

Disruption of a RF front-end subject to a out-of-band signal

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Out-of-band effects of millimeter-wave EMI on a 2.4 GHz RF front-end

Context

Experiment Bench

Time Response

Other Results

Conclusion & Perspectives

◆ Context

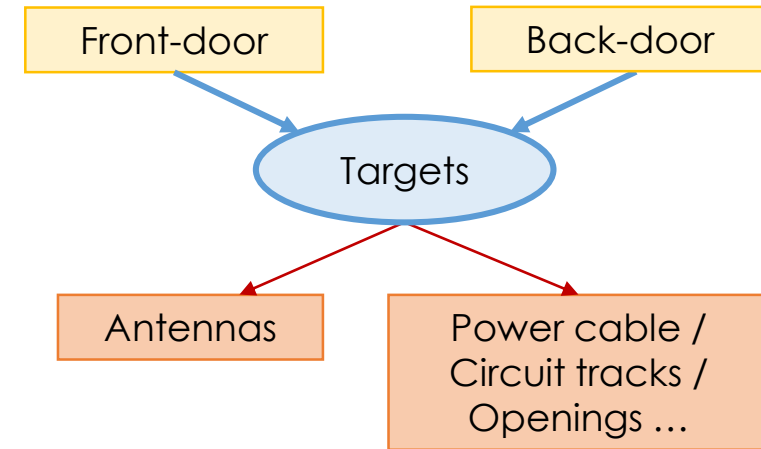
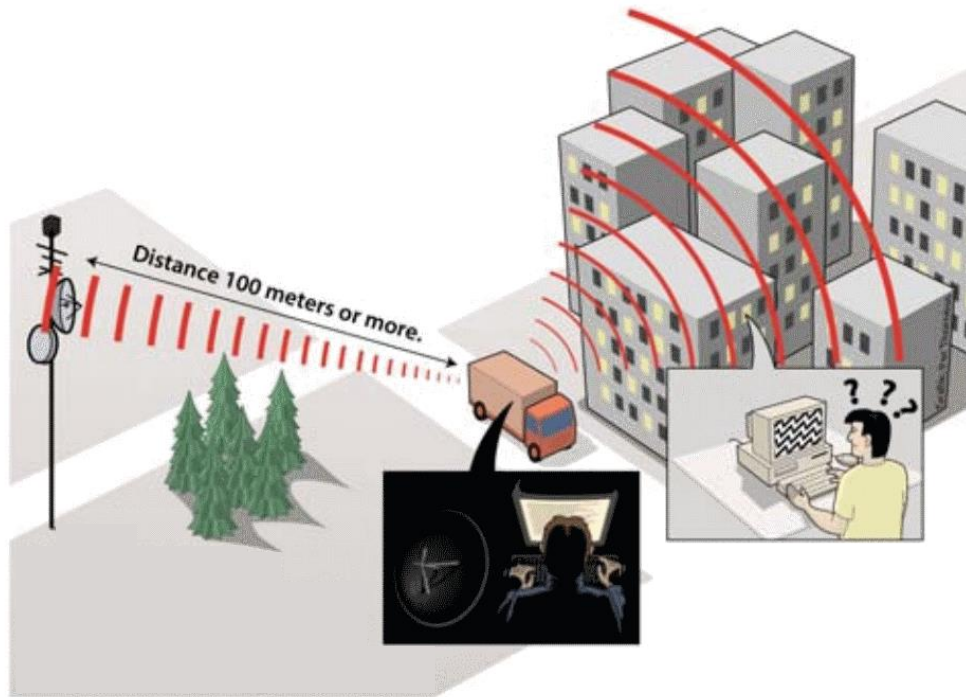
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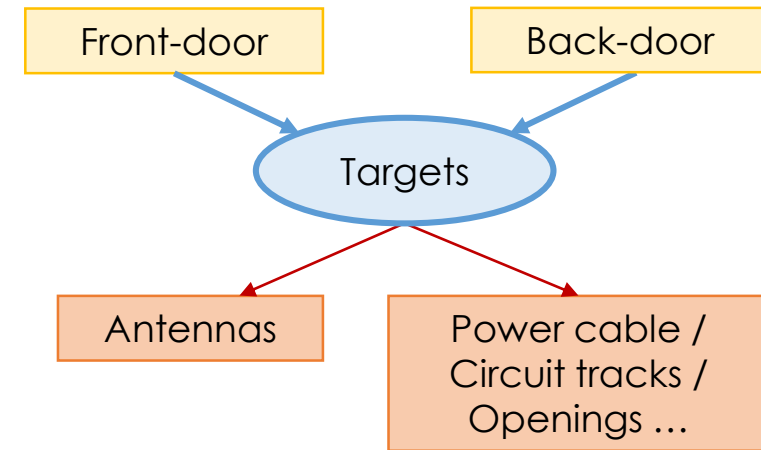
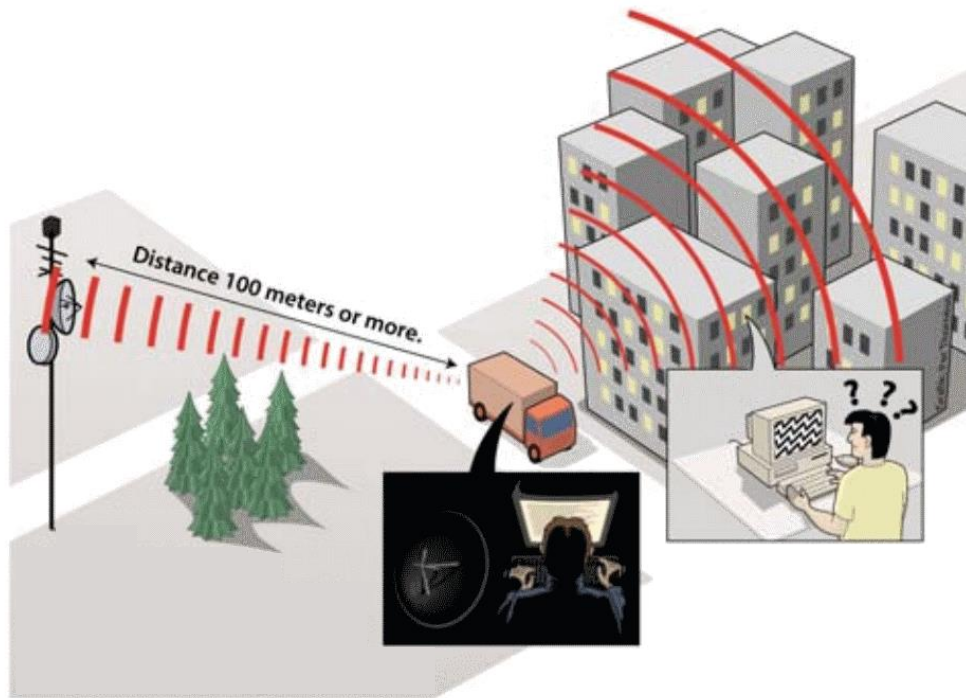
Problem: Study the impact of a high frequency environment on communicating objects type RF Front-Ends.



Distance between source-sample choice ?

- ▶ Far field
 - More Powerful
 - Larger
- ▶ Near field
 - Less power available
 - Smaller

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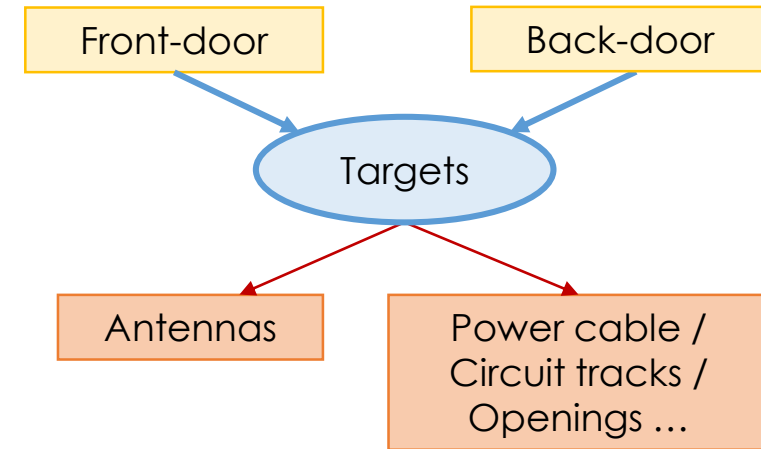
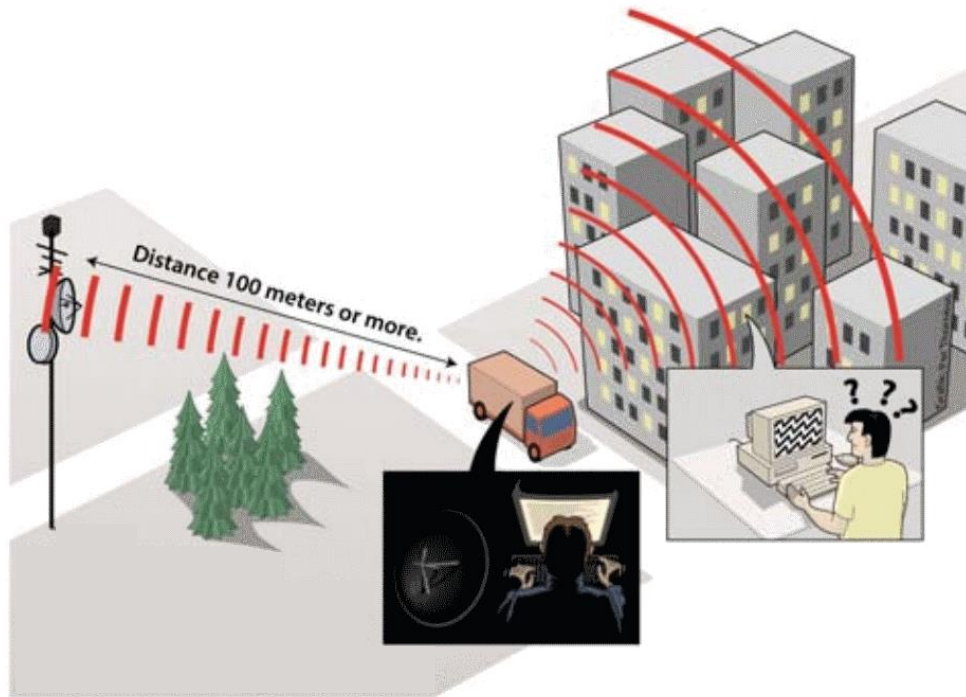
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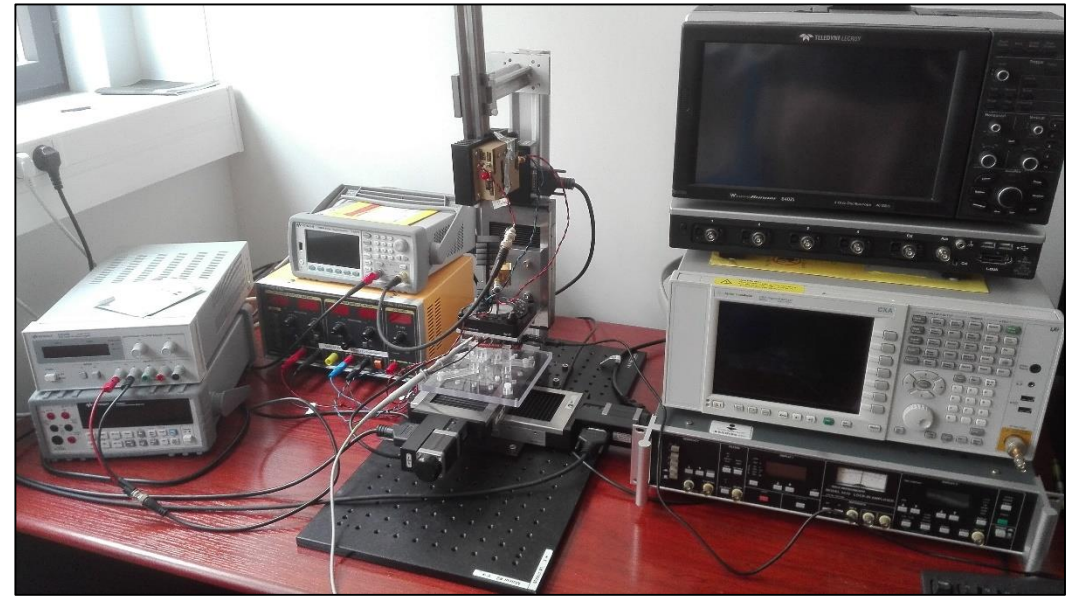
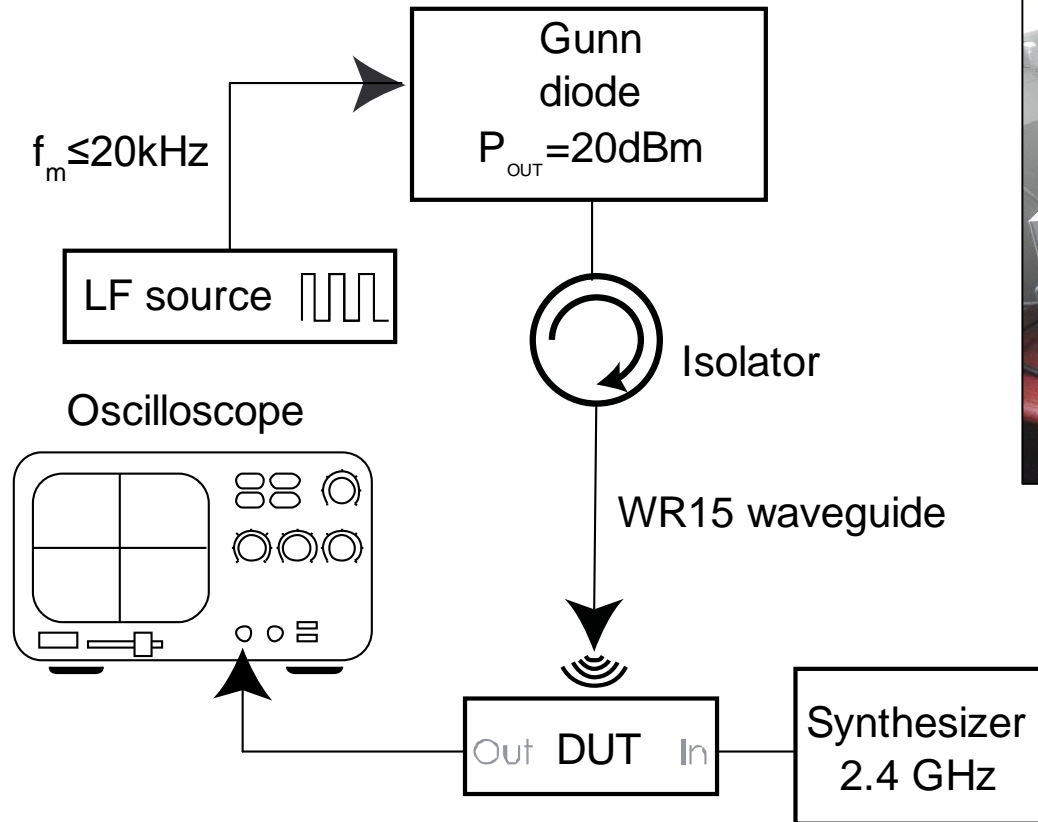
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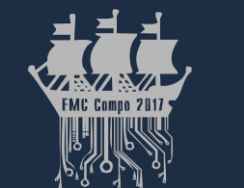
Radiated mm-wave injection



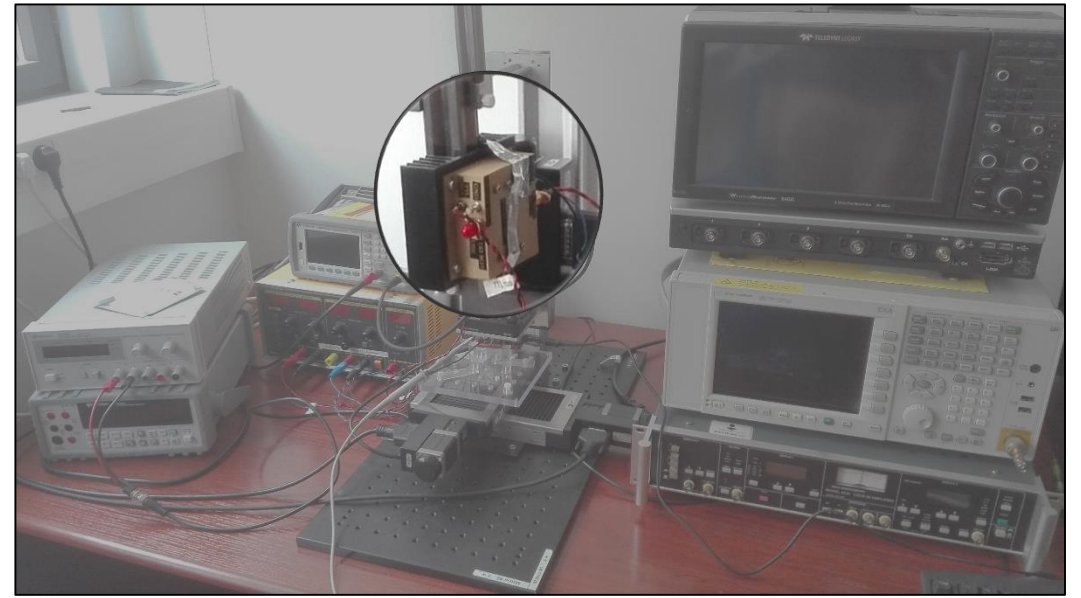
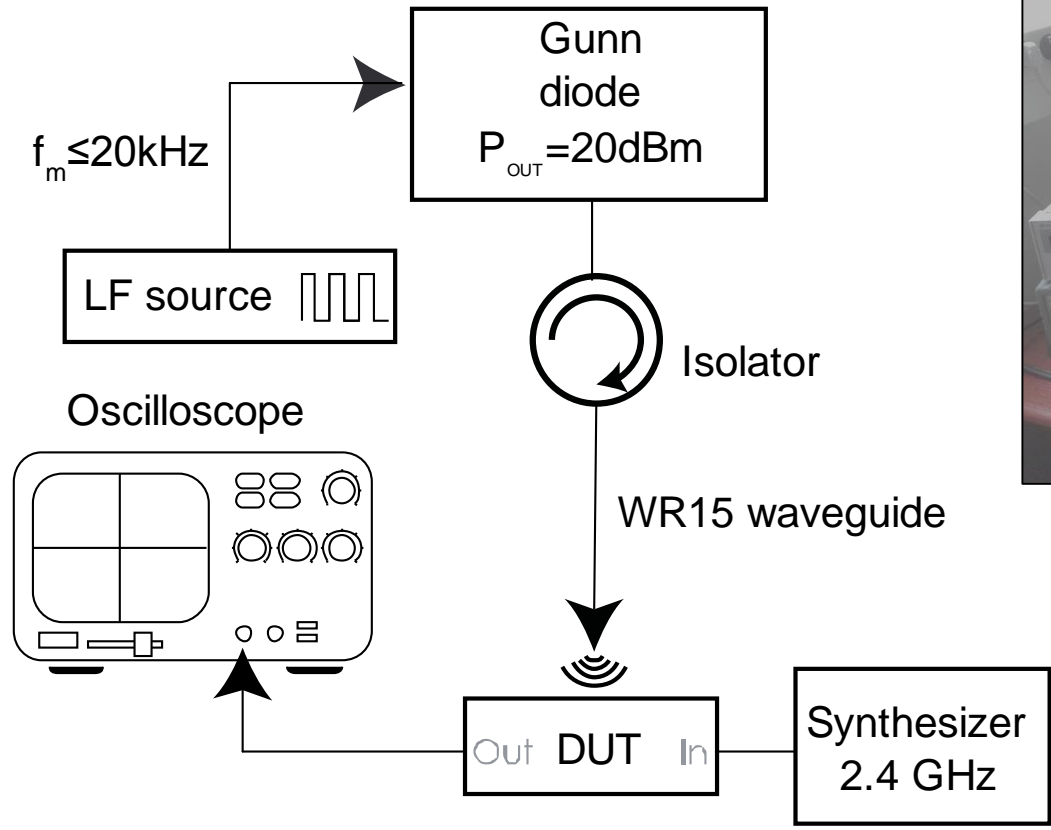
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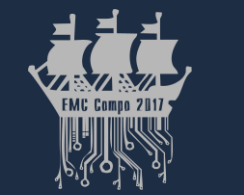
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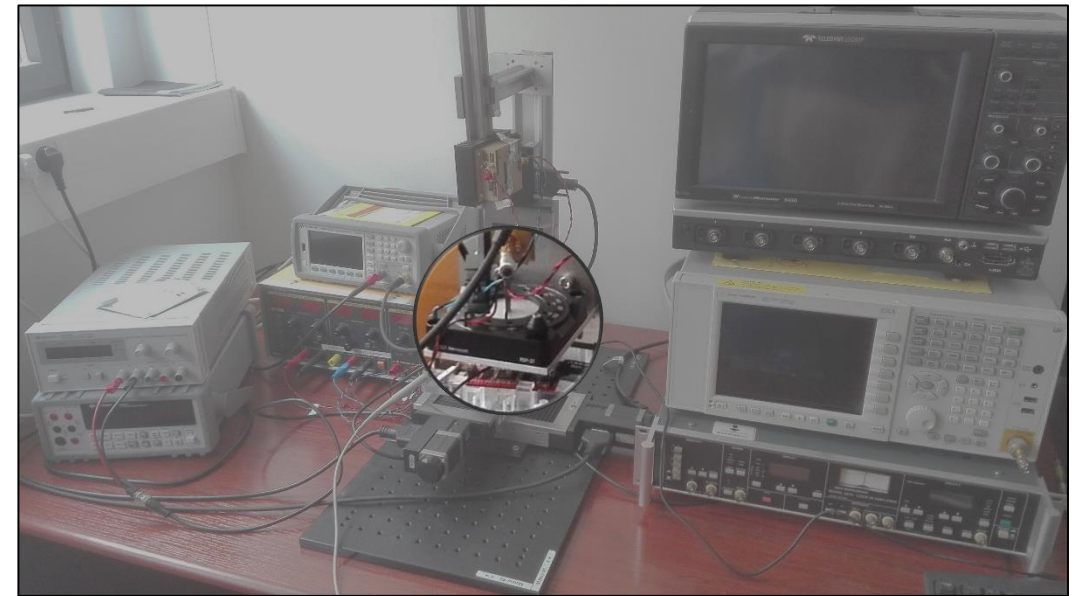
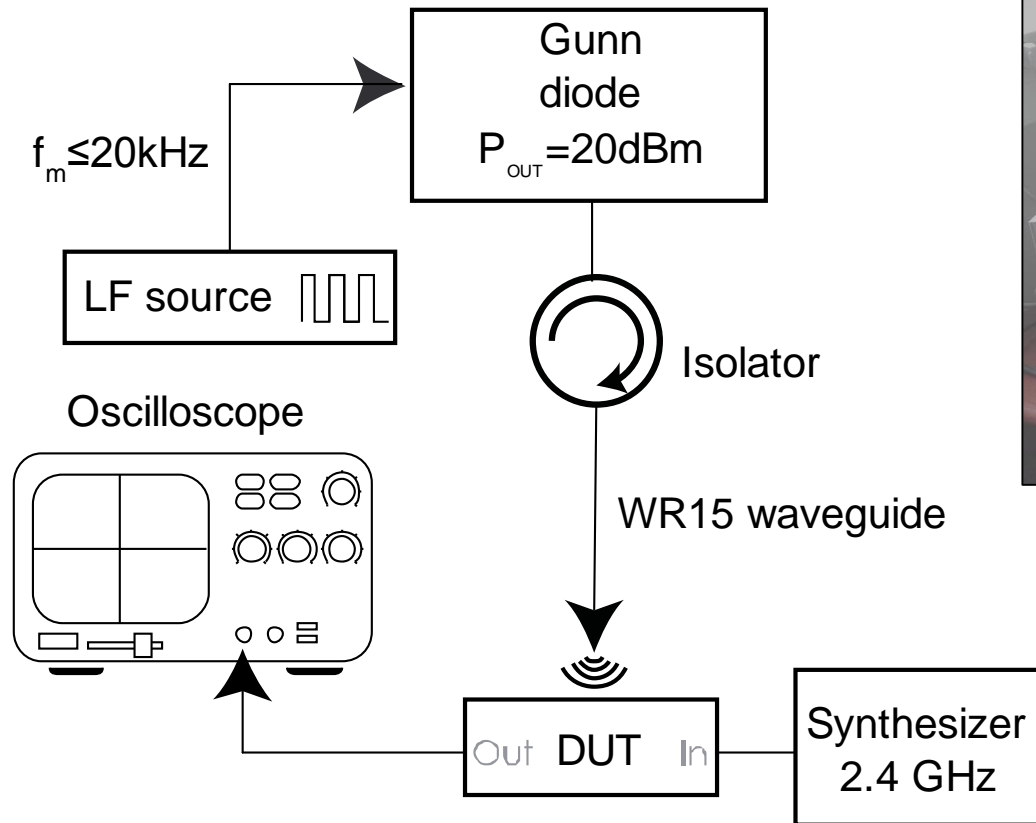
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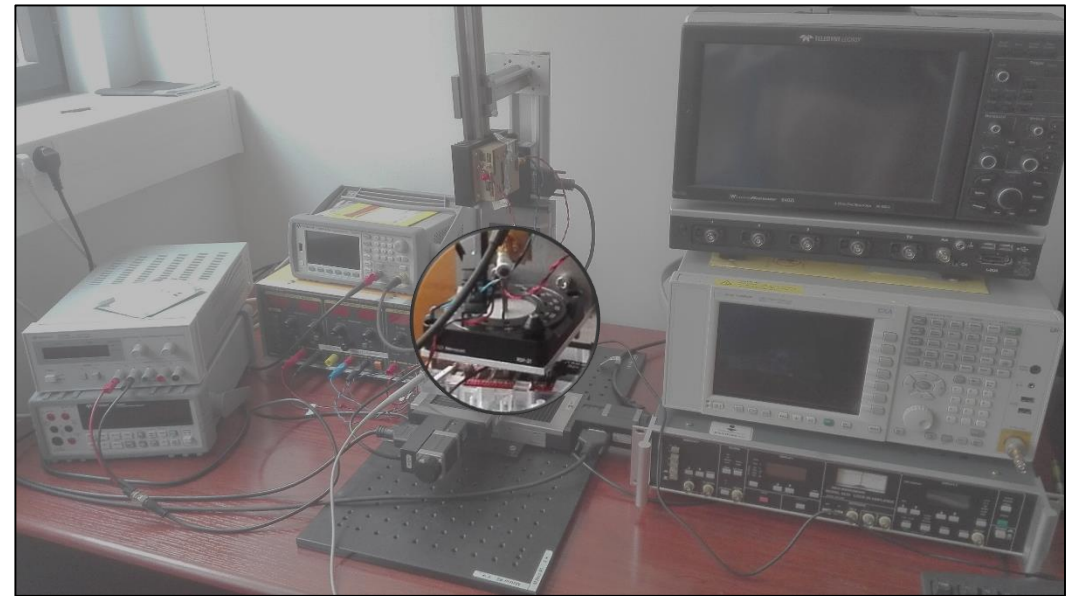
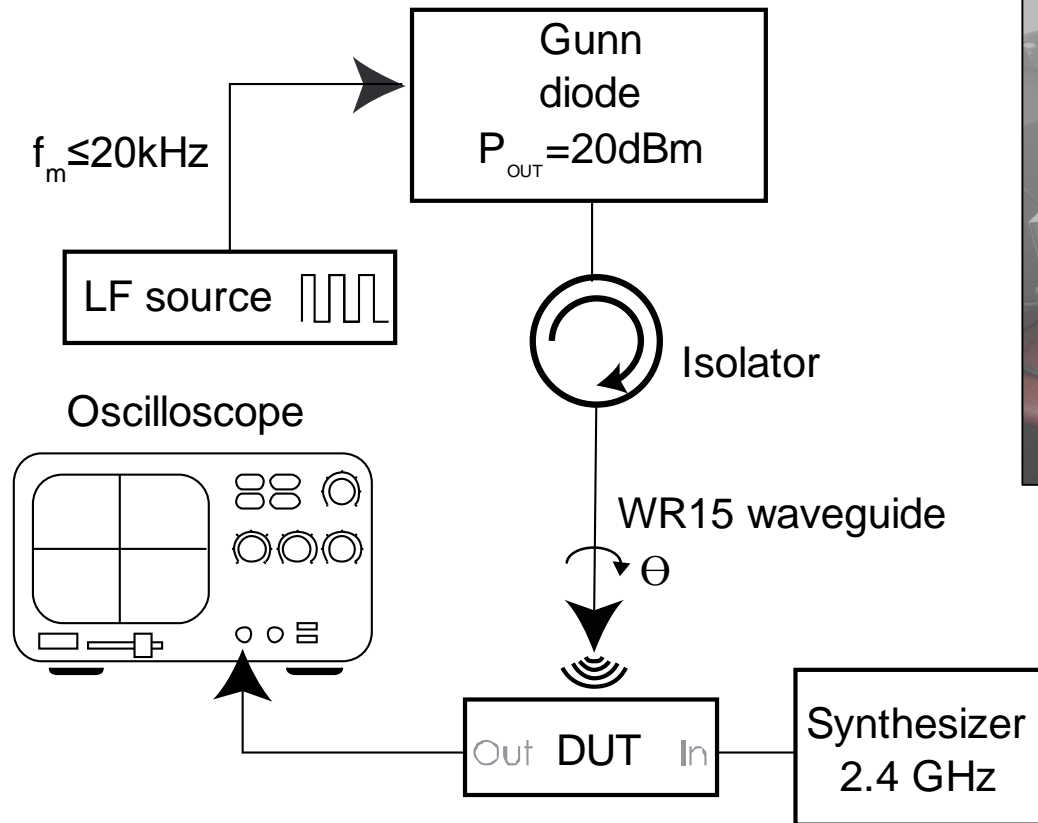
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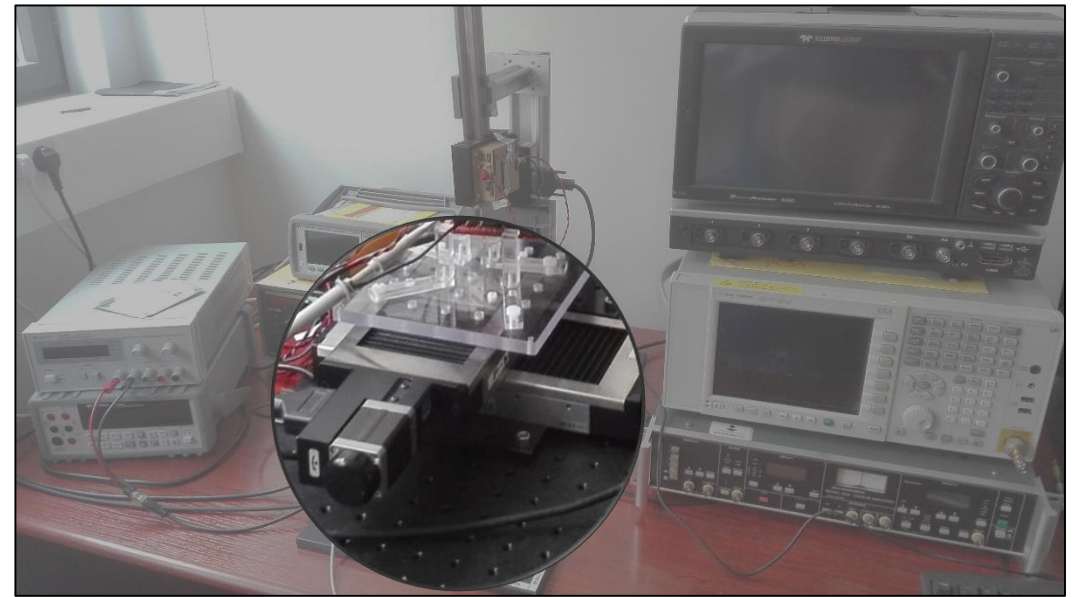
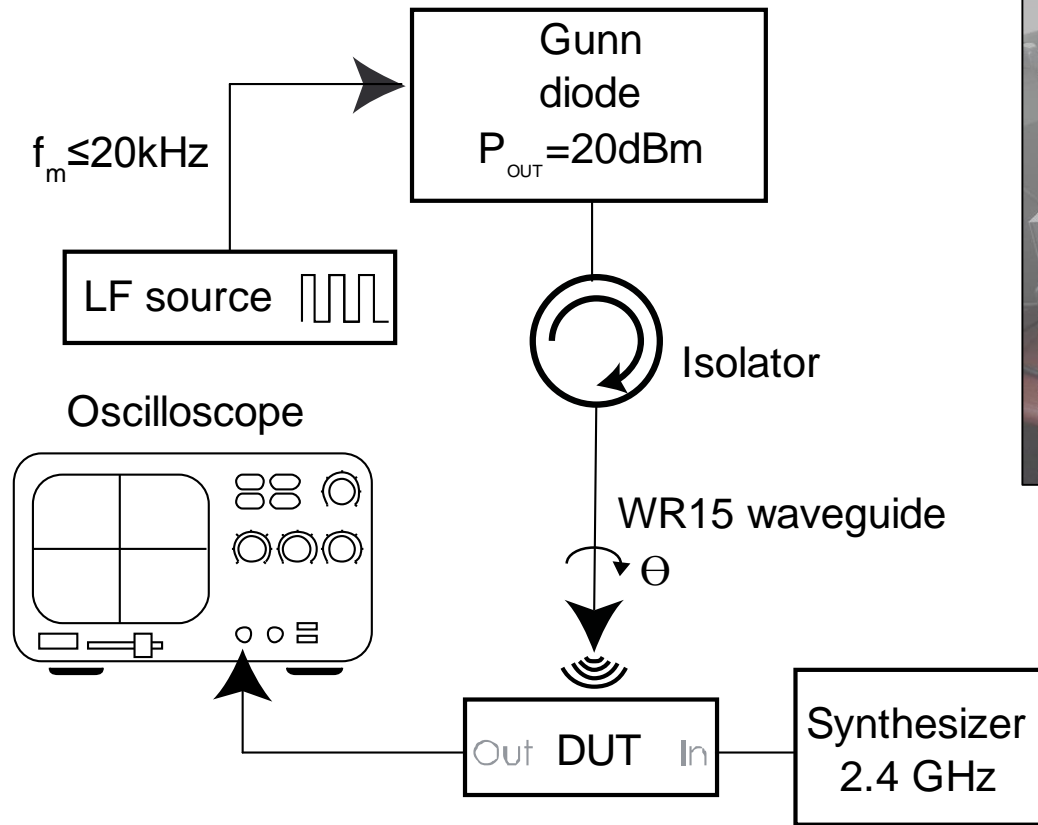
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Radiated mm-wave injection



Radiated mm-wave injection



- Parameters :
- DUT/Source distance
 - f_m
 - θ

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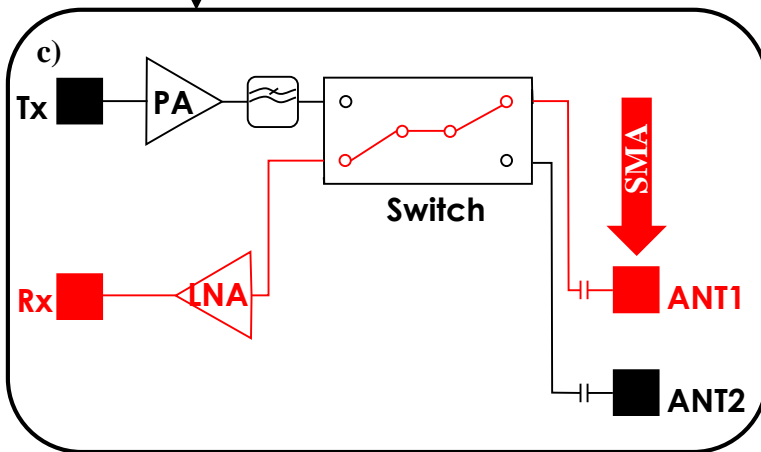
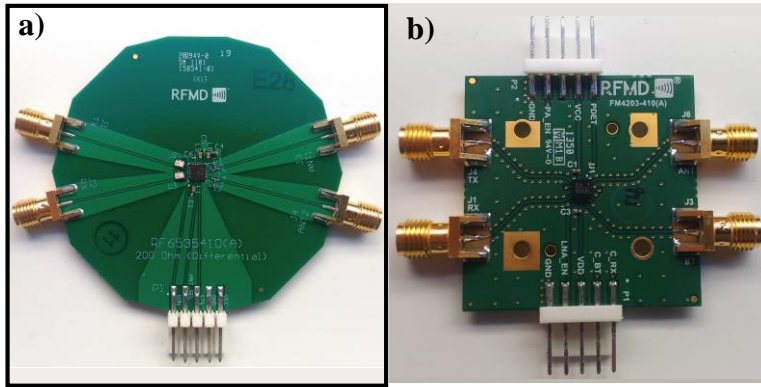
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- ▶ Samples :
 - 7 analog boards tested.
 - 400 MHz to 5.1 GHz.
 - 2 functions LNA and/or PA.
 - *TP 0.5 to 1.47 mm.

- ▶ RF6535 → [2400 – 2500 MHz]
 - ↳ TP ≈ 0.5 mm
- ▶ RFFM4203 → [2400 – 2500 MHz]
 - ↳ TP ≈ 1 mm

*TP : Thickness Package

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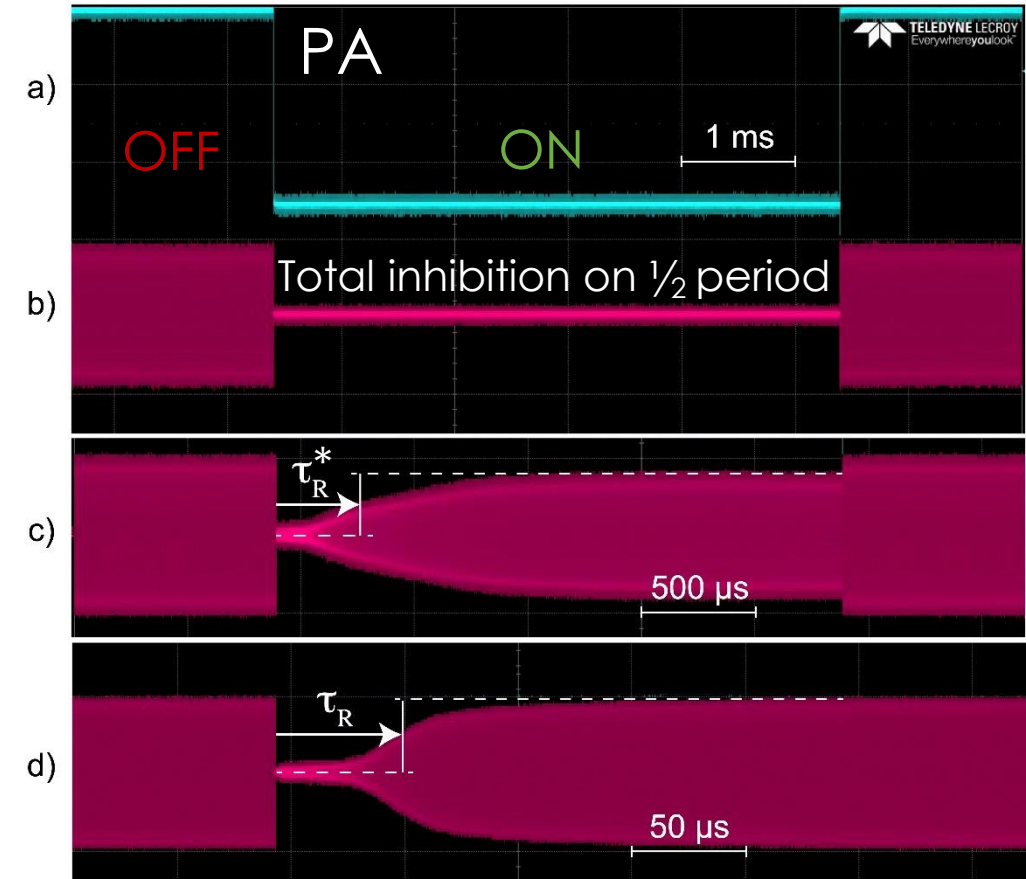
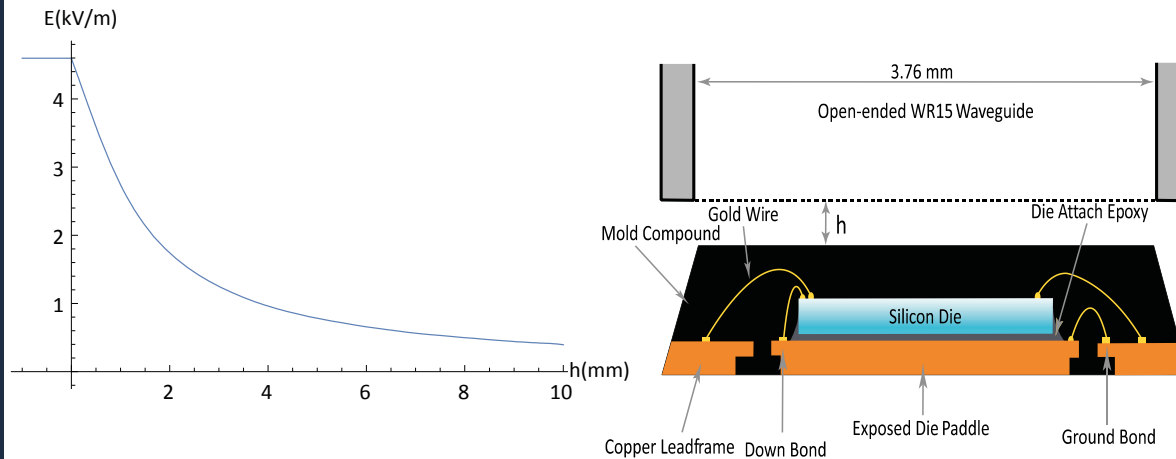
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Measurement of output device

- ▶ PA function
 - ➔ Inhibited by 60 GHz signal
 - ➔ The amplification function is recovered
 - ↳ τ_R ?

- ▶ It is a first injection at 60 GHz !



*** τ_R : Recovery time**





OUTLINE

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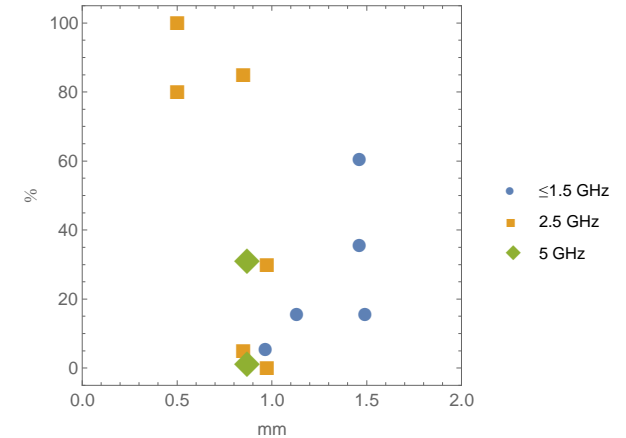
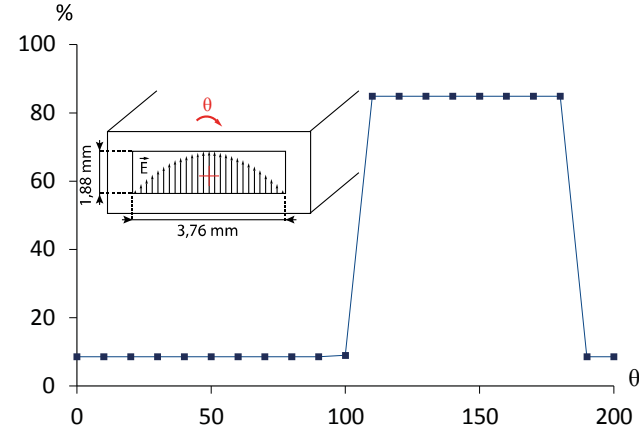
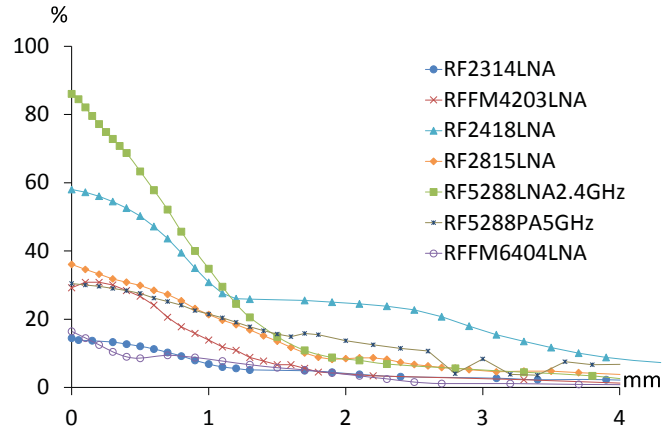
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Upset of a 2.4 GHz RF Front-End with mm-waves EMI



► All IC's are disturbed at various levels 😊

► Sensitivity to the orientation of the target within circuit. 😊

► It would also be interesting to make similar plots using the MOS gate length as parameters.

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- ▶ It is demonstrated a remote extinction of a front-end with an out-of-band EMI.
- ▶ The efficiency of the perturbation is considerably enhanced with a chopped microwave signal.
- ▶ Both the LNA and the PA have been easily disrupted.

Perspectives

- ▶ In-depth study of the coupling mechanism.
- ▶ Propose a first electrical model of this coupling.

Thank you for your attention.
Do you have any questions ?

