I. SUMMARY

The primary frequency standard NIM5 was used to measure the average fractional frequency difference of the H-maser H271, identified by the clock code 1404871, during an evaluation campaign over 15 days in Jun. 2014. The results are given in table 1, together with the total uncertainties in relating NIM5 to maser H271.

Table 1 Summary of the frequency measurements of H-maser H271 (1404871)

Period	MJD 56809.0 to 56824.0
$y_{(NIM5-H271)}$ [$\times 10^{-15}$]	2383.4
Duty cycle [%]	96.4%
u_A [$\times 10^{-15}$]	0.9
u_B [$\times 10^{-15}$]	1.4
$u_{link/lab}$ [$\times 10^{-15}$]	0.2
u_{total} [$\times 10^{-15}$]	1.7

The combined total uncertainty u_{total} is the square sum of the three uncertainties as following:

$$u_{total} = \sqrt{(u_A)^2 + (u_B)^2 + (u_{link/lab})^2} \quad (1)$$

Type A uncertainty u_A is the statistical uncertainty on the frequency measurement, u_B is the Type B uncertainty from bias evaluations, and $u_{link/lab}$ is the uncertainty induced by the link between NIM5 fountain clock and the H-maser H271, which includes the dead time and the phase noise of the link between NIM5 and H271. All the above uncertainties are calculated at 1σ.

II. Measurement methods

No change to the physics package of NIM5 has been introduced since the previously reported evaluation. A summary of the systematic frequency shift evaluations for NIM5 is listed in Table 2. The combined relative Type B uncertainty is approximately 1.4×10^{-15}.

Table 2 Uncertainty budget of NIM5 in these evaluations.

Physical Effect	Bias [$\times 10^{-15}$]	Uncertainty [$\times 10^{-15}$]
2nd order Zeeman	73.4	0.2
Collisional shift	-0.7*	0.2
Microwave interferometric Switch	0.0	1.2
Microwave leakage	0	<0.1
DCP	0.0	0.6
Microwave spectral impurities	0.0	0.1
Blackbody radiation	-16.2	0.1
Gravitational red shift	11.8	0.1
Majorana transition	0.0	0.1
Light shift	0.0	<0.1
Rabi and Ramsey pulling	0.0	<0.1
Cavity pulling	0.0	<0.1
Collision with background gases	0.0	<0.1
Total	68.3*	1.4 *

* The collision shift is calculated at low density.

The dead time distribution during the report period is shown in the figure 1:

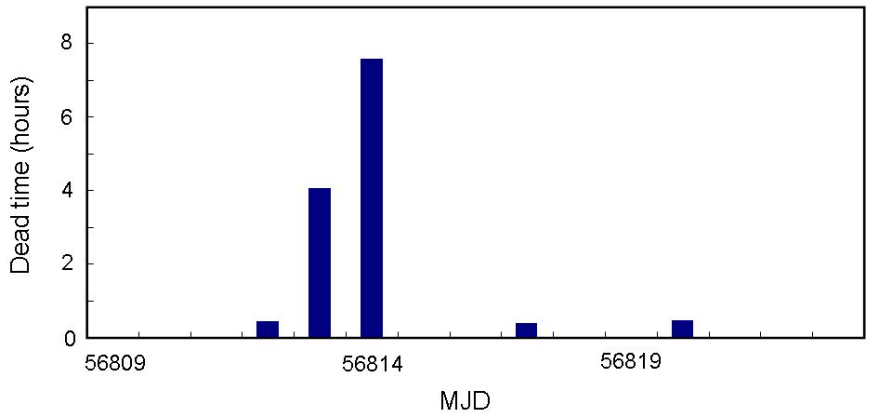

Figure 1 Dead time distributions in Jun., 2014 report period.

REFERENCES

1. Fang F, et al, 2014, submitted to *metrologia*