

MEP 2005

STRONTIUM ($\lambda \approx 674$ nm)

Absorbing ion $^{88}\text{Sr}^+$, $5\ ^2\text{S}_{1/2} - 4\ ^2\text{D}_{5/2}$ transition

1. CIPM recommended values

The values $f = 444\ 779\ 044\ 095\ 484.6$ Hz
 $\lambda = 674\ 025\ 590.863\ 136$ fm

with a relative standard uncertainty of 7×10^{-15} apply to the radiation of a laser stabilized to the unperturbed transition observed with a trapped and cooled strontium ion. The values correspond to the centre of the Zeeman multiplet.

2. Source data

Adopted value $f = 444\ 779\ 044\ 095\ 484.6$ (3.0) Hz $u_c/y = 7 \times 10^{-15}$
for which
 $\lambda = 674\ 025\ 590.863\ 136$ (5) fm $u_c/y = 7 \times 10^{-15}$

calculated from

f / Hz	u_c/y	source data
444 779 044 095 484.6	3.4×10^{-15}	[1]
444 779 044 095 484	3.4×10^{-14}	[2, 3]
Weighted mean:	$f = 444\ 779\ 044\ 095\ 484.6$ Hz	

The weighted mean of these two values gives the current CCL value. Given the very good agreement between laboratories and with the previous values, the CCL decided to adopt a standard uncertainty equal to the NPL uncertainty multiply by a factor of two (3 Hz or 7×10^{-15}).

3. References

- [1] Margolis H. S., Barwood G. P., Huang G., Klein H. A., Lea S. N., Szymaniec K., Gill P., Hertz-Level Measurement of the Optical Clock Frequency in a Single $^{88}\text{Sr}^+$ Ion, *Science* **306**, pp. 1355-1358, 2004.
- [2] Madej A. A., Bernard J. E., Dubé P., Marmet L., Windeler R. S., Absolute frequency of the $^{88}\text{Sr}^+$ $5s\ ^2\text{S}_{1/2} - 4d\ ^2\text{D}_{5/2}$ reference transition at 445 THz and evaluation of systematic shifts, *Phys. Rev. A* **70**, 012507/1-13, 2004.
- [3] Dubé P., Madej A. A., Bernard J. E., Marmet L., Boulanger J.-S., Cundy S., Electric Quadrupole Shift Cancellation in Single-Ion Optical Frequency Standards, *Phys. Rev. Lett.* **95**, 033001/1-4, 2005.