# GW170104: FACTSHEET

Background Images: time-frequency trace (top), H1 and L1 time series and maximum-likelihood binary black hole model (middle top), residuals between data and best-fit model (middle bottom), reconstructed waveforms from wavelet and binary black hole analyses (bottom)

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|---|---|---|---|
| observed by | LIGO L1, H1 | duration from 30 Hz | ~ 0.25 to 0.31 s |
| source type | black hole (BH) binary | # of cycles from 30 Hz | ~ 14 to 16 |
| date | 04 Jan 2017 | signal arrival time delay | arrived at H1 3 ms before L1 |
| time | 10:11:58.6 UTC | | |
| signal-to-noise ratio | 13 | credible region sky area | 1200 sq. deg. |
| false alarm rate | < 1 in 70,000 years | peak GW strain | ~ 5 × $10^{-22}$ |
| probability of astrophysical origin | > 0.99997 | peak displacement of interferometer arm | ~ ± 1 am |
| distance | 1.6 to 4.3 billion light-years | frequency at peak GW strain | 160 to 199 Hz |
| redshift | 0.10 to 0.25 | | |
| total mass | 46 to 57 $M_\odot$ | wavelength at peak GW strain | 1510 to 1880 km |
| primary BH mass | 25 to 40 $M_\odot$ | peak GW luminosity | 1.8 to 3.8 × $10^{56}$ erg $s^{-1}$ |
| secondary BH mass | 13 to 25 $M_\odot$ | | |
| mass ratio | 0.36 to 0.94 | radiated GW energy | 1.3 to 2.6 $M_\odot$ |
| remnant BH mass | 44 to 54 $M_\odot$ | remnant ringdown freq. | 297 to 373 Hz |
| remnant BH spin | 0.44 to 0.73 | remnant damping time | 2.5 to 3.2 ms |
| remnant size (effective radius) | 123 to 150 km | consistent with general relativity? | passes all tests performed |
| remnant area | 1.9 to 2.8 x $10^5$ km$^2$ | graviton mass combined bound | ≤ 7.7 x $10^{-23}$ eV/$c^2$ |
| effective spin parameter | -0.42 to 0.09 | | |
| effective precession spin parameter | unconstrained | evidence for dispersion of GWs | none |

Parameter ranges correspond to 90% credible intervals.

**Acronyms:**
L1/H1=LIGO Livingston/Hanford, am=attometer=$10^{-18}$ m, $M_\odot$=1 solar mass=2 x $10^{30}$ kg