A STUDY OF THE EXTRASOLAR PLANETS SURROUNDING THE PULSAR PSR 1257+12

SUMMARY

Being the first group of extrasolar planets to be discovered and confirmed, the three known pulsar planets surrounding PSR 1257+12 were crucial in demonstrating to the astronomical community that planets can exist outside of main-sequence stars. However, as these were relatively early discoveries, there is a large amount of uncertainty surrounding the nomenclature of this planetary system: primarily in its formation and the possible existence of more planets. The purpose of this research will be to analyse the currently accepted theory of formation, involving the merging of two white dwarves into a single pulsar with a resulting system, and compare this with more radical theories such as this system resulting from supernova remnants. In addition, it is proposed that investigation into the formation of this pulsar and its planetary system may shed light on the possibility of the existence of a fourth planet.

PROPOSAL *(in progress)*

- PSR 1257+12 is a millisecond pulsar (approximately 10^9 years old) that was discovered to have a planetary system of at least 4 bodies (1 star, 3 planets). While millisecond radio pulsars are normally thought to be "spun up" by the accretion of matter from other stellar objects, current prevailing theory states that the pulsar was initially the result of two white dwarf stars merging with each other. During this event, the resulting disk of matter that was pulled into the surrounding area would then be crushed over time to form these planets
- The objective will be to research the formation of pulsars through various methods, ranging from most plausible to radical. By comparing gathered information and expectations with what is known about the system, an argument for the pulsar's most likely cause of formation may be created. Next, this accepted method of formation will be researched to gain insight on how it may affect the formation of planetary systems, yielding and educated approximation of the number and sizes of expected planets.
- Pertinent literature to this proposal will be research on the formation of pulsars and planetary systems based on the initial conditions of the environment. This will then be used to develop a profile which can be applied to PSR 1257+12, allowing a theoretical representation of the system's formation to be achieved.

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