Performance of FSK441 on Meteor Scatter

Summarised from a paper given by Rex Moncur, VK7MO at GippsTech 2002

While the numbers of meteors vary on a random basis it is possible to gain an appreciation of the factors that control QSO time by working on averages. These factors are listed below and the major ones are discussed in later sections where a "QSO time factor" is derived.

- Distance
- Elevation of horizon at both ends
- Power
- Frequency
- Time of Day
- Date in the year
- Use of single tones
- Noise levels at both ends
- Murphy's Law

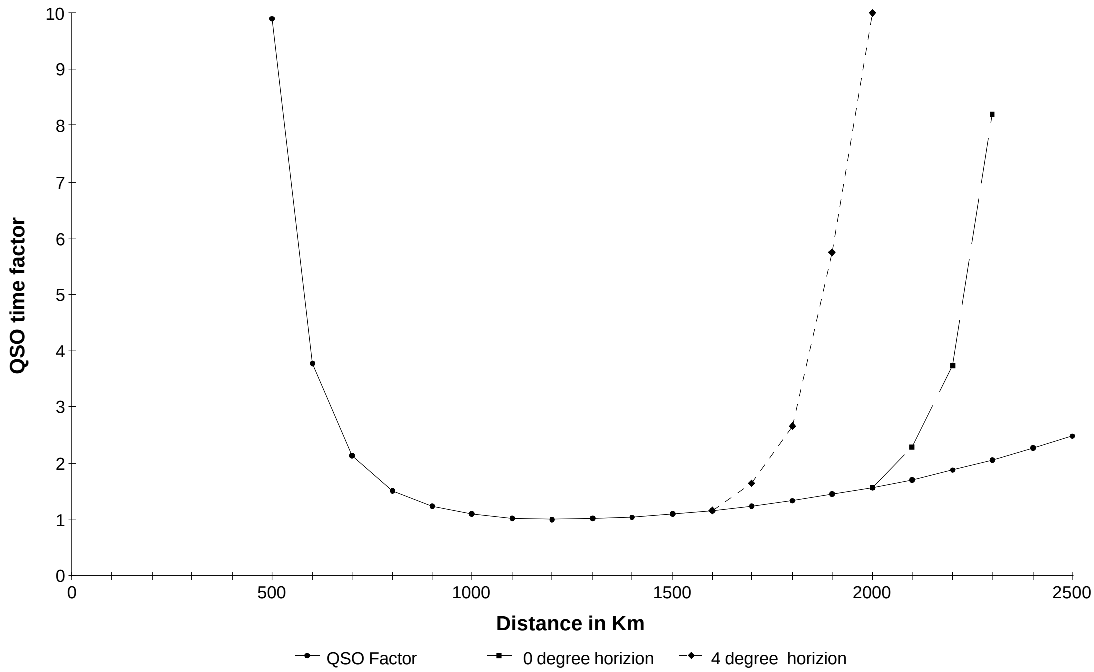
Murphy's Law is included in the above list because it covers the most frustrating reasons why one may wait for long periods to complete QSOs and these include:

- Stations transmitting in the same time segment.
- Computer time is not accurate.
- Stations working on different frequency.
- Strong power line noise.
- Transmitting station has not equalised the four tones – see manual.
- Antennas not connected, or pointed in the wrong direction.
- Your sked partner not getting out of bed.

While meteors do vary randomly it is always worth considering Murphy's Law factors if one is not receiving the number of pings one would expect.

Distance

The maximum distance is controlled by the height at which meteors can produce ionised trails (about 95km) and still be line of sight to both stations. This works out at about 2400 km less 108 km for the total of degrees of horizon lost by both stations. At short distances the signal strength is reduced, as the wavefront must be scattered through a large angle to return to Earth. A QSO time factor with distance may be derived as follows:



It is seen that the optimum distance for meteor scatter is around 1200 km. For example compared to the optimum distance it takes, on average, 10 times as long to complete a QSO at 500 km, and at 1900 km with a 4-degree total horizon it will take around 6 times as long.

Transmitter Power and Frequency

On two meters 100 watts will work well and QSOs have been completed with 50 watts. Power levels as low as 10 watts are sufficient on six meters. 70 cm is probably impractical with Australian power limits.

Power (watts)	**QSO Time Factor**
100	1
50	1.4
25	2

Thus, for example, if it typically takes 20 minutes to complete a QSO on 2 metres with 100 watts it will take 40 minutes with 25 watts.

Time of Day and Year

The average rates of non-shower meteor bursts vary with time of day and time of year, and can be used to derive QSO time factors as follows:

Local Time	QSO Time Factor
Midnight	1.3
0300	1.0
0600	1.1
0900	1.5
1200	1.7
1500	2.5
1800	3.5
2100	2.5

As an example, if a QSO takes typically 20 minutes at 3.00 am in the morning it will take 22 minutes at 6.00 am but over an hour at 6.00 pm in the evening.

Month	QSO Time Factor
Jan	1.1
Feb	1.3
Mar	1.4
Apr	1.3
May	1.4
June	1.5
July	1.3
Aug	1.1
Sep	1.1
Oct	1.0
Nov	1.0
Dec	1.0

Antennas

A good general antenna for 2-metre meteor scatter is a single 5 to 10-element yagi, but higher gain antennas are worthwhile for long distance skeds (above 1 500 km).

Antenna Polarisation

Test show that the number of readable pings is reduced to about 1/10th if stations use different polarisation. It is the practice in VK and ZL to use horizontal polarisation for meteor scatter.

Single tones

FSK441 provides for four special single-tone messages, two for reports R26 & R27, and for RRR and 73. The performance on single tones is improved due to the use of a lower bandwidth and also due to the shorter time required compared to, say, sending two call signs and a report. As a result single tone messages can produce 5 to 12 times as many readable pings and thus dramatically reduce the time to complete a contact.