

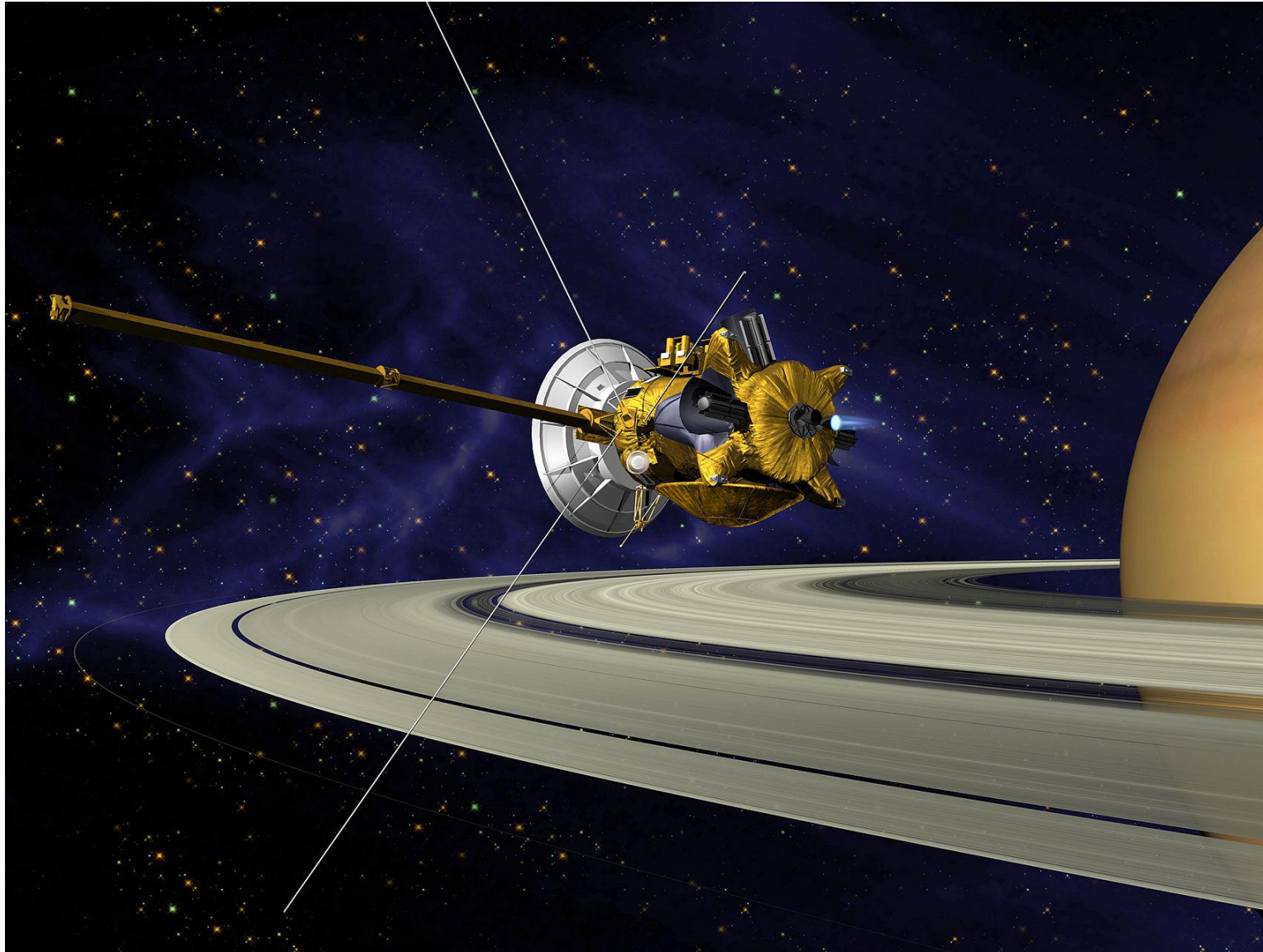
# Cassini Gravitational Wave Experiment

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# Cassini-Huygens



- Launched 1997
- Flybys of
  - Venus(1998, 1999)
  - Earth (1999)
  - Jupiter (2000)
- Gravitational Wave Experiment opportunities when Cassini is at opposition

# Cassini Planetary Science

- Discovered seven new moons of Saturn
- Released Huygens probe to land on Titan
- Discovered plumes of Enceladus
- Discovered stationary storm at Saturn's South Pole
- Imaged rings in visible and radio waves



# Gravitational Wave Experiment

- Makes use of the Radio Science Subsystem (RSS)
  - Mass: 14.38 kg
  - Peak Power Consumption: 80.70 W
- Consists of radio transmitters and receivers on both Cassini and on the Earth
- Can test how radio signals change as they are sent through solar system bodies
- Using Doppler tracking, can search for gravitational waves
- Was done 3 times, 40 days each

# Results

- No detection made
- Upper limits placed on background in  $10^{-6}$  to  $10^{-3}$  Hz
- Limits seven orders of magnitude higher than recent LIGO detection

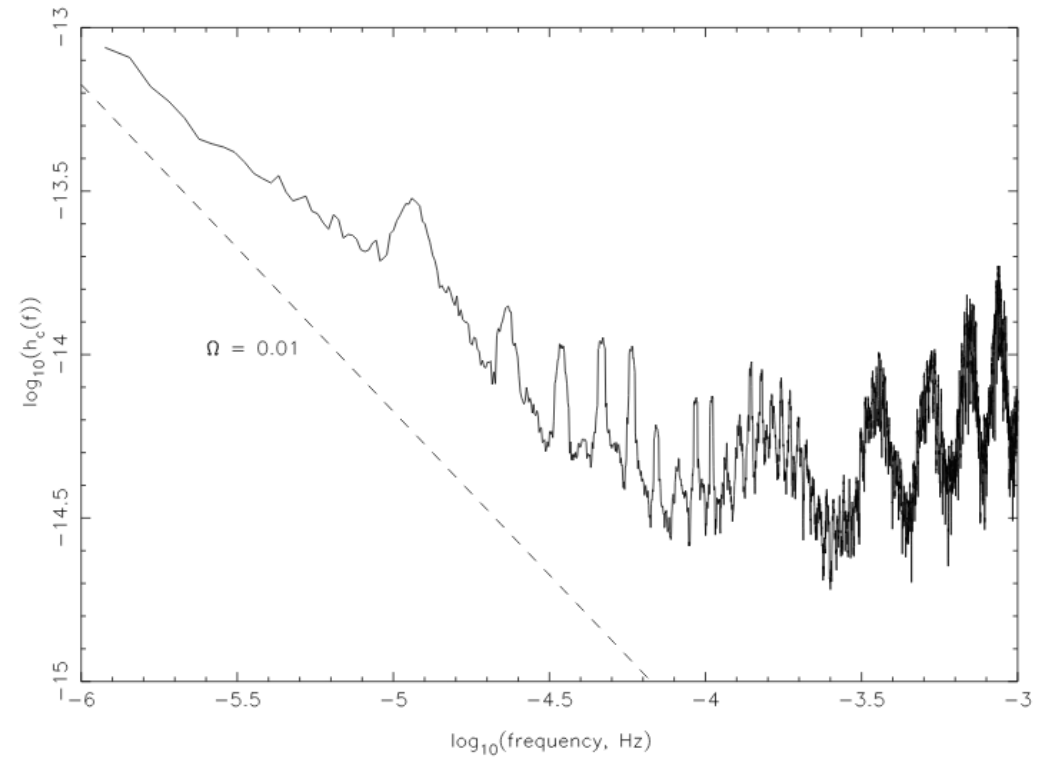


FIG. 4.—Upper limits from the spectrum of Fig. 1, restated in terms of characteristic strain  $h_c(f) = [2fS_h(f)]^{1/2}$ . Constant  $\Omega = 0.01$  is indicated.

# References

- Peralta and Flanagan, Control Eng. Practice, Vol. 3, No. 11, pp. 1603-1610, 1995
- Stochastic Gravitational Wave Background: Upper Limits in the 10<sup>-6</sup> to 10<sup>-3</sup> Hz Band, Armstrong et al. 2003
- <http://saturn.jpl.nasa.gov/mission/navigation/missionnavigationuplinkdownload/>
- <http://saturn.jpl.nasa.gov/spacecraft/cassiniorbiterinstruments/instrumentscassinirss/>