



Side Effects of IRS: On the Need for Coordination in 6G Multi-Operator IRS-assisted Networks

JOANA ANGJO / ANATOLIJ ZUBOW / FALKO DRESSLER

Is network coexistence an issue in IRS-assisted communication systems? How can unwanted reflections of an (intelligent reflecting surface) IRS be mitigated? Should IRSs be jointly controlled in order to achieve multi-operator coexistence?



An IRS can impact the channel propagation characteristics of not only its controlling operator's signals but also those of other operators nearby. This occurs because IRS typically lack bandpass filtering capabilities, leading to signal reflections across various frequencies. These unwanted reflections can cause interference due to uncontrolled multipath effects. As illustrated, a centralized IRS shared among different operators shows desired reflections for Operator A in orange and Operator B in blue, while unwanted reflections from subIRS B to Operator A's user equipment are shown in red.

KEY FINDINGS

Deploying IRSs in 5G networks may require coordination among network operators. Simulations have shown that the lack of bandpass filtering in IRSs can degrade signal quality due to unintended reflections. To address this, we propose dividing a common IRS into multiple sub-blocks (subIRS) and dynamically assigning them to operators, by taking into consideration the impact on nearby operators. Properly assigning subIRSs to operators can significantly improve the overall multi-operator network performance compared to static or random assignments. Our simulation results indicate substantial improvements in both sum rate and fairness of data rates among operators. Specifically, the sum rate for optimal assignments can be up to six times higher than the minimum possible outcome and twice as high as the average assignment. Moreover, there exists an assignment which is almost perfectly fair among the operators. We additionally assessed the performance gain based on the number of operators, the number of IRS elements, and the spectrum used. Our findings reveal that the gain diminishes as the number of operators increases, while the impact of increasing the number of IRS elements is minimal regarding the overall gain.

[1] Joana Angjo, Anatolij Zubow and Falko Dressler, "Side Effects of IRS: On the Need for Coordination in 66 Multi-Operator IRS-assisted Networks," Proceedings of IEEE Global Communications Conference (GLOBECOM 2023), 4th Workshop on Emerging Topics in 66 Communications (66Comm), Kuala Lumpur, Malaysia, December 2023.