OVERVIEW OF KOREA OCEAN SATELLITE CENTER (KOSC) DEVELOPMENT

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ABSTRACT The Korea Ocean Satellite Center (KOSC) is under development to establish in line with the launch of the first Korean multi-function geostationary satellite COMS (Communication, Ocean and Meteorological Satellite) scheduled in 2008. KOSC aims to receive, process and distribute Geostationary Ocean Color Sensor (GOCI) data on board COMS in near-real time. In this report, current status of KOSC development is presented in the following categories; site selection for KOSC, antenna design, GOCI data receiving and processing system, data distribution, future works.

KEY WORDS: Korea Ocean Satellite Centre (KOSC), Geostationary Ocean Color Sensor (GOCI), COMS (Communication, Ocean and Meteorological Satellite)

1. INTRODUCTION

The Korea Ocean Satellite Center (KOSC) will play as a primary data processing center for Geostationary Ocean Color Sensor (GOCI) data. KOSC covers the acquisition, processing, archival, distribution and pricing policy for GOCI data. After processing GOCI 1A data, a systematically corrected product (GOCI level 1B) and ocean geophysical products (level 2) will be generated and distributed on-line to users on request. The user will have the option of performing further processing on the data.

KOSC provides the following tasks:

- Mission request for GOCI operation
- Reception of raw data
- Radiometric and geometric correction
- Extraction of ocean products by using further processing systems

KOSC functionalities are listed as below:

- Mission request for GOCI operation
- GOCI Sensor Data Receiving & Archiving
- Analysis of GOCI Data
- The GDPS system will process GOCI data for ocean applications. This system will be prepared by KOSC.
- Development of New techniques for Satellite Ocean Applications
- Production and Verification of GOCI radiometric Calibration Coefficients
- Distribution of GOCI data inside & outside of the country
- Science program management for GOCI data application
- International cooperation of GOCI data application
- Education & training for GOCI

2. SITE SELECTION FOR KOSC

A preliminary study has been conducted to identify and evaluate appropriateness of the candidate sites to be proposed for KOSC establishment. Five candidate sites have been identified as follows: Ansan (H/Q), Deajeon (MOERI), Jangmok (South Sea Institute), Uljin and Busan.

Evaluation of these sites was based on (1) radiowave environment – radio monitoring, (2) site survey – radio receiving conditions, radio shielding, local circumstances and topography and rapid accessibility by users/international scientists, (3) natural environment – wind, typhoon and ground quake.

Radiowave environment measurement was carried out using a Spectrum Analyzer – Agilent 8590 E-series Portable Spectrum Analyzer, with frequency range of 1GHz-18GHz (L-ku Microwave band). Measurements of

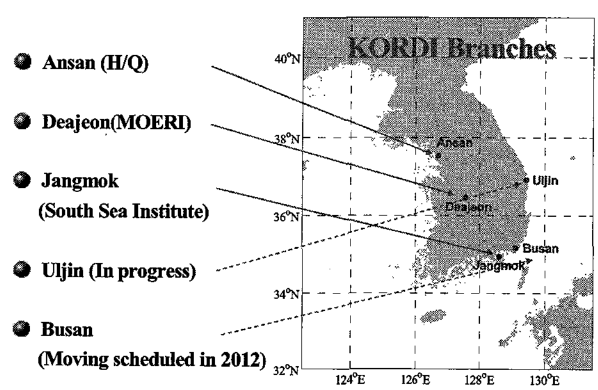

Figure 1. KOSC Candidate Sites.

radio conditions in Uljin area indicated that periodicity does not exist in the L-band (1.670-1.698GHz) but non-periodicity is rather high. In frequency of 1-18GHz, a part of spectrum shows a periodicity but it goes off planned frequency range. The natural environmental conditions are not favoring the set up of KOSC in Uljin.

This study indicates that Ansan is an ideal site because of being not susceptible to natural environmental conditions and possessing favorable radiowave environmental conditions and other local circumstances. In contrast, other sites excluding Deajeon are located very near to the beaches/coastal areas that are often dominated by high winds and frequent typhoons. Thus, the candidate site for KOSC establishment can be arranged in the following order Ansan - Deajeon - Jangmok - Busan - Uljin.

3. ANTENNA DESIGN

Optimum size and structure of Antenna has been assessed to be 9m (diameter), Theta_E 34 (deg), Zfocus 0.60m, Z_main -1.9m and Z_sub 1.1m. Since the Antenna has a larger aperture, it provides higher gains in units of dBi (decibels). The gains result from the logarithm of the ratio of the intensity of an antenna's radiation pattern in the direction of strongest radiation to that of a reference antenna. The ultimate figure of merit for this receiving Antenna is the G/T, that is, the gain of the antenna (in dB) minus the noise temperature of the receiving system (in dB). The proposed Antenna has a

Table 1. Antenna G/T

Contributor	Gain 1.67GHz	Gain 1.71GHz
Gain at LNA Input	40.93 (dBi)	41.14 (dBi)
Antenna Noise Temperature	100 °K	100 °K
LNA Noise Temperature	40 °K	40 °K
System Noise Temperature (°K)	140 °K	140 °K
System Noise Temperature (dB)	21.5 (dB)	21.5 (dB)
Expected G/T	19.43(dB/°K)	19.64(dB/°K)

Table 2. 9M L-Band Ant. Down Link Budget

Device	Gain (dB)	Input Level (dBm)	Output Level (dBm)	Remark
Satellite EIRP (dBm)			52	22dBW
Space Loss(dB) to Ansan	-191.19	52	-139.19	
Propagation Loss(dB)	-0.9	-139.19	-140.09	
E/S Antenna Gain(dBi)	40.93	-140.09	-99.16	Efficiency= 50%
OMT to LNA Loss(dB)	-0.5	-99.16	-99.66	
Pol. S/W Loss	-0.4	-99.66	-100.06	Coaxial S/W
Cable Loss(dB/2m)	-0.66	-100.06	-100.72	Rigid Cable MegaPhase SR250
LNA(Gain=50dB)	50	-100.72	-50.72	Output power(1dBComp):+10dBmin
Cable Loss (LNA to D/C input),30m	-3.3	-50.72	-54.02	Andrew LDF4-50A, -11dB/100m
D/C Divider	-3	-54.02	-57.02	3dB Divider Loss
D/C(Max 45dB Gain)(Atten -10dB)	35	-57.02	-22.02	Miteq,45dB Gain ,
Cable Loss(D/C to IF Divider), 70MHz-250m	-10	-22.02	-32.02	Andrew LDF1-50, -4dB/100m
IF Divider Loss	-3	-32.02	-35.02	
MODEM/BB Input(dBm)			-35.02	Modem/BB AGC Range = -25 to -90dBm, In-SNEC

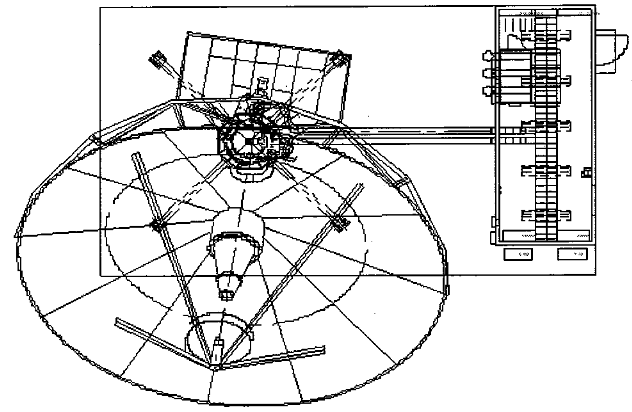

Figure 2. A design of 9m SD receiving antenna.

G/T of 19.43 dB/K and 19.64 dB/K for gains 1.67GHz and 1.71GHz respectively.

The structure of antenna for GOCI sensor data reception will be prepared in 9m-sized. Now a design of antenna is completed and KOSC will order for it in the coming 2007 year budgets. The following figure 1 shows the design of 9m GOCI receiving antenna.

4. COMPOSITION AND STRUCTURE OF THE CENTRE

4.1 Structure of KOSC Building

Figure 3 is the proposed locations of KOSC at KORDI headquarter in ANSAN. 9m data reception antenna will be located with some distance in front of KOSC building.

The following figure shows the temporary design of KOSC building. The final KOSC building will be constructed within the KORDI campus in Busan in 2012.

Figure 4 is the proposed locations of KOSC at KORDI headquarter in ANSAN. The KOSC building will have a receiving & archiving room, an operating room and a monitoring room. The temperature and humidity of the receiving & archiving room can be controlled uniformly.

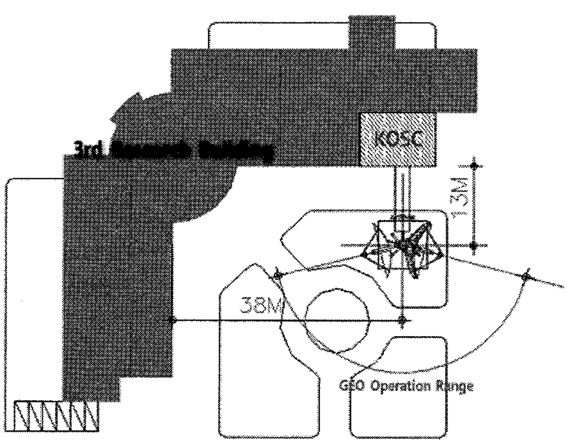

Figure 3. KOSC expected location and antenna facility design.

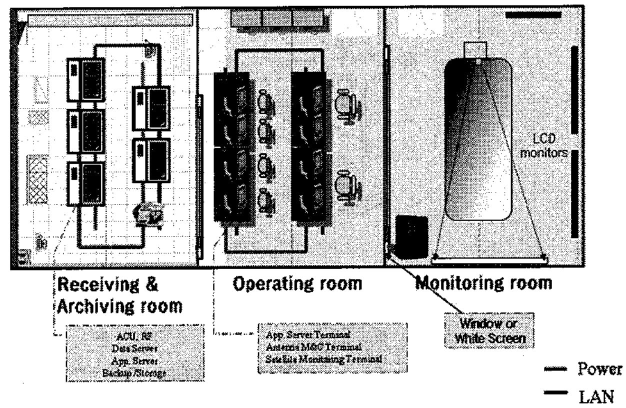

Figure 4. A design of KOSC building.

And the entrance authority of operating room will be limited. In the monitoring room, many LCD monitors will show the present condition of satellite and the latest ocean color data of GOCI.

4.2 GOCI Data Flow

The KOSC covers the acquisition, processing, archival, distribution and pricing policy for GOCI data as shown in Fig. 5. GOCI data processing system (GDPS) at KOSC will be operated as a standard data production system for GOCI sensor data.

GDPS will generate several ocean environment products. This system will include an atmospheric correction algorithm and a bidirectional correction algorithm to produce normalized water leaving radiance. And this system will include many ocean analysis algorithms and techniques to generate the physical ocean surface information and environmental change monitoring products.

These data will be made available to all users through KOSC. Browse data (a lower resolution image for determining image location, quality and information content) and metadata (descriptive information on the image) will be available, on-line, to users within 1 hour of acquisition of the image with internet access. After processing GOCI 1A data, a systematically corrected product (GOCI level 1B) and ocean geophysical products (level 2) will be also generated and distributed on-line to users on request.

4.3 KOSC Network Description

In order to design an efficient network of KOSC systems, an environment analysis of the equipments to be operated is required and the following is the summary of the requirements.

- **Structure of user environments**
  - Number of Nodes
  - Organization of server system
  - Main equipments

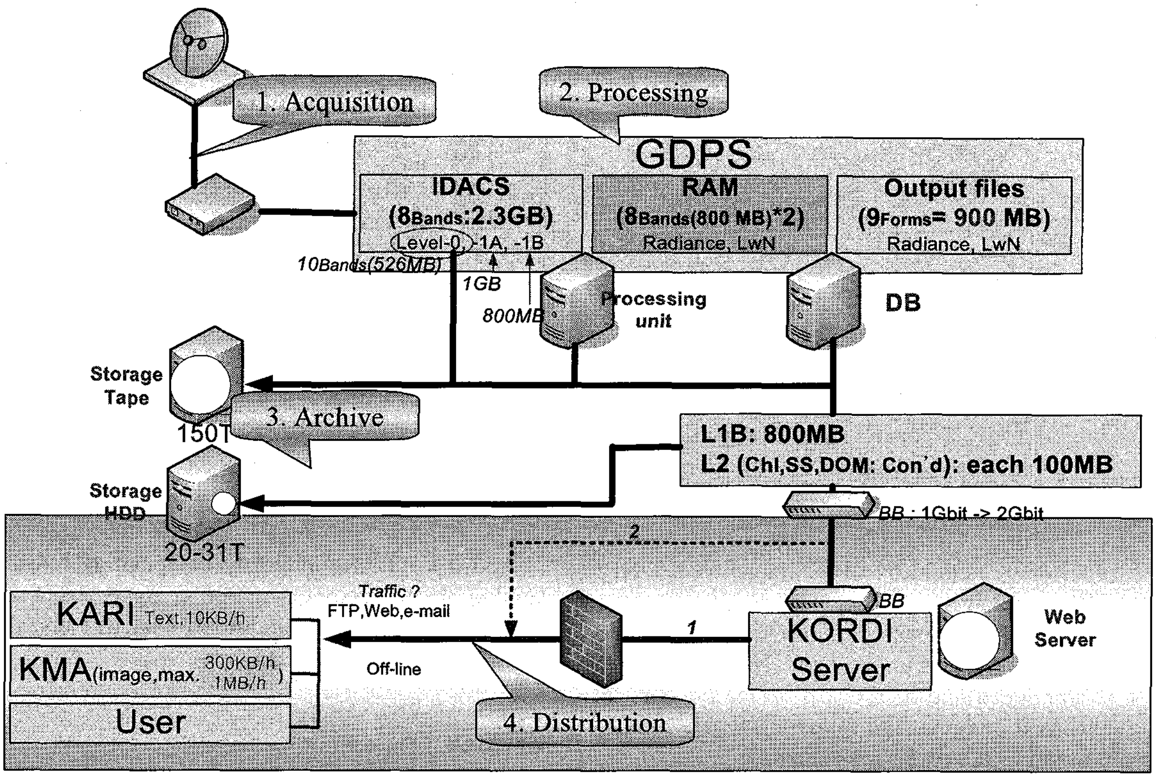

Figure 5. GOCI Data Processing Steps and Distribution.

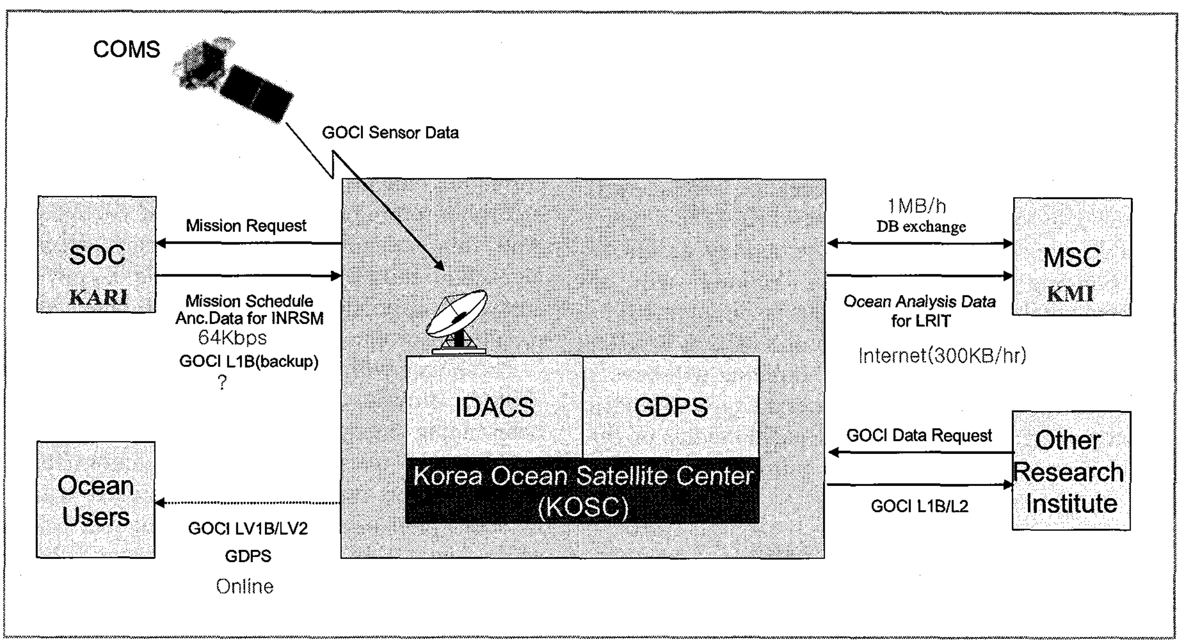

Figure 6. Operational Interfaces of KOSC.

- **Understanding of cabling organization**
- **Organization of Host server**
- **Network traffic**

Figure 6 shows possible all interfaces of KOSC with satellite, SOC/MSC and other Research Institutes.

5. FUTURE WORKS

The present study has focused on the identification, evaluation and selection of a suitable site for KOSC and assessment of Antenna design for receiving data from GOCI. Detailed design of Antenna, network, H/W and O/S will be expected to be completed by February 2007. GOCI/COMS Receiving System, GOCI Data Processing System and test and operation will be established by April 2008. Network System Development and Network Operating System will be launched in the beginning of 2008.