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INFORMATION RECOVERY AND TRANSMISSION OF COSMIC TRANSACTIONS

By

K. H. Schmelovsky

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Information recovery and transmission of cosmic transactions

by K.H. Schmelovsky

It is characteristic of cosmic transmission by means of electromagnetic waves that optical propagation results for frequencies in the band about 100MHz to 10GHz and at an angle of gradient ≻ 5° and the atmosphere as well as the ionosphere on the geometric course and the intensity of radiation have virtually no influence. The attainable reception capacity depends, at the same time, on the transmitting capacity, the recovery of the transmitting and receiving antennae and also their directive efficiency as well as from the square of the quotient of wavelength to distance. For simple, random communications such as are realized, for example, by navigation, minimum communication or weather satellites, the relatively low frequency range from 136 to 138MHz is therefore the most appropriate with ostensibly restricted transmitting capacity. For exacting information communications which are conceived of for an exact antenna secondary guide the antenna surfaces appear as the cost determining factor and the receiving capacity is virtually independent of frequency. Since cosmic thermal noise decreases with increasing frequency a further possibility exists with getting along with installation transmitting capacity in which, by appropriate technical expenditure, it is possible to reduce ground noise of the receiving arrangement to the level of celestial noise. About 80°K can be reached with cooled parametrical amplification. The area of 350MHz can be cut out for optimal receiving operation. Above this frequency use of microwave amplification by stimulated emission of radiation is employed. In the band from 4 to 10GHz cosmic thermal noise drops by 2°K; technically, 20°K is attainable. Of course, with this type of use the so-called secondary endpoint thermal noise already has an effect.

The atmosphere and ionosphere, to be sure, have no influence on the geometry of the wave propagation but they cause a positive effect of the second order since they are the first essentially known through satellite observations of the occurence of propagation. For that reason it is a question of the occurence of fading through rotation of polarization in the ionosphere (Faraday Rotation) and deviation of the Doppler shift in comparison to the Doppler shift in vacuum. This must especially be taken into account on selection of the appropriate modulation method for anolog measured value transmission. Since with earthly transactions the Doppler shift for a carrier can be turned off from 100MHz about ± 5Hz a modulation method against this carrier shift must be used that is invariant in the first approximation. For simple telemetry methods the so-called subcarrier method has been proven a success. A series of auxillary beams modulate the measured values by means of a special power poor RC voltage frequency converter. This auxillary beam then directs the phase of the proper carrier whereby, in the interest of a favorable signal to noise ratio the modulation index would gravitate toward 5. The attainable precision of this method lies at 1% with a tolerence of 10^{-4} for the transformer.

As a consequence of the necessarily large transmission band width an unfavorable signal to noise ration results in practice with digital methods of telemetry. When the realizable technical expenditure is limited for identification of a probable possible code word full use of the redundance relationship in the signal is no longer allowed. Theoretically, an ideal digital process demodulator must be formed for all possible code words of the distance modul to the received signal and , in regard to the most probable choice, for example, of the code words already mentioned. A demodulator of this type would require, for example, in regard only to the last identified code word in each case, a technical expenditure proportional to 2^{2n} (with n - place code words). On the other hand, a good analog demodulator practically produces the momentary value on the basis of its active principle which is the most probable in regard to the previous values. This aspect of analog methods make them a little more desirable than digital methods.

The problem of signal recognition from fading processes is not only of importance as a consequence of the limited installable transmitting capacity but also because it underlies chance perturbations of the process of information retrieval.

(received April 25, 1972)

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