Original Data from 2002 Background Igloos

Alpha	A1107	B0806	C0912	D0405	E0403	Beta	A1107	B0806
	13	3	1	2	3		234	155
	17	3	5	1	1		255	171
	12	3	3	2	2		272	228
	4	4	1	3	2		206	196
	18	6	2	3	3		283	237
	9	11	0	3	1		199	172
	8	5	0	3	2		235	253
	16	5	2	2	4		202	216
	4	3	1	0	2		220	191
	7	2	2	2	2		215	231
	4	3	3	2	2		183	204
	9	4	1	1	1		225	231
	14	4	0	0	0		213	162
	5	5	0	3	1		243	171
	14	3	2	1	3		203	197
	12	5	0	1	1		252	246
	16	2	0	0	7		197	166
	11	2	1	1	0		226	198
	15	5	0	2	2		220	169
	6	2	1	3	1		181	162
	5	5	0	2	2		222	256
	4	5	0	1	0		231	233
	1	3	3	2	0		241	179
	9	2	3	3	1		228	260
	12	5	1	4	2		277	248
	15	8	2	3	1		260	212
	15	2	1	1	0		387	211
	6	3	3	3	0		216	229
	111	86	13	5	34		596	430
	8	2	3	3	3		163	134
Average	13.33333	6.7	1.8	2.066667	2.766667		242.8333	211.6
SD	19.03596	15.10686	2.483046	1.201532	6.078131		78.13432	53.74692

C0912	D0405	E0403
334	199	206
168	189	206
205	248	251
170	317	111
210	337	253
274	281	222
243	222	230
229	199	276
159	187	246
187	232	260
202	188	228
224	246	236
168	204	164
185	286	223
173	189	179
233	264	218
169	206	189
182	204	200
200	202	172
168	188	156
240	280	243
215	226	257
181	196	214
197	259	250
214	234	231
216	183	219
199	272	206
249	369	180
209	286	299
138	223	129
204.7	237.2	215.1333
39.07919	48.914	42.06459

Kruskal-Wallis Test, per NUREG-1505 Section 13

Ordered Data	Rank	Adj Rank	A1107	B0806	C0912	D0405	E0403
0	1	9.5			9.5		
0	2	9.5			9.5		
0	3	9.5			9.5		
0	4	9.5			9.5		
0	5	9.5			9.5		
0	6	9.5			9.5		
0	7	9.5			9.5		
0	8	9.5			9.5		
0	9	9.5			9.5		
0	10	9.5				9.5	
0	11	9.5				9.5	
0	12	9.5				9.5	
0	13	9.5					9.5
0	14	9.5					9.5
0	15	9.5					9.5
0	16	9.5					9.5
0	17	9.5					9.5
0	18	9.5					9.5
1	19	30.5	30.5				
1	20	30.5			30.5		
1	21	30.5			30.5		
1	22	30.5			30.5		
1	23	30.5			30.5		
1	24	30.5			30.5		
1	25	30.5			30.5		
1	26	30.5			30.5		
1	27	30.5			30.5		
1	28	30.5				30.5	
1	29	30.5				30.5	
1	30	30.5				30.5	
1	31	30.5				30.5	
1	32	30.5				30.5	
1	33	30.5				30.5	
1	34	30.5				30.5	
1	35	30.5					30.5
1	36	30.5					30.5
1	37	30.5					30.5
1	38	30.5					30.5
1	39	30.5					30.5
1	40	30.5					30.5
1	41	30.5					30.5
1	42	30.5					30.5
2	43	57		57			
2	44	57		57			
2	45	57		57			
2	46	57		57			
2	47	57		57			
2	48	57		57			

2	49	57	57			
2	50	57		57		
2	51	57		57		
2	52	57		57		
2	53	57		57		
2	54	57		57		
2	55	57			57	
2	56	57			57	
2	57	57			57	
2	58	57			57	
2	59	57			57	
2	60	57			57	
2	61	57			57	
2	62	57			57	
2	63	57				57
2	64	57				57
2	65	57				57
2	66	57				57
2	67	57				57
2	68	57				57
2	69	57				57
2	70	57				57
2	71	57				57
3	72	85.5	85.5			
3	73	85.5	85.5			
3	74	85.5	85.5			
3	75	85.5	85.5			
3	76	85.5	85.5			
3	77	85.5	85.5			
3	78	85.5	85.5			
3	79	85.5	85.5			
3	80	85.5		85.5		
3	81	85.5		85.5		
3	82	85.5		85.5		
3	83	85.5		85.5		
3	84	85.5		85.5		
3	85	85.5		85.5		
3	86	85.5			85.5	
3	87	85.5			85.5	
3	88	85.5			85.5	
3	89	85.5			85.5	
3	90	85.5			85.5	
3	91	85.5			85.5	
3	92	85.5			85.5	
3	93	85.5			85.5	
3	94	85.5			85.5	
3	95	85.5			85.5	
3	96	85.5				85.5
3	97	85.5				85.5
3	98	85.5				85.5

3	99	85.5					85.5
4	100	104	104				
4	101	104	104				
4	102	104	104				
4	103	104	104				
4	104	104		104			
4	105	104		104			
4	106	104		104			
4	107	104				104	
4	108	104					104
5	109	114.5	114.5				
5	110	114.5	114.5				
5	111	114.5		114.5			
5	112	114.5		114.5			
5	113	114.5		114.5			
5	114	114.5		114.5			
5	115	114.5		114.5			
5	116	114.5		114.5			
5	117	114.5		114.5			
5	118	114.5		114.5			
5	119	114.5			114.5		
5	120	114.5				114.5	
6	121	122	122				
6	122	122	122				
6	123	122		122			
7	124	124.5	124.5				
7	125	124.5					124.5
8	126	127	127				
8	127	127	127				
8	128	127		127			
9	129	130	130				
9	130	130	130				
9	131	130	130				
11	132	132.5	132.5				
11	133	132.5		132.5			
12	134	135	135				
12	135	135	135				
12	136	135	135				
13	137	137.5	137.5				
13	138	137.5			137.5		
14	139	139.5	139.5				
14	140	139.5	139.5				
15	141	142	142				
15	142	142	142				
15	143	142	142				
16	144	144.5	144.5				
16	145	144.5	144.5				
17	146	146	146				
18	147	147	147				
34	148	148					148

86	149	149		149			
111	150	150	150				
							Total
	Sum of Ranks	3800	2841.5	1379.5	1771.5	1532.5	11325
	Count	30	30	30	30	30	150
	Avg. Rank	126.6667	94.71667	45.98333	59.05	51.08333	

K	0.00053	481333.3	269137.4	63434.01	104607.1	78285.21	528.1044
k-1	4						
Kc	9.5						

K>Kc therefore significant variability

75.10439

Lower Boundary of Gray Region Calculation, per NUREG-1505 Section 13

	Measurements (cpm)					Measurements Squared				
Data Groups	A1107	B0806	C0912	D0405	E0403	A1107	B0806	C0912	D0405	E0403
	13	3	1	2	3	169	9	1	4	9
	17	3	5	1	1	289	9	25	1	1
	12	3	3	2	2	144	9	9	4	4
	4	4	1	3	2	16	16	1	9	4
	18	6	2	3	3	324	36	4	9	9
	9	11	0	3	1	81	121	0	9	1
	8	5	0	3	2	64	25	0	9	4
	16	5	2	2	4	256	25	4	4	16
	4	3	1	0	2	16	9	1	0	4
	7	2	2	2	2	49	4	4	4	4
	4	3	3	2	2	16	9	9	4	4
	9	4	1	1	1	81	16	1	1	1
	14	4	0	0	0	196	16	0	0	0
	5	5	0	3	1	25	25	0	9	1
	14	3	2	1	3	196	9	4	1	9
	12	5	0	1	1	144	25	0	1	1
	16	2	0	0	7	256	4	0	0	49
	11	2	1	1	0	121	4	1	1	0
	15	5	0	2	2	225	25	0	4	4
	6	2	1	3	1	36	4	1	9	1
	5	5	0	2	2	25	25	0	4	4
	4	5	0	1	0	16	25	0	1	0
	1	3	3	2	0	1	9	9	4	0
	9	2	3	3	1	81	4	9	9	1
	12	5	1	4	2	144	25	1	16	4
	15	8	2	3	1	225	64	4	9	1
	15	2	1	1	0	225	4	1	1	0
	6	3	3	3	0	36	9	9	9	0
	111	86	13	5	34	12321	7396	169	25	1156
	8	2	3	3	3	64	4	9	9	9

sum	400	201	54	62	83	15842	7965	276	170	1301	
Average	13.333333	6.7	1.8	2.066667	2.766667						
Std Dev	19.035961	15.106861	2.483046	1.201532	6.078131						
Avg Sqd	177.77778	44.89	3.24	4.271111	7.654444						
count	30	30	30	30	30						
count Sqd	900	900	900	900	900	6	6	6	6	6	30

25554	sum of squares of all measurements (A)
640000	square of sum of all measurements (B)
7135	sum of squares of averages weighted by number of measurements (C)
150	N
5	k
30.0	n_o
127.0275862	Sw^2
717.0833333	Sb^2
19.6685249	w^2
4.4	w
13.3	LBGR = 3w, per NUREG-1505
	Other LBGR possibilities
5.9	Mean all bkgd data
16	Std Dev all bkgd data
37	Mean + 2*SD
15	95% Percentile All Data
111	Maximum Background Measurement

Kruskal-Wallis Test, per NUREG-1505 Section 13

Ordered Data	Rank	Adj Rank	A1107	B0806	C0912	D0405	E0403
111	1	1					1
129	2	2					2
134	3	3		3			
138	4	4			4		
155	5	5		5			
156	6	6					6
159	7	7			7		
162	8	8.5		8.5			
162	9	8.5		8.5			
163	10	10	10				
164	11	11					11
166	12	12		12			
168	13	14			14		
168	14	14			14		
168	15	14			14		
169	16	16.5		16.5			
169	17	16.5			16.5		
170	18	18			18		
171	19	19.5		19.5			
171	20	19.5		19.5			
172	21	21.5		21.5			
172	22	21.5					21.5
173	23	23			23		
179	24	24.5		24.5			
179	25	24.5					24.5
180	26	26					26
181	27	27.5	27.5				
181	28	27.5			27.5		
182	29	29			29		
183	30	30.5	30.5				
183	31	30.5				30.5	
185	32	32			32		
187	33	33.5			33.5		
187	34	33.5				33.5	
188	35	35.5				35.5	
188	36	35.5				35.5	
189	37	37.5				37.5	
189	38	37.5				37.5	
189	39	39					39
191	40	40		40			
196	41	41		41			
196	42	42				42	
197	43	44	44				
197	44	44		44			
197	45	44			44		
198	46	46		46			
199	47	48.5	48.5				
199	48	48.5			48.5		

199	49	48.5				48.5	
199	50	48.5				48.5	
200	51	51.5			51.5		
200	52	51.5					51.5
202	53	54	54				
202	54	54			54		
202	55	54				54	
203	56	56	56				
204	57	58		58			
204	58	58				58	
204	59	58				58	
205	60	60			60		
206	61	63	63				
206	62	63				63	
206	63	63					63
206	64	63					63
206	65	63					63
209	66	66			66		
210	67	67			67		
211	68	68		68			
212	69	69		69			
213	70	70	70				
214	71	71.5			71.5		
214	72	71.5					71.5
215	73	73.5	73.5				
215	74	73.5			73.5		
216	75	76	76				
216	76	76		76			
216	77	76			76		
218	78	78					78
219	79	79					79
220	80	80.5	80.5				
220	81	80.5	80.5				
222	82	83	83				
222	83	83				83	
222	84	83					83
223	85	85.5				85.5	
223	86	85.5					85.5
224	87	87			87		
225	88	88	88				
226	89	89	89				
226	90	90				90	
228	91	92	92				
228	92	92		92			
228	93	92					92
229	94	94.5		94.5			
229	95	94.5			94.5		
230	96	96					96
231	97	98.5	98.5				
231	98	98.5		98.5			

231	99	98.5		98.5			
231	100	98.5					98.5
232	101	101				101	
233	102	102.5		102.5			
233	103	102.5			102.5		
234	104	104.5	104.5				
234	105	104.5				104.5	
235	106	106	106				
236	107	107					107
237	108	108		108			
240	109	109			109		
241	110	110	110				
243	111	112	112				
243	112	112			112		
243	113	112					112
246	114	115		115			
246	115	115				115	
246	116	115					115
248	117	117.5		117.5			
248	118	117.5				117.5	
249	119	119			119		
250	120	120					120
251	121	121					121
252	122	122	122				
253	123	123.5		123.5			
253	124	123.5					123.5
255	125	125	125				
256	126	126		126			
257	127	127					127
259	128	128				128	
260	129	130	130				
260	130	130		130			
260	131	130					130
264	132	132				132	
272	133	133.5	133.5				
272	134	133.5				133.5	
274	135	135			135		
276	136	136					136
277	137	137	137				
280	138	138				138	
281	139	139				139	
283	140	140	140				
286	141	141.5				141.5	
286	142	141.5				141.5	
299	143	143					143
317	144	144				144	
334	145	145			145		
337	146	146				146	
369	147	147				147	
387	148	148	148				

430	149	149		149
596	150	150	150	

							Total
Sum of Ranks	2682.5	1935.5	1748.5	2669	2289.5		11325
Count	30	30	30	30	30		150
Avg. Rank	89.41667	64.51667	58.28333	88.96667	76.31667		

K	0.00053	239860.2	124872	101908.4	237452	174727	465.5998
k-1	4						
Kc	9.5						

K>Kc therefore significant variability

12.59982

Lower Boundary of Gray Region Calculation, per NUREG-1505 Section 13

	Measurements (cpm)					Measurements Squared				
Data Groups	A1107	B0806	C0912	D0405	E0403	A1107	B0806	C0912	D0405	E0403
	234	155	334	199	206	54756	24025	111556	39601	42436
	255	171	168	189	206	65025	29241	28224	35721	42436
	272	228	205	248	251	73984	51984	42025	61504	63001
	206	196	170	317	111	42436	38416	28900	100489	12321
	283	237	210	337	253	80089	56169	44100	113569	64009
	199	172	274	281	222	39601	29584	75076	78961	49284
	235	253	243	222	230	55225	64009	59049	49284	52900
	202	216	229	199	276	40804	46656	52441	39601	76176
	220	191	159	187	246	48400	36481	25281	34969	60516
	215	231	187	232	260	46225	53361	34969	53824	67600
	183	204	202	188	228	33489	41616	40804	35344	51984
	225	231	224	246	236	50625	53361	50176	60516	55696
	213	162	168	204	164	45369	26244	28224	41616	26896
	243	171	185	286	223	59049	29241	34225	81796	49729
	203	197	173	189	179	41209	38809	29929	35721	32041
	252	246	233	264	218	63504	60516	54289	69696	47524
	197	166	169	206	189	38809	27556	28561	42436	35721
	226	198	182	204	200	51076	39204	33124	41616	40000
	220	169	200	202	172	48400	28561	40000	40804	29584
	181	162	168	188	156	32761	26244	28224	35344	24336
	222	256	240	280	243	49284	65536	57600	78400	59049
	231	233	215	226	257	53361	54289	46225	51076	66049
	241	179	181	196	214	58081	32041	32761	38416	45796
	228	260	197	259	250	51984	67600	38809	67081	62500
	277	248	214	234	231	76729	61504	45796	54756	53361
	260	212	216	183	219	67600	44944	46656	33489	47961
	387	211	199	272	206	149769	44521	39601	73984	42436
	216	229	249	369	180	46656	52441	62001	136161	32400
	596	430	209	286	299	355216	184900	43681	81796	89401
	163	134	138	223	129	26569	17956	19044	49729	16641

sum	7285	6348	6141	7116	6454	1946085	1427010	1301351	1757300	1439784	
Average	242.83333	211.6	204.7	237.2	215.1333						
Std Dev	78.134316	53.746917	39.079186	48.914	42.06459						
Avg Sqd	58968.028	44774.56	41902.09	56263.84	46282.35						
count	30	30	30	30	30						
count Sqd	900	900	900	900	900	6	6	6	6	6	30

7871530	sum of squares of all measurements (A)
1111822336	square of sum of all measurements (B)
7445726.067	sum of squares of averages weighted by number of measurements (C)
150	N
5	k
30.0	n_o
2936.578851	Sw^2
8394.29	Sb^2
181.923705	w^2
13.5	w
40.5	LBGR = 3w, per NUREG-1505
	Other LBGR possibilities
221.2	Mean all bkgd data
64	Std Dev all bkgd data
350	Mean + 2*SD
287	95% Percentile All Data
596	Maximum Background Measurement

Summary of Kruskal-Wallis Test (per NUREG-1505)
2002 Background Igloo Alpha and Beta Measurements
License Termination Report
Seneca Army Depot Activity

Background Dataset	Reference Area	Average Measurement (cpm)	St Dev (cpm)	Sum of Ranks	Number of Measurements	K	k-1	Kc	K > Kc?	*w*	LBGR (=3*w*)
2002 Igloo Alpha Phoswich	A1107	13.3	19	3800	30	75.1	4	9.5	Yes	4.4	13.3
	B0806	6.7	15	2841.5	30			@ α = 0.05			
	C0912	1.8	2	1379.5	30						
	D0405	2.1	1	1771.5	30						
	E0403	2.8	6	1532.5	30						
2002 Igloo Beta Phoswich	A1107	242.8	78.1	2682.5	30	12.5	4	9.5	Yes	13.5	40.5
	B0806	211.6	53.7	1935.5	30			@ α = 0.05			
	C0912	204.7	39.1	1748.5	30						
	D0405	237.2	48.9	2669	30						
	E0403	215.1	42.1	2289.5	30						

K calculated using equation 13-3 from NUREG-1505
k-1 is based on k=5 datasets
Kc is from Table 13.1, NUREG-1505 for k-1=4 and an α of 0.05.
If K > Kc, the null hypothesis that there is no difference between the populations is rejected (i.e., variability exists between the datasets).