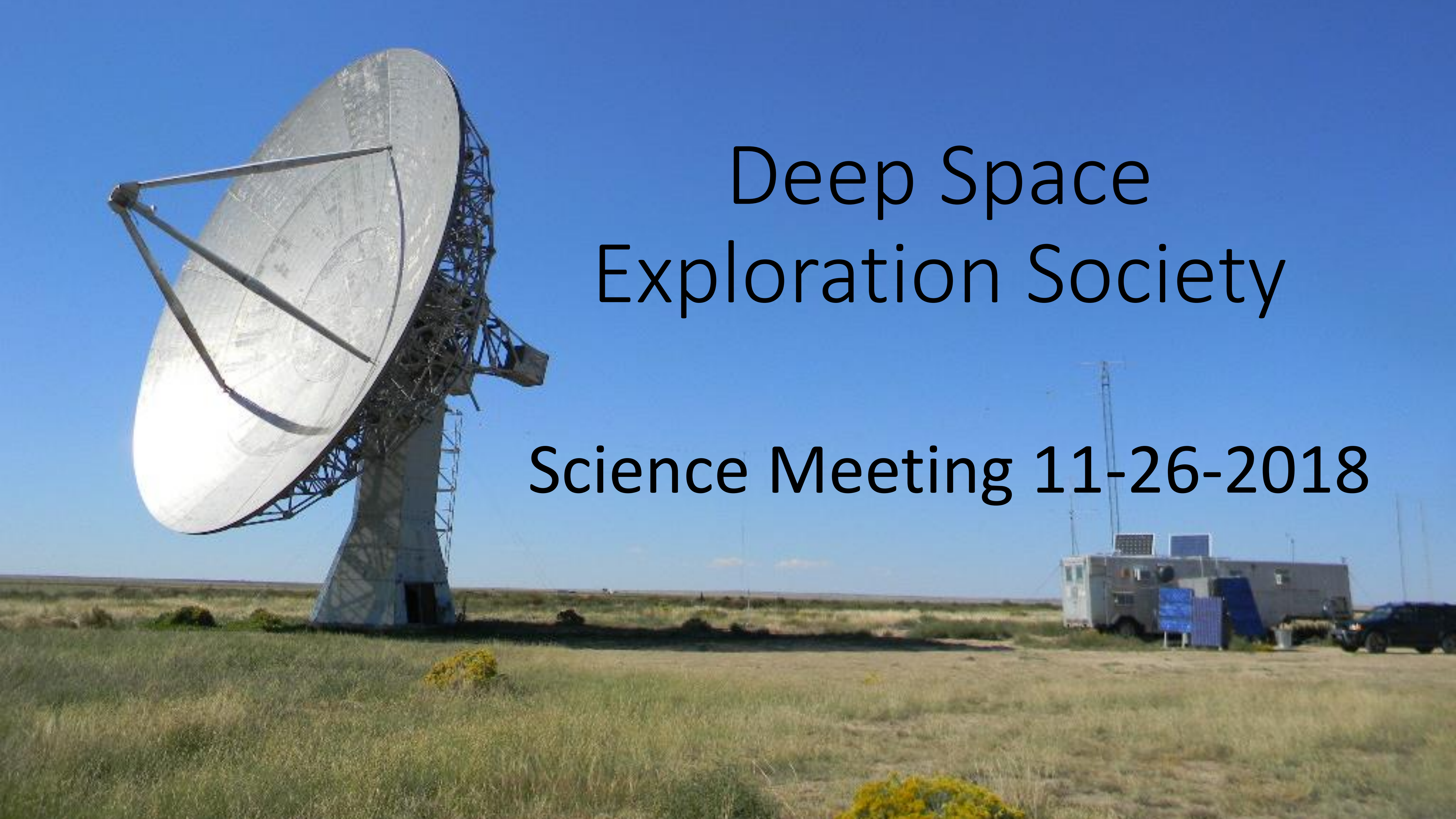
Deep Space Exploration Society

Science Meeting 11-26-2018



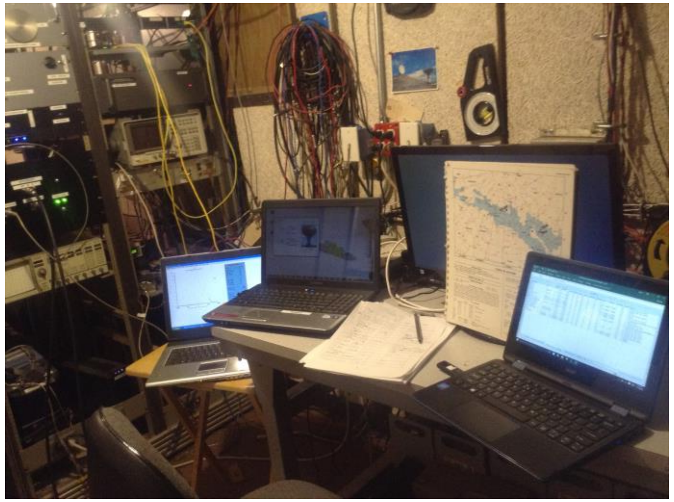
Agenda

- Dayton Jones Brief
- Galactic Rotation Rate Results
- Complete 60-ft antenna Source Observations

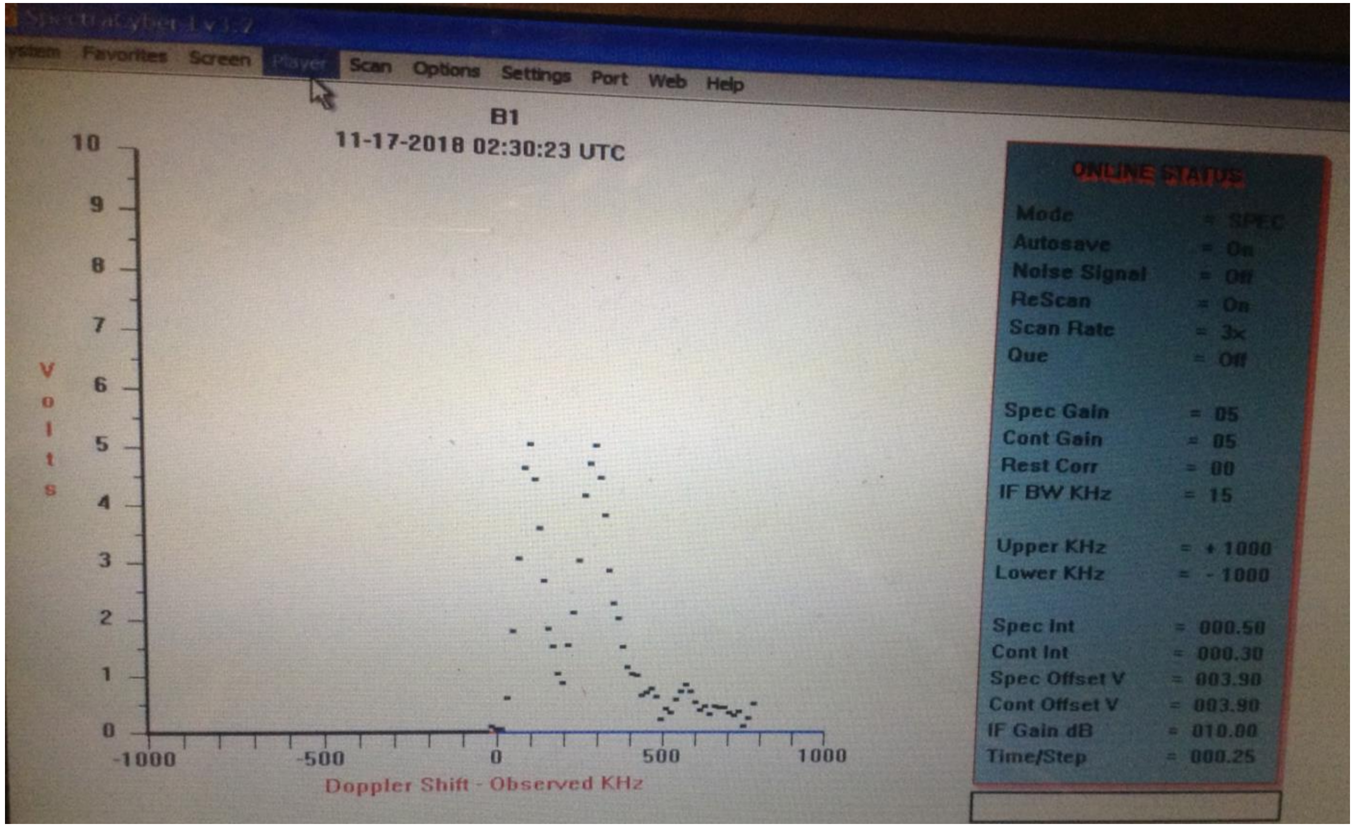
October 16-17, 2018
Observation Trip

Observation Trip 11-16-18

Observers: Richard Russel
Receiver: SpectraCyber with 1420 Mhz. Cavity Filter on 60-foot dish
Pointing System: System 1
Goals:
1) Take Milky Way rotation rate data
2) Observe sources with known Jansky signal levels to determine if a signal calibration level can be estimated



Equipment Setup



Dish: 60 ft.
Filter: Cavity Filter
Receiver: SpectraCyber

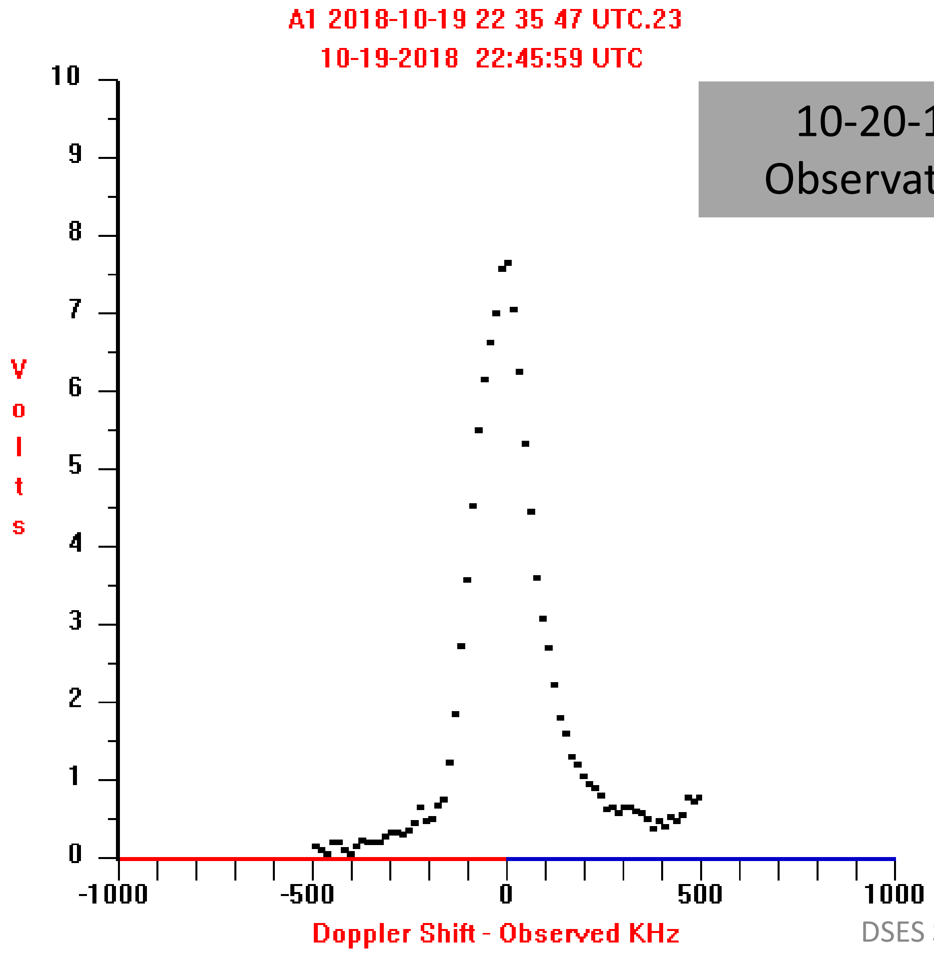
SpectraCyber Setup: (see photo)
- **Gain:** 5
- **SPEC Integration:** 0.5 Second
- **IF BW:** 15 kHz
- **SPEC Offset V:** 3.9V*
- **IF Gain dB:** 10
- **Time/Step:** 0.25

***SPEC Offset was changed at time to maintain the peak signal below 10 volts.**

Galactic Rotation Rate Observations

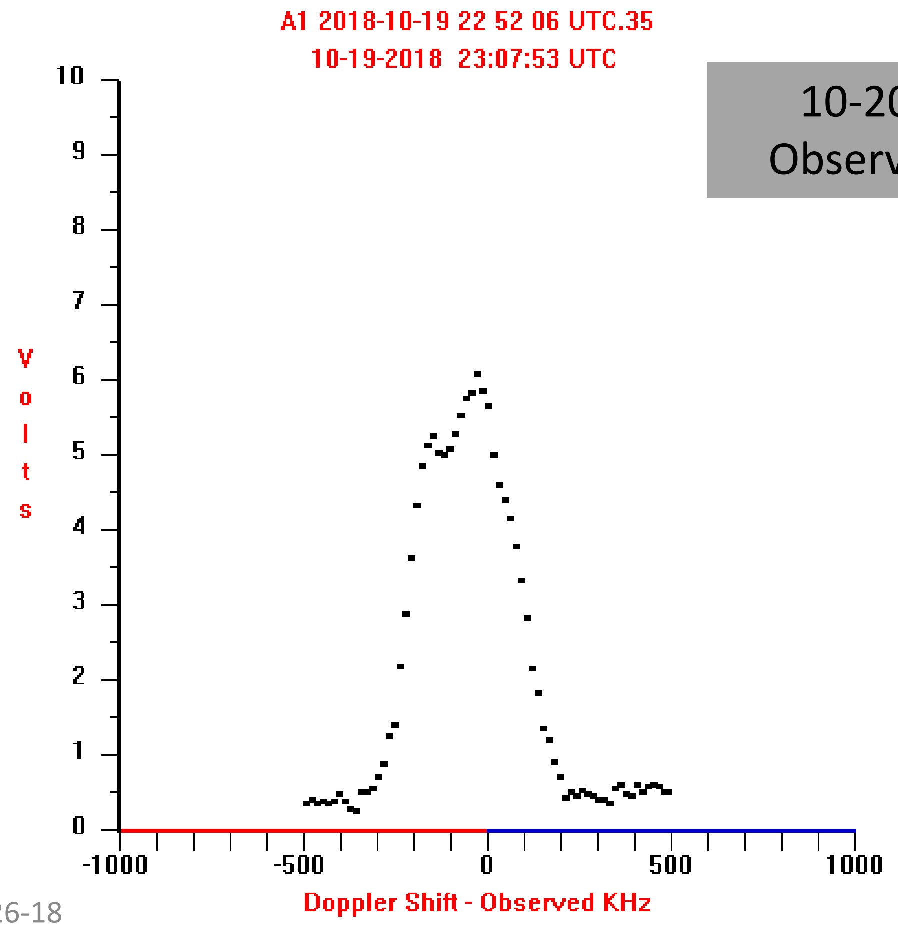
- There was a delay in observation due to antenna and pointing system startup issues. The Galactic plane observations started with b=0, L=55 degrees.

Galactic Lat 0 Long 0
RA 17h45m37s
DEC -28d56m10s



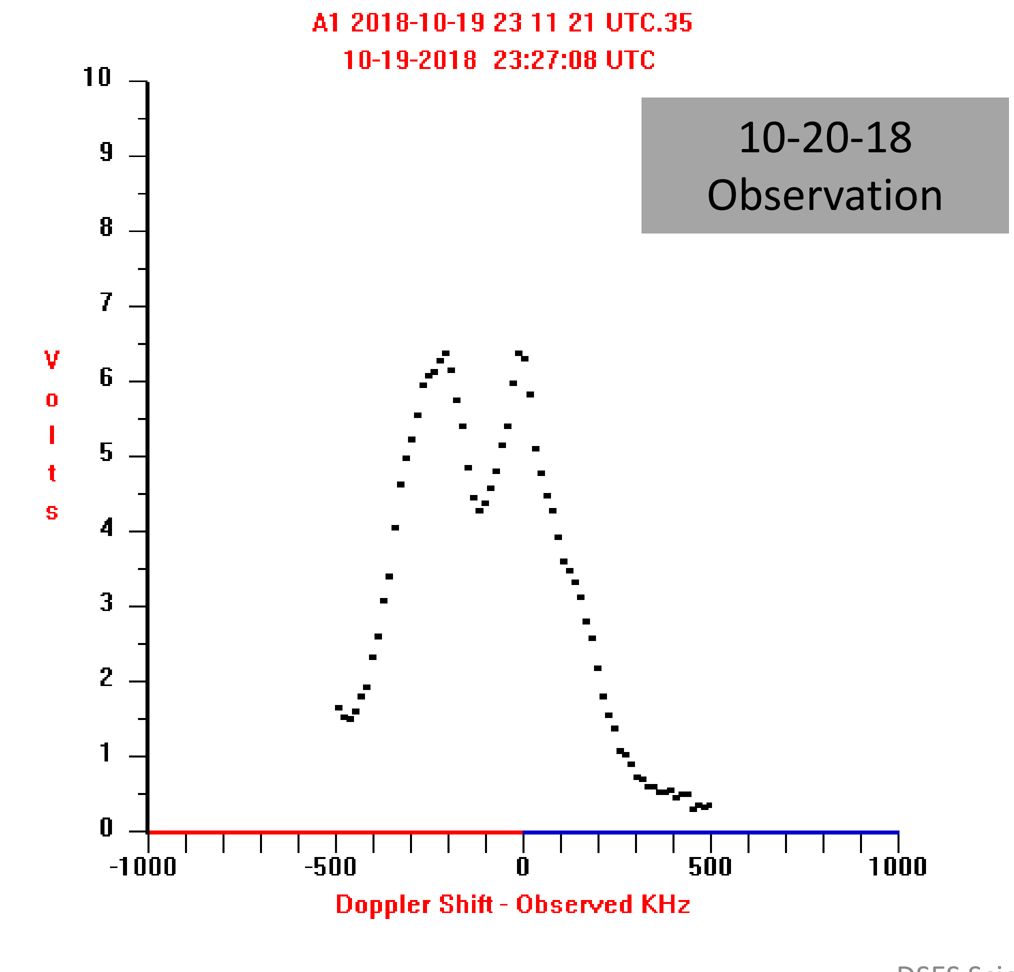
10-20-18
Observation

Galactic Lat 0 Long 10
RA 18h07m46s
DEC -20d17m24s

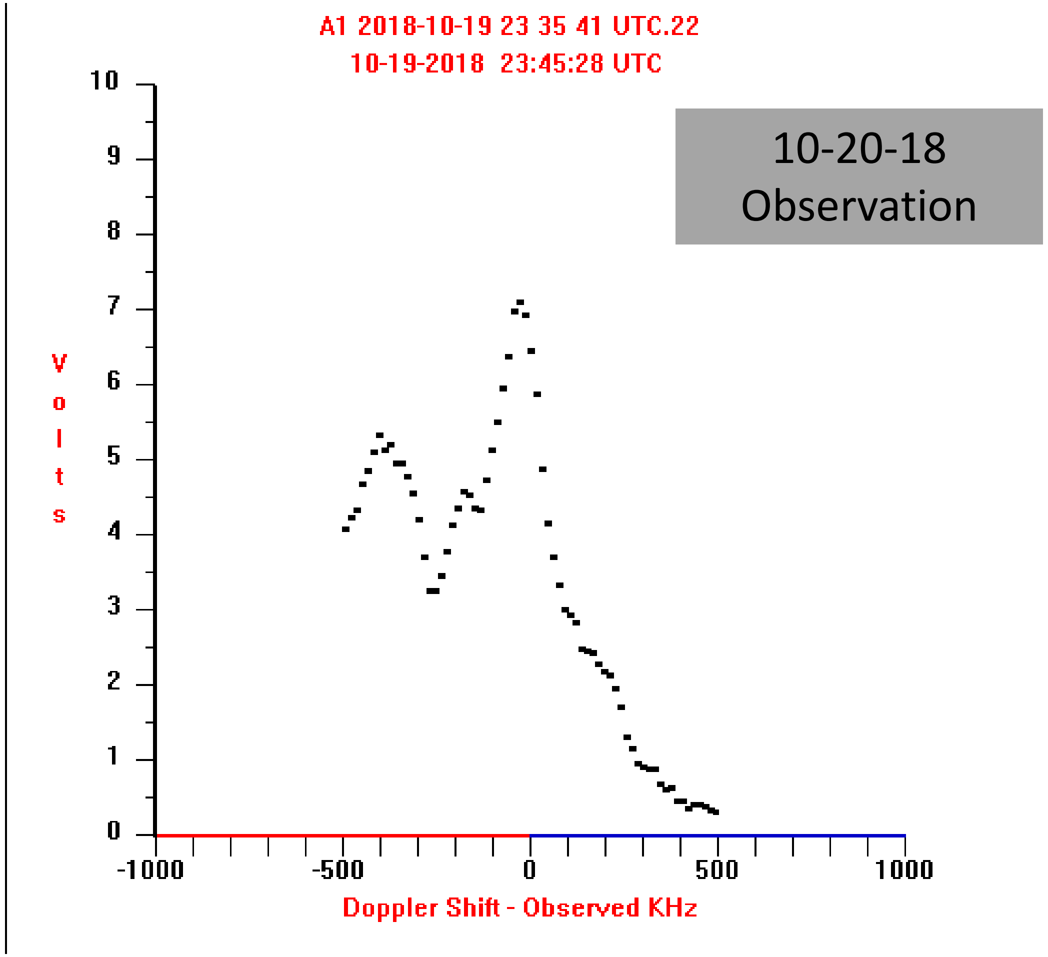


10-20-18
Observation

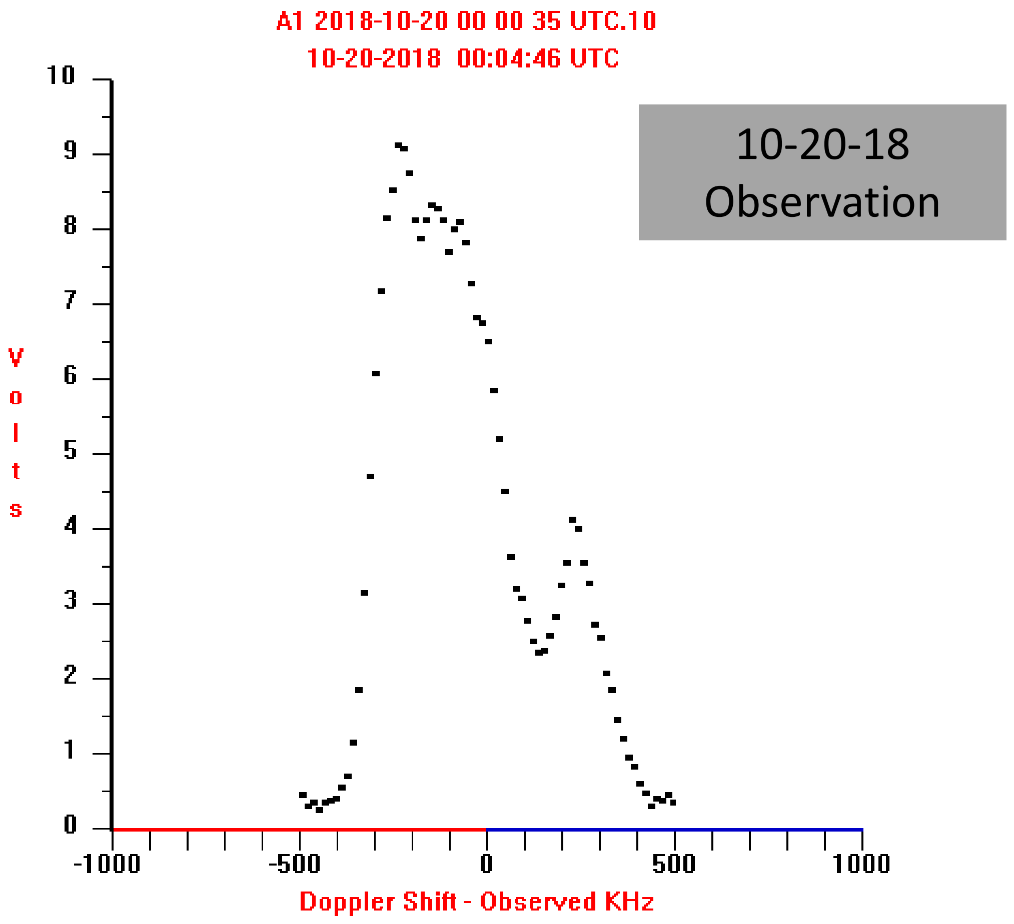
Galactic Lat 0 Long 20
RA 18h27m32s
DEC -11d29m19s



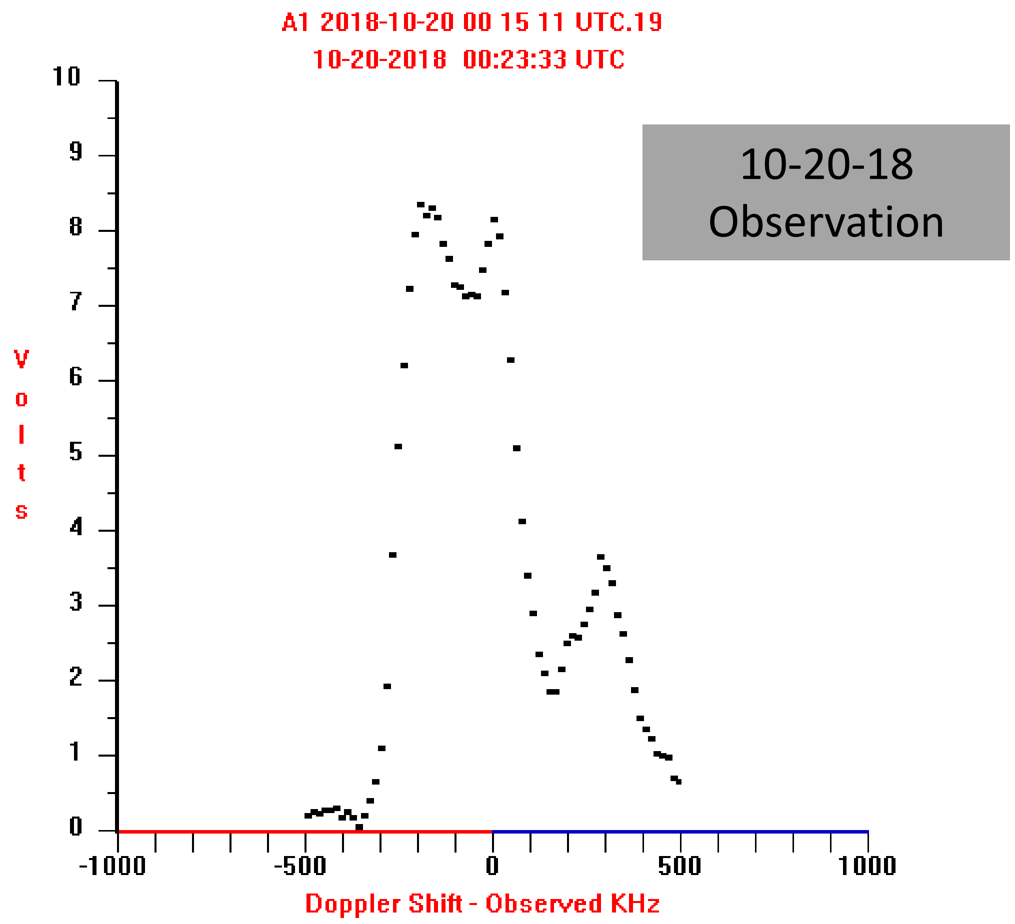
Galactic Lat 0 Long 30
RA 18h46m05s
DEC -02d36m33s



Galactic Lat 0 Long 40
RA 19h04m23s
DEC 06d17m14s

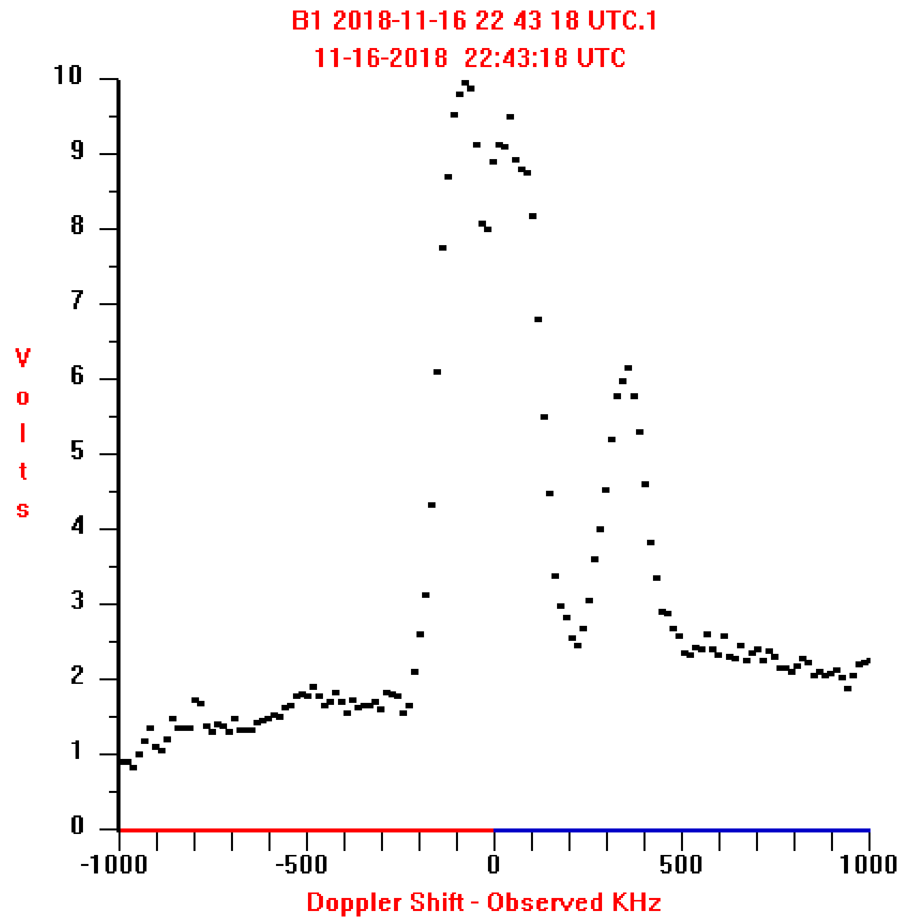


Galactic Lat 0 Long 50
RA 19h23m19s
DEC 15d08m33s



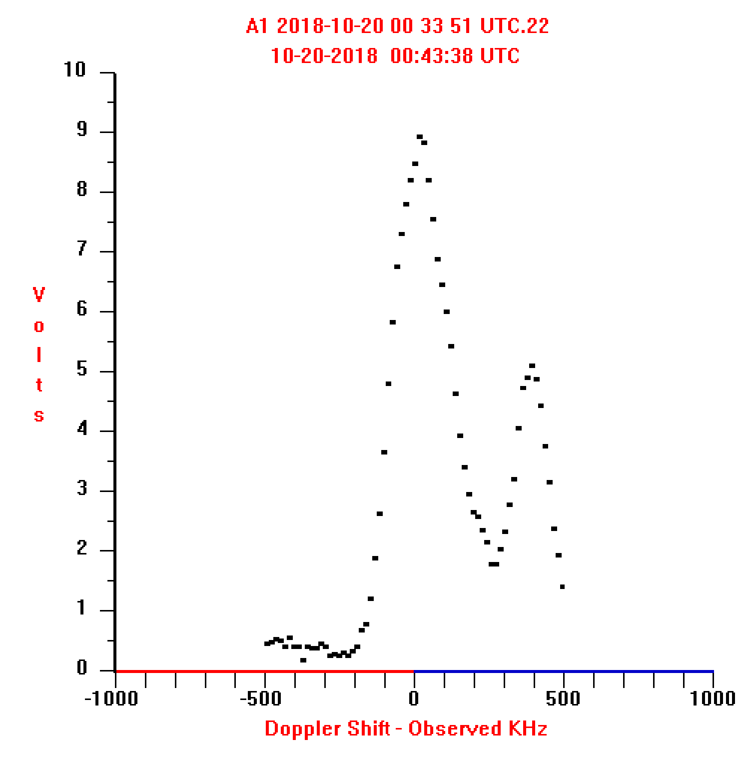
Galactic Lat 0 Long 55
RA 19h33m29s DEC 19d32m04s

New 11-16-18 Observation

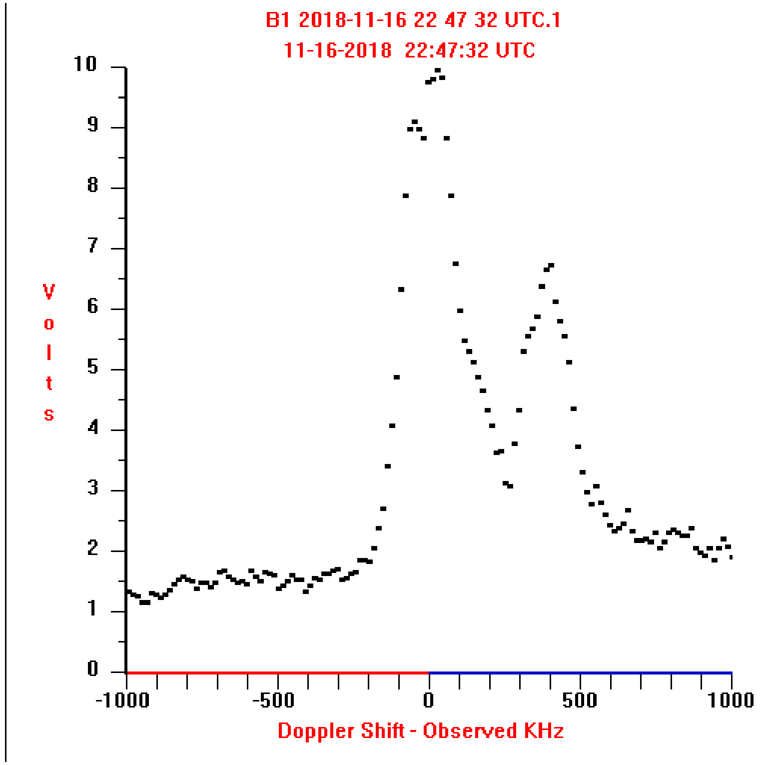


Galactic Lat 0 Long 60
RA 19h43m54s DEC 23d53m25s

10-20-18
Observation

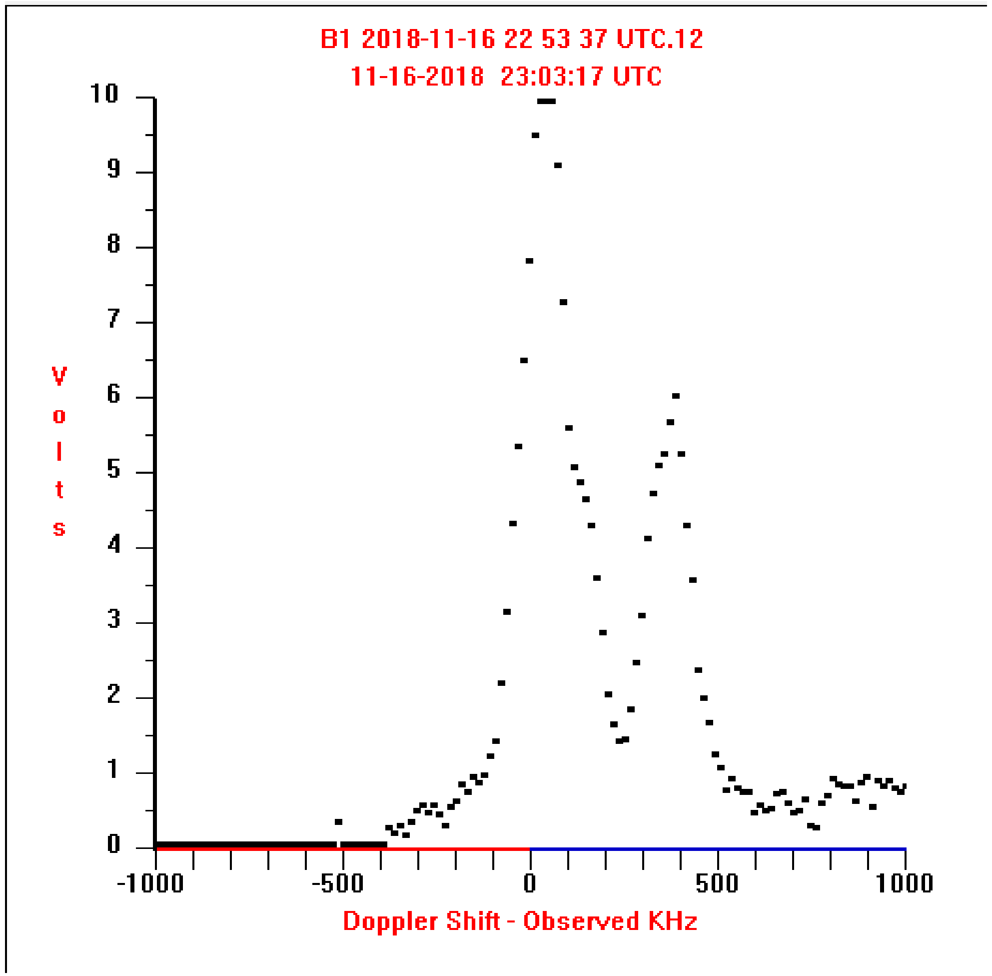


New 11-16-18
Observation



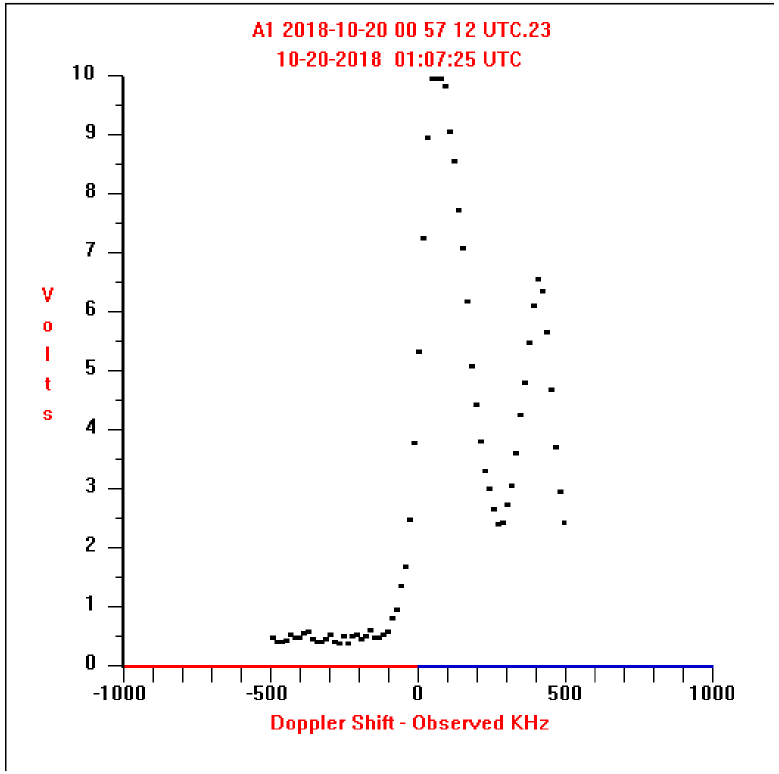
Galactic Lat 0 Long 65
RA 19h55m13s DEC 28d11m52s

New 11-16-18 Observation

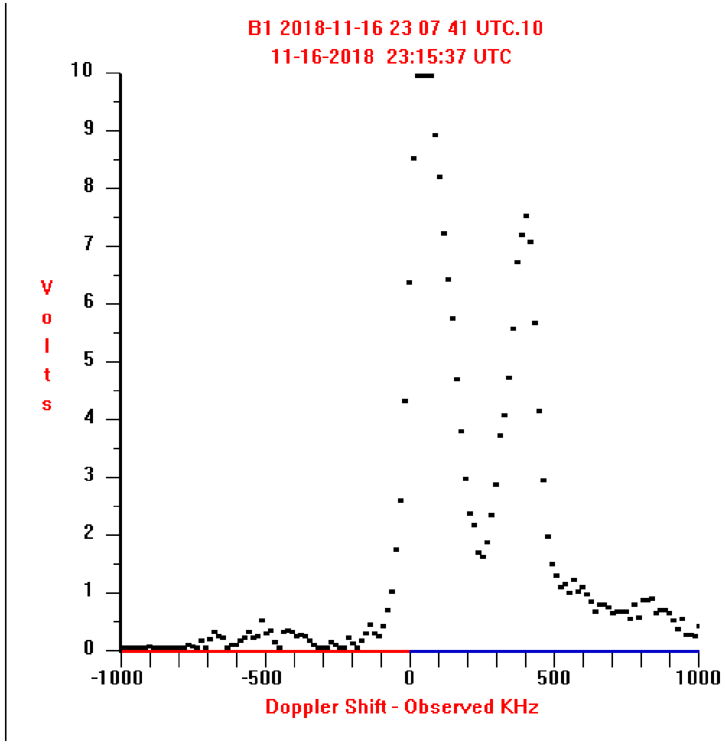


Galactic Lat 0 Long 70
RA 20h07m28s DEC 32d26m33s

10-20-18
Observation

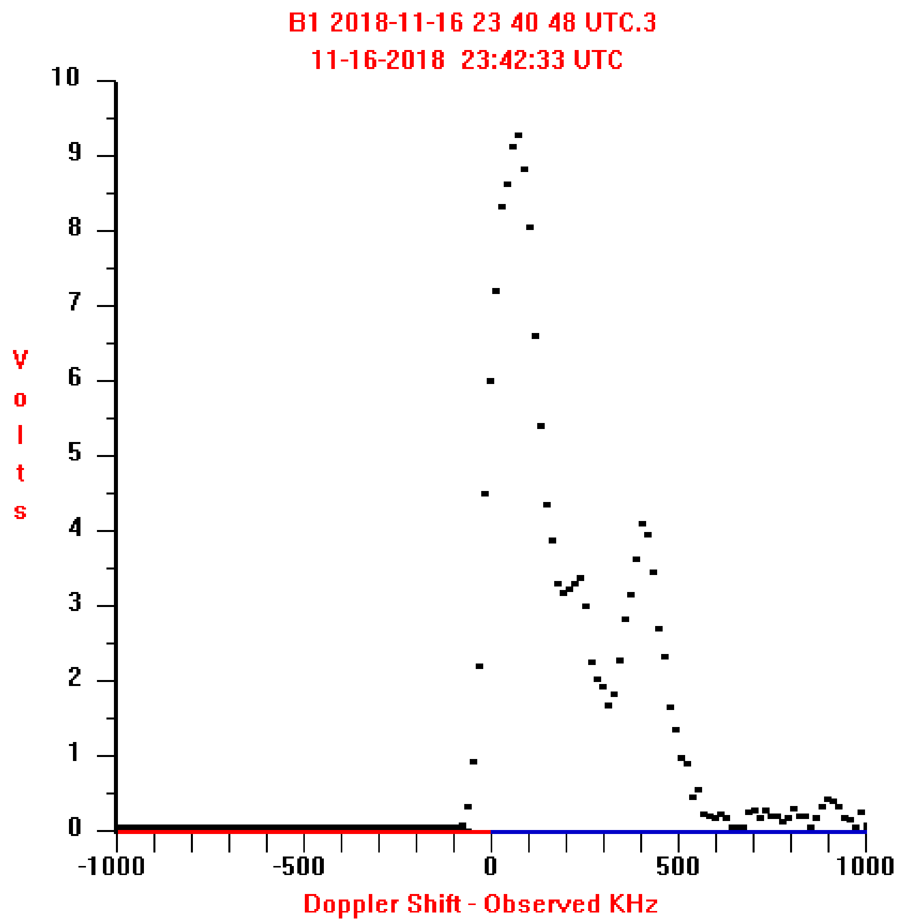


New 11-16-18
Observation



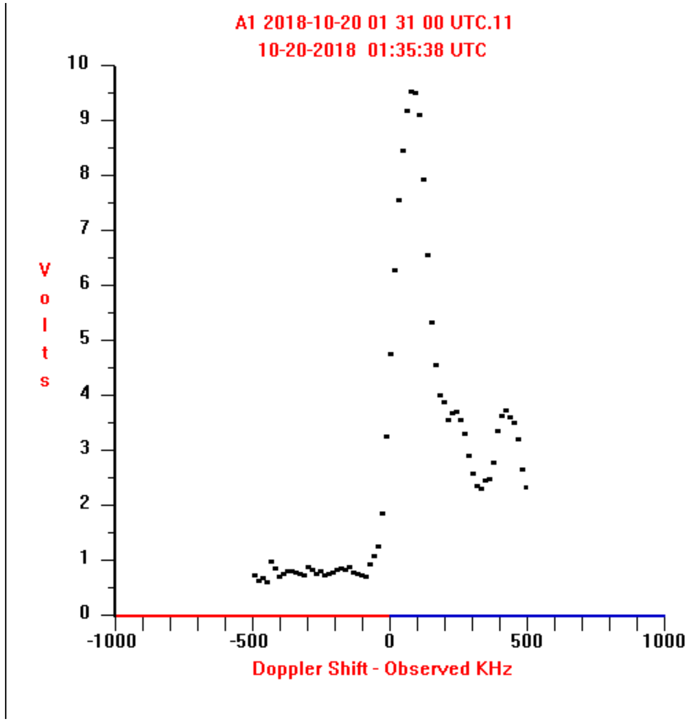
Galactic Lat 0 Long 75
RA 20h20m55s DEC 36d36m20s

New 11-16-18 Observation

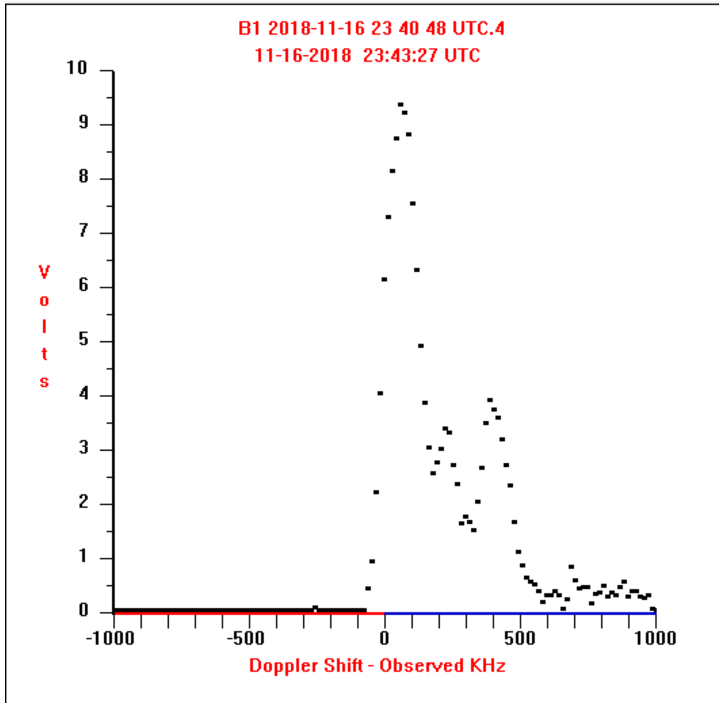


Galactic Lat 0 Long 80
RA 20h35m53s DEC 40d39m49s

10-20-18
Observation

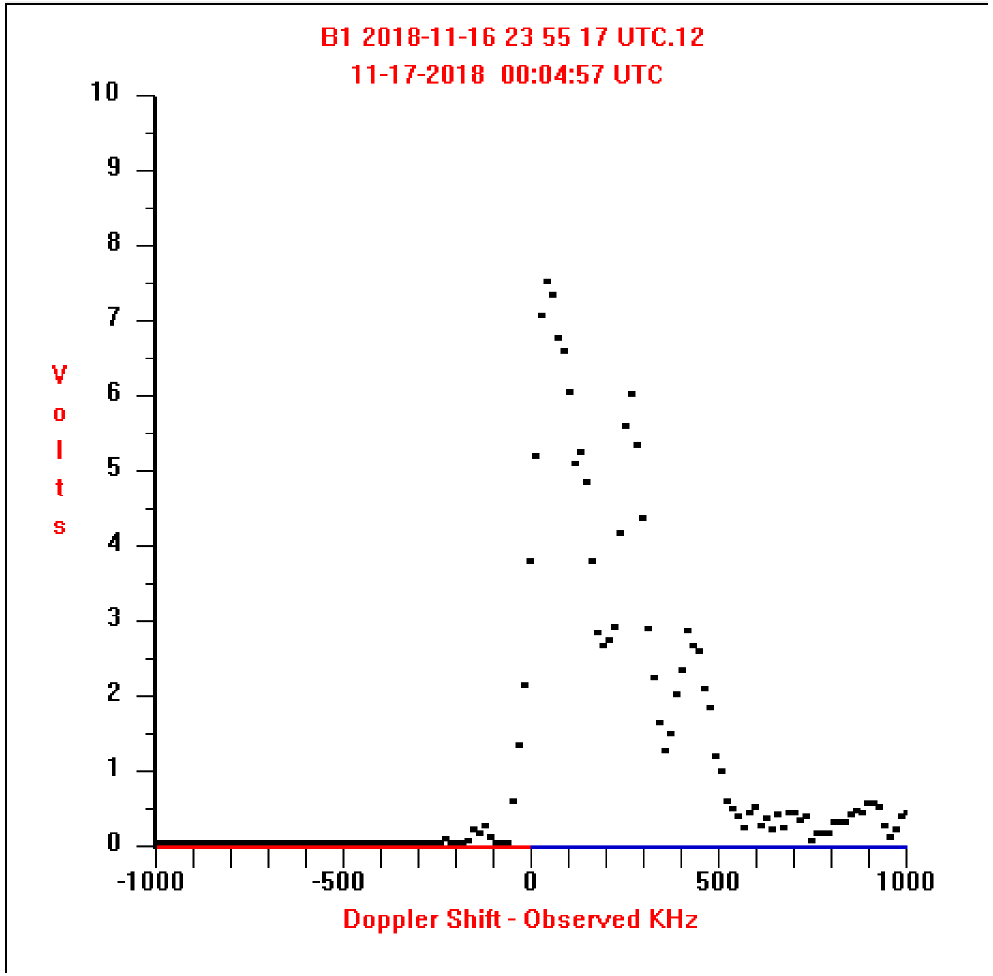


New 11-16-18
Observation



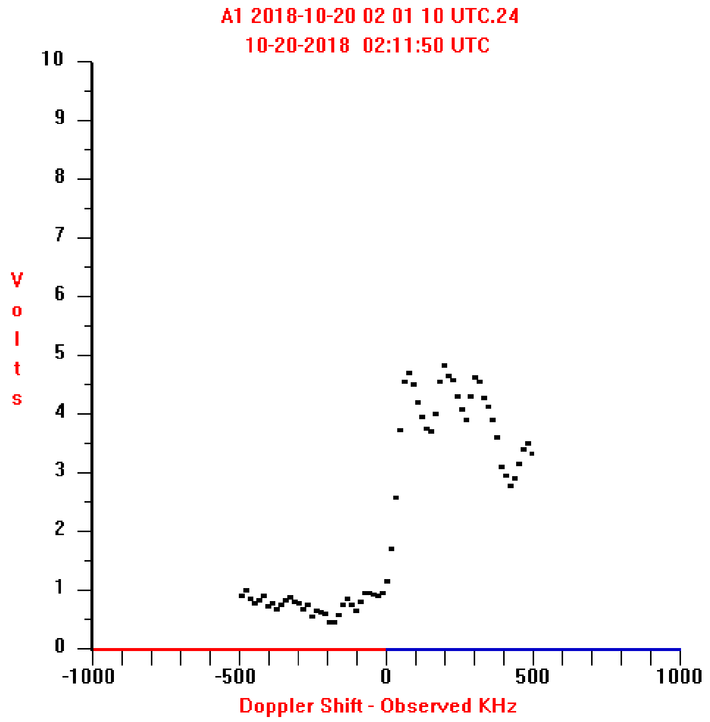
Galactic Lat 0 Long 85
RA 20h52m46s DEC 44d35m07s

New 11-16-18 Observation

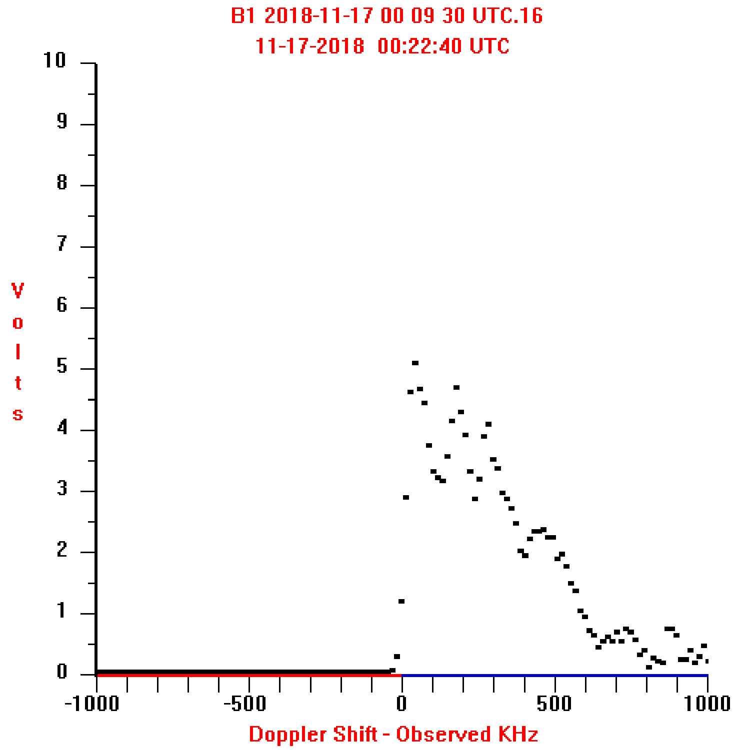


Galactic Lat 0 Long 90
RA 21h12m01s DEC 48d19m46s

10-20-18
Observation

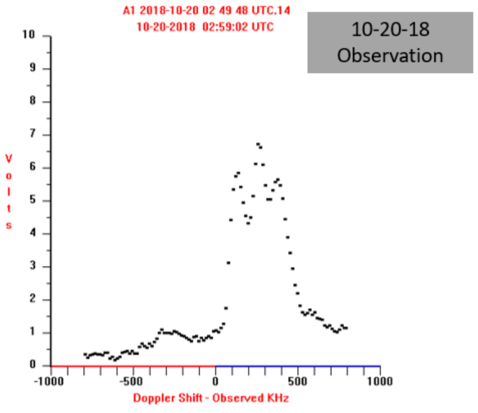


New 11-16-18
Observation

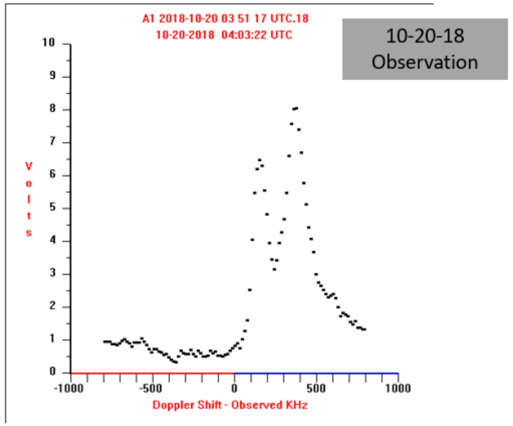


Quadrant II & III Observations

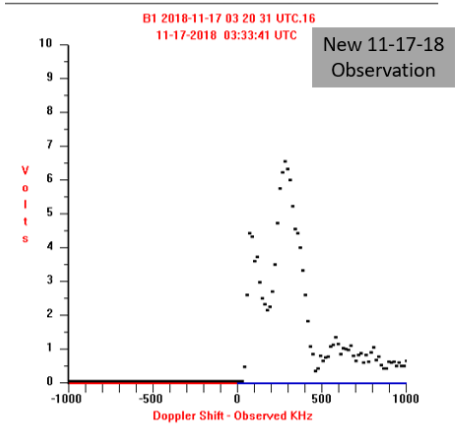
Galactic Lat 0 Long 100
RA 22h00m01s
DEC 55d02m59s



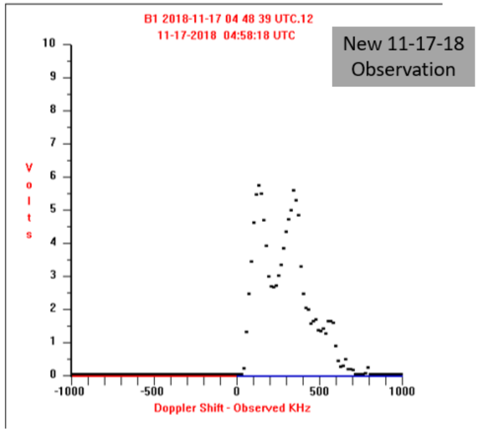
Galactic Lat 0 Long 110
RA 23h04m32s
DEC 60d09m34s



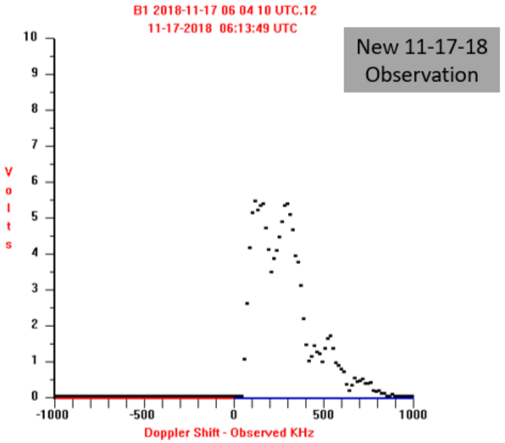
Galactic Lat 0 Long 120
RA 23h04m32s
DEC 62d43m32s



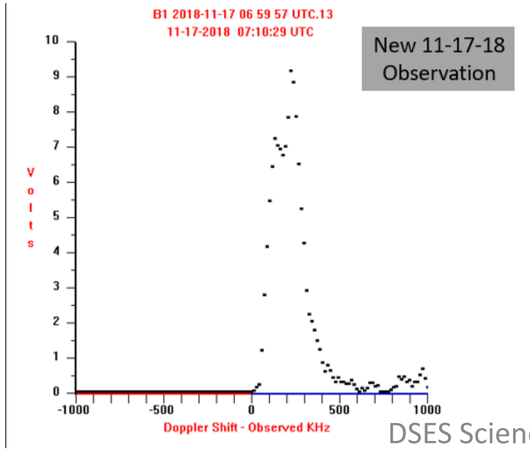
Galactic Lat 0 Long 130
RA 01h52m17s
DEC 62d02m01s



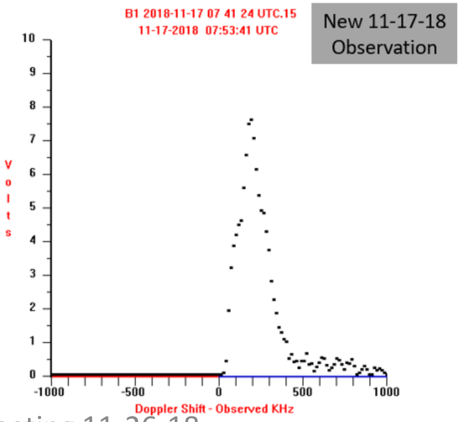
Galactic Lat 0 Long 140
RA 03h07m15s
DEC 58d17m51s



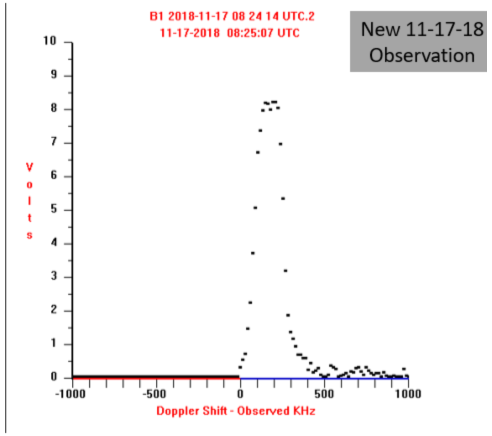
Galactic Lat 0 Long 150
RA 04h04m28s
DEC 52d25m12s



Galactic Lat 0 Long 160
RA 04h46m58s
DEC 45d14m46s

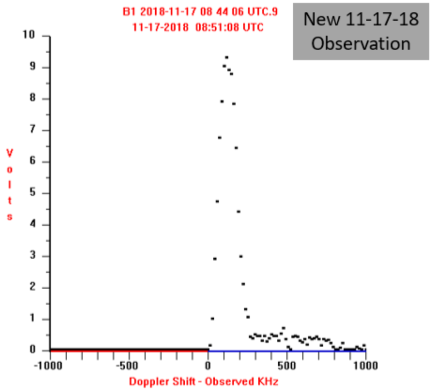


Galactic Lat 0 Long 170
RA 05h19m29s
DEC 37d18m54s

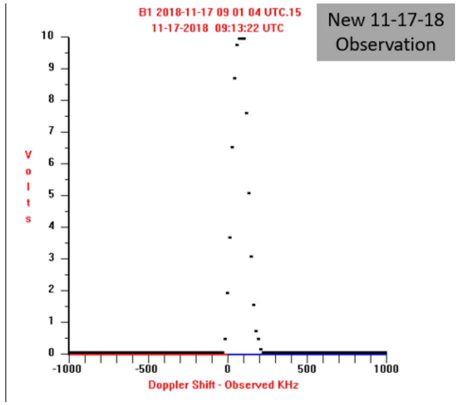


Quadrant III Observations

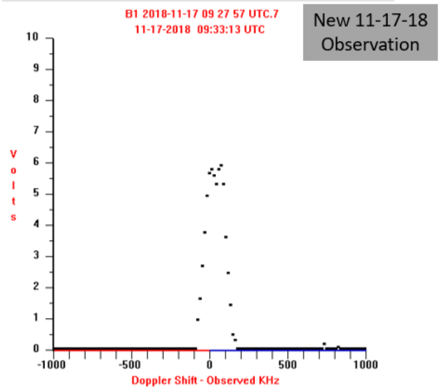
Galactic Lat 0 Long 180
RA 05h45m37s
DEC 28d56m10s



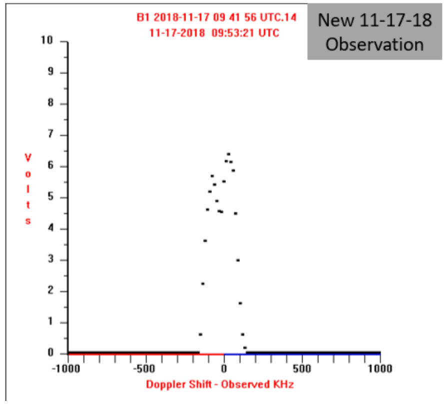
Galactic Lat 0 Long 190
RA 06h07m46s
DEC 20d17m24s



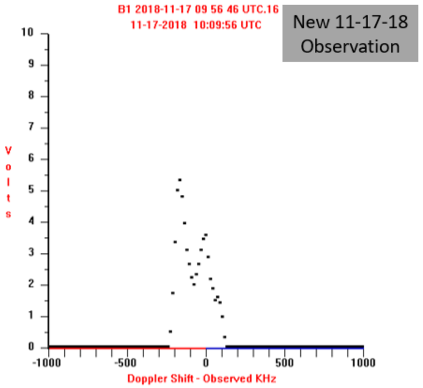
Galactic Lat 0 Long 200
RA 06h27m32s
DEC 11d29m19s



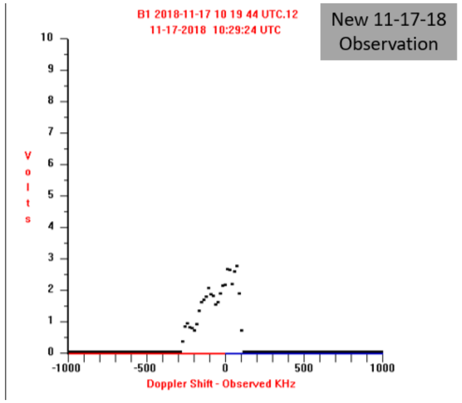
Galactic Lat 0 Long 210
RA 06h46m05s
DEC 02d56m33s



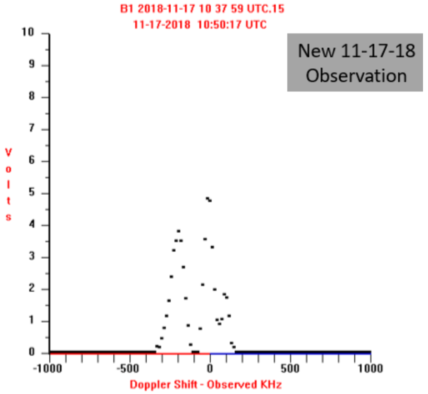
Galactic Lat 0 Long 220
RA 07h04m23s
DEC -06d17m14s



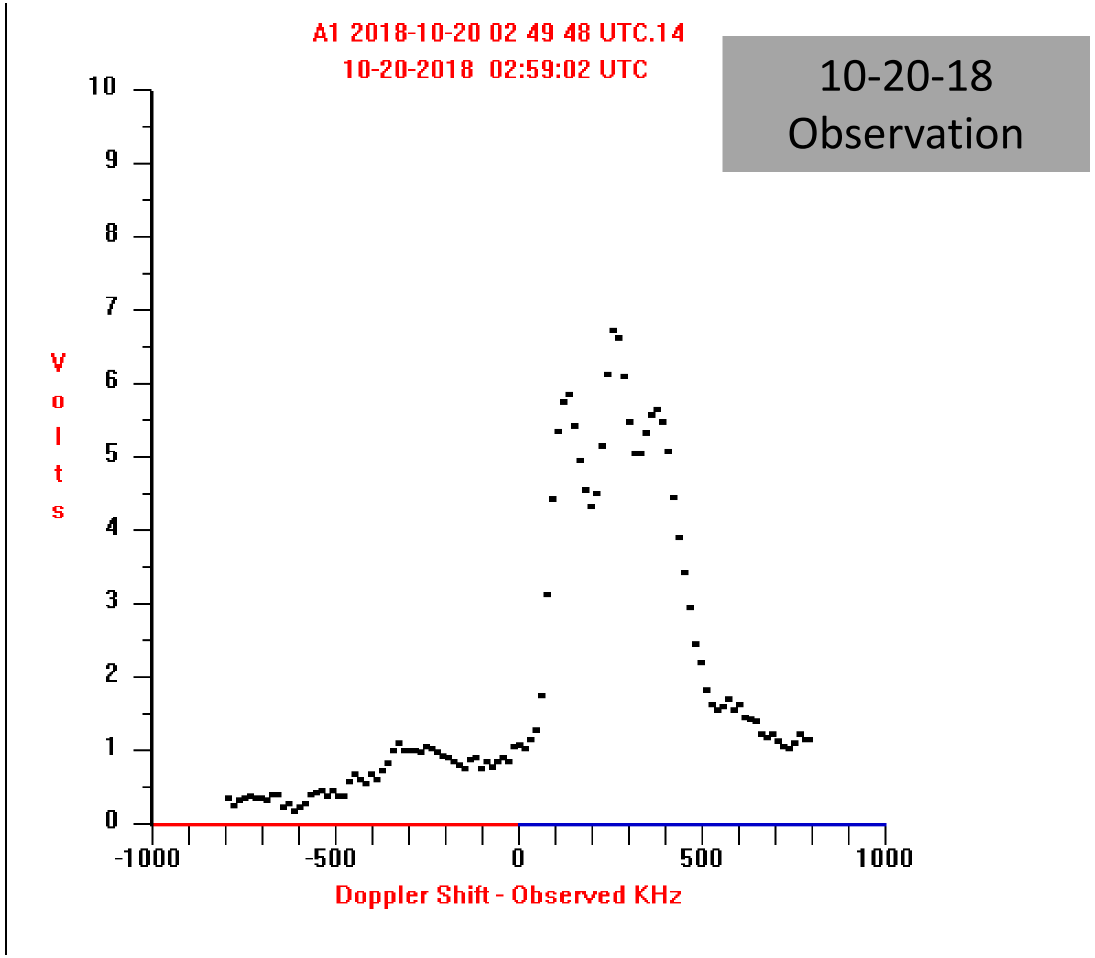
Galactic Lat 0 Long 230
RA 07h23m19s
DEC -15d08m32s



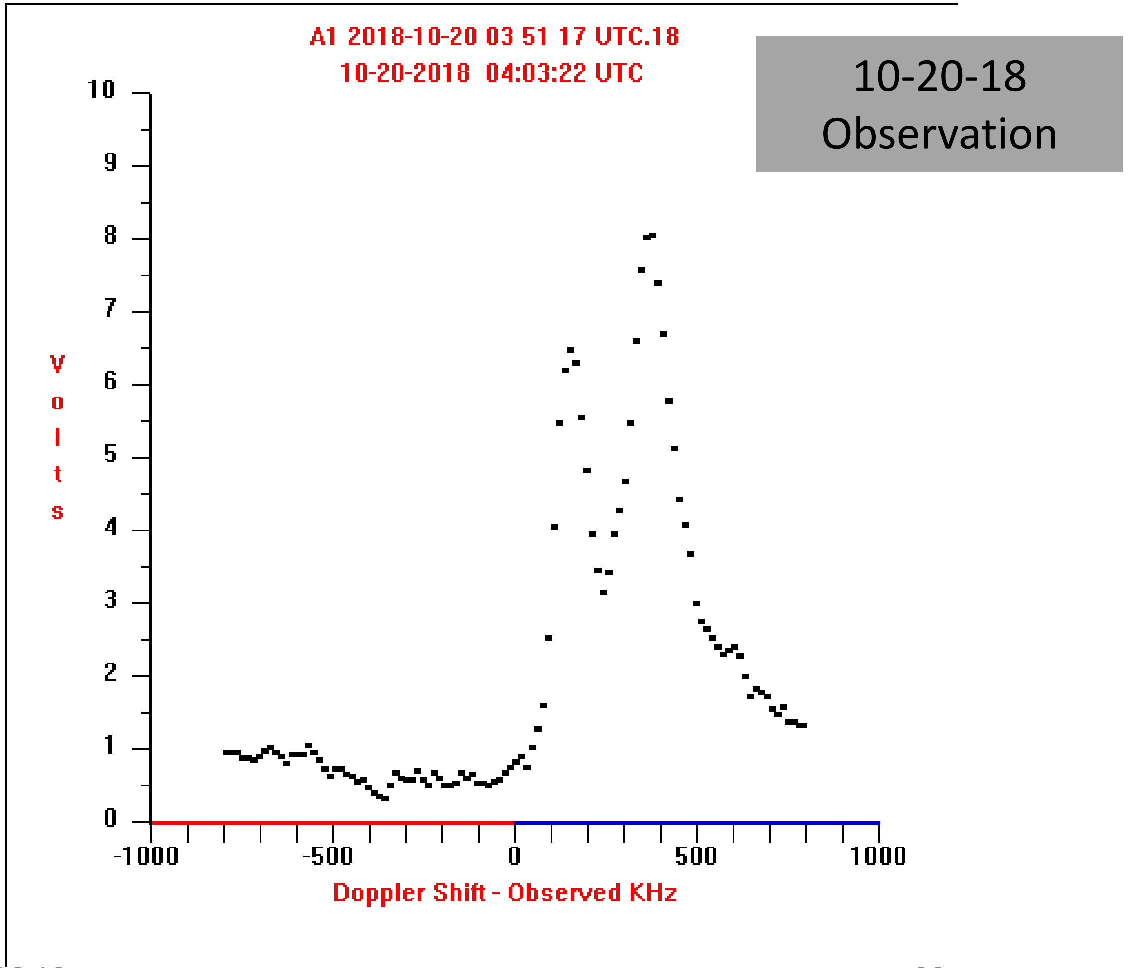
Galactic Lat 0 Long 240
RA 07h43m54s
DEC -23d53m25s



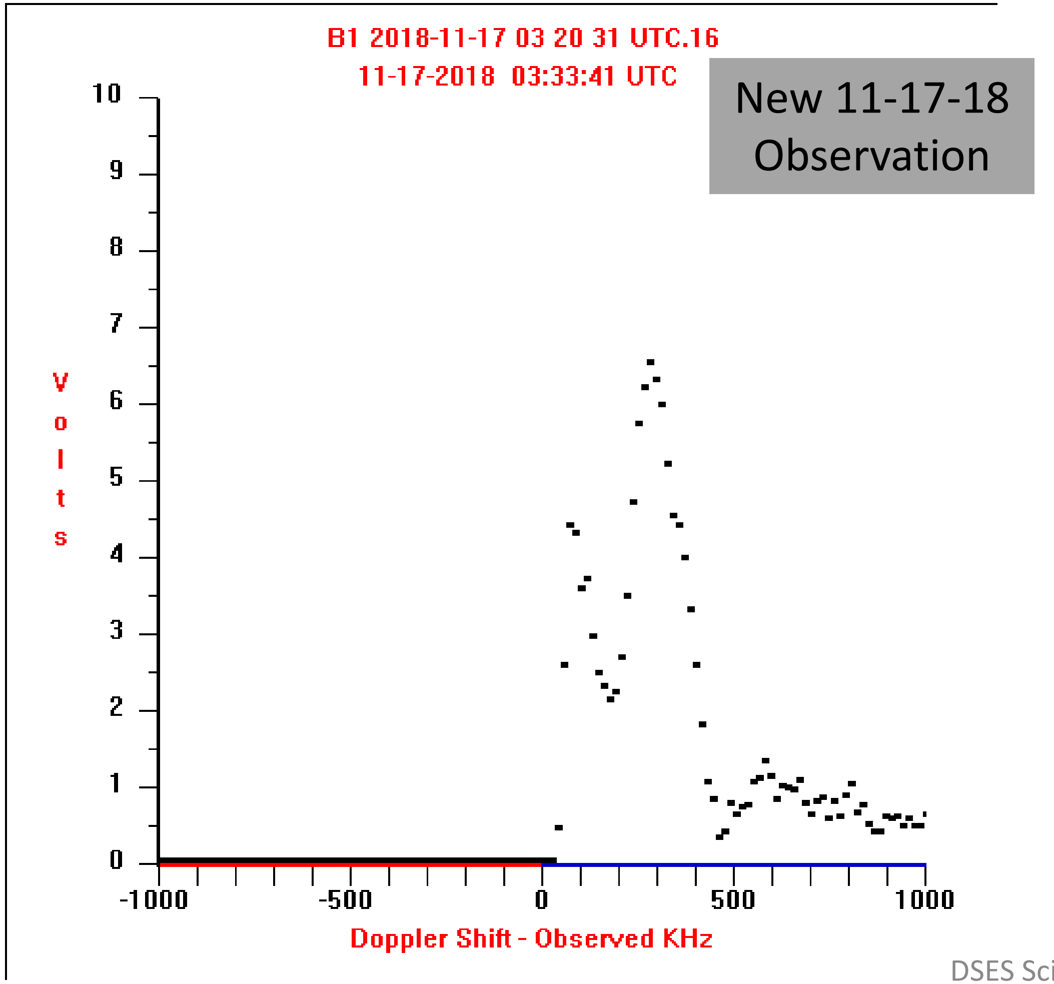
Galactic Lat 0 Long 100
RA 22h00m01s
DEC 55d02m59s



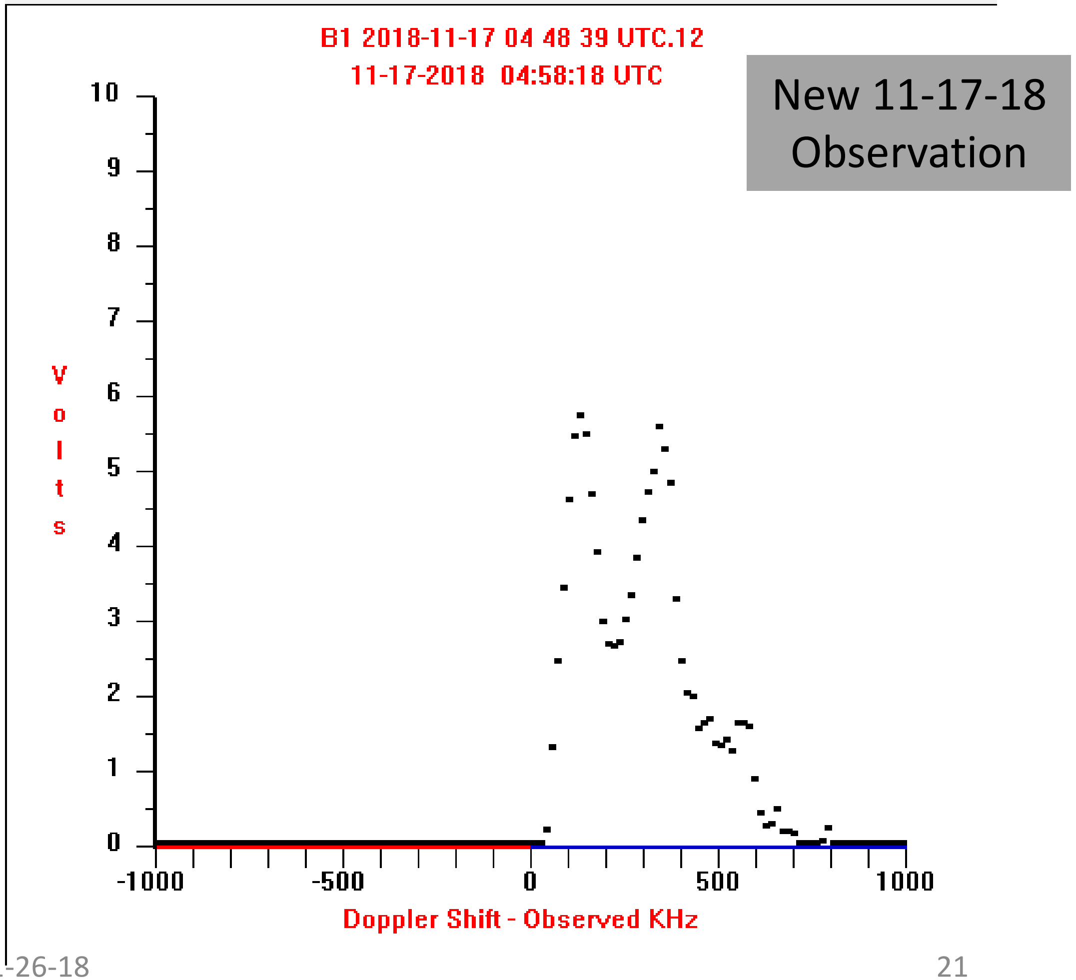
Galactic Lat 0 Long 110
RA 23h04m32s
DEC 60d09m34s



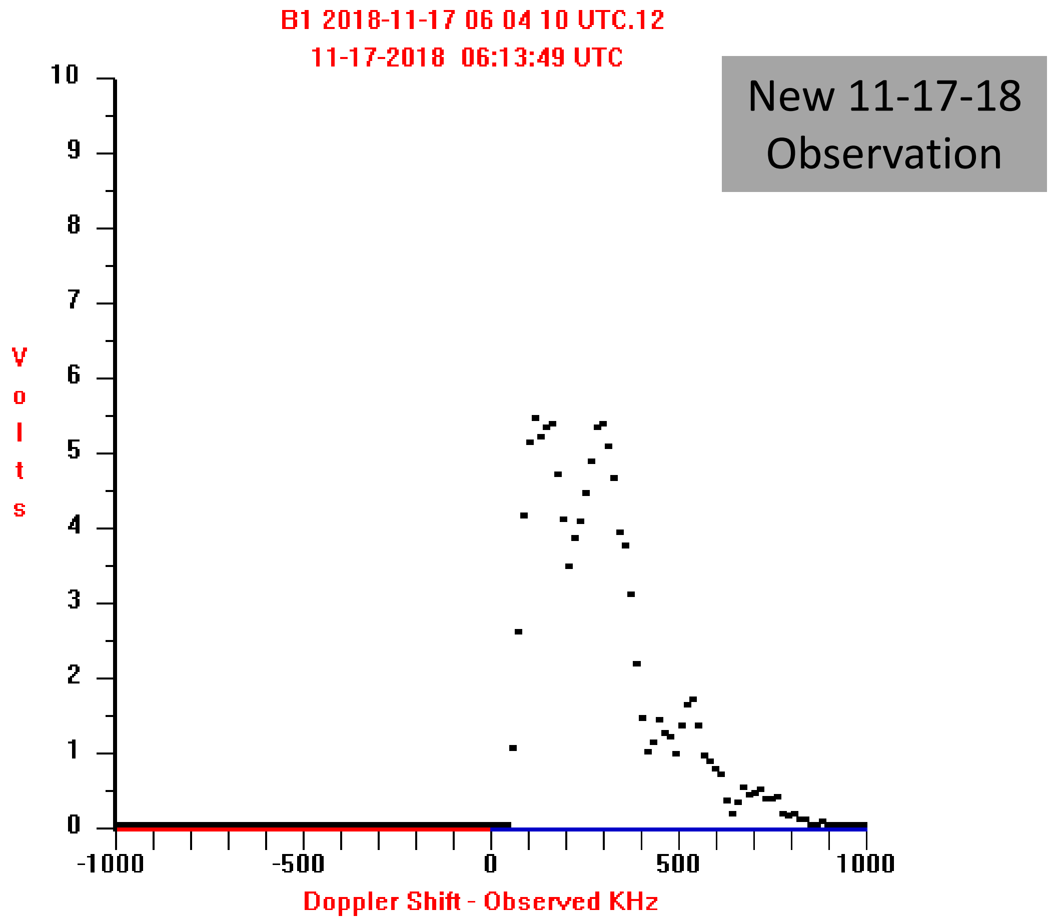
Galactic Lat 0 Long 120
RA 23h04m32s
DEC 62d43m32s



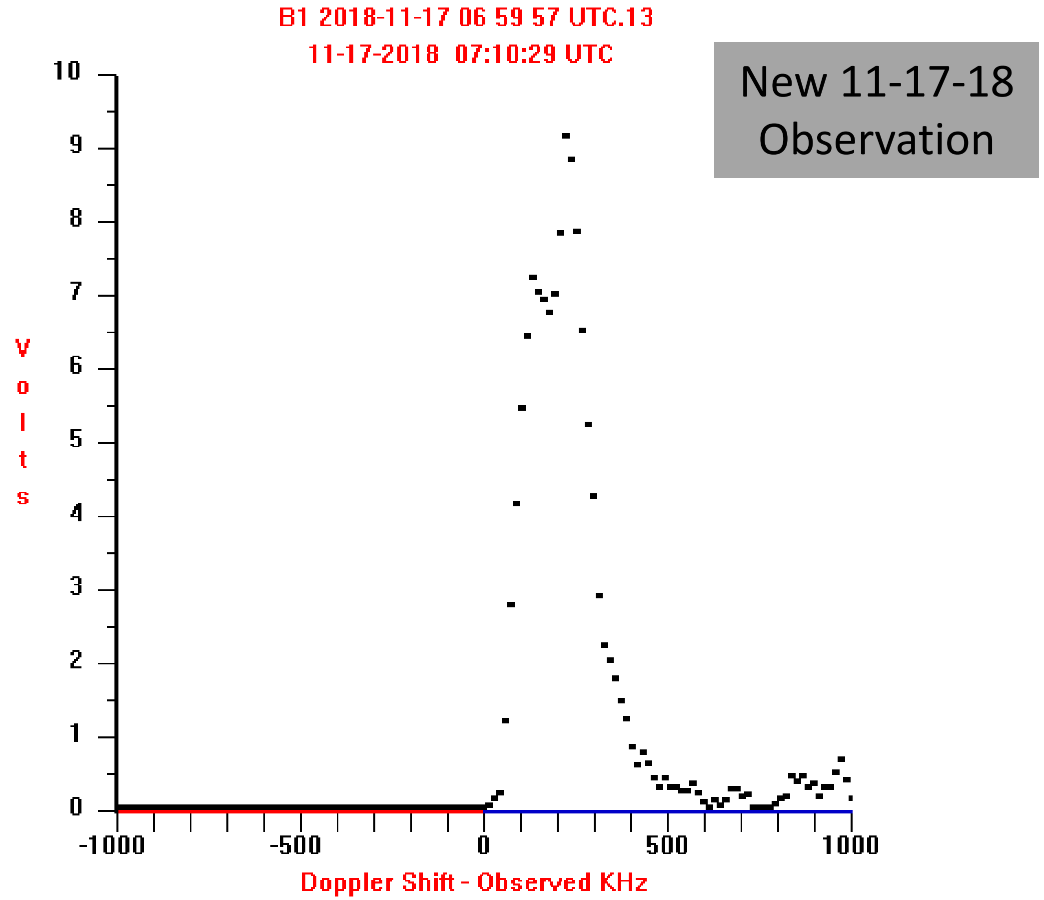
Galactic Lat 0 Long 130
RA 01h52m17s
DEC 62d02m01s



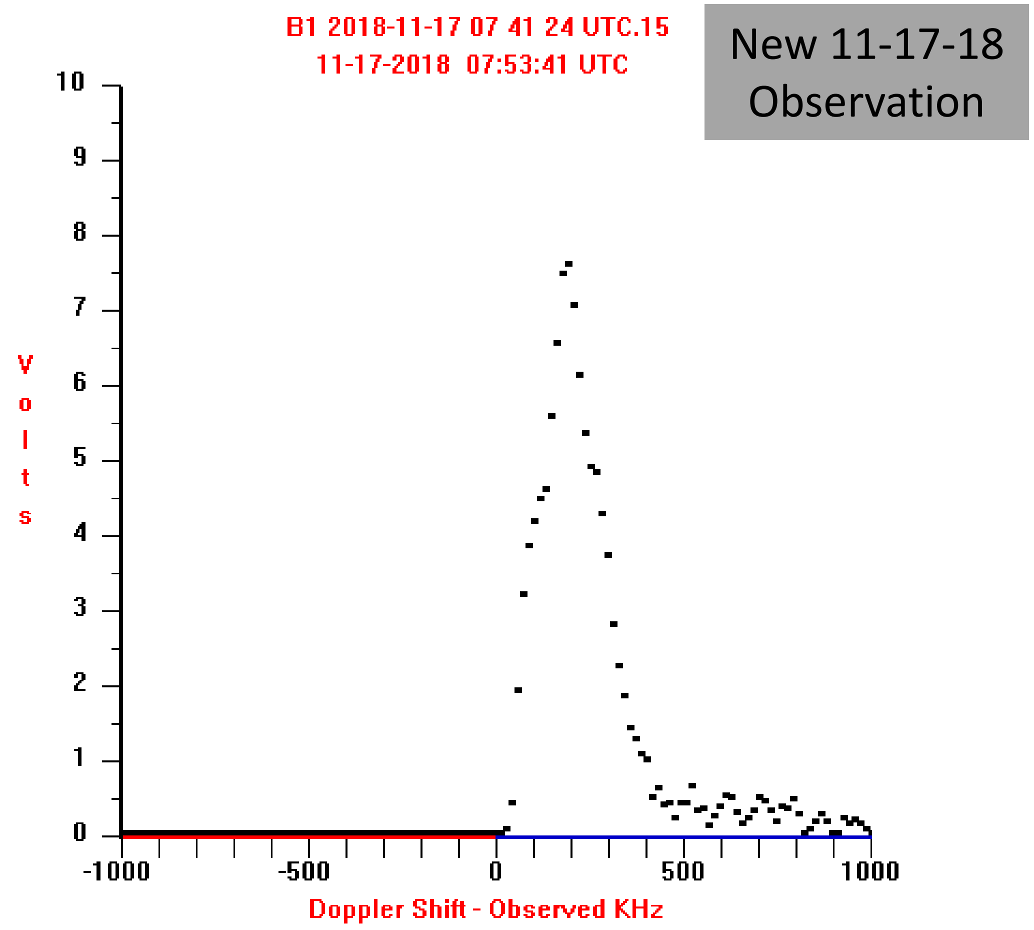
Galactic Lat 0 Long 140
RA 03h07m15s
DEC 58d17m51s



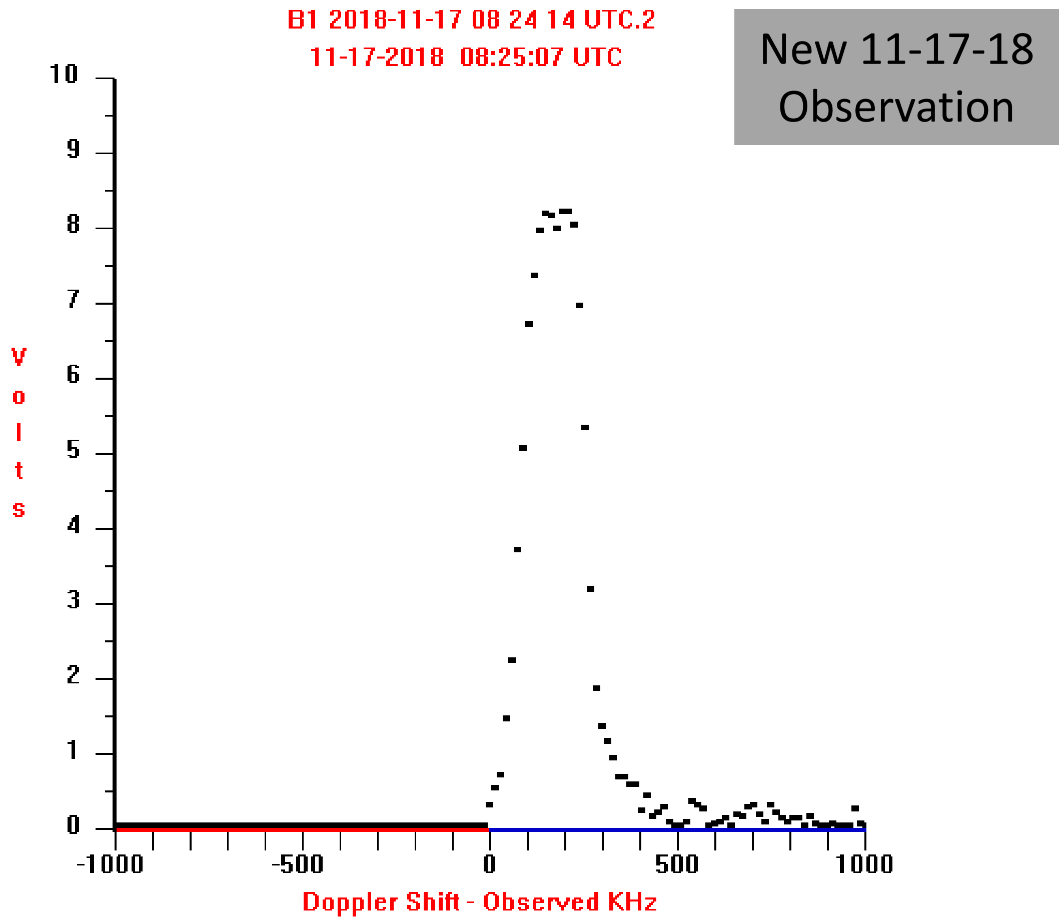
Galactic Lat 0 Long 150
RA 04h04m28s
DEC 52d25m12s



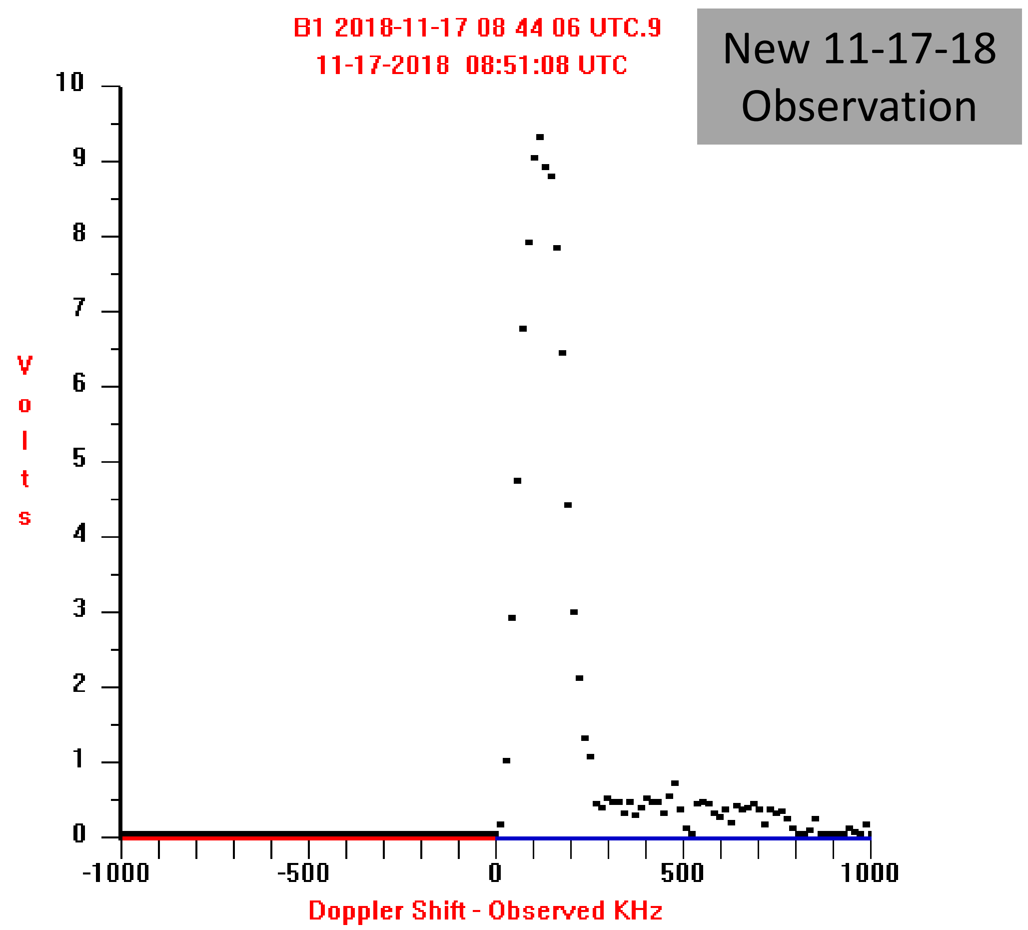
Galactic Lat 0 Long 160
RA 04h46m58s
DEC 45d14m46s



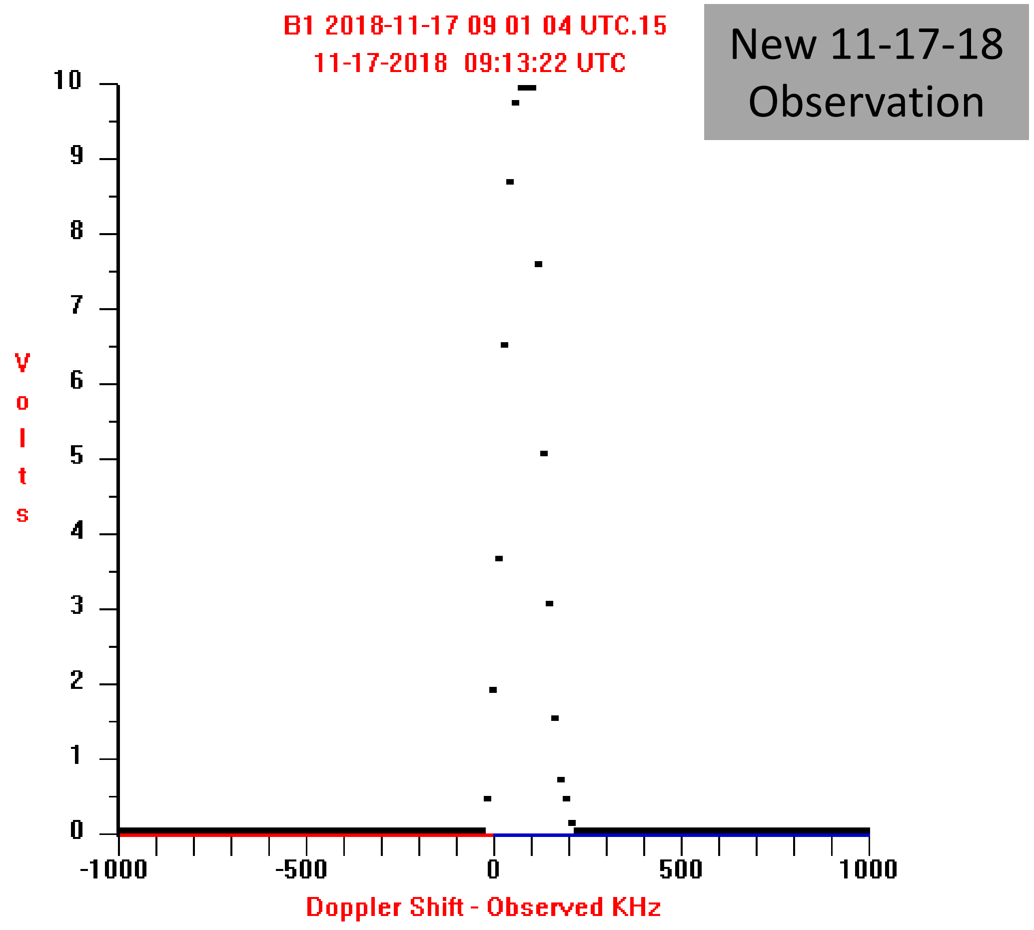
Galactic Lat 0 Long 170
RA 05h19m29s
DEC 37d18m54s



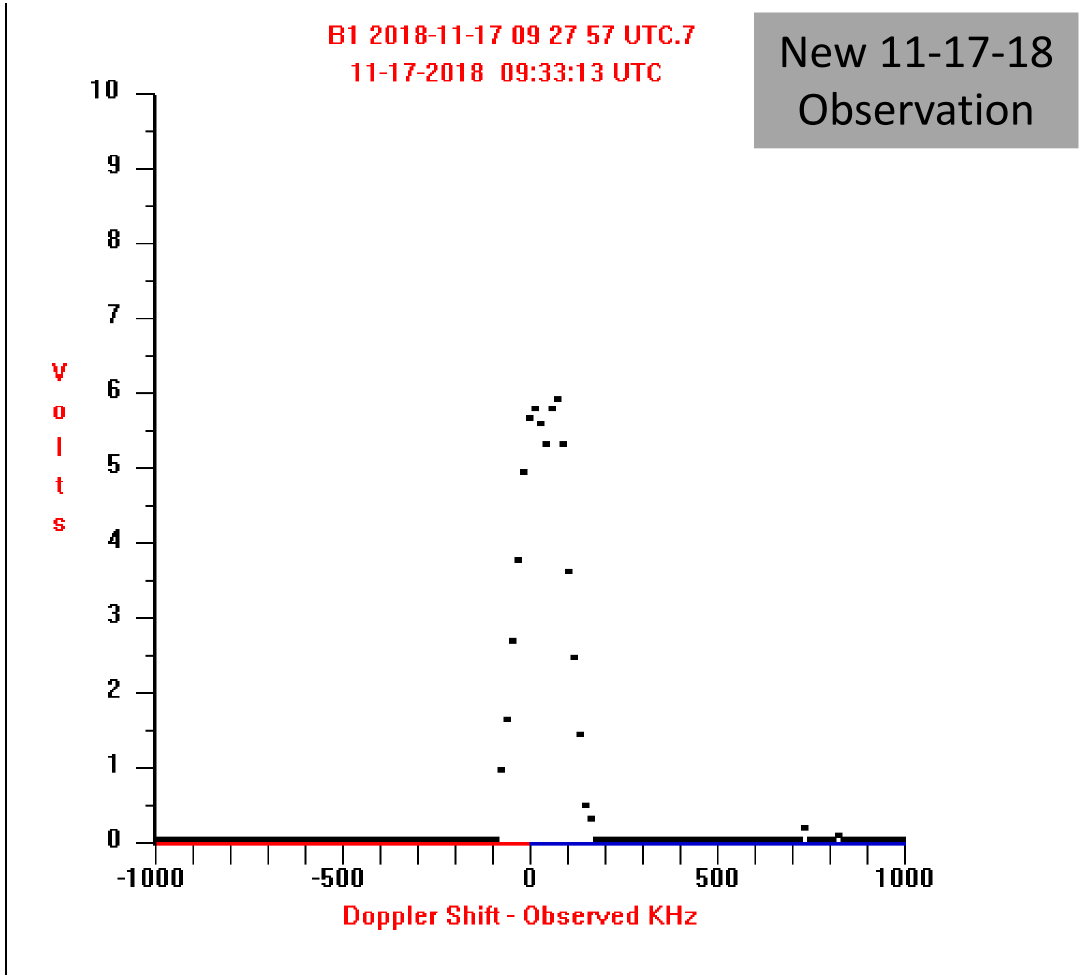
Galactic Lat 0 Long 180
RA 05h45m37s
DEC 28d56m10s



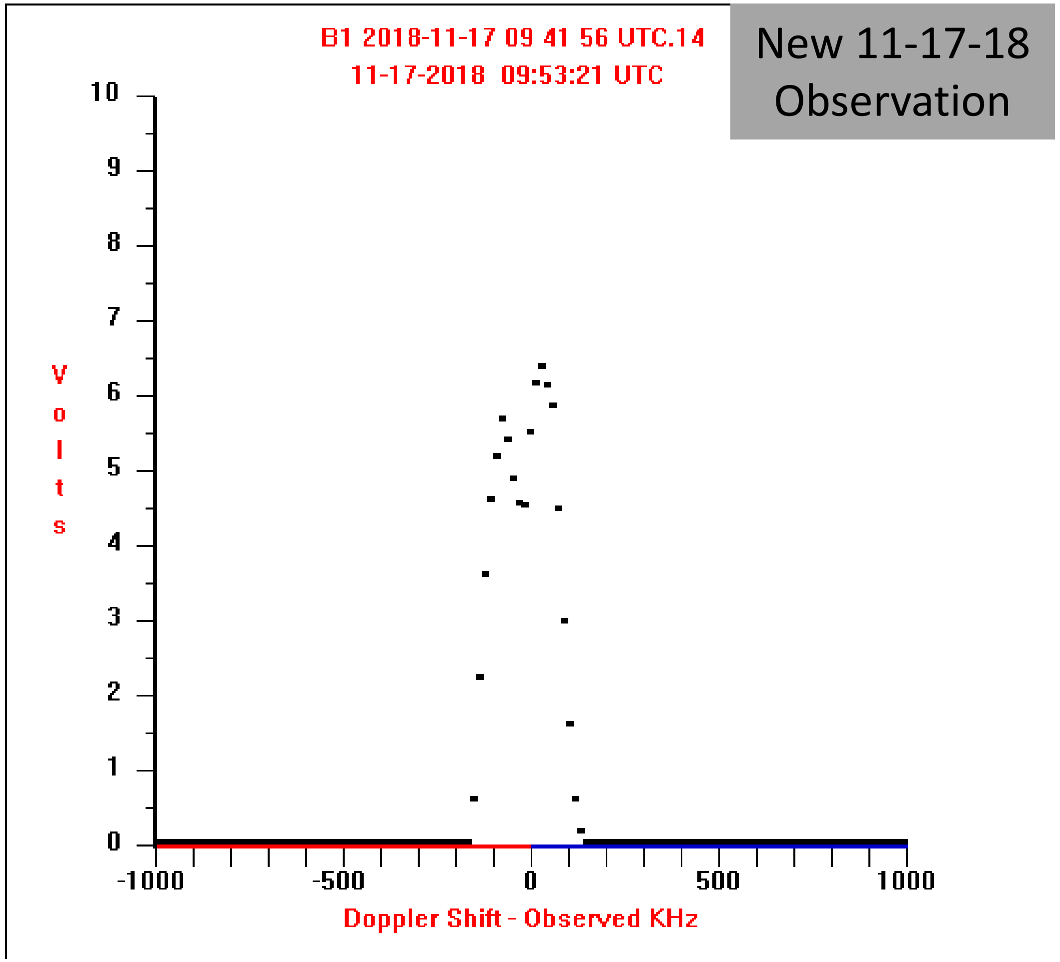
Galactic Lat 0 Long 190
RA 06h07m46s
DEC 20d17m24s



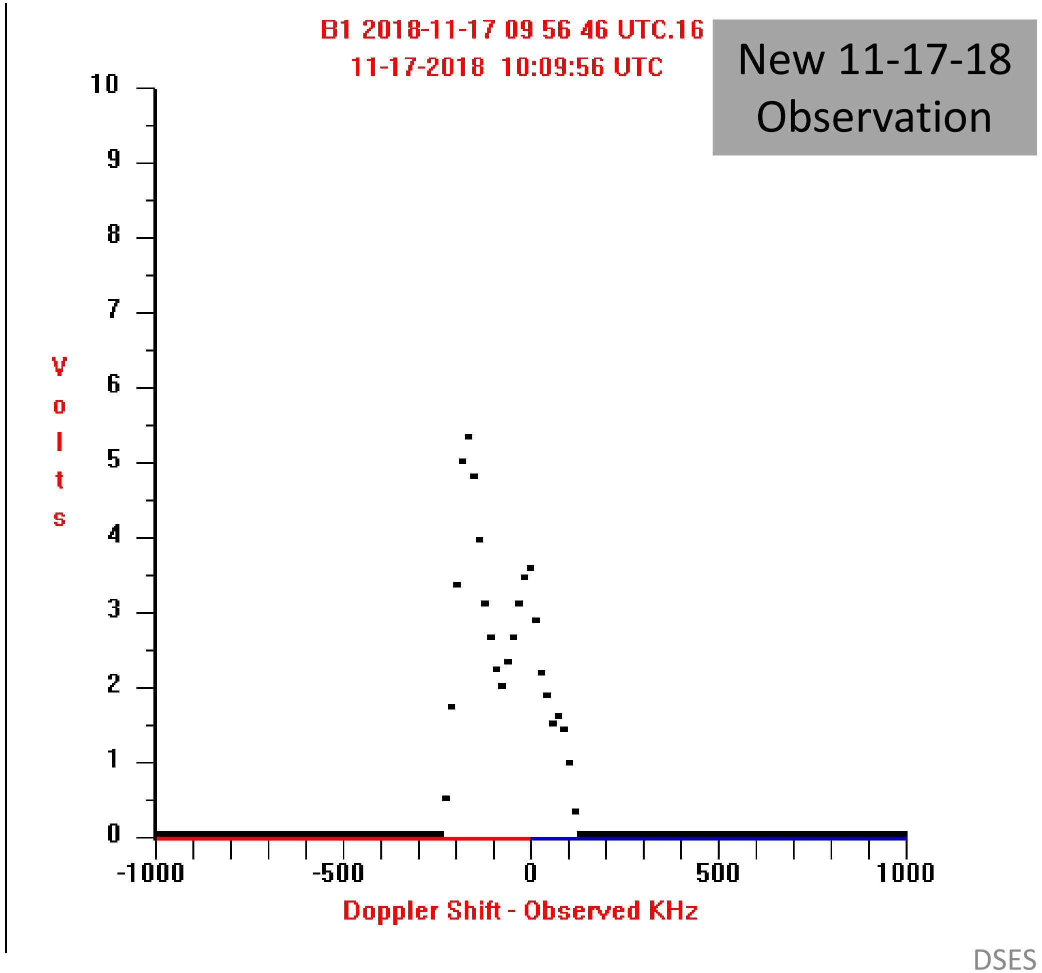
Galactic Lat 0 Long 200
RA 06h27m32s
DEC 11d29m19s



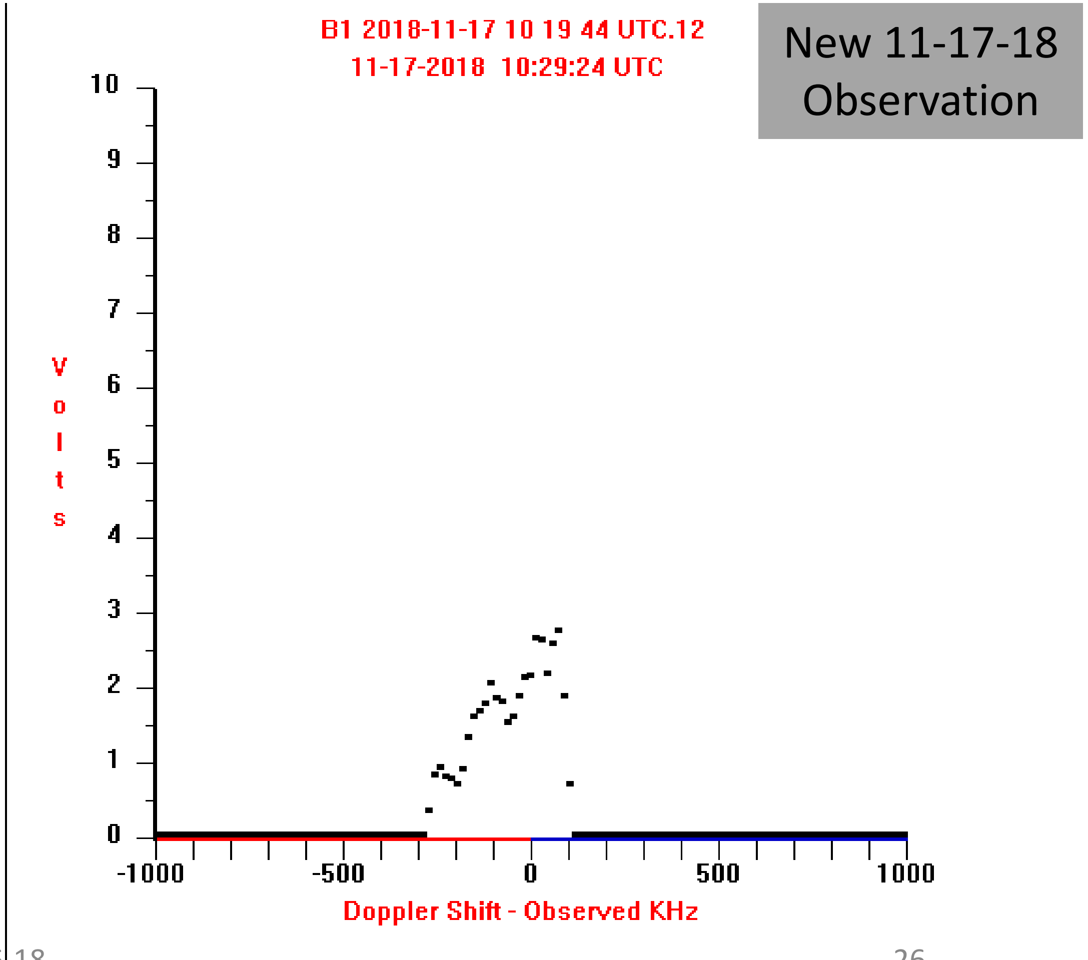
Galactic Lat 0 Long 210
RA 06h46m05s
DEC 02d56m33s



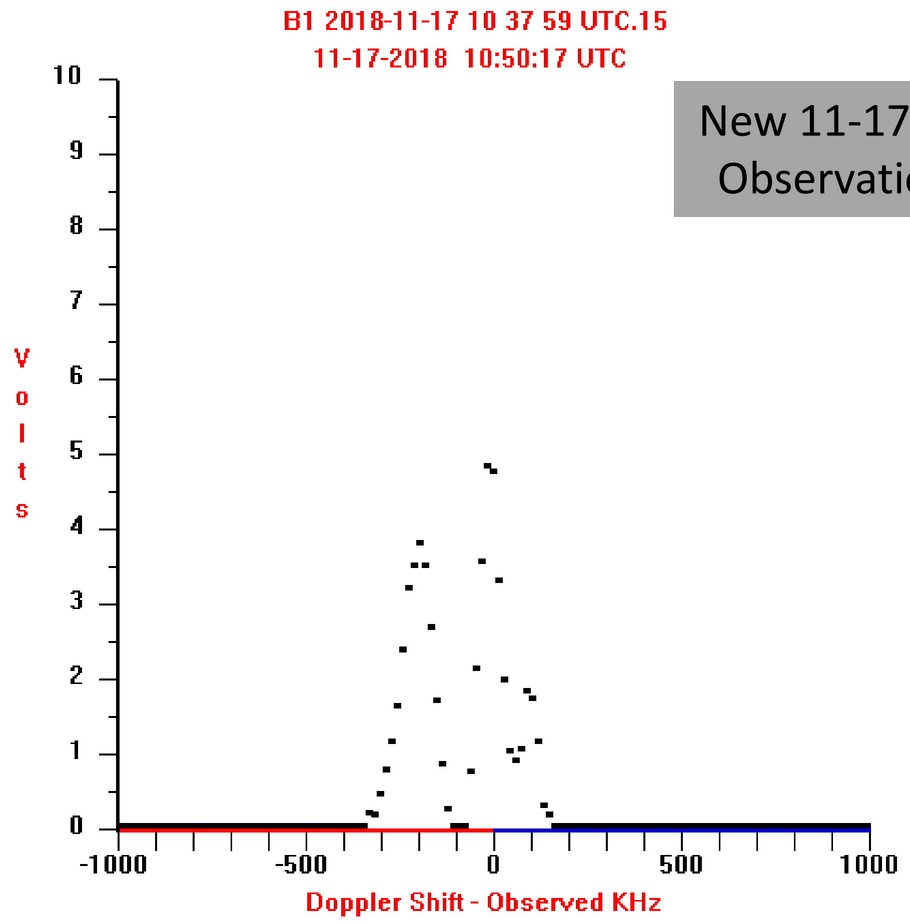
Galactic Lat 0 Long 220
RA 07h04m23s
DEC -06d17m14s



Galactic Lat 0 Long 230
RA 07h23m19s
DEC -15d08m32s

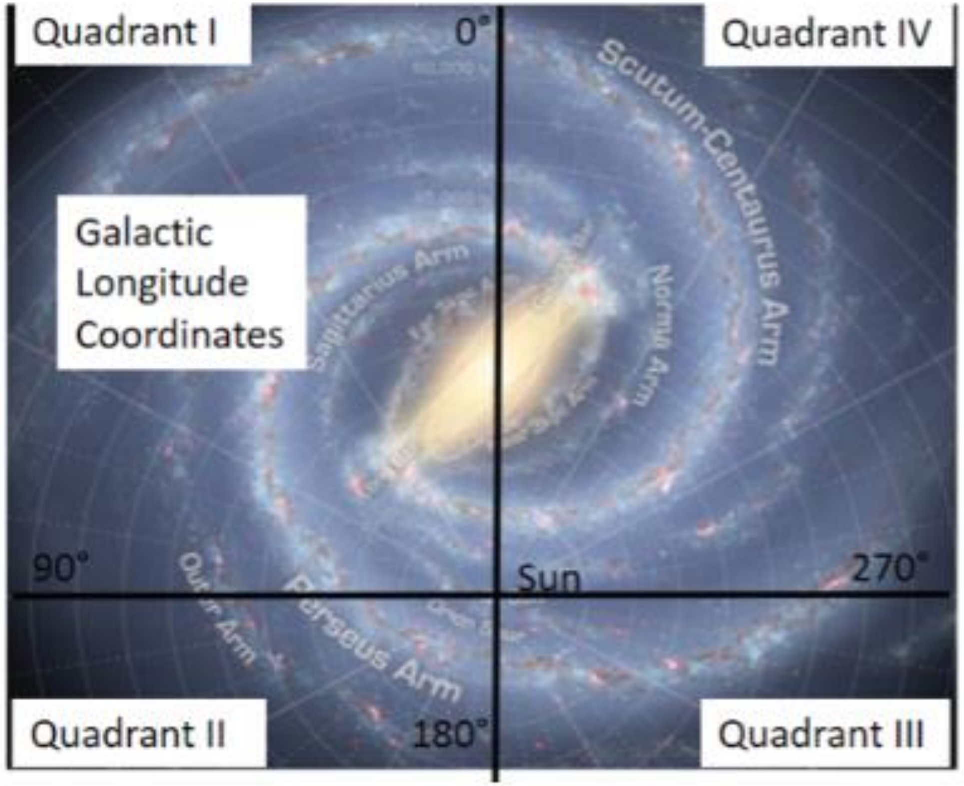


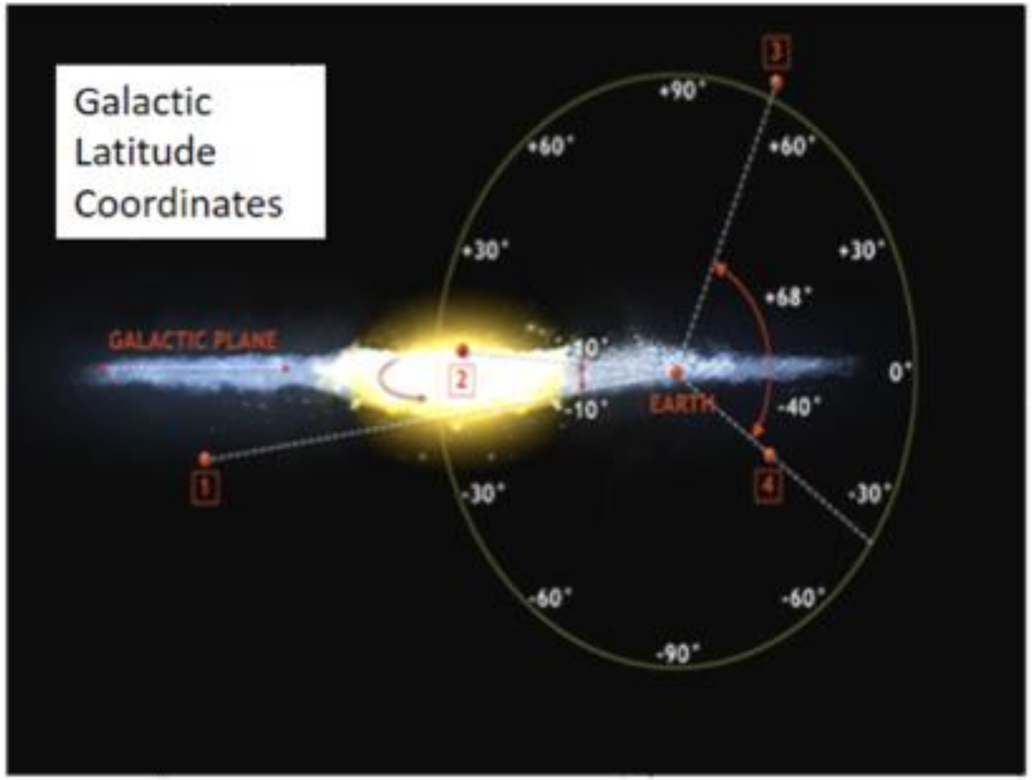
Galactic Lat 0 Long 240
RA 07h43m54s
DEC -23d53m25s



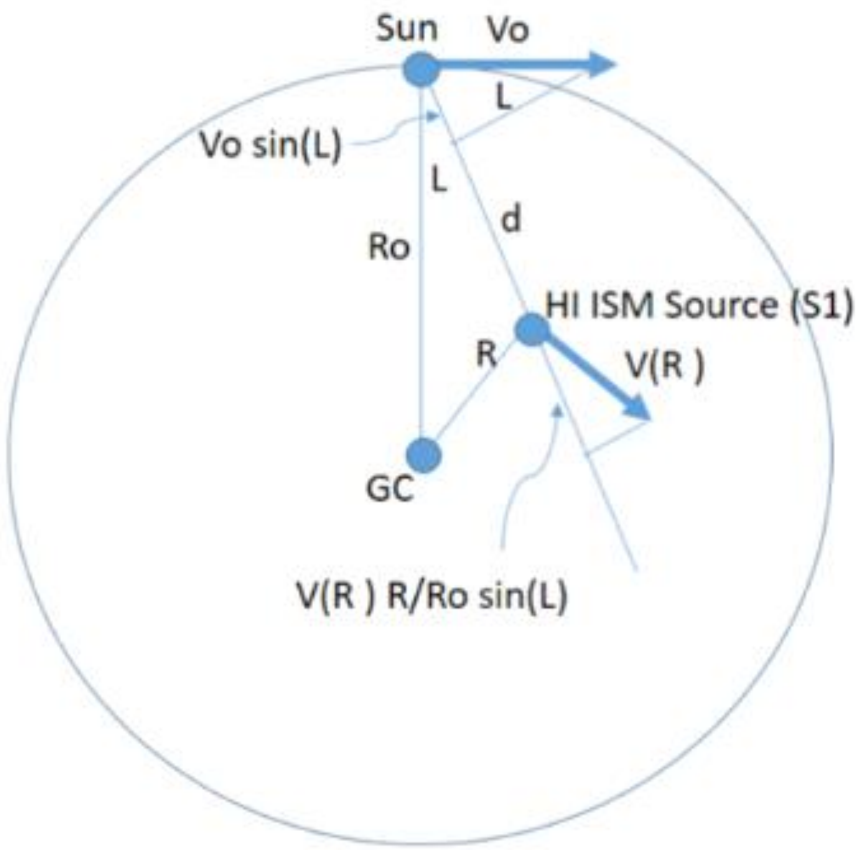
New 11-17-18 Observation

Milky Way Longitude and Latitude Coordinate System





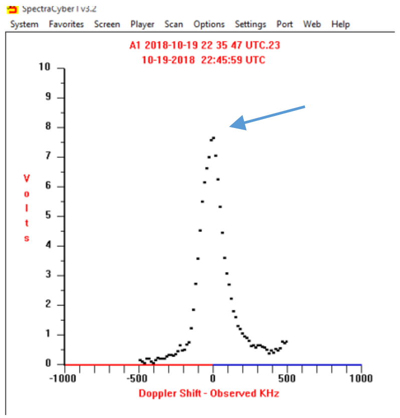
Rotation Rate Geometry (R< Ro)



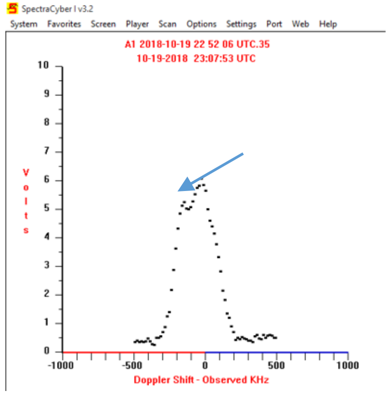
$$Vr = V(R)\frac{Ro}{R}sin(L) + Vo\ sin(L)$$

Galactic Rotation Data (10-20-18 Observations)

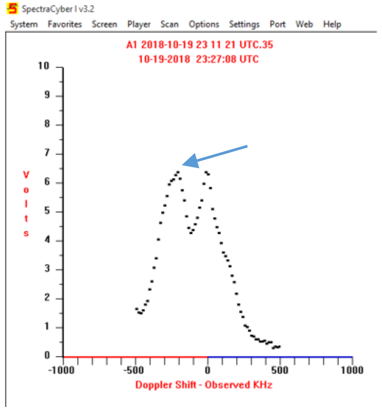
GLat 0 Glong 0



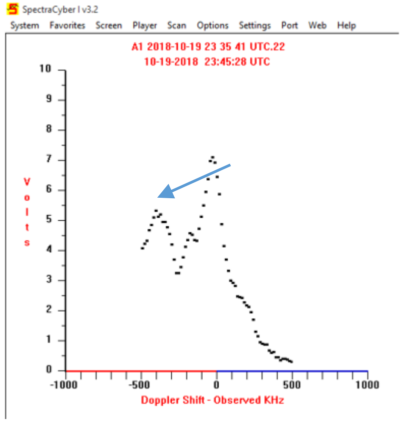
GLat 0 Glong 10



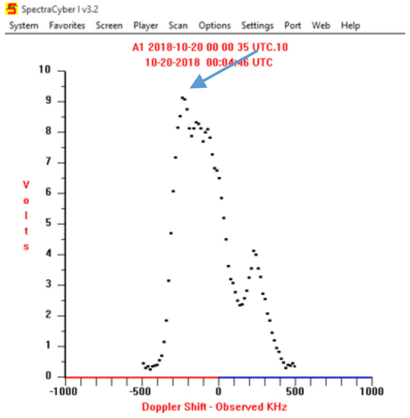
GLat 0 Glong 20



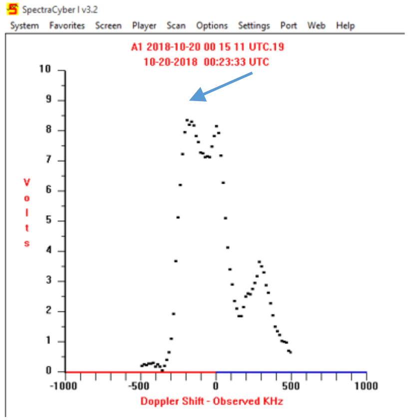
GLat 0 Glong 30



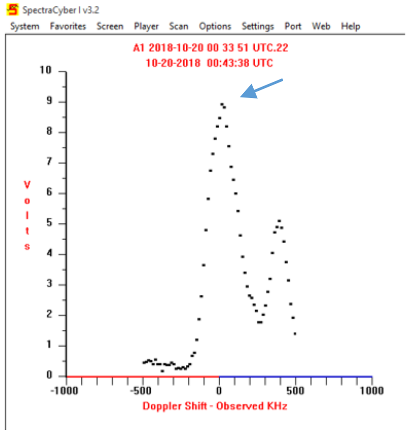
GLat 0 Glong 40



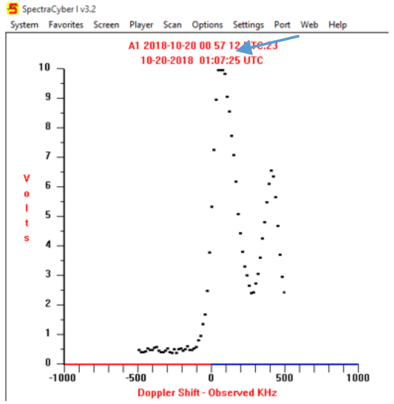
GLat 0 Glong 50



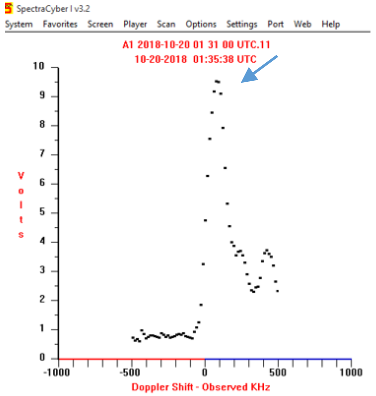
GLat 0 Glong 60



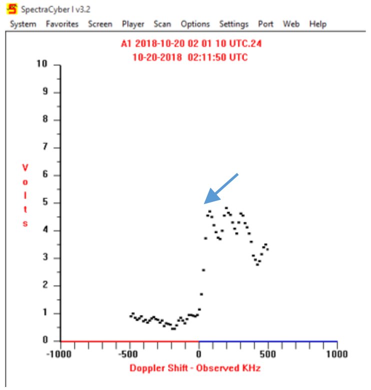
GLat 0 Glong 70



GLat 0 Glong 80



GLat 0 Glong 90



Galactic Rotation Data (11-17-18 Observations)

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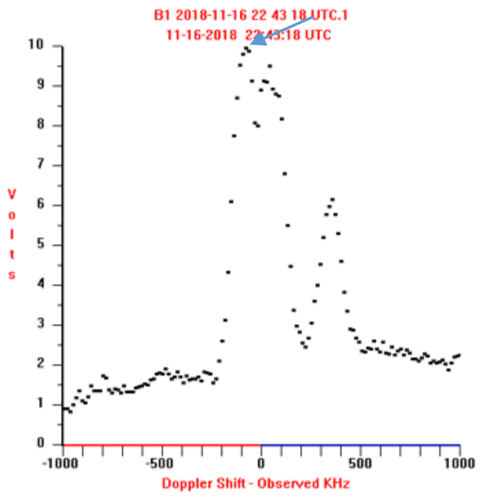

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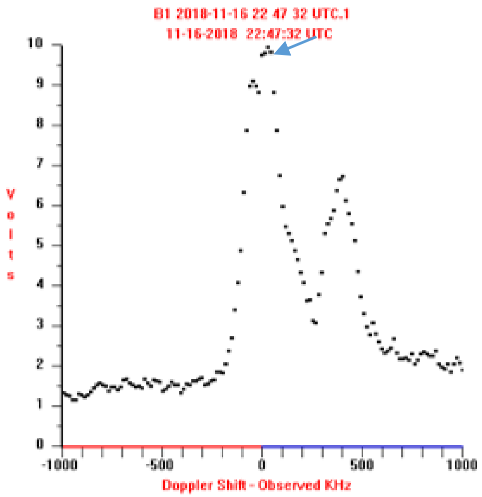

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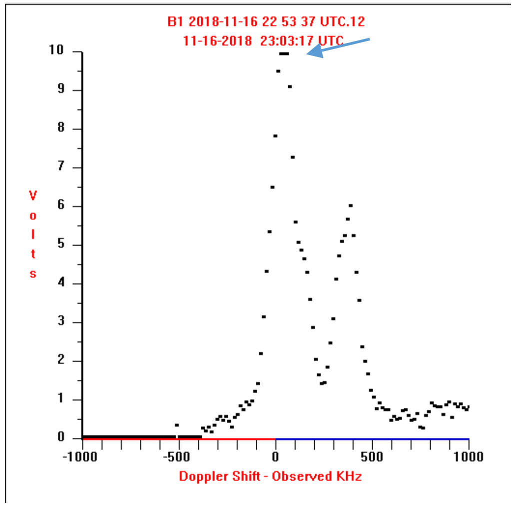

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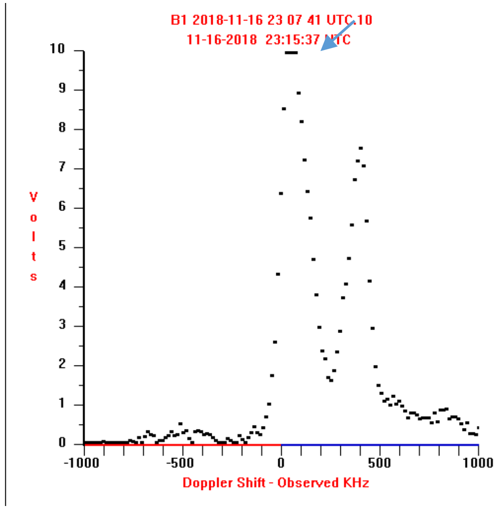

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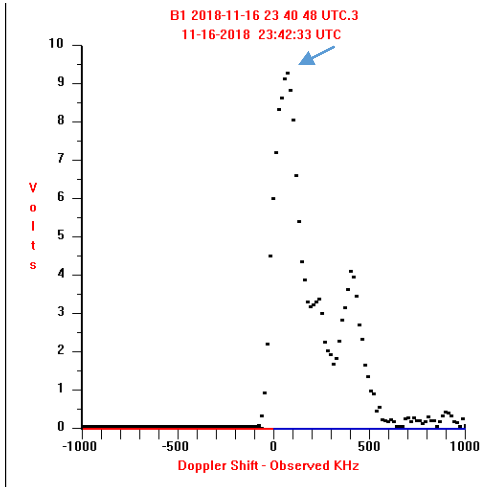

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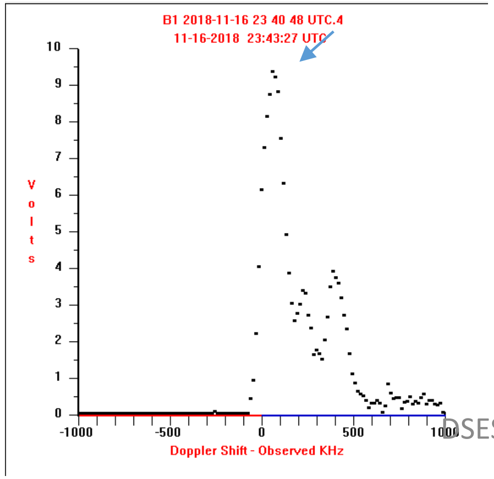
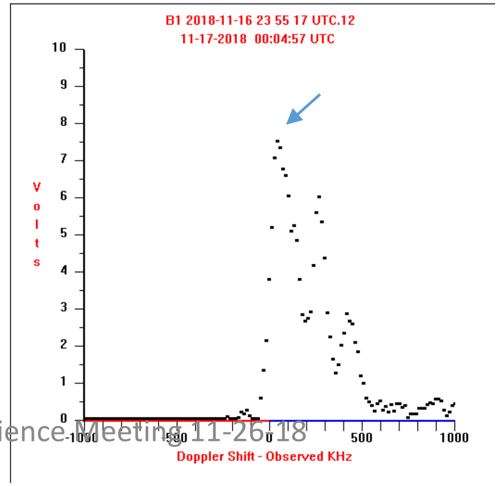


GLat 0 Glong 85



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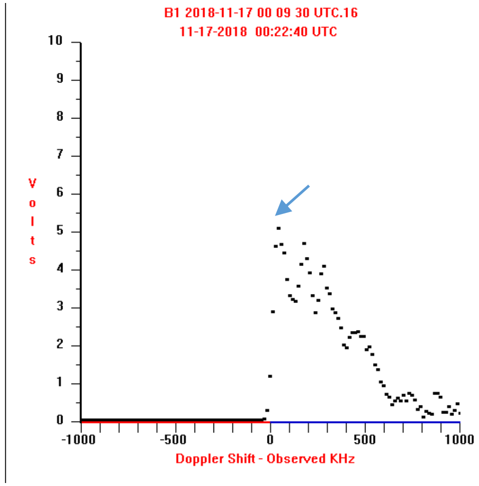
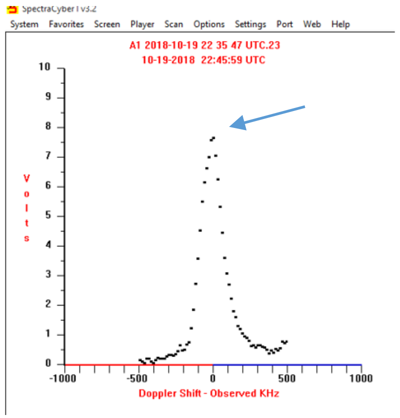
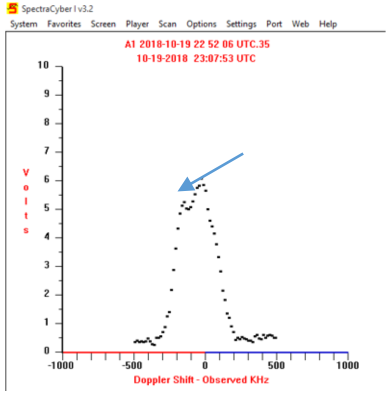


Galactic Rotation Data

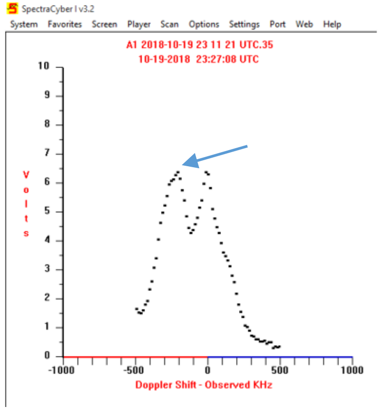
GLat 0 Glong 0



GLat 0 Glong 10



GLat 0 Glong 20



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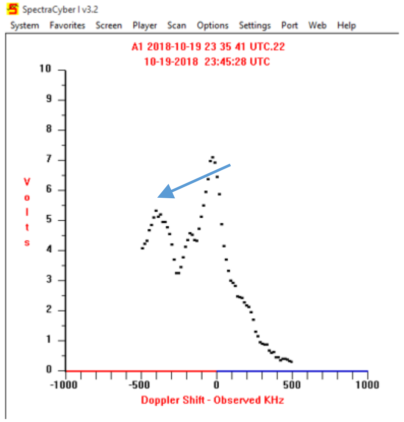

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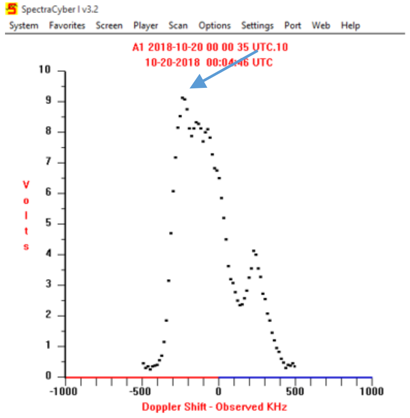
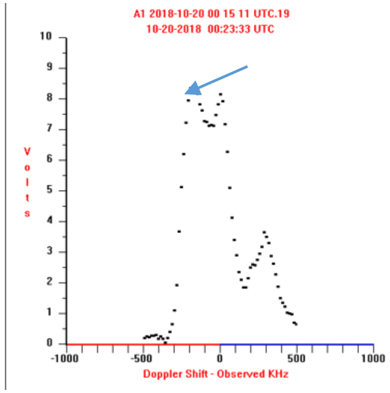
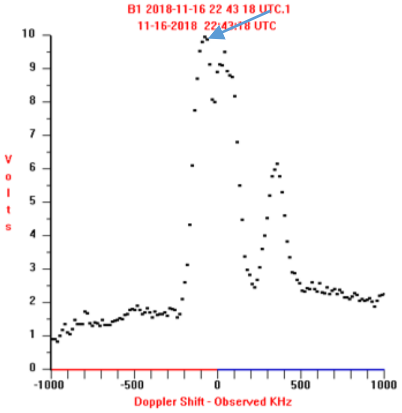


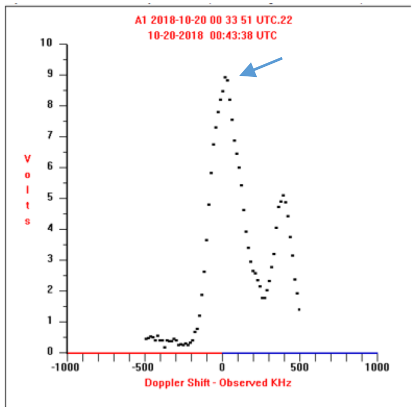
GLat 0 Glong 50



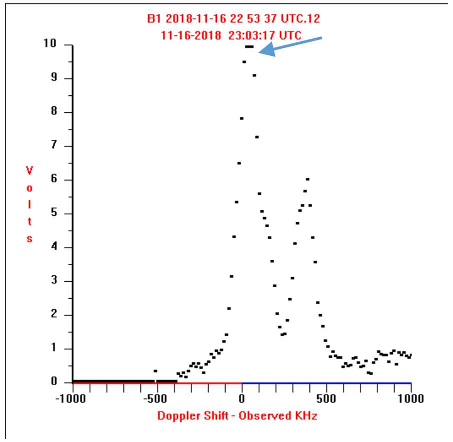
GLat 0 Glong 55



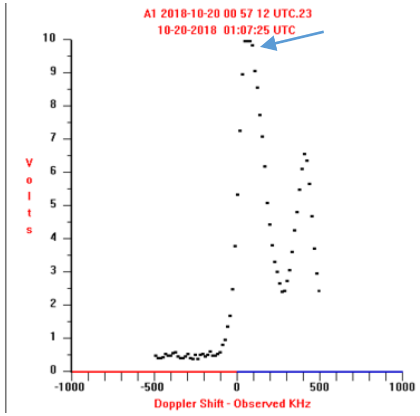
GLat 0 Glong 60



GLat 0 Glong 65

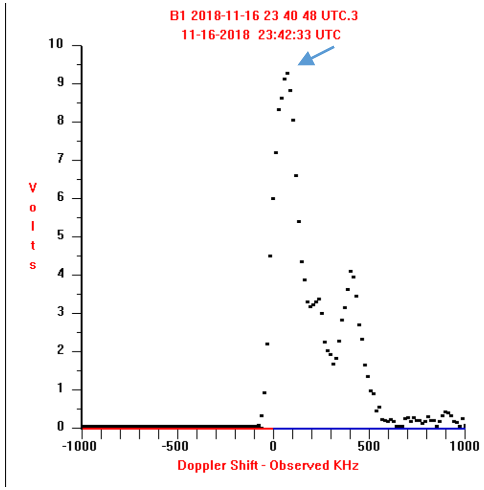


GLat 0 Glong 70

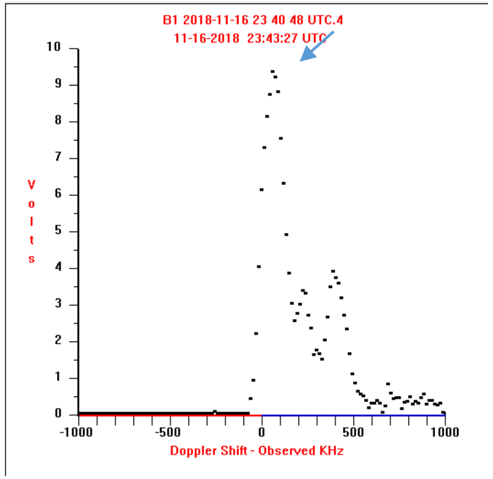


Galactic Rotation Data

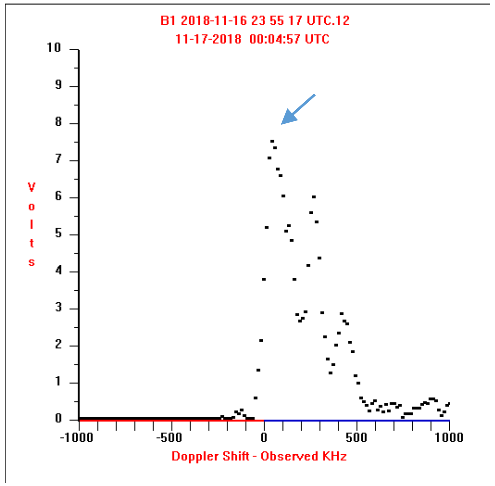
GLat 0 Glong 75



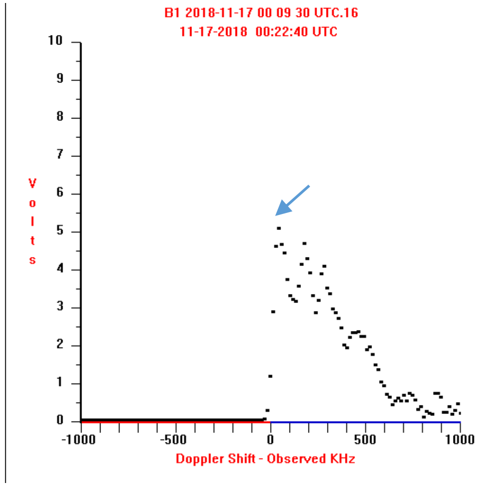
GLat 0 Glong 80



GLat 0 Glong 85



GLat 0 Glong 90



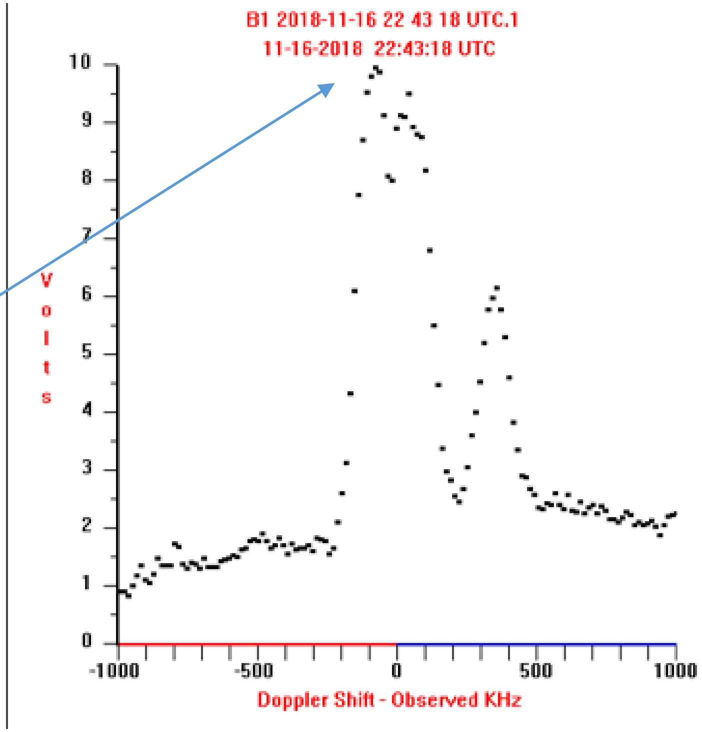
Calculating Velocities

Galactic Lat 0 Long 55
RA 19h33m29s DEC 19d32m04s

	A	B	C	D	E
1	HZ	HZ	s 11 16 2018 22 43 18 0.250000 -1000 1		s 10 20 2018 0 23 33 0.
2	5.0000	1,420,404,751	0.9399390	Offset	Delta
3	Nov 17 2018	1,420,404,756	0.9399390	5.02512540000	0.00000000000
4		1,420,404,761	0.9399390	Base Frequency	1,420,405,751
5		1,420,404,766	0.9350560	Min Peak	1,420,405,671
6		1,420,404,771	0.9350560	Doppler (km/Sec)	-16.88
7		1,420,404,776	0.9350560		
8		1,420,404,781	0.8520490	-204.73	
9		1,420,404,786	0.8520490	-203.67	
10		1,420,404,791	0.8520490	-202.62	
11		1,420,404,796	1.0351540	-201.56	
12		1,420,404,801	1.0351540	-200.51	

	A	B	C	D	E
185		1,420,405,666	9.9902090	-17.94	
186		1,420,405,671	9.9902090	-16.88	Min Peak
187		1,420,405,676	9.9902090	-15.83	
188		1,420,405,681	9.9120840	-14.77	

New 11-16-18 Observation



Frequency Used

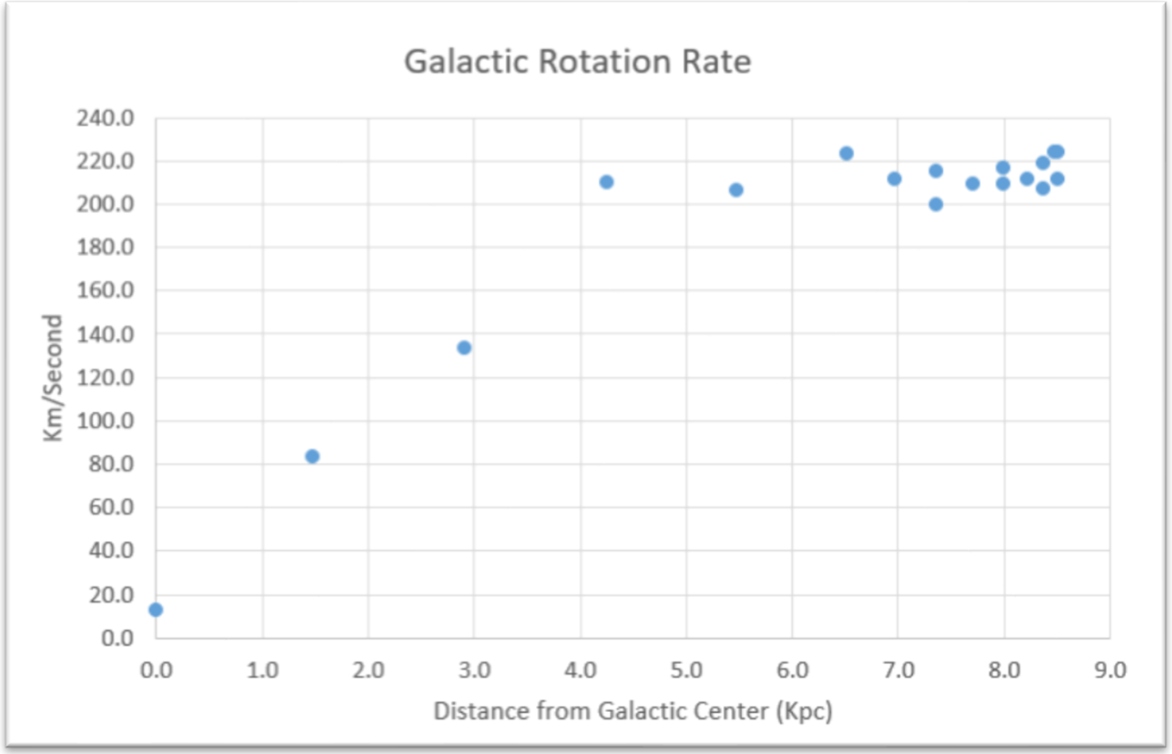
Quadrant I: Earth Orbital Velocity Corrections

Parameter	Value	Units
Velocity (Vr)	0	km/s
Galactic Long	0	Degrees
Circular Velocity	29.5	km/s
Earth Orbit Degrees from GC	0	degrees
Ecliptic Vs Gal Plane	60.2	degrees

Date	Days from Summer Solstice (22 June)	Earth Deg from GC	Velocity Long 0	Velocity Long 5	Velocity Long 10	Velocity Long 15	Velocity Long 20	Velocity Long 25	Velocity Long 30	Velocity Long 35	Velocity Long 40	Velocity Long 45	Velocity Long 50	Velocity Long 55	Velocity Long 60	Velocity Long 65	Velocity Long 70	Velocity Long 75	Velocity Long 80	Velocity Long 85	Velocity Long 90
22-Jun	0.0	0	0.0	-1.3	-2.5	-3.8	-5.0	-7.3	-7.3	-8.4	-9.4	-10.4	-11.2	-12.0	-12.7	-13.3	-13.8	-14.2	-14.4	-14.6	-14.7
2-Jul	10.1	10	2.5	1.3	0.0	-1.3	-2.5	-5.0	-5.0	-6.2	-7.3	-8.4	-9.4	-10.4	-11.2	-12.0	-12.7	-13.3	-13.8	-14.2	-14.4
12-Jul	20.3	20	5.0	3.8	2.5	1.3	0.0	-2.5	-2.5	-3.8	-5.0	-6.2	-7.3	-8.4	-9.4	-10.4	-11.2	-12.0	-12.7	-13.3	-13.8
22-Jul	30.4	30	7.3	6.2	5.0	3.8	2.5	0.0	0.0	-1.3	-2.5	-3.8	-5.0	-6.2	-7.3	-8.4	-9.4	-10.4	-11.2	-12.0	-12.7
30-Jul	40.6	40	9.4	8.4	7.3	6.2	5.0	2.5	2.5	1.3	0.0	-1.3	-2.5	-3.8	-5.0	-6.2	-7.3	-8.4	-9.4	-10.4	-11.2
9-Aug	50.7	50	11.2	10.4	9.4	8.4	7.3	5.0	5.0	3.8	2.5	1.3	0.0	-1.3	-2.5	-3.8	-5.0	-6.2	-7.3	-8.4	-9.4
19-Aug	60.8	60	12.7	12.0	11.2	10.4	9.4	7.3	7.3	6.2	5.0	3.8	2.5	1.3	0.0	-1.3	-2.5	-3.8	-5.0	-6.2	-7.3
30-Aug	71.0	70	13.8	13.3	12.7	12.0	11.2	9.4	9.4	8.4	7.3	6.2	5.0	3.8	2.5	1.3	0.0	-1.3	-2.5	-3.8	-5.0
9-Sep	81.1	80	14.4	14.2	13.8	13.3	12.7	11.2	11.2	10.4	9.4	8.4	7.3	6.2	5.0	3.8	2.5	1.3	0.0	-1.3	-2.5
19-Sep	91.3	90	14.7	14.6	14.4	14.2	13.8	12.7	12.7	12.0	11.2	10.4	9.4	8.4	7.3	6.2	5.0	3.8	2.5	1.3	0.0
29-Sep	101.4	100	14.4	14.6	14.7	14.6	14.4	13.8	13.8	13.3	12.7	12.0	11.2	10.4	9.4	8.4	7.3	6.2	5.0	3.8	2.5
9-Oct	111.5	110	13.8	14.2	14.4	14.6	14.7	14.4	14.4	14.2	13.8	13.3	12.7	12.0	11.2	10.4	9.4	8.4	7.3	6.2	5.0
19-Oct	121.7	120	12.7	13.3	13.8	14.2	14.4	14.7	14.7	14.6	14.4	14.2	13.8	13.3	12.7	12.0	11.2	10.4	9.4	8.4	7.3
29-Oct	131.8	130	11.2	12.0	12.7	13.3	13.8	14.4	14.4	14.6	14.7	14.6	14.4	14.2	13.8	13.3	12.7	12.0	11.2	10.4	9.4
8-Nov	141.9	140	9.4	10.4	11.2	12.0	12.7	13.8	13.8	14.2	14.4	14.6	14.7	14.6	14.4	14.2	13.8	13.3	12.7	12.0	11.2
19-Nov	152.1	150	7.3	8.4	9.4	10.4	11.2	12.7	12.7	13.3	13.8	14.2	14.4	14.6	14.7	14.6	14.4	14.2	13.8	13.3	12.7
29-Nov	162.2	160	5.0	6.2	7.3	8.4	9.4	11.2	11.2	12.0	12.7	13.3	13.8	14.2	14.4	14.6	14.7	14.6	14.4	14.2	13.8
9-Dec	172.4	170	2.5	3.8	5.0	6.2	7.3	9.4	9.4	10.4	11.2	12.0	12.7	13.3	13.8	14.2	14.4	14.6	14.7	14.6	14.4
19-Dec	182.5	180	0.0	1.3	2.5	3.8	5.0	7.3	7.3	8.4	9.4	10.4	11.2	12.0	12.7	13.3	13.8	14.2	14.4	14.6	14.7
29-Dec	192.6	190	-2.5	-1.3	0.0	1.3	2.5	5.0	5.0	6.2	7.3	8.4	9.4	10.4	11.2	12.0	12.7	13.3	13.8	14.2	14.4
8-Jan	202.8	200	-5.0	-3.8	-2.5	-1.3	0.0	2.5	2.5	3.8	5.0	6.2	7.3	8.4	9.4	10.4	11.2	12.0	12.7	13.3	13.8
18-Jan	212.9	210	-7.3	-6.2	-5.0	-3.8	-2.5	0.0	0.0	1.3	2.5	3.8	5.0	6.2	7.3	8.4	9.4	10.4	11.2	12.0	12.7
29-Jan	223.1	220	-9.4	-8.4	-7.3	-6.2	-5.0	-2.5	-2.5	-1.3	0.0	1.3	2.5	3.8	5.0	6.2	7.3	8.4	9.4	10.4	11.2
8-Feb	233.2	230	-11.2	-10.4	-9.4	-8.4	-7.3	-5.0	-5.0	-3.8	-2.5	-1.3	0.0	1.3	2.5	3.8	5.0	6.2	7.3	8.4	9.4
18-Feb	243.3	240	-12.7	-12.0	-11.2	-10.4	-9.4	-7.3	-7.3	-6.2	-5.0	-3.8	-2.5	-1.3	0.0	1.3	2.5	3.8	5.0	6.2	7.3
28-Feb	253.5	250	-13.8	-13.3	-12.7	-12.0	-11.2	-9.4	-9.4	-8.4	-7.3	-6.2	-5.0	-3.8	-2.5	-1.3	0.0	1.3	2.5	3.8	5.0
10-Mar	263.6	260	-14.4	-14.2	-13.8	-13.3	-12.7	-11.2	-11.2	-10.4	-9.4	-8.4	-7.3	-6.2	-5.0	-3.8	-2.5	-1.3	0.0	1.3	2.5
20-Mar	273.8	270	-14.7	-14.6	-14.4	-14.2	-13.8	-12.7	-12.7	-12.0	-11.2	-10.4	-9.4	-8.4	-7.3	-6.2	-5.0	-3.8	-2.5	-1.3	0.0
30-Mar	283.9	280	-14.4	-14.6	-14.7	-14.6	-14.4	-13.8	-13.8	-13.3	-12.7	-12.0	-11.2	-10.4	-9.4	-8.4	-7.3	-6.2	-5.0	-3.8	-2.5
10-Apr	294.0	290	-13.8	-14.2	-14.4	-14.6	-14.7	-14.4	-14.4	-14.2	-13.8	-13.3	-12.7	-12.0	-11.2	-10.4	-9.4	-8.4	-7.3	-6.2	-5.0
20-Apr	304.2	300	-12.7	-13.3	-13.8	-14.2	-14.4	-14.7	-14.7	-14.6	-14.4	-14.2	-13.8	-13.3	-12.7	-12.0	-11.2	-10.4	-9.4	-8.4	-7.3
30-Apr	314.3	310	-11.2	-12.0	-12.7	-13.3	-13.8	-14.4	-14.4	-14.6	-14.7	-14.6	-14.4	-14.2	-13.8	-13.3	-12.7	-12.0	-11.2	-10.4	-9.4
10-May	324.4	320	-9.4	-10.4	-11.2	-12.0	-12.7	-13.8	-13.8	-14.2	-14.4	-14.6	-14.7	-14.6	-14.4	-14.2	-13.8	-13.3	-12.7	-12.0	-11.2
20-May	334.6	330	-7.3	-8.4	-9.4	-10.4	-11.2	-12.7	-12.7	-13.3	-13.8	-14.2	-14.4	-14.6	-14.7	-14.6	-14.4	-14.2	-13.8	-13.3	-12.7
30-May	344.7	340	-5.0	-6.2	-7.3	-8.4	-9.4	-11.2	-11.2	-12.0	-12.7	-13.3	-13.8	-14.2	-14.4	-14.6	-14.7	-14.6	-14.4	-14.2	-13.8
9-Jun	354.9	350	-2.5	-3.8	-5.0	-6.2	-7.3	-9.4	-9.4	-10.4	-11.2	-12.0	-12.7	-13.3	-13.8	-14.2	-14.4	-14.6	-14.7	-14.6	-14.4
19-Jun	365.0	360	0.0	-1.3	-2.5	-3.8	-5.0	-7.3	-7.3	-8.4	-9.4	-10.4	-11.2	-12.0	-12.7	-13.3	-13.8	-14.2	-14.4	-14.6	-14.7

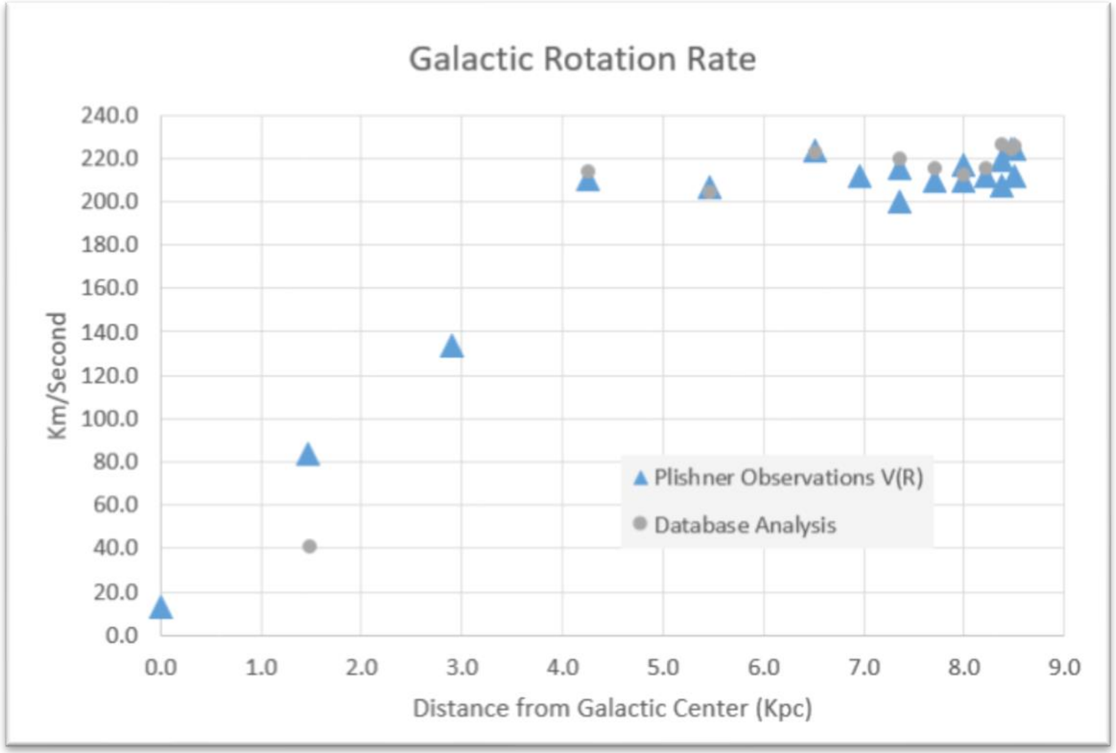
Galactic Rotation Rate Results

Galactic Long (Deg)	Most Neg Freq (Hz)	Max Velocity Vr (km/Second)	VoSin(L)	V(R)	Tangential Distance (kpc)	Observation Date	Earth Velocity (km/Sec) Contribution (Date Dependent)	Total V(R) without Earth Contribution (km/second)
0	1,420,405,751	0.0	0.0	0.0	0.0	10/20/2018	12.7	12.7
10	1,420,405,601	-31.7	38.2	69.9	1.5	10/20/2018	13.8	83.6
20	1,420,405,541	-44.3	75.2	119.6	2.9	10/20/2018	14.4	134.0
30	1,420,405,346	-85.5	110.0	195.5	4.3	10/20/2018	14.7	210.1
40	1,420,405,511	-50.7	141.4	192.1	5.5	10/20/2018	14.4	206.5
50	1,420,405,556	-41.2	168.5	209.7	6.5	10/20/2018	13.8	223.5
55	1,420,405,671	-16.9	180.2	197.1	7.0	11/17/2018	14.6	211.7
60	1,420,405,766	3.2	190.5	187.4	7.4	10/20/2018	12.7	200.1
60	1,420,405,701	-10.6	190.5	201.1	7.4	11/17/2018	14.7	215.7
65	1,420,405,771	4.2	199.4	195.2	7.7	11/17/2018	14.6	209.8
70	1,420,405,791	8.4	206.7	198.3	8.0	10/20/2018	11.2	209.5
70	1,420,405,771	4.2	206.7	202.5	8.0	11/17/2018	14.4	216.9
75	1,420,405,821	14.8	212.5	197.7	8.2	11/17/2018	14.2	211.9
80	1,420,405,841	19.0	216.7	197.7	8.4	10/20/2018	9.4	207.1
80	1,420,405,806	11.6	216.7	205.0	8.4	11/17/2018	13.8	218.8
85	1,420,405,791	8.4	219.2	210.7	8.5	11/17/2018	13.3	224.0
90	1,420,405,826	15.8	220.0	204.2	8.5	10/20/2018	7.3	211.5
90	1,420,405,791	8.4	220.0	211.6	8.5	11/17/2018	12.7	224.3



Galactic Rotation Rate Results
Comparison with Database Analysis

	A	B	C	F	G	H	I	J	K	L	M	N
1	Galactic Long (Deg)	Most Neg Freq (Hz)	Max Velocity Vr (km/Second)	VoSin(L)	V(R)	Tangential Distance (kpc)	Observation Date	Earth Velocity (km/Sec) Contribution (Date Dependent)	Total V(R) without Earth Contribution (km/second)	**Database Analysis Range (kpc)**	**Database V(R) (km/s)**	Delta (km/sec)
2	0	1,420,405,751	0.0	0.0	0.0	0.0	10/20/2018	12.7	12.7			
3	10	1,420,405,601	-31.7	38.2	69.9	1.5	10/20/2018	13.8	83.6	1.5	41.2	
4	20	1,420,405,541	-44.3	75.2	119.6	2.9	10/20/2018	14.4	134.0			
5	30	1,420,405,346	-85.5	110.0	195.5	4.3	10/20/2018	14.7	210.1	4.3	214.0	-3.9
6	40	1,420,405,511	-50.7	141.4	192.1	5.5	10/20/2018	14.4	206.5	5.5	204.4	2.1
7	50	1,420,405,556	-41.2	168.5	209.7	6.5	10/20/2018	13.8	223.5	6.5	222.5	0.9
8	55	1,420,405,671	-16.9	180.2	197.1	7.0	11/17/2018	14.6	211.7			
9	60	1,420,405,766	3.2	190.5	187.4	7.4	10/20/2018	12.7	200.1	7.4	219.5	-19.5
10	60	1,420,405,701	-10.6	190.5	201.1	7.4	11/17/2018	14.7	215.7			
11	65	1,420,405,771	4.2	199.4	195.2	7.7	11/17/2018	14.6	209.8	7.7	215.4	-5.6
12	70	1,420,405,791	8.4	206.7	198.3	8.0	10/20/2018	11.2	209.5	8.0	212.7	-3.2
13	70	1,420,405,771	4.2	206.7	202.5	8.0	11/17/2018	14.4	216.9			
14	75	1,420,405,821	14.8	212.5	197.7	8.2	11/17/2018	14.2	211.9	8.2	215.5	-3.6
15	80	1,420,405,841	19.0	216.7	197.7	8.4	10/20/2018	9.4	207.1	8.4	226.7	-19.6
16	80	1,420,405,806	11.6	216.7	205.0	8.4	11/17/2018	13.8	218.8			
17	85	1,420,405,791	8.4	219.2	210.7	8.5	11/17/2018	13.3	224.0	8.5	224.2	-0.2
18	90	1,420,405,826	15.8	220.0	204.2	8.5	10/20/2018	7.3	211.5			
19	90	1,420,405,791	8.4	220.0	211.6	8.5	11/17/2018	12.7	224.3	8.5	226.0	-1.7
20											STDev	7.4



Mass of Milky Way inside R=8.5kpc

$$M = \frac{V^2 R}{G}$$

$$M = \frac{\left(224.3\,\frac{km}{s}\,x\,\frac{10^3 m}{km}\right)^2 (8.5kpc)\left(\frac{3.09x10^{19}m}{1kpc}\right)}{(6.67x10^{-11}m^3kg^{-1}s^{-2})} = 1.98x10^{41}kg$$

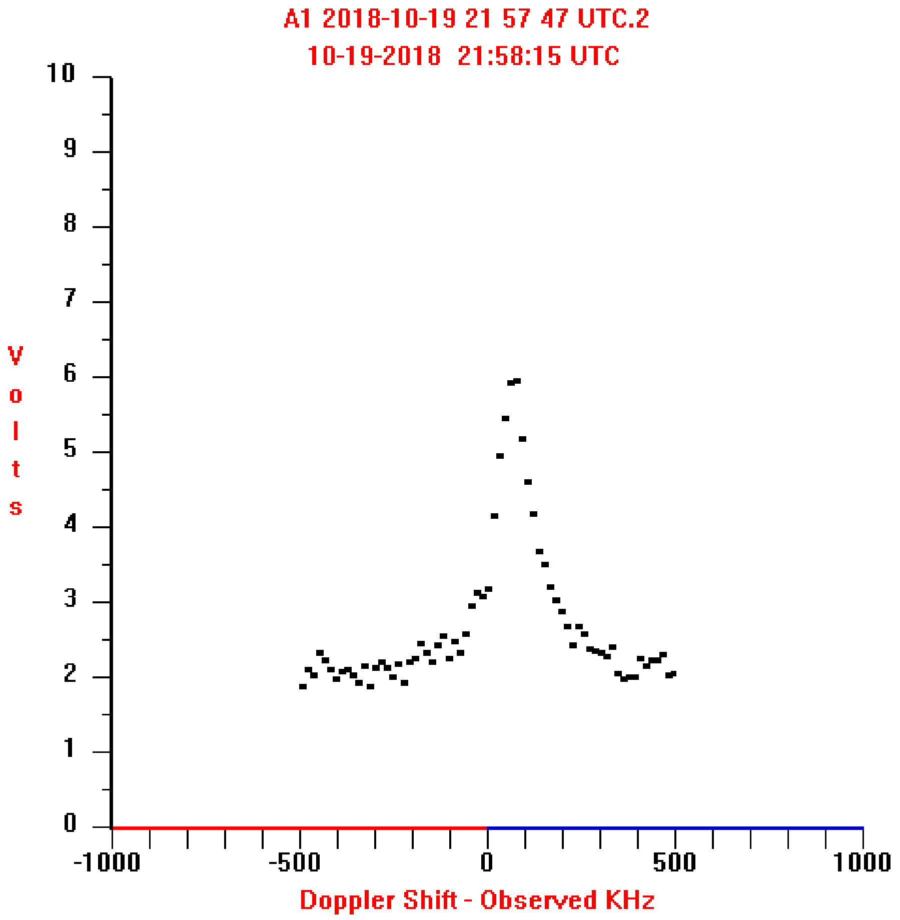
$$M = (1.98x10^{41}kg)\left(\frac{1Msun}{2x10^{30}kg}\right) = \mathbf{9.9x10^{10}Msun \approx 1.0x10^{11}Msun}$$

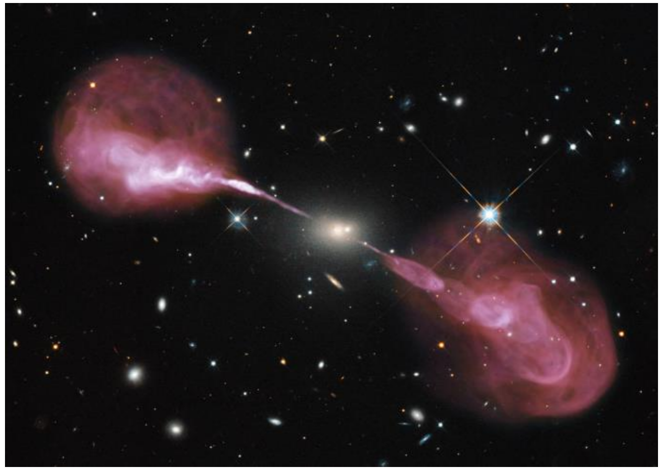
Based On Galactic Radio Astronomy $\quad M \approx \mathbf{1.0x10^{11}Msun\,\frac{R}{Ro}}$

Complete 60-Foot Antenna Spectracyber Observations

Source: 3C348 (Hercules A)
RA 16h48m DEC 05d04m
46.73 JY

10-19-18
Observation





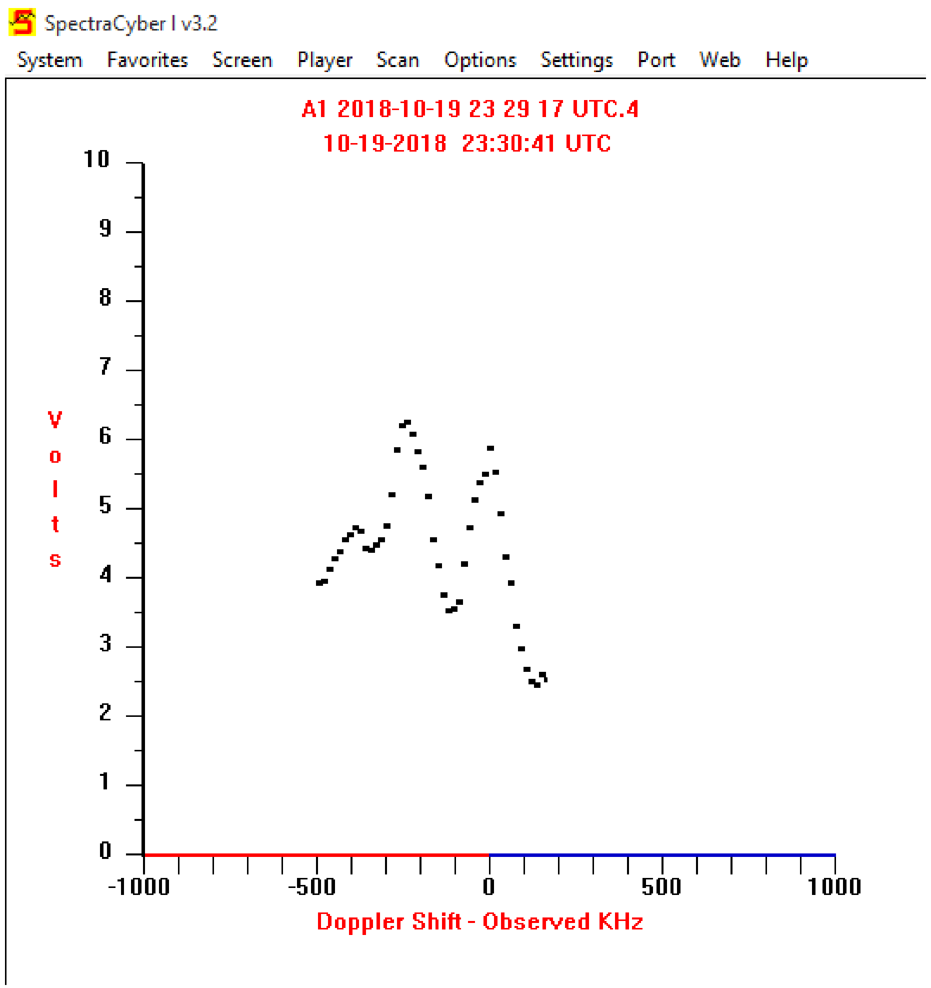
APOD: 2012 December 5 - Plasma Jets from Radio Galaxy Hercules A

Explanation: Why does this galaxy emit such spectacular jets? No one is sure, but it is likely related to an active supermassive black hole at its center. The galaxy at the image center, Hercules A, appears to be a relatively normal elliptical galaxy in visible light. When imaged in radio waves, however, tremendous plasma jets over one million light years long appear. Detailed analyses indicate that the central galaxy, also known as 3C 348, is actually over 1,000 times more massive than our Milky Way Galaxy, and the central black hole is nearly 1,000 times more massive than the black hole at our Milky Way's center. Pictured above is a visible light image obtained by the Earth-orbiting Hubble Space Telescope superposed with a radio image taken by the recently upgraded Very Large Array (VLA) of radio telescopes in New Mexico, USA. The physics that creates the jets remains a topic of research with a likely energy source being infalling matter swirling toward the central black hole.

Source: https://apod.nasa.gov/apod/ap121205.html

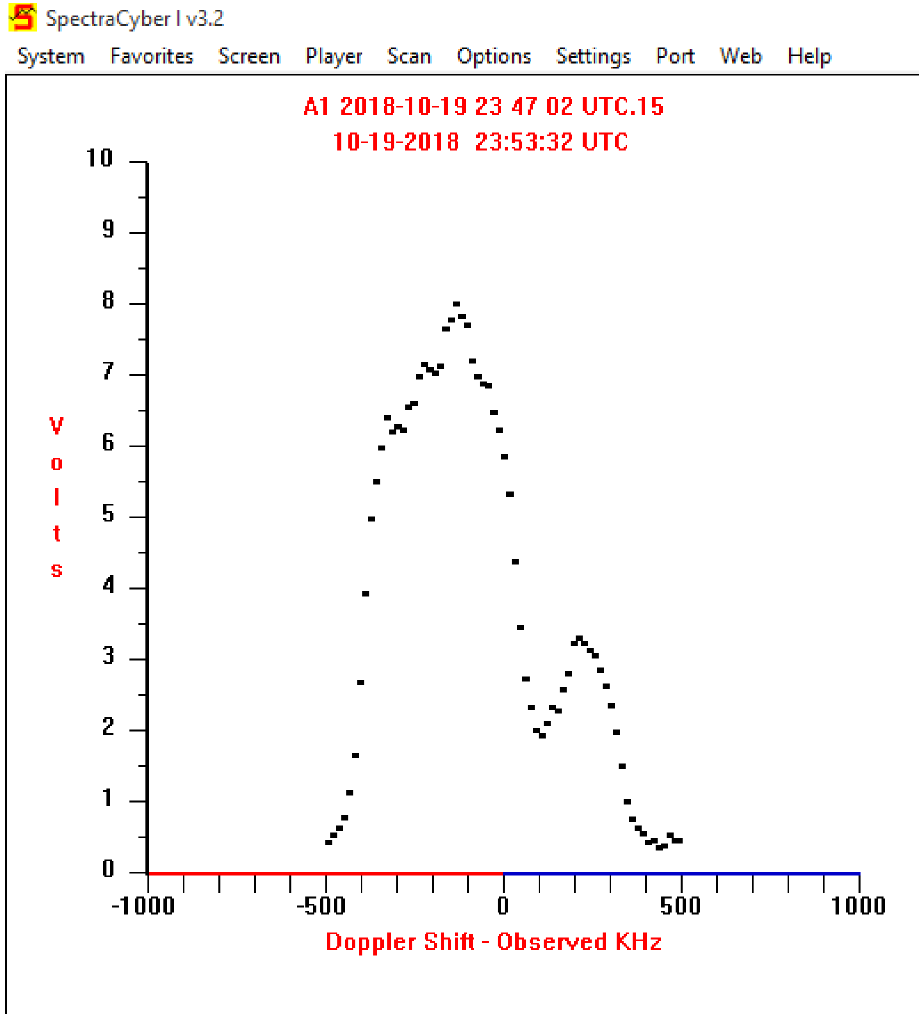
Source: Unknown
RA 18h30m DEC -10d10m

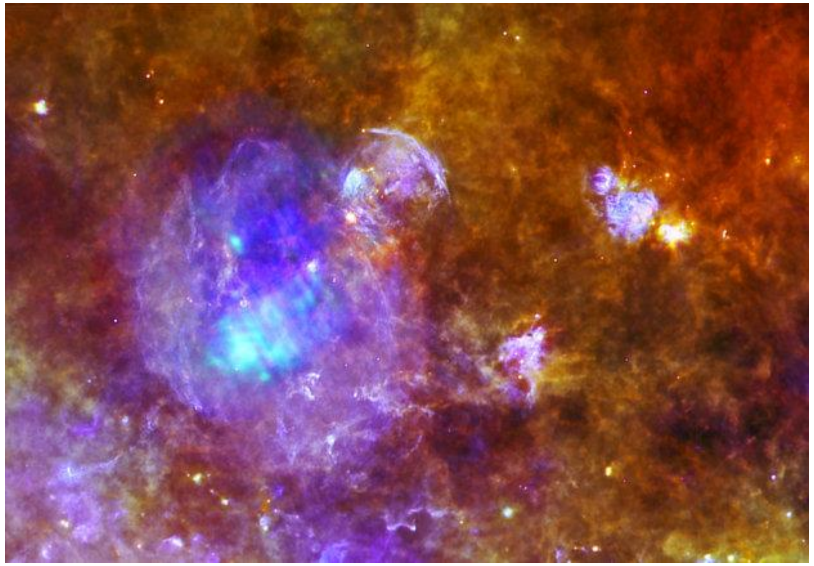
10-19-18 Observation



Source: W44 (Supernova Remnant) RA 18h53m30s DEC 1d18m 230 JY

10-19-18 Observation



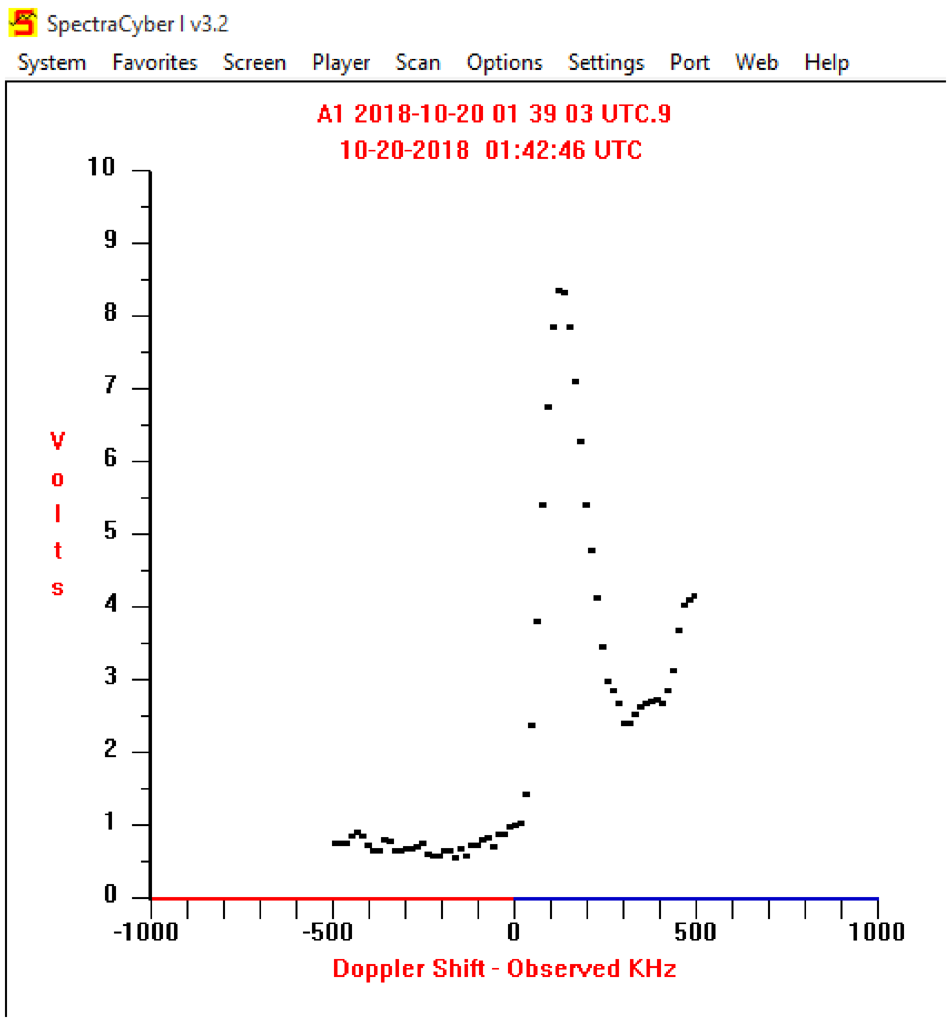


- The aftershock of a stellar explosion rippling through space is captured in this new view of supernova remnant W44, which combines far-infrared and X-ray data from ESA's Herschel and XMM-Newton space observatories.
- W44, located around 10 000 light-years away within a forest of dense star-forming clouds in the constellation of Aquila, the Eagle, is one of the best examples of a supernova remnant interacting with its parent molecular cloud.

Source: http://www.esa.int/Our_Activities/Space_Science/Herschel/Life_and_death_in_a_star-forming_cloud

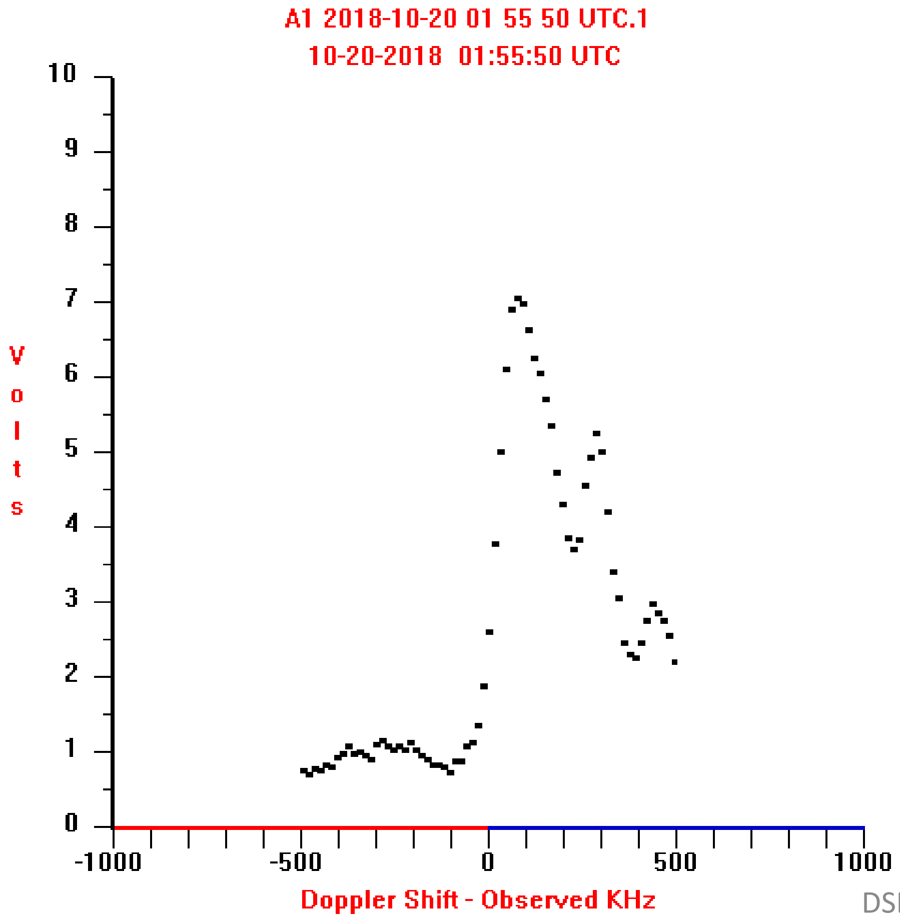
Source: HB21 (Supernova remnant)
RA 20h43m DEC 50d25m
220 JY

10-20-18 Observation



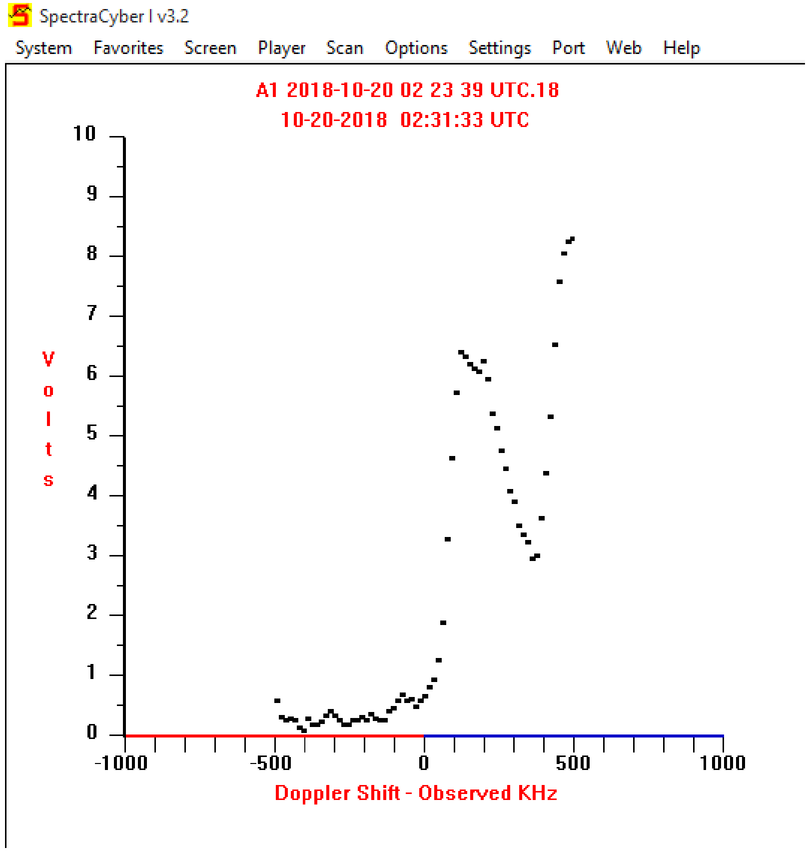
Source: W80 (HII Ionized region)
RA 20h55m DEC 44d03m
550 JY

10-20-18
Observation

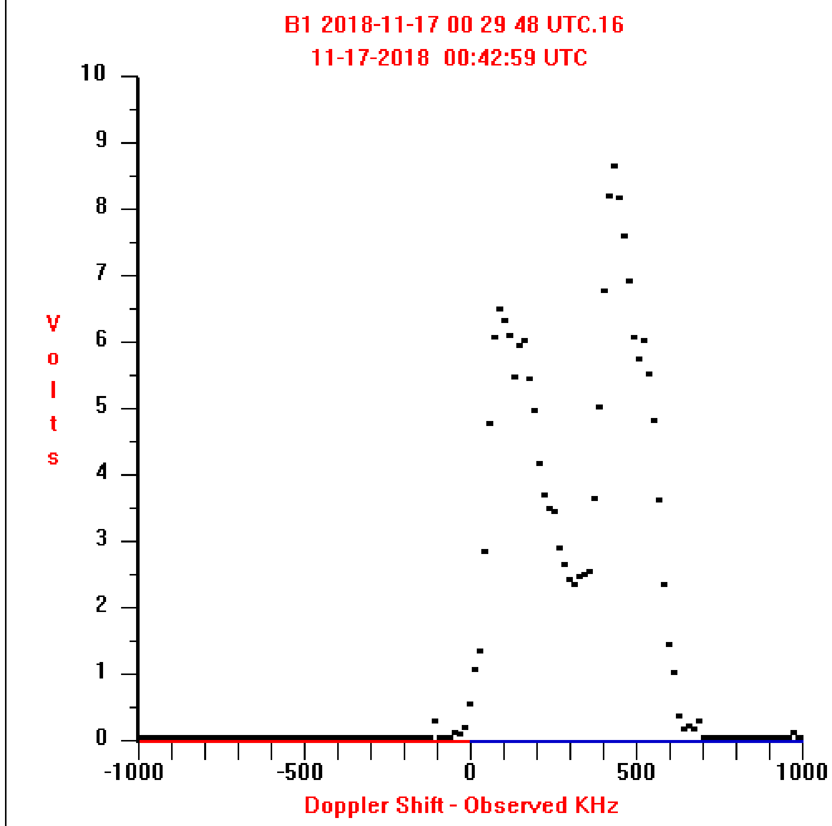


Source: DA554 (Part of HB22) RA 21h35m DEC 57d39m (106 JY @1420Mhz)

10-20-18 Observation



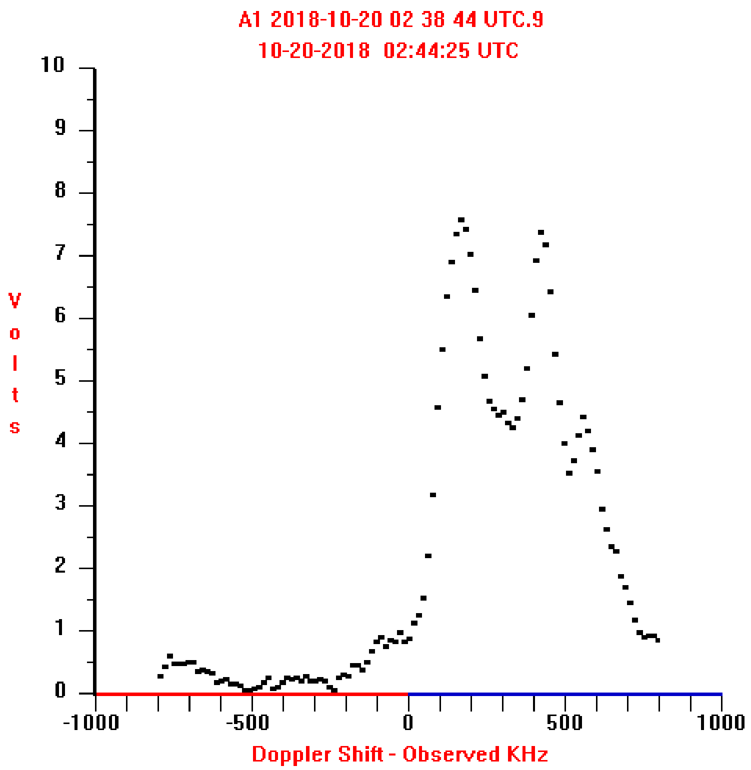
New 11-17-18 Observation

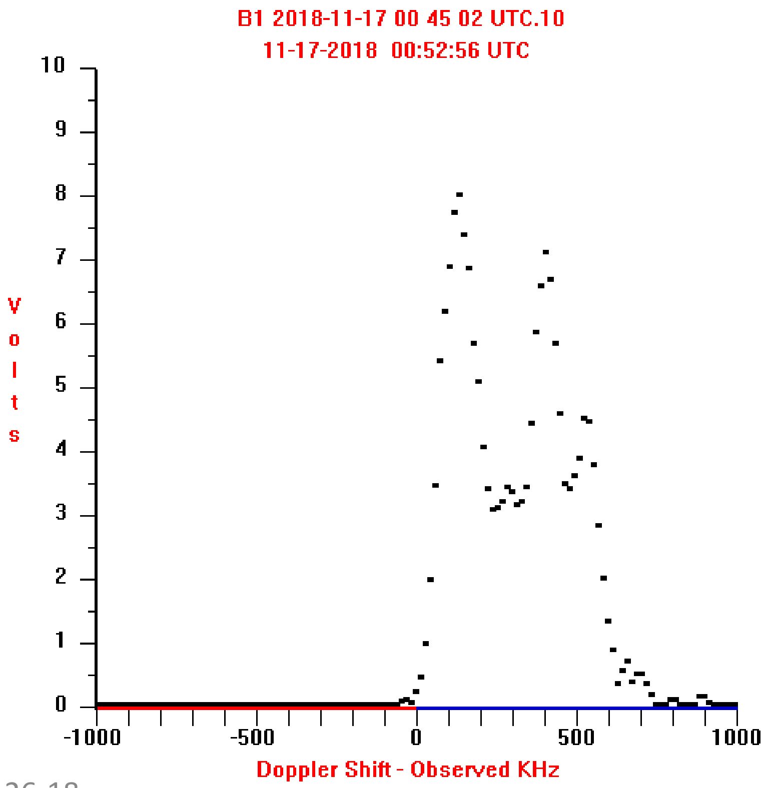


Source: DA 560
RA 21h44m DEC 57d33m
64 JY

10-20-18
Observation

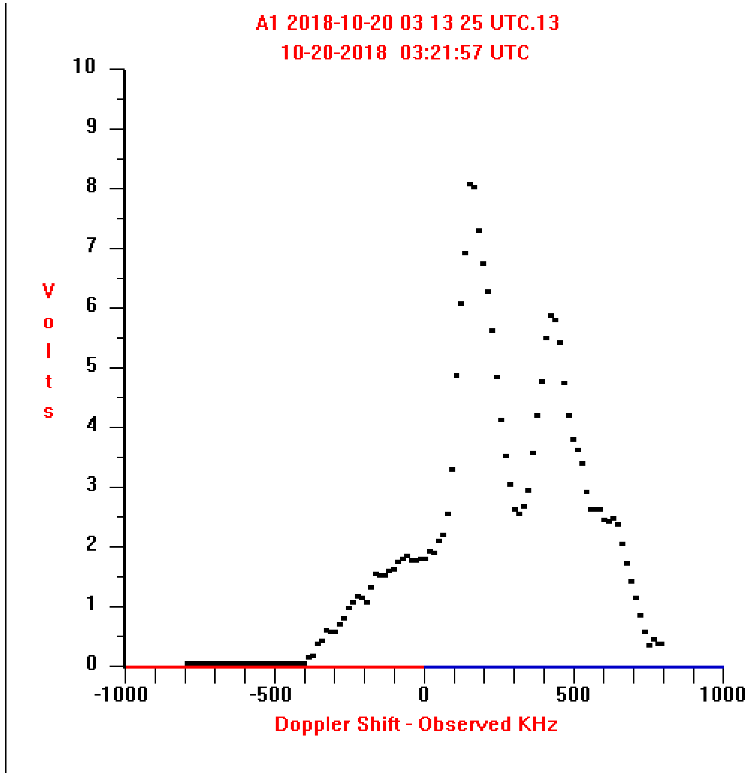
New 11-17-18
Observation



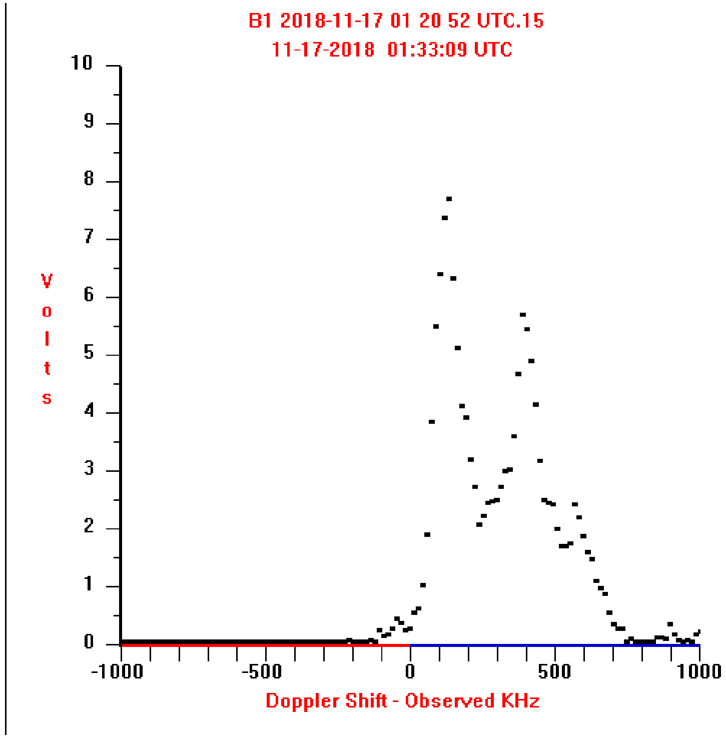


Source: CTB 107
RA 22h24m DEC 63d32m
70 JY

10-20-18
Observation



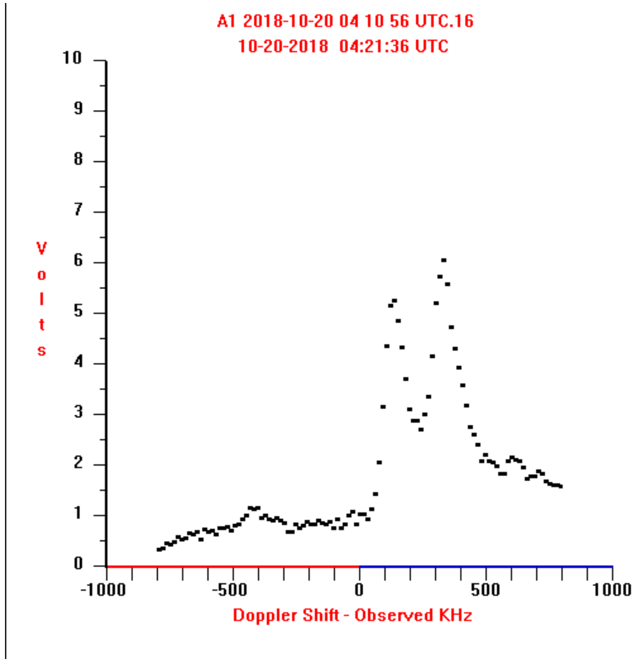
New 11-17-18
Observation

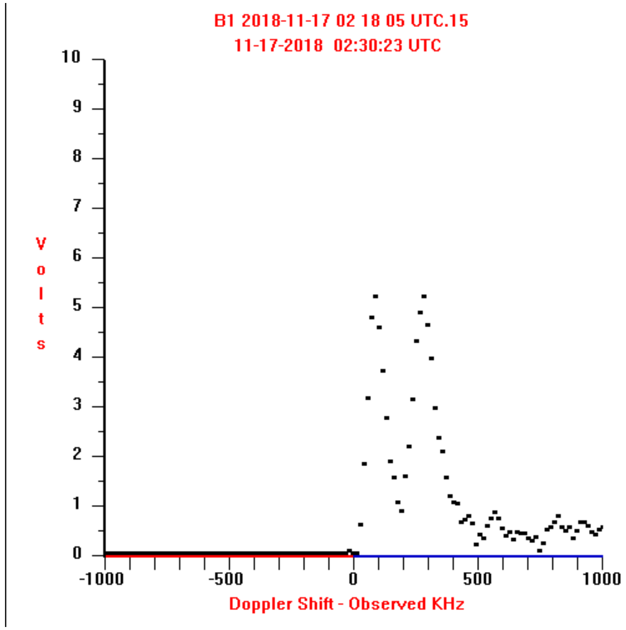


Source: Cassiopeia A
RA 23h27m DEC 58d49m
2720 JY

10-20-18
Observation

New 11-17-18
Observation



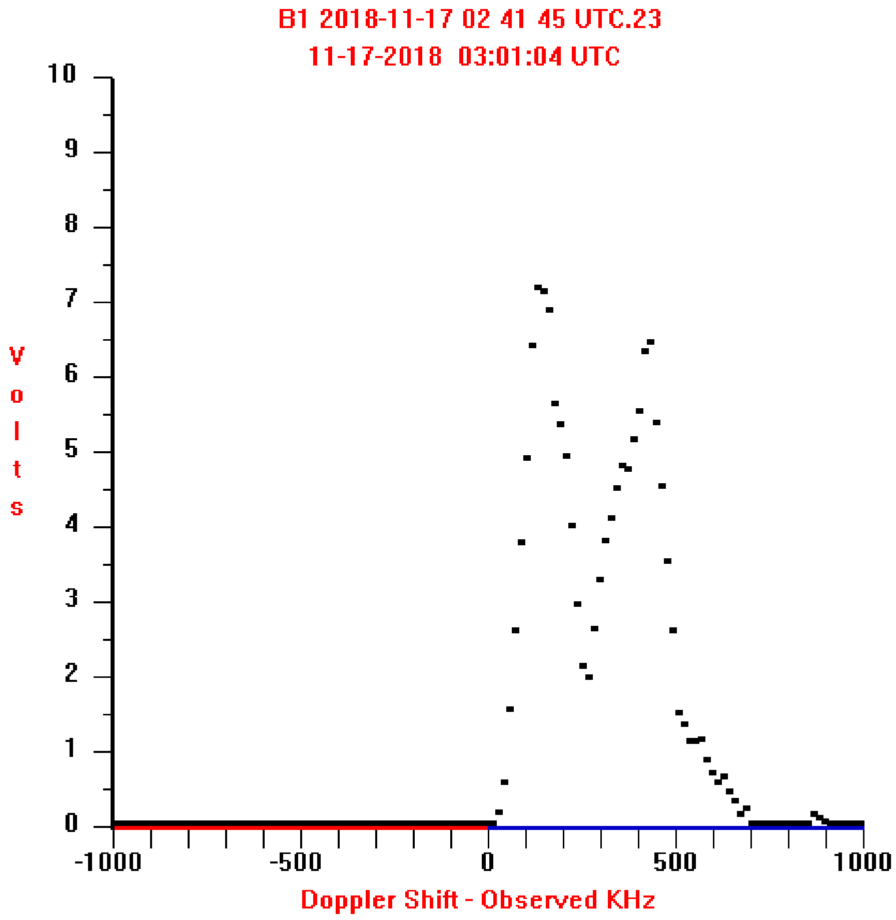


Explanation: Massive stars in our Milky Way Galaxy live spectacular lives. Collapsing from vast cosmic clouds, their nuclear furnaces ignite and create heavy elements in their cores. After a few million years, the enriched material is blasted back into interstellar space where star formation can begin anew. The expanding debris cloud known as Cassiopeia A is an example of this final phase of the stellar life cycle. Light from the explosion which created this supernova remnant would have been first seen in planet Earth's sky about 350 years ago, although it took that light about 11,000 years to reach us. This false-color Chandra X-ray Observatory image shows the still hot filaments and knots in the Cassiopeia A remnant. High-energy emission from specific elements has been color coded, silicon in red, sulfur in yellow, calcium in green and iron in purple, to help astronomers explore the recycling of our galaxy's star stuff - Still expanding, the blast wave is seen as the blue outer ring. The sharp X-ray image, spans about 30 light-years at the estimated distance of Cassiopeia A. The bright speck near the center is a neutron star, the incredibly dense, collapsed remains of the massive stellar core.

Source: https://apod.nasa.gov/apod/ap171228.html

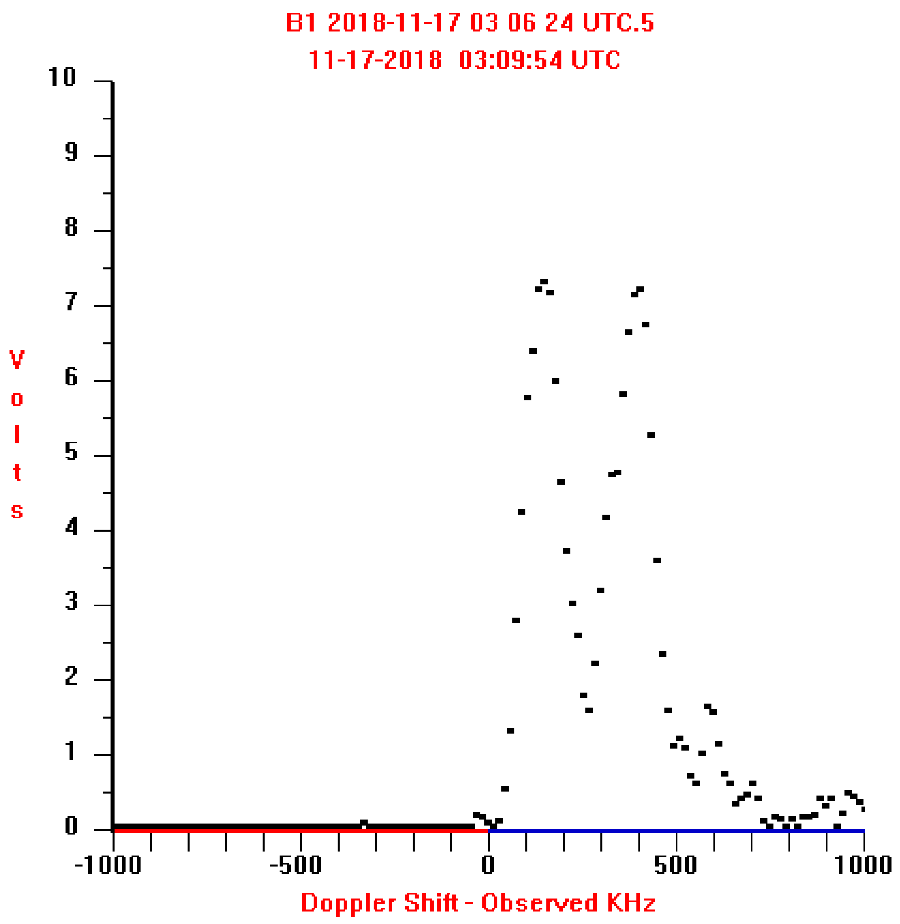
Source: DA612
RA 23hrs 55m DEC 67d56m
62 JY

New 11-17-18
Observation



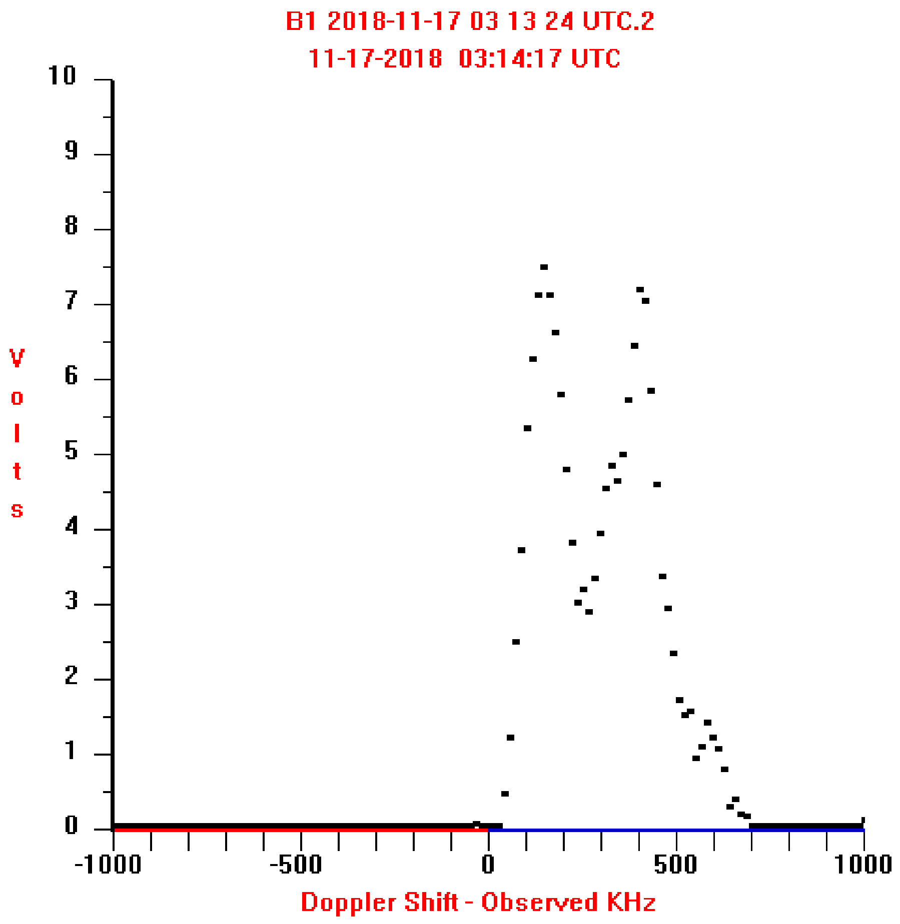
Source: DA001
RA 00hrs 02m DEC 67d19m
150 JY

New 11-17-18
Observation



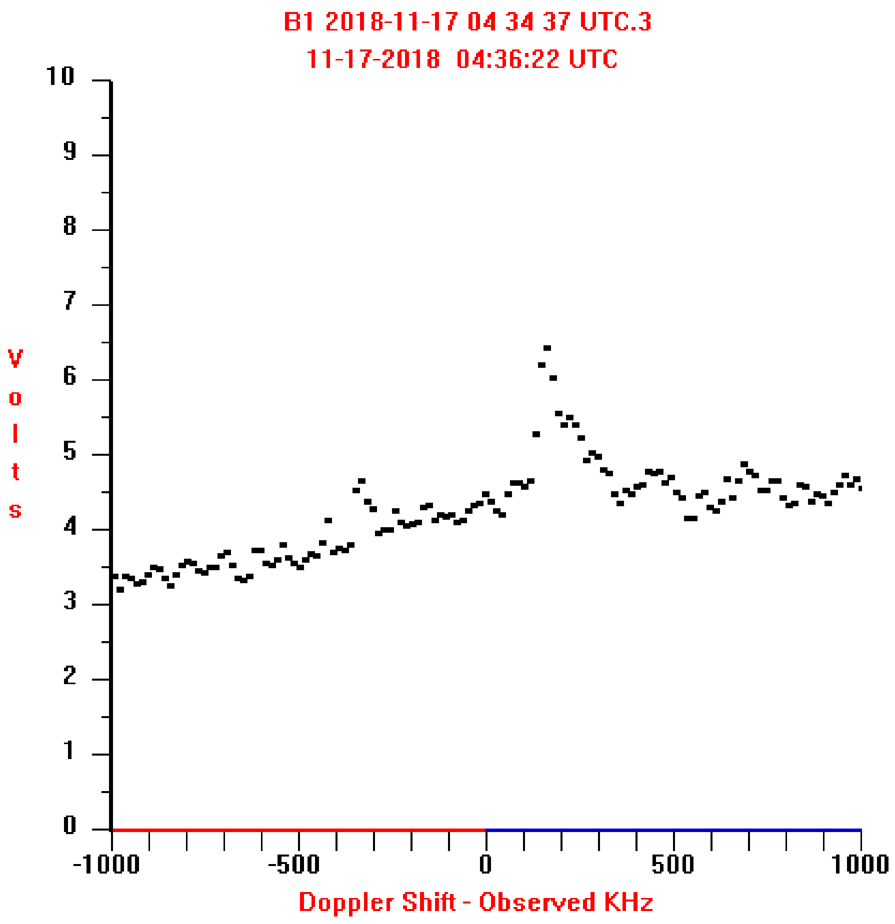
Source: DA003
RA 00hrs 05m DEC 68d06m
66 JY

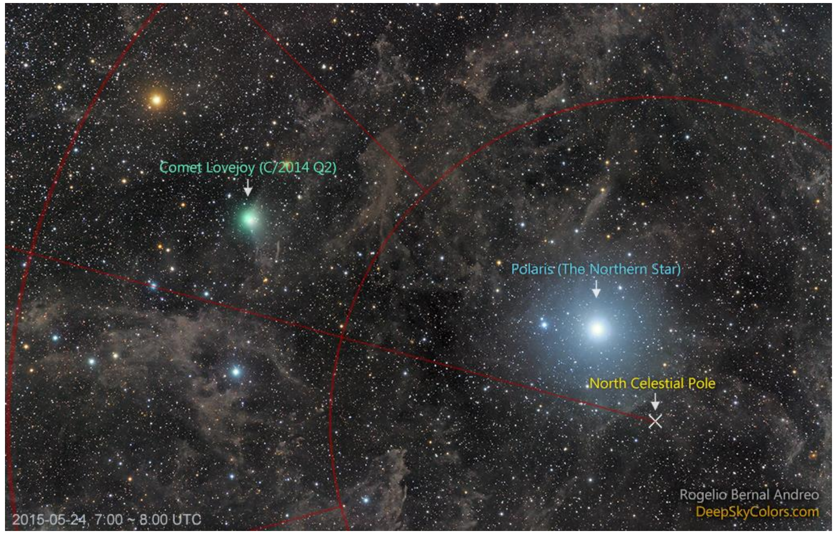
New 11-17-18 Observation



Source: Polaris
RA 01hrs 28m DEC 90d00m

New 11-17-18 Observation



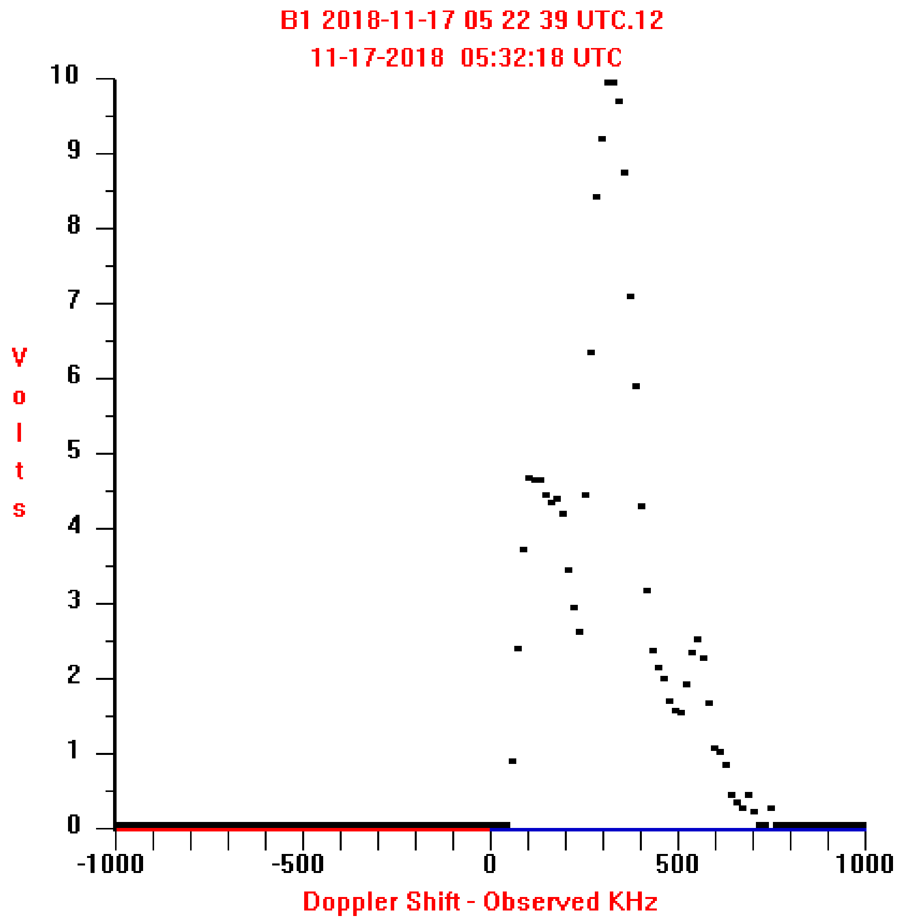


Explanation: (2015) One of these two bright sky objects is moving. On the right is the famous star Polaris. Although only the 45th brightest star in the sky, Polaris is famous for appearing stationary. Once you find it, it will always appear in the same direction -- all night and all day -- for the rest of your life. This is because the northern spin pole of the Earth -- called the North Celestial Pole -- points near Polaris.

Source: https://apod.nasa.gov/apod/ap150602.html

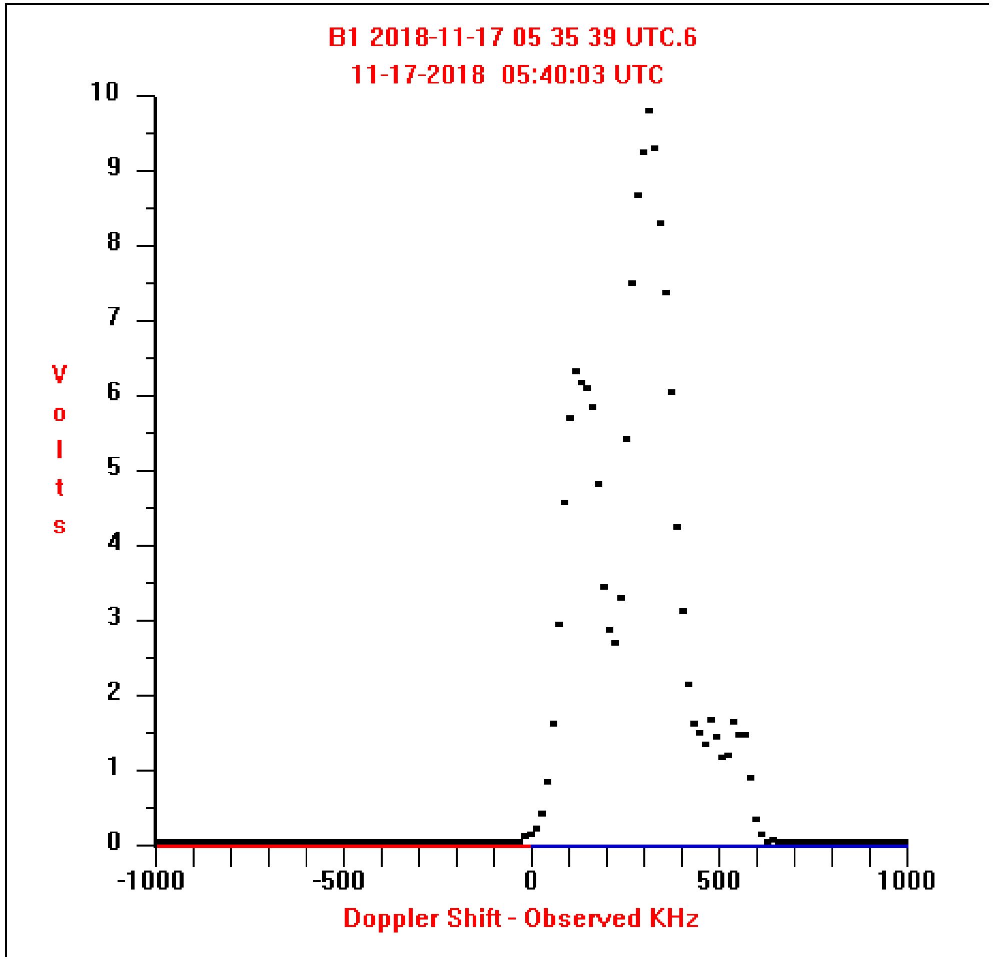
Source: DA076
RA 02hrs 25m DEC 62d08m
150 JY

New 11-17-18 Observation



Source: W04
RA 02hrs 33m DEC 61d26m
90 JY

New 11-17-18 Observation

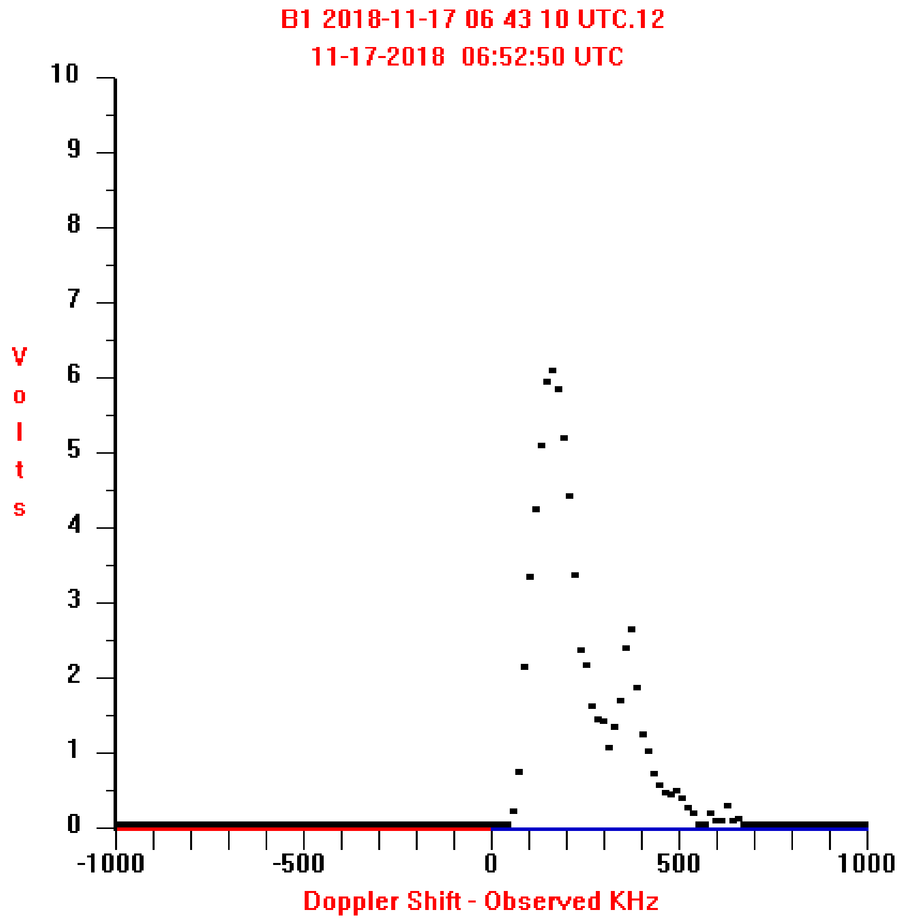


Explanation: A huge chimney venting hot clouds of gas out from the plane of our Milky Way Galaxy has recently been imaged in radio waves. The Canadian Galactic Plane Survey team used an array of radio telescopes to survey an ionized gas region known as W4. At the bottom of W4 and in the center of the above image is a very young open cluster of stars known as OCl 352. Research continues into how these stars created the W4 superbubble. Possible explanations include supernova explosions or strong stellar winds from these stars. It does appear clear, however, that hot gas is expanding outwards, being funneled by relatively cool and dense gas in a chimney-like fashion. The W4 chimney, which lies 6500 light-years from Earth and spans 250 light-years across, is visible as the comparatively dark area extending toward the top of the above image.

Source: https://apod.nasa.gov/apod/ap000207.html

Source: IC342 (Galaxy)
RA 03hrs 46m DEC 68d05m
3124 JY

New 11-17-18 Observation

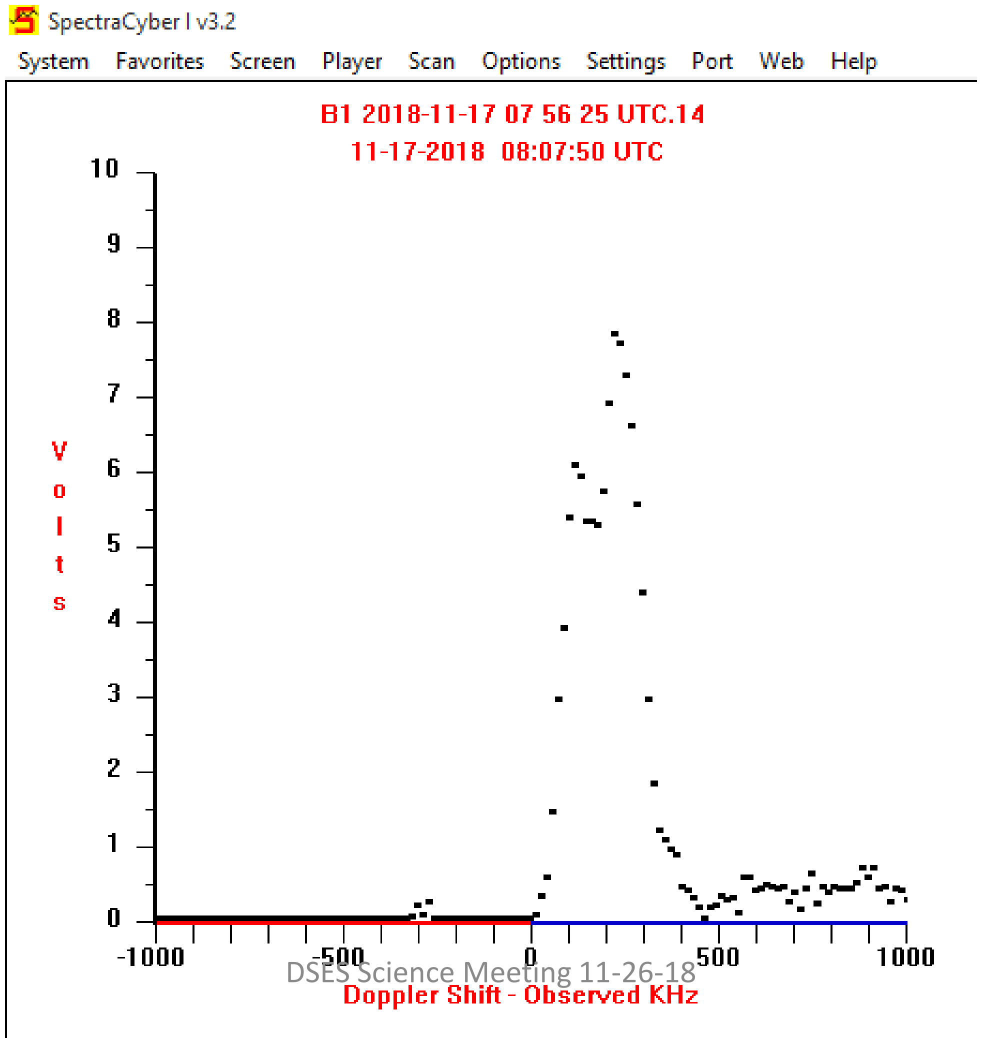


Explanation: Similar in size to large, bright spiral galaxies in our neighborhood, IC 342 is a mere 10 million light-years distant in the long-necked, northern constellation Camelopardalis. A sprawling island universe, IC 342 would otherwise be a prominent galaxy in our night sky, but it is hidden from clear view and only glimpsed through the veil of stars, gas and dust clouds along the plane of our own Milky Way galaxy. Even though IC 342's light is dimmed by intervening cosmic clouds, this sharp telescopic image traces the galaxy's own obscuring dust, blue star clusters, and glowing pink star forming regions along spiral arms that wind far from the galaxy's core. IC 342 may have undergone a recent burst of star formation activity and is close enough to have gravitationally influenced the evolution of the local group of galaxies and the Milky Way.

Source: https://apod.nasa.gov/apod/ap170708.html

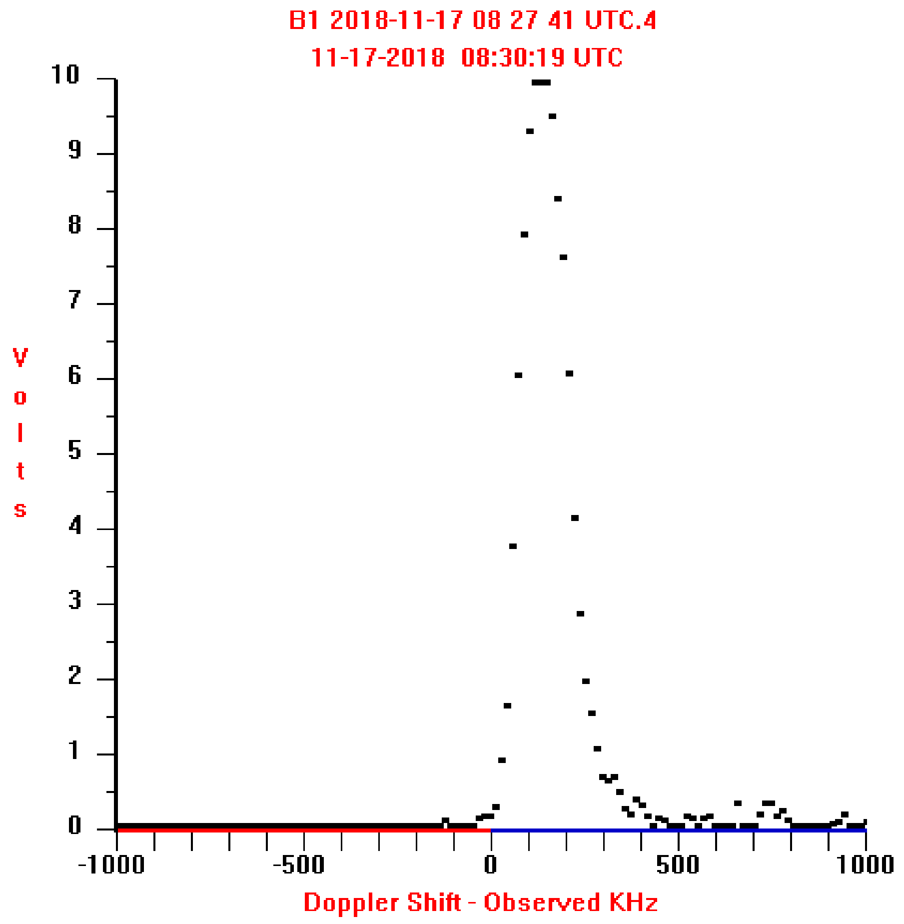
Source: DA156
RA 05hrs 01m DEC 46d28m
150 JY

New 11-17-18 Observation



Source: W08 (IC410)
RA 05hrs 22m DEC 33d22m
77 JY

New 11-17-18 Observation

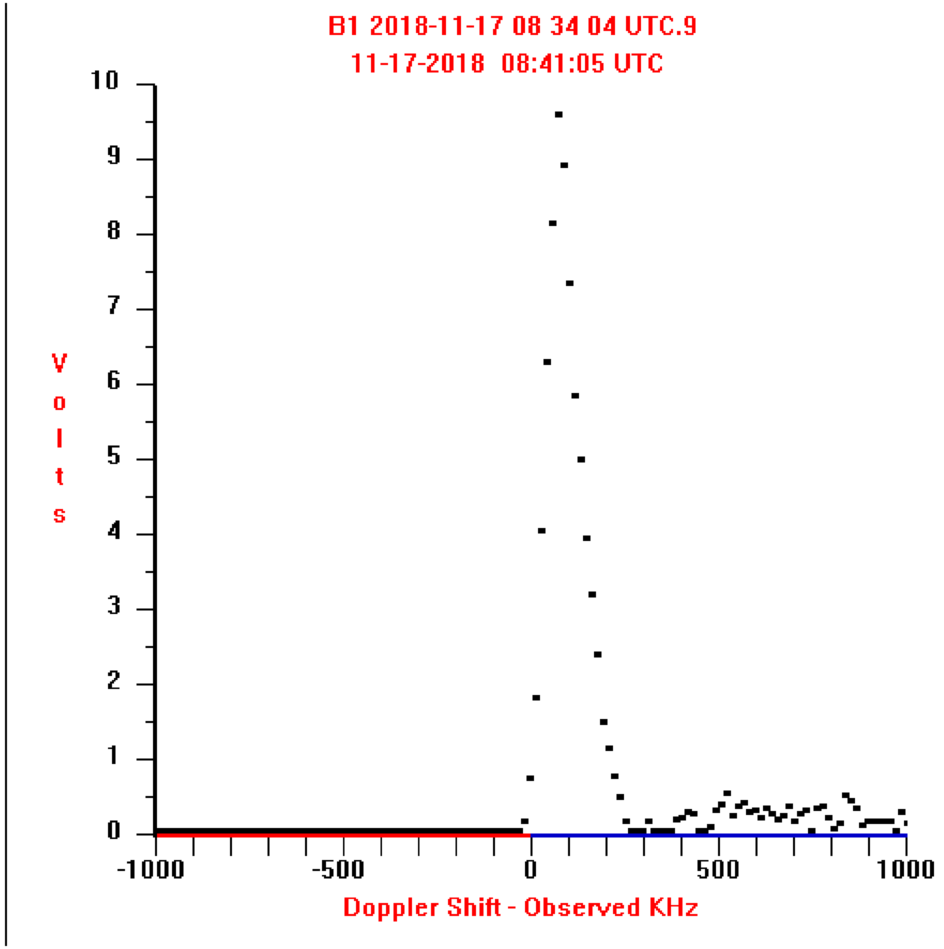


Explanation: This telescopic close-up shows off the otherwise faint emission nebula IC 410. It also features two remarkable inhabitants of the cosmic pond of gas and dust below and left of center, the tadpoles of IC 410. Partly obscured by foreground dust, the nebula itself surrounds NGC 1893, a young galactic cluster of stars. Formed in the interstellar cloud a mere 4 million years ago, the intensely hot, bright cluster stars energize the glowing gas. Composed of denser cooler gas and dust, the tadpoles are around 10 light-years long and are likely sites of ongoing star formation. Sculpted by winds and radiation from the cluster stars, their heads are outlined by bright ridges of ionized gas while their tails trail away from the cluster's central region. IC 410 lies some 10,000 light-years away, toward the nebula-rich constellation Auriga.

Source: https://apod.nasa.gov/apod/ap180124.html

Source: W09 (M1) (Crab Nebula)
RA 05hrs 34m DEC 22d00m
1120 JY

New 11-17-18 Observation

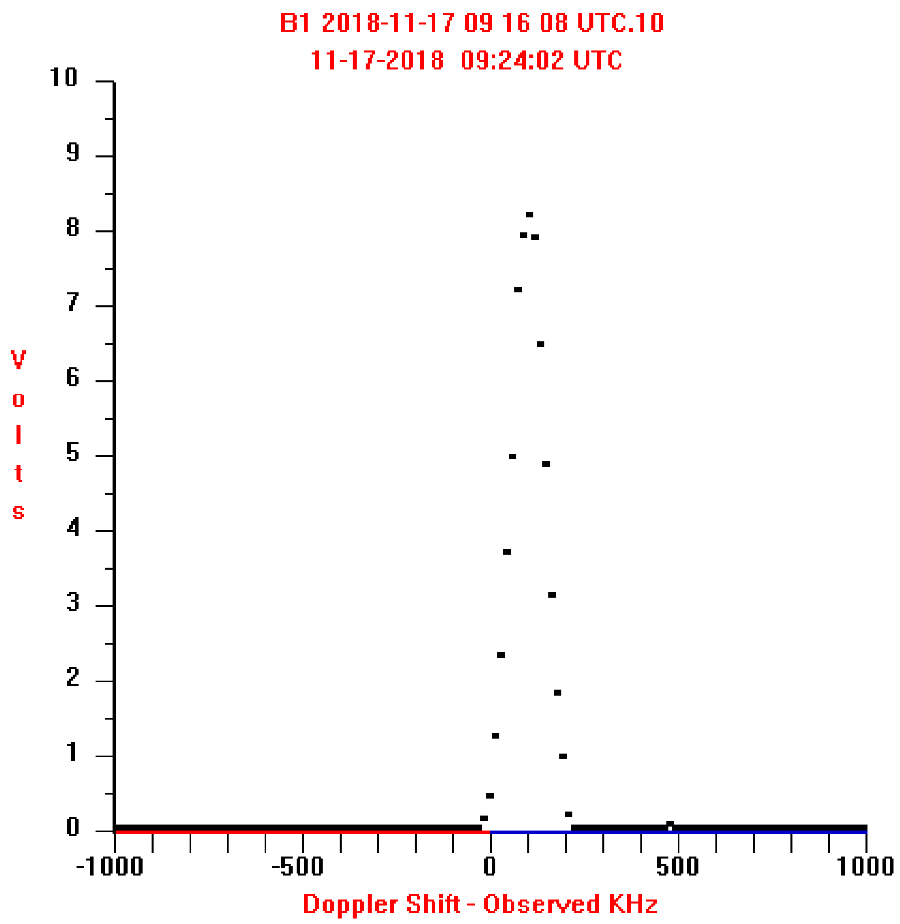


Explanation: This is the mess that is left when a star explodes. The Crab Nebula, the result of a supernova seen in 1054 AD, is filled with mysterious filaments. The filaments are not only tremendously complex, but appear to have less mass than expelled in the original supernova and a higher speed than expected from a free explosion. The featured image, taken by the Hubble Space Telescope, is presented in three colors chosen for scientific interest. The Crab Nebula spans about 10 light-years. In the nebula's very center lies a pulsar: a neutron star as massive as the Sun but with only the size of a small town. The Crab Pulsar rotates about 30 times each second.

Source: https://apod.nasa.gov/apod/ap180909.html

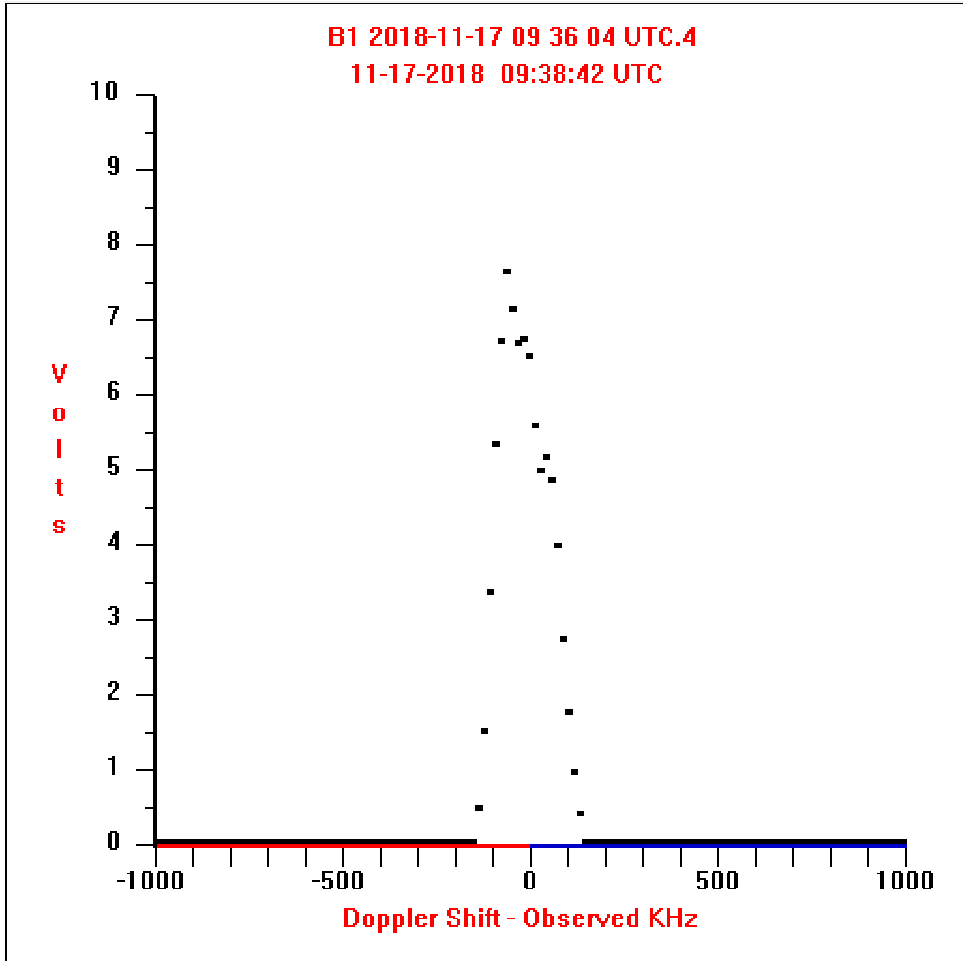
Source: W14(CTA41)
RA 06hrs 17m DEC 22d35m
215 JY

New 11-17-18 Observation



Source: W16 (Rosetta Nebula HII Ionized Region)
RA 06hrs 31m DEC 04d54m
170 JY

New 11-17-18
Observation



Explanation: Would the Rosette Nebula by any other name *look* as sweet? The bland New General Catalog designation of NGC 2237 doesn't appear to diminish the appearance of this flowery emission nebula. Inside the nebula lies an open cluster of bright young stars designated NGC 2244. These stars formed about four million years ago from the nebular material and their stellar winds are clearing a hole in the nebula's center, insulated by a layer of dust and hot gas. Ultraviolet light from the hot cluster stars causes the surrounding nebula to glow. The Rosette Nebula spans about 100 light-years across, lies about 5000 light-years away, and can be seen with a small telescope towards the constellation of the Unicorn (Monoceros).

Source: https://apod.nasa.gov/apod/ap170214.html

Summary

- Galactic Rotation Rate Observations show excellent Results
  - One more round of observations needed
- Radio Source observations increasing –
- Plan to use the new spectracyber observing PI system

- Next Observing session: Friday December 14 –Start about 12AM Local