UNIVERSITEIT GENT

FACULTY OF **ENGINEERING AND ARCHITECTURE**

Efficient Measurement Procedure for Hotspot Detection in Near-Field Pattern of Electronic Devices

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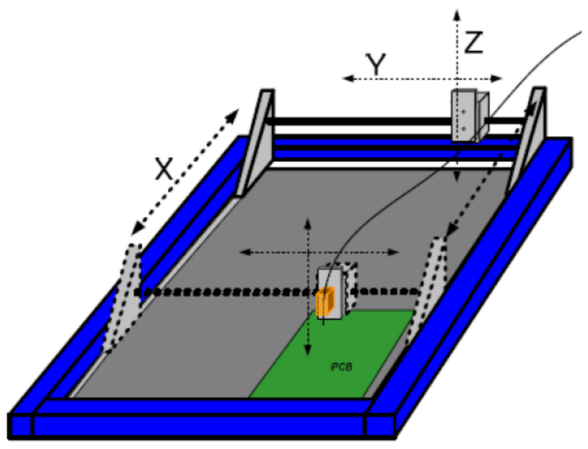
Motivation and Goal

Problem : increasing miniaturization and operating frequencies of electronic devices lead to high risk of inter and intra-system electro-magnetic interference (EMI) issues.

Goal : Early and efficient detection of hotspot regions (i.e. regions where the electric of magnetic field values exceed a threshold)

Methodology : Near-field (NF) scanning has proven to be effective in assessing the EMC behaviour of electronic (sub)systems. It does not require measurements to be taken in (semi)anechoic or reverberant chambers and can also produce radiation models.

How to build a heat map that indicates all hotspots of the device under study, while minimizing the amount of measurements needed?

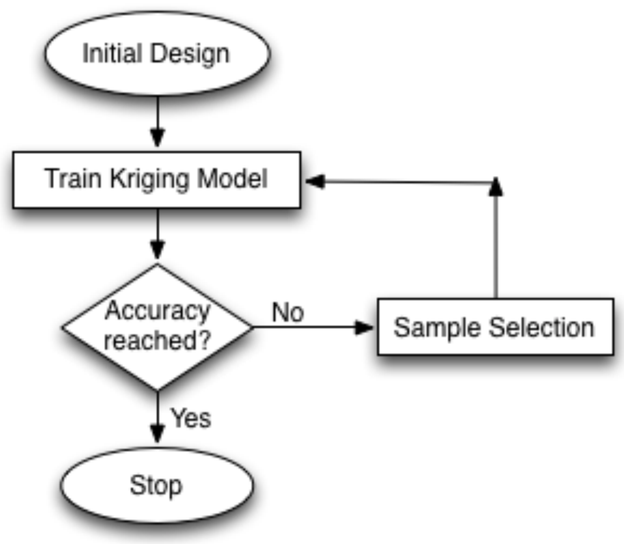


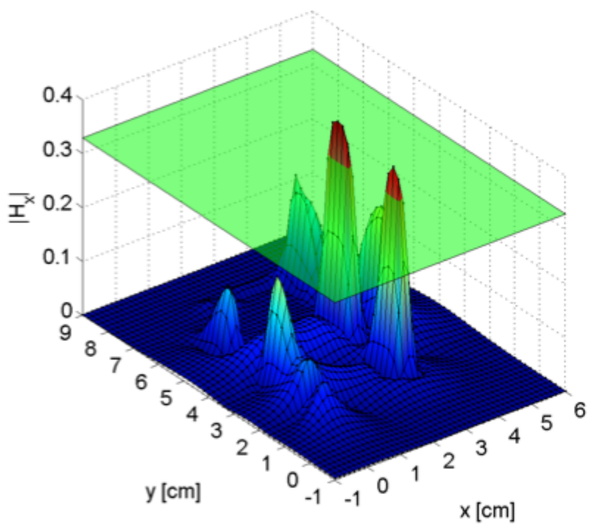
Kriging Models and Sampling Scheme

- **Surrogate modeling** (Kriging) and **Sequential Sampling**
- Location of measurement points is based on statistical criteria

Exploitation : maximizes the probability of the chosen samples to be located inside the specified hotspot range (gPoI criterion)

Exploration : makes sure that each newly chosen point is as far from already chosen points as possible (distance criterion)

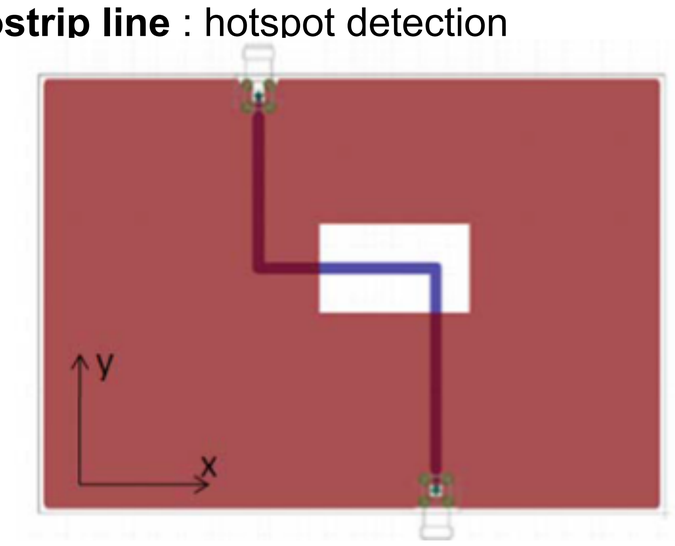




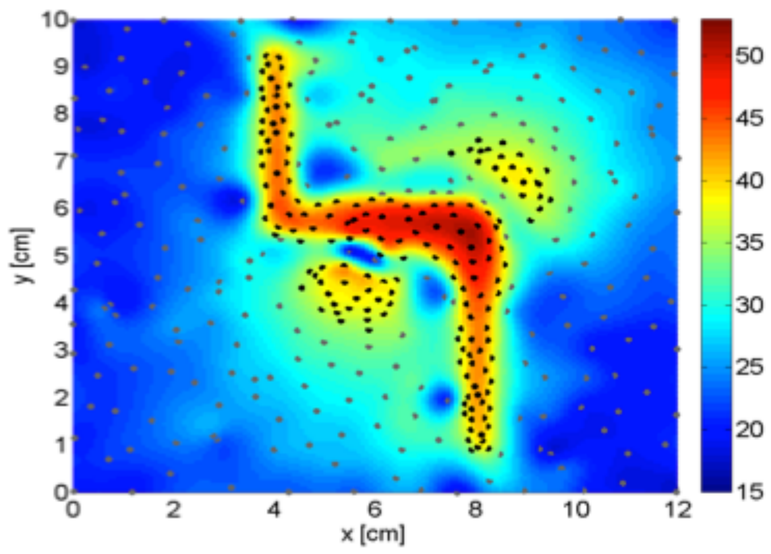
Experiments and Observations

- **Bended microstrip line** : hotspot detection

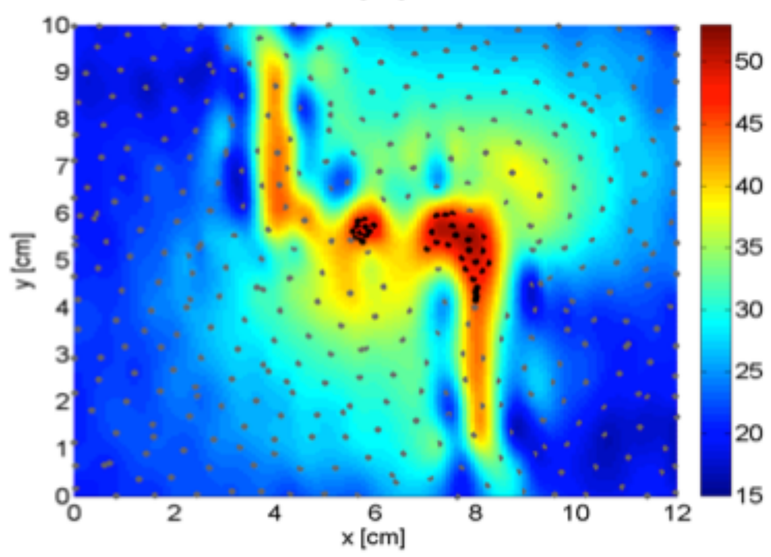
Near-field component $|H_x|$



- [35 dBµV - ∞]



- [45 dBµV - ∞]



Conclusions

- Novel NF-scanning algorithm for hotspot detection and EMC pre-compliance testing of electronic devices.

The algorithm sequentially performs a limited set of NF measurements in the plane and evaluates two statistical criteria to determine the optimal coordinates where additional measurements should be performed.

- The outcome of the process is a heat map that clearly visualizes the presence and location of hotspot regions.

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