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SUBJECT	Operating procedure for Meteor Scatter QSOs		
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Introduction:

This paper describes a new procedure for the use of Meteor Scatter on VHF-UHF.

Background:

The procedure is supposed to replace the old one, which is very detailed and does not mention the modern modulation techniques which are widely in use.
During the interim meeting in Vienna a working group was asked to develop a proposal for improving the.

Key point and proposal:

This paper describes a modern procedure, which should provide a practical guide for starting MS-amateurs. We propose to implement the procedure as attached.

Recommendations:

QSO's via Meteor scatter have to be subject to agreed rules. This is in particular important as we have to be able to count QSO's for "firsts", rewards etc.
We recommend to implement this procedure as the only way to accept QSO's via Meteor Scatter

OPERATING PROCEDURE FOR METEOR SCATTER QSOS

1. INTRODUCTION
The goal of the procedures described is to enable valid contacts to be made by meteor scatter (MS) reflection as quickly and easily as possible. Meteor scatter is unlike most other propagation modes, in that neither station can hear the other until an ionised meteor trail exists to scatter or reflect the signals. As the reflections are often of very short duration the normal QSO procedure is not readily applicable and specialised operating techniques must be taken to ensure that a maximum of correct and unmistakable information is received. The two stations have to take turns to transmit and receive information in a defined format, following the procedures as detailed below. Some meteor showers are strong enough to make some of these measures unnecessary but to encourage use of all generally listed showers there is no reason why the suggested procedures should not always be used. As with operating procedures in general, the virtues of the MS operating procedures are mainly that they are standard and are widely understood throughout IARU Region 1.

2. SCHEDULED AND RANDOM CONTACTS
Two types of MS contacts, arranged in different ways, may be distinguished:

a. A scheduled contact, where two interested stations arrange in advance the frequency, timing, transmission mode, e.g. Telegraphy, SSB or MGM and call signs to be used. Scheduling may be carried out by exchange of letters or e-mail, by radio via the European VHF Net on 14,345 MHz, by Internet chat-rooms, packet-radio etc.

b. A non-scheduled contact, where a station calls CQ or responds to a CQ call, are called "random contacts". Random contacts are far more difficult and because you are starting entirely from scratch, it is particularly important for both stations to follow the standard meteor scatter QSO procedures described in this document.

3. TIMING
Prior to any MS activity it is absolutely vital that clocks need to be set to better than 1 second of standard time. Any clock inaccuracy will result in wasted time. Accurate timing of transmit and receive periods is important for two reasons: 1) to maximise the chances of hearing the other station, and 2) to avoid interference between local stations. Accurate timing can be accomplished for example by checking against the time-ticks on standard frequency transmissions, TV Teletext, telephone 'speaking-clock', GPS time signals or the Internet.
The recommended time periods for the different modes are:

a. Telegraphy: 2,5 minutes periods.

b. SSB: 1 minute periods.

c. MGM: 30 seconds periods.

This practice gives quite satisfactory results. However growing technical standards make it possible to use much different periods and amateurs may wish to arrange 1 minute schedules for Telegraphy and shorter periods for SSB and MGM especially during major showers. If non-standard time periods are used the first priority is to avoid causing interference to local stations that are using the standard periods.
Even though the recommended standard period for SSB contacts is 1 minute periods a quick-break procedure making a break every 10-15 seconds, in case the QSO can be completed within one long burst, are encouraged during major meteor showers.

4. TRANSMIT PERIODS
In order to minimise the overall interference with other stations standard transmit periods are recommended.
All MS operators living in the same area should, as far as possible, agree to transmit simultaneously in order to avoid mutual interference.
In Europe the stations operating from the "IO" and "JO" fields and rest of Germany, Poland and the Czech Republic use second transmit period.
Two stations both being inside, or both being outside, a defined Area agree the transmit period on a case by case basis. In this case the operating frequency should be chosen away from the defined meteor scatter operating frequencies. If a station is operating in the perimeter of an Area and beaming outside or inside the Area reverse timing should be considered.
5. QSO DURATION
Every uninterrupted QSO period must be considered as a separate trial. This means that it is not permissible to break off and then continue the contact at a later time.
Trial contacts usually range:

a. Telegraphy or SSB: 30 to 60 minutes.

b. MGM: 30 minutes.

However, all depending upon conditions and distance trial periods may be significantly reduced or extended.

6. FREQUENCIES

a. Scheduled contacts

These contacts may be arranged on any frequency, taking into consideration the mode and band plan. Scheduled contacts must not use known popular frequencies and the random MS frequencies. Special care should be applied on the frequency selection to avoid interference when using reverse transmit periods according to your location.

b. Random contacts

The frequency used for CQ calls for random contacts should be according to the IARU Region 1 bandplans.
7. QSY FREQUENCIES
To avoid -interference, which results from a large number of stations attempting to complete contacts on the various MS calling frequencies, a QSY method is recommended. During the CQ the caller indicates on which frequency he/she will listen for a reply and carry out any subsequent QSO. The procedure for moving a beginning QSO off the calling frequency without losing contact is as follows.
If an operator wants to call CQ the following QSY procedure should be used:

i. Select the frequency to be used for a QSO by checking whether it is clear of traffic and QRM.

ii. In the call, immediately following the letters "CQ", a letter, for Telegraphy, or kHz-frequency, for MGM, is inserted to indicate the frequency that will be used for reception when the CQ call finishes.

iii. During the receiving period the receiver should be tuned to the frequency indicated by the letter used in the CQ call.

iv. When the caller receives a signal on the receiving frequency indicated during the call and identifies the reply as an answer on his CQ, the transmitter is moved to the same receiving frequency and the whole QSO procedure takes place there.

If an operator instead of calling CQ wishes to listen for a CQ call the following QSY-procedure should be used:

i. Listen on a random contact frequency.

ii. When a CQ call is received, note the letter or kHz-frequency, which follows the letters "CQ" in the call. From this find the correct receiving frequency which the calling station will use use for receiving replies.

iii. QSY the transmitter to the receiving frequency, and transmit a reply during the appropriate period. The format for the reply can be found in section 8.

iv. As the QSO will take place on this frequency, continue to transmit and to listen, during the appropriate periods, on this frequency. It may be that the station calling CQ will not hear your first reply, but may do so during one or more subsequent periods. Hence there is no need to return to the calling frequency.

The QSY frequencies should take place in the segment according to the IARU Region 1 bandplans.

a. Telegraphy, Letter-frequency

The below letters indicates the frequency offset, i.e. relative frequency, from the actual calling frequency used. For instance, CQE would indicate that the operator will listen on the calling frequency +5 kHz.

A = 1 kHz CQA	H = 8 kHz CQH	O = 15 kHz CQO	V = 22 kHz CQV
B = 2 kHz CQB	I = 9 kHz CQI	P = 16 kHz CQP	W = 23 kHz CQW
C = 3 kHz CQC	J = 10 kHz CQJ	Q = 17 kHz CQQ	X = 24 kHz CQX
D = 4 kHz CQD	K = 11 kHz CQK	R = 18 kHz CQR	Y = 25 kHz CQY
E = 5 kHz CQE	L = 12 kHz CQL	S = 19 kHz CQS	Z = 26 kHz CQZ
F = 6 kHz CQF	M = 13 kHz CQM	T = 20 kHz CQT	
G = 7 kHz CQG	N = 14 kHz CQN	U = 21 kHz CQU	

Example: DF7VX wishes to try a random MS experiment on Telegraphy and wants to start with calling CQ. He first checks his receiver in the range 144,101 MHz to 144,126 MHz and finds a clear frequency on 144,107 MHz. He decides to call CQ on 144,100 MHz, and he must now add a letter to his CQ call to indicate on which frequency he intends to listen. In this example he has chosen a frequency offset of 7 kHz, and therefore he will have to include the seventh letter of the alphabet, the letter "G", in his CQ call, i.e. "CQG". Note that the station receiving the CQ call will reply on a frequency exactly 7 kHz above the one on which the CQ call is heard.
Example: You receive SM3BIU who is calling CQH. This tells you that, regardless of the exact frequency SM3BIU is using for his CQ, he will be listening for a reply exactly 8 kHz higher, as H is the eighth letter of the alphabet. Having established that the CQ was "CQH" you will call him 8 kHz up.

b. MGM, kHz-frequency

Users of MGM indicate the frequency they intend to carry out the QSO by adding the three digits of the absolute frequency, i.e. the kHz-frequency. For example CQ383 indicates that the station will listen on 144,383 MHz for a subsequent contact.
Example: DF7VX wishes to try a random MS experiment on MGM and wants to start with calling CQ. He first checks his receiver in the range 144,360 MHz to 144,399 MHz and finds a clear frequency on 144,397 MHz. He calls CQ on 144,370 MHz, and he must now add the kHz-frequency to his CQ call to indicate on which frequency he intends to listen. In this example he will therefore call "CQ397" in his CQ call.
Example: Your receive SM3BIU who is calling "CQ389" on the 144 MHz random frequency. This tells you that SM3BIU will listen on exactly 144,389 MHz.

c. SSB

The QSY principle should not be used for SSB contacts! (De Haan, September 1993).

8. QSO PROCEDURE

All modes use the same QSO procedure. When attempting random SSB contacts, speak the letters clearly, using phonetics where appropriate.

a. Calling

The contact starts with one station calling the other by sending both call signs.

b. Reporting system

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.

Maximum duration of a ping (Underdense Reflection):

Band	Duration
50 MHz	1000 ms
70 MHz	500 ms
144 MHz	100 ms
432 MHz	13 ms

This means that the duration of bursts (Overdense Reflections) are longer than the above ping durations.

c. Reporting procedure

A report is sent when the operator has positive evidence of having received the correspondent's or his own callsign or parts of one of them.

The report should be sent twice between each set of call signs.

The report must not be changed during a contact even though signal strength or duration might well justify it.

d. Confirmation procedure

i. As soon as either operator copies both call signs and a report he may start sending a confirmation. This means that all letters and figures have been correctly received.

The message can be pieced together from fragments received over several bursts and pings, but it is up to the operator to ensure that it is done correctly and unambiguously.

Confirmation is given by inserting an R before the report.

ii. When either operator receives a confirmation message, such as "R27", and all required information is complete he must confirm with a string of R's, inserting his own call sign after each eighth R. When the other operator has received R's the contact is complete and he may respond in the same manner, usually for three periods.

e. Requirements for a complete QSO

Both operators must have copied both callsigns, the report and a confirmation that the other operator has done the same. This confirmation can either be an "R" preceding the report or a string of minimum three consecutive "RRR".

9. MISSING INFORMATION

If a confirmation report (R**) is received it means that the other operator has copied both call signs and the report, yet you may still need something from that station. At that stage, you can try to ask for the information needed by sending a missing information code string or short message.

The following strings may be utilised by operators using Telegraphy or MGM and short messages by operators using SSB to ask for missing information:

Message	Telegraphy and MGM	SSB
Both call signs missing	BBB	Both calls
My call sign missing	MMM	My call
Your call sign missing	YYY	Your call
Duration and signal strength missing	SSS	Report
All information complete	OOO	All info
Faulty keying or unreadable	UUU	Unreadable

The other operator shall respond by sending only the required information. This approach must be used with great caution to prevent confusion.

10. VALID CONTACTS

A valid contact is one where both operators have copied both call signs, the report and an unambiguous confirmation. However no recourse should be made during the contact to obtain the required information, change of frequency, antenna direction, etc. via other methods such as the DX Cluster, talk-back on another band, etc. Such secondary methods invalidate the meteor scatter contact.

In essence: if anything concerning the ongoing QSO attempt is agreed through other means than the QSO attempt frequency a new start is required.

11. NOTES

a. Operational tricks

Operational tricks are not a part of the Meteor Scatter procedure yet common practice might be so.

i. Additional information

Sometimes you may want to send some additional information such as the locator etc.

But it is very important to thoroughly consider the consequences of doing so! By sending additional information you reduce the chances of the required information, as stipulated in section 8.e above, is being received by the other station. Thus, the chance for a completed QSO is reduced.

b. Document history

This procedure was adopted at the IARU Region 1 Conference in Miskolc-Tapolca (1978), later slightly amended at the IARU Region 1 Conference in Noordwijkerhout (1987), Torremolinos (1990), de Haan (1993), San Marino (2002) and Vienna (2004).