

mmW Integrated PAs

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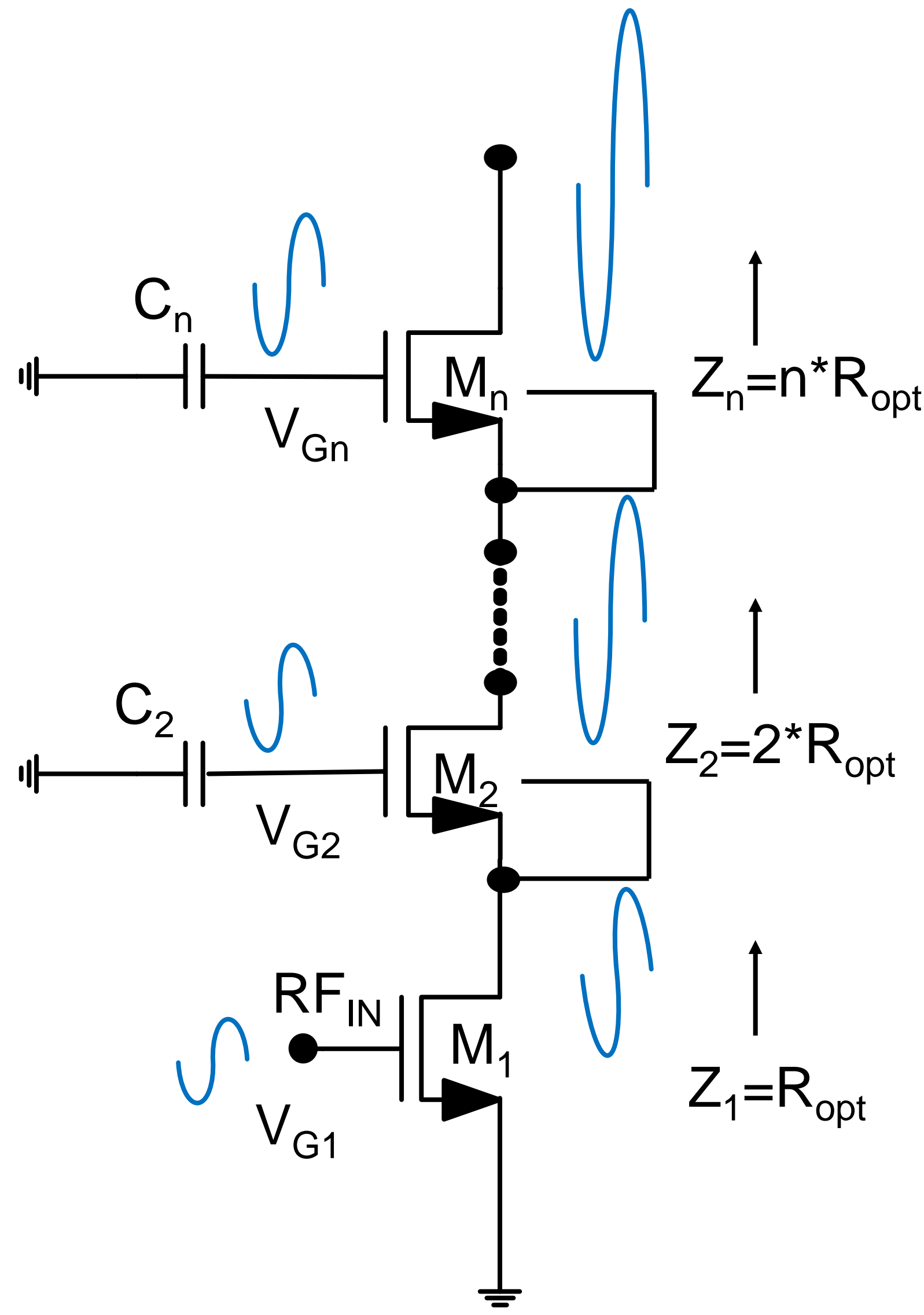


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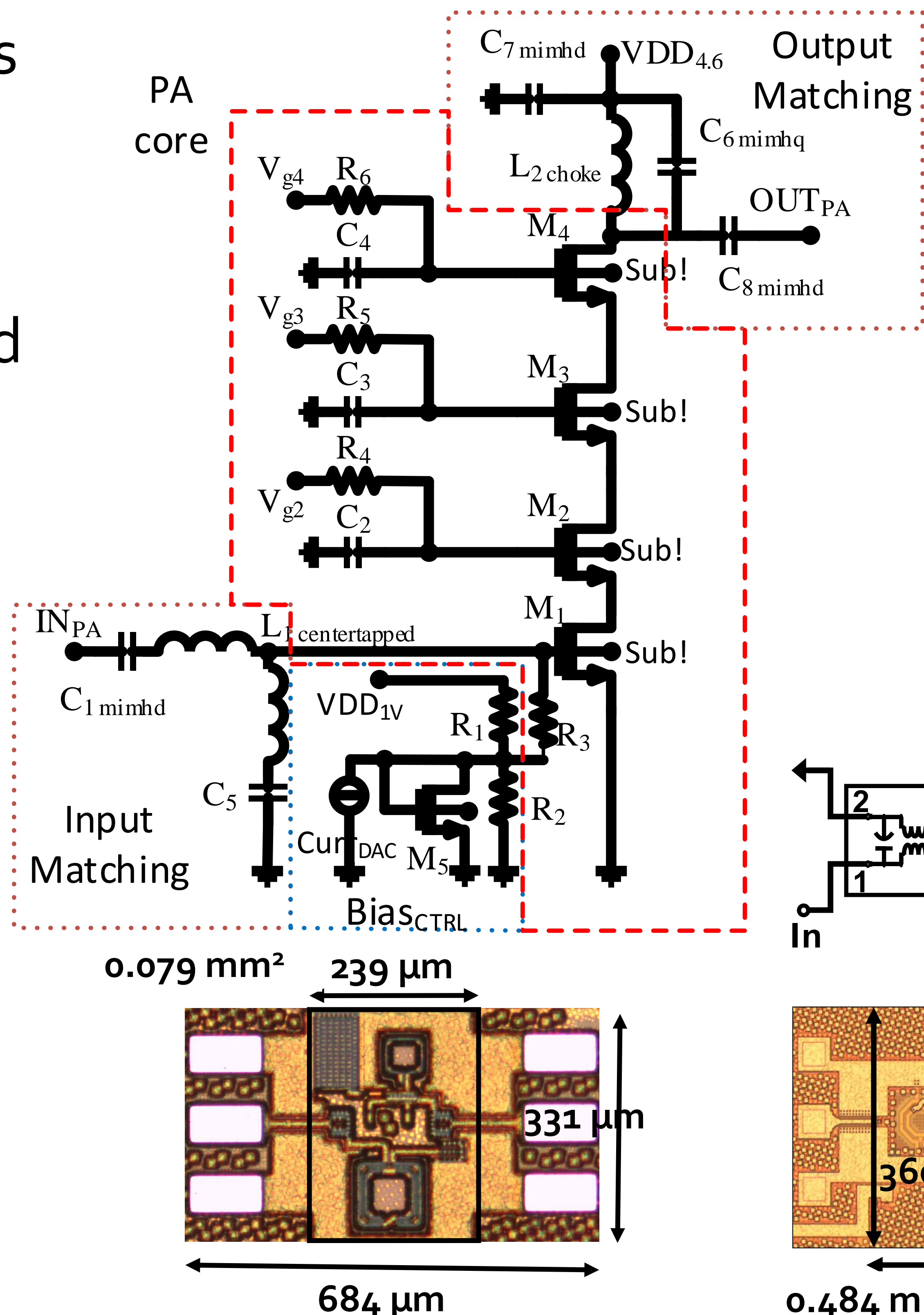
Stacked PA

- Low VDD in CMOS processes limits Vout swing and achievable power
- In CMOS SOI processes devices can be stacked
- Bulk connected to the source or floating => VDD can be increased



mmW 4-stack @ 45rfsoi

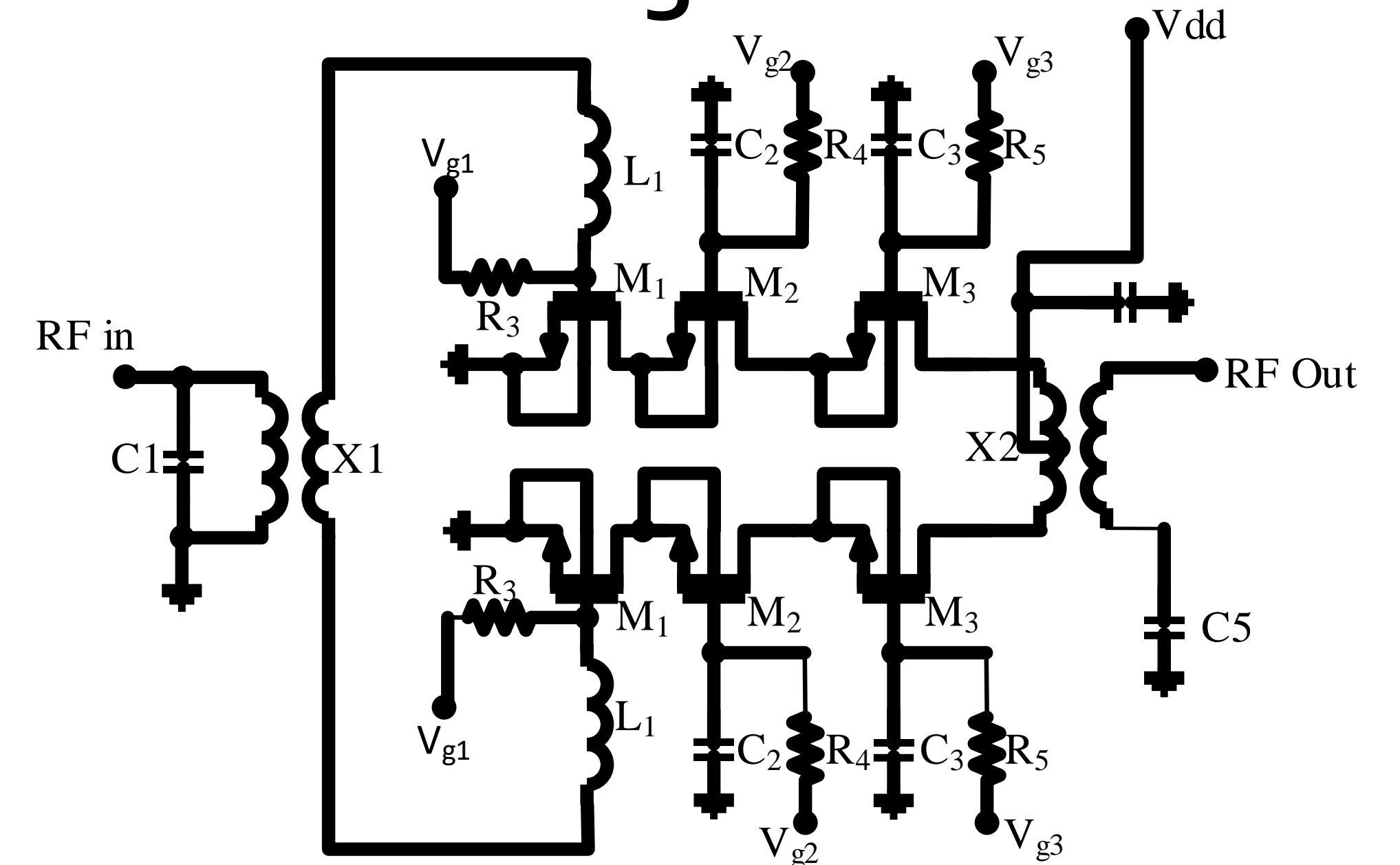
- VDD from 1V to 4.6V
- Output power 20.5 dBm
- Direct 50 ohm output



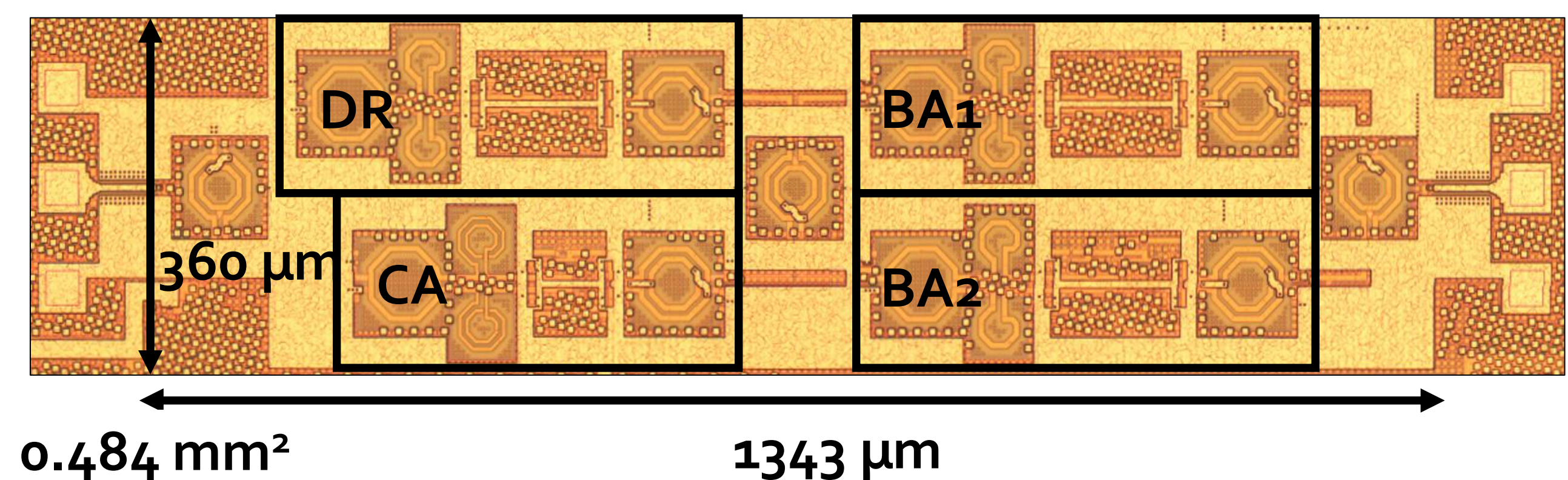
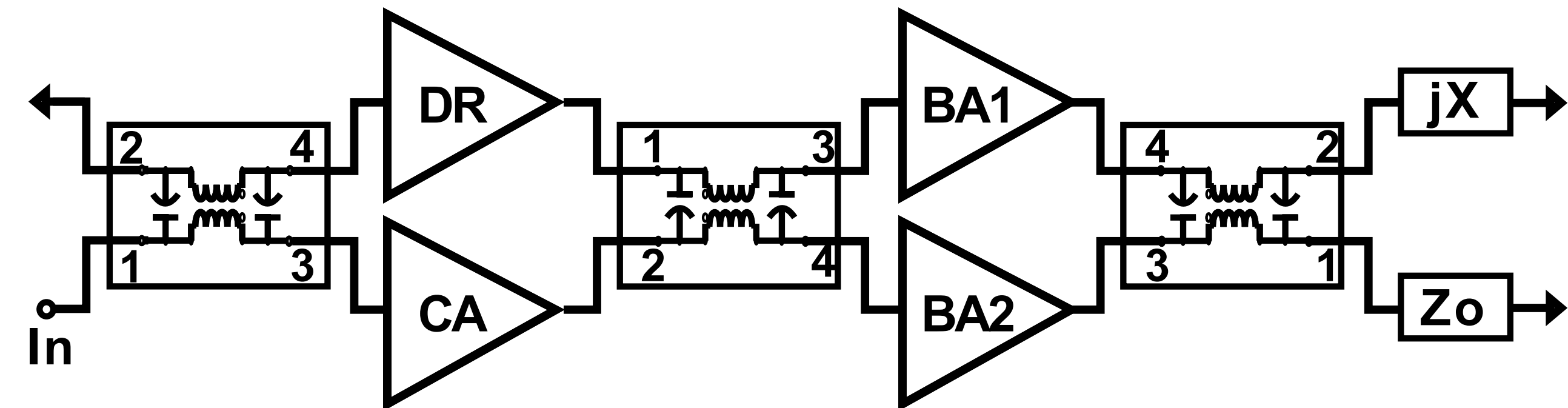
mmW OLMBA @ 22fdx

- XF matched pseudo-diff PAs utilizing quad. hybrid
- 3-stack allowing VDD=2.7V

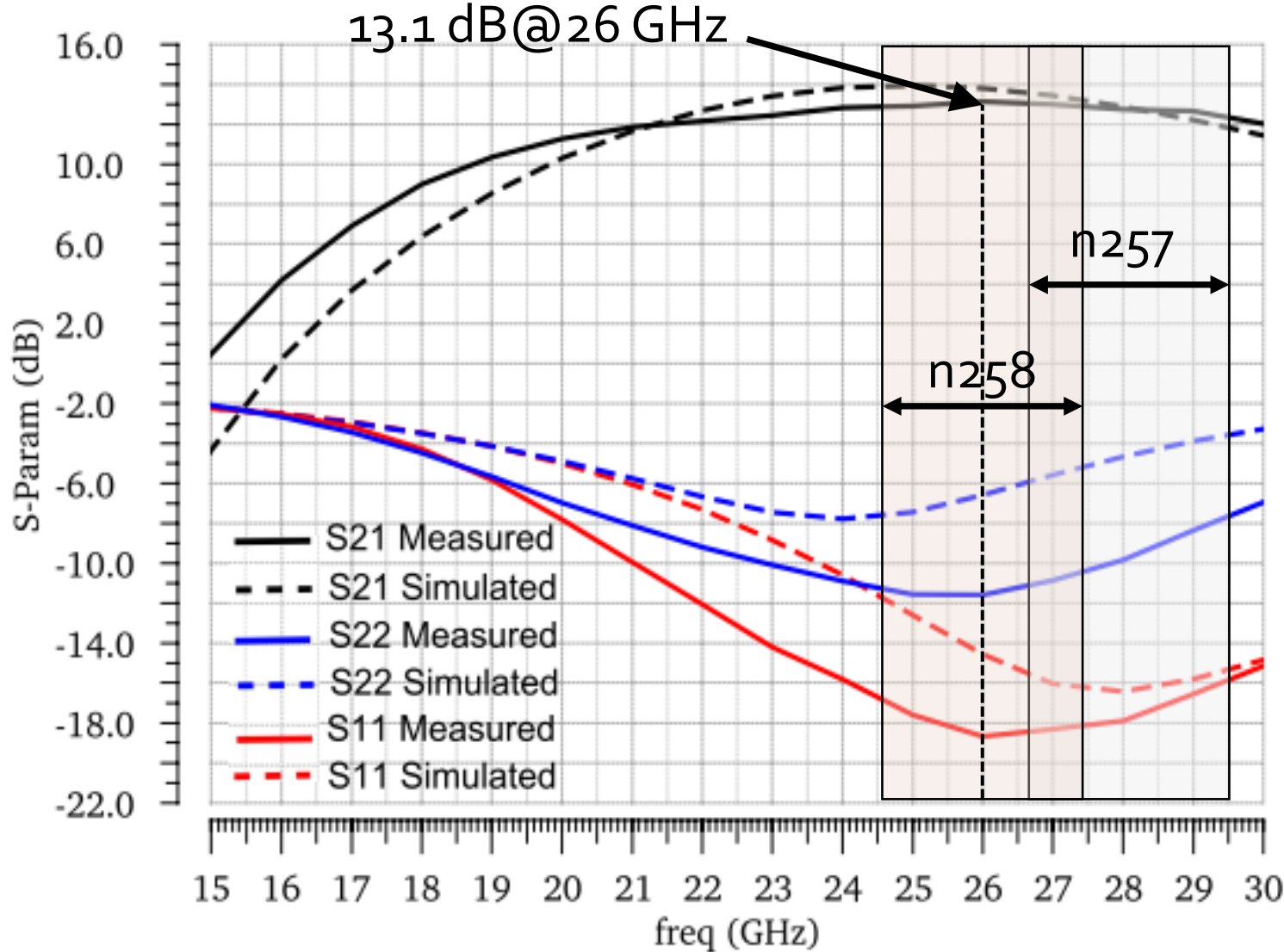
PA design block



- jX reflects CA signal to produce load modulation

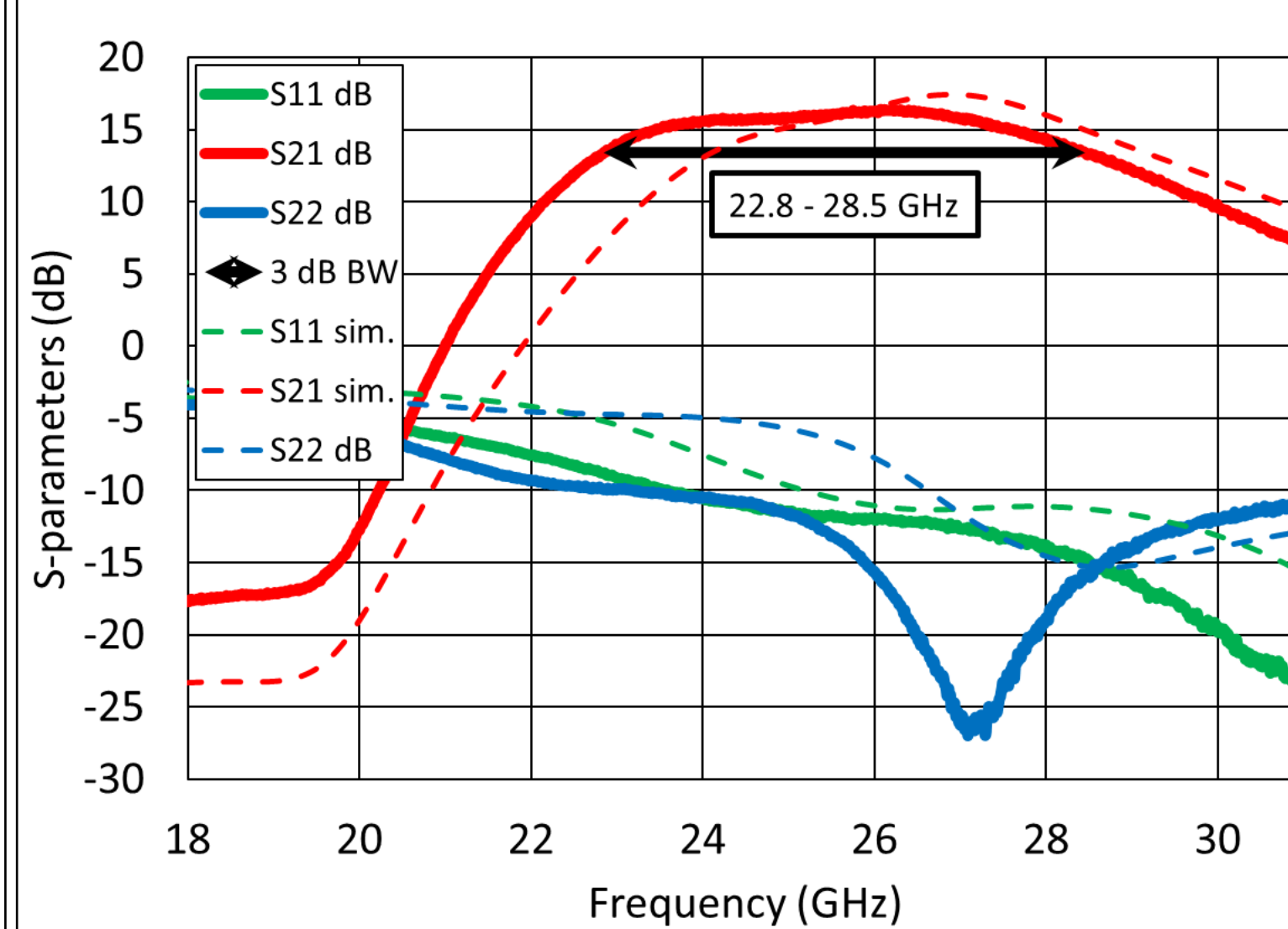


Measured results of 4-stack PA @ 26 GHz



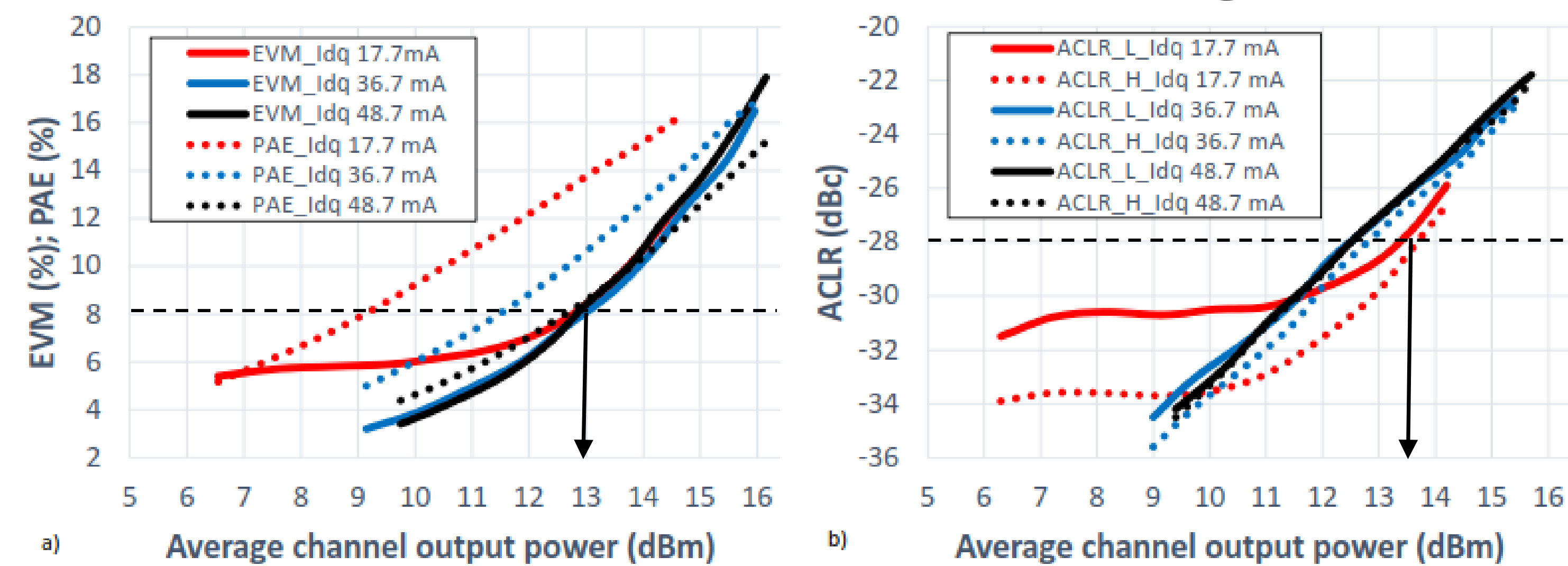
Freq (GHz)	26
VDD	4,6
Psat (dBm)	20,5
P1dB (dBm)	18,8
Gain (dB)	13,2
Peak PAE (%)	29
Area (mm²)	0,225

Measured results of OLMBA PA @ 26 GHz

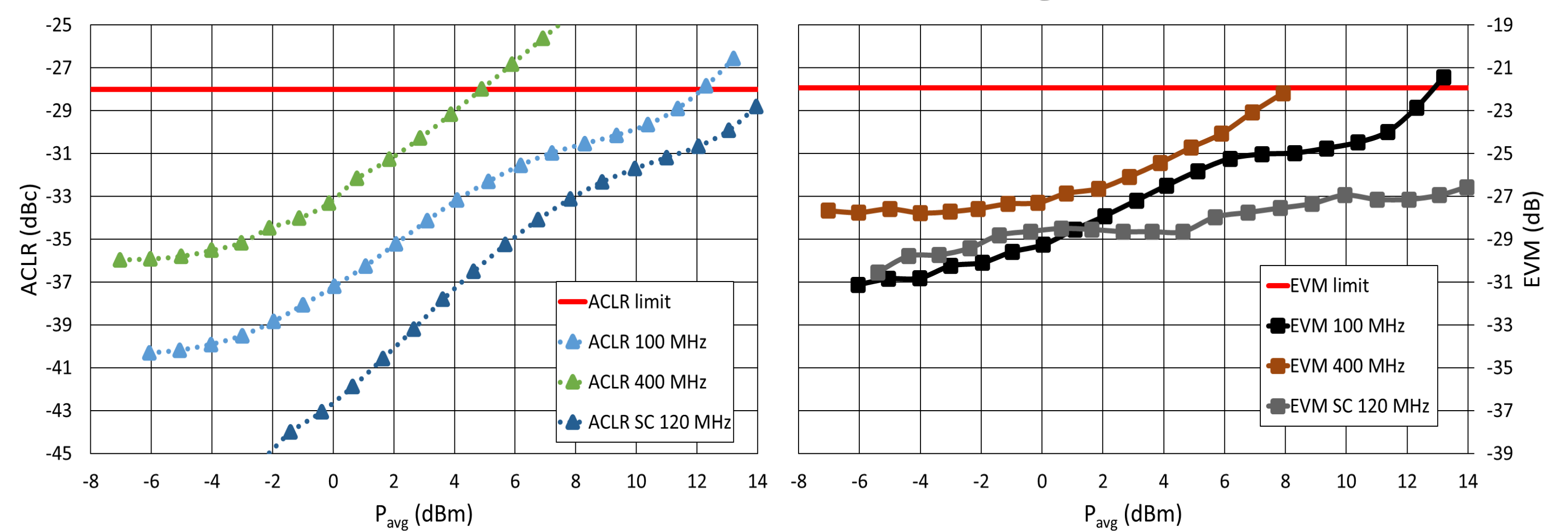


Freq (GHz)	26
VDD	2,6
Psat (dBm)	19,5
P1dB (dBm)	18,3
Gain (dB)	16,6
Peak PAE (%)	15,7
Area (mm²)	0,484

Meas. with 100MHz OFDM 16-QAM @ 26 GHz



Meas. with OFDM/SC 64-QAM @ 26 GHz



Janne P. Aikio, Alok Sethi, Mikko Hietanen, Jere Rusanen, Timo Rahkonen, and Aarno Pärssinen. 2021. "Ka-Band Stacked Power Amplifier Supporting 3GPP New Radio FR2 Band n258 Implemented Using 45 nm CMOS SOI" *Applied Sciences*, 11, no. 15: 6708, July 2021.

J. Rusanen, A. Sethi, N. Tervo, T. Rahkonen, A. Pärssinen, V. Kiuru, J. P. Aikio, "Ka-Band Orthogonal Load-Modulated Balanced Amplifier in 22 nm CMOS FDSOI" *Proceedings of 17th European Microwave Integrated Circuits Conference (EuMIC) 26 - 27 Sept. 2022, Milan Italy.*



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