

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

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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 2014. The clock 1401708 is a physical realisation of UTC(NPL). The evaluation was performed by measuring mean frequency differences over the reporting periods.

No changes to the physics package of NPL-CsF2 have been introduced since the previous 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  $y(\text{CsF2} - \text{HM2})$  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)	29 Sep 2014 – 19 Oct 2014
Start	MJD	56929
Stop	MJD	56949
Duration	Days	20
duty cycle	%	83.9
<i>Biases:</i>	$\times 10^{-15}$	
2 <sup>nd</sup> order Zeeman		336.67
BBR shift		-16.52
cold collisions		0.07
gravity		1.30
<b><math>y(\text{CsF2} - \text{HM2})</math></b>	$\times 10^{-15}$	<b>7.18</b>
$u_A$	$\times 10^{-15}$	0.37
$u_B$	$\times 10^{-15}$	0.21
$u_{l/lab}$	$\times 10^{-15}$	0.05
<b><math>u_{total}</math></b>	$\times 10^{-15}$	<b>0.43</b>

Note that a frequency steer was applied to the H-maser HM2 during the evaluation campaign and the reported value of the frequency difference  $y(CsF2 - HM2)$  is a weighted average of two values obtained for the periods before and after the steer, respectively.