On-Chip Balun In Up-Conversion Mixer For Vehicular Radar Systems Implemented with 90nm CMOS Process

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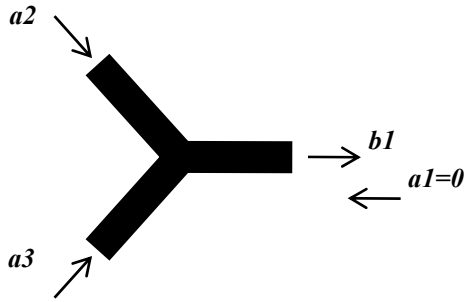
Introduction

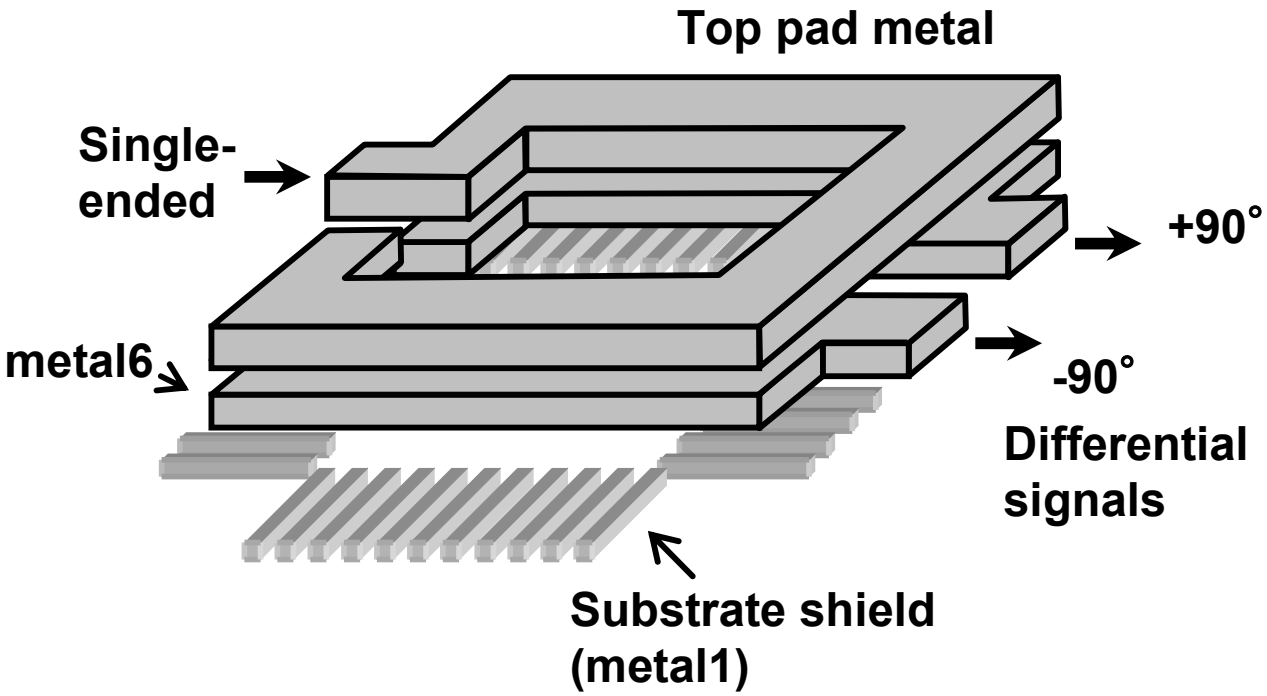
- **Function of a balun**
  - **BALanced-to-UNbalanced conversion**



For the case of the combiner. For splitter, directions are reversed.

  - **Use with differential circuits**
- **Existing implementations of baluns**
  - **Off-chip**
  - **On-chip (CMOS)**

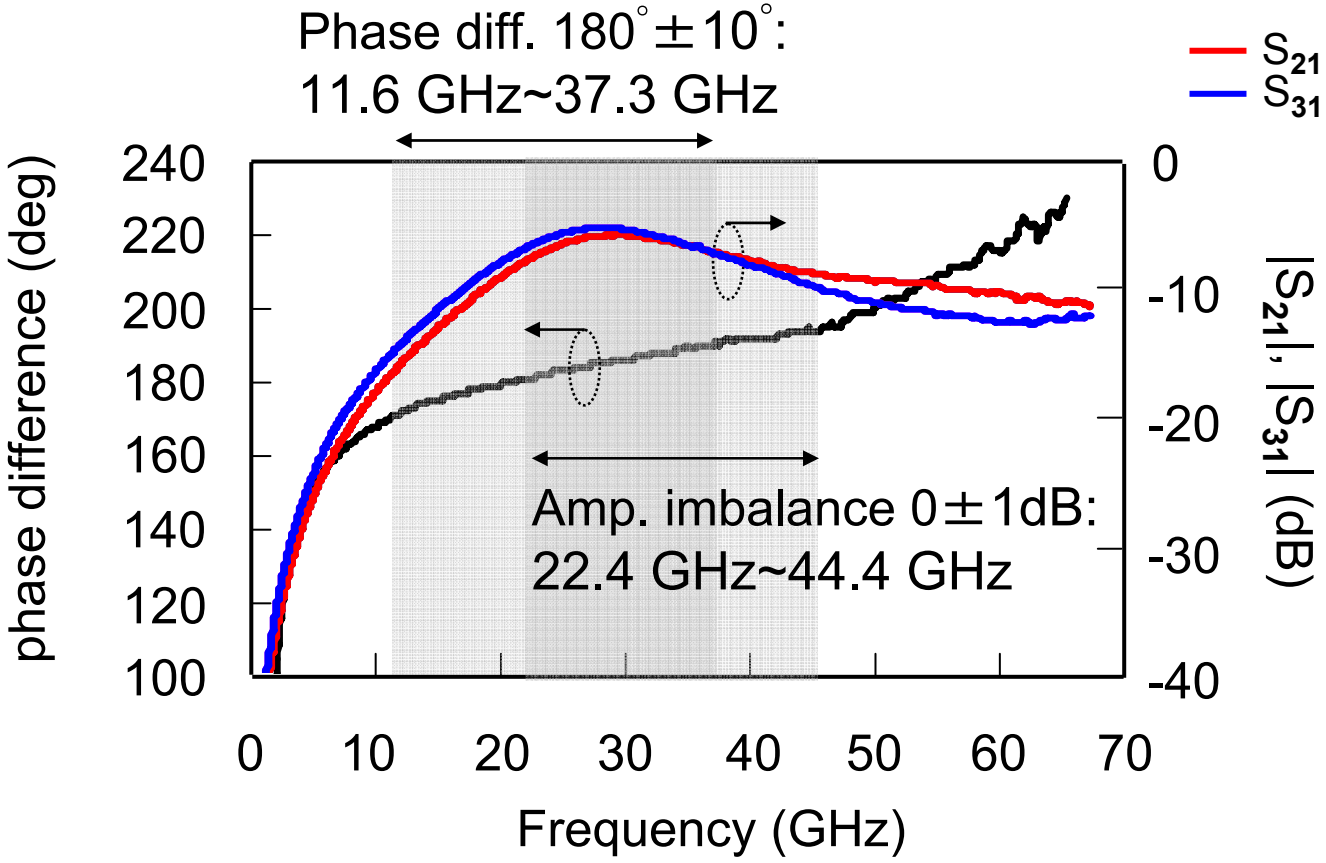
On-chip Marchand Balun



The drain biasing is applied to the differential ports across the lower metal that does not require any voltage headroom

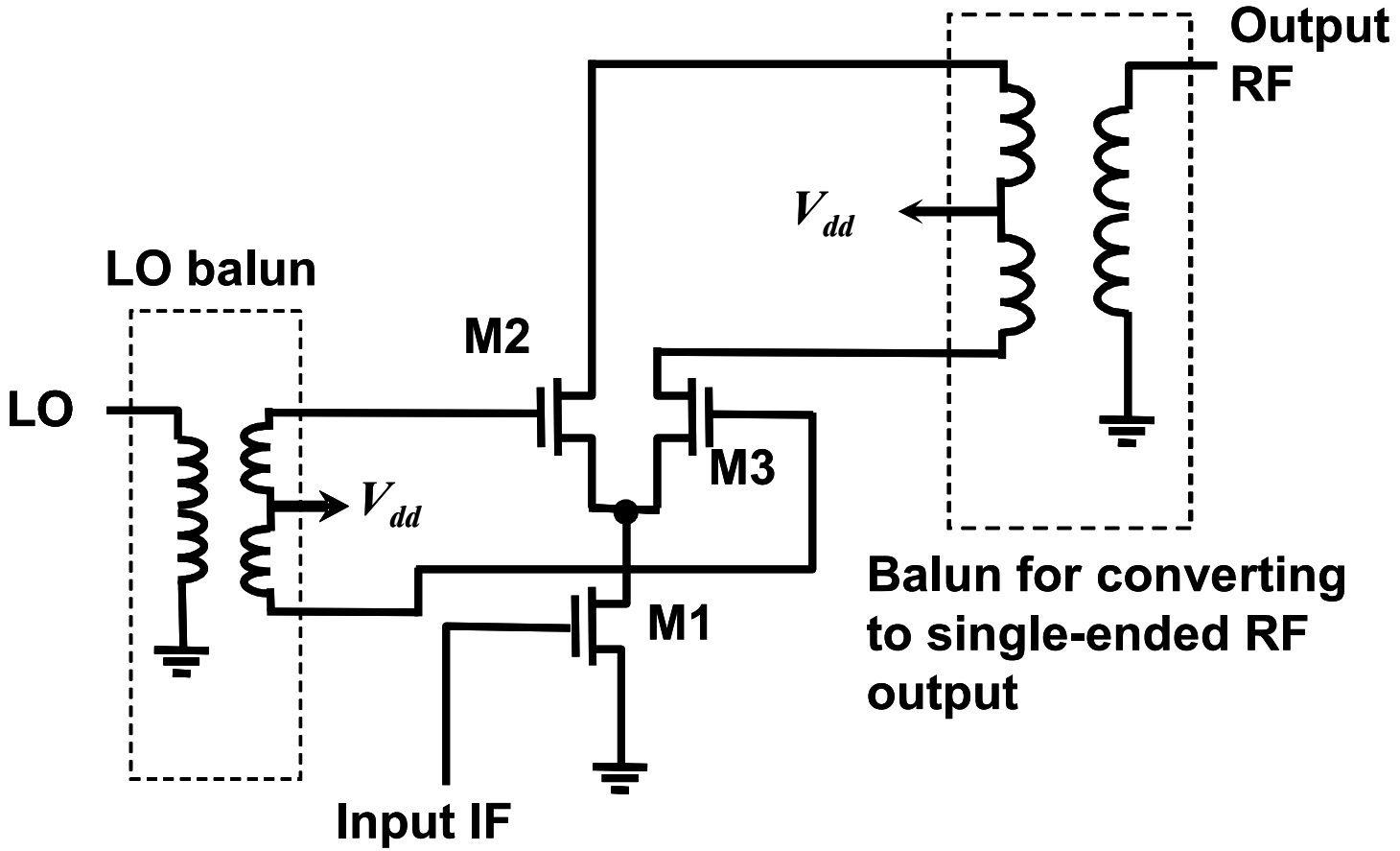
Inter-layer metal coupling is used for realizing the balun

Balun Measured Results



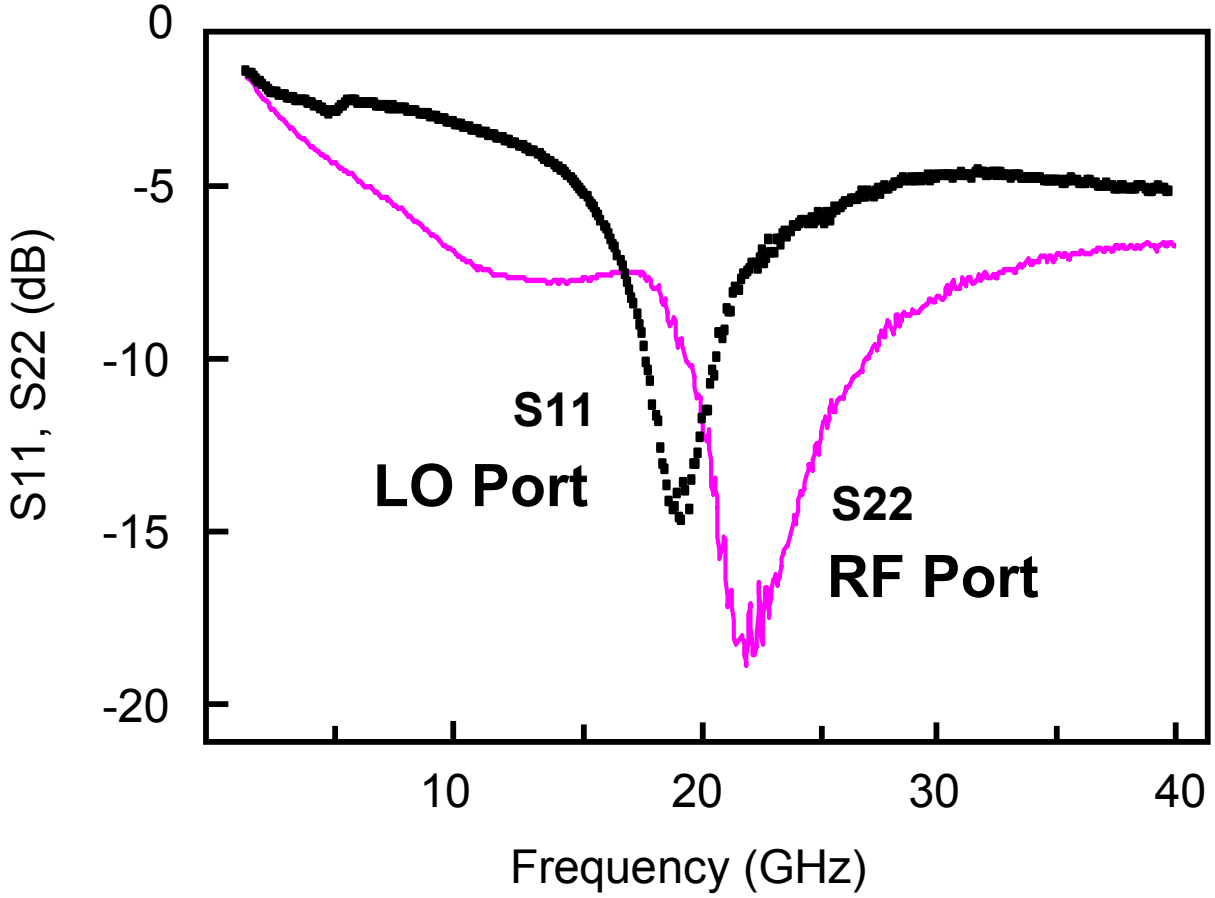
Balun operating range: 22.4 GHz and 37.3 GHz

22-29 GHz Mixer Circuit



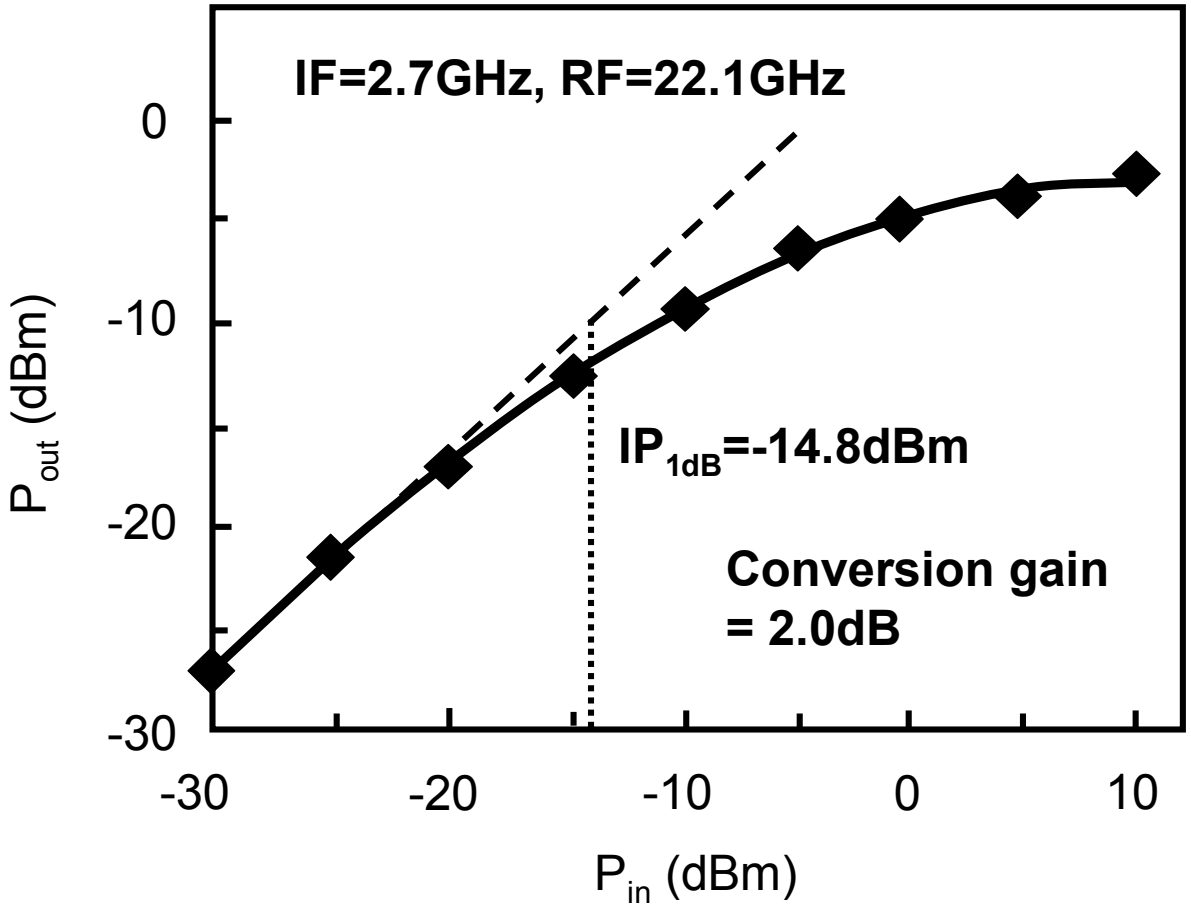
Baluns practical with CMOS that consumes minimal area are considered

Mixer Measured Results



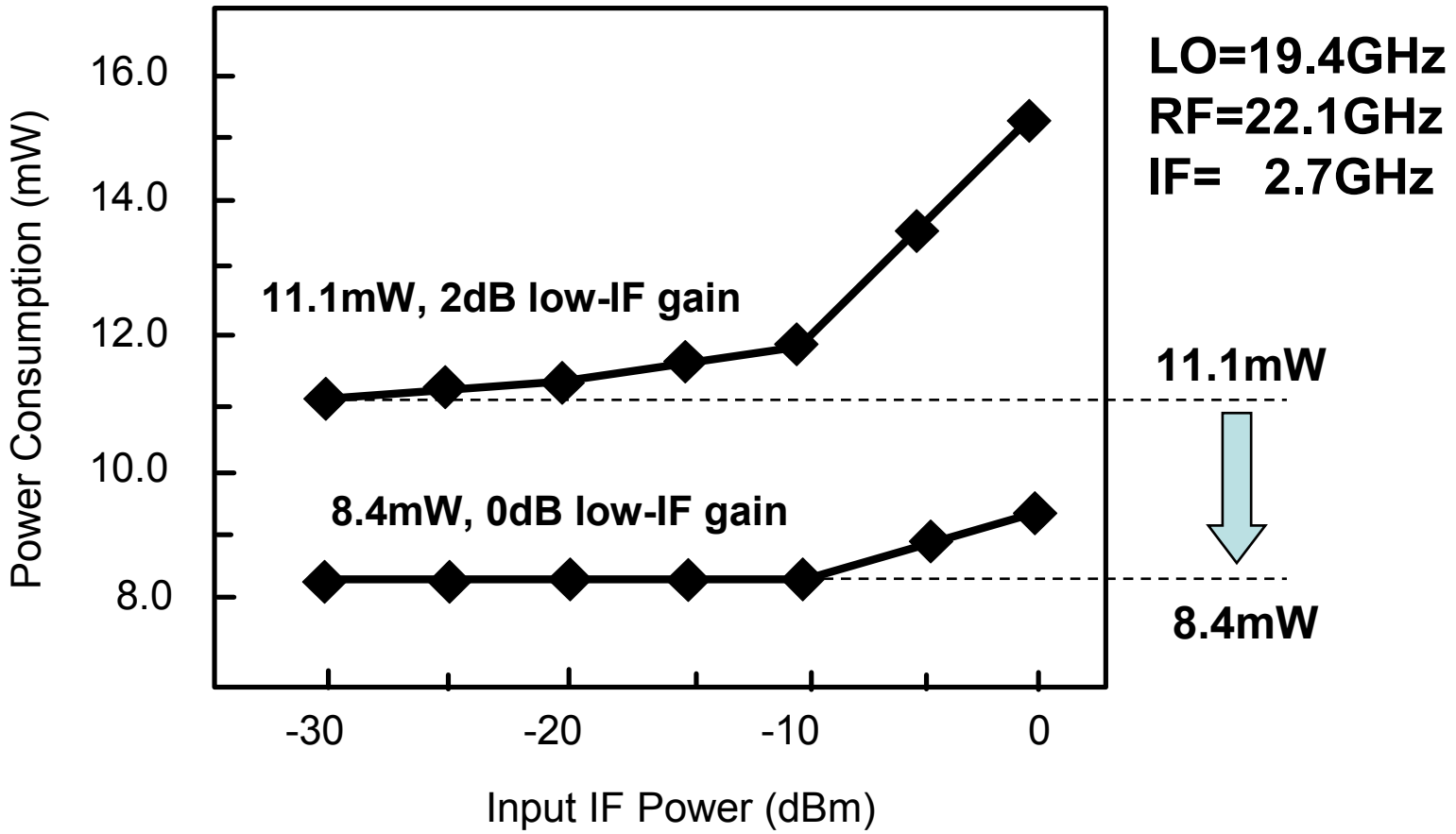
RF port matching better than -10dB at 20~26 GHz

Mixer Measured Results



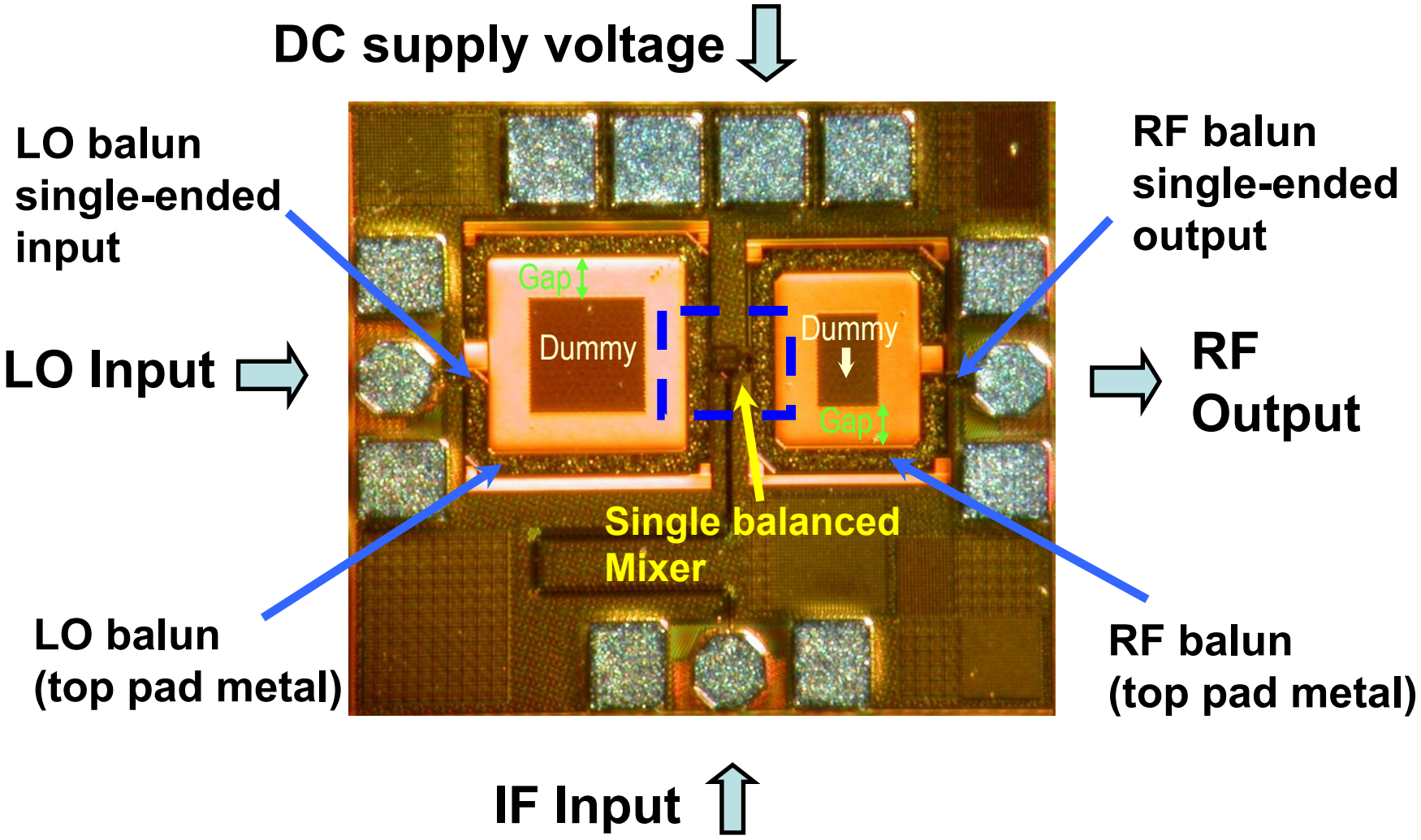
1-dB compression point occurs at -14.8dBm

Mixer Measured Results



Power consumption can be reduced to 8.4mW

Chip Micrograph



Conclusion

- An on-chip balun is designed and simulated for the up-conversion mixer
- High GHz frequency Mixer has been implemented using CMOS 90nm process