



Task Force for Energy Upgrade of the CERN PS Booster from presently 1.4 GeV to ~2 GeV

Follow-up of the 2010 LHC performance workshop at Chamonix

<http://indico.cern.ch/conferenceOtherViews.py?view=standard&confId=67839>

- remove bottlenecks in the LHC injector chain
- consolidation of the injectors is necessary anyway



Mandate

The aim of the study is to evaluate the technical feasibility of an increase in beam energy of the CERN PS Booster from presently 1.4 GeV to about 2 GeV as proposed at the Chamonix 2010 workshop.

The study comprises:

- Confirm the potential gain in terms of intensity and brilliance for LHC-type beams as presented at the Chamonix 2010 workshop.
- Confirm the technical feasibility. Identify accelerator components and equipment that need to be upgraded or exchanged. Identify potential showstoppers and point out solutions. Assign the responsible groups/units. Provide first rough time estimates for the various interventions needed.
- Provide a first estimate of material and personnel resources needed to complete the upgrade. Draft a project break-down into work packages, in preparation for a project to be launched by the director of accelerators.



Working Group Organisation

CERN Task Force Leader	K. Hanke
Scientific Secretary	T. Hermanns
US LARP Representative	E. Prebys

Work-Package	Responsible (confirmed)	Unit
1.Beam Dynamics	G. Rumolo	BE/ABP
2.Magnets	D. Tommasini, A. Newborough	TE/MCS
3.RF System	A. Findlay, M.Paoluzzi	BE/RF
4.Beam Intercepting Devices	O. Aberle	EN/STI
5.Power Converters	S. Pittet	TE/EPC
6.Vacuum Systems	E. Mahner	TE/VSC
7.Instrumentation		
8.Commissioning	B. Mikulec	BE/OP
9.Extraction and Transfer	J. Borburgh	TE/ABT
10.PS Injection		
11.Controls	M. Gourber-Pace	BE/CO
12.Electrical Systems		
13.Cooling and Ventilation	M. Nonis	EN/CV
14.RP and Safety	T. Otto	DGS/RP
15.Transport and Handling	I. Ruehl	EN/HE
16.Survey		
17.Linkperson Consolidation	D. Macfarlane	EN/MEF



Time Lines

1. Identify showstoppers: rapidly; **1-2 months from now**
2. first approximate cost estimate (still with large error bars):
end April / beginning of May 2010
by then inventory of equipment, ballpark estimate but no design yet
3. Enter in MTP in **May 2010**, in time for council meeting

The actual work will be constrained by the shutdowns.

- LHC off 2012, possibly short run of the injectors
- 2013 long LHC run
- 2014/15 long LHC shutdown (connection of Linac4)



Meetings & Homework

In the first phase (to identify showstoppers) suggest weekly meetings (i.e. come back with a first survey of showstoppers next week)

In a second phase, when we do the “real work”, probably go to bi-weekly meetings

Time slot Thursday 16:00 convenient for FNAL

Other possible time slot Wednesday, same time



Homework

1. Beam Dynamics:

identify showstoppers & bottlenecks, confirm the gain that we can expect (primarily for LHC type beams), do we hit other bottlenecks, look particularly into PS injection

2. Magnets:

what field (energy) can be realistically achieved (assume around 2 GeV but to be confirmed; can the magnets run like this 7/7 24/24; can the magnets run like this only for certain users (~1/3 of the beams)?; what are the modifications needed

3. RF:

Biggest uncertainty for me; do we need to re-build an rf system or can we consolidate the existing one?; it is on the consolidation list anyway.

4. Beam intercepting devices:

Inventory of all devices; does the dump withstand this?; the dump is being looked into anyway; spare situation



Homework

5. Power converters:

MPS; other power converters, which ones need to be replaced; is there a fundamental problem with ramping up to 2 GeV within 1.2 s?; keep the 600ms option for ISOLDE (presumably at 1.4 GeV).

6. Vacuum:

Assume no showstopper but a lot of activity.

7. Instrumentation:

Assume no showstopper, but confirm (e.g. intercepting devices)

8. Commissioning:

Main issue will be tight planning, constrained by the (few) shutdowns

9. Extraction and transfer:

Need to go through all the kickers, septa etc and confirm which ones need to be changed; include the corresponding power supplies



Homework

10. PS injection:
probably part of 9.
11. Controls:
Do not expect showstoppers but confirm.
12. Electrical Systems:
Confirm whether electrical systems are appropriate or need to be upgraded; for this need power consumption.
13. Cooling & Ventilation:
Confirm whether present cooling (water station etc) is appropriate, or need to be upgraded; need to estimate power dissipation
14. RP and Safety:
Identify showstoppers (shielding, existing buildings etc); look in particular at PS injection.



Homework

15. Transport and Handling:

Look into existing equipment (cranes etc), confirm whether operational to do major interventions.

16. Survey:

Expect no showstoppers.

17. Consolidation:

Ensure that consolidation takes into account the energy increase; at a later stage need to share the tasks (and the budget)