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Author: Mr. Dezhen XU

Beijing Institute of Tracking and Telecommunication Technology (BITTT), China, xdz09qhdx@163.com

Prof. Guangliang Dong

Beijing Institute of Tracking and Telecommunication Technology (BITTT), China,
wanhong.hao@gmail.com

Mr. Huan ZHOU

Beijing Institute of Tracking and Telecommunication Technology (BITTT), China, zhouhuan@bittt.cn

Mr. Haitao LI

Beijing Institute of Tracking and Telecommunication Technology (BITTT), China, lihaitao@bittt.cn

THE GEODETIC VLBI EXPERIMENT OF THE CHINESE VLBI NETWORK BEFORE CHINESE
CHANG'E5-T1 LUNAR EXPLORATION MISSION**Abstract**

Accurate spacecraft navigation especially deep space navigation using radio metric measurements requires good knowledge of the locations of the ground stations. As a request of the Chinese Chang'E5-T1 Lunar Exploration Mission and Chinese Deep Space Exploration Missions in the coming future, the station locations of the four VLBI Stations of the Chinese VLBI Network (CVN), SESHAN25, URUMQI, BEIJING and KUMING, should be determined with high accuracy and tied into the international terrestrial reference frame (ITRF). Geodetic Very Long Baseline Interferometry (Geodetic VLBI) experiments now permit measurements of relative positions of points on the Earth's surface with the accuracy of better than centimeter-level. In fact, SESHAN25 and URUMQI have long history of Geodetic VLBI, as members of the IVS station, and their station locations has been determined with high accuracy. In order to determine the locations of the Beijing and the KUNMING stations in the framework of CVN before Chinese Chang'E5-T1 Lunar Exploration Mission, a 24-hour S/X dual-band geodetic VLBI experiment of CVN was conducted on Sep. 28, 2014 to determine their locations in the ITRF. Six channels (spanning 2210.75 to 2335 MHz) at S-band and eight channels (spanning 8210.75 to 8570.75 MHz) at X-band were setup in order to make the most of the VLBI backend of all the antennas. More than 1000 delay observations were obtained at both S-band and X-band by correlating of the raw data and fringe-fitting. Analysis of the observations yields good results about the locations of both BEIJING and KUNMING in terms of formal errors. The locations of BEIJING and KUNMING are measured to a precision better than 5 mm in the local north and east direction, and 1-2 cm in the local up direction, which validates the effectiveness of the design, data processing, and analysis of the experiment.