

## OBSERVATION OF METEOR SHOWERS IN 2014 - 2015 BY 5CH HRO-IF AND EVALUATION OF SYSTEMS AT KOCHI UNIVERSITY OF TECHNOLOGY

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Introduction: Ham-band Radio meteor Observation (HRO) has an advantage of 24-hour continuous data-detection. In Kochi University of Technology (KUT), 5 channel HRO-interferometer (HRO-IF) was developed in 2009 and has been observing the meteor appearance position of every meteor echo. We operated an automatic meteor observation system that automatically shows observational results on Web in quasi-real time for about two years until 2011 (Noguchi, 2009). In addition, we have developed a system of meteor trajectory measurement by multiple-sites observation with GPS time keeping and the 5ch HRO-IF (Yamasaki, 2012). In 2012, an HRO observation with a calibrating system which could regularly observe the absolute strength of the meteor echo was developed, thus the plasma density of each meteor echo was precisely determined (Yamato, 2013). We will report observation facilities, equipments, the future prospects and latest observation result.

Meteor observation by 5ch HRO-IF: In KUT, we started 6 direction HRO in 2003. We performed the basic development of the 3ch HRO-IF from 2005 to three years (Horiuchi, 2005; Okamoto, 2005) and obtained an arrival angle of each meteor echo from the phase difference of three antennas, calculating the approximate meteor appearance position (Hamaguchi, 2006; Noguchi, 2007). The 3ch HRO-IF is limited in positional accuracy for the angle of arrival obtained from the phase difference. In order to solve this problem, we developed the 5ch HRO-IF as the improved version in 2009, realizing the automatic meteor observation for two years in KUT (Noguchi, 2009). Since high time resolution is needed for interferometer, we calculate phase difference at every 0.1 s, synchronizing the 5 channel input signal to an AD board with 1 PPS (Pulse Per Second) signal provided by a GPS receiver every 1 s. We observed Camelopardalis meteor shower (May, 2014) and Daytime Arietids meteor shower (June, 2014) by using these equipments.

Meteor shower observation result in 2014 - 2015: We observed meteor showers of Camelopardalis, Daytime Arietids and Leonids 2014 by the KUT 5ch HRO-IF. We tried calculate trajectory vector of each meteor echo by a multisite observation of Geminids 2014 and Quadrantids 2015 meteor showers. The multisite observation system was developed with the other two HRO sites in addition to the KUT 5ch-IF. Preliminary result of the multisite observation was obtained and the system performance was evaluated with trouble shooting process.

Summary: We performed the KUT 5ch HRO-IF as a forward scattering meteor radar system continuously with some verifications of accuracy that is important to reveal meteor showers structures (e.g. Geminids). However, it is necessary to realize calculation of meteor trajectory information by the multiple-sites observation to obtain precise parameters of the meteor showers such as the suddenly observed Camelopardalid 2014 meteor shower. Therefore, we will have to develop an improved version of the HRO-IF observation system as a permanent automatic data transmission with acquiring observation data from multiple sites. We tried multisite observation of Geminids 2014 and Quadrantids 2015 meteor showers with evaluating the system performance and trouble shooting process. In this paper, we will report the current status of the KUT 5ch HRO-IF system with recent observational results in 2014 - 2015 and outlook for the future.

Keywords: Meteor radio observations, Radio interferometer, Multisite observations