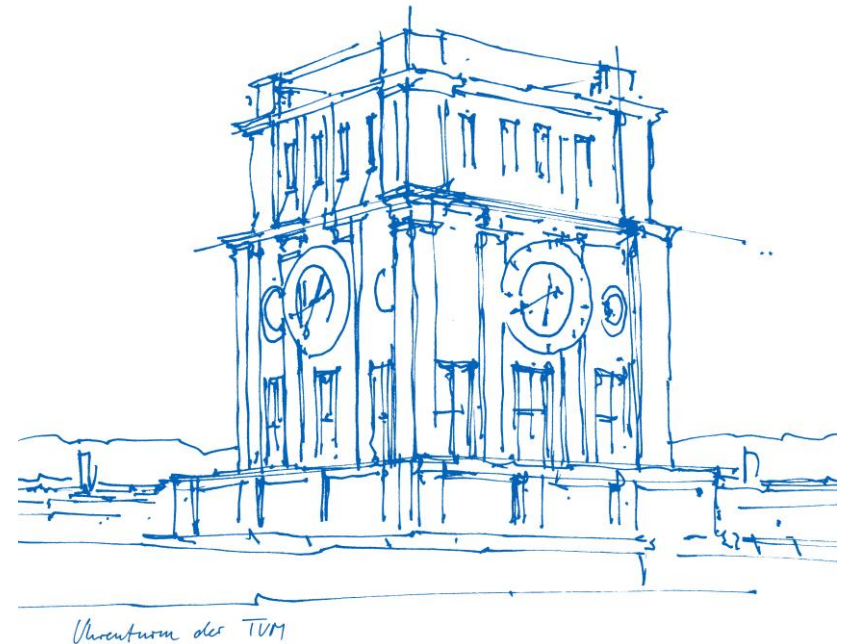# DHH Status

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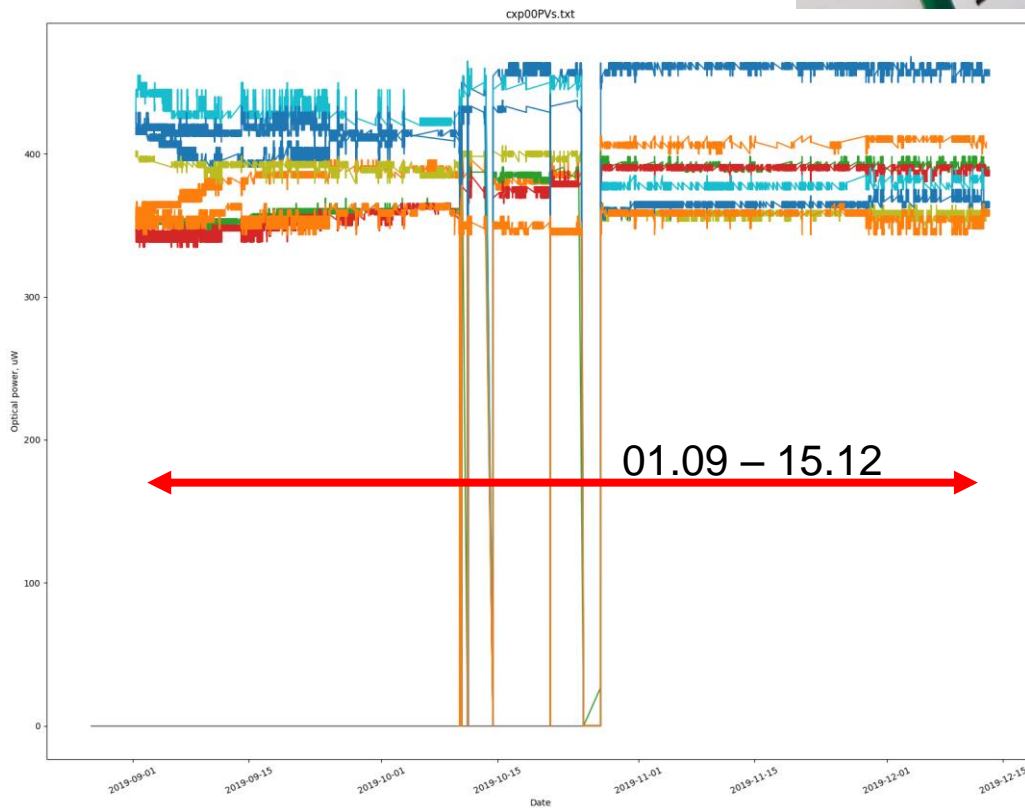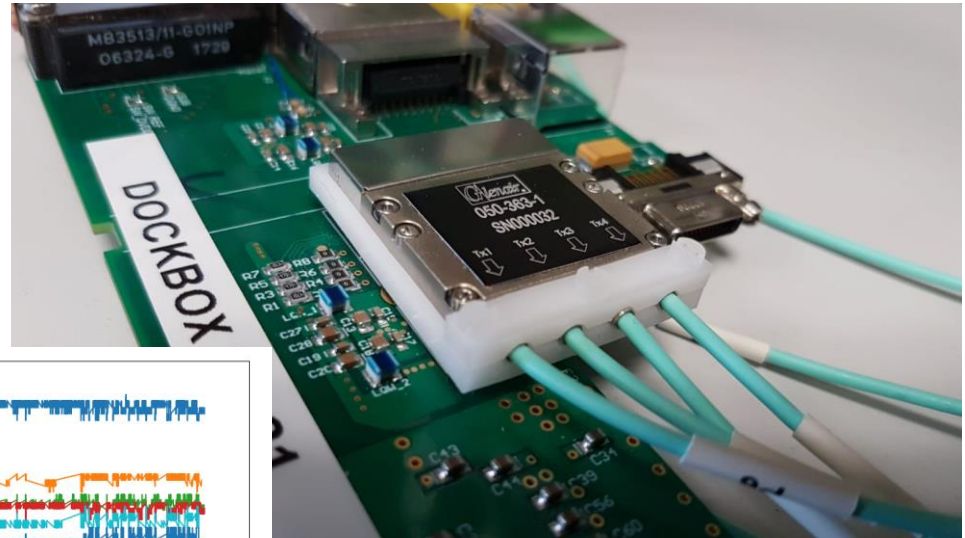
Technical University of Munich

Belle2 PXD Workshop

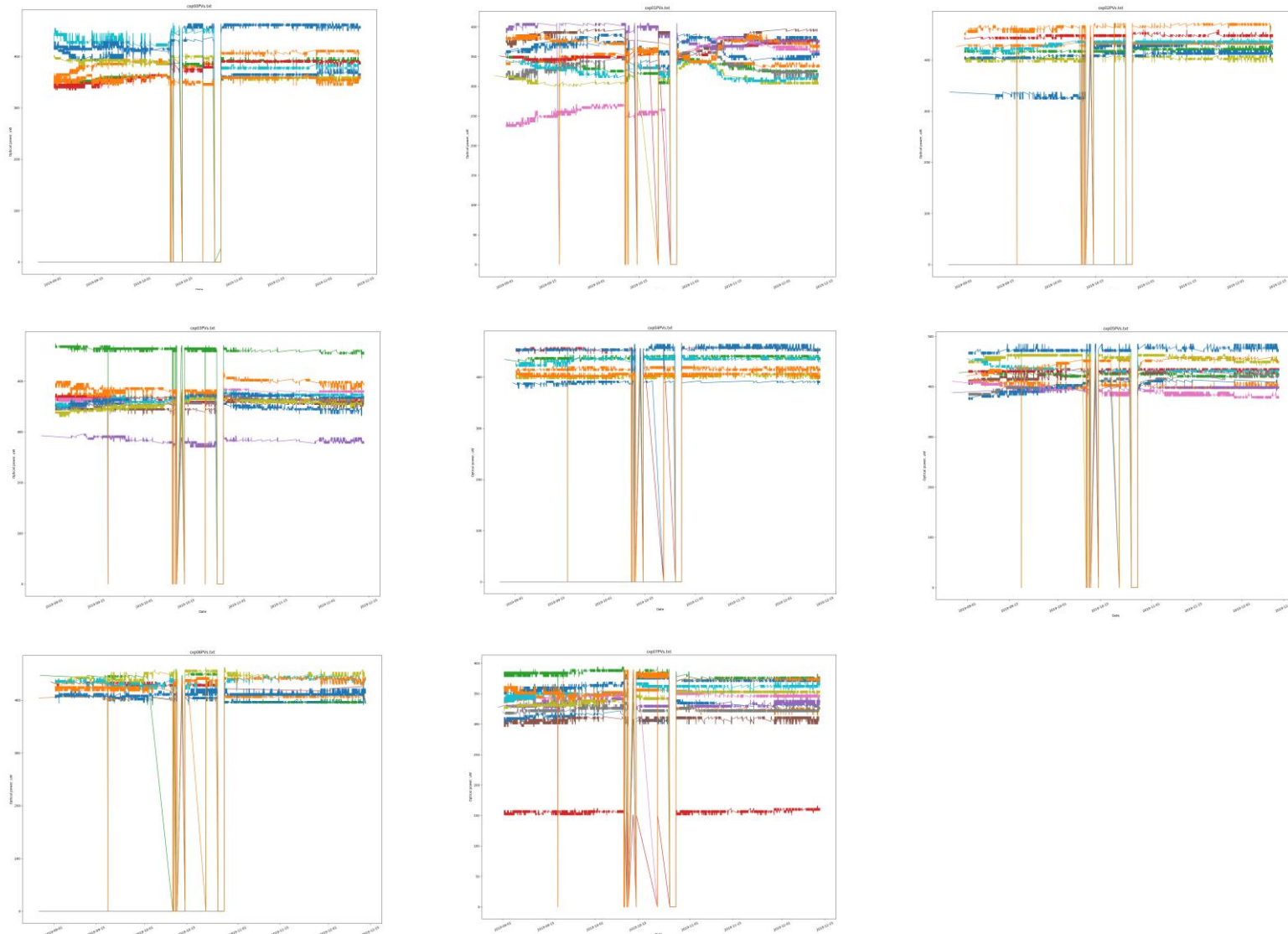January 20-th, 2020

Uhrenturm der TUM

DHP Links' Light Power

01.09 – 15.12

DHP Links' Light Power

Changes of Gated Mode in DHC

➢ **Previous implementation**
- Two state machines to generate GATE and Trigger VETO
- Two sets of parameters to define start and length
- Time relation between frames and injection signal could cause resynchronization at start and stop of the state machines

➢ **Current version**
- One state machine for both signals with programmable offset and length for TRIGGER VETO

Observed Problems

➢ **Missing trigger(event)**
- It caused synchronization error of event building in ONSEN due to Round-robin algorithm of event distribution in DHC
- One Hub was affected (5 detectors)
- DHC detected consecutive event number error
- Possible origin of the problem FTSW port or DHC
- Action :
  - Round-robin algorithm modified to use FTSW event number for evaluation destination number instead of local event number
  - Installation of VME DHH module to centralize trigger distribution to entire PXD

➢ **Missing start of row error**
- Error reported by ONSEN
- No errors in DHE and DHC
- Possible it is caused by DHH-ONSEN link errors

Observed Problems

➢ **Blown up fuse of Cross-switch caused long stop of PXD**

➢ **Instability of UCF links**
  ▪ after power up some links are not established, mostly affects DHI modules

Problem Analysis , Yamada's slide

DAQ DOWNTIME IN THE LAST 11DAYS(RUNS IN DEC.)

12/1/2019-12/11/2019

Sub-system	Total downtime [min]	# of troubles	Ave. downtime [min.]
DAQ	563.8	87	6.5
TRG	358.3	33	10.9
CDC	145.5	23	6.3
PXD	137.7	12	11.5
TOP	54.2	7	7.7
ARICH	9.0	2	4.5
KLM	9.0	2	4.5
Accelerator	331.6	12	27.6

The last week in 2019a run in June

subsystem	Downtime[min.]
TRG	227.2
DAQ	161.7
TOP	150.3
CDC	88.8
ARICH	30.8
PXD	20.3
ECL	15.1
KLM	4.5

4. PXD troubles

➢ Due to high-occupancy, link lost, strange DQM plots etc.
➢ Basically, needs experts' help to fix

Date	Downtime [min.]	Symptom
12/09-23:45:35	50.4	PXDRC error (no data for backward modules according to PXD expert)
12/10-00:54:04	38.3	To fix the PXD data lost problem
12/02-23:51:05	9.8	to cure the high occupancy module
12/09-02:00:18	9.8	PXD sensor problem
12/02-23:20:58	6.8	to cure the high occupancy module
12/09-05:11:28	6	PXD Common Mode in DQM is red
12/02-23:28:30	3	to cure the high occupancy module
12/03-00:01:37	3	PXD Common mode plot in DQM is red
12/03-00:24:12	3	PXD DQM turned red
12/07-02:51:47	3	PXDRC ERROR(zero efficiency)
12/09-04:39:52	2.3	PXD CommonMode in DQM is red
12/10-00:47:17	2.3	PXD lost some data links

Error Analysis

➢ No PXD data from DHC30

 ▪ 9.12 at 11:50pm, lasted 2 hours
 ▪ Problem was solved by DHH power cycling

 ▪ Origin of the problem
   − Readout Mode was set to local run. Detector produced MemDump data.
   − Caused by crashed script and left DHH in wrong mode
   − Wrong DHH status is not be propagated to ALARM
   − Slow control should handle such case

After Run Activities at KEK
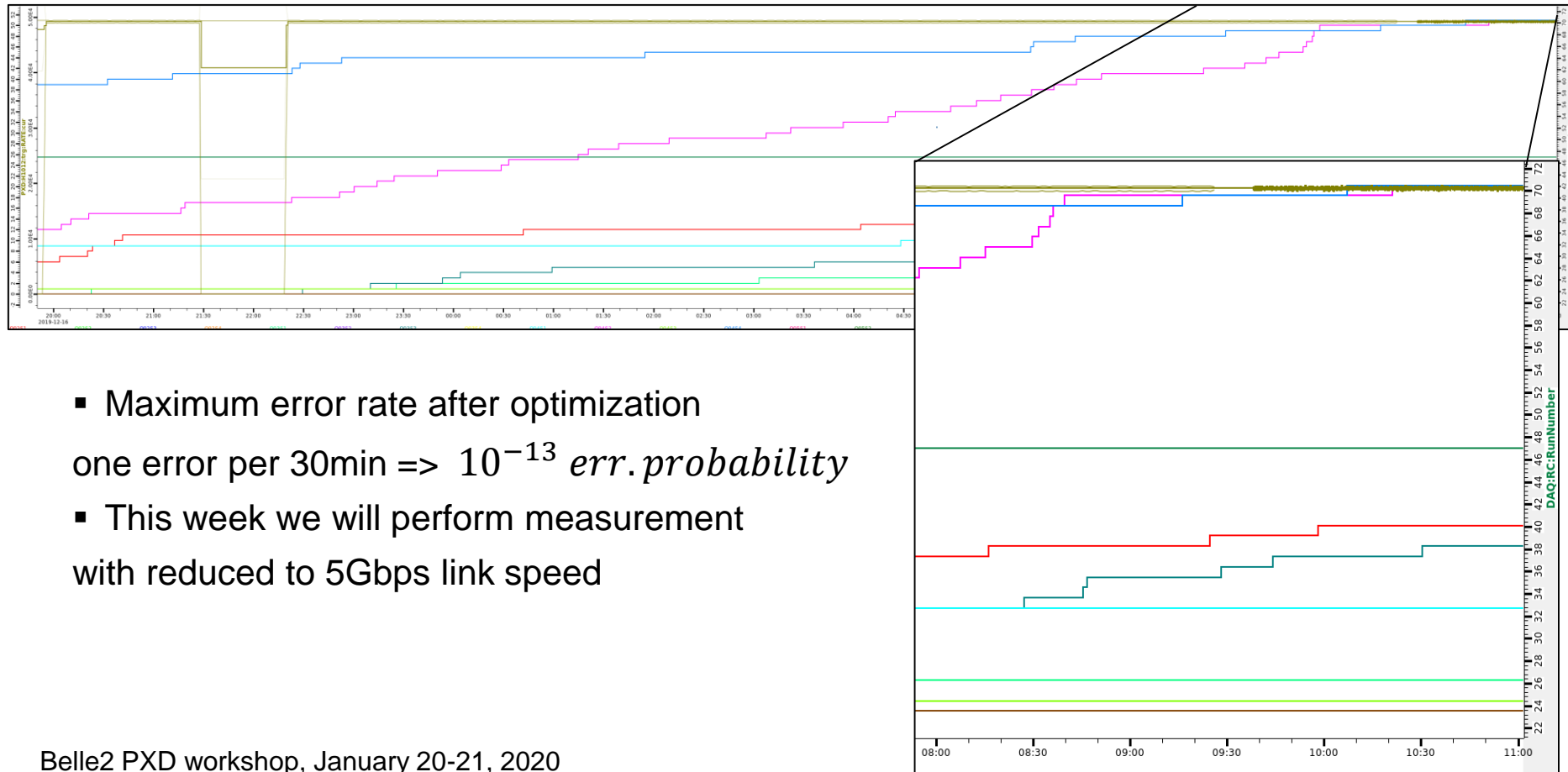
➢ **Investigation of problem with DHP link**

- ▪ During autumn run after IPMCs' installation one DHP link went down and solution was to reconnect the detector to spare DHE by reconfiguring cross-switch
- ▪ Problem was traced to broken optical receiver socket in DHH RTM module
- ▪ Spare DHH RTM installed instead

➢ **5-th fully functional DHH system installed as spare**

After Run Activities at KEK

> **Test of DHH-ONSEN links**

- Individual optimization of DHC TX parameters to minimize error probability

- Maximum error rate after optimization

one error per 30min => $10^{-13}\ err.\ probability$

- This week we will perform measurement

with reduced to 5Gbps link speed

Activity before Start of Run

➢ **Installation of second cross-switch as spare**

➢ **Installation of VME DHH module**
  ▪ FTSW => VME DHH => 5-th DHH
  ▪ Test of centralized trigger distribution

➢ **Test of ONSEN links**
  ▪ 5-th DHH will be connected via

Preparation for Full PXD Installation

➢ **Production of 22 DHE/C modules**
- Completed and all modules tested
- 127MHz oscillators to be mounted

➢ **2 spare DHH systems were shipped back from KEK to TUM, thanks to Shuji**

➢ **3(4) DHH systems will be prepared for installation at DESY**
- Will be ready in April
- When to be installed at DESY?

➢ **To be done at KEK**
- Increase DHH rack size, the high is too low to fit all equipments
- Install second ATCA shelf with 6 slots
- Install one(two) online server on top of Belle2
- Install Ethernet switch for new equipments
- third cross-switch

Conclusions and Outlook

➢ Clamp fixed problem of DHP optical links' instability

➢ Few DHH stability issues were improved and few more to be improved

➢ Improving propagation of status information within slow control to be improved in order to maximize up time

➢ DHH worked reliably during last run

➢ Closer look at full PXD preparation and installation is required

THANK YOU