ATMOSPHERIC ABSORPTION OF TERAHERTZ WAVES

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The idea of terahertz communication appears fascinating owing primarily to great bandwidth at hand. By the historic Shannon's capacity theorem, [1] the data rate, C of a communication medium is related to the bandwidth, W as:

$$C = W \log_2 \left(1 + \frac{S}{N}\right) \tag{1}$$

where $\frac{S}{N}$ is the signal-to-noise ratio of the communicating wave. As it is evident in 1, higher bandwidths lead to higher data rates. However, the applicability of terahertz waves for communication is hampered by the significant influence of the atmosphere. For frequencies greater than $1THz$, signals face attenuation due to wave absorption due to water vapors and oxygen present in the atmosphere. [2]

References

[1] C. E. Shannon, "Communication in the presence of noise," *Proceedings of the IRE*, vol. 37, no. 1, pp. 10–21, 1949.

[2] A. Danylov, "Thz laboratory measurements of atmospheric absorption between 6% and 52% relative humidity," *Submillimeter-Wave Technology Laboratory University of Massachusetts Lowell*, vol. 175, 2006.

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