

Current Status of Development of Compact VLBI System with 1-m class Antenna (MARBLE): Part 2

Atsutoshi Ishii[1]; Ryuichi Ichikawa[1]; Hiroshi Takiguchi[1]; Kazuhiro Takeufji[2]; Yasuhiro Koyama[2]; Tetsuro Kondo[1]; Shinobu Kurihara[3]; Kensuke Kokado[3]

[1] KSRC,NICT; [2] NICT; [3] GSI

We are developing a compact VLBI system with 1m-class antenna in order to provide reference baseline lengths for calibration baselines. The calibration baselines are used to validate surveying instruments such as GPS and EDM and maintained by the Geographical Survey Institute (GSI). The long (10 km) calibration baseline is examined only by GPS receiver at present. Therefore, to examine the 10 km calibration baseline by another technique is required. VLBI technique can give an independent measurement to examine the long calibration baseline. Our concept of this VLBI system is using a pair of very small antennas combined with a large aperture antenna. Time delay between small antennas is directly undetectable due to their low sensitivity. However their time delay can be obtained from delays observed with a large antenna and the baseline vector between small antennas can be measured. We named this project MARBLE (Multiple Antenna Radio-interferometry for Baseline Length Evaluation) based on the measuring concept.

We developed a very small VLBI system of prototype that is core equipment for MARBLE. At present this system is under testing. An antenna of the VLBI system consists of a main reflector with 1.65 m diameter and a broad-band feed horn. The frequency bands that can receive it by this system are X band and S band that are commonly used in the geodetic VLBI. The antenna is mounted on an Az-El driving unit that can be driven at the speed of five degrees per second. In order to carry, this system can be dismantled for seven parts that are the main reflector, the elevation driving unit, the azimuth driving unit, a front-end unit, a down converter unit, a counter weight and a pillar. This system can also equip a target marker in the point for intersection of Az-El drive axes that is the reference point of the VLBI measurement. Moreover, the GPS antenna can be installed on the pillar. By these mechanisms, the comparison between the VLBI measurement and the GPS measurement can be easily done. To achieve the distance measurement by the MARBLE, at least two very small VLBI systems are needed. The second VLBI system has been developed since the end of 2008. The main improvement point of the second system is a lightening driving unit and a miniaturization of the main reflector. We will describe about the performance test of the first prototype, the VLBI experiment between a big diameter antenna and the first prototype and the current status of the second system.