ECL expert shifter manual.
Last updated: 2025.10.16

TODO: Add screenshots for main DQM histogram

Added information about registering in b2mms and ShifTool as ECL expert shifter.

ECL shifter duties.

1. Communicate with other members of Belle II experiment.
- Provide contact details.
- Always monitor Mattermost messages or be available via PHS / Skype.
- Report at daily run meeting.

2. Verify quality of ECL data.
- Perform daily testpulse calibration (take data/analyze data).
- Monitor ECL DQM histograms (occupancy/fit quality/adc data).
- Set ECL Quality in Run Registry based on ECL DQM.
- Check automated email notifications

3. In case of ECL problem, promptly identify its source.
- Check run control GUI.
- Check ECL front-end timing switch (ECL FTSW) status.

4. Fix ECL-related problems that prevent data-taking.
- ECL DAQ problems (lost connection/UNKNOWN/ERROR/CONFIGURING).
- ECL front-end timing switch (ECL FTSW) problems.
- ECL data quality problems (no data/fit quality failure/no ADC data).
- ECL luminosity monitor problems.

Usual ECL expert workflow

* Book the shift at https://shift.belle2.org/.
* Check that you have the required accounts and software.
* Check that you are subscribed to ECL shifter mailing list:
  https://lists.belle2.org/sympa/info/ecl-alarm

* At the start of the shift, report in Mattermost chat, in #ecl and #global_run channels.
* Update Currently on Shift and Duty webpage
  (due to some technical difficulties, this is now done manually).
* Check ECL expert shift for latest updates.

* Check Mattemost chat:
https://b2chat2.kek.jp/b2rc/channels/global_run
* Check DQM histograms:
https://dqm.belle2.org/webpage/expert.html?det=ecl
* Set run quality flags based on DQM histograms:
Run registry
* Check email notifications.
* Be ready to connect to ECL DAQ servers in case of a problem.

* At the end of the shift, report in Mattermost chat, in #ecl and #global_run channels.
* Write a short report in ELOG: list all runs that did not have GOOD status, list all issues.
https://elog.belle2.org/elog/ECL+operation/

0. ECL expert shifter prerequisites

Required accounts

(I'm assuming you already registered as a Belle II member)
There are 4 tracks that can be done in parallel:

1. **KEK network accounts**.
   * KEK computing account: https://www.belle2.org/registration/kek_registration/
   * bdaq account: DAQ Web Home (see also these slides)
   * KEK VPN account: https://ccportal.kek.jp/application/
     - https://ccwww.kek.jp/ccsupport/network/passlogic/en/
     - HowToVPNToKEK

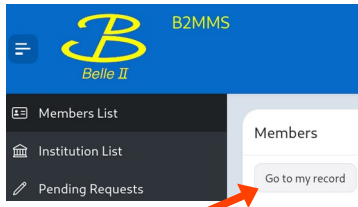
   Registration for KEKCC and VPN accounts takes several days (up to 14 days).
   Other registrations are usually done much faster.
2. **KEK chat account.**
   * MatterMost chat account: DAQ Web Home.
3. **Contact ECL shift manager to add you to the ECL shifter list**.

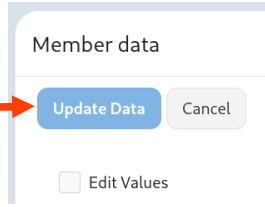
(ECL shift manager in 2025c is Alex Bobrov)

4. **Add ECL group to your B2MMS account (https://b2mms.belle2.org).**

(low-priority, only needed for quota calculations)

   * Go to your user record.
   * Choose "Edit values" and go to "Group Data"
   * Add "ECL" and "Update Additional Data" on the upper left





For on-site expert shifters, you need to register as radiation worker. Please see Becoming a Radiation Worker at KEK

Required software

* **SSH client**
  - For Linux and Mac: Already available.
  - For Windows:
    Windows 10 (build >1908) => SSH is already available in command line.
    In Windows 10 case, follow the same instructions as for Linux and Mac.
    Otherwise, install PuTTY and follow Windows-specific instructions.

* In case of problems with ECL shifter web server, please install **VNC client**.
  - For Mac: Already available.
  - For Linux and Windows: Several available clients, use TightVNC or anything else.

Setting up SSH tunnel (Linux, Mac, Windows 10)

* Don’t forget to connect to KEK VPN/yubikey first.
* Make sure that you have your id_rsa key file in $HOME/.ssh folder.
  - You can specify path to the key file with `ssh -i path/to/id_rsa`

```
# In command line (for Linux, Mac, Windows 10):
ssh -L 8013:eclpc13:80 -L 5900:eclpc14:5900 USERNAME@bdaq.local.kek.jp
```

After the SSH tunnel is set up, open http://localhost:8013 in your web browser.
You will see “ECL expert shifter web tools” webpage.

ECL expert shifter web tools

ECLDAQ password: to get password for ECL run control GUI and Luminosity monitor GUI, call `cat ~remnev/ecldaq_password` at bdaq.local.kek.jp

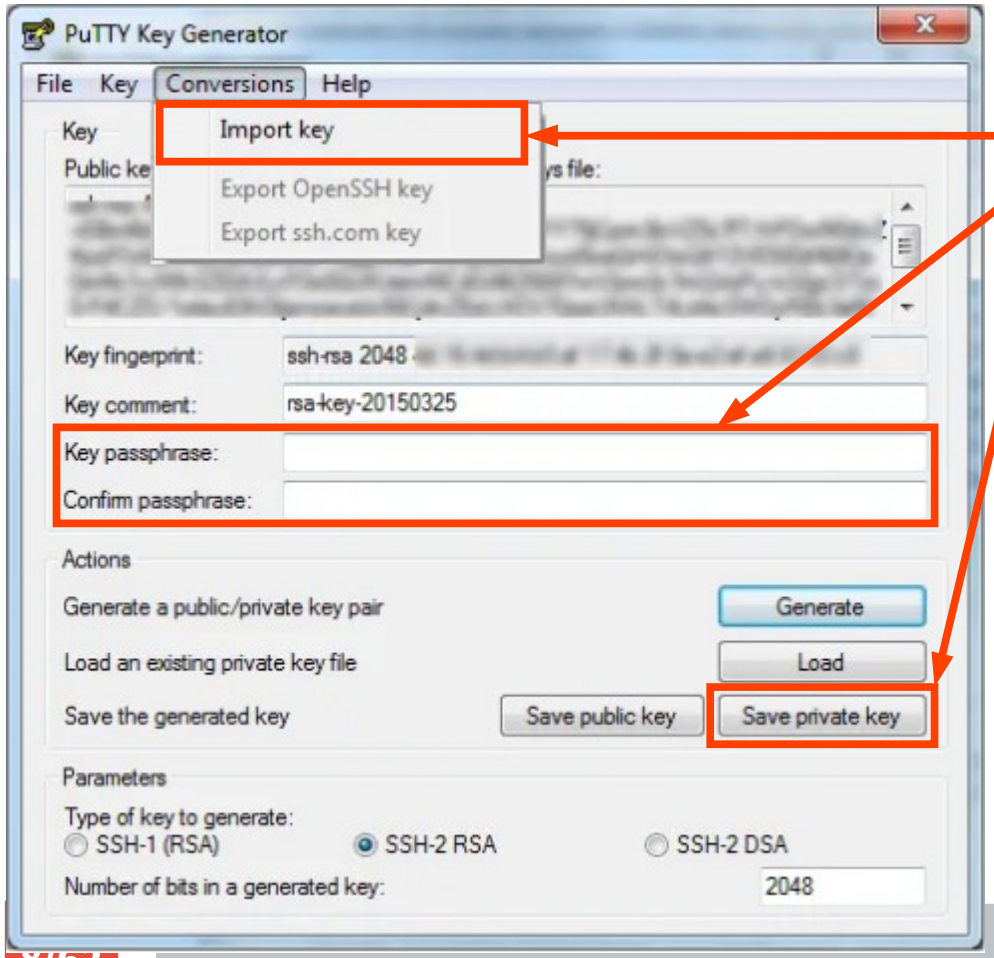
Current JST time: 2024-04-03 10:45:38

- ECL expert manual
- Urgent contact details:
  - **Mikhail Remnev** (mikhail.a.remnev@gmail.com):
    Mobile phone +7 951 384 9016 (International calls, WhatsApp, Telegram).
    You can also ask CR shifter to call me from PHS using this number:
    0 001 7 951 384 9016

Instructions for Windows (1/3)

For ECL shifter tasks, you will need SSH tunnel connection to bdaq. In Windows, this can be done by PuTTY client program. Instructions for tunnel setting in Putty are listed below:

Upon completion of your bdaq registration, you should have **id_rsa** file generated at KEKCC. You need to convert it from RSA to PPK format (format used by PuTTY ssh client).

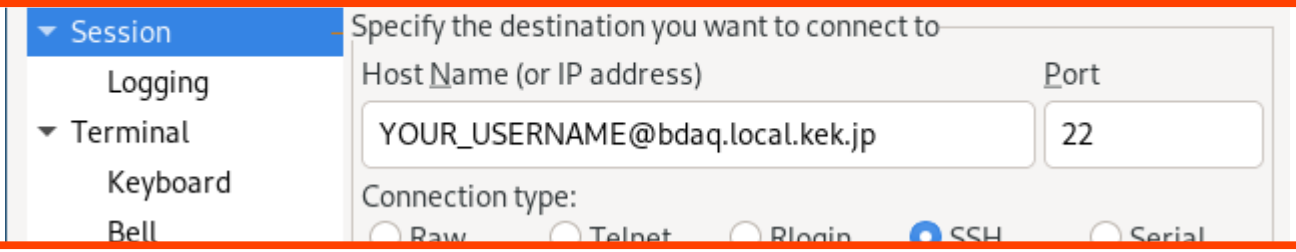


1. Open puttygen.exe (included with PuTTY).
2. Import your id_rsa key.
3. (optional) set key passhprase.
4. Save the key in PPK format.

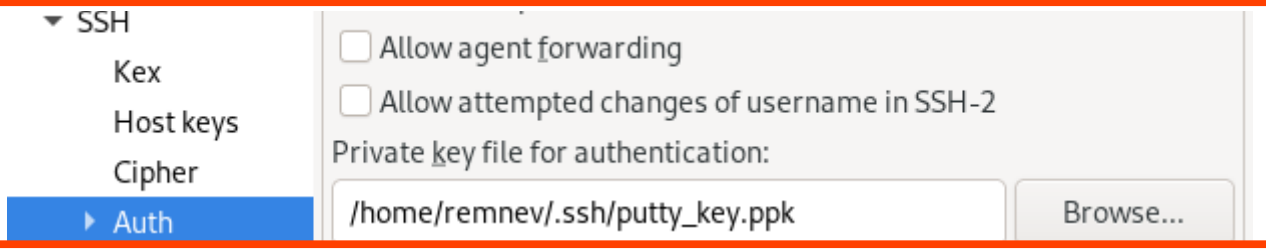
Instructions for Windows (2/3)

Now, open PuTTY and configure SSH tunnel settings there

1. Set correct session settings.



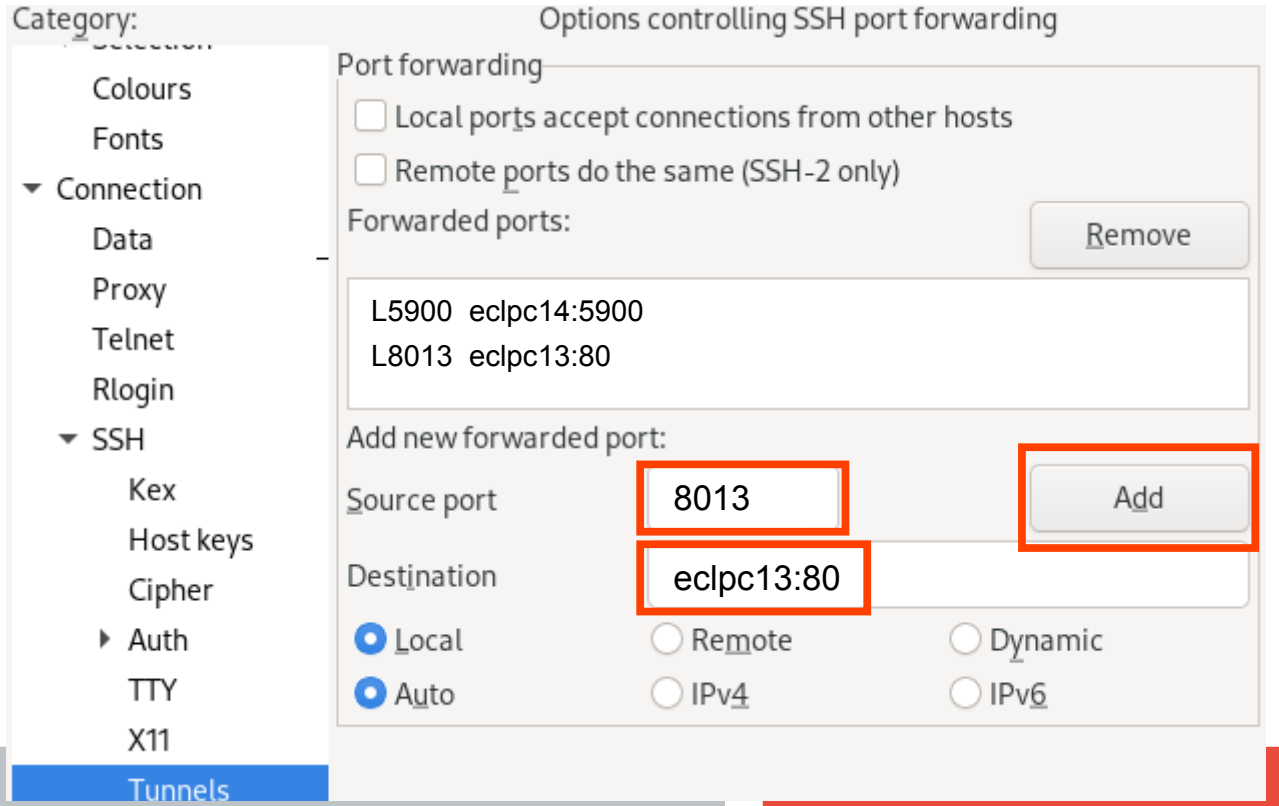
2. In SSH→Auth, specify private key file for authentication.



3. In SSH→X11, set "Enable X11 forwarding"

4. In SSH→Tunnels, add two port forwardings:
   - 4.1. (Source port 8013) (Destination eclpc13:80)
   - 4.2. (Source port 5900) (Destination eclpc14:5900)

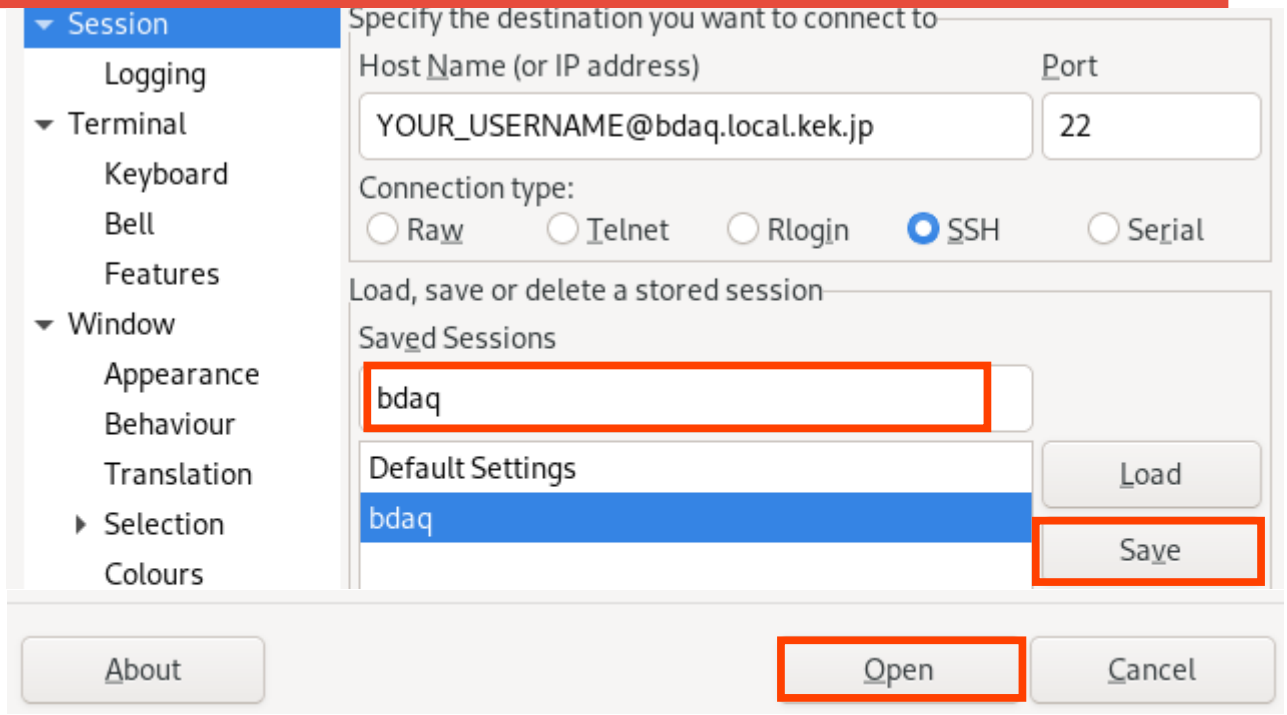
5. **Don't forget to press "Add" each time.**



Instructions for Windows (3/3)

6. Go back to session settings, save them. Next time, you can just load them instead of steps 1-5.

7. Then, press “Open”.

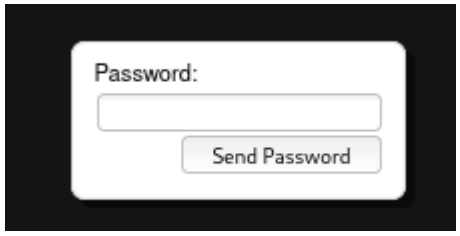


8. Complete authentication at bdaq.

9. Open http://localhost:8013/ in your browser.

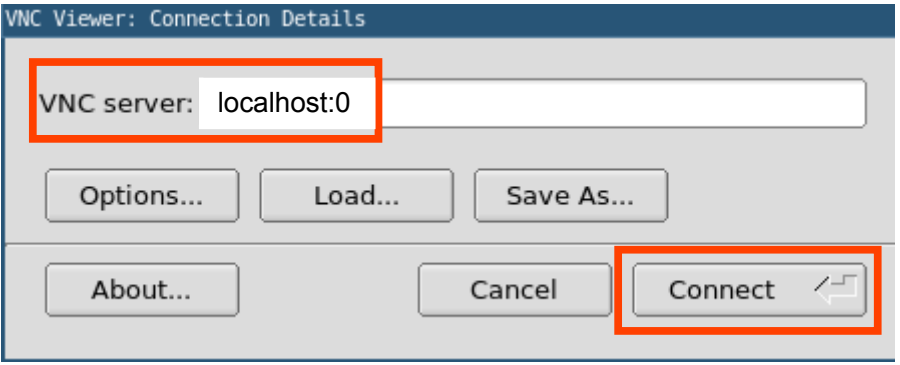
Accessing ECL run control GUI

After establishing SSH tunnel, go to http://localhost:8013/, link “ECL run control GUI”.
For the access, you will need ECLDAQ password (ask other ECL experts).



If ECL shifter web server is not available, you can use direct VNC connection.
(SSH connection has to be established using instructions from previous slides)

Windows
TightVNC



Linux
TightVNC

```
# In new terminal
vncviewer localhost:0
```

Mac
open (available by default)

```
# In new terminal
open vnc://localhost:5900
```

Please don’t run it in the same terminal where
you started SSH connection.
(otherwise vnc viewer will start at bdaq, not at your PC)

ECL expert shifter web tools

External links

<...>

ECL data acquisition tools and info (+testpulse calibration)

NOTE: remote GUI webpages are "viewonly" by default.
To change this, open settings sidebar and tick off "View Only".

- ECL run control GUI (requires ecldaq password, see above)
  - Secondary ECL run control GUI
- List of ECL local runs
- recl1 ssh
  - If there are any issues, run the command to fix them from here.
    Run control GUI shows incorrect information: **~/restart.sh recl stop start**
    No data from ECL or bad ECL data quality: **ecl-upload-collector-fw**
- Status of FTSW #64 (ECL FTSW)
- Status of FTSW #184 (Global FTSW)
- ttd11 ssh

For local runs and
for fixing ECL DAQ problems.

For fixing ECL FTSW problems.

Luminosity monitor

NOTE: remote GUI webpages are "viewonly" by default.
To change this, open settings sidebar and tick off "View Only".

- Luminosity monitor GUI (requires ecldaq password, see above)
- Luminosity monitor Grafana dashboard
- eclpc15 ssh (luminosity readout PC)
- ~~eclpc16 ssh~~ (old luminosity readout PC)
- Instantaneous and max luminosity, 10^{30} cm^{-2} s^{-1}
- Integral luminosity, nb^{-1} (10^{33} cm^{-2})
- UNIX time from luminosity monitor (should be straight diagonal line)

For fixing ECL luminosity
monitor problems

1. Collaborative services/tools used by ECL expert shifter.

Collaborative services and tools

1. Communicate with other members of Belle II experiment.
 - Provide contact details.
 - Always monitor Mattermost messages or be available via PHS / Skype.
 - Report at daily run meeting.

Before the start of your shift:
 * Book a shift slot at shift.belle2.org (log in with your DESY account).
 * Register in ecl mailing list: https://lists.belle2.org/sympa/info/ecl-alarm

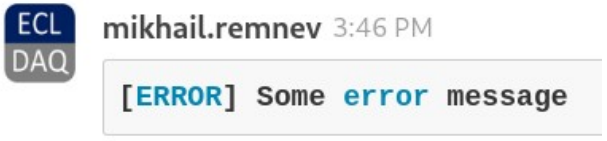
At the start of your shift:
 * Put your contact details into “ECL” table at the Currently on Shift web page.
 * Report that you start your shift in #ecl and #global_run channels of Mattermost.

Collaborative services and tools

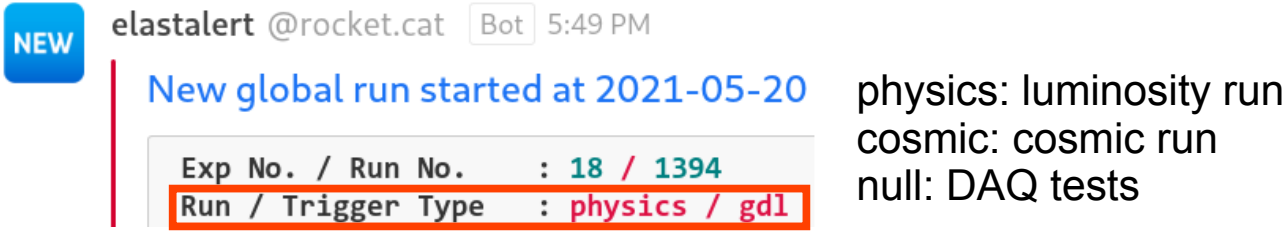
1. Communicate with other members of Belle II experiment.
 - Provide contact details.
 - **Always monitor Mattermost messages or be available via PHS / Skype.**
 - Report at daily run meeting.

Before the start of your shift:
 * Register MatterMost chat account: DAQ WebHome
 * Join channels ecl, ecl_bot, global_run, bcg and daqcore.
 * **NOTE**: If you are not connected to VPN, you will be asked for common username and password. This information is available in registration details.

Mattermost tips: (I guess they are common knowledge by now, since almost every messenger supports those features)
 * Notify someone: @someones.name . This user will get a sound alert.
 * Notify everyone in the channel: @here . All users will get a sound alert.
 * Send formatted code: ```[ERROR] Some error message```.



 * By checking notifications in global_run channel, you can see which type of run is ongoing.



physics: luminosity run
cosmic: cosmic run
null: DAQ tests

Collaborative services and tools

1. Communicate with other members of Belle II experiment.
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- Report at daily run meeting.

Run meeting access:

Remotely: https://speakapp.link/to/MyNTPg
Password is rm4b2p3
See Main Audio Video Conferencing
for SpeakApp registration details (guest access is also ok).

ECL expert shifter for DAY1 should give a short report about ECL status and confirm with run coordinator if it will be possible to take ECL testpulse calibration during the day.
Before or after the run meeting, please also post a report to **#shiftinfo** channel of Mattermost.

Meeting minutes: https://elog.belle2.org/elog/Beam+Run/?Type=%5ERun+Meeting%24

2. Verifying ECL data quality.

Verifying ECL data quality

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 - **Perform daily testpulse calibration** (**take data**/analyze data)
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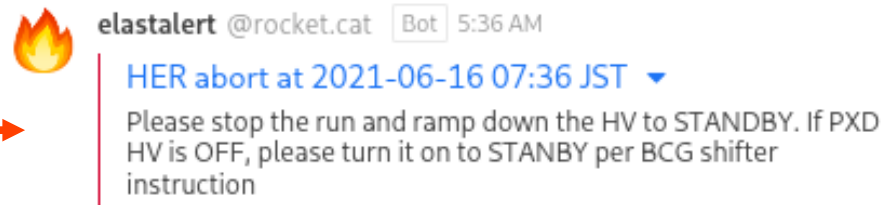
See section 0, slide 10 for remote connection instructions.

 * If testpulse calibration was already done during the day, you don't need to do it.
 * Otherwise, find suitable time (see below for the instructions) and
 ask control room shifter in global_run channel to exclude ECL (from global data taking).

We try to take local runs daily but it is not always possible
 * Physics data taking is always higher in priority.
 * If beam abort happens, ask to exclude ECL and take local run (injection takes at least ~3 minutes so there is enough time for ECL)
 * Sometimes run coordinator announces time for local runs at the daily run meeting (meeting minutes).
 * During null runs (high-rate tests when data is not saved) it is ok to exclude ECL at any time.

If beam abort happens, it will be shown in global_run channel of Mattermost.



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See section 0, slide 10 for remote connection instructions.

1. Find suitable time (see previous slide for the instructions).
2. If SuperKEKB is operating, ask in bcg channel if it is ok to take local run.

(in bcg channel)

If beams are active

ECL DAQ mikhail.remnev

May I take ECL local run?

The local run will take ~2 minutes. ECLTRG hit rate will jump to very high value for a few seconds.

We do not need HV permission, injection during ECL local run is fine.

If both beams are aborted

ECL DAQ mikhail.remnev

Just to inform you, we will take ECL local run now. The local run will take ~2 minutes.

Since both beams are aborted, no need to tell KCG (it doesn't affect machine operation).

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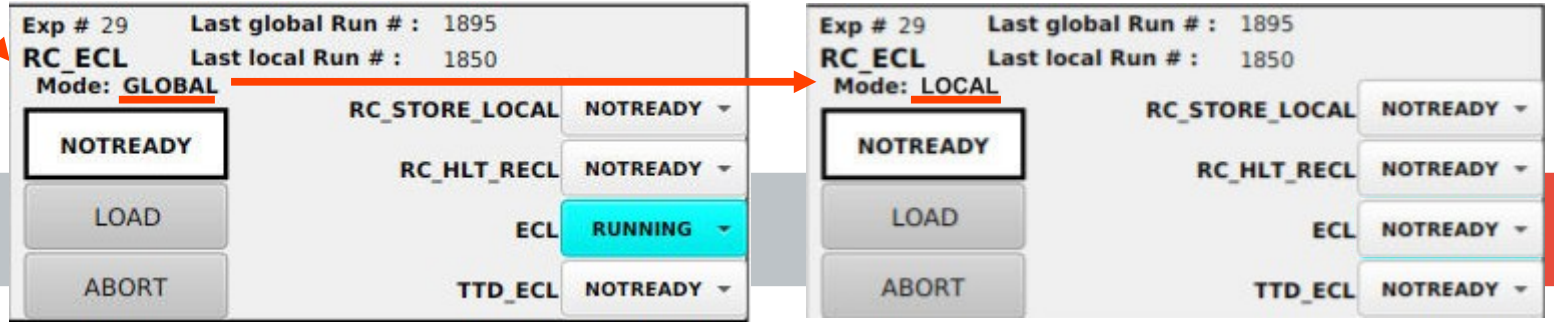
3. Ask control room shifter in global_run channel to exclude ECL (from global data taking).

(in global_run channel)

ECL DAQ **mikhail.remnev**

Please exclude ECL

Note that mode will change from GLOBAL to LOCAL when control room shifter excludes ECL.



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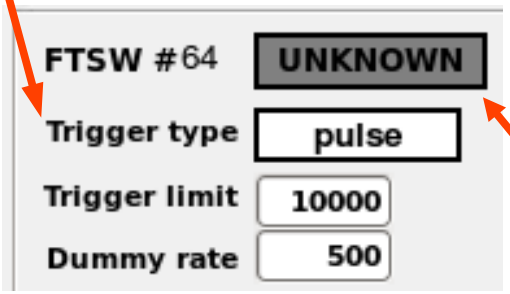
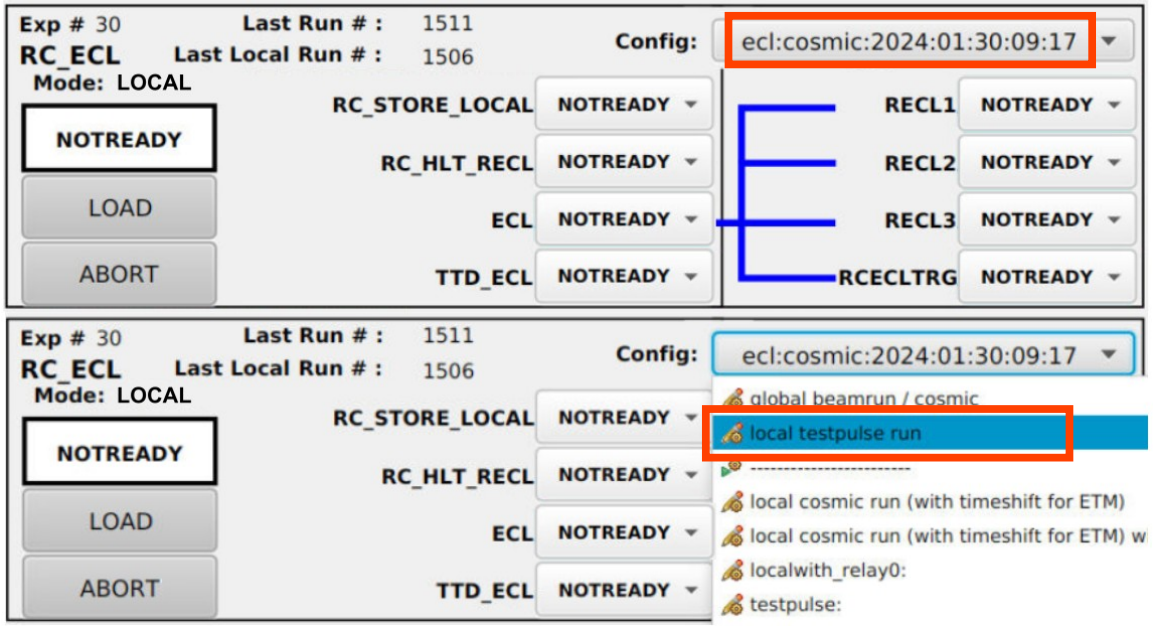
1. Select “local testpulse run” config.

We are sending 10’000 test pulses at 500 Hz (amplitude ~= 1 GeV). Trigger type, limit and rate should automatically switch to these values:



(FTSW status can be UNKNOWN, READY or anything else, ignore it)



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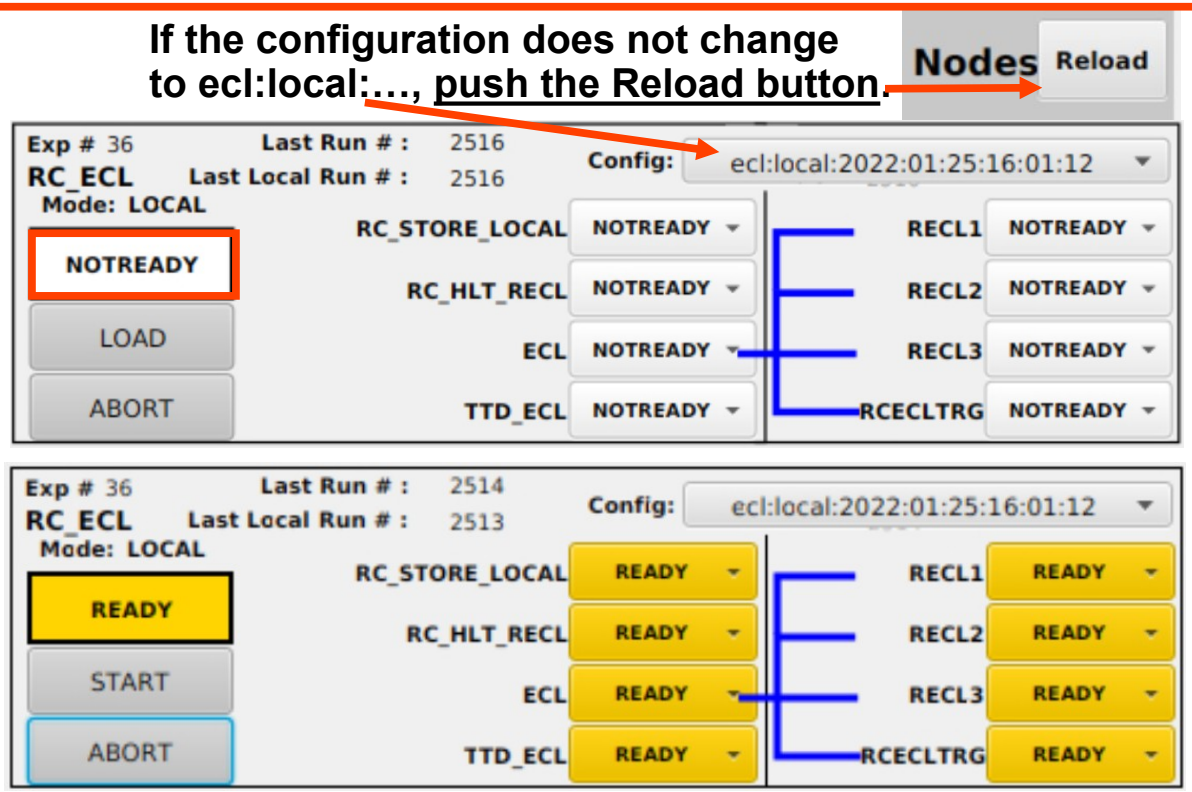
1. Select “local testpulse run” config. Wait until “ecl:cosmic:” changes to the “ecl:local” configuration.
2. Press LOAD.



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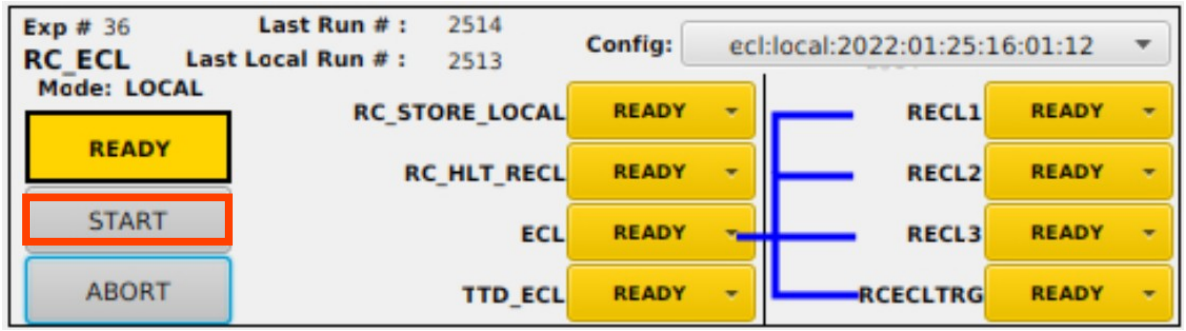
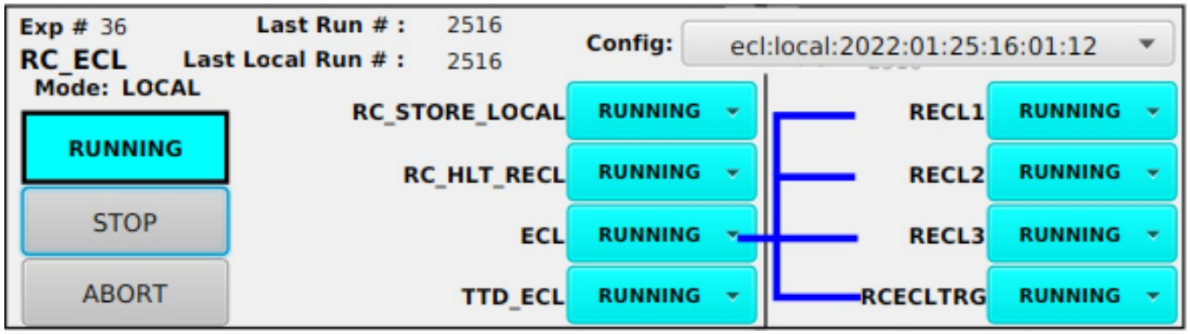
1. Select “local testpulse run” config.
2. Press LOAD.
3. Press START.





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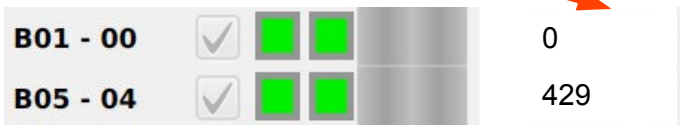
1. Select “local testpulse run” config.
2. Press LOAD.
3. Press START.
4. Wait until all events are received.

Number of events should become equal to the specified trigger limit.
If event numbers are different, there might be an FTSW problem.

In that case, refer to “Troubleshooting FTSW” subsection.



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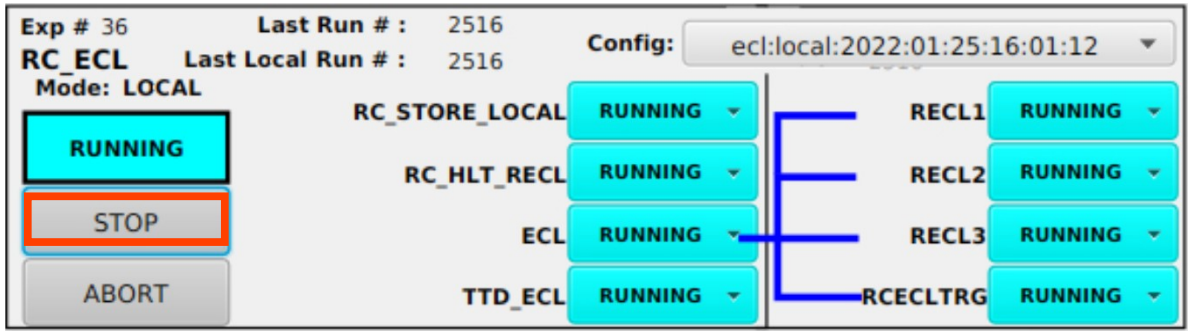
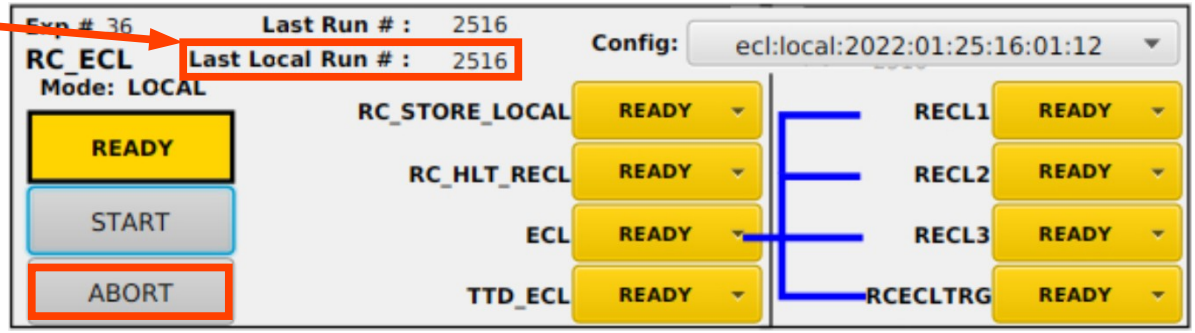
1. Select “local testpulse run” config.
2. Press LOAD.
3. Press START.
4. Wait until all events are received.
5. Press STOP.

Note run number.

6. Wait for the READY status.





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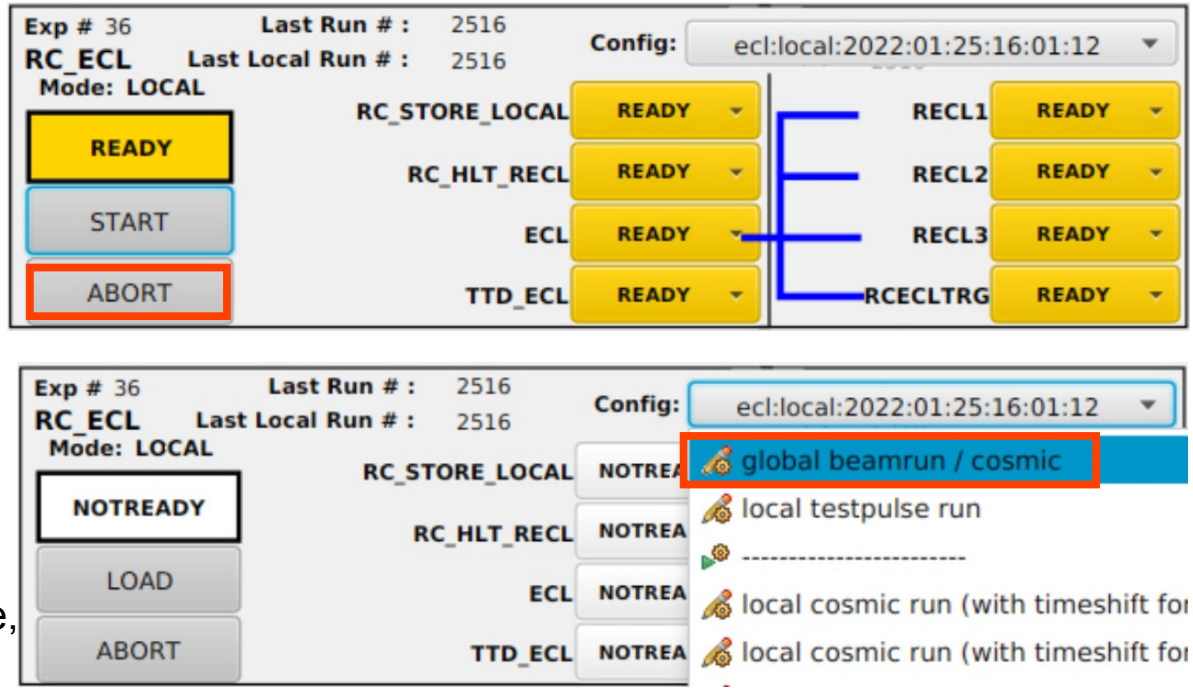
1. Select “local testpulse run” config.
2. Press LOAD.
3. Press START.
4. Wait until all events are received.
5. Press STOP.
6. Wait for the READY status.
7. Press ABORT.
8. Select “**beam run / cosmics**” config.
9. Ask in #global_run to include ECL.

“beam run / cosmics” is used for all global runs.
Note that it is called “ecl:cosmic:*” in the database, so the button label will look like that:

ecl:cosmic:2019:10:21:14:20



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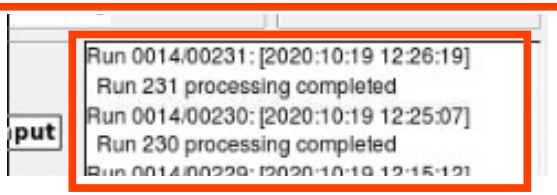
 - **Perform daily testpulse calibration** (take data/**analyze data**)
 - Monitor ECL DQM histograms (occupancy/fit quality/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.

See data transfer status in the bottom of ECL run control GUI.
After the message “run processing completed”, go to ECL shifter web tools, open “List of ECL local runs” link and select the processed run.



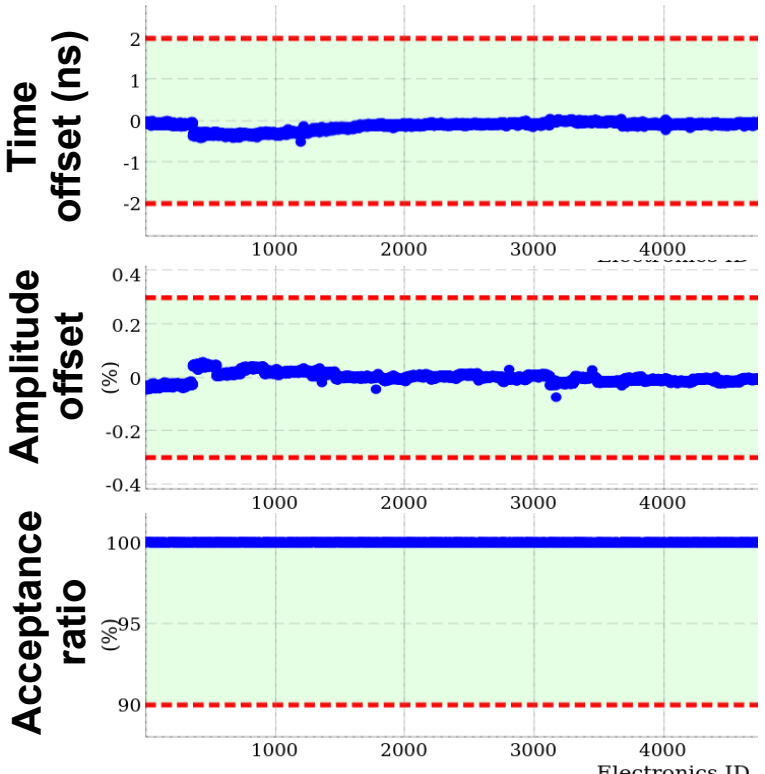
These plots will be shown:

Time offset: average testpulse time - reference time for each channel (in nanoseconds).

Amplitude offset: For each channel, (average testpulse amp) / (reference amp) * 100% - 100%

Acceptance ratio: Percentage of events that have acceptable amplitude and time. For example, all events with amplitude 0 are discarded from the calibration.

Plot points should be within horizontal red lines.



Verifying ECL data quality

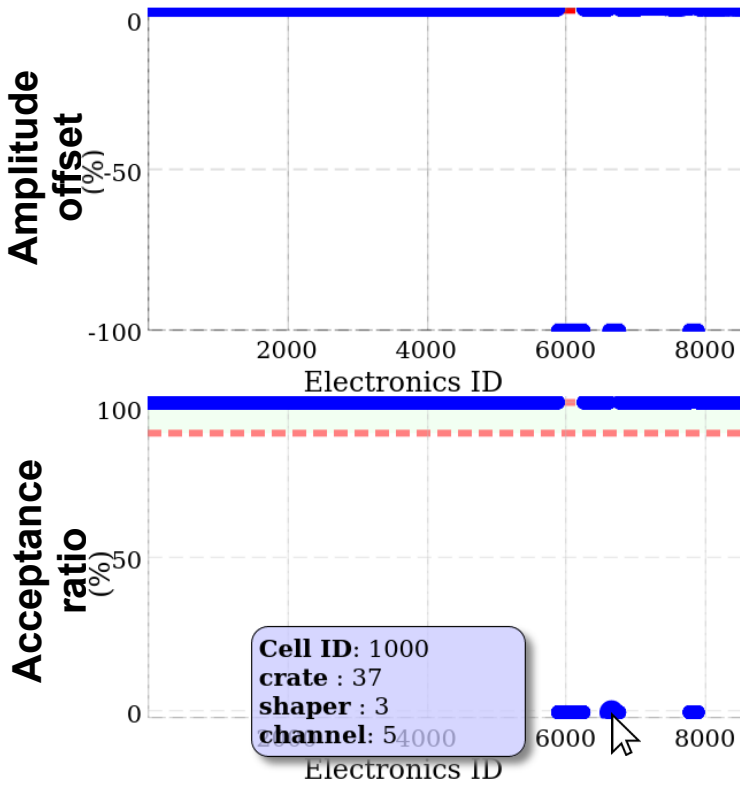
2. Verify quality of ECL data.
 - **Perform daily testpulse calibration** (take data/**analyze data**)
 - Monitor ECL DQM histograms (occupancy/fit quality/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.

Plot points should be within horizontal red lines.

For example, here we have very low acceptance ratio.
It means there are no events at all from this channel.

Mouse over the outliers to see, which crate, shaper, channel have problems.
(usually it's only necessary to know crate numbers)

Then proceed to the "Fixing ECL problems section", "no data" subsection.

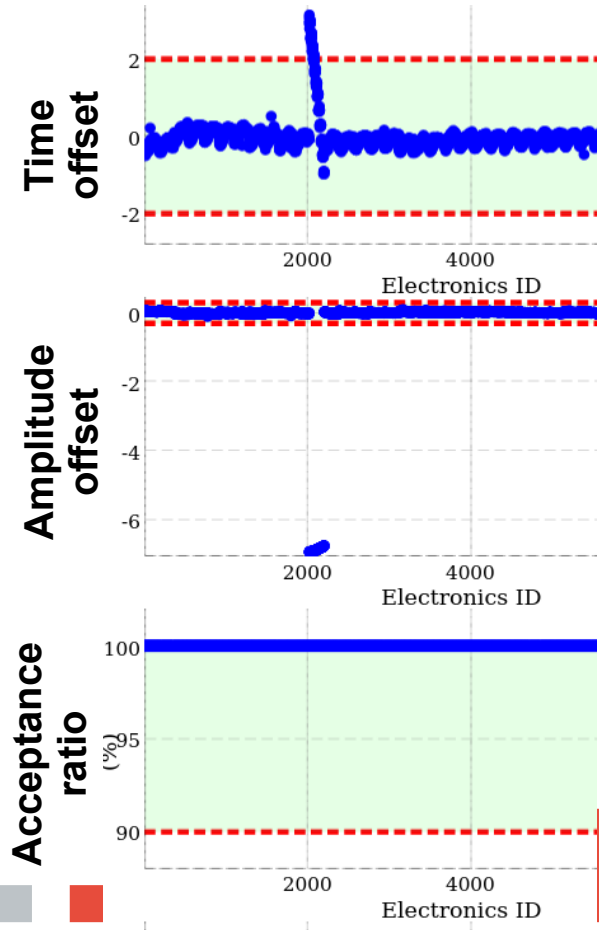


Verifying ECL data quality

2. Verify quality of ECL data.
 - **Perform daily testpulse calibration** (take data/**analyze data**).
 - Monitor ECL DQM histograms (occupancy/fit quality/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.

If acceptance ratio is fine but time offset and amplitude offset are large:

* This might be fixed by re-initialization of shaperDSP.
  Shaper initialization
* If not, this is likely to be hardware problem.
  Report about it in rocket chat, “ecl” channel.



Verifying ECL data quality

2. Verify quality of ECL data.
 - Perform daily testpulse calibration (take data/analyze data).
 - **Monitor ECL DQM histograms** (occupancy/fit quality/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.

ECL DQM histograms are available at dqm.belle2.org (DESY account required).
 * Latest histograms are located at https://dqm.belle2.org/webpage/expert.html?det=ecl

 * Detailed description of all DQM histograms is given here:
 ECL DQM instructions

It is necessary to check DQM histograms for all physics runs and for all cosmic runs.
If there are no such runs, please still check the histograms few times per shift.
 * Most critical time to check is when runtype switches from ‘null’ to ‘physics’.
 (reported by CR shifters in MatterMost chat)

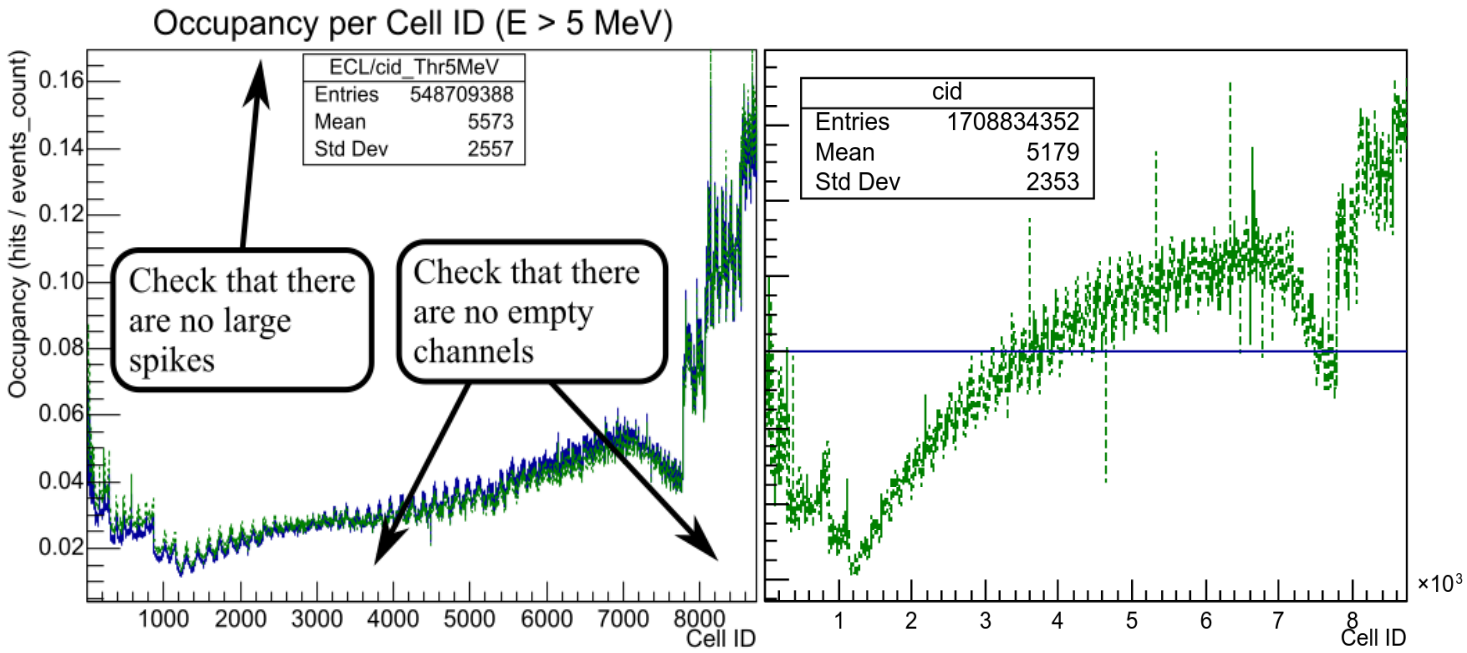
Verifying ECL data quality

2. Verify quality of ECL data.
 - Perform daily testpulse calibration (take data/analyze data).
 - **Monitor ECL DQM histograms** (**occupancy**/fit quality/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.

Description: Number of readouts in all ECL counters (hit map) with the E > 5 MeV

Green is reference data, blue is the current value.

If green and blue are different, it's fine, occupancy varies due to bkg conditions

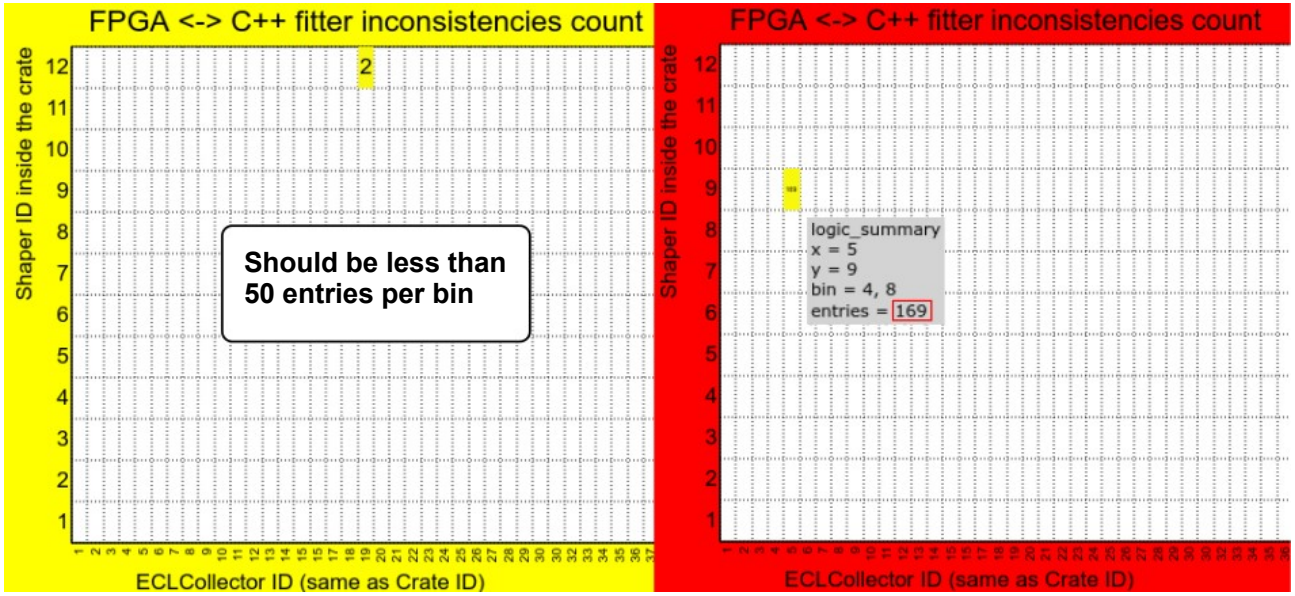


If all channels have equal number of events: check that ECL configuration is correct.

If some channels have 0 events: proceed to subsection "ECL data quality problems (no data)" in section 4 ("Fixing ECL problems").

Verifying ECL data quality

2. Verify quality of ECL data.
 - Perform daily testpulse calibration (take data/analyze data).
 - **Monitor ECL DQM histograms** (occupancy/**fit quality**/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.



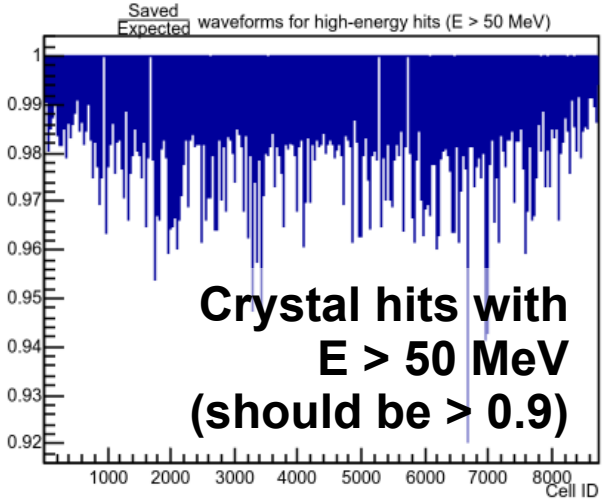
Description: Number of inconsistencies detected in FPGA fitter logic as compared to C++ fitter logic for each ShaperDSP submodule of ECLCollector modules.

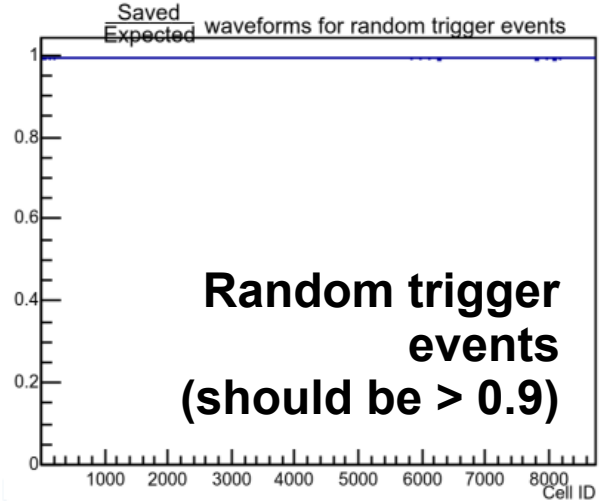
If there are more than 50 entries:

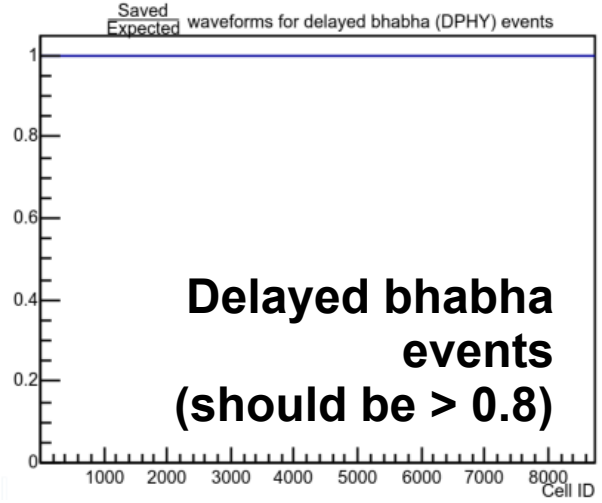
 * This might be due to ShaperDSP board replacement. In that case, it's fine. Ask other ECL experts if ShaperDSP boards have been replaced recently (or check Mattermost history in ecl channel).
 * Otherwise, report to the Mattermost channel "ecl" (add @here to the post).
 * Ask to stop and **full abort** the run; do shaper initialization for the affected crates.

Verifying ECL data quality

2. Verify quality of ECL data.
 - Perform daily testpulse calibration (take data/analyze data).
 - **Monitor ECL DQM histograms** (occupancy/fit quality/**adc data**).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - Check automated email notifications.







Description: Fraction of saved ECL waveforms for different event types.

In physics runs, check all 3 histograms.
In cosmic runs, check 1st and 2nd histograms, ignore histogram for bhabha events.

If histogram has > 100’000 entries and numbers are still different, refer to section “Fixing ECL problems”, “no ADC data”.
(most likely you need to verify that the configuration is correctly set to “ecl:cosmic:”)

Verifying ECL data quality

2. Verify quality of ECL data.
 - Perform daily testpulse calibration (take data/analyze data).
 - Monitor ECL DQM histograms (occupancy/fit quality/adc data).
 - **Set ECL Quality in Run Registry based on ECL DQM.**
 - Check automated email notifications.

* It is necessary to set ECL Quality in rundb.belle2.org based on data quality histograms.
* List of runs where ECL Quality have not been set yet: cosmic, physics.

* It is not necessary to set ECL Quality for null runs.
* Setting ECL Quality can be done at any point during the shift, not necessary to do it immediately after run stop.
* DQM histograms for past runs can be accessed at dqm.belle2.org, HLT Past Runs Display.

Guidelines for setting quality flag: Data quality flag

If histograms are not shown, select RECOVERABLE

If problem happened in last ~5% of the run, select RECOVERABLE

If the problem was happening most of the run, select BAD.

* **Add a comment before submitting BAD or RECOVERABLE status.**

Verifying ECL data quality

2. Verify quality of ECL data.
 - Perform daily testpulse calibration (take data/analyze data).
 - Monitor ECL DQM histograms (occupancy/fit quality/adc data).
 - Set ECL Quality in Run Registry based on ECL DQM.
 - **Check automated email notifications**.

Go to https://lists.belle2.org/sympa/info/ecl-alarm to subscribe to ecl-alarm mailing list that automatically delivers email messages about common ECL problems.

Problems that are monitored:
 * Issues with fit quality in ShaperDSP.
 * Incorrect configuration for global run.
 * No data from luminosity monitor.

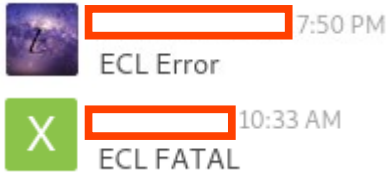
3. Troubleshooting for ECL problems.

3. Troubleshooting for ECL problems.

3. In case of ECL problem, promptly identify its source.

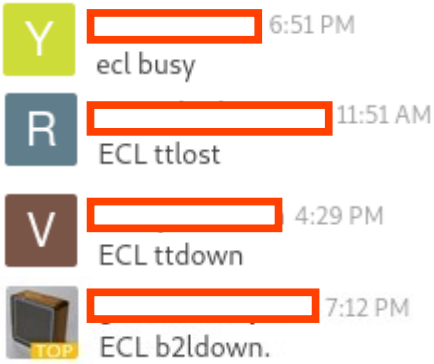
Information about ECL problems is reported by:
- Message from Mattermost (most frequent).
- Call from control room shifter to PHS / Skype.
- Automated email notification (see section 2).

Messages about ECL DAQ problems:



In these cases, check run control GUI.

Messages about ECL FTSW problems:

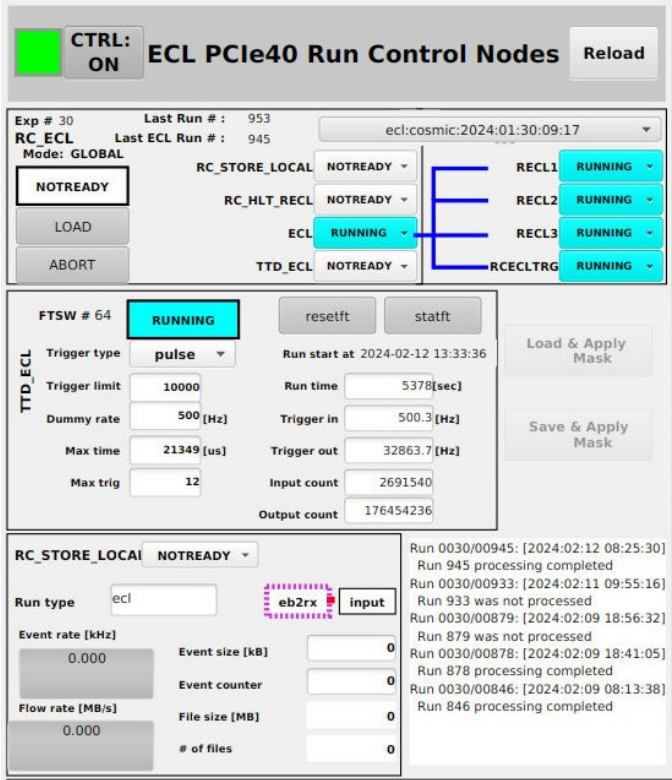


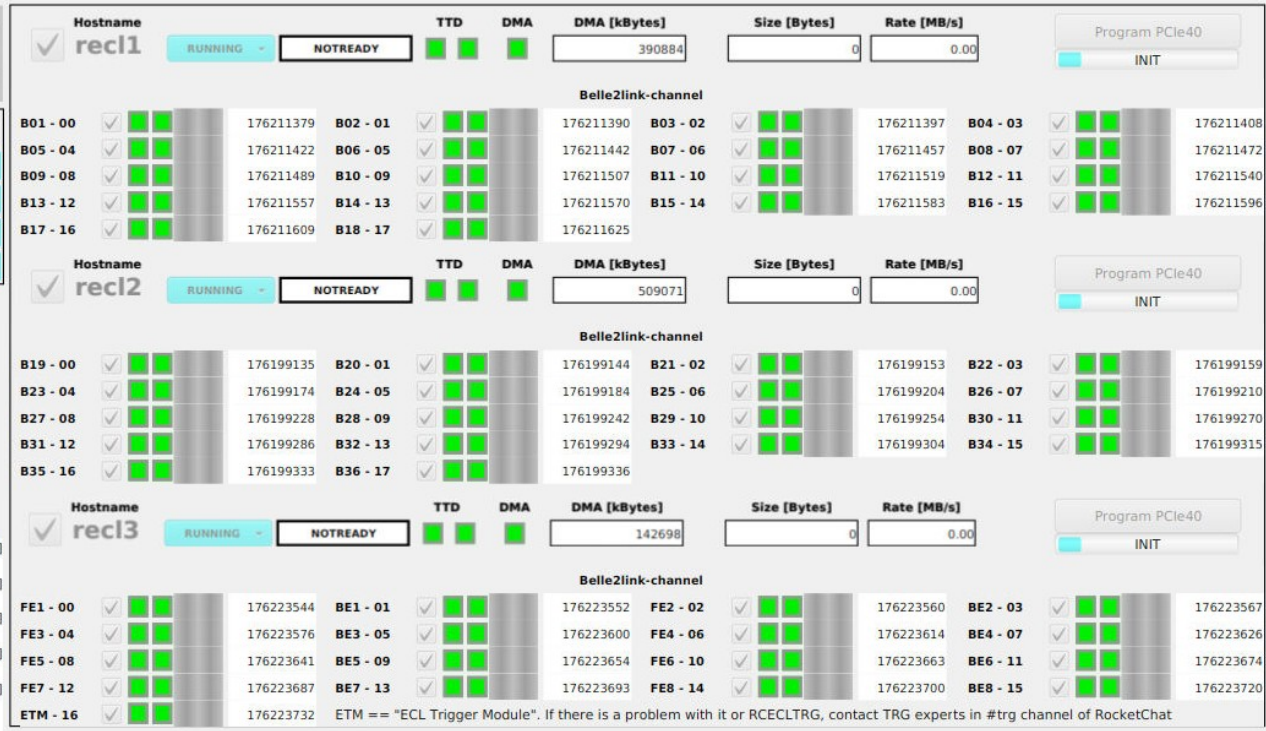
In these cases, check FTSW64 status.

There are three relevant PCs:
recl1 (ECL readout), **eclpc15** (luminosity monitor), **ttd11** (trigger timing distribution)
They all can be accessed either from ECL shifter web tools or from bdaq, using bdaq password.

3. Troubleshooting for ECL problems.

3. In case of ECL problem, promptly identify its source.
 - Check run control GUI.
 - Check ECL front-end timing switch (ECL FTSW) status.





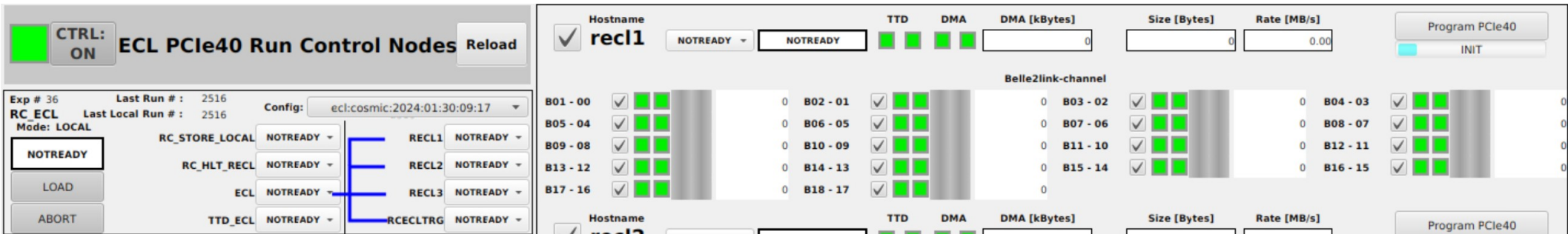
Some tips (Updated on Feb. 18, 2022)
* How to program PCIe40 firmware
- Push "Program PCIe40" and wait until the progress-bar reaches "SUCCESS".
- Mask was set as before program PCIe40, refresh OPI to confirm.

* Mask/unmask channels
- Update channel checkboxes and push "Save & apply Mask".

* Load and apply the last saved mask setting
- Push "Load & Apply Mask" and then checkboxes should be updated.
- Refresh OPI to confirm the update.

3. Troubleshooting for ECL problems.

3. In case of ECL problem, promptly identify its source.
 - Check run control GUI.
 - Check ECL front-end timing switch (ECL FTSW) status.



 - Each white NOTREADY rectangle is one run control process (“node”).
 - These processes are organized into hierarchy.

RC_ECL → STORE_ECL, RC_HLT_ECL, **ECL**, TTD_ECL
ECL → **RECL1-3**, RCECLTRG

ECL experts can fix only nodes that are written in **bold**.
If RC_ECL has problems, it is very likely caused by some lower-level nodes.

3. Troubleshooting for ECL problems.

3. In case of ECL problem, promptly identify its source.
 - Check run control GUI.
 - Check ECL front-end timing switch (ECL FTSW) status.

Can only be fixed by DAQ expert (#daqcore).

Can only be fixed by TRG expert (#trg)

Can be fixed by ECL expert.

For global run, only ECL is needed.
For local runs, we need all four nodes: STORE_ECL, RC_HLT_ECL, ECL, TTD_ECL.

If RC_ECL has problems, it is very likely caused by some lower-level nodes.

3. Troubleshooting for ECL problems.

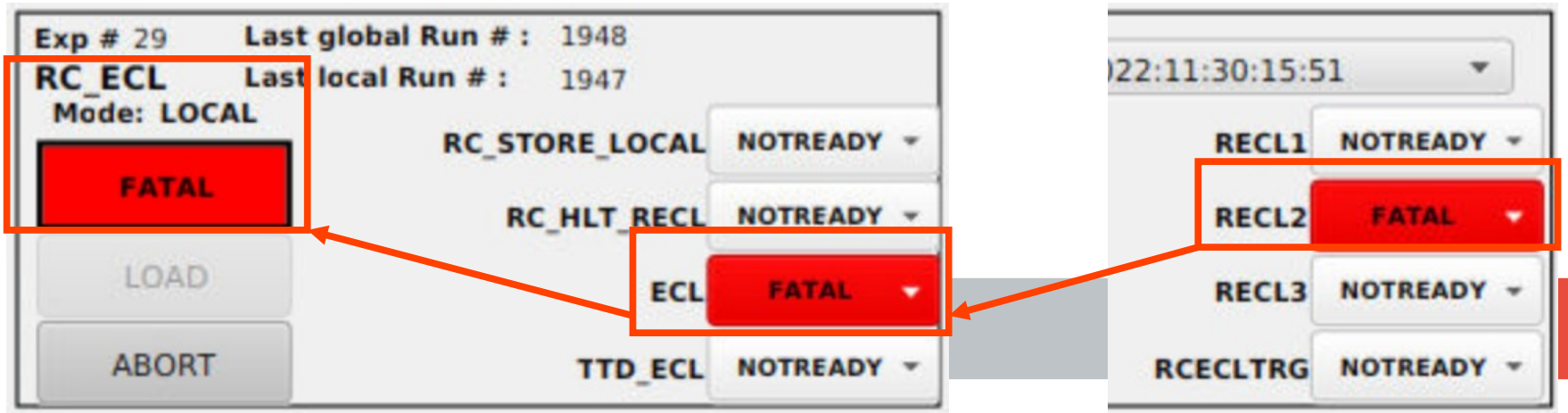
States from run control nodes propagate to the highest level.

STORE_ECL → **RC_ECL**

RC_ECL has FATAL because STORE_ECL has UNKNOWN state.
UNKNOWN == process crashed.

Here you see FATAL in **RC_ECL**
but actual FATAL is caused by **RECL2**,

RECL2 → ECL → RC_ECL



3. Troubleshooting for ECL problems.

3. In case of ECL problem, promptly identify its source.
 - Check run control GUI.
 - Check ECL front-end timing switch (ECL FTSW) status at ttd11 with statft -64 -c

```
ssh
bdaq.local.kek.jp
ssh ttd11
statft -64 -c
```

or go to ECL shifter web tools,

- Status of FTSW #64 (ECL FTSW)

There are 7 possible error types.
 - busy == deadtime is higher than ~75%.
 - ttlost, ttdown == b2tt connection (timing) is down.
 - clklost, clkdown == clock distribution is down.
 - b2llost, b2ldown == b2link connection (data) is down.

3. Troubleshooting for ECL problems.

3. In case of ECL problem, promptly identify its source.
 - Check run control GUI.
 - Check ECL front-end timing switch (ECL FTSW) status with

```
ssh
bdaq.local.kek.jp
ssh ttd11
statft -64 -c
```

High-priority information
Information for detailed troubleshooting
ECL TRG information (problems there can't be fixed by ECL expert)

```
statft-20230602 FTSW #064 / ft2o093a 2023.08.15-21:42:24 -> 02.10 14:47:44
[ RUNNING (unknown freq 0.000000 since 2024.02.10 11:04:29 for 13395s) ]
16  exprun=07836f00 exp 30 run 879 sub 0
17    omask=00001980 s3q=0 clk=00 gmask=0180 GLOBAL
1f9f  jpll=cc028000 clk=in GOOD-CLOCK
28292c trg=00029674 pulse 50.036 Hz 662e7 limit 0 <-> last 0
2a2b27 cnt 670187 > 670187 > 333918642 > 0 (50.0 > 50.0 > 24928.6Hz)
2d stafifo=10000000 empty trg-enabled
20   reset=80000000 02.10-11:04:29.999(start) no-FIFO
31     err=10000000 02.10-11:04:29.998(error) RUNNING
25/30 e/bs=0a000000 00000000 tag=0
393a3b  me=06400000 0a000000 10800400 ready tag=0 min=a
405468  00=07200000 0ae731bc 10800400 ready tag=1
415569  01=07300000 0ae731bd 10800400 ready tag=1
42566a  02=07400000 0ae731bd 10800400 ready tag=1
43576b  03=07500000 0ae731bd 10800400 ready tag=1
44586c  04=07600000 0ae731bd 10800400 ready tag=1
45596d  05=07700000 0ae731bd 10800400 ready tag=1
465a6e  06=26500000 0a6e1aff 10800000 ready tag=7
495d71  09=0640a000 0ae731c0 0ae731c0 ready tag=1
4a5e72  010=05900000 0a000000 00000000 ready tag=0
9f limiter=0c000ab1 maxtrig=12 maxtime=21.35us
a0-a7 dead 19.39% (t=19.39% c=0.00% p=0.00% f=0.00% r=0.00% v=0.00% i=0.00%)
```

FTSW mode can be LOCAL or GLOBAL

Status of FTSW #64 itself

Status of FTSWs for ECL collectors. (groups in "ECL Mapping & Cabling" article show how they correspond to ECL collectors)

Status of three PCIe40 modules that read data from ECL.

Status of ETM (ECL Trigger Module).

Status of TMM (Trigger and Monitoring Module)

3. Troubleshooting for ECL problems.

There are 7 possible error types.

- busy == deadtime is higher than ~80%.
- **ttlost, ttdown == b2tt connection (timing) is down.**
- clklost, clkdown == clock distribution is down.
- b2llost, b2ldown == b2link connection (data) is down.

```
statft-20230602 FTSW #064 / ft2o093a 2023.08.15-21:42:24 -> 02.10 14:47:44
-- ERROR (at 2024.02.10 11:04:29 while not running) ----------------------
16  exprun=07836f00 exp 30 run 879 sub 0
17    omask=00001980 s3q=0 clk=00 gmask=0180 LOCAL
1f9f  jpll=cc028000 clk=in GOOD-CLOCK
28292c trg=00021144 pulse 500.179 Hr 529e4 limit 10000 <-> last 5243
2a2b27 cnt 183741 > 183741 > 4757 > 0 (493.9 > 13124.4 > 339.8Hz)
2d stafifo=10000000 empty trg-enabled
20   reset=00100000 02.10-10:55:19.000(start) RUNNING
31     err=90000002 02.10-11:04:29.162(error) RUNNING src=1
25/30 e/bs=0f800000 80000000 mask=none
393a3b  me=0640000c 0f800000 1b800002 anyerr mask=none ttlost=1
405468  O0=07200000 0ae731bc 10800400 ready tag=4757 min=a d=0.00%
415569  O1=07300000 0ae731bd 10800400 anyerr ttlost=a d=0.00%
42566a  O2=07400000 0ae731bd 10800400 ready tag=4757 min=a d=0.00%
43576b  O3=07500000 0ae731bd 10800400 ready tag=4757 min=a d=0.00%
44586c  O4=07600000 0ae731bd 10800400 ready tag=4757 min=a d=0.00%
45596d  O5=07700000 0ae731bd 10800400 ready tag=4757 min=a d=0.00%
465a6e  O6=26500000 0a6e1aff 10800000 ready tag=72158 min=none d=0.00%
495d71  O9=0640a000 0ae731c0 0ae731c0 ready tag=4757 d=0.00%
4a5e72  O10=05900000 0a000000 00000000 ready tag=0 d=0.00%
9f limiter=0c00b000 maxtrig=12 maxtime=21.35us
a0-a7 dead 0.00% (t=0.00% c=0.00% p=0.00% f=0.00% r=0.00% v=0.00% i=0.00%)
```

'a' is a hexademical number of faulty module.

Use **ttaddr -64 -p** to see the details.

3. Troubleshooting for ECL problems.

There are 7 possible error types.

- busy == deadtime is higher than ~80%.
- **ttlost, ttdown == b2tt connection (timing) is down.**
- clklost, clkdown == clock distribution is down.
- b2llost, b2ldown == b2link connection (data) is down.

Generally, in any type of FTSW error (busy, ttlost, ttdown, …) first ask the shifter to SALS (restart the run by Stop-Abort-Load-Start), then, if the error persists, try to do some additional actions.

4. Fixing ECL problems.

4. Fixing ECL problems.

4. Fix ECL-related problems that prevent data-taking.
 - ECL DAQ problems (lost connection/stuck/UNKNOWN/ERROR/no data).
 - ECL front-end timing switch (ECL FTSW) problems (busy/ttlost/clklost/b2llost).
 - ECL data quality problems (no data/fit quality failure/no ADC data).
 - ECL luminosity monitor problems.
 - ECL hardware problems, with remote help from other ECL experts.

If there are issues that you can't fix, refer to contact details for ECL experts on these pages:

Sub-system Experts at KEK
Sub-system Operation Leaders

You can ask control room shifter to call ECL expert by PHS.

4. Fixing ECL problems.

4. Fix ECL-related problems that prevent data-taking.
 - **ECL DAQ problems** (**lost connection**/stuck/UNKNOWN/ERROR/no data).
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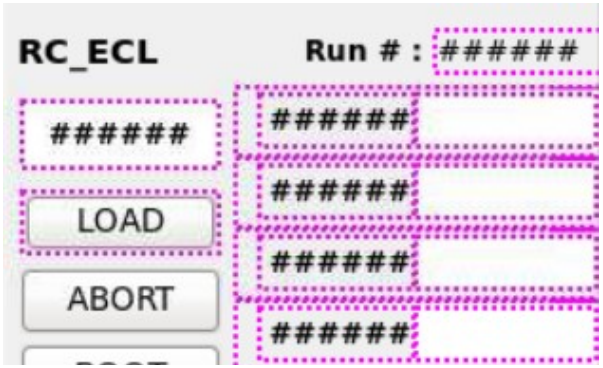


Pink rectangle means that there is no network connection to the node. This indicates either:
1. Problems at the client side (where your GUI is running).
2. Problems at the server side (where this node is running).

1. Press “Reload” button.

2. If it doesn’t help, the issue is probably at the server side.
Restart DAQ processes, then refresh GUI again.

```
ssh bdaq.local.kek.jp
ssh recl1
b2ecl
~/restart.sh recl start
```

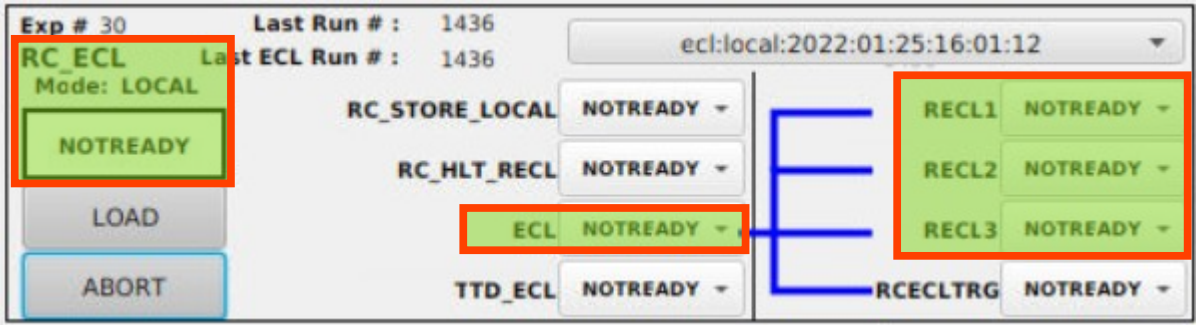
You can also open “recl1 ssh” link at ECL shifter web tools instead of these three steps.

4. Fixing ECL problems.

4. Fix ECL-related problems that prevent data-taking.
 - **ECL DAQ problems** (**lost connection**/stuck/UNKNOWN/ERROR/no data).
 - ECL front-end timing switch (ECL FTSW) problems (busy/ttlost/clklost/b2llost).
 - ECL data quality problems (no data/fit quality failure/no ADC data).
 - ECL luminosity monitor problems.
 - ECL hardware problems, with remote help from other ECL experts.

```
ssh bdaq.local.kek.jp
ssh recl1
b2ecl
~/restart.sh recl start
```

Note that restart.sh will only restart ECL-related processes.



4. Fixing ECL problems.

4. Fix ECL-related problems that prevent data-taking.
 - **ECL DAQ problems** (lost connection/**stuck**/UNKNOWN/ERROR/no data).
 - ECL front-end timing switch (ECL FTSW) problems (busy/ttlost/clklost/b2llost).
 - ECL data quality problems (no data/fit quality failure/no ADC data).
 - ECL luminosity monitor problems.
 - ECL hardware problems, with remote help from other ECL experts.

Sometimes nodes can get stuck in LOADING/CONFIGURING/etc.

Solution: same as in ‘lost connection’, refer to the above slides for details.

1. Refresh GUI (by pressing Reload button).
2. If it didn’t help, run
   ~/restart.sh recl stop start
   and then refresh GUI again if necessary.

RC_HLT_ECL, RCECLTRG often get stuck in ABORTING state, in this case contact corresponding expert (DAQ expert or ECL TRG expert).

4. Fixing ECL problems.

4. Fix ECL-related problems that prevent data-taking.
 - **ECL DAQ problems** (lost connection/stuck/**UNKNOWN**/ERROR/no data).
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 - ECL luminosity monitor problems.
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UNKNOWN == node crashed

Solution: same as in ‘lost connection’, refer to the above slides for details.

1. Refresh GUI (by pressing Reload button).
2. If it didn’t help, run
   ~/restart.sh recl start
   and then refresh GUI again if necessary.

4. Fixing ECL problems.

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First, just ABORT and LOAD again, hopefully it will be fixed.
(control room shifters are already instructed to do it before contacting ECL expert)

If the situation was not fixed, try these steps:
1. Restart ECL DAQ processes (refer to previous ‘lost connection’ slides).
2. Refresh GUI (refer to previous ‘lost connection’ slides).
3. Reprogram ECL collector firmware by running ecl-upload-collector-fw from b2ecl@recl1.

4. Fixing ECL problems.

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If there are no data, refer to ECL FTSW problems (subsection on FTSW busy)
or to ECL data quality problems (subsection on ‘no data’)

4. Fixing ECL problems.

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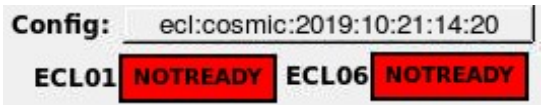
FTSW busy == deadtime is higher than ~75%.

1. Fix FTSW mask (ssh ttd11 ~b2ecl/ecl-reset-ftsw-mask).
2. Check masks in the GUI. All PCIe40 modules and their channels should be included. (don't forget to press "Save & Apply Mask")

3. Check config in GUI. If global run is started with testpulse config, deadtime will be very high.

For global run, config should be this:



Not this:

4. Reprogram collector firmware.
Use ecl-upload-collector-fw script from the Confluence instruction:
Uploading collector firmware

4. Fixing ECL problems.

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ttlost/ttdown == b2tt connection (timing) is down.

1. Check FTSW (statft -64 -c), sometimes ttlost from ECLTRG is reported as ttlost from ECL.
If that's the case, inform ECLTRG expert.
Otherwise, identify the source with ttaddr -64 -p

If ttlost happens once or twice, that's ok. Just continue data-taking.
If ttlost happens very often, this is the hardware problem.

2. In that case, write down the faulty module and try to reprogram FTSW.
Controlling FTSW #64

4. Fixing ECL problems.

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clklost == someone went to electronics hut and kicked FTSW or fell down on the cable

Ignore "Need to program **ftx034**" and "Need to program **ftx035**" errors, these modules are not used anymore.

1. Check status of high-level FTSW ('ftsw').
   ssh ttd11 then /usr/local/bin/jtag-chain-ecl.sh ftsw
   If there are errors of type "Need to reprogram xxx", do /usr/local/bin/jtag-program-ecl.sh xxx
2. Check status of low-level FTSW ('fee').
   ssh ttd11 then /usr/local/bin/jtag-chain-ecl.sh fee
   If there are errors of type "Need to reprogram xxx", do /usr/local/bin/jtag-program-ecl.sh xxx
3. Reprogram collector firmware:

```
ssh bdaq.local.kek.jp
ssh recl1
b2ecl
ecl-upload-collector-fw
```

4. Fixing ECL problems.

4. Fix ECL-related problems that prevent data-taking.
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b2llost == b2link connection (data) is down.

Just restart the run.

If it happens several times, try running
ecl-upload-collector-fw
from b2ecl@recl1

4. Fixing ECL problems.

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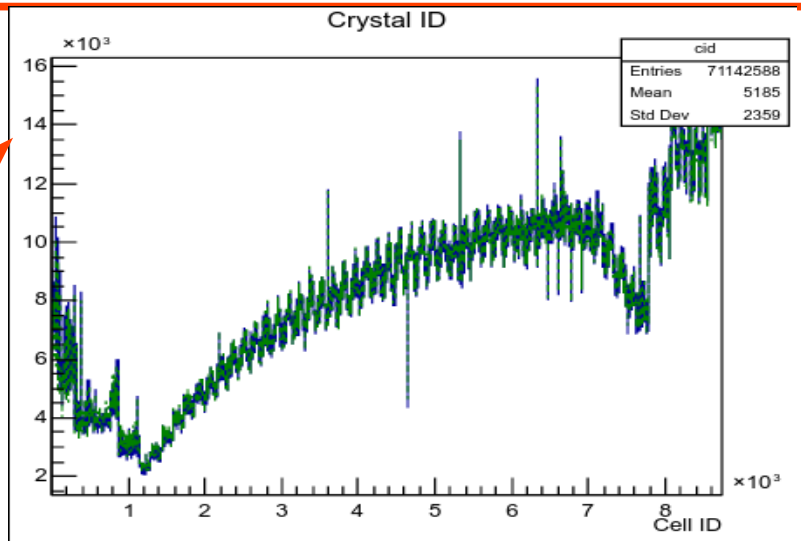
 - **ECL data quality problems** (**no data**/fit quality failure/no ADC data).
 - ECL luminosity monitor problems.
 - ECL hardware problems, with remote help from other ECL experts.

This problem is normally found from testpulse run data.
You can also discover it by checking occupancy histogram.



If (with sufficient statistics) some channel have 0 events:

1. Stop global run.
2. Re-program faulty modules with ecl-upload-collector-fw
Uploading collector firmware
3. If you have time, take testpulse run, check if problem is fixed.
4. Return to global run.

4. Fixing ECL problems.

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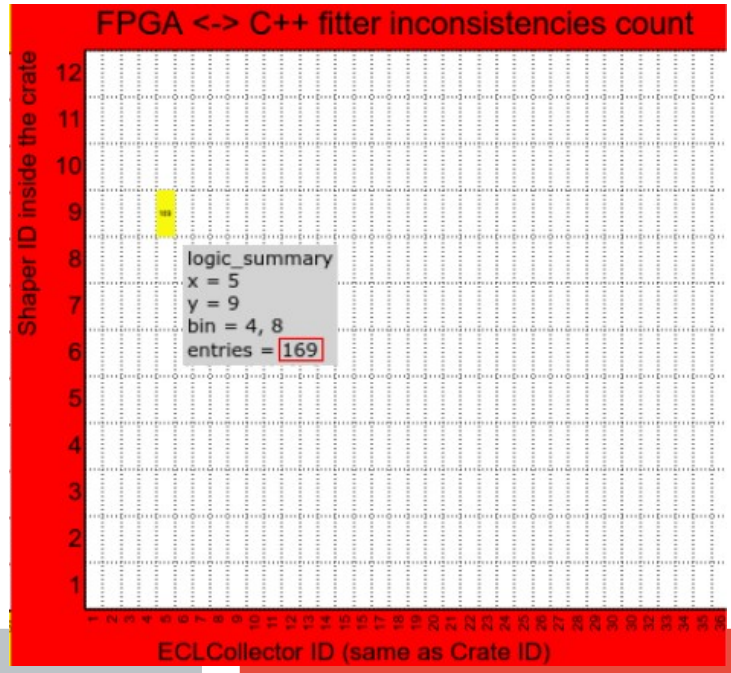
If some bins of ECL logic summary histogram contain > 50 entries:

1. Check with other ECL experts. This might have happened because DSP coefficients have been updated in electronics but not yet updated in the database.
(this will lead to false positives)

2. If that's not the case, stop and **full abort** global run, then re-initialize shaperDSP modules.
ssh recl1 , b2ecl , ecl-init-shaper
Shaper initialization



4. Fixing ECL problems.

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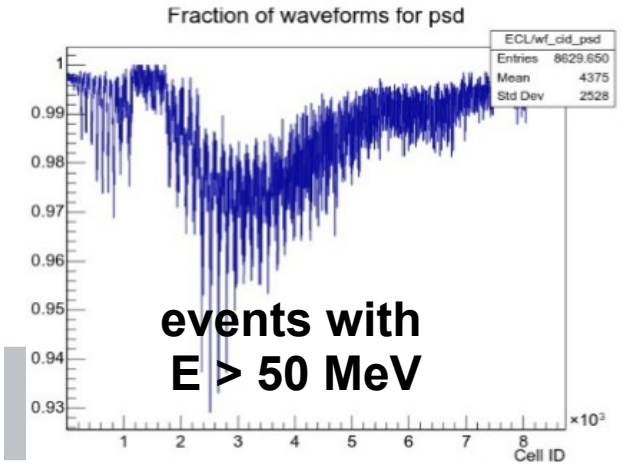
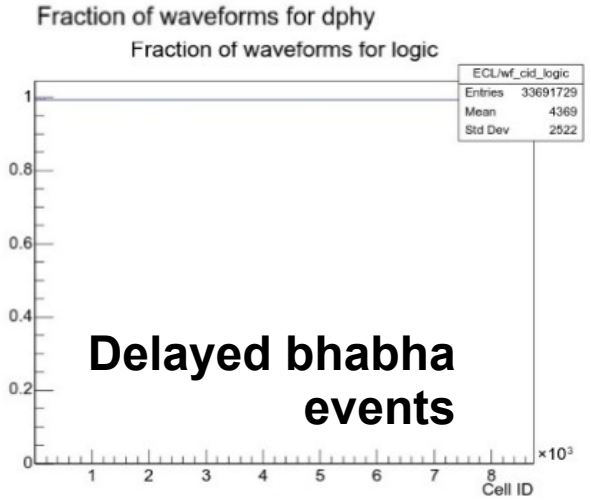
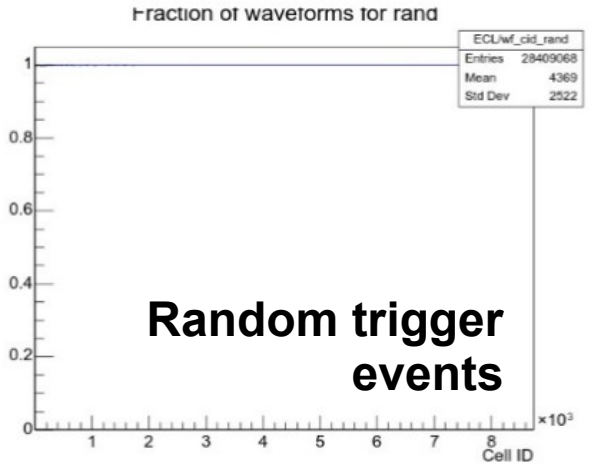
* verify that configuration is ‘cosmic’ and try to restart the run.

* If it didn’t help, inform other ECL experts. It will be necessary to study in detail if the problem is with all ECL collectors or only with some specific ones.







4. Fixing ECL problems.

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 - **ECL luminosity monitor problems.**
 - ECL hardware problems, with remote help from other ECL experts.

If there is no data from luminosity monitor:
ssh eclpc15 , b2ecl , ./restart_lom_server.sh
Press Enter

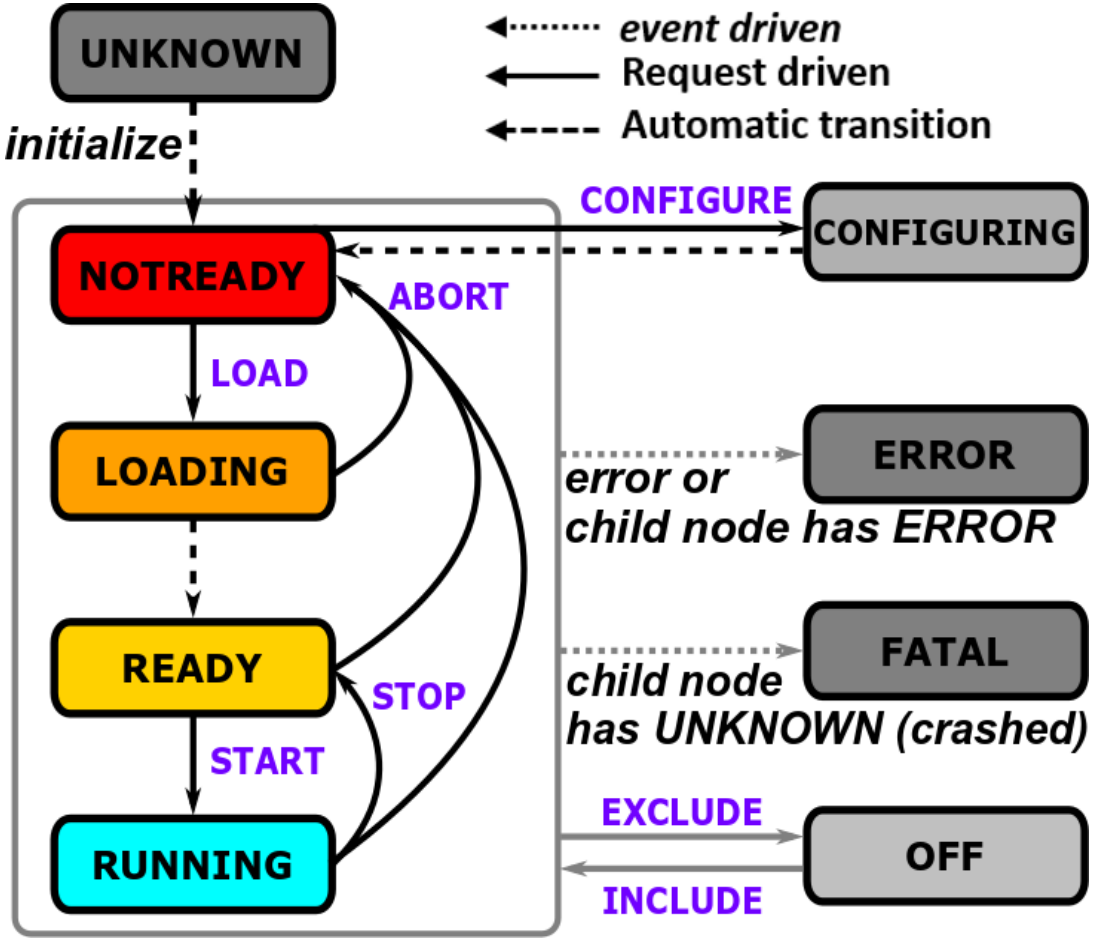
Checking that luminosity monitor sends data:
ssh eclpc15 , b2ecl , ./lumi_readout.sh

GUI will now show values instead of “Disconnected”

Backup slides

Run control status

Run control (RC) nodes compose DAQ system.



- UNKNOWN usually means that RC node has crashed.
- Most common states are:
  - NOTREADY
  - READY
  - RUNNING
- RC states have hierarchy:
  if child node has ERROR, parent node will usually have FATAL state.

Fixing ECL DAQ-related problems

Usually it is enough to just use:

```
ssh yourname@recl1
b2ecl
~/restart.sh recl start
```

If that didn’t work, try full restart of recl1-recl3

```
ssh yourname@recl1
b2ecl
~/restart.sh recl stop start
```

Initialization of ECL electronics

There are basically 2 steps to initialize ECL electronics

1. Load ECL collector firmware
   https://xwiki.desy.de/xwiki/bin/view/BI/Belle%20II%20Internal/Detector%20WebHome/ECL%20
2. Initialize ShaperDSP modules.
   https://xwiki.desy.de/xwiki/bin/view/BI/Belle%20II%20Internal/Detector%20WebHome/ECL%20

Before step 2 it is recommended to do:

```
[b2ecl@recl1 ~]$ ./clean_cpr_processes.sh
```

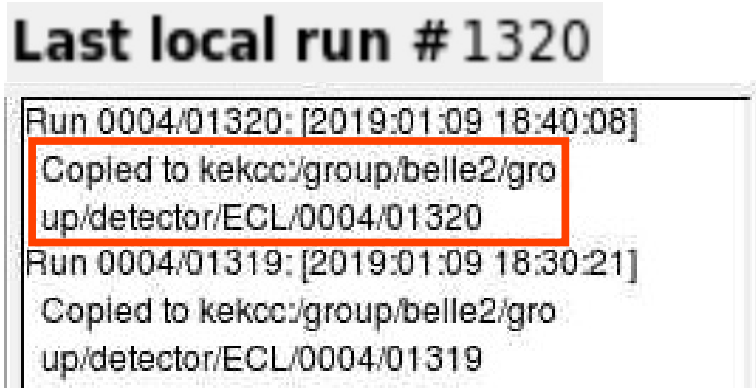
There will be many BEFORE and AFTER process lists.
You can check whether some processes were terminated.

Checking run data

ECL Shifter manual (Obsolete)

Runs are automatically copied to KEKCC.
If it wasn't copied, you can do it manually:

```
ssh yourname@qasrv01
~remnev/copy_run.sh 1320
# Press y
```



If it is not available within 2 hours, contact DAQ expert at b2rc.kek.jp

Then, at KEKCC (it's better to use X forwarding):

```
~remnev/localRunCalib/start_calib_shell.sh
calibrate 1320 ──→ takes ~2 minutes
check 1320
draw_norm 1320 ──→ already done in calibrate
```

Simple alternative: `~remnev/shared_scripts/check_run 4 1320`

0004/01304 as an example of bad data

```
~remnev/shared_scripts/check_run 4 1304
```

[ERROR] Ecl Unpacker:: bad shaper header { module: ECLUnpacker }
[ERROR] Corrupted data from ECL collector { module: ECLUnpacker }

[ERROR] Different trigger phases for crate 37 :: 108 != 74 ECL data is corrupted
for whole run probably
[ERROR] Different trigger tags for crate 37 :: 15 != 14 ECL data is corrupted
for whole run probably

Problems in collectors
1,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52