

# IST Slow Control GUI Instruction

## 1. IST Slow control GUI

The main IST GUI (Figure 1) should always be running on IST-OPS2, the PC on the left-hand side to the door when you enter the STAR control room (Display labeled as **IST-OPS2.STARTP.BNL.GOV**). In case it is not running, please start it according to instructions in section 6 how to start IST Main GUI. IST has 3 operation status and 3 status flags as following:

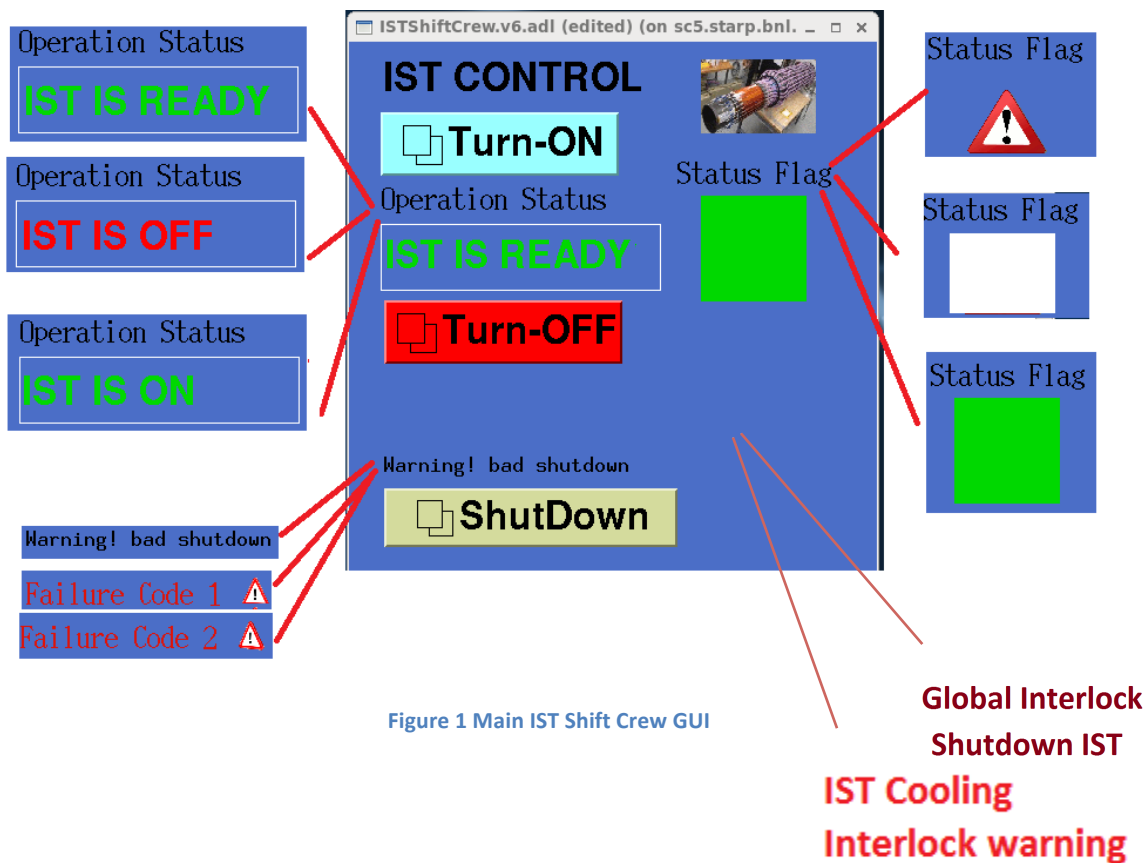
### 1. Operation Status:

1. **IST IS OFF:** It means IST power systems and all HV channels are switched off
2. **IST IS READY:** It means IST power systems and all HV channels are switched ON and in the correct working conditions. **ONLY IST IN THIS status is READY for PHYSICS.**
3. **IST IS ON:** It means IST power systems and all HV channels are switched ON, BUT not ready for physics.

### 2. Status Flags:

1. **Green:** It means there is no error in IST
2. **Flashing Warning:** It means there is an issue with IST, Please read the failure code and follow related procedure.
3. **White:** This happens if communication with "IOC" servers is lost due to network or ioc related problems.

**Note: If Status Flag is not Green immediately inform the shift leader and follow error procedure in the failure code section 5 (IV).**



## 2. Turning ON IST

**IMPORTANT Note:** Before turning on the IST, Please check with the shifter leader and the detector status spreadsheet that show when it should be on/off and when it is safe to turn on IST (e.g., make sure that there will be NO change in the beam condition when IST is on). Please remember that the IST is at risk when it is ON. So unless it is absolutely necessary (e.g., physics data taking or calibration), the IST should be in OFF status.

- 1- Click on “Turn-ON” button in the IST main GUI. A second window (Figure 2 left) will show up to ask you for confirmation to turn on the IST.
- 2- Click on “Confirm” button to start turning on IST. A terminal (Figure 2 right) will show up, automatically executing the commands to turn on the IST. After about 90 seconds, the terminal (Figure 2 right) will disappear. The IST status bar will become Green indicating that turning on IST is successful and “IST IS READY” text will appear in main GUI and confirmation windows (Figure 3).
- 3- Close the confirmation window (Figure 2 left) and inform the shifter leader that the IST is turned on.

**Note:** After the terminal (Figure 2 right) disappears, the status bar on the main GUI should be green with the message “IST IS READY”. In case the turn-on process is not successful, a failure flag will show up in the main GUI (see section “Failure Codes and Actions To be Taken”) in this case:

- I. Close the Turn-on Confirmation window
- II. Click on the “TURN ON” button on the IST main GUI again and repeat the above procedure.
- III. If the Issue remains after this second trial, click on “ShutDown” button on the main GUI (see section “Emergency Shutdown”) and then repeat the “Turn ON” procedure. If this still does not solve the problem, Click on “ShutDown” button on the main GUI (see section “Emergency Shutdown”) and contact the IST on-call expert.

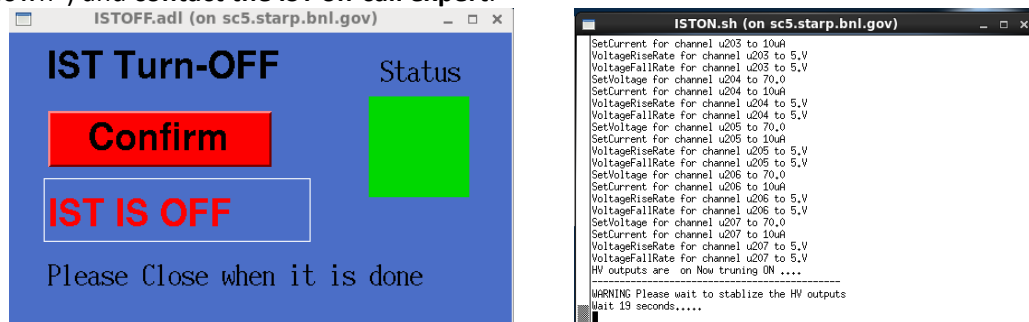


Figure 2 Left: IST Turn-On Confirmation Window; Right: Pop-up terminal during turn-on.

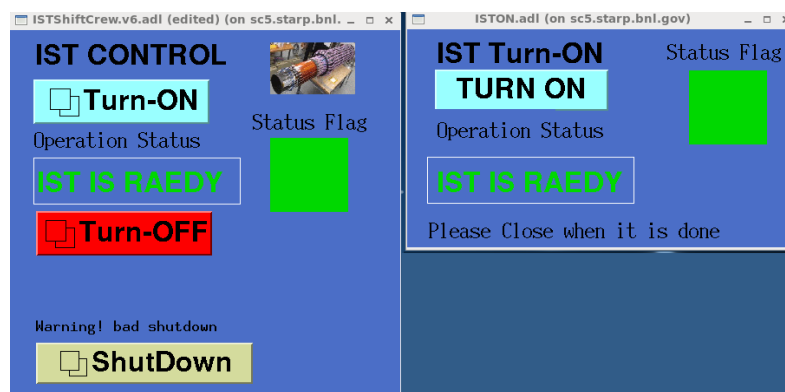


Figure 3 IST Main GUI (Left) and Turn-on Confirmation Window (Right) after the IST has been successfully turned on.

### 3. Turning OFF IST

- 1- Click on **“Turn OFF”** button in the IST main GUI (Figure 1). A window (Figure 4 left) will show up to ask you for confirmation to turn off the IST.
- 2- Click on the **“Confirm”** button. A terminal (Figure 4 right) will show up, automatically executing the commands to turn off the IST. After about 60 seconds, the terminal (Figure 4 right) will disappear after the last command being executed. The IST status bar will become green indicating that turning off is successful and **“IST IS OFF”** (Figure 5).
- 3- Close the Turn-Off confirmation window (Figure 4 right) and inform the shifter leader that the IST is off.

**Note:** After terminal disappears if the status bar does not go to green or the main GUI shows a failure flag (see section “Failure Codes and Actions To be Taken”) do following steps:

- I. Close the Turn-Off confirmation window (Figure 4 right), then click on **“Turn OFF”** button again and repeat the above procedure.
- II. If this does not solve the issue, Click on **“ShutDown”** button on the main GUI (see section “Emergency Shutdown”) and contact the IST on-call expert.

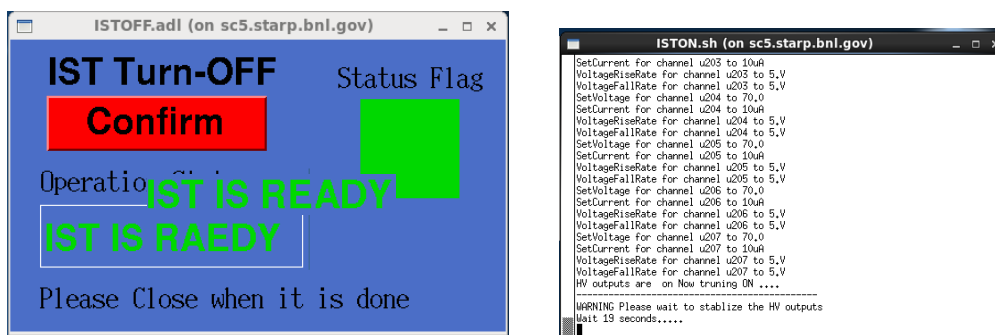


Figure 4 Left: IST Turn-Off Confirmation Window. Right: Pop-up terminal during turn-on.

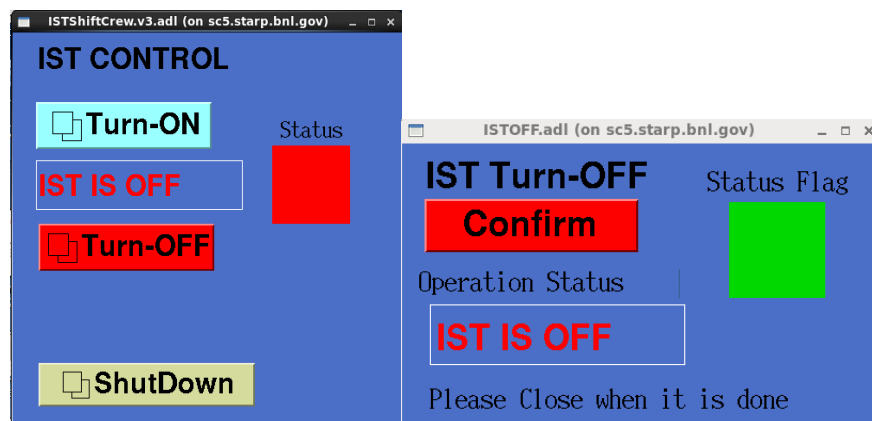


Figure 5 IST Main GUI (Left) and Turn-off Confirmation Window (Right) after IST is successfully turned off

## 4. ShutDown

In the situations that you need to turn off the IST very quick consulting with shift leader and the detector status spreadsheet (for instance Magnet trip/ramp or Beam injection is imminent shortly and there is no time to Turn-off IST properly) or in case of appearing the failure code in main GUI (Please follow failure section), you should use Emergency Shut-Down procedure.

1. Click on the “ShutDown” button in main GUI (Figure 1). A new window will pop up (Figure 6).
2. Click on the “Confirm” button to Shut Down the IST. This will raise a “warning bad shutdown” text in IST Main GUI, which can be cleared in next IST Turn-on.
3. If it did not cleared out follow the failure code section.

**Note:** After Power Shut Down procedure is done if IST does not go to green “IST IS OFF” state as shown in Figure-1 and 2-left or shows a failure flag, you should Turn OFF IST Trun-ON it again. If it does not solve the issue, do **Shutdown** again and contact IST-Experts.

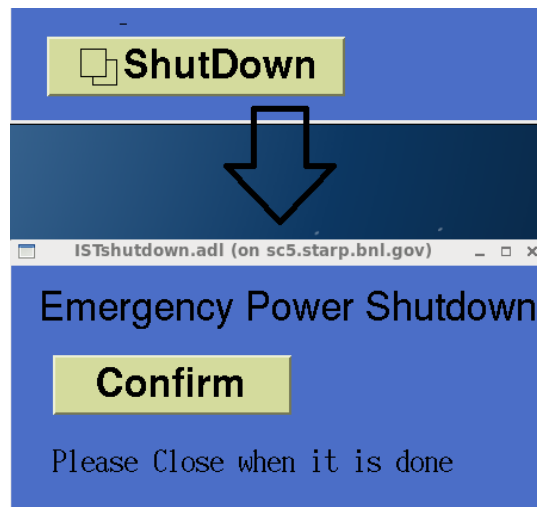


Figure 6 IST Emergency Power Shutdown Confirmation window.

## 5. Failure Codes and Alarms and Actions should be taken

**Note: Any warning or failure even after being fixed MUST be written in shift log.**

Following failure codes in case of any problem will appear in main IST GUI as shown in Figure-7 and for these failures and also they will activate an Alarm:

### 1. Time Out error in terminal:

If there would be some “time out” error and loop of error in terminal after confirming the Turn ON/OFF and **repeat more than 2 minutes**, you should close (only) the terminal and click again on Confirmation button to continue Turning ON/OFF the IST.

### 2. Failure Code 1:

This will appear if IST is in OFF state but a crate shows power on. To fix this error follow these steps:

- 1- do a Shutdown procedure, it should clear the error code and show a warning “Warning bad shutdown” in main IST GUI,
- 2- if it does not clear the Failure code 1, try the Emergency Shutdown procedure **two more times**. If the error remains call expert immediately.

### 3. Failure Code 2:

This will appear if IST is in ON state but a crate shows power off or one of the HV channels trips or be shut off due to current limit shutdown or other issue that turns off one or more HV channels. To fix this error follow these steps:

- 1- do “Turn On” IST again. After procedure is done in a few seconds, “IST IS READY” and green rectangle should be in screen as shown in Figure-3.
- 2- if error remains **Do Shutdown** procedure after that do “Turn On” for **second time**. After the **2<sup>nd</sup> Turn** on if still error remains **Do Shutdown** procedure and call IST-Experts.

### 4. Warnings:

If there is warning the “Warning bad shutdown” which will appear after **Shutdown** that should be cleared after first successful turn-on procedure. This warning does affect the IST status and if the Status Flag is green IST is ready for Physics but If it is not cleared after successful turn-on and appearing green “IST IS READY” please call expert.

### 5. Link to IOC Lost:

In case of network or ioc issue, Some **white** windows will appear in main GUI or child GUIs as Figure 8. (They are marked with red triangles in Figure 8 to show the places but in real GUI the triangles won't appear). If this status took more than 10 second IST was off do not turn it on contact slow control and IST expert and if IST was in on state:

- I. Immediately inform the shift leader to inform the MCR and make sure that the beam won't be dumped until the IOC problem is solved and IST is ready for beam dump.
- II. Do **ShutDown** procedure and inform shift leader to contact IST and slow control experts. **DO NOT trun-on IST in this status.**

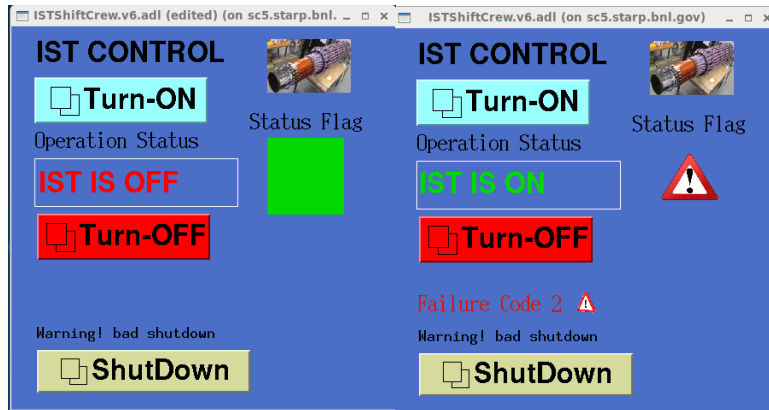


Figure 7 IST GUI with warning flag at left and failure flag and its code at right

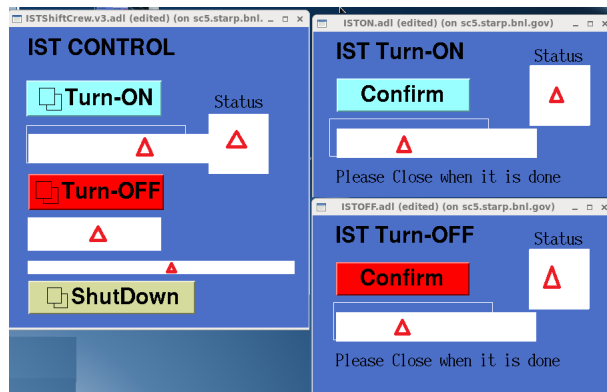


Figure 8 Appearance of IST Main GUI when link to IOC is lost

## 6. Start IST Main GUI

- 1- Open a terminal on IST-OPS2 display.
- 2- Login to SC5 as following “ssh sysuser@SC5” and “sysuser” password that you should get it from STAR red-book at Control Room.
- 3- Please follow the IST\_GUI\_START\_README.txt that is saved at IST-OPS2 desktop for latest command to start the IST main GUI.

## 7. IST Power Recycles

There cases that readout chips or run control software needs a reboot and restart one can power cycle IST as the following:

1. Do Turn OFF procedure and make sure status is green.
2. Do Turn ON procedure and make sure status is green.

## 8. IST Deadtime Stays at 100%

1. Stop the run, and start a new one
2. If the problem persists, stop and start a new run again
3. If the problem still persists, Power cycle the IST
4. If the problem still persists, turn off the IST, rremove it from data taking and call IST expert.
5. If the problem is resolved from any of the above steps, write an email to [starist-l@lists.bnl.gov](mailto:starist-l@lists.bnl.gov)

## 9. IST RDOX problem (Temporary fix)

If the auto-recovery did not fixed it and stops the run and asks to power cycle IST manually please do following steps:

- 1- Reboot IST from run control menu and start another run.
- 2- If it did not fix it , Power cycle IST as written operation manual from **IST Slow Control GUI** ( or just simply Turn off IST then Turn ON ) than reboot IST again from run control menu.
- 3- Start another run after IST power cycled if it did not fix the RDOX issue, mask out the RDOX and start another run then call/email experts.

### How to mask out RDOX:

From run control, go to “Edit configuration” chose the “daq” from “DAQ\_RUN\_name” menu then click on “details” then a window would pop up. In that window go to [23] IST, Now you can Un-mark the RDO number “X” (or X<sup>th</sup> block from left), then click OK .

## 10. Global Interlock warning

IST power supply is connected to Global interlock system. In case of activation of Global Interlock alarm, IST would be shutdown automatically. In this case you will see the warning message in GUI (Figure 9).

### Global Interlock Shutdown IST

Figure 9 Global interlock warning

In this case IST would not response to any Turn ON/OFF command and **you should do IST “Shutdown” procedure**. Only after Global Interlock alarm is deactivated you can gain access to IST Slow control.

## 11. IST Cooling interlock

IST has a cooling system, which is running all the time either IST is ON or OFF. If there would an issue with cooling system there is a interlock system that would shut down IST. In this case IST would not response to any Turn ON/OFF command and the warning message would appear in IST GUI (Figure 10).

### IST Cooling Interlock warning

Figure 10 Cooling interlock warning

**You should do IST “Shutdown” procedure and call experts**. Only after Global Interlock alarm is deactivated you can gain access to IST Slow control.



## 12. IST Online QA Plots

The Shift Crew should regularly check the IST online QA plots. Reference plots for the most important distributions are shown below. In case of significant discrepancy, please contact the IST on-call expert.

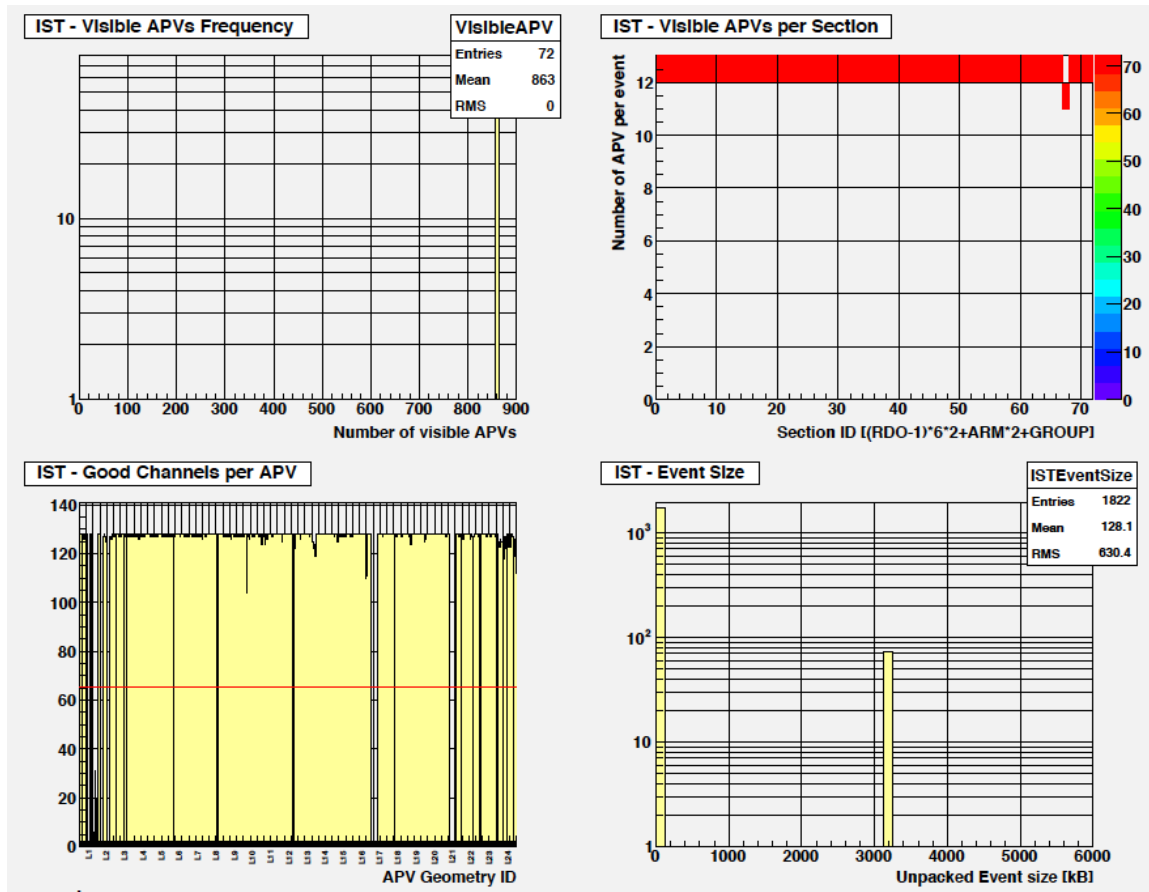


Figure 11. IST Online QA Plots (A): Top-left, number of visible APV chips per event; Top-right, number of visible APV chips per event vs section number; Bottom-left: number of good channels vs APV Geometry ID; IST Data size per event.

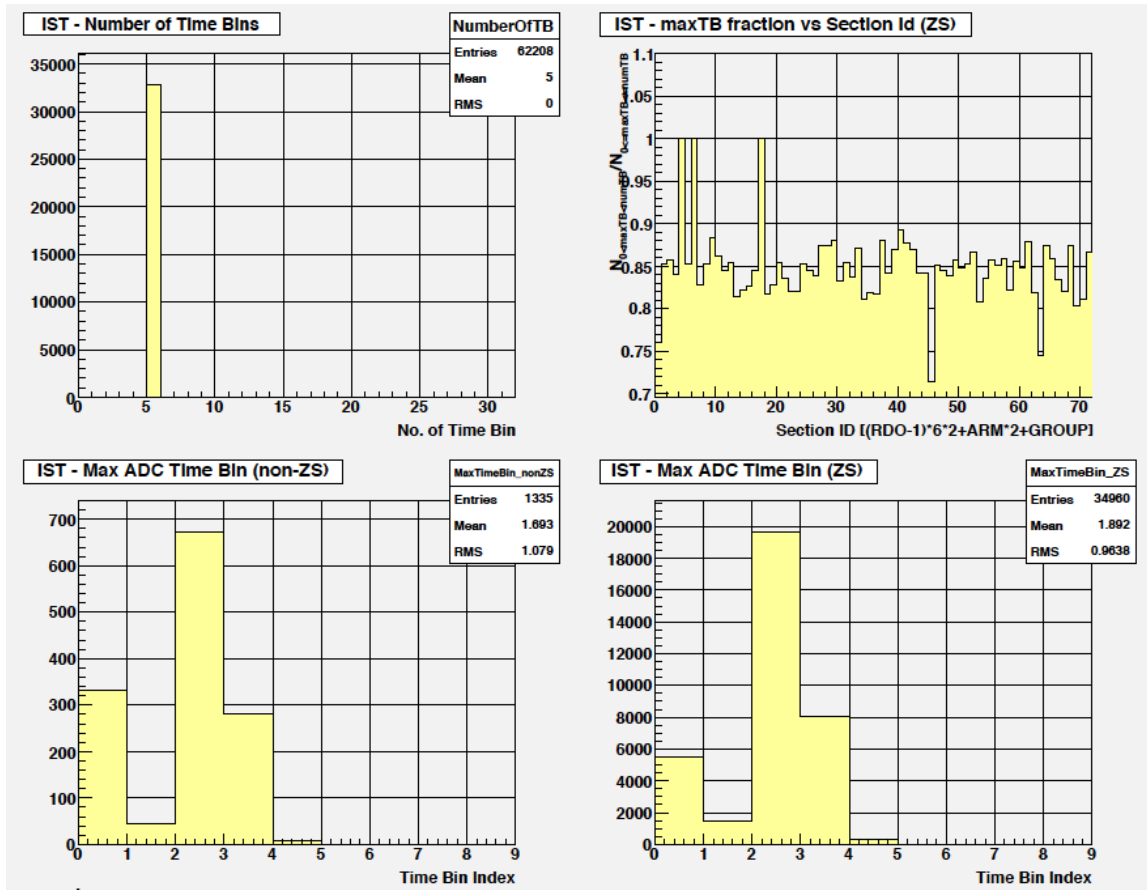


Figure 12. IST Online QA Plots (B): Top-left, number of time bin; Top-right, fraction of max ADC time bins that are not 0; Bottom-left, max ADC time bin distribution in non-ZS data stream; Bottom-right, max ADC time bin distribution in ZS data stream;

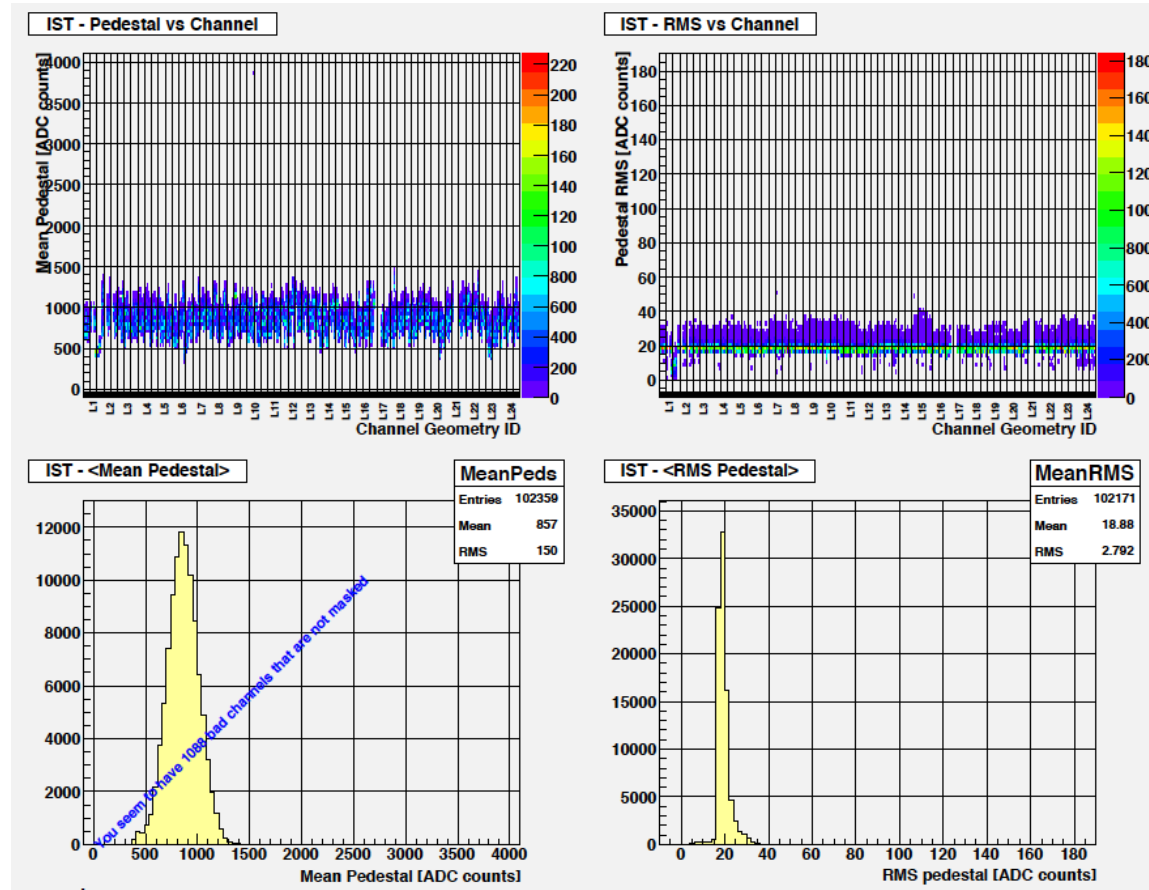


Figure 13. IST Online QA Plots (C): Top-left, IST pedestal mean vs channel Geometry; Top-right, IST pedestal RMS vs channel Geometry ID; Bottom-left, IST pedestal mean distribution; Bottom-right, IST pedestal RMS distribution.

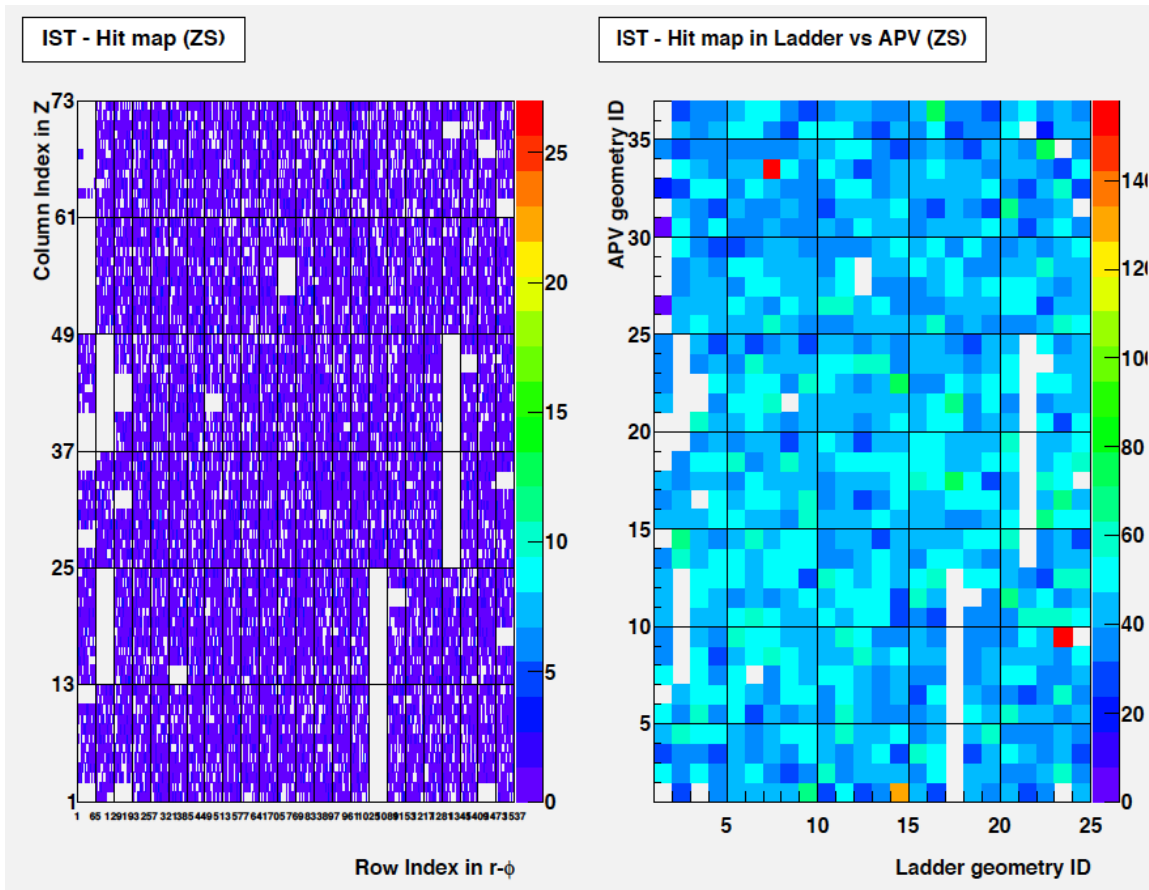


Figure 14. IST Online QA Plots (D): Left, IST hit map vs Pad row and column indices; Right, IST hit map vs Ladder and APV geometry ID.

### **IST Detector Expert Contact Info:**

Zaochen Ye (on-site), cell: [312-804-3915](tel:312-804-3915), office: x5795, [zye20@uic.edu](mailto:zye20@uic.edu)

Xiaozhi Bai (on-site), cell: [312-998-2257](tel:312-998-2257), [xiaozhi@uic.edu](mailto:xiaozhi@uic.edu)

Bingchu Huang, cell: [631-312-8695](tel:631-312-8695), [bingchu@uic.edu](mailto:bingchu@uic.edu)

Zhenyu Ye, cell: [630-962-9496](tel:630-962-9496), [yezhenyu@uic.edu](mailto:yezhenyu@uic.edu)

Gerrit J. van Nieuwenhuizen, cell: [857-928-7477](tel:857-928-7477), [nieuwhzn@gmail.com](mailto:nieuwhzn@gmail.com)