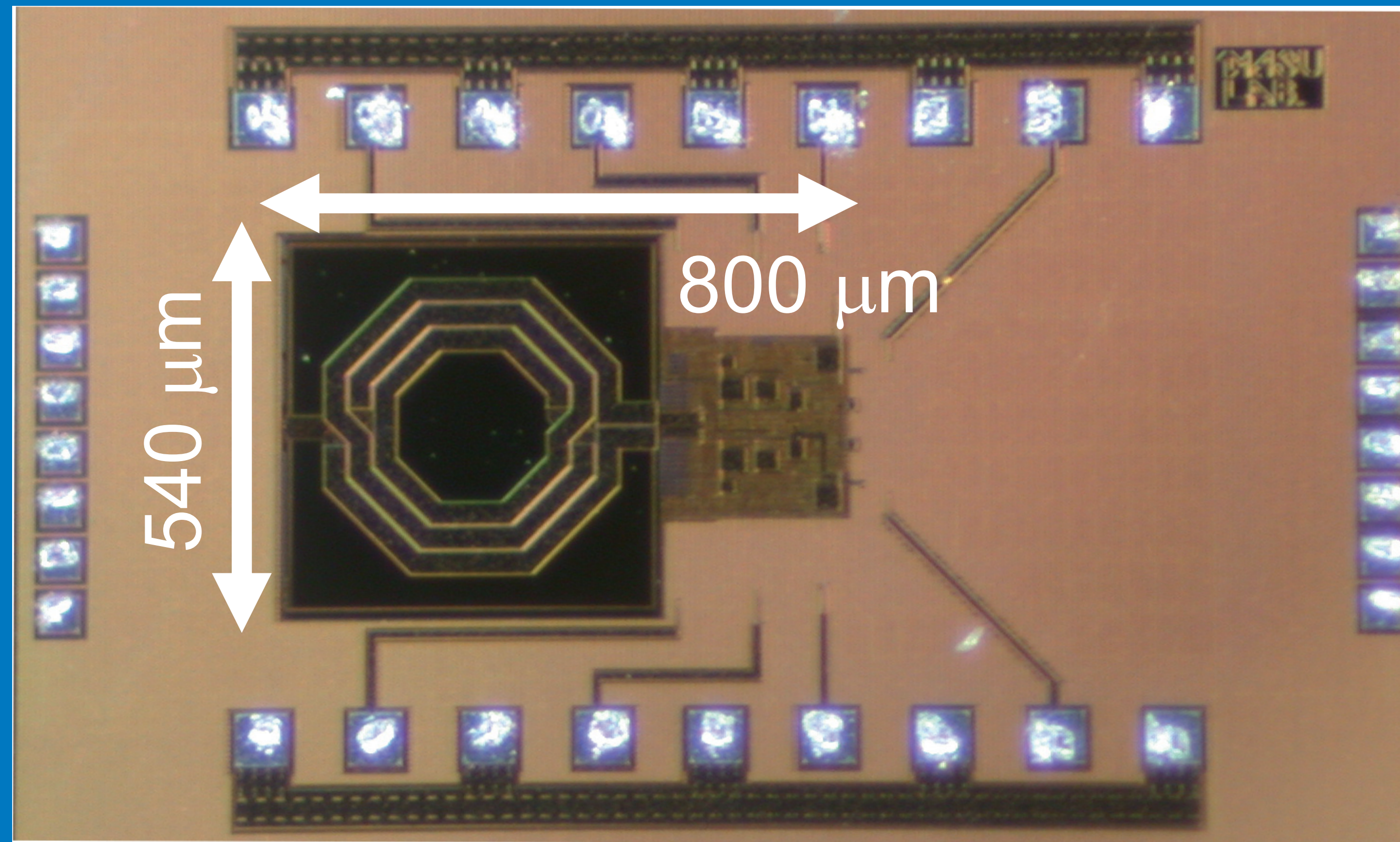


A 0.98 to 6.6 GHz Tunable Wideband VCO in a 180 nm CMOS Technology

for Reconfigurable Radio Transceiver

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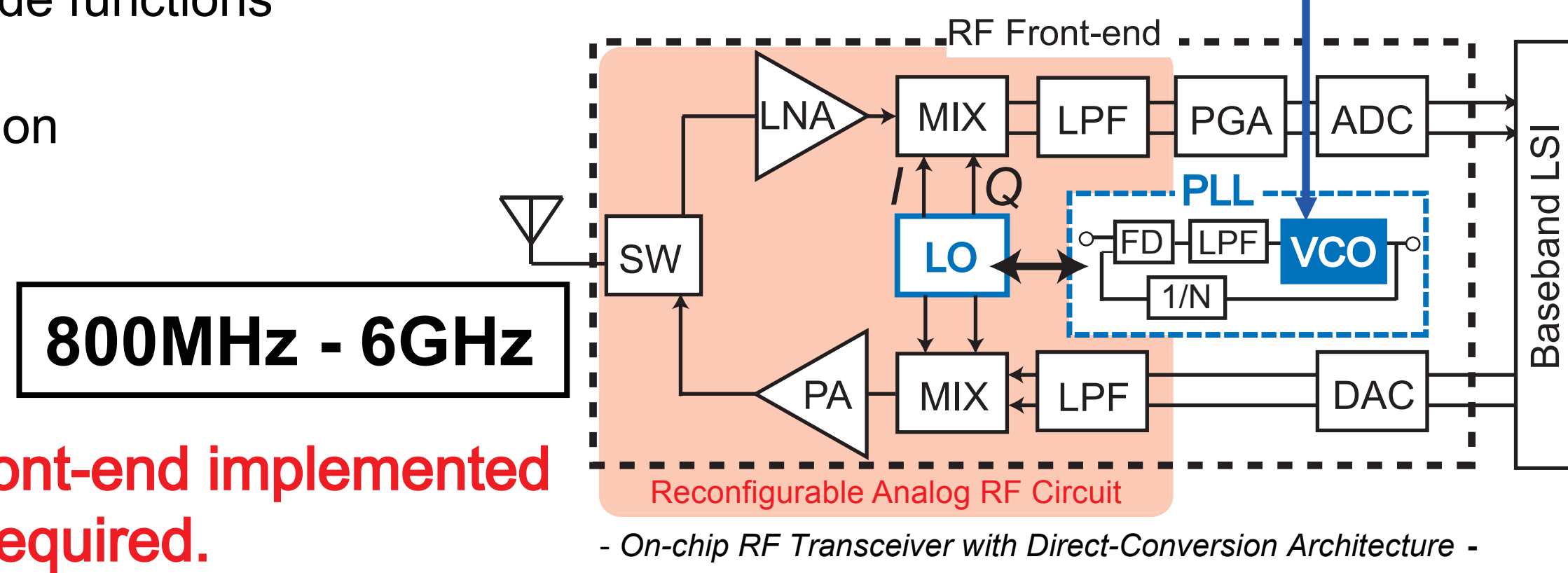


Background

Mobile Communication Device

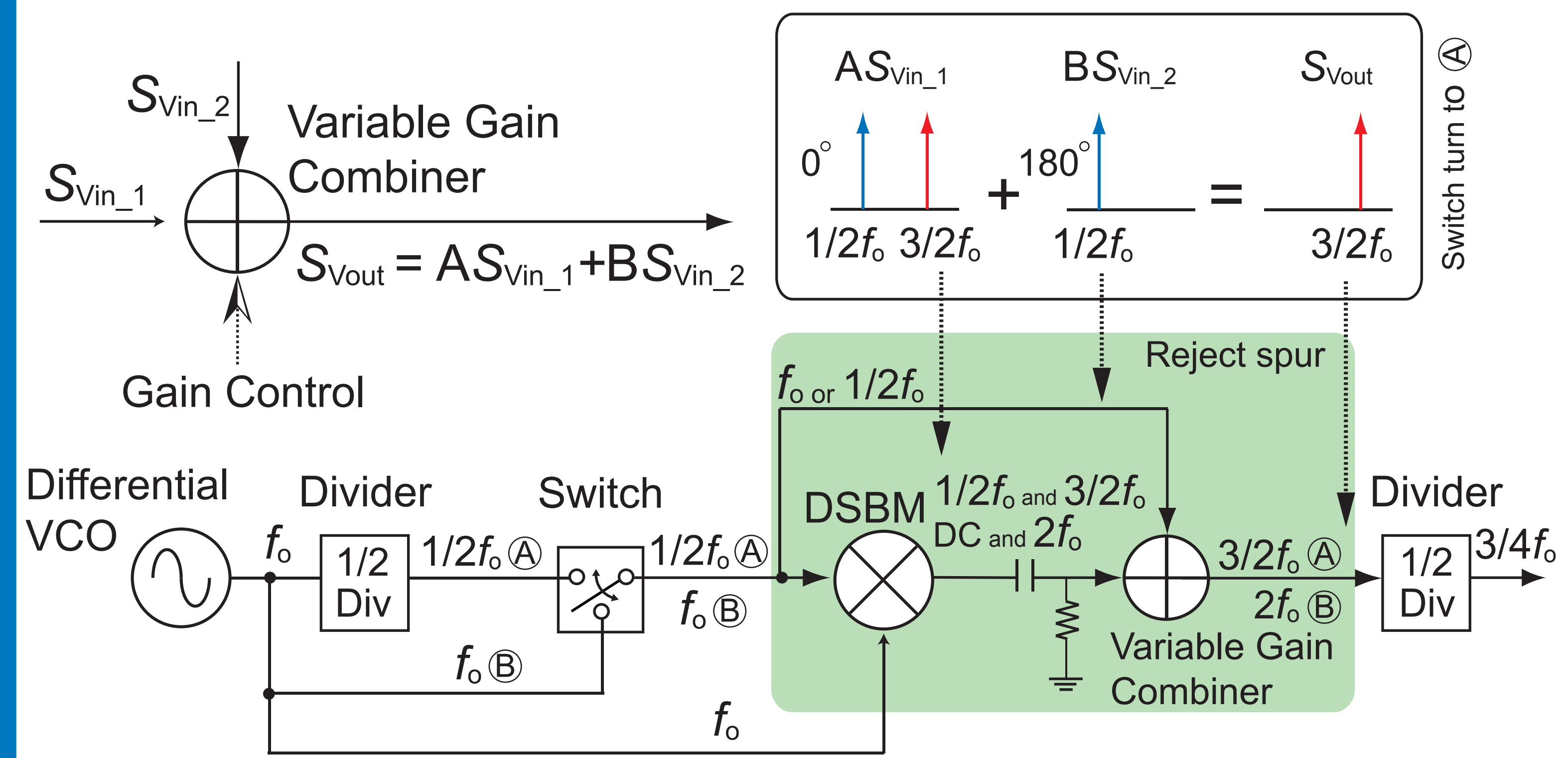
- More multi-band/mode functions
- Smaller size
- Lower power operation

Wideband VCO is an indispensable component to achieve the multi-band RF front-end.



A Multi-band RF front-end implemented in a single chip is required.

Detail of proposed VCO



Purpose of this work

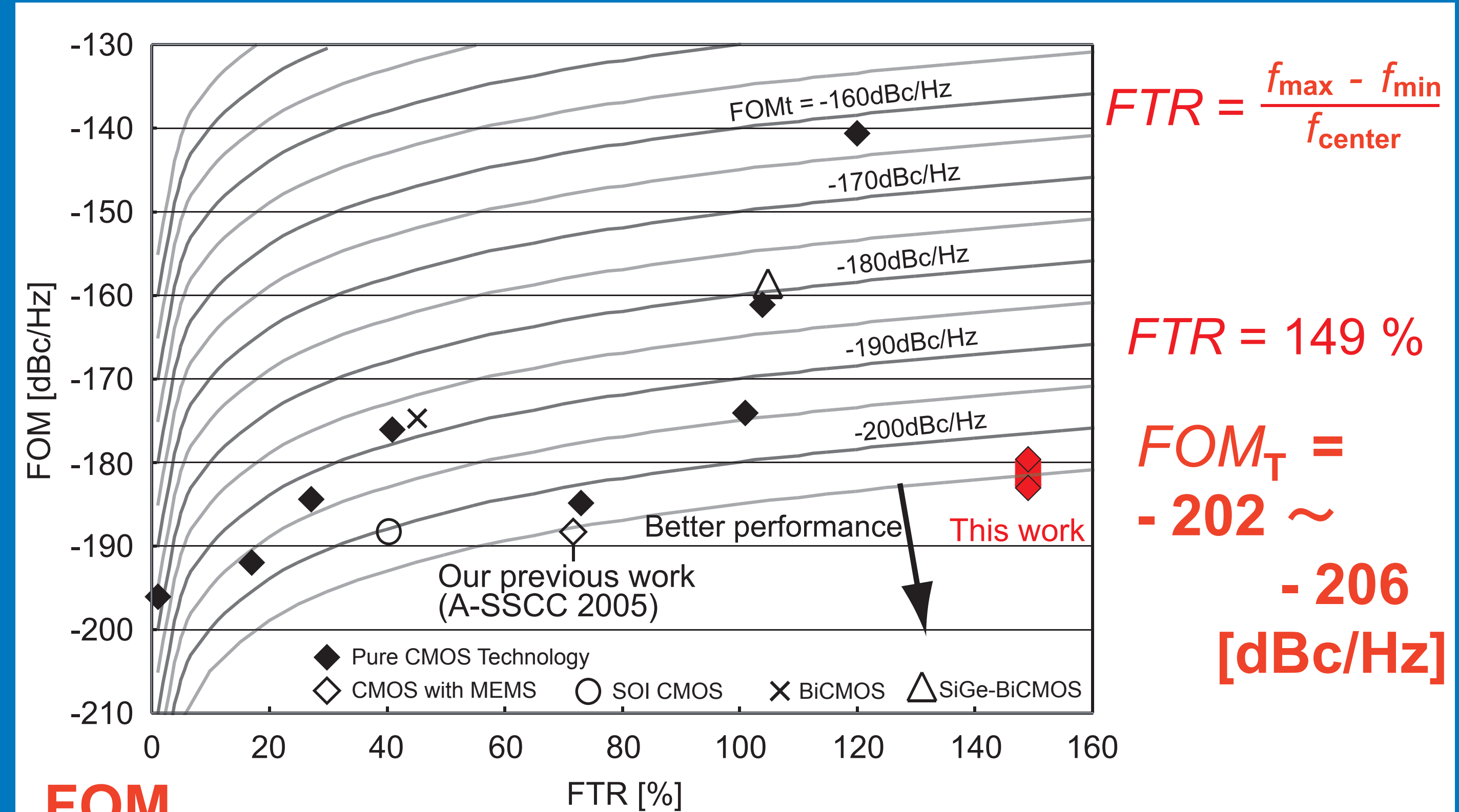
Tuning-range extension technique (Using LC-VCO, divider and mixer)

It can achieve the wide tuning range with sufficient phase noise.

We use the Differential VCO instead of QVCO.

We can achieve the wide tuning range and low phase noise with smaller layout area.

Impact



$$FTR = \frac{f_{max} - f_{min}}{f_{center}}$$

$$FTR = 149\%$$

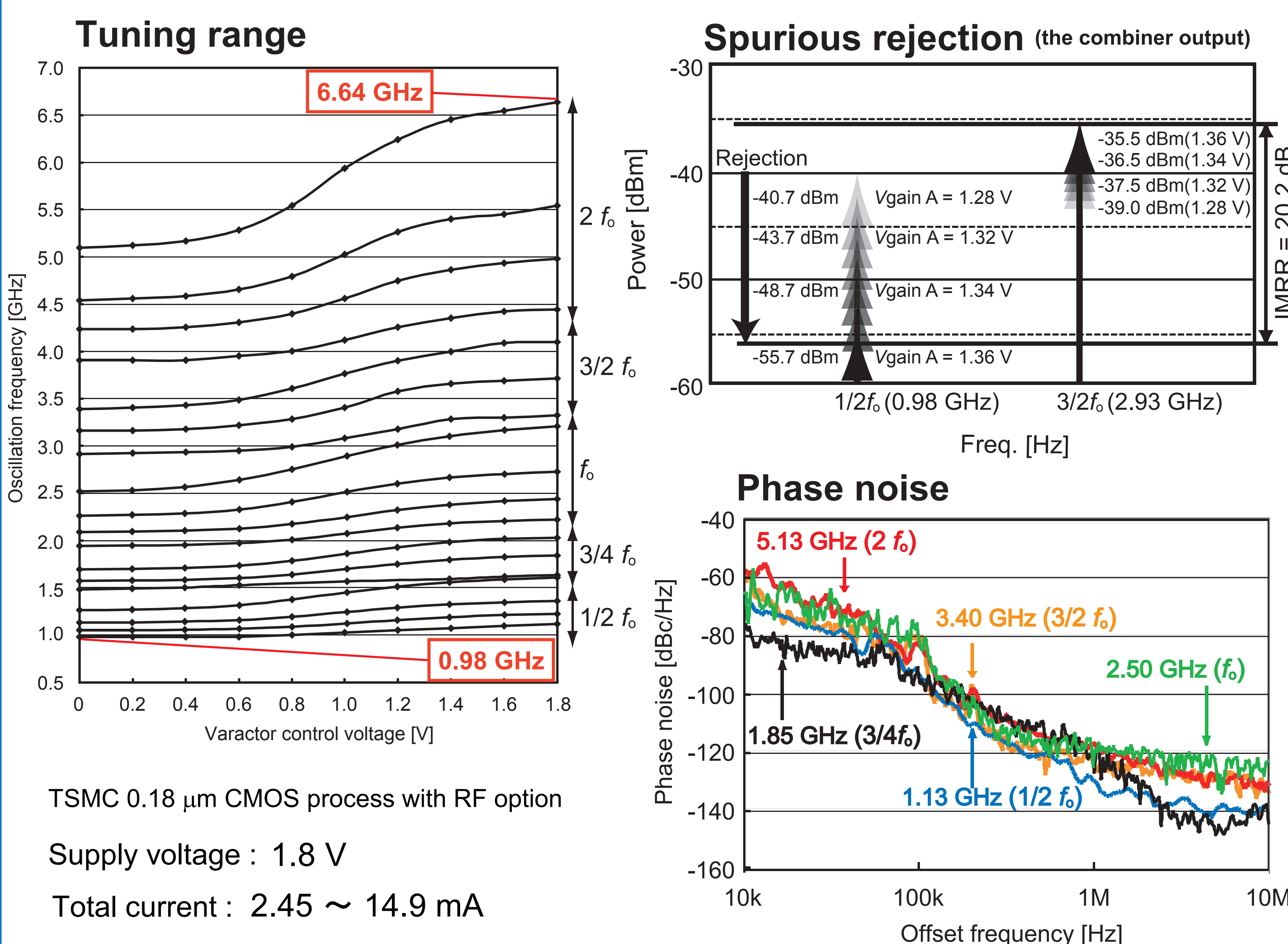
$$FOM_T = -202 \sim -206 \text{ [dBc/Hz]}$$

Normalizing VCO phase noise ($L\{f_{offset}\}$) by center frequency (f_0), power consumption (P_{dc}) and frequency tuning range (FTR).

$$FOM_T [\text{dBc/Hz}] = L\{f_{offset}\} - 20 \log \left(\frac{f_0}{f_{offset}} \cdot \frac{FTR}{10} \right) + 10 \log \left(\frac{P_{dc}}{1 \text{ mW}} \right) = FOM - 20 \log \left(\frac{FTR}{10} \right)$$

The proposed wideband LC-VCO achieves the widest tuning range, and the best FOM_T simultaneously using pure CMOS technology.

Measurement results



Conclusion

A differential LC-VCO and a double side-band mixer and utilized instead of a QVCO and a SSMB. The proposed wideband VCO can achieve wide tuning range 0.98 - 6.64 GHz with sufficient phase noise.