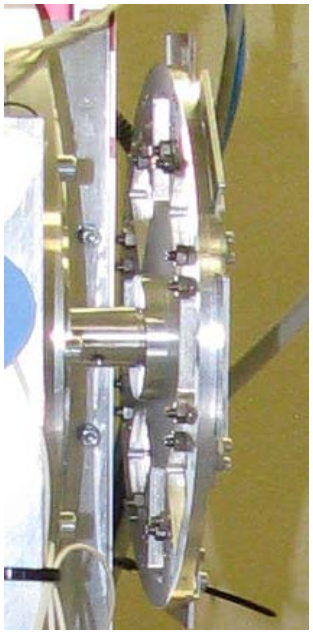
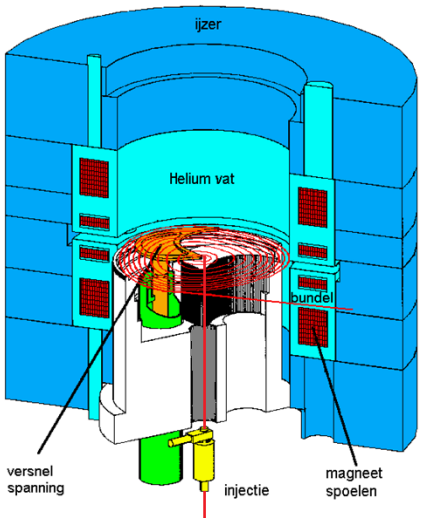
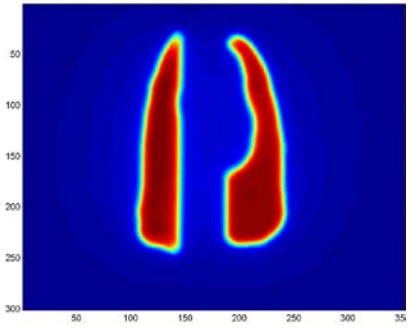
Applications at KVI-CART







M.A. Hofstee

10-jul-2014

EFINION Workshop, Greece

- Introduction
  - History
  - Mission Statement
- Facility
  - AGOR Cyclotron
  - AGOR-FIRM
- Activities
  - Science for Science
    - Fundamental interactions (TRIμP)
    - Nuclear physics research
    - Astroparticle Physics
  - Science for Society
    - Instrumentation development
    - Accelerator and Ion Source research
    - Biomedical Research
    - Irradiations
  - Collaborations
- Summary

History

Kernfysisch Versneller Instituut

- ›1968 KVI started
- ›1972 joint venture RuG & FOM
- ›1972 – 1993 Philips cyclotron
- ›1985 – 1994 AGOR cyclotron @ IPN Orsay
- ›1996 AGOR cyclotron @ KVI
- ›2007 collaboration with GSI
- ›2014 conversion to KVI-CART

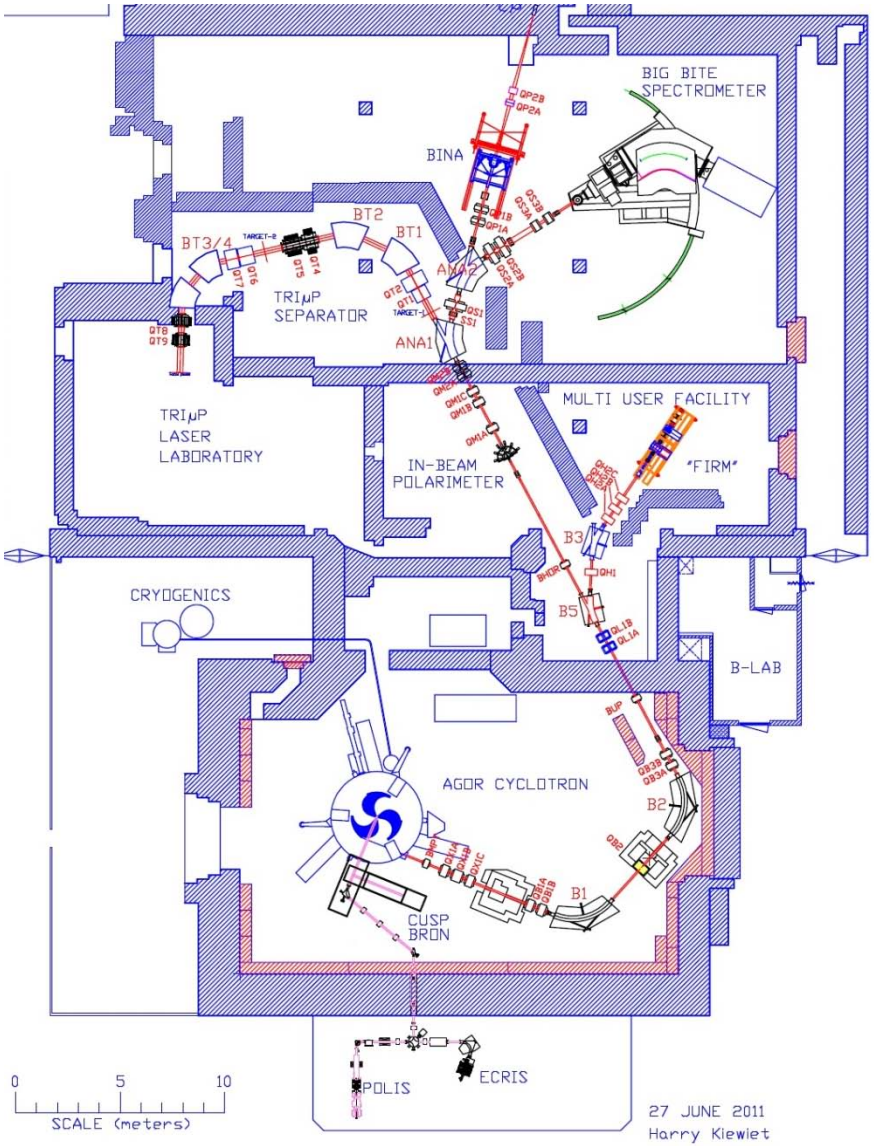
KVI

Mission Statement KVI-CART

- Basic research on subatomic and astroparticle physics.
- Application-driven research on accelerator physics and physics in medicine.
- Collaboration with the scientific community, healthcare and industry.
- Foster the cross-fertilization between basic and application-driven research.
- Educate young researchers in physics and medical technology at BSc, MSc and PhD level.

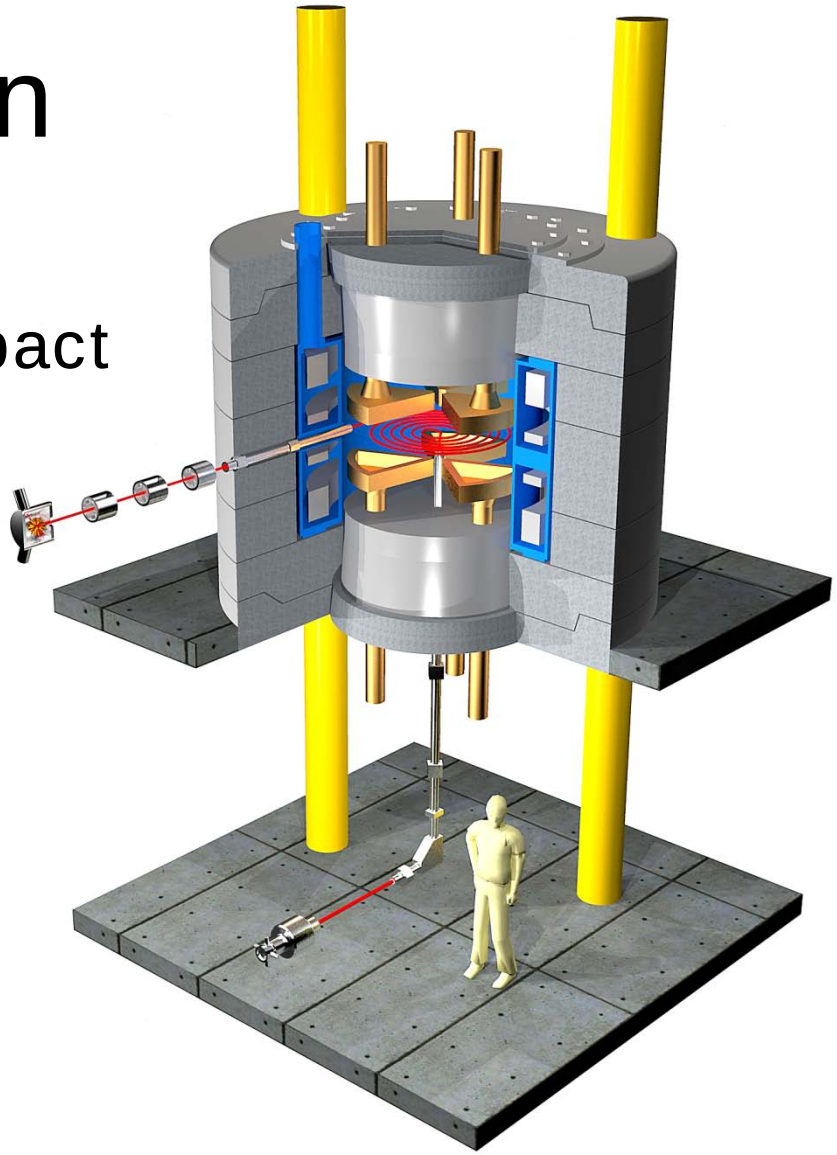
Facility

- K600 Cyclotron
- AECR and Supernanogan source
- CUSP light ion source
- Dedicated beamlines



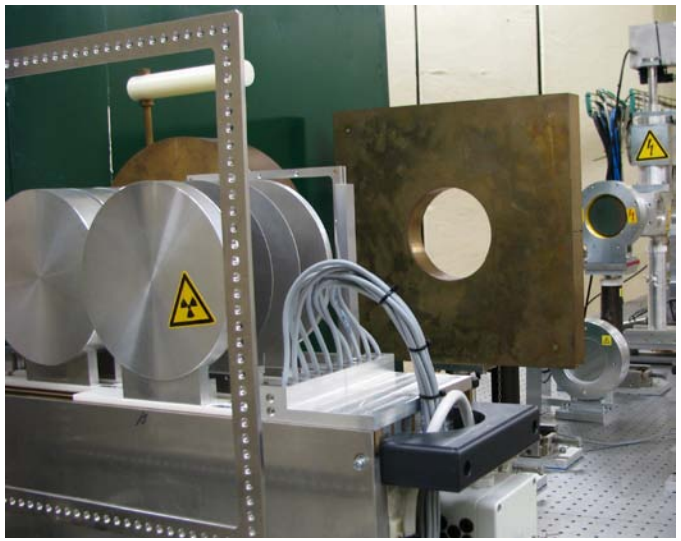
AGOR Cyclotron

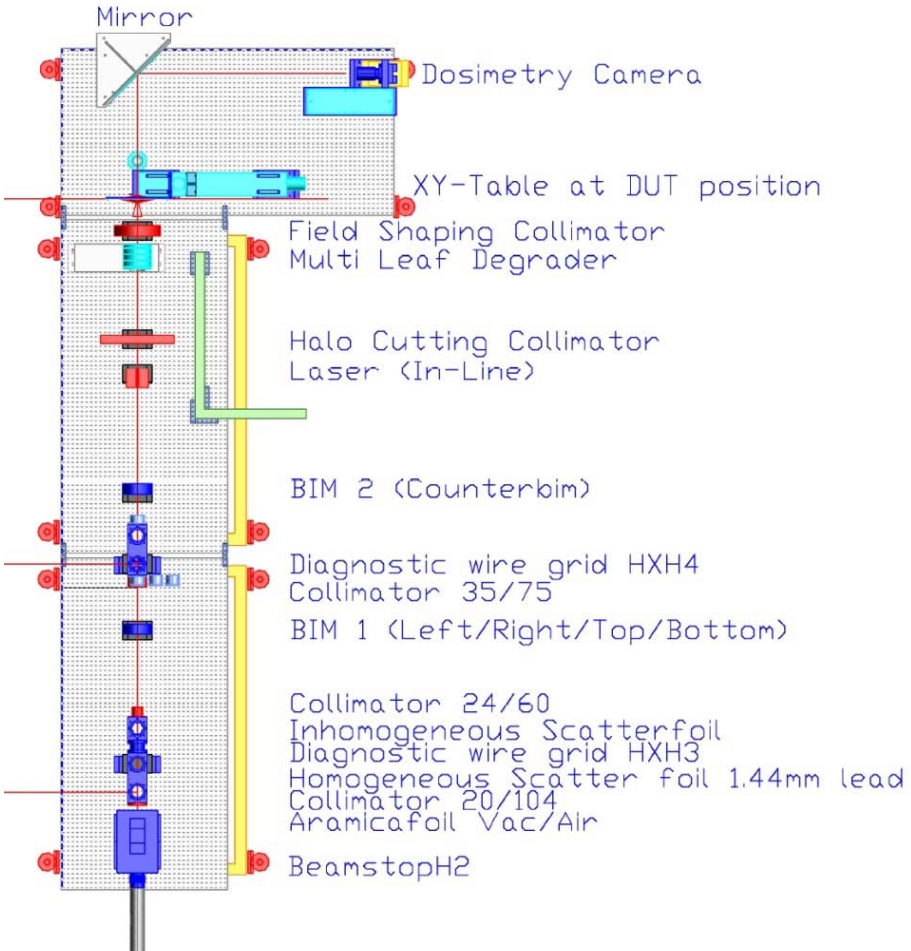
› K = 600 Cyclotron
› Superconducting, Compact
› Protons to Bismuth



AGOR-FIRM
Facility for Irradiation of Materials

- Modular
- In Air
- Remote Controlled





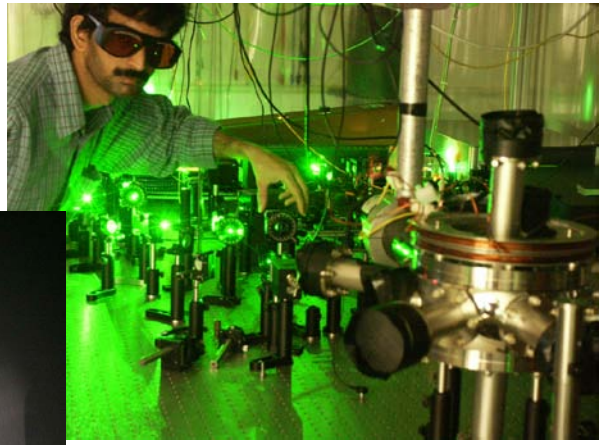
Activities

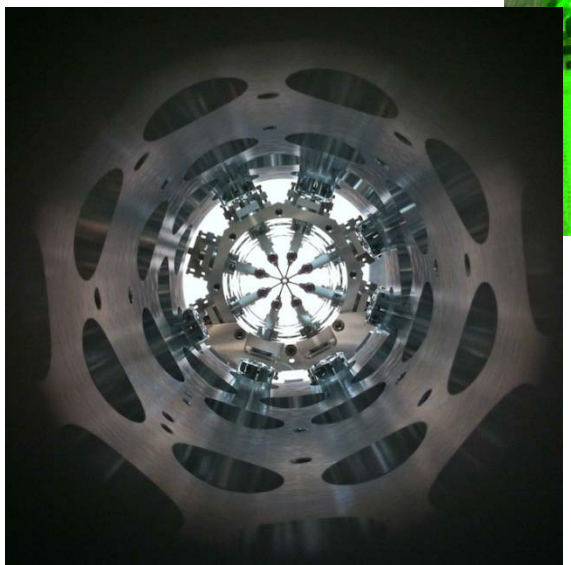
› Science for Science
- Fundamental interactions (TRIμP)
- Nuclear physics research
- Astroparticle Physics

› Science for Society
- Instrumentation development
- Accelerator and Ion Source research
- Biomedical Research
- Irradiations

Science for Science

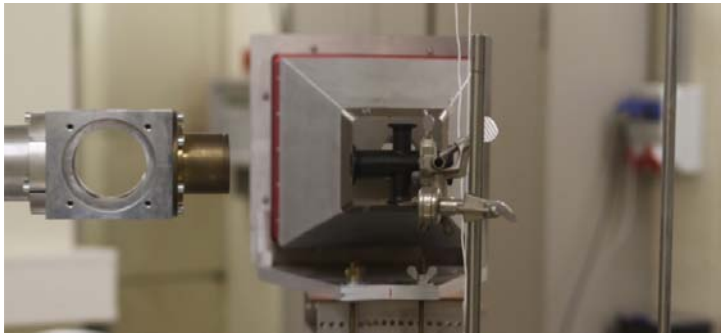
› Fundamental interactions (TRIμP)
› Nuclear physics research
› Astroparticle Physics





Fundamental Symmetries

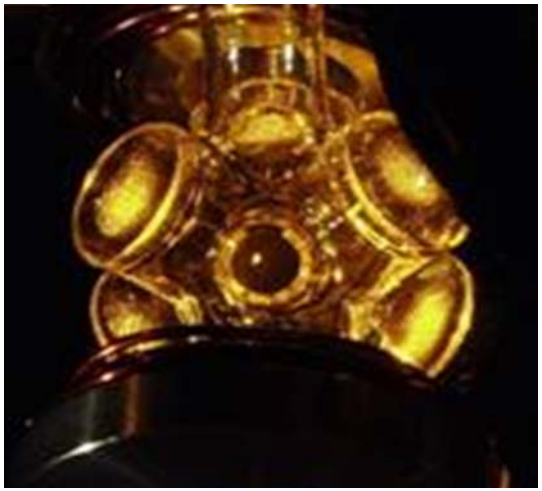
› TRIμP group moved to Physics Department per 1-1-2014



Lorentz Invariance, Onderwater, 2010

Traveling wave Stark detector

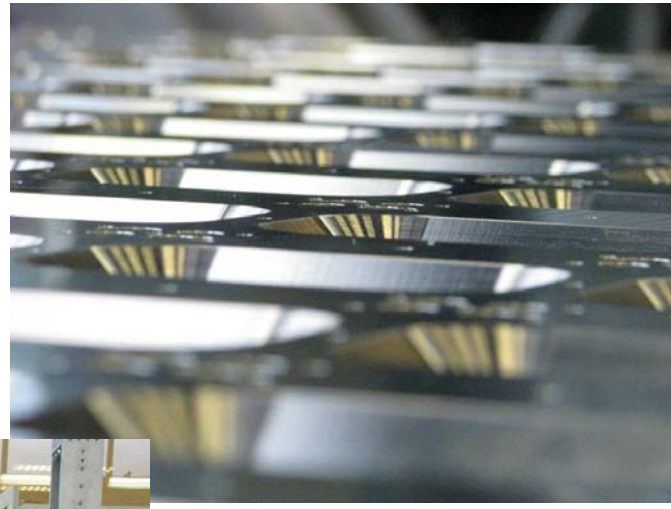
Trapped Na atoms

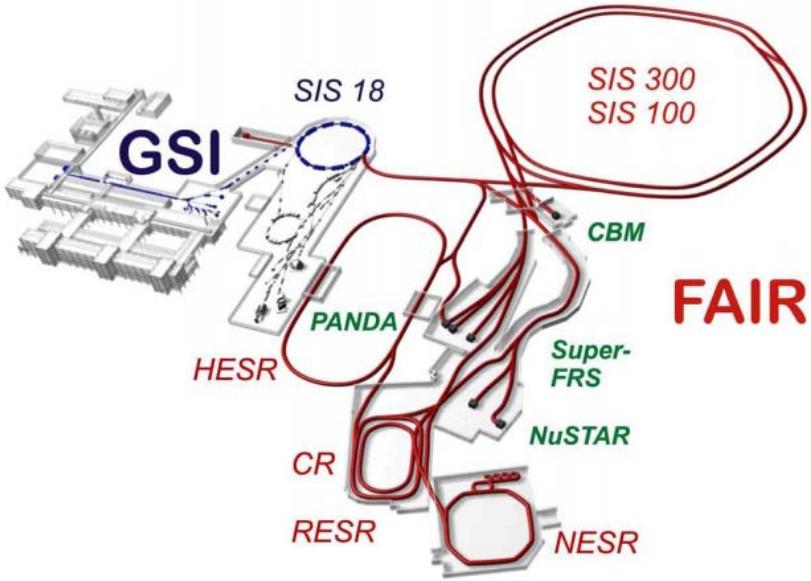


TRImP Beam Line

Nuclear Physics Research

- Experimental
- Collaborations
  - FAIR, Darmstadt
  - BESIII, Beijing





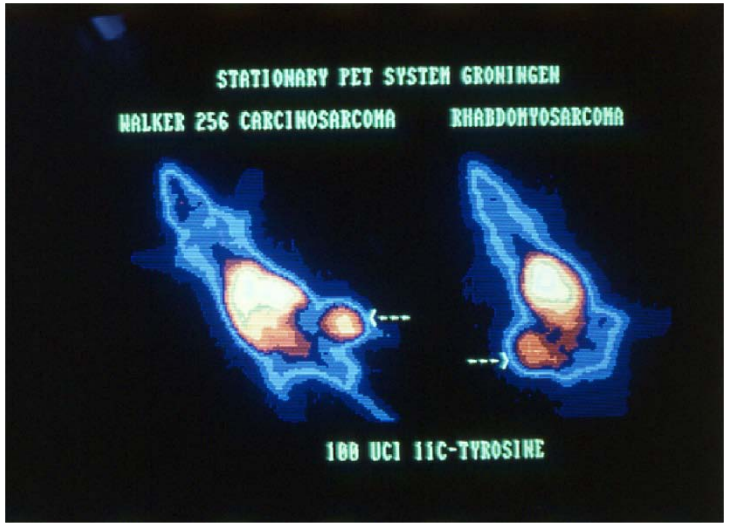
antiProton ANnihilations at DArmstadt (PANDA)
Holdingstructure for calorimeter endcap

Astroparticle Physics

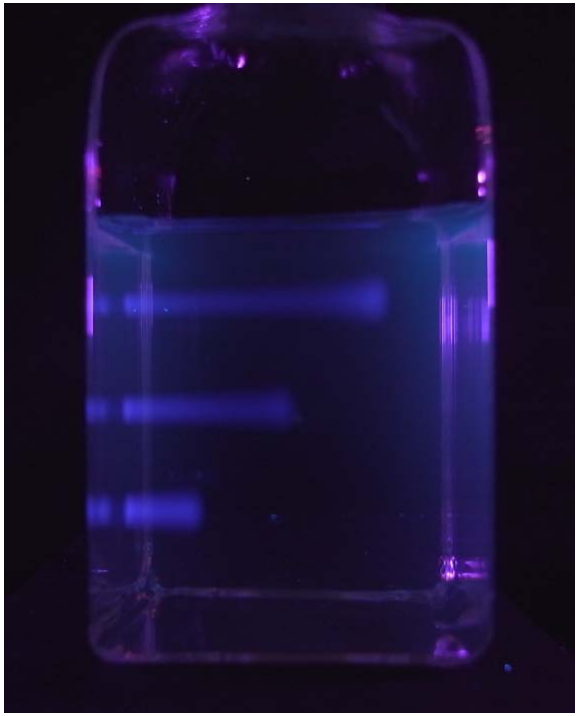
- Not accelerator based
- Theoretical and experimental research
- Radio detection of cosmic rays at Pierre Auger observatory, Argentina
- LOFAR
- KM3NET
- CTA

Science for Society

› Instrumentation development
› Accelerator and Ion Source research
› Biomedical Research
› Irradiations



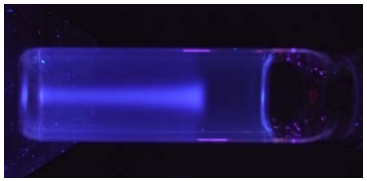
1988

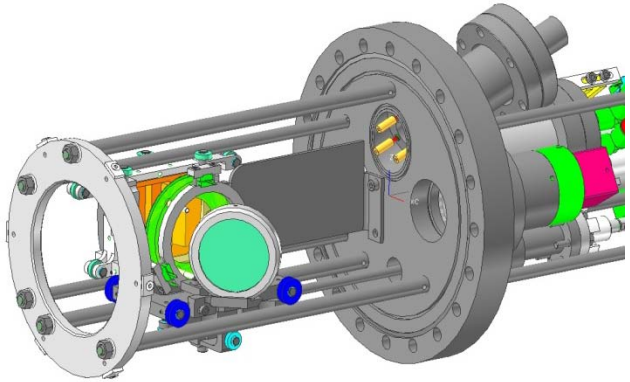


2013

Instrumentation Development

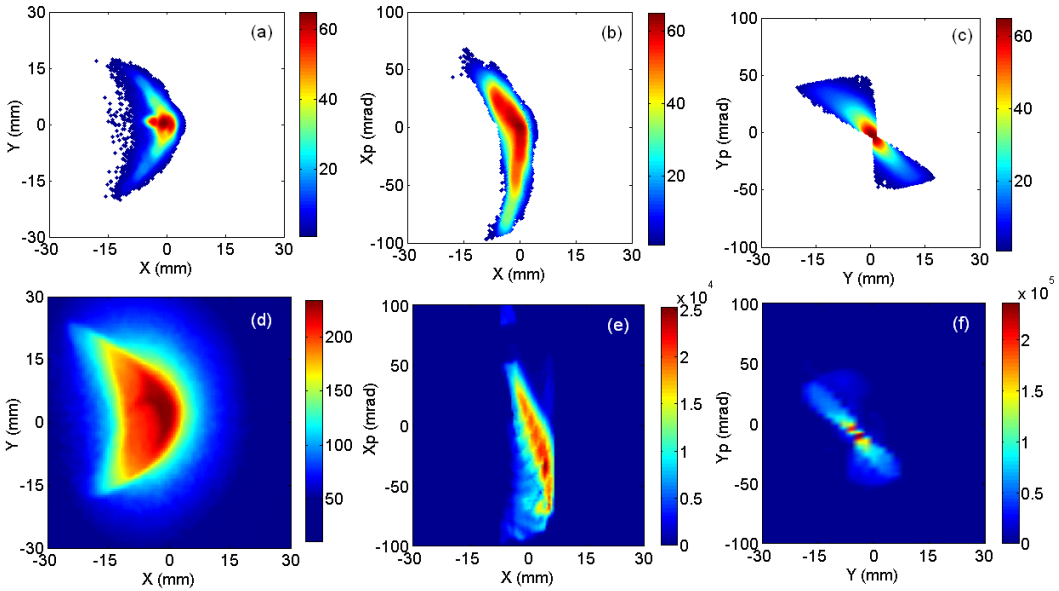
- Spin/off Medusa
- Collaborator INCAS3
- Diverse applications:
  - Road contruction
  - Agriculture
  - Nuclear Physics
  - Medical Physics

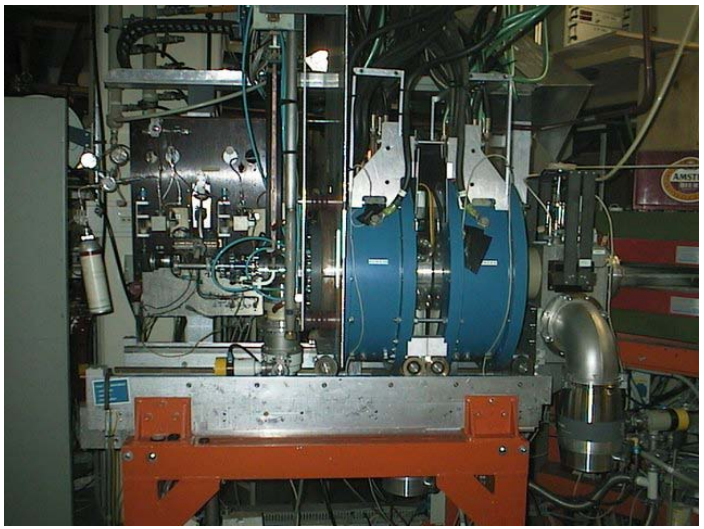




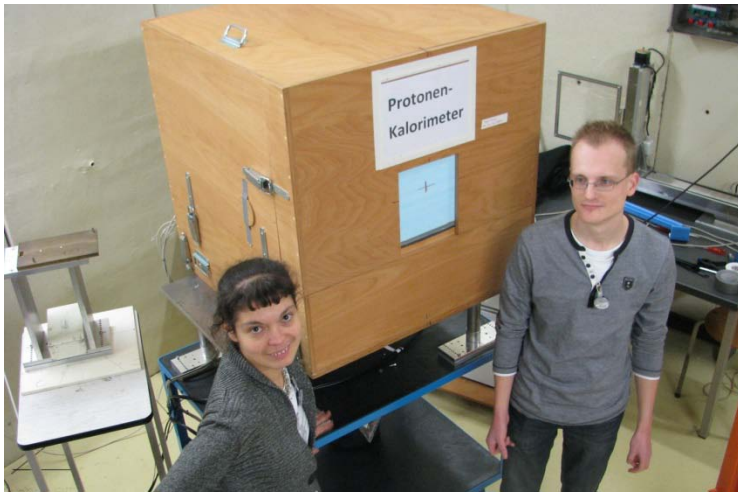
Accelerator and Ion Source Research

- Development of beams for acceleration
- Low energy beams for irradiation of plasmid-DNA
- Development of ion sources (AECR)
- Diagnostic tools (polarimeter, emittance meter)





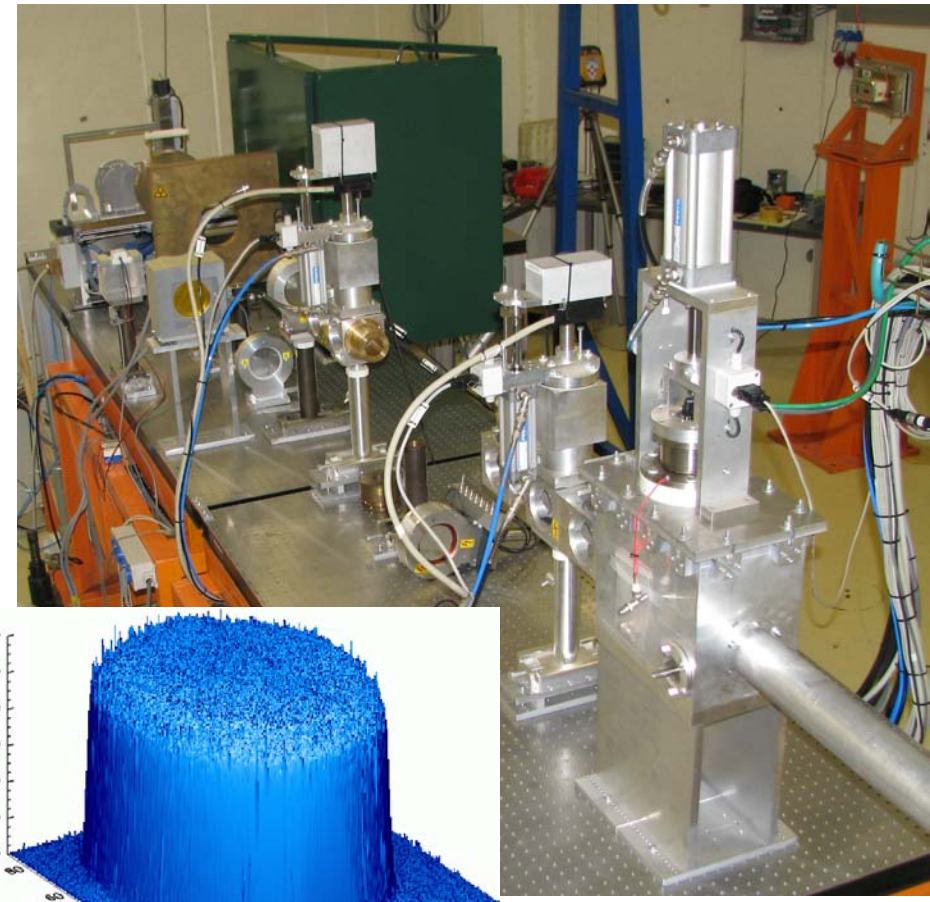
Biomedical Research



- DECT to stopping powers
- Water calorimetry
- Proton radiography
- Detector development
- In vivo dose delivery verification
- Technical know-how for UMCG-PT
- Cell irradiation with Carbon (with UMCG)

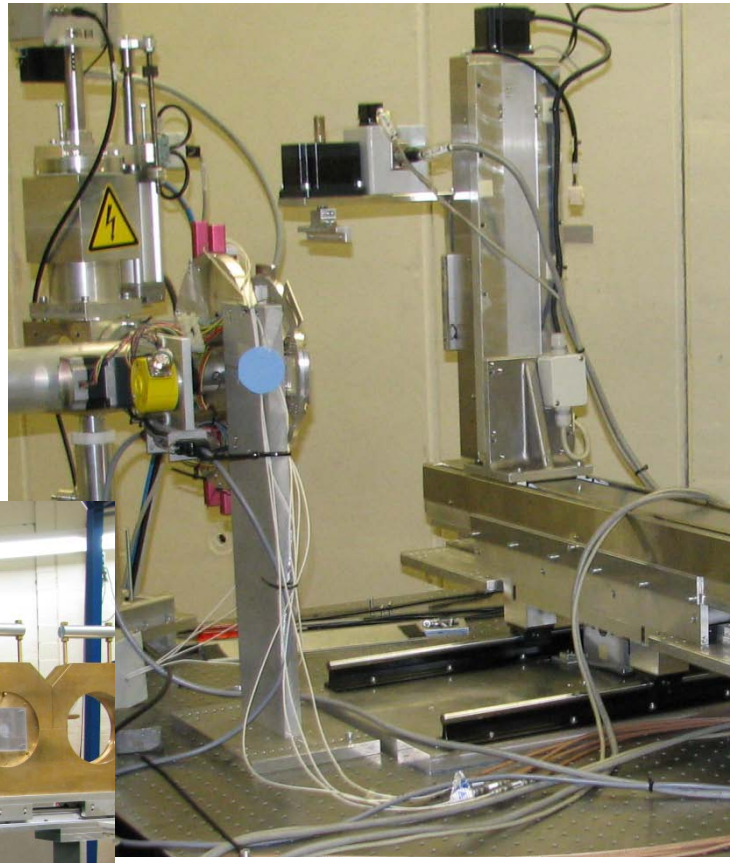
Light Ion Irradiations

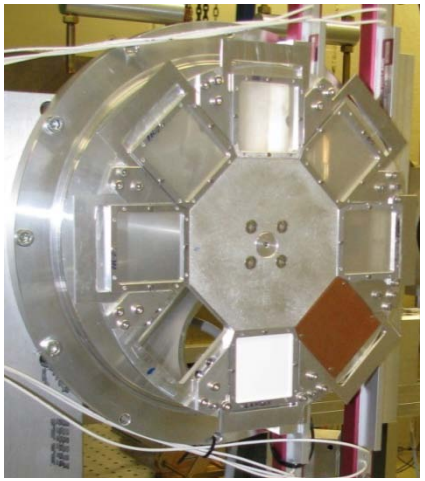
- Modular
- In Air
- Beams: 40 MeV/u to 190 MeV protons
- Flat fields (± 3%)
- Large fields (up to 14 cm ø)
- Flux up to 10^9 p/s
- Degrader



Heavy Ion Irradiations

- Irraddiation in Air
- Heavy Ion Cocktail @ 30 MeV/u
- xyzθ-motion
- field up to 3.5 cm ø





Collaborations

Summary

- AGOR Cyclotron is a versatile accelerator
- Many different applications being pursued
- Both Technical and Scientific expertise present at the lab is exploited
- Change of emphasis since 1-1-2014
- Continuing development in consultation with users

Thank you for your attention

Questions?