



LIETUVOS SVEIKATOS MOKSLŲ  
UNIVERSITETO LIGONINĖ  
KAUNO  
KLINIKOS



LIETUVOS SVEIKATOS  
MOKSLŲ UNIVERSITETAS

ktu

1922

kauno  
technologijos  
universitetas

# Nuclear Medicine Research Center

Cyclotron  
infrastructure project



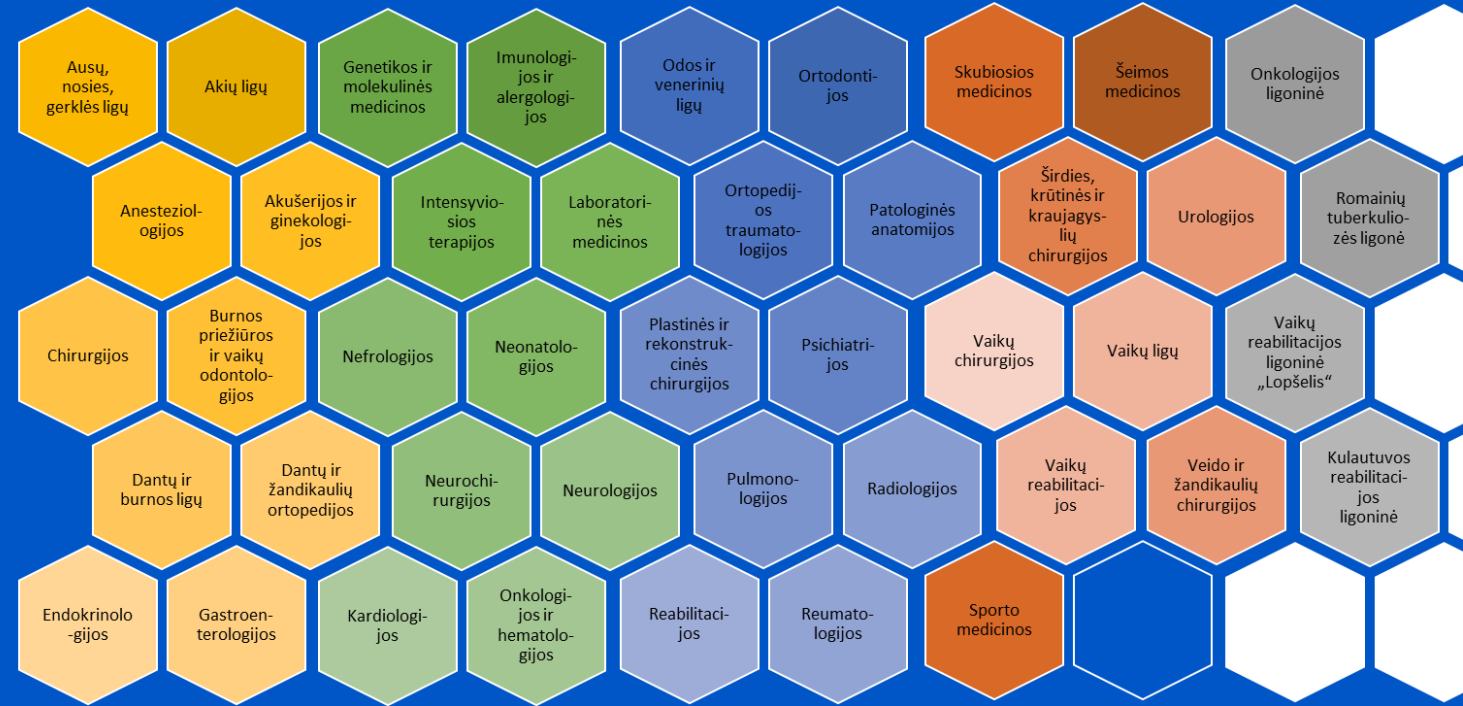
# KAUNO KLINIKOS STRUCTURE



39 profile clinics with 103 departments

4 affiliated hospitals

Other medical departments and centers (Tissue Bank, Blood Center, Coordinating Center for Rare and Undiagnosed Diseases, Fetal Medicine Center, Mother's Milk Bank, Reproductive Medicine Center, Gamma Knife Center, Telemedicine Center)



# STRATEGIC DEVELOPMENT DIRECTIONS

1. Priority areas of health care:
  - Reducing morbidity and mortality from cardiovascular diseases;
  - Reducing morbidity and mortality from cerebrovascular diseases;
  - Ensuring the prevention, diagnosis and treatment of oncological diseases;
  - Reducing injuries and mortality from external causes;
  - Strengthening the health of mothers and children, disease prevention and effective treatment;
2. Promotion of cooperation with university and regional hospitals and other health care institutions
3. Development of modern diagnostics and therapy, minimally invasive surgery and transplantology
4. Development of support for patients with rare diseases
5. Active participation of representatives of Kaunas clinics in shaping the Lithuanian health system that meets modern public expectations

# KAUNO KLINIKOS IN NUMBERS

7368 employees:

- 2205 doctors
- 2399 nurses
- 1468 supporting medical staff



Outpatient services – 1 323 951

Inpatient beds 2 213

Inpatient services 91 071





## LSMU PROFILE

Academic  
staff  
1272

Research  
staff  
264

Members of  
the Academy  
of Science of  
Lithuania  
10

Emeritus  
11

Students  
7709

First, second cycles and  
integrated studies  
6375

PhD students  
243

Residency students  
1091

- Public University providing education since **1922**
- **Largest** University of biomedical sciences in Lithuania
- **Top** selected programs at national level attracting high scored students
- **Quality** assurance complies with **EU standards** for universities
- **International** membership and expertise
- **WHO** Collaborating Centre for Education and Practice
- **Integration:** mixed groups, exchange activities, involvement in different projects, international teachers

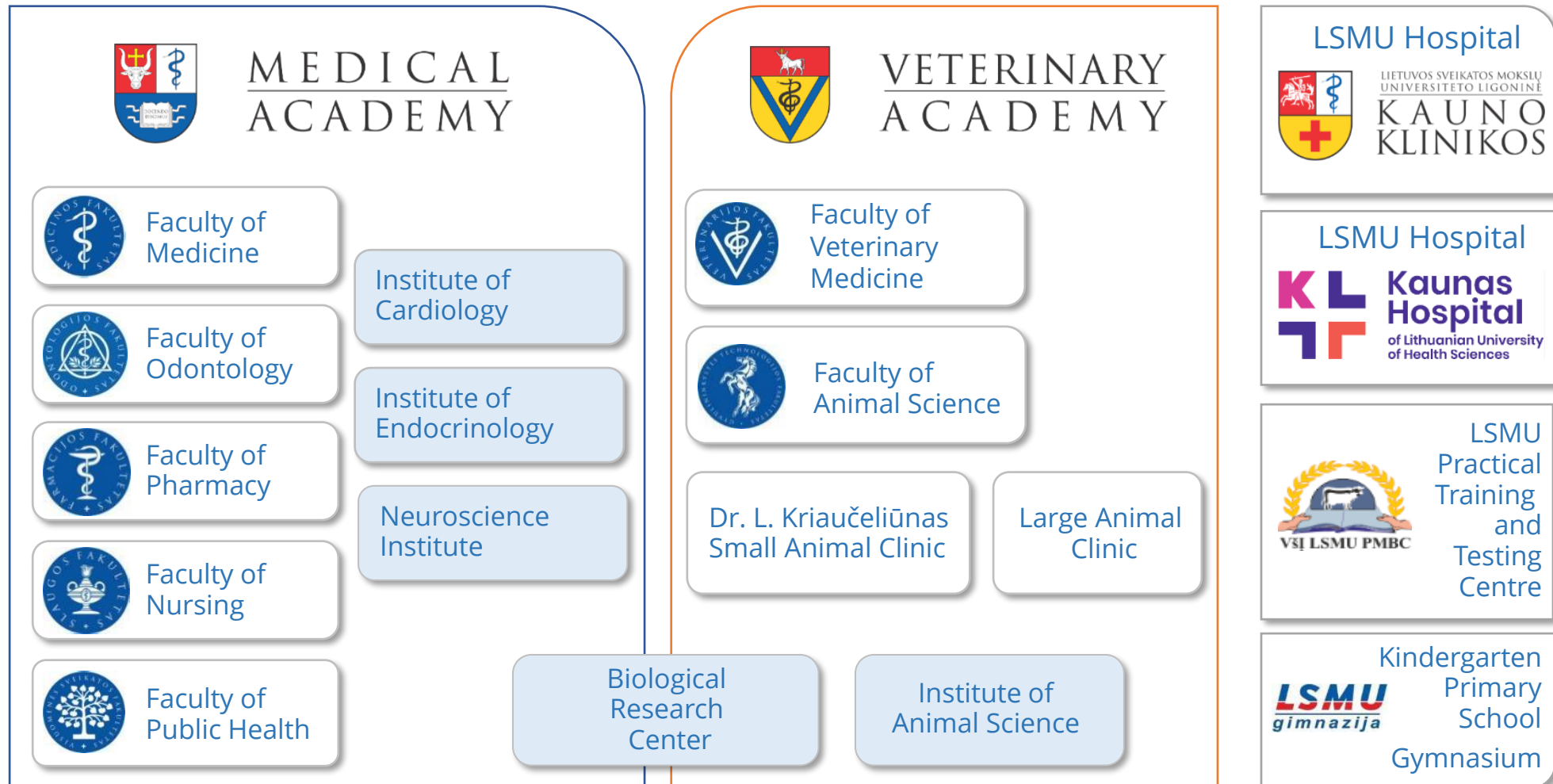


# LSMU STRUCTURE



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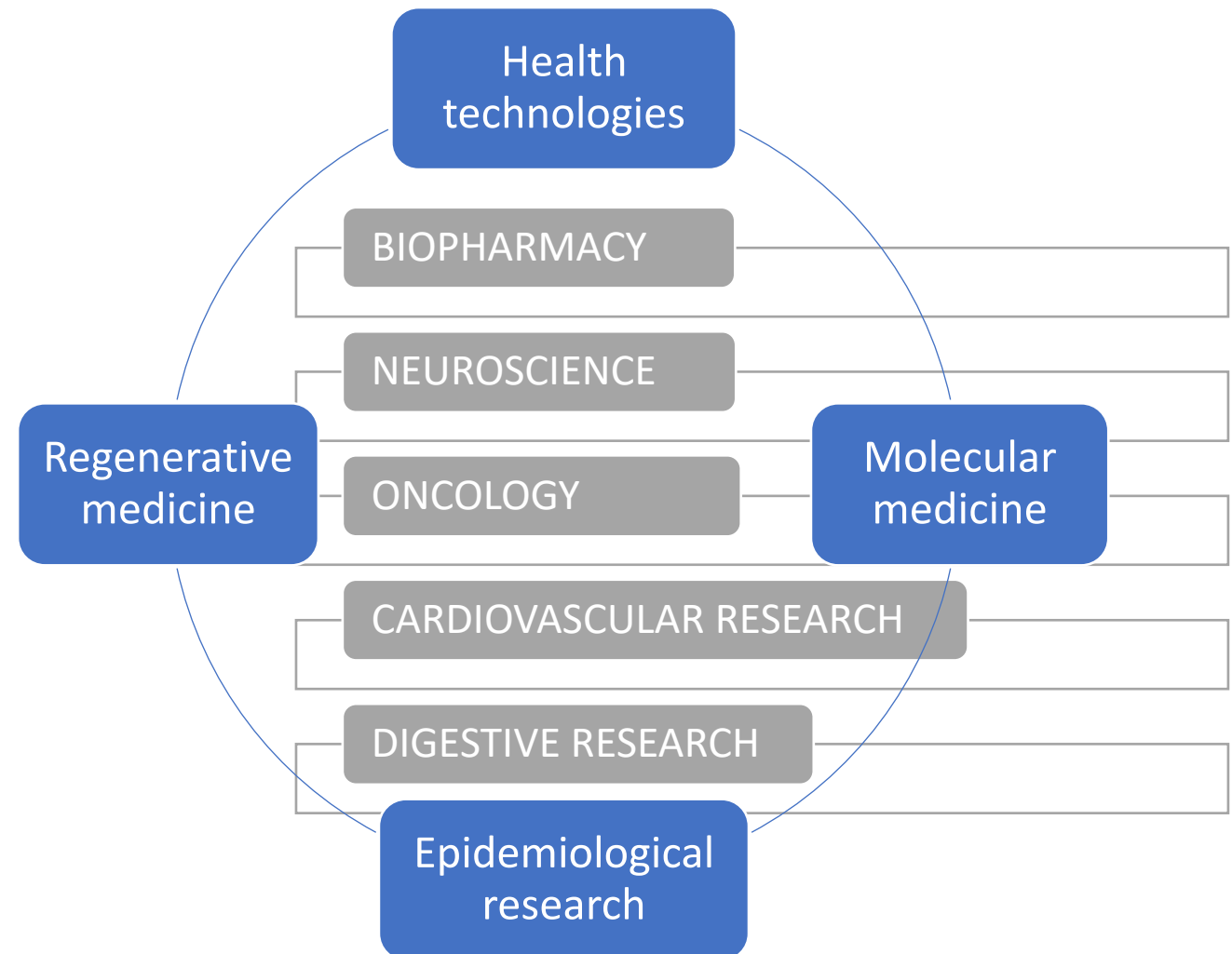
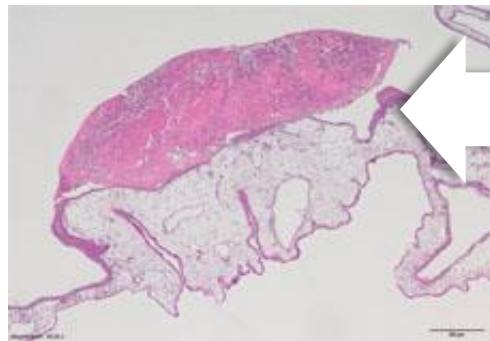
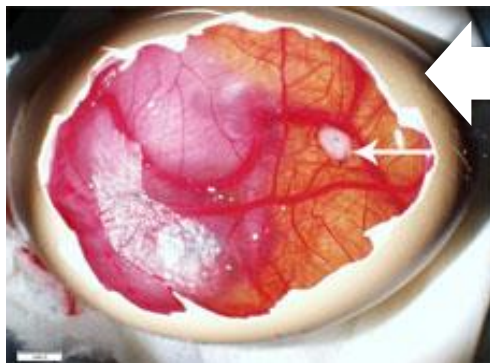
2 Academies, 7 Faculties, 4 Research Institutes,  
20 Academic Departments, 47 Clinical Departments and 9 Institutes at the Faculties



# STRATEGIC RESEARCH AREAS OF BIOMEDICAL SCIENCES 2017-2023



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# Cyclotron infrastructure founding at LSMUL KK



- 2010 – the need for cyclotron infrastructure
- 2012 – the first positron emission tomograph in LSMUL Kauno klinikos
- 2014 – the second positron emission tomograph in VUL Santaros klinikos
- .... Coordination with the government of the Republic of Lithuania, the EU Comision, ...
- 2019 – Cyclotron project in Lithuania is approved
- 2020 – the contract for the purchase of the cyclotron was signed
- 2021 – a contract for the purchase of laboratory equipment was signed
- 2022 – end of cyclotron infrastructure design, start of construction work...



# INFRASTRUCTURE PROJECTS

## Nuclear medicine research center

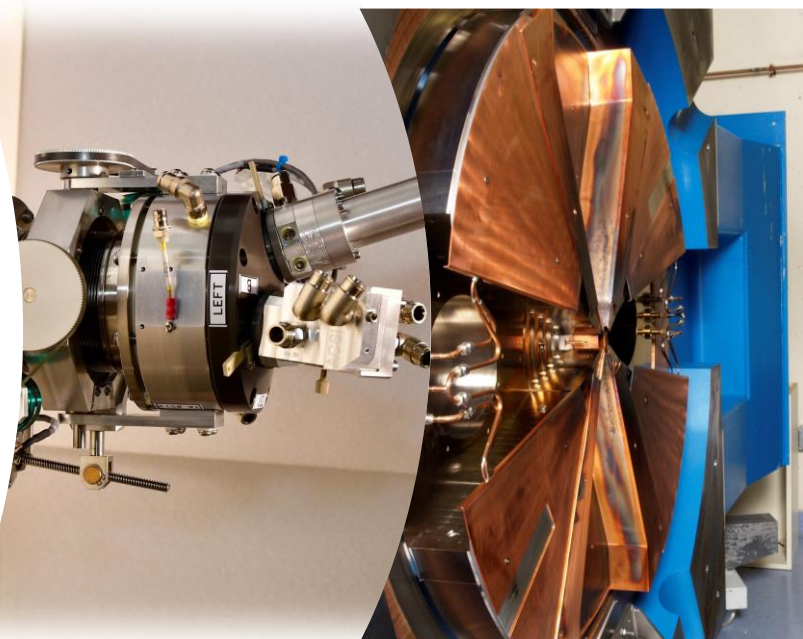


- Production of radioisotopes and radiopharmaceuticals
- Clinical PET/CT imaging
- Clinical and preclinical research activities
- Preclinical PET/MRI imaging

# CYCLOTRON INFRASTRUCTURE PROJECT

## Cyclotron

- Variable energy negative ion cyclotron (14 – 19 MeV)
- Possibility to irradiate 2 channels at the same time
- Irradiated targets - liquid, gaseous, solid

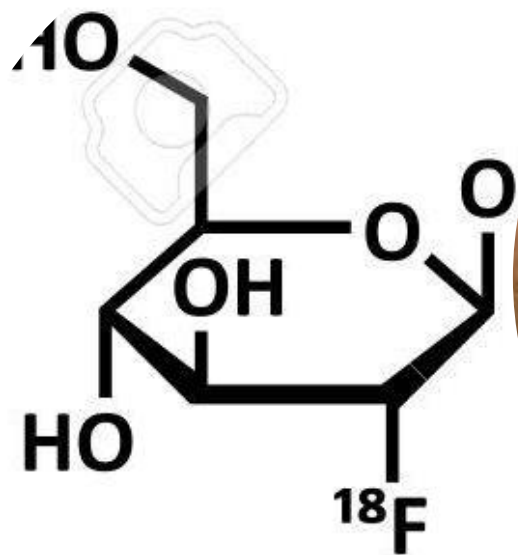
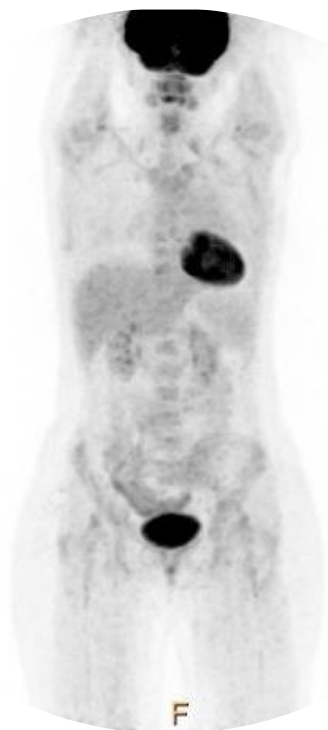


## GMP laboratory

- 5 Isolators with synthesis units for production of radiopharmaceutical – F18, Ga68, N13, C11
- O15 radiowater generator
- Quality control laboratory

Scientific laboratory

# PRODUCTION of PET/CT RADIOPHARMACEUTICALS





# PRODUCTION of other PET/CT RADIOPHARMACEUTICALS

Radionuclide	Radiopharmaceutical	Usage
F-18	F18-FDG	Swiss knife in oncology + cardiology + neurology

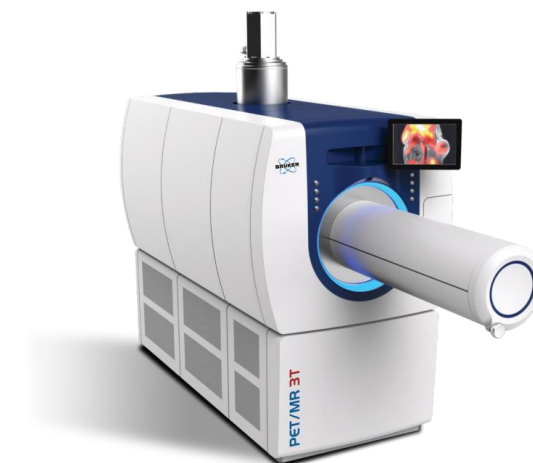
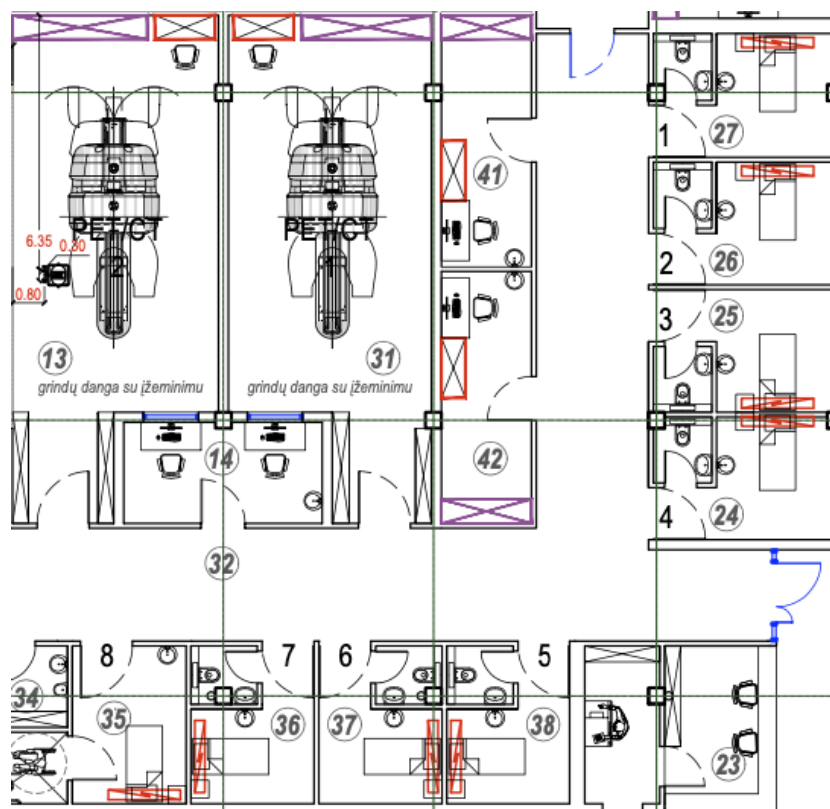
Radionuclide	Radiopharmaceutical	Usage
F-18	F18-Na	
F-18	F18-choline	
F-18	F18-DOPA and it's variations	
F-18	F18-Flutemetamol, F18-Florbetapir	
F-18	F18-FLT	
F-18	F18-FET	
F-18	F18-Estradiol	
F-18	F18-MISO or F18-FAZA	
Other		



Radionuclide	Radiopharmaceuticals	Usage
O-15	O15-H2O	Myocardial perfusion
I-123 (SPECT)	I123-Na	Thyroid cancer
I-123 (SPECT)	I123-MIBG	NET
I-124	Various imonulogic compounds	
Cu-64	Various compounds	Genetic disorders, Tumors
In-111, Ga-67, Tl-201	SPECT nuclides	

# CYCLOTRON INFRASTRUCTURE PROJECT

## Clinical PET/CT imaging



## Prie clinical PET/MRI imaging

# CYCLOTRON INFRASTRUCTURE PROJECT FUTURE OPERATIONS



## Synthesis process

- $^{18}\text{F}$
- $^{68}\text{Ga}$
- $^{11}\text{C}$
- $\text{NH}_3$
- $^{15}\text{O}$

## Laboratory process

- HPLC
- MCA
- Radio-TLC
- GC
- pH
- Endotoxins

## Operations

- Monitoring
- Dosimetry

## Documentation

- Laboratory information system
- Batch records
- SOP's
- Inventory
- Procurement



# CYCLOTRON INFRASTRUCTURE PROJECT

## FUTURE OPERATIONS

We have:

- Well established Nuclear medicine research centre
- Motivated and progressive team working with innovative nuclear medicine equipment, dedicated for clinical work, and seeking for a scientific breakthrough in nuclear medicine area
- The accessibility of learning cyclotron infrastructure operations at advanced foreign centres for the cyclotron infrastructure team
- Onsite training

Future operations:

- Preparation of cyclotron work documentation for regulatory compliance - aspects of radiation protection
- Preparation of GMP documentation: procedures, specifications, processes, standard operating procedures (SOPs), etc.
- Advanced training/site visits for the cyclotron infrastructure team
- Active cooperation with progressive foreign institutions for clinical and research activities