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Linac beam losses

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Subject Linac Beam Losses

OBSERVATIONS AND CONCLUSION

The linac beam radiation was measured using the LRM (long radiation monitor) system to measure losses as the magnets and rf were adjusted. The losses in the tank #1 and tank #2 region were measured using the linac beam current transformers (LBX).

For a typical run, the losses are as follows:

1. Beam injected into tank #1, but not accelerated
   TK #1 input = 120 mA
   TK #1 output = 78 mA
   Loss 37.5%

2. Tank #2 input = 78 mA
   Tank #2 output = 65 mA
   Loss 17%

3. Loss in tanks #3 - #9 for 65 mA into tank #3

Tank #	Beam microamperes lost	Possible error
3	50	+ 100 - 25
4	5	± 5
5	50	± 25
6	5	± 5
7	5	± 5
8	3	± 2
9	5	± 5

The losses in tank #2 appear to be due to beam falling out of the bucket in tank #1 since small changes in rf or magnet parameters in tank #2 do not affect the loss ratio.

The losses in tank #3 is primarily due to improper rf capture. Any changes in bunchers or tanks 1 - 3 rf parameters changes the loss pattern.

The losses in tanks 4 - 9 should be taken as upper limits. It is possible to reduce these losses to zero (no measurable radiation) by careful quadrupole adjustment.

Two dipole steering magnets in tank #3 are powered. While these do not eliminate all steering errors the losses in the high energy parts of the linac do not appear to be correctable by beam position changes at this location.

The losses in HEBT appear to be less than 5 microamperes total, but requires the LRM system to be callibrated vs beam loss in order to obtain a more accurate measurement.

Clearly, transport through the linac and HEBT was improved by the procedures used in these studies. It remains to be shown that the section IV of HEBT can produce a proper match to the AGS with these new transport parameters.