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SUBJECT	**Low VHF Multi-band Beacon**		
Society	**RSGB**	**Country:**	**UK**
Committee:	**C5**	**Paper number:**	**CT08_C5_24**
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Introduction

This paper covers the rationale behind the deployment of a multi-band low VHF beacon in the UK. It proposes that further clusters are deployed and that the signals are actively monitored to improve our understanding of VHF ionospheric propagation. Annexes to this document provide information on the design and transmission format of the GB3RAL beacon cluster and a summary of reports received during the testing phase in Summer 2007.

Background

A major enhanced propagation mode at low VHF is via ionospheric refraction, either via Sporadic E or at solar maximum via the F2 layer. These propagation modes show a strong frequency dependence. VHF operators are known to monitor signals between 30 MHz and 144 MHz in order to predict when band openings are likely. While there are many beacons operating in the low VHF amateur bands around 28, 50 and 70 MHz there are very few beacons operating all from the same site and there are large gaps in frequency between the amateur bands.

To address this, a multi band beacon cluster has been installed at the Rutherford Appleton Laboratory in Southeast England. This beacon transmits with 10W EIRP at 40.05 MHz, 50.05MHz, 60.05MHz and 70.05 MHz and complements the 28.215 MHz beacon also on site. This effectively allows receiving stations to assess current ionospheric propagation state in 10 MHz steps from 30 MHz to 70 MHz. The beacons are also co-sited with the Chilton Ionosonde, and a 5.29 MHz experimental beacon. The beacons were installed for testing in August 2007 and several reports of reception have already been received.

Experience with the 5.29 MHz experimental beacon has demonstrated that automated beacon monitoring stations are now very much within the reach of amateur operators using of software defined radio (SDR) techniques and are able to contribute quantitative reception data to propagation studies. The 40 – 70 MHz beacons have been designed using advanced techniques to aid in their detection; the 28.215 MHz beacon is currently being upgraded.

Details of the construction and transmission format are presented in Annex 1. A summary of unsolicited reports of beacon reception is presented in Annex 2.

Key points and proposal

It is proposed that other administrations press for the construction and deployment of similar beacon clusters and that these be located at similar frequencies using compatible transmission formats. In particular the deployment of beacons should be encouraged in the 40 MHz region as this fills an important gap between the 28 MHz and 50 MHz bands. It is also proposed that automatic monitoring techniques are further developed and that amateurs are encouraged to install automatic reception systems and contribute the results to the community.

Recommendations

Noting:

1) That the deployment of beacon clusters at low VHF is of great benefit in propagation studies but that the relatively large frequency spacing between amateur bands at VHF hinders these studies

2) There are currently very few reliable signal sources transmitting easily monitored signals at appropriate frequencies between amateur bands

3) That recent developments in digital signal processing facilitate the construction beacons with greatly enhanced capabilities

4) That automatic beacon signal strength reporting using software defined radio is now practical and reports can be rapidly disseminated via radio and wired networks.

Recommends:

1) Administrations should encourage the deployment of multi-band beacon clusters covering low VHF between about 30 MHz and about 70 MHz.

2) Deployed beacon clusters should wherever possible provide signals at around 40 MHz and around 60 MHz.

3) Amateurs should be encouraged to set up and maintain automated monitoring stations and to contribute the measurement results to the community.

4) A common transmission format should be adopted to aid the reception of multiple clusters