FACET-II DAQ

Live planning notes

Goal: Update DAQ to HDF5

- What has already been done?
 - We have a working version of the HDF5 DAQ, and now we are working on making it robust
 - ° Sharon has shown that HDF5 file writing in "Streaming" mode is very fast.
 - Now we want to extend capability for scans so that we have 1 file per camera.
- How to save scan image data into HDF5 file?
 - Use PVs:
 - extraDimSizeN = Number of shots per step
 - . nExtraDims = Number of scan dimensions (0 = simple DAQ, 1 = 1D scan, 2 = 2D scan . . .)
 - extraDimSizeX = Number of steps for Dim 1
 - extraDimSizeY = Number of steps for Dim 2
 - extraDimSize3 = Number of steps for Dim 3

 - ° These PVs implicitly control the NumCapture PV
 - NumCapture_RBV = extraDimSizeN * extraDimSizeX * extraDimSizeY * . . . (depending on number of nExtraDims)
- In this scheme, we have to carefully control the triggers so that each scan step gets exactly the right number
 - We will use a new feature to do this:
 - EVNT:SYS1:1:PMAQCTRL.H = extraDimSizeN = Number of shots per step
 - EVNT:SYS1:1:PMAQCTRL.E = 0/1 to stop/start triggers to cameras
 - Need to toggle back to 0 after every step
 - Set EVNT:SYS1:1:PMAQCTRL.H back to zero at end of scan
- · What happens if the camera does not receive all triggers?
 - $^\circ$ Then scan steps are kind of messed up . \ldots think about how best to handle this with pulse ID
- Prefer "NDArrayUniqueId" to be "NDArrayPulseId"
- Make caput/lcaPut/lcaPutSmart consistent
- "BSA buffer" for UV spectrometer IOC?
- Find a reliable fix to shot counting issue
 - checkShots is not counting the correct number of shots at some steps. we think the DAQ is just not waiting long enough for the shot number to go up, because the shots do get saved eventually
 - for E332 shift on 5/30, we just added a while/pause loop to force DAQ to wait for shot numbers to go up
 - ^o if we decide to keep this functionality we should at least add a break for the while loop but for now it is working again

DAQ tests E320 shift 4/30/24

Testing TIFF/HDF5 switch

- take a DAQ with TIFF and try to load it in DAN
- results look normal
- Testing HDF5 DAQ
- take a DAQ with HDF5, simple DAQ, 20 shots, 1 camera (LBG_LFOV)
- all 20 shots saved
- test with 1000 shots
 - saved 999 shots
- took a little over 2 minutes
- add more cameras (LBG_LFOV, EOS2, GAMMA1)
- saved 993 shots for each camera
- ~2 min 10 seconds in total
- try streaming
- 1000 shots
- failed TEST 7480
- try streaming but with 10 shots
- success with all matches
- try streaming with 200 shots
- success with 197 matches
- try streaming with 700 shots
- says DAQ failed on step 1 but 641 matches
- try streaming with TIFF, 700 shots
 - saved 155 matches
- took a little more than 3 minutes
- try a 1D scan, 10 shots, 3 steps
 - did not restore to initial value - Spec Quad E

 - 28 matches
- trying a 2D scan, 10 x 2 x 2
- saved 40 shots - trying 2D scan with streaming
- saved 40 shots
- try to open HDF5 images in DAN
- error when "Plot Correlation" button pushed, expecting a TIFF image
- Error in hlpGetImage with "imgType'

Bugs and Robustness

Issue	Person	Priority	Status	Notes
Background not being saved	Sharon	High	DONE	
Not saving non BSA data and getting F2_EventClass error	Sharon	High		This is caused by a PV in a list being down
Implement HDF5 file saving for images	Sharon	High	Testing	
Modify DAQ to write image data to "RAM disk"		High	N/A	
Calculate how much space on disk is required		High		
Install 10G switch and NAS in S10	Arjun	High	Planning	
Check what happens if new DAQ is started before old one is finished (failed abort)		High		
Fix binning and ROI for CMOS cameras		Medium		
Can't get magnet values on first DAQ?		Medium		
Check that the beam rate is not equal zero if rate set to "BEAM"	Spencer	Medium		
Fix "Use_PV" functionality.	Sharon	Medium	DONE	
Fix camera triggers if DAQ fails.	Sharon	High	DONE	
"Fix cameras" button disabled if DAQ hasnt run yet	Sharon	Medium	DONE	
"Fix cameras" button should use default values? - yes	Sharon	Medium	DONE	
Timestamping fails on certain ROI settings?	Spencer	High	DONE	
Upgrade all machines in S20 to 10G connection	Spencer	Medium	DONE	
Camera binning messes up pulse ID finding	Spencer	Medium	DONE	

Feature requests

Issue	Person	Priority	Status
Add check/remove bad PVs and notify user in an obvious way	Sharon		
Add nonBSA arrays so we can get UV spectrometer (Claudio request)	Sharon	High	DONE
DAQ Monitor GUI	Sharon	High	DONE
Find a way to globally trigger a modifier bit (e.g. "DUMP_2_9").	David		
Scan function that pauses until you click 'ok'			
Generate "camera config" file including trigger info and add a save/restore button. Monitor if this finished ok or not.	Sharon		
Load/Save Config files. Default config files.	Claire		
Robustness issues	Spencer	High	In progress
DAN features	Sharon		
Documentation/commenting	Spencer	High	In progress
Fix "Use_PV" functionality.	Sharon	Medium	DONE

Documentation

For now, the main references on the DAQ are these attached PDFs from IBIC 2021.



GUI Interface

Main screen Profile Monitor LI20 FACET DAQ (green button)

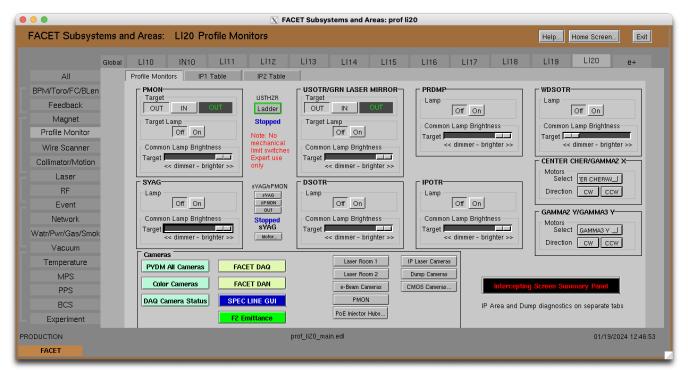
			X FA	CET Subsys	tems and A	reas: prof	li20						
FACET Subsystems a	ind Areas: LI20	Profile Mo	nitors							Help	Home Scree	n Exit	
Global	LI10 IN10 Profile Monitors	LI 11 IP1 Table	LI 12 IP2 Table	LI13	LI14	LI15	LI16	LI17	LI18	LI19	L120	e+	
BPM/TordFC/BLen Feedback Magnet Profile Monitor Wire Scanner Collimator/Motion Laser RF Event Network WatVacuum Temperature MPS PPS BCS Experiment	PMON Target Lamp Ort C Common Lamp Br Target K SYAG Lamp Ort C Common Lamp Dr Target	cur https: brighters> a ghtness brighters> cur brighters> cur cur cur cur cur cur cur cur	USTH2R Ladder) Stopped Note: No mechanical limit switches Ecyperi use only svAGsPMON 2005 3 svAGsPMON 2005 2007 2007 2007 2007 2007 2007 2007	Target OUT Target L Commor Target Commor Target Commor Target		OUT ress ghter >> ress res	IPOTR Lamp Common Target	Off On Lamp Brightr dimmer - bri Off On Lamp Brightr dimmer - bri IP	ess ghter >> hess ghter >>	CENTER Motors Selec	Off On Lamp Bright dimmer - bri CHER/GAMI CHER/GAMI CHER/GAMIA3 CONCOLONIC CONCOLONICS	ghter >> AA2 X	
PRODUCTION FACET			1	orof_li20_ma	n.edl						01/1	9/2024 12:46:	:53

Wait for a bit after pressing the FACET DAQ button.

AQ Settings		Camera Config				
Experiment E300 V Co	mment	▶ \$10 Inj				
Event Code		S10 Laser				
		S11 Linac	dd			
0 53 TS5 10 Hz		S14 Linac				
		S15 Linac	Bor	nove		
Shots per step 20 🗹 F	Print to eLog?	S20 Chicane	Rei	love		
✓ Save background	Load Preset	▶ S20 Exp				
Background shots 1		 S20 Laser S20 sCMOS 				
	Clear Preset	F 520 SCINOS				
V Lists		Scan				
BSA Data	non-BSA Data	Scan Type				
BSA_List_S10	nonBSA_List_LaserS10	Single Step 🔻				
BSA_List_S11 nonBSA_List_LaserS20		First Dimension		Second Dimension		
BSA_List_S14	nonBSA_List_S10	Scan function				
	BSA List S20 InonBSA List S11 InonBSA List S1			Scan function		
Add Remove Display Add Remove Disp		Dummy_Scan	•	Dummy_Scan 🔻		
		PV		PV		
		Tolerance	0	Tolerance	0	
Include SCP Display	Include non-BSA Arrays	Start	0	Start	0	
	,	Stop	0	Stop	0	
un						
Run	Abort	Steps	0	Steps	0	
		Scan Values		Scan Values		
Loaded 63 cameras.						

DAQ Camera Status GUI

Main screen Profile Monitor LI20 DAQ Camera Status



Indicator lamps light up when a camera is being used by the DAQ, and the "Shots Recorded" field updates as the DAQ runs

0 Laser	S10 Injector LI10-11	Linac Laser F	Room 1 Laser Room 2	e-Beam	Cameras IP Laser Camera	as Dump Cameras	CMOS Cameras	
	Name	FPS	Settings	CNCT	Shots Requested	Shots Recorded	In Use by DAQ	
	C1F	10.00	Camera		20	20		
	CIRISF	10.00	Camera	0	20	20		
	C2F	10.00	Camera	•	20	20		
							SIOC-LR10-LS01	
	OscOut	9.00	Camera	•		0		
	RegenOut	10.00	Camera	•		0		
	MPAOut	8.00	Camera	\bigcirc	100	100		
	CompOut	10.00	Camera	\bigcirc	200	200		
	C1F	10.00	Camera	\bigcirc	20	20		
	CIRISF	10.00	Camera	\bigcirc	20	20		
	C2F	10.00	Camera	\bigcirc	20	20		
	LHCompOut	10.00	Camera	\bigcirc	20	20		
	LHLaunch	10.00	Camera		20	20		
							SIOC-IN10-PM01	