

Report of the 10th Meeting of the ESS Technical Advisory Committee Lund, 5-6 November 2014

1. Introduction

The 10th meeting of the ESS Technical Advisory Committee (ESS-TAC) took place in Lund on 5-6 November 2014.

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 report presented in the close-out session on 6 November 2014. The report constitutes section 3 of this document.

The Committee wishes to thank the ESS team for their hospitality and appreciates the effort put into preparation of the agenda, documents and presentations, made available before the meeting.


The Committee appreciates that its previous recommendations were taken into account and commented/answered in writing.

2. Participants in TAC

Present: Caterina Biscari (ELBA)[a-TAC chair], Giovanni Bisoffi (INFN), Bertrand Blau (PSI), Matthew Fletcher (ISIS) [acting t-TAC chair], Matasoshi Futukawa (J-PARC), Frank Gerigk (CERN), Mark Heron (DIAMOND), Philippe Lebrun (CERN) [TAC chair], Wolf-Dietrich Möller (DESY), Anton Mösslang (KIT), Ralph Pasquinelli (Fermilab), Karen White (ORNL-SNS)

Excused: Michael Borden (LANL), Philip Ferguson (ORNL-SNS), John Galambos (ORNL-SNS), Akos Horvath (ENERGIA), Guy Laffont (CEA), Robert Stieglitz (KIT), Werner Wagner (PSI), Yoshishige Yamazaki (FRIB)


3. Report of TAC10



ESS Technical Advisory Committee
Summary Report of the 10th Meeting
Lund, 5-6 November 2014

Ph. Lebrun for the ESS-TAC

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General

- The Committee wishes to thank the ESS team for their hospitality and appreciates the effort put into preparation of the agenda, documents and presentations, made available before the meeting. The finally presented slides should however be uploaded in INDICO
- The Committee acknowledges that its previous recommendations are taken into account and commented/answered in writing
- The management of ESS is to be commended for having hired a knowledgeable and experienced technical director
- As the presentations at TAC10 could only address a limited number of topics, the Committee was not informed about the technical status of many other aspects of the project. The Committee would therefore appreciate an overview of all WPs to be systematically presented at the TAC meetings, showing critical path, EVM, main issues and possible mitigation actions
- In the next meeting (April 2015), the Committee wishes to hear reports on
 - Progress of civil construction
 - Accelerator warm front-end
 - Plans for component logistics: receiving, testing, storing
 - General staff plan (by profile) for the construction, installation, commissioning and operation phases

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Project status [1/2]

- With ground-breaking and the start of civil works, the project has clearly entered the construction phase
- Ongoing reviews of requirements from the different technical systems provide necessary input to the definition of civil works
- Staffing has been rising steadily: this trend should continue with the preferential recruitment of experienced scientific, engineering and technical staff. Is there a plan to significantly ramp up the technician hiring? There could be good opportunities to train this staff over the next two years if test stands would be set up in Lund
- The goal of obtaining 35% of the total value of the project in the form of IKC looks achievable, on the basis of the contributions announced by the participating states and of the agreements in preparation. However, very few IK contracts are signed at this date.
- The Committee was pleased to hear that IK contracts are formulated in terms of obligation of results rather than obligation of means, thus ensuring responsibility and commitment of the contributing partners until completion of commissioning and beyond

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Project status [2/2]

- The schedule aiming at providing first protons on target by Dec 2019 and 2 GeV beams by Dec 2022, is aggressive and highly dependent on the success of ongoing technical developments, on the acceptance by the licencing authorities and on the proper execution of IKCs.
- The yearly budget, of 102 MEUR in 2014, is expected to rise to 217 MEUR in 2015. The peak of expenditure foreseen in the years 2016-2018 is expected to be buffered by loans from the European Investment Bank and the Swedish Export Credit Corporation
- The foreseen change of status of ESS from Swedish A/B to ERIC is expected to bring fiscal advantages and added administrative flexibility

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General concerns

- The project strategy rests on the successful execution of a large number of IKC: will ESS have the personnel resources needed to manage them? To cope with difficulties arising? To correct for failures?
- The present schedule, which shows little or no float, cannot absorb delays. How will the risk of delay be mitigated?
- It is not clear whether the essential project management tools are unified throughout the project, or fully operational yet. With construction having started, it becomes urgent to clarify and settle this issue
- The IK policy of outsourcing not only the procurement of key components, but also their design, engineering and testing, limits opportunities of on-the-job training for ESS personnel. How will this personnel take technical ownership of the equipment? How will the competencies for operation, maintenance and future upgrades be built-up at ESS?



Report of a-TAC 10 5-6 November 2014

Caterina Biscari (Chair), Giovanni Bisoffi, Frank Gerigk,
Mark Heron, Wolf Dietrich Möller, Ralph Pasquinelli,
Karen White



Accelerator – general [1/2]

- **Observations**

- The accelerator team reports progress on all ACCSYS WP. In particular tests in a vertical test stand of high- β elliptical cavities prototypes are above specs, contracts for 2 IOT prototypes and for 2 modulator prototypes have been signed.
- 47% of total in-kind value has been attributed to potential partners, but there are very few signatures so far. Many WP planning need rescheduling due to IK negotiations.

- **Comments**

- The committee strongly supports the idea to define a collaboration model with in-kind partners, in which the partner subscribes to the delivery and commissioning of components rather than to a certain cost for the equipment. In this model the risk for any potential increase in prototyping cost or production cost is borne by the in-kind partner.
- The transfer of design and operating knowledge from the in-kind contributing labs to ESS staff has to be ensured. This can only be done by participation at the different IK lab



Accelerator – general [2/2]

- **Recommendations**

- Next aTAC address the progress of different WP's in order to get a better overview of the general schedule, with special attention to the first systems needed for commissioning (as RFQ and DTL)
- Include in new aTAC composition an IKC expert from XFEL
- Complete the sooner the definition of all systems which may need revision in order to fit with the civil construction constraints
- The in-kind contributions should include the commissioning of the systems at ESS and ESS should also encourage the transfer of staff from the in-kind contributor to ESS when the equipment is delivered
- Make the staff increase in the RF group a priority, since even though the RF system is the biggest cost factor for the ESS linac, the RF group today consists of only 10 people



a1) Is the design and prototyping of the spoke systems sufficiently well advanced to permit the timely construction of the spoke section of the ESS linac?

- The prototype phase is well advanced, proceeding smoothly and conducted with good organization and a high degree of proficiency; the first decisive milestones are getting very close.
- The general schedule depends on the success of the prototype testing and does not provide any time contingency, in case the milestone tests requires actions to be taken, prior to launch of series production of components and could lead to delays.
- In general, with respect to other work packages, the Spoke WP does not seem to be more critical and has been conveniently defined till the final assembly stage at the ESS. The strategy to build them and test them at IPNO seems close to the best possible one for the moment being.
- Series production of components is ambitious but still reasonable. The test and assembly phase, and the final tests in Sweden, are tight: infrastructures and manpower should be secured, by both the ESS and IPNO.



a2) Does the committee concur with the recommendations made for collimators at ESS?

• **Observations**

Having substituted the octupole scheme with the raster scanning for distribution flattening at target, the beam at HEBT suffers much less of non-linearities and therefore halo particles are not an issue. End to end simulations with nominal errors show that the collimators (movable plus fixed), damping up to 50kW, are not necessary.

• **Comments**

The committee agrees with the decision to remove the collimation system in the HEBT.

• **Recommendations**

The option of collimating the beam in the MEBT should be pursued. Maintain the space available in case the full power beam will need collimation system, but ensure to define what are the radiation related issues to installing a collimator in a region that could have been heavily radiated during commissioning.



a3) Are the plans for modulators for the ESS RF sources feasible and does the committee have specific recommendations regarding the modulator development performed at Lund University in collaboration with ESS?

- **Observations**

The module test stand will be built at Uppsala

- **Comments**

We appreciate that there are plans for a cryomodule test stand in Lund. However, we regret to hear that it was decided to move the RF test stand #1 from Lund to Uppsala. Especially because the modulator development and the first modulator tests are carried out at Lund university. The modulator is an ESS in house development. The know how is needed for the commissioning and operating of the linac at ESS. Proximity of the test stand would be an added value.



Comments on responses to last aTAC

- **Comments**

- aTAC acknowledges the answers to past meeting recommendations.
- Commissioning plans are outlined in the draft document for Beam Commissioning, prepared after the dedicated workshop on April 2014. The list of tasks covers the staged commissioning. Requirements on beam diagnostics, control system, high level software, etc. are not in the document as it has been presented.

- **Recommendations**

- Commissioning of the technical systems, coordinated with the IK partners, is to be addressed together or even in advance to beam commissioning.



4.5. Reliability and availability

- **Observations**
 - User requirements have been defined after the opinion of ESS instrument scientist. Beam trips longer than 2 hours should be avoided, since they would oblige to reschedule affected experiments. Shorter trips could be acceptable.
 - The present requirements are tighter than what SNS delivers today for integrated flux experiments, while more relaxed for the kinetic experiments
- **Recommendations**
 - Define staged levels of reliability over the start-up years, using as comparison the original specifications for availability at SNS with today's performance.
 - Consult user community.



Status of spoke cryomodules [1/3]

- **Observations**
 - The prototyping activity of cavities, couplers and cryomodules is proceeding at a quite impressive pace, and with high degree of proficiency.
 - The design is finished and the prototype components like cavities, power couplers, tuners and one module are already received or are expected in spring 2015. The preparation of the cavities has started and the vertical tests are foreseen to start end of 2014, giving the first important answer on accelerating field and Q_0 .
 - Prototype coupler will be delivered soon and tested as soon as the conditioning bench will be operational. The assembly procedure of all components into cryomodules, equipped with valve boxes, was analyzed in detail.
 - Procurement of Niobium will be started in March 2015. The prototype cryomodule can be assembled and tested beginning Q2 2015. The series production and module assembly and tests are scheduled for 2016 to 2018. All module tests are performed at the Uppsala test stand together with the WP4 team.
 - Planning: prototype test milestones (cavity vertical test, cavity+coupler power test, validation of whole cryomodule) were put in the schedule, in appropriate anticipation of series production of the relevant components.



Status of spoke cryomodules [2/3]

- **Comments**

- We note 5 months of delay in prototyping the power coupler due to difficulties with the Cu plating. Alternatives are under investigation: either to accept a degraded RRR value or to use the couplers without plating. A qualification program is being developed and the suppliers are investigating the issues. These measures are adequate.
- For all systems (cavities, cryomodule, couplers, etc) it is appreciated that the series production can start after the related prototypes tests. However, if any prototype does not fulfil the specs or design adjustments are needed this will immediately translate into a project delay. Additional tests are not planned because of schedule restrictions (this is true also for other WP's)
- The test of the cavity- coupler system is very important and a crucial milestone.
- Series production strategy of components is ambitious but still reasonable.

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Status of spoke cryomodules [3/3]

- **Recommendations**

- As it applies also to other WP's, the risk of unexpected technical problems in the prototype phase must be taken into account.
- Increase the effort to save time during the prototyping with the goal to allocate some time contingency in the WP.
- Procure the materials and be ready for an iteration on the couplers before going into series production.
- The test facility at Saclay for testing couplers is available for only a few months per year. This may make it difficult to qualify the couplers and test more than prototypes. A test station at Lund should be dedicated to coupler testing to be a training infrastructure for the ESS staff. It could be extended to modulators and klystrons testing.
- ESS staff should be involved in the cryomodule tests at Uppsala in order to gain operating experience for later linac commissioning.

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Status of spoke RF systems

- **Observations**

- The 352 MHz RF system will be based on a tetrode cavity amplifier. A prototype system is to be tested at the Uppsala RF test stand. Significant progress has been made on the design before the company (Electrosys) went bankrupt. This is a significant setback that has schedule implications.
- Elenos has bought the bankrupt company but access to all the components in stock has not been released as of this meeting.
- Plan A is that Elenos will finish the system. 2 back-up plans were presented involving procurement at other companies.

- **Recommendations**

- A decision point is needed when to apply the back up plans for the Uppsala RF system in case plan A fails.
- The schedule impact for the back-up plans should be elaborated. Including realistic time for testing, debugging and commissioning the new systems, which can take several months.
- The parameter choice for the stability of the RF system (0.1 deg, 0.1%) should be documented in an ESS report.

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Klystron modulator update and Modulator Laboratory at LTH [1/3]

- **Observations**

- The in house design of a scaled high voltage modulator for the RF systems is moving forward. It was refreshing to see the construction of the hardware at Lund University. While a critical part is still missing, the high voltage transformer section, the balance of the modulator will be in initial testing mode within a few weeks. A space at the University has been designated for the test of the modulator with a resistive load. This work is most commendable
- The in house design is far enough along that with the proper support, a modulator could be ready in this time frame. The prototype is expected ready for testing in 2015.
- 2 further modulator prototypes have been ordered in industry and should be delivered in Jan 2016.

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Klystron modulator update and Modulator Laboratory at LTH [2/3]

- **Comments**

- Whatever modulator is selected, floor space in the service buildings (already designed) will be at a premium. No cranes are in these building and some of the modulator components are expected to weigh in excess of 7 tons. With a modulator capable of operating 4 klystrons, there is no section of the accelerator that can cope with a modulator failure and still allow running beam; hence prompt replacement or repair will be necessary in the gallery. The size and modularity of the power supply design is critical for smooth operation, maintenance, and availability.
- Even if all 3 prototypes were delivered in-time and were successful, there is a strong risk that the series production will be late because of limited production capabilities of the chosen companies.
- There is a risk that the scaled in-house prototype will not be fully representative of a full-scale device and may exhibit problems once extended to a full scale system.

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Klystron modulator update and Modulator Laboratory at LTH [3/3]

- **Recommendations**

- Quarterly reports and regular visits at the vendors are recommended to make sure that the 2 companies deliver in time.
- The vendor-contributed modulators are intended to go to Uppsala versus Lund. This is a missed opportunity for training staff at the Lund site. So called "soaked runs" for long term testing will be required before full acceptance and before making the decision of which design to pursue for manufacture. The opportunity for staff training is ideal for increasing the Lund technical staff and should not be missed. At least one modulator/RF station (if not more) should be setup in Lund

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Report of t-TAC 10 5-6 November 2014

Bertrand Blau, Matthew Fletcher (Chair), Masatoshi
Futukawa, Anton Möslang



General remarks

- Good detailed and open presentations available and before the TAC.
- Impressive progress in many areas towards engineering design
- Good neutronic developments presented
- Securing in-kind contributions is a major issue and understood
- Establishing a Technical Board is a good idea.
- Monitoring all work packages will be a significant activity.
- Ensure that the assessment of experience and capability is strongly built into the selection of in-kind partner.



Is the newly formulated moderator and reflector mechanical configuration viable? Does it incorporate adequate flexibility to allow for future innovations in this area?

- The proposed 'twister' design looks viable, and allows considerable flexibility in separate, independent access to either moderator.
- New concept allows maximum flexibility for future variations in moderator and reflector design
- The concept requires the cutting of the moderator and coolant pipework and looks possible.
- The current design has the limitation that the whole assembly (reflector, moderator, pre-moderator) is replaced.
- Obviously the concept will need refining in detail with many analysis to follow.

Recommendations

- Concentric pipes for LH2 and water are not recommended because of blocking and destroying water pipes in case of loss of insulation vacuum.
- The method of cutting needs to be developed further to ensure this can be achieved with limited dose to personnel.



Is the approach that we are using to arrive at a neutronically optimized moderator/reflector reasonable?

- The approach of separating the detailed neutronic design from the general arrangement is good and sensible.
- We agree with the planned timetable to fix the arrangement of the moderators (planned Nov / Dec 14), as this will fix the cooling requirements for the cryoplant and provide a stable point for instrument development. This is really important to fix now to keep to the schedule.
- Neutronic development should continue even after the reference arrangement is made, as future developments of moderators could be implemented during the life of the facility.
- The reference design will fix the beamline arrangement which is difficult to change later.
- Butterfly-type moderator appears to have good performance possibilities, however, the concepts looks even more challenging in terms of manufacture and its impact on the instruments has to be validated first.
- The new bottom OT moderator looks a good approach and gives flexibility.

Recommendations

- Stick to the planned date of fixing the reference moderator arrangement in Nov/Dec 2014
- Continue with moderator development ideas



Is the updated monolith design approach incorporating a reduced diameter, smaller vessel, and support structures reasonable?

- The smaller diameter vessel appears simpler than the TDR arrangement.
- The support structures look credible and allow the use of cheaper shielding materials.



Does the committee concur with the projects position that a water-cooled, rotating W target represents a technically viable backup approach?

- Yes



Were recommendations from the 9th TAC meeting adequately addressed?

- Responses to all recommendations were received prior to the TAC 10 meeting
- Progress and/or plans on 8 of the 13 recommendations have been presented at TAC 10; the 5 remaining issues were either trivial, or are ongoing with deliverable dates beyond 2015.
- The proposed definition of safety critical systems starting in 2016 appears too late.

Recommendations

- Presentation of preliminary safety assessment should be made at TAC11



Comments on progress towards completion of Preliminary Design in all areas highlighted at the meeting are most welcome

- The approach of in-kind engagement is critical and good efforts are being made to maximise this.
- The alternative of using in-house staff as a back-up is sensible.
- Pleased to see safety class being identified for each system

Recommendation

- Continue with the efforts to complete in-kind agreements with experienced partners.
- Ensure that the assessment of experience and capability is strongly built into the selection of in-kind partner.



Reflector:

- Pure Be has a very short half live
- Decay time after irradiation depends therefore only on impurities and decays therefore quickly
 - The Al casing of Beryllium will dominate the decay time
 - After irradiation: If it is kept at room temperature, tritium does not leave beryllium, but sticks forever inside
- Swelling of Be at high temperatures is an issue

Recommendation:

- The material specification of Be is important for disposal.
- Confirm maximum temperature under accident conditions
- Disposal path for Be has to be pursued further in collaboration with authorities



- Limited information presented regarding the cleaning technologies used for the helium.
- The 'new concept' for remote handling looks interesting, but TAC does not have experience in non-traditional remote handling.

Recommendation

- Present the purification technologies intended to TAC11.
- Temperature measurements in storage area should be considered
- Seek advice from others who work with non-traditional remote handling techniques.

- Building of a second target wheel should be considered for backup as experience from all other facilities show that it is advisable to always keep a spare target in stock. (similar for all key components)



Report on ICS at TAC 10 5-6 November 2014

Mark Heron, Karen White



ICS General (1/2)

- Observations
 - Good progress has been realized on staffing
 - 10 news hires.
 - key position of Lead Engineer for PSS filled.
 - 8 positions remain to be filled this year.
 - ICS standards not yet established although the tender for preferred PLC vendor is ready for release.
 - Development of Interface Definition Documents (IDD) underway for NSS, Target and Accelerator Beam Instrumentation (due 12/2014).
 - Only a small fraction of IKCs have been identified (43% is needed).
 - Issues with tools to create/manage drawings and other documents.
 - Retender of CS Services framework agreement is underway.
 - Of the six high-level milestones for ICS in 2014 – one was met, one is due in December, the other four are delayed (1-3 quarters).
 - Decision taken to use OpenXAL framework for physics applications.



ICS General (2/2)

- Comments
 - It is well past time to have established standards for ICS (hardware, software, processes, documentation) – this is critical to enable the delivery of integrated controls solutions.
 - Some of the recommendations from the previous review have not been fully addressed.
 - While there has been progress on hiring, the ICS appears to be short of resources for system integration.
- Recommendations
 - Issue ICS standards for hardware, software, processes and documentation.
 - Proactively seek IKC agreements with other institutions and work with accelerator subsystem IKCs to see if these can include an IKC of controls.
 - Finalize decision on ESS standard PLC for ICS.
 - Develop Interface Control Documents for the technical systems.

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Hardware Platforms for ESS

- Observations
 - A strategy was presented for the hardware platforms of the control system based on MTCA for high end applications and network attached devices and PLCs for middle and low end applications.
- Comments
 - Having separate and modular hardware solutions for high end and low end applications is a good solution.
 - MTCA is now (probably) the only open hardware platform suitable for high end applications that has an established users base within the accelerator community.
 - However it has a limited overall user base.
 - The development of a new MTCA controller must be shown to be compatible with the project plan for early operational systems.
 - Prototype systems (modulator prototype) are already being developed with non ICS solutions and IKCs are being setup which could potentially include an IKC control system component.
- Recommendations
 - Fix hardware standards and document, so they are available for in house and IKC developments, by Q4 2014.

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Is the proposed HW strategy sound considering the timescale of the project? Does the proposed solution provide the required performance with a reasonable cost?

- Yes, proposed HW strategy sound.
- Having separate solutions for high end and low end applications provides for the required performance with a reasonable cost.
- In terms of timescales, the interface standards still needs to be documented and suppliers established to be available to meet early project needs. The development of the MTCA controller needs to be shown to be compatible with early system requirements.



Conventional Facilities Controls

- Observations
 - The ICS engineer assigned to CF has been working closely with CF engineers to define the scope and design for CF controls.
 - Allocations have been made for cable trays in all building plans including separate trays for safety cables.
 - A server room has been designed for ICS and IT servers and storage.
- Comments
 - A good working relationship has been established between ICS and CF for controls integration.
 - This work is progressing well with lessons learned from initial attempts now incorporated in a defined process.
 - It would be prudent to consider having an alternate server room prepared to host critical services in the event of a catastrophic failure to equipment in the primary server room. This is a consideration of long-term availability rather than a requirement for initial commissioning and operations.



Is the scope of Conventional Facility controls integration properly defined? Are the work package activities properly derived from and aligned with CF planning?

- Yes, the scope of CF controls integration is well defined.
- The work package activities are appropriate for this stage of the project, the ICS engineer is working closely with CF personnel and the work is aligned with the CF schedule.



Personnel Safety Systems

- Observations
 - An experienced Lead Engineer has been appointed with responsibility for PSS.
 - An initial scope of work for the PSS has been defined, and a strategy for its realisation was presented.
 - Detailed realisation will be based on a life cycle defined by the standard IEC61508.
- Comments
 - The committee strongly endorses the approach being taken with the PSS.
 - The realisation of the PSS in line with the IEC61508 standard will necessitate the development of processes and documentation to show compliance. The amount of resource and time required for this should be considered.
 - A number of European accelerator projects (E.g. Diamond and Alba) have adopted IEC61508 for PSS. It may be worth consulting on their experiences.



Personnel Safety Systems (Cont)

- Comments (cont)
 - As part of the Hazard Identification process the project should recognise that there may be hazards (flammable gases, fire/smoke detection) that need managing with an active protection system that are not currently within the defined scope of the PSS.
 - Subsystem hardware, delivered as IKC, will have to be interfaced to the PSS (to control Hazards). It is essential that all such hardware adopts and complies to the same set of safety standards.
 - The PSS should consider a possible requirement for stepwise beam commissioning of the accelerator.
 - The committee endorses the early engagement with the Swedish regulator for IRR.



Personnel Safety Systems (Cont)

- Recommendations
 - ESS should develop engineering standards and distribute to all collaborators as early as possible. PSS interface, lock out tag out (LOTO) standard, electrical safety, X-ray shielding, pressure vessels standards, RF power leakage, are some of the more important things for such a set of standards. Compliance with such standards should part of the design (PDR and FDR) and inspection of progress of IKCs.
 - Consider establishing a framework agreement for the provision of IEC61508 support services (Examples being, Development of processes and documentation, Failure Mode Analysis Studies, Fault Tree Analysis, Design Verification).



Is the scope of Personnel Safety Systems for ICS appropriate? Are the technical solutions proposed for implementing PSS appropriate?

- Yes, scope of the PSS is appropriate.
- Present PSS status is such that the technical solution is not sufficiently advance to assess.

Annex 1: Agenda of TAC 10 meeting



ESS/TAC10/14/001
ESS Technical Advisory Committee 5th & 6th November 2014

Date: November 5-6, 2014
Place: ESS HQ, Tunavägen 24 Lund
Time: 08:30 – 18.30 5th November, 08:30 – 14:45 6th November

Wednesday 5th November

08.00 Taxi from Hotel Lundia to ESS HQ

08.30	Internal discussions TAC (TAC only) <i>P. LeBrun (30 min)</i>	Meeting room: <i>Tänkartanken</i>
09.00	Welcome & overall status and plans of project <i>J. Yeck, R. Garoby (30 min)</i>	<i>Tänkartanken</i>
09.30	Progress and plans on: <ul style="list-style-type: none"> • Accelerator <i>M. Lindroos (20+5 min)</i> • Target <i>J. Haines (20+5 min)</i> • ICS <i>G. Trahern (15+5 min)</i> 	<i>Tänkartanken</i>

10.40 – 11.00 Coffee in Ljussgården

11.00 – 12.30 Parallel sessions

a-TAC Meeting room: <i>Tänkartanken</i>	t-TAC Meeting room: <i>Linneasalen</i>
<ul style="list-style-type: none"> • Responses to last aTAC <i>D. McGinnis (20+5 min)</i> • Status of Spoke Cryomodules <i>S. Bousson (30+10 min)</i> • Status of Spoke RF Systems <i>A. Sunesson (20+5 min)</i> 	<ul style="list-style-type: none"> • Target Project Progress and Plans <i>E. Pitcher (20+10 min)</i> • Moderator Optimization Studies <i>L. Zanini (20+10 min)</i> • Moderator and Reflector Systems Design <i>D. Lyngh (20+10 min)</i>

12.30 – 14.00 Lunch in Inspira Restaurant, Medicon Village

Wednesday 5th November

14.00 – 15.10 Cont. parallel sessions

a-TAC Meeting room: Tänkartanken	t-TAC Meeting room: Linneasalen	ICS-TAC Meeting room: Scheele
<ul style="list-style-type: none"> High Energy Collimator <i>H. Dølrath Thomsen, (25+10 min)</i> Klystron Modulator Update <i>C. Martins (25+10 min)</i> 	<ul style="list-style-type: none"> Target Systems Update <i>U. Odén (20+10 min)</i> Completion of Water-Cooled Backup Study <i>E. Pitcher (15+5 min)</i> Materials Studies <i>Y. Lee (15+5 min)</i> 	<ul style="list-style-type: none"> Hardware Platform Freeze and Approach <i>T. Korhonen (25+10 min)</i> Conventional Facilities integration: Approach and Issues <i>D. Pisco Fernandez, (25+10 min)</i>

15.10 – 15.30 Coffee in Ljussgården

15.30 – 17.00 Cont. parallel sessions

a-TAC Meeting room: Tänkartanken	t-TAC Meeting room: Linneasalen
<ul style="list-style-type: none"> Tour of modulator laboratory at LTH (60 min + 2x15 min travel time) 	<ul style="list-style-type: none"> Monolith Design Progress and Plans <i>R. Linander (20+5 min)</i> Active Cells Approach and Handling of Spent Targets <i>M. Göhran (20+5 min)</i> Discussion (40 min)

17.00 – 18.00 Closed session TAC Only

a-TAC Meeting room: Tänkartanken	t-TAC Meeting room: Linneasalen
Working session (TAC Only)	Working session (TAC Only)

18.00 Bus from ESS HQ to the restaurant

18.30 Welcome drink and dinner at Flädie Restaurant, outside Lund

21.30 Bus returns to Hotel Lundia

Thursday 6th November

08.15 Taxi from Hotel Lundia to ESS HQ

08.30	Personnel Safety System <i>S. Birch (30+15 min)</i>	Meeting room: <i>Tänkartanken</i>
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09.15 – 12.00 **Closed session TAC Only**

10.30 – 10.45 Coffee in Ljusgården

a-TAC Meeting room: <i>Tänkartanken</i>	t-TAC Meeting room: <i>Linneasalen</i>
Working session (TAC Only)	Working session (TAC Only)

12.00 – 13.30 Lunch in Inspira Restaurant, Medicon Village **TAC only and by invitation**

13.30	Close out with Director & Machine Director (TAC only closed session) TAC members, J. Yeck and R. Garoby	Meeting room: <i>Tänkartanken</i>
14.00	Close out (Open session)	<i>Tänkartanken</i>

14.45 End of meeting

15.00 Taxi to Central station in Lund from ESS HQ

Charge to the TAC 10th meeting at ESS HQ, Lund November 5-6, 2014

During the Summer of 2014, the ESS project has effectively entered into its construction phase. Civil Engineering has visibly started and the pouring of concrete has begun. This milestone has been met on time and comforts the credibility of the overall project schedule. This major achievement was properly celebrated with the Ground Breaking event on September 2 and the Foundation Stone ceremony on October 9.

The other activities in the project have to keep pace with the progress of the Conventional Facilities, providing the necessary requirements and preparing for construction of equipment.

During its 10th meeting, on November 5-6, 2014, the ESS Technical Advisory Committee will be informed about the follow-up of its previous recommendations. Subjects requested during the previous meeting will be presented.

Our first question to the Committee is therefore:

Have the recommendations and concerns of the previous TAC meeting been addressed adequately?

More specifically, we would like the ESS Technical Advisory Committee to address the following questions:

- concerning the **Accelerator**:

a1) Is the design and prototyping of the spoke systems sufficiently well advanced to permit the timely construction of the spoke section of the ESS linac?

a2) Does the committee concur with the recommendations made for collimators at ESS?

a3) Are the plans for modulators for the ESS RF sources feasible and does the committee have specific recommendations regarding the modulator development performed at Lund University in collaboration with ESS?

- concerning the **Target:**

t1) Is the newly formulated moderator and reflector mechanical configuration viable? Does it incorporate adequate flexibility to allow for future innovations in this area?

t2) Is the approach that we are using to arrive at a neutronically optimized moderator/reflector reasonable?

t3) Is the updated monolith design approach incorporating a reduced diameter, smaller vessel, and support structures reasonable?

t4) Does the committee concur with the projects position that a water-cooled, rotating W target represents a technically viable backup approach?

t5) Were recommendations from the 9th TAC meeting adequately addressed?

t6) Comments on progress towards completion of Preliminary Design in all areas highlighted at the meeting are most welcome.

- concerning the **Integrated Control System:**

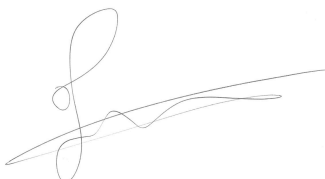
c1) Is the proposed HW strategy sound considering the timescale of the project? Does the proposed solution provide the required performance with a reasonable cost?

c2) Is the scope of Conventional Facility controls integration properly defined? Are the work package activities properly derived from and aligned with CF planning?

c3) Is the scope of Personnel Safety Systems for ICS appropriate? Are the technical solutions proposed for implementing PSS appropriate?

The Committee is encouraged to provide suggestions/comments and recommendations on all these subjects as well as on any other it would find relevant.

Lund 2014-10-22



Roland Garoby
Technical Director
European Spallation Source ESS AB