

Table S1. Experiments and lasers used.

Type of experiment	Green	Blue	Red
Long term peak position stability Quartz	Yes	Yes	No
Long term peak position stability Zircon	Yes	No	No
Power density (flux)	Yes	Yes	No
Duration of analysis	Yes	Yes	No
Point-to-point comparisons	Yes	Yes	Yes

Table S2. Apparent position of  $464\text{ cm}^{-1}$  peak of two different quartz inclusions and reference crystals using different tools (LabSpec, PeakFit, and MATLAB).

Spectra fit	LabSpec position	PeakFit® position	MatLab position
Quartz inclusion 1	465.26	465.27	465.25
Quartz inclusion 2	465.15	465.16	465.13
Quartz reference 1	465.34	465.35	465.35
Quartz reference 2	465.45	465.46	465.44

Note: Reproducibility in peak position fits is c.  $\pm 0.01$  to  $0.02\text{ cm}^{-1}$ . The three software methods show indistinguishable differences in peak positions for each spectrum.

Table S3. Average peak positions ( $\pm 2\sigma$ ) for quartz and zircon analyses for continuous measurements on reference crystals during stable and unstable periods.

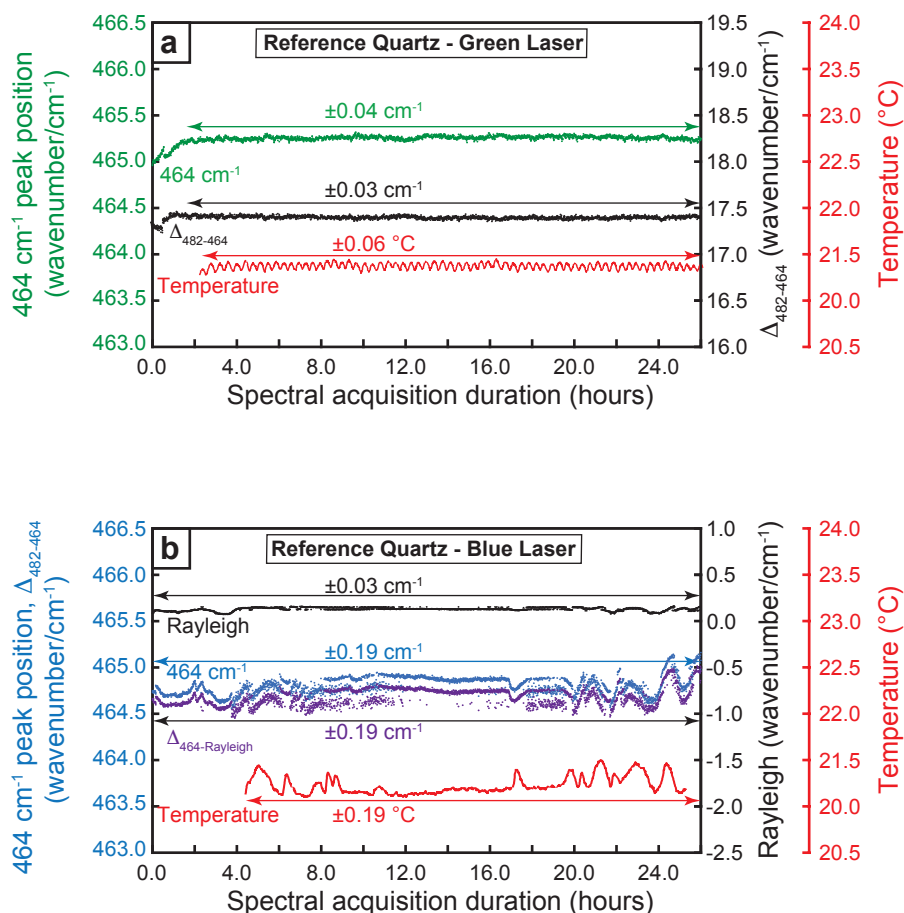
	Blue	Green
128 cm <sup>-1</sup> Quartz (stable)	128.78±0.10	129.91±0.07
Hg – 128 cm <sup>-1</sup> Quartz (stable)		354.12±0.05
128 cm <sup>-1</sup> Quartz (unstable)	130.05±1.16	139.79±0.67
Hg – 128 cm <sup>-1</sup> Quartz (unstable)		354.08±0.14
206 cm <sup>-1</sup> Quartz (stable)	207.12±0.14	208.32±0.13
Hg – 206 cm <sup>-1</sup> Quartz (stable)		275.71±0.12
206 cm <sup>-1</sup> Quartz (unstable)	208.34±1.20	209.11±0.71
Hg – 206 cm <sup>-1</sup> Quartz (unstable)		275.76±0.21
464 cm <sup>-1</sup> Quartz (stable)	465.26±0.09	466.30±0.06
Hg – 464 cm <sup>-1</sup> Quartz (stable)		17.73±0.05
464 cm <sup>-1</sup> Quartz (unstable)	466.43±1.15	467.18±0.67
Hg – 464 cm <sup>-1</sup> Quartz (unstable)		17.69±0.15
482 cm <sup>-1</sup> Quartz (stable)		484.03±0.09
482 cm <sup>-1</sup> Quartz (unstable)		484.87±0.77
975 cm <sup>-1</sup> Zircon (stable)	974.96±0.03	975.25±0.05
Hg – 975 cm <sup>-1</sup> Zircon (stable)		-492.24±0.06
975 cm <sup>-1</sup> Zircon (unstable)	974.90±0.30	975.58±0.41
Hg – 975 cm <sup>-1</sup> Zircon (unstable)		-492.22±0.13
1008 cm <sup>-1</sup> Zircon (stable)	1008.54±0.03	1008.77±0.06
Hg – 1008 cm <sup>-1</sup> Zircon (stable)		-525.76±0.06
1008 cm <sup>-1</sup> Zircon (unstable)	1008.48±0.29	1009.13±0.37
Hg – 1008 cm <sup>-1</sup> Zircon (unstable)		-525.77±0.16

Note: Atomic emission line for Hg is measurable by green laser only.

Table S4. Average peak positions ( $\pm 2\sigma$ ) and peak separations ( $\Delta\nu$ ) for quartz and zircon analyses that cycle among different lasers and between reference and inclusion crystals.

	Blue	Green	Red
128 cm <sup>-1</sup> Quartz reference	127.95±0.22	127.96±0.20	128.44±0.10
128 cm <sup>-1</sup> Quartz inclusion	128.59±0.26	128.32±0.28	128.79±0.45
<b><math>\Delta\nu_{128}</math> (Inclusion-Reference)</b>	<b>0.64±0.23</b>	<b>0.36±0.25</b>	<b>0.34±0.42</b>
Hg – 128 cm <sup>-1</sup> Quartz reference		355.99±0.19	
Hg – 128 cm <sup>-1</sup> Quartz inclusion		355.68±0.33	
<b><math>\Delta\nu_{128}</math> (Inclusion-Reference, Hg)</b>		<b>0.31±0.24</b>	
206 cm <sup>-1</sup> Quartz reference	206.65±0.27	206.77±0.20	206.62±0.37
206 cm <sup>-1</sup> Quartz inclusion	209.77±0.69	209.46±0.41	
<b><math>\Delta\nu_{206}</math> (Inclusion-Reference)</b>	<b>3.11±0.78</b>	<b>2.69±0.42</b>	
Hg – 206 cm <sup>-1</sup> Quartz reference		277.18±0.21	
Hg – 206 cm <sup>-1</sup> Quartz inclusion		274.54±0.47	
<b><math>\Delta\nu_{206}</math> (Inclusion-Reference, Hg)</b>		<b>2.64±0.44</b>	
464 cm <sup>-1</sup> Quartz reference	464.58±0.22	464.43±0.19	464.85±0.08
464 cm <sup>-1</sup> Quartz inclusion	465.73±0.23	465.48±0.23	466.00±0.20
<b><math>\Delta\nu_{464}</math> (Inclusion-Reference)</b>	<b>1.15±0.19</b>	<b>1.05±0.20</b>	<b>1.10±0.48</b>
Hg – 464 cm <sup>-1</sup> Quartz reference		19.52±0.19	
Hg – 464 cm <sup>-1</sup> Quartz inclusion		18.52±0.28	
<b><math>\Delta\nu_{464}</math> (Inclusion-Reference, Hg)</b>		<b>1.01±0.20</b>	
975 cm <sup>-1</sup> Zircon reference	974.80±0.35	974.07±0.19	974.82±0.12
975 cm <sup>-1</sup> Zircon inclusion	976.75±0.35	976.06±0.20	976.83±0.13
<b><math>\Delta\nu_{975}</math> (Inclusion-Reference)</b>	<b>1.95±0.27</b>	<b>1.99±0.27</b>	<b>2.01±0.15</b>
1008 cm <sup>-1</sup> Zircon reference	1008.35±0.35	1007.59±0.19	1008.44±0.11
1008 cm <sup>-1</sup> Zircon inclusion	1010.31±0.33	1009.59±0.20	1010.49±0.17
<b><math>\Delta\nu_{1008}</math> (Inclusion-Reference)</b>	<b>1.96±0.26</b>	<b>2.00±0.24</b>	<b>2.04±0.14</b>

Note: Spectra collected with the red laser during cycled analyses were too poor to resolve the 206 cm<sup>-1</sup> peak well. Atomic emission line for Hg is measurable by green laser only. Paired inclusion-reference analyses were collected within minutes of each other.



**Supplemental figure S1. Time-series experiments in March, 2022, after Raman system was moved to a new room with better electrical and environmental controls. (a) Reproducibility of peak position (green) and difference between peaks (black) is strongly improved, even over very long run durations. Although peak drift still occurs soon after the laser is turned on, no abrupt shifts are observed. Temperature (red) still shows regular oscillations, but no abrupt shifts and no correlations with peak positions. (b) Blue laser and temperature show poorer stability, but on a lesser scale than earlier experiments. Referencing to Rayleigh line does not improve reproducibility.**