SLOW EXTRACTED BEAM AND THE BEAM MONITORING SYSTEM AT KEK

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Slow extracted beam of 12 GeV proton synchrotron has been used for the high energy counter experimental physics. The beam transport system and the instrumentation are described.

Beam Transport

A slow spill primay proton beam (EP2) is extracted from the long straight section III-2F of the KEK 12 GeV proton synchrotron by a half integer resonant extraction method[1]). A layout of the slow extracted beam is shown in Fig. 1. After travelling through a matching section, the primary proton beam is splitted vertically by the three way beam splitting system, which consists of an electro-static splitter(ESS) and two magnetic iron septa (SM1 and SM2). A schematic view of three way splitting system is shown in Fig. 2. The flexibility of this system is achieved by adjusting the quadrupoles and the vertical steering magnets upstream of the splitter station.
The operation modes of the splitting system are shown in Fig.3. The three beams splitted by the splitter are transported to the external target

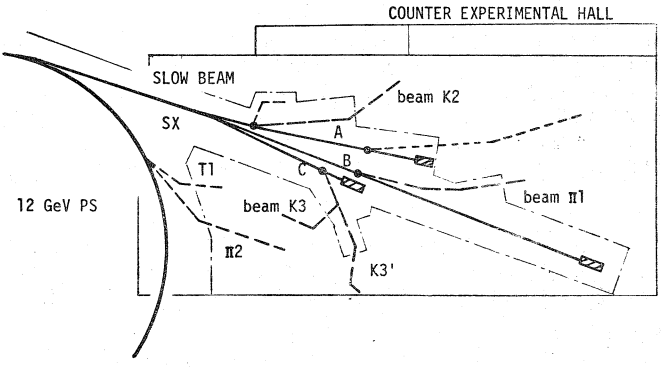
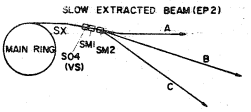


Fig. 1, Layout of slow extracted beams



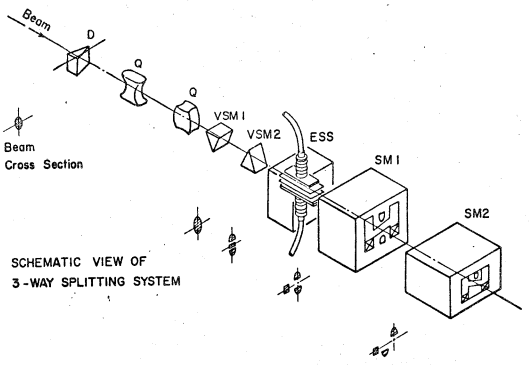


Fig. 2, Schematic view of three way beam splitting system.

MODE	BEAM PROFILE AT ENT OF SM1	SO4 (VS)	SM1	SM2	A	B	C
1		POS & HIGH	OFF	OFF	O		
2		OFF	OFF (ON)	ON (OFF)		O	
3		OFF	ON	ON			O
4		POS & LOW	OFF (ON)	ON (OFF)	O	O	
5		POS & LOW	ON	ON	O		O
6		NEG & LOW	ON	ON		O	O
7		OFF	ON	ON	O	O	O

Fig. 3, The modes of the beam splitter.

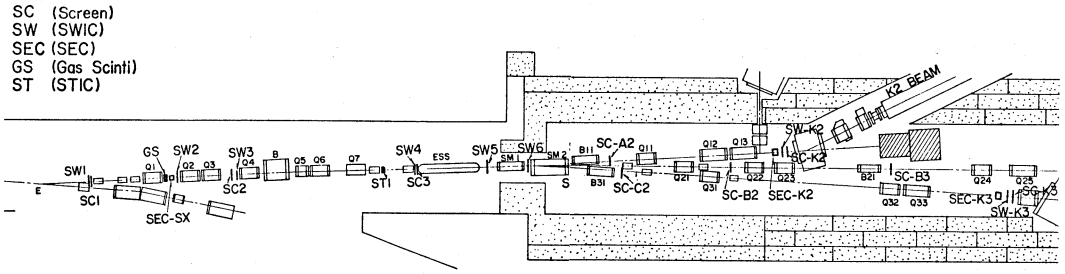


Fig. 4, Typical layout of the beam monitors.

station, respectively.

Instrumentation

Luminescent screens and segmented wire ionization chambers (SWIC) are used to know the beam profile. In early stages of tuning, the screens are used and the SWIC's are used for the fine tuning and the beam emittance measurement. The intensity of the extracted beam is measured with a secondary emission chamber (SEC). The SEC has been calibrated by a toroid (current transformer) in conjunction with the fast extracted beam and by foil activation analysis. The typical layout of beam monitors is shown in Fig. 4. The cross sections of the SWIC and the SEC are shown in Fig. 5 and Fig. 6., respectively.

Beam Characteristics

The external beam emittance has been measured with using the method of "the quadrupole lense plus drift space between reference and obserbation point"[2]. The result are ε_h = 6π mm.mr (2σ) and ε_v = 6π mm.mr (2σ).

References

1) K. Endo et.al., IEEE Trans., NS-26 (3) 1979, p.3170.
2) H.Ploss and L. N. Blumberg, BNL-AGS DIV 68-4.

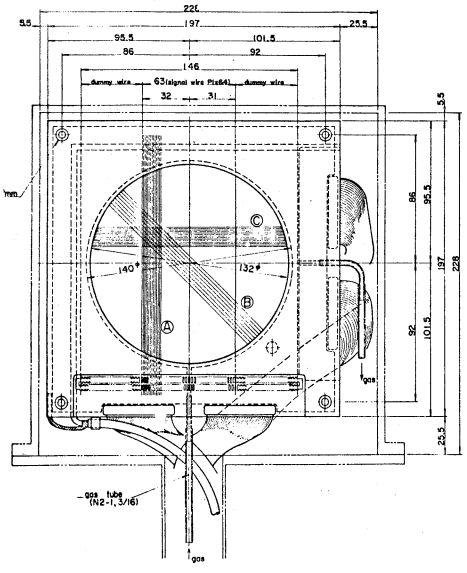


Fig. 5, Cross section of the SWIC.

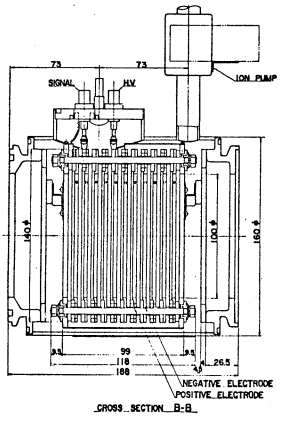


Fig. 6, Cross section of the SEC.