MEDICAL RADIOISOTOPE PRODUCTION PLATFORM

Supplying the fight against cancer

Greg Moffitt, PhD
Director of Target Development

Commercial operations begin Q1 2025

West Valley City, UT

177
Lu
nca

Q1 2025

225
Ac

2025

NUSANO

Nusano's proprietary, high-current ion source technology:

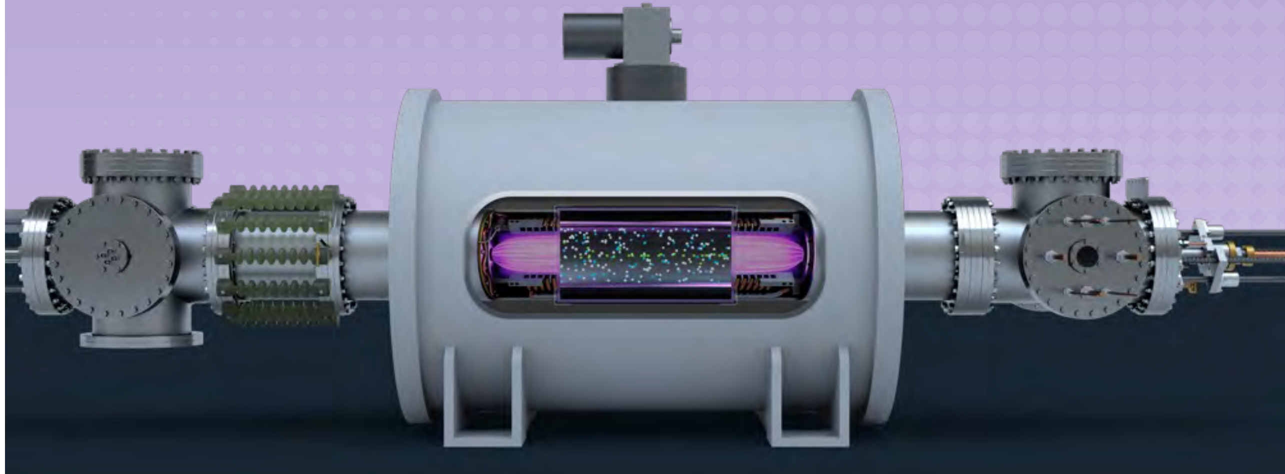
- Generates heavy ions, He^{++} & $^{2}H^{+}$, to greatly increase yield & efficiency
- Beam enables production of broad array of radioisotopes
- Annual preventive maintenance vs. monthly downtime

36mA
ALPHA BEAM CURRENT

≥36mA
DEUTERIUM BEAM CURRENT

288 – 720x
GREATER ALPHA PRODUCTION
than existing alpha ion beams

10,000+
HOURS RUNTIME



Performance

Particles

$^{2}H^{+}$

$^{3}He^{2+}$

$^{4}He^{2+}$

$^{7}Li^{3+}$

3-5

MILLIAMP

AVERAGE CURRENT ON TARGET*

Particle Energy

25 MeV

37.5 MeV

50 MeV

87.5 MeV

* Li beam ~1 mA

Production Capabilities 25+ isotopes

DIAGNOSTIC

- 64 Cu — **Copper-64** — *Beta, Positron*
- 18 F — **Flourine-18** — *Positron*
- 68 Ga — **Gallium-68** — *Gamma*
- 124 I — **Iodine-124** — *Positron, Gamma*
- 82 Rb — **Rubidium-82** — *Positron*
- 89 Zr — **Zirconium-89** — *Positron*
- 67 Ga — **Gallium-67** — *Gamma*
- 111 In — **Indium-111** — *Gamma, Auger*
- 123 I — **Iodine-123** — *Gamma*
- 203 Pb — **Lead-203** — *Gamma*
- 99m Tc — **Technetium-99m** — *Gamma*

PET

SPECT

THERAPEUTIC

- 225 Ac — **Actinium-225** — *Alpha, Beta*
- 211 At — **Astatine-211** — *Alpha*
- 131 Cs — **Cesium-131** — *Brachytherapy, X-ray*
- 67 Cu — **Copper-67** — *Beta*
- 131 I — **Iodine-131** — *Beta*
- 192 Ir — **Iridium-192** — Brachytherapy, Gamma, Beta
- 212 Pb — **Lead-212** — *Alpha*
- 177 Lu — **Lutetium-177** — **n.c.a.** *Beta*
- 103 Pd — **Palladium-103** — Brachytherapy or Auger X-rays, Auger, IC electrons
- 223 Ra — **Radium-223** — *Alpha*
- 186 Re — **Rhenium-186** — *Beta*
- 47 Sc — **Scandium-47** — *Beta*
- 89 Sr — **Strontium-89** — Beta
- 117m Sn — **Tin-117m** — *Gamma, IC electrons*

GENERATOR

- 131 Ba — **Barium-131** → Cs-131
- 68 Ge — **Germanium-68** → Ga-68
- 211 Rn — **Radon-211** → At-211
- 82 Sr — **Strontium-82** → Rb-82
- 227 Th — **Thorium-227** → Ra-223

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^{211}At: Worldwide Production

Table 1
Current ^{211}At production sites. Facilities that have reported production of ^{211}At during the last 5 years.

Location		Facility	Cyclotron manufacturer	Model and target	Production parameters	Current production status
North America	Durham, USA	Duke University Medical Center	CTI	CS-30 cyclotron, Internal target system	28 MeV, 100 μA	Max 9.3 GBq in 4-h
	Seattle, USA	University of Washington Medical Center	Scanditronix	MP-50, External target system	29.0 MeV, 58 μA	Max 4.3 GBq in 4-h
	Philadelphia, USA	University of Pennsylvania	Japan Steel Works (JSW)	BC3015, External Target	28.4 MeV, 10 μA	Max 395 MBq in 5-h
	Bethesda, USA	National Institutes of Health	CTI	CS-30 cyclotron, Internal target system	29.8 MeV, 43 μA	Max 1.71 GBq in 1-h
	College Station, USA	Texas A&M University	In house	K150 variable energy cyclotron	28.8 MeV, 7 μA	1.5 GBq in 9-h
Europe	Copenhagen, Denmark	Copenhagen University Hospital	Scanditronix	MC-32, Internal target system	29 MeV, 20 μA	Max 3–4 GBq in 4-h
	Nantes, France	Arronax	IBA	Cyclone 70	28 MeV, 15 μA	Production since 2020, 0.5–1 GBq capacity
Asia	Osaka, Japan	RCNP-Osaka University	In house	K140 AVF cyclotron	28.2 MeV	3 GBq expected after upgrade
	Chengdu, China	Sichuan University	CTI	CS-30	28 MeV, 15–20 μA	Max 200 MBq in 2-h
	Takasaki, Japan	QST-Takasaki, (TIARA)	In house	AVF (K110)	28.1 MeV, 4.5 μA	300 MBq in 3 h
	Chiba	QST-NIRS	In house	AVF-930	28.5 MeV, 10–13 μA	0.74–1.11GBq in 5-h
	Wako Saitama, Japan	IPCR Riken	In house	AVF	29 MeV, 40 μA	1.3 GBq in 1-h
	Fukushima City, Japan	Fukushima Medical University	Sumitomo	CYPRIS MP-30, External target system	29 MeV, 20 μA	Max 2 GBq in 4-h

Source: Yutian Feng, Michael R. Zalutsky. (2021). Production, purification and availability of 211At: Near term steps towards global access. *Nuclear Medicine and Biology, Volumes 100–101*, Pages 12-23. https://doi.org/10.1016/j.nucmedbio.2021.05.007.

~350 μA

combined worldwide alpha current being used to produce ^{211}At **in the last 5 years**

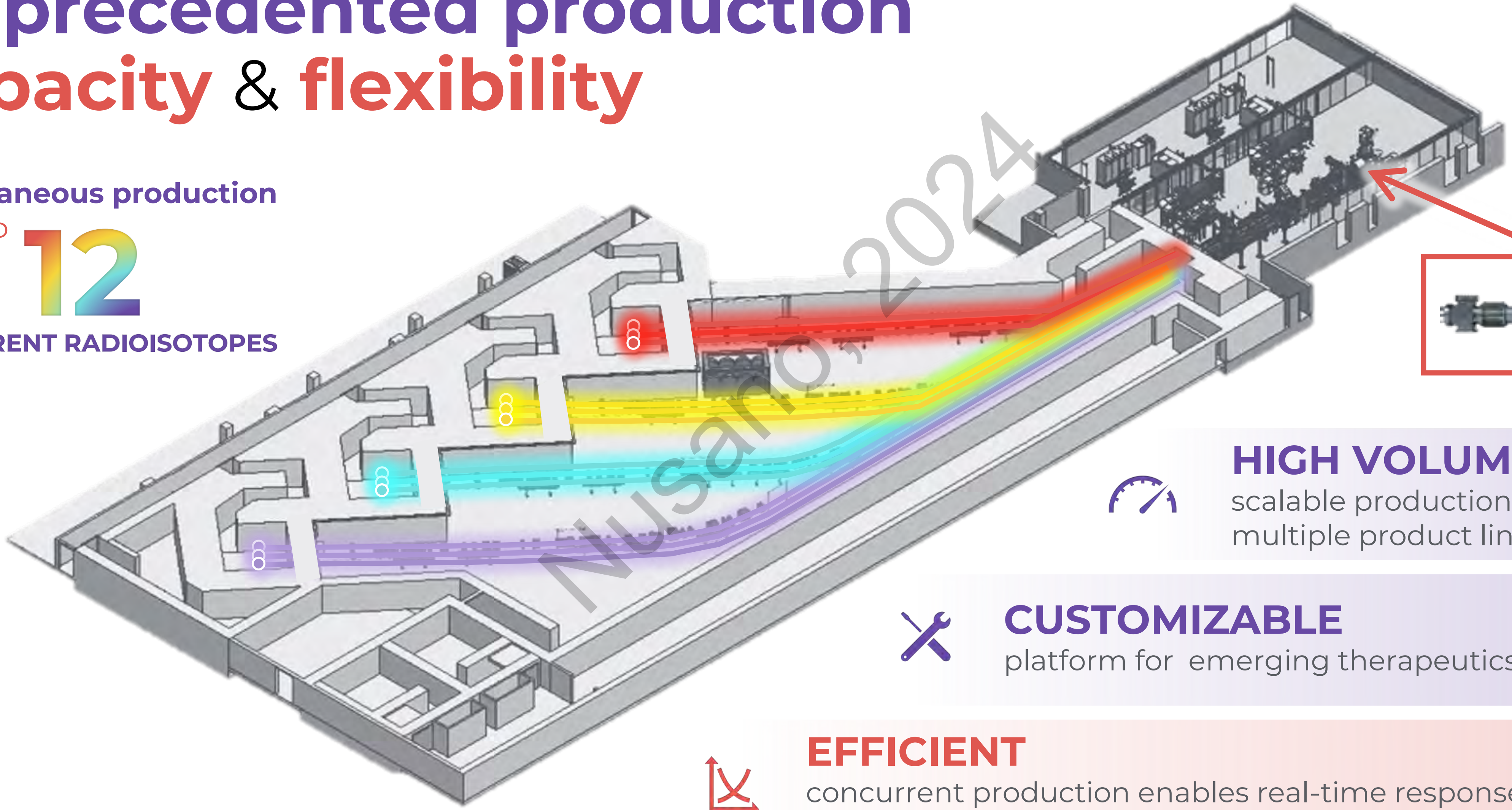
Nusano's single facility will have an

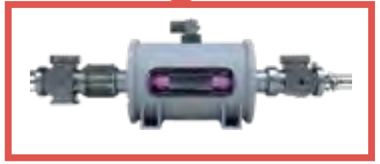
ORDER of MAGNITUDE

greater current than current worldwide capacity

Unprecedented production capacity & flexibility

Simultaneous production
of up to **12**
DIFFERENT RADIOISOTOPES





HIGH VOLUME
scalable production supporting multiple product lines at launch

CUSTOMIZABLE
platform for emerging therapeutics needs

EFFICIENT
concurrent production enables real-time response to changing isotope needs

^{211}At Production

211

At

DIRECT

^{211}At yields: 0.44-1.1 mCi/μAhr[1]

Average current 250 μA per target with up to 12 simultaneously running targets

Annual production capacity of ^{211}At up to 27000 Ci at EOB

With co-location and/or vertical integration, single facility able to serve entire U.S. market for R&D/early phase trials

Future: ~3 production sites in U.S. and 1-2 in EU to fulfill market needs when multiple approved therapeutics on market

[1]Source: Yutian Feng, Michael R. Zalutsky. (2021). Production, purification and availability of 211At: Near term steps towards global access. *Nuclear Medicine and Biology, Volumes 100–101*, Pages 12-23. https://doi.org/10.1016/j.nucmedbio.2021.05.007.

^{211}At Production

211

Rn

INDIRECT

FUTURE CAPABILITY

Nusano's $^{7}Li^{+++}$ source capability untested, though we are highly confident we could do >1 mA of average current

^{211}Rn generator for ^{211}At - expand our service region

Calculated yearly production capacity ^{211}Rn at EOB: 400-600 Ci

Special consideration to avoid/limit co-production of ^{210}Rn

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[1]Source: Yutian Feng, Michael R. Zalutsky. (2021). Production, purification and availability of 211At: Near term steps towards global access. *Nuclear Medicine and Biology, Volumes 100–101*, Pages 12-23. https://doi.org/10.1016/j.nucmedbio.2021.05.007.

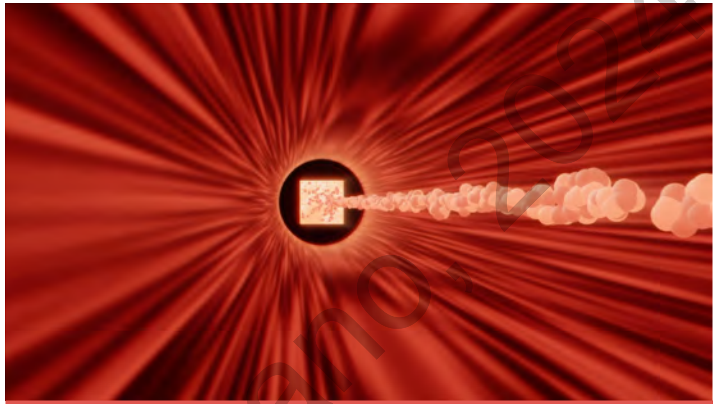
CONTACT | Gregory Moffitt, PhD | info@nusano.com

Technology Overview Videos

Watch at https://nusano.link/tech-overview

Transforming Radioisotope Production: The Nusano Platform

Nusano's CEO, **Chris Lowe**, and Co-Founder, **Howard Lewin**, provide an overview of the Nusano production platform. The first-of-its-kind technology allows for simultaneous production of multiple products and provides the flexibility to create rare and undersupplied isotopes.



Nusano Beam Flythrough

The Nusano production platform is capable of producing a wide variety of radioisotopes for cancer diagnostics and therapeutics and can switch between products in a matter of minutes. In this video, viewers travel with the ions through Nusano's process to see how radioisotopes are created.

Technical Overview: How the Nusano Ion Source Creates Alpha Ions

Existing electron cyclotron resonance (or ECR) methods generate less than 1 percent alpha ions. Nusano solves this problem by shifting from making alpha ions in one step to making them in two steps. The result is a rich, sustained flow of heavy ions through the accelerator – more than 700 times greater than existing alpha beams.