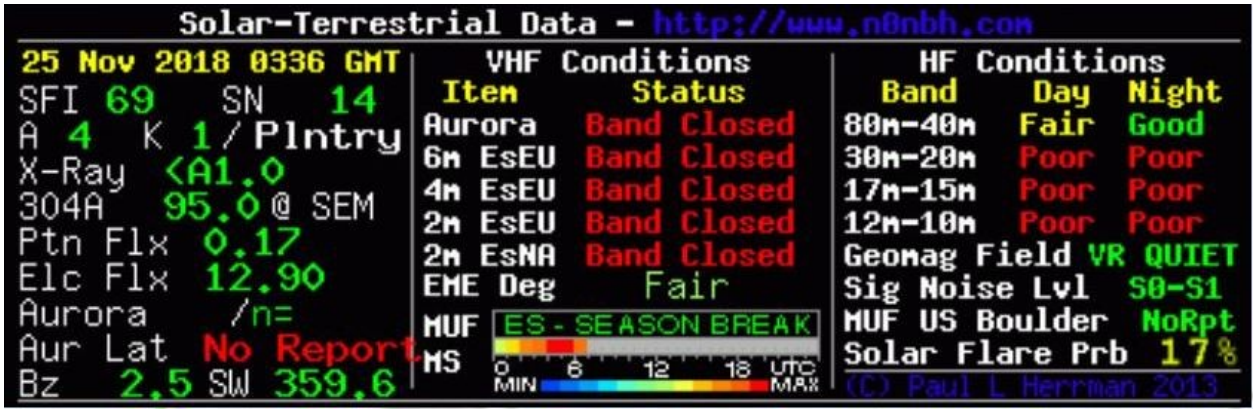
Brass Tacks

An in-depth look at a radio-related topic

Understanding the Band Conditions Banner



The above graphic of *Solar-Terrestrial Data* is created and produced by Paul Herrman, NØNBH, and I refer to it as the *Band Conditions Banner*. Many of us have seen this on websites, Facebook group pages, and even in magazines. But it occurs to me that most of us find much of the information presented on the banner over our heads. While not all of the banner information is immediately relevant, I'd like to take a few minutes to decipher the contents, based on the field names it presents, grouped here more by function than appearance in the banner.

This article does not explain *every detail* of the Band Conditions Banner. For example, some versions of the banner display photographs of the solar surface through one filter or another, but I won't elaborate on them. For the most part, I describe the left and right columns, plus some of the middle column of the above graphic. You can download your own free banner from Paul's website.

The date and time

UTC The displayed date and time represent the last time the banner was updated at the moment your browser was last refreshed, in GMT (Greenwich Mean Time), which today is called *UTC*. So, in the above banner, the time equates to 24 Nov 2018 at 8:36 pm MST.

SFI (70 = poor / 160 = good / 280 = fabulous)

Solar Flux Index The SFI (62.5 to 300), as mentioned in the previous issue of the *UVARC Shack* (Nov 2018, *Brass Tacks*), is the amount of solar radio noise measured at 2800 MHz (10.7 cm), and is updated daily. The SFI gives us an idea of how well the ionospheric F-Layer can support radio communication on HF, and more especially on 20 meters through 10 meters. Numbers below 75 are quite poor, while those above 160 are very good.

SN (2 = poor / 90 = good / 220 = fabulous)

Sunspot Number The SN (0 to 250) is a calculation that is roughly 10 X the number of *sunspot groups facing us* + the number of *individual sunspots facing us*, and is updated daily. The SN typically follows the SFI, and offers another indicator of F-Layer ionization.

Brass Tacks

continued

Solar-Terrestrial Data - http://www.n0nbh.com

25 Nov 2018 0336 GMT
SFI 69 SN 14
A 4 K 1/ Plntry
X-Ray <A1.0
304A 95.0 @ SEM
Ptn Flx 0.17
Elc Flx 12.90
Aurora /n=
Aur Lat No Report
Bz 2.5 SW 359.6

VHF Conditions

Item	Status
Aurora	Band Closed
6m EsEU	Band Closed
4m EsEU	Band Closed
2m EsEU	Band Closed
2m EsNA	Band Closed
EME Deg	Fair
MUF	ES - SEASON BREAK
MS	0 6 12 18 UTC (MIN / MAX)

HF Conditions

Band	Day	Night
80m-40m	Fair	Good
30m-20m	Poor	Poor
17m-15m	Poor	Poor
12m-10m	Poor	Poor

Geomag Field VR QUIET
Sig Noise Lvl S0-S1
MUF US Boulder NoRpt
Solar Flare Prb 17%
(C) Paul L Herrman 2013

304A (80 = poor / 150 = good / 240 = fabulous)

304 Angstroms The 304A (0 to unknown) is the relative strength of total solar radiation in the UV (ultraviolet) range, originating primarily from ionized Helium in the Sun's photosphere, and often follows the SFI value. The designation following the 304A value (@ EVE, @ SOHO, @ SEM) indicates the instrument used to take the measurement, and the value is updated hourly.

A Plntry (4 = calm / 40 = minor storm / 80 = severe)

A, planetary The A_p index is the daily average long-term stability of Earth's magnetic field, the subscript 'P' meaning planetary, or averaged from several locations around the earth. The value ranges from 0 to 400, with anything over 100 indicating unfavorable conditions for radio propagation, and is updated once daily.

K Plntry (1 = calm / 5 = minor storm / 7 = severe)

K, planetary The K_p index is the daily average short-term stability of Earth's magnetic field, the subscript 'P' meaning planetary, or averaged from several locations around the earth. The value ranges from 0 to 9, with anything over 5 indicating unfavorable conditions for radio propagation, and is updated once daily.

Geomag Field

Geomagnetic Field Relative label of the Earth's magnetic field activity, reflecting the K_p index. Labels include **INACTIVE**, **VR QUIET**, **QUIET**, **UNSETTLD**, **ACTIVE**, **MIN STORM**, **MAJ STORM**, **SEV STORM**, and **EX STORM**, in order of disruptive impact on radio propagation, and is updated every three hours.

Bz (20 = good / 2 = ok / -2 = not ok / -20 = disruptive)

B sub Z Interplanetary magnetic field vector (strength and direction) perpendicular to the plane of Earth's orbit, with positive values enhancing Earth's magnetic field and negative values canceling it. Values range from 50 to -50, updated hourly.

Brass Tacks

continued

Solar-Terrestrial Data - http://www.n0nbh.com

25 Nov 2018 0336 GMT

SFI 69 SN 14

A 4 K 1/ Plntry

X-Ray <A1.0

304A 95.0 @ SEM

Ptn Flx 0.17

Elc Flx 12.90

Aurora /n=

Aur Lat No Report

Bz 2.5 SW 359.6

VHF Conditions

Item	Status
Aurora	Band Closed
6m EsEU	Band Closed
4m EsEU	Band Closed
2m EsEU	Band Closed
2m EsNA	Band Closed
EME Deg	Fair

MUF ES - SEASON BREAK

MS 0 6 12 18 UTC

MIN MAX

HF Conditions

Band	Day	Night
80m-40m	Fair	Good
30m-20m	Poor	Poor
17m-15m	Poor	Poor
12m-10m	Poor	Poor

Geomag Field VR QUIET

Sig Noise Lvl S0-S1

MUF US Boulder NoRpt

Solar Flare Prb 17%

(C) Paul L Herrman 2013

X-Ray (A1.1 = good / C5.0 = moderate / X2.3 = severe)

X-Rays X-ray emissions most heavily impact the ionospheric D-Layer, such that the stronger the radiation, the lower the ability of radio waves to propagate by skywave refraction. The intensity of X-ray radiation striking the atmosphere, ranging from A0.0 to X9.9, is defined by a class (A, B, C, M, and X), followed by a logarithmic quantity (0.0 to 9.9) that defines the intensity within the class, updated eight times a day.

Ptn Flx (0.10 = good / 2.0 = moderate / 20.0 = heavy)

Proton Flux Density of protons in the solar wind, such that the higher the value, the greater the impact on the ionospheric E-Layer. Values range from 0 to unknown, updated hourly.

Elc Flx (<1000 = little impact / >1000 = heavy impact)

Electron Flux Density of electrons in the solar wind, such that the higher the value, the greater the impact on the ionospheric E-Layer. Values range from 0 to unknown, updated hourly.

SW (100 = good / 500 = moderate / 700 = disruptive)

Solar Wind Average speed of solar wind particles in km/s, with figures greater than about 500 impacting HF communication. Values range from 0 to 1000, updated hourly.

Aurora (1/n=1.99 : weak ... 6/n=0.8 : moderate)

Aurora Possibility Relative strength in GW of ionospheric F-Layer, affecting DX over polar regions, such that the stronger the ionization, the greater chance of aurora at lower latitudes. If populated, values range from 0 to 10++ (over the normalization factor, such that n < 2.0 shows a high confidence, and n > 2.0 shows a low confidence), updated every 15 minutes.

Aur Lat (70 = weak / 60 = moderate / 50 = strong)

Aurora Latitude Lowest estimated latitude impacted by an aurora, in degrees N Latitude. Values range from 67.5 to 45.0 or **No Report**, updated every 15 minutes.

Brass Tacks

continued

Solar-Terrestrial Data - http://www.n0nbh.com

25 Nov 2018 0336 GMT

SFI 69 SN 14

A 4 K 1/ Plntry

X-Ray <A1.0

304A 95.0 @ SEM

Ptn Flx 0.17

Elc Flx 12.90

Aurora /n=

Aur Lat No Report

Bz 2.5 SW 359.6

VHF Conditions

Item	Status
Aurora	Band Closed
6m EsEU	Band Closed
4m EsEU	Band Closed
2m EsEU	Band Closed
2m EsNA	Band Closed
EME Deg	Fair
MUF	ES - SEASON BREAK
MS	0 6 12 18 UTC (MIN / MAX)

HF Conditions

Band	Day	Night
80m-40m	Fair	Good
30m-20m	Poor	Poor
17m-15m	Poor	Poor
12m-10m	Poor	Poor

Geomag Field VR QUIET

Sig Noise Lvl S0-S1

MUF US Boulder NoRpt

Solar Flare Prb 17%

(C) Paul L Herrman 2013

VHF Conditions

The VHF Conditions column provides an idea of *favorability* for SSB operation in frequencies between roughly 50 MHz and 150 MHz. Except for Auroral Activity, the status for each applicable band reports how well Sporadic-E (**Es**) conditions over the particular continent support the band, and **Band Closed** for low or no activity, updated every 30 minutes.

These reports don't mention anything about ducting, because tropospheric propagation by ducting is primarily a weather effect, and not directly predictable by solar measurements.

Aurora

Auroral Activity General report of the current Auroral activity, displayed as **MID LAT AUR** to indicate activity extended to between 30 and 60 degrees N Latitude, **High LAT AUR** to indicate activity confined to higher 60 degrees N Latitude, and **Band Closed** to indicate little or no Auroral activity, updated every 30 minutes.

6m EsEU

6-meter Activity, Es over Europe **50MHz ES** indicates 6 meters is open for Es.

4m EsEU

4-meter Activity, Es over Europe **70MHz ES** indicates 4 meters is open for Es.

2m EsEU

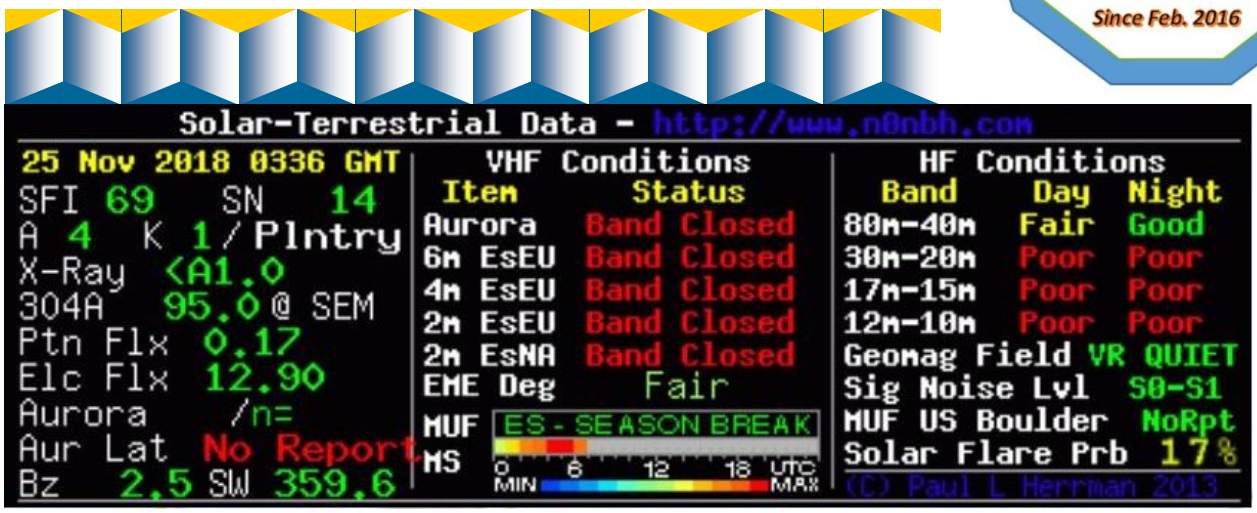
2-meter Activity, Es over Europe **144MHz ES** indicates 2 meters is open for Es, or **High MUF** to indicate conditions support 2 meter Es propagation.

2m EsNA

2-meter Activity, Es over North America **144MHz ES** indicates 2 meters is open for Es, or **High MUF** to indicate conditions support 2 meter Es propagation.

Brass Tacks

continued



HF Conditions

The ***HF Conditions*** column is often where people glance first, to get an idea of the general propagation conditions across the HF bands, and is fairly self-explanatory. Each pair of bands is listed with a separate general condition report for daytime operation and nighttime operation, as **Poor**, **Fair**, and **Good**, compiled from other banner data. The subjective conclusions are based on the combined contributions of the Solar Flux Index, Sunspot Number, the 304A value, the Ap index, and the Kp index. In general, here are what the three reports mean:

Good : **Able to communicate with distant (DX) stations via multiple hops**

Fair : **Able to communicate with in-country stations via one or two hops at the most**

Poor : **Largely unable to communicate by skywave propagation**

EME Deg

Earth-Moon-Earth Degradation Measurement of the best Earth-Moon-Earth (*Moonbounce*) propagation path attenuation, displayed as **Very Poor** (high attenuation), **Poor**, **Fair** (medium attenuation), **Good**, and **Excellent** (little attenuation), updated every 30 minutes.

MUF

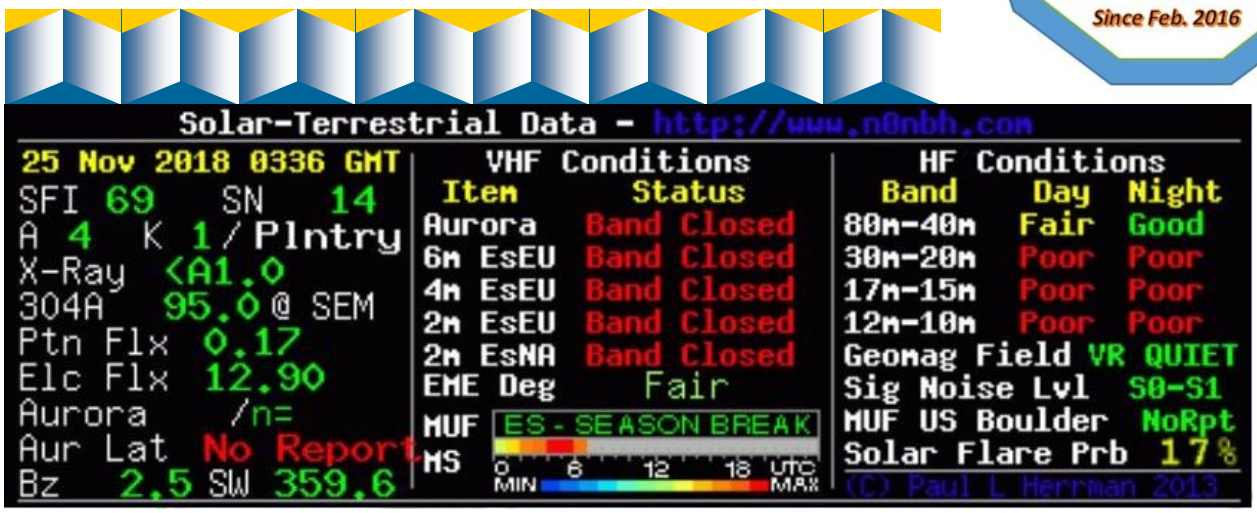
Maximum Usable Frequency, Es The MUF, relative to Sporadic-E (**Es**), is the highest frequency that can be reliably used for skywave communication by Sporadic-E propagation. In this column, the banner displays the MUF as a colored bar for each VHF band: 6 m = blue, 4 m = green, 2 m EU = yellow, 2 m NA = red, and gray for no activity, updated every 30 minutes. The **SEASON BREAK** label indicates that Sporadic-E is not normally active this time of year.

MS

Meteor Scatter The Meteor Scatter activity bar shows relative meteor scatter activity for the times of the day listed in UTC, using the **MIN…MAX** color scale below it. The bar displays colors for the active times, and gray for no activity, updated every 15 minutes.

Brass Tacks

continued



Sig Noise Lvl (S0 = great / S4 = fair / S7 = horrible)

Signal Noise Level The signal noise level is a logarithmic measurement (in 6 dB-increments, like you see on an S-meter) of the noise generated as a result of the solar wind, compared with the noise floor. The greater the disturbance in the solar wind, mostly due to interaction with Earth's magnetic field, the higher the S-value, and is updated every 30 minutes.

MUF US Boulder (14 = 20 to 10 no-go / 29 = 20 to 10 ok)

Maximum Usable Frequency From one of eleven locations worldwide, the highest frequency that can be reliably used for communication by skywave propagation. Normally listed in MHz, but also showing **NoRpt** if no info is available, and is updated every 15 minutes.

Solar Flare Prb

Solar Flare Probability A solar flare is a sudden burst of radiation, consisting of electrons, ions, and high energy electromagnetic radiation, over the surface of the Sun. This huge emission can reach Earth and strengthen ionization of the ionospheric D-Layer, absorbing radio signals and disrupting HF communication. The chance of a flare erupting on the solar surface gives you an idea of how much your HF communication might get disturbed by a solar storm in the next 24 hours, and the value is updated hourly.

Finally

Paul does a great job of explaining the various fields of his banner on his website, hamqsl.com, and so I've stolen some of his information to compile here. And because Paul is the author, he's given everybody permission to post his banner on their own websites, provided they don't remove or obscure his name or website address.

Now, you can impress your ham friends with your knowledge of the info presented on this cryptic banner. But maybe more importantly, you can glance at the info and get some idea of what to expect when you get on the radio, hoping the heavens will be in your favor.

— Noji Ratzlaff, KNØJI (kn0ji@arrl.net)