

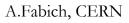


Beta-beam production chain

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3rd 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, 2nd 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*10¹⁸ anti-neutrinos or 1.1*10¹⁸ 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*10¹² ⁶He/pulse , 5.5*10¹¹ ¹⁸Ne/pulse

Assumed efficiencies on the low-energy part \rightarrow

Efficiency []	⁶ He	¹⁸ 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]⁶HeLINAC injection1.9*10¹³ECR out1.9*10¹³
- Linac current (peak):
- (peak): ECR in ECR in
 - ⁶He (charge state 2+): 12 mA peak
 - ¹⁸Ne (charge state 6+): 11 mA peak



2*1013



Beam parameters

At injection to the RCS

- 100 MeV/nucleon
- Charge state: ⁶He²⁺, ¹⁸Ne¹⁰⁺ (fully stripped)
- Physical transverse emittance
 - Injected:
 - h/v 1-1.5 π 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 ⁶He
 - ¹⁸Ne 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.



