CGMS

CGMS-38 EUM-WP-09
v1, 13 September 2010

Prepared by EUMETSAT
Agenda Item: C.2
Discussed in Plenary

PLANS FOR METEOSAT THIRD GENERATION (MTG)

This paper presents the status of the activities for the Meteosat Third Generation (MTG) Programme as performed in the framework of the MTG Preparatory Programme at EUMETSAT. It addresses the progress achieved until early September 2010, and the short term objectives upon which EUMETSAT is concentrating efforts in the design and development of the system. The status of the MTG activities at ESA is also addressed.

The MTG Programme activities at EUMETSAT are part of the MTG Preparatory Programme. Phase B which started in Jan 2009 following the successful completion of the Preliminary Requirements Review (PRR) at the end of Phase A. At the EUMETSAT Council meetings in March 2010 (Council 69) the MTG End User Requirements Document (EURD) was agreed by Delegations and in June 2010 (Council 70) the contents of the MTG Programme Proposal, covering the Phase C/D and E activities of the EUMETSAT Programme have also been agreed. The voting process for approving the Programme is ongoing, with a target completion by end of 2010. Engineering work is progressing towards the preparation of the system Preliminary Design Review (PDR), to consolidate requirement, plans and preliminary design before start of the development work in Phase C/D.
At space segment level as part of the ESA MTG Programme the Phase B1 was completed in July 2009 with the release of the Invitation to Tender for the Phase B2-C/D and support to Phase E, to select the industrial prime consortium for the satellites. Following delivery of the Industrial Offers, the evaluation process has taken until end of June 2010.
Negotiations in preparation for the Phase B2 are now ongoing.

Plans for Meteosat Third Generation (MTG)

1 INTRODUCTION

The MTG Programme activities at EUMETSAT are part of the MTG Preparatory Programme. Phase B started in Jan 2009 following the successful completion of the Preliminary Requirements Review (PRR) at the end of Phase A. At the EUMETSAT Council meetings in March 2010 (Council 69) the MTG End User Requirements Document (EURD) was agreed by Delegations and in June 2010 (Council 70) the contents of the MTG Programme Proposal have been agreed, covering for the EUMETSAT Programme the activities of Phase C/D and E. The voting process for approving the full MTG Programme has started at Council 70 and is currently ongoing, with a target completion by end of 2010.
At space segment level as part of the ESA MTG Programme the Phase B1 was completed with the release in July 2009 of the Invitation to Tender to Industry for the Phase B2-C/D and support to Phase E, to select the industrial prime consortium for the satellites. The evaluation process of the Industrial Offers has taken until end of June, and negotiations in preparation for the Phase B2 are now ongoing.

2 MTG PROGRAMME STATUS AT EUMETSAT

2.1 Programmatic aspects

The contents of the MTG Programme Proposal and Programme Resolution covering the Phase C/D and E for EUMETSAT activities have been agreed at the 70th Council meeting in Rome, enabling Member States to start the voting process, thereby committing funds for MTG Programme. The voting process is ongoing with a target to complete by the end of 2010, getting the full programme approved. The EUMETSAT activities to define the overall system requirements, architecture plans are strictly connected with the parallel progress on the space segment to consolidate requirements and plans for the satellites committed by industry. In that respect work is on going on the consolidation of the industrial set up for the satellite and negotiations of the industrial offer which will lead to the readiness for the Phase B2 at satellite level.

The MTG mission objectives, its observation missions, and the contents of the EUMETSAT Programme according to the agreement reached at Council 70 in June 2010 are in annex to this paper.

2.2 Overall System, Scientific Studies and Ground Segment

At EUMETSAT level work entered in phase B in January 2009 following the System Preliminary Requirements Review (PRR). The part I of the System Requirements Review (SRR-1) was completed in the first half of September 2009 and the part 2 (SRR-2) of this Review is currently under preparation. The split between part one and two was

done in view of the parallel approval process of the EURD by EUMETSAT Member States. The objectives of the SRR part 2 are to baseline the MTG system requirement documentation addressing segment level requirements and system interfaces as result of the SRR-1 conclusions and the evolution since then, including the transition at space segment level from competitive phases running in parallel until July 2009 in Phase B1 and availability of industrial commitments for the satellites performance as part of the industrial offers for the B2- C/D and support to Phase E.
The documentation for SRR-2 includes provision of design justification documents of the MTG system, system architecture, operations concept and system engineering plans. It will be the major milestone before the system Preliminary Design Review (PDR). The current plan is to have the system PDR in spring 2011; however this schedule is depending upon the progress on the space segment and conclusion of the space segment SRR in particular, which is a prerequisite to the system PDR.

The MTG End-User Requirements Document (MTG EURD) was agreed by Council at its 69th meeting in March this year; the document is now owned by EUMETSAT Council and the MTG Programme will maintain its agreed updates and approved Requests for Waivers.

Scientific activities are progressing well in Phase B. The list of Level 2 Day-1 products to be centrally hosted and disseminated to users has been unanimously agreed by Council at the 70th meeting in June 2010. This list will evolve during next phases according to the progress of activities.

The scientific work on MSG Day-2 development carried out by the EUMETSAT is now fully supporting the future applications for the MTG Flexible Combined Imager (MTG-FCI). For the agreed list of MTG-FCI Day-1 Level 2 Products the required Algorithm Theoretical Baseline Documents (ATBDs) are being drafted based on the MSG Day-2 development work, and taking into account the novel MTG FCI capabilities.

The MTG-InfraRed Sounder (IRS) Science Team (MIST) and the Lightning Imagery Science Team (LIST) have been established, targeting the scientific development and the assessment of Level 2 processing concepts for fully exploiting the capabilities of these missions. Concerning the IRS applications, several studies have been initiated with scientific institutions to establish by the time of the system Preliminary Design Review (PDR) a consolidated baseline of the science algorithms for the Day-1 Level 2 products to be centrally generated in the MTG Ground Segment.

Concerning the LI applications, the lack of suitable LI proxy data was identified as the critical item to scientifically consolidate a MTG-LI Day-1 Level 2 end-to-end processing concept and scientific studies have been activated in the meantime.

2.3 Ground Segment

The internal work at EUMETSAT is focussed on the consolidation system level requirements to derive the Ground Segment (GS) requirements. Progress has been maturing concerning the definition of the GS architecture and interfaces at GS system level. The procurement approach for the MTG GS was traded concluding for keeping in EUMETSAT the GS system design and integration role, and procuring Facilities or

group of Facilities. Trades are ongoing at Facility level, addressing the Level 1/2 processing, the data processing architecture, and the Ground Stations procurement approach. Arrangements have been internally set up for controlling the evolution of the GS Multi Mission Elements (MME) which will be used for the MTG GS deriving from GS elements already in routine operations. Beyond specific GS inputs for the SRR-2, the medium term milestones of the ongoing work at EUMETSAT will be associated with baselining the GS System Requirements Document at the system PDR in spring 2011, and preparing the GS PDR for the second half of 2011. According to this plan ITTs for GS Facilities would be released to Industry in a staggered way starting from end 2011. These plans are based on the assumption of having the full MTG Programme approved in EUMETSAT by the end of 2010.

3 SPACE SEGMENT

At ESA the evaluation of the industrial Offers for the space segment Phase B2- C/D and support to Phase E lasted until spring 2010, and EUMETSAT was actively involved in the full process. The decision of ESA DG endorsing the recommendation of the Tender Evaluation Board to enter negotiations with Thales Alenia Space - F as MTG satellite Prime was disclosed to the ESA Member States in the ESA Council meeting in March 2010, following which preliminary negotiations started with industry, targeting a release of the Contract Proposal to the Industrial Policy Committee of ESA by end of June. Following the June IPC, detailed negotiations with industry have started. A KO for the Phase B2 is to take place in the last quarter this year.

4 PLANS FOR IN ORBIT DEPLYMENT OF THE MTG SYSTEM

The deployment of the MTG system will be driven by the specified duration of the operational services to the users, associated availability analyses and readiness of the protoflight satellites. The overall flexibility regarding the schedule of launches will be preserved in the deployment scenario in order to maximise the duration of the operational service to the users and actual launch dates will be determined as necessary by EUMETSAT Council, based on the current and projected status of operational and back up satellites (including MSG satellites) at the time.

The lifetime of MTG satellites has been specified to be at least 8.5 years per satellite. Based on this minimum life, twenty years of routine operations of the imagery mission are included, encompassing fifteen and a half years of routine operations of the sounding mission.

The resulting MTG satellite deployment scenario, developing from a baseline of *earliest launch dates* was assuming at the time of releasing the ITT for the space segment procurement in July 2009 the following launch planning:

- MTG-I1: Dec 2016 (*)
- MTG-S1: June 2018 (*)
- MTG-I2: Dec 2021 (*)
- MTG-I3: Jan 2025 (*)
- MTG-S2: June 2026 (*)
- MTG-I4: Dec 2029 (*)

(*)

Note 1:

MTG-I : MTG Imaging satellite – MTG-I1 : first Imaging satellite
MTG-S : MTG Sounding Satellite – MTG-S1 : first Sounding satellite

Note 2:

Based on the status in September 2010, in consideration of the postponement of the launch of MSG-3 to June-August 2012 which has been agreed in the meantime and resulting from the extended duration of the selection process of the industrial Prime on the MTG space segment, *a postponement of one year of each of the above earliest launch dates for the MTG satellites is estimated*.

5 CONCLUSIONS

CGMS is invited to take note of the progress of preparation of the MTG Programme.

ANNEX

1 MTG MISSION OBJECTIVES AND MTG MISSIONS

MTG is the basic Programme required to continue the provision of observations from geostationary orbit following MSG. As successor of MSG, it has the capability and capacities to provide the geostationary satellite data needs to continue supporting and improving meteorological applications and services at Meteorological Centres. The MTG Imagery mission provides substantially enhanced information compared to that currently delivered by SEVIRI on MSG to improve the Nowcasting (NWC) and regional/global Numerical Weather Prediction (NWP) systems. The novel Infrared sounding mission delivers unprecedented information on the dynamic features of atmospheric moisture and temperature profiles in high vertical, horizontal and temporal resolution, beyond serving emerging applications of operational chemistry and air pollution. Nowcasting applications are further supported by the lightning imaging mission delivering continuously and simultaneously information on total lightning (cloud to cloud and cloud to ground) over the full disc with a high timeliness and homogeneous data quality. Finally the Sentinel 4 mission of GMES will be implemented via MTG, supporting the need for continuous monitoring of the atmospheric composition and air quality.

2 MTG OBSERVATION MISSIONS

The nominal MTG system will be based upon two types of satellites, MTG-I, the imaging satellite, and MTG-S, the sounding satellite. MTG-I will embark an imaging radiometer, the Flexible Combined Imager (FCI), and an imaging lightning detection instrument, the Lightning Imager (LI). MTG-S will embark an imaging Fourier interferometer, the InfraRed Sounder (IRS), and a high resolution spectrometer, the Ultraviolet- Visible Near infrared (UVN) spectrometer, provided by ESA as a part of the GMES Space Component programme.

The MTG System is designed, in support to nowcasting (NWC) and Numerical Weather Prediction (NWP), to fulfil the objectives agreed for the following observation missions:

- the **F**ull **D**isk **H**igh **S**pectral resolution **I**magery (**FDHSI**) mission, which will be provided via measurements taken by the FCI. In FDHSI mission mode data from the FCI will be provided over the full earth disc at a repeat cycle time of 10 minutes with a spatial resolution of 1 km;

- the **H**igh spatial **R**esolution **F**ast refresh **I**magery (**HRFI**) mission, which will be provided via measurements taken by the FCI. In HRFI mission mode data from 4 channels of the FCI will be provided on regional scales (e.g. about 1/4th or 1/3rd of the full disk seen from the geostationary position) at a repeat cycle rate of 2.5 or 3.3 minutes and a spatial resolution of 0.5 km and 1.0 km;

- the **I**nfra**R**ed Sounding (**IRS**) mission able scan the full earth disc within 60 minutes providing a spatial resolution of 4 km, and hyperspectral imaging and sounding information at a spectral resolution of 0.625 cm^{-1} in two bands, a **L**ong

Wave **I**nfra**R**ed (**LWIR**: 700 – 1210 cm^{-1}) and **M**id **W**ave **I**nfra**R**ed (**MWIR**: 1600 - 2175 cm^{-1}) band;

- the **L**ightning **I**magery (**LI**) mission, continuously detecting optical pulses, over almost the full earth disc in view from the geostationary satellite position;

Moreover, the MTG missions comprise the accommodation of the GMES Sentinel -4 **(S4)** sounding mission, achieved through the **U**ltraviolet, **V**isible & **N**ear-infrared **(UVN)** Instrument, covering Europe every hour taking measurements in three spectral bands (UV: 305 - 400 nm; VIS: 400 - 500 nm, NIR: 750 - 775 nm) with a resolution around 8 km.

In addition, the MTG mission will make a major contribution to climate monitoring activities providing high quality radiances, reprocessed product supporting generation of Essential Climate Variables (ECVs), providing also stewardship of decadal geostationary data records of the First and Second Generation of Meteosat.

3 OTHER MTG SYSTEM FUNCTIONS

Besides the essential functions covering the optical observations, the MTG system includes essential support functions necessary to fulfil its operational services, including:

- The Level 2 product generation and extraction;

- The processing of data received from Data Collection System (DCS) platforms collecting data of in-situ observations gathered from the land beacons, buoys, ships, balloons or airplanes;

- The Foreign Satellite Dissemination, that collects selected data from other EUMETSAT and Third Party satellite systems for support to global applications;

- Delivery and Data services to users, including:

    - Near real-time and direct data distribution services;

    - Data stewardship and re-analysis support;

    - Off-line data delivery;

    - On line services to Users;

    - Data exploitation support, reach-out, training, and help desk;

- The Search and Rescue mission: similarly to MSG, the MTG system will accommodate a SAR terminal, enabling the operations of the mission under the aegis of the COSPAS-SARSAT system;

- Extension of the DCS capabilities to support the relay and delivery to Argos ground stations of messages transmitted by Argos platforms.

4 SCOPE OF THE EUMETSAT MTG PROGRAMME

The scope of the EUMETSAT MTG Programme encompasses the following main elements:

A fixed financial contribution to the ESA MTG Space Segment Development Programme;
Procurement of the four recurrent satellites and related activities;
Procurement of Launch and LEOP services for all six MTG satellites;
Establishment of a ground segment system to support the operation of the MTG System;
At least twenty years of routine operations of the imagery mission, encompassing fifteen and half years of routine operations of the sounding mission;
Ten years of continuous development and operations (CDOP) activities of the EUMETSAT SAFs;
The management of the developments and procurements, and the conditioning of the infrastructure to host components of the system, including back-up services and related systems.