ProtoDUNE-DP Construction and Installation schedule

- Main dates
- Detailed planning for each item
- Table of urgent tasks and timescale

Detector installation schedule revised to take into account new inputs from the different elements of last months

19/01/2018

D. Duchesneau

Hypothesis for CRP:

=> G10 and Invar frames are received by 1st week of February as expected from companies

- \Rightarrow 36 LEMs with CFR-35 available by Feb 26th
- \Rightarrow 36 anodes by mid Feb.
- \Rightarrow Additional 36 LEMs are ordered by Beginning of February depending on tests of CFR-36 design
- \Rightarrow LEMs for CRP 3 and 4 can follow the same decision if we decide to go on for 4 CRPs

Critical paths:

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⇒ the Patch panels of the CRP which are on a critical path: design not ready for HV patch panel and tests of design to be done before ordering
 => this can affect the end of first CRP construction and then shifts all the schedule

=> SGFT details (from IWG meeting of 16/06) are added but lot of uncertainties on the real tasks schedule: we should not change the design which is adapted and we should go on with the tendering and production.

CRP Production and installation

	Task name 👻	Start date (dd//mm/yy)	Finish date (dd//mm/yy)	- Duration -	Half 1, 2017 Half 2, 2017 Half 1, 2018 Half 2, 2018 Half 1, 2019 Half 2, 2019 J M M J S N J M M J S N J M M J S N J N M J S N J N N J S N N N S S S S
	CRP Cold box construction	04/12/2017	23/03/2018	70 days	CRP Cold box construction
	CRP Cold box design	04/12/2017	12/01/2018	20 days	CRP Cold box design
Ļ	CRP Cold box parts procurement	15/01/2018	23/02/2018	30 days	
;	CRP Cold box assembly	26/02/2018	09/03/2018	10 days	
5	CRP Cold box cryogenic installation	12/03/2018	23/03/2018	10 days	
7	CRP Cold box instrumention and control	12/03/2018	23/03/2018	10 days	
3					
)	CRP Production & Installation	10/04/2017	31/08/2018	354,29 days?	CRP Production & Installation
)	CR185 material order	10/04/2017	25/08/2017	100 days	CR185 material order
1	Clean Room Material reception	28/08/2017	26/01/2018	100 days	
2	Signal Patch panel design and production	16/11/2017	24/01/2018	40 days	
3	HV Patch panel design and production	15/01/2018	23/02/2018	30 days	
ł	CR185 preparation	04/07/2017	01/02/2018	143 days	CR185 preparation
1	CRP assembly in CR185	29/01/2018	14/08/2018	141,29 days	CRP assembly in CR185
2	▷ CRP #1	29/01/2018	29/03/2018	43,57 days	CRP #1
7	▷ CRP #2	29/03/2018	15/05/2018	32,57 days	CRP #2
2	▷ CRP #3	15/05/2018	28/06/2018	32,57 days	CRP #3
7	▷ CRP #4	28/06/2018	14/08/2018	32,57 days	Г СRР #4
96	Test CRP#1 in cold box	29/03/2018	08/05/2018	28 days?	Test CRP#1 in cold box
97	Transport to cold box area	29/03/2018	30/03/2018	1 day	
98	Unpack the CRP	30/03/2018	02/04/2018	1 day?	ξ
99	Cable the CRP to the cold box Feedthroughs	02/04/2018	05/04/2018	3 days	
0	Insert into the cold box	05/04/2018	06/04/2018	1 day?	
)1	Perfom cooling and test	06/04/2018	20/04/2018	10 days	
)2	Open and heat the box	20/04/2018	04/05/2018	10 days	L
)3	Packing in transport box	04/05/2018	08/05/2018	2 days	1
04					
)5	CRP installation in the cryostat	08/05/2018	31/08/2018	82,71 days	CRP installation in the cryostat
6	CRP #1 Installation in Cryostat	08/05/2018	23/05/2018	11 days	□ CRP #1 Installation in Cryostat
3	CRP #2 Installation in Cryostat	15/05/2018	06/06/2018	16,43 days	CRP #2 Installation in Cryostat
20	CRP #3 Installation in Cryostat	28/06/2018	13/07/2018	11 days	CRP #3 Installation in Cryostat
27	CRP #4 Installation in Cryostat	14/08/2018	29/08/2018	11 days	□ CRP #4 Installation in Cryostat
34	CRP lateral position adjustment (warm conditions)	29/08/2018	31/08/2018	2 days	h h
35	All CRPs installed and cabled	31/08/2018	31/08/2018	0 days	₫ 31/08

Cold bath done only for CRP#1 = > in parallel produce the CRP#2

LEM and Anode production

		Start date	Finish date		2017 Qtr 3, 2017 Qtr 4, 2017 Qtr 1, 2018 Qtr 2, 2018 Qtr 3, 2018 Qtr 4, 2018 Qtr 1, 2019
		(dd//mm/yy)			
112	LEM Supply	29/05/2017	22/05/2018	247 days?	T LEM Supply
113	Green Light LEM CFR-35 production for first CRP	18/12/2017	18/12/2017	1 day?	• 18/12
114	Administrative time to start first CRP LEM Production	19/12/2017	20/12/2017	2 days	*Administrative time to start first CRP LEM Production
115	Green Light LEM CFR-35 or 36 production for second CRP	05/02/2018	05/02/2018	1 day?	• 05/02
116	Administrative time to start second CRP LEM Production	06/02/2018	07/02/2018	2 days	*Administrative time to start second CRP LEM Production
117	LEM Firm_A Production Validation	29/05/2017	11/08/2017	55 days	LEM Firm_A Production Validation
121	12 LEM Firm_A production	21/12/2017	29/01/2018	18 days	12 LEM Firm_A production
126	12 LEM Firm_A production	18/01/2018	12/02/2018	18 days	12 LEM Firm_A production
131	12 LEM Firm_A production	01/02/2018	26/02/2018	18 days	[] 12 LEM Firm A production
136	second CRP at Firm_A	14/02/2018	14/02/2018	0 days	
137	12 LEM Firm_A production	15/02/2018	12/03/2018	18 days	12 LEM Firm_A production
142	12 LEM Firm_A production	01/03/2018	26/03/2018	18 days	12 LEM Firm_A production
147	12 LEM Firm_A production	15/03/2018	09/04/2018	18 days	12 LEM Firm_A production
152	Green Light LEM production for third CRP Firm B	05/02/2018	05/02/2018	1 day?	• 05/02
153	Administrative time to start third CRP LEM Production	06/02/2018	07/02/2018	2 days	*Administrative time to start third CRP LEM Production
154	Green Light LEM production for fourth CRP Firm A	29/03/2018	29/03/2018	1 day?	• 29/03
155	Administrative time to start fourth CRP LEM Production	30/03/2018	02/04/2018	2 days	* Administrative time to start fourth CRP LEM Production
156	LEM Firm_B Production Validation	08/02/2018	21/03/2018	30 days	LEM Firm_B Production Validation
160	12 LEM Firm_B production	22/03/2018	12/04/2018	16 days	12 LEM Firm_B production
165	12 LEM Firm_B production	05/04/2018	26/04/2018	16 days	rtailing 12 LEM Firm_B production
170	12 LEM Firm_B production	19/04/2018	10/05/2018	16 days	12 LEM Firm_B production
175	12 LEM Firm_A production	03/04/2018	24/04/2018	16 days	12 LEM Firm_A production
180	> 12 LEM Firm_A production	17/04/2018	08/05/2018	16 days	12 LEM Firm_A production
185	> 12 LEM Firm_A production	01/05/2018	22/05/2018	16 days	12 LEM Firm_A production
190	Anode Supply	03/07/2017	08/06/2018	235 days	Anode Supply
191	40 anode for CRP 1	03/07/2017	02/02/2018	145 days	40 anode for CRP 1
192	40 anode for CRP 2	19/01/2018	06/04/2018	56 days	40 anode for CRP 2
193	40 anode for CRP 3	05/02/2018	27/04/2018	60 days	40 anode for CRP 3
194	40 anode for CRP 4	19/03/2018	08/06/2018	60 days	40 anode for CRP 4

Anodes orders should be placed sequentially at a rate of 40/month

Field Cage Installation

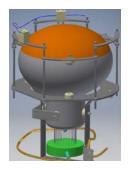
• The assembly procedure in the cryostat takes into account the test of 4 submodules which was done end of 2017

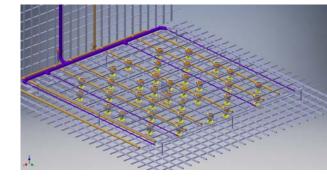
		Start date	Finish date		Half 2, 2017 Half 1, 2018 Half 2, 2018
	Task name 👻	(dd//mm/yy) 👻	(dd//mm/yy)	Duration 👻	A M J J A S O N D J F M A M J J A S O N D
266	In Drift Cage Production and Installation	01/05/2017	12/11/2018	390,29 days	Drift C
267	Mechanical Test assembly in UTA	01/05/2017	31/08/2017	89 days	Mechanical Test assembly in UTA
268	PCB production and testing in cold	01/06/2017	29/09/2017	87 days	PCB production and testing in cold
269	Assembly test in CRB	08/12/2017	20/12/2017	9 days	Assembly test in CRB
273	Installation test in cryostat	13/12/2017	30/01/2018	25 days	Installation test in cryostat
277	Full Assembly in CRB	17/08/2018	07/09/2018	15 days	Full Assembly in C
282	Full Installation in cryostat	04/09/2018	12/11/2018	49 days	Full Ins
283	Assemble Fourth column	04/09/2018	06/09/2018	2 days	h
284	Assemble Fifth column	06/09/2018	10/09/2018	2 days	1 t
285	Fix clips and contacting dividers and reinforcements	10/09/2018	14/09/2018	4 days	
286	Assemble 2/3 of columns 6 and 7	14/09/2018	21/09/2018	5 days	
287	Bring last 5 submodules on the side	21/09/2018	24/09/2018	1 day	1 K
288	Bring and assemble cathode and GND grid modules	24/09/2018	02/10/2018	6 days	
289	Remove Crane I-Beam inside the	09/10/2018	11/10/2018	2 days	b
290	Install 4 of the last FC submodules + missing reinforcement clips	11/10/2018	18/10/2018	5 days	
291	HVFT and degraders	11/10/2018	18/10/2018	5 days	
292	connect cathode and ground grid to the FC	18/10/2018	19/10/2018	1 day	
293	Remove floor and scaffoldings	19/10/2018	23/10/2018	2 days	
294	Lower the ground grid	08/11/2018	12/11/2018	2 days	
295	Field cage installed	18/10/2018	18/10/2018	0 days	₹ 18/10
296	HVFT installed	19/10/2018	19/10/2018	0 days	₹ 19/10
297	Cathode installed	12/11/2018	12/11/2018	0 days	* 12/11

The other modules will be installed after CRP4 in Sept-Oct 2018 But this could be optimised and done before with a specific assembly sequence allowing a safe CRP installation and cabling in cryostat

Light Readout System







1	Fask name	Start date (dd//mm/yy)	Finish date (dd//mm/yy)	Duration	A	М	J. H	lalf 2, 201 J A		O N	D	Half	1, 2018 F 1	A	М	Half J J	2, 2018 A S	0	Half 1, 2 N D J F
315	PMT and Light Read Out System	01/12/2016	08/11/2018	495,29 days?	-				121										PMT and Light
316	LRO electronics	08/03/2017	06/07/2018	338 days															
317	PMTs preparation and installation	01/12/2016	08/11/2018	495,29 days?	-													-	PMTs preparat
318	PMT procurement	01/12/2016	23/12/2016	17 days	ent														
319	PMT base design and manufacturing	09/01/2017	28/04/2017	80 days?															
320	PMT support structure production and assembly	09/01/2017	28/04/2017	80 days	-														
321	PMTs characterization	09/01/2017	29/09/2017	190 days?															
322	TPB coating	02/04/2018	31/05/2018	44 days															
323	Splitter production and tests	04/09/2017	30/11/2017	64 days					i);		1								
324	PMT cable and fiber routing in cryostat from flange to bottom	31/08/2018	04/09/2018	2 days													TR		
325	PMT support installation on the membrane	23/10/2018	25/10/2018	2 days														ţ	
326	PMT testing, installation in cryostat and cabling	25/10/2018	08/11/2018	10 days														ł	
327	Splitter installation	25/10/2018	08/11/2018	10 days														i i	
328	 Light calibration system 	08/03/2017	08/11/2018	426,29 days	-														- Light calibratio
329	Fibers, light source tests and procurement	08/03/2017	01/12/2017	193 days	-														
330	Fiber calibration system installation	25/10/2018	08/11/2018	10 days															
331	Light readout installed and cabled	08/11/2018	08/11/2018	0 days															€ 08/11
332	Lower the Ground grid to its fnal position	08/11/2018	12/11/2018	2 days															T
333																		_	
334	Front End electonics	03/09/2018	12/10/2018	30 days													-		ront End electonic

Installation and cabling in cryostat Sept-Oct. 2018

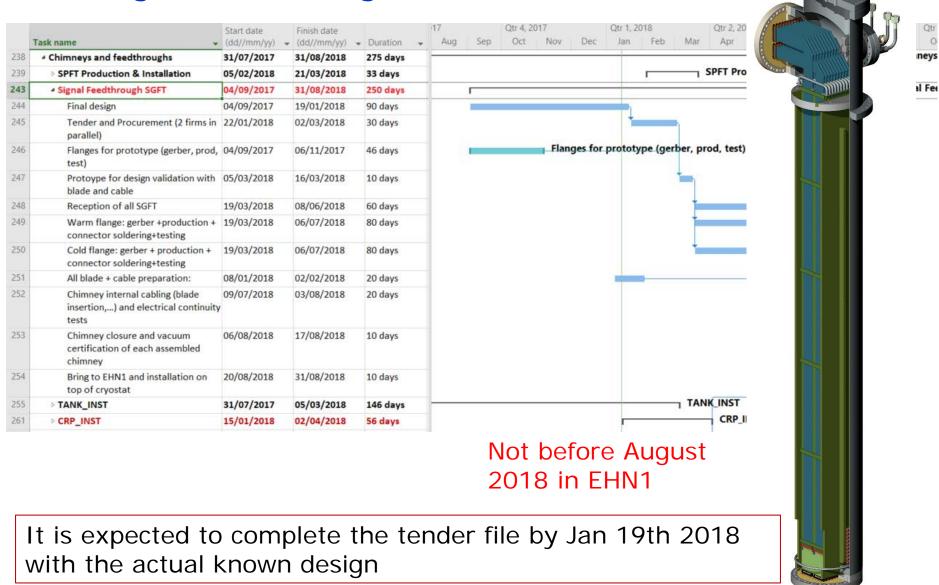
Very High Voltage system

	Task name 👻	Start date (dd//mm/yy) 👻	Finish date (dd//mm/yy) 👻	Duration 👻	Half 2, 2017 Half 1, 2018 Half 2, 2018 A M J A S O N D J F M A M J J A	S O N
299						Autor and a second
300	VHV system	08/05/2017	28/09/2018	354,29 days	1	VHV system
301	4 300 kV PSU	08/05/2017	16/03/2018	215 days	7 300 kV PSU	
302	procurement and reception	08/05/2017	09/05/2017	2 days	1	
303	QA/QC test in Bld 182	06/11/2017	17/11/2017	10 days		
304	sent to EHN1	05/03/2018	16/03/2018	10 days		
305	4 300 kV FT	03/07/2017	05/03/2018	166 days	1 300 kV FT	
306	Production (3 FT)	03/07/2017	13/11/2017	96 days		
307	Test with 300 kV in upgraded setup in Bldg 182	08/01/2018	28/02/2018	38 days		
308	Sent to EHN1	01/03/2018	05/03/2018	3 days	1	
309	4 Extension	09/10/2017	17/01/2018	63 days	r Extension	
310	final design and validation	09/10/2017	20/10/2017	10 days		
311	Procurement and production follow up	23/10/2017	06/12/2017	33 days		
312	QA/QC	07/12/2017	17/01/2018	20 days	*	
313	Insertion and assembly in cryostat	14/09/2018	28/09/2018	10 days		i

Was discussed in September - Need confirmation and some updates

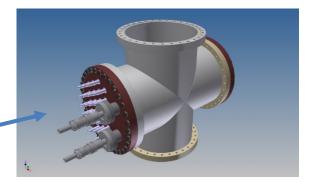
Chimneys and Feedthroughs

SGFT: Signal Feedthroughs => 12 elements



Chimneys and Feedthroughs

TANK_INST: PMTs HV+optical fibers + slow control=> 2 elements



	Task name	dd//mm/yy)	Finish date (dd//mm/yy)	Duration 👻	Qtr 3, 20 Jul	Aug	Sep	Qtr 4, 2 Oct	017 Nov	Dec	Qtr 1, 20 Jan	018 Feb	Mar
255	4 TANK_INST	31/07/2017	05/03/2018	146 days	ſ	-					E.		TANK
256	Final design	31/07/2017	06/09/2017	28 days									
257	Procurement, fabrication and QA/QC	07/09/2017	24/01/2018	90 days			<u>t</u>						
258	Fabrication of chimney separator	25/01/2018	14/02/2018	15 days							t	1	
259	ship to CERN	15/02/2018	19/02/2018	3 days								1	3
260	Installation on top of covostat	01/03/2018	05/03/2018	3 days									
261	CRP_INST	15/01/2018	02/04/2018	56 days							-		1
26	Design	15/01/2018	09/02/2018	20 days								Des	sign
263	Procurement and fabrication	12/02/2018	19/03/2018	26 days								+	
264	Test and validation	20/03/2018	02/04/2018	10 days									+

CRP_INST: not yet designed Should be started now with a milestone to be ready for end of March

D. Duchesneau

External cabling, roof layout and Racks

Some tasks to be confirmed with NP

	Task name	Start date (dd//mm/yy) -	Finish date (dd//mm/yy) +	Duration	Qtr 3, 2017 Jul
343		(dd//mm/yy) +	(dd//mm/yy) +	Duration +	Jui
344	Large Area Trigger Counters	04/06/2018	13/07/2018	30 days	
348	External cabling, roof layout and Racks		14/11/2018	431 days	·
349	✓ cable trays and roof piping	08/03/2017	04/05/2018	293 days	
350	design and 3D layout	08/03/2017	29/03/2017	16 days	
351	external trays purchase and installation	02/10/2017	24/11/2017	40 days	
352	Warm cryogenic piping installation	09/04/2018	04/05/2018	20 days	
353	External cables and optical fibers	06/11/2017	27/02/2018	72 days	
354	Manufacturing and QA/QC	06/11/2017	31/01/2018	53 days	
355	Installation	01/02/2018	27/02/2018	19 days	
356	▲ Roof crates	15/10/2018	08/11/2018	18,29 days	
357	Low voltage	15/10/2018	17/10/2018	3 days	
358	PMT calibration	25/10/2018	08/11/2018	10 days	
359	Cameras	15/10/2018	17/10/2018	3 days	
360	4 Racks	04/09/2017	14/11/2018	303 days	
361	Define rack position	04/09/2017	07/09/2017	4 days	
362	Move rack 0 in position	20/09/2017	27/09/2017	6 days	
363	Ship Racks from 182 to EHN1	04/12/2017	11/01/2018	19 days	
364	Rack cabling and connection to external cabling	12/01/2018	08/02/2018	20 days	
365	Install light system HV modules in rack	04/09/2018	11/09/2018	5 days	
366	General slow control testing	18/10/2018	14/11/2018	20 days	
					10



URGENT Tasks and timescale:

Tasks	Start date
CRP_INST design	Now and to be completed by 9/02/18
CRP_INST procurement	9/02/18 and to be completed by 29/03/18
HV CRP patch panel design and procurement	Now and to be completed by 27/02/18
Signal CRP patch panel design and procurement	Now and to be completed by 27/02/18
LEM ordering and production for CRP#3 and 4	5/02/18; 29/03/18
Anode ordering for CRP#2, 3 and 4	19/01/18; 5/02/18; 19/03/18
SGFT final file for tendering process	22/01/18
SGFT start tendering process	23/01/18

List of some items to cover now in priority:

- URGENT: finalise design and produce the patch panels for the CRPs.
- SGFT tenders to send in January
- CRP_INST design in January
- CRP_INST production for end of March
- Cathode and ground grid to conclude the design and start the orders

ProtoDUNE-DP main schedule

		Start date	Finish date	
	Task name 👻	(dd//mm/yy) 👻	(dd//mm/yy) 👻	Duration 🚽
4	ProtoDUNE-DP	01/12/2016	14/11/2018	500 days?
5	Cryostat preparation	08/03/2017	07/12/2017	197 days
14	Cryostat internal cables and instrumentation	03/07/2017	23/10/2018	331,29 days?
30				
32	CRP Cold box construction	04/12/2017	23/03/2018	70 days
38				
39	CRP Production & Installation	10/04/2017	31/08/2018	354,29 days?
237				
238	Chimneys and feedthroughs	31/07/2017	31/08/2018	275 days
265				
266	Drift Cage Production and Installation	01/05/2017	12/11/2018	390,29 days
298	Beam plug installation	02/10/2018	09/10/2018	5 days
299				
300	VHV system	08/05/2017	28/09/2018	354,29 days
314				
315	PMT and Light Read Out System	01/12/2016	08/11/2018	495,29 days?
332	Lower the Ground grid to its fnal position	08/11/2018	12/11/2018	2 days
333				
334	Front End electonics	03/09/2018	12/10/2018	30 days
339				
340	End of installation inside the cryostat	12/11/2018	12/11/2018	0 days
341				
342	Ready to seal TCO & cryostat	12/11/2018	13/11/2018	1 day
343				
344	Large Area Trigger Counters	04/06/2018	13/07/2018	30 days

Full revision done on 15/01/2018

The end of installation is Nov. 15th, 2018

ProtoDUNE-DP main schedule

To be noted:

- The actual schedule doesn't take into account possible interference with ProtoDUNE-SP between August and end of October where the EHN1 access could be subject to some limitations:
 - > Access restrictions (number of persons, safety equipments) during the NP04 filling
 - Access to the pit not allowed when the beam is on