Supporting Information

Methodological applicability of ultra-low background liquid scintillation counters in low-level tritium measurement

Contents of Supporting Information

Table S1 GCT 6220 under high-quench condition

GCT mode	OFF			LOW			HIGH		
Counting window（kev）	2-18.6	4-7	4-18.6	2-18.6	4-7	4-18.6	2-18.6	4-7	4-18.6
Background (CPM)	8.23	1.93	7.35	1.83	0.56	1.57	1.42	0.46	1.21
Efficiency (%)	30.88	11.53	25.43	30.76	11.52	25.42	30.76	11.52	25.42
FOM	115.78	68.92	88.00	517.85	238.85	411.47	664.51	286.68	534.17
MDA (Bq/L)	2.84	3.71	3.26	1.35	2.01	1.52	1.20	1.84	1.33

Table S2 GCT 6220 under low-quench condition

GCT mode	OFF			LOW			HIGH		
Counting window（kev）	2-18.6	4-7	4-18.6	2-18.6	4-7	4-18.6	2-18.6	4-7	4-18.6
Background (CPM)	11.63	2.58	9.59	1.74	0.54	1.10	1.39	0.41	0.85
Efficiency (%)	33.35	13.86	21.34	33.32	13.85	21.32	33.32	13.85	21.31
FOM	95.33	74.48	47.48	637.83	356.37	412.71	799.48	469.59	537.14
MDA(Bq/L)	12.51	14.24	17.74	4.88	6.60	6.09	4.36	5.77	5.35

Table S3 Quantulus 1220 under high-quench condition

Channel Windows	50-320	50-270	60-220
Background (CPM)	2.25	1.86	1.44
Efficiency (%)	27.51	27.51	27.20
FOM	336.66	406.66	514.14
MDA（Bq/L）	1.68	1.53	1.36

Table S4 Quantulus 1220 under low-quench condition

Channel Windows	50-320	50-270	60-220
Background (CPM)	2.22	1.90	1.58
Efficiency (%)	41.14%	41.13%	40.48%
FOM	762.57	889.01	1039.07
MDA(Bq/L)	4.45	4.13	3.83

Table S5 Measurement results of high-quench samples on GCT 6220 using relative measurement method

Sample	Activity (Bq/L)	Quench index (TSIE)	Sample	Activity (Bq/L)	Quench index (TSIE)
1	56.45±2.49	314.26	2	26.75±2.18	313.81
3	11.69±2.08	319.67	4	2.65±0.59	322.04
5	2.71±0.71	320.4	6	5.96±2.32	319.74
7	34.12±2.28	330.01	8	21.19±2.69	324.35
9	16.11±1.58	327.9	10	23.67±2.90	328.17
11	13.28±2.18	328.29	12	6.21±1.71	327.74
13	9.29±1.07	325.78	14	30.25±2.74	327.02
15	31.39±2.11	321.97	16	19.96±1.57	327.39
17	15.32±2.50	325.36	18	14.85±2.69	324.91
19	23.86±2.37	325.81	20	14.17±2.45	326.21

Table S6 Measurement results of high-quench samples on Quantulus 1220 using relative measurement method

Sample	Activity (Bq/L)	Quench index (SQP)	Sample	Activity (Bq/L)	Quench index (SQP)
1	56.90±2.31	773.99	2	26.11±1.65	776.73
3	13.87±2.14	776.53	4	2.93±0.98	777.46
5	3.94±1.21	776.45	6	6.14±2.24	777.48
7	33.89±1.63	773.52	8	23.11±1.87	775.86
9	16.69±1.50	777.20	10	19.98±2.46	777.79
11	12.96±1.87	775.03	12	4.53±1.71	777.48
13	9.96±2.32	775.94	14	32.58±2.33	776.88
15	33.10±2.01	776.11	16	18.72±0.98	777.85
17	15.78±2.87	780.86	18	14.29±2.54	776.53
19	13.80±2.65	778.47	20	16.29±2.47	777.64

Table S7 Measurement results of low-quench samples on Quantulus 1220 using internal standard method

Sample	Activity (Bq/L)	Quench index (SQP)	Sample	Activity (Bq/L)	Quench index (SQP)
1	17.62±3.85	823.328	20	11.15±1.82	829.144
2	16.79±4.66	834.762	21	10.21±1.54	766.078
3	13.39±1.51	767.372	22	26.47±3.29	831.882
4	11.73±2.08	836.414	23	10.82±1.65	883.633
5	10.32±3.45	831.69	24	10.26±2.47	833.036
6	9.38±2.74	838.542	25	9.23±0.81	768.948
7	12.01±1.11	769.728	26	10.39±1.79	827.83
8	13.50±2.13	829.066	27	11.15±2.24	833.3
9	14.79±1.47	832.784	28	18.17±2.17	833.978
10	13.47±2.23	834.024	29	9.82±3.42	834.424
11	12.23±2.11	831.068	30	8.83±3.51	828.24
12	17.12±4.97	828.156	31	11.15±2.24	838.212
13	12.88±3.56	836.2	32	14.96±2.17	282.37
14	9.16±2.39	827.094	33	10.82±3.08	829.248
15	9.99±1.98	829.062	34	10.24±2.34	829.618
16	23.15±0.54	837.428	35	13.53±2.07	827.032
17	24.81±2.26	829.756	36	7.89±2.83	826.204
18	5.24±1.89	824.00	37	13.47±2.23	834.024
19	9.82±3.42	834.424	38	12.23±2.11	831.068