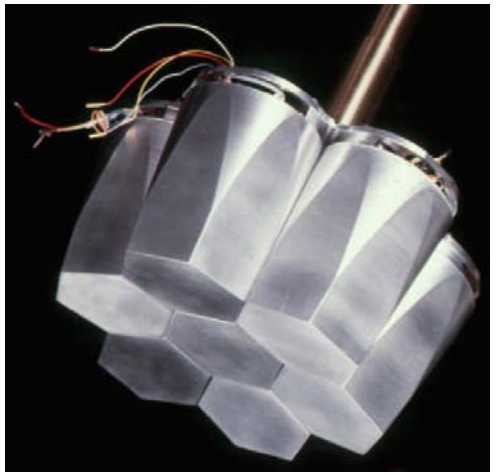
History of encapsulated HPGe detectors

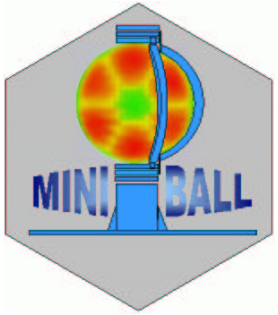
−first encapsulated detectors 92

−Euroball 96−98 at INFN

−Euroball 99−03 at IReS Institut de Recherches Subatomiques STRASBOURG

−EB−Cluster now at (GSI Darmstadt) RISING



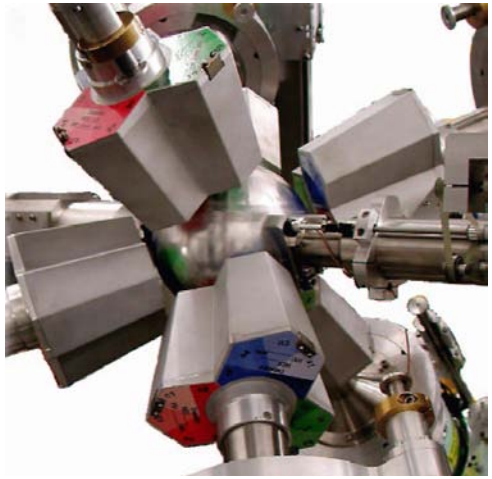


−1st six−fold segmented, encapsulated detector 97

−Miniball at Köln 01/02 and 02/03

−Miniball at CERN 02 and 03

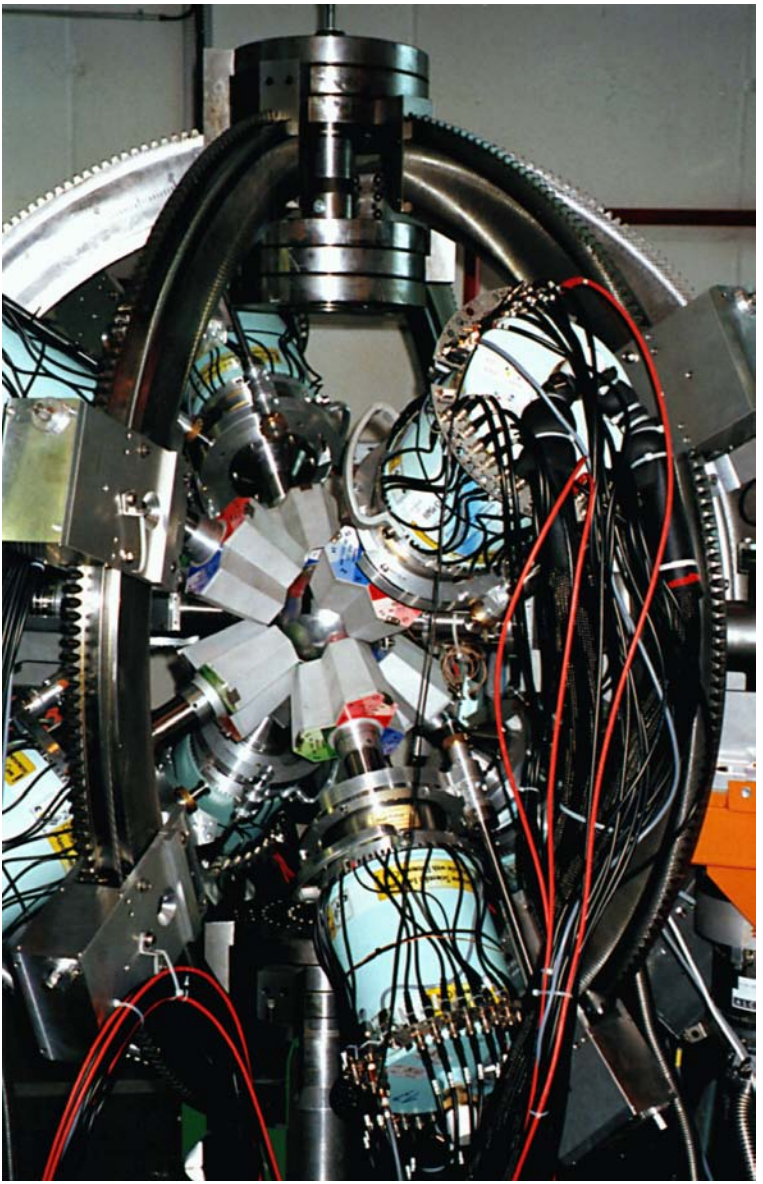
−12−fold segmented detectors since 2000

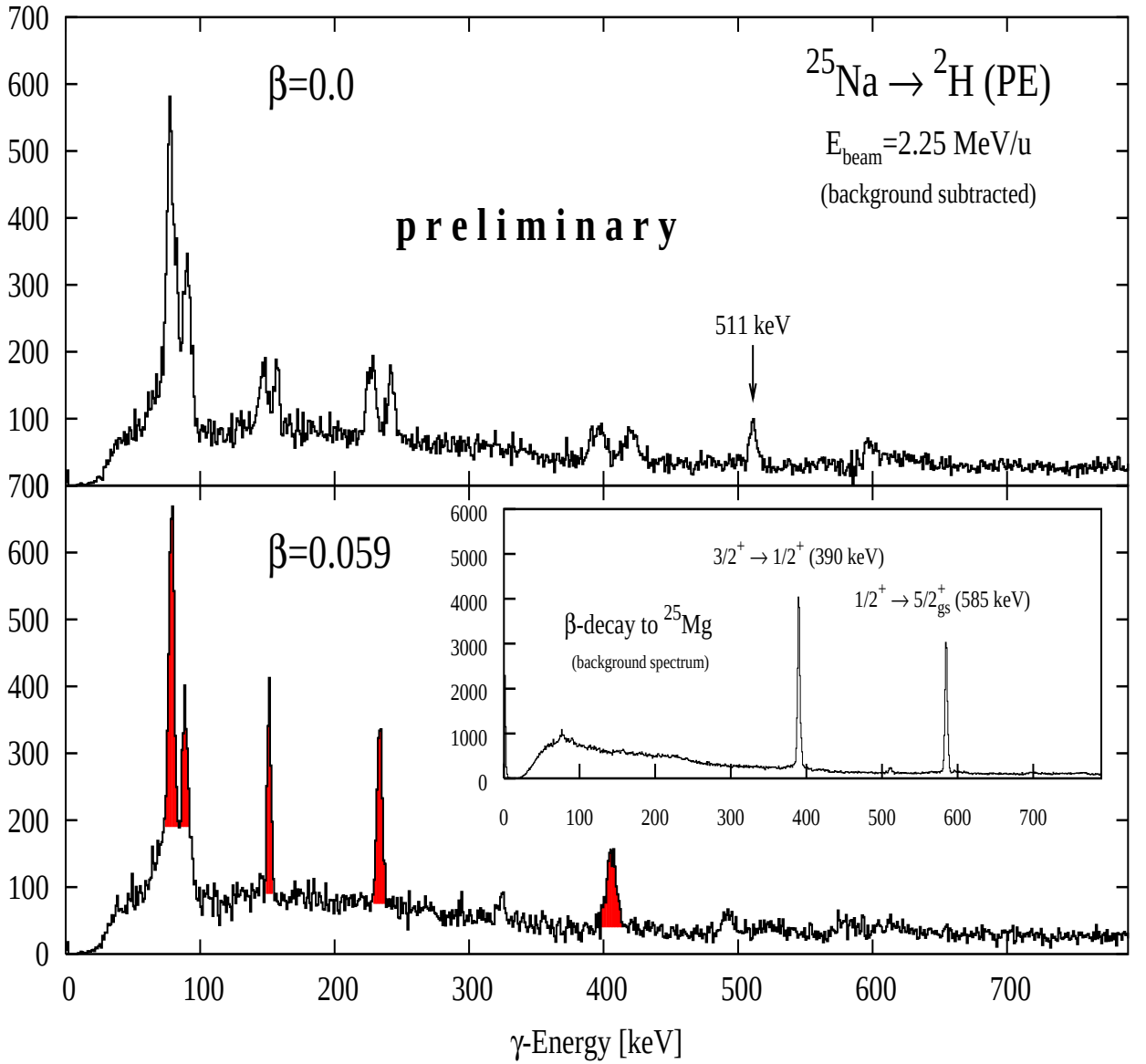


Reliability of encapsulation technology has been proven over 10 years.
Encapsulation will be used for the 36−fold segmented AGATA detector.

MINIBALL am CERN 2002

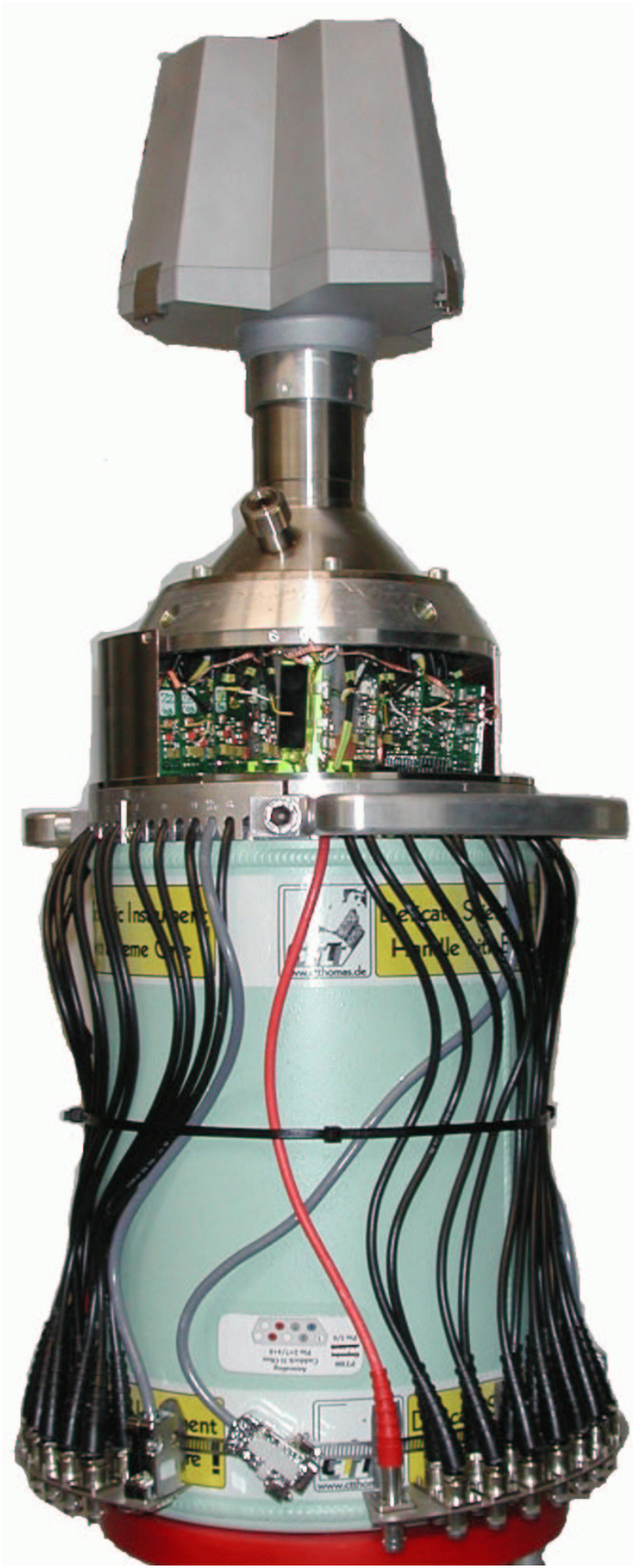
n-Pickup of ^{25}Na on ^{2}H





(Heiko Scheit, MPI Heidelberg)

MINIBALL cryostat for 12−fold segmented encapsulated detectors



AGATA symmetric detector specification

- impurity concentration is 0.4−1.8 10^{10}/ccm
- measured impurity concentration and parameterisation of variation throughout the crystal will be provided by CE
- one crystal axis will go through the center of one flat with an accuracy of 5^{o}. It will be marked on the capsule and stay the same for all AGATA detectors
- minimum length of crystal is 90mm
- diameter is 80 mm (before it is cut into tapered hexagon)
- inner core diameter is 10mm
- crystal geometry and segmentation as shown in the figure

- thickness of capsule wall is 0.8mm
- mean distance between encapsulation and crystal is 0.4−0.6mm
- drawing of capsule, capsule lid, position of feedthroughs and threads for mounting will be submitted for approval by the AGATA collaboration
- plan of the cabling of segment signals to feedthroughs will be submitted for approval by the AGATA collaboration
- any material containing Fluorine will be avoided within the capsule

- operating voltage is $V>(10 \times V_{depl}+7500)/11$ V, maximum operation voltage is limited to 5000V
- leakage current of the detector will not exceed 100pA at operation voltage
- cross talk between different segements is <.001

- detector is warranted to perform within specification for a period of one year following its acceptance by the AGATA collaboration. Acceptance test has to take place within one month after delivery.

specifications AGATA vs. CANBERRA EURISYS (CE)

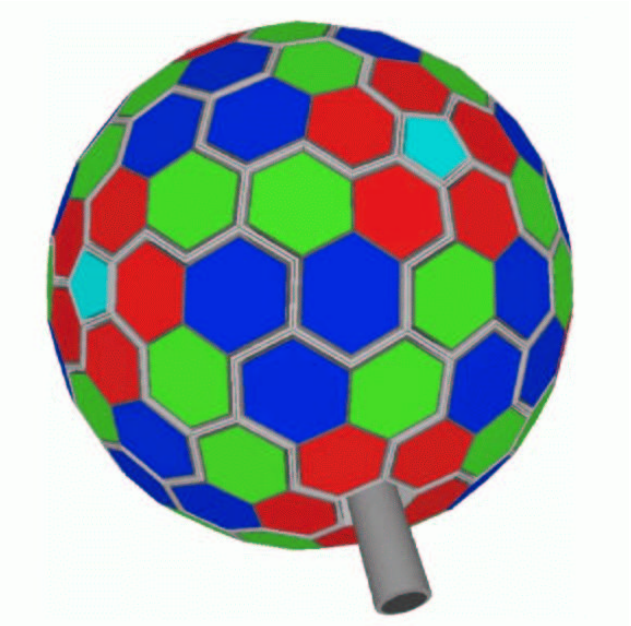
AGATA	CANBERRA
annealing	
10 annealing cycles of 5h at 110^{o} warranted.	1 cycle at 100^{o} for 24h with customers attending. No other commitment, because customer annealing cycle is not under CE control.
FWHM at 6us	
of segments	
<2.0keV at 1.3MeV	<2.3keV at 1.3MeV each mean value <2.1keV
<1.0keV at 122keV	<1.4keV at 122keV each mean value <1.2keV
of core	
<2.3keV at 1.3MeV	<2.35keV at 1.3MeV
<1.2 at 122keV	<1.35keV at 122keV
peak shape	
FWTM/FWHM <2.0 at 1.3MeV	FWTM/FWHM <2.0 at 1.3MeV

Status: symmetric AGATA detectors ordered by
INFN Padova, GSI Darmstadt and IKP Köln
delivery early 2004

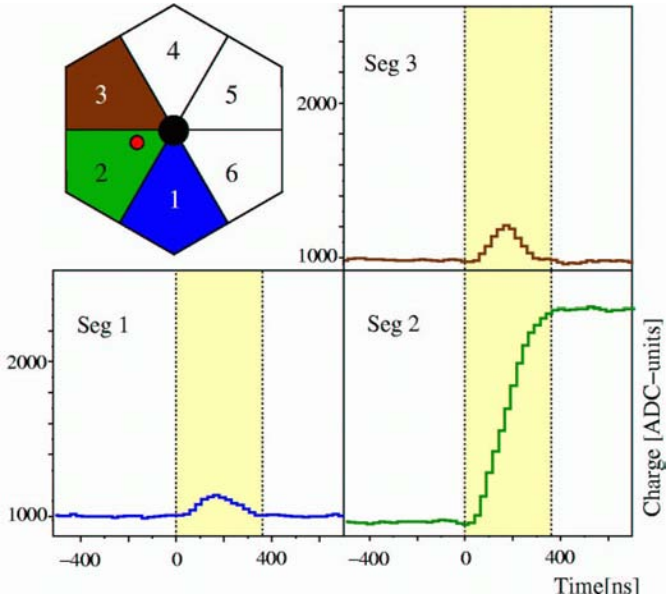
The AGATA triple cryostat

Requirements:

- coverage of whole solid angle



- fast and ‘clean‘ electronic for pulse−shape analysis and good resolution



- reliability

Design of AGATA cryostat

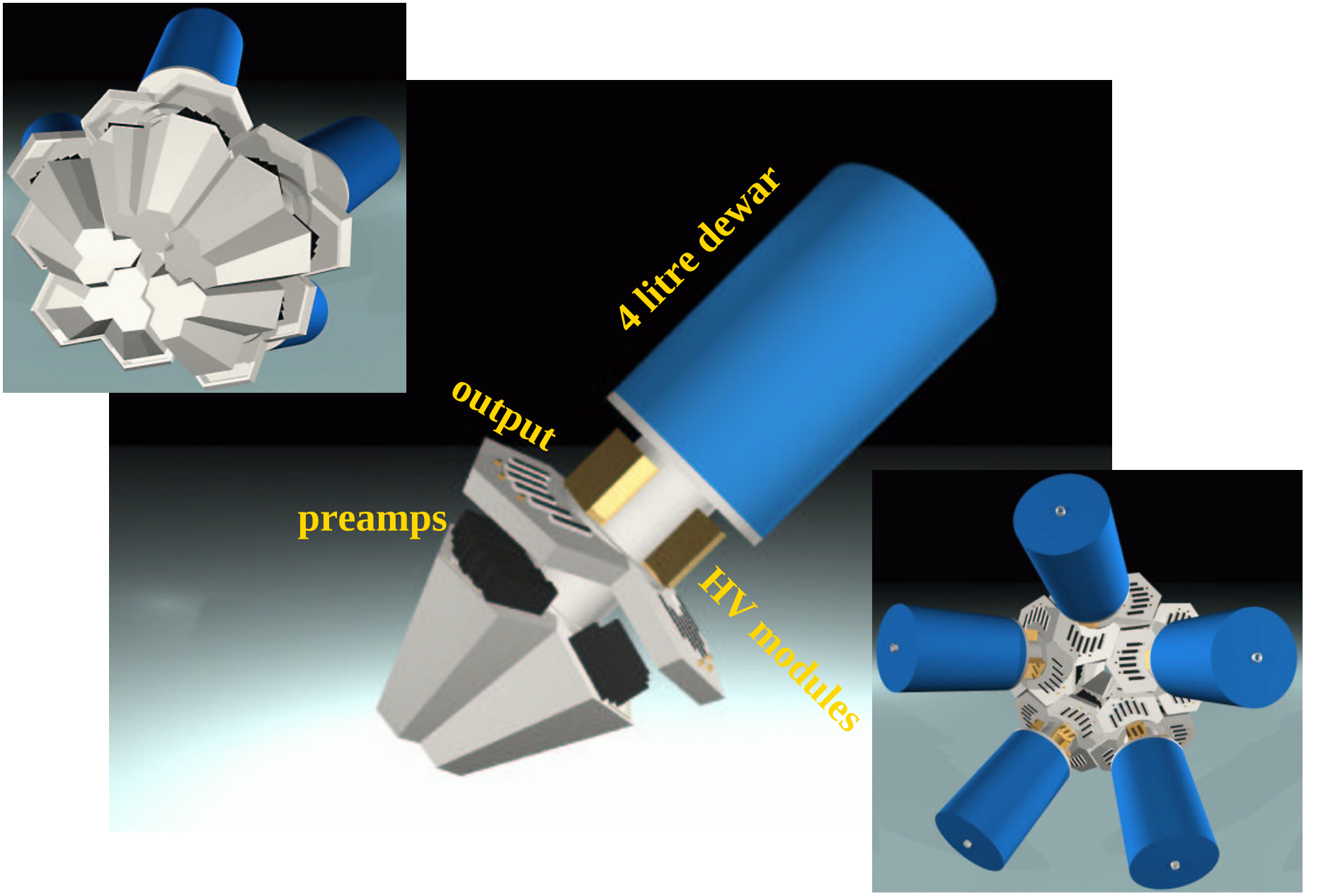
1.) start with capsule

2.) group 3 capsules
with gap of 0.3mm

3.) endcap
inner wall − capsule 1.5mm
wall thickness <1.5mm

All components have to fit in solid angle behind the endcap

Triple cluster for regular shaped capsules



status

− 3 symmetric, encapsulated AGATA detectors are ordered (delivery early 2004)

−First design of symmetric triple cluster is ready and shows that good communication is needed between infrastructure and detector group concerning frame, power supply, LN system

−self production of encapsulated AGATA detectors is under discussion in AMB and ASC
cost AGATA−detectors (w/o cryostat, electronic...)
18−29MEuro (120 det.)
27−43MEuro (180 det.)