

Status and activity of the CLARA-PRISMA setup

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I. INTRODUCTION

The CLARA-Prisma setup (see Fig.1) is now working at the Laboratori Nazionali di Legnaro since March 2004. The setup consists of CLARA [1], an array of 25 Clover (EUROBALL type) Ge detectors, placed at the target position of the large acceptance PRISMA [2] magnetic spectrometer. The setup has been built with the main goal to investigate the structure of neutron rich nuclei, populated in multi-nucleon transfer reactions and deep inelastic collisions with stable beams.

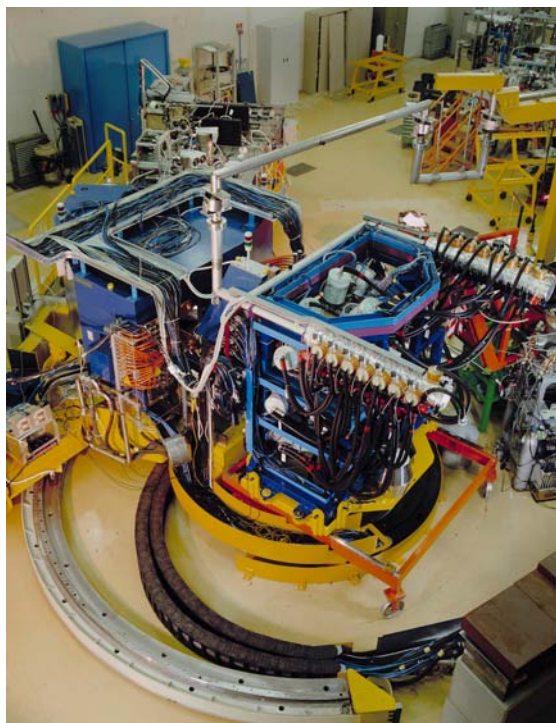


Fig. 1: View of the CLARA-PRISMA setup

PRISMA allows the unambiguous mass and Z identification of the reaction products, opening the possibility to explore nuclei further away from stability with respect to previous experimental studies using the aforementioned reactions.

Eight experiments have been performed in 2004 with beams delivered by the LNL Tandem and the ALPI linac. A consistent fraction of the experimental activity was connected with the study of the evolution of magic numbers in neutron rich nuclei. In particular, nuclei in the vicinity of $N=50$ towards the doubly magic ^{78}Ni , have been studied. The appearance of unexpected magic numbers and the onset of new regions of collectivity, in particular in n -rich nuclei with $A\sim 60$ and $N\sim 34$ has also concentrated experimental effort. The excited state population pattern of nuclei in the ^{90}Zr and ^{40}Ca regions has been studied with multinucleon transfer reaction, as well as the decay of resonances associated to molecular states. Once overcome the difficulties in the data analysis, naturally coming in a new setup, the experimental groups have started to produce new results. Due to the complexity of the instrument, the analysis of most experiments is still in progress, nevertheless, some of the early results are included as contributions to this Annual Report [3-7].

In addition the year 2004 has been the debugging period for the instrument, and some problems have been identified and solved in CLARA as well as in the PRISMA instruments.

II. PROBLEMS ENCOUNTERED DURING 2004

Since early 2004 few problems have been found at the CLARA-PRISMA instrument:

- Problems with the PRISMA start detectors electronics
- Malfunction of the new CLOVER detector EURYSIS preamplifiers.

- Damage of the ADC sliding scale mezzanines inside the VXI Clover cards.

Early CLARA-PRISMA experiments suffered from a small (about 20%) leak in the mass spectrum (see Fig.2). This affected the spectrum of neighbouring masses for few of the performed experiments and had to be corrected during the offline analysis. The problem, connected with the constant fraction discriminator of the start detector electronics, was identified and solved in July 2004.

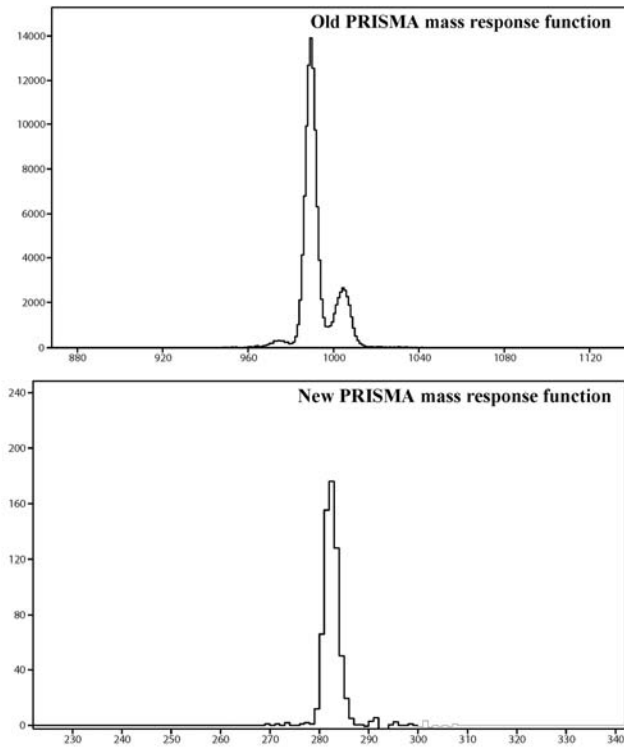


Fig. 2: Upper panel: Mass spectrum for ^{82}Se in the $^{82}\text{Se} + ^{238}\text{U}$ experiment. Lower panel: the same for the $^{32}\text{S} + ^{58}\text{Ni}$ experiment after changes on the PRISMA electronics. Both spectra have been obtained from the CLARA-PRISMA coincidences with a condition on $2^+ \rightarrow 0^+$ transitions

The problem connected with the new Clover detector EURYSIS preamplifiers started in Christmas 2003. The number of preamplifiers changed during 2004 amounts to 38 cards. The cause of the problem was identified by the IReS detector laboratory personnel in November 2004. One capacitor of the preamplifier circuit was mounted inverted for several cards.

A complete check and reparation of the CLARA Clover detector preamplifiers was done by the IReS detector laboratory personnel in collaboration with LNL in early January 2005.

The damage of the ADC sliding scale mezzanines was found in early 2004, i.e. the mezzanines of several VXI cards were burned in the region of the connector in contact with the motherboard (see Fig.3). The problem with the mezzanines is being solved with the production and installation of new mezzanines, with PCB insulating coating,

during the first quarter of 2005. The presence of this problem has prevented us from going to a configuration with more than 22 Clover detectors installed in the array.

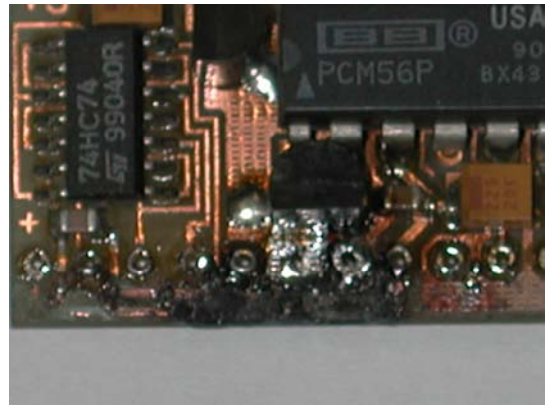


Figure 3: ADC sliding scale mezzanine burned.

III. PERSPECTIVES

The INFN CLARA-PRISMA collaboration has applied for funds to build an ancillary array of position sensitive detectors for CLARA. The array will be built in collaboration with the group of the FLNR of Dubna, with CORSET type MCP detectors. The main goal of this ancillary device is to open for CLARA the possibility of measuring pure γ - γ coincidences with Doppler correction, with larger efficiency than that provided by the PRISMA entrance detector, simultaneously to the standard CLARA-PRISMA run. The first prototype of detector with a dimension of 70x50 mm will be built at LNL in the first quarter of 2005.

IV. ACKNOWLEDGEMENTS

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