K1SIX SIX METER TRANSATLANTIC Es SEASON BEST FIVE DAYS

And

Data Collection Methodology (Updated 17 June 2024)[1]

To date, using the objective accumulated data point sampling method described below, the best five UTC days of the present 6M transatlantic Es season were (**red values in ( ) are the data point scores**):

27 May 2024 (145) ***The 1st place best 'data point day' in all records was 4 June 2021 (675).***

13 June 2024 (124) ***The 2nd place best 'data point day' in all records was 17 June 2021 (632).***

8 June 2024 (83) ***The 3rd place best 'data point day' in all records was 19 May 2021 (611).***

1 June 2024 (61) ***The 4th place best 'data point day' in all records was 9 July 2022 (438).***

3 June 2024 (44) ***The 5th place best 'data point day' in all records was 6 July 2022.*** (402).

The highest accumulated annual data point count since 1982 was for the record 2021 summer season (6,623). ***Past record dates significantly influencing present 3 Yr. M.A. projections are in RED FONT.***

2024 Transatlantic Season Limits based upon 3 Prior Year Moving Average are: 14 May – 19 August

Table 1 (History) **DIURNAL FIT HISTORY**

Data Valid for >	17-Jun-24	Reference model data points:	30,194
Reference Model Used** >	K1SIX 31 August 2023 Diurnal for Northern Hemisphere		
Paths of Interest** >	Transatlantic, mostly Temperate Zone, some Arctic		
Number of samples for test >	589	Accumulated data points to date for season	

Click on "Table 1 (History)" above for a charted history using this system.

TODAY'S "SIX Score":	25.6	3 Prior Year Moving Average:	61.1
This season has reached	41.9%	of expectations to date.	

PREVIOUS YEAR	SAMPLES	DAYS OPEN	SIX Score
2023	1,854	69	26.9
2022	4,927	68	72.5
2021	6,623	79	83.8

The "SIX Score" for each season is simply the total number of data points recorded divided by the total number of days open. This value will change every day of an ongoing season and is compared against a 3 prior year moving average to capture QUALITY. If this value reaches an expectation of at least a passing grade of 70%, the the fill inside that box will turn green :) ***Data points are simply statistical samples.***
NOTE: Valid only for~ the unique location local area (+/-?) and paths of interest shown!**

PURPOSE OF THIS PAGE and DESIGN

The purpose of this page is to convey locally experienced six meter conditions that are related to long haul (three or more hops) 50 MHz Sporadic E. This information may be useful to others that share a common interest in six meter DXing. Although the information provided is primarily focused on transatlantic paths, the Season Summary section may mention paths to the Far East which are relatively rare on 6M here in FN43ad. The intention is to convey all information in a manner that is efficient with the most important areas of interest listed first. A foundation of evidence is provided so that the information is as objective as possible. To accomplish this, hyperlinks are provided which are ***always in bold underlined blue font*** and mostly **CAPITALIZED.** These links allow one to 'drill down' into more detailed information should they desire. [1]***ALWAYS HIT RELOAD/REFRESH TO ENSURE YOUR BROWSER CACHE RECEIVES THE MOST RECENT DATA!*** To access the ***most recent*** information as quickly as possible follow the order shown:

1. Access this page via **THIS LINK** first. This will display the ***most recent*** season status in terms of the number of days that meet the criteria of being considered open for the transatlantic path. This is a seasonal perspective but the number of days open is only one small part of any assessment. How does the present season compare against modern (presently 3 prior year moving average) historical expectations? Approximately how many days are estimated to remain? Will the estimates succeed or fail? **There is (mostly) no such thing as magic**. ***During unproductive periods I may update ONLY this page with fresh projections but all other pages will remain unaffected.***
2. In the lower portion of the yellow highlighted area within the chart, click on the HERE word where it states "Click HERE for 'BEST FIVE'…" and the embedded hyperlink will direct to this page.
3. This page will state the best five days of the season ***to date*** in terms of data points (statistical samples) collected and list historical record dates for comparative reference. How does the present season compare to these references? Just below this section, Table 1 is shown. The contents of this table are a single value, a 'SIX Score' of season quality ***to date***, a report card of sorts and that includes a short description. More detail regarding this method is addressed below.
4. **OPTIONAL**. Just above Table 1 are two hyperlinks: "Table 1 (History)" and "DIURNAL FIT HISTORY". Clicking Table 1 (History) displays the results of applying a 'SIX Score' to every year since 1982. Just what this may imply requires further research. The present season value will change with each and every qualifying opening where data samples (data points) are collected.
5. **OPTIONAL**. Clicking on 'DIURNAL FIT HISTORY' displays charts and graphs that are explained in the associated document. This compares an ongoing season against an annually updated diurnal model. The results can be interesting. This IS a confidence test of a ***practical*** diurnal model but it may also reveal external influencing factors, e.g. mutual availability.

Data Collection Methodology

Data Points Defined (Thresholds)

A data point is defined as follows: For CW or SSB- a signal strong enough to accurately determine the full call sign. For WSJT (JT65 and FT8 effective 17 June 2017) - A signal equal to or greater than -10 dB with an accurate call sign decode. Note that -10 dB signal levels are weakly audible by ear here in the 3 kHz wide IF WSJT bandwidth utilized and should be detectable on CW (not SSB) when the IF bandwidth is narrowed down to 500 Hz or even 250 Hz or less. In addition, -10 dB is an easy number to remember. ***Every data point is considered a sample.***

Note that it was essential to account for the popularity of FT8 in the entire history of data collection so that some correlation to past history could be determined. It had to be done. Some have argued the point but this is what I have adopted as a standard going forward and I have high confidence in this methodology.

Data Points are accumulated in one hour time bins

The overall data points accumulated are parsed to ensure they all meet the minimum signal levels required and represent ***mostly*** 3 hop paths across mostly 3-hop+ ranges across ***mostly*** mid-latitude transatlantic paths. Some Arctic paths like OH and TF are maintained as are the Azores which could be 2x Es at times from here. OX is removed as are more southern end-points in southern Africa to avoid equatorial zone contributions which would greatly over-complicate a generally temperate zone goal.

After the initial parsing, the time stamped data are placed into one of 24 one hour UTC time bins for the particular UTC date then parsed again. This time to remove any dupes. No duplicate call signs are allowed within any one hour time bin to ensure that the total data point count for each individual hour represents unique stations. The data counts for each individual hour are then placed in a master spreadsheet.

This process continues until all hours for a day's run are completed. Daily dupes are allowed in different hourly bins but never within a unique hourly bin. Once entered into the master spreadsheet, hourly data point counts are summed with all previous years' hourly counts to produce a diurnal plot such as **THIS**. Diurnal plots for transatlantic and **FAR EAST PATHS** are updated annually along with the models from contributors in the Es_Predict.xls spreadsheet on my website at **https://www.k1six.com/**.

The file ALL.txt within the WSJT-X application is the source for all WSJT data collected. I hit STOP then Open Log Directory, choose ALL.txt then File Save As to a networked transport drive during a "run" renaming the exported file to something like "ALL070423_12Z" and compile on a separate workstation. The compilation run can be as small as 1 hour, batches of several hours or several days. Once I ensure I have a good file transport, I hit Erase ALL.txt, hit MONITOR and start all over again. Usually at the top of the hour. Each "Time Bin" starts at the top of the UTC hour and runs through 59 minutes, 59 seconds after that hour. They are plotted at half past the hour for best resolution and to avoid confusion. Thus, a "time bin" starting at 12:00 UTC would have the results plotted at 12:30 UTC. **CLICK HERE FOR A 4 JULY 2021 JA OPENING EXAMPLE OF MANUALLY PARSED HOURLY SUMMARY DATA PREPARED FOR IMPORT.**

The parsing process is still manual at this time and can be time consuming after a busy day, taking up to three days to catch up. Actual data collection is completely automated. It has been a learning process and I am now in the process of completing a Macro driven MS Excel Spreadsheet to automate the quite complex task of parsing the imported ALL.TXT file. I will make this available as "freeware" once the project is completed and published. This may be useful to others. The present goal is to parse any signals below a user defined threshold and a user defined list of prefixes with some exceptions. The increasing popularity of WSJT-X has a profound influence on 6M DXing. The well thought out inclusion of ALL.TXT makes it a masterpiece for automated data collection for those interested in propagation research.

The automated data collection methodology ensures that my personal schedule does not interfere with the collection of statistical samples. More is better. I can collect data whether or not I am QRV, even if I am travelling away from home. The only time I shut it down is when there is a risk of lightning. This process and not my retirement is the single most influencing factor for the large increase in detected days open since 2012. The second most influencing factor is WSJT-X digital sub-mode FT8 introduced on 29 June 2017. This led to international agreement to its use on ***50.313 MHz*** for six meters. It is no longer necessary to tune around to find what you are looking for. ***Managing airtime on this widely shared resource should be considered a top priority.*** Under severe QRM conditions**,** it has become accepted practice to move 10 kHz up to ***50.323 for DX only*** but I would recommend that this practice be avoided unless absolutely necessary. Some folks may prefer 10 kHz down to 50.303 as an alternate DX Only "channel" but do we really need two DX Only "channels"? More is not necessarily better when it comes down to efficient use of spectrum. Self-discipline must be a consideration.

Daily data point counts and compilation

The final step in the process of compilation is to take the sum of all accumulated data points for a given UTC day and place them in the daily database portion of the master spreadsheet for a unique date (MM/DD). These are recorded for each year then summed to estimate some statistical assessments of things like **summer Es season 3x Es seasonal probabilities** (from which **single hop probabilities** can be statistically derived from which any number of hop probabilities can be statistically derived), **a season report card** to compare against previous seasons with a projection, estimated quality, etc., etc. Please note that ***I am presently using 3 past year moving average projections*** which is subject to change. 4 of these will fit into the span between solar maximums. Past moving average projections account for the dynamics of change from the influences of ***modern*** history.

Operational Planning using Statistical Modeling (use fractions)

The best dates and times to operate can be estimated to a reasonable degree of accuracy by using the following formula where **X** equals the % chance of probability for a desired path:

X = DIURNAL Prob. % (A) x UNIQUE or BLENDED SEASONAL Prob. % (B) x CHAOS Prob. % (C)

Chaos cannot be modeled with statistics. It is a real time issue. An example of chaos is when a similarly capable neighbor only 7 miles away is working stations you can't even hear. This is caused by ray focusing, particularly during multi-hop events, from cloud alignment and differing values of FoEs.

At times just waiting can bring you into the path footprint as the dynamics of multiple interrelated complex refraction points comes into play and the path footprint changes for your benefit. Be patient! All the CQing in the world won't help here – it's all pure luck! **PSKREPORTER** can help and is essential!

The more hops, the more likely this will occur. For one hop, a straight line can be drawn between any two end points. However, once multiple refraction points are added into the mix, the probability of a straight-line path becomes orders of magnitude more difficult. Mathematically, this can best be described by the Y^x formula: $\mathbf{PROB}^{\#\mathbf{hops}}$ Where **PROB** is the decimal fraction probability of a ***single hop***, raised to the exponent value (**#hops**) for the number of hops.

Single hop **PROB** values, based upon published science, can be found on my republished edited chart with references cited **HERE**. For my published DIURNAL data, the ***cube root*** of the ***% of Total DATA POINTS*** must be used for a single hop. Thus, 7% (.07) for 3 hops would equate to ~ 41.2% (.412) for a single hop.

I am selfish. I want to know, with some reasonable level of confidence, when to operate to serve what interests me the most and that is extreme, multi-hop six meter dx. Is trusting a single hop model sufficient? I want to see for myself! Is it true that a single hop model is not nearly sensitive enough to serve my best interests? The answer is statistically yes and that is why I am doing what I do. The data that I provide allows comparisons against an expectation that is an annually updated multi-hop model. Many tens of thousands of samples are required to meet quality confidence goals.

The "SIX Score"

I was recently attending a ham flea market and bumped into a fellow six meter dxer. "How is your 6M Es season going so far?" he asked. Being in a rush, I replied "30.2", quickly turned and sped off but out of the corner of my eye I could see him standing there with a dumbfounded look on his face as if to say: "What the **** is he talking about?". A few weeks later, after he read this web page, I bumped into him again and asked him "How is your 6M Es season going so far?" With a saddened look on his face, looking me straight in the eye, he replied: "RED", quickly turned and sped off. **But RED is so subjective!**

The "SIX Score" is a no frills single number used to evaluate an ongoing Es season in terms of quality. The value will change anytime there is a change in the number of days open which implies that at least one data sample has been logged. The manner in which these data points are collected implies widespread geographic coverage (no dupes per hour) possibly over long durations of time. Higher sample counts over time implies quality openings on at least one, ***assumed reciprocal***, end of the path. The "SIX Score" is simply: The TOTAL NUMBER OF SAMPLES LOGGED divided by the NUMBER OF DAYS that qualify as open.

I will be trying this out as a new table on Page 1 to convey a very fast and easy message of 6M conditions here in FN43ad. It will be interesting to see how this evaluation compares with others. I suspect that it may correlate over a wide temperate zone area, likely be worse closer to the geomagnetic poles and better at lower geomagnetic latitudes than my ***(CLICK>) 52.2°***. Time will tell. Give it a try too.

For reference purposes: On 15 July 2023 the "SIX Score" was only 30.2 with a declining trend for what will be subjectively described as a poor-mediocre long-haul Es season that was well below 70% Past 3 Year Moving Average expectations as of that date and if you don't believe it- CLICK HERE. There must be an easier way to describe all of this! Oh! What impact will **THIS** have?

It is my hope that all of this is (objectively) brief and to the point, as I quickly turn and speed off.

2023 6M Long Haul Es Season "Stats", Highlights and Summary

General Statistics [Note: Projections **(P)** are *3 prior year, modern moving averages where:*
(C)apture**%**= **(A)**ctuals/ **(P)**rojections**)**

Season Limits: (A) 8 May – 15 Aug. **(99 Days), (P)** 11 May – 22 Aug. **(103 Days), (C)= 96.1%**
Transatlantic Days Open: (A) 69**, (P)** 77**, (C)= 89.6%**
Statistical Samples (Data Points) Collected: (A) 1,854**, (P)** 5,128**, (C)= 36.2%**
SIXScore: (A) 26.9**, (P)** 67.9**, (C)= 39.6%**

Heard but not worked (all on FT8 and would be new 6M DXCC):

3B9FR Rodriguez Is. ***E-Linked TE(F)*** ALL.txt redacted file capture from 24 June:
160300 50.313 Rx FT8 -15 -0.0 1737 XXXXXX 3B9FR R-11

A71** Qatar. A71CT, A71VV and A71XX all heard. They may have high noise issues. Here's a nice ***ALL.txt*** file capture from 13 June:
114615 50.313 Rx FT8 -4 0.4 619 CQ A71VV
A71XX was also seen cqing on 30 July.

1 new 6M DXCC Entity Worked (FT8 confirmed via LoTW):

D2UY Angola believed to be via ***E-Linked TE(F)***. 27 May ALL.txt file capture:
195930 50.313 Rx FT8 3 0.6 1400 K1SIX D2UY 73

2023 Summer Es Season Summary (all FT8 at K1SIX FN43ad):
The **General Statistics** shown above appear to indicate a problem for this particular season. Although the duration for the long-haul season and the number of qualifying days open met expectations, the overall quality in terms of widespread geographic footprints was very poor. This is best described by the "SIXScore", a constantly changing dynamic value that tracks a season one day at a time.

Long-haul E-W paths ***traversing for long ranges*** through the aurora oval appeared to be depressed. Although I was heard in and also heard Japan and Kazakhstan, openings to these areas were few and far between with no QSOs logged and no signals reached the minimum required level of -10 dB:
230708_225815 50.313 Rx FT8 -15 0.1 709 K1SIX JN4MIV -11
230624_143200 50.313 Rx FT8 -17 0.2 1245 XXXXX UN8GEQ MN83

Middle latitude propagation appeared to be impacted minimally and geomagnetic equatorial crossing ray paths seemed to show some enhancement.

Please refer to the ***15-Aug-23*** diurnal comparison shown **HERE**. After 11 June, my 1900 – 2259 UTC PM Peak began to diminish with a significant migration to the 0900 – 1359 UTC AM Peak noted. At the end of the 2023 season, the PM peak period was reduced by 10.8% and the AM peak increased by 15.2%. At least in my case, the PM Peak period represents improved Es conditions to extreme northern Europe and some 4 hop paths to NE Europe with all paths traversing the aurora oval.

High rates of ‘dx efficiency’ are enjoyed by everyone operating on the 50.313 “channel” making it easy to find the dx and QSYing to the 50.323 DX only “channel” only when necessary. However, interference levels are rising and some ‘creative’ operators are placing temporary **CQ BEACONS AND ROBOTS** in service.

Sadly, the previous record of 2 consecutive days of 12 hours per day continuous cqing from a very strong (***nlos***) local only 20 miles away was eclipsed by a different strong station in May 2023! So what some enjoyed in the past may not be able to be sustained in the future. Time will tell.

Vy 73.

Bob, K1SIX FN43ad87