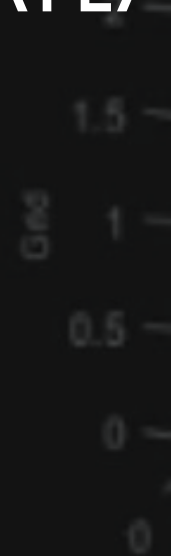


---

# Test and Verify 5G, LTE, and WLAN Systems

Ensuring Standard Compliance  
with MATLAB and Simulink

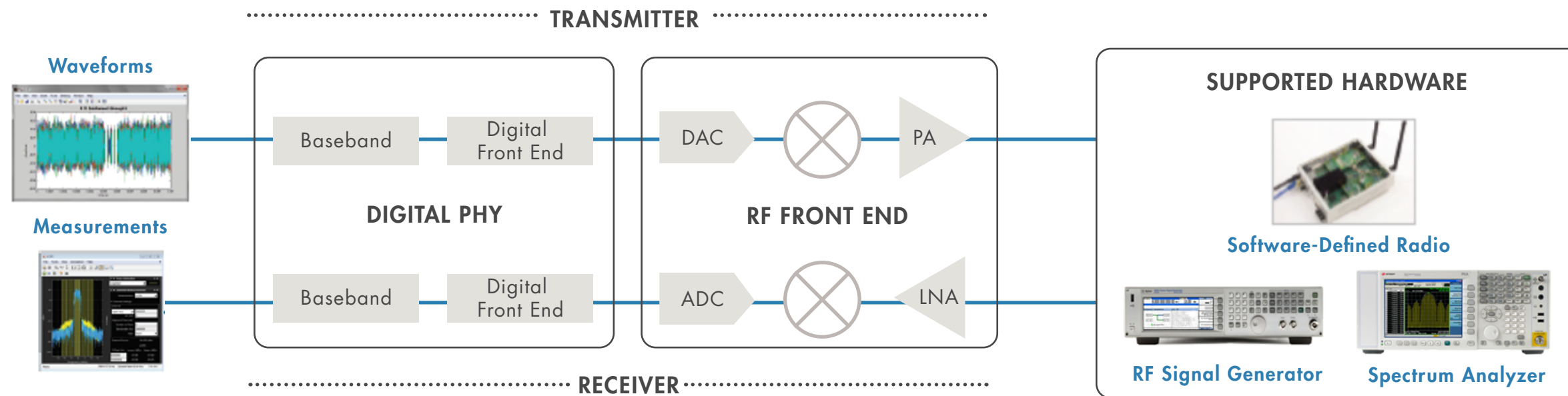


# Overview

Evolving standards and new technologies make testing wireless systems more complex. New functionalities and toolboxes in MATLAB® and Simulink® enable engineering teams to automate standard-complaint testing and verification before hardware implementation.

This ebooklet provides examples and use cases for:

- Generating customizable waveforms to verify conformance to the latest 5G, LTE, and WLAN standards
- Performing link-level simulation and analysis for physical layer design
- Automating configuration and communications with test and measurement instruments



*Wireless development and testing using MATLAB and Simulink.*

# Generating Standard-Compliant and Custom Waveforms

For engineers developing tests, MATLAB provides:

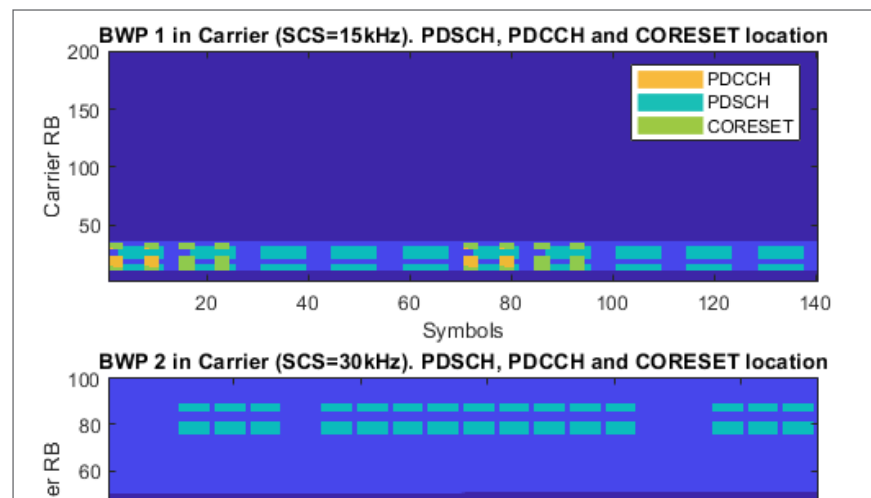
- Standard-compliant 5G, LTE, and WLAN waveform generation
- Open MATLAB for customizing waveforms and reference designs
- Interoperability with *C* and *C++*
- *Test automation and test bench reuse* to verify hardware implementation

“The MATLAB system model is used to calibrate the system and generate pre-distorted test signals... The PA and RF Systems group use this system to validate components and algorithms.”

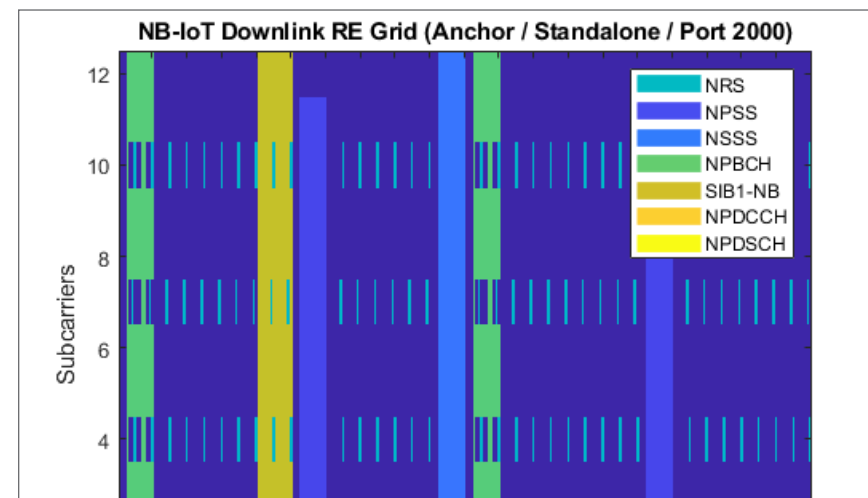
—Sean Lynch, senior staff engineer, Qualcomm UK

» [View presentation slides](#)

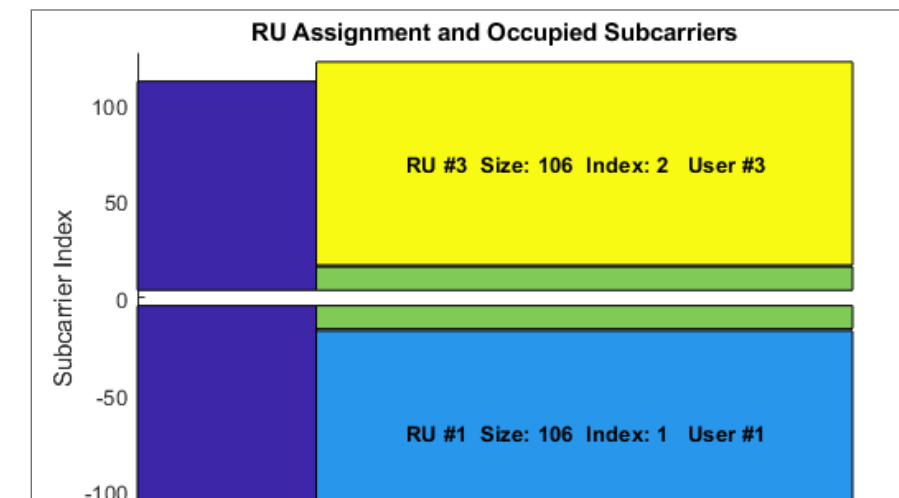
## Examples



5G Downlink Carrier Waveform Generation



NB-IoT Downlink Waveform Generation

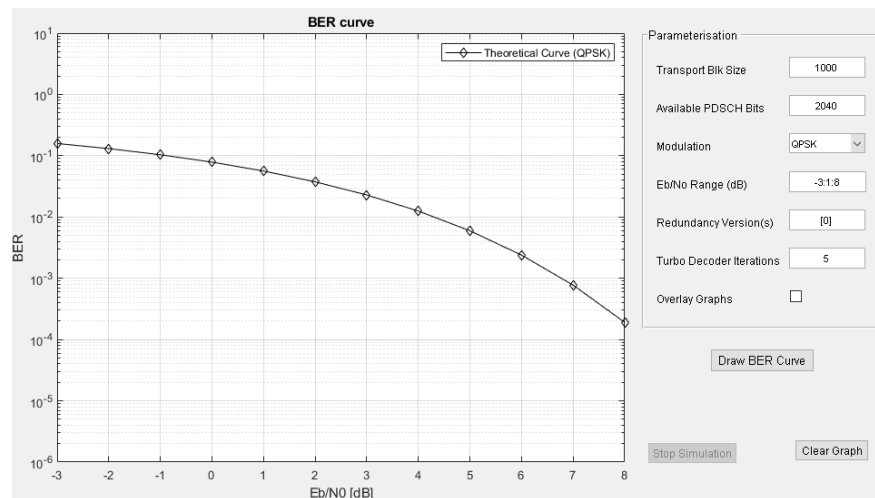


802.11ax Parameterization for Waveform Generation and Simulation

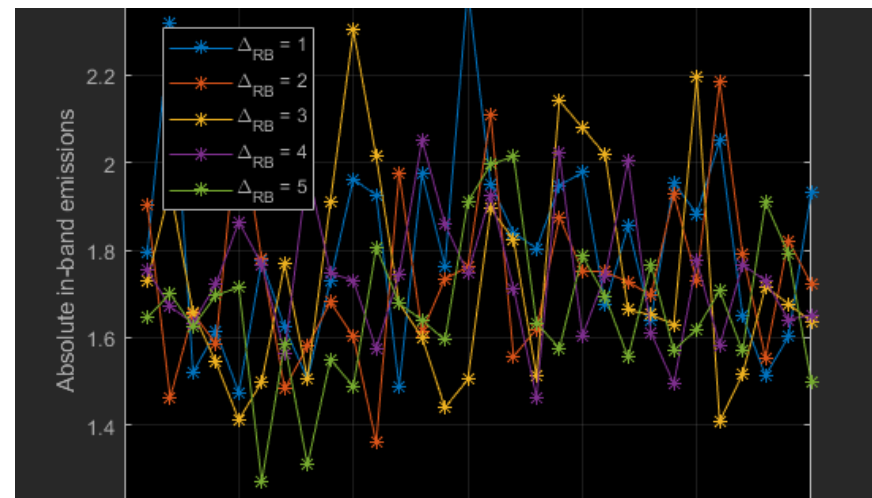
# Measuring and Analyzing Link-Level Performance

With MATLAB, you can compute standard measurements (including EVM, ACPR, ACLR, BER, MER, CCDF, constellation, and eye diagram) for visualization and analysis of communications simulations and captured test data.

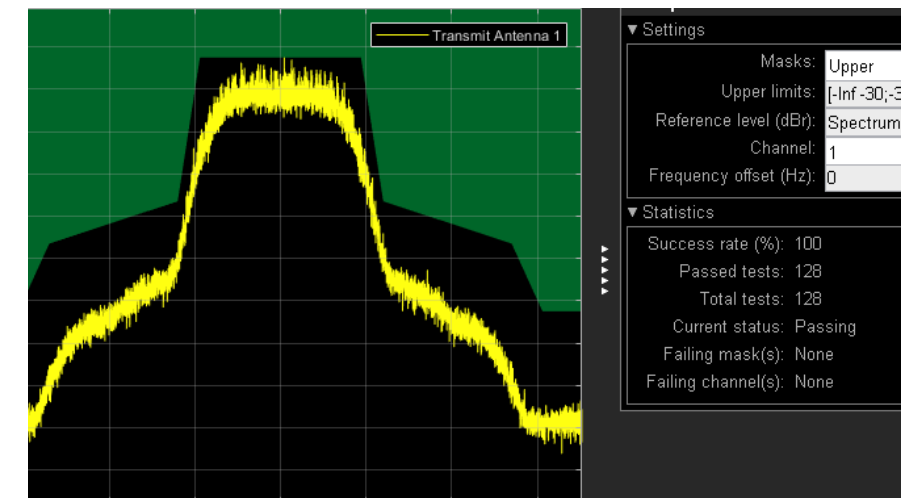
## Examples



*PDSCH Bit Error Rate Curve Generation*



*LTE Uplink EVM and In-Band Emissions Measurements*



*802.11ad Transmitter Spectral Emission Mask Testing*

# Automating Communication with RF Test Instruments

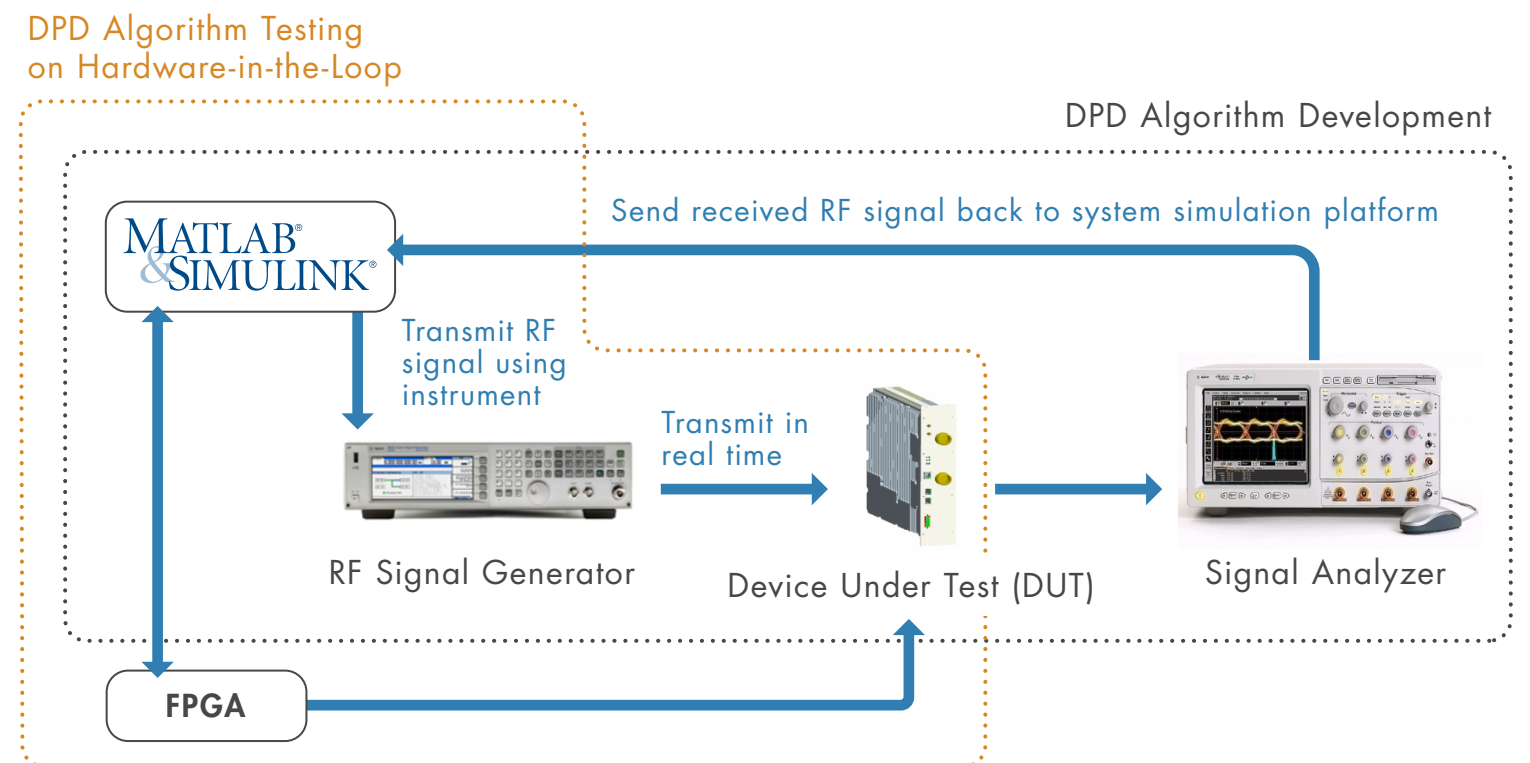
*Instrument Control Toolbox™* enables you to communicate with and configure instruments directly from MATLAB. It lets programmers and nonprogrammers:

- Control and communicate with instruments
- Read and write IQ data with instruments
- Create custom reports

“MATLAB and Simulink provide a unified and efficient system development platform to bridge between analog and digital; software and hardware; and algorithm, implementation, and verification.”  
—Erni Zhu, Huawei

» [Read case study](#)

The toolbox supports a wide range of test and measurement instruments from manufacturers such as *Keysight* and *Rohde & Schwarz*.



*Developing a radio frequency system for wireless at Huawei.*

# Learn More

*5G: Model, Simulate, Design, and Test 5G Systems with MATLAB* (27:29)

*Extracting Filter Models from RF/Microwave Measurements* (28:54)

*Waveform Generation and Testing with SDR and RF Instruments* (23:54)

