

MAP65 Version 2

A Panoramic, Polarization-
Matching Receiver for JT65

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MAP65: What is it?

- SDR software, works with JT65 signals
- “Big brother” to WSJT
- Rx hardware converts RF to baseband
- Decodes all JT65 signals in 90 kHz BW
- X-Pol: Automatic polarization matching
- Designed for EME on 144, 432, 1296 MHz

JT65 Protocol

- 60 s T/R sequences
- Compact, structured messages
- Modulation: 65-tone FSK, 2.7 baud
- ECC: Reed-Solomon $(63,12)_6$
- Works at 10 to 15 dB below CW limit
- > 1000 EME users on 144 MHz !

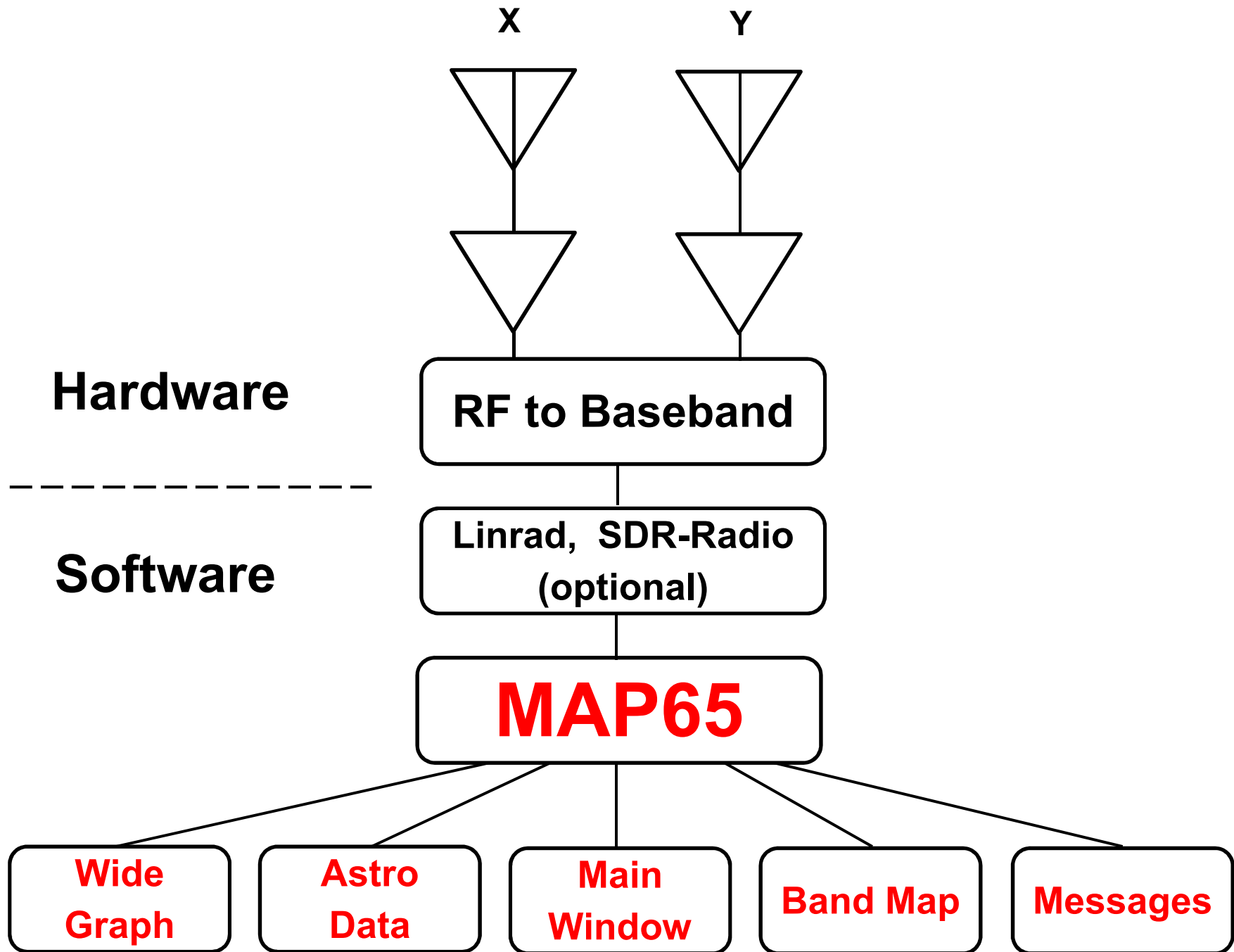
Program Comparison

WSJT

- BW 2-5 kHz
- Many modes
- Decodes one signal
- One polarization

MAP65

- BW 90 kHz
- JT65 only
- Decodes all signals in passband
- All polarizations (avg 3 dB better)
- Automatic Band Map



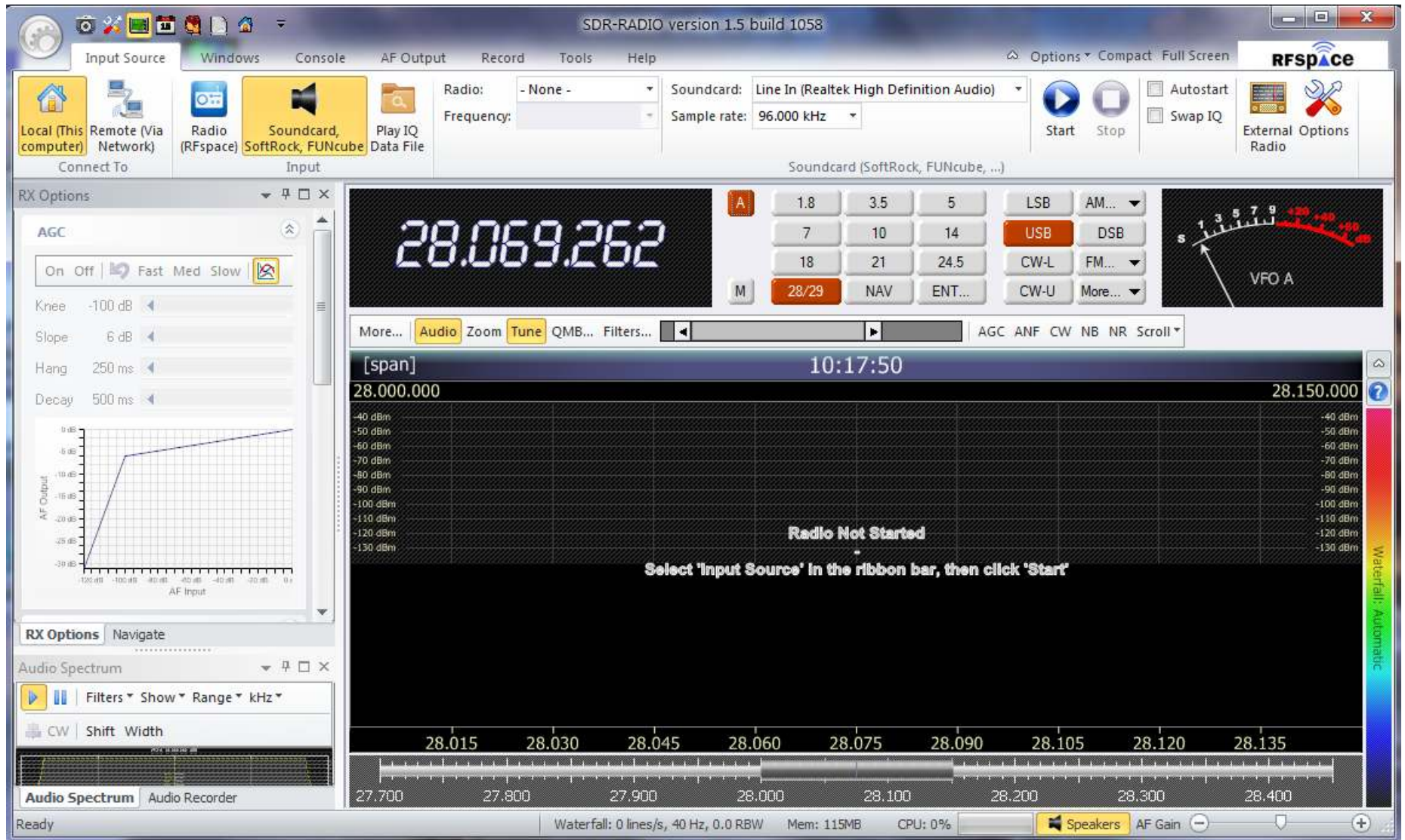
MAP65: Version 2 Features

- Supports X-pol and Single-pol systems
- Sub-modes JT65A, B, and C
- Sample rate: 96000 or 95238 Hz
- Optional front-ends: Linrad, SDR-Radio
- Rx hardware: WSE converters, IQ+, Perseus, SDR-IQ, FUNcube Dongle, SoftRock, ...
- QtSDK, C++ for GUI; Fortran for decoder
- Windows, OS X, Linux, ...

Example Receivers



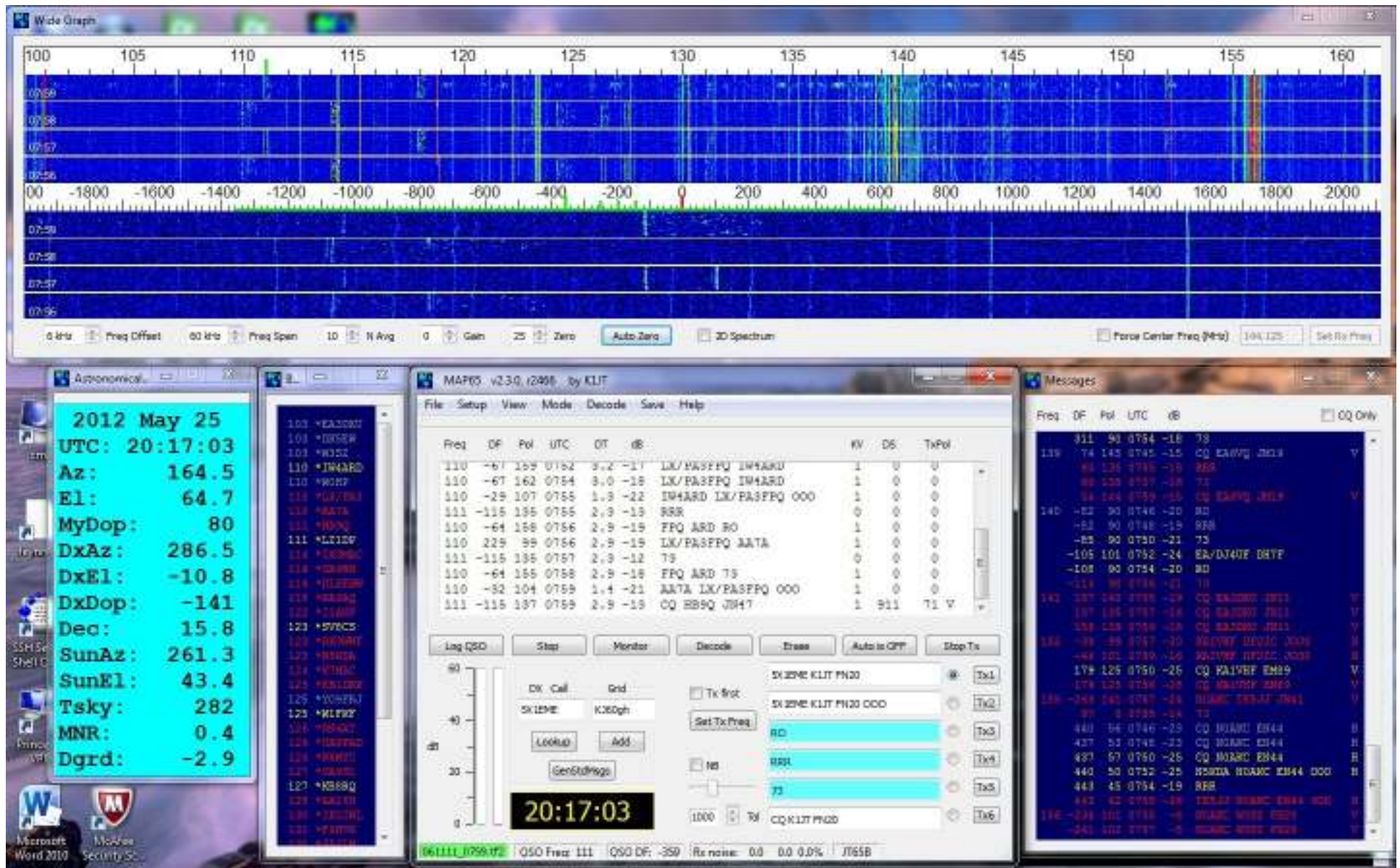
SDR-Radio



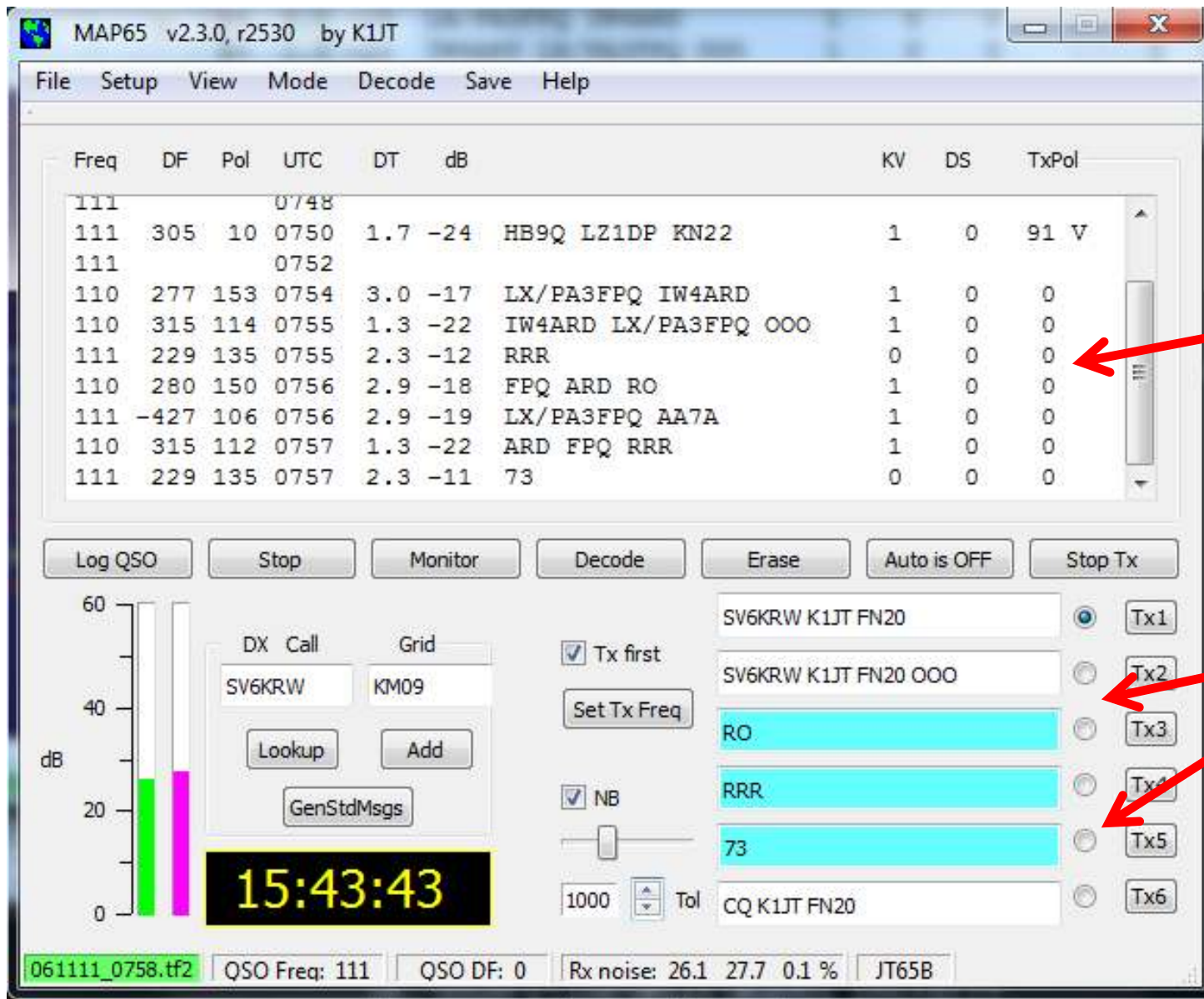
Normal Operation at K1JT (2m EME)

1. Turn on Rx, warm up PA
2. Start Linrad and MAP65
3. Click to track Moon
4. Callsigns start to appear on screen
5. Double-click on a CQing callsign
6. Select Tx polarization (H or V)
7. Click “Auto On” to call him

MAP65: Full Screen Display



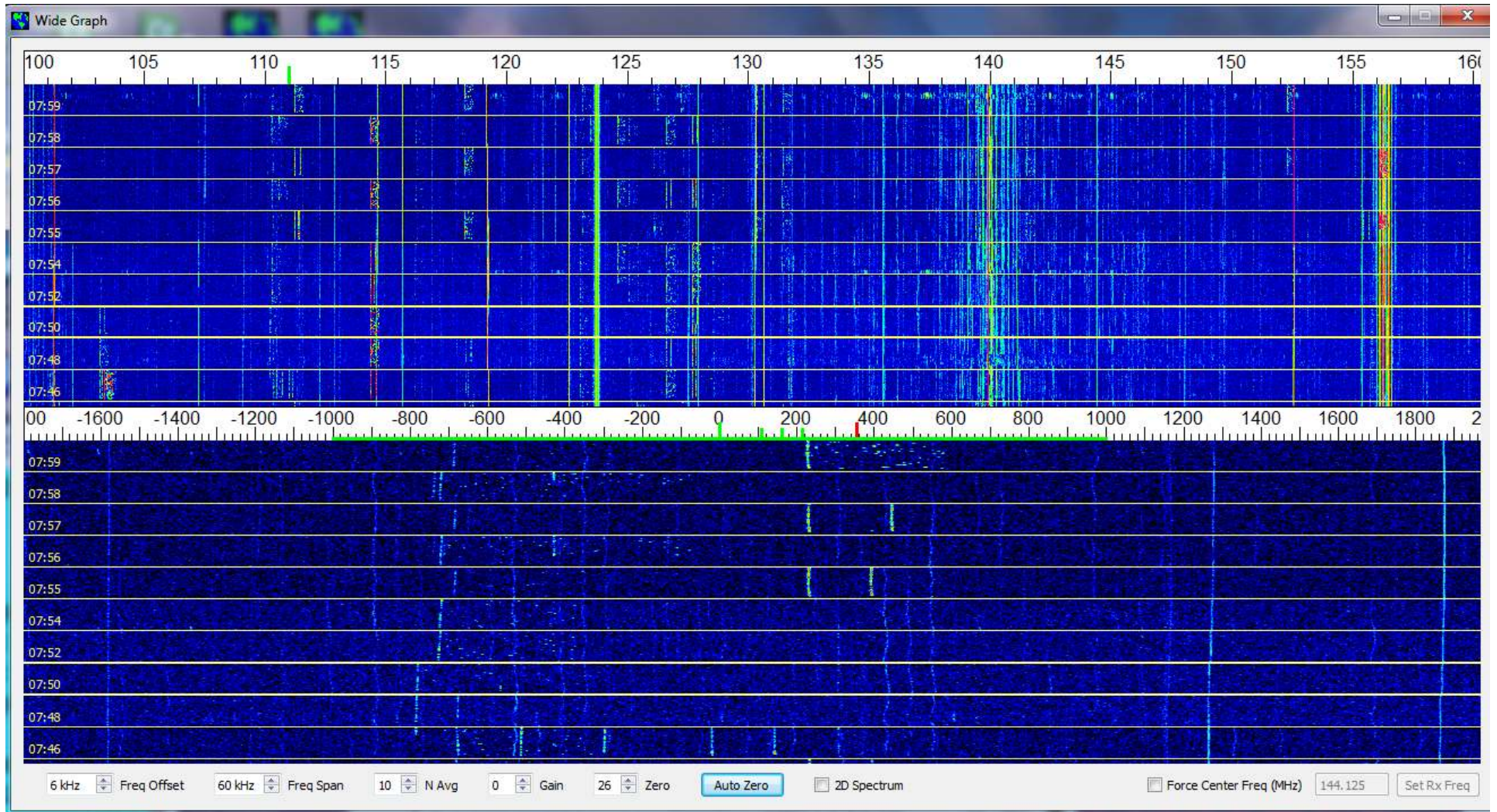
Main Window



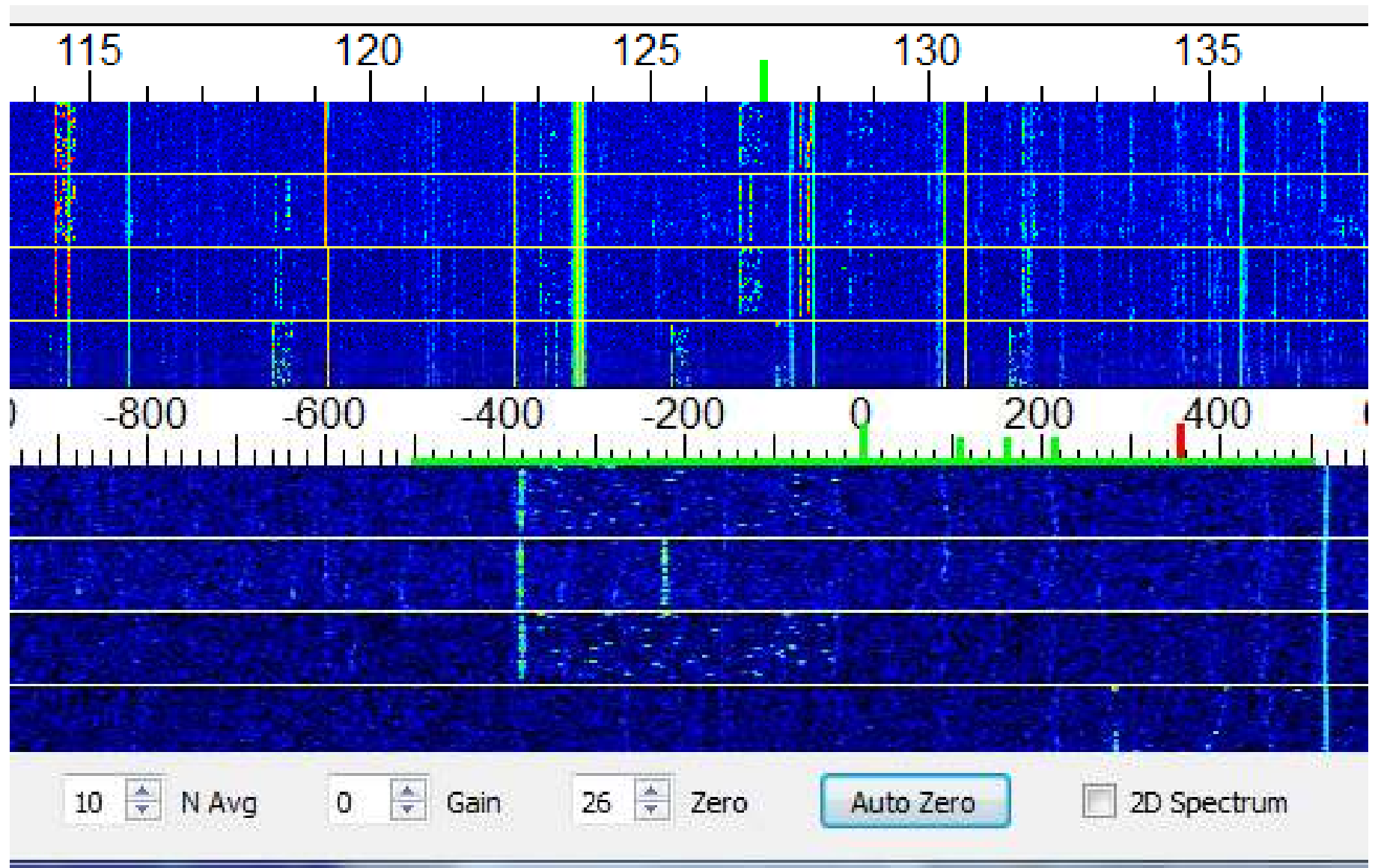
QSO
Window

Tx
Messages

Wide Graph

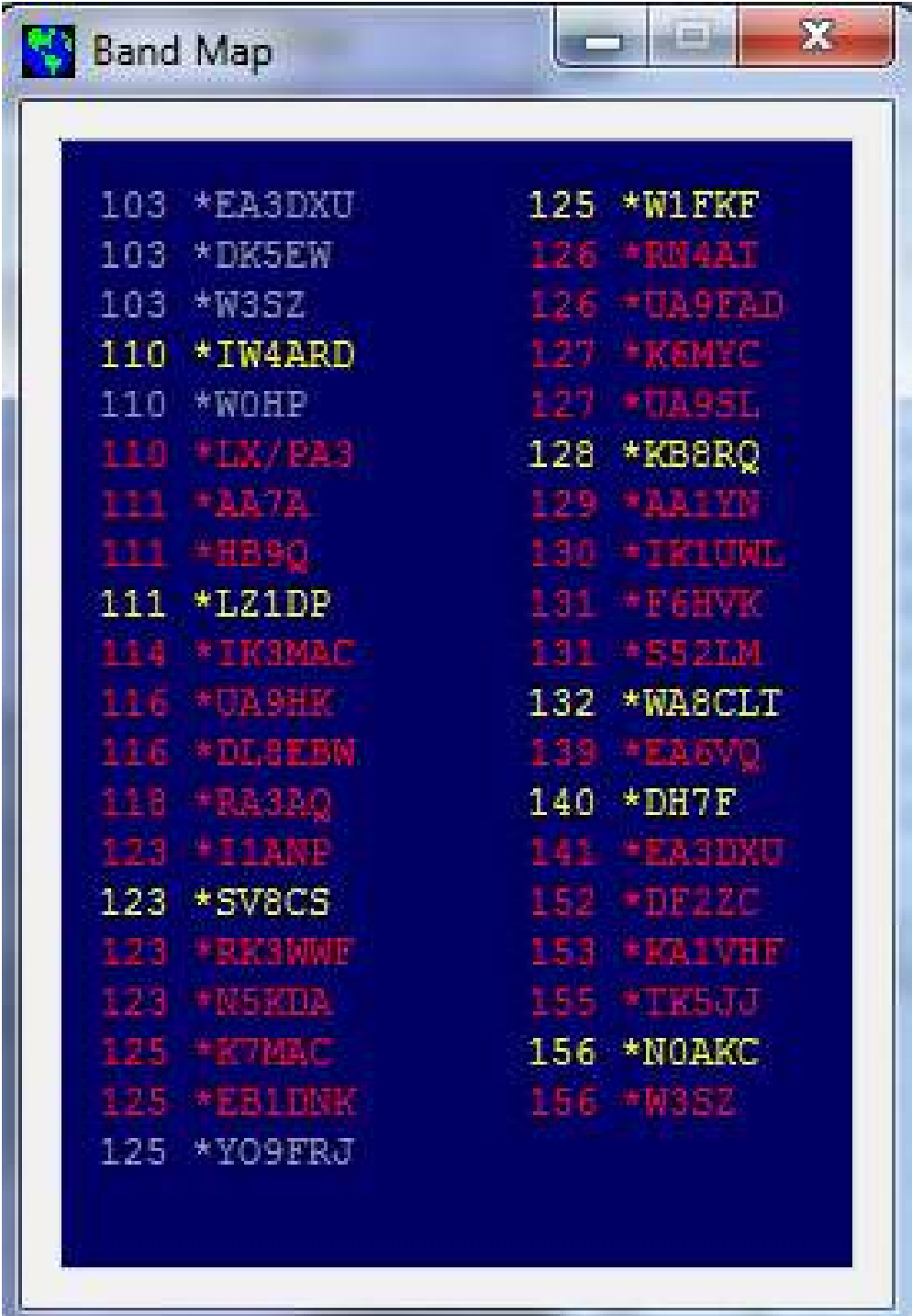


Wide Graph (detail)



Band Map

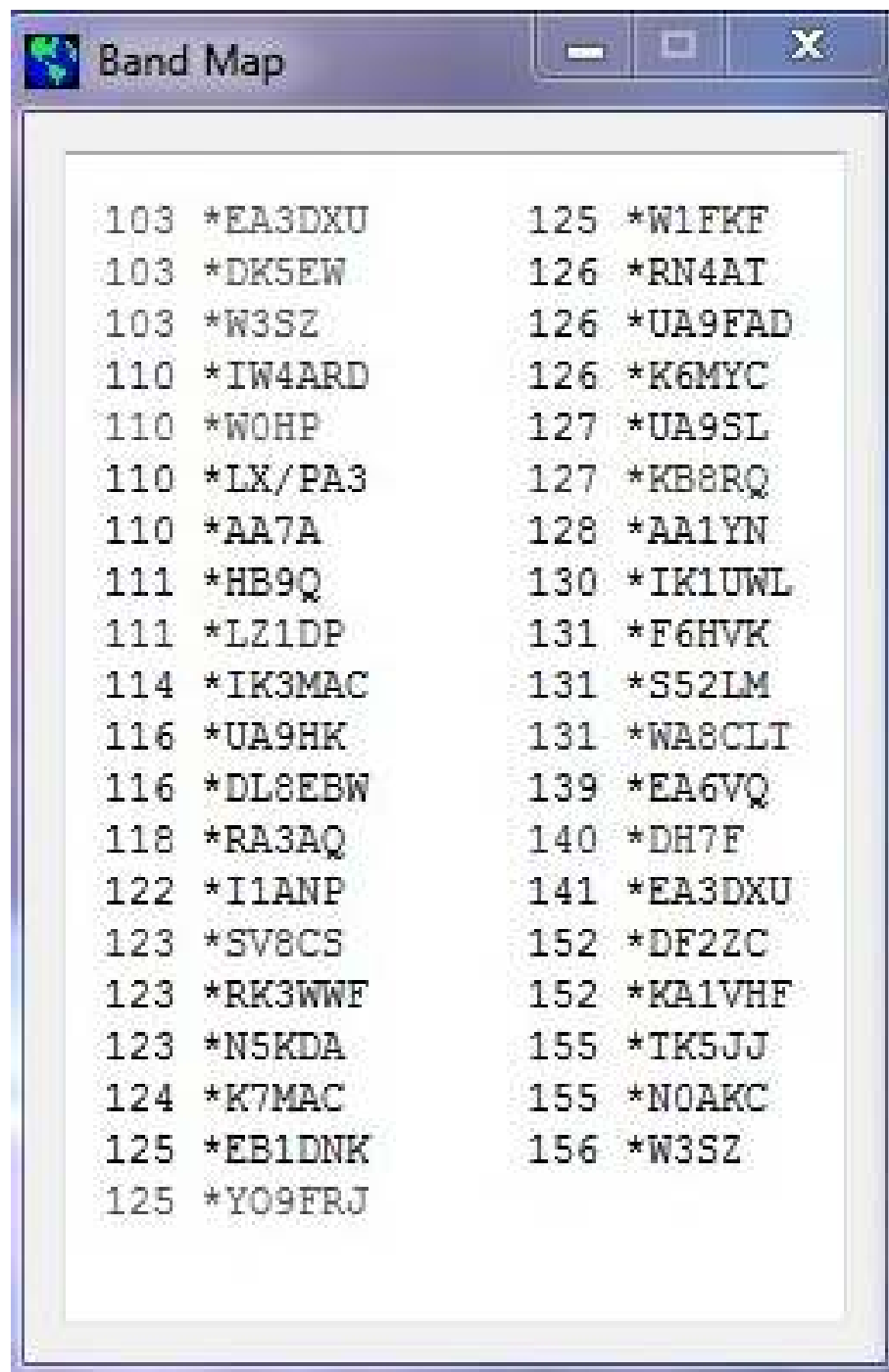
2 × 10-element
Xpol Yagis



The screenshot shows a window titled "Band Map" with a dark blue background and yellow and red text. The window contains a list of call signs and their corresponding frequency bands, organized in two columns. The call signs are listed in two columns, with the frequency band on the left and the call sign on the right. The call signs are: *EA3DXU, *DK5EW, *W3SZ, *IW4ARD, *WOHP, *LX/PA3, *AA7A, *HB9Q, *LZ1DP, *IK3MAC, *UA9HK, *DL8EBW, *RA3BQ, *I1ANP, *SV8CS, *RK3WWE, *NSKDA, *K7MAC, *EB1DINK, *YO9FRJ, *W1FKF, *RN4AJ, *UA9FAD, *K6MYC, *UA9SL, *KB8RQ, *AA1YN, *IK1UWL, *F6HVK, *S52LM, *WA8CLT, *EA6VQ, *DH7F, *EA3DXU, *DE22C, *KA1VHF, *TK5JJ, *NOAKC, and *W3SZ.

103	*EA3DXU	125	*W1FKF
103	*DK5EW	126	*RN4AJ
103	*W3SZ	126	*UA9FAD
110	*IW4ARD	127	*K6MYC
110	*WOHP	127	*UA9SL
110	*LX/PA3	128	*KB8RQ
111	*AA7A	129	*AA1YN
111	*HB9Q	130	*IK1UWL
111	*LZ1DP	131	*F6HVK
114	*IK3MAC	131	*S52LM
116	*UA9HK	132	*WA8CLT
116	*DL8EBW	133	*EA6VQ
118	*RA3BQ	140	*DH7F
123	*I1ANP	141	*EA3DXU
123	*SV8CS	152	*DE22C
123	*RK3WWE	153	*KA1VHF
123	*NSKDA	155	*TK5JJ
125	*K7MAC	156	*NOAKC
125	*EB1DINK	156	*W3SZ
125	*YO9FRJ		

Band Map (grayscale)



103	*EA3DXU	125	*W1FKF
103	*DK5EW	126	*RN4AT
103	*W3SZ	126	*UA9FAD
110	*IW4ARD	126	*K6MYC
110	*W0HP	127	*UA9SL
110	*LX/PA3	127	*KB8RQ
110	*AA7A	128	*AA1YN
111	*HB9Q	130	*IK1UWL
111	*LZ1DP	131	*F6HVK
114	*IK3MAC	131	*S52LM
116	*UA9HK	131	*WA8CLT
116	*DL8EBW	139	*EA6VQ
118	*RA3AQ	140	*DH7F
122	*I1ANP	141	*EA3DXU
123	*SV8CS	152	*DF2ZC
123	*RK3WWF	152	*KA1VHF
123	*N5KDA	155	*TK5JJ
124	*K7MAC	155	*N0AKC
125	*EB1DNK	156	*W3SZ
125	*YO9FRJ		

Messages

Messages

Freq	DF	Pol	UTC	dB						<input type="checkbox"/> CQ Only
127	278	178	0758	-14	RN4AT	K6MYC	DM07	000	V	
	-113	174	0759	-17	KB8RQ	UA9SL	LO71		V	
	329	90	0746	-12	RRR					
	326	90	0748	-12	RRR					
	326	90	0750	-14	73					
	329	116	0752	-12	SP2JYR	KB8RQ	EM79	000	V	
	326	120	0754	-13	SP2JYR	KB8RQ	EM79	000	V	
	329	135	0756	-12	RRR					
	326	135	0758	-12	73					
128	211	73	0746	-21	CQ	AA1YN	FN43		V	
	205	65	0748	-23	CQ	AA1YN	FN43		V	
	205	70	0750	-23	QRZ	AA1YN	FN43		V	
	202	68	0752	-24	QRZ	AA1YN	FN43		V	
	202	66	0754	-21	CQ	AA1YN	FN43		V	
	202	71	0756	-23	CQ	AA1YN	FN43		V	
	199	60	0758	-23	CQ	AA1YN	FN43		V	
	130	10	41	0755	-15	CQ	IK1UWL	JN33		H
4		42	0757	-18	CQ	IK1UWL	JN33		H	
-10		46	0759	-16	CQ	IK1UWL	JN33		H	
131	30	125	0754	-20	K1JT	F6HVK	JN27		V	
	30	120	0756	-18	K1JT	F6HVK	JN27		V	
	91	154	0745	-16	WA8CLT	S52LM	JN65	000	V	
	94	152	0755	-20	CQ	S52LM	JN65		V	
	97	150	0757	-16	CQ	S52LM	JN65		V	
	97	148	0759	-16	CQ	S52LM	JN65		V	
	299	90	0746	-17	RO					
	299	90	0748	-18	73					
	305	100	0750	-19	K1JT	WA8CLT	EN80	000	V	
139	308	90	0752	-20	RRR					
	311	90	0754	-18	73					
	74	145	0745	-15	CQ	EA6VQ	JM19		V	
	60	135	0755	-18	RRR					
	60	135	0757	-16	73					
140	54	144	0759	-15	CQ	EA6VQ	JM19		V	
	-82	90	0746	-20	RO					
	-82	90	0748	-19	RRR					

Rx Hardware Interfacing

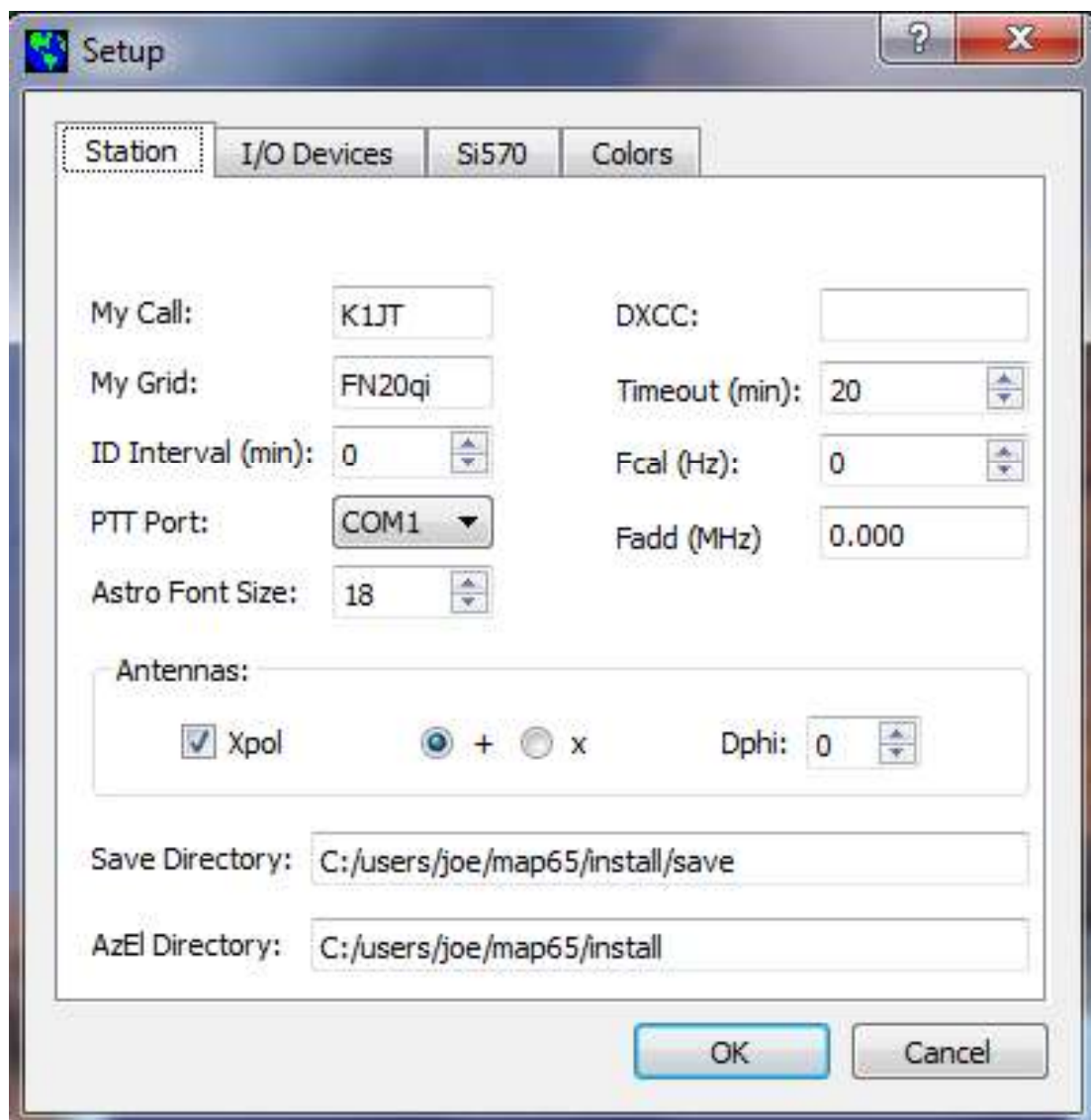
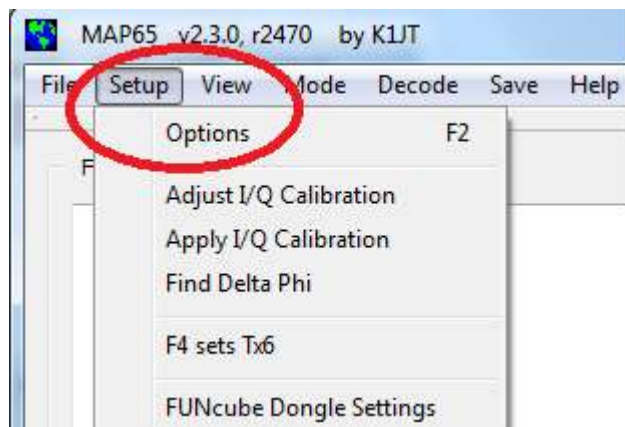
	SoftRock	FUNcube Dongle	SDR-IQ, Perseus	SoftRock × 2	IQ+ VL, V, U	WSE
Input Freq (MHz)	28, 144	144, 432, 1296	28	28, 144	50, 144, 432	144
Polarizations	1	1	1	2	2	2
Soundcard Channels	2	–	–	4	4	4
Digital Interface	USB	USB	USB	USB	USB	Parallel Port
Frequency Control*	L, S, M	L, S, M	L, S	L, M	L, M	L
Front-End Software*	L or S optional	–	L or S required	L optional	L optional	L optional

* L = Linrad, S = SDR-Radio, M = MAP65

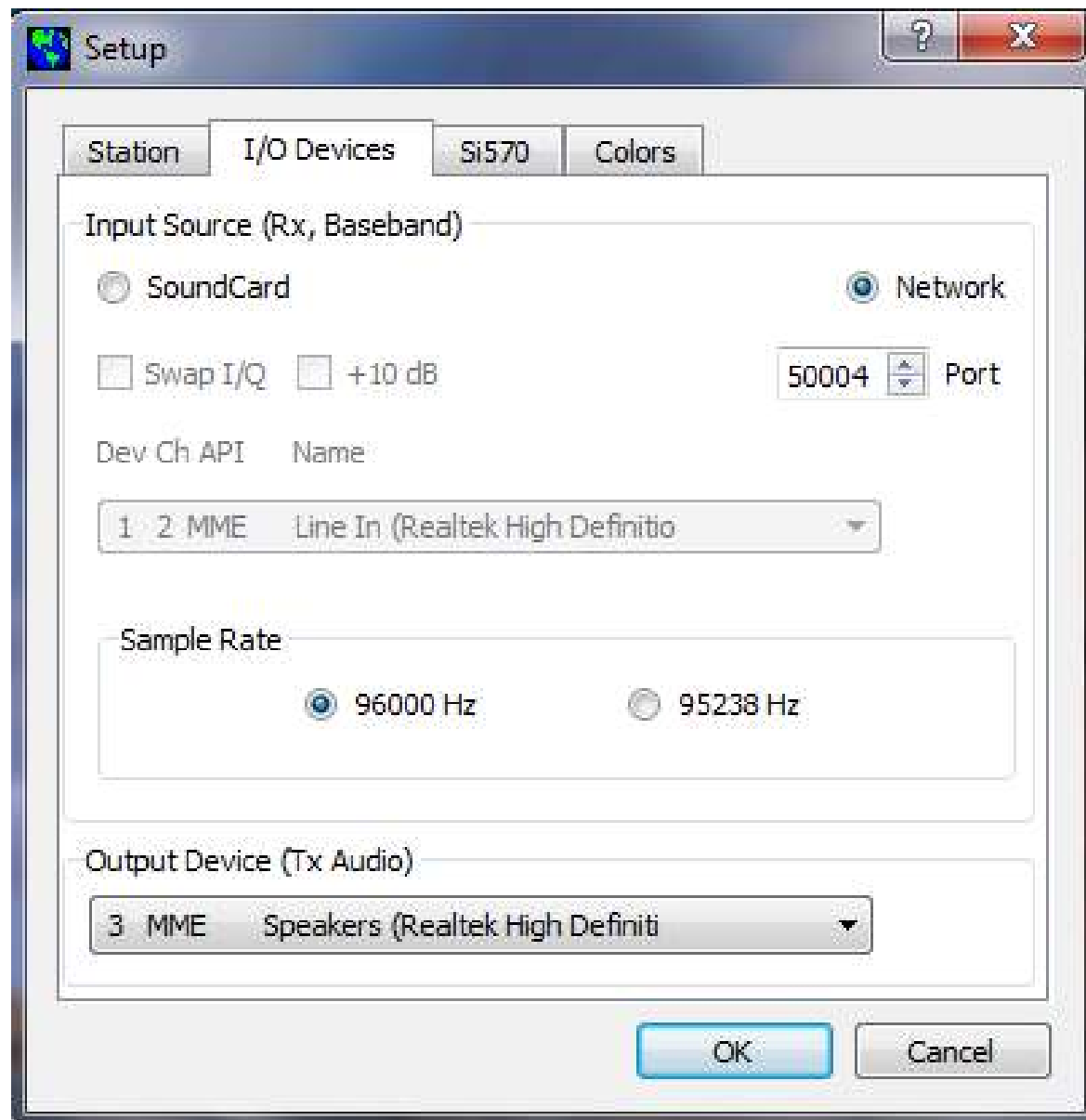
MAP65: Why do you need it?

- Random EME on 144, 432, 1296
(no skeds or logger)
- Superb wideband noise blanker
- Copy all EME signals in band
- Monitor CW as well as JT65
portions of band
- Powerful EME contest operating aid !

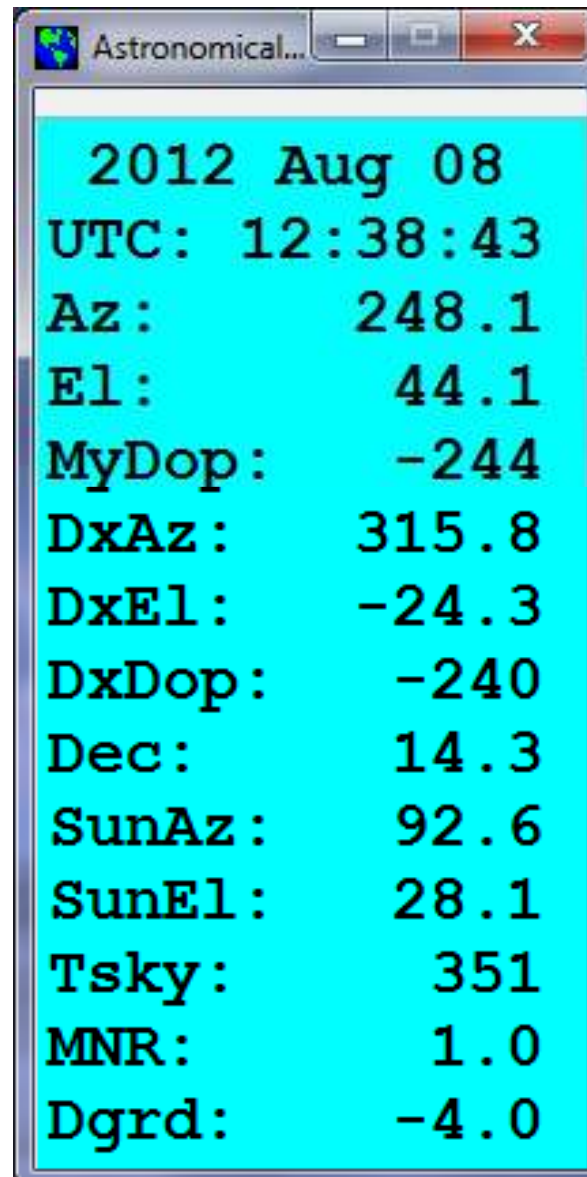
Setup | Options – Station tab



Setup | Options – I/O Devices



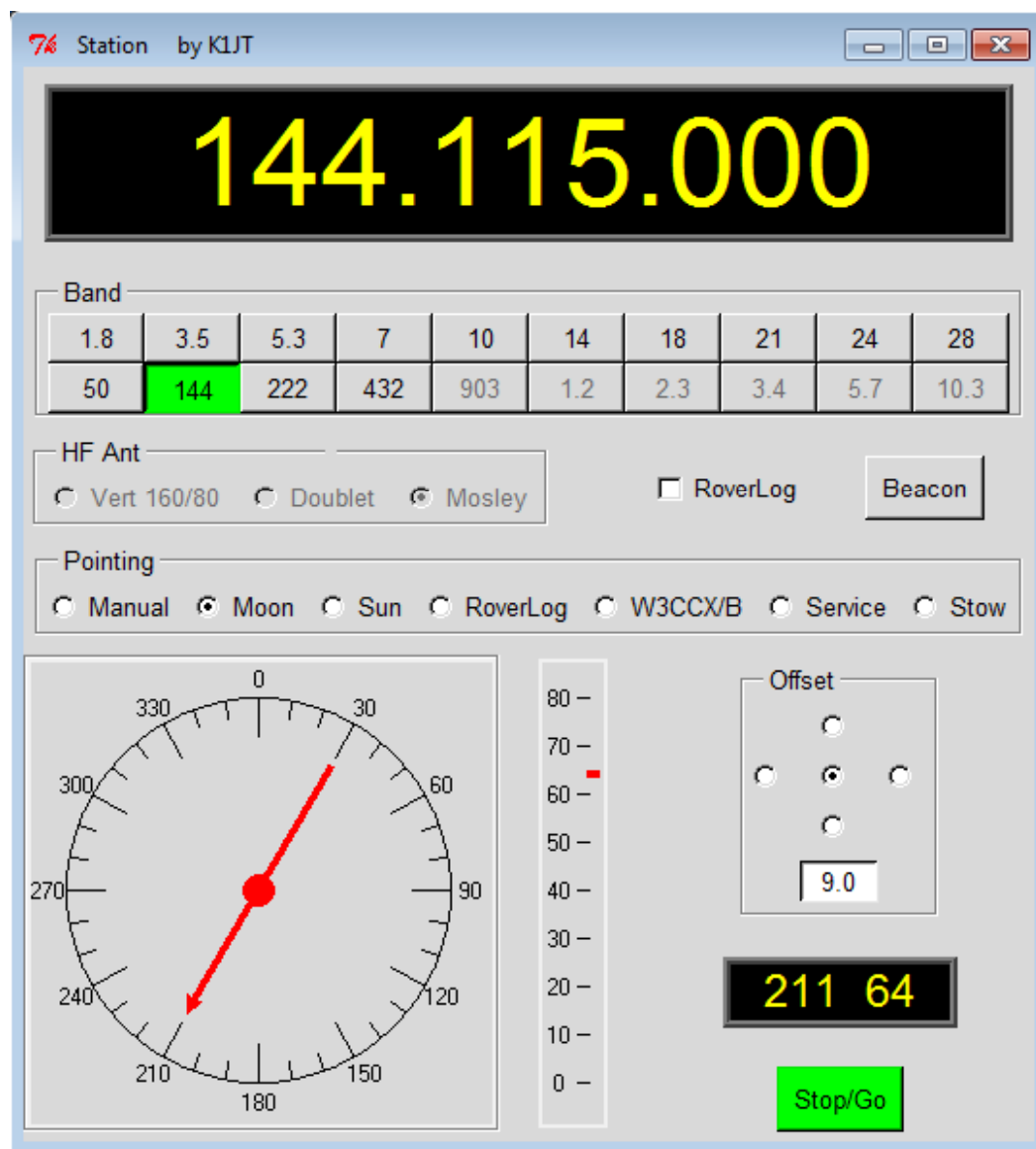
Astronomical Data



A screenshot of a software window titled "Astronomical..." with a globe icon. The window has a cyan background and displays a list of astronomical data points in a monospaced font. The data includes a date, a UTC time, and various angular measurements and rates.

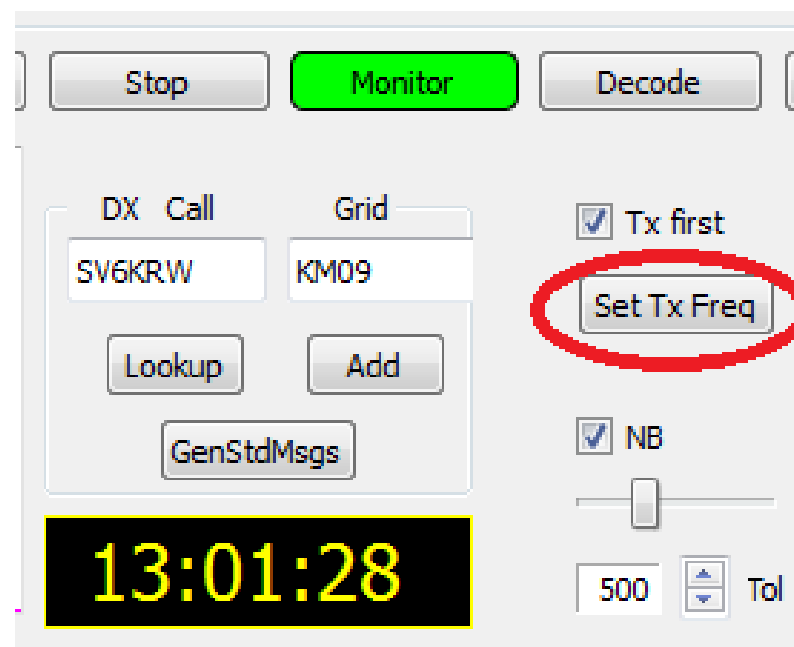
2012 Aug 08	
UTC:	12:38:43
Az:	248.1
El:	44.1
MyDop:	-244
DxAz:	315.8
DxE1:	-24.3
DxDop:	-240
Dec:	14.3
SunAz:	92.6
SunEl:	28.1
Tsky:	351
MNR:	1.0
Dgrd:	-4.0

Station Control at K1JT

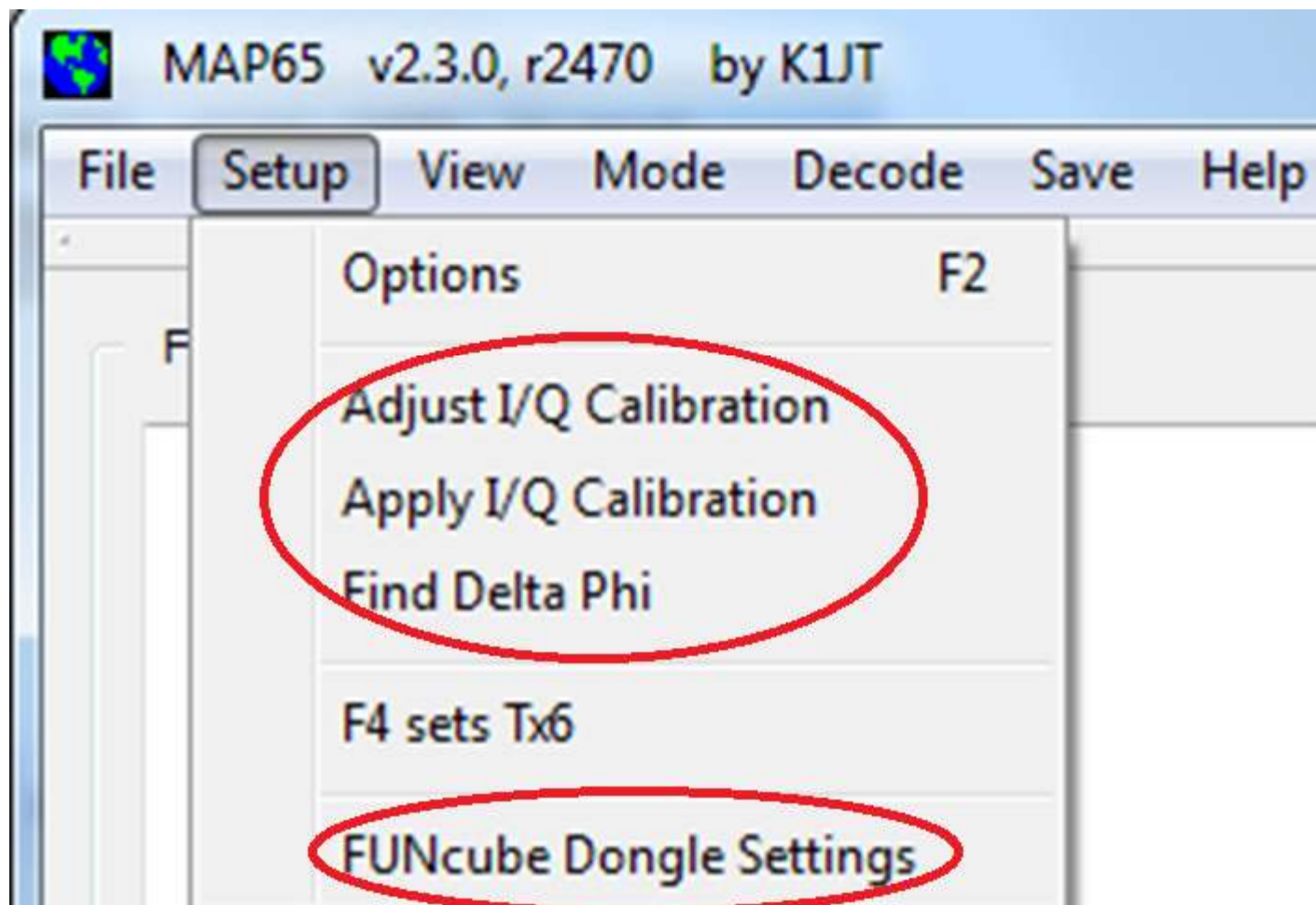


File azel.dat

13:01:28,211.3, 64.1,Moon
13:01:28, 98.3, 33.9,Sun
144, 162,Doppler
115,0,fQSO



More Setup Features



Setup Utility for FUNcube Dongle

FUNcube Dongle Controller

File Tools Help

89,102,000 Hz

< 25,000 >

Corr -120 ppm

PLL Locked ☐ IF RSSI 0

Correction

DC I 0.00015 Gain 1.00000

DC Q -0.00116 Phase 0.00000

Firmware

Bootloader Upload

Application Verify

LNA RF Filter Mixer Filter IF RC Filter IF Filter

IF Amp 1 IF Amp 2 IF Amp 3 IF Amp 4 IF Amp 5 IF Amp 6

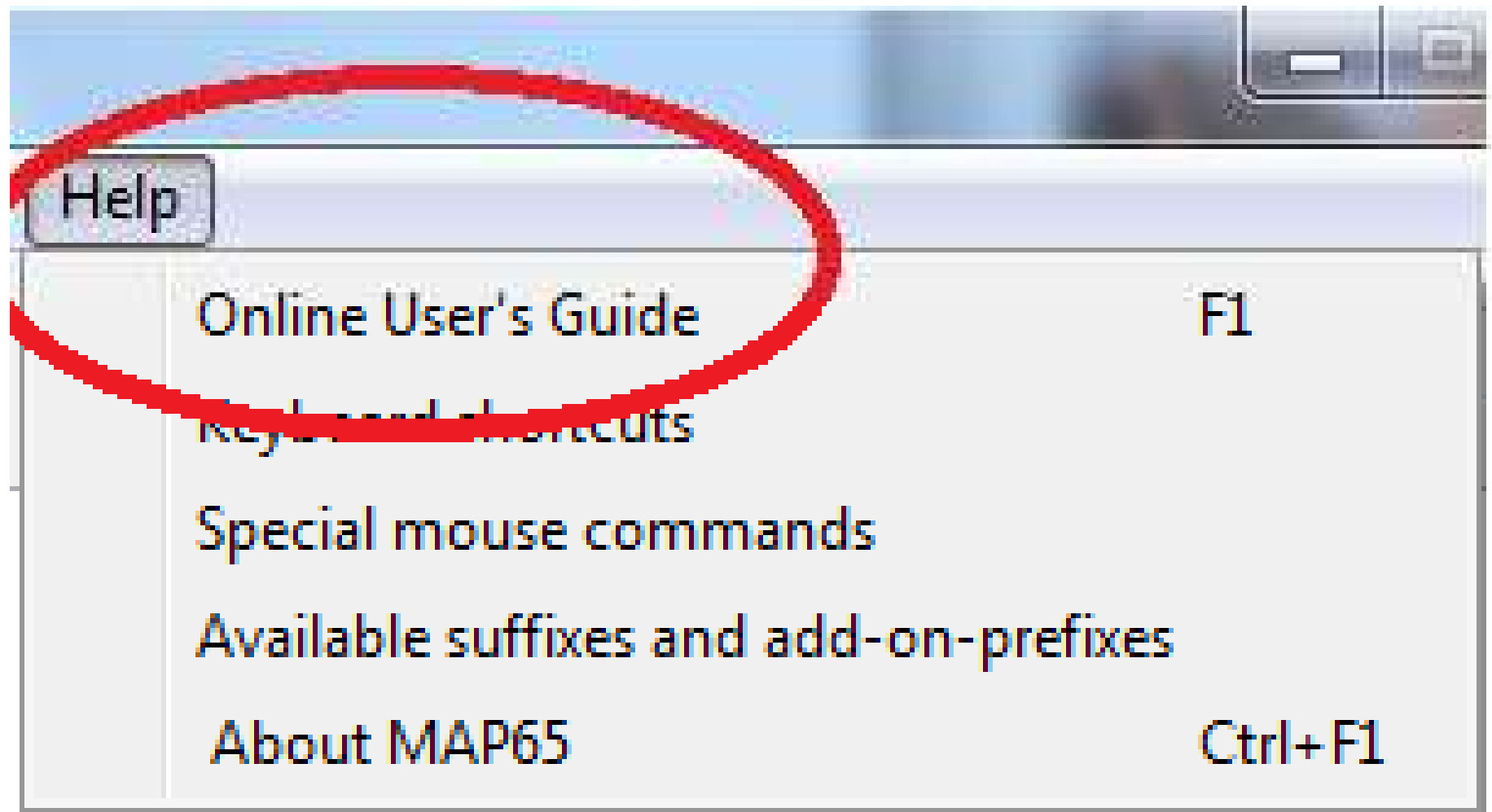
LNA gain +20.0dB RF Filter 509MHz LPF Mixer gain 12dB Mixer filter 1.9MHz IF gain 1 +6dB IF RC filter 1.0MHz IF gain 2 0dB IF gain 3 0dB IF gain 4 0dB IF filter 2.15MHz IF gain 5 +3dB IF gain 6 +3dB

LNA enhance Off Band VHF II Bias current 11 V/U band IF gain mode Linearity

Defaults

No FCD detected

Online User's Guide



432 and 1296 MHz

- “Best” EME bands
- Much smaller T_{sys}
- Much smaller antennas are “enough”
- Hear your own echoes with:
 - 432: 4 x 6m yagis, 250 W
 - 1296: 3m dish, 150 W
- MAP65 is great for JT65 and CW !
- Use Xpol Yagis on 432
- Single pol’n (RHC/LHC) on 1296

Possible Future Modes?

JT65B2, JT65C2

- 2 × speed, for EME contesting
- 30 s T/R sequences → up to 20 QSOs per hour !
- Sensitivity: 3 dB less
- Presently available in WSJT (only)
- Possible problems ...
 - QRM? Sub-band plan? Switching between modes?