NHS Greater Glasgow & Clyde Immunology and Neuroimmunology		
QF_20	Measurement Uncertainty summary table for cells (flow cytometry)	Version: 2
Author: Lauren Hennessy	Authoriser: Fran Henriquez / Chris Edwards	Date of Issue: 23/05/24

Measurement Uncertainty: Summary table for cells (flow cytometry)

Measurement Uncertainty (MU) is calculated using internal quality control (IQC)

The raw data and calculations can be found at the following location:
 \\xggc-fsrv-04\GGC Biochemistry\Immunology\1IMM&NI\Quality\Uncertainty of Measurement

Analyte	Absolute Lymphocyte Count (cells/cmm)	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	1470.5	1496.8
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	62.06	56.57
Coefficient of Variance (%CV)	4.22%	3.78%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 8.4%**	**± 7.6%**
Uncertainty of measurement **example** (using IQC**)**	1470.50 ± 124.13 cells/cmm (1346.4 – 1594.6 cells/cmm)	1496.78 ± 113.15 cells/cmm (1383.6 – 1609.9 cells/cmm)

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Analyte	% CD3+ T cells	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	71.3	71.6
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	1.03	1.01
Coefficient of Variance (%CV)	1.45%	1.40%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 2.9%**	**± 2.8%**
Uncertainty of measurement **example** (using IQC**)**	71.3 ± 2.06% (69.2 – 73.4%)	71.6 ± 2.01% (69.6 – 73.6%)

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Analyte	CD3$^+$ T cells absolute count (cells/cmm)	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	1048.3	1071.3
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	48.33	41.51
Coefficient of Variance (%CV)	4.61%	3.87%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 9.2%**	**± 7.7%**
Uncertainty of measurement **example** (using IQC**)**	1048.32 ± 96.67 cells/cmm (951.7– 1145.0 cells/cmm)	1071.27 ± 83.02 cells/cmm (988.3 – 1154.3 cells/cmm)

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Analyte	% CD3$^+$ CD4$^+$ T cells	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	46.5	46.5
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	0.87	0.96
Coefficient of Variance (%CV)	1.87%	2.07%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 3.7%**	**± 4.1%**
Uncertainty of measurement **example** (using IQC**)**	46.45 ± 1.74% (44.7 – 48.2%)	46.53 ± 1.93% (44.6 – 48.5%)

Analyte	CD3$^+$ CD4$^+$ T cell absolute count (cells/cmm)	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	683.0	696.5
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	30.69	28.50
Coefficient of Variance (%CV)	4.49%	4.09%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 9.0%**	**± 8.2%**
Uncertainty of measurement **example** (using IQC**)**	683.0 ± 61.38 cells/cmm (621.6 – 744.4 cells/cmm)	696.5 ± 57.00 cells/cmm (639.5 – 753.5 cells/cmm)

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Analyte	% CD3$^+$ CD8$^+$ T cells	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	20.9	21.1
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	0.89	0.87
Coefficient of Variance (%CV)	4.25%	4.11%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 8.5%**	**± 8.2%**
Uncertainty of measurement **example** (using IQC**)**	20.9 ± 1.78% (19.1 – 22.7%)	21.1 ± 1.73% (19.4 –22.8%)

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Analyte	CD3$^+$ CD8$^+$ T cell absolute count (cells/cmm)	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	307.6	313.5
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	19.33	15.98
Coefficient of Variance (%CV)	6.28%	5.06%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 12.6%**	**± 10.1%**
Uncertainty of measurement **example** (using IQC**)**	307.62 ± 38.66 cells/cmm (269.0 – 346.3 cells/cmm)	315.54 ± 31.96 cells/cmm (283.6 – 347.5 cells/cmm)

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Analyte	% CD19$^+$ B cells	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	15.2	15.1
Number of measurements (n)	49	37
Estimated Standard Deviation (s)	0.85	0.73
Coefficient of Variance (%CV)	5.60%	4.84%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 11.2%**	**± 9.7%**
Uncertainty of measurement **example** (using IQC**)**	15.22 ± 1.70% (13.5– 16.9%)	15.08 ± 1.46% (13.6 – 16.5%)

Analyte	CD19$^+$ B cell absolute count (cells/cmm)	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	223.9	225.8
Number of measurements (n)	49	37
Estimated Standard Deviation (s)	14.66	14.15
Coefficient of Variance (%CV)	6.55%	6.27%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 13.1%**	**± 12.5%**
Uncertainty of measurement **example** (using IQC**)**	223.9 ± 29.31 cells/cmm (194.6 – 253.2 cells/cmm)	225.8 ± 28.29 cells/cmm (197.5 – 254.1 cells/cmm)

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Analyte	**% CD16$^+$ /56$^+$ NK cells**	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	12.0	11.9
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	0.71	0.77
Coefficient of Variance (%CV)	5.93%	6.51%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 11.9%**	**± 13.0%**
Uncertainty of measurement **example** (using IQC**)**	12.0 ± 1.42% (10.6 – 13.4%)	11.9 ± 1.55% (10.4 – 13.5%)

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Analyte	CD16$^+$/56$^+$ NK cell absolute count (cells/cmm)	
	IQC on Integrated Lyric	IQC on Stand Alone Lyric
Mean (x)	176.3	178.2
Number of measurements (n)	50	37
Estimated Standard Deviation (s)	12.01	14.23
Coefficient of Variance (%CV)	6.81%	7.98%
Coverage factor (k) to define a confidence level of 95%	2	2
Relative standard expanded uncertainty (U)	**± 13.6%**	**± 16.0%**
Uncertainty of measurement **example** (using IQC**)**	176.34 ± 24.01 cells/cmm (152.3– 200.4 cells/cmm)	178.19 ± 28.45 cells/cmm (149.7 – 206.6 cells/cmm)

For the details of the calculation and MU protocol please refer to document QP_5: Measurement Uncertainty Protocol.