TWC 200 MHz Hardware
and
Rephasing

Results from Long MD Oct 21, 2002

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Hardware status. TWC 200 Cavities

- Feedforward same as last year

- Feedback BW improved compared to last year: Impedance reduction by ~18 dB at center frequency ~200.2MHz (same as last year) plus impedance reduction by ~6 dB on the second lobe of the cavity response (~197.9MHz and ~202.6MHz for cavities 1 and 2 - installed before MD 17 July 02, ~198.3MHz and ~202.1MHz for cavities 3 and 4 - installed before MD 28 Aug 02)

Hardware status continued

- Longitudinal damper installed on cavities 2 and 3 with programmable gain and no saturation at the output (*non-saturating output* installed on Cavity 2 before MD 26 Sept 02 and installed on Cavity 3 before MD 21 Oct 02)

- However … frequent trips of TX3 -> reduce gain of 1-T feedback on cavity 2 (-6 dB) and switch off longitudinal damper on cavity 2

Longitudinal damper

- Increase gain (x2 linear) for 20 ms on each injection

- Kicks generated by damper ~2 MV max in Cav 3 !
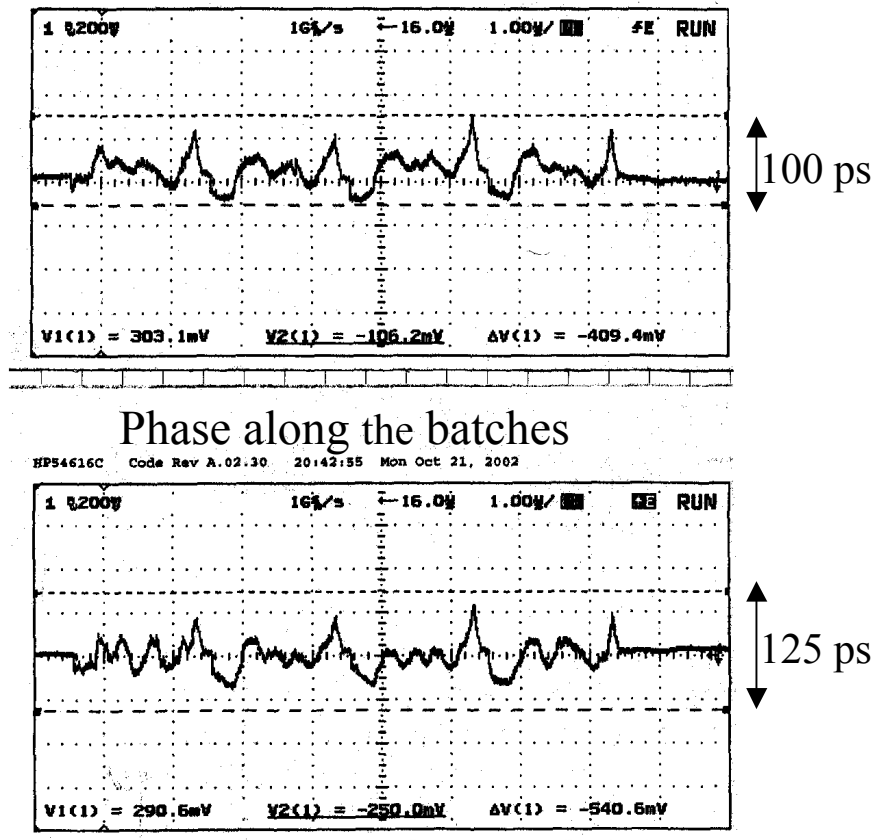
- Damping of injection phase error for second batch

1.875 MV
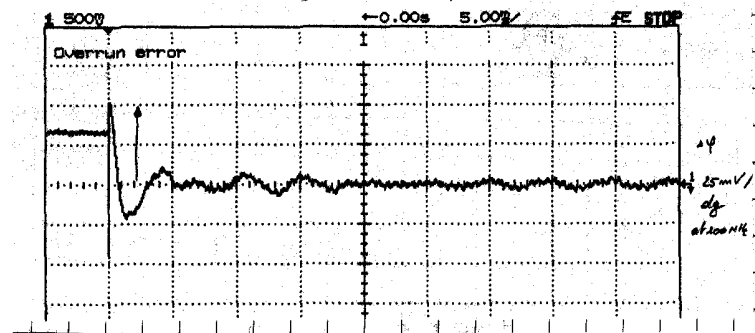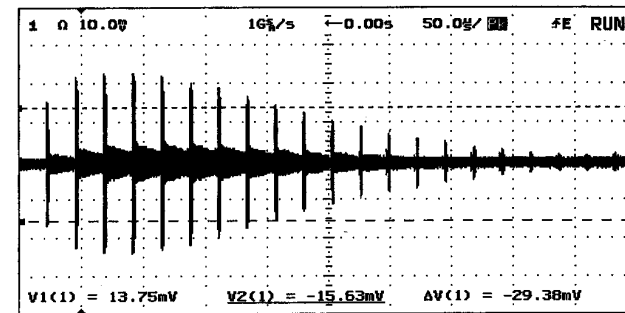
25 mV/deg @ 200 MHz

Phase error along batch on flat top bunch/Master RF phase

- Nominal intensity, i.e. $1.05 \ 10^{11}$ per bunch at 450 GeV. 7 MV @ 200 MHz + 0.7 MV @ 800 MHz. A typical shot: All bunches in 100 ps (calibration 230ps/V)

- 10 successive cycles fall in the 125 ps window

100 ps

Phase along the batches

125 ps

Phase error along batch end flat bottom bunch/Master RF phase

- Nominal intensity 1.15 10^{11} per bunch at 26 GeV. 2MV @ 200 MHz 0.20MV @ 800 MHz

- All bunches in a 140 ps window

- All bunches in a 175 ps window

140 ps

Phase along the batches

175 ps

6
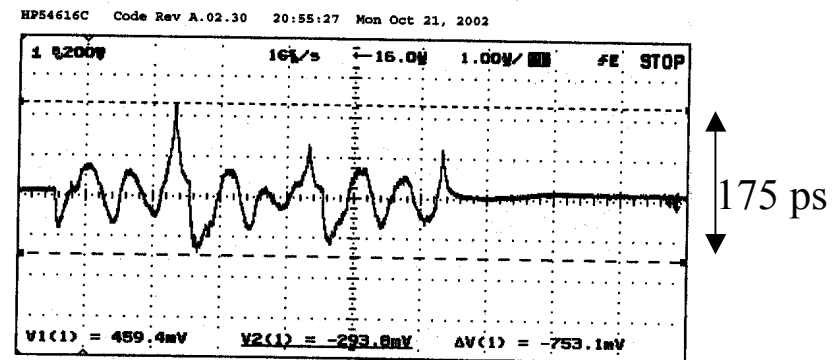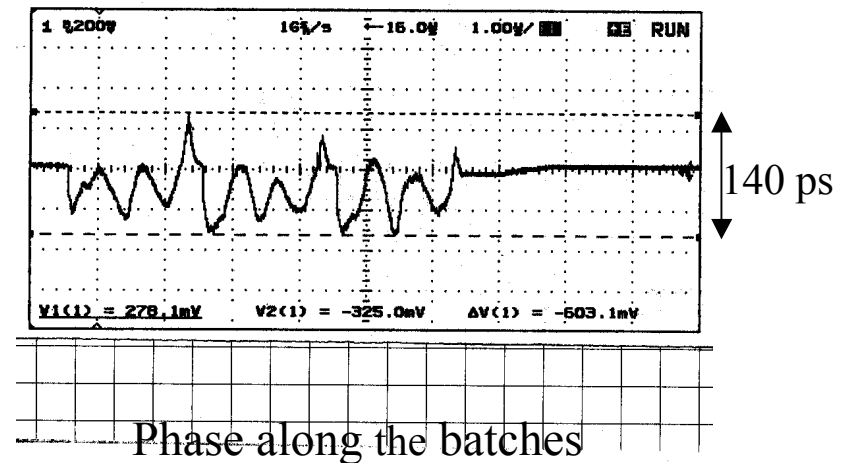
Transparent rephasing

- Idea: Use the LHC bucket reference (fiducial frequency) to synchronize the CPS-SPS transfer so that, at 450 GeV, the SPS beam is in correct position for transfer to LHC -> No Rephasing in the SPS

- Problem #1: Fluctuation of B field from cycle to cycle -> expect +- 100 ns on the final beam position at 450 GeV (see CERN SL-98-027 RF). Solution = Playback mode

- Problem #2: Asynchronism of the MTG driving the B field (and frequency program) and the SPS-LHC fiducial frequency -> expect 390 ns max (see Chamonix IX CERN-OPEN-99-077). Solution = Reset DDS (FSK)

Transparent rephasing continued