A 20GHz Push-Push Voltage-Controlled Oscillator for a 60GHz Frequency Synthesizer
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1. Motivation
- 60 GHz Communications
  - 9 GHz unlicensed band at 60 GHz
- Several Gbps wireless communications
  - 3.5 Gbps/ch (QPSK)
  - 7 Gbps/ch (16QAM)

2. Conventional 60GHz LOs
a) 60GHz QPLL
- 9GHz tuning range
- Low quality factor for capacitor
b) 30GHz PLL + Polyphase Filter
60GHz
[1] IMEC, ISSCC 2009
c) 20GHz PLL + Injection Locked Oscillator
20 GHz OSC
20GHz ILO
POS
NEG

3. Design Considerations
- Higher Quality Factor of LC-resonator tank
- Less concern for parasitic capacitance
- Power-hungry high frequency prescaler can be eliminated
- At 10GHz, the quality factor of LC resonator is relatively higher than that at 20GHz.

4. Proposed Push-Push VCO
Detailed circuit architecture

5. Measurement Results
Chip microphotograph

The proposed 20GHz push-push VCO based on a 10GHz super-harmonic coupled QVCO achieves an improvement of 2.3dB in FoM over previously-implemented 20GHz VCO [3]