Meteor Scatter Observations at 50 MHz in the 1980s

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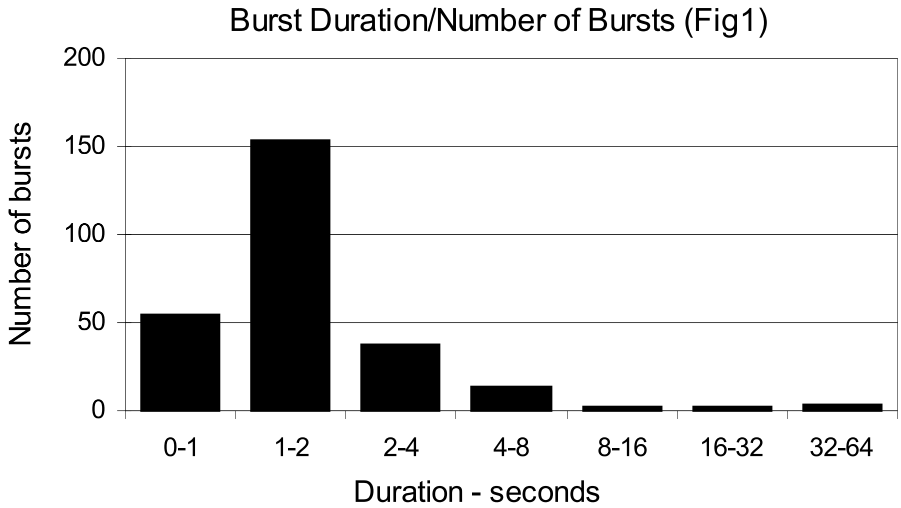
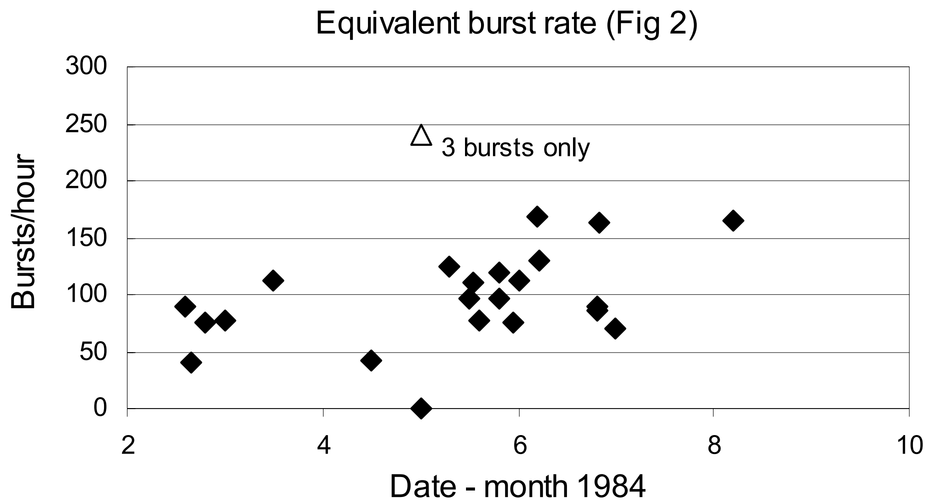
The recent interest in digital modes and meteor scatter propagation reminded me of some work, which I did in the 1980's. In the files I found some graphical results which may be of interest today. Luckily I also have the original notebooks which helped with some of the details.

I made the first observations in 1984 as part of the research project associated with the issue of special permits for 50MHz before the band was generally available in the UK.

At this time we could only operate outside TV hours and the early morning operation period suited m/s work. There were daily skeds between GM3WCS (IO86) using high speed CW, GM3WOJ (IO77) using ssb and G4IJE (JO01). They took place between 0700 and 0745 local time. I listened to these, in IO91 (London N4), and observed the number and length of bursts during these contacts. The results are shown in Figs 1 and 2.





In 1987, when the band was generally available, I made observations of the GB3SIX beacon, which beamed towards the US from Anglesey. Fig 4 shows results during the Quadrantids shower. This is compared with 24 hour observations after the shower, Fig 3. These two plots show the marked difference between typical sporadic meteor activity and that during a major shower.

I also made some observations of the GB3RMK and CT0WW beacons in July and August 1987. Some of these were made during the Perseids shower when they show reliabilities (what I was calling 'availability' A) of up to 60% of the time.

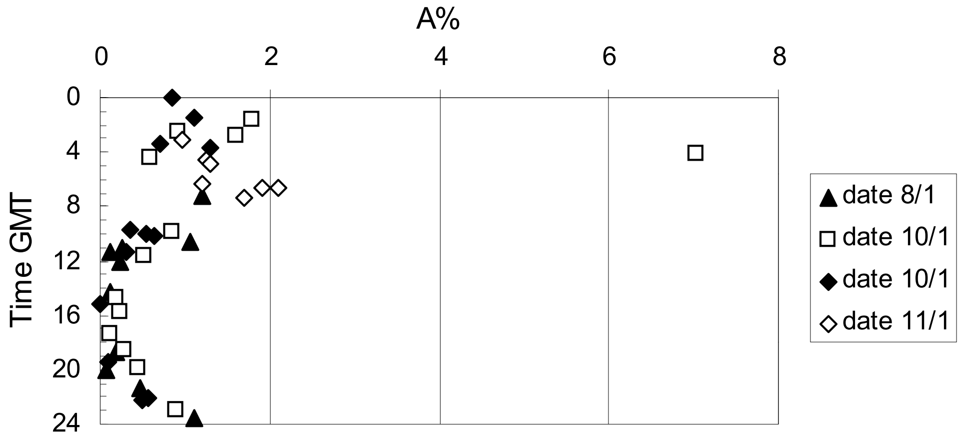
Note on Observation Technique

The duration of the bursts was estimated. Bursts less than I second were really 'guesses' but contribute little to the total time when propagation is available. Longer bursts were timed using the second hand of the clock. The 1984 observations lasted the duration of the m/s contact. This was usually 10 to 20 minutes, the 'overs' were 2.5 minutes, later changed to 30 and even 15 seconds for ssb working. For the 1987 observations a standard listening period of 11 minutes was used, the burst durations were added to give a total propagation time in the 11 minutes. The value A represents the percentage of the 11 minutes that the signals were heard.

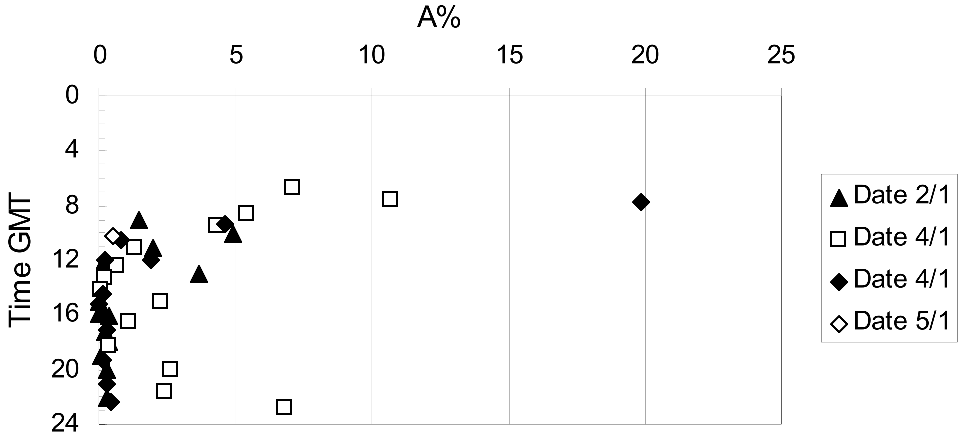
Discussion of Results

Fig 1 gives an idea of the typical length of bursts that may be expected at a good time of day. The results for February to early August cover a mixture of sporadic and shower meteor activity. Also shown are results for August to early November 1984. Here dates with known showers have been excluded so we are looking only at sporadic meteors. For February to August, as might be expected, there are relatively fewer short bursts of under I second, presumably because the shower meteors tend to be larger and give rise to longer bursts. The erp's in use were probably under 1 kW with short yagis at both ends of the path. Fig 2 shows the numbers of effective meteors arriving per hour. The data used in Fig 2 is the same as that in Fig 1 for the period February to August. There is no shower in February or March but one could still expect 40 to 100 sporadic meteors per hour.

GB3SIX backscatter- no shower (Fig 3)

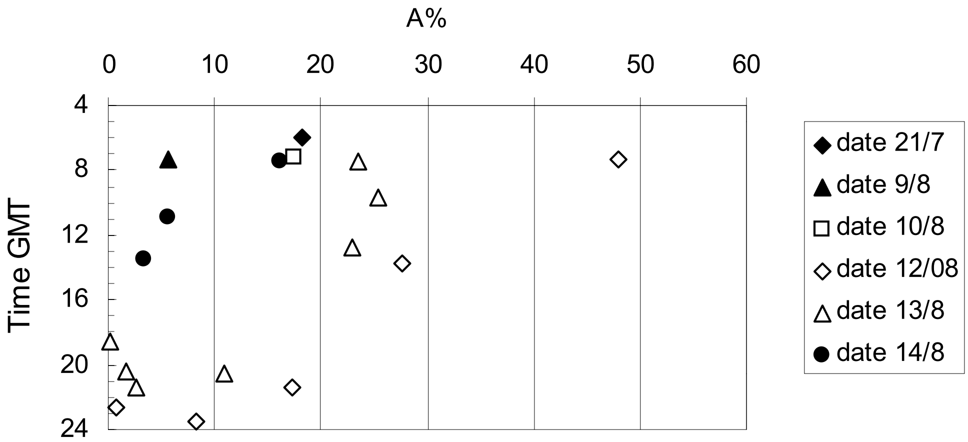


GB3SIX backscatter - Quadrantids shower (Fig 4)

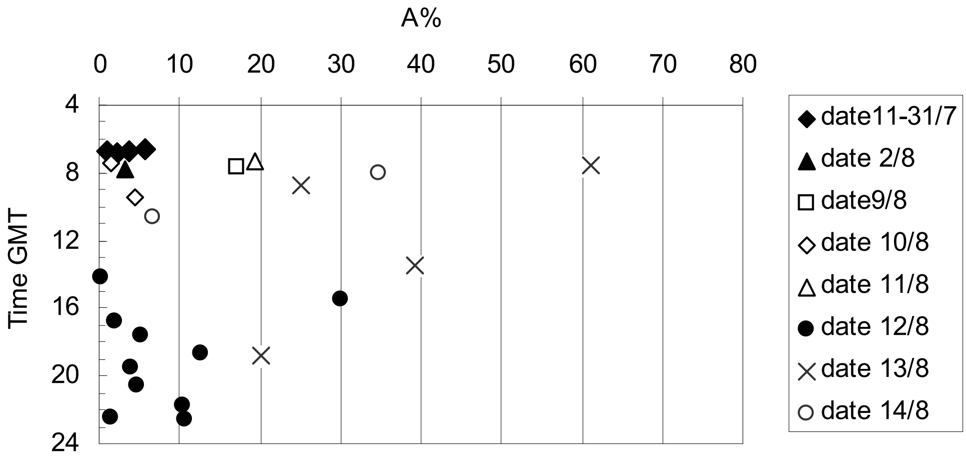


The Quadrantids shower is intense but lasts only about 2 days. Fig 3 shows the typical diurnal variation of sporadic meteor bursts after the shower, while Fig 4 shows much higher A values because of the shower. It also shows that good reflections can occur at times when sporadic meteors are poor. If one relies only on sporadic meteors it is clear that the afternoon to early evening is a very bad time to choose. Since backscatter was involved, higher A values could be expected with ideal beam headings.

GB3RMK (Fig 5)



CT0WW (Fig 6)



Figs 5 and 6 show what can be achieved with better beam headings during a major shower. (For simplicity I have lumped all the July observations together as there was only one listening period on each day). Incidentally the format of these graphs with time of day on the vertical axis was chosen to match the computer printouts published in RSGB Amateur Radio Operating Manual and elsewhere. These show the optimum time of day for various directions for each known shower.

<u>Conclusions</u>

So what do these observations tell us today? As far as I know the results for sporadic meteor activity in the 1980’s would be generally similar to those one could expect in the 2000’s. It was possible to make a m/s contact every day (at the early morning times). Sometimes it took ten minutes or more to complete, but a lucky long burst could be used to complete in a minute or two. If it is possible to use short overs, both stations can be aware of a long burst and exchange the necessary data immediately. A situation like this could be exploited in digital modes with short overs. With an automatic error correction protocol one could make effective use of any bursts of propagation that occur for two way communication. From Fig 2 one can see that there are many bursts in the 1 to 2 and 2 to 4 second categories available from sporadic meteor activity, so any digital system should be able to exploit these. The results obtained during showers cannot be expected to repeat every year. They are past history! We can never run into the same meteors again. Never the less the path of a shower in space can be predicted. What these results do show is that it is worth doing the necessary homework to be aware of the times and directions when really good bursts are possible, particularly in order to make difficult contacts. The results presented here are mostly for path lengths of 700 to 1300 Km. For extreme ranges up to over 2000 Km planned operation during showers might give better results than leaving things to chance. It may be that the results for GB3SIX which were by backscatter give a better indication of what might be expected for the longest paths.

Jeremy, G3IMW, November 2003