



**Institute of Nuclear Physics**

National Nuclear Centre  
Republic of Kazakhstan

– conversion of science to innovations

**International Innovative Nanotechnology Centre Establishment Forum**

**Dubna, 1-2 July, 2009**



# Institute of Nuclear Physics

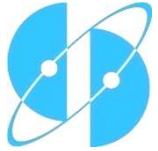
National Nuclear Centre  
Republic of Kazakhstan

**Institute of Nuclear Physics in Almaty,  
Kazakhstan, was established  
in 1957 and incorporated into National  
Nuclear Centre in 1992**

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## BASIC FACILITIES



**Research Nuclear Reactor WWR-K**



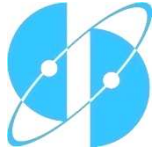
**Isochronous Cyclotron U-150M**



**Heavy Ion Accelerator UKP-2-1**



**Electron Accelerator ELV-4**



# **Institute of Nuclear Physics:** Primary Research Areas

**Nuclear Physics**

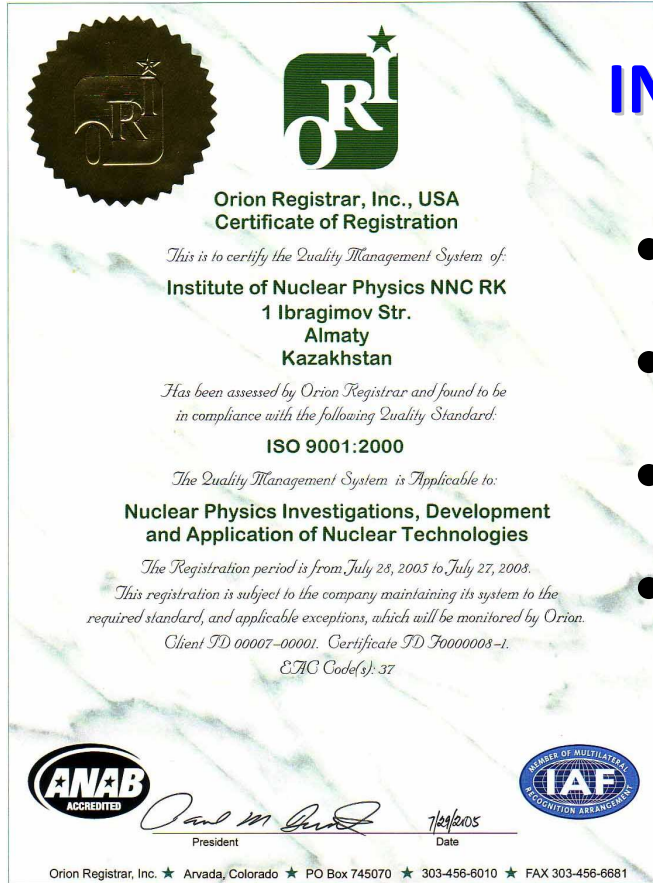
**Radiation  
Solid State Physics**

**Applied Nuclear  
Physics**

**Accelerator  
Technologies**

**Reactor  
Investigations**





## INP ACTIVITIES

- Basic research
- Applied research
- Services
- Production





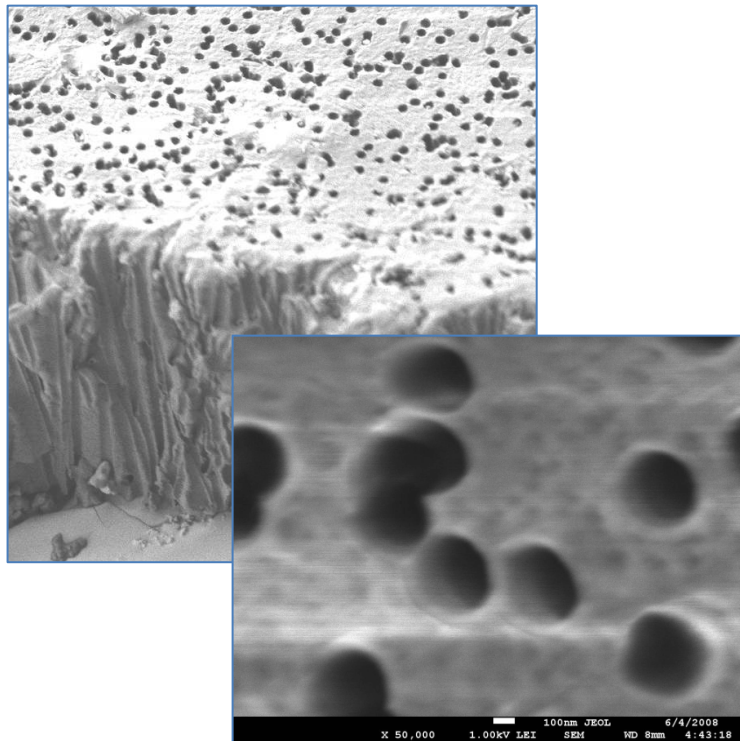
## PRODUCTION OF NUCLEAR TRACK MEMBRANES AT DC-60 HEAVY ION CYCLOTRON (Astana)

2009 – 2 000 m<sup>2</sup>

2010 – 20 000 m<sup>2</sup>

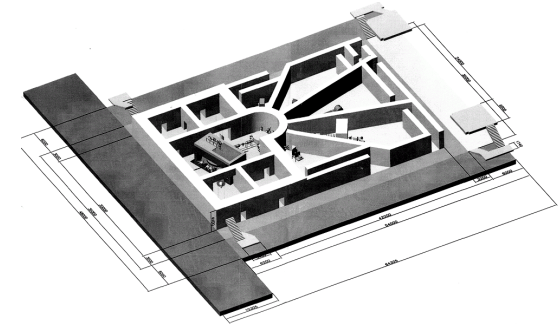
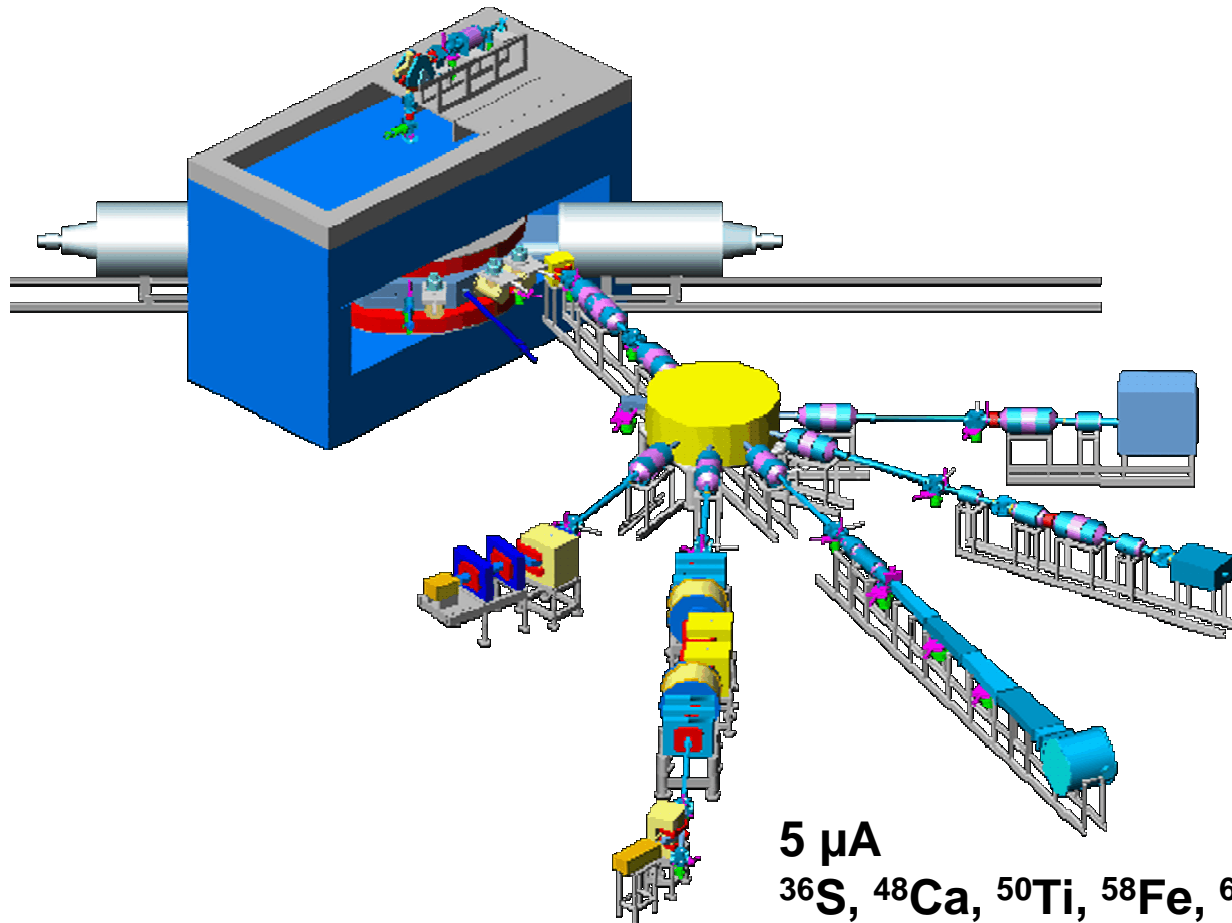
2011 – 100 000 m<sup>2</sup>

2012 – 200 000 m<sup>2</sup>





# PROJECT OF NEW HEAVY ION CYCLOTRON DC-350



**5  $\mu$ A**  
 **$^{36}\text{S}$ ,  $^{48}\text{Ca}$ ,  $^{50}\text{Ti}$ ,  $^{58}\text{Fe}$ ,  $^{64}\text{Ni}$  ions**

**Synthesis of super-heavy elements**

# RADIATION PROCESSING (electron beam)



## - Sterilization of medical supplies

- Syringes, surgical gloves, catheter systems, hygienic tissue for newborns, plastic containers for drugs, cotton-wool, bandages

- Routine business

## - Polymerization and cross-linking

- roofing/hydroinsulating material
- foamed polyethylene
- hydrogels for medicine



- Transferred to Nuclear Technology Park

- Facility set up





# RADIATION TECHNOLOGY COMPLEX IN NUCLEAR TECHNOLOGY PARK

Commissioned in 2009 (Kurchatov city, East Kazakhstan Region)



General view



Electron accelerator bunker



“Krovlen” roofing material production line



Foamed polyethylene production line

# PROJECT OF RADIATION STERILIZATION PLANT IN NUCLEAR TECHNOLOGY PARK (Kurchatov city, East Kazakhstan Region)



**ILU-10 electron accelerator  
5 MeV, 50 KW**

**Conveyor system**

**Process dosimetry lab**

**Analytical lab**

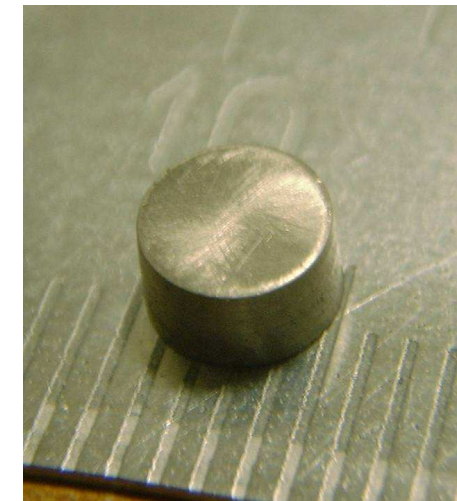
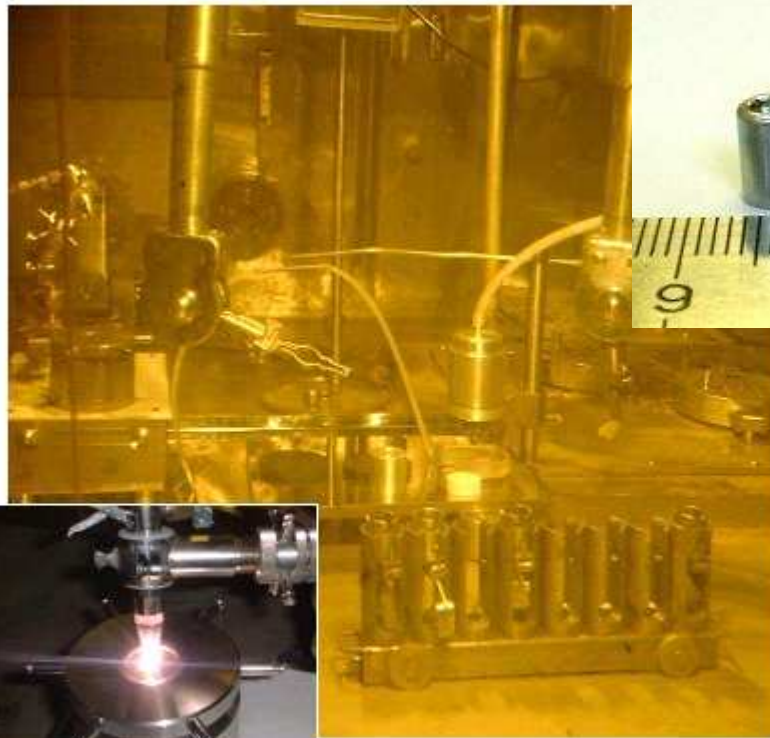
**Storage facilities**



# SEALED GAMMA AND X-RAY SOURCES FOR INDUSTRY

$^{192}\text{Ir}$ ,  $^{124}\text{Sb}$ ,  $^{60}\text{Co}$ ,  $^{204}\text{Tl}$  *Reactor*

$^{109}\text{Cd}$  *Cyclotron*





# Radiopharmaceuticals produced at INP NNC RK and licensed for clinical application



$^{201}\text{Tl}$  (Thallium chloride)

$^{99\text{m}}\text{Tc}$  (Sodium pertechnetate)

$^{131}\text{I}$  (Sodium iodide, hippurate)

$^{67}\text{Ga}$  (Gallium citrate)



# CENTER FOR NUCLEAR MEDICINE AND BIOPHYSICS

Institute of Nuclear Physics, Almaty



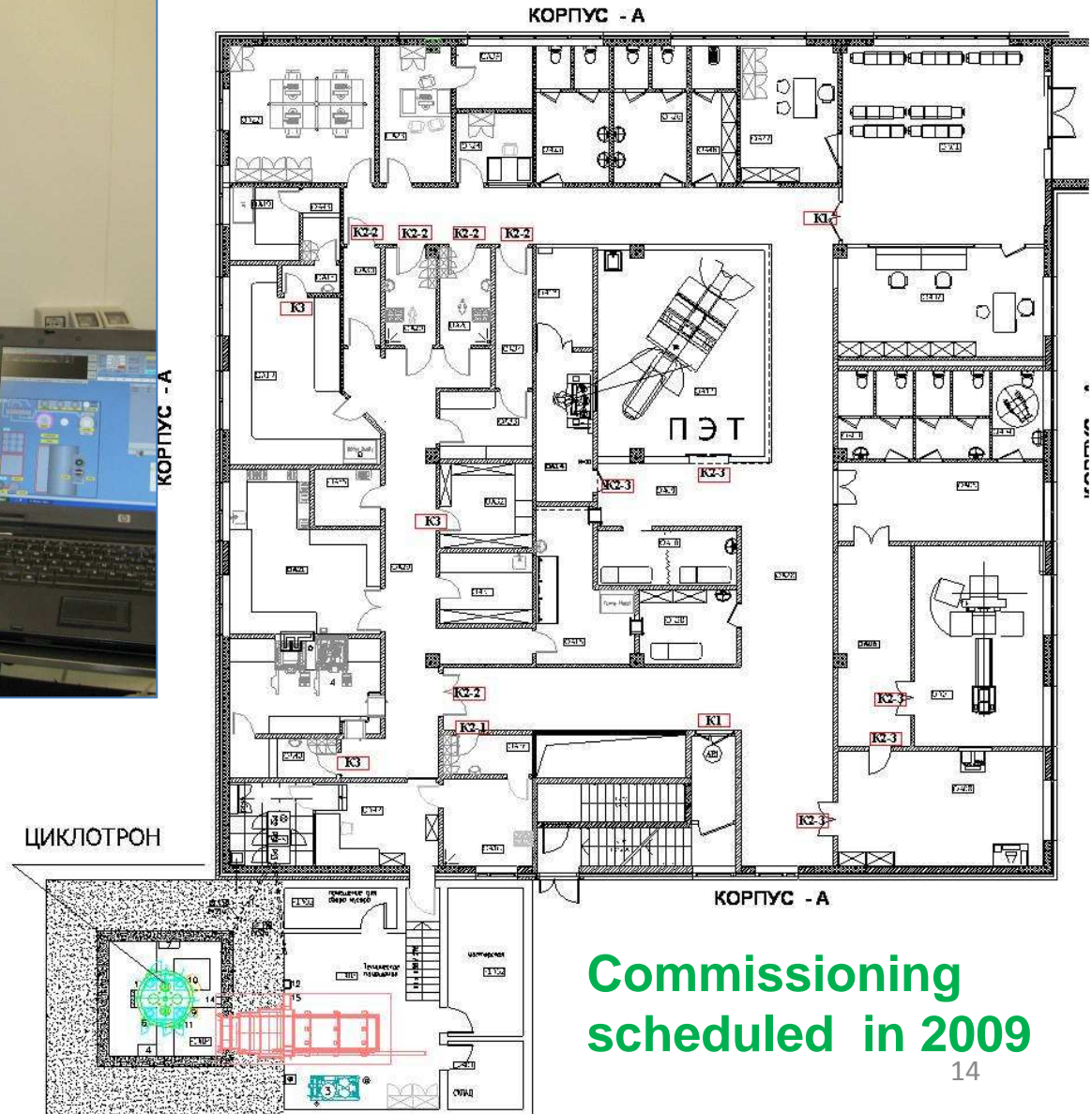
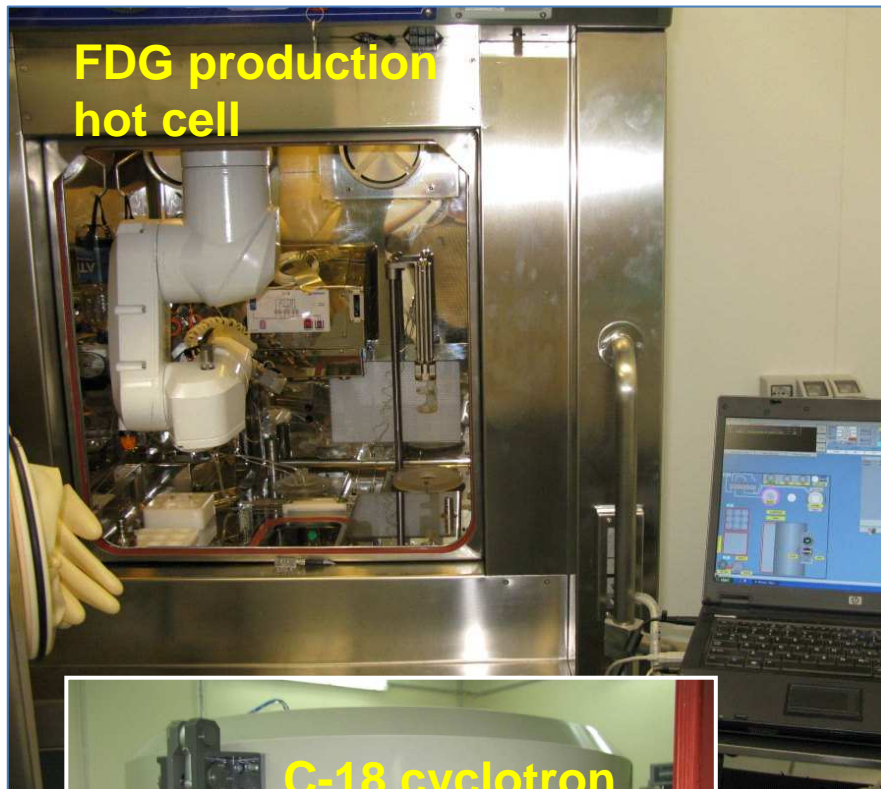
- Production of radioisotopes for medical applications
- Development and testing of new radiopharmaceuticals
- Nuclear diagnostics and treatment techniques
- Nuclear medicine staff training for regional centers of Kazakhstan

**Construction started in 2009**



# FIRST PET-CENTER IN KAZAKHSTAN

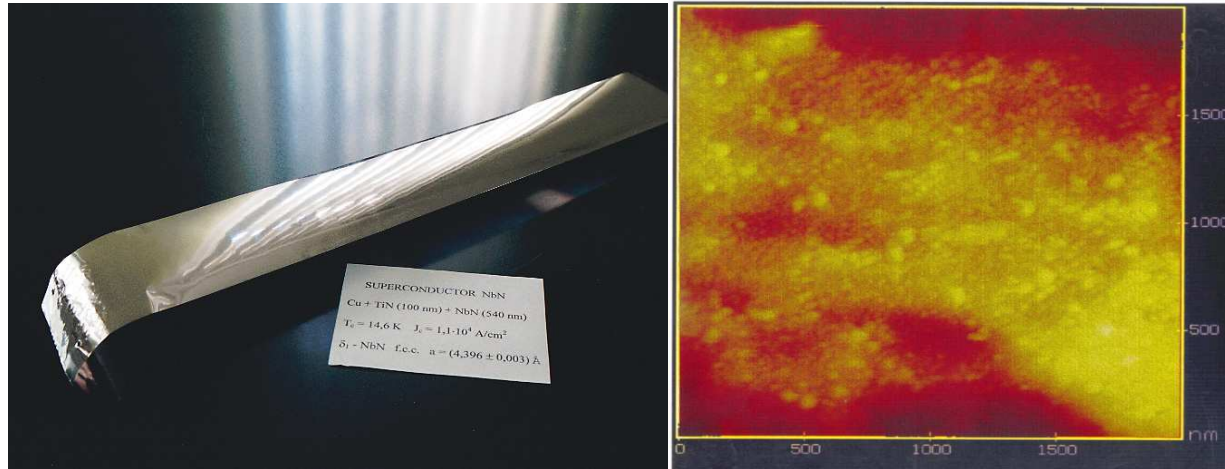
(Republican Diagnostic Center, Astana)



Commissioning  
scheduled in 2009



# ION-PLASMA SYNTHESIS OF SUPERCONDUCTORS



Nano-size grains of niobium nitride (atomic force microscopy)

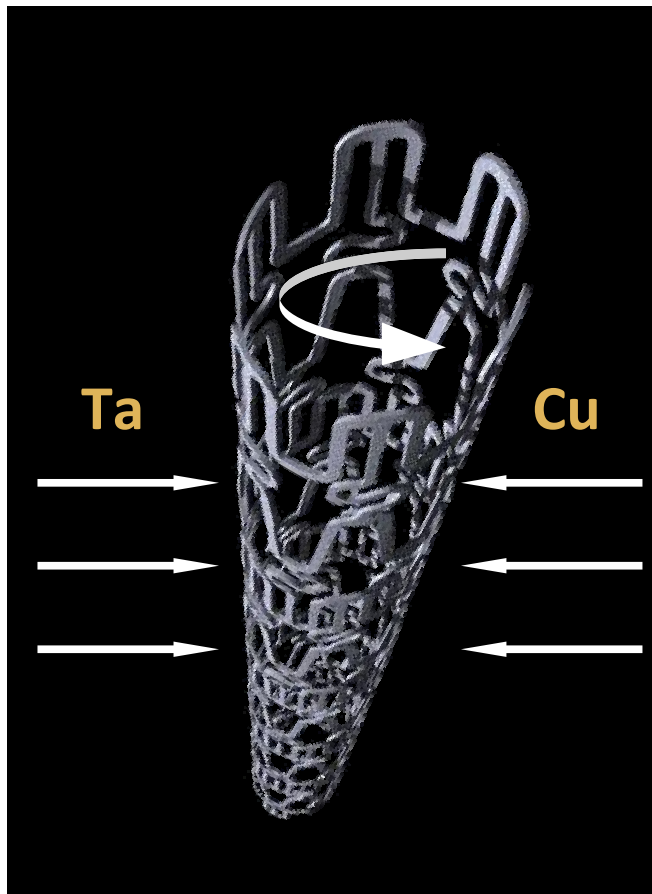
Tape superconductor NbN,  $T_c=15,5\text{K}$



Tape superconductor  $\text{Nb}_3\text{Sn}$ ,  $T_c=16\text{K}$

## ION-PLASMA COATING

**Anti-proliferation  
tantalum/ copper coating  
for cardiosurgical stents**



- Tantalum is biologically inert but subjected to proliferation
- Copper prohibits from proliferation but oxidizes rapidly
- Tantalum/Copper Coating protects stents from proliferation for a long period of time