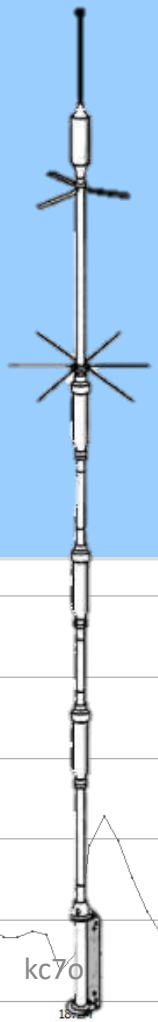
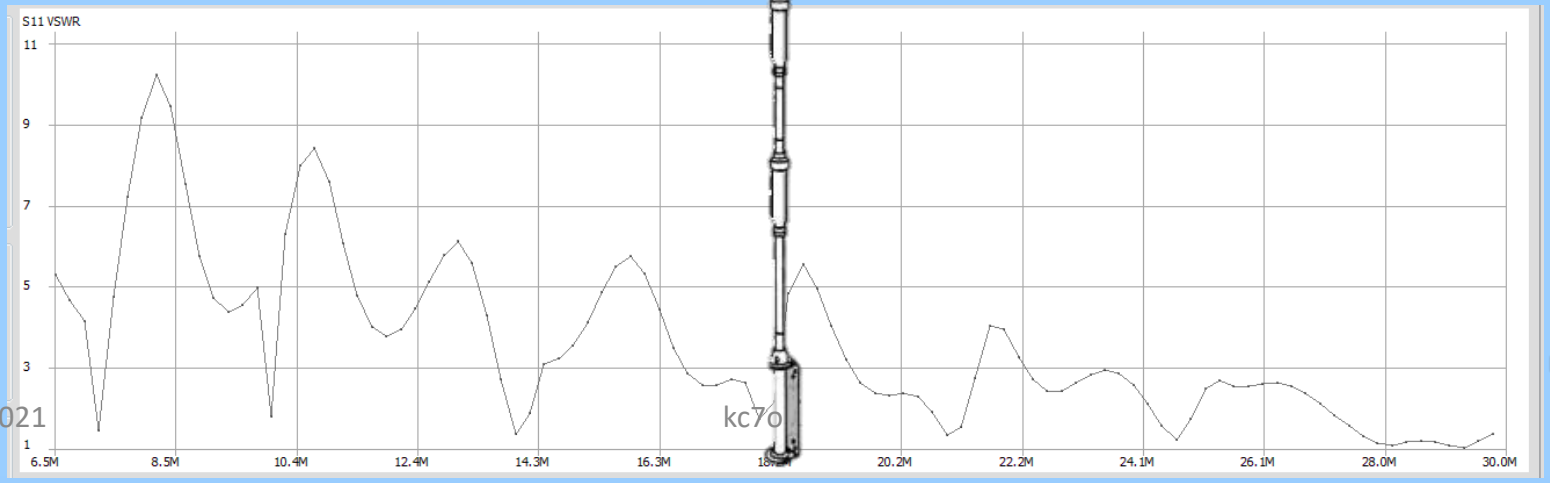
Pizza Pan Antenna Test Fixture, SWR Bridges & NanoVNA

Allen Wolff – kc7o

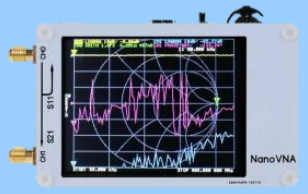
kc7o@arrl.net





Topics

- ***Equipment & usability***
  - ***Traditional SWR bridge & use***
  - ***Antenna analyzer***
  - ***Network analyzer***
- ***VHF/UHF antenna checks***
  - ***Pizza Pan***
    - ***Flexible***
    - ***Fast***
- ***NanoVNA***
  - ***Vector Network Analyzer***
  - ***Overview***
  - ***Calibration***
  - ***Examples of use***



SWR Bridges

Popular Model P-2 SWR/Power Meter Kit

- Reads Standing Wave Ratio and Relative Power
- Covers 1.8 to 432 Mc—Ham Bands, CB
- Handles A Full Thousand Watts of RF Power
- Negligible Loss—Leave It in Line Permanently
- Flexible 2-Unit Design—Coupler and Indicator
- Also Works Well With Low-Powered Transmitters

Outstanding Features

Flexible 2 Unit Design
Full Kilowatt Capacity
Requires No Power/Batteries
Reads SWR from 1:1 to 20:1
Can be Left In Line as Constant Monitor
Accuracy Better than 10%
Has Coax Connectors
For Unbalanced 50-72 Ohm Lines—Amateur and CB
Range from 1.8 to 432 Mc
Negligible Insertion Loss
Has Sensitivity Adjustment

Be sure you're getting the most from your transmitter and antenna system. The easy-to-build Model P-2 SWR/Power meter provides a constant check of your rig's efficiency. Measures relative power fed to the antenna and standing waves reflected back from it. Lets you make your own matching adjustments between line and driven element for maximum antenna efficiency. Covers 1.8 to 432 mc—Amateur bands, Citizens Band, other communications services. Has a full kilowatt power capacity, works well with low-powered transmitters, too. May be permanently left in the transmission line with negligible power loss. Uses popular SO-239 coax connectors. Flexible 2-unit construction—coupler and indicator units connected by a 4-foot shielded cable. Requires no AC power or batteries. Styled in gray satin—matches the Knight-Kit T-60 and T-150A transmitters. With all parts, instructions. Shpg. wt., 3 lbs.

83 Y 627-D. In Kit Form..... 15.95
83 Y 546-D. As Above, but factory assembled..... 22.95

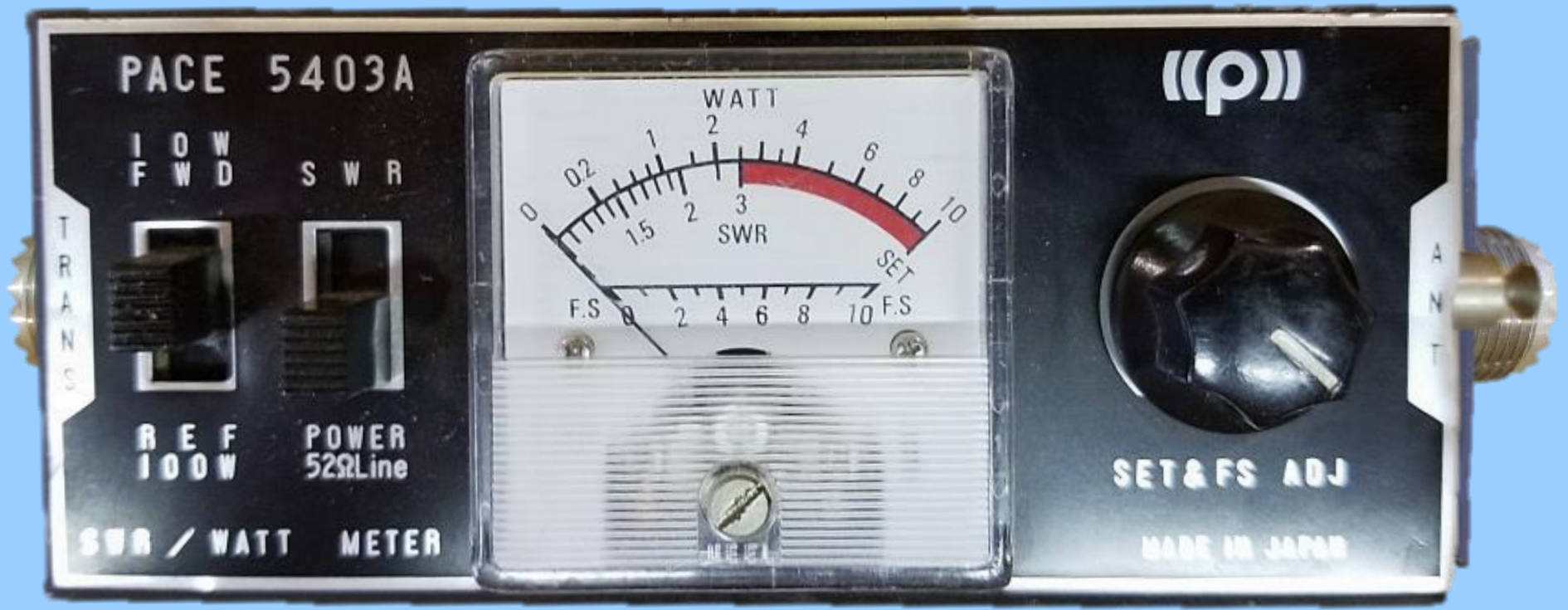
SPECIFICATIONS

Frequency Range: 1.8 to 432 mc (includes Amateur bands.)
Minimum RF Power: 45 watts at 1.8 mc, ½-watt at 432 mc for full-scale meter deflection.
Maximum RF Power: 1 kilowatt.
Input/Output Impedance: 52 or 72 ohms.
Accuracy: better than 10%.
Meter Sensitivity: 100 μa. full scale.
Meter Scales: Relative Power, 0-10; SWR, 1:1 to 20:1.
Sizes: coupler, 2x5x2½"; indicator; 2⅞x 6¼x3"; 4-ft. connecting cable.
Connectors: two SO-239 coaxial.

Simplicity

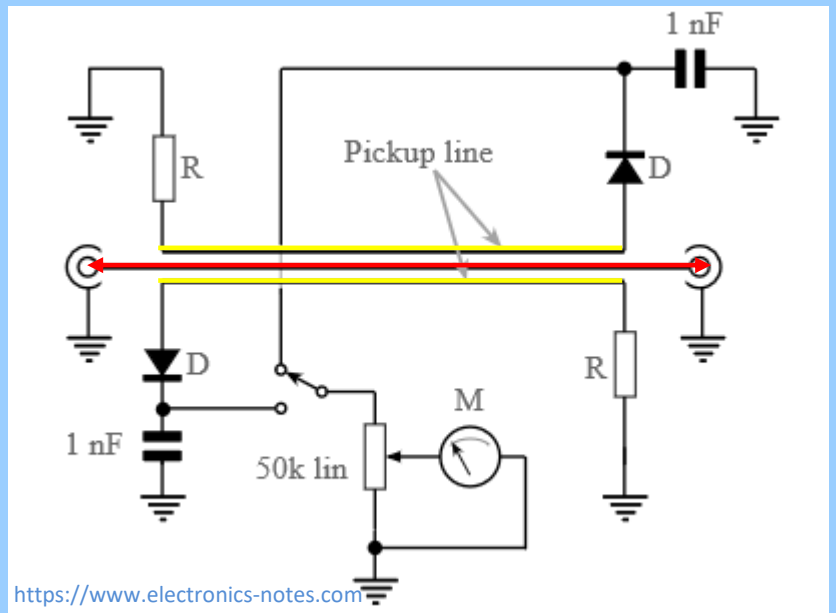
SWR - Standing Wave Ratio

Or VSWR - Voltage Standing Wave Ratio

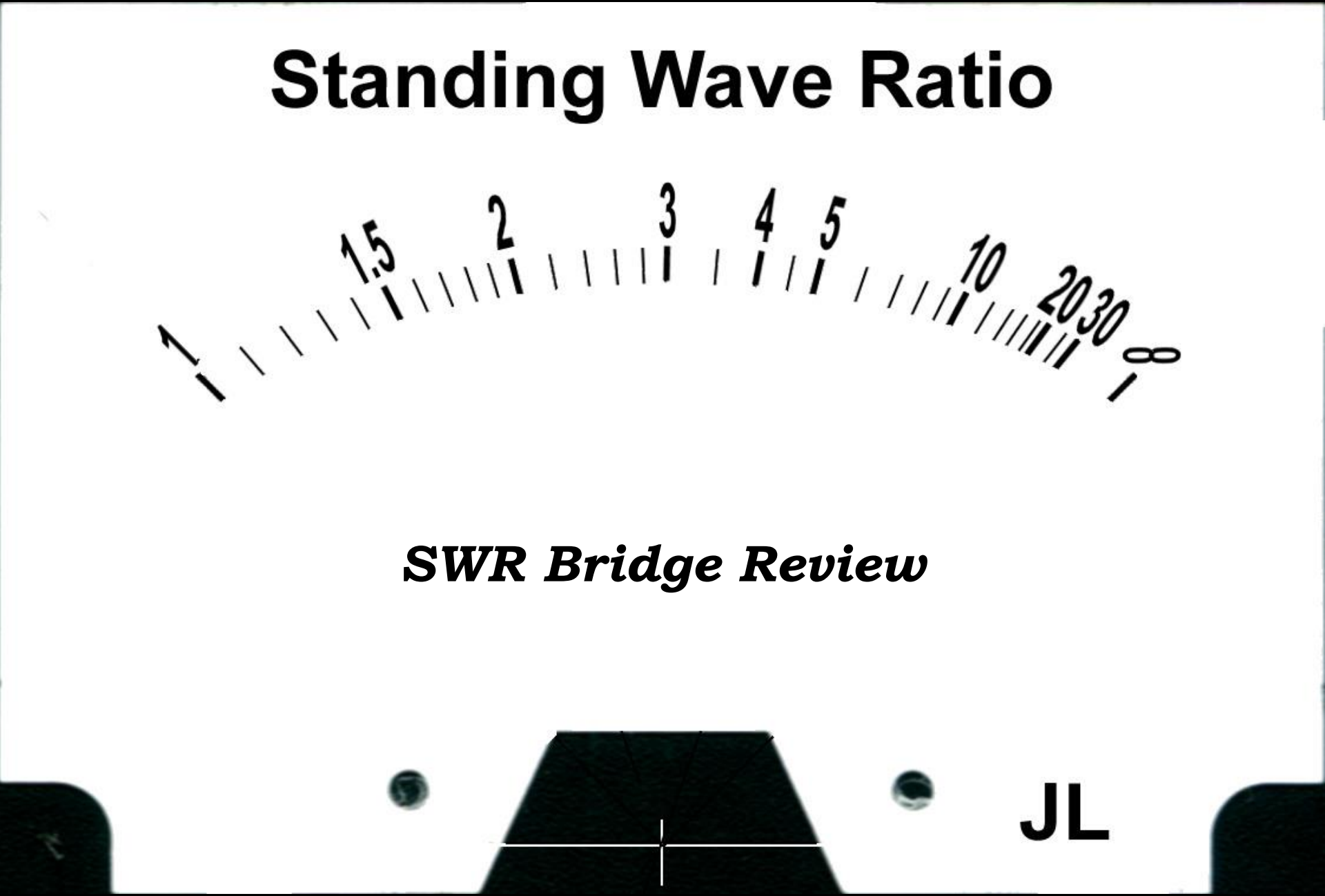


HF through 30+ MHz (CB)

M = 100 µA



https://www.electronics-notes.com

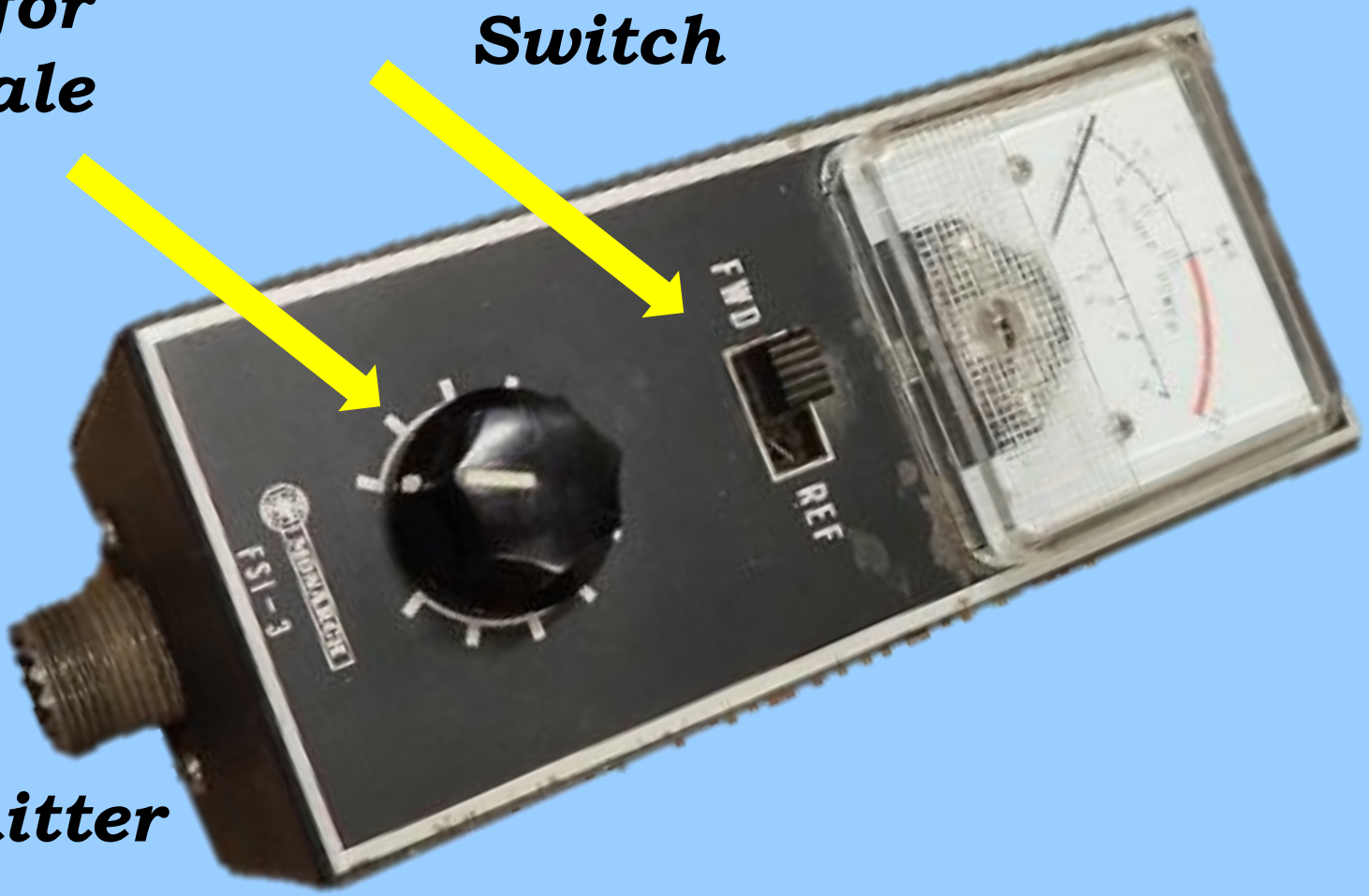


SWR Bridge Review

Forward Reverse Switch

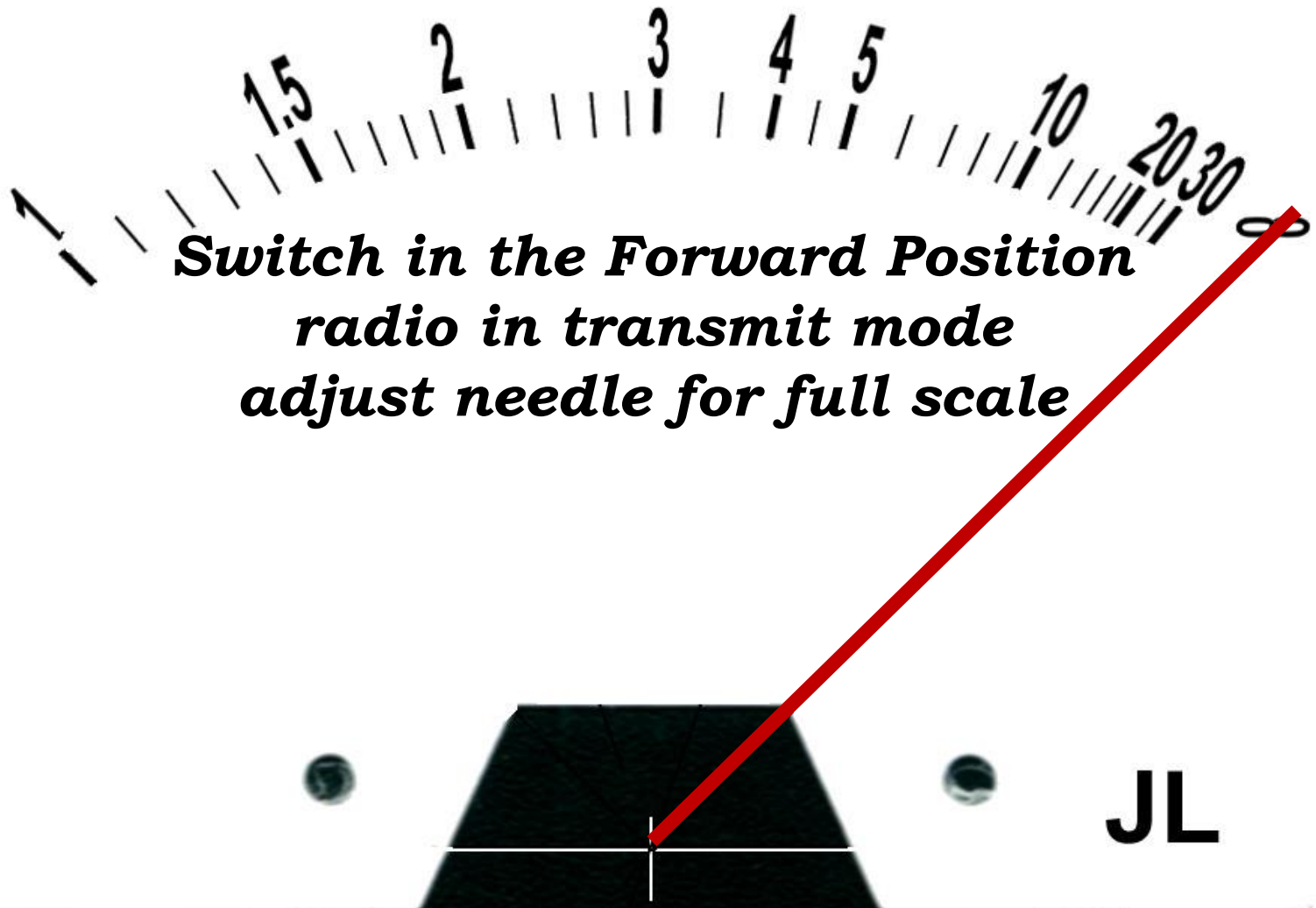
Antenna

Adjust for Full Scale



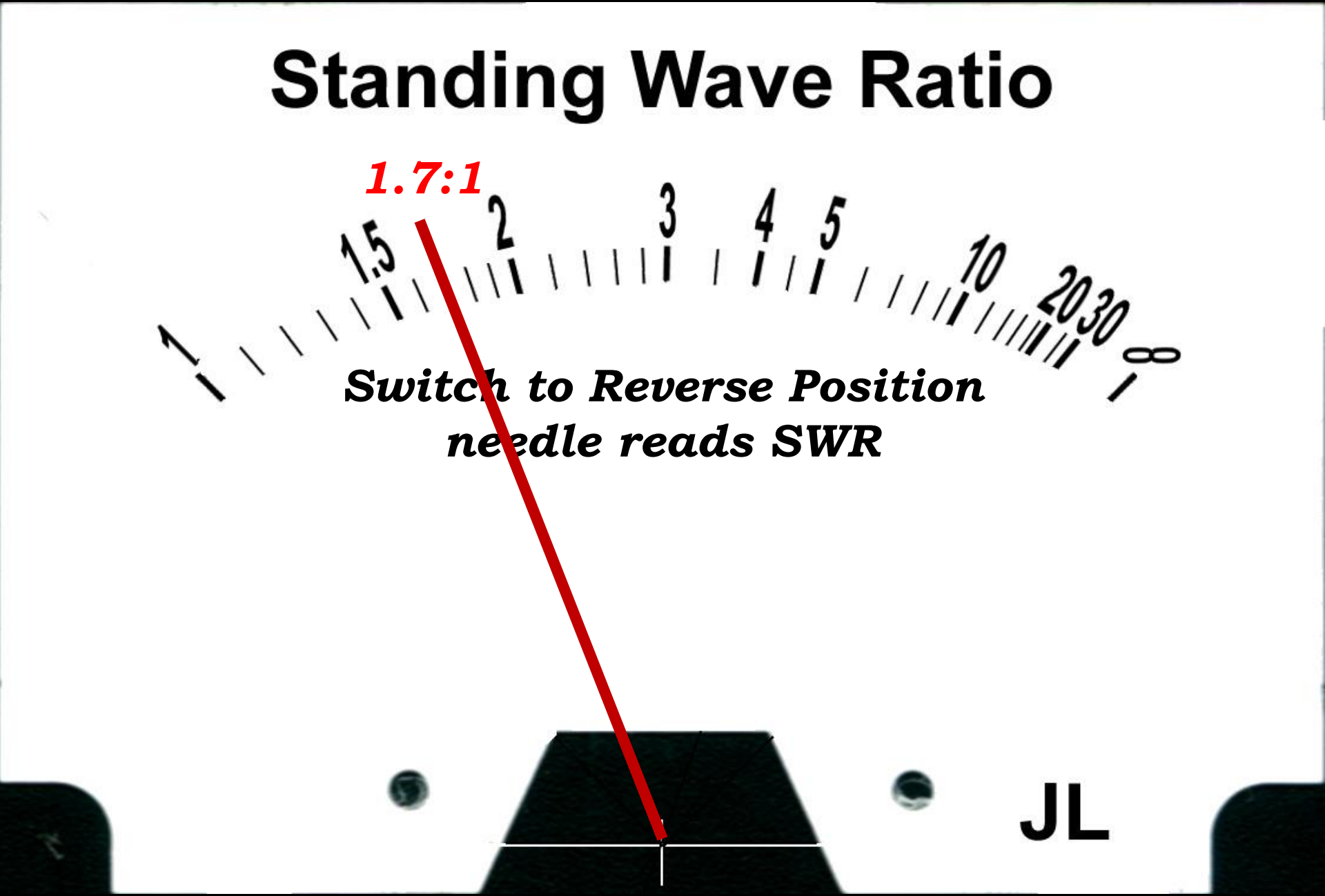
Transmitter

Standing Wave Ratio



Switch in the Forward Position
radio in transmit mode
adjust needle for full scale

Standing Wave Ratio



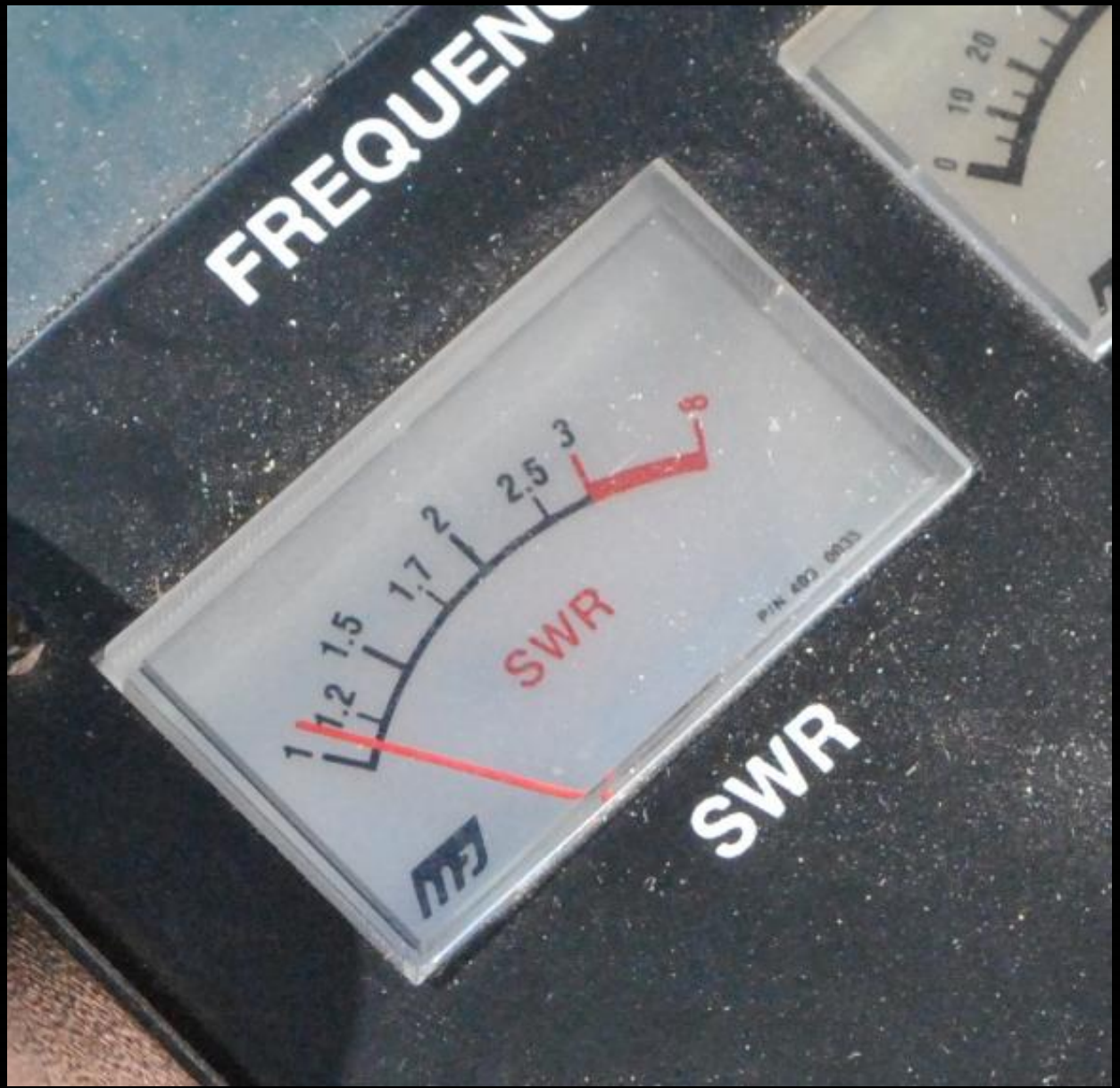
Antenna Analyzer Easily finds the frequency of Minimum SWR

10 Meters – 1.1:1

N1BN Photo

Test of PRC's TH-3 after rebuild

10 Meters – 1.1:1



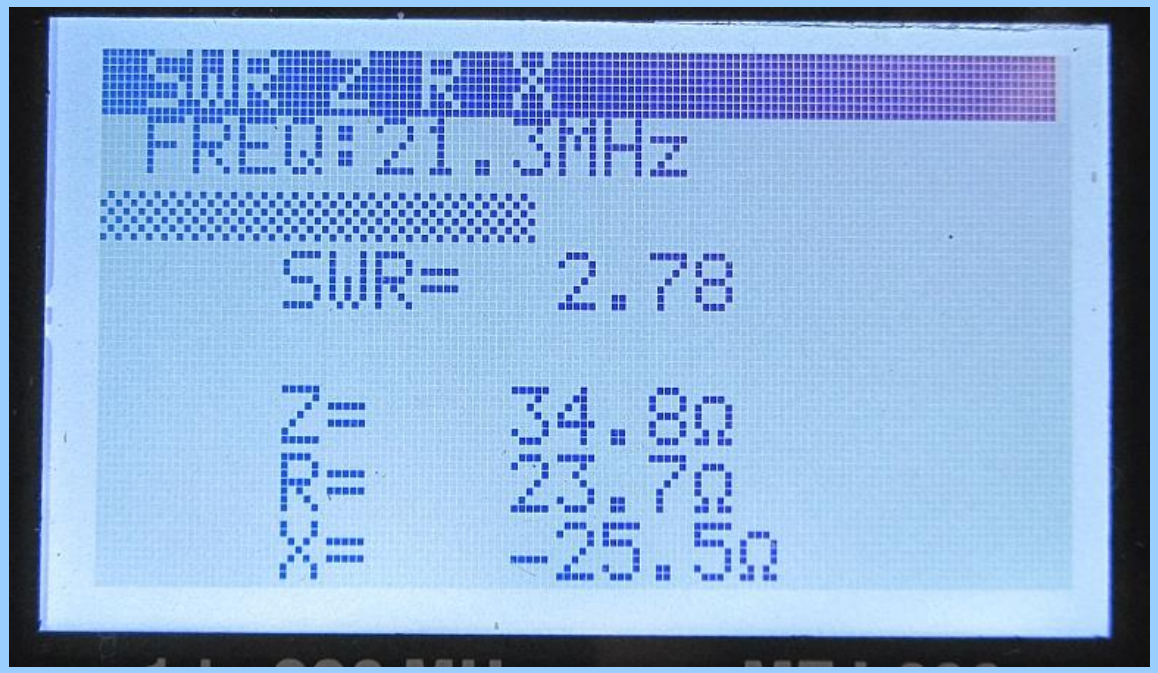
N1BN Photo

15 Meters – 1.6:1

N1BN Photo


20 Meters – 1.6:1
MFJ HF/VHF SWR ANALYZER
1.8-170 MHz
MODEL MFJ-259
FREQUENCY COUNTER
RESISTANCE
SWR
TUNE
FREQUENCY MHz
10-26.2
4-10
26.2-62.5
62.5-113
-170
N1BN Photo

MFJ-226 Network Analyzer
Can sweep a range of frequencies from 1 to 230 MHz



The AntPan


16” steel pizza pan
Walmart <$4
Decorative items not included
MAINSTAYS™
Pizza Pan
Bandeja para Pizza
Made in the USA
Factory Certified
Steel construction
Fabricado en acero
Even heating
16 in dia (40.6 cm)
Bring a magnet


Ferrite – isolates coax from the antenna
NMO mag mount
BNC to reverse SMA
PL-259 to SMA
PL-259 to BNC
SO-239 to NMO


Setup for testing
a PL-259 antenna

NMO
PL-259
BNC
SMA
Rev SMA

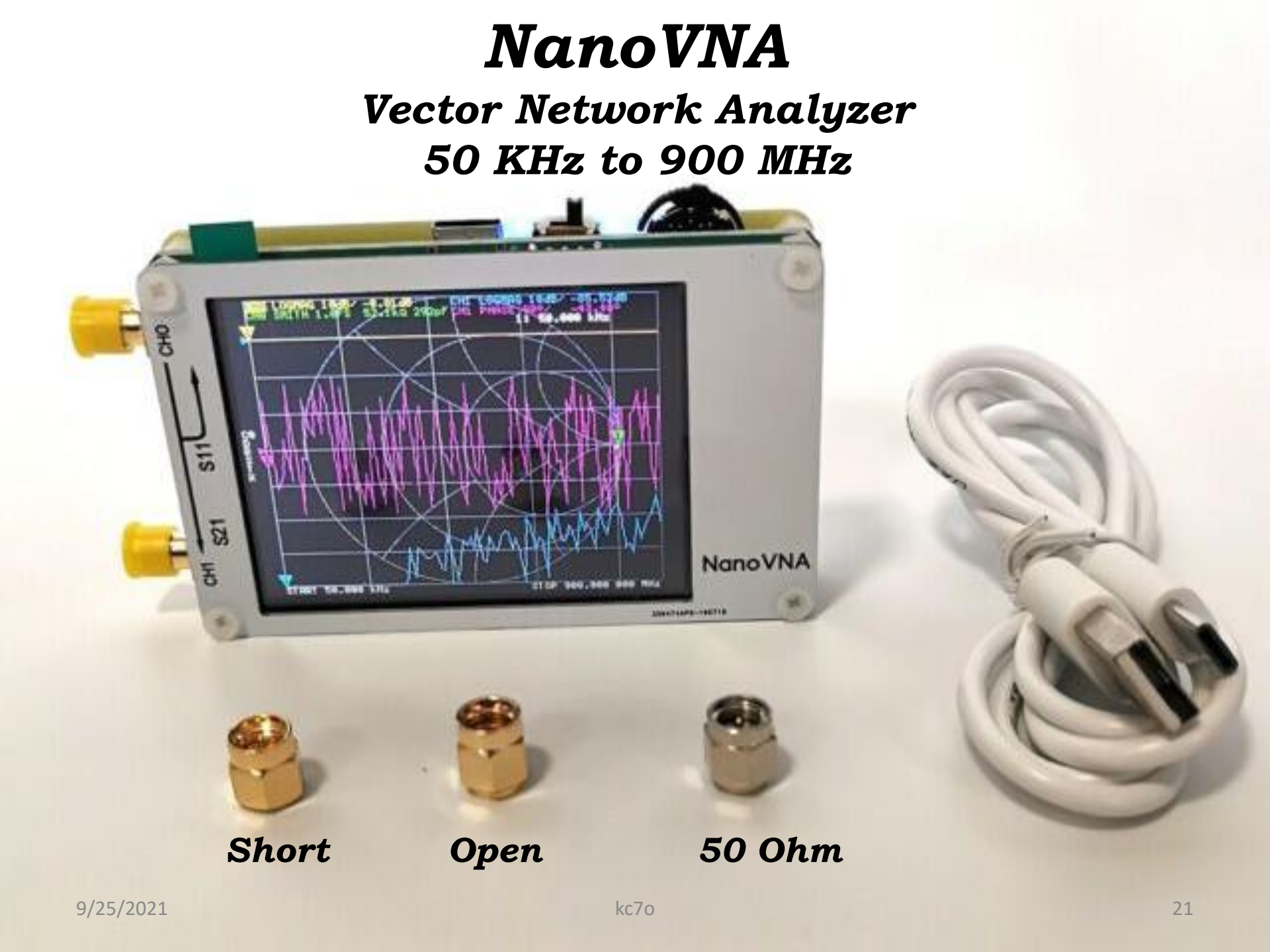
Using a PL-259 "Tee" makes a connector holder and handy handle

Wrapped up for storage or transport

NanoVNA

Vector Network Analyzer

50 KHz to 900 MHz



Short ***Open*** ***50 Ohm***

amazon

All | nano vna antenna analyzer

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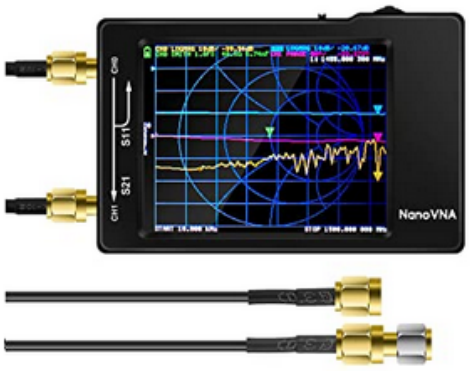
Industrial & Scientific | Lab | Test & Measurement | Safety | Janitorial & Facilities | Food Service | Education | Material Handling | Materials | Metalworking | Electrical

‹ Back to results



Roll over image to zoom in

【Upgraded】AURSINC Vector Network Analyzer 10KHz -1.5GHz HF VHF UHF Antenna Analyzer Measuring S Parameters, Voltage Standing Wave Ratio, Phase, Delay, Smith Chart(Latest Version REV3.4)

Brand: AURSINC

4.4 out of 5 stars 155 ratings | 25 answered questions

Amazon's Choice for "nano vna antenna analyzer"

Price: $69.98 & **FREE Shipping**. Details & FREE Returns

- IMPORTANT NOTE: Please order in SHY Store which is the only AURSINC authorized store. UPGRADED: Added battery circuit management, more secure. Redesigned PCB, you can connect to mobile phone with Type C-Type C cable(original PCB needs OTG cable), see a clear HD image on your phone. Designed a practical and simple control application on PC, you can download touchstone(SNP) files for radio design and simulation software. Added a case, which is protective and dust-proof.
- IMPROVED FREQUENCY ALGORITHM: The improved frequency algorithm can use the odd harmonic extension of si5351 to support the measurement frequency up to 1.5GHz. The 50K-300MHz frequency range of the si5351 direct output provides better than 70dB dynamic, The extended 300M-900MHz band provides better than 60dB of dynamics, and the 900M-1.5GHz band is better than 40dB of dynamics
- MULTIPLE FUNCTIONS: The default firmware main function is used for

$69.98

& **FREE Shipping**. Details

& FREE Returns

Arrives: **Sunday, Sep 20** Details

Fastest delivery: **Sunday, Sep 13**

Order within 9 hrs and 47 mins

Details

In Stock.

Qty: 1

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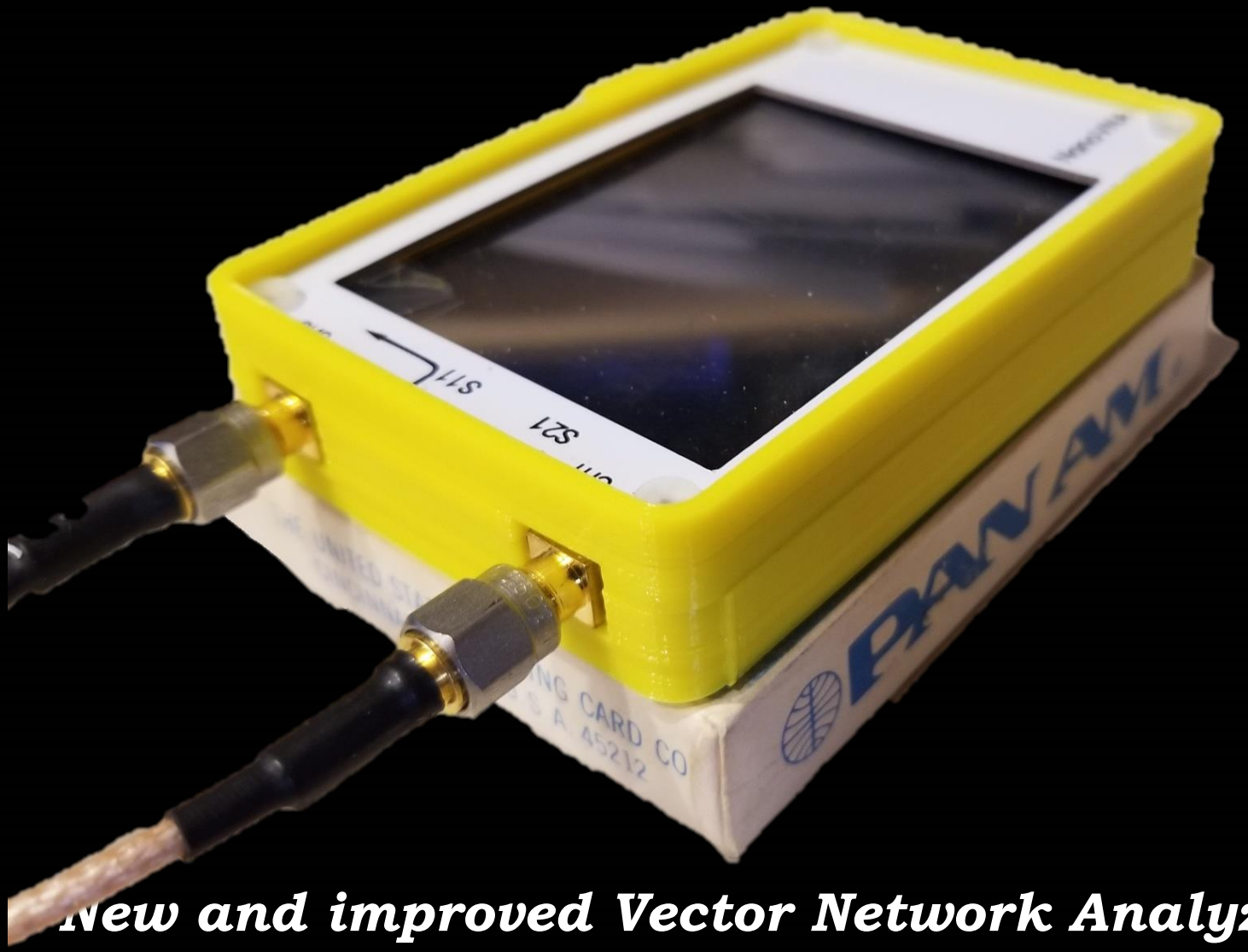
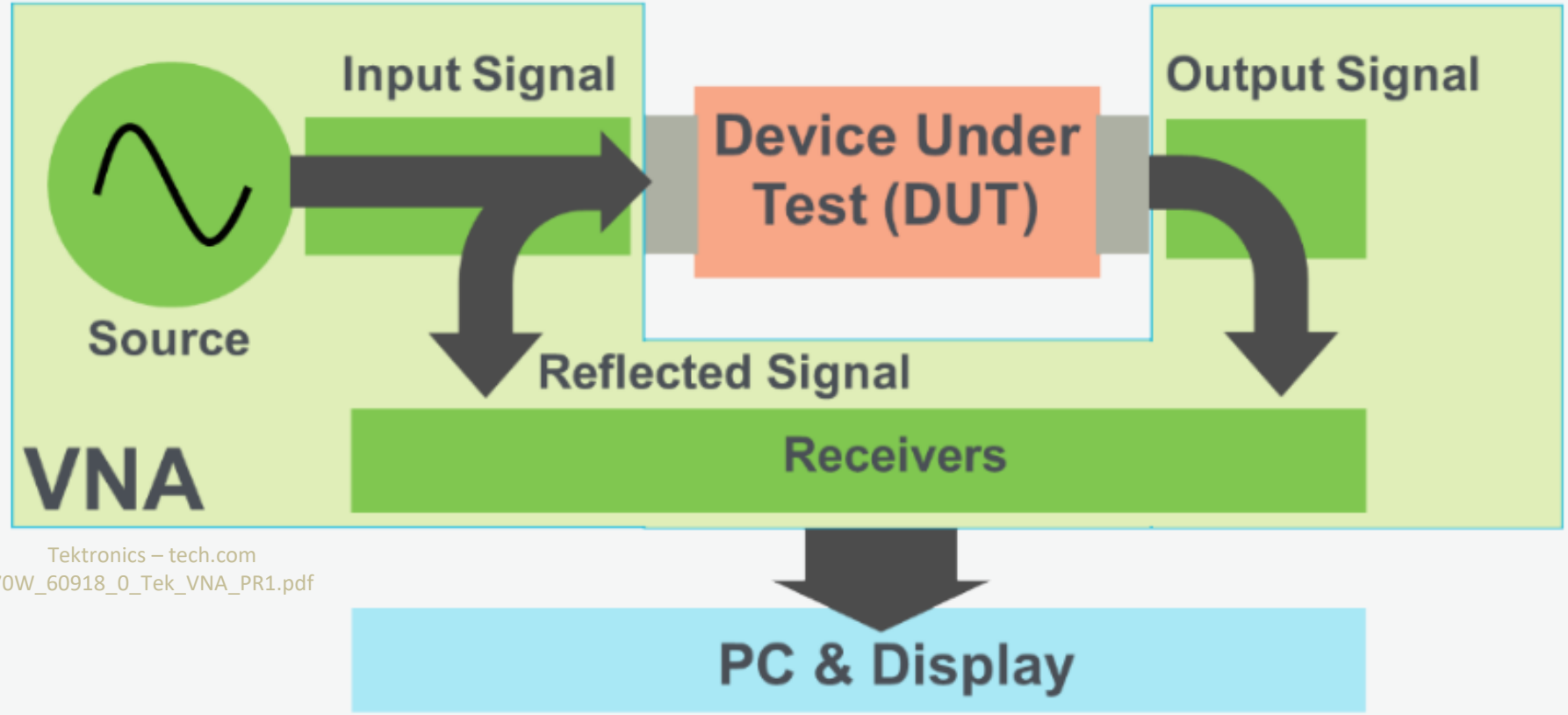
New and improved Vector Network Analyzer 10 KHz to 1.5 GHz



New and improved Vector Network Analyzer
10 KHz to 1.5 GHz

S11 S21

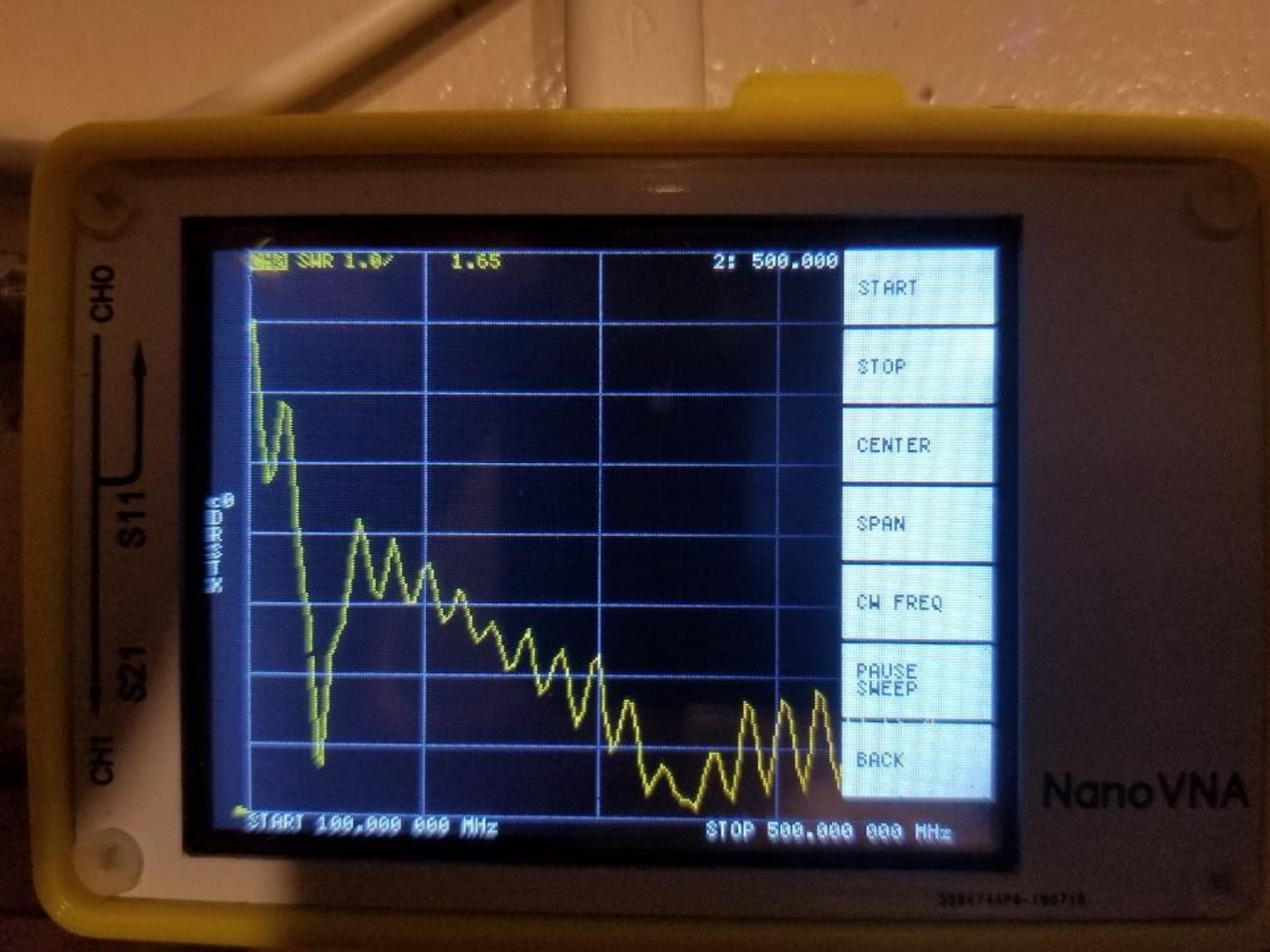


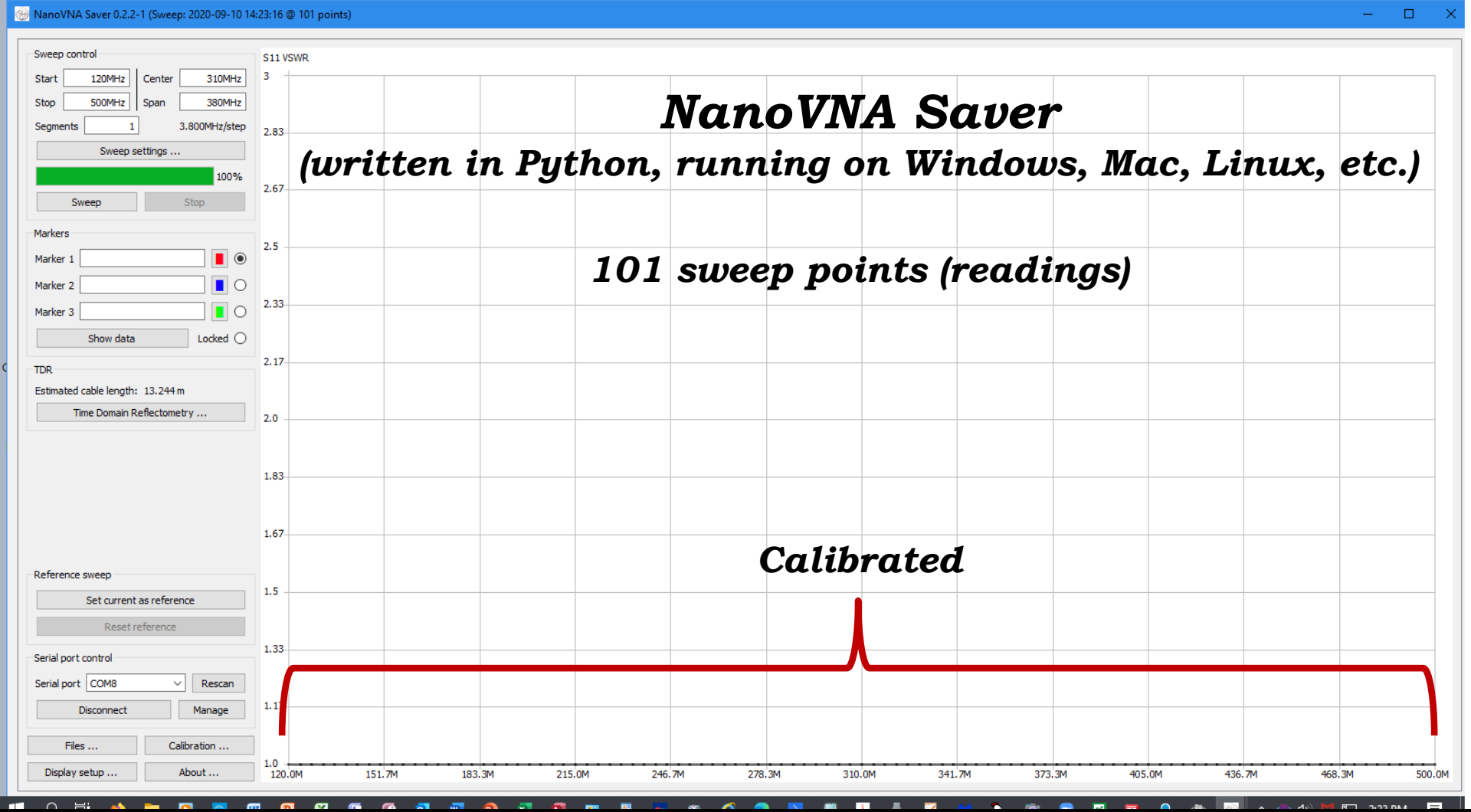
Tektronics – tech.com
70W_60918_0_Tek_VNA_PR1.pdf

Reflection S11
- ***VSWR***
- ***Impedance***
- ***Admittance***
- ***Return Loss***

Transmission S21
- ***Gain/Loss***
  - ***(Insertion loss)***
- ***Phase***
- ***Group delay***
  - ***(Delay time)***

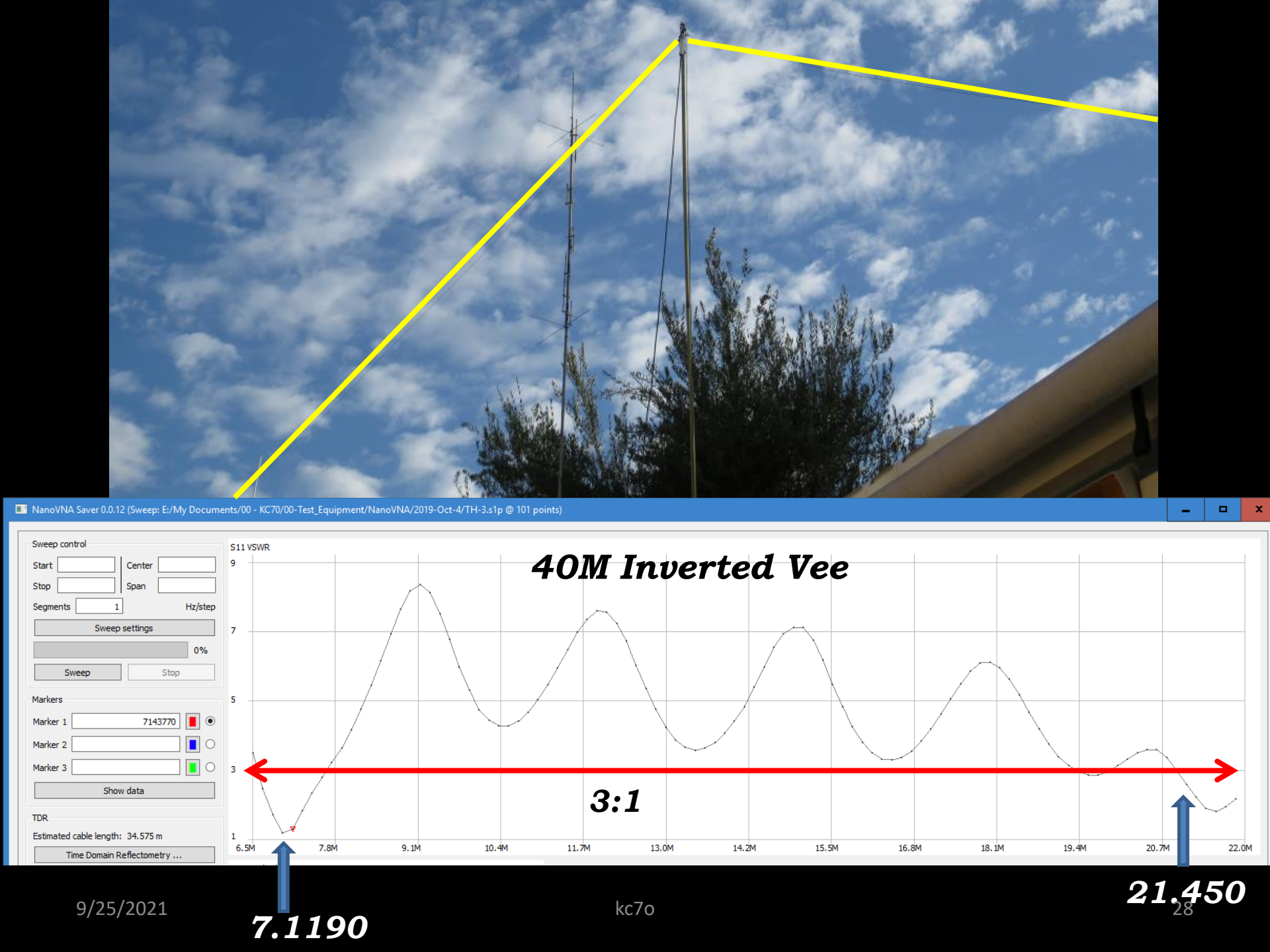
From Tektronics


SWR 1.0
1.65
2: 500.000
START
STOP
CENTER
SPAN
CW FREQ
PAUSE SWEEP
BACK
START 100.000 000 MHz
STOP 500.000 000 MHz
CH0
S11
S21
CH1
NanoVNA



Screen prints

Alinco DJ-MD5TGP dual band DMR handheld stock antenna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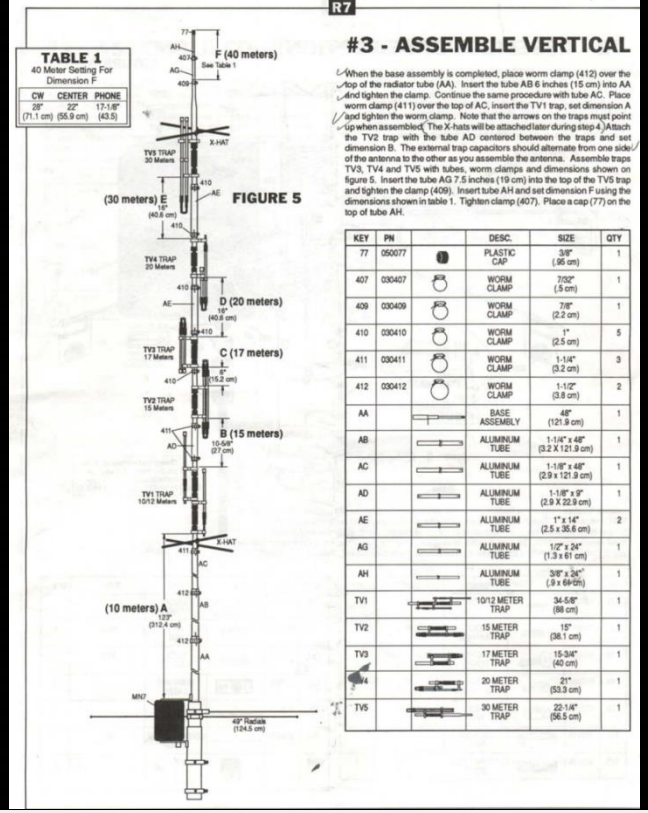
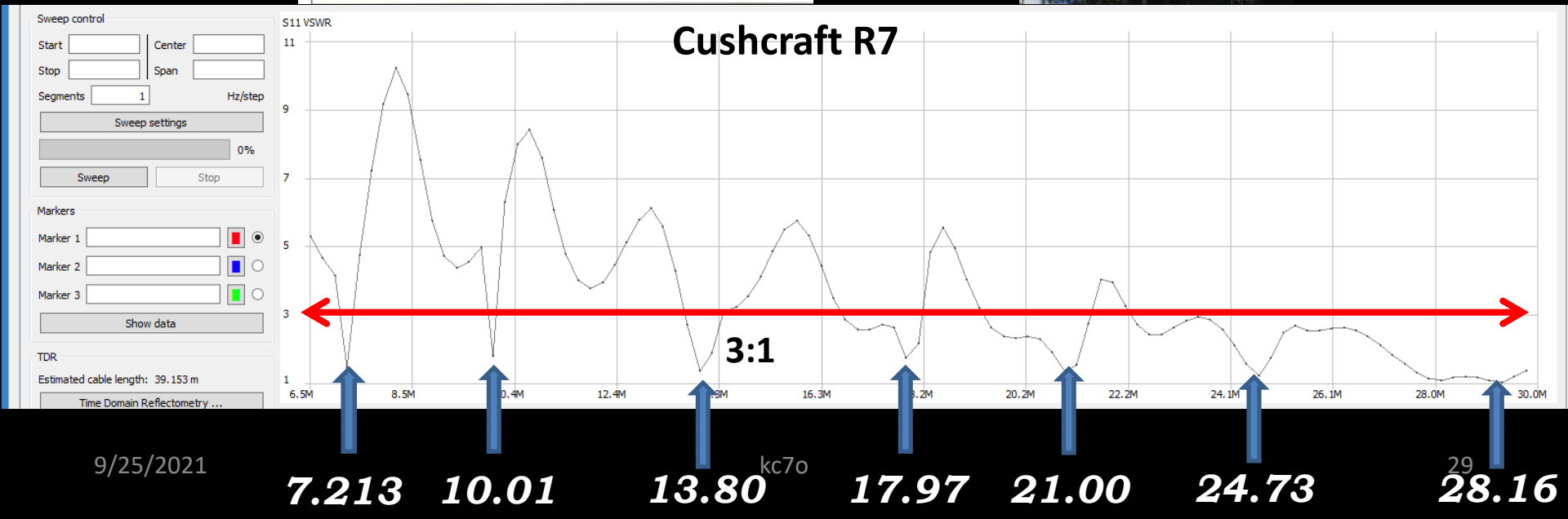
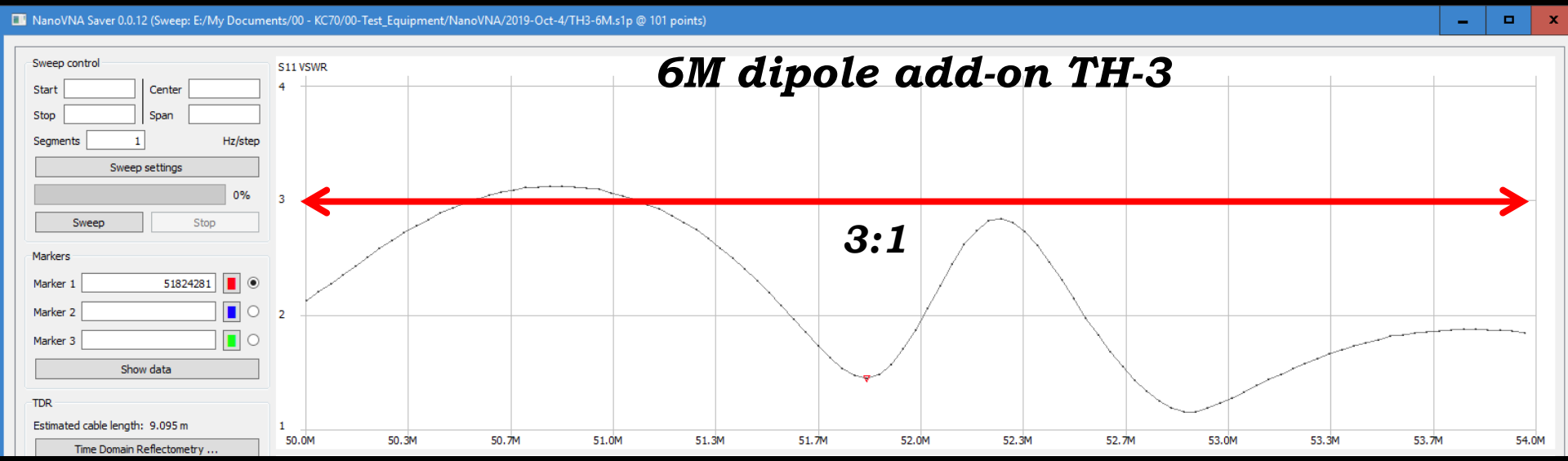
Sweep control
Start
Center
Stop
Span
Segments
1
Hz/step
Sweep settings
0%
Sweep
Stop
Markers
Marker 1
7143770
Marker 2
Marker 3
Show data
TDR
Estimated cable length: 34.575 m
Time Domain Reflectometry ...
S11 VSWR
40M Inverted Vee
9
7
5
3
1
3:1
6.5M
7.8M
9.1M
10.4M
11.7M
13.0M
14.2M
15.5M
16.8M
18.1M
19.4M
20.7M
22.0M
7.1190
21.450


R7
TABLE 1
40 Meter Setting For Dimension F
CW CENTER PHONE
28" 22" 17-1/8"
(71.1 cm) (55.9 cm) (43.5)
F (40 meters)
See Table 1
TV5 TRAP 30 Meters
X-HAT
(30 meters) E
FIGURE 5
TV4 TRAP 20 Meters
D (20 meters)
TV3 TRAP 17 Meters
C (17 meters)
TV2 TRAP 15 Meters
B (15 meters)
TV1 TRAP 10/12 Meters
X-HAT
(10 meters) A
49" Radials
#3 - ASSEMBLE VERTICAL
When the base assembly is completed, place worm clamp (412) over the top of the radiator tube (AA). Insert the tube AB 6 inches (15 cm) into AA and tighten the clamp. Continue the same procedure with tube AC. Place worm clamp (411) over the top of AC, insert the TV1 trap, set dimension A and tighten the worm clamp. Note that the arrows on the traps must point up when assembled. The X-hats will be attached later during step 4.) Attach the TV2 trap with the tube AD centered between the traps and set dimension B. The external trap capacitors should alternate from one side of the antenna to the other as you assemble the antenna. Assemble traps TV3, TV4 and TV5 with tubes, worm clamps and dimensions shown on figure 5. Insert the tube AG 7.5 inches (19 cm) into the top of the TV5 trap and tighten the clamp (409). Insert tube AH and set dimension F using the dimensions shown in table 1. Tighten clamp (407). Place a cap (77) on the top of tube AH.
KEY PN DESC. SIZE QTY
77 050077 PLASTIC CAP 3/8" (.95 cm) 1
407 030407 WORM CLAMP 7/32" (.5 cm) 1
409 030409 WORM CLAMP 7/8" (2.2 cm) 1
410 030410 WORM CLAMP 1" (2.5 cm) 5
411 030411 WORM CLAMP 1-1/4" (3.2 cm) 3
412 030412 WORM CLAMP 1-1/2" (3.8 cm) 2
AA BASE ASSEMBLY 48" (121.9 cm) 1
AB ALUMINUM TUBE 1-1/4" x 48" (3.2 X 121.9 cm) 1
AC ALUMINUM TUBE 1-1/8" x 48" (2.9 x 121.9 cm) 1
AD ALUMINUM TUBE 1-1/8" x 9" (2.9 X 22.9 cm) 1
AE ALUMINUM TUBE 1" x 14" (2.5 x 35.6 cm) 2
AG ALUMINUM TUBE 1/2" x 24" (1.3 x 61 cm) 1
AH ALUMINUM TUBE 3/8" x 24" (.9 x 61 cm) 1
TV1 10/12 METER TRAP 34-5/8" (88 cm) 1
TV2 15 METER TRAP 15" (38.1 cm) 1
TV3 17 METER TRAP 15-3/4" (40 cm) 1
TV4 20 METER TRAP 21" (53.3 cm) 1
TV5 30 METER TRAP 22-1/4" (56.5 cm) 1

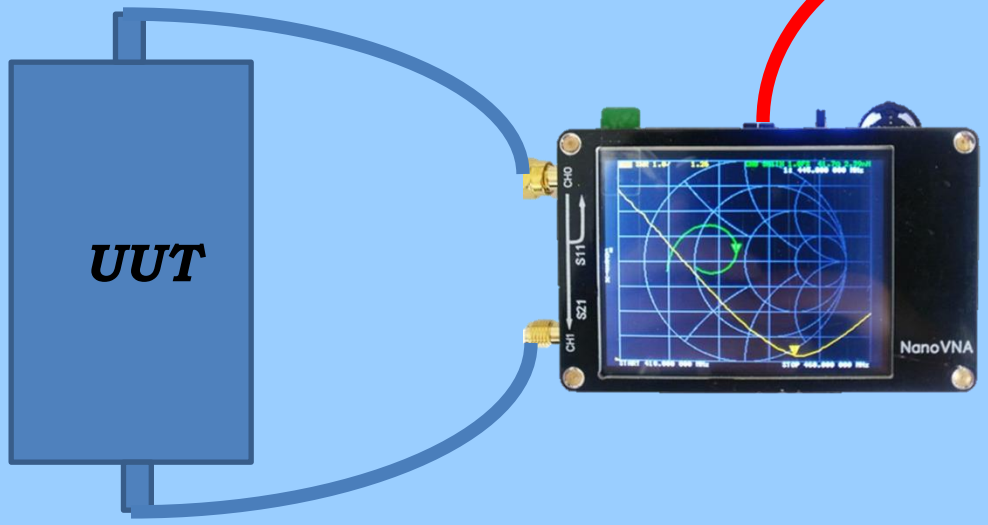

Sweep control
Start
Center
Stop
Span
Segments 1
Hz/step
Sweep settings
0%
Sweep
Stop
Markers
Marker 1
Marker 2
Marker 3
Show data
TDR
Estimated cable length: 39.153 m
Time Domain Reflectometry ...
S11 VSWR
Cushcraft R7
11
9
7
5
3
1
3:1
6.5M
8.5M
12.4M
16.3M
20.2M
22.2M
24.1M
26.1M
28.0M
30.0M
7.213
10.01
13.80
17.97
21.00
24.73
28.16


NanoVNA Saver 0.0.12 (Sweep: E:/My Documents/00 - KC70/00-Test_Equipment/NanoVNA/2019-Oct-4/TH3-6M.s1p @ 101 points)
Sweep control
Start
Center
Stop
Span
Segments
1
Hz/step
Sweep settings
0%
Sweep
Stop
Markers
Marker 1
51824281
Marker 2
Marker 3
Show data
TDR
Estimated cable length: 9.095 m
Time Domain Reflectometry ...
S11 VSWR
6M dipole add-on TH-3
3:1
4
3
2
1
50.0M
50.3M
50.7M
51.0M
51.3M
51.7M
52.0M
52.3M
52.7M
53.0M
53.3M
53.7M
54.0M

NanoVNA FEATURE

Two Port Measurement

USB



Unit Under Test


FUJITSU
XLP-150
TVI SUPPRESSOR
LOW PASS FILTER
NanoVNA

- ***So, what do you need?***
- ***It depends***
- ***For the average HF / VHF user probably an Antenna Analyzer***
  - ***For HF and 2 Meters***
  - ***Adjust an antenna tuner***
  - ***Cheap (used)***

- ***Over the years I have used all of the above and will keep them all in my tool kit***