

KMA Report on Status of the current and future satellite systems

Presented to CGMS-46 plenary session, agenda item [D.4]

Current Geo-Satellite : COMS

COMS(Communication, Ocean, and Meteorological Satellite)

- Orbit : 128.2E (Launched on June 26, 2010)

- * Two years extended operation (1 April 2018~ 31 March 2020)

➤ MI : 5 Channel VIS/IR Meteorological Imager

- MI data Service via Satellite : Broadcast to M/SDUSs with H/LRIT
- 16 products(AMV, CLD, SST, TPW, CTT/CTH, CA, AOD, OLR, RI, Fog, LST....)
- Service via Landline [Website] KMA/NMSC homepage(for registered users)
[FTP] Access to NMSC FTP(for organization with MOU)

➤ GOCI : Geostationary Ocean Color Imager

- 0.5km X 0.5km(ground sampling distance) with 1hr (8 times/day)
- L1B RGB, Chlorophyll, Colored dissolved organic matter, Suspended solid
- <http://kosc.kordi.re.kr/processingsoftware/gdaps/onlinehelp.kosc>
- <http://map.naver.com> (for Public user)

Meteorological and Environmental Geo-Satellites : Future

Sector	Satellite in Orbit	Operator	Location	Launch date	Environmental payload and status
West Pacific	GEO-KOMPSAT-2A	KMA	128.2°E	Nov. 2018	Advanced Meteorological Imager (AMI), Space Environmental monitoring payload Direct broadcast via UHRIT/HRIT/LRIT
	GEO-KOMPSAT-2B	MOF(Ministry of Ocean and Fisheries), ME(Ministry of Environment)	128.2°E	October 2019	Advanced Geostationary Ocean Colour Imager(GOCI-II), Geostationary Environmental Monitoring Spectrometer(GEMS)

- **GEO-KOMPSAT-2A, AMI(Advanced Meteorological Imager)**
 - Multi-channel capacity: 16 channels
 - Temporal resolution: within 10 minutes for Full Disk observation
 - Flexibility for the regional area selection and scheduling
 - Lifetime of meteorological mission: 10 years

GEO-KOMPSAT-2A: Activities of Meteorological Products

❖ **Current Status:** The pre-launch version of meteorological algorithms were completed in May 2018.

❖ **Activities of Development and Utilization**

- **Algorithm Improvement** by regular review meeting of developers and the International Review Team (IRT) and NMSC algorithm working group
- **Integrated Algorithm Tests for Product Validation** using Himawari-8/AHI data
 - evaluating product maturity
- **User Readiness and Training**
 - Implementing pre-operational monitoring system of GK-2A meteorological products using Himawari-8 AHI data internally
 - Application feedbacks from users (e.g., forecasters)
 - Training of how to utilize and analyze the products

The status of Application Projects using Satellite(2015~2019)

- The prototype algorithms of application products were prepared in December 2017 and these will be optimized for the operational use in 2018.
- All of application products developed in this program will included on the “**Meteorological Data Analysis system**” of ground segment systems until 2018
- The analysis guidance will be provided to the users

Areas	Contents
Nowcasting	<ul style="list-style-type: none"> • Objective cloud analysis based on satellite • Convective cloud lifetime monitoring and analysis • Precipitation merging and analysis • Satellite Imagery forecast technique
Typhoon & Ocean	<ul style="list-style-type: none"> • Optimization of ADT and ARCHER for the East Asia • Estimating the intensity change of tropical cyclone • Ocean monitoring(Ocean Front, Upwelling, Ocean eddy, Vessel Icing, SST change) • Satellite-based 3D winds
Hydrology & Forest & Supporting Studies	<ul style="list-style-type: none"> • Soil moisture, Drought and Flood • Fire(Risk, Radiative Power, Fraction of Burned Area) • Verification, Satellite data Blending and Downscaling
Climate & Environmental Monitoring	<ul style="list-style-type: none"> • Applications on climate study • Aerosol surface concentration, peak height, AOD blending • Greenhouse gases, atmospheric composition • Air Quality model applications

Data Service Plan : Geo-KOMPSAT-2A

[Via GK-2A broadcast]

- **Broadcast all 16 channels data (UHRIT, full resolution)** of meteorological observations
- Maintain **L/HRIT broadcast** corresponding to COMS five channels

[Via Landline]

- **Real-time cloud service similar to Himawaricloud** will be implemented (completed in 2018)
- GK-2A data also will be available in DCPC-NMSC (<http://dcpc.nmsc.kma.go.kr>)

[L1 Data Format]

- netCDF4(for each channels), with GSICS information

[L2 Data Format]

- netCDF4(for each products)

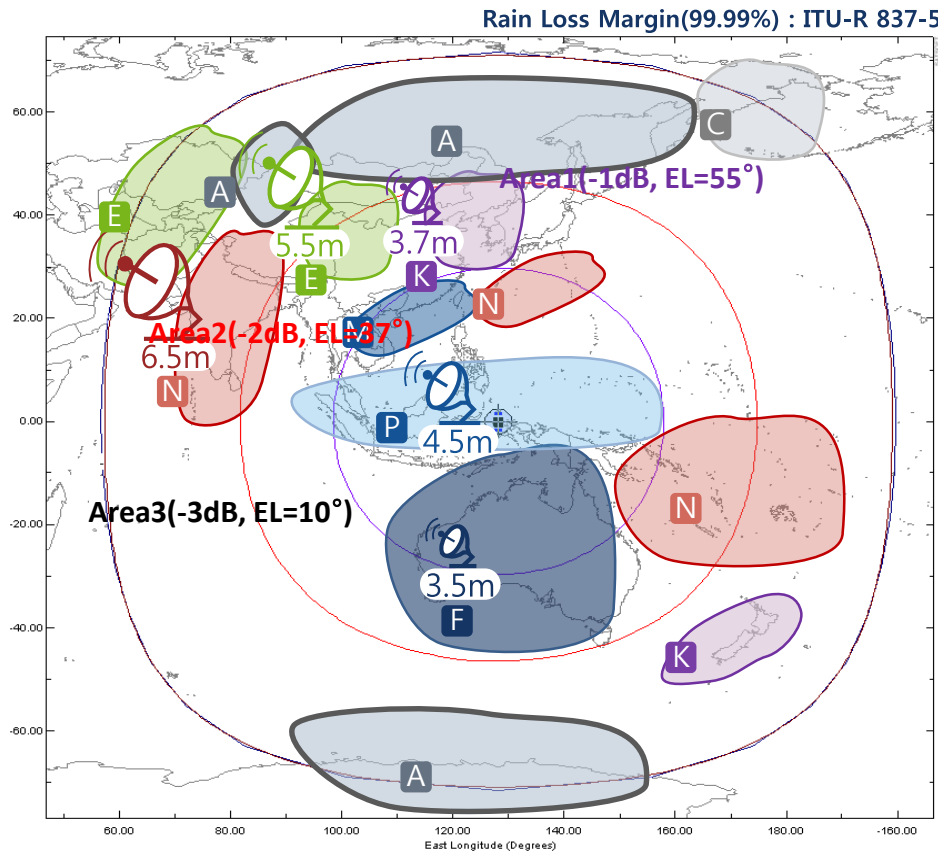
L1 Data Header Structure

General Information
Output Information
Pixel File Information
Projection Information
Star Measurement Information
INR Characteristics Information
Image Geometry Quality Information using Star Measurements
Registered Image Information
Quality Area Image Information

Data Service Plan : LDUS System Development(Under detail design)

[MDUS]

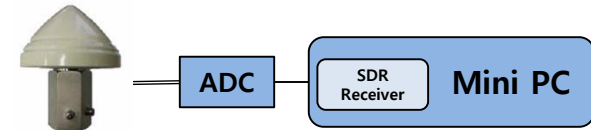
- AMI 16ch data will be serviced by CCSDS formatted UHRIT Telemetry on DVB-S2 Broadcasting Standard
- **Service Area is same as COMS** ($EL > 10^\circ$) but required antenna diameter depends on the rain degradation margin.



[UHRIT Service Area and Rain rate Map by ITU-R]

[SDUS]

- **LRIT service is redesigned for using on a ship mounting with an Omni directional antenna.**
- Minimized SDR(Software Defined Radio) Receiver
- Contents will be satellite images, weather fax, etc.



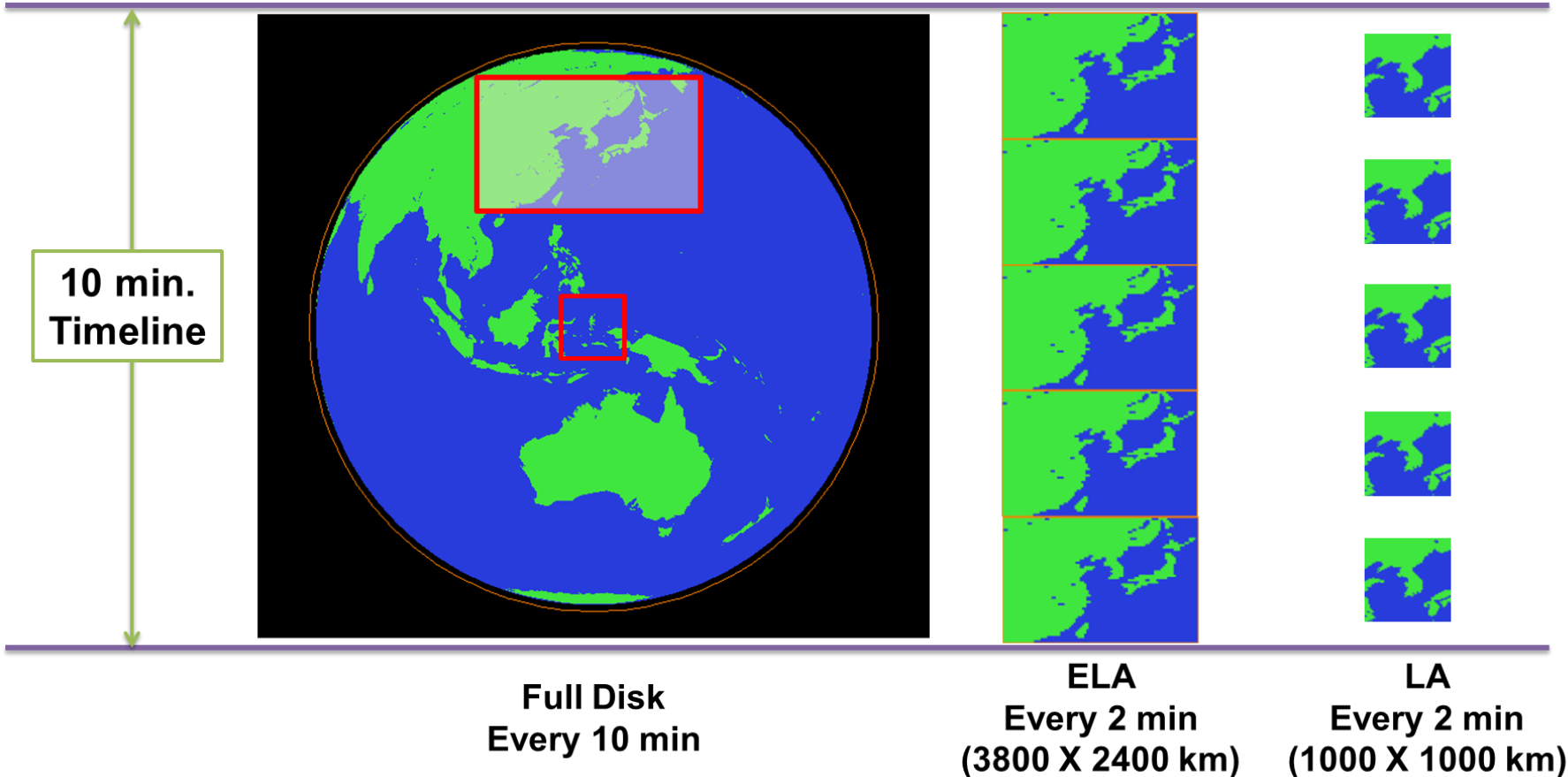
[SDUS System]

[MDUS]

- **Downscaled 5 ~ 14ch data(TBC) will be serviced by COMS compatible HRIT telemetry.**
- Compact SDR(Software Defined Radio) Receiver built in Receiving Server

GK-2A 10-minute Timeline

❖ **1 FD**(Full Disk) + **5 ELA**(Extended Local Area) + **5 LA**(Local Area)



GK-2A 10-minute Timeline

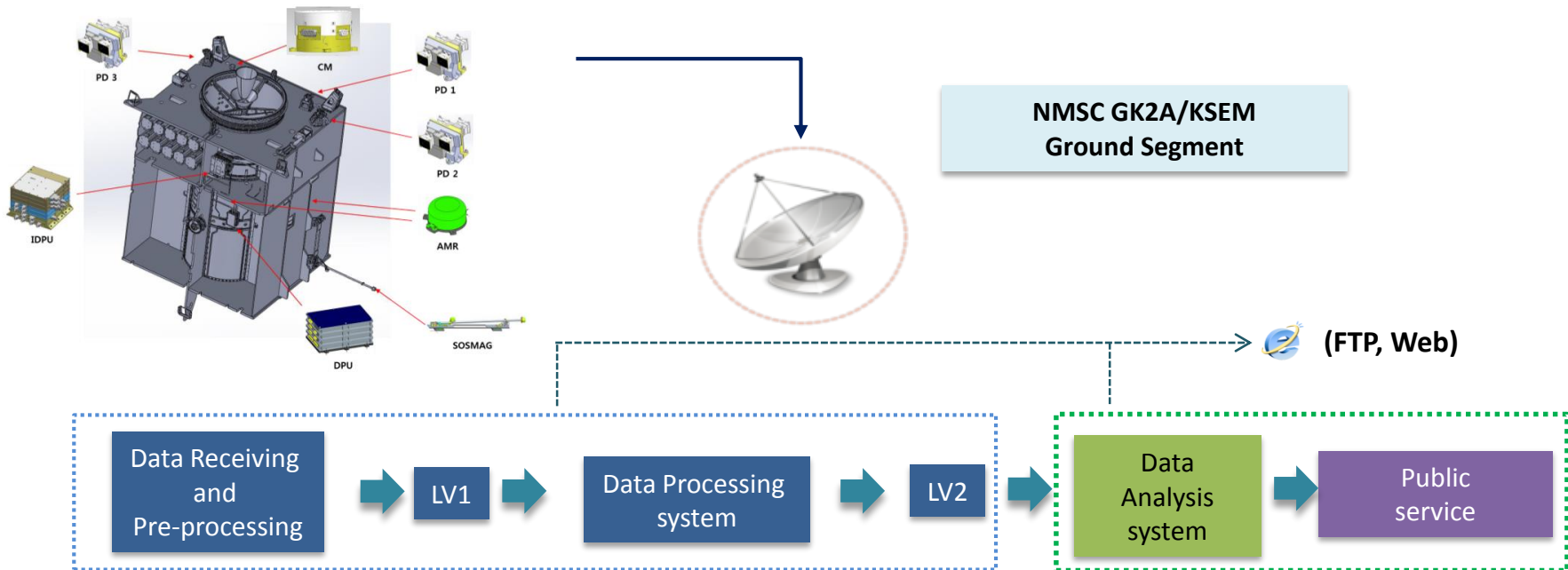
- KMA will operate 3 different observation areas with 10-min schedule
 - FD : Full Disk
 - ELA : Extended Local Area centered Korean Peninsular
 - LA : Target Area which can observe any area by user request

- **The official request of target area observations by global users** over the Asian Pacific region (RA II and RA V) will be available
 - The first priority is the disasters monitoring over Korean Peninsular, such as typhoon, wild fire etc
 - Global users submit official request form defining specific measurement area via designated web page (or email)
 - Decision will be made before disseminating images via designated web page

Korean Space wEather Monitor (KSEM) on Geo-KOMPSAT-2A

Development Status of KSEM and its Ground System, SWDPS

- **KSEM** successfully completed PER (July of 2017), PSR (Aug. of 2017) and FAR (Jan. of 2018). **KSEM FM** has been integrated into GK2A and now GK2A is in environment test.
- **SWDPS** (Space Weather Data Processing Subsystem) is in the integrated system test including data pre-processing for L1 and L2 retrieval subsystem.



LV1 : Reconstructed, Processed instrument data at full resolution, time-referenced annotated with ancillary information including calibration coefficients and georeferencing parameters applied

LV2 : Product retrieved using additional algorithm or model with LV1 data

FUTURE LEO SATELLITES for meteorological use

- **Current status** of KMA LEO satellite program
 - Under the process of specific feasibility test
- **Specifications of MW sounder**
 - Altitude/orbit : ~800km / Sun-synchronous, dawn-dusk orbit
 - Satellite : ~500kg / Instrument : ~150kg
 - Possible Instrument : MW Sounder
 - Limited number of payloads due to the weight of satellite

Thank you