



# TAS Removal & TAXS Installation scenarios

Antonio Alonso on behalf of WP8,  
Contributions from M. Raymond, D. Mergelkuhl, J. Sestak, J. Perez  
Espinosa.

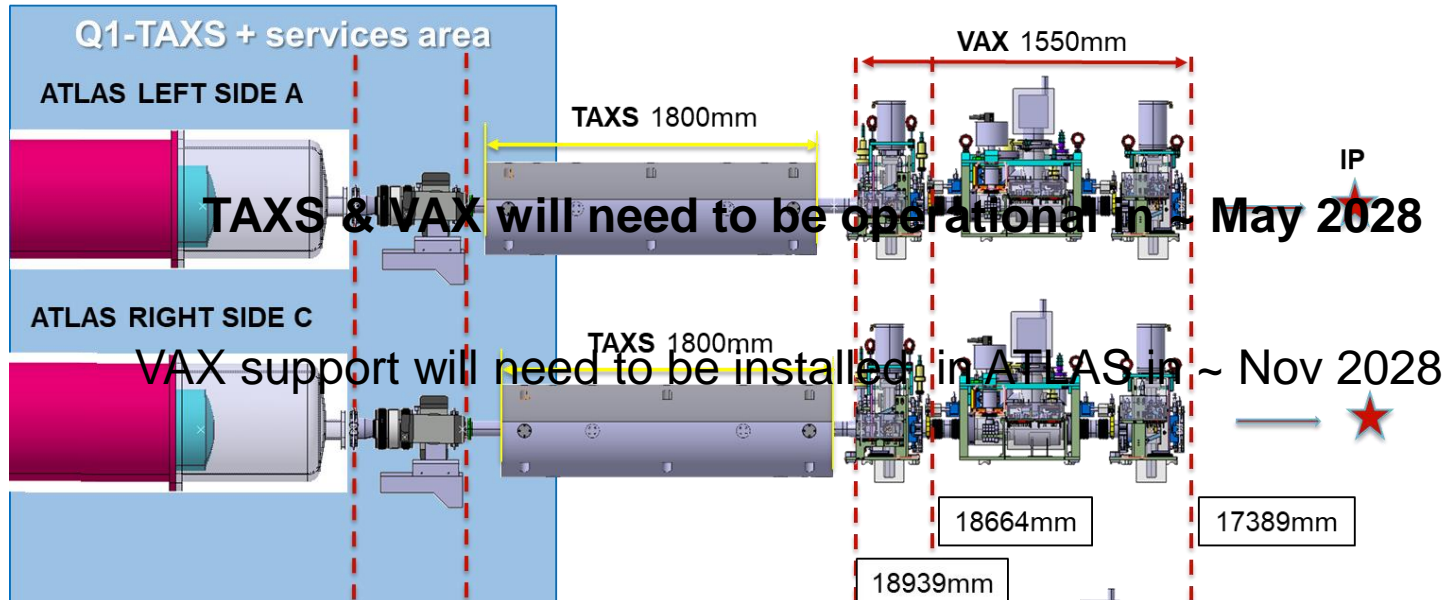


# Outline

- Reminder: VAX relocation
- ATLAS
  - TAS installation
  - LS3 deinstallation
  - LS3 Planning
  - Installation slot
- CMS
  - TAS installation
  - LS3 deinstallation
  - Planning
  - Installation slot

# Reminder

**LHC Commissioning: Now linking VAX installed & vacuum tests because of sector valve**

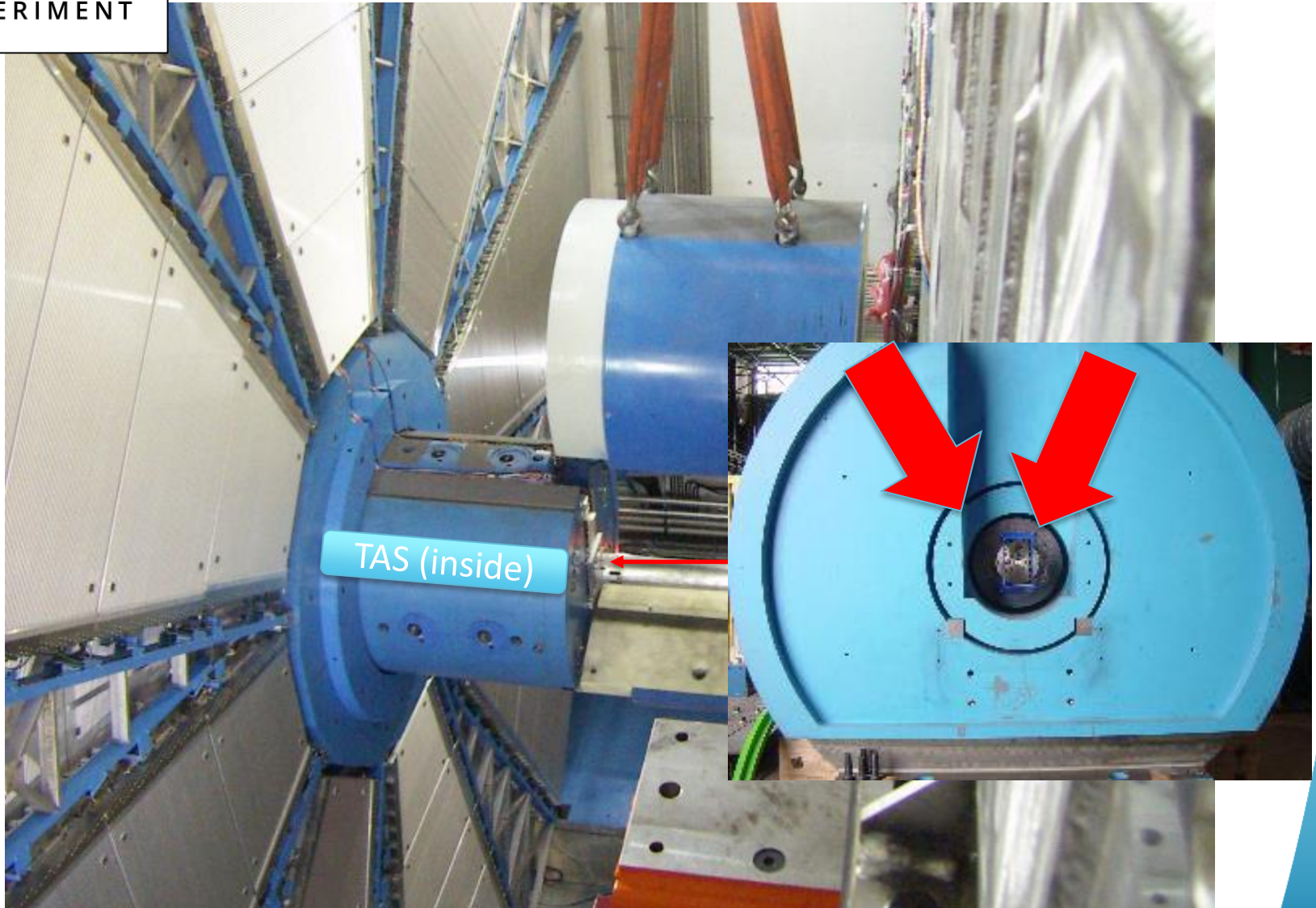


**Need to find/agree a window (1 week per side) allowing access to TX1S for services, TAXS and 1<sup>st</sup> valve installation between IT removal & LHC commissioning (8 months before end of LS3)**

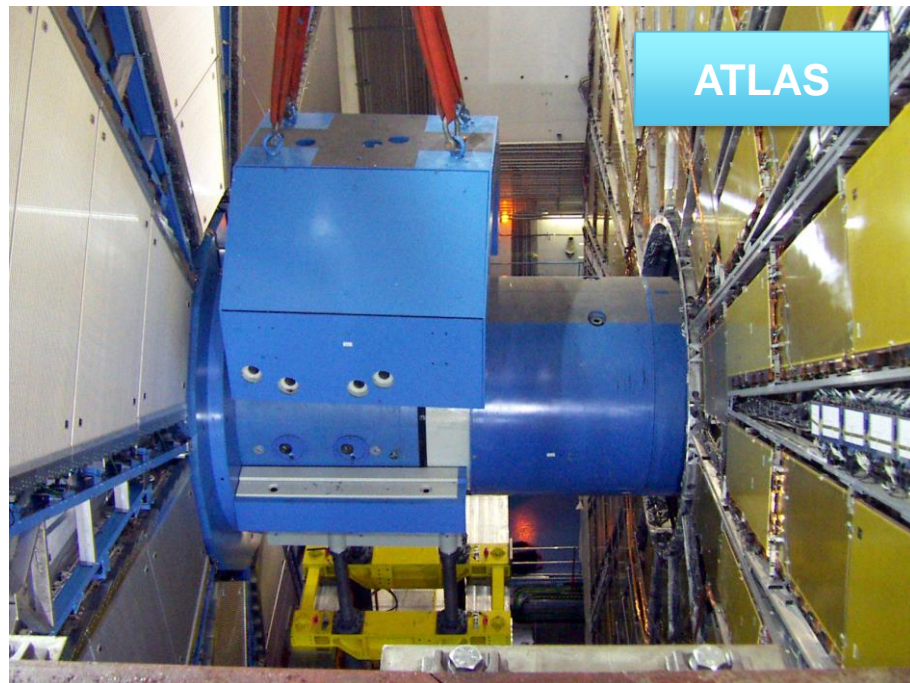
**If a window cannot be identified, we need to create it!**

**(Extension to LS3 in an agreed slot: ATLAS, TE-VSC, BE-EA, EN-HE)**

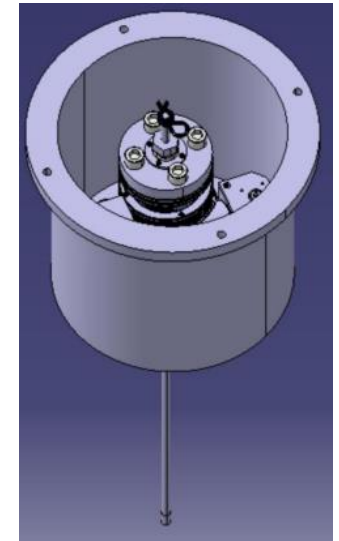
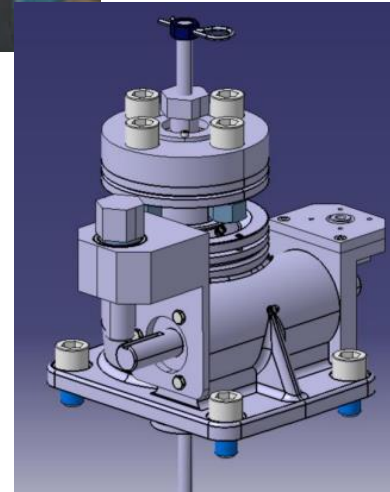
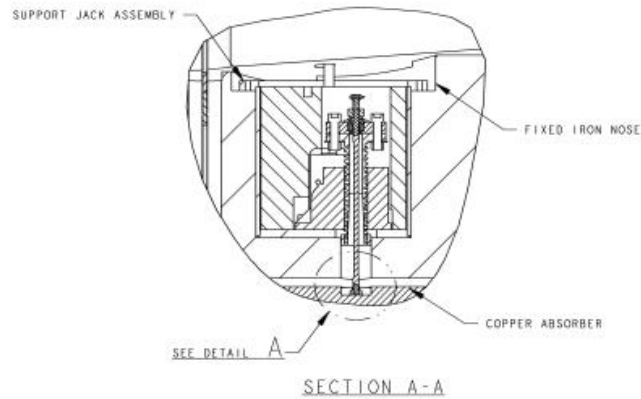
# TAS, TAXS in ATLAS Forward Shielding



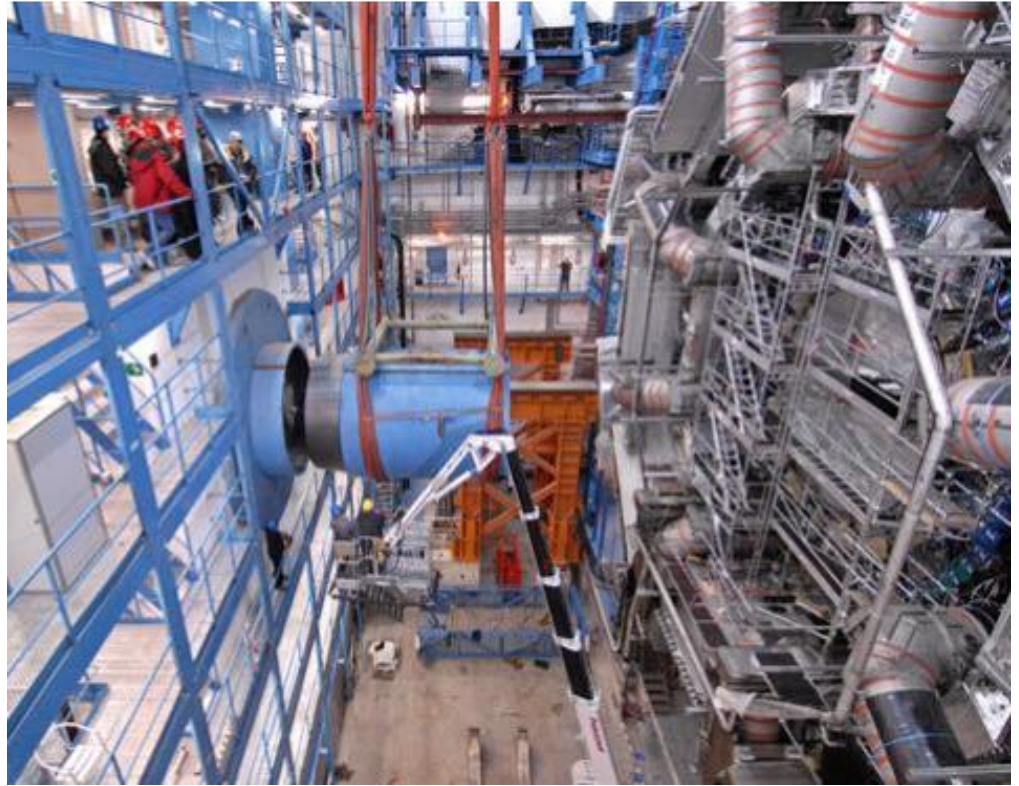
# Access to TAS from the Experimental caverns



# LHC, TAS Installation @ ATLAS

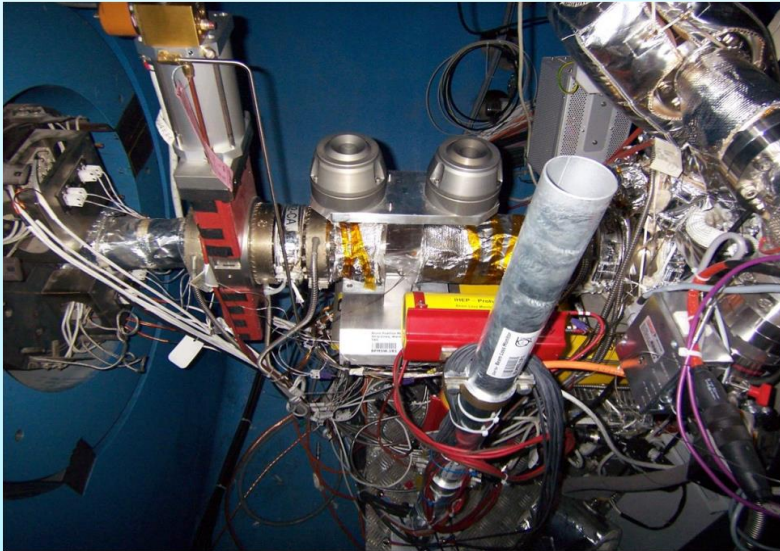


# LHC, TAS Installation @ ATLAS



# LS3 TAS Deinstallation (~May 2026) @ ATLAS

## Tunnel side activity



- **BE-EA: Removal He protection dome, disconnection cooling pipes**
- **TE-VSC: Disconnection Q1-TAS**
- **TE-VSC: Removal of pump, services**

Safety, RP

## Cavern side activity

Access to TAS alignment

- **TE-VSC: Disconnection of TAS from VAX**
- **EN-HE / ATLAS: Installation of TAS cradle**
- **BE-EA: Removal of alignment supports**
- **EN-HE / ATLAS: Removal of TAS with cradle (JTT-like)**

Safety assessment with  
Experiment, RP



# LS3 planning @ ATLAS

## Perspective VS Schedule

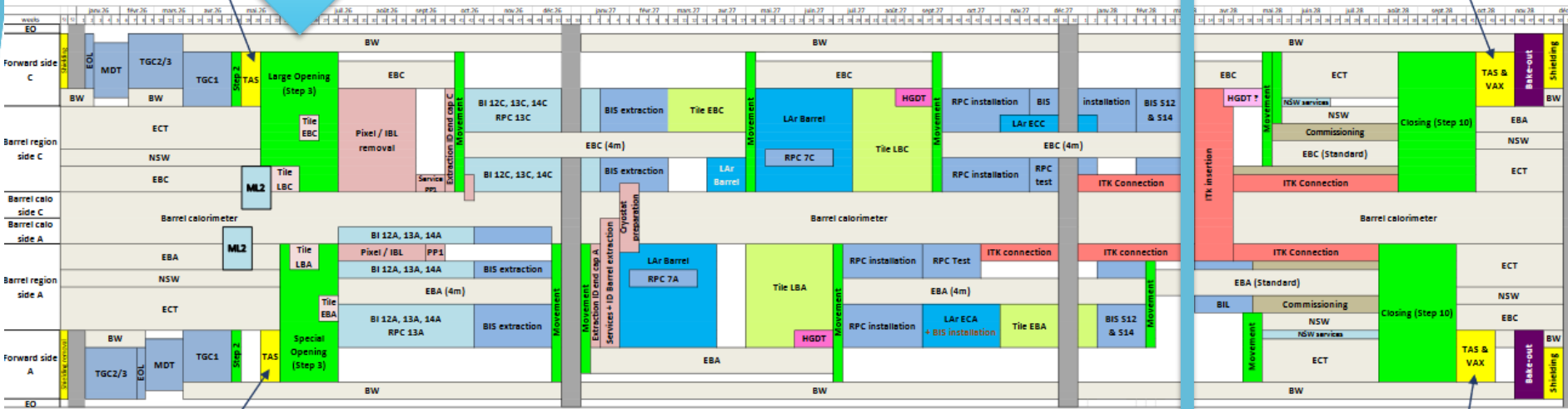


Side C

Current TAS removal

Alternative configuration periods

TAXS installation together with VAX



Side A

Current TAS removal

Alternative configuration periods are very busy, a possible time slot is not easy to find, but opens nevertheless some extra options

TAXS installation together with VAX

M. Raymond - 21st June 2022

WP8: TAS / TAXS activities in UX15

LHC  
commissioning





# Baseline Configuration



Baseline for the extraction of TAS ==> from UX15 side (as it was installed)

- Access to alignment jacks is required
- Octagonal & cylindrical shielding removed
- Big Wheel at Run position
- TAS is  $\approx 13\text{m}$  high from ground level
- In this configuration there is no Truck by default, but it may be added
- No existing platform to be installed on the Truck, 4.3m lower than TAS axis

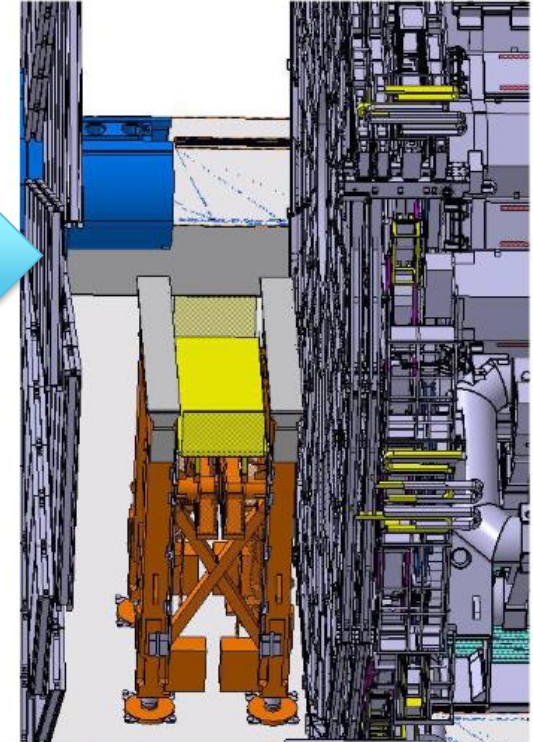


M. Raymond - 21st June 2022



Vacuum chamber will not be present

WP8: TAS / TAXS activities in UX15



Installing a truck is possible but not easy

- Gap is 3,3m wide
- Truck is  $>3,4\text{m}$

## Clean access to TAS supports & survey bars

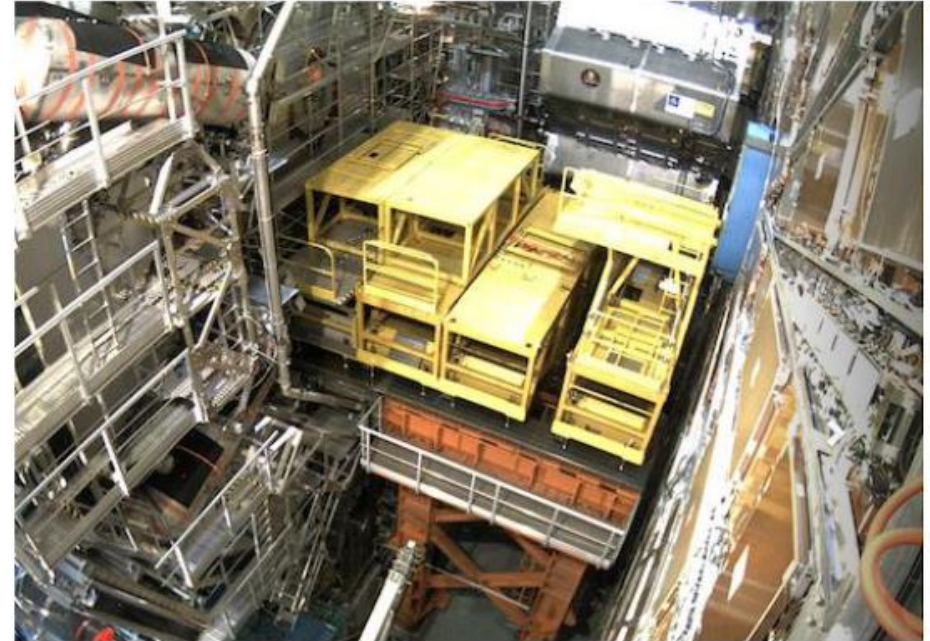




# Proposed alternative configuration



In such configuration access to TAS area is easier and work can be made more efficient



Could be suitable for

- TAS removal
- TAXS insertion
- VAX Module 1 installation





Will not work for

- TAS disconnection
- TAXS positioning
- VAX Module 1 services installation
- VAX support installation

M. Raymond - 21st June 2022

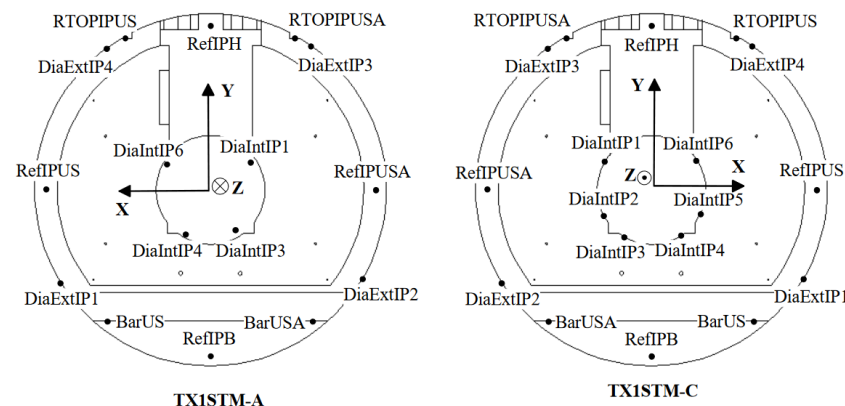
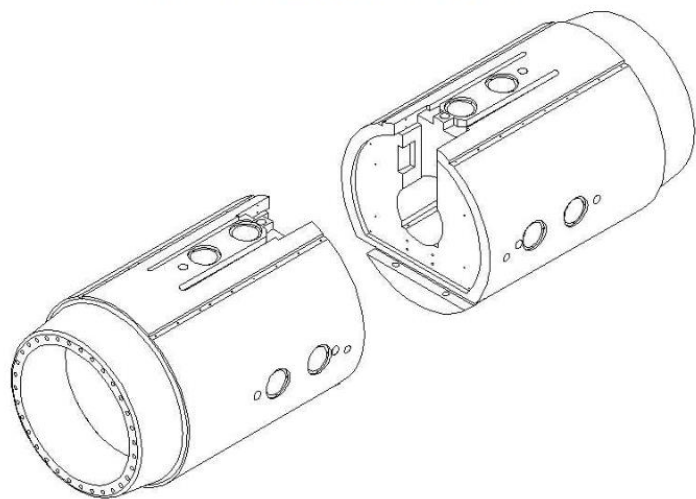
WP8: TAS / TAXS activities in UX15

# TX1S measurements

Title	Document id	Document status	Document author(s)	Last ...	Exter...
 ATLAS - GEOMETRICAL CONTROL OF THE TX1STM A and C AT JUNG GmbH (Netphen, Germany) 16. + 17. December 2004	ATL-J-UR-0007 v.1	   Released-for info	Dirk MERGELKUHLE	2004-01	CERN EST SU EXP

## ATLAS – GEOMETRICAL CONTROL OF THE TX1STM A and C AT JUNG GmbH (Netphen, Germany)

16. + 17. December 2004



Confidence to align TAS within 10mm of its final position without the alignment mechanisms.

Green light form TE-VSC for commissioning.

**TBC in a HL-LHC CG (ATLAS, TE-VSC)**

# LS3 planning @ ATLAS

## Perspective VS Schedule



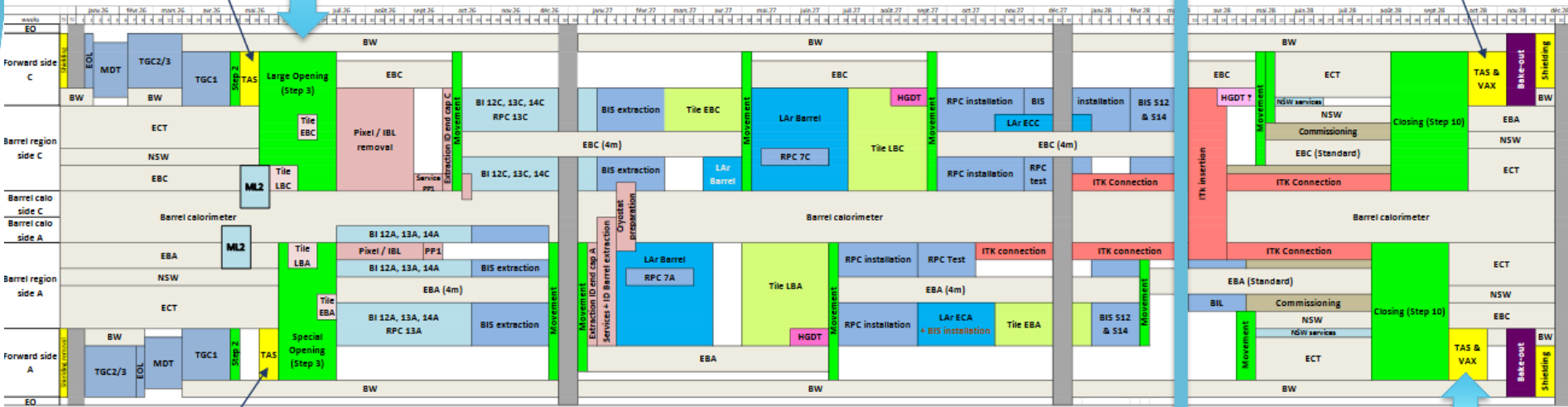
**TAXS**  
installation,  
prealignment

Side C

Current TAS removal

Alternative configuration periods

TAXS installation  
together with VAX



Side A

Current TAS removal

Alternative configuration periods are very busy, a possible time slot is not easy to find, but opens nevertheless some extra options

Alignment  
& VAX  
installation

LHC  
commissioning

M. Raymond - 21st June 2022

WP8: TAS / TAXS activities in UX15

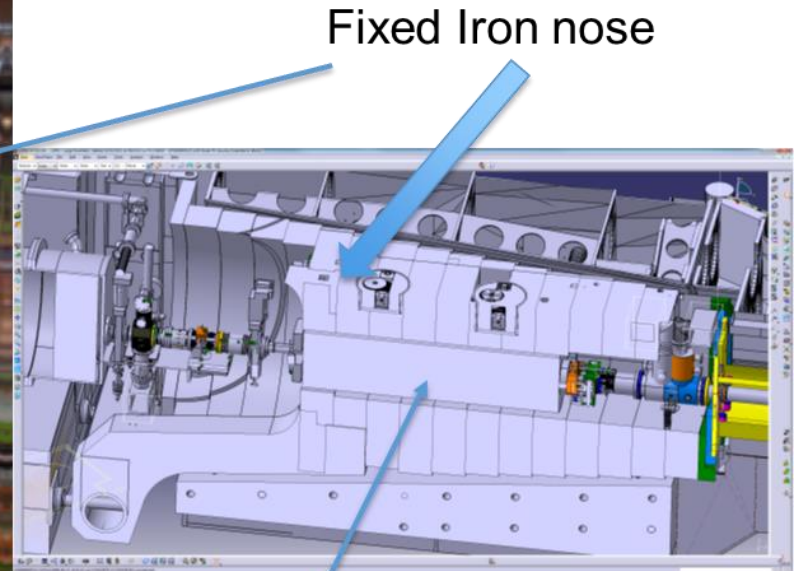




# TAS, TAXS in CMS Forward Shielding



Rotating shielding



Fixed Iron nose

TAS absorber

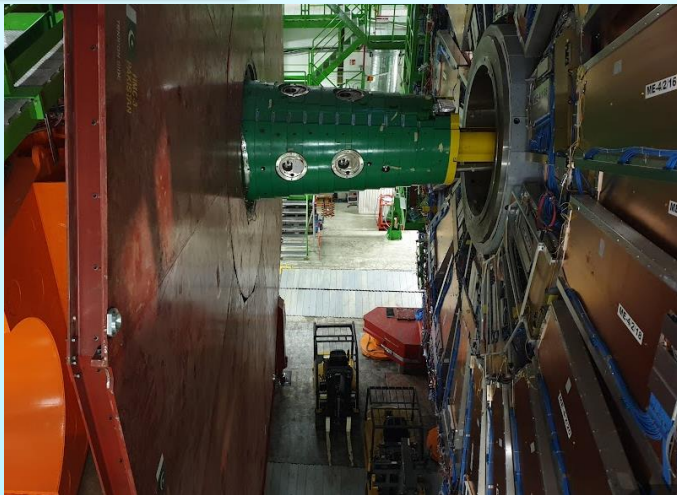
# LHC, TAS Installation @ CMS



# LS3 Deinstallation (Q1 2026) @ CMS

Q1/TAS

## side activity



- **BE-EA: Removal He protection dome, disconnection cooling pipes**
- **TE-VSC: Disconnection Q1-TAS**
- TE-VSC: Removal of pump, services

Safety, RP

## Cavern side activity



- TE-VSC: Disconnection of TAS from VAX
- BE-EA: Removal of lateral alignment supports.
- EN-HE / CMS: Removal of TAS with Upper-Plug

Safety assessment with  
Experiment, RP



# CMS challenges

- Machining of FIN (talk O. Boettcher)
- VAX-related (talk J. Perez Espinos)



# CMS Schedule: OPENING STUDY

## 1st access to FWD region

For removal of TAS and services installation

According to CMS schedule version 20220112\_LS3\_Baseline2

1<sup>st</sup> access window to access the TAS region is after removal of the FWD Beam Pipe module: **“start LS3 + 3 weeks”** (with access to Z- given first and then Z+)  
No more access to this area after **“start LS3 + 4 weeks”** because HF and YEs are open

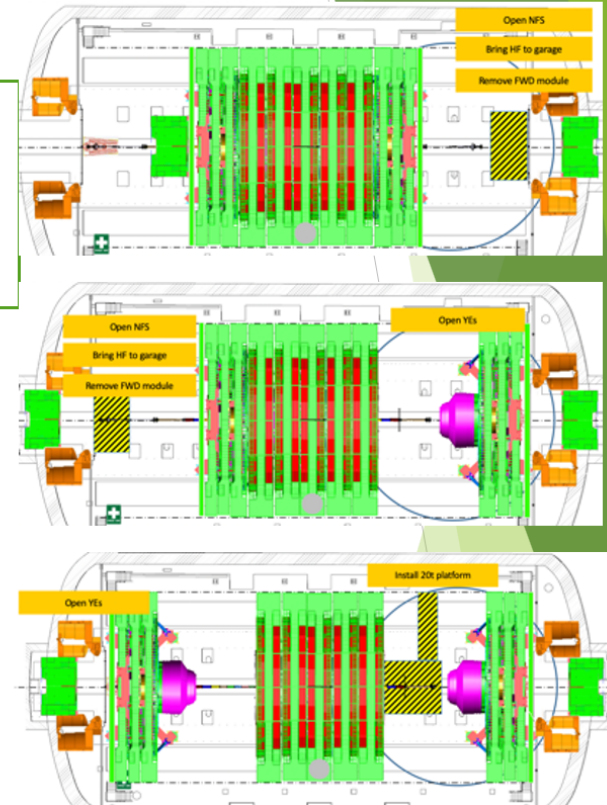
TAS access on tunnel side is driven by triplets schedule (can this activity be anticipated?)



In case of need for a different access window: need to perform unforeseen movement of the CMS Endcaps

One possibility is to perform this task after closure of the YBs and before to install Enfourneur: **“Start of LS3 + about 7 months”**

In this case the additional work to close and reopen the CMS endcaps delays the LS3 CMS schedule by about 1.5 week



1/19/22

CMS Technical Coordination

Note:

this delay takes into account only the additional time needed for the move, the time needed for TAS activity itself is not considered.  
Any day spent of the TAS activity on the CMS side directly impact the overall CMS LS3 schedule

# CMS Schedule: OPENING STUDY

## 2<sup>nd</sup> and Last access to FWD region For installation of the TAXS

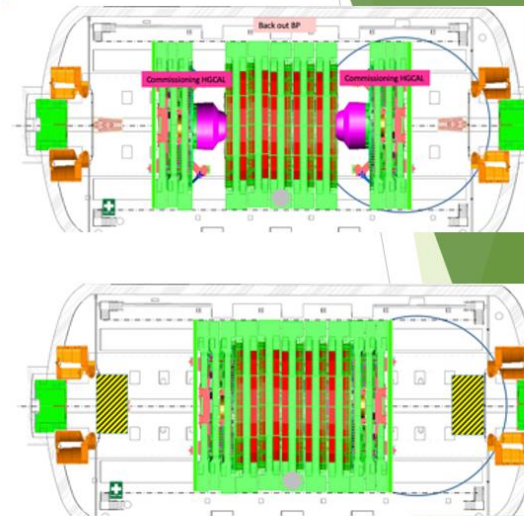
According to CMS schedule version 20220112\_LS3\_Baseline2

After opening, the YEs stays open up to partial closure for installation of the Beam Pipe and Bake Out.  
The Next window to access the FWD region is before installation of the Beam Pipe “end of LS3 - 8 months”

Last window to access the FDW region is before closure Rotating Shielding and HF, magnet commissioning and CRAFT run “end of LS3 - 3 months”

However it may be technically impossible to install the VAXS after installation of the BP

In case the installation of the TAXS needs to be performed in a different time slot, same consideration of time apply (about 1.5 weeks) - No clear window can be individuated at today stage in the sequence of LS3 activities for the detector



# Conclusions

In **ATLAS**, TAXS will be installed at the start of LS3, right after TAS removal (May 2026). First sector valve along LS3 (~2027, tbd WP12/VSC).

Alignment of TAS with respect to TX1S in the range of 10 mm for LHC commissioning (achievable from GM & acceptable from VSC, tbc).

Alignment supports & VAX modules (M2 & M3) will be installed at the end of the large opening.

In **CMS**, TAS will be removed at the start of LS3, TAXS will be installed in 2027 (tbc). Machining of FIN in Q1-to-Q1 time slot.

Both plannings need to be officially confirmed & approved in a HL-LHC CG.



***Many thanks  
(special to Michel, Dirk, Josef, Jaime,  
Francisco & Oliver )  
to be continued***

**NEXT**

Tbc WP8 meetings,  
HL-LHC CG





## ***Backup slides***



# Latest references

Chamonix- LHC Performance workshop 2022

<https://indico.cern.ch/event/1097716/>

119<sup>th</sup> HL-LHC WP8 Meeting

[https://indico.cern.ch/event/1163785/contributions/4887270/attachments/2466273/4229473/HL-LHC\\_WP8\\_Meeting\\_20220621.pdf](https://indico.cern.ch/event/1163785/contributions/4887270/attachments/2466273/4229473/HL-LHC_WP8_Meeting_20220621.pdf)

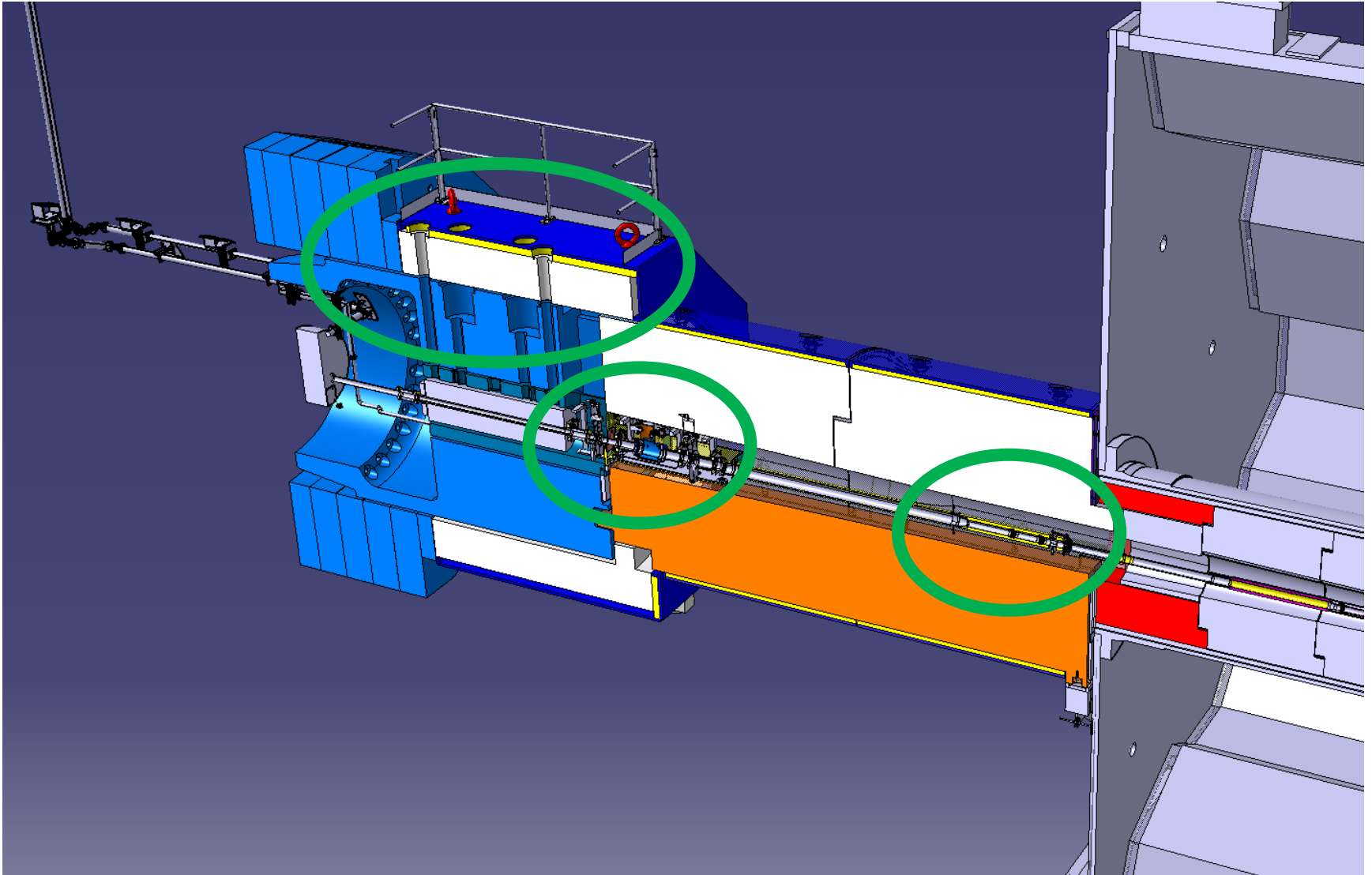
## NEXT

Tbc WP8 meetings,

Uppsala, parallel sessions WP8/WP12,

HL-LHC CG

# ATLAS Layout





# Removal/Installation scenarios

## TAS removal

### ATLAS

<https://edms.cern.ch/document/1764384/2>

### CMS

[https://indico.cern.ch/event/647382/contributions/2630663/attachments/1479507/2293645/INDC\\_WP8\\_pres\\_2\\_20170620.pdf](https://indico.cern.ch/event/647382/contributions/2630663/attachments/1479507/2293645/INDC_WP8_pres_2_20170620.pdf)

<https://edms.cern.ch/document/1952410/1>

# TAS ATLAS removal step-by-step v2

## (Paul Strahle / EN-HE)

■ <https://edms.cern.ch/document/1764384/2>

No.	Stage	Time (min)	mSv/h (chest)	mSv (chest)	mSv/h (hands)	mSv (hands)	No. Workers	Task	Tools	Parts
1	Preparations	30	0.200	0.100	1.000	0.500	1	Disconnecting TAS from the LHC		
2		15	0.200	0.050	1.000	0.250	1	Disconnecting the heating and cooling equipment at the back of the TAS		
3		5	0.200	0.017	1.000	0.083	1	Installing a blocking bar on the back side of the TAS	SW30	Blocking bar; 2x ISO 4
4		5	0.050	0.004	0.050	0.004	1	Installing the support between the TAS and the TAS cradle	long metal rod	TAS support slab
5		300	3.000		0.000			Big wheel in closed position		
6		30	0.000	0.000	0.000	0.000	2	Lower the paleazzani mobile elevator in the cavern		
7		5	0.001	0.000	0.001	0.000	2	Lift the TAS		
8		120		0.000		0.000	2	Upper alignment spacer removal	SW5 allen key	
9								Remove the upper half of the alignment rod		
10								Remove the alignment spacer	SW13	
11		120		0.000		0.000		JFSU shield removal		
12		7		#VALUE!		#VALUE!		JFSL shield removal		
13		7		#VALUE!		#VALUE!		TX1SP shielding plug removal		
14		150		0.000		0.000		JFC 3 shield removal		
15		5		0.000		0.000	2	Lower the TAS	SW38	
16		10	0.001	0.000	0.001	0.000	2	Removal of the support rods	SW38 + 7/8"; nippers	
17		10	0.001	0.000	0.001	0.000	2	Remove the lower half of the alignment rods	nippers	
18		300		0.000		0.000		Move the big wheel in the open position		
19		150		0.000		0.000		JFC 2 shield removal		
20		180		0.000		0.000		JFC 1 shield removal		
21		120		0.000		0.000		Remove the A-frame		
22		120		0.000		0.000		Removal of VT and VJ beam pipe sections		
23	VJ sliding plate removal	2	0.100	0.003	0.400	0.013	2	Assembly of the VJ sliding plate Attachment points	SW12 allen key	2x Rud VRS-F-M20
24		5	0.100	0.008	0.400	0.033	2	Loosen the M20 nut on all 4 interface plates	SW30	Loosen them about 20mm
25		5	0.100	0.008	0.400	0.033	2	Loosen the M20 screws on all 4 interface plates	SW30	Tight them about 20mm to remove the interface plates
26		5	0.100	0.008	0.400	0.033	2	Remove the M12 screws on all 4 interface plates	SW18	
27		2	0.100	0.003	0.400	0.013	2	Remove the 4 interface plates		
28		5	0.100	0.008	0.400	0.033	2	Attach the crane to the VJ sliding plate attachment points	SX1 surface crane	Round sling set (30mm; WLL 1t)
29		1	0.100	0.002	0.400	0.007	1	Tighten the crane cable	SX1 surface crane	Which crane c
30		5	0.100	0.008	0.400	0.033	2	Remove the four M20 screws which connect the VJ sliding plate to the monobloc	SW30	First the two at the bottom; then the two on top; crane has to be adjusted to prevent the VJ sliding plate from falling
31		10	0.000		0.000		1	Remove the VJ sliding plate with the crane	SX1 surface crane	Lift the VJ sliding plate to the buffer zone
32		2	0.000		0.000		1	Attach the hooks to the assembly points of the support frame		TAS support frame with winch frame; 2x Round sling set (30mm; WLL 1t)
33		10		0.000		0.000	1	Lift the support frame next to the monobloc	SX1 surface crane	Important to put the hooks in the right position to align the frame to the monobloc
34		TAS removal	5	0.100	0.008	0.400	0.033	2	Assembly of the support frame	SW24
35	2		0.200	0.007	1.000	0.033	1	Assembly of the front attachment points	SW12 allen key	2x Rud VRS-F-M20
36	2		0.200	0.007	1.000	0.033	1	Attaching the hooks to the assembly point		Crossbeam unit
37	7		0.010	0.001	0.010	0.001	1	Extracting the TAS cradle		aprox. 315 winch turns are needed; pull TAS cradle until it is completely out
38	2		0.200	0.007	1.000	0.033	2	Remove the front attachment points	SW12 allen key	
39	5		0.200	0.017	1.000	0.083	2	Installing a blocking bar on the front side of the TAS	SW30	Blocking bar; 2x ISO 4017-M20x50-8.8
40	2		0.600	0.020	0.600	0.020	2	Assembly of the top Attachment points	SW46	2x Rud ICE-LBG-SR 6.7 t M30
41	2		0.600	0.020	0.600	0.020	1	Attaching the hooks to the assembly point		Round sling set (180mm; WLL 6t)
42	15			0.000		0.000	1	Lift the TAS cradle into a container at the surface	SX1 surface crane	Attach it without skew Do not remove the sling set leave it in the container
43				0.000		0.000		Transport the container		Has the TAS s of container? where is the c
44			0.000		0.000		Install additional shielding for the operators		What kind of	



# TAS CMS removal step-by-step (Isabel Naranjo De Candido / CMS)

- <https://edms.cern.ch/document/1952410/1>

## CMS TAS REMOVAL STUDY

53<sup>rd</sup> WP8 Meeting  
20/06/2017

Isabel Naranjo De Candido

## WHEN?

- From W116
- 3 weeks in total, 2 weeks per each side, 1 week overlying
- Draft LS3 Baseline Schedule modified

