A Measurement of Received Echo Power at Forward Scatter Radio Meteor Observation(HRO)

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When the number of meteor echoes is counted with present meteor radio observation (HRO), it is general to count echoes beyond the certain standard receiving echo power. However, because this certain standard power varies between observers, it is the subject to normalize the number of meteor echoes between more than one observation sites. By this study, the technique of calibration of the receiving level of the observation site is established, and this study is aiming at construction of the broad observation network of the meteor or the meteoric shower by dealing with many results of observation statistically.

We have measured the reception power of each meteor echo by calibrating the gain of the receiver of the observation system with using signal generator (SG) of making by oneself, and by measuring the loss of the coaxial cable. And we have proposed the technique for measuring the received power of an individual meteor echo. After calibrating the reception power and knowing the range of the meteor echo electric power of each observation site, it learns to get the absolute value of the received power of the meteor echo which only relative power from the background noise level was found out so far about. Whereas, as for the long-term observation, it is afraid that precision gets bad due to the change in the gain of receiver and receiving frequency that it originates in a change mainly in temperature of the observation room. So, the reference signal whose power was well-known was taken out from the SG, and the system that a receiving level was calibrated by switching this reference signal and an observation antenna periodically was developed in order to prevent the gain and the receiving frequency of the system from changing due to the temperature change of the day and night and the season. Furthermore, a heater and refrigerator were used, and the temperature stabilization of the receiver and the SG were planned. Thus, the observation with more stable and higher precision as for the long-term observation like the annual modulation of the meteor echo can be achieved as well.

We installed this system in Nobeyama Radio Observatory in Nagano, and did observation by the forward scatter by using the continuous wave of 53.75MHz transmitted from Fukui for several times from 2003 years. Then, we could get the electric power distribution of the sporadic meteor echo from the data for ten days in early March when a main meteoric shower isn't active. Moreover, received power simulation was done from the radar equation, and compared with a result of observation. The distribution of power of the sporadic meteor echo showed a tendency to increase as much as the weak thing of the receiving power as that result from the viewpoint of exponential function. Moreover, the neighborhood of -123.7dBm which is the upper limit value of the receiving power of underdence echo by the simulation was done in the border, and the inclination of the distribution straight line grew big. This showed a good agreement with the proposed theory(Hines and 1958). Then, a place could do this as to the estimation of the observation area of underdence echo.

Finally, The same receiving systems were installed in the place of 6m apart from each other. The receiving waveforms of the meteor echo were analyzed and the power distributions of the receiving echo were compared. Moreover the observation results from other sites, such as Kyoto, Saitama and Kanagawa are being processed. We can compare the normalized data from many different observation points. Thus, it will be expected to achieve the more precise observation of the activities of the meteoric shower.

We mention the construction of the receiver with the automatic calibration system, results of the power distribution of the received echo in several observation points, the future subject, and the outlook.