

<b>Brookhaven National Laboratory/ Photon Sciences Directorate</b>			
<b>Subject:</b>	<b>Beamline Equipment Protection System Test Checklist</b>		
<b>Number:</b>	<b>PS-R-XFD-EPS-CHK-001</b>	<b>Revision:</b>	<b>1</b>
		<b>Effective:</b>	<b>8/19/14</b>
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**Beam Line: BMM**

**Test Date:**

**EPS Engineer: Garrett Bischof**

**BL Group Leader: Bruce Ravel**

**Beam Line master spreadsheet: PS-R-XFD-CO-DR-BMM-002**

**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<sup>1</sup> 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 close:

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)

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<sup>1</sup> if the intensity of the beam in the section cannot cause damage to its valves, poor vacuum doesn't have to cause shutter close

**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)

Gauge name:	EPS fault:			(1)	(2)
	Shutter:	d/s GV:	u/s GV:		
XF:06BMA-VA{FS:1-CCG:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{FS:1-TCG:1}	-	-	-	Good	Good
XF:06BMA-VA{Mono:DCM-CCG:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{Mono:DCM-TCG:1}	-	-	-	Good	Good
XF:06BMA-VA{FS:2-CCG:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{FS:2-TCG:1}	-	-	-	Good	Good
XF:06BMA-VA{Mir:2-CCG:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{Mir:2-TCG:1}	-	-	-	Good	Good
XF:06BMA-VA{Mir:3-CCG:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{Mir:3-TCG:1}	-	-	-	Good	Good
XF:06BMB-VA{BT:1-CCG:2}	FE + A	Good	Good	Good	Good
XF:06BMB-VA{BT:1-TCG:2}	-	-	-	Good	Good
XF:06BMB-VA{FS:3-CCG:1}	A	Good	Good	Good	Good
XF:06BMB-VA{FS:3-TCG:1}	-	-	-	Good	Good

**Simulate pressure rise (toward poor vacuum) by disabling the vacuum pump controller channel. Ensure EPICS PVs enter proper alarm states, photon shutter closes<sup>2</sup> 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)

<sup>2</sup> if the intensity of the beam in the section cannot cause damage to its valves, poor vacuum doesn't have to cause shutter close

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**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)

**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.**

<b>EPS vacuum fault:</b>	<b>Front end:</b>	<b>End station:</b>
Photon Shutter closes	Good	NA
GV2 closes	Good	NA
FS:1-GV1 closes	Good	NA
GVz closes	NA	NA
Shutter and GVs cannot be opened	Good	NA

**Simulate a poor vacuum EPS signal to front end, GV2 and Shutter should close, and not be allowed to open.**

<b>EPS vacuum fault:</b>	<b>Front end:</b>
Photon Shutter closes	Good
GV2 closes	Good
Shutter and GVs cannot be opened	Good

<b>Gauge name:</b>	<b>EPS fault:</b>	<b>(1)</b>	<b>(2)</b>
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	<b>Shutter:</b>	<b>d/s GV:</b>	<b>u/s GV:</b>		
XF:06BMA-VA{FS:1-IP:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{Mono:DCM-IP:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{FS:2-IP:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{Mir:2-IP:1}	FE	Good	Good	Good	Good
XF:06BMA-VA{Mir:3-IP:1}	FE	Good	Good	Good	Good
XF:06BMB-VA{BT:1-IP:1}	FE + A	Good	Good	Good	Good
XF:06BMB-VA{FS:3-IP:1}	A	NA	Good	Good	Good

**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 XFD-EPOS, 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.**

<b>Sensor name:</b>	<b>Nominal flow:</b>	<b>LOW:</b>	<b>LOLO:</b>	<b>EPS:</b>
XF:06BMA-UT{DI}F:1-I (FS:1)	0.54	.43	.38	Closed FE Shutter
XF:06BMA-UT{DI}F:2-I (Mono)	0.67	.54	.47	Closed FE Shutter
XF:06BM-PPS{DI}F:A1-I	0.58	-	-	No EPS action
XF:06BM-PPS{DI}F:B1-I	0.60	-	-	No EPS action

**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.**

*Type K Thermocouples*

<b>Sensor name:</b>	<b>Temperature:</b>	<b>HI:</b>	<b>HIHI:</b>	<b>EPS:</b>
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FE:C06B-OP{Mir:1}T:1-I	33.3	90	100	Monitoring only
FE:C06B-OP{Mir:1}T:2-I	32.5	35	40	Monitoring only
FE:C06B-OP{Mir:1}T:3-I	33.3	35	40	Monitoring only
XF:06BMA-OP{FS:1}T:1-I	29.0	70	85	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:1-I	28.7	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:2-I	28.6	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:3-I	28.7	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:4-I	28.6	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:5-I	28.2	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:6-I	28.6	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:7-I	28.8	50	70	FE Shutter closed
XF:06BMA-OP{Fltr:1}T:8-I	28.6	50	70	FE Shutter closed
XF:06BMA-OP{Mono:DCM-Crys:1}T-I	27.3	30	40	FE Shutter closed
XF:06BMA-OP{Mono:DCM-Crys:2}T-I	28.9	65	85	Monitoring only
XF:06BMA-OP{Mono:DCM-Crys:1-Ax:R}T-I	28.5	65	85	Monitoring only
XF:06BMA-OP{Mono:DCM-Crys:2-Ax:P}T-I	27.6	65	85	Monitoring only
XF:06BMA-OP{Mono:DCM-Crys:2-Ax:R}T-I	28.0	65	85	Monitoring only
XF:06BMA-OP{Mono:DCM-Crys:2-Ax:Perp}T-I	26.9	65	85	Monitoring only
XF:06BMA-OP{Mono:DCM-Crys:2-AX:Para}T-I	25.6	65	85	Monitoring only
XF:06BMA-OP{Mir:2}T:1-I	25.7	65	85	Monitoring only
XF:06BMA-OP{Mir:2}T:2-I	25.4	65	85	Monitoring only
XF:06BMA-OP{Mir:3}T:1-I	25.4	65	85	Monitoring only
XF:06BMA-OP{Mir:3}T:2-I	25.3	65	85	Monitoring only
XF:06BMA-OP{PBS:1}T:1-I	28.8	35	40	FE Shutter closed

*RTD (Pt 100)*

<b>Sensor name:</b>	<b>Temperature:</b>	<b>HI:</b>	<b>HIHI:</b>	<b>EPS:</b>
XF:06BMA-PU{PCW}T:Supply-I	13.3	-	-	No EPS action
XF:06BMA-PU{PCW}T:Return-I	13.9	-	-	No EPS action
XF:06BMA-UT{DI}T:Supply-I	28.8	-	-	No EPS action
XF:06BMA-UT{DI}T:Return-I	28.8	-	-	No EPS action

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#### **Test Set 4: EPS/PPS interface**

##### **For the primary Photon Shutter:**

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

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

Command the front end shutter to close.

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

With the front end open force a user interlock.

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

**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: Good

##### **For each secondary photon shutter:**

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

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

Command the shutter to close.

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

**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: Good

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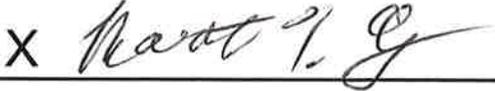
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**Prepared by:**

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**Approved by:**

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Appropriate Beamline Group Leader



<u>Title</u>	<u>Name</u>	<u>Approval Date</u>
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: 06BM-BMM					
Deviation & Waiver: _____						

OP	Description	Name/Life #	Date	DR
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10 Follow the ES&H and Personal Protective Equipment Requirements for the area.

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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.

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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.

30 BEAMLINE INFORMATION - This step shall be performed by the cognizant EPS Engineer.

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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

40 INSTALLATION VERIFICATION

A) List the relevant drawing(s):

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Drawing No.: LT-EL-BL-EI-  
EPS-2060-90 Rev. No.: A  
 Drawing No.: \_\_\_\_\_ Rev. No.: \_\_\_\_\_

B) Verify the following items are acceptable:

- System layout configured per drawing(s)
- System Labeled / Tagged



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.: <u>LT-EL-BL-EI- EPS-2060-70</u> Rev. No.: <u>A</u>	<i>g. Bischof</i> 25835	7/18/17	
60	ACCEPTANCE TESTING A) List relevant testing procedure Procedure No.: <u>PS-R-XFD-EPS- CHK-001</u> Rev. No.: <u>1</u> B) Verify acceptable completion of test procedure C) Attach test report to this traveler	<i>g. Bischof</i> 25835	7/18/17	
65	WATER LEAK DETECTION SYSTEM TEST Verify water leak detection system, as designed for this beamline, functions correctly.	<i>g. Bischof</i> 25835	7/18/17	
70	Verify All Traveler Operations Complete	<i>Stammant</i> 25077	7/18/17	
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

