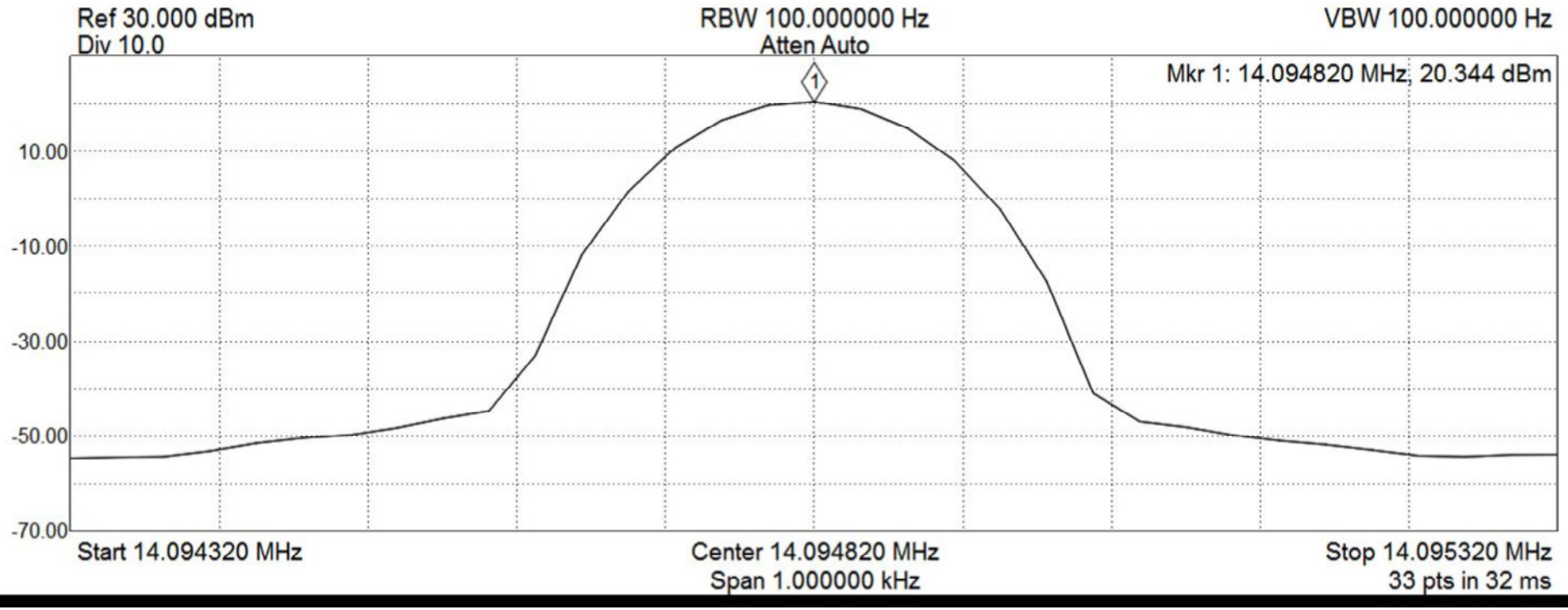
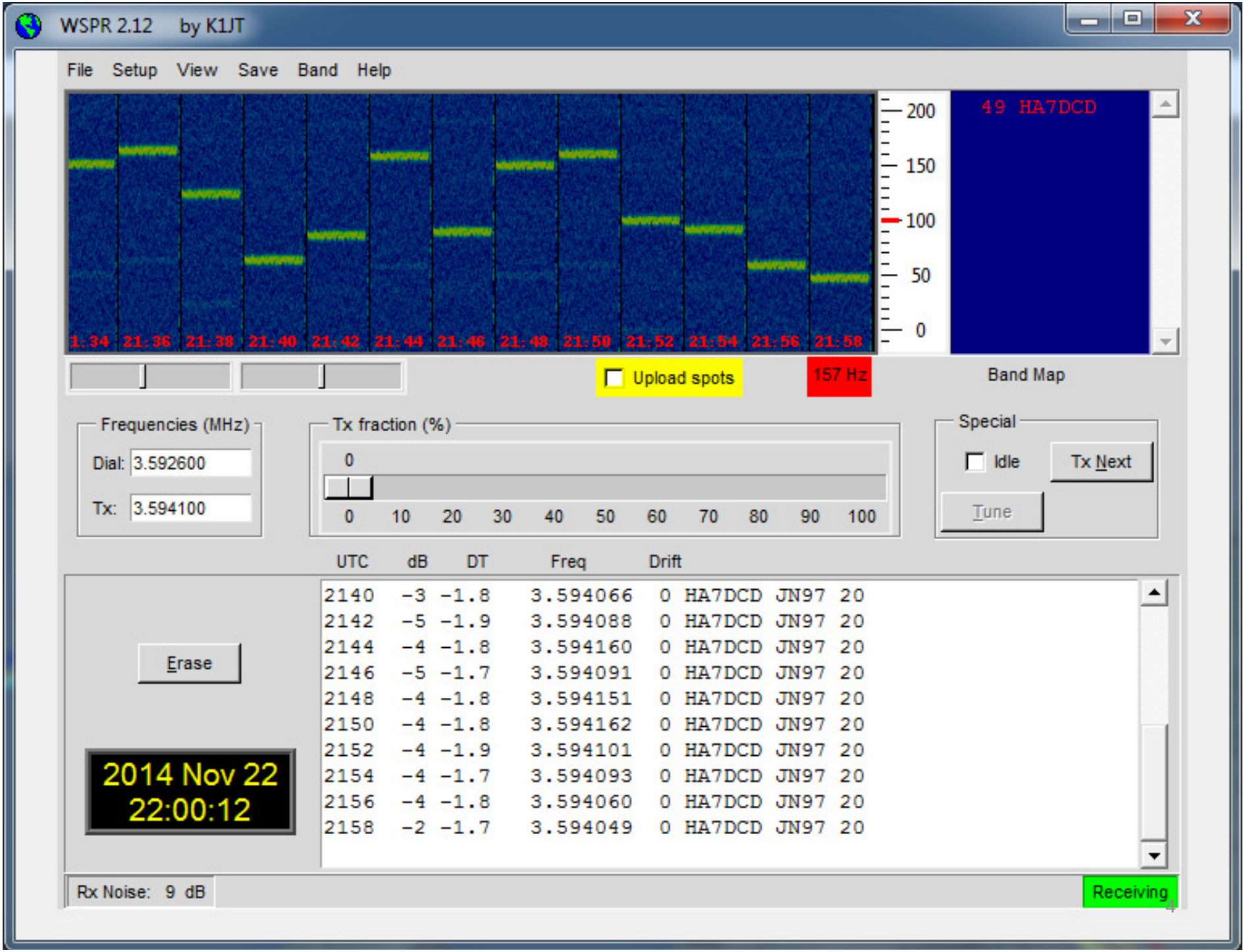
QRPi
Whispering Raspberries

Zoltán Dóczi, HA7DCD
Budapest, Hungary




"the quieter you become, the more you are able to hear"
PENETRATION TESTING,
REDEFINED.
A Project By Offensive Security


ICOM
HF / 50MHz TRANSCEIVER
IC-7800
POWER
TRANSMIT
TUNER
TIMER
PHONES
ELEC-KEY
MIC
CF CARD
MIC GAIN
COMP
DRIVE
VOX GAIN
ANTI VOX
CONTRAST
BRIGHT
VOICE MEMORY
REC
PLAY
AUTO TUNE
SPECTRUM SCOPE
7.007.800
50.110.000
ATT
MARKER
CENT/FIX
MAIN/SUB
SET
SSB
CW
RTTY/PSK
AM/FM
DATA
M.SCOPE
EXIT/SET
TWIN PBT
DIGI-SEL
NOTCH
RIT
CW PITCH
DUALWATCH
SPLIT
SPEECH
LOCK


WSPR 2.12 by K1JT
File Setup View Save Band Help
1:34 21:36 21:38 21:40 21:42 21:44 21:46 21:48 21:50 21:52 21:54 21:56 21:58
200
150
100
50
0
49 HA7DCD
Upload spots
157 Hz
Band Map
Frequencies (MHz)
Dial: 3.592600
Tx: 3.594100
Tx fraction (%)
0
0 10 20 30 40 50 60 70 80 90 100
Special
Idle
Tx Next
Tune
UTC dB DT Freq Drift
2140 -3 -1.8 3.594066 0 HA7DCD JN97 20
2142 -5 -1.9 3.594088 0 HA7DCD JN97 20
2144 -4 -1.8 3.594160 0 HA7DCD JN97 20
2146 -5 -1.7 3.594091 0 HA7DCD JN97 20
2148 -4 -1.8 3.594151 0 HA7DCD JN97 20
2150 -4 -1.8 3.594162 0 HA7DCD JN97 20
2152 -4 -1.9 3.594101 0 HA7DCD JN97 20
2154 -4 -1.7 3.594093 0 HA7DCD JN97 20
2156 -4 -1.8 3.594060 0 HA7DCD JN97 20
2158 -2 -1.7 3.594049 0 HA7DCD JN97 20
Erase
2014 Nov 22
22:00:12
Rx Noise: 9 dB
Receiving

	WiFi	GSM	2m FM	WSPR
Watt	0.1	2	5	0.1
Miles	0.06	22	62	6214
Miles/W	0.6	11	12	62137

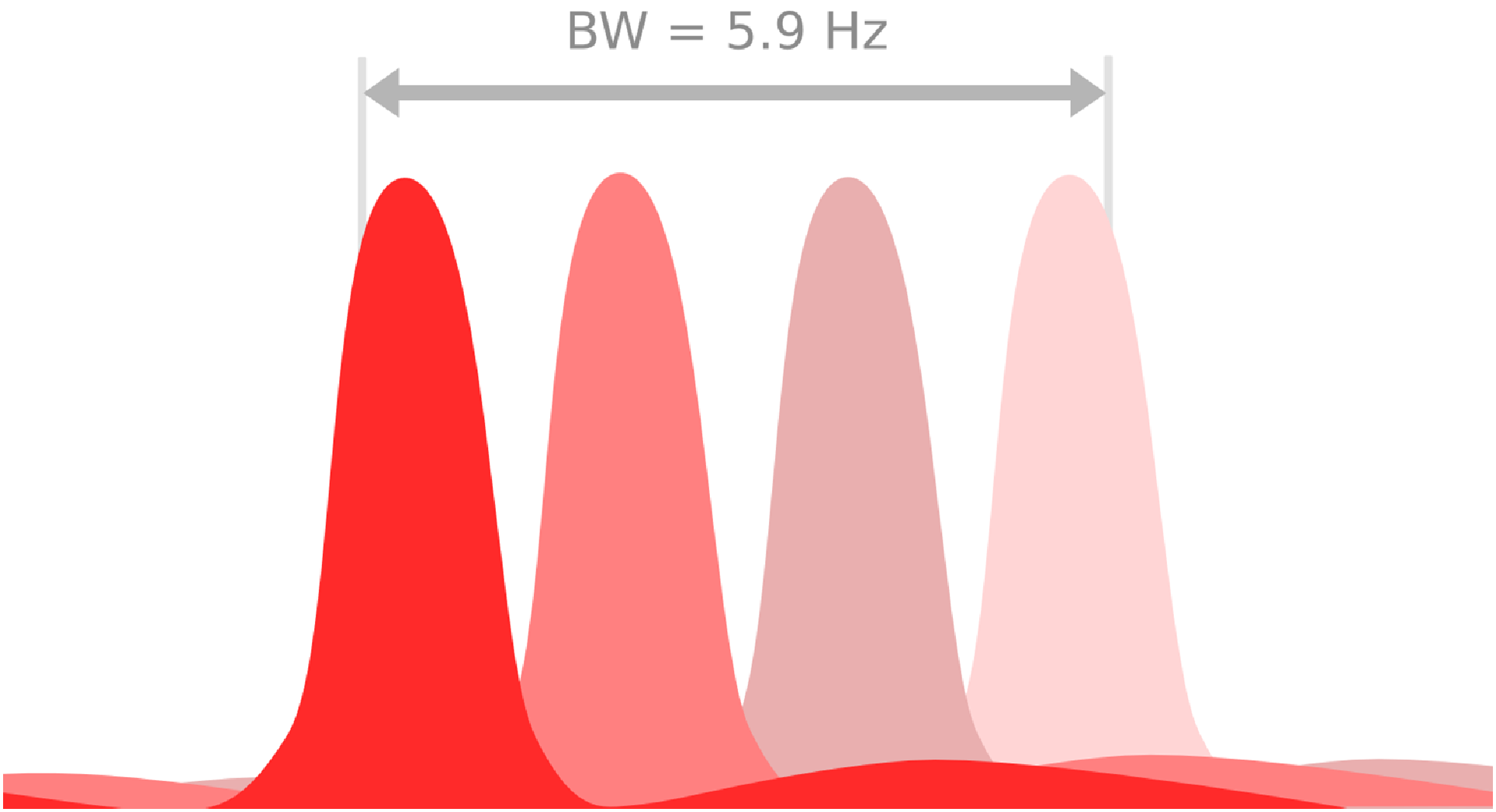
- Message components:

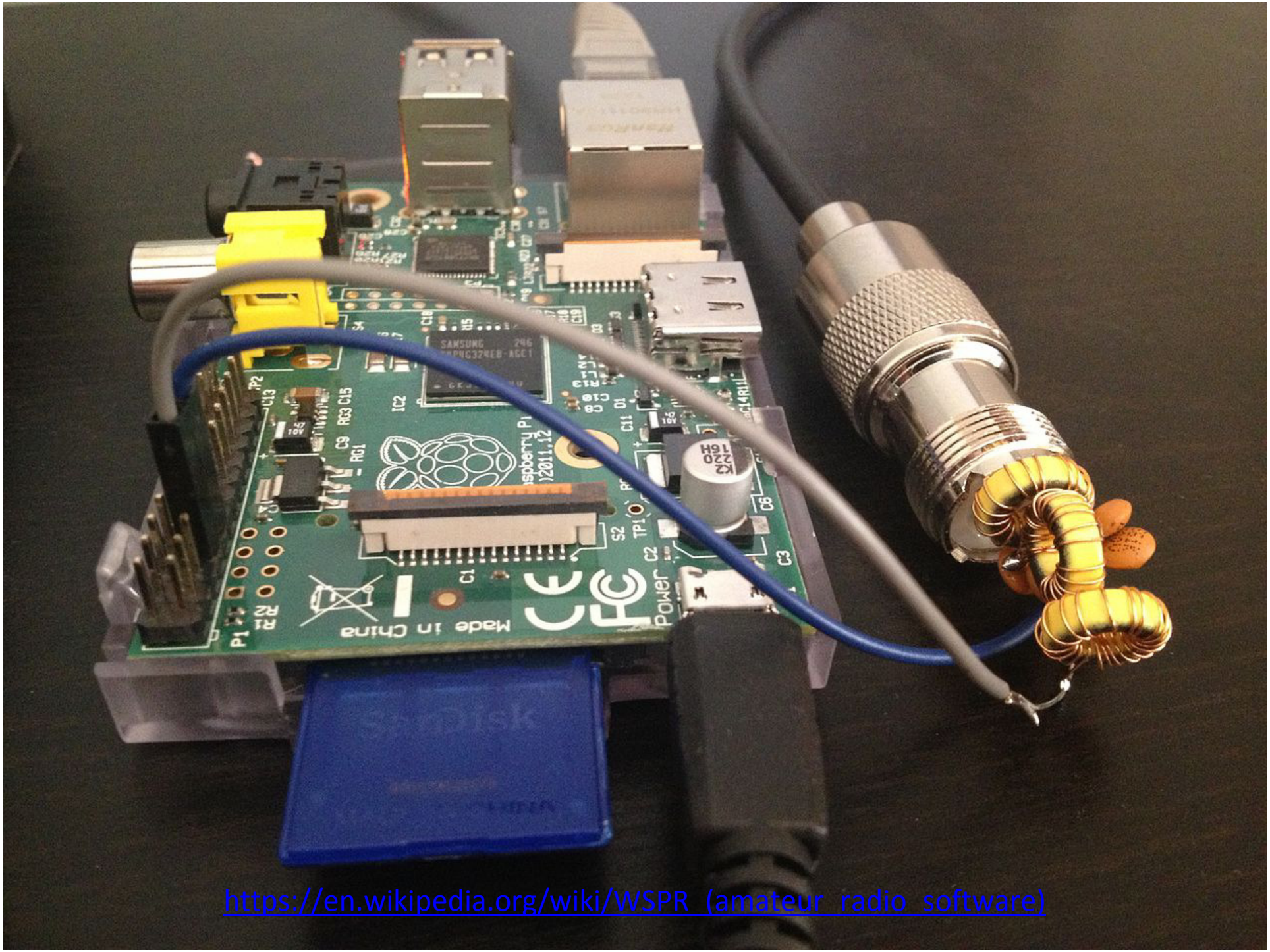
  28 bits for callsign

  15 for locator

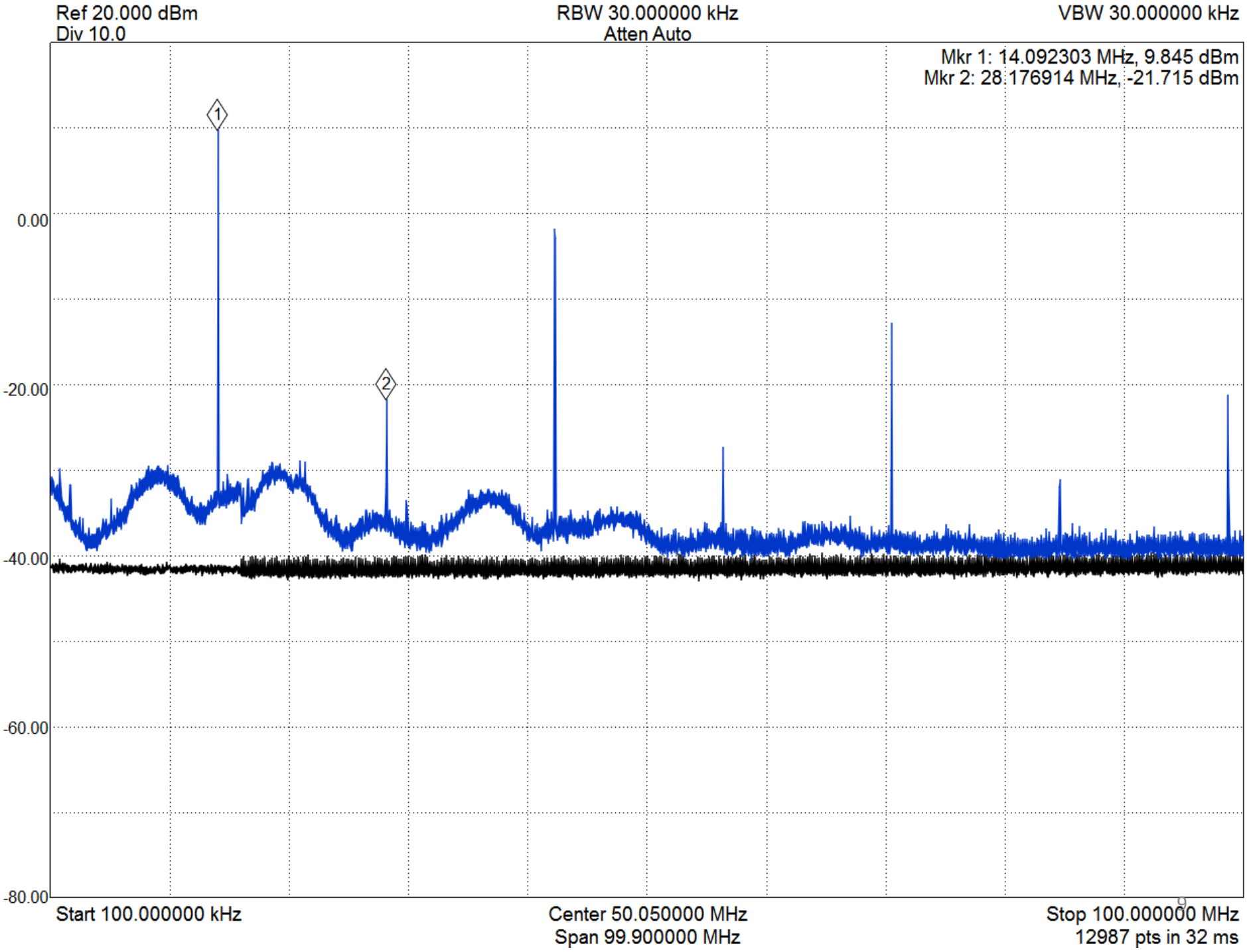
  7 for power level

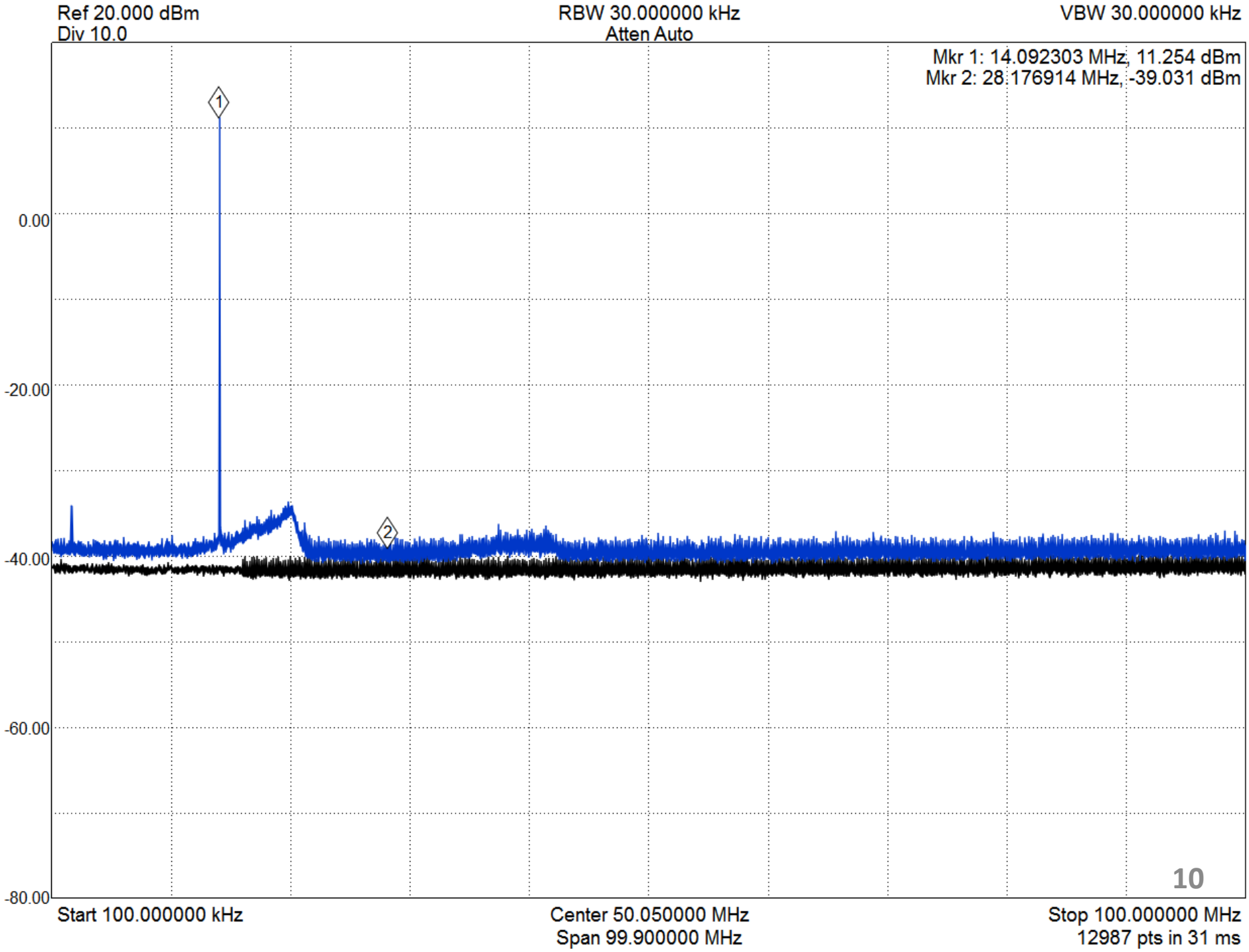
  = 50 bits total.
- Forward error correction (FEC)
- 1.4648 baud

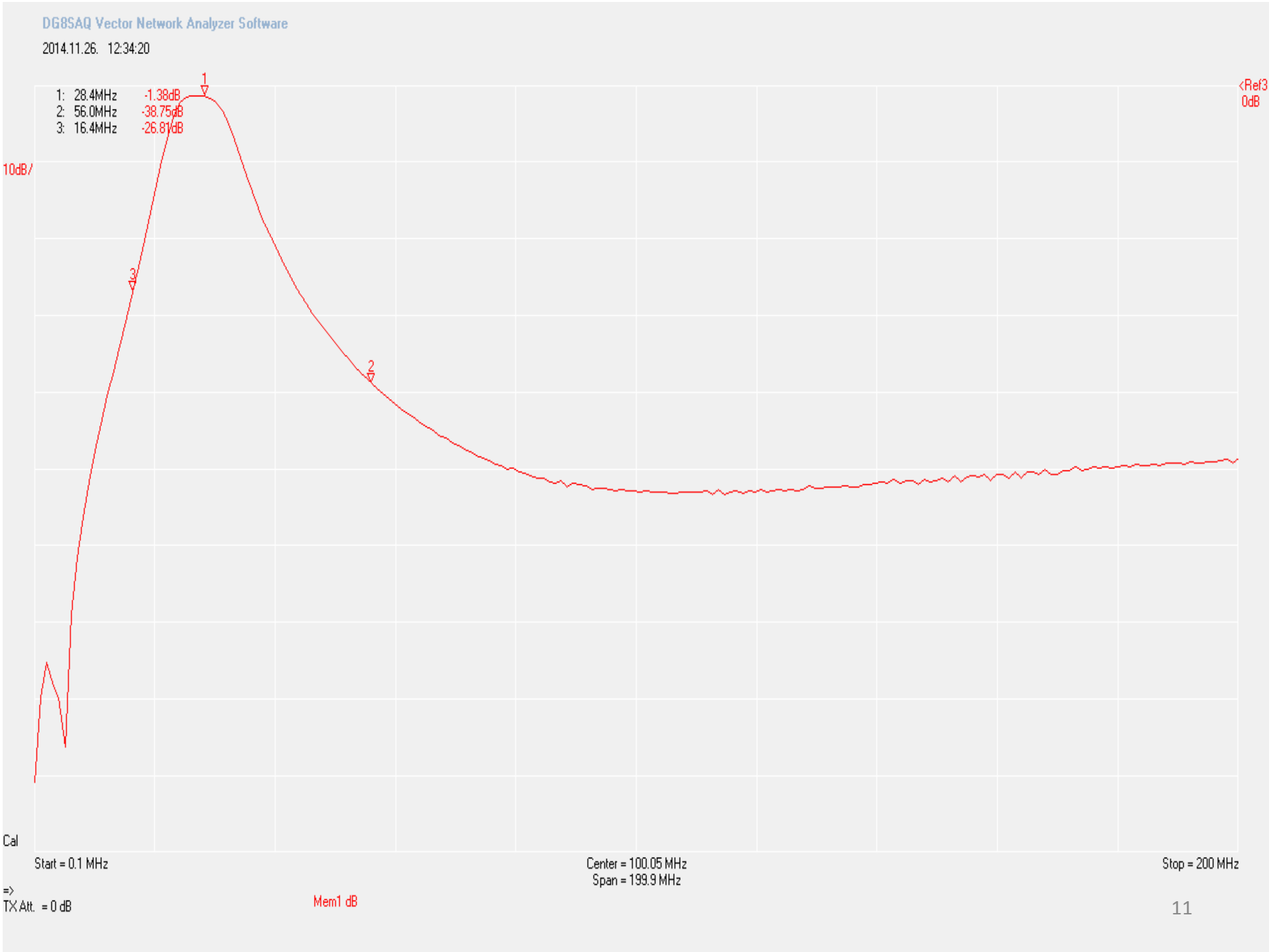

BW = 5.9 Hz

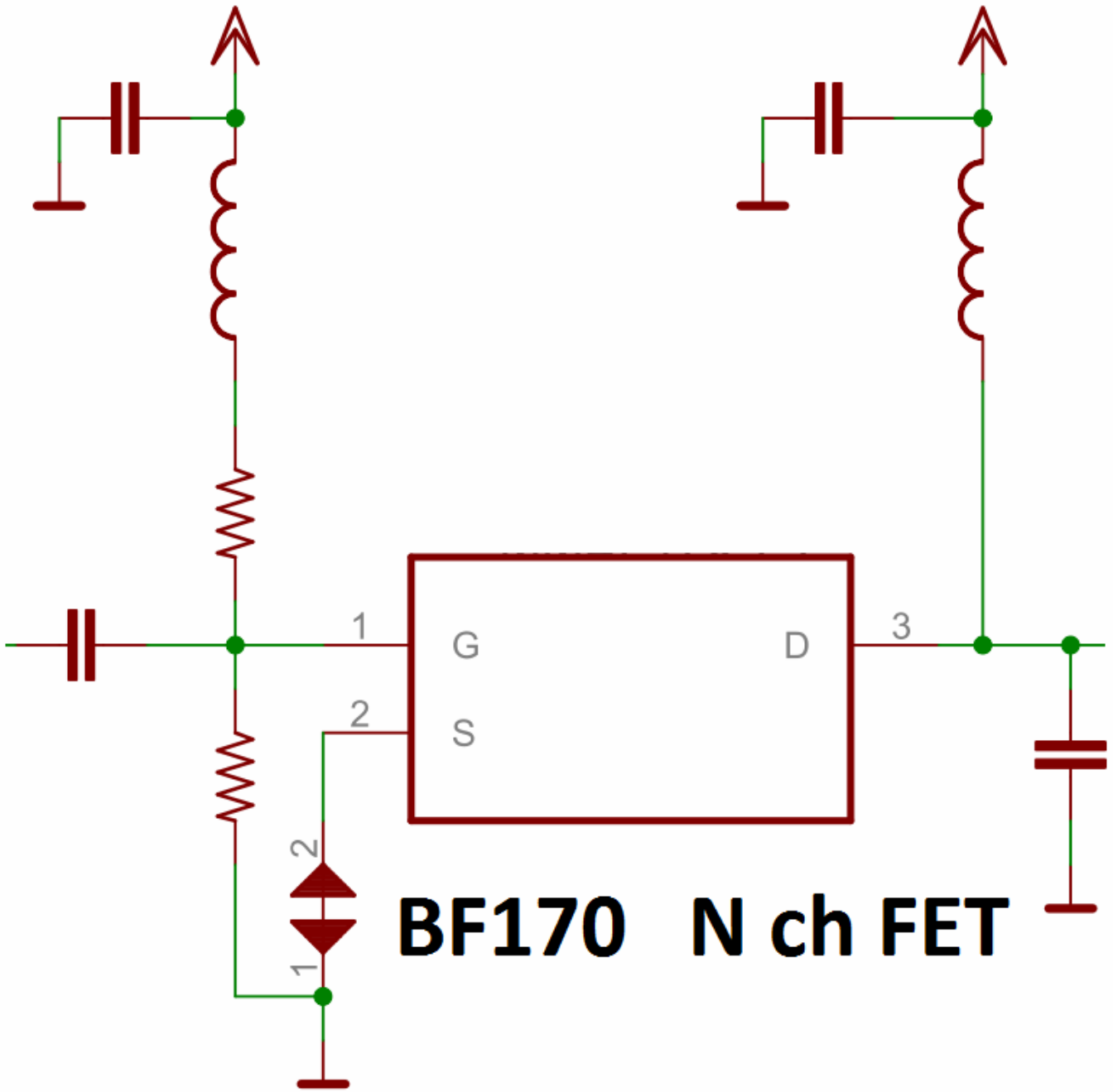


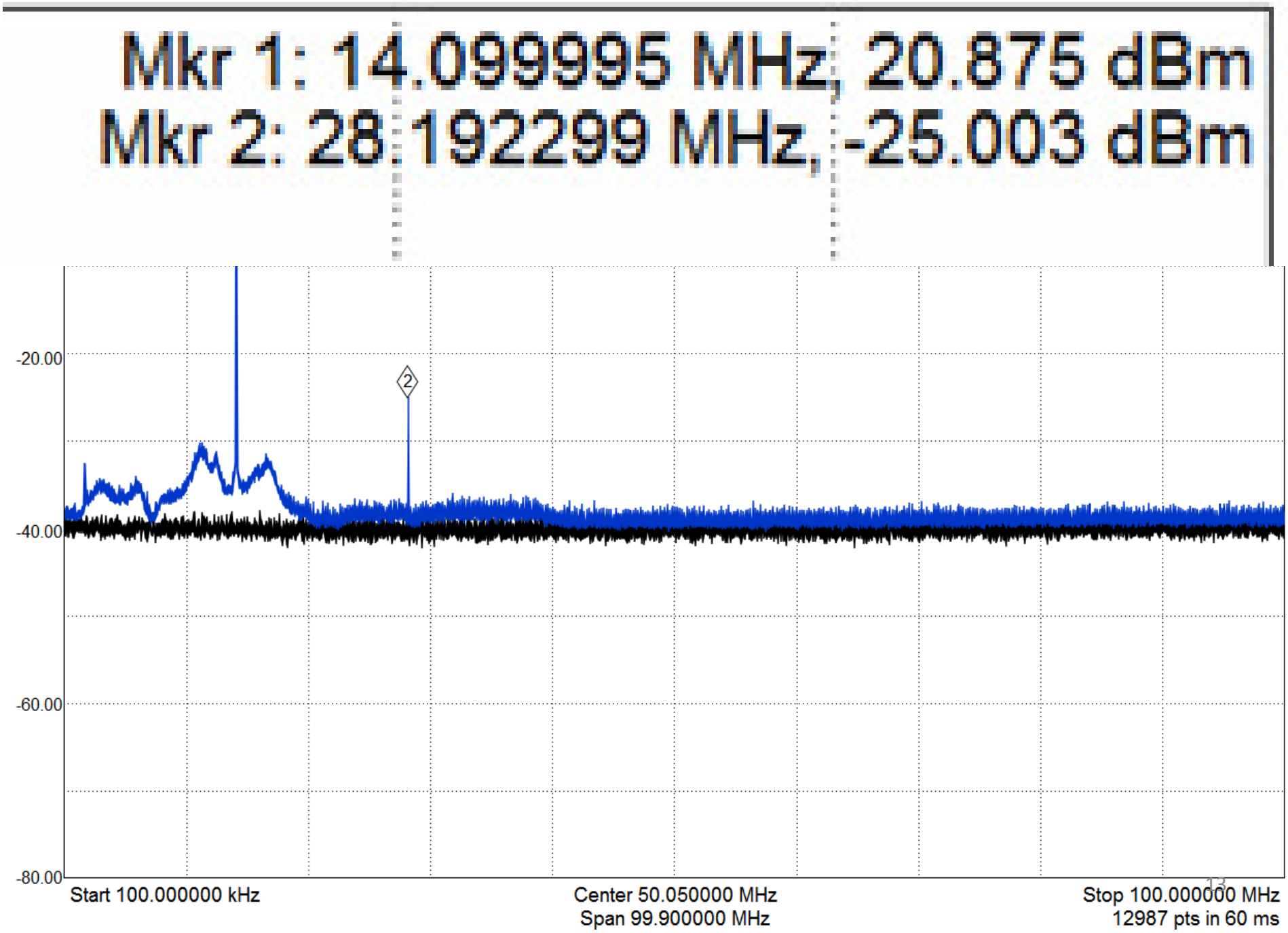
https://en.wikipedia.org/wiki/WSPR_(amateur_radio_software)

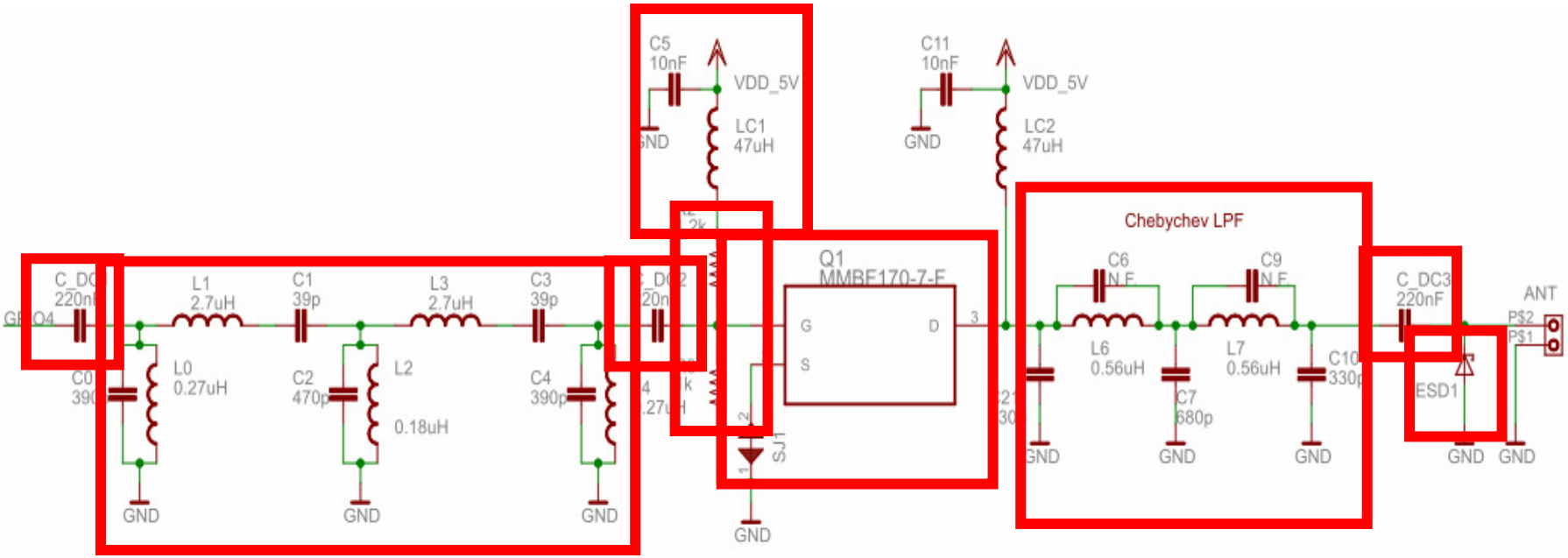

Ref 20.000 dBm
Div 10.0
RBW 30.000000 kHz
Atten Auto
VBW 30.000000 kHz
Mkr 1: 14.092303 MHz, 9.845 dBm
Mkr 2: 28.176914 MHz, -21.715 dBm
0.00
-20.00
-40.00
-60.00
-80.00
Start 100.000000 kHz
Center 50.050000 MHz
Span 99.900000 MHz
Stop 100.000000 MHz
12987 pts in 32 ms

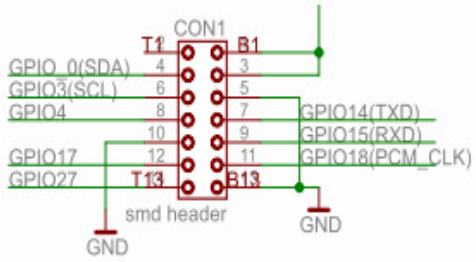

Ref 20.000 dBm
Div 10.0
RBW 30.000000 kHz
Atten Auto
VBW 30.000000 kHz
Mkr 1: 14.092303 MHz, 11.254 dBm
Mkr 2: 28.176914 MHz, -39.031 dBm
0.00
-20.00
-40.00
-60.00
-80.00
Start 100.000000 kHz
Center 50.050000 MHz
Span 99.900000 MHz
Stop 100.000000 MHz
12987 pts in 31 ms
10

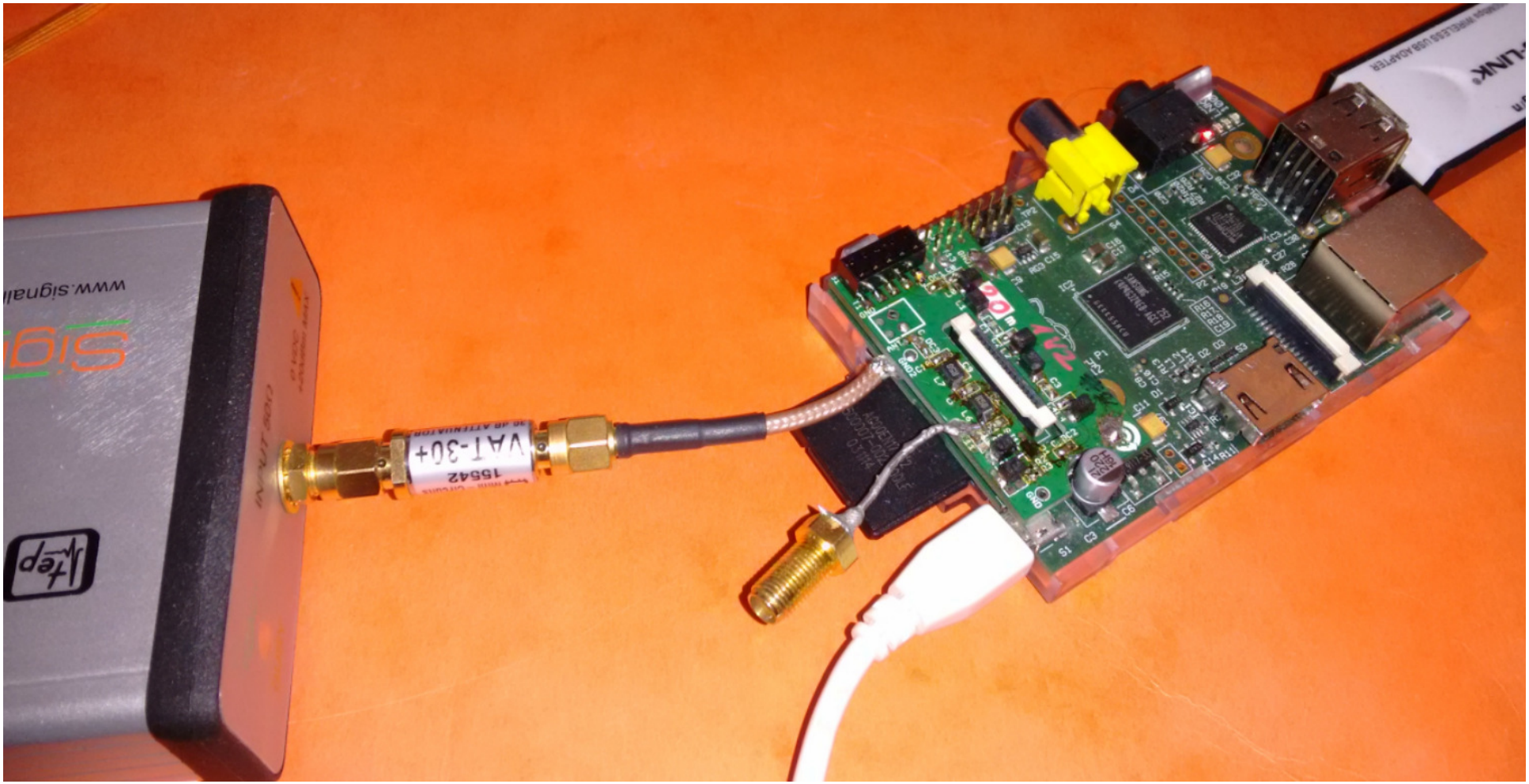

DG8SAQ Vector Network Analyzer Software
2014.11.26. 12:34:20
1: 28.4MHz -1.38dB
2: 56.0MHz -38.75dB
3: 16.4MHz -26.81dB
<Ref3
0dB
10dB/
Cal
Start = 0.1 MHz
Center = 100.05 MHz
Span = 199.9 MHz
Stop = 200 MHz
=>
TX Att. = 0 dB
Mem1 dB

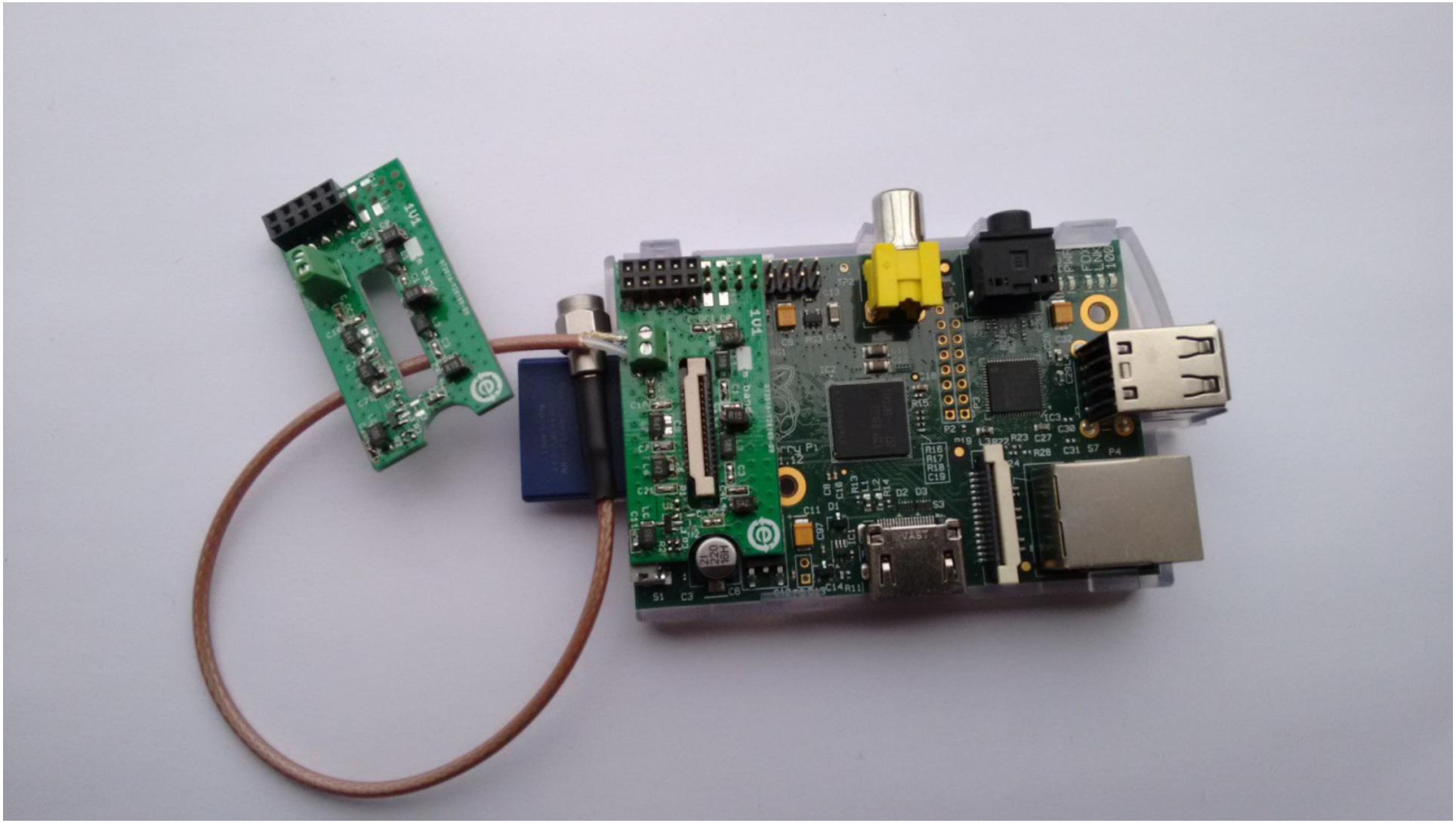

1
G
D
3
2
S
2
1
BF170 N ch FET

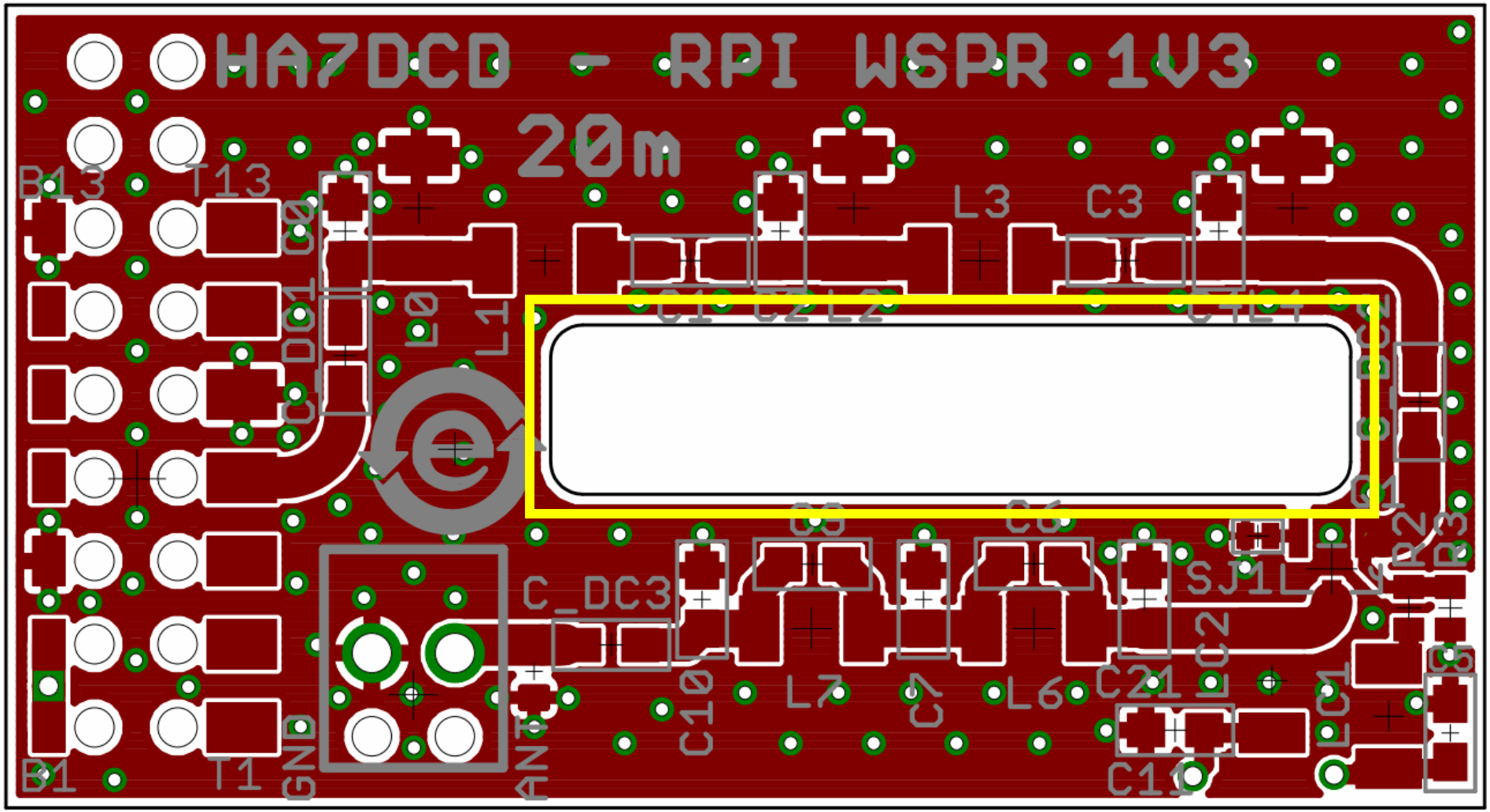

Mkr 1: 14.099995 MHz, 20.875 dBm
Mkr 2: 28.192299 MHz, -25.003 dBm
-20.00
-40.00
-60.00
-80.00
2
Start 100.000000 kHz
Center 50.050000 MHz
Span 99.900000 MHz
Stop 100.000000 MHz
12987 pts in 60 ms


C5
10nF
VDD_5V
LC1
47uH
C11
10nF
VDD_5V
LC2
47uH
GND
Chebychev LPF
Q1
MMBF170-7-F
G
D
S
C_DC1
220nF
L1
2.7uH
C1
39p
L3
2.7uH
C3
39p
L0
0.27uH
C2
470p
L2
0.18uH
C4
390p
C6
N.F
C9
N.F
L6
0.56uH
L7
0.56uH
C7
680p
C10
330p
C_DC3
220nF
ESD1
ANT
P$2
P$1
SJ1
GND

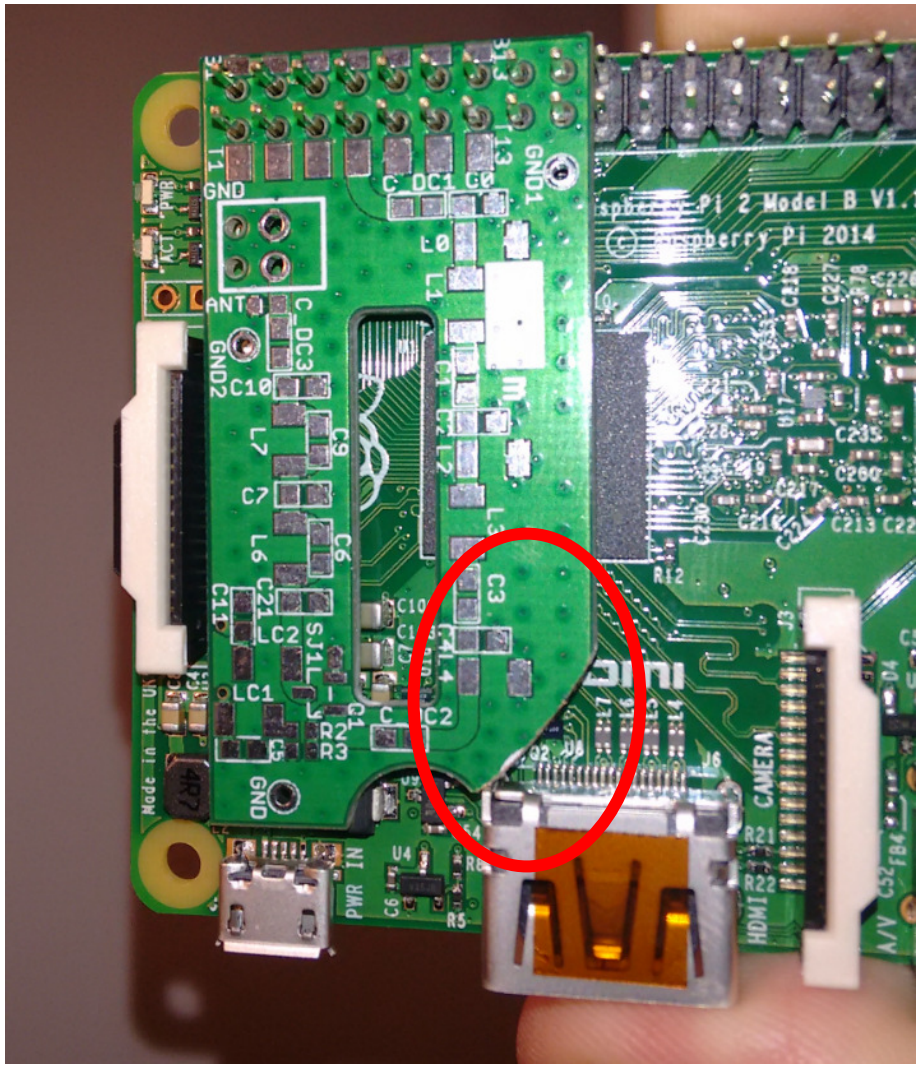

CON1
GPIO_0(SDA)
GPIO3(SCL)
GPIO4
GPIO17
GPIO27
GPIO14(TXD)
GPIO15(RXD)
GPIO18(PCM_CLK)
smd header
GND


VAT-30+
15542

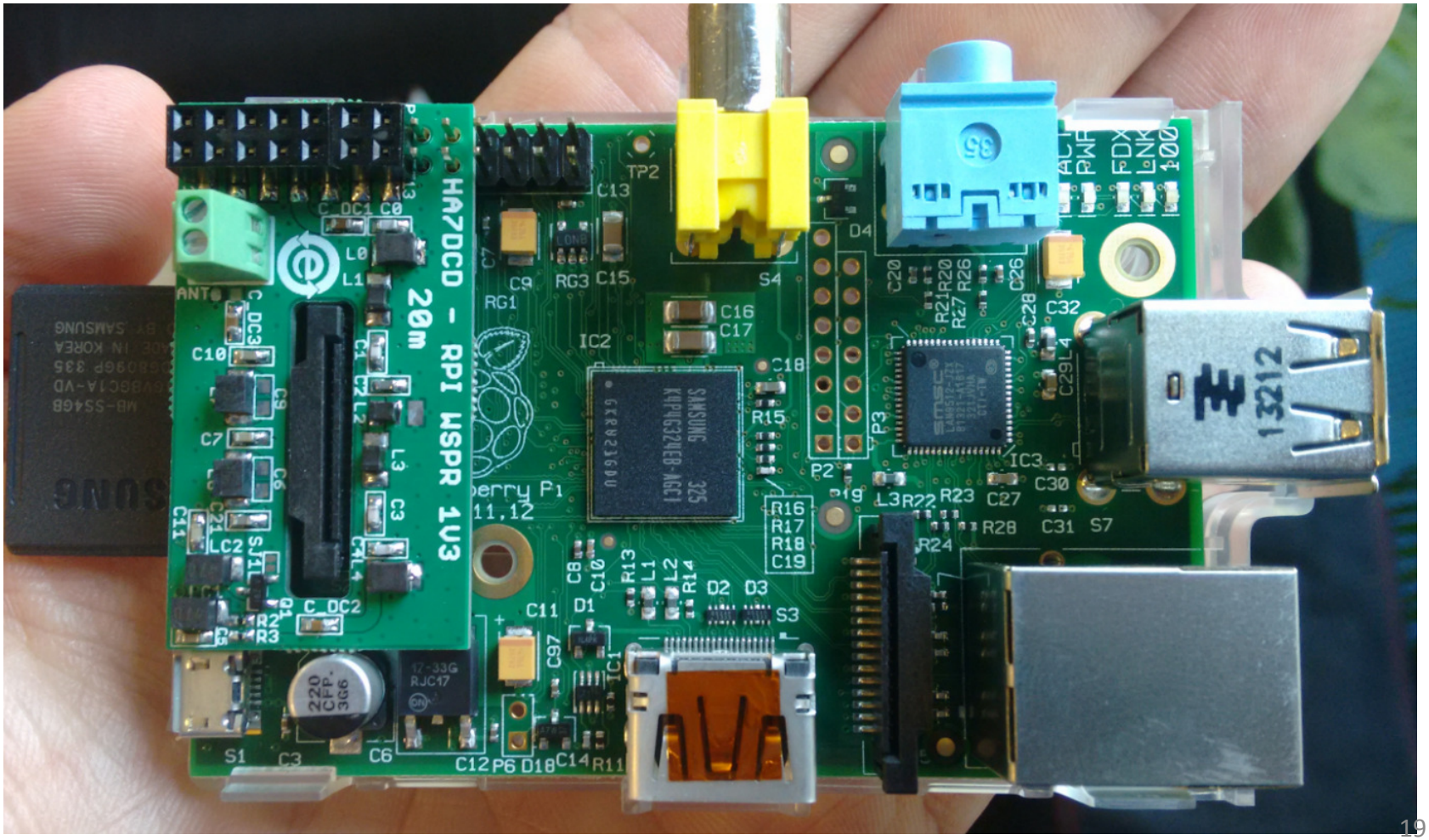



HA7DCD - RPI WSPR 1V3
20m
B13
T13
L3
C3
C1
C2
L2
L0
L1
C_DC1
C_DC2
C8
C6
C_DC3
SJ1
R2
R3
C5
C10
L7
C7
L6
C21
C2
C4
C11
B1
T1
GND
ANT

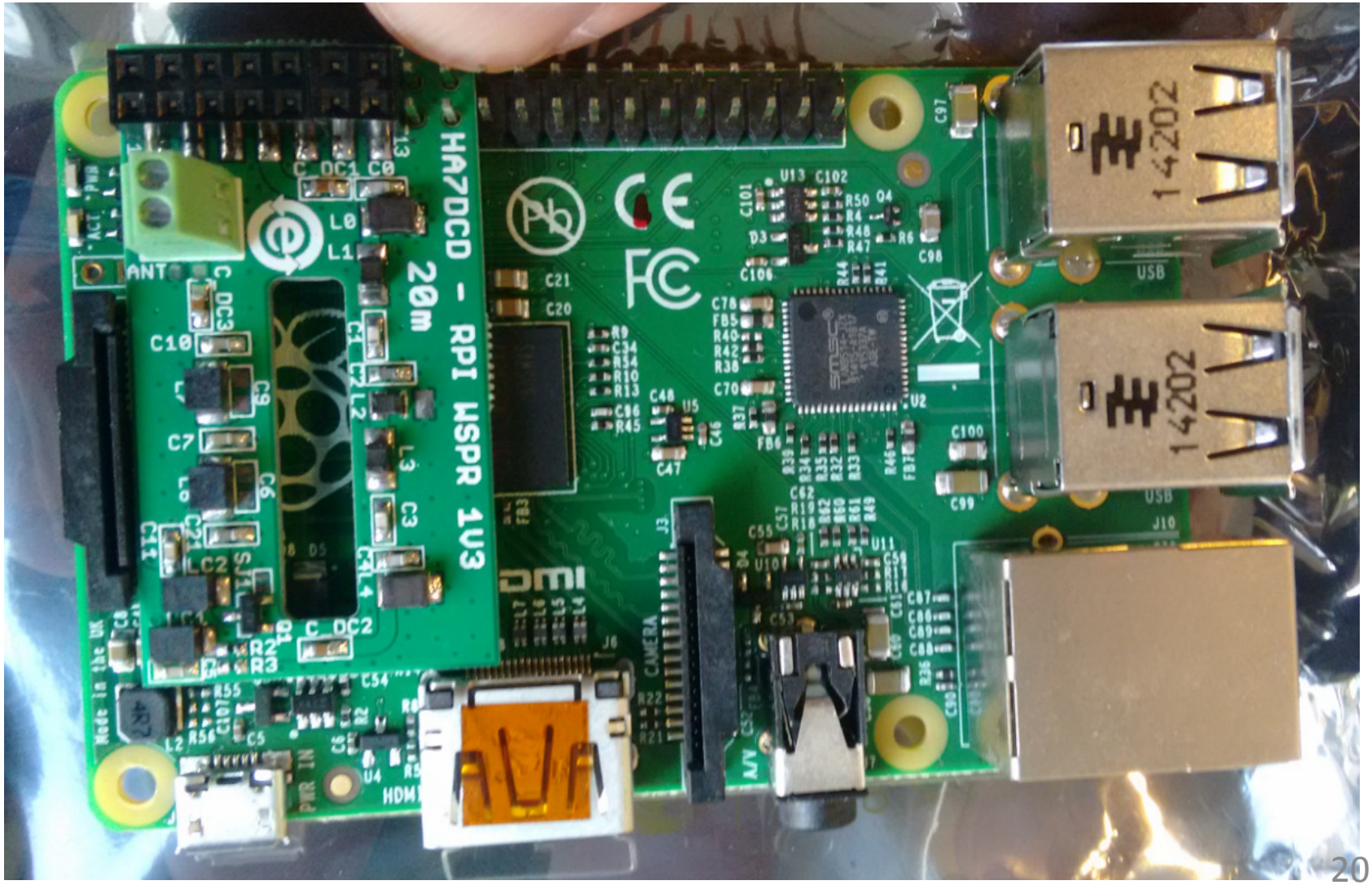
Initial cross version compatibility issues ☺



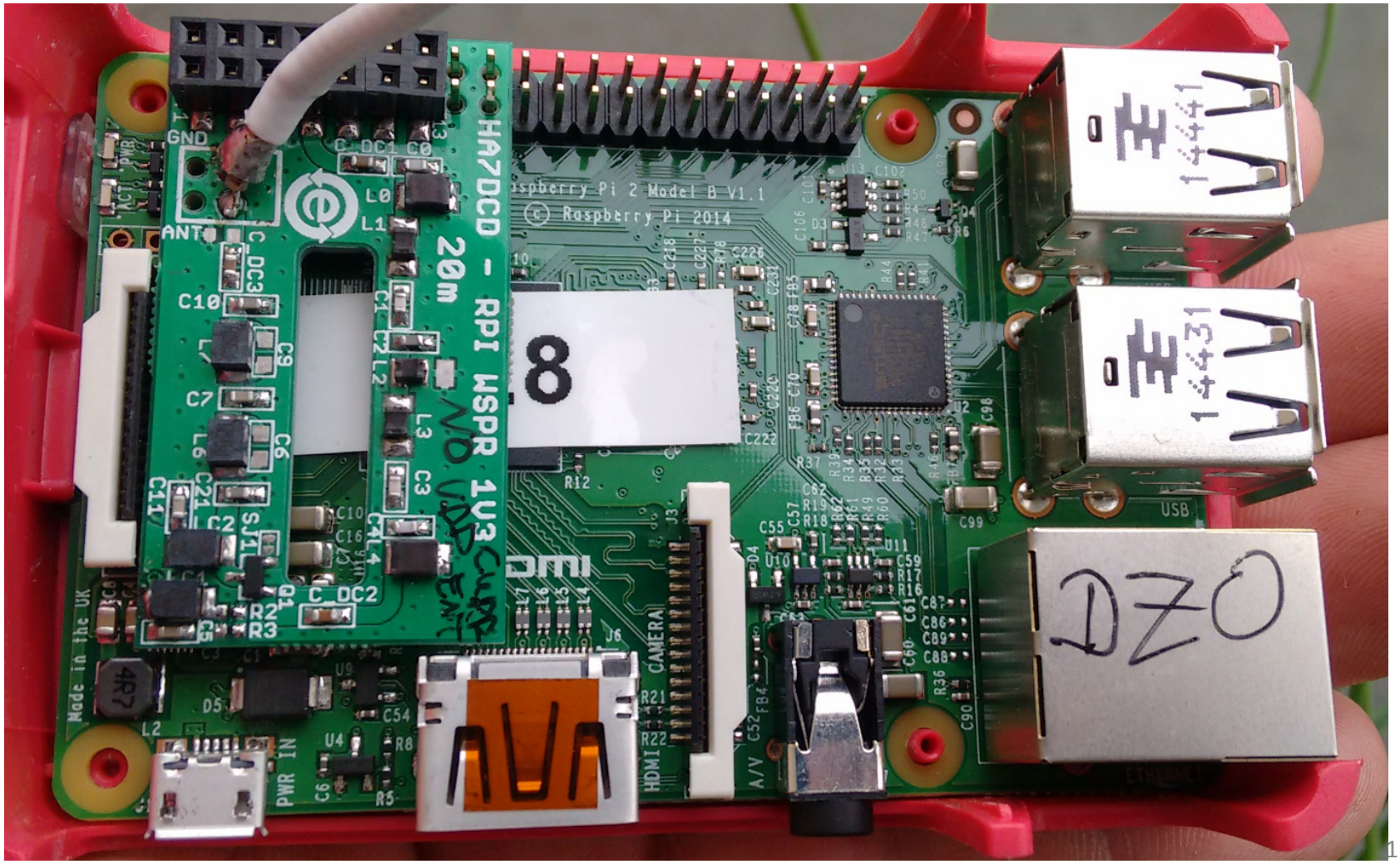
RaspberryPi V1 B



RaspberryPi V1 B+



RaspberryPi V2 B



WsprryPi terminal screen

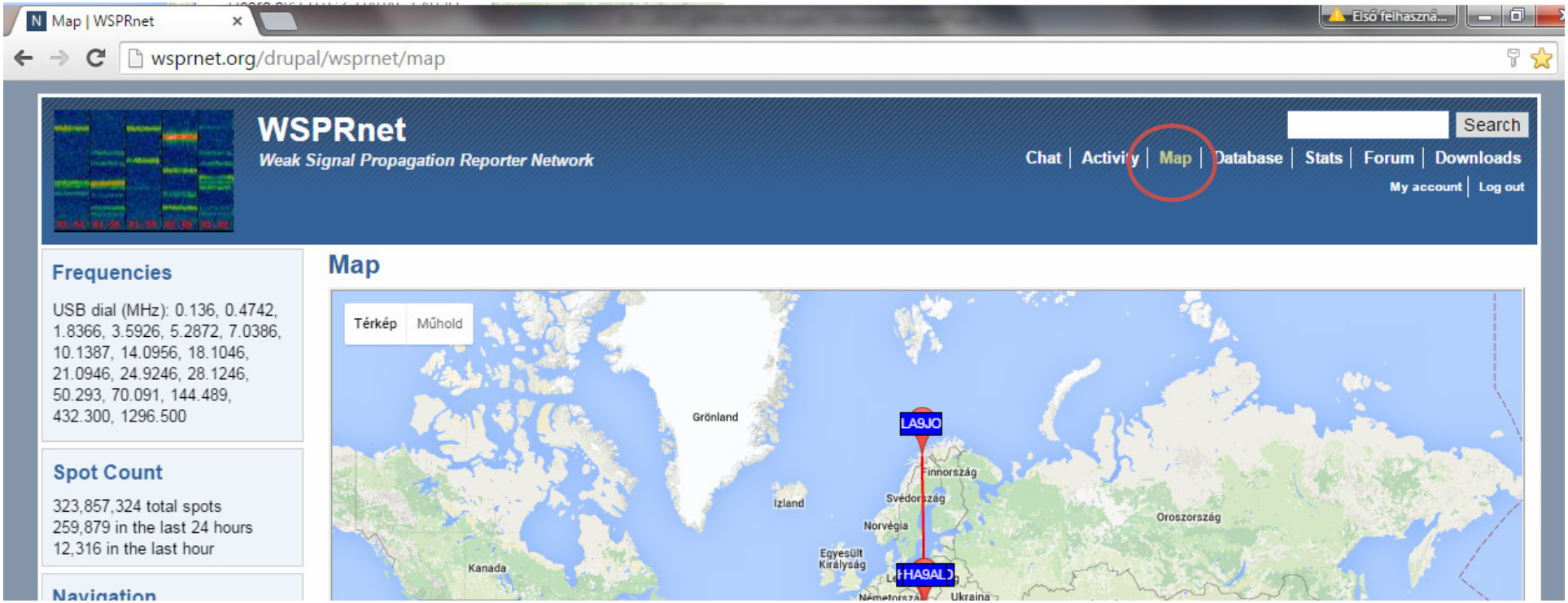
```
pi@raspberrypi ~/WsprryPi_V2_no_printf $ sudo ./wspr -r -s ha7dcd jn97ml 20 20m
WSPR packet contents:
  Callsign: ha7dcd
  Locator:  jn97ml
  Power:    20 dBm
Requested TX frequencies:
  14.097100 MHz
Extra options:
  ntp_adjtime() will be used to peridocially calibrate the transmission frequenc
y
  Transmissions will continue forever until stopped with CTRL-C

Using mbox device /dev/vcio.
Ready to transmit (setup complete)...
Desired center frequency for WSPR transmission: 14.097100 MHz
  Waiting for next WSPR transmission window...
^[[B^[[B  Obtained new ppm value: 6.15073
  TX started at: UTC 09-25-2015 21:06:01.002
          TX ended at:   UTC 09-25-2015 21:07:51.617 (110.615 s)
Desired center frequency for WSPR transmission: 14.097100 MHz
  Waiting for next WSPR transmission window...
  Obtained new ppm value: 9.07901
  TX started at: UTC 09-25-2015 21:08:01.002
```

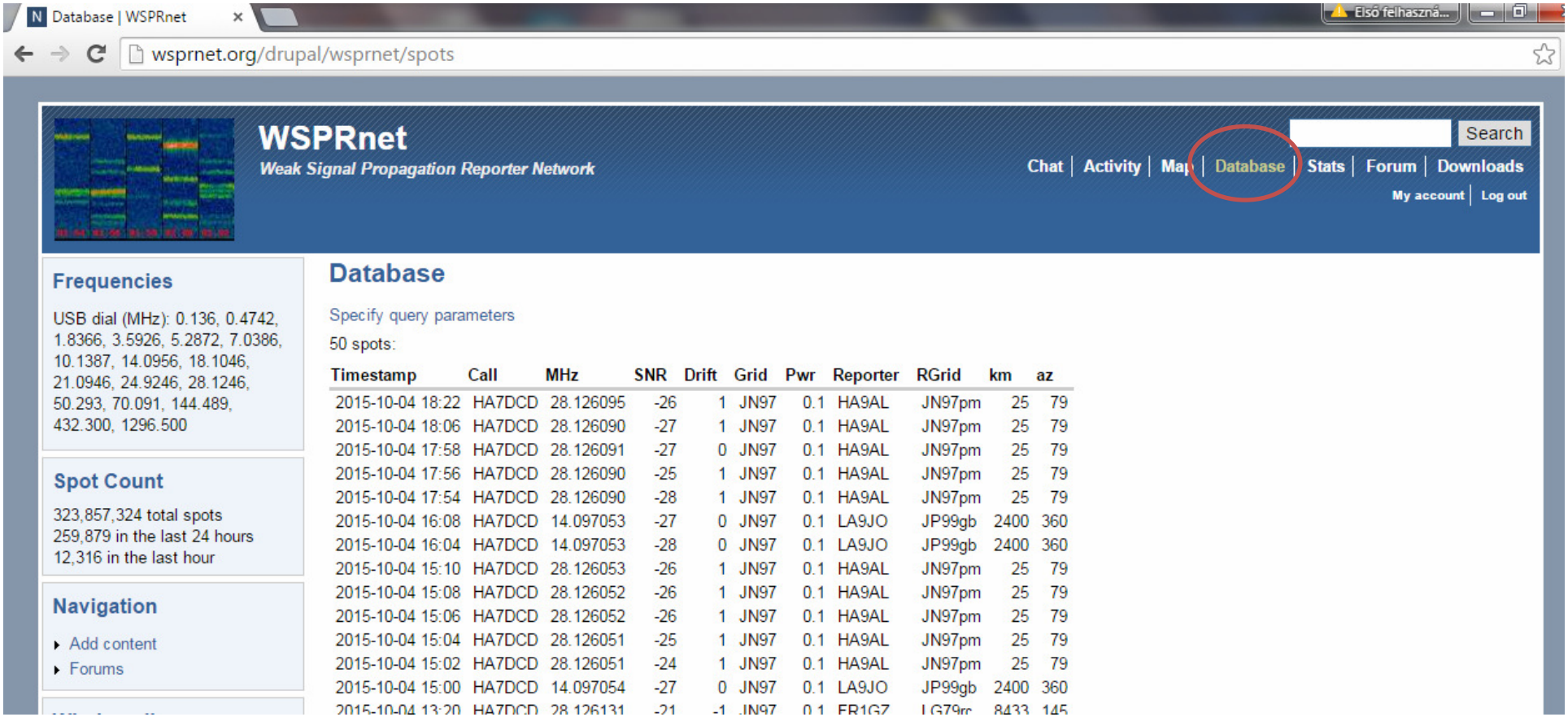

LA9JO
PI4THT
HA7DCD
HB9TJM
Norwegian Sea
Svédország
Norvégia
Finnország
Oslo
Stockholm
Helsinki
Tallinn
Észtország
Balti-tenger
Göteborg
North Sea
Lettország
Litvánia
Moszkva
Москва
Dánia
Egyesült Királyság
Írország
Birmingham
Hamburg
Minszk
Минск
Vilnius
Fehéroroszország
Hollandia
Berlin
Lengyelország
London
Belgium
Németország
Prága
Krakkó
Kijev
Київ
Kharkiv
Харків
Párizs
Csehország
Pozsony
Ukrajna
München
Vaduz
Ausztria
Moldova
Dnyipropetrovszk
Дніпропетровськ
Franciaország
Magyarország
Zágráb
Románia
Odessza
Одеса
Horvátország
Szerbia
Bukarest
Olaszország
Fekete-tenger
Marseille
Barcelona
Róma
Bulgária
Grúzia
20m band

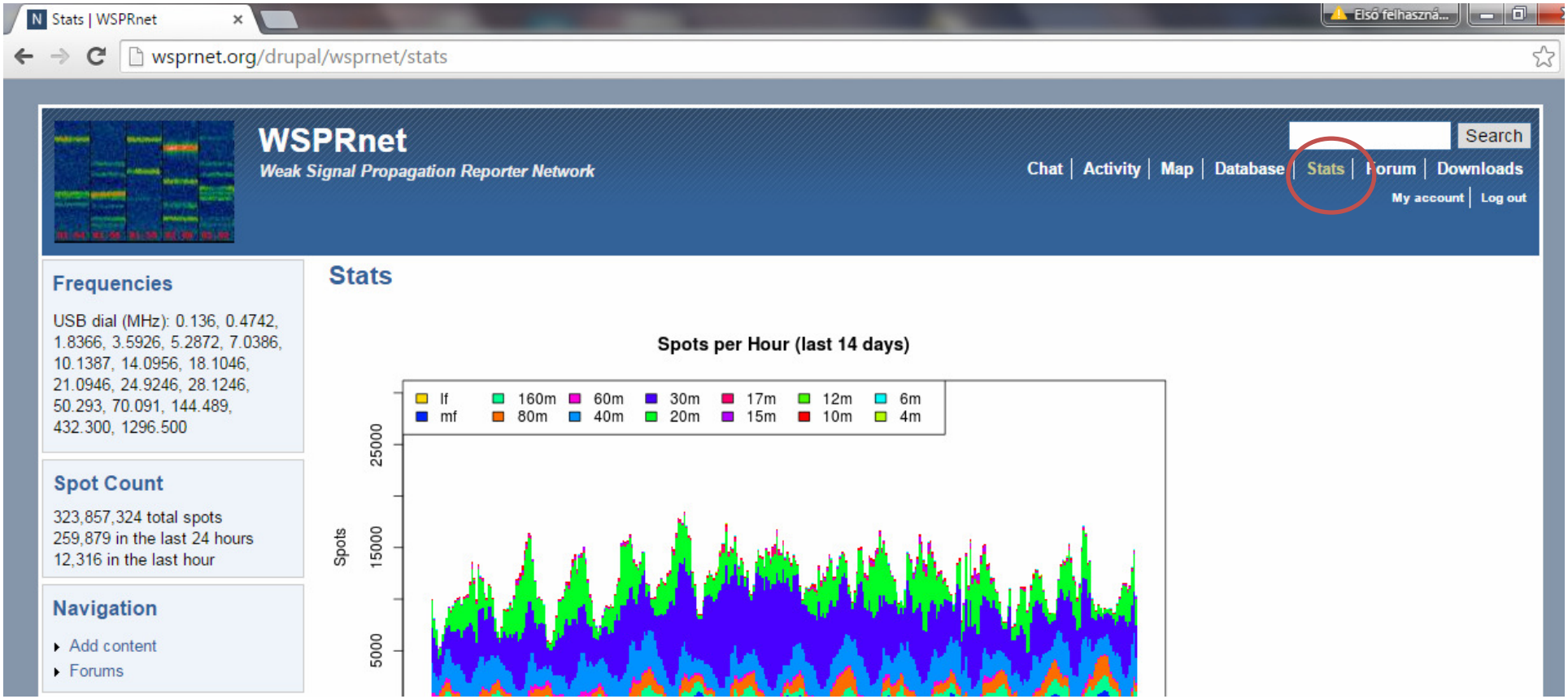

OZ1IPH
OZ7IT
DG7BBP
PI4THT
ON7KB/P
DK8JP
LX2GT
DK6UG
DL1GCD
HB9TJM
HA7DCD
UT7GH
20m band
Stockholm
Tallinn
Észtország
Balti-tenger
Göteborg
Riga
Lettország
North Sea
Edinburgh
Glasgow
Egyesült Királyság
Dánia
Litvánia
Kaunas
Vilnius
Gdansk
Minszk
Минск
Man-sziget
Leeds
Manchester
Dublin
Sheffield
Liverpool
Birmingham
Írország
Amszterdam
Berlin
Szczecin
Białystok
Fehéroroszország
Lengyelország
Poznań
Łódz
Varsó
Lublin
Wrocław
London
Dortmund
Belgium
Németország
Prága
Krakkó
Lviv
Львів
Kijev
Київ
Csehország
Párizs
Ukrajna
Dnyipropetrovs
Дніпропетров
Szlovákia
Kassa
München
Krivij Rih
Кривий Ріг
Moldova
Zaporizzsj
Запоріжж
Nantes
Zürich
Ausztria
Odessza
Одеса
Magyarország
Kolozsvár
Franciaország
Svájc
Genf
Lyon
Milánó
Velence
Szlovénia
Zágráb
Horvátország
Románia
Szevasztopol
Севастополь
Bukarest
Toulouse
Torino
Bologna
Genova
Olaszország
Szarajevó
Szerbia
Várna
Варна
Montenegró
Koszovó
Bulgária
Andorra
Fekete-tenger

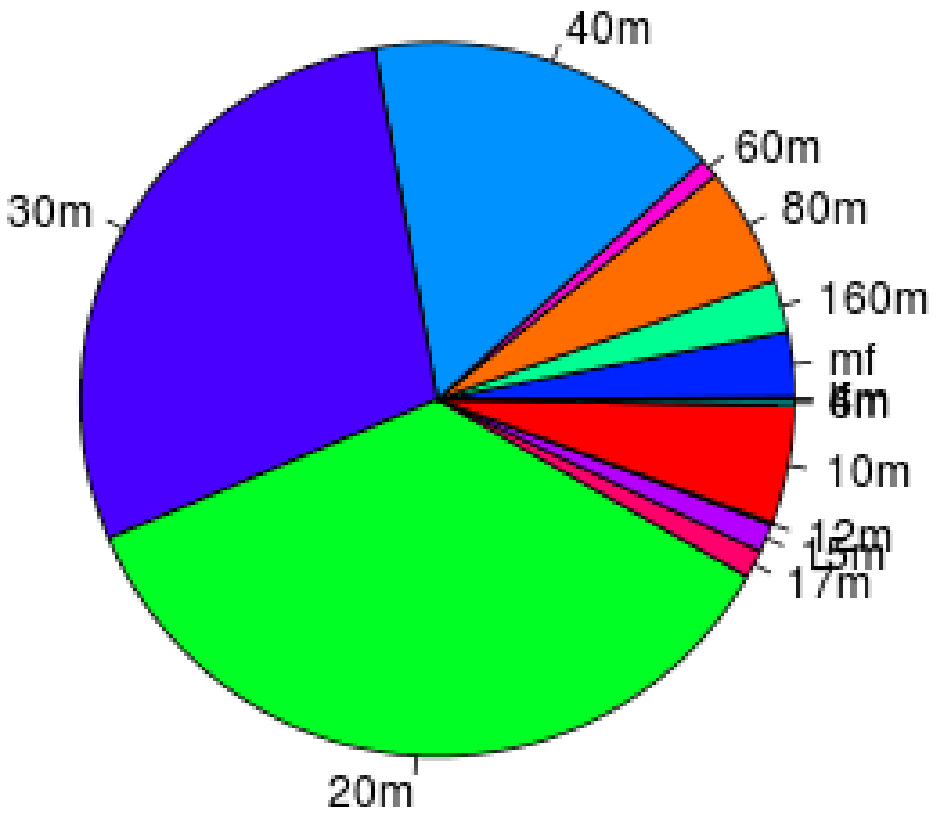

HA7DCD
Heard by: FR1GZ, HA9AL, LA9JO
HA9AL
FR1GZ
Írország
Fehéroroszország
Németország
Ukrajna
Kazahsztán
Ausztria
Franciaország
Románia
Olaszország
Spanyolország
Portugália
Görögország
Törökország
Üzbegisztán
Türkmenisztán
Szíria
Irak
Irán
Afganisztán
Pakisztá
Tunézia
Marokkó
Algéria
Líbia
Egyiptom
Nyugat-Szahara
Szaúd-Arábia
Omán
Mauritánia
Mali
Niger
Csád
Szudán
Jemen
Ádeni-öböl
Arab-tenger
Burkina Faso
Guinea
Nigéria
Ghána
Dél-Szudán
Etiópia
Guineai-öböl
Szomália
Kenya
Gabon
Kongói Demokratikus Köztársaság
Tanzánia
Angola
Zambia
Mozambik
Namíbia
Zimbabwe
Botswana
Madagaszkár
Atlantic Ocean
Dél-afrikai

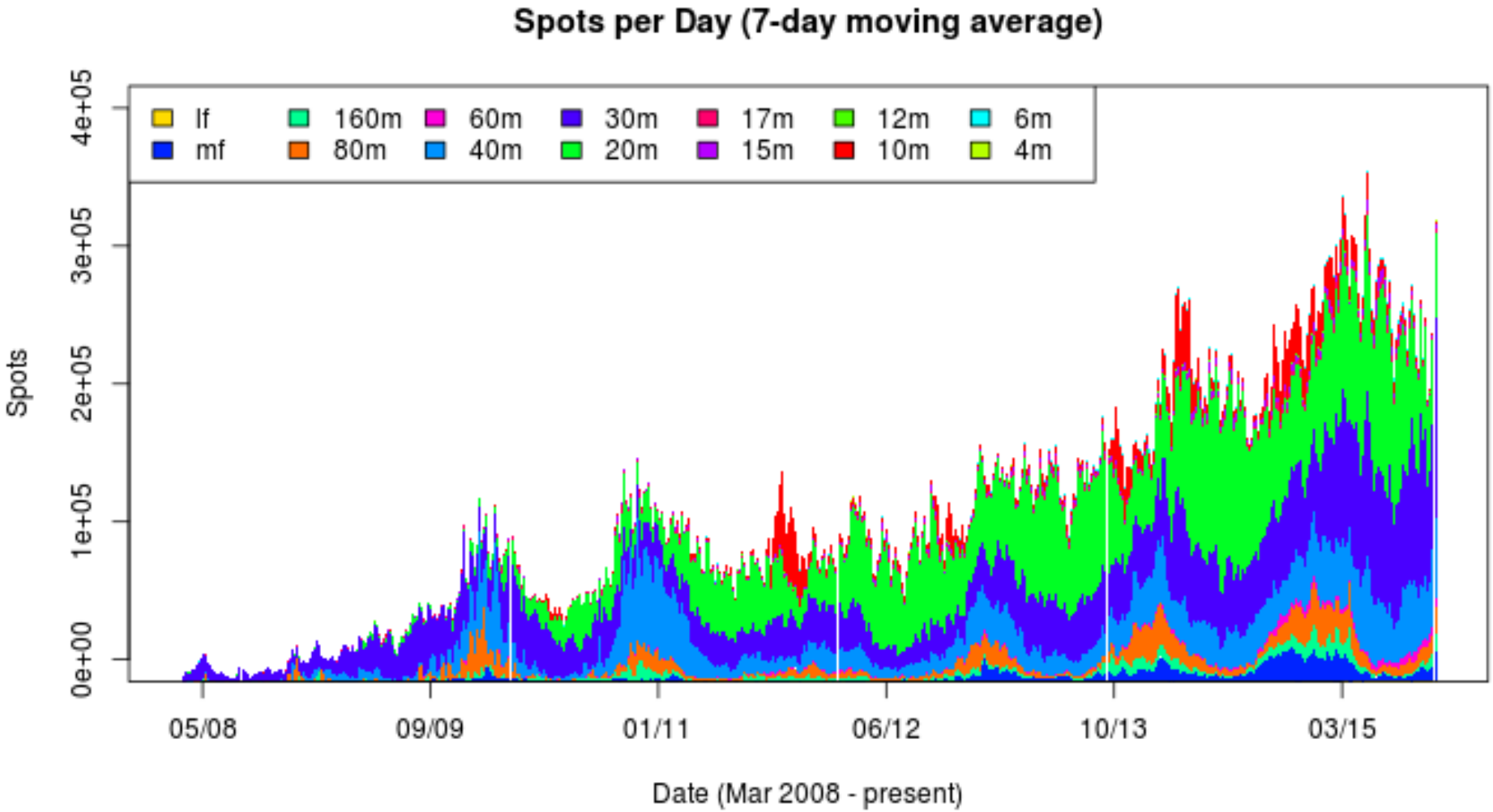
10m band


Map | WSPRnet
wsprnet.org/drupal/wsprnet/map
WSPRnet
Weak Signal Propagation Reporter Network
Search
Chat | Activity | Map | Database | Stats | Forum | Downloads
My account | Log out
Frequencies
USB dial (MHz): 0.136, 0.4742, 1.8366, 3.5926, 5.2872, 7.0386, 10.1387, 14.0956, 18.1046, 21.0946, 24.9246, 28.1246, 50.293, 70.091, 144.489, 432.300, 1296.500
Spot Count
323,857,324 total spots
259,879 in the last 24 hours
12,316 in the last hour
Navigation
Map
Térkép
Műhold
Grönland
Izland
Svédország
Norvégia
Oroszország
Kanada
Egyesült Királyság


Database | WSPRnet
wsprnet.org/drupal/wspr net/spots
WSPRnet
Weak Signal Propagation Reporter Network
Search
Chat | Activity | Map | Database | Stats | Forum | Downloads
My account | Log out
Frequencies
USB dial (MHz): 0.136, 0.4742, 1.8366, 3.5926, 5.2872, 7.0386, 10.1387, 14.0956, 18.1046, 21.0946, 24.9246, 28.1246, 50.293, 70.091, 144.489, 432.300, 1296.500
Spot Count
323,857,324 total spots
259,879 in the last 24 hours
12,316 in the last hour
Navigation
Add content
Forums
Database
Specify query parameters
50 spots:
Timestamp Call MHz SNR Drift Grid Pwr Reporter RGrid km az
2015-10-04 18:22 HA7DCD 28.126095 -26 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 18:06 HA7DCD 28.126090 -27 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 17:58 HA7DCD 28.126091 -27 0 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 17:56 HA7DCD 28.126090 -25 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 17:54 HA7DCD 28.126090 -28 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 16:08 HA7DCD 14.097053 -27 0 JN97 0.1 LA9JO JP99gb 2400 360
2015-10-04 16:04 HA7DCD 14.097053 -28 0 JN97 0.1 LA9JO JP99gb 2400 360
2015-10-04 15:10 HA7DCD 28.126053 -26 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 15:08 HA7DCD 28.126052 -26 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 15:06 HA7DCD 28.126052 -26 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 15:04 HA7DCD 28.126051 -25 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 15:02 HA7DCD 28.126051 -24 1 JN97 0.1 HA9AL JN97pm 25 79
2015-10-04 15:00 HA7DCD 14.097054 -27 0 JN97 0.1 LA9JO JP99gb 2400 360

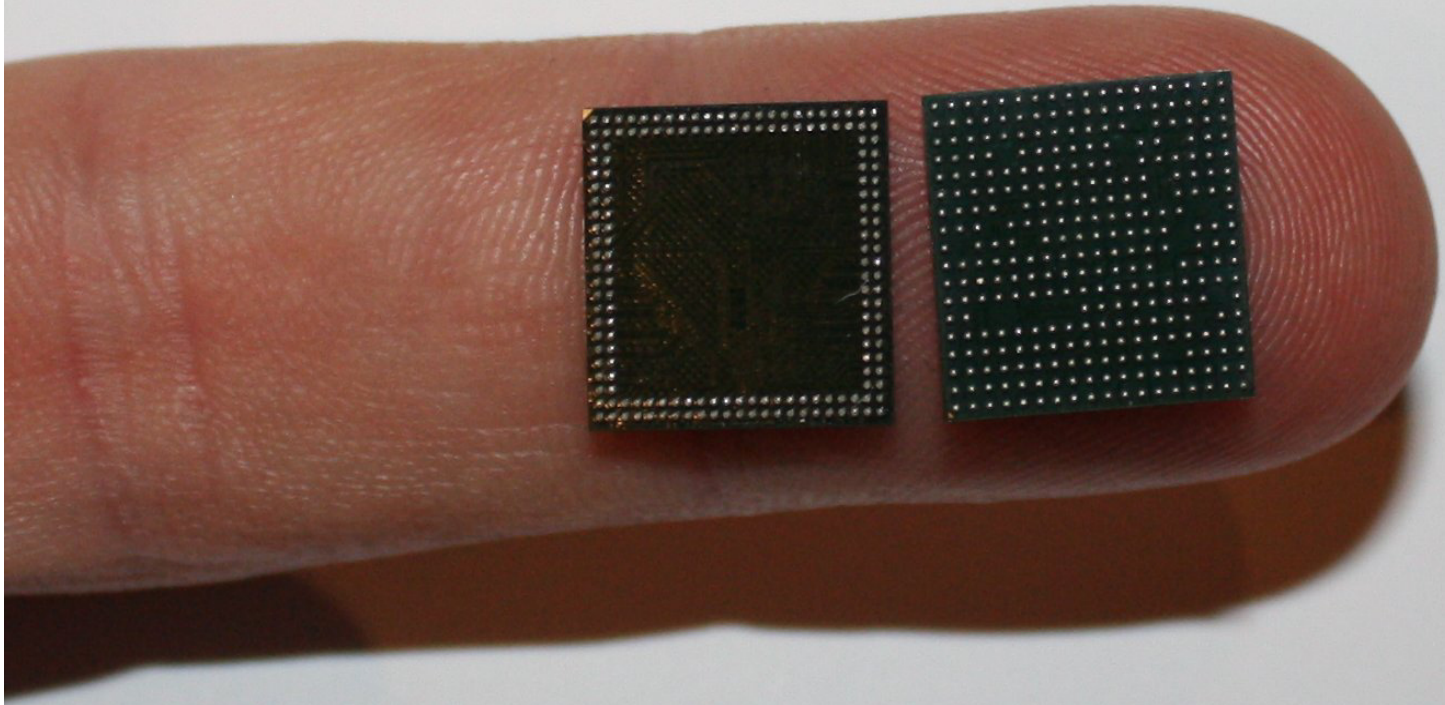

Stats | WSPRnet
wsprnet.org/drupal/wsprnet/stats
WSPRnet
Weak Signal Propagation Reporter Network
Search
Chat | Activity | Map | Database | Stats | Forum | Downloads
My account | Log out
Frequencies
USB dial (MHz): 0.136, 0.4742, 1.8366, 3.5926, 5.2872, 7.0386, 10.1387, 14.0956, 18.1046, 21.0946, 24.9246, 28.1246, 50.293, 70.091, 144.489, 432.300, 1296.500
Spot Count
323,857,324 total spots
259,879 in the last 24 hours
12,316 in the last hour
Navigation
Add content
Forums
Stats
Spots per Hour (last 14 days)
lf
mf
160m
80m
60m
40m
30m
20m
17m
15m
12m
10m
6m
4m
Spots
25000
15000
5000


Spots by Band (overall)
40m
60m
80m
160m
mf
10m
12m
17m
20m
30m


Spots per Day (7-day moving average)
lf
mf
160m
80m
60m
40m
30m
20m
17m
15m
12m
10m
6m
4m
Spots
0e+00
1e+05
2e+05
3e+05
4e+05
05/08
09/09
01/11
06/12
10/13
03/15
Date (Mar 2008 - present)

The BCM2835 SoC (right) and its accompanying memory

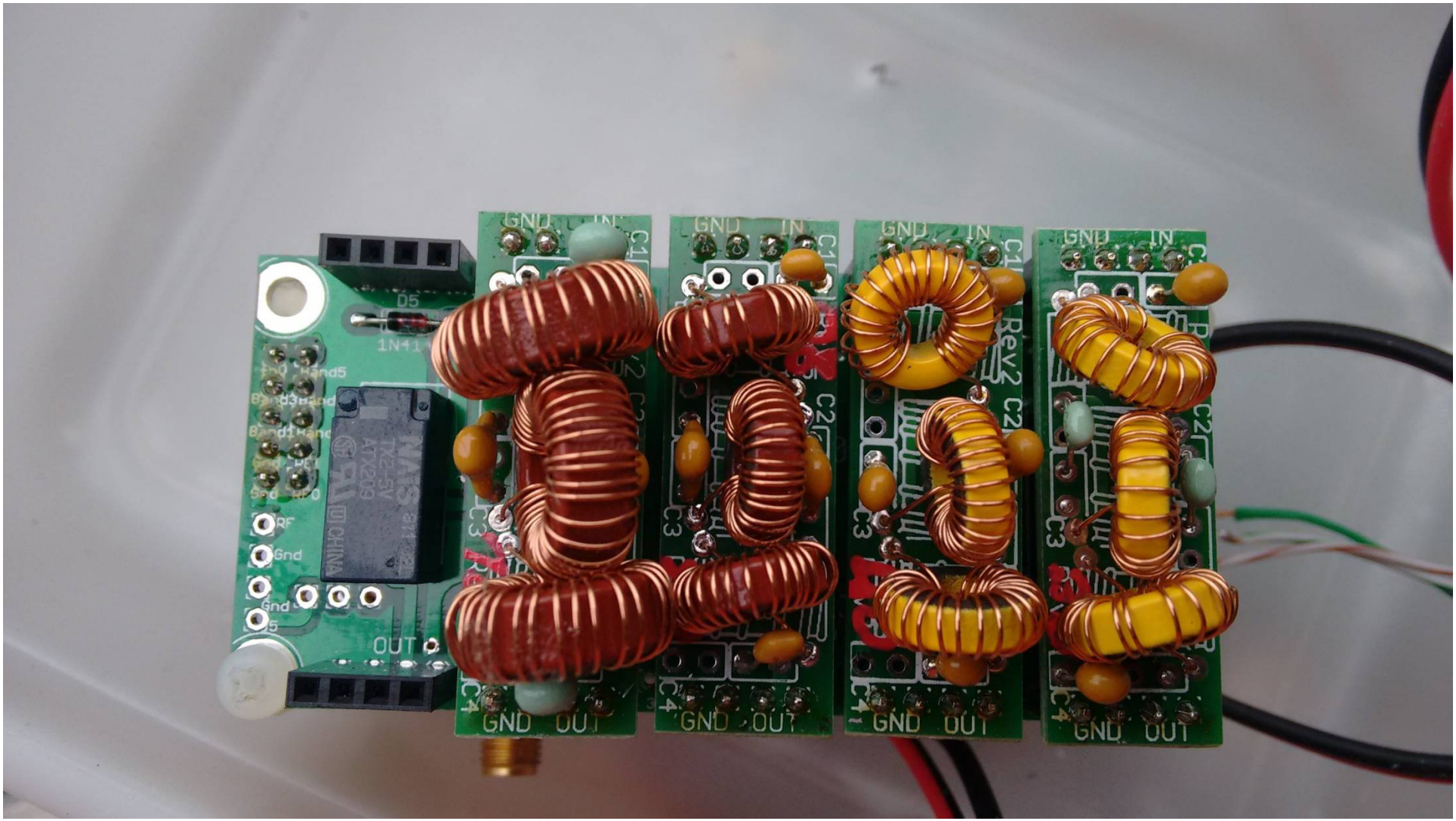
https://www.raspberrypi.org/blog/libraries-codecs-oss/



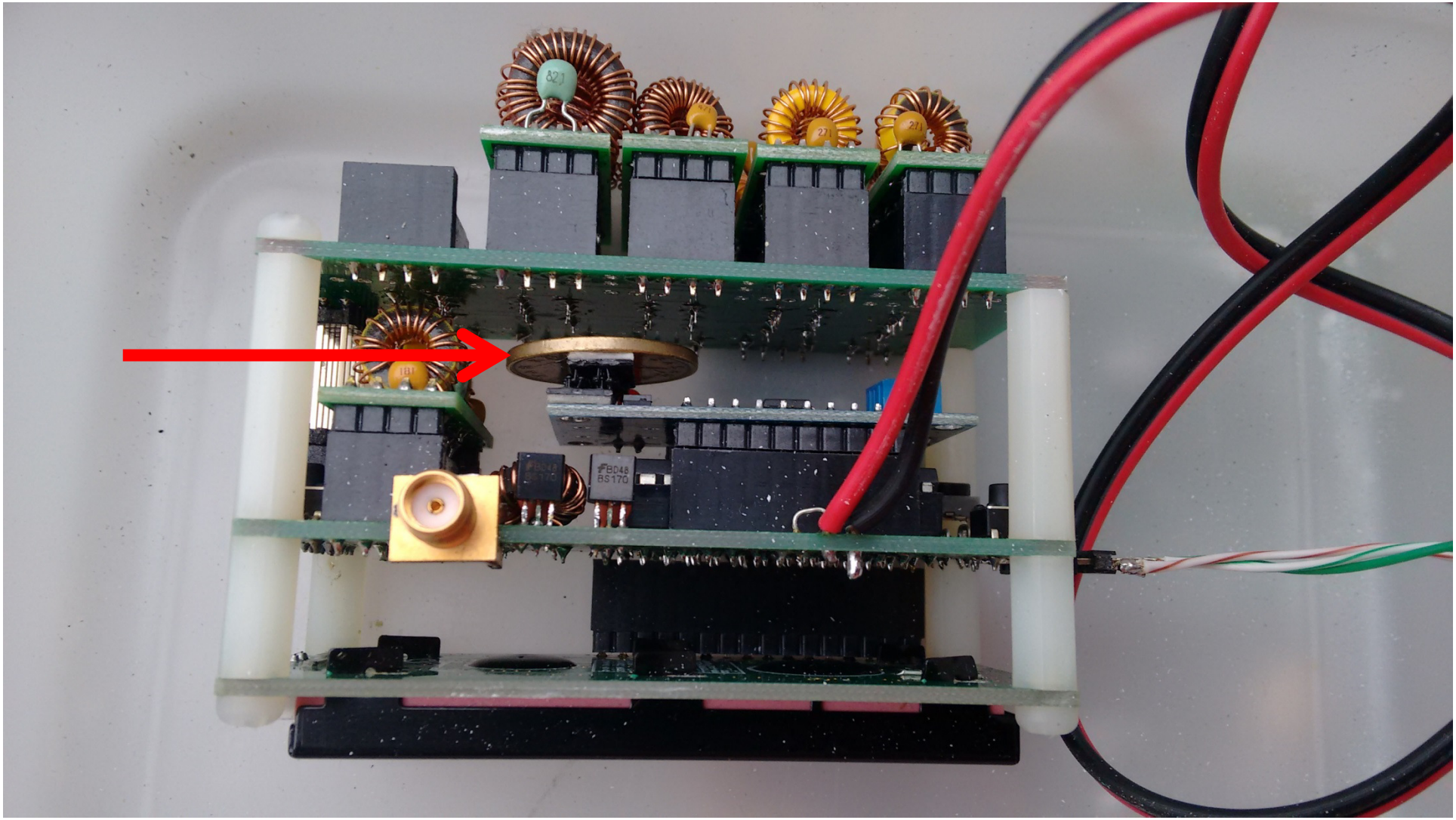
James Peroulas
james@peroulas.com

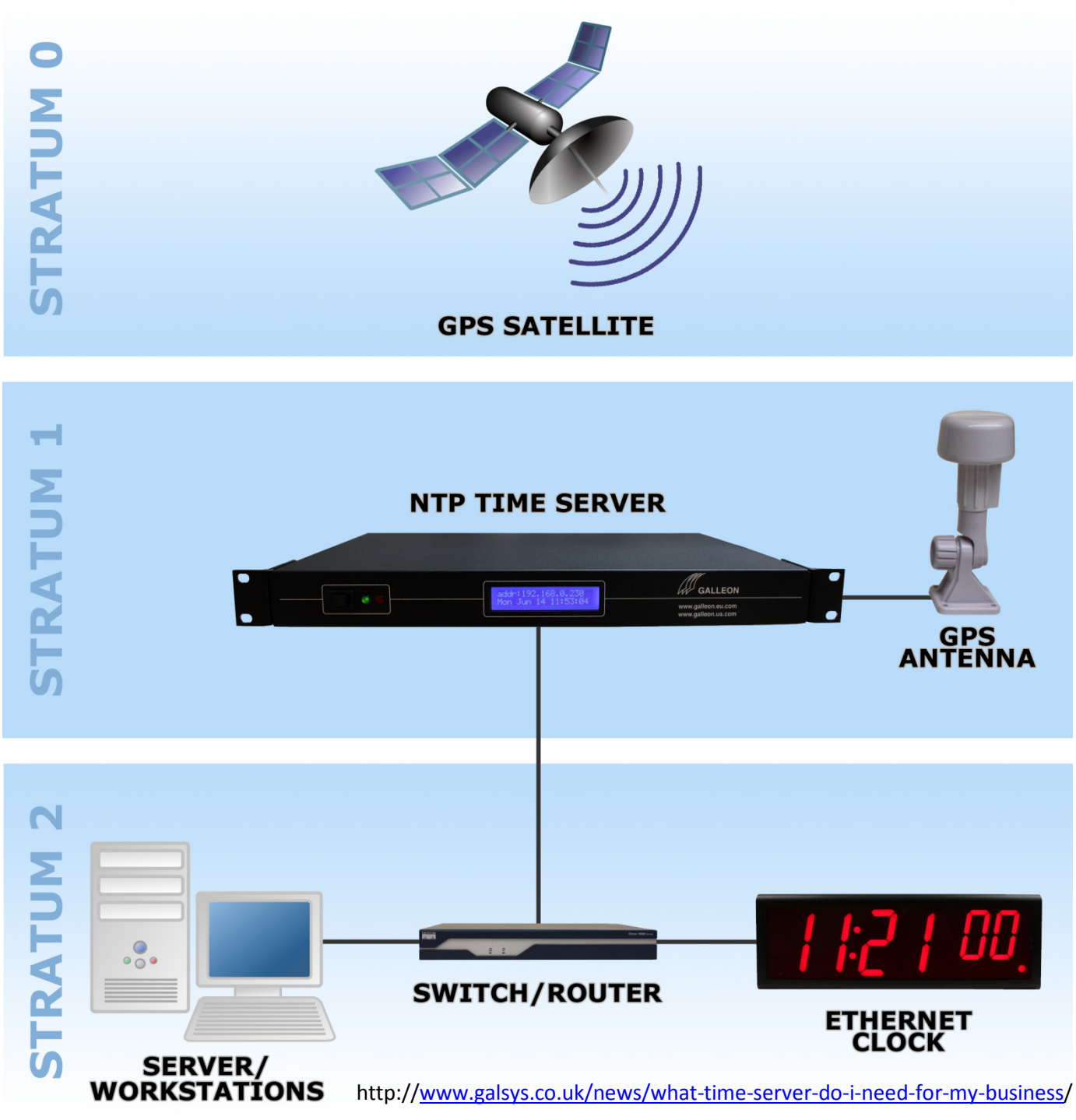
One of the creators of WsperryPi

Ultimate 3 QRSS, Assembled by HA7DCD

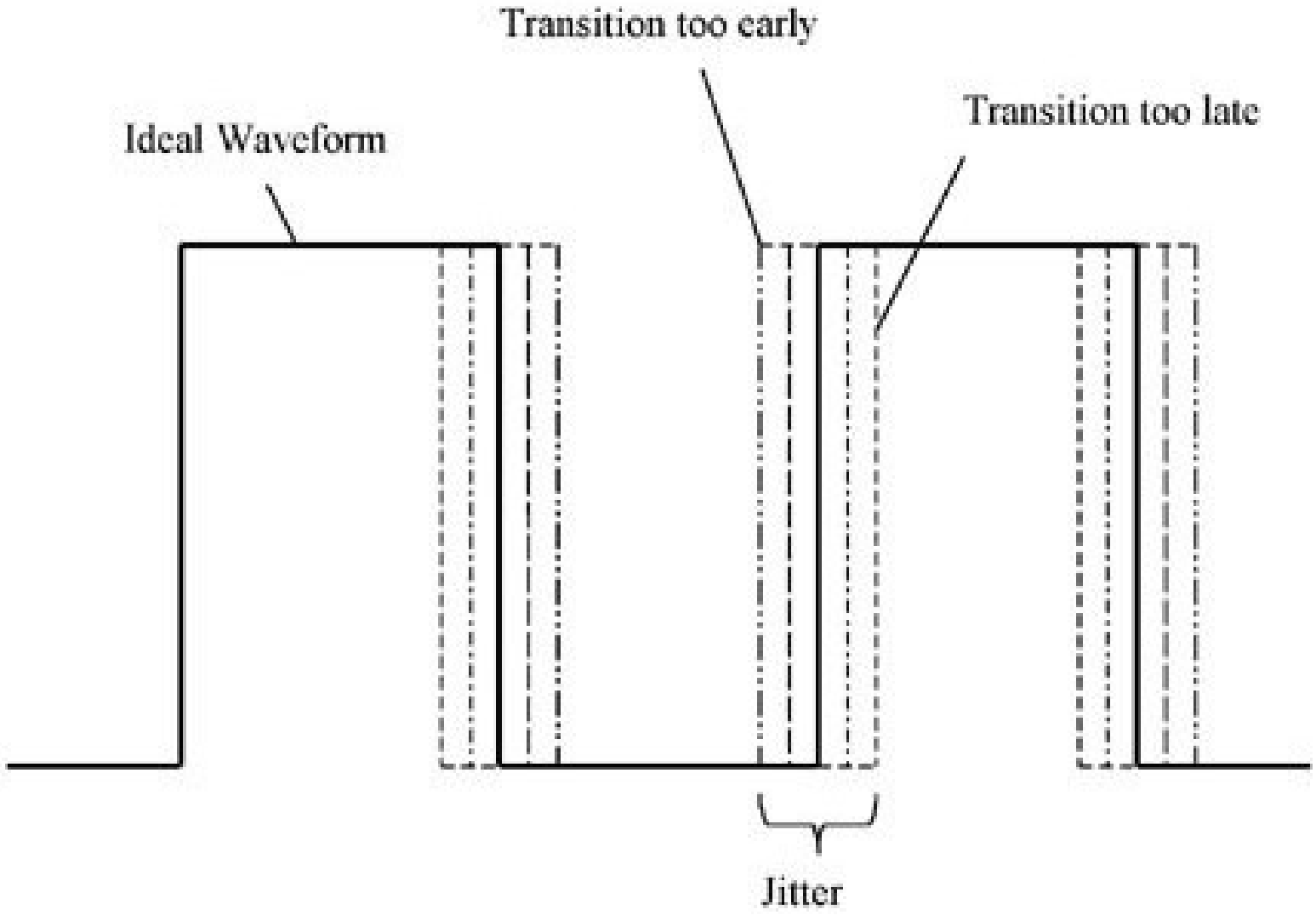


Ultimate 3 QRSS, Assembled by HA7DCD





http://www.galsys.co.uk/news/what-time-server-do-i-need-for-my-business/



http://www.eetimes.com/document.asp?doc_id=1277196

Oliver Mattos and Oskar Weigl (PiFM)

Dan, MD1CLV

F8CHK

Guido PE1NNZ

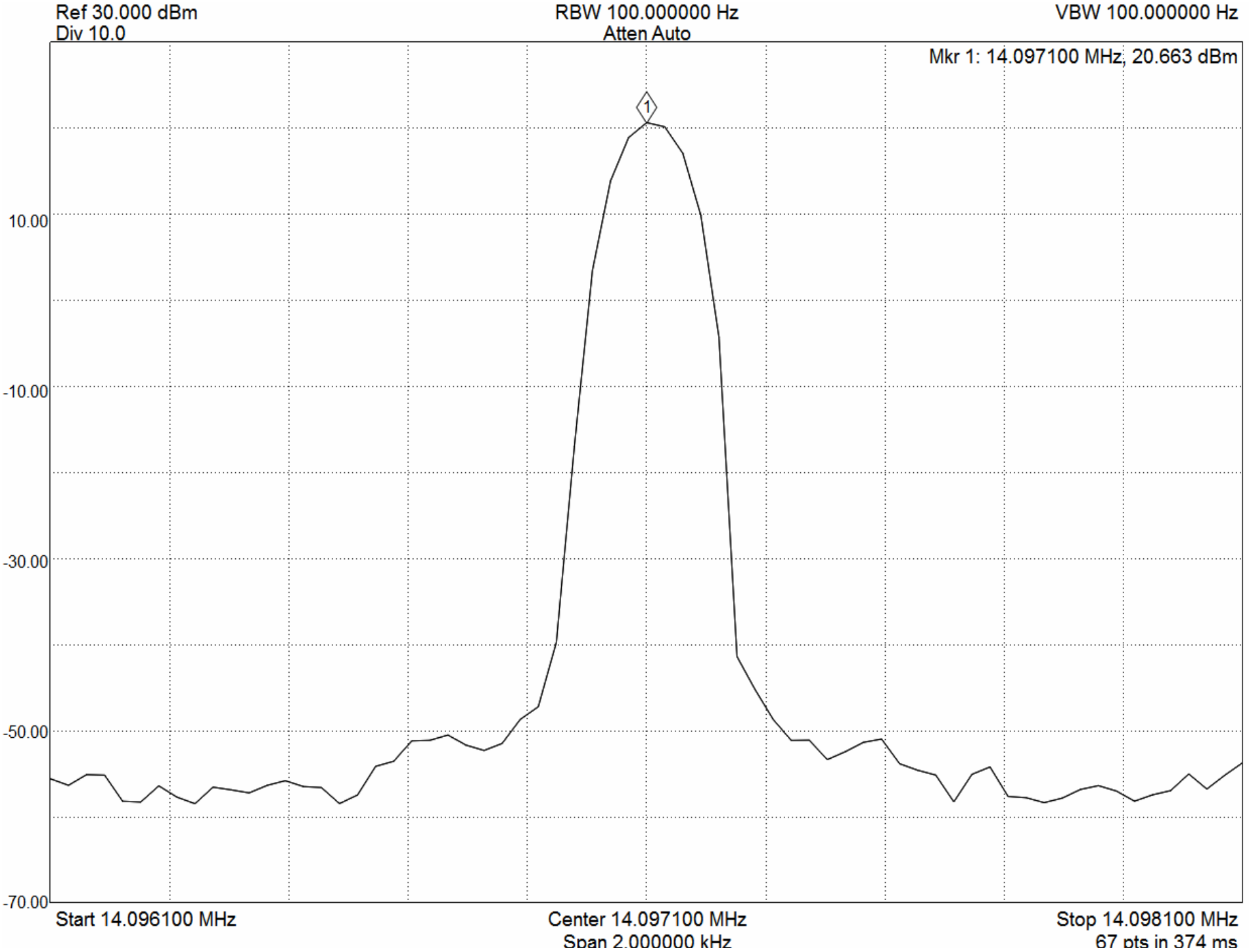
Michael Tatarinov

James Peroulas

WsperryPi mod – HA7ILM

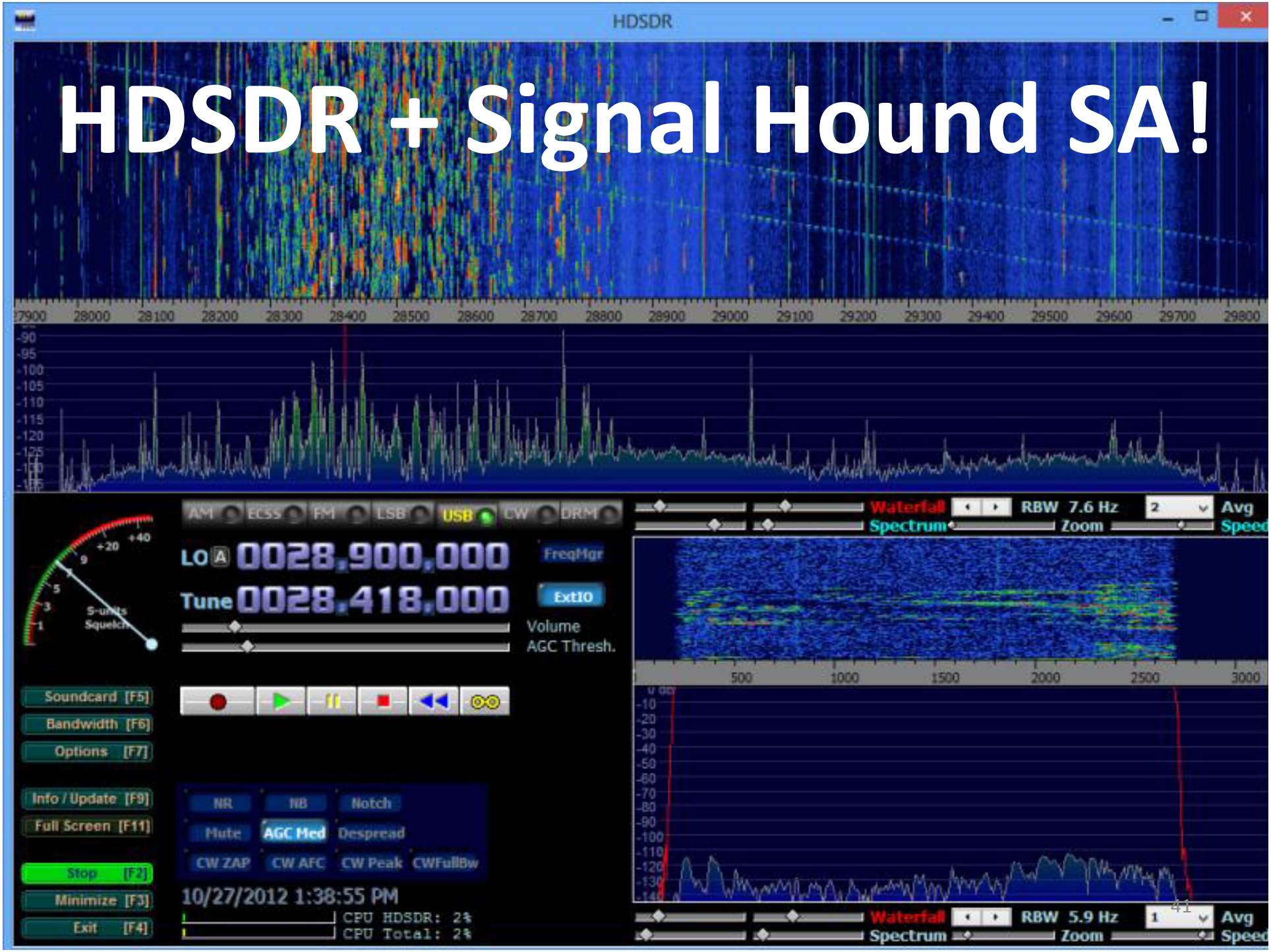
Andrew Holme:
http://j.mp/GPU_FFT

http://j.mp/PI-FMRDS


Ref 30.000 dBm
Div 10.0
RBW 100.000000 Hz
Atten Auto
VBW 100.000000 Hz
Mkr 1: 14.097100 MHz, 20.663 dBm
1
10.00
-10.00
-30.00
-50.00
-70.00
Start 14.096100 MHz
Center 14.097100 MHz
Span 2.000000 kHz
Stop 14.098100 MHz
67 pts in 374 ms

QRPi manual:

j.mp/tapr-qrpi


HDSDR
HDSDR + Signal Hound SA!
AM ECSS FM LSB USB CW DRM
LO A 0028,900,000
Tune 0028,418,000
FreqMgr
Ext10
Volume
AGC Thresh.
S-units
Squelch
Soundcard [F5]
Bandwidth [F6]
Options [F7]
Info / Update [F9]
Full Screen [F11]
Stop [F2]
Minimize [F3]
Exit [F4]
NR NB Notch
Mute AGC Med Despread
CW ZAP CW AFC CW Peak CWFullBw
10/27/2012 1:38:55 PM
CPU HDSDR: 2%
CPU Total: 2%
Waterfall
Spectrum
RBW 7.6 Hz
Zoom
Avg
Speed
RBW 5.9 Hz


Antenna
Thank you for your attention!
j.mp/tapr-qrpi