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Section 5. Atmospheric Radio Noise and Thunderstorms

The electromagnetic radio noise generated from the electric ignition system of various types of vehicles is known to interfere the behavior of communication systems. There is profound interest in measuring the characteristics of this noise so that the performance of communication systems subjected to this kind of interference can be predicted. Based upon the field measurement and data analysis, then, APDs and CRDs were obtained for the the noise from a succession of vehicles running on the Tomei high-speed motor way(Tomei Kohsoku), and at the same time an attempt to extract a singly running vehicle separately from among a succession of ones has been made to study the grade and characteristic of impulsive noise caused by individual vehicles running solely. It has been found for individual vehicles that there is a wide variation as regards intensities as well as characteristics, when they are running on the Tomei Kohsoku.

An equipment was constructed to measure the occurrence time interval between impulses to determine the point process parameter for the impulsive noise. Then measurements were performed of the Shin-Kansen noise and the noise from vehicles running on the Tomei-Kohsoku. The estimated power spectra for occurrence time intervals has exhibited peaks at 120 Hz and its harmonics for the Shin-Kansen noise, and the characteristic related to the rotation frequencies of vehicle-engines for the vehicle noise. Another series of measurements were performed for the counting of vehicle-currents and analysis of vehicle-noise to obtain correlations between them.

A model for the varying vertical electric field produced by a near thunderstorm has been presented to give a physical interpretation to observed properties of the field variation in terms of the peak amplitude distribution of received impulses at a narrow-band receiver. A single log-normal distribution model for only return strokes, and double log-normal distributions one for the total noise consisting of return strokes and K-changes, were used in calculating the respective peak amplitude distribution of received impulses with a help of knowl-

edge on propagation over a short distance. Comparisons between measured and calculated impulse amplitude distributions have shown to be good for the return strokes noise forming a part of the total noise, and also to be fairly well for the total noise. Further calculations can provide us with some prediction on the field noise variation with distance near a thunderstorm in terms of the peak amplitude distribution of impulses.

The winter thunderstorms were observed at Tsuruga from December 1980 to January 1981 and Mikuni from December 1981 to January 1982. Both sites are located along the coast of the Sea of Japan. We have already reported the oscillatory field changes due to return strokes at the 6th International Conference on Atmospheric Electricity held at Manchester, England. Nine oscillatory field changes were obtained through last three winters in Japan. The oscillations were well explained by us using the transmission line model for the lightning channels. It shall soon be submitted to a journal. Our new item at Mikuni was measurements of velocities of uppward strokes from two chimneys, 150 and 200 m high. The first rough estimation showed that the velocities were same order as the ordinary negative return stroke. Nakano has returned from New Mexico Tech., U.S.A. He has taken part in data analysis on the winter thunderstorms observed at Hokuriku, Japan during Japan-U.S.A. Cooperative Project. A meeting on thunderstorms was held at March 2,1982 at The Research Institute of Atmospherics with about 50 attendance from about 20 organizations.

March 3, 1982
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