

Energy Saving in the Optimization of the Planning of Fixed WiMAX with Relays in Hilly Terrains: Impact of Sleep Modes and Cell Zooming

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Abstract:

Layered and cooperative elements such as femto-cells and relays can improve performance or energy efficiency in mobile networks; however, they consume energy per se and their durations in operational state must therefore be minimised. This paper investigates the use of relays in WiMAX network deployments and concentrates on the cost/revenue performance and energy efficiency trade-off in such cases. Specifically, it investigates the performance achievable by networks that are deployed in various sectorization configurations with and without relays, and matches this to varying traffic loads at different times of the day to maximise the use of sleep modes, where possible, by relays, also in consideration of coverage requirements. It does this for scenarios based on pioneering propagation measurements in the hilly area of Covilhã, Portugal. Results show that through the maximal use of power saving by relays at low traffic times, considerable energy savings in the relays' power consumption are achievable, typically 47.6 %. These savings are shown to map to a financial saving for the operator of 10% in the operation and maintenance cost. However, it is also demonstrated that such solutions have to be used cautiously so as to maintain coverage requirements and not decrease the profit in challenging propagation scenarios such as investigated in this paper.