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Cost Benefit Analysis: Evaluation among the Millimetre Wavebands and SHF Bands of Small Cell 5G Networks

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Abstract : This article discusses the benefit cost analysis aspects of millimetre wavebands (mmWaves) and Super High Frequency (SHF). The devaluation along the distance of the carrier-to-noise-plus-interference ratio with the coverage distance is assessed by considering two different path loss models, the two-slope urban micro Line-of-Sight (UMiLoS) for the SHF band and the modified Friis propagation model, for frequencies above 24 GHz. The equivalent supported throughput is estimated at the 5.62, 28, 38, 60 and 73 GHz frequency bands and the influence of carrier-to-noise-plus-interference ratio in the radio and network optimization process is explored. Mostly owing to the lessening caused by the behaviour of the two-slope propagation model for SHF band, the supported throughput at this band is higher than at the millimetre wavebands only for the longest cell lengths. The benefit cost analysis of these pico-cellular networks was analysed for regular cellular topologies, by considering the unlicensed spectrum. For shortest distances, we can distinguish an optimal of the revenue in percentage terms for values of the cell length, R ≈ 10 m for the millimeter wavebands and for longest distances an optimal of the revenue can be observed at R ≈ 550 m for the 5.62 GHz. It is possible to observe that, for the 5.62 GHz band, the profit is slightly inferior than for millimetre wavebands, for the shortest Rs, and starts to increase for cell lengths approximately equal to the ratio between the break-point distance and the co-channel reuse factor, achieving a maximum for values of R approximately equal to 550 m.

Keywords : millimetre wavebands, SHF band, SINR, cost benefit analysis, 5G
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