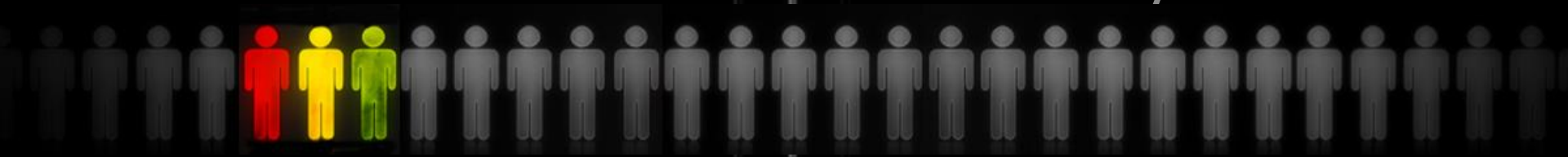
A. ALIKHANYAN National Laboratory

Isotopes Production & Research Department

RADIOISOTOPES PRODUCTION

Head of the R&D team

Manukyan Andranik



ISOTOPE RESEARCH & PRODUCTION DEPARTMENT

- Բաժինը հիմնադրվել է 2010թ. Ալբերտ Ավետիսյանի կողմից, և զբաղվում է ռադիոիզոտոպների ստացման տեխնոլոգիաների մշակմամբ

Tc^{99m} Technetium

Cu^{64} Copper

Ga^{67} Gallium

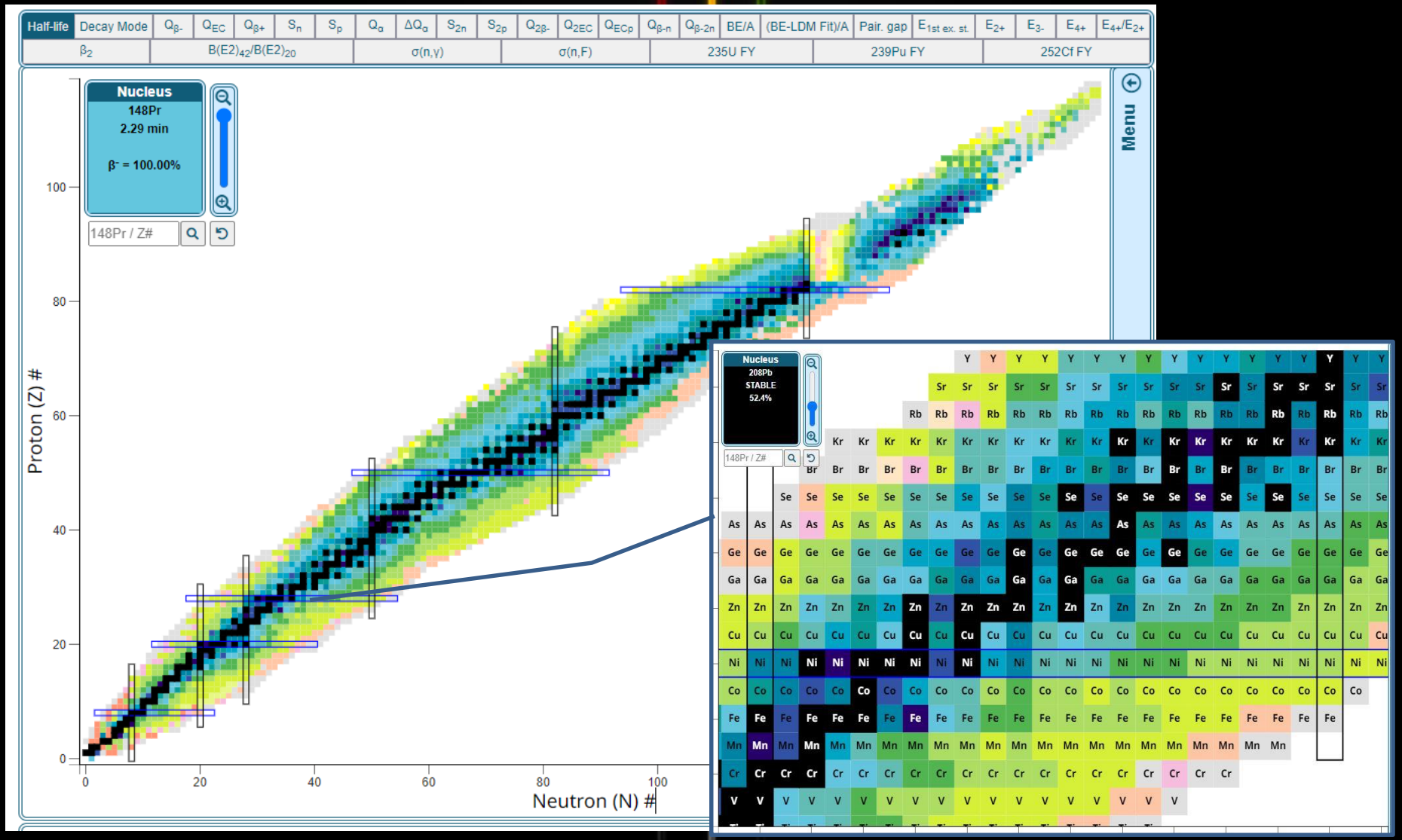
Ga^{68} Gallium

Periodic Table

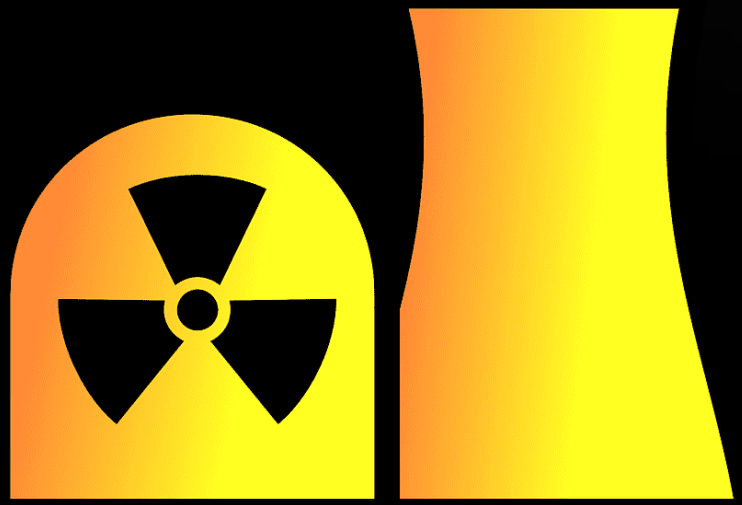
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

Lanthanides*	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
Actinides**	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

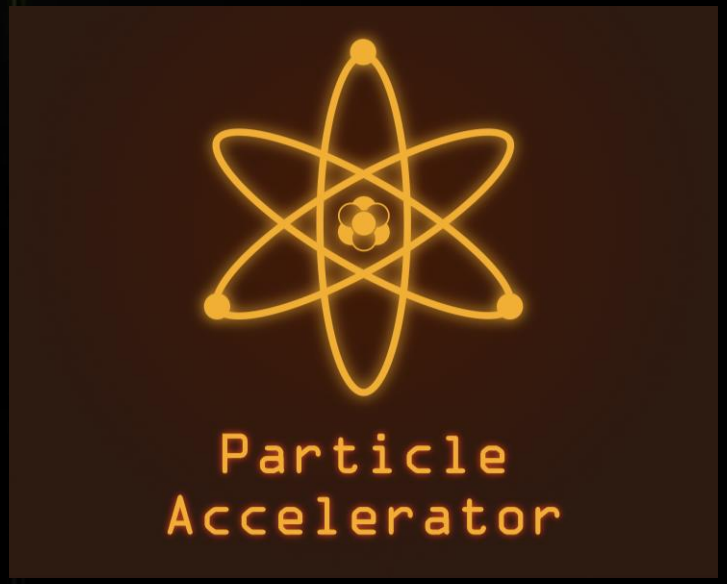
Full Table


Half-life
Decay Mode
$Q_{\beta-}$
Q_{EC}
$Q_{\beta+}$
S_n
S_p
Q_α
ΔQ_α
S_{2n}
S_{2p}
$Q_{2\beta-}$
Q_{2EC}
Q_{ECp}
$Q_{\beta-n}$
$Q_{\beta-2n}$
BE/A
(BE-LDM Fit)/A
Pair. gap
$E_{1st\ ex.\ st.}$
E_{2+}
E_{3-}
E_{4+}
E_{4+}/E_{2+}
β_2
$B(E2)_{42}/B(E2)_{20}$
σ(n,γ)
σ(n,F)
235U FY
239Pu FY
252Cf FY
Nucleus
148Pr
2.29 min
β⁻ = 100.00%
148Pr / Z#
Menu
Proton (Z) #
Neutron (N) #
0
20
40
60
80
100
Nucleus
208Pb
STABLE
52.4%
148Pr / Z#

Radioisotopes Production Methods



1. Reactors



2. Accelerators

Reactors

Australia's only nuclear reactor at Lucas Heights in Sydney has stopped production of the radioisotope molybdenum-99 due to a valve problem

Commercial Cyclotrons for isotope production

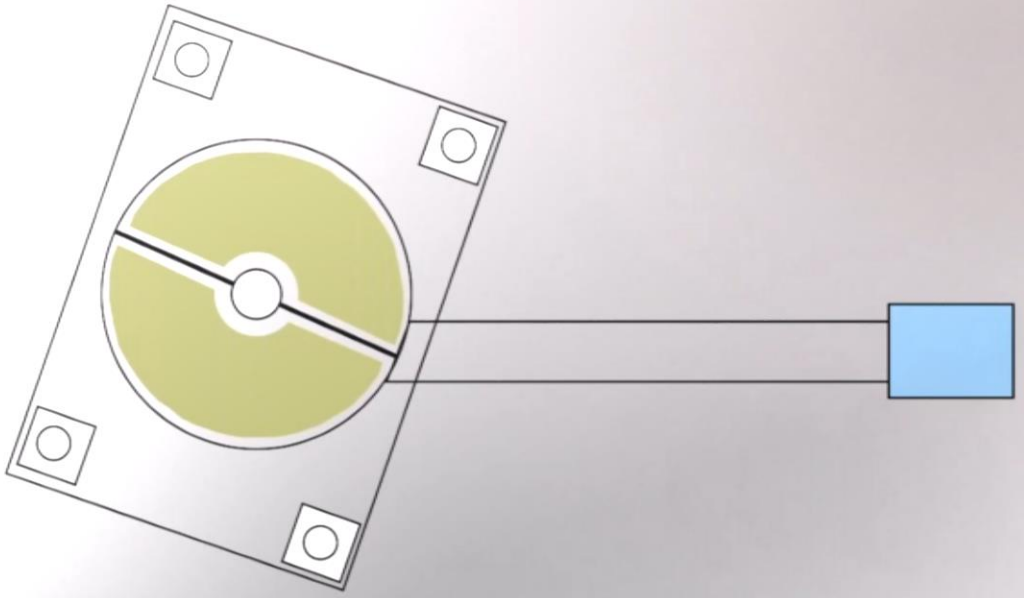
Характеристики наиболее распространенных коммерческих циклотронов для производства ПЭТ-радионуклидов

Фирма-производитель	Модель	Тип ускоряемых частиц	Энергия ионов, H^-/D^-, МэВ	Ток пучка ионов, H^-/D^-, мкА
IBA Molecular Imaging	Cyclone 10/5 Cyclone 18/9	H^-, D^- H^-, D^-	10/5 18/9	60/35 80/35
Siemens	ECLIPSE HR ECLIPSE RD	H^- H^-	11 11	120 80
GE Health Care (GEHC)	PETtrace MINItrace	H^-, D^- H^-	16,5/8,5 9,6	75/60 Более 50
EBCO (ASCI)	TR30/15 TR18/9	H^-, D^- H^-, D^-	30/15 19/9	400/150 300
SAMYOUNG UNITECH	KOTRON-13	H^-	13	30
SUMITO HI	HM-12 HM-18	H^-, D^-	12/6 18/9	60/25 60/30
НИИЭФА	СС-18/9	H^-, D^-	18/9	100/50

Г.Е.Кодина,
Р.Н.Красикова

«Методы получения РФП и радионуклидных генераторов для ядерной медицины»

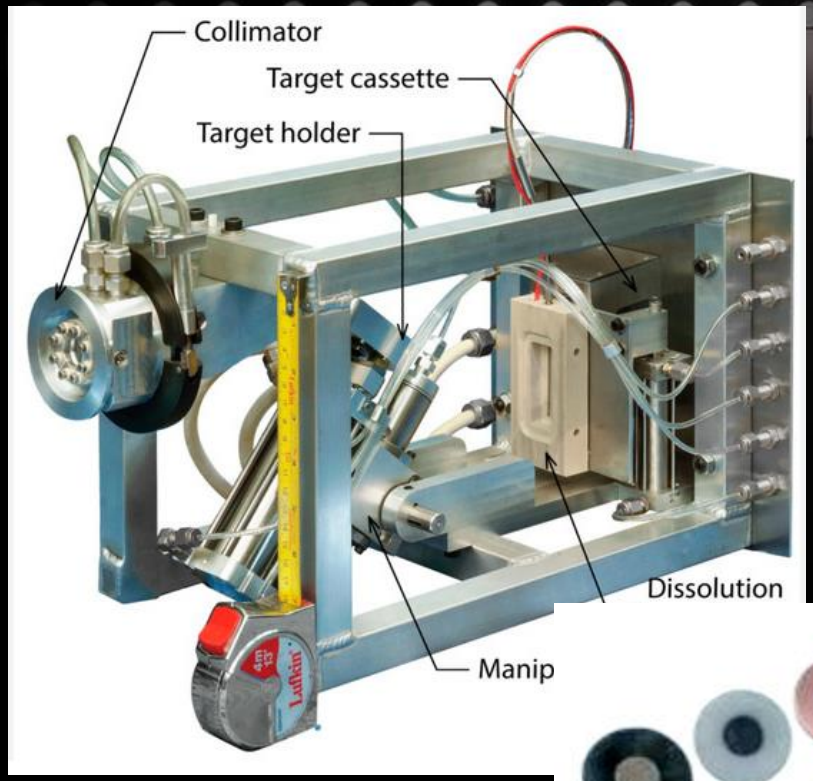
What is a Cyclotron and what is it for?

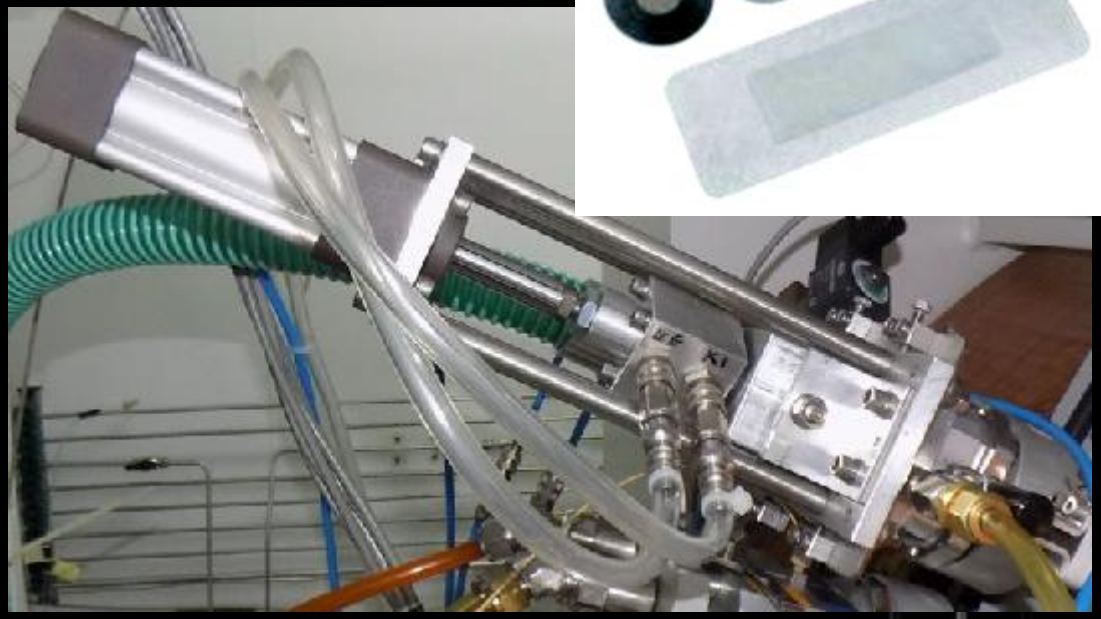


Basic RadioPharma Prod. Lab.

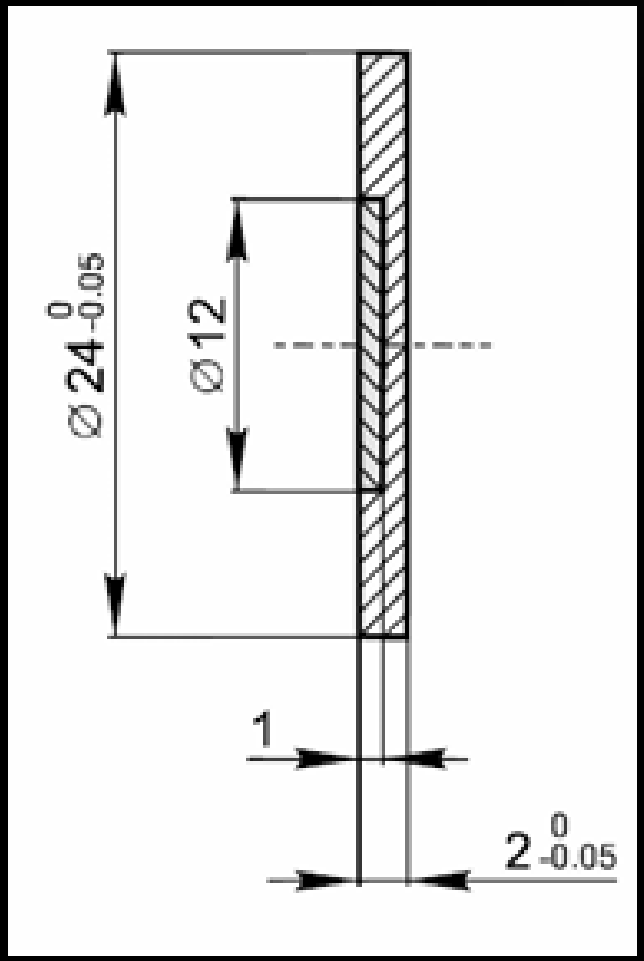
Commercial Synthesizers

Solutions for Solid targets





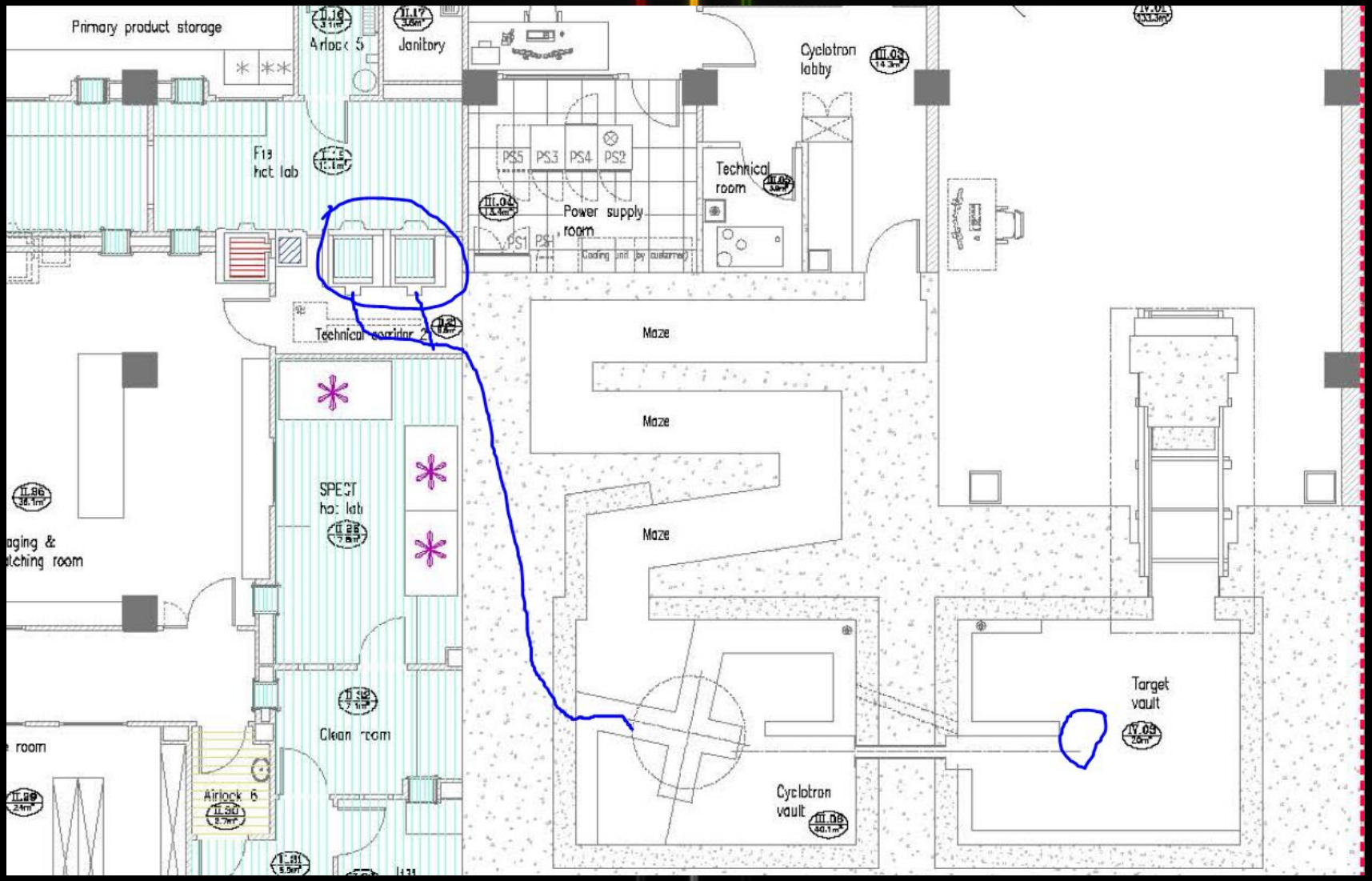
What We Have



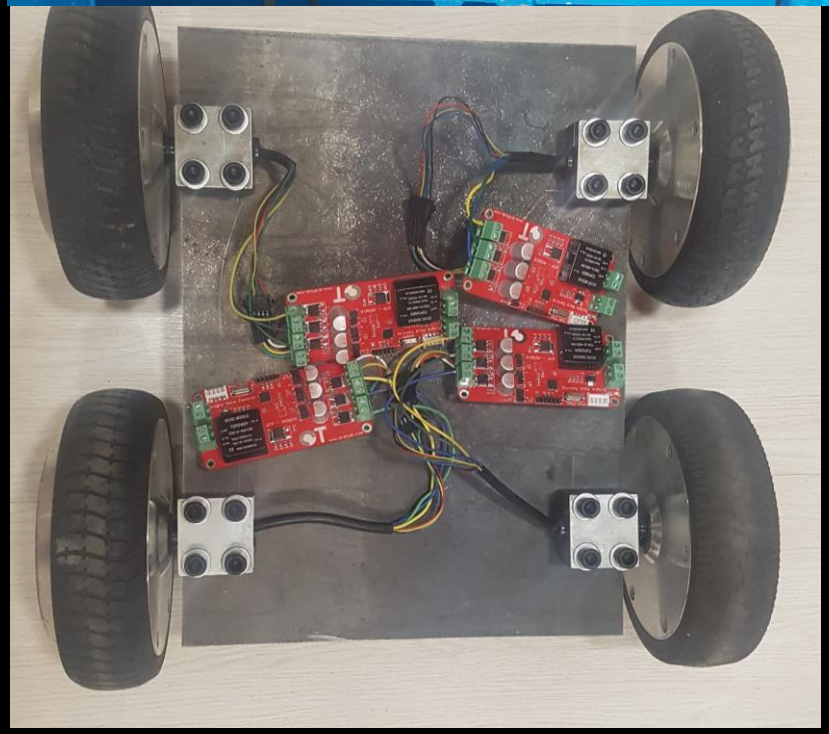
Solid Target

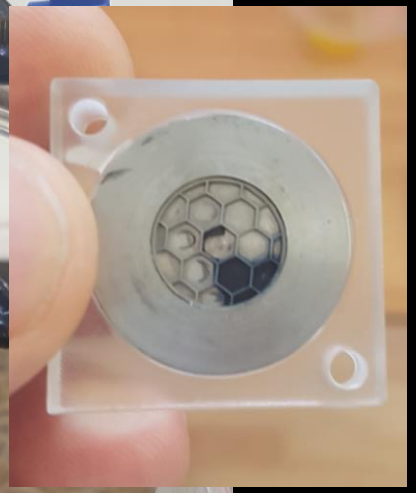
Solid Target Module

RPC Floor Plan



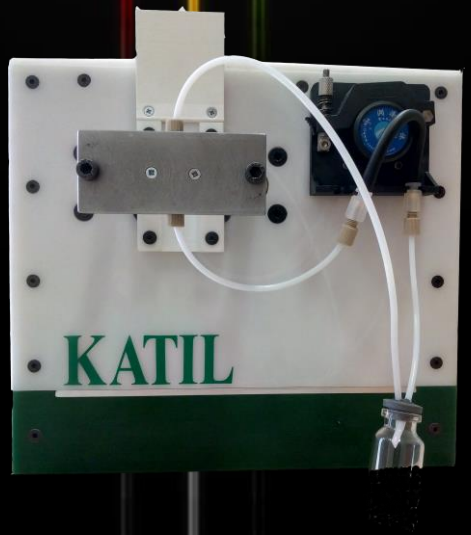
Development Proc.





Post Irradiation Processes

Solid Target Module

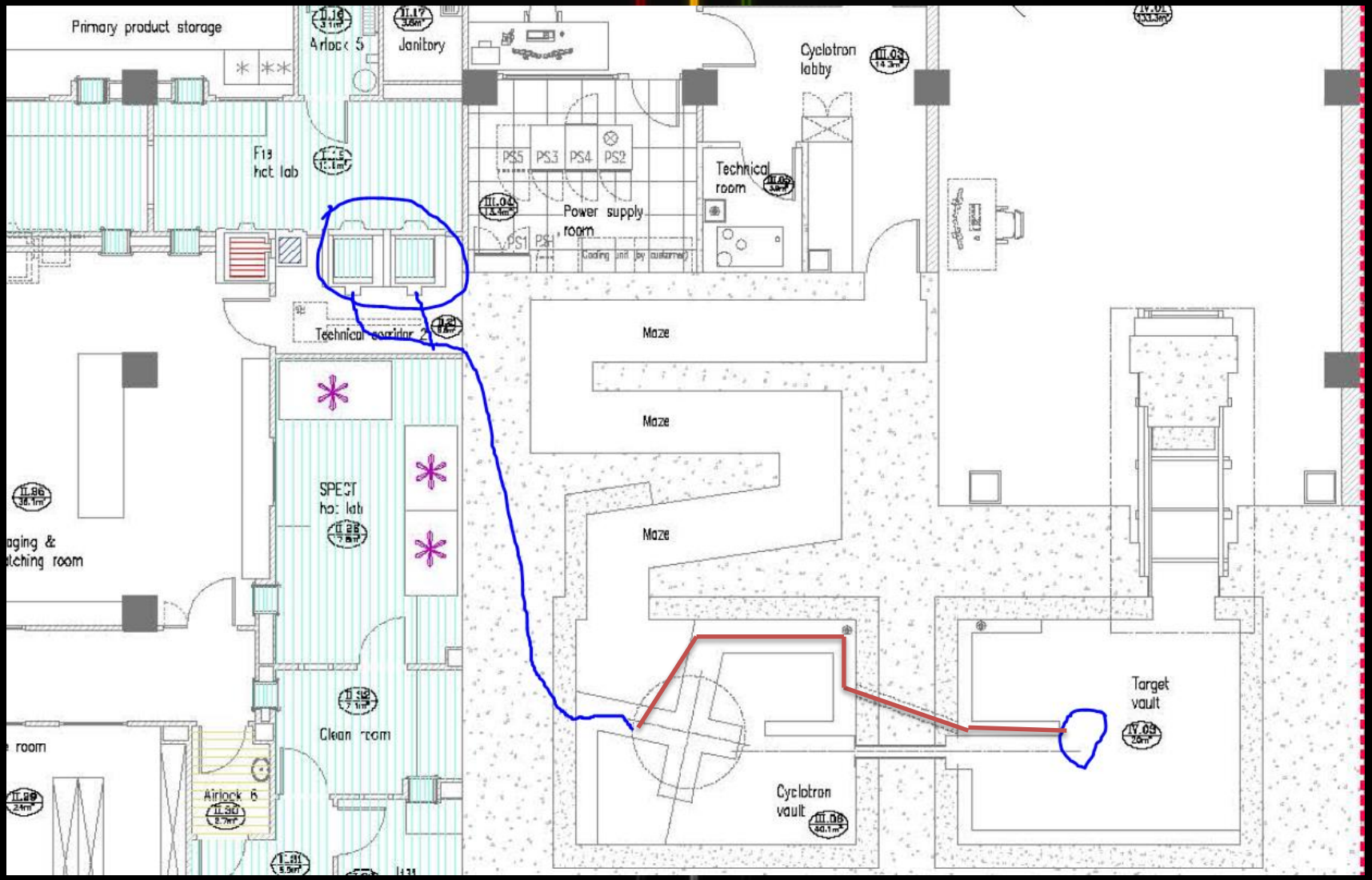


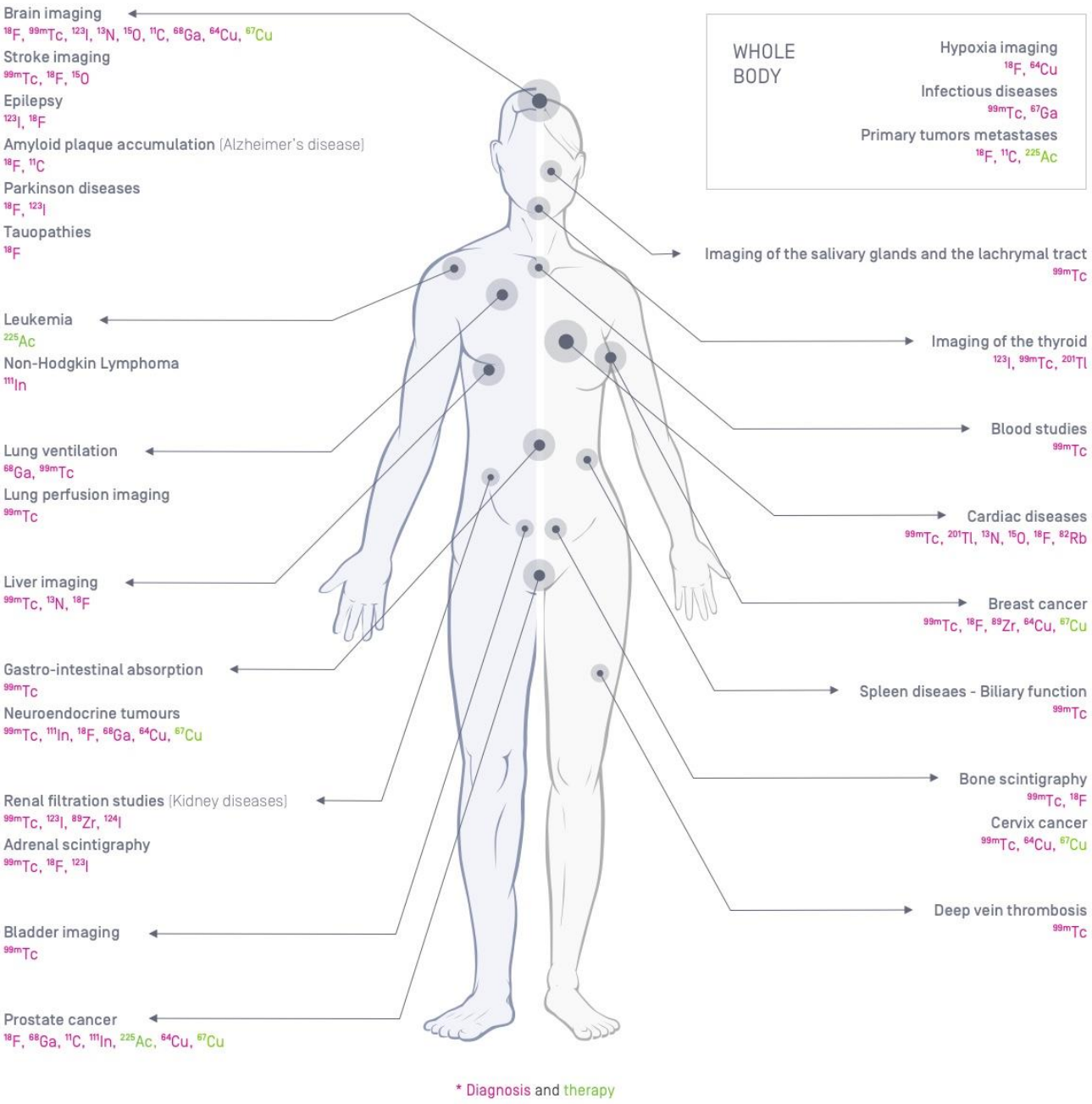
Prototype of
Dissolution station

Prototype of
Purification station

- Possibilities of Irradiation Solid materials
- Possibilities of production 64Cu, 68Ga, 67Ga, 99mTc
- Possibilities to get the isotopes in liquid form

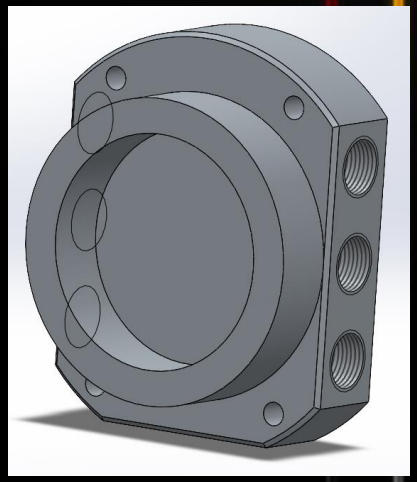
RPC Floor Plan

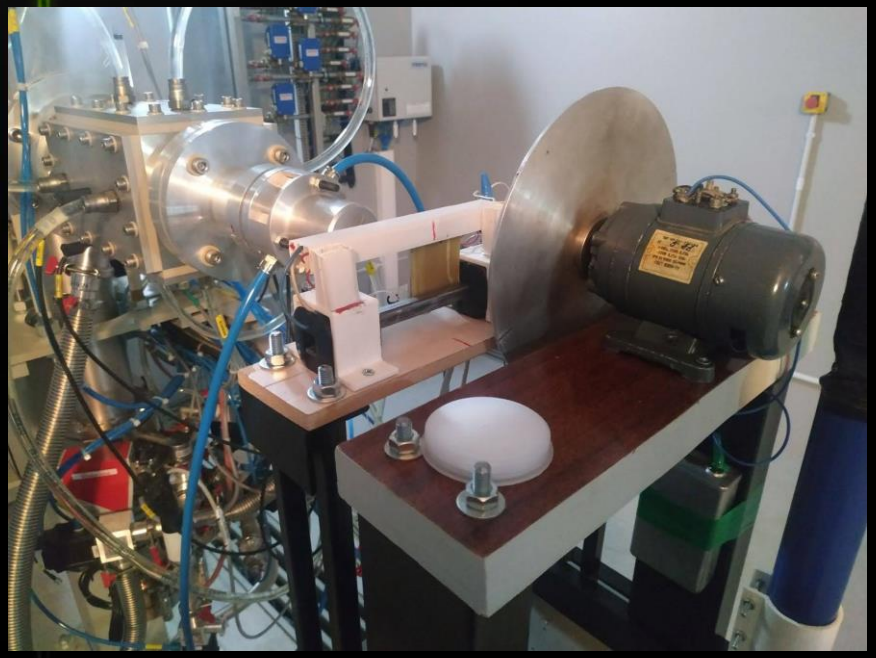


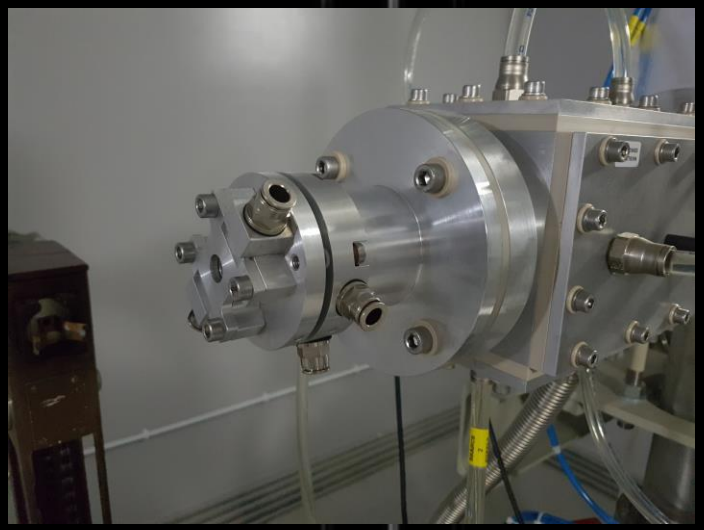


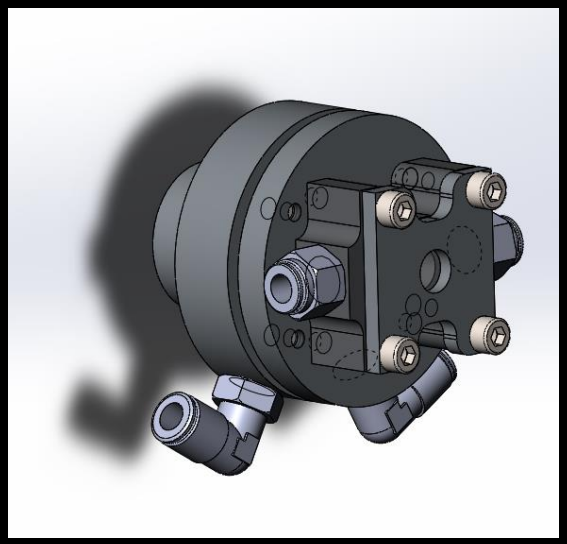
* Diagnosis and therapy

What Else?

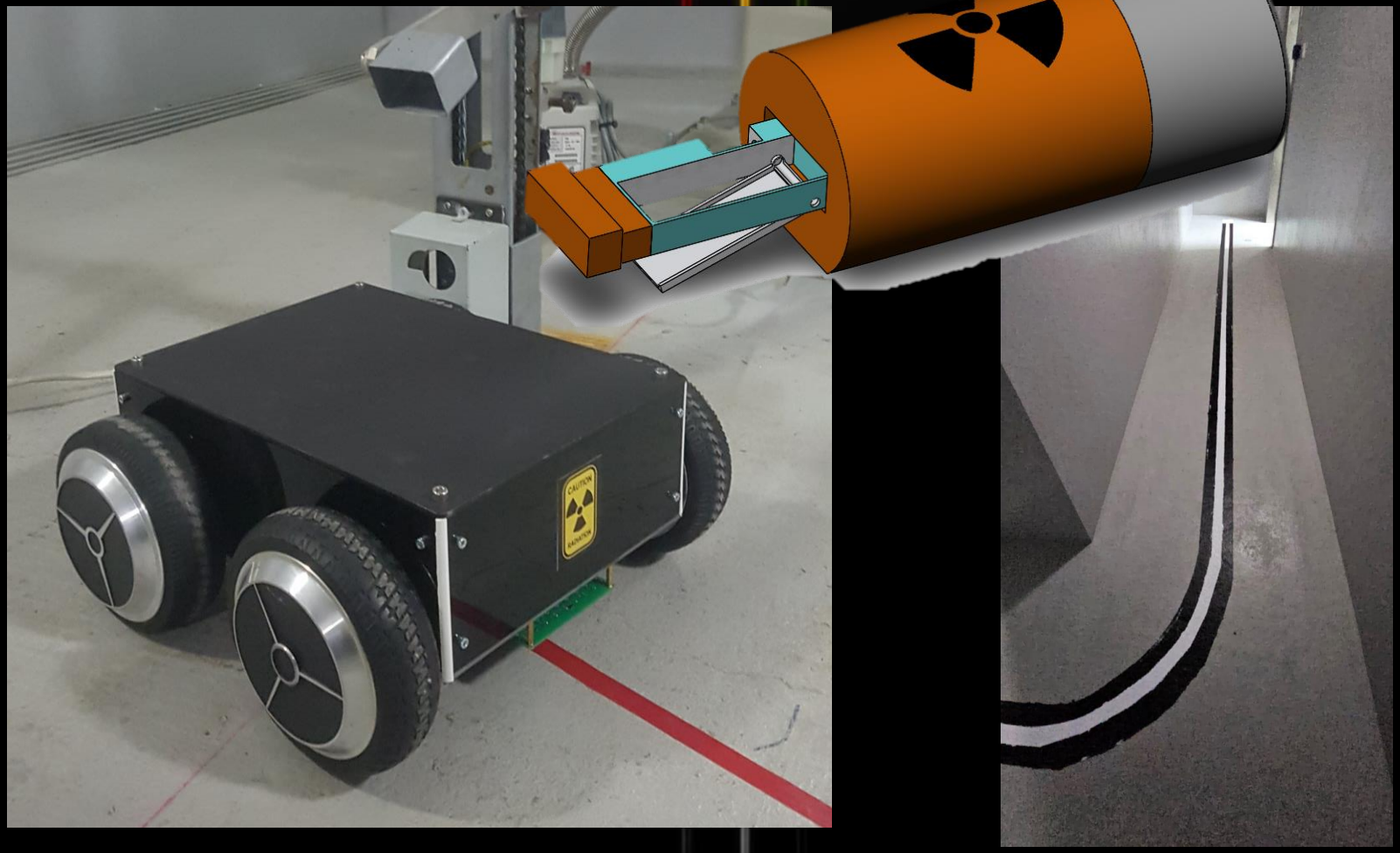




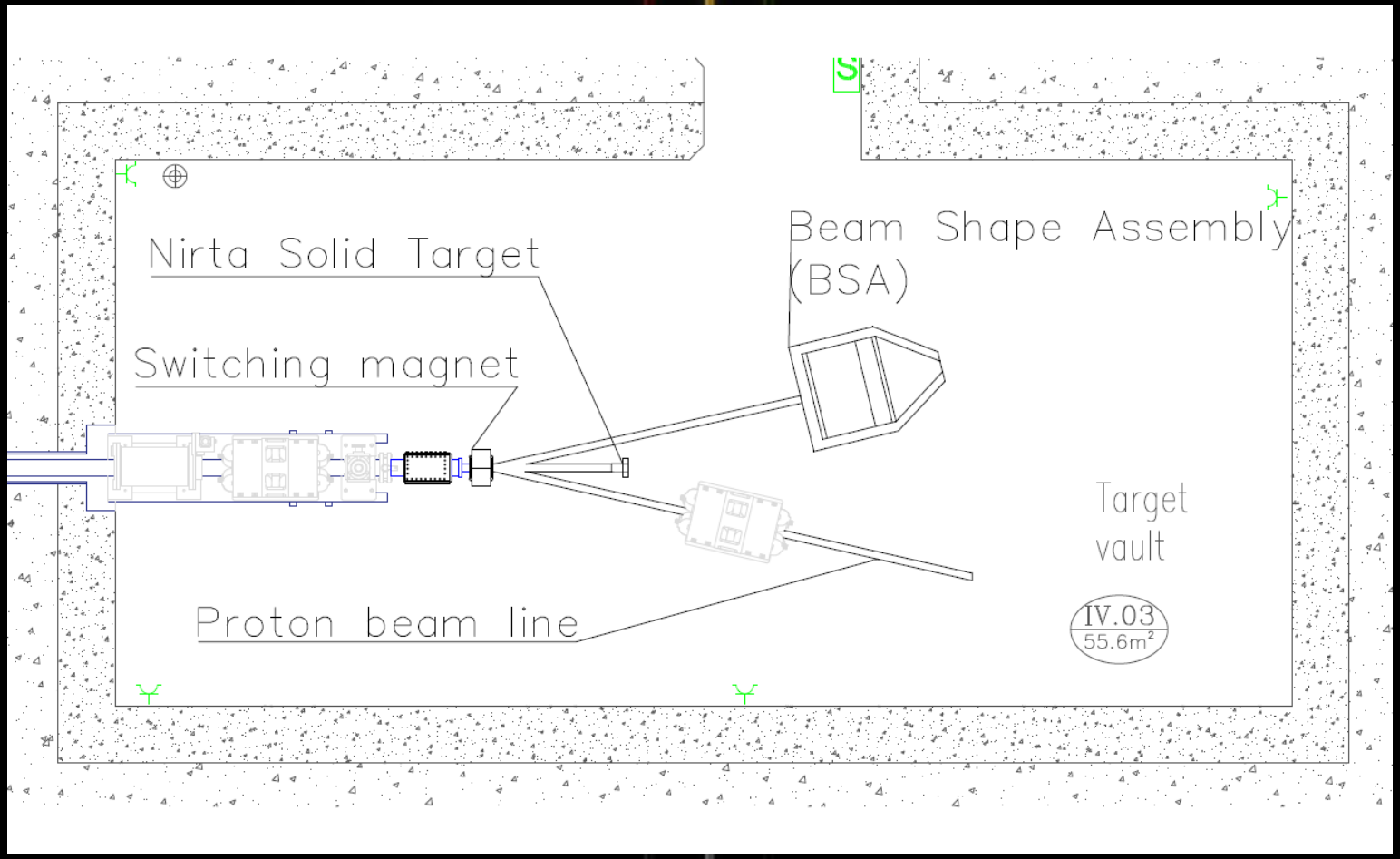




Transportation System



Future Project




Thanks for attention