Background noise

Atmospheric noise

Hf low bands have higher atmospheric noise than higher frequency bands. At 7 MHz, atmospheric noise is always high, with values higher at night than during the day, due to the greater attenuation suffered by daytime ionospheric propagation caused by region D. (Noise is always an electromagnetic radiation that propagates within the ionosphere responds to the same laws and undergoes the same attenuation as the actual signals). The effect of atmospheric disturbances almost completely ceases for frequencies above 30 MHz, both because its energy contribution is now insignificant and because ionospheric reflection becomes unlikely at these frequencies. I report a graph where, as a function of frequency, disturbances are depicted, neglecting galactic noise, which turns out to be almost constant for almost the entire spectrum of Hf. Atmospheric noise decreases progressively as already mentioned with frequency, above 22 MHz becomes practically negligible. The atmospheric disturbance is due to temporal electrical discharges and is therefore subject to wide variations over time depending on seasonal and daily climatic conditions. The 40-meter band is quieter in winter precisely because the probability of thunderstorms in our latitudes is lower. Each discharge caused by a thunderstorm originates RF pulses, with decreasing spectral density with frequency, propagating in all directions (the average number of thunderstorms occurring simultaneously on earth is about 1800, with an average number of 100 electric discharges/sec.). As a result, their effects are assessed up to very large distances, since propagation can occur ionospherically. A local effect is distinguished, caused by local weather conditions, and a distant effect. The first is essentially a sequence of very intense impulses but spaced out over time, while the latter loses its markedly impulsive character due to the random overlap of the effects due to many distant discharges.

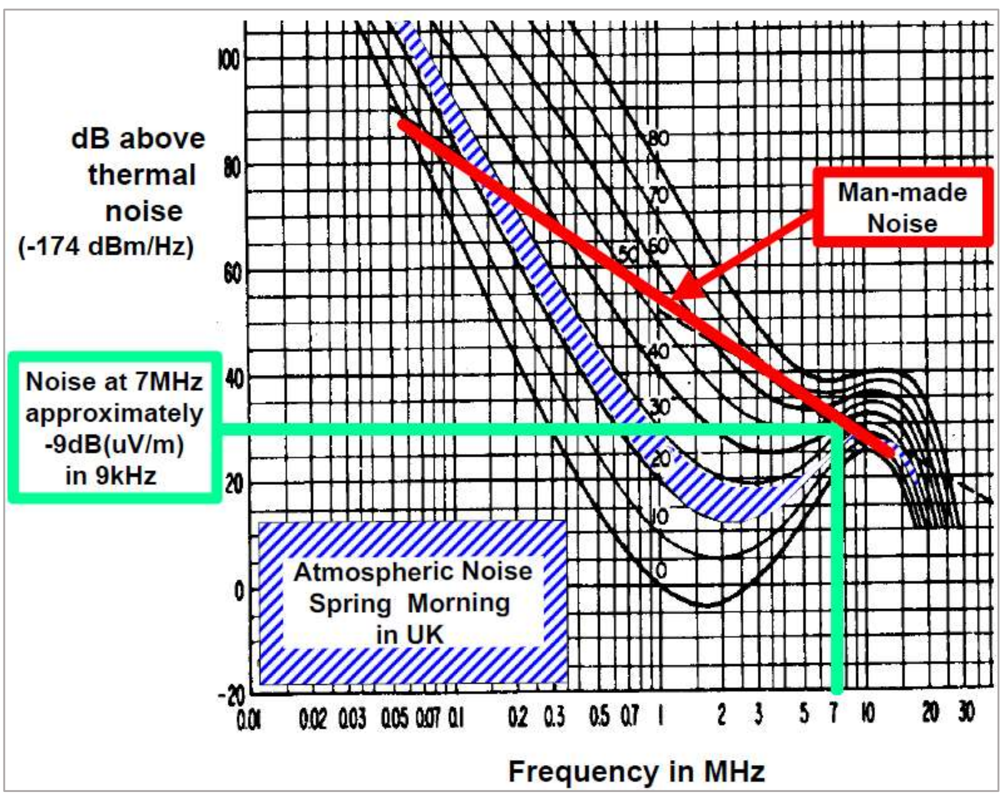


Fig. atmospheric noise relationship. The standard has tables and maps that determine the noise figure at 1 MHz according to the season and the time of day. This graph converts that noise figure to other frequencies. Notice that the plotted lines are spaced in 10 dB increments at 1 MHz.

Credits: Wikipedia Amount of atmospheric noise for LF, MF, and HF spectrum according CCIR322 - with overlaid lines added by G3JWI for published presentation on behalf of RSGB.

W8WWV, Greg Ordy -Summer Summary 2003 Noise Monitoring
Thanks to Greg Ordy, because he gave me his permission to publish these interesting studies of his on noise in the bands of 40-80 and 160 meters. I think they are significant, because they allow to give an idea of the background noise, in the low bands of the HF.
His first round of monitoring took place in July, of 2003, which is his local summer. The 160 meters, 80 meter, and 40 meters results are presented on these pages. He monitored each band on successive weeks. Even though sunrise and sunset times are changing, it's interesting to overlay the three different bands on one graph.

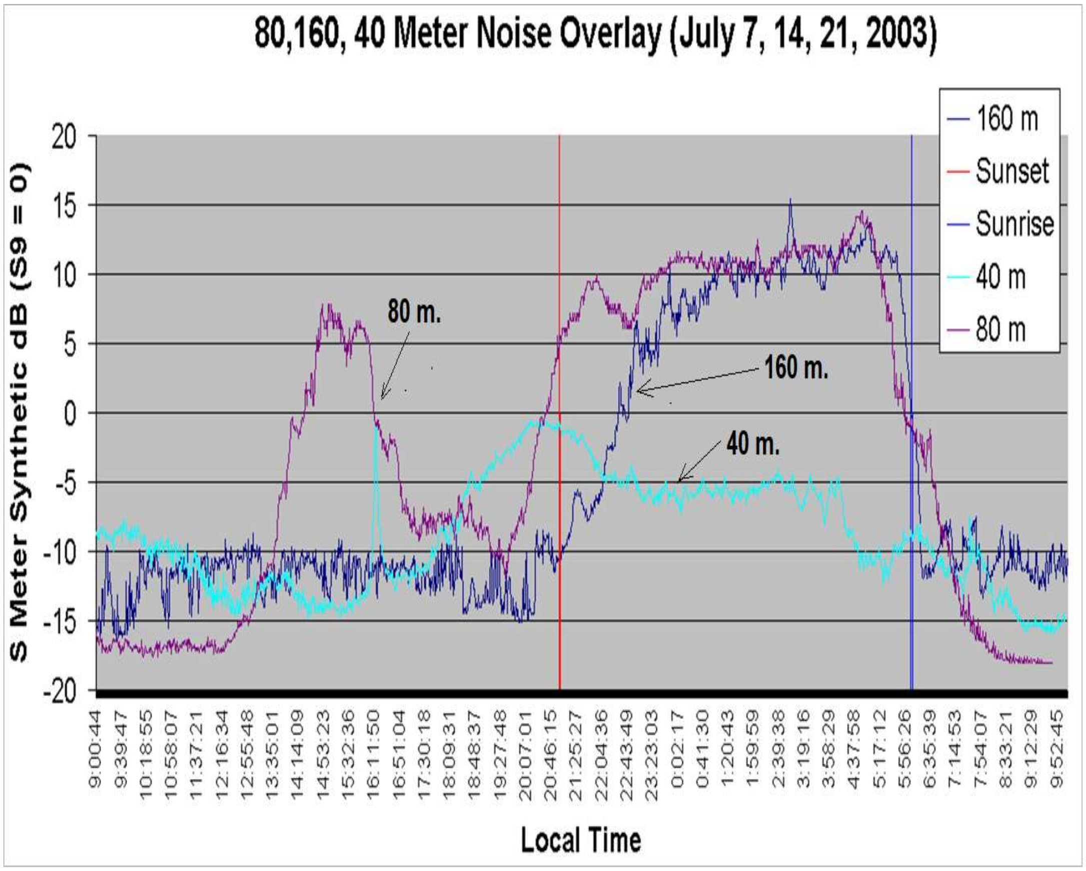
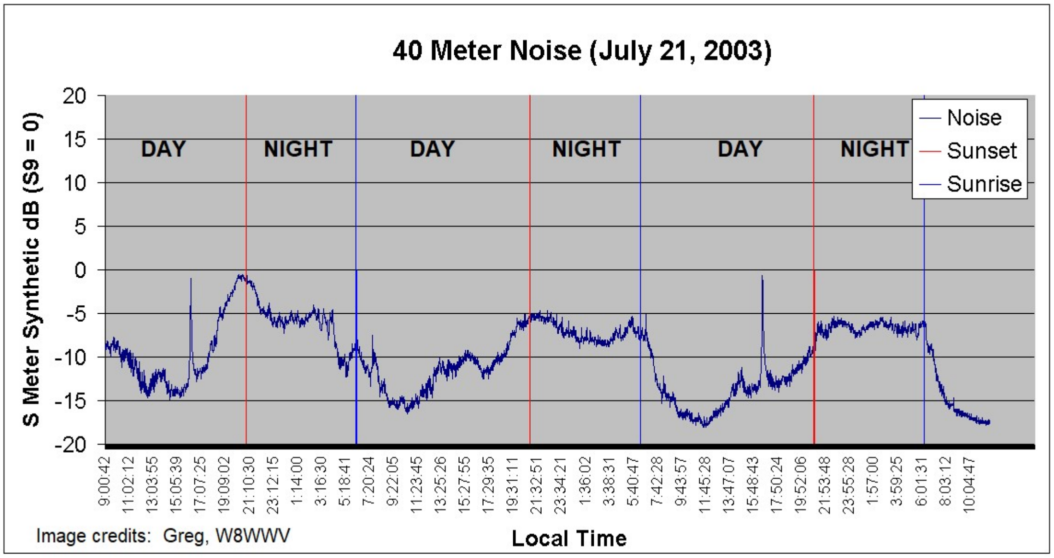
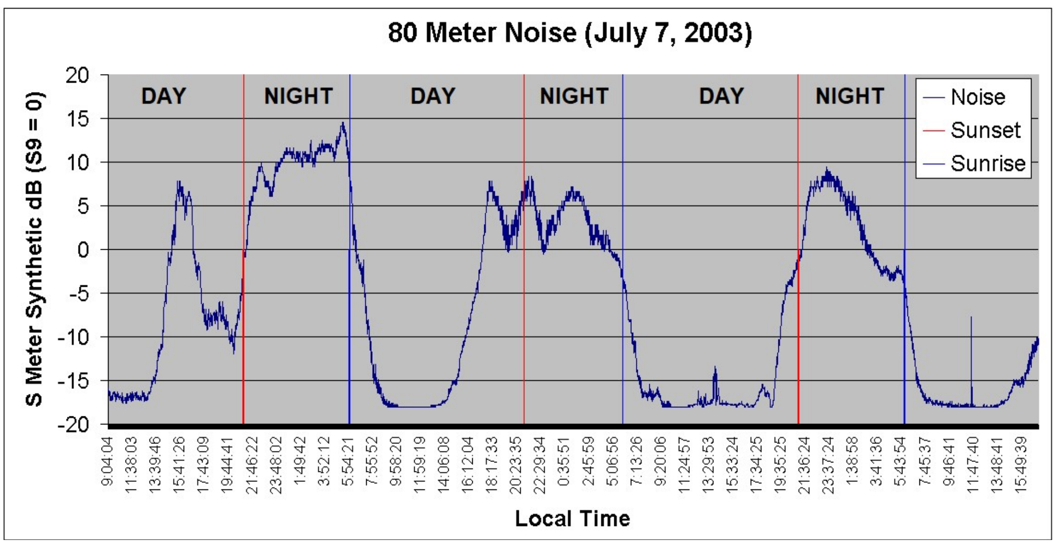


Fig. The noise level of the 160-meters, 80 meters, and 40 meters band on a single graph.
Credits: Greg Ordy, W8WWV.

Measurements by W8WWV
We are just about ready for the measurements. In general, the radio was set up to some unoccupied frequency near a given amateur band and began recording the S Meter. He tried to record data for several days. Unless otherwise modified by a given measurement page, the conditions are as follows:
The radio used is an ICOM 756PRO and it supports remote reading of the S Meter.
Preamp set to maximum. The idea here is to discourage the meter from bottoming out at S0 when the band is quiet during the day. In normal operation, the use of preamps on the lower bands is seldom necessary.
The receiver is set to the CW mode, with a 350 Hz filter width.
The receiver AGC is set to the factory mid position, which is 0.5 seconds.
Since the goal was to measure background noise, He need to pick frequencies which do not have signals. This is impossible to guarantee within the amateur bands, so he normally selects a frequency right below the bottom of the amateur band.
Data is sampled at an interval of 1 minute. Since S Meter Lite samples, the S Meter at a rate of 20 times per second, each sample in the file consists of the average of (60 X 20) or 1200 S Meter readings. The data was recorded with the software created by Greg: “S Meter Lite program”. This program reads the radio receiver's S Meter through the computer, and in this application, saves the readings in a data file.





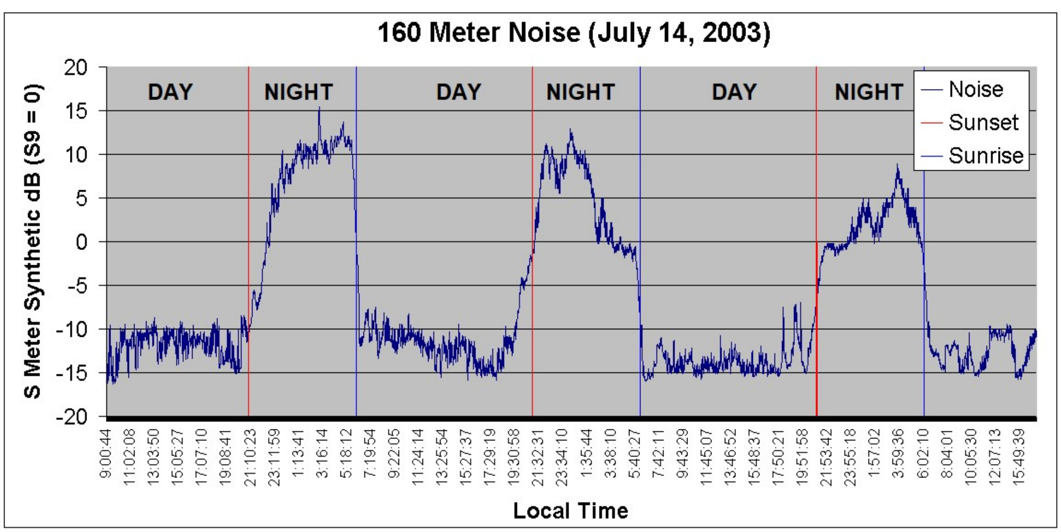


Fig. B*background noise monitoring for a few consecutive days on 40-80 and 160 meters. Credits:W8WWV.*

Considerations by Greg W8WWV

The general sense I got from looking at this data, and the data on the individual band pages, was that 80 meter and 160 meters noise tends to move between their day and night values in relatively rapid transitions. On 160 meters, the transition seems closely tied to actual sunrise and sunset times. On 80 meters, at least during this monitoring period, the noise level would sometimes rise in the middle of the day, which is a little unexpected. 40 meters did show a difference between day and night noise levels, but the transitions took much more time. It seemed as if the 160-meter band was like a square wave, moving quickly between day and night noise levels. As the frequency went up, the shape of the transition went from square wave to more like a sine wave. It took many hours to move between the day and night noise levels. The noise level was also lower on 40 meters and averaging, 10 to 15 dB lower then in 160 meters or 80 meters. On all three bands, sunrise appeared to have more influence as compared to sunset. Sunrise really shut off the noise. In some cases, the noise ramped up to night levels across several hours before sunset. It seemed as if the quietest time of day was within a few hours of sunrise. Finally, on 80 meters, the (average) noise level would bottom out during the day. This did not happen on 160 and 40 meters. In all cases, the radio was set to the same preamp position, preamp #2 (maximum gain). I realized that on 80 meters the antenna was an inverted vee with the apex at 50', and on 160 and 40 meters, the antenna was a vertical. I have no doubt that the radiation angle is much lower on 160 and 40 meters. The 80-meter vee is low enough to the ground that it will be largely shooting straight up (NVIS). Perhaps that has impacted the relative noise strength between the two antenna types.

Thanks to Greg Ordy, W8WWV, for granting me the credits for publishing his studies.