

The 14th Mini-Workshop on Septa Devices in Accelerators

Session I: Septa Specifications and Experiences

Septa Requirements for Rare Symmetry Violating Process (RSVP) Experiments at BNL

Kevin Brown (BNL)

- Requirements for the two experiments (MECO and KOPIO) which comprise RSVP were presented
- The major concern for KOPIO was the bunch structure (40 usec bunches with a bunch width of 200 picoseconds). The purity of the inter bunch gap should be less than 10^{-3} (extinction).
- The KOPIO beam intensity will be 100×10^{12} ppp. The AGS has operated at 70×10^{12} ppp
- The aperture of the present extraction device is adequate for KOPIO

Septa Requirements for Rare Symmetry Violating Process (RSVP) Experiments at BNL

- Due to the lower Energy required for MECO the aperture of all three extraction devices, the H20 ESS, the F5 thin septum, and the F10 thick septum are adequate and the devices must be upgraded
- The purity of the inter bunch gap is a major concern (less than 10^{-9} extinction)
- Extraction for MECO will be normal Slow Extracted Beam
- The Present AGS Extraction Efficiency can be tuned up to 97.5% but it shows a tendency to degrade with higher intensities.

Experience of the trouble for Extraction septa at the KEK 12 GEV-PS Main Ring

Hikaru Sato
(KEK)

- The 12 GEV PS at KEK was commissioned in 1971 and has undergone a series of upgrades since then
- A major intensity upgrade in 1999 caused several problems associated with higher radiation levels to appear
- The ring is scheduled to be Shutdown and Upgraded for J-Parc in 2007
- There are two extractions lines into the North Hall and the East Hall
- Extraction is achieved with an ESS, two thin septa (A&B), and three thick septa (C,D,& E)

Experience of the trouble for Extraction septa at the KEK 12 GEV-PS Main Ring

- The ESS operates at 100 kV (@3 mA) and has been tested at 200 kV. It has tungsten wires and a Ti cathode
- The cathode of the ESS can move in relation to the wires to change the gap. The whole assembly also moves to align the device.
- Major parameters for the Septa where presented. The magnetic septa are pulsed
- Septa A & B can operate at 3300 Amperes while C,D, & E can operate at 6000 Amperes.
- Extraction efficiency has been as good as 95% but settling in the ring has dropped that to 87%
- The spill structure is controlled with an active filter and a DSP feedback system operating on a quadrupole magnet string

Design of Septum Magnets Based on Measurements and 3D Calculations of a Prototype Septum Magnet for the 3-GeV Rapid Cycle Synchrotron of J-PARC

Masao Watanabe
(JAERI)

- J_PARC Injection energy is 181 MEV to be upgraded to 400 MEV
- Extraction Energy is 3 GEV
- 8.3×10^{13} ppp---25 Hz rep rate----Iaverage=333ua
- There are 2 injection septa. 2 dump septa , and 3 extraction septa
- Injection septa—6246 amperes, 5650 amperes
- Dump—6787 amperes, 5603 amperes
- Extraction---11,176, 12,312, and 11,035 amperes
- The coils will be ceramic coated (flame sprayed on copper)

Design of Septum Magnets Based on Measurements and 3D Calculations of a Prototype Septum Magnet for the 3-GeV Rapid Cycle Synchrotron of J-PARC

- Nichicon manufactures the High Current Power Supplies
- The ceramic coatings are 0.2 to 0.3 mm thick
- The standard is to keep the field in the magnets below 1.5 Tesla
- The simulations were done with Opera 3D and compared to measurements on a prototype magnet. The results were acceptable

Experience with operating and maintaining septa at BNL

Tom Russo
(BNL)

- The operating experience with the H20 ESS were presented
- The device operates at 58 kV and is conditioned to 65 kV
- It is powered with a Glassman Power Supply which can operate at 85 kV 350 μ A
- The problem of Dark current was discussed as were its implications on operations
- The cathode is made Ti and the foils are Tungsten Rhenium
- Concerns about the insulating fluid in the feed through were discussed

Round Table Discussion

- Discussion of Dark Current : No one else has seen it. There is some literature that suggests reversing polarities on wires may help
 - KEK takes one to two weeks to condition septa
 - KEK runs there septa at 110 kV with a 2.5 cm gap
 - KEK condition the septum at 30 ua
- The KEK septa has a 1 megOhm resistor protection and a voltage divider at the septa before the resistor.
 - Vacuum in the KEK Septa is 10^{-7} or 10^{-8} torr
 - Septa components are cleaned in acetone
- At J-PARC the will change the ESS gap to facilitate conditioning
 - The J-PARC ESS will be similar to CERN's in design
- J-PARC 's ESS will operate at 6.8 megavolts/meter—25mm gap at 170 kV

Round Table Discussion

- Scattering on the ESS for RSVP will be the major cause of particles between bunches. Suggestion were made to put a smaller higher gradient ESS before the H20. I10 may be a better position for the ESS.
- The spill structure at the AGS may be dominated by hot spots caused by beam coalescing. This would be very hard to eliminate with feedback. At the AGS we attack problem with the VHF cavity
- KEK eliminates spill ripple with feedback into the tune quadrupole system
- Discussion was held on the water blockages in the AGS F10 septum. BNL has moved to an oxygen free system. KEK has gone to an oxygen free system two years ago but no data is available to determine if it has improve their water problems
- BNL uses a 5 to 10u filter on the f10 and back flush when indicated by the resistance chassis

Round Table Discussion

- BNL described the operation of their Resistance chassis for temperature monitoring. KEK uses flow switches and thermocouples to protect their devices. They are not happy with this solution
- A discussion was held on Flame spraying ceramic on copper pipe. They flame spray 10 coats of 0.025 mm on preformed tubing. The tubing can bend up to 1mm without damage on a one meter long pipe. The ceramic coated tubing is stacked and wrapped in kapton for assembly.
- BNL has had magnets (F6 and Booster Dipoles) insulated with kapton fail.
- BNL described the Magnesium oxide radiation resistant cable it is supplying to SNS
- SNS has developed a quick disconnect water connection