

# Influence of typical railway objects in mmWave propagation channel

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Since in the future railway services, wireless communication is the fundamental part and millimeter wave (mmWave) is foreseen to be a key enabler towards the smart railway, an accurate understanding of the propagation environment can assist designing both systems and railway infrastructures for better communication services. In this paper, the influence of typical objects is analysed for mmWave channel in "Train-to-infrastructure" and intra-wagon scenarios. Propagation measurements are conducted in the mmWave band for the 12 most common railway materials. The corresponding electromagnetic parameters are obtained and a 3D ray tracing (RT) simulator is calibrated.

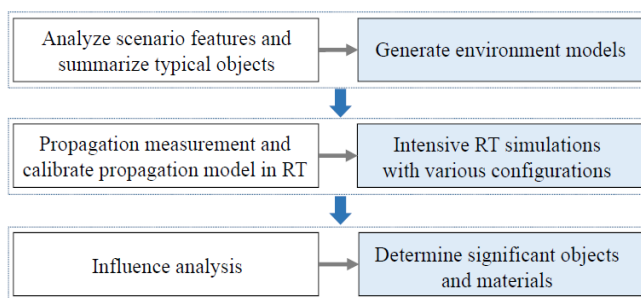


Fig 1: the framework of influence analyses

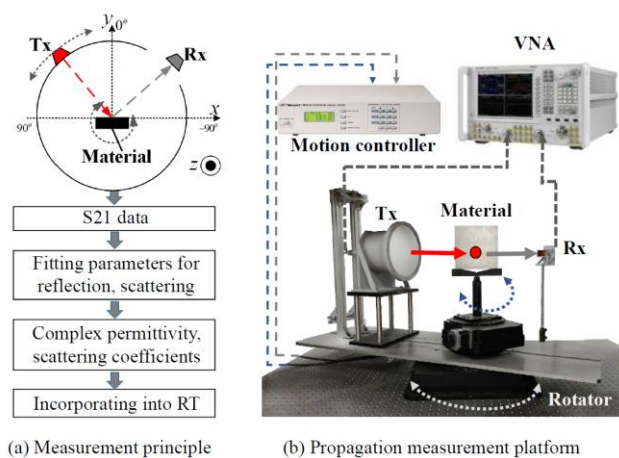


Fig. 2: Propagation mechanism measurement: principle and platform

Statistically consistent scenarios and deployments are generated, which enables drawing unbiased numerical results based on intensive RT simulations. The influence of typical objects and corresponding material compositions are then compared and significant objects are determined for each scenario. The results of this work not only imply how the propagation environment impacts on the propagation channel, but also makes suggestions to efficiently reconstruct railway environment models for an accurate RT based channel model.

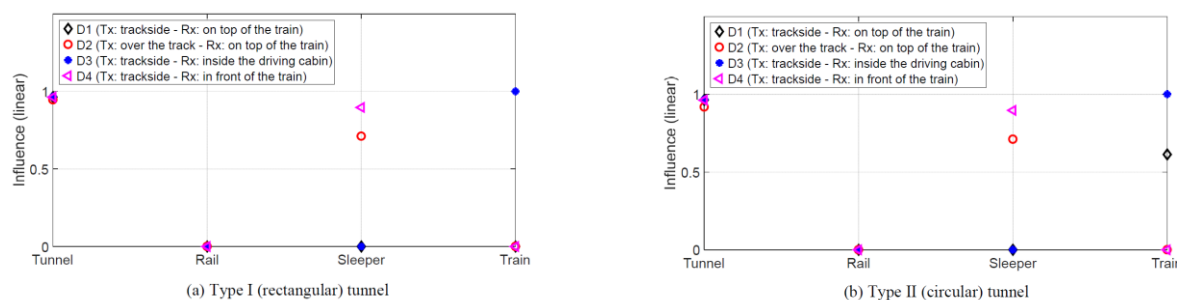


Fig. 3: Influence of deterministic objects of tunnel scenario at 26 GHz: (a) Type I (rectangular) tunnel, (b) Type II (circular) tunnel