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The GHz Bands

The big December lift produced a 1724 km QSO on 23 cm

THE BIG OPENING OF 2007. Just as it was beginning to look like 2007 would be a poor year for long distance propagation on the microwave bands, along came a truly remarkable opening in mid December.

A high pressure system settled over Scandinavia, reaching a pressure of around 1045mb near Bergen, Norway, at midday on the 17th. Then, as the pressure began to fall, stations from Eastern Europe started to appear on the bands from VHF through to the microwave bands. Interestingly, conditions were consistently better on the lower microwave bands than on the upper ones, with few really long distance stations, reported worked by UK operators, on 3.4GHz and above.

G0EWN (IO83) reported the event started with him as early as 14 December and supports this with several reports of stations worked between the 14th and the 16th, including F6DKW (JN18) at 581km on the 14th and SM0SBI (JO99) at 1370km on the 16th, both on 1.3GHz.

POLAND ON 1.3GHZ. The extent of the opening on 1.3GHz is well illustrated by the reports that follow. G3AUS (IO80) worked SP4MPB (KO03) on the 17th at the unbelievable distance of 1724km with reports of 55/55 on SSB. The SP was also worked by GM4CXM (IO75) at 539/539 and at a distance of 1613km. G4FSG, G3XDY and G4DDK (all in JO02) then worked SP4MPB at distances of a little over 1300km. No other reports of contacts with SP4MPB have been received for the 17th, although I'm sure there were others.

Conditions were still good on the 18th but appeared not to extend quite so far into Eastern Europe from the UK. However there was a single report of G0EWN working SP4MPB at 1457km on 1.3GHz. The 18th was also the day of the 1.3GHz Nordic Activity Contest (NAC). It was a pleasure to have good conditions that coincided with this popular monthly evening event. Many stations participated right across Europe resulting in lots of contacts exceeding the 1000km mark. The ON4KST chat system was scrolling off screen at a rapid rate of knots as activity peaked mid evening.

On the 19th we were all surprised to see YL3AG (KO26) reporting, via the DX Cluster, that he had heard G0EWN at 1664km on 1.3GHz. However, Gordon was unable to raise YL3AG . It was not for the want of trying, judging by Gordon's efforts! GM4CXM worked SM1HOW (JO97) on the morning of the 19th at 1407km as well as a number of other stations, again at over 1000km on 1.3GHz.

Conditions extended up to at least 2.3GHz and my own efforts to improve my 2.3GHz station at last paid off as I was able to work SM3LBN (JO80) on the morning of the 19th for my ODX on 2.3GHz of 1300km.

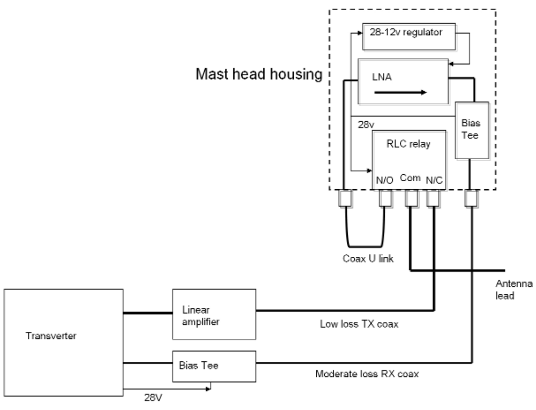

Diagram of the mast-head unit connections

SHETLAND ON 144, 432 AND 1296MHZ. The good conditions continued up to the 22nd with more SP stations being worked on the lower bands. A particularly nice contact for me was with GM4ODA/P (JP80) operating solo from Shetland on 144, 432 and 1296MHz. I was able to raise Keith on 144MHz and from where we then QSYd to 1.3GHz where we exchanged signals of 539/539. This was a new Maidenhead 'Field' for me (as was SP4MPB in Field KO) on 1.3GHz.

This was an extraordinary event in that it didn't support propagation on the higher microwave bands to any great extent and it provided very patchy coverage in parts of the UK. Signals were rarely strong, but they were stable and some eastern European stations remained audible for very long periods, enabling a lot of UK stations to work them after they returned from work.

DOMESTIC DX. Dave, G4FRE (WW2R), arrived in the UK for a Christmas visit to Malvern. He brought gear with him for the 70MHz, 2.3GHz and 10GHz bands. He also brought gear for 5.7GHz but the bag containing the transverter, as well as a TWT PSU, went missing, courtesy of his airline.

Dave's UK QTH is in Malvern (IO82) at 160m ASL. From there, using indoor antennas, he worked G8KQW, G4PBP, G4BRK, G0RRJ, G4BAO, G4DDK and G4FSG on 1.3GHz and had three contacts with G4DDK on 2.3GHz at 247km.

Initially Dave ran 20W on 1.3GHz using a DEMI transverter and an F9FT 23 element Yagi. The power was later increased to 55W with a solid state amplifier. On 2.3GHz he used a G3WDG transverter with 60W power amplifier and 25 element F9FT Yagi.

What was noticeable to me was the reliability of the 2.3GHz signal, which was stronger than the 1.3GHz signal on each occasion we worked.

This shows what can be done from a reasonable location with relatively small antennas, moderate power and good operating skills, even during the indifferent propagation conditions that followed the big opening.

MICROWAVE MASTHEAD PRE-AMPLIFIER ARRANGEMENT. I recently needed to replace my existing 'home brewed' 2.3GHz band mast-head low noise amplifier (LNA) as the internal relay was unable to handle the proposed increase in RF power from 40W to 300W that I was planning.

When it comes to making a mast head pre-amplifier system, there are many ways to go about it, depending on the resources of the individual. The following is how I went about building a new 2.3GHz mast head pre-amplifier system based on the parts I had available.

My old masthead system used a single low loss coaxial cable feed for both transmit and receive, with a transfer relay in the mast head unit to switch the low noise amplifier into and out of the receive path. It also had a single RLC relay behind the transverter to switch the transverter receive and transmit paths to the single coaxial feeder. The mast-head pre-amplifier and relay were both powered by 28V over the coaxial cable.

The problem was that the transfer relay was only rated to handle about 50W at 2.3GHz. The bias 'T' used to feed the 28V to the coaxial cable was also unable to handle more than about 50W of RF and since this

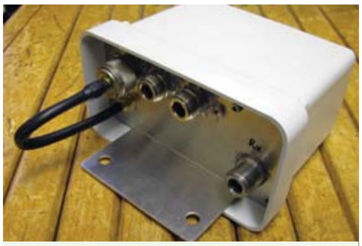

PHOTO 1: Outside of the 2.3GHz mast-head pre-amplifier

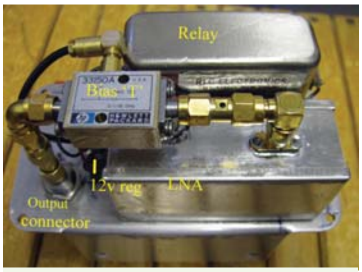

PHOTO 2: Inside view of the 2.3GHz mast-head pre-amplifier. The bias 'T' can clearly be seen. SMA adaptors have been used to connect the various parts as these were available. UT141 coaxial cable and SMA connectors could also be used

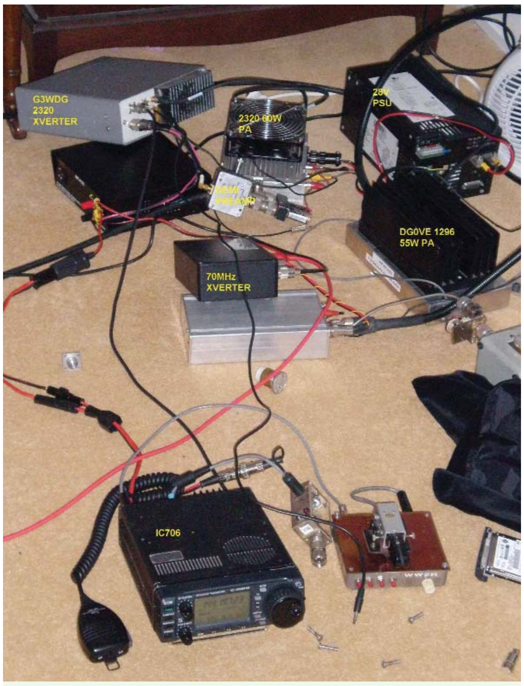

PHOTO 3: Equipment brought to the UK by Dave, G4FRE

FORTHCOMING MICROWAVE EVENTS

Bath Microwave RT, 20 April 2008, Bath University. Details on the UK Microwave Group web page

Eastern 34th VHF/UHF Conference, 18/19/20 April 2008. Enfield, CT, USA. Details, Bruce Wood, N2LIV, Conference Chairman. N2LIV@optonline.net

SVHFS Conference, Southeastern VHF Society 12th Annual Conference, 25/26 April 2008. Details from Chuck Hoover at k0vxm@arrl.net. www.svhfs.org

13th EME Conference, 8 - 10 August 2008, Florence, Italy. Details www.ari-crt.it/eme2008/questionnaire.html

Martlesham Microwave Roundtable, 8/9 November 2008. Details, G3XDY@btinternet.com

was in the transmit path, it was critical to good performance. Whilst it would have been possible to upgrade to higher power-rated parts and keep the same mast head unit I felt these to be too expensive and definitely were not available when needed.

I had the good quality 28V RLC antenna changeover relay capable of handling over 300W of RF and with over 70dB of transmit to receive port isolation (at 2.3GHz) so it seemed sensible to use this in the new mast-head unit. A single relay dictated that I had to use two coaxial feeders.

Figure 1 shows the arrangement I used. There is nothing new or original in this arrangement, but readers' questions have shown that there are still some amateurs who are not sure how to build such a system. I have been using a similar system on 1.3GHz for many years.

The housing for the mast-head pre-amplifier is one of the mast head boxes from SSB Electronics (see Web Search) as used in their popular SP range of commercial pre-amplifiers. The empty housings are often seen as 'kits' at Weinheim, Friedrichshafen and other German microwave events. They come as aluminium base/mounting and an ABS plastic cover. The size is convenient to accommodate the RLC type relay and common LNAs such as the units available from DB6NT as well as the popular DJ9BV units. The outside of the mast-head unit can be seen in **Photo 1**.

The base of the housing has to be drilled to accept the three N connectors of the relay. These protrude through the aluminium base and the relay is secured to the base by means of two screws into the mounting holes on the relay. If there are no holes in the end of the relay, an L shaped angle bracket can be used with the two holes on the side of the relay.

Since it is important to keep the length of the coax cable between the normally open (N/O) contact connector of the relay and the LNA input as short as possible to reduce losses it is desirable to mount the LNA with its input connector directly connected to either a bulkhead mount adaptor, or to mount the LNA so that its input connector also protrudes through the base of the housing. However, this is not recommended as the input connector is unlikely to be sufficiently rigidly mounted to accept any stress without breaking the connector or damaging the LNA housing.

Another N connector adaptor is required at the preamplifier output. As this is at the output of the pre-amplifier, its loss is not quite as important as the LNA input connector. However, this connector will also be carrying the 28V to the LNA and relay unless a separate cable is to be used, so it ought to have a reasonable cross section and contact area. I prefer an N connector for its combination of strength and size.

It is possible to eliminate the mast head bias 'T', that is used to extract the 28V, if the LNA has a bias 'T' built in. Be aware, 28V may exceed the dissipation ratings of the LNA internal regulator. I prefer to use an external bias 'T'. These can be either a commercial unit (available from Mini Circuits Labs etc) or home made, as long as it fits the available space in the housing. An external bias 'T' allows the 28V to be connected to an IC voltage regulator, such as an LM7812 or LM7815, to reduce the voltage applied to the LNA's internal regulator (often a 5V regulator) whilst retaining the full 28V for the relay. This reduces the dissipation in the LNA internal regulator, and the external regulator can be effectively heat sunk to the aluminium plate of the housing. **Photo 2** shows the inside of the completed unit for 2.3GHz.

It should be noted that this arrangement means that the relay is operated on receive, in parallel with the LNA. This has the advantage of failsafe. If the LNA develops a fault then the antenna is connected to the coaxial feeder for continued use without an LNA, although you need to supply an antenna changeover relay at the shack end of the coaxial feeder. The sequencer (you do use one, don't you?) switches the LNA and antenna together. This works very well and allows the use of a simple, two-stage, sequencer such as the GM3SEK or DB6NT designs.

INPUT TO THE COLUMN. My grateful thanks go to the many contributors to this month's The GHz Bands. Input for the **May** column by **1 April**, please. My e-mail and postal address are at the top of the page.

WEB SEARCH
SSB Electronics
www.ssb.de/start_e.shtml
GM3SEK
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WW2R/G4FRE
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