

BESIII Inner Tracker Upgrade Meeting

(August 12, 2024) 14:00 - 16:00pm (Beijing time)

Meeting agenda and minutes

- Indico page: <https://indico.ihep.ac.cn/event/23117/>
- Participants:
 1. Present in the meeting room

Zheng Wang, Qun Ouyang, Mingyi Dong, Tingxuan Zeng, Jingyu Fu, Haibo Li, liangChenglong Jin, Michela Greco
 2. Online at ZOOM

Giulio Mezzadri, Gianluigi Cibinetto, Wenquan Gong, Huirong Qi, Stefano Graminia, Jingzhou Zhao, Linghui Wu, Boxiang Yu, Yunhua Sun, Fei Li, Hongliang Dai, Jinfan Chang, Si Ma, Yinghong Zhang, Jing Dong

Schedule and Progress last week: Mingyi Dong

- **Summary of the report:** (**Slides by Mingyi Dong:** [Slides](#))
 1. Progress in the experimental hall last week
 - 1) Installed the tools to pull out the EEMC
 - 2) Removed or loosed the cables of ETOF and EEMC
 - 3) Pulled out the EEMC
 - 4) Prepared the support structure for operation at MDC
 - 5) Removed the cooling gas pipe, shielding plates, and support structure for shielding plates on east side

All the plans have been done as planned.

Moreover, during the weekend, removal of preamps and cables of the inner chamber on east side has been finished.
 2. Plan for the next week

- 1) Install the shielding plates for protection on east side
 - 2) Start to remove the glue on first step (east side)
 - 3) Prepare the support structure for operation at MDC on west side
 - 4) Remove the shielding plates, and support structure for shielding plates on west side
 - 5) Remove the cables and preamps of inner chamber on west side
3. Tests of cooling and cutting the iMDC flange
- 1) The cutting tests are on going
 - 2) The tools for cooling are prepared, and testing is being conducted
 - 3) Will have a review of the scheme and procedures for pulling out the inner chamber on next Monday (August 19)
- **Questions during the slides or planning:**

1. The time to clean the glue.

Haibo: so more than one week to clean the glue? West side no required?

-Mingyi: due to the very limited space around 1 mm between the flange and feedthrough, it is very difficult and challenging to remove the glue between the flange and feedthrough. It will take more than one week.

-Mingyi: For west side, we only need to remove the glue between connection flange1 and flange 2, as well as the glue on the screws, regardless of the feedthroughs. Therefore, it is easier than east side.

2. About endcap door and cable travel

Gigi: the question is about the door!

Mingyi: Due to the connection of the support structure of the endcaps of EMC, the doors are not fully opened.

So the previous scheme for the CGEM cabling is not available. We have already discussed with some experts, and the suggestion is that the CGEM cables should go along the beam pipe and exit from the big door of the BESIII, and then go south and north respectively.

-Zheng Wang: suggest to check carefully the mechanical drawing.

- Stefano: We have to check the travel of the pass of the cables.
- Mingyi: We will check. This is the way to save cable length instead of wasting it, and Xiaoping, Jingyu and Stefano or more people will check this issue.
- Michela: Except all these, we need to check if we would pick up some noise from the beam pipe.
- Zheng Wang: In this way, the cables are quite close to the super conducting magnets of the machine. But at the moment, we don't have any other solutions for CGEM cabling.
- Mingyi: The cables will be arranged under the support structure of SCQ. The support structure of SCQ maybe serve as a shield for the cables
- Michela: In any case, we need to first check the cable length, and second the noise.

Progress and plan in CGEM: Michela Greco

- **Summary of the report: (Slides by Michela: [Slides](#))**

1. CGEM detector:

- 1) Powered on at operation values
- 2) H from 35% to 70% (also depending on the weather outside)
- 3) Ar bottle changed

I was satisfied about the air condition.

2. CGEM-DAQ

- 1) I had an online meeting with Pawel and Angelo on Thursday, 10.
- 2) Angelo and Pawel agreed on next steps:
 - a) Pawel is working on changing the firmware of the upper FPGA in the DC BOARD to fulfill the IRQ requirements, i.e. an IRQ is generated every time an event is ready in the data buffer.

Proposed Changes to Upper FPGA (CGEM_DIAG) in Event Building FSM

- b) Angelo is currently on vacation, but he will work and help us remotely.
- 3) They have read Tingxuan's emails and slides,
They will comment when possible.

4) I will organize another meeting and more details will be presented on August 26. But I was speaking with them during the meeting of Tingxuan, Pawel and Angelo, and I am quite confident that the issue of Tingxuan's test would be solved.

3. DAQ: trigger signal test/ first phase

1) The electric level

In the first stage, our system will read signals from the trigger, which are L1, check, clock, and provide complete signals for the BESIII data system.

The same logic level is shared, since GEMROC fan out using the 'LVPECL' level which is equal to 3.3V level, so we don't need any converter.

2) Check signals

The output signals have been seen on last Saturday and this morning by Jingzhou and Tingxuan after the cables from ZDD trigger system connected to the GEMROC and then to Angelo's PC that controlled by Angelo remotely.

Check 'CLK', 'TRG', 'L1 CHECK' signals in progress...

3) The check of the Signals.

CLK, TRG, CHK Signals acquired with SignalTAP using the Fanout MODULE that we use for Cosmic rays data acquisition

It have been done shortly after the meeting.

Thanks to Angelo, Jingzhou, Li Fei, Tingxuan.

(Jing: This 3)' information is updated by Michela after the meeting on Monday by one slide)

• **Questions during the slides or planning:**

1) No feedback for CGEM

Jingzhou: CGEM has two signals, if error exits from CGEM, it will be no feedback from our side. The feedback will decide if the DAQ will run or stop, now I have to remind this risk.

-Michela: we have other control to check the error. For the matter of feedback,

I will speak to Angelo. I'm sure there will be this control, all the status control have to be under control. I will report next week.

2) FULL signal

Zheng Wang reminds the 'FULL' signal should be almost full, otherwise it costs time.

Michela: Yes, we will check the almost 'FULL' signal's percentage.

3) Words by Michela:

- a) The spare FANOUT module used until August 12th morning has a malfunction of the JTAG interface.
- b) We will retrieve the spare FANOUT module for the second phase but we need some time because we have to do an HW replacement.
- c) In the meantime, Tingxuan can perform real data acquisition tests (noise data) in room106: for these tests we can change the TRIGGER rate. I emphasize that only noise data can be also collected in the experiment hall during the second phase of testing, which will follow as soon as we can retrieve the spare FANOUT module.

Data issues found and tests: Tingxuan Zeng

• **Summary of the report:** (Slides by Tingxuan Zeng: [Slides](#))

1. Tingxuan reminds some issues found during last data taking

- 1) The first GEMDC packet length is wrong.
- 2) The GEMROC data format in the first GEMDC data packet is wrong.
- 3) Found DC buffer pile up, multiple DC packets has been read out in one DMARun.
- 4) GEMROC L1 counter is increasing by 4 most time, sometimes by 3 or 5.
- 5) DAQ software is able to acquire data for 2 minutes, after that, no interrupts happened.
- 6) Sometimes data format of GEMROC 5 is wrong.(new found)
- 7) Link NO in DC packet is not corresponding to the GEMROC ID.(new found)

Our Analysis:

- 1) 1 maybe cause to 2 different GEMROC data formats: confirming with Pawel if the DC firmware support two GEMROC data format.
- 2) 1,2,4 maybe due to the same problem.
- 3) 4 is correct according to current design of DC firmware.
- 4) 6 , 7 still need to study.

2. Test in experiment hall-Test Trigger signals

- a) Network of Angelo's PC is connected.
- b) Make BESIII DAQ system worked with ZDD system.
 - i. The L1/CHK/CLK signals are already seen in the Oscilloscope.
- c) Michela is testing the signals with the GEMROC

3. Summary

- The "interrupt issue"/"buffer empty" issue still exist and I have done more tests.
- New found 2 issues, 8 issues in total. We have prepared the BESIII system for commissioning in the experiment hall. The first step is ongoing.

Questions during the slides or planning:

- ✚ Tingxuan is suggested to send a mail to Angelo and Pawel about all these details of her test.
- ✚ Data taking with BESIII Global trigger, DC boards and GEMROC firmware need flash.

Cabling Test Early Results: Stefano Graminia

- **Summary of the report:** (Slides by Stefano Graminia: [Slides](#))

1. INPUT

1) DETECTOR

- a) The four-spoke flange defines 4 sectors, about 30 cables come out from each sector

- b) Layer 1 cables must travel the longer path
- c) LV cables are the shortest (1 m)
- d) Half of the GEMROCs will be positioned on the north side, half on the south side

2) PREAMP MOUNTING POINTS

The preamplifier boards of the inner chamber will be removed according to the red line on the scheme

In a single preamplifier slot we can fit:

Up to 2 DLVPCs

Up to 4 HVPCs (5 if the slot is one of the innermost ones)

We prefer to keep HVPC and DLVPC stacks separate. Each HVPC stack must also fit at least 1 GNDPC

2. OUTPUT

1) PATCH CARD POSITIONING

- a) Scheme is flipped inside out due to mock-up construction, cable's travel path is conserved
- b) 33 slots available according to the documentation, 32 were actually used
- c) FUNDAMENTAL TO CHECK WHICH SLOTS WILL BE FREED AND THE CORRECT ORIENTATION OF THIS SCHEME

2) CABLE HOLDER FIXING SCHEME

- a) Patch card positioning drives the fixing of the cables near the detector
- b) Cables are fixed to the four cable holders in couples using cable ties
- c) Cables must be fixed in order (L3, L2, L1) to prevent knots near the flange's bottleneck

3 EAST SIDE TEST

- 1) The presented scheme is feasible, all cables reach their destination with a reasonable amount of extra length
- 2) Cables are stretched to evaluate extra length available
- 3) Limiting the cable routing to 0° , 90° , 180° , and 270° as requested earlier this year, to separate CGEM and MDC cables, is not possible

- 4) Access to cable grooves over the full 360° is necessary due to the shortness of LV cables (the length of which was determined in 2018 according to the possibility of accessing all the slots to be freed)
- 5) Inner cable holder not serviceable, outer cable holder redesigned to accommodate all cables in pairs
- 6) Tools for adjusting the beam pipe positioning screws identified (ratchet combination keys, probably hinged).
- 7) Routing of the gas pipes still undefined, input from the gas system group necessary.

4 Conclusion and Future Plan

- The schemes presented are still subject to changes (few minor adjustments still being discussed), final schemes will be submitted via e-mail upon finalization
- Mock-up conversion for west side test within the next two weeks
- West side test and cabling scheme production within the end of August
- Mandatory stop of the cabling studies in September (all people working on this will be at IHEP in early September)

Questions during the slides or planning:

1. About the cables and slot.

✚ Mingyi remind that extra length of the cables may cause trouble due to limited space.

✚ Michela: we are worried the opposite thing, especially for the layer 1. we do not want more slots, we only want to change the position of two of them. The question is if the slot No.1 and 7 can be given to Layer 1.

2. The space for the screw to fixing the inner CF cylinder.

- Jingyu: Just a reminder, 2mm space is need for the eight screws for fixing the new inner CF cylinder, which may have been ignored in the previous drawings.
- Stefano: The new inner CF cylinder can be glued in any case for the gas tightness.
- Mingyi: The CF cylinder not only need glue for gas tightness, but also need

eight screws to stretch and fix it on the flange. We should check the clearance between the CGEM and the Al ring on the inner CF cylinder, and make clear if there are more space for the screws.

- Stefano: it has been checked there is no possibility for the eight points for the screws.
- Mingyi: These screws and the space are very important for the drift chamber. We should check the space carefully, and have a solution.
- Michela: since there is cooling pipes, cables. We will check, but we are not confident there is possibility.