summarised in Table 19. Here, the contributions to momentum resolution from the proton absorber ΔP(absorber) (with the CDC inner wall and the muon stopping target) are estimated from fast Monte Carlo studies given in Fig. 79. In these fast simulations, electrons with a monochromatic momentum of 104.8 MeV/c are generated and momentum smearing effects are examined. The intrinsic momentum resolution ΔP(intrinsic) is given in Section 11.6. It is known that the BaBar CDC for 10 year operation accumulated about 10 mC/cm, which induced a gain drop at the level that can be compensated by increasing HV. The other studies on ageing is summarised in Fig. 81. From these, 0.5 mm or 1.0 mm are acceptable in terms of the past studies of ageing effects. The baseline design is 1.0 mm thick CFRP for the proton absorber. Figure 80 shows the estimated integrated charge for the each CDC layers with the baseline design.

CDC length (m)	Field wire diameter (μm)	Proton absorber thickness (mm)	ΔP (intrinsic) (keV/c)	ΔP (absorber) (keV/c)	Integrated charge per day (mC/cm)	Integrated charge for 300 days (mC/cm)
1.5	80	0	197 (152)	131	2.10	630
1.5	80	0.5	197 (152)	167	0.40	120
1.5	80	1.0	197 (152)	195	0.17	51
1.5	80	1.5	197 (152)	252	0.04	12

Table 19: *Integrated charge for different proton absorber thickness. The numbers of ΔP in parenthesis are those in the core part of double Gaussian fitting. ΔP(absorber) were roughly estimated from histograms in Fig. 79.*

11.6.4 Trigger rates

The trigger from the trigger hodoscope is estimated to be about 3.2 kHz [33]. It is dominated by the DIO electrons. About 10 % of these DIO electrons are of sufficient energy to enter the CyDet. The remaining 90% only hit the trigger hodoscopes but the rate remains acceptable for the DAQ system. Should it be required to reduce the rate then coincidences with CyDet hits can be required or shielding placed in front of the trigger hodoscopes. Figure 82 shows the fraction of the DIO momentum spectrum hitting the trigger counter in blue.

11.6.5 Track occupancy

The rate of accidental tracks and hits per trigger at the CyDet have been estimated [37]. The time window for the measurement of $\mu^- N \to e^- N$ conversion signals opens after 700 ns after the proton pulse and lasts for about 500 ns. Within this time window most of the tracks in the CyDet originate from muons stopped in the muon stopping target. No aftermath from the beam flash is expected in this time window.

As mentioned in Section 11.6.4, the trigger rate is determined by the DIO electrons whose rate is about 3.2 kHz. The probability of having a second DIO electron within the gate time is about 0.002 events, and so can be neglected. The rate of protons in the CyDet is about 1 per bunch with an average rate of one within the measurement window. The photons and neutrons from nuclear muon capture do not produce any high momentum tracks that will reach the CyDet. A typical event displays of the CyDet (from one bunch) is shown in Fig. 83, where the track in blue is an electron triggering the CyDet and the red tracks are protons. Additionally it should be noted that discriminating electrons from protons may be possible based on the larger charge deposit from the protons.