The Stanford University ELF/VLF Receiver

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Narrowband transmitter guide
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July 2009

The following document shows a list of narrowband transmitters commonly recorded by AWESOME, though it should be noted that transmitters do change, so this list may, as well.

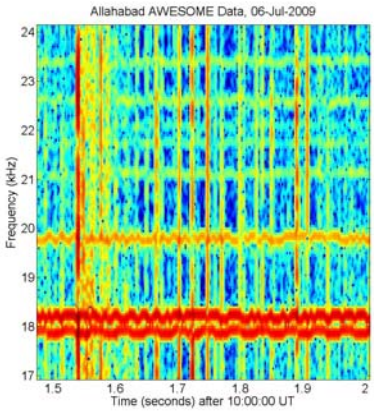
LAT	LON	FREQ	SIGN	LOCATION	MOD	Baud	kW	Comments
55.760	84.450	Alternates	RA1	Novosibirsk, Russia	CW	0	500	3.6s pattern, see chart on right
45.403	38.158	Alternates	RA2	Krasnodar, Russia	CW	0	500	3.6s pattern, see chart on right
50.070	135.600	Alternates	RA3	Komsomolsk-na-Amur, Russia	CW	0	500	3.6s pattern, see chart on right
59.910	10.520	16400 Hz	JXN	Kolsas, Norway (NATO)	MSK	100	45	On only certain times of day
8.387	77.753	18200 Hz	VTX	Katabomman, India	MSK	200		
46.713	1.245	18300 Hz	HWU	Le Blanc, France (NATO)	MSK	200	400	May be only for occasional tests
-38.481	146.935	18600 Hz	NST	Woodside, Australia (USA)	MSK	100		
52.911	-3.280	19600 Hz	GQD	Anthorn, Great Britain (NATO)	MSK	100	100	
-21.816	114.166	19800 Hz	NWC	North West Cape, Australia (USA)	MSK	200	1000	
40.923	9.731	20270 Hz	ICV	Isola di Tavolara, Italy (NATO)	MSK	200	20	
39.600	103.330	20600 Hz	3SB	Datong, China	MSK	225		Not always in operation
48.544	2.576	20900 Hz	HWV	St Assise, France	MSK	200	400	May be only for occasional tests
25.030	111.670	21100 Hz	3SA	Changde, China	MSK	225		
21.420	-158.154	21400 Hz	NPM	Lualualei, Hawaii, USA	MSK	200	424	
46.713	1.245	21750 Hz	HWU	Le Blanc, France (NATO)	MSK	200	400	Might also be in St Assise, France
52.911	-3.280	22100 Hz	GQD	Anthorn, Great Britain (NATO)	MSK	100	200	
32.040	130.810	22200 Hz	JJI	Ebino, Japan	MSK	225	200	
46.713	1.245	22600 Hz	HWU	Le Blanc, France (NATO)	MSK	200	400	Might also be in St Assise, France
53.079	7.614	23400 Hz	DHO	Rhauderfehn, Germany (NATO)	MSK	200	800	Operates at 100 Baud sometimes
44.646	-67.281	24000 Hz	NAA	Cutler, Maine, USA	MSK	200	1000	
48.203	-121.917	24800 Hz	NLK	Jim Creek, Washington, USA	MSK	200	192	
46.366	-98.335	25200 Hz	NLM	LaMoure, North Dakota, USA	MSK	200		
37.430	27.550	26700 Hz	TBB	Bafa, Turkey	MSK	225		
63.851	-22.459	37500 Hz	NRK	Grindavik, Iceland (USA)	MSK	200		
18.399	-67.178	40750 Hz	NAU	Aguada, Puerto Rico (USA)	MSK	200	100	
38.000	13.500	45900 Hz	NSC	Sicily, Italy (USA)	MSK	200		

The three RA transmitters are in fact navigation beacons operated by Russia, are powerful enough to be seen nearly anywhere in the world. The three locations alternate between the three frequencies, so if monitoring a single frequency, you are actually

monitoring three different locations according to some pattern. The pattern is described here by Trond Jacobsen http://www.vlf.it/alphatrond/alpha.htm.

JXN is a pulsed transmitter, turning off and on with long (few hours) periods.

The HWU and HWV transmitters have at times been at four different frequencies, and since there are two fairly close to each other, it is difficult to distinguish which one comes from where.



The best way to determine what transmitters are operating is to look at VLF receiver broadband data.

Here is an example. You can use the vlf_spec Matlab command to make a spectrogram, and zoom in on the horizontal lines. With certain spectrogram properties, you can even see the frequency moving up and down, which is the communication signal. Each one is transmitter, and you can correspond it most of the time with the list above in this document. If you see something new, then perhaps one of them has changed frequencies.

Here is a map showing the location of these transmitters, worldwide.