

Dirac status report 2012

The main aim of 2012 and 2011 runs was the data taking for the long-lived $\pi\pi$ atoms observation. It opens the possibility to measure the Lamb shift of $\pi\pi$ atom and to check the low energy QCD precise predictions

Run 2012

- ◆ During 4.7 months data taking, the total number of spills during 2012 run was 740000 (3.07 spills per supercycle). The proton beam intensity was 3×10^{11} protons/spill and the total number of proton interactions with a Be target of thickness 100 μm was 5.4×10^{13} .
- ◆ The Sm-Co magnet was installed near the target to improve the long-lived atoms identification.

- ◆ The magnet was irradiated by neutrons and other particles produced on the target.
- ◆ The magnetic field strength decreased during the 2012 run by 0.26%.
- ◆ The magnetic field strength of the magnet made of Nd-Fe-B installed in the 2011 run decreased by 50% under the same conditions.
- ◆ As today, the data from July up to the end of September have been processed (5.05×10^5 spills).

- ◆ The total number of $A_{2\pi}$ was obtained from the Coulomb $\pi^+\pi^-$ pairs analysis: $N_A=5700\pm500$.
- ◆ In agreement with Monte Carlo simulation, the corresponding number of atomic pairs from long-lived $A_{2\pi}$ breaking in the Pt foil will be $n_a=130\pm12$.
- ◆ For the total number of spills in the 2012 run (=740000), the expected signal from atomic pairs after background subtraction divided by its uncertainty will be at the level of **more than 6**.

Run 2011

All experimental data were preselected and ntuples prepared.

Multiple Scattering measurements :

- ▶ In the present analysis, only events with one track in each projection were selected.
- ▶ The data analysis of Ni target with 100 μm and 150 μm thickness was done.

- ▶ The preliminary measurement of the multiple scattering angle has a precision of 0.7 % in each target.
- ▶ The final precision for the 2011 run using ALL events will be better than 0.5 %.
- ▶ These measurements were continued during the 2012 run.

$\pi^+\pi^-$ atoms (RUNS 2008, 2009, 2010)

- ❖ After e^+e^- background subtraction, the systematic error analysis using 2008 data was performed.
- ❖ The numbers of atomic pairs were obtained for the events with a low level of background in the scintillation fiber detector (SFD), using distributions of pairs in Q, Q1 and Q1-Qt.
- ❖ After systematic error reduction, the numbers of atomic pairs n_a are:

$$n_a = 3455 \pm 163 (Q)$$

$$n_a = 4059 \pm 270 (Q1)$$

$$n_a = 3601 \pm 162 (Q1-Qt)$$

The atom break up probability is $P_{br} = (45.6 \pm 3.4)\% (Q1)$, the same as $P_{br} = (44.6 \pm 0.9)\%$ obtained in 2001- 2003 runs.

- ❖ The difference between the numbers of atomic pairs in these three analyses was caused by systematic error connected to the new SFD planes.
- ❖ The method to decrease the systematic error is known. The total number of atomic pairs detected in 2008-2010 runs will be more than 21000 for the statistic with low and medium background in SFD, which is about 70% of the total experimental data.

π^-K^+ and π^+K^- atoms (RUNS 2008, 2009, 2010)

- ✿ The multiplicity in all detectors for $\pi\pi^-$ and πK^- triggers are the same. Therefore the systematic error suppression used in the $\pi\pi$ atoms analysis can be used also for the $K\pi$ atoms analysis.
- ✿ The preliminary results on πK atoms and πK atomic pairs production will be ready in April 2013. This analysis will take into account the non point-like π and K mesons productions.
- ✿ The total number of πK atoms detected in 2008-2010 runs will be about 600 using experimental statistic with low and medium background in the SFD, which is about 70% of the total experimental data.

The new ionization hodoscopes

- * The existing ionization hodoscopes (IH) consists of **4 planes** with an area of $S=108 \times 108 \text{ mm}^2$ assembled from **16 slabs** with thickness 1 mm. Each slab connection to its PM uses Lucite light-guide.
- * The 4 planes of the new IH consists of **32 slabs**.
- * The granularity increase allows to decrease the signal overlapping and the dead time of electronics.
- * This detector was installed in the beam and was investigated during October–November 2012.

DIRAC dismantling

In accordance with the plan prepared by CERN and the DIRAC collaboration, the setup dismantling will be finished before **June 2013**.

The calculation of the πK
and $\pi\pi$ atoms yield on SPS
CERN ???