MicroTCA Technology Lab at DESY
Summary of 1st Year Operations
Jan Marjanovic on behalf of Thomas Walter
2018-12-05
TRANSFER MTCA TO RESEARCH AND INDUSTRY

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

Marketing.
Services & Support.
Tech-Shop.
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: ~ 10 FTE in January 2019
Status
<table>
<thead>
<tr>
<th>Bevatech GmbH</th>
<th>CAEN ELS s.r.l.</th>
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<tr>
<td>el-spec GmbH</td>
<td>EMCOMO Solutions AG</td>
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<td>N.A.T. GmbH</td>
<td>nVent Schroff</td>
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<td>powerBridge GmbH</td>
<td>Rohde &amp; Schwarz</td>
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<td>Teledyne SP Devices</td>
<td>Struck Innovative Systeme GmbH</td>
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<td>VadaTech</td>
<td>WIENER Power Electronics GmbH</td>
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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.

Talk on Thursday at 10:15 by P. Nonn:
”Overview and status of LLRF system developments at the MicroTCA Technology Lab”
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"
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® MaliTM-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
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)
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
Full implementation of everything needed on management 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 \(\rightarrow\) 20 GHz VNA with TDA Option
- FSWP \(\rightarrow\) Phase Noise Analyzer
- RTO2064 \(\rightarrow\) 6 GHz / 20 GS/s
- SMA100B \(\rightarrow\) 20 GHz / 30 dBm Ultra Low Phase Noise Generator
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:
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
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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