

ReA3 Radioactive Beam List

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
22	12	Mg	g	3.8755 sec	8.70E+02	5.5
23	12	Mg	g	11.317sec	1.80E+04	5.3

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
26	14	Si	g	2.2283 sec	3.14E+02	6.000
27	14	Si	g	4.15 sec	1.32E+03	5.778
31	14	Si	g	157.3 min	2.48E+03	5.032
32	14	Si	g	153 y	9.65E+02	4.875
33	14	Si	g	6.18 sec	3.26E+02	4.727
34	14	Si	g	2.77 sec	3.00E+02	4.588

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
29	15	P	g	4.142 sec	6.40E+02	5.4
30	15	P	g	2.498 min	3.10E+03	5.3
32	15	P	g	14.263 d	4.60E+03	5.0
33	15	P	g	25.35 d	3.10E+03	4.8
34	15	P	g	12.43 sec	1.20E+03	4.7
35	15	P	g	47.3sec	3.90E+02	4.6

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
30	16	S	g	2.572 sec	4.60E+02	5.6
31	16	S	g	2.572 sec	8.60E+03	5.5
35	16	S	g	87.37 d	3.70E+04	4.9
37	16	S	g	5.05 min	6.50E+03	4.7
38	16	S	g	170.3 min	2.40E+03	4.5
39	16	S	g	11 sec	8.80E+02	4.4

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
32	17	Cl	g	298 ms	1.10E+03	5.6
33	17	Cl	g	2.511 sec	1.70E+04	5.5
34	17	Cl	g+i	1.5266 sec	8.80E+04	5.4
38	17	Cl	g+i	37.24 min	5.20E+04	4.8
39	17	Cl	g	56.2 min	2.20E+04	4.7
40	17	Cl	g	1.35 min	5.70E+03	4.6
41	17	Cl	g	38.4 sec	2.70E+03	4.5
42	17	Cl	g	6.8 sec	1.00E+03	4.4
43	17	Cl	g	3.13 sec	5.80E+02	4.3

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
34	18	Ar	g	843.8 ms	3.30E+03	5.7
35	18	Ar	g	1.7756 sec	3.40E+04	5.5
37	18	Ar	g	35.011d	1.40E+04	5.3
39	18	Ar	g	269 y	1.00E+05	5.0

41	18	Ar	g	109.61 min	3.10E+04	4.8
42	18	Ar	g	32.9 y	3.10E+04	4.7
43	18	Ar	g	5.37 min	1.80E+04	4.6
44	18	Ar	g	11.87 min	7.80E+03	4.5
45	18	Ar	g	21.48 sec	2.70E+03	4.4
46	18	Ar	g	3.13 sec	7.00E+02	4.3

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
37	19	K	g	1.2 sec	1.20E+04	5.5
38	19	K	g+i	7.636 min	7.90E+04	5.4
42	19	K	g	12.4 hr	3.90E+04	5.0
43	19	K	g	22.3 hr	6.80E+04	4.8
44	19	K	g	22.1 min	8.60E+04	4.7
45	19	K	g	17.3 min	9.80E+04	4.7
46	19	K	g	105 sec	7.7 E+04	4.6
47	19	K	g	17.5 sec	4.70E+04	4.5

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
38	20	Ca	g	444 ms	5.40E+02	5.7
39	20	Ca	g	860 ms	3.60E+03	5.6
45	20	Ca	g	162.61 d	1.44E+03	4.9
47	20	Ca	g	4.536 d	3.60E+03	4.7
49	20	Ca	g	8.718 min	7.20E+02	4.5

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
43	21	Sc	g+i	3.89 hr	6.00E+02	5.4
44	21	Sc	g+i	3.97 h, 58.6 h	6.72E+02	5.3
49	21	Sc	g+i	57.18 min	3.84E+02	4.8

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
46	23	V	g	0.422 sec	5.44E+02	5.5
47	23	V	g	32.6 min	1.70E+03	5.4
48	23	V	g	15.9735 d	2.84E+03	5.3
49	23	V	g	330 d	3.68E+03	5.1
52	23	V	g	3.743 min	3.31E+02	4.8
53	23	V	g	1.543 min	3.09E+02	4.8

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
50	25	Mn	g+i	283.2 ms	4.80E+02	4.5
51	25	Mn	g	46.2 min	1.80E+03	4.4
52	25	Mn	g+i	5.59 d	3.60E+03	4.3
53	25	Mn	g	3.7 My	2.80E+03	4.2
54	25	Mn	g	312.1 d	2.00E+03	4.2
56	25	Mn	g	2.58 hr	1.10E+03	4.0
57	25	Mn	g	85.4 sec	5.30E+02	4.0
58	25	Mn	g+i	3.0 sec	3.60E+02	3.9

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
51	26	Fe	g	0.3 sec	4.40E+02	4.6
52	26	Fe	g+i	8.3 hr	1.20E+03	4.5
53	26	Fe	g+i	8.5 min	8.00E+03	4.4
55	26	Fe	g	2.7 yr	2.10E+04	4.3
59	26	Fe	g	44 d	2.50E+03	4.1
60	26	Fe	g	1.5 My	1.80E+03	4.0
61	26	Fe	g	6 min	5.80E+02	4.0

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
54	27	Co	g+i	0.2 sec	1.60E+03	4.6
55	27	Co	g	17.5 hr	1.60E+04	4.5
56	27	Co	g	77 d	6.50E+04	4.4
57	27	Co	g	272 d	6.70E+04	4.4
58	27	Co	g+i	71 d	2.00E+03	4.3
60	27	Co	g+i	5.2 y	1.10E+04	4.2
61	27	Co	g	1.6 hr	8.80E+03	4.1
62	27	Co	g+i	1.5 min	1.00E+04	4.1
63	27	Co	g	27 sec	5.90E+03	4.0
64	27	Co	g	300 ms	4.50E+02	4.0

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
56	28	Ni	g	6.075 d	1.9E +03	4.6
57	28	Ni	g	35.6 hr	1.30E+04	4.5
59	28	Ni	g	101 ky	1.20E+03	4.4
63	28	Ni	g+i	101.7 y	1.10E+04	4.2
65	28	Ni	g+i	2.52 hr	1.30E+03	4.1
66	28	Ni	g	54.6 hr	3.40E+02	4.0
67	28	Ni	g+1	21 sec	3.00E+02	4.0

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
60	29	Cu	g	23.7 min	6.56E+02	4.0
61	29	Cu	g	3.33 hr	1.58E+03	4.0
62	29	Cu	g	9.67 min	1.77E+03	3.9
66	29	Cu	g	5.12 min	2.63E+03	3.8
67	29	Cu	g	61.83 hr	2.36E+03	3.7
68	29	Cu	g+i	30.9 sec	1.58E+03	3.7
69	29	Cu	g	2.85 min	1.05E+03	3.7
70	29	Cu	g+i	44.5 sec	2.10E+02	3.7

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
64	31	Ga	g	2.6 min	1.30E+03	4.1
65	31	Ga	g	15 min	4.30E+03	4.1
66	31	Ga	g	9.5 hr	5.00E+03	4.0
67	31	Ga	g	3.2 d	5.30E+03	4.0
68	31	Ga	g	68 min	2.60E+03	3.9
70	31	Ga	g	21 min	1.30E+04	3.9

72	31	Ga	g	14 hr	2.60E+04	3.8
73	31	Ga	g	4.9 hr	3.20E+04	3.8
74	31	Ga	g+i	8 min	2.20E+04	3.7
75	31	Ga	g	126 sec	1.60E+04	3.7
76	31	Ga	g	32 sec	6.20E+02	3.7

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
68	33	As	g	151.6 sec	9.60E+02	4.4
69	33	As	g	15.2 min	4.80E+03	4.3
70	33	As	g	52.6 min	6.30E+03	4.3
71	33	As	g	65.3 hr	7.68E+03	4.2
72	33	As	g	26 hr	8.40E+03	4.2
73	33	As	g	80.3 d	3.00E+03	4.1
74	33	As	g	17.77 d	1.80E+03	4.1
76	33	As	g	1.0778 d	6.12E+03	3.9
77	33	As	g	38.79 hr	3.60E+03	3.9
78	33	As	g	90.7 min	3.30E+03	3.8
79	33	As	g	9.01 min	1.05E+03	3.8
80	33	As	g	15.2 sec	9.00E+02	3.8
81	33	As	g	33.3 sec	2.88E+02	3.7

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
71	34	Se	g	4.74 min	6.30E+02	4.2
72	34	Se	g	8.4 d	1.58E+03	4.2
73	34	Se	g+i	7.15 hr	1.89E+03	4.1
75	34	Se	g	119.8 d	1.26E+03	4.0
79	34	Se	g+i	650Ky	1.89E+03	3.9
81	34	Se	g+i	18.45 min	4.73E+02	3.8
83	34	Se	g+i	22.3 min	3.94E+02	3.8
84	34	Se	g	3.26 min	2.52E+02	3.8

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
72	35	Br	g+i	78.6 sec	3.50E+03	4.3
73	35	Br	g	3.4 min	2.50E+04	4.3
74	35	Br	g+i	25.4 min	9.50E+04	4.2
75	35	Br	g	96.7 min	1.00E+05	4.2
76	35	Br	g+i	16.2 hr	1.00E+05	4.1
77	35	Br	g+i	57.04 hr	6.00E+04	4.1
82	35	Br	g+i	35.282 hr	7.10E+04	3.9
83	35	Br	g	2.4 hr	7.00E+04	3.9
84	35	Br	g+i	31.8 min	4.70E+04	3.8
85	35	Br	g	2.9 min	2.20E+04	3.8

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
74	36	Kr	g	11.5 min	7.00E+02	4.4
75	36	Kr	g	4.29 min	6.20E+03	4.3
76	36	Kr	g	14.8 hr	4.30E+04	4.3

77	36	Kr	g	74.4 min	1.00E+05	4.2
79	36	Kr	g+i	35.04 hr	1.20E+03	4.1
85	36	Kr	g+i	10.776 y	1.00E+05	3.9
87	36	Kr	g	76.3 min	4.00E+03	3.8

A	Z	Element	g/i	Half-life	ReA Intensity (pps)	Energy [MeV/u]
77	37	Rb	g	3.78 min	7.50E+02	4.519
78	37	Rb	g+i	17.66 min	1.92E+03	4.462
79	37	Rb	g	22.9 min	3.12E+03	4.405
80	37	Rb	g	33.4 sec	3.00E+03	4.350
81	37	Rb	g+i	4.572 hr	1.80E+03	4.296
82	37	Rb	g+i	1.273 min	1.50E+03	4.244
83	37	Rb	g+i	86.2 d	4.20E+02	4.193
88	37	Rb	g	17.773 min	3.60E+02	3.955
89	37	Rb	g	15.15 min	2.88E+02	3.910

The following list is for ReA3 experiments. If you plan to propose a very low energy "stopped beam" experiment, for example using LEBIT or BECOLA, the rates will be higher and a wider range of elements may be available. Please contact Chandana Sumithrarachchi for assistance.

Notes:

- Expected ReA3 beam intensities and corresponding maximum energy is listed in the table assuming acceleration of ions in the he-like charge state. The minimum energy is 300 keV/u; higher energies can in principle be reached up to the limit of about 6 MeV/u in selected cases at reduced intensity. Please contact Antonio Villari for assistance if you would like to propose use of a higher energy.
- The ReA3 beam has a microstructure of 80.5 MHz and a macrostructure varying from about 1 Hz to 10 Hz. Typical duty cycle varies from 10% to a maximum of 40%. The choice of the duty cycle and frequency is a compromise between the charge state to be accelerated and the experimental apparatus.
- ReA3 can offer an alternative microstructure of the beam at 16.1 MHz, instead of the original 80.5 MHz, using a new multi-harmonic buncher. This would allow delivery of beam bunches spaced at 62.1 ns instead of 12.4 ns. Please, note that the overall efficiency of the system decreases by about 30% when using the new buncher. Note also that, for the moment, this capability is offered without a chopper, which means that satellite bunches are still present at 80.5 MHz frequency with intensity equivalent to about 5% of the full beam intensity.
- All beams may be contaminated by their daughters and grand-daughters. Experiments should expect a level of contamination of the order of 20% or higher. Some beams can also have stable contamination, depending on the charge state used in the acceleration.
- g/i refers to presence of ground state and isomeric state. The half-life in the table refers to the half-life of the ground state.
- Isotopes with lifetimes longer than 10 minutes can be difficult to tune. Please contact Antonio Villari for assistance if you need a long-lived isotope and would like to use any of these beams for your proposal.
- The actual beam intensity depends on the purity of the gas cell at the time of the experiment.
- Additional beams not on the list may be possible. Requests for new stable or radioactive beams can be sent to the Manager for User Relations, Jill Berryman, in the form of a letter to the NSCL Director.