MEP 2003

Osmium tetroxide ($\lambda \approx 10.3$ µm)

Absorbing molecule OsO_4, transition in coincidence with the $^{12}C^{16}O_2$, R(10) (00^01) – (10^00) laser line

1 CIPM recommended values

The values $f = 29\ 054\ 057\ 446\ 579$ Hz
$\lambda = 10\ 318\ 436\ 884.460$ fm
with a relative standard uncertainty of 1.4×10^{-13} apply to the radiation of a CO_2 laser stabilized with an external OsO_4 cell at a pressure below 0.2 Pa. This laser line is selected due to its reduced sensitivity to pressure shifts and other effects, in comparison with the previously selected R(12) laser line.

2. Source data

Adopted value : $f = 29\ 054\ 057\ 446\ 579\ (20)$ Hz $u_c/y = 6.9 \times 10^{-13}$

for which:

$\lambda = 10\ 318\ 436\ 884.460\ (7)$ fm $u_c/y = 6.9 \times 10^{-13}$

calculated from

f / Hz	u_c/y	source data
29 054 057 446 579	1.4×10^{-13}	[1]

With this value, based on measurements made over more than one year, but determined by one single laboratory, the CCL considered it prudent to adopt a standard uncertainty given for standard conditions [2] of 20 Hz, i.e. five times the reported measured uncertainty of 4 Hz, giving a relative standard uncertainty of 6.9×10^{-13}.
This value is linked to the earlier recommended transition, R(12) (00^01)-(10^00) laser line in $^{12}C^{16}O_2$, resonant with OsO_4 [3–6].

3. Absolute frequency of the other transitions related to those adopted as recommended and frequency intervals between transitions and hyperfine components

This table replaces that published in BIPM Com. Cons. Long., 2001, **10**, 178 and Metrologia, 2003, **40**, 125.

The notation for the transitions and the components is that used in the source references. The values adopted for the frequency intervals are the weighted means of the values given in the references.

For the uncertainties, account has been taken of:

- the uncertainties given by the authors;
- the spread in the different determinations of a single component;
- the effect of any perturbing components;
- the difference between the calculated and the measured values.

In the table, u_c represents the estimated combined standard uncertainty (1 σ).

$\lambda \approx 10.3$ µm OsO_4							
	$^{12}C^{16}O_2$	OsO_4					
n	laser line	line	[isotope]	$[f_n - f\{R(10)\}]$/kHz	u_c/kHz	$[f(OsO_4) - f(CO_2)]$/kHz	u_c/kHz
1	P(22)	P(74)A1(5)	[192]	−802 127 930.98	0.09	−12 149.5	0.2
2	P(20)	*not identified*		−747 823 325.30	0.09	9 229.6	0.2
3	P(18)	*n. i.*		−694 298 622.36	0.08	−14 992	5
4	P(18)	*n. i.*		−694 287 490.14	0.08	−3 855.2	0.1
5	P(18)	P(64)A1(2)−	[188]	−694 228 479.74	0.08	55 150	5
6	P(18)	P(64)A1(2)+	[188]	−694 222 035.30	0.08	61 594	5
7	P(16)	*n. i.*		−641 510 912.32	0.08	−43 197	5
8	P(16)	*n. i.*		−641 434 335.52	0.08	33 384.6	0.1
9	P(14)	*n. i.*		−589 380 507.62	0.08	3 219.6	0.2
10	P(12)	P(39)A1(3)	[192]	−538 005 458.32	0.08	25 330.6	0.1
11	P(12)	P(39)A1(2)	[192]	−538 005 001.14	0.08	25 782	5
12	P(10)	*n. i.*		−487 427 074.66	0.08	−18 821.1	0.1
13	P(8)	P(30)A1(1)	[188]	−437 503 817.04	0.08	11 864.7	0.1
14	P(6)	*n. i.*		−388 374 844.21	0.08	−22 003	5
15	P(4)	*n. i.*		−339 945 022.42	0.08	−25 299	5
16	P(4)	*n. i.*		−339 937 689.31	0.08	−17 966	5
17	P(4)	*n. i.*		−339 929 467.51	0.08	9 744	5
18	R(0)	Q(15)A2(2)	[188]	−222 040 746.1	2.0	−9 519.0	2
19	R(2)	*n. i.*		−176 145 049.74	0.08	9 955	5
20	R(4)	*n. i.*		−131 026 773.25	0.08	−15 760	5
21	R(6)	*n. i.*		−86 634 255.43	0.08	−33 873.0	0.1
22	R(8)	*n. i.*		−42 940 582.49	0.08	−16 145	5
23	R(8)	*n. i.*		−42 920 080	1	4 368	1
24	R(8)	*n. i.*		−42 898 034.29	0.08	26 402	5
25	R(8)	*n. i.*		−42 894 454.94	0.08	29 982	5
26	R(8)	R(26)A1(0)	[189]	−42 876 821.68	0.08	47 615	5
27	R(8)	*n. i.*		−42 876 683.60	0.08	47 753	5
28	R(8)	*n. i.*		−42 875 301.45	0.08	49 135	5
29	R(8)	*n. i.*		−42 875 199.99	0.08	49 237	5
30	R(10)	*n. i.*		0	–	−15 252.7	0.6
31	R(12)	*n. i.*		42 217 505.67	0.08	558.1	0.1
32	R(14)	*n. i.*		83 689 586.75	0.08	10 919.1	0.1
33	R(16)	R(49)A1(2)	[187]	124 411 469.06	0.08	13 237.9	0.1
34	R(18)	*n. i.*		164 349 843.53	0.08	−23 400	5
35	R(18)	*n. i.*		164 392 583.43	0.08	19 342.6	0.1
36	R(18)	*n. i.*		164 394 642.25	0.08	21 398	5
37	R(20)	R(67)	[192]	203 576 376.40	0.08	−24 706.6	0.2
38	R(22)	R(73)A1(0)	[192]	242 072 138.79	0.08	−6 788	5
39	R(22)	*n. i.*		242 088 910.50	0.08	9 986.0	0.2
40	R(24)	*n. i.*		279 818 815.98	0.09	15 102.1	0.1
41	R(26)	*n. i.*		316 756 631.74	0.09	−15 542.5	0.1
Frequencies referenced to			R(10) / CO_2, OsO_4: f = 29 054 057 446 579 Hz				[7]

[6, 8–17]

4. References

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