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LUNAR CRATER RADIO TELESCOPE AND CRITICAL ENGINEERING ISSUES: PROBING
THROUGH THE DAWN OF THE UNIVERSE**Abstract**

Ever since humanity has been to the moon, astronomers envisaged the concept of building astronomical observatories on the moon taking advantage of its unique isolated environment with no atmosphere. The Lunar Crater Radio Telescope is one of the best proposals named in NASA's Innovative Advanced Concepts Program. When compared to Earth-based and Earth-orbiting telescopes, the installation of a Lunar Crater Radio Telescope on the far side of the moon has substantial advantages. Due to ionospheric absorption and reflection, our Universe is poorly investigated in the 10-100 m wavelength range by Earth-based or Earth-orbiting telescopes. The Earth generates a lot of noise in this frequency range, but the moon could physically shield the Lunar Crater Radio Telescope from Earth's noise and the Sun's radio emission during the lunar night. Observation of these long wavelength radio waves generated from the Cosmic Dark Ages may allow cosmologists better comprehend the evolution of the Universe and make ground breaking discoveries. But there are various critical engineering issues and technological challenges to be addressed in making the Lunar Crater Radio Telescope a reality. These technologies include power systems, thermal management, lunar dust management and communication with Earth from the far side of the moon and data transmission. In this paper, several lunar power supply strategies are analyzed including large solar panels, regenerative power storage devices to provide power during the 14 Earth-days lunar night and radioisotope thermoelectric generators. Furthermore, the impact of thermal fluctuations and solar panels degradation on power generation is investigated. Finally, advanced cryocoolers can play a key role in thermal protection. The development of advanced cryocoolers integrated with radioisotope thermoelectric generators can be a suitable option. Current Technological gaps are highlighted in this paper and addressed using novel technologies.