



RIBF BigRIPSの DAQ —問題点と展望

RI Beam Science/RIKEN

Koichi Yoshida

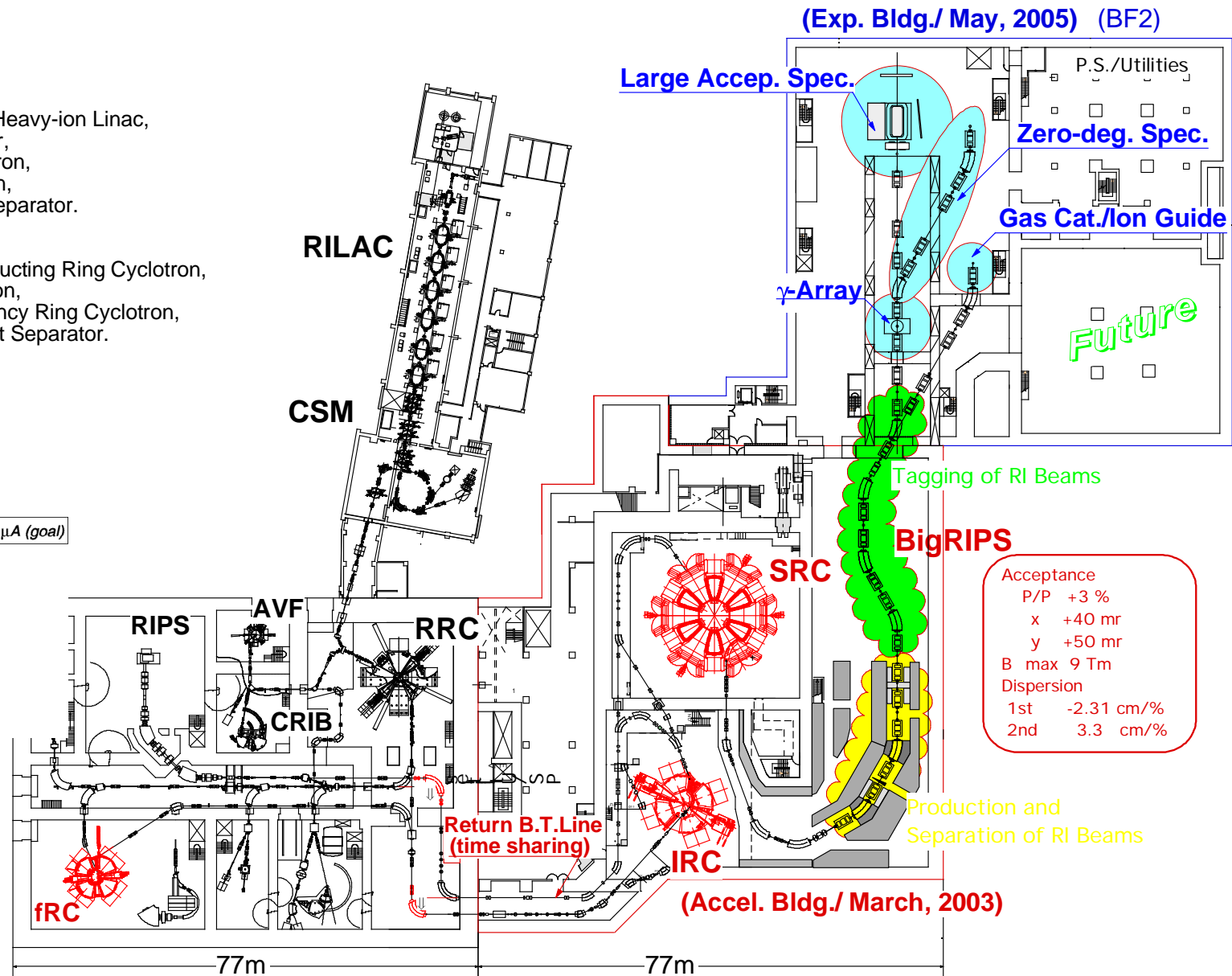
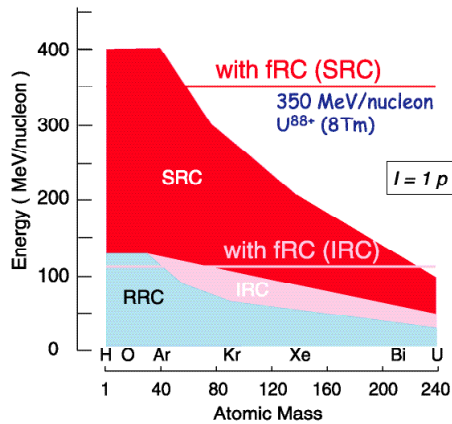
Layout of the RI Beam Factory (RIBF)

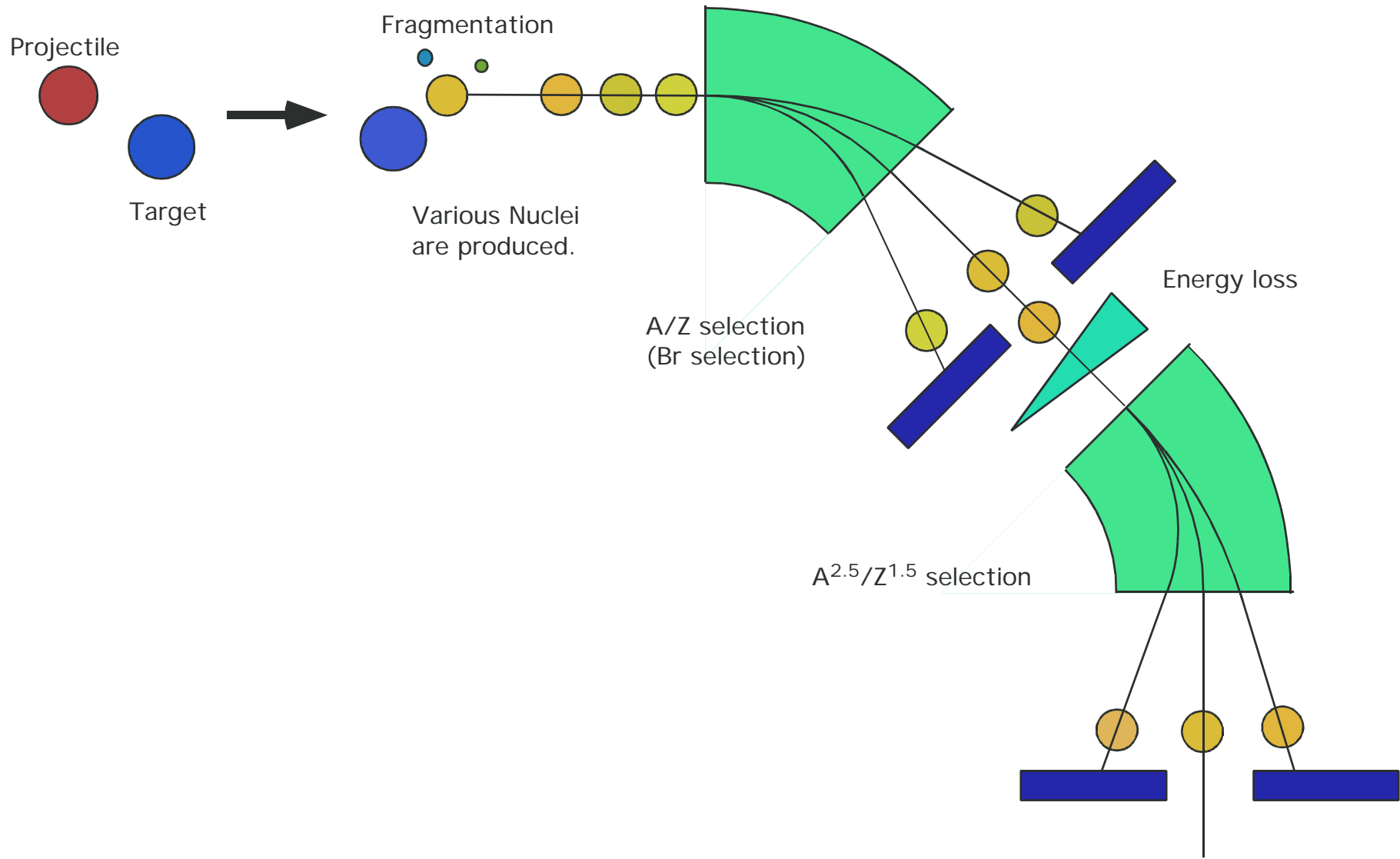
Existing Facility:

RILAC: Frequency-variable Heavy-ion Linac,
 CSM: Charge State Multiplier,
 RRC: K540MeV Ring Cyclotron,
 AVF: K70MeV AVF Cyclotron,
 RIPS: Projectile Fragment Separator.

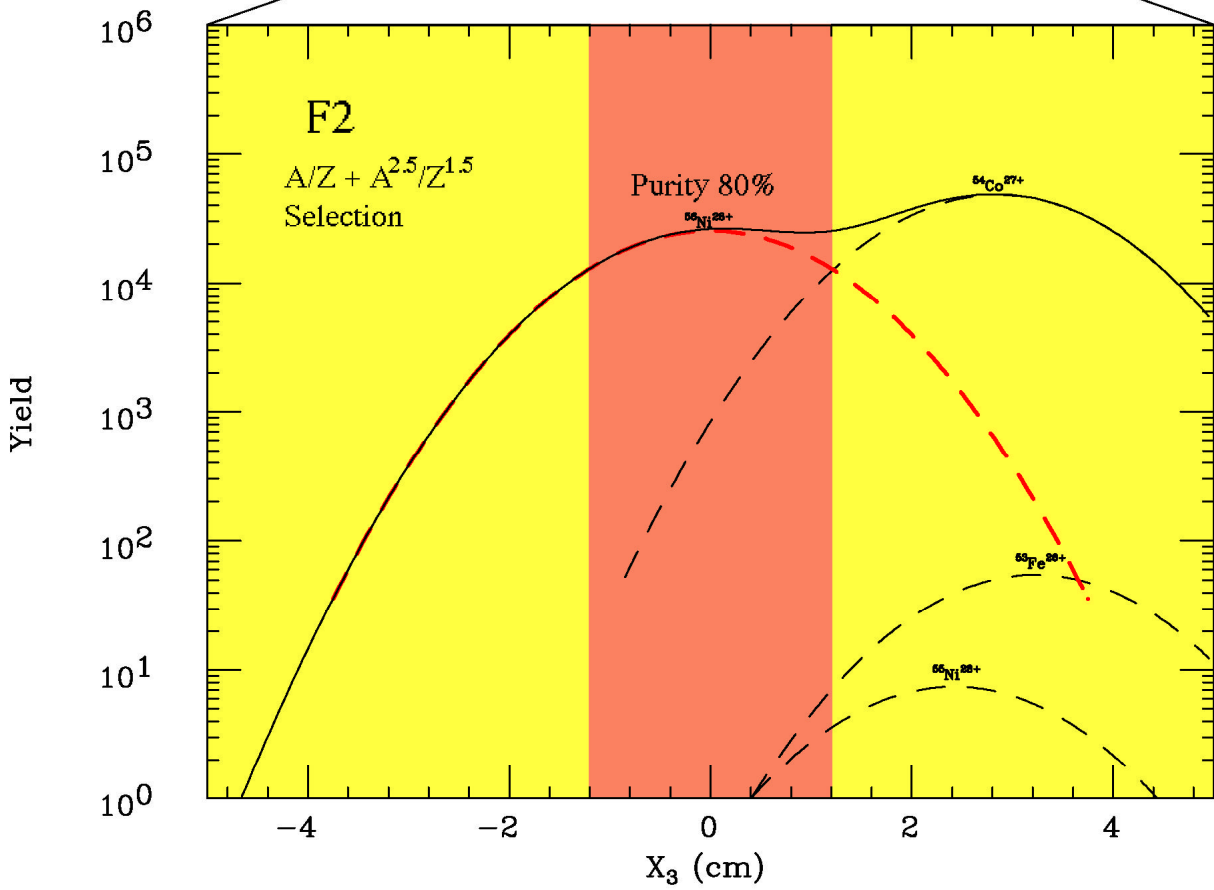
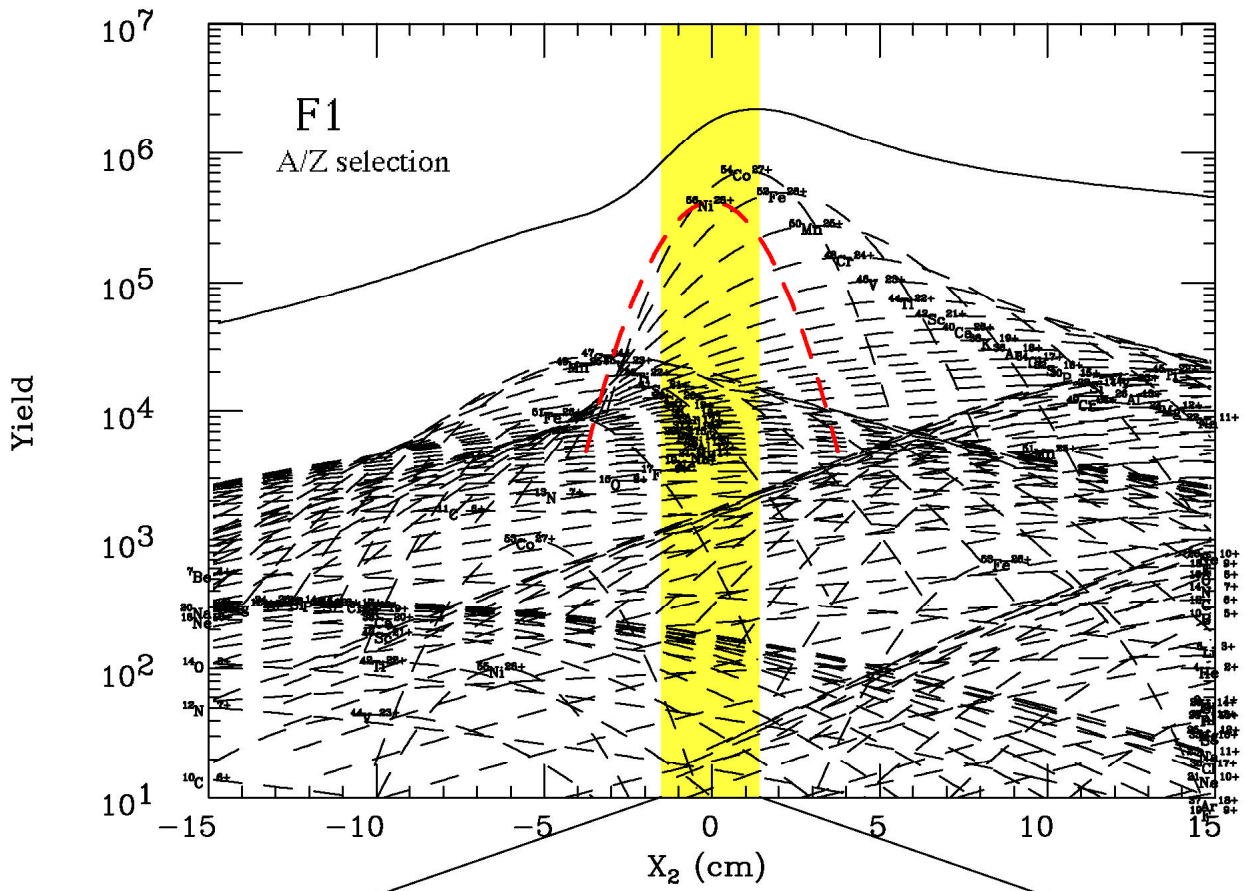
RIBF Phase I:

SRC: K2500MeV Superconducting Ring Cyclotron,
 IRC: K980MeV Ring Cyclotron,
 fRC: K520MeV Fixed-frequency Ring Cyclotron,
 BigRIPS: Projectile Fragment Separator.

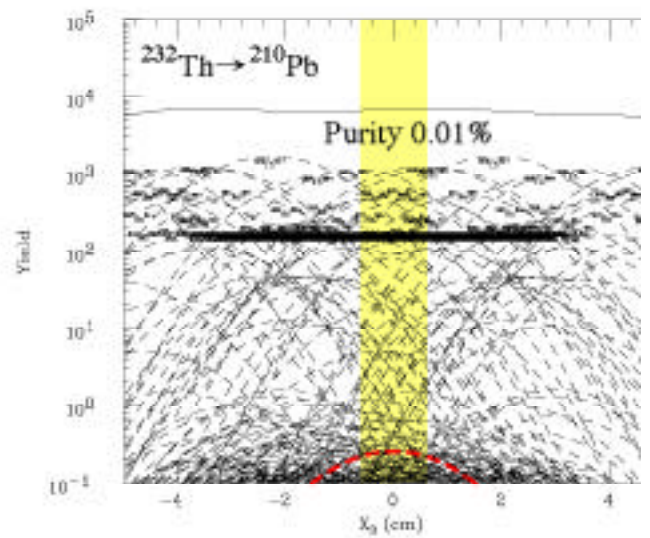
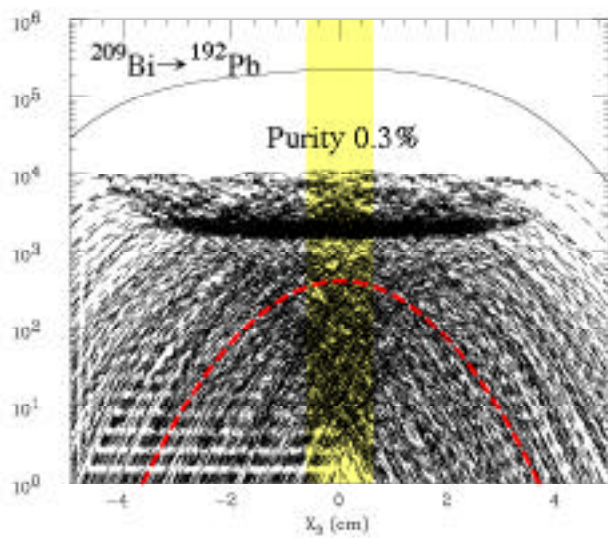
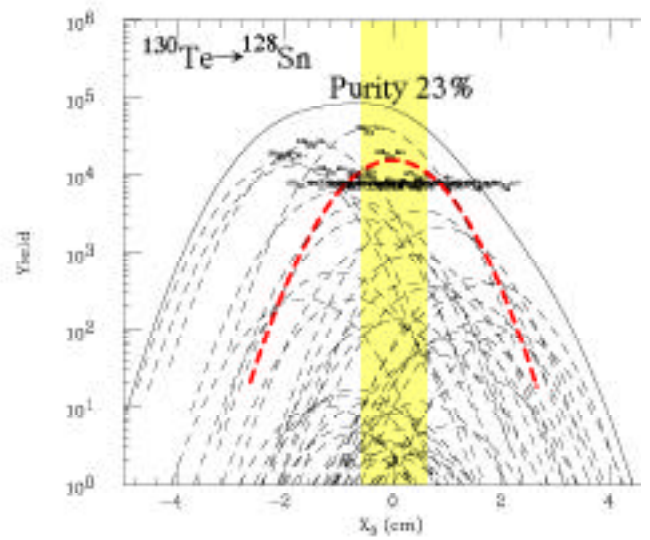
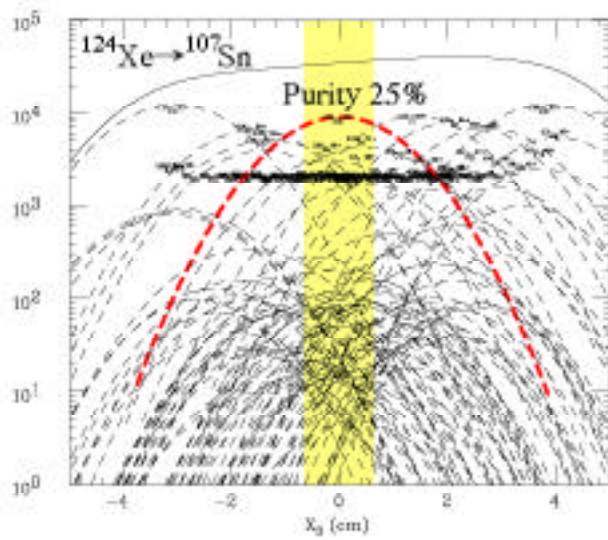
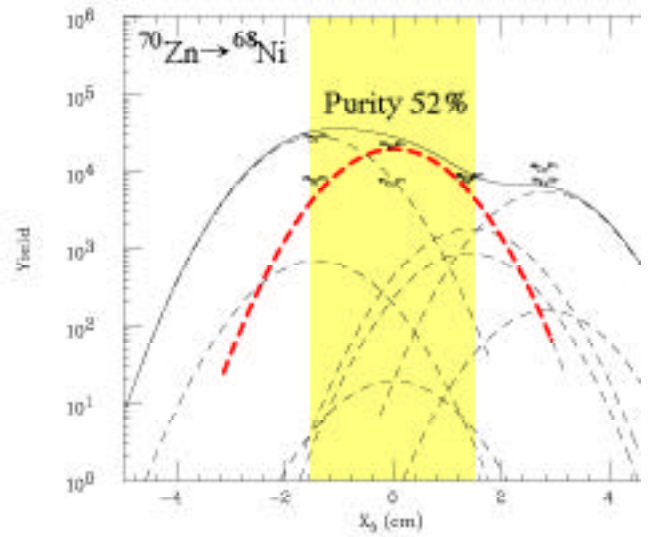
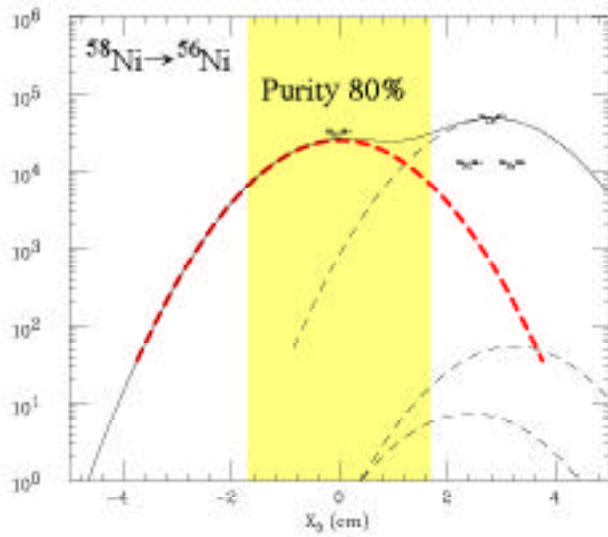




Fragment Position Distribution



Fragment Position Distribution at F2



Specific Point of BigRIPS DAQ

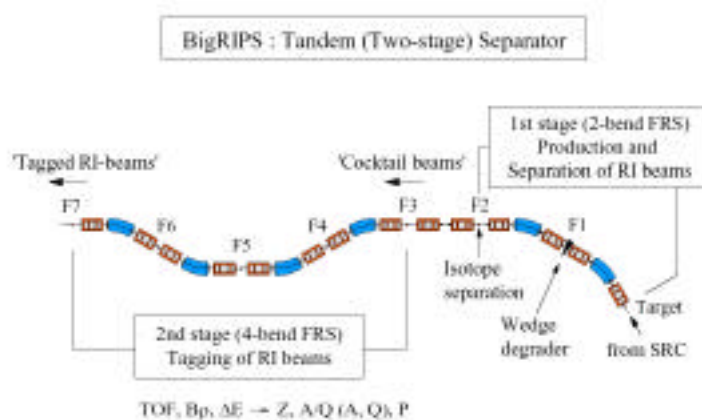
■ User Parts

- -array : more than 2000 param.
Special circuit for pulse shape analysis
- Large Acceptance Spec.: MWDC, counter array
- Zero-deg. Spec.

Specific DAQ for each user groups.

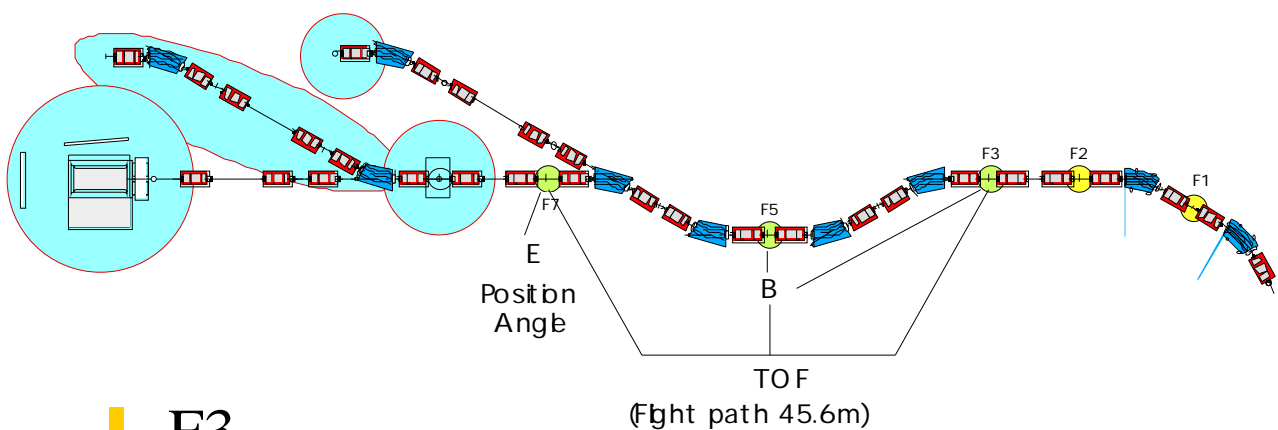
■ Beam transportation also requires DAQ.

- RI beam $< 10^7/\text{sec}$: counter measurement
- Cocktail beams: beam identify



Beam tagging

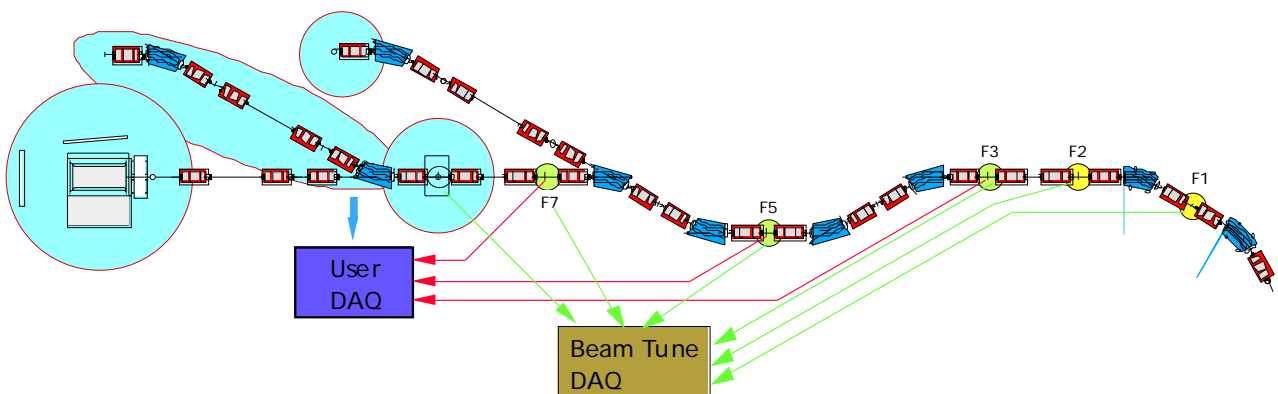
- Beam tagging information is necessary for most of users.



- F3
 - | Position: Delay-line PPAC x5
 - | Timing: Plastic Scinti.x4
- F5
 - | Position: Delay-line PPAC x10
- F7
 - | Position: Delay-line PPAC x5
 - | Timing: Plastic Scinti.x4
 - | DE:MUSIC x5

Traditional Method

- Concentrate to One DAQ machine at User site.
 - Limited number of signals
Total < 50 signals
 - Cable connection from F3,F5,F7 to user site.



- Problem:
 - Ground loop noise
 - Users should care about beam information

Modern Method

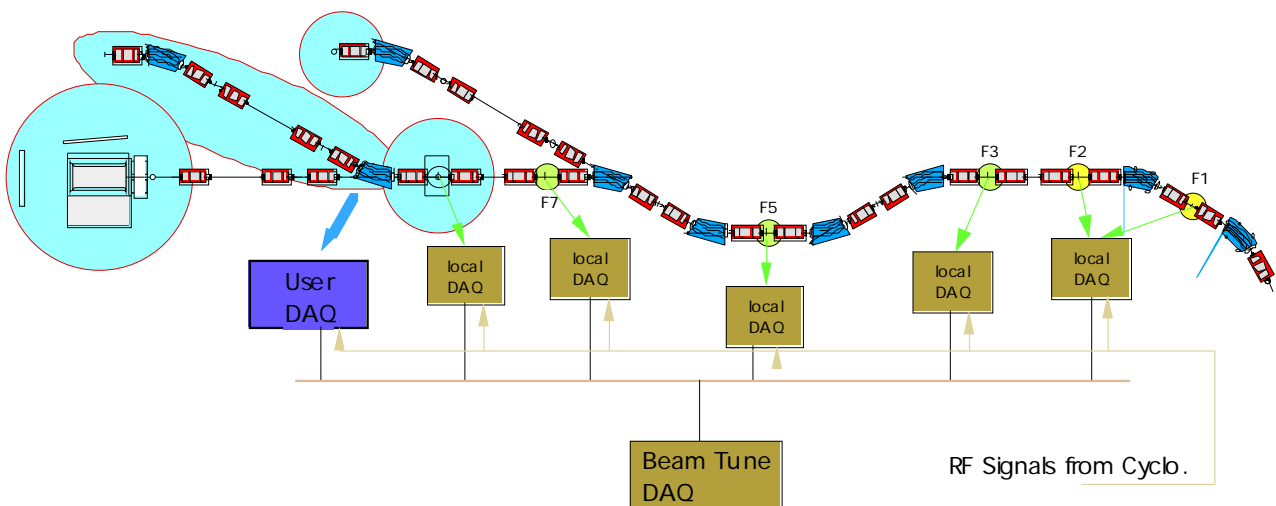
■ Distributed DAQ

- Local trigger and DAQ(front-end) at each focus.
 - Local spectra for beam transport.
- Data are send to User site through the network.
 - Local DAQ should have 100% efficiency to user DAQ trigger.

Event rate $\sim 10^6$ @ F2, F3 : Process time < 100 ns

■ Event construction

- RF based event ID



■ Fast Clear may not work

- Beam(F2-F7) 230ns + User Trigger 100ns + Fast Clear Signal 220ns = 550 ns

Local DAQ

- ADCs and TDCs

- Amplitude : better than 0.5%.
- Time resolution: better than 100ps

- “Dead time free” DAQ

- Process time $< 100\text{ns}$: event rate $< 10^6$

- Analog stack

- Pipe-line digital conversion

