

Status report of the DIRAC experiment (PS212)

SPSC Committee, April 3, 2012.

I. Run in 2011: results.

In 2011, data were taken for the long-lived $\pi^+\pi^-$ atoms observation. To decrease the background level on long-lived atoms breaking, between Be target and Pt foil, a magnet made of Nd-Fe-B was installed. The signal value without magnet installation was expected to be at the level of 3.5 sigmas. With the magnet, the signal value will be increased at a level of more than 8 sigmas. Off-line analysis done during data taking showed that the strength of the magnetic field was decreasing, due to the neutrons produced in the Be target. As a result, the level of background was increasing with time and the reliable observation of long-lived atoms using statistics of this run cannot be guaranteed. The preselection of the data obtained in this run will be finished in June 2012. The Ntuples preparation will be done in September 2012.

Simultaneously with the data taking for the long-lived atoms observation, the data taking for the measurement of the multiple scattering in few materials with an expected precision about 0.5% was performed. These measurements allow to reduce the systematic error of the published results on the π - π atom life-time measurement and the future results which will be obtained using 2008-2010 data. Preliminary results on the multiple scattering measurement on Ni target will be presented in October 2012.

II. Run in 2012: preparation.

In 2012, a new magnet made of Sm₂-Co₁₇ will be used. This magnet resistance against neutron radiation is two orders of magnitude larger than the Nd-Fe-B magnet. The bending power of the new magnet is 0.023 Tesla-meter, more than the bending power of 0.01 Tesla-meter in the magnet used in 2011. As a result, the level of the background in 2012 is expected to be a factor 1.5 smaller than in 2011, without magnet degradation. The signal value with the new magnet is expected to be at a level more than 9 sigmas. The new retracting device will allow to replace the magnet by a spare in a few minutes.



III. Status of $K\pi^-$, $K\pi^+$ and $\pi^+\pi^-$ atoms.

At present time, using events with low and medium background in the fiber detectors (about 70% of the total statistics), 277^{+52} $K\pi^-$ and $K\pi^+$ and 27320^{+520} $\pi^+\pi^-$ atomic pairs were identified. All these results were obtained without e^+e^- background subtraction and without taking into account non point-like π^- and K^- productions. The analysis of 2008, 2009 and 2010 data with e^+e^- background subtraction will be accomplished in June 2012. The analysis of the same data taking into account non point-like π^- and K^- productions will be finished in October 2012.

IV. Measurement of the $\pi^+\pi^-$ atom lifetime.

The published results on $\pi^+\pi^-$ atom life-time measurement and S-wave scattering lengths difference $|a_0 - a_2|$ will be presented together with the $|a_0 - a_2|$ values obtained by NA48/2 from K decays.

V. The planning of the DIRAC setup dismantling will be presented in October 2012.

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