

Newcomers and Elmers Net: Propagation Banners Pt. 2

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Last time around we started exploring the meanings behind the Solar Banners commonly displayed on amateur radio websites, and which can be added to one's own website by going [here](#).

While the **SFI**, **SN**, and the **K** Index are the most commonly monitored numbers, these banners are filled with a lot of good information which can greatly improve one's propagation savvy.

We finished last time on the qrz.com banner above with the Solar Wind, winds which can, when measured over 200 km/s, greatly affect the shape of our own magnetic field by flattening it and thereby weakening the magnetic field at the poles. Heightened activity can also increase the F-layer activity by allowing ionized particles through the magnetic field; more activity leads to greater disturbances.

Proton Flux (0-unknown)

The *proton flux* (**PF**) is a measurement indicating the density of protons in the magnetic field of the earth, particularly along the polar magnetic lines.

- Solar flares and CMEs can cause proton storms which allow for a greater influx of protons to penetrate the magnetic field, which in turn, causes a rise in the E-layer of the atmosphere.

- This increase in activity can reduce or completely block signals from getting beyond the E-layer, effectively shutting down HF signals until the magnetic field stabilizes.

- The protons are drawn into the earth's magnetic field toward the poles, meaning they do not typically penetrate the lower latitudes. The increased levels can cause geosynchronous satellites to be interfered with, as well as Polar Cap Absorption events, or PCAs.

- The **PF** levels have to exceed 10 PFUs before this occurs, but as long as levels remain this high, communication will be disrupted.

- In addition to disrupting communications, extreme proton storms have been known to interfere with spacecraft equipment and optics, and some astronauts have reported seeing streaks or flashes of light. This coincides with optical imagery issues experienced by cameras monitoring solar events.

Electron Flux (0-unknown)

A similar measurement reported on the solar banners is the electron flux. Like the proton flux, an electron flux reading indicates the density of electrons in the magnetic field of the earth, and increased numbers indicate potential interference with communications.

-- Solar flares can dramatically increase the electron density, affecting the E-layer of the atmosphere. Both the proton flux and the electron flux are measured hourly.

Maximum Usable Frequency (Boulder CO)

The maximum usable frequency (MUF BDR) is a measurement of the MUF at the given time from Boulder Colorado. MUFs are measured at various locations around the world, and each location will be different

-- Keep in mind that any MUF reading is *only a guide*, nothing is set in stone! The MUF may be low at night and still signals might come through on 20 meters, for example.

EME Degradation

The Earth-Moon-Earth Degradation is a measure of expected EME conditions based on signal attenuation for a given day, dependent upon the sky noise temperature and the astronomical sky, along with the moon's location in the sky.

-- The measurements are from "Very Poor" to "Excellent", meaning an attention of >5.5 dB to <1.5 dB, respectively.

For more excellent information on EME and meteor scatter propagation, go [here](#).

Band Conditions Forecast

Many solar banners will include the band forecast for both day and night conditions. These are determined using the solar flux index and the sunspot number. Again, these are only suggestions, and are not necessarily accurate for any given location.

-- Many times I have found good propagation conditions when bands were reported to likely be poor, as well as the reverse. This is why the more we understand all of the resources available to us the more accurately we can predict propagation conditions.

As an aside, when conditions seem to run counter to the general predictions, that is the very time to pay closer attention to the various numbers and their contribution to the whole, because the significance of each category will become more evident as patterns emerge.

Geomagnetic Field

This indicator gives an indication of the level of disturbance to the geomagnetic field. This is based on the **K** index value, ranging from Inactive to Extreme Storm over nine levels.

-- The last three levels, Major, Severe and Extreme usually indicate blackout potential as well as high Auroral activity.

Signal Noise Level

The signal noise level is an indication of the interaction of the solar winds with the earth's magnetic field. Increased solar wind activity means more signal noise (measured in S-units), and this number is updated every ½ hour.

- Following strong geomagnetic activity, the signal noise level may actually be very quiet, presenting a good opportunity to work the lower bands.
- Likewise right after a solar flare the MUF will be raised, but the noise levels will be lower, and so daytime propagation will usually be better. This is because while the noise burst during a flare is significant, as soon as the flare is over noise levels drop considerably, but the ionization levels are still high.
- Two to three days after a solar flare there will be an impact from the shock wave of the flare which can cause a geomagnetic storm. Again, after this storm subsides, noise levels can be quite low.
- Keep an eye on the noise levels during and after a solar event to make the best use of these opportunities.

CME

The CME (Coronal Mass Ejection) reading is a prediction of when the next CME is likely to occur. Unless there is a reason for NOAA to think a CME is headed to earth, this reading is not updated.

- The color code signifies the threat level, with green being mild, yellow being moderate, and red being severe.

Auroral Activity

Two additional categories are the Aurora and the Aurora Latitude indicators. The Aurora number is a range from 1-10, with higher numbers indicating an expansion of the auroral oval.

- The aurora oval is elliptical band around each geomagnetic pole, normally ranging from about 75 degrees magnetic latitude at noon to about 67 degrees magnetic latitude at midnight.
- As greater amounts of energy strike the geomagnetic field at the poles, the auroral oval increases, meaning it moves to lower latitudes. This has the benefit of increasing VHF communications at the expense of HF communications.
- When the Northern and Southern lights are greatest, a result of heightened auroral activity, there is the real possibility of the polar blackouts discussed above.
- The aurora latitude measurement is the expected lowest latitude of the auroral oval. The text is also colored according to activity, with red being low

activity, yellow being high-latitude activity, and green being mid-latitude activity.

Some Additional Information

Other banners may show some additional information, representative of some of the different styles of banners available from NONBH.

-- This can include VHF propagation condition predictions, as well as a solar flare prediction category similar to the CME prediction.

-- The VHF propagation tool is particularly useful during periods of expected E-skip activity and solar flare activity, where VHF propagation is likely to increase dramatically.

-- One of the lessons learned from studying the solar banners is that when HF conditions worsen, VHF conditions often improve, even if only for a few hours.

-- Some banners will give indications for the MUF specifically as it relates to VHF, while others will show the probability of E-skip conditions in various parts of the world.

-- As an example, the color coding for E-skip Europe is Band Closed (Red) = No Sporadic E (ES) activity; High MUF (Green) (2M only) = Conditions support 2M ES; 50/70/144MHz ES = the respective band is open.

-- There is also a meteor scatter color coded bar on the some banners which indicates the probability of meteor scatter activity, from Min. to Max., measured by the hour (UTC).

More than Meets the Eye

There is a wealth of information just upon a casual glance at one of these banners, but the greater benefit comes from studying them, discovering patterns, and applying the information in the real world.

-- No amount of propagation information will help us make contacts unless we turn our radios on and use them!

-- Propagation maps and banners like these can be a help or a hindrance depending upon how they are used. They can be a challenge or an excuse.