Commissioning and initial experimental program of the BGOOD experiment at ELSA

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BGOOD Collaboration

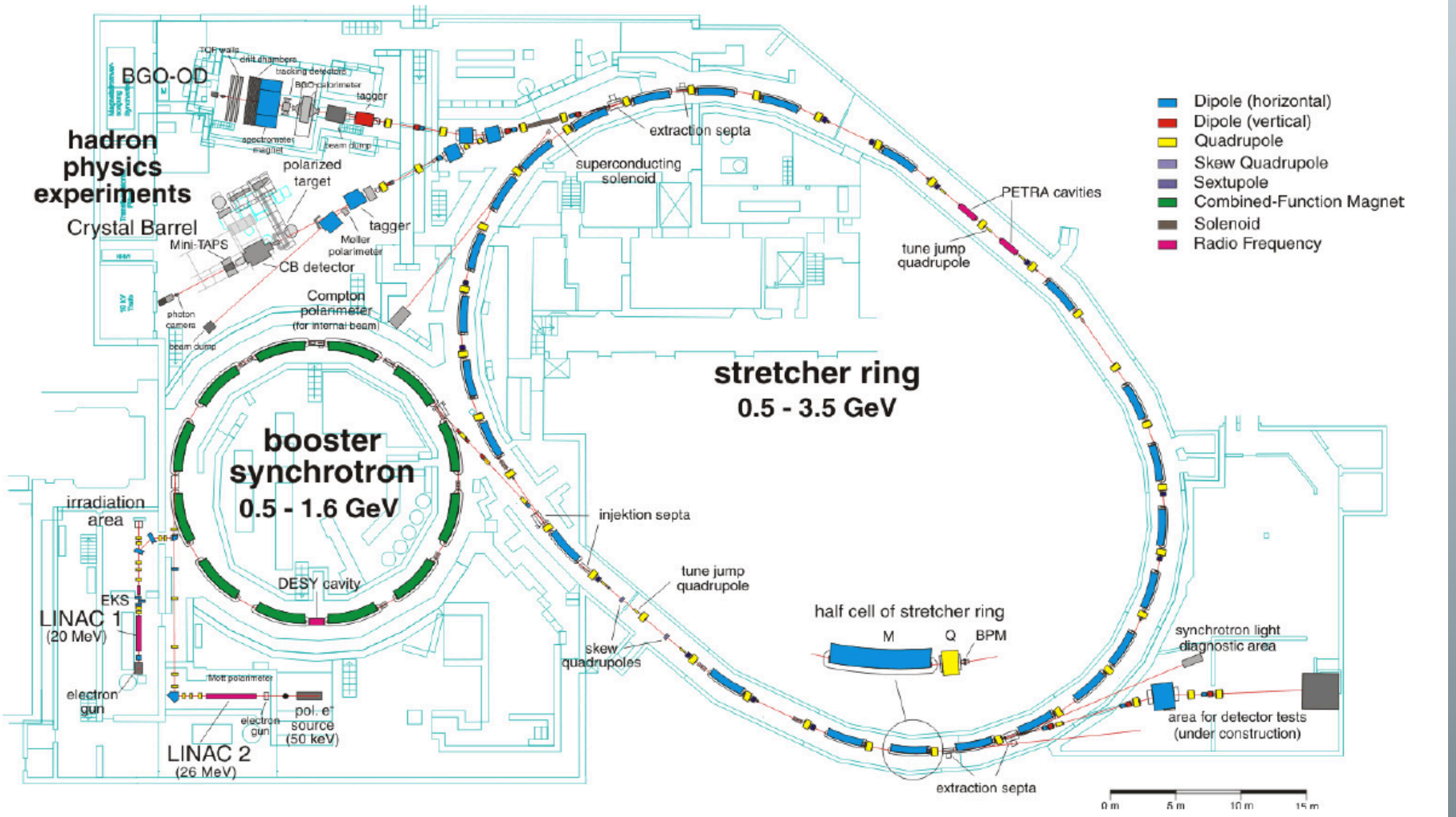
BGOOD is collaboration formed by ~ 60 people coming from 18 institutions (Germany, Italy, Russia, Ukraine, Switzerland, Scotland and US).

The physics goal is the study of meson photoproduction in mixed neutral and charged final states.

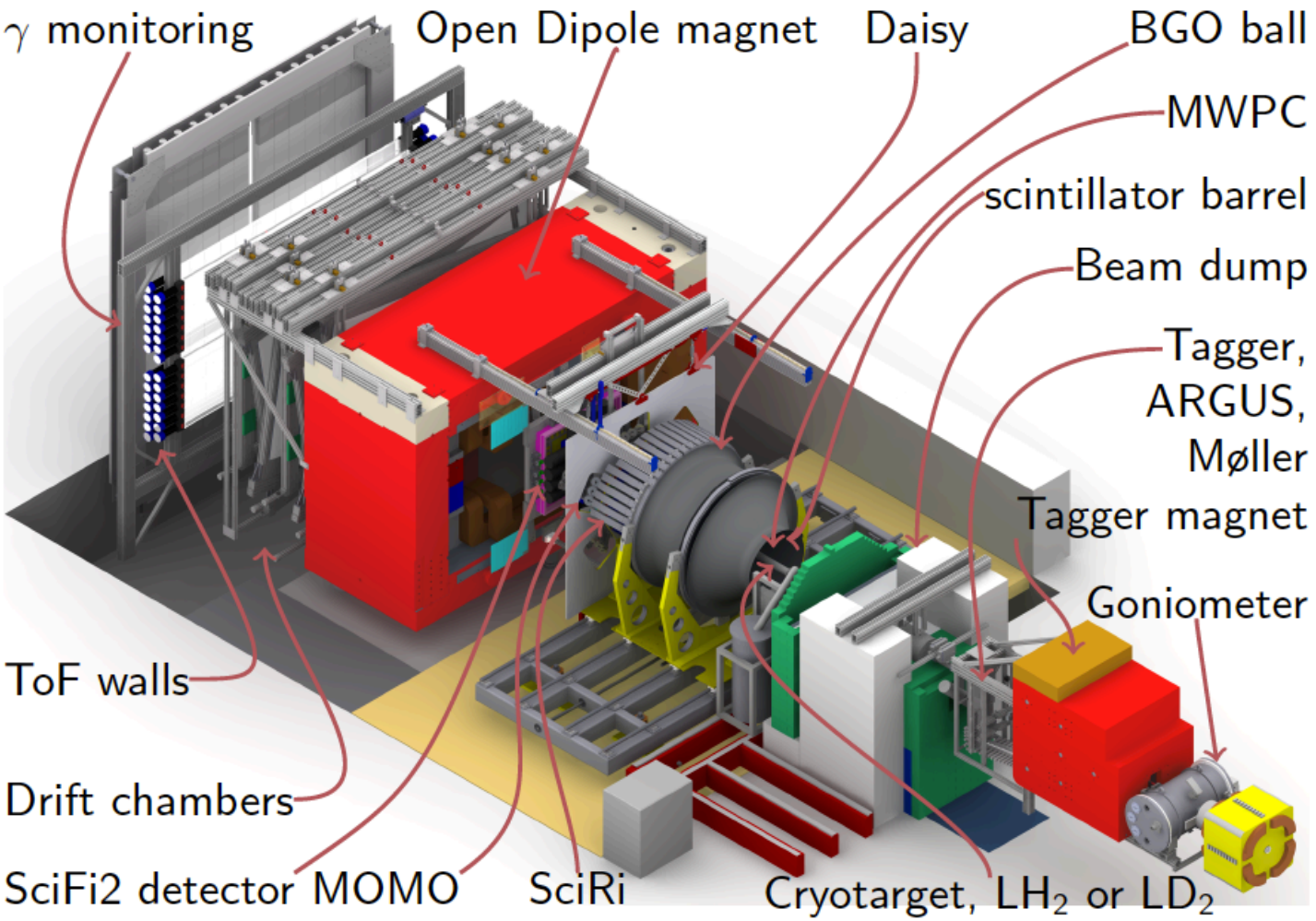
The photon beam covers the resonances region with good energy resolution (~5 MeV) and linear polarization (~40%).

The detector couples the Open Dipole spectrometer ($\Delta p/p \sim 2\%$) with the Bgo *Rugby Ball* calorimeter previously used in the GrAAL experiment and other ancillary detectors.

ELSA stretcher ring



BGOOD setup


γ monitoring
Open Dipole magnet
Daisy
BGO ball
MWPC
scintillator barrel
Beam dump
Tagger,
ARGUS,
Møller
Tagger magnet
Goniometer
ToF walls
Drift chambers
SciFi2 detector MOMO
SciRi
Cryotarget, LH_2 or LD_2

photon tagger & ARGUS

Tagger

120 scintillators

160 ps time resolution

0.5-2% energy resolution

up to 50 Mhz

In Trigger

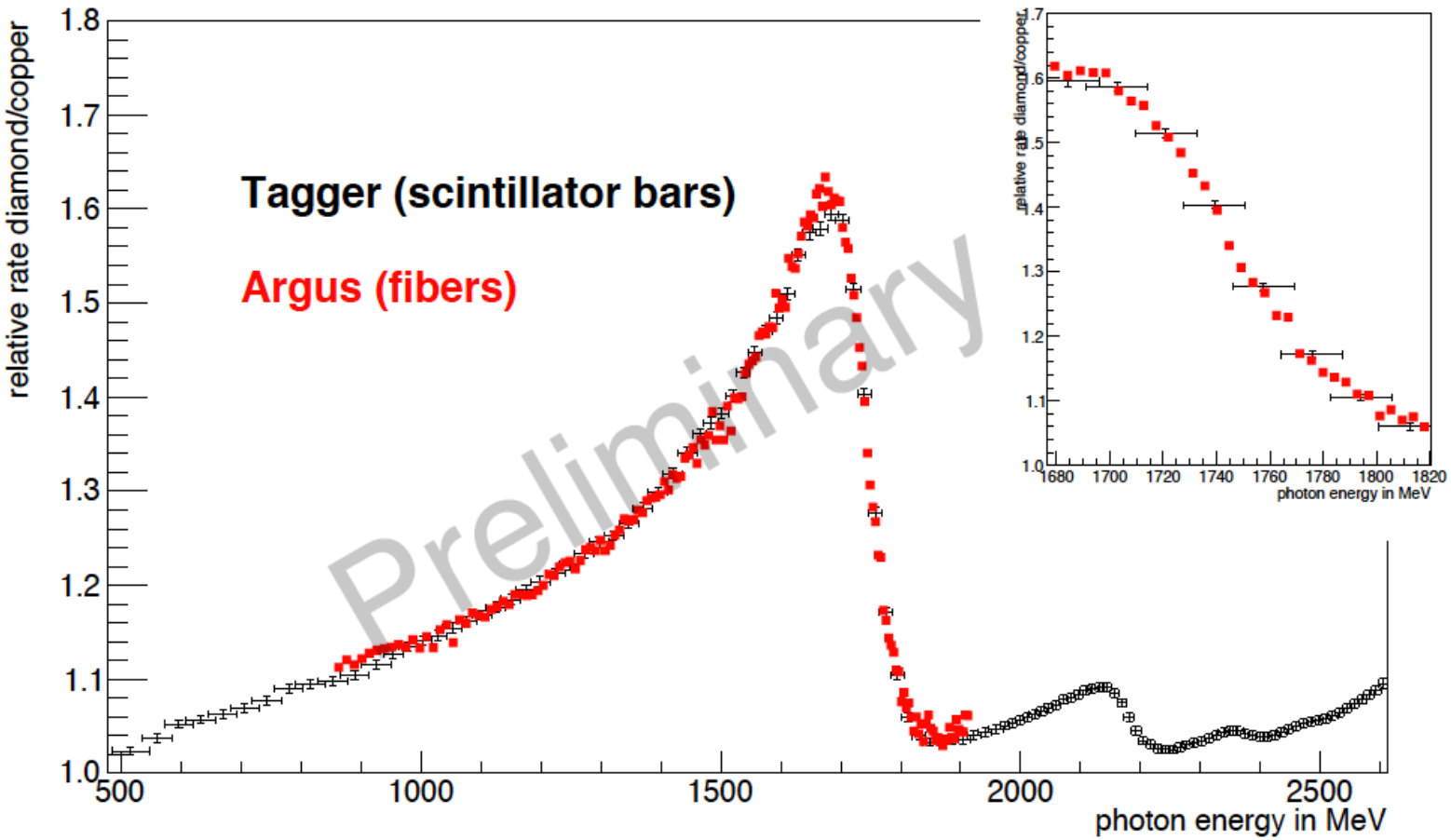
ARGUS

480 scintillating fibers hodoscope

energy resolution 0.08%

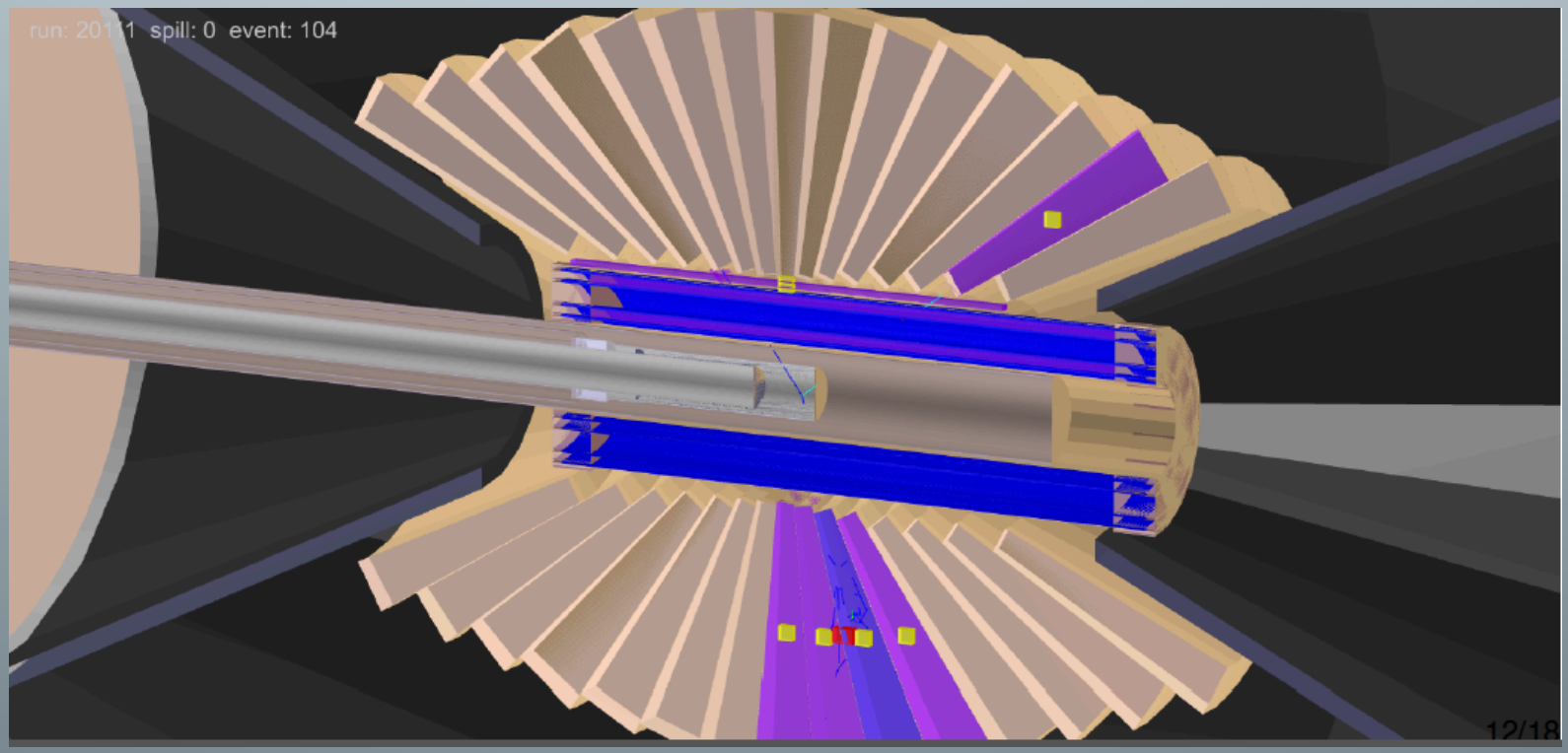
photon tagger & ARGUS

A. Bella

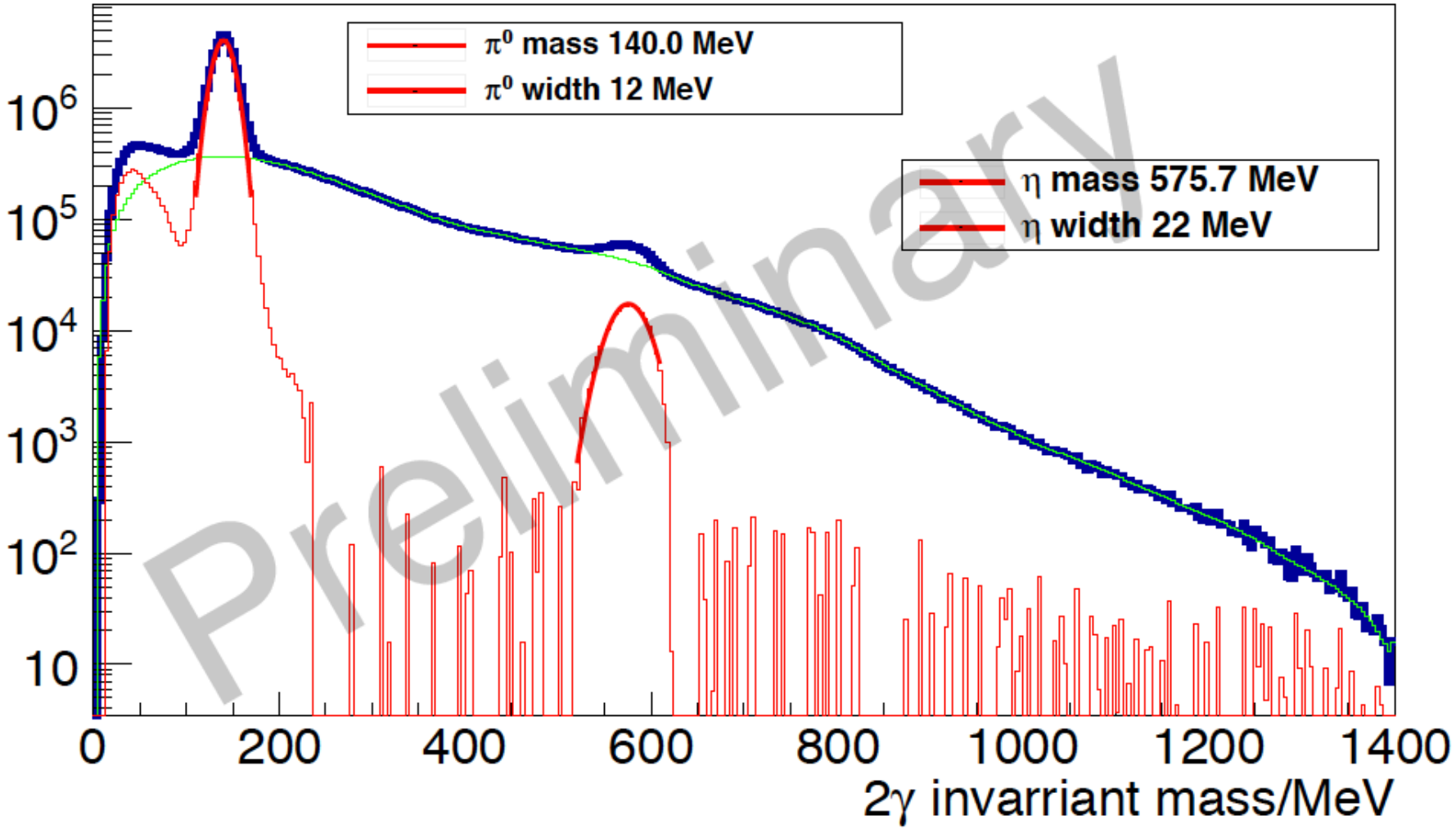


Rugby Ball
and central detectors

Liquid H_2 D_2 or solid target
480 BGO crystals PMT readout and sampling ADC's
Scintillator barrel for PID
Cylindrical MWPC for tracking
Total Energy in Trigger



Rugby Ball
2γ invariant mass



calibration with ^{22}Na source

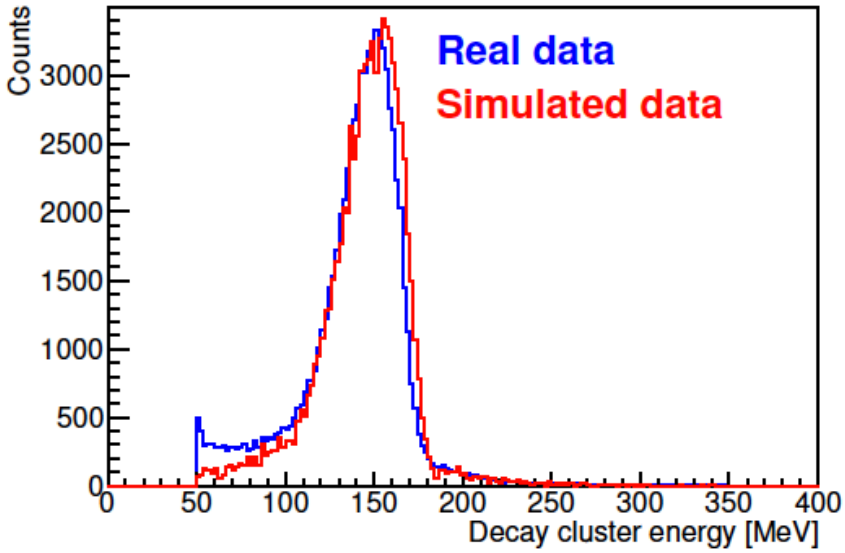
Rugby Ball
K^+ detection

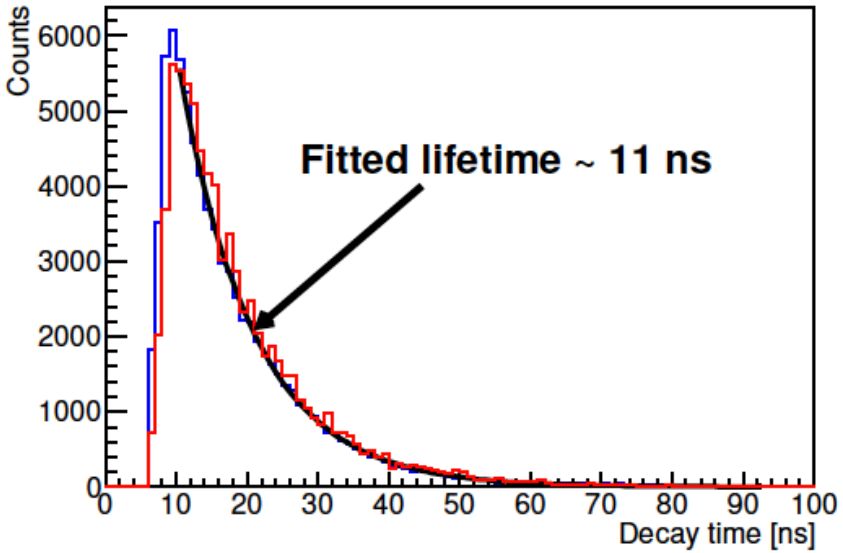
T. Jude et al PLB, 735 (2014) 112

K^+ lifetime ~ 12 ns

$K^+ \rightarrow \mu^+\nu_\mu$

the usage of sampling ADC's with ~ 2ns time resolution allows to distinguish K^+ ionization from μ^+ delayed ionization





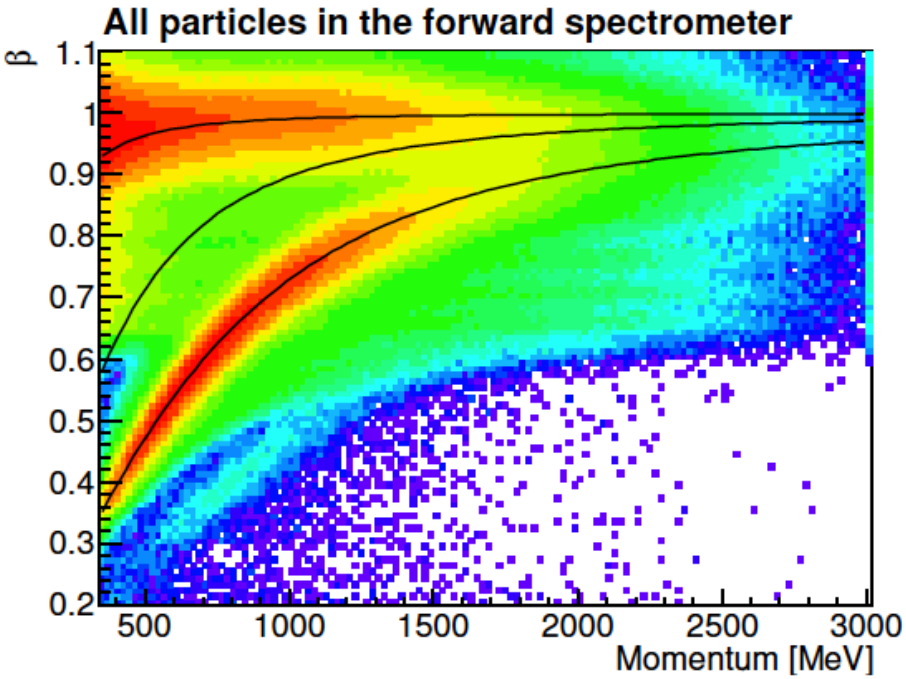
Forward spectrometer

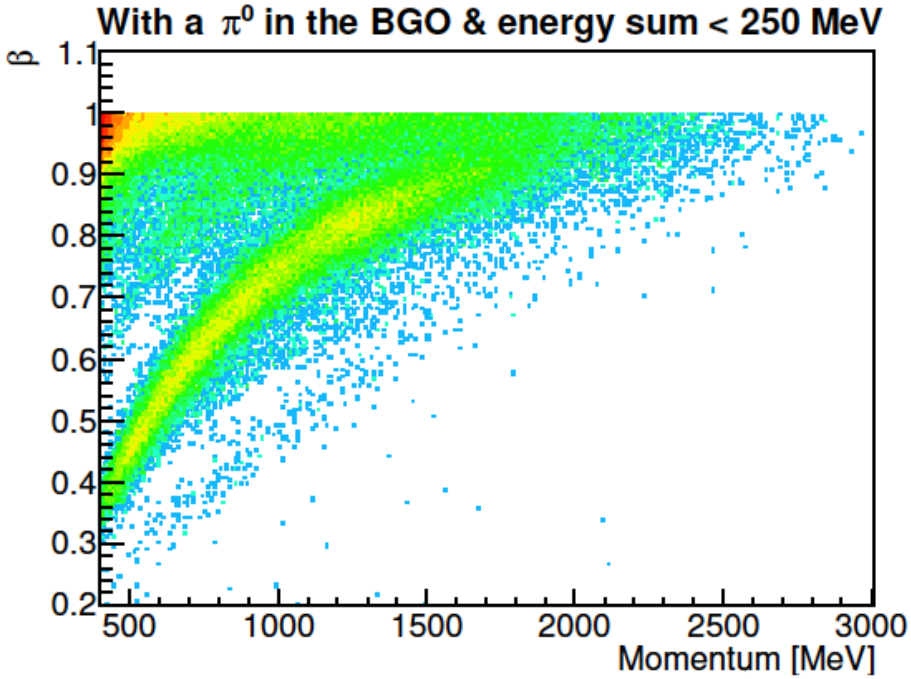
8° x 12° aperture

0.45 T Open Dipole

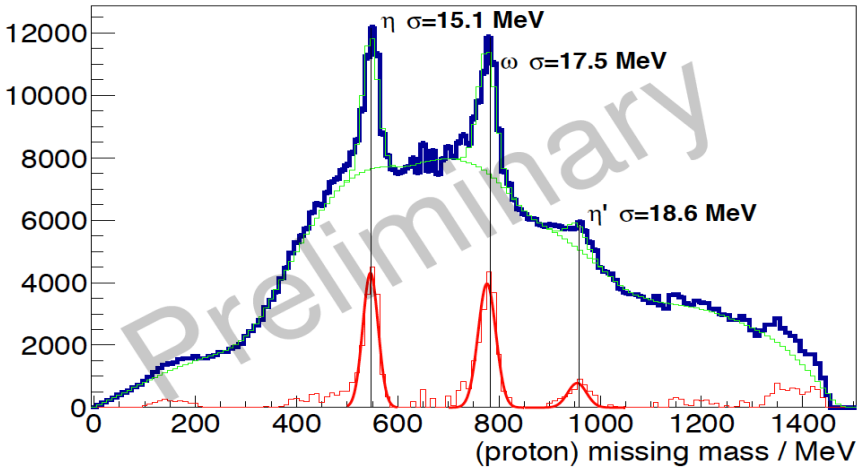
8 double layer drift chambers

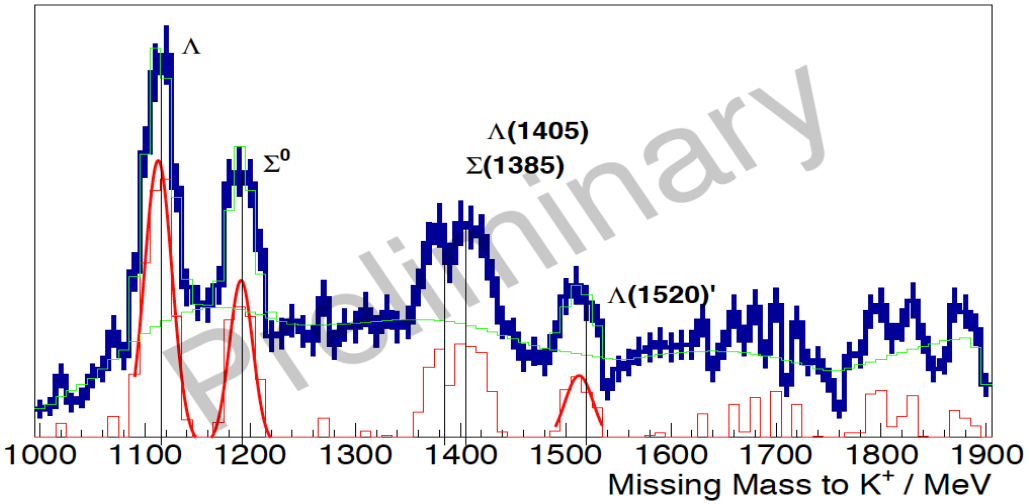
3 ToF scintillating walls





Forward spectrometer missing mass reconstruction





Initial experimental program

BGOOD is an open trigger experiment

$E_{RugbyBall}$ AND Tagging

All (~ most of) the channels are recordered

Approved (PAC) experiments

Strageness photoproduction ($K^+\Lambda$, $K^+\Sigma^0$, $K^0\,\Sigma^+$...)

η photoproduction (off p and n)

η' photoproduction off p ⟵

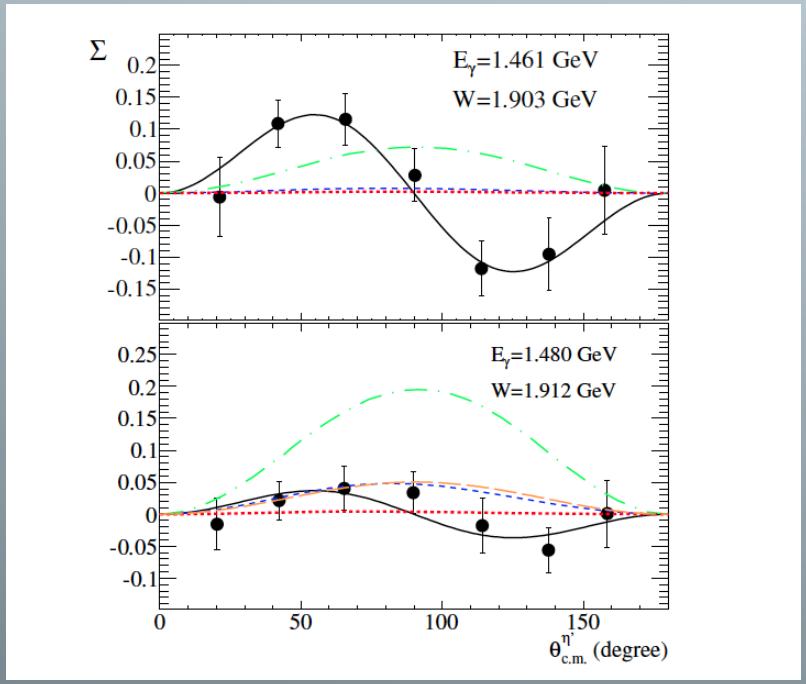
vector mesons (ω, Φ)

η mesic nuclei ^{12}C target

η’ photoproduction

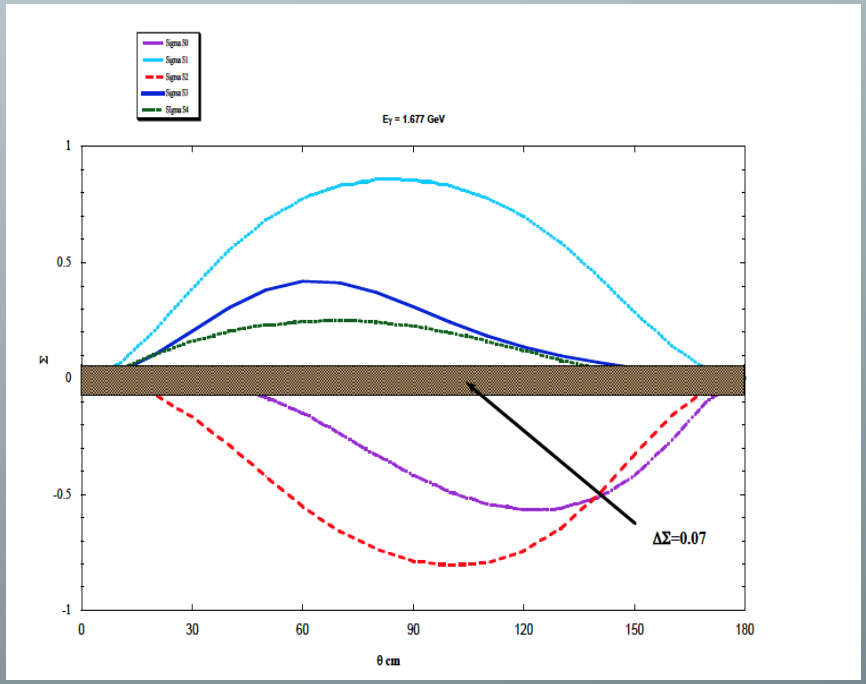
two different analyses with different sets of polarization peak.
both need ~ 30 days of beamtime

photoproduction very close to threshold
recoil proton a 2-body kinematics analysis
unexpected behaviour measured at GrAAL



Eur. Phys. J. A (2015) 51: 77

“high” energy (~1.7 GeV) photoproduction
to disentangle ingredients of existing models
η’ decay products based analysis



Phys. Rev. C 87, 054004 (2013).

conlusions

- BGOOD is now ready to run in its full final configuration
- two runs (~40 days beamtime) were performed already. Analysis is ongoing (mainly strangness photoproduction)
- proton target data taking up to beginning 2017
- neutron target (D_2) and ^{12}C target in a later stage

thanks to

S. Alef, B. Bantes, D. Bayadilov, R. Beck, M. Becker, A. Bella, S. Boese, A. Braghieri, K.-Th. Brinkmann, D. Burdeynyi, P. Cole, R. Di Salvo, H. Dutz, D. Elsner, A. Fantini, O. Freyermuth, S. Friedrich, F. Frommberger, V. Ganenko, D. Geffers, G. Gervino, F. Ghio, S. Goertz, A. Gridnev, E. Gutz, D. Hammann, J. Hannappel, W. Hillert, A. Ignatov, R. Joosten, T.C. Jude, F. Klein, K. Kohl, K. Koop, B. Krusche, A. Lapik, C. La Storia, P. Levi Sandri, I. Lopatin, G. Mandaglio, F. Messi, R. Messi, V. Metag, D. Moricciani, A. Mushkarenkov, M. Nanova, V. Nedorezov, D. Novinskiy, P. Pedroni, B.-E. Reitz, M. Romaniuk, T. Rostomyan, N. Rudnev, C. Schaerf, G. Scheluchin, H. Schmieden, A. Stuglev, V. Sumachev, V. Tarakanov, V. Vegna, D. Walther, D. Watts, H.-G. Zaunick, T. Zimmermann.