The Road to 10 and 24 GHz

Club Project … May Status

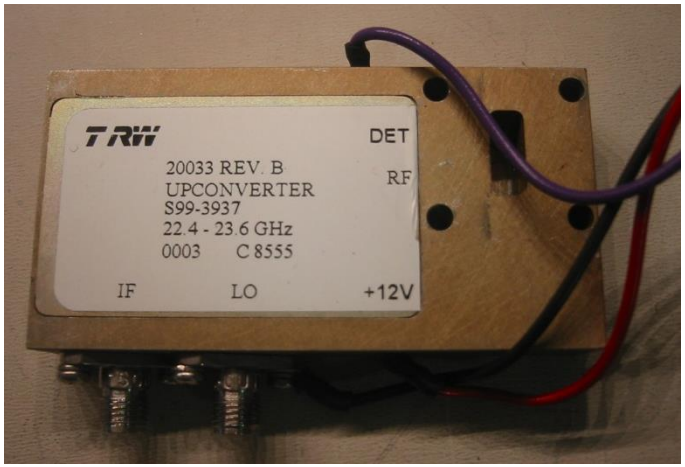
Workshops

- 24 GHz Up, Down Converter Testing (4/27)
- 10 GHz Brick and Filter Tuning (4/28)
- 10/24 GHz Feed, Soon
- 10 GHz Feed, Soon
- 10 GHz Brick Crystal Install, June

24 Ghz Workshop

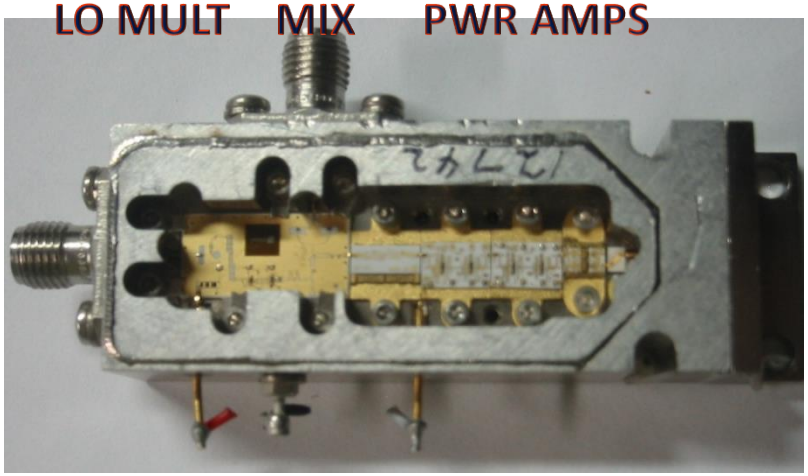
- 24 GHz Testing on Saturday, 4/27
  - N9JIM, KD6W, W6RXQ, K6MGM, K6ML
  - Thanks to Will for source, filter, atten, dncvtrs
  - Thanks to Joel for 24 GHz SA
- Upconverters (3744 + 10224 -> 24192)
- Downconverters (24.2 - 10224 -> 3744 SA)

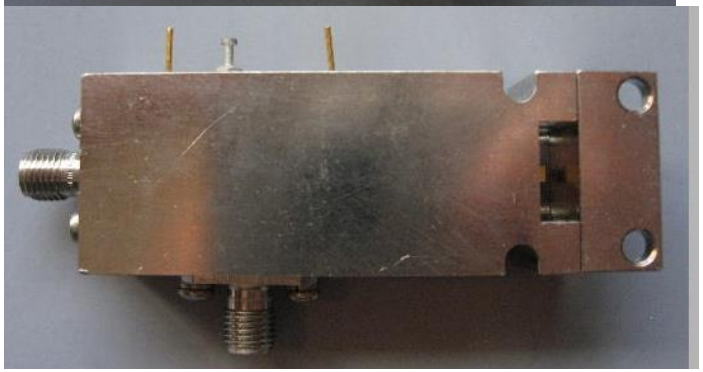
“PCOM” Up Converter Mug Shots



WR42/34/28 ***RF OUT***,
SMA LO IN & ***IF IN***
Longer than down converters (more stages)

LO MULT MIX PWR AMPS





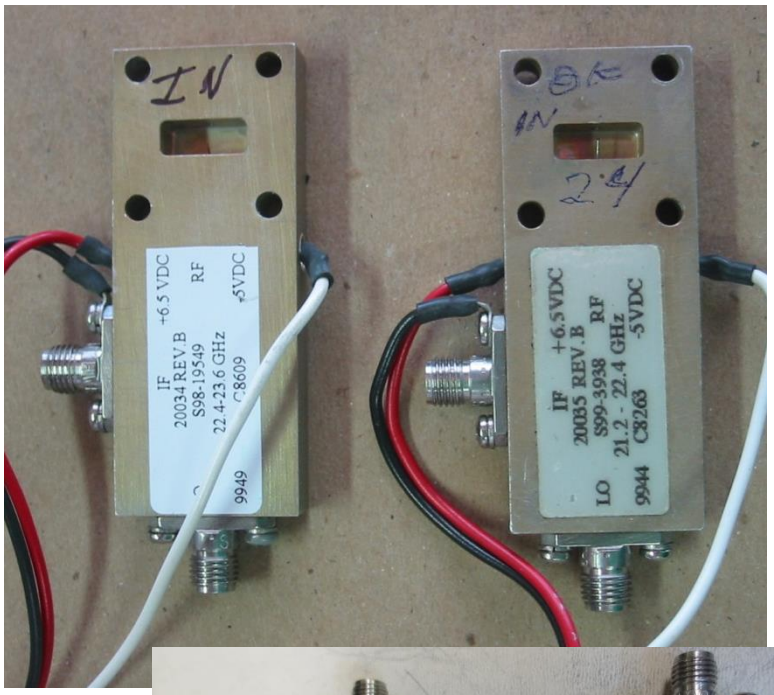
24 Ghz Workshop

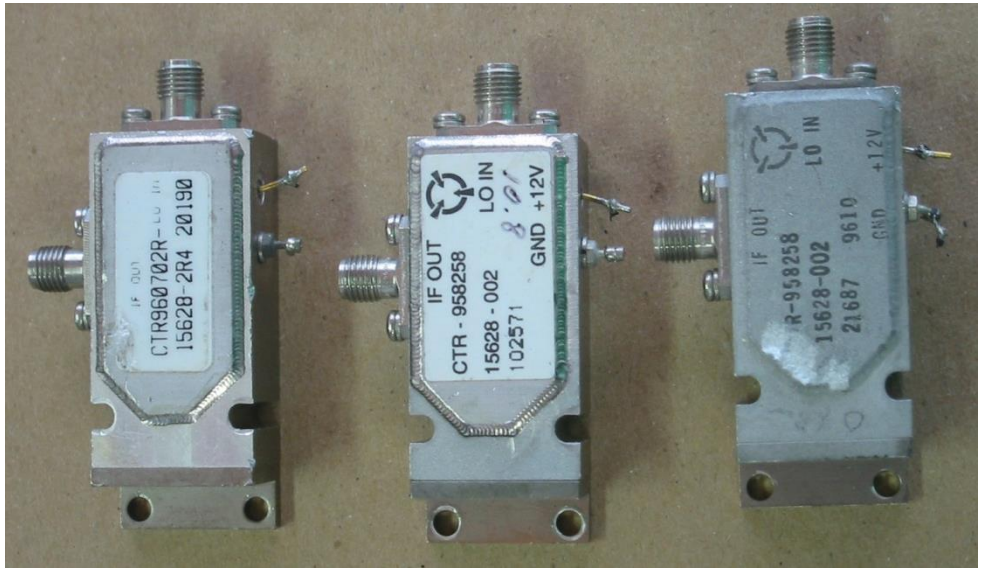
13 Upconverters (3744 + 10224 -> 24192)

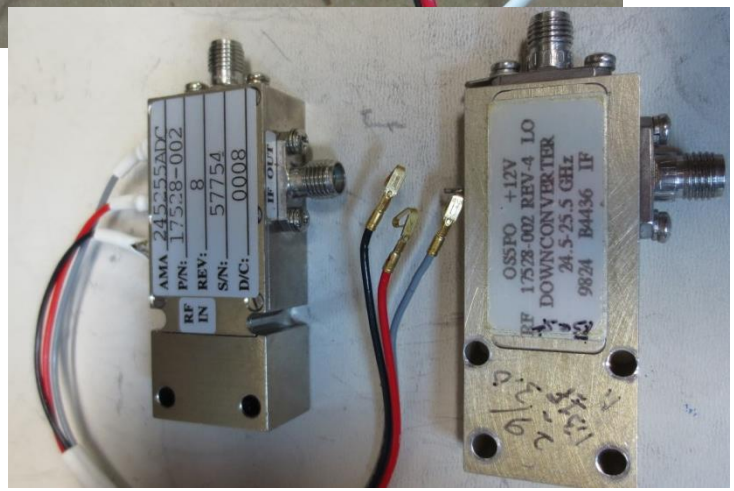
- +10 dBm (most), -5 to -1 dBm (some) 3744 IF input
- +10.6 dBm (most, some less) 10224 LO input
- +22(3), +20(3), +17.5, +14, +13(2), +10, +1, -2 dBm (< 1mW to 150 mW) 24192 RF output

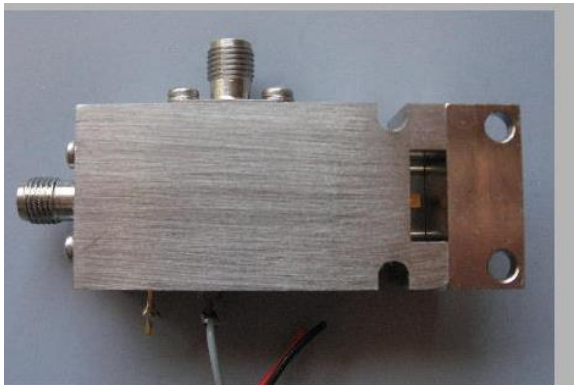
- Strong LO leakage @ 20.4
- No image @ 16.7

“PCOM” Down Converter Mug Shots









WR42/34/28 ***RF IN***

SMA LO IN & ***IF OUT***

Usually shorter than up converters

24 Ghz Workshop

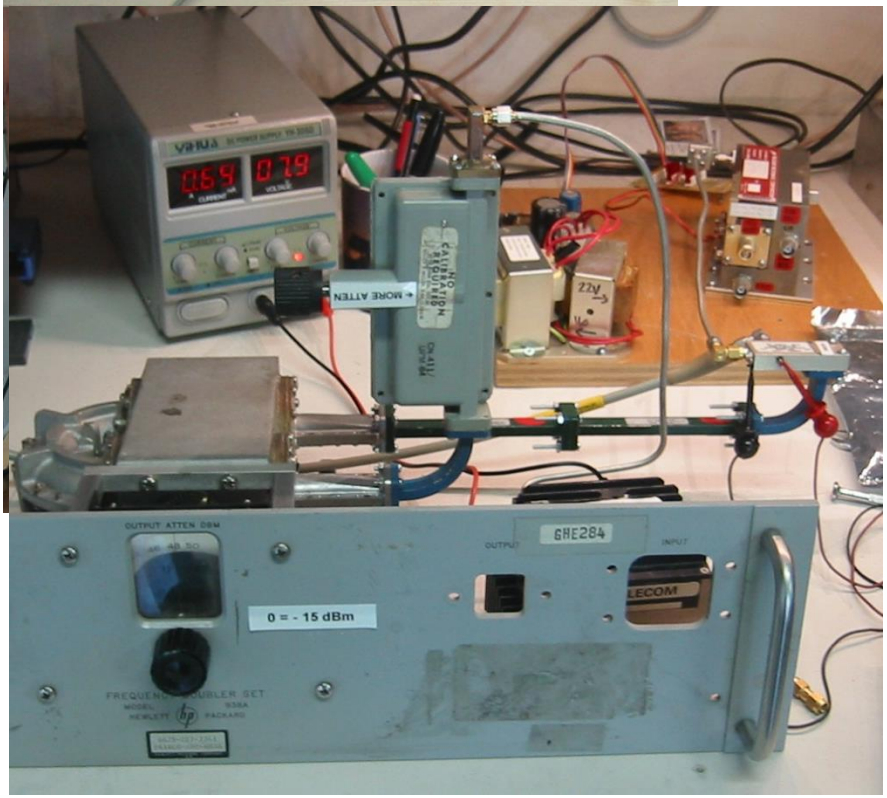
>12 Downconverters (24.2 - 10224 -> 3744)

- Not set up to measure NF at this time
- MDS test limits:
  - Attenuator leakage (-95 dBm) @ RF
  - SA MDS @ IF

- +11 (some OK with +8, two with +5) dBm 10224 LO/2

- Conversion loss/gain: “deaf”, -15, -6, -2, +5, +8, +11 dB

Down Converter Test



IF out to
spectrum analyzer

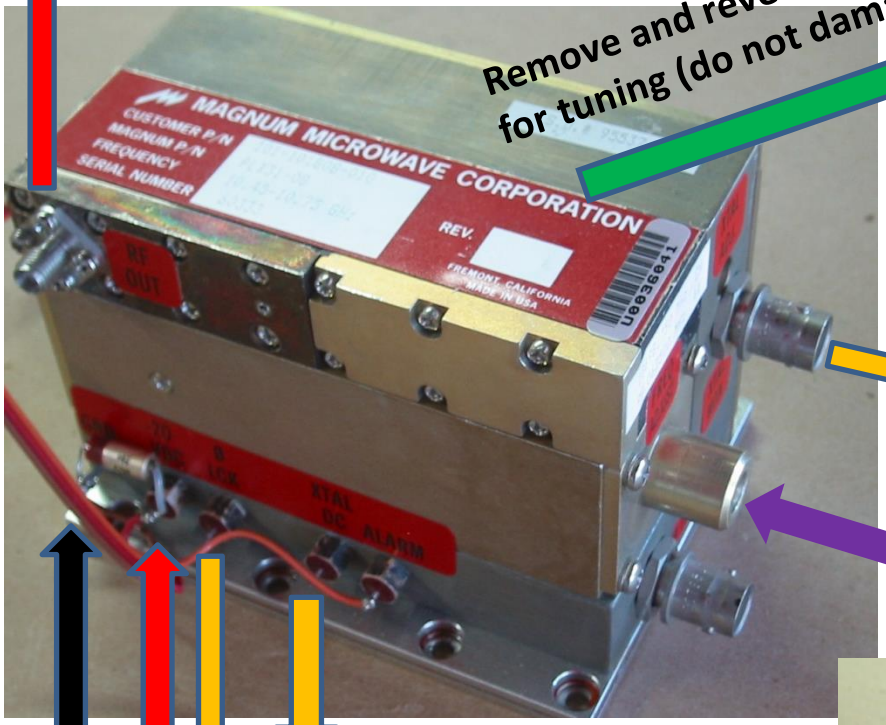
LO in
from brick

24 Ghz source into 3 cascaded vane attenuators

10 Ghz Workshop

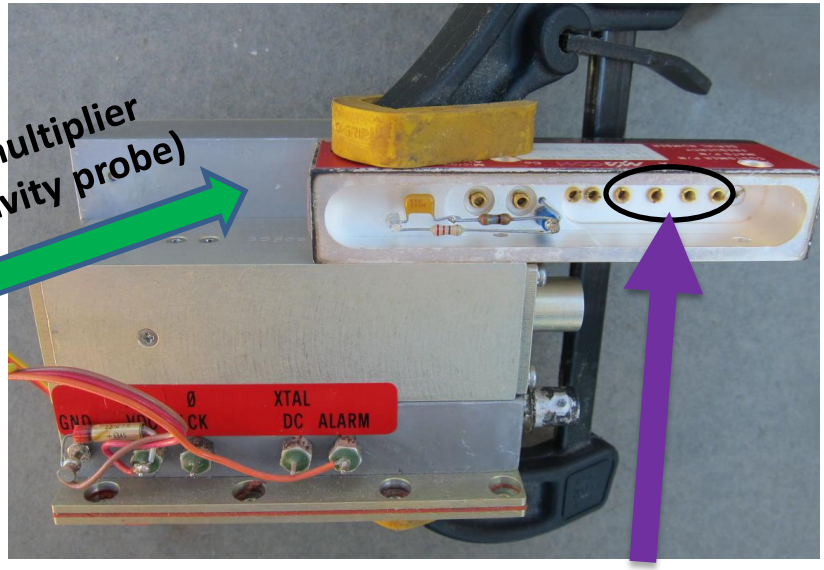
- 10 GHz Brick and Filter Tuning on Sunday, 4/28
  - KK6DNY, AA6PZ, K1YQP, W6PDC, N6KLD, KB6BA, W6RXQ, K6CLS, K6ML
  - Thanks to Paul, W6PDC, for bringing his VNA and tuning filters
- ~8 Bricks retuned to 10224
  - Most gave +14 to +15 dBm output
  - Used SA, counter, scope, DVM, power meter; temporary 106.5 xtals
  - Retuned cavity osc to 1704 MHz, repeaked mult out filter at 10224 MHz
  - Most were MACOM/Magnum PLX31-08 internal xtal (from Harris)
  - One external, one 11 GHz, one eBay…
- Harris Farinon chassis conversions, waveguide filters
  - Retuned or checked ~8 waveguide filters
    - 0.7 to 1.3 dB insertion loss, ~30-40 MHz passband
    - About 110 Mhz wide at -40 dB down, 150-175 MHz at -60 down (VNA limit)
  - Rewired a couple of Harris units on the spot for Rx, one heard the beacon
- Also checked a DB6NT PA

Brick Tuning



10224 MHz @ +15 dBm

Remove and reverse output multiplier for tuning (do not damage cavity probe)

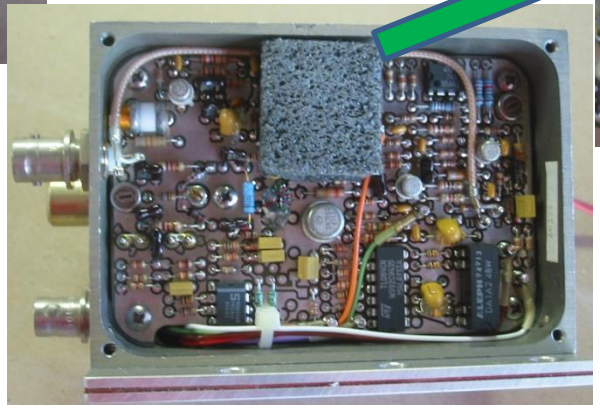


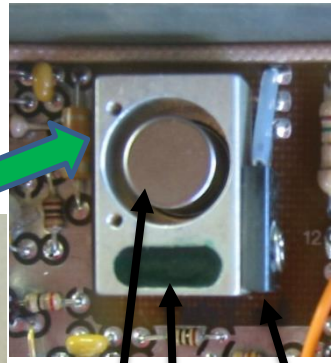
Tune these four screws
X6 Mult Out filter (10224)

Xtal osc freq mon

Cavity Osc Tune (1704 MHz)

Xtal oven





GND

-20V
(replace cap before it blows!)

Xtal osc level det

PLL Error Voltage
(set for -8 to -9 DC; AC wave when not locked)

heater

temp sense

Xtal (106.5 MHz)

10224 Bricks

- Nineteen 106.5 MHz crystals (for PLX31-08) due by end of May
  - Delivery at June meeting or by other arrangement ($40 ea)
  - Will hold an “insertion/tuning” workshop in June
  - Trim leads carefully (.15” +/- .03”, use a jig) to fit oven socket w/o shorting
  - Additional internal and external foam insulation to reduce temp drift
  - Tune oven temp to minimum drift point of xtal

- Brick Power Supply
  - Brian/Duncan found Mean Well SD-25A-24 12VDC-24VDC converter
    - $21 at TRC electronics or Jameco
    - Looks clean on SA, sounds good on air tests
  - Build and mount a -20 V linear regulator at brick power pins
    - Filters out converter hash and wiring IR drop to avoid FM, spurs and voltage drift
    - Use 3 term reg or Duncan’s multi-terminal reg design
    - Remove old cap on brick -20V (it may blow)

10224 Bricks

- Preliminary Measurements of Temperature drift at 10224 MHz
  - Wrong xtal package and temp, open cover, poor oven fit:
    - ***~8 kHz over 20 deg F***
  - Right xtal pkg, ? Xtal temp, sealed and insulated brick:
    - ***~4 kHz over 20 deg F***
  - Correct pkg & temp, correct oven temp, insulated brick:
    - ***TBD in June***

- Future project:
  - Lock 106.5 osc to 10 MHz double oven ref for better stability
  - Upgrade for:
    - Bricks (int/ext VCXO)
    - DB6NT/DEMI LO (ext VCXO)

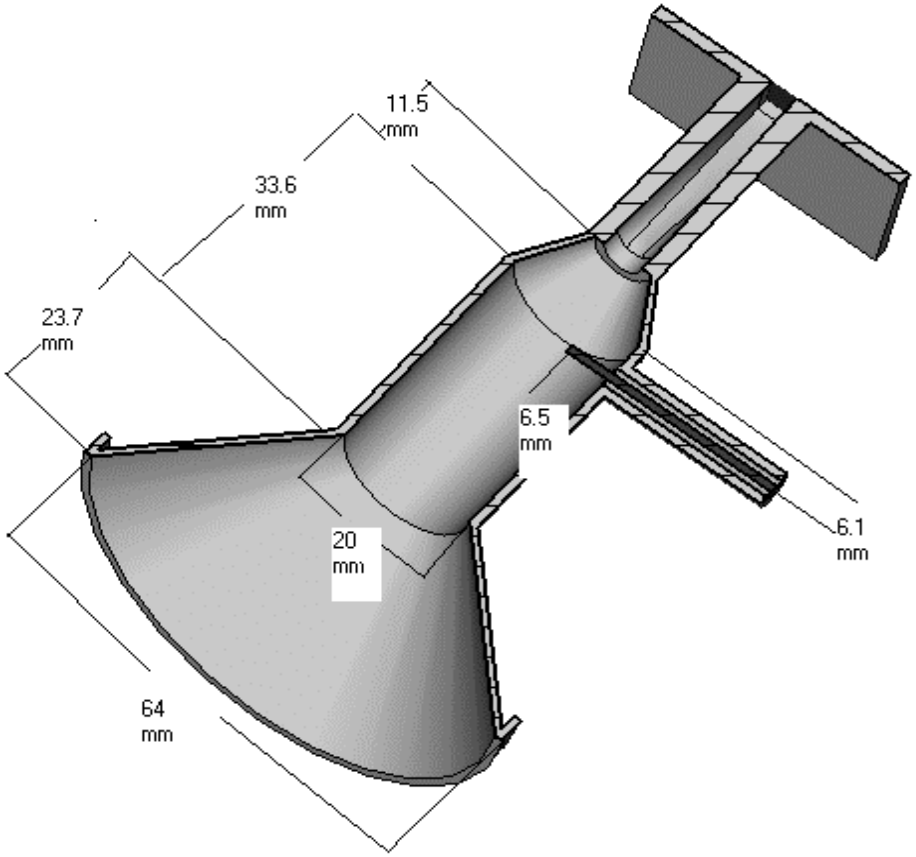
Dish Feed Workshops

Status: 10/24 GHz Dual Frequency Dish Feeds

Steve Shyvers

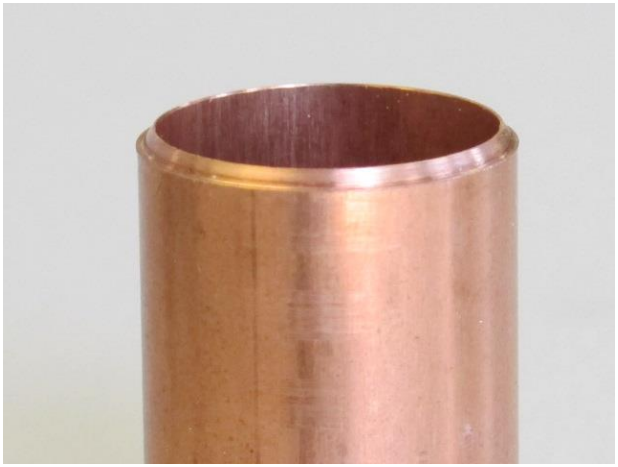
n6kld

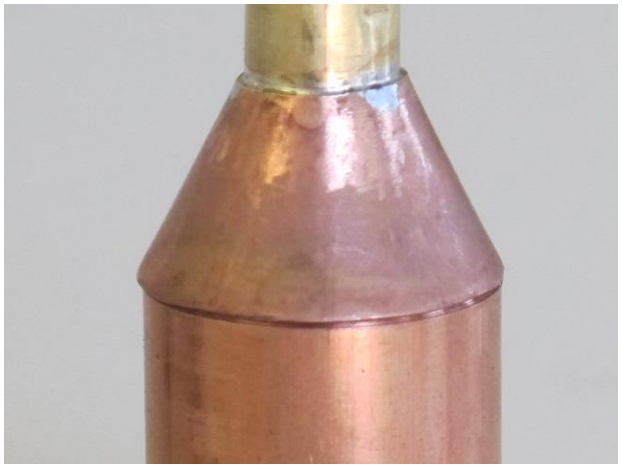
10/24 GHz Dual Frequency Design from Gary's and Lars' 2001 Presentation

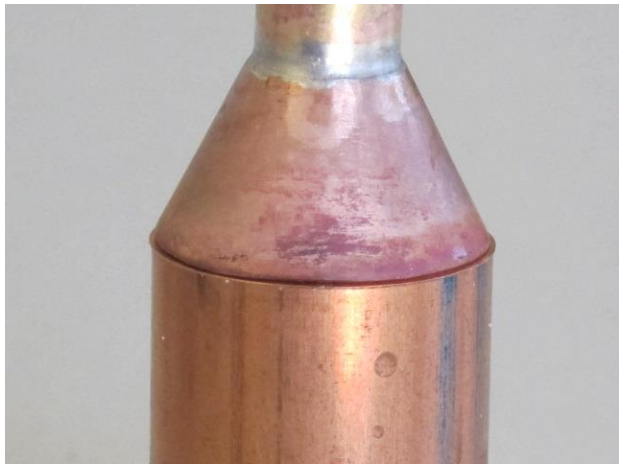


Silver-Soldered 24 GHz to WR-42 Transitions

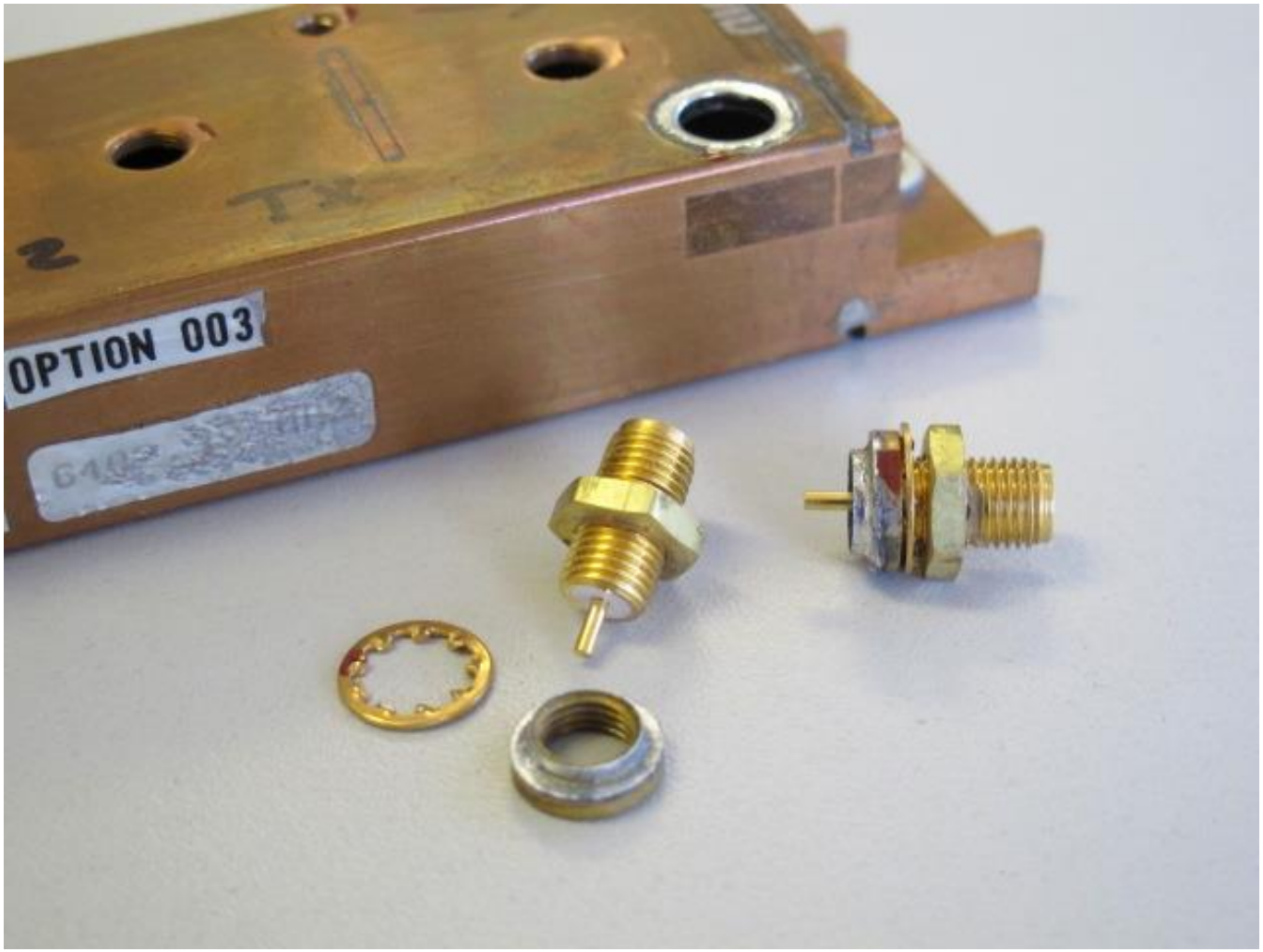
Fitting Small Cone to ¾" Pipe







SMA Connectors from 6.4 GHz Harris Filter



Chapparal Corrugated Cone Feed
(useful for front of 10/24 or for 10)

chaparral.net http://www.chaparral.net/feed-horns/offset-straight-feedhorn/

11/12 GHz Offset Straight Feedhorn

Designed for reception of signals in the extended Ku-Band range of 10.7 – 12.95 GHz, the 11/12GHz Offset provides internationally renowned Chaparral quality and reliability.

Specifications

Part Number	13-4016-1
Frequency Range	10.7-12.95 GHz
Reflector Type	Offset
Insertion Loss	Less than 0.1 dB
VSWR	Less than 1.3 to 1
f/D Range	0.60 to 0.90
RF Ports	WR75
Size	70mm x 108mm
Mounting Diameter	27mm
Weight	6oz/166grams

Ku Offset

Price: $30.00

Buy Now

Applications

The Offset Feedhorn is ideally suited to deliver exceptional performance with any high stability LNB downloading high speed internet data or the latest in digital television.

Features

- Single polarity reception
- Weather tight throat cover
- Economical
- Easy to install

More Workshops ?

- Rig Show and Tell? (@June meeting?)
  - Mechanical and Electrical Platform Techniques
- Antenna Range ?
  - Test those feeds and dishes
- Full Rig Testing ?
  - Test the whole shebang
- NF measurement ?
- Any others needed ?
- Roving / Contesting Tips (Aug meeting?)

T/R Sequencing Requirements

- Required Interlocks To Avoid Self Destruction
  - (Depletion mode devices) Gate Bias (-) before/after Drain Power (+)
  - (Power Amps) Power and Bias before/after RF input (from IF rig or driver stages)
  - (PA out, LNA in) PA to Ant before/after RF output

- Rx to Tx sequence (inhibit IF TX until end):
  PTT on>Ant TX, Gate Bias|>PA Drain|>enable IF TX

- Tx to Rx sequence (inhibit IF TX at beginning):
  PTT off>disable IF TX|>PA Drain|>Ant Rx, Gate Bias

- Many solutions: relays, one shots, microcontrollers
  - Get advice from some one who has done it and lived to tell the tale

- Also make sure that:
  - Your IF rig TX inhibit method works w/o spikes
  - Your IF rig TX power out control doesn't have spikes