NEW WORLDS FOR MICROWAVE ROVING

MICROWAVE UPDATE 2026

NEW WORLDS FOR MICROWAVE ROVING

By: Ben Lowe, K4QF

INTRODUCTION

- Most microwave roving activity takes place within driving range to where the operator can drive a vehicle
- There are numerous other rover locations to which a vehicle cannot be driven
- A highly portable station configuration can open up many additional locations for rover operation
- An operator may want to fly across the country to join a different group effort. This requires a station that can be taken on a commercial aircraft to fit the overhead luggage area: max dimensons: 22” x 14” x 9”

OBJECTIVES

- The goal is to have a compact station to facilitate travel and man-portable operation with multiple bands
- Provide enough RF power to allow operation with 10 to 20 dB antenna gain enabling the use of smaller aperture antennas that fit in a back pack or luggage
- For microwave bands below 10 GHz, the Vivaldi, Log Periodic, or BBQ grill reflectors are candidates
- A candidate antenna for 10 GHz is the horn which fits in a suitcase or backpack and provide 14 to18 dB gain
- A flat panel array is suitable for 10 or 5.76 GHz

CURRENT MAN-PORTABLE EQUIPMENT

1. Antennas:
   - The DSS 18” dish is too large and heavy to carry
   - The purpose is to get to other sites not available by car, typical sites may have LOS ranges of ~100 or more miles
   - The 30 dB gain typically with a dish can be reduced to 10 to 20 dB gain to accommodate a smaller aperture antenna
   - Candidate antennas for 10 GHz are the horn which fits in a suitcase or backpack and offer 18 dB gain
   - The flat panel array is suitable for 10 or 5.76 GHz
   - For microwave bands below 10 GHz, the Vivaldi, Log Periodic, or BBQ grill reflectors are candidates

AVAILABLE TRANSVERTERS

2. Radio equipment
   - Down East Microwave

     MINIVERTER – 1296 MHz, 50 mw.

     MINI2304 – 2304 MHz, 50 mw.

     MINI3400 – 3400 MHz, 50 mw.

     5760-144LP – 5.76 GHz, 10 mw.

     5760-144 - 5.76 GHz, 2 watts

     10368-144LP – 10.368 GHz, 10 mw.

     10368-144LP – 10.368 GHz, 3 watts

   - Kuhne

     MKU 13 G4 - 1296 MHz, 1 watt

     MKU 23 G4 – 2304 MHz, 1 watt

     MKU 57 G4 – 5760 MHz, 250 mw.

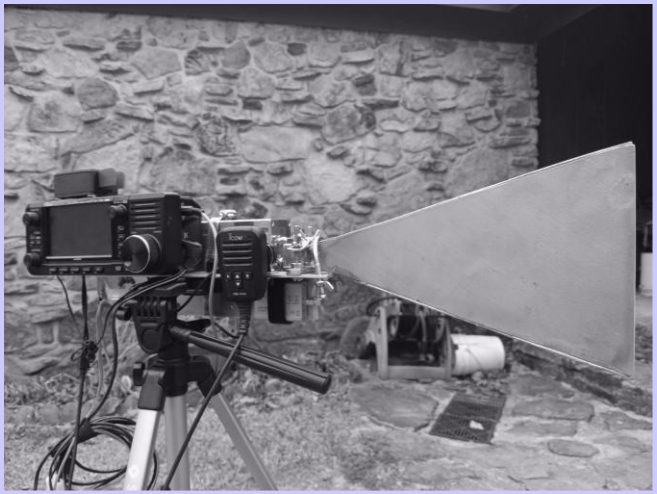
     MKU 10 G5 - 10.368 GHz, 200 mw.

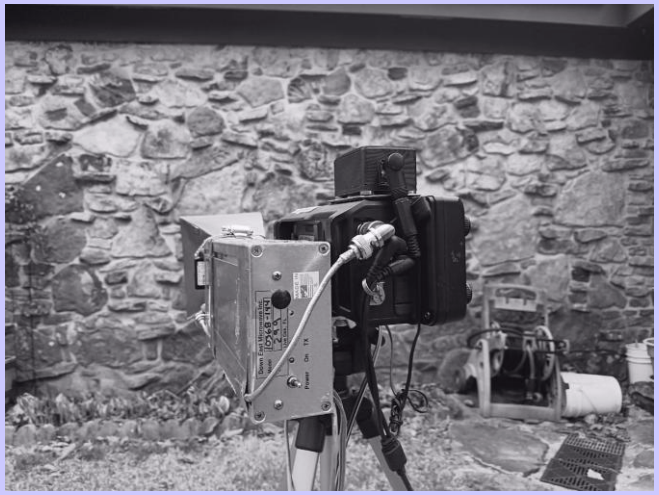
     MKU 24 G3 – 24.192 GHz, 2 watts

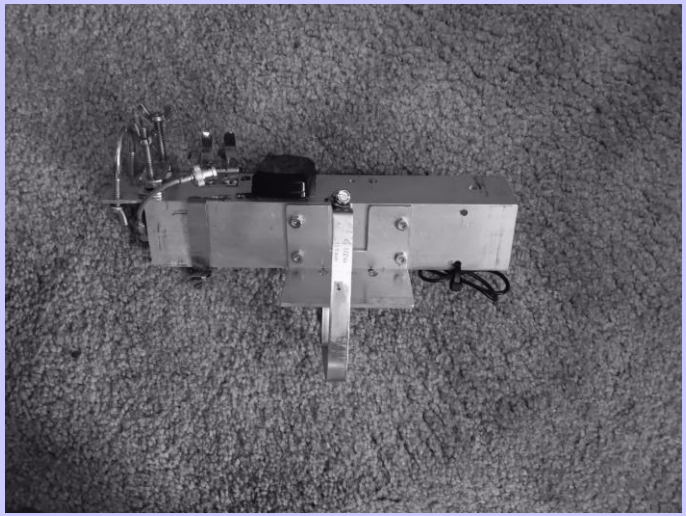
     MKU 47 G2 – 47.088 GHz, 30 mw.

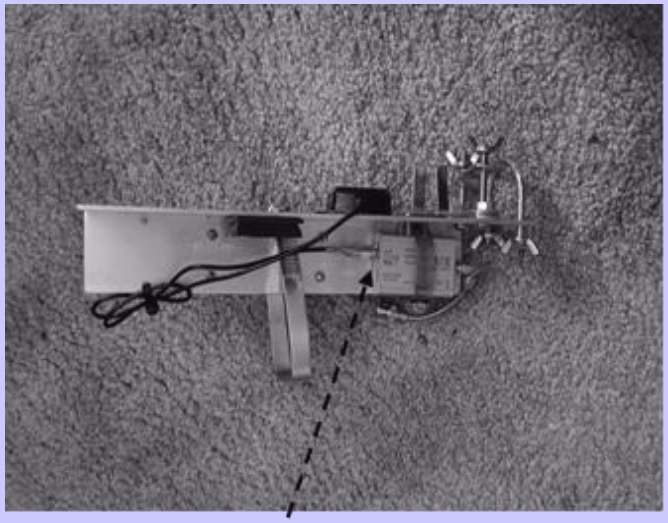
MAN PORTABLE EQUIPMENT (con't)

3. The platform and stand, initial configuration









SOME GOOD LOCATIONS

DESIGNATION	STATE	GRID	LAT (deg.)	LON (deg.)	ELEVATION ASL, ft.
Mount Mitchell	NC	EM85US	35.765	-82.265	6,684
Clingmans Dome (Kuwohi)	TN	EM85GN	35.563	-83.498	6,643
Mount Lecont	TN	EM85GP	35.655	-83.441	6,355
Whitetop Mountain	VA	EM96EP	36.636	-81.606	5,430
Huckleberry Knob	NC	EM85AH	35.322	-83.994	5,541
Black Balsum Knob	NC	EM85NH	35.328	-82.874	6,214
Roosevelt Mountain	TN	EM75PU	35.867	-84.714	2,031
Lookrock Overlook	TN	EM85EP	35.631	-83.941	2,566
Covenant College	GA	EM85XH	34.966	-85.374	2,106
Gadsden Cherokee Rock Village	AL	EM74CE	34.182	-85.813	1,624
Cheaha Mountain	AL	EM73CL	33.486	-85.809	2,400
Brasstown Bald	GA	EM84CU	34.874	-83.811	4,784
Windrock Mountain	TN	EM76TC	36.111	-84.335	3,373
Wayah Bald	NC	EM85FE	35.178	-83.563	5,312

AIRLINE COMPATABLE CARRY-ON LUGGAGE

Size limitation: 22 x 14 x 9 inches



WHEN THE ROAD RUNS OUT

Foldable Wagon





HITTING THE TRAILS

Hiking Stroller:

- Big wheels for rough trails
- Hand breaks for “controlled” decent

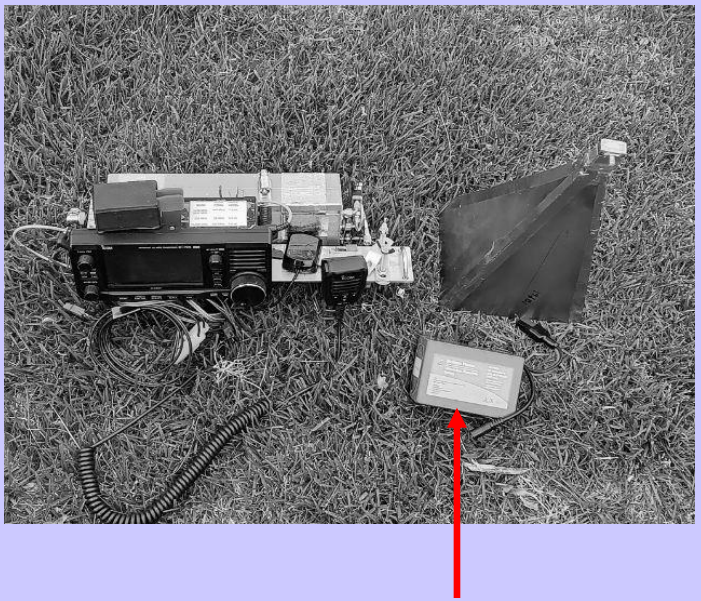


BACKPACK CONFIGURATION

Back Pack



Contents



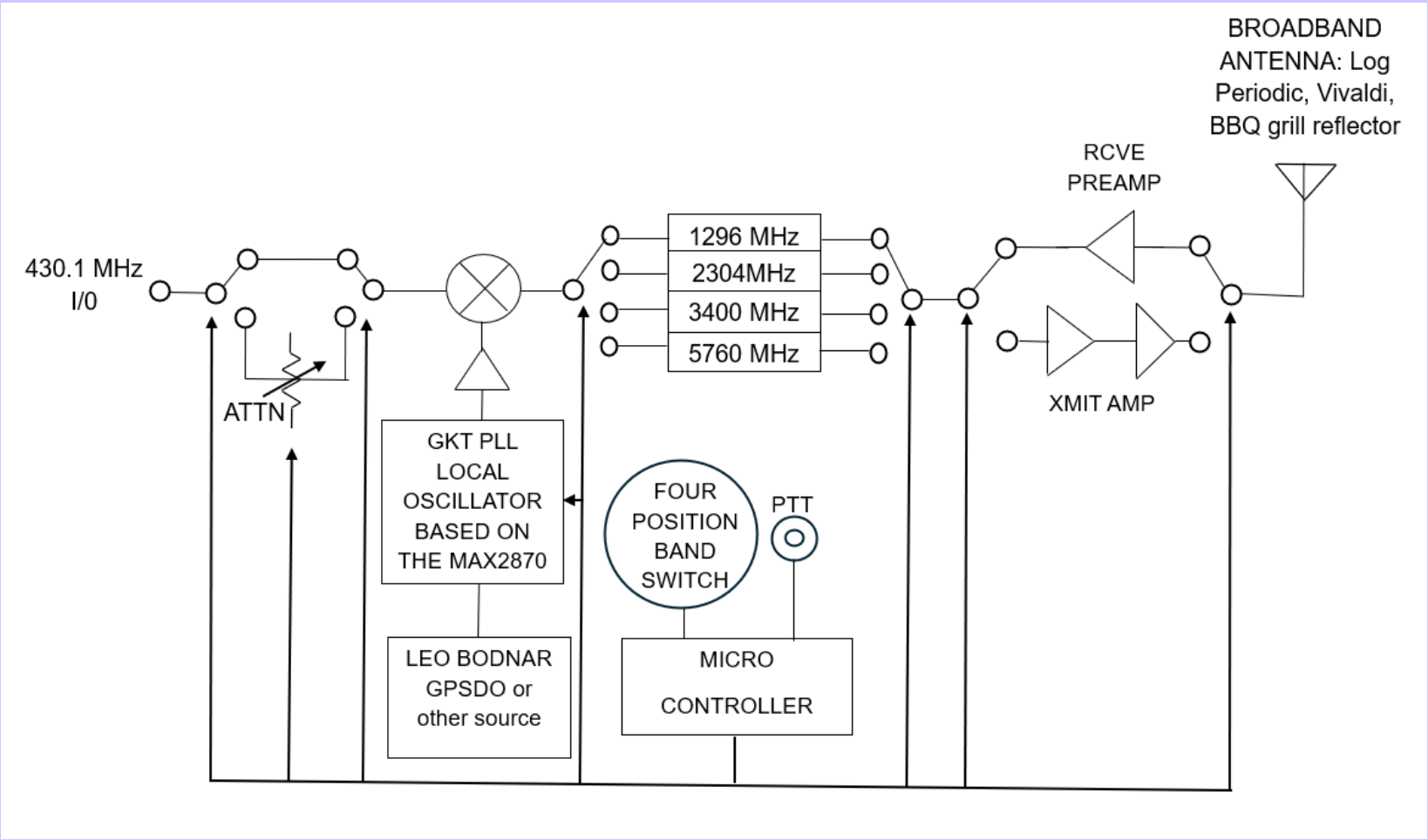
Note the smaller, 6 amp-hr $LiFePO_4$ battery

GETTING TO NEW WORLDS REQUIRES A NEW TRANSVERTER CONCEPT

REQUIRMENTS FOR THIS NEW TRANSVERTER

- SMALL AND LIGHTWEIGHT
- LOW PRIME POWER CONSUMPTION
- MULTI-BAND OPERATION
- FITS IN A BACK PACK OR PERSONAL CARRYON LUGGAGE
- USES AN EXISTING PORTABLE I.F. RADIO SUCH AS THE ICOM 705 OR FT-818
- MULTI-BAND OPERATION WITHOUT CABLE CHANGES
- MOUNTS ON A CAMERA TRIPOD
- REASONABLY PRICED

FOUR BAND TRANSVERTER BLOCK DIAGRAM



MANUFACTURING APPROACH

- PARTNER WITH GREG, W1GKT, A SUBJECT MATTER EXPERT FOR PRODUCT DESIGN AND VOLUME MANUFACTURING
- GREG HAS DESIGNED HUNDREDS OF PRODUCTS USING MINIATURE COMPONENTRY AND SMT REFLOW SOLDERING
- FOR THIS TRANSVERTER, DEVICES THAT ARE TOO SMALL TO RELIABLY HAND SOLDER ARE UTILIZED THROUGHTOUT
- GREG IS INTIMENTLY FAMILIAR WITH THE SELECTION OF COMPONENTS, CIRCUIT DESIGN, PCB DESIGN, AND FLOW SOLDERING ASSEMBLY FROM HIS EXTENSIVE EXPERIENCE IN ELECTRONIC MANUFACTURING

SIGNIFICANT FEATURES

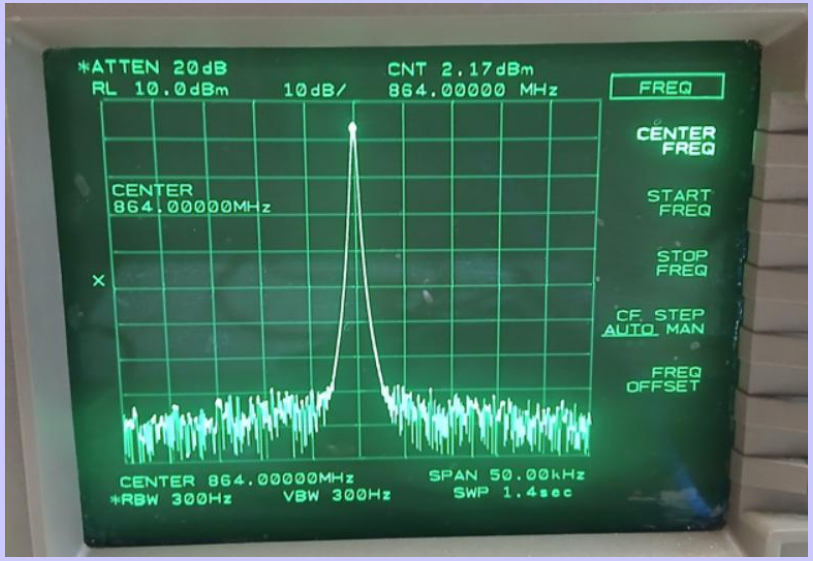
- USES A COMMON I.F. FOR FOUR MICROWAVE BANDS
- SMALL SIZE: ~ 3.5 X 4.5 INCH PACKAGE, SLIGHTLY LARGER THAN A PACK OF CIGARETTES
- WEIGHS LESS THAN 1 LB.
- USES SURFACE MOUNT TECHNOLOGY AND FLOW SOLDERING
- 500 MILLIWATTS OUTPUT INTO BROADBAND ANTENNA (LOG PERIODIC, VIVALDI, OR BBQ GRILL REFLECTOR
- USES “GKT” LOCAL OSCILLATOR (BY W1GKT) BASED ON MAX2870 FOR CLEAN LO OUTPUT AND GPSDO ACCURACY/STABILITY

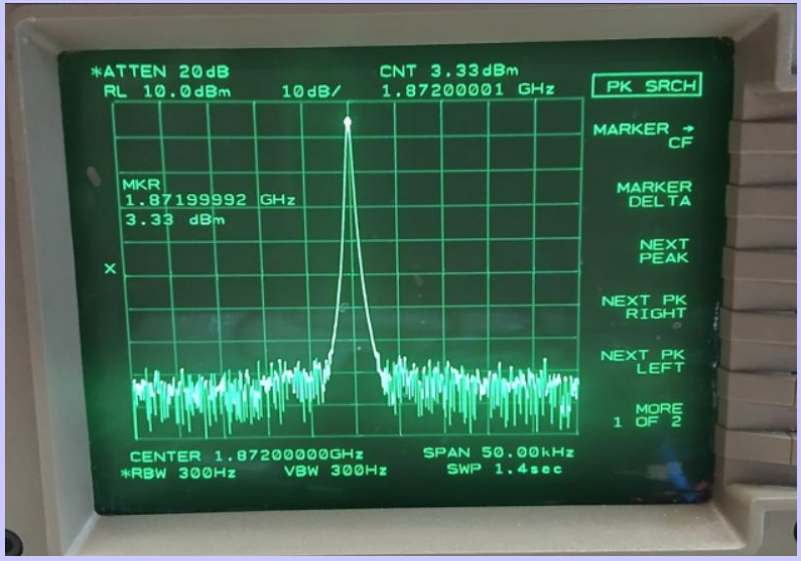
SIGNIFICANT FEATURES (CON'T)

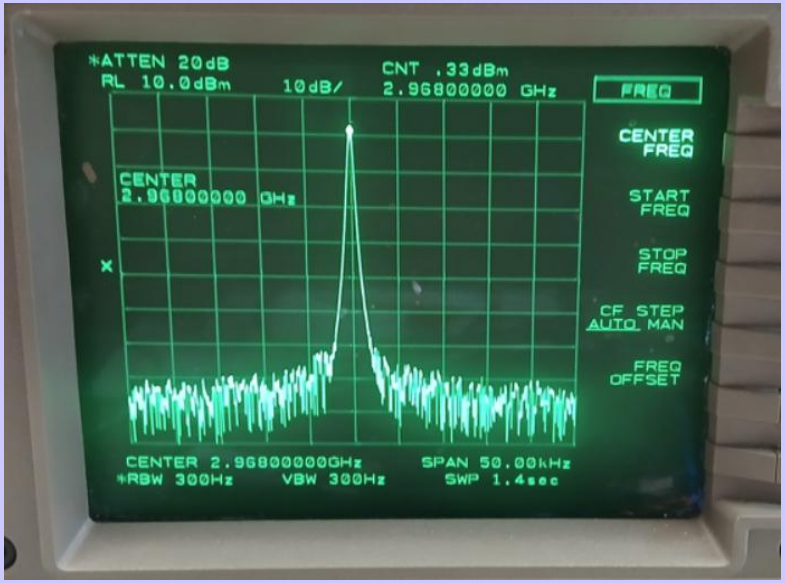
- FITS IN A HAND BAG OR BACK PACK FOR AIRLINE PERSONAL CARRY-ON ITEM
- USES AN EXISTING PORTABLE I.F. RADIO SUCH AS THE ICOM 705 OR FTX-1 FIELD
- MULTI-BAND OPERATION WITHOUT CABLE CHANGES
- MOUNTS ON A CAMERA TRIPOD
- SMALL AND LIGHT WEIGHT
- REASONABLY PRICED AND READILY AVAILABLE

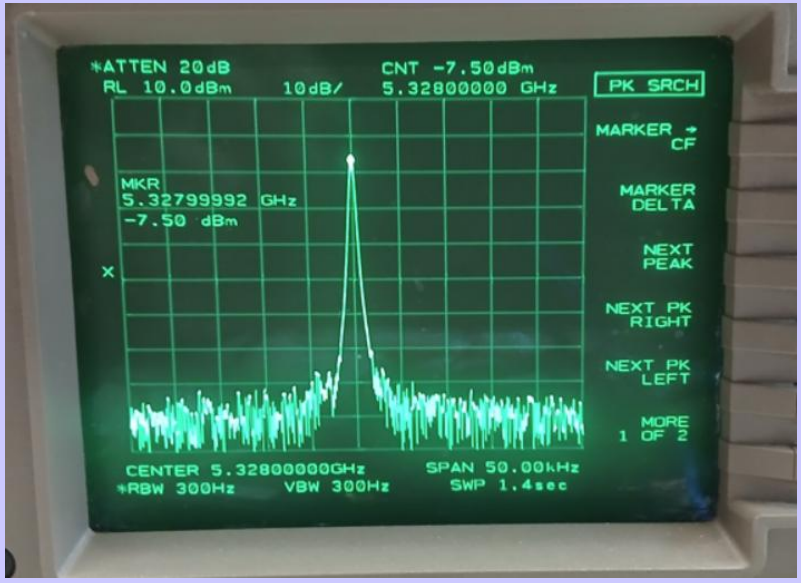
CLEAN LOCAL OSCILLATOR

LO SIGNALS





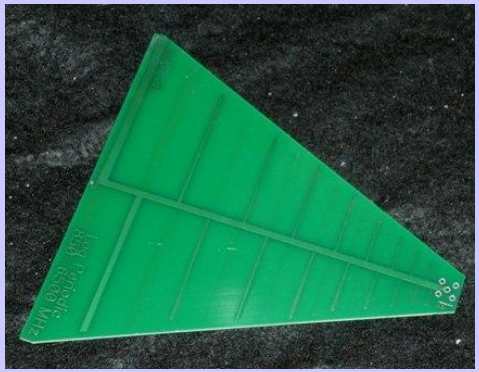




CANDIDATE BROADBAND ANTENNAS

WA5VJB LOG PERIODIC

850 - 6500 MHz



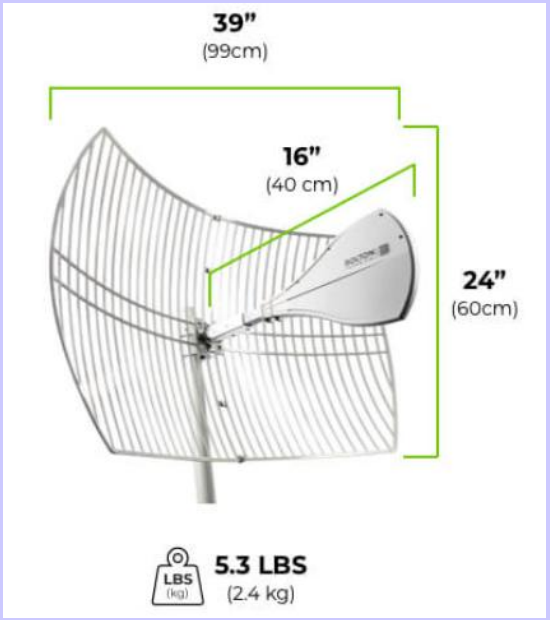
RF SPACE VIVALDI

675 MHz - 12GHz



BOLTON LONG RANGER

600 – 6500 MHz



THREE FREQUENCY BAND OPTIONS

LIMITED TO FOUR BANDS DUE TO FOUR-WAY MMIC SWITCH

- OPTION I:

  902/1296/2304/5760 MHz

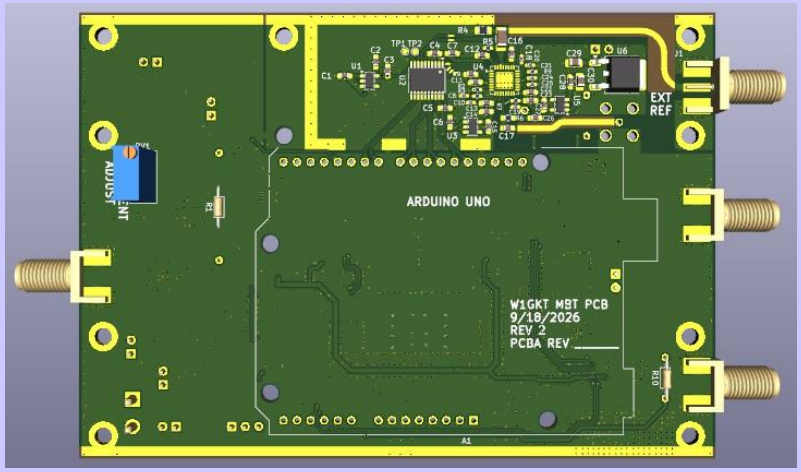
- OPTION II:

  902/2304/3400/5760 MHz

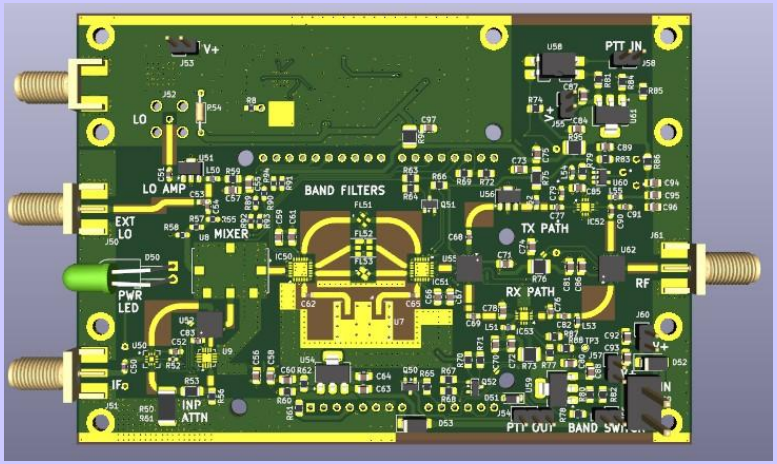
- OPTION III:

  1296/2304/3400/5760 MHz

FRONT AND BACK SIDE OF XVTR BOARD



BACK SIDE OF THE BOARD



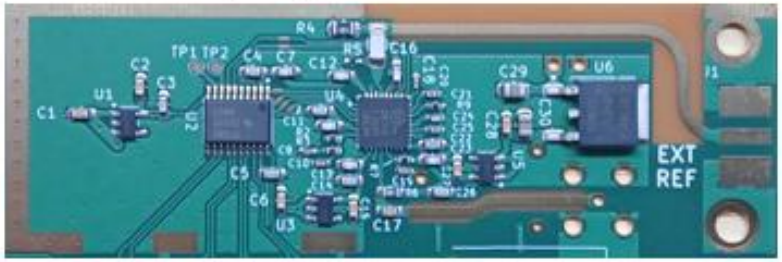
FRONT SIDE OF THE BOARD



HOUSING

NOTABLE TRANSVERTER FEATURES

Local Oscillator:
Balanced LO Power to mixer: 10.2dBm to 10.7dBm on all bands
Power and frequency under software control



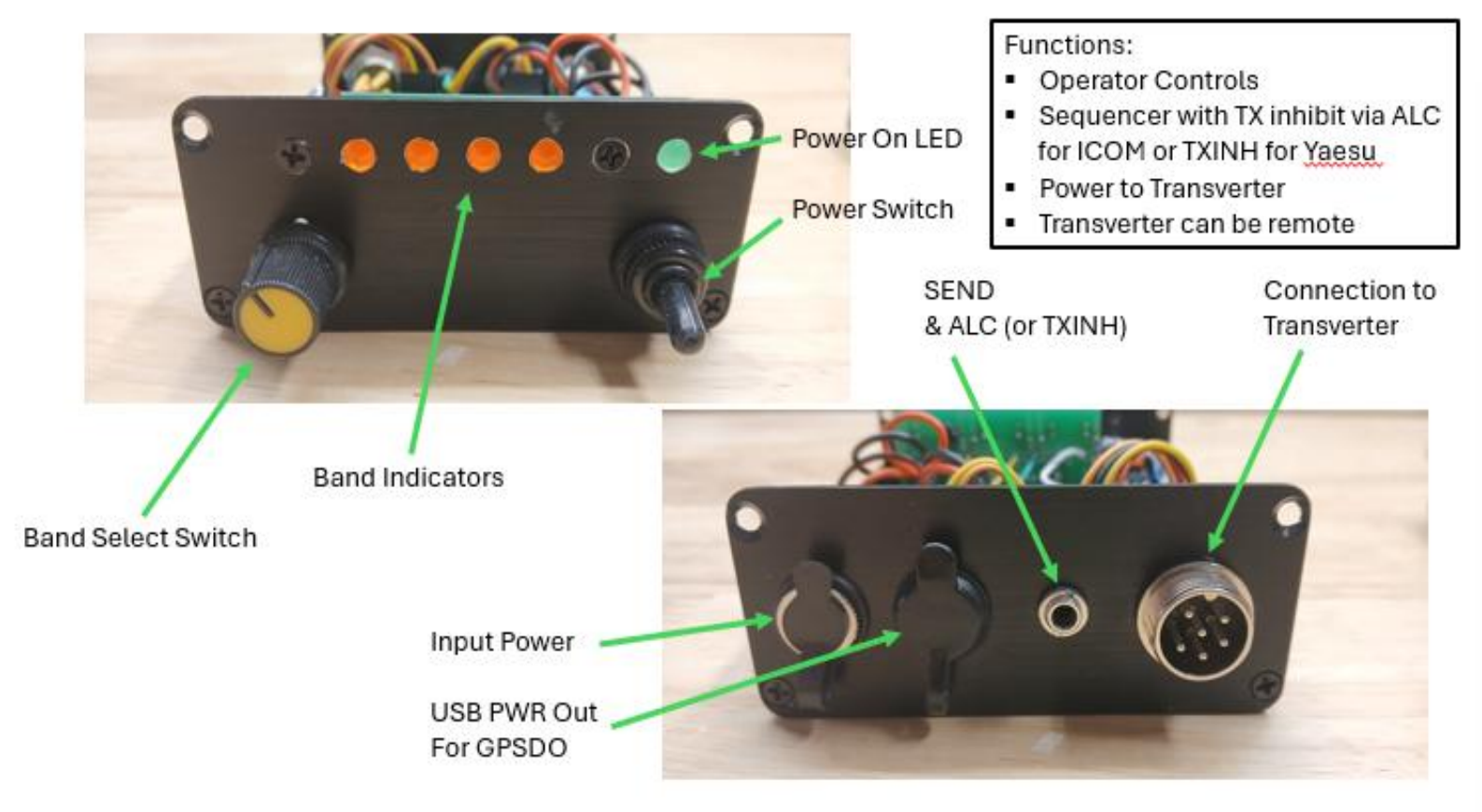
- Microprocessor / Software Control
- Band switching - Software controlled LO Frequencies and filter bank switching.
- Sequencer interlocks
- TR control
- Interface with external PA
- Control/balancing of power on each band



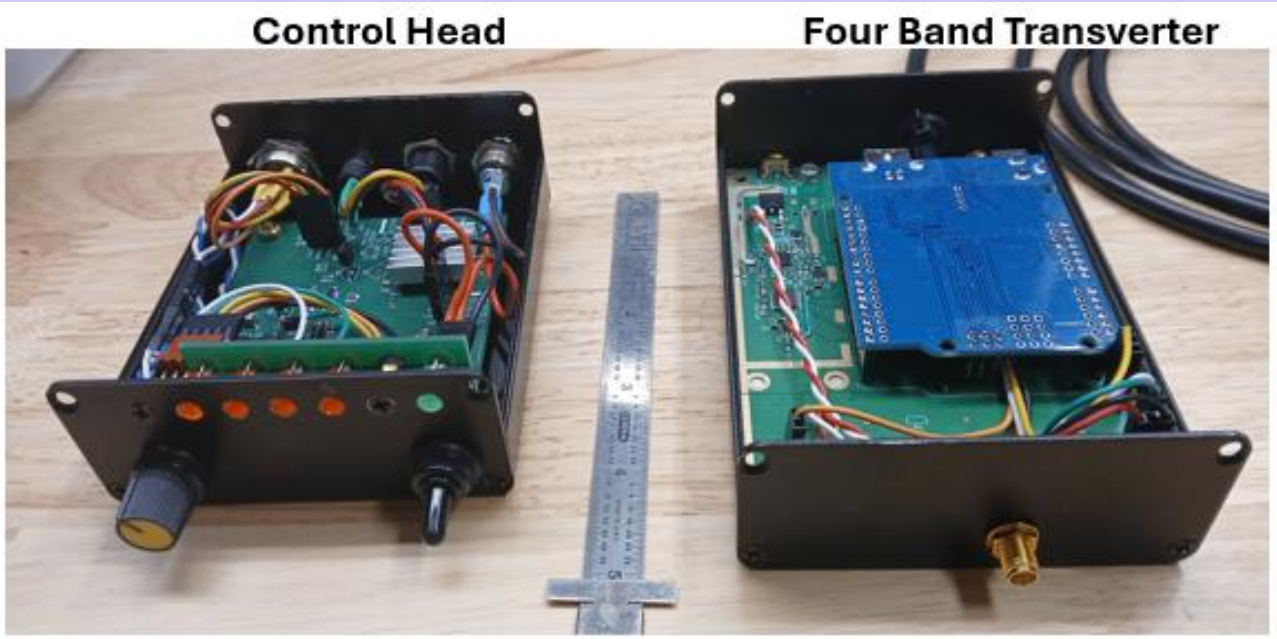
Filter Bank:
Multiple band pass filter population options:

5760MHz	3400MHz
2304MHz	1296MHz
902MHz	

CONTROL HEAD FEATURES



SIZE COMPARISONS



Size comparison with DEMI Transverter for Perspective.....



MAN-PORTABLE CONFIGURATION

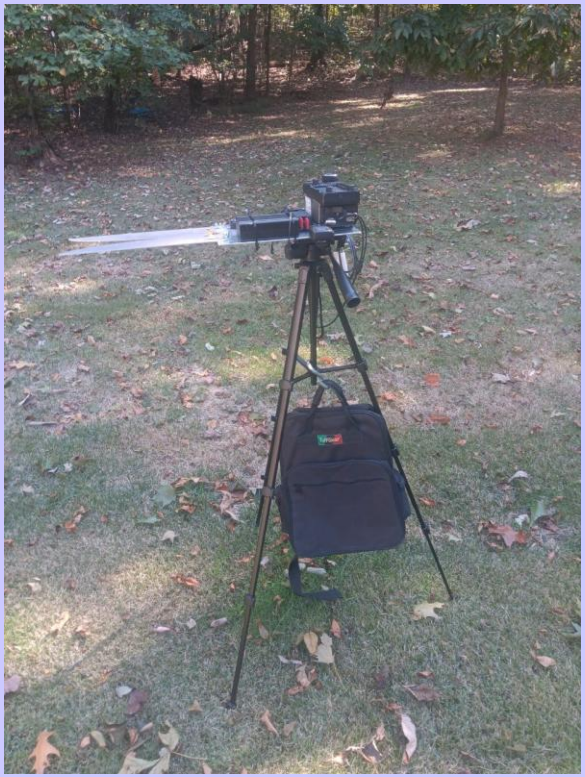




BACKPACK

- COMPLIES WITH “PERSONAL ITEM SIZE” FOR AIRLINE CARRY-ON
- WEIGHTS: TRANSVERTER WITH TRIPOD – 7.6 LBS.
  BACKPACK WITH CONTENTS – 11.4 LBS
- BACKPACK CONTENTS JOILCAN M30 TRIPOD WITH XVTR





WHAT SHOULD WE NAME THIS BEAST?

- "LOWETEK" HAS A NEGATIVE CONNOTATION, AND THIS ISN'T A LOW TECHNOLOGY DESIGN
- REVERT TO THE ORIGINAL SPELLING AND PRONOUNCIATION
- LÖWE (TRANSLATES TO "LION" FOR NON-GERMAN SPEAKERS)
- THEREFORE, USE "LÖWENTEK" (PRONOUNCED LEUVENTEK) AND LÖWENTEK 4BXV FOR FOUR BAND TRANSVERTER

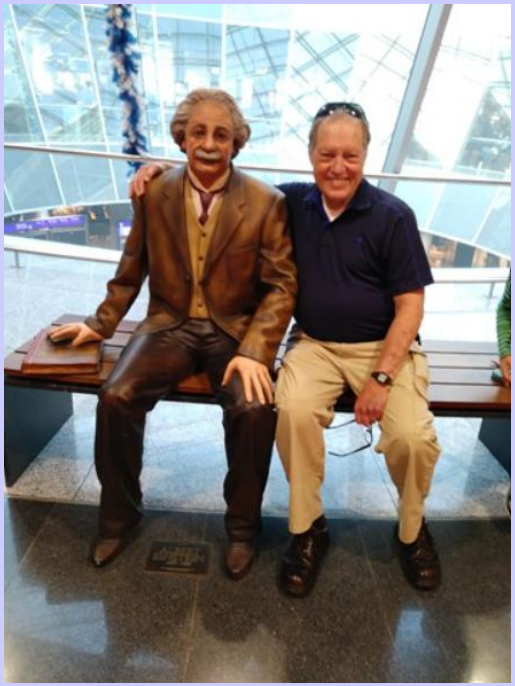
WHAT'S NEXT?

- DISCUSSIONS ARE IN PROCESS TO OFFER THE ASSEMBLED TRANSVERTER THROUGH GIGAPARTS IN HUNTSVILLE WHO CAN DO THE ADVERTISING AND SALES. THE TARGET PRICE RANGE IS ~$750; NOT BAD FOR 4 BANDS.
- "GKT LOCAL OSCILLATOR" (BY W1GKT) WILL BE AVAILABLE AS A STAND ALONG ITEM FOR HOMEBREWERS
- A 10/24 GHz TRANSVERTER BASED ON A SIMILAR IMPLEMENTATION

LÖWENTEK



King of the Mountain





BIOS:

EDUCATION AND CERTIFICATIONS/EXPERIENCE

K4QF – BEN LOWE, BSEE/MSEE, P.E., FIRST CLASS RADIO TELEPHONE WITH RADAR ENDORSEMENT, COLLINS RADIO CO., TEXAS INSTRUMENTS CO. STANFORD RESEARCH INSTITUTE, SAIC, ENGRINEERING SYSTEMS & PLANNING – RF CIRCUIT DESIGN, MISSILE RADAR DESIGN, COMMUNICATIONS AND RADAR ANALYSIS, DIGITAL MICROWAVE LINKS, GPS ANTI-JAMMING DEVELOPMENT FOR MISSILES, RESCUE BEACON DEVELOPMENT FOR SARSAT

W1GKT – GREG THOMPSON, BSEE IN COMPUTER ENGINEERING. EXPERTISE IN PRODUCTIZATION OF NEW CONCEPTS, DESIGN, AND TRANSITION TO VOLUME MANUFACTURING. FORMER EXECUTIVVE IN CHARGE OF PRODUCT DESIGN WORLDWIDE FOR SANMINA CUSTOMERS. EXPERIENCE IN AVIONICS, MEDICAL, COMMUNICATIONS, CONSUMER PRODUCTS, AND MILITARY EQUIPENT. PREVIOUS POSITIONS WITH SCI, HONEYWELL, AND SPERRY. MORE THAN 200 PRODUCTS DESIGNED INCLUDING MORE THAN 500 PCBAs


I AM AN
RF
ENGINEER,
IF YOU SEE
ME RUNNING,
TRY AND
KEEP UP!!!

QUESTIONS/SUGGESTIONS?