	Felt at Maadi
3	Z	i(P)	08 10 08.0	D
3	Z	M	19 44	
3	Z	iP	21 54 55	C
	NE	iS	22 05 30	
	Z	M	25.0	
4	Z	iP	01 51 26	D
	NE	iS	02 02 20	
4	Z	eP	04 39 08	
	Z	M	05 06.0	
5	Z	iPn	09 21 59	D
	E	iSn	23 16	
5	N	i(S)	10 35 59	
6	Z	M	00 20.0	
6	Z	iP	13 05 59	C
	NE	iS	08 26	

7	Z	iP	01 06 34.0	
	NE	i(S)	09 20	
	Z	M	13.5	
7	Z	ePg	12 33 48.5	Blast
8	Z	iP	23 27 29	0
	Z	e	57	
	ZE	eS	32 10	
	NE	e	21	
	Z	M	36.1	
9	E	eSn	18 44 29	
9	Z	ePn	21 15 13	
	E	eSn	16 39	
10	Z	iP	23 16 38	D
	Z	i	50	
	Z	i	18 40	
	Z	iPP	19 06	
	E	iS	25 54	
	E	iSKS	26 20	
	NE	i	27 10	
	Z	M	55.3	
11	Z	ePg	09 59 37	Blast
11	Z	ePg	12 46 34	Blast
11	Z	iP	22 16 28	0
	Z	e	34	
	Z	i	17 36	
	Z	iPP	56	
	Z	iPPP	18 26	
	NE	iS	22 36	
	NE	e	27 33	
	Z	M	39.5	
11	Z	iP	22 29 00	
	E	i S	35 25	
13	Z	M	11 31.8	
13	Z	ePn	15 11 42	
	E	eSn	13 22	



14	Z	M	01 50.0		
14	E	eSn	02 11 53		
14	E	eSn	05 30 33		
16	Z	ePn	16 35 23		
	N	iSn	36 34		
16	N	eSn	18 49 40		
17	Z	iP	00 56 16		C
	Z	ipP	34		
	Z	iPP	01 00 06		
	NE	eSKS	06 50		
	NE	iS	07 22		
	Z	M	37.5		
17	Z	ePn	09 13 22	778	M(HLV) =4.47
	NE	iSn	14 34		
17	Z	ePg	10 58 49		Blast
18	Z	e	05 34 46		
	Z	e	35 02		
18	Z	M	13 38.5		
18	Z	M	20 10.0		
19	Z	iPg	09 59 21.8		Blast
19	Z	iPg	11 31 34.0		Blast
20	Z	iP	10 08 50		D
	N	iS	20 02		
20	Z	iPg	10 43 20		Blast
20	Z	iPg	14 07 41		D, Very Weak
	N	iSg	45		
20	Z	eeP	17 11 32		
	Z	M	45.0		
23	Z	iP	00 49 54		C
	N	iS	01 00 48		
		i			

23	Z	M	19 22.0	
24	Z	iP	00 22 30	C
	NE	iS	33 00	
	Z	M	58.0	
24	Z	M	05 12.0	
24	Z	iPg	09 52 47	Blast
25	Z	i(P)	04 11 04	D
25	Z	iPg	12 11 43.8	C
25	Z	iP	14 16 35	C
	Z	i	39	
	NE	iS	25 14	
	Z	M	40.0	
26	Z	iPn	12 37 39	D
	E	iSn	38 55	
26	NE	i(S)	17 44 02	
27	Z	ePn	11 12 37	
	NE	iSn	14 24	
27	NE	i(S)	14 28 15	
28	Z	iP	02 47 28	C
	NE	iS	52 37	
	F		10.0	
28	Z	iP	04 32 32.0	C
28	NE	i(S)	07 20 32	
28	NE	i(S)	09 37 23	
28	Z	M	14 10.0	
<b>March</b>				
2	N	i(S)	14 21 08	
	Z	M	50.0	
2	Z	i(P)	22 35 37.0	C

3	Z	iPn	01 01 43.0	C
	NE	iSn	03 38	
3	Z	iP	15 02 13	C
	NE	iSKS	12 50	
	N	iS	13 32	
	Z	M	47.5	
3	Z	eP	16 50 04	
	Z	epP	29	
	Z	ePP	54 05	
	E	e(SKS)	17 00 08	
	E	eS	01 02	
4	Z	iPn	01 49 07	C
	NE	iSn	50 20	
5	Z	iP	14 05 18	C
	Z	e(pP)	29	
	Z	e	08 30	
	E	eSKS	15 52	
	E	eS	16 52	
	Z	M	54.0	
5	Z	iPn	14 43 46.5	D
	E	iSn	45 37	
5	Z	eP	16 24 24	
	Z	ePP	28 13	
	E	eSKS	35 04	
	E	eS	36 02	
5	Z	iP	19 39 44.5	C
	Z	e(PP)	40 23.5	
	E	eS	44 52	
	Z	M	57.5	
7	E	M	20 44.4	
9	Z	e	14 04 46	
	Z	e	06 50	
	E	e	12 50	
	N	e	14 00	
	NE	e	15 40	
	Z	M	50.5	



10	Z	iP	07 13 38	D
	Z	e	14 20	
	Z	e	15 16	
	Z	e	44	
	N	e	21 02	
	N	e	22 40	
	NE	i	29 24	
	N	e	30 40	
10	Z	iPg	09 58 48	Blast
11	Z	ePn	01 52 19	C,
	NE	eSn	53 23	
11	Z	eePn	14 16 15	
	NE	eSn	17 38	
11	Z	ePg	12 38 34	Blast
12	Z	iPg	13 14 49.5	Blast
12	Z	ePn	14 55 44	
	Z	e	50	
	NE	eSn	56 57	
12	NE	eSn	18 52 53	
13	Z	iP	20 51 47	D
13	Z	M	23 28.5	
14	Z	e	04 19 52	
	Z	e	57	
	Z	e	20 06	
	Z	e	11	
14	Z	iP	09 05 42	D
	Z	e	06 27	
	Z	e	42	
	E	i	11 36	
	NE	eS	15 00	
	NE	eSKS	32	
	E	e	16 00	
14	Z	ePg	12 04 04	Blast

15	Z	ePn	14 14 19	
	NE	eSn	15 08	
16	Z	eP	16 06 58	
	NE	iS	17 32	
17	Z	ePg	11 17 11	Blast
18	Z	eeP	03 52 36	
	Z	M	04 50.0	
18	Z	eP <sub>g</sub>	09 58 39	Blast
19	Z	ePg	08 11 17	Blast
19	Z	iP	14 11 26	D
	Z	e	12 08	
	Z	e	22	
	Z	e	15 14	
	NE	i	21 22	
	N	i	22 12	
	N	e	23 22	
20	Z	ePg	11 37 30	Blast
20	Z	iP	16 31 58	D
	Z	e	33 14	
	Z	e	34 26	
	N	e	42 26	
	N	iS	42 52	
	E	M	17 21.5	
21	Z	eP	03 17 53	
	NE	eS	28 18	
	NE	e	42	
	NE	e	29 20	
22	Z	eP	04 59 28	
	Z	M	05 15.5	
22	Z	eP	06 03 49	
	Z	e	04 00	
	Z	e	09 00	
22	Z	ePn	18 03 10	
	NE	eSn	04 54	

22	Z	M	18 26.5		
22	Z	eSn	19 18 03		
22	Z	ePn	19 25 08		
23	Z	ePn	00 18 03		
	NE	eSn	19 15		
23	Z	e	12 15 10		
	Z	e	22		
	Z	e	19 50		
	Z	M	39.5		
23	Z	ePn	12 40 14		
	NE		41 05		
23	NE	eSn	13 17 50		
23	Z	iPn	21 11 00		
24	Z	iPn	02 01 49		
	E	iSn	03 32		
24	Z	e	03 01 08		
24	Z	ePn	08 15 18		
	NE	eSn	17 00		
24	Z	ePn	11 36 50		
	NE	eSn	38 35		
24	Z	iPn	11 55 05		
	NE	eSn	50		
24	Z	ePn	12 25 18		
24	Z	ePn	12 51 38.8		
24	Z	ePn	14 28 32		
24	Z	ePn	19 18 39		
	E	eSn	19 20		
				1067	D,M(HLW)=5.5
				1057	D,M(HLW)=5.2
					$m_{Pn}(HLW)=4.9$
					$m_{Pg}(HLW)=5.1$
					$m_{P+}(HLW)=5.1$
				356	D,M(HLW)=5.04
					$m_{Pn}(HLW)=5.1$
					$m_{Pg}(HLW)=5.05$
					$m_{P+}(HLW)=5.09$
					$m_{Pn}(HLW)=4.2$
					$m_{Pn}(HLW)=4.74$
					$M(HLW)=4.75$
					$M(HLW)=4.15$
					$m_{Pn}(HLW)=4.04$
					$M(HLW)=3.97$
					$m_{Pn}(HLW)=3.90$

M(HLW)=3.68,  $m_{Pn}(HLW)=3.49$

M(HLW)=3.89  
 $m_{Pn}(HLW)=3.9$



24	Z	ePn	19 53 42		M(HLW) =4.15
	N	eSn	54 24		
25	Z	ePn	02 17 47		M(HLW) =4.2
	E	eSn	18 27		mPn(HLW)=4.07
25	E	eSn	08 44 28		
25	Z	iPn	10 41 58.8		C,M(HLW)=4.48
	N	eSn	42 50		
25	Z	iPn	13 23 27	1070	M(HLW) =5.6 M <sub>t</sub> (HLW) =5.7
25	Z	ePn	14 21 05		
	E		22 45		
25	E	eSn	16 11 00		
25	Z	ePn	16 15 46		
	E	iSn	17 43		
25	Z	ePn	18 56 19		M(HLW) =3.93
25	Z	ePn	19 09 14		M(HLW) =3.72
25	E	eSn	19 39 46		
25	Z	ePn	22 28 48		M(HLW) =3.72
26	Z	ePn	03 33 41		
	NE	iSn	35 17		
26	Z	ePn	11 25 31		M(HLW) =3.89
26	ZNE	eSn	12 05 22		
26	Z	ePN	16 20 32		M(HLW) =3.63
	NE	eSn	21 17		
26	Z	ePn	17 15 06		
	NE	iSn	16 15		
26	Z	ePn	21 34 00		M(HLW) =4.29
	NE	iSn	46		mPn(HLW)=4.1
26	Z	ePn	22 02 20		M(HLW) =3.66
	E	eSn	59		

27	Z	ePn	01 55 09		M(HLW) =3.98
	NE	eSn	46		mPg(HLW)=4.01
27	Z	iPn	04 13 11		C,M(HLW)=4.52
	NE	iSn	45		mPg(HLW)=4.47
27	N	eSn	04 45 30		
27	Z	iPn	06 16 19.4	356	D,M(HLW)=4.83
	E	iSn	17 06		mPn(HLW)=4.67
					mPg(HLW)=4.74
					mP <sup>+</sup> (HLW)=4.75
					m <sub>t</sub> (HLW) =4.89
27	Z	ePn	06 39 07		M(HLW) =4.14
	E	iSn	55		mPn(HLW)=4.07
27	Z	iPn	07 44 39		D
	NE	iSn	45 47		
27	ZNE	eSn	08 53 14		
27	Z	iP	11 57 54		D
27	Z	iP	12 54 48		C
	N	iSKS	13 05 27		
	E	eS	50		
27	Z	ePn	16 21 30		M(HLW) =3.99
	NE	iSn	22 13		mPg(HLW)=3.99
27	Z	ePn	17 55 17		M(HLW) =3.78
					mPg(HLW)=3.77
27	Z	iP	18 09 18		C
27	Z	ePn	20 36 53		M(HLW) =3.83
28	Z	eP	01 21 57		
28	Z	iPn	01 50 39		C,M(HLW)=6.16
	NE	iSn	52 20	1006	mPn(HLW)=5.86
					M <sub>t</sub> (HLW) =5.88
28	Z	eePn	02 39 53		
28	Z	iPn	05 42 18		C

28	N	iSn	06 33 21	
28	E	eePn	07 18 (32)	M(HLW) =4.11
	NE	e(Sn)	(32)	
28	Z	ePn	07 47 35	M(HLW) =4.31
	E	eSn	48 23	mPg(HLW)=4.2
28	Z	iPn	08 08 52	D <sub>0</sub> M(HLW)=4.5
	NE	eSn	09 46	mPn(HLW)=4.39
28	Z	iPn	10 04 33	C
	E	iSn	06 17	
29	Z	iPn	02 11 30	D <sub>0</sub> M(HLW)=3.78
	NE	iSn	12 17	mPn(HLW)=3.9
29	Z	iPn	07 44 22.5	C <sub>0</sub> M(HLW)=4.46
	NE	iSn	45 08	mPn(HLW)=4.25
29	Z	ePn	20 58 45	M(HLW) =3.58
30	NE	eSn	10 52 39	
30	N	eSn	12 22 39	
30	Z	ePg	13 58 27	Blast
30	Z	e	22 10 31	
	Z	e	11 18	
31	Z	ePn	05 28 51	M(HLW) =3.72
	NE	eSn	29 35	
31	Z	iPn	07 16 42	C <sub>0</sub> M(HLW)=5.99 Severe Earthquake 3--Dead 12--injured 15--buildings destructive Felt . I <sub>0</sub> = IIV-IIIIV

D.S. : After shocks continued for about two hours and interferred with the main shock . It was difficult to identify the first arrivals .



31	Z	iPn	09	---	-----	
31	Z	ePn	09	31	36.5	mPn(HLW)=4.25
31	Z	ePn	09	34	12	mPn(HLW)=4.33
31	Z	ePn	09	35	04	mPn(HLW)=4.76
31	Z	ePn	09	38	40	mPn(HLW)=4.11
31	Z	ePn	10	15	08	mPn(HLW)=3.95
31	Z	ePn	10	19	13	mPn(HLW)=4.73
31	Z	ePn	10	34	14	mPn(HLW)=4.79
31	Z	ePn	10	40	22	mPn(HLW)=4.21
31	Z	ePn	10	49	21	mPn(HLW)=4.48
31	Z	ePn	11	10	12	mPn(HLW)=4.4
31	Z	ePn	11	30	-----	
31	Z	ePn	11	34	05	mPn(HLW)=4.43
31	Z	ePn	11	48	31	mPn(HLW)=4.64
31	Z	ePn	11	54	21	mPn(HLW)=4.16
31	Z	ePn	11	59	36	mPn(HLW)=4.4
31	Z	ePn	12	16	20	mPn(HLW)=4.48
31	Z	ePn	12	32	00	mPn(HLW)=3.95
31	Z	ePn	12	51	55	mPn(HLW)=4.03
31	Z	ePn	12	58	20	mPn(HLW)=4.21
31	Z	ePn	13	13	17	mPn(HLW)=4.21
31	Z	ePn	13	26	42	M(HLW) =3.38
31	Z	ePn	13	29	49	M(HLW) =3.42
31	Z	ePn	13	30	55	M(HLW) =3.68
31	Z	ePn	13	30		mPn(HLW)=4.03



31	Z	ePn	13 33 44	M(HLW)	=4.08
31	Z	ePn	13 39 20	M(HLW)	=3.39
31	Z	ePn	14 01 08	M(HLW)	=3.85
31	Z	ePn	14 08 05	M(HLW)	=3.38
31	Z	ePn	14 10 07	M(HLW)	=4.09
31	Z	ePn	14 32 22	M(HLW)	=3.88
31	Z	ePn	14 52 50	M(HLW)	=3.68
31	Z	ePn	14 55 15	M(HLW)	=4.16
31	Z	ePn	15 05 50	mPn(HLW)	=4.35
31	Z	ePn	15 10 52	mPn(HLW)	=4.46
31	Z	ePn	15 19 23	M(HLW)	=3.82
31	Z	ePn	15 42 08	mPn(HLW)	=4.26
31	Z	ePn	15 57 50	M(HLW)	=3.68
31	Z	ePn	16 10 08	M(HLW)	=3.38
31	Z	ePn	16 13 18	M(HLW)	=3.52
31	Z	ePn	16 17 55	M(HLW)	=3.74
31	Z	ePn	16 23 03	M(HLW)	=3.68
31	Z	ePn	1631 06	M(HLW)	=3.85
31	Z	ePn	16 42 24	M(HLW)	=3.74
31	Z	ePn	17 12 31	mPn(HLW)	=4.06
31	Z	ePn	17 24 38	M(HLW)	=3.46
31	Z	ePn	17 36 35	mPn(HLW)	=4.03
31	Z	ePn	17 37 53	M(HLW)	=3.52
31	Z	ePn	17 44 36	M(HLW)	=3.52
31	Z	ePn	17 48 56	mPn(HLW)	=4.37

31	Z	ePn	17 58 18	mPg(HLW)=4.11
31	Z	ePn	18 22 40	mPn(HLW)=4.26
31	Z	ePn	18 44 40	mPn(HLW)=4.64
31	Z	ePn	19 00 52	M(HLW) =3.38
31	Z	ePn	19 12 15	mPn(HLW)=4.37
31	Z	ePn	19 23 08	mPn(HLW)=4.33
31	Z	eP	19 37 00	
	NE	i(SKS)	46 30	
	NE	iS	42	
31	Z	ePn	20 04 45	mPg(HLW)=3.95
31	Z	ePn	20 13 52	mPn(HLW)=4.25
31	Z	ePn	20 19 55	mPn(HLW)=4.33
31	Z	ePn	20 23 07	M(HLW) =3.85
31	Z	ePn	20 32 58	mPn(HLW)=4.35
31	Z	ePn	21 02 27	mPn(HLW)=4.56
31	Z	ePn	21 22 57	M(HLW) =3.98
31	Z	ePn	21 27 40	<del>M(HLW)</del> =3.85
31	Z	ePn	21 33 04	M(HLW) =3.46
31	Z	iPn	21 45 20	mPn(HLW)=4.83
31	Z	ePn	21 55 00	M(HLW) =4.22
31	Z	ePn	22 39 08	mPg(HLW)=4.33
31	Z	ePn	22 41 -----	
31	Z	ePn	22 57 35	M(HLW) =3.63
31	Z	ePn	23 03 27	mPg(HLW)=4.21
31	Z	ePn	23 20 40	M(HLW) =3.46
31	Z	ePn	23 16	mPn(HLW)=4.19



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1	Z	ePn	00 16 04	M(HLW) =3.48 mPn(HLW)=3.59
1	Z	ePn	00 17 41	mPn(HLW)=4.53
1	Z	ePn	00 22 46	mPn(HLW)=3.9
1	Z	ePn	00 38 07	mPn(HLW)=3.36
1	Z	ePn	01 00 40	M(HLW) =3.59 mPg(HLW)=3.66
1	Z	ePn	01 13 50	M(HLW) =3.44
1	Z	ePn	01 16 30	M(HLW) =3.62
1	Z	ePn	01 27 23	mPn(HLW)=4.07
1	Z	ePn	01 47 41	M(HLW) =3.39
1	Z	ePn	01 56 46	M(HLW) =3.41
1	Z	ePn	02 08 32	M(HLW) =3.90
1	Z	ePn	02 36 26	M(HLW) =3.79
1	Z	ePn	02 45 00	M(HLW) =3.38
1	Z	ePn	02 48 59	M(HLW) =3.54
1	Z	ePn	02 55 58	M(HLW) =3.39
1	Z	ePn	03 23 19	mPg(HLW)=3.64
1	Z	ePn	03 50 51	M(HLW) =3.48
1	Z	ePn	03 53 48	mPn(HLW)=4.07
1	Z	ePn	04 15 57	M(HLW) =3.39
1	Z	ePn	04 19 15	M(HLW) =3.53
1	Z	ePn	04 50 58	M(HLW) =3.65
1	Z	ePn	05 15 39	M(HLW) =3.38
1	Z	ePn	05 25 33	M(HLW) =3.39
1	Z	ePn	05 52 54	M(HLW) =3.45

1	Z	ePn	06 14 03	M(HLW) =3.67
1	Z	ePn	06 25 39	M(HLW) =3.87
1	Z	ePn	06 37 16	M(HLW) =4.3 mPn(HLW)=4.33
1	Z	ePn	07 01 42	mPg(HLW)=3.8
1	Z	ePn	07 26 38	M(HLW) =3.73 mPg(HLW)=3.99
1	Z	ePn	07 31 34	G, M(HLW) =4.52 mPn(HLW)=4.44
1	Z	ePn	07 47 44	mPg(HLW)=3.77
1	Z	ePn	07 53 47	M(HLW) =3.92 mPn(HLW)=3.92
1	Z	ePn	08 36 34	M(HLW) =3.68
1	Z	ePn	09 16 42	M(HLW) =3.6 mPn(HLW)=3.77
1	Z	ePn	09 18 01	M(HLW) =4.32
1	Z	ePn	09 43 38	M(HLW) =3.82
1	Z	ePn	10 28 48	M(HLW) =3.76 mPn(HLW)=3.8
1	Z	ePn	10 32 51	M(HLW) =3.55
1	Z	ePn	12 09 32	M(HLW)= 3.9
1	Z	ePn	12 35 34	M(HLW) =4.1
1	Z	ePn	13 53 54	M(HLW) =4.24 mPn(HLW)=4.07
1	Z	ePn	14 04 56	M(HLW) =4.03 mPn(HLW)=3.99
14	Z	ePn	14 10 55	M(HLW) =3.62
1	Z	iPn	14 25 55	D
	E	eSn	27 05	



1	Z	ePn	14 33 37	M(HLW) =3.48
1	Z	ePn	14 50 22	M(HLW) =3.65
1	Z	ePn	15 15 02	M(HLW) =4.2 mPg(HLW)=4.08
1	Z	ePn	16 11 47	M(HLW) =3.36
1	Z	ePn	16 48 56	M(HLW) =3.38 mPg(HLW)=3.47
1	Z	ePn	17 05 25	M(HLW) =3.66
1	Z	ePn	18 34 09	M(HLW) =3.81
	E	eSn	47	
1	Z	ePn	19 17 53	M(HLW) =3.36
	E	eSn	18 32	
1	Z	ePn	19 55 56	M(HLW) =3.81 mPg(HLW)=3.99
	E	eSn	56 36	
1	Z	ePn	20 03 0L	M(HLW) =3.36
1	Z	ePn	20 08 52	M(HLW) =3.84 mPg(HLW)=3.9
1	Z	ePn	20 57 37	M(HLW) =3.92 mPg(HLW)=3.9
1	Z	ePn	20 58 ———	M(HLW) =3.86
1	Z	ePn	21 33 50.5	M(HLW) =3.84 mPg(HLW)=3.9
	E	eeSn	34 34	
1	Z	ePn	22 25 33	M(HLW) =3.99
1	Z	ePn	23 27 13	M(HLW) =3.66
2	Z	eePn	00 31 11	M(HLW) =3.84 mPg(HLW)=3.94
	NE	eSn	55	
2	Z	eePn	01 39 00	M(HLW) =3.99
	NE	eeSn	42	
2	Z	eePn	02 34 25.5	M(HLW) =3.9
	NE	eeSn	35 04	

2	Z	eePn	02 48 37	M(HLW) =3.81
	NE	eeSn	48 22	
2	Z	ePn	02 56 48	M(HLW) =3.89
2	Z	ePn	03 38 46	M(HLW) =3.82
2	Z	ePn	04 09 56	M(HLW) =3.82
2	Z	ePn	05 34 21	M(HLW) =3.4
2	Z	ePn	06 39 21	M(HLW) =4.03
2	Z	ePn	06 42 44	M(HLW) =4.06
2	Z	ePn	06 59 55	M(HLW) =3.81
2	Z	ePn	07 11 55	M(HLW) =3.82
2	Z	ePn	08 27 35	M(HLW) =4.2
	E	eSn	28 12	mPg(HLW)=4.22
2	Z	ePn	08 35 17	M(HLW) =3.45
2	Z	ePn	08 46 38	M(HLW) =4.25
2	Z	ePn	09 01 11	Mpg(HLW)=4.2
2	Z	ePg	09 58 26	Blast
2	Z	ePg	10 29 20	Blast
2	Z	ePn	11 48 50	M(HLW) =3.98
	NE	eSn	49 33	mPg(HLW)=4.07
2	Z	ePn	12 52 39	M(HLW) =3.69
2	Z	ePn	13 03 50	M(HLW) =3.52
2	Z	ePn	13 15 54	M(HLW) =4.14
				mPg(HLW)=4.11
2	Z	ePn	13 46 10	M(HLW) =4.02
2	Z	ePn	16 24 22	M(HLW) =3.39
2	Z	ePn	16 34 40	M(HLW) =3.64
2	Z	ePn	17 48 38	M(HLW) =3.5

2	Z	ePn	18 17 27	M(HLW) =3.92
2	Z	ePn	18 29 49	M(HLW) =3.75
2	Z	ePn	18 41 32	M(HLW) =4.18 mPg(HLW)=4.13
2	Z	ePn	18 47 52	M(HLW) =4.06
2	Z	ePn	19 19 52	M(HLW) =3.95 mPg(HLW)=4.07
2	Z	ePn	20 26 12	M(HLW) =4.26 mPg(HLW)=4.44
2	Z	ePn	21 35 49	M(HLW) =3.95
2	Z	ePn	22 42 45	M(HLW) =4.31 mPg(HLW)=4.2
2	Z	ePn	23 32 50	M(HLW) =3.89 mPg(HLW)=3.9
3	Z	ePn	03 55 55	M(HLW) =4.8
3	Z	ePn	04 53 18	M(HLW) =3.93
3	Z	ePn	05 32 41	M(HLW) =3.63
3	Z	ePn	06 06 37	M(HLW) =3.68
3	Z	ePn	06 18 45	M(HLW) =3.51
3	Z	ePn	07 42 20	M(HLW) =3.61 mPg(HLW)=3.77
3	Z	ePn	07 55 29	M(HLW) =4.38
3	Z	ePn	09 56 52	M(HLW) =3.97
3	Z	ePn	13 01 09	M(HLW) =3.46
3	Z	ePn	13 23 17	M(HLW) =4.11
3	Z	ePn	13 28 30	M(HLW) =3.63
3	Z	eiPn	14 28 13	M(HLW) =3.76



3	Z	iPn	18 01 52		
	NE	iSn	02 48		C, M(HLW) =4.61
3	Z	iPn	18 27 10		
	E	iSn	28 11		mPg(HLW)=4.2
3	Z	ePn	19 43 46		M(HLW) =3.78
3	Z	iPn	20 07 03		
	N	iSn	46	378 C,	M(HLW) =4.71 mPn(HLW)=4.48
3	Z	ePn	20 20 59		M(HLW) =3.89
3	Z	ePn	20 37 38		M(HLW) =3.72
3	Z	ePn	20 51 04		M(HLW) =3.71 mPg(HLW)=3.9
3	Z	ePn	21 18 53		M(HLW) =3.53
3	Z	eP	22 15 20		
	Z	iPPP	40		
	Z	i	50		
	Z		16 07		
	N	iS=	42		
	N	iS	18 12		
3	Z	ePn	22 15 37		M(HLW) =3.71
3	Z	ePn	22 17 12		M(HLW) =4.12
4	Z	ePn	01 45 36		M(HLW) =3.64
4	Z	ePn	01 40 25		M(HLW) =4.25
4	Z	iPn	04 30 32		
				C,	mPg(HLW)=3.99
4	Z	ePn	04 57 28		M(HLW) =4.36
4	Z	ePn	06 42 43		M(HLW) =4.31
4	Z	ePn	08 24 10		M(HLW) =3.56
4	Z	ePn	09 01 46		M(HLW) =3.61
4	Z	ePn	09 02 24		
	E	iSn	03 32		



4	Z	ePn	09 03 16	M(HLW)	=4.61
4	Z	ePn	11 06 51	M(HLW)	=4.31
4	Z	iPn	12 19 34	C, M(HLW)	=4.64
				mPn(HLW)	=4.64
4	Z	ePn	14 03 54	M(HLW)	=3.49
4	Z	ePn	17 34 28	M(HLW)	=3.7
				mPg(HLW)	=3.9
4	Z	iPn	18 10 03	M, M(HLW)	=4.22
	N	iSn	53	mPn(HLW)	=4.07
4	Z	ePn	22 27 35	M(HLW)	=3.74
	E	eSn	28 25	mPg(HLW)	=3.9
4	Z	iPn	22 47 44	C, M(HLW)	=3.86
	E	eSn	48 34	mPn(HLW)	=3.94
5	Z	iPn	01 08 35	C, M(HLW)	=3.79
	E	iSn	09 26	mPn(HLW)	=3.9
5	Z	iP	02 23 03	D	
	Z	iPPP	24		
	NE	iS	26 52		
5	Z	ePn <sup>48</sup>	48 14	M(HLW)	=3.89
	E	eSn	49 06	mPg(HLW)	=3.99
5	Z	ePn	04 04 53	mPg(HLW)	=4.14
5	Z	iPn	05 18 35	M(HLW)	=4.28
	E	iSn	19 30		
5	Z	ePn	07 07 47	M(HLW)	=3.83
	E	iSn	08 22		
5	Z	ePn	08 39 20	M(HLW)	=3.83
				mPg(HLW)	=3.92
5	Z	ePn	10 32 25	M(HLW)	=3.76
				mPg(HLW)	=3.9
5	Z	ePn	15 06 13	M(HLW)	=4.34

6	Z	iP	16 56 21	
	NE	iS	17 00 12	
	Z	M	04.8	D
6	Z	ePn	17 33 50.5	
	NE	eSn	35 25	
6	Z	ePn	18 20 05	M(HLW) =3.87
	NE	eSn	47	
6	Z	ePn	21 39 15	M(HLW) =3.82 mPg(HLW)=3.91
7	Z	ePn	04 42 13	M(HLW) =4.4
	E	iSn	43 22	mPn(HLW)=4.3
7	Z	eP	<del>06 22</del> 28	
	N	e	32 20	
	Z	M	34.9	
7	Z	eiPn	08 43 38	mPn(HLW)=4.16
7	Z	ePn	12 14 40	M(HLW) =4.05 mPg(HLW)=4.0
7	Z	ePn	13 09 32	M(HLW) =3.64
7	Z	ePN	13 29 02	M(HLW) =3.89 mPg(HLW)=3.91
7	Z	ePn	15 22 55	M(HLW) =3.68
7	Z	ePn	17 53 30	M(HLW) =3.74
7	Z	ePn	18 56 30	M(HLW) =3.8
7	Z	ePn	20 35 31	M(HLW) =3.89
7	Z	ePn	20 46 09	M(HLW) =3.78
8	Z	ePn	00 06 54	M(HLW) =3.66
8	Z	ePn	00 09 11	mPg(HLW)=3.8
8	Z	ePn	02 04 57	M(HLW) =3.73

8	Z	ePn	02 06 57	M(HLW) =4.14
	N	eSn	07 35	
8	Z	eP	02 20 33.5	C
	N	eS	28 00	
	E	e	14	
8	Z	ePn	06 12 23	M(HLW) =3.88
	N	eSn	13 25	
8	Z	ePn	06 18 24	M(HLW) =3.84
	N	eSn	19 08	mPg(HLW)=3.91
8	Z	ePn	06 36 44	M(HLW) =3.79
	N	eSn	37 30	
8	Z	ePn	09 28 20	M(HLW) =3.82
8	Z	iPn	10 32 43	348 D, M(HLW)=5.11
	NE	iSn	33 21	M <sub>t</sub> (HLW) =5.4
8	Z	ePn	14 18 11	M(HLW) =4.04
8	Z	ePn	14 48 11	
	NE	eSn	50 02	
8	Z	ePn	20 01 33.5	M(HLW) =3.54
8	Z	eePn	20 15 16	M(HLW) =3.47
	NE	eSn	16 01	
8	Z	ePn	21 35 29	M(HLW) =3.98
	NE	eSn	36 21	
8	Z	ePn	23 22 52.5	M(HLW) =3.53
	NE	eSn	23 35	
9	Z	ePn	00 01 16	M(HLW) =3.84
	NE	eSn	02 00	mPg(HLW)=3.91
9	Z	ePn	05 44 54	M(HLW) =4.35
	NE	eSn	45 32.5	mPn(HLW)=4.23
9	Z	ePn	17 12 19	M(HLW) =3.68
	NE	iSn	13 02	



9	Z	ePn	22 43 00	M(HLW) =3.86
	NE	iSn	41	
10	Z	ePn	00 48 33	M(HLW) =4.01
	NE	iSn	49 20	
10	Z	ePn	00 56 15	M(HLW) =3.97
	NE	iSn	57 00	
10	Z	ePn	21 56 02	M(HLW) =4.26
	NE	iSn	56	mPn(HLW)=4.16
11	Z	eiPn	02 37 59	M(HLW) =3.9
	NE	eSn	38 34	
11	Z	iePn	14 39 50	C,M(HLW)=4.01
	NE	eSn	45	
11	Z	iPg	15 49 38	Blast
11	Z	iPn	16 29 37	C,M(HLW)=3.86
	NE	eSn	30 18	
11	Z	ePn	17 45 52	M(HLW) =3.7
12	Z	eiPn	09 28 24	C,M(HLW)=3.64
12	Z	ePn	11 41 31	M(HLW) =3.57
	NE2	eSn	42 12	
12	Z	ePn	18 35 42	M(HLW) =3.52
12	Z	ePn	19 17 00	M(HLW) =4.08
12	Z	ePn	23 34 25	M(HLW) =3.7
13	Z	ePn	03 46 40	M(HLW) =3.61
	NE	eSn	47 19	
13	Z	ePn	04 17 30	M(HLW) =3.99
13	Z	ePn	04 55 44	M(HLW) =3.94
				mPn(HLW)=3.91



14	Z	ePn	22 24 41	M(HLW) =4.06
	NE	eSn	25 21	
15	Z	ePn	01 06 37	M(HLW) =4.01 mPn(HLW)=4.08
15	Z	ePn	04 40 09	M(HLW) =3.86 mPg(HLW)=3.91
15	Z	ePn	09 52 10	M(HLW) =3.57
	E	iSn	49	
15	Z	ePn	11 16 02	M(HLW) =3.86
	E	iSn	39	
15	Z	eP	17 43 38	
	NE	iS	54 00	
	Z	M	18 22.0	
15	Z	ePn	18 23 21	M(HLW) =3.88
15	Z	iP	22 26 30	D
	Z	e	27 03	
	Z	e	13	
15	Z	ePn	23 18 48	M(HLW) =3.98
16	Z	e(P)	01 42 44	
	Z	e	43 50	
	Z	e	45 00	
	N	eS	50 32	
	M		02 22.0	
16	Z	iPn	02 08 41	C
	N	iSn	09 50	
16	Z	iPn	04 55 39	D
	N	iSn	56 48	
16	Z	iPn	05 11 13	C
	NE	iSn	12 12	
16	Z	ePn	08 07 45	M(HLW) =4.2
	N	eSn	08 19	mPg(HLW)=4.06

16	Z	iPn	08 13 44.8		
	N	eSn	14 30	356	C,M(HLW)=5.04 mPn(HLW)=4.92 mPg(HLW)=4.97
16	Z	ePn	08 33 11		M(HLW) =3.86
16	Z	ePn	08 39 27		M(HLW) =3.92
	E	eSn	40 10		
16	Z	iPg	09 59 37		Blast
16	Z	iPn	12 34 42		C,M(HLW)=4.2 mPn(HLW)=4.02
16	Z	ePn	17 34 23		M(HLW) =3.84
	E	eSn	35 00		mPg(HLW)=3.91
16	Z	ePn	21 02 27		M(HLW) =3.8
	E	eSn	03 10		mPn(HLW)=3.91
16	Z	iPn	22 57 06	677	D,M(HLW)=5.15 mPg(HLW)=5.25 mP <sup>+</sup> (HLW) =5.3
	N	eSn	58 16		
16	Z	iPn	23 22 33	688	C,M(HLW)= 5.3 mPg(HLW)=5.33 mP <sup>+</sup> (HLW) =5.2
	N	e	23 38		
16	Z	eePn	23 37 12		
	N	eSn	38 21		
17	Z	iPn	00 56 05		D
	N	eSn	57 17		
17	Z	iPn	05 29 40		D
	E	eSn	30 50		
17	Z	ePn	08 01 54		M(HLW) =4.8
17	Z	iPn	12 40 06		D
	NE	iSn	41 15		
17	Z	M	15 54.3		
18	z	ePn	07 21 13		M(HLW) =3.84

18	Z	ePn	07 21 13	M(HLW) =3.84
18	Z	ePn	07 32 02	M(HLW) =3.78
18	Z	iPn	07 44 53	D,M(HLW)=3.8
	N	iSn	45 35	mPn(HLW)=3.91
18	Z	ePn	07 59 26	M(HLW) =4.1
	N	iSn	08 00 16	
18	Z	iPg	12 35 47	Blast
18	Z	iPn	16 35 06	D,M(HLW)=3.76
				mPn(HLW)=3.87
18	Z	iPn	21 12 01	D,M(HLW)=3.83
	NE	iSn	37	mPn(HLW)=3.91
18	Z	iPn	23 36 00	D,M(HLW)=4.27
	NE	iSn	48	mPn(HLW)=4.21
19	Z	ePn	01 37 48	M(HLW) =3.62
19	Z	iP	08 57 24	C
	NE	iS	09 07 01	
	Z	M	28.0	
19	Z	ePn	13 37 30	M(HLW) =3.77
	E	iSn	38 10	
19	Z	ePn	13 42 29	M(HLW) =3.64
19	Z	iPn	16 14 40	C,M(HLW)=4.2
	N	iSn	15 30	mPn(HLW)=4.12
19	Z	eP	16 29 09	
19	E	M	19 53.0	
20	Z	iPn	04 13 40.5	D,M(HLW)=3.68
20	Z	eePn	06 30 15	M(HLW) =3.70
20	Z	ePn	08 09 16	M(HLW) =3.72
	E	iSn	58	



20	Z	ePn	12 41 52	M(HLW)=3.87
	E	eSn	42 35	mPg(HLW)=3.93
20	Z	eePn	17 38 44	M(HLW) =3.53
21	Z	M	03 18.0	
21	Z	iP	07 31 47	C
	Z	e	34 22	
	NE	i	38 40	
	NE	i	42 04	
	Z	M	08 41.5	
21	Z	iPn	17 37 45	C
	N	eSn	38 51.5	
21	Z	iP	20 39 16	D
	N	M	48.8	
21	Z	iPn	20 59 21	C
	N	eSn	21 00 35	
21	Z	eePn	21 29 55	
	E	eSn	30 31	
22	Z	iPn	00 57 31	D
	N	eSn	58 26	
22	Z	iPn	04 48 48	C
	N	eSn	49 57	
22	Z	M	06 00.0	
22	Z	eP	06 51 50	
	Z	e	52 00	
22	Z	iPn	06 53 48	C, M(HLW)=3.97
	N	iSn	54 41	mPn(HLW)=4.0
22	Z	M	07 50.0	
22	Z	iP	08 24 00	C
22	Z	iPn	10 42 24	D
	E	iSn	43 40	
22	Z	iPg	11 37 39	Blast

22	Z	ePn	22 16 34		M(HLW) = 3.80
	E	eSn	17 14		
22	Z	iP	22 40 48		D, MB=5.7
	N	iS	45 50		
	Z	M	51.50		
23	Z	iPn	08 35 57		D
	E	eSn	36 17		
23	Z	iPg	09 59 30		Blast
23	Z	iP	11 53 40		D
23	Z	iPn	13 38 10	356	D, M(HLW)=4.94
	N	iSn	51		mPn(HLW)=4.92
					mPg(HLW)=5.05
					mP <sup>+</sup> (HLW) = 5.0
					M <sub>t</sub> (HLW) = 5.08
23	Z	ePn	15 01 02		M(HLW)=3.63
	NE	eSn	40		
23	Z	ePn	21 21 48		M(HLW) = 3.80
	N	iSn	23 08		
24	Z	eSn	01 00 25		D, MB=5.7
	E	iSn	01 11		
24	Z	ePn	03 20 04		M(HLW) = 3.58
	N	iSn	40		
24	Z	iPn	13 44 33.5		D, M(HLW)=3.76
	NE	iSn	45 12		
24	Z	iPn	14 20 07		D
24	Z	iPn	14 47 28	356	D, M(HLW)=4.94
	NE	iSn	48 40		mPn(HLW)=4.92
					mPg(HLW)=5.05
24	Z	iPn	19 21 53		D, M(HLW)=3.87
	N	iSn	22 37		M <sub>t</sub> (HLW) = 5.08
24	Z	ePn	20 20 08		M(HLW) = 4.03
24	Z	ePn	22 21 04		M(HLW) = 3.84
	Z				M(HLW) = 3.80

25	Z	ePn	23 35 12		
	E	eSn	54	M(HLW) =3.79	
26	Z	eeP	06 17 40		
	Z	i	18 40		
	E	i	28 08		
	E	e	20		
	Z	M	07 00.0		
26	Z	ePn	08 27 00		
	NE	eSn	28 20		
27	Z	ePn	01 28 01	M(HLW) =3.84 mPg(HLW)=3.91	
27	Z	ePn	01 43 00		
	NE	eSn	35		
27	Z	ePn	05 12 37		
	NE	eSn	L3 09	M(HLW) =3.69	
27	Z	ePn	10 07 14	M(HLW) =3.74	
27	Z	ePn	11 00 11.5		
	N	iSn	01 30		
27	Z	eP	13 25 52		
	N	e	33		
	Z	M	53		
27	Z	e	20 07 20		
28	Z	eP	07 44 54		
	N	e	46 52		
28	Z	iPg	12 34 23	Blast	
28	Z	iPg	12 59 50.5	Blast	
28	Z	iPg	13 23 08.5	Blast	
28	Z	ePn	15 41 29		
	E	eSn	42 15		
29	Z	Z	iPn	04 41 46	
	N	eSn	44 57		
	Z	M	50.0	1946 D, M(HLW)=5.59	



29	Z	ePn	08 09 39	
	NE	eSn	10 32	
29	Z	ePn	08 33 09	M(HLW) =3.95
	N	eSn	49	
29	Z	ee	20 11 32	
	N	e	12 02	
	Z	e	13 30	
29	Z	eP	21 30 56	
29	Z	M	22 15.5	
30	Z	ePn	01 15 07	M(HLW) =3.89
	NE	eSn	54	
30	Z	ePg	10 39 49.5	Blast
30	Z	eePn	14 01 37	M(HLW) =3.9
	N	eSn	02 12	
30	Z	ePn	17 36 30	M(HLW) =3.84
	N	eSn	37 24	mPn(HLW)=3.87
30	Z	iPn	20 22 50.5	1065 C,M(HLW)=5.34
	E	iSn	24 34	mPg(HLW)=5.17
				mP+(HLW) =5.19

May

1	Z	eeP	03 04 48
	Z	e	05 39
	N	e	27
1	Z	eP	03 32 15.5
	Z	M	04 10.5
1	Z	eePn	13 27 15.5
	N	eSn	28 27
1	Z	ePn	16 09 12
	NE	eSn	10 08
1	Z	ePn	16 23 26.5
	N	eSn	24 20
1	Z	iPn	18 03 44
	NE	eSn	04 51
1	Z	iP	19 24 51
	Z	i	25 10
	Z	i	26 22
	E	i	35 18
1	Z	iP	19 28 45
	Z	i	30 00
	E	i	36 50
	E	i	39 02
1	Z	iPn	20 23 22
	NE	iSn	24 21
2	Z	ePn	01 14 00
	N	eSn	15 12
2	N	eSn	09 44 00
2	Z	ePn	18 39 45
	NE	eSn	40 51.5
3	Z	ePn	03 27 00
	NE	eSn	28 11

5	Z	ePg	09 01 42
	N	e5g	45
5	Z	eePn	13 02 59
	NE	eSn	04 23
5	NE	eSn	14 01 15
5	Z	e(Sn)	14 21 19
	N	e(Sn)	22 54
5	Z	eP	14 22 00
	N	e	23 08
	Z	M	15 19.5
5	E	e(Sn)	15 15 30
5	EN	eSn	16 29 26
5	EN	e	18 32 20
6	NE	eSn	12 36 53
6	Z	iPn	12 41 52.5
	NE	eSn	42 35
6	NE	eSn	13 16 48
6	Z	ePn	16 41 42
	NE	eSn	42 35
6	Z	ePn	17 23 26
	NE	eSn	24 11
6	Z	e	18 43 40
6	Z	eSn	20 16 22
6	Z	iPn	22 20 49
	NE	iSn	31 58
7	N	eSn	00 50 13
7	N	eSn	01 38 13

Blast

C

D



7 N eSn 03 08 08  
 7 N eSn 05 44 04  
 7 Z iP 09 05 23  
 7 N eSn 13 20 06  
 7 N eSn 16 32 19  
 7 N eSn 20 42 25  
 7 Z ee(P)23 29 09  
 N eSn 45  
 8 Z iPg 11 18 23  
 8 N eSn 19 07 43  
 8 Z eePn 23 39 19  
 N eSn 40 10  
 9 N eSn 01 40 08  
 9 N eSn 05 17 26  
 9 N eSn 05 14 52  
 9 N eSn 13 55 00  
 10 NE eSn 09 17 10  
 10 Z iPn 09 28 46.5  
 EN iSn 29 20  
 10 Z e(Pn) 09 40 49  
 N eSn 41 34  
 10 N eSn 11 00 36  
 10 N eSn 11 12 36  
 10 N iPg 11 22 04  
 10 N eSn 16 32 47

Blask

378 M(HLW) =5.0  
 mPn(HLW)=4.9  
 mPg(HLW)=4.7  
 mP+(HLW)=4.7  
 M<sub>t</sub>(HLW) =5.03

Blast

11	Z	iPn	20	19	10
	NE	eSn	20	10	
11	2	ePn	21	41	52.5
	NE	eSn	42	41.5	
12	N	eSn	00	44	09
12	N	eSn	02	09	19
12	Z	ePn	04	24	48
	NE	eSn	25	47	
12	N	eSn	06	00	18.5
12	Z	eePn	10	40	45
	NE	eSn	41	34	
12	NE	eSn	19	21	28
13	Z	eePn	01	27	52
	NE	eSn	28	49	
13	NE	eeSn	01	38	54
13	Z	ePg	09	10	48
13	N	eSn	14	34	40
13	Z	eP	14	31	10
	Z	ePP	35	28	
	Z	ePPP	38	38	
	EN	isks	42	20	
	E	i(s)	44	50	
	E	pt	46	10	
	Z	M	15	20	
13	ZNE	eSn	17	50	19
13	NE	eSn	17	56	46
13	NE	eSn	18	28	00
14	NE	eSn	00	31	59

Blast

13	Z	e(P)	07 48 34
	N	eSn	49 29
14	Z	e	08 10 35
14	Z	ePn	08 14 11
	NE	eSn	15 20
14	Z	ePn	10 06 46
	E	iPn	10 06 46
	E	iSn	07 54
	Z	M	10.5
14	Z	ePn	11 01 07
	N	eSn	50
19	E	eSn	12 11 32
14	Z	eePn	14 49 10
	E	eSn	50 4.5
14	Z	e(P)	16 23 29
		eSn	24 8.5
14	Z	iP	19 46 14.5
	Z	e	47 54
	Z	e(PP)	49 22
	Z	i(PPP)	50 05
	E	i	53 12
	E	i	55 26
	E	iSn	56 54
14	Z	iPn	23 59 52
15	EN	eSn	00 02 37
15	Z	iPg	09 00 43.5
15	NE	eSn	11 49 58
15	Z	iPn	12 07 25.5
	NE	iSn	08 35

D

C

Blast



15	NE	iSn	12 44 43
15	N	eSn	13 06 22
15	Z	ePn	13 56 43
	N	iSn	57 51
15	Z	iPg	14 32 33.5
	N	iSg	35
15	Z	e(Pn)	18 35 12
	N	eSn	58
15	Z	ee(Pn)	18 25 15.5
	N	eSn	59
15	Z	eP	20 56 03
	Z	e	12
	Z	e	58 08
	Z	ePPP	59 22
	E	iS	21 06 20
	E	i	06 36
	Z	M	33.5
16	Z	ePn	05 11 16
	N	iSn	12 44
16	Z	eP	07 23 21
	Z	e	33
	Z	e	07 20 20
	E	e	32 50
16	Z	ePn	07 29 50
	E	eSn	01 59
6	Z	M	08 27 5
16	Z	eePn	09 21 40
	N	eSn	22 28

16	N	iSn	15 31 00
17	N	eSn	04 52 54
17	ZN	eSn	05 59 50
17	NE	eSn	11 09 15
17	N	eSn	17 44 26
17	Z	ePn	19 51 28.5
	NE	eSn	52 23
17	Z	ePn	19 57 52
	NE	eSn	59 10
18	Z	eP	08 57 07
	N	eS	09 07 36
	N	e	08 00
18	N	eSn	09 21 51
19	N	eSn	13 39 24.5
19	Z	ePn	17 18 35
	N	eSn	19 43
19	Z	ePn	18 16 28
	N	eSn	18 06
20	NE	eSn	10 57 29
20	NE	eSn	11 34 55
20	NE	eSn	18 30 10
21	NE	eSn	02 40 50
21	Z	iP	03 09 40
	Z	e	50
	Z	e	10 48
	N	iS	20 20
	NE	i	30

C

21	Z	ePn	15 53 21
	N	eSn	54 04
21	N	eSn	21 21 31
22	N	eSn	00 03 05
22	N	eSn	11 19 34
22	Z	ee(P)	19 59 59
	NE	eSn	20 01 10
23	N	eSn	00 01 14
23	E	ePn	07 46 36
	N	eSn	47 37
23	Z	ePn	11 06 21
	N	eSn	07 24
24	Z	ePn	06 00 01
	N	eSn	58
24	Z	ePn	11 51 08
24	Z	eBn	52 43
25	Z	iePn	11 33 27.5
	NE	iSn	34 20
25	NE	eSn	15 47 12
25	NE	eSn	19 33 16
26	Z	iPn	04 22 26
	NE	iSn	23 21
26	E	eS	08 24 45
26	Z	iPg	09 01 51
26	Z	eP	15 50 08

Felt

D.M(HIW)=5.0

~~2.6~~ mPn(HIW)=4.9

mPg(HIW)=4.8

mP<sup>+</sup>(HIW)=4.9

D

Blast



26	Z	iP	15 50 08	
	Z	e	51 06	C
	E	esKs	16 00 30	
	E	i(5)	01 00	
	Z	M	32.5	
26	Z	ePn	18 52 21.5	
	NE	eSn	53 20	
26	EM	eSn	22 50 00	
27	NE	eSn	04 56 36	
27	NE	eSn	05 03 45	
27	Z	ePg	12 31 35	
	E	eSg	06.5	Blast
27	Z	M	13 16.5	
28	Z	iPn	01 59 33	
	N	iSn	00 24	C
28	Z	e(PKP)	13 24 32	
	Z	e	35 22	
	ZE	e	27 41	
29	Z	eePn	12 44 37	
	N	eSn	45 12	
29	N	eSn	14 42 48	
29	N	eSn	16 15 05	
29	N	eSn	22 57 10	
30	Z	ePn	00 44 49	
	NE	eSn	25 26	
30	Z	ePh	04 43 05	
	NE	eSn	44 06	

30	N	eSn	05 04 08
30	NE	eSn	10 01 10
30	Z	ePn	11 09 32
	NE	iSn	36
30	Z	e	11 36 48
30	Z	eP	18 15 26
	Z	e	16 04
	Z	e	17 42
	E	e	26 20
30	N	eSn	16 36 25
30	Z	iP	16 42 38
	Z	e	43 20
	Z	e	46 22
	E	i	53 30
	E	i	54 16
31	Z	ePn	00 35 00
	N	eSn	43
31	Z	eP	22 44 24
	E	e	55 18
31	Z	eP	22 48 11
	E	e	58 38
1-6	Z	M	00 27.5

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1	Z	iPg	10 20 38
	N	ePg	41
1	E	eSn	16 36 18
1	Z	e	20 13 12

1	NE	eSn	20 39 25
1	NE	eSn	21 08 17
2	Z	ePn	22 43 52
	NE	eSn	44 38
2	Z	e	10 04 40
	N	e	11 36
	N	i	12 04
3	N	eSn	08 44 06.5
3	N	eSn	18 04 15
4	N	eSn	02 32 03
4	Z	eP	05 31 38
	Z	e	32 10
	Z	e	57
	N	e	34 10
4	Z	g	08 59 29.5
4	Z	eSn	11 11 47
	N	eSn	12 36
4	N	eSn	12 46 04
4	N	eSn	14 11 09
4	Z	eSn	15 28 37
4	Z	N	16 40.5
5	Z	ePn	02 25 37
	N	eSn	26 39
5	Z	iP	10 56 28
	Z	e	34
5	Z	e	11 4.5

C, 131.5



5	Z	eP	20 51 08	
	Z	e	24	
	E	e(S)	21 01 10	
	Z	M	19.5	
5	N	eSn	21 50 44	
5	N	eSn	22 07 38	
5	N	eSn	23 57 11	
6	Z	iPn	09 40 50.5	C
	NE	eSn	41 27	
6	Z	ee(P)	21 15 48	
	N	eSn	16 40	
7	N	eSn	01 59 12	
7	Z	iP	10 57 30	Blast
7	Z	iPg	11 34 41.5	C
	N	iSg	46	
7	Z	ePn	15 34 02	
	N	eSn	36 12	
7	Z	e	23 00 40.5	
	E	e	01 05	
8	Z	iP	15 02 07	C
8	Z	ePn	11 03 13	
	E	eSn	51	
8	Z	iPn	20 35 44	
	E	eSn	36 34.5	
09	Z	iPg	09 00 37	Blast
09	Z	e(P)	22 12 55	
10	NE	e	10 54 35	

10	E	e	13 41 14
10	Z	eP	15 55 40
	EN	eS	56 24
10	Z	iP	23 37 13
11	Z	e	07 00 25
11	N	e	11 37 17
11	Z	eP	19 21 56
	N	eS	22 38
12	Z	iP	15 15 12
	E	iS	16 34
12	Z	M	21 26.5
12	Z	ePn	17 59 07
	N	eSn	18 00 19
12	Z	e	18 02 08
13	Z	ePn	01 24 55
	N	eSn	26 08
13	Z	ePn	07 31 06
	NE	eSn	32 05
13	Z	iP	09 01 09
	Z	epP	18
	Z	e	02 11
	Z	epp	04 38
	Z	e	05 44
	NE	esKs	11 28
	NE	iS	11 38
	Z	M	36.5
13	N	e	10 31 40
13	NE	eSn	10 34 36

800  
 M...

13	Z	M	11 10.5
13	NE	eSn	12 58 09
13	Z	ePn	16 55 43
	N	eSn	56 31
13	N	eSn	18 10 10
13	N	eSn	19 16 45
13	NE	eSn	21 32 10
13	NE	eSn	21 37 21
13	Z	e(P)	22 51 50
	NE	eSn	52 38
14	Z	ePn	00 50 24
	N	eSn	51 11
	NE	iSn	02 17
14	NE	eSn	01 43 48
14	Z	iP	03 41 56
	Z	i	42 06
14	Z	iP	03 41 56
	Z	i	42 06
14	Z	iP	03 43 50
	N	e	04 01 08
14	Z	iP	12 29 44
14	Z	ePn	13 59 09
	NE	iSn	50 32
14	Z	ePn	14 34 38
	NE	eSn	35 52
14	NE	eSn	16 18 31
14	Z	ePn	16 26 50
	N	eSn	27 42

D

C

Blas

796, H/W: 5.0  
m Pn: 5.1  
m Pg: 4.9



14	Z	ePn	18 46 18
	NE	eSn	47 04
14	NE	eSn	19 55 41
14	NE	eSn	21 45 53
15	Z	iP	06 00 23.5
	NE	iSn	01 37
15	NE	eSn	09 01 19
15	Z	iPn	15 25 05
	N	eSn	59
15	Z	M	17 40.0
15	N	eSn	17 43 11
15	N	eSn	18 51 53
15	Z	e	23 22 22
	Z	e	23 12
	Z	e	25 20
16	Z	eP	16 09 13
	N	e(g)	11 25
16	Z	ePn	<del>23 09 23</del>
	Z	e	31
	N	e(Sn)	21 14
17	N	eSn	00 03 14
17	NE	e(S)	03 26 12
17	Z	ePg	09 00 48
17	Z	cP	19 34 50
		e	40 28
			41 00
		e	44 40
		e	45 08
	N	ES	18 50 05
			51 40

C

17	Z	ip	23 28 47
18	Z	eP	00 17 34
		e	20 08
		e	21 06
18	NE	e(S)	19 54 29
18	Z	iPn	22 56 42
	N	iSn	57 34
18	Z	iP	32 57 40
			01 30
	N	i(S)	08 18
		i	32
k9	Z	iPn	05 57 30
	N	iSn	06 00 18
19	Z	iP	06 54 16
	NE	eS	55 30
19	Z	iP	13 55 37
		e	42
		e	47
17	Z	eP	19 09 24
20	Z	eP	02 09 10
	N	eS	23
20	Z	iP	15 50 20.5
20	Z	e	17 37 21
21	Z	M	07 39 09
21	Z	i	15 23 38
21	Z	iP	16 40 00
	NE	iS	44 14
21	NE	eSn	20 21 21

C

22	Z	eP	01 41 10
	N	e	47 24
	N	e	50 52
	Z	M	02 25
22	Z	eP	02446 42
	Z	e	47 18
	Z	e	50 14
	NE	i(S)	57 34
	Z	N	40.5
22	N	eSn	03 30 23
22	Z	iP	10 58 40
	Z	e	59 52
	E	i(S)	09 28
	E	i	11 28
22	E	eSn	14 41 29
22	E	eSn	15 11 38
22	E	eSn	17 11 50.5
23	Z	e(P)	13 39 32
	N	eSn	40 24
23	N	eSn	14 38 45.5
23	Z	ePn	17 34 06
	N	eSn	35 16
24	Z	eP	11 10 45
	EN	e	21 30
25	Z	e(P)	00 21 24
	N	e(sKs)	31 36
	Z	M	01 2.5
25	Z	ePn	06 13 31
	N	eSn	14 45



25 Z eP 07 35 48  
 N eS 44 10  
 Z M 08 04.5  
 25 NE eSn 17 24 46  
 25 NE eSn 20 47 57  
 25 BE eSn 21 30 24  
 26 Z ePn 14 05 14  
 NE eSn 06 48  
 27 Z iP 02 28 09  
 E e 40  
 E e 39 06  
 27 Z eFn 03 34 38  
 NE eSn 35 24  
 27 Z e 10 37 38  
 27 NE eSn 10 38 56  
 27 NE eSn 20 24 14  
 27 NE eSn 23 07 39  
 28 Z eFn 07 52 15  
 NE eSn 53 04  
 28 Z E 22 57 00  
 28 N e 23 41 03  
 29 Z eP 05 38 33  
 N eS 31 04  
 29 E ES 08 26 23  
 29 Z eP 09 59 57  
 29 Z ePg 11 06 05  
 N eSg 10 07 07  
 27 BE 10 34 24  
 27 BE 10 34 24

29 N e 15 28 30  
 26 N e 16 48 40  
 29 Z M 18 38 20  
 29 N e 20 30 55

July, 1969

1 E e(S) 07 28 30  
 1 Z ePn 16 51 13  
 NE iSn 44  
 1 Z ePn 18 02 40  
 N e(Sn) 25  
 2 Z eePn 03 38 40  
 E eSn 25  
 2 Z iPg 09 00 53  
 2 Z ePn 12 57 03  
 N eSn 40  
 3 Z ePn 10 08 20  
 N eSn 50  
 3 N e 13 01 05  
 3 Z ePn 19 26 05  
 N eSn 34  
 4 E eS 02 50 39  
 4 Z ePn 06 13 07  
 E eSn 43  
 4 Z M 07 37  
 4 Z iPn 10 15 23  
 N iSn 16 33

Lyrah Elast

4 Z iPg 10 36 20  
 N eSg 22  
 4 N e(Sn)20 01 21  
 5 Z M 00 05  
 5 Z N 06 01.5  
 5 Z eePn 19 51 32  
 NE iSn 52 11  
 6 Z eePn 19 59 47  
 NE eSn 20 00 19  
 6 N eSn 20 57 21  
 7 N e Sn 01 30 50  
 7 Z ePn 15 32 24.5  
 NE iSn 33 20  
 8 Z e(Sn)01 26 12  
 8 Z eeP 01 59 47  
 NE eSn 02 00 20  
 8 Z iP 08 12 03  
 NE iS 14 10 10  
 Z M 19 00  
 8 Z ePg 09 01 11  
 8 Z iPn 21 27 28  
 e 45  
 e 50  
 NE iSn 28 15  
 09 Z iPg 10 09 59  
 10 E e(Sn)05 44 40  
 10 E e(Sn)15 50 57

V. weak

1300 G; M(HLW)=5.65

Elast

Comp



10 Z iPg 23 43 21  
 NE eBg 32  
 11 Z ePn 01 40 54  
 N eSn 48 05  
 11 Z eePn 02 52 30  
 NE eSn 53 10  
 11 N eeSn 15 12 50  
 12 Z iP 13 13 28  
 NE iS 23 56  
 Z M 38.0  
 12 Z iP 19 29 14  
 ZN i 32 36  
 NE iS 39 39  
 E i 54  
 Z M 19 54.0  
 14 NE iSg 06 02 28.5  
 14 Z iPg 09 01 33.8  
 NE iSg 36  
 15 Z eP 16 47 19  
 Z e 49 40  
 16 Z eP 05 32 18  
 NE i 40 10  
 NE i 46 32  
 16 Z iP 08 29 29  
 Z i 54  
 Z ePP 33 10  
 NE iSks 39 49  
 NE iS 40 19  
 Z M 09 6.5

C

C

V. weak

16	Z	iPg	10	16	49	
	N	eSg		17	3.5	D
16	Z	eaP)	18	47	54	
	NE	eS		48	47	
17	NE	eSn	13	59	56	
17	NE	eSn	14	07	11	
18	Z	eP	05	36	03	
	EN	iS		45	18	C
	EN	eSks			54	
18	Z	ePn	11	39	47	
	NE	eSn		40	35	
18	NE	eSn	21	05	45	
19	Z	iP	05	13	55.5	D
	Z	e		25	12	
	E	e		21	00	
	E	e			24	
19	Z	e	05	30	27	
	Z	M	06	58	30	
19	Z	ePg	11	15	27	
	N	eSg			30.5	
19	Z	iPg	11	15	27	
	NE	eSg			30.5	C
19	Z	iPn	13	51	57	
	NE	eSn		52	25	C
19	Z	ePg	13	67	09	
	NE	eSg			13	
20	Z	M	11	25.5		
20	Z	iPn	15	54	45	
	NE	iSn		56	51	D

20	N	eSn	22 28 41
20	Z	e	22 42 30
21	Z	Pn	01 57 29.5
	N	iSn	57 54.5
21	N	eSn	02 55 09
21	N	eSn	05 32 24
23	N	e(Sn)	10 12 40
23	Z	e	13 27 14
23	Z	iPg	16 31 43
	N	eS <sub>g</sub>	54
23	Z	eP	30
		e	44
		PKP	20 44
	E	(SKS)1	28 00
	Z	M	04 04 00
24	Z	eP	12 53 24
	Z	e	54 10
		e	24
	E	(S)	13 03 00
	Z	M	13 25 00
24	Z	ePn	23 22 56
	E	eSn	23 09
24	Z	ePn	23 35 36
	E	eSn	36 48
25	Z	e	06 22 04
	Z	e	24 12
	Z	e	26 12
	N	e	29 40
	N	e	30 24

D



25	Z	M	13.46.5
25	Z	iP	23 01 03
	Z	PP	05 15
	E	SKS	10 24
	Z	M	38 00
26	Z	iPn	01 48 05
		eSn	42
26	Z	iPg	11 40 <sup>0</sup> 18
		eSg	05
26	E	e	15 34 51
26	Z	M	18 13.5
26	E	eSn	21 13 09
27	Z	iPg	10 27 12.8
	N	iSg	20
27	Z	iPn	17 19 19
	E	iSn	20 26
28	Z	iPn	04 40 30
	E	iSn	50
			31
28	Z	iPg	09 00 05
	N	eSg	08
28	Z	ePn	18 30 56
	N	eSn	31 48
30	Z	iPn	23 23 08
	NE	eSn	58
31	Z	eePn	04 05 12
	NE	iSn	06 27
31	Z	M	12 12.5

August, 1969

1 Z iP 23 56 29  
 E iPP 57 28  
 2 NE iSk 00 07 13  
 NE eS 43  
 Z M 42.8  
 2~~8~~ NE eSn 05 10 39  
 3 Z e 00 41 16  
 Z e 42 40  
 E e 49 34  
 Z M 01 32.5  
 3 Z iPn 02 10 47  
 NE eSn 11 41  
 3 Z iPn 23 51 59  
 eSn 52 56  
 4 N e(Sn)04 13 51  
 4 Z eeP 17 31 53  
 e 33 34  
 e 35 50  
 e 38 06  
 EN eS 41 42  
 i 42 22  
 4 Z M 23 00 00  
 5 Z iP 02 26 24  
 31  
 i 27 10  
 NZ i 30 30  
 E eS 37 10  
 N eS 38 00

C

C

346 Mt(HLW) =4.71  
 D,M(HLW)=4.59  
 mPn(HLW)=4.47  
 mPg(HLW)=4.51  
 mP(HLW)=4.68

C

5	Z	M	14 3.5
5	Z	eaP	16 50 53
		e	51 13
		i	52 40
		i	53 20
	E	i(sks)	16 59 54
		iS	17 02 34
	Z	M	17 40.5
6	Z	iPg	10 19 6.5
		Sg	7.5
6	Z	eP	15 53 14
		e	54 07
		e	55 50
		M	16 24 00
6	Z	iP	22 41 56
7	Z	iPg	09 00 18.5
7	Z	iPn	22 41 41
	EN	Sn	42 34.5
8	Z	iP	06 37 19
	N	e	42 26
8	Z	eP	11 21 05
		ePP	24 16
		e	25 16
	N	eSks	31 16
	Z	U	58
8	Z	M	17 20.7
8	Z	Pn	18 56 03
	N	Sn	46
5			20 37 40



8 Z eP 20 57 48  
 e 58 30  
 e 21 02 18  
 E e 08 06  
 Z M 44  
 09 Z iPg 10 38 39.5  
 NE iSg 42.5  
 09 Z eePn 12 14 58  
 E eSn 15 51  
 09 E iPn 13 29 18.5  
 NE eibn 30 01.5  
 09 Z eePn 16 35 29  
 NE eSn 36 09  
 11 Z iP 21 39 19  
 E eS 50 16  
 E i  
 11 Z iPn 21 40 16  
 11 Z eP 23 15 38  
 12 Z eP 00 06 11  
 12 Z eP 03 46 22  
 12 Z iP 05 06 19  
 12 Z iP 03 16 11  
 NE ibks 26 14  
 E eS 36  
 12 Z eiP 06 06 27  
 12 Z iPg 09 01 24  
 12 Z iP 17 34 07  
 NE iSks 44 30  
 NE ib 52

C

333 D M(HLW) =4.66  
 mPn(HLW)=4.79  
 mPg(HLW)=4.72  
 Mt(HLW) =4.93

C

C

13 Z iP 08 44 12  
 Z iPP 30  
 N iSKS 54 44  
 E iS 55 04  
 Z M 09 27.2  
 13 Z iP 23 09 50  
 Z iPP 10 00  
 E iSKS 20 22  
 E iS 20 36  
 Z M 37.5  
 14 Z M 01 16 00  
 14 Z iP 14 31 45  
 E iSKS 42 11  
 E iS 28  
 15 Z eePn 03 01 05  
 EN eSn 50  
 15 Z iP 04 44 46  
 N i(SKS) 55 11  
 E iS 50  
 15 Z iP 05 54 50  
 Z i 57  
 Z i(PP) 58 46  
 E i(SKS)09 05 00  
 E iS 22  
 16 eiP 15 28 11  
 NE iSKs 38 35  
 N iNS 15 39 00  
 Z M 16 02.5

C

C

C

C

16	Z	ePn	08	57	02	
	EN	eSn			28	
17	Z	eP	20	32	35	
	EN	e	<del>142</del> 32		02	
	N	e			15	
17	Z	eP	20	34	20	
	EN	e		44	11	
	EN	e			40	
18	Z	iP	1	23	48.5	
	N		2	31	30.0	
18	E	eSn	2	01	30.0	
18	E	eSn	2	13	12	
18	Z	iPg	10	21	32	
18	NE	eSn	15	10	26	
18	NE	eSn	15	33	57	
18	Z	ePn	17	11	36	
	NE	eSn		12	56	
18	E	eSn	21	08	42.0	
19	E	eSn	00	48	54.0	
19	Z	iP	09	02	36	
	NE	iSKS		13	12	
	NE	iS			31	
	Z	M	09	46.7		
19	Z	M	18	52.4		
19	NE	eSn	11	<del>59</del> 29.5		
20	Z	iP	8	02	44	
	NE	iSKs		13	00	
	NE	iS			24	



20	Z	iPg	9	00	42
20	Z	iPg	10	04	42
21	Z	ePn	00	05	30
	NE	eSn		06	38
21	NE	eSn	04	44	35
23	EN	eSn	01	53	39
23	EN	eSn	02	15	29
23	NE	eSn	02	22	44
23	NE	eSn	02	30	23
23	NE	eSn	03	50	17
25	Z	iPg	11	17	42
	N	iSg			44.5
25	Z	ePg	16	24	01
	N	iSn			40
25	Z	iPn	18	10	26
	E	iSn		11	07
25	Z	M	22	30.0	
26	Z	e	16	43	04
26	Z	iP	17	16	47
	Z	M	18	5.5	
26	Z	iPg	09	01	09
	E	eSg			12.5
27	Z	iPg	09	31	5.5
	E	eSg			12
28	Z	eP	04	05	49
	Z	e		07	08
	N	e		10	18
	N	M			20.5

28	Z	eP	14 14 26.5
	EN	e	22 14
28	E	M	16 16 36.5
28	Z	e	17 09 58
29	Z	iPg	10 01 40
	N	iSg	42
29	Z	e	10 12 16
	Z	e	13 12
29	N	eSn	10 30 21
30	Z	eP	07 24 22
	NE	e(S)	34 44
	NE	e	35 2
30	Z	eP	08 40 50
	NE	e	51 24
	NE	e	51 40
31	Z	ePn	11 11 38
	EN	eSn	12 15
31	Z	iPg	11 34 36
	N	iSg	39
31	Z	ePn	15 49 03
	NE	eSn	54
Sept.			
1.9	NE	eSn	01 22 39
1.9	Z	M	09 42.5
1.9	Z	ePn	11 44 00
	NE	eSn	41
1	Z	eP	23 19 56
	Z	ePP	20 06
	Z	ePPP	21 18
	E	eb	25 11

2	NE	eSn	05 18 29
2	ZNE	eSn	09 01 11
2	Z	iPg	11 17 39.5
	NE	eSg	47
2	Z	eP	13 35 10
	NE	eS	39 22
	Z	M	45.5
3	Z	iPg	6 10 36
	NE	iSn	11 34
3	Z	ePn	6 20 29
	NE	eSn	22 31
3	NE	eSn	13 59 20
3	Z	e	16 33 04
	NE	e	44 06
2	NE	e	05 18 22
2	NE	eSn	09 01 48
3	NE	eSn	20 44 48
4	Z	iP	03 21 39
	Z	ipP	50
	Z	e	22 08
	Z	ePP	25 06
	8	ePPP	26 52
	NE	isks	32 10
	NE	eS	32
	Z	M	04 05 00
4	NE	eSn	12 19 46
4	Z	ePn	17 20 49.5
	E	eSn	23 12
4	Z	iPn	19 26 48
	N	iSn	28 08



4	Z	iP	21 25 17	
	E	i	35 50	
	E	éSks	36 12	
	Z	M	22 3.5	
5	Z	eePn	04 10 58	
	E	eSn	11 38	
5	Z	iP	11 54 19	C
	NE	e	12 04 20	
	E	e	05 26	
	Z	M	35.5	
5	NE	eSn	20 11 40	
6	NE	eSn	01 17 17.5	
6	Z	eP	07 56 10	
		e	22	
	NE	e(s)	08 06 44	
	N	e	54	
6	Z	eP	14 37 46	
	NE	eS	43 24	
	Z	M	53.5	
6	Z	M	16 4.5	
6	Z	iPn	20 32 24.5	
	N	iSn	33 22	
7	N	eSn	06 38 22	
8	NE	e	10 04 15	
9	Z	eP	05 28 12	
	NE	e(s)	38 40	
	Z	M	06 09	
9	Z	Pg	11 36 53	Blast
	NE	Sg	25	

10	Z	iP	12 16 56
	NE	eS	20 56
12	Z	eP	09 10 25
		e	28
		PP	14 16
	N	(SKs)	<del>21</del> 21 00
	NE	(S)	23 00
	Z	M	57
14	Z	ePg	09 55 09
	E	eSg	11.5
14	Z	ePg	12 37 18
	N	eSg	20
14	Z	eP	14 53 27
			31
			36
	E	(S)	15 03 18
	E	e	09 00
14	Z	iP	16 22 30
		i	24 00
		O	56
		e	28 22
		e	32 50
	Z	M	28.5
15	NE	eSn	11 41 20
15	NE	eSn	12 12 41
15	NE	eSn	12 51 39
15	NE	eSn	14 45 32
16	Z	iPn	00 24 54.5
	N	eSn	25 51

C

16	NE	eSn	11 58 41
16	Z	e	14 48 34.5
17	NE	eSn	13 53 12
17	Z	iP	18 53 12
			24
		e	54 12
	NE	e	19 03 32
	N	e	52
	Z	M	28.5
17	Z	iP	19 03 33
18	Z	ePn	11 08 42
	E	Sn	09 23
18	<del>NE</del>	Pn	15 48 30
	EN	Sn	49 20
20	Z	eP	01 22 08
	ZNE	e	24 08
20	Z	ePn	04 12 39
	NE	eSn	13 19
20	Z	iP	05 18 02
	Z	iPP	20 00
	NE	is	25 24
	Z	M	38.5
20	Z	iPn	23 22 17.0
	EN	iSn	57.0
21	NE	eSn	05 00 02.0
22	Z	iP	01 57 02.5
	EN	is	02 05 51.0
	EN	e	06 33.0
	Z	M	02 27.6

D



22	Z	ePn	08 19 28.5	C
	NE	eSn	20 44.0	
22	Z	eP	13 58 30	C
	NE	eS	14 07 16	
	NE	eSks	08 34	
	Z	M	14 28.0	
22	Z	M	22 41.2	
23	Z	M	02 48.7	
24	Z	iP	04 08 59	C
	Z	iPP	1 11 00	
	NE	iS	15 17	
	NE	e(SSS)	19 00	
	Z	M	32 22	
24	Z	iP	10 16 20.5	
24	Z	iP	18 14 39.5	C
	Z	iPP	17 17.0	
	NE	iS	18 24 02.0	
	Z	M	45.1	
25	Z	iPn	08 00 53.5	
	NE	iSn	01 25.5	
25	Z	iPg	09 00 25.0	Local Blast
26	Z	iPn	00 57 08.5	
	NE	iSn	43.5	
26	Z	iPn	01 40 56	C
	NE	iSn	41 45.5	
26	Z	iPn	02 14 49	D
	NE	iSn	15 53	

26	Z	iPn	04 58 20.5
	NE	iSn	05 01 29.5
	Z	<del>M</del>	<del>07</del> 05.5
26	Z	iPg	19 16 24
	NE	iSg	32.5
27	Z	eSn	08 33 39
27	Z	eP	9 29 32
	NE	eS	33 20
	<del>M</del>	<del>SKs</del>	34
	Z	<del>M</del>	10 1.5
27	NZ	eSn	15 09 42
27	Z	eP	16 59 53
	NE	eS	17 03 33
28	ZNE	eSn	08 45 24
28	Z	iPn	22 40 42
	NE	iSn	42 10
28	NE	eSn	23 11 32
29	NE	eSn	00 39 24
29	NE	eSn	01 09 24
29	NE	eSn	01 43 02
29	NE	eSn	02+00 43
29	Z	iPg	11 44 03
	NE	eSg	08
29	NE	eSn	12 15 28
29	Z	e	18 11 22

D

29 Z iP 20 19 02  
 Z e 24  
 Z e 16 12  
 Z ePPP 17 10  
 NE i 22 40  
 Z M 44.5

29 Z iPn 23 50 46  
 NE iSn 52 11

~~30 Z ePn 02 41 28~~  
 NE eSn 42 41

30 Z e 04 31 18

30 NE eSn 11 30 20

30 Z iP 18 11 43  
 Z e 12 28  
 Z e 15 16  
 Z e 16 28  
 NE e 19 12 30  
 13 08

30 Z M 20 05.0

1.10.69

Oct.  
 1 Z eP 05 24 52  
 N e 01 31 02  
 E e 02 00 00  
 E e 34 16  
 Z M 06 00

1 Z eP 05 27 12  
 E e 36 17  
 E e 58

1 NE eS 15 55 28

C

C



1	Z	iP	17 30 14	
	Z	e	31 28	D
	Z	e	32 36	
	NE	eS	39 46	
	Z	M	18 65	
1	Z	eP	20 36 31	
	NE	e	47 50	
2	Z	iP	22 19 17.5	
				C
2	NE	i(S <sub>N</sub> )	23 26 31	
3	Z	iP	02 04 27	
				D
3	Z	iPn	14 40 19	
		iSn	41 45	D
3	Z	M	16 17.0	
3	Z	M	18 27.0	
5	Z	e	16 47 08	
6	Z	iP	13 00 14.5	
				C
	E	e	10 30	
6	Z	eP	21 54 25	
	E	e	22 10 14	
7	Z	iPn	05 11 29	
	NE	eSn	13 12	
7	Z	e	14 46 25	
	Z	e	47 06	
	Z	e	48 08	
7	Z	ePn	18 51 18	
	NE	eSn	52 28	
8	Z	eP	12 30 00	
				Blast
8	Z	iPg	12 37 52	
	NE	eSg	55	

8	NE	eSn	18 11 45	
9	Z	iPg	12 38 08	
	Z	eSg	12	
10	Z	ePn	02 92 20.5	
	NE	iSn	43 30	
12	Z	ePn	13 37 23	
12	NE	eSn	13 39 38	
12	Z	ePn	22 05 35	
13	Z	iePn	01 05 32	D
		iSn	07 51	
13	Z	iP	07 14 59	
	Z	i(pP)	15 10	
	Z	i	16 10	
	E	iPP	18 10	
	Z	i	21 34	
	NE	iSkS	25 06	
	NE	iS	25 10	
14	Z	iPg	07 08 38	
14	Z	iPg	09 54 45.5	C
14	Z	iPg	10 00 32	
14	Z	iPg	10 21 28	
15	Z	i	00 19 42	
	E	i	30 16	
	E	i	33 50	
17	Z	iP	01 34 42.5	C
	ZNE	i(pP)	35 15	
	N	iS	42 24	
	Z	M	02 01.5	

17	Z	eaPn	05 53 12
	NE	eSn	53
17	NE	eSn	18 52 22
18	Z	e(P)	01 26 26
	Z	e	55
	NE	e	35 38
	E	e	50
18	Z	ePn	02 12 16
	E	eSn	52
19	Z	iPg	09 28 21
19	Z	iePn	10 14 55
	E	iSn	15 45
19	Z	M	20 18.2
20	Z	ePg	12 47 40
	E	eSg	42
20	Z	M	14 15.5
	eeSg	E	25
21	Z	M	11 29 00
21	Z	eeP	21 07 06
	N	eS	19 44
	Z	M	54
22	Z	M	11 29
22	Z	eeP	13 05 07
	N	ees	15 46
22	Z	ePn	20 53 47
	E	eSn	55 00

Blast



22	Z	eeP	23 10 40
	Z	e	13 03
	N	e	20 12
	Z	M	00 1.5
23	Z	ePn	03 37 20
	E	eSn	38 07
24	Z	M	10 27.5 40
24	N	eSn	21 59 23
24	N	eSn	22 15 04
26	Z	iP	06 57 42.5
	NE	iS	07 08 10.0
26	Z	iP	15 41 45.0
	NE	iS	44 37.0
	Z	M	51.7
26	Z	iP	21 51 46
	Z	iPP	57 02
	Z	iPPP	57 13
	NE	iSKS	22 02 13
	NE	i(s)	02 36
	NE	i	03 08
	Z	M	26.4
27	Z	iP	08 15 11.0
	Z	iPPP	15 37.0
	NE	iS	19 14.0
	NE	iSS	19 14.0
	NE	iSSS	19 25.0
	Z	M	08 25.2
28	Z	iPg	10 42 36.5
	NE	iSg	44

29	NE	iSn	16 21 36	
30	NE	iSn	12 00 08.5	
31	<del>NE</del>	iP	08 56 58.5	
	NE	i	59 36	
	N	i(S)	09 01 25	
31	Z	iP	11 46 24.5	D
	ZN	i(PP)	50 10	
	N	iSKS	56 53	
	NE	iS	57 11	
	Z	M	12 24.8	

1.11  
Nov.

1.	Z	eP	11 27 50	
	N	eS	37 30	
		F	14.5	
1	Z	ePn	11 44 24	
	NE	eSn	45 07	
3	Z	i	12 26 17	
3	Z	iPn	07 02 05.0	
	NE	iSn	35	
4	Z	ePn	06 36 29	
4	Z	iPg	09 59 56.0	
	NE	iSg	57.S	
4	Z	ePn	21 12 19	
4	Z	iP	23 59 09	
5	Z	iP	18 13 21	
	NE	iS	22 54	
		M	44.0	
5	Z	iP	20 02 12	

5	Z	iP	20 02 12
6	Z	eeP	04 40 34
		M	44 16
6	E	M	06 43/0
6	Z	i	9 59 52.5
6	Z	i	10 30 12.5
6	Z	eP	20 37 30
	NE	i	44 15
	N	i	18
	Z	M	21 7.0
7	E	M	12 38.0
Z	Z	M	13 12.0
Z	Z	M	17 02.0
7	Z	iP	18 39 26
	Z	i	46
8	Z	M	23 42
9	Z	eP	09 29 53
	Z	e	31 13.5
	Z	e	31 40
	E	i	36 12
9	Z	ePg	11 29 13
	N	ebg	17
9	Z	M	12 13.5
11	Z	eP	00 35 11
	NE	NE	39 02
11	Z	e	00 42 06
	N	e	43 30
11	NE	eSg	23 07 52

D

D



12	Z	iP	19 22 24	
	N	e	32 50	
	N	e	33 12	
	N	e	35 20	
	Z	M	20 3.5	
13	NE	eSn	05 32 12	
13	Z	M	09 32 21	
13	Z	iP	07 57 22	D
	Z	i	08 01 10	
	Z	i	05 48	
14	Z	eP	10 56 13	Blast
14	NE	eSn	14 28 55	
15	Z	iPn	02 56 37	
	NE	eSn	58 12	
16	Z	e	00 03 28	
	Z	e	09 50	
	Z	e	<del>12</del> 12 22	
16	Z	iPg	11 35 44	C
	NE	iSg	52	
16	Z	iPn	16 55 49	
	NE	eSn	57 05	
18	Z	M	11 51.5	
18	Z	ePn	21 47 09	
	N	eSn	58	
19	Z	iPg	11 53 41	C
	E	iSg	45	
19	Z	iPg	12 07 42.5	Blast

19	Z	iPg	13 15 08
	E	iSg	04.5
20	Z	ePg	02 56 58.5
	E	eSn	57 56
20	Z	ePn	05 12 14
	E	eeSn	40
21	Z	iP	02 16 22.5
21	Z	iPg	12 25 56
	E	iSg	58
21	Z	M	21 09.2
22	Z	iP	23 22 05
	NE	iS	32 22
24	Z	iP	17 29 56.5
	Z	i	30 36
	N	iS	35 16
24	Z	iP	17 21 04
24	Z	iP	21 49 58.5
	Z	i	50 06
	Z	i	15
24	Z	iP	23 05 06
24	Z	i	23 08 52
	N	iS	15 23
25	Z	iPg	14 28 26
26	Z	eP	13 06 13
	N	i	24 20
	N	i	40

C

D

D

Blast

26	N	i	19 20 30	
	N	i	46	
	N	i	21 10	
	N	M	20 22.5	
28	Z	eP	01 32 42.5	
	N	eS	36 52	
Dec.				
1. 12	Z	iPg	09 59 44	
1. 12	Z	iPg	11 41 20.5	
1	Z	M	13 18.3	
1	Z	eiPn	20 19 51.8	
	NE	iSn	27 12	
1	Z	eiP	22 26 18	C
	Z	i	34	
	E	i(SKS)	36 36	
	E	i(S)	50	
	Z	M	23 03.00	
2	Z	iP	18 09 51.5	D
	Z	i	10 15.0	
	E	i(SKS)	20 10.0	
	N	i(S)	33.0	
	E	i	21 02.0	
	Z	M	50 00.0	
4	Z	iPn	23 41 59	
	NE	iSn	44 27.0	
6	Z	iP	07 08 08.5	C
	Z	i	13	
	Z	i	24.5	
	Z	i	29.0	
	Z	i	33.5	
	Z	i	41.0	
	Z	i	46.0	
	N	i	50.0	



7	Z	iPg	10 20 54	C., Blast
7	Z	ePg	11 19 26	
	NE	iSg	28	
7	Z	iPg	12 15 50.8	C., Blast
8	NE	iSn	18 30 38	
8	NE	iSn	18 32 21.5	
9	Z	ePn	05 27 33	
	NE	eSn	28 18	
9	NE	eSn	11 45 10	
10	Z	eP	20 13 26	
	Z	e	38	
	Z	e	16 21	
	Z	e	17 11	
	NE	e	34 20	
	N	e	4 42	
11	Z	ePn	08 47 55.5	
	NE	eSn	48 55	
11	Z	M	11 59.5	
12	Z	e	00 42 25	
	Z	0	49	
12	Z	e	01 25 56	
	E	e	6 32	
12	Z	ePn	17 45 30	
	NE	eSn	4 46 25	
12	NE	eSn	23 12 56	
13	Z	eP	23 50 29	
	Z	M	46.5	

13	Z	ePn	10 04 34
	NE	eSn	05 38
14	Z	iP	02 55 30
	Z	e	56 32
	Z	ePP	59 20
	N	i(S)	08 06 28
	NE	i	54
	Z	M	03 35
14	Z	ePn	15 36 09
	NE	eSn	27 06
14	Z	ePn	17 23 34
	NE	eSn	24 28
14	Z	iP	18 43 47
	Z	ePP	34
	Z	ePP	45 00
	Z	iPPP	45 15
	Z	i	46 10
	NE	iS	49 12
	E	eSSS	51 38
	Z	M	55.5
15	Z	ePg	09 28 46
	N	eSg	49
15	E	eSn	14 06 15
16	Z	ee	13 27 03
	NE	eSn	36 06
16	NE	eSn	15 08 17
17	Z	M	03 11.5
17	NE	eSn	14 06 27

17	NE	eSn	20 45 55
17	NE	eSn	20 59 35
18	Z	ePg	10 02 57
	NE	eSg	02 60
18	Z	ePg	13 43 49.5
	NE	eSg	55
18	Z	e	13 45 11
	Z	e(pP)	44
	Z	e	46 34
	Z	epp	47 04
	Z	ePPP	48 46
	E	iS	53 34
	E	ePP-S	54 16
	N	e	55 08
	E	e	56 46
	E	e	57 11
20	Z	eP	11 02 51
20	Z	ePn	17 42 49
	NE	eSn	44 24
21	NE	eSn	17 32 40
21	Z	ePn	22 02 51
	NE	eSn	04 07
23	Z	eP	13 35 24
	Z	e	30
	Z	e	40
	NE	e(S)	45 50
	NE	e	46 04

Blast



28	NE	eSn	10 26 07	
28	NE	eSn	10 51 30	
29	Z	eP	01 04 15	
	NE	e	14 28	
	NE	e	15 00	
29	Z	ePg	14 13 14	Dil
	NE	eSg	18	
30	Z	iFn	05 10 55.5	Dil
	NE	eSn	11 12	
	NE	iSn	48	
31	Z	iPn	01 06 47.5	Dil
	E	eSn	07 48	
31	Z	iPn	05 09 38	D
	NE	iSn	10 44	
31	Z	ePn	05 38 32	
	NE	eSn	39 44	
31	Z	eP	13 22 48	
	E	e	26 16	
	E	e	27 08	
31	Z	iP	19 14 16	
	Z	ipP	14 28	
	Z	iPP	17 30	
	Z	i	18 16	
	NE	eS	24 30	
	N	ePS	25 30	
	Z	M	47.5	