ADS-L air2air test flight report

Paweł Jałocha, 21.02.2026

The flight organisation and goal:

There were two aircraft with OGN/ADS-L transmitters: one with external and the other with internal (in the cockpit) antenna. There was a third aircraft with an onboard SDR receiver (Stratux) to test the reception in the air of the transmitters. The goal was to measure and compare reception ranges for ADS-L signals between aircraft thus air-to-air.

Date: 21 of February 2026, **Time**:12:00-13:00 UTC

Pilots: Mirosław Kaszuba (monitoring aircraft) + 2 of his friends from local airfields

Aircraft: total three aircraft, Aeroprakt A22

Flight path: from Jasienna Flight School airfield to Łęg Tarnowski airfield. The two aircraft carrying transmitters departed first and then and the monitoring aircraft followed to test the reception.

ADS-L equipment onboard:

Aircraft	ADS-L equipment	Antenna	ADS-L category
TX.1	Cubecell ADS-L/OGN tracker	External	M-Band TX/RX
TX.2	Cubecell ADS-L/OGN tracker	In the cockpit	M-Band TX/RX
RX	Stratux SDR receiver Cubecell ADS-L/OGN tracker	External	All-Band RX M-Band TX

External antennas were mounted at the bottom of the aircraft like in the previous tests. The transmitter mounted inside is shown on the picture.

Cubecell modules from Heltec use SX1262 chip which can transmit up to +22dBm, they were both set to +16dBm, actually 2dB above the intended +14dBm

Stratux uses RTLSDR USB receivers for 868 and 1090MHz as well as Raspberry Pi as the signal processing unit. Reception code for 868MHz is very much like in the ground OGN receiver, a bit lighter thus less processing is applied to push the reception to the limit.

Results in the essence

Air-to-air reception range for the transmitter with the external antenna was up to 20-30 km

Air-2-air reception range for the transmitter mounted in the cockpit was up to 10-15 km

A surprising discovery: the noise seen by an airborne receiver can be significantly higher than on the ground, like 15dB or even more.

Observations

The pilot was positively surprised after takeoff and reported continuos visibility of both transmitter aircraft throughout the flight. The collected range data does not support this, as there was a smaller reception gap for the RX.1 target and quite big for the RX.2 target (with in-the-cockpit antenna) but the relay feature of the OGN protocol filled in that latter gap and so this is why he did not experience it.

Reception range for the aircraft with the external antenna appeared to work at over 30km but there was a significant gap (see the plot): when we check in details we found a significant (more than 10dB) increase in the noise level and it happened when overflying a city. The nature of that noise could not be determined, but most likely it was the ISM-Band traffic related to the city. We will attempt to obtain spectrogram of that noise and then the identification should be possible.

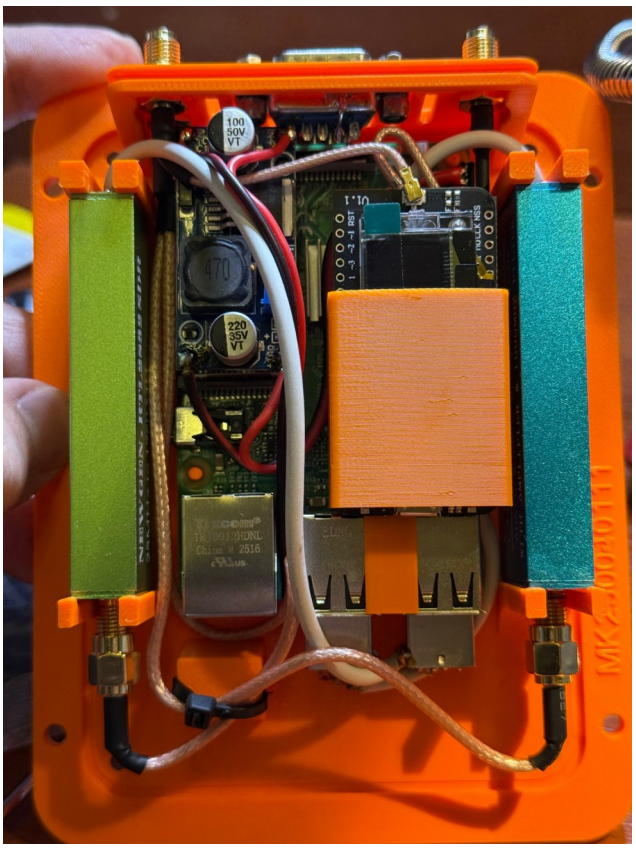
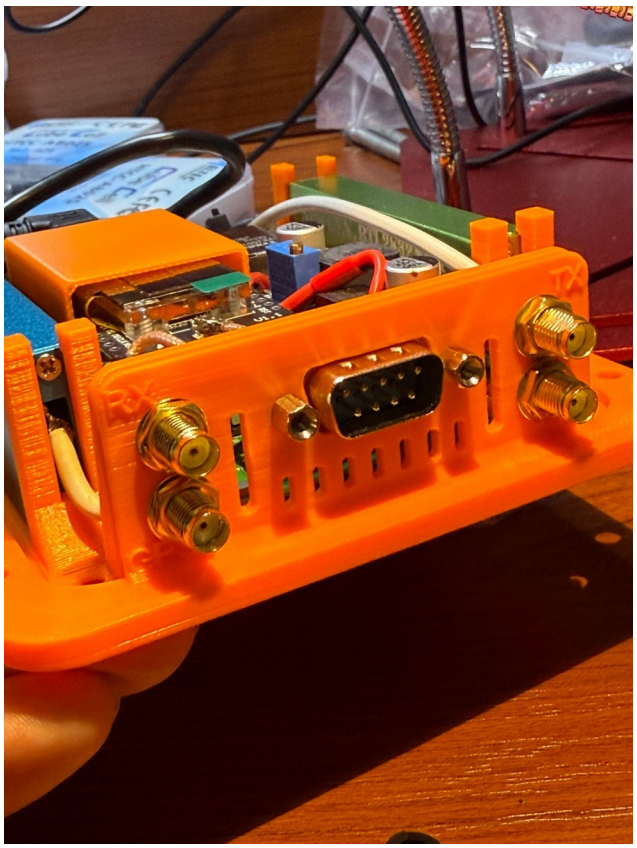
Reception on the ground was good and in some instances up to 150km range: all aircrafts could be tracked at all times.

The important question remains what is the reception range when using the RF chip, not an SDR: during this flight we had no direct capability to record packets received by the trackers.

Pictures and plots

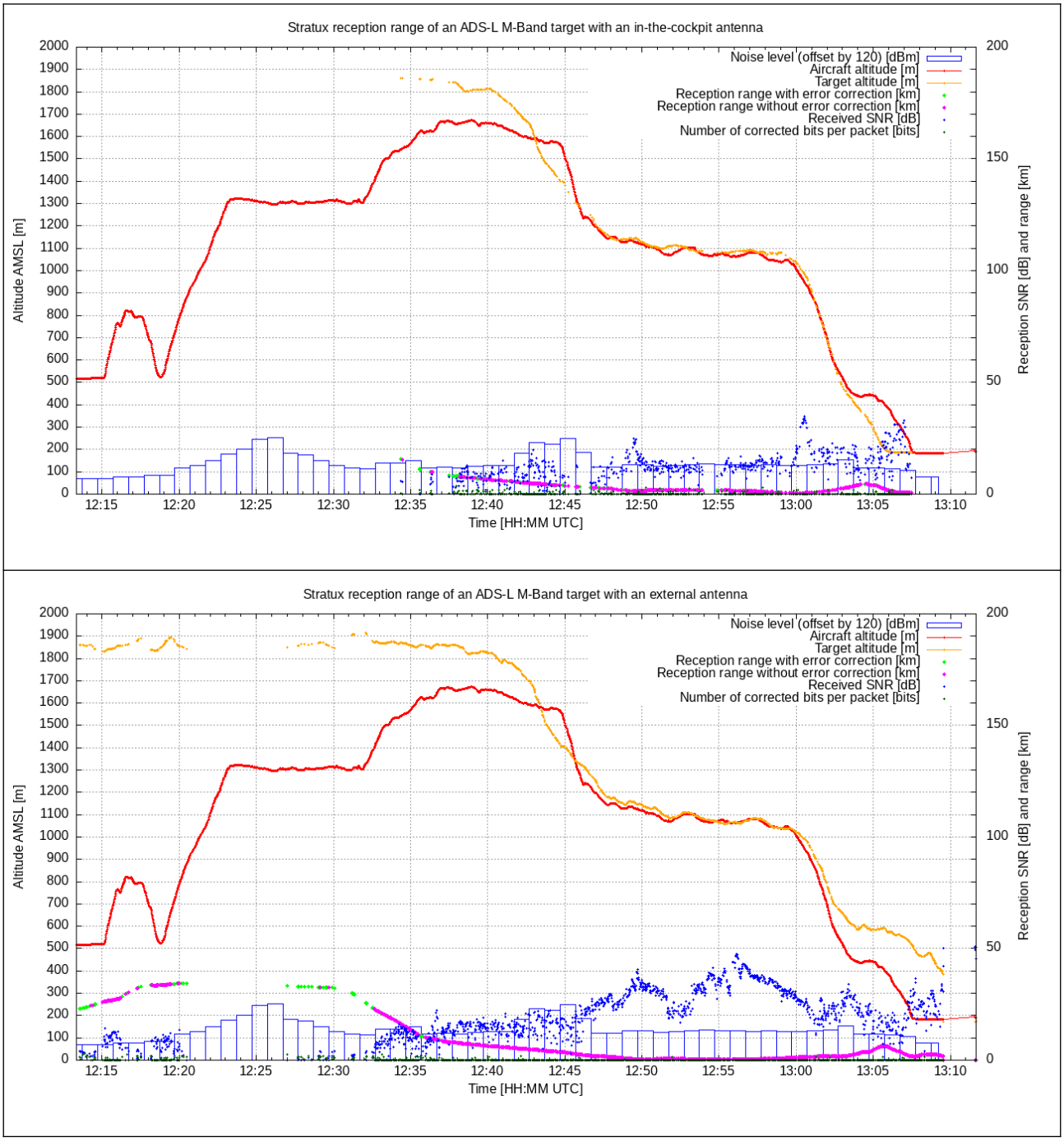
External antenna mounted at the bottom of the TX.1 aircraft. Same antenna and mounting style as on the RX arcraft.

ADS-L/OGN tracker mounted in the cockpit of the TX.2 aircraft

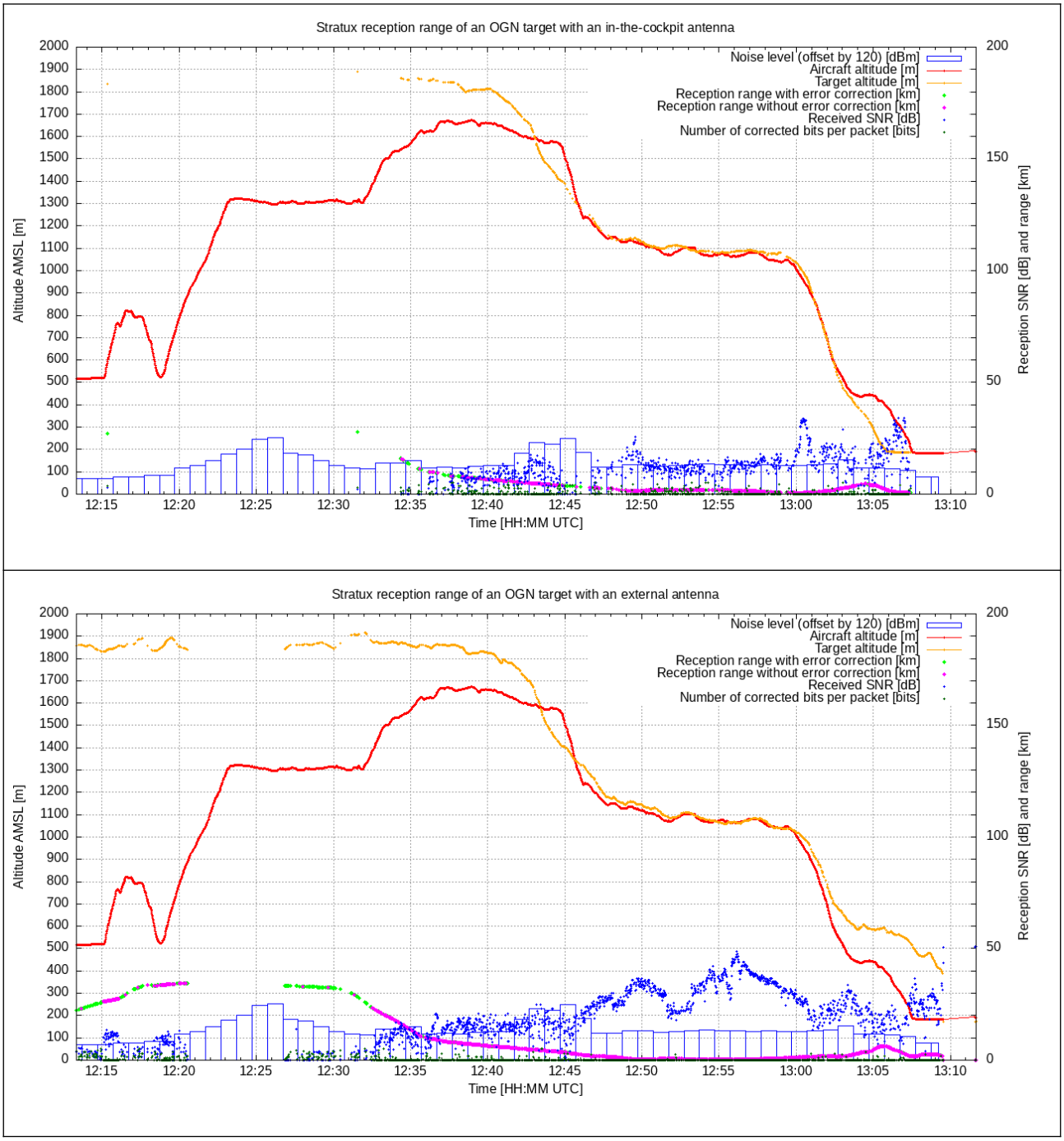



Stratux SDR receiver with Cubecell ADS-L/OGN transmitter, the four SMA connectors are Rx 868MHz, Rx 1090MHz, Tx 868MHz and GPS antenna.

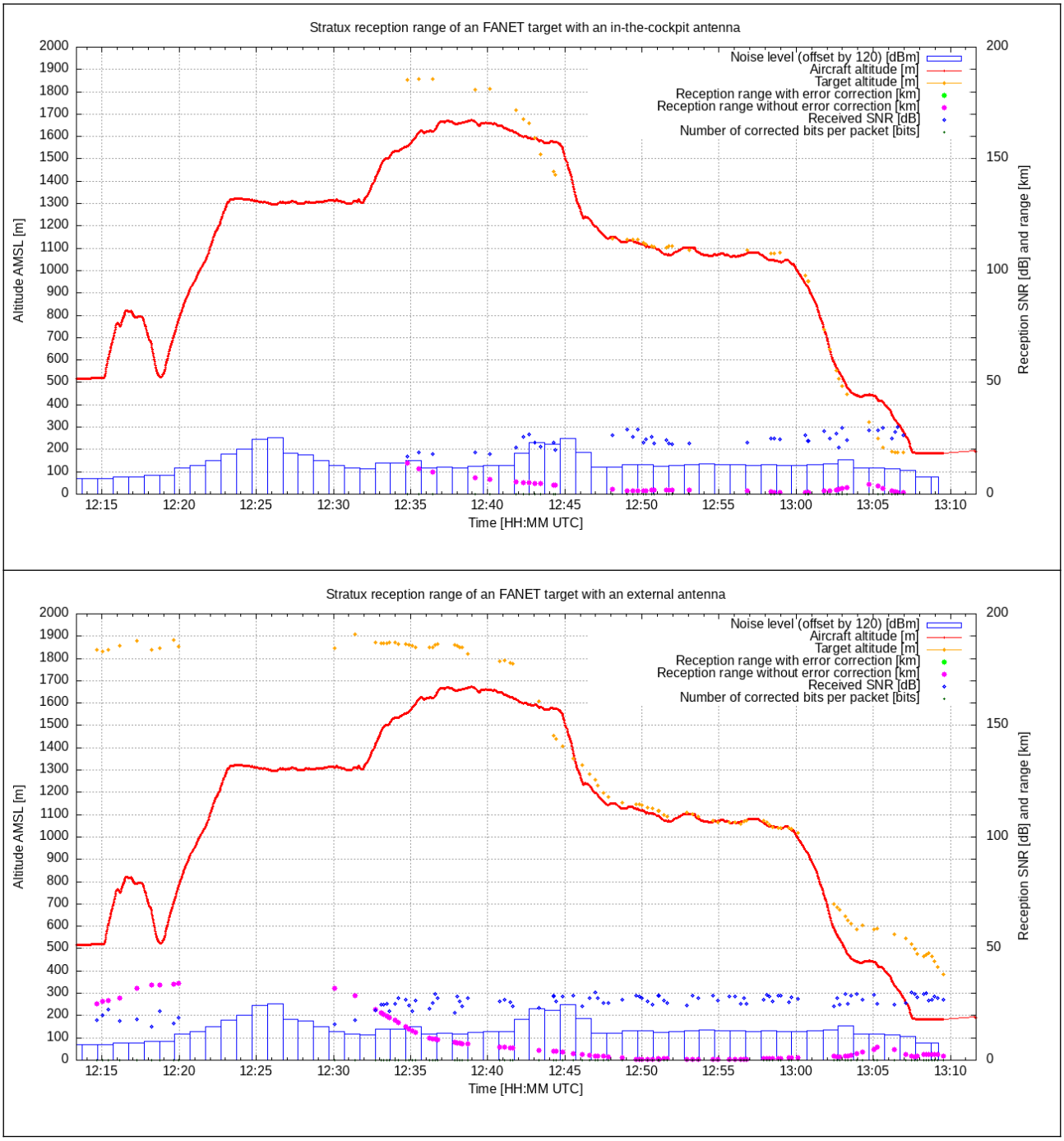
Reception antenna duplexer and filter, which allow single antenna to be used for 868 and 1090MHz reception. At the same time it performs filtering thus preventing cross modulation noise to obscure weak signals.



Reception range, plot for M-Band ADS-L signal for in-the-cockpit (top) and external antenna (bottom). Note the receiver noise increase (the blue boxes) at 12:25 when the aircraft was flying over a city. The distance was about constant but it clearly influenced the reception. At the peak the noise was more than 15dB above the flight average. The flight average was still 5-6dB above the quiet noise level when at the ground.



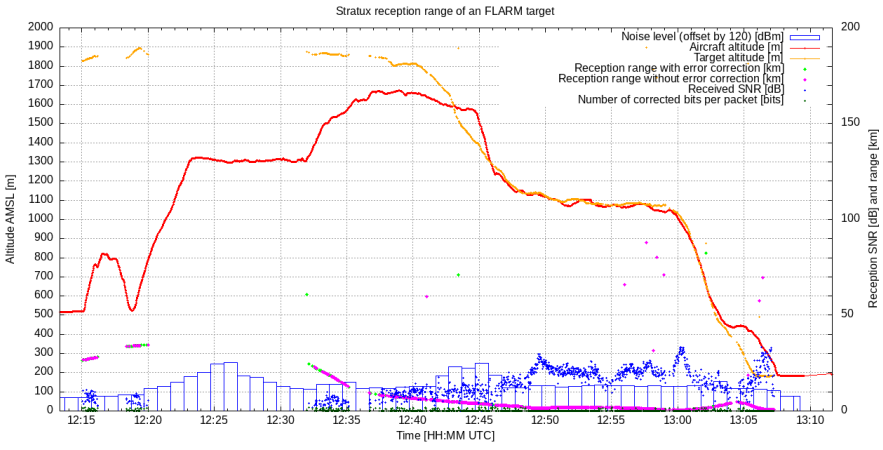
Range plots for the OGN signal, thus same modulation as M-Band ADS-L but stronger CRC/FEC allowing for stronger error correction. Magenta points are packets received without errors and the green ones are packets received with errors where errors have been corrected. The number of corrected bits are the black points on the very bottom, up to 10 bits per packet could be corrected.

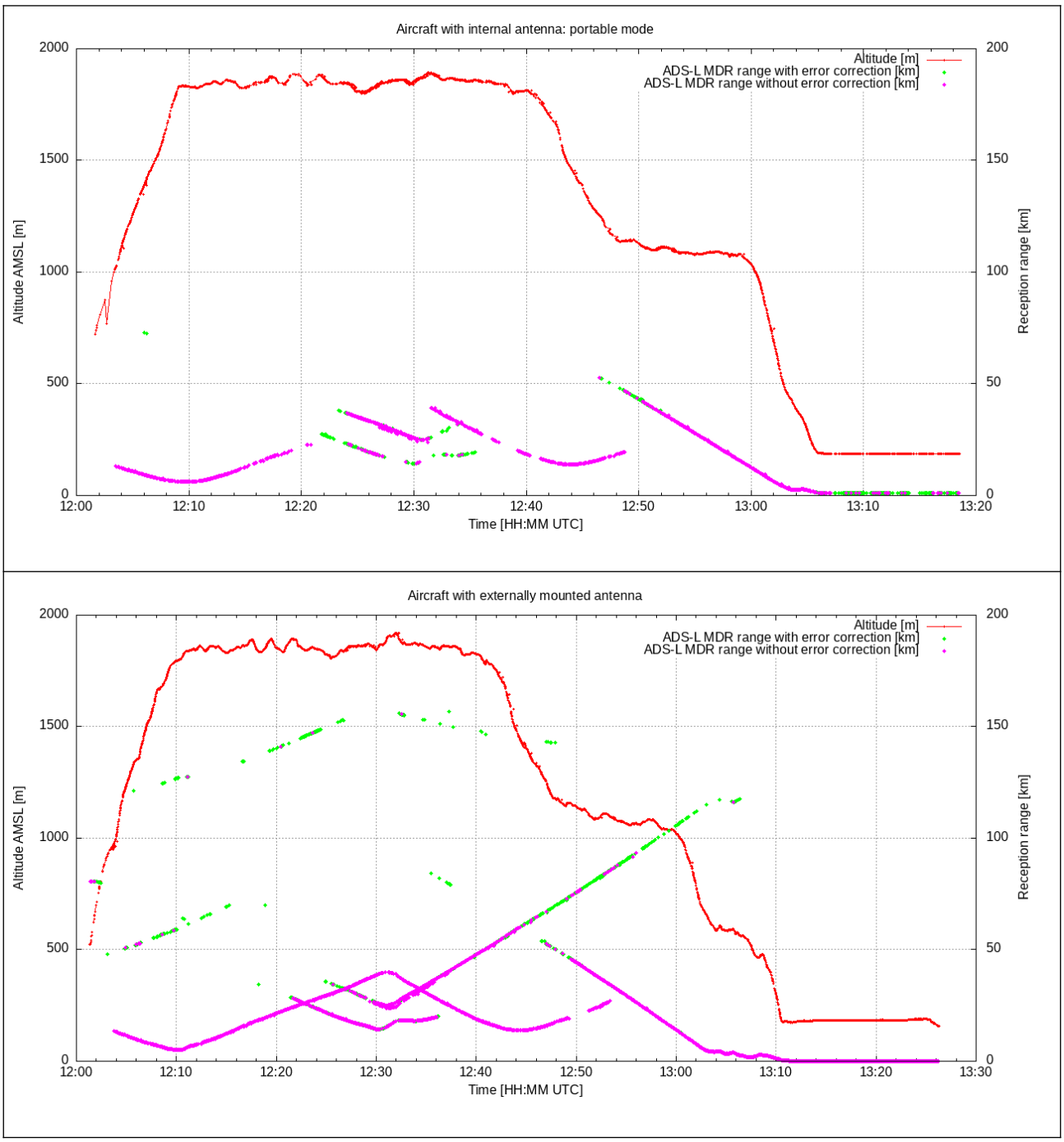


Range plots for the reception of FANET: top is with in-the-cockit antenna and bottom is with external antenna.Fewer points are received as FANET has many times longer packets and so sends fewer of them.

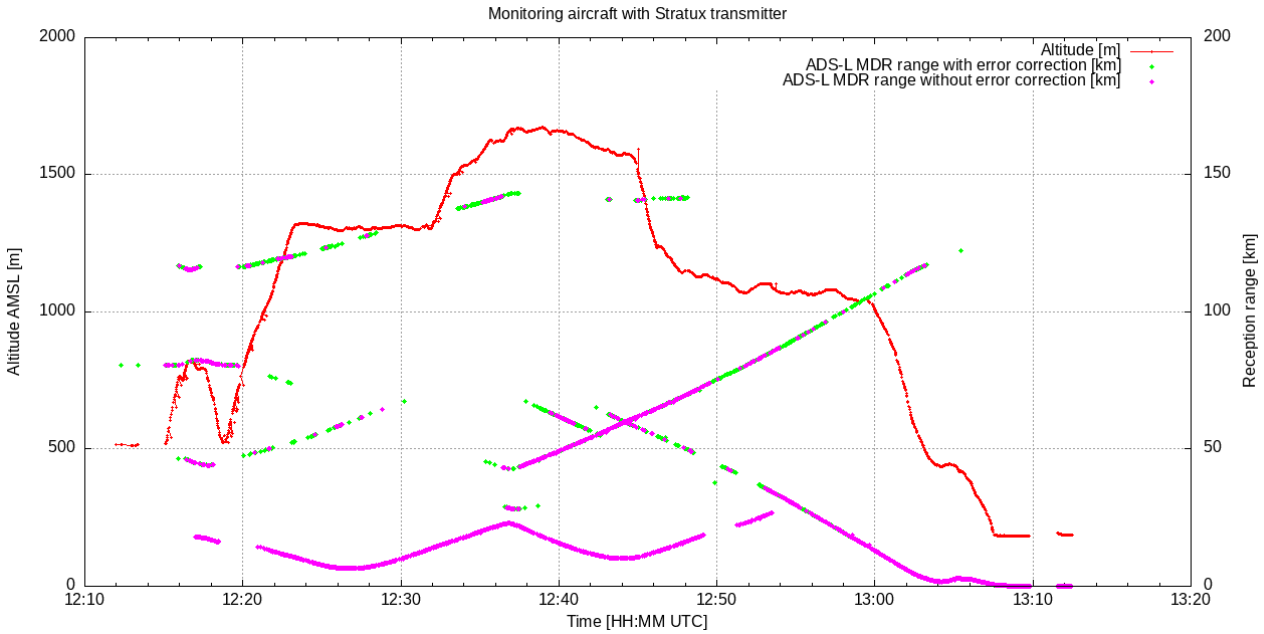
There was a FLARM device mounted in the TX.2 aircraft, it is difficult put the antenna mounting in external/internal category thus just the pictures are provided.

Range plot for receiving the FLARM device: not too bad if you consider how the antenna is mounted.

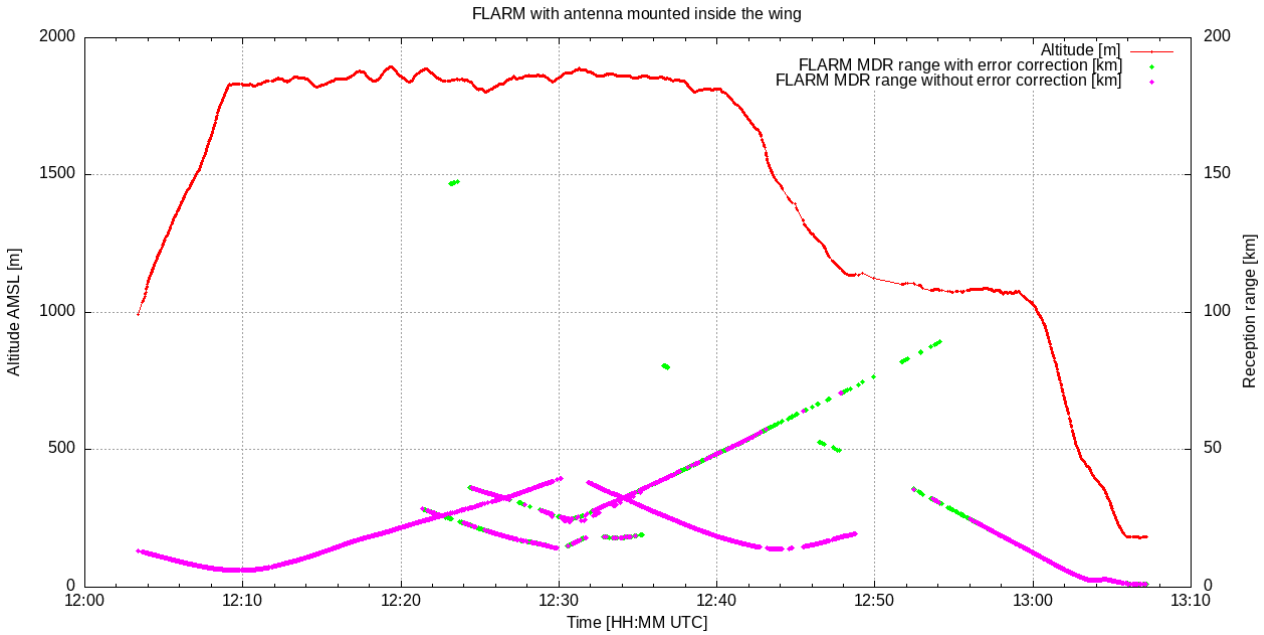




Ground network range/coverage for the in-the-cockpit (top) and external antenna (bottom). Sporadic reception occurs up to more than 150km when flying at 1700m altitude, which is about the geometrical distance to the horizon from this altitude.



Monitoring aircraft (RX) ground range/coverage.



FLARM (TX.2 aircraft) ground range and coverage.