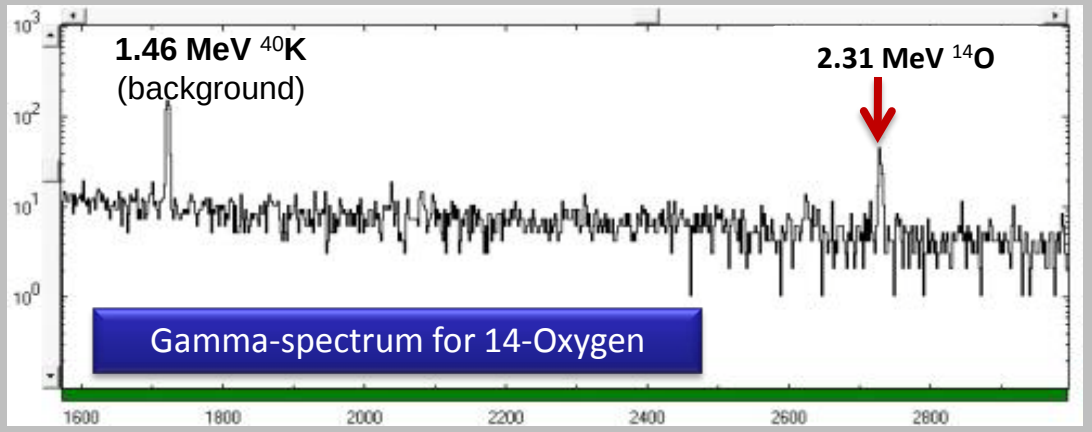
RIB produced so far

RIB	Prod. route	T1/2	I(pps) @ before RFQ	I(pps) @ after RFQ	Applications
^{14}O	$^{14}N(p, n)$	71 s	5.0×10^3	3.2×10^3	super-allowed beta decay, test of standard model; break-out reaction from hot CNO cycle to rp-process
^{42}K	$^{40}Ar(\alpha,pn)$	12.36 hr	2.7×10^3	-	bio-medical tracer
^{43}K	$^{40}Ar(\alpha,p)$	22.3 hr	1.2×10^3	-	bio-medical tracer
^{41}Ar	$^{40}Ar(\alpha,2pn)$	109 min	1.3×10^3	-	tracer used in engineering ; wear studies
^{111}In	$^{nat}Ag(\alpha,xn)$	2.8 days	1.6×10^3	-	Perturbed angular correlation spectroscopy, medical radio-tracer

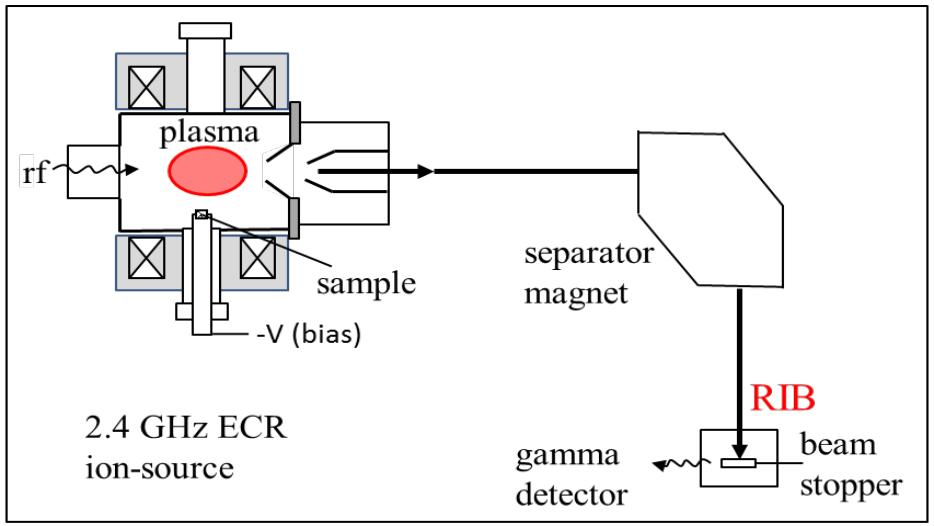


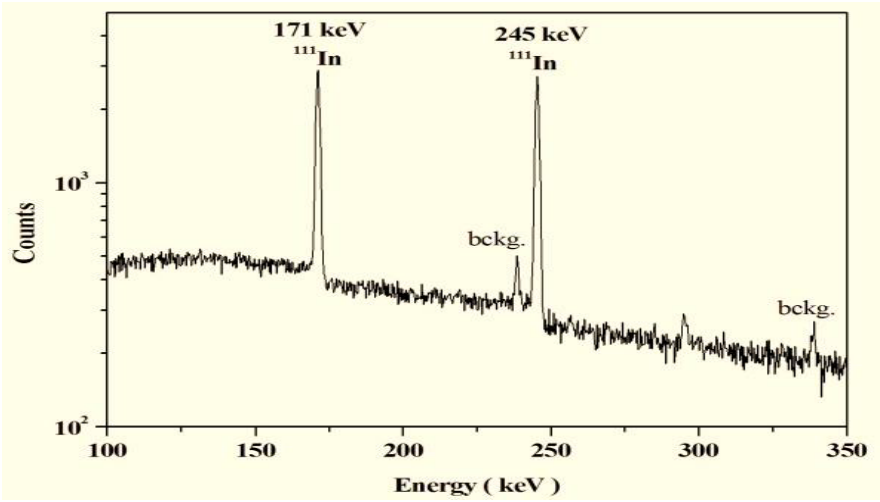
Gamma-spectrum for 14-Oxygen

Optimized parameter	value
beam	$^{14}O^{2+}$
ECR ext. vol.	12.3 kV
RFQ power	10 kW cw
RFQ vane vol.	27 kV

RFQ parameters for 14-Oxygen

^{111}In RIB by ion-beam sputtering for Perturbed Angular Correlation studies





Gamma-ray spectrum from decay of ^{111}In

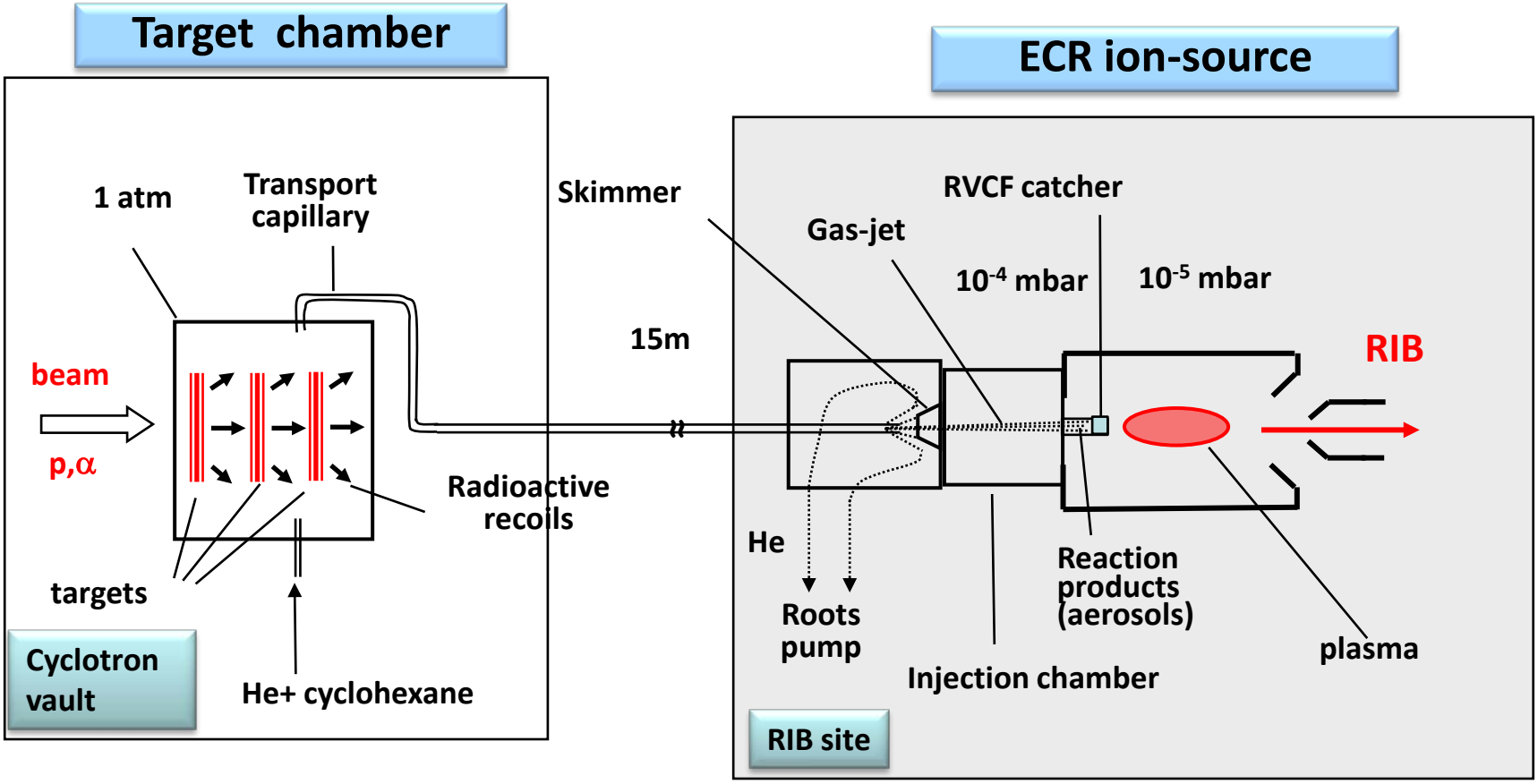
PAC : hyperfine interaction between the probe and lattice site gives information about the surroundings. Required implanted dose ≈ 10^{9} - 10^{10} atoms

^{111}In RIB : indium produced in ^{nat}Ag(α,xn) with 30 MeV, alpha beam from K-130 cyclotron.

70 micro-curie activity inserted in ECR plasma chamber ; measured ^{111}In dose on sample ~ $1x10^{9}$

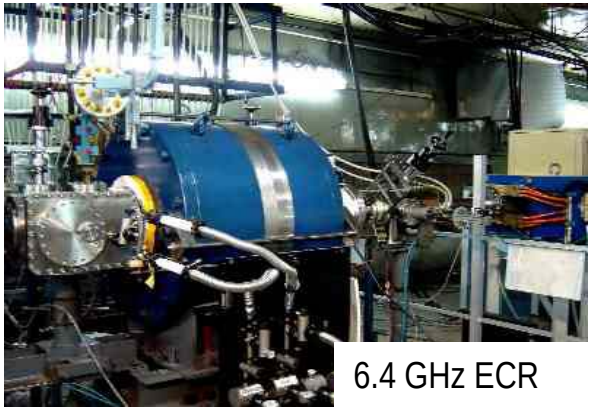
One user experiment was done (Parnika Das et.al) using this beam. In this experiment the change in beta-decay rate, which is of fundamental importance in nuclear astrophysics, is being examined for ^{111}In by implanting it in different environment such as gold and silicon matrix.

Gas-jet based RIB production using RVCF as Catcher



RVCF : reticulus vitrous carbon fibres : very porous

RIB facility also delivers beams of stable isotopes



6.4 GHz ECR

2.4 GHz ECR

Nucl. Instrum. & Meth. A 447 (2000) 345
Nucl. Instrum. & Meth. A547 (2005)270
Nucl. Instrum. & Meth. A562 (2006)41

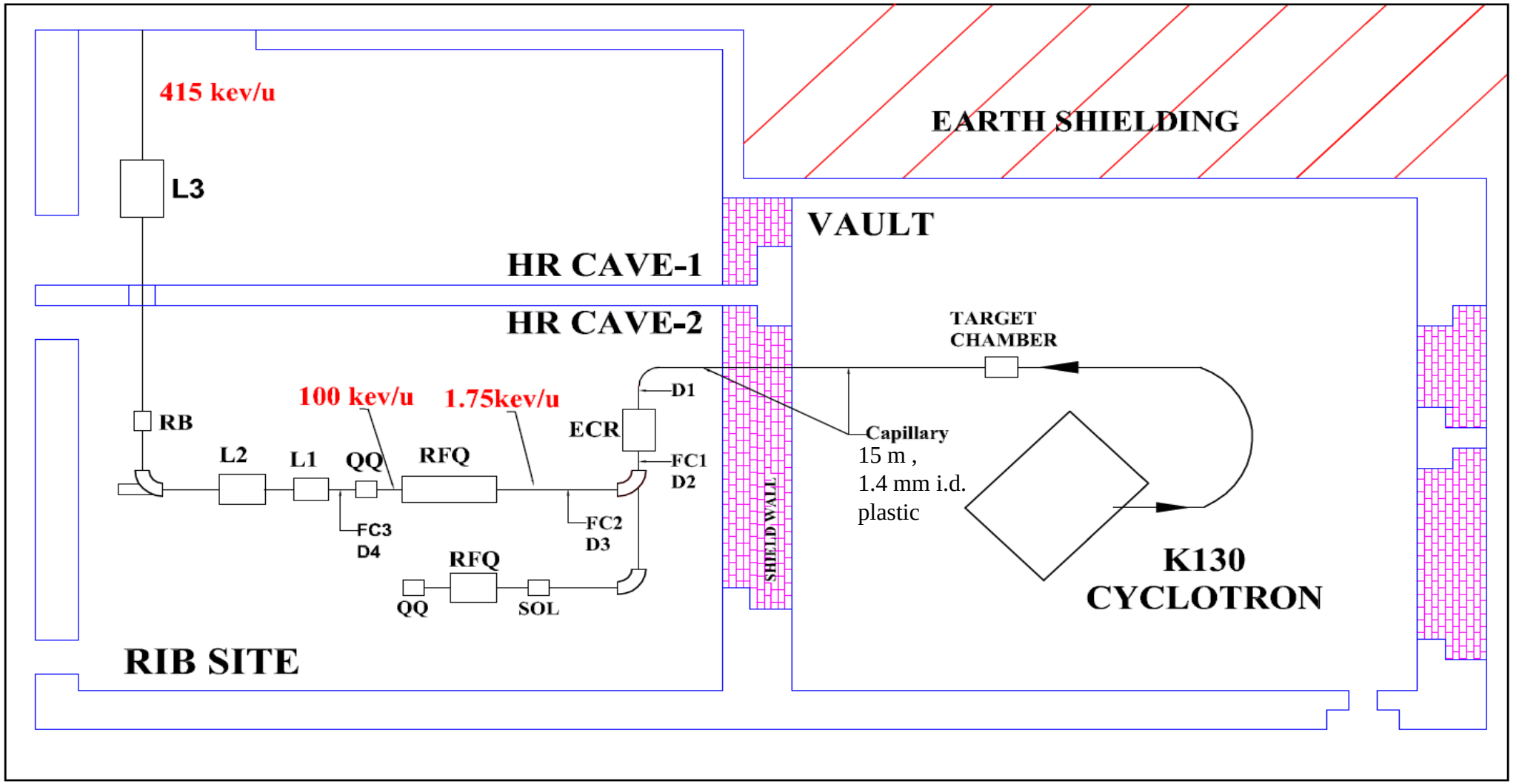
Stable isotope beams available

Species	*Method of production*
Ar	Argon gas
C	CO_2 gas
O	O_2 gas
N	N_2 gas
K	KCl evaporation
Fe	Ferrocene; by MIVOC (metallic ions from volatile organic compounds) method
Zn	Zinc oxide ; sputtering
In	Indium oxide : sputtering

Typical beam currents ~ 1 – 100 micro-amps depending on species & charge state

Production of RIB using gas-jet coupled ECR ion-source

Experimental arrangement



First online production of radioactive ion beams at VECC

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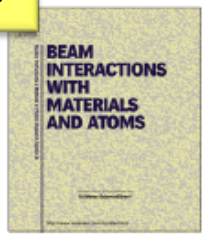

First online production of radioactive ion beams at VECC

Vaishali Naik [a,*], Alok Chakrabarti [a], Mahuwa Bhattacharjee [a], Prasanta Karmakar [a], Sampa Bhattacharjee [b], Arup Bandyopadhyay [a], Siddhartha Dechoudhury [a], Dodi Lavanya Kumar [a], Manas Mondal [a], H.K. Pandey [a], T.K. Mandi [a], D.P. Dutta [a], Tapatee Kundu Roy [a], Debasis Bhowmik [a], Dirtha Sanyal [a], Ayan Ray [a], Md. Sabir Ali [a], S.C.L. Srivastava [a], P.Y. Nabhiraj [a]

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…using a novel gas-jet ECR technique

REVIEW OF SCIENTIFIC INSTRUMENTS **84**, 033301 (2013)

A gas-jet transport and catcher technique for on-line production of radioactive ion beams using an electron cyclotron resonance ion-source

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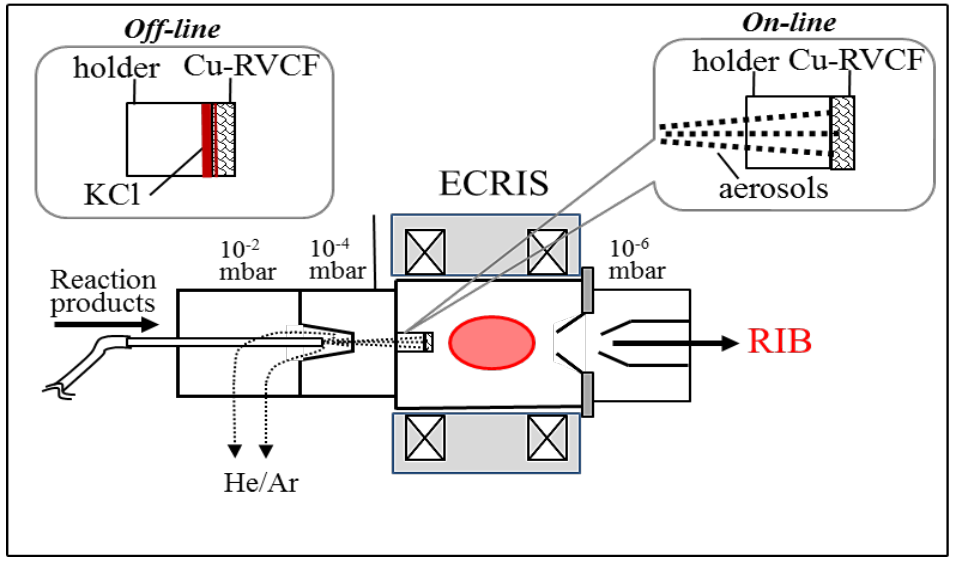
Off-line tests

(a) choose optimum position of the catcher to get minimum reflected rf power

(b) see if any beam transported out of the ECR

(c) check if surface of the catcher deteriorates

(d) vacuum with high pressure in target chamber



~ 3 micro-amp of K^{4+} with 80 W rf, without gas load
Vacuum of 10^{-5} mbar with 1 atm Ar in target chamber

On-line tests