TinySA Workshop

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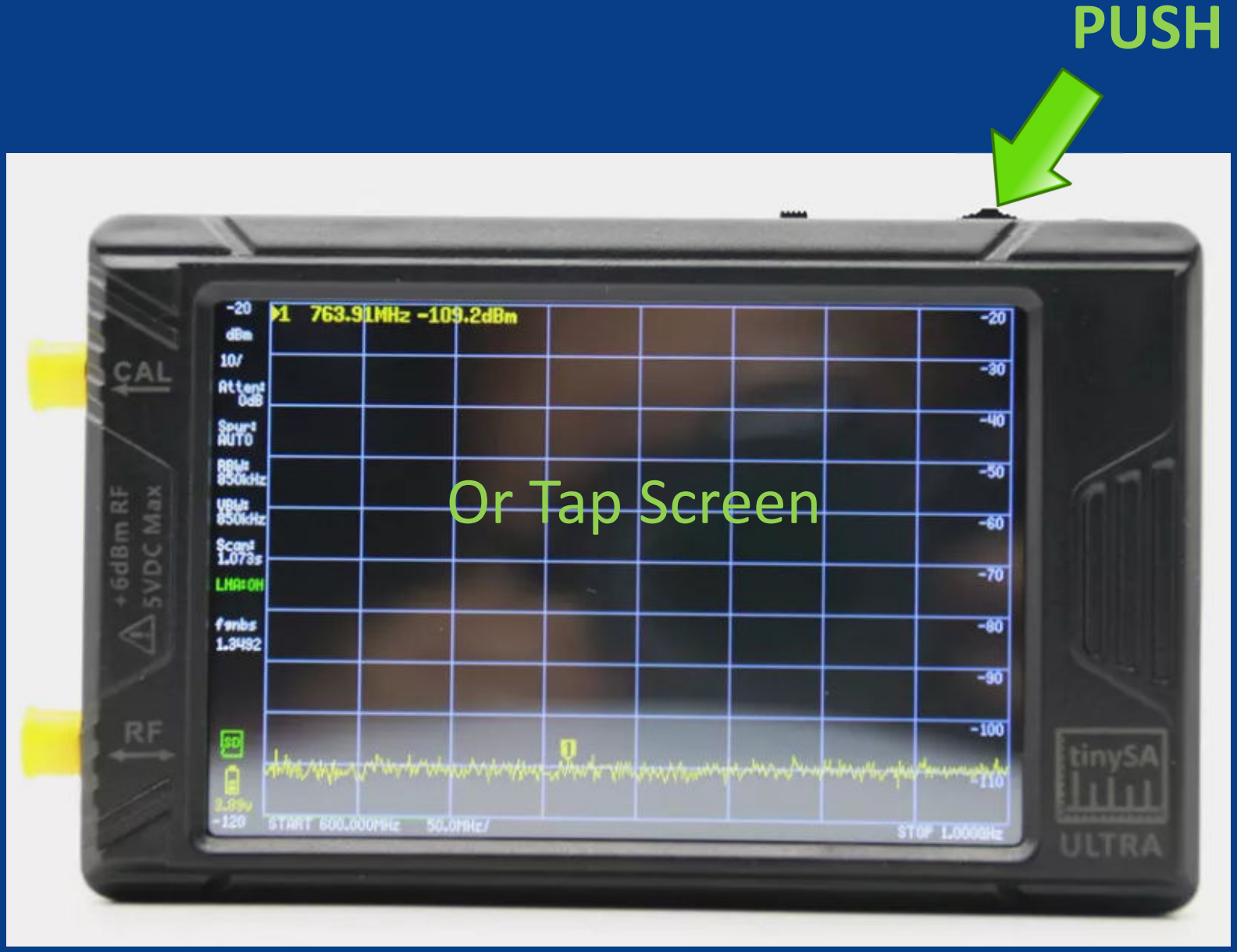
TinySA = Spectrum Analyzer

- Receiver that scans across a range of frequency
- Displays signal amplitude at each frequency
- Amplitude in dB, not S(illy) units
- Adjustable bandwidth

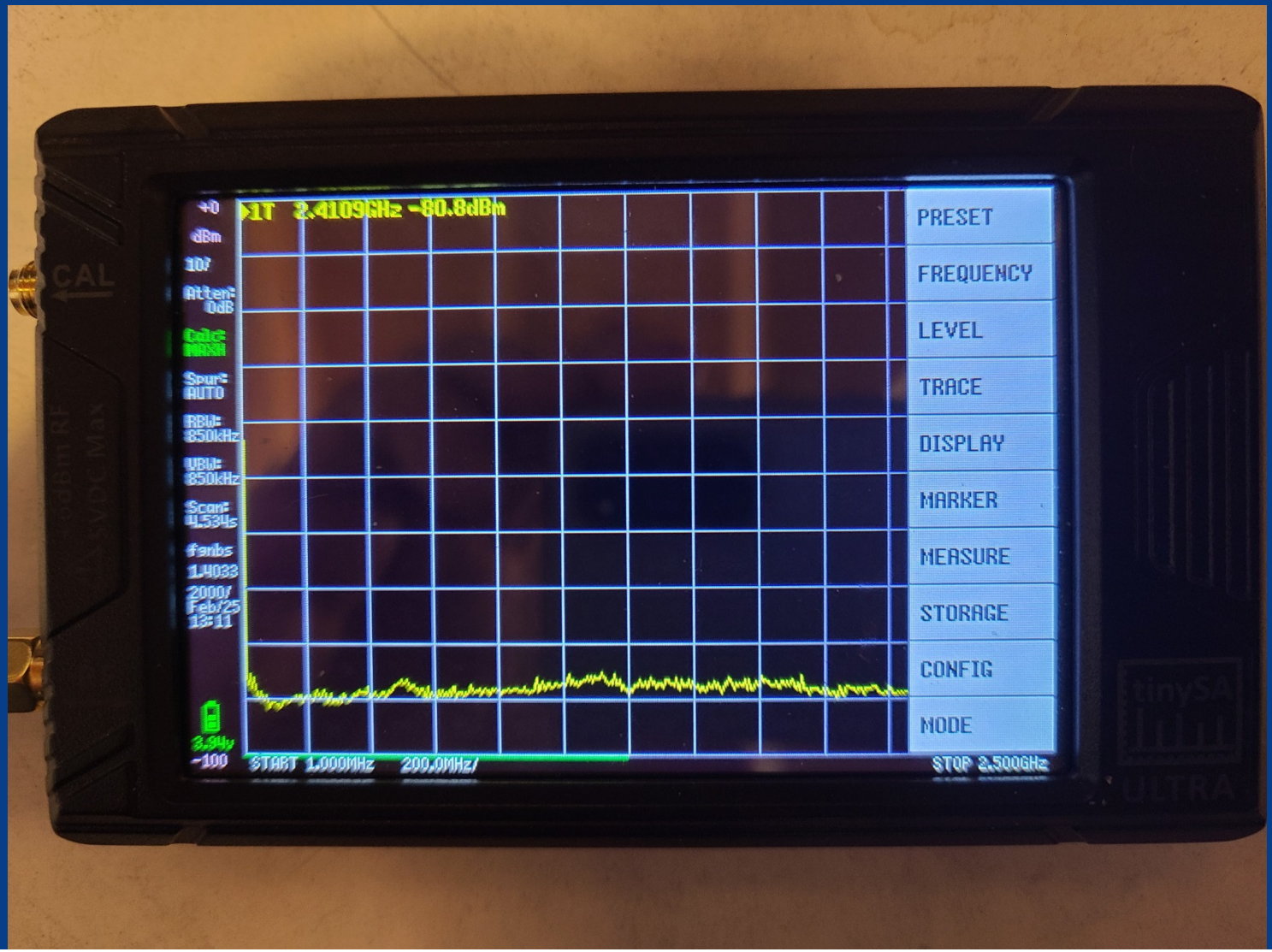
TinySA
Small inexpensive Spectrum Analyzer

- tinySA Basic – 960 MHz max, 2.8” screen
- tinySA Ultra – 6 GHz max, 4” screen
  - 20 GHz extended range with reduced sensitivity
- Signal Generator Mode
- https://www.tinysa.org/wiki/
  –Docs, manual, videos

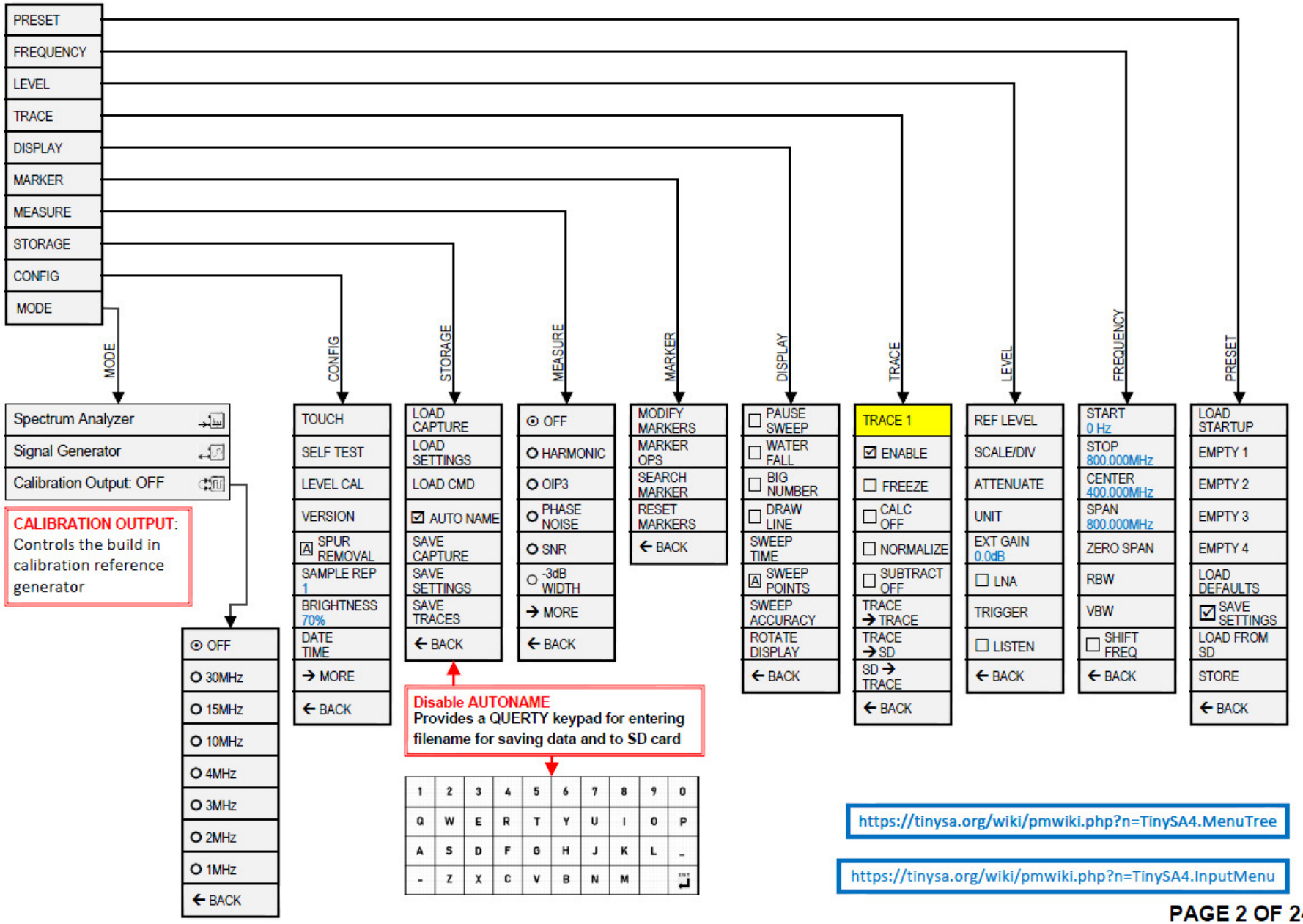
Menu Driven



Top Menu


PRESET
FREQUENCY
LEVEL
TRACE
DISPLAY
MARKER
MEASURE
STORAGE
CONFIG
MODE
START 1.000MHz
200.0MHz/
STOP 2.500GHz

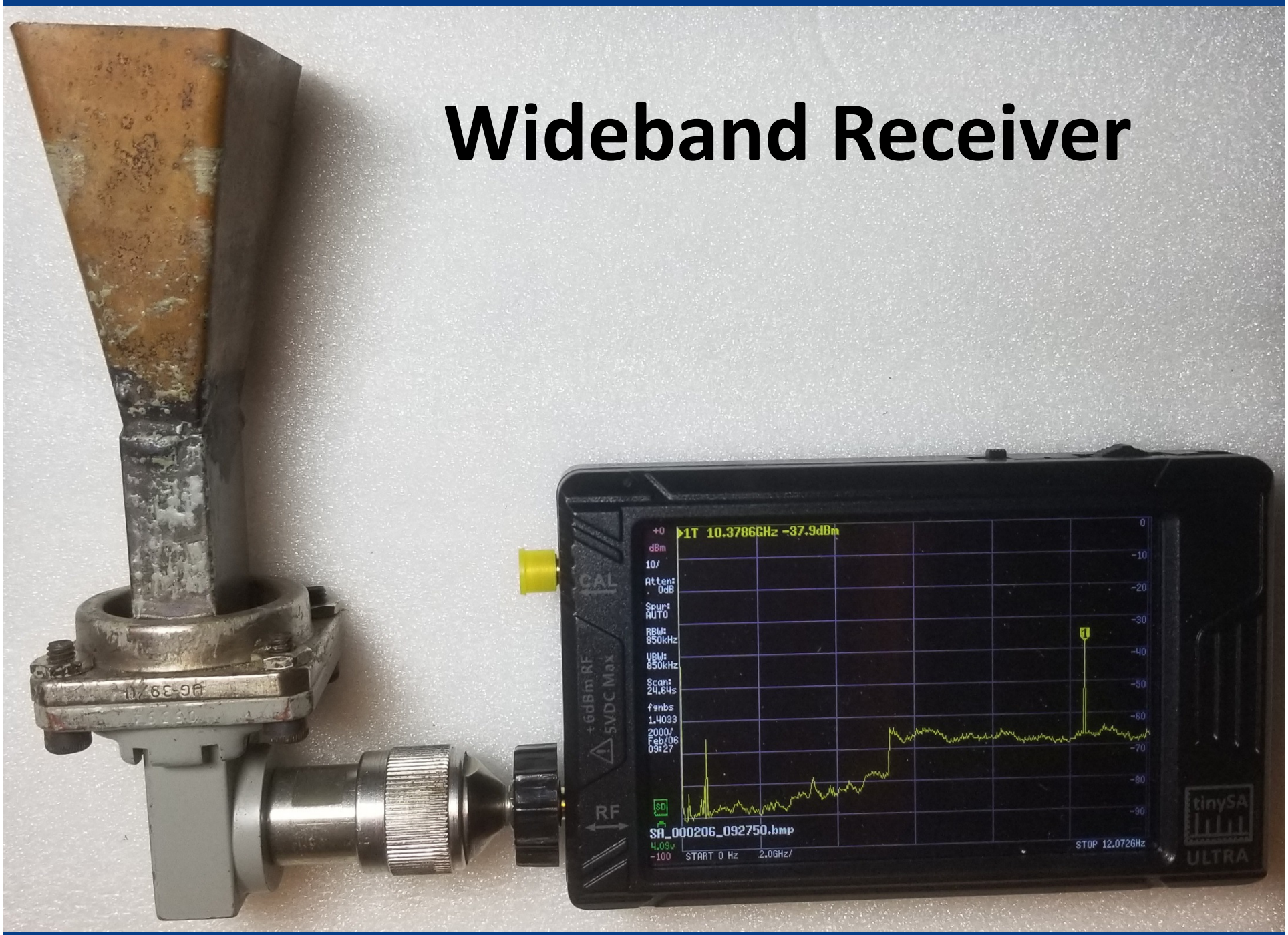
TinySA Ultra TOP Menu Chart



https://tinysa.org/wiki/pmwiki.php?n=TinySA4.MenuTree

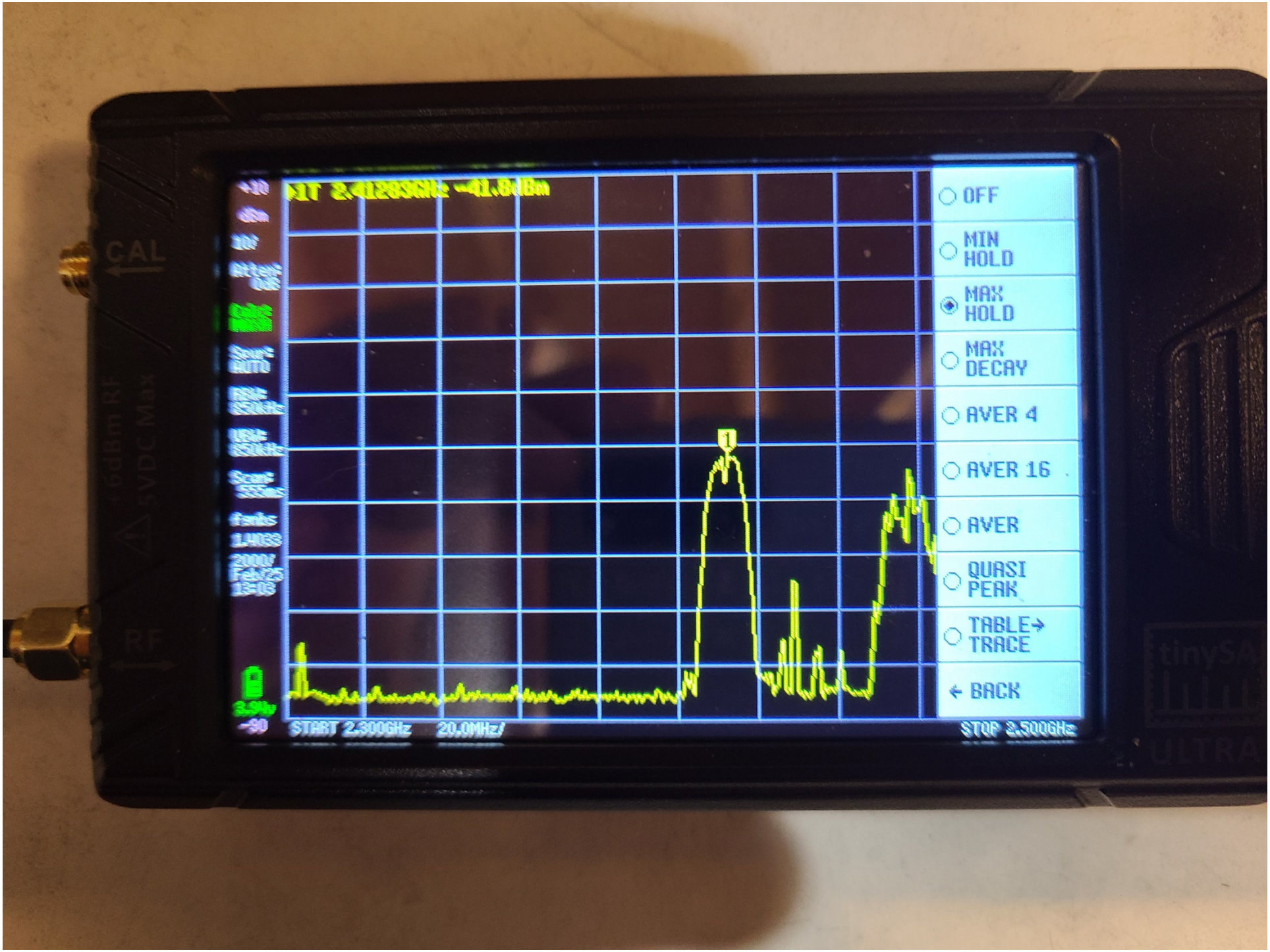
https://tinysa.org/wiki/pmwiki.php?n=TinySA4.InputMenu

Wideband Receiver

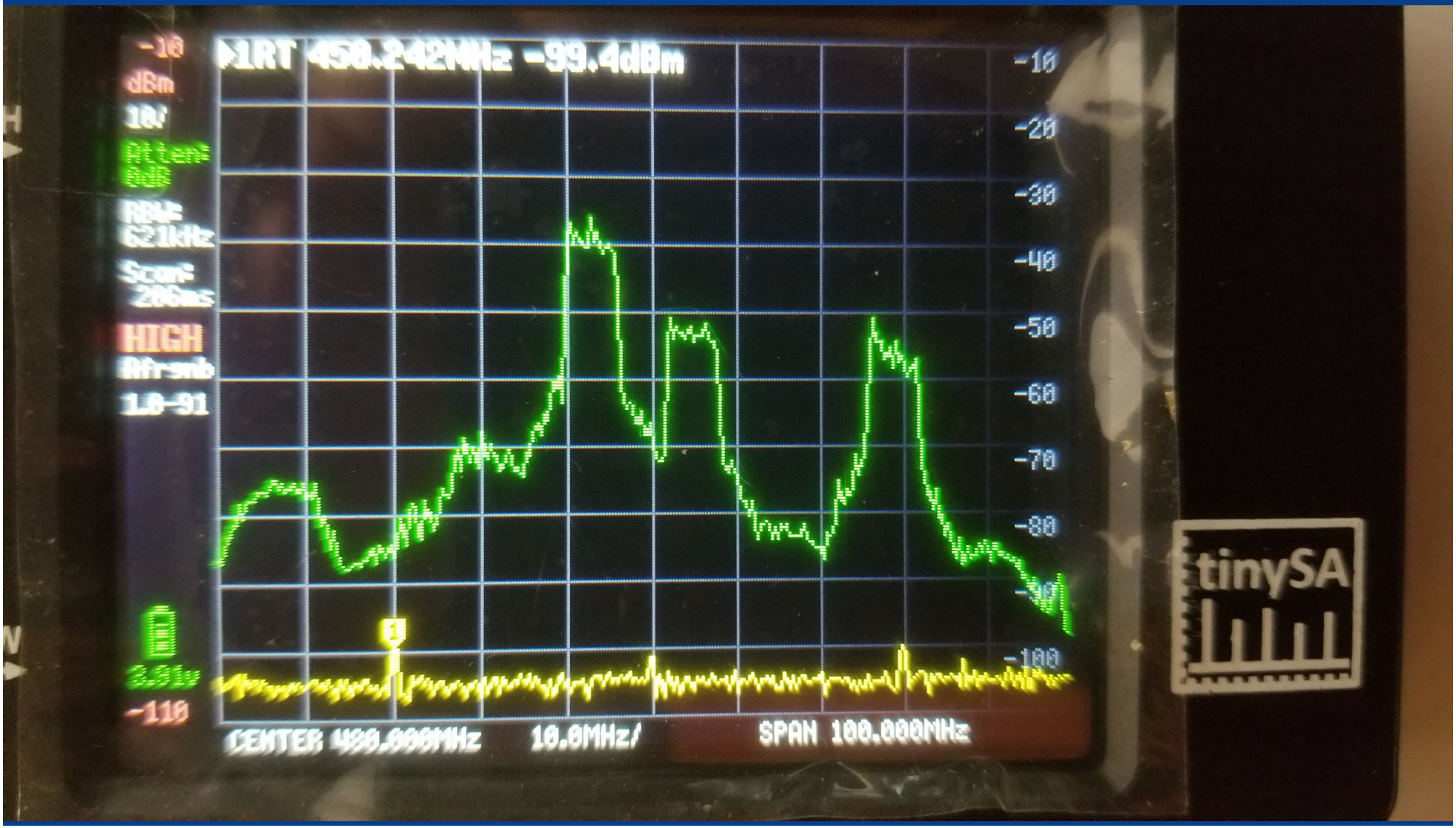


Wideband Receiver

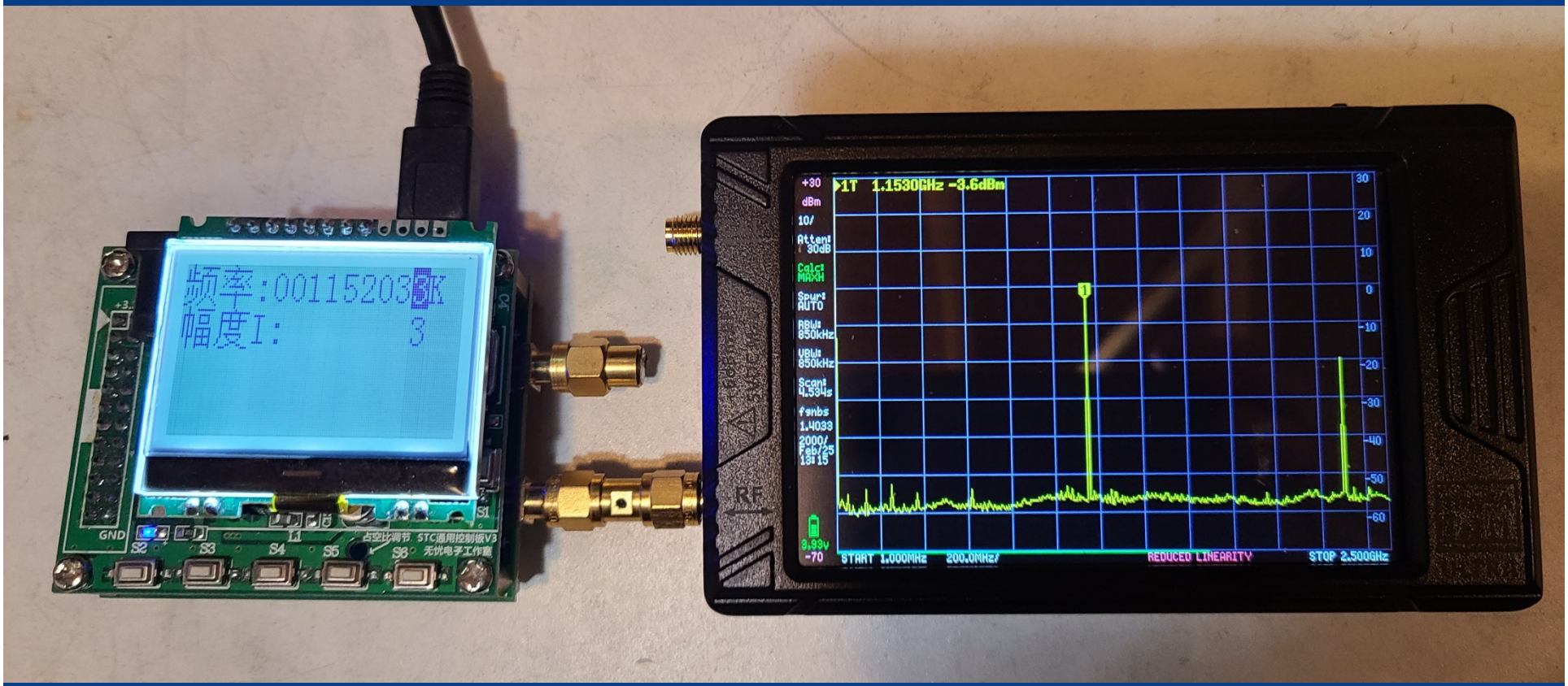
- Connect your antenna
- Look for
  - 2M Handy Talky signal
  - Wifi 2.4 GHz or 5 GHz?
  - Cell Phone
- For Transient Signals
  - Menu ->TRACE ->CALC ->MAX HOLD


OFF
MIN HOLD
MAX HOLD
MAX DECAY
AVER 4
AVER 16
AVER
QUASI PEAK
TABLE→ TRACE
← BACK
START 2.300GHz
20.0MHz/
STOP 2.500GHz
CAL
RF

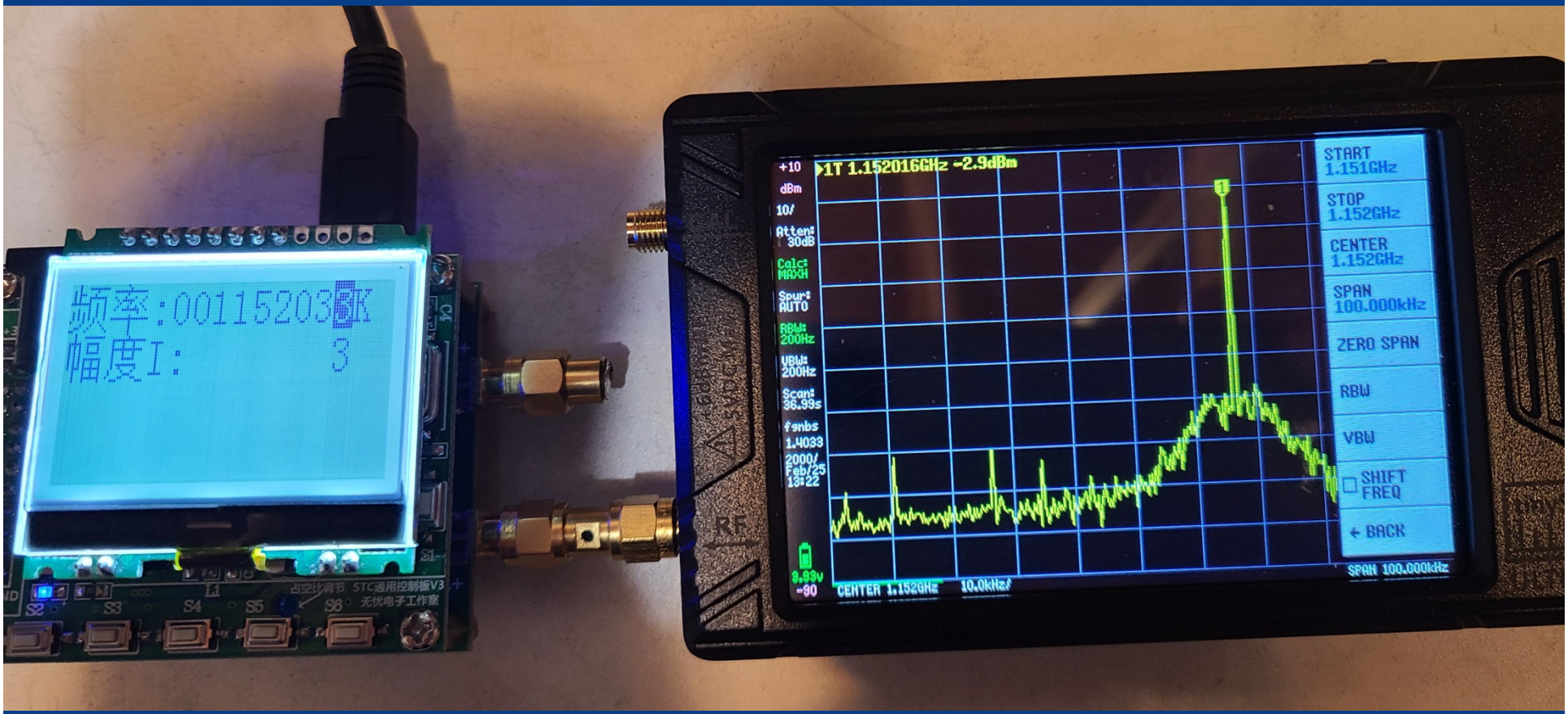
DTV Signals
Wideband Intermod



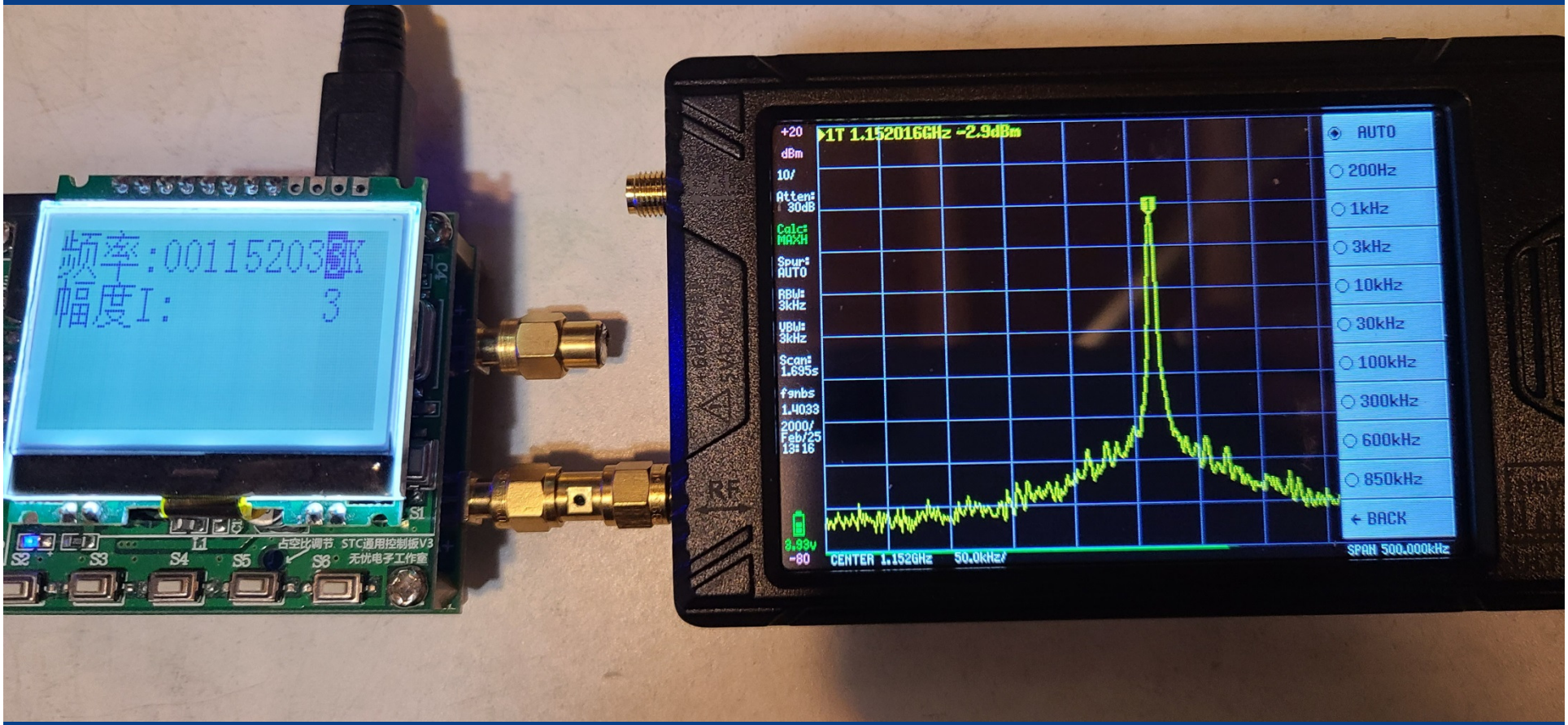
Signal Purity



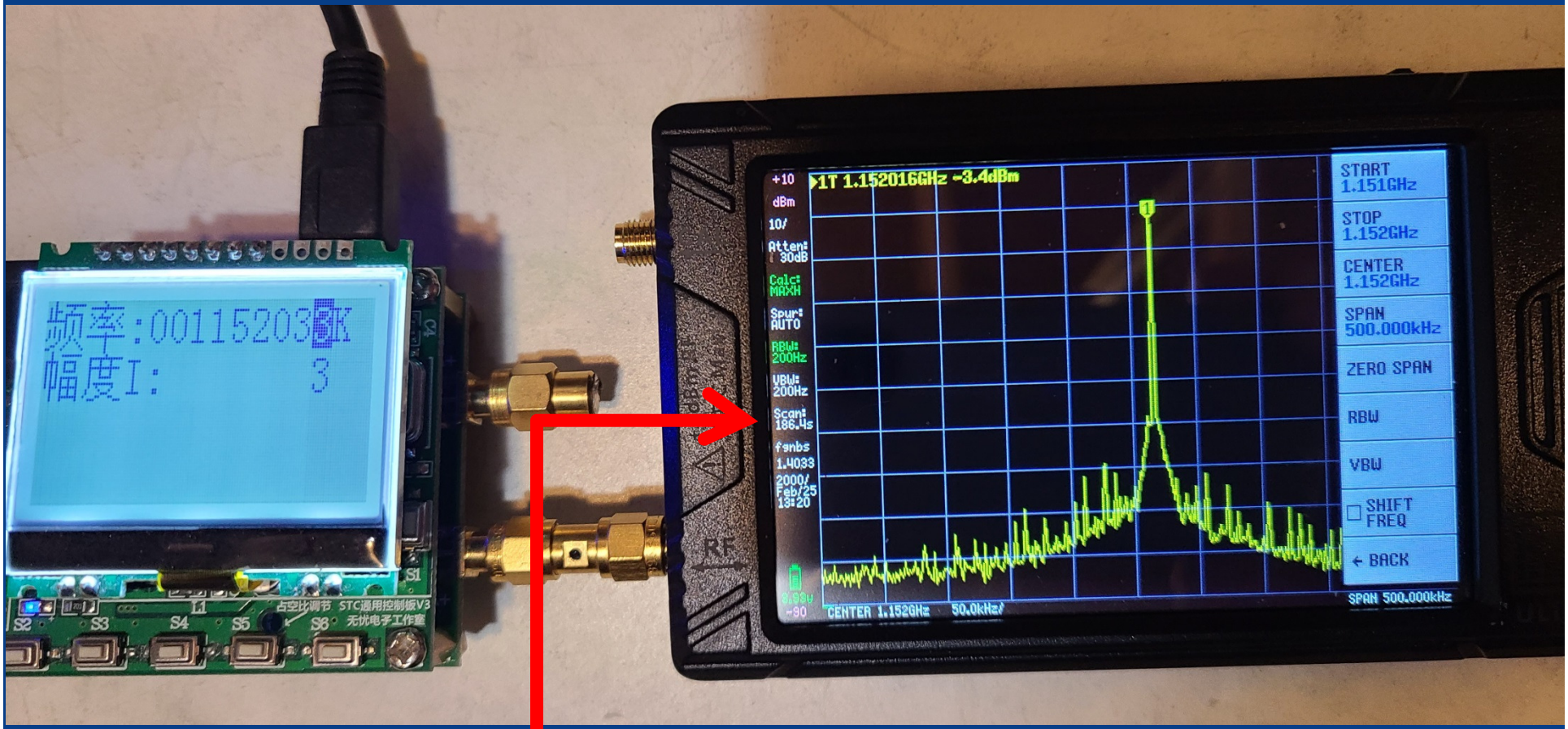
Signal Close In



Change Receiver Bandwidth



Narrow BW reduces Noise Floor

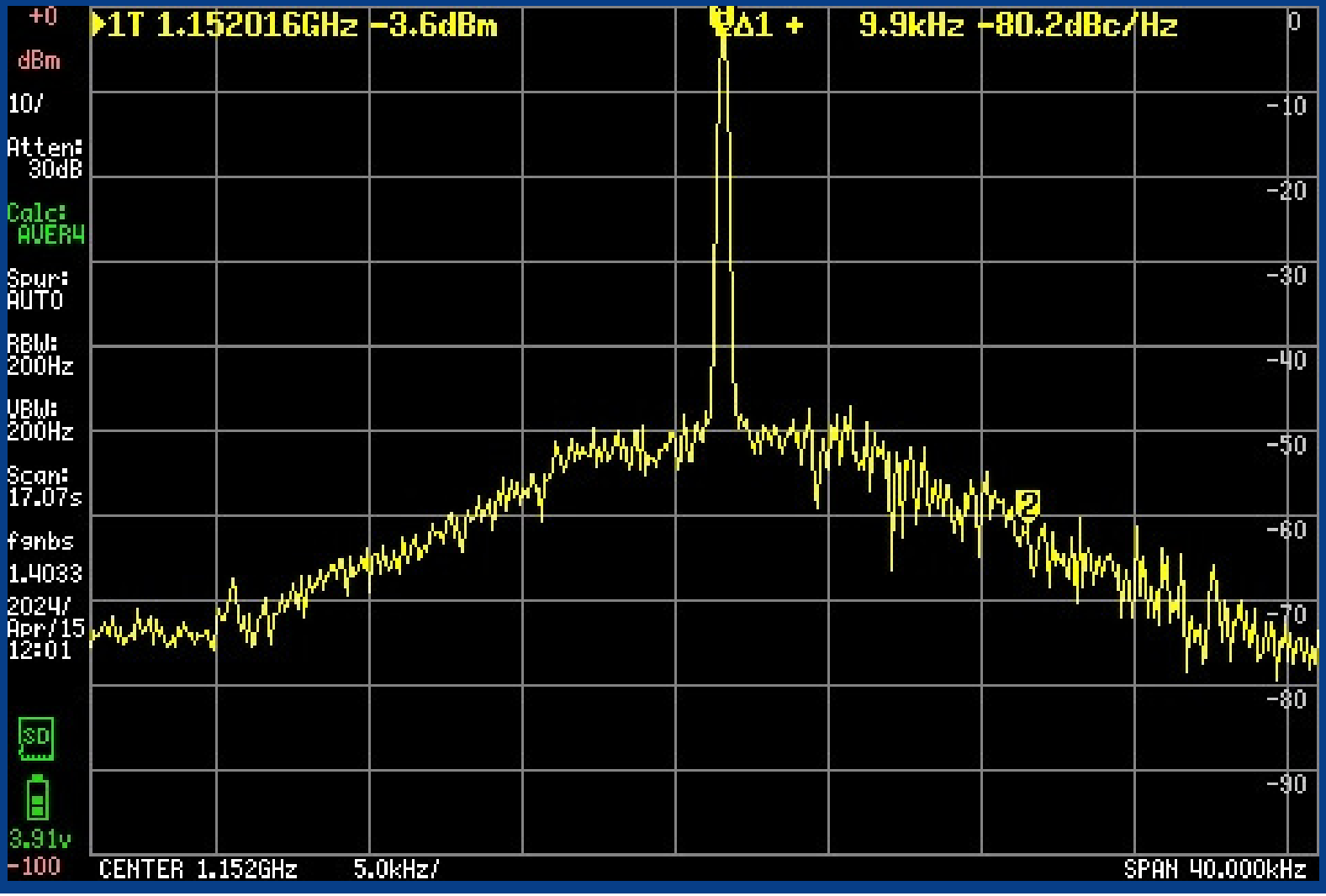


LONG SWEEP TIME

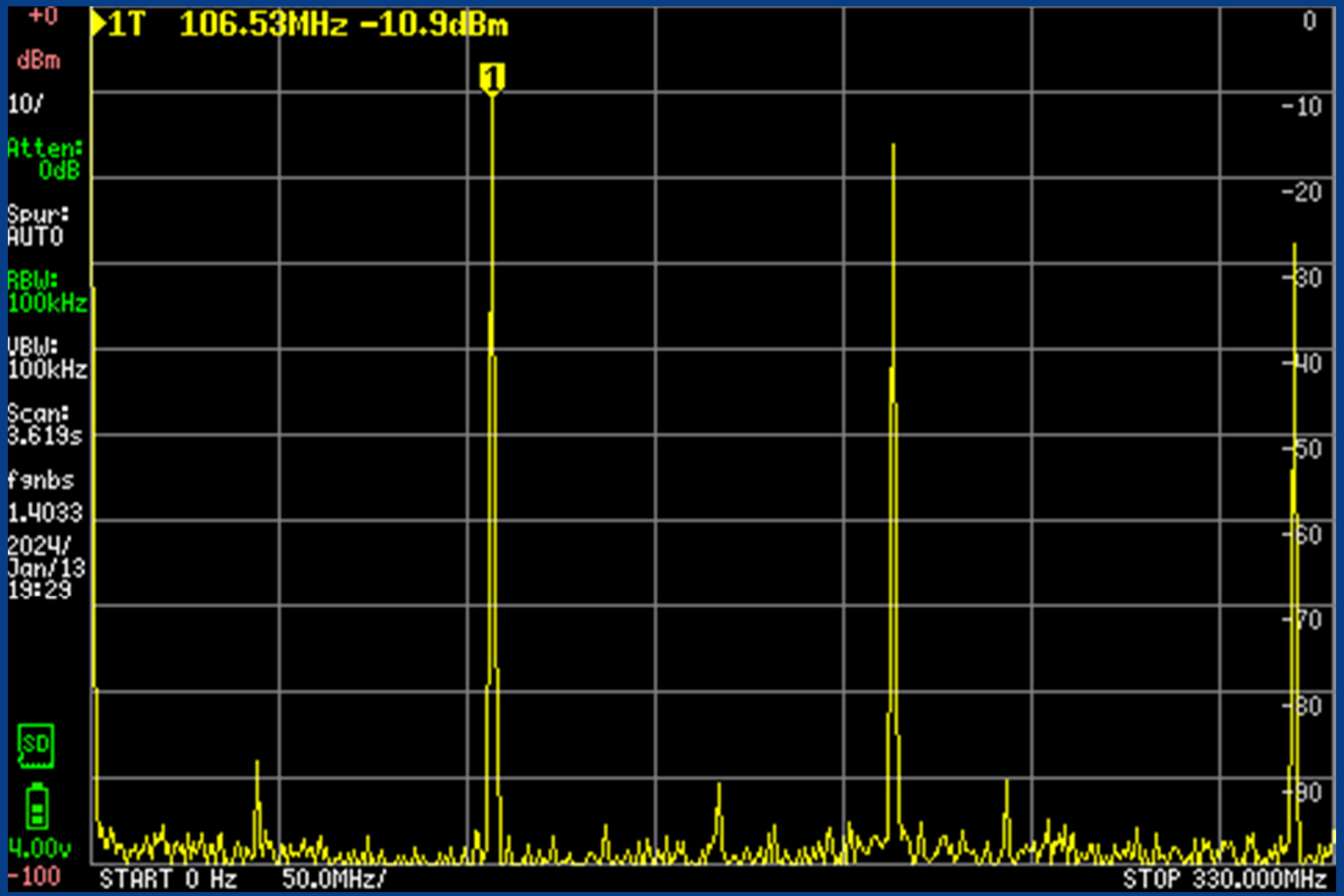
Menu -> Measure -> Phase Noise

Screen Capture

Menu ->STORAGE -> SAVE CAPTURE

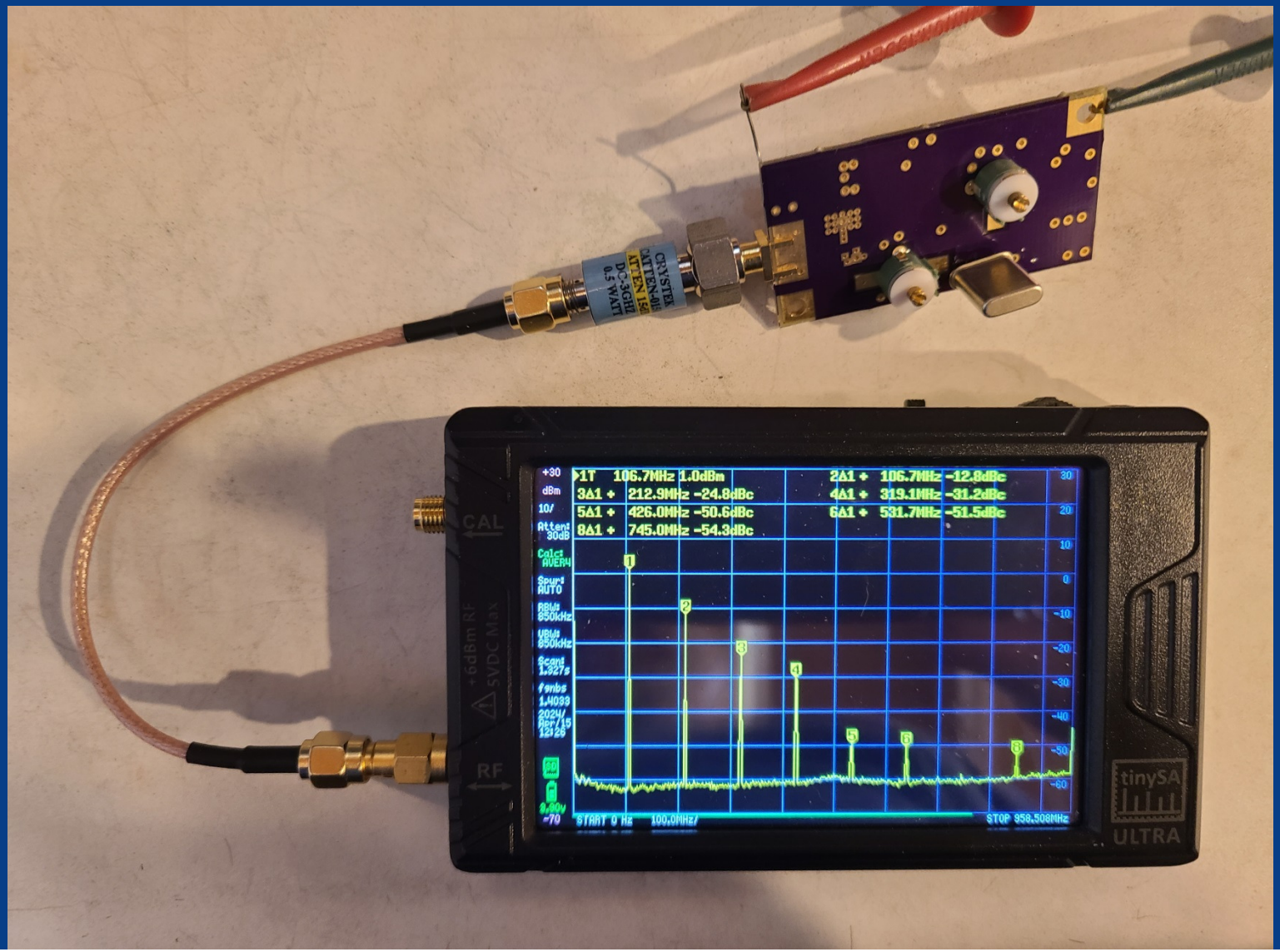


Crystal Oscillator



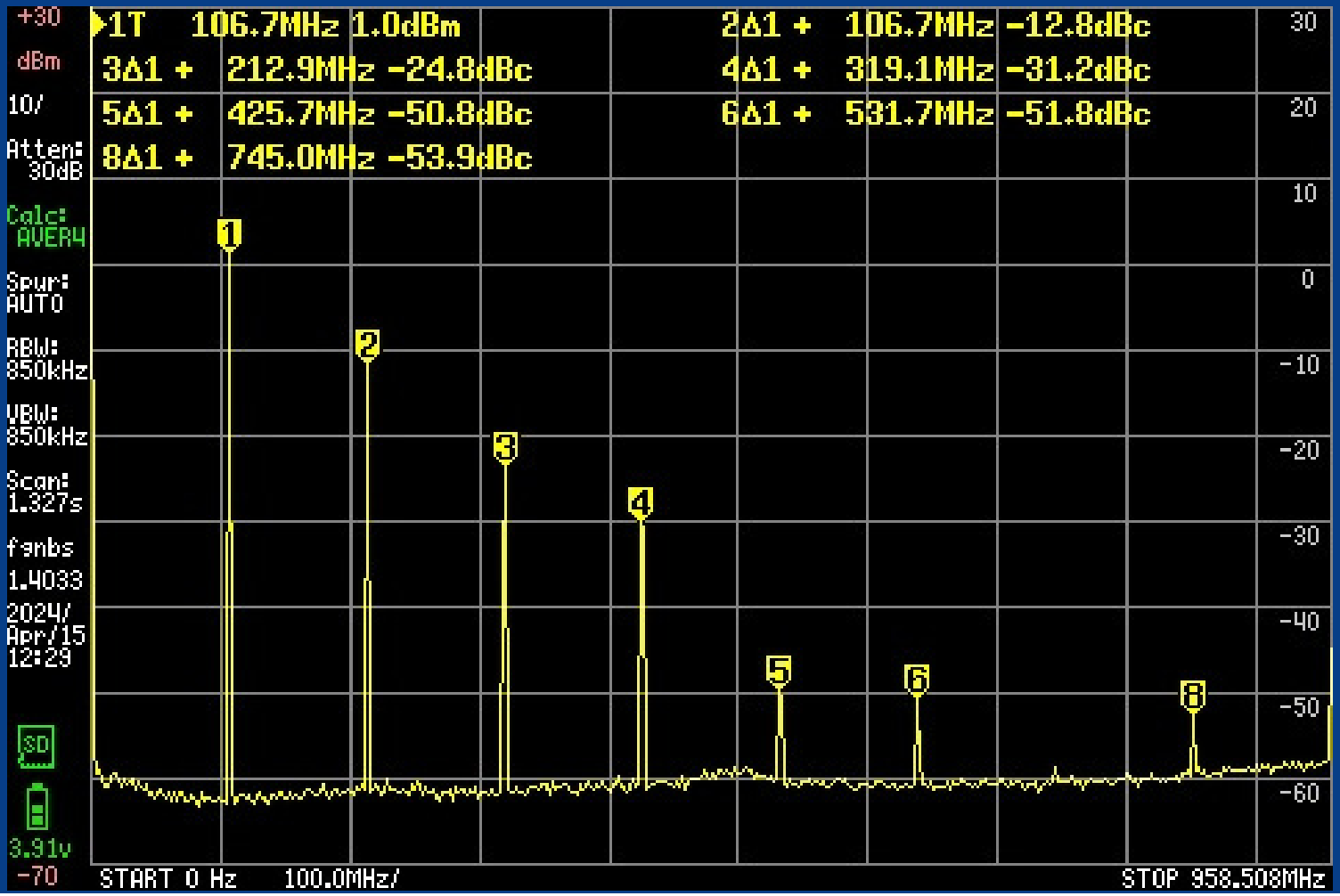
Harmonics

Menu -> Measure -> Harmonic

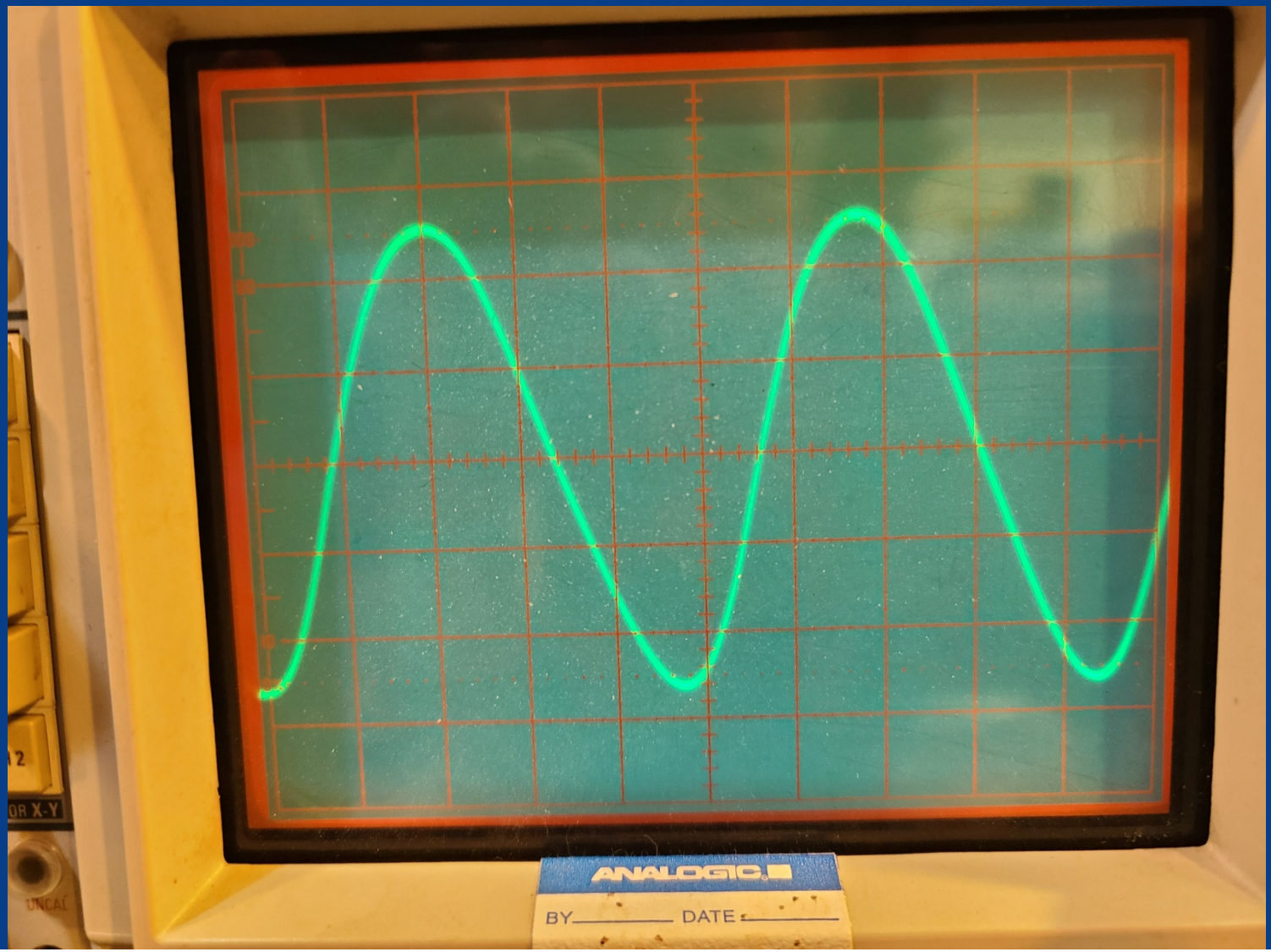


Harmonics

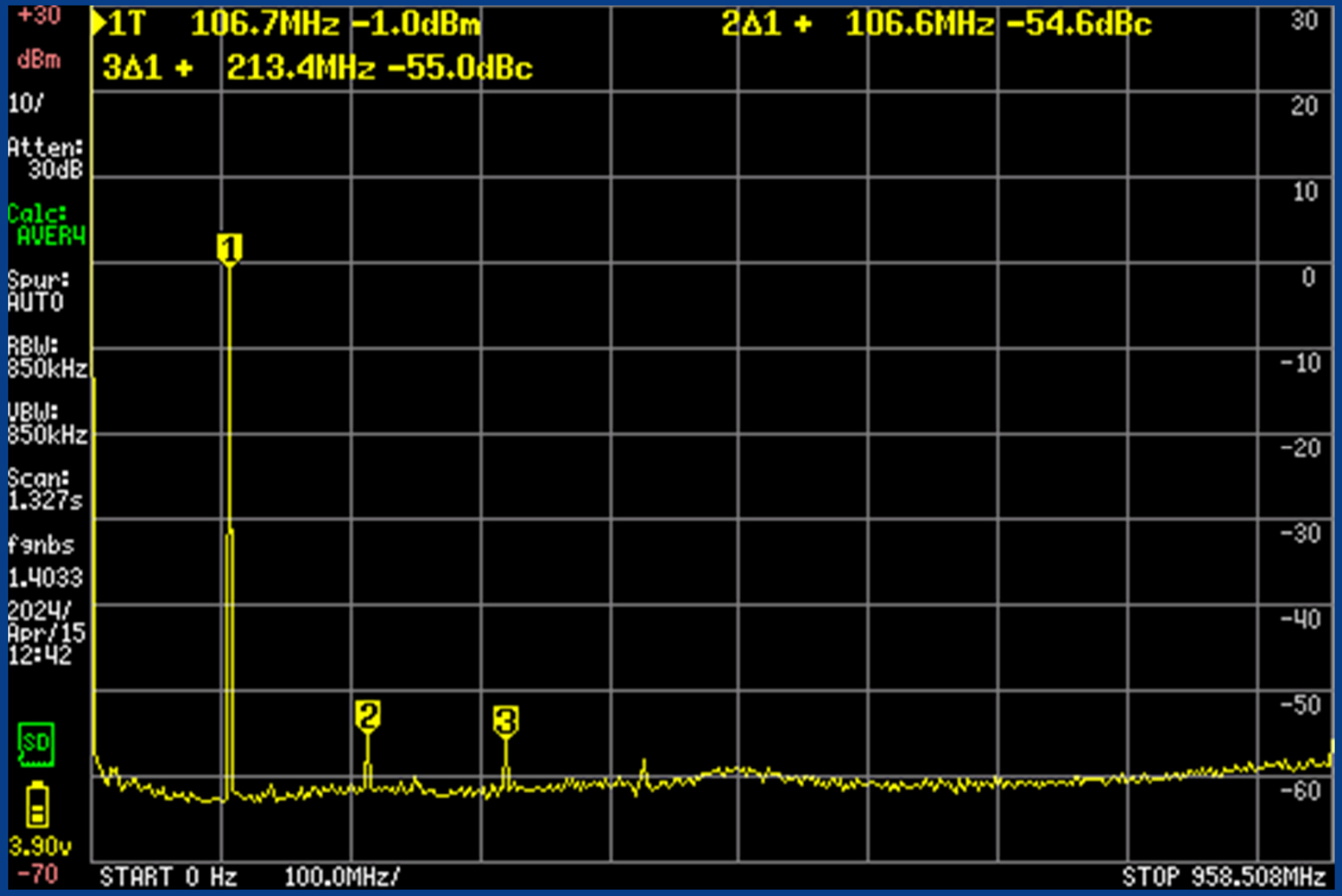
Menu -> Measure -> Harmonic



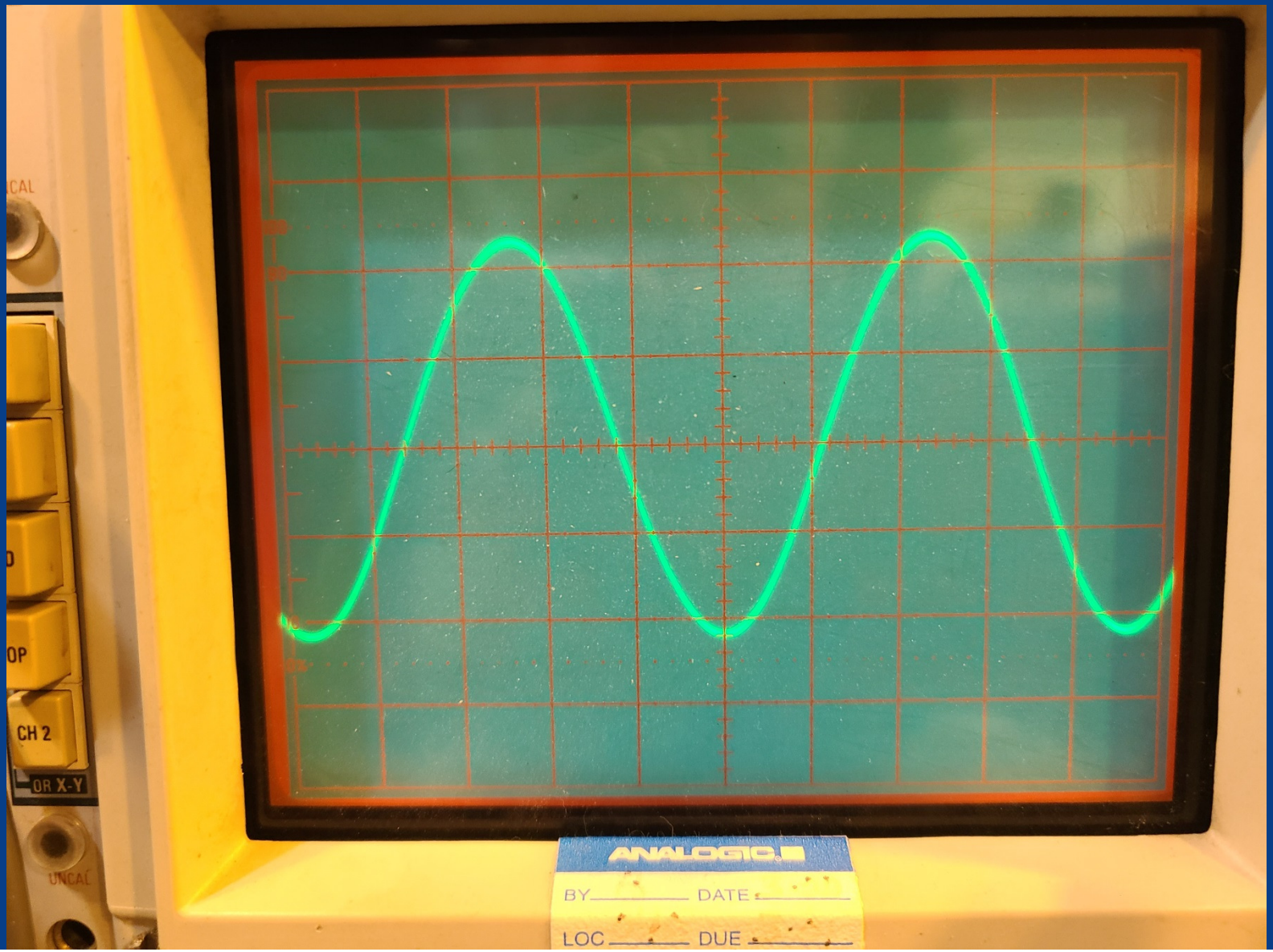
Harmonics Distort Waveform



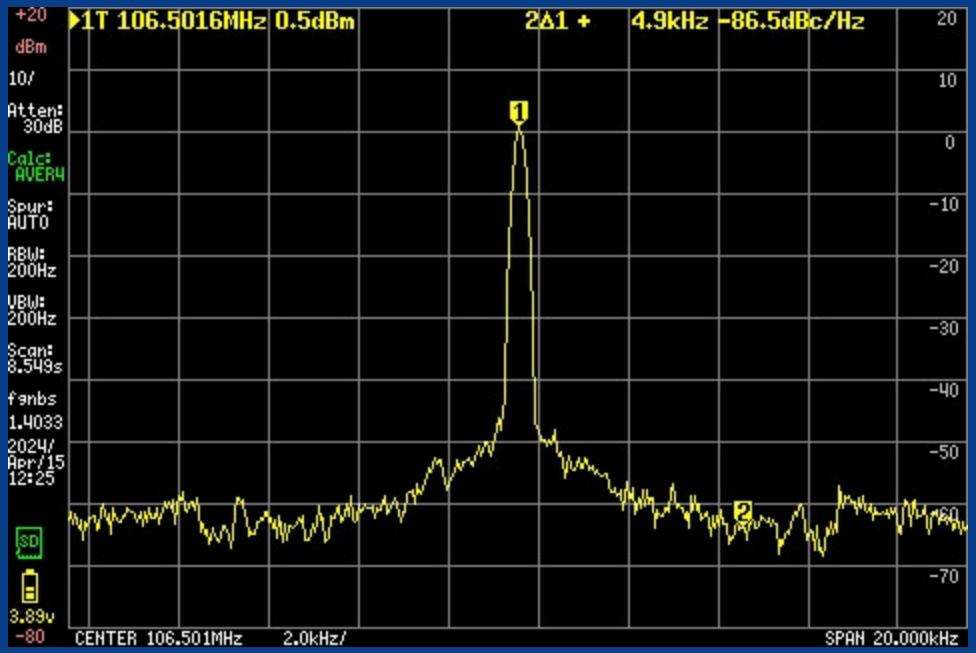
Harmonics after Low-Pass Filter



Sine Wave after LPF



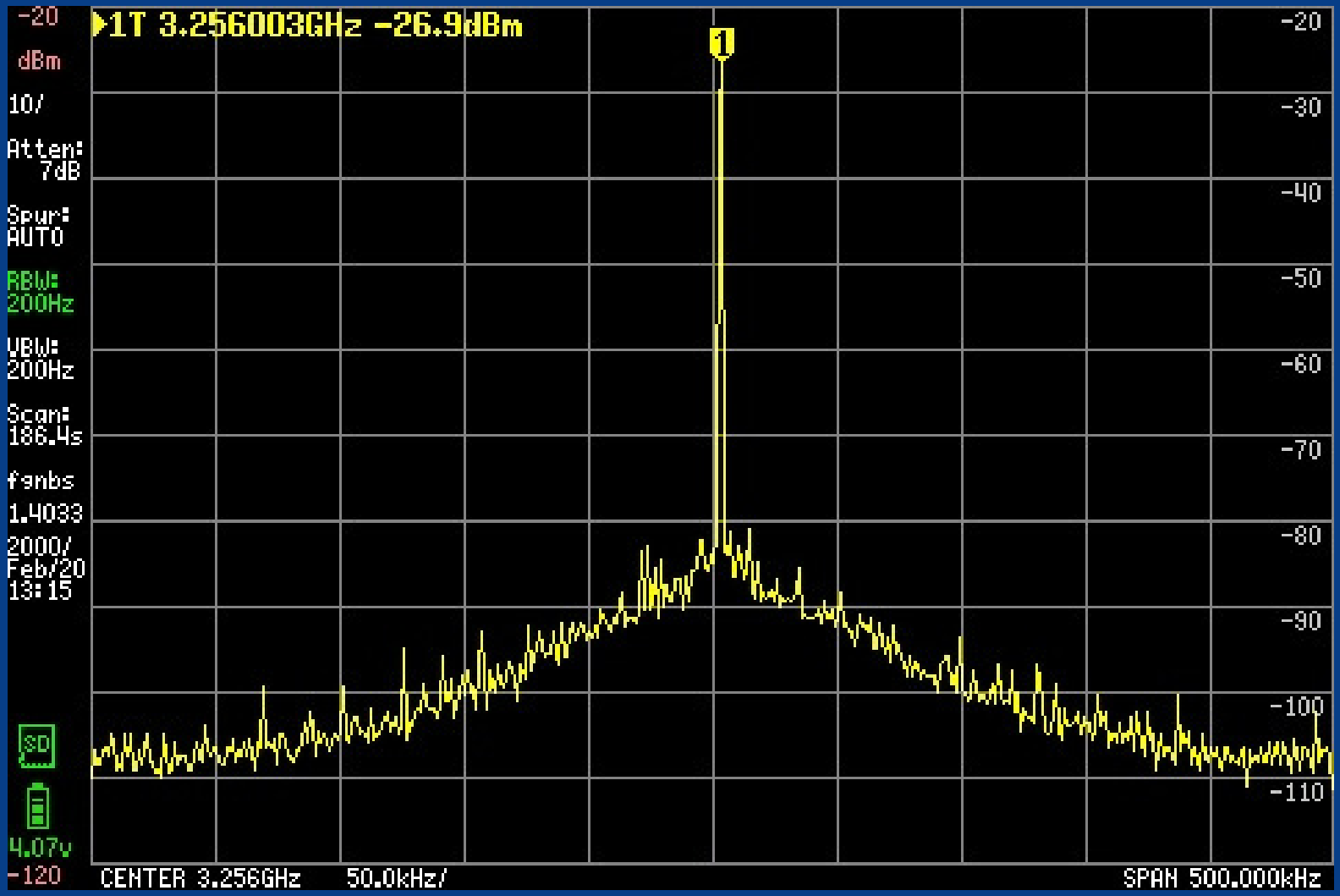
Crystal Oscillator Phase Noise
Menu -> MEASURE -> PHASE NOISE



Similar PN to Synthesizer

∴ Limited by tinySA Phase Noise

3.4 GHz Transverter LO



3.4 GHz Transverter Output

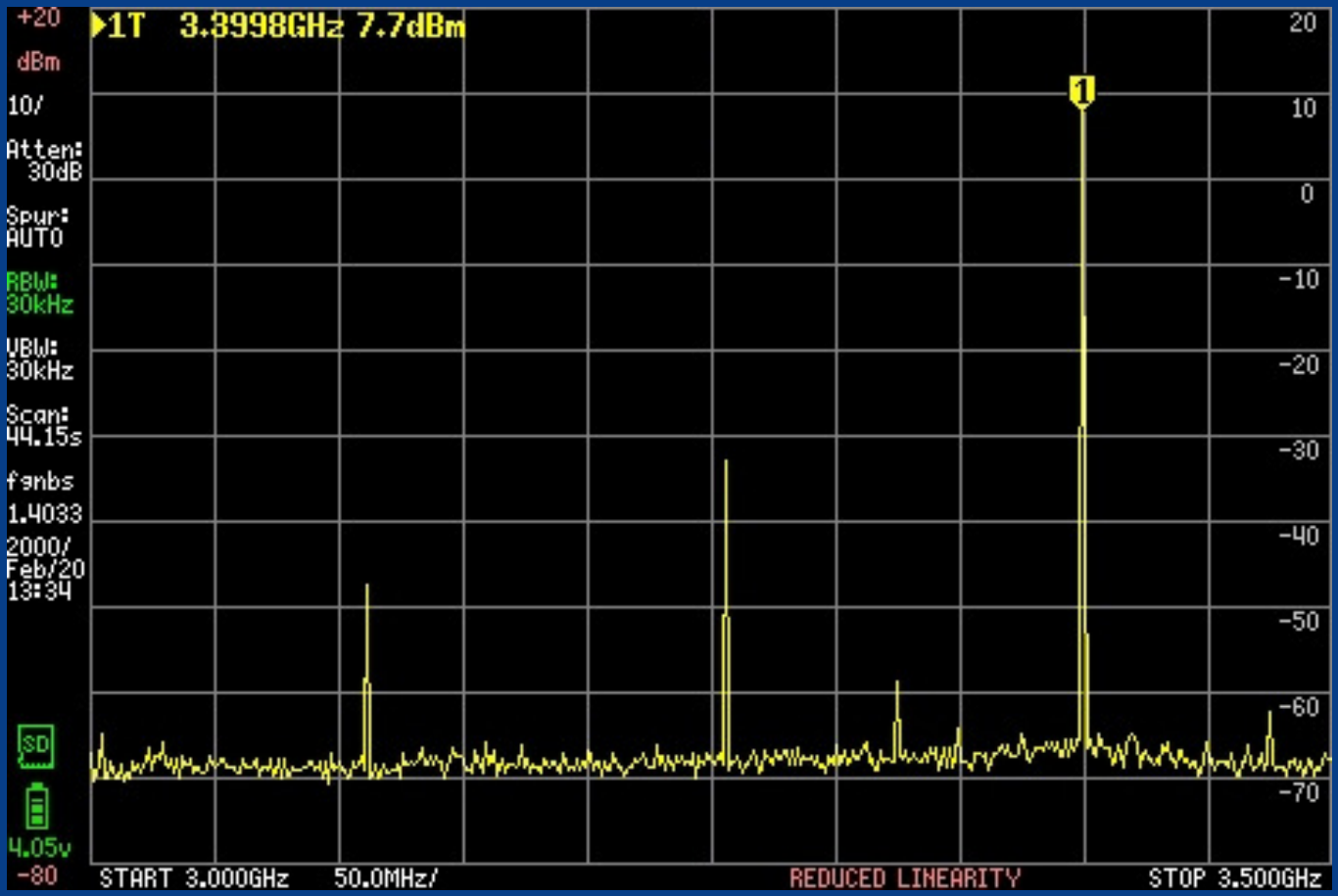
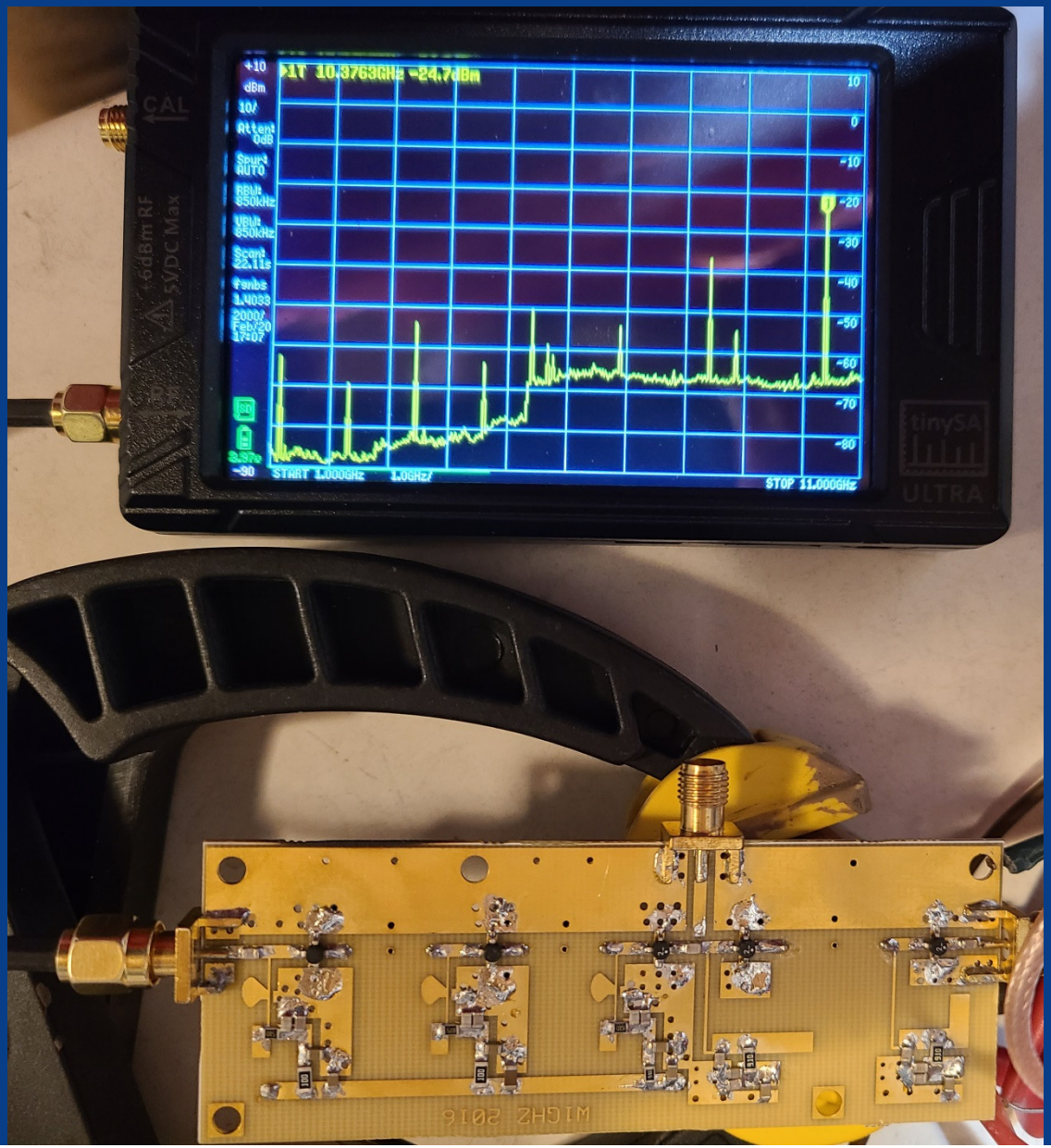


Image LO Signal

Tune Transverter RX with Signal Generator Mode

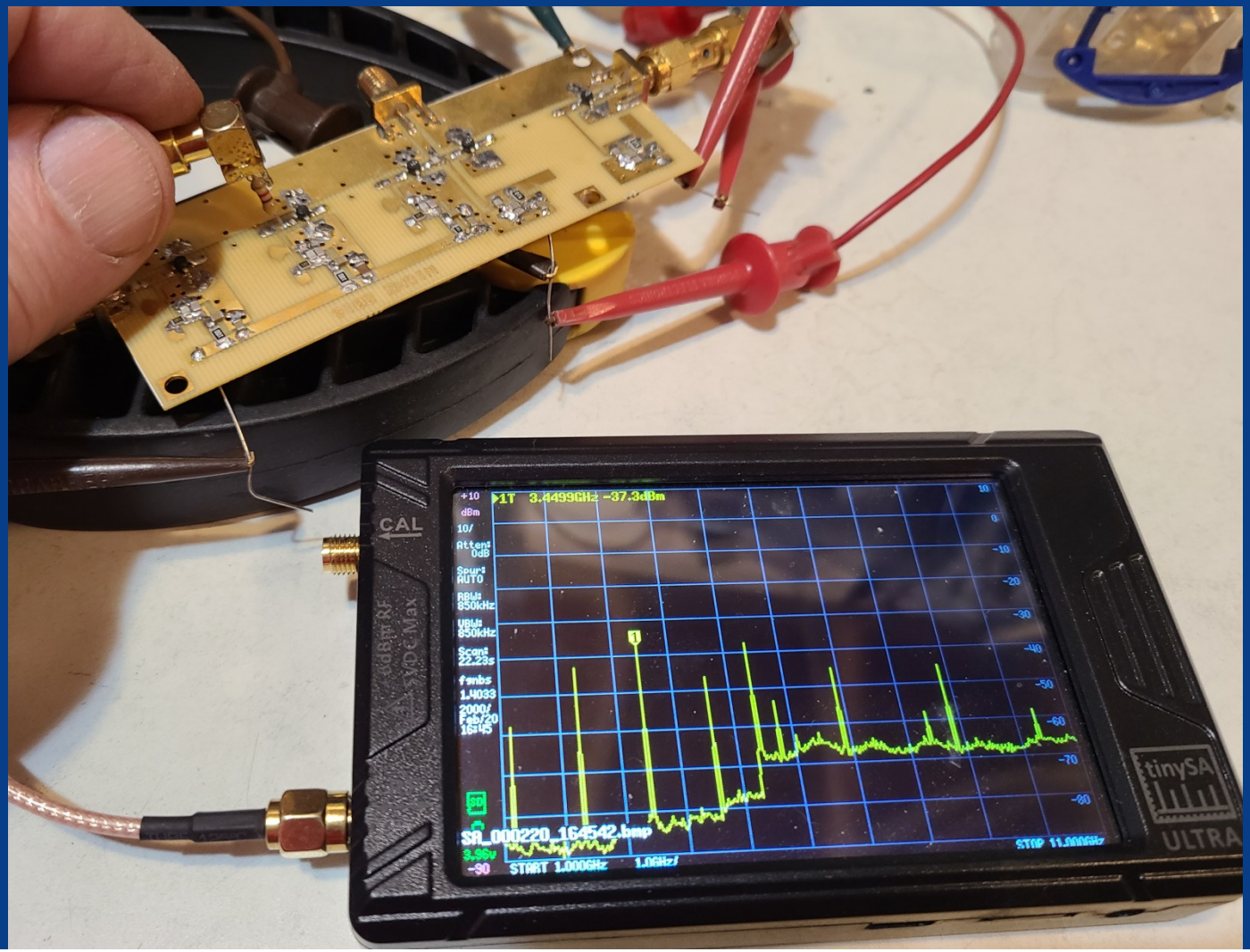
Menu -> MODE -> Signal Generator

10 GHz Personal Beacon

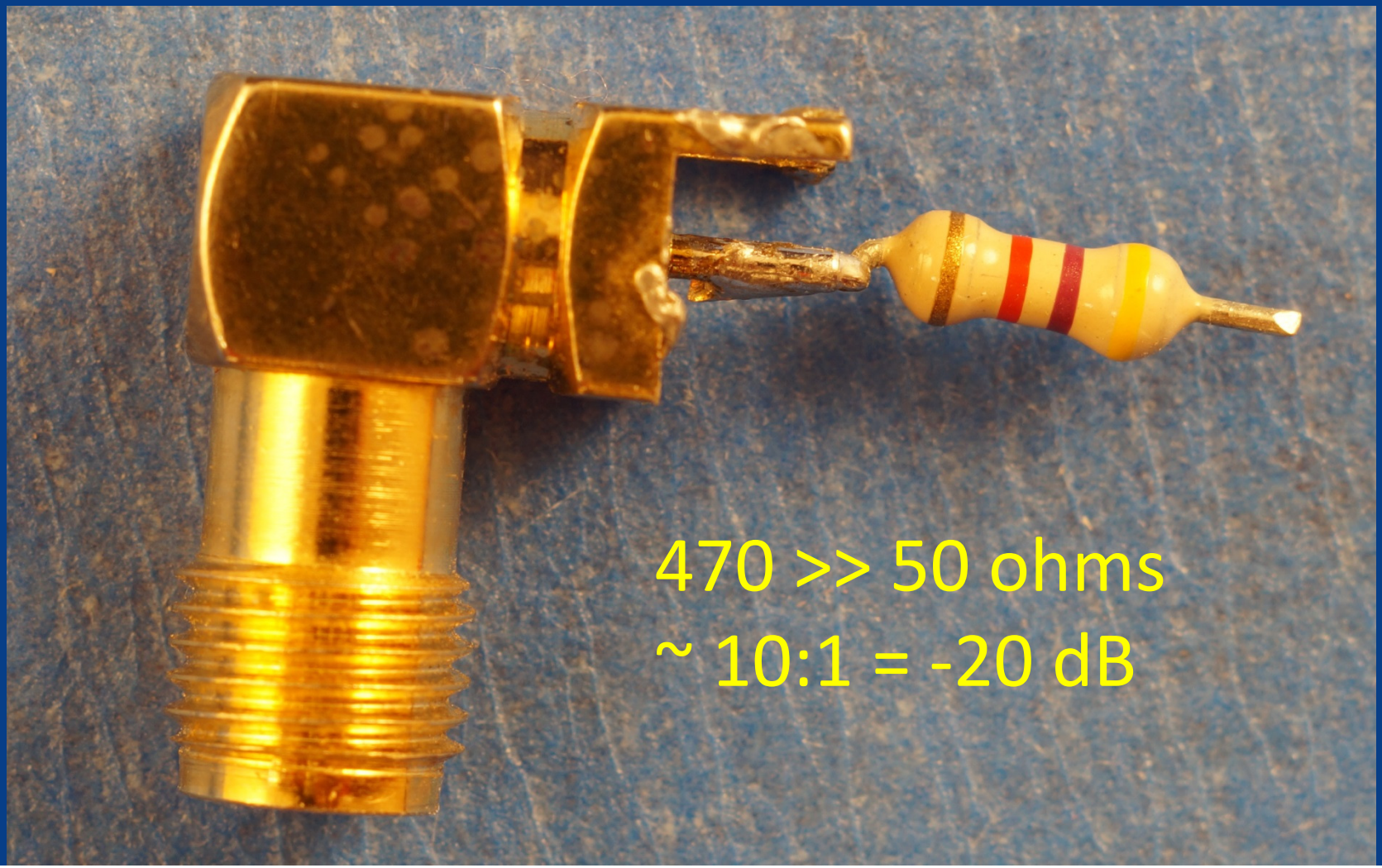


Low Output

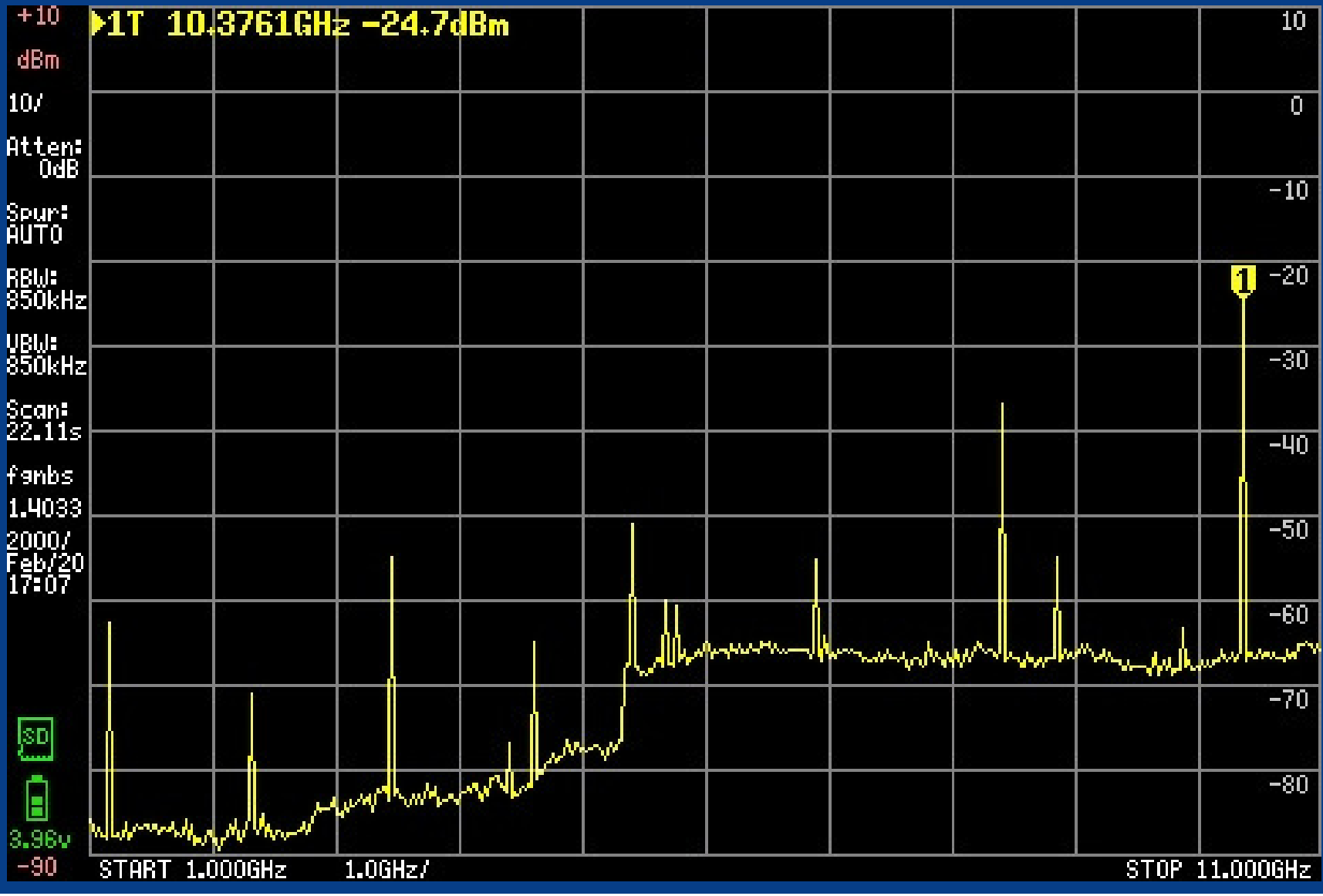
Troubleshooting with Probe before pipe-cap filter 8 GHz harmonic stronger than 10 GHz



High Impedance RF Probe
470 ohms on SMA connector



10 GHz Output after Retuning



Other Measurements

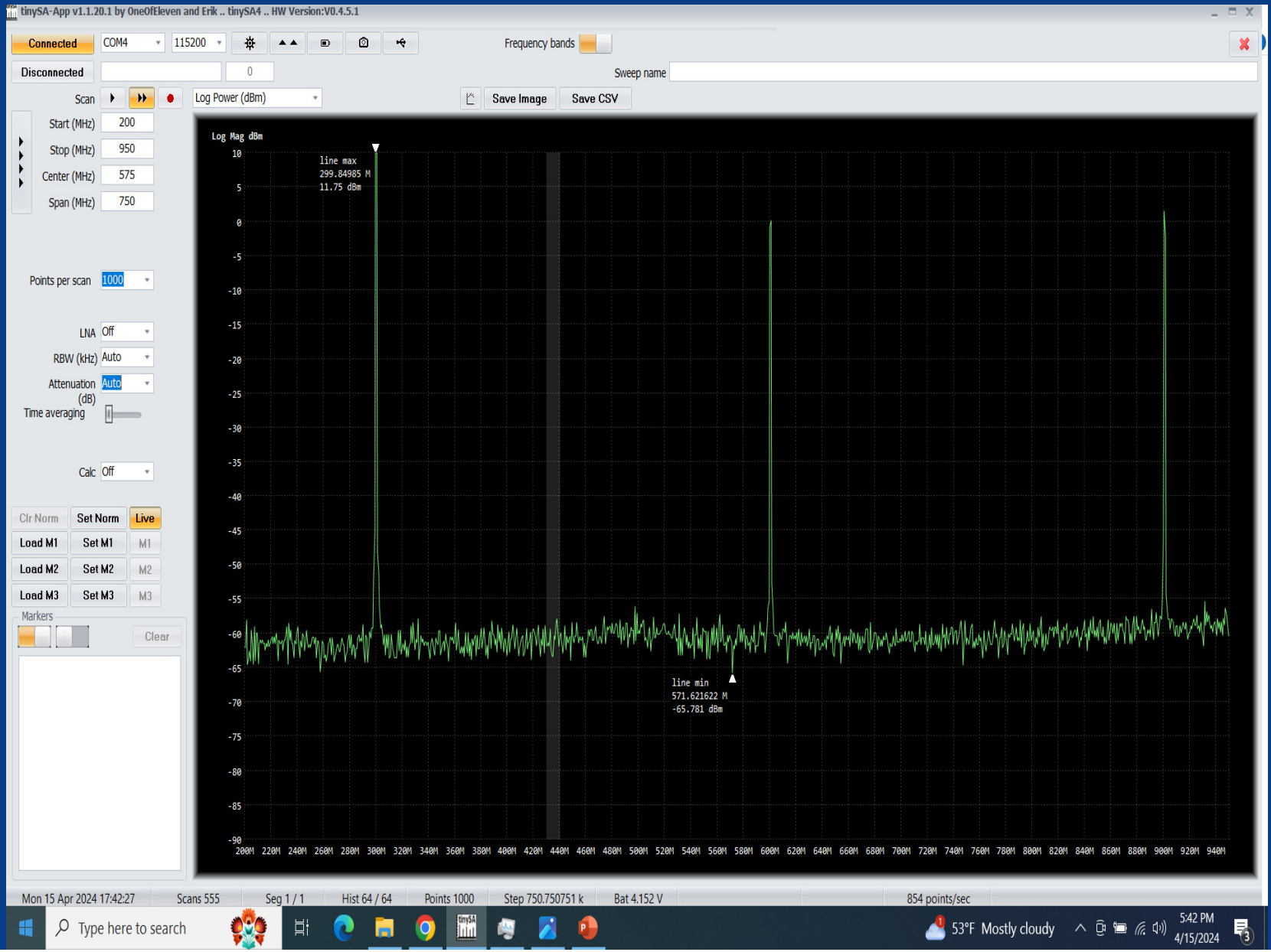
- SNR
- IP3
- AM modulation
- FM modulation
- Noise Figure (need calibrated Noise Source)

- *And more – see menus*

Maximum Signal = 10 dBm

- Approaching max signal level reduces linearity
- Worst case repair cost ~$160

TinySA-App for Windows



tinySA wrapup

- A really useful instrument
- Lots of cabability
- Fits in pocket, runs on battery

- This is real test equipment, not a toy

- Professional equipment costs 100x, weighs 100x

www.w1ghz.org