Results of DIRAC experiment

Leonid Nemenov

28 June 2011

Number of $\pi^+\pi^-$ and $K\pi$ prompt events

The Q cuts applied to create ntuples: $Q_l < 45$ MeV ; $Q_t < 10$ MeV

low SFD background X and Y planes	$\pi^+\pi^-$	$K^+\pi^-$	π^+K^-
2008	6.60×10^6	6.75×10^5	9.58×10^4
2009	9.98×10^6	9.98×10^5	6.13×10^4
2010	9.97×10^6	9.80×10^5	8.16×10^4

medium SFD background X, Y and W planes	$\pi^+\pi^-$	$K^+\pi^-$	π^+K^-
2008	1.05×10^7	1.08×10^6	1.53×10^5
2009	1.55×10^7	1.56×10^6	9.43×10^4
2010	1.55×10^7	1.53×10^6	1.26×10^5

Number of $\pi^+\pi^-$, $K^-\pi^+$, $K^+\pi^-$ atomic pairs

Number of events with low background

Year	$\pi^+\pi^-$	$K^-\pi^+$	$K^+\pi^-$
2008	**5870±160**	**27±11**	**21±15**
2009	**6380±200**	**31±13**	**42±30**
2010 (expected as in 2009)	**≈ 6400±200**	**31±13**	**42±30**
$\sum$	**≈ 19000 ±325**	**89±21**	**105±45**

Total number of events with low and medium background

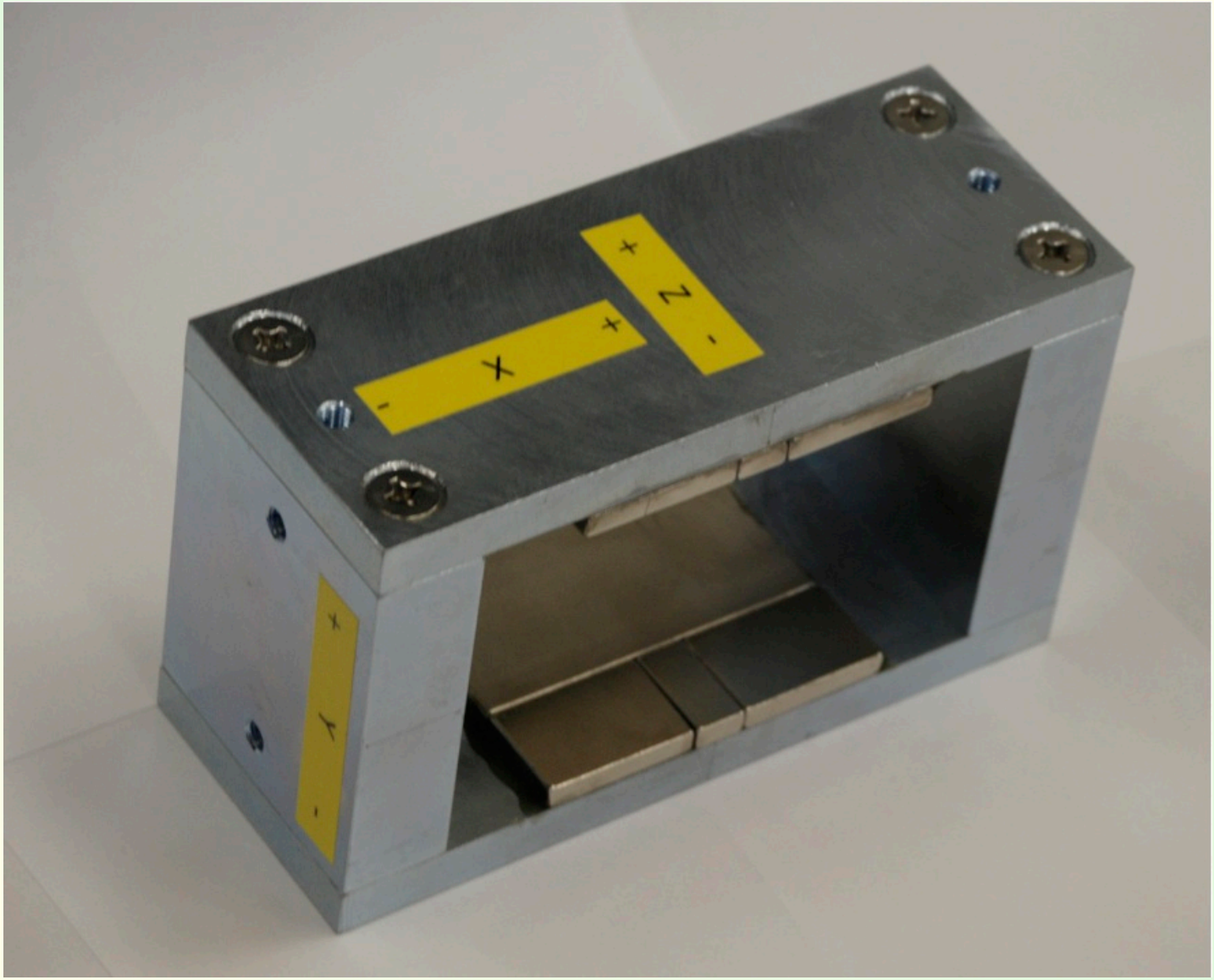
$\pi^+\pi^-$	$K^-\pi^+$	$K^+\pi^-$
≈ 25000	**116±24 (4.8 σ)**	**136±51 (2.7 σ)**

Number of $\pi^+\pi^-$, $K^-\pi^+$, $K^+\pi^-$ atomic pairs

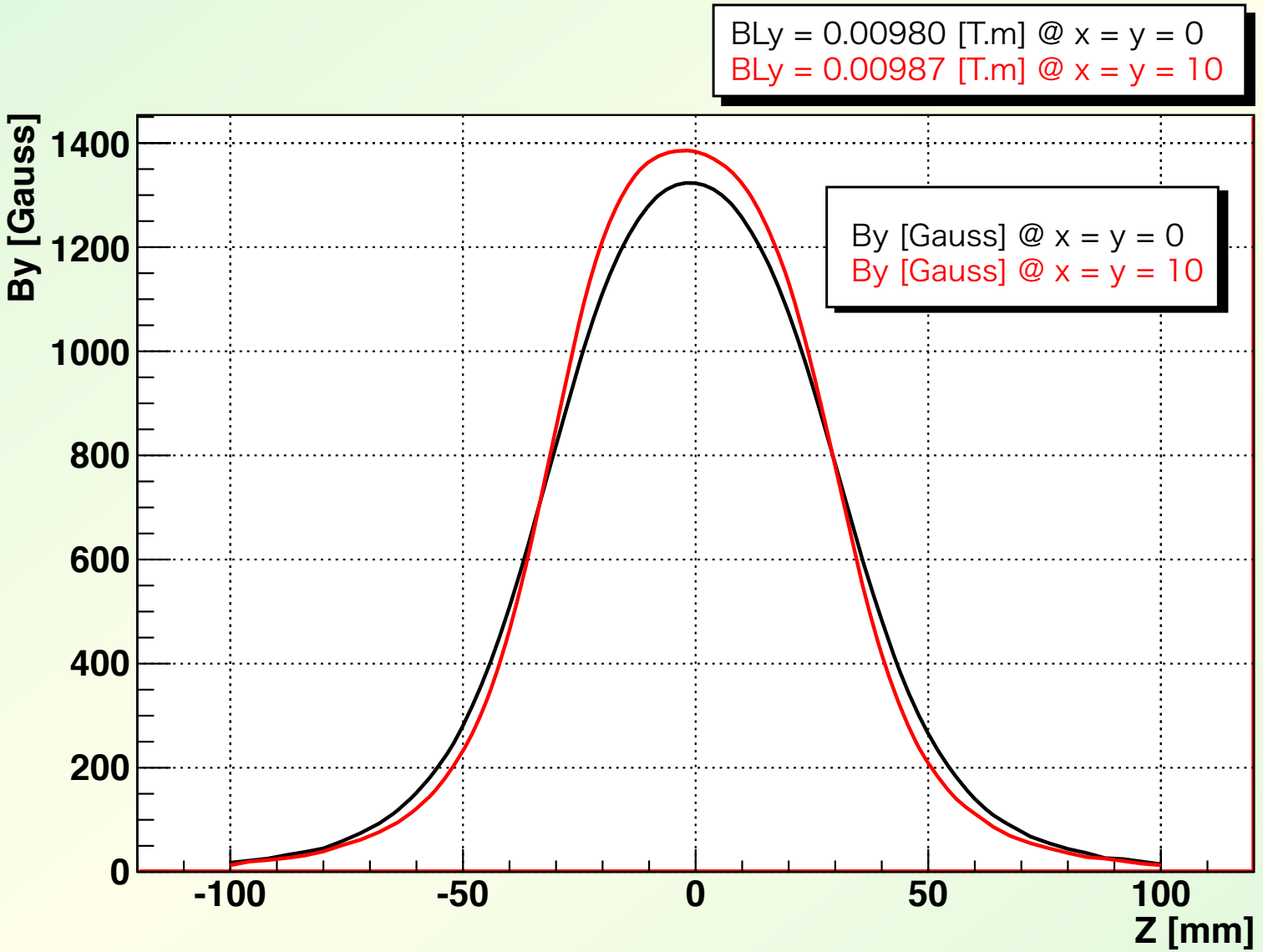
- *About 40% of all statistics has a high level of SFD background. Part of this statistics will be analyzed.*

- *The errors in the number of $K^-\pi^+$, $K^+\pi^-$ events will be decreased after a more efficiently background suppression.*

The magnet



A graph of typical By at (x, y) = (0, 0) and (x, y) = (10, 10).

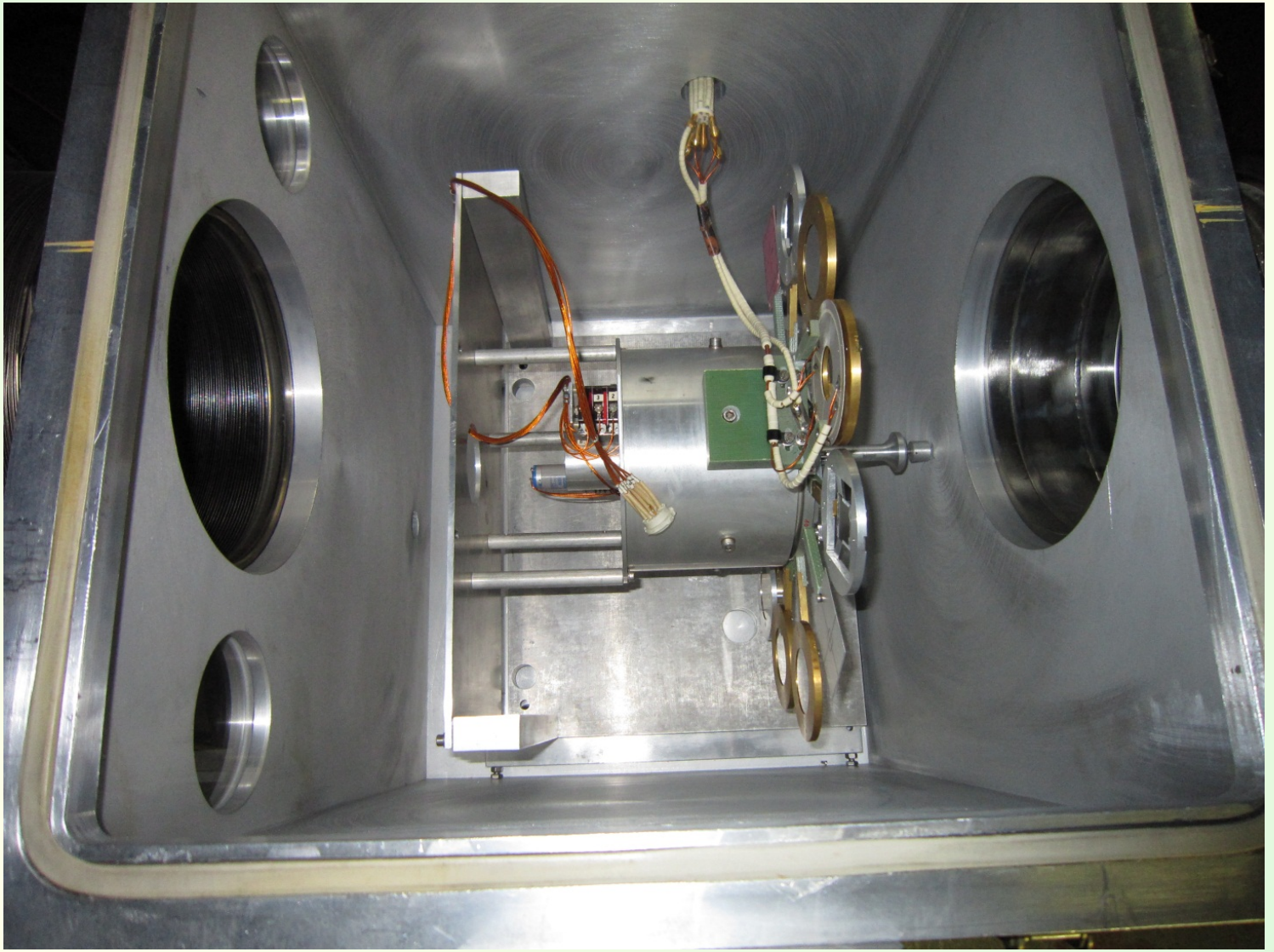


Black line is the graph of x = y = 0. Red line is the graph of x = y = 10.

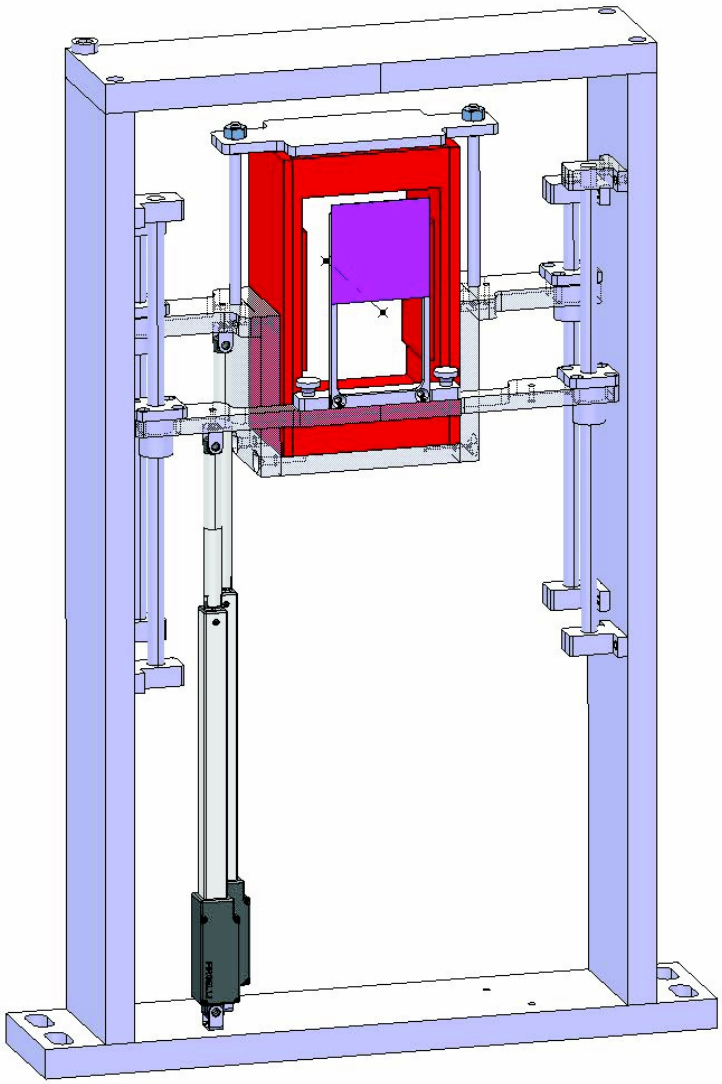
BL differences between calculated and experimental data

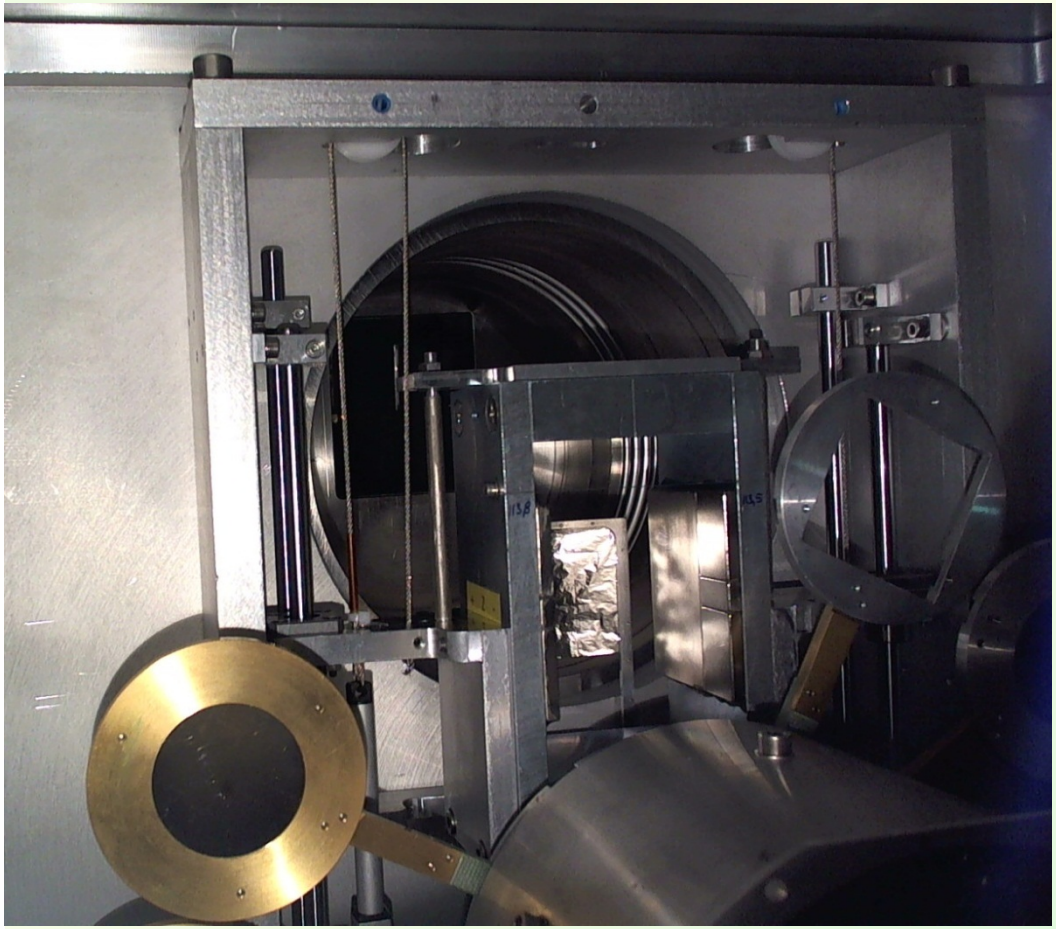
	BLx@ x=y=10(mT.m) -100 ≤ z ≤ 0	BLx @ x=y=10(mT.m) -100 ≤ z ≤ 10	BLy @ x=y=0 (T.m) -100 ≤ z ≤ 0	BLy @ x=y=0(T.m) -100≤z≤100	BLz @ x=y=10(mT.m) -100 ≤ z ≤ 0
Calculated Data	0.305	0.633	0.00472	0.00978	1.295
Experimental Data	0.384	0.754	0.00481	0.00980	1.340
Difference (%)	-25.9	-19.1	-1.9	-0.2	-3.5

Target station

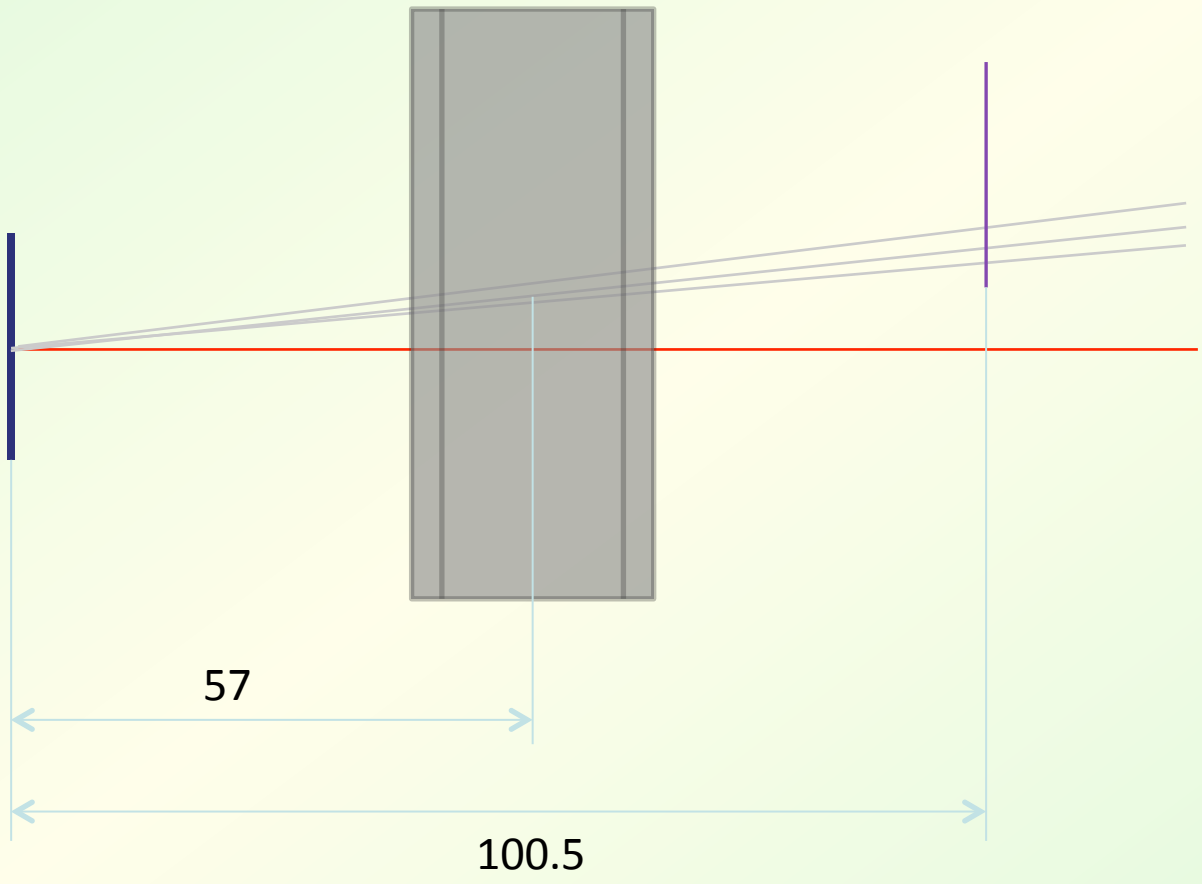


Gear

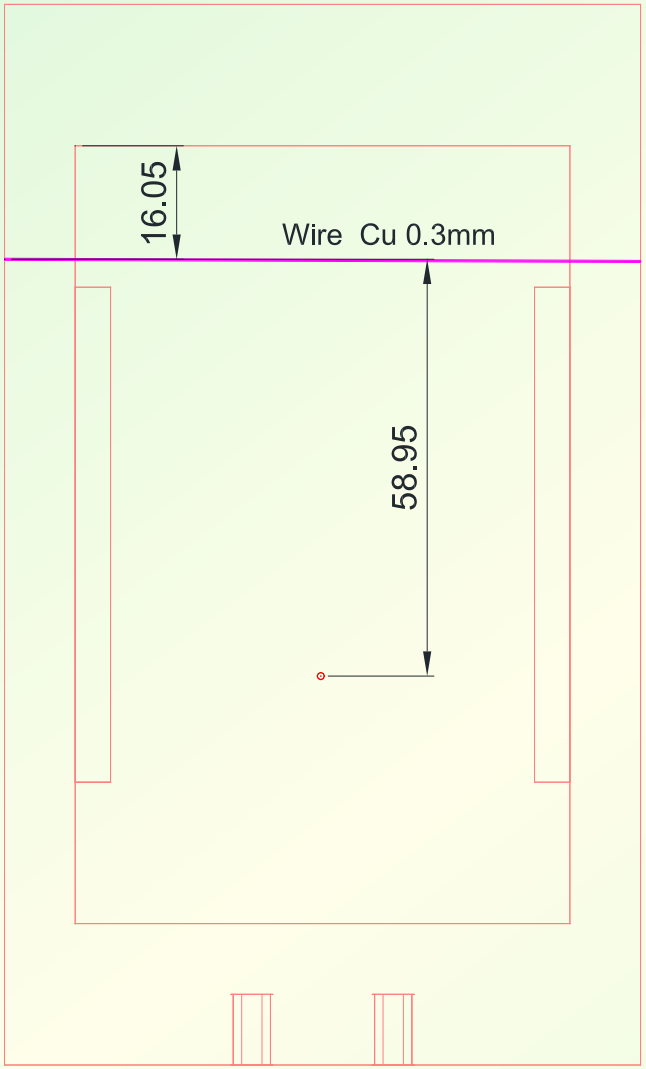


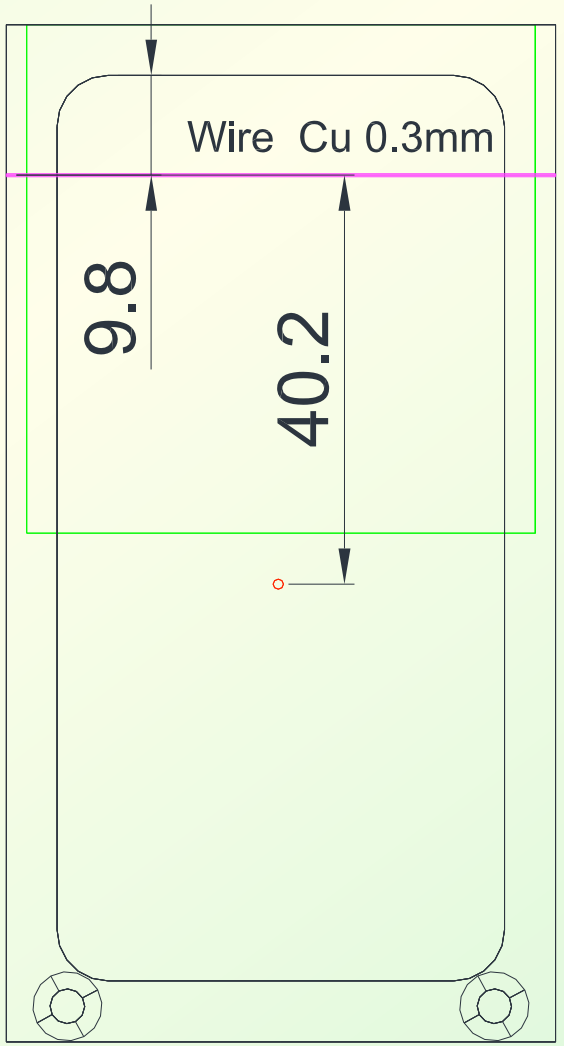


The Active Position

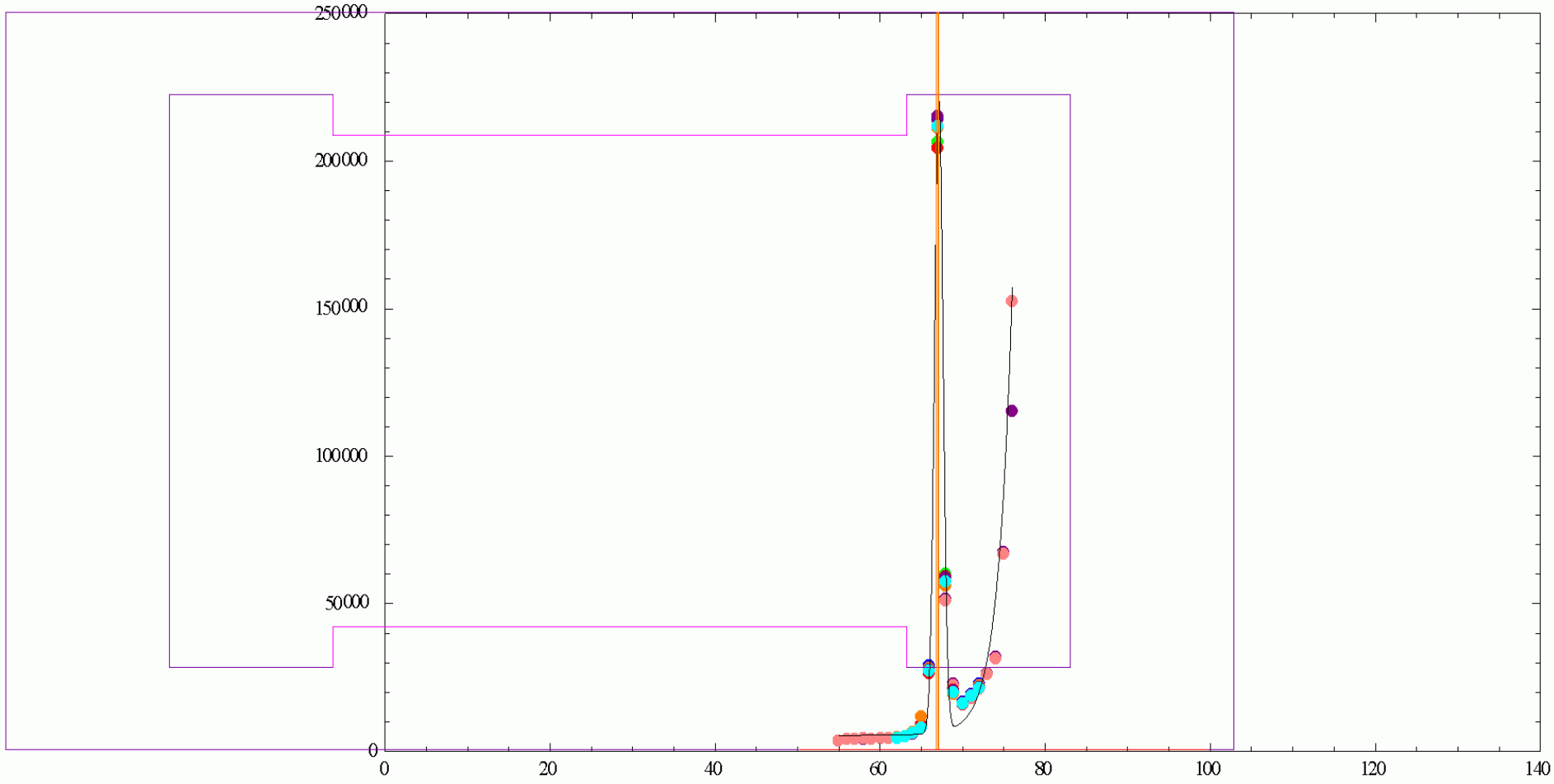


Magnet and Platinum - Beam Position

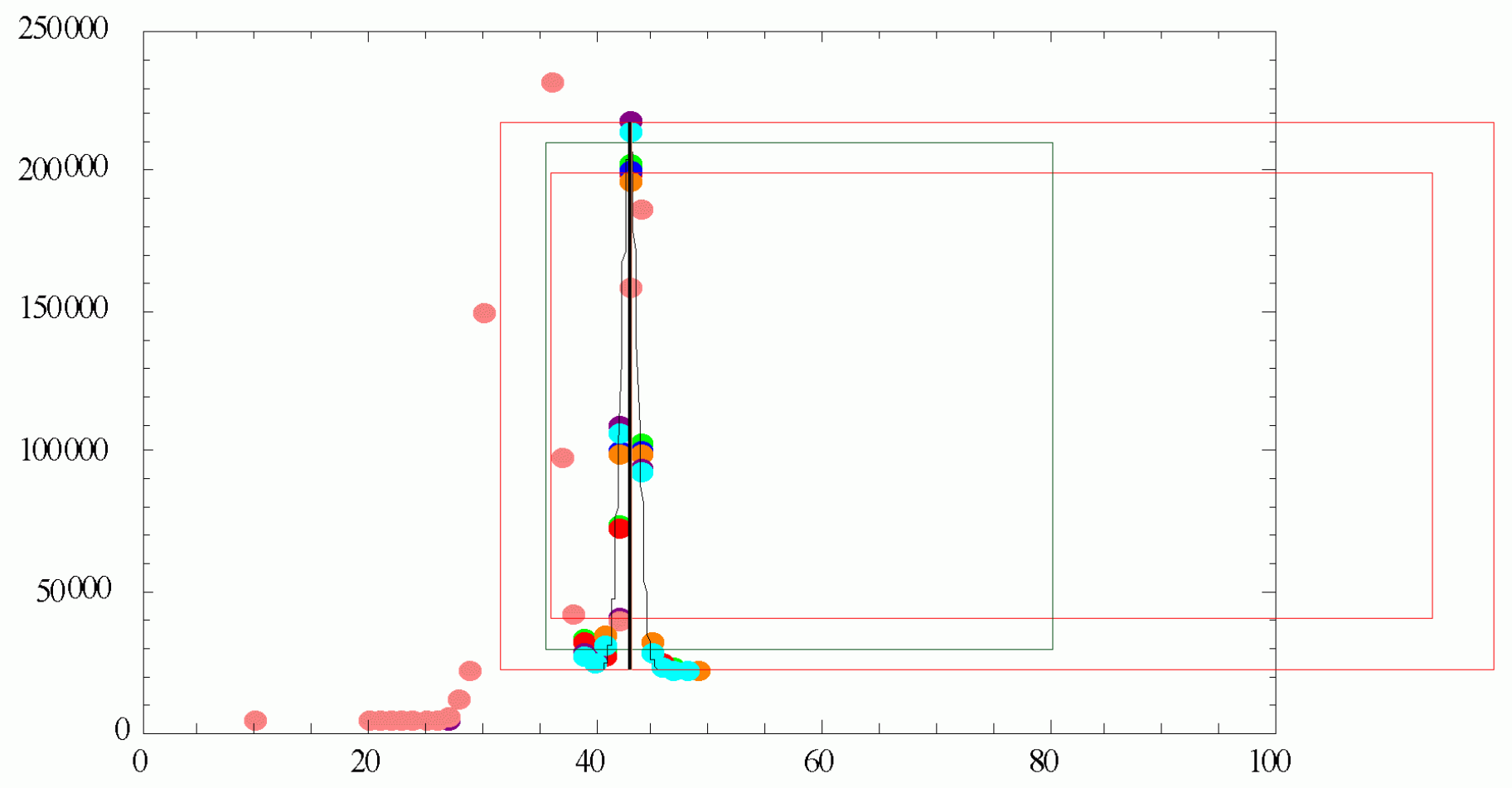




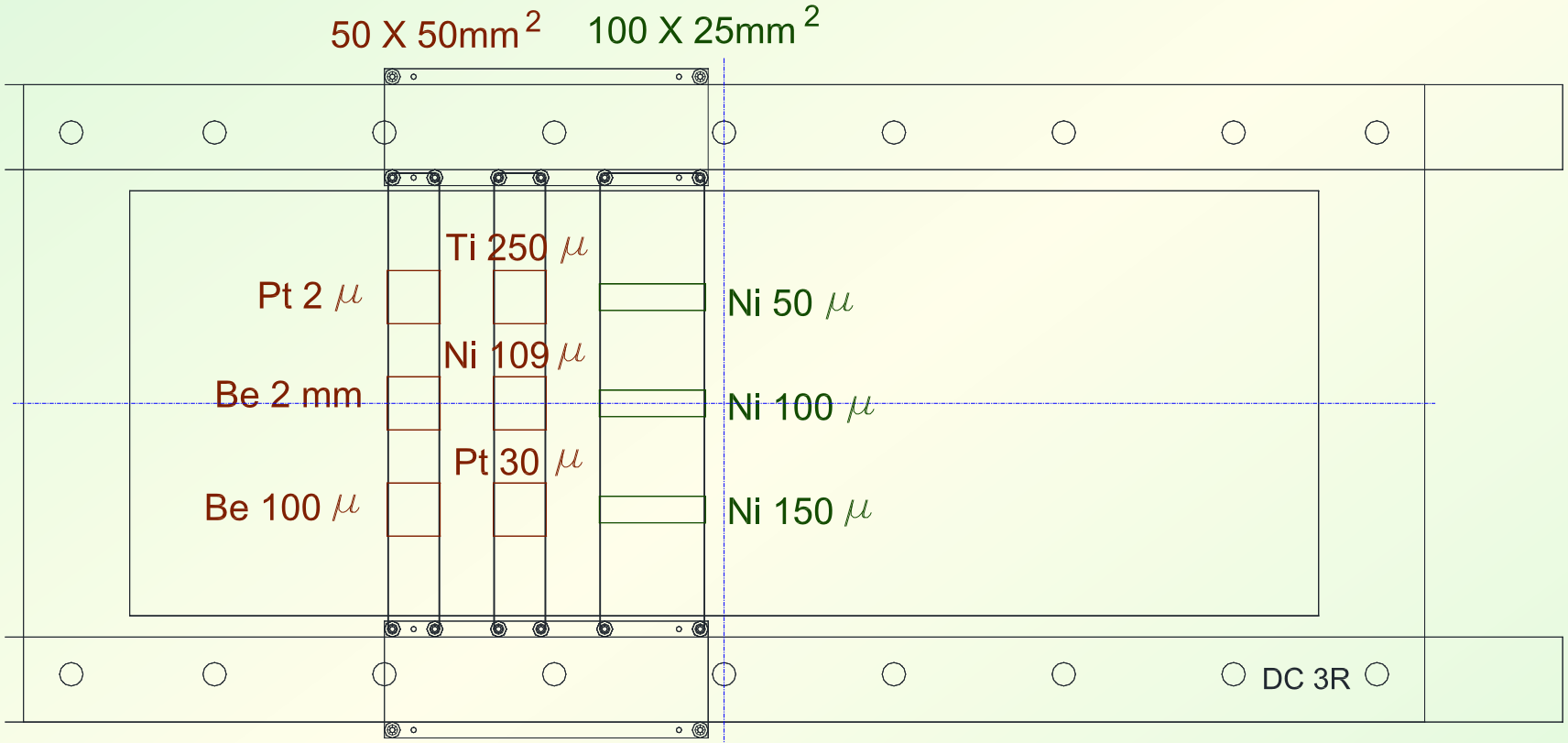
Magnetic scan results



Platinum foil scan results



Multiple scattering foils - position and dimensions



Trigger upgrade

• Before the 2011 run, the trigger system of DIRAC setup was considerably upgraded.

• A lot of NIM modules used for synchronization of the readout subsystems, were replaced with a single programmable CAMAC module based on FPGA chip.

• This way was increased the reliability of the trigger system, have been added new performances and was introduced a full computer control on the data acquisition system.

Run STATUS

- The data taking with Be target without magnet and Pt foil is finished.
- The data taking for long-lived $\pi^+\pi^-$ atoms observation, using magnet and Pt foil, are in progress.

DIRAC Data Analysis Plan

The following results of the 2008, 2009 and 2010 experimental data analysis will be presented at the end of October 2011:

• Search for $K\pi$ atomic pairs number based on 2008, 2009 and 2010 with low background data.

• Preliminary results on $K\pi$ atomic pairs number based on 2008, 2009 with low and medium background data.

• Results on $\pi^+\pi^-$ atomic pairs number based on 2008, 2009 and 2010 with low background data.

• Preliminary results on $\pi^+\pi^-$ atomic pairs number based on 2008, 2009 with low and medium background data.