

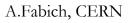


# Beta-beam production chain

### A. Fabich, CERN AB-ATB

### 3<sup>rd</sup> beta-beam task meeting, GSI, May 2006

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production chain includes

- Target
- ECR
- Linac

Report from meeting of task 6, 9 and 10 at Orsay, 2<sup>nd</sup> May 06 Purpose:

- Communicate the requirements of the beta-beam
- Learn the status of the related EURISOL tasks
- Discussion with task 3 members





# Ion intensities

Based on baseline scenario and top-down approach

- Achieve either a rate of 2.9\*10<sup>18</sup> anti-neutrinos or 1.1\*10<sup>18</sup> neutrinos per "physics year"
- LINAC to RCS
  - 10 Hz pulsed operation
  - during 2 s out of 6 or 3.6 s cycle
  - Rate: 1.9\*10<sup>12</sup> <sup>6</sup>He/pulse , 5.5\*10<sup>11</sup> <sup>18</sup>Ne/pulse

Assumed efficiencies on the low-energy part  $\rightarrow$ 

Efficiency []	<sup>6</sup> He	<sup>18</sup> Ne
LINAC inj - RCS inj transfer	1	1
ECR ejection (charge state)	1	0.3
ECR accumulation	~0.9	~0.9
Target out - ECR injection	0.2	0.5
Target diffusion	0.4	0.4
Total efficiency	0.07	0.05

 $^{18}$ Ne

 $0.5*10^{13}$ 

1.6\*1013

2\*1013

- - Impact on production numbers  $\rightarrow$ Rate [s-1]<sup>6</sup>HeLINAC injection1.9\*10<sup>13</sup>ECR out1.9\*10<sup>13</sup>
- Linac current (peak):
- (peak): ECR in ECR in
  - <sup>6</sup>He (charge state 2+): 12 mA peak
  - <sup>18</sup>Ne (charge state 6+): 11 mA peak



2\*1013



## Beam parameters

At injection to the RCS

- 100 MeV/nucleon
- Charge state: <sup>6</sup>He<sup>2+</sup>, <sup>18</sup>Ne<sup>10+</sup> (fully stripped)
- Physical transverse emittance
  - Injected:
    - h/v 1-1.5  $\pi$  mm mrad (full)
  - Accumulated:
    - Physical h/v 13.7/7.4 π mm mrad (rms);
    - Simulated accumulation efficiency: 60-80%
- Longitudinal
  - Pulse length from linac:  $\leq$ 50 µs (determined by ECR; RCS accumulation)

#### ECR ejection (traced from above requirements)

- 10 Hz repetition rate
- $\varepsilon_{\text{transverse, full, physical}} = 50 \pi \text{ mm mrad (also quoted at NuFact'02)}$ 
  - Allows a blow-up factor 2 to arrive at the RCS injection figures
- Bunch length: ≤50 µs







- Production at target
  - Task 3 is optimistic to achieve rates for <sup>6</sup>He
  - <sup>18</sup>Ne seems to be impossible
    - Rely on alternative production scenarios for alternative ions (C. Rubbia et al.)
- ECR. task 6
  - Charge state efficiency under investigation
  - Short pulse duration achievable?
  - Mock-up test planned this summer, 70 GHz source V. Zorin et al. at Institute of Applied Physics, Nizhny Novgorod, Russia
- Linac
  - vet not studied
  - Limited resources within Task6
  - decision will be taken at upcoming CB meeting (June at PSI)
    - Recommendation to study independent linac
      - EURISOL post-accelerator to sophisticated
      - Beta-beam would occupy major part of beam time. Not acceptable for EURISOL physicists.

#### Conclusion:

- Current study within Task12 is independent of production scenarios
- This allows to identify and study technical challenges of a beta-beam facility independently.



