Ready to accelerate into the future?

Productive.
Adaptive.
Effective.

CYCLONE® **IKON**
by iba

Yves Jongen
Founder of IBA

Hi, my name is IKE,
I am the soul of IBA's new Cyclone® IKON.

I am the culmination of 35 years of breakthrough innovation and technology that started in 1986 with the launch of the first IBA Cyclotron: the Cyclone® 30 designed by Yves Jongen.

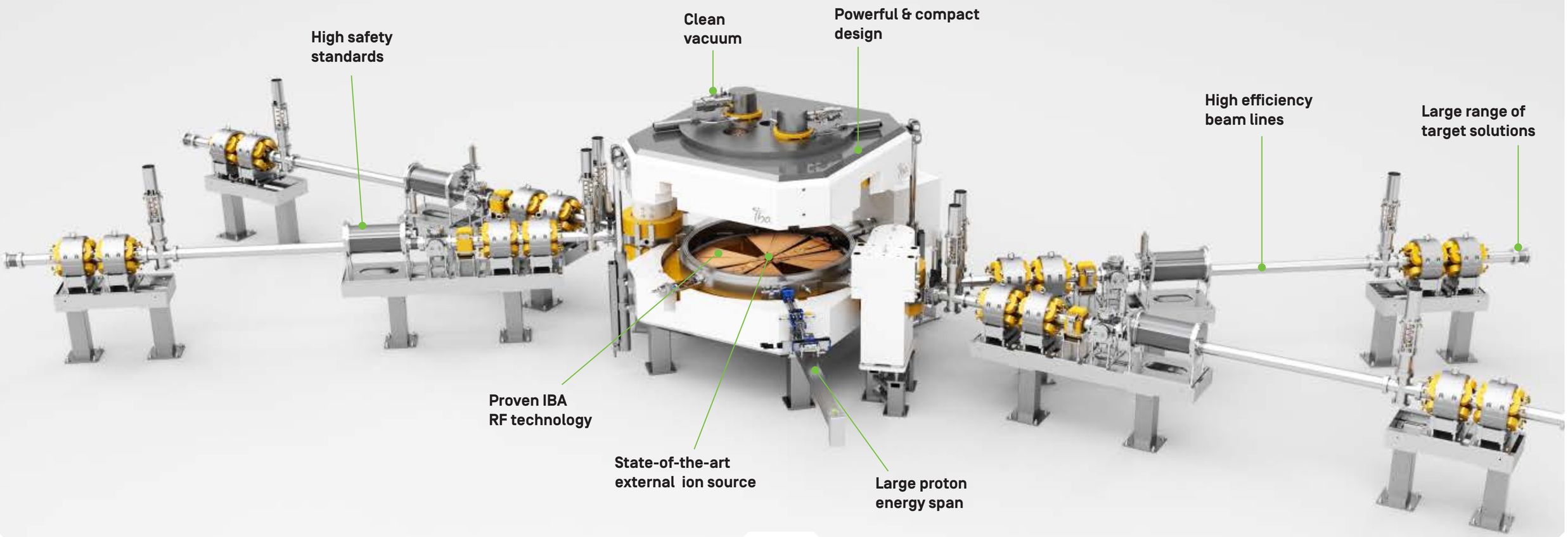
Since then, the Cyclone® 30 family has earned IBA the position of world leader in high-energy cyclotrons with more than 30 installed units worldwide. A clear demonstration of high reliability and the validity of an efficient design.

Today, the new Cyclone® IKON takes IBA's technology to the next level. With a 13 to 30 MeV energy range, but still light and compact, yet exceptionally powerful (up to 1500µA of extraced proton beam), Furthermore, I am designed to accelerate everything: your versatility, your productivity, your business longevity ... and your profits.

I am packed in a one-stop shop solution, with complete radioisotope production packages and comprehensive integrated services for the setup of your radiopharmacy. Moreover, premium customer services will keep you running with outstanding uptime for the many years to come.

IKE

CYCLONE®**IKON**



WATCH PRESENTATION VIDEO

Versatility

Unprecedented flexibility for a new world of possibilities

More doesn't always mean better. This is particularly true when producing radioisotopes. This is why Cyclone® IKON offers a large proton energy range from 13 to 30 MeV.

Injecting a pure and safe radiopharmaceutical is crucial. The optimization of the reaction energy is a key-factor in ensuring this is the case.

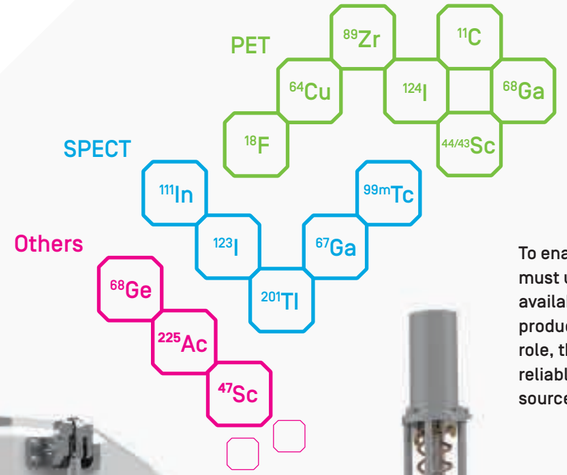
Some very promising radioisotopes are actually produced at energies of 13MeV to avoid the coproduction of other isotopic impurities and therefore ensure the highest purity of the end-product. This level of energy is ideal for the production of Copper-64 and Zirconium-89.

On the other hand, the production of Germanium-68 (used for the production of Ge/Ga generators) and other SPECT isotopes (such as Iodine-123, Indium-111, Thallium-201) are typically produced around 30MeV.

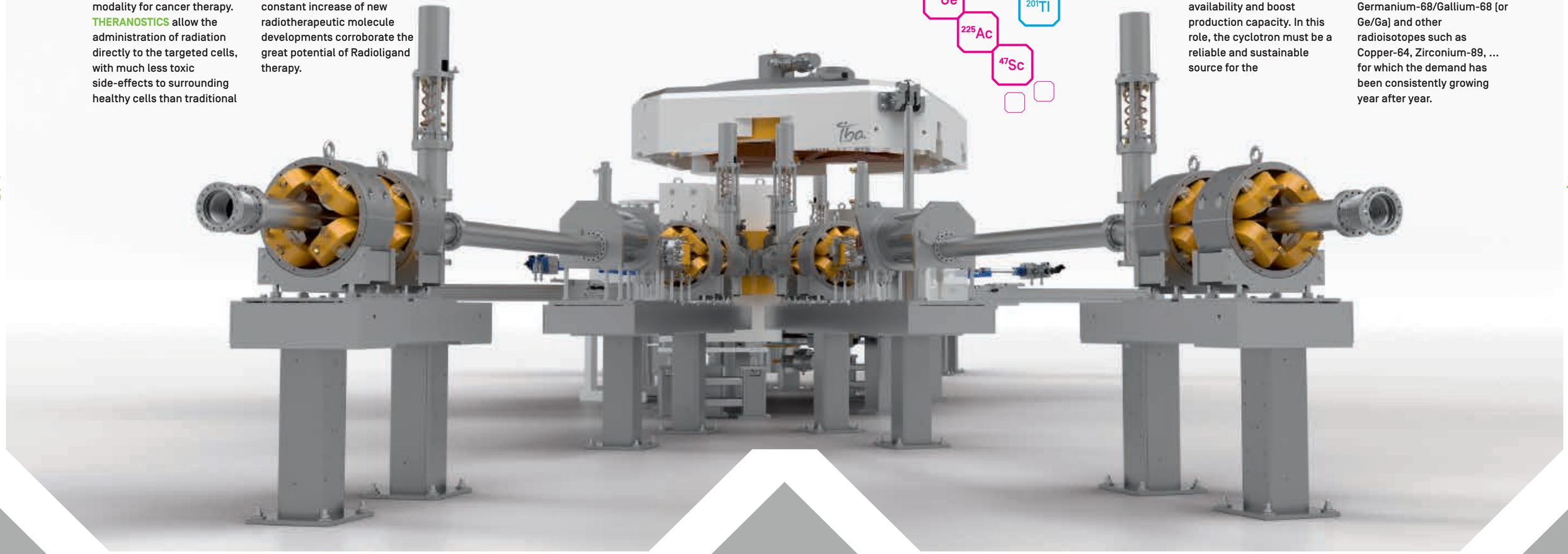
It was therefore crucial for the Cyclone® IKON to offer a large energy span (13 to 30MeV) with full current capacity to enable the large-scale and high-purity production of emerging PET, SPECT and generator isotopes.

Making novel isotopes available

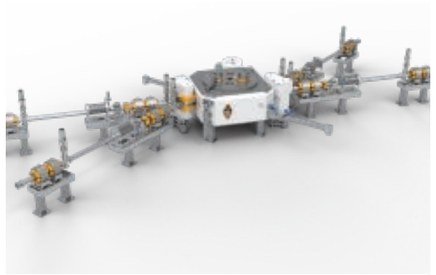
Today, Nuclear Medicine is emerging as a relevant modality for cancer therapy. **THERANOSTICS** allow the administration of radiation directly to the targeted cells, with much less toxic side-effects to surrounding healthy cells than traditional modalities. The growing numbers of clinical trials and constant increase of new radiotherapeutic molecule developments corroborate the great potential of Radioligand therapy.



To enable this revolution, we must unlock novel isotopes availability and boost production capacity. In this role, the cyclotron must be a reliable and sustainable source for the radiopharmaceutical industry, particularly for Germanium-68/Gallium-68 (or Ge/Ga) and other radioisotopes such as Copper-64, Zirconium-89, ... for which the demand has been consistently growing year after year.



Compact Design



Less is more

Space is precious.
Our team of engineers have managed to limit the size of the Cyclone® IKON while keeping a high level of performance and reliability. The modular beam line options now allows users to design their radiopharmacy according to their own needs and requirements.

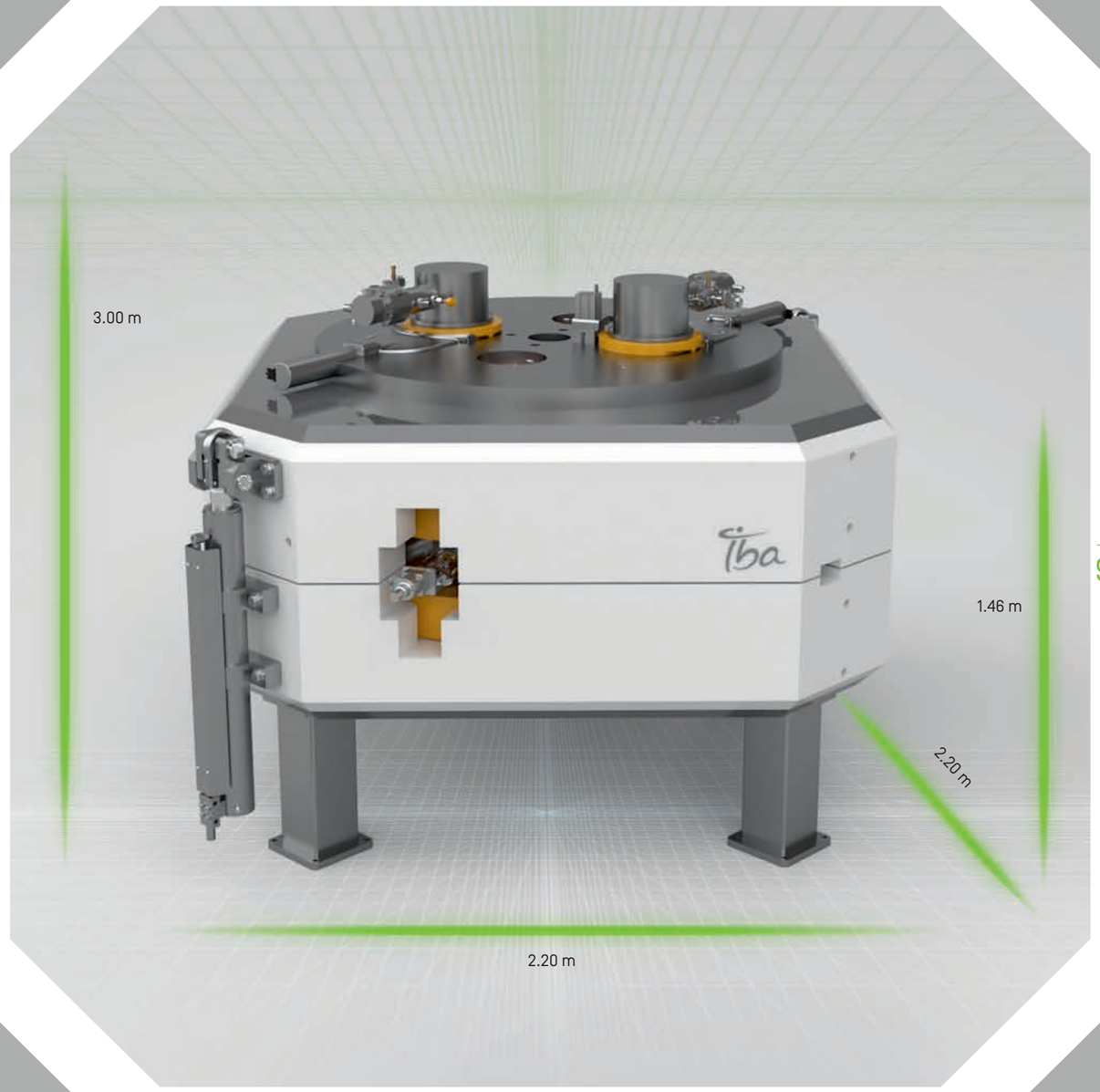
With its compact design, IBA's Cyclone® IKON makes it possible to significantly reduce the size of the vault. This represents substantial savings in terms of the initial investment for the building. Its flexible design also enables both long-beam lines for separated target vaults and compact short beams.

Light & compact, the Cyclone® IKON makes no compromise on power with up to 1500µA extracted beam current.

IBA REVOLUTIONIZED OUR WORK

"IBA is a trusted partner for a long time now. We've selected IBA for its world-recognized expertize and because the new Cyclotron is outstanding with its highest level of reliability."

Renaud Dehareng
CEO
Curium Pharma

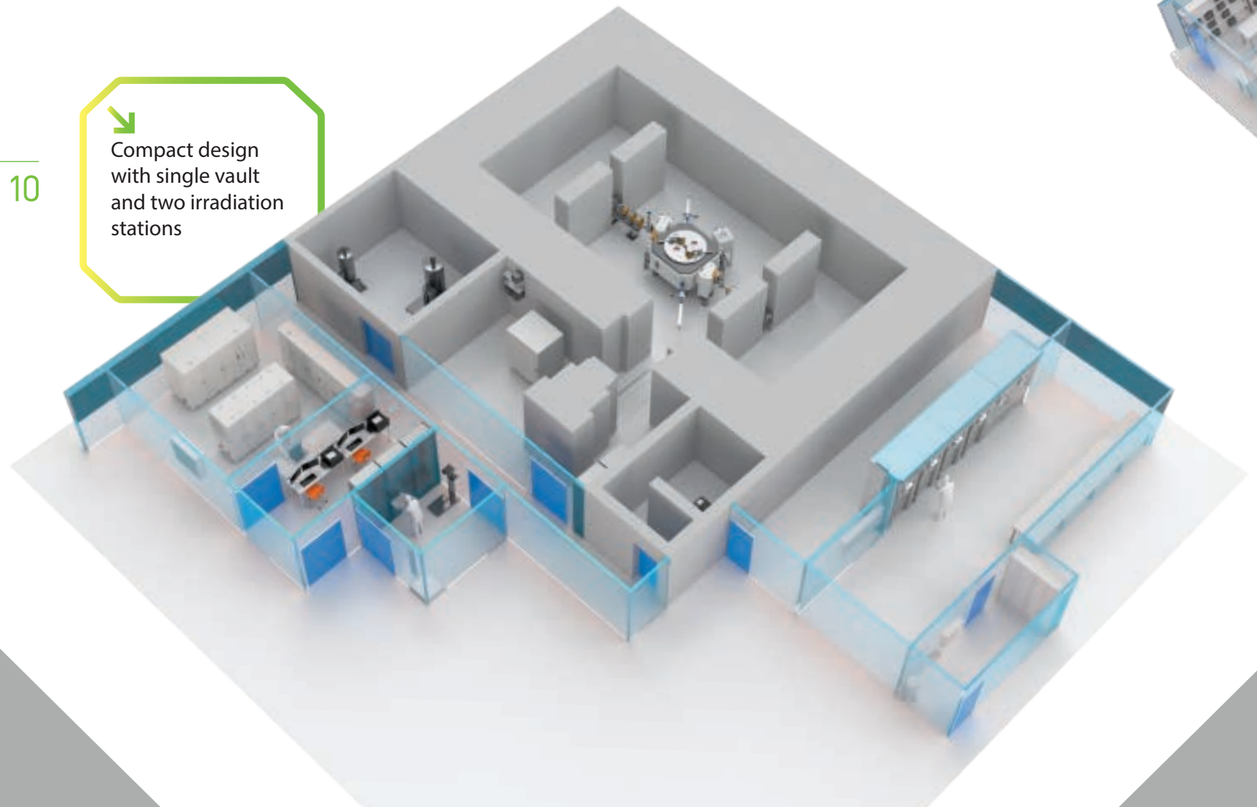


Integrated Solution

Acquiring a cyclotron is only the first step in a complex process.

Multiple procedures and sophisticated equipment must be integrated into a cost effective and high-performance solution.

IBA's experienced team of experts in equipment and radiopharmacy provides the best support to create your fully compliant GMP facility.



Compact design with single vault and two irradiation stations

Extended design with four target vaults for multiple isotope production

From project to reality

The **IBA IntegraLab®** team of experts will support you during every step of the setting up of your tailor-made radiopharmacy.

Trust our experts to advise you on the most compact to the most extended layout, from project definition to routine operation.

Integrated Solution

A comprehensive range of solutions for PET and SPECT isotope production

All the benefits of an integrated solution

We know how important it is to provide integrated solutions. That's why IBA offers complete production solutions, from the target irradiation system to the purified end-product. This enables IBA users to have full control of their production process and to always know who to turn to for support.

Tomorrow's radiopharmaceuticals will not be the same as today's. That's why IBA provides continuous support over the entire lifetime of your project.

We'll help you expand your skills and applications, boost your uptime and maximize the return on your investment with all the latest innovations, services and training. In addition, the system is designed so that future upgrades can be easily implemented to keep your Cyclone® IKON state-of-the-art.

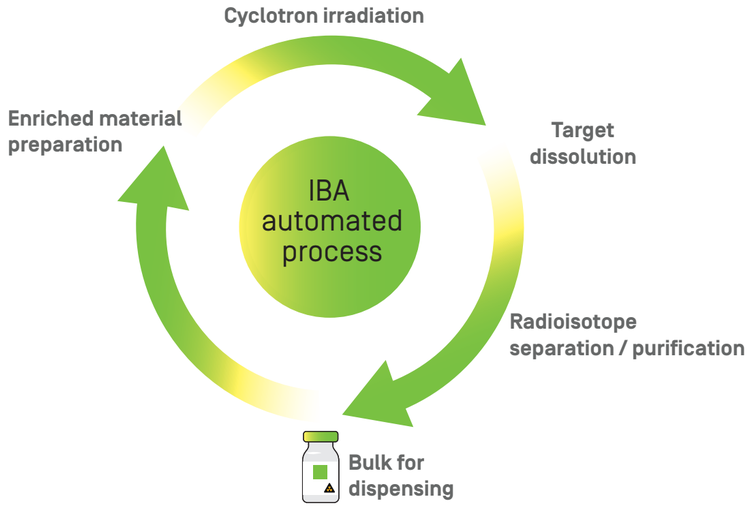
With the Cyclone® IKON, you will be making an attractive investment in the future growth and profitability of your activities.

"We selected IBA because of the reliability of its equipment. It has the most compact and efficient high energy cyclotron on the market."

Erich Kollegger
CEO, Institute of radio-elements Belgium

Radiopharmaceuticals production solutions

RADIOISOTOPE	CHEMISTRY MODULE	MOLECULES PRODUCED
^{18}F	Synthera®	[^{18}F]FDG, [^{18}F]FPSMA, [^{18}F]FET, [^{18}F]FCH, [^{18}F]NaF, [^{18}F]FMISO, [^{18}F]FLT and others...
^{123}I	Pinctada® Iodine	[^{123}I]NaI
^{124}I	Highmor	[^{124}I]NaI
^{64}Cu	Pinctada® Metal	[^{64}Cu]Cl_2
^{89}Zr	Pinctada® Metal	[^{89}Zr][Zr$(C_2O_4)^{4-}$
^{111}In	Pinctada® Indium	[^{111}In]$InCl_3$
^{201}Tl	Pinctada® Thallium	[^{201}Tl]TlCl
^{68}Ga	Synthera® platform	^{68}Ga-DOTATATE, ^{68}Ga-DOTANOC, ^{68}Ga-PSMA
^{99m}Tc	Synthera® platform	[^{99m}Tc]$NaTcO_4$
^{68}Ge	Pinctada® Germanium	[^{68}Ge]Cl_4



Technical specifications

		Cyclone® IKON 500	Cyclone® IKON 1000	Cyclone® IKON 1500
Beam	Particle		proton	
	Energy		13-30 MeV	
	Extracted maximum current	500 µA	1000 µA	1500 µA
	Target maximum current	400 µA	800 µA	1200 µA
Exit ports	Simultaneous extracted beam		2	
	Number of exits per side		3	
	Extraction		automated, stripper system	
	Number of beam lines		up to 4 (2 per side)	
	PET exit port (up to 18MeV)		1 per side	
	Beam line length		short (2m) or long (6m)	
	PET Target switching		optional 5-ports target switching magnet	
Magnet	Technology		resistive magnet	
	DC Power		17 kW	
RF	Technology		RF directly coupled to dees	
	Dee voltage		50 kV	
	Power final amplifier	60 kW	80 kW	100 kW
	Frequency		75 MHz (harmonic 4)	
Ion source	Type of source		external, multicusp	
	Vacuum		turbo pump	
	Injected current	up to 5 mA	up to 10 mA	up to 15 mA
Yoke size & weight	LxW		2.2m x 2.2m	
	H		1.46m (closed) ; 2.26m (open)	
	Weight		30 tons	
Vacuum	Technology		Cryopumps	
	Number of pumps		4	
	Operational vacuum		< 10-7 mbar	
Cyclotron vault	Minimum size (short beam lines)		6m x 11m (h=3m)	
	Minimum size (long beam lines)		6m x 8m (h=3m)	
Electrical power	Cyclotron only (beam on)	160 kW	180 kW	200 kW
	Cyclotron + 2 long beam lines (beam on)	190 kW	210 kW	230 kW
	Standby power (beam off)		~20 kW	
	Installed power		400V, 3-phases, 300 kVA	
HVAC	Cyclotron room	6 kW	7 kW	8 kW
	Power supply room	14 kW	17 kW	20 kW
Cooling	Inlet temperature		6-16°C	
	Heat load (beam ON with 2 beam line)	160 kW	180 kW	200 kW

Patent No. : EP3244707, U10064264 - EP3244708, US9961757 - EP3244709, US10278277 - EP 3244710, US 9907153

Typical production yields

SPECT Isotopes

Isotope	Chemical Form	Target Reaction	Enriched Material	Energy on target (MeV)	Irradiation Time (h) typ.	Yield EOC[1][2] (Ci/100µA)
^{111}In	[^{111}In]$InCl_3$	^{112}Cd(p,2n)^{111}In	^{112}Cd	30	9.5	4.5
^{201}Tl	[^{201}Tl]TlCl	^{203}Tl(p,3n)^{201}Pb→ ^{201}Tl	^{203}Tl	30	9.5	1.2
^{123}I	[^{123}I]NaI	^{124}Xe(p,x)^{123}Cs^{123}Xe →^{123}I	^{124}Xe	30	6	4 (EOB+6h)
^{99m} Tc	[^{99m} Tc]$NaTcO_4$	^{100}Mo(p,2n)^{99}mTc	^{100}Mo	24	6	6.55

PET Isotopes [4]

Isotope	Chemical Form	Target Reaction	Target Material	Target size	Energy on target (Mev)	Irradiation Time (min)	Recovered Activity EOB[3] or Yield
Liquid/Gas							
^{11}C	[^{11}C]CO_2	^{14}N(p,α)^{11}C	N_2+ 1% O_2		15	30	4000 mCi
	[^{11}C]CH_4		N_2+ 5 % H_2		15	30	1000 mCi
^{18}F	[^{18}F]F^-	^{18}O(p,n)^{18}F	$H_2{}^{18}O$	5	18	120	5000 mCi
				8	18	120	8000 mCi
				12	18	120	12000 mCi
				16	18	120	16000 mCi
^{68}Ga	[^{68}Ga]$GaCl_3$	^{68}Zn(p,n)^{68}Ga	^{68}Zn		13	60	120 mCi
Solid							
^{64}Cu	[^{64}Cu]$CuCl_2$	^{64}Ni(p,n) ^{64}Cu	^{64}Ni		14	60-240	1.34-8.5 mCi/µAh[4]
^{89}Zr	$Zr(C_2O_4)_2$	^{89}Y(p,n)^{89}Zr	^{89}Y		13	60-600	0.34-1 mCi/µAh[4]
^{124}I	[^{124}I]NaI	^{124}Te(p,n) ^{124}I	$^{124}TeO_2$		14	60-600	0.5 mCi/µAh

Generator isotope

^{68}Ge	$GeCl_2$	Ga(p,2n)^{68}Ge	^{nat}Ga		30	2500-7200	0.02 mCi/µAh

[1] Purity according to EU pharmacopoeia
[2] EOC: End of chemistry
[3] EOB: End of beam
[4] Depending on target material thickness. For ^{64}Cu : 0.073 mCi/µAh/mg of Ni-64
Note: Other radioisotopes can also be produced with the Cyclone IKON [^{86}Y, ^{67}Ga,...].

Life,
Science.

ABOUT IBA (Ion Beam Applications S.A.)

IBA is a cancer diagnostics and treatment company and the worldwide technology leader in the field of proton therapy. The company's expertise lies in the development of next-generation proton therapy technologies and radiopharmaceuticals that provide oncology care providers with premium quality services and equipment, including IBA's leading fully-integrated IntegraLab® system.

ABOUT IBA RADIOPHARMA SOLUTIONS

Based on long-standing expertise, IBA RadioPharma Solutions supports hospitals and radiopharmaceutical distribution centers with their in-house radioisotope production by providing them with global solutions, from project design to the operation of their facility. In addition to high-quality technology production equipment, IBA has developed in-depth experience in setting up GMP radiopharmaceuticals production centers.

IBA
Chemin du Cyclotron, 3 | 1348 Louvain-la-Neuve, Belgium
T + 32 10 201 275 | F + 32 10 475 958
RadioPharmaSolutions@iba-group.com
iba-radiopharmasolutions.com/cyclone-ikon

Certified B Corporation