Introduction to LISE++

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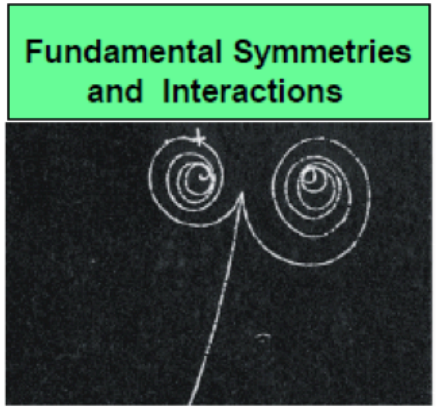
General Information

- LISE++ is a versatile and complex program **highly adaptable** to specificity of problem to solve
- Due to the time shortage, this course only **very brief introduction** (partial)
- Good online documentation
- This presentation is largely based on material gathered from other presentations:
    - **H. Weick**, **M. Gorska**, P. Boutachkov and C. Nociforo, Frs-training workshop, GSI November 2010 (www.linux.gsi.de/frsgast)
    - O. Tarasov and D. Bazin (http://groups.nscl.msu.edu/lise/lise.html)
    - Lecture by K.-H. Schmidt (http://www-win.gsi.de/charms/euro2000.htm)
    - H. J. Wollersheim, the FRS (http://www-linux.gsi.de/~wolle/EB_at_GSI/FRS-WORKING/FRS/frs.html)
- Lots of practice required!

Motivation



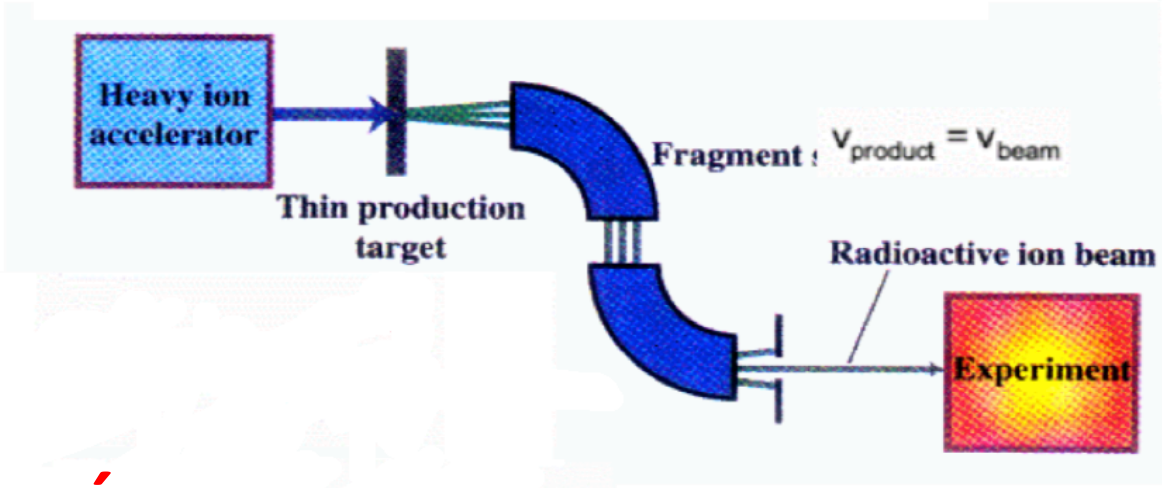
María José talk!!

3000 nuclei identified

>5000 new nuclei must exist

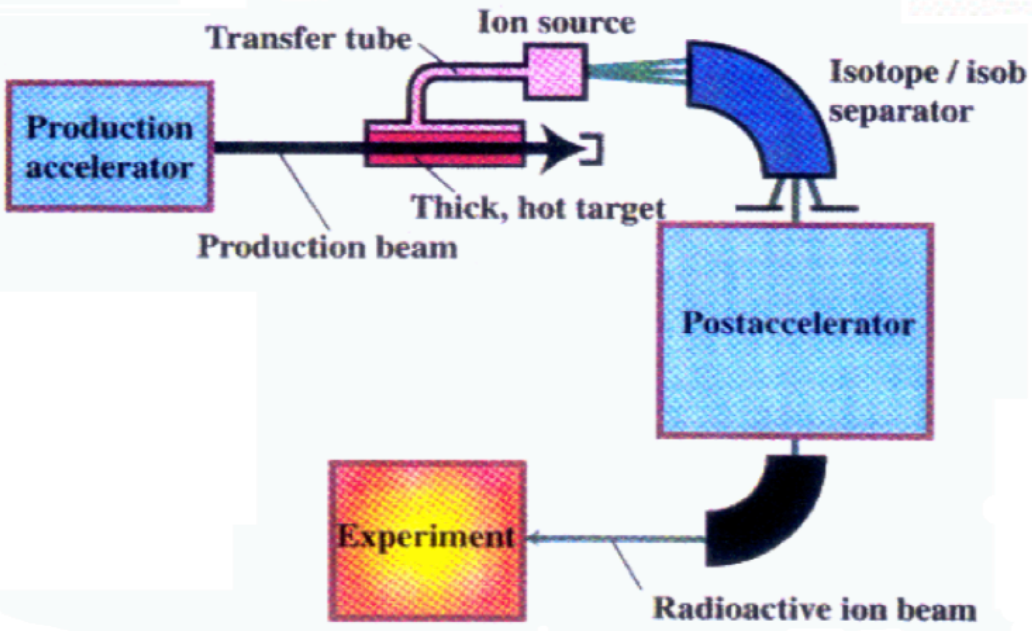
Production

IN-FLIGHT



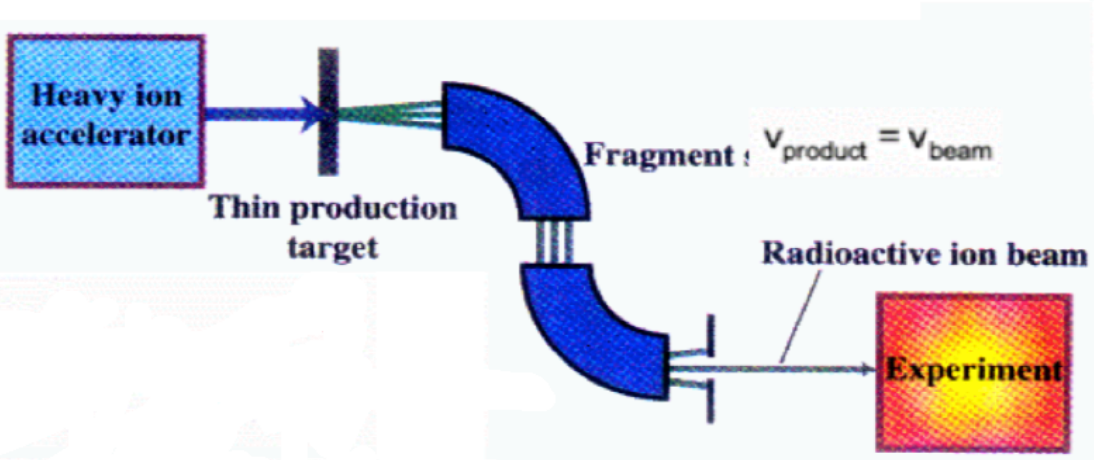
→ **María José talk!!**

ISOL



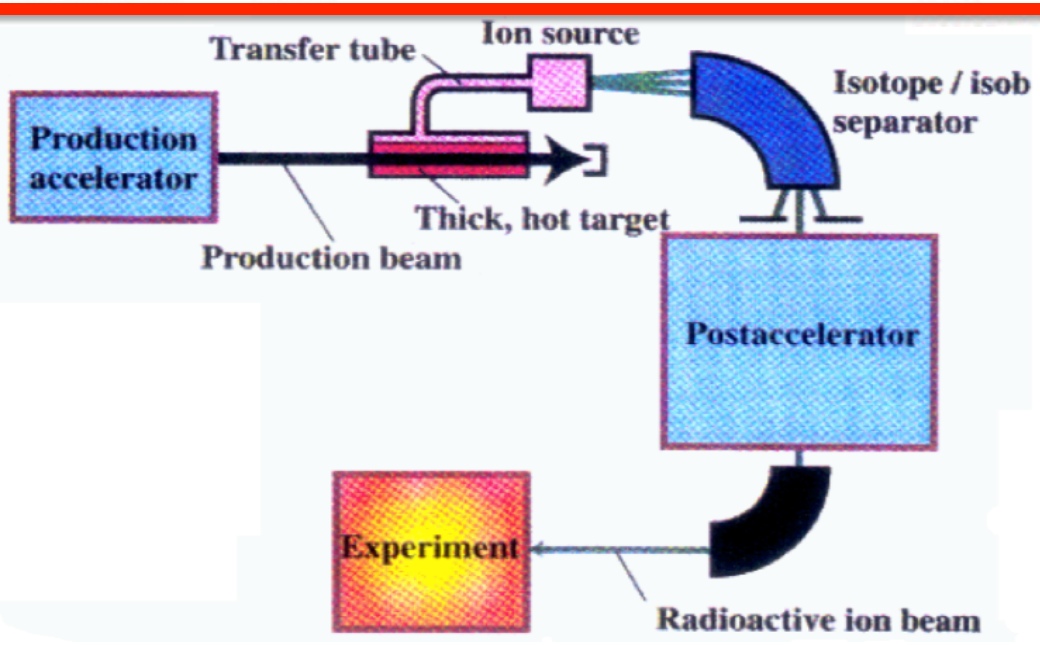
Production

IN-FLIGHT

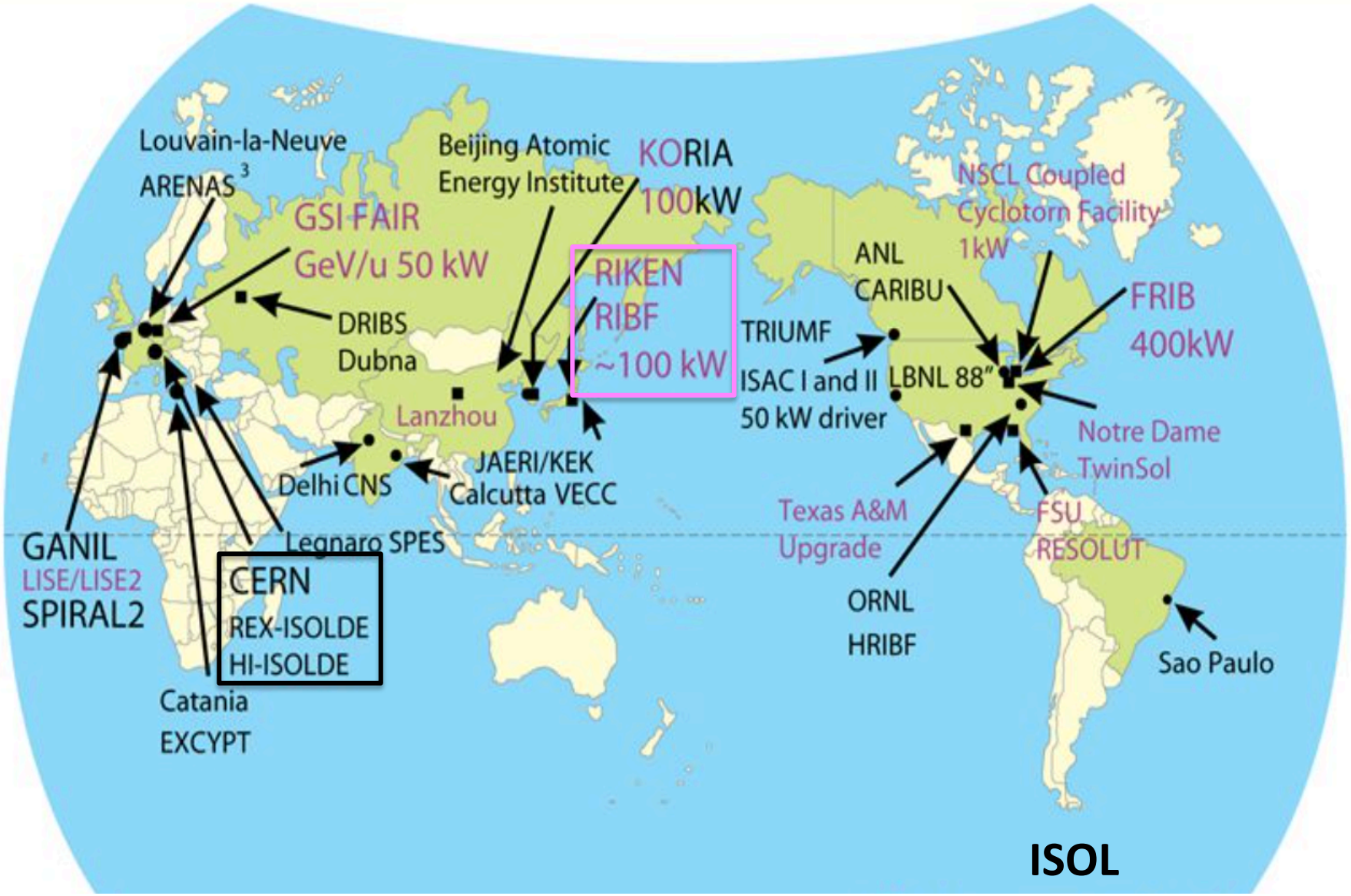


María José talk!!

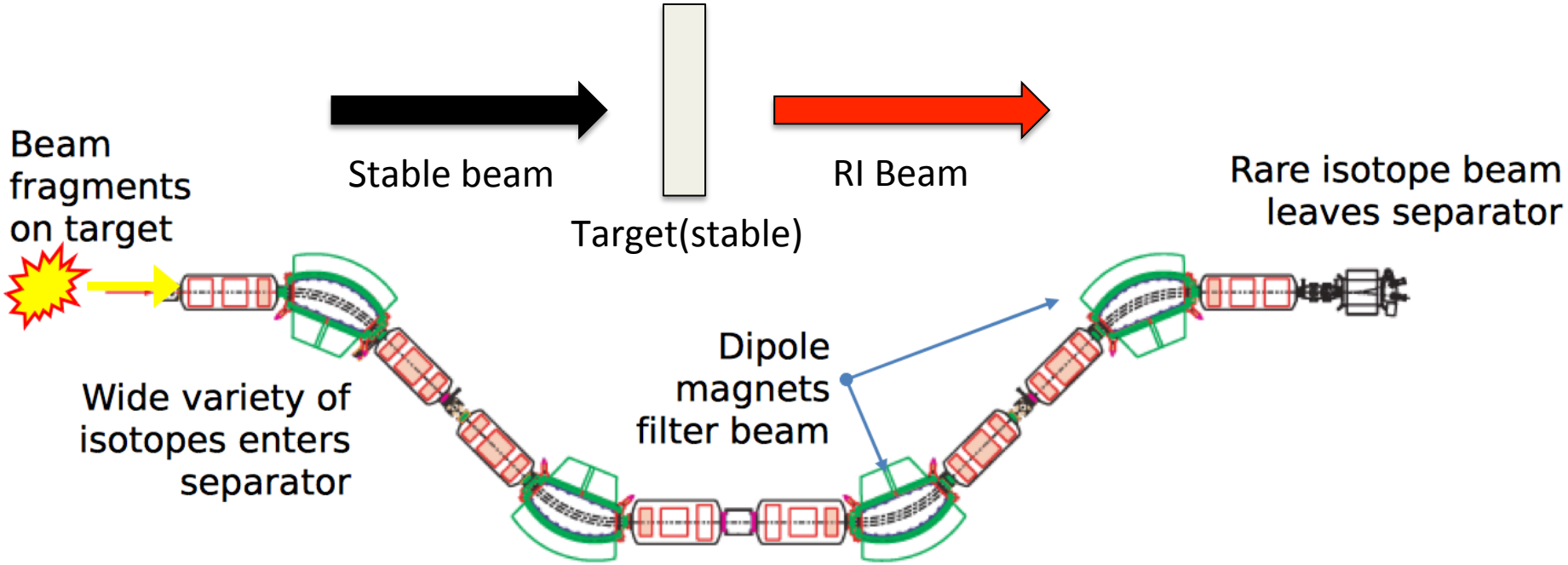
ISOL

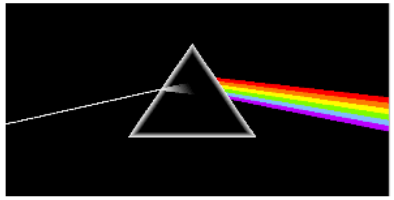


Facilities


Louvain-la-Neuve
ARENAS
Beijing Atomic Energy Institute
KORIA 100kW
GSI FAIR
GeV/u 50 kW
RIKEN
RIBF
~100 kW
NSCL Coupled Cyclotorn Facility
1kW
ANL
CARIBU
FRIB
400kW
DRIBS
Dubna
TRIUMF
ISAC I and II
50 kW driver
LBNL 88"
Lanzhou
Notre Dame
TwinSol
JAERI/KEK
Calcutta VECC
Delhi CNS
Texas A&M
Upgrade
FSU
RESOLUT
GANIL
LISE/LISE2
SPIRAL2
Legnaro SPES
CERN
REX-ISOLDE
HI-ISOLDE
ORNL
HRIBF
Sao Paulo
Catania
EXCYPT
ISOL
In-Flight

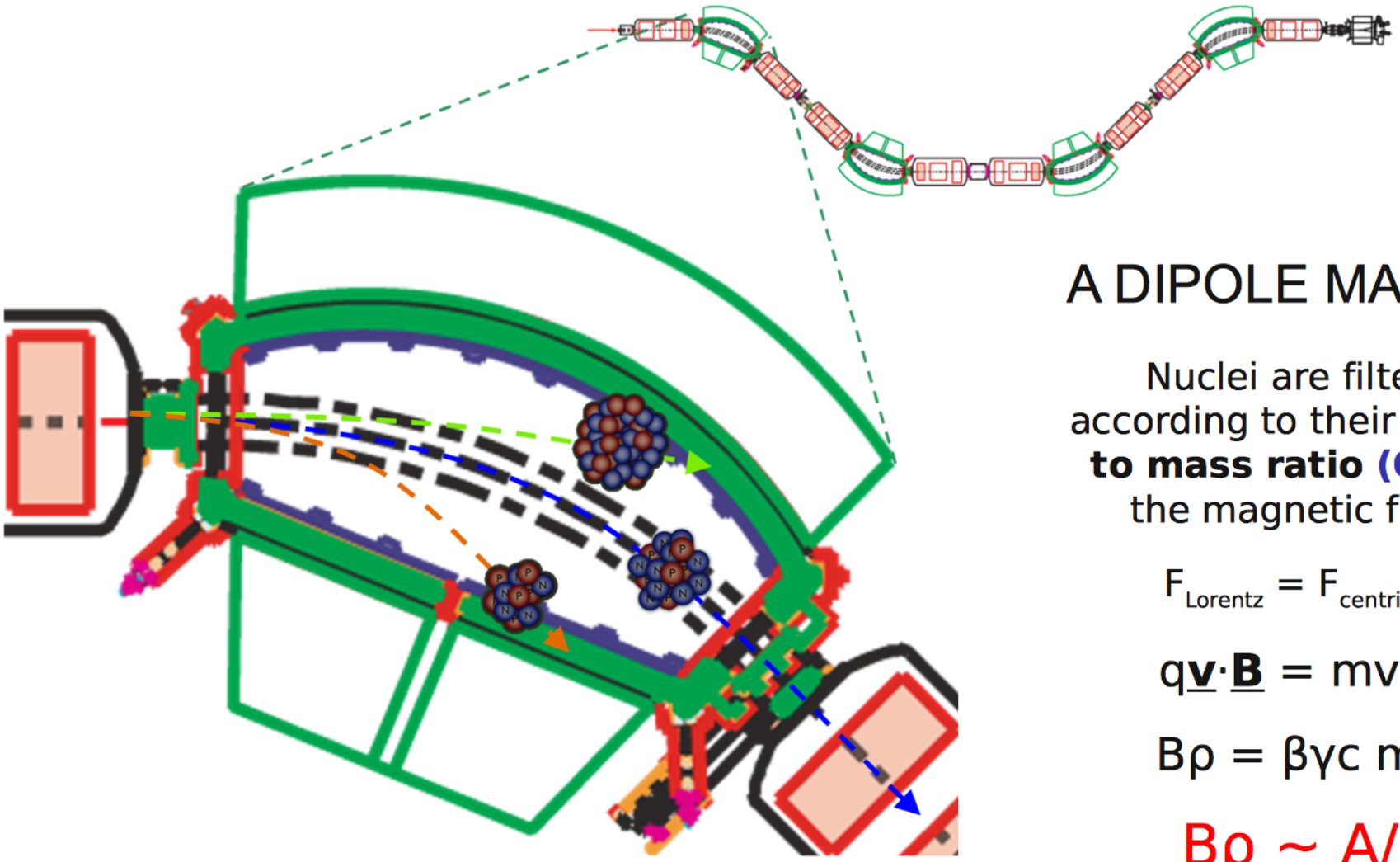
In-Flight Separation





The *dipole magnets* affect different isotopes "like prisms affect light", separating the unwanted nuclei (of any isotope not currently being studied) out of the beam

In-Flight Separation



A DIPOLE MAGNET

Nuclei are filtered according to their **charge to mass ratio (Q/A)** in the magnetic field.

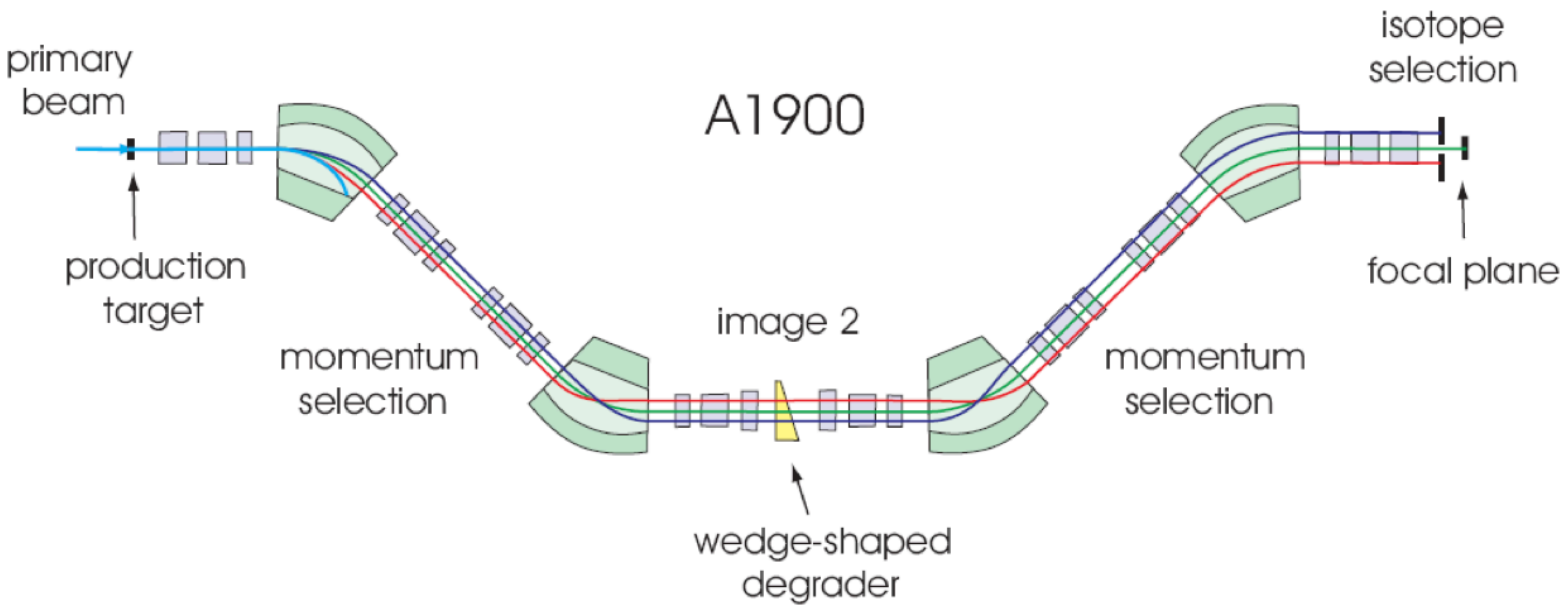
$$F_{Lorentz} = F_{centripetal}$$

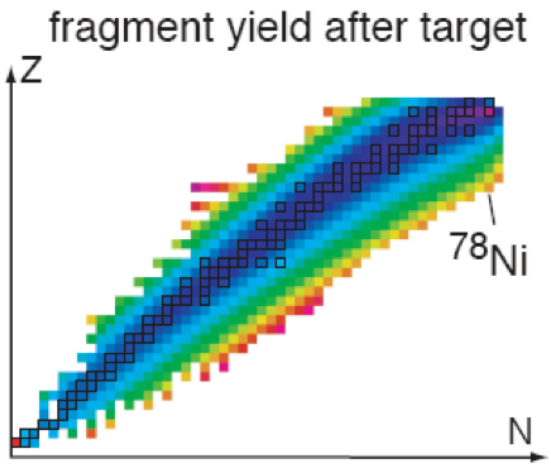
$$q\underline{\mathbf{v}}\cdot\underline{\mathbf{B}} = mv^2/\rho$$

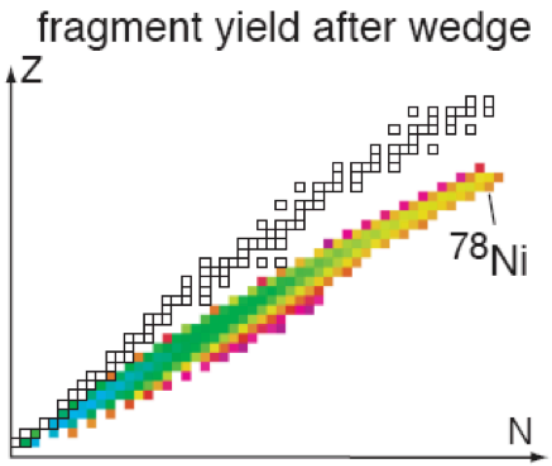
$$B\rho = \beta\gamma c\, m/q$$

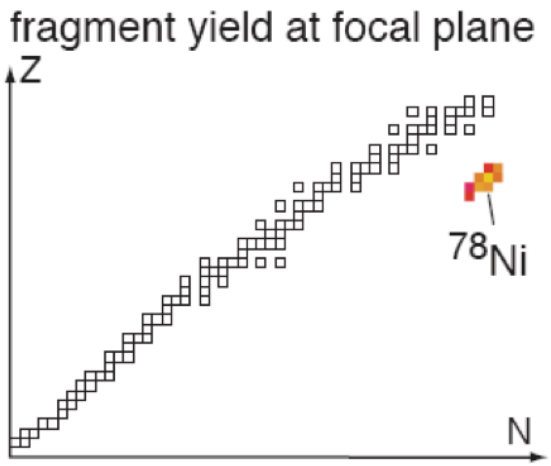
$$B\rho \sim A/Z$$

In-Flight Separation

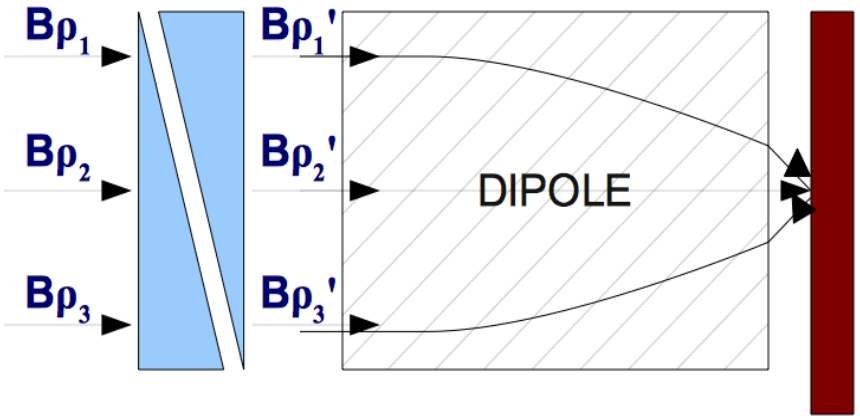


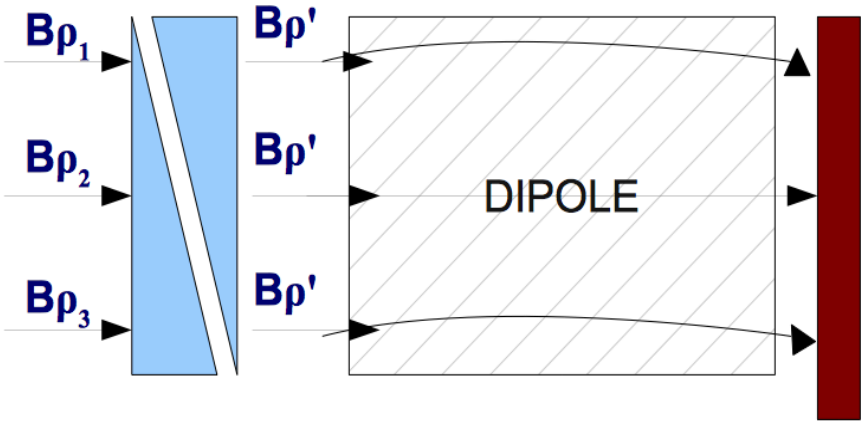






In-Flight Separation

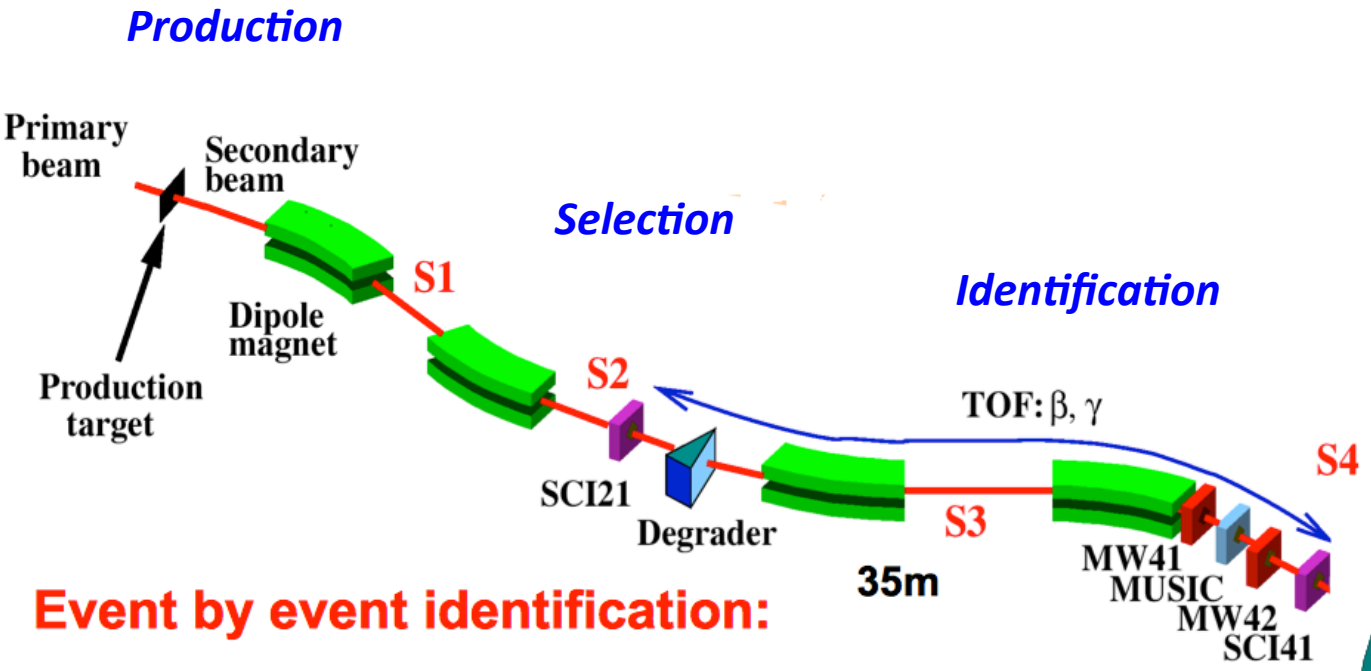




- **ACHROMATIC MODE**
  - Ions lose constant amount of energy in wedge
  - All nuclei of same species arrive at same position on focal plane

- **MONOENERGETIC MODE**
  - Momentum spread compensated by different path lenths in degrader
  - All fragments of same species have same energy
  - Fragments preserve their spacial distribution

In-Flight Identification

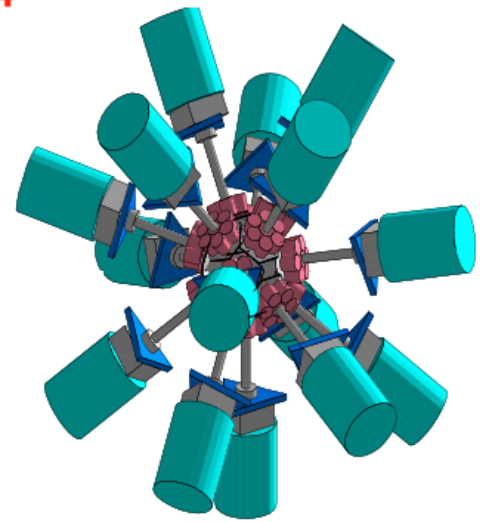


Event by event identification:

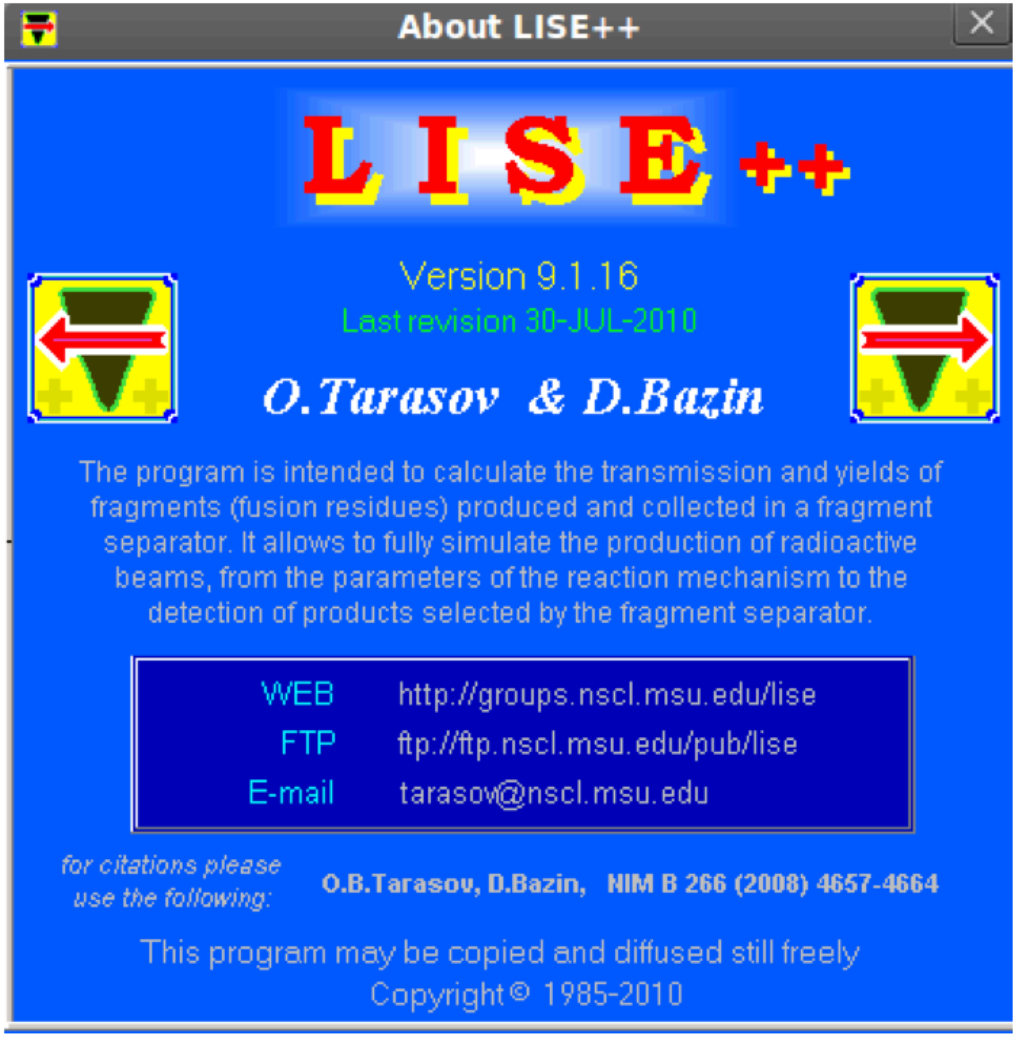
Ionization Chambers → ΔE → Z^2 → **Z**

Scintillators S2, S4 → ToF → velocity = L/Δt

A/Z = m/q = B ρ / (γ v)



LISE++


About LISE++
L I S E ++
Version 9.1.16
Last revision 30-JUL-2010
O.Tarasov & D.Bazin
The program is intended to calculate the transmission and yields of fragments (fusion residues) produced and collected in a fragment separator. It allows to fully simulate the production of radioactive beams, from the parameters of the reaction mechanism to the detection of products selected by the fragment separator.
WEB http://groups.nscl.msu.edu/lise
FTP ftp://ftp.nscl.msu.edu/pub/lise
E-mail tarasov@nscl.msu.edu
for citations please use the following:
O.B.Tarasov, D.Bazin, NIM B 266 (2008) 4657-4664
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