



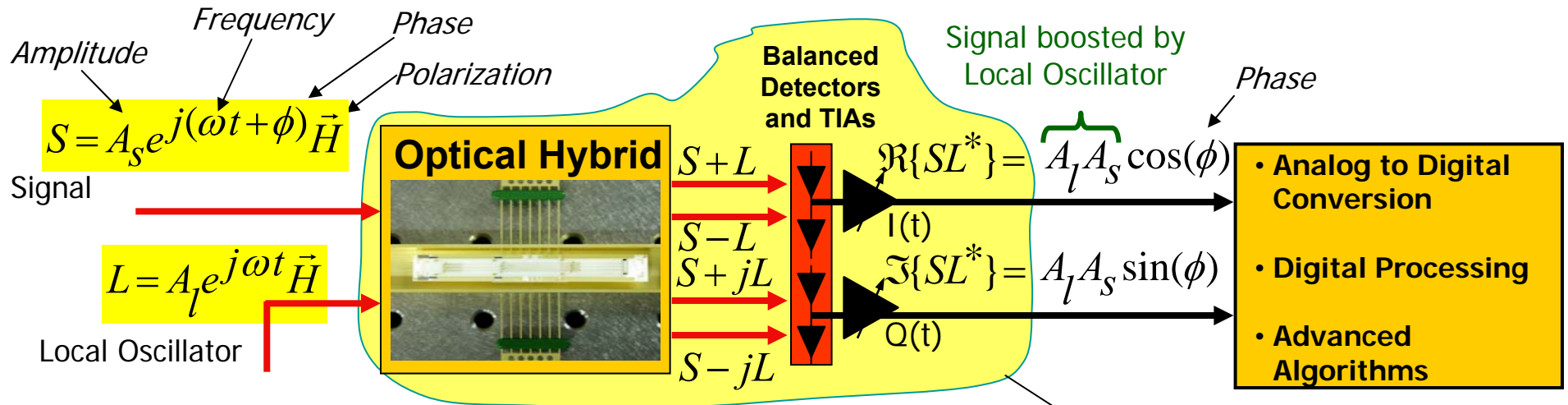
Digital Fieldable Interferometric Sensing

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Digital Coherent Interferometric Sensing



Linear Transformation of Optical Signal to Baseband → Advanced Digital Signal Processing & New Capabilities

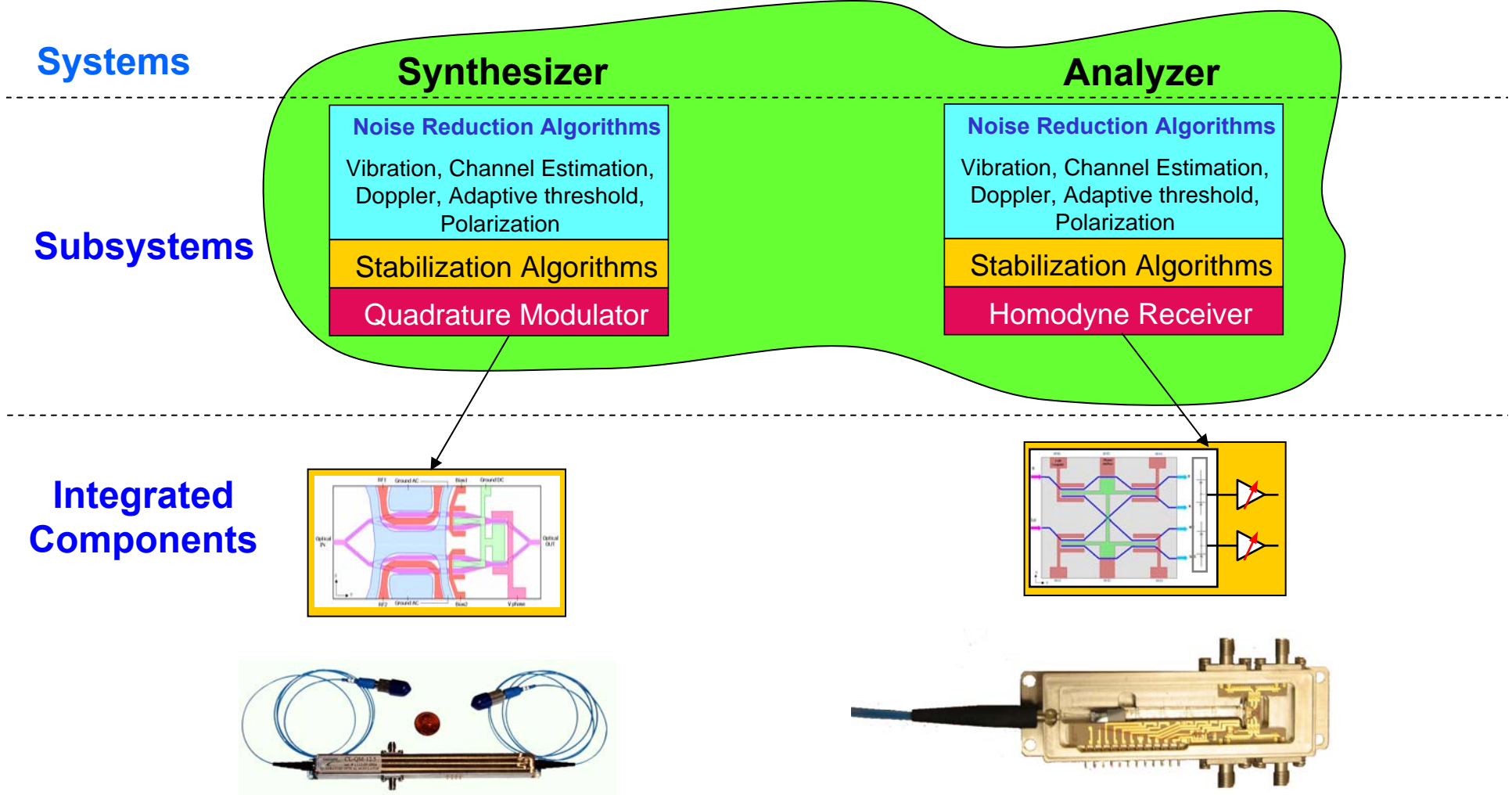
- **Advanced Coherent Detection Capabilities**
 - Received Signal Boosted By Local Oscillator For **Highest Shot-noise Limited Receiver Sensitivity**
 - Inherently Frequency-selective Receiver Using An Agile Local Oscillator
 - **Linear** Down-conversion To Electrical Baseband Enables Cost-effective Electrical Filtering
 - Digital Signal Processing Enables Noise Reduction For Operation In Digital Fieldable Interferometric Sensing Applications



Integrated Homodyne Receiver

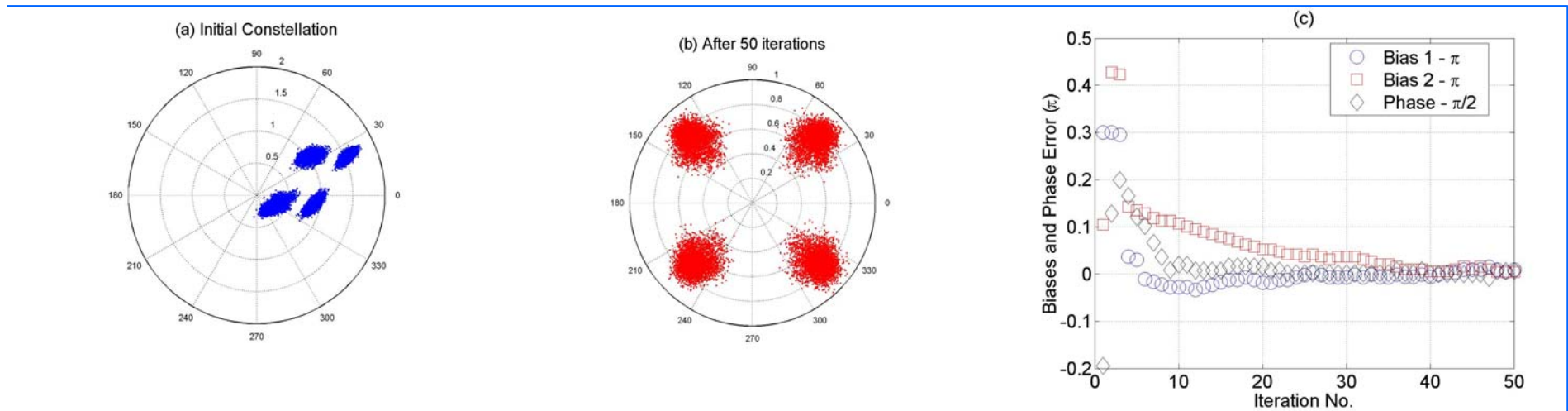
Layered Architecture for Digital Fieldable Interferometric Sensing

Coherent Applications



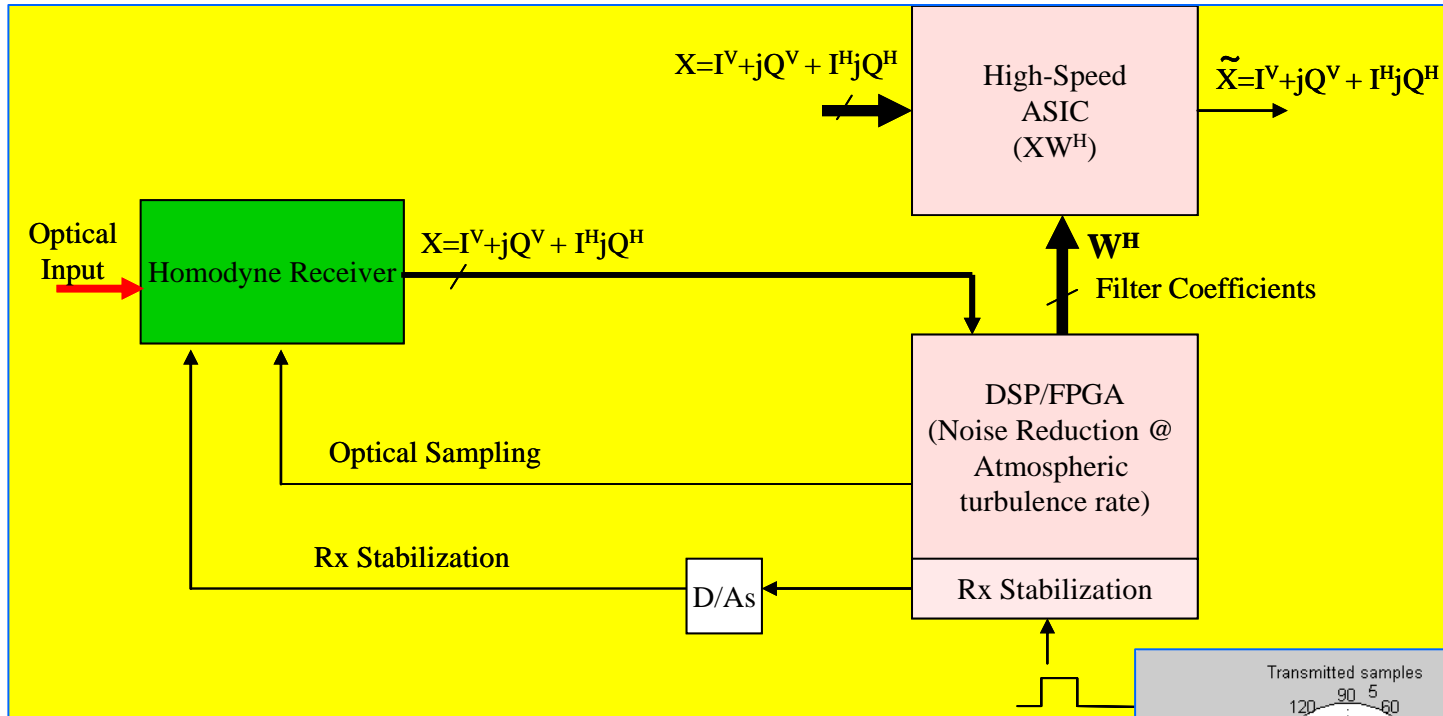


Digital Adaptive Stabilization of QM

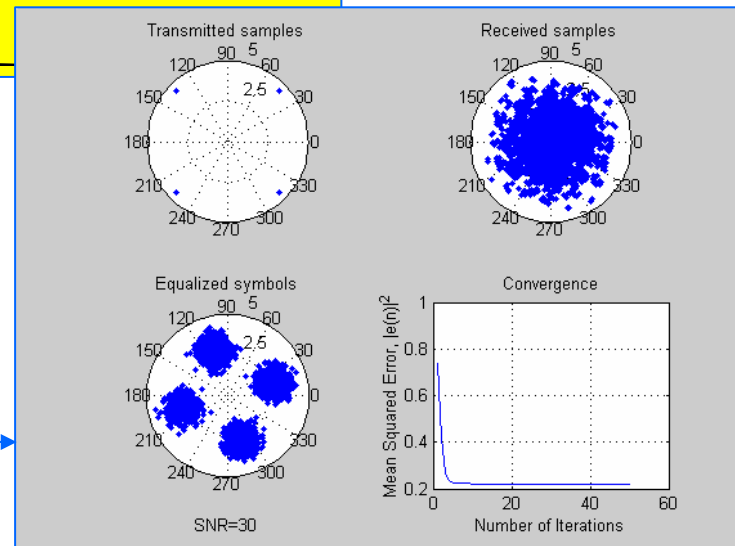


- (a) Constellation plots of the QM optical output at startup
- (b) After 50 iterations of the control loop
- (c) Plot of deviations of the two biases and phase from their optimal points (π and $\pi/2$) versus iteration number

Adaptive Noise-Reduction Algorithms



Performance of the channel equalization algorithm over a turbulent atmospheric channel





Summary

- Unified layered architecture for digital fieldable interferometric sensing based on:
 - Interferometric Components
 - Digital Stabilization
 - Digital Adaptive Noise Reduction algorithms
 - Forming a Synthesizer Analyzer constructs
- For coherent communications in fiber or free space
 - Synthesizer and Analyzer not co-located
- For sensing applications
 - Synthesizer/Analyzer are co-located yielding:
 - Coherent LADAR
 - Vibrometry
 - Remote Sensing
- Leveraging DSP Practiced in RF over an Optical Carrier