

A Full 4-channel 60GHz Direct-Conversion Transceiver

Seitaro Kawai, Ryo Minami, Ahmed Musa, Takahiro Sato, Ning Li, Tatsuya Yamaguchi, Yasuaki Takeuchi, Yuki Tsukui, Kenichi Okada, and Akira Matsuzawa

Tokyo Institute of Technology, Japan

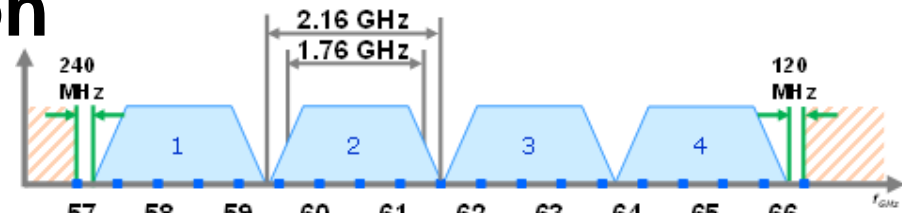


Motivation

60GHz CMOS direct-conversion transceiver for multi-Gbps wireless communication

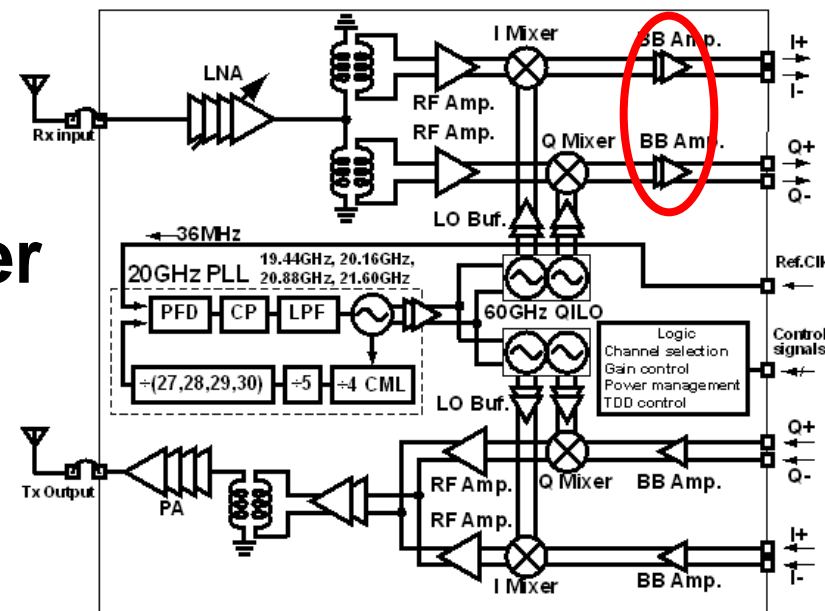
IEEE 802.11ad specification

- 57.24GHz - 65.88GHz
- 2.16GHz/ch x 4channels
- QPSK → 3.5Gbps/ch
- **16QAM → 7Gbps/ch**



Direct-conversion transceiver

- Small area
- Low power consumption

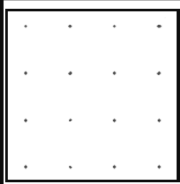
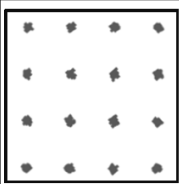
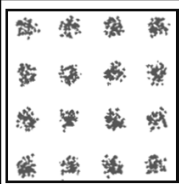


Gain peaking technique

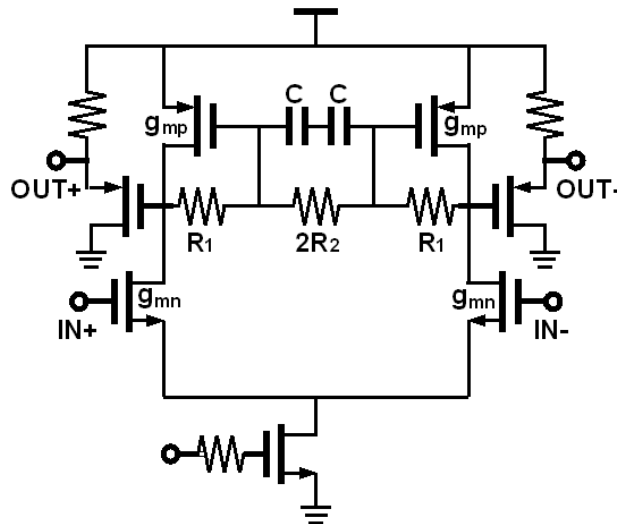
Conventional Problem

- Realize good gain flatness in 9GHz bandwidth is difficult.
- The gain flatness degrades the EVM.

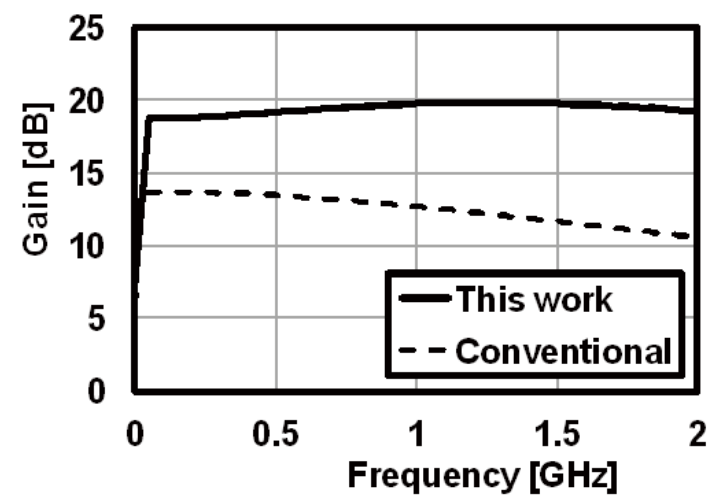
EVM < -17dB to communicate with 16QAM

Gain Flatness	0dB	1dB	2dB
EVM	-	-22dB	-18dB
Constellation			

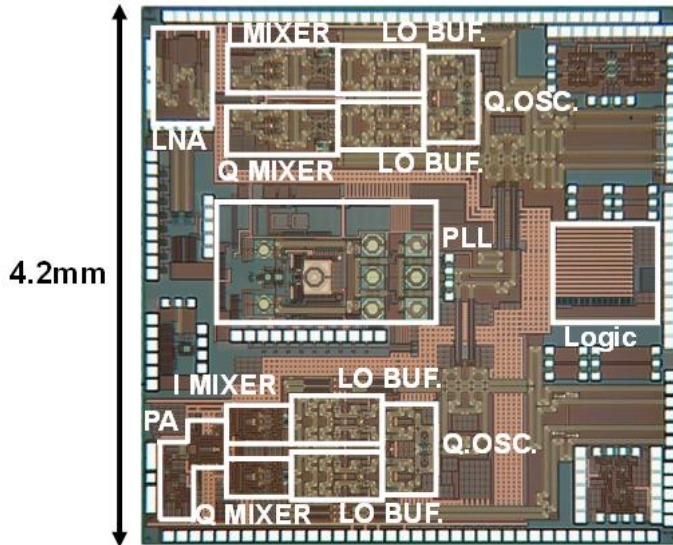
Proposed gain peaking amp.





Simulation result



Measurement summary for 16QAM



Channel	ch.1 - 4	Max rate
Constellation		
Data rate	7.0 Gb/s	10.0 Gb/s (ch.3)
EVM	-23.0 dB	-23.0 dB (ch.3)

- Gain peaking technique is proposed.
- Full rate **16QAM in every channel** of IEEE standard with EVM of around **-23dB**.

Thank you for your attention!