Two-element radio interferometer for the observation of Jupiter's synchrotron radiation (I)

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Synchrotron radiation from Jupiter's radiation belt and its time variation provide us information on acceleration and transport of relativistic electrons in the Jovian inner magnetosphere.

Recent investigation of Jupiter's synchrotron radiations (JSR) showed that the total flux density of them significantly enhanced associated with a substorm in the Jovian magnetosphere (Nomura et al. 2007). We have proposed that two-element radio interferometer with a baseline length of a few kilometers provide the spatial characteristic of JSR during the enhanced events.

We have started the development of a back-end section of the interferometer observation system. The back-end section consists of a baseband converter, a GPS receiver, and a high speed data sampler. The GPS receiver is used as a standard clock for the radio interferometer system and K5/VSSP which is developed by the Kashima VLBI group of NICT is used as the data sampler. The back-end receivers were installed behind the 325MHz receiver of the Iitate Planetary Radio Telescope (IPRT) in order to test their performance and confirm procedures for calibration methods and correlation analyses. IPRT consist of two separate parabolic antennas whose separation length is 16.5 meters and enables interferometer experiments. It was confirmed that significant cross-correlation coefficients were obtained from the observations of some radio sources whose flux densities are as weak as that of JSR (ex. 3C257). In this paper, back-end receivers developed and results of test observations will be shown in detail.