# Towards the inverse design of reflectionless states in disordered waveguides

Isam Ben Soltane* and Matthieu Davy[1]

[1]Institut d'Électronique et des Technologies du numéRique – Université de Rennes, Institut National des Sciences Appliquées - Rennes, CentraleSupélec, Centre National de la Recherche Scientifique, Nantes Université - Ecole Polytechnique de l'Université de Nantes – France

**Abstract**

Reflectionless states are zeros of the response in reflection of a system to an excitation. Their manipulation offers a platform to study and achieve perfect absorption within a cavity or perfect transimission through a waveguide. A reflectionless state can be inverse designed by controlling the disorder within a perturbed waveguide. Here we show how this design can be achieved by leveraging the expression of the scattering matrix T of a waveguide described by the coupled dipole model, to obtain a simple calculation of its derivative with respect to a perturbation in the waveguide.

*Speaker