

Chapter 12

Practice of Meteor Burst Communication

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ABSTRACT

A lot of research and experiments on meteor burst communication described in the previous chapter have been done by research institutions, educational institutions, and amateur radio operators. The contents of research and experiments are roughly classified into two categories. One is to investigate the frequency and duration of meteor bursts themselves, and the other is to study data transmission using meteor bursts. This chapter introduces some experiments on meteor burst communications conducted in Japan and the method of QSO by meteor scatter communications conducted by amateur radio operators.

INTRODUCTION

Currently, the main institutions conducting research on meteor burst communications in Japan are Shizuoka University, Numazu National College of Technology, Tokyo Metropolitan College of Industrial Technology, National Defense Academy, High Tech Research Inc., and Geosports Co., Ltd.

Shizuoka University, Numazu National College of Technology, National Institute of Technology, National Defense Academy have been conducting long-term research with the cooperation of the Institute of Low Temperature Science at Hokkaido University. Through a single-tone transmission experiment, we investigated the propagation status of meteor burst communications in various parts of Japan, and developed the IT-5000S, an original MBC transceiver, jointly with Intertech Co., Ltd., taking advantage of our experience. The initial model had a built-in digital signal processor (DSP) control unit and controlled transmission and reception timing. This first model was actually trans-

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ported to Antarctica and played an active role in field experiments conducted by graduate students of Shizuoka University and faculty member of Numazu National College. The second machine, IT-5000N, is a transceiver equipped with a single-board computer (SBC) that runs on a Linux OS instead of DSP on the IT-5000S, and it can perform internal processing using software radio technology. Modulation and demodulation can be performed by the built-in SBC, and various experimental data can be acquired and stored. Both IT-5000S and IT-5000N are still in operation, and not only single-tone transmission experiments but also various digital data transmission experiments are being carried out utilizing the functions of software defined radio.

Also, in the joint research titled “Development of the Okhotsk Sea Area Environmental Information Collection System” with the Institute of Low Temperature Science of Hokkaido University, the MCC radio equipment used in SNOTEL (i.e. the US Department of Agriculture system described in the previous chapter) was used, and a meteorological observation data collection system with a master station in Sapporo (Hokkaido University) has been constructed.

On the other hand, High Tech Research Inc. has built a meteorological observation system with a master station in Ibaraki Prefecture, and a data collection system that transmits data from Okinotorishima, the southernmost part of Japan, to the master station in Ibaraki by meteor burst communication. The total distance of this communication channel is 2,150 km. Since it exceeds the limit of meteor burst communication, a 2-hop line with a relay station is constructed along the way. All the radio equipment owned by Hi Tech Research Inc. has now been transferred to Geosports Co., Ltd., and the radio station business has been taken over by that company.

In addition, amateur radio operators have studied meteor burst communication (which is more commonly referred to as meteor scatter communication by amateur radio operators) for a long time, and some excellent software have been developed and released as free software due to recent improvements in personal computer processing capabilities.

Here, the single-tone transmission experiment system and the Okhotsk sea area environmental information collection system conducted by the author and the other collaborators are introduced, and the observation data obtained by them are outlined. In addition, the current state of meteor scatter communications developed by amateur radio operator is also described.

DATA COLLECTION SYSTEM

The Institute of Low Temperature Science Hokkaido University in Japan has been conducting comprehensive research of various natural phenomena occurring in the cryosphere and cold environments. One of the objects of research is drift ice, and it is indispensable to conduct a thorough survey of the weather in the Pan Okhotsk region to carry out the research. The method of recording in a data logger and collecting data at a later date involves a significant time delay unless the data is collected fairly frequently. The method of transmitting data using a satellite communication line allows data to be collected in real time, but the system is quite expensive and the antenna adjustment is also required to be precise. Therefore, data collection using meteor burst communication lines began to be considered in 2002. This is because the cost of using the line is free and data can be collected several hours after the data acquisition although real-time data transmission is not always possible.

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