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Linac beam bunching at 2.5 MHz (ring rf frequency)

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Date 4/21/77 Time 1800-2100 Experimenters N. Fewell

Subject Linac beam bumching at 2.5 MHz (ring rf frequency)

OBSERVATIONS AND CONCLUSION

Setup - The linac buncher #1 was run at 2.5 MHz higher in frequency than the linac tanks, this causes the bunched beam to move across the phase acceptance of tank #1, producing an amplitude modulated beam at 2.5 MHz.

Procedure - As the present buncher tuning range is only $\pm$ 500 KHz about the linac frequency (201.25 MHz) the effective length of buncher #1 had to be shortened. This was accomplished by changing the capacitor plates that form an rf short circuit at the ends of the buncher cavity. The buncher cavity and rf system was then tuned to 203.75 MHz using a signal generator. 3.5 mW of 2.5 MHz from the ring starting oscillator was then mixed with 40 mW from the linac reference line using a balanced mixer. The upper sideband of 203.75 MHz was then amplified to 40 mW with a Boonton amplifier and fed into the amplifier system. The Q of the cavity and amplifiers was sufficient to attenuate the carrier and lower sideband frequencies.

Results - Using buncher #1 only, at normal gradient, the beam out of tank #9 was modulated 53%. I_{peak} = 55 mA, I_{min} = 26 mA, I_{ave} = 40 mA.

Using buncher #2 only (linac freq.) I_{ave} = 57 mA.

Using both bunchers at normal settings the modulation was 39%. I_{peak} = 71 mA, I_{min} = 43 mA, I_{ave} = 57 mA.

Comments - This method is an effective way of modulating the linac beam. No attempt was made to maximize the modulation or ring capture at this time.