SOLUTION BRIEF

PROPSIM MANET Channel Emulation Solution

Mission Critical Communications

Highly Scalable Channel Emulation Solution for MANET and Mesh Radio Testing

The need for robust wireless communications systems for mission critical operations has dramatically increased as defense organizations transition from using traditional stationary forces to rapidly deploying military forces with high mobility requirements. Ensuring the robust operation of avionics, surveillance, radar or satellite systems for mission critical wireless communications, manufacturers and military forces require the ability to test mixed networks that combine tactical and avionic radios with satellite links.

Technological advancements accelerate the need for testing large mesh network topologies with dynamically changing radio channel and interference conditions. Using the latest commercial wireless networks as the baseline for public safety networks increases the complexity of testing mission critical radios, as is the case with military LTE and upcoming military 5G. This raises the urgency of more comprehensive testing in which realistic field-to-lab simulations are used for early fault detection.

The PROPSIM MANET Channel Emulation solution addresses a wide range of challenges associated with the development of modern tactical wireless systems. The solution enables users to conduct end-to-end performance and interoperability testing of MANET (Mobile Ad-Hoc Networks) and mesh radio systems (self-forming and self-healing reliable networks that eliminate single points of failure). It delivers unrivaled performance and flexibility in terms of duplicating realistic field conditions in an accurate and repeatable manner.

KEYSIGHT TECHNOLOGIES

The PROPSIM MANET Channel Emulation Solution is a highly scalable and flexible solution that supports:

- Full mesh configurations of up to 16 radios with FS16 and 45[1] radios with F64.
- Up to 1.2GHz of instantaneous bandwidth for ultra-wideband support for testing gigabit links
- Advanced MANET test scenario building with purpose-built intuitive scenario-based user interface including access to all key radio channel parameters to address custom testing needs.

Figure 1. F8820A PROPSIM FS16

The high-performing, network level channel emulation solution replicates field-testing conditions in an easy and repeatable way:

- Scales from single link testing up to whole network level testing
- Standard and waveform agnostic testing guarantees operation with all proprietary systems
- Dynamic mesh with multipath links
- Full control of Doppler, delay, and phase
- Advanced tools for test scenario creation
- Scales from single antenna to high order MIMO, including antenna modelling

Figure 2. F8800ARF2 PROPSIM F64

Highly Scalable and Flexible PROPSIM MANET Channel Emulation Solution

Support for up to 64 Radio Mesh Network Topologies

Testing the dynamic nature of mesh networks can be challenging. The high number of possible topologies and creation of a network of radios corresponding to the real use of equipment in the field conditions can be costly, resource intensive and time-consuming. With PROPSIM MANET Channel Emulation Solution, the user can easily replicate field-testing conditions in a repeatable way in a controlled laboratory environment. The solution scales from single link to whole network level testing

[1] Release 4 capability, end of 2020.

Scalable Use of Resources and Bandwidth

Starting from testing a single pair of radios with 2 TRX configuration, PROPSIM FS16 offers a cost-efficient solution for starting the testing of MANET public safety radios. Extending the number of channels up to 16 guarantees a flexible growth of testing capability while constantly maintaining the same efficient tools for defining the use case scenarios. The user can also synchronize multiple devices within same test environment – and if that is not enough, the biggest channel emulator in the market, PROPSIM F64 with 64 radio channels, is fully compatible with the PROPSIM FS16.

The wide signal bandwidth support – up to 1.2GHz – enables testing the widest tactical radio links as well as frequency-hopping within a single channel.

Full Testing of Arbitrary MANET Radio Systems

PROPSIM MANET Channel Emulation Solution is compatible with any type of wireless links and system parameters, which enables the user to test radios with any type of arbitrary waveform. The standard independent file-based emulation engine guarantees operation with any proprietary radio systems.

Industry Leading Channel Modeling Tools

PROPSIM MANET Channel Emulation Solution uses an intelligent Scenario Wizard that guides the user through the first steps to ensure a simple set-up procedure. Users can create dynamic scenarios and advanced modelling of an entire operational environment, including multi-link and multi-antenna configurations.

PROPSIM MANET Solution offers the most accurate signal fading processing in terms of time, phase and amplitude, all within an easily configurable user-interface with powerful options:

- Built-in input power measurement
- Fully automated phase and amplitude calibration without the need for a vector network analyzer
- The most accurate channel modelling technology

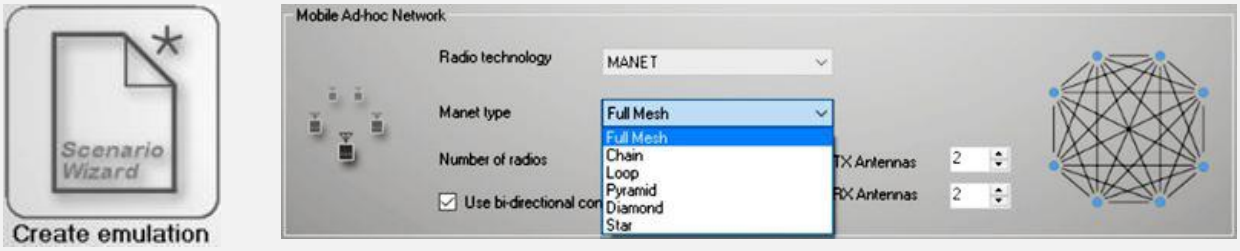

Figure 3. Easy-to-use Scenario Wizard guides the user through the first steps of the set-up procedure

Easy Operation Across a Vast Range of Functions

PROPSIM MANET Channel Emulator platform offers complete testing with real radio hardware and RF equipment. The radios are exposed to realistic link and radio conditions in a controlled laboratory environment. The accuracy requirements of the system exceed even the most demanding specifications of modern tactical radios, including the linearity requirements for 256 QAM and 1024 QAM-modulations.

The PROPSIM platform supports all arbitrary systems and the most advanced standard technologies and wireless systems, including multi-user MIMO, beamforming, smart antennas, CoMP, carrier aggregation, HetNet and multi-RAT. This makes PROPSIM MANET Channel Emulator a highly capable multi-purpose tool. PROPSIM platform supports all arbitrary systems and the most advanced standard technologies and wireless systems, including multi-user MIMO, beamforming, smart antennas, CoMP, carrier aggregation, HetNet and multi-RAT. This makes PROPSIM MANET Channel Emulator a highly capable multi-purpose tool.

Virtual Battlefield in the Laboratory

Keysight's PROPSIM FS16 and F64 units scale up to a full battlefield simulation with large scale mesh topologies. The possibility for automated 24/7 testing and ATE remote control interface (LAN) enables unattended, cost-efficient and quick test case execution.

Fully connected mesh networks (full mesh) require N x (N – 1) number of interlinks between radios. This is the most resource demanding scenario. In this connection, every radio can hear every radio. All the links are bidirectional (TX/RX). In the following table the maximum number of digital links is a result of full mesh connection.

PROPSIM model	Amount of RF channels with 160MHz bandwidth	Max. number of digital channels with 1 to 16 MIMO split	Max. number of radios in full mesh
FS16 – 2ch	2	32	2
FS16 – 4ch	4	64	4
FS16 – 8ch	8	128	8
FS16 – 16ch	16	256	16
F64 – 8ch	8	128	8
F64 – 32ch	32	512	23
F64 – 64ch	64	1024	32

Table 1. Resource scaling and full mesh topologies

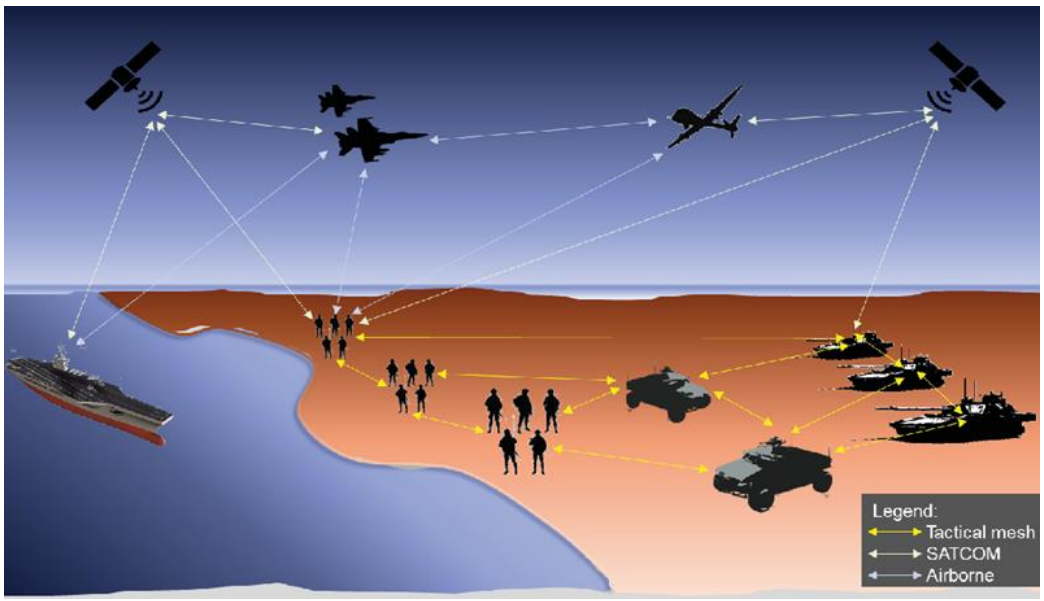

Figure 4. Bringing the virtual battlefield into a laboratory environment

Keysight Radio Testing Solutions

Keysight's PROPSIM MANET Channel Emulation Solution secures end-to-end performance and interoperability of MANET and mesh radio systems. The industry-leading solution enables users to easily replicate field-testing conditions in a repeatable way to ensure the robust inter-operation of avionics, surveillance, radar or satellite systems for mission critical wireless communications, manufacturers and military forces.

- For more information about Keysight's MANET and mesh testing, visit www.keysight.com/find/propsimmanettesting
- For more information about Keysight's PROPSIM F64 and FS16, visit http://www.keysight.com/find/PROPSIM

Keysight's PROPSIM Channel Emulation Solution delivers advanced and cost-efficient performance assessment of satellite and ground networks for the expanding satellite communications market. Keysight' industry-leading performance validation solutions enable the aerospace industry to capitalize on opportunities that will help establish commercial success and deliver new technology breakthroughs in space exploration, scientific research and satellite communications.

- For more information about Keysight's PROPSIM Aerospace Testing, visit www.keysight.com/find/propsimaerospacetesting

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES