Time-Reversal Physics and Innovation

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Time-reversal invariance is a very fundamental concept in physics. The objective of this talk is to show how this concept can be turned into a huge source of innovations and successful start-up companies.

It was first in the field of acoustics and later for microwaves, where antenna array technology was available, that "time-reversal mirrors" have been built. Such mirrors allow to refocuses in space and time an incident wave field at the original source location regardless of the complexity of the propagation medium. Contrary to intuition, a remarkable property was shown: the more complex the propagation medium, the sharper the focus. Such results have been recently extended to focus on spots much smaller than the wavelength using sub-wavelength structured media, opening new avenues toward super-resolution imaging and high rate telecommunications.

Time reversal mirrors are not only unique research tools in the field of fundamentals physics but they have plenty applications including therapy, medical imaging, telecommunications and human-machine interface. An overview of these applications will be presented and

Recently, the concept of time-reversal mirrors has been revisited through the concept of tunable metasurfaces and we will discuss of this new approach.