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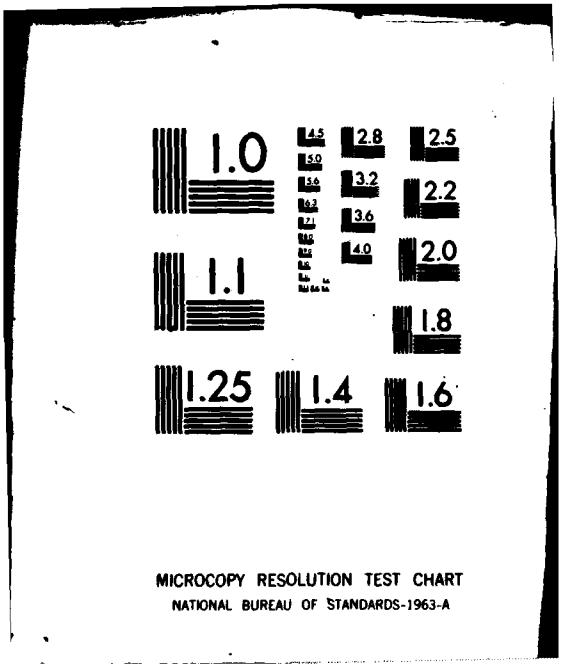
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TRANSMISSOMETER EFFECTIVENESS

Final Technical Report
by

REINHOLD REITER

September 1980

United States Army

RESEARCH & STANDARDIZATION GROUP (EUROPE)
London England

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Fraunhofer Institut für Atmosphärische
Umweltforschung

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18. Supplementary Notes

19. Key Words

Telemetry of data and signals

20. Abstract

By means of BARNES transmissometers light transmission in the visible range and infra-red shall be measured under very poor visibility conditions (strong haze, fog, precipitation) over a distance of 2,7 km.
To ensure exact transmission even under such conditions a telemetry link has been installed between optical transmitter and receiver. This permits now reliable measurements in both windows as low as < 0,1% transmission.
Simultaneously, the telemetry link is used to transmit measured data (temperature, humidity, aerosol particle spectrum, and others) to the Institute.

An essential requirement for sufficiently sensitive measurements of light transmission levels with the two BARNES transmissometers (visible and infra-red range) under low visibility conditions such as haze, fog, and/or precipitation between mountain station and valley over a distance of 2,7 km is a reliable transmission of the chopper frequency from the transmitter to the receiver. Until completion of the contractual work this happened exclusively through phase lock effected by the signal itself that had to be measured and chopped. Consequently, during bad transmission of about 15% and less it was no longer possible to make reliable measurements because the chopper signal then failed.

The most practical solution of this problem was offered by installing a telemetry link between transmitter and receiver which transfers the chopper frequency to the receiver absolutely independent of the transmission quality.

Such a system was installed partly by commercial means and partly by self-produced components and is now in operation.

Technical Data

Carrier frequency: 2.45 GHz
Transmitter power: 1 Watt
Transmitting and receiving antenna: Helical antenna, circularly polarized

Working Procedure

The chopper frequency emitted by the BARNES source controller is supplied to the telemetry system via an amplifier. The 100 per cent modulated carrier signal is demodulated in the receiver, transformed in a geometrical square wave signal and feeded into the lock-in amplifier of the transmission receiver.

Outcome

The transmission signals can now be evaluated in the infrared as low as 1% transmission and in the visible range as low as 0,2%. The system functions trouble-free.

Additional Use of the System

Additional transmission of all data obtained at the Kreuzeck (temperature, humidity, Knollenberg spectra, and others if desired) to the Institute is now possible. The measured values can thus immediately be controlled at the Institute and evaluated by computer. Punch tape storage at the mountain station is therefore superfluous.

The works under Contract DAJA37-80-C-0256 are herewith completed.

Garmisch-Partenkirchen, September 20, 1980

(Dr. R. Reiter)
Director