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Philippe Lebrun

1/11/2016

Report of the 14th Meeting of the ESS Technical Advisory Committee Lund, 5-7 October 2016

1. Introduction

The 14th meeting of the ESS Technical Advisory Committee (ESS-TAC) took place in Lund on 5-7 October 2016.

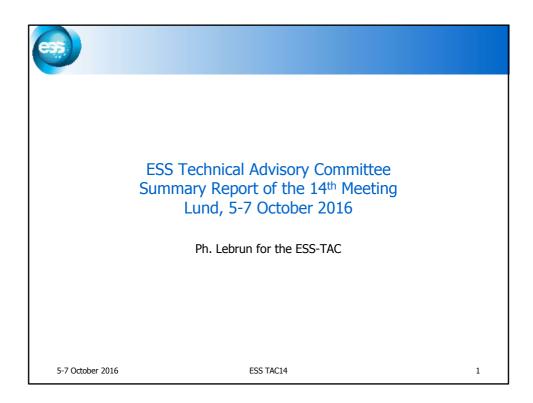
The meeting followed the agenda given in Annex 1. The Committee was given a specific charge (Annex 2), addressed in the meeting and answered in the oral report presented in the close-out session on 7 October 2016. The report proper constitutes section 3 of this document.

2. Participants in TAC

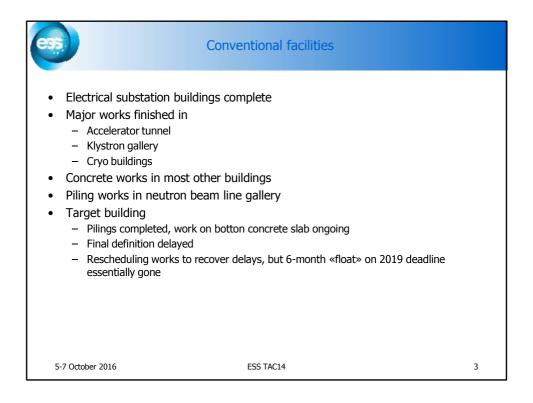
<u>Present:</u> Michael Borden (LANL), Tim Broome (ISIS), Michael Butzek (FZJ), Alberto Facco (INFN), Philip Ferguson (ORNL-SNS) [t-TAC chair], John Galambos (ORNL-SNS) [a-TAC chair], Frank Gerigk (CERN), Mark Heron (DIAMOND), Philippe Lebrun (CERN) [TAC chair], Alessandra Lombardi (CERN), Alban Mosnier (CEA), Anton Mösslang (KIT), Ralph Pasquinelli (Fermilab), Manuel Perlado (UPM), Szabina Török (MTA), Karen White (ORNL-SNS), Michael Wohlmuther (PSI)

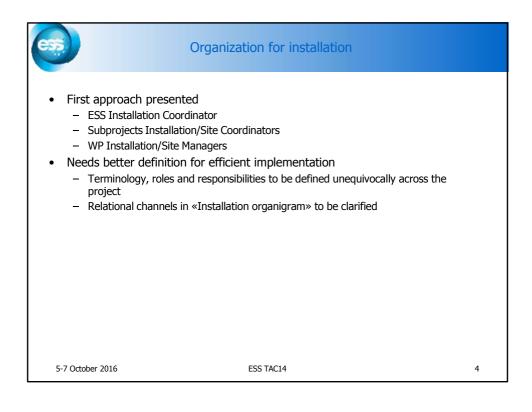
<u>Excused:</u> Bertrand Blau (PSI), Matasoshi Futukawa (J-PARC), Robert Stieglitz (KIT), Hans Weise (DESY)

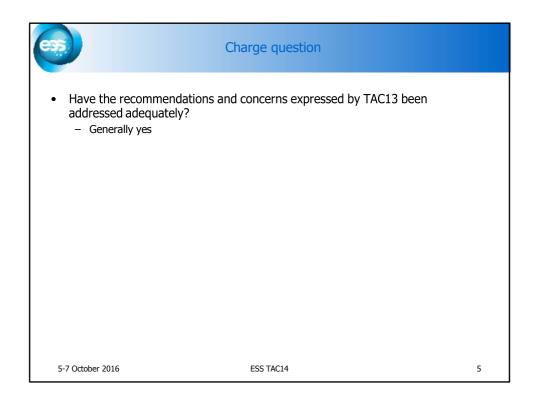
3. Report of TAC13

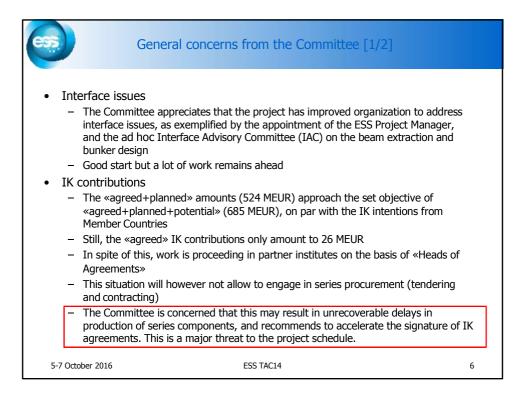


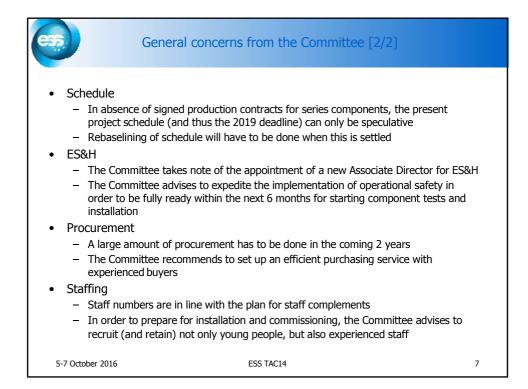
General TAC14	
Well-organized, well-prepared meeting	
 Clear charge to Committee and Sub-Committees 	
 Presentation topics in line with the charge questions 	
 Documents available on the INDICO site in advance of the meeting 	
 Commented replies to the recommendations of TAC13 	
 Good hospitality of ESS (as usual) 	
Project status	
 Impressive progress of CE construction 	
 New recruitments in managerial positions, new position of «Project Manager» 	
 Personnel at 460 (375 staff), expected to keep growing to 550 	
 Licencing application submitted in time (May 2016) 	
 First installation in time (Sep 2016) 	
 Construction 25% complete, on track 	
 EV 467 MEUR of which 	
199 MEUR conventional facilities	
94 MEUR accelerator	
27 MEUR target IX agreed and planned 524 MEUR, identified pescible up to 685 MEUR	
 IK agreed and planned 524 MEUR, identified possible up to 685 MEUR Under investigation, weach facility, to bridge liquidity gap during construction 	
 Under investigation: «cash facility» to bridge liquidity gap during construction 5-7 October 2016 	2
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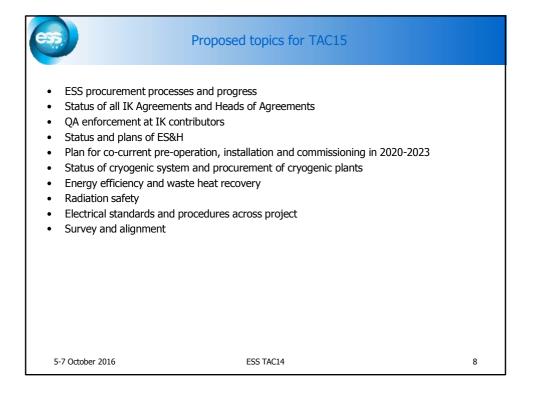


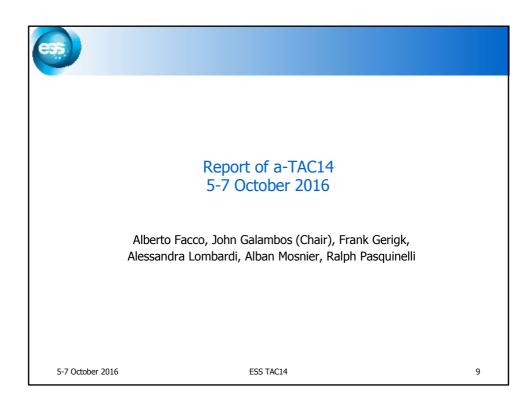


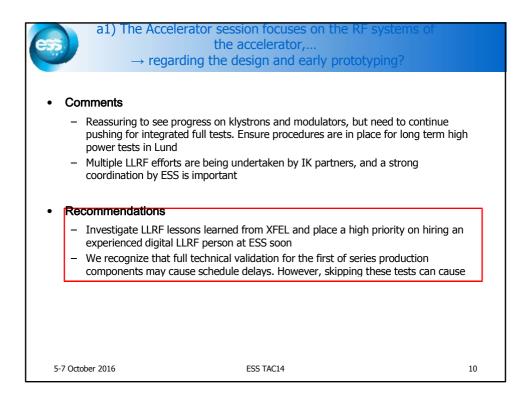


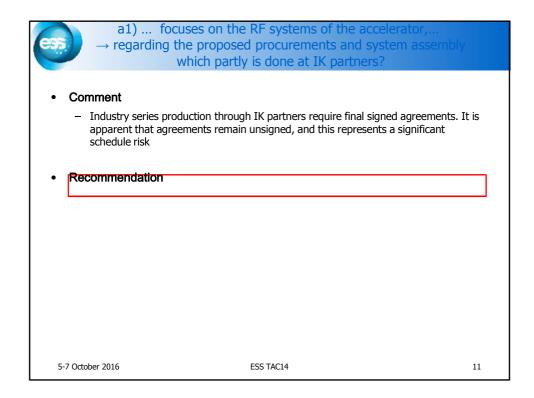


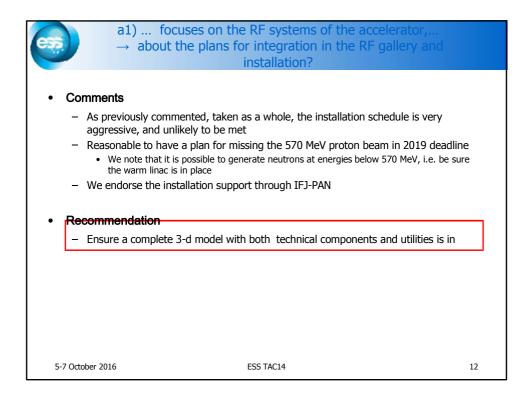


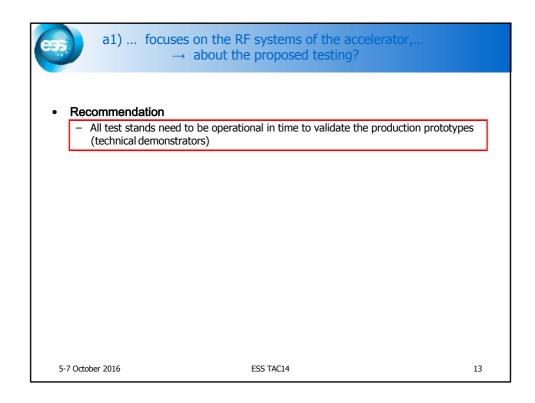


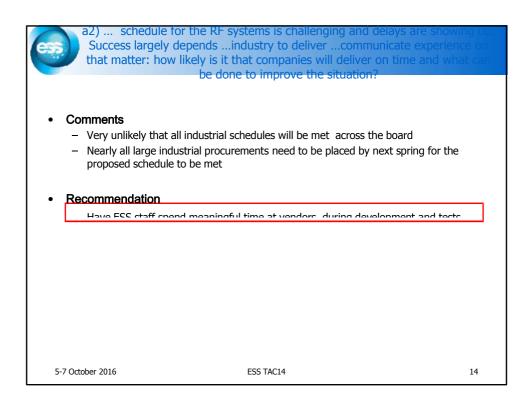


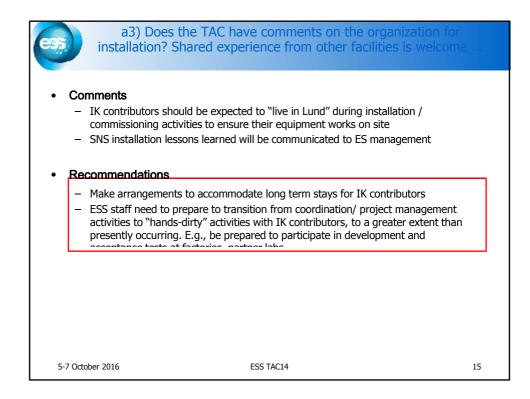


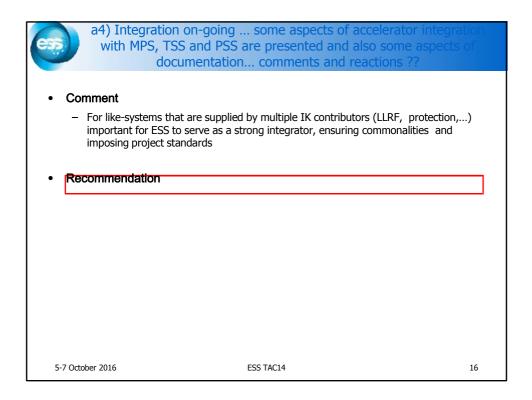


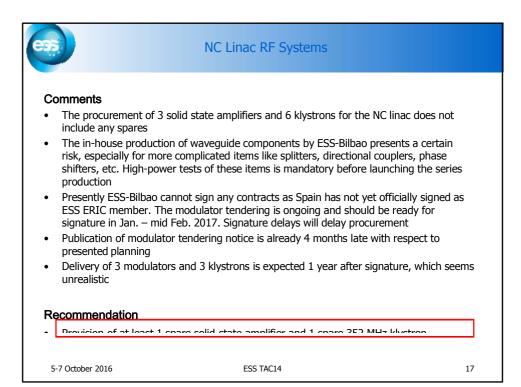


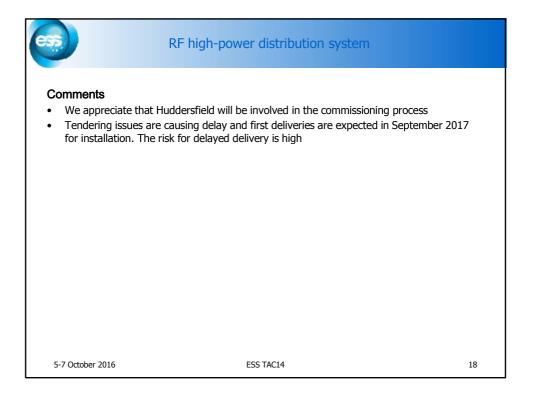


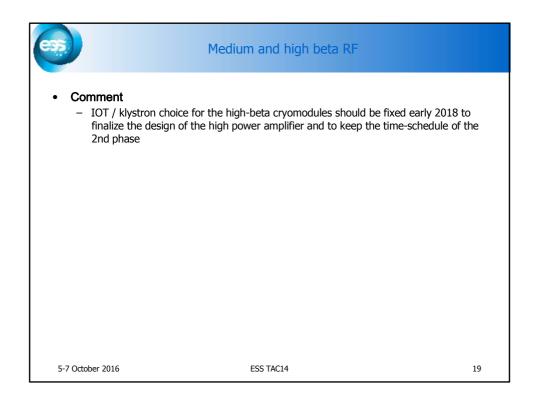


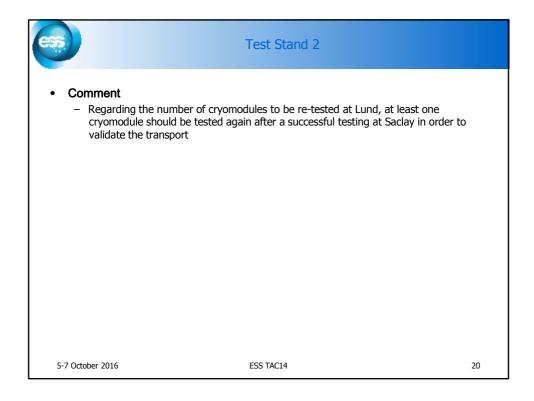


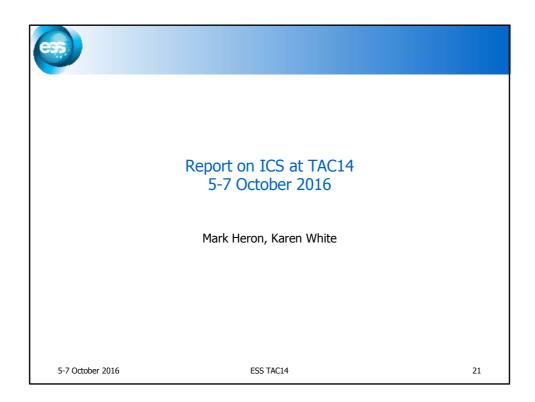


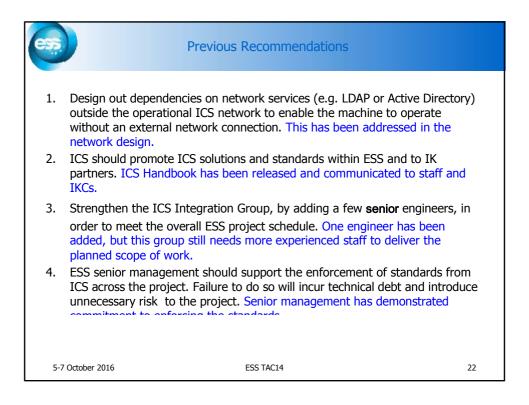


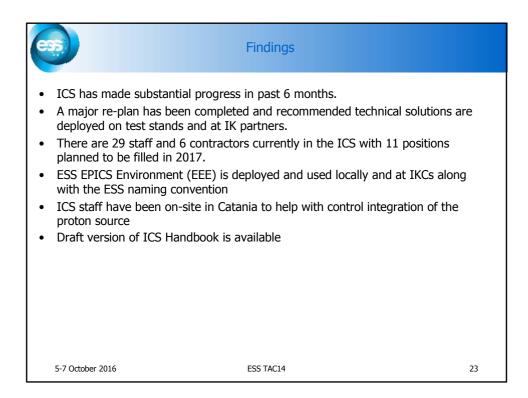


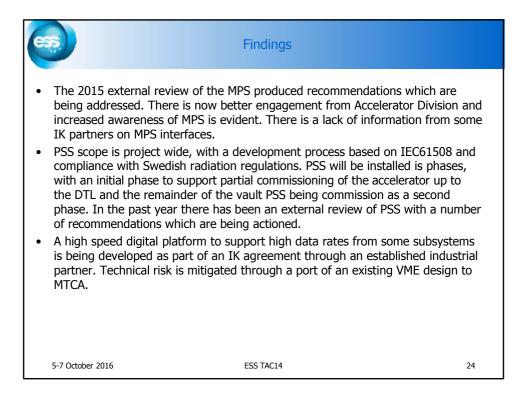


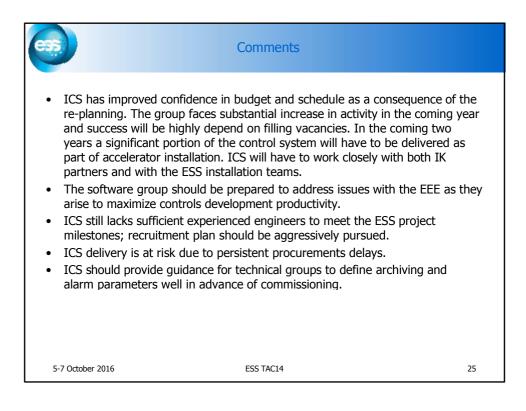


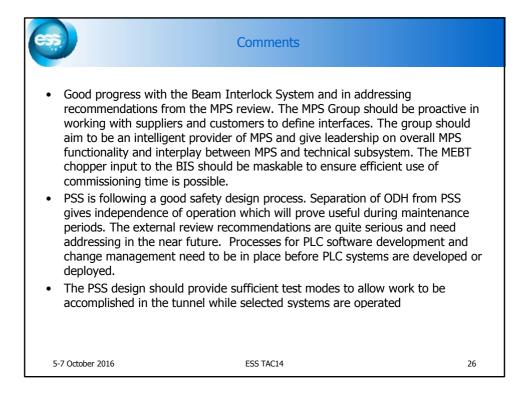


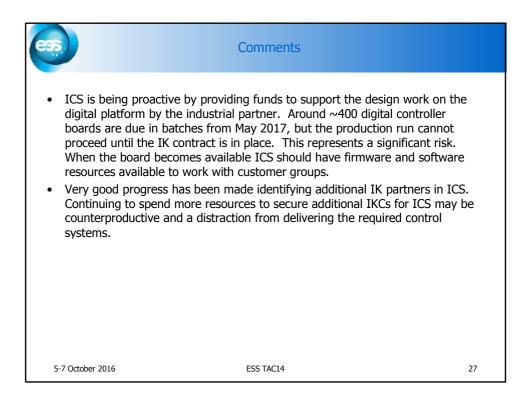




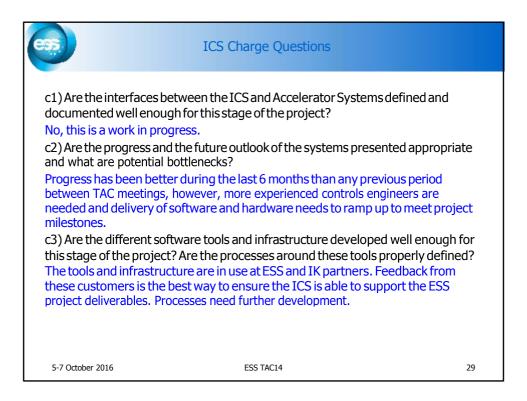


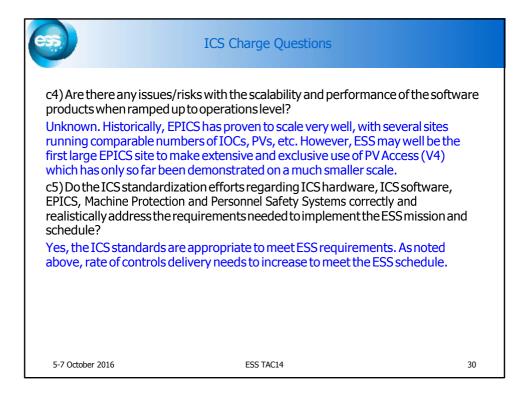


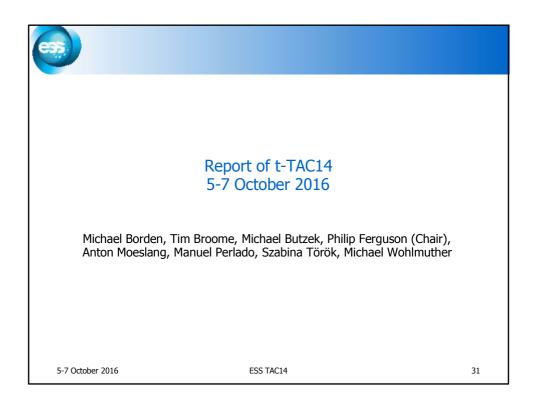


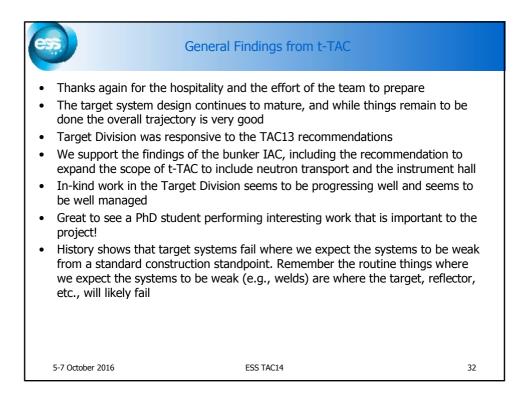


65	Recommendations	
1	. ICS should give priority to execution of technical work over search for further IK agreements]
2	. ICS should ensure they provide complete input for integrated installation planning and implementation	
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t1) Are the proposed concepts and preliminary plan for the in monolith diagnostics and instrumentation appropriate and sufficient to satisfy the needs of monitoring the target wheel?

Observations

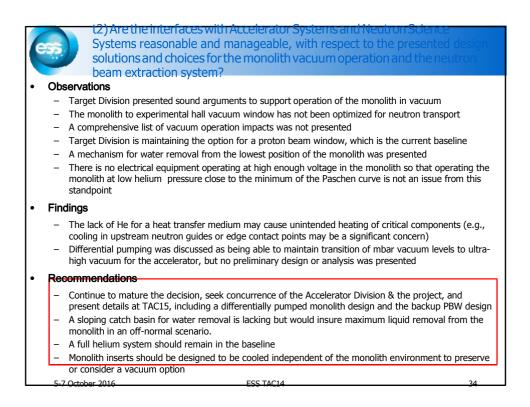
- Measurement of a long list of parameters is being considered
- Diverse instrumentation is being investigated
- Innovative methods are being developed for temperature measurement and tungsten block geometry
- Only target diagnostics were presented. A "moderator ready for beam" will also be required

Findings

- Instrumentation is being considered that covers all of the target systems
- How the parameter measurements will be used to inform operational decisions is not clear
- Direct measurement of Tungsten block temperatures is not possible
- Be aware that alignment of position sensors, gamma camera, etc., is critical and cannot be checked after installation. Robust alignment systems and mounting will be required

Recommendations

- Mature the target and monolith instrumentation suite
 - Decide which instrumentation will be used to confirm that the target is 'ready for beam' (What is meant by target failure?)
 - Define which parameters are in TSS and which are in MPS (current logic is good)
 - Define what action would be taken if a critical parameter moves 'out of range' (eliminate the need for personnel judgement as far as possible)
- Continue the simulation calculations and analyses to establish the effects of off normal events and their consequences for safe operation of the target. This work is to mitigate the inability to measure target temperatures directly
 Continue the work on the gamma camera, laser distance and vibration measurements, and
 - temperature measurements from outside the wheel





t3) Are the performed assessments and validations of the integrity and robustness of the spallation material thorough enough to constitute a spass for a safe commissioning and operation of the target?

Observations

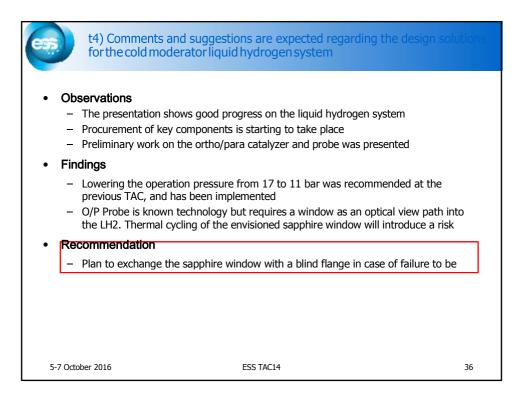
- Significant progress has been achieved on the selection of the spallation material W bricks
- A method for measuring Tungsten release factors for Iodine have been presented

Findings

- The parameters for hot rolling of W should be defined more stringently. In particular the temperature window and the thickness reduction during the process should be part of the specification
- · If not yet established, fracture toughness requirements should be defined
- Compressive residual stresses at the surface of the bricks might have a positive influence
 on fatigue life-time
- The two staged selection process for W material is endorsed
- An extended erosion (ETHEL) test would provide additional insight into W erosion issues

Recommendations

- The t-Tac believes the project should repeat the second stage of the selection process with new samples with refined specifications (especially for the temperature window and the thickness reduction during hot rolling) if this has not already been done
- Experiments on W release factors should be carried out as soon as possible
- Performed an extended ETHEL test and consider oxidation





t5) Is the presented filter solution for the target helium cooling system sufficient, robust and appropriate for a safe and reliable operation and maintenance?

Observations

- Target erosion and ablation was reassessed compared to the TDR
- Generation of eroded particles was estimated from short term ETHEL experiments and vibration experiments

Findings

- The committee agreed that prediction of particulate formation is not accurate.
- We don't believe the 3-4 kg/year number from the TDR, and are not sure about the current 10 g/year number
- Experience of existing facilities has shown unexpected particulate deposition on piping.
- Remote handling of filters during maintenance must be considered carefully
- Particulate monitors could be installed in the He loop (and may be planned)

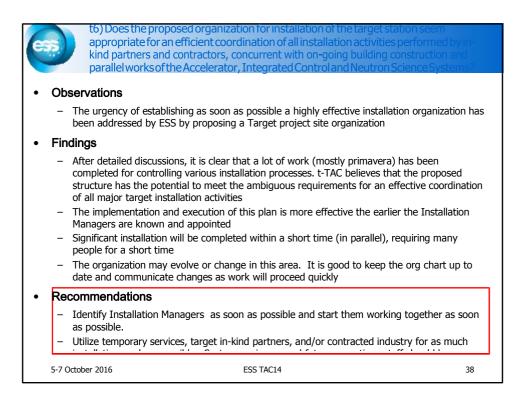
Recommendation

The system should be flexible enough to run with higher particle deposition than planned
 (a.g., space for additional shielding, spacidar where the filters are placed, etc.). Be spaceful

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ESS TAC14

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Annex 1

02/10/2016

Agenda of 14th TAC meeting

ESS Construction site

Wednesday 5, October 2016

TAC Lunch with IAC - Lunch area at ESS Construction site office TAC

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Plenary Sessions (13h30 - 17h30) - Pacific Water

13h30	Welcome and overall status of ESS – R. Garoby/J. Haines (25'+5')
14h00	Status of Conventional facilities – K. Hedin (20'+5')
14h25	Progress and plans for Accelerator – M. Lindroos $(35' + 10')$

15h10: Coffee

15h30	Target overview – E. Pitcher (35'+10')
16h15	ICS overview – H. Carling (35'+10')
17h00	Organization for installation - N. Gazis, T. Lexholm (20'+10')

TAC session Accelerator (17h30 - 18h00) - Atlantic

Target and ICS

	Target and ICS - Pacific Water
17h30	Report from IAC chair about the bunker – R. Pynn

18h30: Transport to Farmshack

19h00: Social Dinner (Farmshack, Lund)

22h00: Transport to Hotel Planetstaden and ESS Tunvavägen/Lund C

Thursday 6, October 2016 ESS Construction site, Odarslövsvägen 113, Lund

Parallel sessions (8h30 - 12h30)

	Accelerator (BrightnESS)	
8h30	30 Overview of the Linac RF Systems – A. Sunesson (15')	
	NC Linac RF Systems – P. Gonzalez (ESS Bilbao) (15'+5')	
	Spoke RF Transmitters – A. Fabris, C. Pasotti (Elettra) (15'+5')	
	RF Interlock System 704 MHz – J. Molnar (MTA Atomki) (15'+5')	
10h00	Coffee	
10h30	0 Phase Reference Line – K. Czuba (Warsaw University of Technology, ISE)	
	(15'+5')	
	LLRF Systems 704MHz – M. Grzegrzolka (Polish Electronic Group) (15'+5')	
	Medium and high beta RF – M. Jensen (15'+5')	
	RF High Power Distribution systems SC Linac – R. Edgecock (University of	
	Huddersfield) (15'+5')	
	RF systems installation – D. Bocian (IFJ PAN Krakow) (15'+5')	
	Cryomodule test stand at ESS Site – W. Hees (15'+5')	

	ICS (Cyclone)
9h05	Progress on Machine Protection – A. Nordt (20'+10')
	Progress on Personnel Safety Systems – M. Mansouri (15'+10')
10h00	Coffee
10h30	Progress on integration – D. Piso Fernandez (20'+10')
	Status of ICS standards – T. Korhonen (20'+10')
	Update on Software scope – S. Regnell (20'+10')
	Progress on common high speed digital platform – Henrik Carling (20'+10')

	Target (Brilliance)
8h30	Response to tTAC-13 Recommendations – E. Pitcher (30')
	Target Wheel Instrumentation Needs and Plan – U. Odén (30')
	Decay Gamma Imaging of Target Wheel Internals – N. Borghi (30')
10h00	Coffee
10h30	Spallation Material Update – F. Sordo (ESS Bilbao) (30')
	Cryogenic Moderator System Update – M. Kickulies (30')
	Update on Monolith Vacuum Operations Mode – R. Linander (30')
	Radiation challenges of primary cooling return water – E. Klinkby (DTU) (30')

12h30: Lunch on site – Pacific Water – By invitation only

Parallel session Accelerator and ICS (13h30 -14h00)

	Accelerator and ICS - Integration - BrightnESS	
13h30	Accelerator tasks wrt MPS, PSS, TSS – A. Ponton (15')	
13h45	Component/signal naming, and Controls Configuration – I. Alonso (15')	

Parallel session Target (13h30 -14h30)

	Target - Brilliance	
13h30	Update on Tungsten Release Factor Experiment – M. Jensen (DTU) (30')	
	Update on Target Helium Cooling System Filter Design – U. Odén – (30')	

Accelerator - Test stand visit - LTH

14h00 Visit to RF and modulator test stand – D. McGinnis/C. Martins (60')

TAC sessions (14h30 - 18h00) with additional interviews on TAC request

~ 16h00: Coffee

18h00: Transport from ESS Construction site to Hotel Planetstaden

19h00: TAC Dinner (Hotel Planetstaden)

Friday 7, October 2016 ESS Construction site, Odarslövsvägen 113, Lund

TAC Sessions (8h30 – 12h15) with additional interviews on TAC request ~10h30 Coffee

12h15 -13h30: Lunch

Close outs (13h30 – 14h45) 13h30: Close out with DG and Technical Director - (if necessary) 14h00: Close out (open session) 14h45: End of meeting

Annex 2



Document Type Document Number Date Revision State Confidentiality Level Page

Agenda ESS-0067537 Sep 8, 2016 1 (1) Preliminary Internal 1 (3)

Charge to the TAC for its 14th meeting on October 5-7, 2016

1. Introduction

The rate of progress of the ESS project has continued to increase during the past 6 months since the last TAC meeting and the project is now close to 25% complete. Construction on site has continued to advance at the foreseen high pace as well as the sub-projects both on site and at the in-kind partners.

The unavoidable difficulties that we encounter are being handled with the main goal of preserving the top-level milestones. Feedback and recommendations of the Committee to the applied solutions are eagerly expected.

The "Installation permit" (for devices generating ionizing radiation) has been submitted to the radiation safety authority (SSM) at the foreseen date, early last May. Interaction is actively taking place with SSM with the goal of getting approval in Fall 2017.

Numerous Technical Annexes and In-Kind Agreements have matured and been signed.

The ESS organization and management has continued to evolve. In chronologic order:

- John Haines has been nominated as ESS Programme Manager since August 15, keeping his former responsibility for the integrated schedule and enlarging his role to oversee the whole ESS construction project,
- Ralf Trant is the new Associate Director for Health, Safety, Environment and Quality since October 1,
- John Womersley will become Director General on November 1, 2016.

The installation phase, which is beginning this fall, will become a major activity during the first half of 2017. A specific organization is being set-up for that purpose.

The 14th meeting of the TAC is an opportunity to describe how we are addressing issues and how we plan for the future. In such a period combining extensive/intensive planning

Document Type	Agenda
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Revision	1 (1)
State	Preliminary
Confidentiality Level	Internal

together with execution work, the Committee's observations and recommendations will be especially precious.

2. Charge questions

Our first interrogation is about the follow-up of former TAC recommendations:

Have the recommendations and concerns expressed by TAC been properly addressed?

More specifically during this meeting, we would like the Committee to address the following questions:

- concerning the **Accelerator**:

a1) The Accelerator session focuses on the RF systems of the accelerator, following the request of the Committee at the last meeting. Does the TAC have recommendations on the systems presented:

- □ regarding the design and early prototyping?
- □ regarding the proposed procurements and system assembly which partly is done at IK partners?
- □ about the plans for integration in the RF gallery and installation?
- □ about the proposed testing?

a2) The schedule for the RF systems is challenging and delays are showing up. Success largely depends on the capability of industry to deliver within the foreseen schedule. We would like the TAC to communicate experience on that matter: how likely is it that companies will deliver on time and what can be done to improve the situation? The same question is asked for the installation and RF gallery integration schedule. Any comments or experience to share?

a3) Does the TAC have comments on the organization for installation? Shared experience from other facilities is welcome as part of the answer to this question.

a4) Integration is an on-going effort. Some aspects of accelerator integration with MPS, TSS and PSS are presented and also some aspects of documentation. TAC comments and reactions are expected.

- concerning the **Target**:

t1) Are the proposed concepts and preliminary plan for the in-monolith diagnostics and instrumentation appropriate and sufficient to satisfy the needs of monitoring the target wheel?

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t2) Are the interfaces with Accelerator Systems and Neutron Science Systems reasonable and manageable, with respect to the presented design solutions and choices for the monolith vacuum operation and the neutron beam extraction system?

t3) Are the performed assessments and validations of the integrity and robustness of the spallation material thorough enough to constitute a solid basis for a safe commissioning and operation of the target?

t4) Comments and suggestions are expected regarding the design solutions for the cold moderator liquid hydrogen system.

t5) Is the presented filter solution for the target helium cooling system sufficient, robust and appropriate for a safe and reliable operation and maintenance?

t6) Does the proposed organization for installation of the target station seem appropriate for an efficient coordination of all installation activities performed by in-kind partners and contractors, concurrent with on-going building construction and parallel works of the Accelerator, Integrated Control and Neutron Science Systems?

- concerning the Integrated Control System (ICS):

c1) Are the interfaces between the ICS and Accelerator Systems defined and documented well enough for this stage of the project?

c2) Are the progress and the future outlook of the systems presented appropriate and what are potential bottlenecks?

c3) Are the different software tools and infrastructure developed well enough for this stage of the project? Are the processes around these tools properly defined?

c4) Are there any issues/risks with the scalability and performance of the software products when ramped up to operations level?

c5) Do the ICS standardization efforts regarding ICS hardware, ICS software, EPICS, Machine Protection and Personnel Safety Systems correctly and realistically address the requirements needed to implement the ESS mission and schedule?

The Committee is encouraged to provide also suggestions/comments and recommendations on any other subject it would find relevant.

A preliminary version of the TAC report is expected at the end of the meeting, in the afternoon of Friday 7, October. The final report is expected before the end of October. The Chairman will orally present the TAC#14 report to the ESS Council on December 5-6 in Bilbao.