

Evaluation of the frequency of the H-maser 1401708 by the primary frequency standard NPL-CsF2

National Physical Laboratory

23 November 2012

The primary frequency standard NPL-CsF2 was used to measure the frequency of the H-maser HM2 identified by the clock code 1401708 during an evaluation campaign over a period of time in October and November 2012. The clock 1401708 is a physical realisation of UTC(NPL). The evaluation was performed by measuring mean frequency differences over the reporting periods.

Changes to the NPL-CsF2 setup introduced since the previous reported evaluation:

- Modification of the detection beam stabilisation (new AOM in place)

Results of the frequency measurements are listed in the table below. Frequency biases are given for information only. The given fractional frequency difference $y(\text{CsF2} - \text{HM2})$ is a value corrected for those biases. Note that the values for the collisional shift and its uncertainty vary, and so vary the total type B uncertainties u_B for particular campaigns. The value of collisional shift is a time-averaged value for the high and low densities. The total uncertainty u_{total} of the measurement is defined as:

$$(u_{total})^2 = (u_A)^2 + (u_B)^2 + (u_{l/lab})^2$$

Period	(date)	24 Oct 2012 – 23 Nov 2012
Start	MJD	56224
Stop	MJD	56254
Duration	Days	30
duty cycle	%	90.6
<i>Biases:</i>	$\times 10^{-15}$	
2 nd order Zeeman		336.79
BBR shift		-16.51
cold collisions		-0.43
gravity		1.30
$y(\text{CsF2} - \text{HM2})$	$\times 10^{-15}$	0.45
u_A	$\times 10^{-15}$	0.20
u_B	$\times 10^{-15}$	0.23
$u_{l/lab}$	$\times 10^{-15}$	0.04
u_{total}	$\times 10^{-15}$	0.31