

Time reversal and spectral wave engineering via damping pulses

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Jia¹, A. Tourin¹, M. Fink¹, A. Eddi¹, M. Labousse² and E. Fort¹



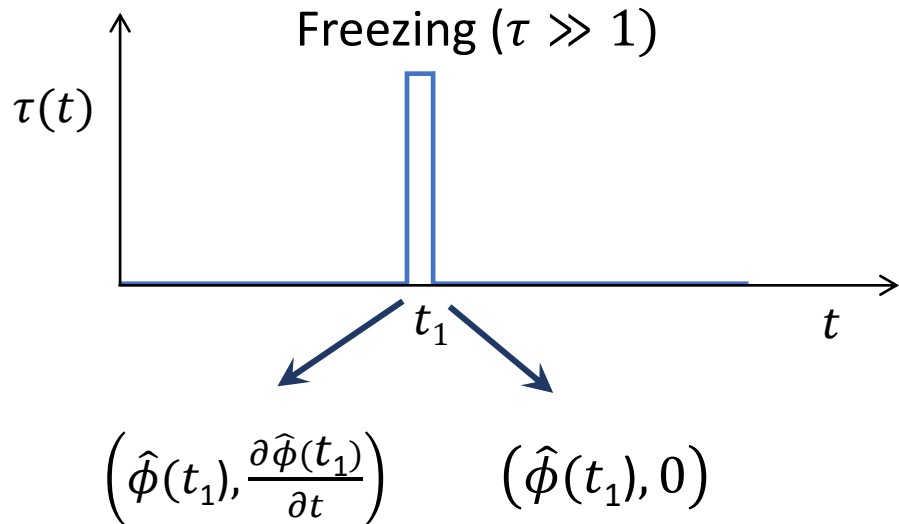
DAMPING-DRIVEN TIME REVERSAL OF WAVES

- Let us consider a wavefield described by:

$$\frac{\partial^2 \hat{\phi}(\mathbf{k}, t)}{\partial t^2} + \tau(t) \frac{\partial \hat{\phi}(\mathbf{k}, t)}{\partial t} + \omega_0^2 \hat{\phi}(\mathbf{k}, t) = 0$$

↑
Time Irreversible term

We apply a damping pulse:



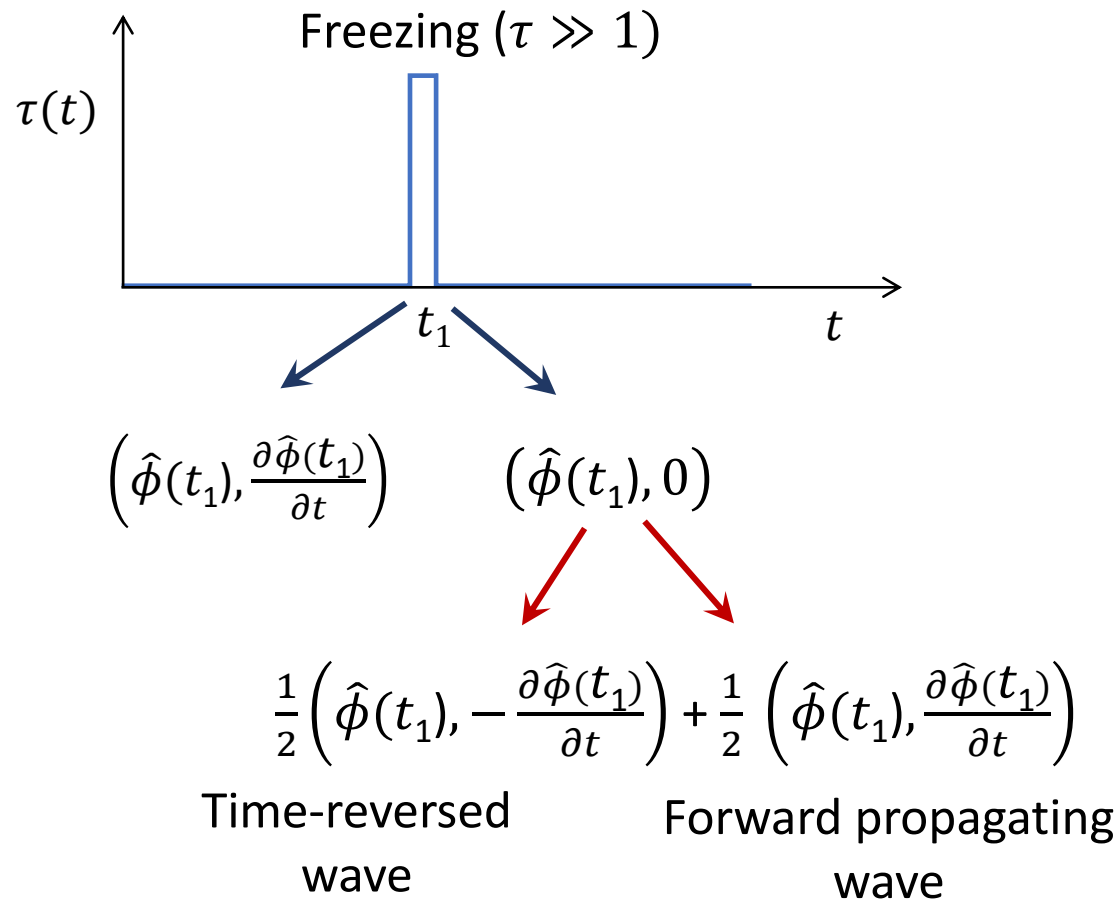
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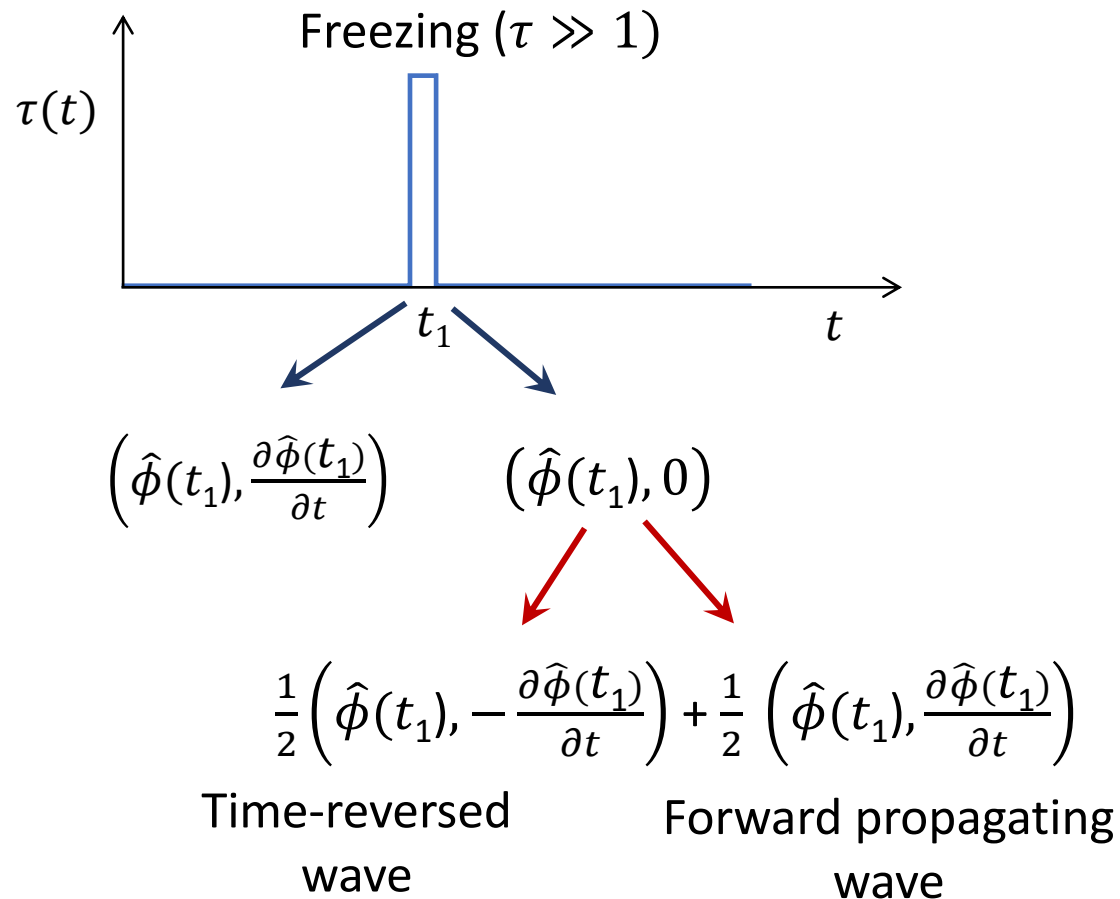
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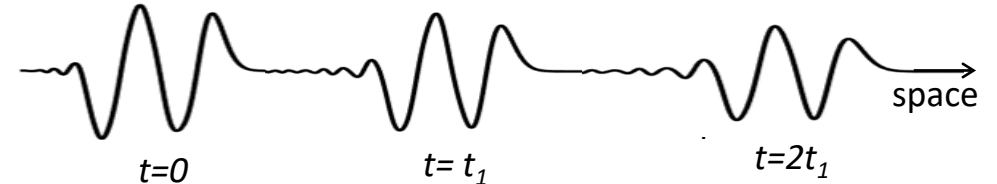
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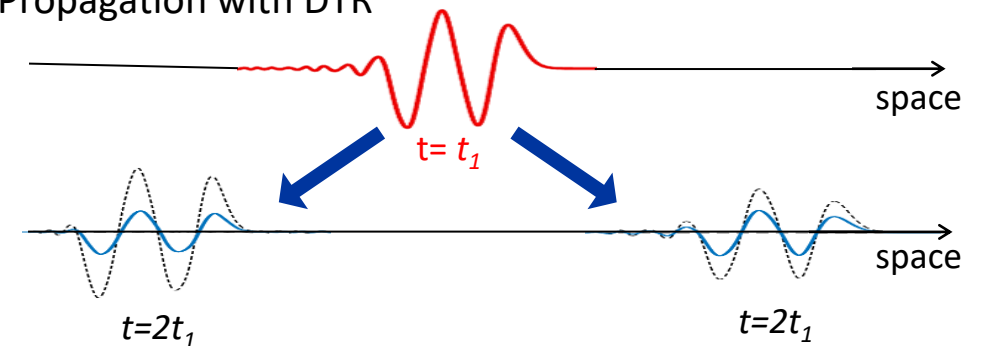


Comparison of the wave propagation

(a) Propagation without DTR

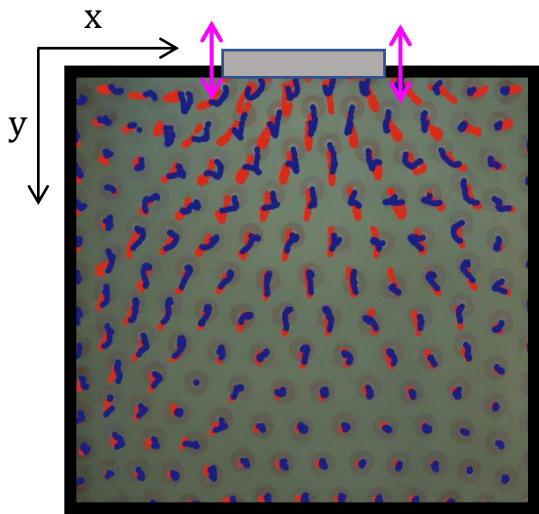
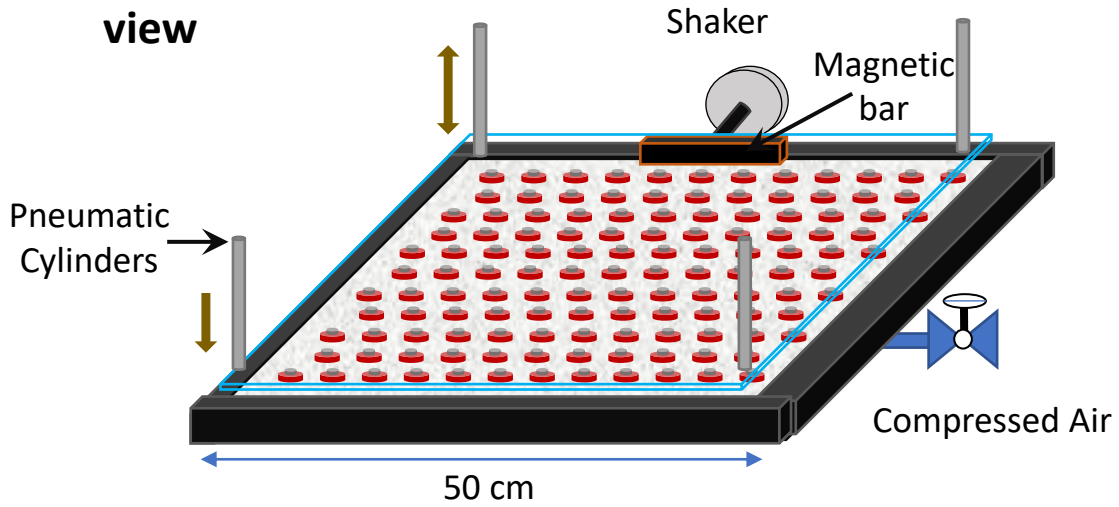


(b) Propagation with DTR

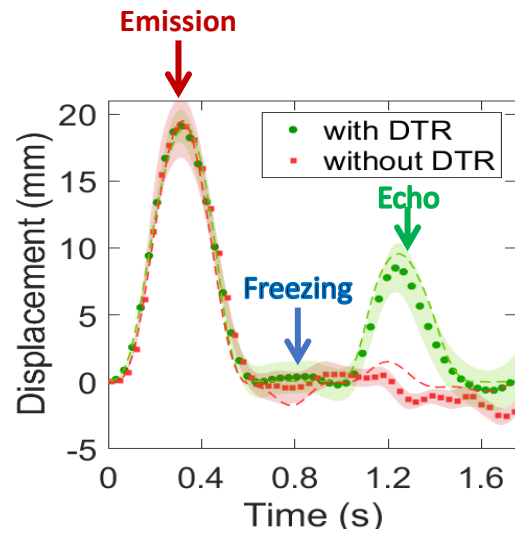


1. EXPERIMENTAL DEMONSTRATION

Isometric
view



Particle Trajectories

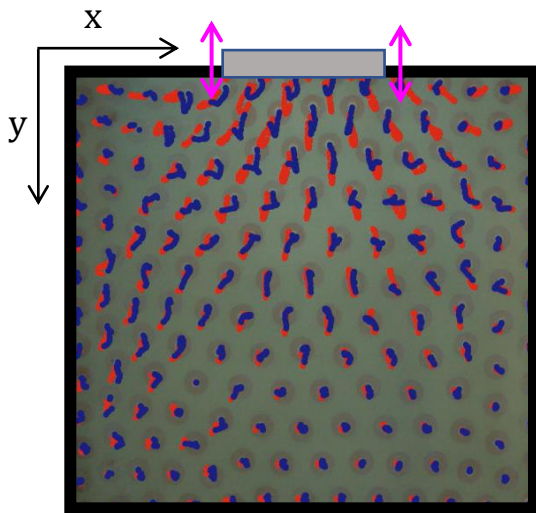
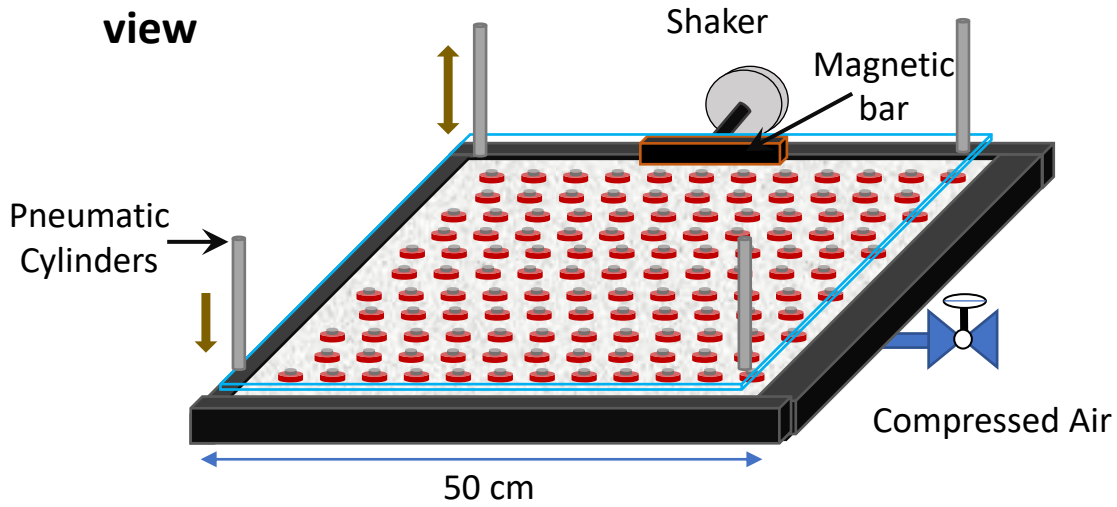


Y-Particle displacements
around the source

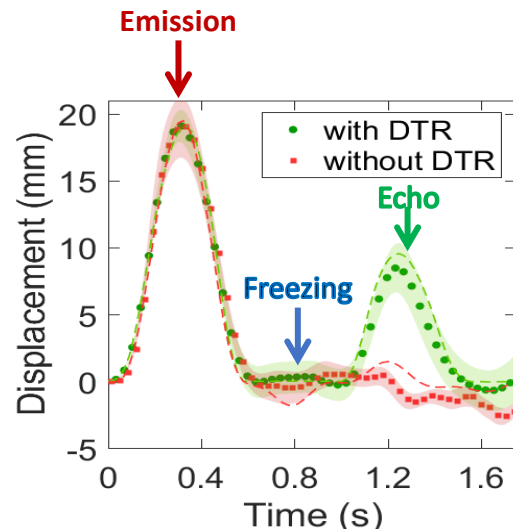
1. EXPERIMENTAL DEMONSTRATION

2. WAVE KILLING STRATEGY

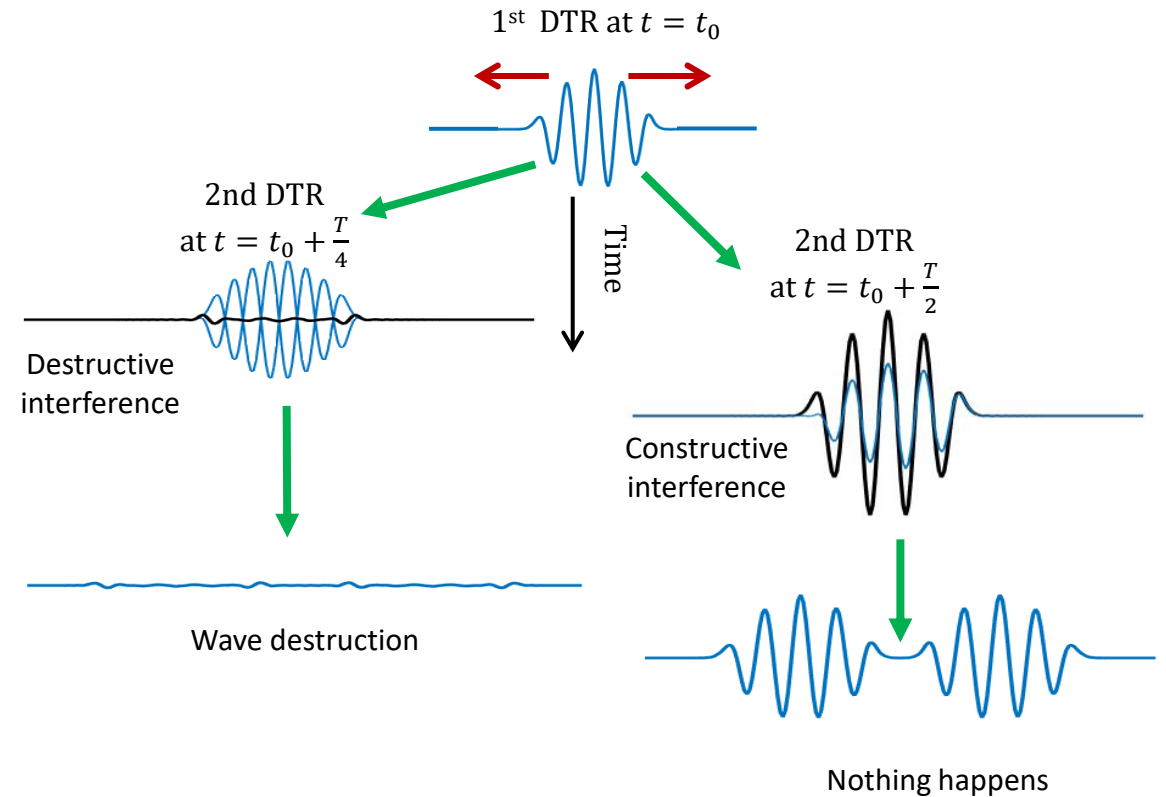
Isometric view



Particle Trajectories



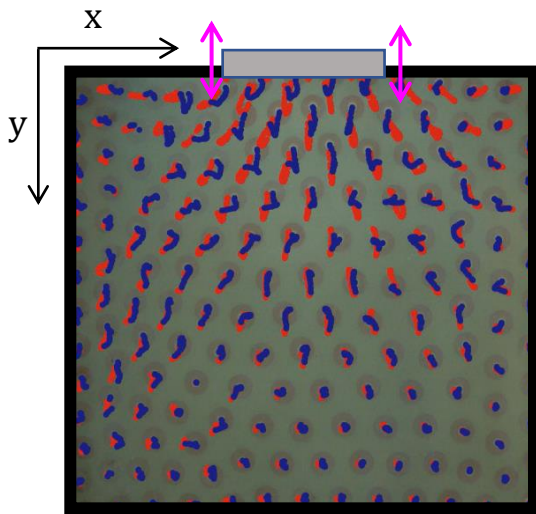
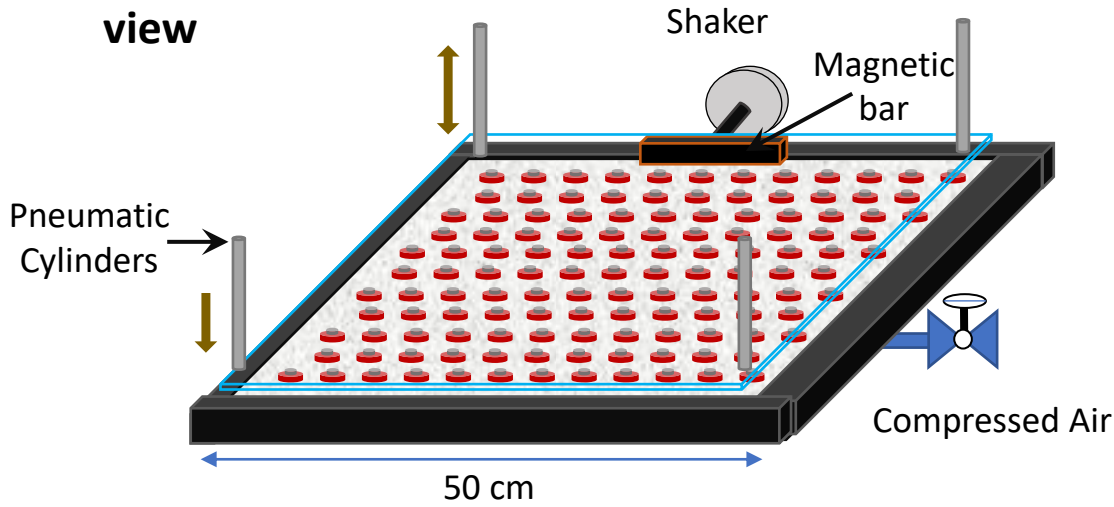
Y-Particle displacements around the source



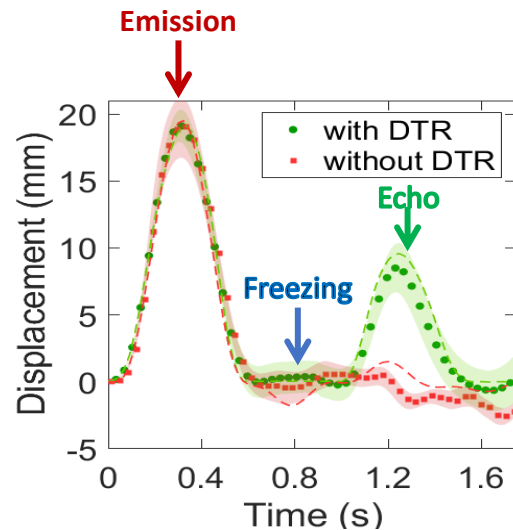
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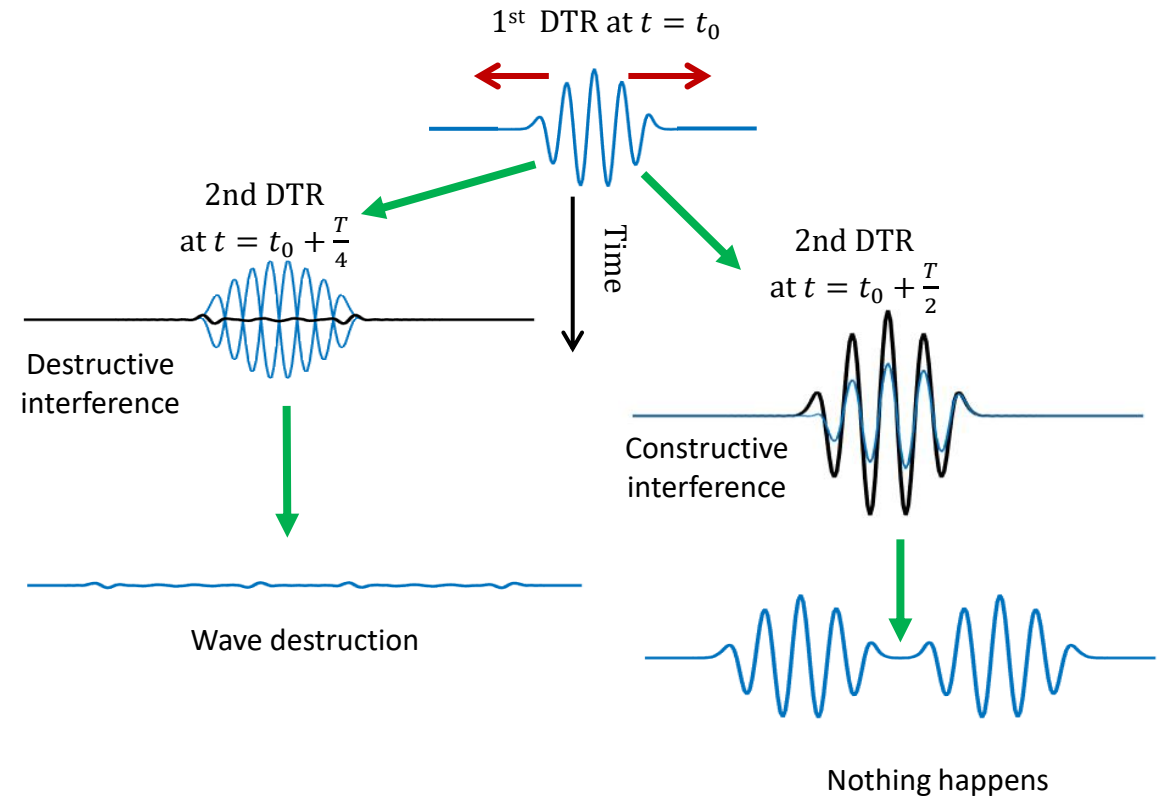
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3. WAVE ENGINEERING

