

AN ILLUSTRATED GUIDE TO THE USE OF THE GRAFANA WEB TOOL FOR DISPLAY OF WSPRDAEMON NOISE MEASUREMENTS AND THE INFLUX DATABASE

1. The wsprdaemon Grafana web tool home page

<https://grafana.int8.com/d/3dcOdAmWk/calibrated-noise-dashboard>

This screen will initially show graphs from all receivers and all bands from one reporting site, for example:



2. Left-hand pull down menus:

- **Site** - selects the reporting station by the identifier they have provided. One or more specific sites can be selected. You will need to manually untick a selected site if no longer needed.
- **Receiver** - some sites have more than one receiver. This pull-down lists the names of all receivers, as provided by the sites. Many are cryptic. Until you know the receiver names for a site it is best to leave as All. Click once on the graph area and the data for the last 24 hours for all bands for all receivers at the selected site should appear.

Here is the result for site OE9GHV. Bottom left is a Legend for the coloured spots by band, site, receiver and noise analysis type (FFT and RMS). You can jot down the name of this site's receiver(s) you're interested in, e.g. to select just those you need in the Receiver pull-down.



- **Band** - At this point, you can place your cursor on the list of bands at bottom left, where you will see each label turn to bold white as you hover. If you click on a single band, its data alone will be displayed, the y axis changing to suit its range. You can shift-click to add other bands. Place your cursor in the lower middle and scroll down to see other bands listed at left.
To return to full view reload the web page.
Alternatively, use the tick boxes under the Band pull-down to select your bands then click on the screen away from the menu.
To return to full view select All and click on the screen away from the menu.
- **Pull-downs not used** - **Calibrated Noise Dashboard** is a pull-down for other databases hosted by the user that has kindly provided us this space. **Four Squares** icon does not concern us.
- **Grafana help** - Click on the **circled question mark** bottom left for general Grafana help.

3. Information on the screen

- **X axis hour display** - At this stage the screen is showing 24 hours of data, and the labels are hours in the time zone (adjusted for daylight savings if applicable) local to the web browser. They are not UTC.
- **Min, Max and average** - shown at bottom right for the data currently displayed. The average is for the dBm values, i.e. the geometric (not the arithmetic) average of the noise power.
- **Cursor** - moving the cursor along the data, a thin red line will be seen, one can read the time in the pop-up information box and the levels of the noise, with the variable name and type of the data point at the cursor being in bold white in the box. **Cursor click and drag** will show a pale grey box starting at the initial cursor location; on unclicking that time period will fill the screen.

4. Right-hand pull down menus

- **Share** - Click this icon to share . The **Link** option along the top gives a custom URL at bottom to copy to your clipboard. The recipient can use it as a base for further data exploration. The **Snapshot** option provides a link where the dataset is frozen, that is, the recipient cannot alter the bands, receiver etc. However, the user is cautioned that the URL of the Grafana site will be visible to the recipient. The **Export** option writes a JSON file.
- **Zoom out and shift the time span** - Click the **magnifying glass with** - to zoom out, maintaining the current time at the right-hand margin. Click < to move that time span back in time. Click > to move the time span forward.
- **Set common or custom time range** - Click on the indicated time span next the **clock** icon, top right, to bring up a set of common time spans, or to set custom start and stop times and dates and a custom refresh rate.

Important note - You will notice that as you zoom out the number of displayed points will **not** increase in proportion. That is, Grafana implements automatic decimation. This can lead to misleading display of higher-frequency variations - as an insufficient number of points will be plotted to show the true variations - it may violate the Nyquist theorem and alias the data. This also affects the data series downloaded via Grafana (but not via Influx).

5. Centre pull down menu

Click on Calibrated Noise in the centre of the screen to bring up the following options:

- **View** - this is the normal setting we've used so far.
- **Share** - brings up a panel of options and settings similar to what was available using the Share icon top right.
- **More** - brings up three options to the right: **Panel JSON** opens a window with the JSON code for the current panel, **Toggle legend** does just that, hiding / showing the legend and min max average data at the bottom of the display. Of more use is the **Export csv** option. If intending to use with a spreadsheet, select **Mode** as **Series as columns**, edit the default **Date Time format** to replace the "T" with a space, and delete ":ssZ". Leave Excel CSV dialect unticked, then click Export and save

the file. To import, in Excel for example, select the column with the data, use the Text to Columns option, set semicolon, and only semicolon, as the delimiter and convert. This provides the date time in an Excel format, but you must be sure to check the time zone. You should also check data decimation, e.g. if displaying a month of data the csv file will probably show values every 30 minutes. Conversely, if the display is over a short period of time Grafana may add null records, e.g. every odd minute. Full data sets can be downloaded directly from the Influx database to which Grafana is providing a visual interface, as shown next.

6. The Influx database behind the Grafana graphing tool

[Influx](#) is open source database specifically designed to operate on time series. It is not a relational database. Before you can submit queries, there must be a copy of Influx [installed](#) on the machine you use to submit queries. A [Getting Stated](#) guide outlines the form of queries. The following are examples of some basic common queries specific to the Calibrated Noise database, each should be on one line, these examples are from a MacOS installation using a command line within Terminal:

```
influx -ssl -unsafeSsl -host 35.238.159.210 -username radio_read -password '79ESsPMY' -format 'csv' -database 'radio' -execute "SELECT * FROM atmospheric_noise WHERE site = 'KD2OM' AND band = '40' AND time > '2019-10-15T00:00:00Z' AND time < '2019-10-29T22:00:00Z' LIMIT 2000" > output_file.csv
```

Comments: -unsafeSsl is set when connecting not using ssl verification. Note the capital S in unsafeSsl.

username radio_read has read only permission into the database.

-format options other than csv are JSON and column

-database name here is 'radio' and, in Influx terminology, 'atmospheric_noise' is the 'measurement', from which we SELECT all fields (i.e. *)

The WHERE clause operates on tags and, as here, values, that is, the site name and band are included as values in each record.

Note how we select a time interval using greater than (>) and less than (<). The format of the times is important. One digit days or months must have a preceding zero, so 08 not 8, as must hours, minutes and seconds. The Z signifies UTC. Set a records LIMIT if required.

The output is piped to a named csv file in the current directory.

Note that time in the csv file is by default in nanoseconds past 0000 UTC on 1 January 1970. A simple formula e.g. $=\text{(B2)/(86400*1000000000)}+"1/1/1970"$ converts to Excel time.

After seeing all of the fields in a test file one can select just those of interest, noting that the 'measurement' name will appear in each line, in the first example below we also specify a receiver. The second example shows all fields while showing the syntax for how to perform a logical 'OR', here selecting multiple bands, each band with its own line in the output file:

```
influx -ssl -unsafeSsl -host 35.238.159.210 -username radio_read -password '79ESsPMY' -format 'csv' -database 'radio' -execute "SELECT \"time\", \"fft_level\", \"rms_level\" FROM atmospheric_noise WHERE site = 'OE9GHV' AND receiver = 'KIWI_1' AND band = '40' AND time > '2019-06-12T00:00:00Z' AND time < '2019-11-08T00:00:00Z' LIMIT 200000" >output_file.csv
```

```
influx -ssl -unsafeSsl -host 35.238.159.210 -username radio_read -password '79ESsPMY' -format 'csv' -database 'radio' -execute "SELECT * FROM atmospheric_noise WHERE site = 'OE9GHV' AND band = ~ /40|80/ AND time > '2019-12-06T00:00:00Z' AND time < '2019-12-08T00:00:00Z' LIMIT 200" >output_file.csv
```