The Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences

www.ifj.edu.pl

Instytut kategorii A+

HR EXCELLENCE IN RESEARCH

World University Rankings 2023

Discover the world's top 2000 universities

CWUR

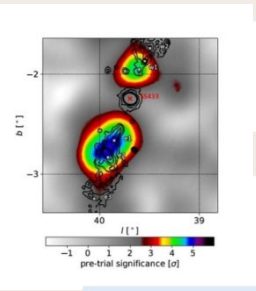
Place 670 (3.3%)

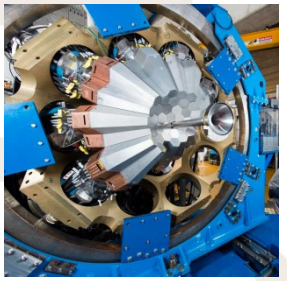
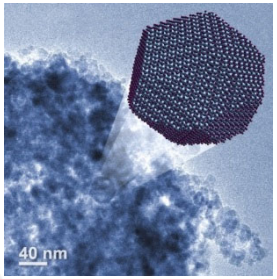
Prof. Tadeusz Lesiak

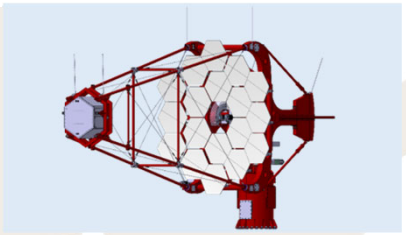
Director General

General Information about IFJ PAN

- **Personnel: 559; Prof. 31, Assoc. Prof. 60, Ph.D. 96, engineers & technicians 156**
- **Scientific Divisions:**
  - Division of Particle and Astroparticle Physics
  - Division of Nuclear Physics and Strong Interactions
  - Division of Condensed Matter Physics
  - Division of Theoretical Physics
  - Division of Interdisciplinary Research
  - Division of Applications of Physics
- **Researcher Departments:**
  - Cyclotron Centre Bronowice
  - Division of Scientific Equipment and Infrastructure Construction
  - Four accredited laboratories
- **Education:**
  - International Ph.D. Studies
  - Interdisciplinary Doctoral Studies
  - Kraków Interdisciplinary Doctoral School
- **Scientific output: > 650 publications annually**



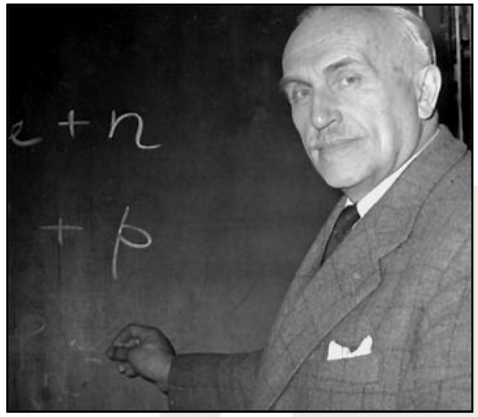







KISD
KRAKOWSKA INTERDYSCYPLINARNA SZKOŁA DOKTORSKA


Genesis and History

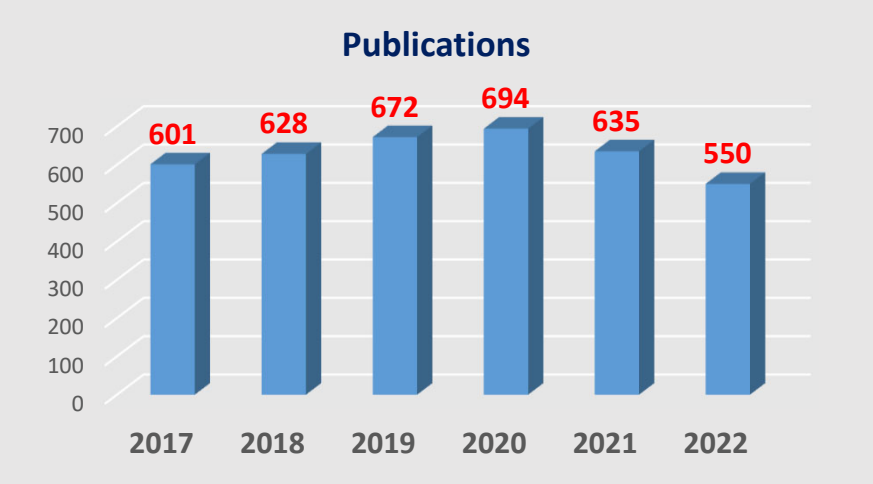


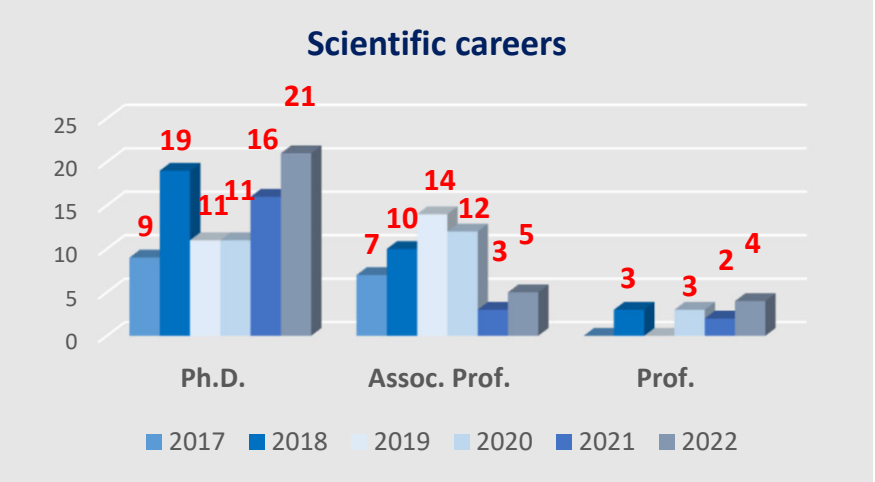
(Fot. Archiwum of the IFJ PAN)

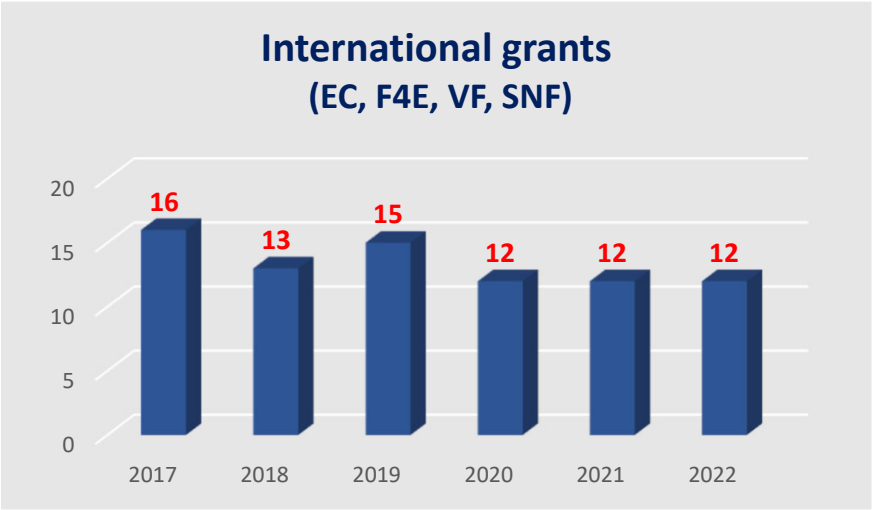
- **1955 – foundation of the IFJ – as a branch of the Institute of Nuclear Research – Prof. Henryk Niewodniczański (1900-1968)**

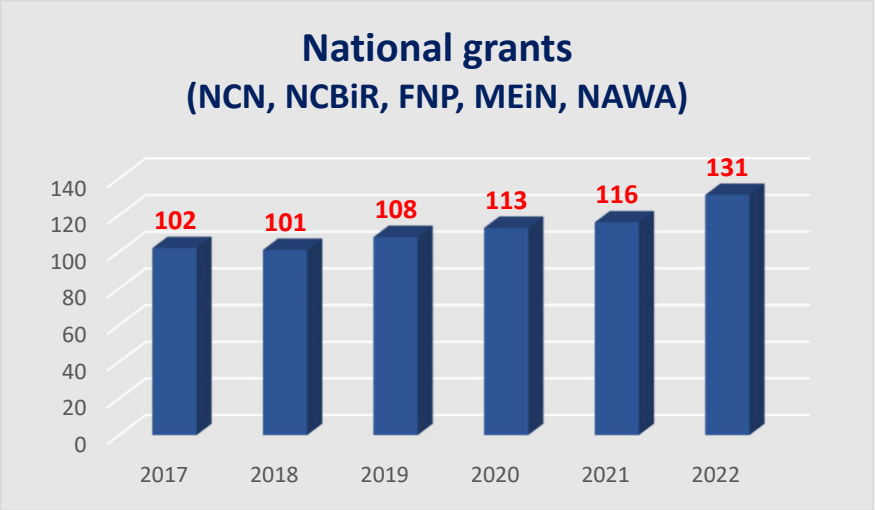
- **1960 – IFJ as a standalone unit**
- **1970 – Particle physics enters – Prof. Marian Mięsowicz (1907-1992)**
- **1988 – IFJ gets the name of its patron – Henryk Niewodniczański**
- **2003 – IFJ gets the status of a research institute of Polish Academy of Sciences**

Scientific Activity (2017-2022)









IFJ PAN on Polish Roadmap for Scientific Infrastructure

Projects coordinated by the IFJ PAN

1. CCB – Cyclotron Center Bronowice (development, next phase)
2. Centrum of Engineering of Cryogenic Materials
3. ESS - European Spallation Source
4. SPIRAL2
5. Research in particle physics at CERN

Projects with IFJ PAN as a partner, correlated with the national contribution to ESFRI:

1. **E-XFEL**
2. **ELI**
3. **CTA**
4. **FAIR**
5. **ESRF** – European Synchrotron Radiation Facility

Integration of European Accelerator Research Infrastructures

Participation of IFJ PAN in projects aimed at the Development of Innovation and Cooperation of European Technological Infrastructures for Accelerators and Magnets

TIARA – Test Infrastructure and Accelerator Research Area (2 years, 2011-2013)

In Poland, the project was carried out by a consortium of 7 scientific institutions: the Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences, the AGH University of Science and Technology, the Cracow University of Technology, the Andrzej Sołtan Institute of Nuclear Problems, the Warsaw University of Technology, the Lodz University of Technology, the Wrocław University of Technology.

AMICI – Accelerator and Magnet Infrastructure for Cooperation and Innovation (2017-2019)

In Poland, the project was carried out by the Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences

i.FAST – Innovation Fostering in Accelerator Science and Technology (2021-2025)

WP13 activities are carried out by the Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences

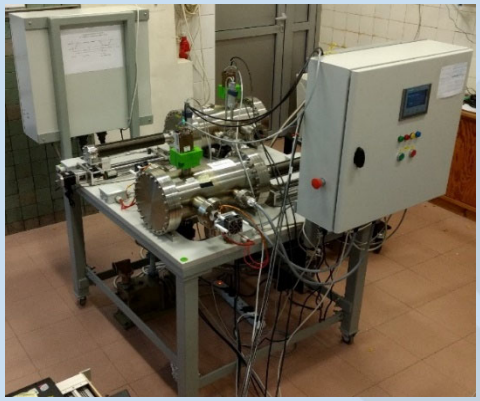
FuSuMaTech - Future Superconducting Magnet Technology (2017-2019, 2021-2025)

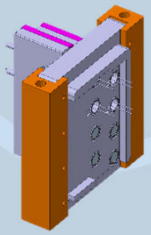
In Poland, the project is was carried out by the Henryk Niewodniczański Institute of Nuclear Physics of the Polish Academy of Sciences

Scientific & Engineering Activity

Tests for ITER

(feedthrough, diamod detectors)





Test stand built at the IFJ PAN

Installation of SIS100 (GSI)

Contribution to LHC

QC for interconnections of LHC magnets

Dedicated measuring apparatus built at the IFJ PAN

Surface Scintillator Detector (SSD) for Pierre Auger

Batch of 15 SSDs ready to ship to Argentina

Local infrastructure: test stand for s.c. materials

Under commissioning

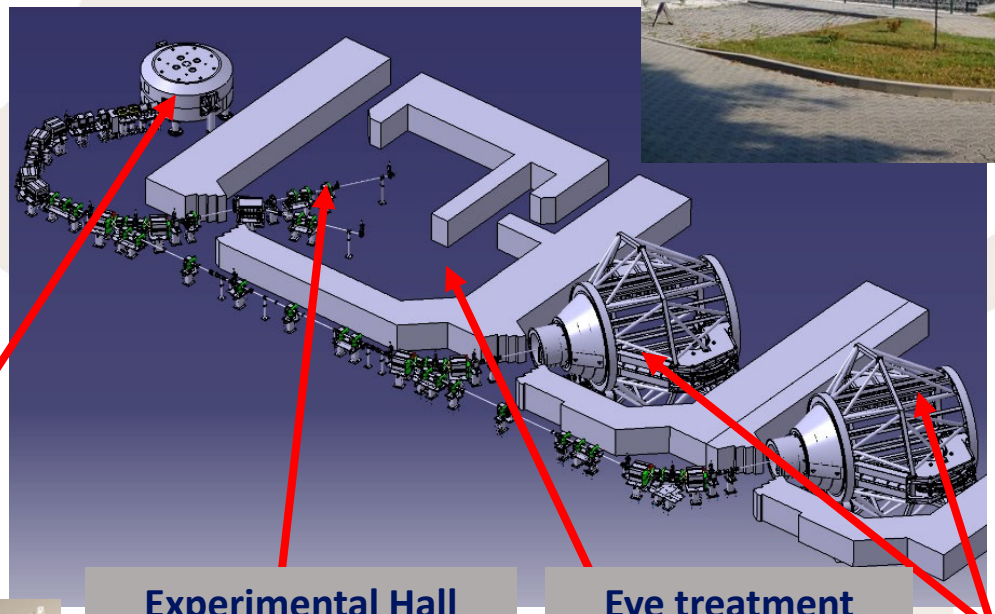
Cyclotron Centre Bronowice (CCB)

Construction 2010-2015;
the 1st patient: Oct. 2016

Start of operation : 2005-2010
Treatment of first patient with eye melanoma

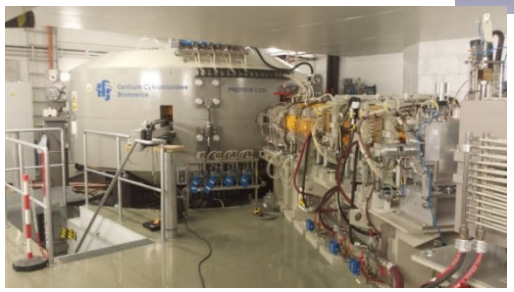
- **1065** patients finished irradiation in gantries
- **355** occular patients with eye melanoma

(by the end of 2023)



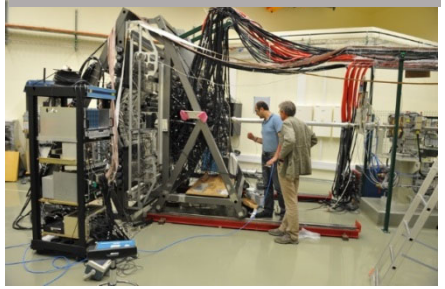
Staff: about 50 people

Proteus-235 cyclotron IBA



70-230 MeV, I_{beam} = 1-500 nA

Experimental Hall



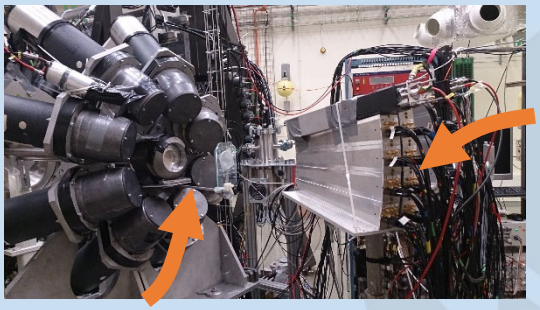
Eye treatment

Two dedicated scanning gantries

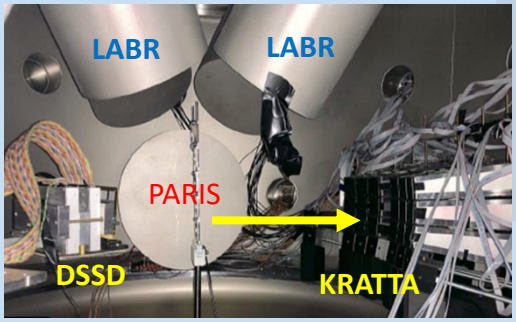
Fundamental Research at the Cyclotron Center Bronowice

Proton beam (230 MeV) from the Proteus-235 Cyclotron at the Cyclotron Centre Bronowice

Studies of resonance excitations of nuclei

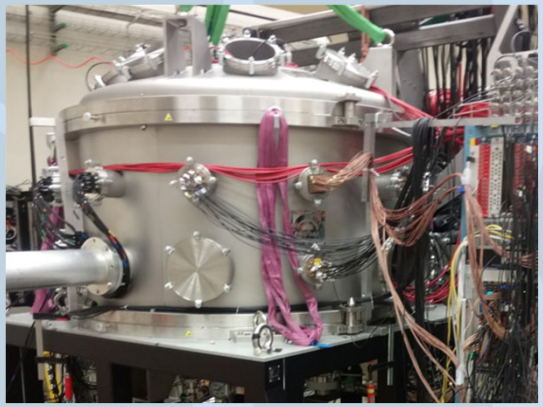


detector HECTOR
Measurements of gammas)



Detectors inside the scattering chamber

Detector KRATTA
Measurement of proton's inelastic scattering

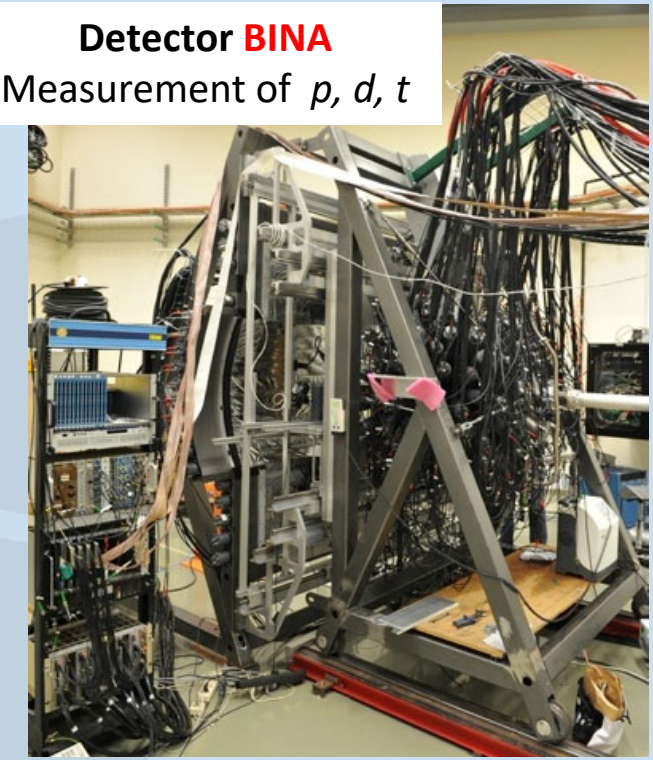


„Big" scattering chamber

PARIS and LaBr3
high-energy γ-ray array

Studies of triple nucleon dynamics

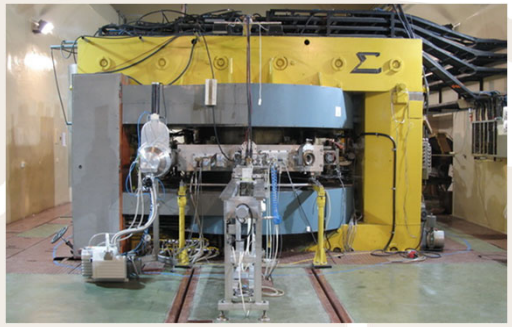
Detector BINA
Measurement of *p, d, t*



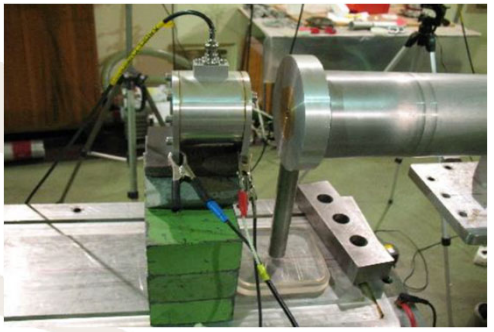
Applied research at the AIC-144 60 MeV proton cyclotron

Eye line for precise irradiation
- dose rate: 0.001 – 1 Gy/min
- beam field size: ≤ 40 mm;
- Typical flux: 10e8 – 10e9 p/cm2·s;

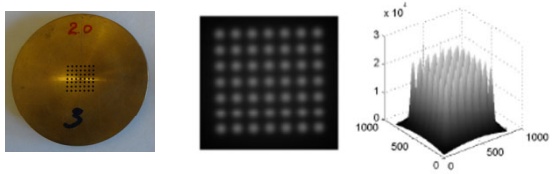
Line for isotope production
- proton current: < 100nA;



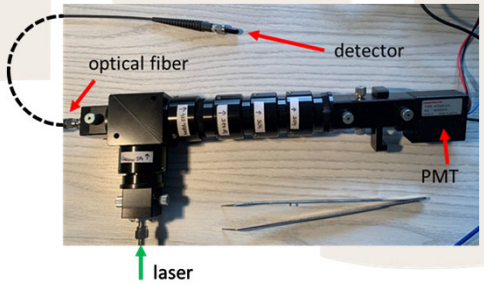
AIC-144 Cyclotron
- energy 60 MeV; RF 26,26 MHz;
- beam current 80 nA



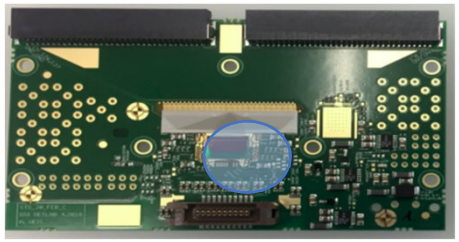
Experimental room: high beam intensity
- proton current: 2nA – 100nA;
- Dose rate up to 50 Gy/s
- irradiation field d < 12 cm;



Proton grid therapy – to reduce side effect sof treatment



Testing of detectors and dosimeters



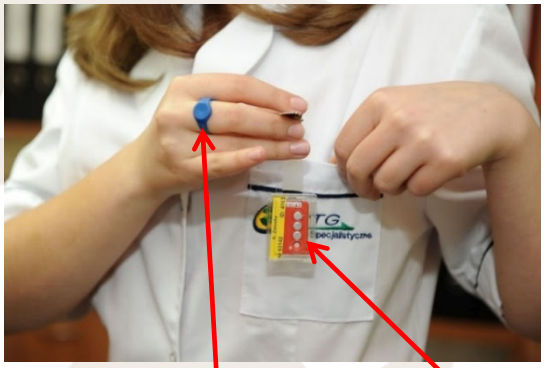
Testing of electronics for space flights

Staff: 10 people

Accredited Laboratories

Laboratory of Individual and Environmental Dosimetry (LADIS)

- Measurements of individual and environmental doses by thermoluminesce method
- 210 000 measurements annually
- 11 000 institutions in Poland and Europe
- 50 000 radiation workers/measurement points under dosimetric supervision
- 730 installations of Roentgen radiography under supervision
- Work in progress: implementation of the 1st in Poland Optically Stimulated Luminescence (OSL) system, based on BeO detectors



For measurements on 3 mm depth in tissue (for eye-lens) Hp(3) w mSv

0,07mm skin dosimetry Hp(0,07) w mSv

10 mm depth for the whole body dosimetry of deep organs Hp(10) w mSv

Laboratory of Calibration of Radiation Protection Instruments

Laboratory of Radiometric Expertise

Laboratory of Radioactivity Analyses

Underground Low Radiation Background Laboratory

application for funds

Accredited Laboratories

Laboratory of Radiometric Expertise

- 695 measurements and expert opinions for external customers (materials, terrains, buildings, soil, water etc, …)
- Calibrations of radon detectors
- Lectures and courses
- Designs of radon protection systems for buildings
- Mobile radiometric laboratory (van)

Laboratory of Radioactivity Analyses

- Laboratory is an important ingredient of the national network of radioactive contamination monitoring
- Member of the expert network "ALMERA" (Analytical Laboratories for the Measurement of Environmental Radioactivity, IAEA)
- < 100/yr commercial measurements of concentration of ^{40}K, ^{228}Th, ^{226}Ra, $^{238, 239+240}Pu$, $^{134,137}Cs$, ^{99}Tc, ^{131}I, ….
- Full-body counter (one of the two counters in Poland)

Underground Low Radiation Background Laboratory

- Two sites – salt mines in Wieliczka and Bochnia
- Depth of 200-300 m
- Calibration of dosimetric equipment, low-level measurements of radioactivity

application for funds

Readiness for Nuclear Power in Poland

- **IFJ PAN – wide expertise in radiological protection, based on home-made technologies**

- **Close collaboration with other players in this field – initiative of the Polish Consortium of Radiological Protection**

- **Working contacts with the Ministry of Climate and Environment, ORLEN, KGHM etc.**

Scientific & Engineering Experience

Major partners in the world