

DE LA RECHERCHE À L'INDUSTRIE



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# CRITICAL DESIGN REVIEW #1 FOR MEDIUM BETA CAVITY CRYOMODULES

3-4 APRIL 2017

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**PROCUREMENT PLAN**

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## 1. Cryomodules components procurement strategy

## 2. Status of the contracts for procurement

- Signed contracts
- Under signature contract
- Tendering process already launched
- Tendering process in « stand by »

## 3. Conclusion

## **AIK 5.1** : Complete H-ECCTD demonstrator

## **AIK 5.2** : 30 sets of Components (except cavities) for Elliptical Cryomodules (9 medium & 21 high)

- 120 (30 X 4) RF power couplers 1.1 MW RF peak power, 704MHz, 14Hz.
- The availability RF power source at 704MHz and 1.5MW for the RF coupler processing
- 120(30 X4)cold tuning system
- 30 sets of Cryomodules components: Vacuum vessel, magnetic shield, space frame, thermal shield and cavity supports.

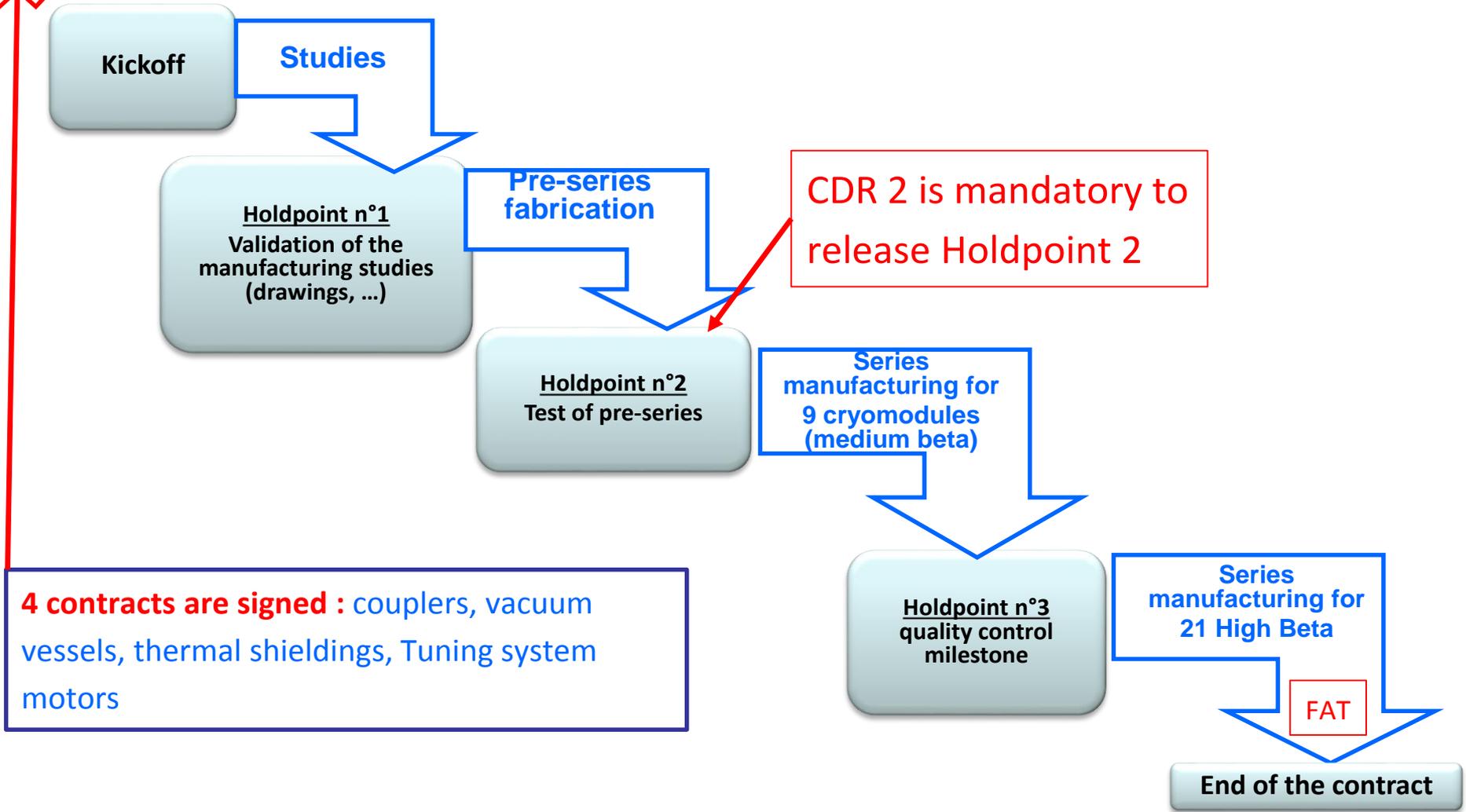
## **AIK 5.3** :

- Assemble 30 Elliptical Cryomodules
- 6 RF tests of Elliptical Cryomodules

1. Calls for tenders are placed for the whole components of the series in one batch ((1+) 30 sets of components for Medium and High Beta)
2. To respect time schedule, the tendering process had to be anticipated to CDR for most critical components. Risks shared with ESS which approved the strategy.
3. CEA procurement department standards are used for the tendering and selection of companies.
4. For each contract, an ESSI pool is identified for the contracts follow up
  - Business responsible
  - Product responsible (technical and performance aspects)
  - Product assurance officer (quality assurance)
  - Back base experts team
  - Buyer from CEA procurement department
5. For procurement plan Follow-Up, a dashboard is shared between ESSI Project, CEA procurement department and Irfu Cost Control.



Signature of the contract between firm and CEA



Contract intitled		Nb pcs ou Ens.
1	Vacuum Vessel	30 + 1 pcs
2	Couplers	120 sets
3	Cold Tuning Systems	120 sets
4	Cold Tuning Systems - motors	120+2 pcs
5	Thermal exchanger	31 pcs
6	Ti diphasic pipes + circuit cryo circuit + pipes for rupture disks + coupler bells	31 sets
7	Warm / Cold transitions et inter-cavities bellows	31 sets
8	Internal bellows	31 sets
9	Spaceframe	31 pcs
10	Magnetic shields	120 sets
11	Thermal shields	30 + 2 pcs
12	MLI	31 pcs
13	Screws for clean room	31 sets
14	Piezo	240 pcs
15	Cavities supports & machining components	31 sets
16	Cables RF	31 sets
17	RF Feedthrough	31sets
18	Gaskets (Aluminium, cuivre, helicoflex, elastomère, VCR, KF)	31 sets
19	Instrumentation (fils, cartouches chauffantes, chaufferettes, sondes PT100, connecteurs LEMO)	31 sets
20	Couplers jauges	120 sets
21	He valves cryo (WEKA)	62 pcs
22	Cernox	31 pcs
23	Safety valves	31 pcs
24	He pressure sensors (modele MKS)	124 pcs
25	Cryo Safety valves	31 pcs
26	Rupture disks	60 pcs
27	Vacuum components (vannes d'angles, raccords, ...)	31 ens
28	Level jauges	30 pcs
29	Copper breads	30 pcs

Procurement decomposition is based on industrial specialities

Orders placed

Tendering launched

Tendering in stand by

Possibility to use « shared agreement signed between CEA and ESS for vacuum components

## **SIGNED CONTRACTS FOR CRYOMODULES COMPONENTS PROCUREMENTS**

1. Couplers
2. Vacuum vessels
3. Thermal shields
4. Cold tuning systems motors

# 1. COUPLERS

**Contract for the 120 RF power couplers (1.1 MW RF peak power, 704MHz, 14Hz) procurement is signed between CEA (on behalf of ESS-ERIC) and PMB**

PMB  
ALCEN



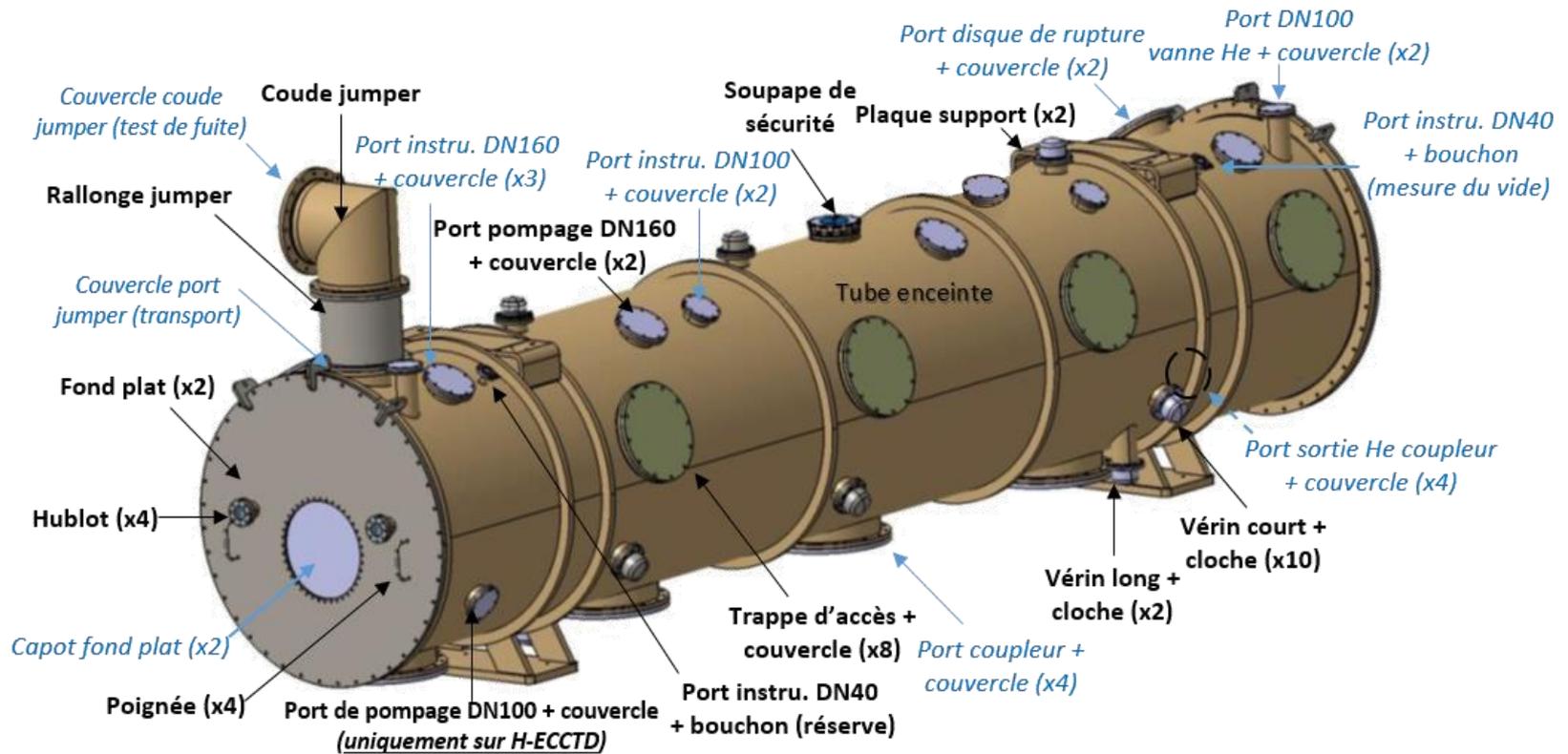
MILESTONES	PLAN DATES
Kick-Off Meeting	T0 : 28th march 2017
PA1 = manufacturing file	T0 + 2 months (end May 2017)
Delivery of pre-series (X6)	T1 + 5 months ( end Nov 2017)
PA2 : Release for Medium $\beta$ couplers prod.	January 2018
PA3 : Release for High $\beta$ couplers production	January 2019

**Delivery rate (from PA2) : 4 couplers / month minimum**

**Factory Acceptance Tests : cf. C. Arcambal talk**

## 2. VACUUM VESSEL

**Contract for the 1 (H-ECCTD) + 30 vacuum vessels procurement is signed between CEA (on behalf of ESS-ERIC) and ACPP**



## 2. VACUUM VESSEL

MILESTONES	PLAN DATES
Kick-Off Meeting	T0 : 1st february 2017
PA1 = manufacturing file	T0 + 2 months (april 2017)
Delivery of 1 pre-serie (H-ECCTD)	T0 + 10 months ( december 2017)
PA2 : Release for Medium $\beta$ vacuum vessels prduction	January 2018
PA3 : Release for High $\beta$ vacuum vessels	January 2019

**Delivery rate (from PA2) :  
1 vacuum vessel / month**

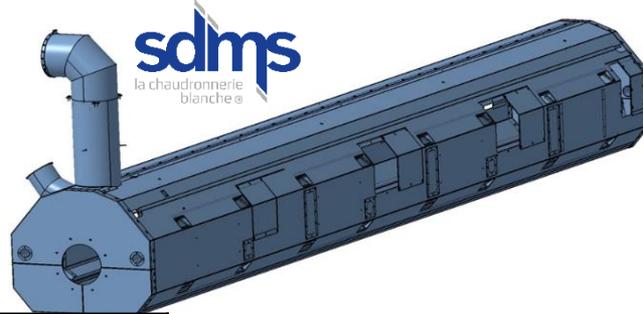
### Factory Acceptance Tests :

- Dimensional controls of the functional dimensions
- Welding controls
- Vacuum Tightness Checks
- Weldings thightness checks with Helium
- Cleanliness controls
- Material data sheet cheks (magnetic permeability)

**Interfaces have to be  
fixed for mid-april  
(transport configuration)**

### 3. THERMAL SHIELD

**Contract for the 1 (H-ECCTD) + 30 thermal shieldings procurement is signed between CEA (on behalf of ESS-ERIC) and SDMS**



MILESTONES	PLAN DATES
Kick-Off Meeting	T0 : mid- april 2017
PA1 = T1 (manufacturing file)	Mid june 2017
Delivery of 1 pre-serie system	End December 2017
PA2 = T2 : Release for Medium $\beta$ thermal shields production	January 2018
Delivery of the 1st thermal shield	March 2018
PA3 : Release for High $\beta$ thermal shield production	February 2019

#### Factory Acceptance Tests :

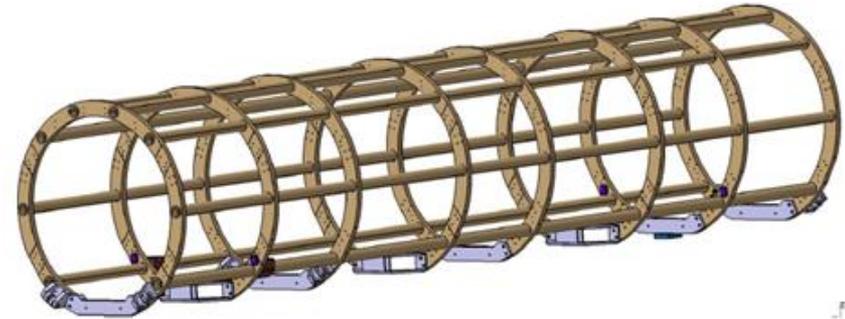
- Dimensional control
- Welding control
- Systematic pressure tests : 30 bars
- Leakage tests ( $<1.10^{-9}$  mbar.l.s)

**Delivery rate (from PA2) : 1 thermal shield / month**

**CONTRACT UNDER SIGNATURE FOR  
CRYOMODULES COMPONENTS  
PROCUREMENTS**

**1. SPACEFRAME**

## Contract for the 1 (H-ECCTD) + 30 space frame procurement under signature



MILESTONES	PLAN DATES
Kick-Off Meeting	T0 : mid- april 2017
PA1 = T1 (manufacturing file)	Mid june 2017
Delivery of 1 pre-serie (H-ECCTD)	End December 2017
PA2 = T2 : Release for Medium $\beta$ spaceframes production	January 2018
Delivery of the 1st medium $\beta$ spaceframe	March 2018
PA3 : Release for High $\beta$ spaceframes production	February 2019

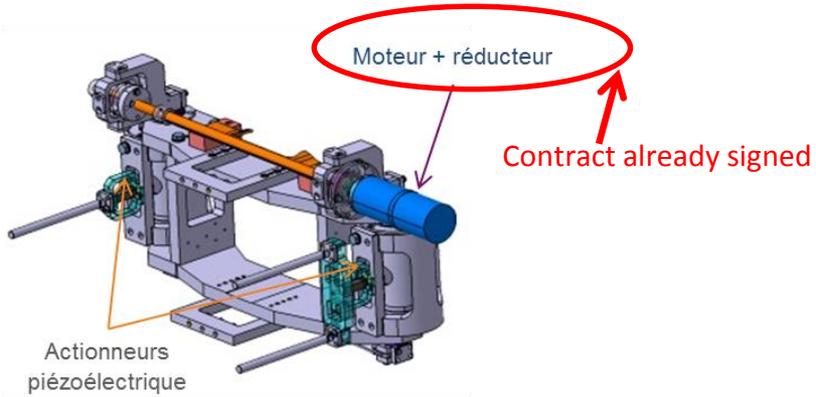
### Factory Acceptance Tests required by CEA:

- Dimensional checks
- Welding checks
- Material data sheets control

**Delivery rate (from PA2) : 1 spaceframe / month**

## **TENDERING PROCESSES ALREADY LAUNCHED**

1. Magnetic shield
2. Cold tuning systems
3. RF cables
4. inter cavities bellow



## Cold Tuning System (120)



## Magnetic shieldings (1 + 120)

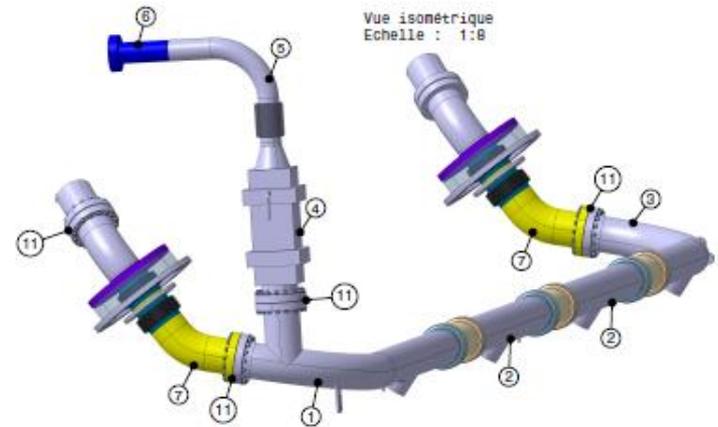
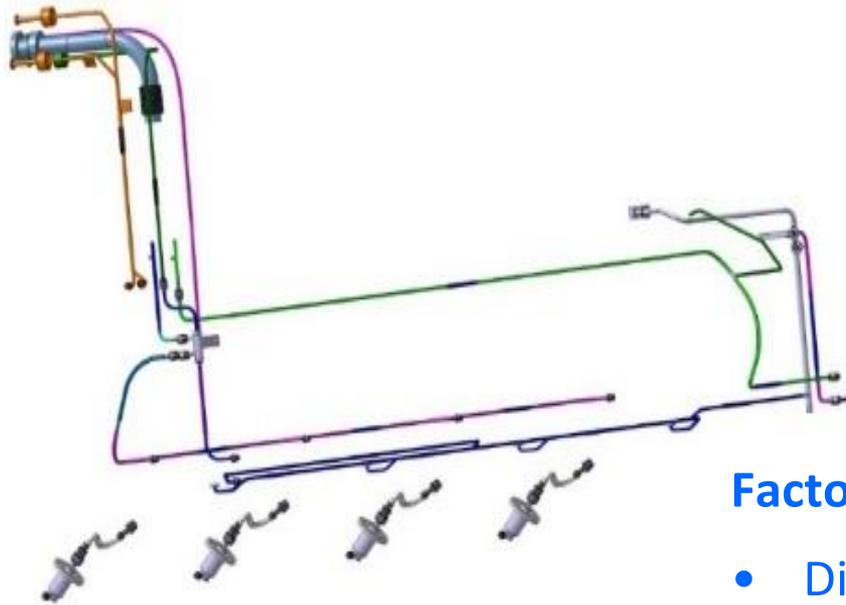


## M.L.I. (1 + 30 sets) : ready to be launched

## TENDERING PROCESSES IN STAND BY

1. Cryo circuits & exchangers
2. Vacuum components and valves
3. Cernox temperature probes
4. PIEZO Tuning System

## 1. Cryogenic circuits and heat exchangers



### Factory Acceptance Tests foreseen:

- Dimensional control
- Pressure tests : 1,43 X Ps

**Interfaces requirements have to be fixed before launching tendering (july 2017)**

## 2. Vacuum components and valves

- Highly linked to Cryogenics interfaces and discussions on going with CDS

## 3. CERNOX temperature probes

- ~~Glue is not yet compliant with requirements (see G. Olivier slides)~~

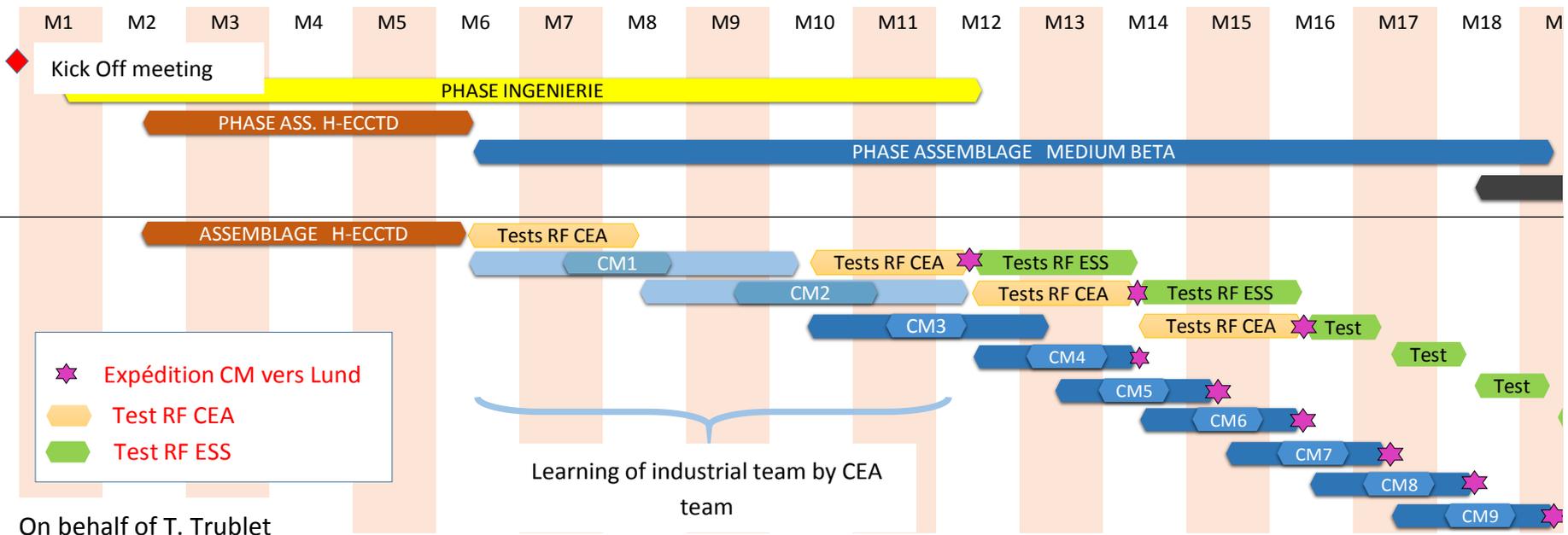
Discussed yesterday : ESS is OK with usual Gluie SYSTCAST 2250

## 4. Cold Tuning Systems PIEZO

- Tests of the M-ECCTD will validate the component choice

Tendering process for « Cryomodules assembly » contract will be launched in april 2017 and the call for tender in june 2017.

## Development plan for Medium Beta Cryomodules Production – inputs for the tendering



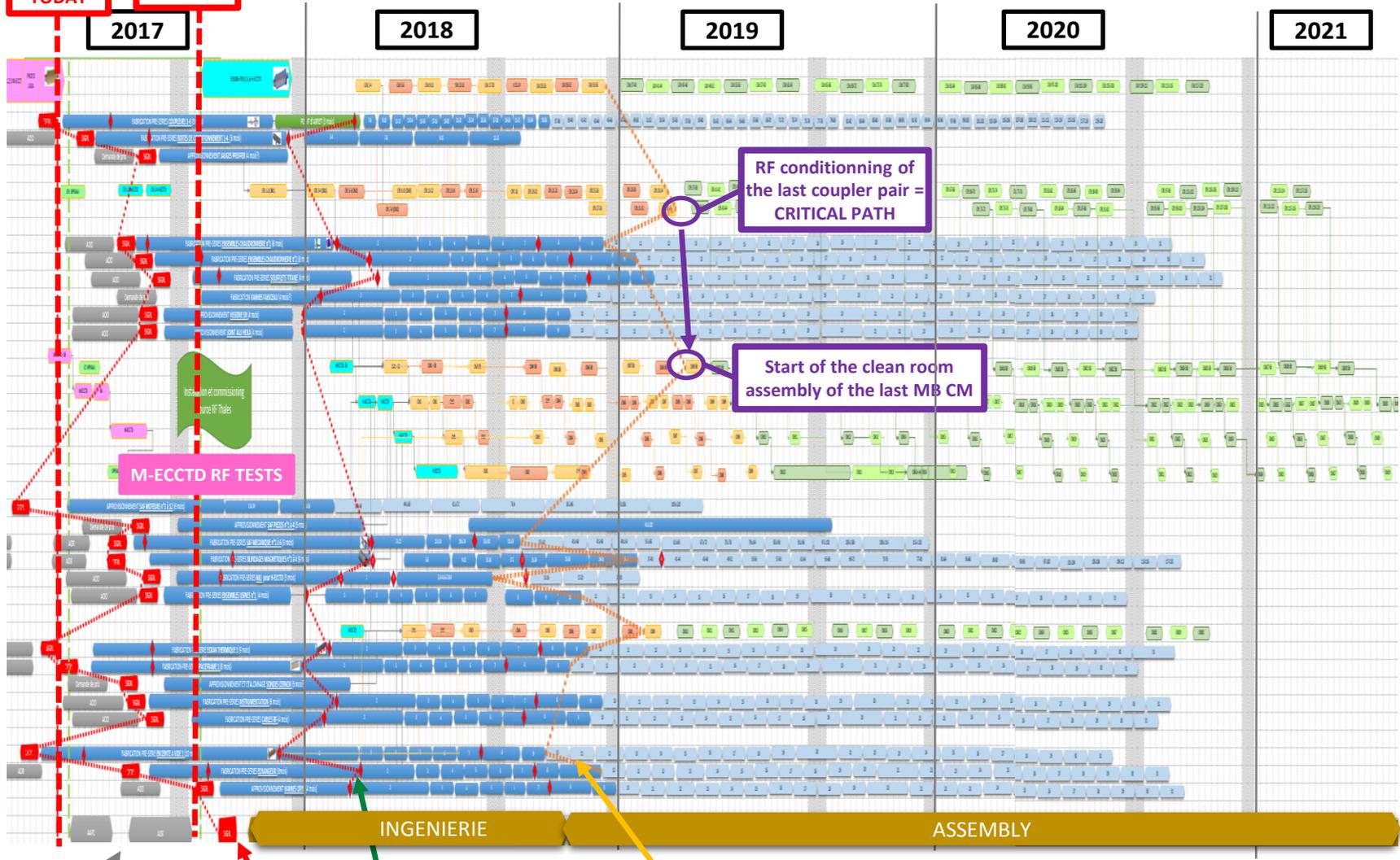
On behalf of T. Trublet

# PROCUREMENT PLAN : FOLLOW UP

CDR-M1 = TODAY

CDR-M2

- CAVITIES
- COUPLERS
- KLYSTRON #1  
KLYSTRON #2
- INTERCAVITY BELLOWS,  
CRYOGENIC LINES
- CLEAN ROOM
- ROLL-OUT
- CRYOSTATING
- TESTS/SHIP.
- TUNERS,  
MAGNETIC SHIELDS, MLI
- SPACEF. PREP.
- THERMAL SHIELD,  
SPACEFRAME,  
INSTRUM.
- VAC. VESSEL,  
EXCHANGER,  
VALVE



CALL FOR TENDER

CONTRACT AWARDED

HOLD POINTS AFTER PRE-SERIES 17, E

LAST MEDIUM BETA CRYOMDULE

modules, procurement plan

**Procurement plan deals with 40 contracts of ~1 M€ average for the cryomodule workpackage :**  
**29 contracts dedicated to components procurement**

With 19 contracts for specific machining / manufacturing systems

- 5 contracts already signed (risks are assumed by CEA & ESS to reach the tight schedule)
- 1 contract under signature process (spaceframe)
- 8 tendering process already launched
- 3 calls for tenders « stand by » before ESS decision (exchanger and frozen interfaces (cryo circuits))
- 2 technical specifications are almost ready to launch tendering

**From now, any change will result in impacts in technical complexity and overcosts**

**Rigorous traceability of each evolution**

# Thank you

03-04/04/2017

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