

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

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04 November 2015

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 August and September 2015. The clock 1401708 is a physical realisation of UTC(NPL). The evaluation was performed by measuring mean frequency differences over the reporting periods.

A modification to microwave source was implemented in August 2015; a new dedicated RF synthesizer based a DDS chip replaced the previously used commercial unit. No further changes to the physics package of NPL-CsF2 have been introduced since the previously reported evaluation.

Results of the frequency measurements are listed in the table below. Frequency biases are given for information only. The given fractional frequency difference $y(CsF2 - HM2)$ 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:

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

Period	(date)	25 Aug 2015 – 19 Sep 2015
Start	MJD	57259
Stop	MJD	57284
Duration	Days	25
duty cycle	%	76.5
<i>Biases:</i>	$\times 10^{-15}$	
2 nd order Zeeman		336.63
BBR shift		-16.51
cold collisions		-0.62
gravity		1.30
$y(CsF2 - HM2)$	$\times 10^{-15}$	-6.81
u_A	$\times 10^{-15}$	0.34
u_B	$\times 10^{-15}$	0.22
u_{lab}	$\times 10^{-15}$	0.14
u_{total}	$\times 10^{-15}$	0.43