



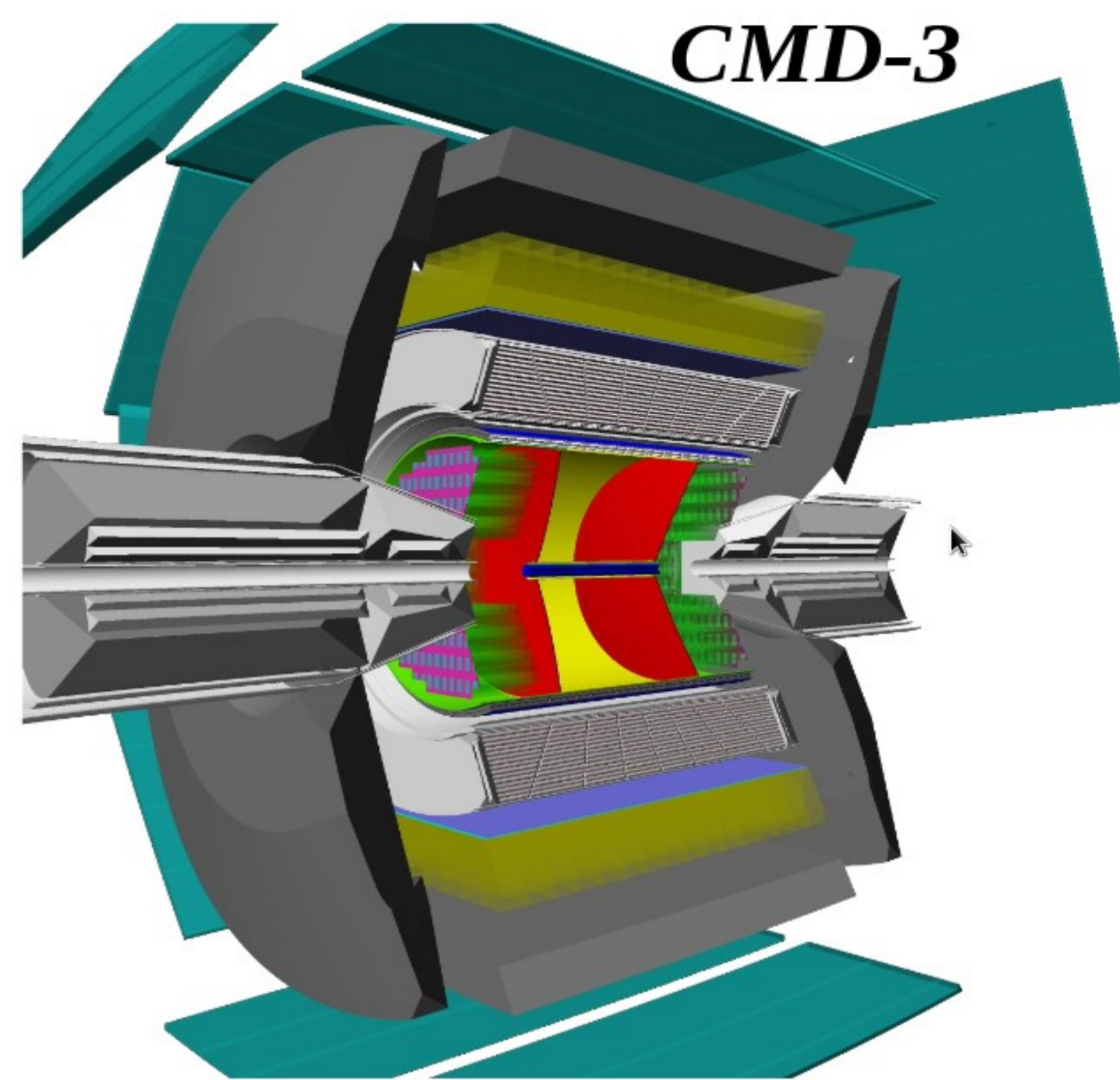
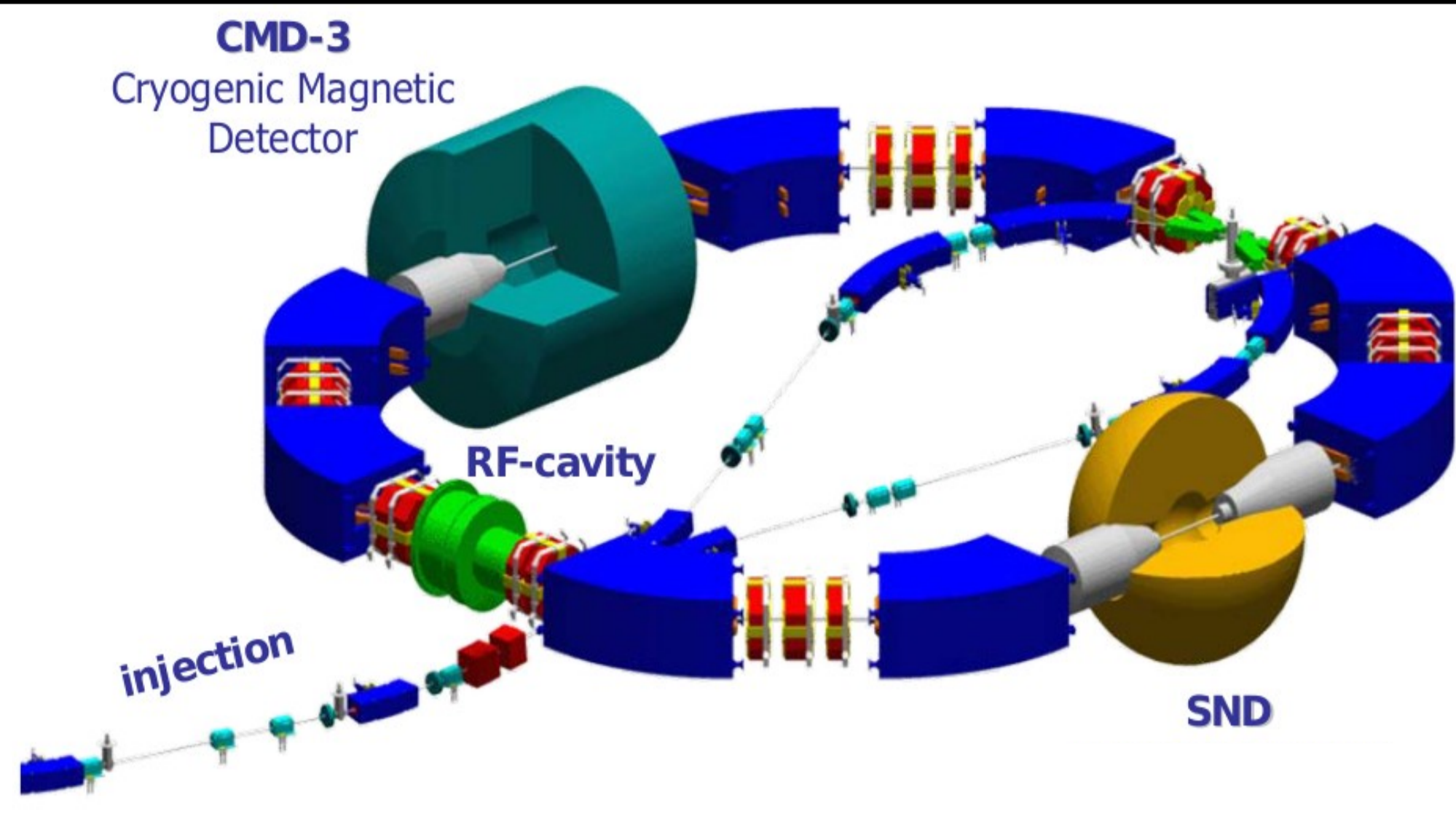
STUDY OF THE PROCESS $e^+e^- \rightarrow p\bar{p}$ IN THE C.M. ENERGY RANGE FROM PRODUCTION THRESHOLD TO 2 GeV WITH THE CMD-3 DETECTOR



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Abstract

Using a data sample of 6.8 pb^{-1} collected in the center-of-mass energy range from threshold up to 2 GeV the cross section of the $e^+e^- \rightarrow p\bar{p}$ and the $|G_e/G_m|$ ratio has been measured with the CMD-3 detector at the VEPP-2000 e^+e^- collider.

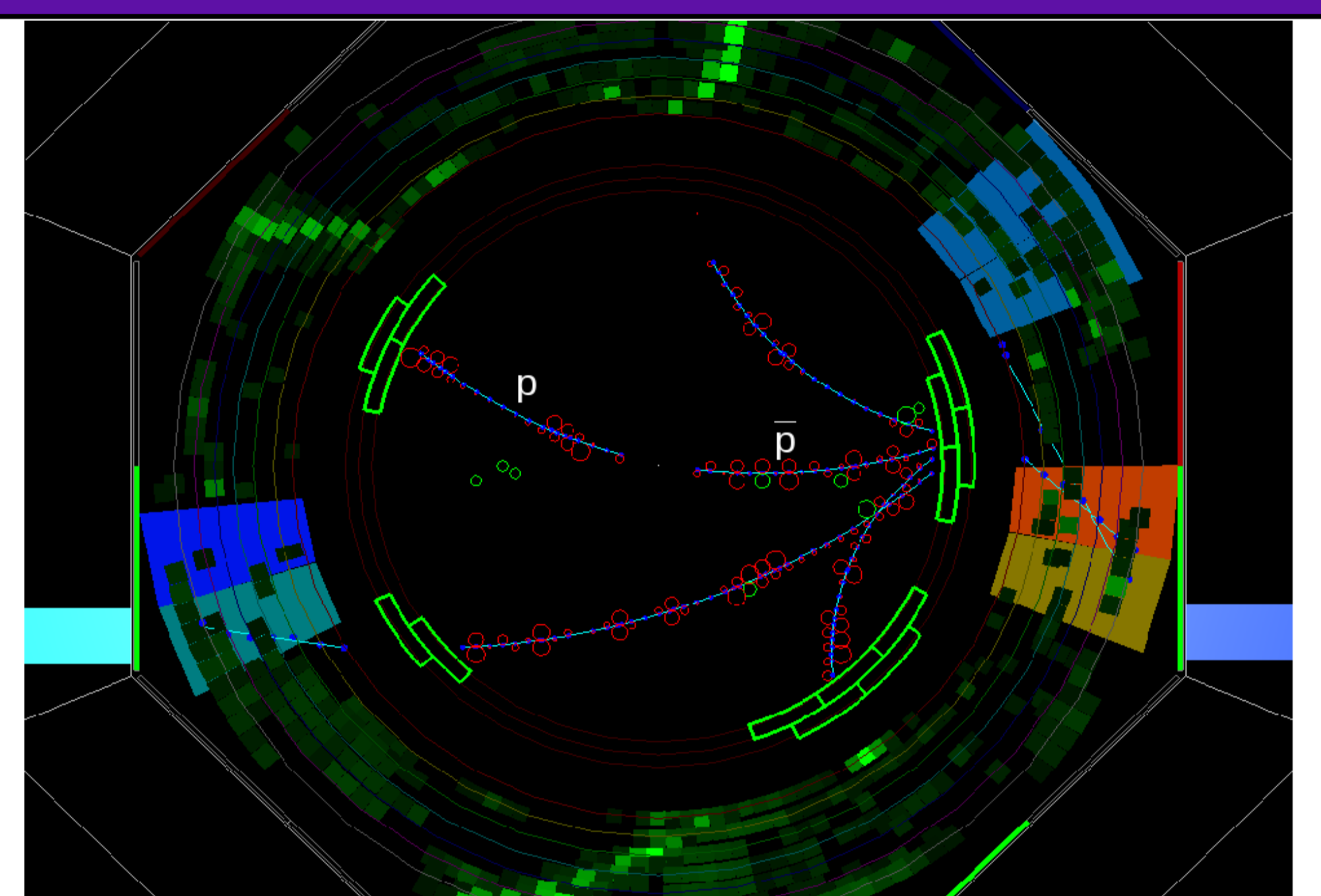
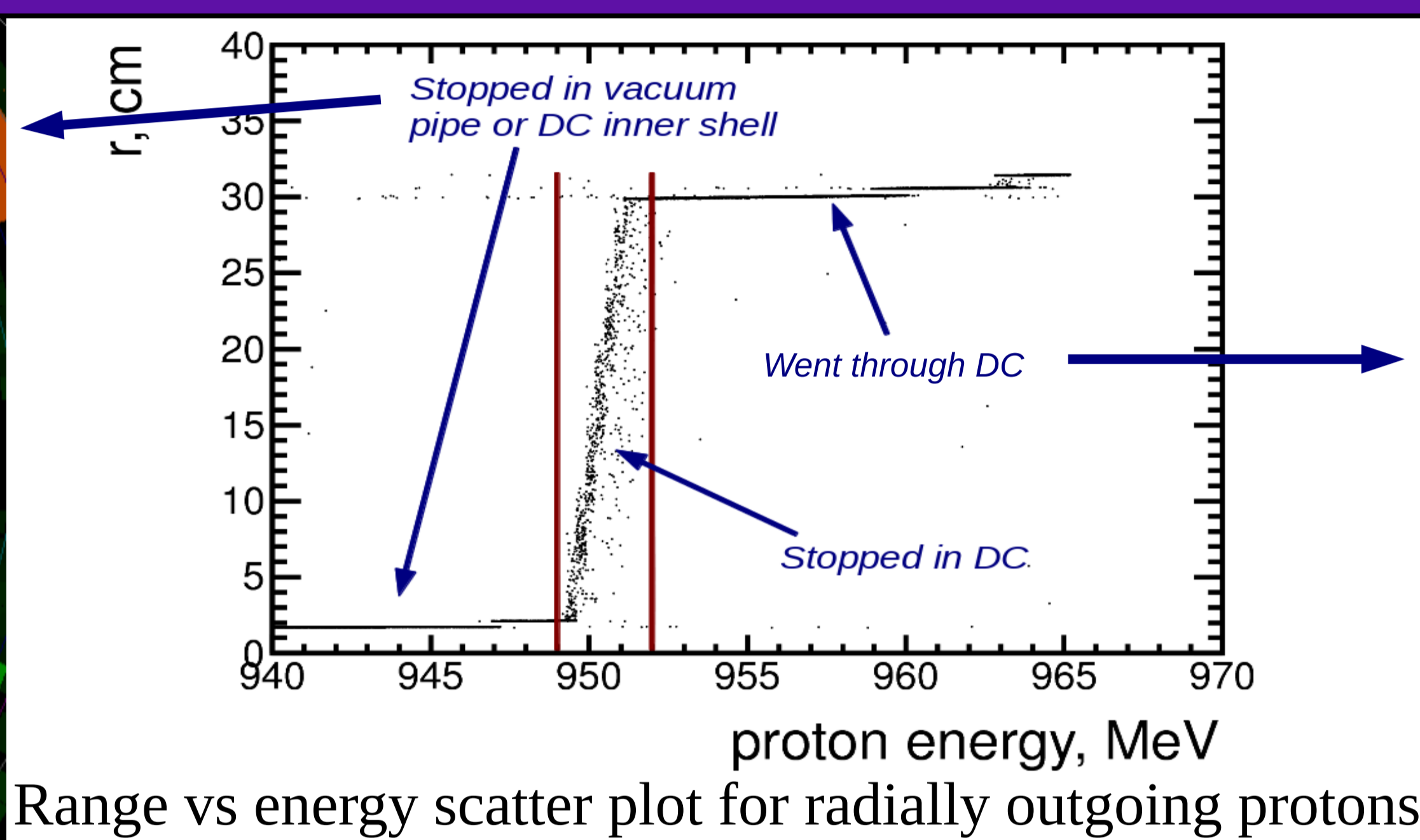
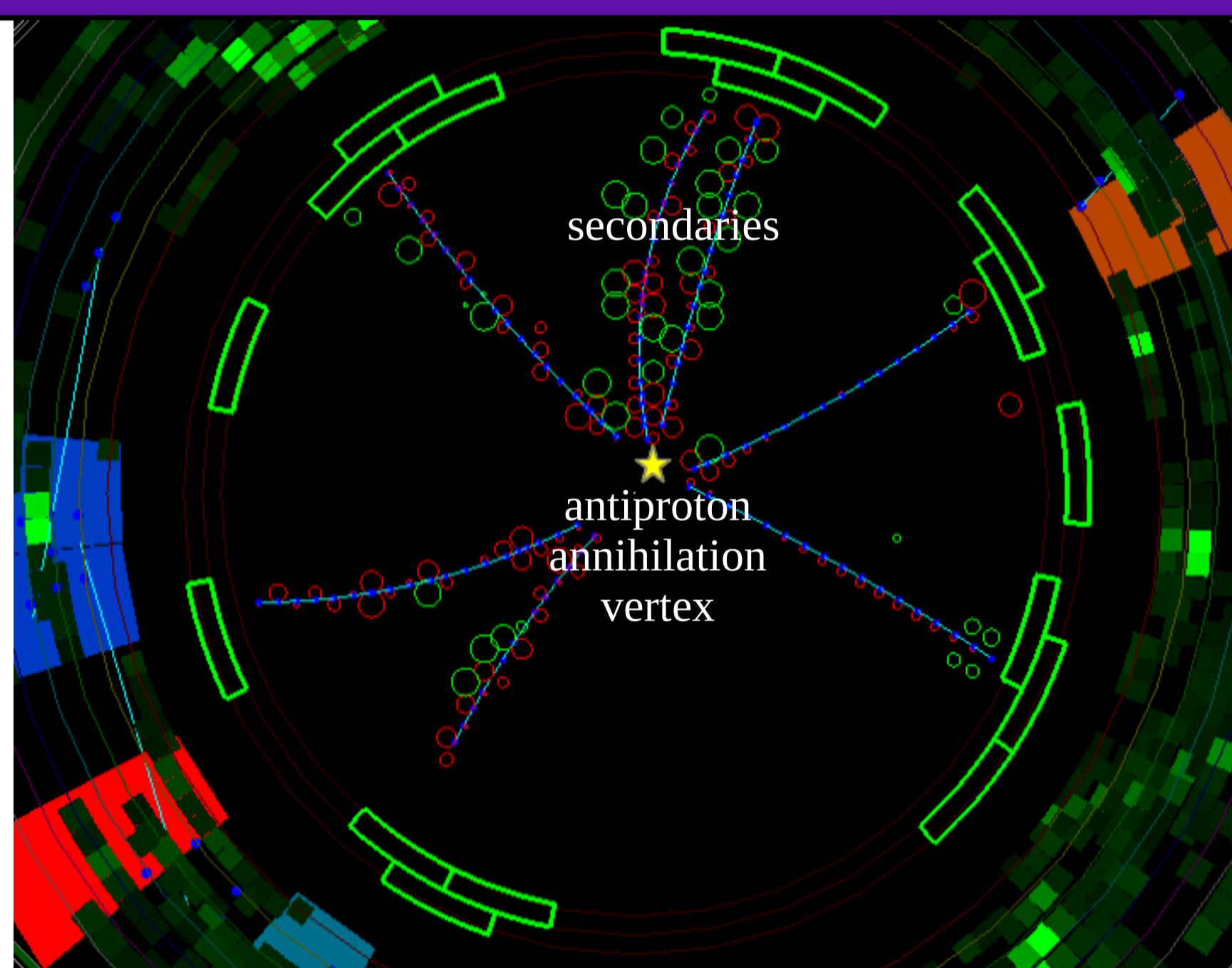


- DC — 1218 hexagonal cells with sensitive wires.
- σ_p/p — 1.5-4.5% for 200-1000 MeV/c, $\sigma_{dE/dx} = 14\%$.
- SC solenoid magnetic field 1.3 T.
- LXe-calorimeter and CsI-calorimeter are in barrel part and BGO-calorimeter is in the end caps.
- the vacuum pipe inside DC is made of 0.5 mm aluminum with 17 mm inner radius.
- inner shell of the DC is made from CFRP and has 20 mm radius.

$$L = 10^{32} \text{ cm}^{-2}\text{s}^{-1} \text{ at } 2 \text{ GeV}$$

$$L_{\text{peak}} = 2 \cdot 10^{31} \text{ cm}^{-2}\text{s}^{-1} \text{ at } 1 \text{ GeV}$$

Event selection

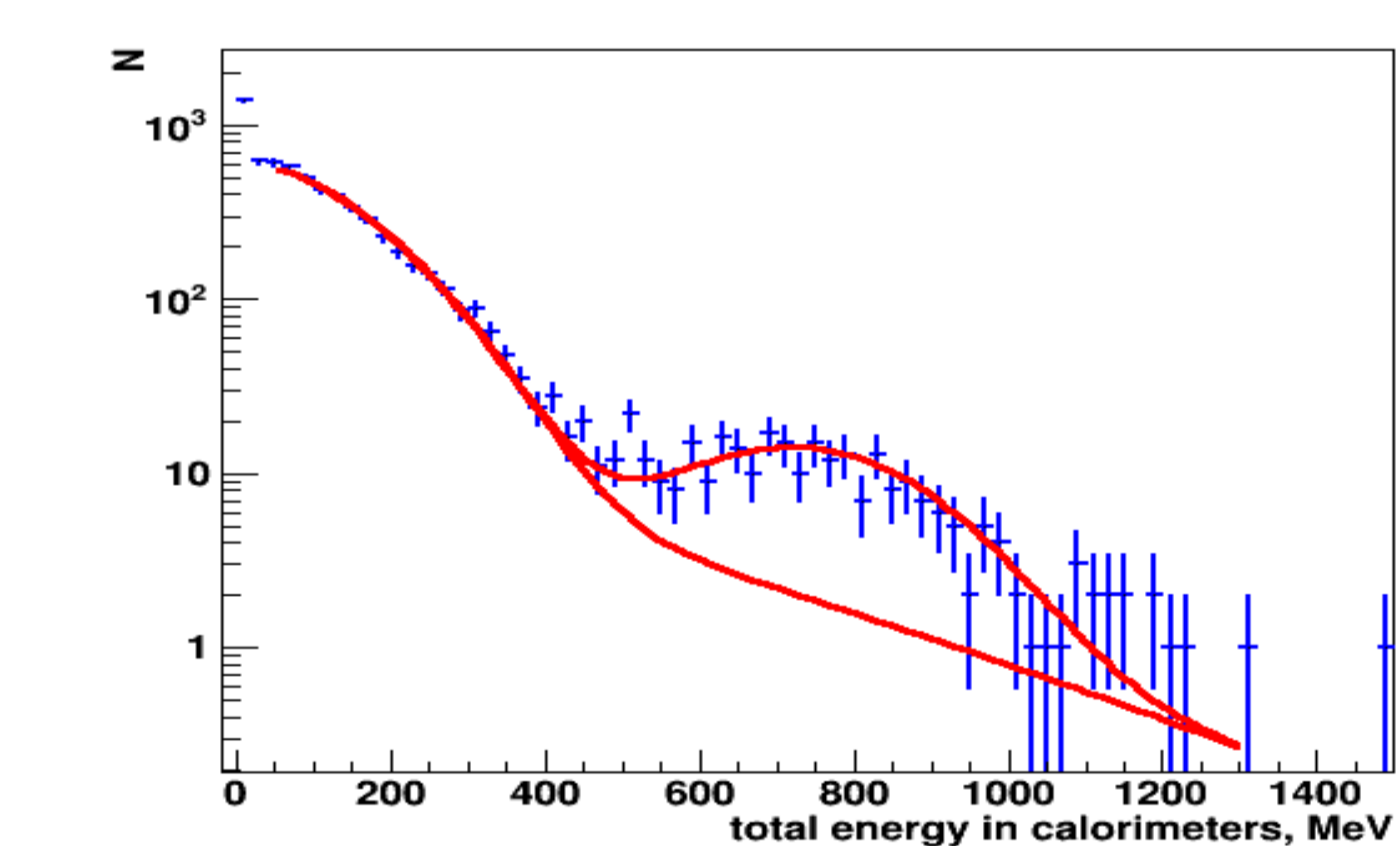
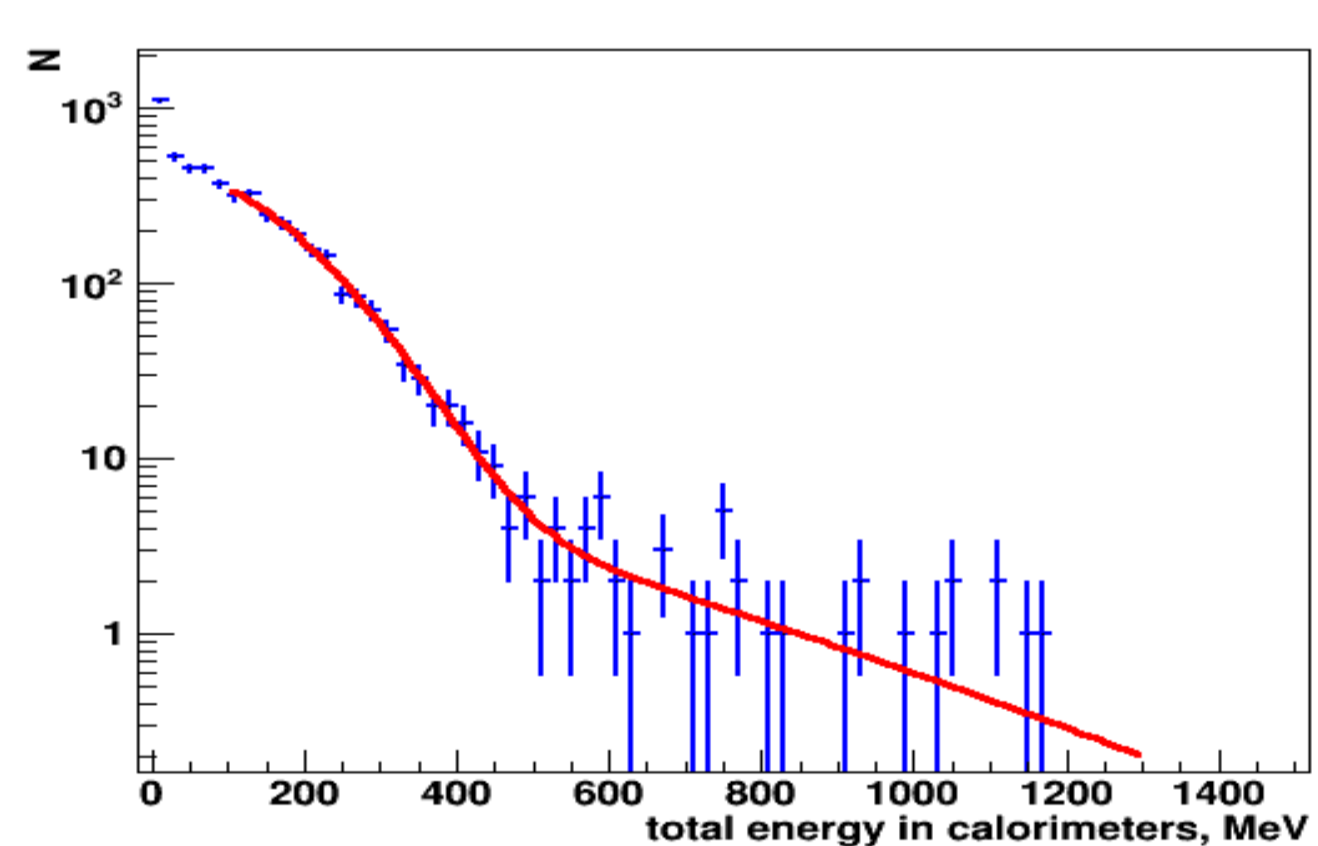


Range vs energy scatter plot for radially outgoing protons

When beam energy is less than 950 MeV all antiprotons annihilate in the vacuum pipe or the DC inner shell producing several secondary particles. If a c.m. energy is above than 952 MeV, almost all nucleons go through vacuum pipe, DC inner shell and DC sensitive volume and stop in DC outer shell or in Z-chamber. For beam energies in between 950-952 MeV, only small part of nucleons penetrate DC volume.

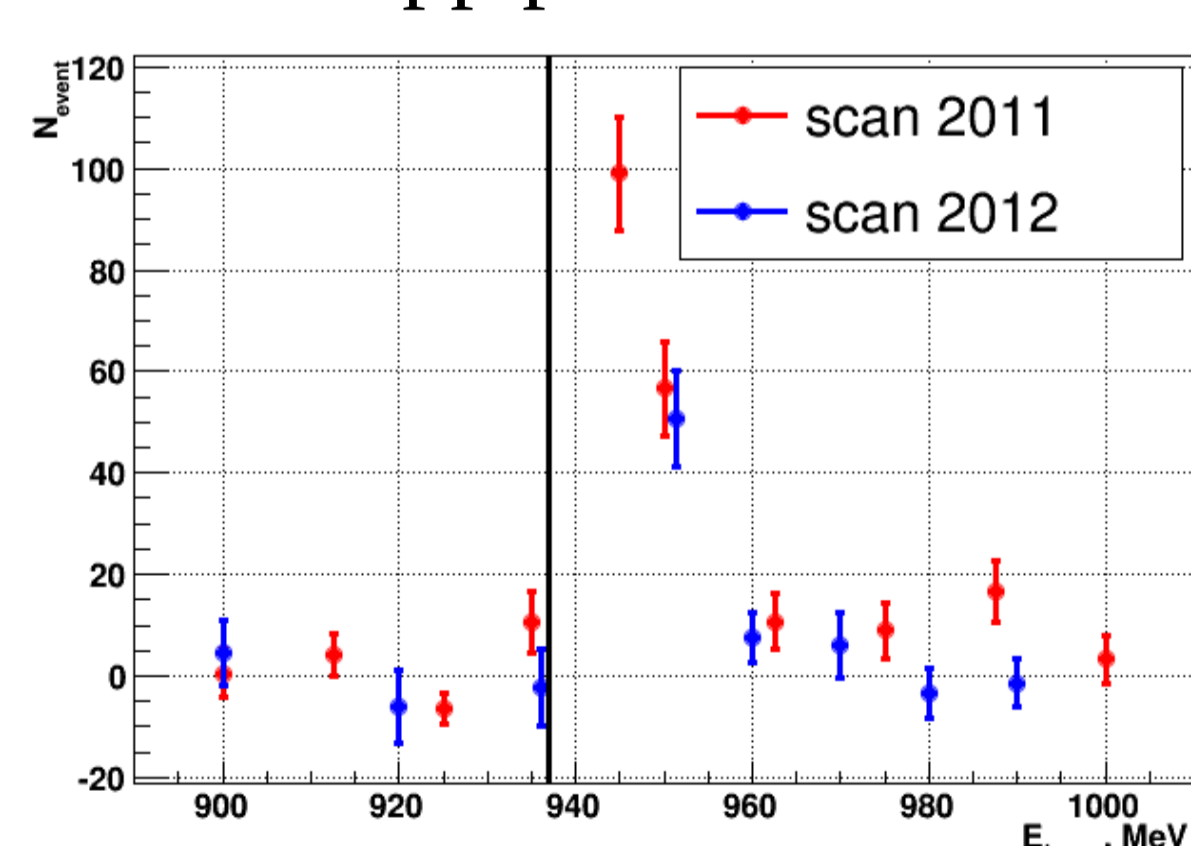
Nucleons stopped in vacuum pipe or DC inner shell

Events with vertex on vacuum pipe or DC inner shell with 4 or more tracks are selected.



Energy deposition in the calorimeters for background events was obtained with runs where c.m. energy was below pp production threshold.

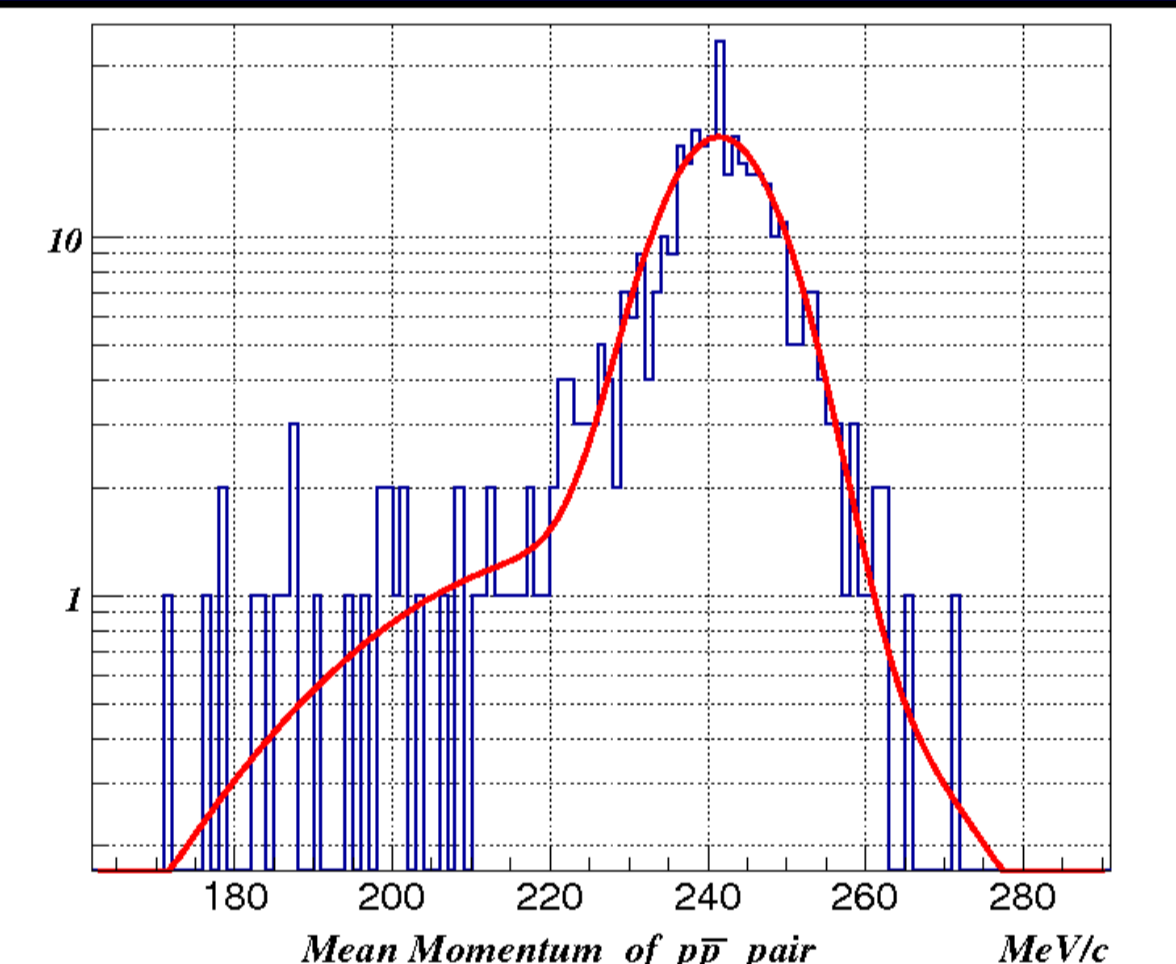
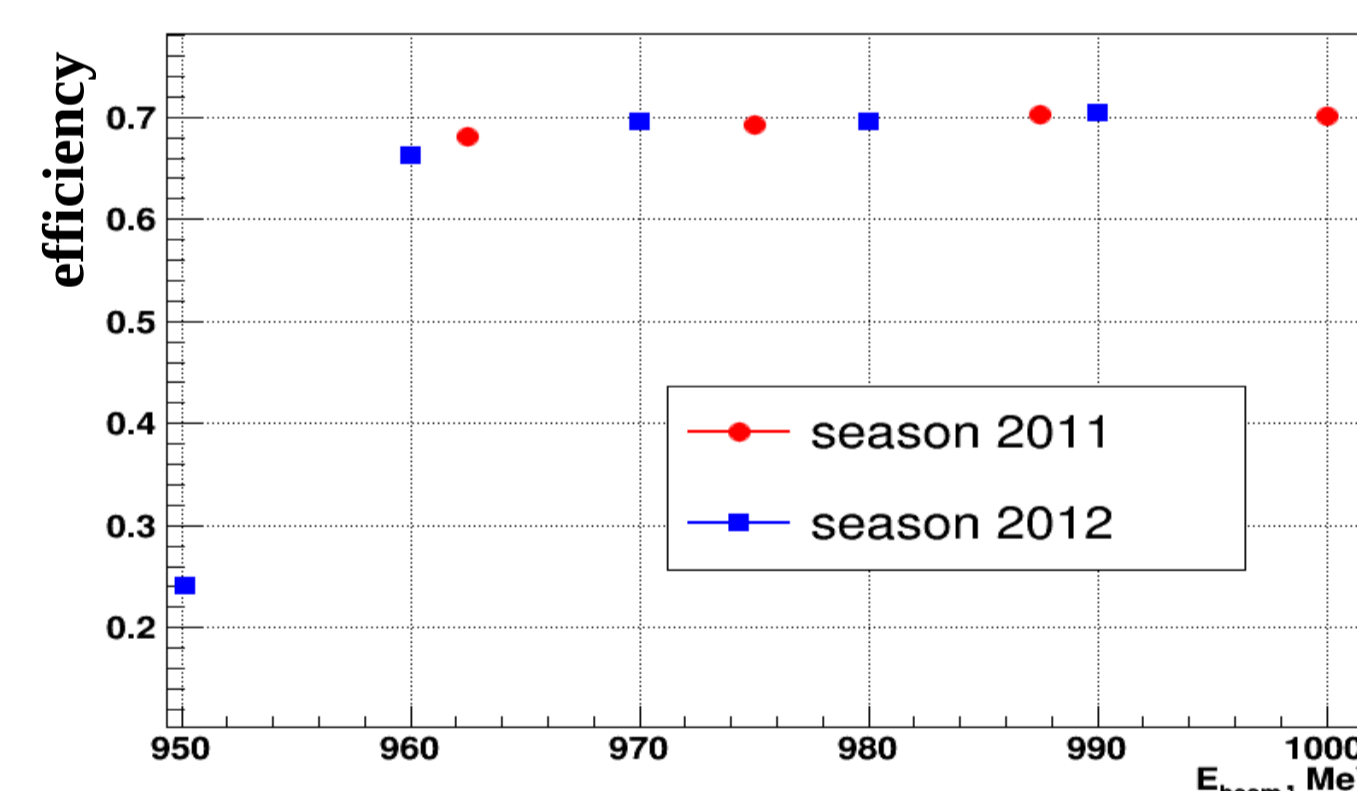
Energy deposition in the calorimeters where c.m. energy was above pp production threshold is fitted by background function plus gaussian.



Registration efficiency could not be established with the help of MC. The current version of GEANT4 does not reproduce correctly multiplicities and types of antiprotons annihilation products in light materials. Registration efficiency is determined at energy point 950 MeV where cross section can be calculated using collinear events.

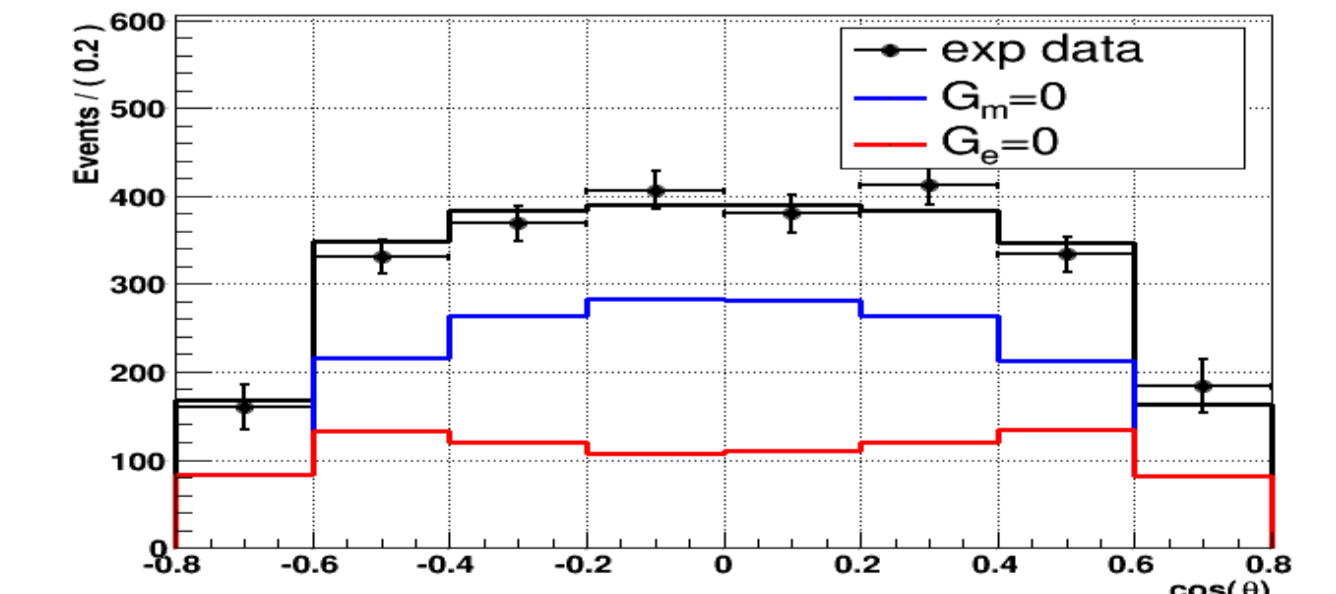
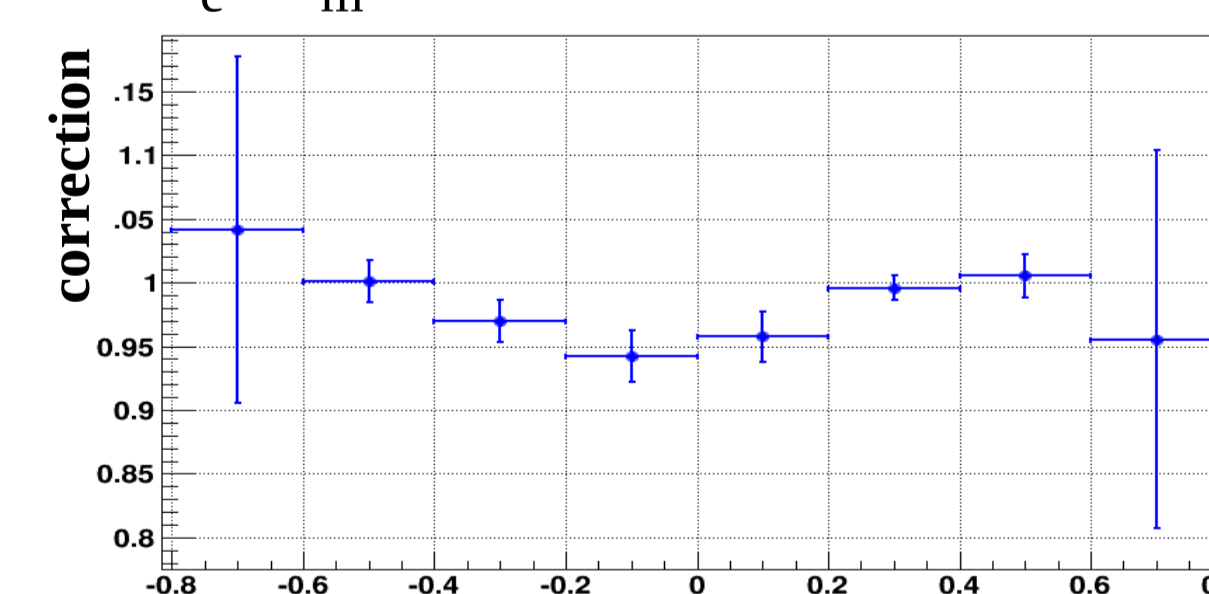
Nucleons go through DC

There are two good collinear tracks with opposite charges and high specific ionization. Total energy deposition in calorimeters is larger than 200 MeV.



Number of events is found from fitting the mean momentum distribution. Efficiency is from MC simulation.

The $|G_e/G_m|$ ratio can be measured from the nucleons polar angle distribution.



All data on nucleons polar angle are combined and fitted by the weighted distributions obtained from MC with $G_e = 0$ and $G_m = 0$ with correction to polar angle inefficiency.

Preliminary results

