



CGMS-38 EUM-WP-35
v1, 14 September 2010

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Agenda Item: WGIV/2
Discussed in WGIV

EPS-SG, Direct Broadcast

The EPS Metop Direct Readout Service provides real-time transmission to local user stations of all instrument data in the Advanced High Resolution Picture Transmission (AHRPT) format, using the 1698 – 1710 MHz frequency band (L-band). For the transmission of all instrument data of EPS Second Generation (EPS-SG) to be deployed in the 2020 timeframe, the baseline is to use the 7750-7850/7900 MHz frequency band (X-band), due to the increased data rate and bandwidth limitation of the L-band. As an EPS-SG direct readout service in L-band would allow the transmission of only a subset of the instrument data, it is proposed with EPS-SG to provide exclusively the baseline service in X-band.

EPS-SG, Direct Broadcast

1 INTRODUCTION

EUMETSAT is conducting the activities for the definition of the EPS Second Generation (EPS-SG), to replace the current satellite system in the 2020 timeframe and contribute to the Joint Polar System to be set up with NOAA. Feasibility studies will be done until early 2012 with the objective to select the baseline configuration for preliminary definition, development and operation programmes to be proposed and coordinated within the involved organisations.

As in EPS, payload data will be distributed in real time via direct broadcast and in near real time through the ground segment.

This paper addresses the selection of radiofrequencies for direct broadcast, as an upgrade with respect to the radiofrequencies used in EPS is required by the higher data volume of EPS-SG.

2 EPS-SG CANDIDATE MISSIONS AND DIRECT BROADCAST

The baseline payload configuration for the EPS-SG feasibility studies and the relevant data rates, based on the mission requirements and implementation concepts established so far, are summarised in the following table.

EPS-SG Payload (EPS heritage)	Data-rate (1) (Kbit/s)	
	Satellite A	Satellite B
METImage (AVHRR)	23603	
Low Light Imager (n.a.)	2048	
IASI-NG (IASI)	6144	
ATMS (AMSU-A, MHS)	52	
MW Imager – Precipitation (n.a.)		230
MW Imager – Clouds (n.a.)		60
Scatterometer (ASCAT)		631
Multi-viewing, -channel, -pol. Imager (n.a.)	4096	
GMES Sentinel-5 (GOME-2)	22900	
CERES follow-on (n.a.)	10	
Radio Occultation (GRAS)	300	300
ARGOS-4 (A-DCS)		(2)
Search and Rescue (S&R)		(2)
Space Environment Monitor (SEM)		25
Total	59153	1246

Notes to the table:

(1) Data-rate could be lower during night-time for instruments with channels in visible spectral bands (METImage, Multi-viewing -channel -pol. Imager, Sentinel-5).

(2) Not foreseen for direct broadcast.

The values above may decrease in the course of the studies as a result of simplifications and/or more detailed analysis, and do not take into account the possibility of introducing data

compression; on the other hand they do not in general include engineering margins that should be applied at this early stage of definition, and therefore represent an approximation.

The Post-EPS Mission Experts Team has stressed the need to continue the provision to the users in real time via direct broadcast of payload data, which should be from all instruments, heritage and new ones, in full resolution and with the same coverage with which they are acquired on board.

The EPS Metop Direct Readout Service uses the Advanced High Resolution Picture Transmission (AHRPT) format and the 1698 – 1710 MHz frequency band (L-band). The amount of data that can be transmitted in this band is limited and would not exceed 20 Mbit/s approximately.

This is largely below the data-rate that is required to support EPS-SG in the order of 60 Mbit/s. Therefore the baseline for the EPS-SG studies is to use the 7750-7850/7900 MHz frequency band (X-band).

Within the Joint Polar System to be set-up by EUMETSAT and NOAA, the X-band band was planned to be used for direct readout also by the US satellites (the former NPOESS satellites, whose programme is being restructured).

Coordination of the use of the 7750-7850/7900 MHz band occurs currently among EUMETSAT, NOAA and CMA within CGMS, and within the broader context of the Space Frequency Coordination Group (SFCG); a relevant paper is being addressed to this CGMS meeting (CGMS-38 EUM-WP-22).

Using the X-band for direct broadcast will require an upgrade of the user reception stations; their specification and design will be established in due time and upon consolidation of the relevant space-ground link configuration.

Continuing the current Direct Readout Service and AHRPT format of Metop in L-band would allow the transmission of only a subset of the EPS-SG instrument data, and/or at a lower resolution; this would be unattractive to the users wishing to fully exploit the data. Moreover it would have a negative impact to the design and resource budgets of the satellites as it would require to be operated in parallel to the baseline service in X-band.

3 CONCLUSIONS

It is proposed to provide with EPS-SG a direct broadcast service for all instrument data in full resolution using the 7750-7850/7900 MHz frequency band (X-band). Specification and design of the user stations will be established in due time and upon consolidation of the relevant space-ground link configuration. The current Metop Direct Readout Service and AHRPT format in L-band would be discontinued in EPS-SG.