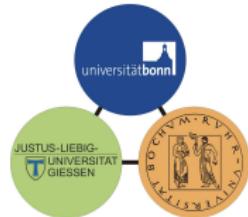


Broad and Narrow Band Feedback Systems at ELSA

Manuel Schedler

16th ESLS RF Meeting
ALBA

October, 10th 2012



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The ELSA Accelerator Facility

Limiting Factors of High Beam Currents

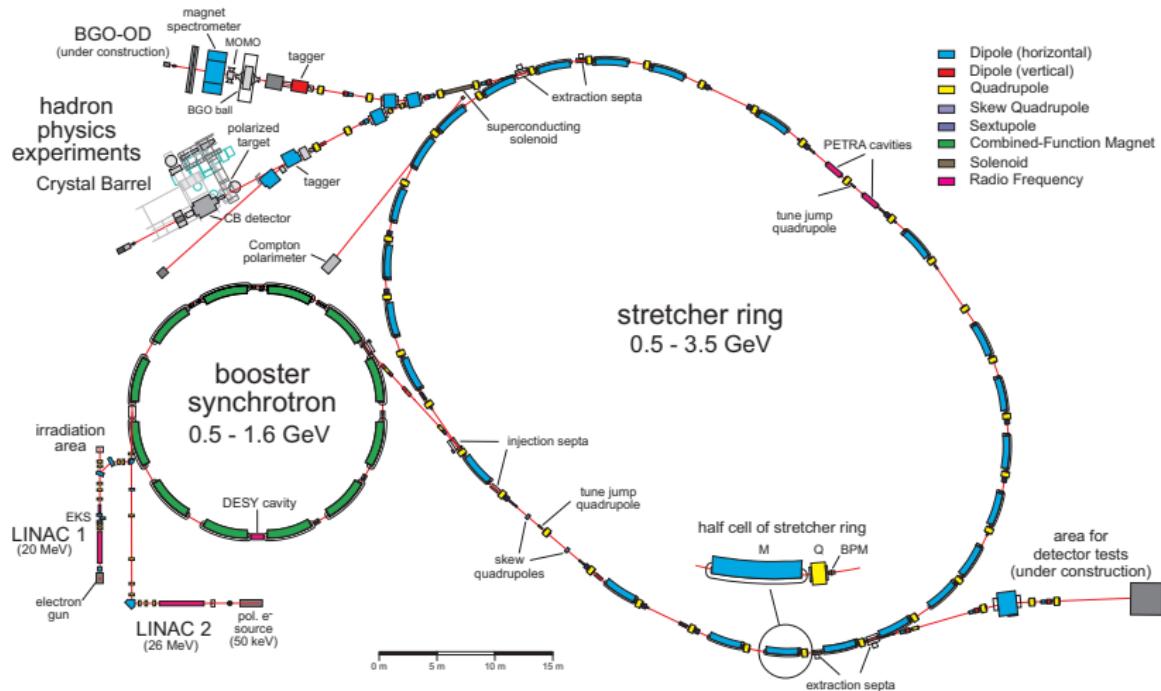
Multi Bunch Feedback System

Feedback on Fast Energy Ramp

Narrow Band Feedback System

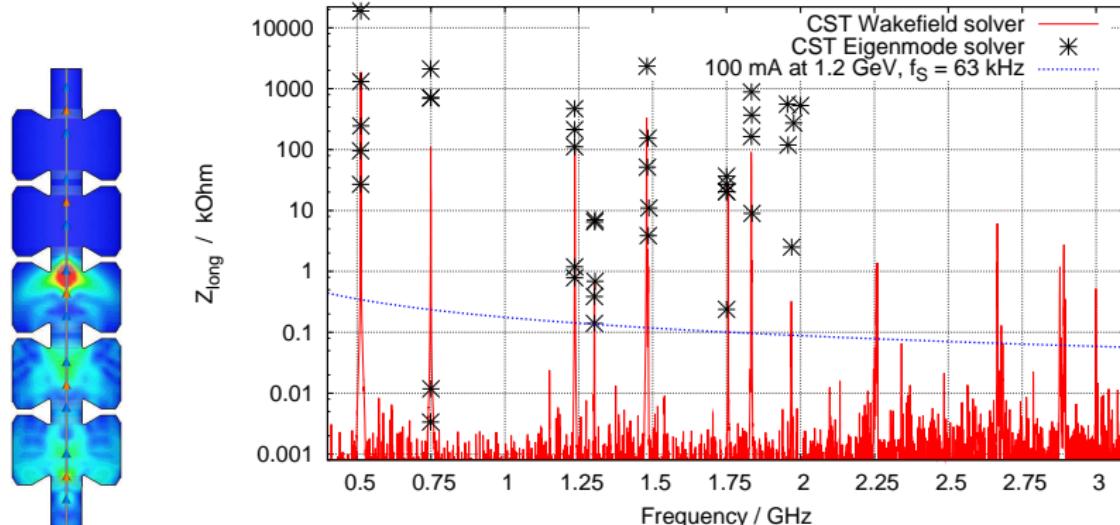
Outlook

The ELSA Accelerator Facility

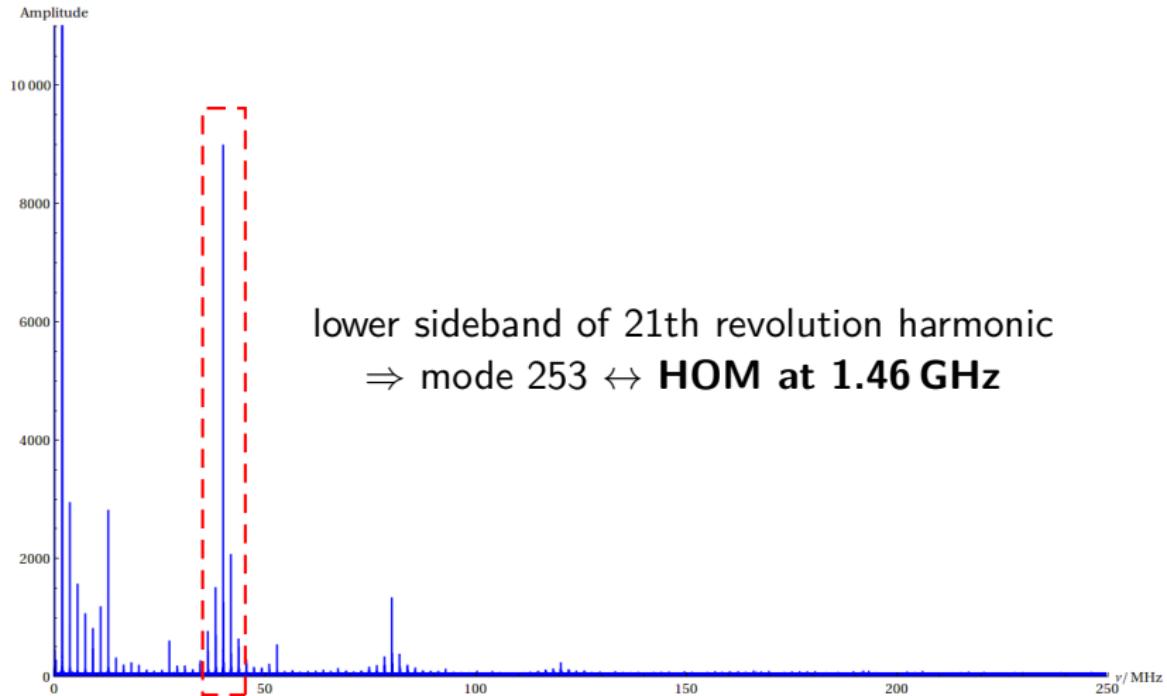


Limiting Factors of High Beam Currents

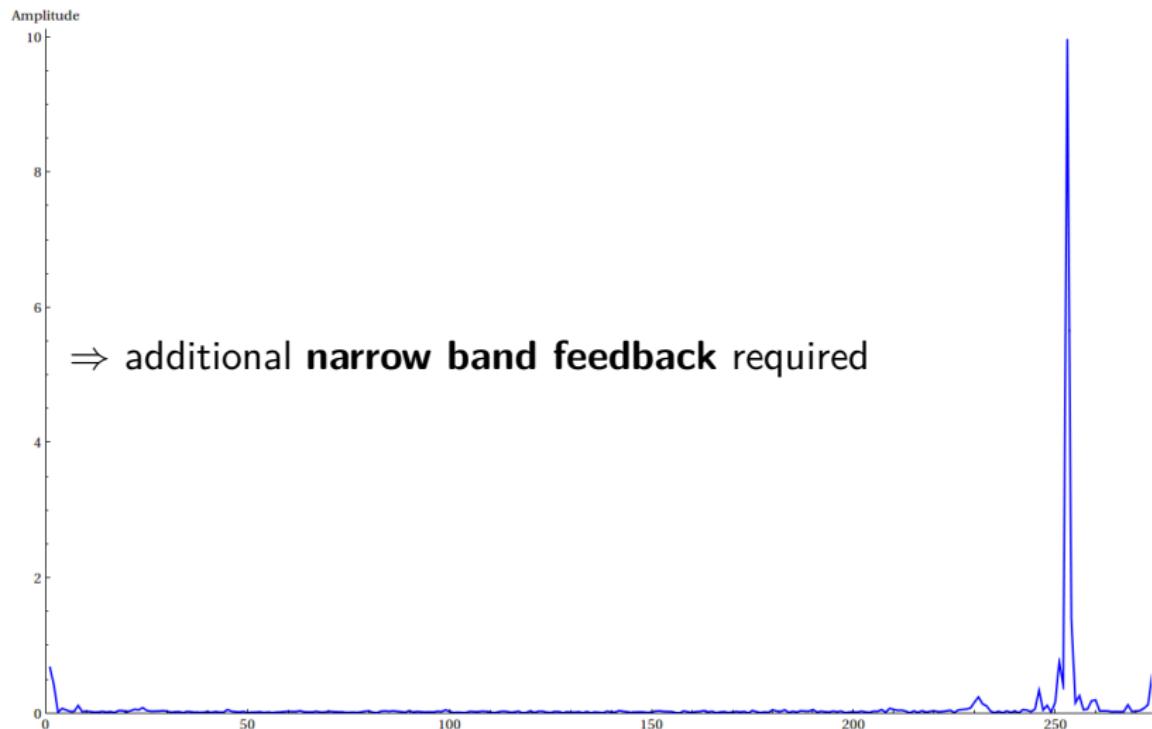
multi bunch instabilities mainly dominated by HOMs of the two 5-cell PETRA-cavities and resistive wall effects



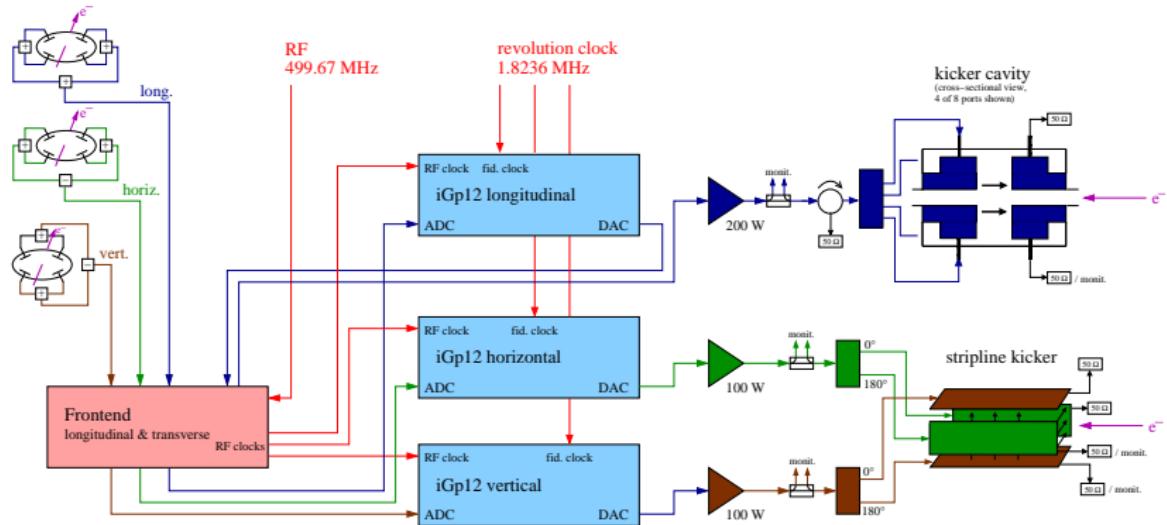
Longitudinal Beam Spectrum



Longitudinal Mode Spectrum

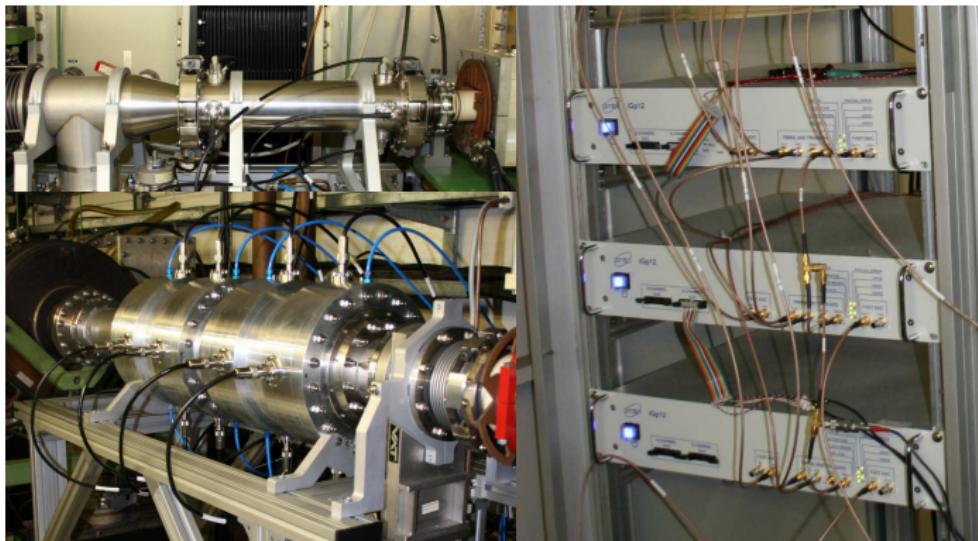


Multi Bunch Feedback System



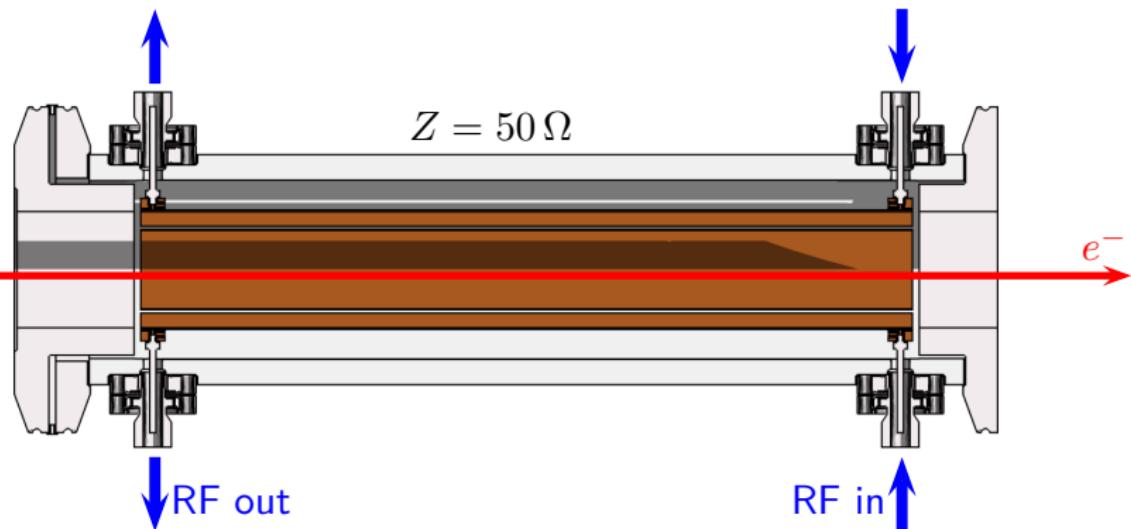
Multi Bunch Feedback System

- ▶ signal processing using FPGAs manufactured by dimtel®
- ▶ in-house development of longitudinal and transverse kickers

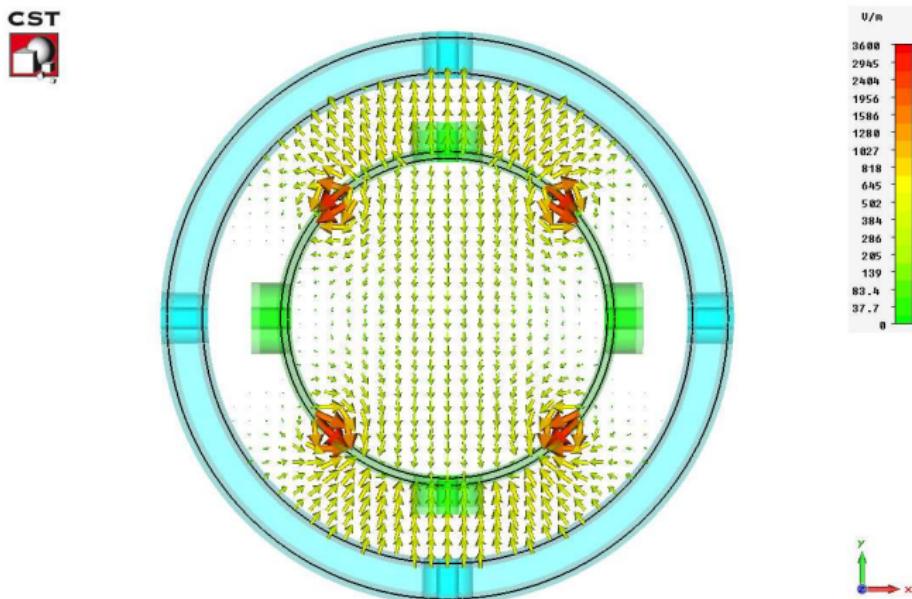


Transverse Stripline Kicker

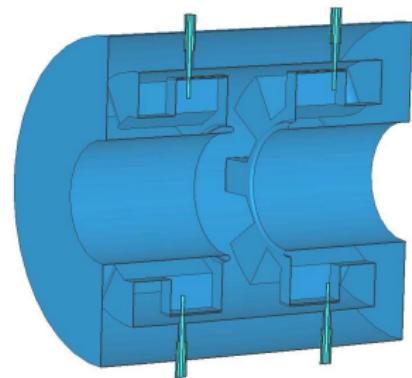
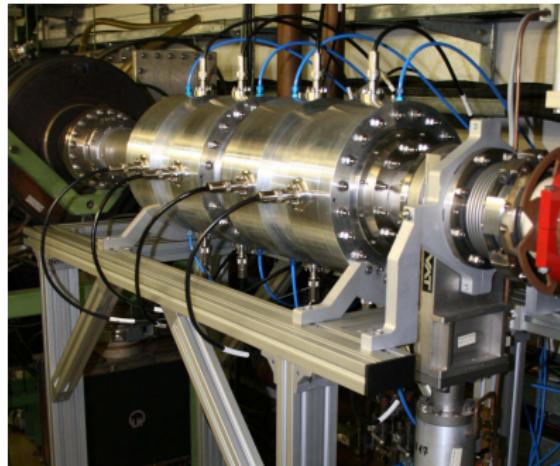
- ▶ coaxial design
- ▶ 250 MHz bandwidth



Electric Field Distribution of the Stripline Kicker

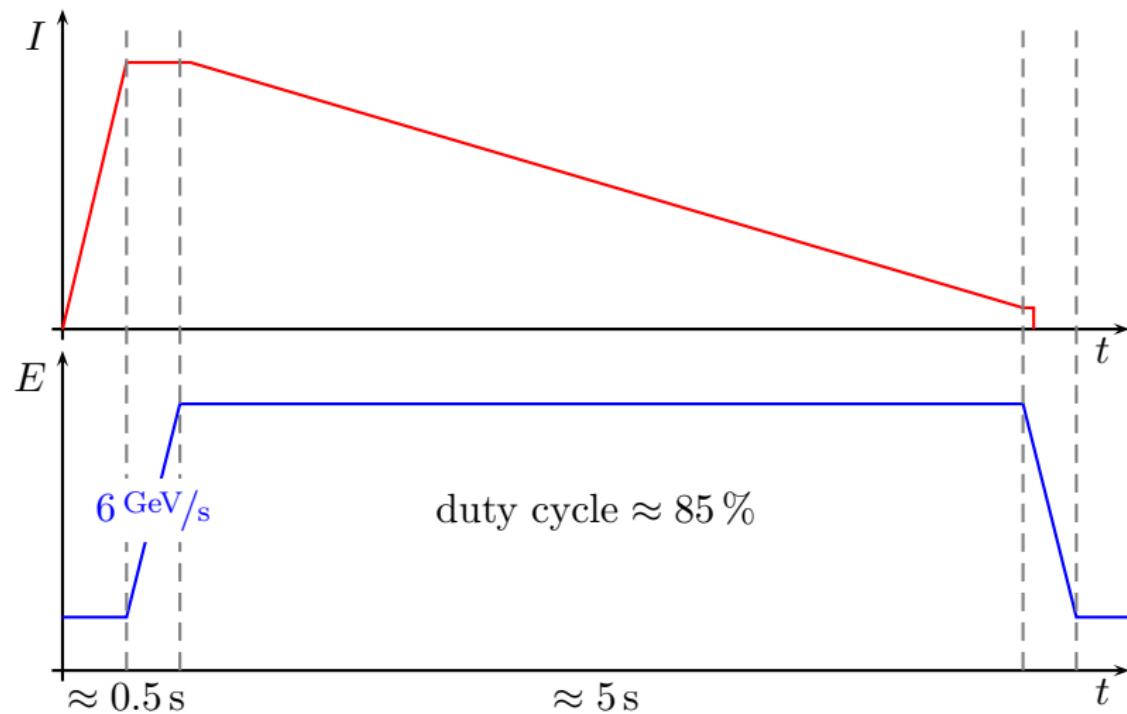


Longitudinal Kicker Cavity



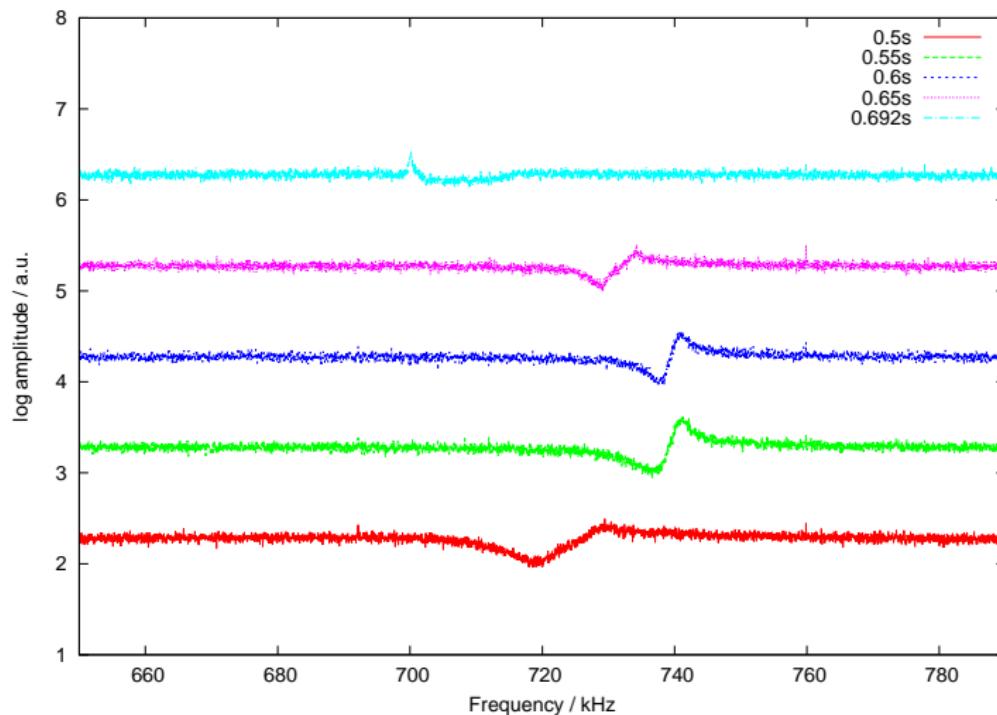
- ▶ $\nu_{\text{res}} = 1.125 \text{ GHz}$
- ▶ $Q_L = 4.5 \rightarrow \Delta\nu > 250 \text{ MHz}$
- ▶ $R_S = 440 \Omega$

Fast Energy Ramp in Booster Mode



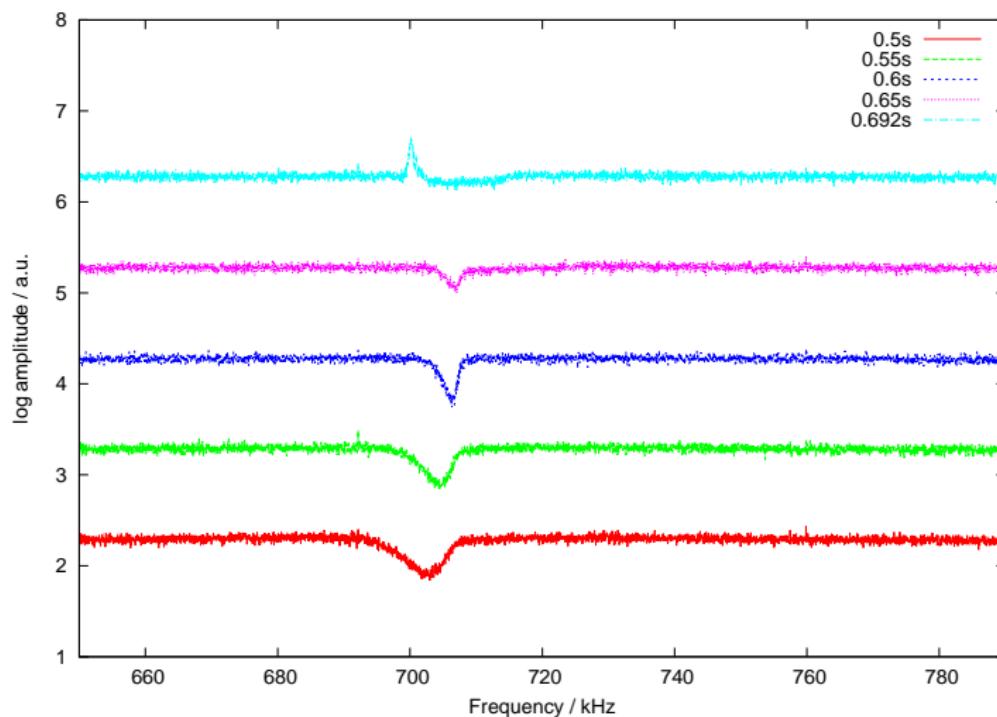
Feedback on Fast Energy Ramp

horizontal beam spectrum **without** tune correction



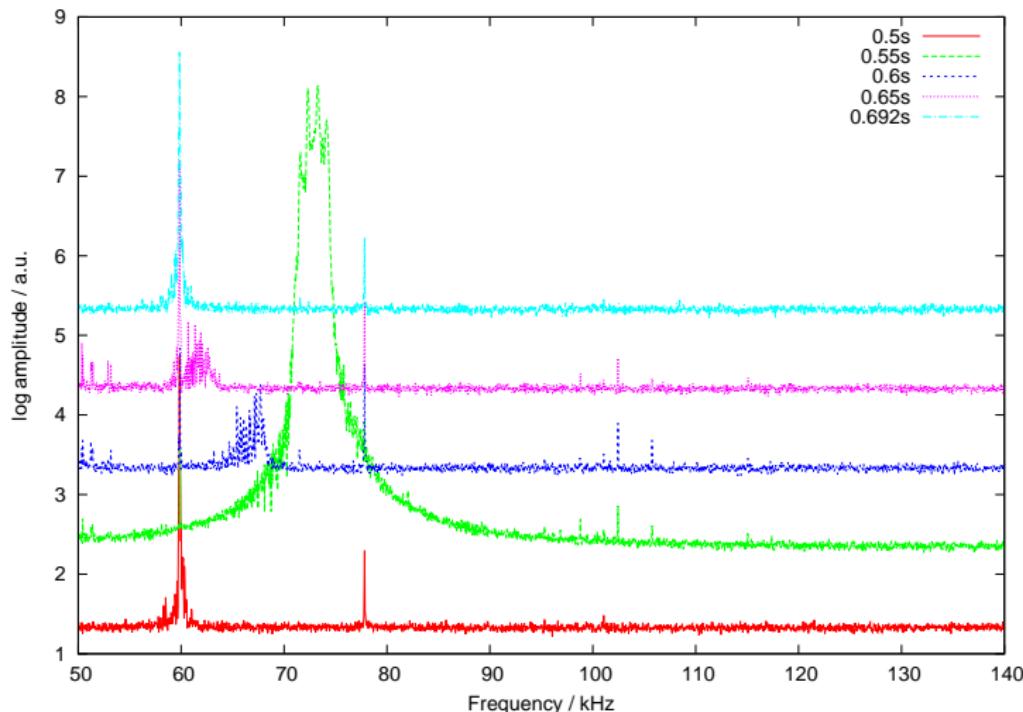
Feedback on Fast Energy Ramp

horizontal beam spectrum **with** tune correction



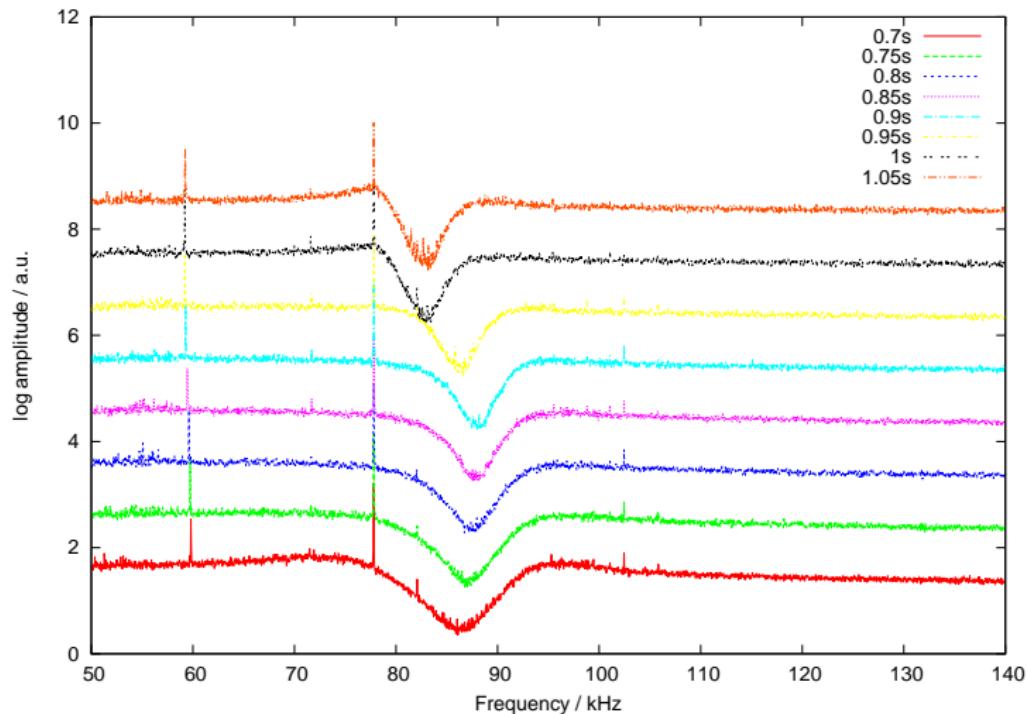
Feedback on Fast Energy Ramp

longitudinal beam spectrum **without** tune correction

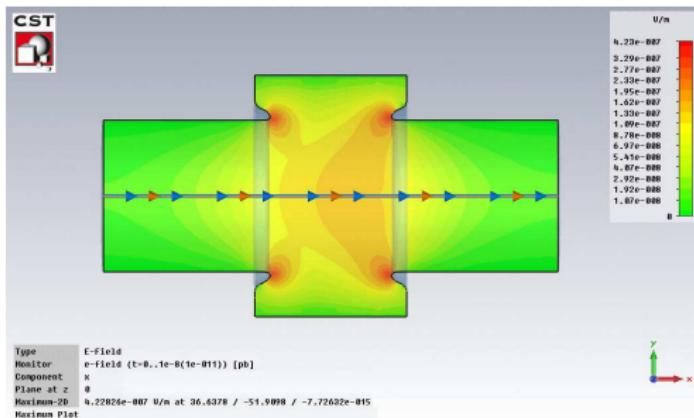
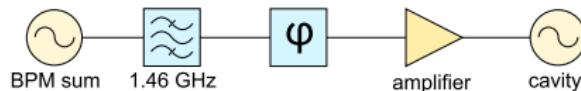


Feedback on Fast Energy Ramp

longitudinal beam spectrum **with** tune correction



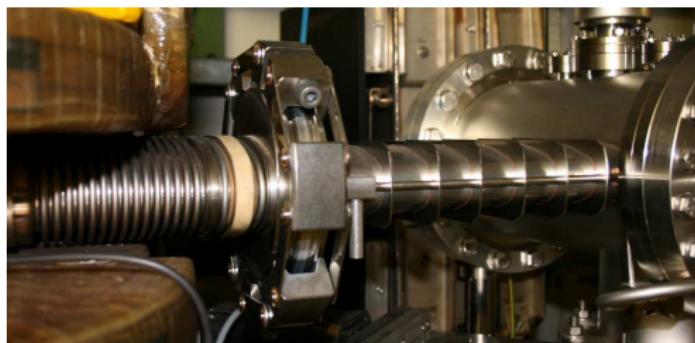
Narrow Band Feedback System



$$\nu_{\text{center}} = 1.46 \text{ GHz}$$
$$Q \approx 2 \times 10^4$$

Outlook

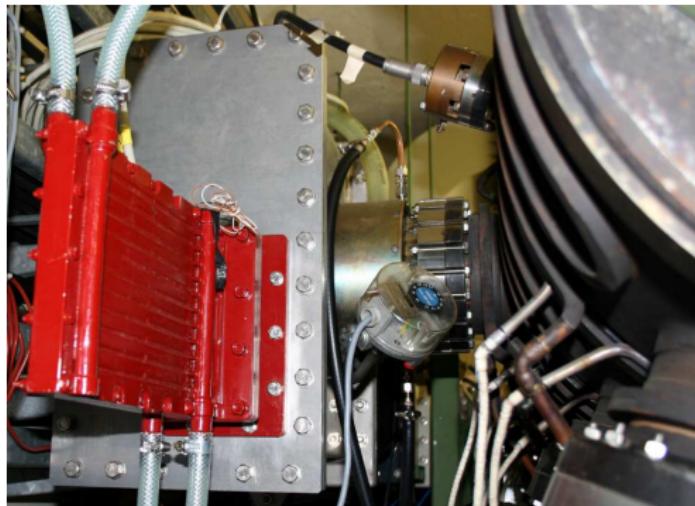
- ▶ Optimization of vacuum chambers to reduce wake impedances



bypass ceramic insulations in every dipol chamber $\approx 1 \text{ M}\Omega$

Outlook

- ▶ New digital LLRF system for PETRA cavities (dimtel)
- ▶ HOM couplers in the wave guides



- ▶ Optimization of the accelerator for high beam currents
 $(20\text{ mA} \rightarrow 250\text{ mA})$

Thank you for your attention.