

results is designed and developed. The main components of the HIL simulator which we focused on are the thruster system to attitude control and automatic mass-balancing for elimination of gravity torques. To control the attitude of the spacecraft simulator, 8 thrusters which using the cold gas (N₂) are aligned with roll, pitch and yaw axis. Also Linear actuators are applied to the HIL simulator for automatic mass balancing system to compensate for the center of mass offset from the center of rotation. Addition to the thruster control system and Linear actuators, the HIL simulator for spacecraft attitude control includes an embedded computer (Onboard PC) for simulator system control, Host PC for simulator health monitoring, command and post analysis, wireless adapter for wireless network, rate gyro sensor to measure 3-axis attitude of the simulator, inclinometer to measure horizontality and battery sets to independently supply power only for the simulator. Finally, we present some experimental results from the application of the controller on the spacecraft simulator.

[VI-2-2] Unscented Kalman Filtering for Spacecraft Attitude and Rate Determination Using Magnetometer

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An Unscented Kalman Filter(UKF) for estimation of attitude and rate of a spacecraft using only magnetometer vector measurement is presented. The dynamics used in the filter is nonlinear rotational equation which is augmented by the quaternion kinematics to construct a process model. The filter is designed for low Earth orbit satellite, so the disturbance torques include gravity-gradient torque, magnetic disturbance torque, and aerodynamic drag. The magnetometer measurements are simulated based on time-varying position of the spacecraft. The filter has been tested not only in the standby mode but also in the detumbling mode. To stabilize the attitude, linear PD controller is applied and the actuator is assumed to be thruster. A Monte-Carlo simulation has been done to guarantee the stability of the filter performance to the various initial conditions. The UKF performance is compared to that of EKF and it reveals that UKF outperforms EKF.

[VI-2-3] Interference analysis on Japanese radio source for KOMPSAT TT&C ground system

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This paper presents the impact of Japanese radio source on the S-Band communication between KOMPSAT-2 satellite and TT&C ground system. Major specifications such as transmitting EIRP (Effective Isotropic Radiated Power) and location of Japanese terrestrial station were informed from Radio Research Laboratory in Korea Communication Commission. To estimate path loss in S-Band, the distance between Japanese station and TT&C ground system was obtained by using COTS (Commercial Off-The-Shelf) software. After that the signal strength of Japanese radio source placed at the TT&C ground system was calculated from link parameters such as transmitting EIRP, path loss, and receiving antenna gain. Consequently, this paper shows that the degradation caused by Japanese radio source is acceptable to TT&C ground system for satellite operation.

[VI-2-4] Study on Triaxiality Velocity of COMS induced by Wheel Off-loading

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KARI (Korea Aerospace Research Institute) is going to launch a Communication, Ocean and Meteorological Satellite (COMS) at summer of 2009. It will be first thing to be developed for a geostationary satellite through domestic technology. Of course, KARI has performed this development program with EADS Astrium in France since 2005. COMS has the non-symmetric configuration that the solar array is only attached on the south panel. Due to the configuration, momentum of satellite will be rapidly accumulated induced by solar pressure and then 3 wheels of large momentum are located on roll-yaw plane for attitude control. Therefore, to prevent the saturation of wheel momentum, wheel off-loading will be performed two times per day during 10 minutes for each one. At the moment, translation movement on 3-axes direction appears because of using thrusters. In this paper, strategy of the wheel off-loading and triaxiality which is the translation effect on 3-axes are introduced. Consequently, the result of optimized triaxiality considering the wheel off-loading strategy is summarized.

**■ Session VIII-2 : Instruments /
Astronomy & Cosmology 3
Thursday, 23 October [15:15-17:15]**

[VIII-2-1] Status Report of Korean Large Telescope Project

Byeong-Gon Park, Sang Chul Kim, Young-Soo Kim, Ho-II Kim, Hyun-II Sung, Sang-Hyun Ahn,

Insoo Yuk, A-Ran Lyo, Dong-Wook Lee, Sung-Ho Lee, Moo-Young Chun, and Jeong-Yeol Han

Korea Astronomy and Space Science Institute

KASI is planning a large telescope project to acquire 10% share of the GMT (Giant Magellan Telescope) extremely large telescope as one of national R&D project. By participating in GMT, we expect to provide the best environment for observational astronomers in Korea and give opportunity to upgrade the current research and instrumentation level to world-leading class. In this contribution, we will report the concept of the GMT project and Korean participation plan as well as the current status of fundraising activity.

[VIII-2-2] Development of 80cm Telescope for Muju County Public Astronomical Observatory

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Space Science and Technology Laboratory at Kyung Hee University developed an 80cm Nasmyth telescope with the joint work of Space & Astronomy, Inc. It was set up at Muju county public astronomical observatory in Jeonlabuk-Do. Nasmyth focus system was selected for the telescope to use two focal points by a rotatable tertiary mirror. Focal ratios of the telescope are f10, f5 respectively. Support of the main mirror is made with Lasalle-system. This system uses 24-points in the back side of the mirror that are all resting on small counter-weights and side support is 10-points Boll link Flexible type with 2 Lasalle type. The mount is wheel & disk type Alt-Azimuth design using DC-servo motors. External high accuracy encoder has 47,600 sine-waves/rot. These encoders are used to make real-time corrections on all gearing errors.

[VIII-2-3] Development of the software for high speed data transfer of the high-speed, large capacity data archive system for the storage of the correlation data from Korea-Japan Joint VLBI Correlator (KJJVC)

Park, Sun-young, Kang, Yong-woo, Roh, Duk-Gyoo, Oh, Se-jin, Yeom, Jae-hwan, Sohn, Bong won, Kanya Yukitoshi, and Byun, Do young

Korea Astronomy and Space Science Institute (KASI)

Korea-Japan Joint VLBI Correlator (KJJVC), to be used for Korean VLBI Network (KVN) in Korea Astronomy & Space Science Institute (KASI), is a high-speed calculator that

outputs the correlation results in the maximum speed of 1.4GB/sec. To receive and record this data keeping up with this speed and with no loss, the design of the software running on the data archive system for receiving and recording the output data from the correlator is very important. But, the simple kind of programming using just single thread that receives data from network and records it by turns, can cause a bottleneck effect while processing high speed data and a probable data loss, and cannot utilize the merit of hardwares supporting multi core or hyper threading, or operating systems supporting these hardwares. In this talk we summarize the design of the data transfer software for KJJVC and high speed, large capacity data archive system using general socket programming and multi threading techniques, and the pre-BMT (Bench Marking Test) results from the tests of the storage product providers' proposals using this software.

[VIII-2-4] Current Progress in Fabrication of Ta and Nb based STJs for an Astronomical Detector

Ho Seop Yoon^{1,2,5}, Young-Sik Park¹, Jang-Hyun Park¹, Min Kyu Yang², Jeon-Kook Lee², Yonuk Chong³, Yong-Ho Lee³, Sang-Kil Lee³, Dong-Lak Kim⁴, and Sug-Whan Kim⁵

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STJ (Superconducting Tunnel Junction) technique offers next generation photon detectors exhibiting high energy resolution, high quantum efficiency and photon counting ability over the broad wavelength range from X-ray to NIR. We report the success in fabrication of Ta/Al-AlOx-Al/Ta and Nb/Al-AlOx-Al/Nb micro structure deposited on sapphire substrates using various techniques including UV photolithography, DC Sputtering, RIE, and PECVD technique. The characterization experiment was undertaken in an Adiabatic Demagnetization Refrigerator at an operating temperature below 50mK. The details of experimental investigations for electrical characterization of STJ of 20~80 μ m in side-lengths are discussed. The measured I-V curves were used to derive the detector performance indicators such as energy gap, energy resolution, normal resistance, normal resistivity, dynamic resistance, dynamic resistivity, and quality factor.

[VIII-2-5] Network Lunar Science for International Lunar Network (ILN)

Young-Jun Choi, Hong-Kyu Moon, Hong-Suh Yim,