APAC 2004 Scientific Program (Feb. 3, 2004)

Sun: Conference Reception - March 21, 18:00~20:00

Monday, March 22

Time		
8:30	Session Chair: MOM-1	
	Opening & Welcome	
9:00	*Opening Plenary*	
9:50	*Break*	
10:00	Status of Accelerators in Operation & New Accelerator Projects	Session Chair: MOM-2
10:20		Accelerator Technologies
10:40	***Break***	
11:10	Session Chair: MOM-3	Session Chair: MOM-4
11:40	Status of Accelerators in Operation & New Accelerator Projects	Accelerator Technologies
12:00		
12:20	***Lunch***	
13:40	Session Chair: MOA-1	Session Chair: MOA-2
14:00	Status of Accelerators in Operation & New Accelerator Projects	Beam Dynamics
14:20	Poster Session (MOP) Session Chair: MOP - Status of Accelerators in Operation and Accelerator Projects - Beam Dynamics - Free Electron Lasers and Next Generation Light Sources - Others	
18:00		

Tuesday, March 23

Time		
9:00	Session Chair: TUM-1	Session Chair: TUM-2
9:30	Synchrotron Radiation Light Sources	High Energy Accelerators & Linear Accelerators
10:00		
10:20		
10:40	***Break***	
11:10	Session Chair: TUM-3	Session Chair: TUM-4
11:40	Status of Accelerators in Operation & New Accelerator Projects	High Energy Accelerators & Linear Accelerators
12:00		
12:20	***Lunch***	
13:40	Session Chair: TUA-1	Session Chair: TUA-2
14:00	Status of Accelerators in Operation & New Accelerator Projects	Radioactive Beam Facilities & Neutron Sources
14:20	Poster Session (TUP) Session Chair: TUP - High Energy Accelerators and Linear Accelerators - Cyclotrons,Synchrotrons and Colliders - Synchrotron Radiation Light Sources - Radioactive Beam Facilities and Neutron Sources - Accelerator Application and Miscellaneous - Medical Accelerators	
18:00		

Wednesday, March 24

Time		
9:00	Session Chair: WEM-1	Session Chair: WEM-2
9:30	Synchrotron Radiation Light Sources	Cyclotrons, Synchrotrons & Colliders
10:00		
10:20		
10:40	***Break***	
11:10	Session Chair: WEM-3	Session Chair: WEM-4
11:40	Status of Accelerators in Operation & New Accelerator Projects	Accelerator Technologies
12:00		
12:20	***Lunch***	
13:40	***Conference Outing***	
18:00		

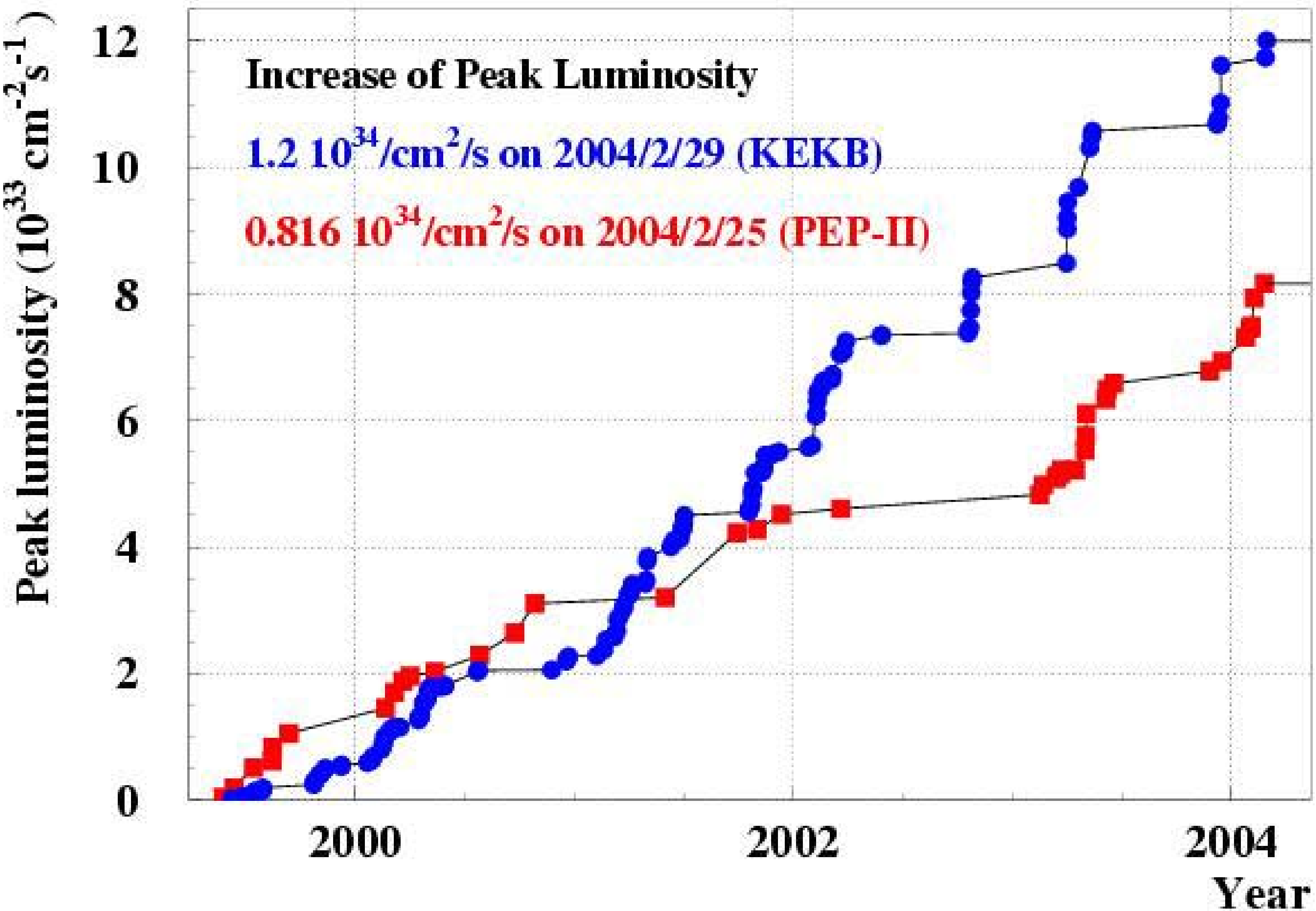
Thursday, March 25

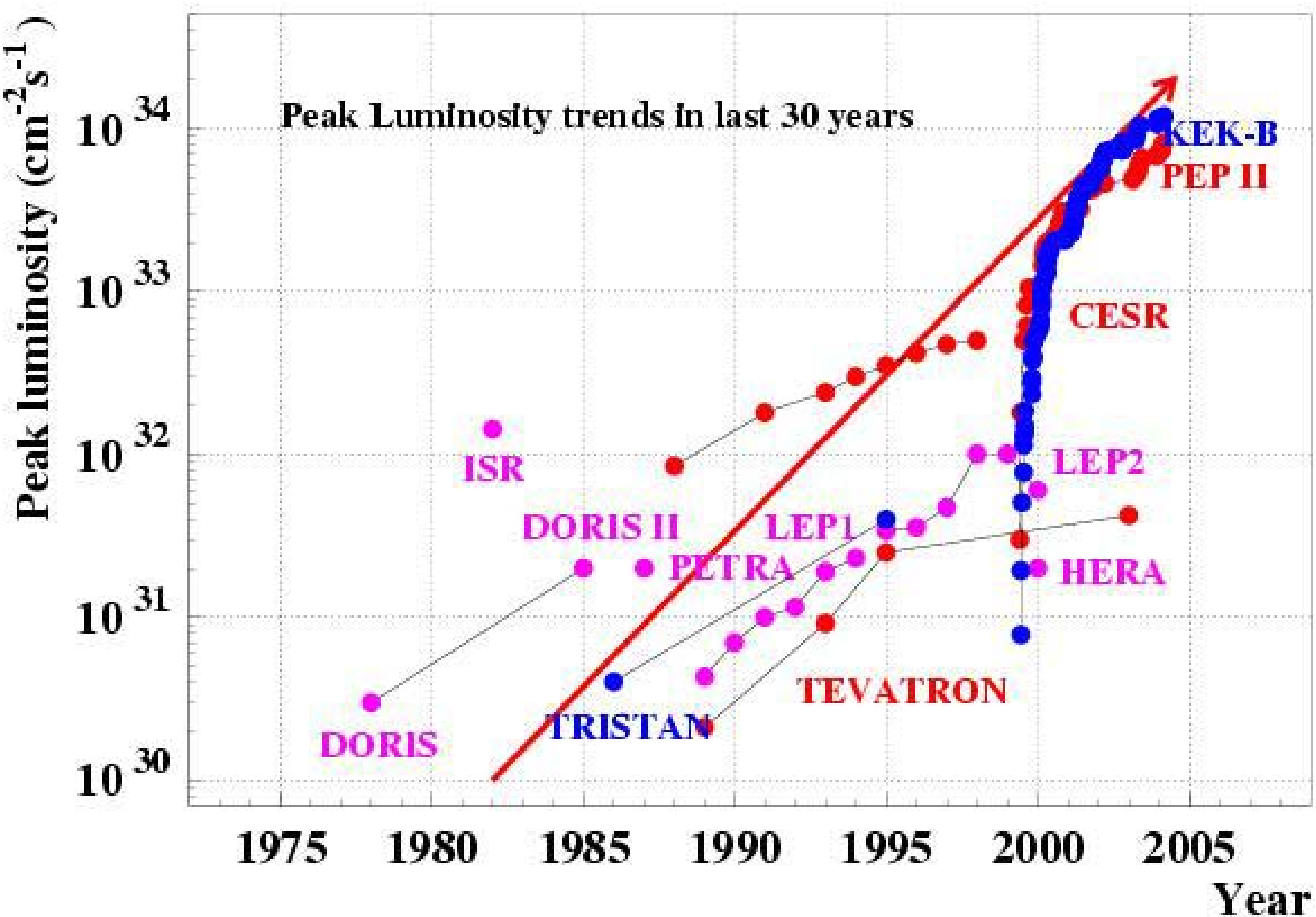
Time		
9:00	Session Chair: THM-1	Session Chair: THM-2
9:30	Status of Accelerators in Operation & New Accelerator Projects	Accelerator Application & Miscellaneous
10:00		
10:20		
10:40	***Break***	
11:10	Session Chair: THM-3	
11:40	High Power Proton Accelerator (Special Session)	
12:00		
12:20	***Lunch***	
13:40	Session Chair: THA-1	Session Chair: THA-2
14:00	Synchrotron Radiation Light Sources	Medical Accelerators
14:20	Poster Session (THP) Session Chair: THP - Accelerator Technologies - High Power Proton Accelerator	
18:00		
19:00	***Banquet***	

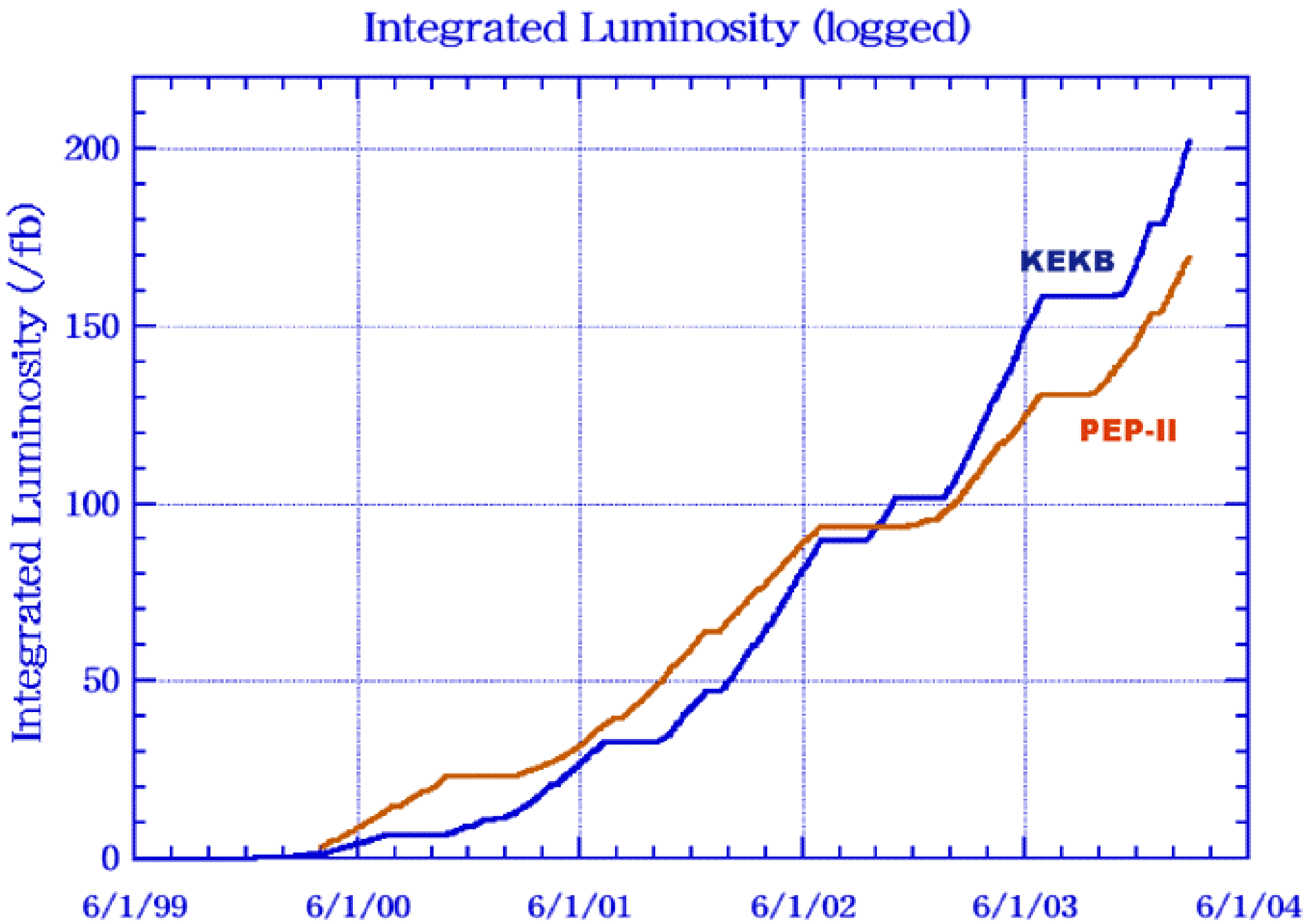
Friday, March 26

Time		
8:30	Session Chair: FRM-1	Session Chair: FRM-2
9:00	Status of Accelerators in Operation & New Accelerator Projects	Accelerator Technologies
9:20		
9:40	***Break***	
10:10	Session Chair: FRM-3	
10:20	Free Electron Lasers & Next Generation Light Sources (Dr. Hogil Kim Memorial Session)	
10:45		
11:10		
11:35		
12:00	***Closing Remarks***	
12:30	***Lunch***	
13:50	***Facility Tour***	
18:00		

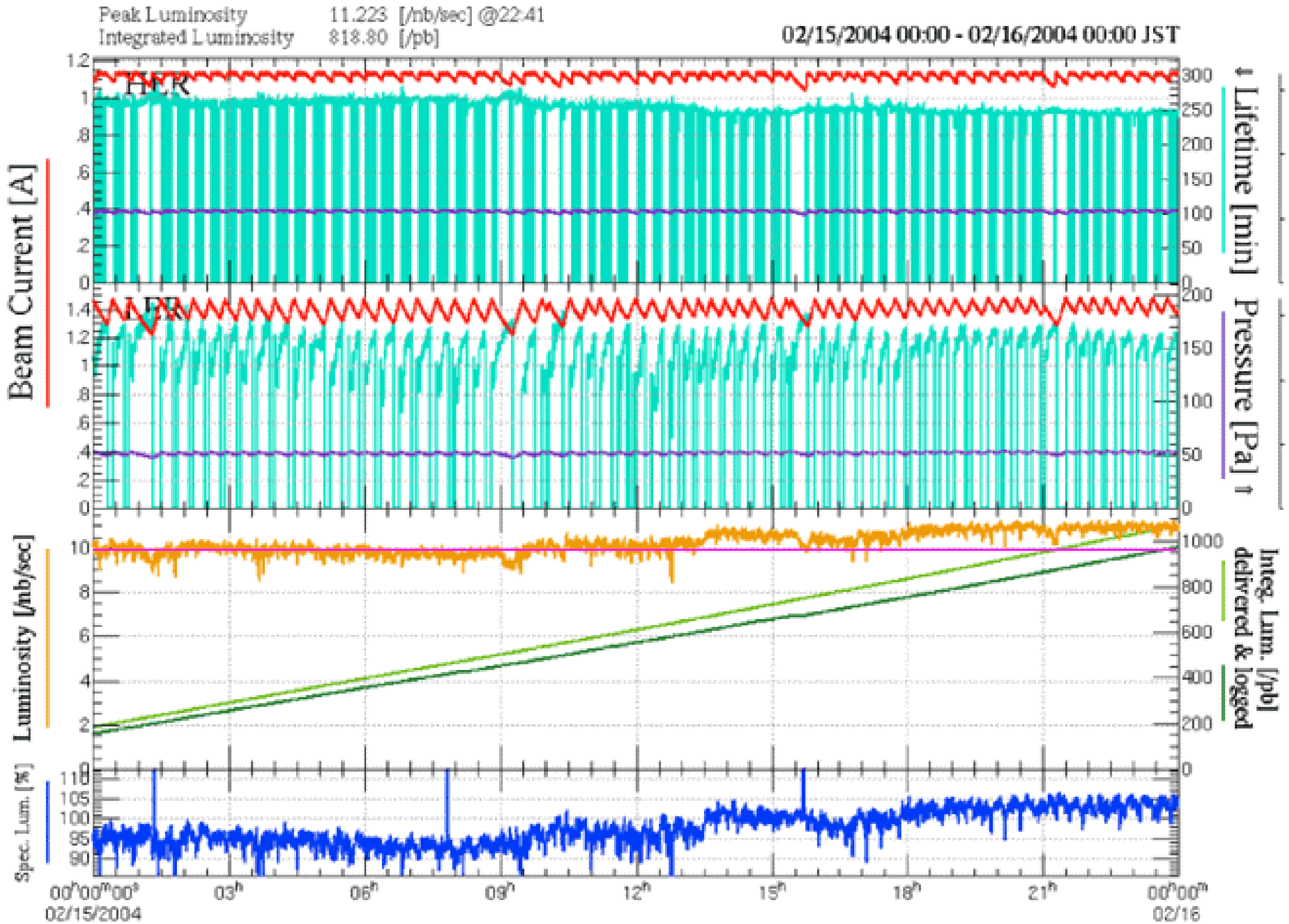
KEK-B


Increase of Peak Luminosity
1.2 10^34/cm^2/s on 2004/2/29 (KEKB)
0.816 10^34/cm^2/s on 2004/2/25 (PEP-II)
Peak luminosity (10^33 cm^-2 s^-1)
12
10
8
6
4
2
0
2000
2002
2004
Year


Peak Luminosity trends in last 30 years
Peak luminosity (cm-2s-1)
10 34
10 33
10 32
10 31
10 30
1975
1980
1985
1990
1995
2000
2005
Year
KEK-B
PEP II
CESR
ISR
LEP2
DORIS II
LEP1
PETRA
HERA
TEVATRON
TRISTAN
DORIS

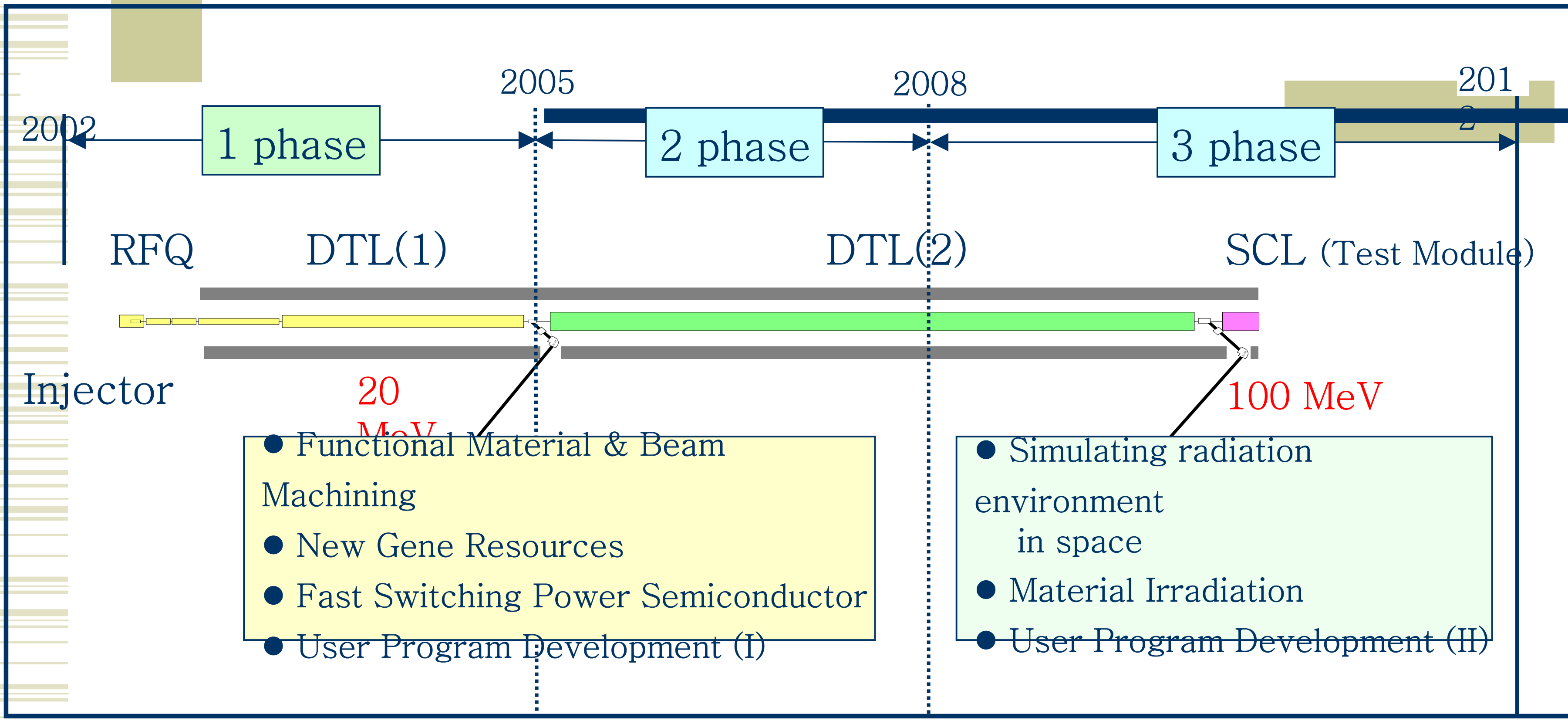

Integrated Luminosity (logged)
Integrated Luminosity (/fb)
200
150
100
50
0
KEKB
PEP-II
6/1/99
6/1/00
6/1/01
6/1/02
6/1/03
6/1/04

The Best Day 818.8/pb



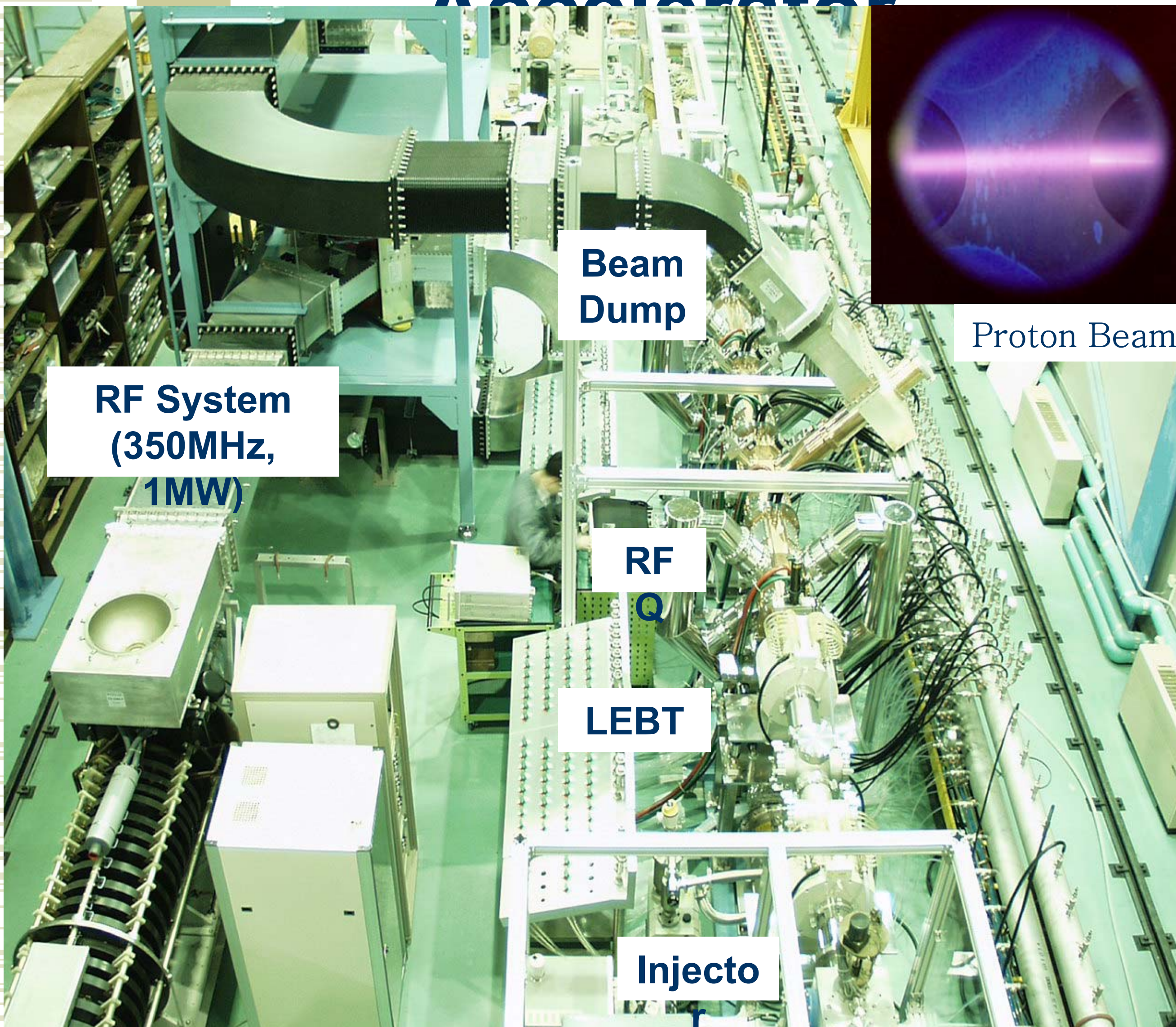
Plan of PEFP (100MeV Linac & Utilizations)

KAERI/Korea



- PEFP is organized into 3 phases.
- Its accelerator composes of 50keV Injector, 3MeV RFQ, 20MeV DTL(I), 100MeV DTL(II) and a test module of
- It has 2 beam extraction systems ; low energy proton beam extraction of 20MeV, high energy beam of 100M
- Extracted proton beams will be used in several fields of beam utilizations & applications.

Status of Accelerator

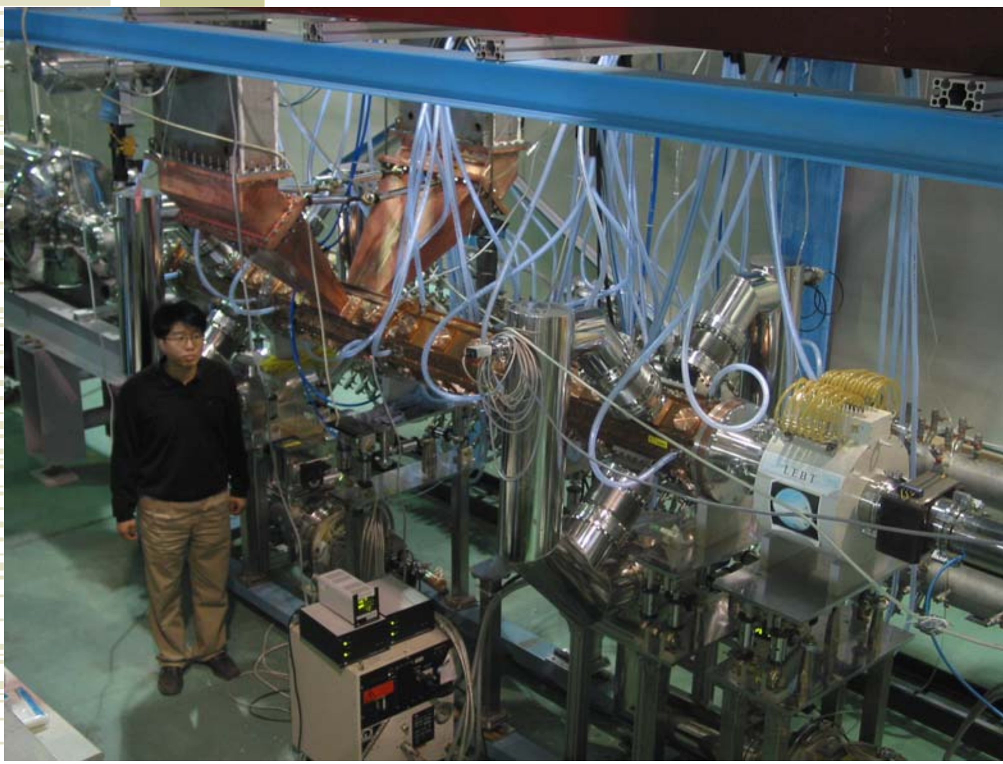


❑ Remarks

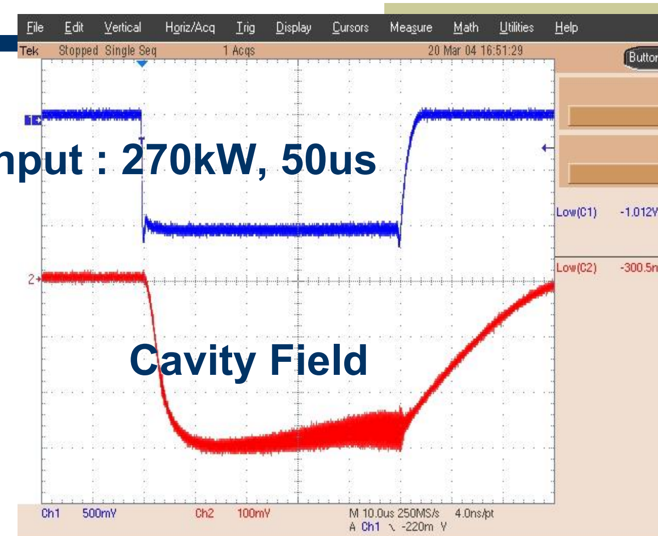
- Injector, LEBT, RFQ & RF System have been developed.
- 50keV injector & LEBT were tested and operated
- RF system of RFQ was tested
- RFQ is under the beam test
- DTL is under fabrication

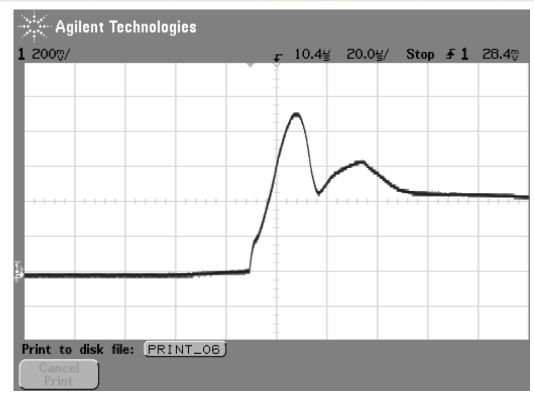
Hot Test of RFQ

❑ Set up for Test of RFQ



❑ Results of the RF & Beam test





Faraday Cup Signal
(70cm downstream from RFQ exit)

❑ Remarks of RFQ test

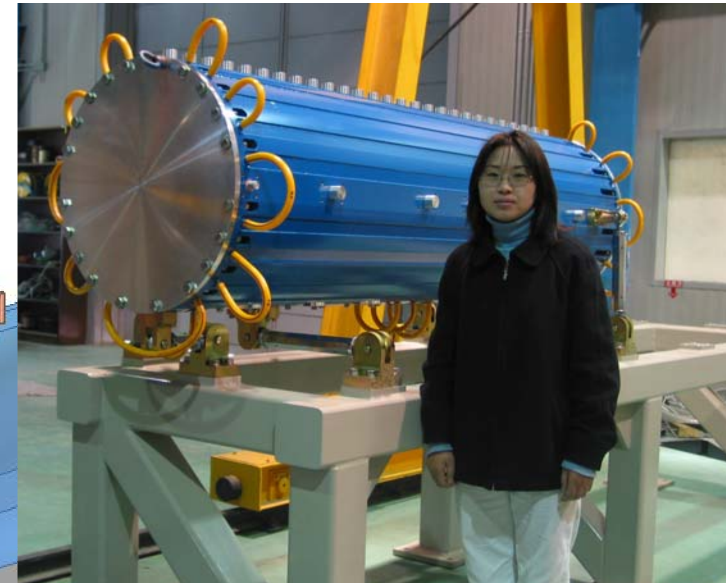
- RFQ have been tuned with 352MHz.
- Hot Test of RFQ is in progress, and beam test is just being started.
- Several premature data with short pulses.

Design of DTL(I)

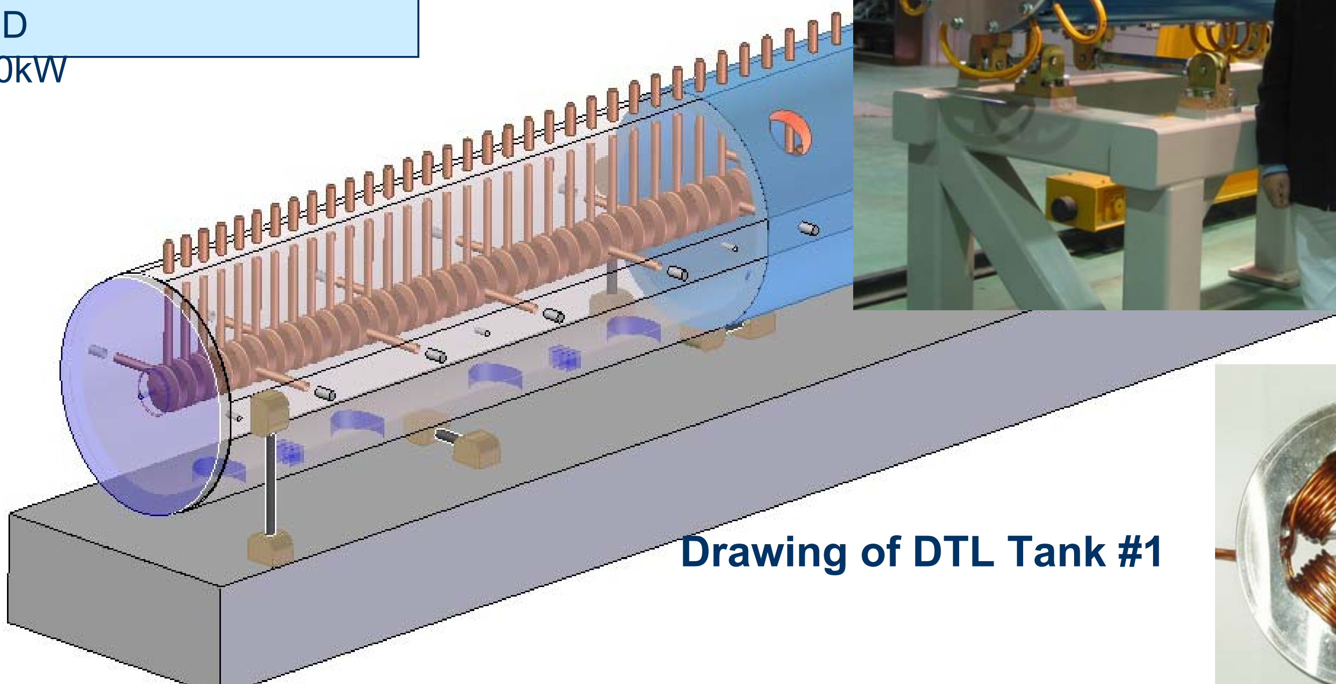
❑ Design of 20MeV DTL

- Input/Output Energy : 3/20 MeV
- Tank Dia. / Length : 54cm / ~ 4.5m/ea
- No. of Drift Tube : 156
- No. of Tank : 4
- Lattice : FFDD
- Total RF : 900kW

DTL Tank



Drift Tube
(E-beam welding)



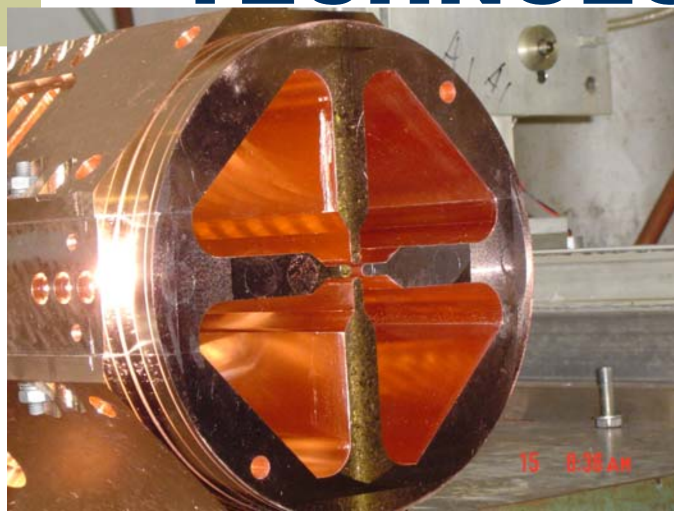
Drawing of DTL Tank #1

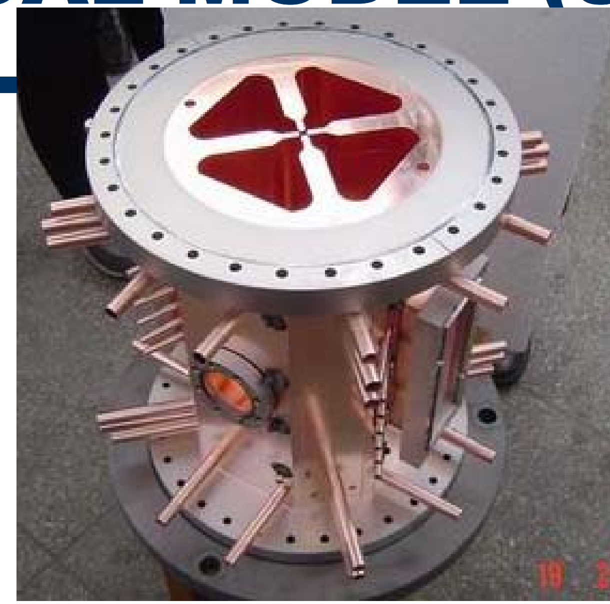
Quadrupole
(ENG. Model)

- Design of the 20MeV DTL has been completed.
- Major fabrication processes such as E-beam welding for the drift tube,
  Electroplating in tank are checked.
- Fabrication is in progress. It will be delivered in March, and tuned.

IHEP/China

3. R&D OF THE TECHNOLOGICAL MODEL (3)

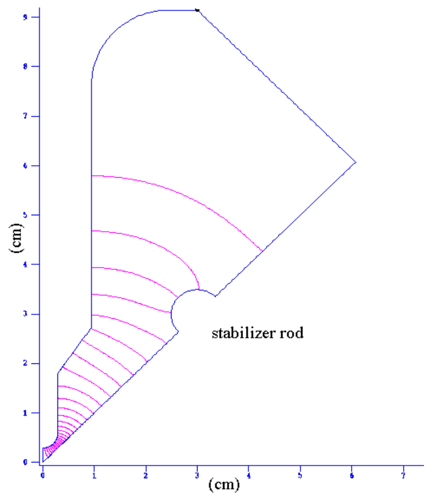


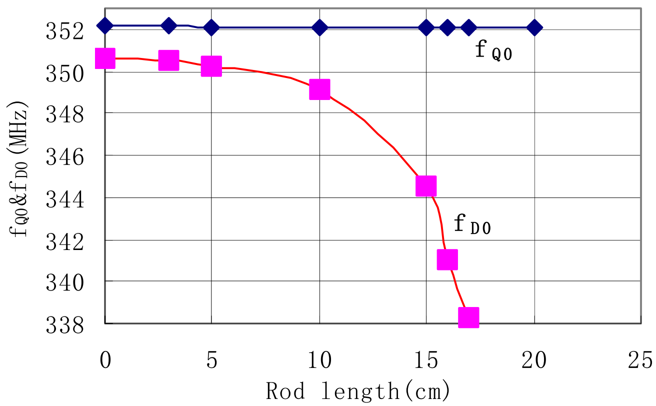


- Three step braze:

1. The water cooling channel was covered by brazing plugs before the semi-fine machining.
2. The four vane-wall pieces were brazed to form the cavity, and then the end-flange step was machined;
3. All the flanges, i.e.,end flanges, vacuum port flanges and tuner flanges, as well as all cooling-water pipes were brazed.

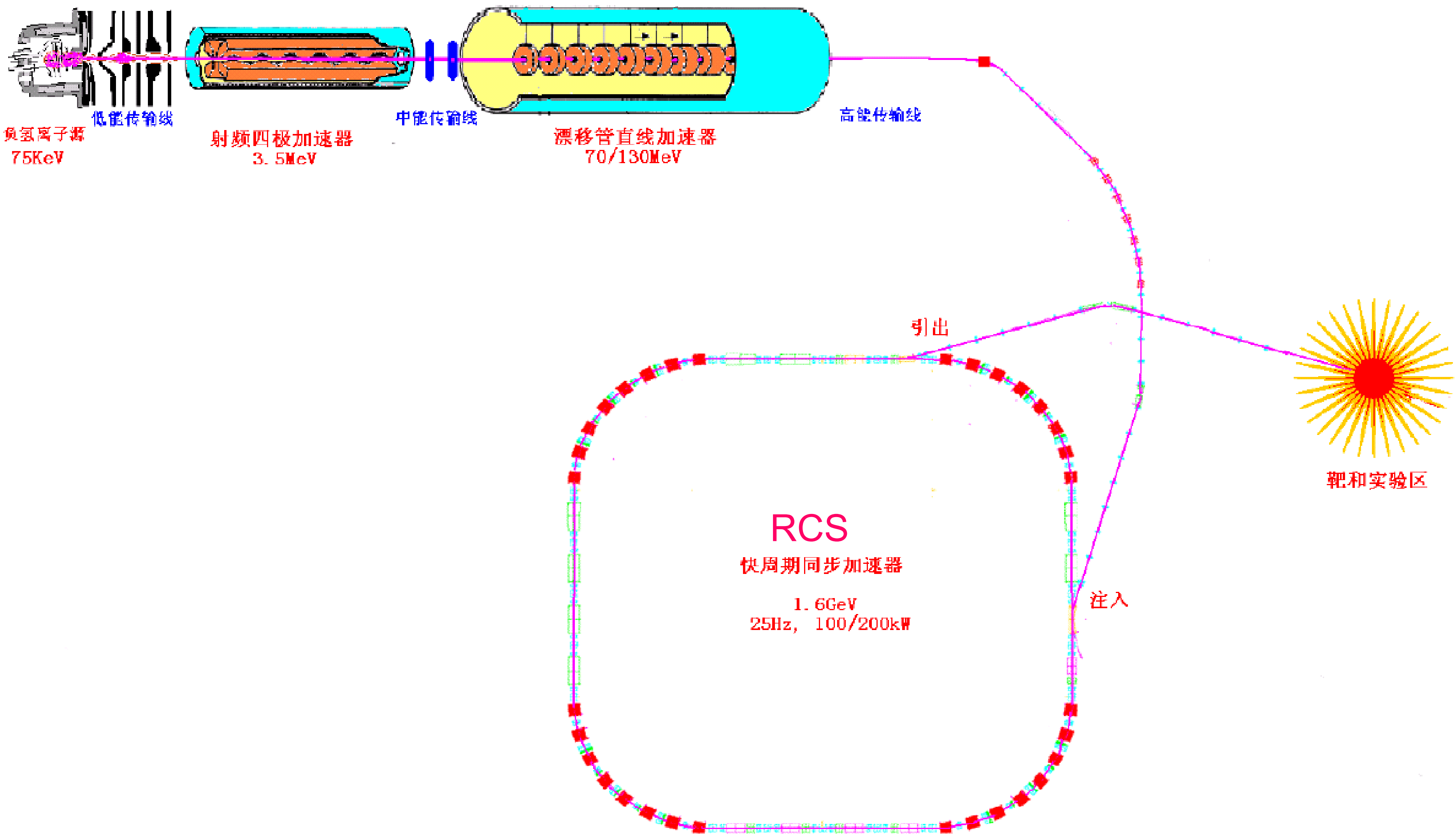
5 STUDY ON THE DIPOLE ROD





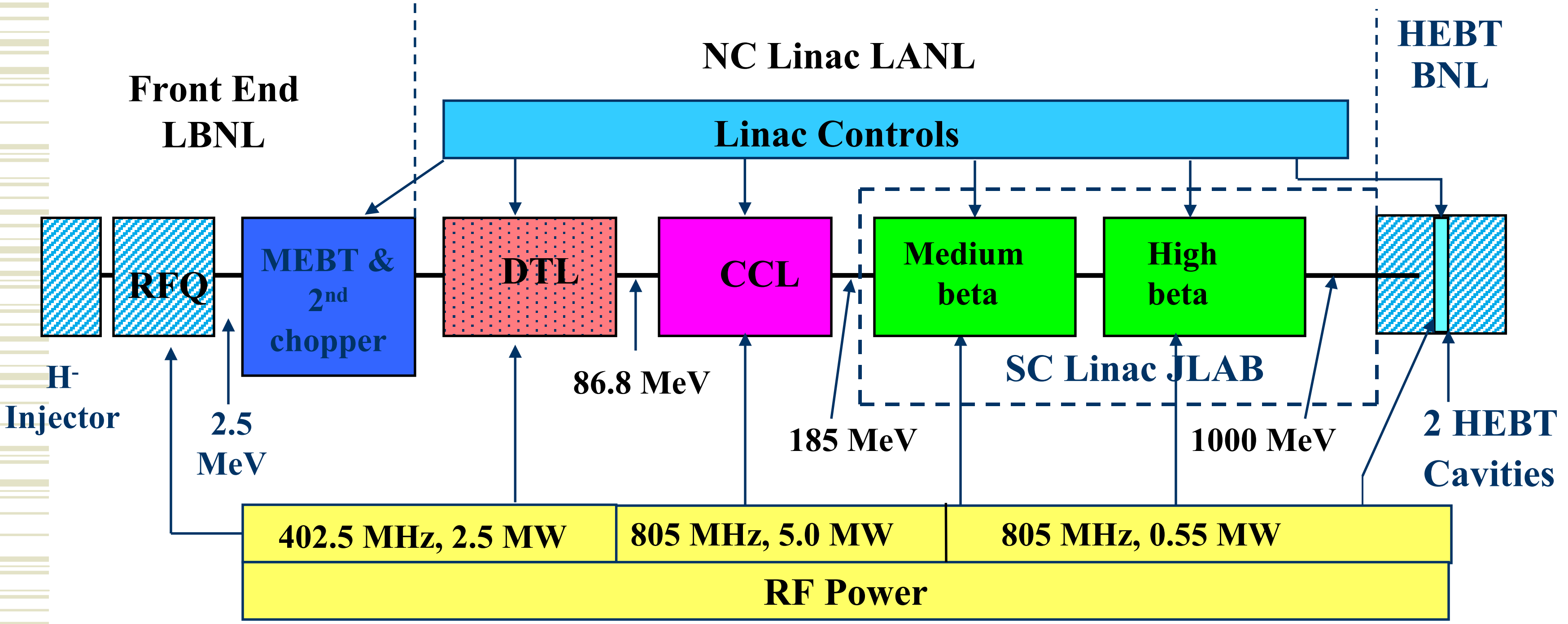
- The measured dipole-rod effect on quadrupole and dipole modes. (see more details on this conference THP-21016).

CSNS pre-study

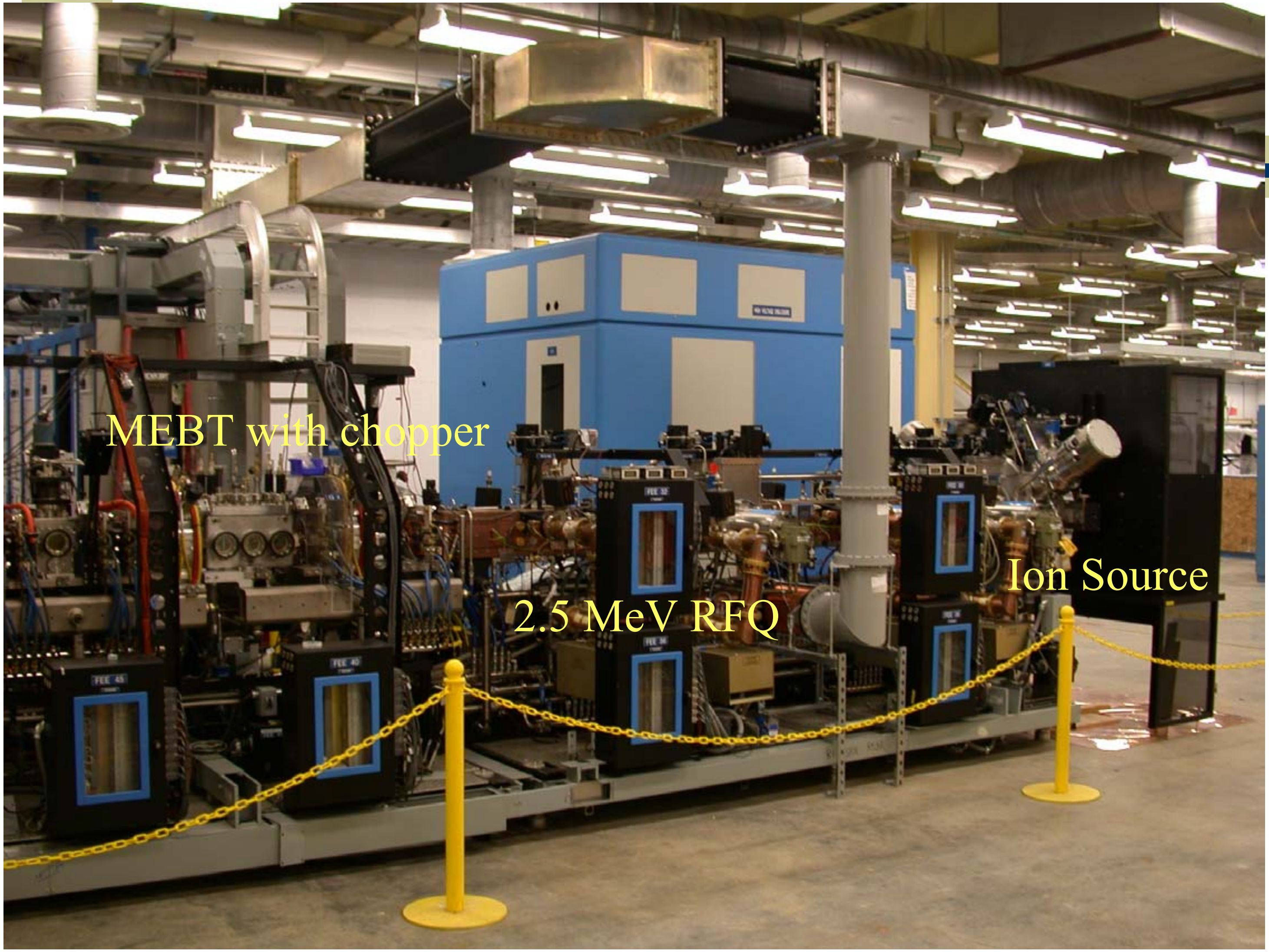


Other than RCS, FFAG possibility is also under investigation.

SNS Linac Configuration



Front End Systems IS, RFQ, MEBT were successfully designed, constructed, and commissioned at LBNL and then installed on the SNS Site



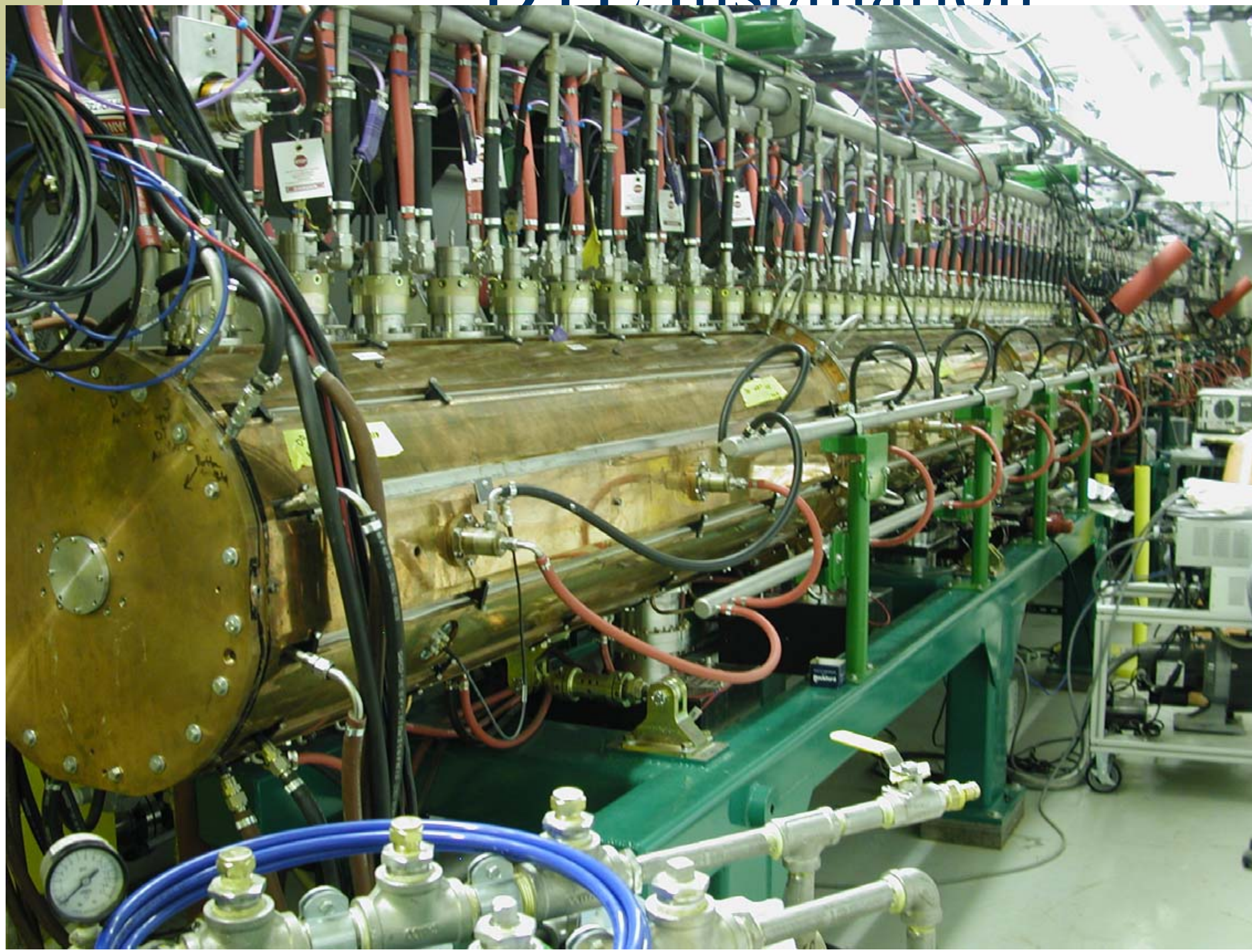
RF Gallery Installation

2.5 MW 402.5 MHz Klystron

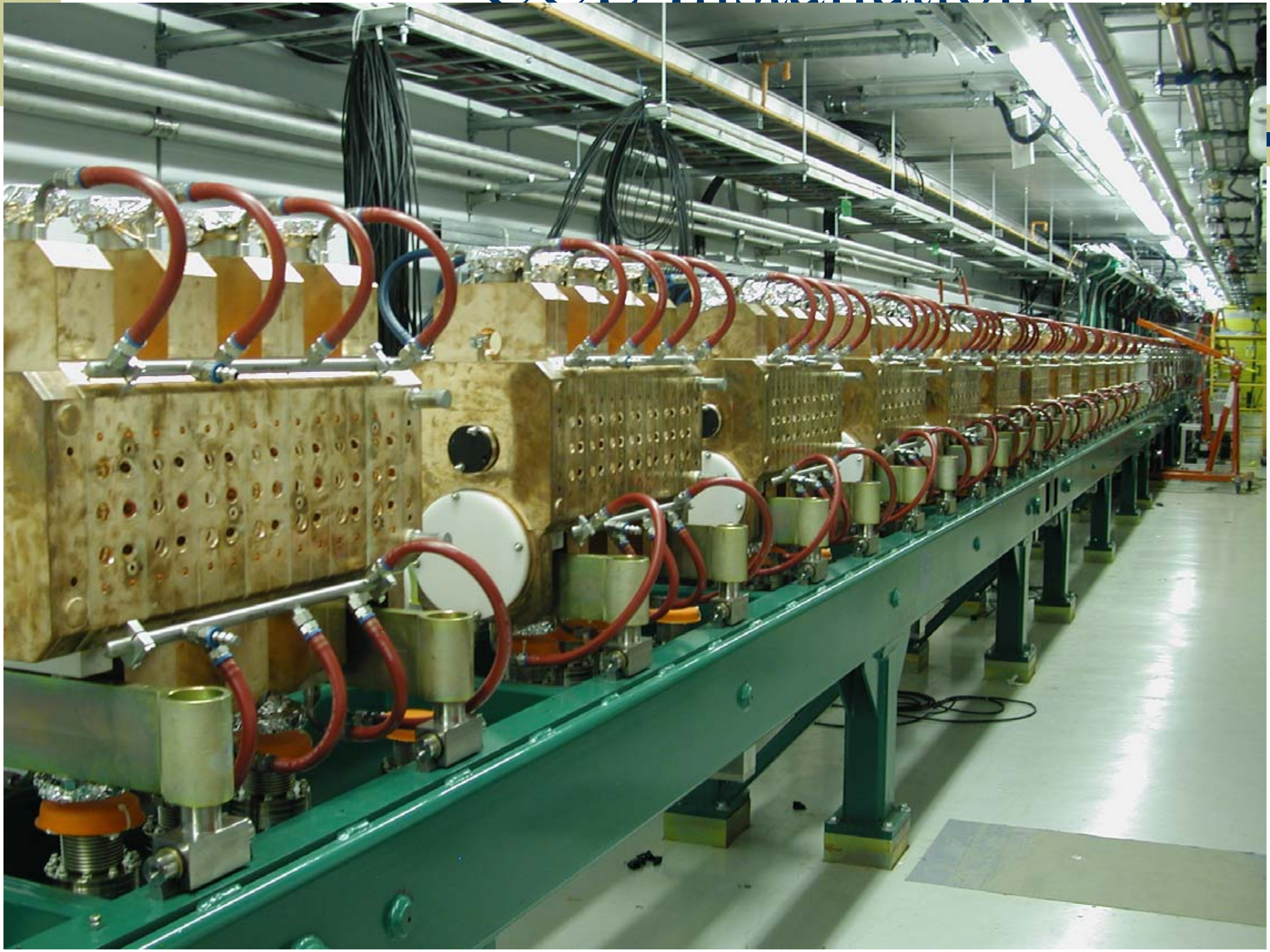
5 MW 805 MHz Klystron

550 kW 805 MHz Klystron

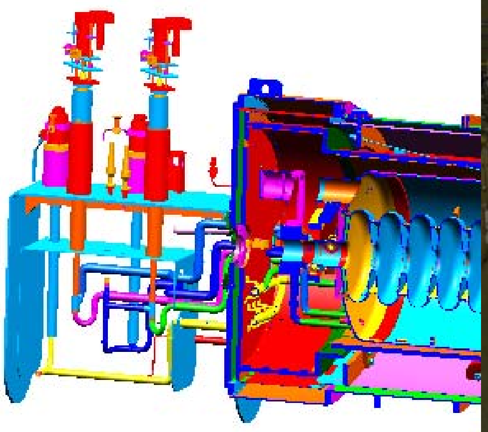
DTL Installation

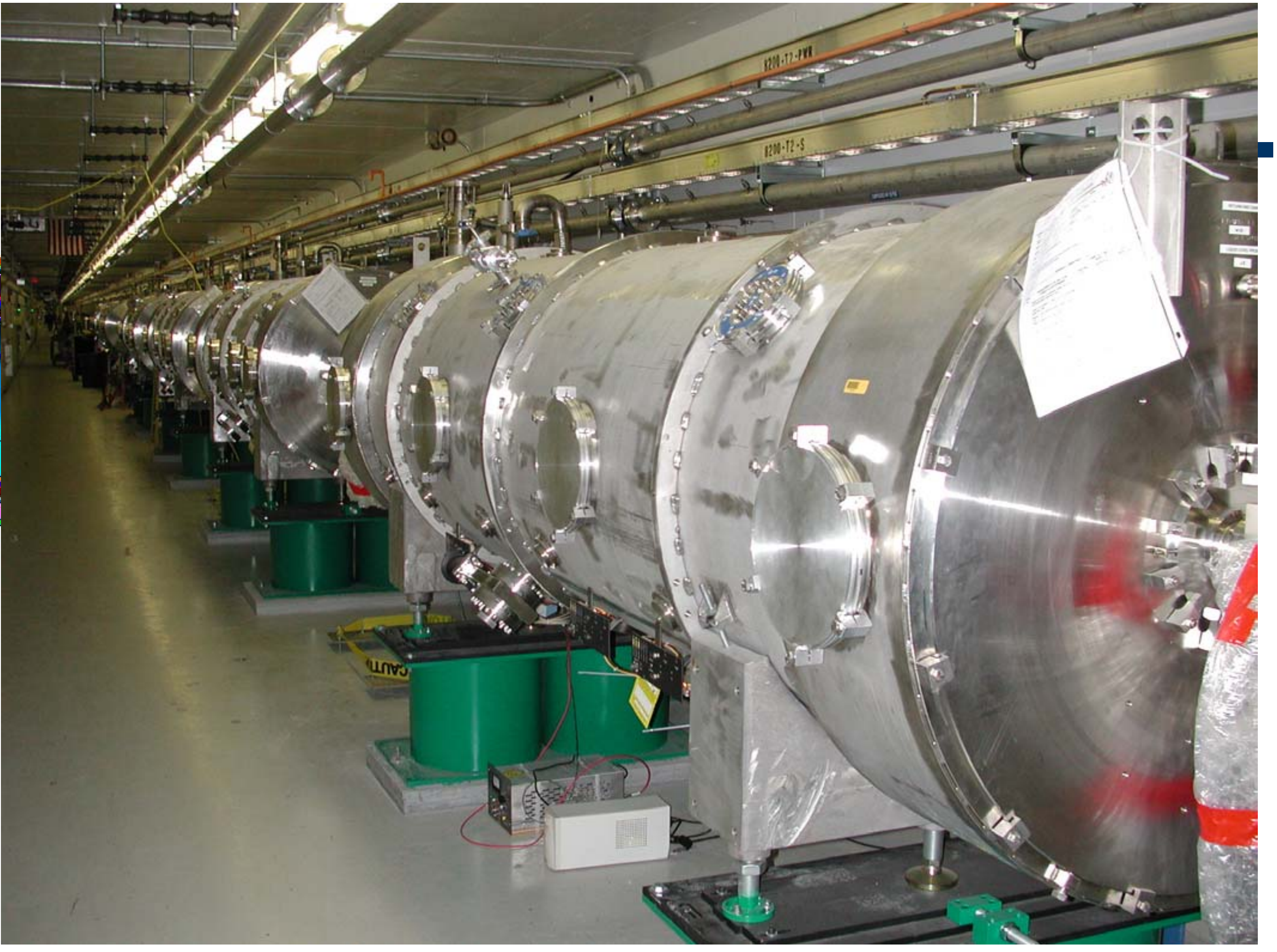


CCL Installation



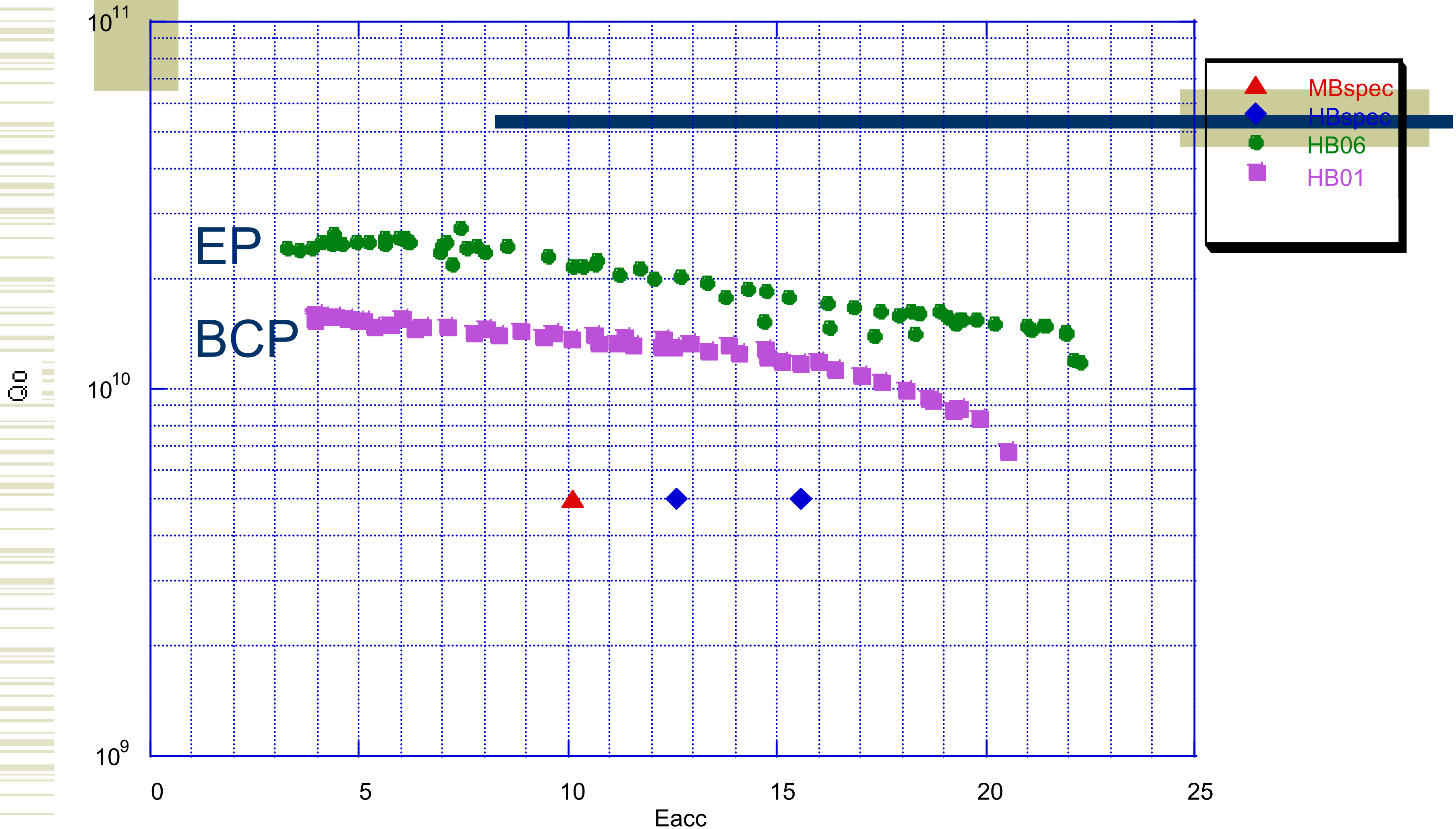
SCL Installation



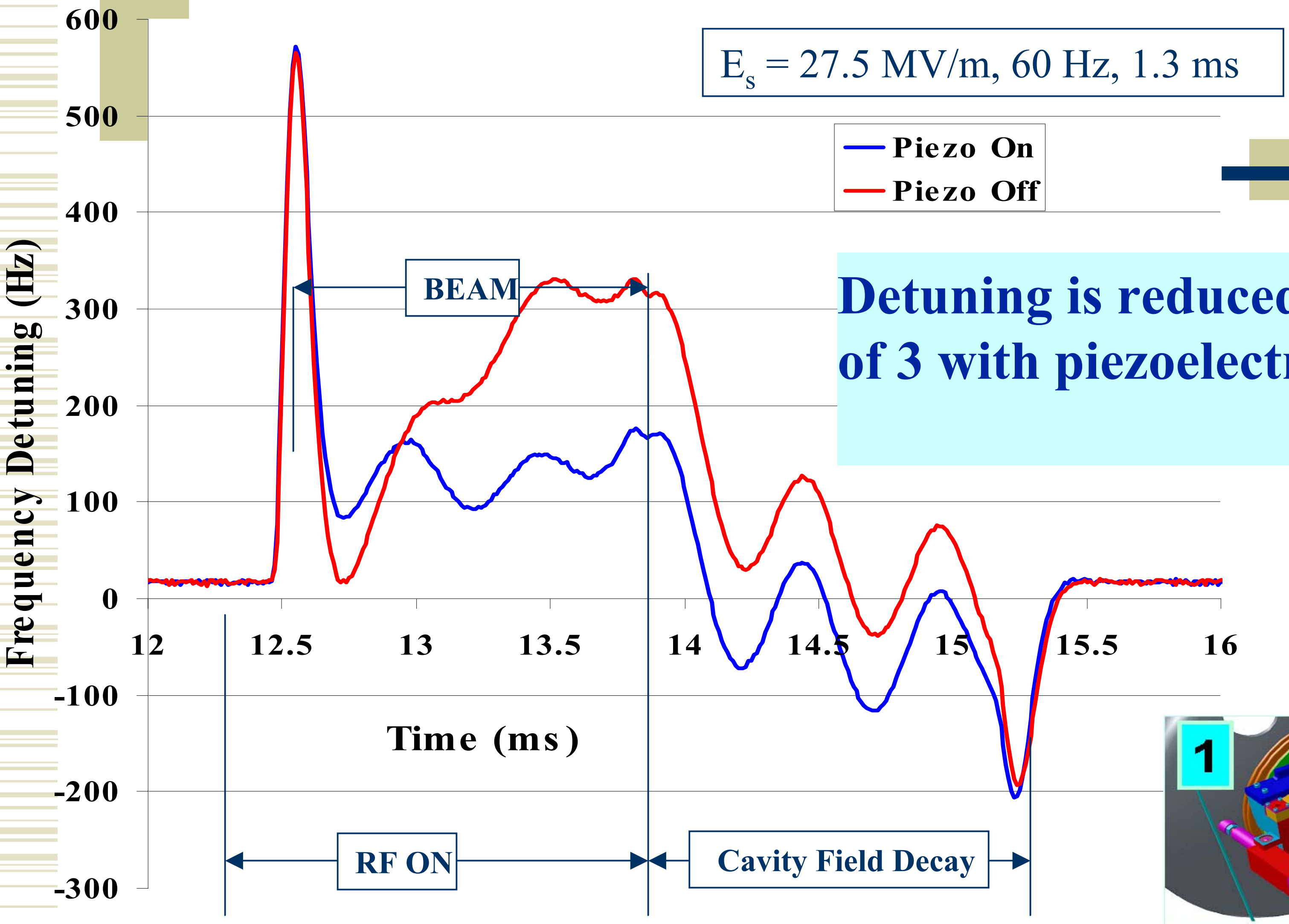


•6 medium-β cryomodules installed in tunnel

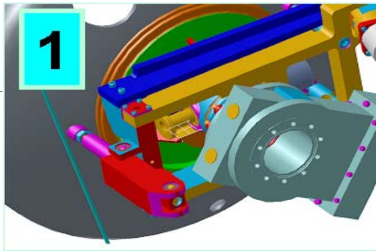
SNS High Beta Performance – Apr-03



Cavity Detuning Compensation by Piezoelectric Tuners Works

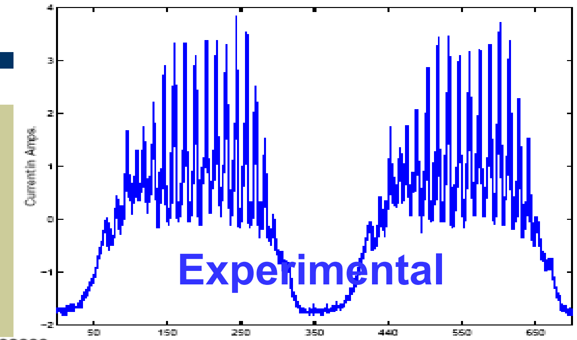


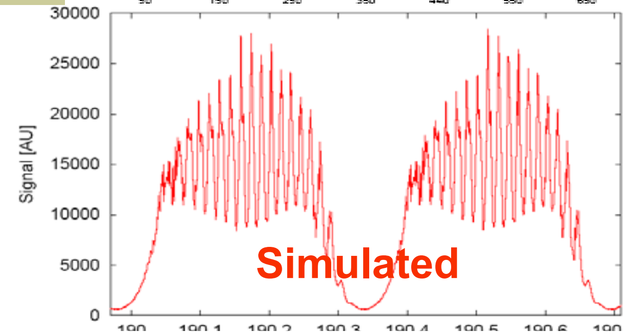
Detuning is reduced by a factor of 3 with piezoelectric tuner

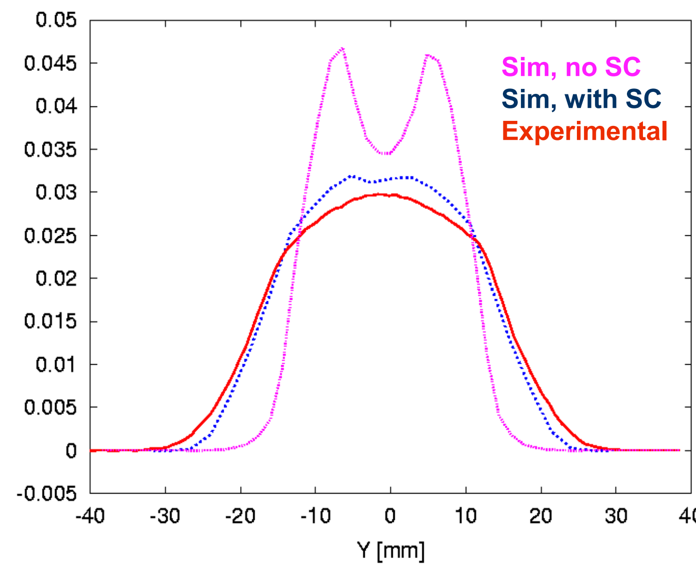


ORBIT Code Development

- The ORBIT Code for beam dynamics in rings has been developed at ORNL during the past six years. Computationally, it is state of the art.
- ORBIT simulates real machines and has many detailed models, including
  - Injection foil and painting
  - Symplectic single particle transport
  - Magnet Errors, Closed Orbit Calculation & Correction
  - RF and acceleration
  - Longitudinal and transverse wall impedances
  - 1D, 2D, and 3D space charge
  - Feedback for Stabilization
  - Apertures and collimation
  - Electron Cloud Model
  - Beam diagnostics
- ORBIT has been used extensively for SNS ring design issues and has been benchmarked against LANL PSR measurements
  - Transverse Broadening of Intense Beam
  - Injected Bunch Dynamics
  - Longitudinal Instability
  - Persistence of 200 MHz bunch structure



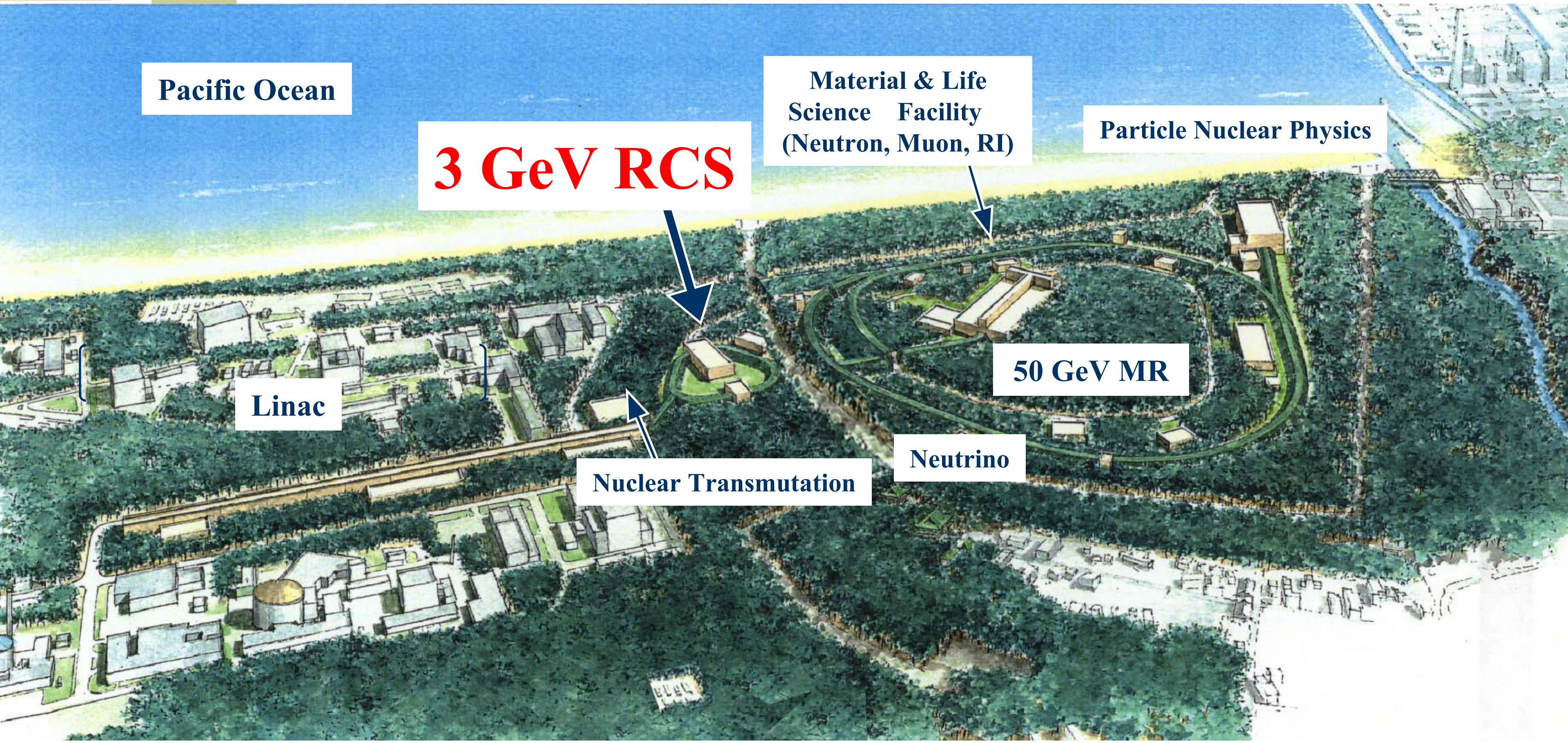




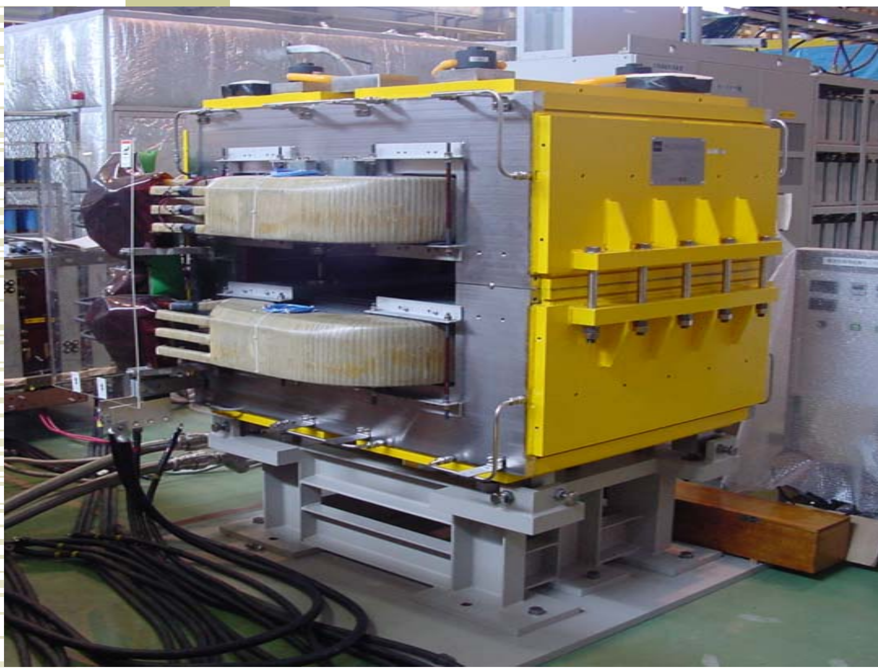
SUMMARY

REMAINING COMMISSIONING MILESTONES	IPS DATE
• Start DTL-2-3 Beam Commissioning	30 Mar 04
• Start DTL & CCL-1-2-3 Beam Commissioning	02 Aug 04
• Cryo System Cool Down	14 May 04 (July?)
• Start SCL Beam Commissioning	11 Mar 05
• Start HEBT and Ring Commissioning	06 Jul 05
• First Beam on Target	01 Feb 06
• CD-4 Project Complete	30 Mar 06

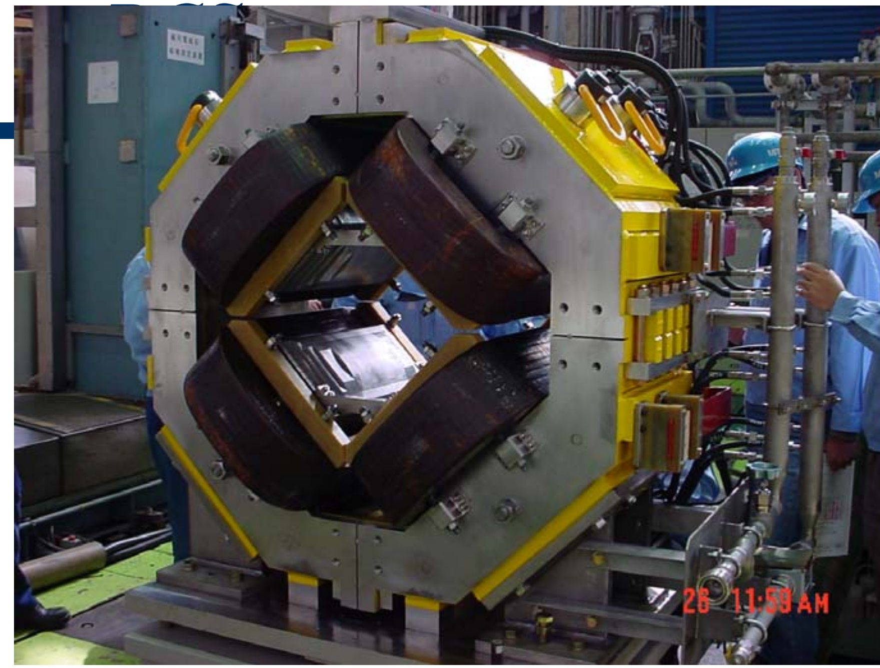
Site View J-PARC RCS



Prototype Magnet *J-PARC*



R&D Dipole Magnet



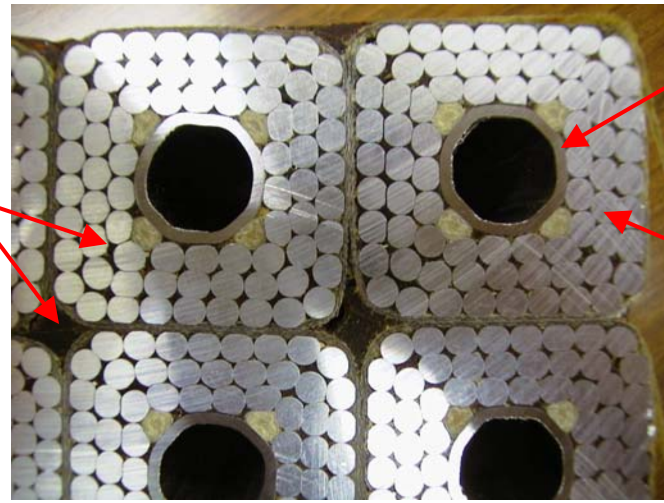
R&D Quadruple Magnet

Gap height	**: 210 mm**
Core Length	**: 1000 mm (real : 2760 mm)**
Turn Number	**: 36 Turn/pole**
Field	**: 1.10 T at 3.0 GeV**
	: 0.27 T at 0.4 GeV
DC current	**: 1588 A**
AC current	**: 907 A**

Bore Diameter	**: 330 mm (max : 410 mm)**
Core Length	**: 450 mm**
Turn Number	**: 32 Turn/pole**
Field Gradient	**: 4.26 T/m at 3.0 GeV**
	: 1.10 T/m at 0.4 GeV
DC current	**: 954 A**
AC current	**: 535 A**

Stranded Conductor J-PARC RCS

Impregnated coil with polyimide resin (for rigidity, high heat-conduction and rad-hard)



SUS cooling pipe (inner diameter : 11 mm)

Stranded wires (Diameter:~3mm Number:72)

Remark:

The temperature of polyimide resin and pressure of the tank are essential to the impregnation and the curing process.

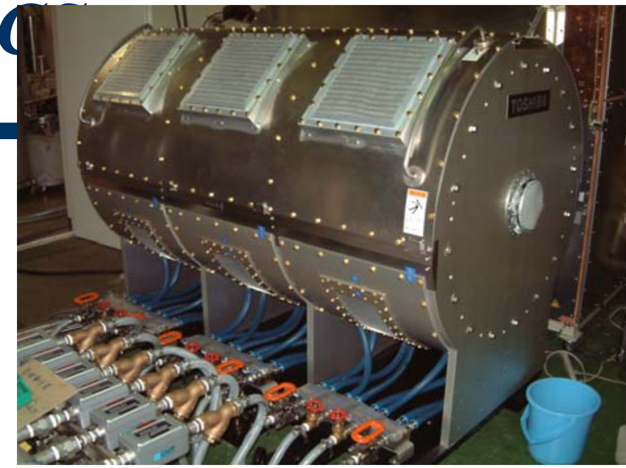
- Impregnation at ~90℃ and curing at 150℃~200℃
- cyclic process between vacuum and +2 atm in the tank for the impregnation

RF System R&D Works (1/2) J-PARC RC

1. High-gradient Magnetic Alloy loaded Cavity

Status: The development using the test cavity which is the direct water cooling of the MA core has been done last year. The confirmation of the final design is on-going.

- Max. gap voltage of 43 kV
- Direct cooling of the MA core
- 5 kW losses (ave.) / MA core



Direct cooling type MA cavity

2. Anode power supply

Status: The anode power supplies are under construction and the high power test of the first three is on-going.

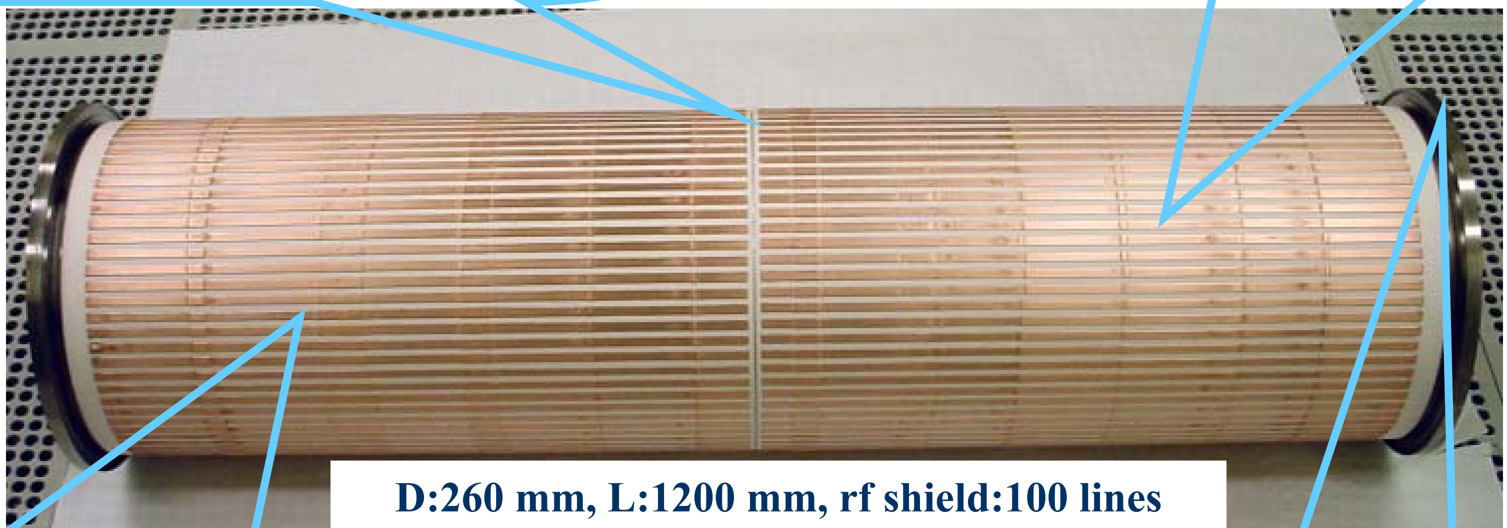
- Max. output of 1.2 MW (13 kV, 92 A)
- Switching type (~33 kHz) power supply by using IGBT
- Very low ripple voltage of dV/V ~0.2 %, and low sag of ~1 % for 25 Hz operation

Anode power supply

Ceramics Chamber *J-PARC RCS*

◆ **Chamber Joint**
to make long chamber (> 3 m)
with Metalizing & Brazing

◆ **RF Shield**
to decrease the impedance
copper with electrotyping methods

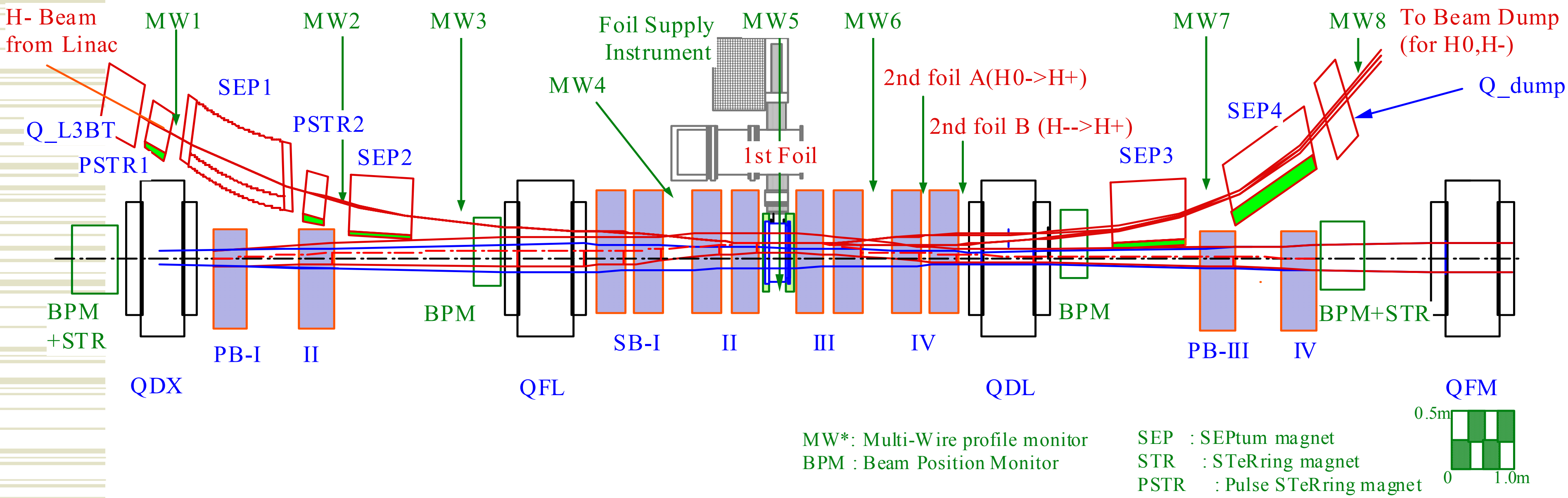


◆ **TiN Coating at inside**
to reduce the secondary-electron emission from surface

◆ **Ti Flange**
to reduce radio-activation

Maximum diameter for QM:400 mm, Maximum length for DM:3300 mm

Injection Layout J-PARC RCS

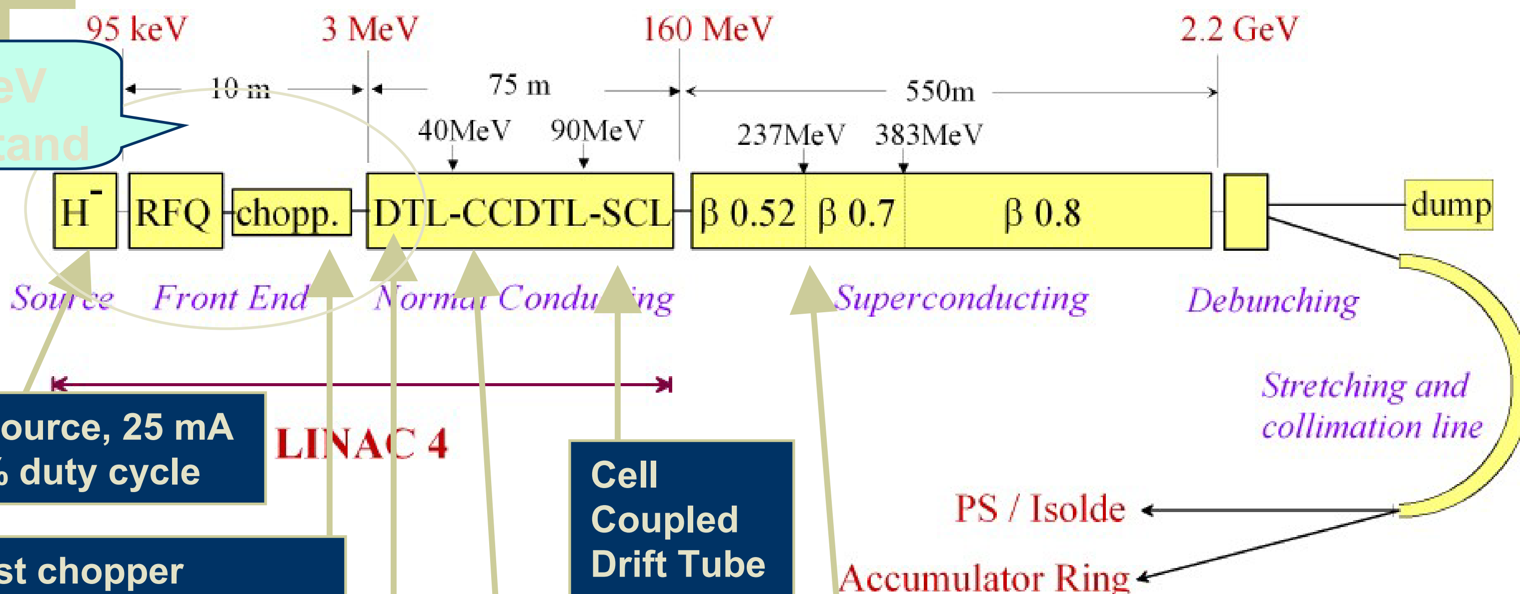


PROGRESS TOWARDS THE SPL (2/4)

SPL/CERN

R&D

3 MeV test stand

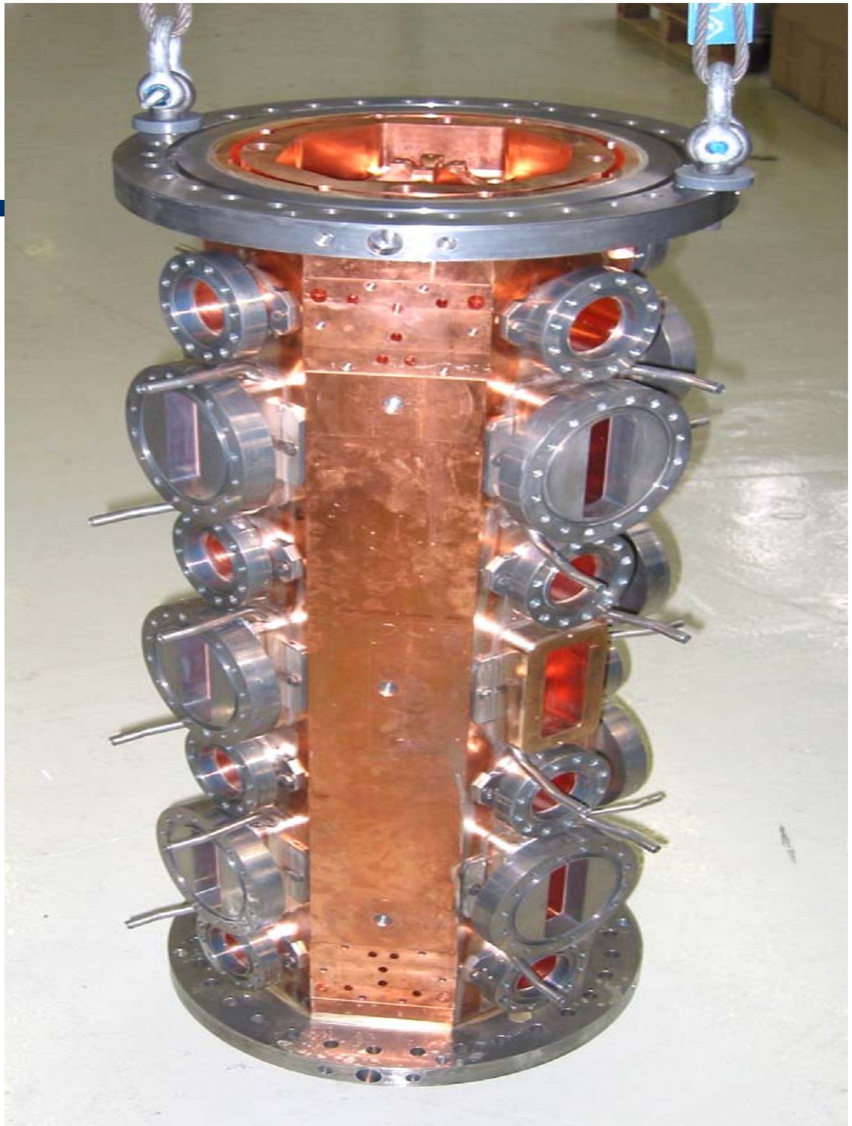


- H⁻ source, 25 mA 14% duty cycle
- Fast chopper (2 ns transition time)
- Halo diagnostics, dump and collimation for MEBT
- RF system: pulsing of LEP klystrons
- Cell Coupled Drift Tube Linac
- DTL test with CEA Saclay
- Development of a new Low Level RF for linacs
- SC cavities
- Vibrations of SC cavities: analysis, compensation schemes
- Beam dynamics studies aiming at minimising losses

Injecteur de Protons de Haute Intensité (in French)

IPHI - SPL collaboration

⇒ Collaboration between CEA-Saclay / IN2P3 / CERN



Goal ⇒ Build a 3 MeV RFQ to be tested in CW with 100 mA beam current at Saclay in 2006 and delivered at CERN at the end of 2006 for the 3 MeV test place (pre-injector of the future linac 4 & SPL)

First 1 m section

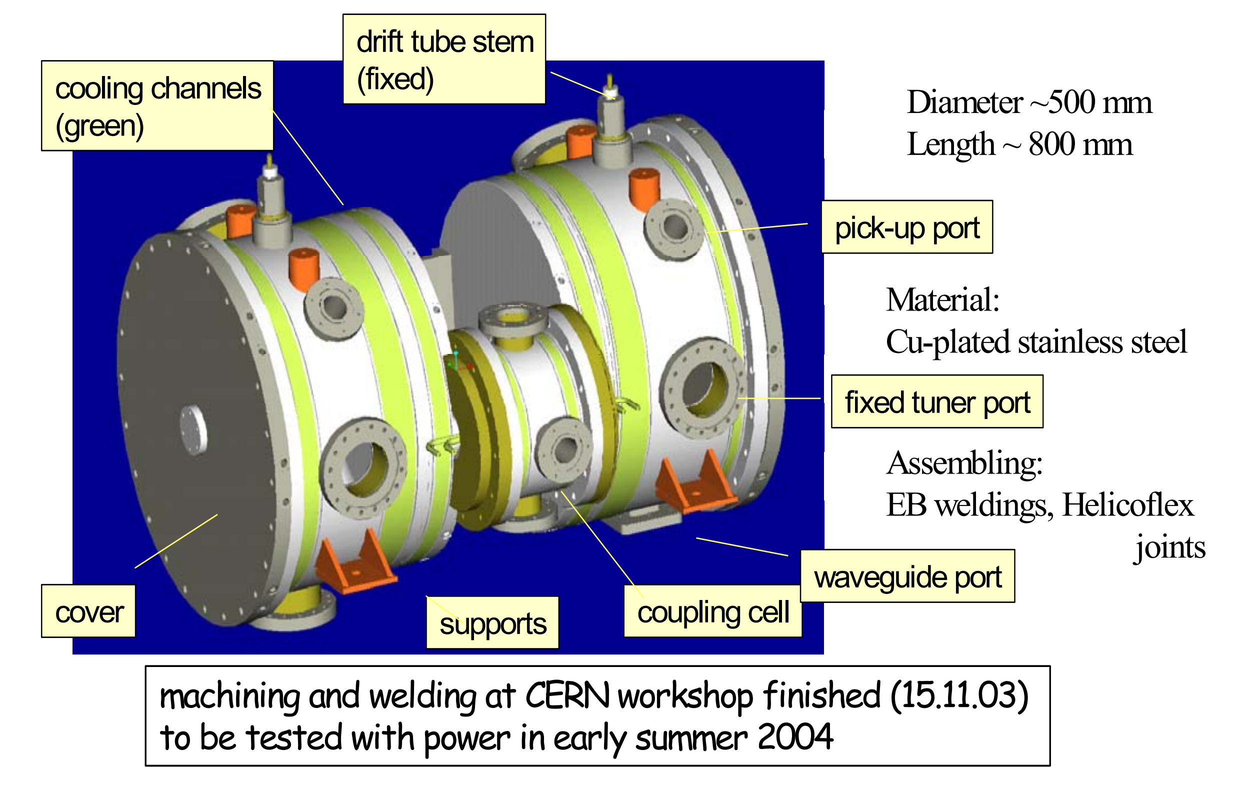
Developments of NC RF accelerating structures (3 – 160 MeV) (3/3)

3 – 40 MeV:

DTL (with CEA/IN2P3 and ITEP/VNIIEF): construction of a prototype Tank1 with dummy drift tubes + complete drift tube prototype (2006)
or DTL-RFQ: high power prototype to be designed and built by IHEP/VNIIEF (2006)

40 – 90 MeV:

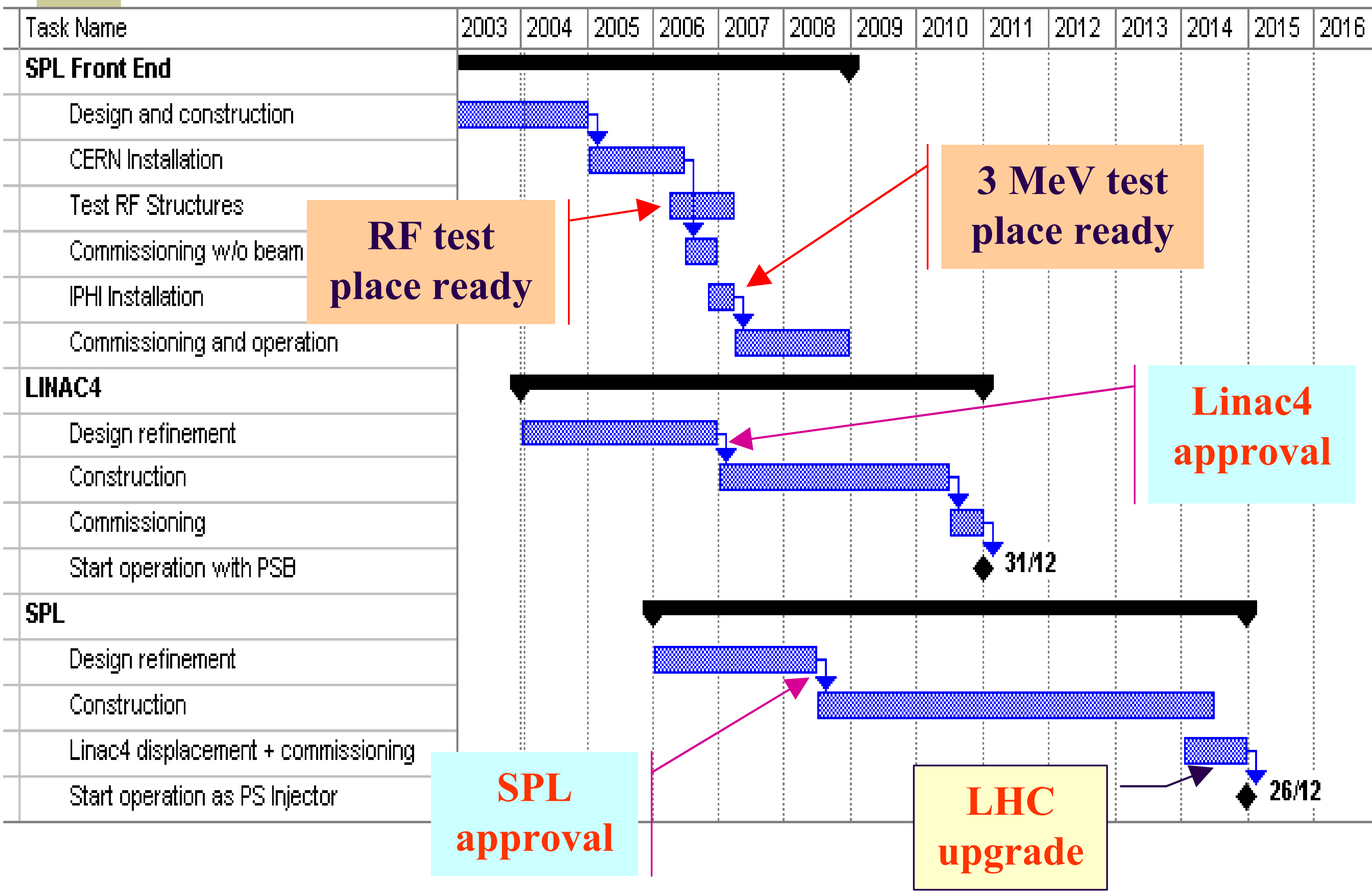
CCDTL full power one-cell prototype built at CERN (end 2003). Multi-cell prototype to be built at BINP/VNIITF (2006)



90 – 160 MeV:

SCL low power prototypes to be developed jointly by IN2P3 (Grenoble) and BINP/VNIITF

Planning … (4/4)


Task Name
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
SPL Front End
Design and construction
CERN Installation
Test RF Structures
Commissioning w/o beam
IPHI Installation
Commissioning and operation
LINAC4
Design refinement
Construction
Commissioning
Start operation with PSB
31/12
SPL
Design refinement
Construction
Linac4 displacement + commissioning
Start operation as PS Injector
26/12
RF test place ready
3 MeV test place ready
Linac4 approval
SPL approval
LHC upgrade