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Wide band Wireless communications in millimeter waves

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The demand for broadband wireless communication links and the lack of open bands in the conventional electromagnetic spectrum cause searching for bandwidths in the Extremely High Frequencies (EHF) above 30 GHz. Realization of wireless links in the millimeter wave regime offers many advantages for communications and radar systems, including broad bandwidths for high data rate information transfer, high longitudinal and spatial resolutions and small aperture antennas and equipment size. However, it faces several challenges due to the low power of available solid-state transmitters, low sensitivity of receivers and also absorptive and dispersive effects emerging during millimeter wave propagation through the atmosphere. When millimeter-wave radiation passes through the atmosphere, it suffers from selective molecular absorption, mainly oxygen and water vapors. The availability and reliability of terrestrial wireless links in the EHF are determined by weather conditions such as temperature, pressure and humidity. Attenuation due to fog, haze, clouds, rain and snow is one of the dominant causes of fading. The unique features of millimeter wave communications are discussed, including study of wireless links operating in the vicinity of peaks and dips in the atmospheric EHF transmission. Utilization of small peak-to-average power ratio modulation techniques, such as constant envelope waveforms and algorithms for compensating group-delay distortions in the received signal, are presented. Theoretical analysis and experimental result of wideband indoor and outdoor millimeter wave transmissions are shown.

Biography

Yosef Pinhasi is the Dean of the Faculty of Engineering at Ariel University. He received BSc, MSc and PhD in Electrical Engineering at Tel-Aviv University, Israel in 1983, 1989 and 1995 respectively. He investigates generation and utilization of electromagnetic waves in a wide range of frequencies, for various applications such as communications, remote sensing and imaging. The space-frequency approach developed by him is employed to study propagation of wide-band signals in absorptive and dispersive media in broadband communication links, and wireless indoor and outdoor networks as well as in remote sensing radars and radiative power beaming operating in the millimeter and terahertz regime.

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