

HELMHOLTZ GEMEINSCHAFT DESY Technical Seminar

Whats new at PITZ RF Systems

News and Tasks on LLRF, High Power RF and RF Station Interlock Systems at PITZ



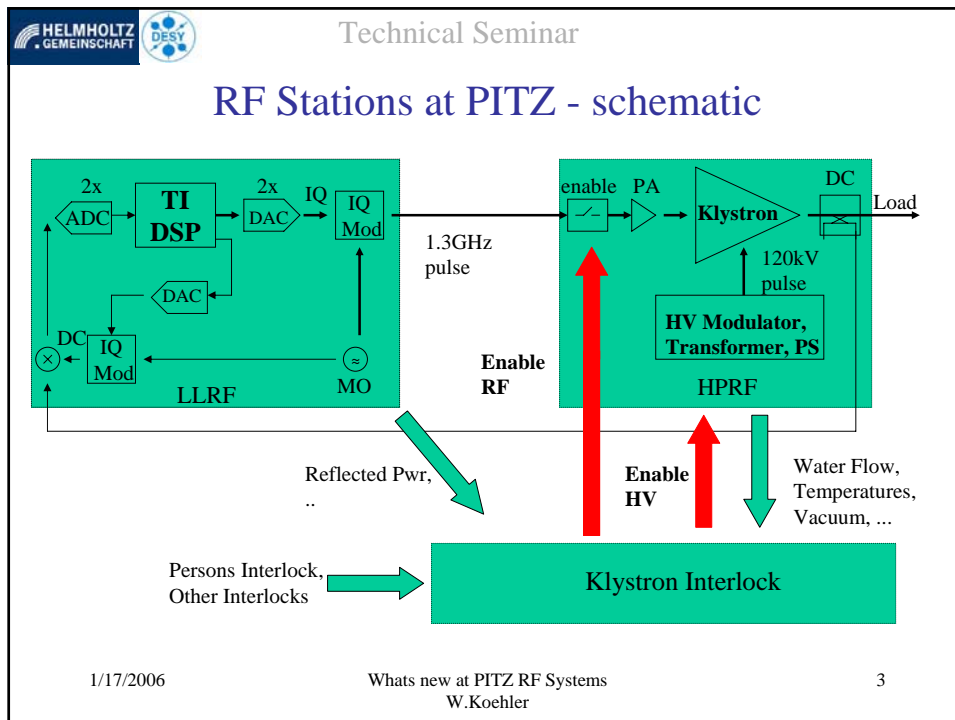
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Overview

- RF Stations at PITZ - Schematic
- News LLRF System
- News Interlock System
- News High Power RF
- Modulator Tests and Development at DESY for the XFEL
- Outlook into next future

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LLRF

Current state:



- Old Texas Instruments DSP boards
- No replacement parts available
- Too slow to react within RF pulse (4 μ sec)
- Too slow for stability at higher gains inside feedback loop
- Needs old sun solaris version

Old DSP system has to be replaced in near future!

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Simcon 3.1 Board

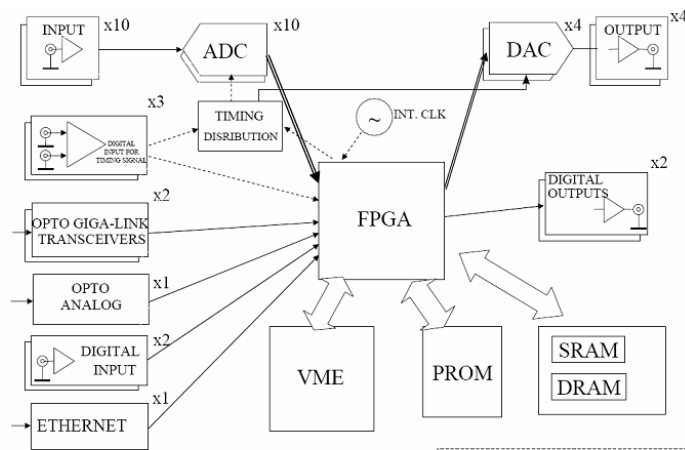
- Developed by our colleagues from DESY Hamburg and Warsaw University
- Will be the solution for LLRF at DESY in next future
- 10times faster than latest DSP type developments, therefore better accuracy possible
- Two freely programmable FPGAs, Xilinx Virtex II Pro and Altera
- Multiple Interfaces for universal usage
- Contains analog Inputs and Outputs, digital IO, Timing, OptoIO

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Simcon 3.1 Schematic



LCB general view
Diagram prepared by
Patryk Kaleta, Wojciech Giurgusiewicz

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Simcon 3.1 Low Latency Control Board

2 x opto IO 3.125 Gbps

Digital IO

10 x ADC, 14 bits, 105MSPS

4 x DAC, 14 bits, 210MSPS

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What has to be changed?

- Needs complete change in LLRF system
- RF IQ-Sensors (already in production/material ordered) to avoid down converters
- Other software/servers, but some DOOCS servers and Matlab tools already available
- Would be already now a backup solution in case of broken old-style DSP system

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Klystron Interlock System

Problems:

- We need Interlock systems for new RF Stations at DESY
- currently no tests on real system done
- New developed Interlock System 3 parts are produced but not tested on a real RF Station (persons safety, technical safety)
- some electronic parts used in Interlock2 System will be no more available in future

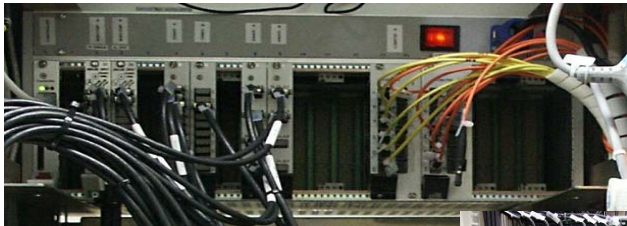
New Interlock 3 is now under test on
PITZ RF System 2 (Thales Multibeam Klystron)

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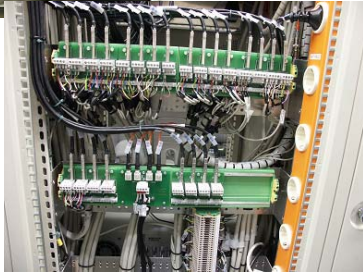
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Interlock 3 pictures





Interlock 3 cabling



Interlock 3 crate

- Controller
- Window Comparator
- DigiIO
- OptoIO
- AnalogIO

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The new Interlock3 System

Advantages:

- Re-Design of all important Parts
- Remotely masking/unmasking Interlock Signals
- Self Tests
- More analog and digital Input Channels
- Analog values readable (TINE/DOOCS)
- Remote Adjustment of Interlock Levels
- Information about Boards (Type, Revision, Name) via Software
- AnalogIO Boards for Integration of PS
- TINE server running directly on Nios processor providing Interface to DOOCS client

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Interlock 3 – next steps

- Get TINE server running
- Solve Software problems
- Develop new spark detectors:
 - SF6 gas tight
 - Fast (<100 nsec)
 - Electronic parts exchangeable without opening wave guide (SF6 inside!)
- AnalogIO Boards for remote control/remote monitoring of RF stations power supplies
- Development front panel for status display

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High Power RF Tasks and Problems

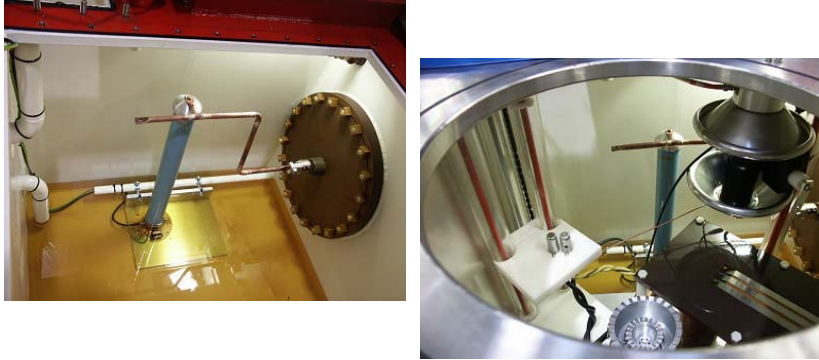
- Improve Modulator Diagnostic
 - High Voltage measurements
 - Temperature measurements
- 10MW multibeam Klystron
 - stability problems/vacuum problems
- Waveguide phase shifter
 - Develop remote control
- Modulator Development/Tests

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Modulator Diagnostic

New 150kV voltage divider inside RF2 klystron tank



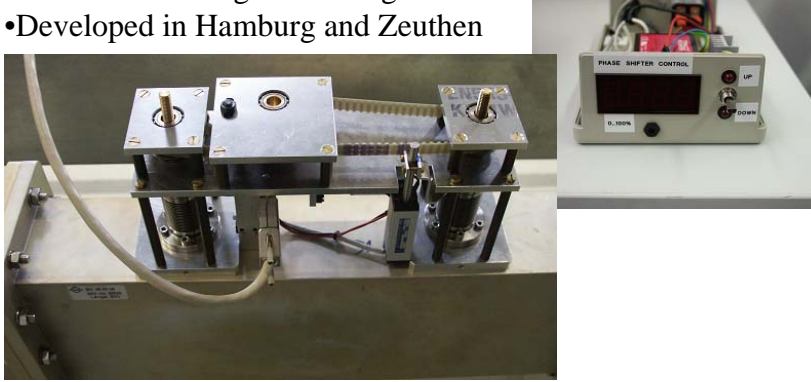
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Waveguide phase shifter

- Needed to adjust RF phase inside waveguides, i.e. for combining two waveguides
- Developed in Hamburg and Zeuthen



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Modulator Development/Tests

- Beginning this year we will start with Modulator Development for the XFEL in Zeuthen and test High Voltage Modulators
- Klystron hall will be extended
- 2 new complete RF Stations for testing Modulators

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Modulator Development/Tests

Why are tests needed:



- ~ 40 Modulators for XFEL
- Precision
- high MTBF
- Complex System
- Open technical details
- Proving the devices in complete System only here possible

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Klystron Hall Extension

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Outlook into near Future

- Developments for complete RF Station in all Subsystems
- Developments for Modulator for existing systems
- Start preparing Modulator Tests as soon as Klystron Hall is ready

Thank you for Attention!

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