A Plan to Construct a Rare Isotope Accelerator Facility

KoRIA

S. W. Hong
Sungkyunkwan University (SKKU)

On behalf of Conceptual Design Project Team

New Korean Science City Caught in Political Crossfire

Plans for a new $34 billion Korean science city inched forward last week when the South Korean administration unveiled enabling legislation that will eventually go to the National Assembly. But opposition political parties may thwart the city, proposed for a spot 120 kilometers south of Seoul named Sejong after a former Korean king, in protest of the administration backing away from also making the location home to 13 ministries and government agencies. If the revised plans are blocked, "I'm not sure if [the scientific projects] would also be given up," says Dong-Pil Min, chair of the Korea Research Council of Fundamental Science & Technology.

Plans for a new science city grew out of discussions among an informal group of scientists over how to push South Korea into more basic research. "Of the current national laboratories, none deals with basic science," says Seung-Woo Hong, a nuclear physicist at the Suwon campus of Sungkyunkwan University. Over several years, the group developed plans for a new institute that would pursue fundamental research across the board. They also proposed a $400 million accelerator that would create beams of exotic isotopes at unprecedented energy levels for studies in nuclear physics and materials science.

really creative environment, including a comfortable environment for living" to attract researchers from around the world, says Hong. The project caught the attention of Lee Myung-bak, who became the Korean president in February 2008 and asked the education and science ministry to further develop what came to be called the International Science and Business Belt.

Meanwhile, in 2002, the previous administration proposed creating Sejong as a new capital to alleviate overcrowding in Seoul. Courts ruled moving the capital to be unconstitutional, however, so the plan was revised to move parts of the bureaucracy to Sejong. The Lee administration announced in January that it wants to scrap those plans and turn Sejong into an education and research hub, incorporating the science city proposal as well as separate

Regal fight. Politicians differ on the purpose of a new city named for Korea's King Sejong.

ogy (KAIST), based in nearby Daejeon, and Korea University, headquartered in Seoul, to build new campuses there. Four of the country's major conglomerates have also committed to building high-tech manufacturing and research facilities in Sejong, lured by sweetheart deals for land.

But national politics may scuttle the administration's push for the science city. Two opposition parties have announced they will fight to keep the original plans for Sejong to be a governmental administrative center when the relevant bills come to the assembly, which could be as early as next month. "It's kind of a mess now," says Yong-Taek Im, dean of external affairs at KAIST. "To implement this new plan, they need approval from the National

WIKIPEDIA

Accelerators in Korea

1. Pohang Light Source
   2.5 GeV electron LINAC: Material and bio sciences
2. **KIRAMS** (Korea Institute of Radiological and Medical Sciences)
   18 Cyclotrons (50 MeV, 30 MeV 0.6mA, 13 MeV): RI production
3. KIGAM(Korea Institute of Geoscience and Mineral Resources)
   0.5 ~ 2 MeV Van de Graaf: Material sciences
4. Seoul National University
   3MV Tandetron: AMS
5. **PEFP KAERI** (Korea Atomic Energy Research Institute)
   100 MeV 20mA proton LINAC
6. National Cancer Center
   235 MeV Proton Cyclotron: Proton therapy

Heavy Ion Accelerator
KoRIA

in the context of

International Science & Business Belt
(ISBB)

International Science & Business Belt

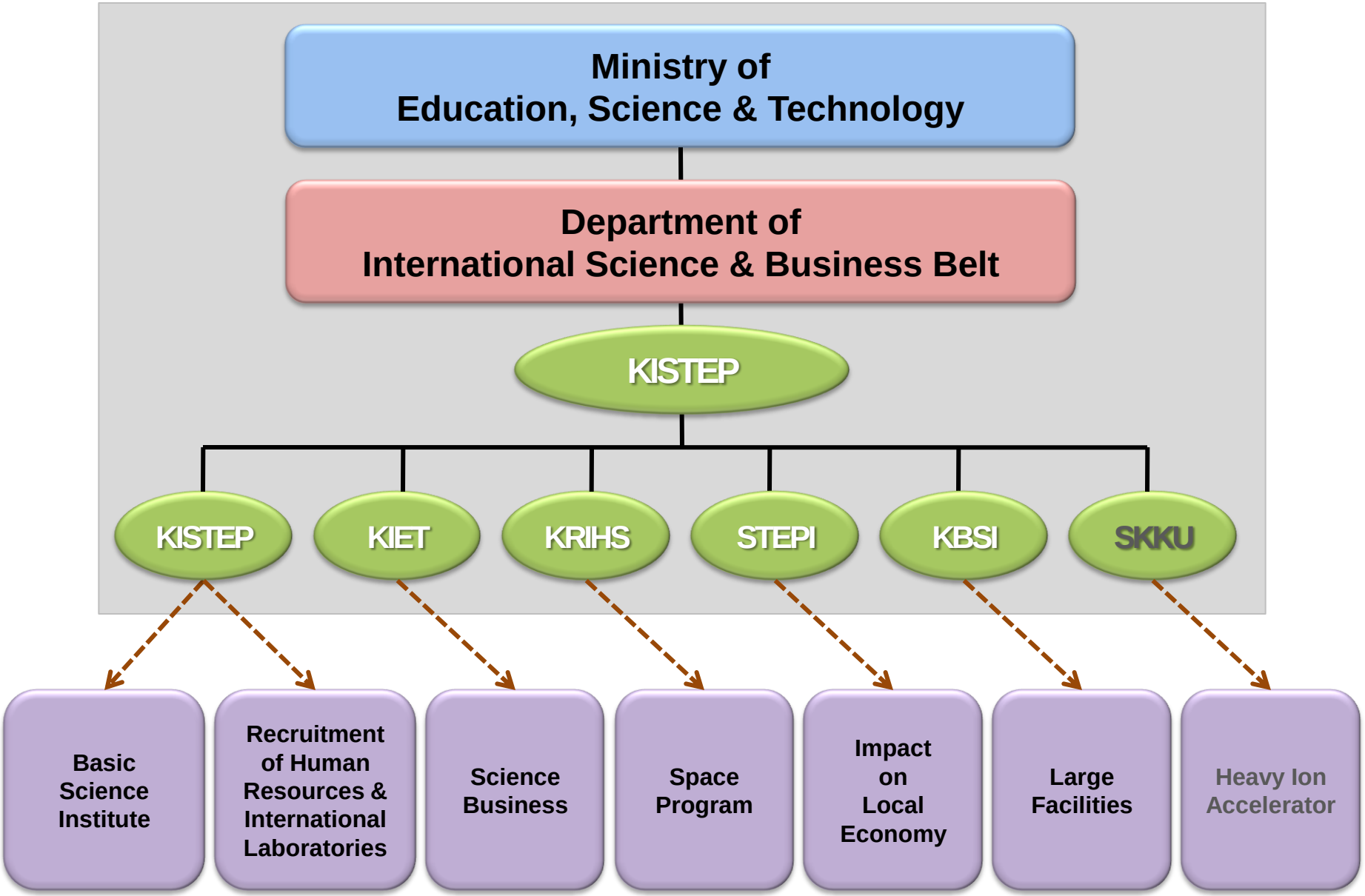
- **Science** project of a new administration -

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

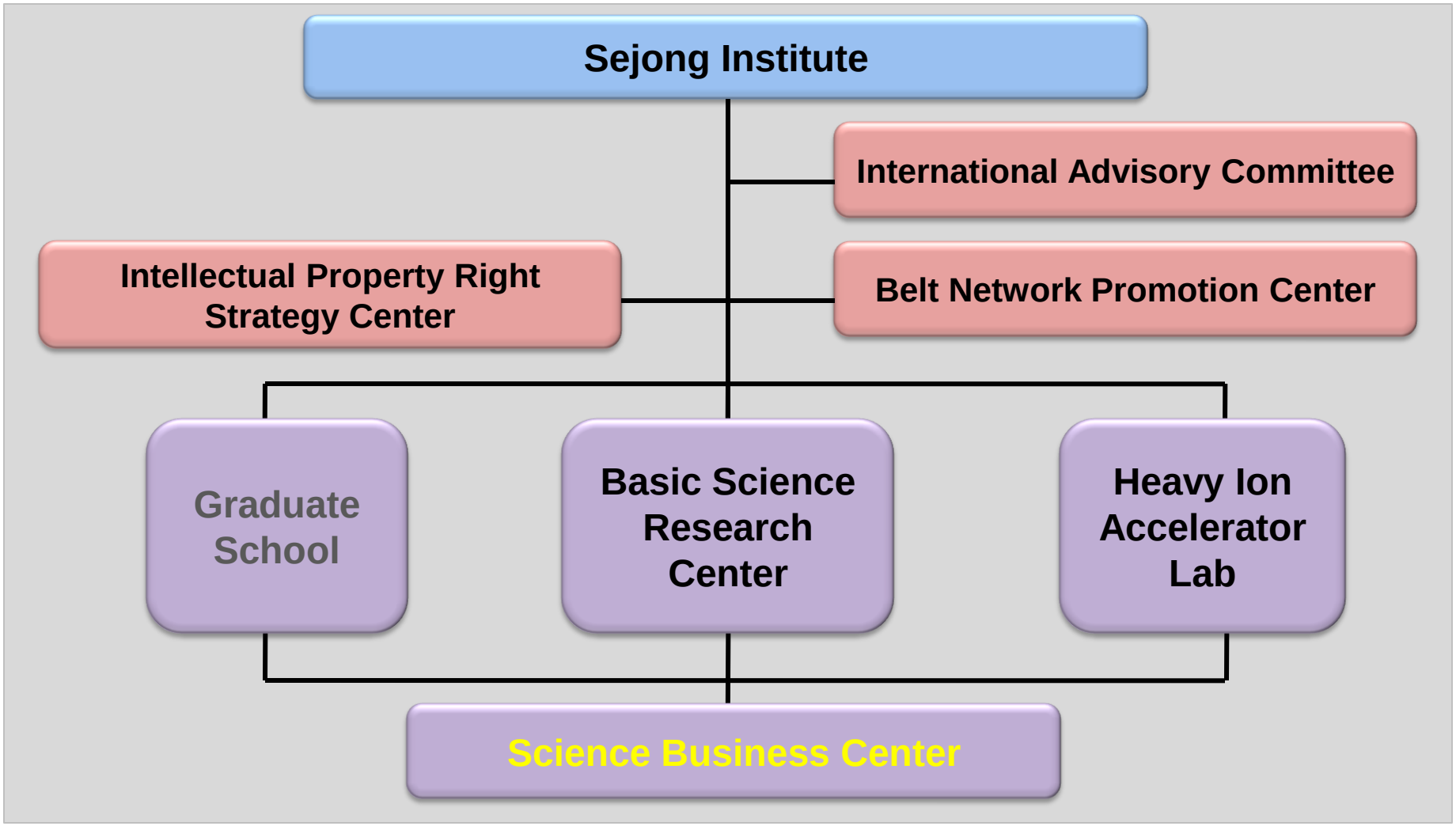
Status

- Feb. 2008: Int'l Science & Business Belt (ISBB) Team was formed in the Ministry of Education, Science & Technology
- Jan. 2009: 'Comprehensive plan' for ISBB was announced by National Council of Science and Technology (Chair: President) with a total budget: ~ 3 B USD
- At present: 'Basic plan' is under preparation by the Ministry.
- A special law is submitted to the National Assembly for approval.

Structure of Planning of ISBB



Sejong Institute as announced Jan. 11, 2010

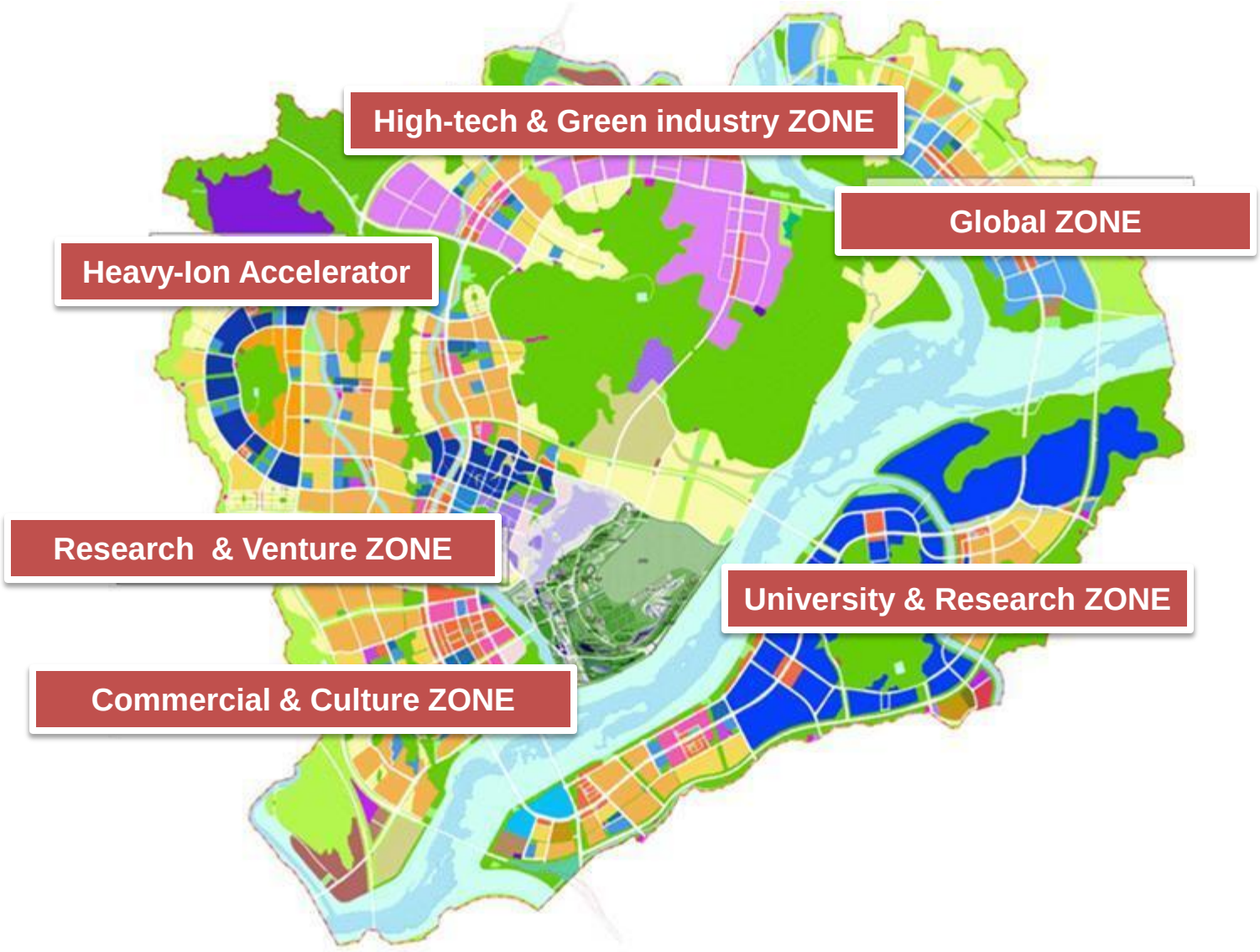


Area: 3,300,000㎡
Budget : ~3 B$

SeJong City

CHINA
KOREA
JAPAN
Seoul
SeJong City
Jilin
Shenyang
Fushun
Tong Hua
Anshan
Beijing
(Peking)
Tangshan
Dalian
North Korea
Pyongyang
Handan
Jinan
Daegu
Kwangju
(Pusan)
Busan
Xuzhou
Huainan
Cheju do
Fukuoka
Hiroshima
Kyoto
Kobe
Osaka
Nagoya
Kawasaki
Japan
Shikoku
Hirado-shima
Fuku-e-jima

Design of Sejong City



An Artist's View of Sejong City

KoRIA

- Name of the facility

  - In Korea we just call it "**Heavy Ion Accelerator**".
  - A **tentative** name that scientists use: "KoRIA".
    (**Ko**rea **R**are **I**sotope **A**ccelerator).
  - The official name needs further discussions.

- Proposed Construction Budget : ~ 0.45 B USD

- Planning: 2009 ~ 2012
- Construction: 2012 ~ 2016

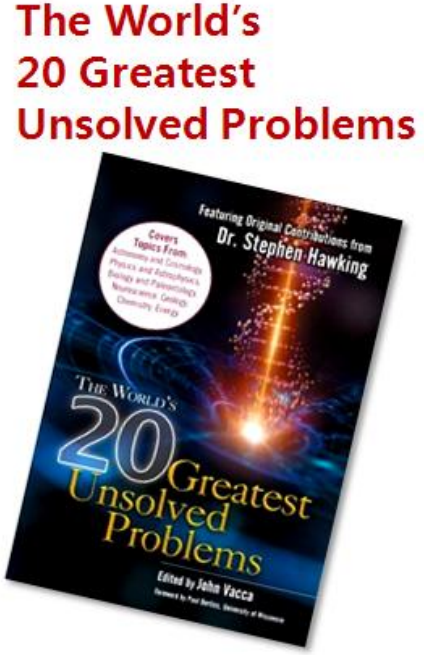
- **Conceptual design project** started.

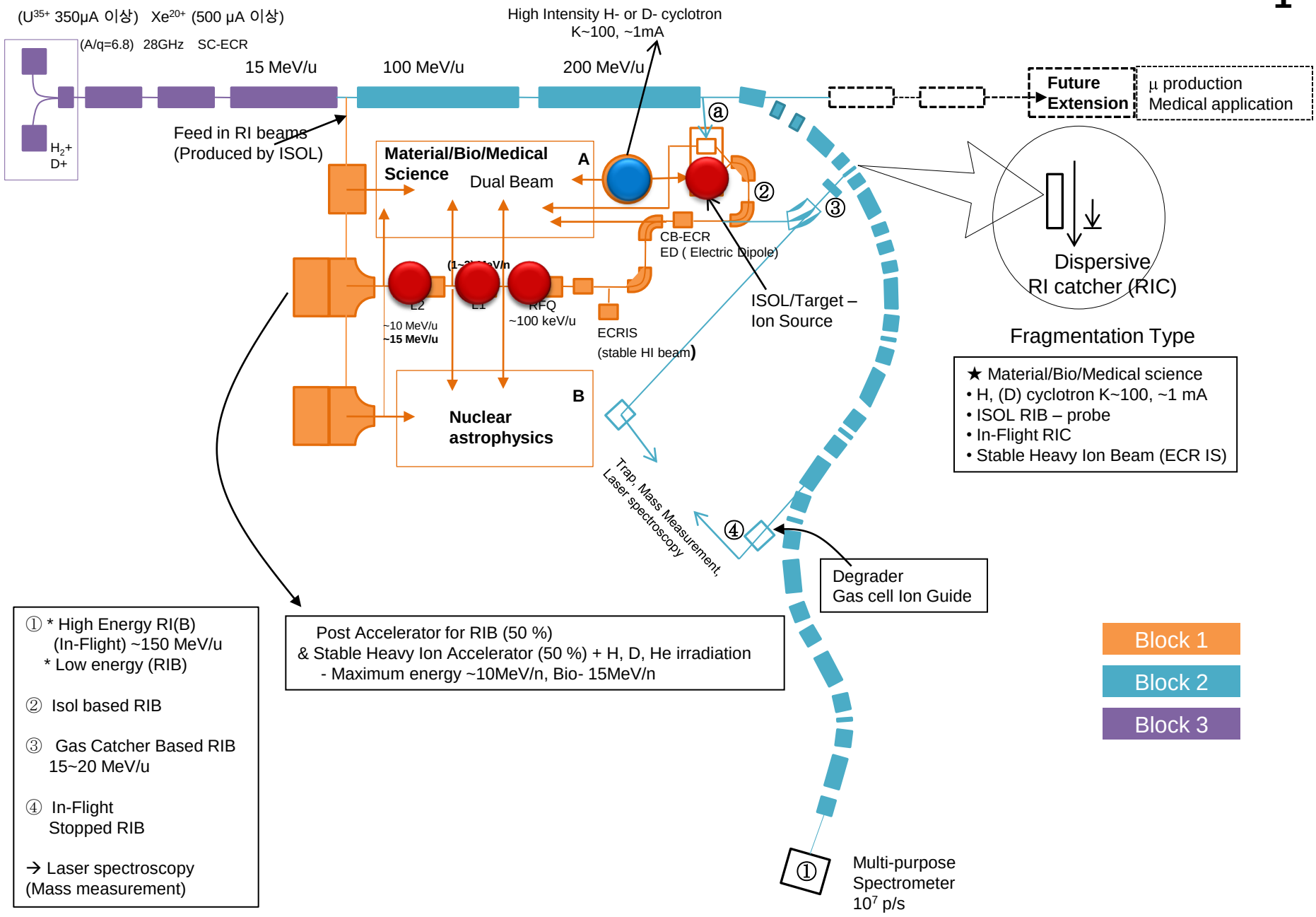
Some Ideas of KoRIA

- Multipurpose
- Two dirvers (Cyclotron & LINAC)
- Both ISOL & In Flight Fragmentation
  (In Flight Fragmentation after ISOL: more exotic beams)
- Start from scratch

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)

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H2+
D+
15 MeV/u
100 MeV/u
200 MeV/u
High Intensity H- or D- cyclotron
K~100, ~1mA
Future Extension
μ production
Medical application
Feed in RI beams
(Produced by ISOL)
Material/Bio/Medical Science
A
Dual Beam
CB-ECR
ED (Electric Dipole)
ISOL/Target – Ion Source
Dispersive
RI catcher (RIC)
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& Stable Heavy Ion Accelerator (50 %) + H, D, He irradiation
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Multi-purpose
Spectrometer
10^7 p/s
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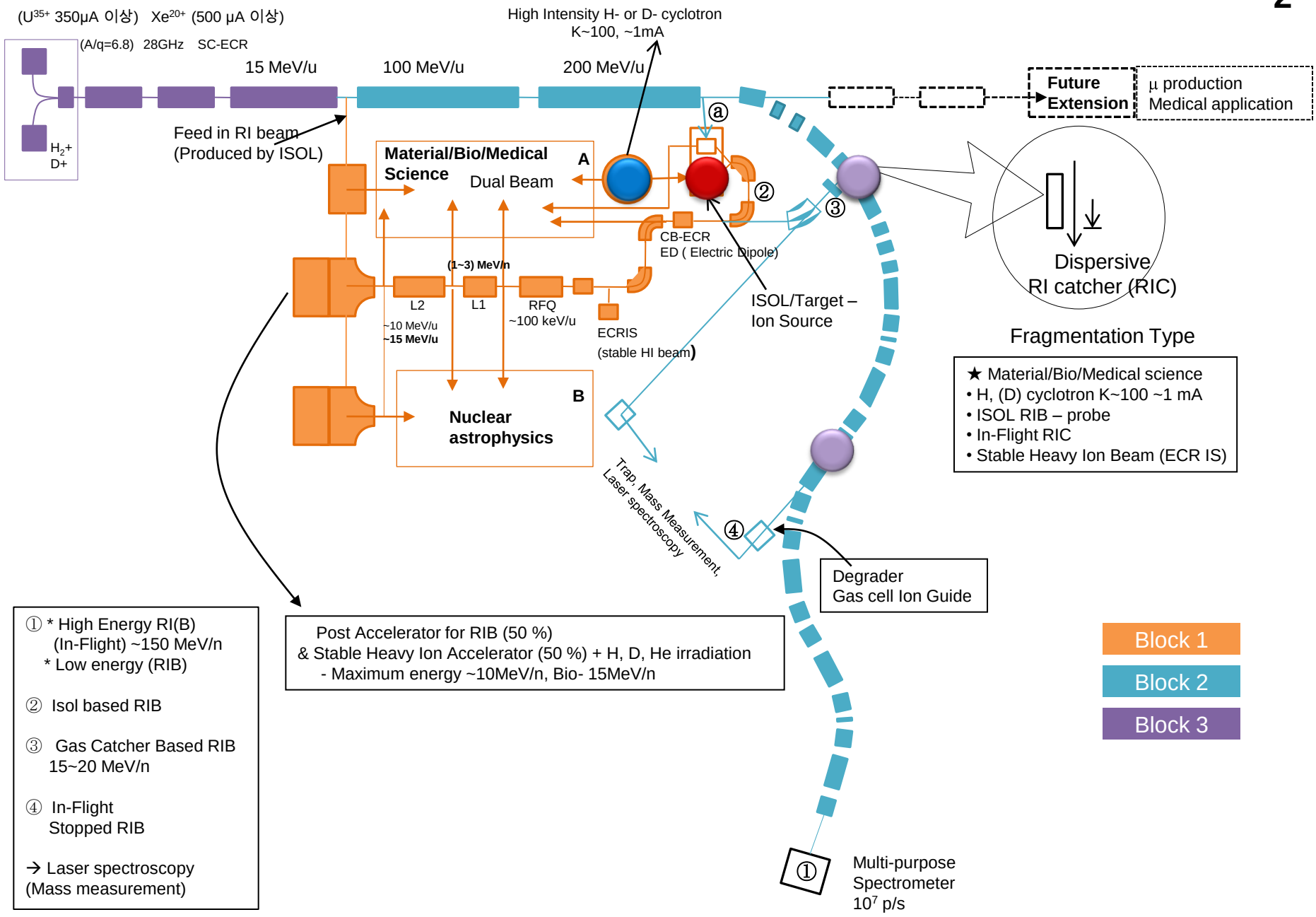
Block 2
Block 3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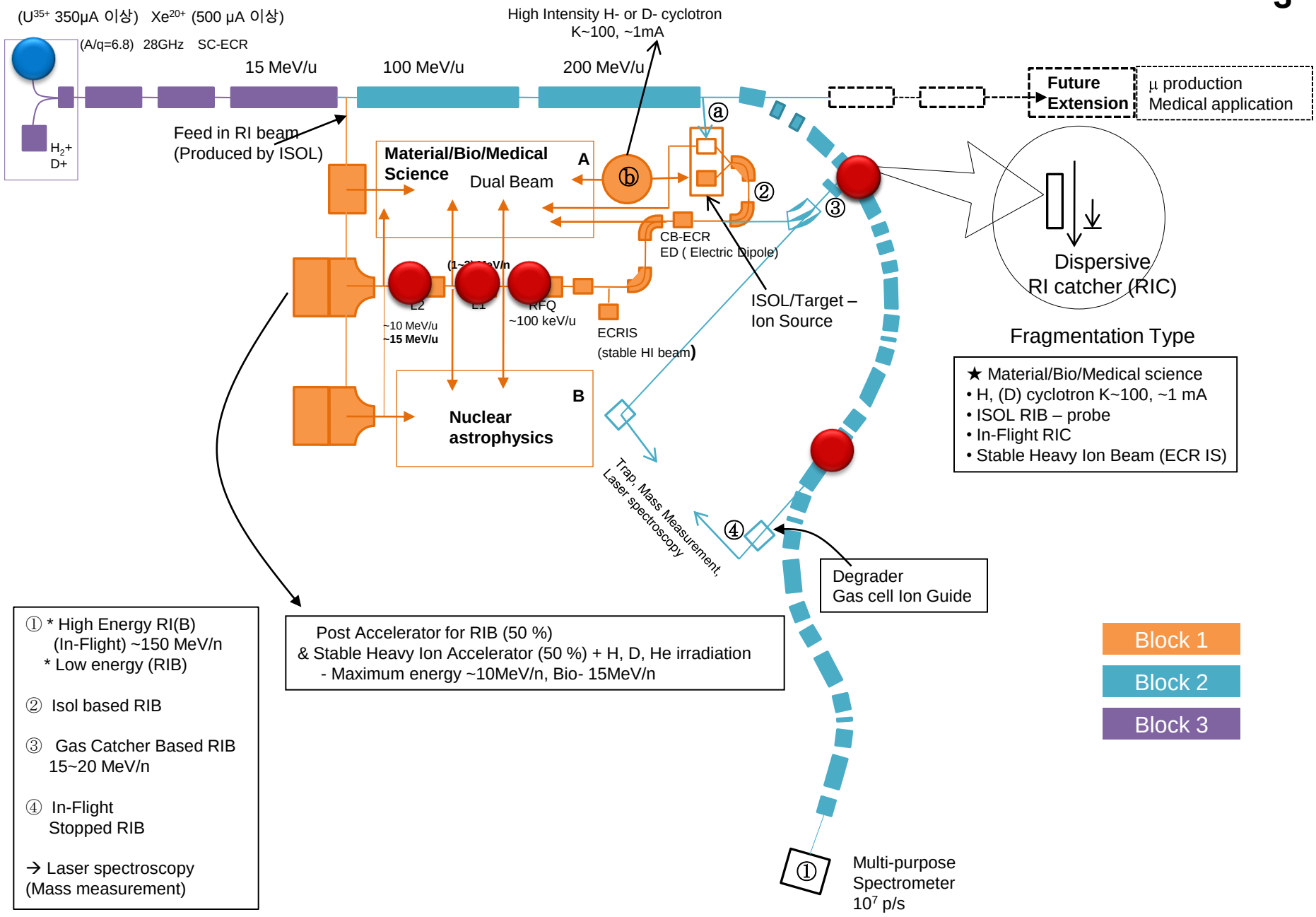
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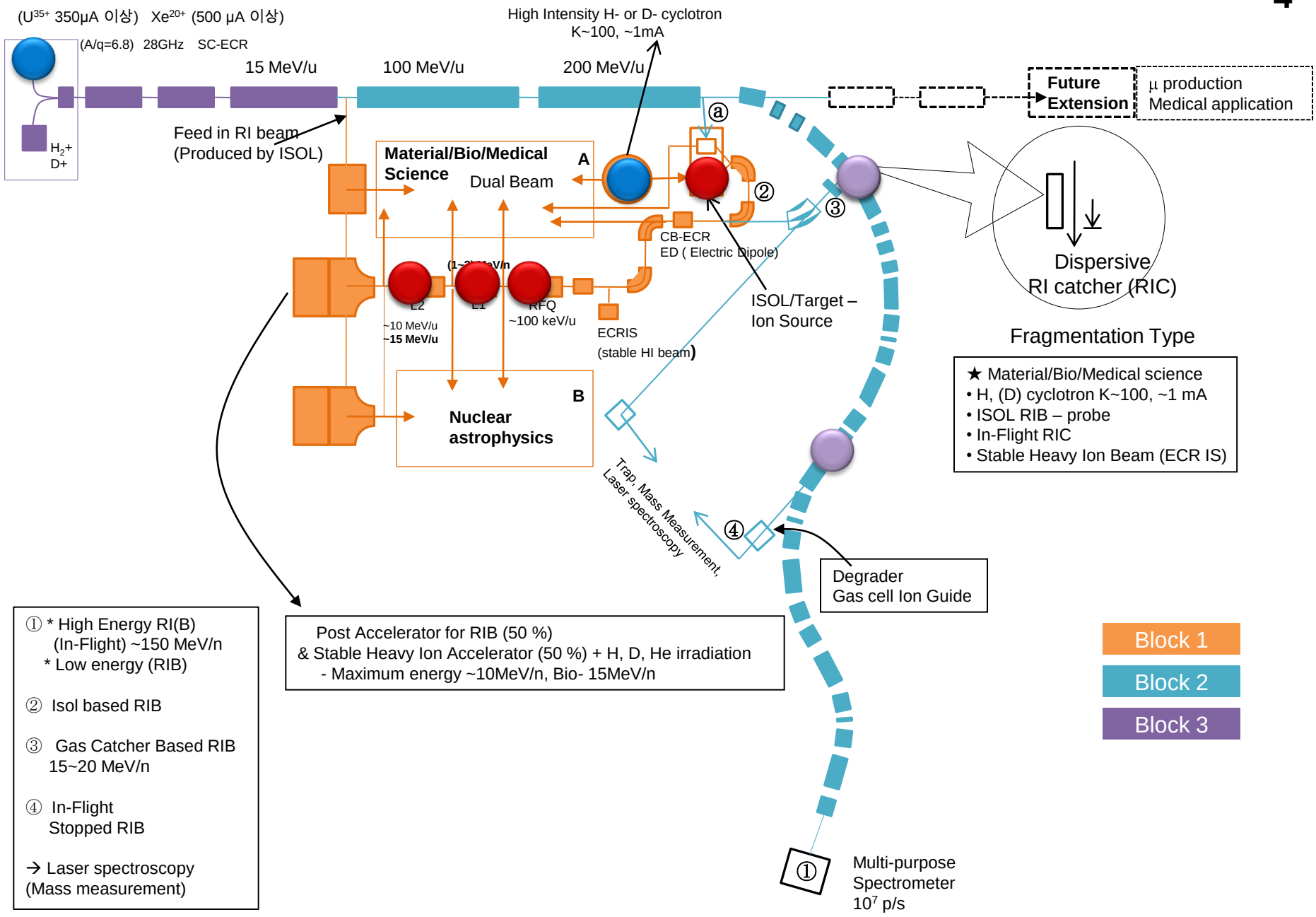
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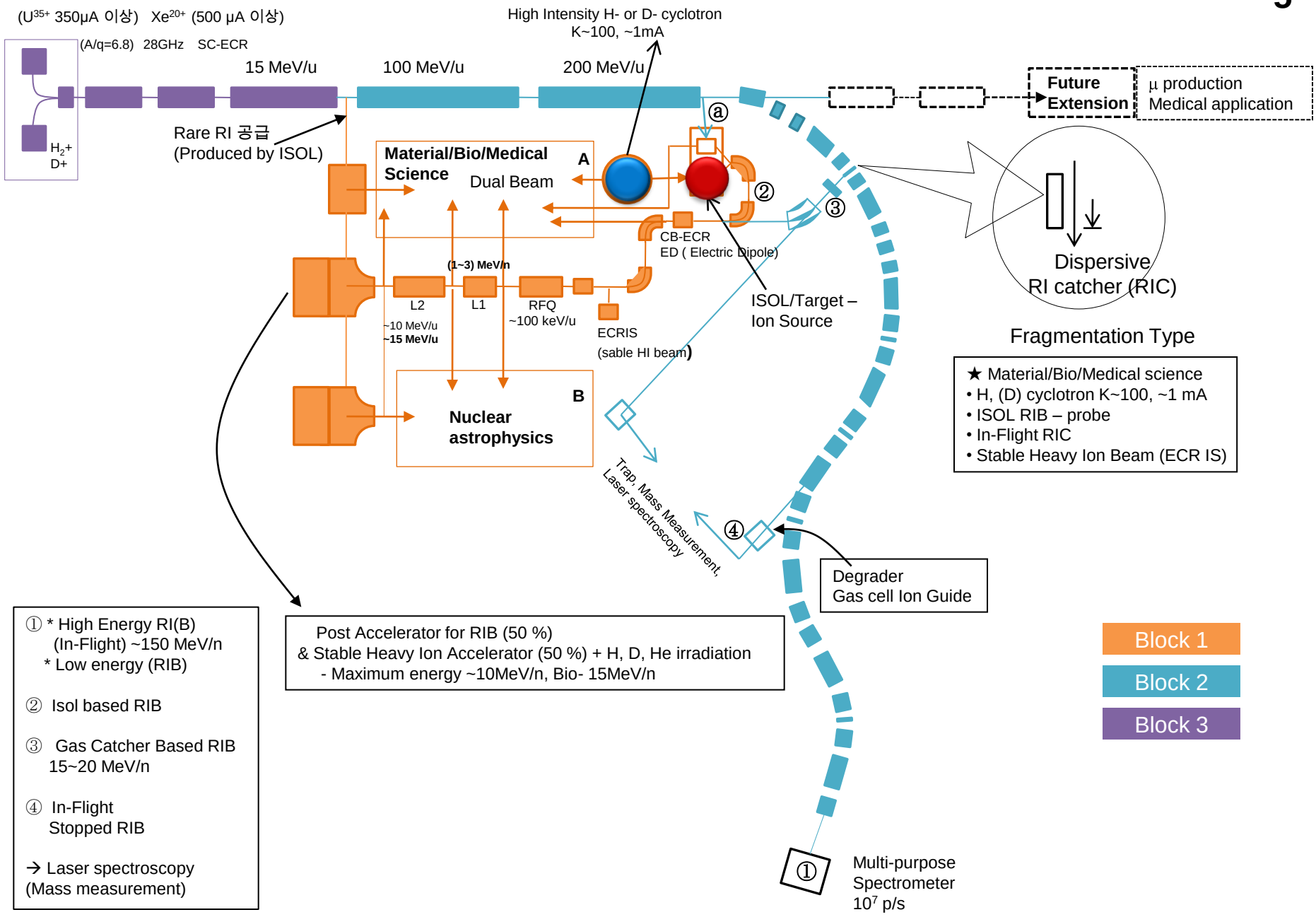
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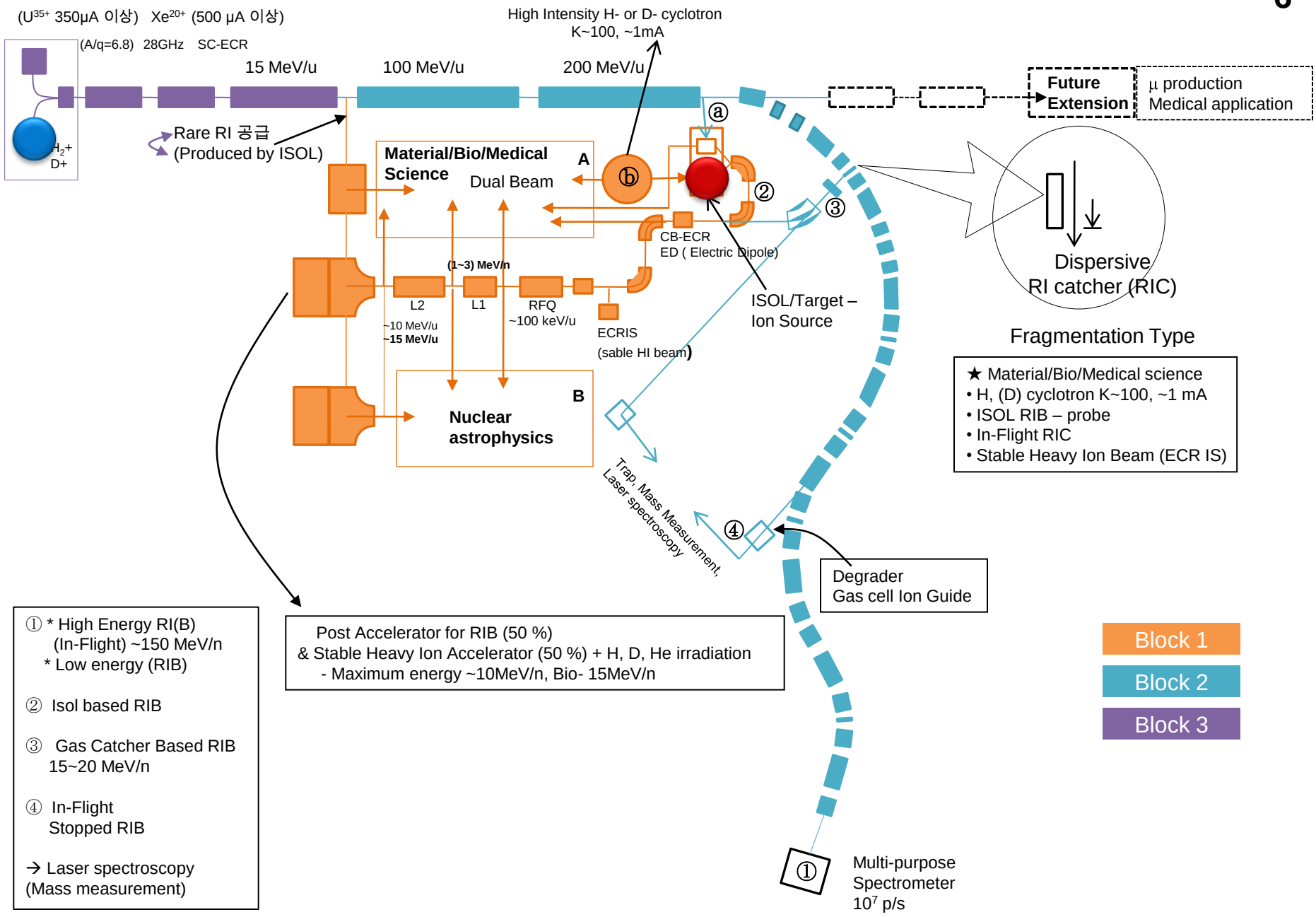
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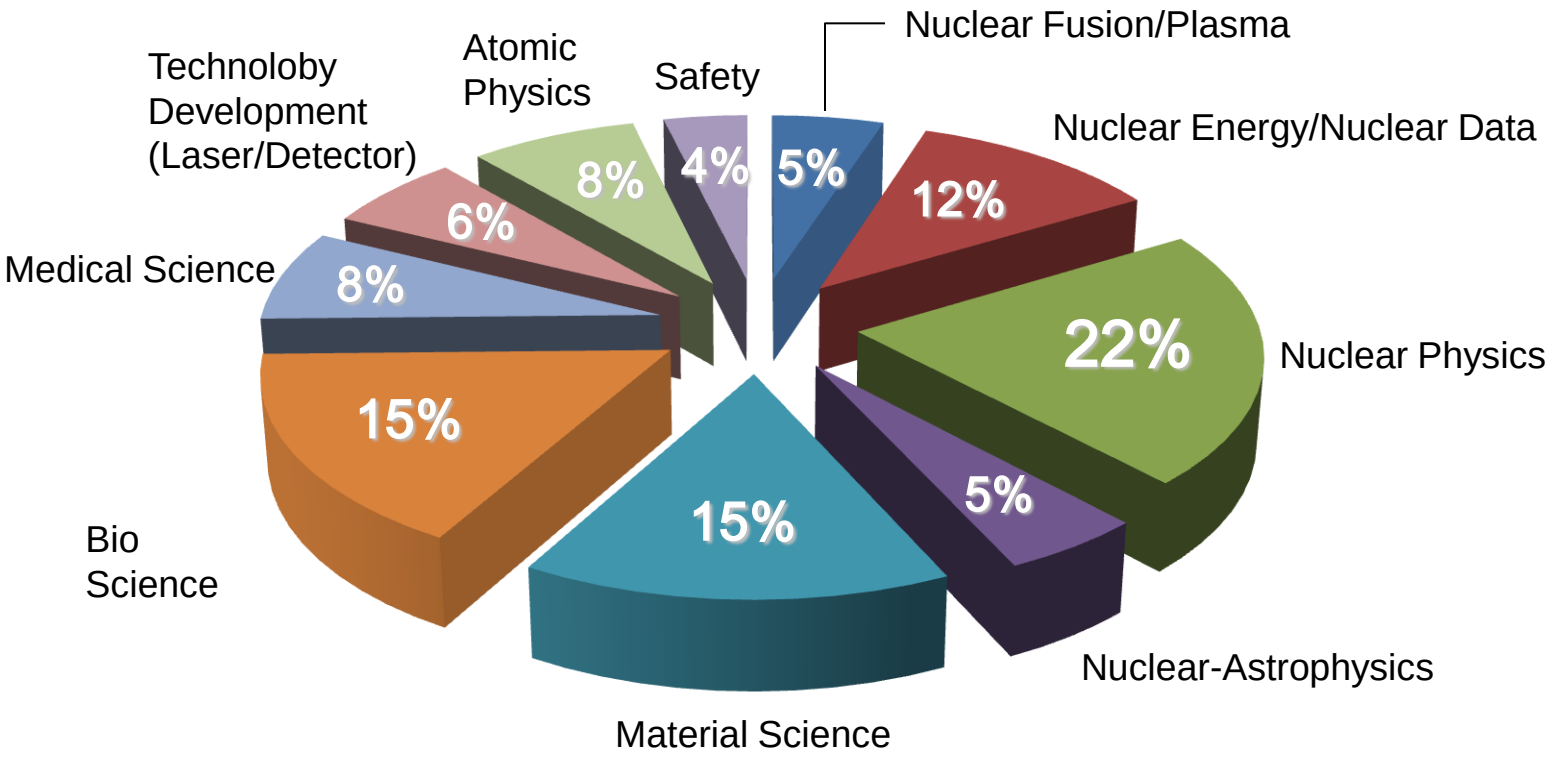
Letters of Intent

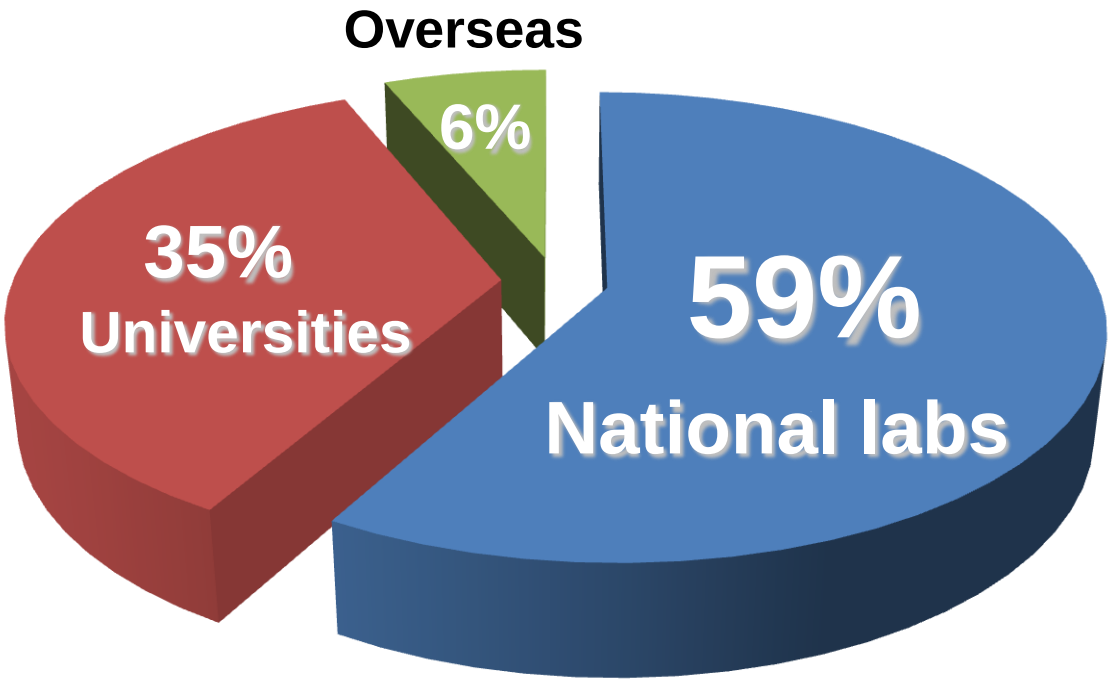
- Call for letters of intent only within Korea in 2009.

- 83 LoI's are received.

Areas of interests

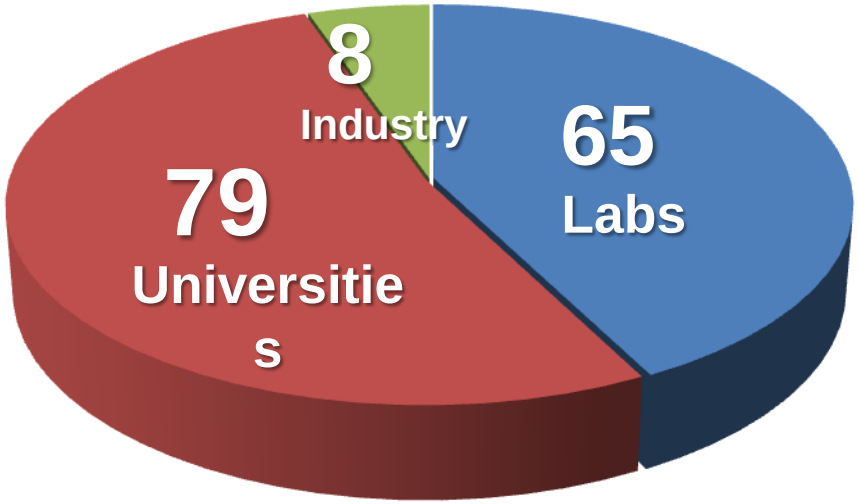


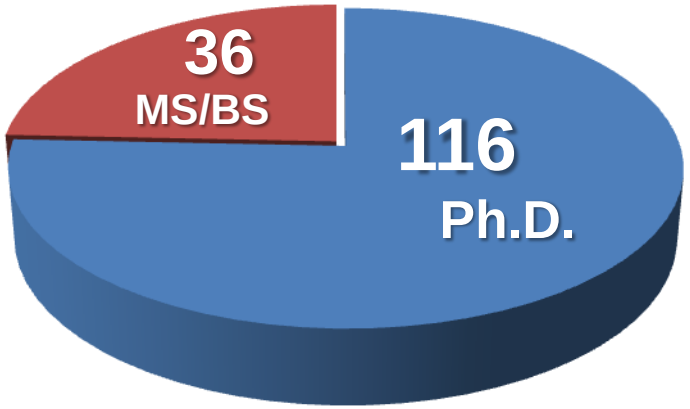
Who submitted LoI?

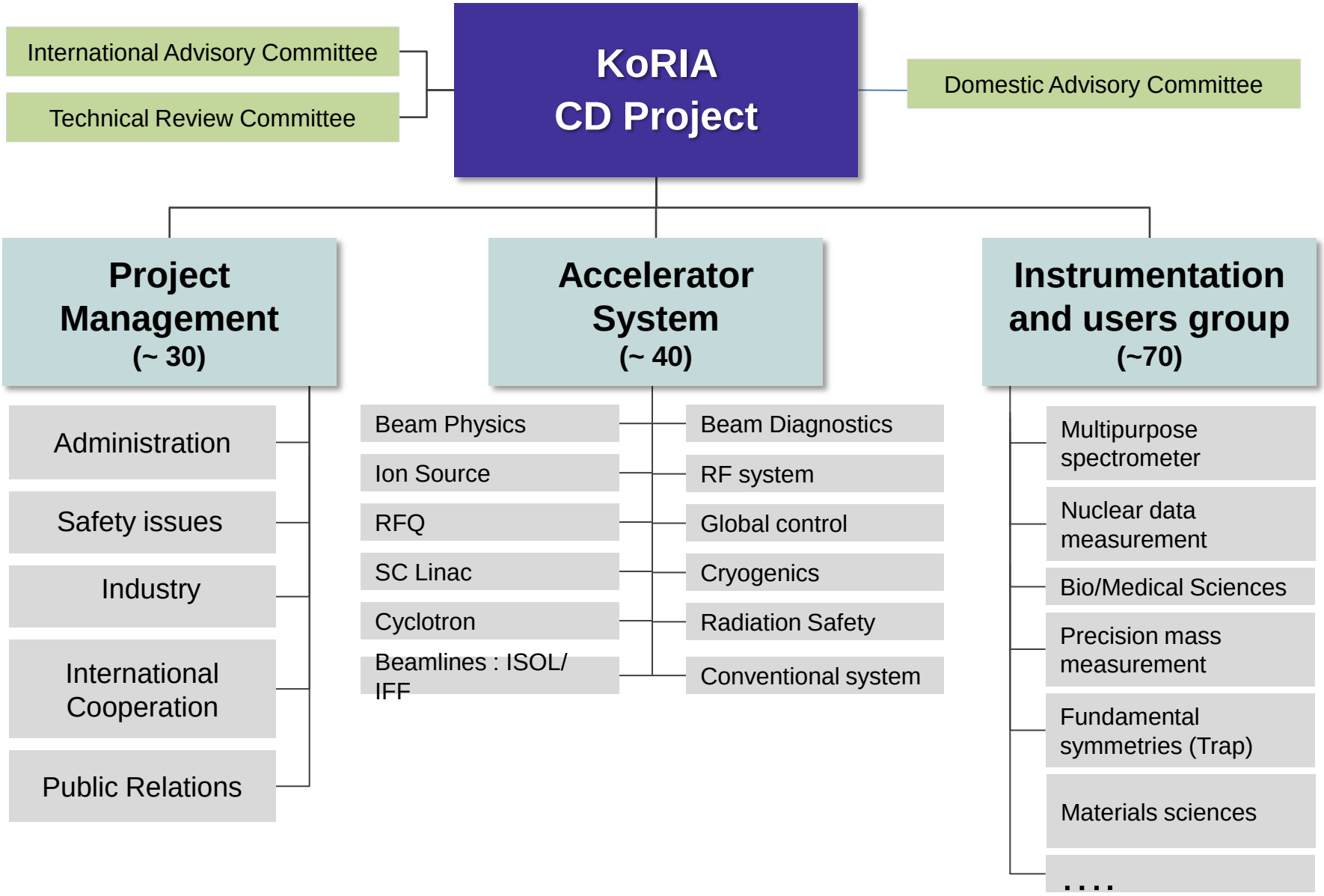


Conceptual Design Project

1. Budget : ~ 1.5M $
2. Period : April ~ November, 2010
3. Manpower : ~ 150 persons






International Advisory Committee
Technical Review Committee
KoRIA
CD Project
Domestic Advisory Committee
Project Management
(~ 30)
Administration
Safety issues
Industry
International Cooperation
Public Relations
Accelerator System
(~ 40)
Beam Physics
Ion Source
RFQ
SC Linac
Cyclotron
Beamlines : ISOL/ IFF
Beam Diagnostics
RF system
Global control
Cryogenics
Radiation Safety
Conventional system
Instrumentation and users group
(~70)
Multipurpose spectrometer
Nuclear data measurement
Bio/Medical Sciences
Precision mass measurement
Fundamental symmetries (Trap)
Materials sciences
. . . .

What we need

- Technology
- Human resources

- To **make this facility unique and complementary** to other facilities existing or under construction
  - Welcome your suggestion.
- Synergies through **international collaboration**
  - MoU: CERN, ISOLDE Collaboration, HIE-ISOLDE, PSI,
  - Individual: ANL, ORNL, MSU, FNAL, TRIUMF, RIKEN, KEK, GANIL, GSI, SPES, and others
  - KoRIA is an agenda for Korea-US Joint Committee Meeting on Science and Technology Cooperation (June 14~15)
- Budget

Summary

- We want this facility to be designed as an international users' facility from the initial stage.
- International collaboration is essential.
- We are open for international collaboration and discussions to improve the very preliminary conceptual schematic diagram.
- R&D studies on the "instrumentation" is part of the conceptual design project.
- A Workshop will be held in Korea in **Oct 1~2, 2010** as the 2nd **ANPhA** (Asian Nuclear Physics Association) Symposium.

May look cloudy and uncertain now….

Thank you!