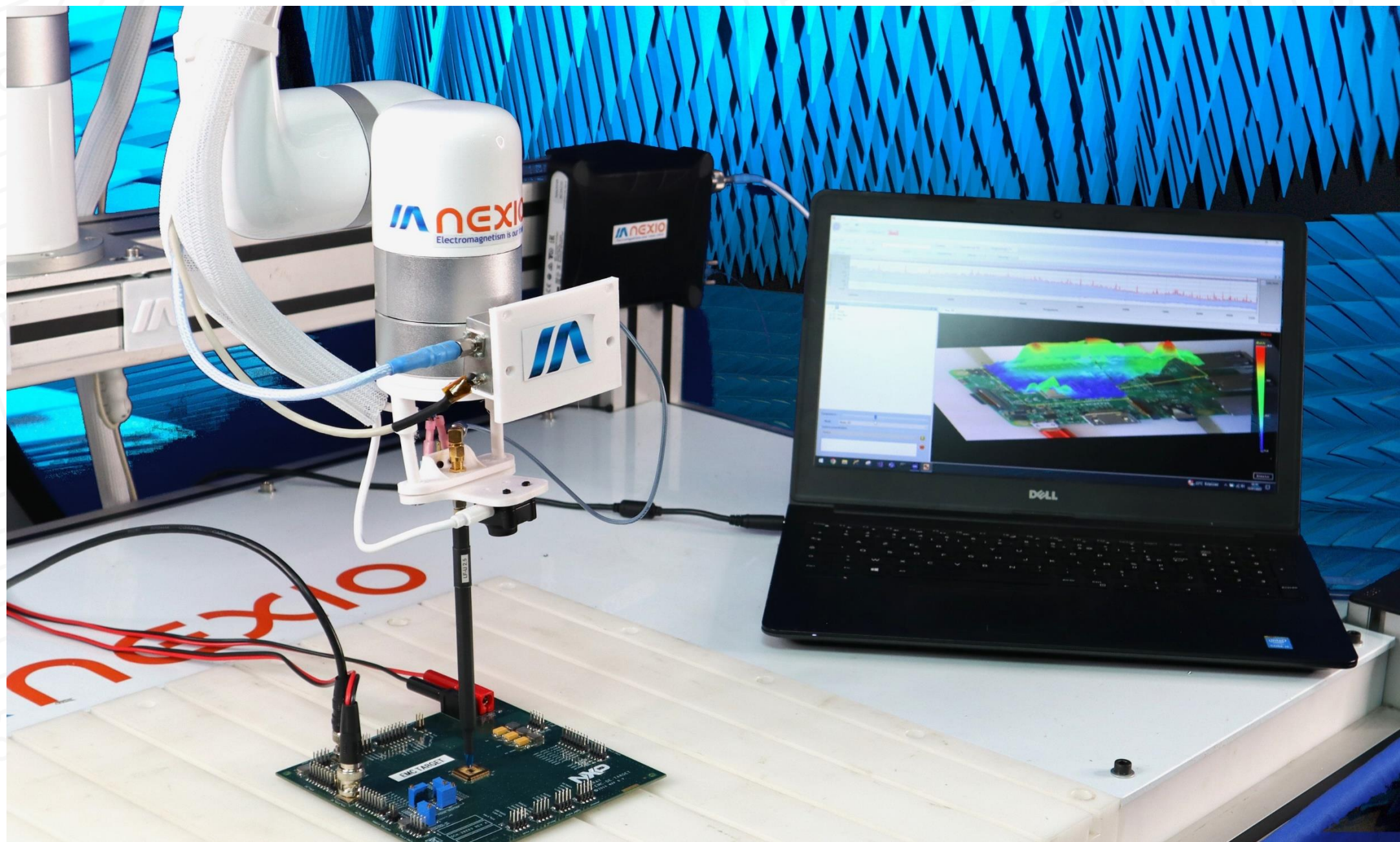


ELECTROMAGNETIC Near Field Measurement Scanner

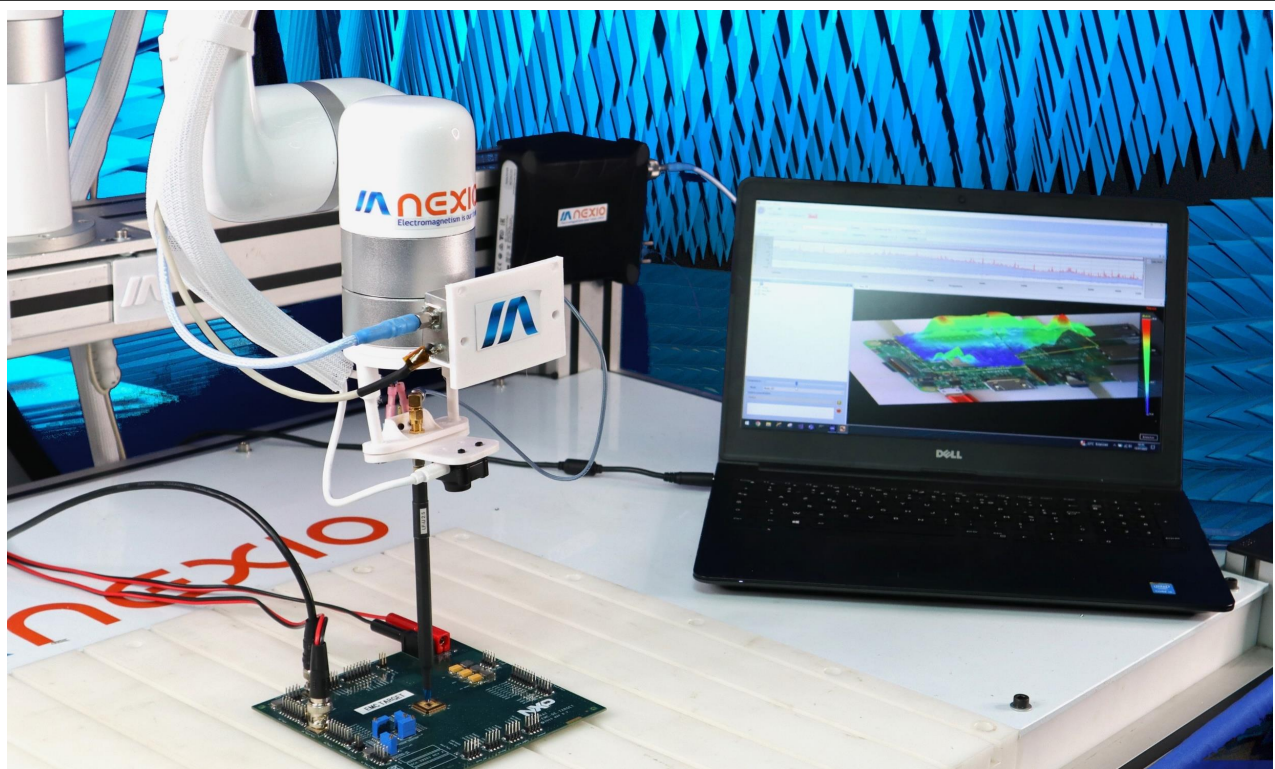
Hardware & software by NEXIO

« Making visible what is invisible »



Why near-field measurement?

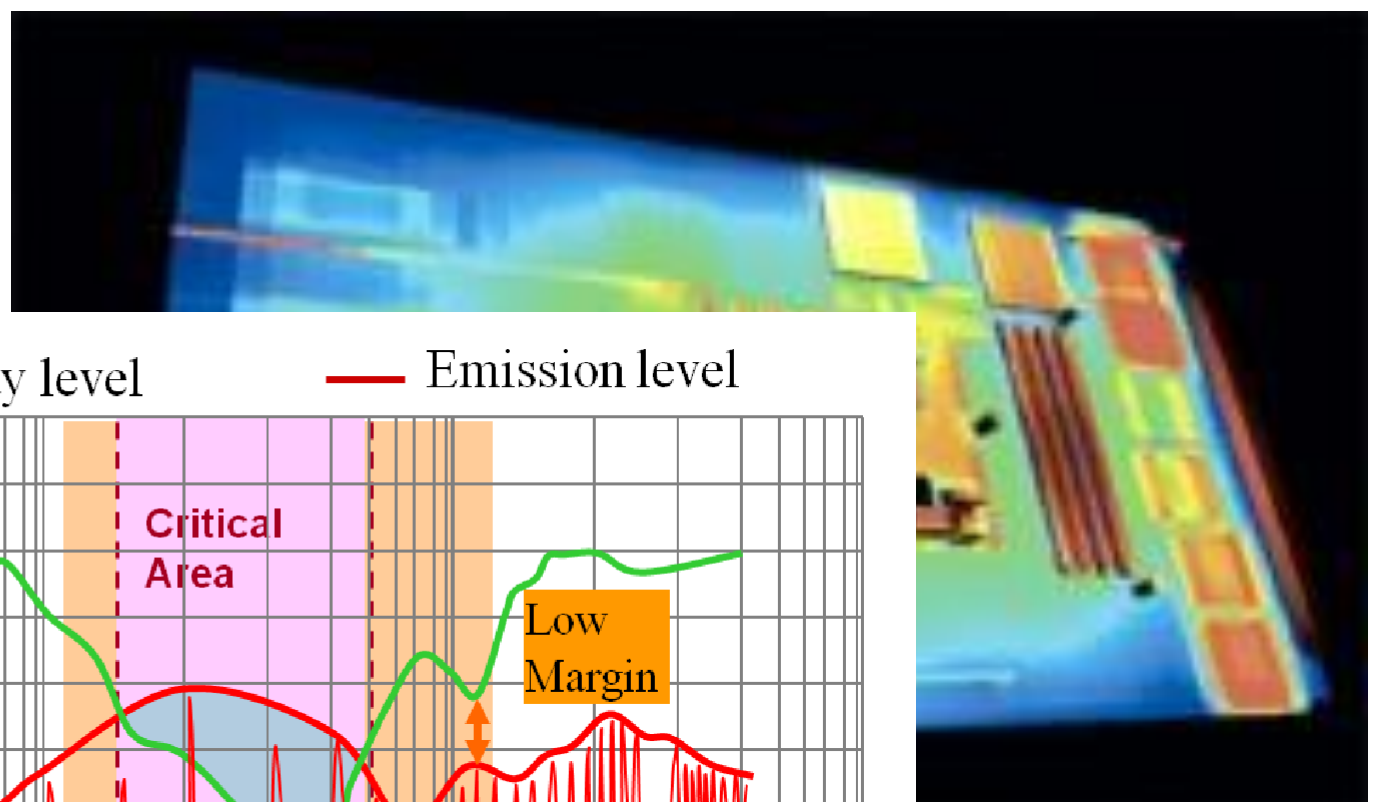
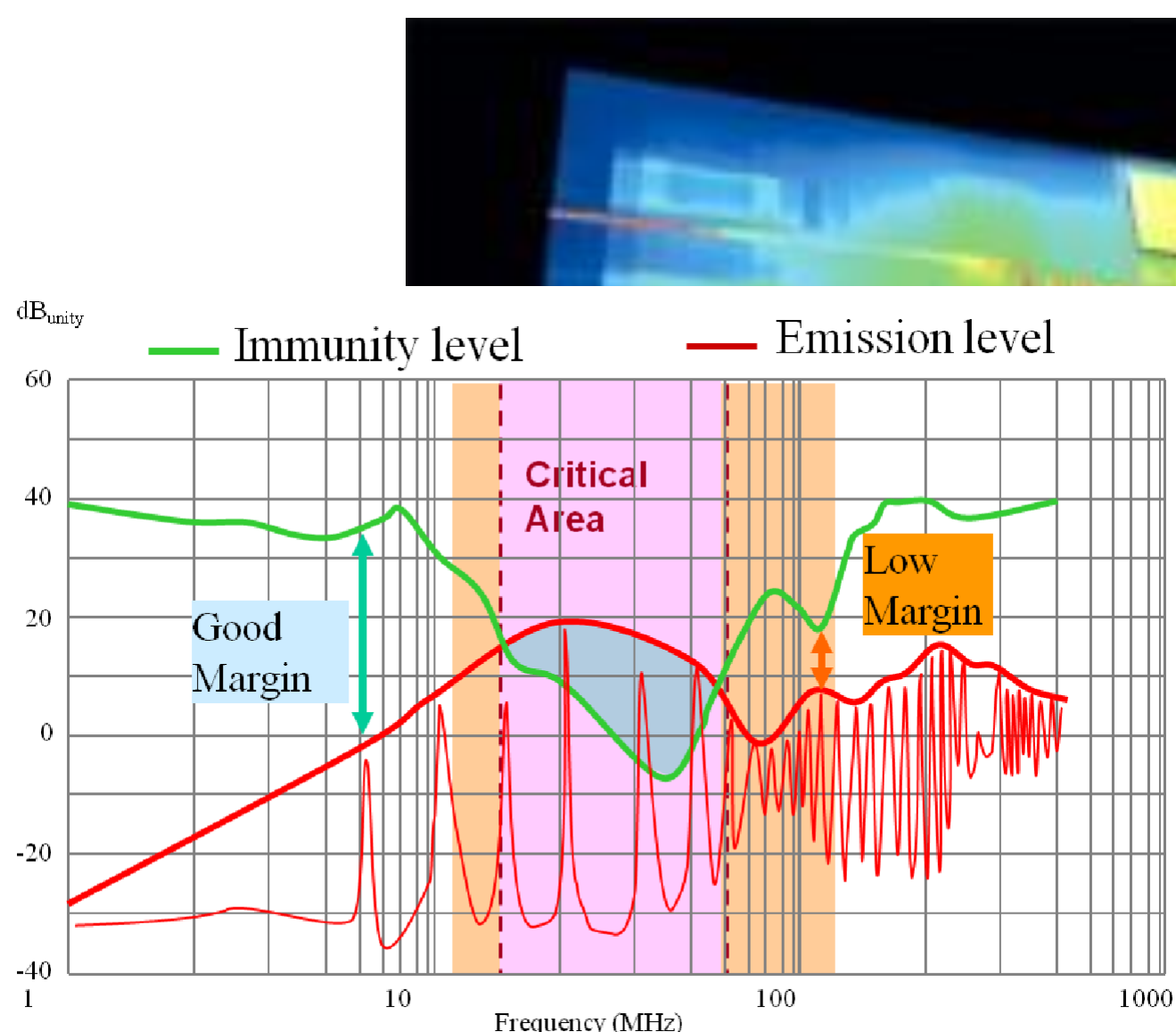
Support the design of electronic circuits by assessing their EMC behavior



- ▶ Examine cases of non-compliance with RS and RE, identifying specific sources of disruption.
- ▶ Evaluate design changes or component obsolescence.
- ▶ Characterize the leakage of a shield.
- ▶ Optimize IC/PCB or PCB/envelope placement.
- ▶ Consolidate, support and provide digital modeling and simulation.

Aide au design

- ▶ Risk analysis
- ▶ Design analysis
- ▶ Design rules
- ▶ Optimization
- ▶ Methodology guide
- ▶ Pre-qualification tests



Investigation of EMC non-compliance

Background and objectives :

At the end of an internal EMC test campaign in GTEM, the customer wanted to evaluate the near-field measurement method and confirm its analysis conclusions calling into question the sensor circuit and shielding solution.

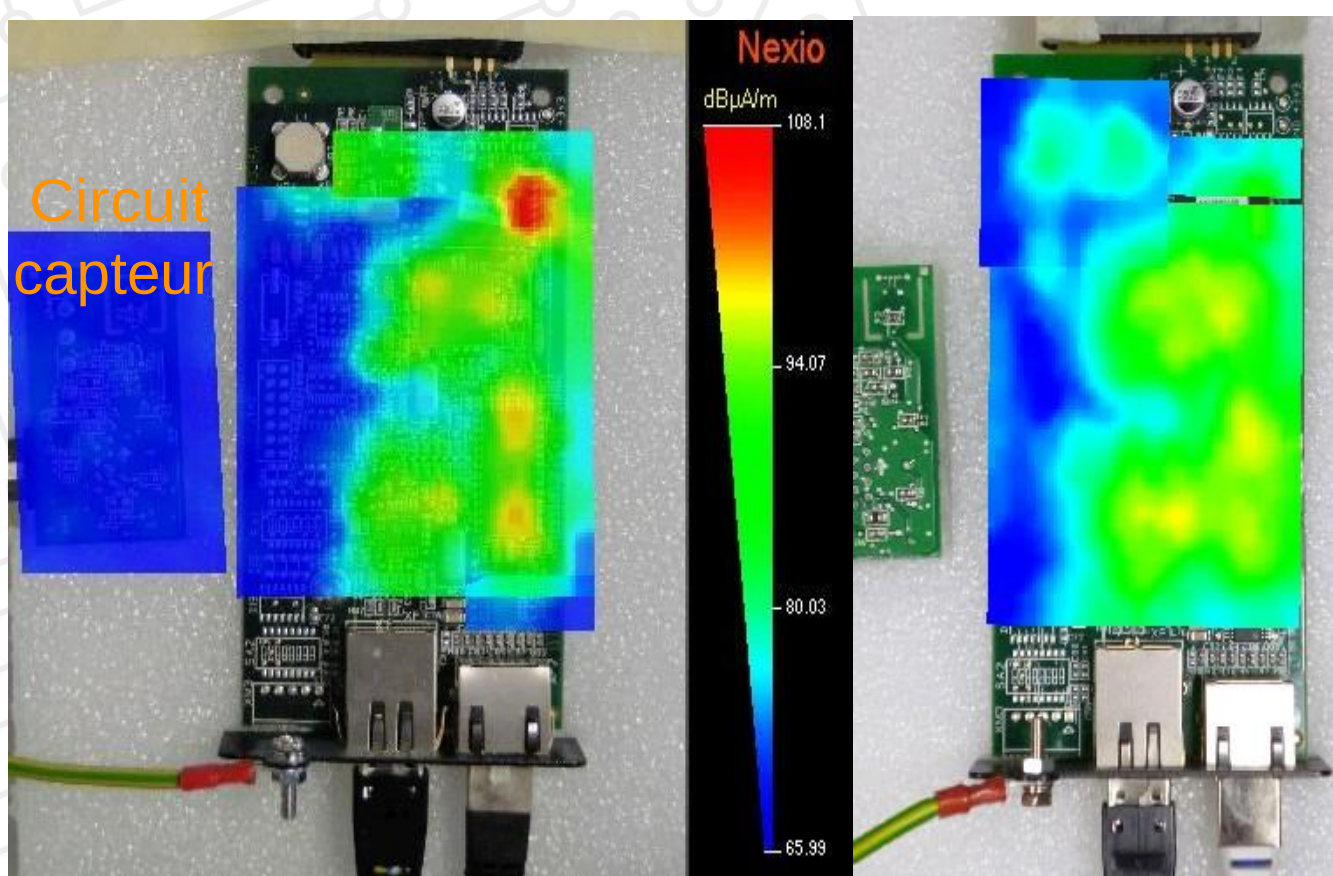
Study duration: 1 day on version 0 + 1 day on version 1

Actions :

- ▶ Rapid measurements on the sensor show that the customer's conclusions were wrong.
- ▶ Additional measures on the map to identify.
A source of disturbance generated by the motherboard's digital circuit and an antenna effect on the sensor circuit.
 - Digital power and non-optimized ground network.
 - Identification of the main responsible party: DC/DC converter to manage the power regulation function.
- ▶ Comparative measurements 6 months later to verify product improvements.

Version v0

Version v1



Run suivant :

- ▶ Hot spot to the memory flash -10 dB
- ▶ Noise on the controller -5 dB
- ▶ EMI reduction of digital circuits <1 dB
- ▶ 0.3 dB difference between the 2 measurements

Customer benefits:

- ▶ Quick measurement versus time spent in-house with conventional testing equipment.
- ▶ Amount of information collected in one day of measurements.
- ▶ Unexpected results in reducing the card's emission level.
- ▶ Promoting the interests of the near field internally.

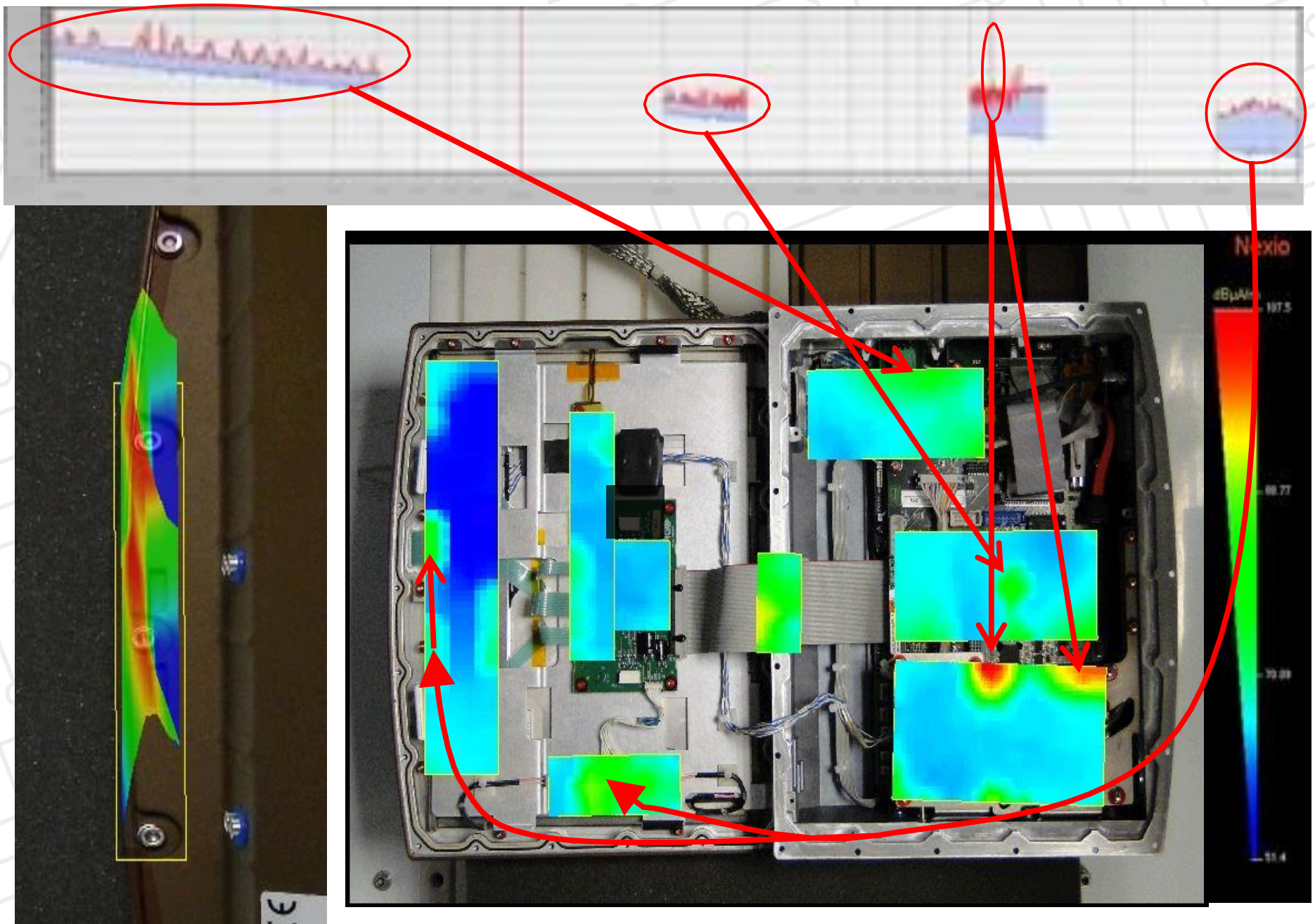
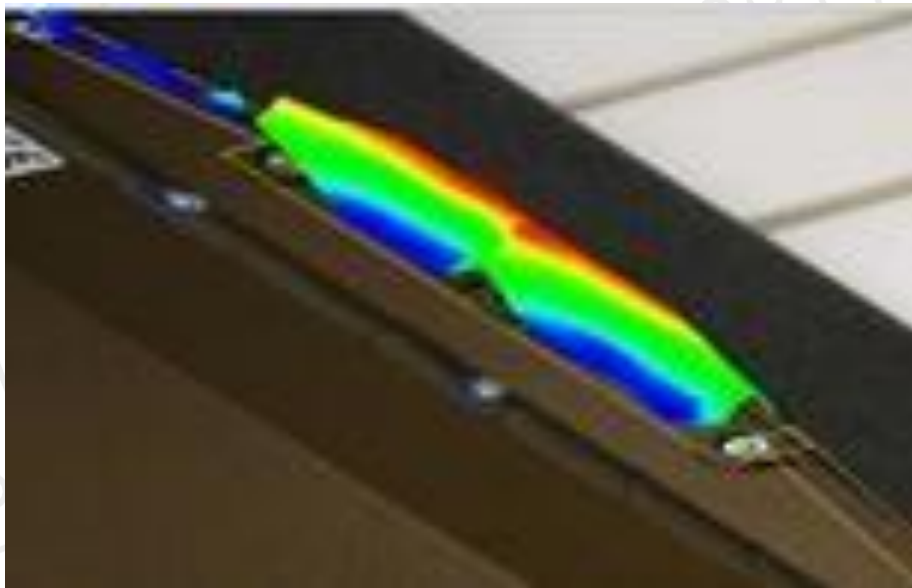
Background and objectives:

- Locate and characterize a leak to validate the need to redesign the casing
- Perform open casing measurements to optimize the design of a product upgrade

Study duration : 1 journée

Actions :

- ▶ Measurements around the various slots to locate leaks.
- ▶ Identification of areas of weakness responsible for visible DO160 RE2 overruns.
- ▶ Open-box measurements to go further and pinpoint leaks on the various boards.



Customer benefits:

- ▶ Quantity of information collected in just 1 day of measurements.
- ▶ Unexpected results that resolved a non-conformity with very economical solutions (no need to remake the mold).
- ▶ Gather valuable information to reduce the level of card issuance at an early stage in the design of a new product version (already planned).

Technology selection, performance characterization

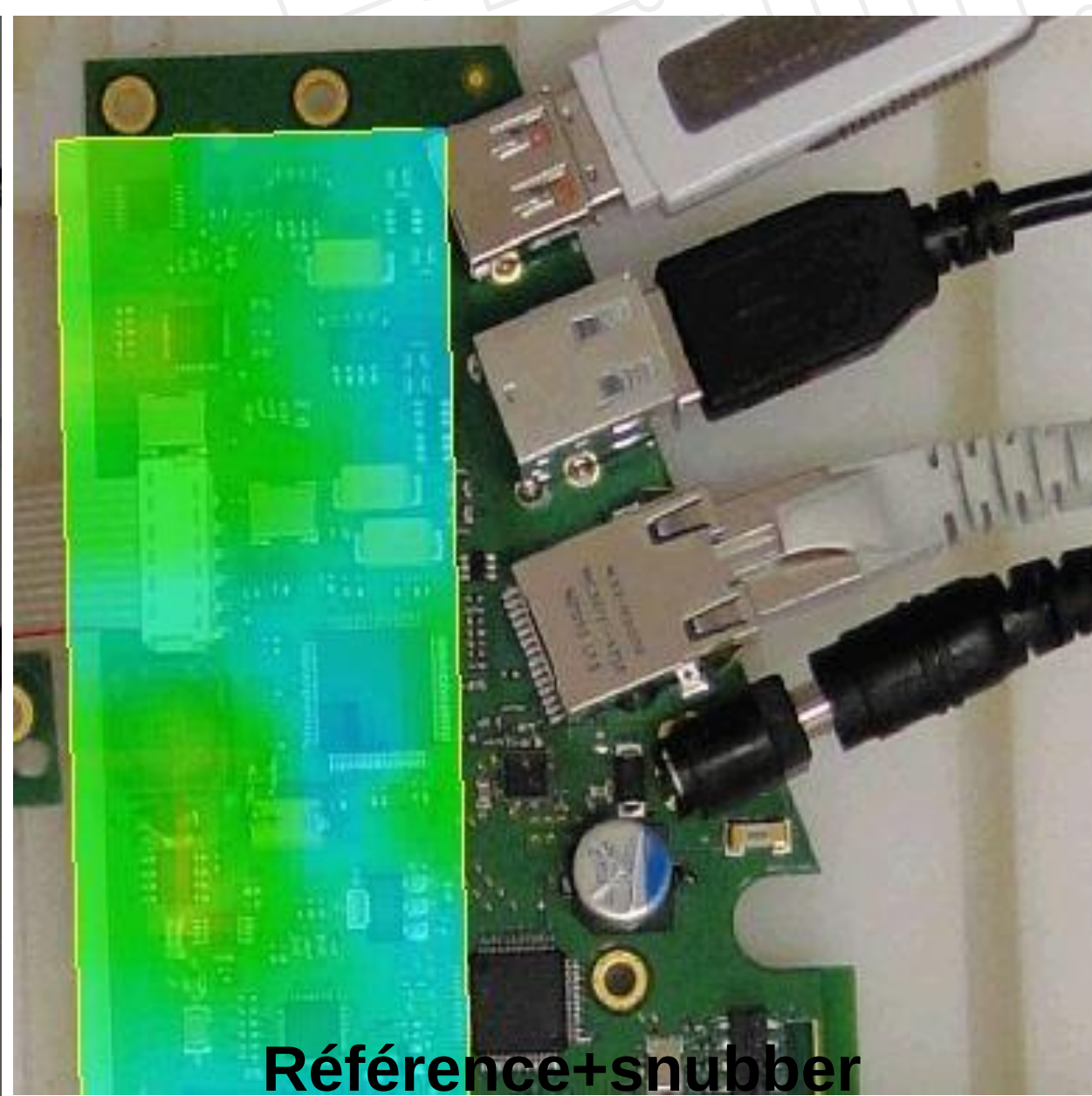
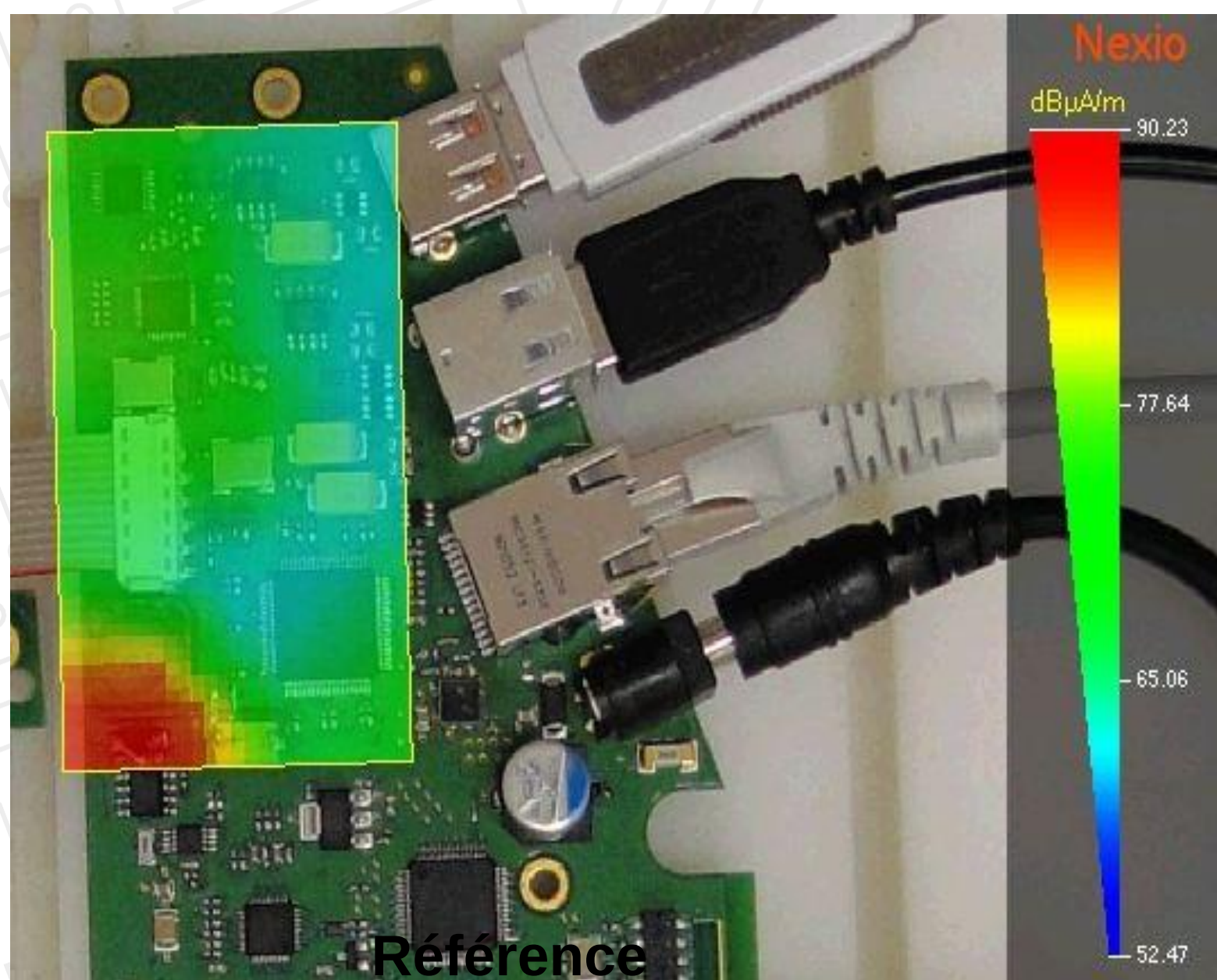
Background and objectives:

Strengthen a product design EMC file by adding a costed performance study to the cost study.

Study duration: 1/2 day

Actions :

- ▶ Measurements on 2 versions of the same product.
- ▶ Reference version.
- ▶ Version with additional filter on DC/DC flyback regulator input.



Customer benefits:

- ▶ Satisfied to associate the cost of this filter with a precise indication of the performance gain from an EMC point of view (-10 dB in EMI).

Change management and manufacturing control

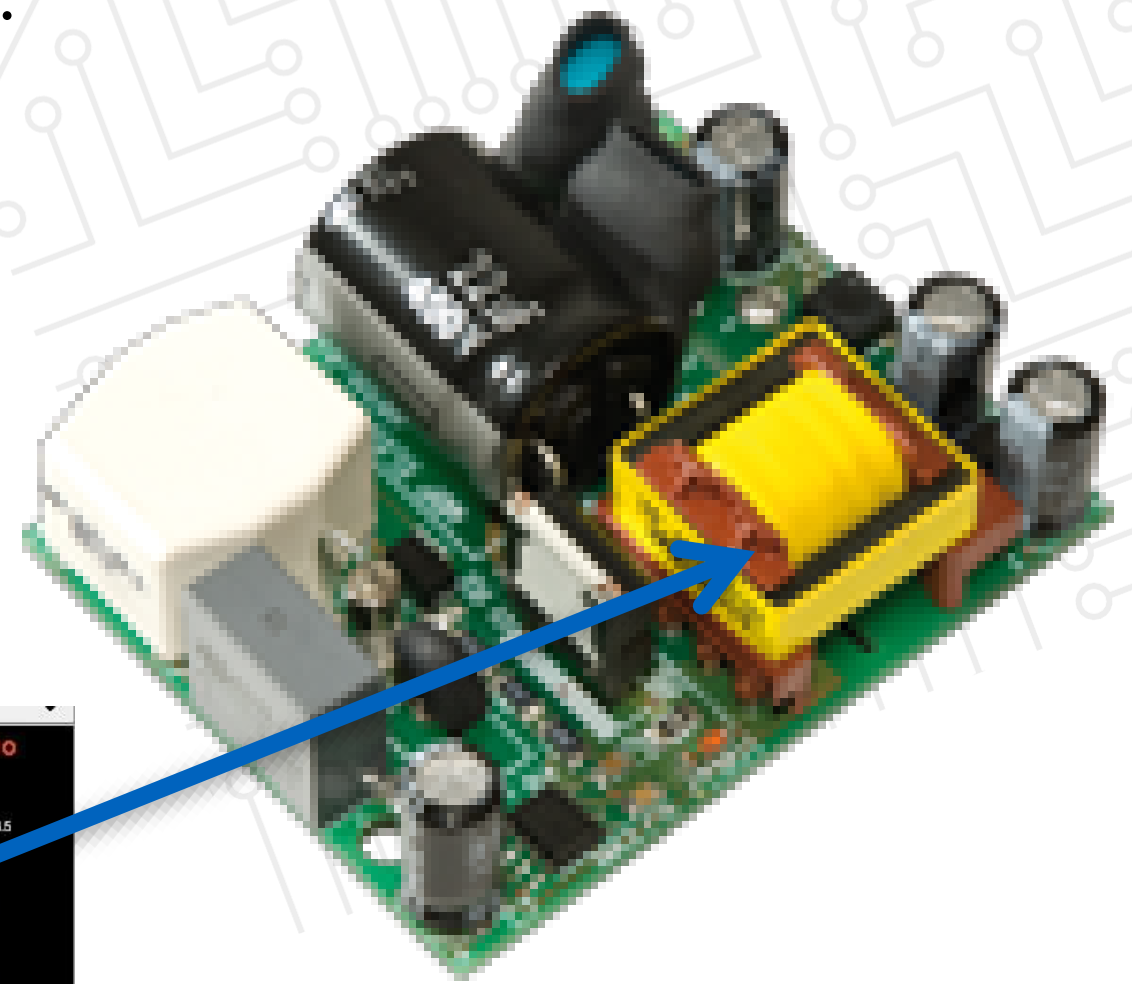
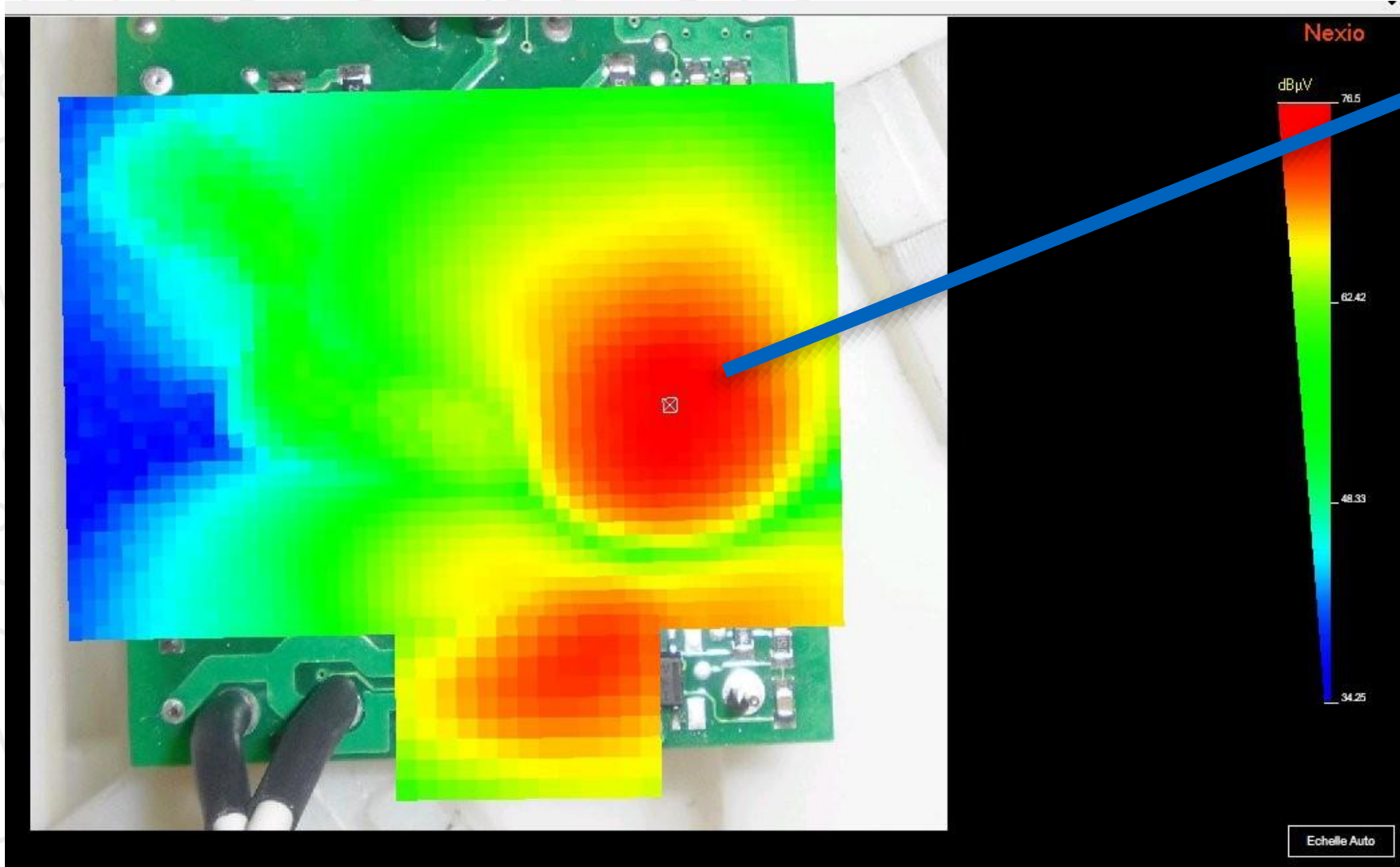
Background and objectives:

Explain disparities in the results of several product samples from a production line (alternately conforming and non-conforming), incriminating the alim card.

Study duration: 1/2 day

Actions :

- ▶ RE measurements on several power supply board samples.
- ▶ Detailed investigations on the transformer.



Customer benefits:

- ▶ Speed of measurement to obtain precise, tangible explanations highlighting batch disparity at one of the main processor's 2 suppliers.
- ▶ Immediate localization and clear proofs facilitate exchanges with suppliers.

Evolution management

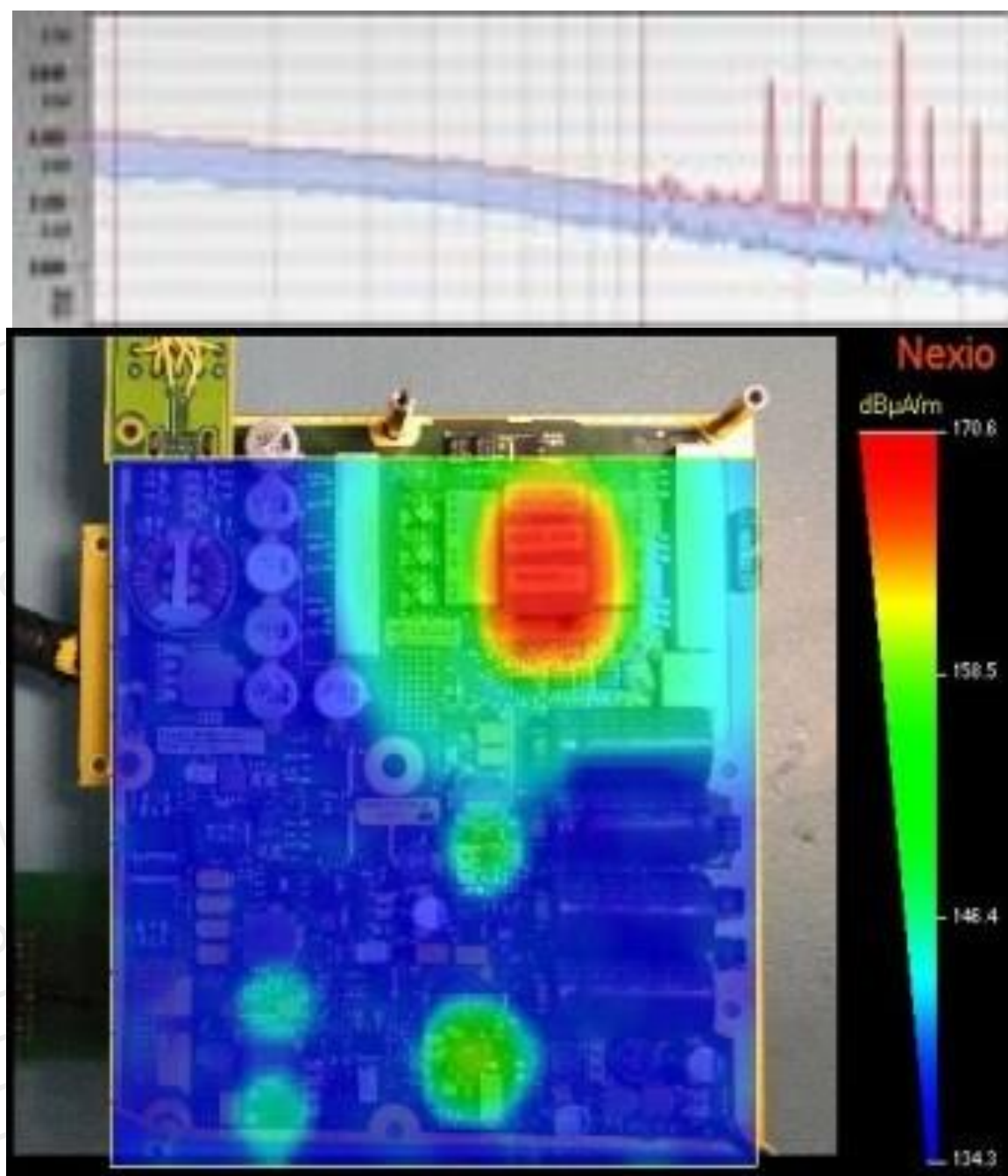
(Second sources, obsolescence, evolution, production checking)

Context:

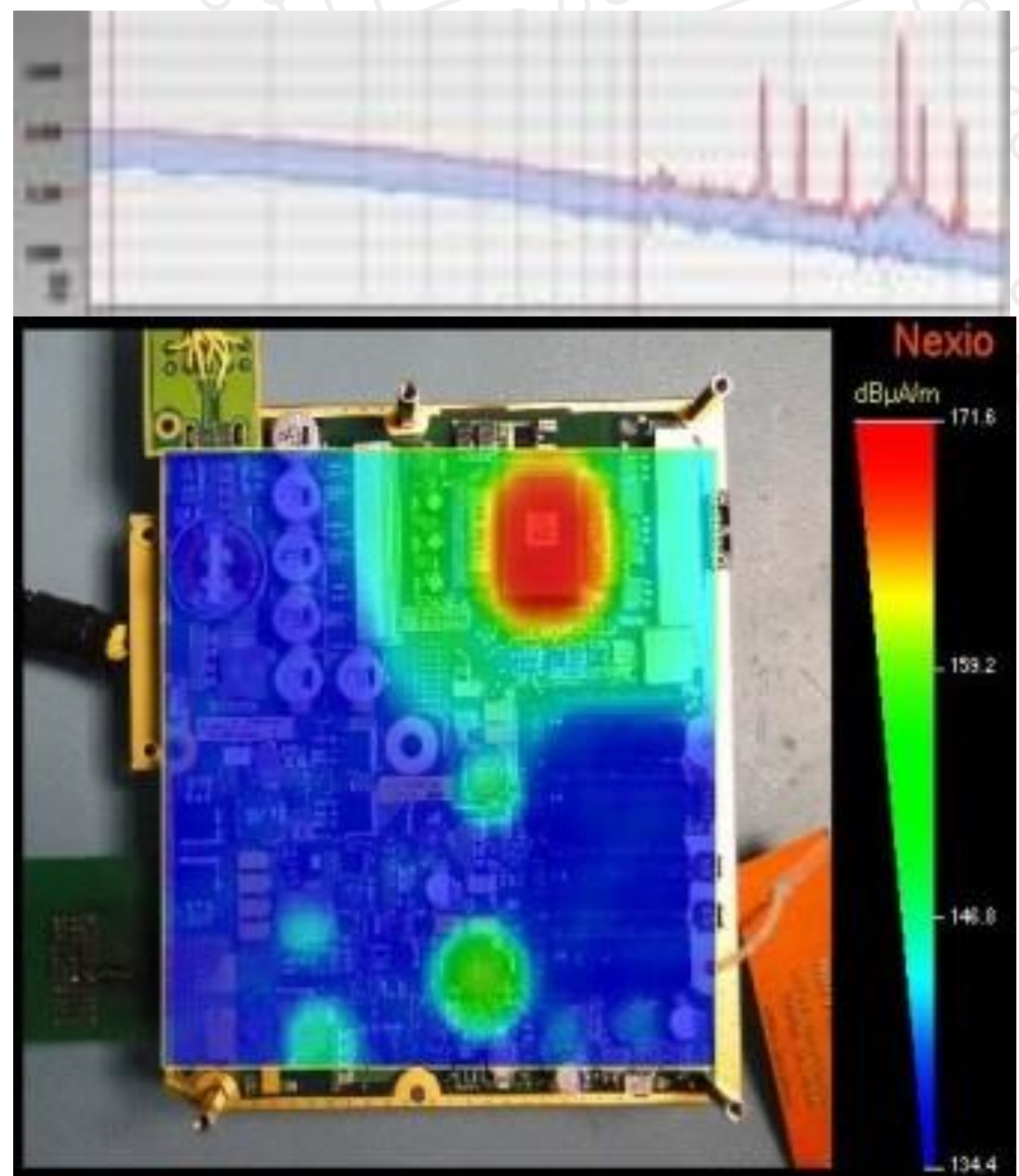
To reduce costs, a product developed in EU must be manufactured in Asia. Question: What is the impact in EMC to transfer manufacturing to the second site?

Actions :

- ▶ NFS measurement on two versions of the product manufacturing in two sites (different component supplier and PCB manufacturer)



Made in EU



Customer Benefits:

- ▶ Simple approach
- ▶ Capitalization of technology
- ▶ Relevant methods to :
 - check EMC during product lifecycle
 - characterize components for second source
 - Validate second production manufacturer

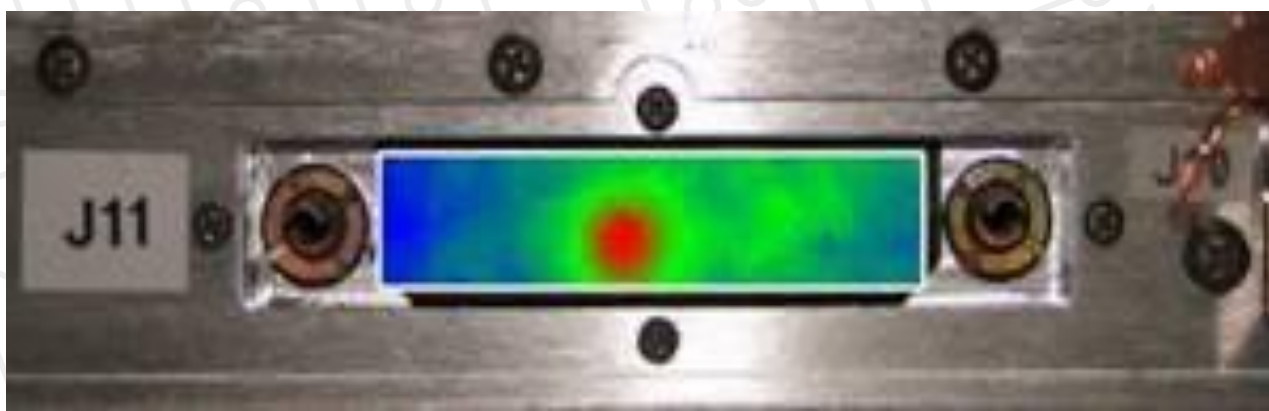
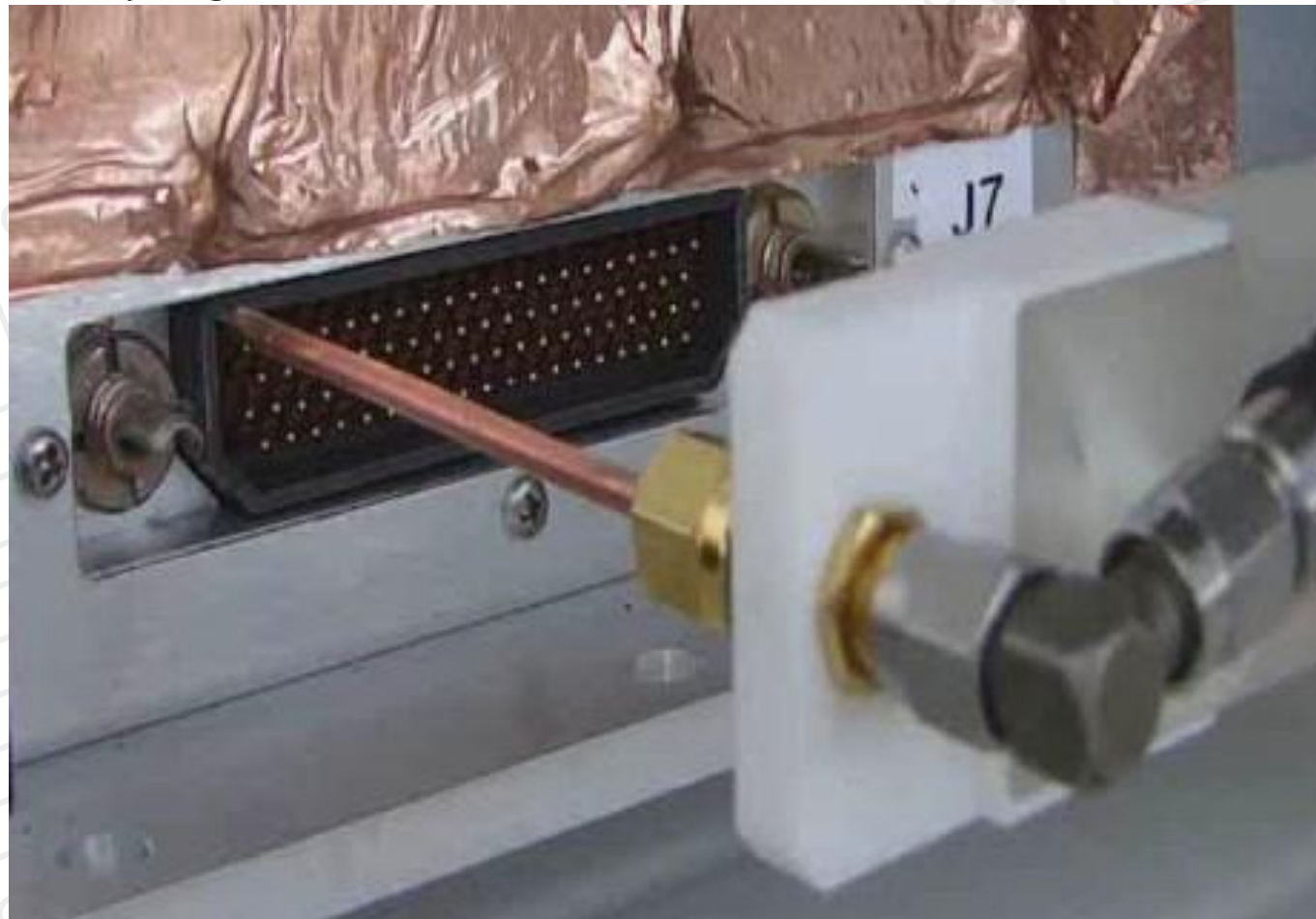
Context:

Investigate a non-conformity in emissions conducted on an A350 ECU at frequencies known but not used by the EUT.

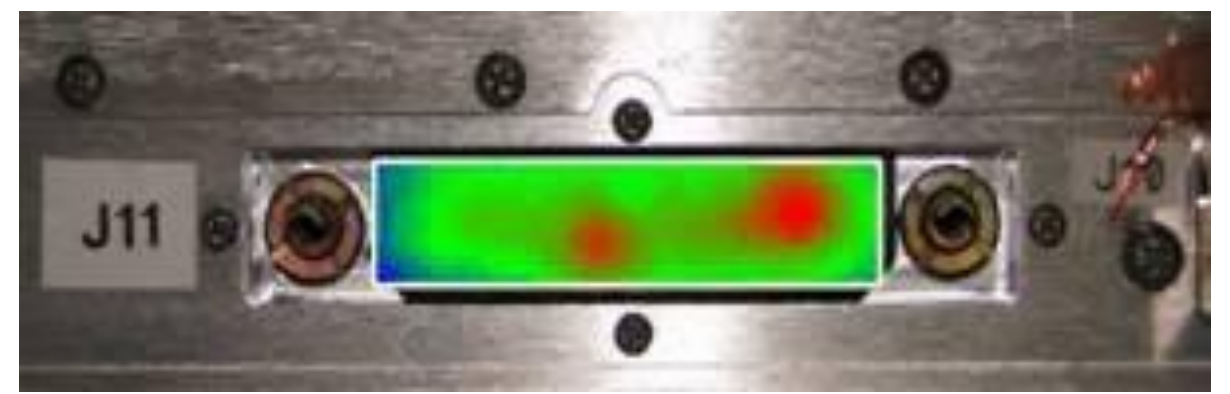
Study delays : 30 mn.

Actions NEXIO :

- ▶ Fast E-field measurements on connector pins (in RE) but close enough to see CE phenomena.
- ▶ Identifying the pins carrying the disturbance.



Connector J11 – Ez- 498MHz-503MHz



Connector J11 – Ez- 560MHz-565MHz

Bénéfices client :

- ▶ Faster measurements than time spent in-house with conventional EMC test equipment (without being able to identify the cause)
- ▶ Understanding the problem as quickly as measuring it (the customer followed the pin to a motherboard where there was a coupling between an internal function and a track on the pin).
- ▶ Purchase of sun scanner system

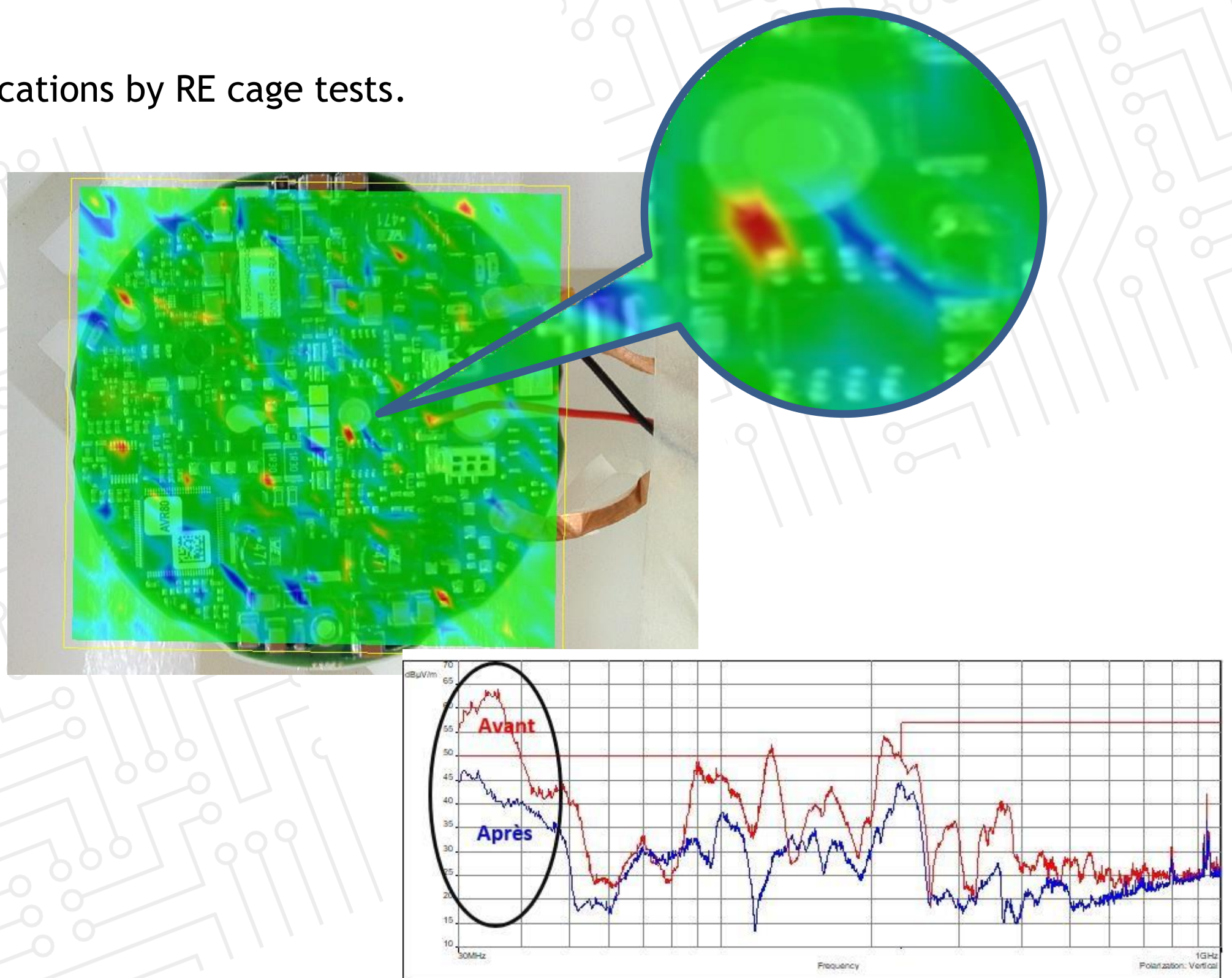
Context:

Understand and locate a non-conformity observed in radiated emission after a sequence of unsuccessful investigations in an accredited laboratory.

Study times : 1/2 day

Actions:

- ▶ Rapid H-field measurements in the offending frequency band to pinpoint root causes.
- ▶ When product routing cannot be modified, decoupling is adjusted to redirect the disturbance to GND.
- ▶ Validation of modifications by RE cage tests.



Customer Benefits :

- ▶ Faster measurements than with conventional EMC test equipment (without being able to identify the cause)
- ▶ Identification and localization of a problem impossible to identify by schematic analysis: coupling between a plated fastening hole and a component lug
- ▶ Increased use of near-field EMI scanners for risk assessment and mitigation

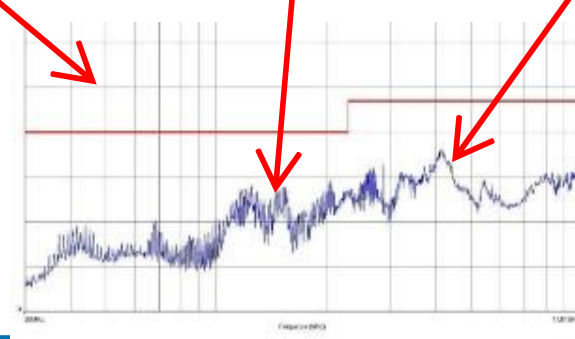
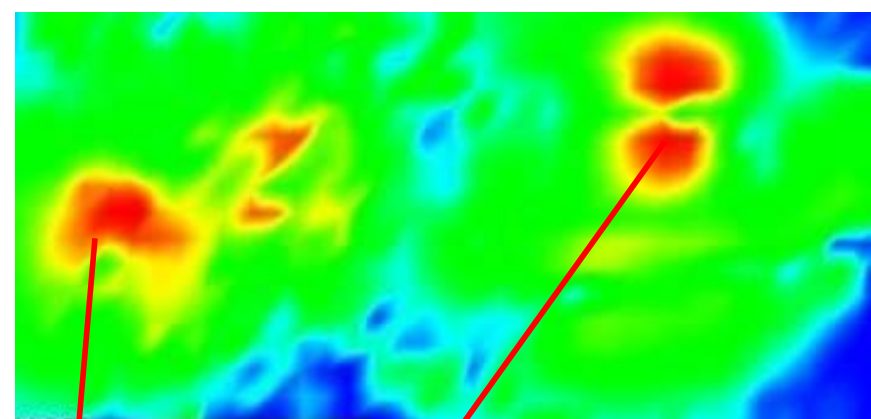
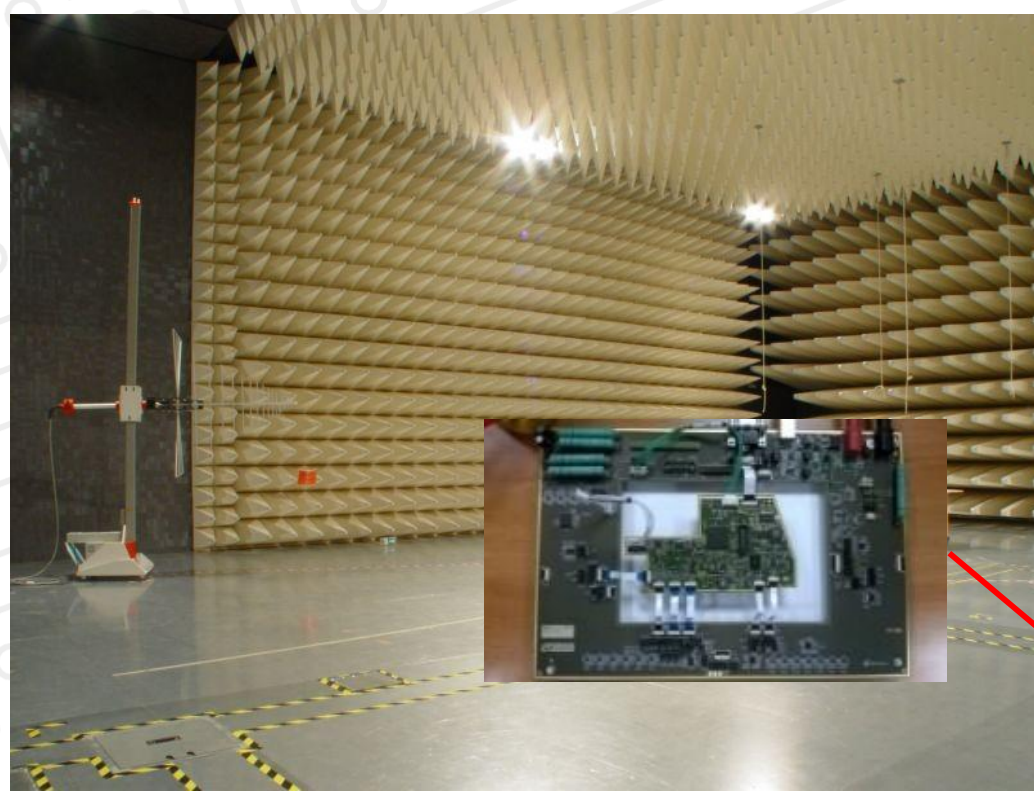
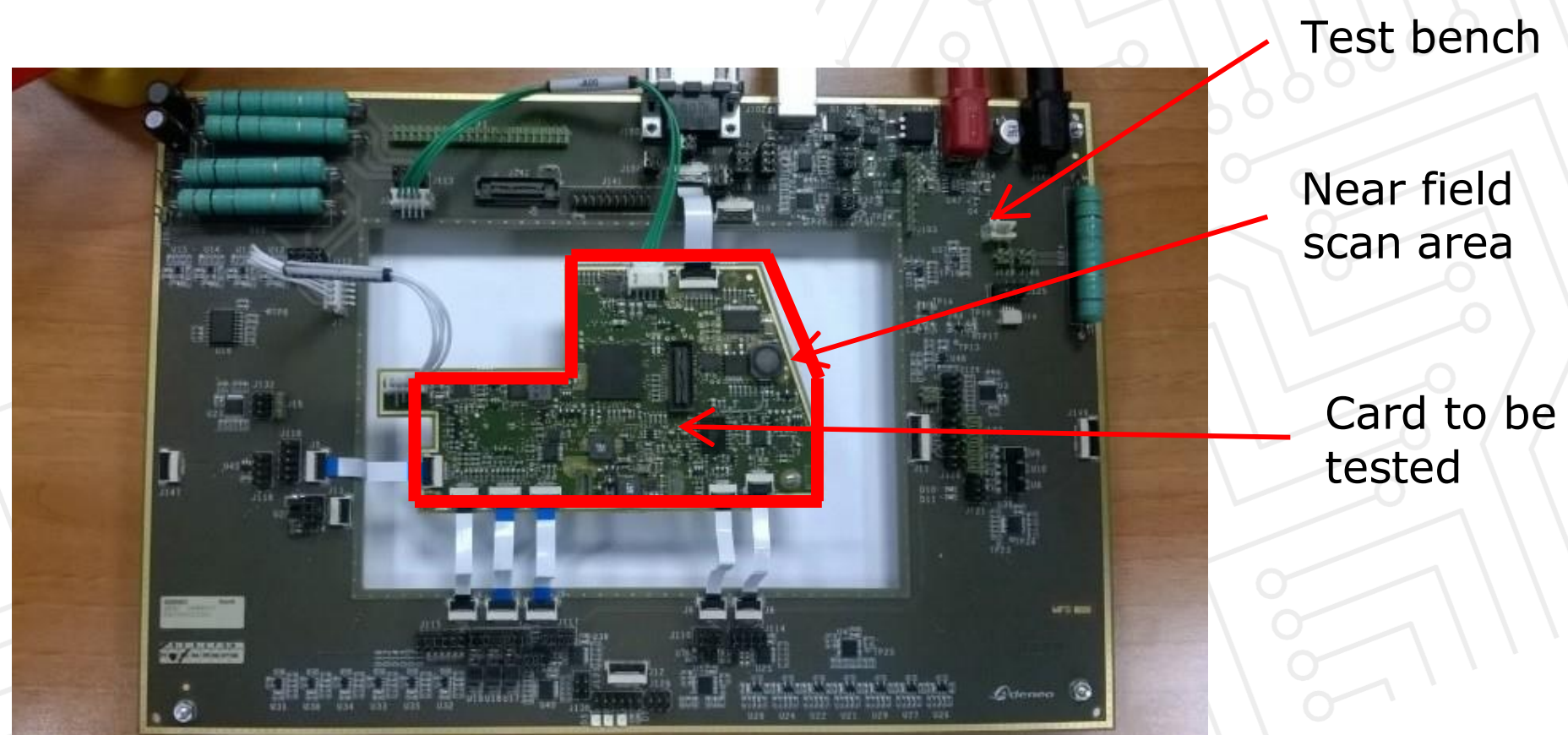
Industrialization and subsystem validation

Context:

The customer needed to clarify its conventional EMC test results with a near-field measurement in order to be able to discriminate between target card and test card.

Actions:

- Acquisition of the target board's EM signature over a wide frequency range.



Customer benefits:

- Verify radiated emissions before the first functional prototypes are produced
- In a complex system context (multi-board / multi-connections), the unit signature of the various elements enables us to better identify sources of disturbance and coupling modes, anticipate problems and find solutions.

Contexte et objectifs :

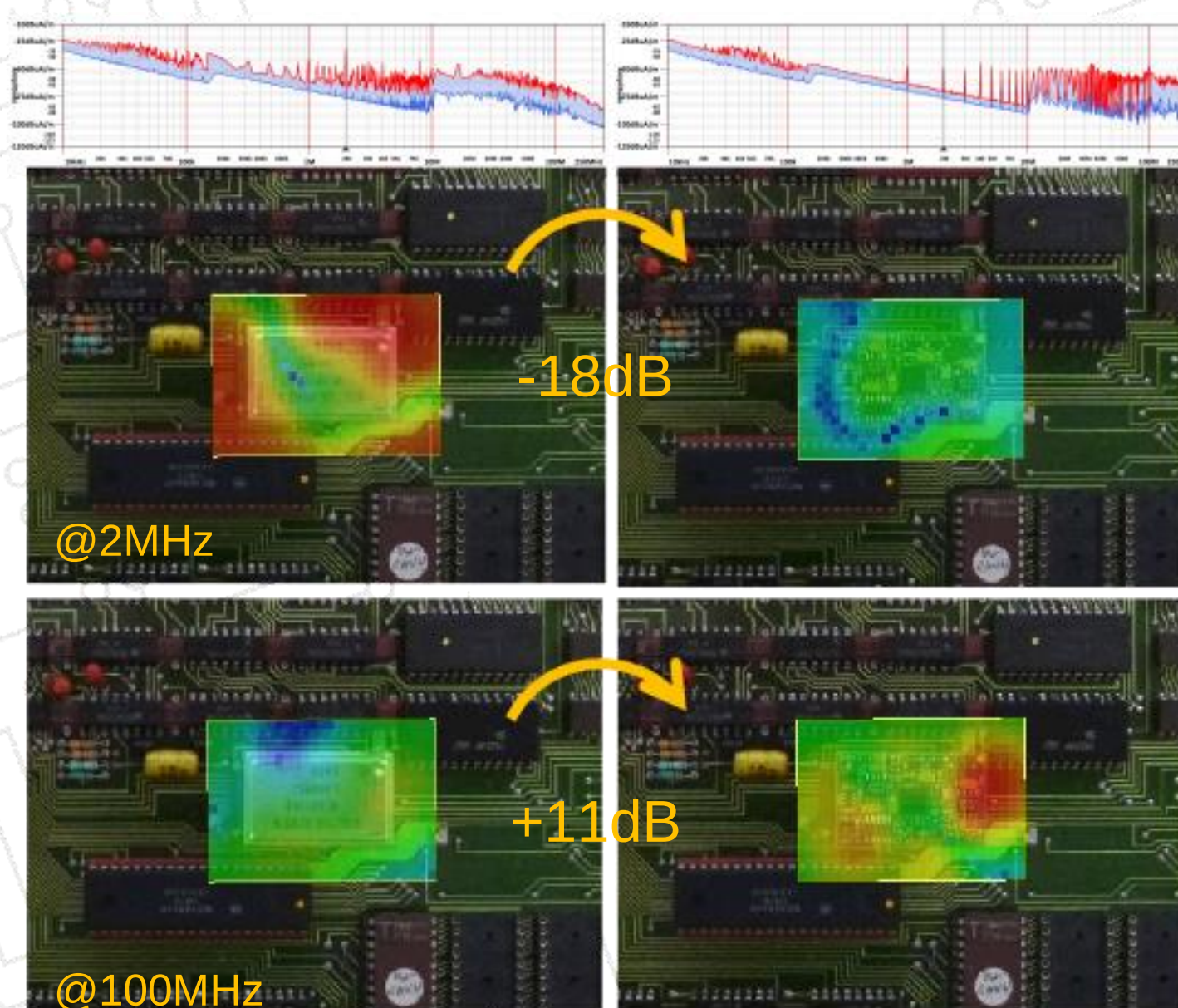
Check the impact of a component change following a production stoppage of the originally chosen component.

Study times: ½ day

Actions :

Measurements on 2 versions of the same product:

- ▶ Reference version.
- ▶ Version including the new component



Customer benefits :

- ▶ Fast measurements for accurate results.
- ▶ Fine characterization of components over a very wide frequency range.
- ▶ Efficient replacement for complex, multi-day impact studies.
- ▶ Avoids time-consuming and costly conventional testing.
- ▶ Optimizes the "requalification" process.

En phase de design

- ▶ Localiser et réduire les sources
- ▶ Optimiser placement et routage
- ▶ Aide aux choix technologiques
- ▶ Constitution de base de données
- ▶ Investiguer les défauts EMI

En phase de production

- ▶ Caractériser les fuites
- ▶ Contrôler la fabrication
- ▶ Evaluer des sous-traitants et 2nde sources

En phase de vie série

- ▶ Vérifier les non-régressions
- ▶ Gérer les obsolescences
- ▶ Capitaliser sur les retours d'expériences

V1

Max=51dBμA/m

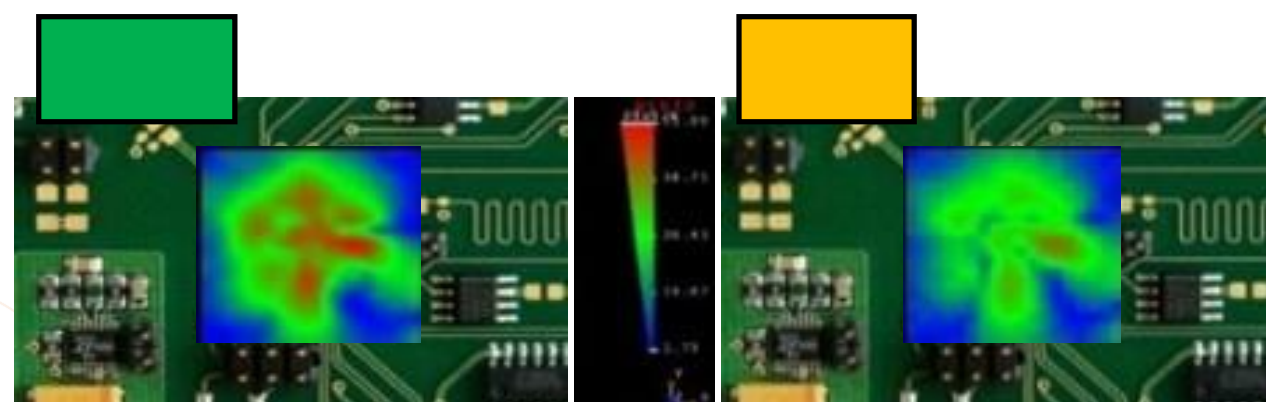
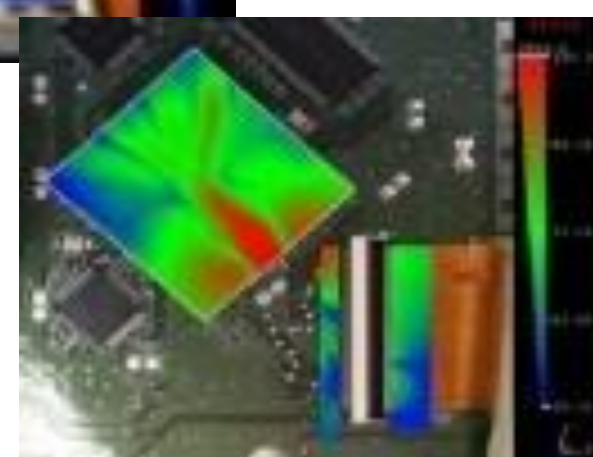
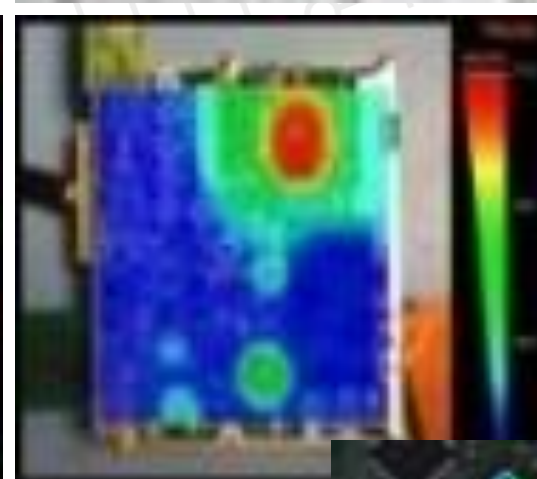
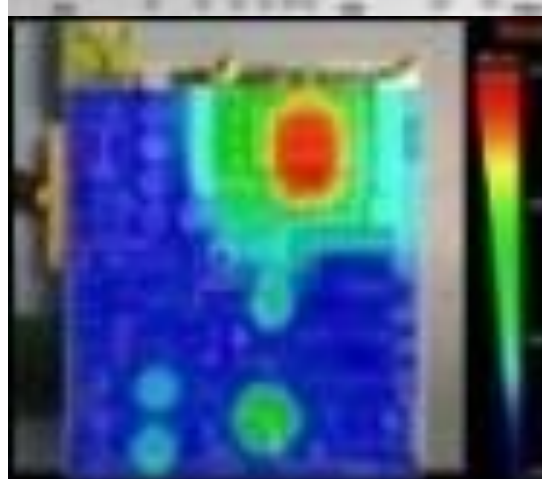
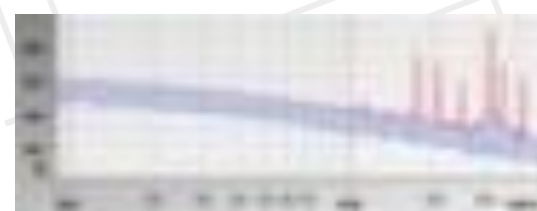
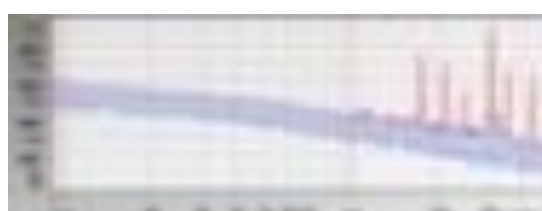
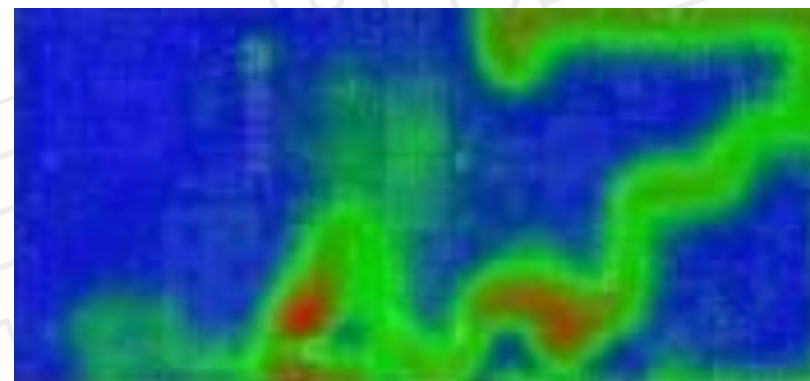
V2

Max=40dBμA/m

Un périmètre d'application très large

SAR measurement for mobile makers – Document PS6

- 11 -



EMI

Simulation : Validation de la méthode de mesure vectorielle

PréQualification : Corrélation champ proche – champ lointain

Phénomènes transitoires : méthode de mesures avec oscillo rapide

Mesures en DC : industrialisation de la mesure

EMS

Immunité rayonnée : Atteindre le même niveau de maturité qu'en EMI classique

DES - Foudre : Mise au point d'une méthode de mesure industrielle

Méthode mixte : EMS pour stimuler l'EST pendant des mesures EMI

Crypto / Circuits sécurisés

Etude de robustesse de circuits critiques

Analyse d'efficacité de chiffrement

Détection de Trojan hardware

Imagerie

Avantages

Outil d'investigations CEM redoutable d'efficacité

Outil de cost et de time-killing

Outil de précision (reproductibilité $<0,5\text{dB}$)

Rend l'invisible visible

Pertinent tout au long du cycle en V

Facilite la communication entre client et fournisseurs

Outil de capitalisation précieux

Outil très économique vs les gains

Limitations

Quantité de temps nécessaire à l'analyse de résultats (besoin de développer des fct de post-traitements)

Taille des fichiers résultats (plusieurs Mo)

Ne remplace pas l'expertise

Ne remplace pas les essais CEM de validation

Near Field Measurement in a nutshell

