

Estimates of proton-rich beam intensities with upgraded target designs and the C70 upgrade

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Element	Mass	Accelerated beam intensity (ions/second on target)			Comments
		present HRIBF capability	with improved target designs	with improved target designs and C70 upgrade	
Be	7	2×10^7	n/a	2×10^7	more readily available with C70
	10	3×10^7	n/a	n/a	limited supply, not likely to be produced with C70
F	17	2×10^7	4×10^7	2×10^8	HfO ₂ target
	18	2×10^6	4×10^6	2×10^7	HfO ₂ target
Al	25	1×10^4	2×10^4	1×10^5	SiC or Nb ₅ Si ₃ target
	26m	1×10^4	2×10^4	1×10^5	SiC or Nb ₅ Si ₃ target
	26g	2×10^7	n/a	n/a	limited supply, not likely to be produced with C70
Si	26	1×10^3	1×10^4	2×10^4	Al ₂ O ₃ target; production beam limit is very low (< 1μA)
Cl	34	5×10^3	1×10^4	5×10^4	CeS target; target material not readily available
Cu	60	3×10^3	1.5×10^4	3×10^4	liquid nickel target; relatively low operating temperature
Ga	67	3×10^5	1.5×10^6	6×10^6	liquid germanium target (mass 70 enriched)
As	69	2×10^6	1×10^7	2×10^7	liquid germanium target (mass 70 enriched)
Si	27	1×10^3	1×10^4	1×10^4	Al ₂ O ₃ target; production beam limit is very low (< 1μA)
Cu	61	1×10^3	5×10^3	1×10^4	low yields with natural abundance targets (liquid Ni)
	62	1×10^3	5×10^3	1×10^4	low yields with natural abundance targets (liquid Ni)
Ga	65	1×10^3	5×10^3	2×10^4	liquid ⁷⁰ Ge target (enriched)
	66	1×10^4	5×10^4	2×10^5	liquid ⁷⁰ Ge target (enriched)
	68	1×10^5	5×10^6	1×10^6	liquid Ge target (natural abundance)
	69	stable			
	70	1×10^4	5×10^4	1×10^5	liquid Ge target (natural abundance)
	71	stable			
	72	1×10^4	5×10^4	1×10^5	liquid Ge target (natural abundance)

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	73	1×10^3	5×10^3	1×10^4	liquid Ge target (natural abundance)
As	70	1×10^7	5×10^7	1×10^8	liquid Ge target (natural abundance) for these As isotopes
	71	1×10^6	5×10^6	1×10^7	
	72	1×10^7	5×10^7	1×10^8	
	73	1×10^7	5×10^7	1×10^8	
	74	1×10^7	5×10^7	1×10^8	
	75	stable			
	76	1×10^6	5×10^6	1×10^7	
	77	1×10^5	5×10^5	1×10^6	
	78	1×10^4	5×10^4	1×10^5	
	79	1×10^4	5×10^4	1×10^5	
Se	70	1×10^4	5×10^4	5×10^4	liquid ^{70}Ge target (enriched)
	71	1×10^6	5×10^6	5×10^6	liquid ^{70}Ge target (enriched)
	72	1×10^7	5×10^7	5×10^7	liquid ^{70}Ge target (enriched)
	73	1×10^7	5×10^7	5×10^7	liquid ^{70}Ge target (enriched)
	74	stable			
	75	1×10^6	5×10^6	5×10^6	liquid Ge target (natural abundance)
	76	stable			
	77	stable			
	78	stable			
	79	1×10^4	5×10^4	5×10^4	liquid Ge target (natural abundance)
C	11	8×10^4	8×10^4	8×10^5	see notes below
Co	56	4×10^8	4×10^8	4×10^9	see notes below
Ni	56	2×10^7	2×10^7	2×10^8	see notes below

These batch-mode beams have not yet been post-accelerated at the HRIBF. Intensities are based on calculated production rates and sputtering efficiencies measured in an off-line ion source. Aggressive target cooling during irradiation will be needed to take advantage of the higher production beam currents available with the C70 cyclotron.