BNL-104018-2014-TECH

AGS.SN140;BNL-104018-2014-IR

Ring rf Cavity Shorting Switch--First Commissioning

L. Ahrens

April 1983

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

Number 140

AGS STUDIES REPORT

Date April 13, 1983 Time

Experimenters L. Ahrens, W. Frey, J.W. Glenn and J.T. Keane

Reported by L. Ahrens

Subject Ring RF Cavity Shorting Switch - First Commissioning

OBSERVATIONS AND CONCLUSION

The shorting switches which have recently been installed on the forty gaps of the AGS ring rf cavities were exercised briefly April 12, 1983 and "commissioned" April 13. The immediate tentative results are given below.

The usual indicators of rf structure during the slow beam spill (flat top) are: for the circulating beam either a spectrum analyzer or a self-triggering oscilloscope looking at either a pick-up point on any given rf cavity or the ac component of the circulating beam; and for the extracted beam the Weisberg external beam rf structure monitor displaying a histogram of time intervals between coincidences in a scintillator telescope looking at scatter from an extraction line.

Apriori all of these showed structure slightly above the 12th harmonic of the revolution frequency (typically at the 13th, 14th and 15th harmonic), this being most quantitatively related to these frequencies by a spectrum analysis of the cavity voltages themselves, but also clearly visible in the external beam rf monitor. With the switches closed during flat top, and hence the cavities "shorted", no signal was seen on a spectrum analysis of the cavities anywhere near the 12th harmonic (certainly less than 5% of the unshorted signal). The external spill rf structure monitor showed no structure. The low frequency component of the spill structure, the envelope of the response from a secondary emission monitor in the extraction line, displayed on an oscilloscope self-triggering, or synced to LILCO or Siemens, was not qualitatively affected by the switch closing.

The other part of the story is that with the switches closed, both the rf cavities and the circulating beam developed an ac component at three times the revolution frequency, whose amplitude was sensitive to the cavity tuning current. This is tentatively explained as due to the fact that the switches are in series with a large capacitor to maintain the integrity of the cavity bias circuit. This capacitance causes the cavity to resonate in the vicinity of 2-3 times the revolution frequency. Curiously, as mentioned above, the external rf spill structure monitor shows no obvious structure in this frequency range.