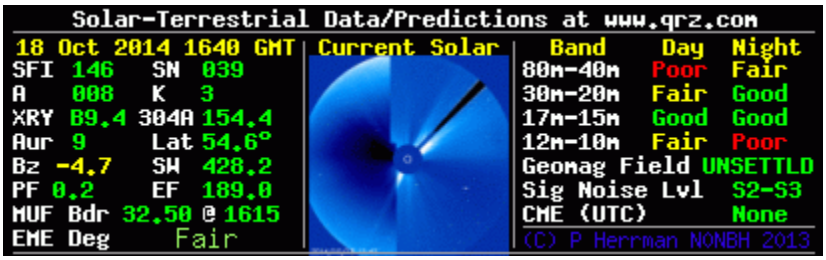
Newcomers and Elmers Net: Propagation Banners Part 1
Robert AK3Q 01/18/15

The propagation banners we see everywhere are the product of Paul Herrman, N0NBH.



Sample Banner from www.qrz.com web page

SFI
The Solar Flux index is one of the most common numbers read on these banners, along with the Sunspot Number.
-- The SFI is considered a reasonably good indicator of the F-Layer ionization level, although it does not really affect propagation directly.
-- The 2.8 GHz measurement (sometimes called the 10.7 cm flux) is measured daily with typical ranges between 60-300. Higher numbers usually indicate higher MUFs, and therefore higher bands for DXing.
-- This number should be seen more in terms of a pattern rather than an individual number.
-- A high Solar Flux Index on any given day does not mean conditions will be great—rather several days of a high SFI can mean favorable conditions have developed which will offer good DXing on some of the higher bands.

Sunspot Number
Sunspot numbers indicate overall sunspot activity and the size/quality of the sunspot groups.
-- The ranges go from 0-250, with higher numbers indicating more upper-level ionization.
-- Folks start talking on the ham bands when the sunspot numbers are up because they are a very useful indicator of when upper bands might allow some serious DXing.

For example, an SFI of 126 is respectable, which might indicate possible upper-level ionization, but we may notice a sunspot number that is rather low, say 49;
-- the SFI may indicate good solar activity, but with a low sunspot number we will see band predictions which are moderate

Sunspot numbers are averaged monthly over 12 months.

-- The 12-month average gives the best correlation for propagation activity, but does not account for unusual sunspot activity

A and K Indices

The A and K indices are the other two most commonly read indicators of ionosphere conditions, and folks will often refer to the K index as an explanation for good or bad propagation conditions.

-- The A Index is an averaged number, meaning it is based on the previous day's readings. The A index is a scaled value in the range of 0—400.

-- The K index is based on the latest average of eight readings taken every three hours from around the world.

-- The K index is a logarithmic value, 0–9, with levels of 4 or more indicating a geomagnetic storm.

-- High geomagnetic activity can lead to HF radio blackouts

<u>K Index Ranges</u>

K0=Inactive
K1=Very quiet
K2=Quiet
K3=Unsettled
K4=Active
K5=Minor storm
K6=Major storm
K7=Severe storm
K8=Very severe storm
K9=Extremely severe storm

<u>A Index Ranges</u>

A0 - A7 = quiet
A8 - A15 = unsettled
A16 - A29 = active
A30 - A49 = minor storm
A50 - A99 = major storm
A100 - A400 = severe storm

XRY

The XRY reading is a measure of the X-ray intensity of X-rays hitting the atmosphere

-- "B" and "C" indicate the lowest levels of activity, while readings of "M" and "X" indicated possible blackout conditions for Regions 1-2, and Regions 3-5 respectively.

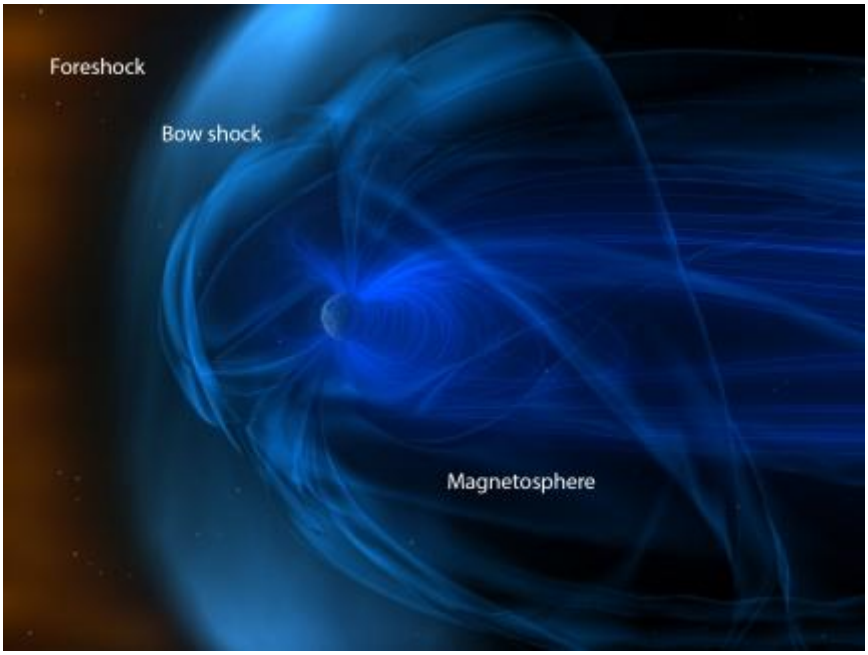
-- more useful is the indication this number/classification gives for the D-layer activity, which is the layer responsible for blocking signals from the broadcast band up to 4-5 MHz during daylight hours.

-- If the X-ray level is high enough, the absorption effect of the D-layer is greatly increased, potentially reaching up through the entire HF band, meaning signals from earth never make it through to be reflected off the F-layer.

X-ray intensity varies greatly with solar activities such as solar flares and CMEs.
-- X-ray intensity increases based solely on the strength of the solar flare. E-layer activity is directly affected by X-ray flux, whereas F-layer activity is more affected by the UV flux.

304A
This category refers to the solar radiation level measured in the ultraviolet light range of 304 angstroms, produced by ionized helium in the sun's photosphere.
-- Radiation in the ultraviolet spectrum creates much of the F-layer ionization, reflecting/refracting RF signals back to earth.
-- Two different measuring stations are used—one here on earth and the other comes from the SOHO satellite. The range is 0—infinity
-- This number increases with increases in the solar flux index (SFI).

Bz
Interplanetary magnetic field, Bz, which indicates a positive or negative pull with or against the earth's geomagnetic field.
-- The solar winds are responsible for carrying the interplanetary magnetic field through space.
-- A positive value indicates the interplanetary field is working with, or oriented in the same direction, as the earth's field.
-- negative numbers mean it is pulling or distorting the earth's magnetic field and therefore increasing the effect of geomagnetic disturbances.
-- In effect the shielding of the earth's magnetic field



is reduced when the readings are negative.
-- The geomagnetic field is a teardrop shape pattern giving us the north and south magnetic poles
-- it helps direct ionization flow around the atmosphere. (The image here shows a representation of the field, including the tail which faces away from the sun, and the bow shock created by the resistance of the earth's magnetic forces encountering the sun's radiation forces.)
-- The magnetic field traps charged particles which might cause a great deal of damage if they were to reach earth's surface, as well as greatly influencing the shape and direction of radio signals.
-- The geomagnetic field is weakest near the polar regions and strongest near equatorial regions and on the night side of the earth opposite the sun
-- The variations in the geomagnetic field are much of what these forecasts are designed to predict because they are the most likely to affect day-to-day HF propagation.

Solar Wind
The SW reading is a measure of the solar wind speed, ranging from 0—2000 km/s, with readings typically well under 500.
-- If the speed increases to more than 500 there is increased pressure on the ionosphere, weakening it, and causing disturbances to the F-layer.
-- The solar wind contains charged particles and magnetic fields.
-- Stronger winds will create a more distorted shape to the earth's magnetic field—in effect flattening it—which further reduces the magnetic strength at the poles as well as causing the tail to extend even further behind the earth.
-- The movement of the solar wind (or plasma) is outward from the sun, and fills an area known as the *Heliosphere*.