Confirmation of Decameter Radio Pulse Sources at the Center of Andromeda Nebula by LBI System

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1.Introduction

From the observation results of a short baseline interferometer system at Iitate ob-servatory, Tohoku University, for the deca-meter radio waves, a large group of pulses from the direction of Andromeda nebula have been identified; the pulses consist of at least 74 kinds of periods. Being based on the observation of the decameter pulses made for our Galactic center, we have inferred that those decameter radio pulses are origi-nated from groups of rotating black holes. If we apply the same criteria to the case of decameter radio pulses from Andromeda Nebu-la, we should state that there are at least 74 super massive black holes at the center part of Andromeda Nebula.

To confirm this hypothesis, then, it is needed to identify the source position of the decameter radio pulses with accuracy of +/- 2 arcsec. In this context, the present study is purposed to confirm the source posi-tion of the decameter radio waves using 100 km class long baseline interferometer system of Tohoku University.

2. Instrumentation and Calibration

The 100km class baseline interferometer of Tohoku University is utilized with spe-cial phase control system. The frequencies of signals of decameter radio wave have been finally converted to the signals of audio frequency range from 900Hz to 1500Hz in the back end of this interferometer system. The phase of signals are controlled in this low frequency stage after transmitted through the wire-less telemeter system. The phase control system consist of series of 1st or-der time delay circuits; and these circuits are assembled by operating relay-banks that are controlled by a computer to equalize the phases of all of the signals sent from inter-ferometer stations for a given source posi-tion of the decameter radio waves. To ob-tain phase stability of the super-heterodyne receiver and telemeter transmitter, cesium time standards are facilitated at all of the observation stations of the present long baseline interferometer system.

In the present observation system, then, decameter radio waves from Cassiopeia A is utilized to calibrate phase shift in the re-ceiver-telemetry system at each observation point. Though Cassiopeia A radio source re-gion broadly spread, we can make pin point selection with resolution of +/-1" by applying fringe correlation method; that is, broad sources can be utilized as calibration sources. Confirmation of the capability of phase calibration is made by mapping the decameter radio wave sources of Cassiopeia A with resolution of +/-1 arc sec.

3. Results

Observations of decameter radio pulses are made since Oct. 2001 as two serieses of observation campaign. In the first series starting from Oct. 9 to Nov. 15 observations of decameter radio wave pulses have been made at 22.158MHz, focusing direction of the fringe correlation to four assumed radio sources; i.e., at the center of Andromeda Nebula, 10" away to the north, south west, and south east from the exact center. In the second series of the campaign, 5 assumed radio pulse sources have been surveyed also at 22.158MHz; i.e., at the center of Andro-meda Nebula, at four points which are shift-ed from the center to north west, south west, south east and north east by 5"arc sec each. The observation data for about 100 hour for each assumed source are Fourier analyzed being integrated over 1 million in-dependent results for each sources. The re-sults show that there are more than three groups of the sources at the center part of the Andromeda Nebula including the pulse group located at exact center of Andromeda Nebula.