

PS Review Jun. 07, 2004

Overview of KEK 12 GeV PS Accelerator

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1. Facility

Accelerator Complex
Beam Utility
Personnel

2. Operation

Operation Statistics
Beam Intensity
Intensity Upgrade for K2K
Recent Major Upgrades

3. Future of KEK PS Complex

Possibility of Operation Extension
Shutdown Scenario

1. Facility

Accelerator Complex (completed in 1976)

Pre-accelerator	750 keV Cockcroft	-Walton, H- ion source
Injector	40 MeV, 200 MHz Drift	-Tube Linac
Booster	500 MeV, Rapid Cycle Synchrotron (20 Hz)	
Main Ring	12 GeV, Fast Ext. (2.2 second cycle), Slow Ext. & Internal Target (4 second cycle)	

Beam Utility

500 MeV Protons from Booster
NML(Neutron Meson Laboratory)
Neutron Science
Meson Science
(Proton Therapy :closed in July, 2000)

12 GeV protons
EP1 K2K Experiment (Fast Ext.)
Kaon Experiment (Slow Ext.)

EP2 Physics Experiment (Slow Ext.)

IT Test Experiment (Internal Target)

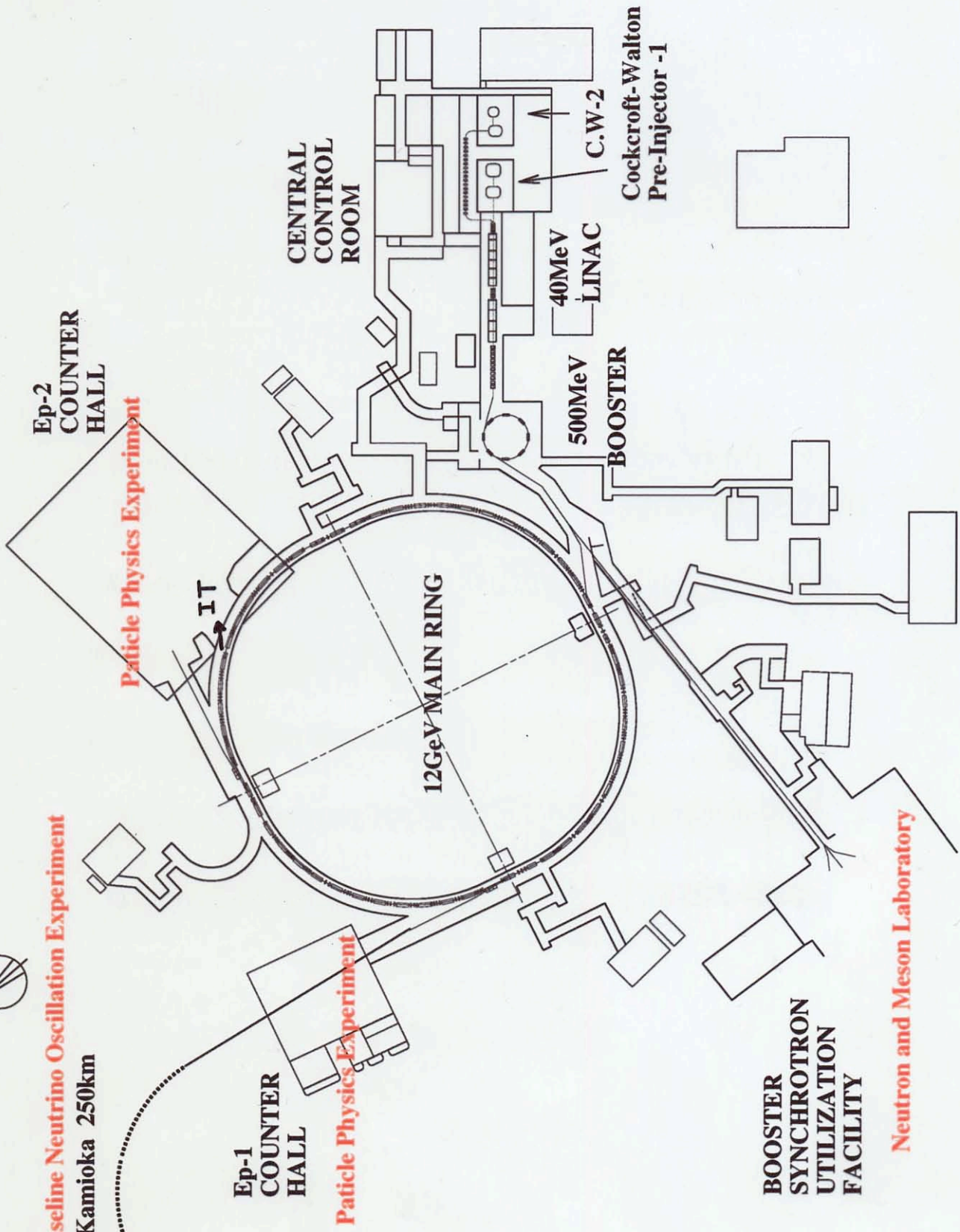
Personnel

Professor	5
Associate Profess	or 4
Research Associate	10
Technical Staff	16

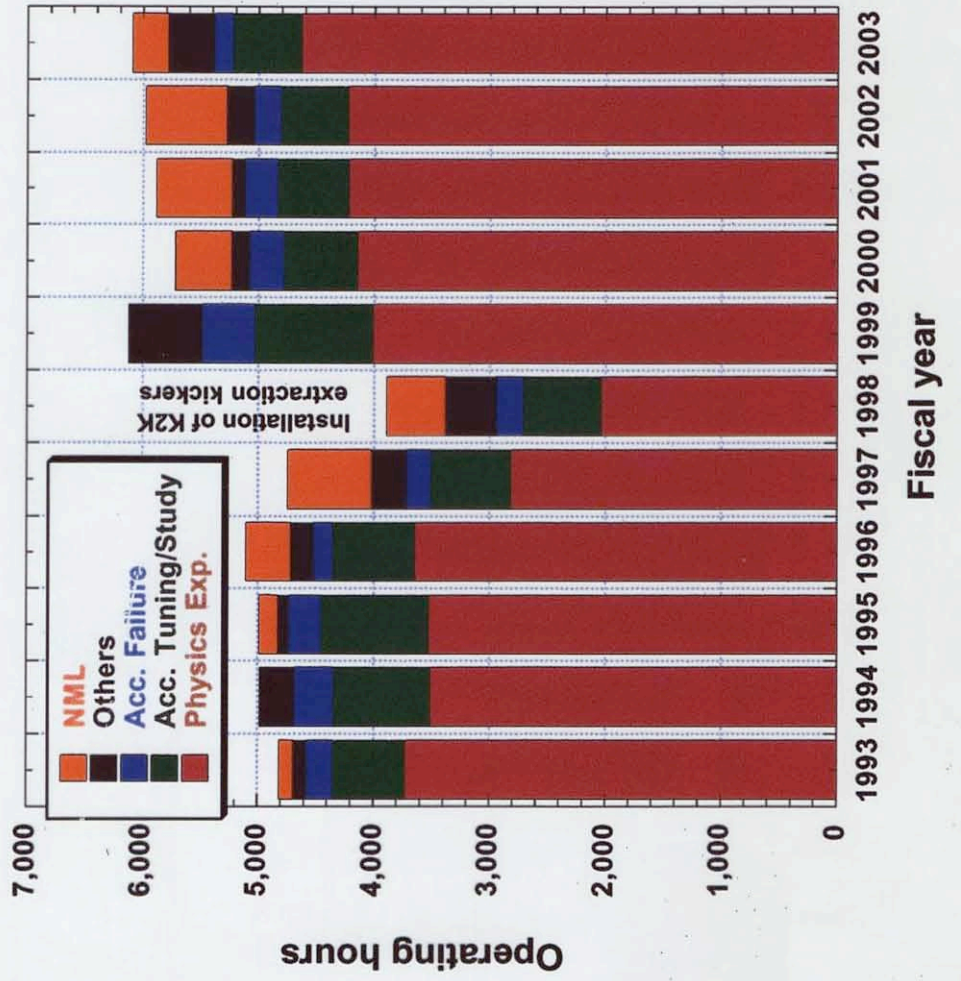
Most are engaged in, supporting, or advising JPARC construction.



Long Baseline Neutrino Oscillation Experiment
To Kamioka 250km



History of PS Operation Statistics



2. Operation

a. History of Operation Statistics

b. Beam Intensity

c. MR Beam Intensity Upgrades for K2K Experiment

Transition Crossing Improvement

Remove cavity -like chambers and reduce the longitudinal impedance causing the microwave instability at the transition crossing.

Bunch Shaping with Band-limited White Noise Signal

In crease the bunch length to reduce the space charge effect.

Average intensity had increased from 4×10^{12} ppp to 6×10^{12} ppp.

d. Integrated Proton Number for K2K Experiment

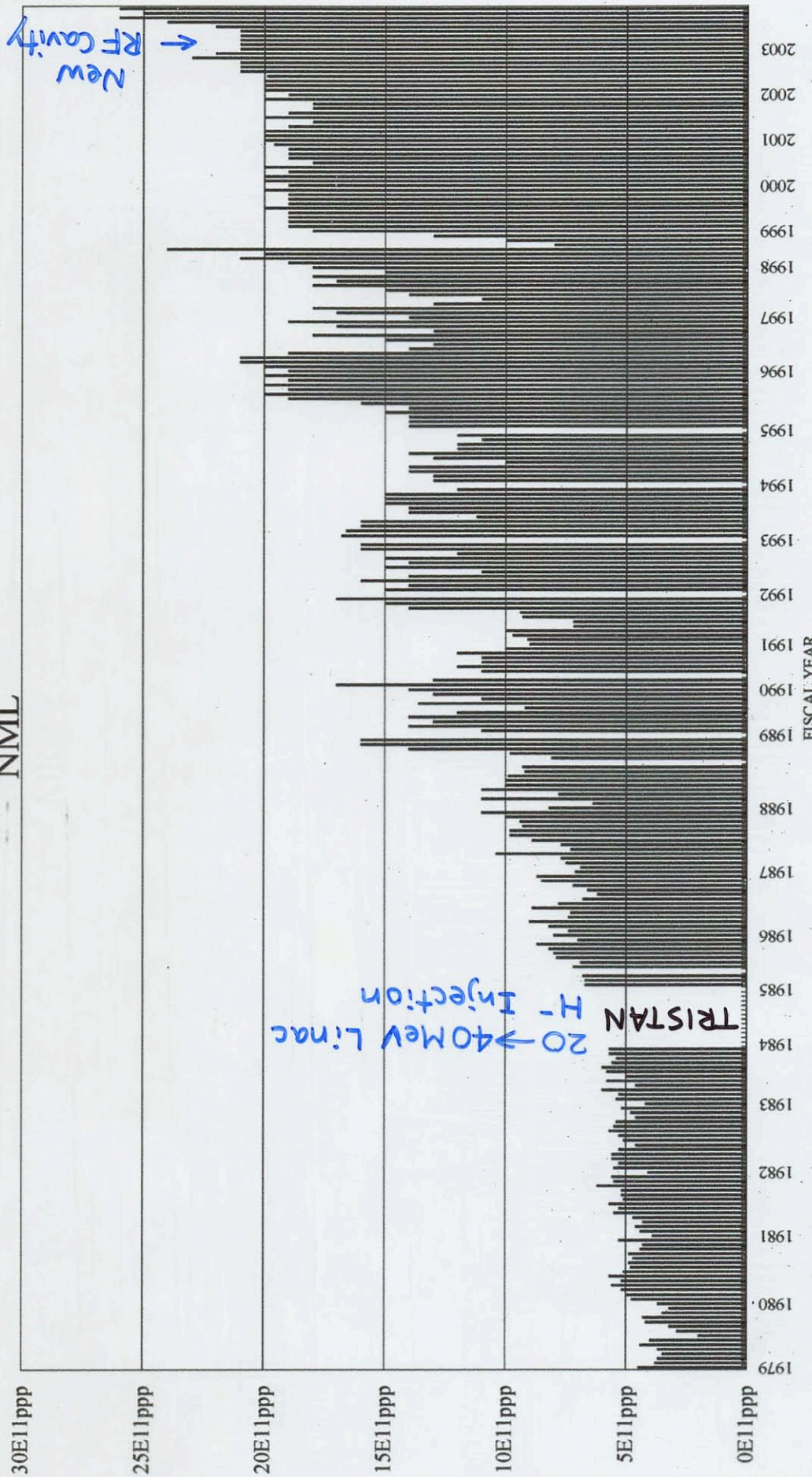
e. Recent Major Hardware Upgrades

Booster Synchrotron Magnet Power Supply (FY2000~2001)

Booster RF Cavities and Power Amplifiers (FY2001~2004)

Average Booster Intensity

NML



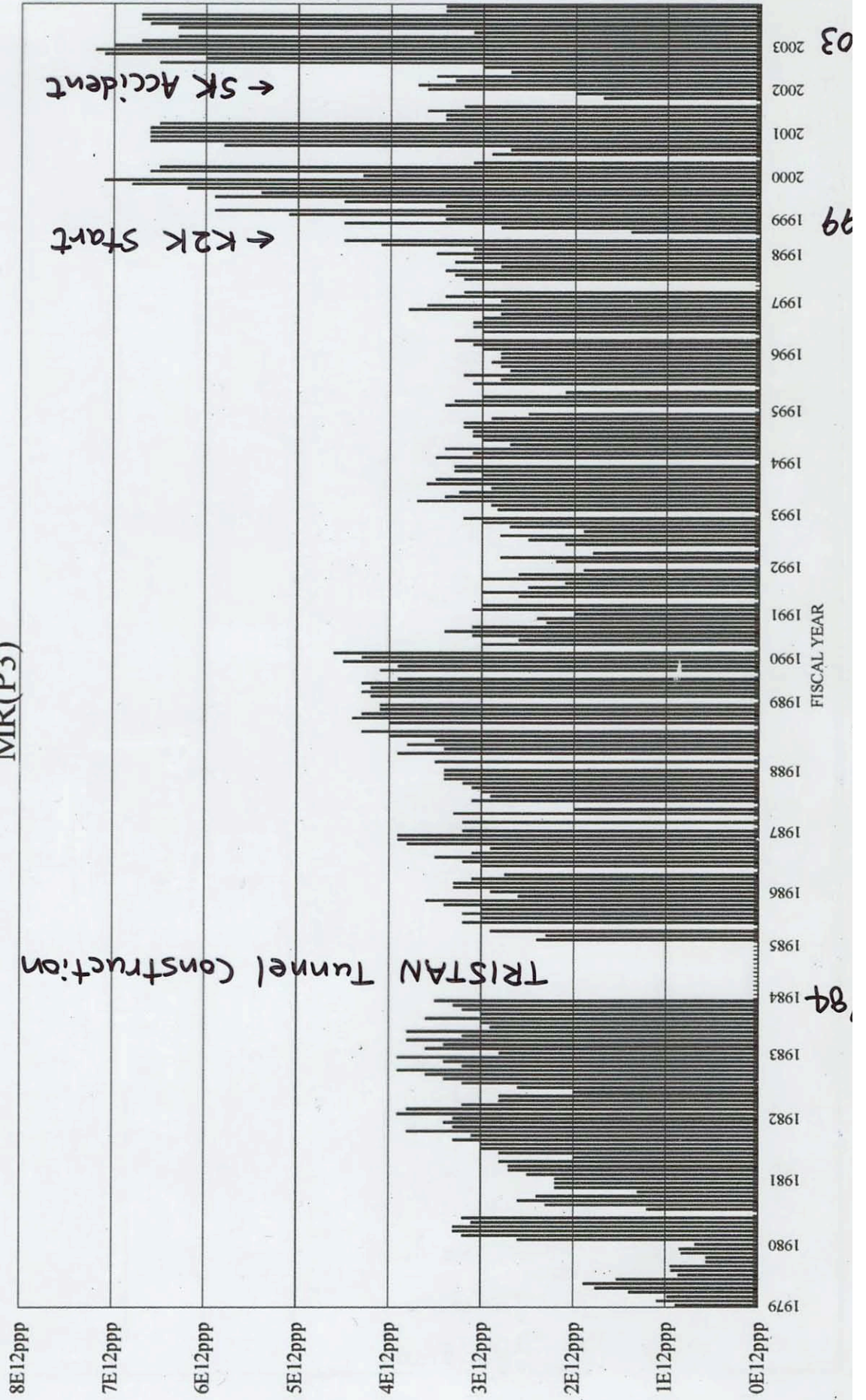
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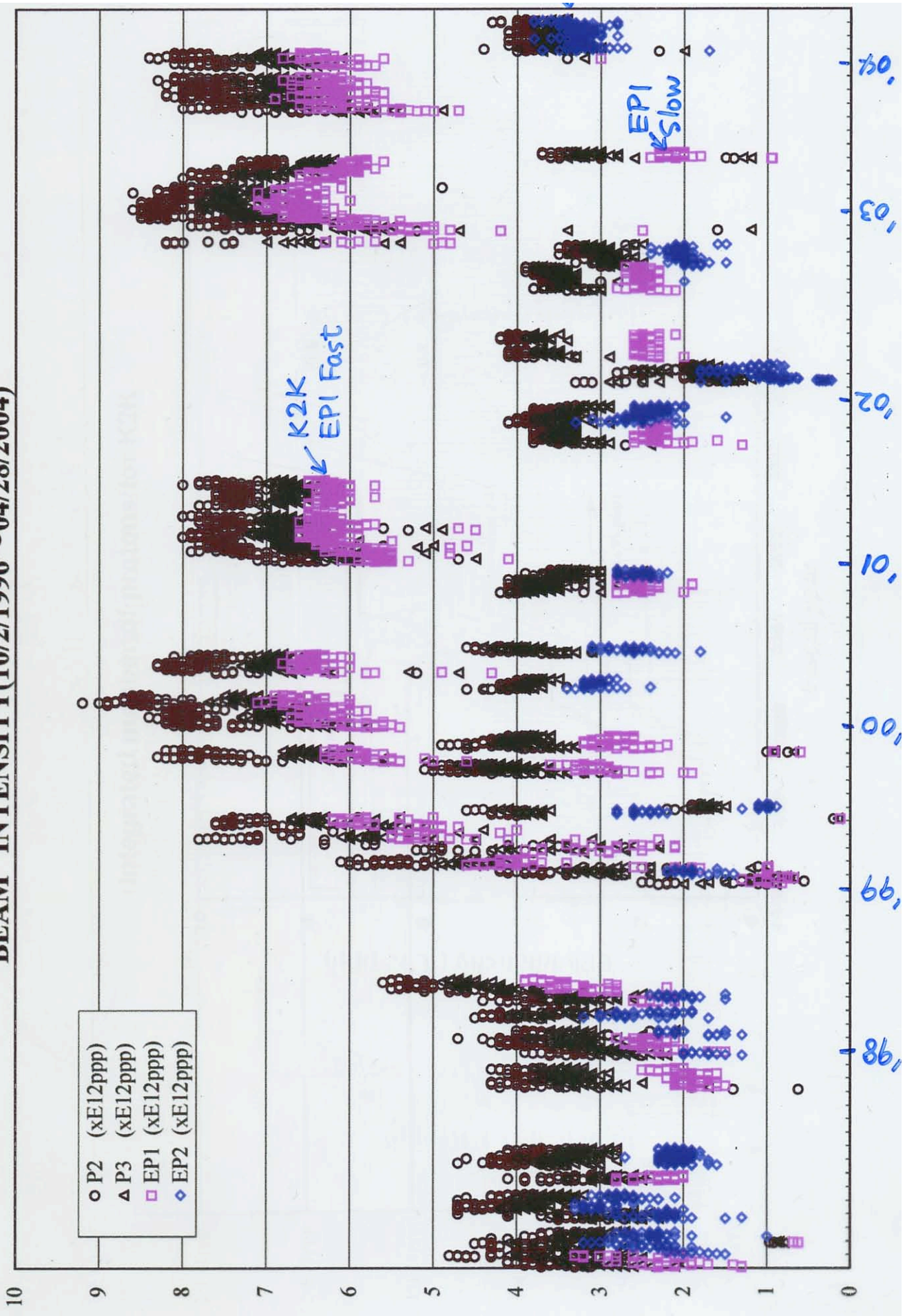
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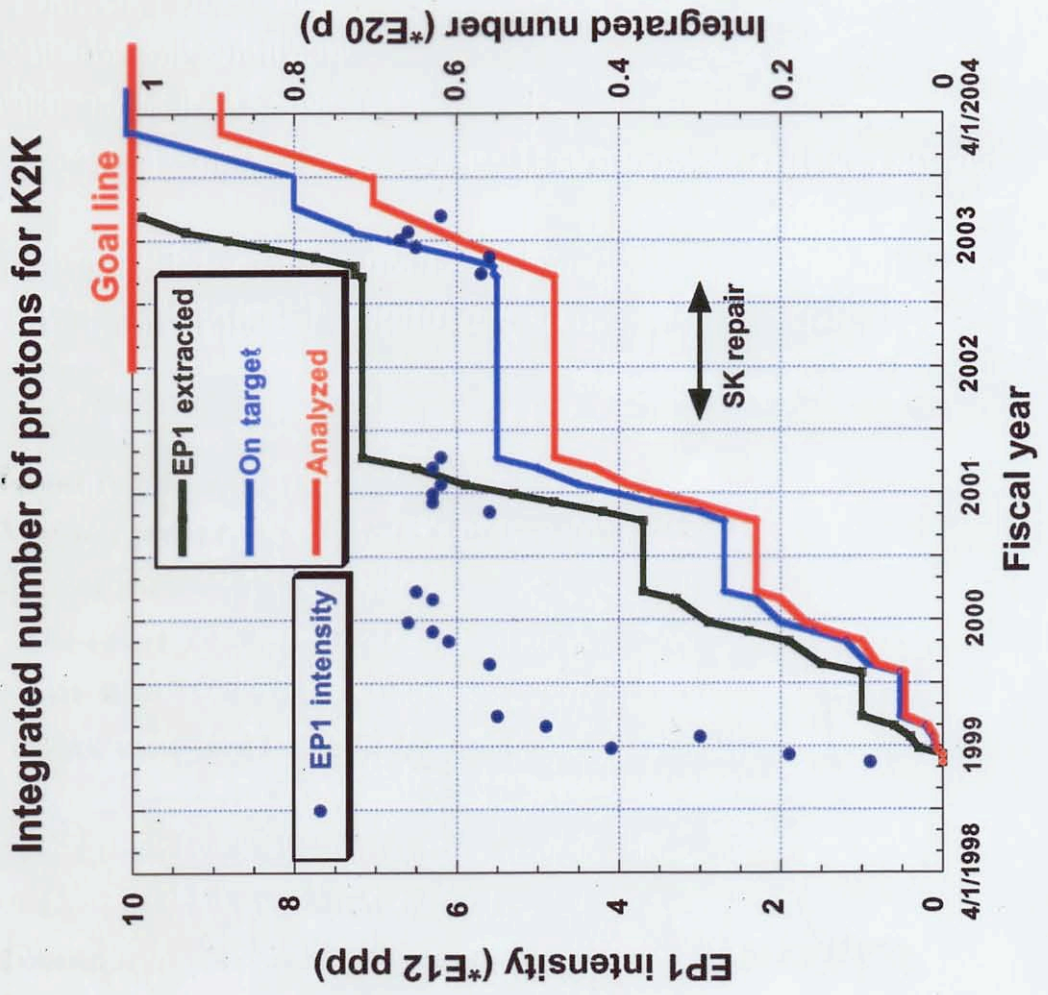
Average Intensity

MR(P3)



BEAM INTENSITY (10/2/1996~04/28/2004)





3. Future of PS Complex

Hardware Status

None of PS components is reused in J -PARC, except for MR fast extraction kicker power supplies.

1. Pre-injector and Linac

Good beam condition

Drift Tube Tanks are stable.

Spare parts and tubes are stored for two more year operation.

**For much longer operation extension,
renewal of the RF amplifier system may be needed.**

2. Booster

Good beam condition

Magnet power supply was renewed in 2001.

One of the two RF systems was upgraded in 2003.

The other is also to be replaced in 2004.

Spare units for injection and extraction,

spare units for bellows chamber are prepared.

**Hard to increase the intensity much further,
restricted by residual activities.**

Laminated core at the magnet edge may need to be fixed.

Able to run for longer years, together with J -PARC.

3. Main Ring

Good beam condition

Spare units for injection and extraction are prepared.

Hard to increase the intensity much further.

Residual activity level is too high for maintenance.

Beam loss must be less than 500W at the extraction.

Unable to align magnets to reduce the orbit distortion.

Unable to avoid the beam loss by the scattering at extraction;

**Beam traverses atmosphere along septum magnets,
and window foils. Estimated to be 5%.**

Components of the magnet power supply are over -aged.

They have not been overhauled or replaced for years.

No spare units for condensers and transformers.

Interrupt operation for several months in case of the failure.

Hard to guarantee stable operation for longer years,

unless reasonable maintenance is planned soon.

Man Power

Half or a third of PS accelerator staff will be busy for J -PARC from a latter half of FY2005.

MR operation in a first half of FY2005 may be supported.

PS Booster operation can be supported by about 10 staff members and 10 operators for one or two years. In case of heavy failures, call OB/OG for help.

**For further operation extension,
DECISION should be made soon on the PS activity.**

Shutdown Scenario

For at least ten years after shutdown:

All accelerator components in the tunnel are to be kept as they are.

They are periodically inspected as radioactive materials.

The tunnel is always dehumidified to avoid rusting.

The tunnel is sometimes ventilated for inspection and maintenance.

No final plan exists for cleansing the PS.

Reuse the tunnel?

R recycle the accelerator components?