MTCA.4-based LLRF control system experience at ELBE

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Outline

1. Project description
2. System architecture
3. Tests
4. Outlook

1 Project description

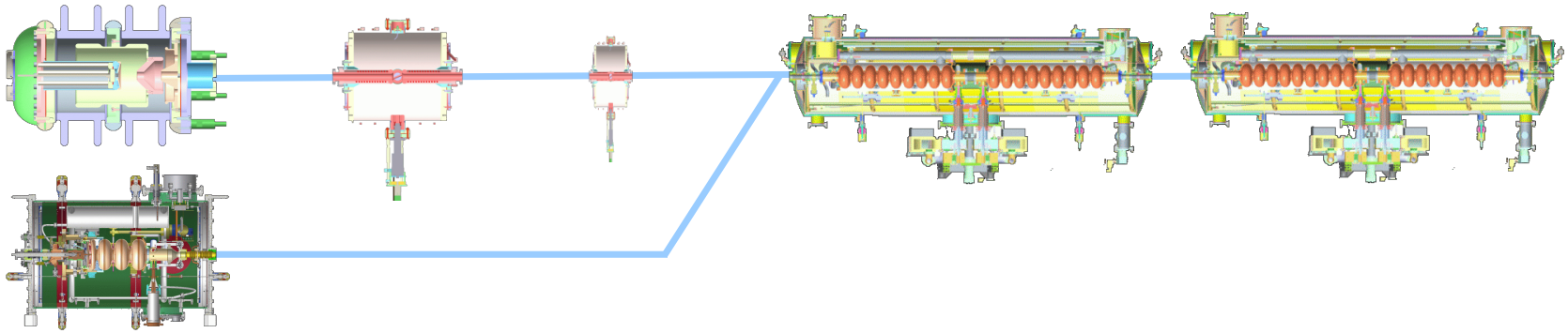
2 System architecture

3 Tests

4 Outlook

Briefly

Setup MTCA.4-based single cavity regulation system at the ELBE facility.



Goals

- Prepare a robust solution for the CW operation.
- Develop a MTCA.4-based LLRF control system suitable for external users.
- Minimize the maintenance effort needed.
- Increase the flexibility.

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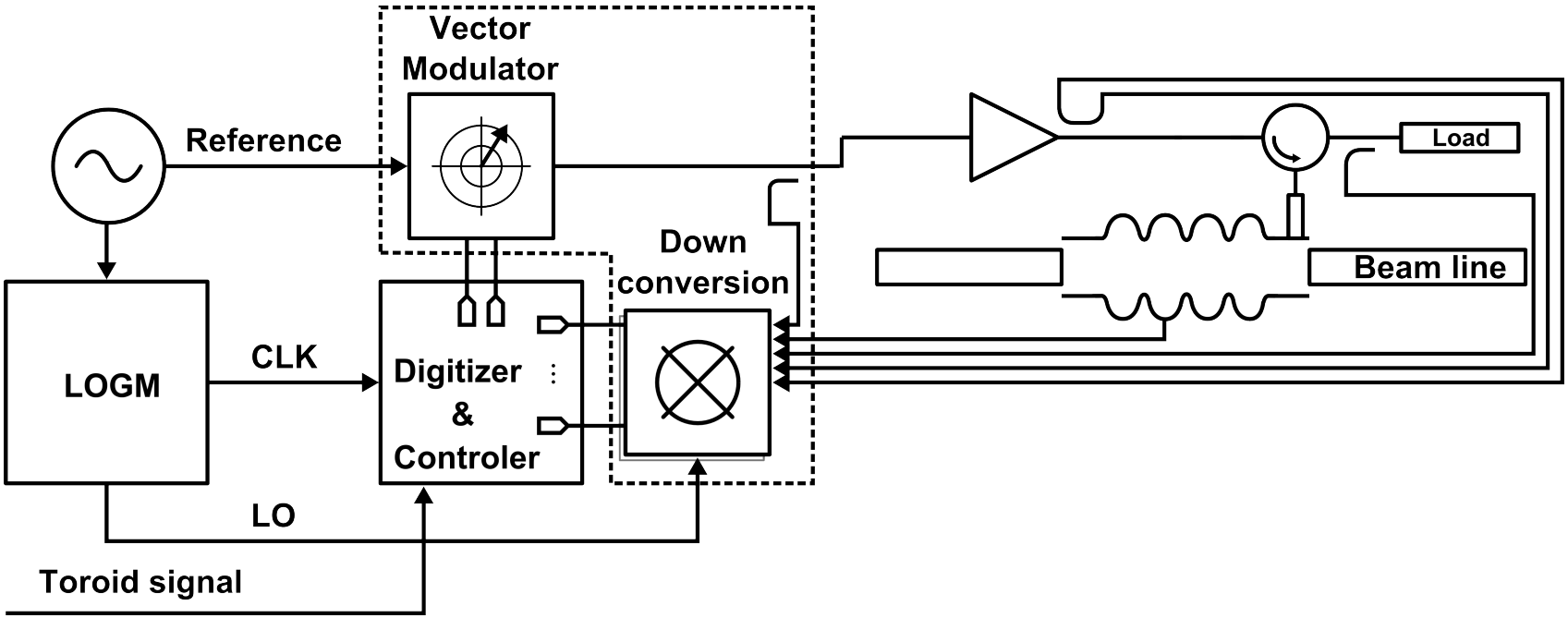
Real-time FB Loop Overview



Hardware platform

Control loop - main components (per cavity)

- DRTM-DWC8VM1 / DRTM-DS8VM1
- Struck SIS8300L2

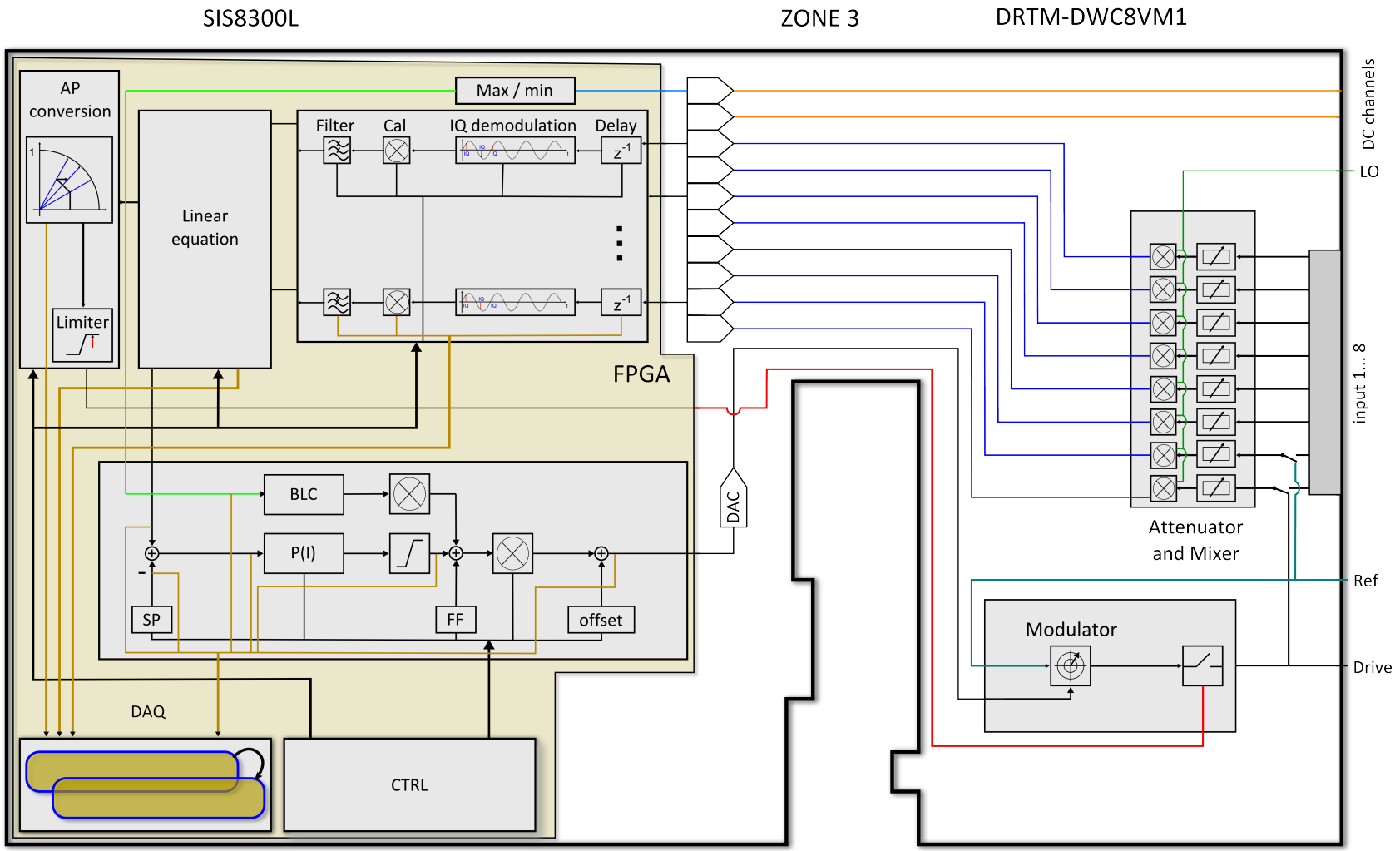
Other components

- MTCA.4 Crate
- CPU
- Power Supply
- Timing module
- MCH

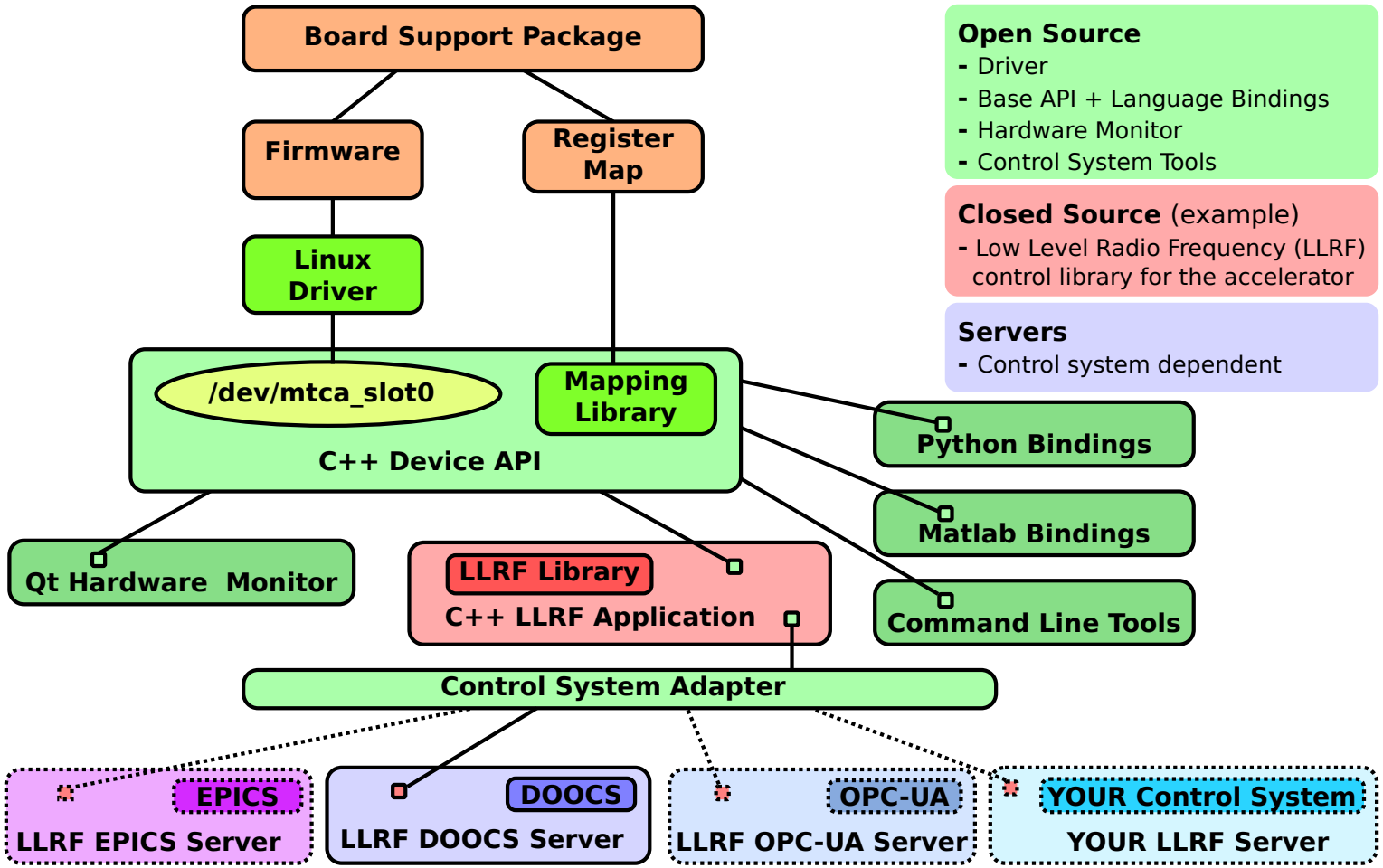
External

- LO Generation Module (LOGM)
- ICT signal conditioning front-end
- Timing system

Firmware


SIS8300L
ZONE 3
DRTM-DWC8VM1
AP conversion
Limiter
Linear equation
Max / min
Filter
Cal
IQ demodulation
Delay
FPGA
BLC
P(I)
SP
FF
offset
DAC
DAQ
CTRL
DC channels
LO
input 1... 8
Attenuator and Mixer
Ref
Modulator
Drive

Software



Courtasy of Martin Killenberg.

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Test runs

November 2013

- First experience
- Integration isssues (Timing)
- Cavity 3 and 4

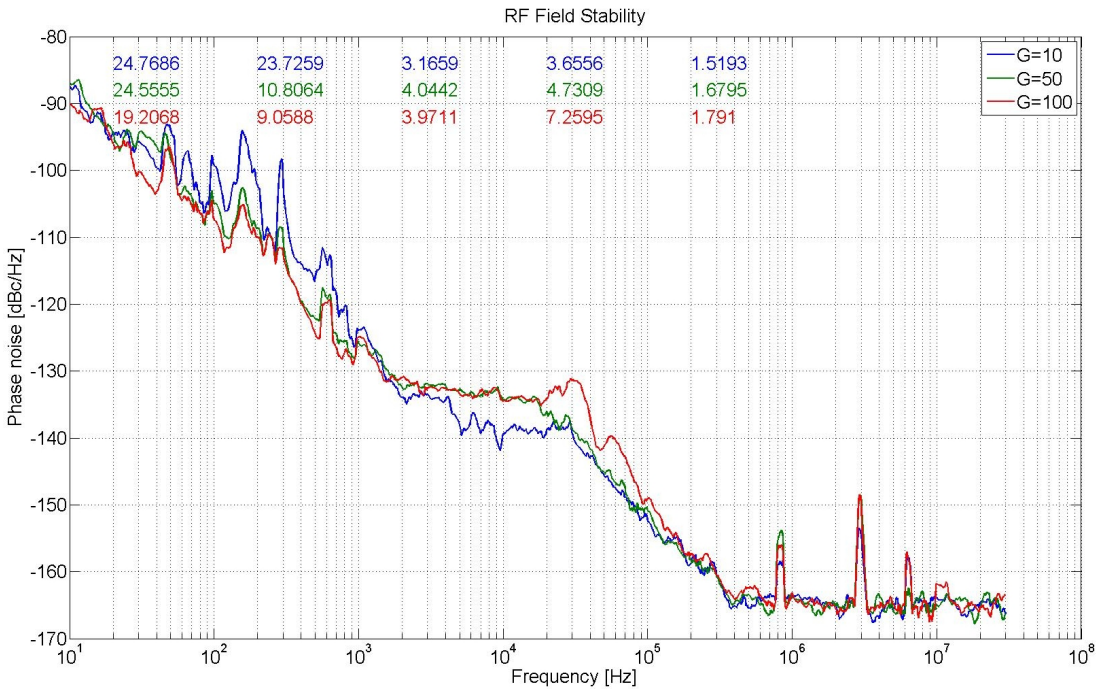
2014

- Cavity 1 and 2
- 260 MHz buncher
- Performance optimization

Gradient: 10.5 $\frac{MV}{m}$
Beam current: 800 uA

Gain (A.U.)	Jitter (fs)
10	34.67
50	27.59
100	22.86

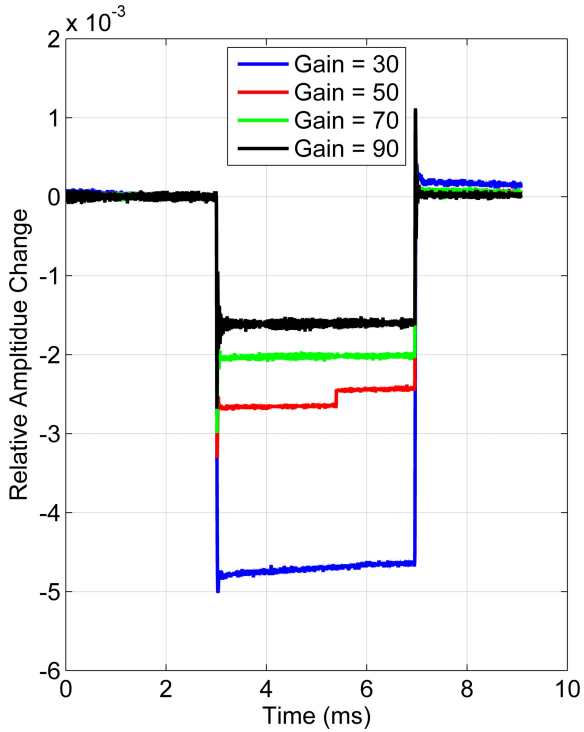
Reference jitter : 21.2 fs

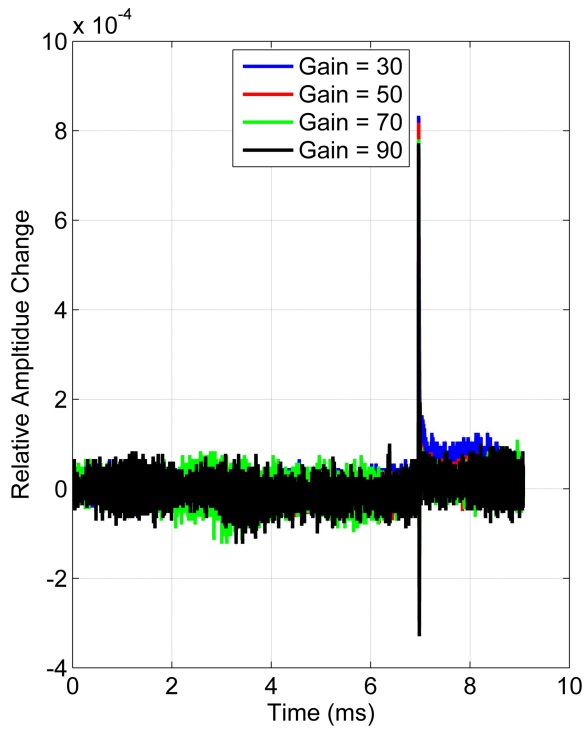


Test runs (cont.)

2015

- Real-time BLC
- Automation (server, close loop ramp up procedure)
- Focus on the system integration





Common problems

- Phase Alignment
- Warm and Cold Windows Interlock
- Timing signal
- MTCA management and OS configuration (RTM CPU issues)

Small mistake with big consequences (Nov 9th 2015)

- Error in communication
- Wrong gradient
- Beam on (CW)
- Below beam loss interlock treshold
- Vaccum broken

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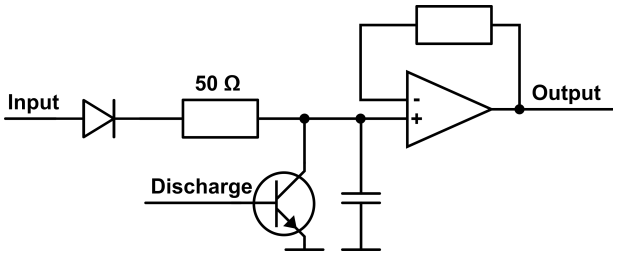
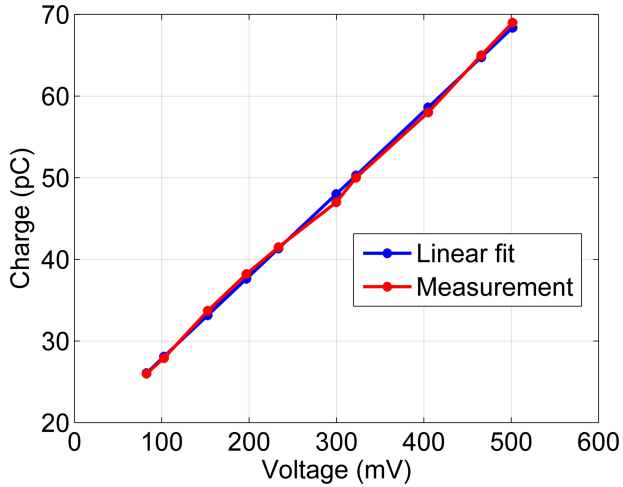
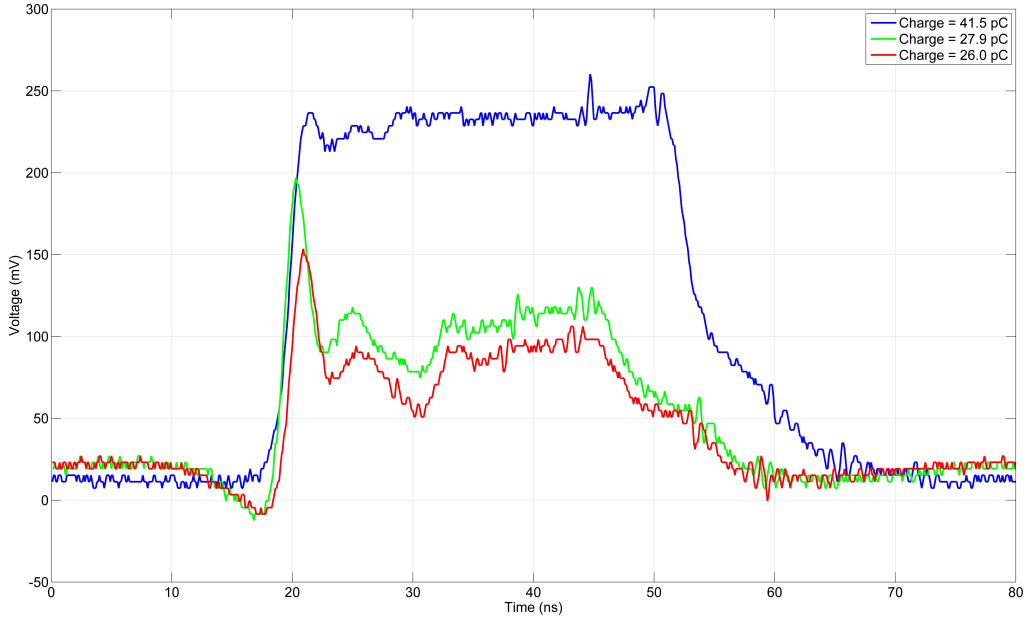
Most important todos

- Control system adaptor
- Interlock integration
- Timing
- UNILOGM (Q1 2016)

Other tasks

- DAQ
- Real-time BLC
- New diagnostic and automation

Questions

Backup slide - BLC