

# The non-detection of radio emissions from Titan lightning

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## Abstract

The Saturn-orbiting Cassini spacecraft has performed 127 Titan flybys from 2004 until 2017. During almost all of them the Cassini Radio and Plasma Wave Science (RPWS) instrument was turned on to search for radio emissions around the frequency of a few MHz that could be attributed to lightning emissions on Titan. The non-detection of Titan lightning after 35 and 72 flybys has already been reported in two previous papers [1, 2], respectively. This presentation deals with the non-detection of Titan lightning throughout the Cassini mission. From Cassini's trajectory we will calculate Titan lightning search times as a function of the hypothetical Titan lightning energy in the radio band. For example, this can answer the special question of how long Cassini RPWS would have been able to detect Titan lightning in case it had a similar strength as Earth lightning. We will also infer upper limits for the strength and for the rate of potential Titan lightning based on the fact of non-detection. We will discuss potential reasons for the non-existence of Titan lightning like the enhanced conductivity of Titan's atmosphere leading to dissipation currents being larger than charging currents, or that strong large-scale electric fields for streamer inception might not be present.

## References

[1] Fischer, G., Gurnett, D.A., Kurth, W.S., Farrell, W.M., Kaiser, M.L, and Zarka, P., Nondetection of Titan lightning radio emissions with Cassini/RPWS after 35 close Titan flybys, GRL, 34, L22104.

[2] Fischer, G., and Gurnett, D., The search for Titan lightning radio emissions, GRL, 38, L08206.