

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Counting Instrument:		Ludlum 2360		Detector:		Ludlum 43-93		Calibration Date:		9/6/2011								
Serial #:		202398		Serial #:		PR211706		12 month calibration:		OK								
Detector Active Area or Area Covered by Smear (cm ²):						100												
	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	T _{1/2} (yr)	Source Decayed Activity	Required MDA (DPM/100cm ²)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm				
Alpha	0.0735	Th-230	7104-10	-	-	-	#VALUE!	500	1	1	0.80	0.92	2601.5	198.74				
Beta	0.0834	Tc-99	7102-10	-	-	-	#VALUE!	1000	1	1	170.90	9.04	1293.8	342.74				
Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
9/16/2011	0	168	2550	1282	0.0	168.0	2550.0	1114.0	PASS	PASS	PASS	PASS	40.82	759	Yes	Yes	PR	PR
9/19/2011	0	178	2560	1669	0.0	178.0	2560.0	1491.0	PASS	PASS	PASS	PASS	40.82	781	Yes	Yes	B Gardner	BG
9/20/2011	0	165	2626	1597	0.0	165.0	2626.0	1432.0	PASS	PASS	PASS	PASS	40.82	753	Yes	Yes	B Gardner	BG
9/21/2011	0	176	2516	1656	0.0	176.0	2516.0	1480.0	PASS	PASS	PASS	PASS	40.82	776	Yes	Yes	PR	PR
9/22/2011	1	163	2579	1746	1.0	163.0	2578.0	1583.0	PASS	PASS	PASS	PASS	104.14	749	Yes	Yes	PR	PR
9/23/2011	1	165	2815	1868	1.0	165.0	2814.0	1703.0	PASS	PASS	PASS	PASS	104.14	753	Yes	Yes	GB	GB
9/28/2011	1	185	2595	1692	1.0	185.0	2594.0	1507.0	PASS	PASS	PASS	PASS	104.14	795	Yes	Yes	GB	GB
10/3/2011	2	164	2488	1631	2.0	164.0	2486.0	1467.0	PASS	PASS	PASS	PASS	130.36	751	Yes	Yes	GB	GB
10/4/2011	1	188	2604	1801	1.0	188.0	2603.0	1613.0	PASS	PASS	PASS	PASS	104.14	801	Yes	Yes	GB	GB
10/7/2011	0	178	2595	1684	0.0	178.0	2595.0	1506.0	PASS	PASS	PASS	PASS	40.82	781	Yes	Yes	PR	PR
10/10/2011	1	171	2586	1856	1.0	171.0	2585.0	1685.0	PASS	PASS	PASS	PASS	104.14	766	Yes	Yes	GB	GB
10/11/2011	0	168	2511	1664	0.0	168.0	2511.0	1496.0	PASS	PASS	PASS	PASS	40.82	759	Yes	Yes	GB	GB
10/12/2011	0	163	2714	1699	0.0	163.0	2714.0	1536.0	PASS	PASS	PASS	PASS	40.82	749	Yes	Yes	GB	GB
10/13/2011	0	165	2567	1737	0.0	165.0	2567.0	1572.0	PASS	PASS	PASS	PASS	40.82	753	Yes	Yes	GB	GB
10/14/2011	0	176	2522	1809	0.0	176.0	2522.0	1633.0	PASS	PASS	PASS	PASS	40.82	776	Yes	Yes	GB	GB
10/17/2011	1	179	2622	1802	1.0	179.0	2621.0	1623.0	PASS	PASS	PASS	PASS	104.14	783	Yes	Yes	GB	GB
10/18/2011	0	160	2576	1630	0.0	160.0	2576.0	1470.0	PASS	PASS	PASS	PASS	40.82	742	Yes	Yes	GB	GB
10/19/2011	0	154	2537	1434	0.0	154.0	2537.0	1280.0	PASS	PASS	PASS	PASS	40.82	729	Yes	Yes	GB	GB
10/20/2011	0	171	2741	1756	0.0	171.0	2741.0	1585.0	PASS	PASS	PASS	PASS	40.82	766	Yes	Yes	GB	GB
10/21/2011	1	188	2631	1571	1.0	188.0	2630.0	1383.0	PASS	PASS	PASS	PASS	104.14	801	Yes	Yes	GB	GB
10/24/2011	1	173	2515	1756	1.0	173.0	2514.0	1583.0	PASS	PASS	PASS	PASS	104.14	770	Yes	Yes	GB	GB
10/25/2011	0	162	2480	1740	0.0	162.0	2480.0	1578.0	PASS	PASS	PASS	PASS	40.82	746	Yes	Yes	GB	GB
10/26/2011	2	161	2444	1543	2.0	161.0	2442.0	1382.0	PASS	PASS	PASS	PASS	130.36	744	Yes	Yes	GB	GB
10/28/2011	1	173	2415	1734	1.0	173.0	2414.0	1561.0	PASS	PASS	PASS	PASS	104.14	770	Yes	Yes	GB	GB
11/7/2011	2	175	2513	1487	2.0	175.0	2511.0	1312.0	PASS	PASS	PASS	PASS	130.36	774	Yes	Yes	N. Berliner	NMB
11/8/2011	2	169	2540	1637	2.0	169.0	2538.0	1468.0	PASS	PASS	PASS	PASS	130.36	762	Yes	Yes	GB	GB
11/9/2011	1	155	2254	1501	1.0	155.0	2253.0	1346.0	PASS	PASS	PASS	PASS	104.14	731	Yes	Yes	GB	GB
11/10/2011	1	168	2548	1542	1.0	168.0	2547.0	1374.0	PASS	PASS	PASS	PASS	104.14	759	Yes	Yes	GB	GB
11/11/2011	3	170	2790	1830	3.0	170.0	2787.0	1660.0	QUESTION	PASS	PASS	PASS	150.48	764	Yes	Yes	GB	GB
11/14/2011	0	184	2688	1751	0.0	184.0	2688.0	1567.0	PASS	PASS	PASS	PASS	40.82	793	Yes	Yes	GB	GB
11/15/2011	2	172	2607	1725	2.0	172.0	2605.0	1553.0	PASS	PASS	PASS	PASS	130.36	768	Yes	Yes	GB	GB
11/16/2011	1	169	2752	1775	1.0	169.0	2751.0	1606.0	PASS	PASS	PASS	PASS	104.14	762	Yes	Yes	GB	GB
11/17/2011	0	155	2565	1597	0.0	155.0	2565.0	1442.0	PASS	PASS	PASS	PASS	40.82	731	Yes	Yes	GB	GB
11/18/2011	0	175	2419	1671	0.0	175.0	2419.0	1496.0	PASS	PASS	PASS	PASS	40.82	774	Yes	Yes	GB	GB
11/21/2011	2	187	2573	1798	2.0	187.0	2571.0	1611.0	PASS	PASS	PASS	PASS	130.36	799	Yes	Yes	GB	GB
11/22/2011	1	163	2442	1623	1.0	163.0	2441.0	1460.0	PASS	PASS	PASS	PASS	104.14	749	Yes	Yes	GB	GB
11/23/2011	2	198	2551	1751	2.0	198.0	2549.0	1553.0	PASS	QUESTION	PASS	PASS	130.36	821	Yes	Yes	GB	GB
11/28/2011	0	164	2402	1422	0.0	164.0	2402.0	1258.0	PASS	PASS	PASS	PASS	40.82	751	Yes	Yes	GB	GB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	T _{1/2} (yr)	Source Decayed Activity	Required MDA (DPM/100cm ²)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm				
Alpha	0.0735	Th-230	7104-10	-	-	-	#VALUE!	500	1	1	0.80	0.92	2601.5	198.74				
Beta	0.0834	Tc-99	7102-10	-	-	-	#VALUE!	1000	1	1	170.90	9.04	1293.8	342.74				
Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
11/29/2011	0	160	2613	1838	0.0	160.0	2613.0	1678.0	PASS	PASS	PASS	PASS	40.82	742	Yes	Yes	GB	GB
11/30/2011	1	171	2649	1613	1.0	171.0	2648.0	1442.0	PASS	PASS	PASS	PASS	104.14	766	Yes	Yes	GB	GB
12/1/2011	0	168	2504	1656	0.0	168.0	2504.0	1488.0	PASS	PASS	PASS	PASS	40.82	759	Yes	Yes	GB	GB
12/2/2011	1	165	2579	1557	1.0	165.0	2578.0	1392.0	PASS	PASS	PASS	PASS	104.14	753	Yes	Yes	GB	GB
12/5/2011	0	153	2546	1867	0.0	153.0	2546.0	1714.0	PASS	PASS	PASS	PASS	40.82	726	Yes	Yes	GB	GB
12/6/2011	1	157	2641	1702	1.0	157.0	2640.0	1545.0	PASS	PASS	PASS	PASS	104.14	735	Yes	Yes	PR	PR
12/7/2011	2	177	2768	1637	2.0	177.0	2766.0	1460.0	PASS	PASS	PASS	PASS	130.36	779	Yes	Yes	GB	GB
12/8/2011	0	169	2578	1841	0.0	169.0	2578.0	1672.0	PASS	PASS	PASS	PASS	40.82	762	Yes	Yes	GB	GB
12/9/2011	1	165	2436	1557	1.0	165.0	2435.0	1392.0	PASS	PASS	PASS	PASS	104.14	753	Yes	Yes	GB	GB
12/12/2011	1	161	2453	1854	1.0	161.0	2452.0	1693.0	PASS	PASS	PASS	PASS	104.14	744	Yes	Yes	GB	GB
12/13/2011	1	188	2546	1807	1.0	188.0	2545.0	1619.0	PASS	PASS	PASS	PASS	104.14	801	Yes	Yes	GB	GB
12/14/2011	1	153	2517	1664	1.0	153.0	2516.0	1511.0	PASS	PASS	PASS	PASS	104.14	726	Yes	Yes	GB	GB
12/15/2011	0	168	2474	1733	0.0	168.0	2474.0	1565.0	PASS	PASS	PASS	PASS	40.82	759	Yes	Yes	GB	GB
12/16/2011	2	160	2459	1598	2.0	160.0	2457.0	1438.0	PASS	PASS	PASS	PASS	130.36	742	Yes	Yes	GB	GB

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Initial Background and Source Counts for Control Chart								
#	Initial bkg counts				Initial source plus bkg counts			
	Alpha	cpm	Beta	cpm	Alpha	cpm	Beta	cpm
1	0	0	178	178	2512	2512	1247	1247
2	0	0	181	181	2927	2927	1147	1147
3	2	2	158	158	2526	2526	1719	1719
4	1	1	168	168	2419	2419	1699	1699
5	0	0	178	178	2759	2759	1161	1161
6	0	0	185	185	2503	2503	1224	1224
7	2	2	163	163	2263	2263	2044	2044
8	1	1	164	164	2820	2820	1282	1282
9	2	2	164	164	2656	2656	1886	1886
10	0	0	170	170	2638	2638	1238	1238
Mean		0.80		170.9		2602.3		1464.7
S _(n-1)		0.92		9.04		198.35		335.98
-3 sigma		-1.96		143.79		2007.24		456.77
+3 sigma		3.56		198.01		3197.36		2472.63
-2 sigma		-1.04		152.83		2205.59		792.75
+2 sigma		2.64		188.97		2999.01		2136.65
					Mean-bkg	2601.5		1293.8
					S _(n-1)	198.74		342.74
				Mean-bkg	-3 sigma	2005.28		265.59
				Mean-bkg	+3 sigma	3197.72		2322.01
				Mean-bkg	-2 sigma	2204.02		608.33
				Mean-bkg	+2 sigma	2998.98		1979.27
						2512		1069
						2927		966
						2524		1561
						2418		1531
						2759		983
						2503		1039
						2261		1881
						2819		1118
						2654		1722
						2638		1068

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Counting Instrument:		Ludlum 2360		Detector:		Ludlum 43-93		Calibration Date:		9/6/2011								
Serial #:		202398		Serial #:		PR211706		12 month calibration:		OK								
Detector Active Area or Area Covered by Smear (cm ²):						100												
	Efficiency (fraction)	Source Nuclide	Source Number	Original Source Activity (DPM)	Source Creation Date	T _{1/2} (yr)	Source Decayed Activity	Required MDA (DPM/100cm ²)	Control Chart & Daily Bkg Count Time	Control Chart & Daily Source-Sample Count Time	Control Chart bkg Average α/β cpm	Control Chart bkg 1 sigma, cpm	Control Chart Source-bkg Average α/β cpm	Control Chart source 1 sigma, cpm				
Alpha	0.0735	Th-230	7104-10	-	-	-	#VALUE!	500	1	1	0.70	0.82	2436.2	79.57				
Beta	0.0834	Tc-99	7102-10	-	-	-	#VALUE!	1000	1	1	223.30	20.63	1364.3	223.01				
Date	Daily Bkg Counts		Daily Check Source Counts		Daily Bkg Rate (cpm)		Net Daily Source Rate (cpm)		Bkg QC Pass/Fail		Source QC Pass/Fail		MDA α (dpm)	MDA β (dpm)	α MDA OK?	β MDA OK?	H.P. Technician	Technician Initials
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta	Alpha	Beta						
12/20/2011	0	219	2381	1690	0.0	219.0	2381.0	1471.0	PASS	PASS	PASS	PASS	40.82	862	Yes	Yes	Gbright	GB
1/4/2012	1	197	2534	1416	1.0	197.0	2533.0	1219.0	PASS	PASS	PASS	PASS	104.14	819	Yes	Yes	Ddavis	DD
1/5/2012	1	201	2350	1694	1.0	201.0	2349.0	1493.0	PASS	PASS	PASS	PASS	104.14	827	Yes	Yes	Ddavis	DD
1/6/2012	1	197	2612	1789	1.0	197.0	2611.0	1592.0	PASS	PASS	QUESTION	PASS	104.14	819	Yes	Yes	Ddavis	DD
1/9/2012	1	209	2460	1768	1.0	209.0	2459.0	1559.0	PASS	PASS	PASS	PASS	104.14	843	Yes	Yes	DAD	DD
1/10/112	1	219	2432	1894	1.0	219.0	2431.0	1675.0	PASS	PASS	PASS	PASS	104.14	862	Yes	Yes	Davis	DD
1/11/2012	1	189	2431	1799	1.0	189.0	2430.0	1610.0	PASS	PASS	PASS	PASS	104.14	803	Yes	Yes	Davis	DD
1/12/2012	2	199	2389	1698	2.0	199.0	2387.0	1499.0	PASS	PASS	PASS	PASS	130.36	823	Yes	Yes	Davis	DD
1/13/2012	2	205	2406	1837	2.0	205.0	2404.0	1632.0	PASS	PASS	PASS	PASS	130.36	835	Yes	Yes	Davis	DD
1/16/2012	1	210	2352	1708	1.0	210.0	2351.0	1498.0	PASS	PASS	PASS	PASS	104.14	845	Yes	Yes	Davis	DD
1/17/2012	0	222	2421	1734	0.0	222.0	2421.0	1512.0	PASS	PASS	PASS	PASS	40.82	868	Yes	Yes	Davis	DD
1/18/2012	1	199	2434	1777	1.0	199.0	2433.0	1578.0	PASS	PASS	PASS	PASS	104.14	823	Yes	Yes	Davis	DD
1/19/2012	1	214	2486	1825	1.0	214.0	2485.0	1611.0	PASS	PASS	PASS	PASS	104.14	852	Yes	Yes	Davis	DD
1/20/2012	3	201	2484	1746	3.0	201.0	2481.0	1545.0	QUESTION	PASS	PASS	PASS	150.48	827	Yes	Yes	Davis	DD
1/23/2012	2	192	2410	1797	2.0	192.0	2408.0	1605.0	PASS	PASS	PASS	PASS	130.36	809	Yes	Yes	Davis	DD
1/24/2012	1	202	2401	1805	1.0	202.0	2400.0	1603.0	PASS	PASS	PASS	PASS	104.14	829	Yes	Yes	Davis	DD
1/25/2012	1	209	2402	1792	1.0	209.0	2401.0	1583.0	PASS	PASS	PASS	PASS	104.14	843	Yes	Yes	Davis	DD
1/26/2012	1	210	2574	1753	1.0	210.0	2573.0	1543.0	PASS	PASS	PASS	PASS	104.14	845	Yes	Yes	Davis	DD
1/27/2012	1	211	2577	1698	1.0	211.0	2576.0	1487.0	PASS	PASS	PASS	PASS	104.14	847	Yes	Yes	Davis	DD
1/30/2012	1	197	2534	1739	1.0	197.0	2533.0	1542.0	PASS	PASS	PASS	PASS	104.14	819	Yes	Yes	Davis	DD
1/31/2012	2	197	2566	1802	2.0	197.0	2564.0	1605.0	PASS	PASS	PASS	PASS	130.36	819	Yes	Yes	Davis	DD

CABRERA ALPHA-BETA COUNTING INSTRUMENT (Rev 6)

Initial Background and Source Counts for Control Chart								
#	Initial bkg counts				Initial source plus bkg counts			
	Alpha	cpm	Beta	cpm	Alpha	cpm	Beta	cpm
1	2	2	196	196	2454	2454	1570	1570
2	1	1	192	192	2478	2478	2099	2099
3	1	1	235	235	2547	2547	1499	1499
4	1	1	230	230	2341	2341	1676	1676
5	0	0	215	215	2380	2380	1403	1403
6	0	0	238	238	2551	2551	1443	1443
7	0	0	200	200	2435	2435	1529	1529
8	0	0	243	243	2305	2305	1432	1432
9	2	2	240	240	2450	2450	1765	1765
10	0	0	244	244	2428	2428	1460	1460
Mean		0.70		223.3		2436.9		1587.6
S _(n-1)		0.82		20.63		79.73		212.89
-3 sigma		-1.77		161.41		2197.72		948.94
+3 sigma		3.17		285.19		2676.08		2226.26
-2 sigma		-0.95		182.04		2277.44		1161.83
+2 sigma		2.35		264.56		2596.36		2013.37
					Mean-bkg	2436.2		1364.3
					S _(n-1)	79.57		223.01
				Mean-bkg	-3 sigma	2197.49		695.27
				Mean-bkg	+3 sigma	2674.91		2033.33
				Mean-bkg	-2 sigma	2277.06		918.28
				Mean-bkg	+2 sigma	2595.34		1810.32
						2452		1374
						2477		1907
						2546		1264
						2340		1446
						2380		1188
						2551		1205
						2435		1329
						2305		1189
						2448		1525
						2428		1216