Holifield Radioactive Ion Beam Facility (H R I B F).

V. Pogosov

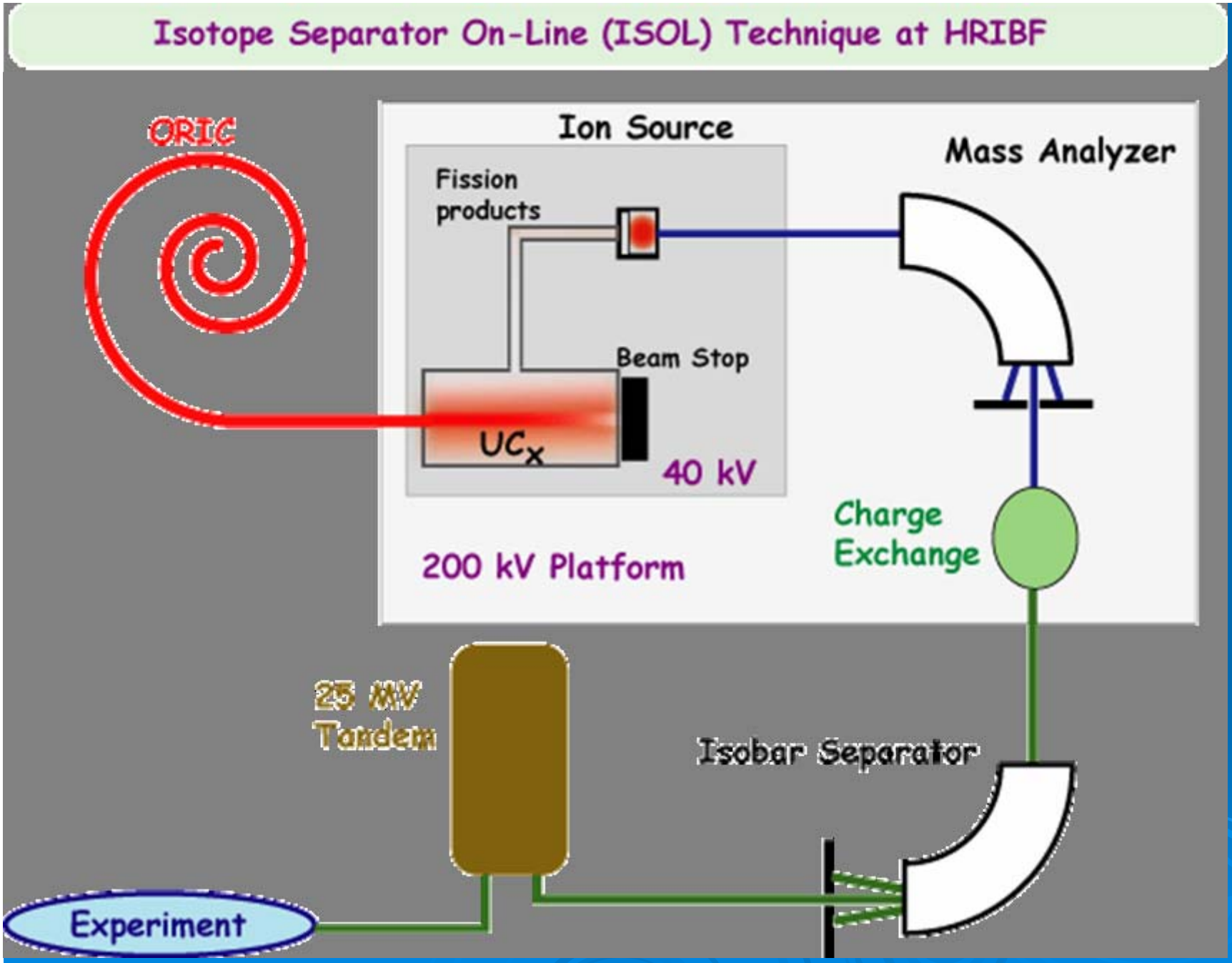
Могут быть ускорены (25 MeV тандем) пучки 175 изотопов; более 60 из них с интенсивностью ~ 106/сек; дополнительно ~30 изотопов с энергией ~50 KeV (без тандема);**
32 протоноизбыточных и 143 нейтроноизбыточных ядер

Nuclear structure and reaction research at HRIBF provides insight into the nature of the force that clusters protons and neutrons into a nucleus. HRIBF tests the limits of nuclear stability using intense beams above the Coulomb barrier and new techniques for detecting the shortest-lived, proton-rich nuclei. The unique capabilities of HRIBF allow the determination of how rapidly some isotopes are created in stellar explosions, and how quickly they may be destroyed.

The questions that HRIBF tries to answer are the major questions that drive the field of low-energy nuclear physics:

- How do protons and neutrons make stable nuclei and rare isotopes?
- What is the origin of simple patterns in complex nuclei?
- What are the heaviest nuclei that can exist?
- When and how did the elements from iron to uranium originate?
- How do stars explode?
- What is the nature of neutron star matter?
- How can our knowledge of nuclei and our ability to produce them benefit the humankind?

Isotope Separator On-Line (ISOL) Technique at HRIBF

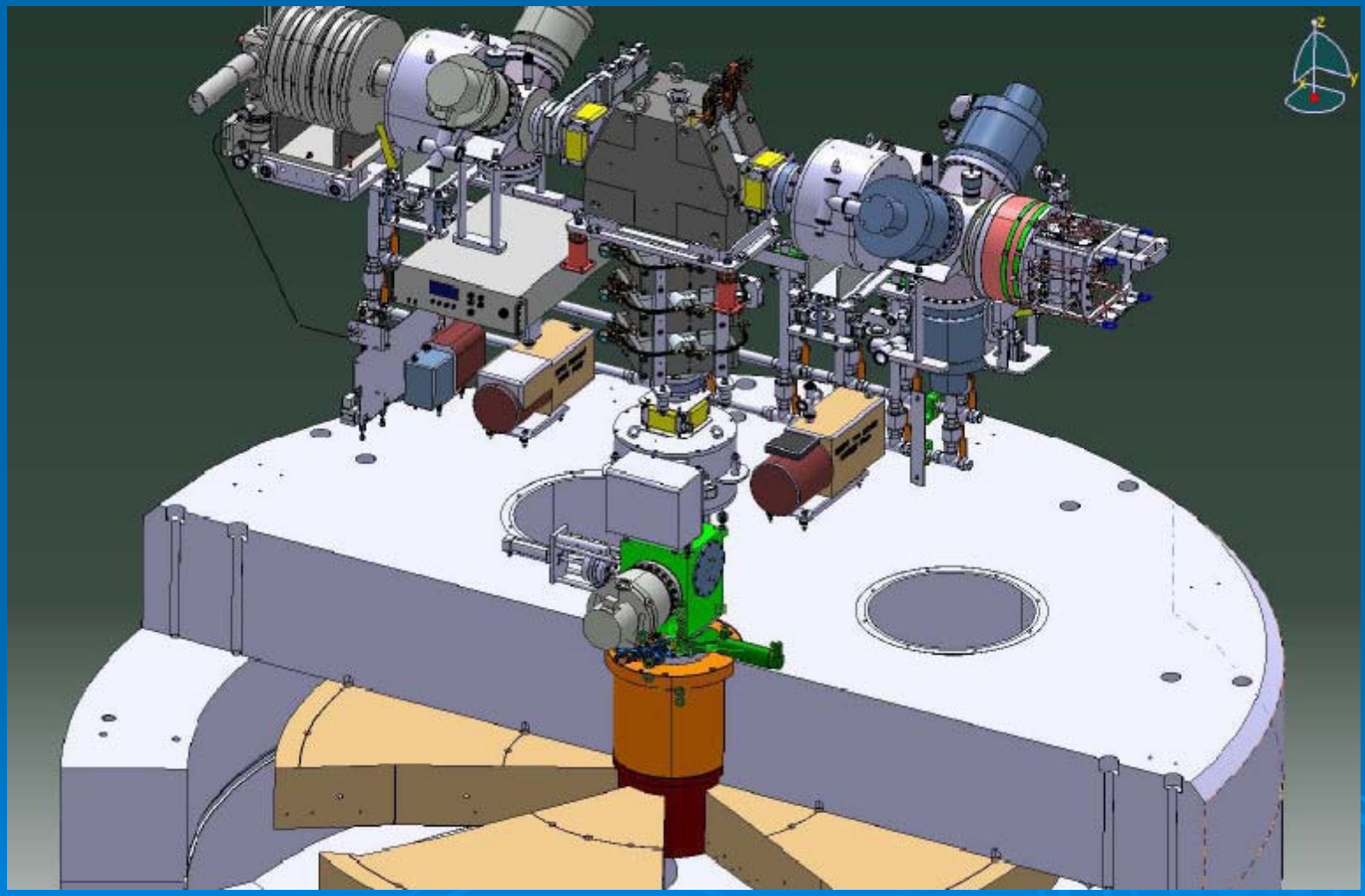


ORIC: 54 MeV; 30 μA protons,
15 μA deutrons,
5 μA alfa
C70:

ion	extraction	E_{min}	E_{max}	I_{max}
		MeV	MeV	μA
H^-	stripping	30	70	750
D^-	stripping	15	35	50
H_2^+	ESD	-	35	50
α	ESD	-	70	50

EDU (infrastructure)

C70



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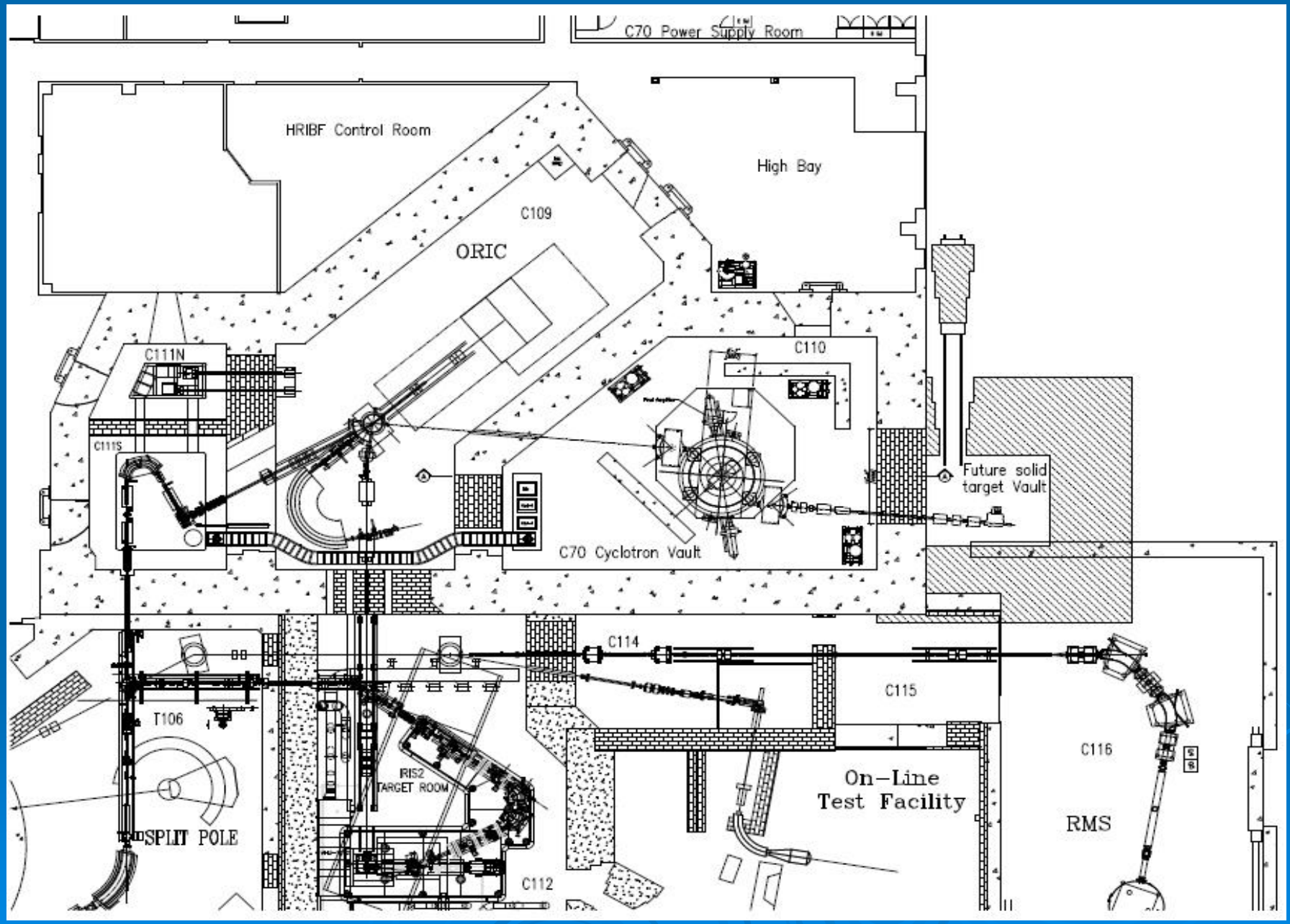
Proton and deuteron beams are produced from foil stripping extraction of H- and D- Beams originating from a multi"cusp ion source and accelerated to the energies shown in Table . Foil stripped beams have the advantage of extremely high extraction efficiencies, and beams can!be concurrently extracted from dual ports on opposite sides of the machine.This added benefit could be useful for isotope production without interruption of RIB production. Alpha beams originate from an Electron Cyclotron Resonance (ECR) ion source and are circulated as positive ions, then extracted by means of an electrostatic deflector (ESD). Both ion sources are permanently mounted on top of the machine so that beam is injected axially and bent onto the median plane with a spiral inflector



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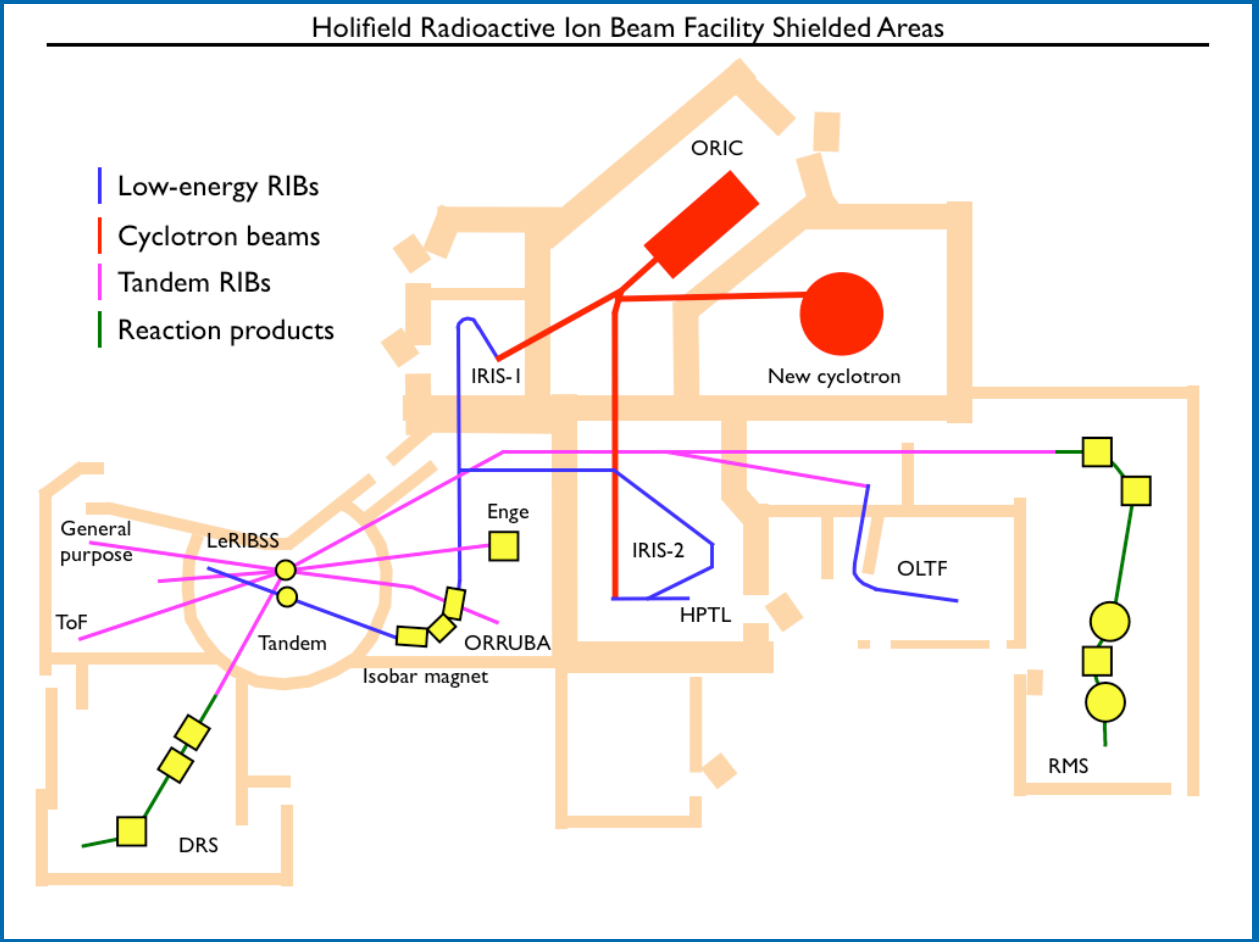
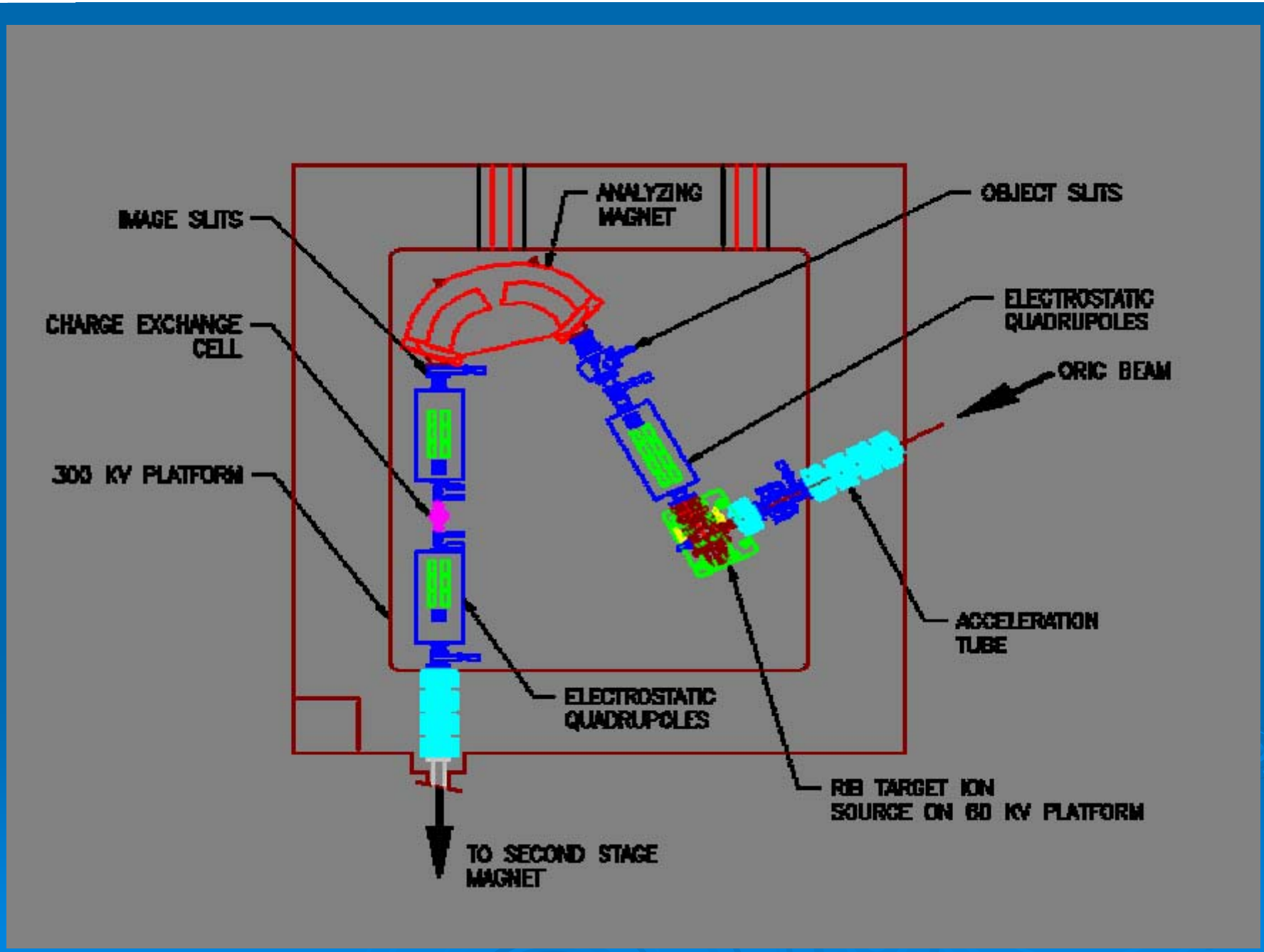


LeRIBSS – Low Energy RIBs Spectroscopy Station
DRS - Daresbury Recoil Spectrometer
RMS - Recoil Mass Spectrometer
ORRUBA- Position sensitive Si-detctors Array
IRIS - Injector for Radioactive Ion Species



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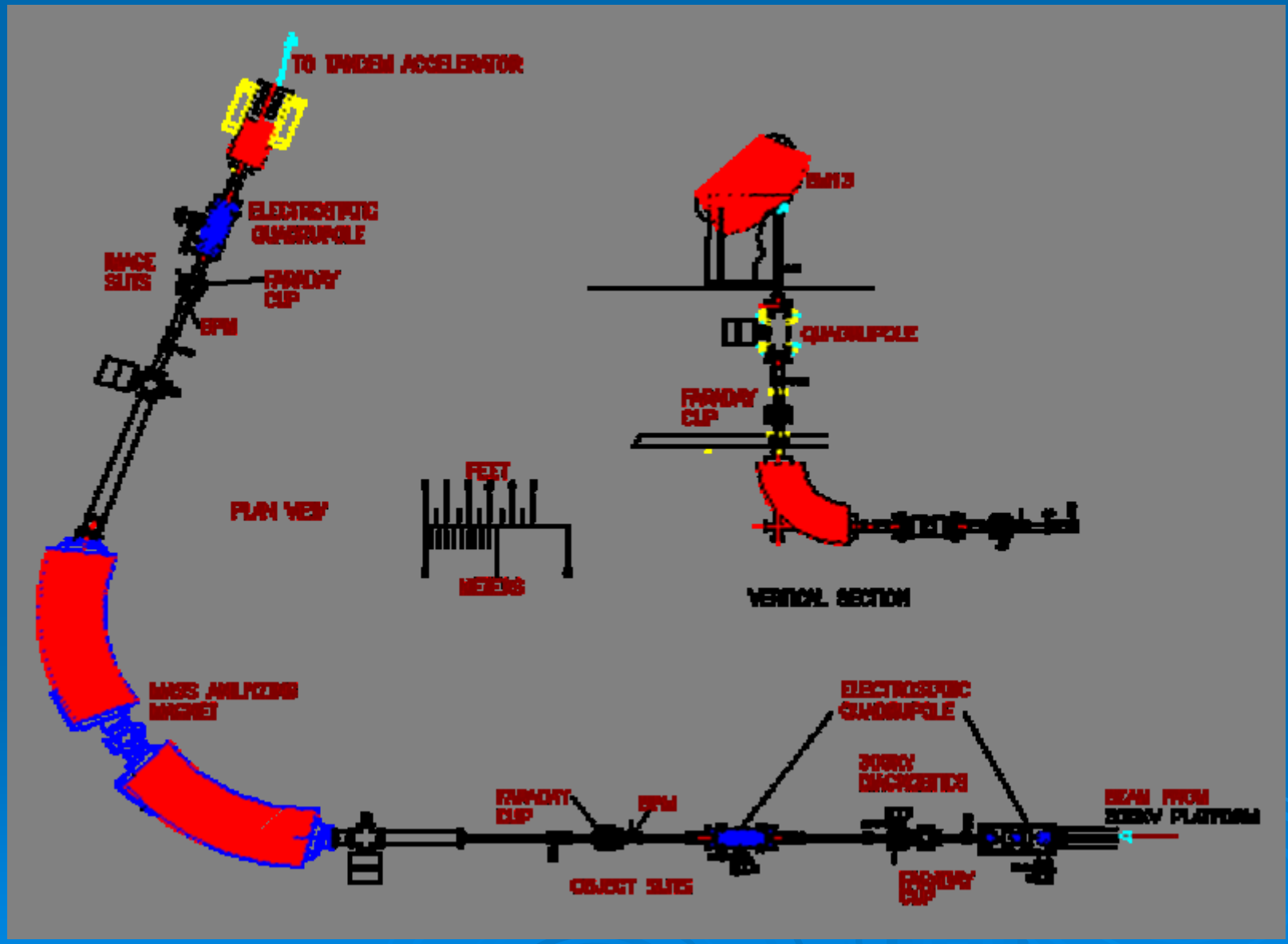

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Тип ускоряемого иона	A/Z	Энергия (МэВ/нуклон)	Максимальная интенсивность выведенных пучков (eμA)	(pps)	Мощность пучка (вт)
H^-	1	72-36	50	$3 \cdot 10^{14}$	3600-1800
$^2H^{1+}$	2	30-15	100	$6 \cdot 10^{14}$	3000-1500
D^-	2	30-15	50	$3 \cdot 10^{14}$	3000-1500
$^3He^{1+}$	3	14-7	50	$1,5 \cdot 10^{14}$	1050-525
$^4He^{1+}$	4	8,6-4,3	50	$1,5 \cdot 10^{14}$	860-430
$^7Li^{1+}$	7	2,8-2,5	3	$6 \cdot 10^{12}$	19,6-9,8
$^{12}C^{3+}$	4	8,6-4,3	20	$2 \cdot 10^{13}$	344-172
$^{14}N^{3+}$	4,7	6,2-3,1	20	$1,7 \cdot 10^{13}$	248-124
$^{16}O^{4+}$	4	8,6-4,3	20	$1,5 \cdot 10^{13}$	344-172
$^{20}Ne^{5+}$	4	8,6-4,3	20	$1,2 \cdot 10^{13}$	344-172
$^{20}Ne^{3+}$	6,6	3,2-2,5	20	$1,3 \cdot 10^{13}$	213-106
$^{40}Ar^{6+}$	6,6	3,2-2,5	10	$4 \cdot 10^{12}$	213-106
$^{40}Ar^{8+}$	5	5,6-2,8	10	$3 \cdot 10^{12}$	124-62
$^{84}Kr^{12+}$	7	2,8-2,5	3	$7 \cdot 10^{11}$	25-12
$^{129}Xe^{18+}$	7,17	2,7-2,5	1	$1,6 \cdot 10^{11}$	10-5

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