

Division of Geological & Geophysical Surveys

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**GEOCHRONOLOGY ($^{40}\text{Ar}/^{39}\text{Ar}$) OF 17 RAMPART-AREA
ROCKS, TANANA AND LIVENGOOD QUADRANGLES, CENTRAL ALASKA**

by

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**Geochronology ($^{40}\text{Ar}/^{39}\text{Ar}$) of 17 Rampart-area rocks,
Tanana and Livengood Quadrangles, east-central Alaska**

by

R.R. Reifenstuhl¹, P.W. Layer², and R.J. Newberry²

Seventeen samples collected from the 1996 Rampart project, southeastern Tanana- and southwest Livengood quadrangles, western Yukon-Tanana Upland, Alaska, were age-dated using $^{40}\text{Ar}/^{39}\text{Ar}$ methodology. Most of the samples have good plateaus and simple interpretations, although three samples (96RN192a, 96RN103, and 96RR16a) have more complex spectra which allow a nonunique interpretation.

$^{40}\text{Ar}/^{39}\text{Ar}$ plateau ages range from 56 Ma for bimodal volcanic rocks to 185 Ma for Rampart Group gabbro. $^{40}\text{Ar}/^{39}\text{Ar}$ dates provide significant new constraints on lithologic affinity and tectonic models such as the approximate 60 Ma age of the high-grade ("Ruby") metamorphic complex.

$^{40}\text{Ar}/^{39}\text{Ar}$ incremental thermal-release spectra are produced by incrementally heating a sample and measuring the apparent age, as reflected by $^{40}\text{Ar}/^{39}\text{Ar}$ ratios, for each thermal step.

If a sample has experienced a partial thermal reset and (or) has cooled very slowly, argon is lost from the margins of the sample mineral. This argon loss is reflected in lower apparent-ages for the lower-temperature fractions. In this case, the lowest temperature fraction shows the approximate age of reheating (or re-set age); the 'plateau' age represents an approximation to the true original cooling age. The 'integrated age' is the age given by the total gas measured, and is equivalent to a potassium-argon (K-Ar) age. If a plateau is not present then the argon spectrum is very irregular and the integrated age has little geologic significance. If the integrated age is > 5 Ma younger than the plateau age, the analyzed mineral has been significantly reset and the plateau age is only a minimum age.

All ages will be used in construction of our geologic map of the Tanana B-1 Quadrangle (Reifenstuhl, R.R. and others, in prep.). Ar/Ar geochronology was completed by Jeff Drake and P.W. Layer of the Geochronology Lab, Geophysical Institute, University of Alaska Fairbanks.

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Location of Age-Date Samples in Tanana B-1 Quad

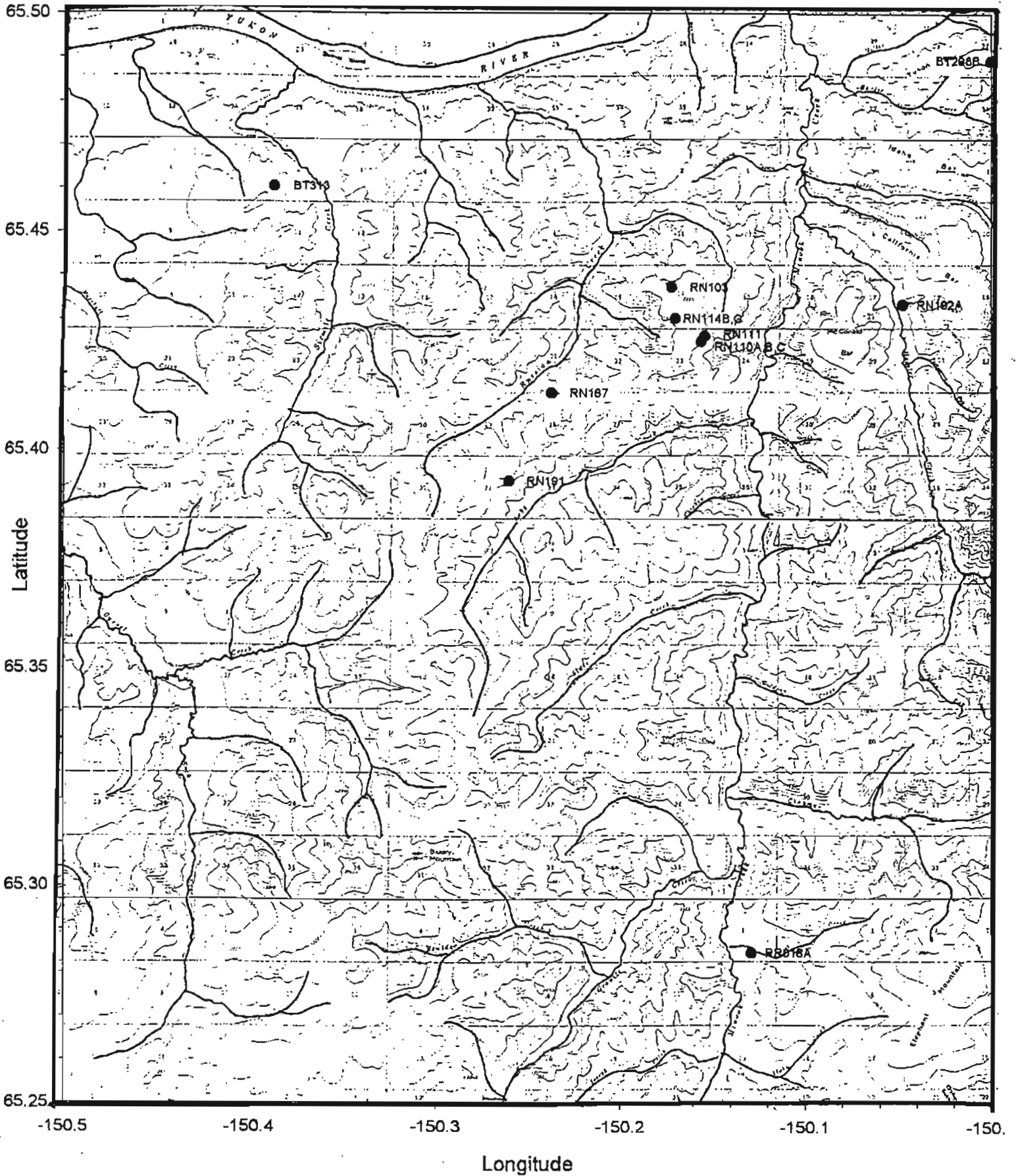


Table 1. Geochronology of samples for Rampart Project 1996.

Sample	Latitude	Longitude	Rock Type (location: Tanana B-1 Quadrangle unless noted)	Min+	Integrated Age (Ma)	Plateau Age (Ma)	plat. fracts.	plat. % ^{39}Ar
96BT298b	65.48944	-150.000	Tertiary Basalt	WR	59.7±0.2	60.0±0.2	10	95
96BT313	65.46034	-150.387	Tertiary Rhyolite	WR	55.7±0.2	56.0±0.3	9	89
96RN103	65.43731	-150.172	Rampart Group Gabbro	HO	179.5±1.1	185.2±1.4	2	27
96RN110a	65.4249	-150.156	Biotite Schist	WM	61.2±0.2	61.6±0.2	13	97
96RN110b	65.4249	-150.156	Amphibolite	HO	57.1±0.3	57.1±0.3	6	73
96RN110c	65.4249	-150.156	Mafic Dike	WR	56.5±0.2	57.8±0.3	10	86
96RN111	65.44262	-150.154	Muscovite Schist	WM	62.7±0.2	63.0±0.2	12	98
96RN114b	65.43021	-150.17	Rampart Au?-Qtz vein	WM	72.6±0.3	73.1±0.3	10	97
96RN114c	65.43021	-150.17	Mafic Dike	WR	58.4±0.3	59.1±0.3	10	93
96RN16	65.04347	-150.603	Hot Springs Granite: Tanana A-2	BI	58.1±0.2	58.3±0.2	9	95
96RN167	65.41301	-150.237	Rampart Group Trachyte Dike	BI	60.0±4.9	57.2±0.9	3	66
96RN167	65.41301	-150.237	Rampart Group Trachyte Dike	WR	57.2±0.2	57.8±0.2	10	88
96RN191	65.39279	-150.26	Hi Meta Cu-Au-Qtz vein	WM	61.8±0.3	61.2±0.3	10	85
96RN192a	65.43347	-150.048	Hoosier Au-Qtz vein	WM	72.2±0.3	none	---	---
96RN243a	65.3272	-151.057	Yukon Rapids Granite: Tanana B-3	BI	59.9±0.2	60.0±0.2	11	98
96RN244	65.51861	-149.588	Victoria Ck Fault Granite: Liv. C-6	WM	83.4±0.4	83.8±0.4	7	90
96RR16a	65.2844	-150.129	Andesite	WR	113.2±0.4	none	---	---

Samples run against standard Mmhb-1 with an age of 513.9 Ma and processed using the standards of Steiger and Jager (1977). All errors quoted to $\pm 1 \sigma$. Bold numbers are interpreted ages (Geochronology Lab, Geophysical Institute, University of Alaska Fairbanks).

+Min = mineral phase: WR = whole rock, HO = hornblende, WM = white mica, BI = biotite

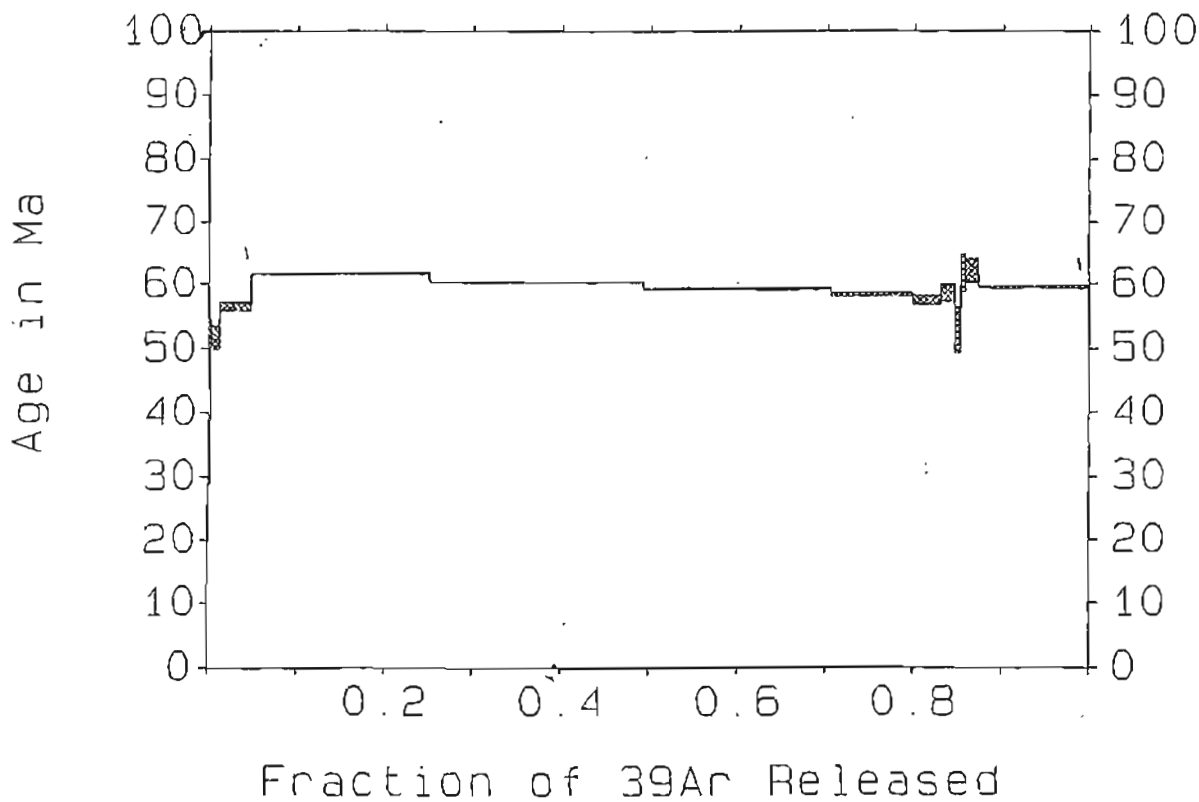
Table 1 continued. Geochronology of samples for Rampart Project 1996: Comments/Interpretations

Sample	Rock Type	Comments/Interpretations	Comments/Interpretations continued
96BT298b	Tertiary Basalt	Good Plateau. Argon loss (42±12 Ma). Bi-modal volcanics correlative with Interior Alaska & northeast Yukon Territory rocks.	
96BT313	Tertiary Rhyolite	Good Plateau. Argon loss (42±2 Ma). Bi-modal volcanics correlative with Interior Alaska & northeast Yukon Territory rocks.	
96RN103	Rampart Group Gabbro	Ho and Plagioclase?(high Ca/K) Gain and loss. Reset at 110 Ma may be thrusting age.	
96RN110a	Biotite Schist	Good Plateau. Argon loss (19±6 Ma).	Amphibolite-facies metamorphic rock ages unlike Yukon Tanana and Ruby terranes, but similar to Raven Creek Hill metamorphic rocks (K/Ar: 66-72 Ma, Weber & others, 1992). The 25 Ma reset age may be due to large-scale, high-angle faulting.
96RN110b	Amphibolite	Good Plateau.	
96RN110c	Mafic Dike	Good Plateau. Argon loss (26±4 Ma)	
96RN111	Muscovite Schist	Good Plateau with hump in profile. Argon loss (24±7 Ma)	
96RN114b	Rampart Au?-Qtz vein	Good Plateau. Argon loss (23±5 Ma)	
96RN114c	Mafic Dike	Good Plateau. Argon loss (16±11 Ma). Related to bi-modal volcanic event. 15 Ma reset due to high-angle faulting? Host is Rampart Group phyllite. 25 Ma reset due to high angle faulting?	
96RN116	Hot Spgs Granite (Tanana A-2)	Good Plateau. (15±11 Ma reset).	Two granites have trace- and major-elements similar to area Tertiary rhyolites.
96RN243a	Yukon Rapids Gr. (Tanana B-3)	Good Plateau.	
96RN167	Rampart Grp Trachyte Dike	Good Plateau. Ar loss (31±4 Ma).	Rampart phyllite host. Related to Tertiary-age bi-modal magmatism.
96RN167	Rampart Grp Trachyte Dike	Good Plateau. Argon loss (36±3 Ma)	
96RN191	Hi Meta Cu-Au-Qtz vein	Good Plateau. Argon loss (36±2 Ma) Some excess? Hosted in amphibolite-facies metamorphic rocks.	
96RN192a	Hoosier Au-Qtz vein	Argon loss. Steps up from 34±4 Ma up to 82 Ma. Hosted in Rampart Group phyllite.	
96RN244	Kaltag Fault Granite (Liv. C-6)	Good Plateau, partly reset. Correlative with Raven Hill Creek granite(?) (K/Ar age 68.1 Ma, Weber & others, 1992).	
96RR16a	Andesite	Complex. 43 to 186 Ma. Minimum age is about 170 Ma. Interpretation based on regional geology is: 120 Ma reset is thrusting age and 50 Ma reset is due to regional magmatism or high-angle faulting.	

Weighted average of J from standards = 0.007587 +/- 0.000026

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0*/39	+/-	Age (Ma)	+/- (Ma)
100	0.0026	13.249	0.631	0.034	76.629	0.632	0.019	3.091	0.958	41.9	12.8
200	0.0121	6.328	0.484	0.008	39.175	0.484	0.009	3.833	0.136	51.8	1.8
300	0.0481	4.491	0.390	0.001	5.959	0.390	0.005	4.197	0.051	56.6	0.7
500	0.2508	4.592	0.322	0.000	-0.315	0.322	0.001	4.578	0.013	61.7	0.2
700	0.4927	4.483	0.248	0.000	-0.949	0.248	0.001	4.477	0.011	60.3	0.2
900	0.7051	4.402	0.175	0.000	-0.536	0.175	0.001	4.397	0.016	59.3	0.2
1050	0.7990	4.388	0.241	0.000	0.524	0.241	0.002	4.335	0.023	58.5	0.3
1200	0.8308	4.366	0.494	0.000	1.512	0.494	0.006	4.273	0.053	57.6	0.7
1350	0.8468	4.458	0.551	0.000	1.890	0.551	0.008	4.348	0.104	58.6	1.4
1500	0.8530	4.345	0.558	0.002	9.518	0.558	0.012	3.907	0.273	52.8	3.6
2000	0.8581	4.457	0.587	0.000	-3.562	0.587	0.009	4.587	0.223	61.8	2.9
2500	0.8731	4.445	0.545	-0.001	-4.284	0.545	0.008	4.607	0.143	62.1	1.9
8500	1.0000	4.445	0.521	0.000	0.000	0.521	0.003	4.418	0.017	59.6	0.2
Integrated		4.504	0.311	0.000	1.029	0.311	0.001	4.430	0.008	59.7	0.2

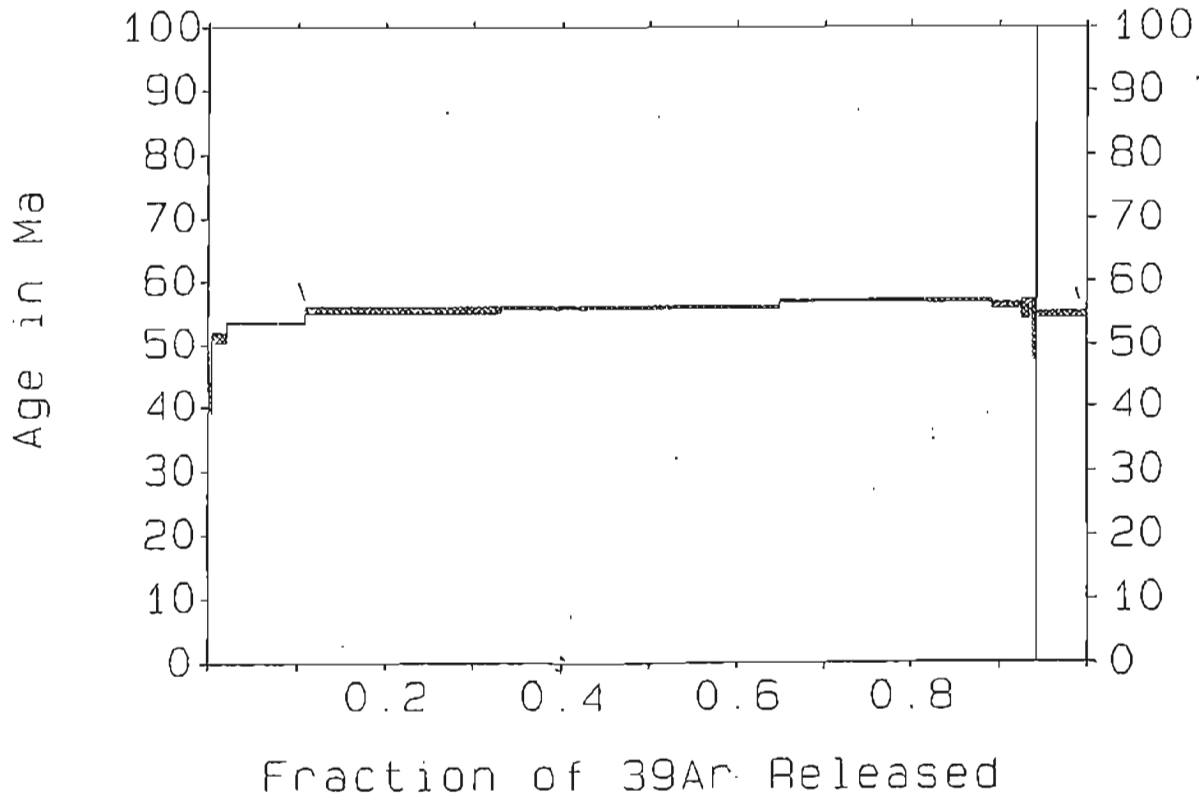
BT298B WR



Weighted average of J from standards = 0.007597 +/- 0.000026

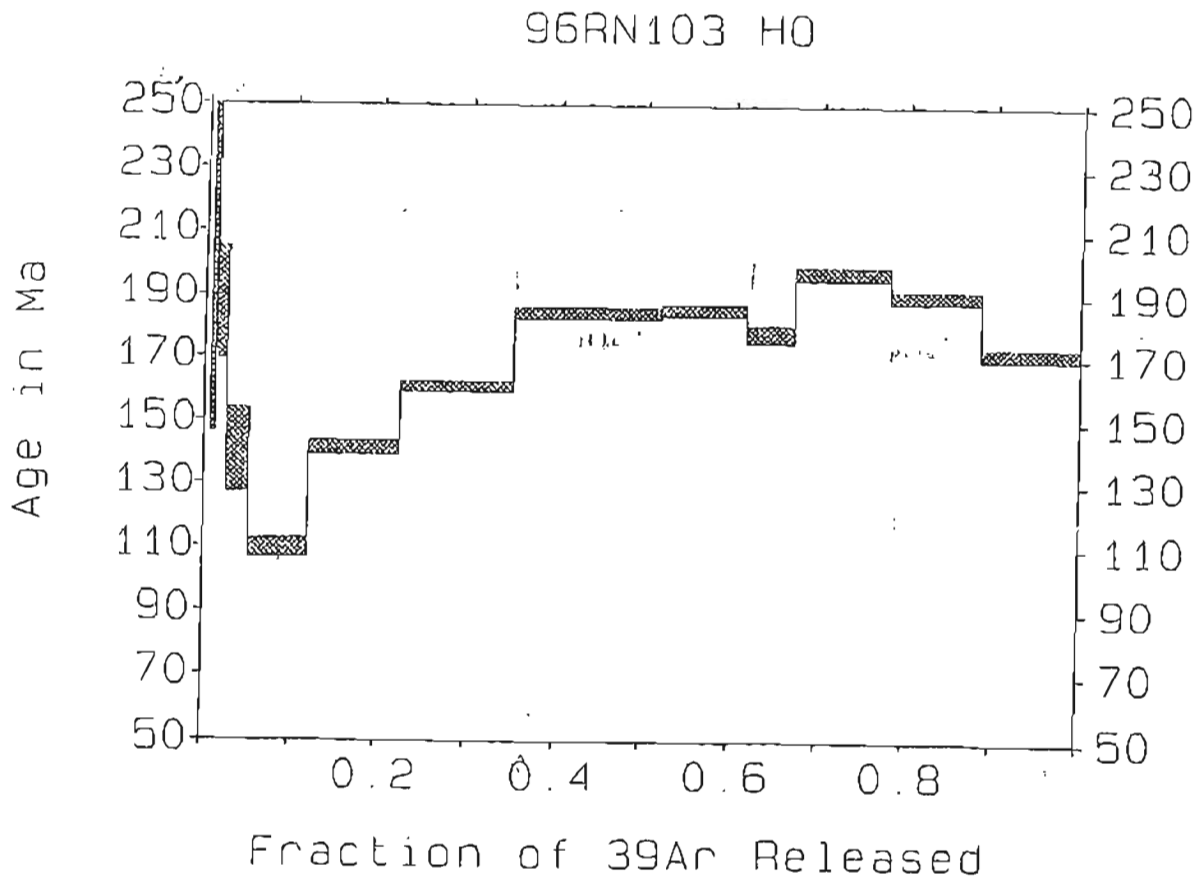
Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	40Ar/39K	+/-	Age (Ma)	+/- (Ma)
100	0.0047	6.431	0.017	0.018	63.476	0.017	0.003	3.069	0.180	41.8	2.4
200	0.0207	5.627	0.014	0.006	32.356	0.014	0.002	3.787	0.064	51.2	0.9
300	0.1091	4.302	0.009	0.001	7.204	0.009	0.000	3.968	0.018	53.5	0.2
500	0.3314	4.309	0.010	0.001	3.781	0.010	0.000	4.118	0.040	55.6	0.5
700	0.6470	4.222	0.010	0.000	1.082	0.010	0.000	4.148	0.019	56.0	0.2
800	0.8141	4.308	0.011	0.000	1.299	0.011	0.000	4.224	0.016	57.0	0.2
1050	0.8920	4.425	0.012	0.001	3.920	0.012	0.000	4.224	0.023	57.0	0.3
1200	0.9254	4.861	0.011	0.002	13.731	0.011	0.001	4.168	0.035	56.2	0.5
1350	0.9377	5.602	0.014	0.005	28.125	0.014	0.002	4.117	0.115	55.6	1.5
1500	0.9403	6.958	0.009	0.010	44.100	0.009	0.006	3.874	0.368	52.3	4.9
2000	0.9416	5.988	0.024	0.009	45.638	0.024	0.015	3.240	0.917	43.9	12.3
2500	0.9417	6.252	0.147	0.020	95.891	0.147	0.121	0.250	7.339	3.4	100.4
8500	0.9419	5.961	0.040	0.011	57.075	0.040	0.126	2.547	6.743	34.6	90.7
2000	1.0000	7.047	0.017	0.010	42.198	0.017	0.000	4.057	0.038	54.8	0.5
Integrated		4.534	0.011	0.001	8.451	0.011	0.000	4.124	0.012	55.7	0.2

BT313 WR



Weighted average of J from standards = 0.007597 +/- 0.000026

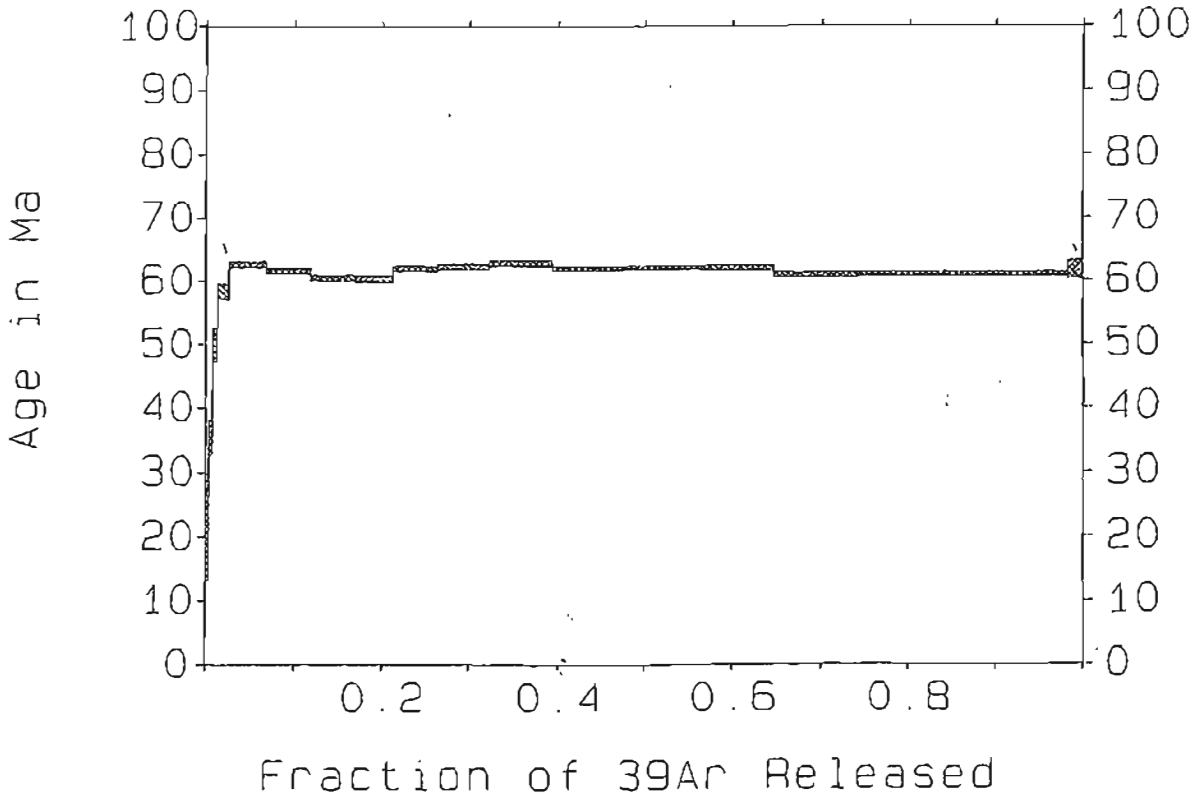
Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	40/39K	+/-	Age (Ma)	+/- (Ma)
100	0.0038	1117.387	7.124	3.190	84.312	7.158	0.373	176.111	12.169	1532.1	71.3
200	0.0068	226.765	10.644	0.636	82.569	10.718	0.430	39.798	4.288	476.6	45.1
300	0.0125	83.485	5.598	0.232	81.751	5.619	0.191	15.282	4.225	198.1	51.9
450	0.0258	73.224	2.653	0.200	80.379	2.658	0.054	14.386	1.451	187.1	17.9
600	0.0517	37.638	3.115	0.092	71.707	3.121	0.037	10.862	1.051	140.5	13.3
750	0.1191	14.925	5.371	0.024	44.839	5.389	0.044	8.246	0.223	109.6	2.9
900	0.2244	13.274	8.038	0.011	19.454	8.080	0.039	10.724	0.169	141.3	2.1
1050	0.3505	14.868	10.140	0.011	16.810	10.207	0.051	12.259	0.131	160.6	1.6
1200	0.5197	16.375	10.171	0.010	13.988	10.238	0.065	14.153	0.146	184.2	1.8
1350	0.6164	17.921	11.709	0.016	21.035	11.799	0.078	14.237	0.147	185.3	1.8
1500	0.6702	18.916	21.940	0.017	20.491	22.257	0.110	13.621	0.236	177.6	2.9
1800	0.7808	17.039	27.221	0.014	12.157	27.712	0.158	15.213	0.176	197.3	2.2
2200	0.8859	15.961	30.429	0.013	10.071	31.044	0.173	14.618	0.177	190.0	2.2
8500	1.0000	16.191	44.092	0.023	21.030	45.395	0.282	13.141	0.153	171.7	1.9
Integrated		22.197	18.071	0.034	38.623	18.287	0.038	13.769	0.077	179.5	1.1



Weighted average of J from standards = 0.007597 +/- 0.000026

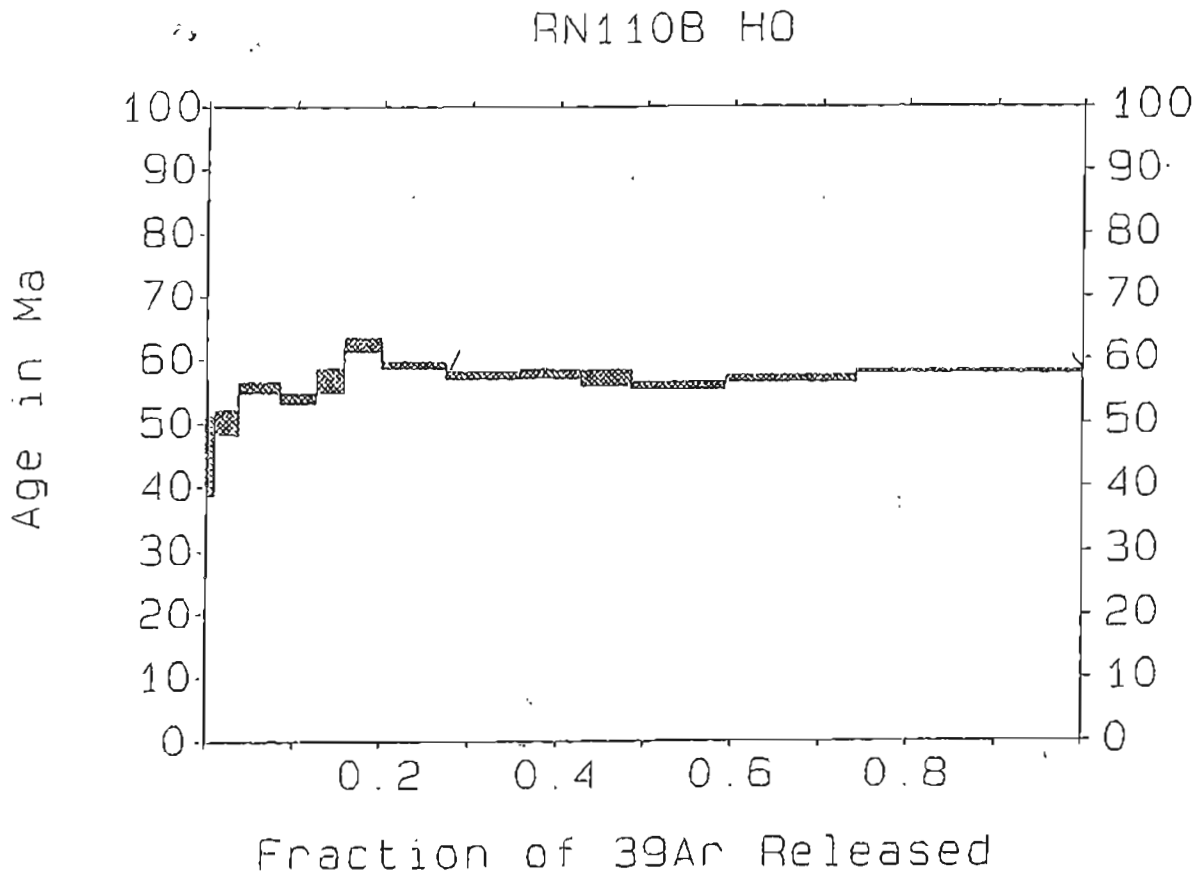
Laser Power (mWatt)	Cumulative ³⁹ Ar	⁴⁰ Ar/ ³⁹ Ar measured	³⁷ Ar/ ³⁹ Ar measured	³⁶ Ar/ ³⁹ Ar measured	% Atmospheric ⁴⁰ Ar	³⁷ Ca/ ³⁹ K	+/-	⁰ / ³⁹	+/-	Age (Ma)	+/- (Ma)
100	0.0038	6.617	0.007	0.017	78.344	0.007	0.006	1.427	0.454	19.4	8.2
150	0.0074	7.160	0.022	0.015	63.368	0.022	0.007	2.612	0.203	35.5	2.7
200	0.0130	7.041	0.010	0.011	47.279	0.010	0.008	3.697	0.200	50.0	2.7
300	0.0263	6.353	0.008	0.007	31.588	0.008	0.002	4.327	0.092	58.3	1.2
450	0.0684	5.174	0.004	0.002	9.567	0.004	0.001	4.653	0.037	62.7	0.5
600	0.1186	5.190	0.004	0.002	11.321	0.004	0.000	4.577	0.030	61.7	0.4
750	0.1698	5.139	0.004	0.002	12.123	0.004	0.001	4.491	0.034	60.5	0.5
900	0.2127	5.243	0.007	0.003	14.192	0.007	0.000	4.475	0.037	60.3	0.5
1050	0.2637	5.089	0.007	0.002	9.118	0.007	0.001	4.599	0.030	62.0	0.4
1200	0.3234	4.895	0.006	0.001	4.937	0.006	0.000	4.626	0.033	62.3	0.4
1350	0.3938	4.788	0.007	0.000	1.990	0.007	0.000	4.684	0.036	62.8	0.5
1500	0.4739	4.720	0.008	0.000	2.114	0.008	0.000	4.600	0.024	62.0	0.3
1650	0.5647	4.760	0.009	0.000	2.556	0.009	0.000	4.610	0.024	62.1	0.3
1800	0.6466	4.786	0.016	0.001	3.163	0.016	0.000	4.607	0.027	62.1	0.4
2000	0.7412	4.701	0.010	0.001	3.245	0.010	0.001	4.521	0.031	60.9	0.4
3500	0.9827	4.756	0.017	0.001	4.166	0.017	0.000	4.531	0.028	61.0	0.4
8500	1.0000	5.339	0.018	0.002	13.619	0.018	0.002	4.587	0.111	61.8	1.5
Integrated		4.919	0.010	0.001	7.051	0.010	0.000	4.545	0.010	61.2	0.2

RN110A WM



Weighted average of J from standards = 0.007597 +/- 0.000026

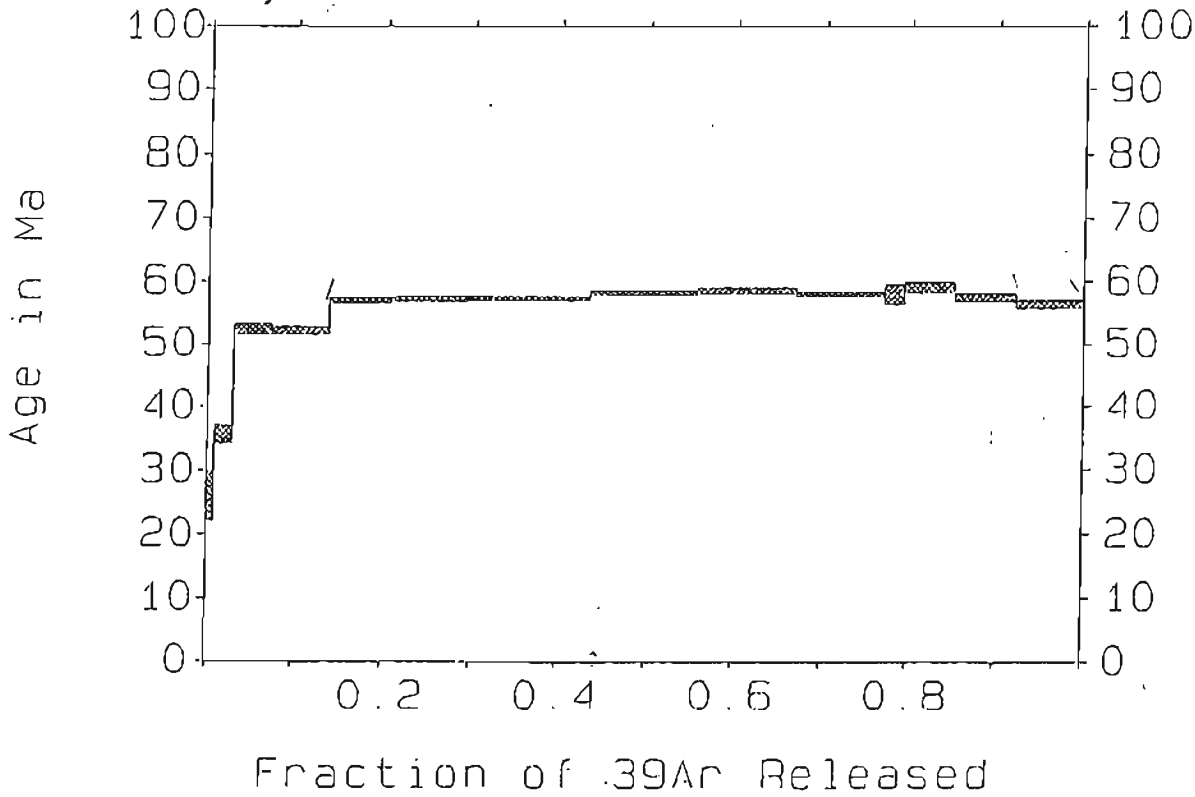
Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0'/39	+/-	Age (Ma)	+/- (Ma)
100	0.0027	152.194	1.417	0.508	98.678	1.418	0.048	2.013	2.188	27.4	29.5
200	0.0102	17.380	0.958	0.048	80.901	0.958	0.020	3.318	0.470	44.9	6.3
300	0.0361	5.756	0.651	0.007	35.038	0.651	0.011	3.722	0.145	50.3	1.9
450	0.0836	5.042	1.837	0.003	17.725	1.839	0.010	4.130	0.059	55.7	0.8
600	0.1243	5.191	2.405	0.005	22.620	2.408	0.012	4.001	0.058	54.0	0.8
750	0.1558	5.194	3.930	0.004	18.748	3.940	0.025	4.208	0.140	56.8	1.9
900	0.1894	5.310	4.568	0.003	12.538	4.582	0.017	4.633	0.080	62.4	1.1
1050	0.2729	5.008	2.499	0.003	11.974	2.504	0.011	4.390	0.036	59.2	0.5
1200	0.3588	4.883	1.221	0.002	8.374	1.222	0.005	4.268	0.043	57.6	0.6
1350	0.4268	4.670	1.282	0.002	7.795	1.283	0.008	4.283	0.052	57.8	0.7
1500	0.4849	4.888	1.765	0.003	13.010	1.767	0.010	4.232	0.095	57.1	1.3
1800	0.5919	4.854	2.551	0.003	14.345	2.556	0.010	4.140	0.042	55.9	0.6
2200	0.7404	4.659	1.830	0.002	9.001	1.841	0.007	4.219	0.038	56.9	0.5
8500	1.0000	5.658	3.388	0.005	23.781	3.393	0.009	4.300	0.019	58.0	0.3
Integrated		5.582	2.440	0.005	23.909	2.444	0.003	4.233	0.016	57.1	0.3



Weighted average of J from standards = 0.007597 +/- 0.000026

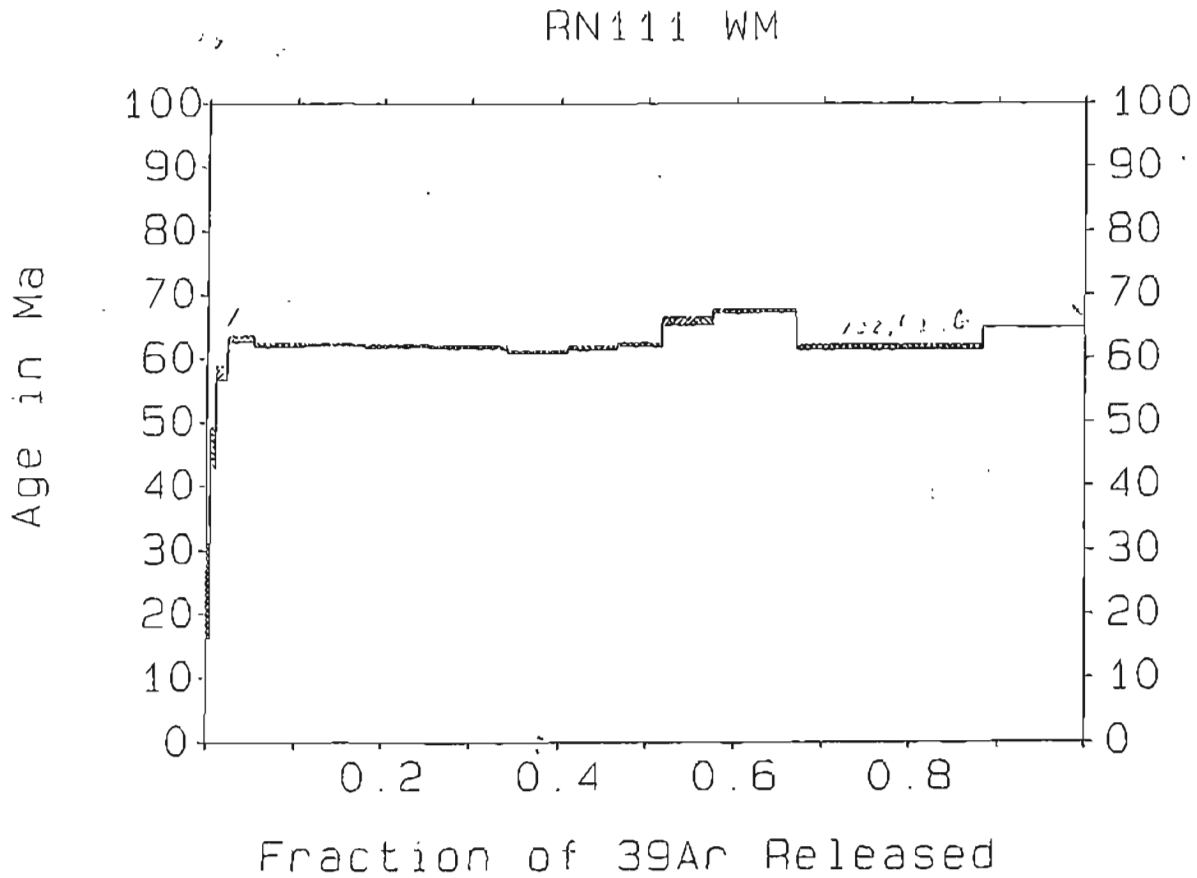
Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0*/39	+/-	Age (Ma)	+/- (Ma)
100	0.0082	13.683	1.062	0.040	85.997	1.063	0.021	1.913	0.289	26.0	3.9
200	0.0291	4.582	0.761	0.007	42.330	0.761	0.011	2.627	0.106	35.6	1.4
300	0.0735	4.959	1.257	0.004	21.291	1.258	0.006	3.884	0.068	52.5	0.9
450	0.1384	4.781	1.559	0.003	18.722	1.560	0.012	3.867	0.046	52.2	0.6
600	0.2068	5.052	1.782	0.003	15.877	1.784	0.012	4.230	0.030	57.1	0.4
750	0.2962	4.905	1.502	0.003	12.905	1.503	0.008	4.251	0.031	57.3	0.4
900	0.4345	4.793	1.015	0.002	10.796	1.015	0.005	4.253	0.023	57.4	0.3
1050	0.5570	4.852	1.241	0.002	10.469	1.242	0.008	4.322	0.031	58.3	0.4
1200	0.6898	4.890	1.223	0.002	12.384	1.224	0.005	4.350	0.035	58.7	0.5
1350	0.7715	4.911	1.361	0.002	11.951	1.362	0.005	4.302	0.028	58.0	0.4
1500	0.7941	5.088	1.333	0.003	15.122	1.334	0.011	4.298	0.118	58.0	1.6
1800	0.8518	4.923	1.069	0.002	10.551	1.070	0.005	4.381	0.061	59.1	0.8
2200	0.9220	4.719	1.115	0.002	9.137	1.118	0.005	4.265	0.049	57.5	0.6
8500	1.0000	5.054	2.588	0.004	16.846	2.592	0.009	4.186	0.048	56.5	0.8
Integrated		4.967	1.378	0.003	15.324	1.380	0.002	4.185	0.012	56.5	0.2

RN110C WR



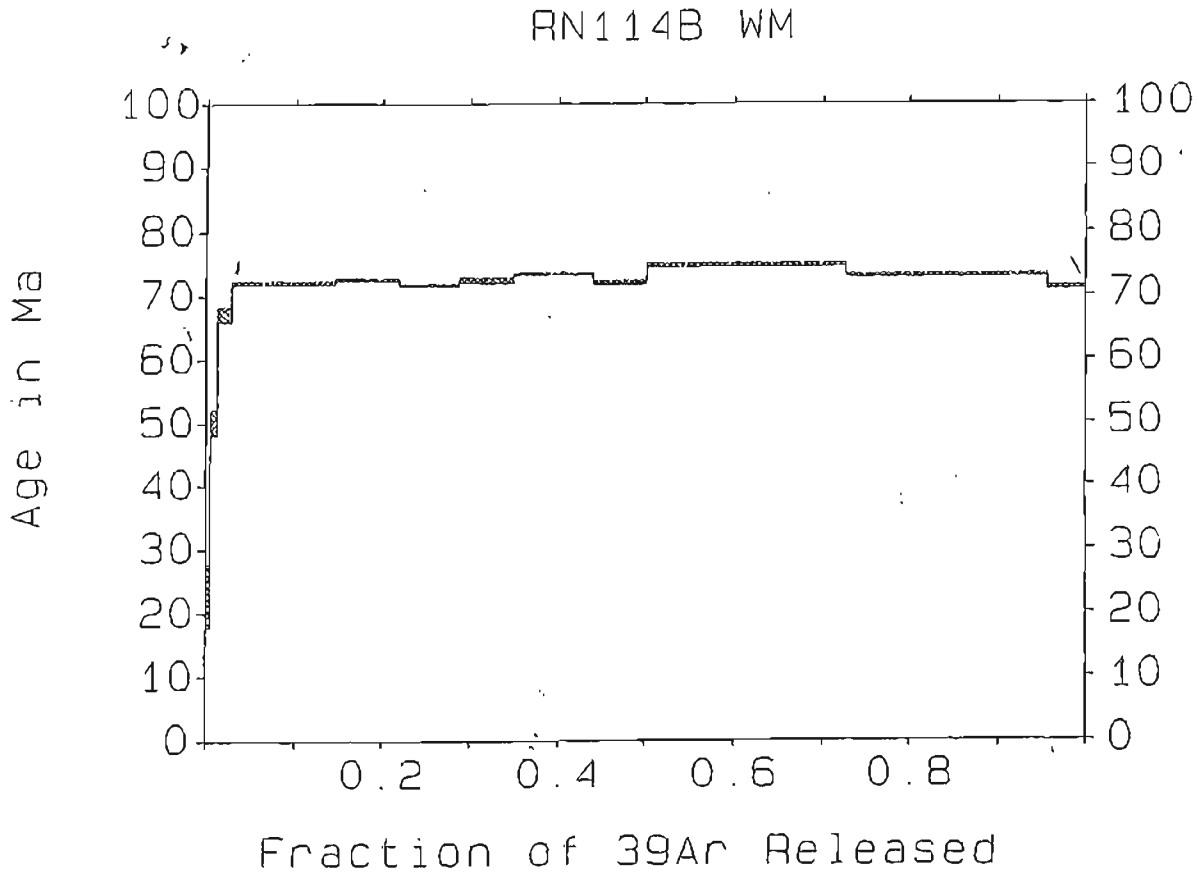
Weighted average of J from standards = 0.007597 +/- 0.000026

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	γ 07/39	+/-	Age (Ma)	+/- (Ma)
150	0.0042	7.287	0.020	0.019	78.076	0.020	0.010	1.737	0.547	23.6	7.4
200	0.0101	5.223	0.017	0.008	34.401	0.017	0.004	3.407	0.239	46.1	3.2
300	0.0230	5.289	0.021	0.003	18.495	0.021	0.004	4.288	0.085	57.8	1.1
450	0.0534	5.133	0.022	0.001	8.231	0.022	0.001	4.685	0.038	63.1	0.5
600	0.1092	4.733	0.010	0.000	1.934	0.010	0.001	4.613	0.024	62.1	0.3
750	0.1785	4.700	0.008	0.000	1.161	0.008	0.001	4.617	0.015	62.2	0.2
900	0.2739	4.733	0.007	0.000	2.297	0.007	0.000	4.596	0.018	61.9	0.2
1050	0.3414	4.726	0.012	0.000	2.409	0.012	0.001	4.585	0.020	61.8	0.3
1200	0.4088	4.679	0.010	0.000	2.585	0.010	0.001	4.531	0.021	61.1	0.3
1350	0.4652	4.720	0.015	0.000	2.409	0.015	0.001	4.579	0.023	61.7	0.3
1500	0.5170	4.742	0.012	0.000	2.109	0.012	0.000	4.614	0.022	62.2	0.3
1800	0.5749	5.099	0.011	0.001	3.425	0.011	0.001	4.897	0.050	65.9	0.7
2200	0.6585	5.130	0.008	0.000	1.696	0.008	0.000	5.015	0.022	67.4	0.3
3500	0.8827	4.727	0.009	0.000	2.476	0.009	0.000	4.582	0.033	61.7	0.4
8500	1.0000	4.877	0.006	0.000	0.551	0.006	0.000	4.821	0.015	64.9	0.2
Integrated		4.833	0.010	0.001	3.153	0.010	0.000	4.653	0.009	62.7	0.2



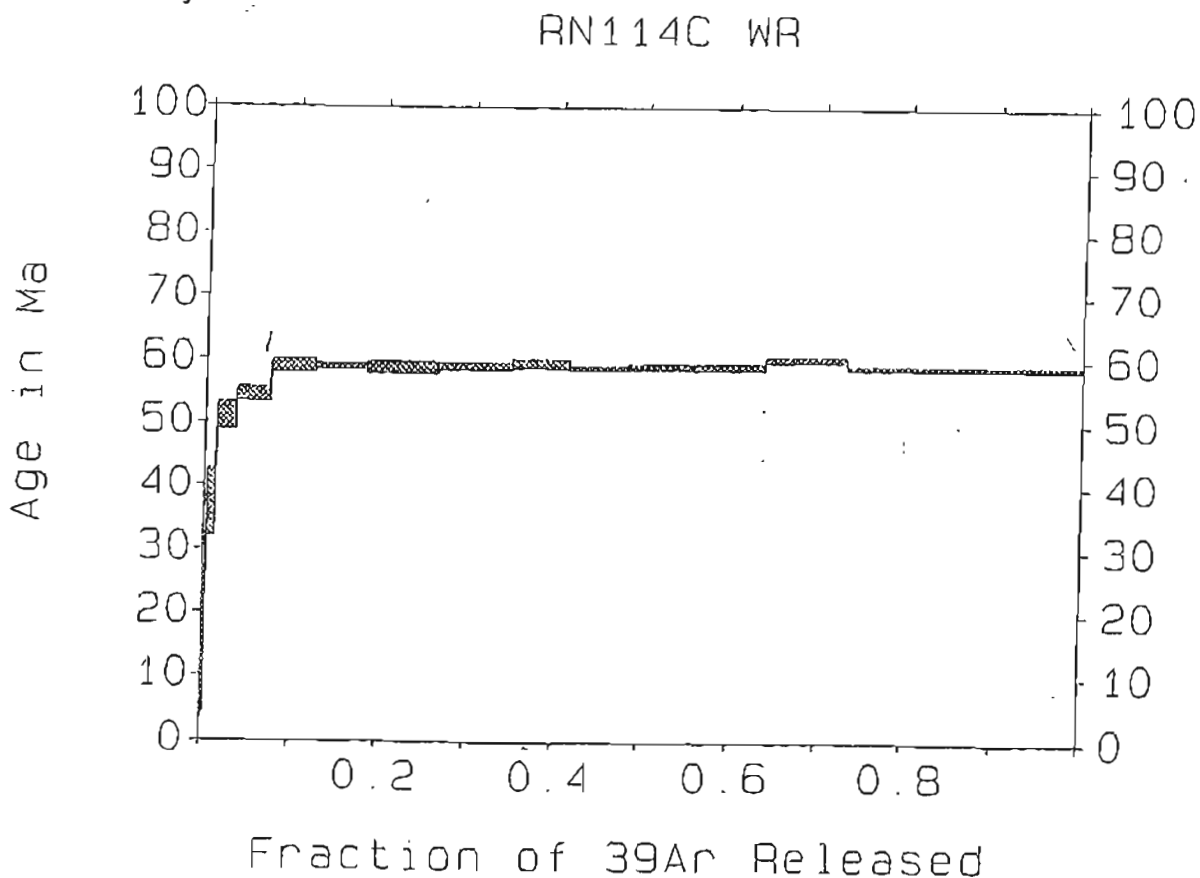
Weighted average of J from standards = 0.007597 +/- 0.000028

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0*/39	+/-	Age (Ma)	+/- (Ma)
100	0.0049	9.912	0.001	0.028	83.146	0.001	0.005	1.668	0.364	22.7	4.9
200	0.0126	8.596	0.001	0.016	58.677	0.001	0.002	3.711	0.146	50.2	1.9
300	0.0285	7.932	-0.001	0.010	36.844	-0.001	0.001	4.992	0.091	67.1	1.2
500	0.0794	6.306	0.000	0.003	14.437	0.000	0.000	5.371	0.022	72.1	0.3
700	0.1458	5.979	0.000	0.002	9.744	0.000	0.000	5.371	0.022	72.1	0.3
900	0.2203	5.873	-0.001	0.001	7.510	-0.001	0.000	5.405	0.017	72.6	0.2
1050	0.2884	5.935	-0.001	0.002	9.502	-0.001	0.000	5.345	0.013	71.8	0.2
1200	0.3487	6.175	0.000	0.003	12.133	0.000	0.000	5.400	0.030	72.5	0.4
1350	0.4407	5.985	0.000	0.002	8.075	0.000	0.000	5.476	0.015	73.5	0.2
1500	0.5023	6.082	-0.001	0.002	11.356	-0.001	0.000	5.366	0.024	72.1	0.3
2000	0.7269	6.027	0.000	0.001	7.099	0.000	0.000	5.572	0.022	74.8	0.3
2500	0.9564	5.724	0.000	0.001	4.379	0.000	0.000	5.446	0.020	73.1	0.3
8500	1.0000	5.412	-0.001	0.000	1.595	-0.001	0.000	5.297	0.021	71.2	0.3
Integrated		6.002	0.000	0.002	9.506	0.000	0.000	5.405	0.008	72.6	0.3



Weighted average of J from standards = 0.007597 +/- 0.000028

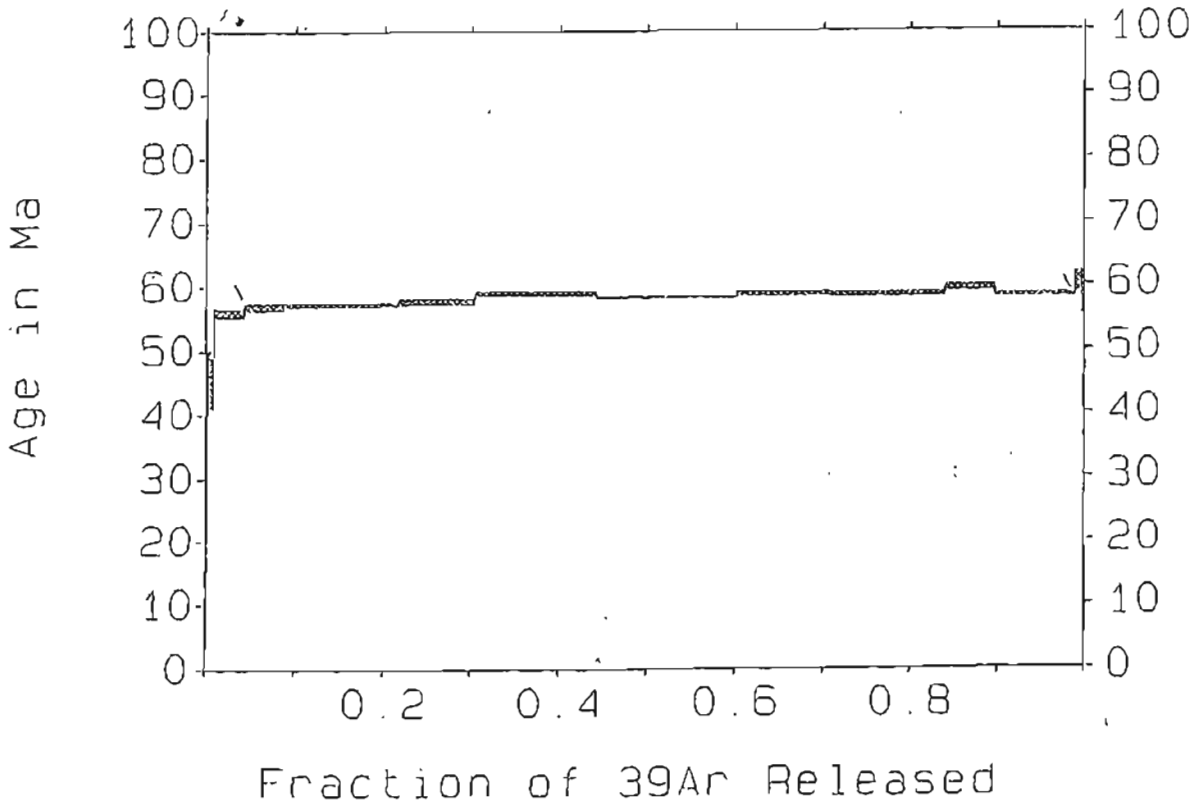
Laser Power (mWatt)	Cumulative ³⁹ Ar	⁴⁰ Ar/ ³⁹ Ar measured	³⁷ Ar/ ³⁹ Ar measured	³⁶ Ar/ ³⁹ Ar measured	% Atmospheric ⁴⁰ Ar	³⁷ Ca/ ³⁹ K	+/-	⁰ / ¹³⁹	+/-	Age (Ma)	+/- (Ma)
100	0.0037	33.558	0.992	0.110	96.545	0.993	0.023	1.159	0.840	15.8	11.4
200	0.0125	22.424	0.819	0.067	87.710	0.819	0.011	2.754	0.394	37.4	5.3
300	0.0349	14.211	0.993	0.035	73.360	0.993	0.008	3.781	0.161	51.1	2.1
450	0.0729	12.430	1.498	0.029	67.452	1.499	0.008	4.040	0.085	54.5	1.1
600	0.1237	10.122	1.689	0.020	56.712	1.691	0.010	4.374	0.075	59.0	1.0
750	0.1820	7.851	1.730	0.012	44.209	1.731	0.008	4.369	0.034	58.9	0.4
900	0.2637	7.703	1.301	0.012	43.255	1.302	0.006	4.358	0.073	58.8	1.0
1050	0.3470	7.498	1.305	0.011	41.463	1.307	0.008	4.375	0.044	59.0	0.6
1200	0.4139	6.642	1.673	0.008	33.456	1.674	0.004	4.408	0.056	59.4	0.7
1350	0.4808	6.376	1.501	0.007	31.388	1.503	0.008	4.360	0.028	58.8	0.3
1500	0.5556	6.642	1.324	0.008	33.894	1.325	0.005	4.378	0.034	59.0	0.5
1800	0.6364	7.549	1.754	0.011	41.855	1.758	0.005	4.378	0.040	59.0	0.5
2200	0.7307	6.857	1.593	0.008	34.077	1.595	0.007	4.485	0.031	60.2	0.4
8500	1.0000	5.681	1.780	0.005	22.772	1.762	0.007	4.370	0.023	58.9	0.3
Integrated		7.492	1.569	0.011	42.047	1.571	0.002	4.329	0.014	58.4	0.3



Weighted average of J from standards = 0.007597 +/- 0.000028

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0 ³⁹	+/-	Age (Ma)	+/- (Ma)
100	0.0019	84.363	0.078	0.282	98.730	0.078	0.021	1.071	0.794	14.6	10.8
200	0.0087	15.731	0.024	0.042	78.617	0.024	0.005	3.358	0.348	45.4	4.7
300	0.0434	6.448	0.006	0.008	35.454	0.006	0.001	4.144	0.049	55.9	0.7
450	0.0874	5.802	0.005	0.005	26.993	0.005	0.001	4.215	0.039	56.9	0.5
600	0.2157	6.057	0.012	0.008	29.647	0.012	0.000	4.241	0.019	57.2	0.3
750	0.3041	5.704	0.014	0.005	24.646	0.014	0.001	4.276	0.031	57.7	0.4
900	0.4417	5.428	0.029	0.003	19.016	0.029	0.001	4.372	0.026	58.9	0.3
1050	0.6007	4.972	0.063	0.002	12.548	0.063	0.001	4.324	0.014	58.3	0.2
1200	0.7090	4.720	0.108	0.001	7.052	0.108	0.001	4.361	0.023	58.8	0.3
1350	0.8401	4.644	0.104	0.001	5.865	0.104	0.001	4.345	0.026	58.6	0.3
1500	0.8965	4.615	0.065	0.001	3.639	0.065	0.002	4.419	0.034	59.8	0.5
1800	0.9885	4.482	0.050	0.000	2.750	0.050	0.001	4.331	0.019	58.4	0.2
2200	0.9969	4.414	0.318	0.000	-2.272	0.318	0.009	4.486	0.111	60.5	1.5
8500	1.0000	7.986	0.124	0.012	45.089	0.124	0.010	4.370	0.339	58.9	4.5
Integrated		5.419	0.054	0.004	20.116	0.054	0.000	4.306	0.008	58.1	0.2

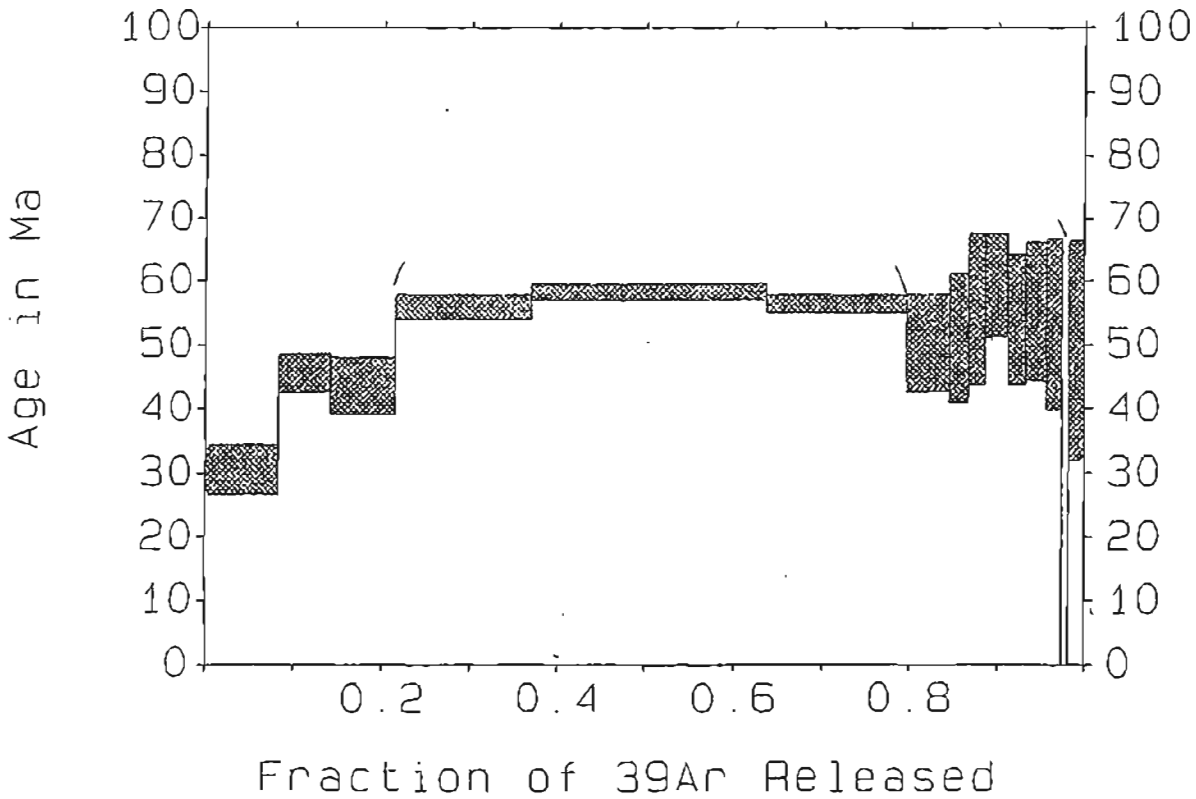
RN16 BI



Weighted average of J from standards = 0.007597 +/- 0.000026

Laser Power (mWatt)	Cumulative ³⁹ Ar	⁴⁰ Ar/ ³⁹ Ar measured	³⁷ Ar/ ³⁹ Ar measured	³⁶ Ar/ ³⁹ Ar measured	% Atmospheric ⁴⁰ Ar	³⁷ Ca/ ³⁹ K	+/-	⁰ / ³⁹	+/-	Age (Ma)	+/- (Ma)
150	0.0828	11.457	0.014	0.031	80.359	0.014	0.005	2.245	0.289	30.5	3.9
200	0.1407	10.577	0.012	0.024	68.099	0.012	0.006	3.365	0.231	45.5	3.1
300	0.2142	9.429	0.009	0.021	65.740	0.009	0.005	3.221	0.337	43.6	4.5
450	0.3588	7.222	0.003	0.010	42.319	0.003	0.003	4.149	0.147	58.0	1.9
600	0.6363	6.834	0.007	0.008	36.424	0.007	0.001	4.327	0.098	58.3	1.3
750	0.7963	8.308	0.000	0.014	49.426	0.000	0.003	4.188	0.108	56.5	1.4
900	0.8457	9.067	-0.008	0.018	58.799	-0.008	0.010	3.724	0.575	50.3	7.7
1050	0.8673	8.601	-0.004	0.016	55.959	-0.004	0.023	3.775	0.769	51.0	10.2
1200	0.8858	8.152	0.024	0.014	49.220	0.024	0.030	4.125	0.903	55.7	12.0
1350	0.9112	8.360	-0.007	0.013	47.070	-0.007	0.023	4.410	0.615	58.4	8.2
1500	0.9319	7.567	-0.010	0.012	47.039	-0.010	0.027	3.992	0.774	53.9	10.3
1800	0.9553	7.187	0.031	0.010	42.782	0.031	0.025	4.096	0.821	55.3	10.9
2500	0.9738	7.633	0.111	0.012	48.167	0.111	0.030	3.942	1.019	53.2	13.6
3500	0.9817	8.447	0.090	0.041	145.461	0.090	0.073	-3.827	3.048	-53.2	43.0
8500	1.0000	7.272	0.023	0.012	49.739	0.023	0.029	3.641	1.293	49.2	17.2
Integrated		8.191	0.008	0.015	53.115	0.008	0.002	3.627	0.081	51.7	1.1

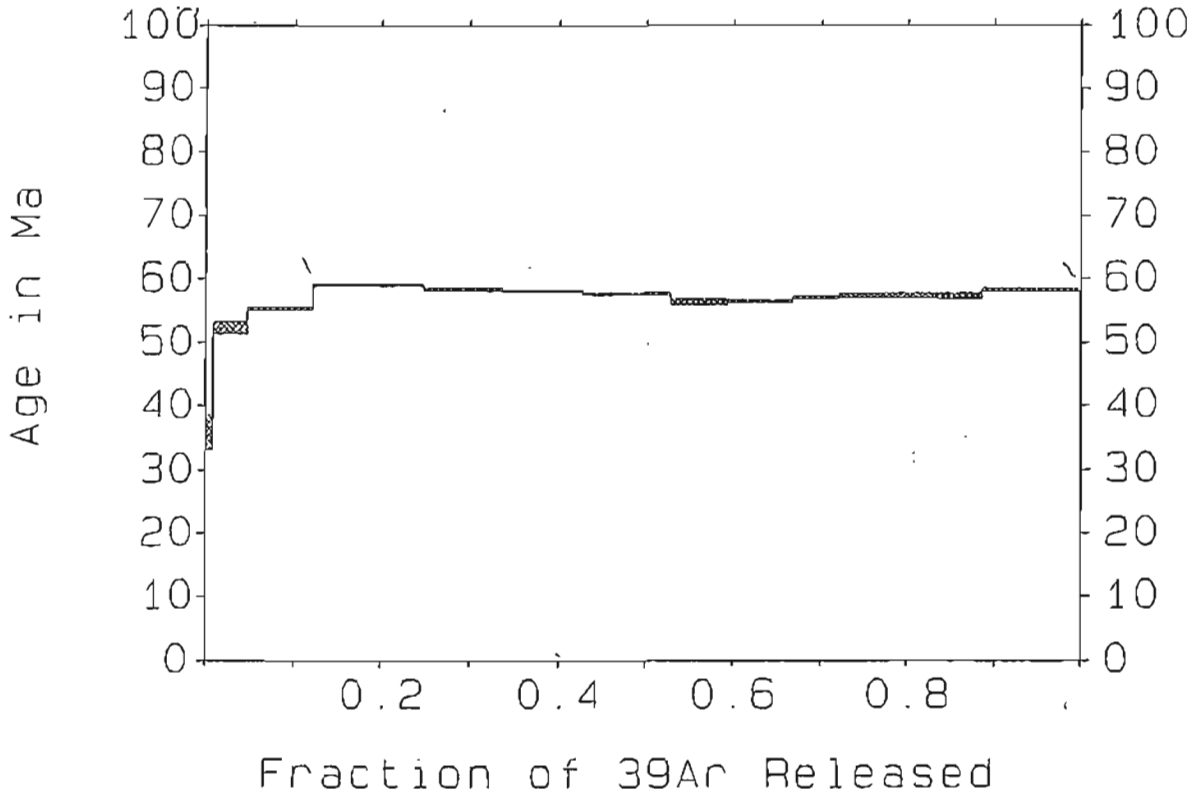
RN167 BI 2ND RUN



Weighted average of J from standards = 0.007597 +/- 0.000028

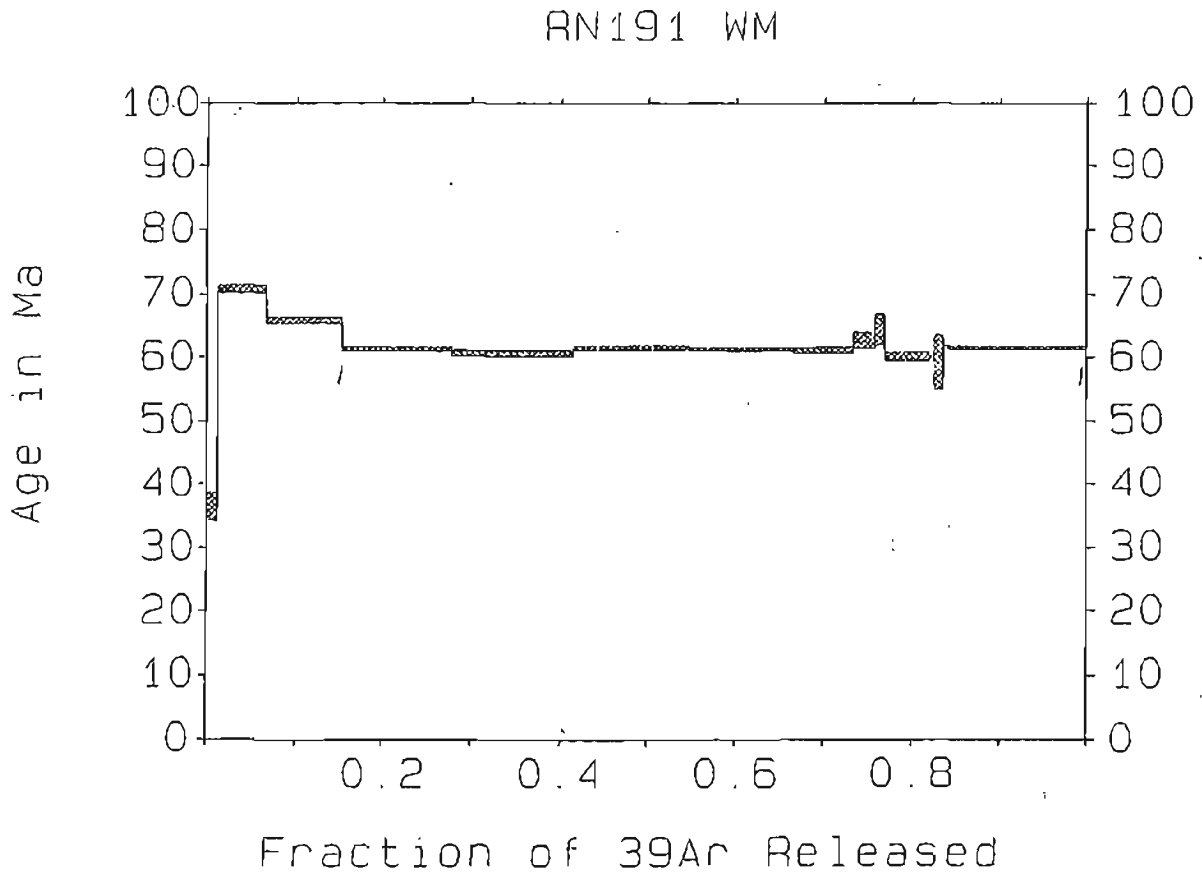
Laser Power (mWatt)	Cumulative ³⁹ Ar	⁴⁰ Ar/ ³⁹ Ar measured	³⁷ Ar/ ³⁹ Ar measured	³⁶ Ar/ ³⁹ Ar measured	% Atmospheric ⁴⁰ Ar	³⁷ Ca/ ³⁹ K	+/-	0*/39	+/-	Age (Ma)	+/- (Ma)
100	0.0084	13.247	0.032	0.036	79.920	0.032	0.002	2.654	0.210	36.0	2.6
200	0.0473	6.052	0.015	0.007	35.647	0.015	0.000	3.876	0.071	52.4	0.9
300	0.1206	4.711	0.020	0.002	12.339	0.020	0.000	4.105	0.019	55.4	0.2
500	0.2489	4.803	0.025	0.001	8.179	0.025	0.000	4.383	0.014	59.1	0.2
700	0.3370	4.770	0.037	0.001	8.686	0.037	0.000	4.330	0.017	58.4	0.2
900	0.4268	4.872	0.031	0.002	11.135	0.031	0.000	4.304	0.014	58.0	0.2
1050	0.5292	5.085	0.042	0.003	15.407	0.042	0.000	4.277	0.017	57.7	0.2
1200	0.5937	5.121	0.028	0.003	17.674	0.028	0.000	4.182	0.030	56.4	0.4
1350	0.6676	5.283	0.020	0.004	20.245	0.020	0.000	4.191	0.018	56.5	0.2
1500	0.7212	5.235	0.028	0.003	18.698	0.028	0.000	4.233	0.020	57.1	0.3
2000	0.8296	5.411	0.027	0.004	20.985	0.027	0.000	4.253	0.027	57.4	0.4
2500	0.8859	5.548	0.019	0.004	23.039	0.019	0.001	4.247	0.035	57.3	0.5
9000	1.0000	5.768	0.020	0.005	24.715	0.020	0.000	4.321	0.018	58.3	0.2
Integrated		5.245	0.027	0.003	18.681	0.027	0.000	4.242	0.007	57.2	0.2

RN167 WR



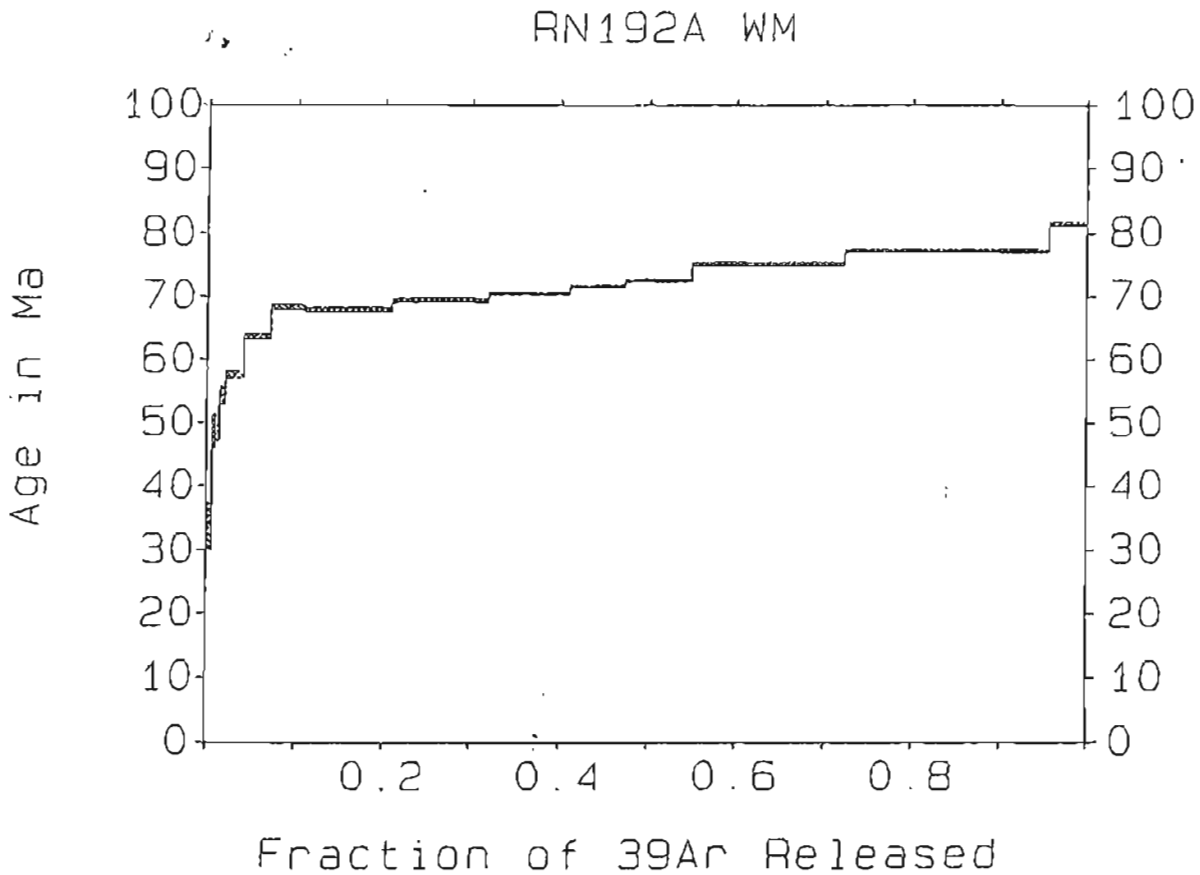
Weighted average of J from standards = 0.007597 +/- 0.000026

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0/39	+/-	Age (Ma)	+/- (Ma)
100	0.0128	3.416	0.016	0.002	20.784	0.016	0.003	2.683	0.165	36.4	2.2
200	0.0673	5.537	0.004	0.001	4.406	0.004	0.001	5.268	0.045	70.8	0.6
300	0.1529	4.962	0.002	0.000	0.851	0.002	0.001	4.891	0.037	65.8	0.5
500	0.2787	4.783	0.000	0.001	3.964	0.000	0.000	4.547	0.026	61.3	0.3
700	0.4155	4.826	0.000	0.001	6.212	0.000	0.000	4.499	0.040	60.8	0.5
900	0.5477	4.611	-0.001	0.000	0.482	-0.001	0.001	4.561	0.028	61.4	0.3
1050	0.6654	4.645	-0.002	0.000	1.540	-0.002	0.000	4.545	0.022	61.2	0.3
1200	0.7338	4.570	-0.001	0.000	0.078	-0.001	0.001	4.537	0.039	61.1	0.5
1350	0.7578	4.539	-0.007	0.000	-3.258	-0.007	0.002	4.657	0.094	62.7	1.2
1500	0.7895	4.572	-0.007	-0.001	-5.361	-0.007	0.004	4.787	0.188	64.4	2.6
2000	0.8243	4.535	-0.001	0.000	1.023	-0.001	0.001	4.460	0.047	60.1	0.6
2500	0.8360	4.573	0.003	0.000	3.229	0.003	0.005	4.397	0.320	59.3	4.2
8500	1.0000	4.609	0.000	0.000	0.297	0.000	0.000	4.567	0.022	61.5	0.3
Integrated		4.719	0.000	0.000	2.171	0.000	0.000	4.588	0.011	61.8	0.3



Weighted average of J from standards = 0.007597 +/- 0.000026

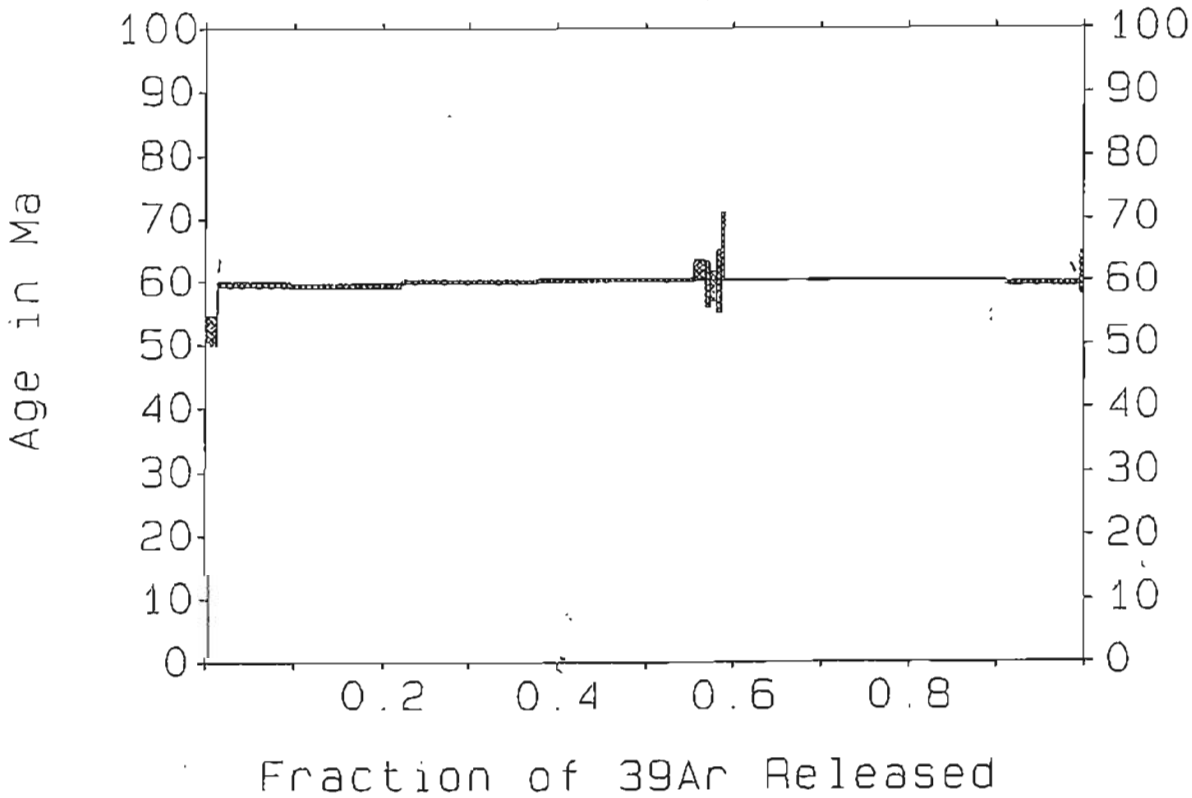
Laser Power (mWatt)	Cumulative ³⁹ Ar	⁴⁰ Ar/ ³⁹ Ar measured	³⁷ Ar/ ³⁹ Ar measured	³⁸ Ar/ ³⁹ Ar measured	% Atmospheric ⁴⁰ Ar	³⁷ Ca/ ³⁹ K	+/-	0*/39	+/-	Age (Ma)	+/- (Ma)
150	0.0067	23.710	0.004	0.072	89.400	0.004	0.003	2.510	0.295	34.1	4.0
200	0.0095	11.828	0.065	0.028	69.486	0.065	0.006	3.601	0.204	48.7	2.7
300	0.0150	7.902	0.034	0.014	53.545	0.034	0.003	3.658	0.162	49.4	2.2
450	0.0210	5.568	0.087	0.005	27.161	0.087	0.004	4.035	0.107	54.5	1.4
600	0.0414	5.347	0.023	0.004	19.540	0.023	0.001	4.279	0.044	57.7	0.6
750	0.0712	5.050	0.016	0.001	5.824	0.016	0.001	4.729	0.032	63.7	0.4
900	0.1110	5.257	0.013	0.000	2.789	0.013	0.001	5.082	0.030	68.3	0.4
1050	0.2094	5.163	0.003	0.000	1.608	0.003	0.000	5.052	0.031	67.9	0.4
1200	0.3198	5.267	0.002	0.000	1.408	0.002	0.000	5.165	0.024	69.4	0.3
1350	0.4105	6.325	0.002	0.000	0.936	0.002	0.000	5.247	0.012	70.5	0.2
1500	0.4736	5.421	0.007	0.000	0.938	0.007	0.001	5.342	0.017	71.8	0.2
1800	0.5502	5.512	0.010	0.000	1.431	0.010	0.000	5.405	0.017	72.6	0.2
2500	0.7223	5.725	0.002	0.000	1.645	0.002	0.000	5.603	0.025	75.2	0.3
3500	0.9574	5.854	0.001	0.000	1.056	0.001	0.000	5.763	0.018	77.3	0.2
8500	1.0000	8.414	-0.001	0.001	4.723	-0.001	0.001	8.083	0.024	81.5	0.3
Integrated		5.709	0.005	0.001	5.383	0.005	0.000	5.374	0.008	72.2	0.3



Weighted average of J from standards = 0.007597 +/- 0.000028

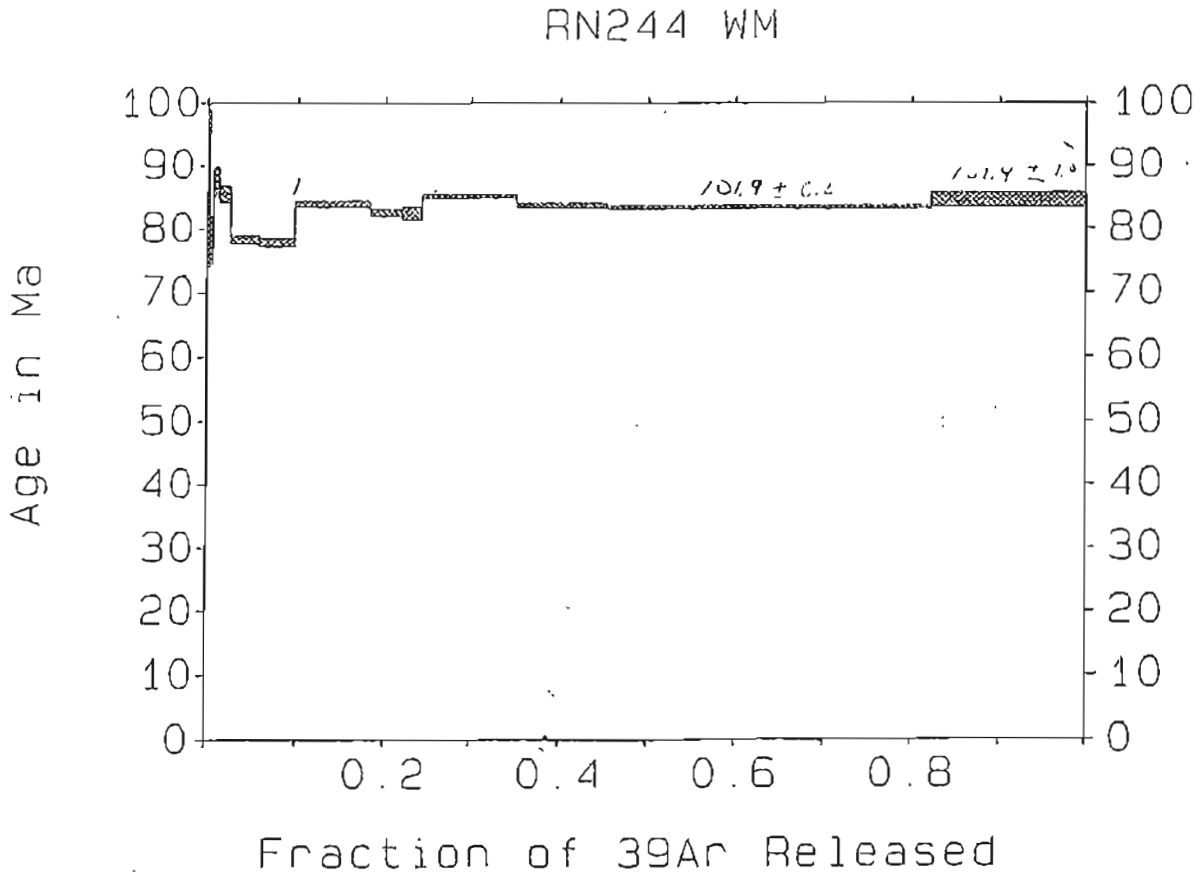
Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0 ¹ /39	+/-	Age (Ma)	+/- (Ma)
100	0.013	7.393	0.026	0.012	47.408	0.026	0.005	3.873	0.175	52.3	2.3
200	0.0968	4.744	0.003	0.001	8.148	0.003	0.001	4.425	0.034	59.6	0.4
300	0.2213	4.580	0.002	0.001	3.248	0.002	0.000	4.404	0.030	59.4	0.4
500	0.3775	4.536	0.004	0.000	1.159	0.004	0.001	4.456	0.022	60.1	0.3
700	0.5553	4.523	0.004	0.000	0.525	0.004	0.000	4.470	0.021	60.2	0.3
900	0.5695	4.500	-0.003	0.000	-2.658	-0.003	0.005	4.590	0.118	61.8	1.6
1050	0.5741	4.569	-0.011	0.000	2.560	-0.011	0.015	4.415	0.274	59.5	3.8
1200	0.5817	4.465	-0.005	0.000	0.894	-0.005	0.009	4.396	0.183	59.3	2.4
1350	0.5872	4.473	0.002	0.000	-0.219	0.002	0.010	4.454	0.374	60.0	5.0
1500	0.5912	4.590	-0.016	-0.001	-8.851	-0.016	0.017	4.873	0.414	65.6	5.5
2000	0.9118	4.499	0.121	0.000	0.070	0.121	0.001	4.468	0.011	60.2	0.1
2500	0.9952	4.463	0.010	0.000	0.237	0.010	0.001	4.424	0.026	59.6	0.3
8500	1.0000	5.992	0.052	0.005	23.875	0.052	0.011	4.552	0.258	61.3	3.4
Integrated		4.582	0.042	0.000	2.350	0.042	0.000	4.446	0.009	59.9	0.2

RN243A BI



Weighted average of J from standards = 0.007597 +/- 0.000026

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0/39	+/-	Age (Ma)	+/- (Ma)
100	0.0006	39.511	0.043	0.114	85.418	0.043	0.087	5.758	2.783	77.2	36.3
200	0.0018	34.589	0.082	0.104	89.135	0.082	0.032	3.755	1.501	50.7	20.0
300	0.0033	17.712	0.016	0.038	63.595	0.016	0.025	6.438	0.995	86.1	13.0
450	0.0079	13.271	0.015	0.025	55.854	0.015	0.010	5.848	0.289	78.4	3.8
600	0.0143	13.125	0.008	0.022	50.012	0.008	0.005	6.547	0.183	87.6	2.4
750	0.0279	7.730	-0.008	0.004	17.007	-0.008	0.002	8.391	0.111	85.5	1.4
900	0.0596	5.982	-0.002	0.000	1.862	-0.002	0.001	5.843	0.047	78.3	0.6
1050	0.0980	7.037	-0.002	0.004	17.134	-0.002	0.001	5.807	0.050	77.9	0.7
1200	0.1829	6.621	-0.002	0.001	4.993	-0.002	0.000	6.263	0.034	83.9	0.4
1350	0.2208	6.160	0.002	0.000	-0.504	0.002	0.001	6.162	0.038	82.5	0.5
1500	0.2438	6.271	-0.001	0.000	1.376	-0.001	0.001	6.156	0.080	82.5	1.0
1800	0.3514	7.469	-0.001	0.004	14.481	-0.001	0.000	6.363	0.026	85.2	0.3
2200	0.4539	6.445	-0.001	0.001	2.596	-0.001	0.000	6.250	0.026	83.7	0.3
8500	0.8223	6.645	0.000	0.001	5.895	0.000	0.000	6.226	0.020	83.4	0.3
9000	1.0000	7.096	0.007	0.003	10.586	0.007	0.000	6.319	0.094	84.6	1.2
Integrated		6.911	0.001	0.002	9.462	0.001	0.000	6.231	0.020	83.4	0.4



Weighted average of J from standards = 0.007597 +/- 0.000028

Laser Power (mWatt)	Cumulative 39Ar	40Ar/39Ar measured	37Ar/39Ar measured	36Ar/39Ar measured	% Atmospheric 40Ar	37Ca/39K	+/-	0*/39	+/-	Age (Ma)	+/- (Ma)
100	0.0108	5.526	0.013	0.008	42.484	0.013	0.004	3.162	0.217	42.8	2.9
200	0.0268	8.160	0.013	0.003	16.447	0.013	0.003	5.123	0.190	68.9	2.6
300	0.0772	10.220	0.004	0.001	3.312	0.004	0.001	9.854	0.067	130.2	0.9
500	0.1788	10.438	0.003	0.000	1.350	0.003	0.000	10.269	0.048	135.5	0.6
700	0.2465	10.175	0.005	0.001	3.064	0.005	0.001	9.835	0.058	130.0	0.7
900	0.3401	10.653	0.006	0.000	1.314	0.006	0.001	10.484	0.043	138.3	0.5
1050	0.5175	10.978	0.005	0.000	0.228	0.005	0.000	10.922	0.037	143.8	0.5
1200	0.6726	7.428	0.004	0.000	0.670	0.004	0.000	7.348	0.035	98.0	0.4
1350	0.8134	8.673	0.005	0.000	0.942	0.005	0.000	8.582	0.032	88.0	0.4
1500	0.8995	6.088	0.022	0.001	2.594	0.022	0.001	5.901	0.053	79.1	0.7
2000	0.9798	5.270	0.039	0.000	-0.074	0.039	0.001	5.245	0.040	70.5	0.5
2500	0.9841	13.593	0.045	0.002	3.744	0.045	0.009	13.057	0.533	170.6	6.6
8500	1.0000	17.074	0.136	0.009	18.345	0.136	0.005	14.281	0.154	185.6	1.9
integrated		8.738	0.011	0.001	2.154	0.011	0.000	8.521	0.014	113.2	0.4

