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SPACE PROPULSION SYMPOSIUM (C4)
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University of Petroleum and Energy Studies, India, kshah41976@gmail.comINTERSTELLAR MISSION TO BARNARD'S STAR USING ADVANCED NUCLEAR PROPULSION
METHODS**Abstract**

Since the dawn of time, more and more people have been looking upwards to the skies and seeing the little twinkling lights. These twinkling lights were the reason that Galileo and Kepler were able to expand their horizons and see the universe as it is supposed to be. As science and technology progressed, the possibility of traveling to these destinations also became more possible. When the space race started with the launch of Sputnik in 1957, the possibility of going to far reaches of space also started to become prominent. For an interstellar distance, Barnard's star is an obvious choice. While it is not the nearest star to our solar system, it is predicted that Barnard's star is an example of one of the most oldest stars in our galaxy and as a result, going to Barnard's star would allow for the possibility of understanding the creation of our universe as well as our galaxy. Furthermore, the presence of planets orbiting Barnard's star would also give us an insight to presence of exoplanets and the possibility of life on them. Naturally traveling many light years on present forms of propulsion technology wont be practical, but it would be possible to travel to Barnard's star using advanced nuclear space propulsion techniques. With the adaptation of gas core nuclear reactor technology, it would be possible to travel at semi-relativistic speeds like $0.1c$ to $0.4c$ and while it may still take decades to reach, due to time dilation, the time spent on the spacecraft would be felt much less. Furthermore, with some mission planning, the crew can be put to deep sleep or a larger craft can be used to create a generational ship. In addition, the same principles can be applied for a robotic exploration mission to Barnard's star as well if human crew is not to be used. This paper discusses the technology as well as the possibilities and also examines the challenges and possible solutions to an interstellar Mission to Barnard's star. It will also give detailed analysis of the gas core nuclear propulsion system along with simulations.