Korean Physical Society 2015 Fall Meeting
ANPhA Symposium
Hwabaek Convention Center, Gyeonju
2015. 10. 21 (Friday)

Overview of Rare Isotope Science Project (RISP)

Jaehong Kim
Project Integration Division

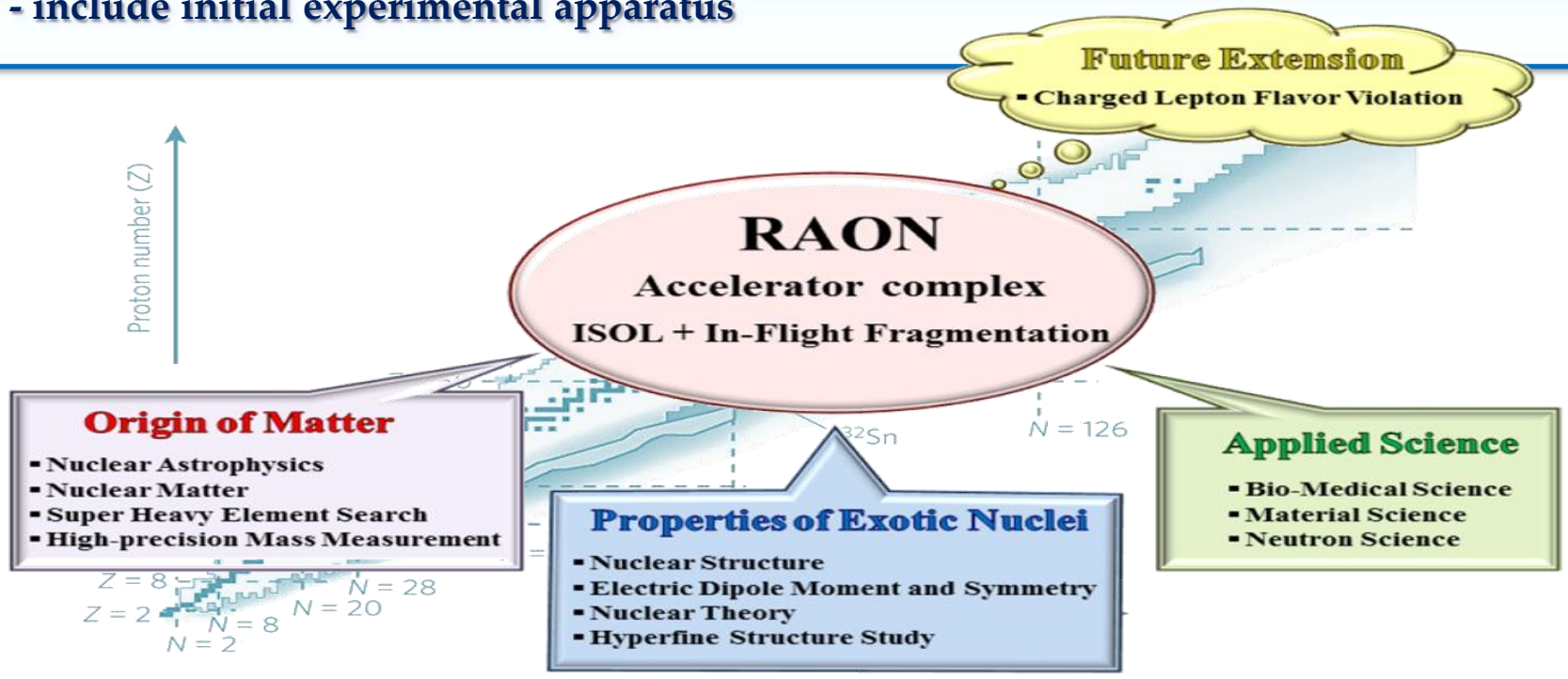
Outline

I. Rare Isotope Science Project (RISP)

- ○ Goal : To build a heavy ion accelerator complex for rare isotope science researches in Korea
- ○ Project period : 2011.12 - 2021.12
- ○ Total Budget : ~$ 1.44 billion

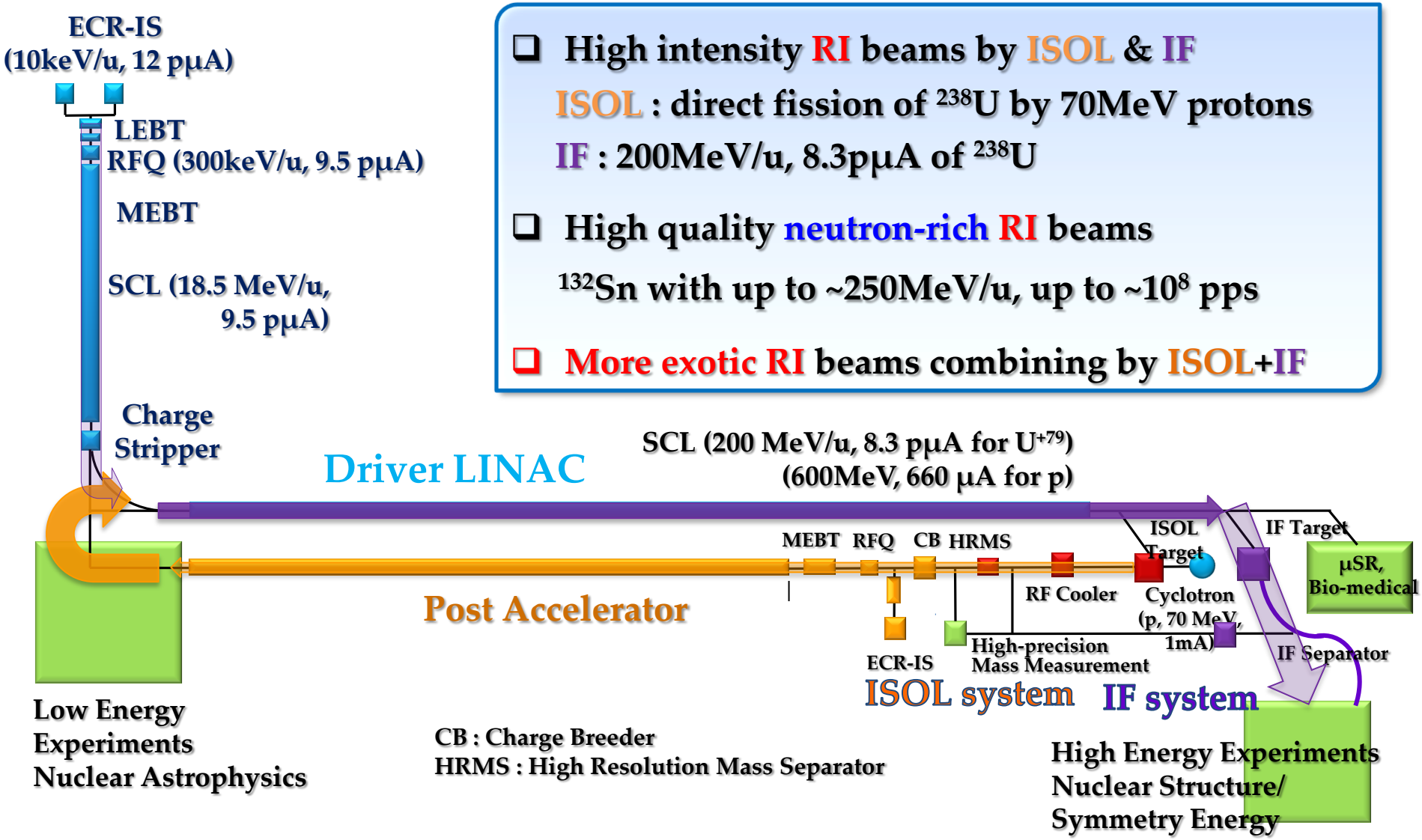
(Facilities ~ $ 0.46 bill., Bldgs & Utilities ~ $ 0.98 bill.)

- include initial experimental apparatus



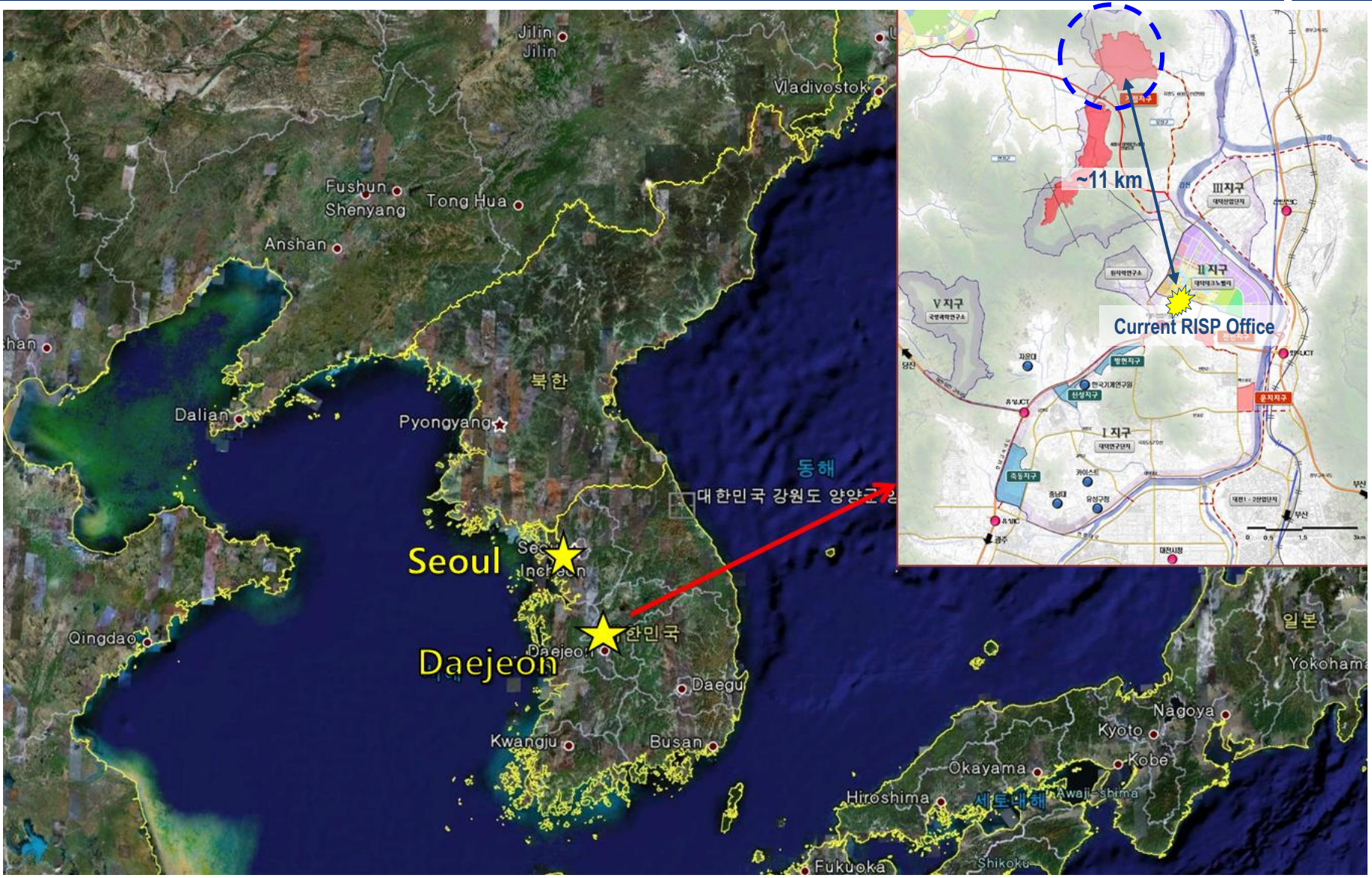
Design of the RISP Facility

- High intensity RI beams by ISOL & IF
  - ISOL : direct fission of ^{238}U by 70MeV protons
  - IF : 200MeV/u, 8.3pμA of ^{238}U
- High quality neutron-rich RI beams
  - ^{132}Sn with up to ~250MeV/u, up to ~10^8 pps
- More exotic RI beams combining by ISOL+IF

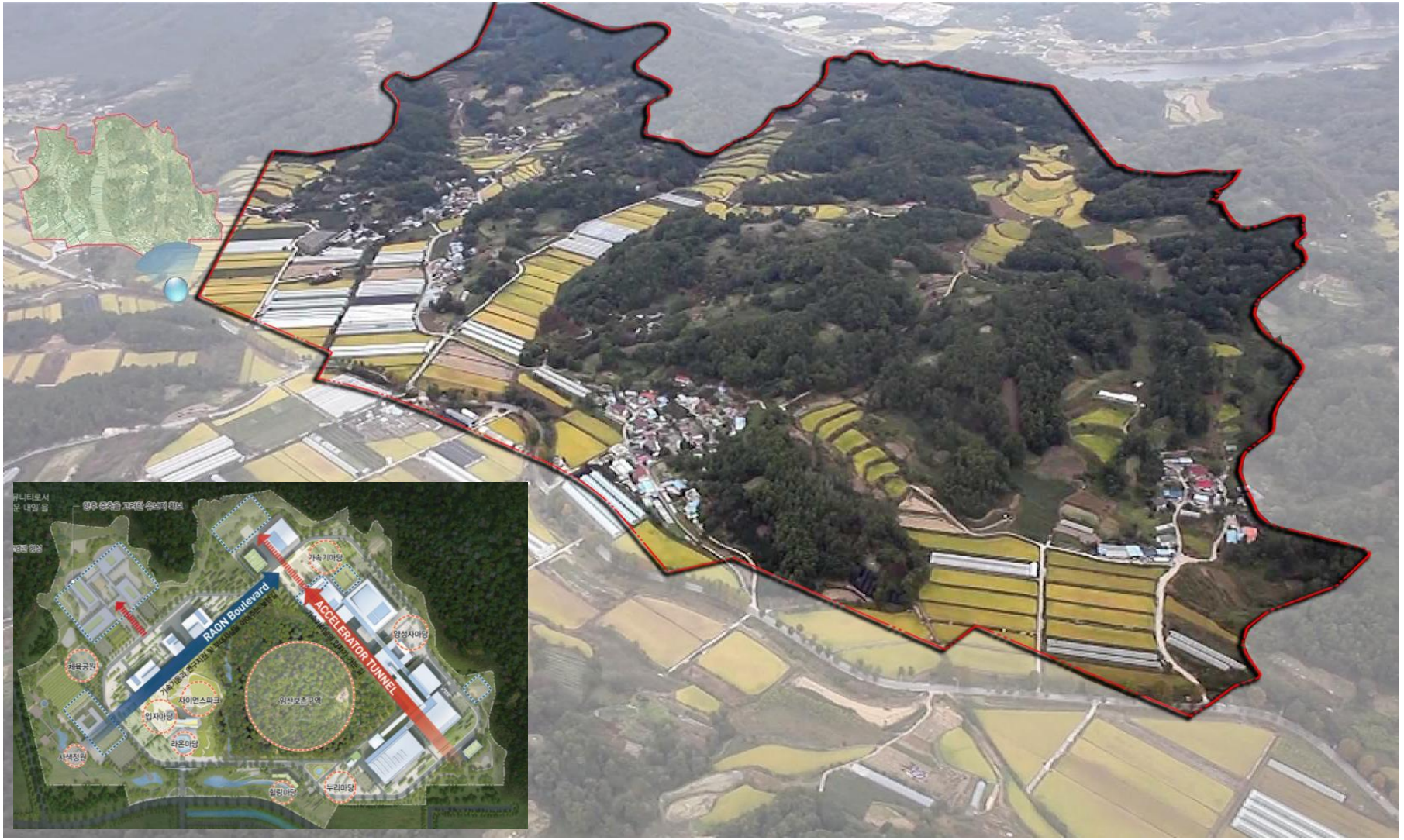


Bird's eye view of the RISP Facility

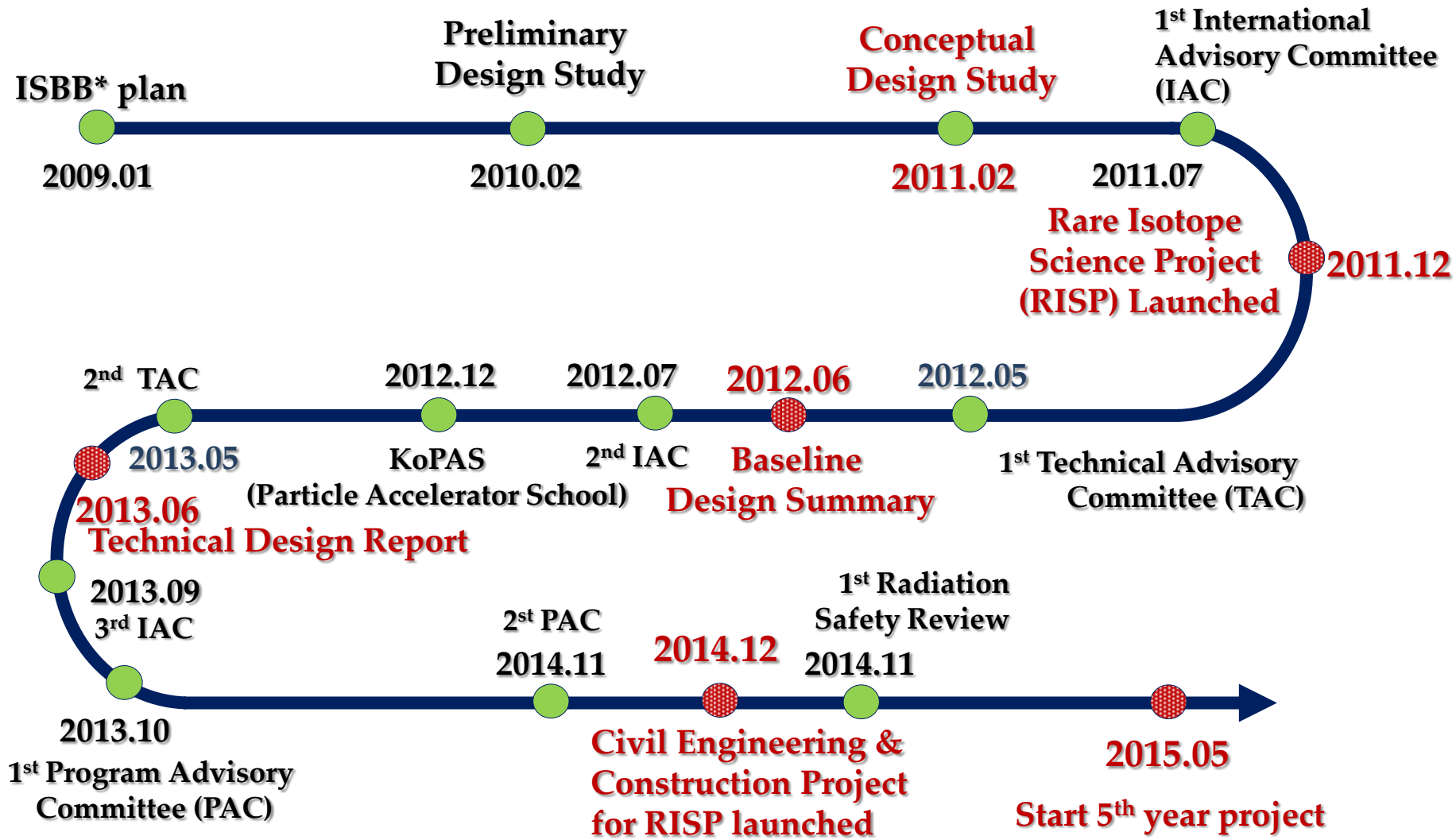
Location of the RISP Facility



Snapshot of the RISP site

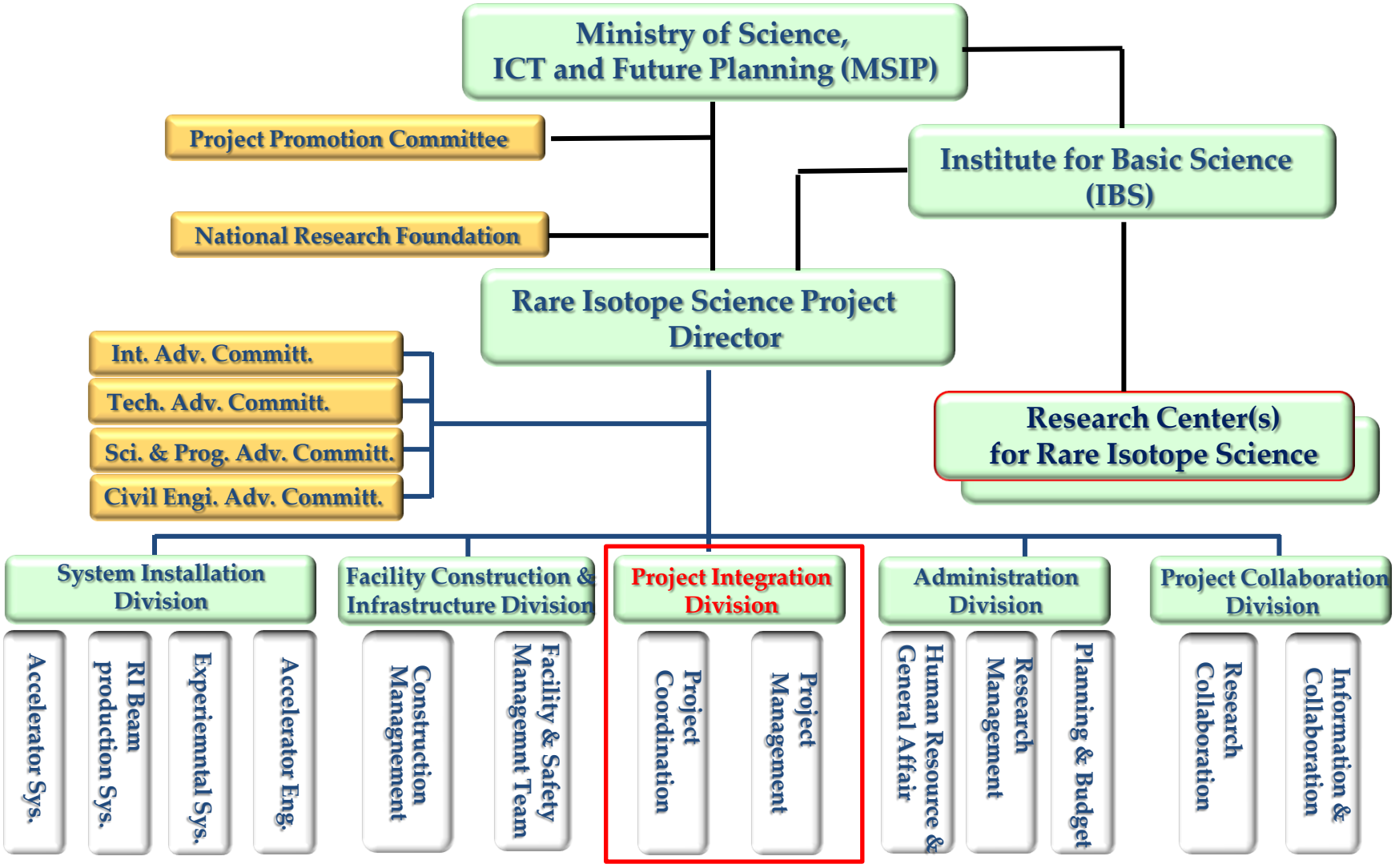


History of the RISP



* ISBB : International Science Business Belt

RISP Organization with Advisories

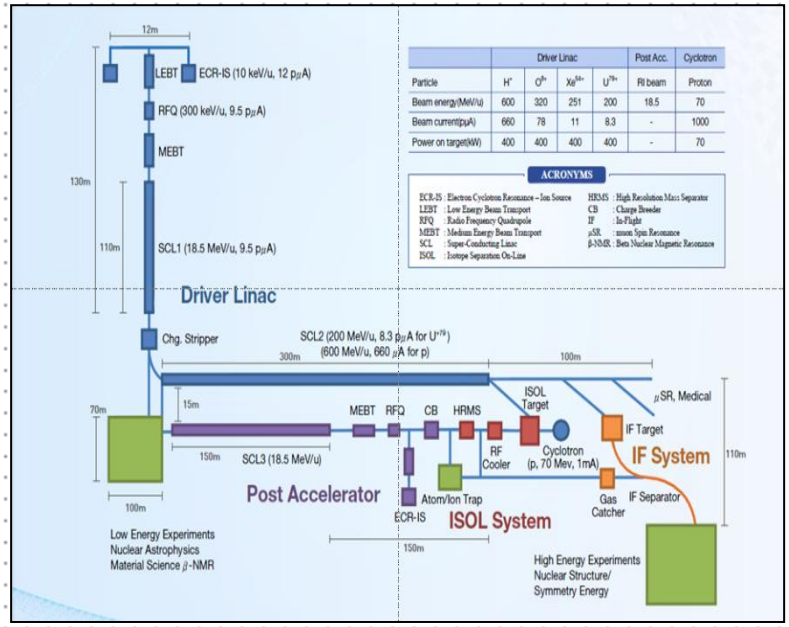


Integrated Project Management

- **Well-defined Scope, Cost, Resources and Schedule**
- **Within budget and with high quality**

System Installation

Development of a Superconducting LINAC for Heavy Ions of 200MeV/u, 400kW



Conceptual Design

Match

Civil Construction

Conventional Facilities and Civil Construction

※ Tunnel, Experimental buildings, Utilities, Guest Houses

View of RISP

Project Management System(PDCA)

FEEDBACK (Monthly operated)

PLAN

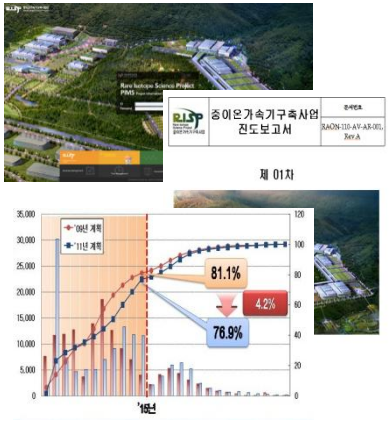
- 기본계획에 따른 사업목표, 관리기준 사업비, 통합사업관리 계획에 따라,
- 기본공정표, 관리기준 공정표 계획을 수립
- 사업비계획 및 종합 진도율 계획을 수립

DO

- 관리기준공정표를 기초로 시행공정표를 작성하고,
- 제반 업무절차에 따라 연구개발, 장치구축, 시설건설을 추진

CHECK

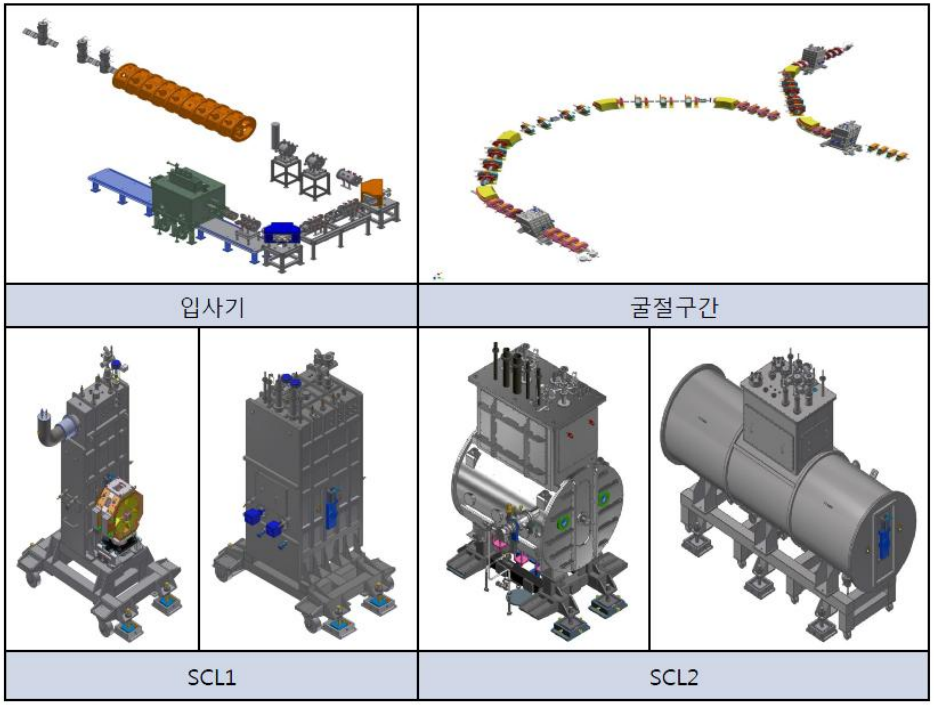
- 사업정보관리시스템에 담당별 관련 실적정보를 입력
- 이를 통해 주·월간 예산집행, 종합진도율, Activity 일정, 계약 및 기성 등 사업정보 취합
- 분석하여 진도보고서 제공 및 공유



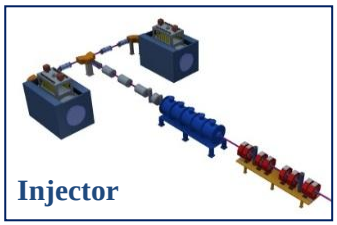
ACTION

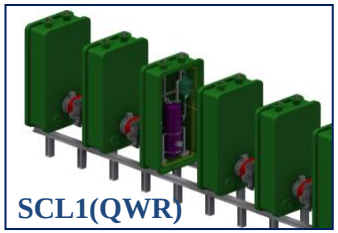
- 진도보고서의 분석을 통한 현황 및 현안사항을 사업관리회의체 운영을 통해 전파
- 사업조정 및 의사결정
- 부진공정/만회대책
- 세부 전략목표 수립

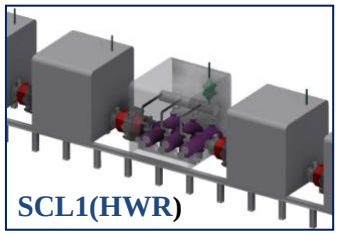
II. Accelerator and Experimental Systems Layout

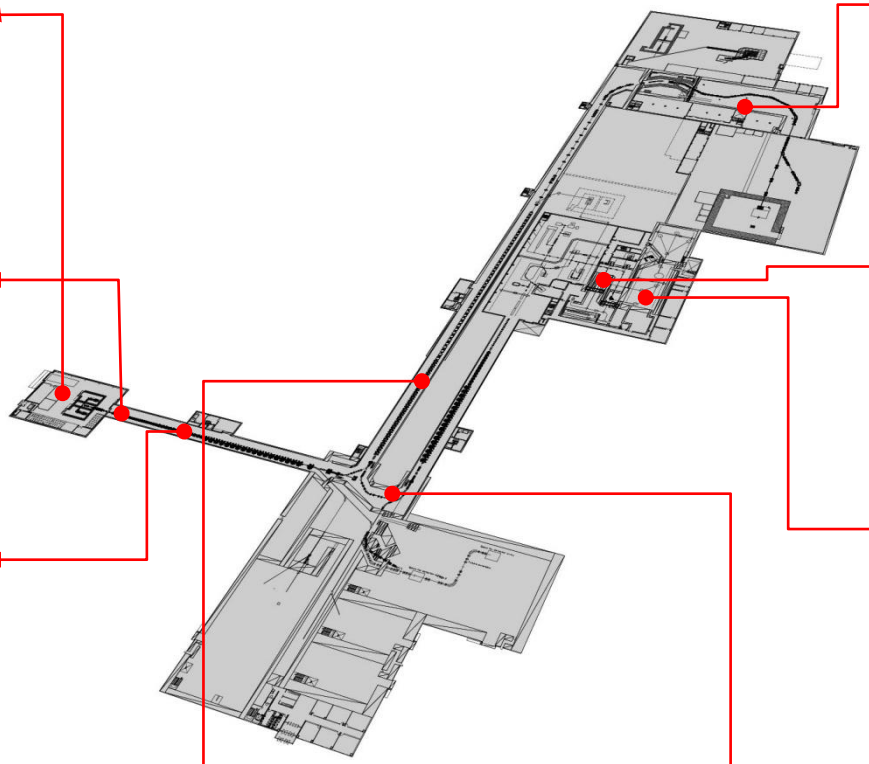


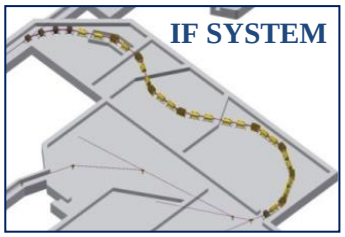
Status of accelerator systems

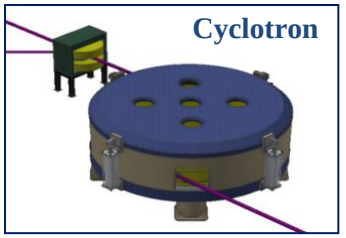


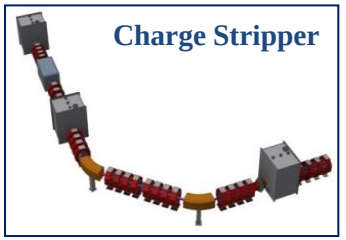






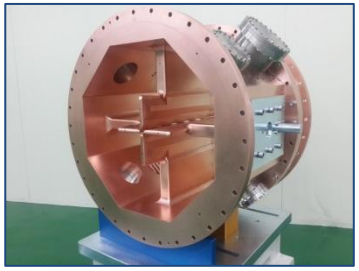




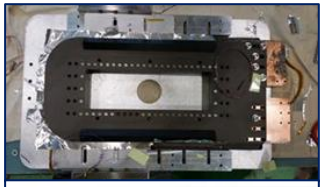


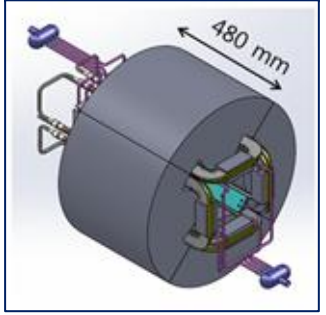
Technical development on Track

28 GHz ECR Ion Source



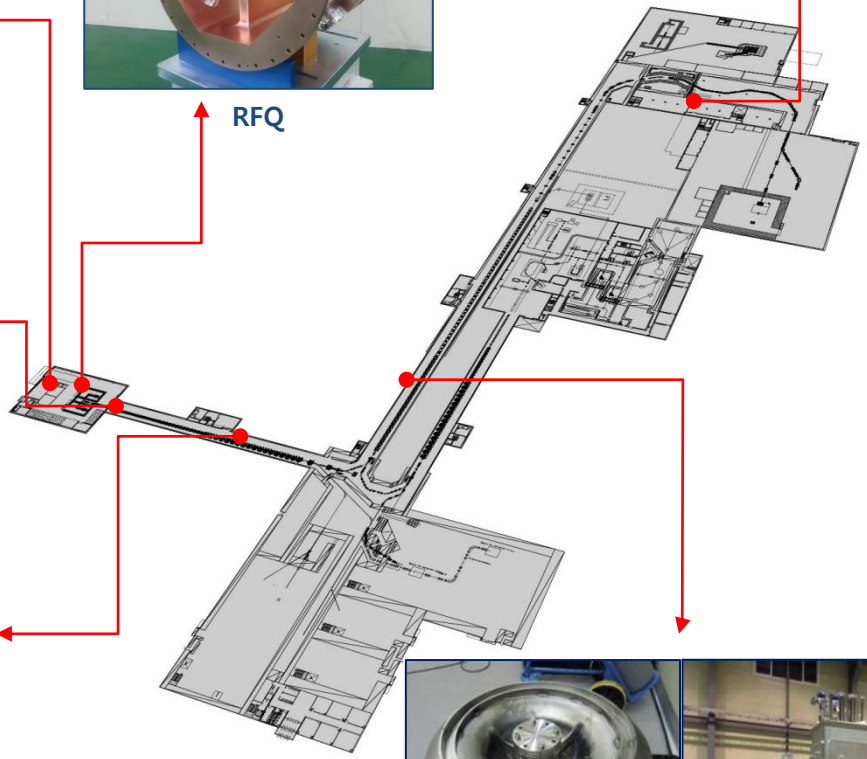
RFQ





HTS Q-magnet

QWR SC Cavity & its Cryomodule

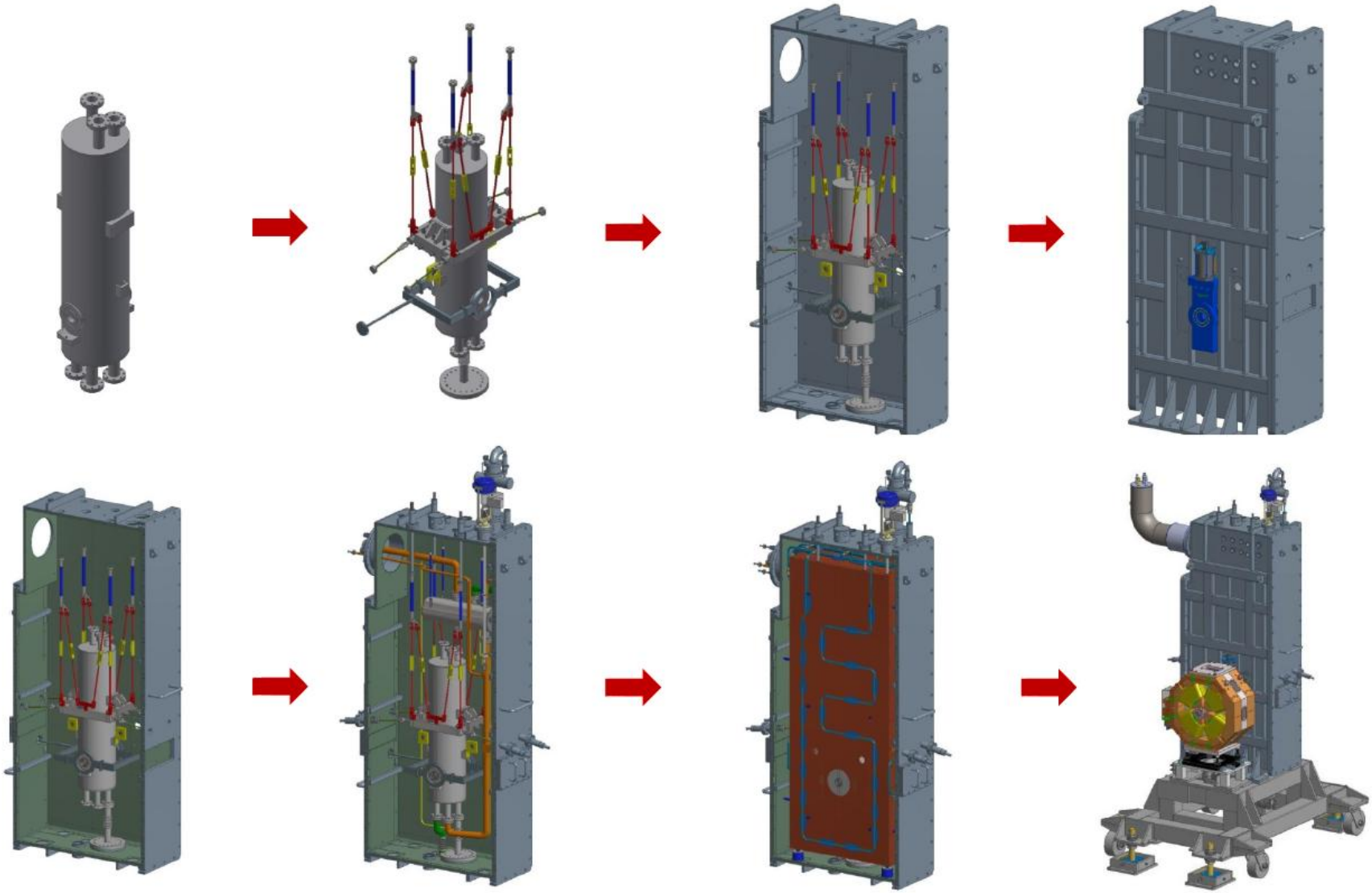


HWR SC Cavity & its Cryomodule

SSR SC Cavity and its Cryomodule

QWR Cavity/Cryomodule Assemble

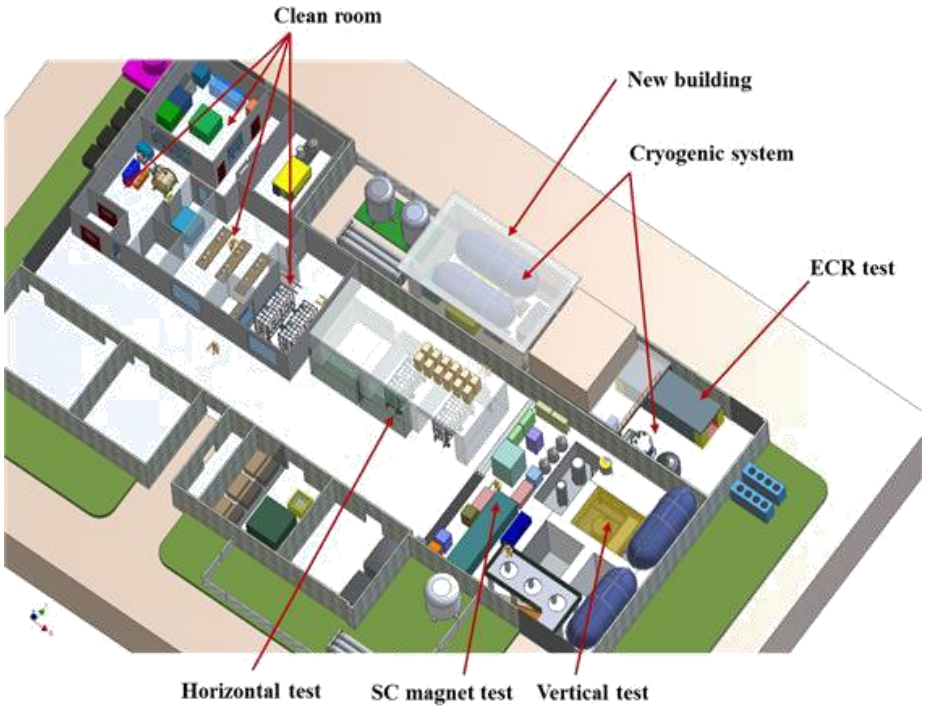
- **Domestic Manufacturing can be transferred Technology to Industry**



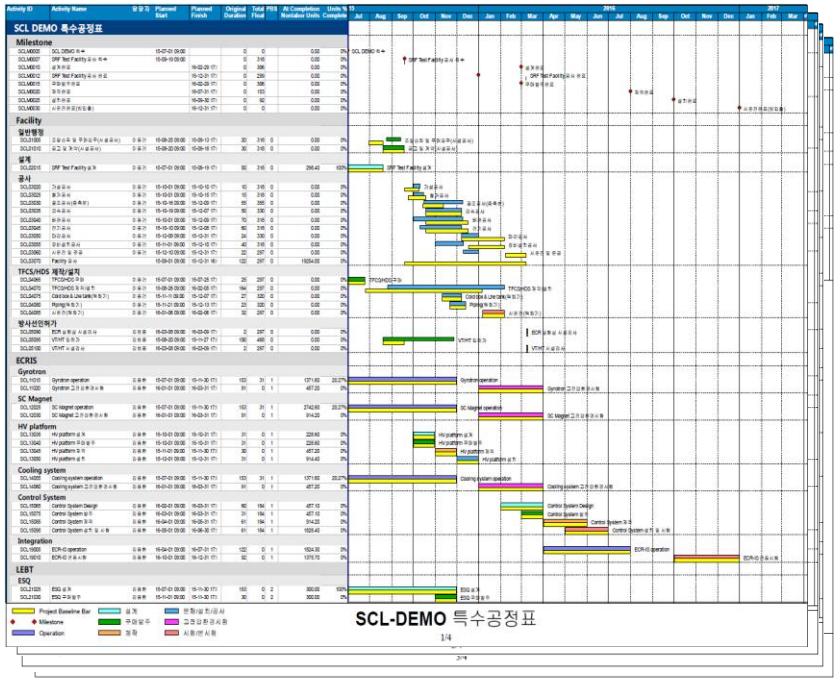
SRF Test Facility Layout

- For the test of SC cavities and cryomodules
- Under construction for the operation from the early of 2016

[Conceptual 3D Design]



[Project Management]

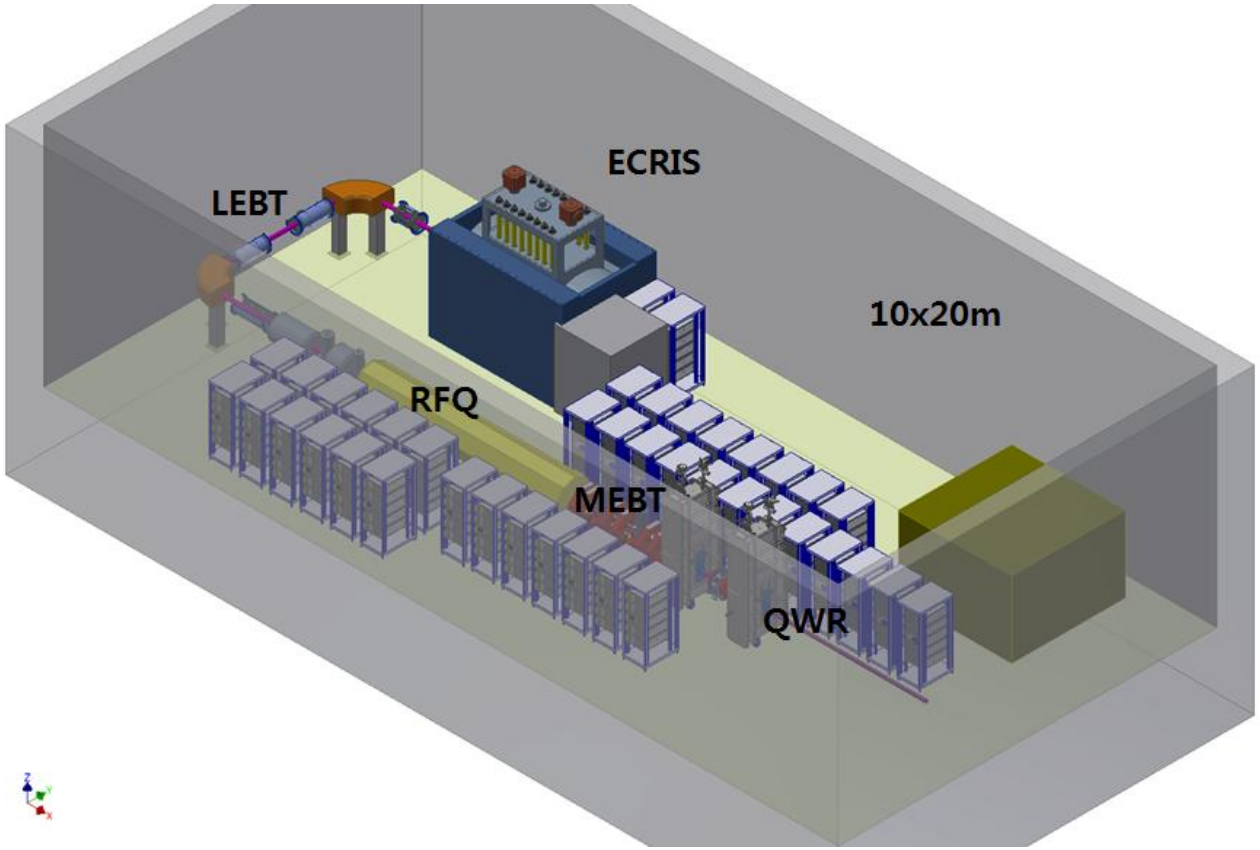


SCL Demo System

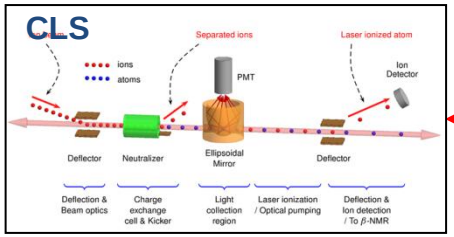
- **For integral test of key accelerator components**
- **Systems to be installed :**

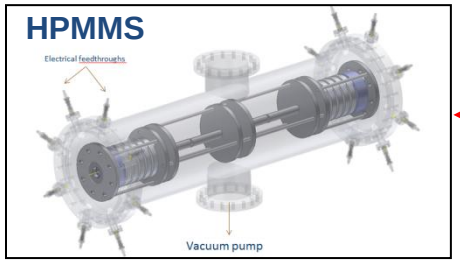
  - ECR-IS, LEBT, RFQ, MEBT, 2QWR cryomodules

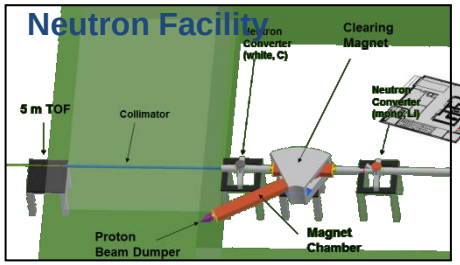
  - Aux systems: Cryogenic system, RF system, Beam diagnostics, Beam dump, etc.

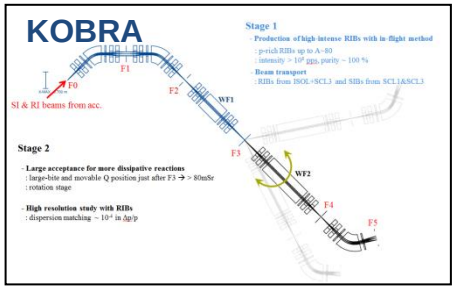


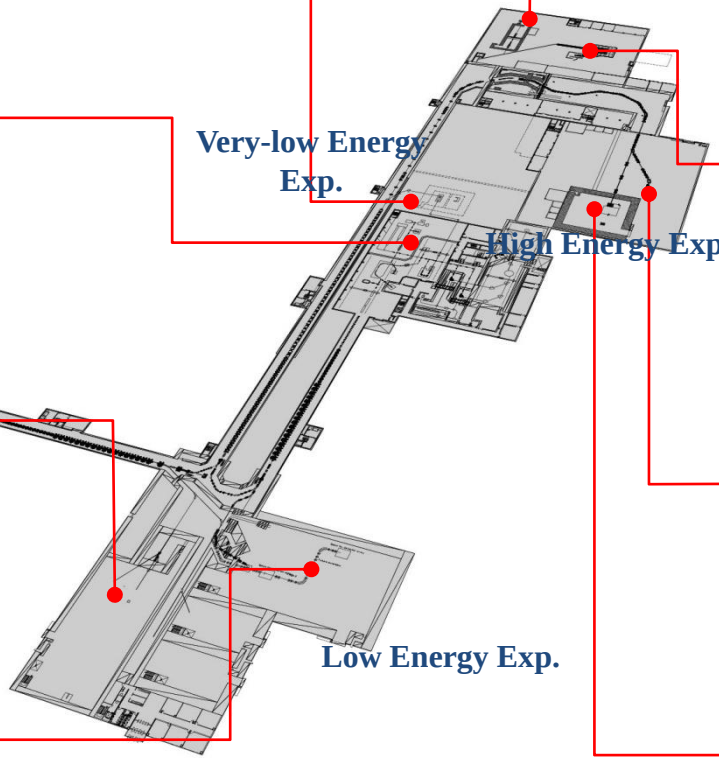
Status of experimental system

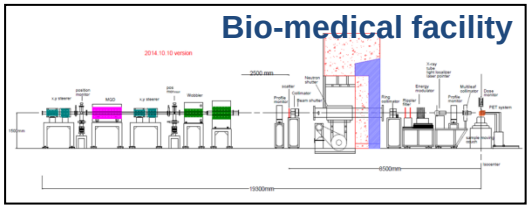


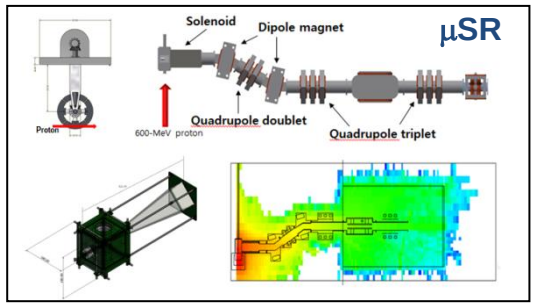


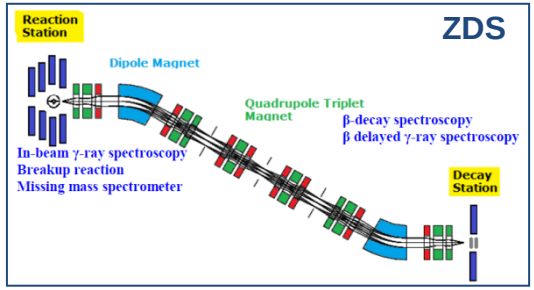


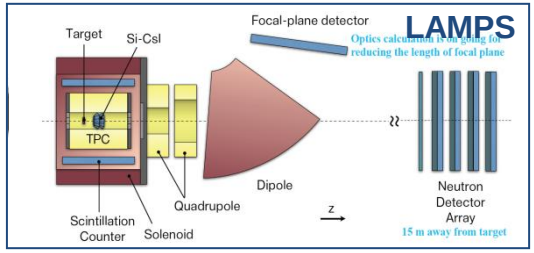






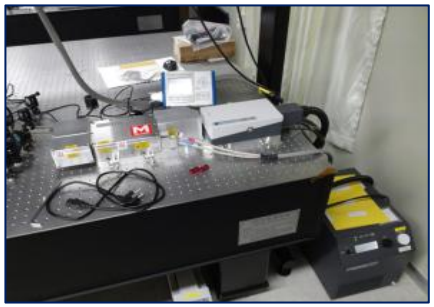




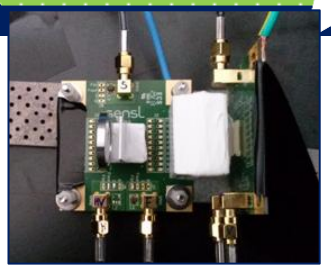


Prototypes of experimental system

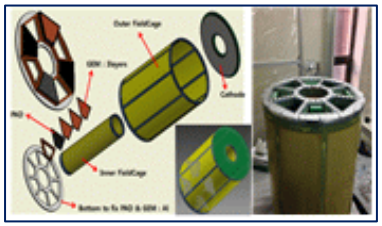
Gamma array



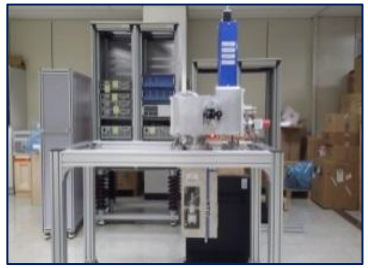
LASER for Collinear
Laser Spectroscopy



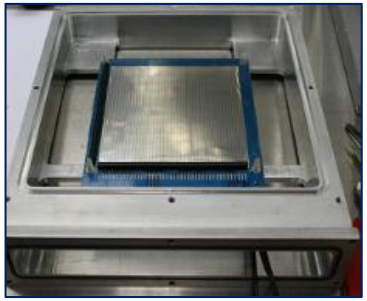
β-detection System for μSR



Time Projection Chamber



ISOL Beam Diagnotics

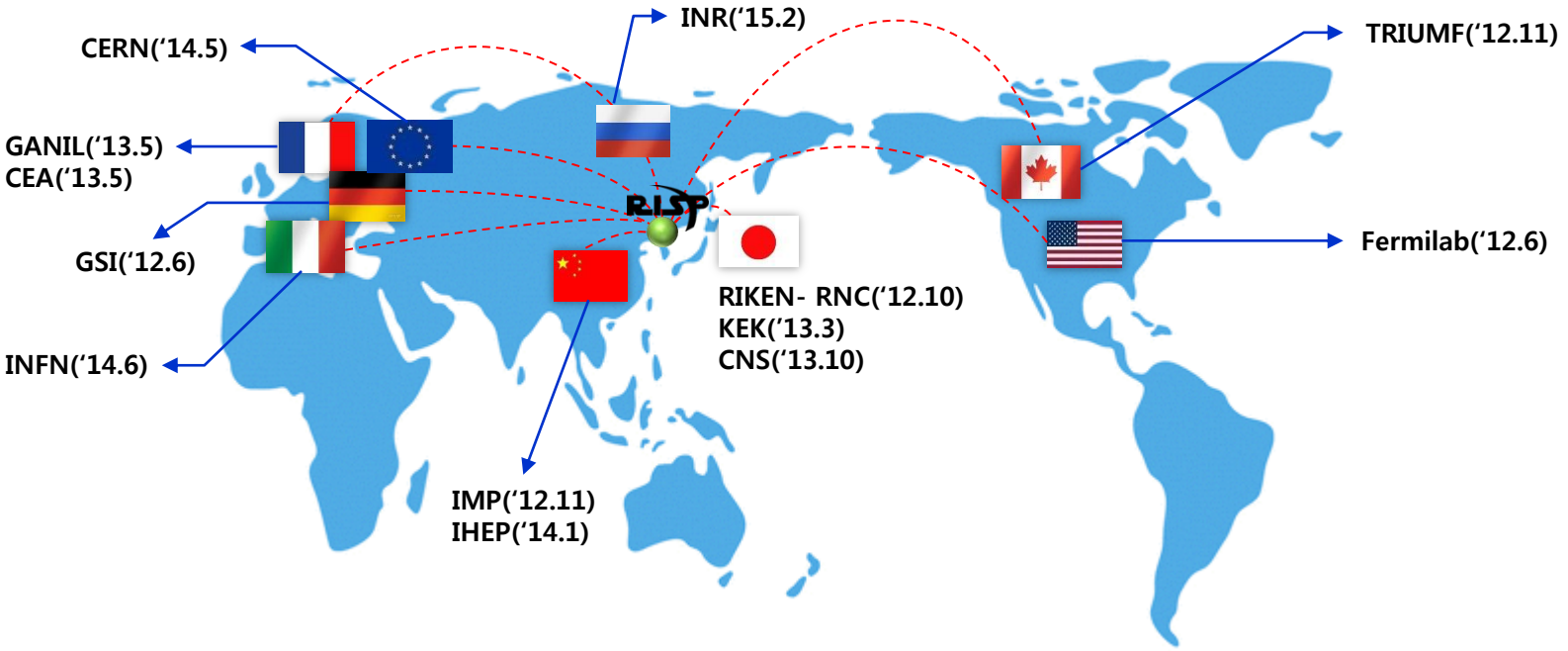


Beam Tracking Detector (PPAC)

ISOL target

Collaborations Make RISP Successful

International collaboration (9 countries, 13 Institutes)



Domestic Collaboration (5 institutes)

KAERI 한국원자력연구원 Korea Atomic Energy Research Institute ('12.11)

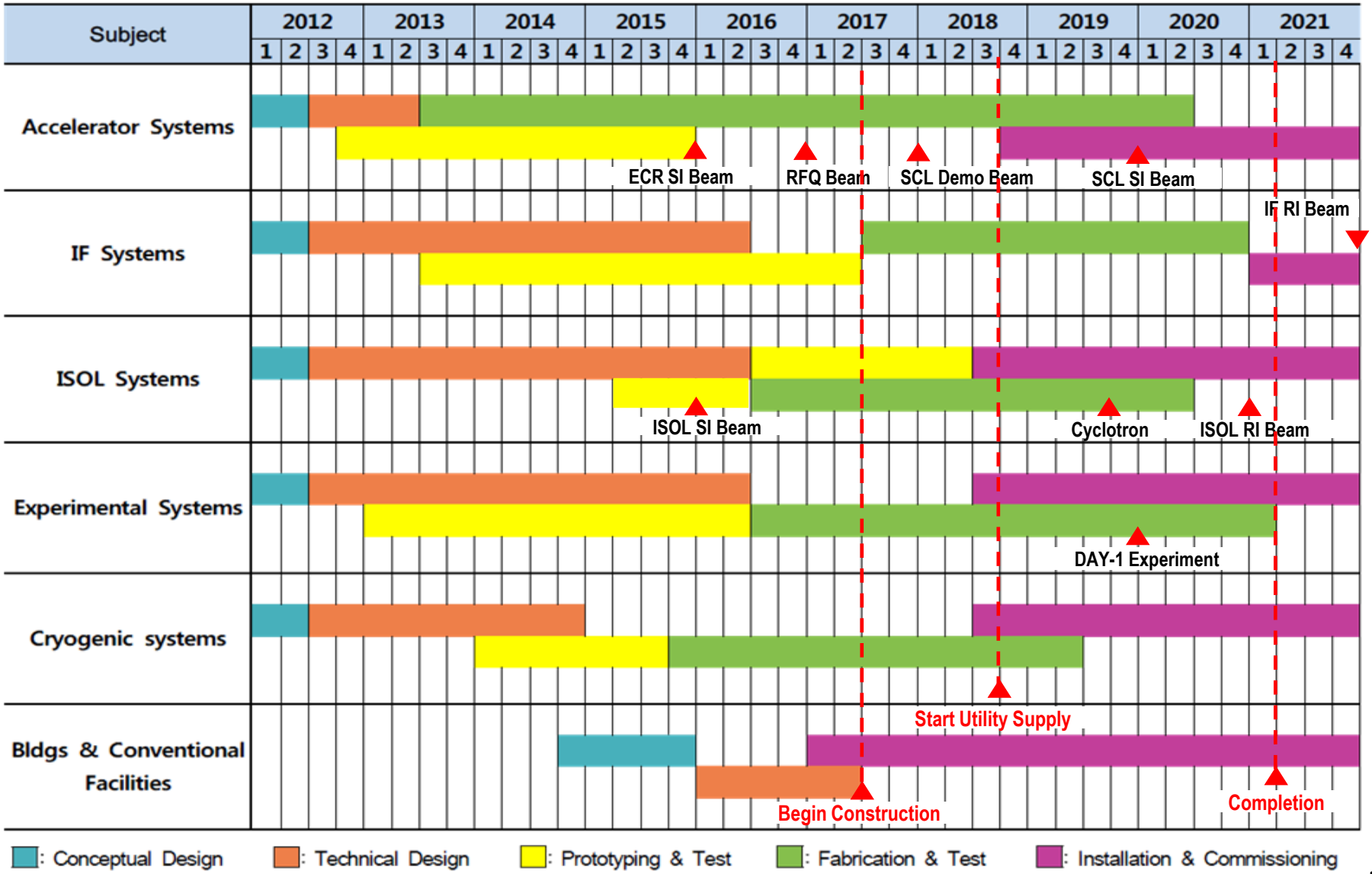
KOREA UNIVERSITY 고려대학교 ('13.4)

KIRAMS 한국원자력의학원

PAL 포항가속기연구소 POHANG ACCELERATOR LABORATORY

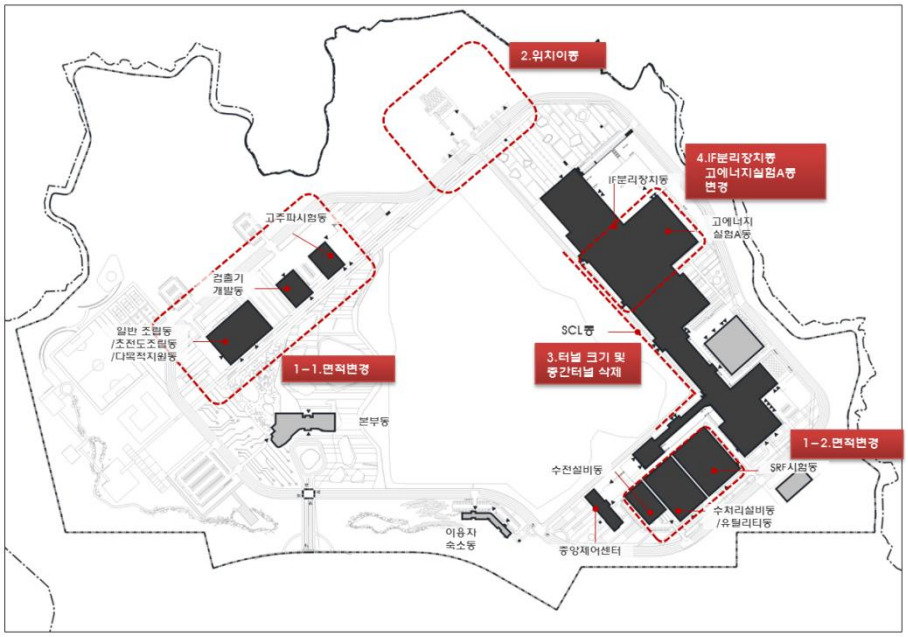
NFRI 국가핵융합연구소 National Fusion Research Institute ('13.8)

III. RISP Milestones and Schedule

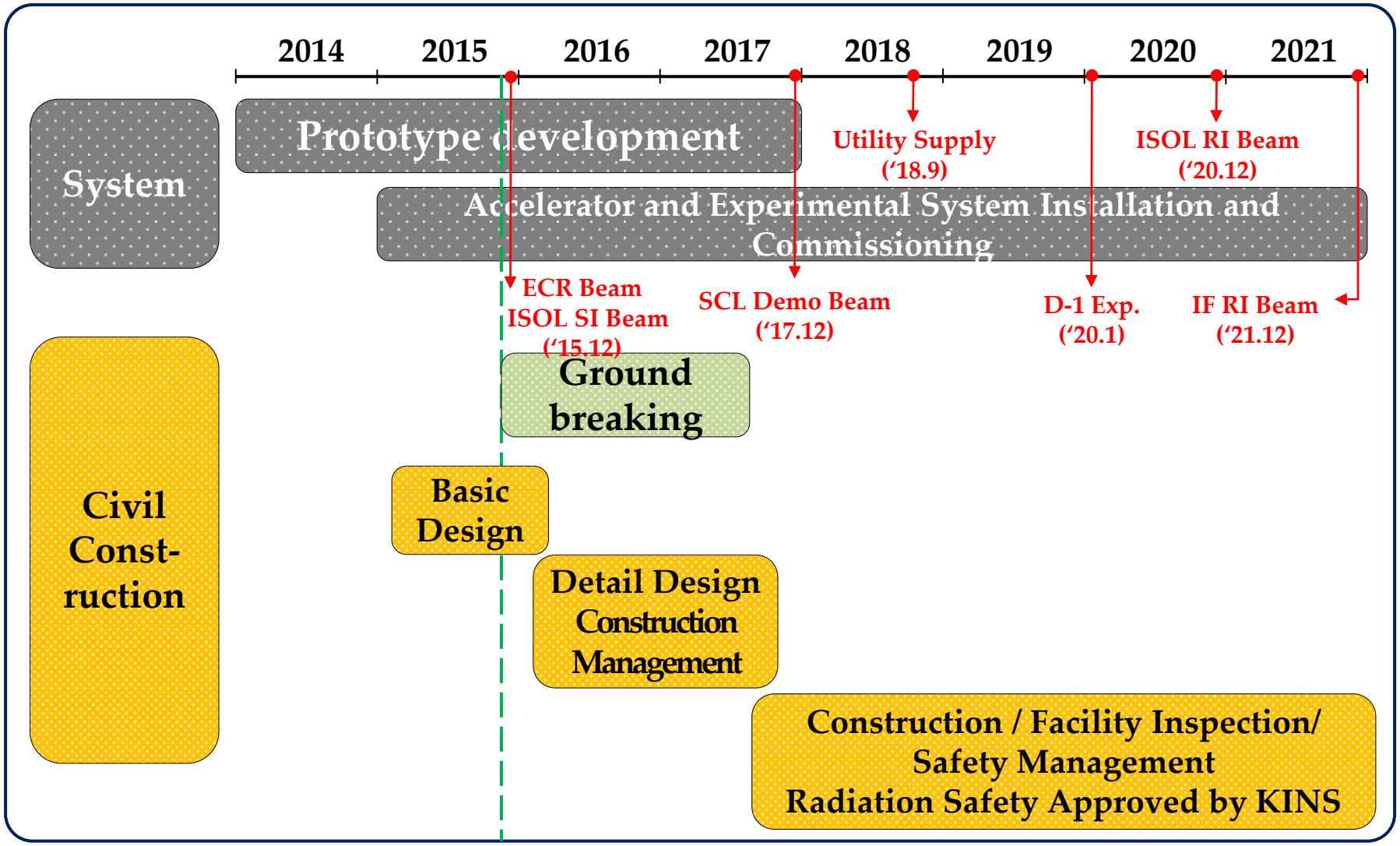


Civil Design is underway

Time Schedule



Major Milestones



Progress of sub-systems of RISP(8.31)

종합 진도율

시제품	85.39%	본제품	6.42%

1 입사기시스템


이온빔 생성 및 주입 장치
ECR-IS[1]/LEBT[2]/RFQ[3]/MEBT[4]로구성
[1] Superconducting Electron Cyclotron Resonance Ion Source
[2] Low Energy Beam Transport
[3] Radio Frequency Quadrupole accelerator
[4] Medium Energy Beam Transport

시제품	87.37%	본제품	시제품시험 완료 후 본제품전환

2 초전도선형가속기1

초전도 이온원에서 인출된 안정된 중이온 빔을18.5MeV/u 까지 가속하는 초전도 선형 가속기(QWR[5], HWR[6] 초전도 가속관으로 구성)
[5] Quarter Wave Resonator
[6] Half Wave Resonator

시제품	93.37%	본제품	–

3 초전도선형가속기2

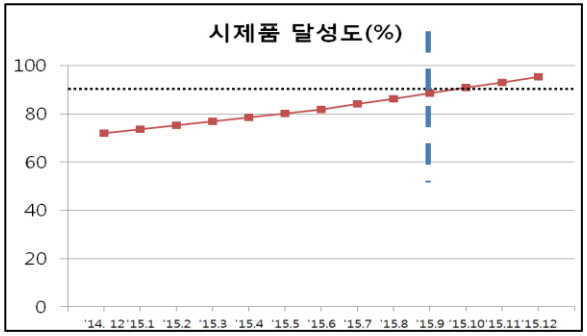
초전도선형가속기1 또는 초전도선형가속기3에서 가속된 빔을 200MeV/u 까지 가속하는 초전도선형가속기(SSR[7] 초전도가속관으로 구성)
[7] Single Spoke Resonator

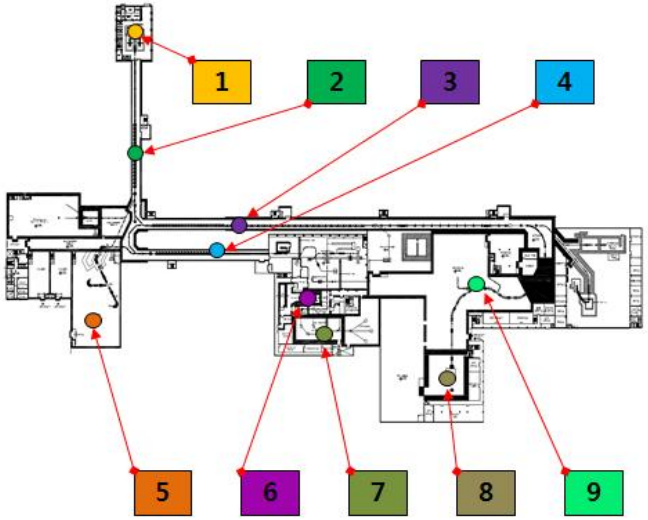
시제품	93.31%	본제품	–

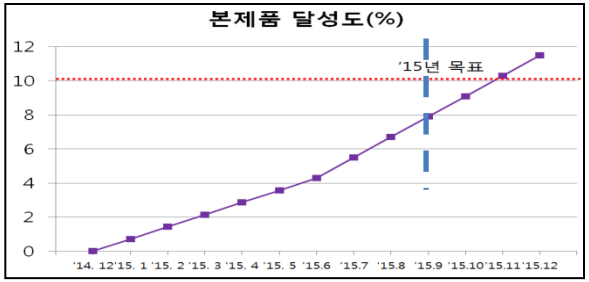
4 초전도선형가속기3

ISOL 시스템으로부터 분리된 동위원소 빔을 18.5MeV/u 까지 가속하는 초전도선형가속기(QWR[5], HWR[6] 가속관으로 구성)
[5] Quarter Wave Resonator
[6] Half Wave Resonator

시제품	93.37%	본제품	6.24%







5 저에너지 실험시설

18.5MeV/u 에너지 빔을 이용하는 저에너지 실험 시설(KOBRA[8] 등)
[8] KOrea Broad Acceptance Recoil Spectrometer and Apparatus

시제품	100%	본제품	11.36%

6 ISOL[9] 시스템

저에너지 회귀동위원소 빔을 생성하고 분리·공급하는 장치
[9] Isotope Separate On Line (온라인 분리 장치)

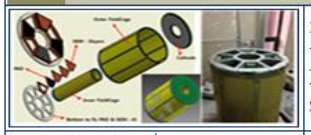
시제품	86.23%	본제품	24.2%

7 사이클로트론[10]

ISOL 시스템에 70MeV 양성자 빔을 공급하는 원형 가속기
[10] Cyclotron

시제품	도입	본제품	23.93%

8 고에너지 실험시설



200MeV/u 빔 또는 IF 시스템에서 분리된 빔을 이용하는 고에너지 실험시설(LAMPS[11] 등)
[11] Large Acceptance Multi Purpose Spectrometer

시제품	91.5%	본제품	–

9 IF[12] 시스템

고에너지 회귀동위원소 빔을 생성하고 분리·공급하는 장치
[12] In flight Fragmentation (비행파쇄 분리 장치)

시제품	63.11%	본제품	0.59%

Summary

- **RISP is well managed and receives good reviews from international committees**
- **Development of accelerator and experimental systems of the RISP is on track with civil constructions**
- **Basic researches in RISP with rare isotopes will lead to many other applications**
- **RISP will made possible us to carry innovated researches in rare isotope sciences**

Thank you for your attention !
We have Spirit We can DO it!