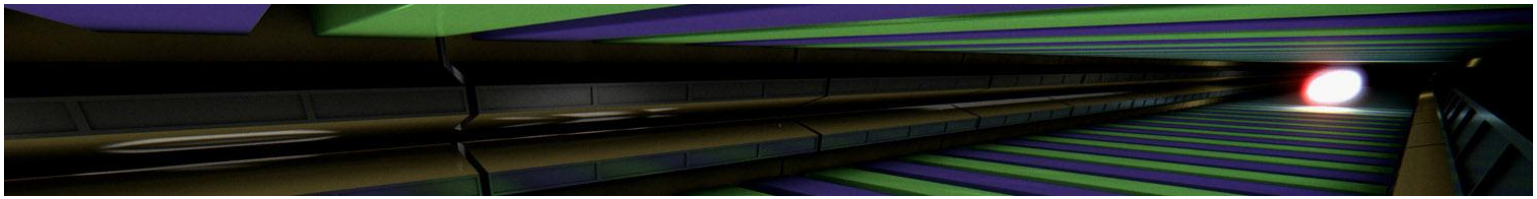


DCM status
(Drift Calibration Module)

LLRF Collaboration Workshop

Otwock-Swierk, 20.02.2013

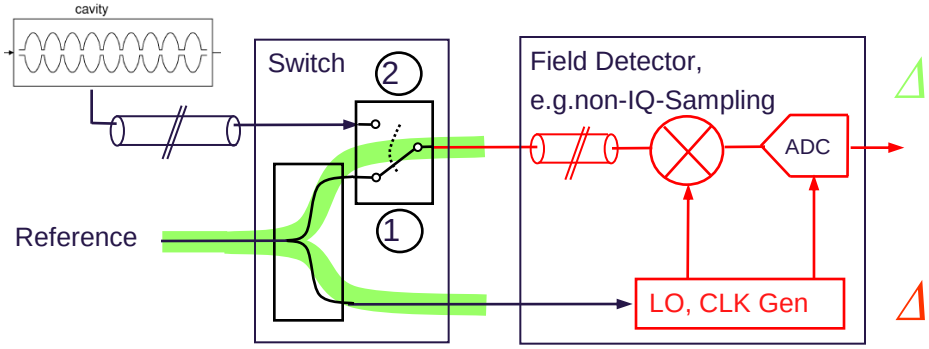
Jan Piekarski

ISE/WUT

Introduction

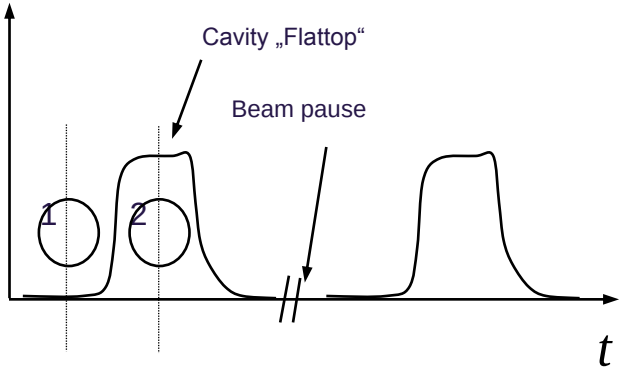
Reference Injection

Relative Phase Calibration :

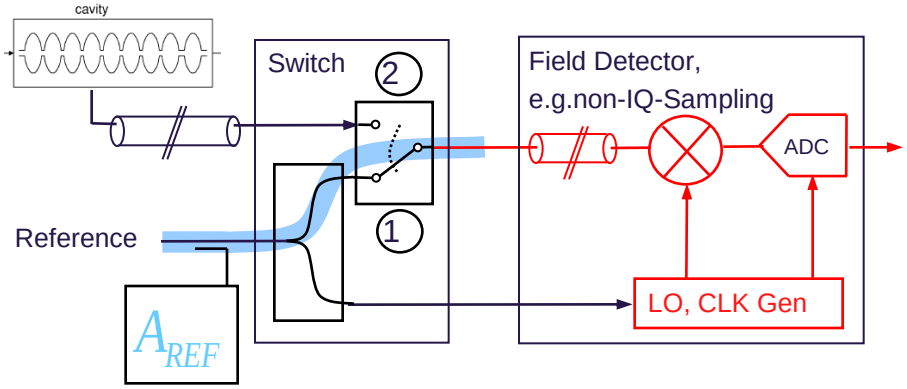


$\Delta\varphi = 0$

$\Delta\varphi = 0$



Absolute Amplitude Calibration :



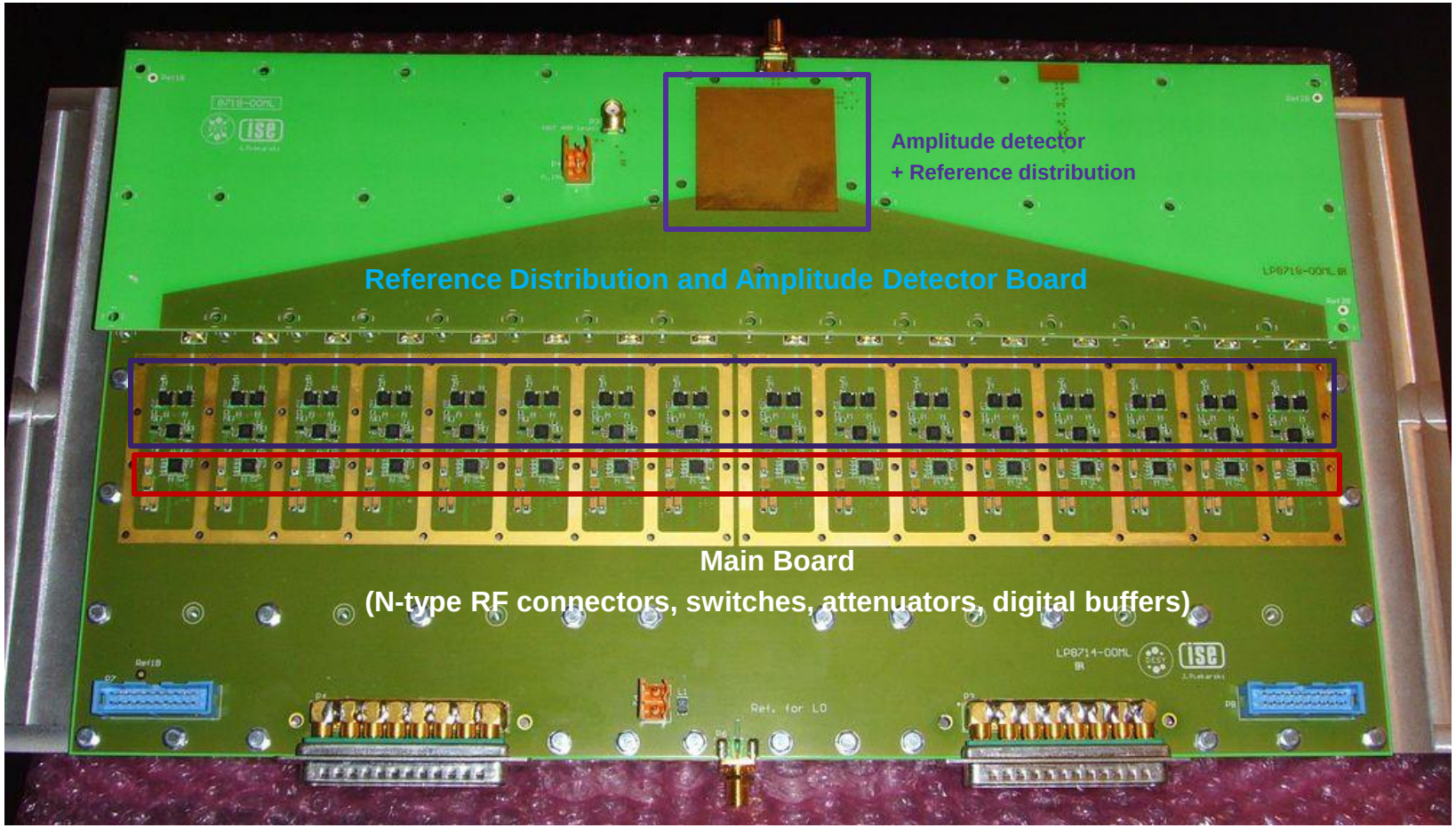
A_{REF}

A_{DWC}

DCM – RF part

Bottom view

Stable reference

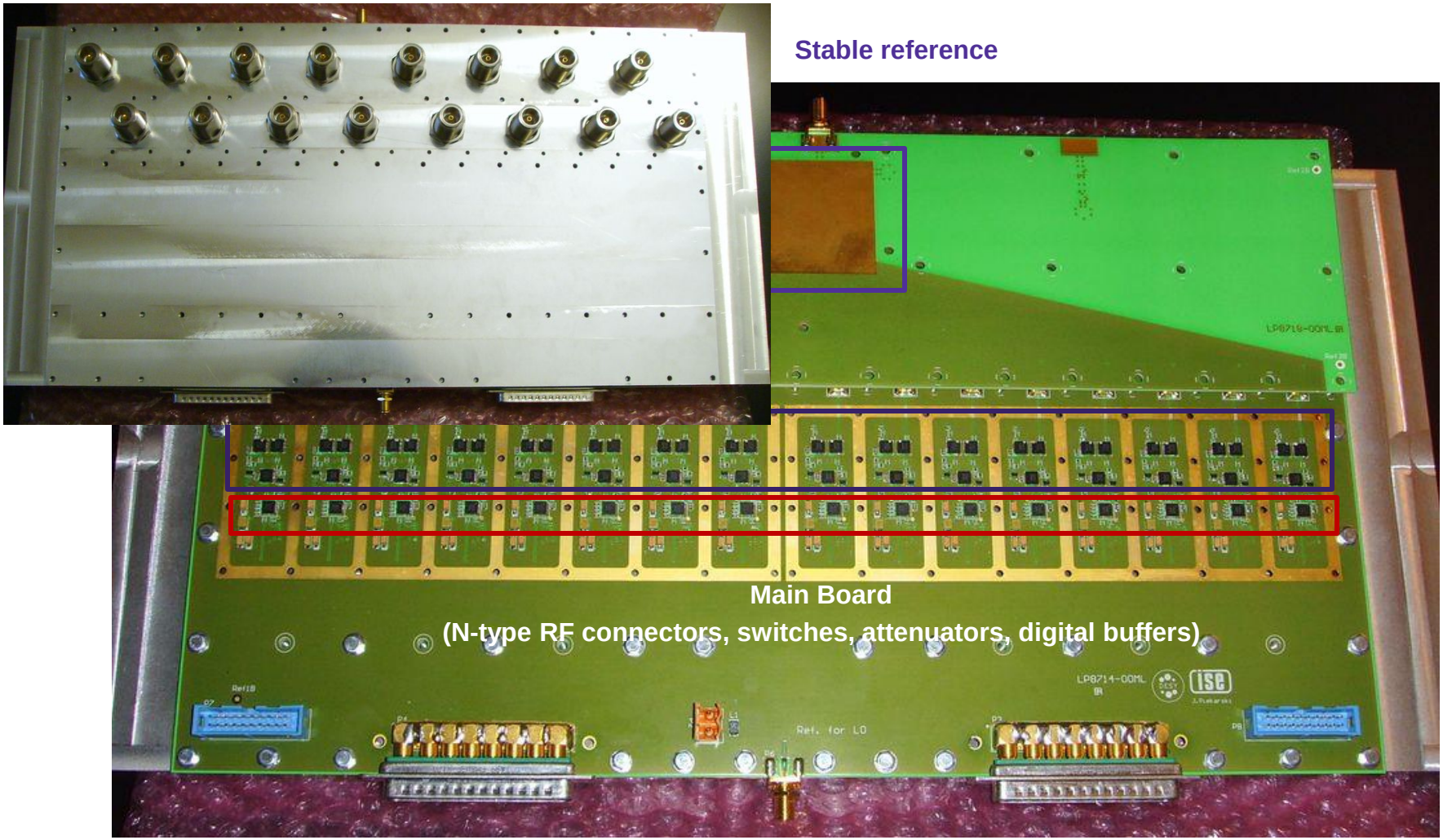


8xFBM to RTM DWC

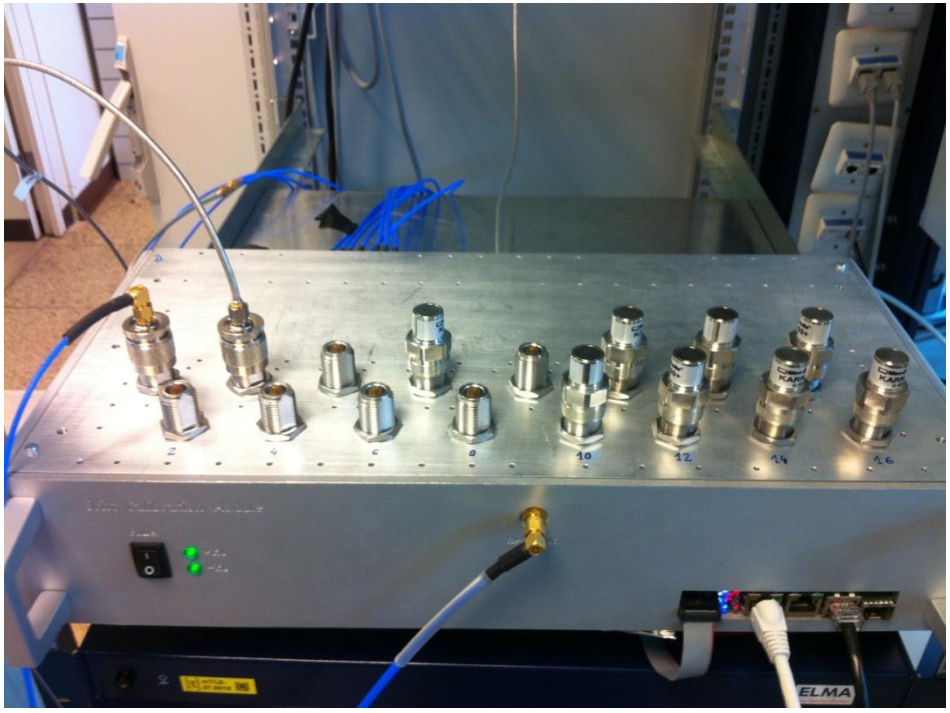
Ref for LOGM

8xFBM to RTM DWC

DCM – RF part

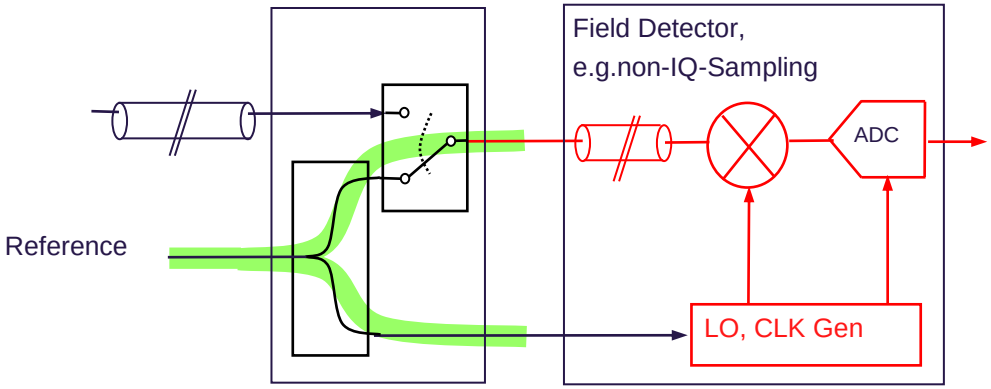

Stable reference
Main Board
(N-type RF connectors, switches, attenuators, digital buffers)
8xFBM to RTM DWC
Ref for LOGM
8xFBM to RTM DWC

DCM



DCM – problems

Impedance difference



$$\frac{A_1'}{A_1} = \frac{\left|1-\Gamma_1\cdot\Gamma_D\right|}{\left|1-\Gamma_1\cdot\Gamma_D\cdot e^{i\Delta\phi}\right|}$$

$$\frac{A_2'}{A_2} = \frac{\left|1-\Gamma_2\cdot\Gamma_D\right|}{\left|1-\Gamma_2\cdot\Gamma_D\cdot e^{i\Delta\phi}\right|}$$

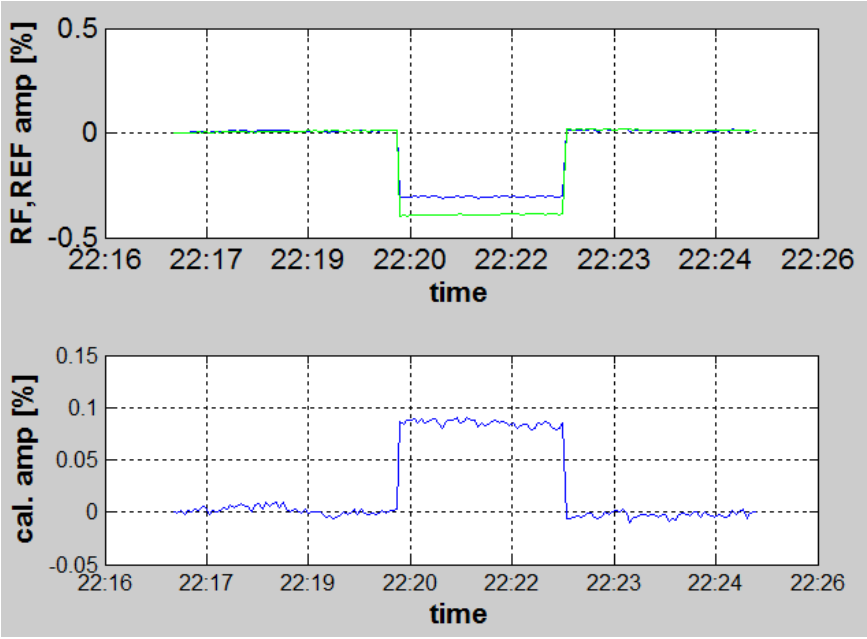
Solution: attenuator placed directly after the switch to decrease impedance difference

European XFEL

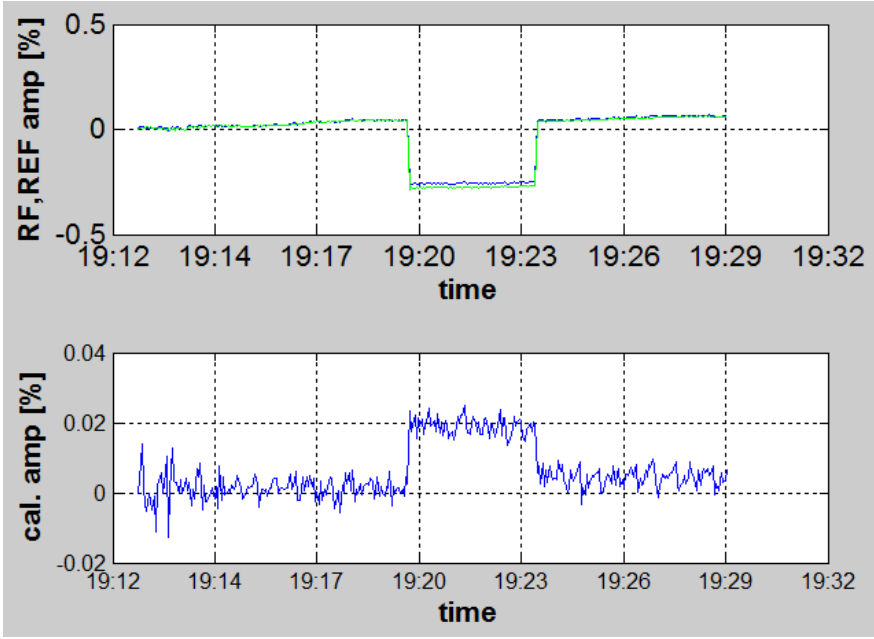
DCM – problems

Impedance difference

Measured cable drift inluence (phase drift: 0.7 deg)



Att=0dB



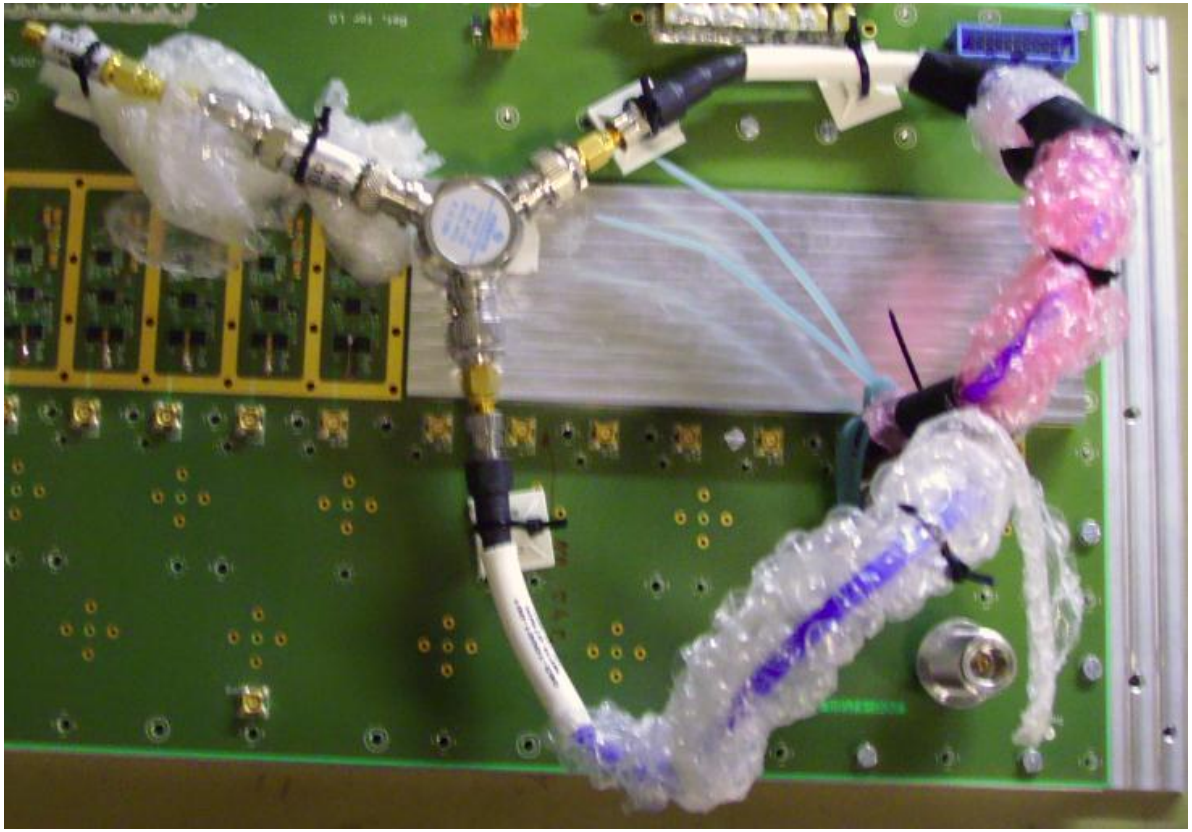
Att=6dB

European XFEL

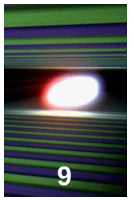
DCM – problems

Results comparison

DCM main board **without** ***reference distribution board*****:**



DCM – problems



Results comparison

DCM main board without ***reference distribution board***:

equal power splitting

I. with temperature stabilization: **0.01% /degC**

II. without temperature stabilization: **0.02 %/degC**

not equal (6dB) power splitting, board temperature stabilized
accuracy: **0.05% /degC**

not correct mechanical fixing

or

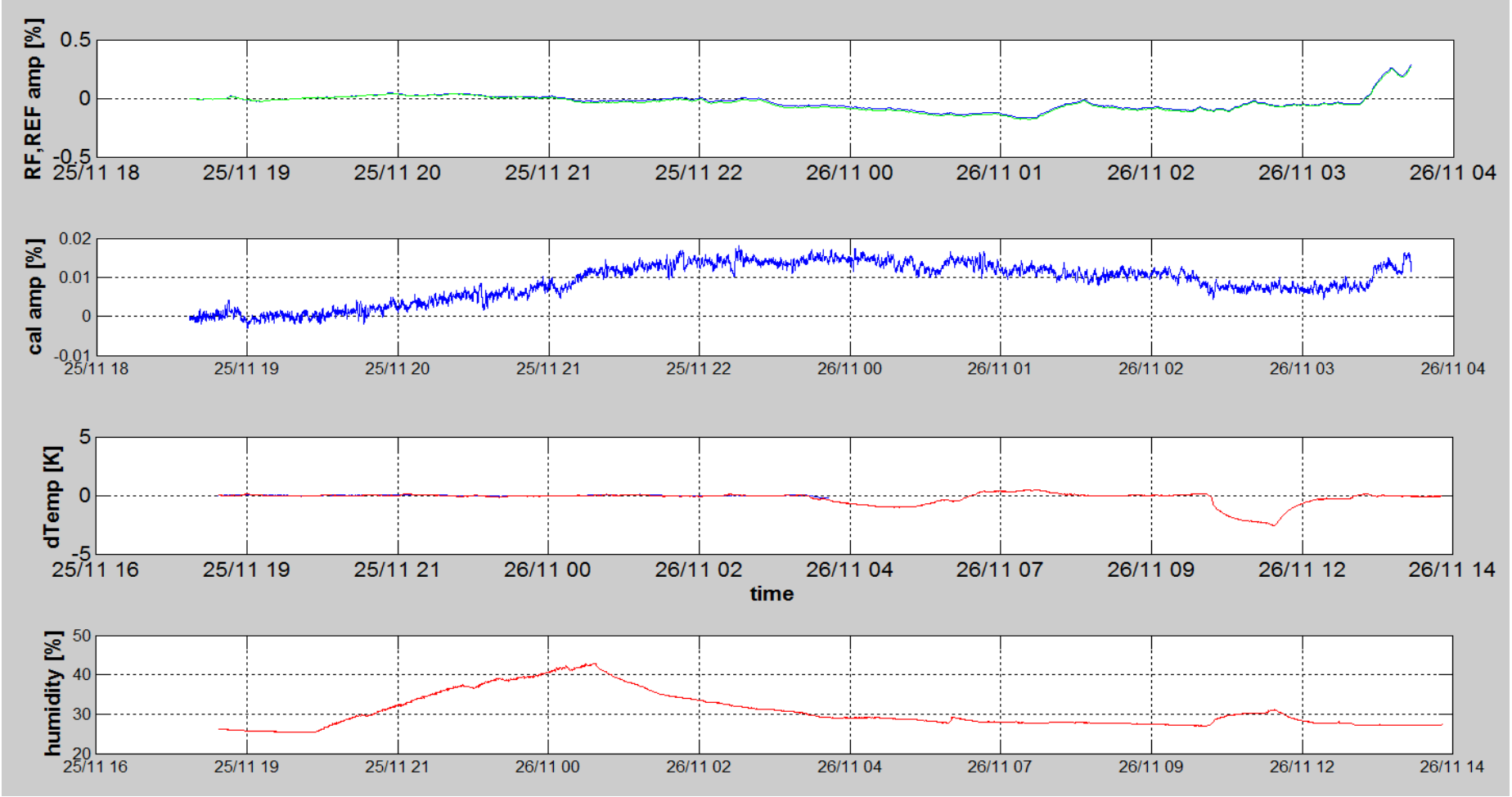
amplitude difference influence

European XFEL

DCM – problems

Humidity influence ?

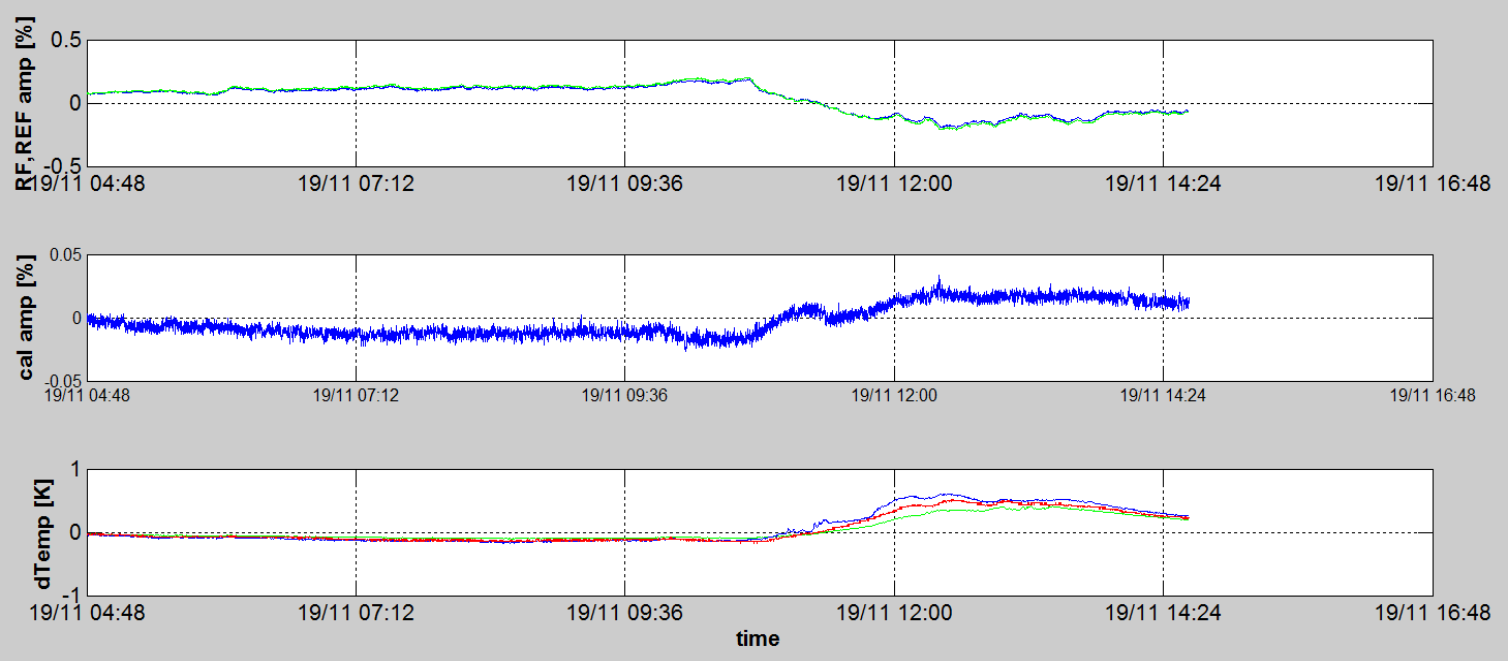
Setup: board without temp. stabilization, power levels are equal



ISE DESY HELMHOLTZ ASSOCIATION

DCM – problems

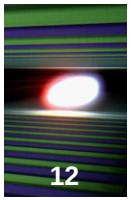
DCM with REF board - results



Possible reasons:

- **Reference distribution board problem** f.e. thermal expansion of this board, MMBX connectors (design)
- **Not correct power splitting in the setup** (vertical N vs horizontal SMA connectors) (measurement error)
- **High power level difference in RF and REF states** (~20dB) (concept) -> to check

DCM- to do



Tests reqiured :

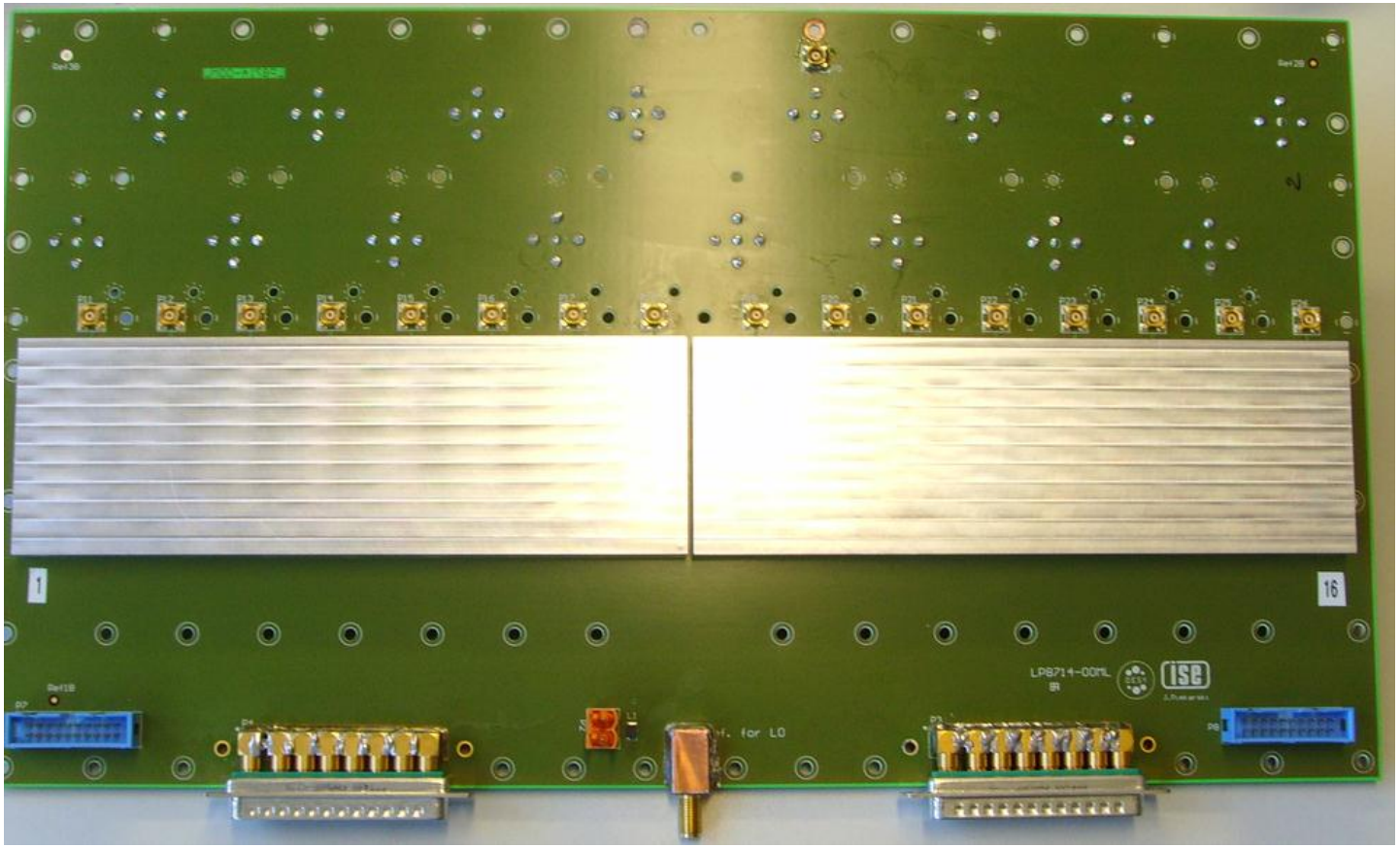
1. Influence of the **power levels difference** should be checked
2. **Amplitude detector** accuracy must be checked

Major change in the design:

- Integration of the main and reference distribution boards

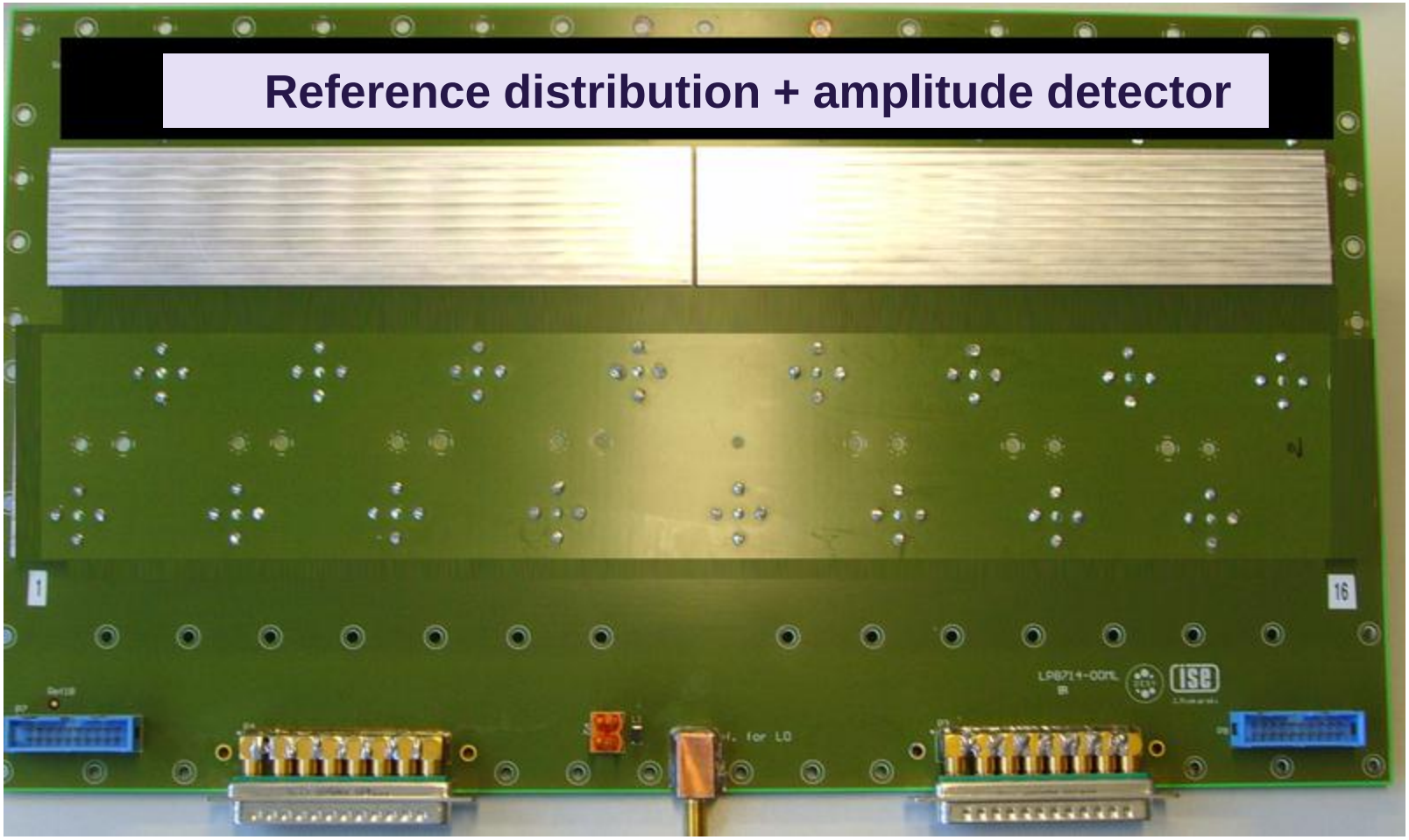
European XFEL

DCM- to do

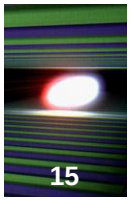


European XFEL

DCM- to do



Schedule



Additional tests: **11-15.03**

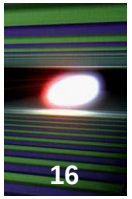
Board redesign: **11.02 – 30.03**

Mechanical design: **15.03 – 15.04**

Board and mechanical production: **15.04 – 15.05**

Working on temperature controller: **15.04-15.05**

TMCB: ?



Thank you for your attention !