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To: EDGES group

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Subject: Analysis of effects of strong signals on the EDGES3 at the MRO

Starting in September 2026 some EDGES-3 data from the MRO been effected by strong signals that pin the ADC in an "saturated state" . There are number of strong signals which include the following:

122.6 MHz Murchison Shire Airport (YMSS)

132.6 MHz Air Traffic Control (ATC) Area Control Services

131.55 MHz ACARS (Aircraft Communications Addressing and Reporting System)

The strongest and most frequent of these is ACARS

Figure 1 shows the waterfall plot for day 294 from 08 to 09 UT and 120 to 140 MHz as an example of recent data with strong signals at 121,122,125,126,127.5,130,130.5,131.5,134,137 and 138 MHz.

The data is smoothed to a resolution of 391 kHz resolution to make the emissions more visible. The signals at 127.5 130.0 131.5 134.0 are strong enough to pass an RFI signal for small fractions of time during periods when the ADC is saturated.

The signal in the 137-138 MHz are from Orbcomm satellites and in memos 28, 42, 364 and 366 it is shown that they come close to saturating the ADC which is consistent with the waterfall in figure 1.

The blue time blocks have a low temperature because there is a signal present to hold the ADC in saturation. In some cases, when the saturation is present, some of the strong signals appear in light blue, green, orange or red in the time span along with other frequencies in saturation state .

DATA range MHz	122.0 -123.0	127.0-128.0	131.0-132.0	133.5-134.5	137.0-138.0	Total K 30 -160
2026_294 08-09	~10 K	700 K	127150 K	1700 K	2000 K	126640 K
2026_280 08-09	3116 K	81800 K	19641 K	18756 K	2500 K	96085 K
2024_294 08-09	4429 K	91 K	11453 K	900 K	8323 K	41428 K
2025_291 08-09	~ 10K	50 K	61007 K	15290 K	9093 K	60751 K
2025_280 08-09	800 K	2000 K	202719 K	7403 K	11808 K	201908 K
2026_297 08-09	~10 K	900 K	550 K	3000 K	4300 K	broad
2026_298 08-09	3500 K	310000 K	7800 K	4000 K	1200 K	352256 K
Signal source	YMSS	VHF airband	ACARS	VHF airband	Orbcomm	Mostly ACARS

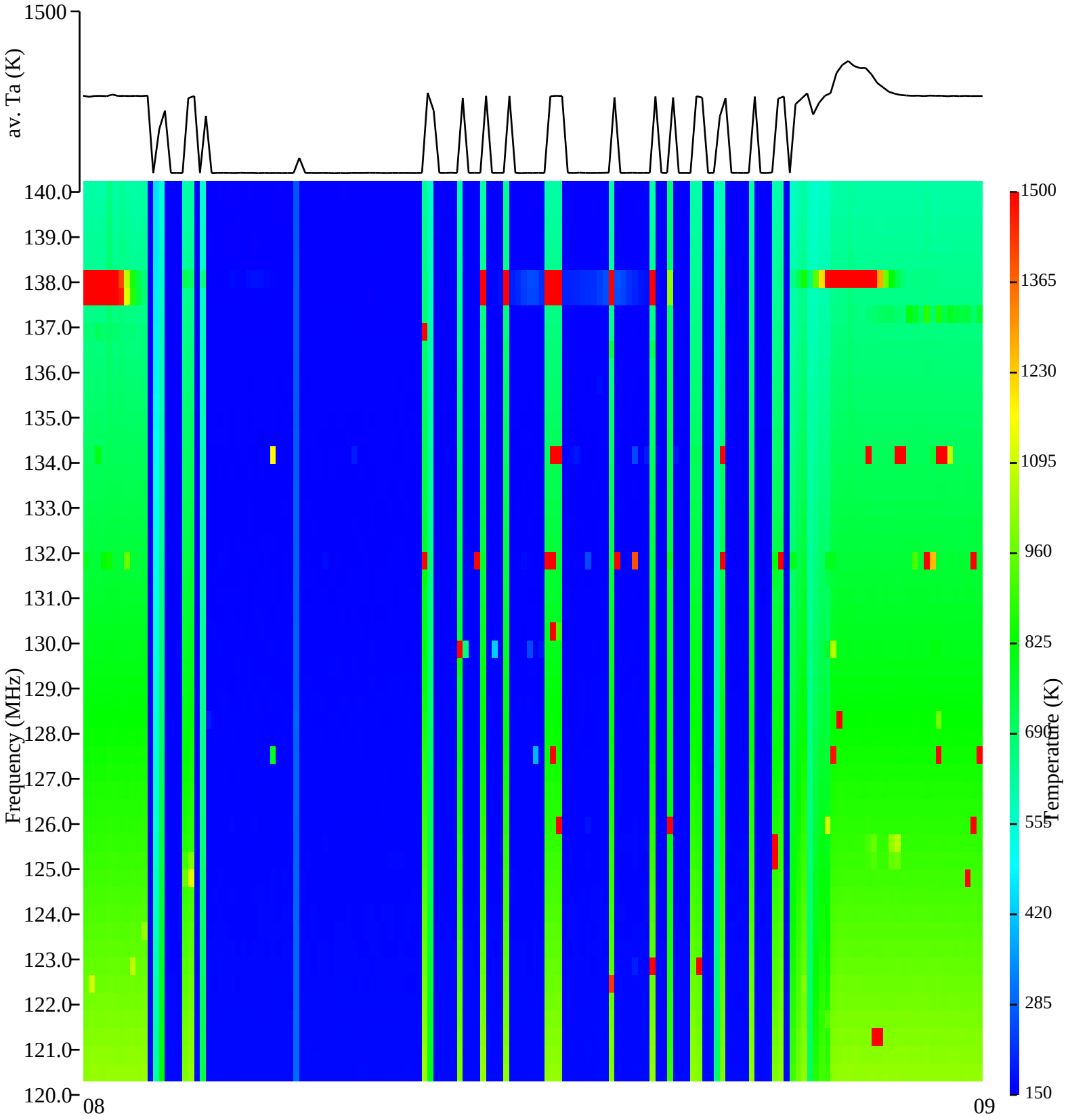
Table 1. Strengths of strong signals from EDGES-3 at the MRO

The last column of table 1 is the average over 30 to 160 MHz. Day 294 has a "bad" antenna S11 at 02 hours. While day 294 is a day with strong signals which may be strong enough to "saturate" the VNA ADC a direct correlation with strong antenna signals is not possible as measurements of the s11 and sky spectra are not made at the same time.

Another example of the presence of the strong signal is shown in figure 2 which show the waterfall plots for 2023 day 43 which has a saturated ADC from 04 to 06 UT using a temperature scale from 150 to 1500 K on the left and 138 to 160 K on the right. The strong signals at 137.35 and 137.8 MHz show up at low level owing to the saturation. It is noted that the main cause of the saturation could be from the aircraft in the UHF band at 225 to 380 MHz or the ACMA communications at 420 MHz which are not seen in the EDGES-3 spectra which have an upper limit of 200 MHz. If this is the cause of saturation a low pass filter could be added to the path from antenna to the 8-position switch to avoid the effect of strong signals on the LNA /ADC and the VNA.

While e-callisto data is no longer available from Murchison recent e-callisto data from the northeast of Adelaide, near the Murray River region of South Australia shows very strong signals close to 280 MHz which is in the band used by military MUOS as well as other services and the atmospheric ducting of TV signals observed by the MWA and reported by Balthasar Indermuehle and Hajime Suzuki (https://arxiv.org/pdf/2608.12861).

In recent years the Australian Communications and Media Authority (ACMA), 280 MHz sits within a larger band (273–312 MHz) dedicated to FIXED and MOBILE communications has increased the power of transmitters in this band so a SLP-200+ filter which has a loss of 0.1 dB at 190 MHz and 30 dB and 60 dB loss at 420 MHz might be the best choice for a low pass filter.



UT 8.00 to 9.01 2026:294 file: temp.acq

Fri Oct 23 20:32:10 2026

fstart 120 fstop 140 pfit 0 smooth 64 resol 391 kHz rfi 0.0 nline 155 secint 991

Figure 1. Waterfall plot for day 2026 day 294 from 08 to 09 UT and 120 to 140 MHz

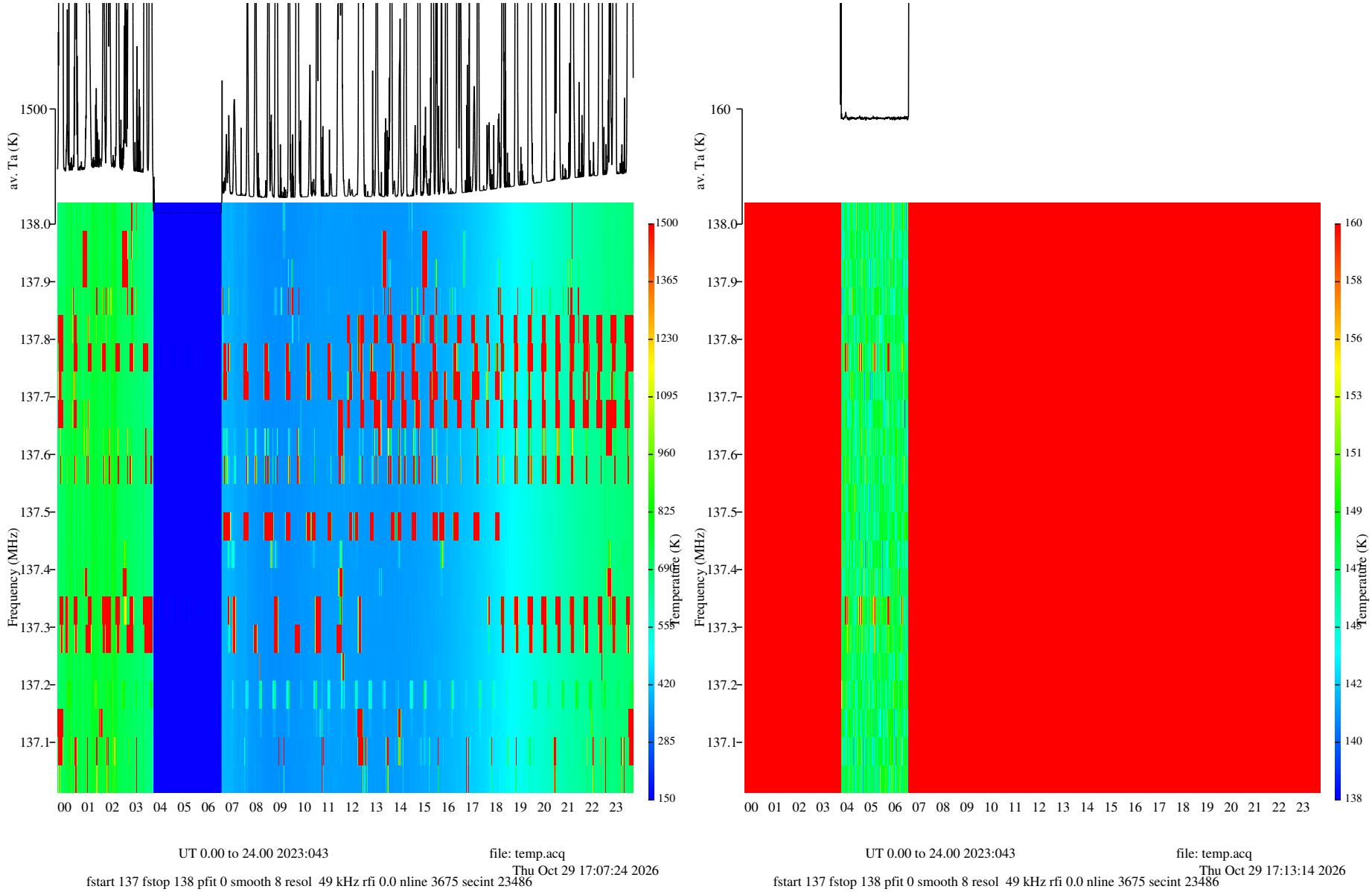


Figure 2. Waterfall plots from 2023 day 43 with scales 150 – 1500 K on the left and 138 – 160 K on the right