LBS for Linac3

Should we study if we need a better Linac3 energy measurement?

R Scrivens, 1/10/2013 – NSWG/LIU-Ions

- Presently, it is a classical spectrometer line.
- Using the bending edge angle focusing for object(slit) – image(SEMGrid) plus dispersion.
- It is located at the hand over point of Linac2-PSB.
- Ions must be sent through 40 m (otherwise unused for ions) transfer line, including 30 m of common line with Linac2.
  - Requires specialist set ups, unorthodox controls, PSB+LEIR synchronisation, maintenance of ION user in PSB.
  - Only 1 person ever dares to try and make measurements. It takes ~2 days to get everything working!
  - Systematic and reference measurements are very rare because of these difficulties. E.g. we have no before and after measurement of the tank 2 phase change.
  - Dedicated MD time for LEIR (no ions to LEIR during measurements).
- Recent consolidation was put off because Linac4 was renovating the line – this is no longer the case.
- Linac3 has an ITFS line, but it is before the last debuncher where the energy spread is set.

CERN-ATS-Note-2013-035 MD

Table 3: Statistical summary of the two momentum distributions, shown in Figure 4 as frequency distributions, with relative standard deviation (σ_p/μ_p) and relative full-width-halve-maximum ($FWHM_p/\mu_p$) for each tank 2 phase setting.

	Tank 2 phase = 65°	Tank 2 phase = 71°	Difference
σ_p / μ_p	4.292×10^{-4}	4.460×10^{-4}	1.68×10^{-5}
$FWHM_p / \mu_p$	7.295×10^{-4}	4.216×10^{-4}	3.079×10^{-4}

- The LBS “inter wire” resolution is $\Delta P/P=8 \times 10^{-4}$. If this is critical we need 4x better resolution.

- Questions a study should address:
- MAIN QUESTION: Propose a solution to measure the Linac3 energy (relative mean and spread), and must allow setting up of the debuncher (wider energy spread and mean energy range).
- Considering (in order of priority)
  - Meets the specification.
  - Easy to use (for reference measurements).
  - Minimises perturbation to PSB and LEIR.
  - Is affordable.

- Just consolidate what we have in present location?
  - Recover similar spectrometer magnets from Linac2?
  - New power convertors?
- Are specifications sufficient and flexible enough for LIU-Ions?
- Is bunch shape tomography a better / cheaper option (as Linac4 will do).
- Is LEIR Schottky a better measurement – is this instrument maintained? Is this a way to set up beams?
- Move the instrument to an area dedicated to ion beams.
- Make a brand new spectrometer line in a optimal location?

Time Line

- 2014 – Start studying these questions. Requires input from many groups, plus design/integration support.
- Mid 2015 – solution must be fixed (including funding and personnel).
- Mid 2015 – end 2016 : Production (assuming major changes).
- 2017 Installation during Linac4-PSB connection.