KOMPSAT At Your Service

KOMPSAT-2 Image Data Manual

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1. INTRODUCTION

This image data manual provides customers with the overview of KOMPSAT-2 system, detailed product description, license, order options and ordering process.

2. KOMPSAT-2 SYSTEM OVERVIEW

KOMPSAT-2 is a high performance remote sensing satellite, which provides 1.0 m GSD panchromatic image and 4.0 m GSD multi-spectral image data for various applications. KOMPSAT-2 was launched into a sun synchronous low Earth orbit on the 28th of July, 2006.

2.1 Mission Orbit

The nominal mission orbit has the following characteristics.

- Sun synchronous orbit with 685 km altitude
- 98.13 deg for inclination
- 10:50 for MLTAN
- 98.46 min nodal period

Typically, the satellite passes certain region during the day along ascending orbits and during the night along descending orbits.

2.2 Mission Constraints

Duty Cycle and Maximum Imaging Time

The MSC operates at up to a 20% duty cycle per orbit.

Sun Incidence Angle

Sun incidence angle in the KOMPSAT-2 satellite is the incidence angle of the sunlight with respect to telescope entrance plane of the payload module. This incidence angle should not exceed 34 degrees for protecting the Optical Module of the MSC. Therefore, it constrains satellite operations during the separation from launch vehicle, roll/pitch maneuver, maneuver mode, and etc.

Memory

KOMPSAT-2 can provide a 128 Gbits on-board storage capability to support image collection outside of the boundary of contact of a ground station.

Roll and Pitch Tilt

The satellite can be tilted up to +/-30 degree from LVLH about roll axis and up to +/-30 degree about pitch axis.

3. KOMPSAT-2 IMAGERY DATA

3.1 Product Description

There are two products levels for KOMPSAT-2 image data : Level 1R product and Level 1G product. All products are provided as a bundle (pan + 4 multi-spectral) or as a pan-sharpened (4 pan-sharpened bands).

3.1.1 Level 1R Product

Level 1R is the product corrected for radiometric and sensor distortions. The difference of relative radiometric response between detectors is corrected and internal detector geometry and mis-registrations between detectors are corrected when applicable.

3.1.2 Level 1G Product

Level 1G is the product corrected for geometric distortions and projected to UTM. Processing for Level 1G includes all radiometric corrections and sensor corrections applied to Level 1R processing.

3.2 The Structure of MSC Image Data

3.2.1 PAN Imagery

The MSC PAN Imagery may be reconstructed from 6 separate PAN image data channels as will be detailed below. Each PAN Data channel will provide a strip of the total PAN Image of 2528 pixels wide. The total width of a MSC PAN Image swath will thus produce 6 x 2528 = 15,168 pixels. Of these pixels the overlapping pixels (in butting zone) per image data channel must be discarded, leaving a PAN Image swath containing more than 15.000 pixels. MSC has two CCD line; PAN Primary (PAN-P) and PAN Redundancy (PAN-R). PAN-R will be just used in case of malfunction of PAN-P. The total number of pixels in PAN-P band is 15,065 and in PAN-R band is 15,023. The total length of a MSC PAN Image will depend on the duration of the image scan, i.e. the number of PAN image lines.

3.2.2 MS Imagery

The Multi Spectral Imagery in MSC may be reconstructed from 2 separate MS image data channels, as will be detailed below. Each MS data channel will provide image data of two entire MS Images, each one for a different spectral band, each one 3792 pixels wide. The total width of an MSC MS image swath will thus produce 3792 pixels. Of these pixels 42 pixels per spectral band Image must be discarded with an average of 21 pixels on each, leaving an exact 3,750 pixels wide MS Image swath. MS spectral bands will be also referred to as “colors”;

MS1: Green
MS2: Blue

MS3: Near Infrared

MS4: Red

The total length of a MSC MS image will depend on the duration of the image scan, i.e. the number of MS image lines.

3.3 Data File Size

The size of a MSC Level 1R data or a MSC Level 1G data, which includes PAN and MS image data, is about 600Mbytes.

3.4 KOMPSAT-2 Grid Reference System

The KGRS-2 consists of a set of grid points aligned with the KOMPSAT-2 orbital ground track, numbered with reference to the earth's geographic coordinate system. The derivations in the following sections are based upon an earlier derivation for the KOMPSAT-1 Grid Reference System. The KGRS-2 is designed to be a right-handed (K, J) system, with the K-coordinate denoting relative longitudinal position on the earth's surface (increases to the right on a map), and the J-coordinate denoting relative latitudinal position (increases upwards on a map). The numbering of K begins with the prime meridian (0 longitude) for K = 1, with K increasing as longitude increases. The numbering of J uses a fixed value of J = 1000 at all points on the equator, with J increasing as latitude increases.

The definition of the KGRS-2 constants depends upon certain orbital parameters for the KOMPSAT-2 satellite. These orbital parameters are:

i = 98.127 (orbital inclination)

e = 0.0 (eccentricity of circular orbit)

h = 685.13 km (altitude of orbit)

a = 7063.275 km (orbital semi-major axis)

rep = 409 orbits (repetition rate of orbital cycle)

p = 5907.72 s (period of orbit (seconds))

s = 13.6 km (effective swath)

The KGRS-2 coordinate system is applicable for all latitudes reached by the KOMPSAT-2 spacecraft. Due to the inclination of the KOMPSAT-2 (i = 98.127), the applicable latitude range is from –81.873 (at an orbital elongation of -90) to +81.873 (at an orbital elongation of +90). Within that latitude range, the J coordinates are numbered from J = 332 to J = 1668, with J = 1000 at the equator. The K coordinates range from K = 1 to K = 2863.

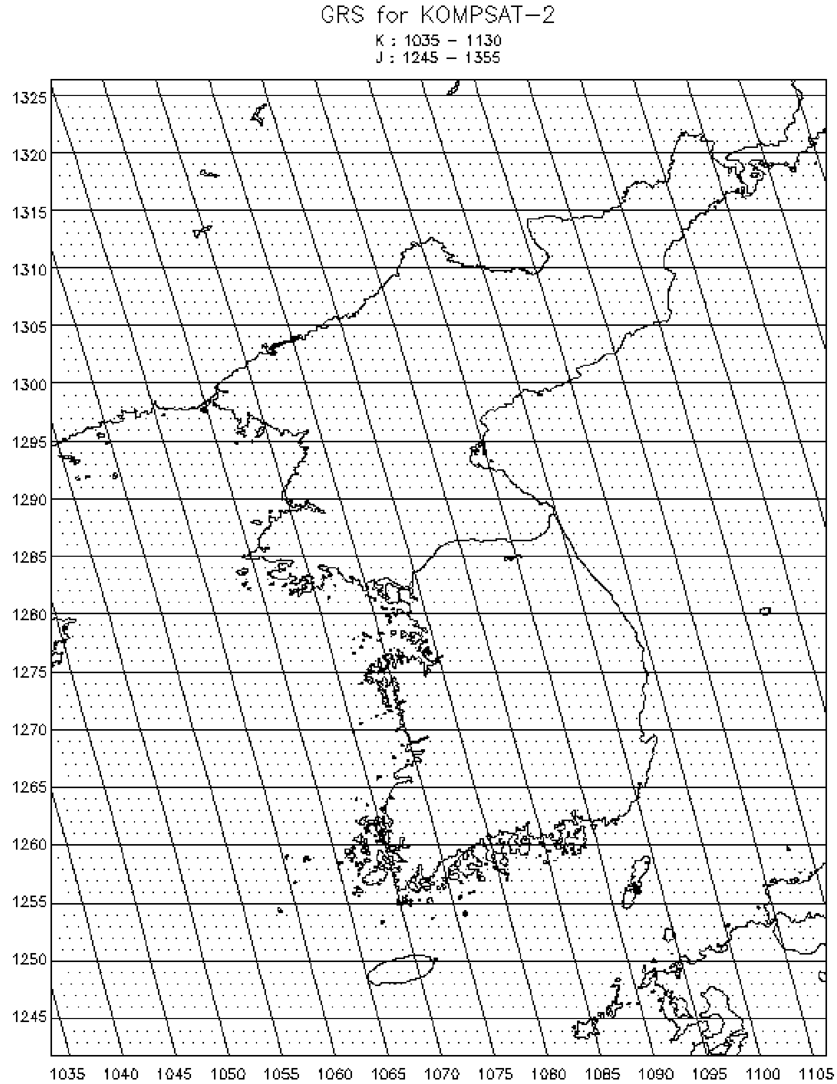

Figure 3-1 Example of KGRS-2 nearby Korea

4. MSC IMAGE DATA FORMAT

4.1 File Naming Convention

PAN files :	MSC_YYMMDDHhmmss_nnnnn_PPPPrrrr**PAxx_tt.ext**
MS files :	MSC_YYMMDDHhmmss_nnnnn_PPPPrrrr**MXAxxB_tt.ext**
Pan-sharp Image file :	MSC_YYMMDDHhmmss_nnnnn_PPPPrrrr_**1G_1mC.tiff**
Browse file :	MSC_YYMMDDHhmmss_nnnnn_PPPPrrrr**Ttt_br.jpg**
Thumbnail file :	MSC_YYMMDDHhmmss_nnnnn_PPPPrrrr**Ttt_tn.jpg**

YYMMDDHhmmss – Scene center time in UTC
nnnnn – Orbit number
PPPP – Path number
rrrr –Row number
P – P(Pan only)
MX - M(MS only) X(1,2,3,4)
A – P(positive), N(negative) tilt angle
xx – Tilting angle(first two digit)
B – G(Green), B(Blue), N(NIR), R(Red)
tt – Product Level : 1R or 1G
ext – file extention(eph, rpc, tif, txt)

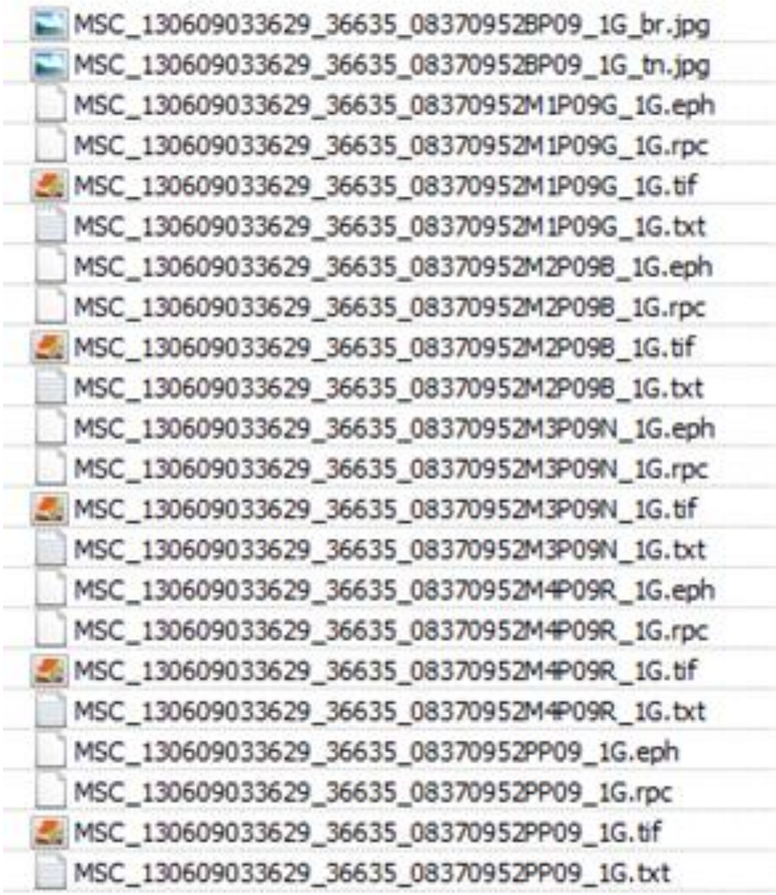

Figure 4-1 Files of Bundle Product

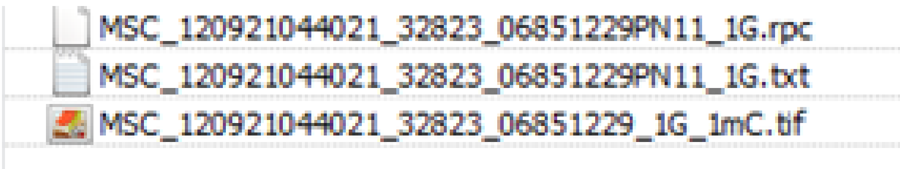

Figure 4-2. Files of Pan-sharpened Product

4.2 Archived Media

The MSC image data will be basically archived in DVD or CD for Users.

4.3 Composition in an Archived Media

4.3.1 TIFF and GeoTIFF

The composition in an archived media for storing plural scenes in one media is the same as the GeoTiff (Level 1G or Level 1R) or Tiff (Level 1R) format. However, in case of TIFF & GeoTIFF, each 'SCENE_NNN' directory has image files, the number of which is the same as the number of image bands, and the three files of a Browse image data, a Thumbnail image data and ancillary text file. The "readme.txt" file in Root directory has the information of all files in the archived media.

5. GEOTIFF AND ANCILLARY DATA

5.1 GeoTIFF Overview

The GeoTIFF tags conform to a hierarchical data structure of tags and keys. This is similar to the tags which have been implemented in the "basic" and "extended" TIFF tags already supported in TIFF Version 6 specification. A GeoTIFF library and software tool is required to access GeoTIFF data. The GeoTIFF homepage (http://www.remotesensing.org/geotiff) is offered information about the GeoTIFF library and software tool since it has been open software. The following references are highly recommended to comprehend this data format. These are also designate in GeoTIFF website.

GeoTIFF Format Specification Version: 1.8.2

5.2 The Version of GeoTIFF

The GeoTIFF file is produced based on GeoTIFF Revision 1.0.

5.3 The Content of an Ancillary Data Text File

The ancillary data text file consists of ephemeris information data file and general information data file. The ephemeris information data file uses the “EPH” file extension and general information data file uses the “TXT” file extension

5.3.1 The ephemeris information data file

Field name		Format	Remark
IMG_ACQISITION_START_TIME		%4d %2d %2d %2d %2d %8.6f	Imaging start time (YYYY MM DD hh mm ss.ssssss). UTC
IMG_ACQISITION_END_TIME		%4d %2d %2d %2d %2d %8.6f	Image end time (YYYY MM DD hh mm ss.ssssss).
BEGIN_EPEMERIS_BLOCK			
	NMR_EPH	%d	Ephemeris Number
	EPH_TIME	%4d %2d	Ephemeris Time (YYYY MM DD hh mm ss.ssssss). UTC

		%2d %2d %2d %8.6f	
	EPH_POD_POS_XYZ_ECEF_KM	3[%10.5f]	Position X, Y, Z (WGS84, ECEF) (Km)
	EPH_POD_VEL_XYZ_ECEF_KMS	3[%11.7f]	Velocity X, Y, Z (WGS84, Km/sec)
	EPH_PAD_RPY_DEG	3[%14.9f]	Attitude Angle Roll, Pitch, Yaw (degree)
	EPH_SUN_ANGLE_DEG	2[%12.7f]	Solar Azimuth Angle, Solar Elevation Angle (degree)
END_EPHEMERIS_BLOCK			
AUX_SATELLITE_NAME		%s	KOMPSAT2
AUX_SATELLITE_SENSOR		%s	KOMPSAT2 Sensor name(MSC)
AUX_TILT_ANGLE_ROLL_DEG		%7.3f	Roll Tilt angle (degree)
AUX_TILT_ANGLE_PITCH_DEG		%7.3f	Pitch Tilt angle (degree)
AUX_BITS_PER_PIXEL		%d	Bit per Pixel
AUX_SAMPLES_PER_LINE_PAN+MS		%d	Sample per Line in PAN+MS
AUX_LINES_PER_IMAGE_PAN+MS		%d	Line number in PAN+MS
AUX_SCENE_CENTER_XY_PIXEL		%d %d	Pixel value of Image center for Pan and MS (pixel) (across-track, along-track)
AUX_IMAGE_GSD_METER		2[%5.3f]	P+MS GSD(meter) (along-track, across-track)
AUX_LINE_SCAN_TIME_USEC		[%12.9f]	Line Scan Time for PAN and MS(sec)
AUX_IMAGE_SATELLITE_AZIMUTH_DEG		%f	Satellite azimuth angle(degree) Angle between the projection of the image center and local counted from local north(clock-wise)
AUX_IMAGE_SATELLITE_INCIDENCE_DEG		%f	Ground incidence angle at the image center(degree)
AUX_IMAGE_PAD_POD_FLAG		%s	POD/PAD (Yes or No) (TRUE, FALSE)
AUX_PROJECTION_NAME		%s	Projection name (UTM, TM)
AUX_PROJECTOIN_PARAMETER		%s	Parameter value (UTM: Hemisphere, Zone #, TM: West, Middle, East) (ex: HEMISPHERE_ZONE23, TM_MIDDLE)
AUX_PROJECTOIN_ELLIPSOID		%s	Ellipsoid name (Bassel, WGS84, etc)

AUX_RESAMPLING_NAME	%s	Resampling method (NN (Nearest Neighbor, BL (Bilinear), CC (Cubic Convolution))
AUX_LOCATION_KGRS_KJ	%d %d	KOMPSAT-2 Grid Reference System (K, J)
AUX_IMAGE_SHIFT_TO_ALONG	%d	Image shift along track
AUX_IMAGE_ORBIT_NUMBER	%d	Image orbit number
AUX_IMAGE_CENTER_LATLONG_DEG	2[%13.8f]	Center Latitude and Longitude (degree)
AUX_IMAGE_CENTER_ALTITUDE	%f	Satellite altitude from WGS 84 ellipsoid at the image center(meters)
AUX_IMAGE_TL_LATLONG_DEG	2[%13.8f]	Top Left(0,0) Latitude and Longitude (degree)
AUX_IMAGE_TC_LATTONG_DEG	2[%13.8f]	Top Center(samples/2,0) Latitude and Longitude (degree)
AUX_IMAGE_TR_LATTONG_DEG	2[%13.8f]	Top Right(samples,0) Latitude and Longitude (degree)
AUX_IMAGE_BL_LATLONG_DEG	2[%13.8f]	Bottom Left(0,lines) Latitude and Longitude (degree)
AUX_IMAGE_BC_LATTONG_DEG	2[%13.8f]	Bottom Center(samples/2,lines) Latitude and Longitude (degree)
AUX_IMAGE_BR_LATTONG_DEG	2[%13.8]	Bottom Right(samples, lines) Latitude and Longitude (degree)
AUX_STRIP_ACQ_DATE_UT	4d% 2d% 2d%	Strip imaging Date (YYYYMMDD)
AUX_ STRIP_ACQ_START_UT	%2d %2d %8.6f	Strip imaging start time (hhmmss.ssssss)
AUX_ STRIP_ACQ_CENTER_UT	%2d %2d %8.6f	Strip imaging center time (hhmmss.ssssss)
AUX_ STRIP_ACQ_END_UT	%2d %2d %8.6f	Strip imaging end time (hhmmss.ssssss)
AUX_ STRIP_ACQ_DURATION_SEC	[%12.9f]	Strip Imaging duration (sec)

5.3.2 General Information Data File

Field Name		Format	Remark
INST_LAST_NUC_DATE		%4d %2d %2d	Last update date of NUC (YYYYMMDD)
INST_LAST_GEO_DATE		%4d %2d %2d	Last update date of Geometric Cal/Val parameters(YYYYMMDD)
INST_COMPRESSION_FLAG		%s	Compression Yes or No (ex: TRUE, FALSE)
INST_COMPRESSION_RATIO_OF_PAN		%d	PAN Compression Ratio
INST_COMPRESSION_RATIO_OF_MS		4[%d]	MS1, MS2, MS3, MS4 Compression Ratio (ex: 1 2 3 4)
INST_TDI_GAIN_OF_PAN		%d	PAN TDI level (gain)
INST_TDI_GAIN_OF_MS		4[%d]	MS1, MS2, MS3, MS4 TDI level (gain) (ex: 1 2 3 4)
INST_ELEC_GAIN_OF_PAN		13[%d]	PAN Electrical Gain (12) (ex: 1 2 3 4 5 6 1 2 3 4 5 6)
INST_ELEC_GAIN_OF_MS		5[%d]	MS Electrical Gain (4) (ex: 1 2 3 4)
INST_ELEC_OFFSET_OF_PAN		13[%d]	PAN Electrical Offset (12) (ex: 1 2 3 4 5 6 1 2 3 4 5 6)
INST_ELEC_OFFSET_OF_MS		5[%d]	MS Electrical Offset (4) (ex: 1 2 3 4)
INST_BAND_DISPLAY		%s	Band identification (PAN, R, B, NIR, R)
INST_BAND_WIDTH		%d	Spectral Band width in micro(400, 80, 70, 140, 60)
INST_PAN_CCD_ALIGNMENT		4[%12.7f]	PAN CCD alignment (meter)
INST_MS_CCD_ALIGNMENT		4[%12.7f]	MS CCD alignment (meter)
INST_PAN_FOCAL_LENGTH		%[%12.8f]	PAN Focal length(meter)
INST_MS_FOCAL_LENGTH		%[%12.8f]	MS Focal length(meter)
INST_CCD_MODE		%s	PAN and MS of Primary or Redundant
CAL_MTF_OF_PAN		%d	PAN MTF value at Nyquist Frequency
CAL_MTF_OF_MS		4[%d]	MS MTF value at Nyquist Frequency
CAL_RADIANCE_GAINOFFSET_PAN		2[%6.2f %6.2f]	Gain/Offset to convert DN to Radiance in PAN
CAL_RADIANCE_GAINOFFSET_MS		4[%6.2f %6.2f]	Gain/Offset to convert DN to Radiance in MS
BEGIN_CALGCP_BLOCK			
	NMR_GCP	%d	GCP Number
	CAL_GCP_XY_LLH_UTM	5[%14.9f]	GCP (X, Y, Lat, Long, Height) (WGS84, UTM)

END_CALGCP_BLOCK		
CAL_DEM_FILE	%s	File name for DEM data CALDEM_071122100001_12345_00010001PP10_1G.txt CALDEM_071122100001_12345_00010001MP10_1G.txt NULL (no DEM)
AUX_FILE_NAME	%s	Each PAN, MS1, MS2, MS3 and MS4 Image File Name
AUX_STRIP_ID	%s	Associated data strip ID
AUX_STRIP_BEGIN_END	%d %d	First and last line of the image into the data strip
AUX_IMAGE_LEVEL	%s	Image Level (ex: L1A, L1R, L1G)
AUX_PRODUCT_LEVEL	%s	Product Level (ex: L1A, L1R, L1G)
AUX_CLOUD_STATUS	%d	Cloud Status
AUX_IMAGE_QUALITY	%s	Image Quality
AUX_IMAGE_BAD_LINES	%d	Bad/reduced quality lines
AUX_IMAGE_BAD_COLS	%d	Bad/reduced quality columns
AUX_SATELLITE_NAME	%s	Satellite Name (KOMPSAT2)
AUX_SATELLITE_SENSOR	%s	Sensor Name (MSC)
AUX_TILT_ANGLE_ROLL_DEG	%7.3f	Roll Tilt angle (degree)
AUX_TILT_ANGLE_PITCH_DEG	%7.3f	Pitch Tilt angle (degree)
AUX_BITS_PER_PIXEL	%d	Bit per Pixel
AUX_SAMPLES_PER_LINE_PAN+MS	%d	Sample per Line in PAN+MS
AUX_LINES_PER_IMAGE_PAN+MS	%d	Line number in PAN+MS
AUX_SCENE_CENTER_XY_PIXEL	%d %d	Pixel value of Image center for PAN and MS (along-track, across-track)
AUX_IMAGE_GSD_METER	2[%5.3f]	PAN+MS GSD(meter) (along-track, across-track)
AUX_LINE_SCAN_TIME_USEC	%f	Line Scan Time for PAN and MS(sec)
AUX_IMAGE_SATELLITE_AZIMUTH_DEG	%f	Satellite azimuth angle(degree) Angle between the projection of the image center and local counted from local north(clock-wise)
AUX_IMAGE_SATELLITE_INCIDENCE_DEG	%f	Ground incidence angle at the image center(degree)
AUX_IMAGE_PAD_POD_FLAG	%s	POD/PAD (Yes or No) (TRUE, FALSE)
AUX_IMAGE_MTF_FLAG	%s	MTF (Yes or No) (TRUE, FALSE)
AUX_PROJECTION_NAME	%s	Projection name (UTM, TM)
AUX_PROJECTOIN_PARAMETER	%s	Parameter value (UTM: Hemisphere, Zone #, TM: West, Middle, East)

		(ex: HEMISPHERE_ZONE23, TM_MIDDLE)
AUX_PROJECTOIN_ELLIPSOID	%s	Ellipsoid name (Bassel, WGS84, etc)
AUX_RESAMPLING_NAME	%s	Resampling method (NN (Nearest Neighbor, BL (Bilinear), CC (Cubic Convolution))
AUX_LOCATION_KGRS_KJ	%d %d	KOMPSAT2 Grid Reference System (K, J)
AUX_IMAGE_SHIFT_TO_ALONG	%d	Image shift along track
AUX_IMAGE_ORBIT_NUMBER	%d	Image orbit number
AUX_IMAGE_CENTER_LATLONG_DEG	2[%13.8f]	Center Latitude and Longitude (degree)
AUX_IMAGE_CENTER_ALTITUDE	%f	Satellite altitude from WGS 84 ellipsoid at the image center(meters)
AUX_IMAGE_TL_LATLONG_DEG	2[%13.8f]	Top Left(0,0) Latitude and Longitude (degree)
AUX_IMAGE_TC_LATTONG_DEG	2[%13.8f]	Top Center(samples/2,0) Latitude and Longitude (degree)
AUX_IMAGE_TR_LATTONG_DEG	2[%13.8f]	Top Right(samples,0) Latitude and Longitude (degree)
AUX_IMAGE_BL_LATLONG_DEG	2[%13.8f]	Bottom Left(0,lines) Latitude and Longitude (degree)
AUX_IMAGE_BC_LATTONG_DEG	2[%13.8f]	Bottom Center(samples/2,lines) Latitude and Longitude (degree)
AUX_IMAGE_BR_LATTONG_DEG	2[%13.8]	Bottom Right(samples, lines) Latitude and Longitude (degree)
AUX_STRIP_ACQ_DATE_UT	4d% 2d% 2d%	Strip imaging Date (YYYYMMDD)
AUX_ STRIP_ACQ_START_UT	%2d %2d %8.6f	Strip imaging start time (hhmmss.ssssss)
AUX_ STRIP_ACQ_CENTER_UT	%2d %2d %8.6f	Strip imaging center time (hhmmss.ssssss)
AUX_ STRIP_ACQ_END_UT	%2d %2d %8.6f	Strip imaging end time (hhmmss.ssssss)
AUX_ STRIP_ACQ_DURATION_SEC	[%12.9f]	Strip Imaging duration (sec)
AUX_IMAGE_L0_PROCESSED_UT	%4d %2d %2d %2d %2d %5.2f	Time that process the Level 0 (YYYYMMDDHHMMSS.SS)
AUX_IMAGE_L1A_PROCESSED_UT	%4d	Time that process the Level 1A

	%2d %2d %2d %2d %5.2f	(YYYYMMDDHHMMSS.SS)
AUX_IMAGE_L1R_PROCESSED_UT	%4d %2d %2d %2d %2d %5.2f	Time that process the Level 1R (YYYYMMDDHHMMSS.SS)
AUX_IMAGE_MINMAX_OF_PAN+MS	%d %d	Maximum and Minimum DN value in PAN+MS
AUX_RECEIVED_STATION_NAME	%s	Ground station Name that received
AUX_RECEIVED_STATION_ LOCATION_LATLONG_DEG	2[%13.8f]	Location of Latitude, Longitude(degree)
AUX_PROCESSED_STATION_NAME	%s	Ground station Name that processed
AUX_PROCESSED_STATION_ LOCATION_LATLONG_DEG	2[%13.8f]	Location of Latitude, Longitude(degree)
AUX_PROCESSED_PRODUCER	%s	Operator name (ex: OperatorA)
AUX_PROCESSED_SW_VER	%s	Name of Image data processing S/W
AUX_REQUESTER_NAME	%s	Requester Name
AUX_REQUESTER_COMPANY	%s	Request Company
AUX_REQUESTER_DATETIME	%s	(YYYYMMDDHHMM)
COPYRIGHT	%s	Copyright and restricated use
LICENCE	%s	Licencing information

6. SENSOR MODELING

6.1 Preprocessing for Geometric Correction of KOMPSAT-2

The produced KOMPSAT-2 Level 1R and Level 1G data for users who calculate the ground coordinate, mapping, photogrammetric application etc. are preprocessed on KOMPSAT-2 IRPE(Image Request Processing Element) system. The main preprocessing steps are following this;

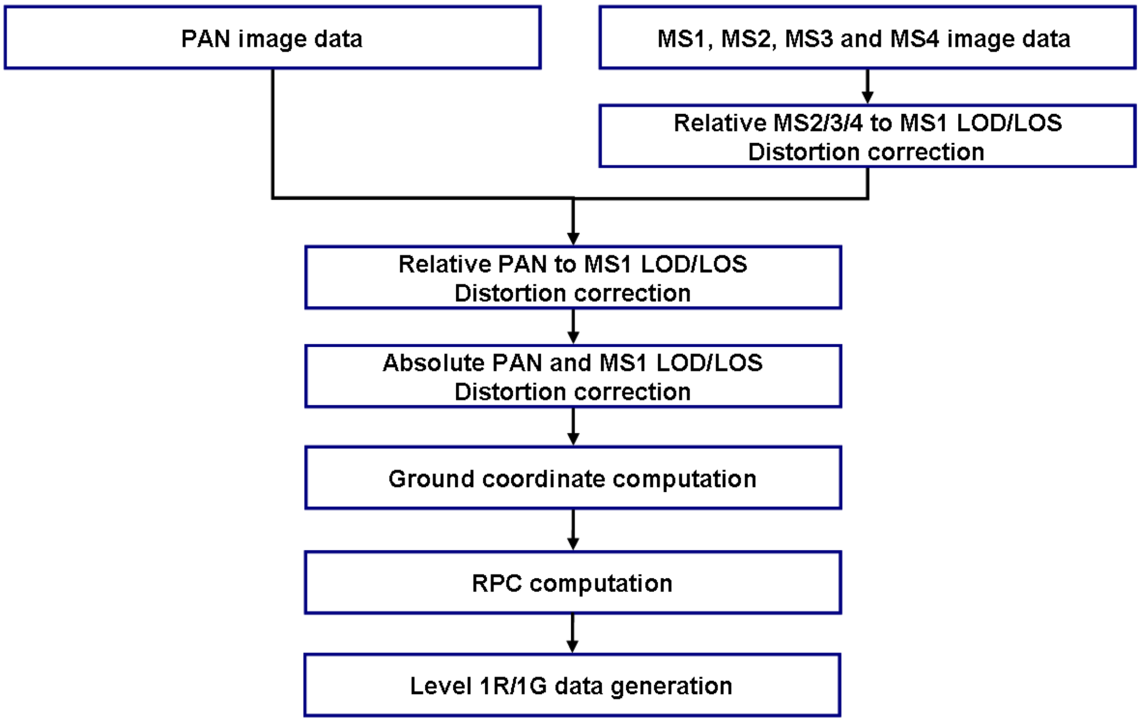

Figure 6-1 Workflow of KOMPSAT-2 geometric correction preprocessing

In Figure 5, Absolute LOD/LOS distortion correction consists of the across-track correction (LOD) and along-track correction (LOS). This correction calibrates the image data with lense distortion and CCD distortion etc. to absolute ground true data such as ground control point, high accurate ortho-rectified image. The purpose of this correction is to calibrate the KOMPSAT-2 optic system distortion. For example, the absolute PAN LOD and LOS distortion correction curve are as following;

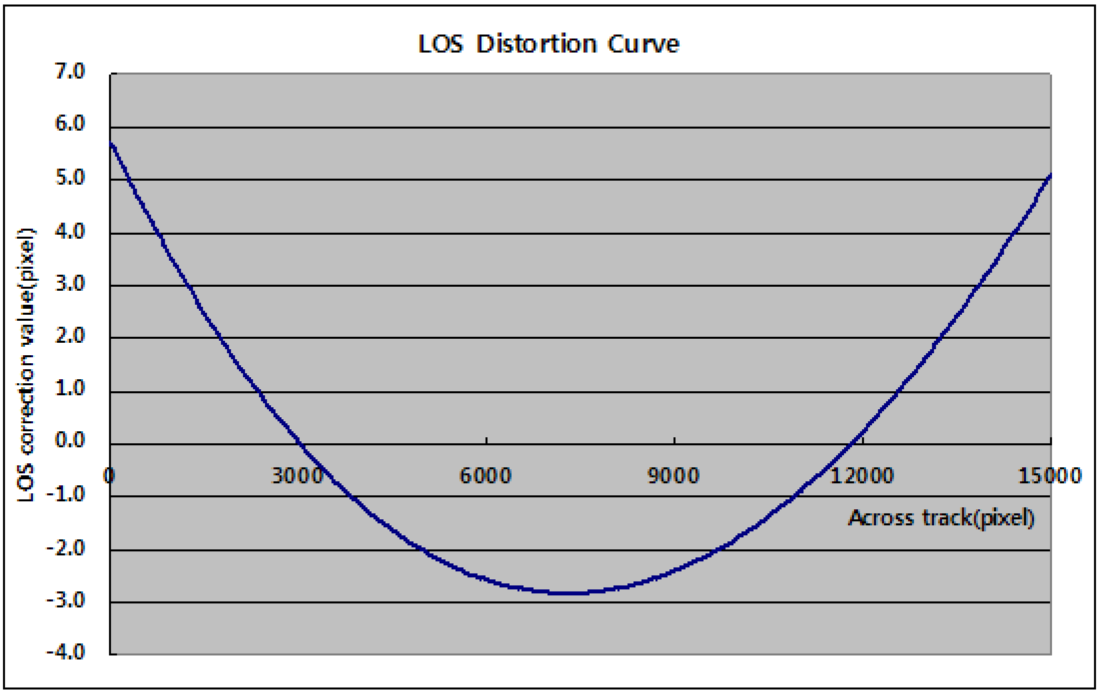

Figure 6-2 Absolute PAN LOS distortion curve

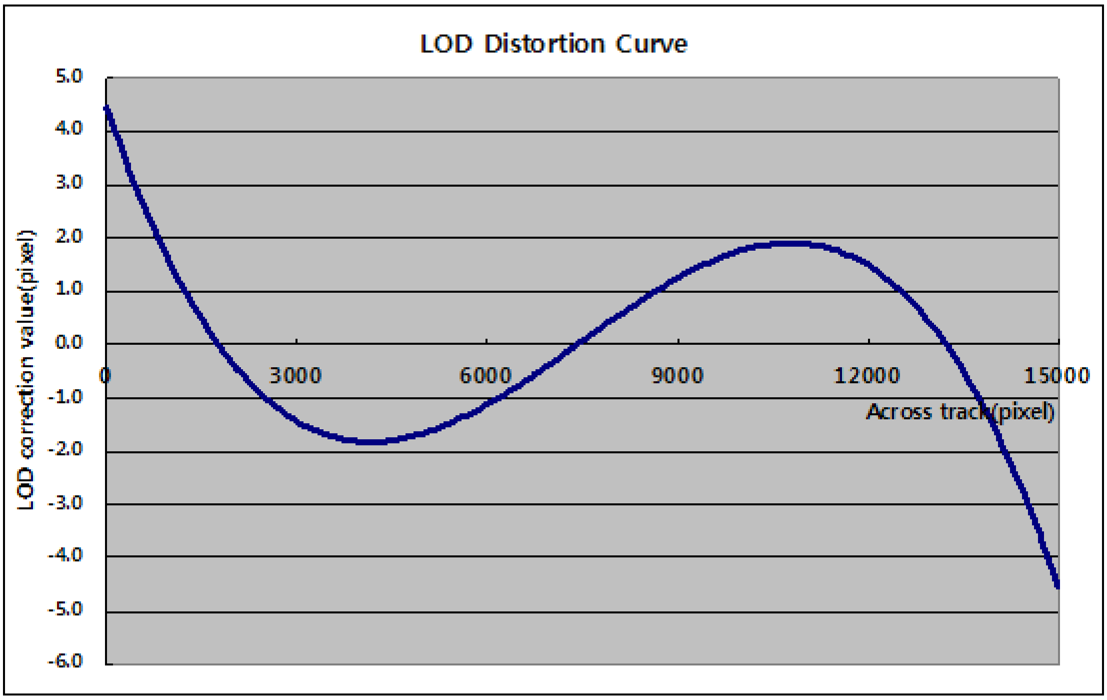

Figure 6-3 Absolute PAN LOD distortion curve

The relative MS to MS LOD/LOS distortion correction and PAN to MS distortion correction are calibrated each MS bands and PAN band to MS band with across-track distortion and along-track distortion. The purpose of this correction is to registration of among MS bands and between PAN band to MS bands.

6.2 KOMPSAT-2 Direct Sensor Modeling

The basic sensor model of KOMPSAT-2 MSC is realized on the co-linearity condition. The spacecraft perspective center, image point and the corresponding ground point are assumed to be on one straight line using six basic coordinate systems. The origin of sensor coordinate system is considering coincided with the origin of the spacecraft which is located at the spacecraft center of mass.

The Figure 8 gives a description of basic sensor model of KOMPSAT-2 MSC.

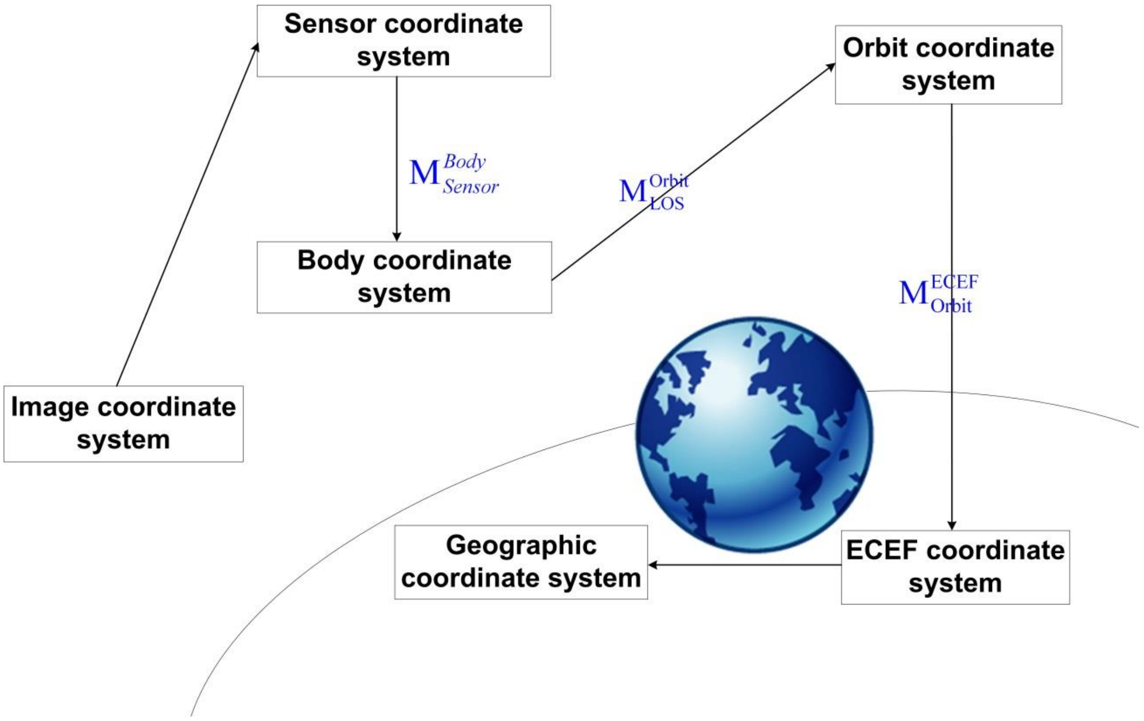

Figure 6-4 Coordinate Systems Overview and Coordinate Transformations

6.2.1 Time Calculation

KOMPSAT-2 spacecraft is a line sensing imaging system, and every scan line is imaged at different time. The time calculation is required to determine the nominal spacecraft position and attitude of the spacecraft at every scan line as well as deviation from the nominal value. The ancillary data is provided an image acquisition start, center and end time in UTC.

Time (t) for any line is given by reference to the scene center data;

t = center time - line rate × (line - center line)

6.2.2 Ephemeris Interpolation

KOMPSAT-2 level 1R data includes ephemeris data to give the spacecraft position and velocity every 1 second. The three components (X, Y, Z) of spacecraft given by ephemeris data set, which are position, velocity and data of each instant time (t), i.e., spacecraft position vector [P] and spacecraft velocity vector [V] for each instant times are given;

$$\vec{P}(t) = \sum_{j=1}^{8} \frac{\vec{P}(t_j) \times \prod_{\substack{i=1 \\ i \neq j}}^{8} (t - t_i)}{\prod_{\substack{i=1 \\ i \neq j}}^{8} (t_j - t_i)} \qquad \vec{V}(t) = \sum_{j=1}^{8} \frac{\vec{V}(t_j) \times \prod_{\substack{i=1 \\ i \neq j}}^{8} (t - t_i)}{\prod_{\substack{i=1 \\ i \neq j}}^{8} (t_j - t_i)}$$

$P(t_i)$: the satellite position coordinates

$V(t_i)$: the satellite velocity coordinates

t_i : times corresponding to the positions and velocities.

We recommended 8 datasets for each interpolation process. Spacecraft position and velocity are expressed in the ECEF reference frame using WGS-84 ellipsoid.

6.2.3 Image Coordinate System

The image coordinates are divided to column and row pixel numbers. When the image is displayed, column and row numbers are increasing when it goes right and downward direction. The origin of image coordinate system is located upper left corner at the first pixel on the first scan line as shown in Figure 9.

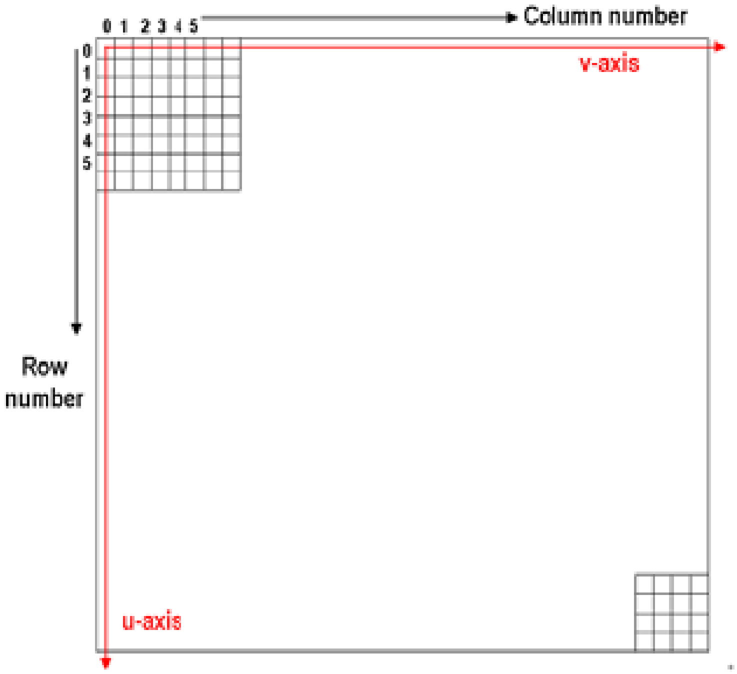

Figure 6-5 Image coordinates system

6.2.4 Sensor Coordinate System

The image coordinate (v,u) of the point in the image coordinate system to be transformed to (x, y, z) coordinate in the sensor coordinate system, as seem in Figure 8. The spacecraft of mass is located in origin of the sensor coordinate system. The z-axis points in direction to the surface of the earth. The y-axis is direction to the direction of spacecraft and the x-axis completes the right handed coordinate system.

The (x, y, z) coordinates are calculated using the pixel size, d, focal length, f, KOMPSAT-2 alignment value fx, fy, lx, ly from ancillary file. The sensor coordinate (x, y, z) is given by;

$$x = (v \times \text{CCD size}) + f_x$$

$$y = ax + b$$

$$\vec{x} = \frac{\vec{x}}{\|\vec{d}\|}, \quad \vec{y} = \frac{\vec{y}}{\|\vec{d}\|}, \quad \vec{z} = -\frac{\vec{f}}{\|\vec{d}\|}$$

$$a = (ly - fy)/(lx - fx)$$

$$b = fy - (a \times fx)$$

$$\|d\| = \sqrt{x^2 + y^2 + z^2}$$

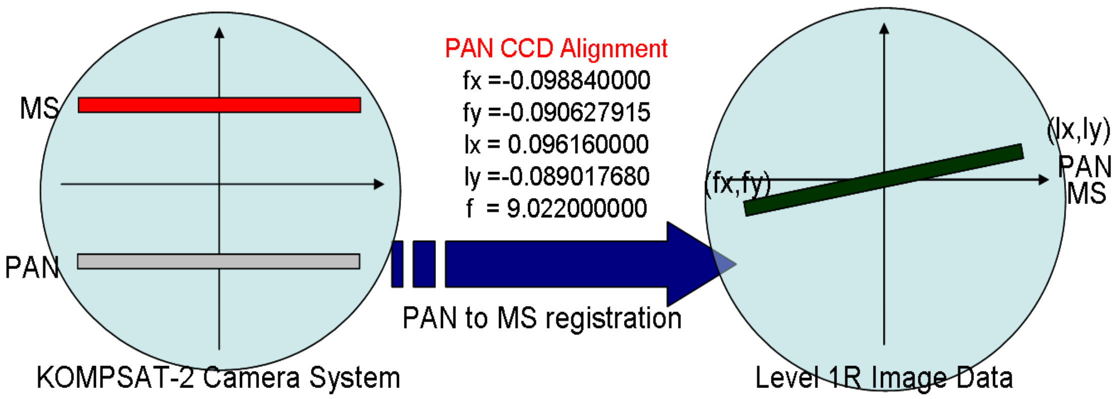

Figure 6-6 CCD alignment

Where, fx, fy, lx, ly are CCD alignment values into the focal plan of KOMPSAT-2 after LOD and LOS distortion correction, as given in figure 10. The value of CCD alignment is on the general information data file (extension: TXT). For example,

INST_PAN_CCD_ALIGNMENT -0.098840000, -0.090627915, 0.096160000, -0.089017680

INST_PAN_CCD_ALIGNMENT fx, fy, lx, ly

6.2.5 Body Coordinate System

The body coordinate system is fixed with the origin of the KOMPSAT-2 spacecraft on the center of mass. The coordinate axes are defined by the spacecraft attitude control system. The X-axis is the spacecraft axis in direction of velocity vector; Z-axis is the spacecraft toward nadir. The Y axis completes the right handed coordinate system.

The transformation from the spacecraft body to the orbit coordinate system is defined by the spacecraft attitude and bias angle which is determined the resulted KOMPSAT-2 geometric Cal/Val. This transformation is formation of three-dimensional rotation matrixes; performed functions with components of the spacecraft roll, pitch and yaw these attitude angles.

The proper order is required to perform the rotation about roll, pitch and yaw. The transformation matrix is following:

$$T_{BODY \to Orbit} = R_{Yaw} \cdot R_{Pitch} \cdot R_{Roll}$$

$$R_{roll} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\xi_r & \sin\xi_r \\ 0 & -\sin\xi_r & \cos\xi_r \end{bmatrix} R_{Pitch} = \begin{bmatrix} \cos\xi_p & 0 & -\sin\xi_p \\ 0 & 1 & 0 \\ \sin\xi_p & 0 & \cos\xi_p \end{bmatrix} R_{Yaw} = \begin{bmatrix} \cos\xi_y & \sin\xi_y & 0 \\ -\sin\xi_y & \cos\xi_y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

6.2.6 Orbit Coordinate System

The spacecraft center of mass is located in origin of the orbit coordinate system, and fixed in the respected the KOMPSAT-2 Orbit Plane. The Z-axis points in direction to the surface of the earth, i.e. the spacecraft direct to the negative position vector in ECI system. The X-axis is direct to the velocity vector of spacecraft on orbit plane, and the Y-axis is perpendicular to the orbit plane. The orbit coordinate system is the reference system for the attitude controller.

The position and velocity ephemeris of KOMPSAT-2 are given in the WGS 84 system. In particular, the velocities given from auxiliary data are inertial velocities in ECEF.

The rotation matrix convert orbital to ECEF is constructed by following equation;

$$\vec{Z} = -\frac{\vec{P}}{\|\vec{P}\|} \quad \vec{Y} = \frac{\vec{Z} \times \vec{V}}{\|\vec{Z} \times \vec{V}\|} \quad \vec{X} = \vec{Y} \times \vec{Z}$$

$$T_{Orbit \to ECEF} = \begin{bmatrix} (X)_X & (Y)_X & (Z)_X \\ (X)_Y & (Y)_Y & (Z)_Y \\ (X)_Z & (Y)_Z & (Z)_Z \end{bmatrix}$$

6.2.7 Earth Centered Rotating Coordinate System (Earth-Centered, Earth-Fixed (ECEF) Coordinate System)

The Earth Centered Rotating (ECR) coordinate system is Earth fixed with its origin at the center of mass of the Earth (see Figure 9). It corresponds to the Conventional Terrestrial System (CTS) defined by the International Earth Rotation Service (IERS), which is the same as the U. S. Department of Defense World Geodetic System 1984 (WGS84) geocentric reference system.

The relationship between ECR and geodetic coordinates can be simply expressed in its direction form

$$x = (N + h)\cos(lat)\cos(lon)$$

$$y = (N + h)\cos(lat)\sin(lon)$$

$$z = \left(N\left(1 - e^2\right) + h\right)\sin(lat)$$

$$N = a / \left(1 - e^2 \sin^2(lat)\right)^{\frac{1}{2}}$$

$$e^2 = 1 - \frac{b^2}{a^2}$$

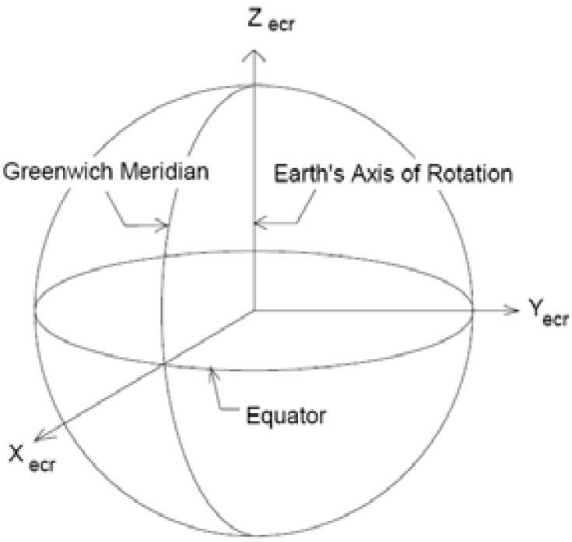

Figure 6-7 ECR Coordinate System

Where:

(x, y, z) ; ECR coordinates

(lat, lon, h) ; Geodetic coordinates

N ; Ellipsoid radius of curvature in the prime vertical

e ; Ellipsoid eccentricity

a, b ; Ellipsoid semi-major and semi-minor axes

There are no closer solutions for the inverse problems (which is the interesting problem here). Latitude and height must be solved iteratively for points that do not lie on the ellipsoid surface.

6.2.8 Geodeteic Coordinate System

The geodetic coordinate system is based on the WGS84 reference frame with coordinates expressed latitude, longitude, and height above the reference Earth ellipsoid. According to the definition of the ECR Coordinate System none ellipsoid is required, however the Geodetic Coordinate System is depending on the choice of an Earth ellipsoid. Latitude and longitude are defined as the angle between the ellipsoid normal and its projection onto the equator and the angle between the local meridian and the Greenwich meridian, respectively.

6.3 RPC

The RPC for the KOMPSAT-2 MSC sensor is generated from the resulted KOMPSAT-2 DSM using the RFM.

The RPC generation in KOMPSAT-2 IRPE system consists of 4 main parts as shown in Figure 12.

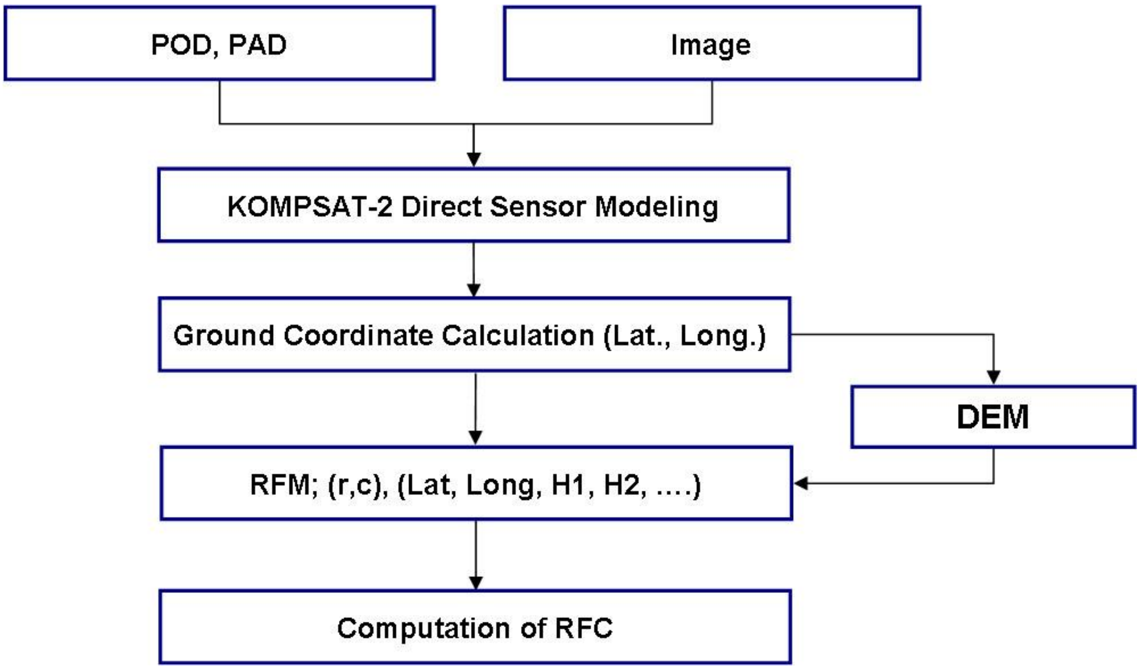

Figure 6-8 The KOMPSAT-2 RPC generation workflow.

KOMPSAT-2 RFM is forward method which can be calculated from ground coordinate (Latitude, Longitude, Height) to image coordinate (Column, Row). Auxiliary file(***.rpc) gives RPC parameters for “ground to image” location model.

A least-squares approach is utilized to determine the RPC a_n, b_n and d_n from a three-dimensional ground coordinates generated using the KOMPSAT-2 MSC camera model. The basic relationship of the KOMPSAT-2 MSC camera model that describes the ground coordinates in term of sensor coordinates is realized by the co-linearity condition in which the KOMPSAT-2 MSC perspective center, an image point and the corresponding ground point are assumed to be on one straight line. The 3D ground coordinates of object points in RFM are generated by intersecting the rays emanating from a 2-D grid of image with a number of constant elevation planes. (See Figure 12)

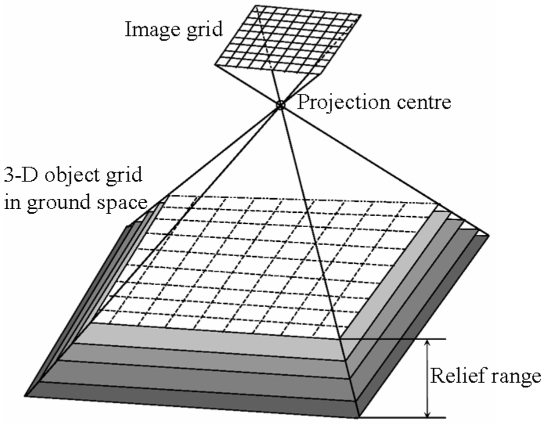

Figure 6-9 Use a 3-D object grid to solve for the RFM

In the RFM, image pixel coordinates (c, r) are expressed as the ratios of polynomials of ground coordinates (X, Y, Z). In order to improve the numerical stability of equations, the two image coordinates and three ground coordinates are normalized to fit the range from –1.0 to 1.0 using offset values and scale factors. Coefficients of the RFM are called RPC. In general, distortions caused by optical projection can be represented by ratios of first order polynomials, while corrections such as earth curvature, atmospheric refraction, and lens distortion etc., can be well approximated by second order polynomials. Some other unknown distortions with high order components can be modeled using a RFM with third order polynomials.

The RFM is given as;

$$c_n = \frac{p1(X_n, Y_n, Z_n)}{p2(X_n, Y_n, Z_n)}$$

$$r_n = \frac{p3(X_n, Y_n, Z_n)}{p4(X_n, Y_n, Z_n)}$$

$$p2 \equiv p4$$

$r_n,\ c_n$, : the normalized row and column index of pixels in image.

X_n, Y_n, Z_n : the normalized coordinate values of object points in ground space(Longitude, Latitude, Height)

$p1(X_n, Y_n, Z_n)$, $p2(X_n, Y_n, Z_n)$ and $p3(X_n, Y_n, Z_n)$ are expressed as

$$p1(X_n,Y_n,Z_n) = a_0 + a_1X + a_2Y + a_3Z + a_4X^2 + a_5XY + a_6XZ + a_7Y^2 + a_8YZ + a_9Z^2 + a_{10}X^3 + a_{11}X^2Y + a_{12}X^2Z + a_{13}XY^2 + a_{14}XYZ + a_{15}XZ^2 + a_{16}Y^3 + a_{17}Y^2Z + a_{18}YZ^2 + a_{19}Z^3$$

$$p2(X_n,Y_n,Z_n) = 1 + b_1X + b_2Y + b_3Z + b_4X^2 + b_5XY + b_6XZ + b_7Y^2 + b_8YZ + b_9Z^2 + b_{10}X^3 + b_{11}X^2Y + b_{12}X^2Z + b_{13}XY^2 + b_{14}XYZ + b_{15}XZ^2 + b_{16}Y^3 + b_{17}Y^2Z + b_{18}YZ^2 + b_{19}Z^3$$

$$p3(X_n,Y_n,Z_n) \equiv p4(X_n,Y_n,Z_n) = 1 + d_1X + d_2Y + d_3Z + d_4X^2 + d_5XY + d_6XZ + d_7Y^2 + d_8YZ + d_9Z^2 + d_{10}X^3 + d_{11}X^2Y + d_{12}X^2Z + d_{13}XY^2 + d_{14}XYZ + d_{15}XZ^2 + d_{16}Y^3 + d_{17}Y^2Z + d_{18}YZ^2 + d_{19}Z^3$$

The total number of RPC for each polynomial is {(N+1)(N+2)(N+3)}/6. For example, when N is 3, each $p1(X_n,Y_n,Z_n)$, $p2(X_n,Y_n,Z_n)$ and $p3(X_n,Y_n,Z_n)$ equation becomes a 3rd order three-dimensional polynomial with 20 coefficients.

The normalization of the coordinates is computed using the following equations:

$$r_n = \frac{r - r_o}{r_s}, \quad c_n = \frac{c - c_o}{c_s},$$

$$X_n = \frac{X - X_o}{X_s}, \quad Y_n = \frac{Y - Y_o}{Y_s}, \quad Z_n = \frac{Z - Z_o}{Z_s}$$

r_o, c_o, X_o, Y_o and Z_o are the offset values

$$r_o = \frac{r_{\max} + r_{\min}}{2}$$

$$c_o = \frac{c_{\max} + c_{\min}}{2}$$

$$X_o = \frac{X_{\max} + X_{\min}}{2}$$

$$Y_o = \frac{Y_{\max} + Y_{\min}}{2}$$

$$Z_o = \frac{Z_{\max} + Z_{\min}}{2}$$

r_s , c_s , X_s , Y_s and Z_s are the scale factors

$$r_s = \frac{r_{\max} - r_{\min}}{2}$$

$$c_s = \frac{c_{\max} - c_{\min}}{2}$$

$$X_s = \frac{X_{\max} - X_{\min}}{2}$$

$$Y_s = \frac{Y_{\max} - Y_{\min}}{2}$$

$$Z_s = \frac{Z_{\max} - Z_{\min}}{2}$$

7. REGULATION GOVERNING IMAGE DSITRIBUTION

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In brief, copyright covers a certain number of rights granted to the author of an original work, whether scientific or artistic in nature, which are added to the usual right of ownership. At least under the copyright laws of the Republic of Korea, these rights are granted exclusively and automatically.

The users of KOMPSAT-2 data acknowledge the right of KARI to copyright protection and/or protection against unauthorized use of the KOMPSAT-2 products, in accordance with the copyright laws of the Republic of Korea and applicable international agreements. The intellectual property rights related to the KOMPSAT-2 products are protected through the end-user license agreement. The user of KOMPSAT-2 data undertake to have printed the following copyright notice on all products, in such a way that KARI/s copyright be plain to all "ⓒKARI _____(year of production), Distribution (Satrec Initiative, Republic of Korea)".

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When the user buys KOMPSAT-2 image and pays the current stated price, the user obtains in return one or more copies of the products requested. However, the sale is subject to the following conditions;

- The user can only use the KOMPSAT-2 products for his own private needs and is forbidden to make these products or reproductions of these products available to a third party, either on a non-paying or a paying basis, whether temporarily or permanently.
- However, KARI may grant approval to the user to sell these data and reproductions derived from them.
- All KOMPSAT-2 products (including data and derived works) must bear the indication: all "ⓒKARI _____(year of production), Distribution (Satrec Initiative, Republic of Korea)".and be accompanied by a note setting forth the above regulations.

Purchase of KOMPSAT-2 image gives the owner what is generally referred to as a right of private use, which includes the right to transform the image. On the other hand, any and all collective and public use is prohibited and particularly right to distribute the image.

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(e) to use any VAP for its own internal needs;

(f) to make available the PRODUCT and/or any VAP to contractors and consultants, only for use on behalf of the END-USER, subject to such contractors and consultants agreeing in writing (I) to be bound by the same limitations on use as applicable to the END-USER, and (II) to return the PRODUCT and VAP to END-USER, and to keep no copy thereof, upon completion of the contracting or consulting engagement;

(g) to post an extract, maximum size 1024 x 1024 pixels, of a PRODUCT or a VAP on an internet site, in a JPEG format, with the following credit conspicuously displayed: "includes material © KARI _____(year of production), Distribution (Satrec Initiative, Republic of Korea), all rights reserved" written in full. Such posting shall be used for promotion purposes only, and may in no event allow downloading of the extract posted, nor be used to distribute, sell, assign, dispose of, lease, sublicence or transfer such extract. Prior to any posting, the END-USER shall inform KARI, specifying the URL address used by END-USER: kocust@kari.re.kr;

(h) to print any extract, maximum size 1024 x 1024 pixels, of a PRODUCT or a VAP, and to distribute such print for promotion purposes only. Such print shall include the following credit conspicuously displayed: "includes material ©KARI _____(year of production), Distribution (Satrec Initiative, Republic of Korea), all rights reserved" written in full;

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The END-USER recognizes and agrees that the PRODUCT is and shall remain the property of KARI, and contains proprietary information of KARI and thus is provided to the END-USER on a confidential basis.

The END-USER shall not cause any contractor or consultant engaged as per the provisions of Section 4.3(f) to, do any of the following:

(a) do anything not expressly authorized under Section 4.3; and

(b) alter or remove any copyright notice or proprietary legend contained in or on the PRODUCTS.

8. LICENSING

All KOMPSAT-2 image products are subject to the terms of an end-user license that will be provided to the user at the time of delivery. The following commercial licenses are currently available from Satrec Initiative. Certain amount of uplift will be applied to the price for Muli-user, Expand, and Enterprise license and certain amount of discount will be applied to the price for Academic license.

Table 8-1 License

License Type	User copy	Description
Standard	1~5	Permits INTERNAL use of KOMPSAT-2 image product within 1 to 5 users* as identified by the customer at the time of purchase.
Multi-user	6~10	Permits INTERNAL use of KOMPSAT-2 image product within 6 to 10 users* as identified by the customer at the time of purchase.
Expand	11~25	Permits INTERNAL use of KOMPSAT-2 image product within 11 to 25 users* as identified by the customer at the time of purchase.
Enterprise	26+	Permits INTERNAL use of KOMPSAT-2 image product within ANY users* as identified by the customer at the time of purchase.
Academic	1~5	Permits ACADEMIC use of KOMPSAT-2 image product within 1 to 5 users* as identified by the customer at the time of purchase.

- Definition of User includes
  - One private individual
  - One company or corporation but not subsidiaries
  - One state or provincial agency
  - All departments of one county government
  - All departments of one city government
  - One Non-Governmental Organization or Non-Profit Organization
  - All departments within a single educational organization within a single country
  - One International Agency(such as United Nations) and the sponsoring host nation.

9. WARRANTY INFORMATION

- Satrec Initiative warrants that it has sufficient ownership rights in the PRODUCT to make the PRODUCT available to the END-USER under the terms thereof.
- The PRODUCT is complex; Satrec Initiative does not warrant that the PRODUCT is free

of bugs, errors, defects or omissions, and that operation of the PRODUCT will be error free or uninterrupted nor that all non-conformities will or can be corrected. It does not warrant that the PRODUCT shall meet the END-USER's requirements or expectations, or shall be fit for the END-USER's intended purposes. There are no express or implied warranties of fitness or merchantability given in connection with the sale or use of this PRODUCT. Satrec Initiative disclaims all other warranties not expressly provided in End User License Agreement (EULA). In case the medium on which the PRODUCT is supplied by Satrec Initiative to the END-USER is deficient, as demonstrated by the END-USER and accepted by Satrec Initiative, Satrec Initiative shall replace said medium. Any such claim for replacement shall be submitted to Satrec Initiative within seven (7) days after delivery of the PRODUCT to the END-USER.

- In no event shall KARI nor Satrec Initiative, nor anybody having contributed to the development and/or production and/or delivery of the PRODUCT, be liable for any claim, damage or loss incurred by the END-USER, including without limitation indirect, compensatory, consequential, incidental, special, incorporeal or exemplary damages arising out of the use of or inability to use the PRODUCT, and shall not be subject to legal action in this respect. The financial cumulative liability of KARI and Satrec Initiative and of anybody having contributed to developing and/or production and/or delivery of the PRODUCT is limited to distribution of the PRODUCT and shall not in any case exceed the price paid by the END-USER to purchase the PRODUCT.

10. NEW TASKING OPTIONS

- **Minimum Order Size**

The minimum order size of the new tasking order is currently 100 km2..

- **Product Type**

Bundle (PAN + MS) or Pan-sharpened are available. Product type needs to be specified on the order form.

- **Product Level**

1R and 1G are available. Product level needs to be specified on the order form.

- **Area of Interest (AOI)**

AOI needs to be specified in the order form as one of following method.

- Circle : center latitude and longitude, radius in km
- Rectangle : latitude and longitude of 4 corners (UL, UR, LL, LR)

- File : shape file or KML/KMZ file.
- Minimum swath of AOI is 5 km.

- **Cloud Cover**

All imagery products acquired by the new tasking order will contain less than equal to 20% cloud cover unless cloud cover condition is specified in the order form.

Certain amount of uplifts will be applied to the price for the cloud cover <=10%.

- **Roll Tilt Angle**

The roll tilt angle at which an image is collected will have impact on the GSD, the look of the image, and the chance of imaging (re-visit time) as well as delivery schedule. The roll tilt angle has no impact on price.

- **Tasking Priority**

Table 10-1. New Tasking Priority

New Tasking Option	Priority	Description	Nominal collection window
Priority Plus	Very High	**Emergency**: Tasking is guaranteed within 4 days from the order if feasible. No feasibility study report is provided and no guarantee for tasking, cloud cover and/or tilt angle constraint. **Assured**: After feasibility study, the tasking on specified date has highest priority among commercial orders. No guarantee for cloud cover.	4 days or specific date
Priority	Higher	Feasibility proposal is provided If acquisition is not completed during the collection window, user changed its priority to Standard or update collection window to continue acquisition	4 weeks
Standard	Standard	Feasibility proposal is provided If acquisition is not completed during the collection window, the tasking shall be canceled automatically.	12 weeks or more

Certain amount of uplift will be applied to the price for Priority and Priority Plus.

- **Delivery Schedule**

Delivery time would not be guaranteed because of area of interest, collection parameters, weather condition, and so on.

11. ARCHIVE ORDER OPTIONS AND DELIVERY SCHEDULE

- **Minimum Order Size**

The minimum order size of the archive order is currently 25 km2.. Minimum swath of AOI should be greater than 5 km.

- **Media**

KOMPSAT-2 image products are delivered on DVD or electronically via FTP. Media need to be specified on the order form.

- **Product Type**

Bundle (PAN + MS) or Pan-sharpened are available. Product type needs to be specified on the order form.

- **Product Level**

1R and 1G are available. Product level needs to be specified on the order form.

- **Delivery Service**

Delivery services are applied only for the archive order. Delivery service needs to be specified on the order form. Standard delivery would be applied as default.

Table 11-1 Delivery Service (Archive Order)

[Delivery Service] : only for Archive Orders	
Standard	3 working days** after confirmation of order
Rush	1 working days** after confirmation of order

** Duration required for delivery depends on the volume of order. The above figure indicates usual duration for a single scene. The duration is not guaranteed and commercially reasonable efforts will be applied.

Certain amount of uplifts will be applied to the price for the Rush delivery service.

Customer Support or regional reseller will provide information when a product will be processed, and how soon it can be delivered.

12. ORDERING INFORMATION

12.1 How to Order KOMPSAT-2 Image Data

Order for new tasking or the archived image may be placed by two methods:

- Through regional reseller : Contact information of each reseller can be founded on Satrec Initiative's home page (http://www.satreci.com)
- By calling Satrec Initiative's customer support representatives :
    - ◆ Satrec Initiative (Customer Support Representative)
        - E-mail : sales@satreci.com
        - Phone : +82-70-7006-6058
        - Hours of Operation : 09:00am ~ 06:00 PM (+9GMT), Monday to Friday
        - Web : http://kompsat.satreci.com
        - Address : 21 Yuseong-daero 1628 beong-gil, Yuseong-gu, Daejeon, 305-811, Korea

12.1.1 Order Process

In case of order through the regional reseller, ordering process is as per SI - Reseller interface. The client requests the new tasking order or archive order to reseller, and the reseller will provide all support required for ordering to the customer.

In case of order directly inputted to SI, steps in the ordering process for new tasking order and archive order are as follows:

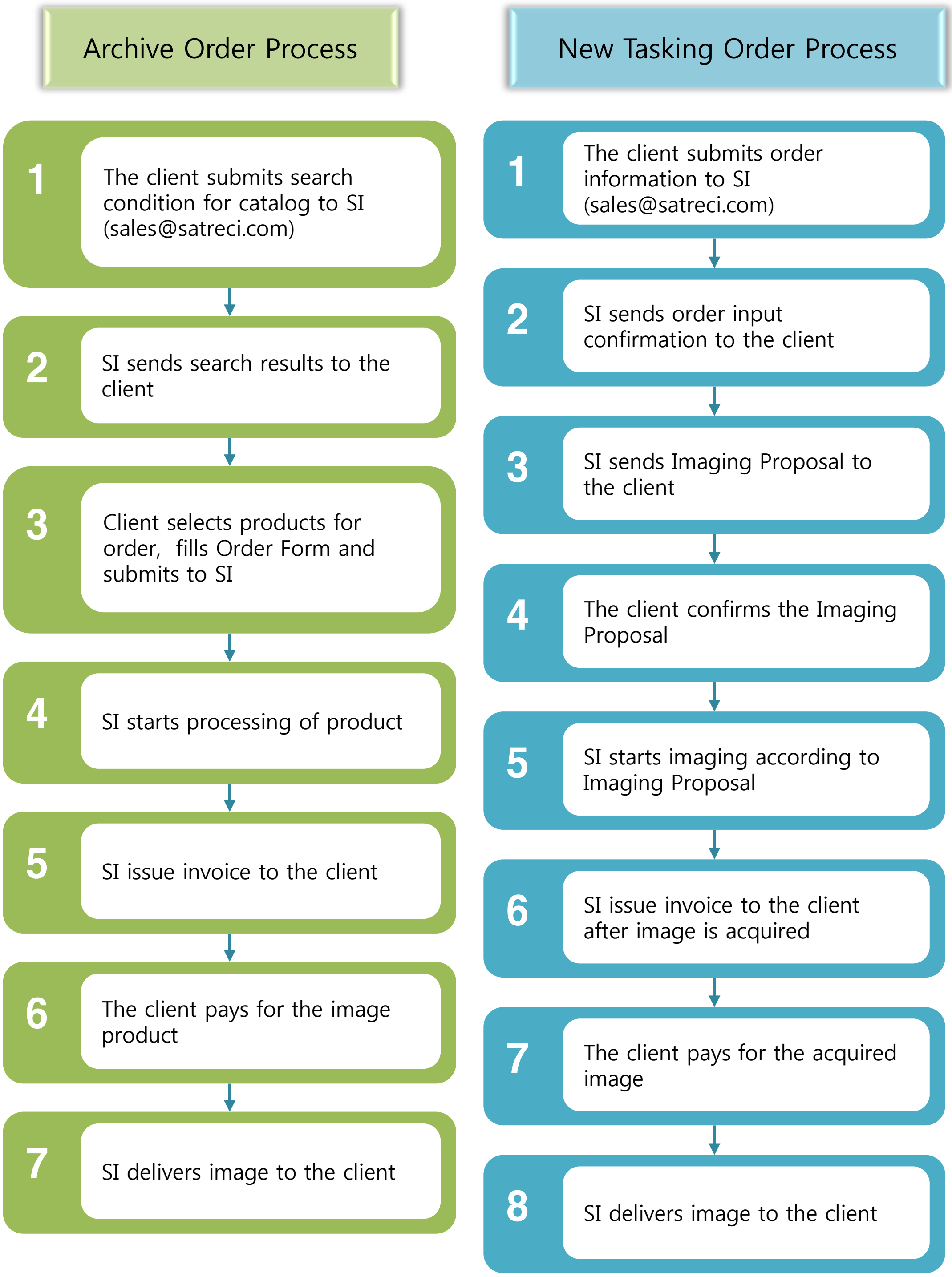

Figure 12-1. Order Process

12.1.2 Cancellation Policy

To avoid unnecessary operation of satellite and to maximize operation for image processing, a cancellation fee would be applicable to orders that are cancelled after the order has been confirmed. Cancelation condition and fee are described in the following table.

Table 12-1. Cancellation Fee

Orders	Conditions	Cancellation Fee
Archive	before processing start	no charge
	after processing start	100%
New Tasking	24 hours before imaging	30%
	otherwise	100%

12.2 Catalog Search

The customers for KOMPSAT-2 data can access the search and catalog system for KOMPSAT-2 data through Arirang Satellite Image Search (http://arirang.kari.re.kr) website.

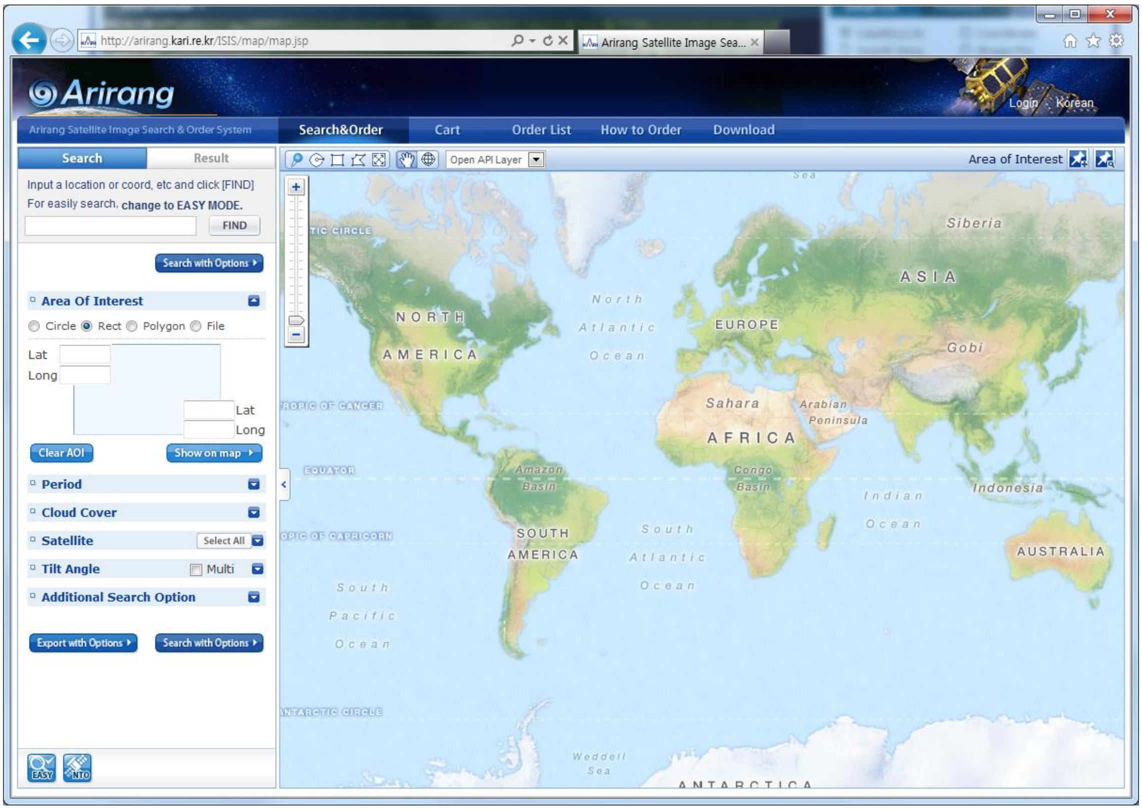

Figure 12-2 Arirang Satellite Image Search Homepage

13. SAMPLE ORDER FORM

This order form is for both new tasking order and archive order. Customer should fill appropriate conditions in the order form , sign at the end of page, then send it to user desk at Satrec Initiative.

satrec initiative

KOMPSAT Imagery Products Order Form

SATREC INITIATIVE (SI)
www.satreci.com
Yuseong-daero(Blvd) 1628-gil(Rd) 21, Yuseong-gu(Jeonmin-dong), Daejeon, 305-811, Korea
Customer Service : sales@satreci.com / FAX : +82 70 7805 8060

Order Date : / / (GMT) (dd/mm/yyyy) **Order ID** : (internal use only)

Reseller / Purchaser Information

Billing Info ☐ Purchaser is also End User

Company :	Division :
Contact name :	Position :
Address :	
Country :	
Phone No :	Fax No :
E-mail :	

Shipping Info ☐ Same as Billing Info

Company :	Division :
Contact name :	Position :
Address :	
Country :	
Phone No :	Fax No :
E-mail :	

General Order Information

☐ *New Task Order* ☐ *Archive Order*

1. Satellite

   ☐ KOMPSAT-2 ☐ KOMPSAT-3

2. Parameters

   (1) Term of Validity : / / ~ / / (dd/mm/yyyy)
   (2) Roll Tilt Angle (K2 : ±30, K3 : ±45) : ± °
   (3) Pitch Tilt Angle (K3 Only : ±30) : ± °
   (4) Stereo : ~ , ~ (exa :-30~0, 0~30)
   (5) Cloud Coverage : ☐ 0% ☐ <=10% ☐ <=20% ☐<=30% ☐ <=50%
   (6) Snow&Ice : ☐ 0% ☐ <=10% ☐ <=20% ☐<=30% ☐ <=50%
   (7) Haze&Sand Wind : ☐No ☐Yes

3. Delivery

   (1) Media : ☐ FTP ☐ DVD

(2) Partial Shipments? : ☐ Yes ☐ No

4. Application Fields

☐ Agriculture	☐ Mapping and Land management	☐ Defense and Security
☐ Forestry	☐ Maritime and Coastal	☐ Natural Resources and Engineering
☐ Hazards	☐ Urban Planning	☐ Other :

Production Specifications

New Task Order Info

1. Product Type (GeoTiff)

(1) Produt Type : ☐ Bundle(Pan+MS) ☐ Pan Sharpened

(2) Product Level : ☐ 1R ☐ 1G

1R : Radiometric Correction

1G : K2 - Georectified without GCP , K3 – Georectified without GCP(Orthorectified Imagery

(3) Ancillary Precision : ☐ Normal ☐ Precise

2. Priority

☐ Priority Plus (specific date : dd/mm/yyyy) ☐ Priority ☐ Standard

3. Request Zone info

Country : Place Name :

4. AOI

☐ Circle

Center Latitude	Center Longitude	Radius
		km

☐ Rectangle

	Latitude	Longitude
UL		
UR		
LL		
LR		

☐ Shapefile or KML/KMZ file

- File Name :

5. Additional Description

Archive Order Info

1. Scene List (http://arirang.kari.re.kr)

Scene ID			Country/Place	
Option	Order Size(km^2)*		Product Type**	
	Process Level***		Delivery Service****	
Scene ID			Country/Place	

Option	Order Size(km^2)*		Product Type**	
	Process Level***		Delivery Service****	
Scene ID			Country/Place	
Option	Order Size(km^2)*		Product Type**	
	Process Level***		Delivery Service****	
Scene ID			Country/Place	
Option	Order Size(km^2)*		Product Type**	
	Process Level***		Delivery Service****	
Scene ID			Country/Place	
Option	Order Size(km^2)*		Product Type**	
	Process Level***		Delivery Service****	

Total Scene Count :

For additional archive orders please provide Excel Sheet. (File Name :

* **Order size(km^2)** : Full Scene or AOI. Minimum order size is 112.5 km^2. AOI file in KML or Shape need to be attached.

** **Product Type** : Bundle or Pan Sharpened (both in GEOTIFF format)

*** **Process Level** : 1R or 1G

**** **Delivery Service** : Standard or Rush

2. Additional Description

Licensing Information

☐ Standard licence (1~5)

☐ Multi-User licence (6~10)

☐ Expand (11~25)

☐ Enterprise (26+)

☐ Academic

Issued by the Reseller/ Purchaser,

Date : ____________________________

Signature : ____________________________