



Addendum II: Table of Engineering Documentation Deliverables

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4 January 2017

Background

Action Items from July, 2016 IIFC Meeting:

Prepare a table of all information related to HISPA design, technology, and supporting infrastructure knowledge to be provided to DAE.

Provide this table by Sept. 30, 2016

- This Fermilab “table of deliverables” was prepared and transmitted to DAE on September 29, 2016

Following discussion between the Fermilab and DAE Technical Coordinators it was decided that:

- The Fermilab table of deliverables would be expanded to provide more detailed information on “supporting documentation”
- The table of deliverables would be incorporated into the Joint Project Document for R&D as Addendum II
 - Companion to the list of DAE deliverables with new dates documented as Addendum I

Addendum II

Fermilab Table of Deliverables is structured to reflect engineering processes at Fermilab

- Two R&D phases:
 - Prototype development
 - Final design
- Processes described in Fermilab Engineering Manual, and application to IIFC R&D phase described in TeamCenter document ED0005292:

Functional Requirements Specification

Risk Assessment

Supporting Documentation

Preliminary Design Review

Preliminary Technical Requirements Specification

Procurement Documents

Prototype

Technical Requirements Specification

Technical Design Report

Technical Interface Specification

Supporting Documentation

Final Design Review

Operational Readiness Clearance

Final Design

- Not all steps apply to every system/component

Addendum II

- Primary tables provide above dates for delivery of all anticipated engineering documentation, listed by major subsystem, for all components under development by IIFC
 - Documents are associated with either the prototype or final design phase
- Supporting documentation in these tables include:
 - 3-D models
 - Engineering drawings
 - Procurement Readiness Review documentation
 - Engineering Notes
 - Manufacturing processes documentation
 - QA documentation
- Not all documentation is provided by Fermilab in all cases
 - For example in cases in which DAE labs are in the lead, engineering documentation is not coming from Fermilab
 - However, in all cases Fermilab is responsible for providing the FRS (Functional Requirements Specification)
- Summary table provides high-level view and also identifies the EPDM (Engineering Process Document Management) in TeamCenter by subsystem
 - An empty cell means that Fermilab is not expecting to provide this documentation
 - NA (not applicable) means this documentation is not required

Addendum II/Supporting Documentation Details

- We have established a standard description of supporting documentation at the sub-component level
 - FRS
 - Risk Assessment
 - Preliminary Design Review
 - 3-D models
 - Engineering drawings
 - Procurement Readiness Review
 - Engineering Notes
 - Final Design Review
 - Manufacturing processes
 - QA
 - Interface specifications
 - Operational Readiness Clearance
- Not all elements are required for each sub-components
- All this is/will be indexed within the EPDMs, including information both in and outside TeamCenter
- See examples

Addendum II/Supporting Documentation Details (SSR1)

	A	C	E	F
1	325 MHz SSR1 Cavity			
2				
3	SSR1 Bare Cavity	Delivery Dates		
4		<i>FNAL: Prototype Phase</i>	<i>FNAL: Final Design Phase</i>	<i>Remarks:</i>
5	FRS			FRS for jacketed cavity only
6	Risk assessment	16-Mar-15	31-Jul-17	RA FNAL requirement only
7	TRS	31-Mar-17	31-Jul-17	TRS for jacketed cavity only
8	Preliminary Design Review Documentation	31-Mar-17	31-Jul-17	RF Design, prelim mech design, multipact sims, thermal/structural analysis, etc.
9	3D Models	17-Aug-16	31-Jul-17	
10	Engineering drawings	17-Aug-16	31-Jul-17	
11	Procurement Readiness Review Documentation	31-Mar-17	31-Jul-17	Production drawings, production plan incl
12	Engineering Note(s)	31-Mar-17	31-Jul-17	
13	Final Design Review Documentation	31-Mar-17	31-Jul-17	Final RF Design, final mech design, final thermal/structural analysis, etc.
14	Manufacturing Process Documents	31-Mar-17	31-Jul-17	Material and welding certs, code
15	QA Documentation and Travelers	31-Mar-17	31-Jul-17	
16	Interface Specification			Required for CM only
17	Operational Readiness Clearance			Required for systems only
18				
19	SSR1 Jacketed Cavity	Delivery Dates		
20		<i>FNAL: Prototype Phase</i>	<i>FNAL: Final Design Phase</i>	<i>Remarks:</i>
21	FRS	29-Oct-14	29-Oct-14	
22	Risk assessment	16-Mar-15	16-Mar-15	RA FNAL requirement only
23	TRS	29-Oct-14	29-Oct-14	
24	Preliminary Design Review Documentation	31-Mar-17	31-Dec-17	RF Design, prelim mech design, multipact sims, thermal/structural analysis, etc.
25	3D Models	17-Aug-16	31-Dec-17	
26	Engineering drawings	17-Aug-16	31-Dec-17	
27	Procurement Readiness Review Documentation	31-Mar-17	31-Dec-17	Production drawings, production plan incl
28	Engineering Note(s)	31-Mar-17	31-Dec-17	
29	Final Design Review Documentation	31-Mar-17	31-Dec-17	Final RF Design, final mech design, final thermal/structural analysis, modal analysis, df/dP, LFD, etc.
30	Manufacturing Process Documents	31-Mar-17	31-Dec-17	Material and welding certs, code
31	QA Documentation and Travelers	31-Mar-17	31-Dec-17	
32	Interface Specification			Required for CM only
33	Operational Readiness Clearance			Required for systems only

	Not Required
	DOE/Fermilab Deliverable
	Not provided by Fermilab/DAE lead

Addendum II/Supporting Documentation Details (SSR2)

	A	C	E	F
1	325 MHz SSR2 Cavity			
2				
3	SSR2 Bare Cavity	Delivery Dates		
4		<i>FNAL: Prototype Phase</i>	<i>FNAL: Final Design Phase</i>	<i>Remarks:</i>
5	FRS			FRS for jacketed cavity only
6	Risk assessment	31-Mar-17	31-Mar-17	RA FNAL requirement only
7	TRS			TRS for jacketed cavity only
8	Preliminary Design Review Documentation			multi-pact sims, thermal/structural analysis, etc.
9	3D Models			
10	Engineering drawings			
11	Procurement Readiness Review Documentation			Production drawings, production plan incl schedule, etc.
12	Engineering Note(s)			
13	Final Design Review Documentation			Final RF Design, final mech design, final thermal/structural analysis, etc.
14	Manufacturing Process Documents			Material and welding certs, code requirements, etc.
15	QA Documentation and Travelers			
16	Interface Specification			Required for CM only
17	Operational Readiness Clearance			Required for systems only
18				
19	SSR2 Jacketed Cavity	Delivery Dates		
20		<i>FNAL: Prototype Phase</i>	<i>FNAL: Final Design Phase</i>	<i>Remarks:</i>
21	FRS	26-Sep-14	30-Jun-20	
22	Risk assessment	31-Mar-17	30-Jun-20	RA FNAL requirement only
23	TRS			
24	Preliminary Design Review Documentation			RF Design, prelim mech design, multi-pact sims, thermal/structural analysis, etc.
25	3D Models			
26	Engineering drawings			
27	Procurement Readiness Review Documentation			Production drawings, production plan incl schedule, etc.
28	Engineering Note(s)			
29	Final Design Review Documentation			Final RF Design, final mech design, final thermal/structural analysis, modal analysis, df/dP, LFD, etc.
30	Manufacturing Process Documents			Material and welding certs, code requirements, etc.
31	QA Documentation and Travelers			
32	Interface Specification			Required for CM only
33	Operational Readiness Clearance			Required for systems only

Addendum II/Summary Level

Addendum 2 to the Joint Project Document for the R&D Phase of the IIFC													Teamcenter Doc. #ED0005292									
IIFC R&D Documentation Delivery Dates																						
R&D Prototype Phase													R&D Final Design Phase									
IIFC Deliverable	TC EPDM #	FRS	RA	PDR	Preliminary-TRs	Procurement Docs.	TRs	TDR	TIS	FDR	ORC	Executive Summary	Comments									
Warm Magnets																						
MEBT Dipole (Indian Deliverable)	ED00002725	11-Feb-13	NA	15-Oct-16	03-Aug-15	NA	03-Aug-15	15-Oct-16	NA	15-Oct-16	NA	30-Jun-20	Post-design phase; series magnets delivered (as of September 2016)									
MEBT Quadrupole (Indian Deliverable)	ED00001275	11-Feb-13	NA	NA	03-Aug-15	NA	03-Aug-15	NA	NA	31-Mar-17	NA	30-Jun-20	Post-design phase; series magnets to be delivered (as of September 2016)									
Linac 650 Dipoles (Indian Deliverable)	ED00003416	20-Jul-15	30-Nov-16	28-Feb-17	28-Feb-17	31-Mar-17	30-Jun-17	31-Dec-17	31-Dec-17	31-Dec-18	31-Dec-18	30-Jun-20										
Linac 650 Quadrupoles (Indian Deliverable)	ED00003415	20-Jul-15	30-Nov-16	28-Feb-17	28-Feb-17	30-Apr-17	30-Jun-17	31-Dec-17	31-Dec-17	31-Dec-18	31-Dec-18	30-Jun-20										
Cold Magnets																						
SSR1 Focusing Lens	ED00001264	06-Jun-12	01-Jan-11	NA	NA	12-Apr-16	12-Apr-16	NA	NA	NA	NA	12-Apr-16	Post-design phase; magnets delivered (as of September 2016)									
SSR2 Focusing Lens (Indian Deliverable)	ED00004177	16-Sep-15	31-Dec-16	20-Jan-16	30-Jun-16	31-Oct-17	31-Jul-18	30-Nov-18	30-Nov-18	31-Dec-18	31-Dec-18	30-Jun-20	PDR was released as EM design report and presentation in PIP-II technical									
325 MHz SSR1 Cavity																						
SSR1 Jacketed Cavity	ED00001234	26-Sep-14	27-Feb-12	03-Nov-15	26-Sep-14	22-Feb-13	26-Sep-14	01-Aug-16	15-Sep-16	03-Nov-15	05-Sep-14	30-Jun-20										
Bare Cavity	ED00001240	26-Sep-14	27-Feb-12	03-Nov-15	26-Sep-14	22-Feb-13	26-Sep-14	01-Aug-16	15-Sep-16	03-Nov-15	05-Sep-14	30-Jun-20										
Helium Vessel	see ED00001234	26-Sep-14	27-Feb-12	03-Nov-15	26-Sep-14	22-Feb-13	26-Sep-14	01-Aug-16	15-Sep-16	03-Nov-15	05-Sep-14	30-Jun-20										
SSR1 Tuner	ED00001246	26-Sep-14	28-Sep-16	01-Mar-15	27-Mar-13	N/A	02-Feb-16		22-Sep-16	29-Sep-16	30-Jun-20	30-Jun-20										
SSR1/2 Couplers	ED00001258	29-Apr-16	07-Apr-16	03-Nov-15	31-Dec-16	07-Apr-15	15-May-18	15-May-18	15-May-18	15-May-18	15-May-18	15-May-18										
325 MHz SSR2 Cavity (Joint deliverable)																						
SSR2 Cavity RF Design		26-Sep-14	31-Mar-17										RF design completed at FNAL in May 2016 and transmitted to BARC. Now									
SSR2 Cavity Mechanical Design (including Design for manufacturing)		26-Sep-14																				
SSR2 Jacketed Cavity	ED00001235	26-Sep-14																				
Bare Cavity	ED00001248	26-Sep-14																				
Helium Vessel	see ED00001235	26-Sep-14																				
SSR2 Tuner	ED00001252												FRS does not exist yet.									
650 MHz Cavities																						
HB650 Dressed Cavity	ED00005154	22-May-15	20-May-15	N/A	31-May-15	N/A	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20										
B.9 Bare Cavity	ED00001249	22-May-15	20-May-15	29-Oct-15	31-May-15	in-house	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20										
Helium Vessel	ED00001250	22-May-15	03-May-16	24-May-16	31-May-15	07-Oct-16	w/cavity	w/cavity	N/A	30-Jun-20	N/A	30-Jun-20	the prototype is the final design. Most documentation is included with the dressed cavity documentation.									
LB650 Dressed Cavity (Joint Deliverable)	ED00005156	26-May-16	29-Jun-16	19-Aug-16									PDR: VECC documents in ED00005064									
Bare Cavity	ED00001241	26-May-16	29-Jun-16	19-Aug-16																		
Helium Vessel	ED00001242	26-May-16	29-Jun-16	19-Aug-16																		
650 HB/LB Tuner	ED00001253	20-Apr-16	03-May-16	15-Apr-16	30-Jun-16	01-Aug-16	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	supporting documents will include testing results after the first prototype becomes available.									
650 HB/LB Coupler	ED00001260	12-Oct-15	07-Nov-16	23-Nov-16	05-Dec-16		30-Jun-20	30-Jun-20	N/A	30-Jun-20	30-Jun-20	30-Jun-20	Conceptual Design Review: 21-OCT-16									
HB650 MHz Cryomodule																						
	ED00001255	28-Sep-15	01-Oct-16	01-Mar-18	on-going	01-May-18	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20										
LB650 MHz Cryomodule																						
	ED00001254	06-Oct-15																				
325 MHz SSR1 Cryomodule																						
	ED00001256	28-Sep-15	25-Mar-14	03-Nov-15	31-Jan-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20										
325 MHz SSR2 Cryomodule																						
	ED00001257	28-Sep-15																				

Addendum II/Summary Level

Addendum 2 to the Joint Project Document for the R&D Phase of the IIFC														Teamcenter Doc. #ED0005292							
IIFC R&D Documentation Delivery Dates																					
R&D Prototype Phase														R&D Final Design Phase							
IIFC Deliverable	TC EPDM #	FRS	RA	PDR	Preliminary-TRS	Procurement Docs.	TRS	TDR	TIS	FDR	ORC	Executive Summary	Comments								
RF Power System (Joint Deliverable)																					
325 MHz 7 kW Solid State RF Amplifier	ED0005428	23-Dec-15			30-Aug-16																
325 MHz 20 kW Solid State RF Amplifier	ED0005429	10-Nov-15																			
850 MHz 40 kW Solid State RF Amplifier	ED0005430	16-Dec-15			02-Aug-16																
850 MHz 70 kW Solid State RF Amplifier	ED0005431	10-Nov-15																			
RF Interlock (Joint Deliverable)																					
RF Protection Interlock System	ED0005432	01-Nov-16	01-Nov-16	15-Feb-17	01-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
PIP-II LLRF EPDM (Joint Deliverable)																					
Integrated LLRF System	ED0004194	21-Oct-16	16-Dec-16		NA		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
LLRF STATION	ED0005046	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
MASTER OSCILLATOR AND PRECISION REFERENCE LINE	ED0005027	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
LLRF FIELD CONTROL CHASSIS	ED0005047	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
RESONANCE CONTROL CHASSIS	ED0005044	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
FPGA BOARD	ED0004508	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
4 CHANNEL UP CONVERTER	ED0004509	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
8 CHANNEL DOWN CONVERTER	ED0004510	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
PIEZO CONTROLLER MODULE	ED0004511	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
ADC/DAC MEZZANINE BOARD	ED0004513	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
TEMPERATURE CONTROL CHASSIS	ED0005045	21-Oct-16	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
POWER SUPPLY CHASSIS	ED0005048	NA	16-Dec-16	18-Feb-17	16-Mar-17		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
SIMULATION AND MODELLING	ED0005030	NA	16-Dec-16		NA		30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20	30-Jun-20									
Horizontal Test Stand - 2 (Joint Deliverable)																					
Feedcan	ED0001681	14-Oct-14	12-Feb-15	03-Nov-14	24-Mar-15	27-Mar-15	24-Mar-15	DAE	31-Dec-17	N/A	01-Dec-18		SDW: 5-DEC-2014, Commissioning Plan: 31-DEC-2017, Safety								
Cryostat	ED0001680	"	"	"	"	"	"	"	"	"	"	"	"								
650 MHz Cryomodule Test Stand (Joint Deliverable)																					
CMTS Feedbox	ED0004522	needed															needs FRS				
CMTS Cryo-Distribution	ED0004523	N/A																			
Cryoplant (Joint Deliverable)																					
	ED0003530	03-Dec-15																			
	ED0005493																Engineering Spec Doc Set ready and posted at Share Point 811				

