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MEASUREMENT OF THE TARGET DENSITY DEPLETION ON THE TIME SCALE OF SINGLE PROTON PULSE

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Abstract

We report on a measurement of the $\overline{p}$ yield of the front of the proton pulse and that of its tail. The purpose of the experiment is to see if any measurable target density depletion takes place during a single pulse. The preliminary results show no sign of the density depletion within the errors.

This report will discuss the measurement of the $\overline{p}$ yield per proton as function of time within one proton pulse. The aim of the experiment was to establish if there is any measurable target density depletion on the time scale of 1 μs, *i.e.* one proton pulse. The preliminary results do not show signs of target density depletion at that time scale.

The proton pulse arriving from the Main Ring consists of 84 bunches approximately 20 ns apart. The proton current is measured by the gap monitor in the transfer line. The first and the last 10 bunches in a pulse are shown in Fig. 1 a and b. The secondary beam (mostly pions) is measured by a similar gap monitor in the Debuncher and the results are shown in Fig. 2 a and b. The integral of these curves represents the total number of particles in each beam.

The quantity we are interested in is the $\overline{p}$ *yield, i. e.* the ratio $\overline{p}/p$ for different bunches in the pulse. We can measure this up to a constant of proportionality by taking the ratio of the areas under the curves of Figs. 1 and 2 averaged over 9 bunches. The last bucket from each group was dropped since the trailing $\overline{p}$ bucket typically contains 50 to 75% of the average of the other 9 (which are more uniform in size).

The "leading" yield ratio resulted from the integration of the area under the first 9 proton buckets in ratio with the same from the first 9 anti-proton buckets in a bunch. The "trailing" yield ratio was done in a similar fashion with the last 9 proton and anti-proton buckets in a bunch. Both measurements were done twice.

The measured heading ratio is

$$1.757 \pm 0.069,$$

while the trailing one is

$$1.763 \pm 0.08.$$

The errors stated result from uncertainty in the integration due to baseline fluctuation and the breadth of the line defining the function to be integrated. The proton and anti-proton measurements were uncorrelated. This source of error should be eliminated by automating the data taking and the integration which will enable us to collect many more data and integrate them more accurately. We expect to do this soon.

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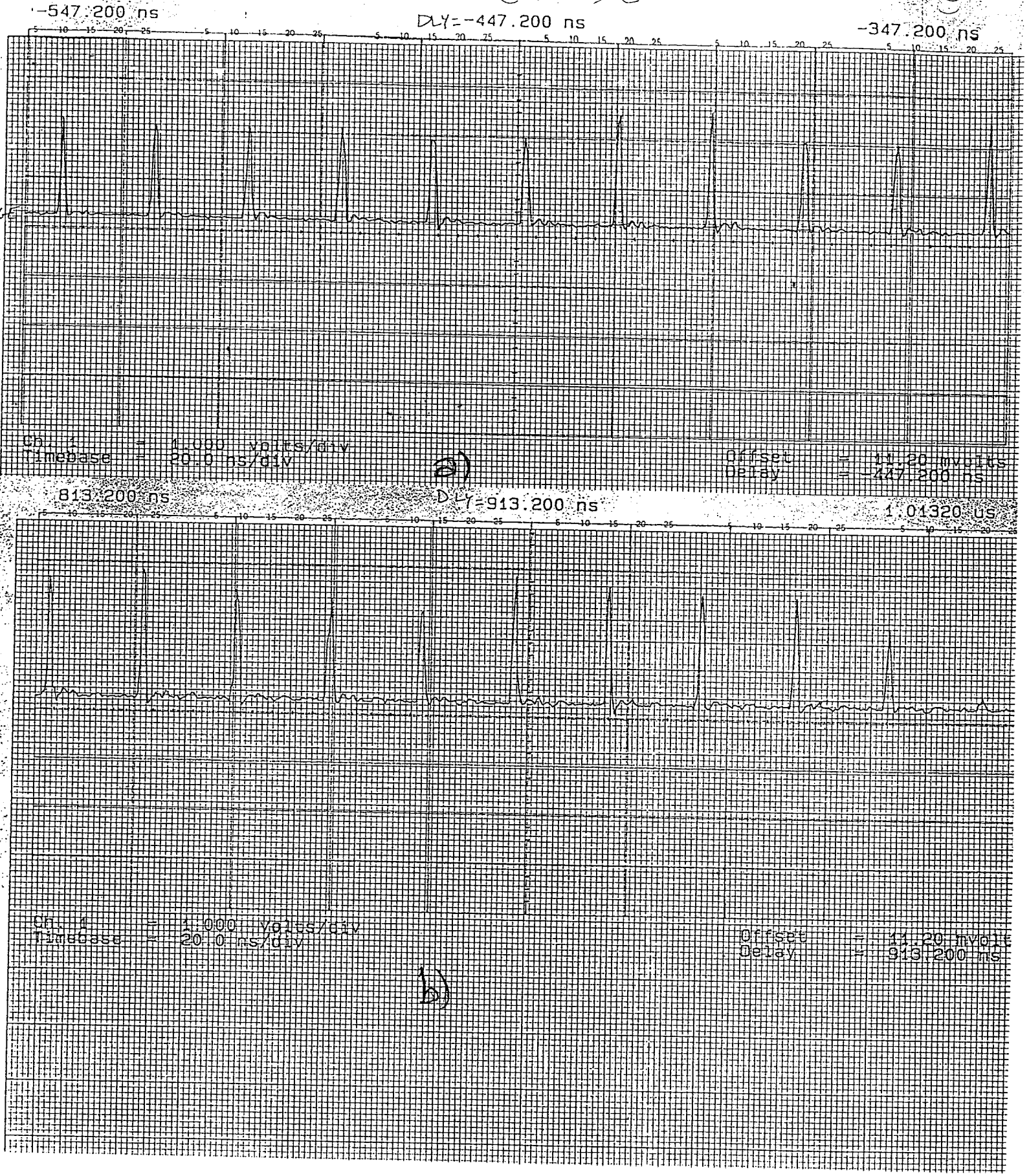

Fig. 1

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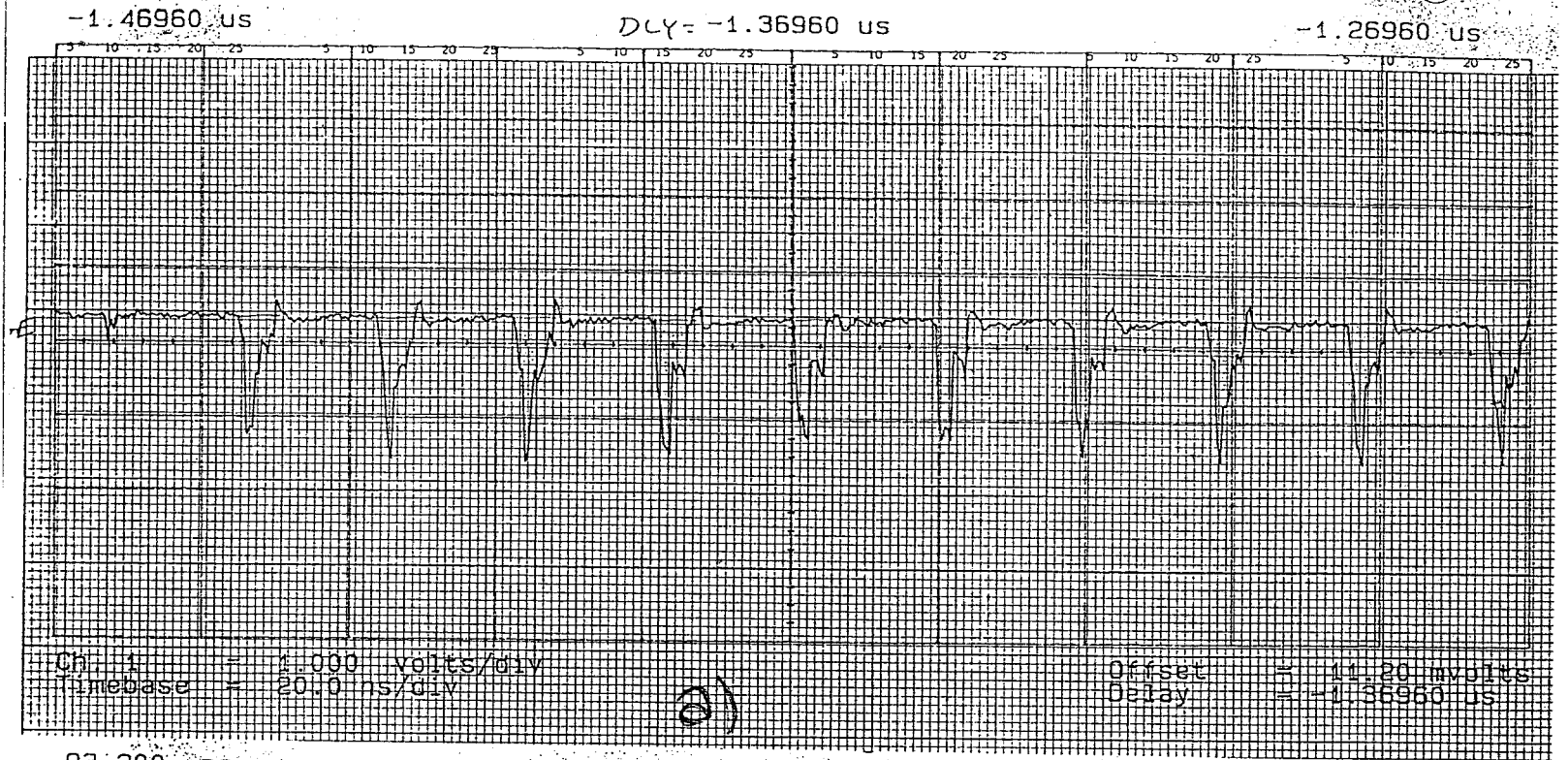

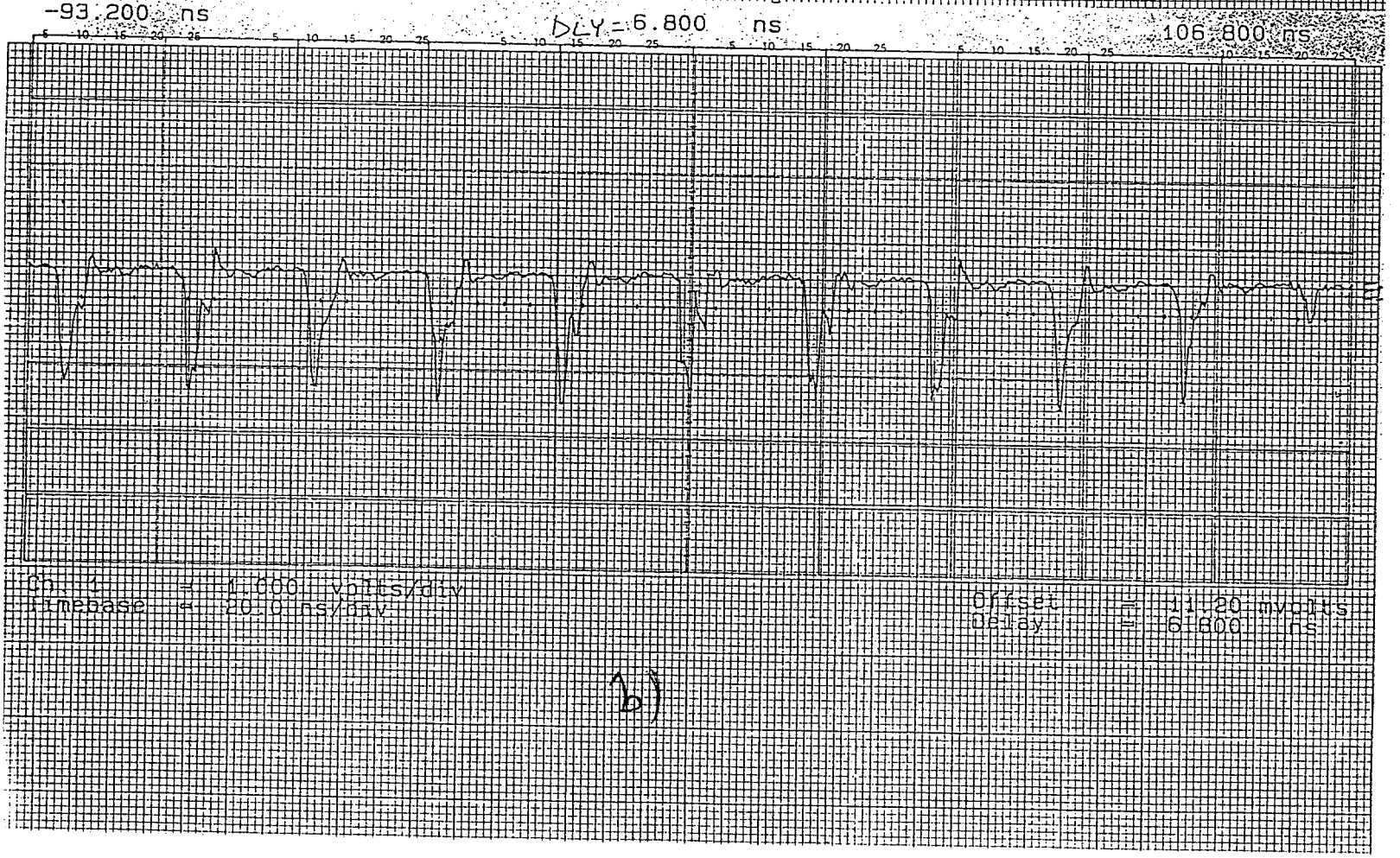

Fig. 2