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Dear Dr. Arias, BIPM,

Attached is the report on the frequency measurement by NMIJ-F1, a cesium atomic fountain frequency standard of NMIJ, during **MJD 54839-54859**. The uncertainty evaluation was the same as that in the last publication.

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## Frequency comparison between H-Maser(405002) and Cs Fountain(NMIJ-F1) during MJD 54839-54859

The frequency of our Hydrogen maser HM(Clock # 405002) have been measured using NMIJ-F1 during MJD 54839-54859 (20 days). The results are shown in tables 1.

Table 1. Results of the comparison in  $1 \times 10^{-15}$  unit.

Period	<b>54839-54859</b>
Measurement ratio	98.2%
Y(NMIJ-F1)-Y(Maser 405002)	-199.9
$u_A$	0.8
$u_B$	3.9
$u_{link / lab}$	0.3

### 1. Type A uncertainty $u_A$

The frequency stability  $\sigma_y(\tau)$  is  $1 \times 10^{-12} \tau^{-1/2}$ . This equation has been used for the estimation of type A uncertainty on the basis of white FM noise. The measurement uncertainty is  $0.8 \times 10^{-15}$ .

### 2. Uncertainty of the link in the laboratory $u_{link / lab}$

The uncertainty of the link in the laboratory,  $u_{link / lab}$ , is written as,

$$u_{link / lab} = \sqrt{u_{dead\ time}^2 + u_{link / maser}^2} \quad (1)$$

where  $u_{link / maser}$  is the uncertainty due to the phase noise of the synthesis chain between the fountain and HM,  $u_{dead\ time}$  is the uncertainty due to the operational dead time of the fountain. ( $u_{link / maser}$ ,  $u_{dead\ time}$ ) are evaluated to be ( $2 \times 10^{-16}$ ,  $2 \times 10^{-16}$ ) for the period of MJD 54839-54859.

### 3. Type B uncertainty $u_B$

The value of type B uncertainty is the same as the last publication, as is shown in table 2.

Table 2: Frequency biases and uncertainties in NMIJ-F1 during the period MJD 54839-54859 in  $1 \times 10^{-15}$  unit.

Source of uncertainty	Bias	Uncertainty
2 <sup>nd</sup> order Zeeman	175.5	0.5
Blackbody radiation	-18.0	1.4
Gravitation	1.6	0.1
Cold collisions	0.0	3.3
Distributed cavity phase	0.0	1.2
Microwave power dependence	0.0	0.7
Total	159.1	3.9