



SUBJECT	3400 MHz EME developments		
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Abstract

In 2007 special efforts were made to increase the EME activity on the 9cm band. This was successful with operation from eight countries in three continents. The paper describes the equipment used and the results. EME operation is always inhibited by any need to operate crossband and the desirability of concentrating future activity on 3400MHz is discussed especially as most European nations do not have access to 3456MHz. Recommendations are made on how this result can be achieved.

Introduction

Although the first EME QSO on the 9cm band was made 20 years ago there has been very little usage in the interim. However, following the recent success in boosting the EME activity on 13cm (which is now running at over 30 stations active in the two annual contests run by ARRL and DUBUS), it was decided to organise some 9cm activity weekends in the summer of 2007. At about 8 weeks notice there were 12 stations active from Europe, North America and Australia and over 30 contacts were achieved.

Previous work had all been done using linear polarisation. However operators were encouraged to use circular polarisation (CP) on these tests as; (a) it is the agreed standard for EME operation above 432MHz and; (b) it avoids the need to rotate a linear feed to avoid polarisation loss when stations from several continents are active. Recent work on parabolic dish feeds using the simple to build and tune septum polariser provided a relatively easy way to achieve CP for several participating stations.

One factor inhibiting exploitation of this band in the past has been the different frequencies chosen for the centre of activity. In Europe this has been 3400MHz and in North America, 3456MHz. In these activity weekends both frequencies were used together with cross band operation and this issue will be discussed later in this paper.

More 9cm activity weekends are planned for 2008 and activity in the two EME contests is anticipated.

Equipment

The key element in the recent exploitation of this band has been the availability of solid state power amplifiers (SSPAs) from the telecomms industry. Two of the North American stations used TWTs but all the rest employed SSPAs, either Toshiba 50W or Ionica 15W used singly or in hybrid-coupled pairs. All of these amplifiers were able to handle either 3400 or 3456MHz.

The size of dishes used ranged from 2.4m to 10m diameter, including one offset dish and several of home construction. In addition the 30m commercial dish at Jamesburg in Northern California was activated. Several stations used moon noise measured in a wide bandwidth channel to keep the antenna pointed accurately at the moon. As mentioned earlier much work was done in the months prior to the activity weekends on building and measuring CP feeds and this is likely to be a continuing field of work in 9cm system optimisation.

There are several good, reproducible, low noise amplifier designs published that give around 0.6dB noise figure and commercial units are also available. Frequency accuracy and drift were not a problem, with many stations now using GPS locked sources or efficient TCXOs. To accommodate the different frequencies either IF offsets or separate local oscillator chains were used.

Results

There was activity from the following countries: DL, G, LX, OK, S5, VE, VK, W. The majority of the activity was by European stations and therefore most operation was on 3400MHz, specifically between 3400.05 and 3400.150. There were also cross band 3400/3456MHz QSOs with the North American stations and two-way QSOs on 3456 between G and North American stations.

In only one instance was there an obvious problem caused by the different frequency allocations, the 30m Jamesburg dish had a long circular waveguide feed whose dimensions caused it to cut off at about 3430 MHz so signals on 3400MHz were very weak and they only made QSOs at 3456MHz. The Australian station transmitted on 3400MHz and made cross band contacts with the North American stations.

Some interesting measurements were also carried out on the polarisation of the moon-reflected signals and, finally, there were no reports of any station encountering interference.

Concluding Comments

- There is wide recognition that, at the marginal signal levels involved in EME, to have to operate cross band is a significant handicap. At 13cm, with four separate allocations in use, this has undoubtedly restrained the growth of EME activity.
- There is growing acceptance by the North America stations that if we want 9cm to become a regularly used EME band with worldwide activity, then concentrating EME operation at 3400MHz is the best strategy. Reference-1 shows that there are 16 nations in IARU Region-1 with 9cm allocations but only four can operate at 3456 MHz.
- The availability of broadband SSPAs and the ease of making a feed with ~2% bandwidth, means that stations have to make relatively minor changes to their equipment in order to work at both 3456 and 3400 MHz thus allowing both EME and tropo operations.
- Societies should make all possible endeavours to maintain the EU17 footnote (see also Reference-1) which encourages administrations to afford some consideration to amateur weak-signal operations in the sub-band 3400-3410MHz, amongst others.
- The EME conference in August 2008 is likely to decide on 3400MHz as the agreed centre of EME activity on 9cm.

References

[1] "Allocations at 3400 MHz", Murray Niman G6JYB, RSGB Microwave Manager, Document B13, Interim Meeting of the IARU Region-1 VHF/UHF/Microwave Committee, Vienna, February 24-25 2007

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