Present status of SPIRAL 2

June 2004
Radioactive isotopes produced in a Uc_x target

+ high intensity light ions
Low Energy Cave

Production Cave

Superconducting Linac

CI ME Cyclotron

Deuteron Source 5 mA

Ions Source 1 mA

RFQ Cavity 0.75 A MeV

\[ E_{HI} = 14.5 \text{ A MeV} \]
\[ E_D = 40 \text{ MeV} \]
SPIRAL 2: the basic options

- Sources+LEBT RFQ MEBT
- RFQ 1
- Source D+
- ion sources (1/3,1/6)
- Eacc = 6-7 MV/m
- 88 MHz β=0.07
- RFQ 2
- RFQ 1
- QWR (12 mod x 1 cav)
- QWR (7 mod x 2 cav)
- 88 MHz β=0.12
- 26 m
- 42 m
- 23 m
- 73 m
SPIRAL 2: the basic options
SPIRAL 2: the basic options
SPIRAL 2: the basic options
Carbon converter and UCx target

Transfer tube in tantalum (2000°C)

UCx pellets

Cooled chamber

Tantalum oven

Transfer tube in tantalum (2000°C)
The PLUG handling
SPIRAL 2: the basic options

BRAMA type separator
(Broad Range Acceptance Mass Analyser)
BRAMA type separator
SPIRAL 2: the basic options

Charge Booster

120° « voie C »

PHOENIX « booster »
14 GHz (18 GHz)

Diagnostic

MicroPHOENIX
10 GHz (14 GHz)

banc de test
LPSC (Grenoble)

1+
SPIRAL 2: the basic options

CIME – G1/G2 direct line
SPIRAL 2: the basic options

Beam lines to Low Energy Hall
SPIRAL 2: the basic options
SPIRAL II: an « IFMIF like » neutron source: High fluency irradiation of fusion reactor materials at fusion relevant conditions.

(replaced by a carbon wheel)

\( \sim 5 \times 10^{16} n/s \text{ over } 4\pi \)
\( 3 \times 10^{14} \text{ n/s over } 4\pi \)

average neutron energy \( \sim 14 \text{ MeV} \)

\( \sim 10^{15} n/s/cm^2 \text{ on the back side of Li} \)
\( \sim 10^{13} n/s/cm^2 \)
SPIRAL 2: the basic options + second irradiation station

Irradiation « plug »

Test line for new « plugs »
Simultaneous Beams

Example (5 beams)
- **SPIRAL2**: 40 MeV D+ onto ECS
  1) Low energy RIB (LIRAT)
  2) 6 A.MeV RIB
     CIME → VAMOS / EXOGAM
  3) stable beam/RIB at 50-100 A.MeV (CSS ‘s)
  4) 1 A.MeV stable (IRRSUD)
  5) 8-10 A.MeV stable (SME)

CIME → salles G1-G2

New direct lines
**SPIRAL 2 :** one possible scenario

**two irradiation stations**

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73 weeks of beam for nuclear physics (90%) and non nuclear physics (10%)

27 weeks of beam for non nuclear physics

**100 Weeks for Physics**

29 weeks of accelerated RIBs: SPIRAL + SPIRAL2

12 weeks for material science (30% of LINAG)
A/Q = 6 injection

Better Ion Source

100 MeV/A

An n-ToF like experimental hall

Fast chopper
Regions of the nuclear chart covered by SPIRAL 2

Primary beams: deuterons, heavy ions

Fusion reactions (with n-rich beams)

Fission products (with converter)

Fusion reactions (without converter)

Fission products

r-process

Transfermiums

In-Flight (Z=106,108)

Light Radioactive Nuclei
(very high intensity)

N = Z ISOL (thick target)

High Ex fs
An “un-FAIR” comparison:

SPIRAL 2 yields after acceleration compared to other facilities

with $10^{14}$ fissions/second
Planning SPIRAL 2

APD SPIRAL 2:
13 Labs.
60 person/year

6.6 M€
115 M€

Preliminary studies

2001 2002 2003 2004 2005

Decision ??

Argonne
Triumf
UK ??
Isolde ??
GSI ??
Isolde ??

APD

Louvain ??
GSI ??

6.6 M€
115 M€