Observations of Jupiter's Synchrotron Radiation Using the GALAXY Real-time VLBI Network

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GALAXY is a real-time VLBI network connecting a 64-m antenna at Usuda and a 34-m antenna at Kashima (about 208 km in distance) with a 2.4 Gbps ATM network. It has been promoted by the collaboration of the Communications Research Laboratory (CRL), the Institute of Space and Astronautical Science (ISAS), National Astronomical Observatory (NAO), and Nippon Telegraph and Telephone Corporation (NTT). We have carried out GALAXY experiments for detecting a small angular size component of Jupiter's synchrotron radiation in January 2001. No radio source bigger than 480 km in size was detected.

1. Introduction

GALAXY is a real-time VLBI network connecting a KSP network including Kashima 34-m antenna and Usuda 64-m antenna with a 2.4 Gbps ATM network. It has been promoted by the collaboration of the Communications Research Laboratory (CRL), the Institute of Space and Astronautical Science (ISAS), National Astronomical Observatory (NAO), and Nippon Telegraph and Telephone Corporation (NTT). Current sensitivity obtained in our observation system is comparable to the highest sensitivity (about 10 mJy) achieved by using the conventional VLBI terminal. We have carried out GALAXY experiments for detecting a small angular size component of Jupiter's synchrotron radiation in January 2001. We report observations and results.

2. Observations

Observations were carried out on January 17 and 19 in 2001. We observed Jupiter for 6 hours each day. Every on the hour we observed 3C120 for system check. Receiving frequency was in a 2 GHz band where synchrotron radiation was emitted from the Jupiter's radiation belt. Correlation processing was carried out in real-time and a fringe search was made using the correlated data spanning 340 seconds corresponding to an integration period.

3. Results

Although the fringe of reference source 3C120 was detected in real-time correlation processing, the fringe for Jupiter was not detected. Later we made a fringe search again using a unit-integrated data in every 4 seconds, however the fringe was not detected. The fringe interval at 2 GHz for the Usuda-Kashima baseline is an about 0.15 arc seconds, and this is equivalent to about 480 km scale at Jupiter. Therefore, results show that no source is smaller than this scale and is stronger than minimum detection level (about 10 mJy) in the Jupiter's radiation belt.

4. Conclusion

Observations to detect the synchrotron radiation from Jupiter using GALAXY were carried out in January 2001. However no fringe was detected. This result means that no clear spot source with a size of several hundred kilometers or smaller is existed in the Jupiter's radiation belt, or if there is a spot source, its flux density should be less than about 10 mJy.