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Author: Dr. Tomoaki Toda
Japan Aerospace Exploration Agency (JAXA), Japan, toda@isas.jaxa.jp

Dr. Atsushi Tomiki
Japan Aerospace Exploration Agency (JAXA), Japan, tomiki.atsushi@jaxa.jp
Mr. Daichi Hirahara
Japan Aerospace Exploration Agency (JAXA), ISAS, Japan, hirahara.daichi@jaxa.jp
Mr. Tatsuya Ichikawa
ISAS/JAXA, Japan, t.ichikawa@ac.jaxa.jp
Prof. Zen-ichi Yamamoto
ISAS/JAXA, Japan, yamamoto.zenichi@jaxa.jp
Dr. Takaji Kato
ISAS/JAXA, Japan, kato.takaji@jaxa.jp
Mr. Yasunori Iwana
Japan Aerospace Exploration Agency (JAXA), Japan, iwana.yasunori@jaxa.jp
Mr. Hisato Ishii
Japan Aerospace Exploration Agency (JAXA), Japan, ishii.hisato@jaxa.jp
Mr. Kaneaki Narita
Japan Aerospace Exploration Agency (JAXA), Japan, narita.kaneaki@jaxa.jp

KA-BAND DEEP SPACE COMMUNICATION OF JAXA

Abstract

It has been more than a quarter century since JAXA constructed Usuda Deep Space Center (UDSC). The 64m station at UDSC was originally built for S-band telemetry, tracking and command (TTC) operation to support Holley's comet missions. Since then, the 64m station has played a major role in JAXA lunar and deep space missions such as Sakigake, Nozomi, Hayabusa and Kaguya. While experiencing operations for these spacecraft, the UDSC 64m was given an X-band capability and its facilities have been replaced with new ones that are compatible with Consultative Committee for Space Data Systems (CCSDS) standards. It is still a major workforce of Venus exploration mission known as AKATSUKI launched in the summer of 2010. However, the construction of a new deep space station succeeding UDSC 64m is now under discussion so that we can switch from old 64m stations to new one smoothly without interruption between them. The JAXA new deep space station will have larger dish than 34m so as to be able to compensate disadvantages coming from rather humid and rainy environment. It will be provided with Ka-band downlink capability together with X-band stable uplink and downlink function. The location of the new station is extremely important to make the most use of Ka-band high-speed link. Not only Usuda, but also northern dry area with less snow through the year is attractive. The detailed design and cost estimation are ongoing for the coming start of the new station project. In correspondence to Ka-band capability for the ground station, we have been developed Ka-band transmitter attached to X-band deep space transponder. Both instruments were carefully designed so as to allow their use for radio-science, that is, to indicate ultra low phase noise in both bands. No additional phase noise increase when comparing the phase noise of two instruments was found except for the increase by frequency ratio. Our Ka-band transmitter is available as breadboard model (BBM) together with BBM of X-band

transponder whose flight model was employed in AKATSUKI. We will discuss more on our future X/Ka-band ground station and corresponding onboard communication instruments in the conference. We will try to make our concept against them as clear as possible and to introduce our roadmap for Ka-band deep space communication.