

Guidelines for the Use of MGM in RSGB VHF Contests

Introduction

- These Guidelines describe the use of digital modes in RSGB VHF contests, referred to by the RSGB and IARU Region 1 as Machine Generated Modes (MGM). A subset of MGM, modes supported by the WSJT software originally developed by Joe Taylor K1JT, are sometimes called JT Modes. This definition excludes CW (Morse code), even though it is frequently machine generated, and Digital Voice (DV).
- Since 1-Jan-16 the use of Machine Generated Modes (MGM) has been permitted in all RSGB VHF Contests (except CW-only contests). This is to provide more opportunities for contacts to be made with stations in remote parts of the country under normal conditions.
- MGM is now a mainstream mode alongside SSB and CW for the exchange of contest information, facilitated by the widespread and low-cost availability of PCs and free software.
- The main purpose of this guide is to provide a protocol for the efficient exchange of contest information when using MGM. However, you will not be penalised for using a different protocol so long as the complete contest exchange only takes place over the air.
- The protocol is an extension of standard meteor scatter procedures to include contest information, and the description is based around the standard WSJT-10 messages and modes (the most commonly used in contests), although the same messages may be used with other Machine Generated Modes such as PSK which are not included in the WSJT suite.
- The Appendix contains supporting information to enable contestants unfamiliar with the use of MGM to understand how it might be used in contests. It is recommended that those not already familiar with MGM first gain experience in its use outside contests.
- In the event of conflict between these Guidelines and the RSGB VHF/UHF/SHF Rules the decision of the RSGB VHF CC Chair is final.
- This Guide does not describe the interconnections between PC and transceiver since such information is readily available on the internet. All that is required is PTT control via the PC and line in/out connections for transmit and receive audio.
- This Guide does not describe how to set up or optimise the use of MGM software, nor does it compare the merits of different software applications.

What Needs to be Logged

In most RSGB VHF contests the following needs to be received over the air and logged accurately by both parties to a contest exchange, in accordance with General Rule 4:

- both calls
- report
- serial number
- 6-character locator (e.g. IO91OJ)

Some contests also require additional information to be exchanged, e.g.:

- Post Code information (see General Rule 7d for details)

In the experimental 1st and 2nd MGM Contests (21-22 April 2018 and 15-16 December 2018) only the following information needs to be sent and received over the air:

- both calls
- report
- 4-character locator (e.g. IO91)

This reduced exchange allows the use of the more recently developed modes such as FT8 without resorting to using the 'free text' facility in such modes.

Note 1: In accordance with General Rule 4d (equally applicable to SSB and CW QSOs) “No points will be lost if a non-competing station cannot provide an IARU locator, serial number, or any other information that may be required. However, the receiving operator must receive and record sufficient information to be able to calculate the score”. Remember that a serial number must be sent, whether or not the station you are contacting sends you one. [The Minos logging software will consider the QSO incomplete if you leave the Serial RX box blank or insert 000 and you will have to click Force, then in the pop-up box remove the tick next to Non-Scoring and click on Force to log the QSO - other logging software may address incomplete QSOs differently].

Note 2: The use of DX Cluster / ON4KST like assistance is allowed in many events and sections of RSGB contests. However, the posting of extracts of received text to ON4KST is discouraged, since contest information may be inadvertently included, thus rendering the contact invalid; for the same reason, comments should not be posted to ‘KST on the progress of the QSO while it is taking place (see General rules 4h and 4i, and Cluster/Chat Do’s and Don’ts).

Contest Exchange

- a) Standard Exchange – such as attempting a QSO on a frequency agreed via a chat room such as ON4KST.

As an example, suppose GM4VVX set up a QSO with G8BCG on ON4KST as follows (in practice, this is all much simpler than when written down, and experienced operators will know from the contents of the text box above what to send):

GM4VVX would

- Enter G8BCG’s call in his log
- Set up the text box as shown, and send message Tx1 in period 2:

| | | |
|------------------------------|----------------------------------|-----|
| G8BCG GM4VVX IO78TA | <input checked="" type="radio"/> | Tx1 |
| G8BCG GM4VVX 26 001 26 001 | <input type="radio"/> | Tx2 |
| G8BCG GM4VVX R26 001 R26 001 | <input type="radio"/> | Tx3 |
| RRRR IO78TA GM4VVX | <input type="radio"/> | Tx4 |
| 73 GM4VVX IO78TA | <input type="radio"/> | Tx5 |
| CQ GM4VVX IO78TA | <input type="radio"/> | Tx6 |

Note that the report of 26 is the default – this would be amended to the actual report prior to transmission of Tx2 or Tx3; once sent it should not be altered during the remainder of the QSO

The GM4VVX sends a message to the ON4KST chat room such as:

/cq G8BCG Hi Peter, calling you on 70.232 VVX 2nd JT6M

G8BCG should set up the equivalent complementary text box and send the required information (initially Tx1) in period 1:

| | | |
|------------------------------|----------------------------------|-----|
| GM4VVX G8BCG IO70RK | <input checked="" type="radio"/> | Tx1 |
| GM4VVX G8BCG 26 005 26 005 | <input type="radio"/> | Tx2 |
| GM4VVX G8BCG R26 005 R26 005 | <input type="radio"/> | Tx3 |
| RRRR IO70RK G8BCG | <input type="radio"/> | Tx4 |
| 73 G8BCG IO70RK | <input type="radio"/> | Tx5 |
| CQ G8BCG IO70RK | <input type="radio"/> | Tx6 |

Again, note that the report of 26 is the default – this would be amended to the actual report prior to transmission of Tx2 or Tx3; once sent it should not be altered during the remainder of the QSO. (Note that the serial number to be sent is in the normal sequence of contest serial numbers)

Once he is transmitting in period 1 G8BCG might respond with a message via ON4KST such as:

/cq GM4VVX RR Clive, now running

Upon receipt of both calls, G8BCG should

- Enter GM4VVX in his log, and also the locator if received
- Send calls, report and serial number (in this case 005) (his Tx2):

GM4VVX G8BCG 26 005 26 005

When this information is received, GM4VVX will

- Log the received report as 26 and the serial number as 005 in his log
- Respond with (Tx3):

G8BCG GM4VVX R26 001 R26 001

the R added to confirm receipt of the report and serial number, with the full calls sent again

When received correctly, G8BCG would

- Log the received report as 26 and the serial number as 001 in his log (*note that the R is not logged, since it is the equivalent of "Roger" in SSB QSOs and is not a part of the report*).
- Respond with (his Tx4):

RRRR IO70RK G8BCG

the RRRR is confirmation of the acknowledgement of receipt of report and serial number. The full locator added with the RRRR as there is space in this Tx box. At this stage G8BCG may be shortened to BCG so the information may be passed more quickly.

Once GM4VVX has received the locator, he has everything he needs, and would

- Enter the locator in his log book if not entered earlier
- Respond with:

73 IO78TA GM4VVX

or

73 IO78TA VVX

this confirms receipt of all required details, including locator; the full locator is added again as extra in case the other operator had not copied it earlier.

When he receives this message, G8BCG

- Logs the locator in his log book (if not previously received)
- Responds in one of the following ways by sending

73 IO70RK BCG

or

CQ G8BCG IO70RK

or a posting on ON4KST such as:

/cq GM4VVX tnx FB QSO Clive 73 GL

This confirms that G8BCG has also received all the information, including locator.

The contest QSO is now complete. The log entry of GM4VVX will look like

| GM4VVX_2017Jan19_70 MHz.Minos | | | | | | | | | | |
|-------------------------------|----------|-------|------|-------|------|--------|------|------|----------|----------|
| UTC | Callsign | RepTx | SnTx | RepRx | SnRx | Loc | brg | dist | Exchange | Comments |
| 15:06 | G8BCG | 26 | 001 | 26 | 005 | IO70RK | 181° | 844 | | JT6M |

In this example the mode actually used (JT6M) has been recorded in the Comments section of the log, although this information is optional.

Notes:

- i) The example QSO above assumes that G8BCG copies both call-signs first – if GM4VVX copies both calls before receiving a report from G8BCG, he responds with Tx2, and so on (roles reversed).
- ii) Reports such as 26 are standard MS reports (see Appendix). However, on tropo paths it is permissible to use RS signal reports such as 54. dB reports are in common use with modes such as ISCAT-A or -B (e.g. -10) and are acceptable although discouraged, since many contest logging programs won't handle them readily, and it introduces unnecessary complexity into the RSGB adjudication process. The IARU R1 VHF Managers Handbook describes another reporting system known as RSQ for MGM QSOs, which is also acceptable, although it is rarely used in practice. All these forms of report will be accepted as satisfying General Rule 4a.
- iii) If long call-signs are in use, the report and serial number might only be sent once in Tx2 or Tx3 to fit into the available space, e.g.

MM6BYZ/P GM4VVX/P R26 005

- iv) Be aware that some continental operators may use a different protocol, for example some may add the serial to the RRRR or 73s so that it reads like

RRRR 001 JO45VV or 73 001 JO45VV OE

- b) Responding to CQ (as sent in Tx6 above) – when not on a calling frequency or centre of activity, the response should start with Tx2 and follow the sequence shown in a) above.
- c) Additional Contest Information (e.g. Post Code Contests) – In contests where additional information needs to be sent as part of the contest exchange, e.g. two letter post codes, they should be inserted in Tx2 and Tx3 as follows:

| | | |
|-------------------------|-----------------------|-----|
| G8BCG GM4VVX 26 001 IV | <input type="radio"/> | Tx2 |
| G8BCG GM4VVX R26 001 IV | <input type="radio"/> | Tx3 |

Tx4 or Tx5 should only be sent when report, serial number and post code have all been received correctly.

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Appendix

Signal Reports

Standard meteor scatter reports are defined in the VHF Managers Handbook (<http://www.iaru-r1.org/index.php/documents/func-startdown/625/>) as:

The report consists of two numbers:

| First number (burst duration) | Second number (signal strength) S-units S/N |
|----------------------------------|--|
| 2 : up to 0,5 s | 6: below S2 or below 5 dB |
| 3 : 0,5 - 1 s | 7: from S2 to S3 or from 5 dB to 10 dB |
| 4 : 1 - 5 s | 8: from S4 to S5 or from 10 dB to 15 dB |
| 5 : longer than 5 s | 9: above S5 or above 15 dB |

Note that the number "1" is not used as the first number/burst duration.

MGM Modes Suitable for Contests

- The suitability of modes for contest exchanges under different propagation modes is still an area worthy of further experimentation. The following is provided as a "Beginners' Guide".
- Highly structured messaging and optimised modes for minimal contacts such as JT65, JT4 and MSK144 are unsuitable for use in RSGB contests in which 6 figure locators and serial numbers have to be exchanged, since they have a maximum character set of 13 which is insufficient for the exchange of contest information (although protocols to make this possible are under consideration, they are not yet proven).
- JT6M is optimised for meteor, ionospheric, and random scatter on 6m. It is equally effective on 4m and has benefits on higher bands since it appears to be effective at cutting through local noise e.g. it is good for 2m scatter propagation as the musical tones make it through background noise whereas weak FSK441 sounds very like hash and is lost in the decoding.
- FSK441 is optimised for meteor scatter and is most commonly used on 2m (and 70cm) for this purpose.
- JTMS is intended for meteor scatter. Although claimed to be more effective than JT6M, it isn't widely used in contests.
- ISCAT is optimised for meteor and ionospheric scatter on 6m, although it is not usually used on that band. In contest operation it is more commonly used from 70cm into the microwave bands, and it appears well-suited to Aircraft Scatter (AS).

Propagation Modes Suitable for MGM

- Extended tropo – a good rule of thumb is that CW gives a 10-12dB improvement over SSB, and that MGM gives a further ~10dB advantage to the average operator. This can give significant range extension, with relatively short QSO durations (i.e. ~ 5-10 minutes).
- Meteor scatter (MS) – MGM is ideally suited to meteor scatter contest exchanges on 6m, 4m and 2m at distances between 900km and 1500 km. Under favourable conditions contest exchanges can be completed in 5 minutes, although they can take much longer. Thanks to MGM, MS is readily accessible and is no longer an exotic mode.
- Ionoscatter – this mode frequently supports MGM communications at ranges of 900 - 2000 km on 6m, characterised by weak, fairly steady signals; and under these conditions, MGM contest exchanges take place relatively quickly.
- Sporadic E and Trans-Equatorial Propagation (TEP) – MGM can often be used on 50 MHz (and 70 MHz) when reflections are too weak to support SSB, thus giving extended openings.
- Aircraft Scatter (AS) - on paths with large scatter volumes, SSB is a more effective means of exchanging contest details since it can be accomplished very quickly; however, on longer distance paths with high aircraft numbers and smaller scatter volumes signals become much more random and MS-like, and MGM may have advantages in such circumstances.
- Random scatter - 6m in particular is characterised by indeterminate random increases in signal strength which are meteor-like in nature and are therefore suited to MGM.

Contest Strategy and MGM

- The use of MGM provides opportunities for contest QSOs at VHF and up at much greater ranges than SSB or CW, although such exchanges usually take longer to complete. Maximising scores by undertaking the trade-off between the extra time needed for MGM

QSOs and the additional bonus points or multipliers gained by doing so represents an interesting challenge for the keen contestant. You have to weigh up the time versus the value of the new bonus/multiplier.

- In multi-mode contests, SSB is the fastest means of exchanging details, so in the early stages contestants tend to work every station they can hear (the initial “feeding frenzy”). In the popular short duration contests such as the UKACs, this phase may fill the whole contest for those living in the densely populated areas, whereas in sparsely populated regions all SSB stations within range may have been worked in 30 minutes. Contestants then move on to the slower CW and MGM modes to make contact over the more difficult paths for the remainder of the contest. At the other extreme from the UKACs, the May 24 hour 144 MHz Post Code contest offers ample opportunity for stations to make MGM MS contest QSOs over extended distances within the UK and CD.
- It’s normal operating procedure for stations transmitting northwards or westwards to transmit in the first period, and stations transmitting southwards or eastwards to transmit in the second period, in order to avoid local QRM. However, this doesn’t always work in practice, in which case it’s quite OK to agree with stations local to you, and/or the station you wish to contact to do the opposite. Misunderstandings on this issue can lead to a lot of wasted time, so ALWAYS tell the other station the period in which you will transmit (via ON4KST), unless you are responding to a CQ you’ve just heard on air.
- The 50 MHz and 70 MHz UKACs take place on a Thursday evening and overlap the NRAU Activity Contest (NAC) – note that in the NAC contestants are not required to exchange serial numbers, and that you will not be penalised in the RSGB contest if you do not receive one from stations not entering the RSGB contest; however, any station entering the RSGB contest, including those located outside the UK and CD, must include a serial number as part of the exchange.
- It should be noted that although the use of MGM is permissible in many RSGB VHF contests (exceptions being the 2m Low Power, 70cm Low Power, and Backpackers contests) IARU R1 contests do not permit its use at 144 MHz and above. You are advised to familiarise yourselves with the rules if you wish to enter IARU R1 contests that run concurrently with RSGB contests.

Summary of Graphics

- You may choose to print the following for reference:

| | | |
|------------------------------|----------------------------------|-----|
| G8BCG GM4VVX IO78TA | <input checked="" type="radio"/> | Tx1 |
| G8BCG GM4VVX 26 001 26 001 | <input type="radio"/> | Tx2 |
| G8BCG GM4VVX R26 001 R26 001 | <input type="radio"/> | Tx3 |
| RRRR IO78TA GM4VVX | <input type="radio"/> | Tx4 |
| 73 GM4VVX IO78TA | <input type="radio"/> | Tx5 |
| CQ GM4VVX IO78TA | <input type="radio"/> | Tx6 |

| | | |
|------------------------------|----------------------------------|-----|
| GM4VVX G8BCG IO70RK | <input checked="" type="radio"/> | Tx1 |
| GM4VVX G8BCG 26 005 26 005 | <input type="radio"/> | Tx2 |
| GM4VVX G8BCG R26 005 R26 005 | <input type="radio"/> | Tx3 |
| RRRR IO70RK G8BCG | <input type="radio"/> | Tx4 |
| 73 G8BCG IO70RK | <input type="radio"/> | Tx5 |
| CQ G8BCG IO70RK | <input type="radio"/> | Tx6 |

| | | |
|-------------------------|-----------------------|-----|
| G8BCG GM4VVX 26 001 IV | <input type="radio"/> | Tx2 |
| G8BCG GM4VVX R26 001 IV | <input type="radio"/> | Tx3 |

| GM4VVX_2017Jan19_70 MHz.Minos | | | | | | | | | | |
|-------------------------------|----------|-------|------|-------|------|--------|------|------|----------|----------|
| UTC | Callsign | RepTx | SnTx | RepRx | SnRx | Loc | brg | dist | Exchange | Comments |
| 15:06 | G8BCG | 26 | 001 | 26 | 005 | IO70RK | 181° | 844 | | JT6M |