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Transition Losses vs. Beam Intensity

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It was verified that at intensities of $3-3.3\times10^{12}$ essentially no dilution at transition can be achieved if the phase jump is adjusted so that an outward radial excursion is obtained (this is an old trick). As the intensity is increased the radial excursion becomes greater but even at 5×10^{12} the so-called transition loss is less than 10%. With the simple control of the phase jumps and timing one finds that the outward radial excursion becomes less at higher intensities. This is not fully understood yet but certainly the radial loop response is limited.

At 6×10^{12} one could adjust the phase jump and timing over 10 msec range and obtain "transition losses" from 12-20% & once one accepts considerable debunching transition parameters are not to critical.

With the intensity in the neighborhood of 3×10^{12} and no dilution the horizontal instability mentioned on 12/1/73 was present. The remainder of the period was used to study this effect and the following observations were made.

1. When observing detected radial signals the blow up is not seen on all PUE's viz. H-7, D-7, F-15 show it but D-15, I-7, J-7 etc plus new PUE's H-4, 8 etc.
2. H-7 when viewed with RF difference indicates within the bunch position variations but other PUE's don't.
3. One sees sees different bunches with different radial position but no distinct longitudinal mode number can be discerned.
4. Very small betatron oscillations about different radial positions for a few bunches can also be seen.
5. Even at 2.5×10^{12} when the most unstable radial position H-7 does not indicate the presence of the effect the FEB on the H-10 plug can be blown up both H & V.

C. Nominal misadjustments at transition of course suppresses the instability.

1. (As mentioned on 12/1/73) the vertical dipole instability that occurs at around 320 msec can also be seen if the radial at H-7 is adjusted to be <0. The horizontal instability occurs from 320 to 400 msec for H-7 $\Delta F > 0$.