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### Lattice Theta series: From physical layer security to high power fiber optics transmission

The motivation of this presentation is to show how both one- and two-variable theta series of Euclidean lattices, are becoming fundamental objects in communication systems.

We will focus on two applications involving theta series.

- First one is the coding problem on the wiretap Gaussian channel. The design criterion of codes is based on the minimization over lattices of the one-variable theta series.
- Second one is the waveform design for optical transmission over fiber in the nonlinear regime. Because of the integrability of the transport equation, transmitting with two-variable theta waveforms is an elegant solution to that problem.

After having presented the two problems, we will show how coding constructions over lattices can help us to

1. Compute theta series of exceptional lattices for first problem
2. Provide some superposition principles for second problem.