Cryomodule Assembly: Sequence et al.

M. Garlaschè on behalf of MME

Cryostating overview on current Master Schedule

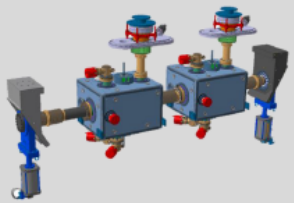
In red, major interactions with entities other than MME

145		362	**Cryostating**	**74 days**	**Mon 31/07/1**	**Fri 10/11/17**		
146		64	**Assembly (pt.0) with tuners and cryolines**	**9 days**	**Mon 31/07/1**	**Thu 10/08/1**	**Marco (EN-MME)**	**EN-MME**
147		271	Mounting tuner frame	3 days	Mon 31/07/1	Wed 02/08/1	Marco	
148		270	Mounting cryolines	3 days	Thu 03/08/1	Mon 07/08/1	Marco	
149		269	Leak test	3 days	Tue 08/08/1	Thu 10/08/1		
150		268	X-rays	0 days	Thu 10/08/1	Thu 10/08/1		
151		147	Transport activity	0 days	Thu 10/08/1	Thu 10/08/1		
152		68	**Assembly (pt. 1) of systems under top plate until removal of string trolley**	**15 days**	**Fri 11/08/17**	**Thu 31/08/17**	**Marco (EN-MME)**	**EN-MME**
153		328	Assembly Cryomodule pt.1	11 days	Fri 11/08/17	Fri 25/08/17	Marco	
154		327	RF frequency	1 day	Mon 28/08/1	Mon 28/08/1	Rama	
155		330	Alignment survey	2 days	Tue 29/08/1	Wed 30/08/1	Mateusz	
156		329	Pre-tuning	1 day	Thu 31/08/1	Thu 31/08/1	Marco	
157		148	Transport activity	0 days	Thu 31/08/1	Thu 31/08/1		
158		78	**Assembly (pt. 2) – first leak check**	**19 days**	**Fri 01/09/17**	**Thu 28/09/1**	**Marco (EN-MME)**	**EN-MME**
159		333	Assembly Cryomodule pt.2	19 days	Fri 01/09/17	Thu 28/09/1	Marco	
160		332	Leak test	0 days	Thu 28/09/1	Thu 28/09/1		
161		331	X-rays	0 days	Thu 28/09/1	Thu 28/09/1		
162		149	Transport activity	0 days	Thu 28/09/1	Thu 28/09/1		
163		84	**Assembly (pt. 3) – second leak check**	**17 days**	**Fri 29/09/17**	**Mon 23/10/1**	**Marco (EN-MME)**	**EN-MME**
164		334	Assembly Cryomodule pt.3	17 days	Fri 29/09/17	Mon 23/10/1	Marco	
165		336	Leak test	0 days	Mon 23/10/1	Mon 23/10/1		
166		335	X-rays	0 days	Mon 23/10/1	Mon 23/10/1		
167		150	Transport activity	0 days	Mon 23/10/1	Mon 23/10/1		
168		92	**Assembly (pt. 4) and closure of cryomodule**	**14 days**	**Tue 24/10/1**	**Fri 10/11/17**	**Marco (EN-MME)**	**EN-MME**
169		339	Assembly Cryomodule pt.4	14 days	Tue 24/10/1	Fri 10/11/17	Marco	
170		340	Systems check for cryomodule closure	0 days	Fri 10/11/17	Fri 10/11/17		
171		338	Cryomodule closure	0 days	Fri 10/11/17	Fri 10/11/17	Marco	
172		337	Leak tests	0 days	Fri 10/11/17	Fri 10/11/17		
173		151	Transport activity	0 days	Fri 10/11/17	Fri 10/11/17		
174		101	**Alignment validation of closed cryomodule**	**16 days**	**Mon 13/11/1**	**Mon 04/12/1**	**Mateusz (EN-ACE**	**EN-ACE**

Cryostating NOW

Step 1

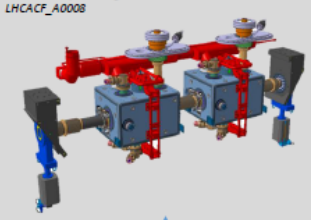
1	Remove clean room equipments
2	Mounting equipment protections
3	Remove FPC plate protection
4	Add support LHCACF_T0406
5	Remove support LHCACF_T0247
6	Insertion of FPC heaters
7	Set the FPC plate as high as possible
8	Remove the latteral support



Step 2

1	Weld the cryo extention and stoppers (DN100 x2 + HOM UP x2 + HOMS Up stopper x2)
2	Intermediate leak test
3	Positionning and welding of upper cryoline
4	Intermediate leak test
5	Insertion of tuning frame upper part
6	Assembly and positioning of tuning frame
7	weld hom cooling line (HOM UP x2)
8	Leak test

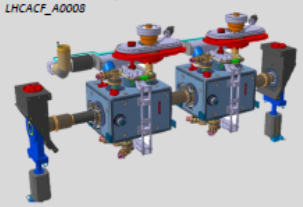
See assembly drawing
LHCACF_A0008



Step 3

1	Installation of tuner BELLOWS (WITH SUPPORT TOOLING)
2	Magnetic shield on FPC plates (x2)
3	Installation of Tuner double pipe on tuning frame
4	Adjust the FPC oblong plate to the nominal height
5	Connect the tuner double pipe to the tuner bellows
6	Installation of FPC and tuner braids on FPC & Tuner
7	Installation of FPC thermal screen on FPC and TUNER
8	Instrumentation cryo -> cavities CERNOXs, PT100 on thermal screen ?
9	Installation pièces supports -> for cavity blades and valve supports

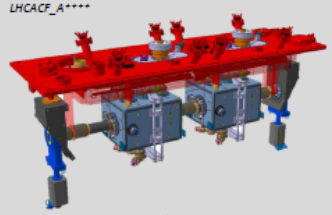
See assembly drawing
LHCACF_A0008



Step 4

1	Low the cryostat top plate to the nominal position
2	Connect support blades x4 (remove tooling for support of blade)
3	Connect valve box to top plate x2
4	Connect cryolines to top plates with tirants
5	Attach FPC thermal screen to cryostat thermal screen

See assembly drawing
*LHCACF_A****



Step 5

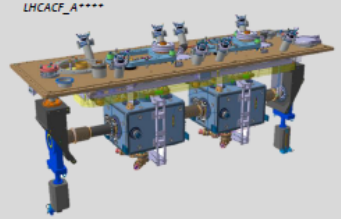
1	Assembly of the cavity support system
2	Assembly of RF coaxial lines for HOMs top x2 + protection on ceramic
3	Remove clean room tooling (inter cavities bellows blocking système, valves tool..etc)

See assembly drawing
*LHCACF_A****

S.6

1	Load transfert from trolley to Cryostat top plate
2	Alignement check
3	Remove clean room trolley

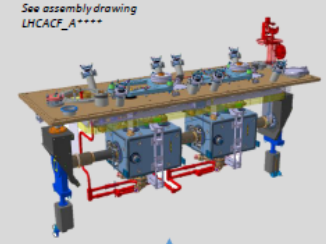
See assembly drawing
*LHCACF_A****



Step 7

1	Weld the cryo extention and stoppers (DN25 x2 + HOM LOW x4 + HOM LOW stopper x4)
2	Weld of lower cryoline
3	Installation of cryogenic pressure measurment set up
4	Weld of pressure measurment lines
5	Leak tests

See assembly drawing
*LHCACF_A****



Sub assembly details

Oblong plate support

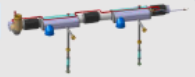
LHCACF_T0409

Protections HOMS & Pick Up

LHCACF_T0643 – HOM feedthrough protection
LHCACF_T0694 – Pick up feedthrough protection

Upper cryoline

LHCACFQC0149



Cryo extentions

LHCACFQC0054 – HOM weld jaw
LHCACFQC0091 – HOM stopper
LHCACFQC0053 – DN100 weld jaw

Tuning frame

LHCACFTU0054 – Tuning frame assembly

HOM cooling line

LHCACFQC0162 – HOM cooling line

Tuner bellows + double pipe

LHCACFTU0053 – Tuner bellows
LHCACFTU0057 – Rod Flange
LHCACFTU0066 – Tuner double pipe

Magnetic shield

LHCACFWM0011 – FPC half plate 1/2
LHCACFWM0018 – FPC half plate 2/2
LHCACFWM0020 – Special washers

Thermal screen + MLI

LHCACFTS0073 – Half oblong plate type 1
LHCACFTS0074 – Half oblong plate type 2
LHCACFTS0075 – Half oblong plate type 3
LHCACFTS0055 – Fixation ring tuner
LHCACFTS0050 – Fixation ring FPC
********** - MLI

Thermalisation braids

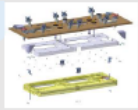
LHCACFTS0018 – Braids for FPC & blades
LHCACFTS0019&28 – Braids for tuner

Partial support

LHCACFAH0021 – Blade base
LHCACF_T0255 – Valve box base

Cryostat upper plate

LHCACF_A0007 - Overall top plate assy
LHCACF_A0001 - Top plate welded
LHCACFTS0061 - Top thermal screen
LHCACFWM0013 - Warm magnetic shield



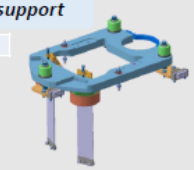
Upper RF-lines

LHCACFRL ****

Waiting for final design

Cavity support

LHCACFAH0030



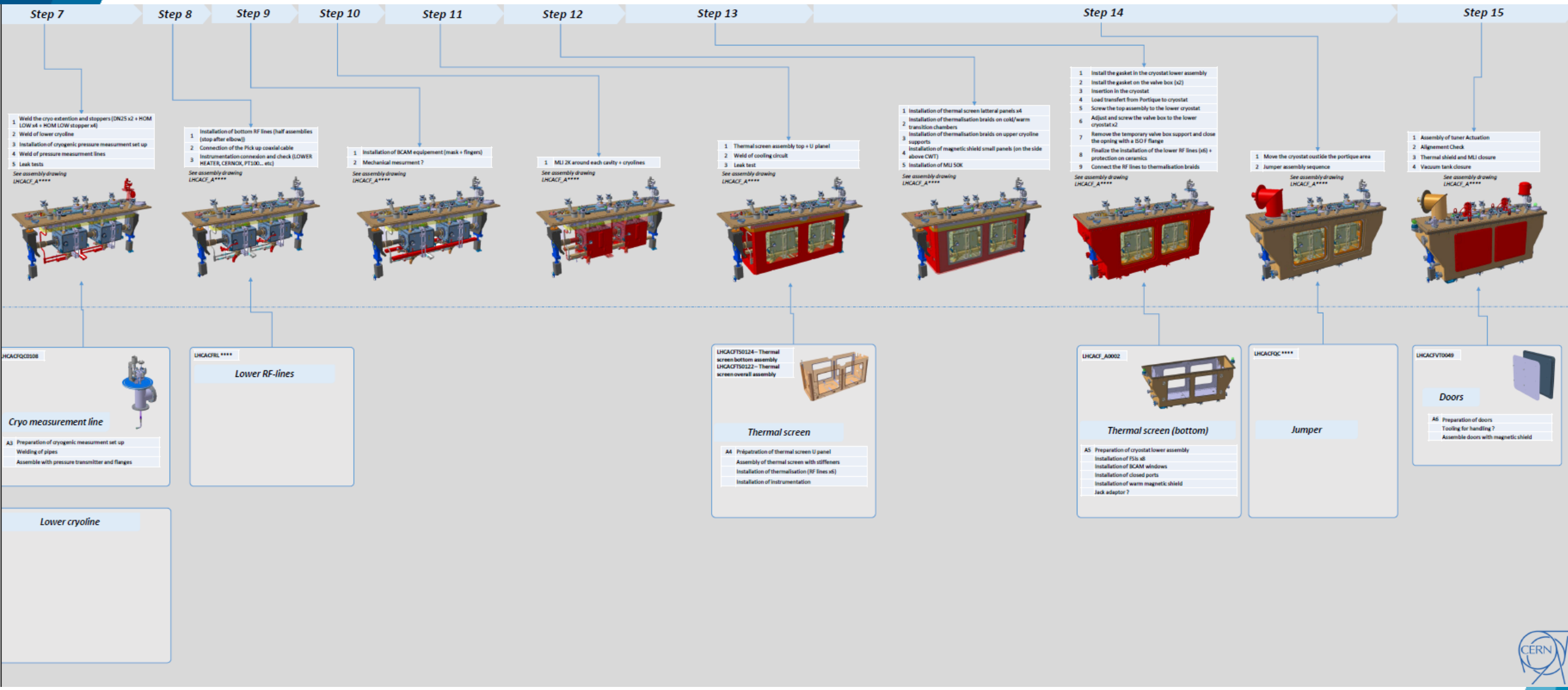
3d view to be updated

LHCACFQC0108

Cryo measurement line

A3 Preparation of cryogenic measurment set up
Welding of pipes
Assemble with pressure transmitter and flanges

Lower cryoline



Current Total number of Assembly actions ~ 90x

Remove clean room equipment…

…Positioning and welding and control of upper cryoline…

…Assembly and positioning of tuning frame…

5x people foreseen for logistics & assembly

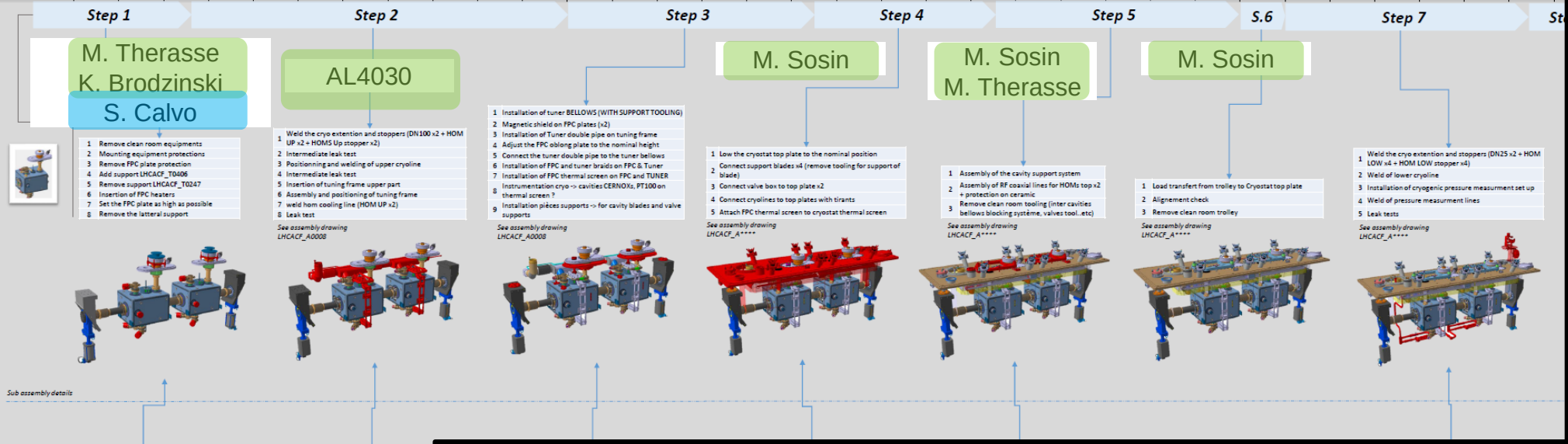
Current slot : tight & no contingency

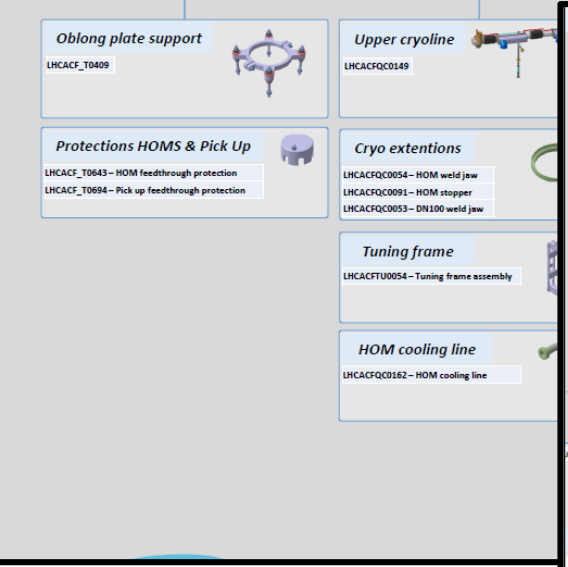
Actors Involved

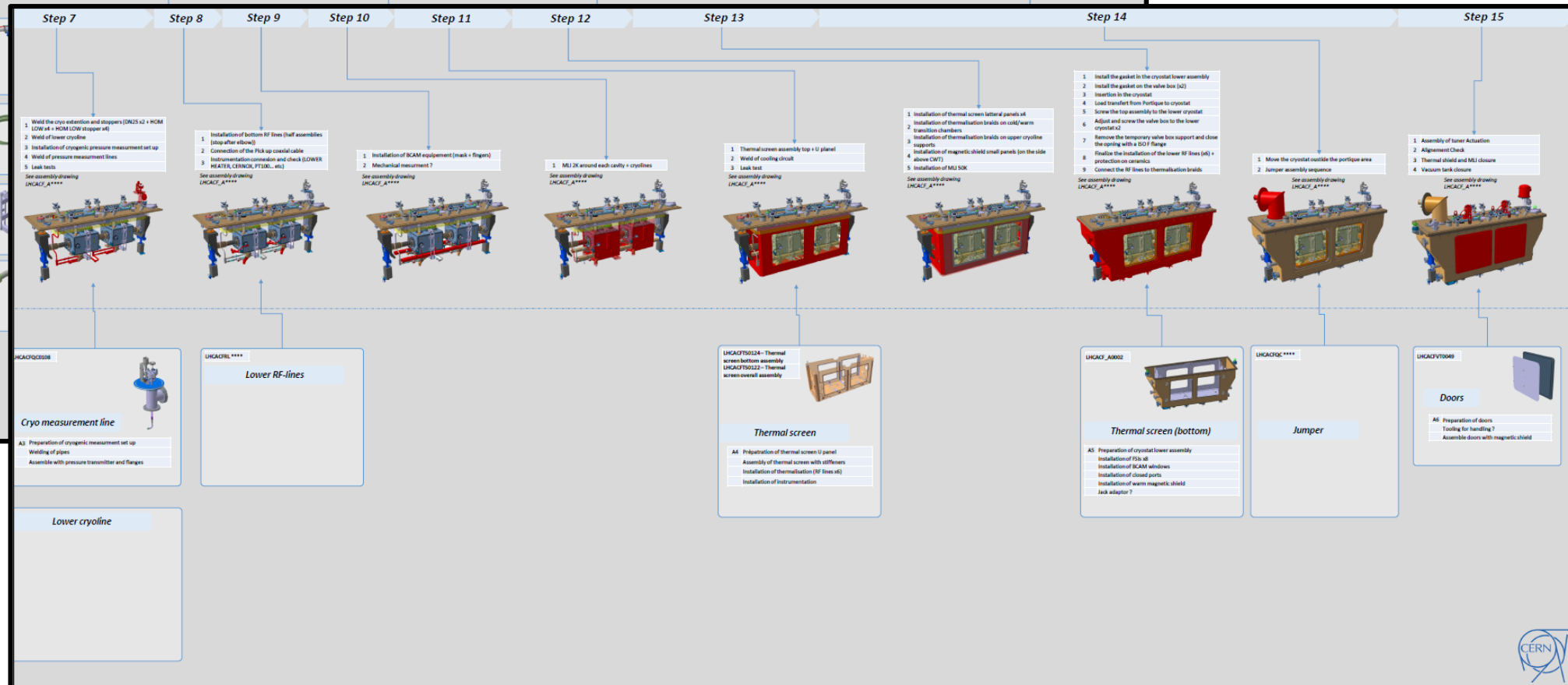
= directly performs actions

= info to MME

Current image not exhaustive







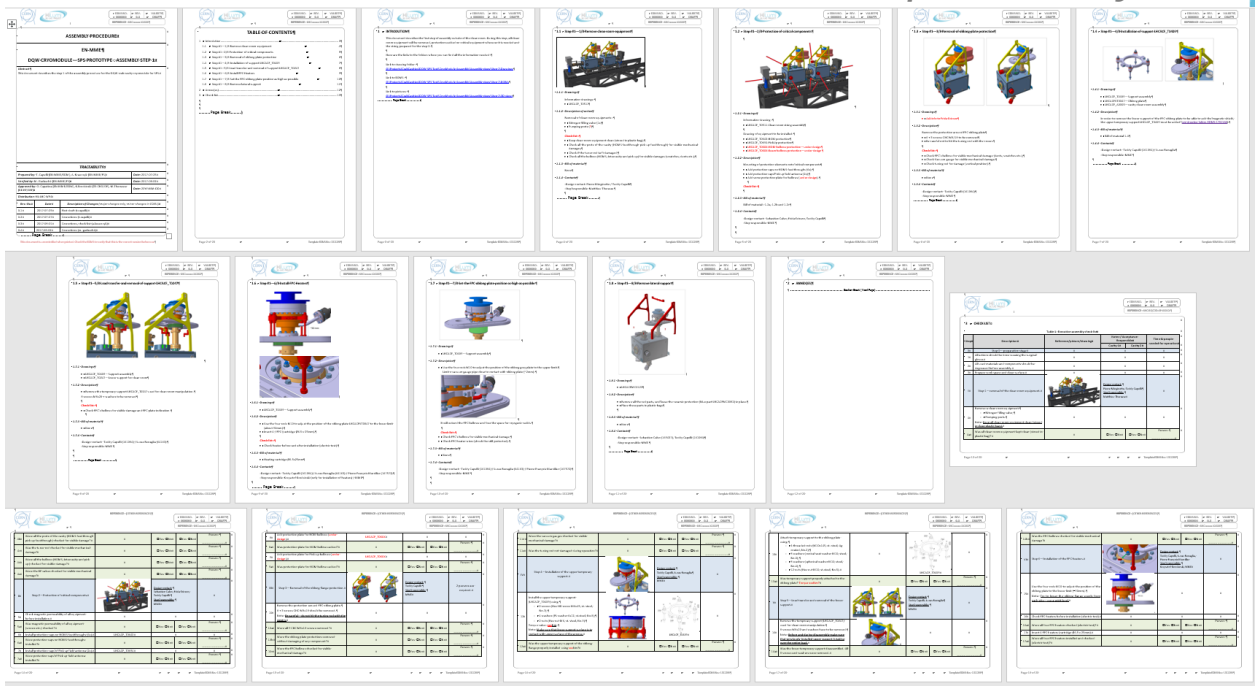
HiLumi HL-LHC PROJECT

CERN

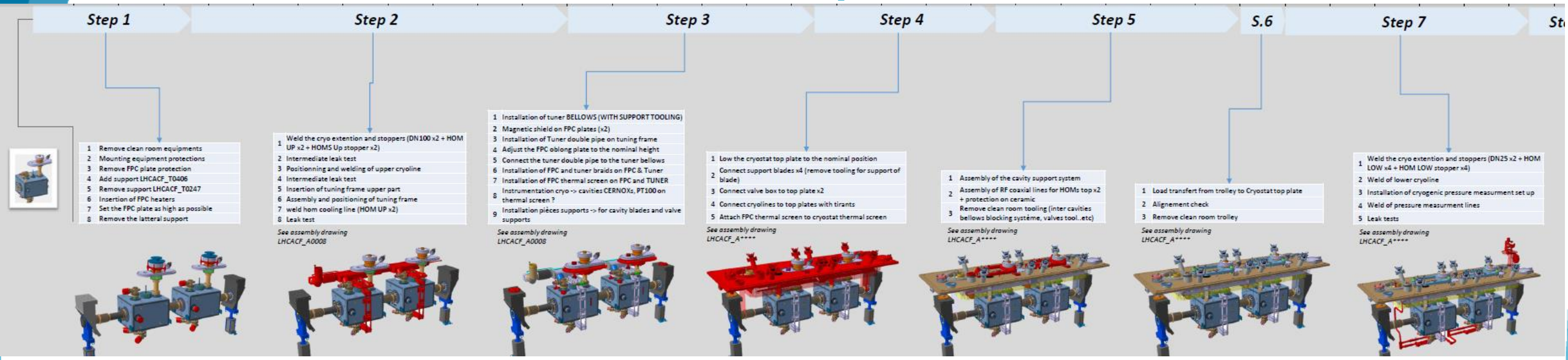
Agenda for Assembly Updates

- On WK(n-1) involved actors + reference people shall expect:
  - granular Planning of WK(n)
  - Assembly doc for concerned steps
- Major upcoming events shall be notified with more advance if possible
- ‘Current’ Assembly step to be updated on eLogbook (https://espace.cern.ch/HiLumi/WP4/default.aspx)

Example of Assy Doc



Status of Preparation



Step	1	2	3	4	5	…
A						
B						
		Top Cryo rdy this week	Remachining Tuner Tube Welding Tuner bellows end of this week	Machining Blades by beg this week Thermal shield degreasing		

A. Assy drawings + BOM + Info + Doc
B. Components

Done
Partly Missing