

Development of a 3-channel HRO interferometer

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Ham-band radio meteor observation (HRO) has been widely spread to meteor observers as a monitoring method of meteor activities. In order to investigate the characteristics of HRO echoes, a trial of 6-channel HRO (6chHRO) was began in 2003 at Kochi University of Technology (KUT). Incident direction of electromagnetic waves scattered from meteor trail was roughly estimated by 6ch-HRO (Horiuchi et al., SGEPSS fall meeting, 2004); whereas precise azimuth and elevation of incident beam of each meteor echo as well as classification of meteor showers are target of HRO development. As one of the goals of HRO as a forward-scattering meteor radar, the method of HRO interferometer has been tested by interferometer experiments in 1999 (K. Suzuki et al.) and in 2004 (Okawa et al.), developing interferometric receiver HRO-RX605a and analyzing software.

In 2004, a 3 channel HRO interferometer system (3chHRO-IF) was built at KUT with using 53.75 MHz beacon from Fukui National College of Technology. Receivers of 3chHRO-IF based on HRO-RX605a were constructed, applying DDS (Direct Digital Synthesizer) circuits to local oscillators so as to obtain highly stabilized frequency of 1 st and 2 nd local signals. Three 2-elements crossed Yagi antennae were built in November 2004 in a right triangle condition of 0.5λ (2.791 m). Through an AD converter, output lines from HRO-IF receivers are fed onto a PC and phase correlation among 3 channel observations are analyzed by the newly developed software of HRO-IF_V2. The HRO-IF_V2 programmed by IDL can analyze phase correlation every 100 ms and create a data file every 10 minutes. A JJY time signal (60 kHz) is also fed for accurate time keeping.

The first fringe of 3chHRO-IF at KUT was successfully obtained on Jan. 24, 2005, and temporal azimuth and elevation for each echo sample was calculated. Verification experiment has been in operation, verifying 1) stability of 3chHRO-IF receivers, 2) uninterrupted operation of HRO-IF_V2 software, and 3) confirmation of time accuracy. In comparison with 6chHRO, the analyses of 1-day data of 3chHRO-IF on Jan. 28, 2005, showed equivalent trend. After realizing precise calibration, the 3chHRO-IF at KUT will be operated as valuable forward-scattering meteor radar.