

Master & PhD Position : Power efficient VCO design on advanced technology beyond 100 GHz

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TIMA Lab

Total Staf : 90

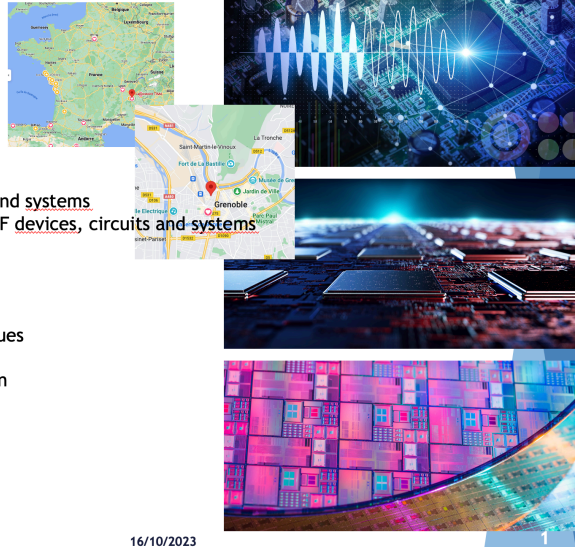
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Topics:

- Design of AMS/RF/mmW devices, circuits and systems
- Modeling, control and calibration of AMS/RF devices, circuits and systems
- Robustness, reliability and test
- Low power design
- Hardware security and embedded trust
- Asynchronous design
- New sampling and data processing techniques
- MEMS, Smart Sensors and Actuators
- New hardware computing and digital design

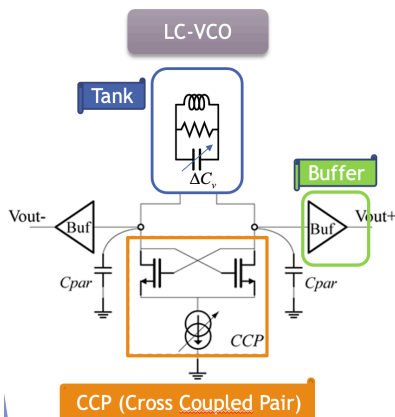
RMS Team Topics:

- mmW hardware design
- RF Low-power
- RF and mmW Bist Converters
- Test-Control and Calibration



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WideBand / Low Power VCO



Conventional approach [1] [2]

The main stream to improve perf. is :

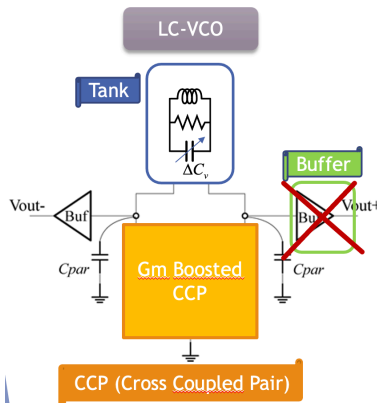
- Improving the tank Q factor to improve the over-all performances.
- Large Q means :
 - Low Power Cons.
 - Large FTR
 - Low Q-Factor

The limitation is :

- Technology dependent
- High performances back-end are needed

[1] L. Gomes, E. Sharma, A. A. L. Souza, A. L. C. Serrano, G. P. Rheder, E. Pistono, P. Ferrari, S. Bourdel, "77.3-GHz Standing-Wave Oscillator Based on an Asymmetrical Tunable Slow-Wave Coplanar Stripline Resonator", *IEEE Transactions on Circuits and Systems I: Regular Papers*, pp.1-12, 2021.
[2] E. Sharma, A. A. Saadi, M. Margalef-Rovira, E. Pistono, M. J. Barragan, A. A. Lisboa de Souza, P. Ferrari, S. Bourdel, "Design of a 77-GHz LC-VCO With a Slow-Wave Coplanar Stripline-Based Inductor", *IEEE Transactions on Circuits and Systems I: Regular Papers*, pp.1-11, 2019.

WideBand / Low Power VCO



Our New Approach:

Use a gm boosted CCP that highly increases the gm with small current ID and small transistor W.

- Small ID reduces Power Cons.
- Small W reduces Cpar and increases FTR
- Large gm can compensate for the buffer load and reduces the buffer impact (buffer can be suppressed)

Thesis objective :

- Study and understand the proposed architecture
- Make a SOA survey
- Measure this new architecture and compare it to SOA
- Propose design and measure solutions to improve the performances especially to increase operating frequency. (Direct synthesis at frequency higher than 100 GHz is not possible in advanced technologies. Is gm-boosting a solution ?)(CMOS B55)
- Propose, design and measure solutions to match this new architecture with wide band mixer (N-Path ?)