



**Heavy Ion Accelerator for RIB**  
**KoRIA**  
in  
**International Science & Business Belt**

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**Sungkyunkwan University (SKKU)**

The First ANPhA Symposium at J-PARC

# Big Picture

International Science & Business Belt

Heavy Ion Accelerator KoRIA

# What is International Science & Business Belt?

– Science project of a new administration –

Science

Cutting Edge Science

Basic Science Institute  
Heavy Ion Accelerator (for RIB)

International

Globalization of Science

International Environment

Business

Science to Business &  
Knowledge Industry

Science Business Network Center

Belt

Belt Formation &  
Synergy

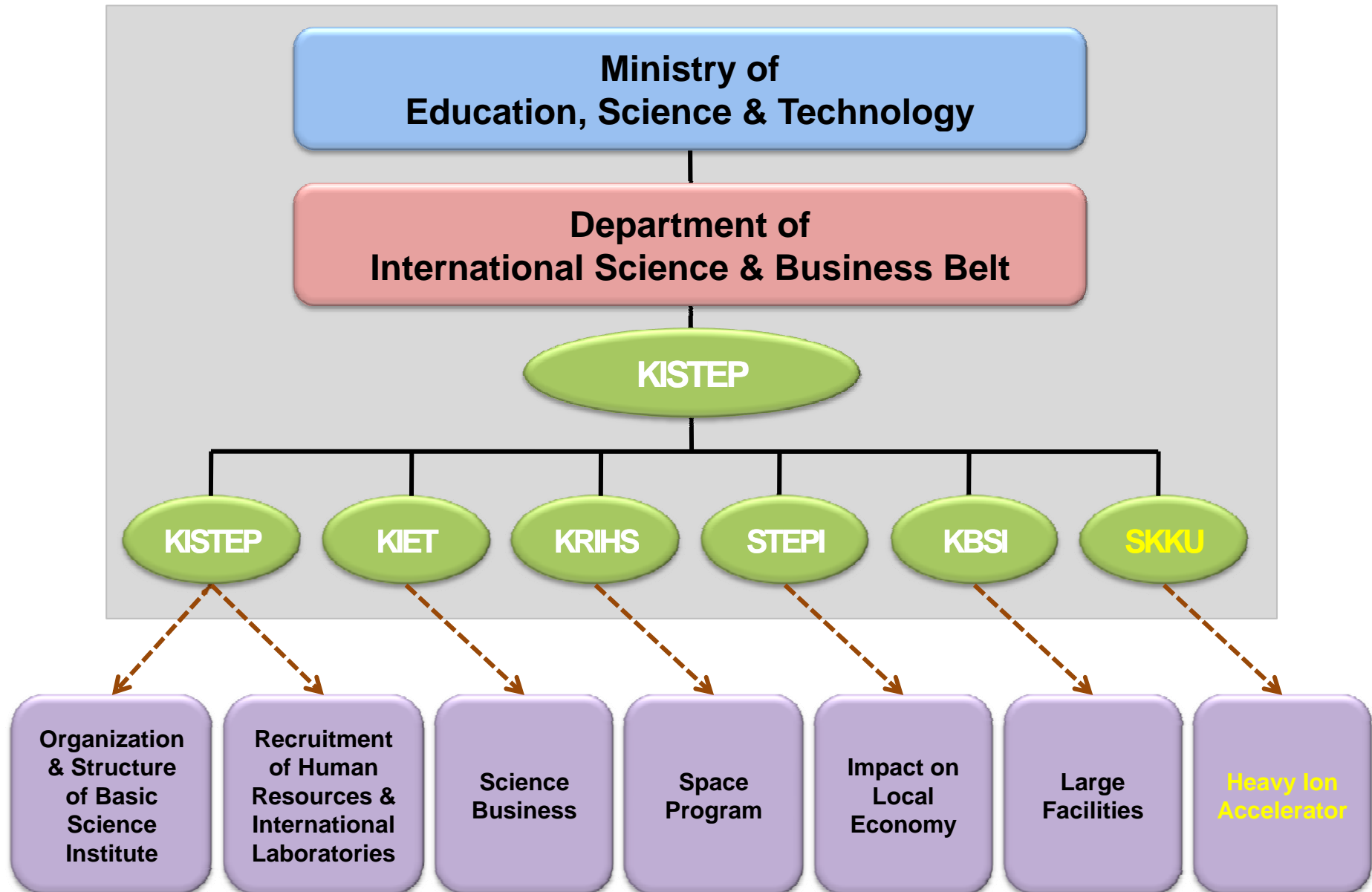
Creative City of Science & Culture  
Regional Science Belt

# Status

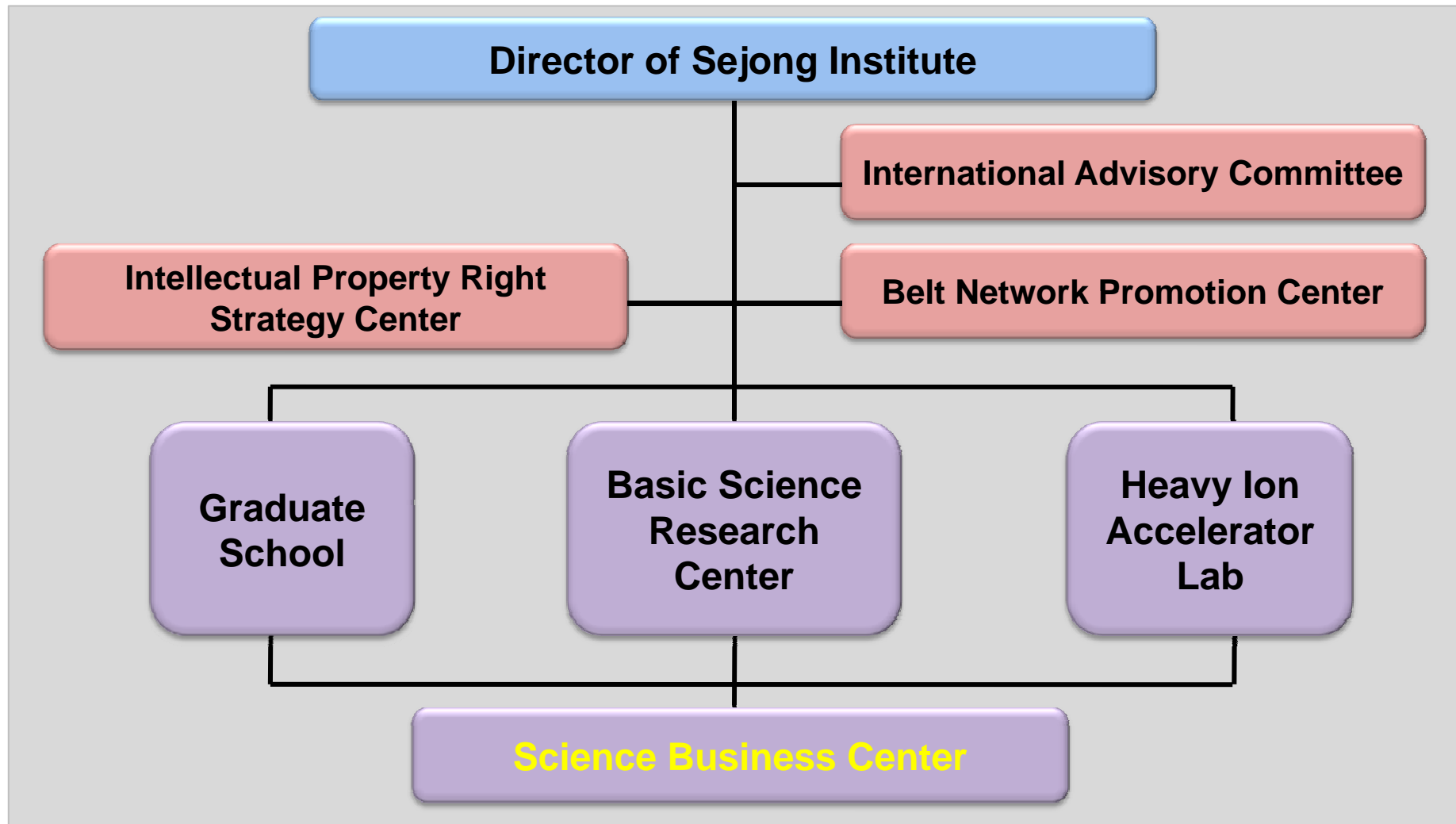
- Feb. 2008: Int'l Science & Business Belt (ISBB) Team  
in the Ministry of Education, Science & Technology
- Oct., 2008: The ISBB Team was expanded to a Department of  
ISBB
- Jan. 2009: Basic Plan for ISBB endorsed by National Council  
of Science and Technology (Chair: President)  
with a total budget: ~ 3 B USD
- At present: Action plan is under preparation (KISTEP\*).

\* KISTEP: Korean Institute of S & T Evaluation and Planning

# Structure of Planning of ISBB



# Sejong Institute as announced Jan. 11, 2010



**Area: 3,300,000m<sup>2</sup>**

**Budget (until 2015: ~3 B\$ (not including the price of the land))**

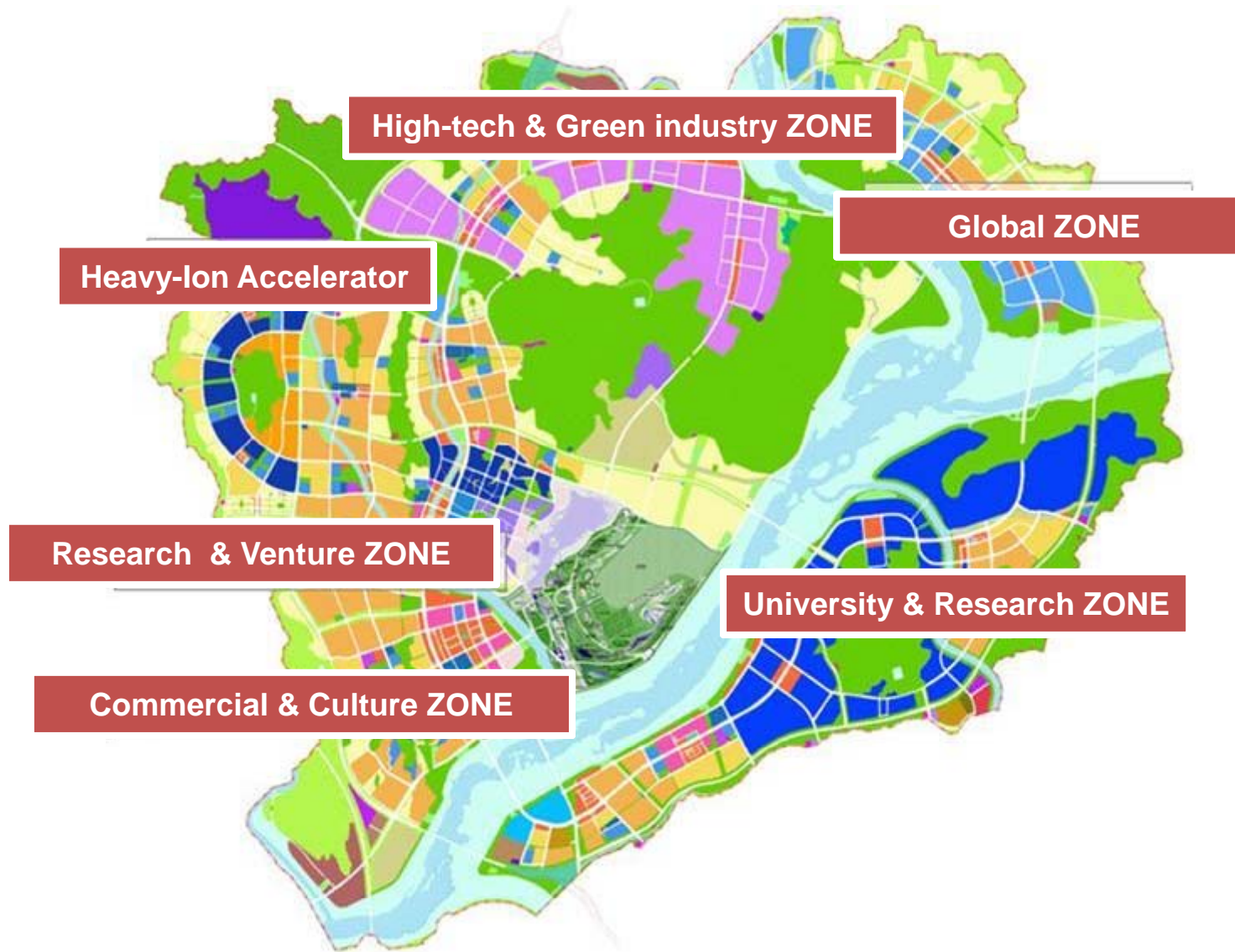
**Graduate School: 0.2 B\$, Accelerator: 0.4 B\$, R&D fund: 1.5B\$**

**Other facilities: 0.6 B\$, Others: 0.4 B\$**

# SeJong(世宗) City

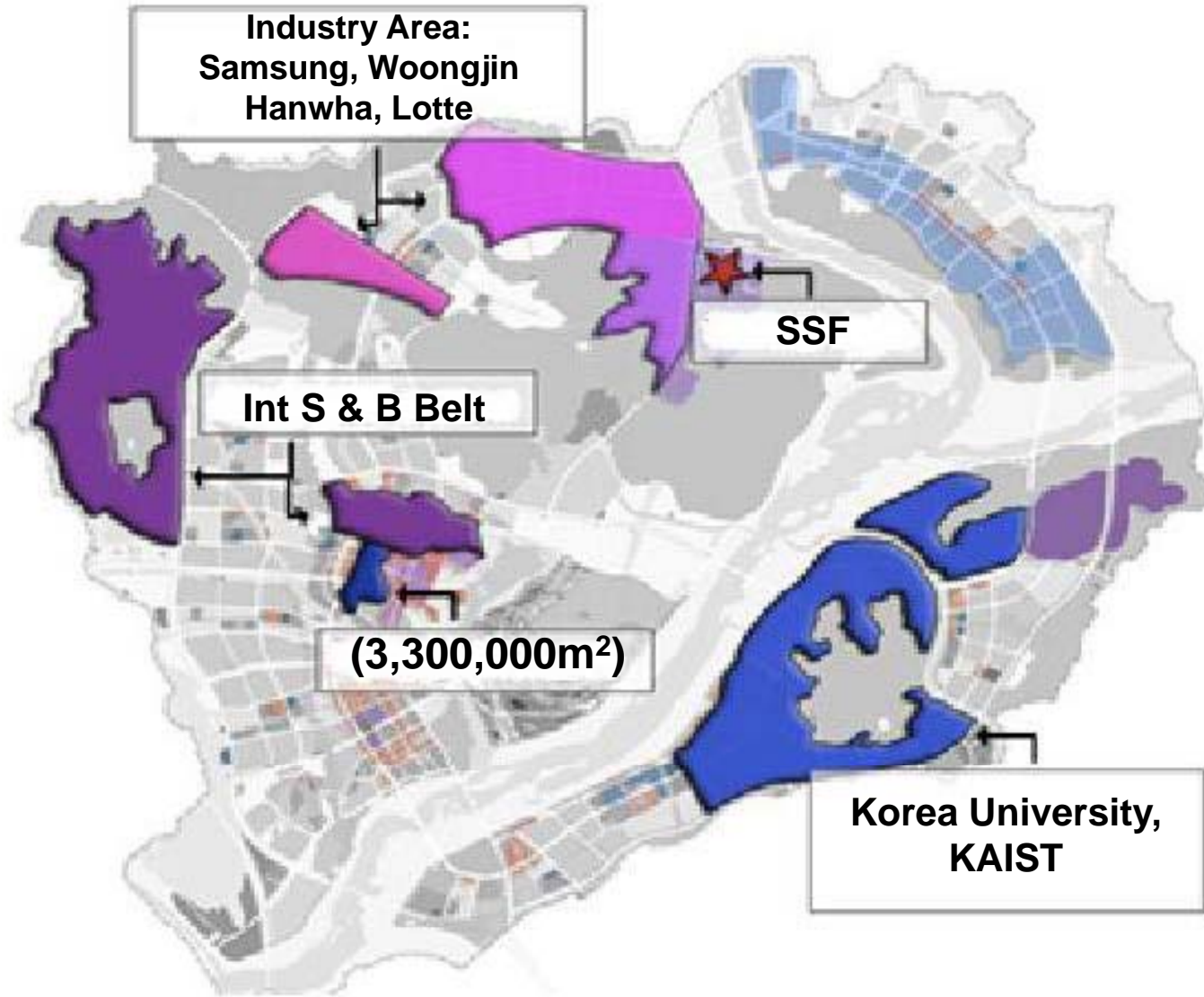


# Design of Sejong(世宗) City





# SeJong(世宗) City



# An Artist's View of Sejong City



# Heavy Ion Accelerator 'KoRIA'

# ABC' s of KoRIA

- Name of the facility
  - At present we call it “Heavy Ion Accelerator”.
  - A tentative name that scientists use: “KoRIA “.  
(Korea Rare Isotope Accelerator).
  - The official name needs further discussions.
- Status
  - Will be the cornerstone core facility for “Basic Science Institute “ to be established.
  - Conceptual design work will start soon.
- Proposed Budget for KoRIA: 460,000,000,000Won ~ 0.4 B USD
- Planning: 2009 ~ 2012
- Construction: 2012 ~ 2016

# Basic Concepts of KoRIA

- **Multipurpose**
- **Both ISOL & In Flight Fragmentation**  
for **production of rare isotope beams**  
(In Flight Fragmentation after ISOL: more exotic beams)
- **Maximum use of (stable & RI) beams**
- **Pump and Probe**

# General features of the facility

- Block 1 : Cyclotron :  $K \sim 100$ ,  $\sim 1$  mA  
ISOL targetry  
Post SC linac : 10 MeV/u

Block 2 : 200 MeV/u driver SC linac for all ions and RIB

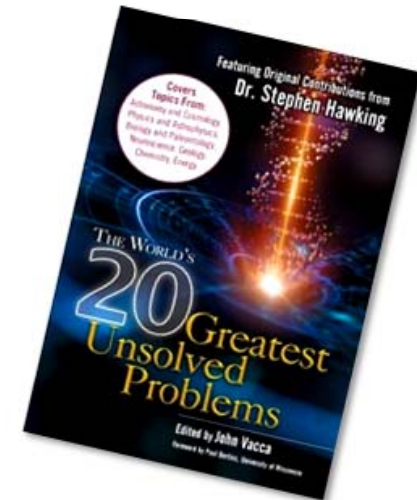
Block 3 : 10 MeV SC linac for injection of stable beams

- A broad range of experimental tools (fast, stopped, reaccelerated)
- Two ISOL target stations and an in-flight fragmentation target

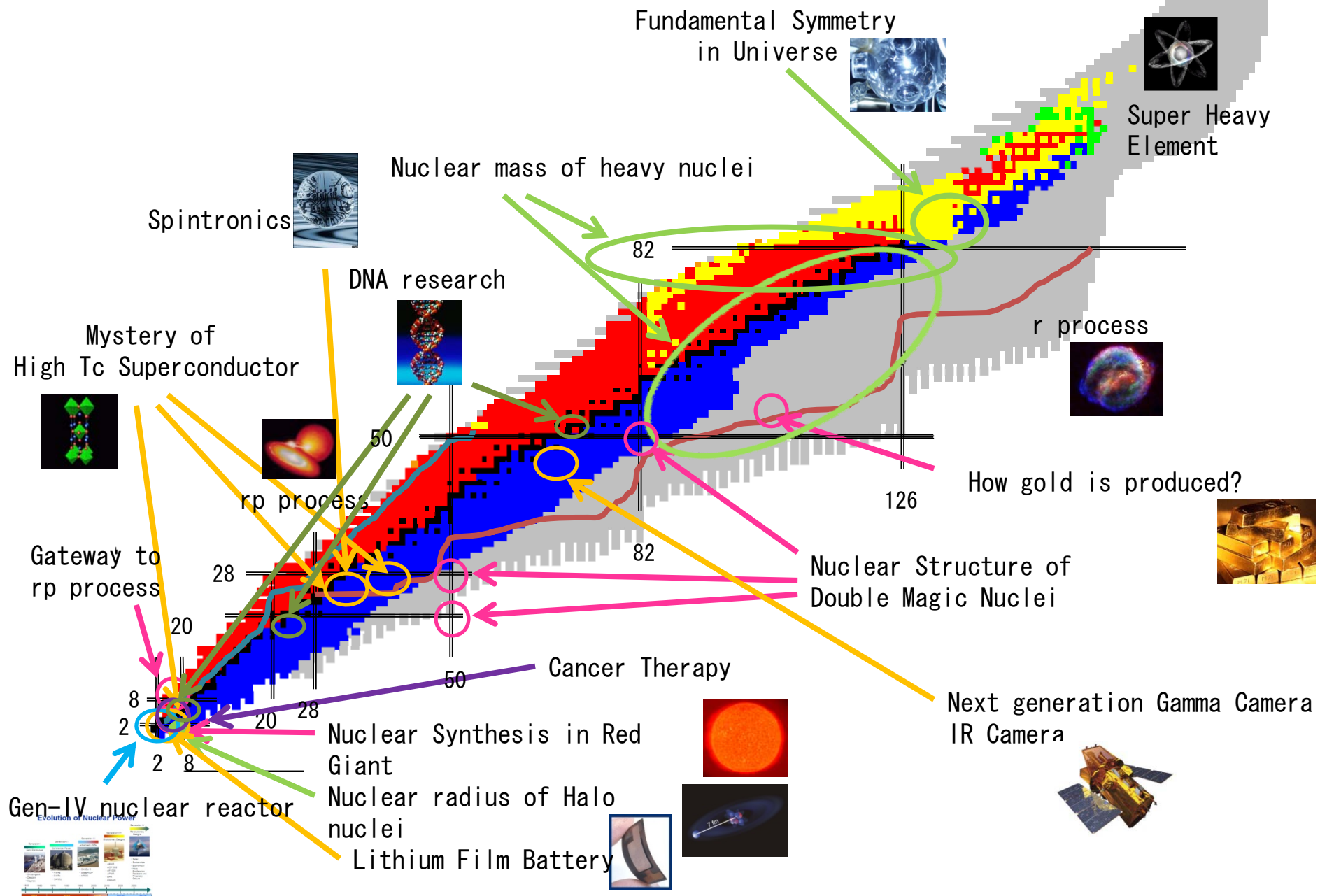
# Multipurpose Facility

- Nuclear and Nuclear Astrophysics
- Material Science using stable HI & RIB
- Bio and Medical Sciences with HI & RIB
- Atomic Physics & Fundamental Symmetry
- Nuclear Data Production for Energy
- Nuclear Fusion (Plasma)

**The World's  
20 Greatest  
Unsolved Problems**



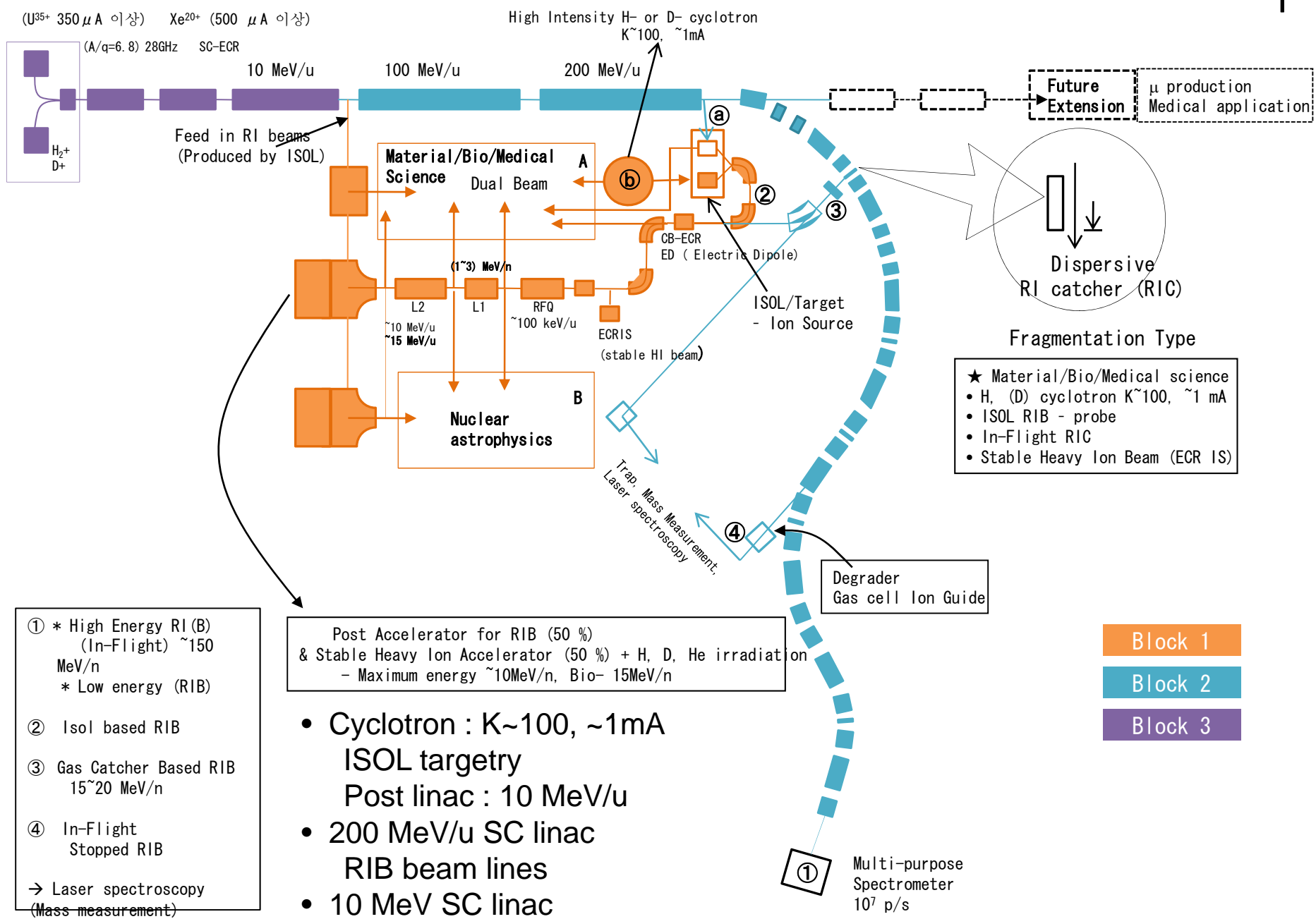
# Possible Sciences with KoRIA





# Both ISOL & In Flight Fragmentation for producing rare isotope beams

- Isotope Separator On Line (ISOL)
- In Flight Fragmentation
- In Flight Fragmentation after ISOL: to produce more exotic beams, if possible.

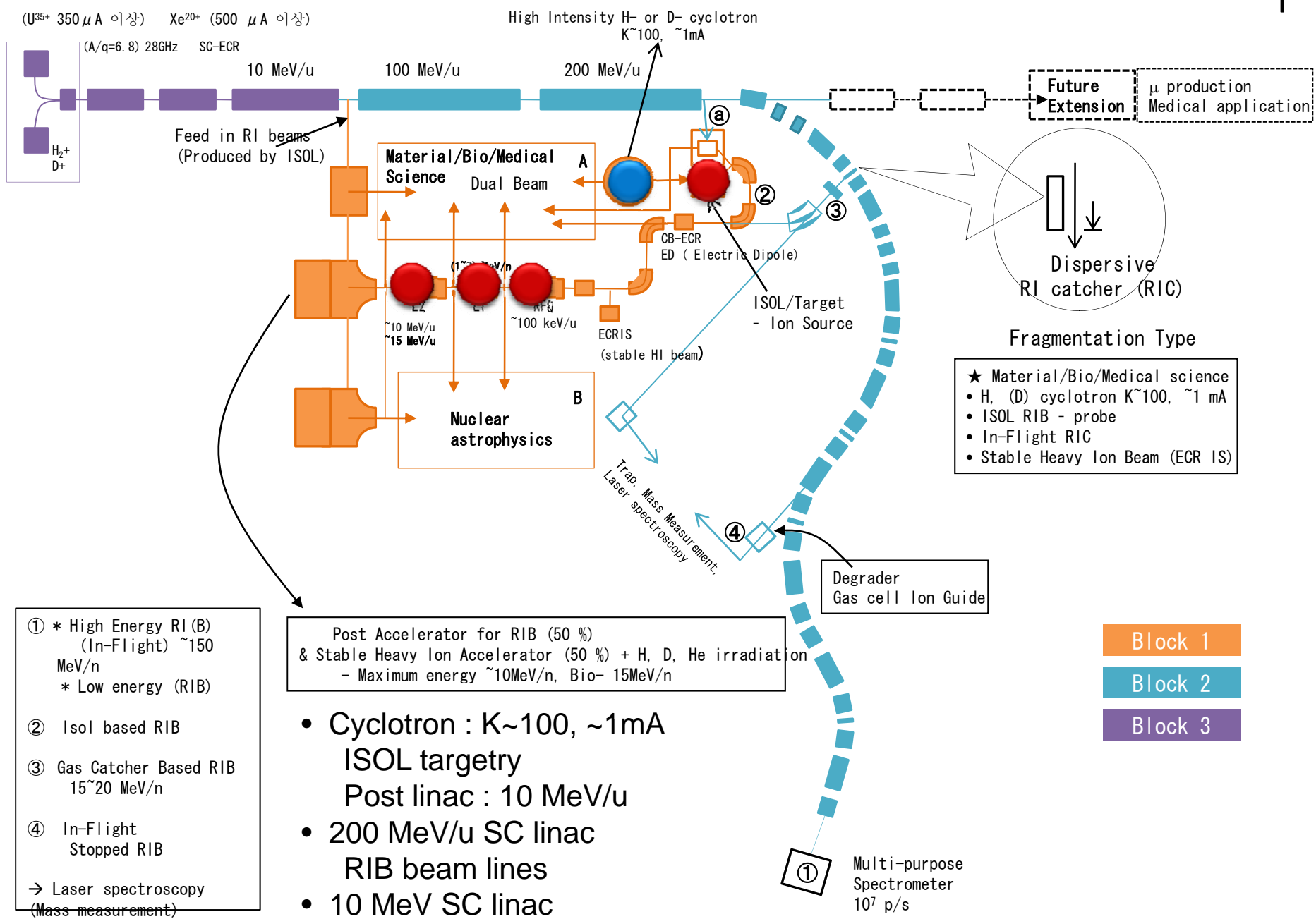


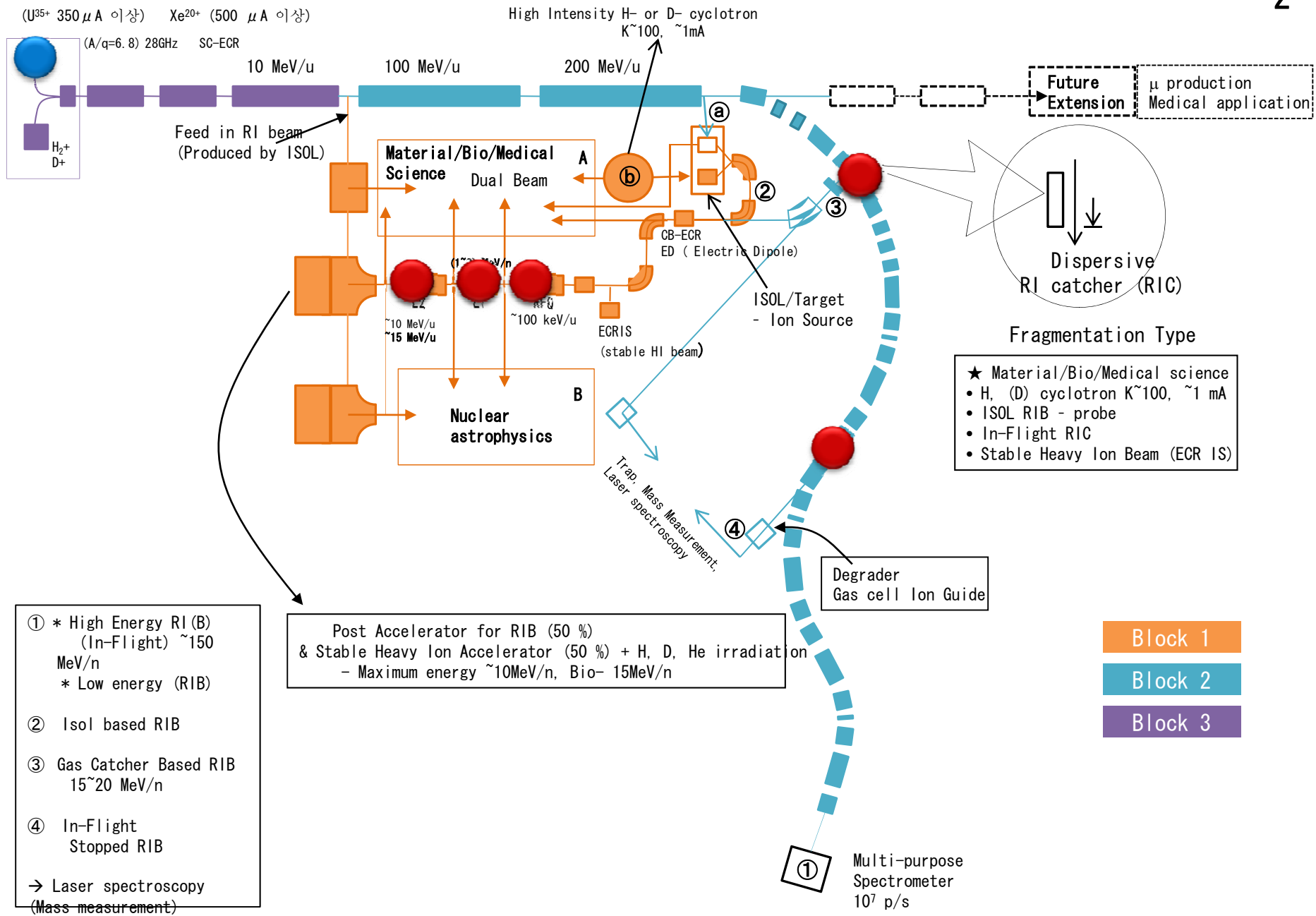
- ① \* High Energy RI(B) (In-Flight) ~150 MeV/n  
\* Low energy (RIB)
  - ② Isol based RIB
  - ③ Gas Catcher Based RIB 15~20 MeV/n
  - ④ In-Flight Stopped RIB
- Laser spectroscopy (Mass measurement)

Post Accelerator for RIB (50 %) & Stable Heavy Ion Accelerator (50 %) + H, D, He irradiation  
 - Maximum energy ~10MeV/n, Bio- 15MeV/n

- Cyclotron : K~100, ~1mA
- ISOL targetry
- Post linac : 10 MeV/u
- 200 MeV/u SC linac
- RIB beam lines
- 10 MeV SC linac

Block 1  
 Block 2  
 Block 3





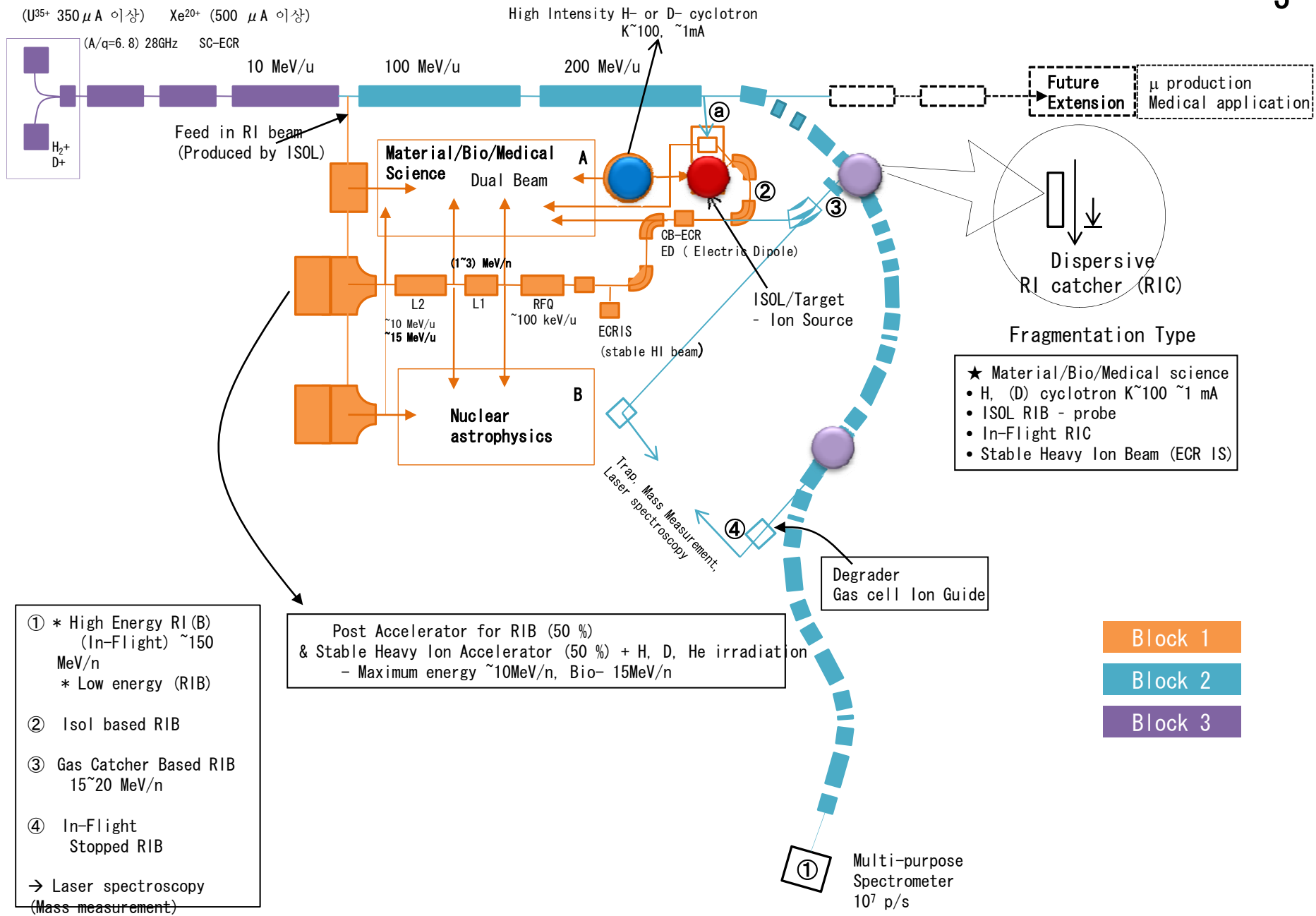
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Post Accelerator for RIB (50%) & Stable Heavy Ion Accelerator (50%) + H, D, He irradiation  
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- ★ Material/Bio/Medical science
- H, (D) cyclotron K~100, ~1 mA
  - ISOL RIB - probe
  - In-Flight RIC
  - Stable Heavy Ion Beam (ECR IS)

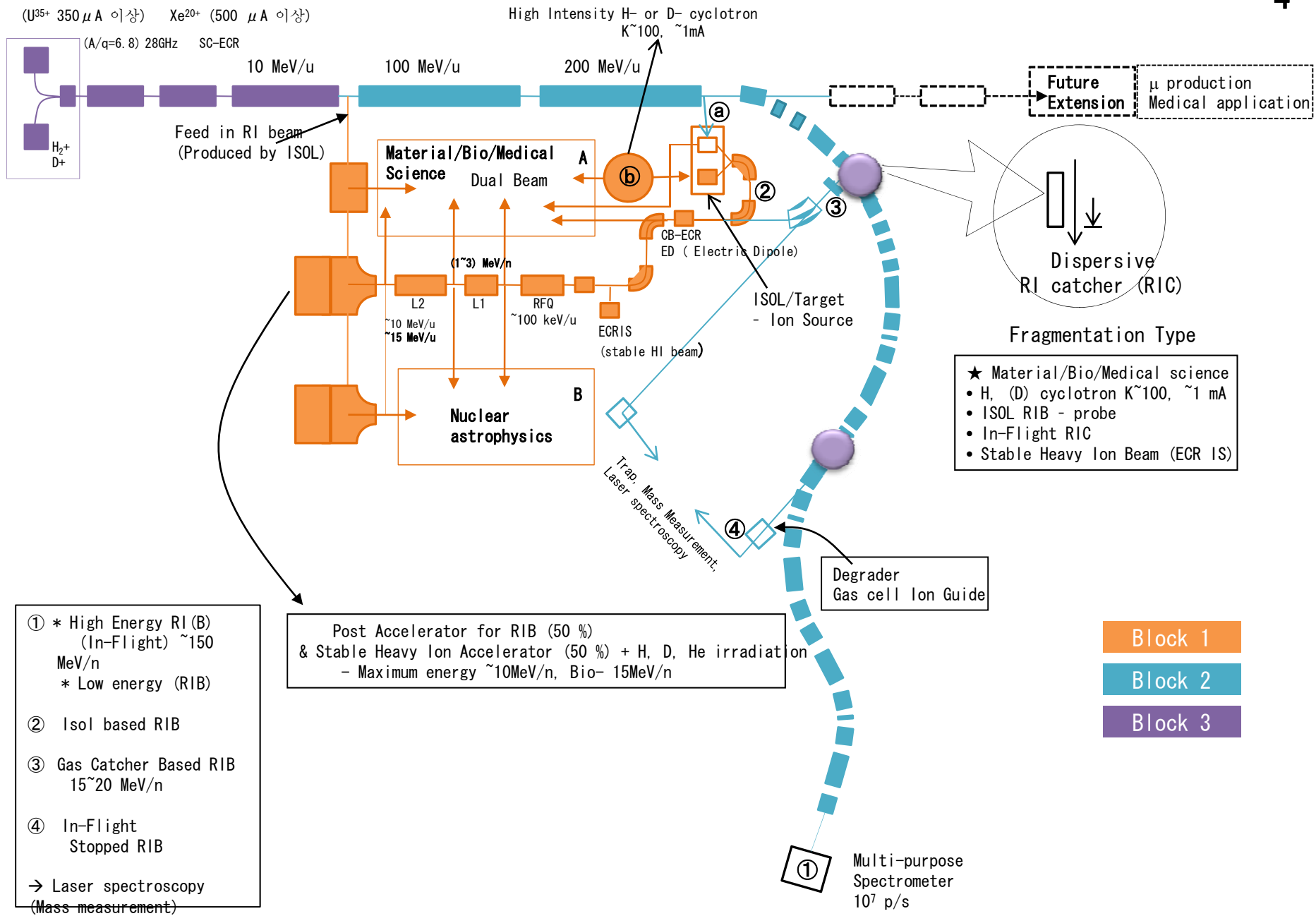
- Block 1
- Block 2
- Block 3

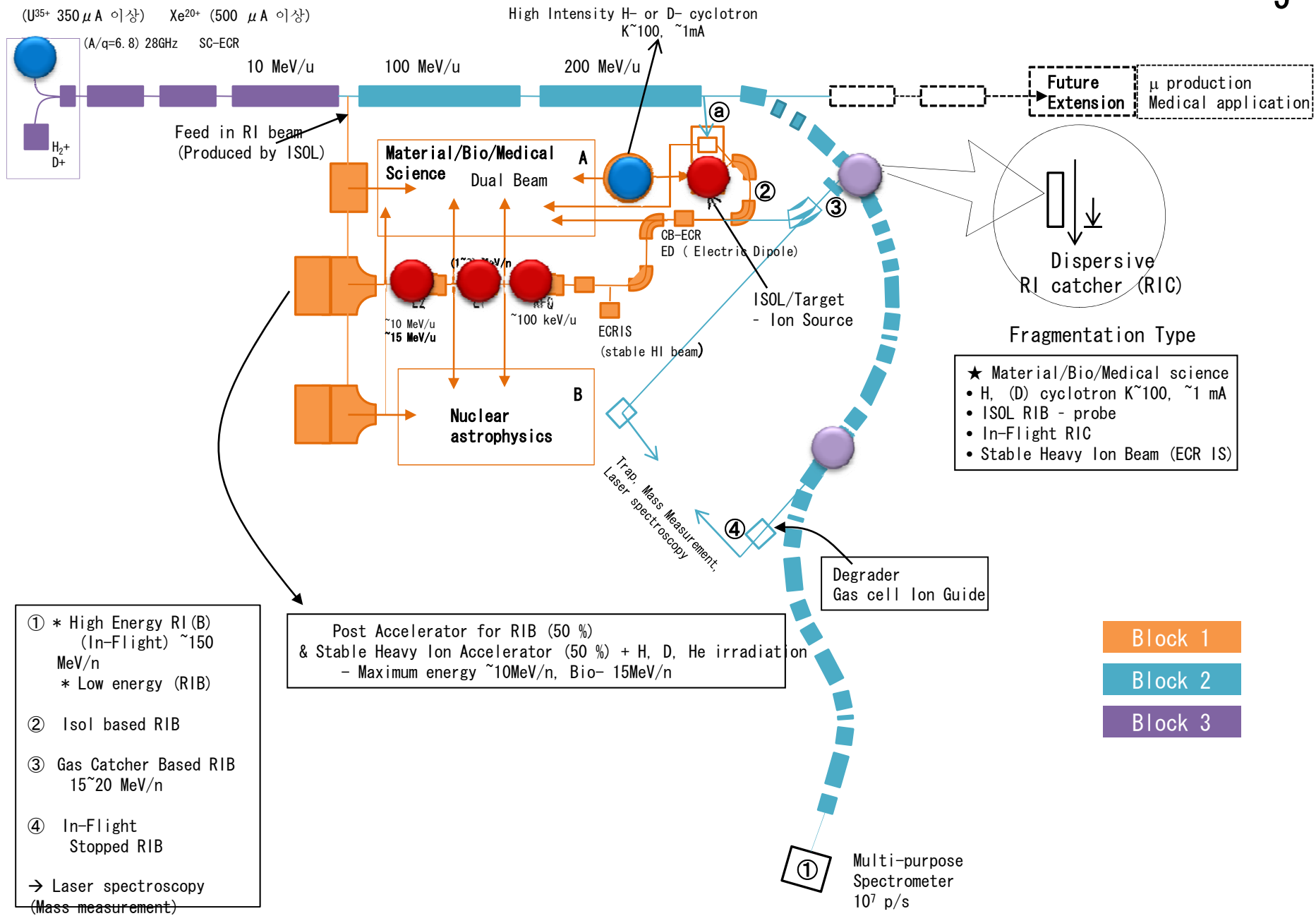
① Multi-purpose Spectrometer 10<sup>7</sup> p/s



# Maximum use of beams

- Maximum use of both stable and RI beams: more beam time
- Independent operations of beam lines
- By virtue of several ion sources
- By using the accelerators in combinations

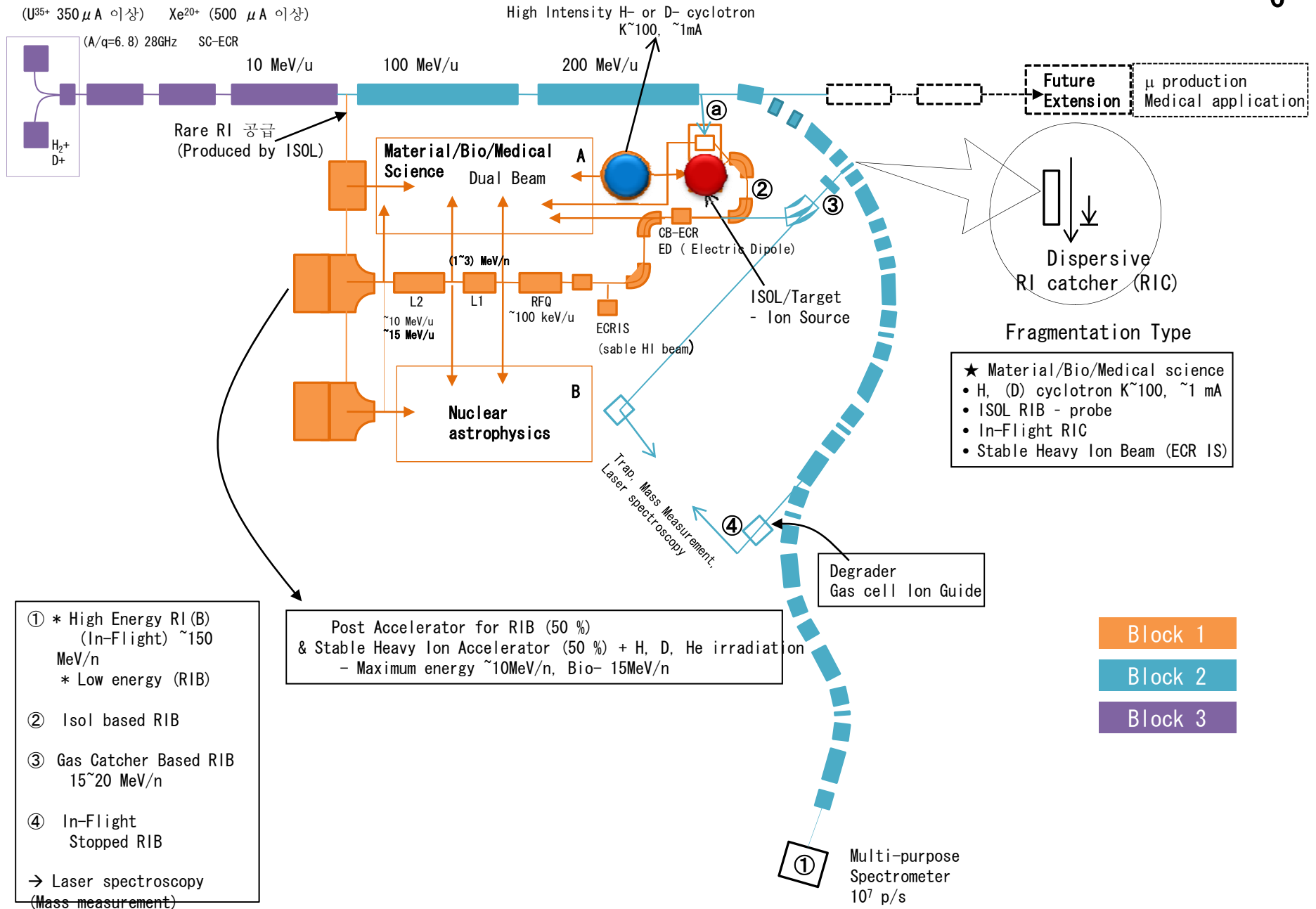


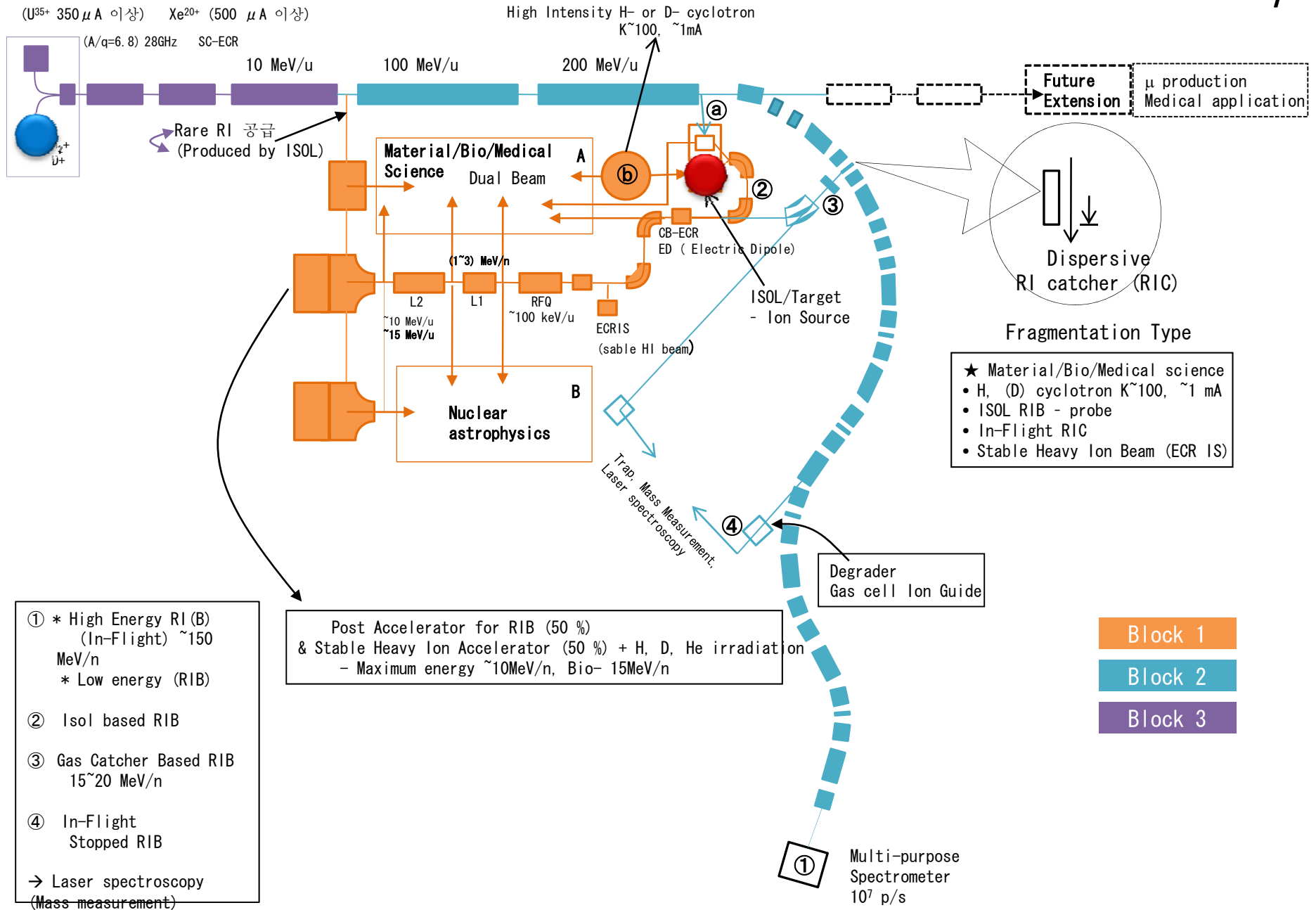




# Pump and Probe

- Excite the materials or nuclei by using stable beams and probe the states by using the RIB.
- Possible because of the use of combination of accelerators and several ion sources.





# Beam Specifications

## Research Area



Concepts of KoRIA and cartoon diagram

Preliminary proposal of research topics

Review of proposed research topics

1<sup>st</sup> version of beam specifications

Letters of intent (domestic)

2<sup>nd</sup> version of beam specification

Preliminary road map

Conceptual design

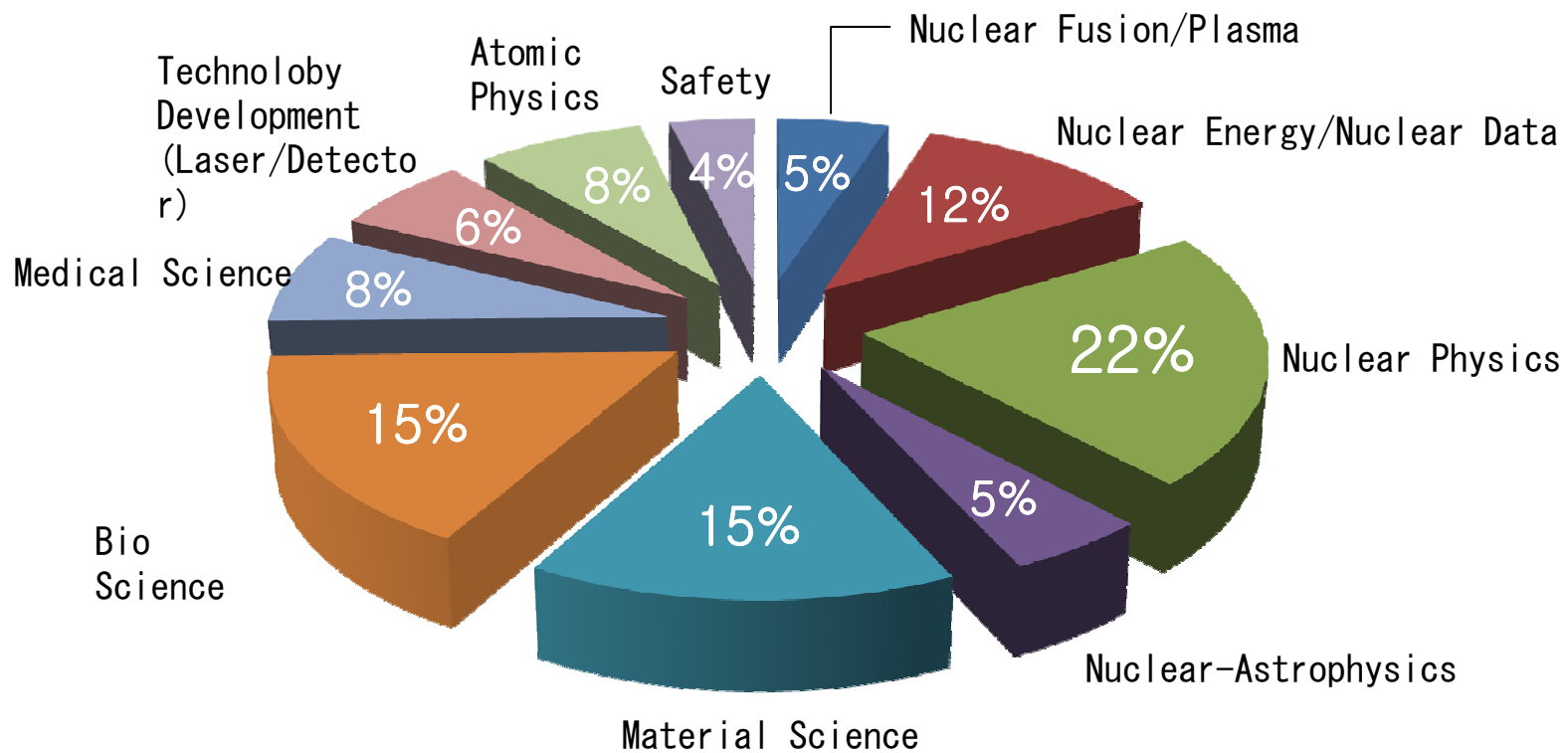
Technical design



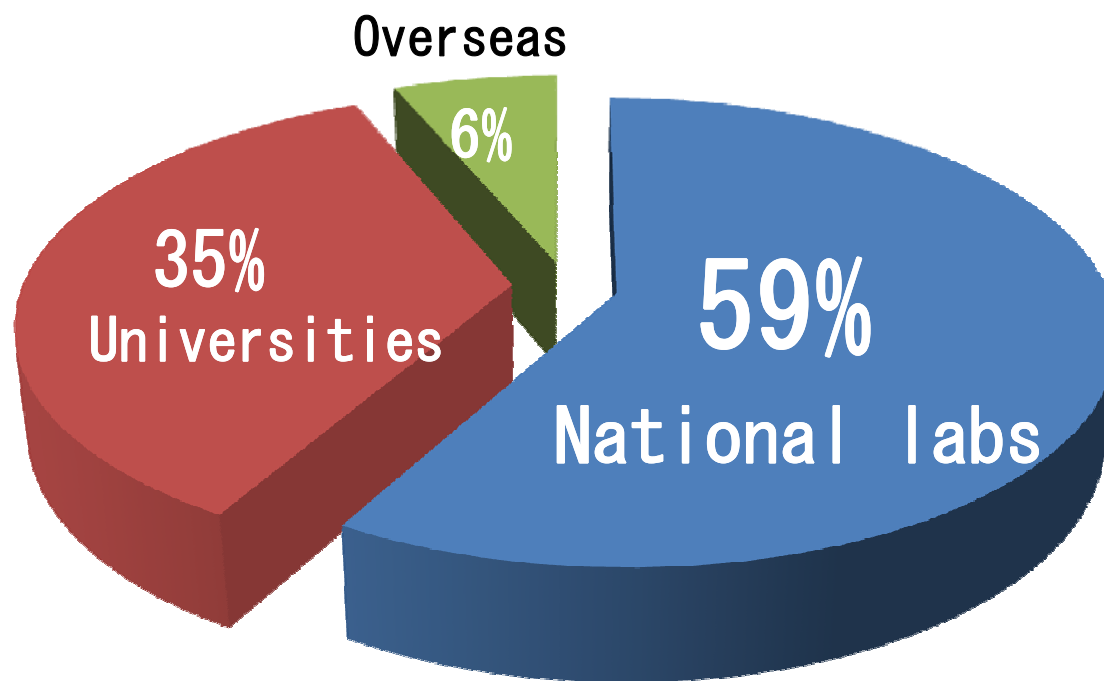
# Letters of Intent

- Call for letter of intent only in Korea at this moment
- During one month in May 20 ~June 20, 2009
- 83 Lol's are received.

# Areas of interests



# Who submitted



# Summary

- We want this facility to be designed as an international users' facility from the initial stage.
- International collaboration is very important.
- Conceptual design will start soon and is to be finished before the end of 2010.
- We are open for international collaboration and discussions to improve the very preliminary conceptual schematic diagram.



# International Users Opinions

- R&D studies on the instrumentation will be done during the conceptual design.
- Letters of Intent from international users will be called for.
- From yesterday's ANPhA Board Meeting, Users Workshop (Sep ~ Oct, 2010) will be held in Korea (Supported by ANPhA)

A vast field of stars in a dark night sky, with the text "Thank you." centered in the middle. The stars are of various colors, including white, yellow, orange, red, and blue. The text is in a simple, white, sans-serif font.

Thank you.