

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

National Physical Laboratory

30 May 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 May 2012. 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)	02 May 2012 – 27 May 2012
Start	MJD	56049
Stop	MJD	56074
Duration	days	25
duty cycle	%	91.1
<i>Biases:</i>	$\times 10^{-15}$	
2 <sup>nd</sup> order Zeeman		337.02
BBR shift		-16.51
cold collisions		0.17
gravity		1.30
$y(\text{CsF2} - \text{HM2})$	$\times 10^{-15}$	<b>0.59</b>
$u_A$	$\times 10^{-15}$	0.21
$u_B$	$\times 10^{-15}$	0.23
$u_{l/lab}$	$\times 10^{-15}$	0.05
$u_{total}$	$\times 10^{-15}$	<b>0.31</b>