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Attempted Transverse Impedance Measurement in RHIC

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Attempted Transverse Impedance Measurement in RHIC

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July 20, 2012

1 Results

An attempt was made to improve earlier measurements of transverse impedance in RHIC¹. Measurement with protons at injection were made on March 7, 2012. Data were taken in the yellow ring with the current as a function of time shown in Figure 1. We used the RHICBTF application with varying numbers of bunches. The measured beam transfer functions are shown in Figures 2 and 3. The two indices parameterizing each curve are the peak current and the number of bunches in the symmetric fill. For the horizontal data in Fig 1 the two blue curves for 8A peak current with 28 bunches have a larger measured tune difference than the green curve with 5A peak current and 6 bunches or the magenta curve with 4A peak current and 28 bunches. The expected tune shift for a transverse impedance of $4M\Omega/m$ and 4 amps is 0.0012. This is comparable to the measured vertical tune shift when changing from 8 to 28 bunches. The RHIC impedance is broadband so any change in tune with bunch number is an instrumental effect. We conclude that another measurement technique is needed to obtain reliable results.

¹“Transverse Impedance Measurements at the RHIC” S.Y. Zhang, H. Huang, P. Cameron, A. Drees, R. Fliller, T. Satogata, EPAC02, p1112, (2002)

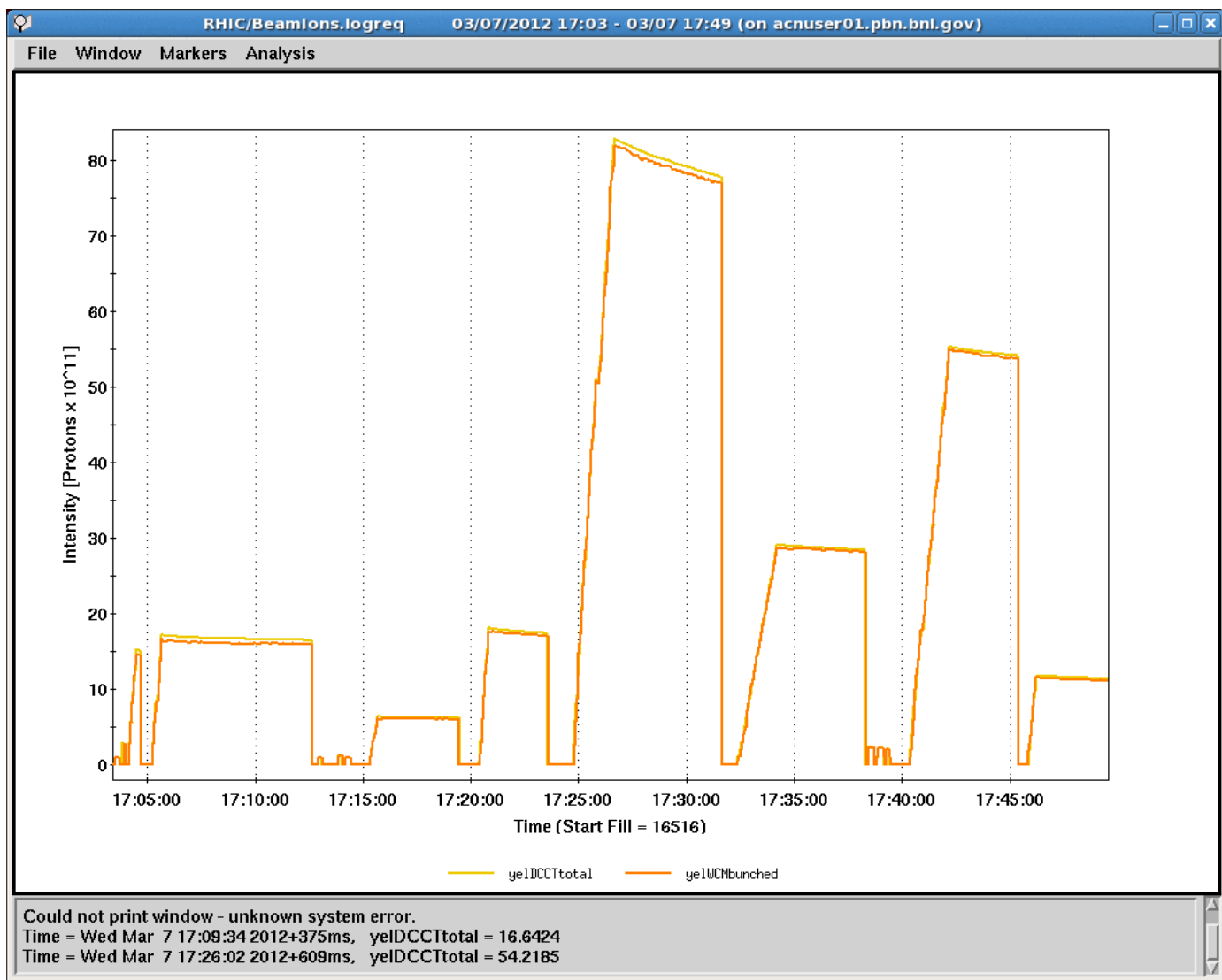


Figure 1: yellow beam current during the experiment

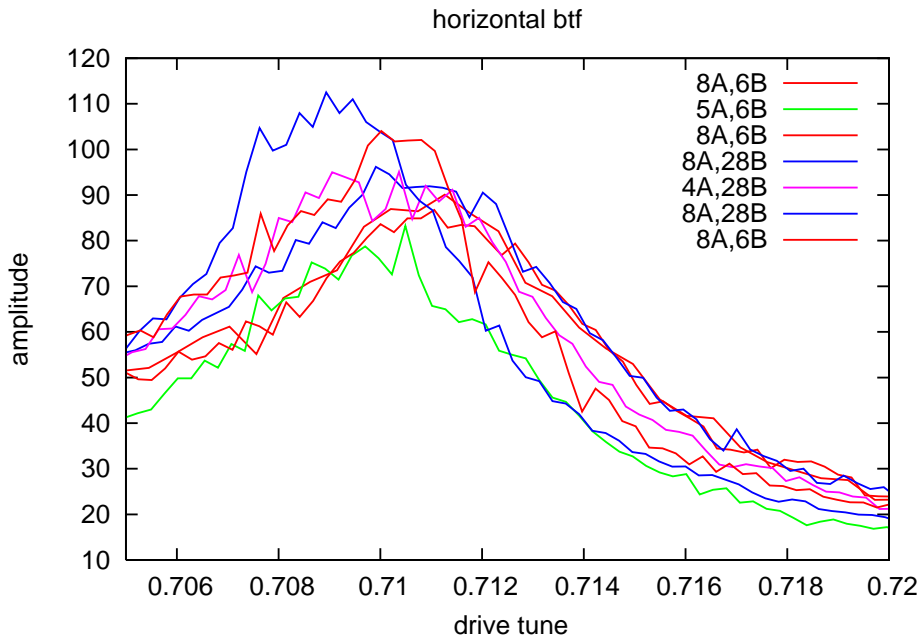


Figure 2: Horizontal BTFs for a range of intensities and fill patterns

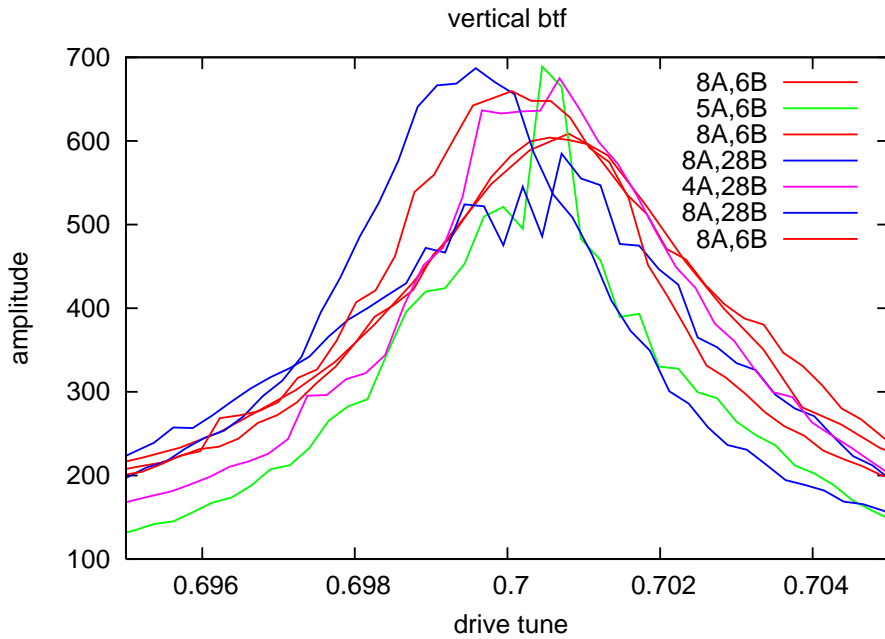


Figure 3: Vertical BTFs for a range of intensities and fill patterns