DEAR Technical Note IR-15

The NTP setup in the third millenium

Bernhard Lauss

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Beginning with the first beam in 2000, the DEAR cryo-target containing 16 CCD-22 will be installed in the DEAR interaction area. For the cryo-setup we will use Jumbo 2 and Jumbo 3 for data-acquisition and the new slow-monitor system for the slow-control of the experiment. Regarding the present installation of the NTP-setup in the pit, only a few cables and the Jumbo 2 readout electronics will be used. This leaves us with the question: is there anything we can do with this fully installed and working NTP-setup?

1) Proposal of installation:

Following the very schematic draft given in figure 1 we can put the present NTP-target, upside down in comparison with the present situation, below the beam pipe, inside the kaon monitor platform. To be able to do that, only small modifications have to be done to the NTP-target; namely the gas in- and outlet, presently on top of the target, have to be cut, sealed and made new on the backside of the target; both can easily be done. The target should be glued to be helium-tight. One aluminum bar of the kaon monitor platform should be lowered a bit, something which is also easily done. The most significant problem is, that one has to use the Jumbo 1 CCD read-out system.

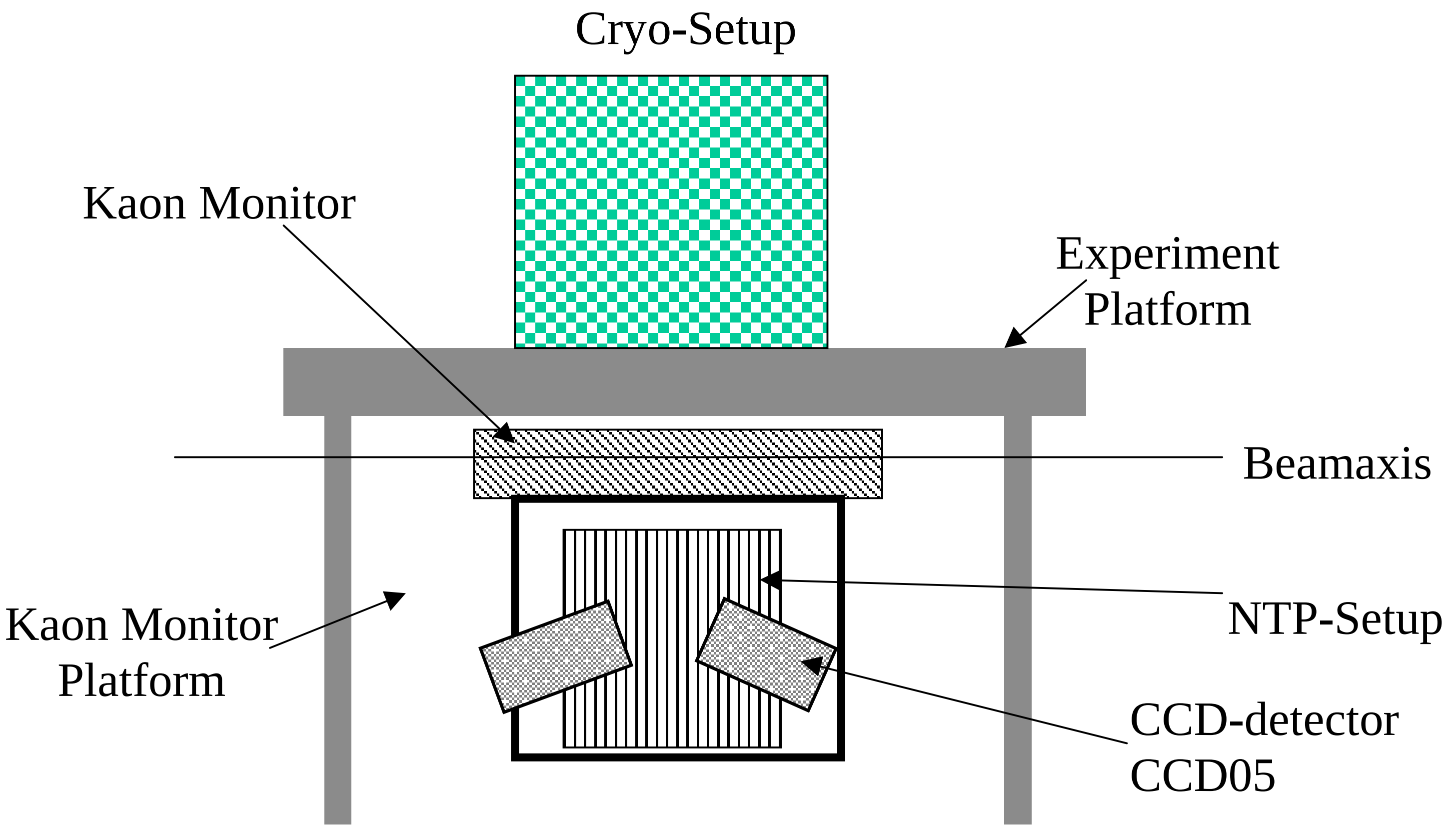

Fig.1: Very schematic view of the proposed setup using cryo-target and NTP target.

2) Are there any extras to be installed or bought ?

All the thing necessary to install this **2 target setup** are already available. Actually we will use all the modules bought as backup or for laboratory use.

In the pit: Enough cables are installed, but it might be useful to install one more RS485 cable for the slow monitor readout. There are enough fiberoptic cables for the CCD-readout. We use the laboratory cryotiger for CCD-cooling, the backup turbo-molecular pump and one of the laboratory pre-pumps. We have to install the Jumbo1 system and one extra VME-crate. One compressor has to be put a bit higher, because we have only two long compressor tubes and so we have to use the short one.

In the control room: One has to install the backup unit of the fiberoptics communication modul. As we have 2 additional PCs, (CCD-readout, slow-monitor) we might need another table.

3) Why is it interesting to do this ?

a) Physics:

The cryo-target will be devoted to measure kaonic hydrogen and deuterium. The additional NTP setup gives us the possibility to investigate other exotic systems at the same time with the full luminosity we will obtain for hydrogen.

i) 4-Helium: First candidate of interest due to the present theoretical work carried out in Japan. Expected line energies are: 3-2 ... 6.46 keV, 4-2 ... 8.72 keV, 5-2 ... 9.77 keV, 6-2 ... 10.33 keV.

ii) 3-Helium: Due to the high cost of 3He one has to built a 100% effective 3Helium recycling system.

iii) 6-Lithium, 7-Lithium: Although one does not expect to see a large strong interaction shift for these two isotopes, it still seems to be interesting to accurately measure the isotope difference. It has been measured with low statistics before [1,2,3]. No difference was seen. Li x-ray lines within the range of the CCD-detectors would be

3-2 ... 15.15 (15.32) keV, 4-3 ... ~5.2 keV, 5-3 ... 7.74 (7.83) keV, 6-3 ... ~9 keV

Additionally, one could see the sigmaonic lines in 6Li and 7Li from the 4-3 transition at 11.5 (11.9) keV with about 1% yield per kaon stop.

iv) Using heavier elements means that the lines interesting in terms of strong interaction physics are energies out of the CCD detection range. The lines within the range are not expected to show strong interaction shifts or widths and so are only of interest if one wants to do kaonic cascade physics in these elements.

b) Installation:

Having everything for the NTP setup installed in the pit means, that in case we need this item for replacement of one part of the cryo-system, we have it ready, runnning and do not have to install it.

Additionally, we fulfill an old scientific commitee request to use our beam time as efficiently as possible.

References:

[1] C.E. Wiegand, D.A.Mack Phys.Rev.Lett. 17 (1967) 685.

[2] C.J. Batty et al., Nucl.Phys. A282 (1977) 487.

[3] S. Berezin et al., Nucl.Phys. B16 (1970) 389.