Quality Assurance Checklist

THIS FORM CAN BE USED AS A CHECKLIST TO CONTROL THE SEQUENCE OF QUALITY ASSURANCE ACTIVITIES TO BE PEFORMED ON LCLS HARDWARE, SYSTEMS OR PROCESSES, OR ATTACHED TO LCLS HARDWARE AS A QUALITY ASSURANCE TRAVELER.

System or Component Name: *LCLS Undulator Main Assembly*		
Part/Drawing Number: *L143-112000*	*Revision:* 05	Serial Number: 40
Manufacturer: HI-TECH		Purchase Order Number: SA-13624

Special Instructions:

This form is to be completed prior to the acceptance of LCLS Undulator Main Assemblies

Quality Assurance Tasks (attach continuation sheets if additional steps are required)

Seq No.	Task Description *Inform the LCLS Technical Lead if a task cannot be competed or a requirement met	Completed by/Date*	Requirement Met	Requirement Not Met*
1	*Confirm that the drawing revisions on the attached Bill of Materials is correct.*	CL 1-12-07	☒	☐
2	*Confirm that the supplier is working to the same drawing revisions as on the attached Bill of Materials.*	1-12-07	☒	☐
3	*Perform visual inspection of the completed assembly for workmanship and correctness.*	CL 1-12-07	☒	☐
4	*Perform visual inspection of the completed assembly for correct the following markings on the Strongback:* L143-11200-05 SA-381-001-35 Assy Rev No *(Not: the serial numbers of the assembly and Strongback should be identical)*	1/12/07	☒	☐
5	*Perform visual inspection of the completed assembly for correct the following markings on the Magnet Structure Assemblies:* • *Upper Left Magnet Structure Assemblies: L-143-110800-assembly no.* 40 • *Upper Right Magnet Structure Assemblies: L143-111200-assembly no.* 40 • *Upper Middle Magnet Structure Assemblies: L143-111000-1,2,3-assembly no.* 40 • *Lower Left Magnet Structure Assemblies: 143-110900-assembly serial no.* 40 • *Lower Right Magnet Structure Assemblies: L143-111300-assembly serial no.* 40 • *Lower Middle Magnet Structure Assemblies: L143-111100-1,2-3-assembly no.* 7	1/12/07	☒	☐
6	*Verify correct gap size along the entire undulator length using contactor's go/no-go gages.*	ET or CL 1-12-07	☒	☐
7	*Verify correct gap size along the entire undulator length using calibrated gage blocks.* N/A	ET	☐	☐
8	*Check the peak field at each magnet location using a portable Hall probe.*	SS or IV	☑	☐
9	*Perform or witness the inspection of the 60.00 mm width of the mounting pads.*	1-12-07	☒	☐
10	*Verify that the following quality assurance documentation has been completed by the contractor:* • *ANL Acceptance Criteria Listings E5-026046, E5-020020, E5-069069* • *LCLS Inspection/Acceptance Report for LCLS Magnets* • *LCLS Inspection/Acceptance Report for Supplier Inspection form for LCLS Magnet Assemblies* • *Magnet Sort List* • *Photographs showing correct magnet serial numbers and orientation* • *ANL Supplier Disposition Reports documenting any noncomformance to specifications drawings or other contract requirements*	1/12/07	☒	☐

11	*Verify that the magnet photographs of the magnet sub assemblies are in agreement with the magnet sort list.* M61 lot 25	1/12/07	☒	☐
12	*Review the shipping container for changes since the last undulator shipment and that that mounting feet will be used to prevent rotation of the assembly while in transit.*	2/19/07	☒	☐
13	*Confirm that contractor has shock and temperature monitoring devices available for shipment of the undulator assembly. Check that the shock and temperature monitoring devices were calibrated within 1 year of initial receipt and then once every 12 months thereafter.*	1/12/07	☒	☐
14	*Obtain a copy of the supplier quality assurance records*	1/12/07	☒	☐
15	*Obtain the required ANL signatures on Acceptance Criteria Listings E5-164018, E5-026046, E5-069069.*	3/19/07	☒	☐
16	*Forward supplier quality assurance records and the completed traveler form to LCLS QA Coordinator Tom Barsz. B401, C4219*	3/19/07	☒	☐

LCLS Task Leader Pre-Approval: _____ **Date:** _____

LCLS QA Coordinator Pre-Approval: _____ **Date:** _____

Optional Approver Comments:

STRONG BACK FROM METROLEX NOT PICK AS INDICATED

Distribute completed traveler to: **Responsible Engineer, Task Leader, LCLS Quality Assurance Coordinator, Chief Engineer**

Other: _____

Enter notes, quality improvement, or lessons-learned issues resulting from this activity below.

Title5	Title4	Name	Keyword	Revision	Version
MAGNET CLAMP	UPPER LEFT MAGNET STRUCTURE	1143-110104.drw	PF-381-000-31	00	12
POLE		1143-110105.drw	PF-381-000-32	03	1
MAGNET		1143-110106.drw	PF-381-000-33	04	0
LAST POLE		1143-110107.drw	PF-381-000-94	02	4
DIVING BOARD	UPPER LEFT MAGNET STRUCTURE	1143-110108.drw	PF-381-000-95	00	2
BRACKET 1		1143-110109.drw	PF-381-001-27	02	2
BRACKET 2		1143-110110.drw	PF-381-001-28	02	1
SCREW		1143-110111.drw	PF-381-001-32	00	1
HORIZONTAL FIELD SHIM		1143-110112.drw	PF-381-001-33	00	0
HORIZONTAL FIELD SHIM HANDLE		1143-110113.drw		00	0
SCREEN		1143-110114.drw	PF-381-001-29	01	0
STOPPER		1143-110115.drw	PF-381-001-30	01	0
SPACER		1143-110119.drw	PF-381-000-99	00	1

		1143-110143.drw		01	0
		1143-110144.drw		00	1
		1143-110145.drw		00	1
STRONGBACK MACHINING	UNDULATOR MAGNET ASSEMBLY	1143-110700.drw	PF-381-000-86	08	0
STRONGBACK FORGING	UNDULATOR MAGNET ASSEMBLY	1143-110701.drw	PF-381-000-87	00	10
WEDGED SPACER		1143-110702.drw	PF-381-001-31	04	0
PEAK FIELD SHIM		1143-110703.drw	PF-381-001-05	02	2
SPACER		1143-110704.drw	PF-381-001-06	00	2
UPPER LEFT MAG. STRUCTURE ASSEMBLY	UPPER LEFT MAGNET STRUCTURE	1143-110800.drw	SA-381-000-54	03	0
BASE	UPPER LEFT MAGNET STRUCTURE	1143-110801.drw	PF-381-000-55	00	12
LOWER LEFT MAG. STRUCTURE ASSEMBLY	LOWER LEFT MAGNET STRUCTURE	1143-110900.drw	SA-381-000-56	02	0
BASE	LOWER LEFT MAGNET STRUCTURE	1143-110901.drw	PF-381-000-57	00	9
UPPER MIDDLE MAG. STRUCTURE ASSEMBLY	UPPER MIDDLE MAGNET STRUCTURE	1143-111000.drw	SA-381-00058	03	0
BASE	UPPER MIDDLE MAGNET STRUCTURE	1143-111001.drw	PF-381-000-59	02	0
LOWER MIDDLE MAG. STRUCTURE ASSEMBLY	LOWER MIDDLE MAGNET STRUCTURE	1143-111100.drw	SA-381-000-88	02	0

BASE	LOWER MIDDLE MAGNET STRUCTURE	1143-111101.drw	PF-381-000-89	02	0
BASE	LOWER MIDDLE MAGNET STRUCTURE	1143-111101.prt	PF-381-000-89	02	1
UPPER RIGHT MAG. STRUCTURE ASSEMBLY	UPPER RIGHT MAGNET STRUCTURE	1143-111200.drw	SA-381-000-90	03	0
BASE	UPPER RIGHT MAGNET STRUCTURE	1143-111201.drw	PF-381-000-55	00	4
LOWER RIGHT MAG. STRUCTURE ASSEMBLY	LOWER RIGHT MAGNET STRUCTURE	1143-111300.drw	SA-381-000-92	02	0
BASE	LOWER RIGHT MAGNET STRUCTURE	1143-111301.drw	PF-381-000-93	00	6
MAIN ASSEMBLY		1143-112000.drw	SA-381-001-35	05	1

Drawing revisions verified by: GL

Date: 12/20/06

Not Required Fields

ARGONNE NATIONAL LABORATORY

ACCEPTANCE CRITERIA LISTING

1. DISTRIBUTION:

INSPECTION REQUIRED: ☑

4. ORIGINATOR'S NAME & DIVISION: Glen Lawrence/XFD 5. PHONE: 2-9298 6. DATE: 06/13/2005

9. FOR INSPECTION, DELIVER TO BLDG. NO.: DIVISION: XFD ATTN.: G. Lawrence

10. AFTER INSPECTION, DELIVER TO BLDG. NO.: SLAC DIVISION: LCLS ATTN.:

11. REFERENCES AND/OR REMARKS:

Item may be inspected by LCLS QA at Contractor site prior to shipment with follow-up inspection at receiving site. First Articles from each of the two contractors are to be shipped to ANL/APS to be magnetically shimmed and characterized in the APS Magnet Measurement room. The 38 remaining units shall be shipped directly to SLAC to be magnetically shimmed and characterized in the LCLS Magnet Measurement room.

15. ORIGINATOR OF PLAN: Glen Lawrence DATE: 06/13/2005

16. PLAN REVIEWED/APPROVED BY: DATE: 00/00/0000

17. QAR CONCURRENCE WITH PLAN: DATE: 00/00/0000

3. ACL NO.: E5-164018 LINE NBR: 1

7. PART NO. & NAME: L143-112000 LCLS Undulator Main Assy. 8. QUANTITY: 2

12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
1	Inspect shipping container for evidence of damage or rough handling	eceiving / Inspectic SLAC	Hitech	
2	Inspect shipping sensors for record of temperature variations and shock/g loads in x,y and z during shipping	eceiving / Inspectic SLAC	"	
3	Review all required certifications for compliance and completeness	actor Fac. or Rec. ANL	QPA	1-12-07
4	Visual inspection of Undulator Assy for shipping damage	eceiving / Inspectic SLAC	Hitech	
5	Visual inspection of Undulator Assy for completeness to print, including all loose parts	actor Fac. or Rec. ANL	"	

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12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
6	Verify Undulator gap using Go-NoGo gauge	Contractor Facility	[illegible]	03/13/07 ET

Not Required Fields

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1. DISTRIBUTION:

INSPECTION REQUIRED: ☑

4. ORIGINATOR'S NAME & DIVISION: Glen Lawrence/XFD. 5. PHONE: 2-9298 6. DATE: 01/25/2005

9. FOR INSPECTION, DELIVER TO BLDG. NO.: N/A DIVISION: ATTN.:

10. AFTER INSPECTION, DELIVER TO BLDG. NO.: NA DIVISION: ATTN.:

11. REFERENCES AND/OR REMARKS:

The Magnet Poles are to be delivered to the Undulator Assembly Contractors by the Machining Contractor. Undulator Assembly Contractor shall inspect the Magnet Poles prior to acceptance. ANL shall review all Certifications and Machining Contractor's reported measurements & optionally perform on-site inspections.

15. ORIGINATOR OF PLAN: Glen Lawrence DATE: 01/27/2005

16. PLAN REVIEWED/APPROVED BY: DATE: 00/00/0000

17. QAR CONCURRENCE WITH PLAN: DATE: 00/00/0000

3. ACL NO.: E5-026046 LINE NBR: 1

7. PART NO. & NAME: L143-110105 Upper Magnet Structure Pole 8. QUANTITY: 192

12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
1	Visual inspection of parts for shipping damage	ulator Assy Contra	Hi Tech	
2	Check that parts were "bagged and tagged" with serial no.'s and part no.'s (ANL & SLAC) per SOW L143-00031, Section 4.1.3	ulator Assy Contra	Hi Tech	
3	Check that parts were marked with serial numbers per SOW section 4.1.3.	ulator Assy Contra	Hi Tech	
4	Check that accompanying certifications have correct part serial numbers	ulator Assy Contra	Hi Tech	
5	Check the material certification for compliance with ASTM A801, Type 1	tor Assy Contracto	Hi Tech	

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ACCEPTANCE CRITERIA LISTING

12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
6	Check the anneal certification for compliance with AMS-A801, or a specified material supplier's annealing schedule.	ator Assy Contractc	Hitech	
7	Check that the machining Contractor's certified dimensional measurements are in compliance with the drawing	ANL	[illegible]	3/12/07 TB
8	Verify the critical dimensions as listed in the SOW, Section 4.5.2 are in compliance with the drawing	ulator Assy Contra	Hitech	

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ACCEPTANCE CRITERIA LISTING

1. DISTRIBUTION:

INSPECTION REQUIRED: ☑

4. ORIGINATOR'S NAME & DIVISION: Glen Lawrence/XFD 5. PHONE: 2-9298 6. DATE: 03/10/2005

9. FOR INSPECTION, DELIVER TO BLDG. NO.: 401 DIVISION: XFD ATTN.: Glen Lawrence

10. AFTER INSPECTION, DELIVER TO BLDG. NO.: 401 DIVISION: XFD ATTN.: Glen Lawrence

11. REFERENCES AND/OR REMARKS:

Most of the magnets will be drop shipped directly to the Undulator Assembly Contractor, who will only perform limited physical inspection of the parts as they are highly magnetized. A sampling from each lot will be sent to ANL for verification of the magnetic field properties.

15. ORIGINATOR OF PLAN: Glen Lawrence DATE: 02/07/2005

16. PLAN REVIEWED/APPROVED BY: DATE: 00/00/0000

17. QAR CONCURRENCE WITH PLAN: DATE: 00/00/0000

3. ACL NO.: E5-069069 LINE NBR: 1

7. PART NO. & NAME: L143-110106 ~~Upper Left~~ Magnet ~~Structure~~ 8. QUANTITY: 192

12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
1	Visual inspection of parts for shipping damage	lulator Ass'y Contra	Hitch	
2	Visual inspection of parts for surface chips and pits	lulator Ass'y Contra	Hitech	
3	Dimensional check of part for conformance to the drawing	lulator Ass'y Contra	Hitech	
4	Review vendor certified test data agrees with SOW requirements	APS Bldg 401	TPM	3/12/07 TB
5	Review Vendor sort list for agreement with sort procedure.	APS Bldg 401	[illegible]	SS

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12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
6	On random sampling, inspect magnetic field with magnetic visualization film for magnetic defects.	APS Magnet Grou	Shigeki Sasaki SS	
7	On random sampling, confirm Magnetic Moment magnitude and vector components agree with vendor reports	APS Magnet Grou	Shigeki Sasaki SS	
8	On radom sampling, verify the magnet s demagnetization and thermal stability.	APS Magnet Grou	Shigeki Sasaki SS	

Not Required Fields

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ACCEPTANCE CRITERIA LISTING

1. DISTRIBUTION:

INSPECTION REQUIRED: ☑

4. ORIGINATOR'S NAME & DIVISION: Glen Lawrence/XFD 5. PHONE: 2-9298 6. DATE: 01/20/2005

9. FOR INSPECTION, DELIVER TO BLDG. NO.: N/A DIVISION: ATTN.:

10. AFTER INSPECTION, DELIVER TO BLDG. NO.: NA DIVISION: ATTN.:

11. REFERENCES AND/OR REMARKS:

Strongbacks are to be delivered to undulator assembly contractor by machining contractor. Undulator assembly contractor shall inspect strongback prior to acceptance. Argonne National Laboratory shall review all certification and machining vendor's reported measurements and optionally on-site inspections

15. ORIGINATOR OF PLAN: Glen Lawrence DATE: 01/20/2005

16. PLAN REVIEWED/APPROVED BY: DATE: 00/00/0000

17. QAR CONCURRENCE WITH PLAN: DATE: 00/00/0000

3. ACL NO.: E5-020020 LINE NBR: 1

7. PART NO. & NAME: L143-110700 LCLS Undulator Strongback 8. QUANTITY: 40

12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
1	Visual Inspection of part for shipping damage. A) Were critical surfaces protected per SOW L143-00030 Section 4.1.4? B) Is there any visible damage?	lulator Ass'y Contra	Hi Tech	
2	Check Strongback is marked with serial number & part no.'s (ANL and SLAC) per SOW Section 4.1.3	lulator Ass'y Contra	Hi Tech	
3	Check all accompanying Certifications have correct part serial number.	lulator Ass'y Contra	Hi Tech	
4	Check Material Certiication for compliance with ASTM B381-03, Grade F	ıtor Ass'y Contractc	Hi Tech	
5	Check Forging Annealing Certification for annealing conformance to AMS-H-81200A, Table V, commercial Pure, Bars & Forgings, including Note 8	ıtor Ass'y Contractc	Hi Tech	

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ACCEPTANCE CRITERIA LISTING

12. STEP NO.	13. INSPECTION/TEST REQUIREMENT	14. INSPECTION TEST LOCATION	18. ACCEPTED BY OR NONCONFORMANCE REPORT NO.	19. DATE
6	Check Rough Machining Anneal Certification for annealing conformance to AMS 2801B section 3.2.9	itor Ass'y Contract	Hi Tech	
7	Check the strongback contractor's reported dimensional measurements against the part drawing.	rgonne National La	[illegible] 3/12/07 TB	
8	Verify the strongback critical dimensions as listed in the SOW section 4.5.2 are in compliance with the print.	lulator Ass'y Contra	Hi Tech	

Mag LOT 29

Date 1/12/07 Device# 40 Start Time 10:25 Start Temperature 21.5

Slot	Value	Slot	Value	Slot	Value	Slot	Value	Slot	Value
1	-	51	-1.27	101	-1.26	151	-1.26	201	-1.26
2	0.75	52	1.26	102	1.26	152	1.27	202	1.26
3	-1.25	53	-1.27	103	-1.26	153	-1.26	203	-1.27
4	1.29	54	1.26	104	1.26	154	1.26	204	1.26
5	-1.26	55	-1.27	105	-1.27	155	-1.27	205	-1.26
6	1.26	56	1.27	106	1.26	156	1.26	206	1.26
7	-1.27	57	-1.27	107	-1.27	157	-1.26	207	-1.27
8	1.27	58	1.26	108	1.28	158	1.26	208	1.27
9	-1.27	59	-1.27	109	-1.26	159	-1.26	209	-1.27
10	1.26	60	1.28	110	1.26	160	1.27	210	1.27
11	-1.27	61	-1.27	111	-1.27	161	-1.27	211	-1.27
12	1.27	62	1.26	112	1.28	162	1.27	212	1.27
13	-1.26	63	-1.26	113	-1.26	163	-1.26	213	-1.26
14	1.26	64	1.26	114	1.26	164	1.26	214	1.26
15	-1.26	65	-1.27	115	-1.26	165	-1.26	215	-1.27
16	1.27	66	1.27	116	1.26	166	1.26	216	1.27
17	-1.27	67	-1.27	117	-1.26	167	-1.26	217	-1.26
18	1.27	68	1.27	118	1.26	168	1.27	218	1.27
19	-1.27	69	-1.27	119	-1.26	169	-1.26	219	-1.26
20	1.27	70	1.27	120	1.26	170	1.26	220	1.26
21	-1.27	71	-1.27	121	-1.26	171	-1.25	221	-1.27
22	1.27	72	1.27	122	1.26	172	1.26	222	1.26
23	-1.27	73	-1.27	123	-1.26	173	-1.26	223	-1.28
24	1.27	74	1.27	124	1.26	174	1.27	224	1.21
25	-1.27	75	-1.27	125	-1.25	175	-1.27	225	-.75
26	1.27	76	1.27	126	1.26	176	1.27		
27	-1.28	77	-1.26	127	-1.26	177	-1.26		
28	1.27	78	1.27	128	1.26	178	1.27		
29	-1.27	79	-1.26	129	-1.26	179	-1.27		
30	1.26	80	1.25	130	1.26	180	1.26		
31	-1.27	81	-1.26	131	-1.25	181	-1.26		
32	1.27	82	1.26	132	1.26	182	1.26		
33	-1.27	83	-1.27	133	-1.26	183	-1.26		
34	1.27	84	1.27	134	1.26	184	1.28		
35	-1.26	85	-1.27	135	-1.25	185	-1.28		
36	1.27	86	1.27	136	1.25	186	1.26		
37	-1.26	87	-1.26	137	-1.26	187	-1.27		
38	1.26	88	1.26	138	1.26	188	1.26		
39	-1.27	89	-1.26	139	-1.25	189	-1.26		
40	1.27	90	1.27	140	1.26	190	1.27		
41	-1.27	91	-1.26	141	-1.26	191	-1.27		
42	1.27	92	1.27	142	1.27	192	1.27		
43	-1.27	93	-1.26	143	-1.26	193	-1.27		
44	1.26	94	1.28	144	1.25	194	1.26		
45	-1.27	95	-1.26	145	-1.26	195	-1.26		
46	1.26	96	1.26	146	1.25	196	1.27		
47	-1.26	97	-1.26	147	-1.25	197	-1.26		
48	1.27	98	1.25	148	1.26	198	1.26		
49	-1.28	99	-1.28	149	-1.27	199	-1.26		
50	1.27	100	1.26	150	1.26	200	1.27		

End Temperature 21.9°C

End Time 11:02

Hall Probe S/N 01231053

Signatures:

Shigeru Sasaki

Emil Trachtenberg