HERA memo #109
Received: 11 Jan 2022

First look at SARAO RFI monitoring

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8 June 2021

SARAO has a spectrum monitor at the HERA container. There are a number of bands spanning the Meerkat/SKA ranges of interest as well as one at 0 to 750MHz covering the HERA and HIRAX bands. Data are available for inspection through a dashboard. Connection details are available on the HERA internal wiki.

Summary of conclusions:

1. Channel 6 TV station turned off 23 April 2021
2. A broadband emission is seen with the following characteristics
   - Spectral shape similar to the sky seen by the Vivaldi feed (50-250MHz), but sometimes extending to >400MHz
   - Occurs in ~30% of the days surveyed (day sample formed for other reasons, might be biased)
   - In one day the time occupancy reported by the RFI analysis dashboard is <3%.

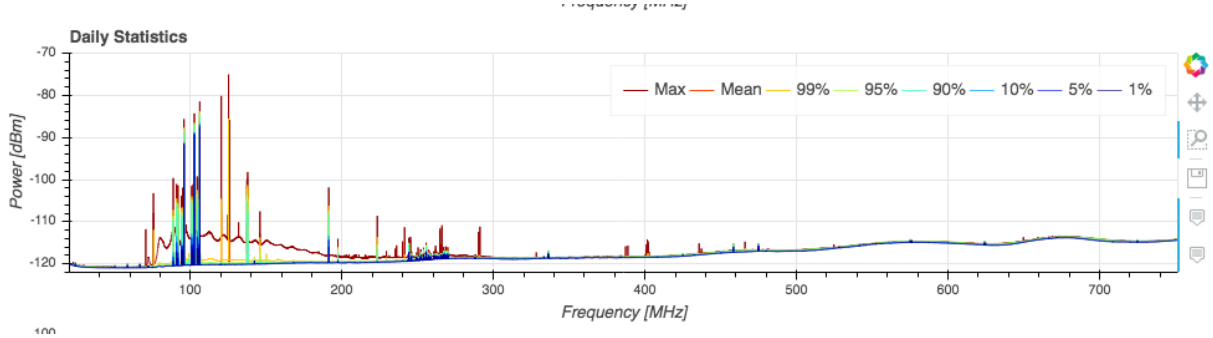
Open questions:

- What is the time resolution of the underlying data. The waterfalls appear to have an integration time of ~1-2min. However, in times when the waterfalls are seeing nearly continuous broadband RFI the
reported flagging fraction is still <3%. Suggests that some time averaging is happening for the waterfall.

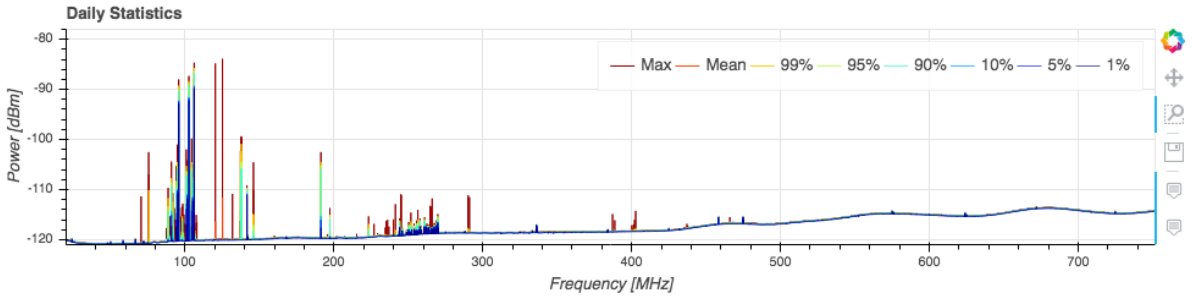
Investigation 1: TV

Can we see evidence for TV stations turning off? Sentech reports that at least one TV station was turned off sometime between Nov 2020 and April 2021 and another will be addressed by 30 June. See memo 82 for an overview of TV; it is at 180-200MHz. In the spectra I can really only see one channel at 190MHz.

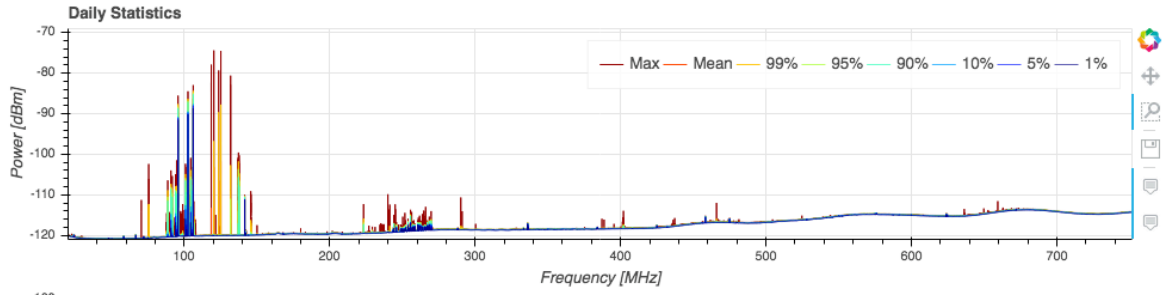
1 March 2021



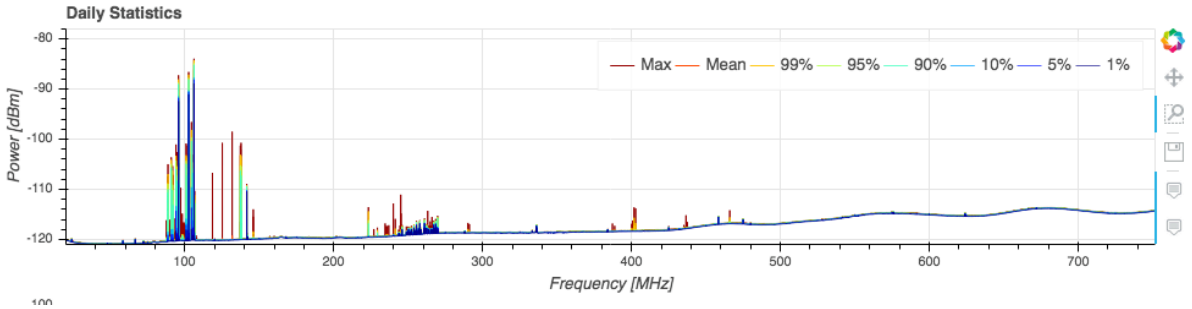
1 April 2021



1 May 2021



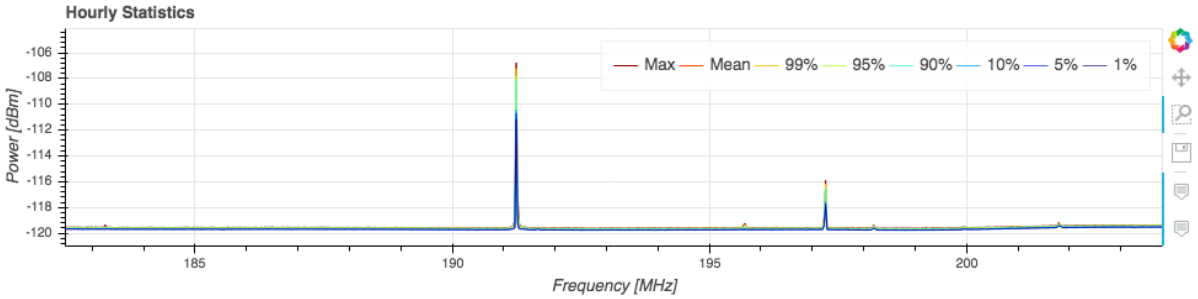
10 May 2021



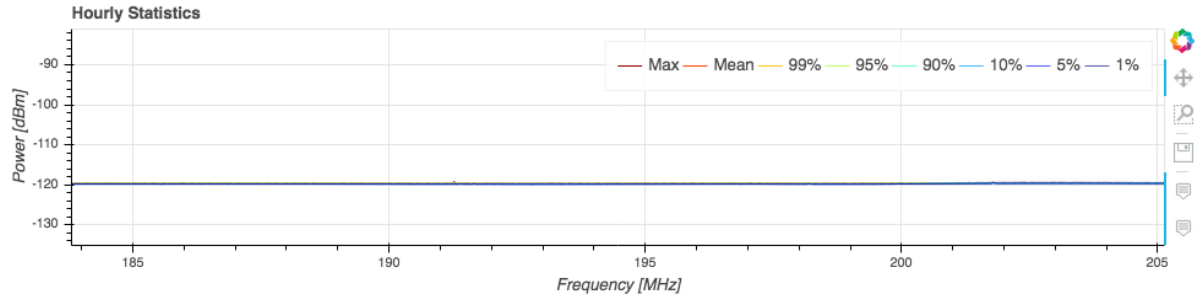
Conclusions: Maybe the two channels at ~180MHz turned off!? Signals at ~75MHz also less. Site radios?

When exactly did the transmitters turn off? Did they turn off at the same time?

Using Newton's method I narrow in.
23 April 0300 - both lines are on



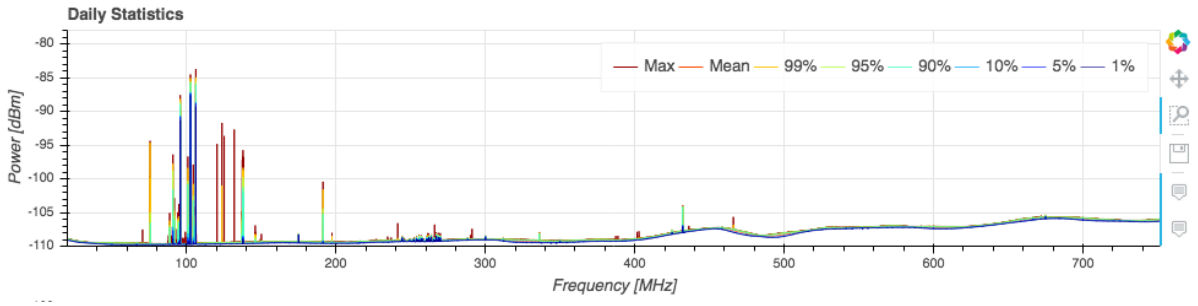
23 April 1800 - both lines are off



According to Wilensky's Memo 85, this was TV channel 6. 190-198, vision carrier 191.25MHz

Looking back further to see evidence of TV turnoff in the fall of 2020

1 Jan 2020



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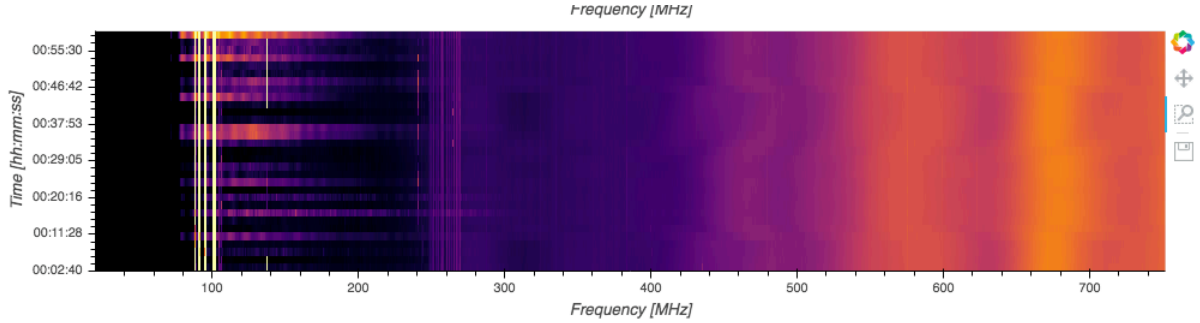
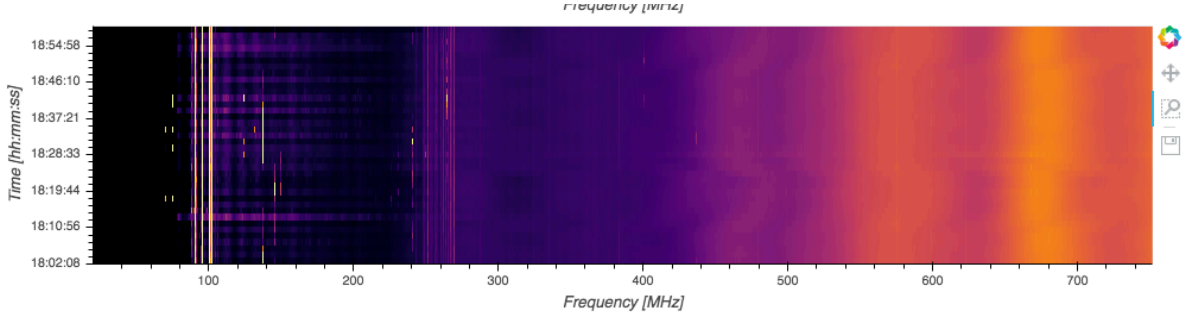
Investigation 2: A broadband bogey

While poking around I found evidence for broadband (e.g. above max-hold spectrum from March 1).

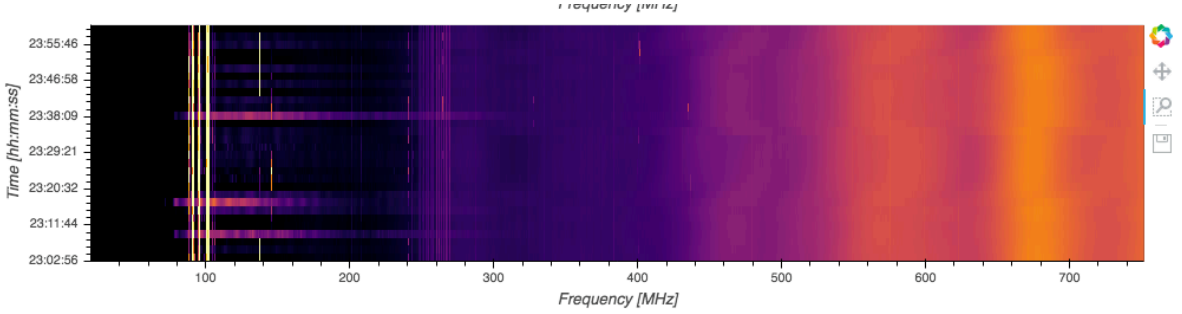
1 March 2021
00 Hours



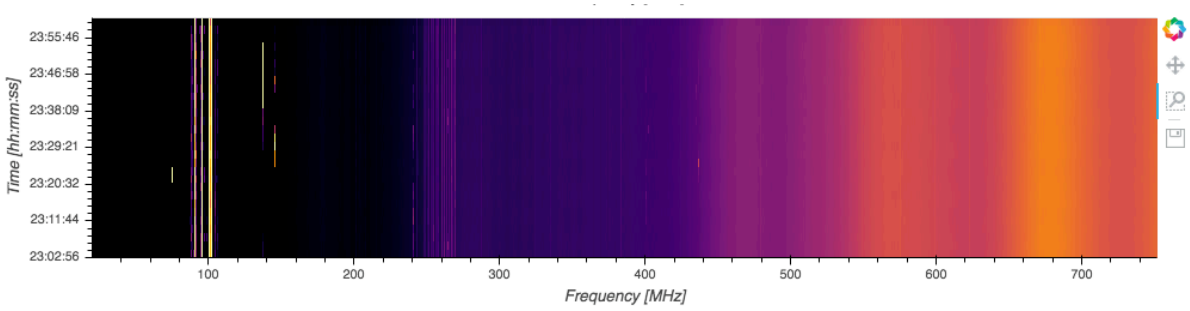
Later that night
1800 hours



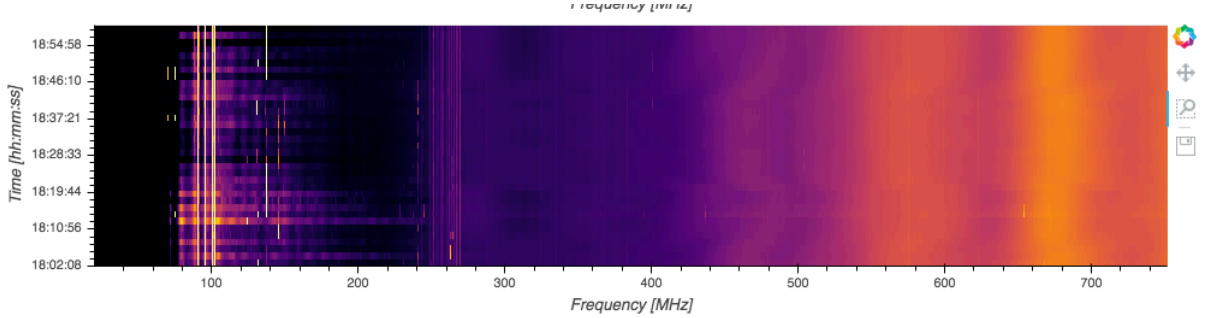
2300 hours



24 hours later its stopped
2 March 2300

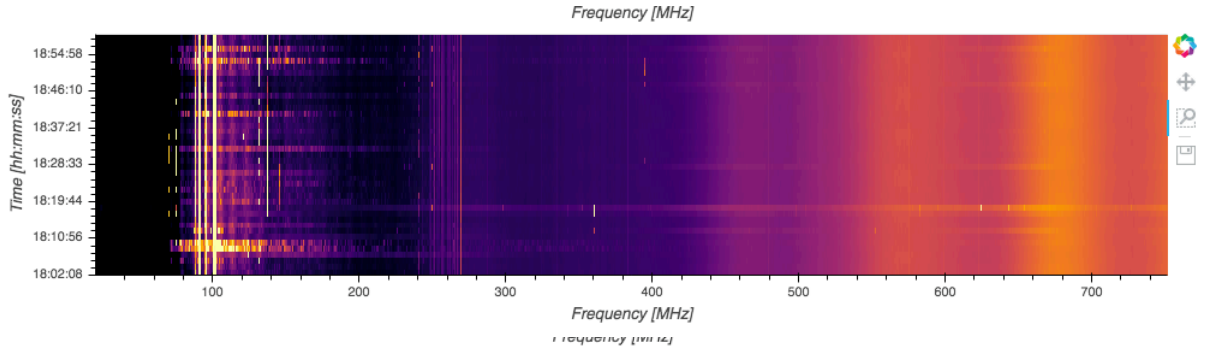


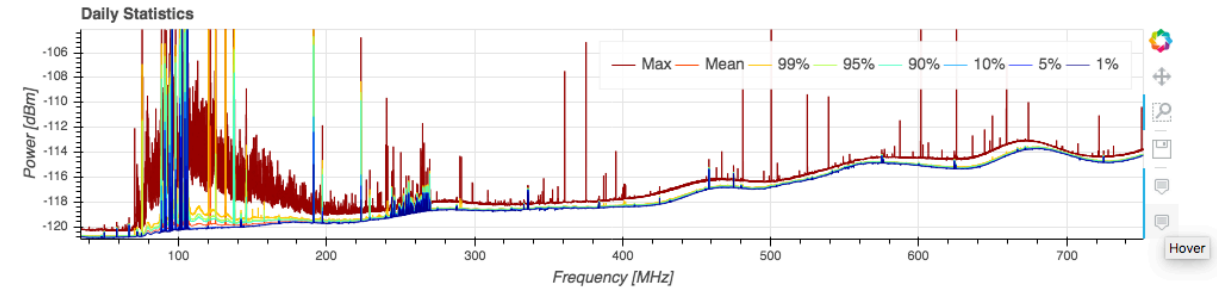
Going back to 28 Feb
1800 hours



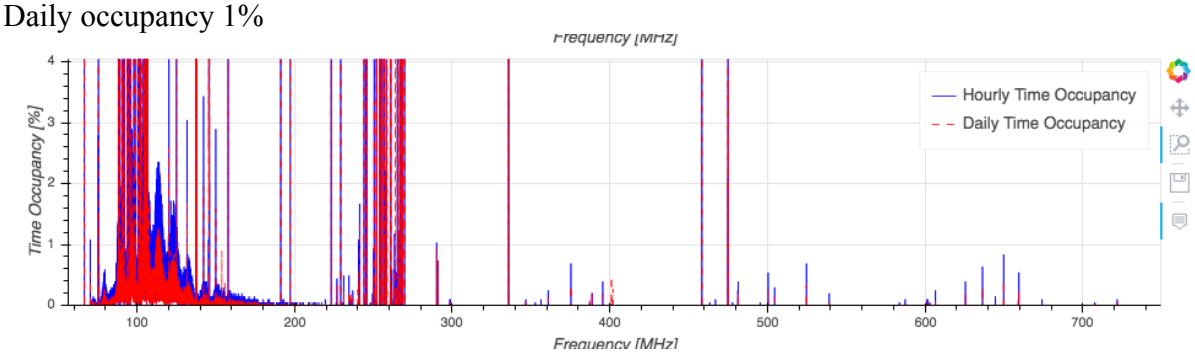
Further back to 27 Feb
No broadband.

Looking for other days with broadband
26 Jan 2021
1800





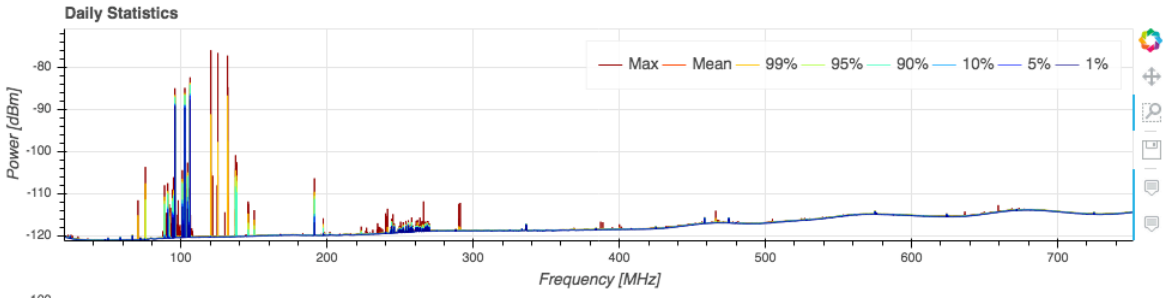
Daily occupancy 1%



Is the bogey related to jumpy power in H4C - IDR2?

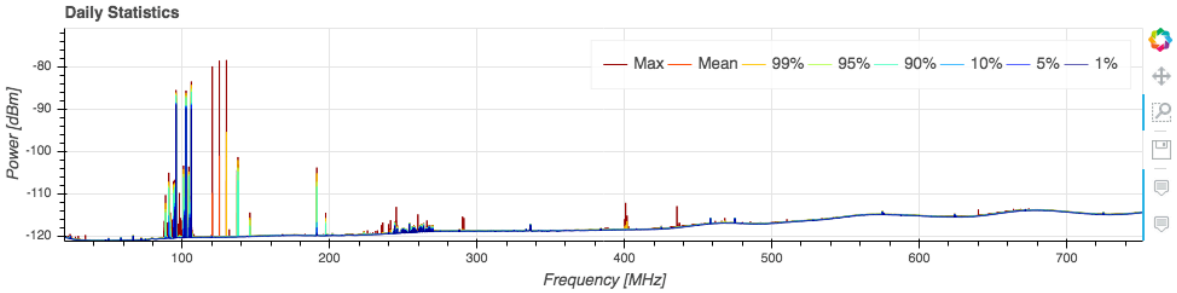
Is that broadband business at all related to the broadband issues seen in H4C?
Lets compare a day which according to auto_metrics is relatively quiet with one that has lots of jumpy power.

Good day 2459122 Sept 29



No obvious broadband

Bad day 2459125 Oct 2



Pretty much the same as the good day. Only difference is no site radios at 70MHz. But those aren't on very often, only showing up in the max and <1% cuts.

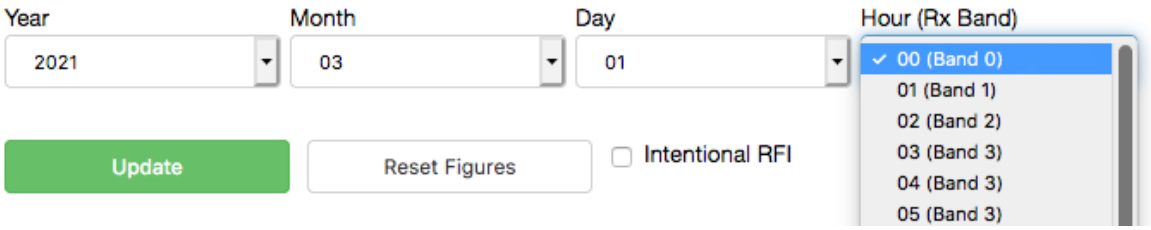
System details

Physical setup

The HERA band antenna is a $40 bicone. The receiver is a ROACH2 spectrometer.

Note on data selection.

The data selector looks like this



Seems to imply that the tuning is changed on the hour. The tuning schedule changes from day to day. Sometimes Band 0 is not available.