Narodowe Centrum Badań i Rozwoju

WPT
WROCŁAWSKI PARK TECHNOLOGICZNY

Industrial LINAC at NDT laboratory

Applications for qualification tests

Progress on spectroscopy and imaging III

Polish Academy of Sciences, Wroclaw, 19-21th November 2019 ,

Jacek Glowinkowski & Piotr Wilk

Prezentacja promująca Projekt
Modularne Detektory GEM (MGEM)
Nr POIR.04.01.02-00-0080/17

Projekt współfinansowany przez Narodowe Centrum Badań i Rozwoju wybrany w ramach programu Program Operacyjny Inteligentny Rozwój w Konkursie nr 1 - 4.1.2/2017_RANB.

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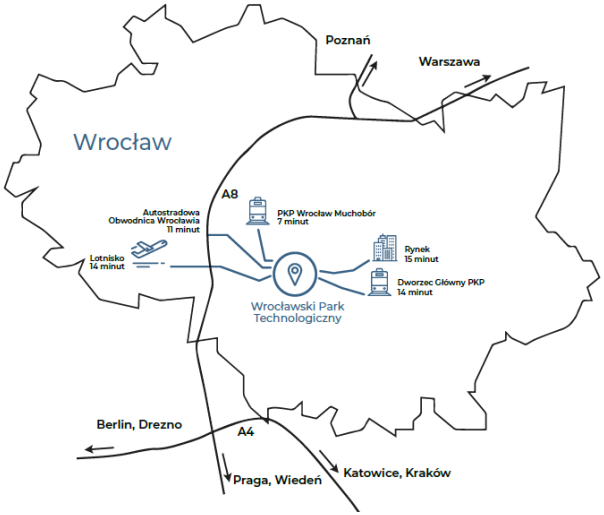
WROCLAW TECHNOLOGY PARK

Wroclaw Technology Park

- **20 years** of experience in R&D services for business
- **supplier** of the high-tech cryogenic equipment for the European Big Science Projects: **XFEL** (DESY Hamburg), **FAIR** (GSI Darmstadt)
- **10 buildings in 3 groups, 70 600 m²** office/labs and production space
- over **220** innovative enterprises, mainly **SMEs with 1600 persons** employed
- **12 laboratories R&D** with the hi-tech equipment
- **84 spin-off's** and **spin-out's** incubated in
- **116 000 m²** of **Investment Areas/ 60** children in the kindergarden



Labs & Prototyping Workshops

Non-Destructive Testing Laboratory

Material Properties Laboratory

Digitalization Transmission Storage Data Laboratory

Cryogenics &Gas Technologies Laboratory

Mechanical Laboratory &Prototype Workshop

Hosting, Collocation & Modelling Centre

Biotechnology Laboratory &Prototype Workshop

Power Engineering Laboratory

Chemical Scaling Laboratory

Bioengineering Laboratory & Prototype Workshop

Electronics, Mechatronic & Spintronics Laboratory

Food Technology Line NUTRIBIOMED

Optics, Photonics &Metrology Laboratory

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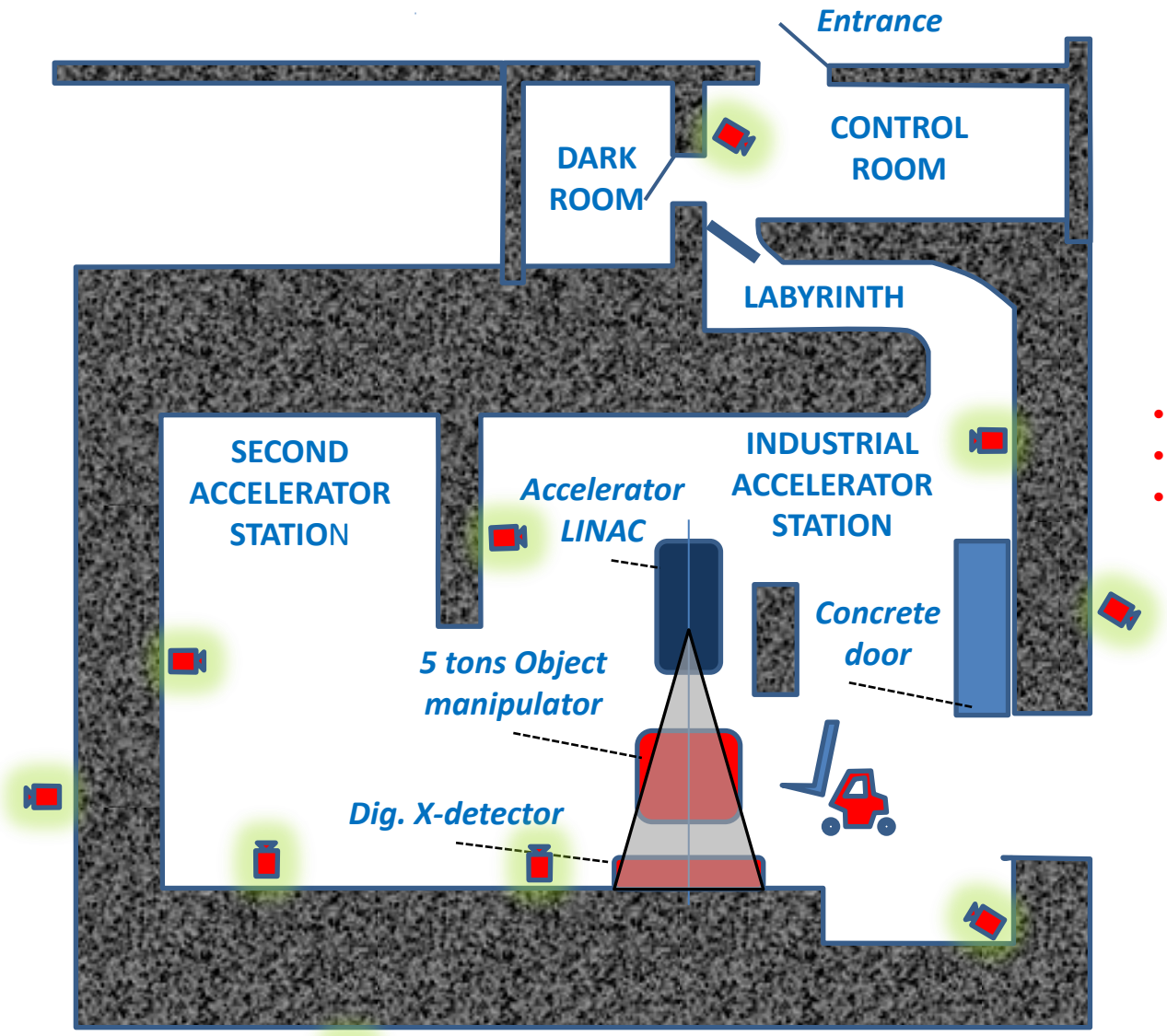
Non-Destructive Testing Laboratory

in underground bunker of the LAMBDA building

Accelerator Workshop of NDT Lab

in Bunker (radiation shelter)



SAFETY SYSTEMS:

- *CCTV monitoring*
- *Voice contact system*
- *Door safety switches*

TRANSPORTATION:

- *Gantry crane*
- *Fork-lift truck*

Industrial accelerator station (manipulators)

Accelerator (2 axes)

Vertical: Z = 1,5 m

Tilting: α: ±22,5°

Object (3 axes)

Horizontal: X,Y = 1 m

Rotating: 360 °Load: 5t

Detector (2 axes)

Vertical: Z = 1,5 m

Horizontal: X = 0,6 m

Mfd. by National Centre for Nuclear Research – Świerk, Poland

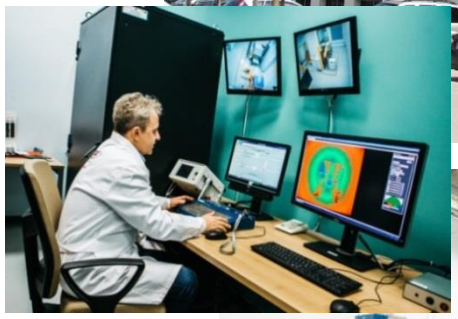
Accelerator Workshop of NDT Lab

LINAC's Parameters (radiation source)

Beam energy	9 MeV (e) , 9 lub 6 MV (X)
Dose rate max	3 000 Gy/min (e) , 150 Gy/min (X)
Image detector	50x60cm, 18Mp, 65536 (X)
Irradiation field	Ø7cm (e) , Ø50cm at 1m distance (X)

R&D services

- **Radiation resistance testing**
  Tests of reliability of devices & materials (spec. electronics) for work in exposure to high-energy radiation - reliability of operation, destruction. Simulation of Space radiation.



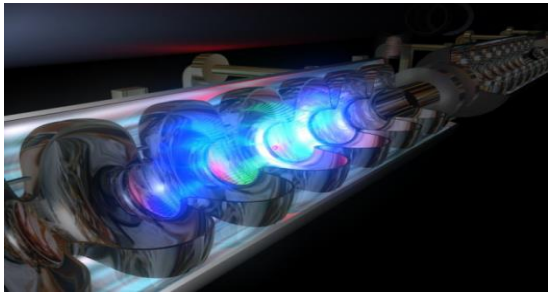
- **Materials properties changes tests**
  Investigations of changes in material properties (spec. polymers and plastics) due to the interaction of high-energy electron beam or X-ray photons.

- **Radiographic tests**
  X-Ray imaging of the internal structure & construction of non-transparent objects i.e. castings, bridges spans, thick welds, finished & assembled equipment
  (*up to 500mm steel thickness*).

Radiation resistance testing

Resistance, reliabity and destruction tests of equipment for:

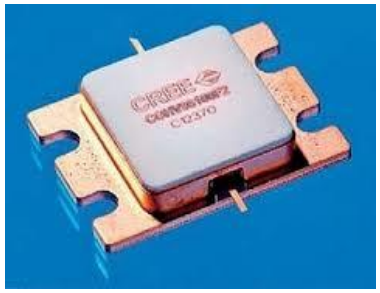
Big-Science Labs (materials, electronics , small equipment),
Space industry (materials, electronics , element of satellites)
Civil nuclear power plants (materials, electronics, robots)
Military (materials, electronics, robots, drones)



Material properties changes

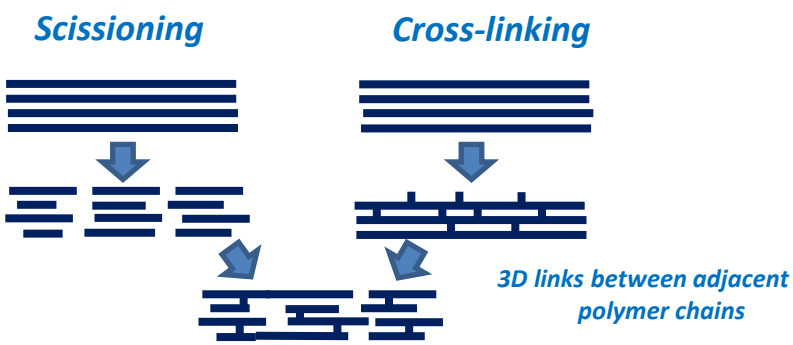
Electronics

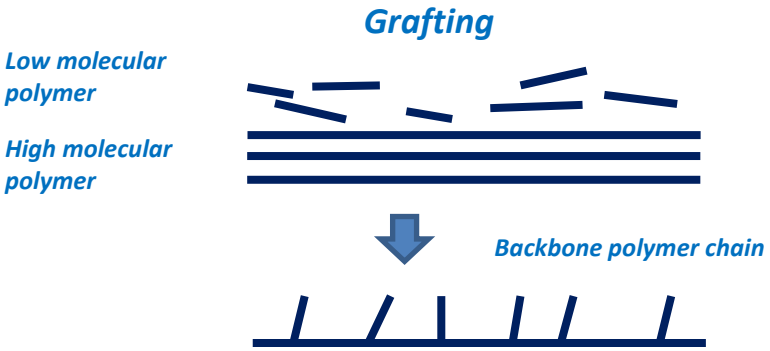
Semiconductors after being irradiated with electron beam improve their **switching speed up 10x**



Plastics & Polymers

Radiation can influnce **the structure of polymers**





Material properties changes (examples)

Heat-shrinkable tubes and foils

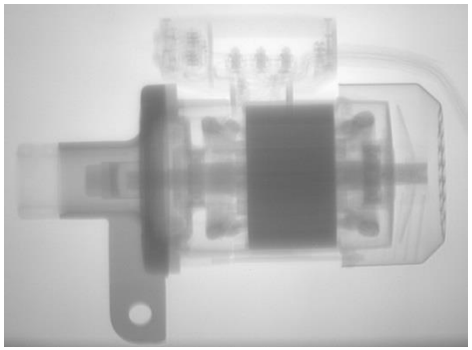
Insulation jacketing (wires)

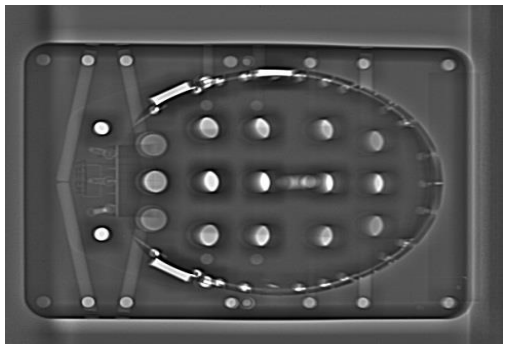
Higher resistance to fire and short circuit
Higher chemical resistance
Higher tensile strength

Curring of elastomers, coatings or inks

Radiography

Imaging technique that uses X-rays to view the internal structure & construction of non-transparent object of varying density.





Thank you for your attention !!!