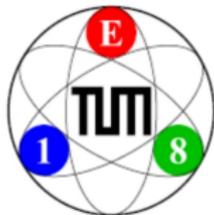


# DHH (Data Handling Hybrid)

Igor Konorov, Dima Levit, Andrei Rabusov, (Yunpeng Bai)



# Present DHE/DHC AMC board

one AMC board  
programmed as  
DHC (data handling concentrator)  
DHE (data handling engine)

v3.2

Virtex-6 LX130T

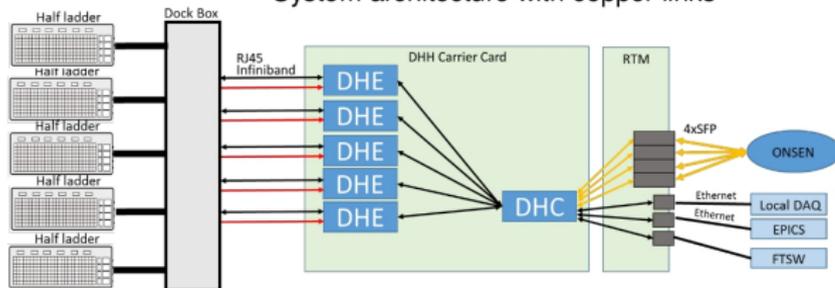
4 GB DDR3

designed for data throughput  
2.5 Gb/s

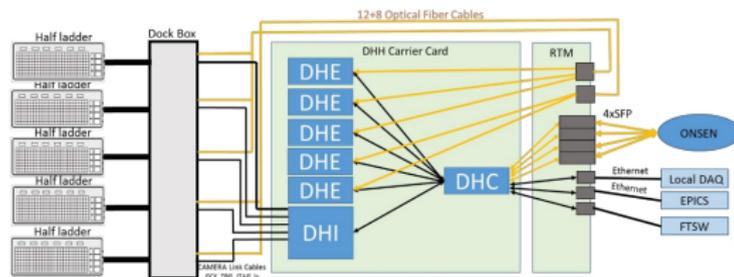


# DHC architecture: old and new

System architecture with copper links



System architecture with optical links



- New: DHI (DH Isolator module, under development) galvanical isolation for 5 half-ladders and JTAG
- New: DHE modules need RTM access (rear transition module)

# DHH, new ATCA carrier board (DHCC)



1<sup>st</sup> prototype: finish layer was HAL instead of immersion gold, which does not insure reliable connections with compress fit and press fit connectors. New production was submitted.

## DHH, Status of hardware

- 10 DHCC and 10 DHRTM modules ready (8 are needed for phase 3)
- 1+1 installed at KEK  
1+1 more ready and being shipped to KEK  
others tested at TUM
- 2 ATCA shelves installed at KEK
  - 2-slot shelf in clean room
  - 5-slot ATCA shelf installed at final location on top of Belle 2
- 2nd rack ordered
- missing:  
DHI, provide galvanic isolation of detector modules from DHE prototype to be installed at KEK in 11/2017 for phase 2  
final modules will be installed in 2018 for phase 3

# DHH firmware

- trigger, connection to FTSW by DHC (only)
- slow control by IPbus  
(Virtex-6 has no embedded PowerPC)
- version management by timestamp
  - store timestamp and board number in USR\_ACCESS  
write into DHC bitstream, write by IPbus to epics
  - write the same timestamp to a git tag to identify the commit
- in run control DHC in power supply group  
for DHC reboot workaround (by slow control group) for TB  
new for phase 2: DHC reboot by FTSW
- handling of multiple triggers per frame → planned for 11/2017  
presently: veto on DHE,  $\tau=200 \mu\text{s}$   
is requirement for high rate (30 kHz) test at KEK with detectors

# DHH firmware

- multiple FIFOs in DDR3  
DHC sends also data to BonnDAQ (UDP)
- DHE-only lab software (used at testing sites): infiniband, trigger receiver on DHE (DHC not required), send data by UDP



photo: Felix Müller

- in combination with ONSEN: **HLT emulator**

sends trigger number to a PC
PC generates HLT package with same trigger number, sends to ONSEN
DHC sends data to ONSEN
ONSEN can match data and HLT (based upon trigger number)

BACKUP