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SUPPLEMENTARY INFORMATION

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Test of general relativity by a pair of transportable optical lattice clocks

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Supplementary Information for

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1. Stability of redshift measurement

The frequency difference between two clocks at TOKYO SKYTREE is shown in Fig. S1a, whose Allan deviation is shown in Fig. S1b.

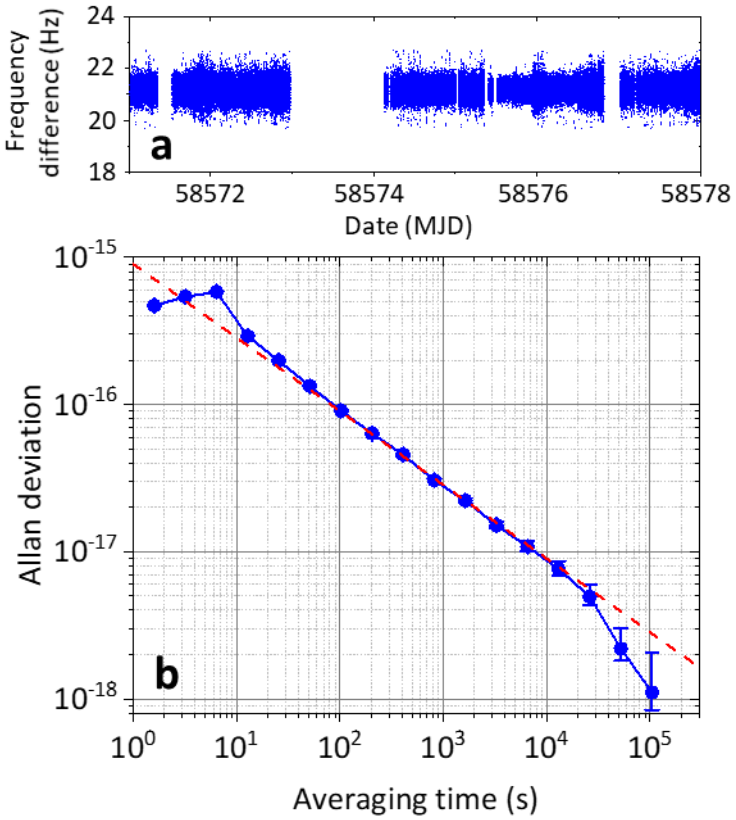

Figure S1 | Frequency difference and Allan deviation. a, Frequency difference is measured for $\sim 3.6 \times 10^5$ s in total in 7 days. **b,** Allan deviation of the frequency difference of two clocks follows $\sigma_y(\tau) = 9 \times 10^{-16}(\tau/\mathrm{s})^{-1/2}$, calculated by combining the full data shown in Fig. S1a. The error bars represent the 1σ statistical uncertainty.

2. Transition diagram of ^{87}Sr for clock experiment

Figure S2 shows the relevant transitions of ^{87}Sr used in this experiment.

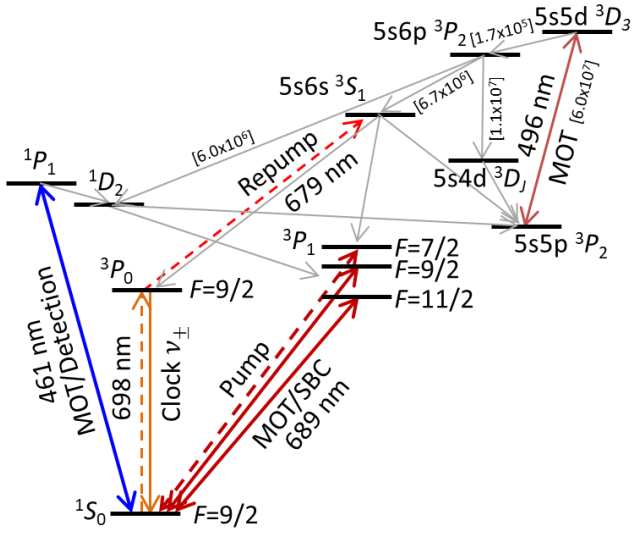

Figure S2 | Relevant transitions of ^{87}Sr. Numbers in angle brackets show radiative decay rates in units of s^{-1}.

3. Uncertainty budgets

Table S1 | Corrections and uncertainties for a single clock (ν_1) and those in beat note measurement ($\Delta\nu$). Numbers are listed in units of 10^{-18}.

Effect	Corr. (Unc.) for clock ν_1	Corr. (Unc.) for grav. redshift $\Delta\nu$
BBR shift	2315.3 (2.6)	0.0 (1.9)
Quadratic Zeeman shift	242.4 (0.3)	0.03 (<0.01)
Lattice light shift	-1.1 (0.8)	-0.37 (1.4)
Probe light shift	73.5 (4.5)	0.0 (2.8)
Density shift	-0.3 (1.3)*	**
First order Doppler shift	0.0 (0.5)	0.0 (0.8)
AOM chirp & switching	0.0 (0.2)	0.0 (0.3)
Background gas collision	5.4 (1.0)	0.0 (1.2)
Systematic total	2635.2 (5.5)	-0.34 (4.0)

*Calculated for a typical atom number of 1,500.

**Density shift is dynamically corrected by monitoring the number of atoms as described in Methods.

4. Summary of height measurement

Table S2 | Summary of height measurement between two clocks conducted in MJD 58,414-58,417 and 58,420-58,422 (October 2018)

Period (MJD)	GNSS (m)	Laser ranging (m)	Levelling (m)	Ruler and radar (m)	Total (m)
58,414.125	460.613(39)		-7.935(2)	-0.029(1)	452.649(39)
-58,417.125		431.651(10)	20.406(2)	0.575(8)	452.632(13)
58,420.125	460.616(39)		-7.935(2)	-0.029(1)	452.652(39)
-58,422.125		431.650(10)	20.406(2)	0.575(8)	452.631(13)