Supporting Information:

The accurate determination of number concentration of inorganic nanoparticles using spICP-MS with the dynamic mass flow approach

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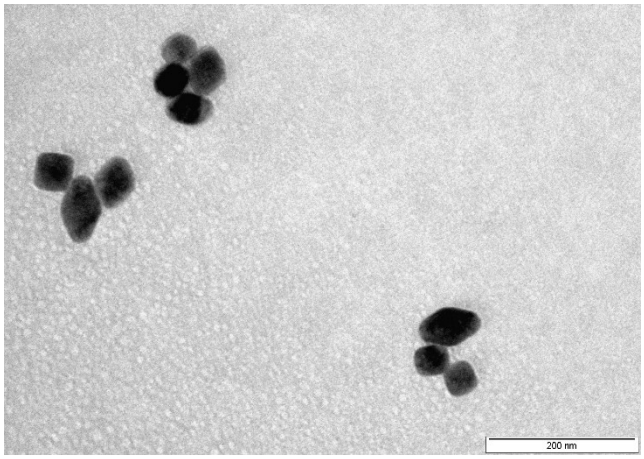

Figure S1. Transmission electron microscope (TEM) image of bipyramidal TiO_2 nanoparticle suspensions. Scale bar: 200 nm. A Morgagni 268 TEM (FEI, Hillsboro, OR) was used.

Table S1. Typical operating parameters for measurements of Au and TiO_2 NP by spICP-MS.

Instrumental parameters	
RF power	1550 W
Argon gas flow rate	
Plasma	15 L min^{-1}
Auxiliary	0.90 L min^{-1}
Nebuliser	1.05 - 1.15 L min^{-1}
Nebuliser type	MicroMist DC Nebuliser 0.4 mL min^{-1}
Spray chamber type	Scott
Spray chamber temperature	2 °C
Sample uptake rate	0.35 g min^{-1}
Ti cell gas conditions	
Oxygen flow rate	20%
Hydrogen flow rate	4.5 mL min^{-1}
Axial acceleration	1.5 V (only for TiO_2 NP)
Data acquisition parameters	
Acquisition mode	SQ (Au), MS/MS (TiO_2)
Dwell time	100 µs
Readings per replicate	600000
Settling time	-
Total acquisition time	60 s
Isotopes monitored	^{197}Au, $^{48}Ti^{16}O$ [MS/MS (Q1: 48, Q2:64)]

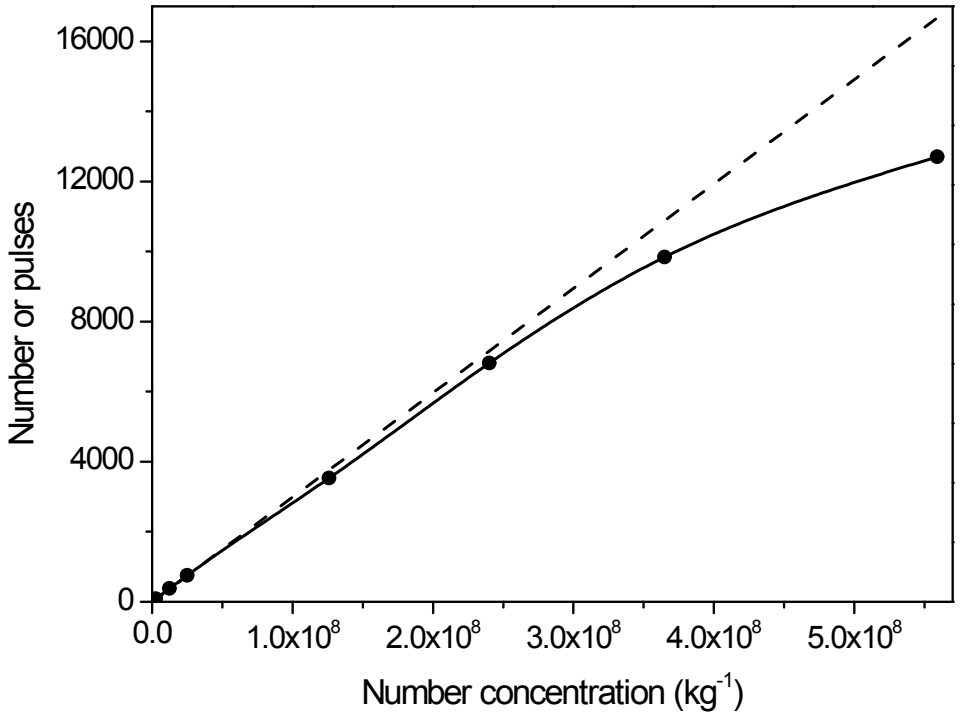

Figure S2. Theoretical (broken line) and experimental (solid line) particle number concentration calibration at t_{dwell}=100 μs obtained for NIST RM 8012 30 nm Au NP. Total acquisition time: 60 s.

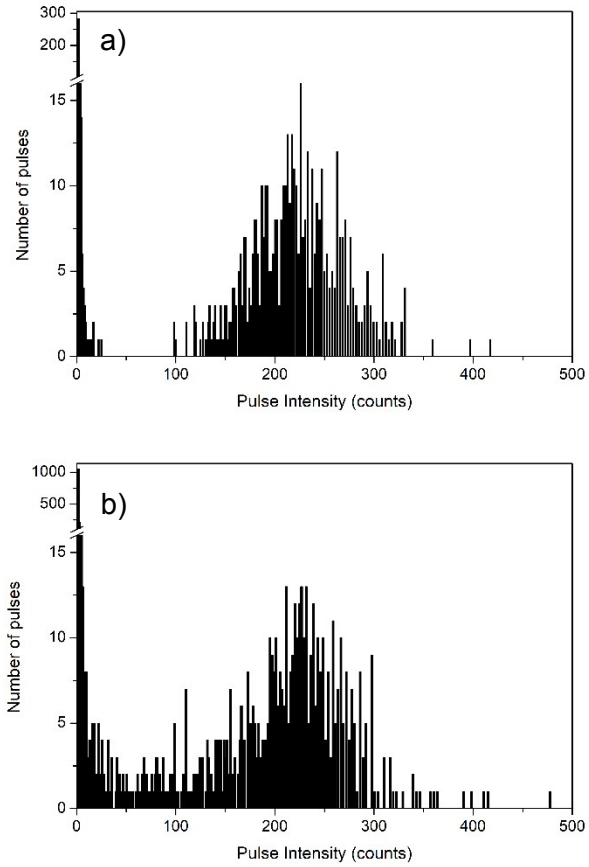

Figure S3. Signal distribution of 30 nm Au NP with dwell time of (a) 100 μs and (b) 3 ms.

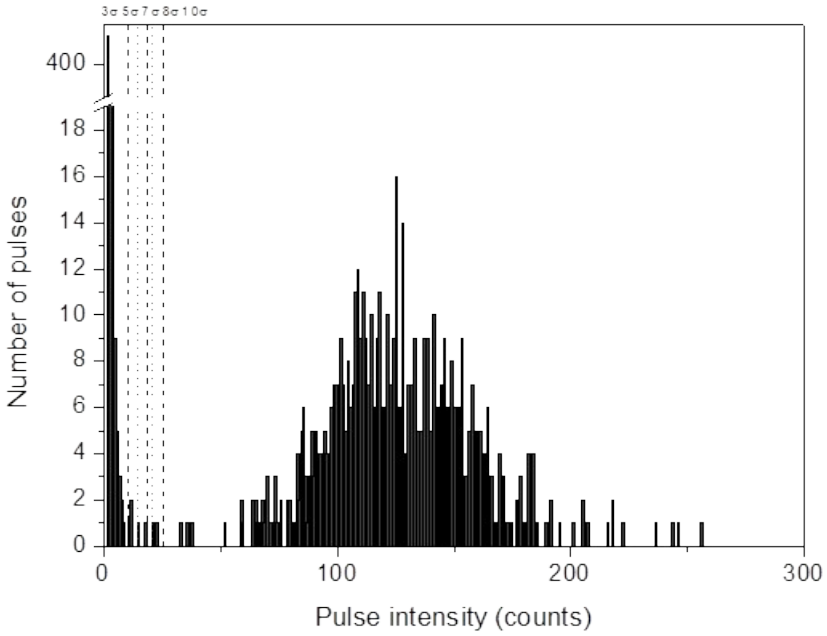

Figure S4. Variation of the detection threshold using 3-10σ critera, as applied for 30 nm Au NP.

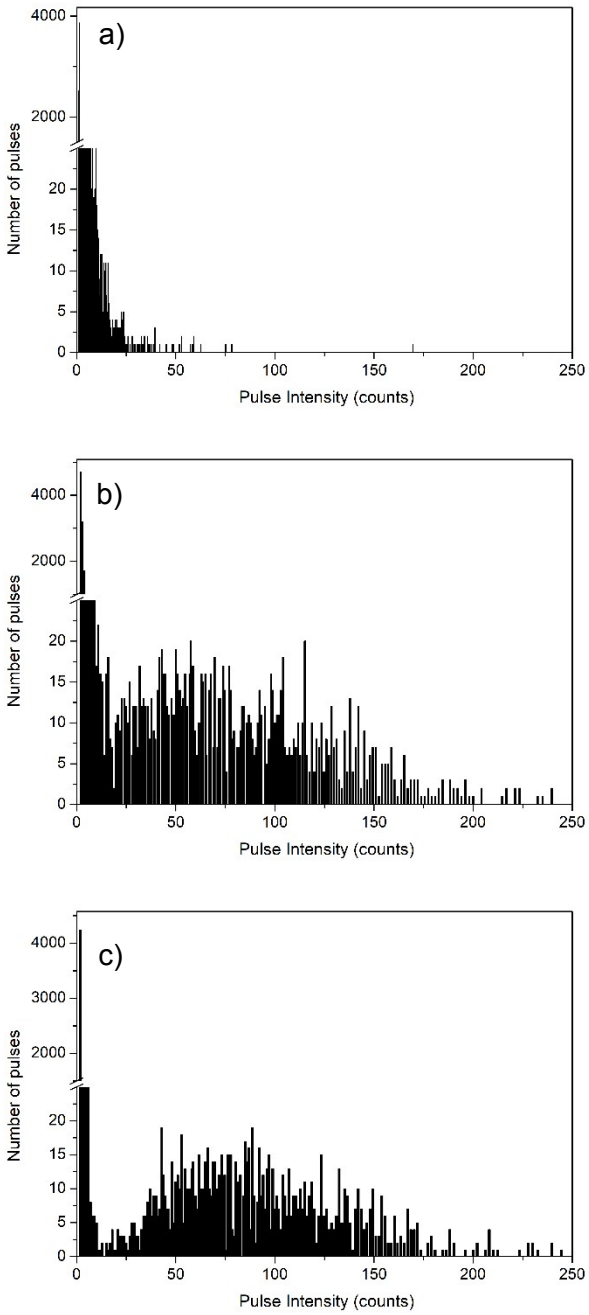

Figure S5. Signal distribution histograms of TiO_2 NP (a) without axial acceleration and dwell time of 100 µs and with axial acceleration and dwell time of 3 ms (b) and of 100 µs (c).

Table S2. Uncertainty budget for the determination of the number concentration of Au NP by DMF and particle frequency methods.

Sample	Method of TE calculation	Uncertainty contribution (%)				
		Number of particles detected in time scan	Dilution factor	Transport efficiency	Sample mass flow	Batch-to-batch variability
Au 30 nm	**Dynamic mass flow**	64.8	0.7	12.3	<0.1	22.2
Au 60 nm (8013 NIST)		65.6	0.7	11.4	0.1	22.2
Au 100 nm		64.9	0.3	7.4	<0.1	27.4
Au 30 nm	**Frequency**	26.6	0.3	63.9	<0.1	9.2
Au 100 nm		28.6	0.2	61.3	<0.1	9.9

Table S3. Further breakdown of uncertainty contribution for the number of particles detected and the TE, using 30 nm Au as an example.

NP detected in time scan (N_{NP})	Contribution (%)
Variability in particle counts	99.89
Variability in background counts	0.11
Detection threshold	<0.1
Transport efficiency (TE)	Contribution (%)
Variability of TE within day:	98.94:
• Slope 1 (mass flow of sample reaching the plasma):	98.28
• Slope 2 (mass flow of sample uptake)	1.72
Time reading	1.06
Weighing	<0.1