

■ LF Forum

Dave Pick G3YXM

David Bowman G0MRF



Timetable

- Where are we now?
- Receiver tests
- Commercial gear
- Forum Q&A

Where are we now?

- Most countries in the world now have access to the bands:
- 135.7kHz-137.8kHz
- Open to all licence classes
- 472.0kHz-479.0kHz
- Advanced (full) licence only

Modes commonly in use

- WSPR * (mostly 2 minute)
- CW on 472kHz
- JT9 *
- FT8 *
- Opera
- QRSS

Experimental modes

- EbNaut
- WSQCall by ZL2AFP
- JS8Call by KN4CRD

- <http://abelian.org/> for EbNaut
- <https://www.qsl.net/zl1bpu/MFSK/WSQweb.htm>
- <http://js8call.com/>

Receiving LF/MF

- Antenna
 - Loop (active or tuned)
 - E-probe
 - Wire antenna

Receiving LF/MF

- Receiver
- HF transceiver
- SDR
- Converter

■ LF Forum

Over to David G0MRF



Available equipment ?

Receiving :

- Commercial transceivers (Gen coverage RX)
- Dedicated SDR with PC / Laptop. – Softrock (\$23)
- Receive only Dongles RTL / FUNcube etc
- Home built kits and designs. Upconverter / transverter

Transmitting :

- Commercial transceivers. - mainly low level out
- Dedicated products. TX converters / transverters
- Home built designs. Transverters / amplifiers

Transceiver reviews

ICOM IC-7610 MEASURED PERFORMANCE

RECEIVER MEASUREMENTS

| FREQUENCY | -----SENSITIVITY SSB 10dBs+n:n----- | | |
|-----------|-------------------------------------|------------------------|------------------------|
| | PREAMP OFF | PREAMP 1 | PREAMP 2 |
| 1.8 MHz | 0.28 μ V (-118dBm) | 0.13 μ V (-125dBm) | 0.1 μ V (-127dBm) |
| 3.5 MHz | 0.25 μ V (-119dBm) | 0.11 μ V (-126dBm) | 0.09 μ V (-128dBm) |
| 7 MHz | 0.22 μ V (-120dBm) | 0.1 μ V (-127dBm) | 0.09 μ V (-128dBm) |
| 10 MHz | 0.32 μ V (-117dBm) | 0.11 μ V (-126dBm) | 0.09 μ V (-128dBm) |
| 14 MHz | 0.28 μ V (-118dBm) | 0.13 μ V (-125dBm) | 0.1 μ V (-127dBm) |
| 18 MHz | 0.32 μ V (-117dBm) | 0.13 μ V (-125dBm) | 0.1 μ V (-127dBm) |
| 21 MHz | 0.32 μ V (-117dBm) | 0.14 μ V (-124dBm) | 0.11 μ V (-126dBm) |
| 24 MHz | 0.32 μ V (-117dBm) | 0.13 μ V (-125dBm) | 0.1 μ V (-127dBm) |
| 28 MHz | 0.32 μ V (-117dBm) | 0.14 μ V (-124dBm) | 0.1 μ V (-127dBm) |
| 50 MHz | 0.4 μ V (-115dBm) | 0.16 μ V (-123dBm) | 0.11 μ V (-126dBm) |

Radio Society of Great Britain
Advancing amateur radio since 1913
RadCom

June 18

Receiver

SSB/CW sensitivity: At 10 dB S/N, 0.16 μ V typical at 1.8 – 30 MHz (preamp 1 on); 0.13 μ V typical at 50 MHz (preamp 2 on), filter soft.

Noise figure: Not specified.

Receiver Dynamic Testing

Noise floor (MDS), 500 Hz bandwidth, IP+ on:

| Preamp | Off | 1 | 2 |
|-----------|------|------|----------|
| 0.137 MHz | -116 | -127 | -133 dBm |
| 0.475 MHz | -130 | -137 | -141 dBm |
| 1.0 MHz | -131 | -140 | -142 dBm |
| 3.5 MHz | -132 | -140 | -142 dBm |
| 14 MHz | -130 | -138 | -142 dBm |
| 50 MHz | -130 | -138 | -141 dBm |

Preamp off/1/2, 14 MHz: 17/9/5 dB;
50 MHz, 17/9/6 dB.

QST

October 18

Transceiver reviews

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QST

October 18

Measuring receiver performance



Signal level for S9

Comparative indicator
between 1830kHz
475kHz and 136kHz

Signal level for 6dB S+N:N

- Mode USB
- Bandwidth 2.4kHz
- Preamps off
- Attenuators off *
- NB and NR off



Receiver sensitivity comparison for 160m, 630m and 2200m band

| Receiver | 1830kHz Level for S9 | 1830kHz 6dB S+N:N | 475kHz Level for S9 | 475kHz 6dB S+N:N | 136kHz Level for S9 | 136kHz 6dB S+N:N | Notes |
|---------------------------|-------------------------|----------------------|------------------------|---------------------|------------------------|---------------------|---|
| ICOM IC756 Pro3 | -75dBm | 122dBm | -66dBm | 114dBm | -64dBm | 110dBm | Fixed MF attenuator below <u>apx.</u> 1700kHz |
| ICOM 7300 | -60 | -110 | -59 | -105 | -52 | -87 | The IC7300 has an increase in background noise which peaks at 320kHz but affects sensitivity at 630 and 2200m. The IC7300 can transmit around 8W on 475kHz |
| ICOM 7100 | -73 | -115 | -69 | -112 | -64 | -103 | |
| ICOM 7610 | -72 | -116 | -71 | -114 | -64 | -97 | Some background noise on 136kHz |
| ICOM 706Mk2G | | | -65 | -109 | -35 | -82 | 160m not measured |
| ICOM IC735 | | | -69 | -106 | -60 | -94 | 160m not measured |
| <u>Yaesu</u> FT817 | | | -60 | -107 | -50 IPO | -91 IPO | 160m not measured |
| <u>Yaesu</u> FT857D | -85 | -121 | -83 | -115 | -70 | -79* | 136kHz S:N estimated as radio has S4 noise level at that frequency |
| <u>Yaesu</u> FTDX3000D | -65 | -114 | -64 | -113 | -56 | -94 | Radio set to IPO. Test on 135.4 to avoid birdie |

| Receiver | 1830kHz Level for S9 | 1830kHz 6dB S+N:N | 475kHz Level for S9 | 475kHz 6dB S+N:N | 136kHz Level for S9 | 136kHz 6dB S+N:N | Notes |
|-----------------------------|-------------------------|----------------------|------------------------|---------------------|------------------------|---------------------|---|
| <u>Yaesu</u> FTDX5000MP | -72 * -60 dBm | -115 * -103dBm | -66 dBm | -103dBm | -66 dBm | -99 dBm | IPO and preamps auto disabled below 1700kHz (* with Preamp 1) |
| <u>Yaesu</u> FT450D | -79 | -116 | -62 | -94 | -44 | -83 | Fixed attenuator below 1700kHz |
| <u>Yaesu</u> FTDX1200 | -68 IPO -80 P1 | -109 IPO -121 P1 | -65 IPO -78 P1 | -105 IPO -117 P1 | -48 IPO -60 P1 | -87 IPO -99 P1 | P1 = Preamp 1 used for test |
| Kenwood TS590SG | -73 | -117 | -73 | -115 | -74 | -116 | Tested on 472 as birdie on 475 |
| Kenwood TS990S | -67 | -112 | -66 | -111 | -65 | -110 | |
| Kenwood TS890S | -69 | -115 | -68 | -112 | -68 | -112 | |
| Kenwood TS2000 | | | -79 | -121 | -79 | -119 | 160m not measured |
| Kenwood TS850 | | | -84 | -125 | -83 | -123 | 160m not measured |
| <u>Elad</u> FDM- Duo SDR | -71 | -116 | -71 | -116 | -71 | -115 | |
| JRC JST135 | | | -85 | | -83 | | S:N not possible as headphone socket non-functional |

MF / LF Hardware from small manufacturers



630m TRANSVERTER

Datasheet

Roger VK4YB

160m to 630m

Very Robust
VSWR / over drive / over current
protection. 100% duty cycle

10 – 16V Supply / 50W RF output
Firmware upgradeable via USB

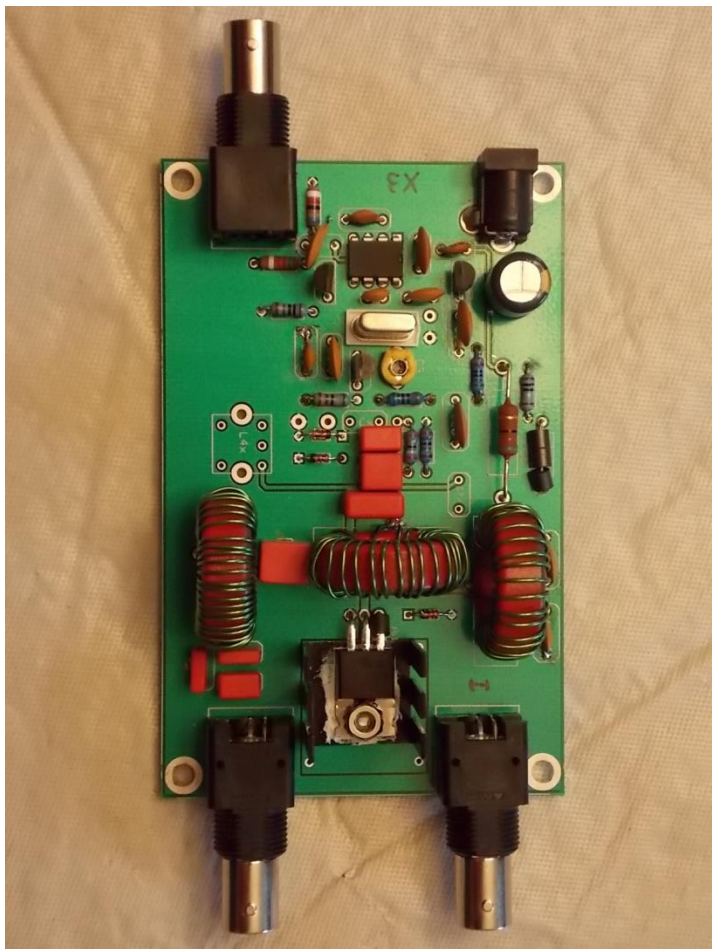
Linear amplifier

Priced at \$600 US



MF / LF Hardware from small manufacturers

MF Solutions TX Converter John-WA3ETD



- Available as a kit or built and tested
- Not suitable for linear modes
- 80m input 1.5W max RF input
- 136kHz version being developed
- 12V supply at 3A
- Output power 22 – 25 Watts
- \$75 Kit \$99 Built + shipping

MF / LF Hardware from small manufacturers

Minikits Transverter

5 Watts output.

Kit with some SMD

Apx £70 + shipping from VK



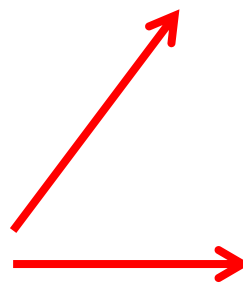
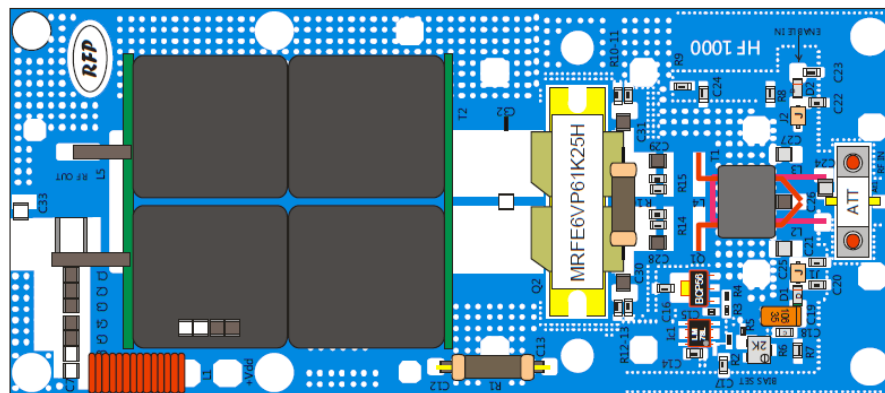
| Specifications | |
|----------------------|---|
| Frequency Range: | 472MHz to 479MHz (630m Band) |
| Local Oscillator: | 3.2MHz (474kHz translates to 3.674MHz IF) |
| Stability: | Typically +/-1Hz (OK for WSPR) |
| RX Gain: | 0dB +/- 2dB |
| RX Noise Figure: | Typically < 5dB (BFQ19 or DXT2222A) |
| TX IF Drive: | Up to 5 Watts +36dBm @ 3.6MHz |
| TX IF Gain: | 0dB Minimum @ 3.6MHz input for +37dBm Output @ 475kHz |
| TX RF Output: | +37dBm (5 Watts) with 5 Watts +37dBm input @ 3.6MHz |
| TX Spurious Outputs: | <50dBc Refer to the Kits webpage |
| Operating Voltage: | +10 to +15vdc @ 130mA RX Stages, <1.5A TX Stages |
| Board Size: | 107mm L x 73mm W x 25mm H |

MF / LF Hardware from small manufacturers



Linear Amp UK. Gemini HF-1K amplifier 472kHz at 200W+

ITB (Italy) offer a range of amplifier 'pallets' some of which work nicely on 630m. Check latest spec is OK before purchasing.

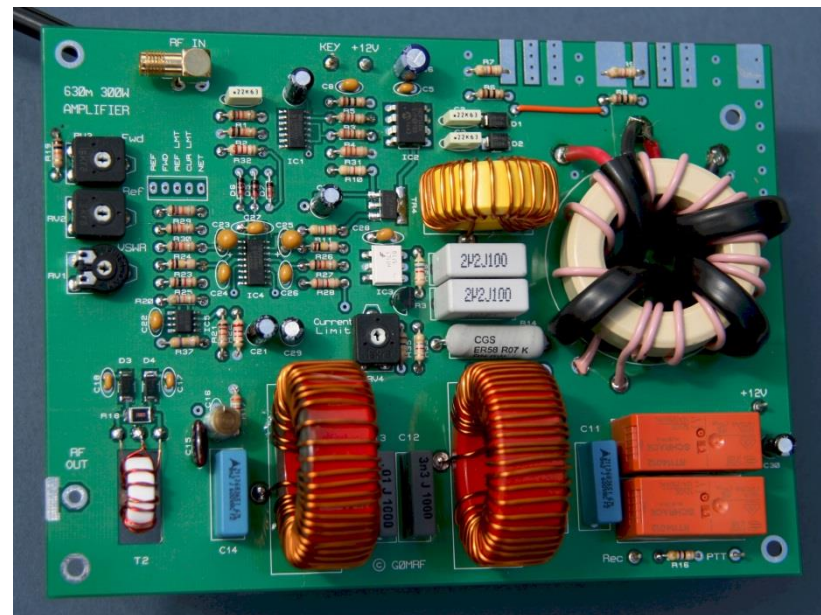


MF / LF Hardware designs - www.

www.g0mrf.com



5 Watt linear amplifier kit. 80kHz to 2MHz
Input power +6dBm. 13.8V supply
Intended as a gain block for transceiver
DRV connectors or SDR radios £20

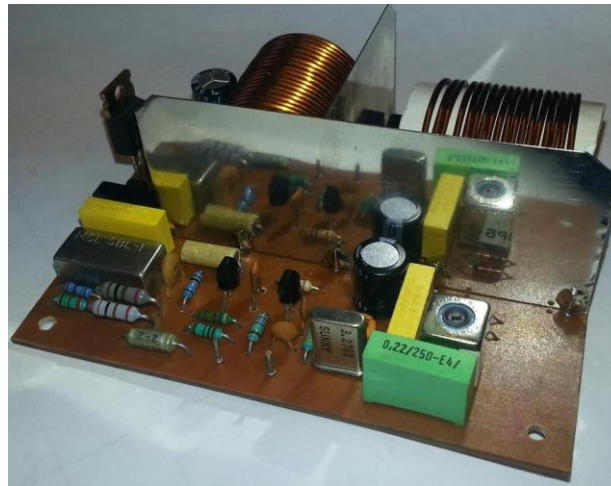


300 W class D amplifier circuit / kit.
Over current and reflected power protection
Fwd / Ref power meter drive.
28 – 32V supply.
Needs drive at twice operating frequency.

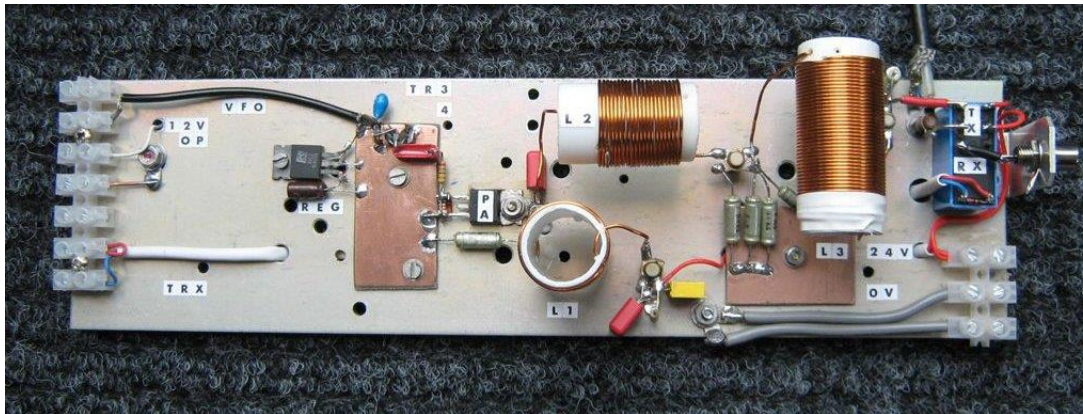
MF / LF Hardware designs - www.



Rally finds ! RF ammeters



G3XBM transverter by M1GEO



GW3UEP 100W Amplifier

40 Variometers for sale !



Time to get on the bands



Software interface for a radio receiver, showing band activity and a waterfall display.

Band Activity

| dB | DT | Freq | Message |
|-----|-----|------|-----------------|
| -26 | 0.9 | 1278 | GOMRF AA1A FN42 |
| -27 | 1.3 | 1278 | GOMRF AA1A FN42 |
| -26 | 1.3 | 1245 | GOMRF AA1A R-26 |
| -26 | 1.1 | 1245 | QSY CW 474.2 |

Rx Frequency

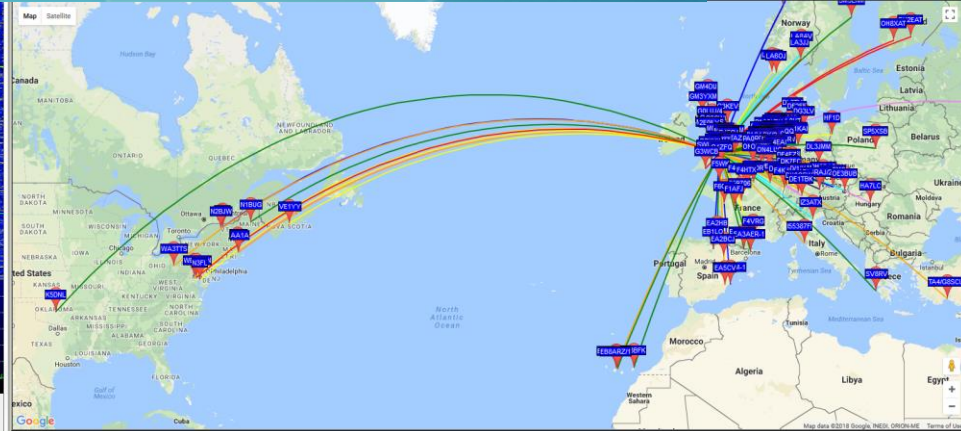
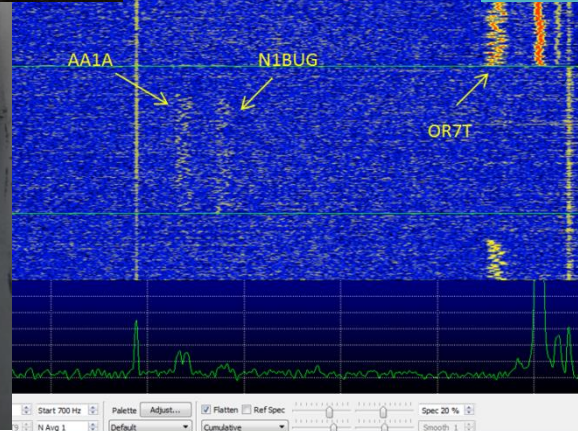
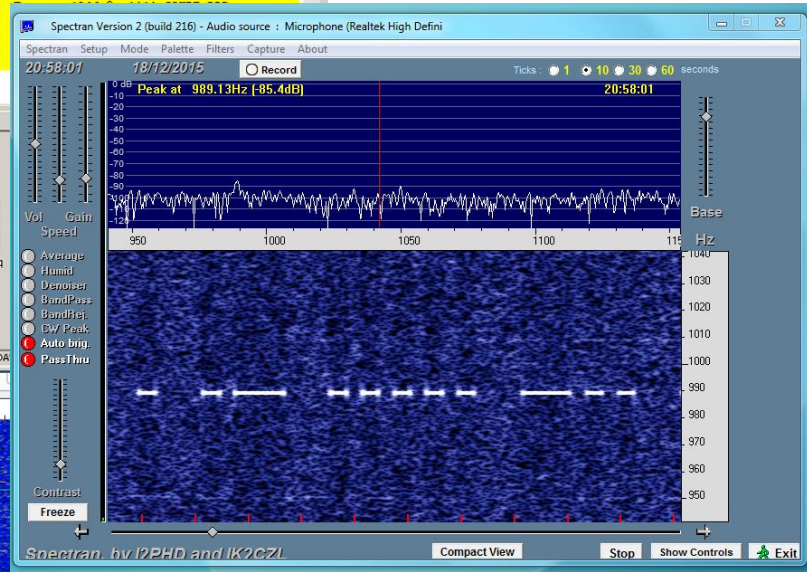
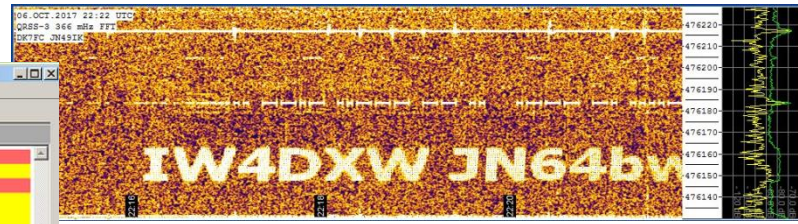
| UTC | dB | DT | Freq | Message |
|------|-----|------|------|-----------------|
| 0038 | -26 | 0.9 | 1278 | GOMRF AA1A FN42 |
| 0039 | Tx | 1245 | 0 | AA1A GOMRF -26 |
| 0040 | -27 | 1.3 | 1278 | GOMRF AA1A FN42 |
| 0041 | Tx | 1246 | 0 | AA1A GOMRF -26 |
| 0043 | Tx | 1246 | 0 | AA1A GOMRF -26 |

Current frequency: **0.474 200**

Call: AA1A FN42, Tx: 1246 Hz, Rx: 1278 Hz

Date/Time: 2017 Dec 23 00:51:37

Waterfall display shows activity for G3KEV, AA1A, N1BUG, and OR7I.



Find out more...

<http://www.gw3uep.ukfsn.org>

<http://njdtechnologies.net/category/630-meter-daily-reports/>

<http://www.472khz.org>

<http://www.wireless.org.uk/>

<http://www.antennasbyn6lf.com/630m-antennas/>

<http://www.g0mrf.com/>

https://sites.google.com/site/g3xbmqrp3/mflf/472khz_tvtr

http://www.linamp.co.uk/gemini_HF.html

https://italab.it/prodotti_uk.php?cat=3

www.rsgb.org



■ LF Forum

Over to you..

