Traveler Title	LCLS-II Prototype Cavity String Traveler			
Traveler Abstract	LCLS-II string traveler to be used to outline the steps and capture data during the prototype cavity string assembly.			
Traveler ID	L2PRO-CST-ASSY			
Traveler Revision	R2			
Traveler Author	Kurt Macha			
Traveler Date	03-Mar-2016			
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Approval Signatures				
Approval Dates	03-Mar-2016	03-Mar-2016	03-Mar-2016	
Approval Title	Author	Reviewer	Project Manager	

References	List and Hyperlink all documents related to this traveler. This includes, but is not limited to: safety (THAs, SOPs, etc.), drawings, procedures, and facility related documents.			
L2PRO-CST-ASSY-BPM BPM Magnet sub-assembly traveler	CP-L2PRO-CST-ASSY-TOOL Lollipop tooling setup procedure	L2PRO-CST-SLBUP LCLS-II Slow bleed-up procedure	Cavity cleaning in preparation for clean room procedure	Cavity caging procedure
LCLS-II Cavity HPR and drying Traveler	Cavity covering, cage removal, installation on rail and alignment procedure	CP-L2PRO-CST-ASSY-VLV Valve alignment and installation procedure	Coupler prep, alignment and installation procedure	CP-L2PRO-CST-BLPR Bellows alignment and installation procedure
F1000009887 Rev-	Prototype String Kit List	L2PRO-CST-ASSY-LT LCLS-IIString Leak test and preparation for transfer to Phase 1 area	LCLS-II Clean room transfer of cavity string/rail procedure	JLab Sequence for HeV Welding and String.pptx

Revision Note	
R1	Initial release of this Traveler.

R2	Many changes due to process step sequence decisions. Think of R1 as a draft and R2 the final way the string is to be assembled.

Step No.	Instructions	Data Input
1	Select the serial number of the cavity string to be assembled. **Preperation:** Assumptions: Eight cavities have been qualified in the VTA, staged and deemed ready for cavity string assembly. A BPM magnet sub-assembly is assembled, leak tested and staged on the rail. The sub-assembly is aligned to the rail and ready for assembly onto the string This is completed as per the L2PRO-CST-ASSY-BPM traveler. Cavity string tooling has been cleaned and setup in the production clean room. Tooling is ready for cavity string assembly as per the CP-L2PRO-CST-ASSY-TOOL procedure. All the cavity string components are verified to be ready as needed for completion of the string as scheduled. Such components includes: 8 Couplers, all bolt hardware, all gaskets, 8 bellows, 1 VAT valve and the BPM sub-assembly as mentioned above. See: Prototype String Kit List and F1000009887 Rev- All tooling is staged and cleaned so it is available for building the string. Such tooling includes: Ion pump sub-assembly, Bridge level, Dial indicator tooling for cavity positioning, Coupler adjustable table, Alignment covers and other miscellaneous tooling. Magnetic surveys have been completed on components and tooling is cleared for assembly.	CMSN -0- Assumptions have been verified complete and ready for the cavity string assembly. Ready (Yes?) PreperationComments TechnicianVerification -0-

2	**Cavity 1: (Pre-cleaning)** Select the 1st cavity (Cavity 1) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav1Prep - 0 -
3	**Cavity 1: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN1 - 0 - Verified Clean DisassemblyBleedComments1 Cav1Start NOW (ex format 18-Jun-2005 16:30) Cav1ChemRoomReady - 0 -

4	**Cavity 1: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav1PrepComments Cav1PrepSign
5	**Cavity 1: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav1BellowsAlignComments Cav1OnRailSign

6	**Install the VAT valve sub-assembly:** Sub-assemble the VAT valve with a blank cover flange on one end and the beam-line spool section on the other. Assemble cleanly as per CP-L2PRO-CST-ASSY-VLV Valve alignment and installation procedure. **Note:** Ensure the VAT valve seat is orientated properly according to the assembly drawing. F1000009887 Rev- · Install the VAT valve sub-assembly onto the lollipop. · Align the VAT valve sub-assembly · Double check the cavity alignment. · Install the cleaned gasket and bolt the valve onto Cavity 1 and torque properly. · Torque the NW-78 flange hardware properly. Do all this in accordance with the CP-L2PRO-CST-ASSY-VLV Valve alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed. Record the torque value.	Cav1ValveInstallComment TorqueValue1 Cav1ValveInstallSign - 0 -
7	**Cavity 1 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 1 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this	Cav1CouplerInstall Cav1CouplerSN TorqueValue2 Cav1CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav1CouplerInstallSign - 0 -

	assembly step to ensure the cavity is still aligned. Align as needed.	

8	**Cavity 2: (Pre-cleaning)** Select the 2nd cavity (Cavity 2) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav2Prep - 0 -
9	**Cavity 2: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN2 - 0 - Verified Clean DisassemblyBleed1Comments2 Cav2Start NOW (ex format 18-Jun-2005 16:30) Cav2ChemRoomReady - 0 -

10	**Cavity 2: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav2PrepComments Cav2PrepSign - 0 -
11	**Cavity 2: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav2BellowsAlignComments Cav2OnRailSign - 0 -

1 2	**Cavity 1-2 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection12Comments TorqueValue3 BellowsConnection12Sign -0-
1 3	**Cavity 2 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 2 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav2CouplerInstall Cav2CouplerSN TorqueValue4 Cav2CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav2CouplerInstallSign -0-

14	**Cavity 3: (Pre-cleaning)** Select the 3rd cavity (Cavity 3) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav3Prep - 0 -
15	**Cavity 3: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN3 - 0 - Verified Clean DisassemblyBleed2Comments3 Cav3Start NOW (ex format 18-Jun-2005 16:30) Cav3ChemRoomReady - 0 -

16	**Cavity 3: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav3PrepComments Cav3PrepSign - 0 -
17	**Cavity 3: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav3BellowsAlignComments Cav3OnRailSign - 0 -

18	**Cavity 2-3 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection23Comments TorqueValue5 BellowsConnection23Sign -0-
19	**Cavity 3 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 3 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav3CouplerInstall Cav3CouplerSN TorqueValue6 Cav3CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav3CouplerInstallSign -0-

20	**Cavity 4: (Pre-cleaning)** Select the 4th cavity (Cavity 4) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav4Prep - 0 -
21	**Cavity 4: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN4 - 0 - Verified Clean DisassemblyBleed3Comments2 Cav4Start NOW (ex format 18-Jun-2005 16:30) Cav4ChemRoomReady - 0 -

22	**Cavity 4: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav4PrepComments Cav4PrepSign - 0 -
23	**Cavity 4: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav4BellowsAlignComments Cav4OnRailSign - 0 -

24	**Cavity 3-4 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection34Comments TorqueValue7 BellowsConnection34Sign -0-
25	**Cavity 4 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 4 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav4CouplerInstall Cav4CouplerSN TorqueValue8 Cav4CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav4CouplerInstallSign -0-

26	**Cavity 5: (Pre-cleaning)** Select the 5th cavity (Cavity 5) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav5Prep - 0 -
27	**Cavity 5: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN5 - 0 - Verified Clean DisassemblyBleed4Comments2 Cav5Start NOW (ex format 18-Jun-2005 16:30) Cav5ChemRoomReady - 0 -

28	**Cavity 5: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav5PrepComments Cav5PrepSign -0-
29	**Cavity 5: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav5BellowsAlignComments Cav5OnRailSign -0-

30	**Cavity 4-5 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection45Comments TorqueValue9 BellowsConnection45Sign -0-
31	**Cavity 5 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 5 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav5CouplerInstall Cav5CouplerSN TorqueValue10 Cav5CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav5CouplerInstallSign -0-

32	**Cavity 6: (Pre-cleaning)** Select the 6th cavity (Cavity 6) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav6Prep - 0 -
33	**Cavity 6: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN6 - 0 - Verified Clean DisassemblyBleed1Comments6 Cav6Start NOW (ex format 18-Jun-2005 16:30) Cav6ChemRoomReady - 0 -

34	**Cavity 6: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav6PrepComments Cav6PrepSign - 0 -
35	**Cavity 6: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav6BellowsAlignComments Cav6OnRailSign - 0 -

36	**Cavity 5-6 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection56Comments TorqueValue11 BellowsConnection56Sign - 0 -
37	**Cavity 6 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 6 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav6CouplerInstall Cav6CouplerSN TorqueValue12 Cav6CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav6CouplerInstallSign - 0 -

38	**Cavity 7: (Pre-cleaning)** Select the 7th cavity (Cavity 7) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav7Prep1 - 0 -
39	**Cavity 7: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN7 - 0 - Verified Clean DisassemblyBleed2Comments6 Cav7Start NOW (ex format 18-Jun-2005 16:30) Cav7ChemRoomReady - 0 -

40	**Cavity 7: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav7PrepComments Cav7PrepSign - 0 -
41	**Cavity 7: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav7BellowsAlignComments Cav7OnRailSign - 0 -

42	**Cavity 6-7 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection67Comments TorqueValue13 BellowsConnection67Sign -0-
43	**Cavity 7 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 7 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav7CouplerInstall Cav7CouplerSN TorqueValue14 Cav7CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav7CouplerInstallSign -0-

44	**Cavity 8: (Pre-cleaning)** Select the 8th cavity (Cavity 8) for assembly in the cavity string. Record the cavity serial number. This will be the cavity closest to the turbo pump station in the Southwest corner of the clean room. Note: A designated order has been set for the cavity locations in the string. JLab Sequence for HeV Welding and String.pptx Cage the cavity and pass it into the pass thru for cleaning. The chem techs will clean the cavity and pass the cavity back into the pass-thru for the next process step.	Cav7Prep2 - 0 -
45	**Cavity 8: (Slow bleed-up and partial disassembly)** Bring the cleaned cavity back into the clean room and verify with the chem technicians that the cavity has been cleaned. Record the cavity serial number Remove the cavity from the cage and transfer the cavity to a wire cart. Bleed-up the cavity as per the Cavity bleed-up and disassembly procedure. Revove hardware from the two beam-line flanges and the FPC flange. Leave four bolts to secure each flange for later removal. Cage the cavity and pass it into the pass thru for: · Cleaning of bolt holes from removed hardware · Adding spring clamps to beam-line flanges and FPC flange · Removal of remaining hardware and cleaning of those bolt holes · HPR · Drying	CleanedCavSN8 - 0 - Verified Clean DisassemblyBleedComments8 Cav8Start NOW (ex format 18-Jun-2005 16:30) Cav8ChemRoomReady - 0 -

46	**Cavity 8: (Cover the cavity in preparation for assembly)** Note any comments or concerns and sign verifying the cavity is staged as desired in the drying area. · Cover the bottom beam-line flange with a cleaned SST mirror finish plate with gore-tex gasket and secure with spring clamps. · Cover the input coupler with the alignment cover flange and secure with spring clamps. · Cover the top beam-line flange with the alignment cover flange and secure with spring clamps. Remove the cavity from the cage and install it into the two arm back-tech lifting fixture. Orient the cavity so the beam-line flange at the FPC end is facing down.	Cav8PrepComments Cav8PrepSign - 0 -
47	**Cavity 8: (Install the bellows onto the cavity and transfer to the rail)** Install the bellows onto the cavity beam-line flange at the FPC end on the cavity. Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Ensure the bellows non-rotatable flange is bolted to the cavity flange. An alignment cover flange will be covering the open port as stated in the LCLS-II bellows assembly procedure. Rotate the cavity horizontal and install the cavity onto the lollipop tooling in the proper location. Align the cavity to the rail using the string alignment tooling. Set the beam-line X-Y to the rail and set cavity roll.	Cav8BellowsAlignComments Cav8OnRailSign - 0 -

48	**Cavity 7-8 Bellows Connection:** Double check alignment of the two cavities to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure.	BellowsConnection78Comments TorqueValue15 BellowsConnection78Sign -0-
49	**Cavity 8 Coupler Installation:** Bleed-up a coupler and remove it from the waveguide box. Record the coupler serial number in this traveler. Install the coupler in the alignment tooling at the Cavity 6 location. Align the coupler to the cavity coupler port. Install the cleaned gasket, bolt the coupler to the cavity and torque properly. Do all this in accordance with the Coupler prep, alignment and installation procedure. **Note:** Double check the cavity alignment after this assembly step to ensure the cavity is still aligned. Align as needed.	Cav8CouplerInstall Cav8CouplerSN TorqueValue16 Cav8CouplerInstallTime NOW (ex format 18-Jun-2005 16:30) Cav8CouplerInstallSign -0-

50	**Install the short bellows onto the BPM sub-assembly:** In accordance with the first page of this traveler the BPM/ Magnet BL section is assembled and on the lollipop in the proper location. Prepare the BPM sub-assembly: · As per the slow bleed-up procedure bleed-up the BPM sub-assembly. · Cage the BPM sub-assembly and install it into the back-tech. Rotate the BPM assembly so the flange that will accept the short bellows is facing down. Install the short bellows onto the BPM sub-assembly · Install the short bellows in the same way the bellows are installed onto a cavity as per the LCLS-II bellows assembly procedure. The bellows alignment cover will be installed on the bellows rotatable flange that mates to the cavity. **Note:** In this case the not-rotatable flange bolts to the BPM sub-assembly so the rotatable flange is available for the last connection. Do this in accordance with the Bellows alignment and installation procedure. · Remove the BPM sub-assembly from the cage and install it back onto the BPM lollipop tooling.	Bellows9InstallComment Bellows9InstallSign -0-
51	**Cavity 8-BPM Bellows Connection:** Align the BPM sub-assembly. Set the beam-line X-Y to the rail and set BPM roll. Double check alignment of the last cavitiy and BPM sub-assembly to be joined together at the bellows connection. **Note:** Roll is the only criticle alignment concern · Align the rotatable flange on the bellows to the mating cavity flange. Make minor adjustments as	BellowsConnection8BPMComments TorqueValue17 BellowsConnection8BPMSign -0-

	needed to ensure bolts will easily be able to be installed. · Remove the bellows alignment cover, install the gasket and hold in place with the gasket holder. · Remove the cavity alignment cover and bolt the two flanges together · Torque both bellows flanges properly. · Install the turnbuckle locking between the two lollipops and remove the bellows support tooling Assemble this according to the LCLS-II bellows assembly procedure. **Note:** Double check the cavity and BPM sub-assembly alignments after this assembly step to ensure the components are still aligned.	

52	**Ready for the next Traveler:** After verification of the completion of this traveler. The cavity string is ready for the next traveler in the process: Leak testing and preparation of transfer out of the clean room to Phase 1.	CompletionComments AllStepsComplete -0-