Synthesis of Intelligent Reflective Surfaces for 5G FR2 indoor Coverage Considering the Reflection of Building Wall

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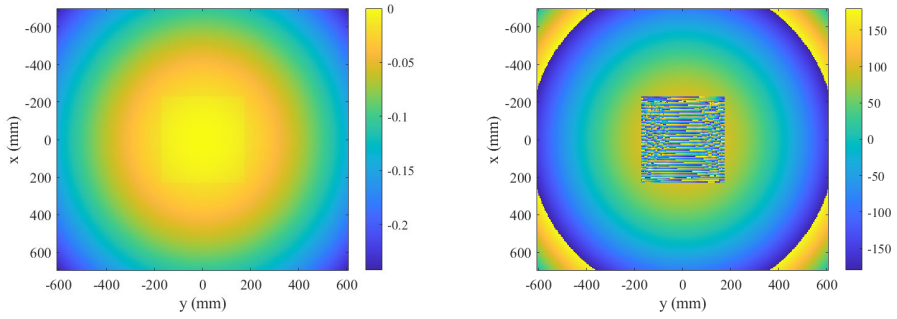
In recent years, Smart Electromagnetic Skins have been proposed to overcome the issues related to signal propagation because of physical barriers in the deployment of novel wireless networks in indoor scenarios. Namely, Intelligent Reflective Surfaces (IRS) are used to enhance 5G FR2 coverage and they avoid the installation of multiple base stations (BS). An IRS is a planar surface made up of phasing cells that reflect the impinging signal radiated from the BS, providing not only beam pointing but also beam shaping if needed. The phasing cells can be either active or passive, depending on the reconfiguration capability provided by the IRS. In addition, they can be defined to redirect the incident wave in a direction, reflecting the impinging beam, or produce a shaped beam to generate broad coverage in blind zones.

IRSs have been proposed for urban areas but they are also required in indoor scenarios, being the walls one of the most suitable placements for installing the IRS. The BS is usually far away from the IRS and therefore the fraction of the power reradiated by the IRS can be very low and the spillover is very high. Thus, the illumination of the surrounding wall is not negligible, see Figure 1. In this case, the field reflected by the wall can produce a significant distortion in the coverage and therefore it should be considered in the synthesis and design of the IRS to get the desired performance of the entire system.

In this work, an IRS is designed and the effect of the wall supporting the panel is considered. Then, the total radiated field is computed as the superposition of the contribution of the IRS and the reflection produced by the surrounding wall. The contribution to the radiated field generated by the wall is fixed but that produced by the IRS can be modified by controlling the phase introduced along the surface. In the presentation, the impact of different building materials for the wall on the coverage will be shown as well as the reradiated field obtained when the wall is considered or not.



(a) (b)

Figure 1. Reflected field on an IRS and surrounding wall considering steel as building material in (a) amplitude (dB) and (b) phase (deg).

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