FLOPS

A long pulse, high current, spallation source proposal

Anirban Bhattacharyya (CERN)
Nikolaj Zangenberg (Danish Technological Institute)
R. Barlow (Cockcroft Institute)
Ulrich Dorda (CERN/ MedAustron)

Bilbao, Spain, 31.05.2011
OUTLINE

1. The objective
2. Selection criteria
3. Alternatives
4. The proposal
The objective
Task

CAS - project design # 2

- Green field accelerator design
- Pulse length: 2 - 3 ms
- Repetition rate: 10 - 20 Hz
- $P \approx 5$ MW
- 1 - 8 GeV - Our Decision: 1 GeV
- Particle type: p or $H^-$
Selection criteria

- Fulfills specs
- Maturity of technology vs. technology pioneering
- Cost of installation
- Cost of operation
  - Electric power
  - Spare part
  - Man power
- Geometric footprint
- Simplicity & Reliability
- Flexibility/ Upgradeability
Alternatives

Just in case you don’t like our real proposal
Cyclotron

Stacked

800 MeV, 2 mA per ring, superconducting, Peter McIntyre and Akhdior Sattarov

Staged

1 GeV, 5 mA, P. Mandrillon, N. Fietier, C. Rubbia

p and $H^-$ in same cyclotron?
first more reasonable proposal

ESS concept:

Alternative concept:

Storage ring 1.1 GeV (Ø80m)
first more reasonable proposal - Detail

Linac at same time $p$ and $H^-$ in case of bypass

storage ring with permanent magnets $l \approx 80 \text{ m}$

horizontal + vertical mti for protons and $H^-$ from opposite side

coasting beam (no longitudinal and reduced transverse space charge)

no ramping/ timing - relaxed control system

Slow 3rd order resonant extraction

Laser stripping needed as foil would blow up the circulating beam
The proposal
For your consideration
Linac into FFAG

FFAG = accelerator + storage ring!

+ transversal phasespace painting

FLOPS = Ffag LOng Puls Source
Some sketch of the idea
Assume Linac RF: 352.2MHz

1 GeV in 80m ring: 0.3µs

Allow RF phase change of 10% → Δt_{rev} = 0.3 ns →

\[ E_{inj} = 998.5\,MeV \]

Little energy variation → “simple” FFAG magnets
Extraction

- Slow resonant extraction
- “slow” acceleration via RF noise using the existing cavities (somehow like a synchro-cyclotron)
- Option to make short pulse by including a kicker
Summary

Linac is the most conventional, reliable option (dual particle option?)

Many other unconventional ways (like the Linac-FFAG combination) still requiring theoretical beam physics considerations → well suited for CAS brain-pool discussions.