Low-Power CMOS Transceiver Circuits for 60GHz Band Millimeter-wave Impulse Radio

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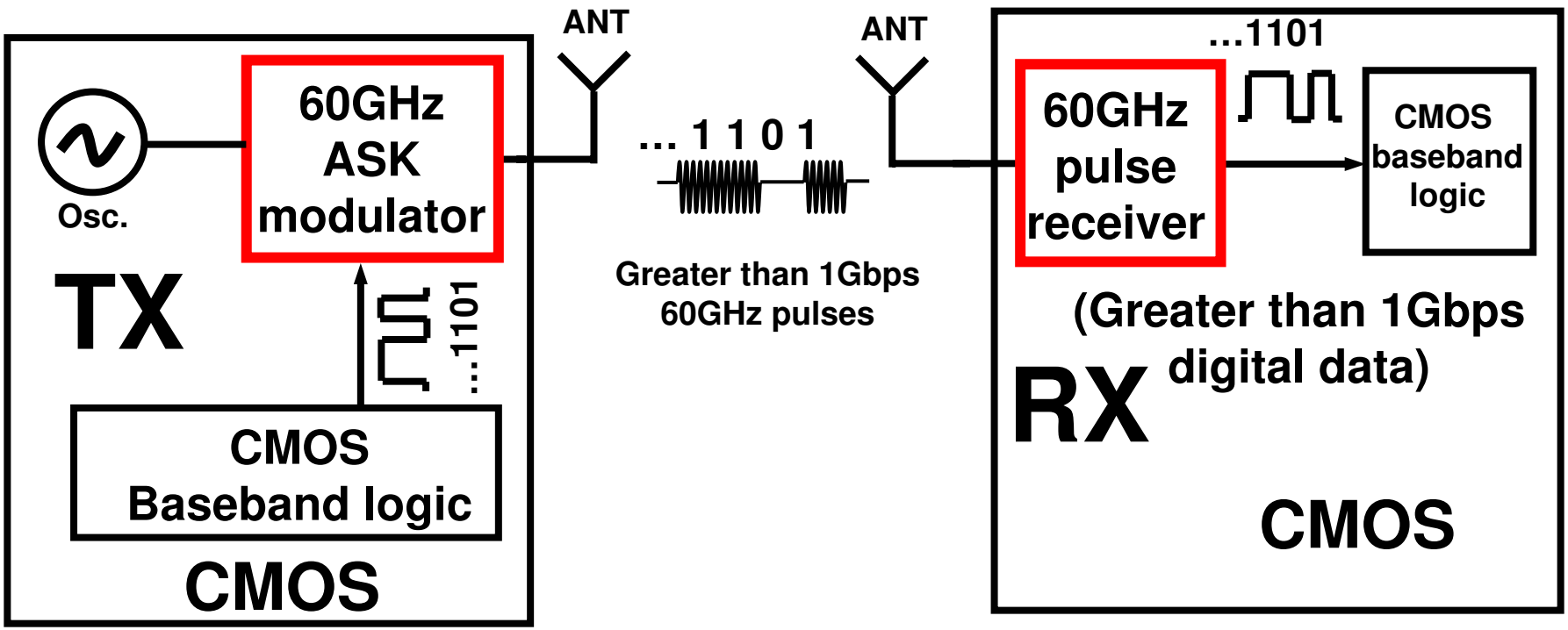
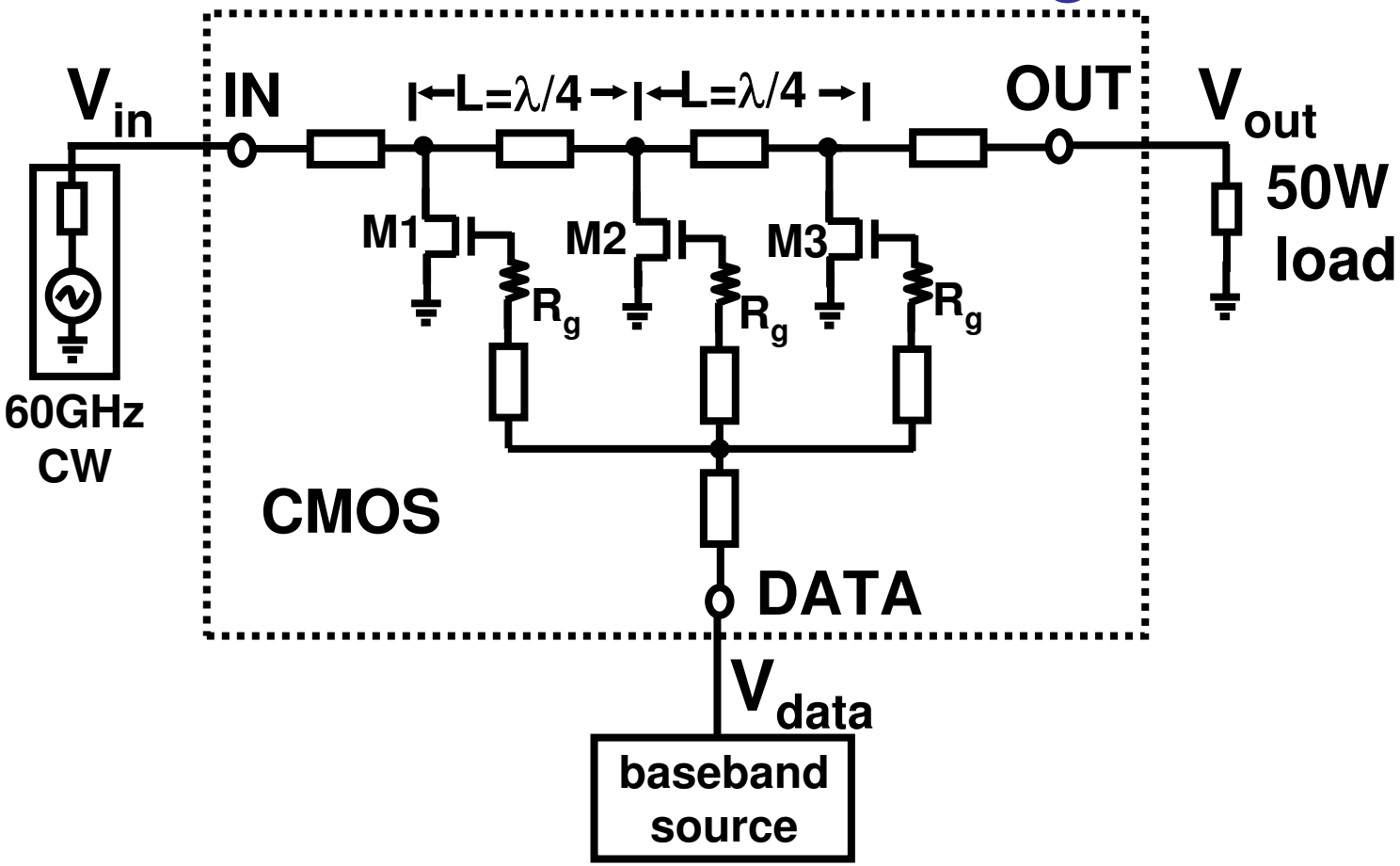
Proposed Low-power 60GHz Impulse Radio

- Low-power, short-range, several Gbps wireless communication will be on demand.
- Conventional millimeter-wave CMOS transceivers contain power hungry building blocks.



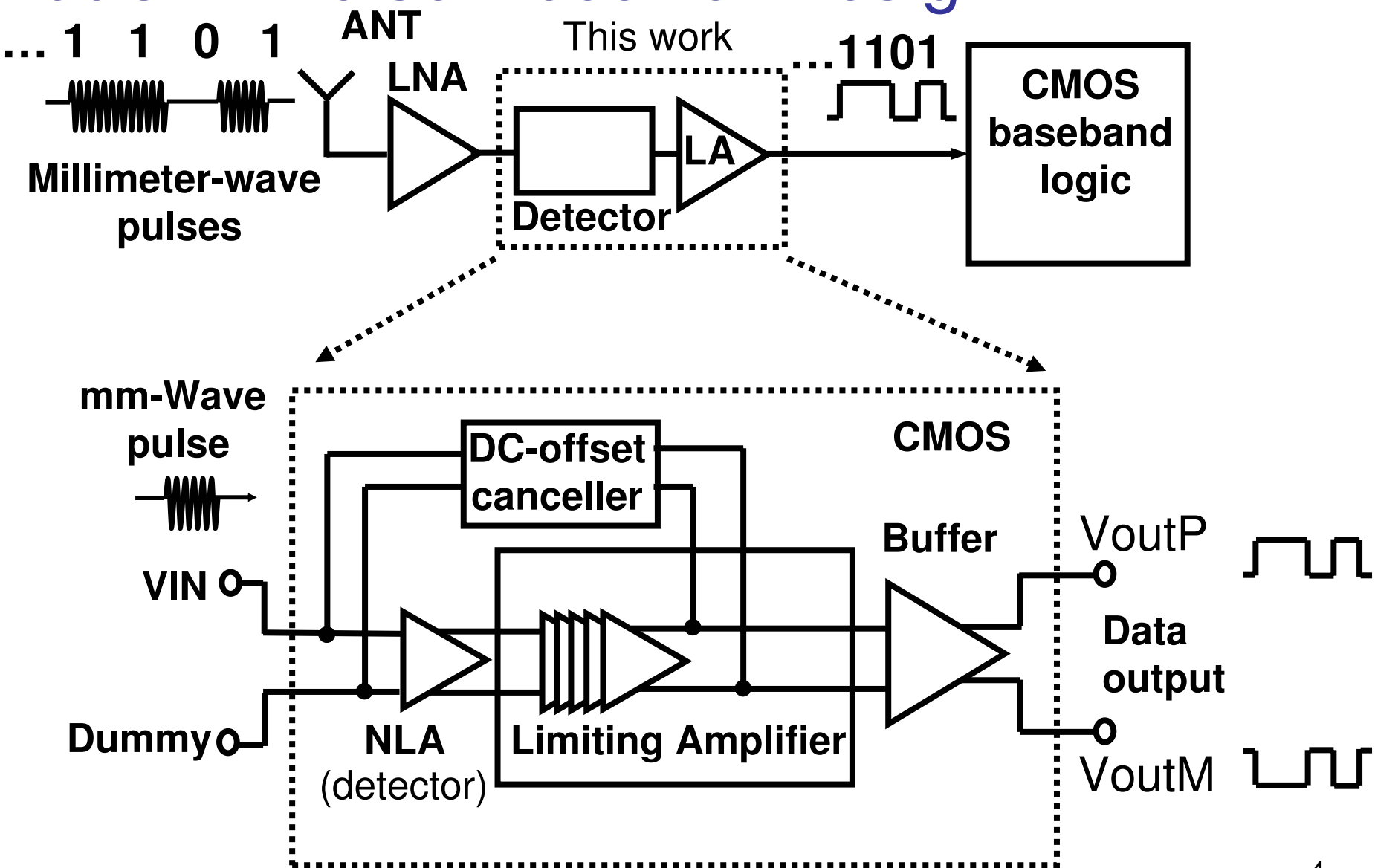
1. **Power-hungry building blocks are removed.**
2. **Pulse modulation is used.**

60GHz ASK Modulator Design



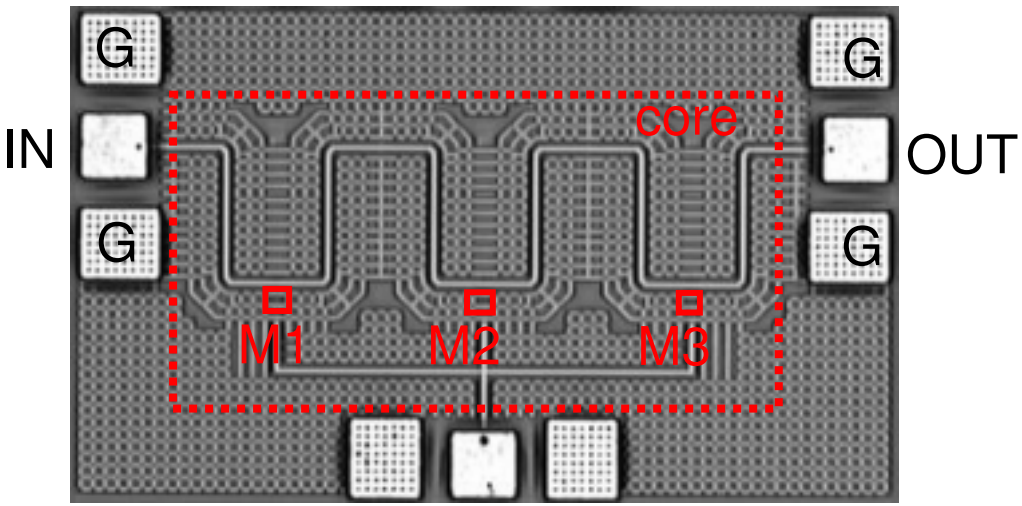
1. First time a high-speed ASK modulator is designed in CMOS.
2. Reduced architecture is applied.
3. Data-Rate and isolation is maximized at 60GHz.

60GHz Pulse Receiver Design



Chip Photo

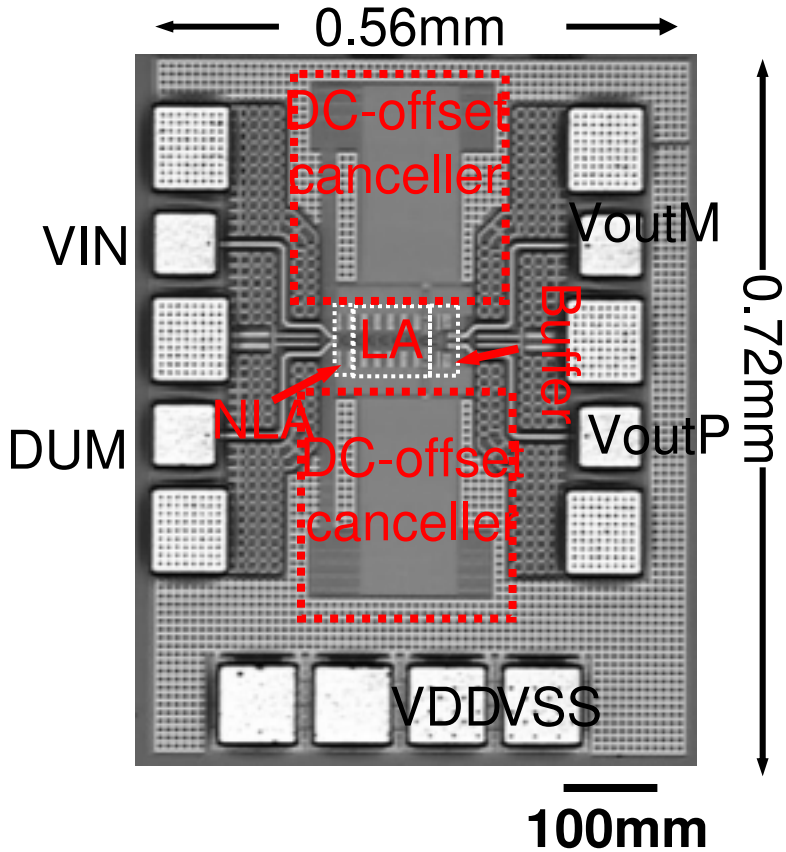
chip size= 0.8mmx0.48mm
core size= 0.61mmx0.3mm



Data

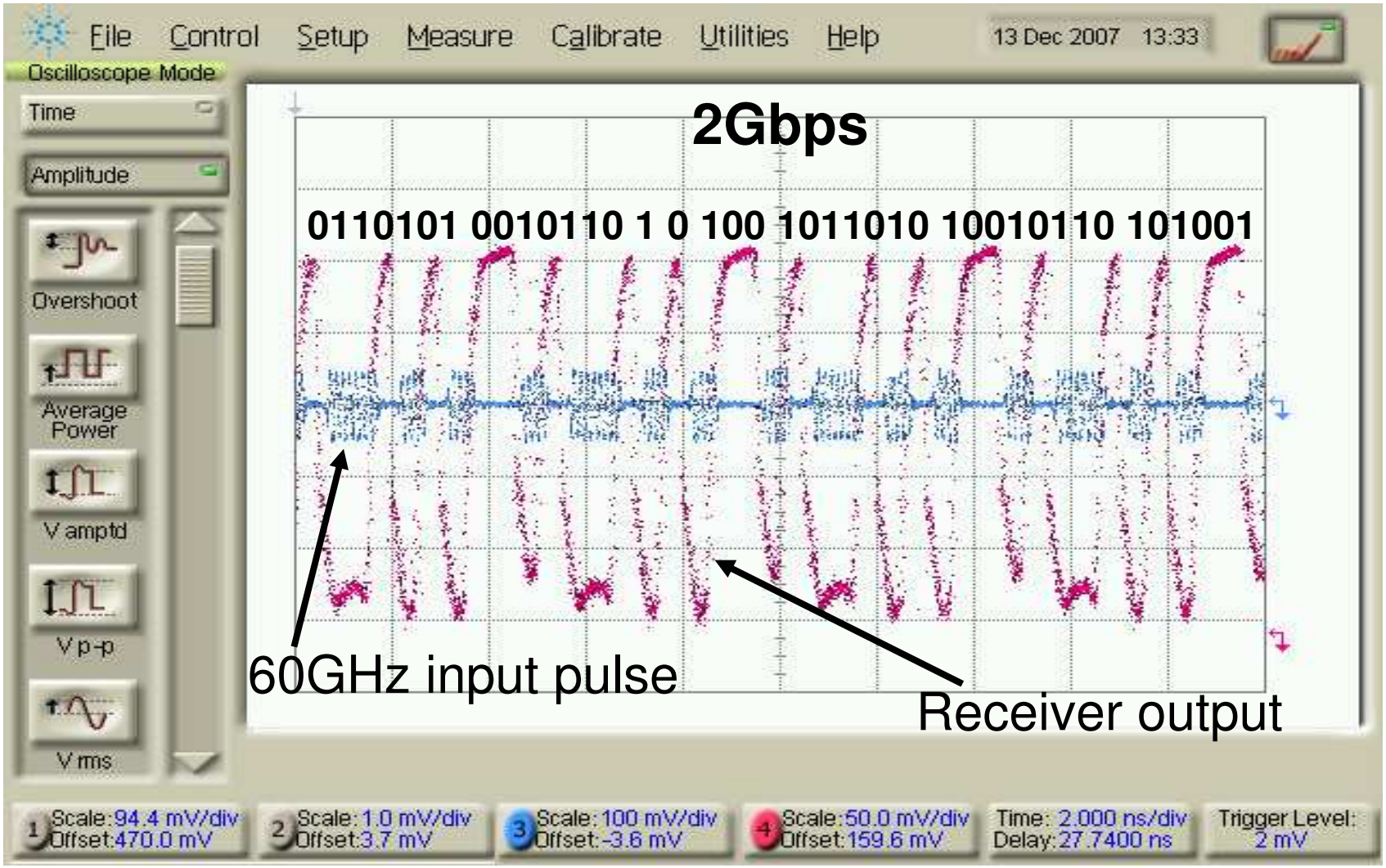
Micrograph of the fabricated 8Gbps 60GHz ASK modulator chip

1Poly 6Metal 90nm CMOS Process



Micrograph of the fabricated 19.2mW 2Gbps CMOS 60GHz pulse receiver chip

Waveforms for 2Gbps Data Rate



Conclusion

- Low-power CMOS Gbps mmW wireless pulse communication is proposed.
- High-Speed millimeter-wave ASK modulator circuit is proposed in CMOS.
- 8Gbps millimeter-wave ASK Modulator is successfully fabricated in 1P6M standard 90nm CMOS.
- The product of maximum data rate and isolation of this modulator is 170G which is the highest value.
- It does not consume DC power.
- Low-power Gbps 60GHz pulse receiver architecture is proposed.
- A 19.2mW 2Gbps pulse receiver prototype is successfully designed, fabricated and tested.
- 60GHz mmW CMOS Impulse Radio will open up new applications in the near future.