

MAMBO

P. Levi Sandri (R), D. Moricciani, A. Spallone.

1 Introduction

MAMBO groups together two complementary INFN activities in Germany, both aimed at studying the excited spectrum of the nucleon: the experimental program A2 with the MAMI-C microtron in Mainz and the BGOOD experiment at Bonn-ELSA. LNF are involved in the latter activity.

2 BGOOD experiment

The BGOOD experiment is performed in collaboration between INFN sections of Roma2, LNF, Pavia, ISS-Roma1 and Torino, the University of Messina, the University of Bonn, Physikalisches Institut, ELSA department, the University of Bonn, Helmholtz Institut für Strahlen- und Kernphysik, the University of Edinburgh, the National Science Center Kharkov Institute of Physics and Technology, the University of Moscow, the Petersburg Nuclear Physics Institute (PNPI), Gatchina, the Lamar University and the University of Basel. More than 70 physicists participate to this experimental program foreseen to last until 2020 with possible extension.

The INFN instrumental contribution consists in the *Rugby Ball* calorimeter and associated detectors previously used at GrAAL, the target system, the cylindrical tracking chambers and the MRPC detector. In the collaboration management, LNF expresses the co-spokesperson and one of the experiments to be performed as advised by the joint MAMI-ELSA PAC is led by LNF as well (η' photoproduction near threshold).

3 Activity in 2019

On December, 18, 2018 a failure occurred to a klystron of Linac 1 of ELSA complex. The repair was found to be impossible and a new klystron was purchased. This incident stopped the ELSA complex for the entire year 2019 and part of 2020. There was therefore no production period during 2019 and the collaboration focused on data analysis.

Results were obtained for $K^+\Lambda$ and $K^+\Sigma^0$ with forward going kaon. These results, though still preliminary, are now stable and ready for publication. In Fig. 1 the results for $K^+\Lambda$ are shown. BGOOD is now the more precise experiment for this reaction, with the best angular resolution (Fig. 2)

Also the reaction $\gamma + p \rightarrow K^+\Sigma^0$ was investigated in the same angular region of small momentum transfer t . The preliminary results are shown in Fig. 3 where a clear change in the dynamics of the reaction can be seen at very forward angles, maybe linked to the threshold of $K^+\Lambda(1405)$ channel at center-of-mass energy $W=1900$ MeV.

The commissioning of the MRPC detector, built by Roma2 and LNF, has continued with technical intervention aimed at the reduction of the noise. The detector is now commissioned, and waits for the first available beam for the final test.

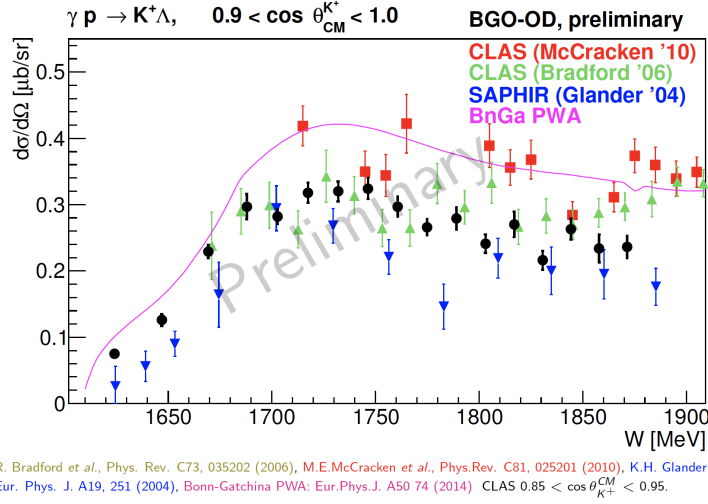


Figure 1: Cross section for $\gamma + p \rightarrow K^+ \Lambda$ for forward going kaons. Black dots: BGOOD data compared to existing measurements and with Bonn-Gatchina partial waves analysis.

The calibration procedure of the BGO calorimeter by using ^{22}Na sources was completely revisited and implemented. The signal to background ratio in the invariant mass spectrum for two photons in the final state was improved.

Finally a technical paper describing the the experiment (beam and apparatus) was produced and is accepted for publication in EPJA

4 Planned activity in 2020

ELSA is expected to resume the beam delivery to the experiments by May 2020. No particular hardware or upgrade interventions are foreseen for the rest of the year. The collaboration is waiting to resume normal production periods to collect data on D2 target (Kaon and η photoproduction off the neutron) and on H2 target to complete the necessary statistics for η' photoproduction at threshold.

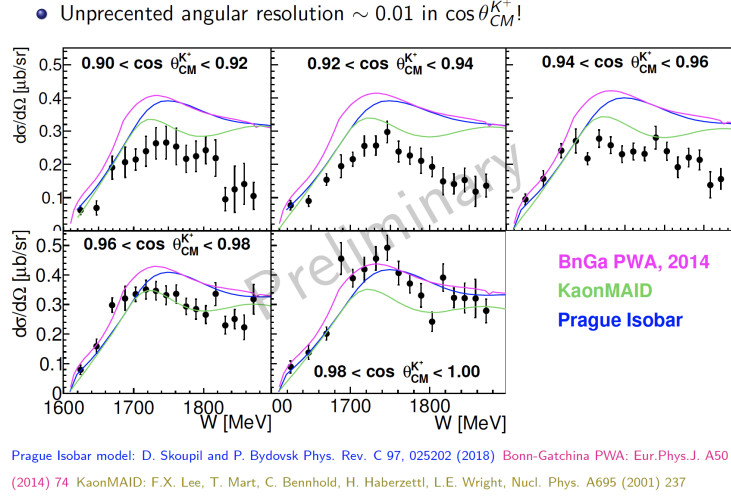


Figure 2: Differential cross section for $\gamma + p \rightarrow K^+\Lambda$ for forward going kaons. BGOOD data compared to different PWA models.

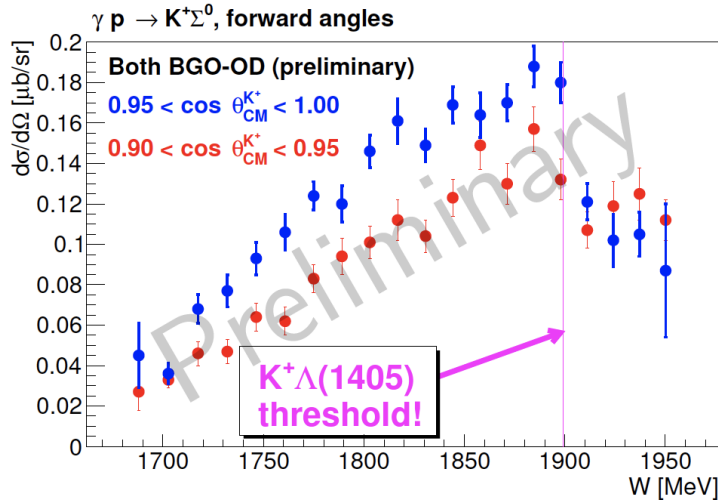


Figure 3: Differential cross section for $\gamma + p \rightarrow K^+\Sigma^0$ for forward going kaons. Blue dots at very forward angles show a change in the dynamics of the process around $W=1900$ MeV.