A Fully Integrated Cartesian Feedback Linearization System

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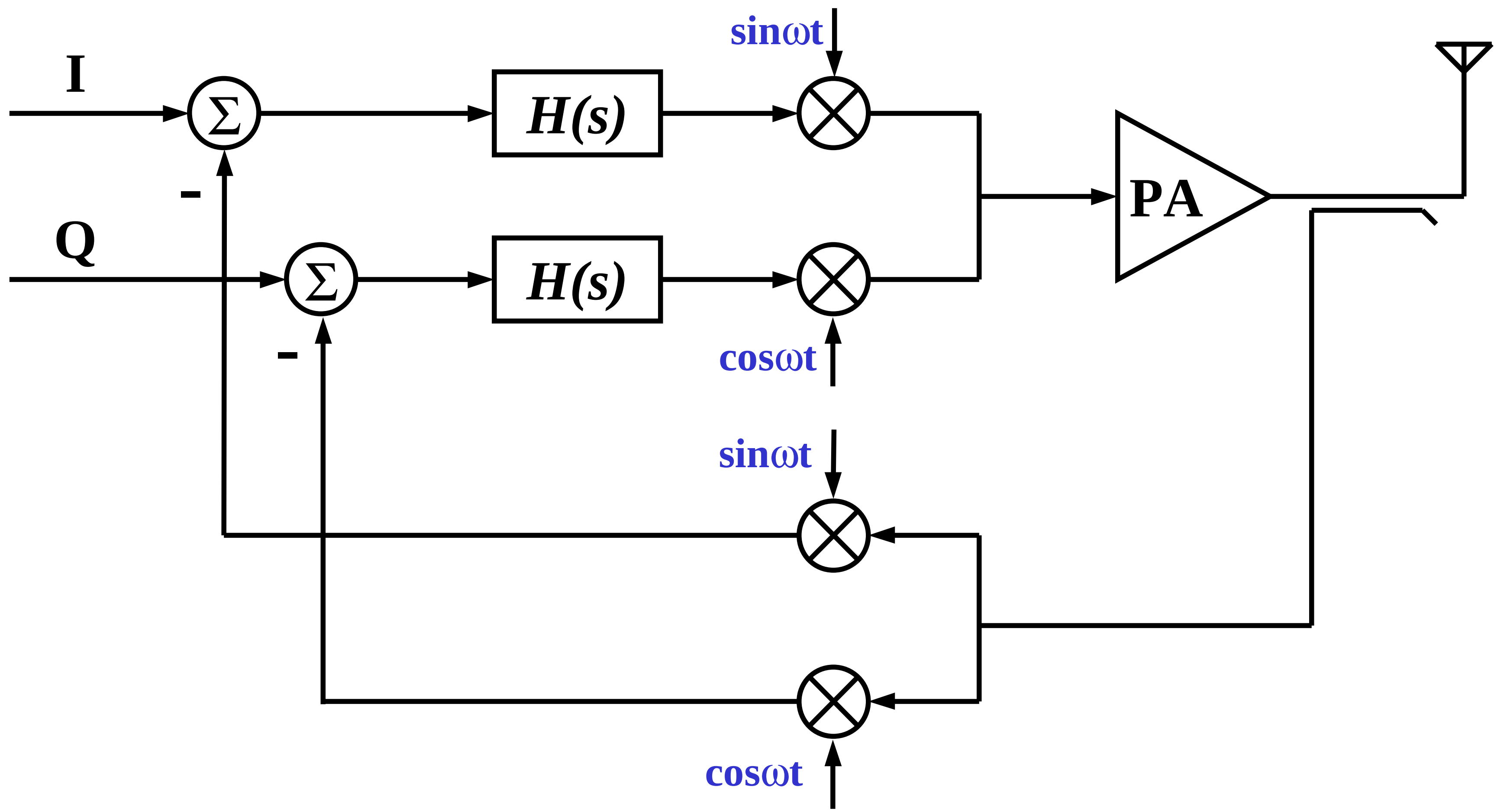
Overview

- Cartesian feedback: merits, design issues
- The problem of phase alignment
- Fully integrated, linearized PA project

Cartesian Feedback

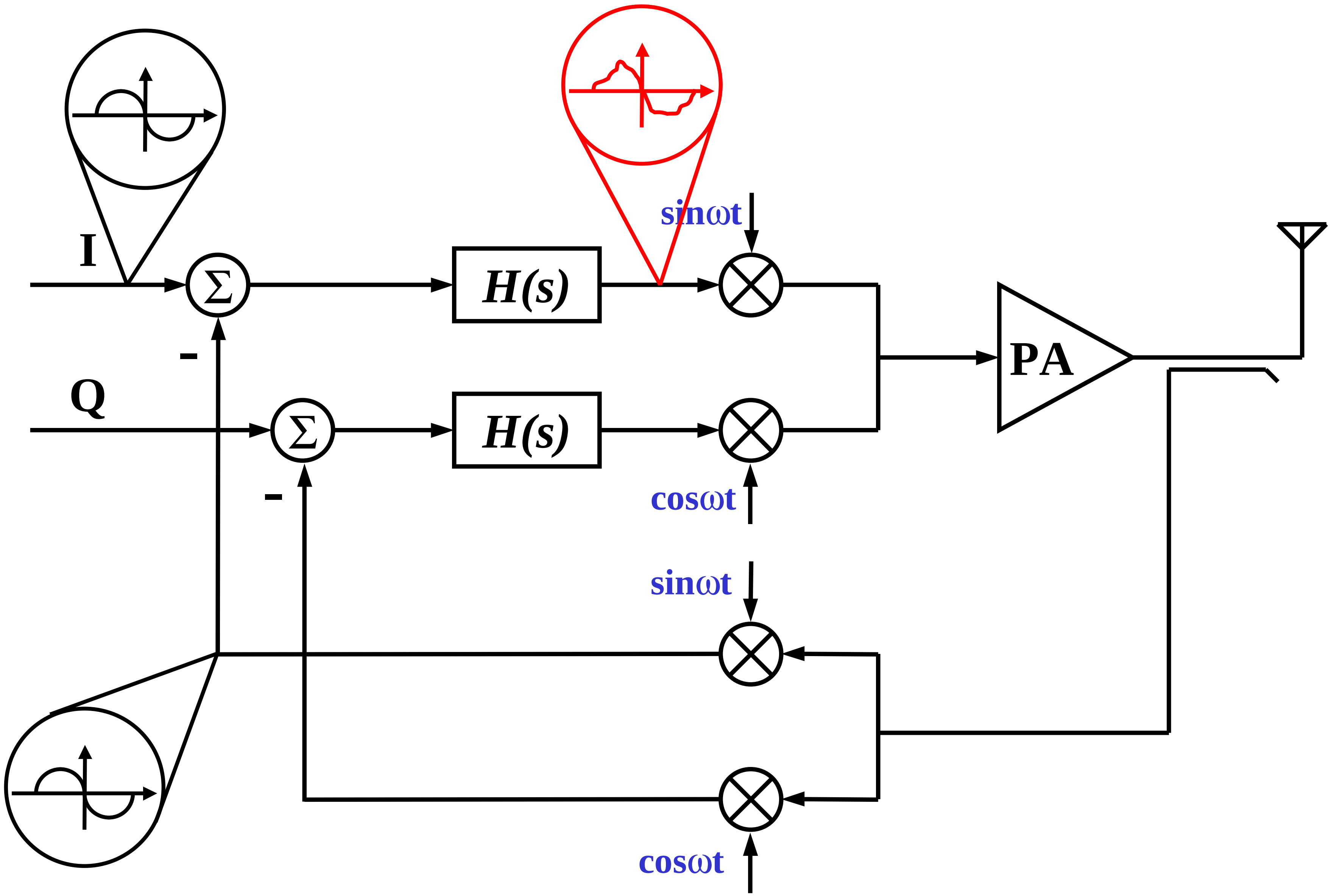


Bandwidth limitation, and phase alignment issues, but...

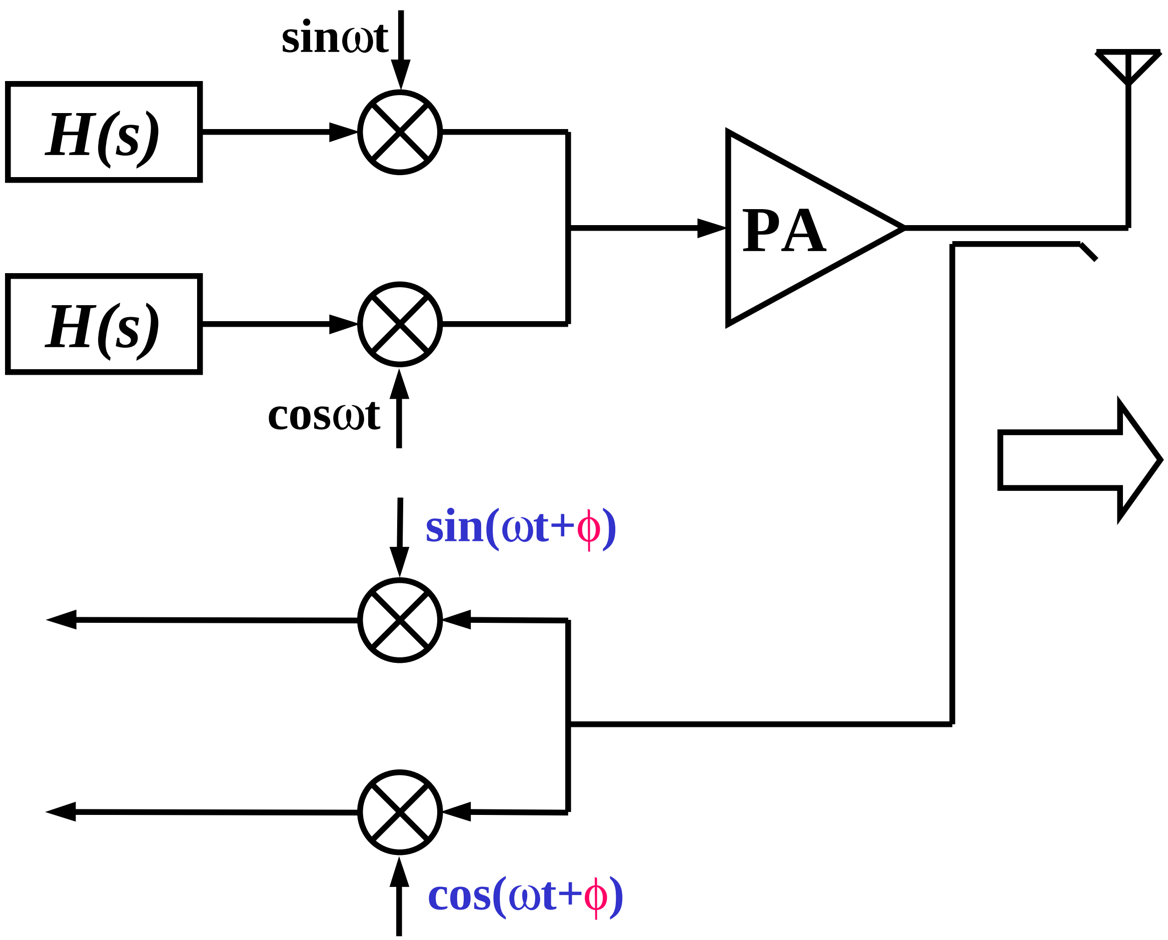
Fundamental strength of CFB:

Relaxes demand for an accurate, detailed PA model.

Using CFB to *train* a predistorter:

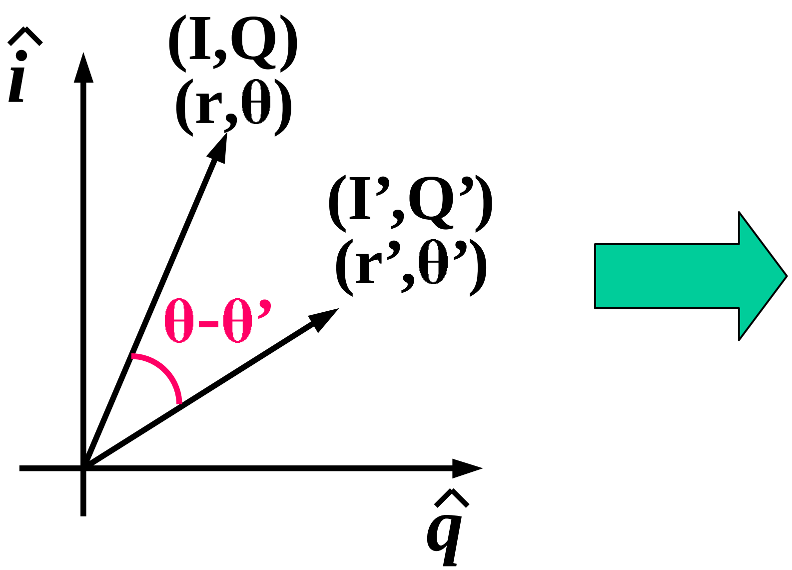


In real CFB systems, apparent LO phase misalignment threatens stability.



$$L_{eff} = H(s)\cos\phi + \frac{[H(s)\sin\phi]^2}{1+H(s)\cos\phi}$$

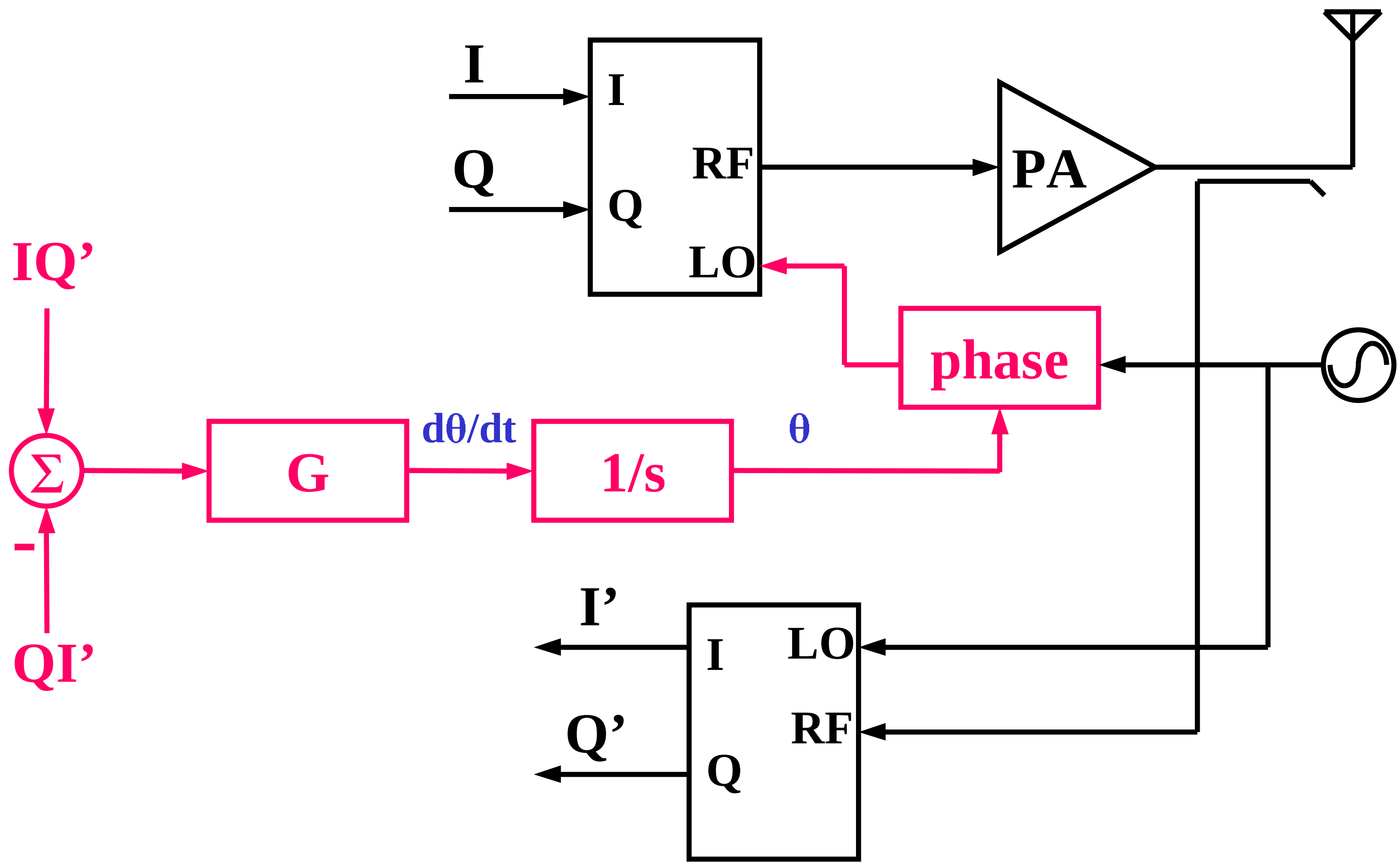
Analog Control Solution
Part I



$$\theta - \theta' = \phi$$

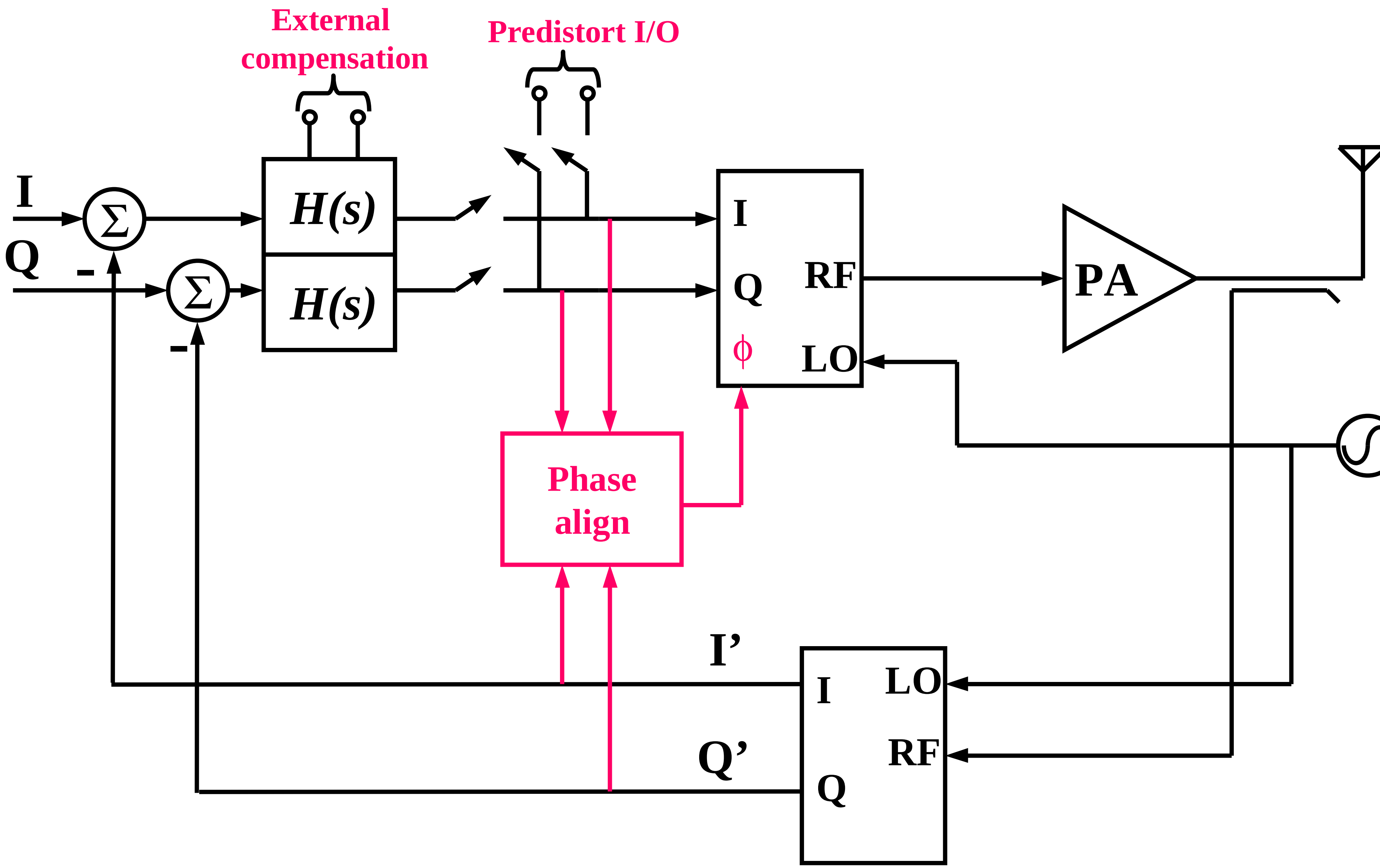
$$IQ' - QI' = rr'\sin(\theta - \theta')$$

Analog Control Solution
Part II

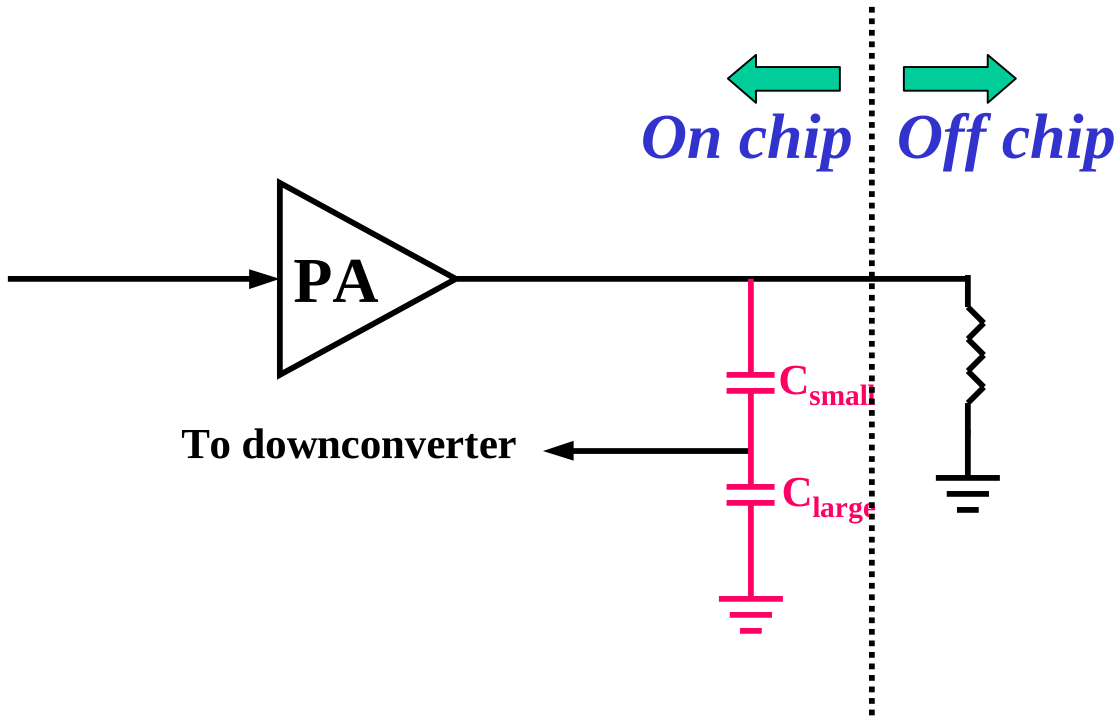


$$d\theta/dt = -\kappa[r(t)]^2 G\sin(\theta - \theta')$$

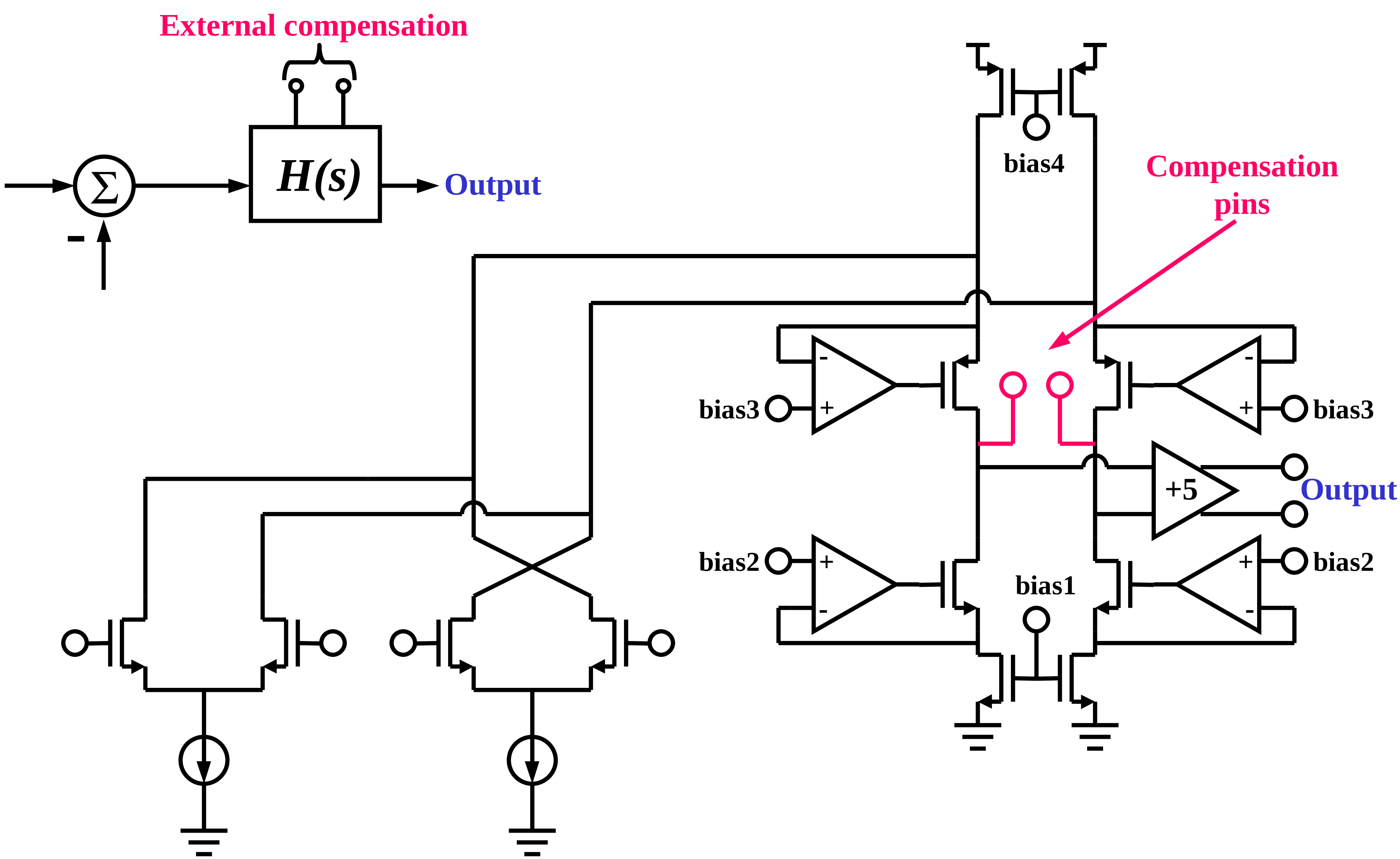
Fully integrated prototype: exploiting CFB's strengths



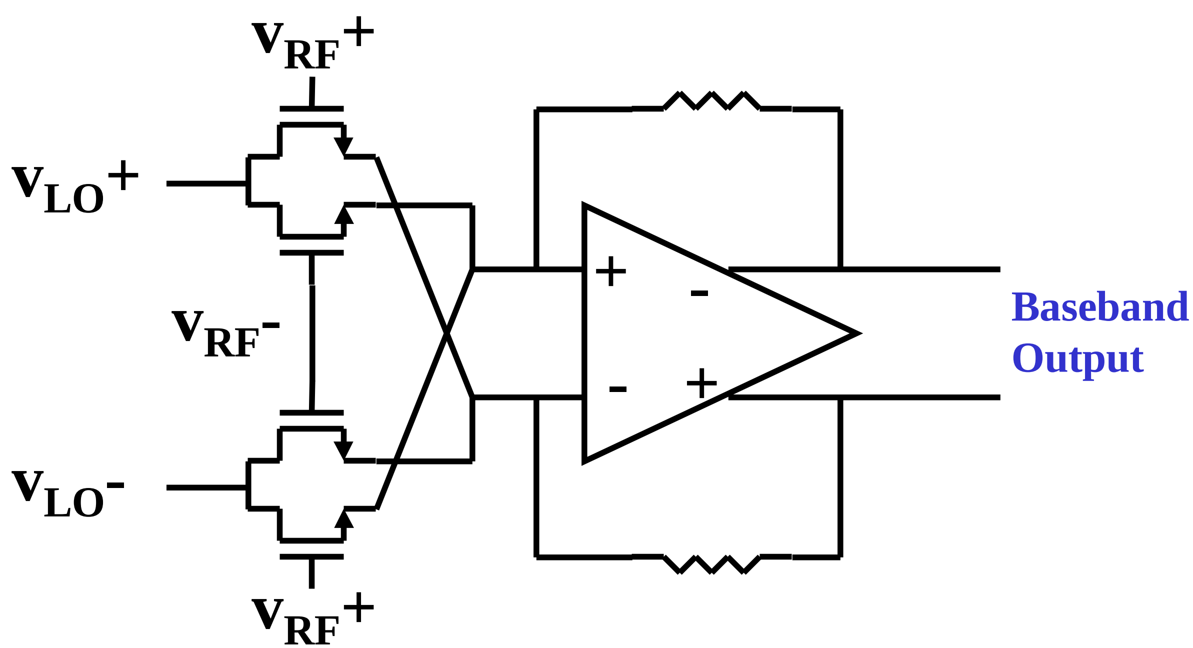
RF feedback: capacitive voltage divider



Loop gain and dynamics



Downconverter design



Linearity of system limited by this block.

Current status of project

- Third version of IC has been fabricated, and testing in progress.
- Phase alignment system verified to be working, and characterized.
- Power output > +13.4 dBm
- Cartesian feedback loop successfully closed; linearization behavior observed but not yet measured.