NSLS-II

NATIONAL SYNCHROTRON LIGHT SOURCE II

Beamline EPS Acceptance Testing

Rev Date: 09/16/2015
Author: Barrett Clay
Approved: 09/16/2015

Title	Name	Approval Date
Controls Infrastructure Group Leader	Ruslan Kadyrov	09/16/2015
ES&H Operations Manager	Lori Stiegler	09/16/2015
Quality Assurance Engineer	Joseph Zipper	09/16/2015

Serial No	Part No	Part Rev	ECN	Rev	ECN	Rev
	Beamline: 8-ID ISS					

Deviation & Waiver: _____

OP	Description	Name/Life #	Date	DR
10	Follow the ES&H and Personal Protective Equipment Requirements for the area.	Ruslan Kadyrov 25392	3/22/16	
20	Verify measuring and test equipment used for this procedure contains a valid calibration label in accordance with NSLS-II Calibration Procedure PS-QAP-0901, where applicable. The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with NSLS-II Discrepancy Reporting Procedure PS-QAP-0002.	Ruslan Kadyrov 25392	3/22/16	
30	BEAMLINE INFORMATION - This step shall be performed by the cognizant EPS Engineer. A) Record the relevant Beamline name on this sheet, in the box for "Part No". B) Review this entire traveler and write in the relevant drawing, software, and procedure numbers where required	Ruslan Kadyrov 25392	3/22/16	
40	INSTALLATION VERIFICATION A) List the relevant drawing(s): Drawing No.: LT-EL-BL-EI-EPS-1080-90 Rev. No.: A Drawing No.: — Rev. No.: — B) Verify the following items are acceptable: ✓ System layout configured per drawing(s) ✓ System Labeled / Tagged	Mike Bilello 24738	3/22/16	

OP	Description	Name/Life #	Date	DR
50	SOFTWARE CONFIGURATION A) Download PLC software to controller and verify it was accepted by the controller. B) Record the software part number: Part No.: LT-EL-BL-ET-EPS-1080-70 Rev. No.: A	Ruslan Kadyrov 25392	3/21/16	
60	ACCEPTANCE TESTING A) List relevant testing procedure Procedure No.: PS-R-XFD-EPS-CHK-001 Rev. No.: 1 B) Verify acceptable completion of test procedure C) Attach test report to this traveler	Ruslan Kadyrov 25392	3/22/16	
65	WATER LEAK DETECTION SYSTEM TEST Verify water leak detection system, as designed for this beamline, functions correctly.	Ruslan Kadyrov 25392	3/22/16	
70	Verify All Traveler Operations Complete	Ruslan Kadyrov 25392	3/22/16	
80	REVISION HISTORY (This step is informational and does not require signoff) Rev - Description - Date A First Release 8/27/2014 B OP#65 added 9/16/15 Joe Delong removed as approver Ruslan Kadyrov added as approver			

Beam Line: 8-ID ISS

Test Date:

EPS Engineer: TBD

BL Group Leader: Klaus Attenkofer

Beam Line master spreadsheet: LT-R-XFD-CO-DR-ISS-001_A

Pre-test setup:

Connect PPS interface test box at beam line EPS/PPS interface connector.

The Beam Line Master Spreadsheet contains a comprehensive list of all EPS related signals. As this test plan is executed note the results in the "test results" column of this spreadsheet.

Test Set 1: Vacuum

Vacuum Section:

Starting conditions: pressure at or below acceptable limits, GVs open.

Simulate pressure rise (toward poor vacuum) by disabling the vacuum gauge controller channel. Ensure EPICS PVs enter proper alarm states, photon shutter closes[1] and vacuum section is isolated. Two local gate valves and one (or more, if it is required to isolate upstream section, e.g. section branching) upstream gate valve close. Record results for the following:

EPICS PV Alarm

EPS fault

Photon Shutter closes

GVx closes

GVy closes

GVz closes

Attempt to open the front end shutter and gate valves through EPICS.

Photon shutter and gate valves cannot be opened through EPICS (1)

Enable vacuum gauge controller and ensure EPICS alarms clear. Open gate valves and photon shutter through EPICS.

Photon shutter and gate valves can be opened through EPICS (2)

[1] if the intensity of the beam in the section cannot cause damage to its valves, poor vacuum doesn't have to cause shutter close

Gauge Name	EPS fault:				(1)	(2)
	Shutter:	d/s GV:	u/s GV:	D u/s:		
XF:08IDA-VA{Fltr:FB-CCG:1}	SHFE	✓	✓ ☆	N/A	✓	✓
XF:08IDA-VA{Fltr:FB-TCG:1}	—	—	—	N/A	✓	✓
XF:08IDA-VA{Fltr:FB-CCG:2}	SHFE	✓	✓ ☆	N/A	✓	✓
XF:08IDA-VA{Fltr:FB-TCG:2}	N/A	N/A	N/A	N/A	—	—
XF:08IDA-VA{Fltr:FB-CCG:3}	N/A	N/A	N/A	N/A	—	—
XF:08IDA-VA{Fltr:FB-TCG:3}	N/A	N/A	N/A	N/A	—	—
XF:08IDA-VA{Mir:1-CM-CCG:1}	SHFE	✓	✓	—	✓	✓
XF:08IDA-VA{Mir:1-CM-TCG:1}	—	—	—	—	✓	✓
XF:08IDA-VA{Mono:HHM-CCG:1}	SHFE	✓	✓	—	✓	✓
XF:08IDA-VA{Mono:HHM-TCG:1}	—	—	—	—	✓	✓
XF:08IDA-VA{Mono:HHMI-CCG:2}	—	—	—	—	—	—
XF:08IDA-VA{Mono:HHMI-TCG:2}	—	—	—	—	—	—
XF:08IDA-VA{Mono:HRM-CCG:1}	—	✓	✓	—	✓	✓
XF:08IDA-VA{Mono:HRM-TCG:1}	—	—	—	—	✓	✓
XF:08IDA-VA{Mir:FM-CCG:1}	—	✓	✓	—	✓	✓
XF:08IDA-VA{Mir:FM-TCG:1}	—	—	—	—	✓	✓
XF:08IDA-VA{BT-CCG:1}	—	N/A	✓	—	✓	✓
XF:08IDA-VA{BT-TCG:1}	—	N/A	—	—	✓	✓
XF:08IDA-VA{BT-CCG:2}	—	N/A	✓	—	✓	✓
XF:08IDA-VA{BT-TCG:2}	—	N/A	—	—	✓	✓
XF:08IDB-VA{BT-CCG:3}	—	N/A	✓	—	✓	✓
XF:08IDB-VA{BT-TCG:3}	—	N/A	—	—	✓	✓

☆ = ~~TESTED UP TO CONNECTOR~~ Tested in full R. Kadyrov 3/22/16

Simulate pressure rise (toward poor vacuum) by disabling the vacuum pump controller channel. Ensure EPICS PVs enter proper alarm states, photon shutter closes[2] and vacuum section is isolated. Two local gate valves and one upstream (or more, if it is required to isolate upstream section, e.g. section branching) gate valve close. Record results for the following:

EPICS PV Alarm

EPS fault

Photon Shutter closes

GVx closes

GVy closes

GVz closes

Attempt to open the front end shutter and gate valves through EPICS.

Photon shutter and gate valves cannot be opened through EPICS (1)

Enable vacuum pump controller and ensure EPICS alarms clear. Open gate valves and photon shutter through EPICS.

Photon shutter and gate valves can be opened through EPICS (2)

[2] if the intensity of the beam in the section cannot cause damage to its valves, poor vacuum doesn't have to cause shutter close

Pump name:	EPS fault: Shutter:	d/s GV:	u/s GV:	D u/s:	(1)	(2)
XF:08IDA-VA{Fltr:FB-IP:1}	✓	✓	✓ ☆	N/A	✓	✓
XF:08IDA-VA{Fltr:FB-IP:2}	✓	✓	✓ ☆	N/A	✓	✓
XF:08IDA-VA{Fltr:FB-IP:3}	✓	✓	✓ ☆	N/A	✓	✓
XF:08IDA-VA{Mir:1-CM-IP:1}	✓	✓	✓	–	✓	✓
XF:08IDA-VA{Mir:1-CM-IP:2}	✓	✓	✓	–	✓	✓
XF:08IDA-VA{Mono:HHM-IP:1}	✓	✓	✓	–	✓	✓
XF:08IDA-VA{Mono:HRM-IP:1}	–	✓	✓	–	✓	✓
XF:08IDA-VA{Mir:FM-IP:1}	–	✓	✓	–	✓	✓
XF:08IDA-VA{BT-IP:1}	–	N/A	✓	–	✓	✓
XF:08IDA-VA{BT-IP:2}	–	N/A	✓	–	✓	✓
XF:08IDB-VA{BT-IP:3}	–	N/A	✓	–	✓	✓

Repeat for each vacuum section on beam line. For the sections adjacent to Front end and End Station, also simulate poor vacuum signal from remote systems.

EPS fault:	Front end: ☆	End station:
Photon Shutter closes	✓	N/A
GVx closes	✓	N/A
GVy closes	N/A	N/A
GVz closes	N/A	N/A
Shutter and GVs cannot be opened	✓	N/A

☆ = ~~TESTED TO CONNECTOR~~ Tested in full on real system

R. Kadgwor 3/22/16

Test Set 2: Water flow

Water flow Section:

Record initial flow through section with all valves fully open.

Slowly close supply valve and record the LOW and LOW LOW PV Alarm levels.

If the channel is associated with an EPS action, also register the flow at which the EPS fault occurs. Ensure cable disconnection results in EPS action.

Repeat for each water circuit on beam line.

Sensor name:	Nominal flow:	LOW:	LOLO:	EPS:
XF:08IDA-OP{Chl}FLW:F1-I	1.41 GPM	—	—	—
XF:08IDA-OP{Chl}FLW:F2-I	1.47 GPM	—	—	—
XF:08IDA-OP{Chl}FLW:F3-I	5.02 GPM	—	—	—
XF:08IDA-UT{Msk:FB}F:A-I	2.06 GPM	—	—	—
XF:08IDA-UT{Msk:FB}F:B-I	2.04 GPM	—	—	—
XF:08IDA-UT{Msk:CM}F:A-I	1.92 GPM	—	—	—
XF:08IDA-UT{Msk:CM}F:B-I	1.96 GPM	—	—	—
XF:08IDA-OP{Mono:HHM-BS:PB}F:A-I	2.05 GPM	—	—	—
XF:08IDA-OP{Mono:HHM-BS:PB}F:B-I	2.02 GPM	—	—	—
XF:08IDA-UT{Fltr:FB}F:1-I	1.72GPM	1.6	1.5	SZ EZ ✓
XF:08IDA-UT{BPM:CM}F:1-I	0.35GPM	0.3	0.27	SZ EZ ✓
XF:08IDA-UT{DI}F-I	7.56GPM	—	—	—

Test Set 3: Thermal

For each temperature transducer ensure the temperature measurement reports expected value.

Attach an appropriate adaptor and transducer simulator to the temperature input of the EPS system (remote IO chassis or Armor Block). Raise the temperature above each of the HI and HIHI PV alarm limits and ensure the alarm is reported. If the transducer is associated with an EPS interlock, continue to raise the temperature until the EPS trip level is exceeded. Ensure the appropriate EPS mitigation process occurs. Ensure channel cable disconnection results in EPS action.

Sensor name:	EPICS PV:	Temperature:	HI:	HIHI:	EPS:
Mask Inboard1	XF:08IDA-OP{Msk:FB}T:I1-I	22.9	32	35	SIE1 ✓
Mask Inboard2	XF:08IDA-OP{Msk:FB}T:I2-I	23.4	32	35	SIE1 ✓
Mask Outboard1	XF:08IDA-OP{Msk:FB}T:O1-I	23.2	32	35	SIE1 ✓
Mask Outboard2	XF:08IDA-OP{Msk:FB}T:O2-I	23.1	32	35	SIE1 ✓
Mask Lower1	XF:08IDA-OP{Msk:FB}T:B1-I	23.1	32	35	SIE1 ✓
Mask Lower2	XF:08IDA-OP{Msk:FB}T:B2-I	23.1	32	35	SIE1 ✓
Mask Lower3	XF:08IDA-OP{Msk:FB}T:B3-I	23.2	32	35	SIE1 ✓
Mask Upper1	XF:08IDA-OP{Msk:FB}T:T1-I	23.3	32	35	SIE1 ✓
Mask Upper2	XF:08IDA-OP{Msk:FB}T:T2-I	23.0	32	35	SIE1 ✓
Mask Upper3	XF:08IDA-OP{Msk:FB}T:T3-I	23.0	32	35	SIE1 ✓
Shroud1	XF:08IDA-OP{Fltr:FB}T:Shr1-I	23.0	80	95	SIE1 ✓
Shroud2	XF:08IDA-OP{Fltr:FB}T:Shr2-I	23.3	80	95	SIE1 ✓
Water1 in	XF:08IDA-OP{Fltr:FB}T:Wtr1-I	22.8	MONITOR		×
Water2 out	XF:08IDA-OP{Fltr:FB}T:Wtr2-I	22.7	MONITOR		×
Filter1	XF:08IDA-OP{Fltr:FB}T:Fltr1-I	23.5	80	95	SIE1 ✓
Filter2	XF:08IDA-OP{Fltr:FB}T:Fltr2-I	23.6	80	95	SIE1 ✓
Filter3	XF:08IDA-OP{Fltr:FB}T:Fltr3-I	23.4	80	95	SIE1 ✓
Filter4	XF:08IDA-OP{Fltr:FB}T:Fltr4-I	23.6	80	95	SIE1 ✓
Filter5	XF:08IDA-OP{Fltr:FB}T:Fltr5-I	23.5	80	95	SIE1 ✓
Filter6	XF:08IDA-OP{Fltr:FB}T:Fltr6-I	23.6	80	95	SIE1 ✓
Mirror X1 m2 Internal	XF:08IDA-OP{Mir:1-CM}T:Mtr2_1-I	22.4	MONITOR		×
Mirror X1 m2 Ch1	XF:08IDA-OP{Mir:1-CM}T:Mtr2_2-I	☆	MONITOR		×
Mirror X2 m1 Internal	XF:08IDA-OP{Mir:1-CM}T:Mtr1_1-I	22.5	MONITOR		×
Mirror X2 m1 Ch2	XF:08IDA-OP{Mir:1-CM}T:Mtr1_2-I	☆	MONITOR		×
Disaster Mask1-1 Ch3	XF:08IDA-OP{Mir:1-CM-Msk:Dis1}T:1-I	22.4	160	200	SIE1 ✓

☆ = THERMOCOUPLE DISCONNECTED. sensor used for monitoring only

Sensor name:	EPICS PV:	Temperature:	HI:	HIHI:	EPS:
Disaster Mask1-2 Ch4	XF:08IDA-OP{Mir:1-CM-Msk:Dis1}T:2-I	23.0	160	200	SIEZ
Disa Mask1-3 Ch5	XF:08IDA-OP{Mir:1-CM-Msk:Dis1}T:3-I	22.4	160	200	SIEZ
Compton Shield-1 Ch6	XF:08IDA-OP{Mir:1-CM-Shld:Comp1}T:1-I	22.7	35	40	SIEZ
Compton Shield-2 Ch1	XF:08IDA-OP{Mir:1-CM-Shld:Comp1}T:2-I	23.1	35	40	SIEZ
Mask1-1 Ch1	XF:08IDA-OP{Mir:1-CM}T:Msk1_1-I	28.4	45	55	SIEZ
Mask1-2 Ch2	XF:08IDA-OP{Mir:1-CM}T:Msk1_2-I	28.7	45	55	SIEZ
Mask1-1 Ch3	XF:08IDA-OP{Mir:1-CM}T:Msk1_3-I	28.4	45	55	SIEZ
Mask1-4 Ch4	XF:08IDA-OP{Mir:1-CM}T:Msk1_4-I	28.7	45	55	SIEZ
Mask1-WC1 Ch5	XF:08IDA-OP{Mir:1-CM}T:Msk1_WC1-I	28.4	MONITOR		x
Mask1-WC2 Ch6	XF:08IDA-OP{Mir:1-CM}T:Msk1_WC2-I	28.7	MONITOR		x
Mirror1-1 Ch2	XF:08IDA-OP{Mir:1-CM}T:Mir1_1-I	22.6	32	35	SIEZ
Mirror1-2 Ch3	XF:08IDA-OP{Mir:1-CM}T:Mir1_2-I	23.0	32	35	SIEZ
Mirror1-3 Ch4	XF:08IDA-OP{Mir:1-CM}T:Mir1_3-I	22.9	32	35	SIEZ
Mirror1-4 Ch5	XF:08IDA-OP{Mir:1-CM}T:Mir1_4-I	23.0	32	35	SIEZ
Mirror1-5 Ch6	XF:08IDA-OP{Mir:1-CM}T:Mir1_5-I	22.7	32	35	SIEZ
Mirror1-6 Ch1	XF:08IDA-OP{Mir:1-CM}T:Mir1_6-I	23.0	32	35	SIEZ
X1 m2 Internal	XF:08IDA-OP{Mir:2-CM-Msk:Dis2}T:Mtr2_1-I	24.3	MONITOR		x
X1 m2 Ch1	XF:08IDA-OP{Mir:2-CM}T:Mtr2_2-I	☆	MONITOR		x
X2 m1 Internal	XF:08IDA-OP{Mir:2-CM}T:Mtr1_1-I	24.3	MONITOR		x
X2 m1 Ch2	XF:08IDA-OP{Mir:2-CM}T:Mtr1_2-I	☆	MONITOR		x
Mask2-1 Ch3	XF:08IDA-OP{Mir:2-CM}T:Msk2_1-I	28.7	40	45	SIEZ
Mask2-2 Ch4	XF:08IDA-OP{Mir:2-CM}T:Msk2_2-I	28.4	40	45	SIEZ
Mask2-3 Ch5	XF:08IDA-OP{Mir:2-CM}T:Msk2_3-I	28.5	60	70	SIEZ
Mask2-4 Ch6	XF:08IDA-OP{Mir:2-CM}T:Msk2_4-I	28.7	60	70	SIEZ

☆ = THERMOCOUPLE DISCONNECTED, SENSOR used for monitoring only

Sensor name:	EPICS PV:	Temperature:	HI:	HIHI:	EPS:
Disa Mask2-2 Ch2	XF:08IDA-OP{Mir:2-CM-Msk:Dis2}T:2-I	24.7	160	200	SIE1 ✓
Disa Mask2-1 Ch1	XF:08IDA-OP{Mir:2-CM-Msk:Dis2}T:1-I	24.4	160	200	SIE1 ✓
Disa Mask2-3 Ch3	XF:08IDA-OP{Mir:2-CM-Msk:Dis2}T:3-I	24.6	160	200	SIE1 ✓
Mirror2-1 Ch4	XF:08IDA-OP{Mir:2-CM}T:Mir2_1-I	24.5	32	35	SIE1 ✓
Mirror2-2 Ch5	XF:08IDA-OP{Mir:2-CM}T:Mir2_2-I	24.4	32	35	SIE1 ✓
Mirror2-3 Ch6	XF:08IDA-OP{Mir:2-CM}T:Mir2_3-I	24.6	32	35	SIE1 ✓
Mirror2-4 Ch1	XF:08IDA-OP{Mir:2-CM}T:Mir2_4-I	24.4	32	35	SIE1 ✓
Mirror2-5 Ch2	XF:08IDA-OP{Mir:2-CM}T:Mir2_5-I	24.3	32	35	SIE1 ✓
Mirror2-6 Ch3	XF:08IDA-OP{Mir:2-CM}T:Mir2_6-I	24.4	32	35	SIE1 ✓
Bender1-1 Ch4	XF:08IDA-OP{Mir:2-CM}T:Bnd_1-I	24.4	MONITOR		x
Bender1-2 Ch5	XF:08IDA-OP{Mir:2-CM}T:Bnd_2-I	24.6	MONITOR		x
Frame1-1 Ch6	XF:08IDA-OP{Mir:2-CM}T:Frm_1-I	24.4	32	35	SIE1 ✓
Frame1-2 Ch1	XF:08IDA-OP{Mir:2-CM}T:Frm_2-I	24.5	32	35	SIE1 ✓
Mask2-WC2-1 Ch1	XF:08IDA-OP{Mir:2-CM}T:Msk2Wtr2_1-I	28.2	MONITOR		x
Mask2-WC2-2 Ch2	XF:08IDA-OP{Mir:2-CM}T:Msk2Wtr2_2-I	28.8	MONITOR		x
Mask3-1 Ch5	XF:08IDA-OP{Mir:2-CM}T:Msk3_1-I	28.3	32	35	SIE1 ✓
Mask3-2 Ch6	XF:08IDA-OP{Mir:2-CM}T:Msk3_2-I	28.6	32	35	SIE1 ✓
Mask3-3 Ch1	XF:08IDA-OP{Mir:2-CM}T:Msk3_3-I	28.3	32	35	SIE1 ✓
Mask3-4 Ch2	XF:08IDA-OP{Mir:2-CM}T:Msk3_4-I	28.7	32	35	SIE1 ✓
Mask3-WC3-1 Ch3	XF:08IDA-OP{Mir:2-CM}T:Msk3Wtr3_1-I	28.6	MONITOR		x
Mask3-WC3-2 Ch4	XF:08IDA-OP{Mir:2-CM}T:Msk3Wtr3_2-I	28.7	MONITOR		x
Bottom BPM CM	XF:08IDA-OP{BPM:CM}T:B-I	25.0	MONITOR		x
Bottom BPM FM	XF:08IDA-OP{BPM:FM}T:B-I	25.1	MONITOR		x
Top BPM CM	XF:08IDA-OP{BPM:CM}T:T-I	28.4	MONITOR		x
Top BPM FM	XF:08IDA-OP{BPM:FM}T:T-I	21.1	MONITOR		x

Sensor name:	EPICS PV:	Temperature:	HI:	HIHI:	EPS:
0X1 motor	XF:08IDA-OP{Mono:HHM-Ax:0X1}T:1-I	23.7	MONITOR		x
Ty2 motor	XF:08IDA-OP{Mono:HHM-Ax:Ty2}T:1-I	56.5	MONITOR		x
Internal mechanism 1	XF:08IDA-OP{Mono:HHM}T:In2_1-I	27.0	MONITOR		x
Internal mechanism 2	XF:08IDA-OP{Mono:HHM}T:In2-2-I	26.9	MONITOR		x
Internal mechanism 3	XF:08IDA-OP{Mono:HHM}T:In2_3-I	25.3	-150	-140	SET ✓
Internal mechanism 4	XF:08IDA-OP{Mono:HHM}T:In2_4-I	25.2	-150	-140	SET ✓
Hinge stage 1	XF:08IDA-OP{Mono:HHM}T:HS3_1-I	27.8	MONITOR		x
Hinge stage 2	XF:08IDA-OP{Mono:HHM}T:HS3_2-I	27.9	MONITOR		x
Hinge stage 3	XF:08IDA-OP{Mono:HHM}T:HS3_3-I	28.6	MONITOR		x
Hinge stage 4	XF:08IDA-OP{Mono:HHM}T:HS3_4-I	29.5	MONITOR		x
Hinge stage 5	XF:08IDA-OP{Mono:HHM}T:HS3_5-I	30.7	MONITOR		x
Hinge stage 6	XF:08IDA-OP{Mono:HHM}T:HS3_6-I	37.5	MONITOR		x
2nd crystal holder 1	XF:08IDA-OP{Mono:HHM-Crys:2}T:4_1-I	25.3	MONITOR		x
2nd crystal holder 2	XF:08IDA-OP{Mono:HHM-Crys:2}T:4_2-I	25.4	MONITOR		x
2nd crystal holder 3	XF:08IDA-OP{Mono:HHM-Crys:2}T:4_3-I	28.0	MONITOR		x
2nd crystal holder 4	XF:08IDA-OP{Mono:HHM-Crys:2}T:4_4-I	27.7	MONITOR		x
1st crystal holder 1	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_1-I	24.4	MONITOR		x
1st crystal holder 2	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_2-I	24.8	MONITOR		x
1st crystal holder 3	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_3-I	24.6	MONITOR		x
1st crystal holder 4	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_4-I	24.7	MONITOR		x
1st crystal holder 5	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_5-I	24.7	MONITOR		x
1st crystal holder 6	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_6-I	24.7	MONITOR		x
1st crystal holder 7	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_7-I	24.5	MONITOR		x
1st crystal holder 8	XF:08IDA-OP{Mono:HHM-Crys:1}T:5_8-I	24.9	MONITOR		x
0X2 motor	XF:08IDA-OP{Mono:HRM-Ax:0X2}T:1-I	23.0	MONITOR		x

Sensor name:	EPICS PV:	Temperature:	HI:	HIHI:	EPS:
2nd mono chamber 1	XF:08IDA-OP{Mono:HRM}T:Chmb1-I	✱	—	—	X
Y Stage motor	XF:08IDA-OP{Mono:HRM-Ax:Y}T:1-I	✱	—	—	X
2nd mono chamber 2	XF:08IDA-OP{Mono:HRM}T:Chmb2-I	✱	—	—	X
2nd mono internal 1	XF:08IDA-OP{Mono:HRM}T:In1-I	✱	—	—	X
2nd mono internal 2	XF:08IDA-OP{Mono:HRM}T:In2-I	25.1	MONITOR		×
Pink beam stop chamber 1_1	XF:08IDA-OP{Mono:HHM-BS:PB}T:1_1-I	✱	—	—	X
Pink beam stop chamber 1_2	XF:08IDA-OP{Mono:HHM-BS:PB}T:1_2-I	✱	—	—	X
Pink beam stop chamber 1_3	XF:08IDA-OP{Mono:HHM-BS:PB}T:1_3-I	✱	—	—	X
Pink beam stop chamber 1_4	XF:08IDA-OP{Mono:HHM-BS:PB}T:1_4-I	✱	—	—	X
Pink beam stop water IN	XF:08IDA-OP{Mono:HHM-BS:PB}T:WtrIn-I	28.7	MONITOR		×
Pink beam stop water OUT	XF:08IDA-OP{Mono:HHM-BS:PB}T:WtrOut-I	28.7	MONITOR		×
4_1	XF:08IDA-OP{Msk:HHM}T:4_1-I	28.6	MONITOR		×
4_2	XF:08IDA-OP{Msk:HHM}T:4_2-I	28.6	MONITOR		×
4_3	XF:08IDA-OP{Msk:HHM}T:4_3-I	28.1	MONITOR		×
4_4	XF:08IDA-OP{Msk:HHM}T:4_4-I	28.4	MONITOR		×
Water IN	XF:08IDA-OP{Msk:HHM}T:WtrIn-I	28.7	MONITOR		×
Water OUT	XF:08IDA-OP{Msk:HHM}T:WtrOut-I	28.5	MONITOR		×
Liquid nitrogen	XF:08IDA-PU:0{Mono:HHM}T:LN-I	✱	—	—	X
Spare	XF:08IDA-PU:0{Mono:HHM}T:sp-I	✱	—	—	X
Mirror frame 1-1 OB US	XF:08IDA-OP{Mir:FM}T:Frm1_1-I	23.6	MONITOR		×
Mirror frame 1-2 OB	XF:08IDA-OP{Mir:FM}T:Frm1_2-I	23.5	MONITOR		×

✱ = THERMOCOUPLE DISCONNECTED. SENSOR USED for monitoring only

Sensor name:	EPICS PV:	Temperature:	HI:	HIHI:	EPS:
Mirror frame 1-3 OB	XF:08IDA-OP{Mir:FM}T:Frm1_3-I	23.8	MONITOR		x
Mirror frame 1-4 OB DS	XF:08IDA-OP{Mir:FM}T:Frm1_4-I	23.6	MONITOR		x
Mirror frame 2-1 IB US	XF:08IDA-OP{Mir:FM}T:Frm2_1-I	23.6	MONITOR		x
Mirror frame 2-2 IB	XF:08IDA-OP{Mir:FM}T:Frm2_2-I	23.6	MONITOR		x
Mirror frame 2-3 IB	XF:08IDA-OP{Mir:FM}T:Frm2_3-I	23.9	MONITOR		x
Mirror frame 2-4 IB DS	XF:08IDA-OP{Mir:FM}T:Frm2_4-I	36.3	MONITOR		x
Mirror bender 1-1 US	XF:08IDA-OP{Mir:FM}T:Bnd1-I	23.6	MONITOR		x
Mirror bender 1-2 DS	XF:08IDA-OP{Mir:FM}T:Bnd2-I	23.6	MONITOR		x
Mirror X motor 1-1 US	XF:08IDA-OP{Mir:FM}T:Mtr1-I	23.6	MONITOR		x
Mirror X motor 1-2 DS	XF:08IDA-OP{Mir:FM}T:Mtr2-I	23.8	MONITOR		x
Chiller	XF:08IDA-OP{Chl}T:PCW-I	46.0	MONITOR		x

'Monitor' means the channel is used for monitoring only, no threshold specified.
'x' means no EPS action recorded

Test Set 4: EPS/PPS interface

For the primary Photon Shutter:

Front End: If *FRONT END ENABLE STATUS* and *FOE PERMIT* and not *USER INTERLOCK* command the front end shutter to open.

Front end opens and ***FRONT END OPEN STATUS*** = OPEN:

Command the front end shutter to close.

Front end closes and ***FRONT END OPEN STATUS*** = CLOSED:

With the front end open force a user interlock.

Front end closes and ***FRONT END OPEN STATUS*** = CLOSED:

Attempt to open the front end shutter through EPICS while not all gate valves in white-beam region down to next secondary shutter are open.

Front end cannot be opened through EPICS:

For the secondary photon shutter:

If PHOTON SHUTTER x ENABLE STATUS = 1 (ABILITY TO OPEN) and ESEE x PERMIT command the shutter to open.

Shutter opens and **PHOTON SHUTTER x *OPEN STATUS*** = OPEN

Command the shutter to close.

Shutter closes and **PHOTON SHUTTER x *OPEN STATUS*** = CLOSED

Attempt to open the shutter through EPICS while not all gate valves in white-beam region downstream the shutter are open.

Shutter cannot be opened through EPICS:

Prepared by:

X

Barrett T. Clay
Electrical Engineer II

Approved by:

X 3/22/16

Ruslan Kadyrov
Controls Infrastructure Group Leader

X

Klaus Attenkofer
ISS Beamline Group Leader 3/22/16

Appendix A:

BPM Compressed air interlocks:

Modify the air pressure reading for each of the BPM air pressure sensors to below the critical value. Verify that an "OPEN" Front End shutter closes and cannot be opened via EPICS command when each signal is lost. Restore signal and verify Front End shutter enabled.

EPICS BPM Name	FE Closes & Disabled	FE Enabled	LOW	LOLO
XF:08IDA-OP{BPM:CM}P-I	✓	✓	50 PSSG	40 PSSG
XF:08IDA-OP{BPM:FM}P-I	✓	✓	50 PSSG	40 PSSG
XF:08IDA-OP{BPM:1-BT}P-I	✓	✓	50 PSSG	40 PSSG
XF:08IDA-OP{BPM:2-BT}P-I	✓	✓	50 PSSG	40 PSSG

Appendix B:

BPM Position interlocks:

Remove position status signal for each pair of BPM position sensors. Verify that an "OPEN" Front End shutter closes and cannot be opened via EPICS command when each signal is lost. Restore signal and verify Front End shutter enabled.

EPICS BPM Name "Inserted"	EPICS BPM Name "extracted"	FE Closes & disabled	FE Enabled
XF:08IDA-OP{BPM:CM}Pos:In-Sts	XF:08IDA-OP{BPM:CM}Pos:Out-Sts	✓	✓
XF:08IDA-OP{BPM:FM}Pos:In-Sts	XF:08IDA-OP{BPM:FM}Pos:Out-Sts	✓	✓
XF:08IDA-OP{BPM:1-BT}Pos:In-Sts	XF:08IDA-OP{BPM:1-BT}Pos:Out-Sts	✓	✓
XF:08IDA-OP{BPM:2-BT}Pos:In-Sts	XF:08IDA-OP{BPM:2-BT}Pos:Out-Sts	✓	✓

Appendix C:

Cryogenic system interlocks testing.

1- Force an alarm status fault from the Cryo cooler and ensure the front end shutter closes. ✱
2- Turn off the Cryo cooler and ensure the front end shutter closes. ✱
3- Disable the cold cathode gauge XF:08IDA-VA{Mono:HHMI-CCG:1} and ensure the cryocooler HMI returns "Inhibit". ✓
4- Enable the cold cathode gauge, return to normal operation. ✓

✱ tested up to interface connector

Appendix D:

Ancillary interlocks:

Remove these ancillary interlock alarms. Verify that an "OPEN" Front End shutter closes and cannot be opened via EPICS command when each signal is lost. Restore signal and verify Front End shutter enabled.

EPICS interlock name	FE Closes & disabled	FE Enabled
XF:08IDA-OP{Chl}FLW:Alrm1	✓	✓
XF:08IDA-OP{Chl}FLW:Alrm2	✓	✓
XF:08IDA-OP{Chl}FLW:Alrm3	✓	✓
XF:08IDA-OP{Chl}T:Alrm	—	—
XF:08IDA-OP{Chl}L:Alrm	—	—
XF:08IDA-OP{Fltr:FB}T:Fltr1-Sts	✓	✓
XF:08IDA-OP{Fltr:FB}T:Fltr2-Sts	✓	✓
XF:08IDA-OP{Fltr:FB}T:Fltr3-Sts	✓	✓
XF:08IDA-OP{Fltr:FB}T:Fltr4-Sts	✓	✓
XF:08IDA-OP{Fltr:FB}T:Fltr5-Sts	✓	✓