



Thoroughly Validate the Performance of C-V2X Designs

HIL solutions for V2X testing

Introduction

Autonomous driving is the future of automotive technology. Vehicle-to-everything (V2X) technology is crucial to enabling communication between vehicles and infrastructure in autonomous driving. The concept of a fully connected system emerges with cellular vehicle-to-everything (C-V2X). With C-V2X, vehicles talk with other vehicles, roadside infrastructure, and mobile networks while working to keep those nearby at a safe distance. C-V2X enables vehicle automation, reliability, dependability, and safety. Achieving the desired performance and communication quality requires V2X testing of autonomous vehicles (AVs) during research and development.

Use Case Summary

As 5G evolves, the requirements for C-V2X testing will be a moving target. The ability to thoroughly validate the performance of C-V2X designs depends on a test platform. The platform must perform RF, protocol, and application layer testing while staying current with changing test scenarios. When performing V2X testing, building a real scenario is time-consuming and difficult to repeat in extreme scenarios. In addition, the driver's safety is at risk, and efficiency is much lower.

Therefore, it is necessary to conduct V2X hardware-in-the-loop (HIL) testing before doing a road test. HIL simulation in V2X applications is safe, accurate, and repeatable. Powerful V2X test equipment is the basis of HIL systems. V2X application launches will occur in phases, beginning with Day 1 basic services. Automotive customers need a solution to simulate scenarios, including Day 1 and 2 standard scenarios and customized scenarios, in the application layer. In addition, the solution must support access layer / intelligent transportation system (ITS) protocol stack conformance test.

Solution Overview

Keysight provides a HIL solution that keeps up with the evolving 3rd Generation Partnership Project (3GPP) C-V2X standard. The solution consists of the [Keysight E7515B UXM 5G wireless test platform](#), [Keysight E7515B UXM 5G test platform software](#), GNSS simulator, V2X scene simulation platform, and C-V2X protocol stack. The V2X test equipment supports complex upper-layer scenarios such as congestion and multiple targets. The interface is open, supports the mature C-V2X protocol stack, and meets the requirements of protocol conformance testing.

The HIL system supports various mature commercial simulation platforms at the upper application and protocol layer levels. It can simulate China Society of Automotive Engineers' standard scenarios and custom scenarios. In terms of the C-V2X protocol stack, the solution supports various national standards packets and integrates extended interfaces that can support security policies.

The HIL solution supports physical layer, C-V2X protocol layer, and application layer testing, following standard and custom scenarios.

Learn more at: [Develop C-V2X with Confidence as 5G Evolves](#)

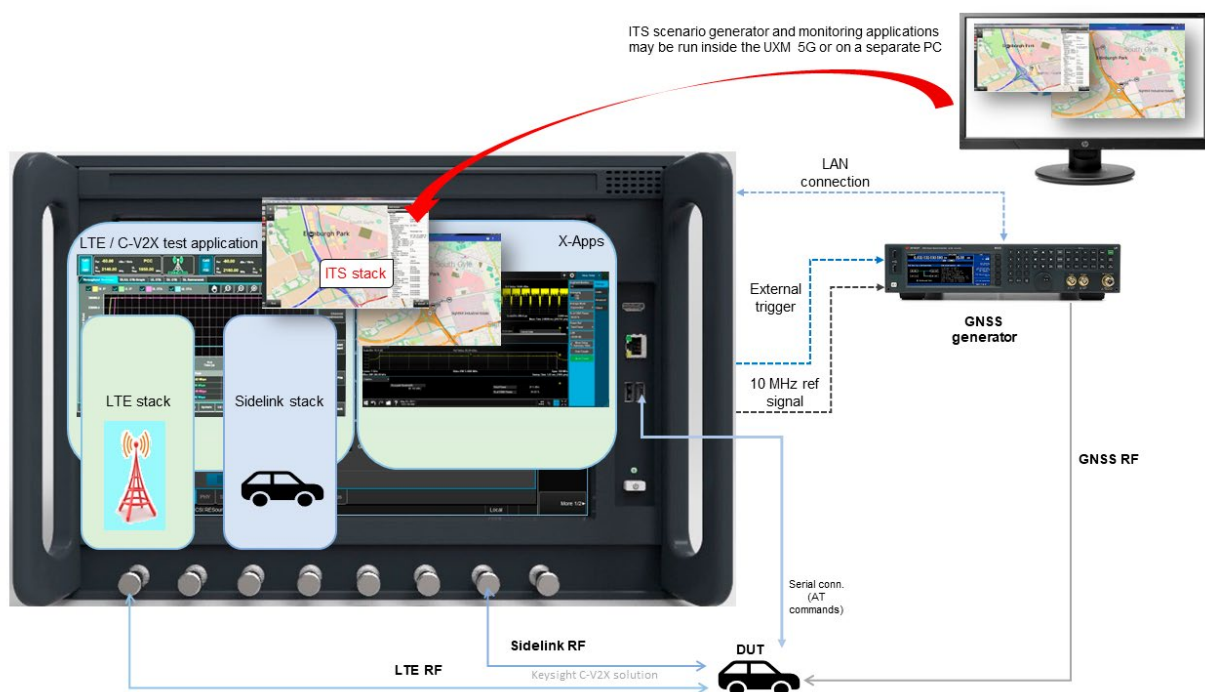


Figure 1. Overview of HIL solution for C-V2X testing

Summary

- The Keysight HIL solution supports 4G / 5G, C-V2X, RF, access layer, and ITS protocol stack conformance test.
- The solution supports Day 1 and Day 2 standard and custom scenarios such as traffic congestion.
- The open interface adapts to various scenario simulation software and supports OmniAir / 5GAA conformance test.

For more information: [HIL Solutions for V2X Testing](#)



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