A 30-88 GHz Phase Shifter with Broadband 90º Hybrid- Marchand Balun Network and Common-base Buffer Achieving 1.34-3.1º RMS Phase Error in 90 nm

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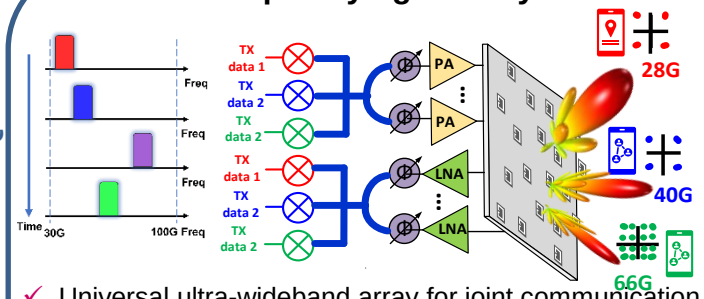
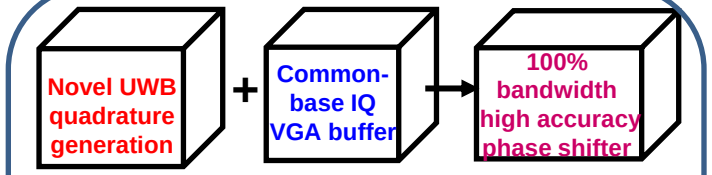
STATUS QUO

Universal frequency-agile array interface



- ✓ Universal ultra-wideband array for joint communication and sensing application
- ✓ Unit array aperture + circuit rather than multiple static narrow band front-ends for low cost and system size
- ✓ Key is an ultra-wideband for beamforming phase shifter

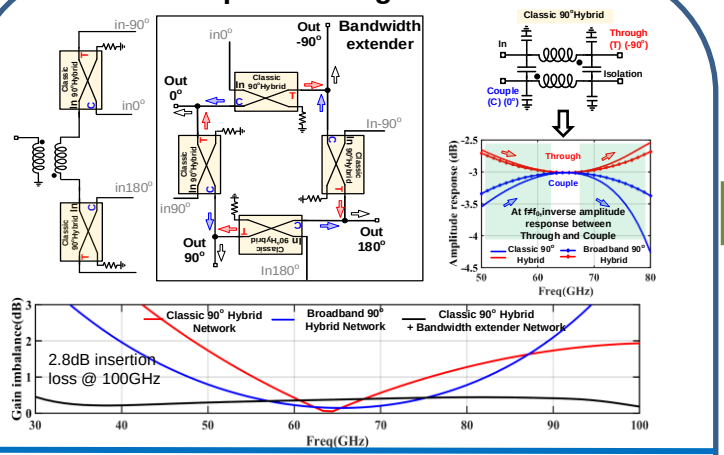
NEW INSIGHTS



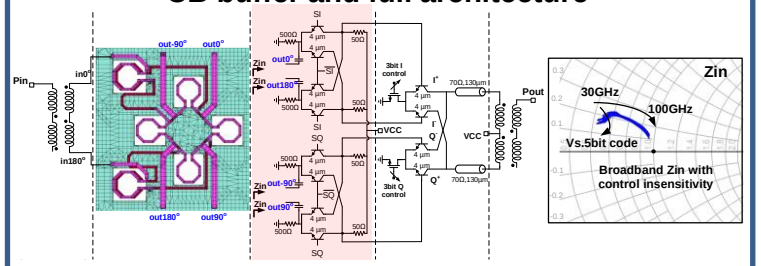
- ✓ Novel UWB quadrature generation network
  - ➢ Bandwidth extension network
  - ➢ Compact Marchand balun and quadrature hybrid
- ✓ Common-base buffer between input network and VGA
  - ➢ Code-independent broadband input impedance
- ✓ Frequency-dependent code optimization for future phase error & gain error improvement

DESCRIPTION

UWB quadrature generation



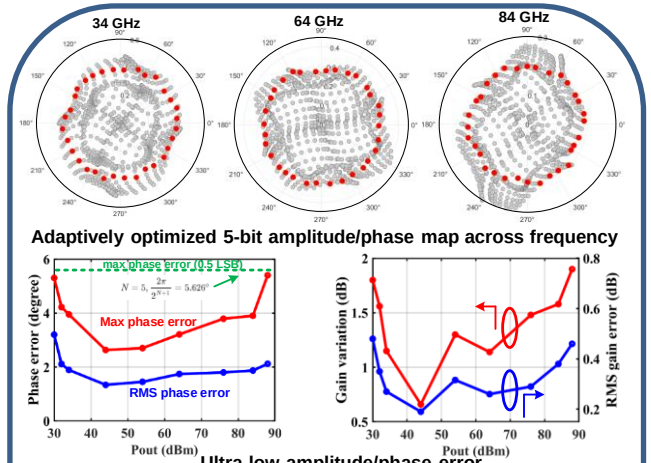
CB buffer and full architecture



Feature

- ✓ **Combine the inverse frequency response between 'Through' and 'Couple' path for bandwidth flatness**
- ✓ **Building block based on compact 90º hybrid**
- ✓ **CB buffer provides broadband and code-independent load for input network-> reduce the phase/gain error**
- ✓ **Inductive peaking at VGA output to enhance bandwidth**

QUANTITATIVE IMPACT



PROPOSED CONCEPT GOALS

Summary

- ✓ **First phase shifter that covers from 5G FR2 to W band with a fractional bandwidth of 98.3% and demonstrates the best amplitude/phase error over one of the widest bandwidths.**

Next steps

- ✓ **Full large scale frequency agile array system implementation.**