



Much Cooler than LHC

AD Electron Cooler Consolidation Review Introduction

ML 25th March 2019

AD Cost & Schedule Review meeting

21 September 2018

Presentations

Current status of the masterplan and priorities implementation	Tommy Eriksson
Cryogenics distribution	Gabriella Rolando
Magnets AD + Target area	Antony Newborough
Power converters	David Nisbet
Vacuum system	Jose Antonio Ferreira Somoza
RF (C02, C10, LL/Schottky, Stoch cooling)	Maria Elena Angoletta,Wolfgang Hofle
Kickers	Vasco Namora
Horn Testbench & Ignitrons	Gregor Grawer
Beam Instrumentation	Lars Varming Joergensen
e-cooler	Lars Varming Joergensen
CV	Michele Battistin
Overall budget situation	Lisette Van Den Boogaard
Target Area renovation	Marco Calviani
Risk analysis, mitigation options	Francois Butin

Cryogenics distribution	Phase 1 upgrade (10000 litre mobile trailer etc.) - funded
Magnets AD + Target area	Looks to be well organized Team re-enforced: 2 FTE plus 150 kCHF (PJAS), 80 kCHF of tooling Transport costs of 300 kCHF not included in MSC budget Re-installation of magnet tight - but some margins.
Power converters	Current consolidation approved program covers only 50% of the needed work - rest LS3
Vacuum system	Basically complete
RF (C02, C10, LL/Schottky, Stoch cooling)	See over
Kickers	See over
Horn Testbench & Ignitrons	The program is basically completed, an overcost of about 32k in 2018 is expected. <i>A new issue was presented, related to replacing 72 power cables (transmission line).</i>
Beam Instrumentation	<i>Request a new cryo system (10k) but it does not solve the problem of contamination of the BCCCA. This item should be checked</i>
e-cooler	See over
CV	AD Target cons: new ventilation for target following today's standards, it is on track Other item postponed
Target Area renovation	Big project - ongoing

Budget 1/4

- The total allocated budget for AD CONS is ~25 MCHF for the period 2010-2023, out of which about 90% is already committed.
- The facility risk analysis shows that the most critical issues are being treated by the current CONS project.

Budget 2/4

- **2010-2017:** 9.96 MCHF spent
- **2018-2023:** 14.9 MCHF in MTP
- **2018:**
 - Allocated: 2.084 MCHF;
 - Charged 1.53 MCHF;
 - Carry over to 2019: 0.65 MCHF

Budget 3/4

- **Approved activities but postponed to after LS2** due to budget restrictions
 - TE-CRG: New AD cryo distribution: 800 kCHF
 - TE-EPC: Capacitor Discharge power converter – 1.9MCHF (50 kCHF in 2018)
- **Cancelled / not approved**
 - AD hall cooling – re-prioritizing - only control migration (cost 45 kCHF instead of 1.3 MCHF)
 - AD hall ventilation – estimated to cost almost 4.4 MCHF – for the moment unapproved LS3 activity
 - 50t EOT cranes Renovation/revamp – 750 kCHF (2022)
 - Electrical infrastructure consolidation: 200 kCHF - out of scope
- ADCONS «available budget» for new or pending activities
 - Budget 2018-2023: 14.9 MCHF
 - Approved activities : 12.75 MCHF
- Remaining 2.1 MCHF to be spent after LS2 due to situation of the ACCCONS budget. Any urgent items will have to be accommodated within existing budget, by reprofiling other activities

Budget 4/4

- **Conclusions**

- Total consolidation budget for ADCONS 24.9 MCHF
- Spent 2010-2017: 10 MCHF
- Approved activities 2018- 2023: 12.75 MCHF
- Budget for new activities or those pending approval: 2.1 MCHF
- No margin to accommodate new items during LS2 unless reprofiling other items

Availability

- AD machine availability is typically 95% but in 2018 went down to 74% due to problems in the target area and vacuum problems in the e-cooler.
- The e-cooler in particular has been responsible for some serious down-time in 2018. This has been due to issues with the collector and subsequently the spare.
- Not directly connected with the ongoing consolidation programme, although the inherent risks are recognized

Electron-cooler

- This system is 40 years old, was the first built for operation and basically there are no spares parts available. The consolidation implies getting a complete new system using the newest technologies and will be able to cool at higher energies (500 MeV/c) and other new features.
- One question here is the time risk. Installation will be done in an EYETS and may imply major bake-out of 3 sectors. Optic changes not accounted and the implication of these changes should be better analyzed.

Recommendation: carry out a cost benefit analysis and maybe a technical review to evaluate if on schedule. Alternative is to produce spares for existing electron cooler, this option should be costed - serious follow-up required.



AD Electron Cooler Consolidation Review

Tuesday 26 Mar 2019, 08:30 → 16:30 Europe/Zurich

APT - approved

				2019	2020	2021	2022
ACP-AD	BE-BI	Replacement of AD electron cooler	64517	50	400	1,200	659
	BE-RF	AD C02 RF System	69515	200			
		AD C02 RF System LLRF + Schottky intensity	69515	62			
		AD C10 consolidation	69517		345		
		AD stochastic cooling amplifiers and filters	69516	192			
	EN-CV	Ventilation/cooling system renewal AD target	53671	162	1,296	0	
	EN-STI	Antiproton production target upgrade	60796	221	350	366	100
		Maintenance/reconstruction of mobile curtain	60798	92	90		
		Services, safety systems and equipments for new building 196	60799	149	200		
		Target area decontamination	60799	300			
		Transport method consolidation	60804	130	162		
	SMB-SE	AD consolidation - Building 196	76357	1,047	40		
	TE-ABT	AD Kicker and septa electronics/controls	99214		12	10	
		AD horn & test bench, electronics & controls	99221		25	30	
		Horn ignitron phase out & test bench, power	99215	13	15	30	10
TE-CRG	New AD cryo distribution	99520			550	250	
TE-EPC	Capacitor Discharge power converter for the AD machine	99633	126		1,492	260	
TE-MSC	AD Consolidation main bending - quadrupoles	99105	133	75			
	AD Consolidation target magnets	99389	334				



- Total budget: 2.38 million CHF
- Most spending after the end of LS2.

AD Cons Review - Risk analysis

- The risk analysis shows that the most critical items have been identified and are indeed treated by the current CONS project.
 - Risk analysis is based on identifying future risks, not in a precise analysis of observed failure modes. This should be corrected urgently and the panel recommends deploying in the AD the Accelerator Fault Tracking system.
- A comprehensive review of required and available spares is needed.
- Infrastructure (EL & CV) need to consider continued operation out to the designated foreseen end of operations, which might change in the future of course. Civil (SMB) need to be considered too in order to ensure a coherent investment and risk reduction.

AD Cons Review - Final remarks

- It became clear in discussion that a clearly defined medium term planning agreed by all parties is not available.
- It was generally assumed that given the recent deployment of ELENA, the operational future of the AD stretches out to at least 2030.
- It is important that this is firmly established to allow the groups concerned to plan consolidation with this date in mind.
- Risk analysis should also clearly identify issues homogeneously across all systems and up to 2030, which is not the case at the moment.
- General infrastructure (CV, EL, SMB) can potentially become a large problem impacting significantly operation if not addressed in time and if the facility operation stretches out to 2030 and beyond. SMB was not considered in the review.

Otherwise looking pretty good

AD Electron Cooler Review Mandate

- The AD electron cooler main components were originally built (by BINP) for the ICE electron cooler in the 1970's, were later used for the LEAR electron coolers and finally reassembled in a shorter version at AD.
- The main objective this review is to present the current status of the AD cooler and show a plan for its consolidation and renewal. The review will report its conclusions to the LHC Injector and Experimental Facilities Committee (IEFC).

Review Panel

- Mike Lamont (BE-HDO, Chair), Henric Wilkens (EP-ADE), Rende Steerenberg (BE-OP), Richard Scrivens (BE-ABP), Diego Perini (EN-MME), Christian Carli (BE-ABP)

Scientific secretaries:

- Adriana Rossi (BE-BI) & G. Tranquille (AD Electron Cooler Project Leader)

AD Electron Cooler Review Review Charges

- Is the case for a complete replacement of the AD electron cooler solid in the context of the long term future of the antiproton facilities at CERN?
- Are the specifications clear & attainable?
- Do the mitigation measures put in place guarantee a low risk of failure until deployment of the new cooler?
- Is the planning optimized and realistic?
- Is the budget required assigned and correctly profiled?
- Are the resources required from other Groups confirmed?