The first measurement of kaonic nitrogen with DEAR at DAΦNE

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on behalf of the DEAR Collaboration

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In May 2001 the DEAR (DAΦNE Exotic Atom Research) collaboration [1] performed the first measurement of an exotic atom (kaonic nitrogen) at the DAΦNE collider of the Laboratori Nazionali di Frascati dell'INFN. The measurement was performed with a cryogenic target (118 K) filled with nitrogen at about 2 bar ($\rho \simeq 4.5\rho_{NTP}$). As detector, 8 CCD-22 were used. A total integrated luminosity of about 2 pb^{-1} was collected. After an optimization of the machine performances and of the DEAR degrader, an X-ray spectrum was obtained and analysed by performing a global fit. The global fit (with a χ^2/NDOF = 0.95) gave a statistical significance of the two kaonic nitrogen lines measurable with DEAR of about 3σ for the line at 4.58 keV ($7 \rightarrow 6$ transition) and of about 3.7σ for the line at 7.6 keV ($6 \rightarrow 5$ transition), giving a global statistical significance of about 5σ. These results compare favourable with the Monte Carlo simulation results with an yield of the two transitions of about 90^{+10}_{-25}%. An empty target-like measurement was as well performed. The background subtracted spectrum is presented in Figure 1. The experiment could therefore demonstrate the capability of creating and detecting exotic atoms using the kaons flux from DAΦNE.

Next stage of the experiment is the measurement of the K-complex in kaonic hydrogen.

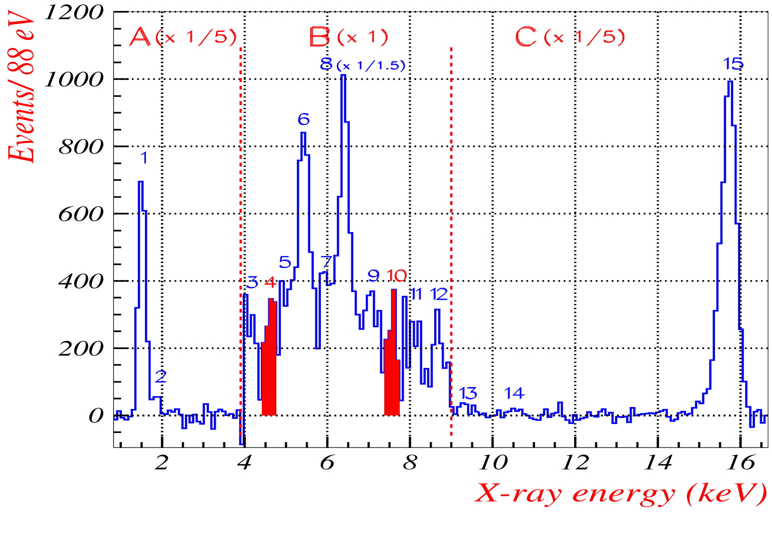

Figure 1: The kaonic nitrogen background subtracted spectrum. X-ray lines are: 1 = Al K_α; 2 = Si K_α; 3 = Sc K_α; 4 = **KN (4.58 keV)**; 5 = V K_α; 6 = Cr K_α; 7 = Cr K_β + Mn K_α; 8 = Fe K_α + Mn K_β; 9 = Fe K_β; 10 = **KN (7.62 keV)**; 11 = Cu K_α; 12 = Zn K_α; 13 = Zn K_β; 14 = Pb L_α

[1] S. Bianco *et al.*, Rivista del Nuovo Cimento **22**, No. 11, 1 (1999)