AK/iw

MPS/SR/MD 72-1
31.1.1972

M.D. NOTE

M.D. preparation note (2) for the CPS-SPS shaving ejection

Instrumentation

It seems reasonable to dispose even for the tests of a rather complete set of measuring devices.

The persons concerned should contact me in case of changes or delays.

Internal beam

	Action:
1. Transformer, 50 turns, upper frequency limit ~ 5 MHz, time constant ~ 1.5 ms, sensitivity ~ 1 V/A, passiv device working into 50 Ohms. Available March 72.	Battisti
2. Passiv transformer 6 turns, upper frequency limit ~ 50 MHz, time constant ~ 150µs, terminated with 75Ω, sensitivity ~ 8 V/A. Available March 72.	Battisti
3. TV screens in s.s. 85 (TSM) and s.s. 16. Available March/April 72.	Steinbach
4. Minitoposcopes or miniscanners: TSM 85 upstream (April 72), septum 16: normal mini-scanner (February 72) replaced during summer by 3 minitoposcopes (2 x horizontal + 1 x vertical).	Steinbach
5. Target in s.s. 84.	Henny
6. Fast loss monitors (Argon chambers) in s.s. 83, 85, 16 and 19. Available April 72.	Steinbach
7. Normal instrumentation as CODD, IBS, slow AIC's, Q-measurement, radial position measurement, slow beam transformer.	

External beam

1. Transformer 5 turns, sensitivity ~ 10 V/A, passive for high frequencies and activ for low frequencies to increase the time constant (method of Unser/Kracht). Available March 72.	Colchester

Action:

2. 20 turns transformer signal via emitter follower. Available March 72. — Colchester

3. SEC, used normally for slow ejection.

4. ACEM (Aluminium Cathode Electron Multiplier) installed near beam stopper. March 72. — Henny

5. Toposcope, horizontal and vertical. Electronics from prototype in slow ejection channel 62 will be moved to channel 16. Available May 72. — Steinbach

During the ejection tests we shall be concerned with a normally bunched beam as well as with a debunched one, modulated by a still unknown structure. The monitoring devices have to cope with both and need a rather high bandwidth.

The signals will be observed on a fast storage scope (Tektronix 549, 5 cm/µs writing speed, 30 MHz bandwidth). This is hoped to facilitate operation.

During the first time no need is seen for an extensive digitization of information. It is planned to start with:

a) Integral ejection efficiency:

Normal procedure by use of $I_{p\ before}$, I_{p} after and SEC signal, readout on STAR display. Calibration with 20 bunch fast ejection. — Serre

b) First slice ejected beam percentage

This is useful for adjustment of the following 10 ejection steps to achieve a uniform external beam. The internal beam intensity is sampled during the revolution following the first ejection step and integrated. The ejected amount is displayed in percentages of $I_{p\ before}$. — Battisti

The observation of analog signals on a scope gives clearly more information than any digitized value, provided the signal shape is matched to the possibilities of the scope and the observer. Therefore, the following auxiliary electronics will be available.

1. Various smoothing filters — Krusche

2. If necessary, differential receivers to suppress mainly 50 Hz ripple and related harmonics.

3. Droop compensation amplifier for 6 turns internal beam transformer and 20 turns external beam transformer.

Action:
(Pearce/Krusche)

4. Contour filter/amplifier, which transforms for example a bunch signal into a trapezoidally shaped pulse with 105 ns half width. A sequence of bunches is then displayed as a dc-signal which is essential for the storage scope and useful for observation of another scope because the shape of the bunches is eliminated. The transient response is 50 to 100 ns for dc-signals, the smoothing interval roughly 100 ns.

5. Internal beam intensity controlled amplifier
The gain of the amplifier is controlled by I_p before such that the output is normalized to a preset value (within a dynamic range of ~ 50%). Therefore, beam intensity changes do not influence the output signal amplitude any more, which facilitates the observation of the differential ejection stability. Furthermore it is rather easy to display reference lines.

   If necessary, the external beam signal can be integrated and digitized every 2.1 µs by use of a fast ADC.

Emittance measurements

The pulse generator for the fast programmed bumper will allow to fire only the first step. Therefore the beam slice with the (theoretically) biggest emittance can be analysed separately.

A very rough measurement is possible by use of the mini-scanners in s.s. 85 and s.s. 16.

The toposcope in ejection channel 16 together with 2 quadrupoles shall yield a more precise value (method Millich/Steinbach), but it is still unclear which precision can be achieved.

A. Krusche

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