

Operating Procedures v3.3

Introduction

To mark the start of the second phase of the concession that allows UK amateurs to experiment on selected channels in the region of 5MHz, the RSGB 5MHz Working Group (5WG) has decided to issue this update of Operating Procedures. This guidance note is not intended to be overly proscriptive, since that could well stifle innovation, as there is plenty of scope for experimentation within the bounds of the Notice of Variation (NoV) issued by the Office of Communications (Ofcom). However, the note is intended to provide a measure of uniformity in describing the station setup for those wishing to participate in the large-scale experiment to characterise propagation around the UK. This uniformity or consistency will help ensure that the data that is logged, sent to the 5WG for consolidation and eventual analysis will not result in undue work to get it added to the growing computer database. It will also help minimise the number of variables being recorded – an essential requirement if we are to get meaningful results at the end of the experiment. When our access to the 5MHz Channels was granted the RSGB launched what it termed “The Fivemegs Experiment”. This pre-dated the formation of the 5WG that started work in November 2002. The concept of “The Fivemegs Experiment” was that amateurs would log QSOs and SINPO signal reports with other UK amateurs and Military Cadet Stations.

The first phase NoVs allowed The Fivemegs Experiment to run through to the minimum of the present sunspot cycle in August 2006. The objectives of the experiment were described in the September 2002 edition of the Radio Society of Great Britain’s *RadCom* magazine. The Fivemegs Experiment has since been updated, and details of what is now called the 5MHz Experiment appear in the September 2003 issue of *RadCom* and at the RSGB HF Committee’s 5 MHz web site at <http://www.rsgb-spectrumforum.org.uk/5mhz.htm>. The second phase will run until June 30th 2010.

All participants in the experiment are expected to take part in the propagation and antenna experiments, and to exchange signal reports in the SINPO code. Data from the logs would be combined to produce a huge database that could be analysed later in a variety of ways. . In order to get consistent data we request that participants submit logs in a particular format; further details of this, and our preferred ways of submitting data can be seen at http://www.rsgb-spectrumforum.org.uk/5mhz_station_log.htm

Throughout these notes, reference is made to 3kHz wide channels designated by the Ministry of Defence (MoD) and centred on frequencies within the range 5250 kHz to 5450 kHz. Under a scheme agreed between the RSGB and Ofcom, NoVs to the UK amateur radio licence may be issued for a period terminating in June 2010 in order to undertake experimental usage of these particular 5MHz channels. Some military cadet stations from the ATC, CCF, ACF and SCC may take part in the experiments from time to time, and their authority to do so comes from the Ministry of Defence (MoD). The channels designated by their centre frequency lie in a portion of the HF spectrum assigned internationally to the Fixed and Mobile services. In the UK the

MoD is the Primary User, and it is with their agreement that the Amateur Radio service is being allowed to use the channels to carry out propagation and antenna experiments.

Centre frequency kHz	USB carrier frequency KHz	Also known as
5260	5258.5	FA
5280	5278.5	FB
5290	5288.5	FC
5368	5366.5	FK
5373	5371.5	FL
5400	5398.5	FE
5405	5403.5	FM

Table 1: 5 MHz Channel frequencies

Since most amateur equipment in use is based upon an SSB transceiver, the suppressed carrier frequencies (or dial settings) have been included in the table detailed above for operation in the USB mode. LSB is not recommended on 5MHz. Operators wishing to use modes other than SSB, for example digital modes or CW, must do so by using USB and audio signals below 3kHz, or use some method that ensures that their transmission conforms to the 3kHz wide channel. Users of narrow-band modes such as CW and PSK31 are encouraged to operate within the bottom 300Hz of a channel since this permits the channel to be used by voice-bandwidth modes at the same time. This can be done by using USB carrier frequencies below those in the above table, in conjunction with audio signals above 300Hz.

Some military operators on these channels will be using the Clansman PRC320 series transceivers on USB. Some of these transceivers use synthesisers with a 1kHz step size, and thus will not be able to net accurately with amateur transmissions using USB. Amateur stations will need to employ their RIT to receive their transmissions – the amateur station will still need to remain within the 3kHz channel as far as transmission is concerned.

NoV Conditions

Any UK radio amateur wishing to take part in the 5MHz Experiment must hold a current Notice of Variation (NoV) of Amateur Radio Licence issued by Ofcom. This specifies the legal limitations and also details precisely the spot frequency limits within which the experimental transmissions must be confined. The basis of the experiment is as detailed below.

Establish and test point-to-point transmission paths across the UK which could be employed by future Radio Communications Voluntary Services. The main objective is to carry out propagation and antenna experiments, with any emergency radio communications being included from time to time on a secondary basis. The efficient gathering of meaningful reception reports is therefore vital. Ofcom believes that voice communications have an important role to play in this, and as such should not

be considered subservient to narrower bandwidth data modes. This is partly why channel bandwidths of 3 kHz are being permitted.

All modes are allowed, as set out in the BR68 for HF operation, but DSB Voice AM is not practicable because of its 6kHz bandwidth. The use of USB for voice is recommended – particularly when military cadet stations are participating. Cross band operation involving any one of the 5 MHz spot frequencies is only permitted between those stations holding current 5 MHz NoVs. Cross band working with stations outside of the UK is not considered to be within the spirit of the experiment. When stations are working cross-band, as a part of the propagation investigations it is suggested that voice operations, in particular, be confined to a limited number of frequencies. Those suggested are 1990 kHz, 3645 kHz, and 7045 kHz, in order to minimise confusion being caused to other amateur stations. The use of LSB on these three amateur bands, rather than USB, will have to be a matter of operating convenience, bearing in mind that USB is advised on 5 MHz.

The maximum power output permitted on 5 MHz for Full licence holders is 200 Watts (23 dBW). NoVs are not currently available for Intermediate and Foundation Amateur Licence holders.

Military Cadet Stations are taking part in the 5 MHz experiment and will be using their military Callsigns (see below). Cadets and Staff from various locations will operate these stations, and although many of the Staff and some of the Cadets may hold Amateur Radio Licences they will not make any reference to this on air. It is not permitted under the NoV to communicate with non-military Fixed and Mobile service stations.

Amateur service stations may be required to cease operation on the 5 MHz channels, at any time, upon an instruction issued by a person authorised under authority of the Secretary of State or any government or military official. Such a request may be received via the Radio Society of Great Britain, in which case the recipient will be given a source telephone number to refer to if they wish to verify the authenticity of the demand. Whatever the circumstances, the operator should comply with the instruction immediately. Failure to do so could result in the immediate suspension of the experiment. The Ofcom monitoring station at Baldock and their MoD counterparts will be taking a close interest in the conduct of the experiment, when the 5 MHz channels are in use, and they will have information regarding the NoV holders.

Equipment

Because transmitters and transceivers for the Amateur service are only designed to transmit on the amateur bands, you will almost certainly have to have your equipment modified in order to operate on the 5 MHz channels assigned to the experiment. Mostly the modern solid-state equipment with digital read-out will have the required frequency setting accuracy and stability. Most amateur radio dealers and importers in the UK have the knowledge and capability to carry out this work, but they are likely to ask to see your Amateur Radio Validation Document and your 5 MHz Notice of

Variation before carrying out the modification. Indeed, they are quite entitled to ask for a copy of these for record purposes, in case they receive enquiries from Ofcom. There is a danger in “broad-banding” amateur radio transmitters and transceivers, which is the form of modification most likely to be necessary. NoV holders are required to ensure that any broad-banding modification does not cause their equipment to emit spurious signals outside the 5 MHz channels defined in the NoV, or outside any authorised amateur band. Operation on any unauthorised frequencies, or outside the authorised 3 kHz wide channels, could result in withdrawal of the Amateur Radio licence involved .

Communicating with UK Military Stations

Phase 1 was the first time in the history of amateur radio in the UK that NoV holders were permitted to establish communication with military or military cadet stations. Their procedure is based upon the four concepts of BREVITY, ACCURACY, SECURITY, and SPEED - or “BASS” for short. Whilst radio amateurs are not obliged to adopt their procedure on 5 MHz, it might assist the propagation reporting if some of their working systems are adopted. For a start, the NoV conditions state that all working involving more than two stations MUST be in the form of a controlled net.

Note that Air Cadet and Sea Cadet stations use M-prefix 3-letter call signs – usually followed by two digits, whilst Army Cadet stations use two figure call signs, sometimes followed by a letter. The military stations are not allowed to give their unit name, location, or the operator’s name. It is hoped that they may be allowed some flexibility with respect to QTH locators. Cadet stations may be heard working each other on frequencies close to ours, but it is NOT permitted for amateurs to contact cadets on such frequencies.

The SINPO reporting system lends itself to a quantitative analysis although it is appreciated that it is based upon a qualitative assessment. Some operators may wish to take more precise signal strength measurements. To improve the data that is being recorded within the experiment it has been decided to use a different interpretation of the conventional SINPO code. These issues are detailed below in the section titled “Assessment of SINPO”.

Improving the logged data

The 5WG reviewed very carefully whether the data that was being presented would eventually be sufficiently accurate from a scientific perspective. NoV holders and others also debated the issues at length more publicly on the Internet. The obvious problem surrounding the use of any qualitative reporting scheme, such as SINPO, is that one person’s view of a “4” or a “5” report may be different from another person’s view. Even the same person may not be that consistent. The idea that the 5WG has taken forward is to provide three beacons on the 5290kHz channel. Apart from the callsign, the beacons will provide an accurate 6dB stepped output-power that listeners can use to assess S+N/N as well as SINPO. The beacons will also carry a sounder pulse sequence for those equipped with the appropriate hardware and

software to assess Doppler and multipath delay. The accuracy of any subsequent analysis of the Experiment's database will be dependent upon the amount of data stored, thus the 5WG would encourage those experimenters who can set up automated receiving systems to do so.

Station Logging Form

The Station Logging Format is the key to reducing the workload and improving the quality of the data that is entered into the computer for analysis. After using an EXCEL spreadsheet for some while a special computer logging program has been developed that is now the preferred way of submitting electronic logs to the Experiment's database. We still accept hand-written logs from those who do not have access to a computer, although it does divert our voluntary effort from participating in other aspects of the experiment. For further information, and downloads, please go to: <http://www.rsgb-spectrumforum.org.uk/5mhz%20station%20log.htm>

Station log features

Full details of the formats for the different columns can be found on the web at http://www.rsgb-spectrumforum.org.uk/5mhz_station_log_description.htm

a) **Data that may be common to many entries:** Information such as callsign, station location (using the 6 character QTH Locator system formerly known as the Maidenhead System), aerial type, aerial height, aerial polarisation and alignment, can be entered into the spreadsheet and copied to other cells in the same column as appropriate. Where one is carrying out aerial comparisons - that is using different aerials - then you can change this for each contact, see h) to j) below, and submit on a single spreadsheet.

For those completing the paper logs, where there are common data fields for several contacts, these are completed as "header" information. You will need to write on different sheets for where this common information changes, for example when using different aerials, location, etc.

b) **Station heard or worked:**

- Date and Time station heard/worked: the start details to be entered in as DD MM YY HH MM, i.e. 2nd April 2003 at 35 minutes past midnight would be 02 04 03 00 35
- Callsign and Locator: as received
- SINPO (see section on SINPO below)
- Steps: this is a column to record the number of beacon steps received above the noise floor, whether that is atmospheric, man-made noise or interference from co- or in-channel operation.
- Bandwidth (Hz): this is to record the bandwidth used in receiving the beacon signal when using special DSP techniques prior to manual assessment. Normally, this column will be left blank.

c) **Received assessment:**

- SINPO: as received from the other station.

d) **Channel:** We will accept either the original FA, FB, etc. channel designators or the actual frequency of the QSO.

- e) **Mode:** Please use one of the following designations: SSB, CW, DRM, PSK, PSK31, FS-1049, FS-1052, SSTV and MT63.
- f) **Power:** Enter for logging outgoing transmissions the transmitter output power in Watts.
- g) **Aerial type:** Please indicate with the following code the type of aerial used:
- RD for resonant dipole
 - NRD for a non-resonant dipole
 - V for vertical, whether resonant or not
 - L for small loop
 - O for other, e.g. large loops, random lengths of wire tuned against ground, etc
- h) **Aerial height above ground:** Please enter this in metres, to the nearest whole number.
- i) **Aerial polarisation:** enter either V (vertical), H (horizontal) or M for mixed
- j) **Aerial alignment:** please use only N-S, NNE-SSW, NE-SW, ENE-WSW, E-W, ESE-WNW, SE-NW, SSE-NNW to show the plane of the aerial, otherwise use O for an omni.

Completed electronic versions of EXCEL Log Form preferably should be sent as an e-mail attachment to 5MHz_Working_Group@rsgb.org.uk. The e-mail "Subject" field should be marked "5MHz Activity Log, *callsign/SWL number*". Alternatively, paper logs and EXCEL log forms saved on a floppy disk, CDROM, etc., should be mailed to RSGB HQ, with the envelope marked "5WG Station Log".

[Assessment of SINPO](#)

The analysis of the initial batch of data has shown the need to give guidance on how to generate a SINPO report. The traditional RS or RST report is usually given at the start of a contact to give the other station some idea of the likely quality of the subsequent contact. The SINPO report on the other hand, is intended to be an assessment of the whole of the contact and should therefore be generated at the end of the contact. The S (signal level) report, on a scale of 1 – 5, is effectively an assessment of how well the signal stands out above the background receiver noise, the I report (interference) is an assessment of how well it stands out above competing signals, and the N report (noise) is an assessment of how well it stands out above static or man-made noise.

The P report is a measure of propagation-related distortion such as fading or flutter, and the O report should be a measure of the extent to which all these factors contributed to the overall intelligibility of the entire contact. One would expect the assessment of interference (I), noise (N) and propagation (P) to be independent of each other and of the signal level (S) report.

Although the CCIR definition describes S1 as "barely audible" we would like those reporting nil contacts, where the other station is known to be transmitting, as 1 also. It would follow that this needs to be paired with an O report of 1. Under these conditions one should be able to make independent assessments of I, N and P as they may not necessarily be 5, for example 15551 would tend to suggest that propagation was non-existent, whereas 15151 might be relevant to very high local noise.

The table below, whilst still somewhat subjective, should assist people to generate their reports.

SINPO - Code (CCIR Recommendation 251)

	1	2	3	4	5
Signal	Barely audible	Poor	Fair	Good	Excellent
Interference	Extreme	Severe	Moderate	Slight	Nil
Noise	Extreme	Severe	Moderate	Slight	Nil
Propagation	Extreme	Severe	Moderate	Slight	Nil
Overall rating	Barely intelligible	Poor	Fair	Good	Excellent

Activity periods

For the main Experiment's data analysis to be worthwhile we need a good spread of operating times. The initial analysis of data showed that without any specific organisation of activity periods, the activity was roughly constant throughout the weekdays and weekends, with no specific days when activity peaked or dipped. This is ideal. However we do need to spread the activity out more across the days, as most activity seems to occur between 2pm and 5pm. We would also be interested in stations attempting QSOs across the full 24 hours, and it would be of value to have QSOs attempted more often when propagation conditions are likely to be unfavourable, e.g. day-night transition and during the hours of darkness. Logs of unsuccessful QSOs, so long as there is reasonable certainty that the transmitting station was operating, are extremely valuable. Ideally, we would like logs of both sides of the attempted contact that may be carried out more effectively as a part of a net operation.

In order to bring additional activity and logs for the Experiment, the RSGB broadcasts its GB2RS News Service at 12:30 local time on Sundays using USB on 5403.5kHz. This is carried out by newsreaders that hold the 5MHz NoV. QSOs with the 5MHz GB2RS operator (drawn from the existing pool of NoV holders) following the news broadcast, SWL reports of the GB2RS broadcast and reporting by non-NoV holders on adjacent bands, have already become a standard feature of the activity. Please ensure that postal and e-mail reception reports are sent directly to the news reading station concerned and NOT to GB2RS. Reports have also become a part of the standard Station Log input to the experiment. The 5WG hopes that this will continue and grow. If you are an RSGB member with a 5MHz NoV and would like to become a GB2RS newsreader on 5405kHz as part of the ongoing experiment, you should contact GB2RS News Manager Gordon Adams G3LEQ on 01 565 652652 or by e-mail via gb2rs@boltblue.com

Miscellaneous

Real-time information about the F2-layer ionospheric critical frequencies, which govern Near Vertical Incidence Skywave (NVIS) communications performance in the UK, can be obtained from R.A.F. Fairford, Gloucestershire at http://sec.noaa.gov/ftpdir/lists/iono_day/Fairford_iono.txt and forecasts from the Radio Communications Research Unit, Rutherford Appleton Laboratories web site at http://www.wdc.rl.ac.uk/ionosondes/view_latest.html. Archive material is also available from the Radio Communications Research Unit web site.

The RAYNET HF Team <http://www.raynet-hf.net/> in its broader range of experiments on HF is making use of the 5MHz channels during their rolling 7-day cycle of nets around the UK. In addition Robin Bellerby, GM3ZYE, who is the Radio Communications Voluntary Services (RCVS) National Coordinator for the RSGB, coordinates other emergency communications activities that dovetail with the wider propagation and antenna experiments. He may be contacted via the Radio Society of Great Britain or via email at rcvs@rsgb.org.uk

Other groups are encouraged to set up regular nets with a view to submitting data into the Experiment's database. Although not mandated by the NoV those wishing to conduct experiments that are outside the scope of main Experiment, described above, or those experiments arranged by the RAYNET HF Team, RCVS, etc, are invited to share their ideas with the 5WG. We should be in a position to give advice, support, and where appropriate give publicity to the particular experiment. The 5WG chairman John Gould, G3WKL, can be contacted via e-mail to 5MHz_Working_Group@rsgb.org.uk, or alternatively by letter to the 5MHz Working Group c/o RSGB HQ.

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