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CMA Report on Preparations for FY-4

Summary of the Working Paper.

This working paper reports that CMA has long embarked on preparation for Fengyun 4 (FY-4) - its next generation of geostationary meteorological satellite, a three-axis stabilized platform that shall provide for CMA with enhanced space-based observations in future. Based on user requirement and technical feasibility, the missions of FY-4 include imagery, sounding, lightning mapping, and space environment monitoring. HRIT, LRIT data transmission, and DCS are available for users. The paper informs CGMS that first flying model is being manufactured and launch is scheduled for 2015, it will serve for test and demonstration of the system.

CMA Report on Preparation for FY-4

1. Introduction

CMA has long embarked on preparation for Fengyun 4 (FY-4) - its next generation of geostationary meteorological satellite, a three-axis stabilized platform that shall provide for CMA with enhanced space-based observations in future. Launch of the first flying model is scheduled for 2015 and to serve for the experiment and demonstration of the system. Based on user requirement and technical feasibility, FY-4 mission is outlined as follows.

● To take multiple spectral band measurements of high temporal resolution and accuracy, to obtain imagery of the earth's surface and cloud, including the segment images; overall increase the capability of CMA in space-based quantitative observation and application.

● To measure the vertical profile of temperature and humidity of the atmosphere with improved detection accuracy and vertical resolution.

● To detect the lightning to obtain the map that positions the lightning occurrences.

● To broadcast the observational images, data and derived products with onboard transmitter.

● To collect the earth environmental measurements from automatic data collection platforms and transmit to users.

● To monitor solar activities and space environment to provide the data for space weather research and service.

2. Payload Characteristics

The instrument should be developed to satisfy user requirement for FY-4 missions in imagery, sounding, lightning mapping, and space environment monitoring. The following payloads are considered to fulfil the missions.

● **Multiple-bands Scan-imaging Radiometer**

- Off-axis reflecting optics
- Two independent scanning-mirrors for north-south and east-west directions respectively
- Total 216 sensors for 14 bands from visible to long-wave infrared

- Full-path on-orbit radiation calibration for all bands

- **Atmospheric Interference Sounder**
  - Off-axis reflecting optics
  - Two independent scanning-mirrors for north-south and east-west directions respectively
  - Middlie-scale focal plane arrays for mid-wave and long-wave infrared bands
  - Active and radiate coolers
- **Lightning Imager**
  - Dual-tube for observation to achieve more spatial coverage
- **Space Weather Monitor**
  - Energetic Particle Sensors: monitor in situ electron and proton fluxes;
  - Magnetometer: monitors Earth's vector magnetic field;
  - Radiation Dosimeters: monitor radiation dose suffered by the satellite;
  - Charging Potential Monitors: monitor differential and absolute surface potential and deep dielectric charging potential on the satellite.

3. Frequencies and Data Transmission

FY-4 use of frequencies shall respect to the need for the increased amount of data in transmission, DCS, Telemetry and commands. FY-4 provides HRIT, LRIT and EWAIB(Emergency Weather Alarm Information Broadcast).

3.1 Raw data transmission (downlink): X-band 7450-7550 MHz (CR and CL)

3.2 HRIT: 8175-8215 MHz (data uplink), 1675-1687MHz (data downlink)

3. 3 LRIT and EWAIB(Emergency **Weather Alarm Information Broadcast):**
2056-2060MHz (data uplink), 1696 -1698MHz (data downlink)

3.4 DCS: Domestic channel: 401.1-401.4MHz (uplink)
International channel: 402.0-402.1MHz (uplink)
1686-1692MHz (downlink)

3.5 Telemetry and command: 2025-2110MHz (uplink), 2200-2290MHz (downlink)

4. FY-4 Ground Segment

The first FY-4 spacecraft model has been being manufactured since the early of 2010. The flow chart of FY-4 ground segment is given as follows.

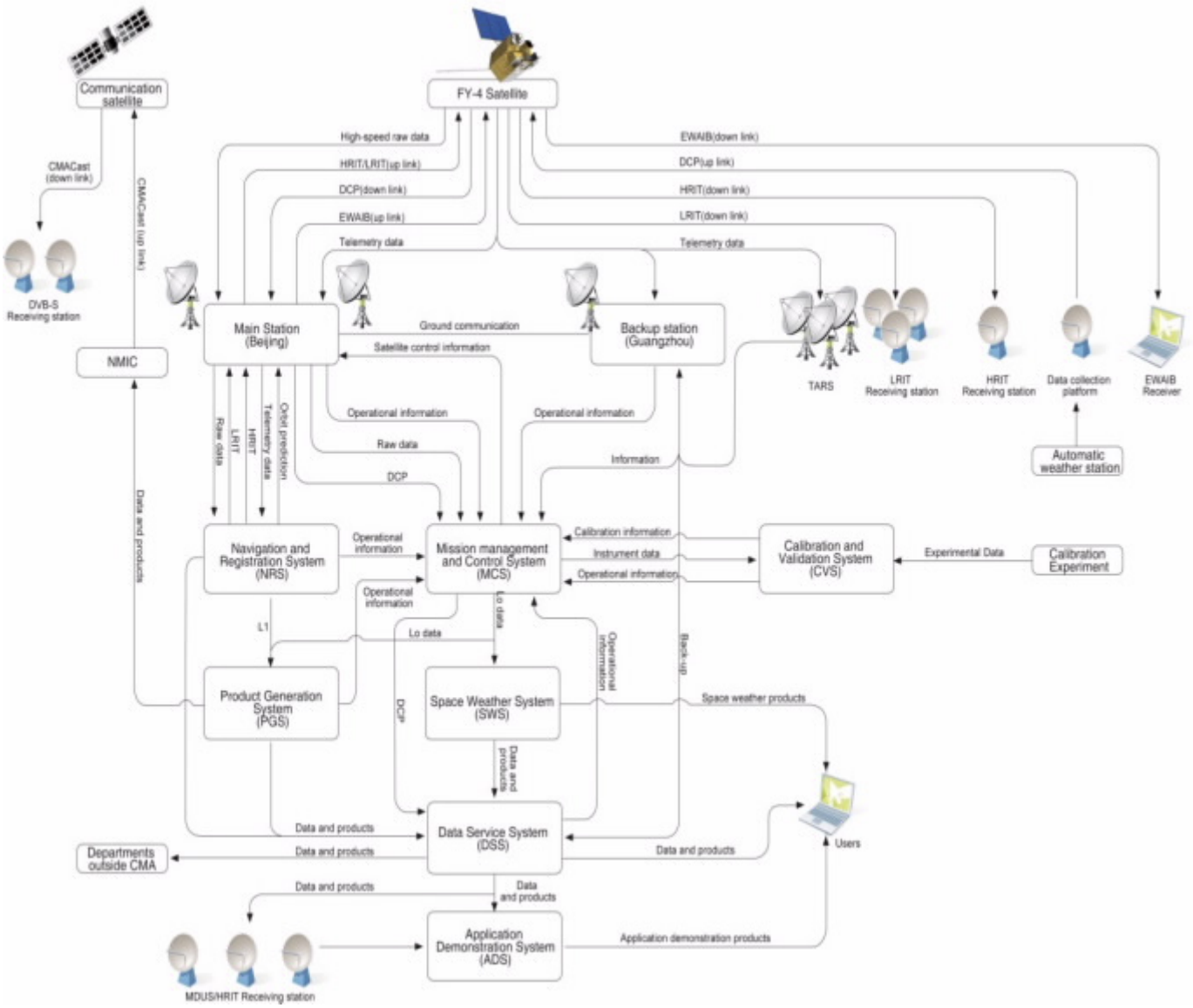

Figure 1 Flow chart of FY-4 ground segment system

The FY-4 products are listed in Table 1.

Table 1 Product list of FY-4 first experimental satellite

No.	Products	No.	Products	No.	Products
1	Clear Sky Masks	10	Upward Long-wave Radiation: TOA	19	Rainfall Rate/QPE
2	Cloud Top Temperature	11	Upward Long-wave Radiation: Surface	20	Convective Initiation
3	Cloud Optical Depth	12	Reflected Shortwave Radiation: TOA	21	Tropopause Folding Turbulence Prediction
4	Cloud Liquid Water	13	Derived Motion Winds	22	Sea Surface Temperature (skin)
5	Cloud Particle Size Distribution	14	Cloud Top Pressure	23	Fire/Hot Spot Characterization
6	Aerosol Detection	15	Vertical Moisture Profile	24	Land Surface (Skin) Temperature
7	Aerosol Optical Depth	16	Ozone Profile & Total	25	Land Surface Emissivity
8	Downward Shortwave Radiation: Surface	17	Cloud Top Height	26	Snow Cover
9	Downward Long-wave Radiation: Surface	18	Lightning Detection	27	Space weather products