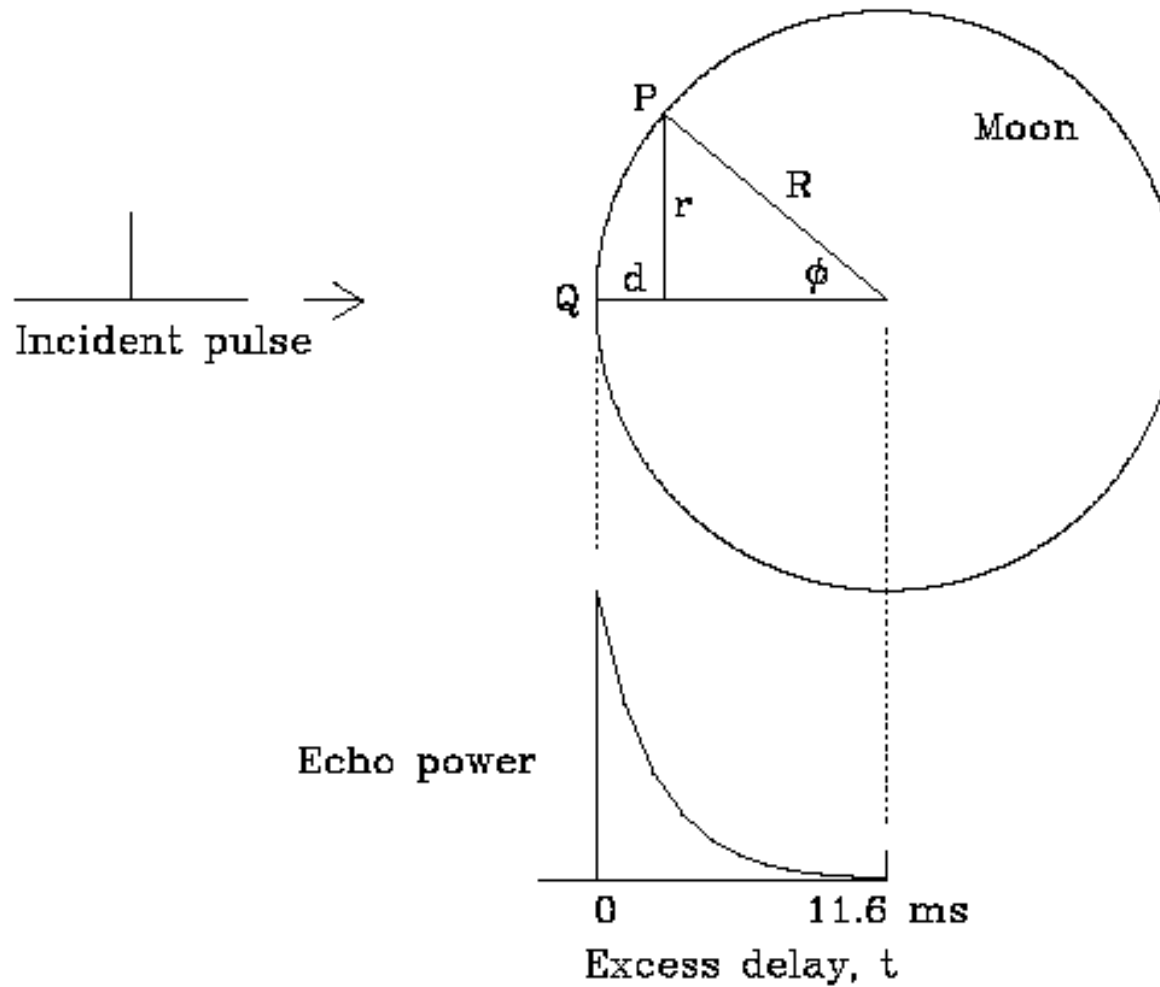


Frequency-Dependent Characteristics of the EME Path

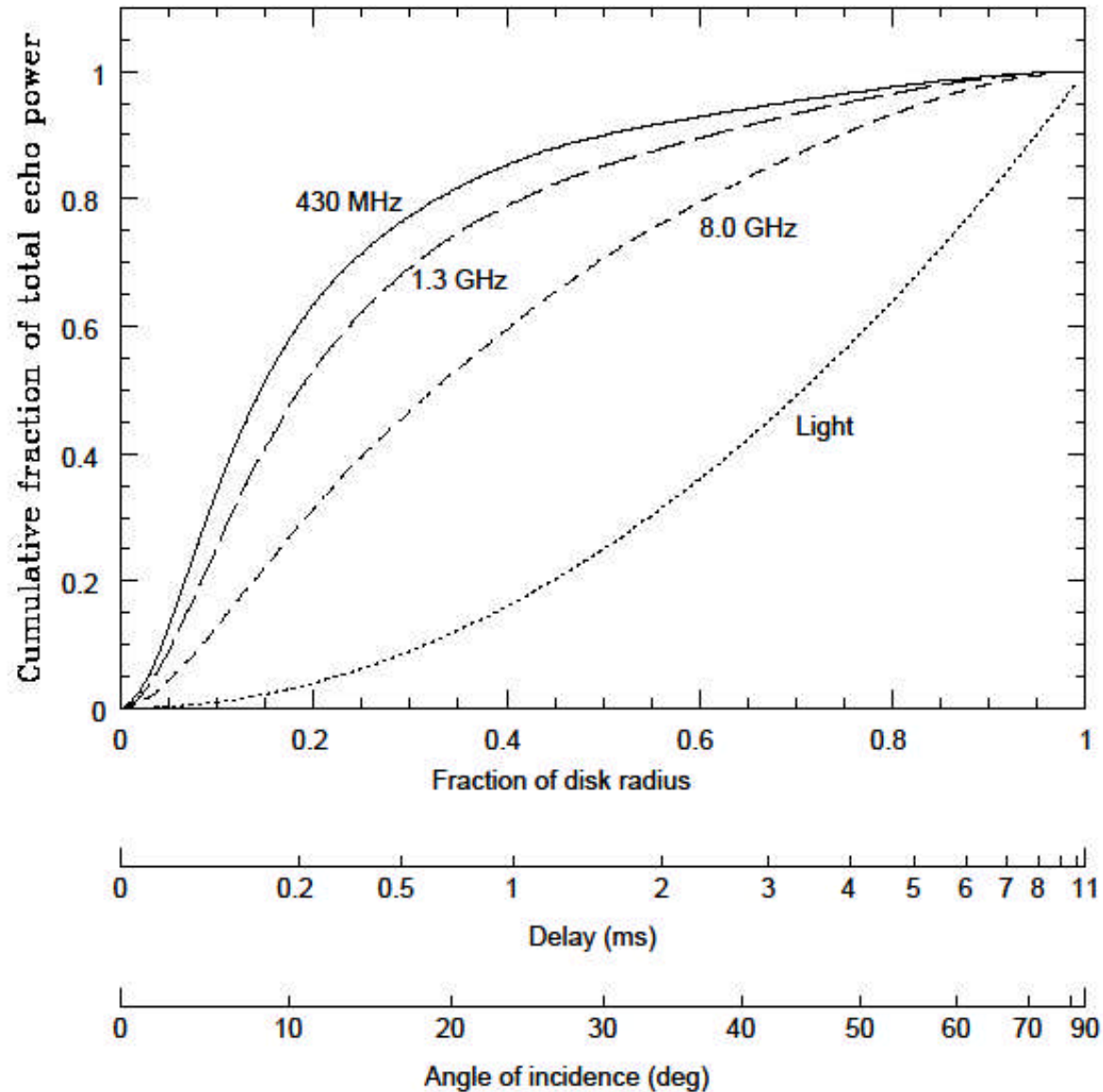
Joe Taylor, K1JT

14th International EME Conference, Dallas
August 12 - 14, 2010

EME Geometry (side view)

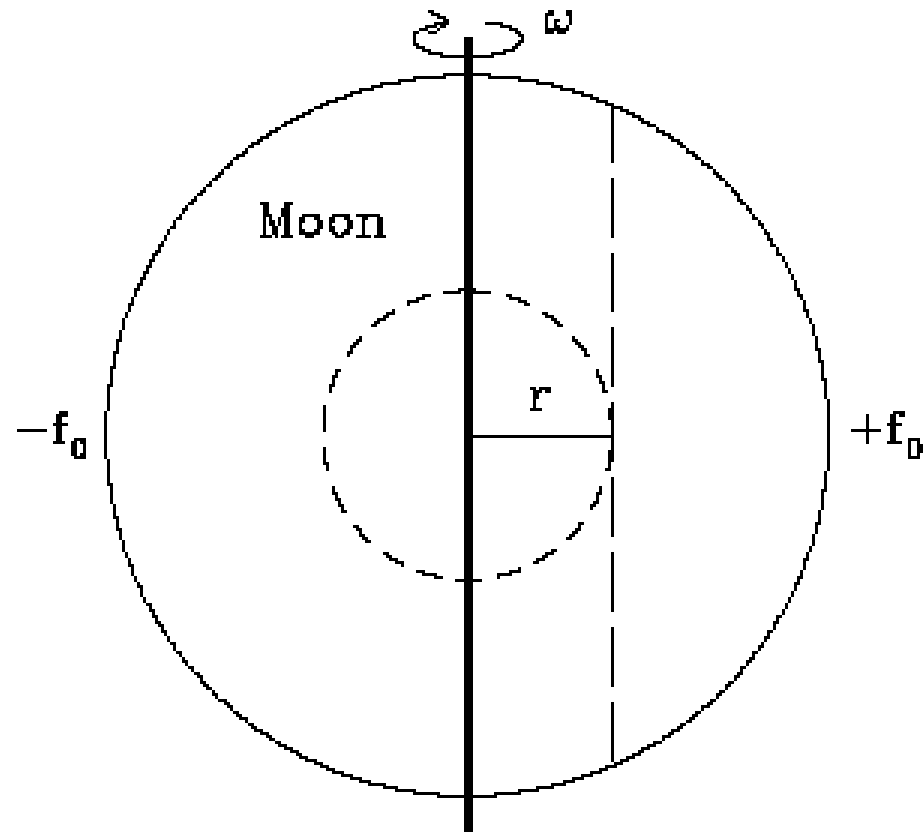


Cumulative Echo Power

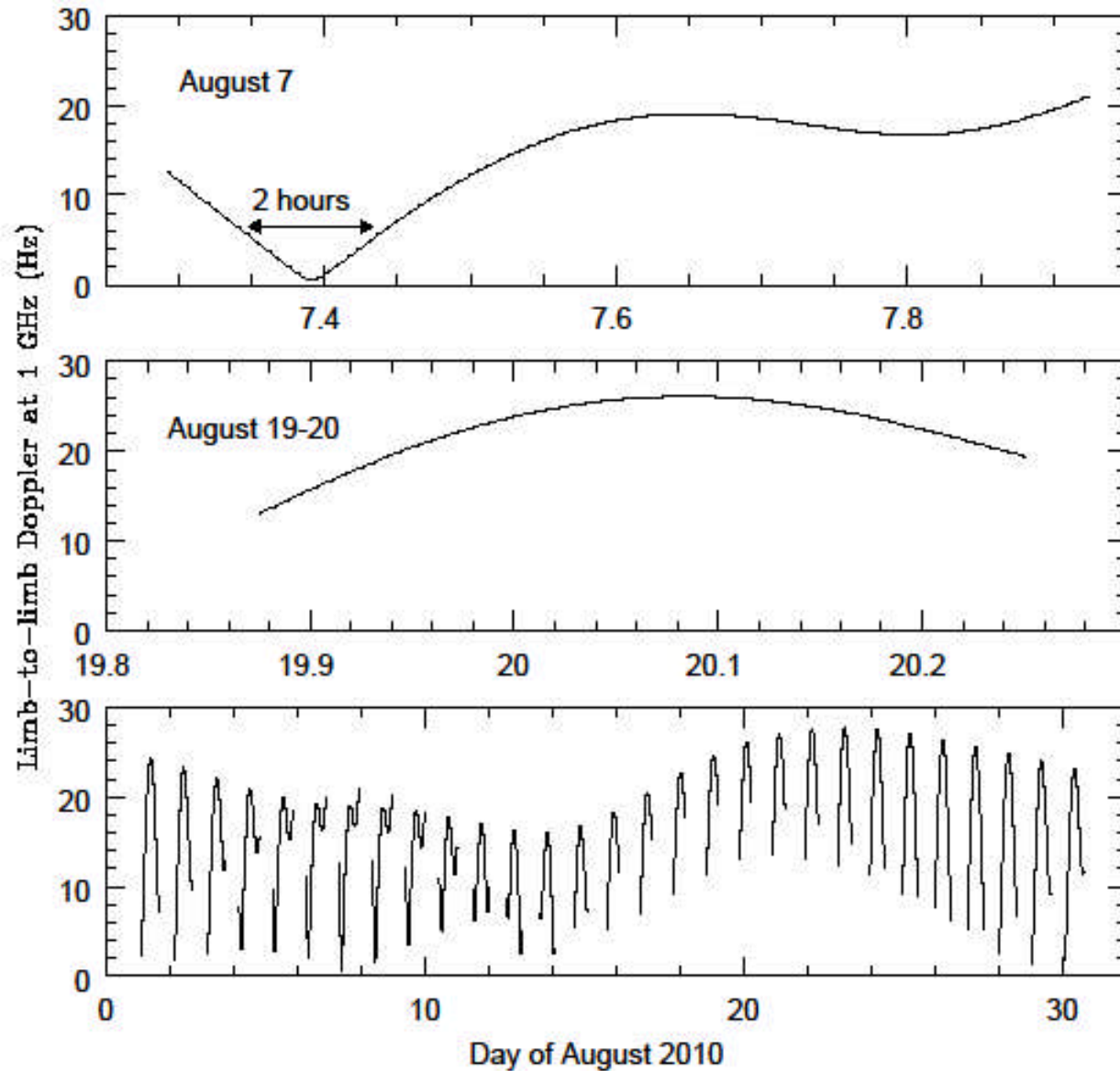


Reference:
Hagfors (1970)

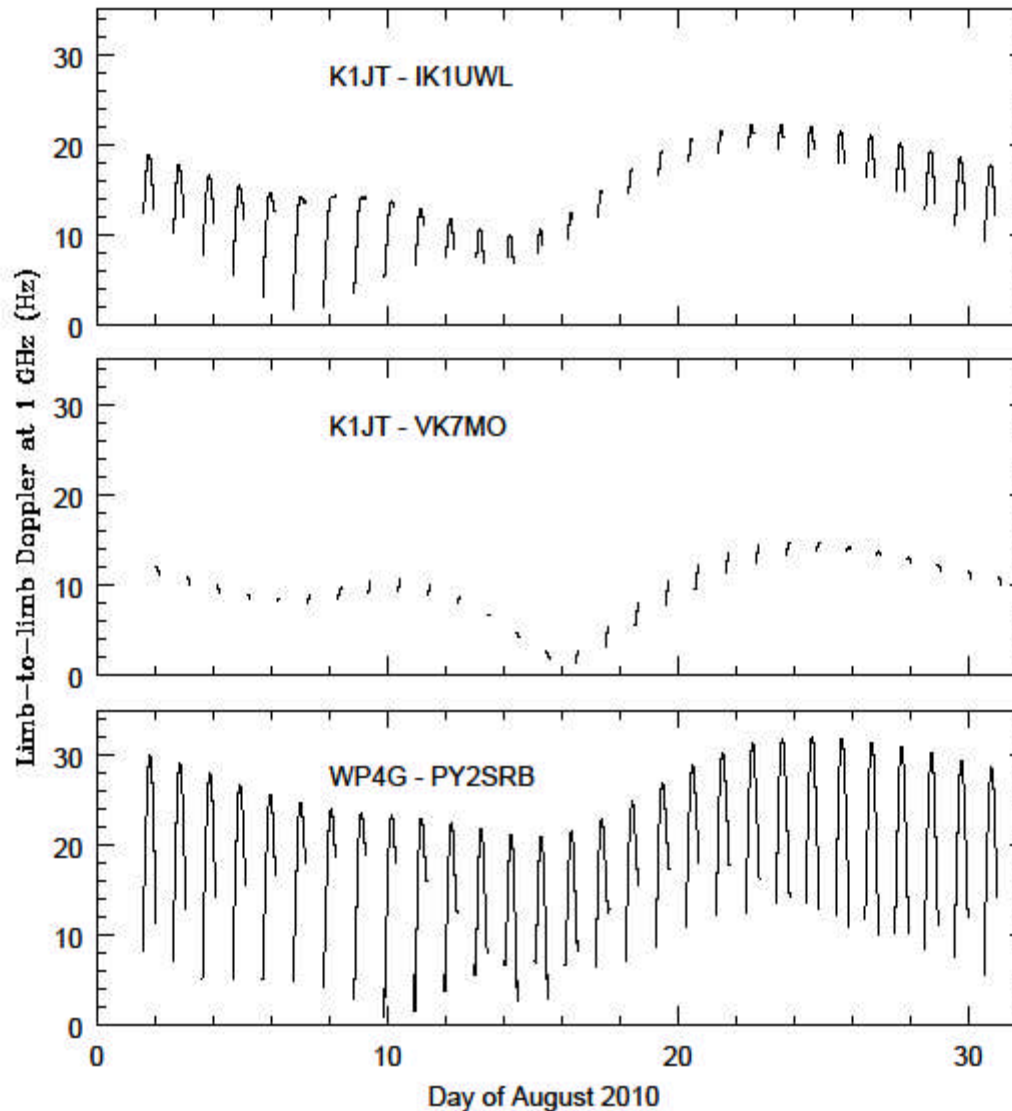
EME Geometry (from Earth)



Predicted Doppler Spread



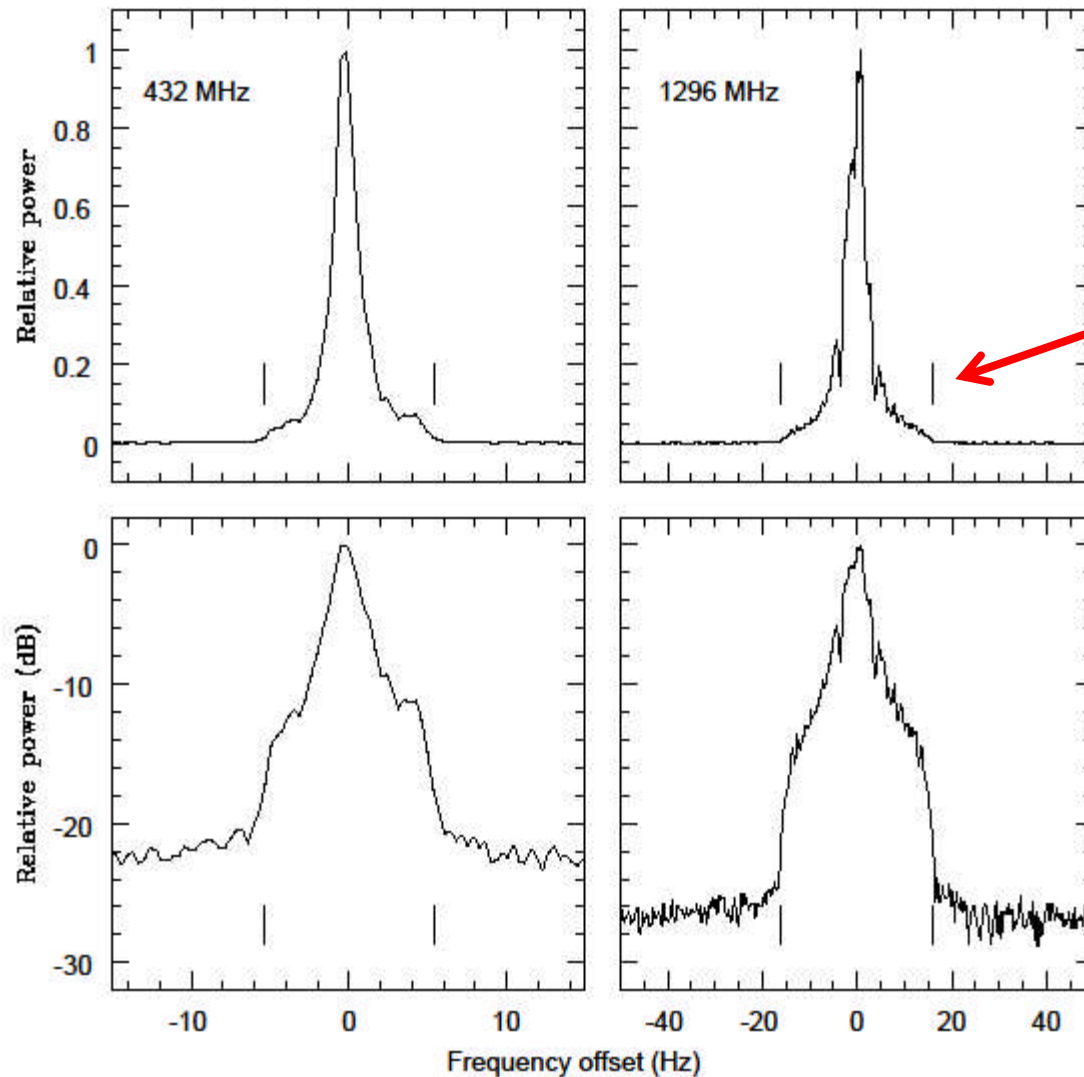
Two-Station Predictions



$f = 1 \text{ GHz}$

Calculations now
in WSJT 9.0

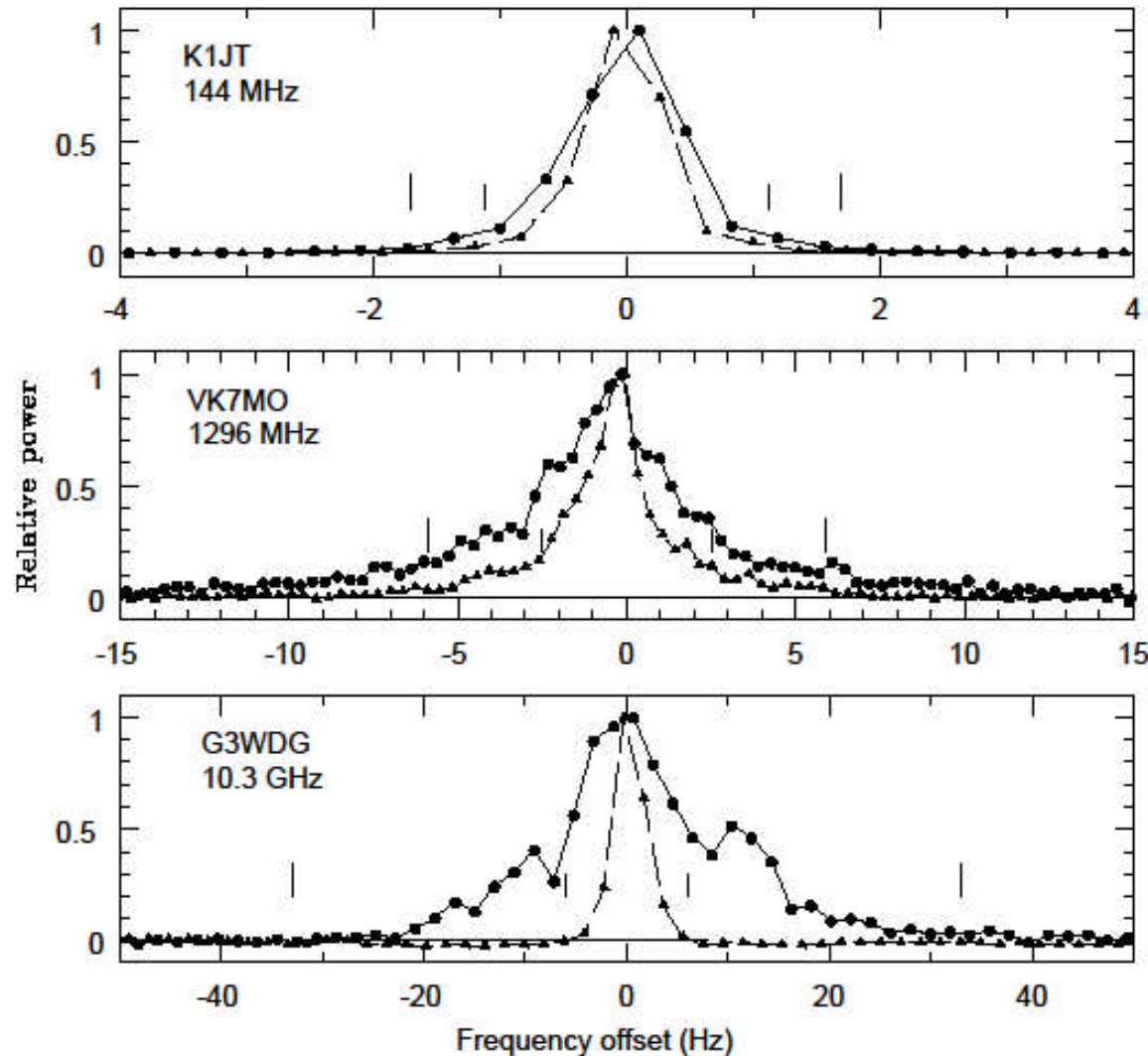
Measurements at 432 and 1296 MHz



Predicted limb-to-limb
Doppler spread

Measurements
at K2UYH using
WSJT 8.0
Echo Mode

High and Low Libration Rates

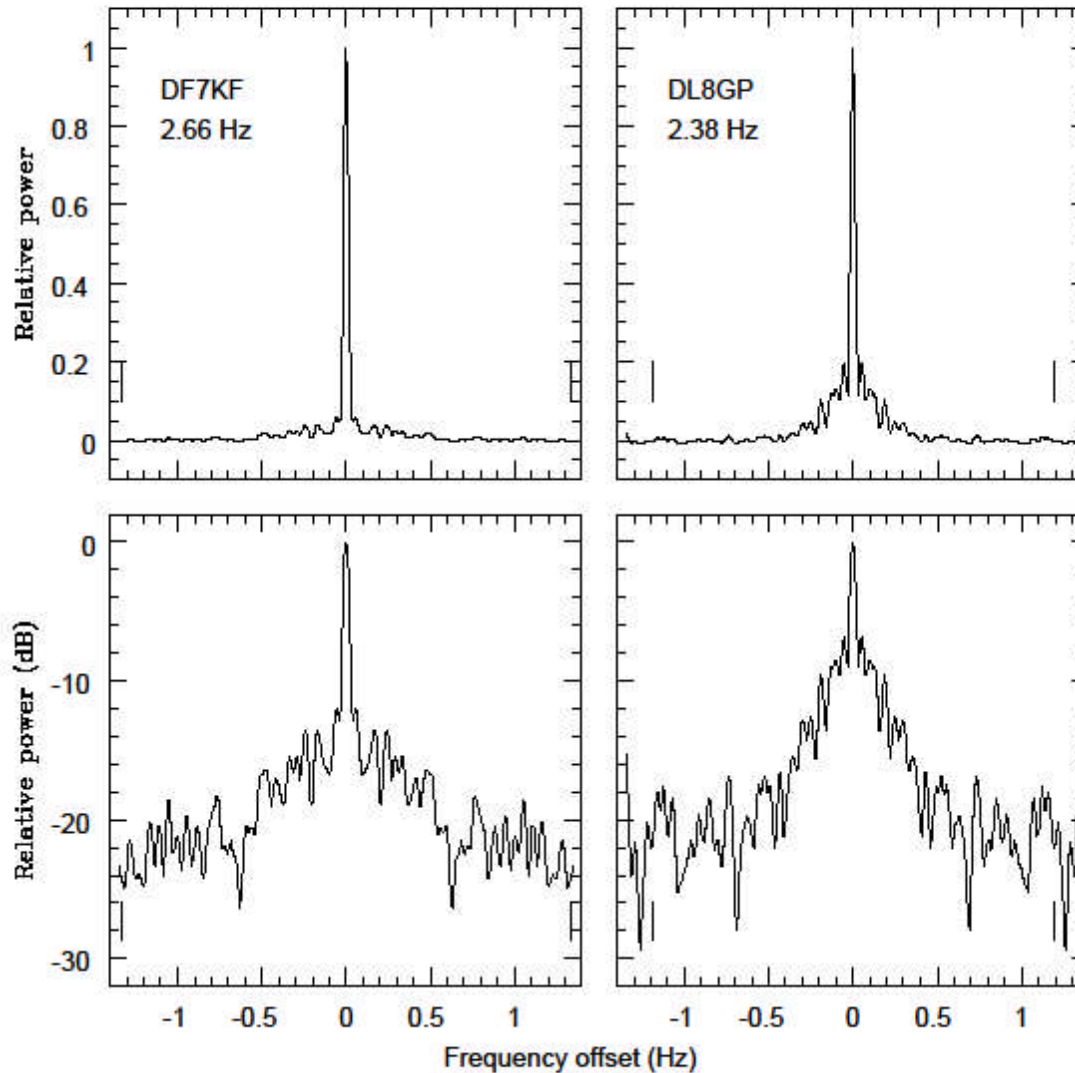


Self-echo
measurements
using WSJT 8.0

Bi-Static Measurements - 144 MHz

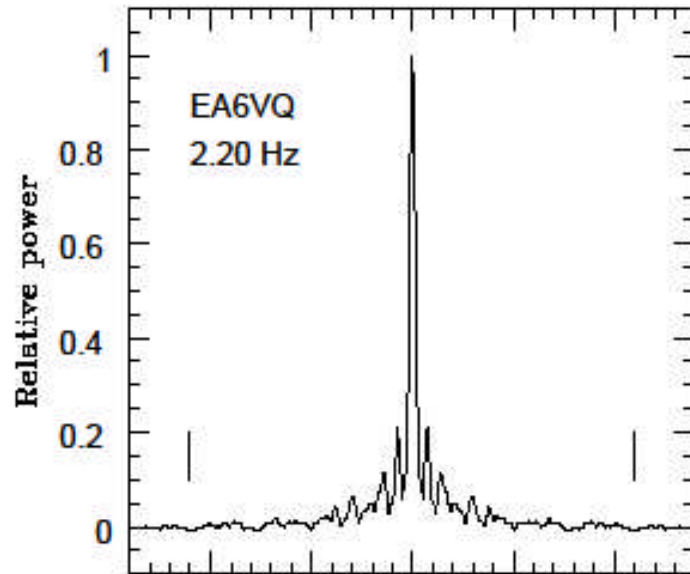
DK7KF

DL8GP

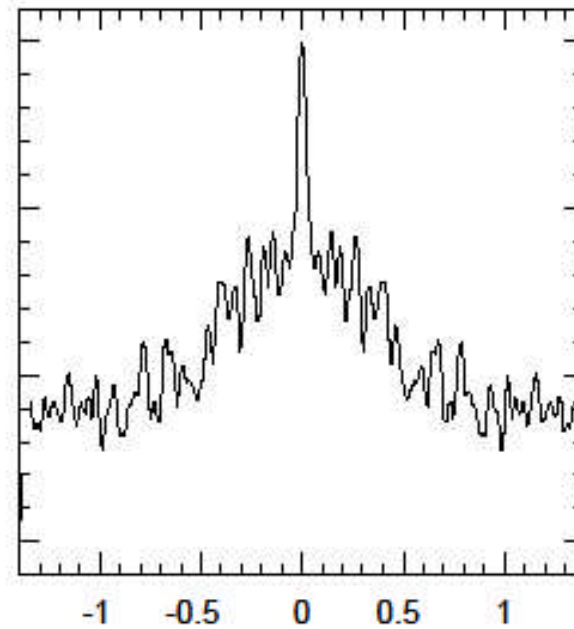
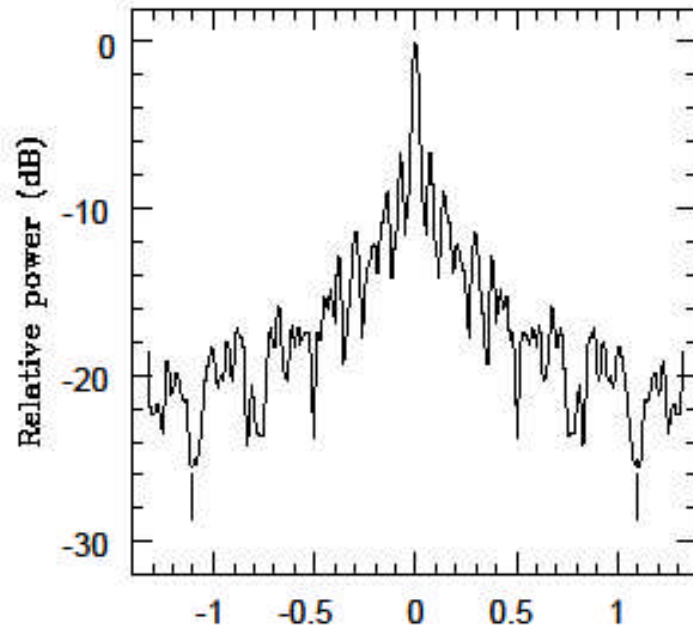
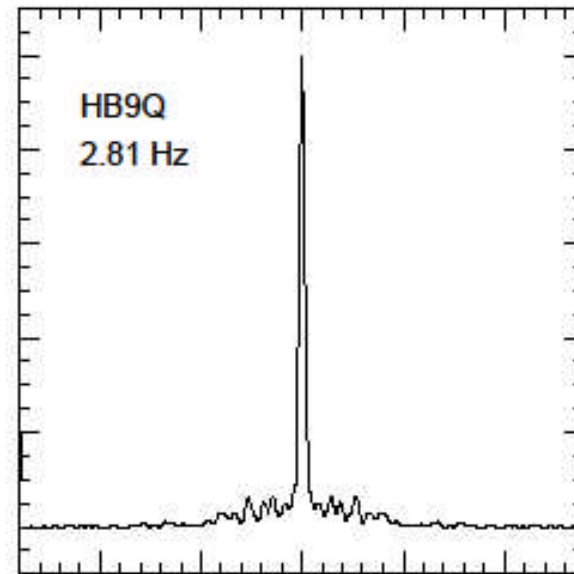


JT65B signals,
duration 47 s,
received at K1JT

EA6VQ

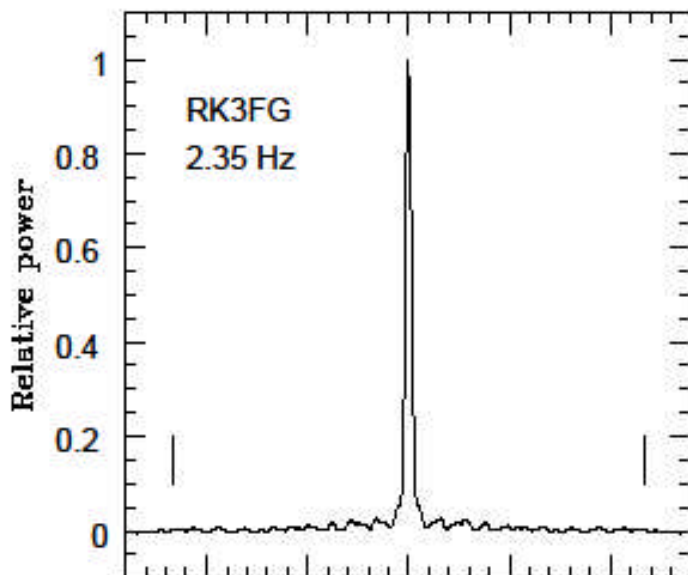


HB9Q

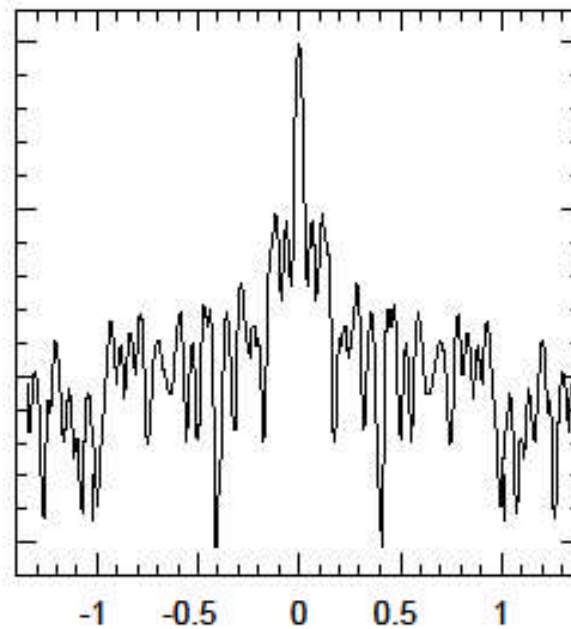
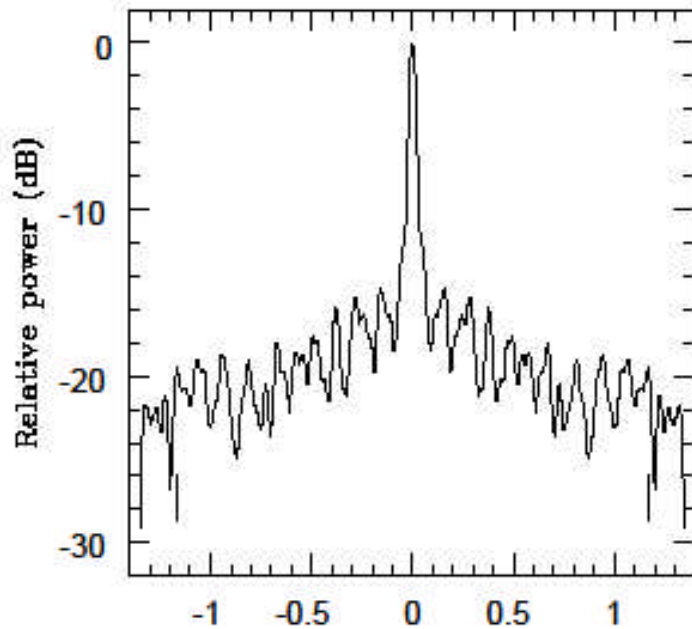
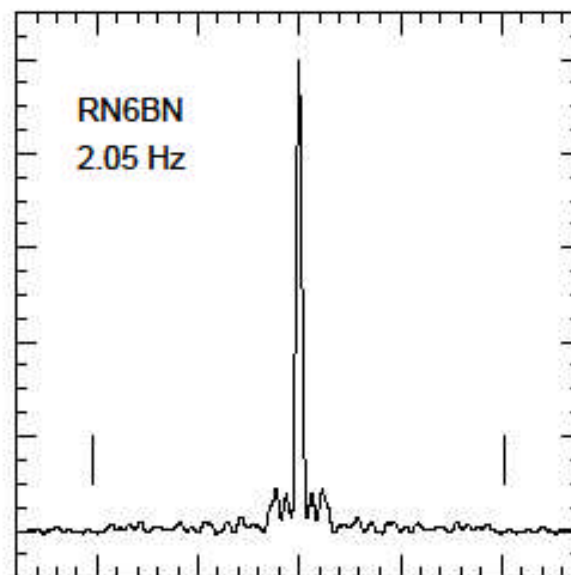


Frequency offset (Hz)

RK3FG

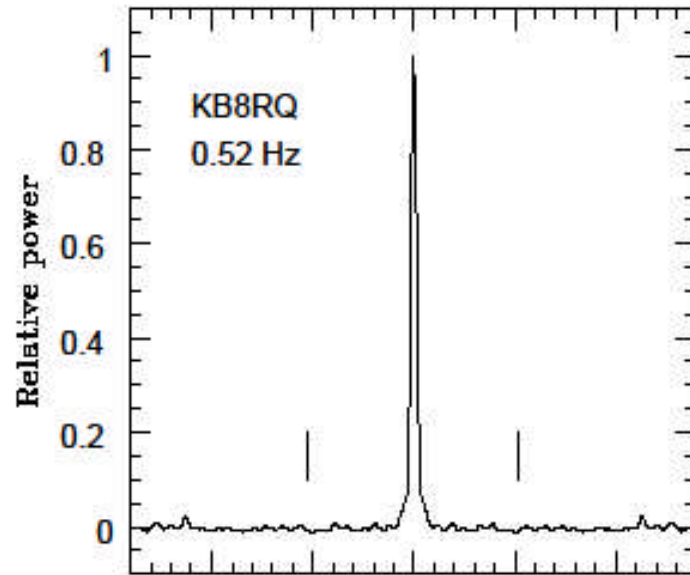


RN6BN

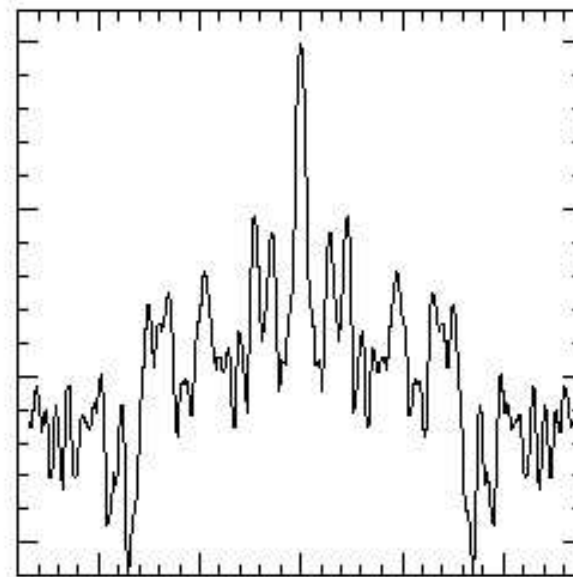
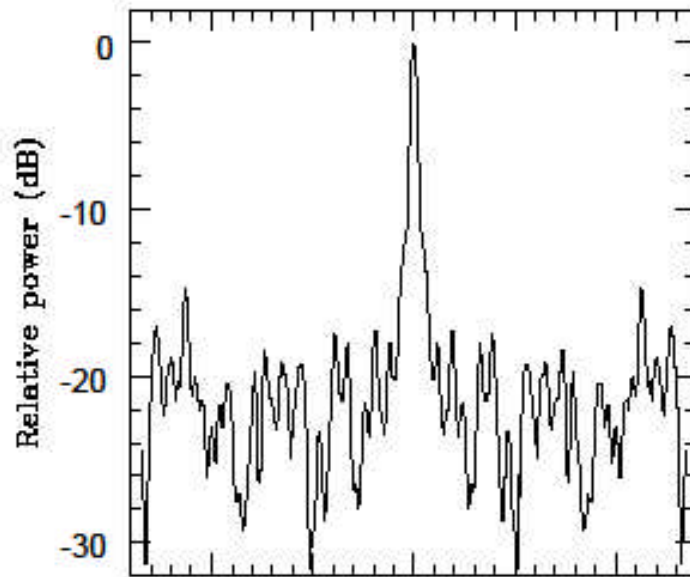
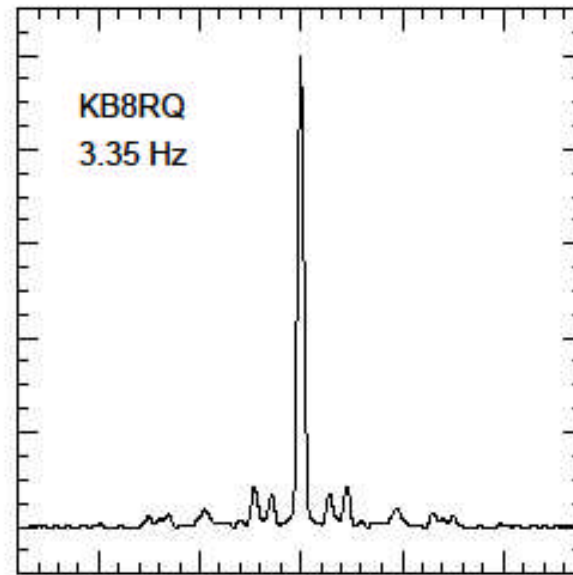


Frequency offset (Hz)

KB8RQ

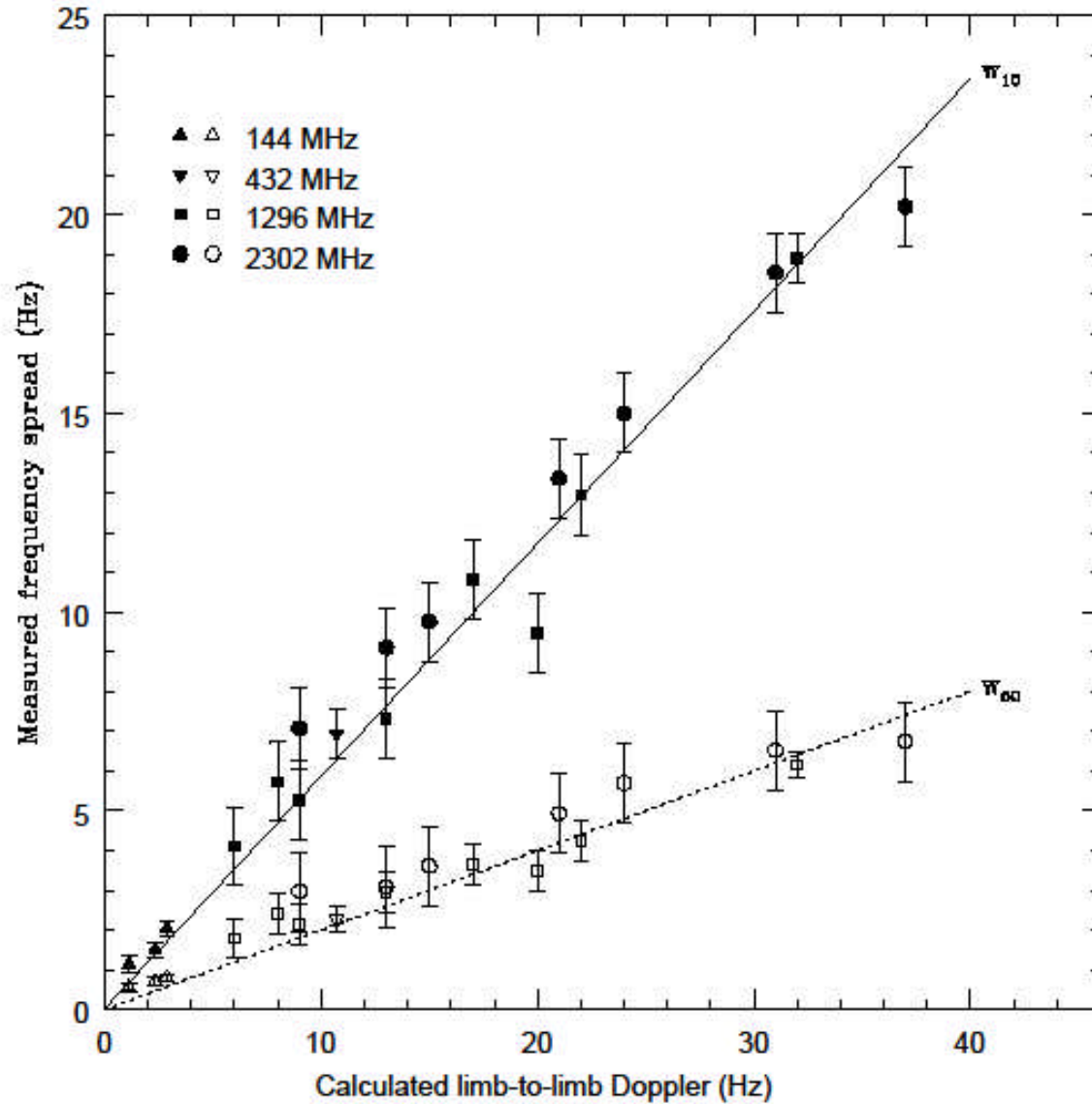


KB8RQ



Frequency offset (Hz)

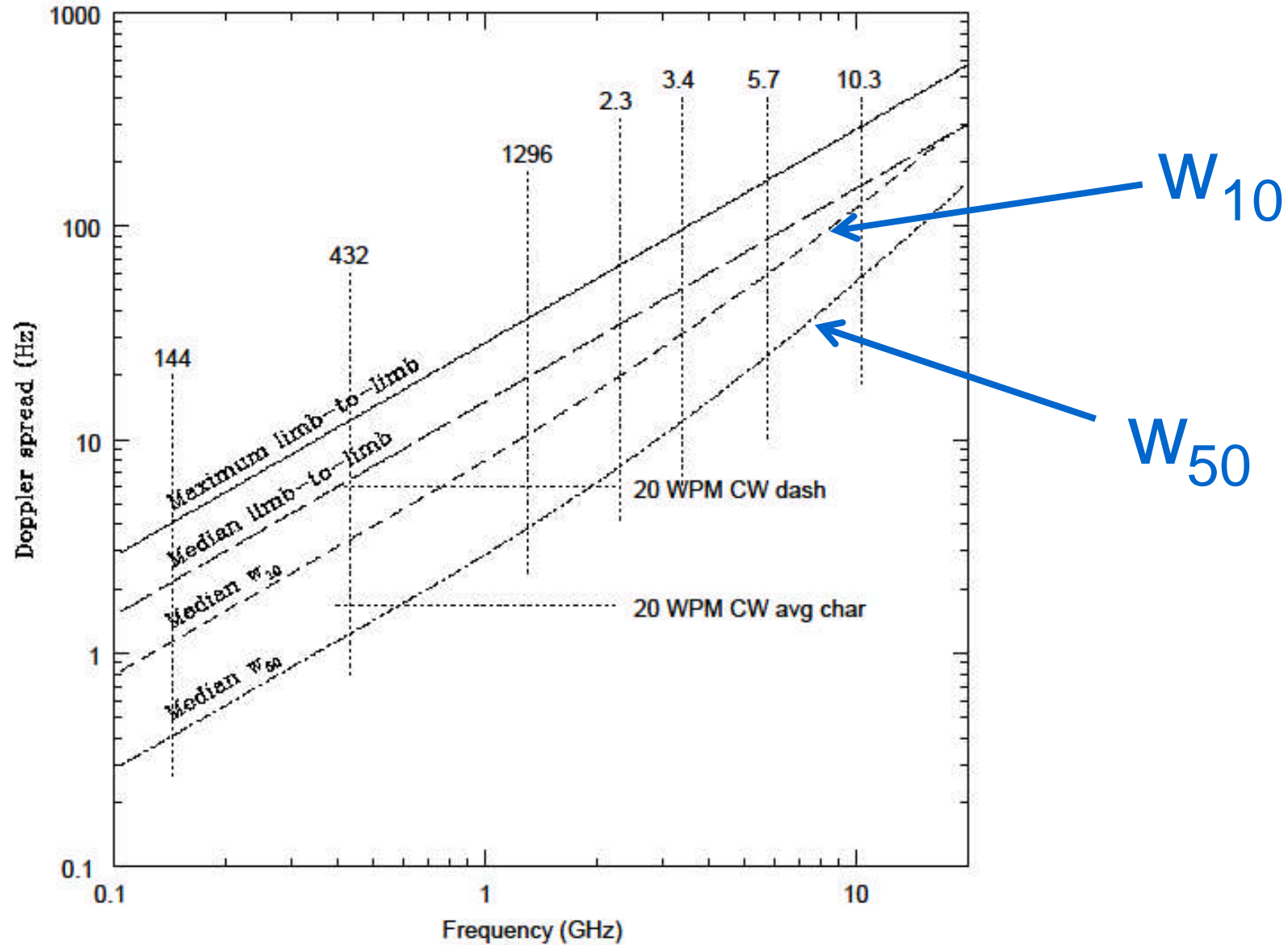
Summary of Measurements



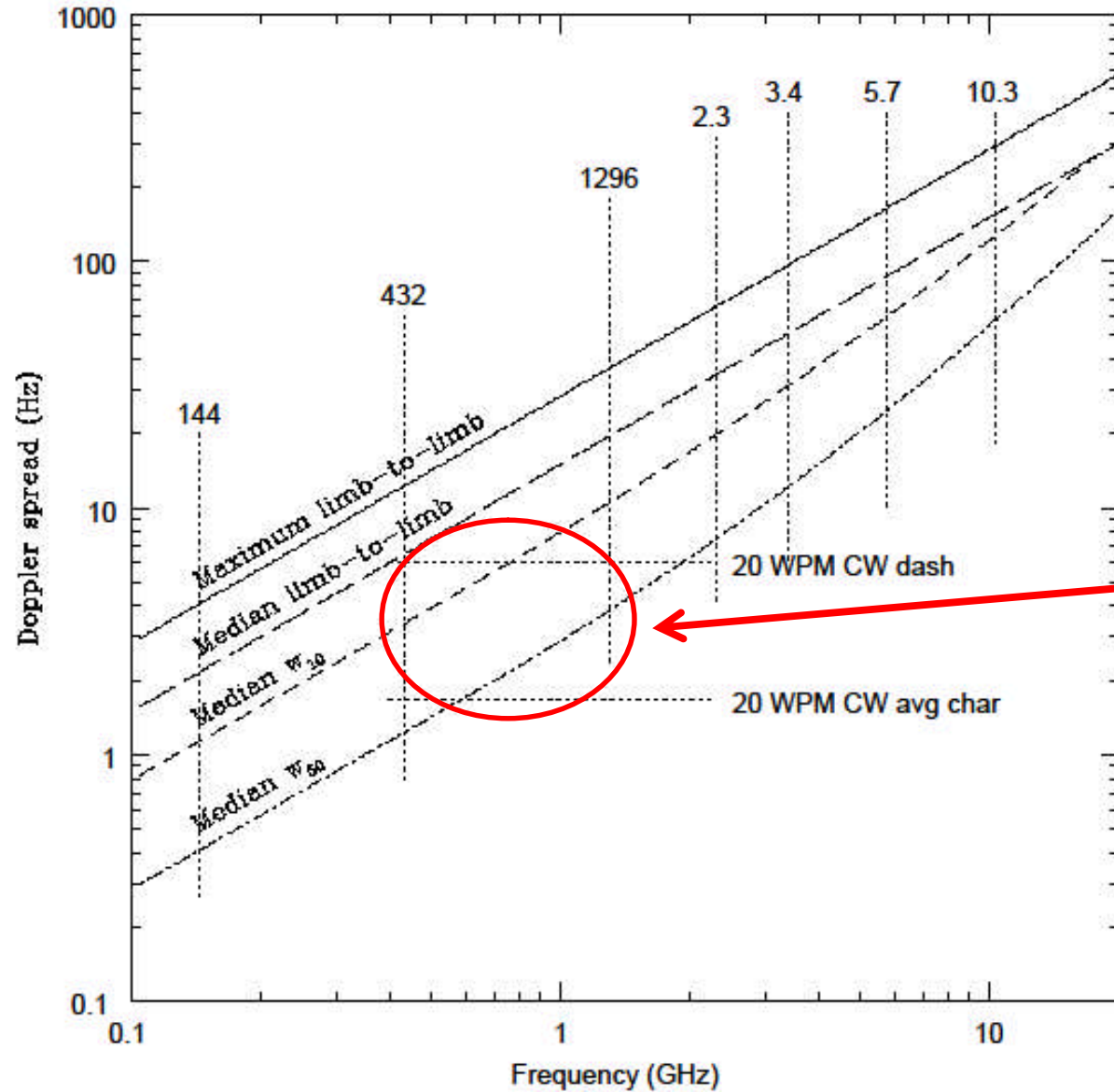
W_{10}

W_{50}

Implications for Amateur EME



Implications for Amateur EME



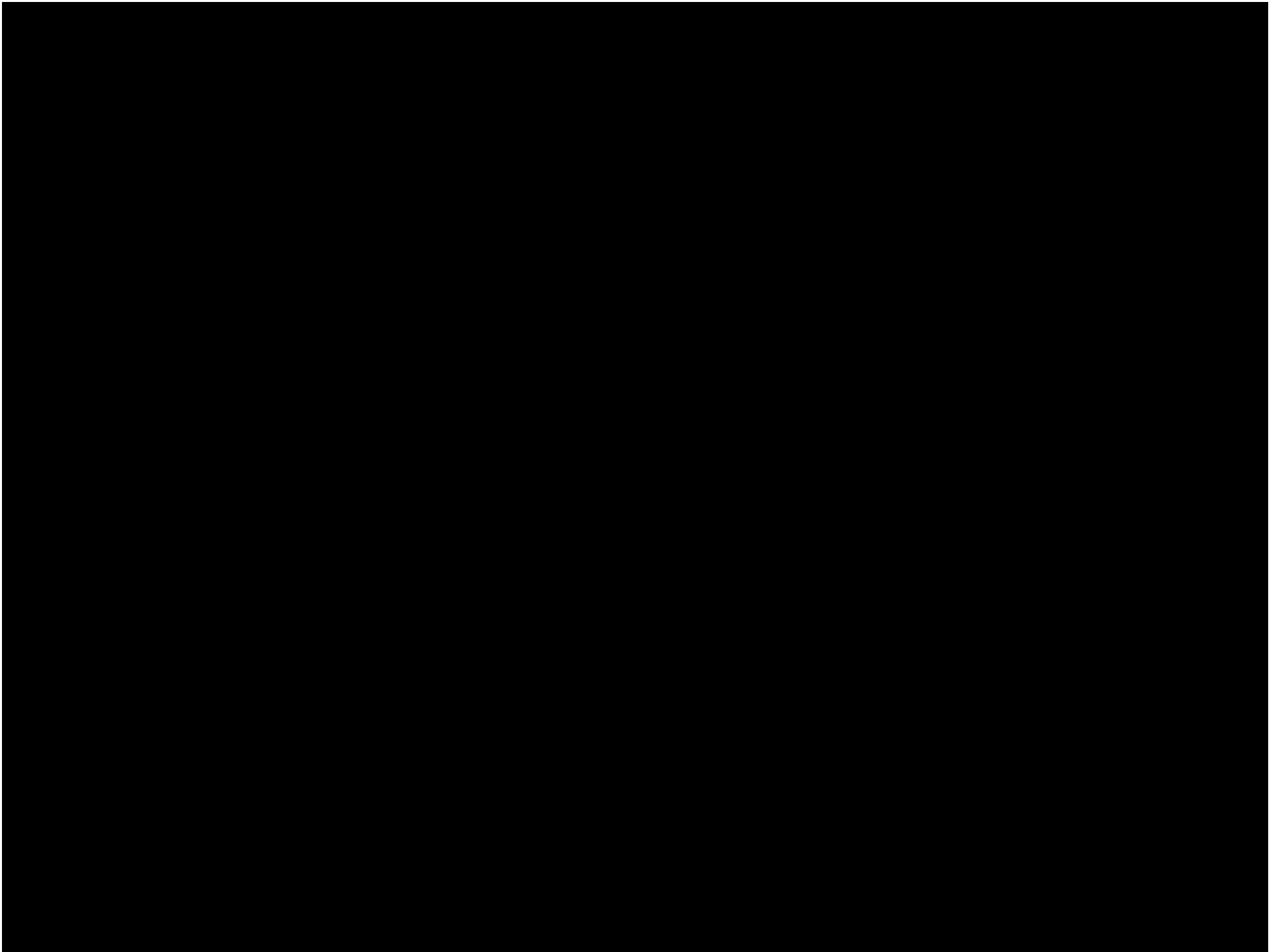
Region of
difficult-to-copy
CW

Typical Numbers, by Band

Frequency (MHz)	Maximum Spread (Hz)	Median Spread (Hz)	Median w_{10} (Hz)	Median w_{50} (Hz)
144	4	2.2	1.1	0.4
432	12	7	3	1.2
1296	37	19	10	4
2304	65	35	20	8
3400	97	51	31	12
5760	164	86	60	25
10368	295	156	128	58

Summary

- EME echoes are nearly specular at VHF, increasingly diffuse at UHF
- Libration is predictable: depends on station locations, daily and monthly cycles
- Libration fading = Doppler spread
(different manifestations of same effect !)
- EME at 70 and 23 cm can benefit greatly from adequate coding/modulation diversity



Coming WSJT Features

WSJT 7

- FSK441
- JT6M
- JT65 A-C
- JT4 A-G
- WSPR

WSJT 9

- FSK441
- ISCAT
- JT65 A-C
- JT4 A-G
- Echo
- JTMS (?)
- JT65AA (?)

