

Wednesday, November 11, 2020

"Veterans Day"

Example: How big is the blackhole at the center of the Milky way galaxy.

$$\begin{aligned} \text{Mass of the black hole} &\approx 4 \times 10^6 M_{\text{sun}} \\ &= 7.96 \times 10^{36} \text{ kg} \end{aligned}$$

$$\text{Event Horizon radius} = R_s = \frac{2 G M}{c^2} \quad \begin{array}{l} \text{Newton's constant} \\ \text{"big G"} \end{array}$$

$$= \frac{2 (6.6743 \times 10^{-11}) (7.96 \times 10^{36})}{(3 \times 10^8)^2}$$

$$= 11.8 \times 10^9 \text{ m}$$

$$\approx 12 \times 10^9 \text{ m}$$

$$\approx 12 \times 10^6 \text{ km}$$

$$\approx 17 R_{\text{sun}}$$

$$\Rightarrow R_s \approx 17 R_{\text{sun}}$$

$$\approx 0.08 \text{ AU}$$

$$\text{Mass} \approx 6.5 \times 10^9 M_{\text{sun}}$$

Note: M87 central blackhole ~~is~~ has $R_s \approx 128 \text{ AU} !!!$
(galaxy)