ETS-Lindgren Software Bulletin

Date October 15, 2021

Issue Highlights

- 5G FR1 SISO and MIMO
- 5G instrument latest modes supported
- Wi-Fi 6e and 5G A-GPS solutions
- TILE! version 7.6 is new
- mmWave RSE test highlight
- Full TILE! version summary
- EMQuest and TILE! users group virtual sessions

5G FR1 SISO Test Case Updates

Four 5G network emulators have driver support in EMQuest available as of this date with band and mode support according to the following table.

Brand	Model	Frequency Range	Modes Supported
Rohde & Schwarz	CMW500 + CMX500	FR1	NSA, EN-DC & SA
Keysight	UXM-5G	FR1 & FR2	NSA, EN-DC & SA
Anritsu	MT8821C + MT8000A	FR1 & FR2	NSA, EN-DC & SA
StarPoint*	SP9500	FR1	NSA & SA
*available in China and Taiwan			

Extensive driver development is ongoing for all models to add bands and combinations of bands for carrier aggregation. LTE band 53 and New Radio bands N13 and N26 are newly available for all instruments. 5G network emulators continue to evolve, so new EMQuest feature support are highlighted for each brand below.

Anritsu's MT8000A now offers LTE + NR without the need of the MT8821C in some cases. Verizon's extensive carrier aggregation scenarios still require both units to cover all combinations, but some labs may see benefit in a single box MT8000A. The EMQuest driver for the MT8000A "single box" is moving quickly, so please check with your sales representative to get the latest coverage across the RF cards. LTE P-MAX measurement was added for MT8821C. For MT8000A, new measurements for SRS PUCCH, PBCH Block Power and CORESET ID for RA response were recently added.

Rohde & Schwarz's CMX500 stand-alone (SA) mode has been stabilized and is now available within the driver. The CMX FLEXX configuration added LTE SISO and MIMO measurements in SA and EN-DC modes.

For CMW500 firmware version 3.8.30 onward the early exit NB-IoT measurement is now supported. The measurement "additional spectrum emission" was extended to include band LTE band 53 on CMW500.

Keysight's UXM-5G driver has added an early exit condition box for test case 15.26.4.
XX and significant new band additions including:

53	N13	N26	N48	N50	N14	N18	N30	N65	N74

5G FR2 SISO Test Updates

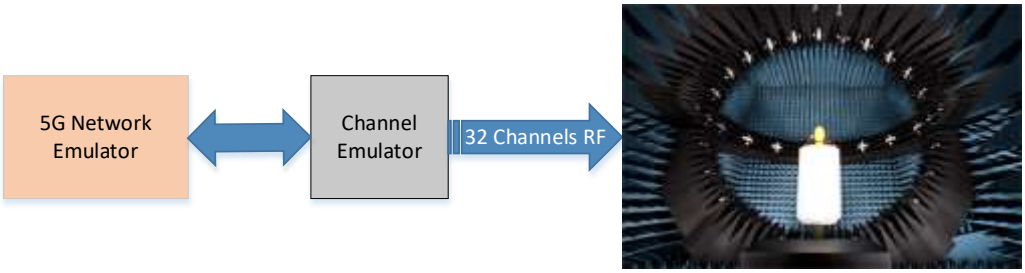
Significant driver work on FR2 capable instrumentation has yielded enhancements to FR2 beam lock/unlock functionality. Beam peak search and tests that rely on knowing beam peak as a prerequisite will be significantly faster in the latest versions of EMQuest and associated drivers for the Anritsu MT8000A and Keysight UXM-5G. FR2 antenna pattern measurements are stable on the MT8000A and UXM-5G remote radio heads, with CMX500 support pending additional development.

FR2 test improvements:

a. Fixed skip point value on call drop
b. Fixed hanging on equipment initialization failure
c. Added check for beam lock on each measurement and on reconnect after call drop
d. Improved efficiency - changed to reverse iteration for measurement polarization and started moving positioners at the same time
e. Fixed Re-measure with aborted data
f. Updated UI to distinguish between Link and Measurement polarization in 5G TX Beam Peak Search test
g. QZ Characterization - Added linearized phase normalization and phase variation calculations for rotary scan procedure

EMQuest 5G FR1 MIMO test solution available

5G MIMO is pretty well defined for this early in the technology cycle. The FR1 MIMO tests will borrow heavily from LTE, but a split between the 3GPP and CTIA approach is possible. 3GPP FR1 MIMO tests will utilize 16 probe antennas on a ring with each receiving a signal with a channel model applied. CTIA will follow a similar path, possibly using only 8 MIMO ring antennas rather than 16. 5G capable channel emulators supported by EMQuest for the FR1 MIMO tests include Keysight's PROPSIM and Spirent's Vertex® products.



FR2 MIMO will diverge from FR1 significantly, likely requiring a specialized chamber. CTIA is working on a concept with the MIMO array clustered rather than spaced equidistant around a ring. Most RF channel emulators operate on signals below 6 GHz, so frequency converters will likely be used after the fader rather than taking on the expense of high frequency fading. From a software point of view, EMQuest drivers for FR2 capable test equipment exist, but the RF design is being examined carefully. CTIA and 3GPP are in the early stages of definition for these tests, so additional information will follow in later bulletins.

5GNR A-GPS / GNSS / LBS Test Case Support

5G assisted GPS (AGPS) test cases will be available soon for the Spirent 8100 platform. Initial work has also started on a 5G AGPS test package using the R&S SMBV vector signal generator and CMX500, roadmap for supporting this solution is mid-2022. The test package using Spirent's 8100 is currently in beta form with a full release expected in November or December 2021. Support for the L5 band and other positioning systems like GNSS are on the roadmap, but A-GPS is the highest priority.

Wi-Fi 802.11ax and 6e Wireless Test Package

ETS-Lindgren announces support for Wi-Fi 802.11ax tests in the legacy 2.4 GHz and 5.8 GHz bands as well as the newly opened extension band from 5.925 GHz to 7.125 GHz. Current support for client or access point mode is available for 802.11ax, with focus on TRP and TIS tests. EMQuest controls either the Anritsu MT8862A with a modified RF frontend or the R&S CMW500 with an external frequency up/down converters for the 6e band. Devices can be stepped through various modes and bandwidths up to the full 160 MHz supported in the 6e band. Most chambers will require new amplifiers and measurement antennas for the 6e band since legacy systems were limited to 80 MHz bandwidth and 6 GHz upper frequency. Solutions for 802.11ax and 6e will be evaluated for each chamber to ensure this test package delivers all the hardware and software necessary, so please contact your sales representative with questions and requirements.

EMQuest™ User Group Meeting

Our goal was to hold EMQuest Users Group meetings about every 6 months and there was much content planned to cover a wide range of topics. With COVID forcing virtual meetings, we have adopted the virtual format as well rather than waiting for trade shows and standardization meetings to gather in-person. While we miss the in-person interaction, there is much to be gained by keeping the schedule and even making these meetings available on-demand.

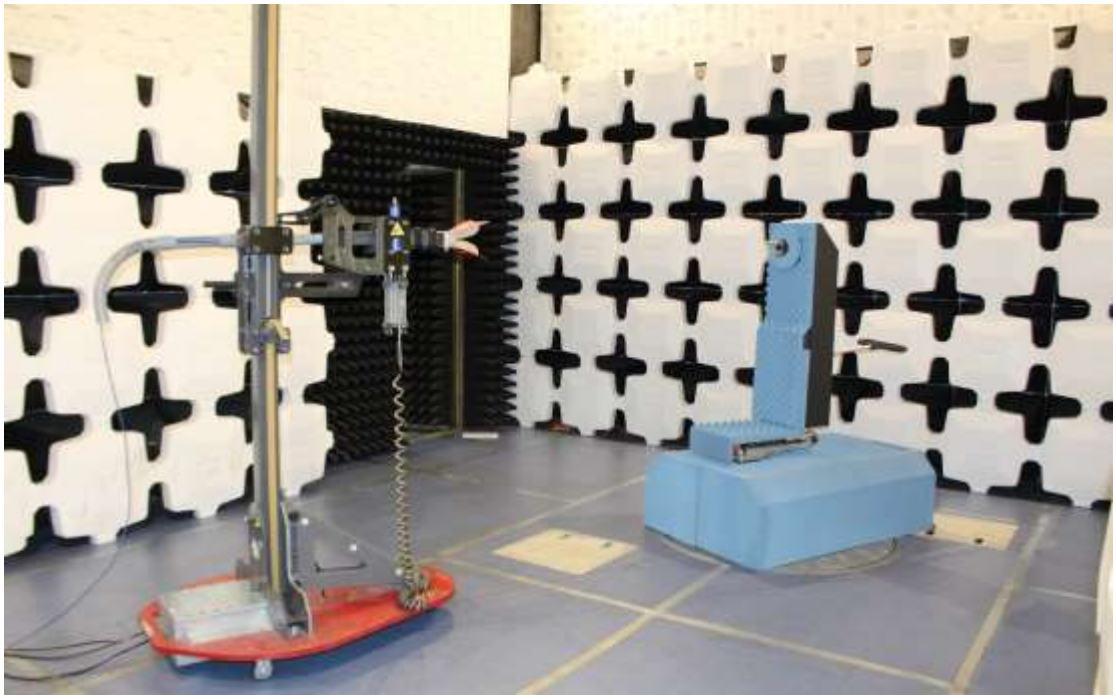
The next EMQuest Users Group Meeting is planned for December 2021, but as of this writing no firm date is scheduled. An update on 5G instrumentation and roadmap topics is the planned topic, possibly reporting on the 5G LBS and Wi-Fi 6e development efforts as well. Announcements will follow as soon as we can pull the content together.

TILE! Version 7.6

The latest TILE! Version is 7.6.2.10 and the change log is always available on the support portal found at https://support.ets-lindgren.com/tile/downloads?Page=downloads. The change log can also be provided upon request from your sales contact in case you want to verify an issue or bug you are seeing has been fixed in a later version. Keeping up with new instruments and changing firmware versions alone seems to drive monthly version turns, but the TILE! software team is keen to roll out requested features as well, driving a good pace of new versions available to those in maintenance.

COVID restrictions for travel and witnessing tests in person seems to have given labs extra time needed to fine tune their TILE! scripts. Michael Christopher and team received many suggestions and much feedback from the TILE! Gurus across the world for implementation within release in TILE! 7.6. Significant scripting capabilities were added or improved upon in this version that will aid your optimization efforts. Additionally, several new instrument drivers have been added, including SteppIR's active antenna, Ceyear instruments, and the R&S ZNx series.

TILE! 7.6 also supports ETS-Lindgren's newly released mobile 3D device positioner. The mobile MAPS was developed for radiated spurious emissions measurements on mmWave radios like those found in 5G smartphones and related devices. This mobile MAPS moves the DUT in azimuth and elevation while the very expensive and fragile instrument and antenna kits stay stationary. Considering the antennas, cables, converters and instruments necessary to reach up to as high as 330 GHz, as prescribed by RED, FCC, 3GPP and others, we feel moving the device and keeping the measurement kit at rest is the better approach. Pictured below inside the 3 meter semi-anechoic chamber at ETS-Lindgren headquarters in Cedar Park, Texas, the mobile MAPS, frequency extender kits, and TILE! spurious emissions measurement routines can be added to your present chamber to automate RSE tests to the greatest extent possible.



If you have evaluated the requirements of radiated spurious emissions tests up this high in frequency you likely noted a highly complex and expensive test setup. On the DUT side, getting the worst case transmission mode, locking the beam, and then finding the beam peak is necessary before any measurements even begin. The 5G network emulator and FR2 remote radio heads likely need to be inside the chamber and hidden behind an absorber fence to avoid interference, thus requiring remote control. Additionally, we have found a preview rotation of the DUT is often require to verify the data session can be maintained even with device movement. Our initial tests and simulations also predict that harmonics and spurs will not be pointing in the beam peak direction, so knowing the peak for the main transmission only helps for the in-band and adjacent band tests. Once all this is stable and known, now the spurious and out-of-band tests can begin.

TILE 7.6 interfaces with EMQuest for mmWave RSE, with EMQuest commanding a 5G network emulator and finding the beam peak of the transmission and then triggering TILE! to search for spurious or harmonic emissions outside the transmitter pass band. Considering all the measurement equipment must be inside the chamber and operated remotely and seven or more antenna changes will be necessary to fully characterize the device, software automation of this test seems mandatory. TILE! and EMQuest make a great team when you are ready to add this capability to your lab. Adding the mobile MAPS helps protect the hugely expensive measurement instrumentation by keeping everything at a fixed height. Cable paths can be kept short and fragile connectors, converters and antennas are kept stable and protected.

As noted, TILE! Version 7.6 was released in October, 2020 with 25 major enhancements, improvements and changes compared to 7.5. The software team has been busy keeping pace with driver requests and version improvements in the year since, as you can sense from the summary of changes included for each version. Also note the Windows 10 update H2 2020 required some changes to how the HASP security key is utilized by TILE! with the final 7.5 drop in September 2020 adjusting to the curve ball Microsoft threw out.

TILE! Version	Release Date	Change Summary
7.6.2.10	September 2021	ZNx driver, scripting and immunity actions expanded
7.6.2.2	July 2021	Additions to reverb method tests and scripting capacity
7.6.1.3	May 2021	Added event logging, instrument drivers, reporting capability
7.6.0.15	April 2021	Enhancements to Lumiloop and MXE drivers
7.6.0.14	February 2021	Graphing fix, MXE driver enhancements
7.6.0.12	January 2021	Holiday and EMSense probe driver improvements
7.6.0.11	December 2020	New SteppIR driver, Vectawave and ZVx driver improvements
7.6.0.10	December 2020	New driver for ETS mobile MAPS, added significant Scripting function
7.6.0.5	November 2020	Update to support Lumiloop LSProbe 1.2 version
7.6.0.4	October 2020	Release of TILE 7.6, 25 significant enhancements and additions
7.5.7.11	September 2020	Updates to HASP security key handling for latest Windows 10 release, scripting editor improvements
7.5.7.6	August 2020	New drivers for EMC_Professional products, scripting and installer improvements
7.5.6.4	July 2020	Enhanced the Explore Drivers function
7.5.6.1	June 2020	New drivers for DT3169, Innco CO3000, and MicroLambda filters, changes to Tower functions

A summary table doesn't really capture the message of the hundreds of tweaks, improvements, additions and fixes taking place. A few highlights are worth exploring.

TILE! v7.6 offers both an improved scripting engine and simulator to check the functionality of your scripts. These tools are uniquely powerful in the hands of advanced TILE! users working to optimize, de-risk or de-skill EMC tests. TILE!'s amazing flexibility and vast instrument support is built on the foundation of users scripting special functionality unique to their lab. We are constantly impressed with the ideas for test automation that TILE!'s advanced users implement, and encourage novice users to explore scripting as a way to build skills appreciated in every EMC lab.

It should be noted that version 7.5.6.x onward contain changes to instrument driver naming that should help with finding the best driver to use. Since instrument life spans are sometimes longer than the naming of the companies that produce them, a new scheme for association of drivers from Hewlett Packard / Agilent / Keysight has been implemented to help sort the Instrument Database. Driver names starting with "hp" will be listed with vendors Hewlett Packard and Agilent. Driver names starting with "ag" will be listed with vendors Agilent, Keysight, and Hewlett Packard. Driver names starting with "ks" will be listed with vendors Keysight and Agilent.

> For example, selecting Keysight in the Vendor selection list will list all drivers starting with "ag" and "ks".

Note that these changes will not take effect until the Instrument Database is rebuilt. Other improvements in the Instrument Database can also be found in version 7.5.6.4 onward.

TILE!™ User Resources

Larry Sheridan administers the TILE! LinkedIn page. We hope to build a stronger resource area for TILE! users on this page, in addition to the Q&A threads. In combination with the YouTube page, much of our scheduled content going forward will be short video highlights rather than written documents, and they will be posted to this page. If you are not a member, just link to the page and hit "request to join." https://www.linkedin.com/groups/2040739/

ETS-Lindgren's YouTube channel is another source of software information, training resources and short videos. Expect some TILE! short topic videos in the coming months to appear on this channel. Instead of writing we plan to shift to voice narrated screen grabs and other ways to highlight important software related items. They can be found here: https://www.youtube.com/c/etslindgrenvideo

TILE!™ User Group Meeting

The TILE! users group meeting was traditionally held one morning during the IEEE EMC Symposium, wherever it was held in the USA. Trade shows have morphed to virtual or been cancelled outright for nearly two years and so the TUG must adapt as well. Since we have all become power users of virtual meeting tools, we invite you to participate in the next TUG wherever you may be. No date for the 2022 meeting has yet been set, and the topics are wide open, so feel free to email tilesupport@ets-lindgren.com with your suggestions.

TILE! ™ Basics University

Due to customer demand, our TILE! experts are preparing an on-demand TILE! Software Basics Training Series that is 100% free and online! This course, served up in 10 easy-to-view modules, is perfect for any beginner as well as those looking for a refresher of the basics. The Basics University classes live on the TILE! Support Portal and are available on demand.

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