BWA/cg

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Rapport du groupe d'études du Booster, GEB

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1. R. Cappi présente le résultat du groupe d'études du Booster qui a travaillé depuis mars 1995 pour formuler des recommandations pour un programme d'améliorations à apporter aux installations du Booster. Avec le LHC et Isolde, le Booster aura encore une longue vie et l'idée était de faire des suggestions qui donneraient des améliorations de l'opération, de performance ou d'efficacité, en supplément des modifications déjà planifiées sur le projet LHC-PS ou du programme de consolidation FPP.

2. R. Cappi présente une liste d'une cinquantaine de sujets, avec une estimation préliminaire de priorité, manpower, coût. Pour la priorité, le chiffre 1 à 5 indique soit la priorité, soit le laps de temps avant de l'attaquer (1 veut dire début en 1996, 2 en 1997, ...). Pour le manpower, l'estimation est en homme-années. Pour le coût, le chiffre est en MCHF. La mention "s" signifie que ce sujet a déjà démarré. Le prime ' est le signe que ce sujet est inclus dans le projet LHC-PS. Voir la liste des recommandations en annexe.

3. Si toutes les recommandations étaient acceptées, le coût global serait de 7 MCHF et demanderait environ 50 homme-années. Pour les sujets jugés les plus importants, le GEB propose une liste (voir annexe) de 8 sujets à démarrer en premier.

4. La conclusion du GEB est que le Booster est en "bon état". A part les modifications prévues dans le LHC-PS et un programme de remplacement et d'entretien régulier, rien n'est essentiel ni urgent à faire. Toutefois, les sujets traités apporteraient une aide importante à l'opération de la machine.

5. La discussion se poursuit sur différents points techniques; la principale crainte est de rajouter encore des travaux sans avoir le personnel nécessaire pour les mener à bien. En conclusion, on décide que la liste des 8 sujets devrait être approfondie dans les groupes concernés pour être plus précis sur les coûts en homme et en argent, et de voir ces "jobs" au point de vue priorité par rapport aux travaux déjà connus dans les groupes. Il y aura une réunion sur le budget le 11 décembre 1995 pour établir un premier point sur ce sujet.

6. A noter que le rapport du GEB est PS/DI/Note 95-25 et qu'une copie pourra être obtenue en répondant à la feuille que Nicole Gaillard/PS/PA est en train de distribuer.

B.W. Allardyce

GEB RECOMMENDATION LIST

with [P, M, $]

where: P = priority or time (e.g.P=2 = to be done in two years from now), 1≤P≤5,

M= manpower in my,

$ = cost in MCHF

Linac beam :

1.Studies are needed to identify the causes of beam trajectory variations. ***[2,1,0]***

Injection lines :

1. PS stray field effects on beam trajectories should be compensated by

   i) a better magnetic shielding, ***[1,1,.2]***

   ii) a compensation method linked to "OCCURRENCE" (cycle position) rather than "USER". ***[1,1,0]***

2. Alignments of various elements in LT, LTB and BI including p.u.'s, screens, to implement ABS for the complete transfer Linac-PSB. ***[1,1,0]s, NB: "s" means "started"***

3. Install, before PSB entrance, one SEM-grid per plane per ring (foreseen for LHC). ***[3,1',.2'] NB:' means "included in LHC accountancy"***

4. Install, before the ion distributor, one SEM grid (H+V). ***[2,1,.1]***

Install more frame grabbers on TV cameras (screens). ***[2,1,.1]***

Multiturn injection :

1. Implement optimisation methods to minimise losses:

   i) theoretically, with simulation programs (taking account the space charge) ***[2,1,0]***

   ii) experimentally, by making use of an improved instrumentation (e.g.: half turn pick up (x,x') plus a digitised fast transformer to be built) ***[2,2,.4]***

   iii) by studying injection line matching with space charge. ***[1,1,0]s***

   iv) investigate implementation of an automatic injection procedure. ***[3,1,0]***

2. Feasibility study of H^- injection to be used when no more ions in the PSB ***[3,3,0]***

Ring :

1. Equip all (14x2x4=112) ring correction dipoles with power supplies and associated controls and applications (to correct orbit and minimise losses all along the cycle). ***[2,2,2]***

2. Interchange magnets when necessary (i.e. replace irradiated by non-irradiated).

3. The new septa (for LHC) will be welcome a.s.a.p. to improve vacuum.

4. To obtain a better vacuum, we suggest a baking by hot nitrogen, to 50/70 degrees and at least add some pumping and gauges at critical places. ***[2,1,.2]***

5. Investigate vacuum problems in injection and extraction regions. *[1, .5, 0]s*

6. Revisit shavers (e.g.: new power supplies). *[1, 1, .4]*

7. BTFM should be made operational for E and DE measurements of the 50 MeV circulating beam. *[1, .5, .2]s*

8. Renew the longitudinal emittance measurements. Use the same hardware (digitiser) and software (adapted to PSB) as in the PS. *[1, 1, .1]*

9. A Q measurement, similar to the PS one, is urgently needed (foreseen for LHC). *[1, 2', .4']s*

10. A transverse emittance measurement, complementary of the present Beamscope, should be installed, (foreseen for LHC). The best candidate seems to be the wire scanner (final decision in ~6 months). *[1, .1, .1]s for prototype!*

11. Upgrade a.s.a.p. QF/QD power supplies to cope with the new faster MPS field rise (foreseen for LHC).

12. Upgrade BLM system to display and record losses vs time and USER. *[1, 2, .3]*

13. Optimise beam orbit at extraction, e.g. new weighting of extraction bumpers. *[2, .1, 0]*

RF :

1. Studies of dynamics of in-phase bunch oscillation modes m = 2, 3, 4,.. (n=0). *[2, 2, .3]*

2. Reduce reflections in transmission lines for phase p.u. signals.

3. Study h=1,2 prototype RF systems with high intensity beams (e.g. ISOLDE). *[1, 0, 0]s*

4. Upgrade the mode analyser system. *[1, 1, .1]s*

5. Study microwave instability in R4. *[2, .5, .1]*

6. Improve resolution and stability of B train generator (for frequency progr. generation). *[1, 2, .3]*

7. Study a better operational system for digital frequency progr. correction functions. *[1, .3, 0]*

8. Compare theory vs experiments in two harmonic systems. *[3, 1, 0]*

9. Compare theory vs experiments in systems with many feedback loops. *[3, 1, 0]*

Study longitudinal blow-up and stability of hollow distributions. *[3, 1, 0]*

Loss management:

1. Study the possibility of installing an electrostatic septum to cut beam halo and concentrate losses in a selected region. In particular, the following items should be subject of more detailed studies: *[3, 6, 1] for realisation?*

i) Machine experiments to confirm (or alter..) the present assumptions about loss mechanisms as given in Table 5.1. *[2, 1, 0]*

ii) Computer simulations to refine the specifications and performance expectations of mini-wire septa for horizontal collimation *[2, 1, 0]*

iii) The mechanical and thermal feasibility of these septa. *[2, 1, 0]*

Extraction lines :

1. (BT, BTP) Upgrade BT3,2.DVT10 (magnets and power supplies) and make the PS injection steering PPM. *[1,2,.5]*

2. (BT) Revisit vertical recombination : geometry, nominal trajectories and magnet settings. The ABS will be exploited to pin down inconsistencies. *[1,1,0]s*

3. (BTM) Make the Emittance Measurement Line operational. *[2,.5,0]*

4. Equip the ISOLDE line with very basic beam diagnostics : 2 beam current transformers, 5 pick-ups, 2 SEMgrid pairs. *[1,2,1]s*

5. Modify instrumentation to cope with "staggered" extraction requirements following formal specifications from ISOLDE.

6. To upgrade ISOLDE to 1.4 GeV four new power supplies are needed for BTY.BVT101,116 and BTY.BHZ 301, 308 and possibly an improvement of the tunnel air cooling. *[4,2,.3]*

7. Study flatness of extraction and recombination kickers. *[4,1',0]*

Operational aspects and controls:

1. For operation technicians:

   i) advocate long term contracts and careers *[1,0,0]*

   ii) stimulate active interest in accelerator physics. *[1,0,0]*

2. Encourage beam performance follow-up and optimisation as well as task oriented MD participation. *[1,0,0]*

3. Keep improving tools (instrumentation, signal observation, controls, etc.). *[1,3,.3]*

4. At the PSB console the necessary facilities (e.g. signals and instruments) should be present to diagnose beam behaviour and in particular beam instabilities (transv. and long.).

5. Study on the advantages and disadvantages of re-installing the "inflector region" allowing PSB and ISOLDE operation independent of the PS access status. *[2,.5,0]*

6. Take more professional care concerning the application program production to diagnose, maintain and document these programs. *[1,0,0]*

7. Rejuvenate the BS team. *[1,n,0]...n>1*

MD requirements

1. Machine physic team should be strongly reinforced, already to cope with the study requirements of coming years. *[1,n,0]*

2. MD time should be regularly scheduled with ISOLDE for beam adjustments on parasitic cycles and also on the target. *[1,0,0]*

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A PROPOSAL FOR 96

1.Stray field shielding *[1,1,.2]*

2.Shavers *[1,1,.4]*

3.Long. em. meas. *[1,1,.1]*

4.BLM display *[1,2,.3]*

5.New B train *[1,2,.3]*

6.Dig. f progr. corr. *[1,.3,0]*

7.PPM in BTP *[1,2,.5]*

8.Tools in MCR *[1,3,.3]*

ΣM ~ 12.3 my
Σ $ ~ 2.1 MCHF