

FROM ELECTRONIC DESIGN AUTOMATION (EDA) TO HARDWARE IMPLEMENTATION

Linking EDA design simulation and hardware testing to enable an easy, straightforward process flow and first-pass design.



Cadence® VSS software with R&S®VSESIM-VSS software plug-in.

Your task

When designing a complex modern RF frontend or complete RF system for a 5G application or a wideband satellite link, you typically start with a simulation using an electronic design automation (EDA) tool. Obviously, you strive to minimize the number of design iterations, aiming for a first-pass design.

It is helpful to use realistic target application signals already during simulation as the latest technologies are more complex and support wider bandwidths. Ideally, you can check the resulting system level performance during

simulation using key performance indicators (KPI) such as error vector magnitude (EVM) in order to enable high data throughput in the real application using the projected signals.

Previously, it was your task to connect the findings obtained with the EDA tool with later real measurements on hardware using real-world signals and standard compliant waveforms, e.g. for 5G and Wi-Fi, or user-defined wideband digital modulation schemes for satellite links.

Application Card | Version 01.00

ROHDE & SCHWARZ

Make ideas real



Solution

In the solution presented here, we are connecting the simulated and the real world. Design tools such as the Cadence® AWR® Visual System Simulator™ (VSS) communications and radar systems design software are used to plan and design RF systems. In the process of realizing defined target system characteristics, Cadence VSS software allows looking into the required performance of function blocks and submodules such as power amplifier stages, filters and antenna matching.

Combining Cadence VSS software with the signal generation capabilities of the R&S®WinIQSIM2 simulation software and the analysis capabilities of the R&S®VSE vector signal explorer software makes it possible to directly connect design simulation with subsequent hardware testing. Cadence VSS software provides access to all relevant digital systems from 5G to the latest Wi-Fi variants and UWB, offering a considerable increase in efficiency. In addition, exactly the same algorithms are used in simulation and

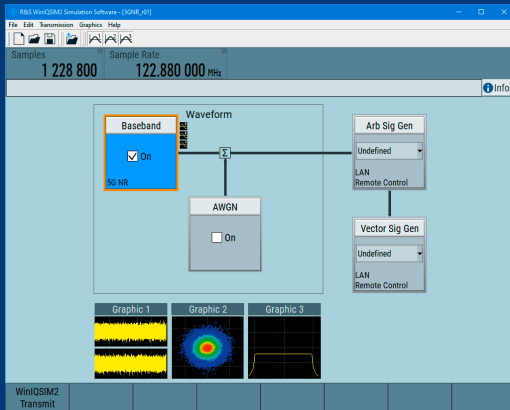
real hardware measurements, allowing direct comparison of simulated and real results.

Application

R&S®VSESIM-VSS provides the link to the EDA world. It connects all the required standards and modules of R&S®WinIQSIM2 and R&S®VSE with Cadence VSS software. R&S®VSESIM-VSS includes a plug-in for this software. R&S®WinIQSIM2 and R&S®VSE are represented by two function blocks in the EDA environment that serve as data source and data sink. In Cadence VSS software, the function blocks act as interfaces to the Rohde&Schwarz software, building the bridge between the software tools.

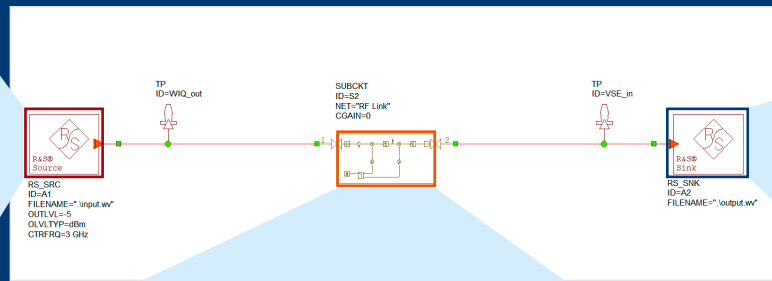
In addition to standard compliant and user-defined signal generation and analysis, R&S®VSESIM-VSS offers digital predistortion (DPD) techniques. This makes it possible to predict, already during simulation, the performance of nonlinear devices such as power amplifiers with active linearization. The R&S®FSx-K18 amplifier characterization

Software integration flow using Cadence VSS software with R&S®WinIQSIM2 and R&S®VSE

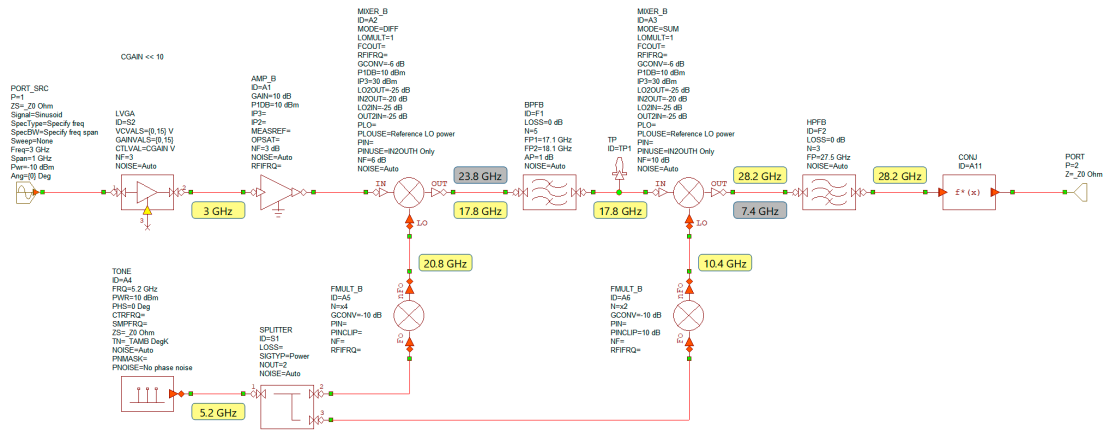


5G NR waveform generation with R&S®WinIQSIM2 simulation software.

Process flow in Cadence VSS software.



Double Upconversion RF Link



View into the "RF Link" submodule representing the DUT.

tools (options) for the Rohde&Schwarz signal analyzers are now available in the EDA environment. Direct DPD can be used to predict how the performance of an RF amplifier can be improved by applying sophisticated linearization.

Based on the linearized signal, you can derive a memory polynomial model in R&S®VSE with user-defined complexity in memory depth and polynomial order. This model can be used for subsequent real-time implementation on the target system.

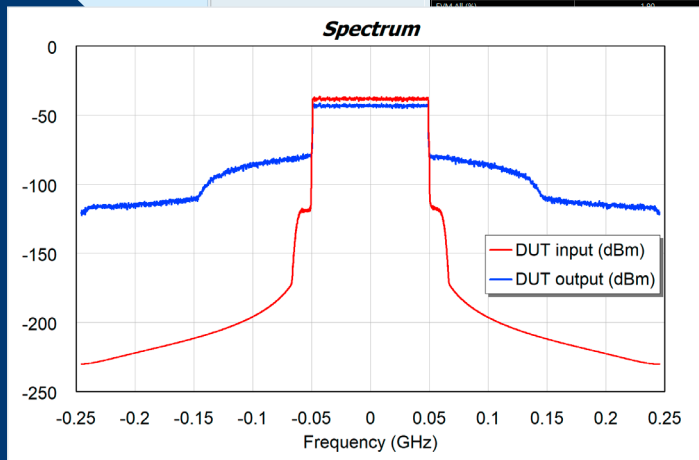
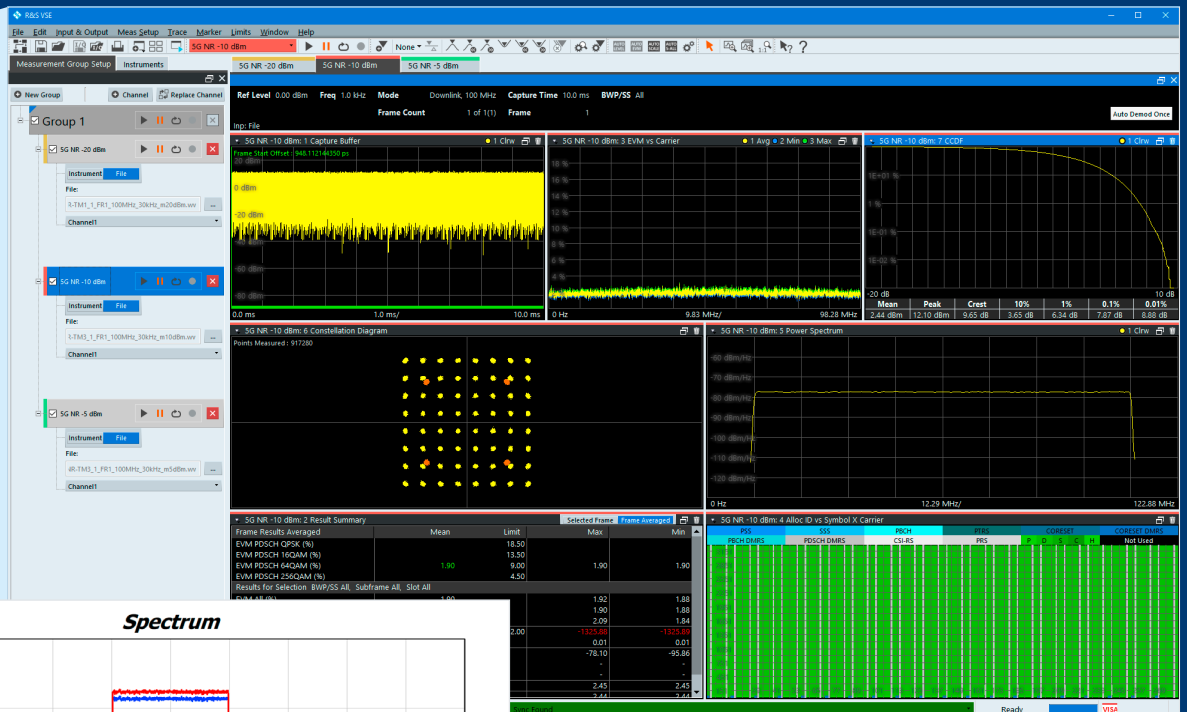
Cadence VSS software is made for system level design at various scales. Some hardware implementations may become available earlier than others. For system level performance testing, use the R&S®VSE block as a sink in Cadence VSS software to grab the signal anywhere in the signal chain. Transferring the extracted waveform to a vector signal generator such as the R&S®SMW200A provides you with a real RF signal for use in your already available hardware implementation.

Connecting to the Cadence world

Once plugged in to the Cadence world, the Rohde&Schwarz tools can also be used together with other connected Cadence products such as Cadence Microwave Office® circuit design software or the Cadence Virtuoso® RFIC and RF module design solution, enabling the use of standard compliant signals in multiple Cadence tools.

See also

- ▶ R&S®VSE vector signal explorer software www.rohde-schwarz.com/product/vse
- ▶ R&S®WinIQSIM2 simulation software www.rohde-schwarz.com/product/winiqsim2
- ▶ Cadence® AWR® Visual System Simulator™ (VSS) communications and radar systems design software www.cadence.com/en_US/home/tools/system-analysis/rf-microwave-design/awr-vss-software.html



Signal analysis with R&S®VSE vector signal explorer software.

Display in Cadence AWR VSS showing the spectrum at the input (red curve) and at the output (blue curve) of the "RF Link" DUT.

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