MicroTCA Technology Lab at DESY
Summary of 1st Year Operations

Jan Marjanovic on behalf of Thomas Walter
2018-12-05

MTCAWS 2018, Hamburg

MicroTCA TECHNOLOGY LAB
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES
DESY.

TRANSFER MTCA TO RESEARCH AND INDUSTRY

- Custom developments
- High-end test & measurement services
- System configuration & integration
- LLRF design

Marketing.
Services & Support.
Tech-Shop.

MicroTCA Technology Lab

- Helmholtz funded project, Funding: 5 mio EUR/5 years
- Goal: foster the MTCA standard in Industry
- ”Enabling space” for innovative ideas and new business models
- Cooperation of DESY and several partners from industry
- Start of renovation, hiring in Oct 2016, Official opening in April 2018
- Size of the lab: $\sim$ 10 FTE in January 2019

Status

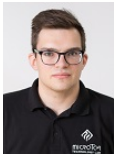
Team

Dr. Thomas Walter

Aaron Gornott

Çağıl Gümüş

Christoph Kampmeyer



Jan Marjanovič

Johannes Zink

Dr. Patrick Nonn

Stanislav Chystiakov

Susanne Schuster

Sven Stubbe

Partner wall

Partners

https://techlab.desy.de/partners/index_eng.html

BEVATECH	Bevatech GmbH	CAENels Gear For Science	CAEN ELS s.r.l.
el spec group GmbH	el-spec GmbH	EMCOMO	EMCOMO Solutions AG
N.A.T.	N.A.T. GmbH	Schroff	nVent Schroff
powerBridge Computer	powerBridge GmbH	ROHDE&SCHWARZ	Rohde & Schwarz
TELEDYNE SP DEVICES Everywhereyoulook™	Teledyne SP Devices	struck innovative systeme	Struck Innovative Systeme GmbH
vadatech THE POWER OF VISION	VadaTech	WIENER Power Electronics / A Phoenix Mecano Company	WIENER Power Electronics GmbH

Conferences and events

We (together with our industrial partners) participated at:

- Embedded World (at PICMG booth)
- IPAC 2018 (with Rohde & Schwarz)
- IEEE RT conf 2018 (with NAT)
- IBIC 2018 (with Struck)
- LINAC 2018 (with WIENER)
- Electronica (with CAEN ELS)
- ...

In 2018 we have also organized several MicroTCA micro-conferences:

- Real Time conference pre-workshop
- at Diamond Light Source
- IBIC 2018 pre-workshop
- Workshop on beamline instrumentation for scientists and engineers
- Photon Science Day

slides available here: `https://techlab.desy.de/events/archive/index_eng.html`

Projects

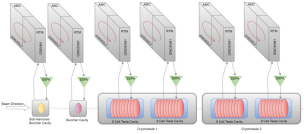
Projects

- LLRF developments
  - TARLA, NICA, ...
- System integration
  - Trioptics WaveScan - quality inspection system
  - configurator
- Custom developments
  - GigE Vision
  - FMC+ carrier with Zynq MPSoC
  - DFMC-DS800 board with new Zone 3 analog class
  - Board Support Package for TCK7
  - MMC System on a Module
- Measurement services
- Supporting activities

Projects: LLRF developments

Turn-key solutions for LLRF, based on experience from FLASH and European XFEL.

Turkish **A**ccelerator and **R**adiation **L**aboratory **A**nkara

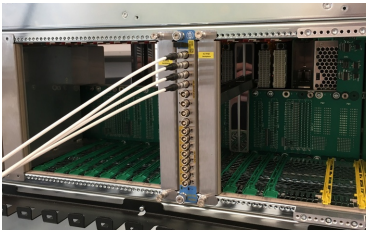


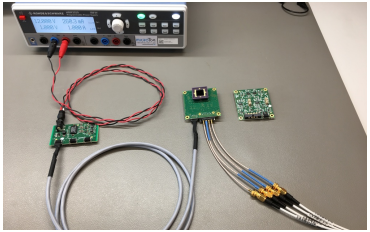
System integration test at DESY & preparation for final rack assembly

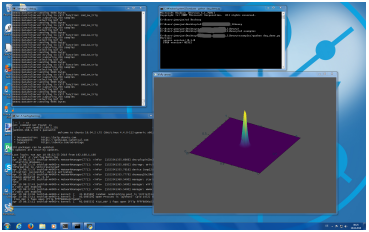
Talk on Thursday at 10:15 by P. Nonn:
”Overview and status of LLRF system developments at the MicroTCA Technology Lab”

Projects: System integration

example: Trioptics WaveScan - high-end quality inspection system

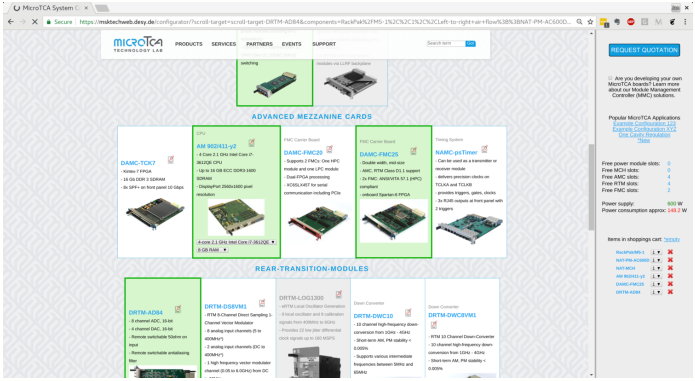






Projects: Configurator

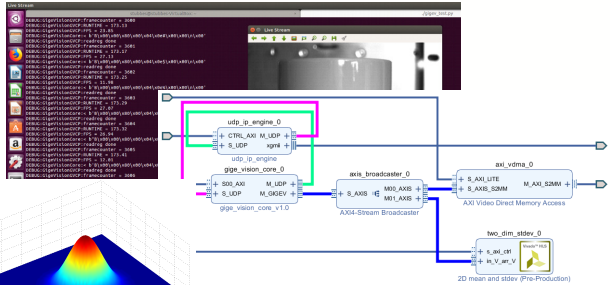
Web-based tool to assemble custom MicroTCA system.
Accessible at: `https://msktechweb.desy.de/configurator/`

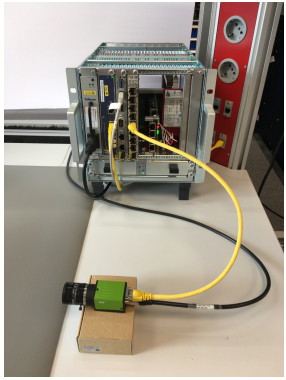


Talk on Wednesday at 12:00 by H. Betancourt (powerBridge):
”The MTCA Configurator tool”

Projects: GigE Vision

Implementation of GigE Vision protocol (with 1/10 GbE UDP/IPv4 engine) in FPGA.

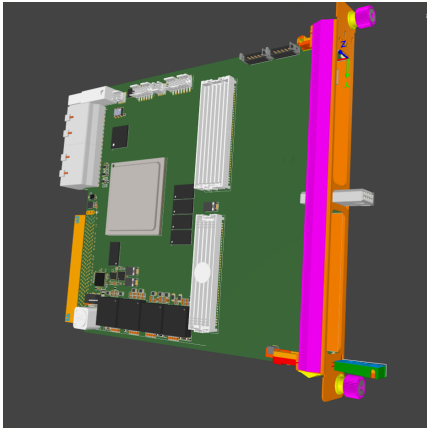




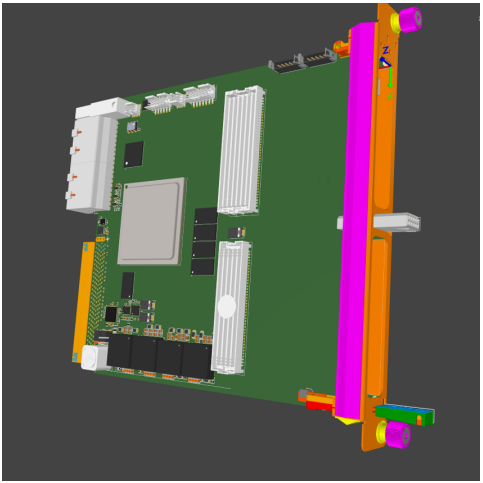
Talk on Thursday at 9:45 by S. Stubbe:
”Implementation of GigE Vision standard and applications in MicroTCA”

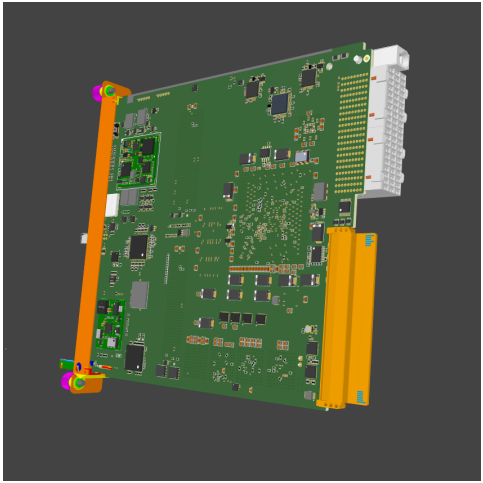
DAMC-FMC2ZUP FMC+ carrier

- high-end FMC+ carrier in MTCA.4 form factor
- based on Xilinx Zynq MPSoC
  - quad-core 64-bit (ARM® Cortex®-A53)
  - real-time co-processor (ARM® Cortex®-R5)
  - large FPGA (650k logic cells, 2920 DSP)
  - transceivers: 32 GTH (16 Gbps), 16 GTY (28 Gbps)
  - hard IP blocks (PCIe Gen3, 100G Eth, Interlaken)
  - ARM® Mali™-400MP multicore GPU
- 16x GTY transceivers (28 Gbps) on FMC+
- flexible clocking scheme, White Rabbit endpoint
- front-panel trigger and clock input over Harlink
- Zone 3 according to class D1.1
- backwards-compatible with DAMC-FMC25
- available Q2/2019, first licensee CAEN ELS



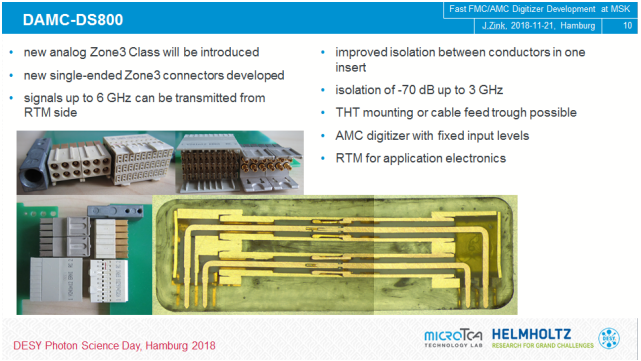
Projects: FMC+ carrier





Projects: new Zone 3 class

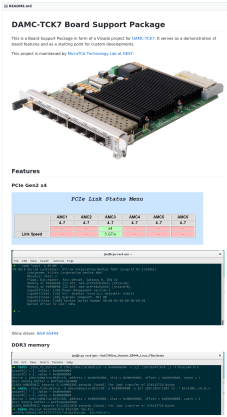
New Analog Zone 3 class for high-frequency signals (up to 6 GHz), new AMC digitizer

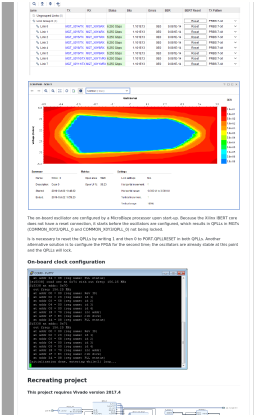


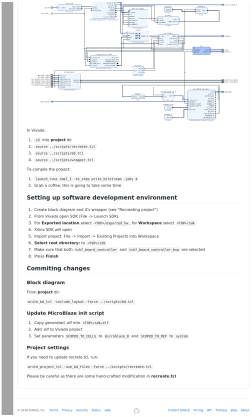
Talk on Thursday at 12:00 by J. Zink:
”Direct Sampling of RF Signals up to 3 GHz in MTCA.4”

Projects: Board Support Package for TCK7

Vivado project including support for PCIe, DDR3, clock configuration, IBERT on SFP+ and UDP/IPv4 beacon on AMC port 0; available under permissive license (3-clause BSD)



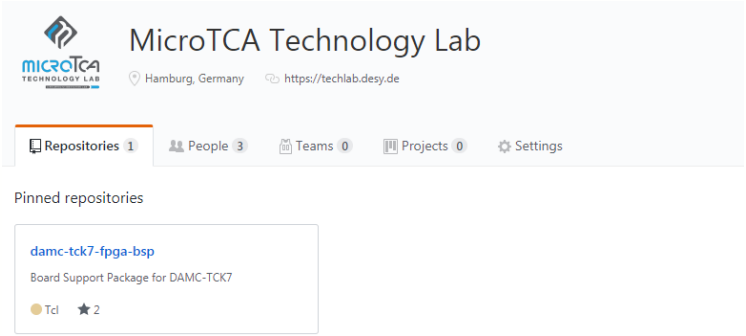




GitHub page

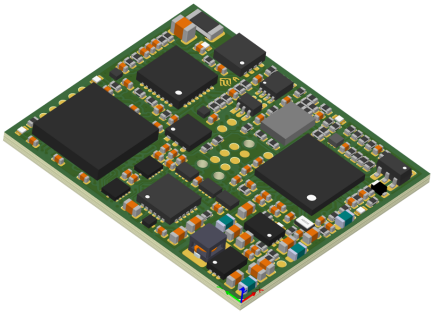
We understand the needs of the community and are committed to provide open-source solution when commercially viable

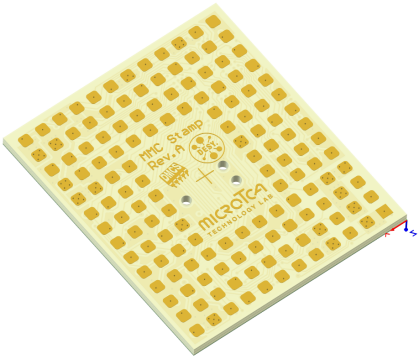
Our GitHub page: `https://github.com/MicroTCA-Tech-Lab`



Projects: MMC System on a Module

Full implementation of everything needed on managment side on a single module

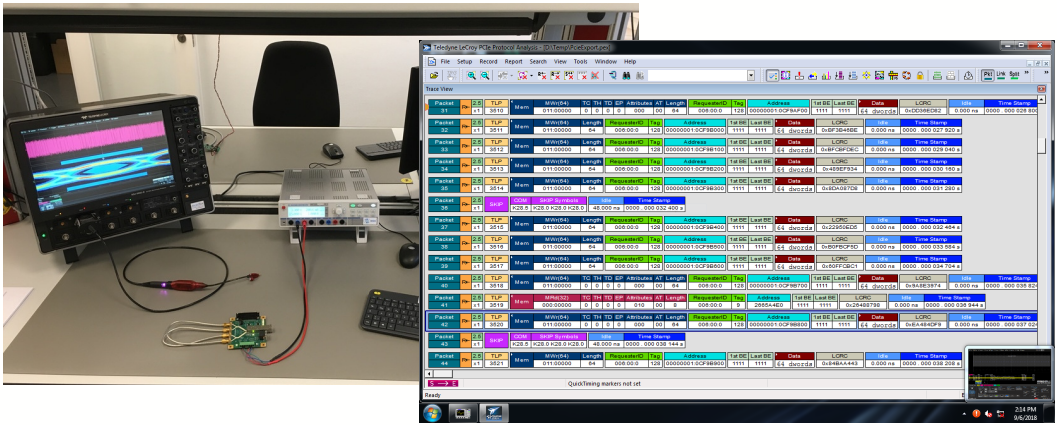




Talk on Wednesday at 17:45 by M. Fenner:
”DESY MMC System on a Module and its Applications”

Measurement services

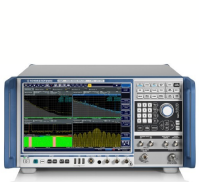
High-end digital measurement equipment (80 GSPS LeCroy)



Measurement services

High-end measurement equipment from ROHDE&SCHWARZ

- ZNB20 → 20 GHz VNA with TDA Option
- FSWP → Phase Noise Analyzer
- RTO2064 → 6 GHz / 20 GS/s

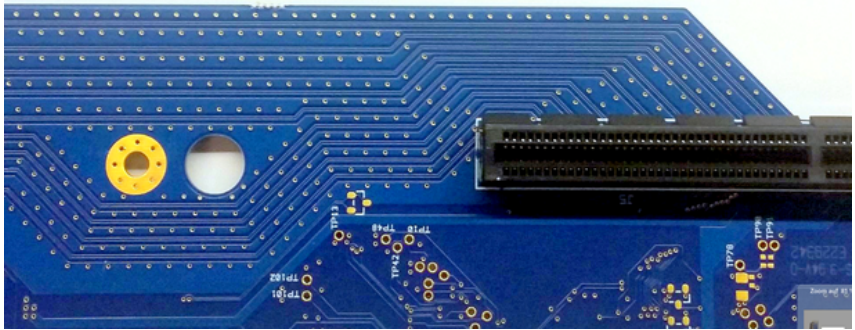


- SMA100B → 20 GHz / 30 dBm Ultra Low Phase Noise Generator

Measurement services

We are able to solve signal integrity issues and provide consulting on high-speed PCB design, FPGA design and other areas of electronics.

Example of a board after our suggestions were implemented:



Supporting activities

Together with N.A.T. we provide training in MicroTCA, both basic and advanced.

More info at:
`https://techlab.desy.de/services/training/index_eng.html`

Next dates:

- basic training: 23 - 24 January 2019
- advanced training: 2 - 13 March 2019

Supporting activities

Website in Chinese at `https://techlab.desy.de/index_cn.html`

Near future

Near future

- New Zone 3 analog class, new AMC digitizer
- Second-sources and product variety
- BSPs for new boards (White Rabbit implementation)
- 40GbE implementation
  - up-coming AMC.2 standard
- RFSoC evaluation
  - 8x 12-bit, 4.096GSPS RF-ADC w/ DDC
  - 8x 14-bit, 6.554GSPS RF-DAC w/ DUC
  - large FPGA
  - quad-core 64-bit ARM
  - ”LLRF-System-on-a-Chip”

Thank you

https://techlab.desy.de

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