

VHF radio interferometer to detect anomalous invisible propagation

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Recently, earthquake-related electromagnetic phenomena have been reported in various frequency bands. In the VHF band, it is known that anomalous propagation (invisible propagation) precedes larger earthquakes. It is considered to be caused by reflection and scattering of VHF radio waves due to atmospheric disturbances generated in the preparation process of larger earthquakes. Temporal correlation between earthquake and anomalous propagation has gradually understood. However, spatial correlation hasn't understood yet in the accumulated data. Then, in this study, we develop a VHF band interferometer system and we conduct experimental test to evaluate characteristic of the system to identify disturbed area related to earthquake. The system is composed of two Yagi antennas, crystal filters, amplifiers, Phase Delay Controllers, FM digital tuners, a signal generator, and a Phase Difference analyzer.

In order to evaluate the capability of the developed system, tests for direction finding estimation of visible VHF station radio has been conducted. We rotate the system by ten degrees every minute, and calculate direction of arrival of radio wave from visible transmitter. In this experiment, target transmitters are Air University [77.1MHz], FM Yokohama [84.7MHz], and NHK FM Mito [83.2 MHz]. As a result, the system can show direction of arrival of radio wave with an error about 2 degrees.

Now, we perform running test for invisible propagation at Chiba Univ. with the developed system. The target transmitter is FM Sendai [77.1MHz]. The system is locked in direction for FM Sendai [N13°E] with elevation of 20°. At the time of Geminids meteor shower, we could observe invisible propagation of FM Sendai radio and hear the sound in FM Sendai program. The observation data will be given in presentation.