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Cosmos-2499 and Cosmos-2491

Page: Sats.Cosmos2499 - Last Modified : Tue, 09 Dec 14

UHF downlink parameters

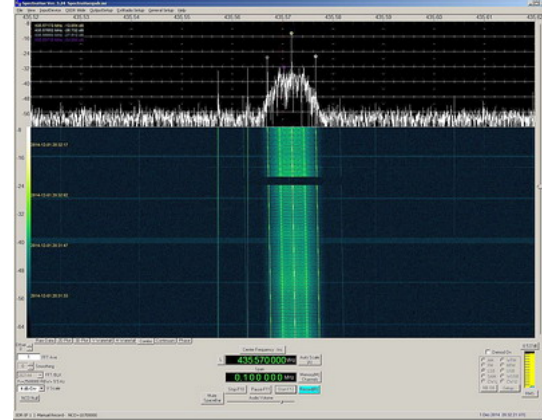
Frequency: 435.460 MHz (Cosmos-2491)
 435.565 MHz (Cosmos-2499)
Modulation: PM + PCM
Frame: DOKA 1136bit frame with ECC
Data: TLM Log file playback, ARQ protocol

UHF downlink spectrum

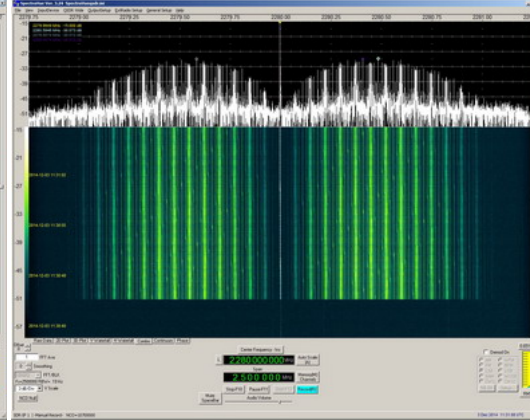
S-band downlink parameters

Frequency: 2280 MHz
Modulation: BPSK + Manchester 1200/64/32 ksym/s
Frame: CCSDS 10232bits (5 RS blocks for ECC)
 (Cosmos-2491 frame is 10240bits long, adding one zero byte before CCSDS sync)
Data: HDR v1, S/C ID: 0, VC1=idle VC2=recorder tlm VC4=recorded data playback

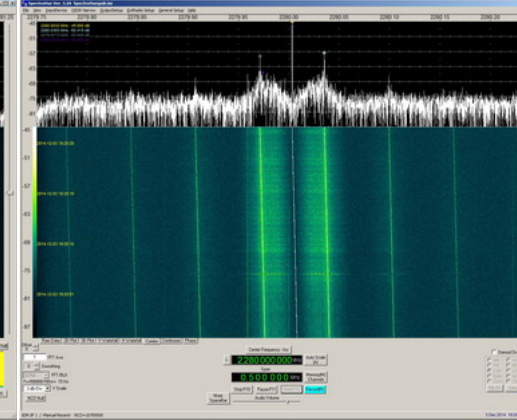
S-band downlink spectrum



Doka downlink mode



Fast (1200ksym/s) mode



Slow (64ksym/s) mode

Telemetry data analysis

Only CCSDS frame header is used, rest of frame is using custom format. It includes status telemetry followed by playback recorder header and playback data. Same DOKA data format is used for TLM playback as on UHF, including ARQ protocol for repeating missed frames if needed. Parsing telemetry data is difficult however it follows usual LOG format, with variable length records of different frame types recorded at predefined intervals. Additional status frames may be inserted depending on events caught by on-board computer. Some frames include values that can be easily understood like GPS X,Y,Z position, timestamps. Other values are difficult to interpret, however some seem to be sun sensor data or solar panels voltages.

Payload data analysis

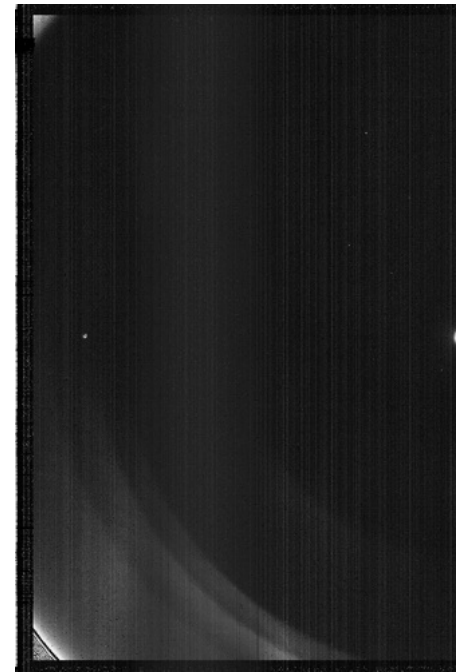
Cosmos-2499

Presence of high rate downlink indicates some sort of payload that requires high amount of data to be transferred. On several passes, data that looked like image data were downloaded. Seems to be 3 channels of B/W image at various gain levels. Resolution of one image is 854x1284 pixels. Images seem to be taken at pre-set intervals, so they capture random view without any specific orientation. Almost all were almost completely black, with following exception.

This image seems to show sun disc on the right side with some lens flare effects on the bottom left. Another possible object is visible in center left part of image.

Cosmos-2491

So far only telemetry log dumps were decoded from this satellite, so actual payload is still unknown.



[Click for full size image](#)

Thanks goes to [pjm](#) for the screenshots and signal recordings

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