Electronic Supplementary Material (ESI) for RSC Advances.

Drop-on-Demand microdroplet generation: a very stable platform for single-droplet experimentation

Bartholomew S. Vaughn, Philip J. Tracey, Adam J. Trevitt*

School of Chemistry, University of Wollongong, New South Wales, 2522, Australia

***corresponding author: adamt@uow.edu.au**

Supplementary Information

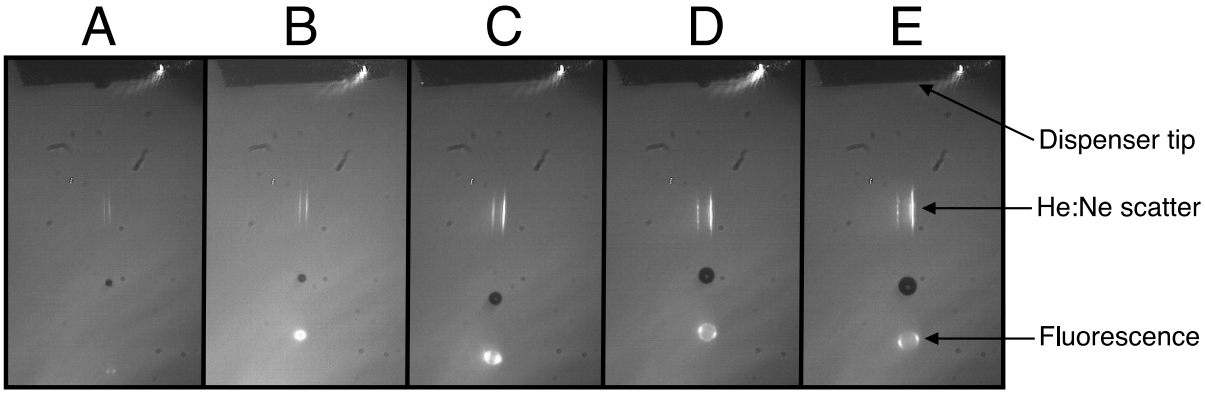

Figure S1 Bright-field images of the droplet interaction region. Each frame shows the dispenser capillary tip, sync laser scattering, fluorescence emission and the resulting droplet from the corresponding waveforms in Figure 1.

TABLE S1. Parameters of the waveforms shown in Figure 2.

Amplitude (V) Section number	Waveform				
	A	B	C	D	E
1	84	84	80	84	84
2	-42	-42	-	-42	-42
3	84	84	-	84	84
Pulsewidth (us) Section number	Waveform				
	A	B	C	D	E
1	17	40	37.1	28	40
2	5	5	-	5	5
3	14	10	-	28	20
Total Pulsewidth (us)	36	55	37.1	61	65

TABLE S2. Fitted parameters for each droplet shown in Figure 2.

	Droplet				
	A	B	C	D	E
Imaged Diameter (pixels)	16	23	36	45	51
Radius (nm)	10700 ± 5	13420 ± 14	21020 ± 45	28100 ± 150	31400 ±1400
n_A	1.33 ± 0.01	1.39 ± 0.02	1.35 ± 0.03	1.30 ± 0.01	1.31 ± 0.6
n_B (nm^2)	2465 ± 23	-1033 ± 27	-637 ± 81	769 ± 83	355 ± 99
Refractive index* (575 nm)	1.34 ± 0.04	1.39 ± 0.05	1.35 ± 0.14	1.30 ± 0.14	1.31 ± 0.18

*refractive index $n(\lambda) = n_{A+}n_B/(\lambda^2)$

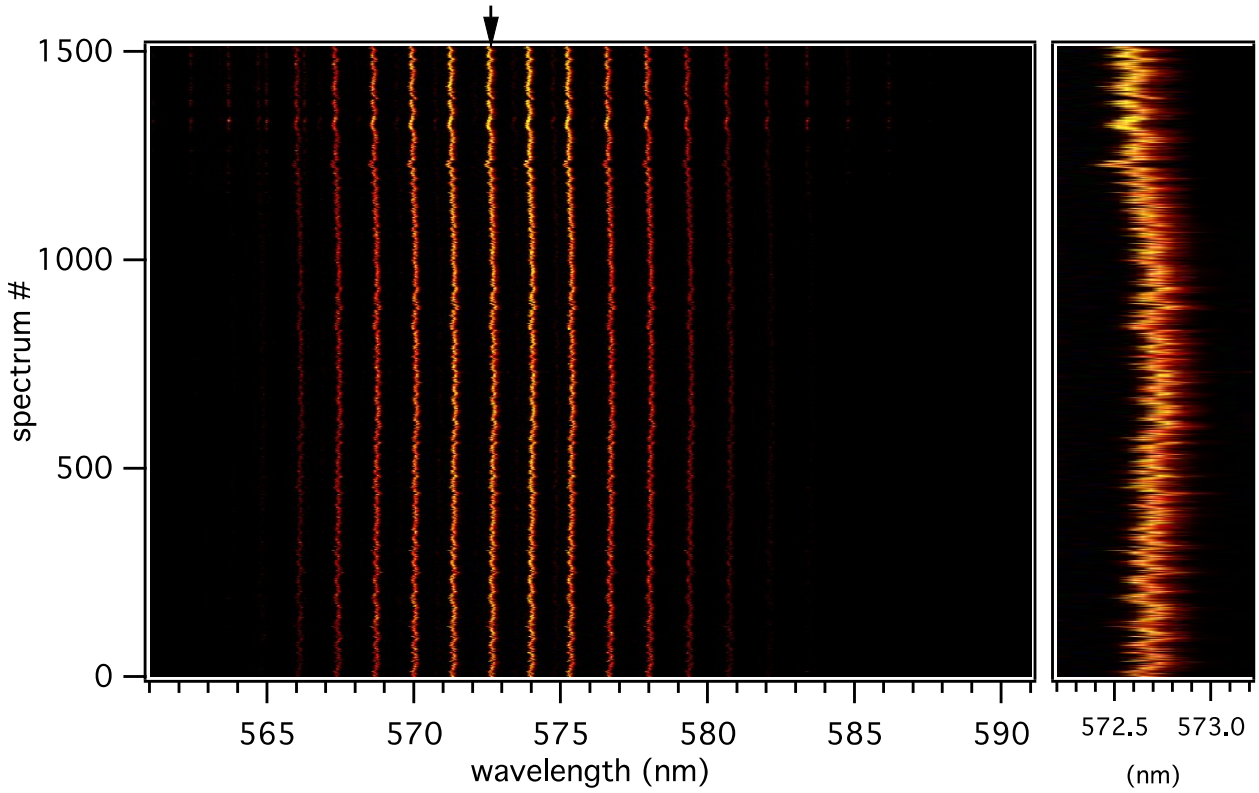

Figure S2 1500 consecutive single droplet fluorescence spectra. The microdroplets were generated using the square wave pulse labeled E in Figure 2. The inset shows an expansion of the single WGM peak marked with an arrow.

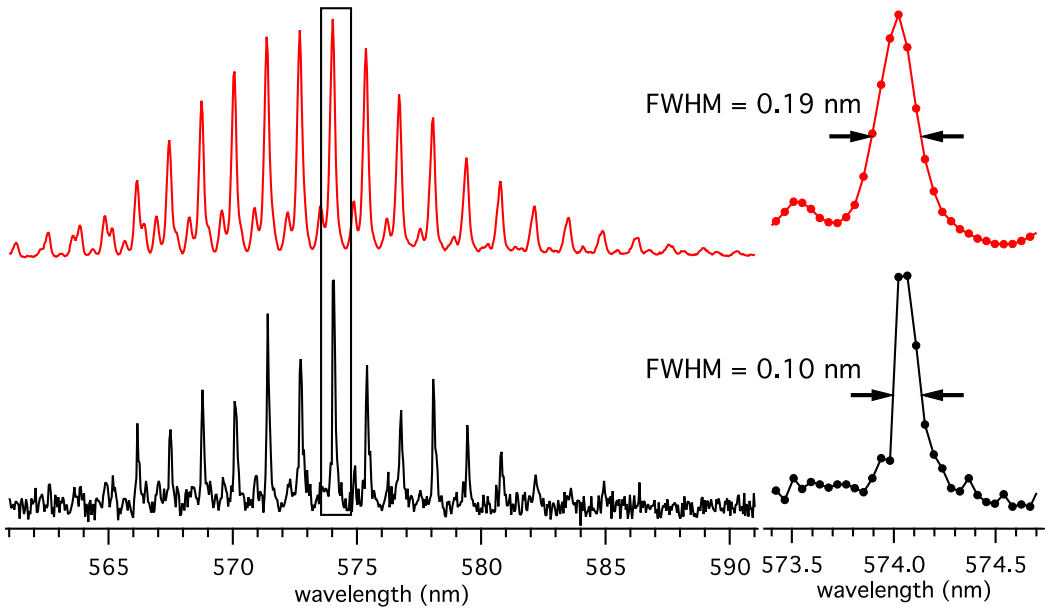

Figure S3 A single droplet fluorescence spectrum (bottom, black) to an average of 1500 single droplet spectra (top, red) from Figure S2.

TABLE S3. Experimental and simulated MDR positions used in the fitting of droplet C. In red are predicted positions.

Experimental positions (nm)	Assignment	Simulated position (nm)	Difference (nm)
567.198	TE_{273}^{5}	567.177	0.021
568.269	TM_{278}^{4}	568.295	-0.026
569.082	TE_{272}^{5}	569.079	0.003
570.187	TM_{277}^{4}	570.191	-0.004
570.996	TE_{271}^{5}	570.994	0.002
572.106	TM_{276}^{4}	572.101	0.005
572.921	TE_{270}^{5}	572.922	-0.001
574.031	TM_{275}^{4}	574.023	0.008
574.858	TE_{269}^{5}	574.863	-0.005
576.812	TE_{268}^{5}	576.817	-0.005
578.787	TE_{267}^{5}	578.785	0.002
580.812	TE_{266}^{5}	580.767	0.045
582.851	TE_{265}^{5}	582.763	0.088
584.887	TE_{264}^{5}	584.772	0.115
-	TE_{274}^{5}	565.288	-
-	TM_{279}^{4}	566.411	-
-	TM_{274}^{4}	575.958	-
-	TE_{280}^{4}	565.621	-
-	TE_{279}^{4}	567.499	-
-	TE_{278}^{4}	569.390	-
-	TE_{277}^{4}	571.293	-
-	TE_{276}^{4}	573.209	-
-	TE_{275}^{4}	575.139	-
-	TE_{274}^{4}	577.081	-
-	TE_{273}^{4}	579.037	-
-	TE_{272}^{4}	581.006	-
-	TE_{271}^{4}	582.988	-
-	TE_{270}^{4}	584.985	-

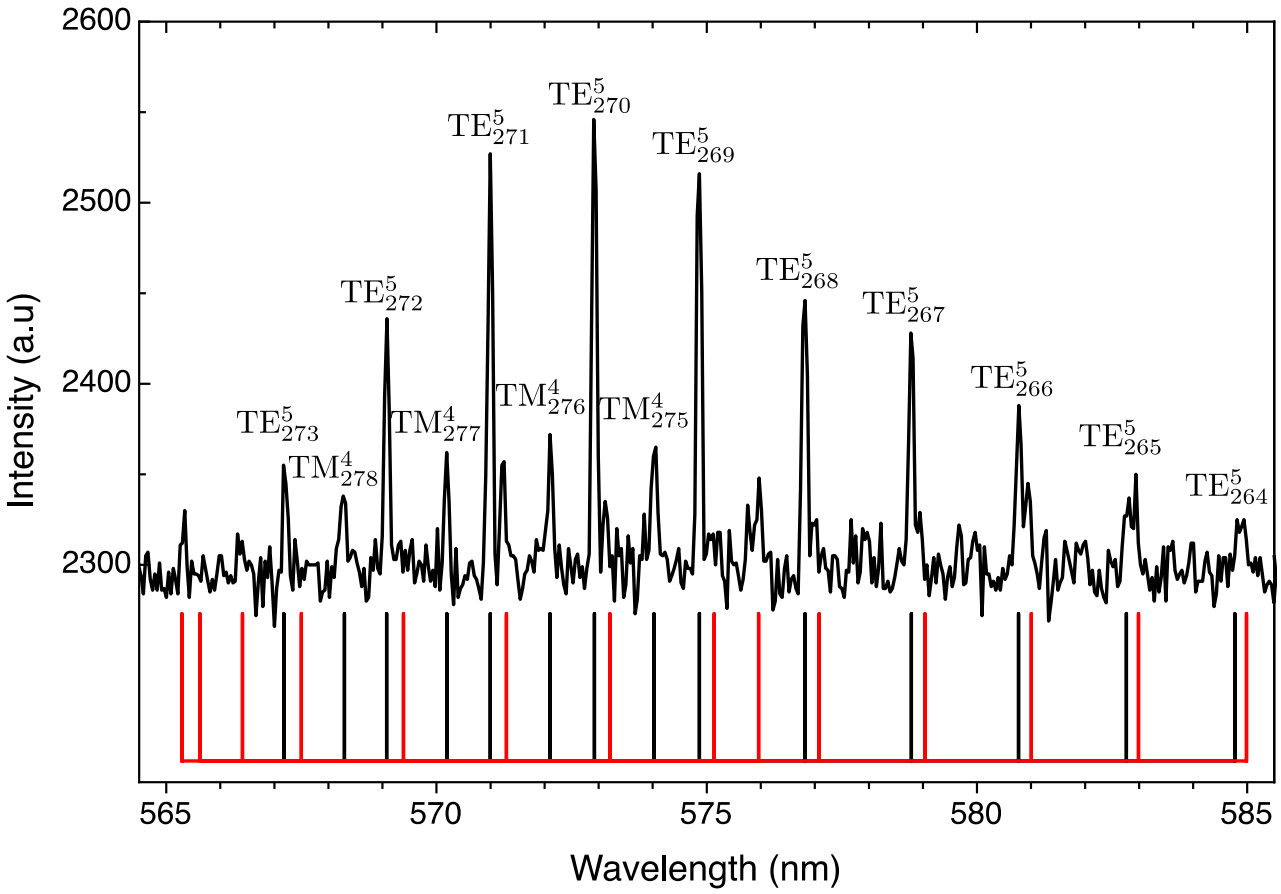

Figure S4 Single droplet emission spectrum using waveform C with WGM assignments. Black bars represent the fitted WGMs – data from Table S3. The red bars are predicted WGMs (as listed in Table III).

TABLE S4. Experimental and simulated MDR positions used in the fitting of droplet A.

Experimental positions (nm)	Assignment	Simulated position (nm)	Difference (nm)
563.880	TE_{137}^{3}	563.859	0.021
565.639	TM_{136}^{3}	565.625	0.014
567.571	TE_{136}^{3}	567.567	0.004
569.359	TM_{135}^{3}	569.362	-0.003
571.326	TE_{135}^{3}	571.326	0.000
573.151	TM_{134}^{3}	573.151	0.000
575.134	TE_{134}^{3}	575.137	-0.003
578.992	TE_{133}^{3}	579.001	-0.009
582.922	TE_{132}^{3}	582.919	0.003
586.917	TE_{131}^{3}	586.893	0.024
590.738	TE_{136}^{2}	590.763	-0.025
590.986	TE_{130}^{3}	590.923	0.063
594.797	TE_{135}^{2}	594.789	0.008
598.887	TE_{134}^{2}	598.871	0.016
-	TE_{137}^{2}	586.794	-

TABLE S5. Experimental and simulated MDR positions used in the fitting of droplet B.

Experimental positions (nm)	Assignment	Simulated position (nm)	Difference (nm)
566.761	TE_{170}^{5}	566.744	0.017
569.716	TE_{169}^{5}	569.706	0.010
570.642	TE_{174}^{4}	570.644	-0.002
571.99	TM_{173}^{4}	571.944	0.046
572.702	TE_{168}^{5}	572.700	0.002
574.958	TM_{172}^{4}	574.934	0.024
575.726	TE_{167}^{5}	575.726	0
576.544	TE_{172}^{4}	576.624	-0.080
577.939	TM_{171}^{4}	577.957	-0.018
578.779	TE_{166}^{5}	578.784	-0.005
581.018	TM_{170}^{4}	581.011	0.007
581.868	TE_{165}^{5}	581.876	-0.008
585.001	TE_{164}^{5}	585.002	-0.001
587.224	TM_{168}^{4}	587.220	0.004
588.172	TE_{163}^{5}	588.162	0.010
590.368	TM_{167}^{4}	590.375	-0.007
591.374	TE_{162}^{5}	591.357	0.017
593.568	TM_{166}^{4}	593.564	0.004

TABLE S6. Experimental and simulated MDR positions used in the fitting of droplet D.

Experimental Positions (nm)	Assignment	Simulated positions (nm)	Difference (nm)
568.006	TE_{359}^{5}	568.001	0.005
568.249	TM_{365}^{4}	568.248	0.001
569.458	TE_{358}^{5}	569.461	-0.003
569.699	TM_{364}^{4}	569.702	-0.003
570.927	TE_{357}^{5}	570.929	-0.002
572.407	TE_{356}^{5}	572.405	0.002
573.89	TE_{355}^{5}	573.889	0.001
575.378	TE_{354}^{5}	575.380	-0.002
576.878	TE_{353}^{5}	576.879	-0.001
578.389	TE_{352}^{5}	578.387	0.002
579.899	TE_{351}^{5}	579.902	-0.003
581.428	TE_{350}^{5}	581.426	0.002

TABLE S7. Experimental and simulated MDR positions used in the fitting of droplet E.

Experimental Positions (nm)	Assignment	Simulated positions (nm)	Difference (nm)
565.046	TE_{416}^{4}	565.024	0.022
566.326	TE_{415}^{4}	566.302	0.024
567.581	TE_{414}^{4}	567.587	-0.006
568.88	TE_{413}^{4}	568.877	0.003
569.683	TE_{420}^{3}	569.721	-0.038
570.171	TE_{412}^{4}	570.173	-0.002
571.472	TE_{411}^{4}	571.475	-0.003
572.308	TE_{418}^{3}	572.312	-0.004
572.779	TE_{410}^{4}	572.783	-0.004
573.618	TE_{417}^{3}	573.616	0.002
574.095	TE_{409}^{4}	574.097	-0.002
574.947	TE_{416}^{3}	574.926	0.021
575.424	TE_{408}^{4}	575.418	0.006
576.748	TE_{407}^{4}	576.744	0.004
577.58	TE_{414}^{3}	577.565	0.015
578.074	TE_{406}^{4}	578.077	-0.003
579.413	TE_{405}^{4}	579.416	-0.003
580.764	TE_{404}^{4}	580.761	0.003
582.124	TE_{403}^{4}	582.113	0.011

583.486	TE_{402}^{4}	583.471	0.015
584.862	TE_{401}^{4}	584.835	0.027