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20GHz Band Digital Wireless Relay Systems

In 1969, research started on the practical use of a large-capacity digital wireless relay system using the 20-GHz band, which had not yet been pioneered. Technologies such as techniques for estimating the propagation characteristics in the 20 GHz band, where high rain attenuation is an issue, high-speed four-phase phase modulation transmission technology and quasi-millimeter wave components were developed, and after four years of on-site testing, the world's fastest (400Mbit/s) 20 GHz band digital wireless relay system with 5,760 telephone lines per system was realized and commercialized between Tokyo and Yokohama and between Osaka and Kobe in 1976. This fundamental research has contributed widely to the development of wireless technology in Japan and elsewhere.

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Low Power Microwave Communication Systems

Since conventional microwave communication equipment performed frequency multiplication and frequency reduction, etc., the power consumption per relay station was several hundred watts or more, making it difficult to install equipment in remote areas where commercial power was not available. In response to this problem, with the development and commercialization of high-frequency transistor direct amplification and transistor direct oscillator, power consumption has been dramatically reduced to about 1/10 or less, and low-power microwave communication systems that overcome the issues of installation conditions have been developed and put into practical use. This system was studied in 1971, and after the completion of the 2GHz band communication system in 1973, the frequency band was expanded to 4GHz and 6GHz. This system has been highly evaluated for its reliability and economy and has been widely adopted in countries around the world.

B-36

Fundamental Study of Digital Modulation

The encoder and modulator, and the demodulator and decoder were integrated, and the error rate characteristics were greatly improved by giving the relationship between the code and the modulated signal waveform. Although coded modulation techniques are widely known today, this study was the world's first to propose coded modulation methods such as

correlated PSK and correlated QAM.

PSK: Phase Shift Keying

QAM: Quadrature Amplitude Modulation