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## Universal $10^{20}$ Hz stochastic gravitational waves from photon spheres of black holes

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We show that photon spheres of supermassive black holes generate high-frequency stochastic gravitational waves through the photon-graviton conversion.

Remarkably, the frequency is universally determined as  $m_e \sqrt{m_e/m_p} \simeq 10^{20}$  Hz in terms of the proton mass  $m_p$  and the electron mass  $m_e$ .

It turns out that the density parameter of the stochastic gravitational waves  $\Omega_{\text{gw}}$  could be  $10^{-12}$ .

Since the existence of the gravitational waves from photon spheres is robust, it is worth seeking methods of detecting high-frequency gravitational waves around  $10^{20}$  Hz.

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