DCM results and status

(Drift Calibration Module)

MSK collaboration workshop

for the European XFEL

DESY-Hamburg, 12.05.2014

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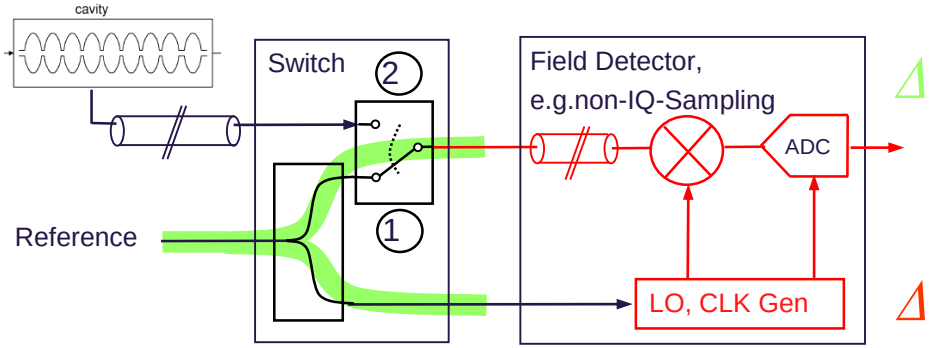
Introduction

Reference Injection

Relative Phase Calibration :



$\Delta\varphi = 0$

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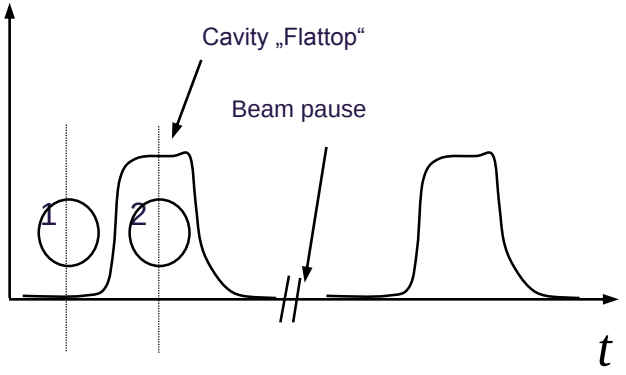
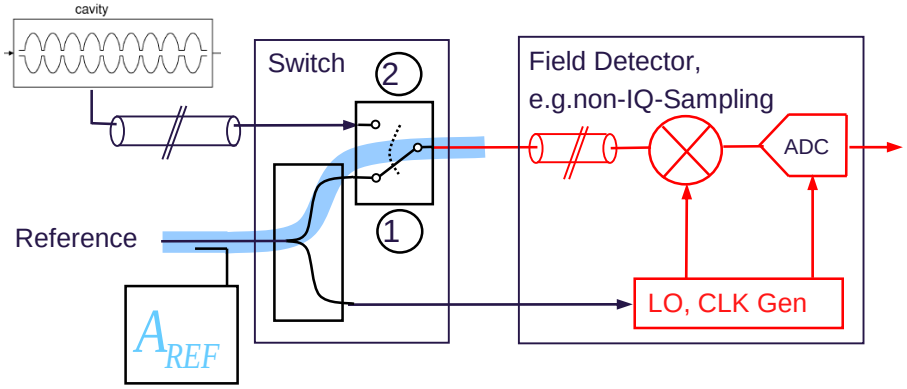


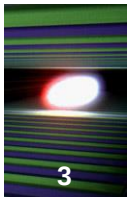
Absolute Amplitude Calibration :



A_{REF}

A_{DWC}

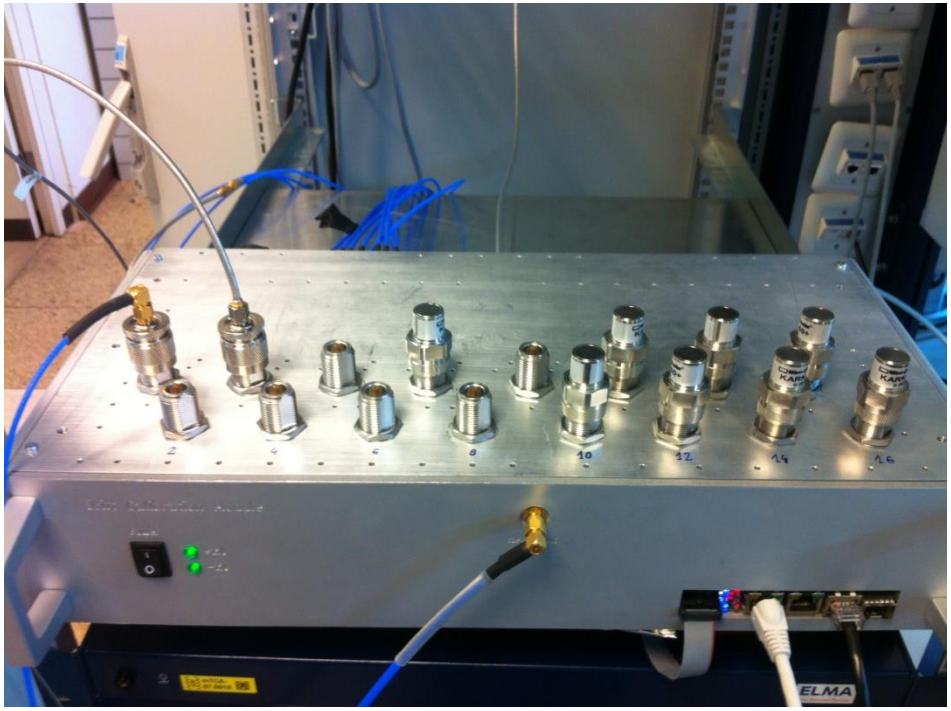
Introduction



- Specification
  - RF switches (cavity/reference signal)
  - Reference distribution (16 channels)
  - Digitally controlled attenuators
  - N-type connectors for cavity signals (with integrated attenuators)
  - Amplitude detector
  - Temperature stabilization

Introduction

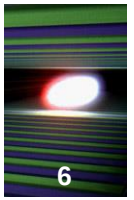
- DCMv1 (2011-2012, never installed)
  - Functionally OK, calibration didn’t work



Introduction

- DCMv2 (2012- VI. 2014)

Results



- Functionality

2.2 Tests of the DCM board functionality

a) DCM PCB is set into correct initial state after powering up – 0dB, cavity state TMCBv1 disconnected – OK

b) DCM PCB is set into correct initial state after powering up – 0dB, cavity state TMCBv1 connected – **FAIL**

c) Controlling the attenuators – OK

d) Controlling the switches – OK

e) Amplitude detector – OK

f) Controlling the switch for correcting amplitude detector ADC offset drift – OK

g) I2C temperature sensors readouts – OK

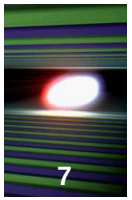
2.3 Tests of the Temperature Controller functionality

a) Remote enable/disable – OK

b) Setting DACs outputs (temperature setpoints) – OK

c) Temperature range: 12 K (-4K max cooling / +8 K max heating), can be extended with choosing another type of Peltier elements

Results



- **RF performance**
  - RF connectors matching <-20dB
  - REF input matching -10dB (SMT splitters limitation)
  - FBM outputs matching <-18dB
  - Crosstalks <-85dB
  - RF channel initial losses: -20dB
  - REF input ->FBM output transmission: -24dB

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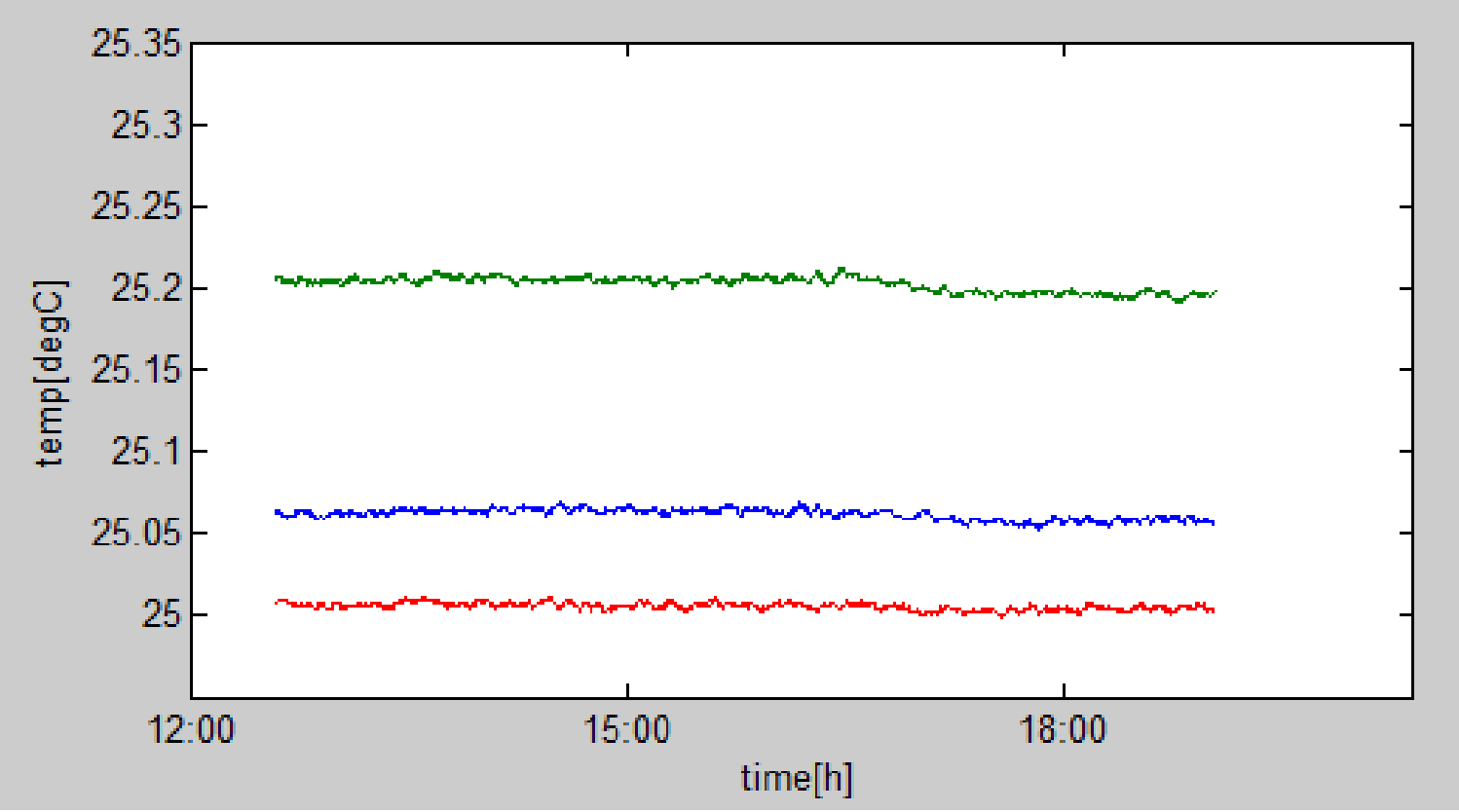
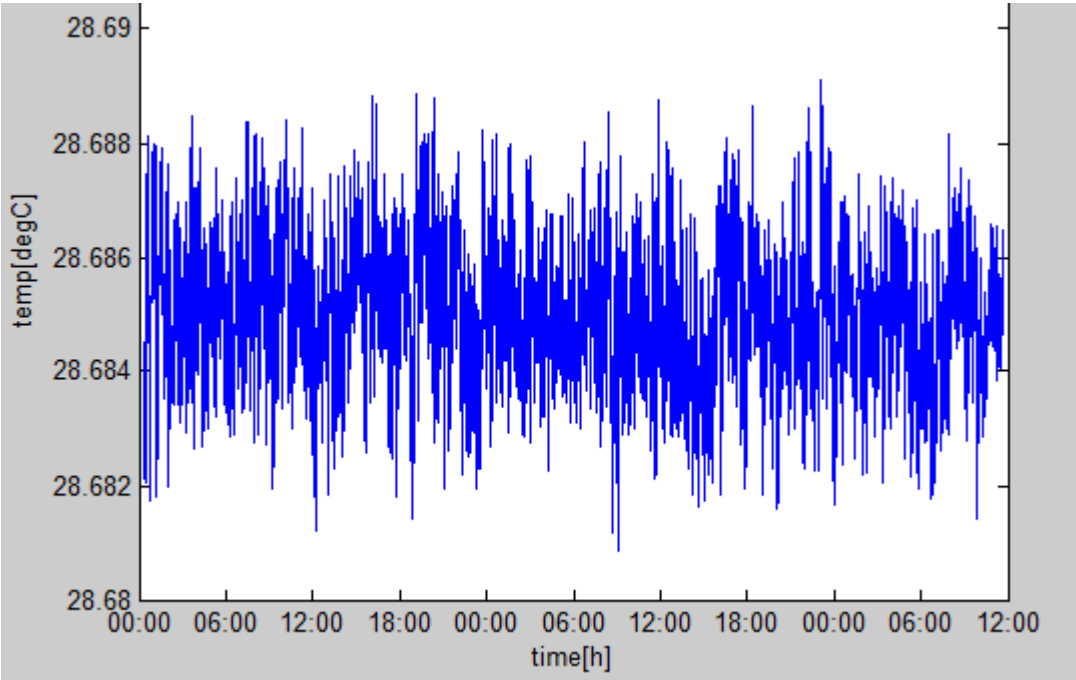
Results

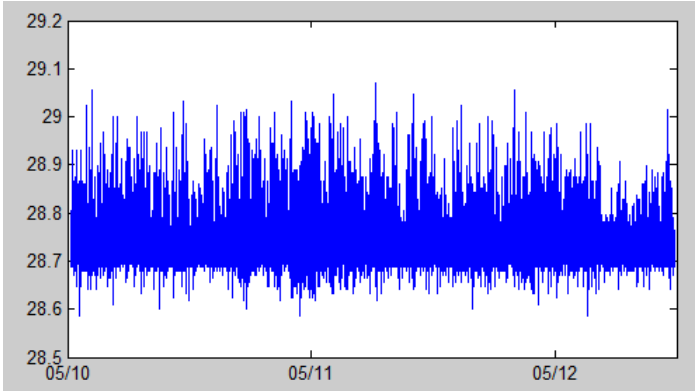
- **DCM temperature stability (in the lab)**



Results

- **DCM temperature stability (in the Test Stand)**





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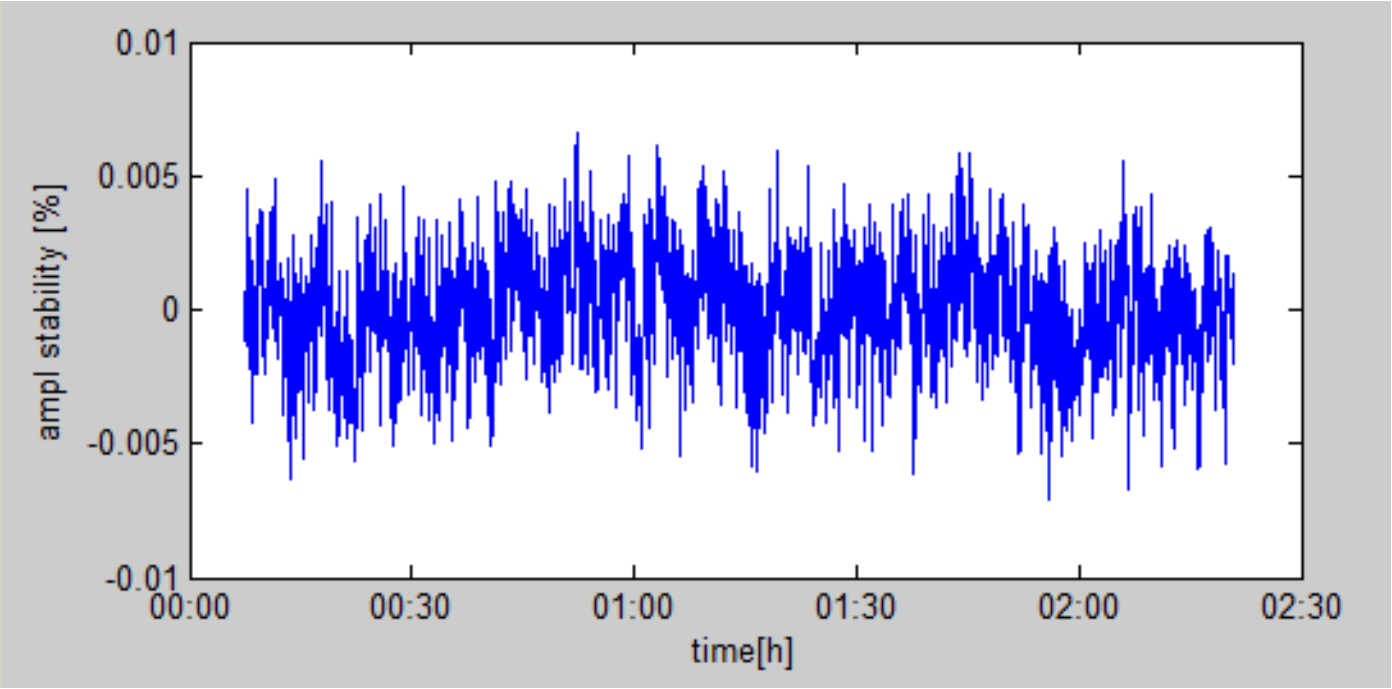
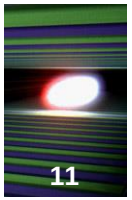
Results

DCM amplitude detector stability (noise)



- Average of 256 ADC samples (125kHz) taken every few seconds
- Possible improvements:
  - Moving average
  - Amplitude detector 1/f noise cancelation
  - Noise because of signal ampltide noise(?)

Results

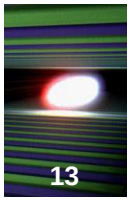


- **Failure report**
  - The file is updated on N-drive, only small changes are needed

TO DO

- Calibration firmware (23.V)
- Temperature Controller board to be designed (18.V)
- Amplitude detector long term stability to be tested (25.V)
- Fron/rear panel design for TMCBv2, new FRED (?.?)
- Cooperation with companies (solving problems like mass production of thermal isolation etc)
- DCMv2.0 documentation, files on SVN (25.V)
- DCMv2.0 Review (30.V)
- 2DCMs v2.0 for XFEL delivery (20.VI)
- Redesign DCM to v2.1 revision (20.VI)
- DCMv2.1 Design Review (27.VI)
- Sending two DCMv2.1 to production (30.VI)

  -> 3.0GHz version too (?)
- Assembling of DCMv2.1 crates, testing (15.VIII)
- Preparing files for mass production (VII-VIII)



Thank you for your attention !