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From frequency to time domain: Signal features and physical characteristics for resonant acoustical systems

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The determination of the impulse response or the reflection function of an acoustical system from data expressed in the frequency domain is not immediate. Signal processing from frequency domain to time domain should involve phenomena of large amplitude as oscillations known as "ripple" that does not correspond to any physical phenomenon.

The "ripple phenomenon" will be analyzed from both a signal processing and a physical point of view with the help of simple duct acoustic examples. A map designed as a new time-frequency tool helps us to show that it cannot be removed in most cases without the use of processing techniques involving modifications in the computed signal. This work has been developed for the automotive research, but can be applied to musical acoustics or to any field connected with time domain exploration of acoustic cues.