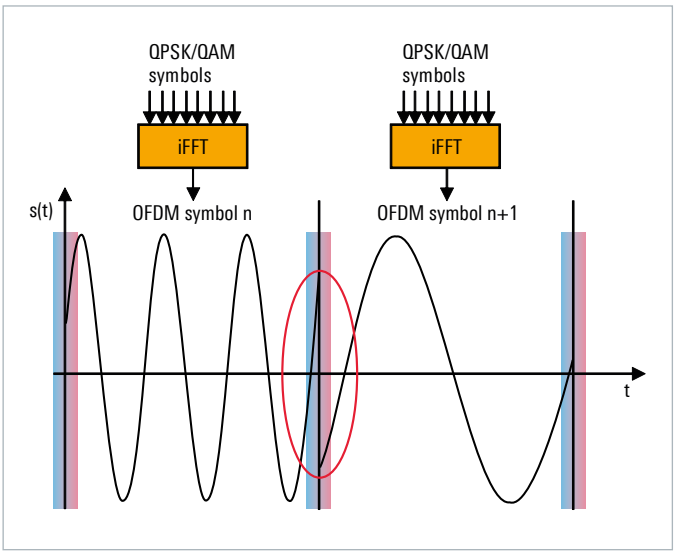
Smooth your LTE signal Application

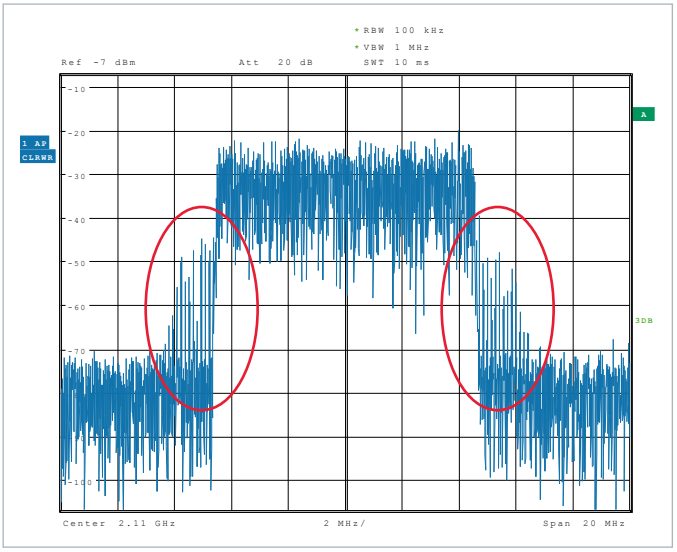
Time windowing and how OFDM impacts the shape of your LTE signal

The transmission scheme used also has a major impact on the shape of a signal. The spectrum of an OFDM signal shows spectral spikes that are caused by the discontinuity between two OFDM symbols during signal generation.



The OFDM principle leads to discontinuities between two consecutive symbols.

The R&S®SMU200A vector signal generator offers an extended feature set for LTE signal generation.



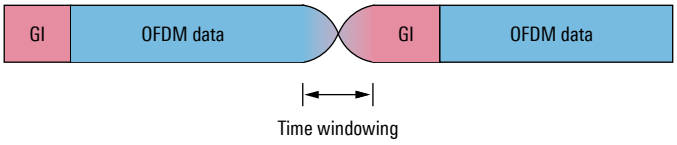
Spikes on both edges of the spectrum result from discontinuities at the transition between two consecutive OFDM symbols.

Your task

Since 3GPP does not specify a filter for LTE, the receiver cannot rely on a defined signal shape like in 3G. This creates possibilities and also presents challenges. The design engineer can optimize the transmitter chain for an LTE signal either for in-channel performance (transmit quality, e.g. EVM) or for out-of-channel performance (ACP, SEM). The challenge is to find the right balance between both.

T&M solution

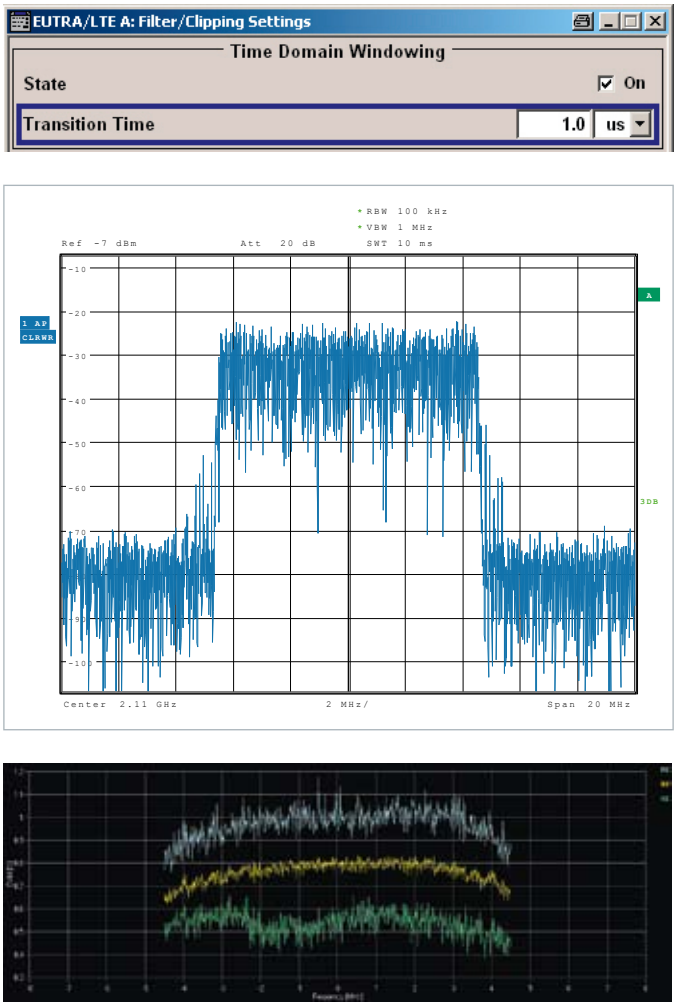
To reduce these spectral spikes, time domain windowing can be applied during signal generation.



Smoothing the transition between two consecutive OFDM symbols reduces the spectral spikes. Rohde&Schwarz signal generators, including the R&S®SMBV100A and the R&S®SMU200A, already offer the functionality to simulate time windowing for LTE signals.

The screenshots below illustrate the impact that selecting a transition time of 1 µs and 9 µs has on a spectrum. Spectral spikes are clearly reduced with increasing transition time. While spectral spikes can be minimized by applying time windowing, the EVM performance degrades because time domain windowing acts like an artificial intersymbol interference (ISI). The R&S®FSQ and R&S®FSV signal and spectrum analyzers enable detailed evaluation of how time domain windowing impacts the signal.

The extensive feature set, including time windowing, as well as preset and user-specific filter types available for Rohde&Schwarz signal generators enable test engineers to verify the behavior of their transmitter circuit against specified tolerances and to optimize their design to achieve the best performance.



As time domain windowing increases, spectral spikes are reduced while EVM performance degrades.

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