FREQUENCY COMPARISON (H_MASER 40 0889) - (LNE-SYRTE-FO2)
From MJD 54224 to MJD 54249

The primary frequency standard LNE-SYRTE-FO2 was compared to the hydrogen Maser (40 0889) of the laboratory during the 4th to 29th May 2007 period, from MJD 54224 to MJD 54249.

Period (MJD)	y(HMaser$_{40\ 0889}$ - FO2)	u_B	u_A	$u_{link\ /\ maser}$
54224 – 54249	- 12014.0	4.6	3.0	4.6

Table 1: Results of the comparison in 1 x 10^{-16} .

Figure 1 collects the measurements of fractional frequency differences during the 4th to 29th May 2007 period. Error bars represent the statistical uncertainties. The measurements are corrected for the systematic frequency shifts listed below.

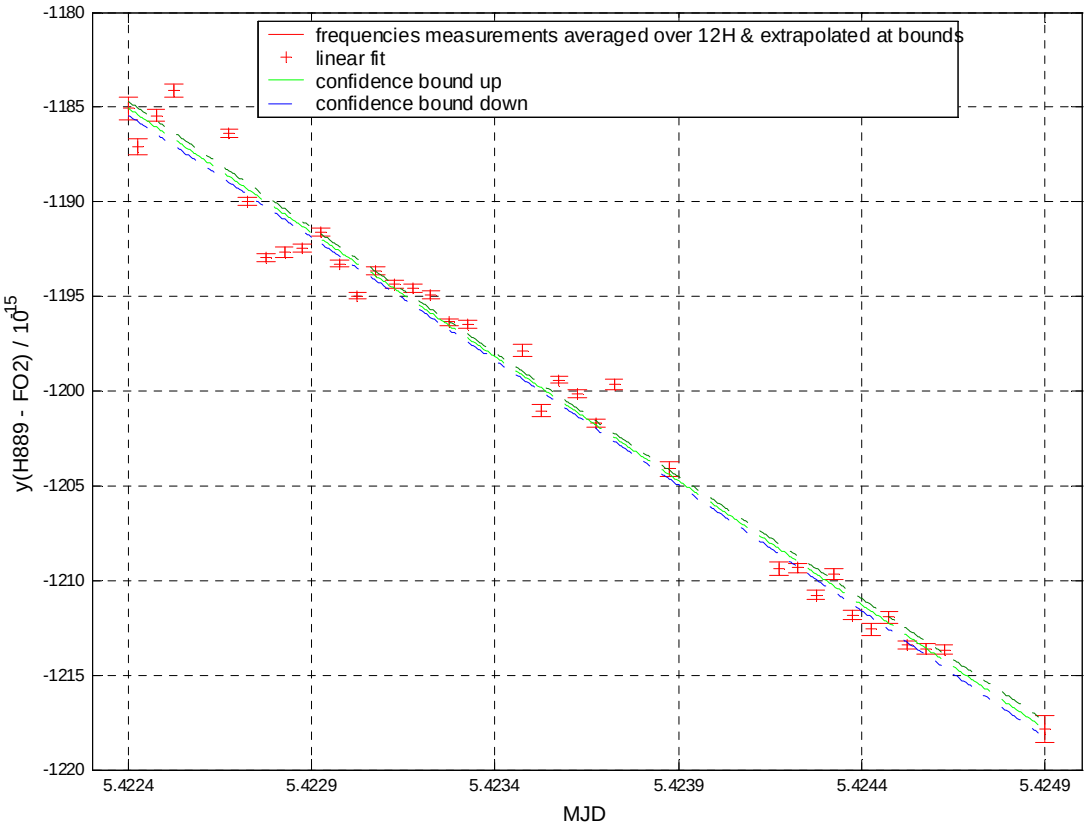

Figure 1: fractional frequency differences between H_Maser40 0889 & FO2 from MJD 54224 to MJD 54249

Table 2 gives the results of the frequency estimate for the middle date of the period, and the associated statistical uncertainty, using either a linear or a polynomial fit to the data.

Dates Duration & Measurement Rate	Mean normalized frequency difference $y_{Maser} - y_{FO2}$	type A uncertainty σ_{Stat}	Uncertainty due to the dead times $\sigma_{deadTime}$
BIPM interval Start date MJD UTC **54224,0** Stop date MJD UTC **54249,0** Length of interval 25 d Measurement Rate: 55,2% mean duration between measurements τ_0 = 61714 s	Mean by linear fit at middle date 54236.5: $\overline{y}$ = **- 12014.0 x 10^{-16}** Mean by polynomial fit order 5: $\overline{y}$ = **- 12014.2 x 10^{-16}**	Uncertainty of linear fit **3.0 x 10^{-16}** Allan Deviation at T with assumption of White Frequency Noise σ_y = **2.0 x 10^{-16}**	$\sigma_{deadTime}$ = **4.5 10^{-16}**

Table 2: Statistics of measurements

Summary of the systematic corrections and uncertainties:

	Correction (10^{-16})	**Uncertainty (10^{-16})**
Cold collisions and cavity pulling	186.0	2.5
Quadratic Zeeman effect	- 1919.5	0.1
Black body radiation	167.0	0.6
Microwave spectral purity & leakage		0.5
First order Doppler effect		3.0
Ramsey & Rabi pulling		< 1.0
Microwave recoil		< 1.4
Second order Doppler effect		< 0.1
Background gas collisions		<1.0
Total		**4.5**
Red shift	- 65.4	1.0
Total with red shift		**4.6**

Table 3: Budget of systematic effects and associated uncertainties in the FO2 fountain.

Systematic effects taken into account are listed in Table 3. The correction and estimated uncertainty for each of them is given. Here the collisional shift correction is the average correction over all measurements, which are taken alternatively at high and low densities. The uncertainty on this correction is taken as 1% of the collisional shift correction at high density to account for 1% spurious population in non-zero m_F states which affect the measurements equally at both densities. Finally, including also an uncertainty for the red shift effect, this gives the type B total uncertainty:

$$\sigma_B = \left(\sigma_{Zeeman2}^2 + \sigma_{BlackBody}^2 + \sigma_{Collision\_Syst}^2 + \sigma_{Microwave\_Spectrum\_Leakage}^2 + \sigma_{first\_Doppler}^2 + \sigma_{Ramsey\_Rabi}^2 + \sigma_{Recoil}^2 + \sigma_{second\_Doppler}^2 + \sigma_{Background\_collisions}^2 + \sigma_{Redshift}^2 \right)^{(1/2)}$$

For the whole May 2007 period it gives

$$\sigma_B = 4.6 \times 10^{-16}$$