

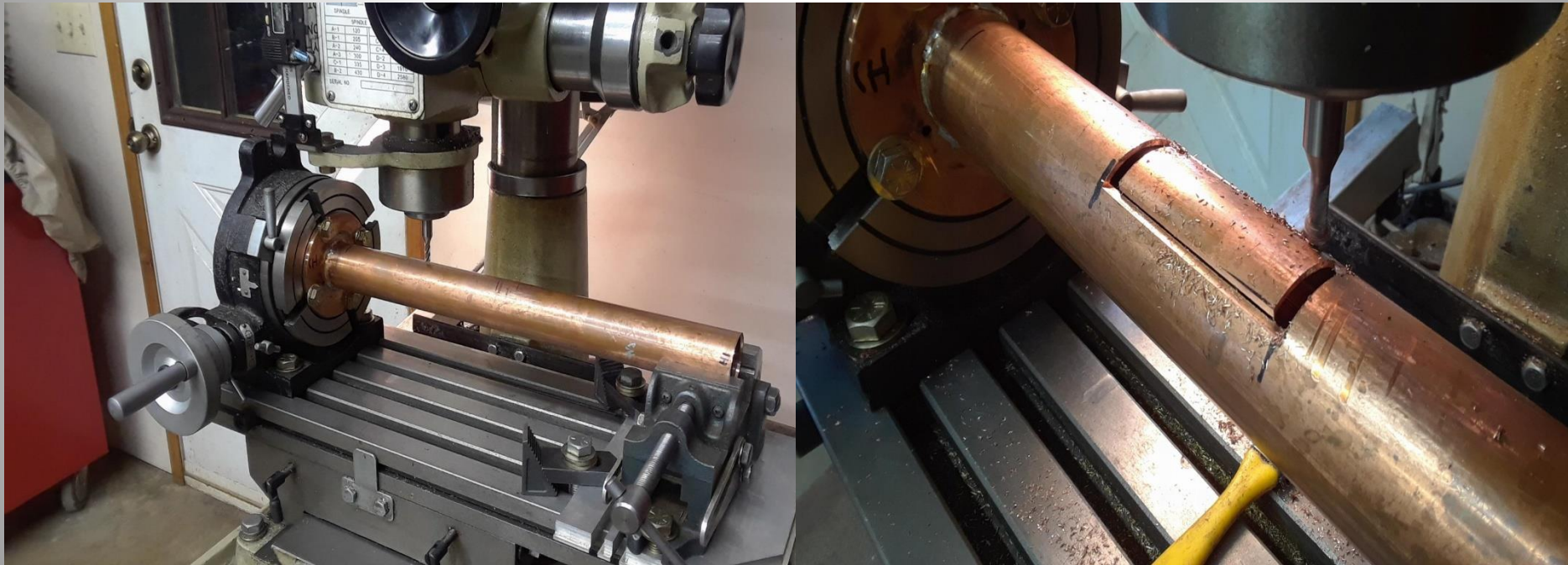
6 Centimeter Feed Experiment

Skip MacAulay, VE6BGT



The Three Amigos

Squeezed Feed Construction



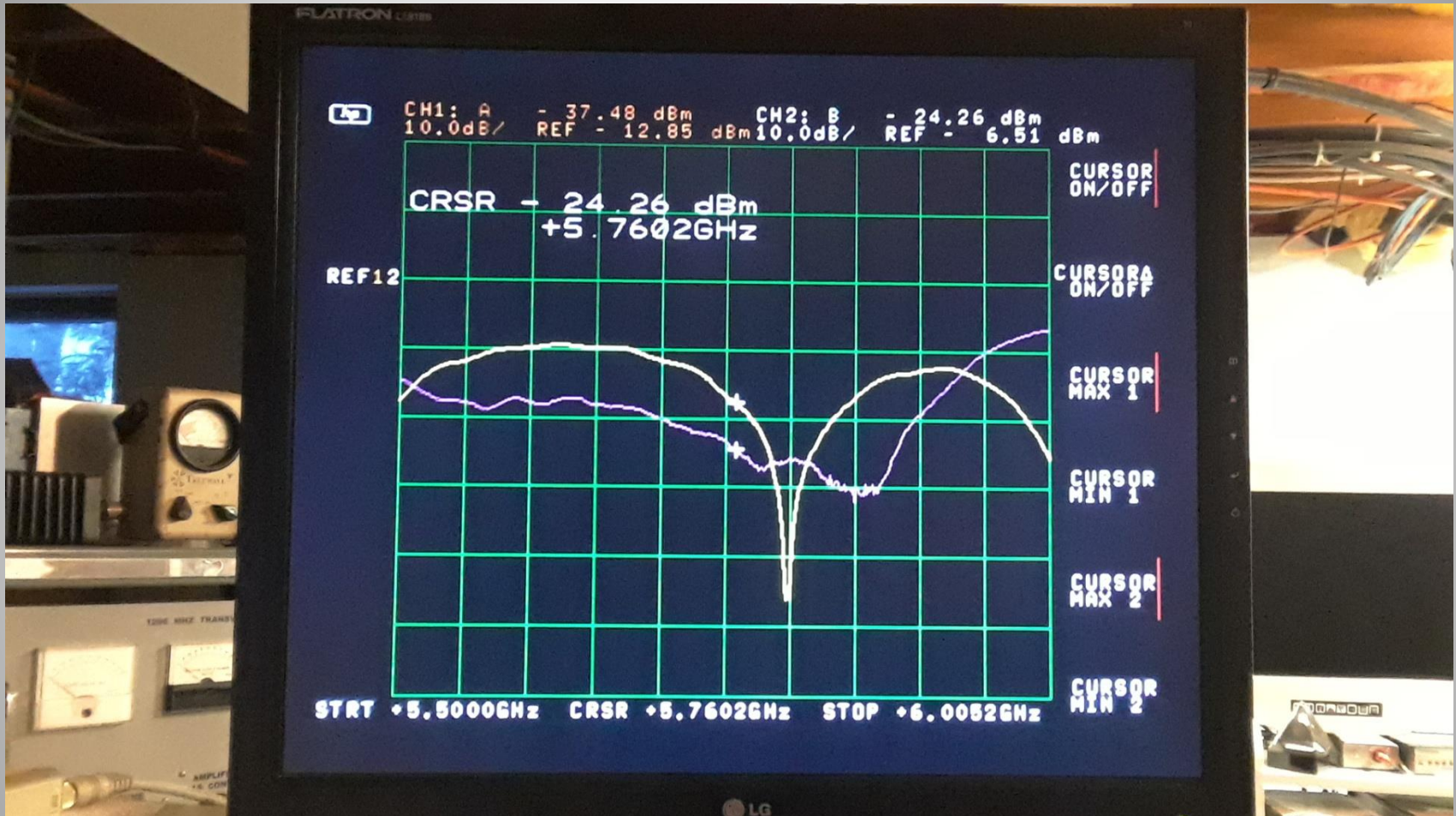
Built the new feed from copper pipe that has a outside diameter of 41.3 mm, inside at 38.5 mm.. With the rotary table took great detail at cutting the two rectangular holes for a spacing of 32mm..

Finished Feed



I planned on using a SMA connector for the TX port and at first on the RX..
Usually build a custom piece of .141 coax for the probe direct out to a SMA.
Also an adjustable back plate or wall for tuning..

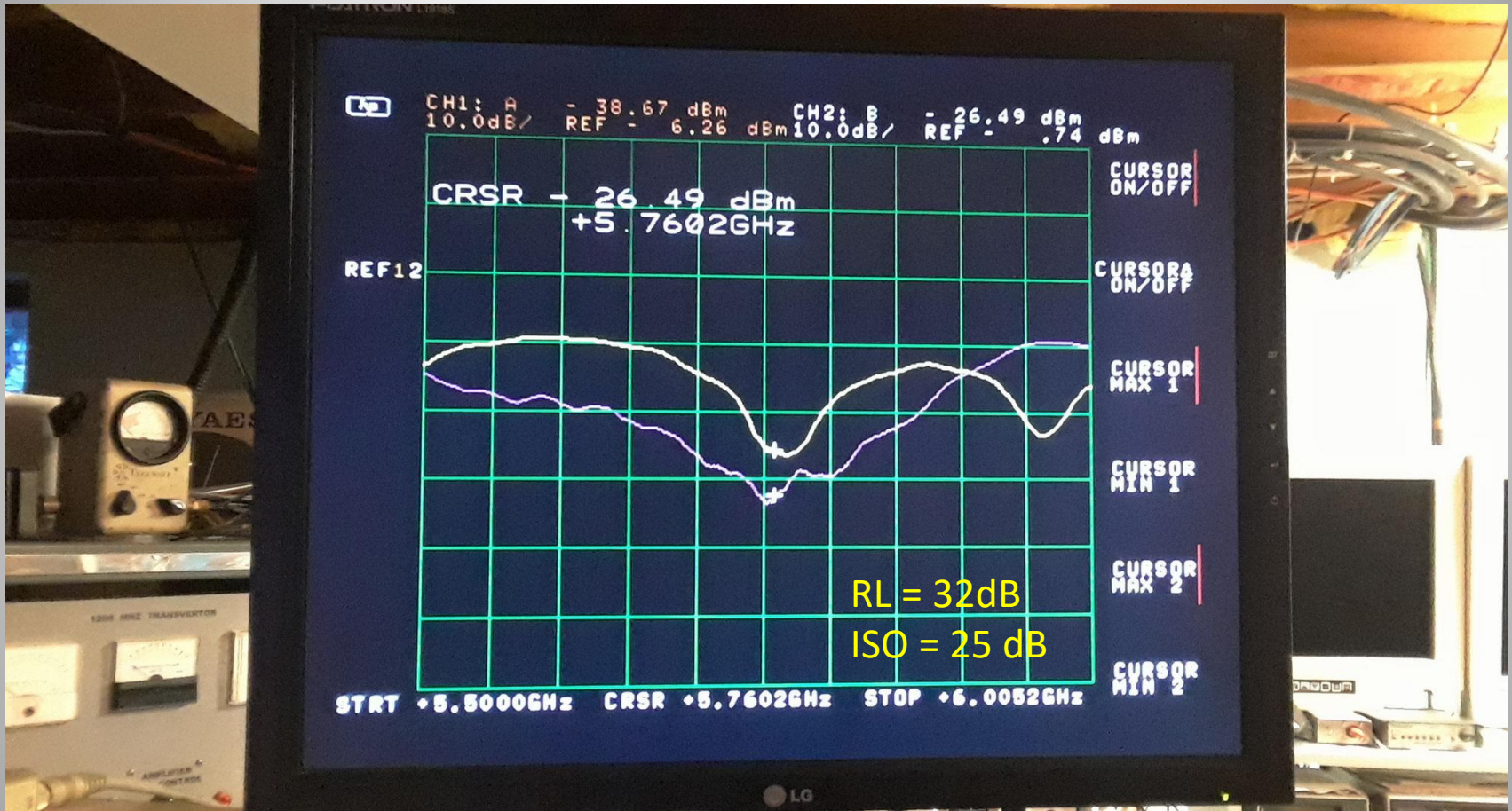
First Tuning Attempt



This is with the back plate tight
and IMU slid tight back, just probe
length being adjusted

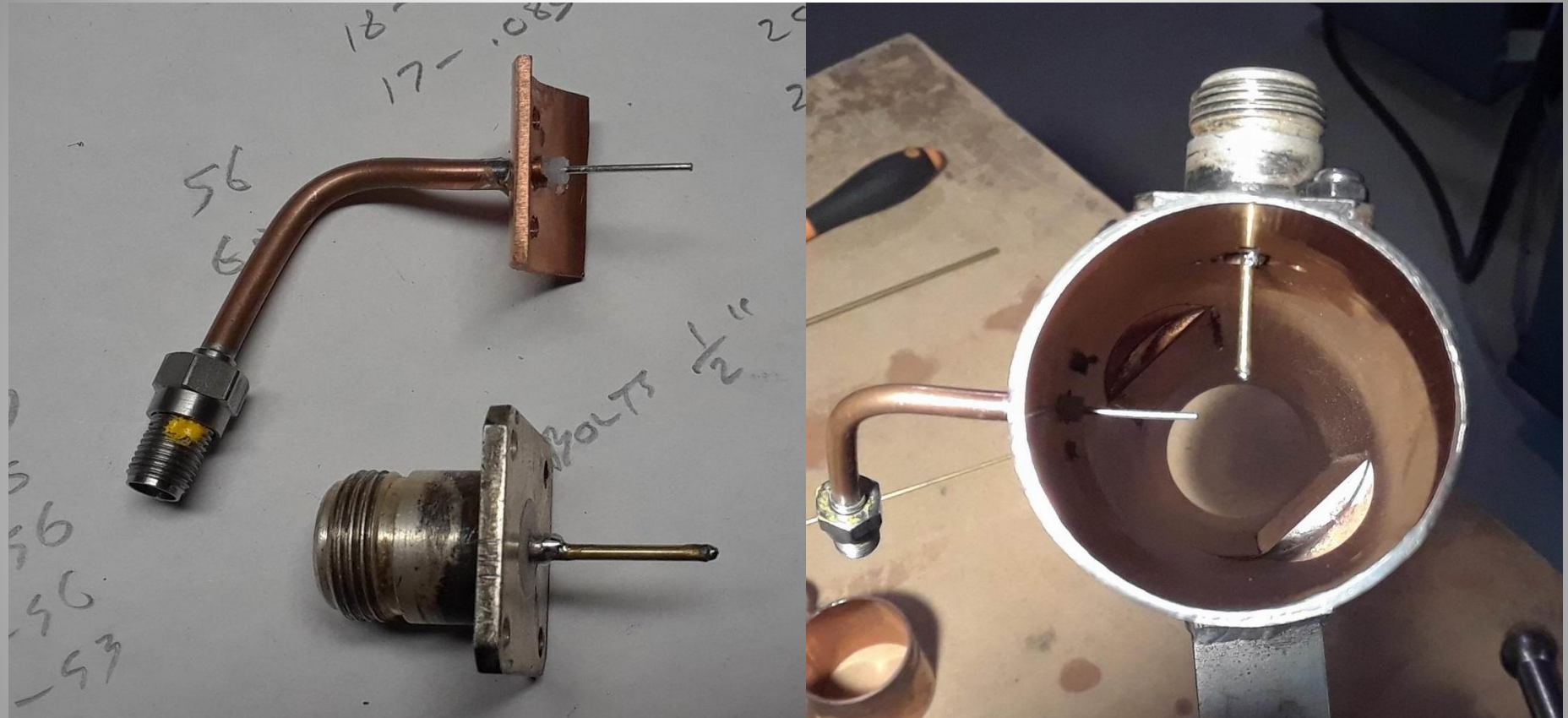
TX port return loss = 25dB
Isolation between ports = 18dB
(I didnt zero SNA readings)

The Best Adjustment



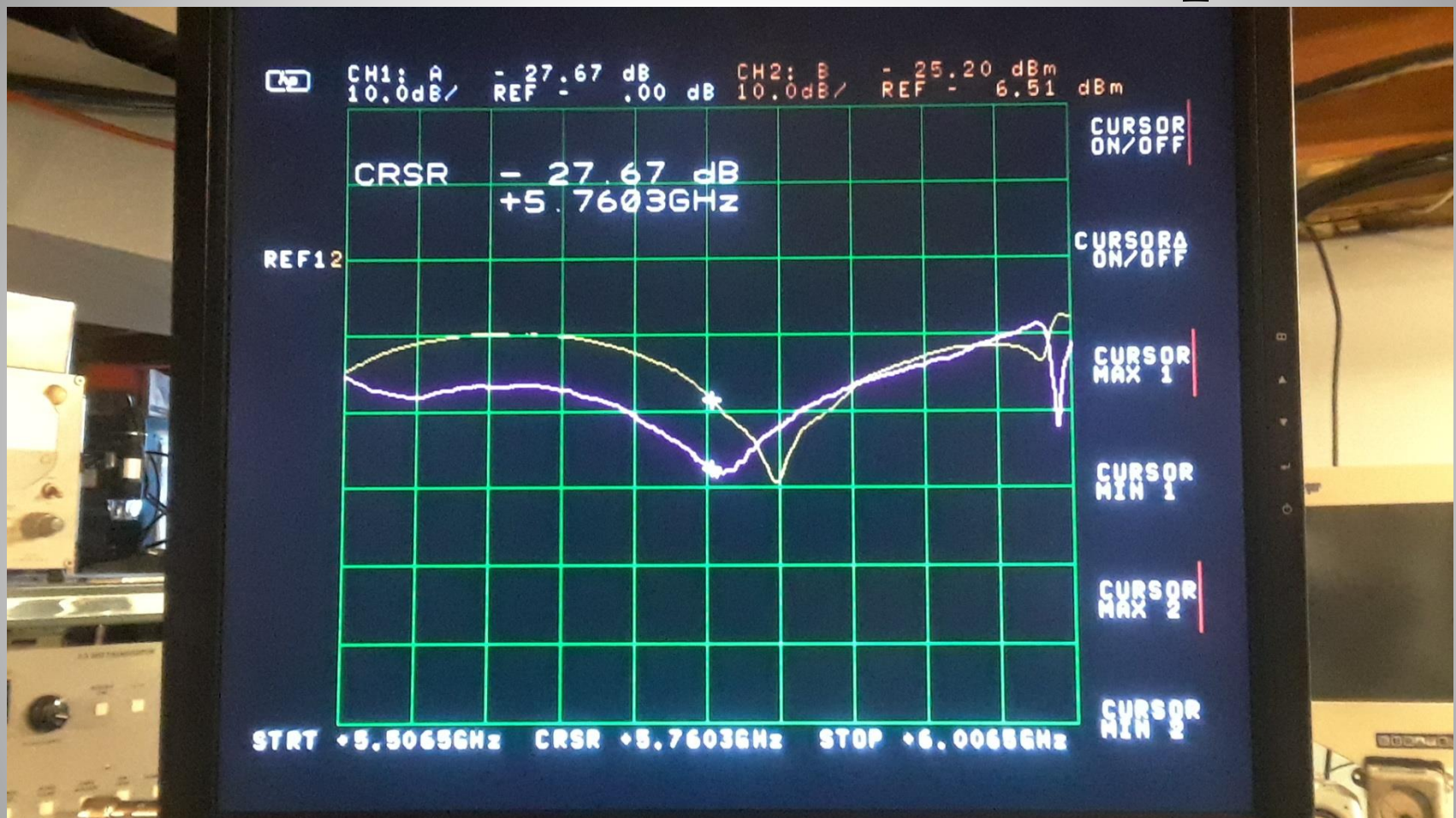
By moving the back plate in and out then sliding the IMU launcher section this is what I came up with... BUT it was the Circular Polarization test that came up weak.. The best I was seeing was a difference of 5 to 6 dB.. Not great.

SMA to a N Connector



Changed the connectors over to a N connector for the TX probe and rigid coax for the RX probe..

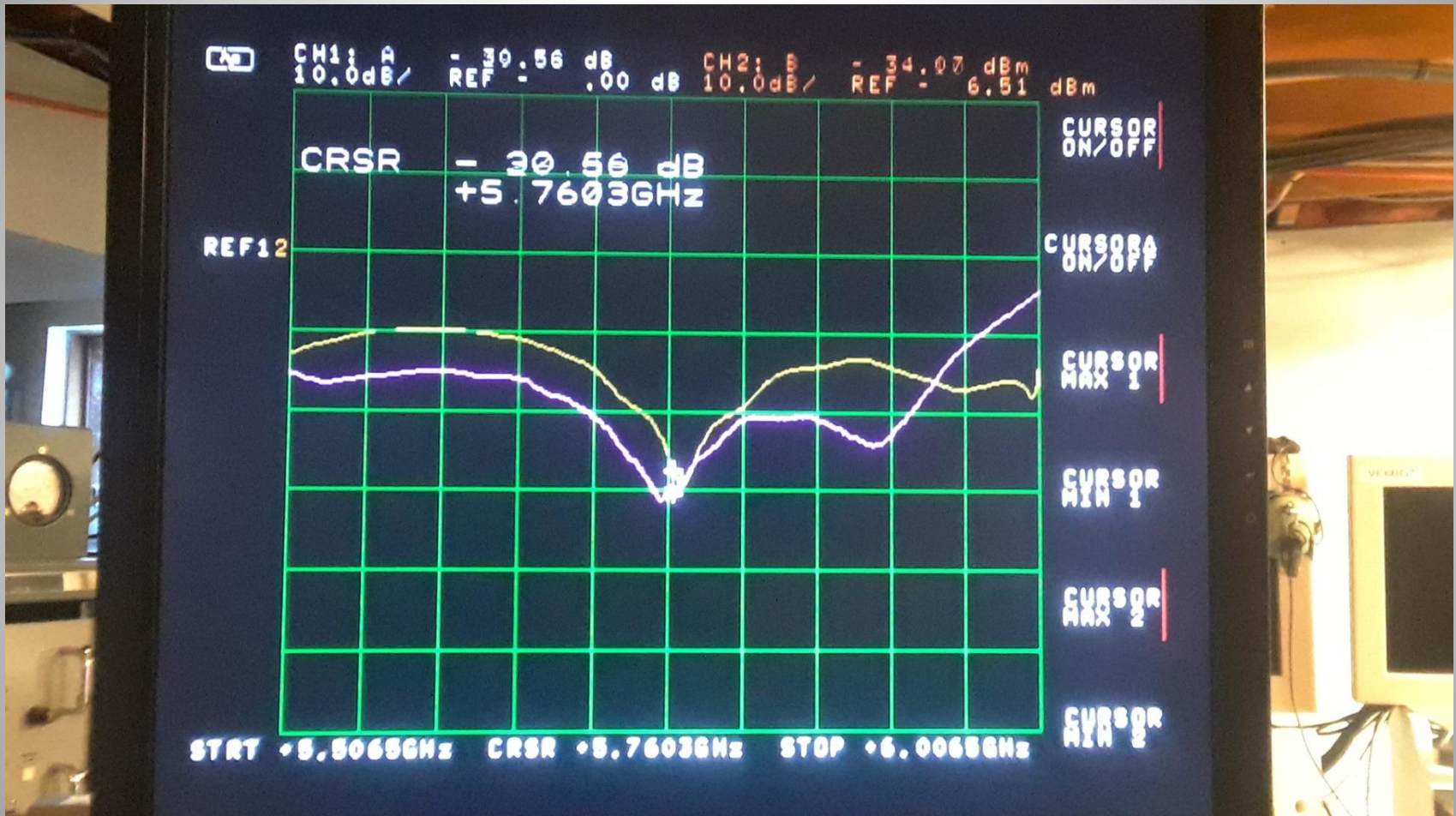
New Connector Sweep



The first adjustment was with the IMU launcher off and the back plate tight against the tube.. Better so far..

RL = 27dB
ISO = 19dB

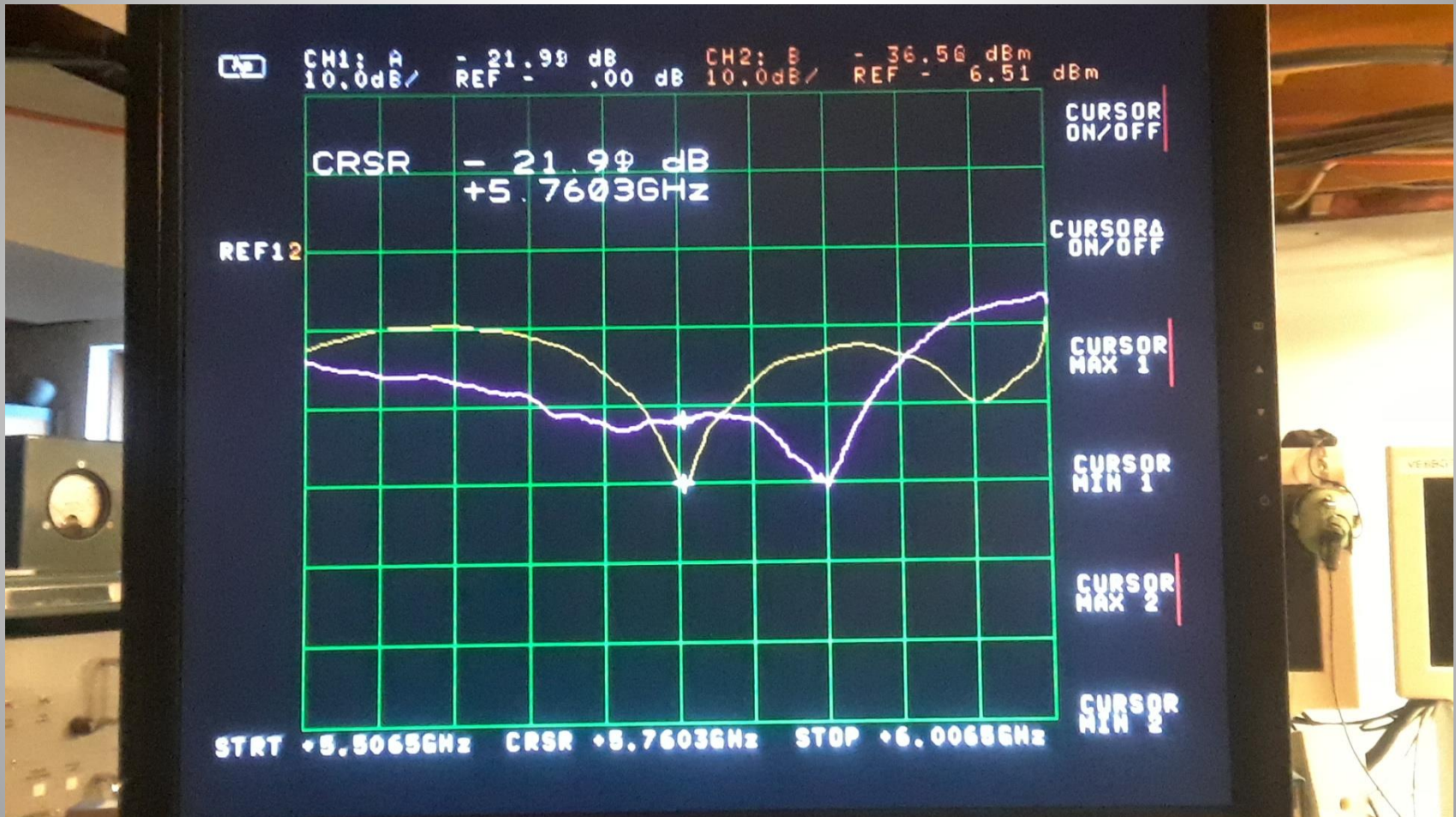
Best of Adjustments



This was after I adjusted the back plate out 1mm,
the IMU launcher installed and slid out 4.5mm..

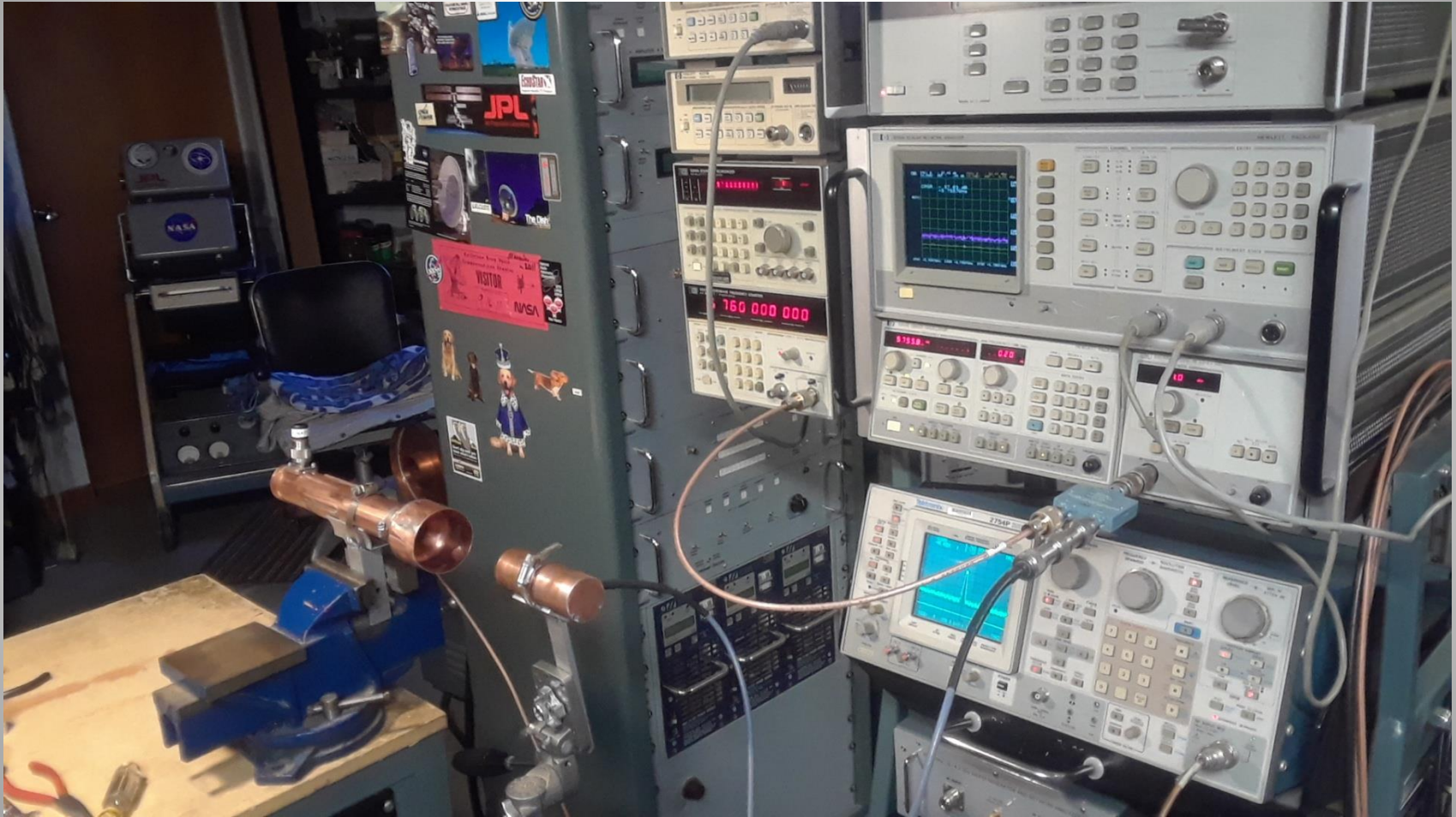
RL = 30dB
ISO = 28dB

Crooked IMU Launcher



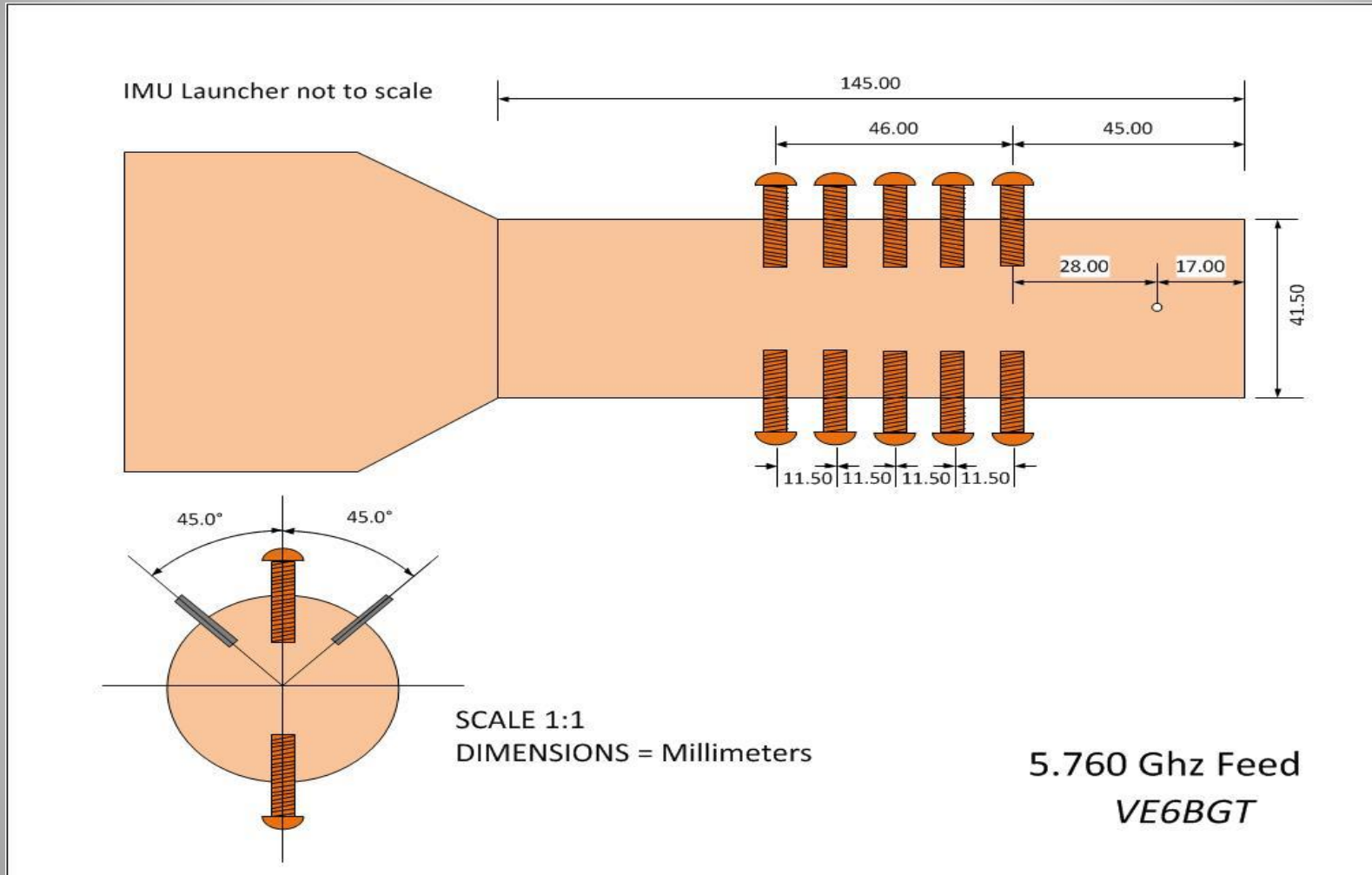
I noticed the IMU was not built true and when I rotated it things liked to change.

Circular Polarization Check



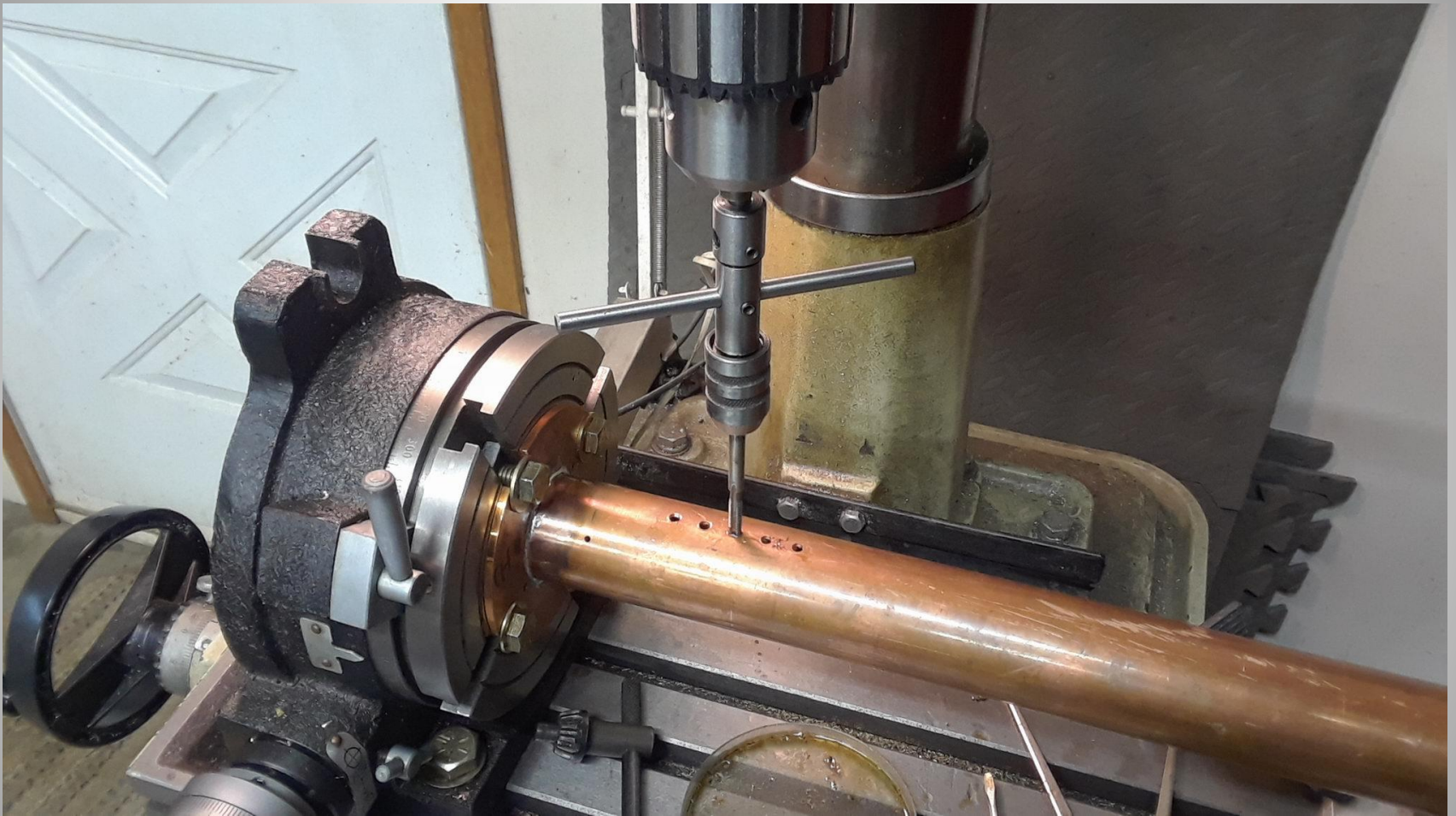
The circular polarization test came up better but still only around 4 – 5 dB difference when I rotated the linear test ant back and forth in rotation.

New Idea Scaled Drawing



The new design scaled from other lower frequency VE4MA style feeds..

Scaled VE4MA Style Feed



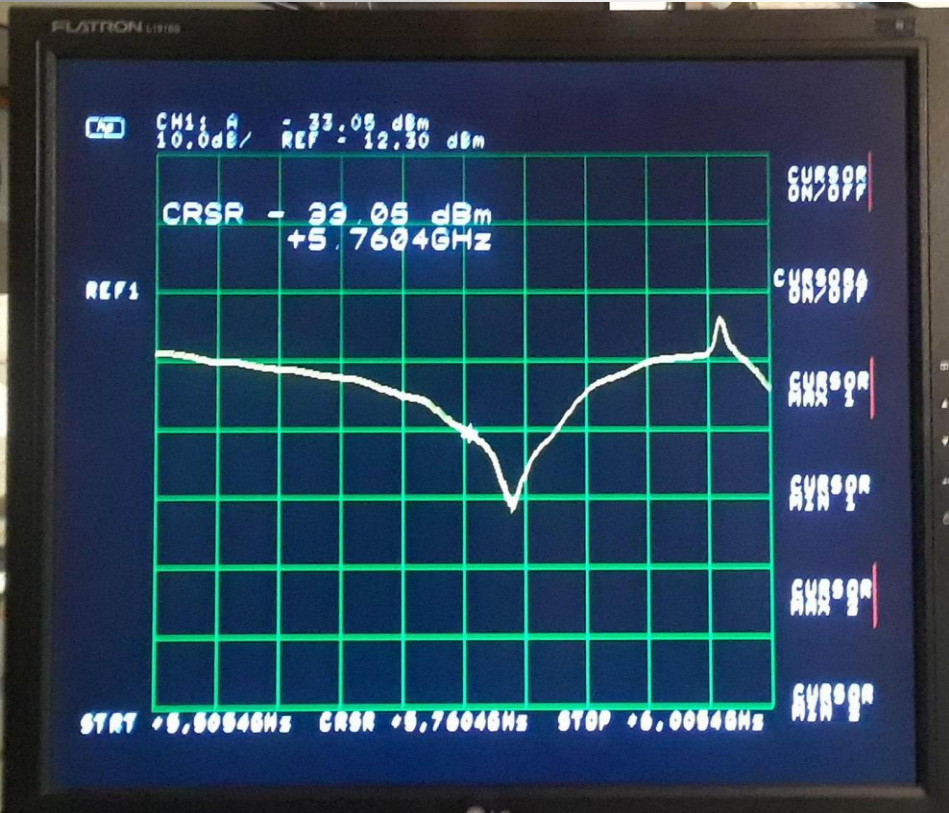
Back to the Mill after scaling a new design from existing feeds for lower bands..

The Next New Feed

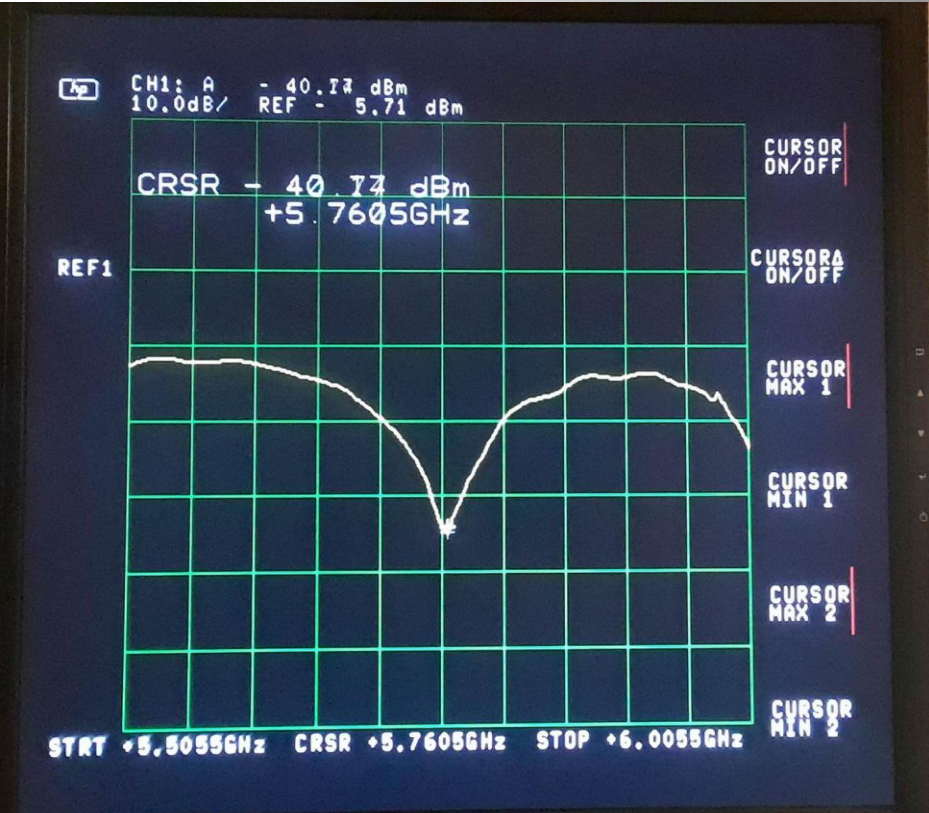


The next test using a SMA on TX probe and screw polarizers, same IMU as before..

Return Loss



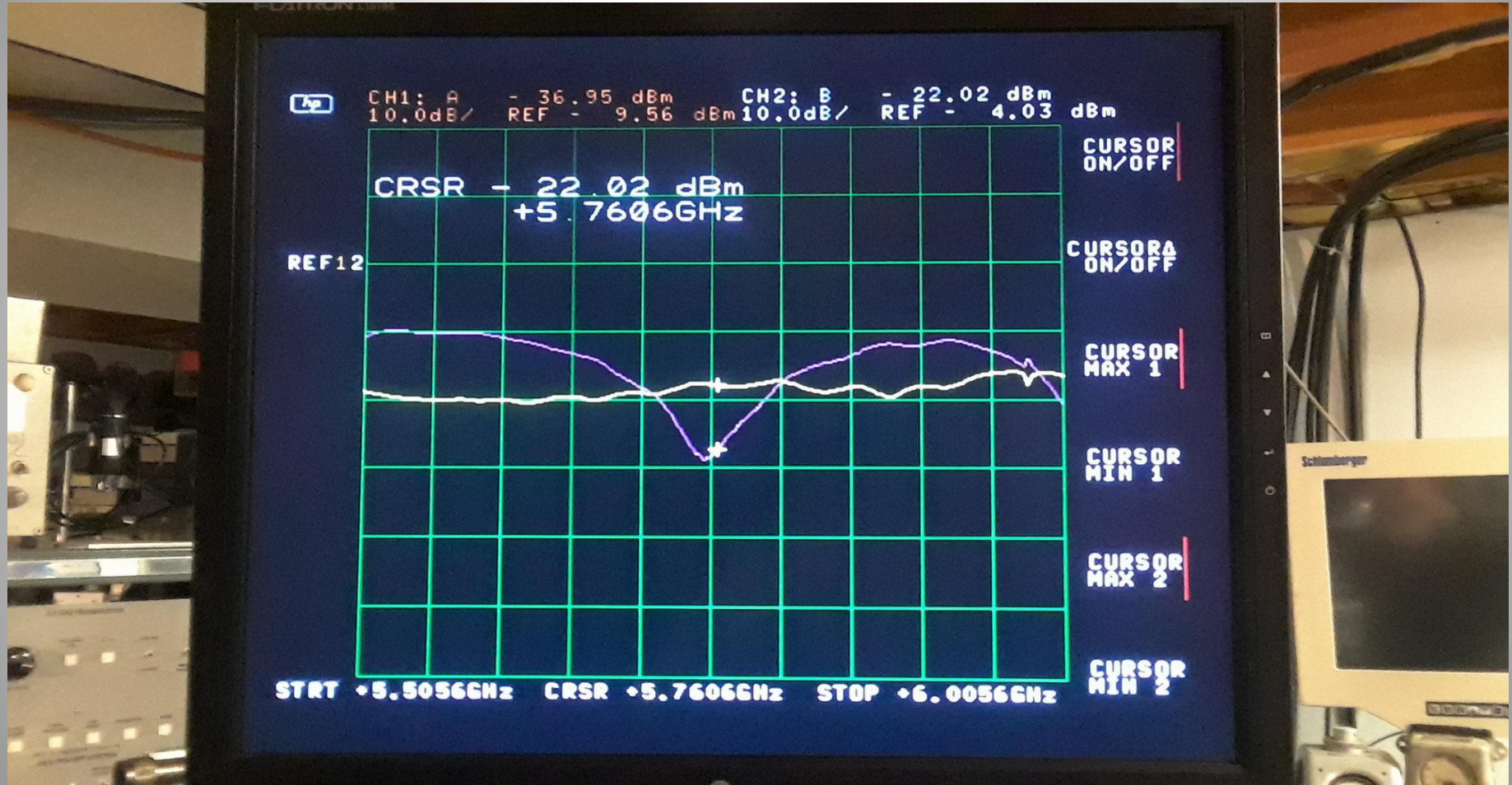
RX Probe, RL = 21dB



TX Probe, RL = 35dB

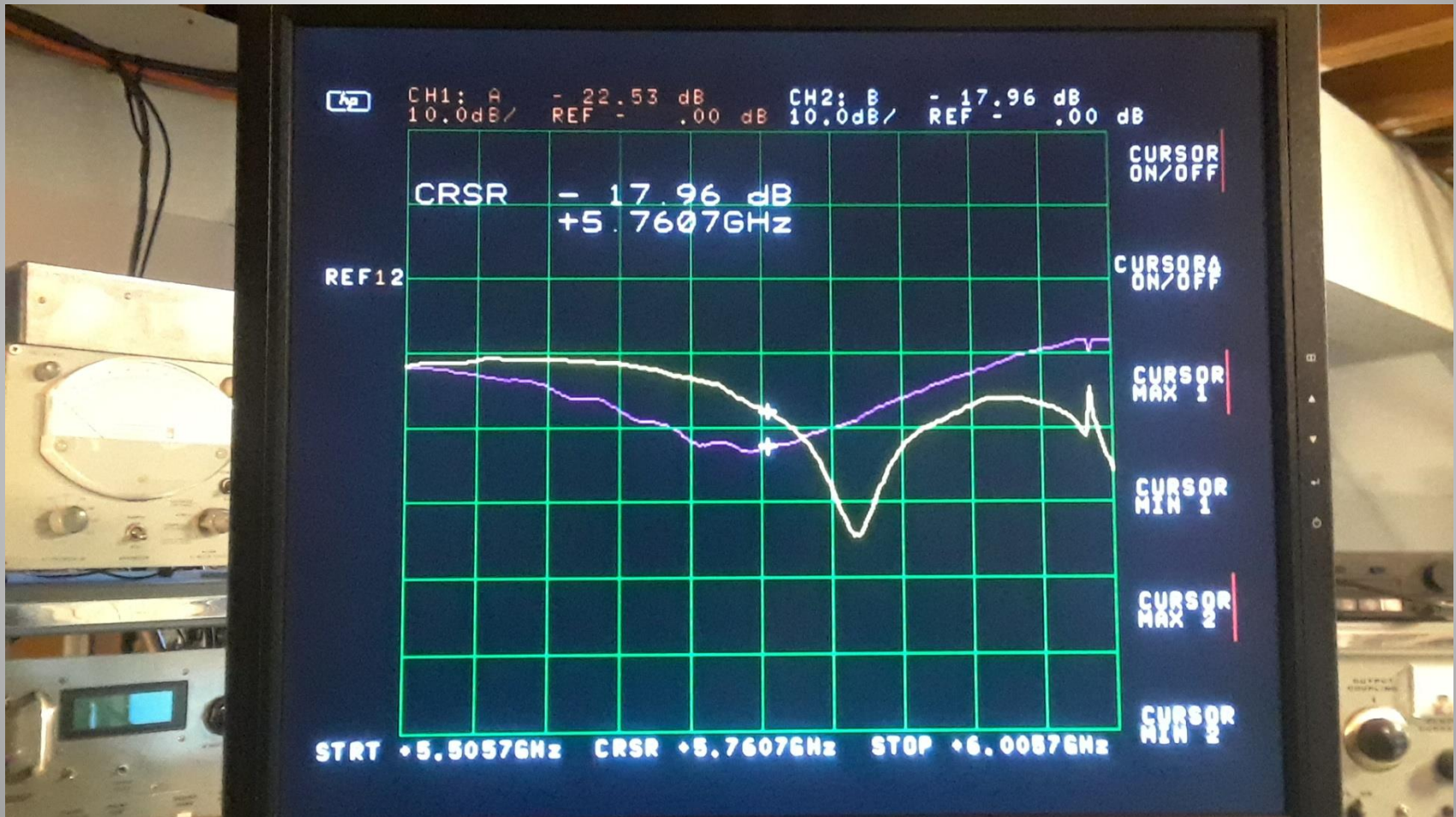
Both probes tuned to a not so bad return loss.. BUT..

Isolation Between Ports



Still not much better than the squeezed feed at first, only around 18dB..

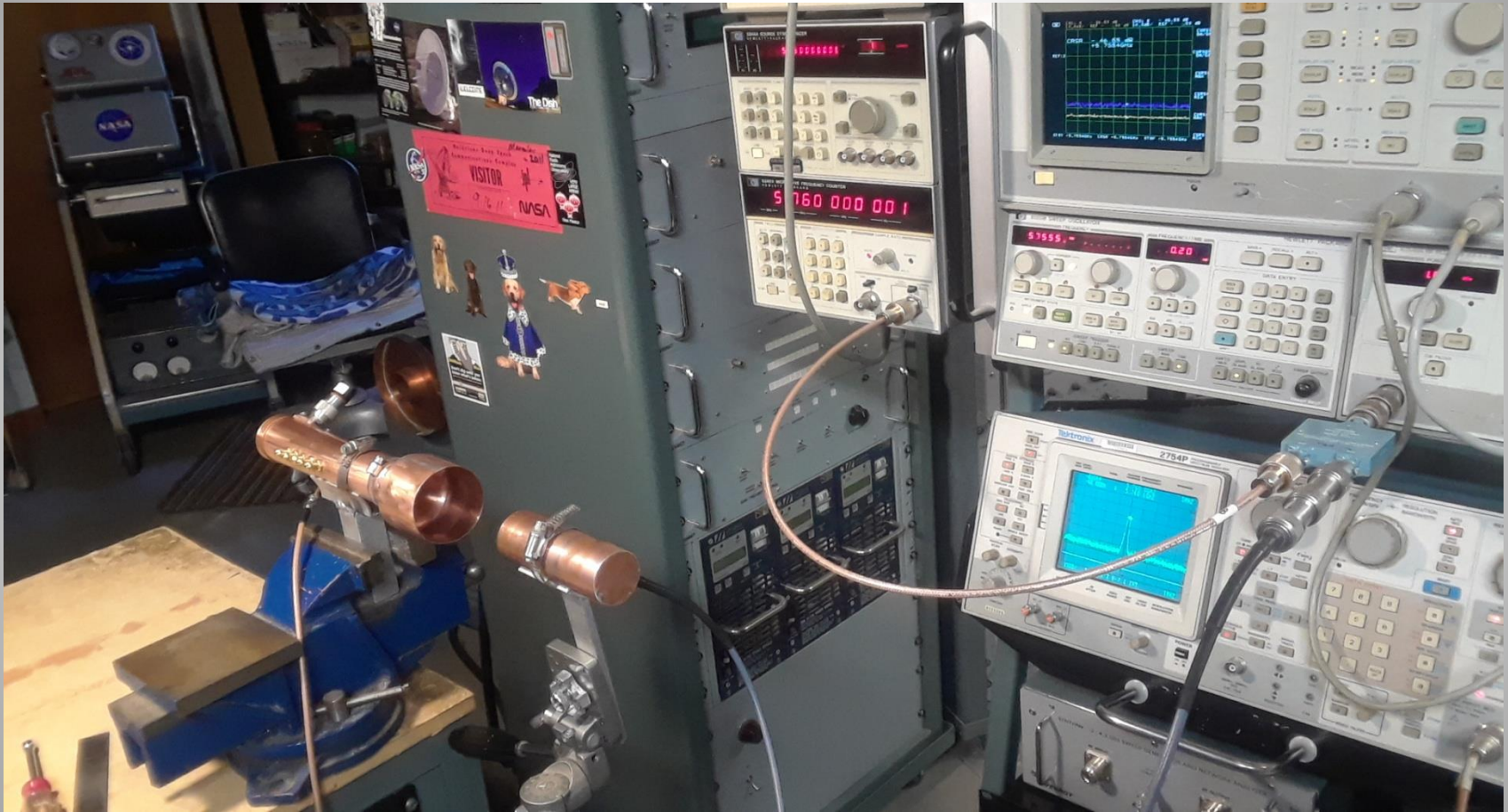
Again Over to N Connector



The best I could get it adjusted before Circular Polarization test..

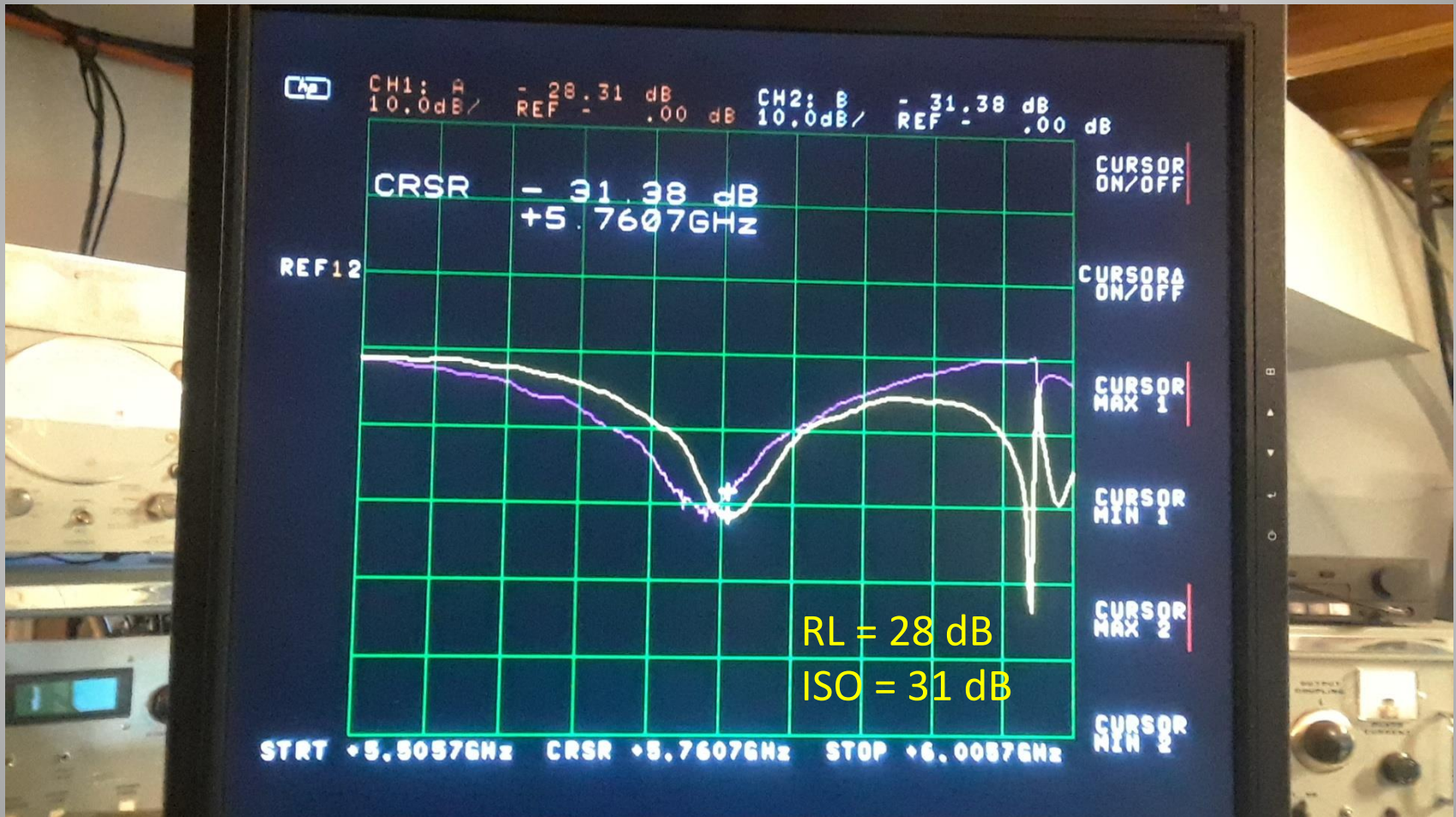
RL = 22 dB
ISO = 18 dB

Polarization Check



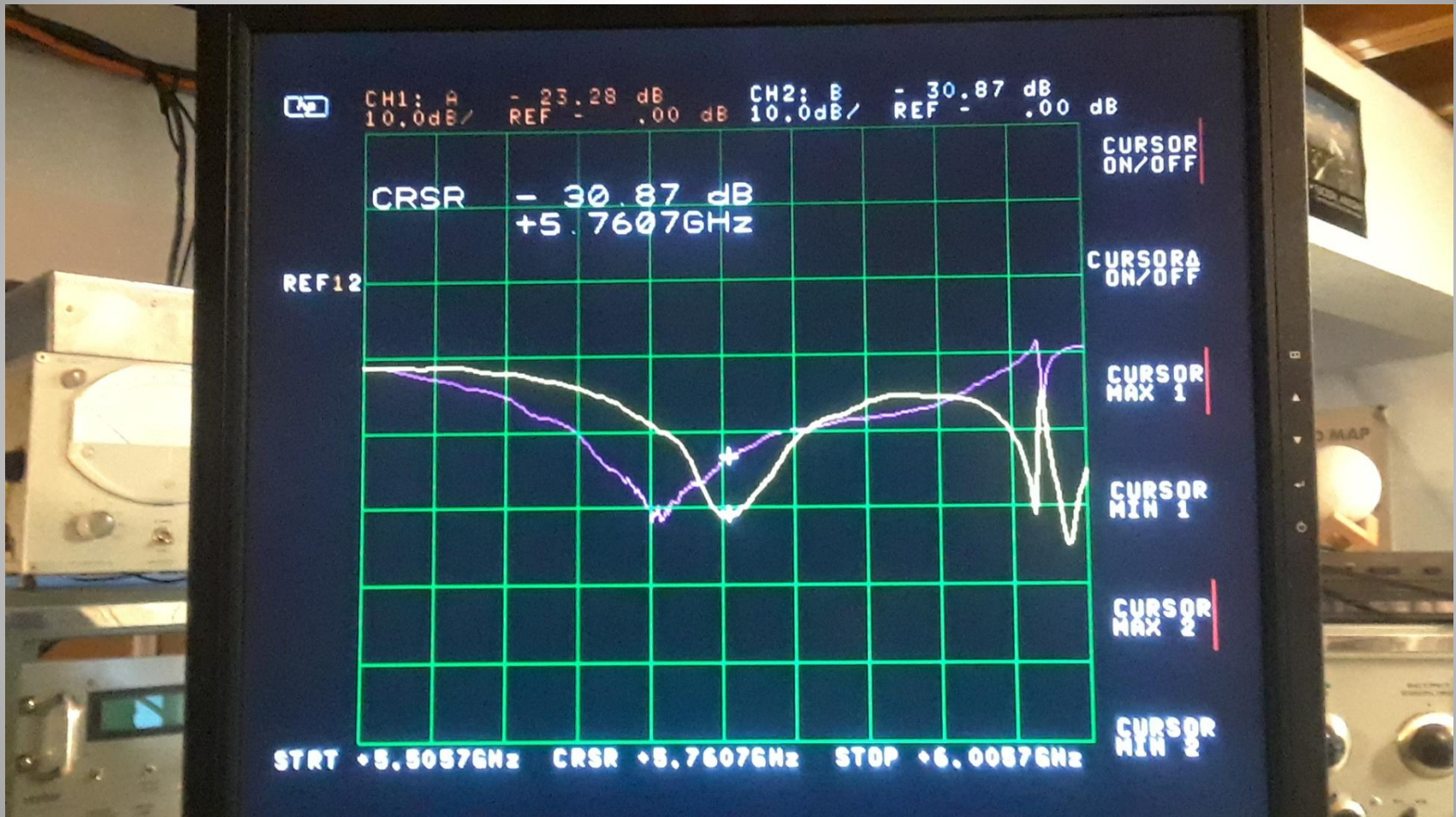
Slowly threading the bolts in I was pleasantly surprised to see the difference in amplitude when rotating the linear TX ant. It tuned to almost no noticeable change.. At most .5 dB difference I could detect..

RL and Isolation Recheck



To my surprise the isolation had increased and lined up better with 5.760 GHz. Readjusted the IMU and back plate, and tweaking the bolts even made it better... I checked the Circular Polarization again and very little change..

IMU Launcher Twist



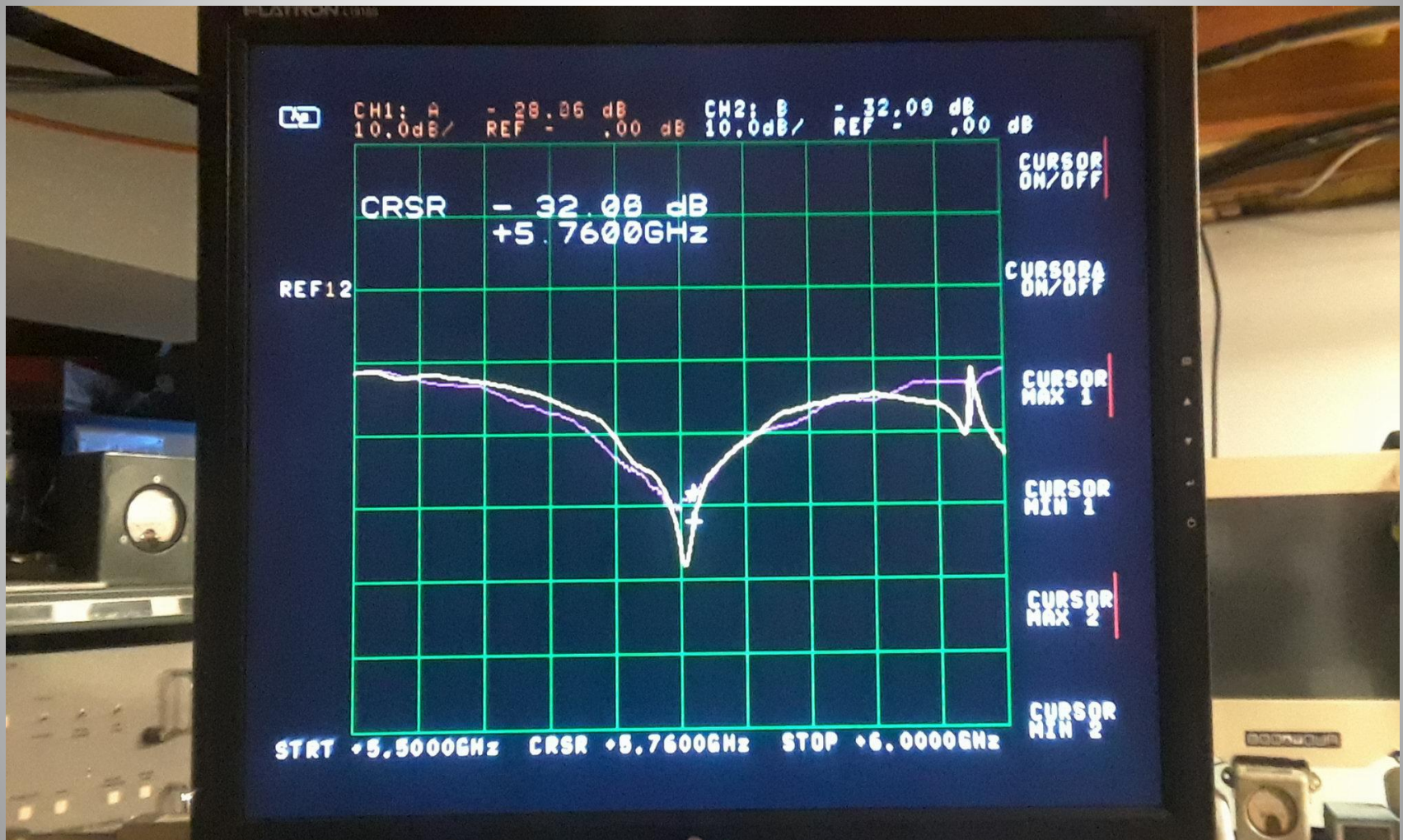
Twisting the IMU still changed things, so it was time for a new IMU..

New Aligned IMU launcher



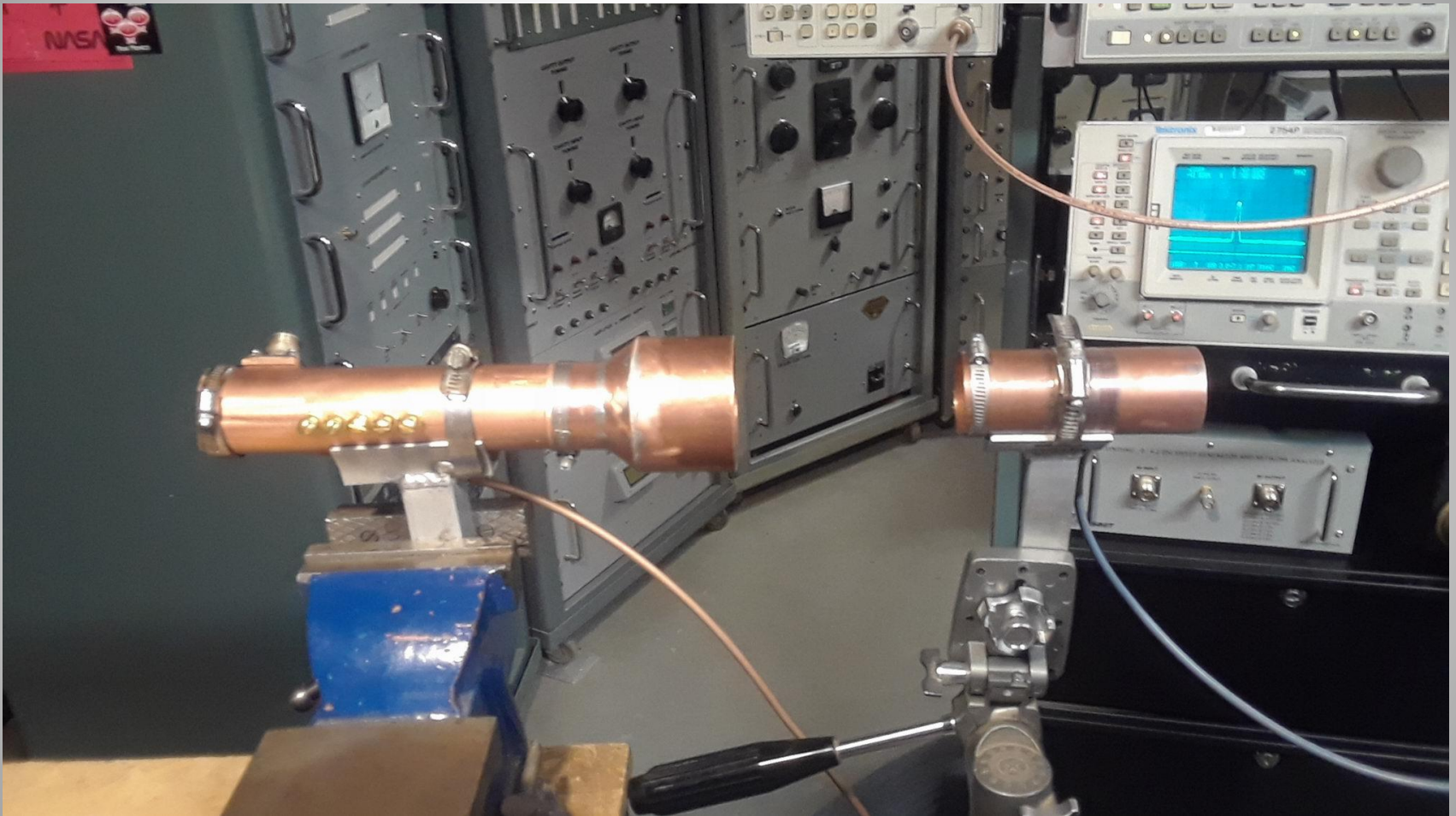
With a lathed aluminum ring inside the launcher holding it centered around the main copper pipe waveguide for centering and soldering..

New IMU Launcher Test



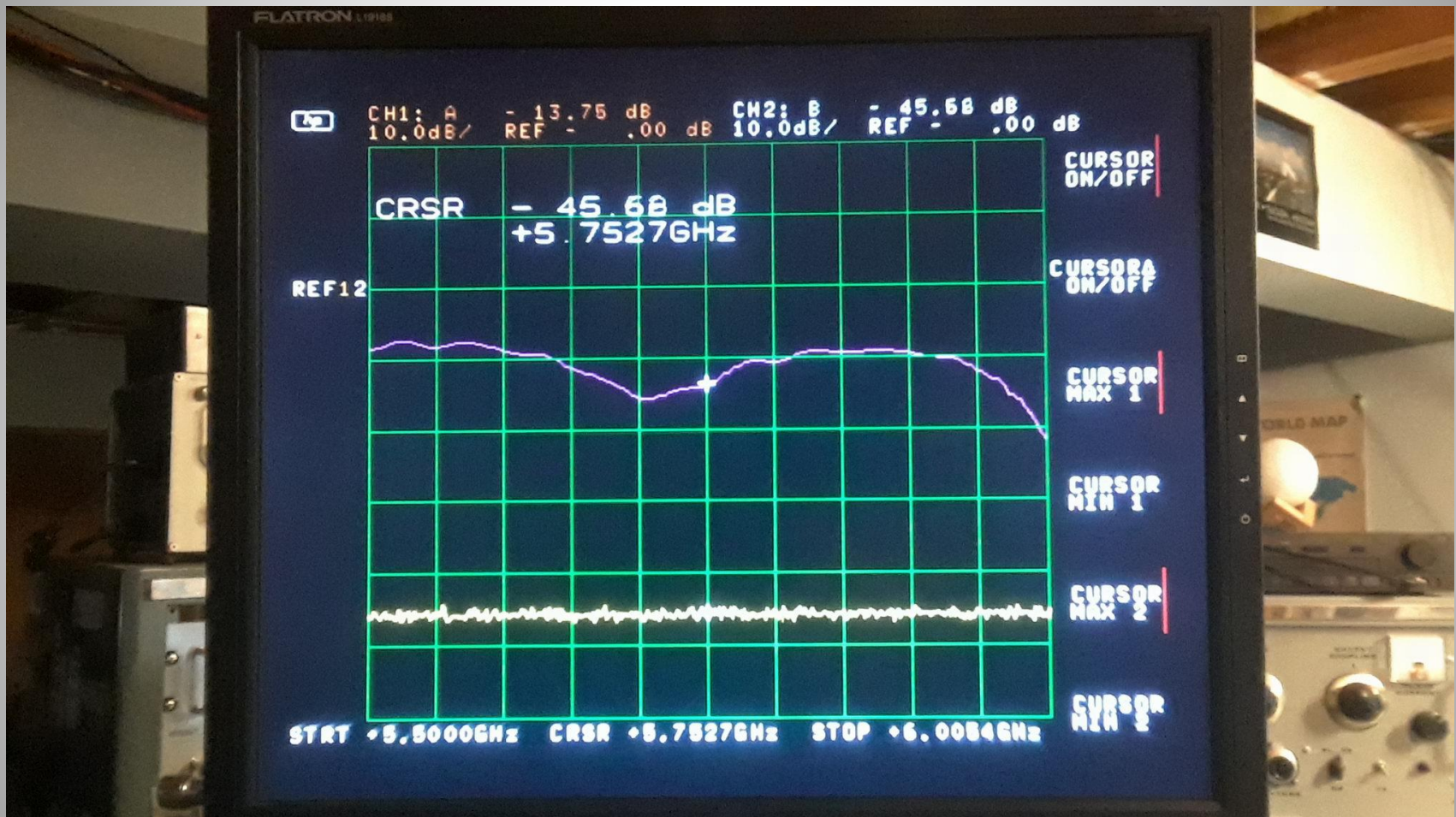
Things looked better and twisting the IMU now made very little difference..

Circular Test Again



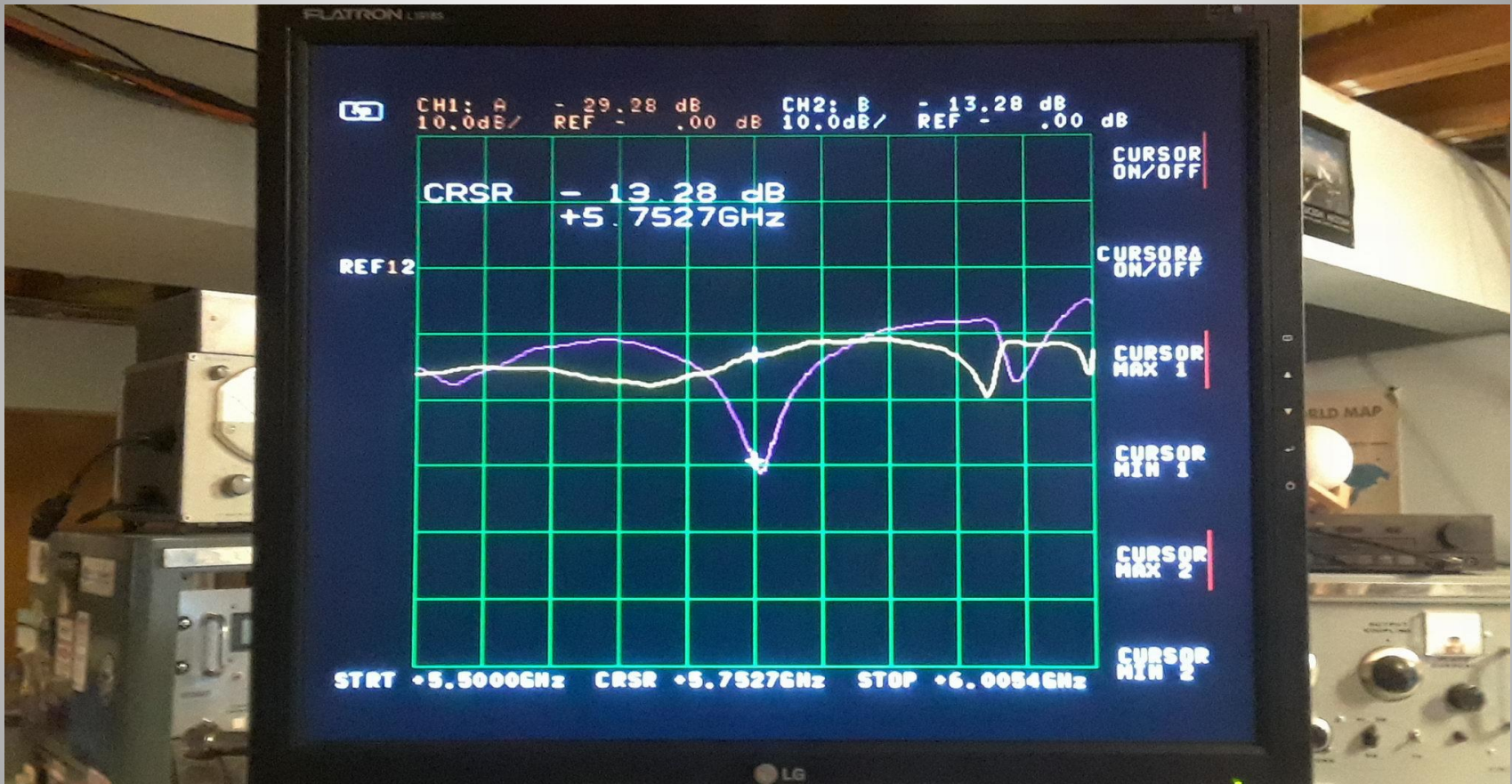
Once again this test proved to be excellent, less than 1 dB change..

Probe Wire Only Adjusted - SMA



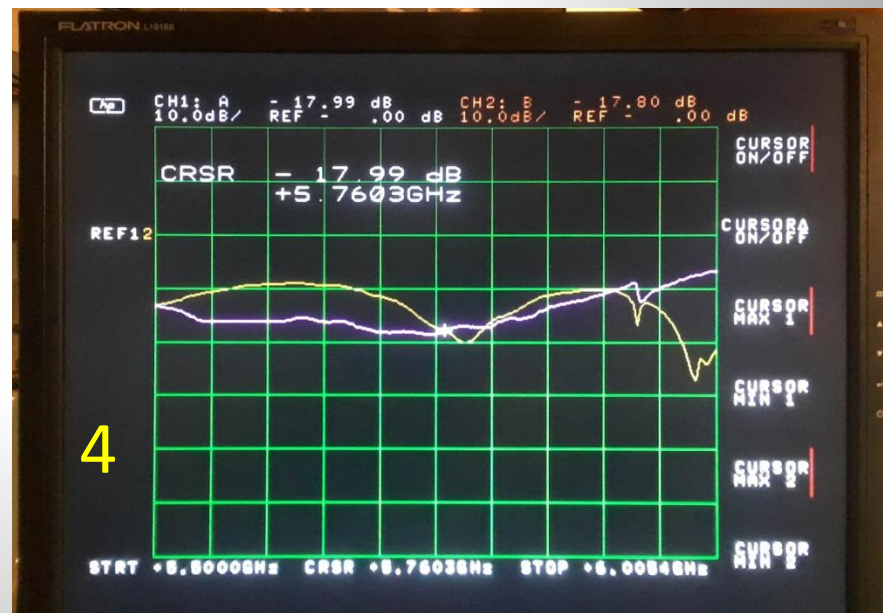
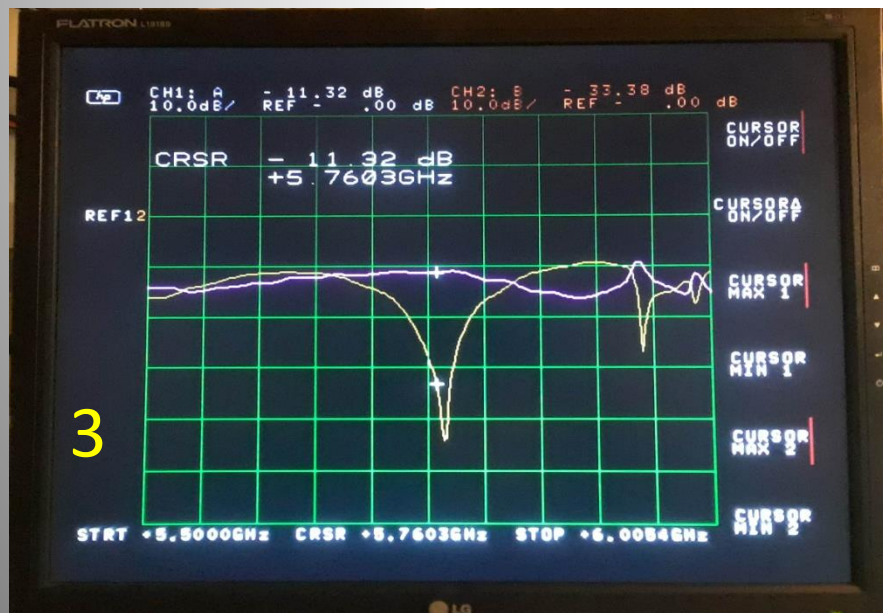
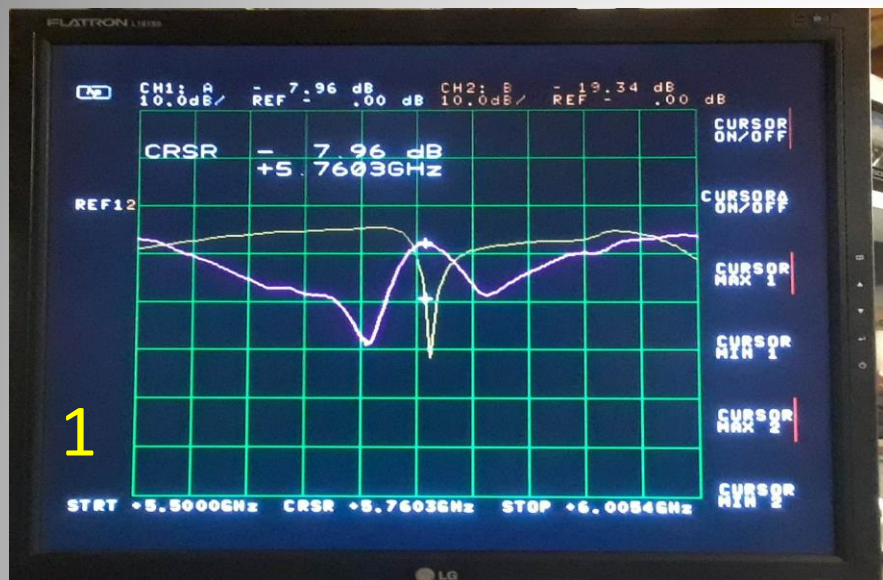
This was as good as I could get it with IMU and back plate tight or not adjusted. Different thickness of probe wires tried this being the best..

Return Loss Adjust - SMA

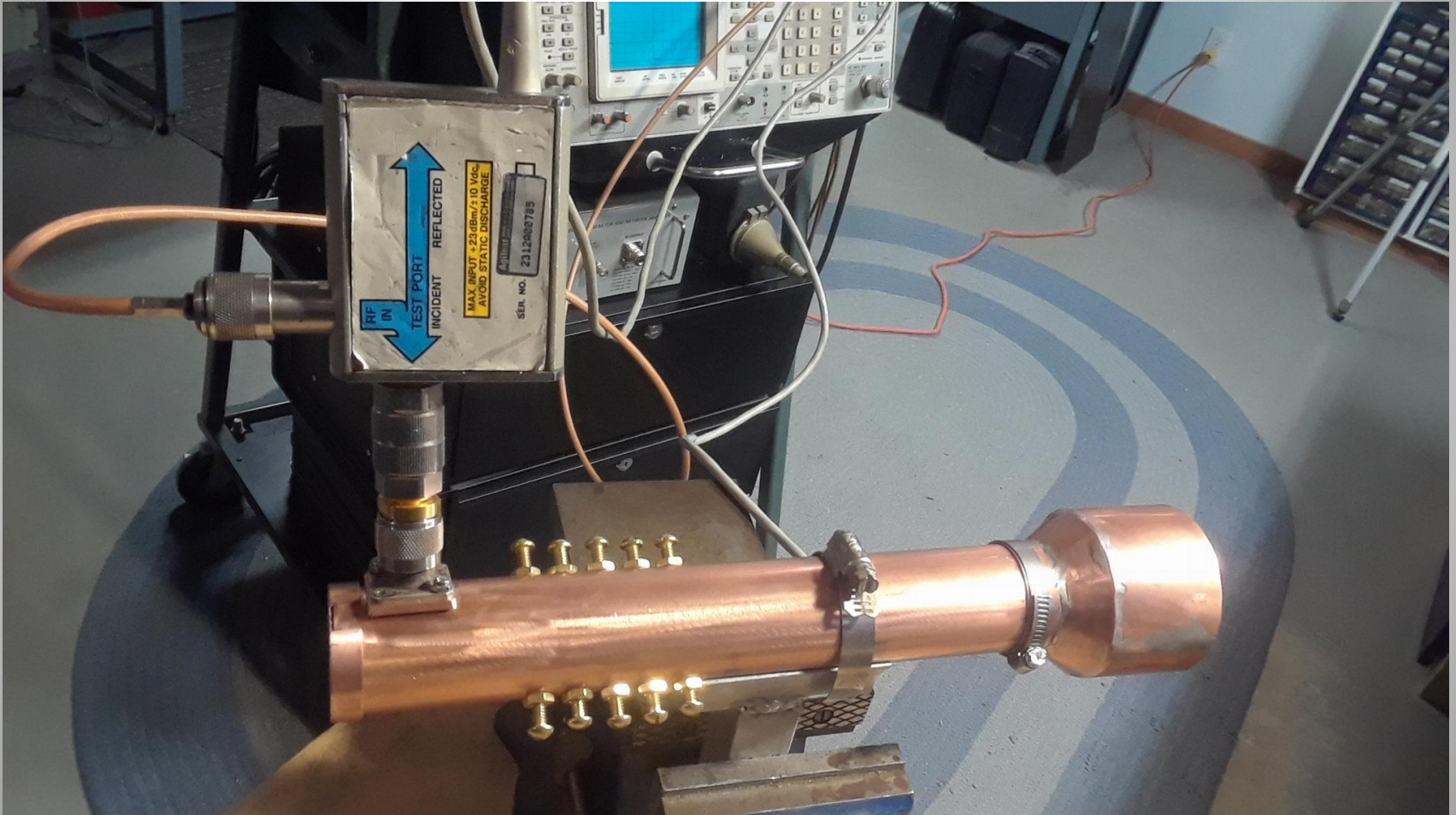


Next adjustment with back plate and IMU launcher adjusted for best RL of 29dB..
Isolation between ports though nothing special, 13dB..

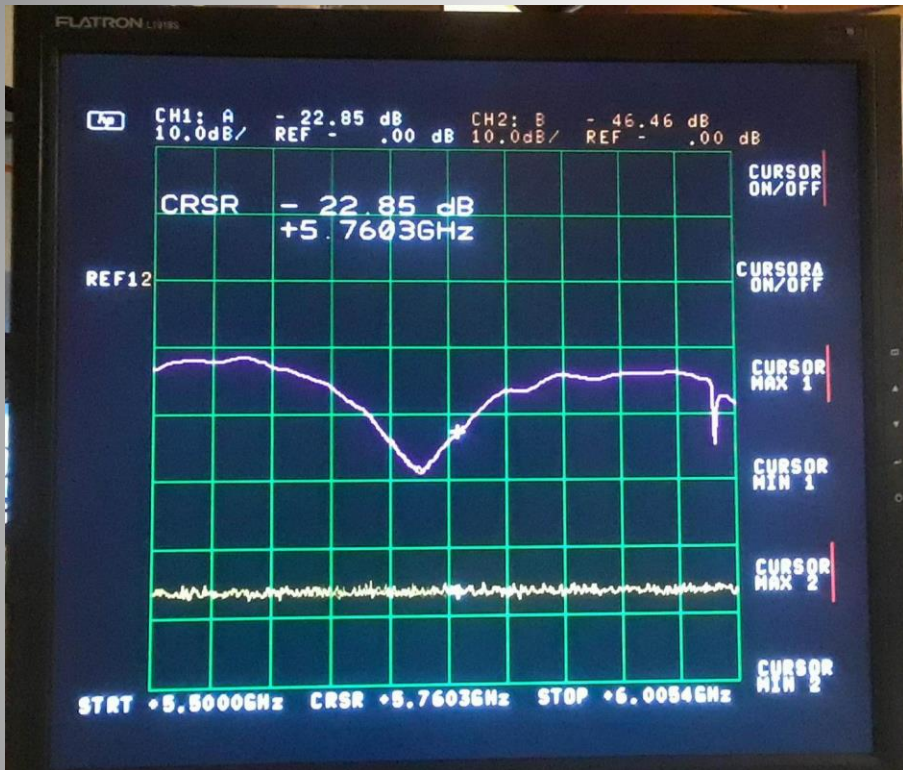
Polarizer Bolt Adjustment (bad)



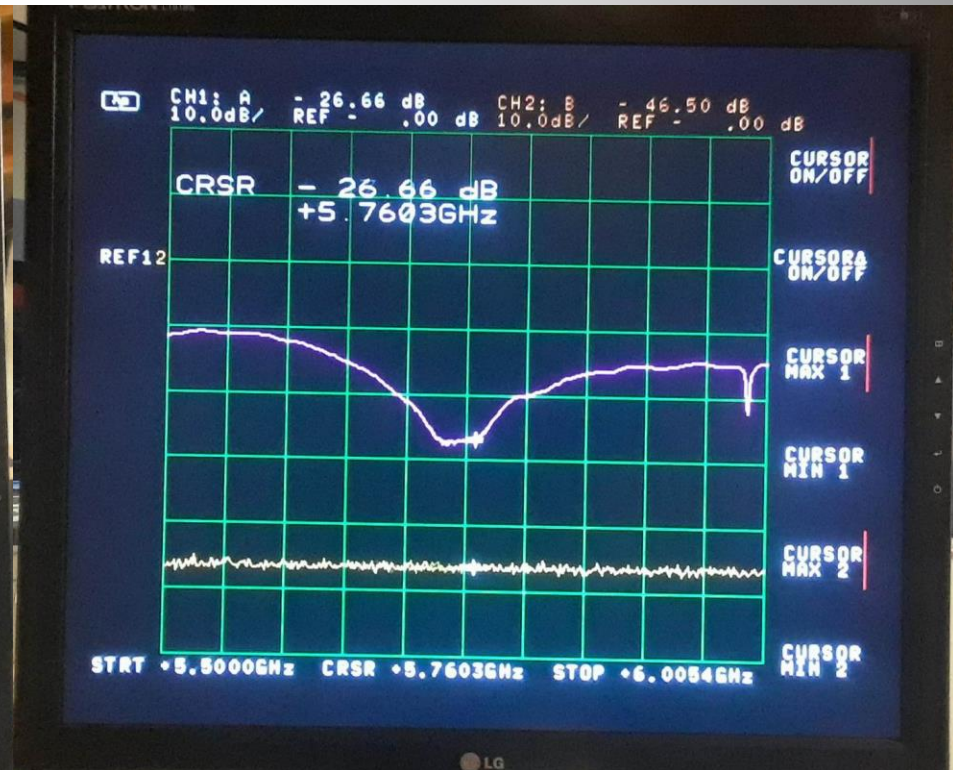
Again N Connector



More RL Sweeps



Best tuned with the IMU on



Best tuned with IMU off

No matter with the launcher on or off the feed had to be retuned each time

Isolation Test with N Connector



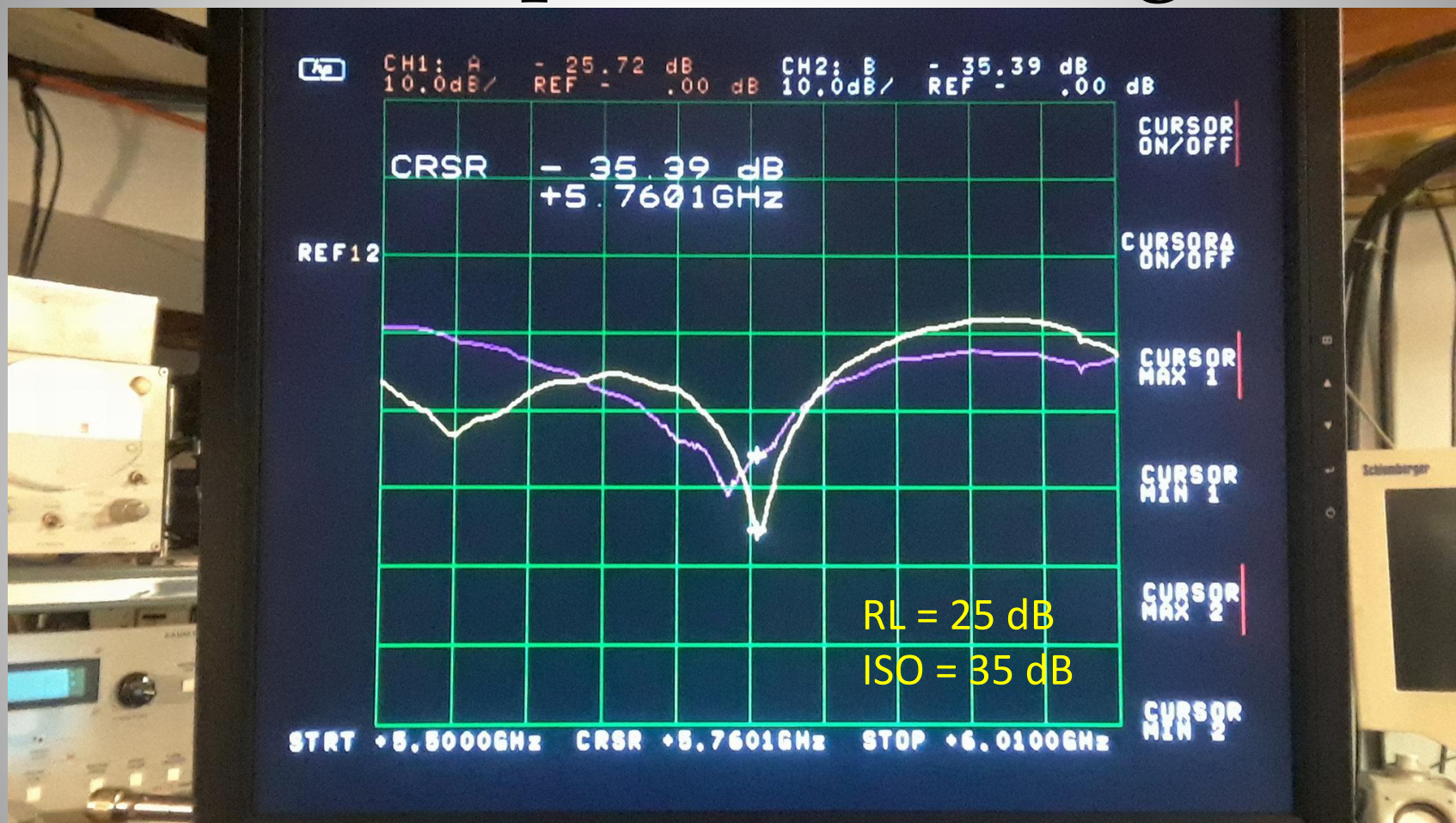
Isolation between probes
before bolt adjustments



Isolation between probes
After bolt adjustments

This sweep test and adjustments were done mainly for RL and best isolation, no polarization check yet..

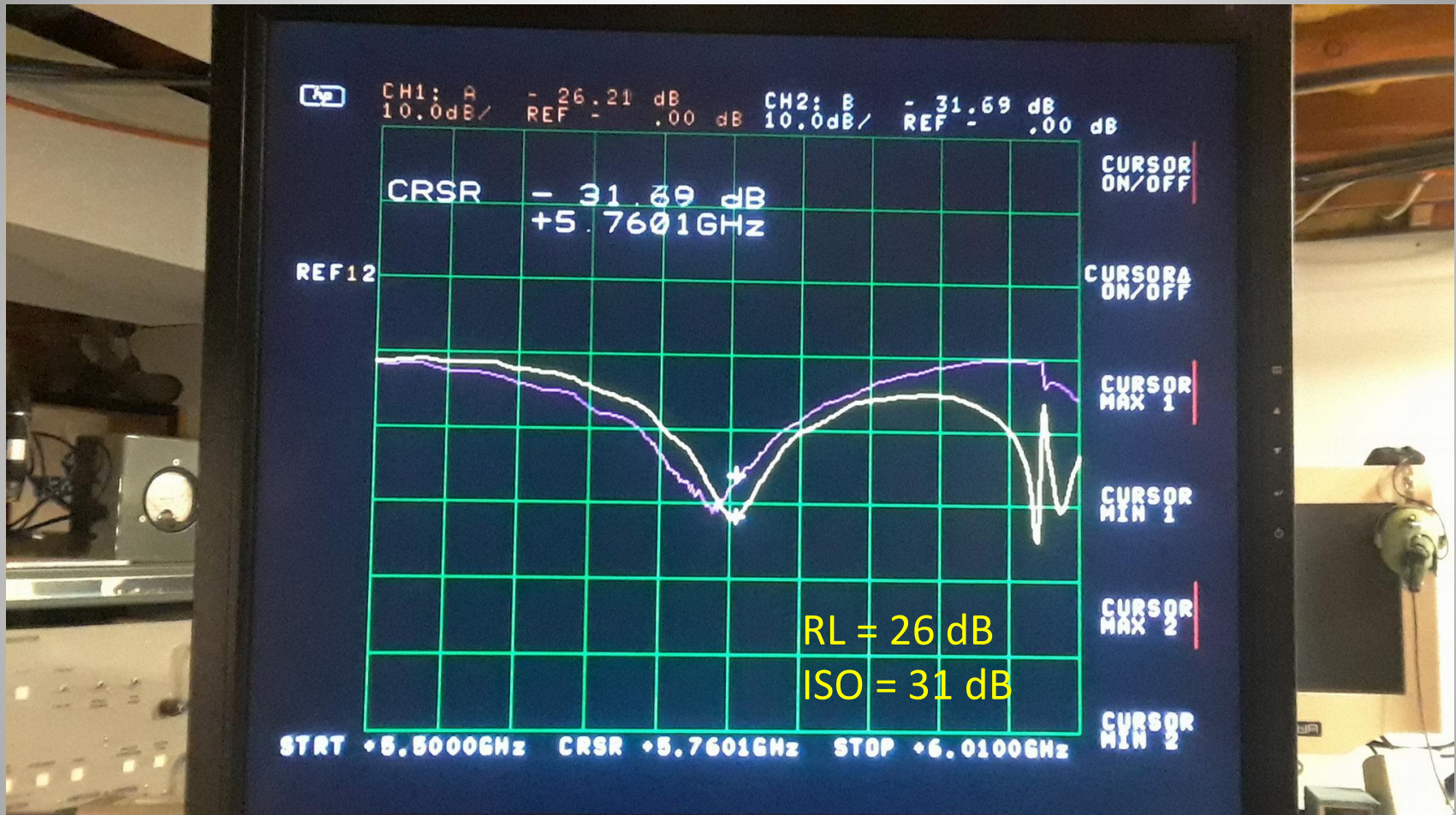
Final Comparison - Long Tube



After Circular Polarization Adjustment

This is the longer bolt polarizer feed final sweep for TX return loss and isolation. The Circular Polarization was tested to be a difference of about 2 dBm..

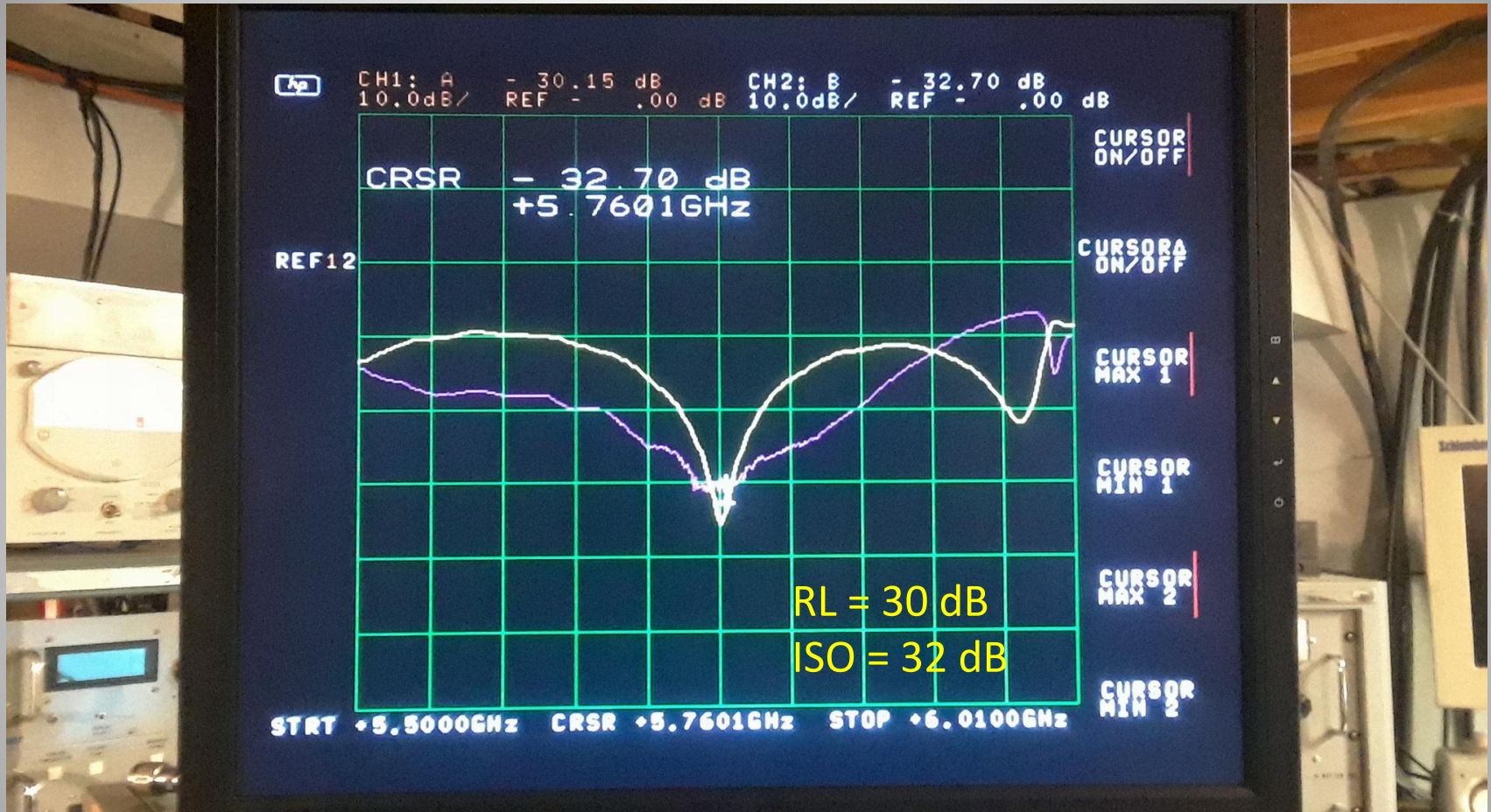
Final Comparison - Short Tube



After Circular Polarization Adjustment

The final test of the shorter bolt polarizer feed for RL and Isolation..
Circular Polarization test was possible to be adjusted to less than 1 dBm..

Final Comparison - Squeezed Tube



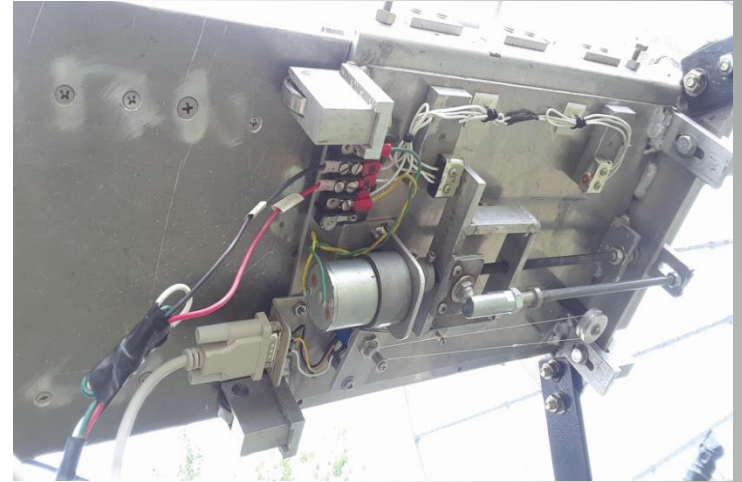
After Circular Polarization Adjustment

Final adjustment and test of the squeezed feed for RL and isolation. Circular Polarization was at 4 to 5 dBm.. Being a fixed type it wasn't possible to try and readjust to make better, not easily..

Conclusion Part-1

- All three feeds are usable but squeezed feed is low on Circular Polarization and would be very hard to adjust for a better rating..
- Shorter feed seems to have better polarization due to closer bolt spacing compared to the longer feed assembly (?)..
- The type of launcher has a great effect on RL and Isolation tuning, way more than I have seen on lower frequency feeds I have built.
- N connectors seem to be easier to use than SMA.. I even tried different types of SMA connectors with no better success..
- Swapping launchers to see the difference when using solar noise will require a complete retuning of the feed itself..

Finally the Dish Test



Upgraded Feed Actuator

After Hours of Murphy Induced Problems... The Sun Was Climbing..

Feed Assembly Monitor & Control

5.760 Ghz Transverter, Amplifier Feed Control and Monitor Ver-1 Dish VE6BGT

SEQUENCER STATUS - GOOD TO GO AUTO SEQUENCE

MANUAL SEQUENCE STATUS

RECEIVE DC CONTROL OFF BIAS CONTROL OFF AMP ENABLED PREAMP ON RECEIVING RECEIVING

PTT INPUT AMP DRAIN VOLTAGES PA GATE BIAS VOLTAGE POWER AMP STATUS RX PREAMP STATUS TRANSVERTOR MODE RADIO MODE

VHF EXCITER RECEIVING

144 MHz - 5.76 GHz KUHNES TRANSVERTOR

12 WATT DRIVER AMP

100 WATT POWER AMPLIFIER

STANDBY ON RECEIVE

30dB GAIN RX PREAMP

+12 VDC

+24 VDC

PTT

EXIT POWER AMPLIFIER

VE6BGT COMM-15

6 Centimeter Feed Assembly Status Monitor Ver-4 VE6BGT

Amp-A Current 90W - 2.1A: 00.1 Amps

Amp-B Current 90W - 2.4A: 00.1 Amps

Amplifier Voltage: 51.6 Volts

Amplifier Temperature: + 21.6 C

Amplifier Output: 00.0 Watts

12V Circuit Voltage: 13.1 Volts

Preamp Voltage: 12.9 Volts

Preamp Relay Voltage: 23.7 Volts

X - Factor: 18

AD Count Below 20: 7

Attenuator Setting: X Factor UP, X Factor DWN, Text1

Feed Assembly Status

* * *

* Cooling Fan On

AMP LOW TEMP SETPOINT = 25.0 C AMP HIGH TEMP SETPOINT = 40.0 C AMP LOW VOLTAGE SETPOINT = 48.5 V

FAN OFF TEMP SETPOINT = 20.0 C

VE6BGT COMM 16

FEED OUT FEED POSITION FEED IN

04.1

SETUP EXIT

6 Centimeter Feed Assembly Status Monitor Ver-4 VE6BGT

Amp-A Current 90W - 2.1A: 00.2 Amps

Amp-B Current 90W - 2.4A: 00.3 Amps

Amplifier Voltage: 51.5 Volts

Amplifier Temperature: + 22.3 C

Amplifier Output: 00.0 Watts

12V Circuit Voltage: 12.9 Volts

Preamp Voltage: 00.0 Volts

Preamp Relay Voltage: 00.0 Volts

X - Factor: 18

AD Count Below 20: 7

Attenuator Setting: X Factor UP, X Factor DWN, Text1

Feed Assembly Status

* Amp-A Drain Voltage On * Driver Amp Voltage On

* Amp-B Drain Voltage on * Cooling Fan On

* Amplifier Gate Bias On * Transverter in TX Mode

AMP LOW TEMP SETPOINT = 25.0 C AMP HIGH TEMP SETPOINT = 40.0 C AMP LOW VOLTAGE SETPOINT = 48.5 V

FAN OFF TEMP SETPOINT = 20.0 C

VE6BGT COMM 16

FEED OUT FEED POSITION FEED IN

04.1

SETUP EXIT

6CM Controller Setpoints VE6BGT

EXISTING FAN OFF TEMP: 20.0 C

EXISTING TEMP ALARM OFF: 25.0 C

EXISTING HIGH TEMP ALARM ON: 40.0 C

EXISTING LOW VOLTAGE ALARM: 48.5 V

POWER LEVEL - 0

0

UP

DOWN

SEND DATA

1 2 3

4 5 6

7 8 9

0 . BACK SPACE

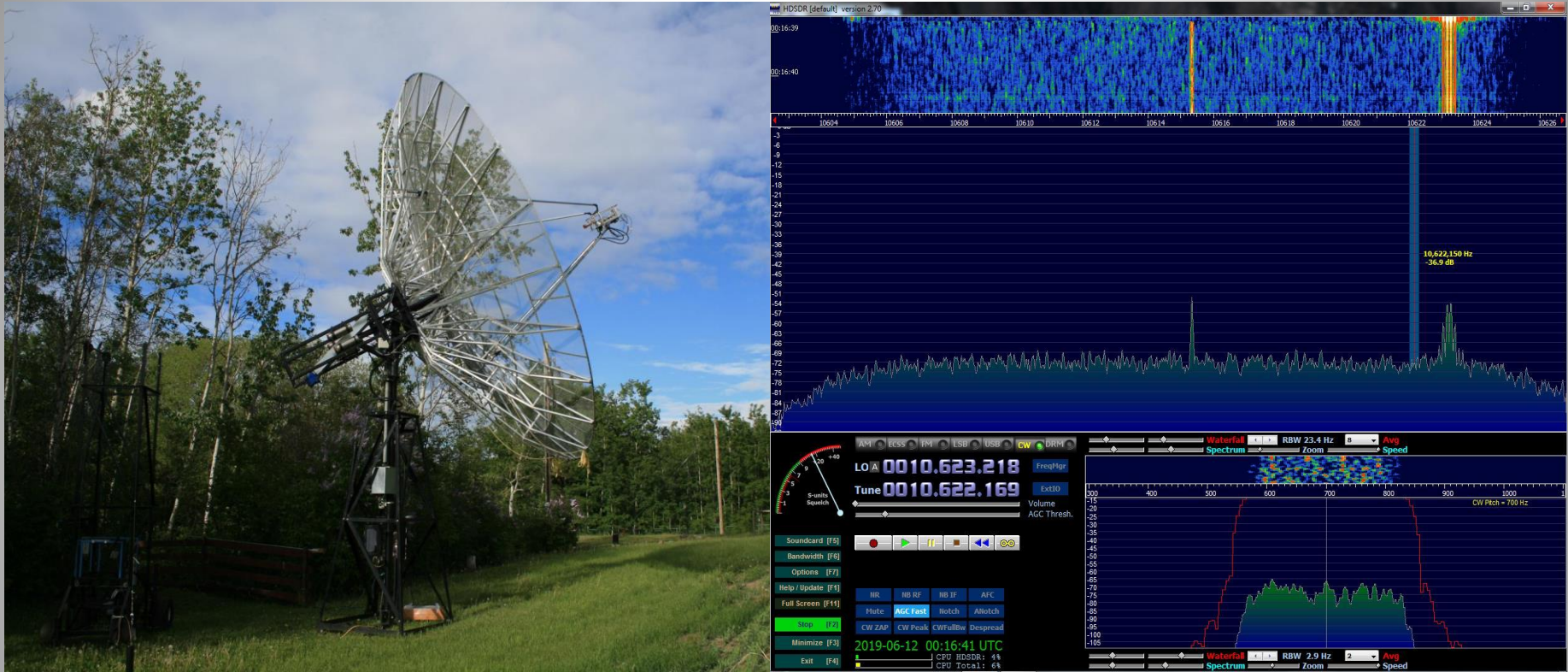
EXIT CLEAR

ENTER ALL PRESET POINTS BEFORE SENDING DATA

VE6BGT COMM-16

SEND DATA STOP ALL DATA

Solar Noise and Moon Echo Test



Solar Flux Index at 69, Cold Sky to Solar Noise – 14 dB Increase After Peaking..
Moon Echo around 17 to 18 dB above the noise floor..
Dish Aiming Critical, .75 degree Elevation off and echo was gone in ..

