



Instrumentation
Technologies

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Coping with Coupled Bunch Instabilities, 1/2

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Libera **WORKSHOP**
2007

25. September 2007

Role of Bunch-by-Bunch Loop

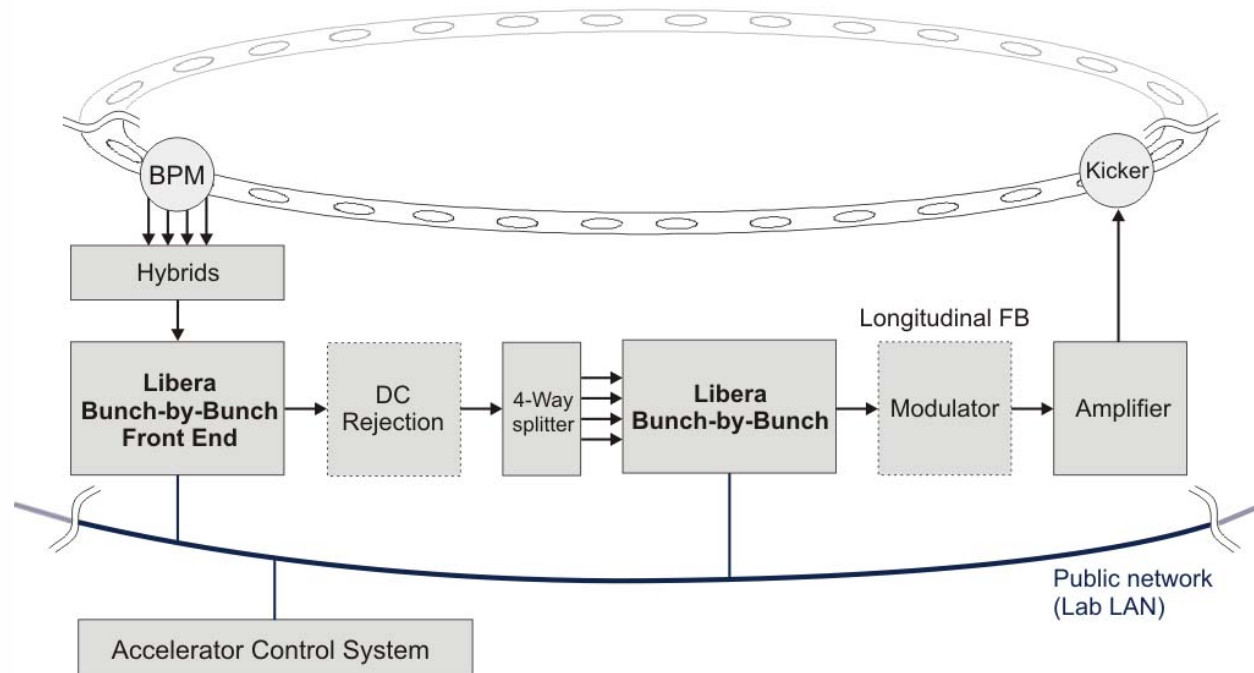
- **Role of bunch-by-bunch feedback is to damp the beam instabilities.**

Sources of instabilities:

- **Cavity High Order Modes (HOM)**
- **Resistive wall impedance**
- **Interactions of the beam with other objects (discontinuities)**
- **Ion instabilities**

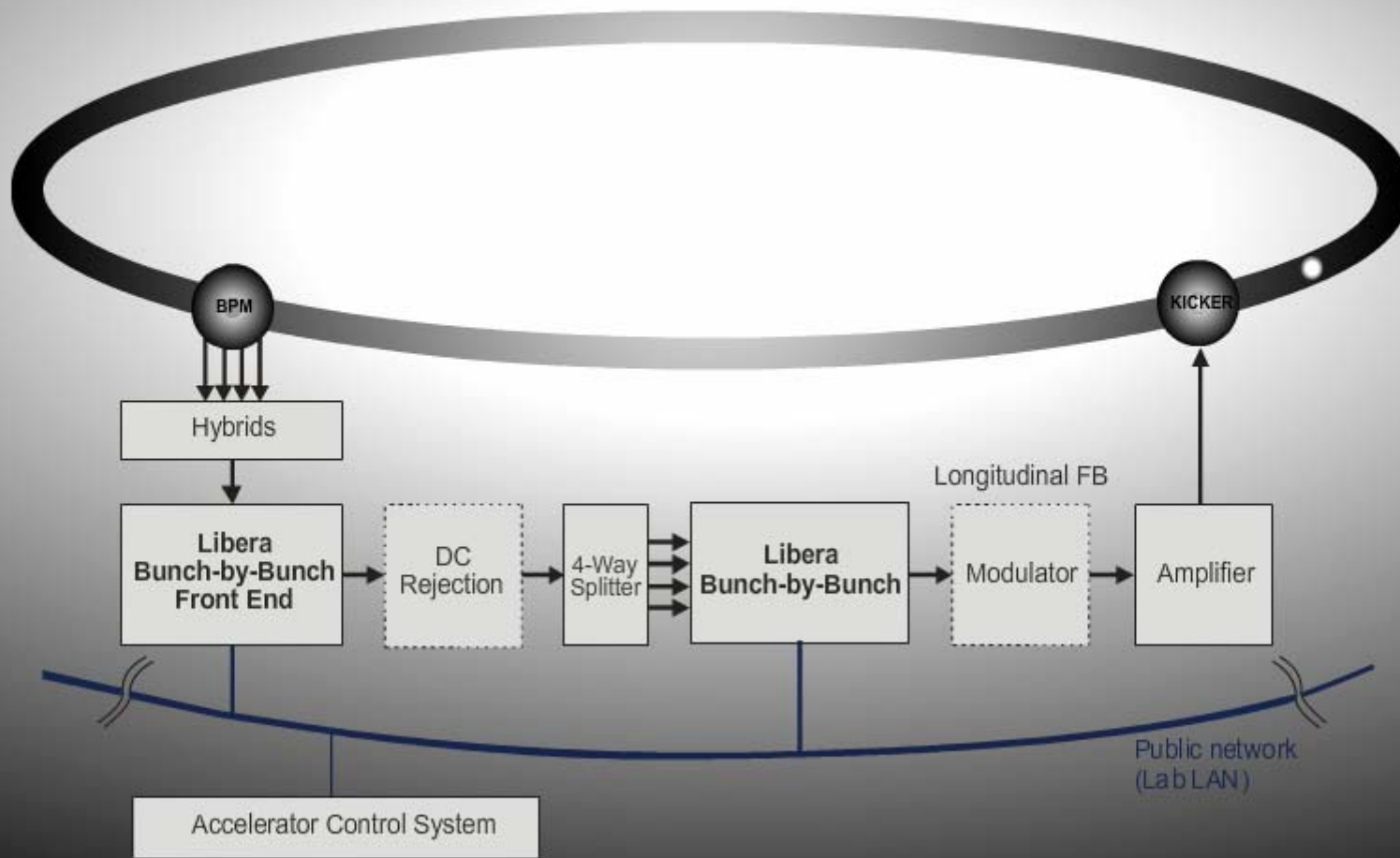
Different passive and active approaches are used to stabilize the beam

Bunch-by-Bunch Loop Operation



- **Hybrids combines BPM pick-ups. The outputs are X, Y, I (sum)**
- **Libera Bunch-by-Bunch Front-End (detector) converts X, Y, I signals to baseband**
- **DC rejection removes the stable components of the beam**
- **Libera Bunch-by-Bunch (processing unit) digitizes the signal, does the processing and converts the signal back to analog**
- **The modulator is used only in longitudinal feedback and translates the correction signal to the frequency of the kicker**
- **The power amplifier supplies the power to the kicker.**

find more on <http://cas.web.cern.ch/cas/Sweden-2007/Lectures/Web-versions/Lonza.pdf>



New Libera Bunch-by-Bunch Front-End

Block diagram

Signal of Interest:

1.5 GHz spectral component

BW: 500MHz

Phase shifters for 360deg

Reference Signal:

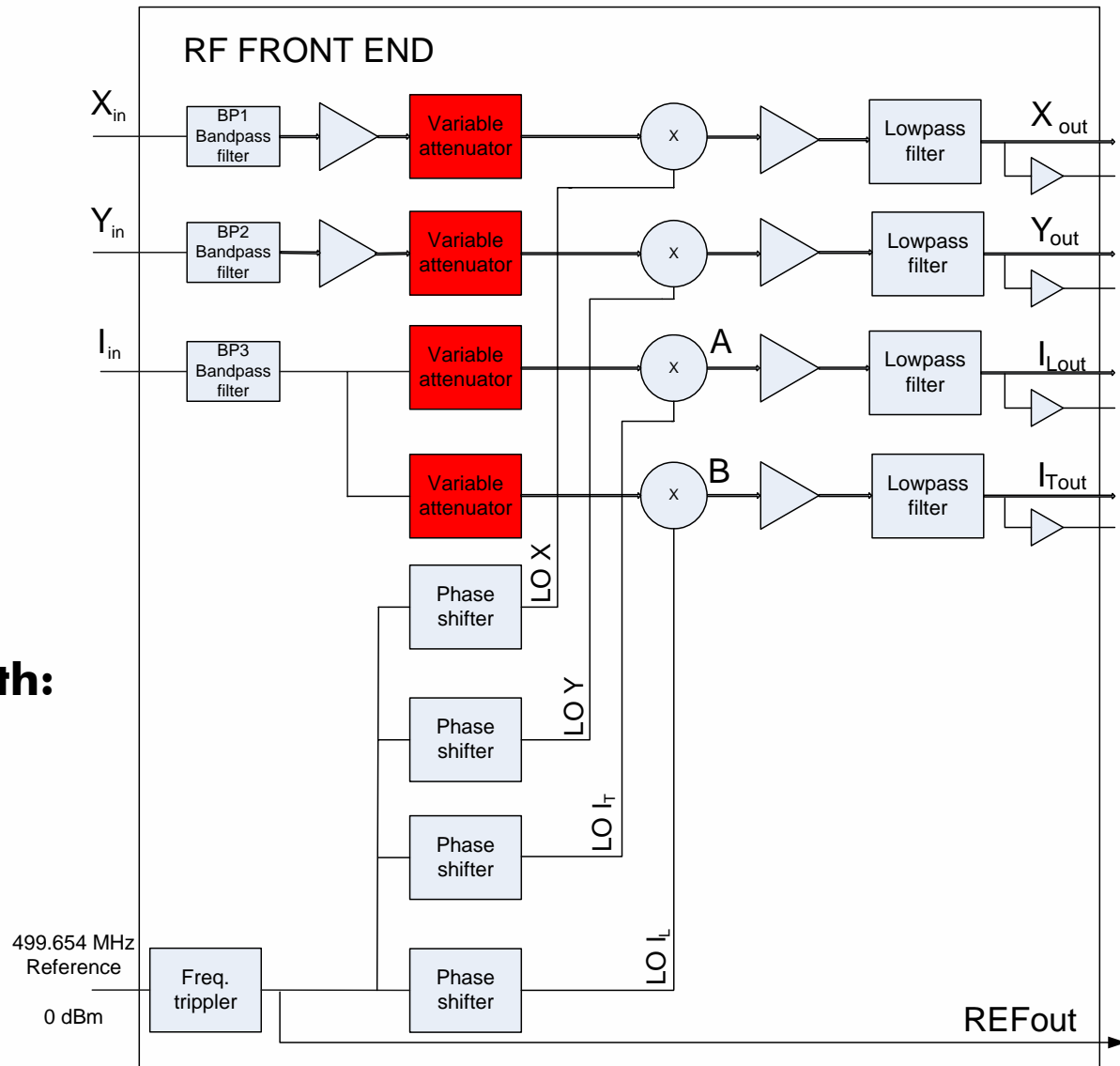
0dBm \pm 2 dBm @ 500 MHz

Reference Signal Strength:

0dBm \pm 2 dBm

Test outputs added

Improved isolation



Front and Back Panel Layout

Parameter control

- **Local:** Control of gain and phase is done on the instrument front panel over control buttons with LCD display.
- **Remote:** Remote control is done over Ethernet (USB) based protocol to be defined.

