

BEAM LIST FOR STAND-ALONE OPERATION AT REA3, REA6, OR STOPPED BEAM AREA

The following list includes stable and long-lived radioactive beams that may be run at ReA3, ReA6, or the stopped beam area in stand-alone mode (that is, not coupled to the FRIB linac).

Please note that beams of long-lived and rare stable isotopes are subject to availability of material at the time of the experiment.

Z	Element	A	Maximum intensity (pps) **	Q	Maximum energy ReA3 (MeV/u)	Maximum energy ReA6 (MeV/u)	Half-life ***
1	H	1	1.0E+10	1	6.0	12.0	
2	He	3	1.0E+08	1	4.0	8.0	
		4	1.0E+08	2	6.0	12.0	
		4	1.0E+10	1	3.0	6.0	
3	Li	6	1.0E+07	2	4.0	8.0	
		7	1.0E+07	3	5.1	10.3	
4	Be	7	5.0E+05	3	5.1	10.3	53 days
		9	1.0E+07	4	5.3	10.7	
		10	5.0E+05	4	4.8	9.6	1.5x10 ⁶ years
5	B	10	1.0E+06	4	4.8	9.6	
		11	2.6E+06	5	5.5	10.9	
6	C	12	1.0E+08	5	5.0	10.0	
		13	1.0E+08	6	5.5	11.1	
7	N	14	1.0E+08	6	5.1	10.3	
		15	1.0E+08	7	5.6	11.2	
8	O	16	1.0E+08	7	5.3	10.5	
		17	1.0E+05	8	5.6	11.3	
		18	1.0E+07	8	5.3	10.7	
9	F	19	1.0E+06	9	5.7	11.4	
10	Ne	20	1.0E+09	9	5.4	10.8	
		21	1.0E+06	10	5.7	11.4	
		22	1.0E+06	10	5.5	10.9	
11	Na	23	1.0E+07	11	5.7	11.5	
12	Mg	24	1.0E+07	11	5.5	11.0	
		25	1.0E+07	11	5.3	10.6	

		26	1.0E+07	11	5.1	10.2	
13	Al	26	1.0E+06	12	5.5	11.1	7x10 ⁵ years
		27	1.0E+08	12	5.3	10.7	
14	Si	28	1.0E+07	13	5.6	11.1	
		29	1.0E+07	13	5.4	10.8	
		30	1.0E+07	13	5.2	10.4	
		32	1.0E+06	13	4.9	9.8	153 years
15	P	31	1.0E+07	14	5.4	10.8	
		33	1.0E+06	14	5.1	10.2	25 days
16	S	32	1.0E+06	15	5.6	11.3	
		33	1.0E+07	14	5.1	10.2	
		34	1.0E+07	14	4.9	9.9	
		36	1.0E+05	14	4.7	9.3	
17	Cl	35	1.0E+07	15	5.1	10.3	
		37	1.0E+07	15	4.9	9.7	
18	Ar	36	1.0E+07	16	5.3	10.7	
		38	1.0E+05	16	5.1	10.1	
		40	1.0E+07	16	4.8	9.6	
19	K	39	1.0E+07	17	5.2	10.5	
		41	1.0E+07	17	5.0	10.0	
20	Ca	40	1.0E+06	19	5.7	11.4	
		41	1.0E+04	17	5.0	10.0	99,400 years
		42	1.0E+06	17	4.9	9.7	
		43	1.0E+06	18	5.0	10.0	
		44	1.0E+06	18	4.9	9.8	
		46	1.0E+06	18	4.7	9.4	
		48	1.0E+06	17	4.3	8.5	
22	Ti	46	1.0E+06	20	5.2	10.4	
		47	1.0E+06	20	5.1	10.2	
		48	1.0E+06	19	4.8	9.5	
		49	1.0E+06	20	4.9	9.8	

		50	1.0E+06	20	4.8	9.6	
23	V	48	1.0E+03	22	5.5	11.0	15 days
		49	1.0E+06	20	4.9	9.8	330 days
		50	1.0E+06	21	5.0	10.1	
		51	1.0E+06	21	4.9	9.9	
24	Cr	50	1.0E+06	22	5.3	10.6	
		52	1.0E+06	22	5.1	10.2	
		53	1.0E+06	22	5.0	10.0	
		54	1.0E+06	22	4.9	9.8	
26	Fe	54	1.0E+06	24	5.3	10.7	
		55	1.0E+06	24	5.2	10.5	2.7 years
		56	1.0E+06	23	4.9	9.9	
		57	1.0E+06	24	5.1	10.1	
		58	1.0E+06	24	5.0	9.9	
		59	1.0E+03	24	4.9	9.8	44 days
		60	1.0E+04	25	5.0	10.0	2.6x10 ⁶ years
28	Ni	56	1.0E+04	24	5.1	10.3	6 days
		58	1.0E+06	26	5.4	10.8	
		60	1.0E+06	26	5.2	10.4	
		61	1.0E+06	26	5.1	10.2	
		62	1.0E+06	26	5.0	10.1	
		64	1.0E+06	26	4.9	9.8	
29	Cu	63	1.0E+06	26	5.0	9.9	
		65	1.0E+06	27	5.0	10.0	
30	Zn	64	1.0E+06	27	5.1	10.1	
		66	1.0E+06	28	5.1	10.2	
		67	1.0E+06	28	5.0	10.0	
		68	1.0E+06	28	4.9	9.9	
		70	1.0E+05	28	4.8	9.6	
31	Ga	69	1.0E+06	29	5.0	10.1	
		71	1.0E+06	29	4.9	9.8	

32	Ge	70	1.0E+06	29	5.0	9.9	
		72	1.0E+06	29	4.8	9.7	
		73	1.0E+06	29	4.8	9.5	
		74	1.0E+06	29	4.7	9.4	
		76	1.0E+06	29	4.6	9.2	
33	As	73	1.0E+06	29	4.8	9.5	80 days
		75	1.0E+05	29	4.6	9.3	
34	Se	74	1.0E+05	32	5.2	10.4	
		76	1.0E+06	32	5.1	10.1	
		77	1.0E+06	32	5.0	10.0	
		78	1.0E+06	32	4.9	9.8	
		80	1.0E+06	32	4.8	9.6	
		82	1.0E+06	32	4.7	9.4	
35	Br	79	1.0E+06	32	4.9	9.7	
		81	1.0E+06	32	4.7	9.5	
36	Kr	78	1.0E+07	32	4.9	9.8	
		80	1.0E+07	32	4.8	9.6	
		82	1.0E+07	32	4.7	9.4	
		83	1.0E+07	32	4.6	9.3	
		84	1.0E+07	32	4.6	9.1	
		86	1.0E+07	32	4.5	8.9	
37	Rb	83	1.0E+05	32	4.6	9.3	86.2 days
		85	1.0E+07	32	4.5	9.0	
		87	4.0E+06	32	4.4	8.8	
38	Sr	84	1.0E+06	32	4.6	9.1	
		86	1.0E+06	32	4.5	8.9	
		87	1.0E+06	32	4.4	8.8	
		88	1.0E+06	32	4.4	8.7	
46	Pd	102	1.0E+06	39	4.6	9.2	
		104	1.0E+06	38	4.4	8.8	
		105	1.0E+06	39	4.5	8.9	

		106	1.0E+06	39	4.4	8.8	
		108	1.0E+06	39	4.3	8.7	
		110	1.0E+06	39	4.3	8.5	
47	Ag	107	1.0E+06	40	4.5	9.0	
		109	1.0E+06	39	4.3	8.6	
48	Cd	106	1.0E+06	41	4.6	9.3	
		108	1.0E+06	41	4.6	9.1	
		110	1.0E+06	41	4.5	8.9	
		111	1.0E+06	41	4.4	8.9	
		112	1.0E+06	41	4.4	8.8	
		113	1.0E+06	41	4.4	8.7	
		114	1.0E+06	41	4.3	8.6	
		116	1.0E+06	41	4.2	8.5	
49	In	113	1.0E+06	42	4.5	8.9	
		115	1.0E+06	42	4.4	8.8	
50	Sn	112	1.0E+06	43	4.6	9.2	
		114	1.0E+06	43	4.5	9.1	
		115	1.0E+06	43	4.5	9.0	
		116	1.0E+06	43	4.4	8.9	
		117	1.0E+06	43	4.4	8.8	
		118	1.0E+06	43	4.4	8.7	
		119	1.0E+06	43	4.3	8.7	
		120	1.0E+06	43	4.3	8.6	
		122	1.0E+06	43	4.2	8.5	
		124	1.0E+06	43	4.2	8.3	
51	Sb	121	1.0E+06	44	4.4	8.7	
		123	1.0E+06	44	4.3	8.6	
52	Te	120	1.0E+06	44	4.4	8.8	
		122	1.0E+06	45	4.4	8.9	
		123	1.0E+06	45	4.4	8.8	
		124	1.0E+06	45	4.4	8.7	

		125	1.0E+06	45	4.3	8.6	
		126	1.0E+06	45	4.3	8.6	
		128	1.0E+06	45	4.2	8.4	
		130	1.0E+06	45	4.2	8.3	
53	I	127	1.0E+06	46	4.3	8.7	
54	Xe	124	1.0E+06	47	4.5	9.1	
		126	1.0E+06	47	4.5	9.0	
		128	1.0E+06	47	4.4	8.8	
		129	1.0E+06	47	4.4	8.7	
		130	1.0E+06	47	4.3	8.7	
		131	1.0E+06	47	4.3	8.6	
		132	1.0E+06	47	4.3	8.5	
		134	1.0E+06	47	4.2	8.4	
		136	1.0E+06	47	4.1	8.3	
55	Cs	133	1.0E+06	47	4.2	8.5	

** Intensities are quoted for the charge states indicated. Intensities can vary with the charge state and energy.

Higher energies for heavy isotopes can be obtained with reduced intensity.

Higher intensities may be obtained by choosing a lower charge state than indicated, which would also come at a lower energy.

Please contact the [Manager for User Relations](#) for a specific energy or beam intensity.

*** Half-lives are given for the long-lived isotopes. Isotopes with no half-lives given are stable.