

# Fast 3D EMC/EMI Scan with Detectus Scanning System and Tektronix Real Time Spectrum Analyzers

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## APPLICATION NOTE



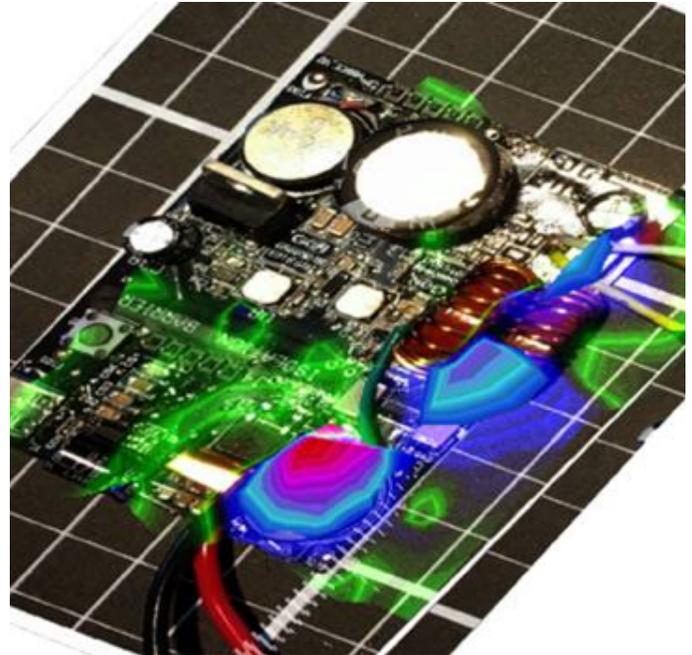


FIGURE 1. An overlapped 3D radiation pattern as obtained from the Detectus sw application.

A critical problem to solve for design engineers is insight into their design's electromagnetic performance in order to adhere to compliance standards and understand emissions and potential interference.

This is particularly true for switching power supply design and AC/DC and DC/DC converters.

With the increasing adoption of wide-bandgap based devices, power supplies are shifting to faster high voltage and high current switching waveforms that generate electromagnetic interference (EMI) in conducted and radiated emissions.

- How do engineers suppress EMI emissions below standard acceptable limits?
- How do they prove their design techniques are effective?
- How do they come to an understanding of the noise sources (for example, not only to locate them but to identify all coupling mechanisms occurring on the design board)?
- How do schematics change due to parasitic capacitances and current loops?
- How do engineers know whether their corrections are effective? How do they prove the sizing of decoupling capacitors is correct? How do they test their own designed inductance to be both effective and not impact the critical areas of the board?

These are the kind of topics that design engineers at **Eggtronic**, an Italian company working on innovative power electronics solutions, have to deal with daily.

Enrico Dente, CTO of Eggtronic, said that EMC is one of the main challenges with new designs of switching power electronics.

"I was enthusiastic to test one of our latest laboratory prototypes with the advanced 3D EMI measurement technique offered by Detectus. The board we tested is an isolated AC to DC converter based on Eggtronic's transformer-less patented technology working efficiently above the MHz threshold, thanks to the use of GaN devices and our proprietary circuit topologies. The analysis allowed us to deeply understand where and at which frequencies we could improve the product design in terms of emissions."

"It was clear to the measurement engineers to run a 3D EMC scan in order to plot in space those areas around the inductors that were radiating disturbances. The 3D scan could visualize critical frequencies for the radiation path across the board and evaluate the impact of applying the right decoupling capacitors," said Enrico Dente.

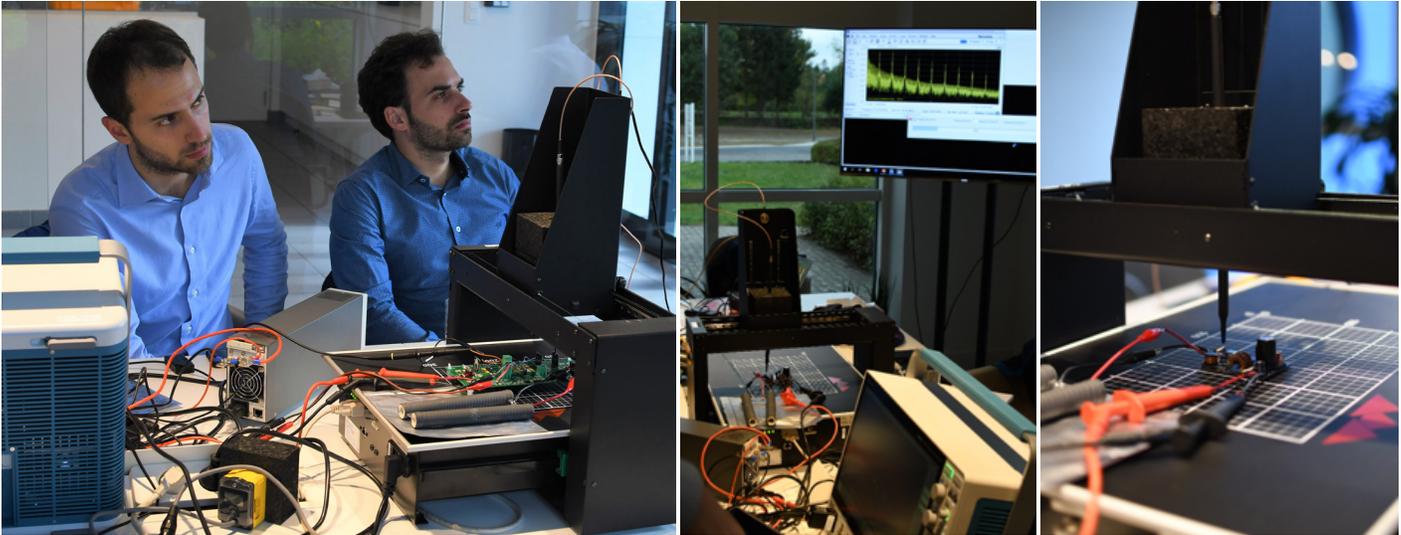


FIGURE 2. Detectus EMC scanner while performing 3D scan by moving a near field probe close by the DUT.

They found a solution combining the **Detectus EMC 3D scanner** with the **Tektronix RSA306B Real Time Portable Spectrum Analyzer**.

The customer needed to run repetitive measurements by scanning with a spatial resolution of 1mm. Running these tests on a relatively large board is time-consuming, depending on the span and resolution frequency used.

“Every single test risked lasting too long with a common spectrum analyzer. For every point of the board analysis, the acquisition needed to be completed on a whole spectrum and transferred to a laptop for processing the acquired data,” said Enrico Dente.

#### Customer Solution Summary

##### CHALLENGE

Eggtronic faced challenges in modeling the behavior of EMI emissions of their design layout in order to optimize it. The impact of applying the right decoupling capacitors on the board was strictly depend to this. This required a lot of modeling and retest and the testing time was rapidly growing increasing cost design.

##### SOLUTION

Detectus 3D EMI scan machine powered by Tektronix RSA306B real time portable spectrum analyzer.

##### BENEFITS

Detectus 3D scan machine allowed a high resolution 3D modeling of the board emission; the combination of the Tektronix RSA306B spectrum analyzer enabled an extremely fast scan procedure without compromising on span and frequency resolution.



Figure 3. Tektronix RSA306B is the core spectrum analysis system processing the acquired data.

“The best companion spectrum analyzer to avoid long acquisition time is the RSA306B Spectrum Analyzer from Tektronix. This instrument is extremely flexible, small and reasonable in cost, but the real advantage is its real time acquisition speed. That allows to collect data quickly so that the full scan can be taken in a reasonable amount of time, and repeated whenever necessary, to immediately see the effect of our design corrections,” said Enrico Dente.

According to Detectus CTO Jan Eriksson, the Tektronix RSA306B is seamlessly integrated into their 3D scan system. “It is fast and reliable in acquiring the scan across a significantly large span, even when the requested resolution bandwidth is tight. This allows our customers to minimize the test time of a 3D scan or any compromise of frequency scan resolution. This also shortens the measurement time and leaves more time for analyzing the acquired data.”

**Eggtronic** is an Italian electronics design company with R&D based in Modena, Italy and distribution and production sites worldwide. Eggtronic has over 50 international patents in the field of power electronics, wireless power transfer and car infotainment architectures. For more information, visit <http://www.eggtronic.com>

**Detectus AB** is a Swedish company that develops, manufactures and sells EMC test systems directly and through distributors worldwide. Detectus AB was founded in 1994 and has been dedicated to providing market-leading EMC scanning technology for mobile phones, home electronics, automotive and military. For more information, visit [www.detectus.se](http://www.detectus.se)

Tektronix Real Time Spectrum Analyzers and our patented DPX technology enable our customers to quickly troubleshoot their design’s electromagnetic performance. For more information, visit [Tektronix](http://www.tektronix.com).



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