

TEST GEAR FOR HAMS

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This Talk

- is mostly about new equipment that is inexpensive
- Best bang for the buck
- Some older gear

Will you want to keep or get any favorites?

Is it what you used to use at work?

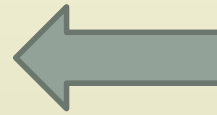
Is it something you always wanted?

Is it something you have always had?

All good reasons to save a fav.
It doesn't mean you can't get a
Newer one too.



Comparison HP 410C and Fluke 117



Keep for
RF measurements



Quicker, more
accurate, hand held
battery operated



Make a list of priorities

- What changes will make the most difference in how you work?
- Make a list and post it.
- This will keep you from impulse buying at the
 - Swap meet
 - Ebay

A LOOK AT MY LAB STANDARDS

Equipment Accuracy

Frequency to 8 parts in 10^{-13} th

- **Voltage** to .0002% @ 10 volts
- **Resistance** to 8 digits. .00002%
- **Low power** <1watt 1.0% 0-1GHz
- **High power** 10w to 200W DC to 2.5Ghz 1.5%

Primary Resistance Standard

Temperature controlled oven
Resistor bank from
1ohm-100K ohms
Julie Research Labs



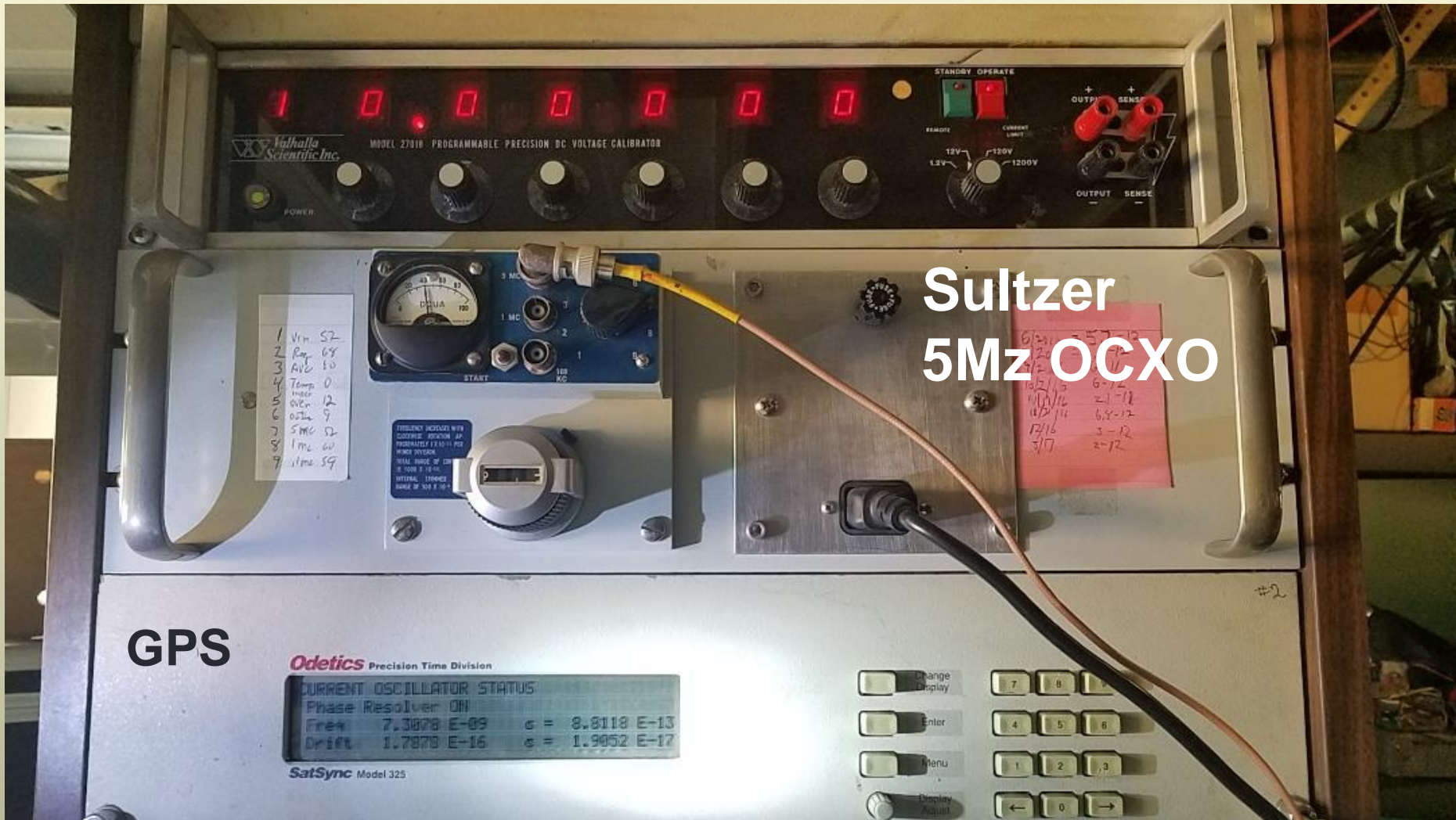
Resistance Comparator

9 digits-
Compares known and
unknown resistors with
a null voltmeter on a
bridge.

ESI 242D



Voltage and Freq. Standards



Calorimetric Wattmeter

1.5%

10-200w

0-2.5GHz



Calorimetric Low Power Meter

Thermopile
AC/DC transfer
Power meter 1%
1w max at 1GHz



Boonton Calibrator 50mhz 1%



Next

**With some focus and direction-
Let's go shopping**

MULTIMETERS

Fluke 115 and 77

Zeros fast, auto ranging and tough

True RMS
One handed
About **\$110**
new



\$50
used



AC/DC clamp on ammeter UT210E



Also a full
DMM

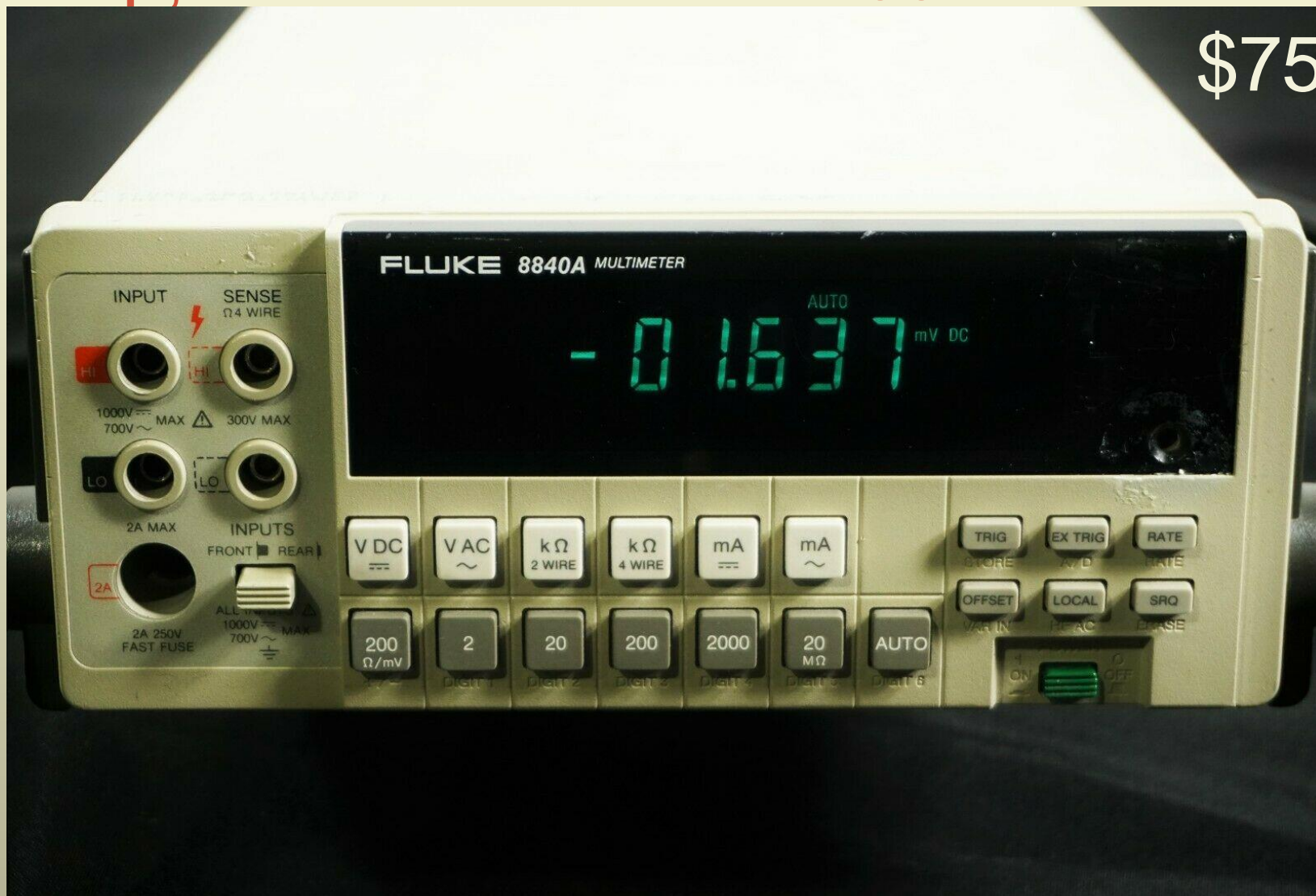
1ma DC

About
\$35

Fluke 8840A Excellent bench DMM

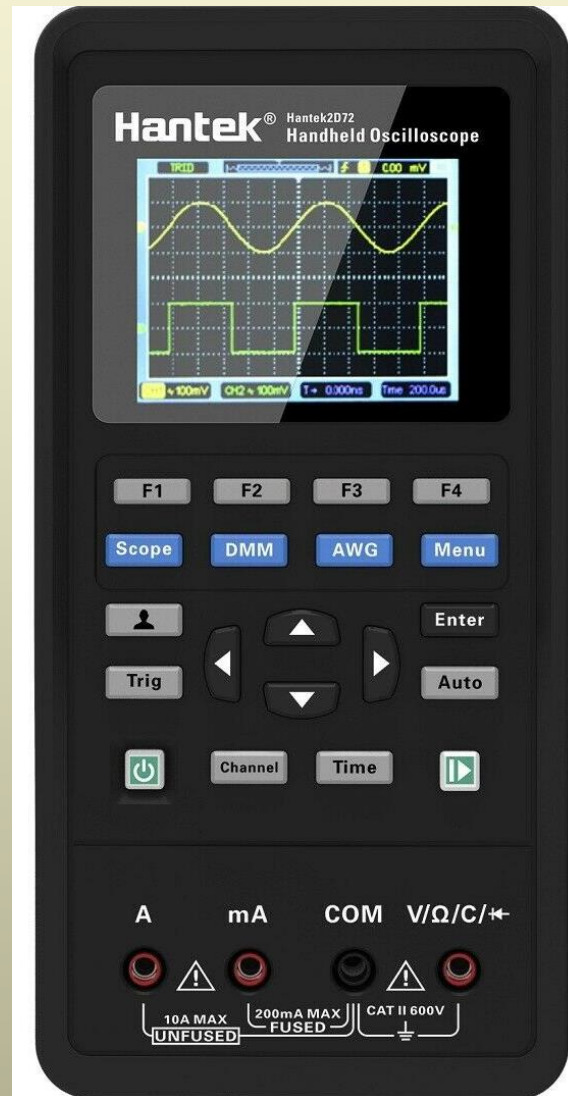
Cheap, stable and reads to .001ohm!

\$75



Hantek 2D71 scope and DMM.

Separate inputs
Excellent display
Small



About **\$100**

Power Meters

Bird 4410A

Seven ranges
per element

5% of reading!



\$300 with
elements

Heathkit IM-4190

VHF-UHF 300w meter
Battery
Excellent Accuracy
Very rugged.

\$50+



Other Meters

- HP 432, 435, and 436 are great meters.
- If you get one, get the whole package.
- HF meters are lead by the LP100A



\$400

Antenna Analyzers

MFJ 223 or KVE60C

- Has QRM meter
- +5DBm output
- 0-60MHz range
- USB charger
- Made to be dropped

\$300 MFJ

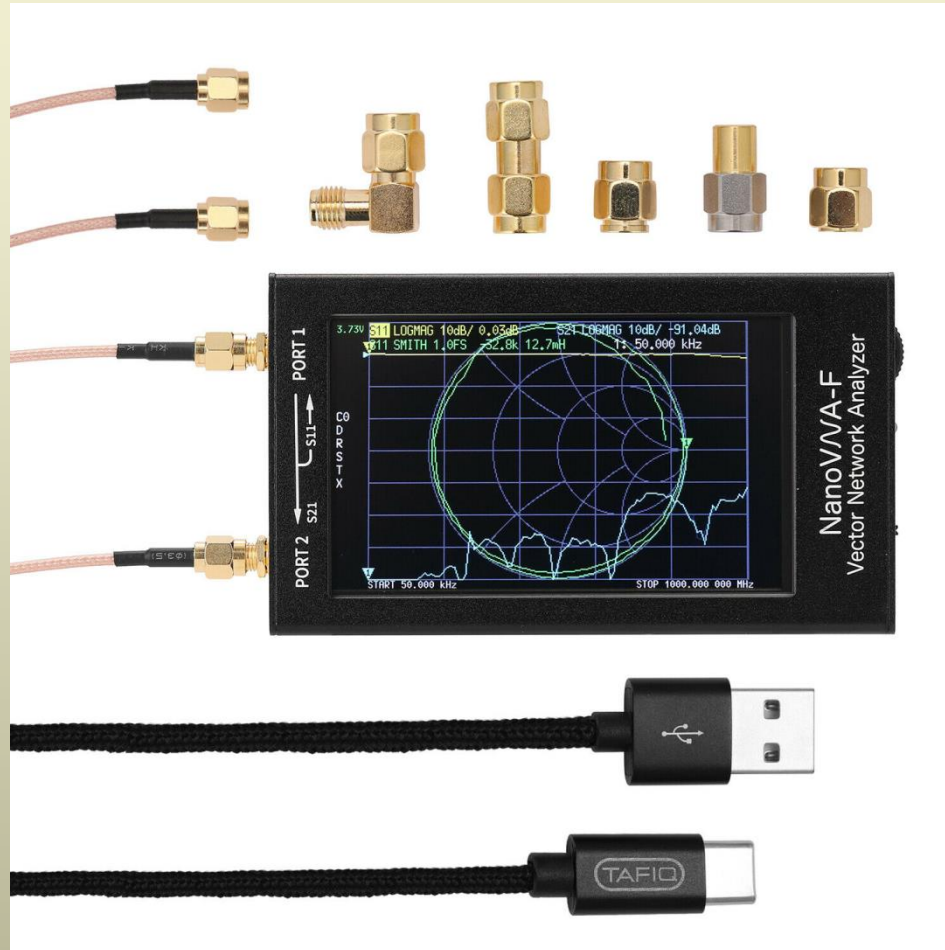
\$200 EBAY



Vector Network Analyzer NanoVNA-F

15KHz to
1,000MHz

Measures
SWR
Gain/loss
Antenna
Analyzer



\$120

Frequency Sources

GPS Oscillator

10MHz output
Data output

\$150



Elecraft XG3 Signal Generator

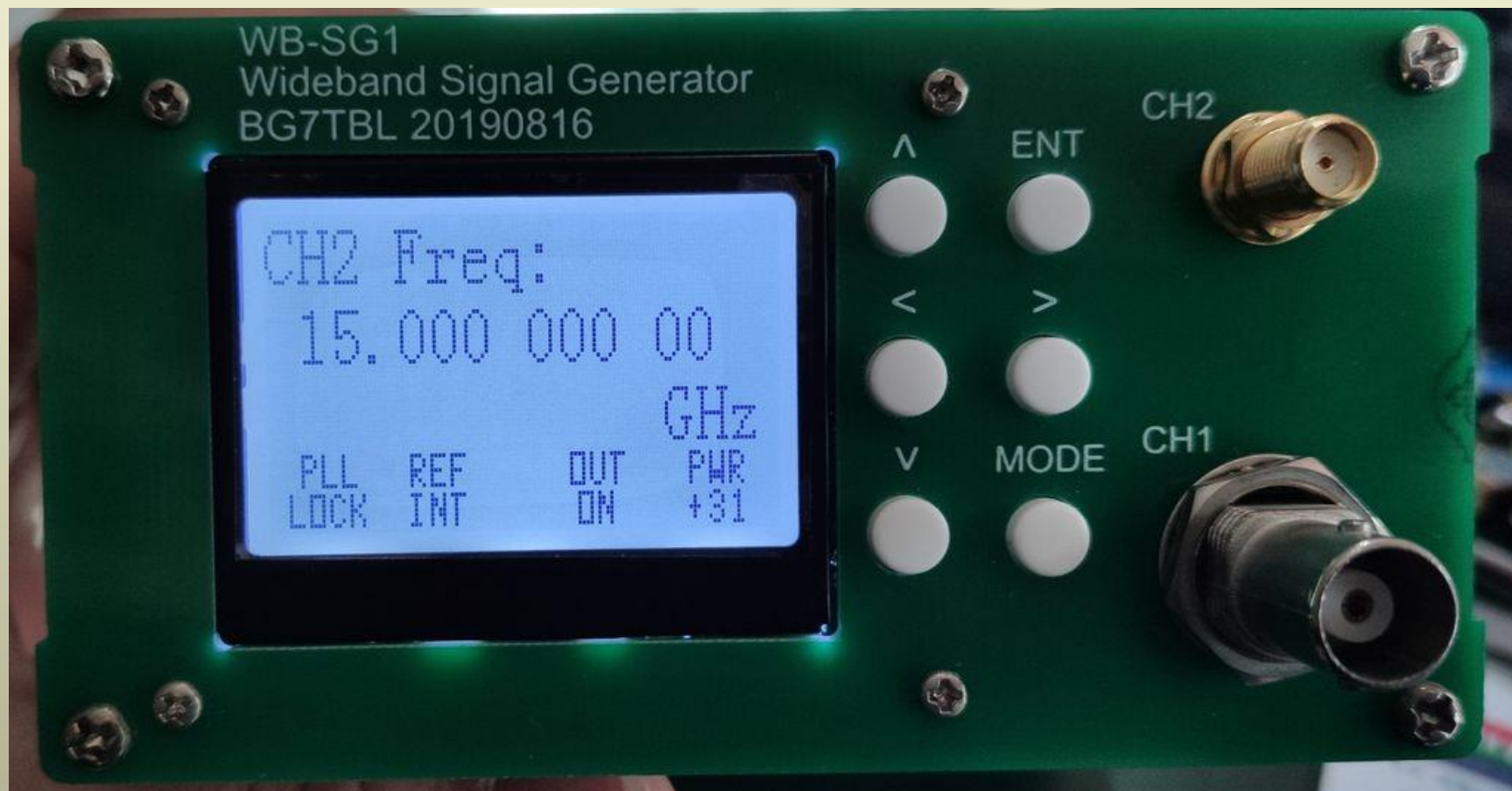
Accurate
versatile
Ham band oriented
Generator.



\$260

1Hz to 15GHz Signal Gen. \$300

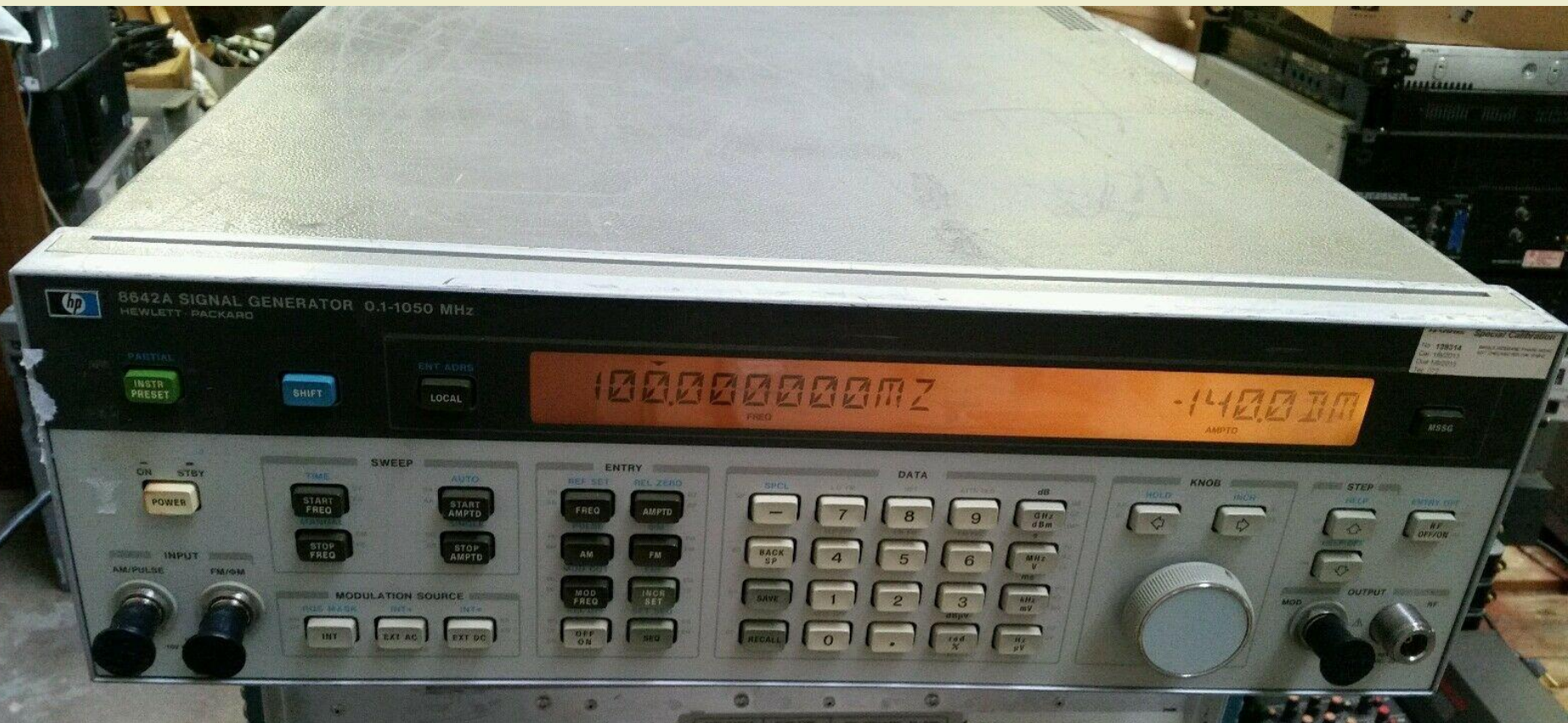
You will probably want to add a step attenuator \$100 extra



HP8642A/B

DC to 2GHz generator

\$500



Nothing newer beats it for frequency and attenuation.

Spectrum Analyzers

RF Explorer- WSUB1G PLUS

15Kc-960MHz

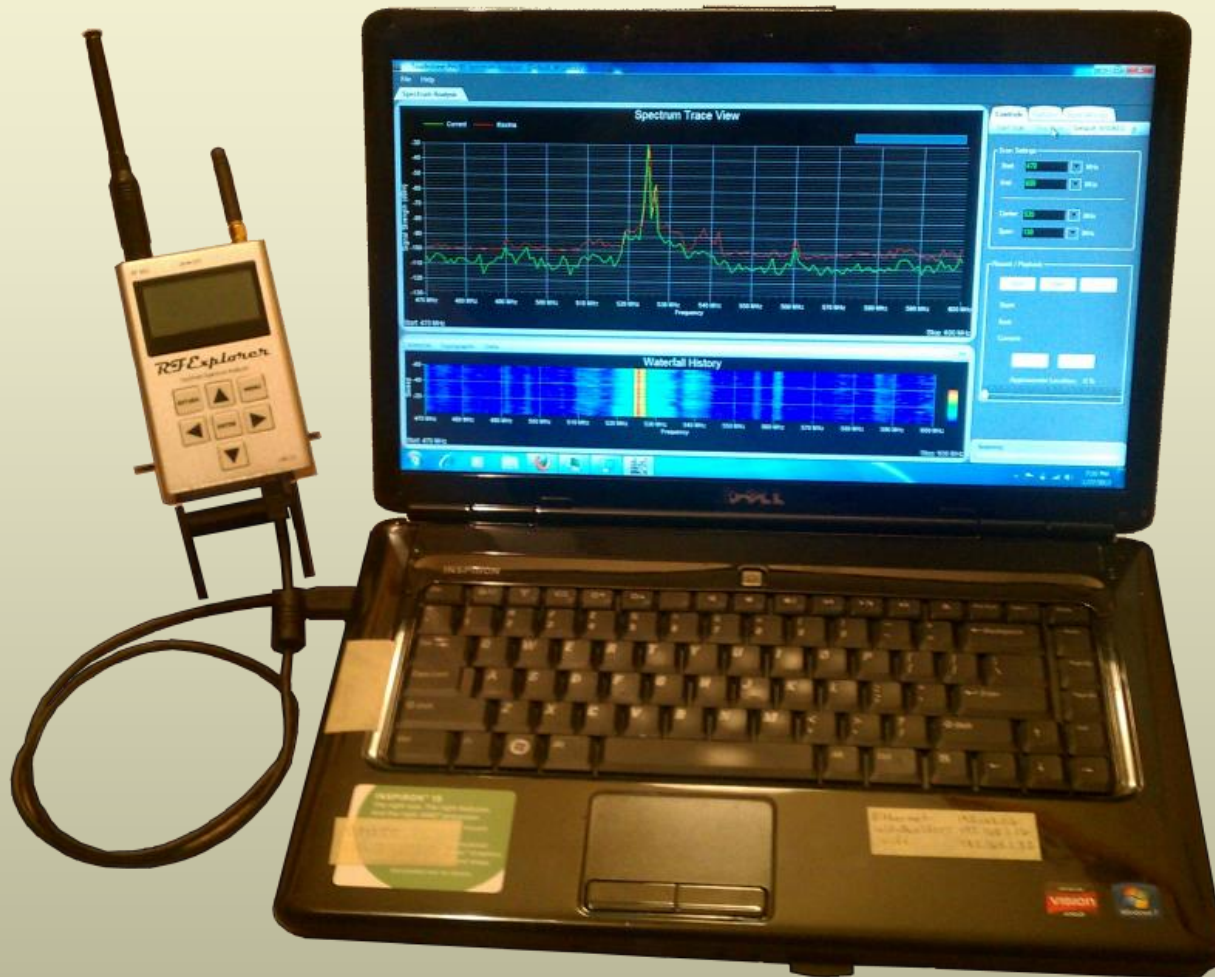
\$175

Min. Selectivity
2.5KHz

Has external
Program via USB



Software for the RF Explorer



RF Explorer 10GHz Spectrum Analyzer

Bias Tee

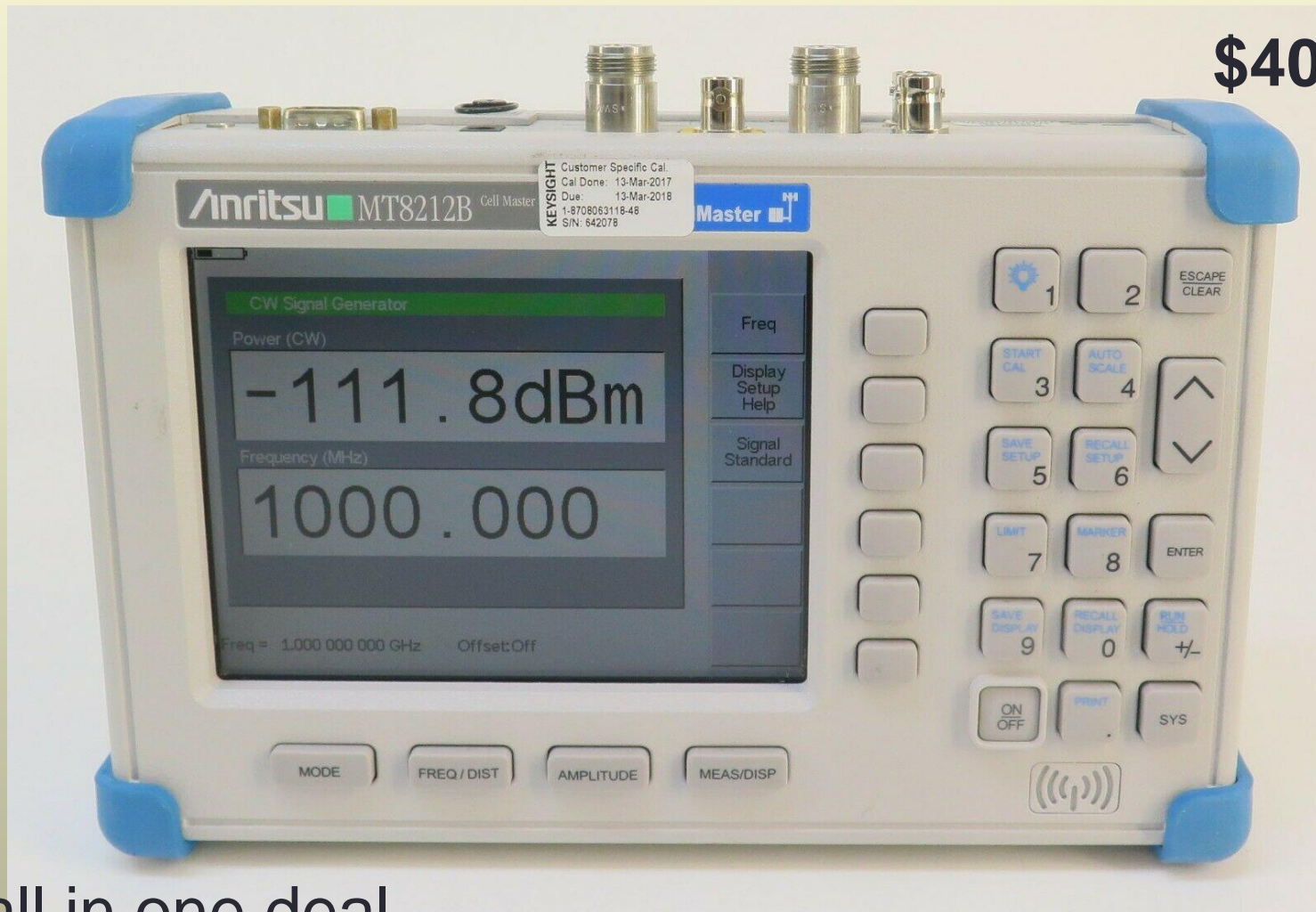
LNB is 1320
\$20



Anritsu MT8212B Cell Master

9kc- 3GHz

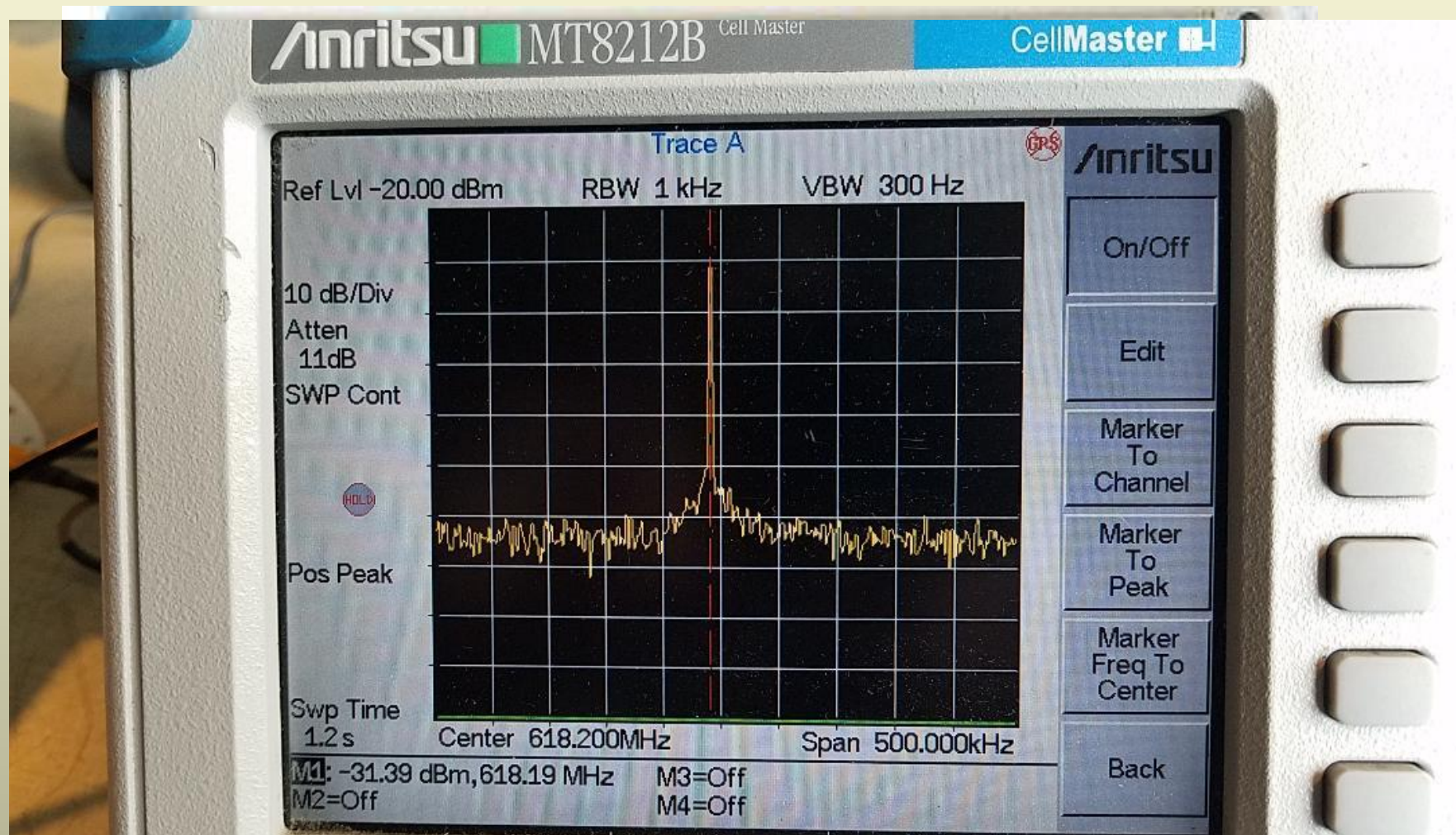
\$400-800



Best all in one deal-

MT8212B

View of the trace and data



Anritsu MS2712E

9Kc to 3GHz

Battery operated, hand held, USB, LAN,
GPS frequency correction, Huge screen

\$1500



\$1500

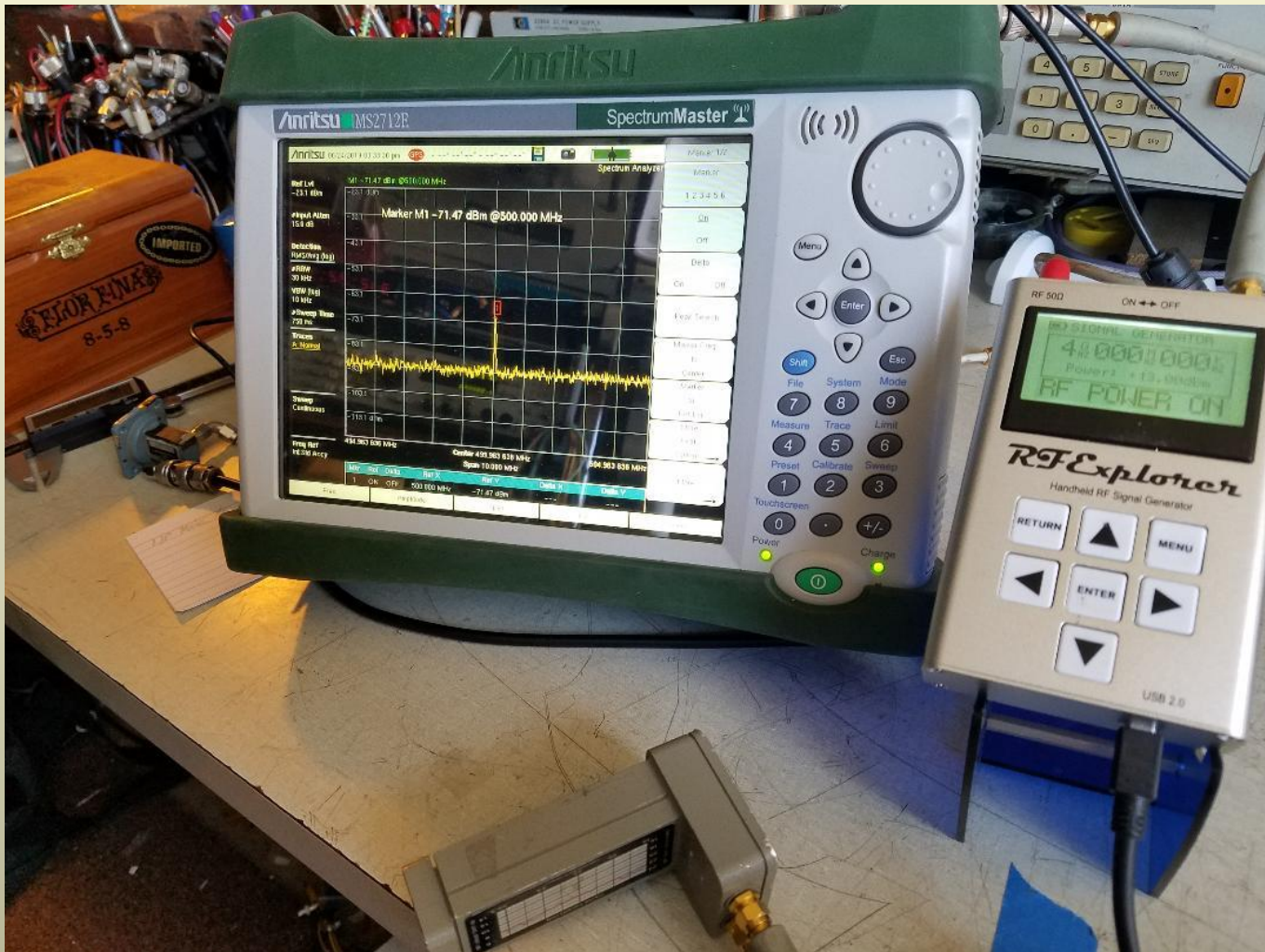
24GHz Spectrum Analyzer

Power
Meter

Freq.
Counter

May be all
You need

24GHz
HP mixer



Signal
Generator
At 4GHz
8mw

Oscilloscope

- You want one with auto set
- Analogue like display- 256 levels of intensity
- What you get should depend on
 - How much you are going to use it
 - What functions you need
 - How much money you have for one
 - Do you want modern or old?

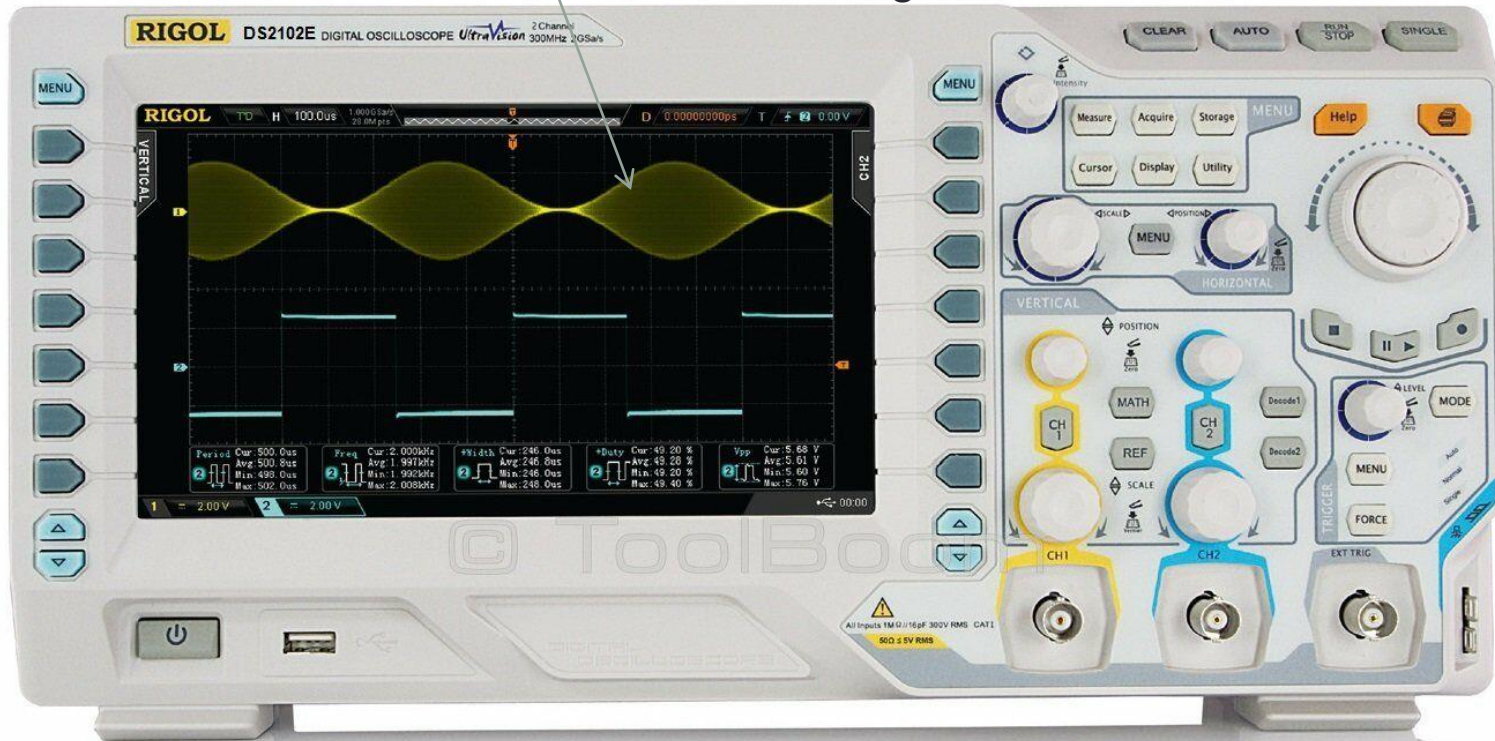
RIGOL DS2102

\$500

- The mark to hit-

256 levels of brightness

▼ Auto set key



DSO Scope \$90

• Kkmoon *Model 5012H*

2.4" LCD Display
100MHz Bandwidth
500MS/s Sampling Rate
(\$90 Amazon)



Cost-effective ▶

IPS Display

Long standby

Wave manager

One-click AUTO

One-click storage

NLS Scope MS215

Small
Battery operated
Accurate!

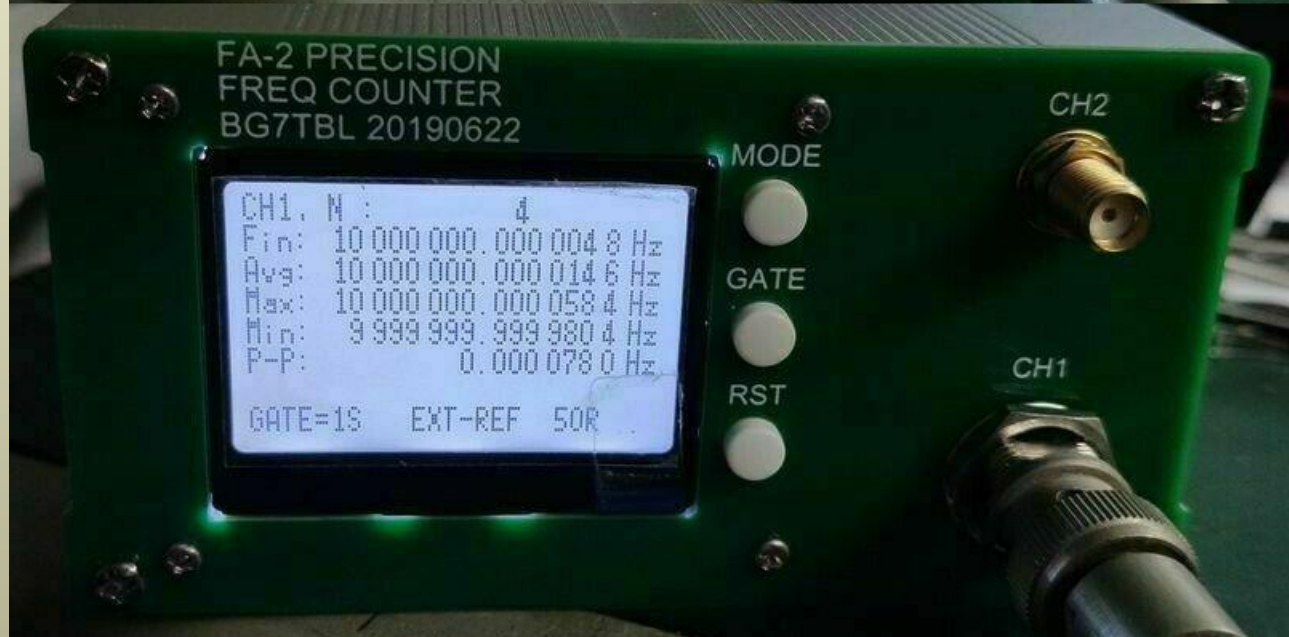


Counter

Frequency Counter

\$115

13 digits
0-6GHz



LCR Meter DE 5000

Make sure
you get the test leads
with the
Order.

Less than **\$80**



ESR Meter MESR 100

In circuit
capacitor checker

Less than **\$60**

Capacitor

Judge The Quality of Capacitor

Appliance Repair

Electronic Development

- ✓ 100KHz Sine Wave
- ✓ High Resolution
- ✓ Support In-Circuit Test

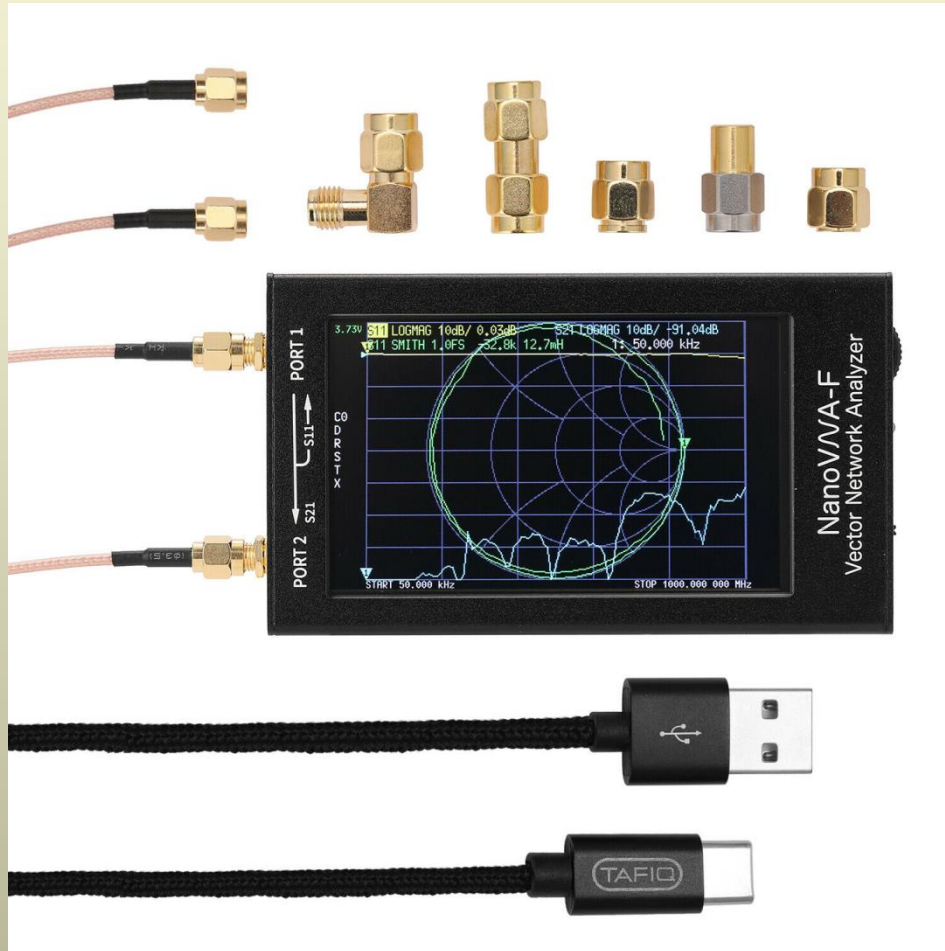


ESR=Equivalent Series Resistance

Vector Network Analyzer NanoVNA-F

15KHz to
1,000MHz

Measures
SWR
Gain/loss
Antenna
Analyzer



\$120

40MHz Filter SWR and Passband

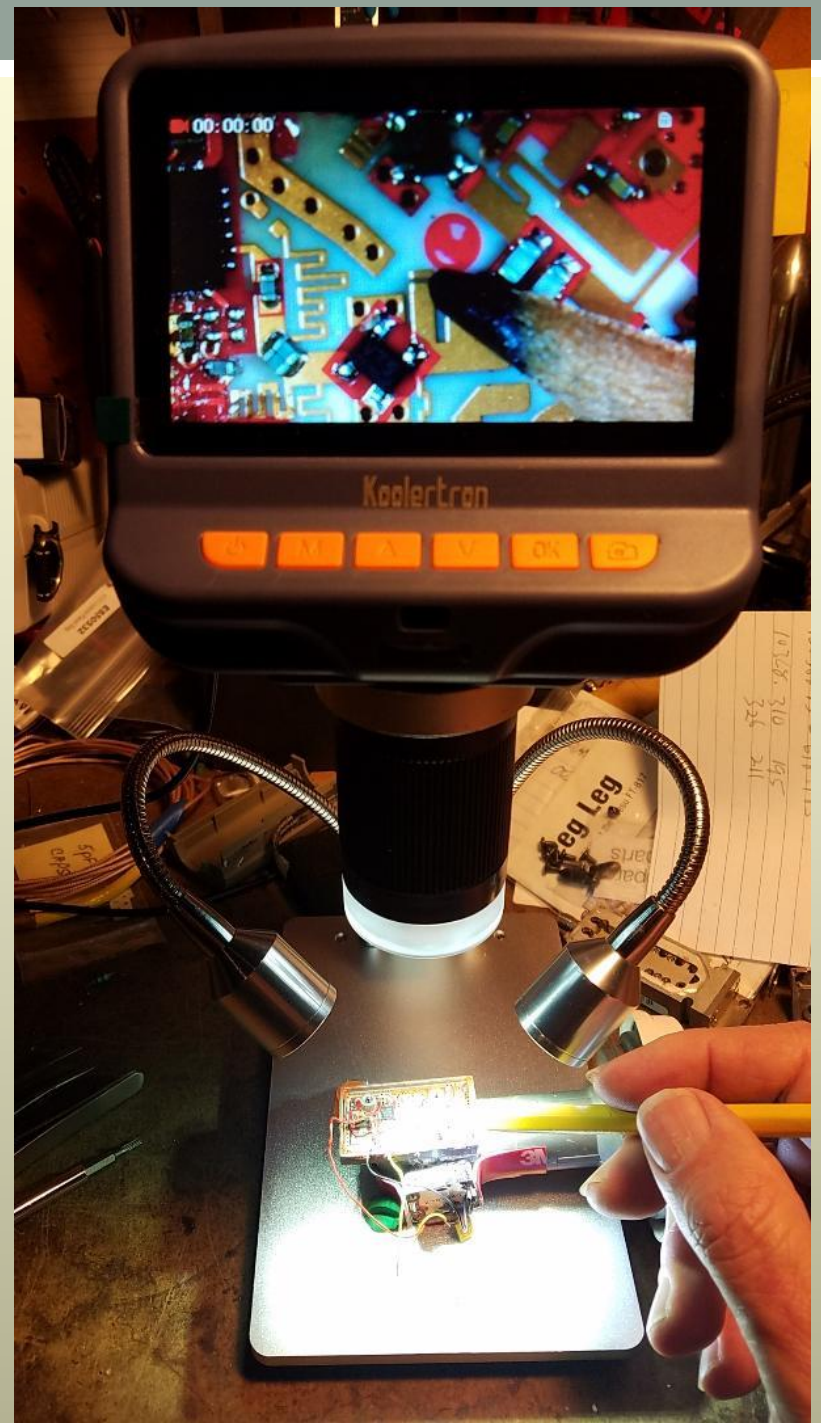


Koolertron 4.5"

\$60

Save your eyes,
do better work
USB powered

These work too.
Headband style.



Totals for a Complete Lab

- DMM \$50
- Elecraft Sig Gen. \$200
- Counter \$120
- RF Explorer Spect. An. \$165
- Nano VNA \$120
- Scope \$80
- LCR Meter- -\$80

- **TOTAL about \$800**
- **Replace with HP and other gear \$3,500.**

Feel free to contact me if you
need more information.
Questions?

Thanks Very Much, Doug K6JEY
drzarkof56@yahoo.com

That's it. Any questions?

Miscellaneous

Most Fundamental Gear

- **DVM**
 - Auto Range and quick zero
- **Signal Generator**
 - Frequency and Power
- **GPS 10AMHz Source**
 - Distribution amp
- **Spectrum Analyzer**
 - Use as good a low frequency one as you can get.
 - Probably costs the most.

Decisions- Choose what you like

- A spectrum analyzer and other test gear can be very expensive or very old, or both or big and heavy. Of course you may luck into something wonderful and cheap. Great, I hope you do. I have fond memories of my years with an HP 8551, SA 84W, various Systron Donner products, several AIL's, Tek 494AP, Anritsu and others. One could get one of those because of nostalgia or limited funds, or spend a bundle for a nice nearly new one, and I can't really say much against any of those choices (except for the SA84W). Choose what you like.

XT127 10MHz-2.7MHz

\$320

88.7MHz
FM Station



What will you need?

- What gear is worn, too limited, or half working.
- If what you have quits can you fix it?
- What newer gear would make your work
 - Smoother and quicker
 - More accurate
-

Evaluating Current Gear

- Which gear do you use the most?
 - Think about what work you do the most.
 - Which pieces of gear get used the most?
 - What condition are they in?
 - What limitations do they have?
 - What factors make you keep them?

LCR Meter

\$130



LCR high precision tester

Resistance (R) : 20MΩ

Inductance (L) : 2000H

Capacitance (C) : 20mF

