

### Automated Multi-Conditional Exploration Rover Series (AMCERS) — Low Cost Lunar Exploration

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**Introduction:** It is not possible for all human to land on lunar surface and even though, there are some points where human can't go. To fulfill all these needs, low cost moon rovers are being developed and propelled to lunar surface. Here I've taken a hypothetical situation of moon rover design and I so as to satisfy the concept of low cost lunar exploration which is the **Automated Multi-Conditional Exploration Rover Series (AMCERS)**. The mission objective is to locate the lunar outpost for the fore coming Deep Space Networking missions and bringing moon close to human.

**Design approach:** According to the concept, the rovers are designed as small as possible in order to minimize the total pay load. A series of three rovers, ALPHA, BETA and GAMMA are designed and fabricated so as to perform the exploration and research in lunar surface. The rovers are enclosed in a container of volume 0.2 m<sup>3</sup> and the total weight inclusive of 3 rover series is subjected to 20kg. This container serves as the data communicator that transmit the data from AMCERS to EARTH. After proper docking from the launch vehicle, the container (DATA COMMUNICATOR) is maneuvered to landed in a location of constant sunlit in lunar surface[1]. The rover is then driven out from the container in an automated way. With the help of GAMMA, the data communicator is automated for the orientation of its primary antenna (PHASED ARRAY) and the solar cells are directed towards constant sunlit. The container serves as the base and makes a communication loop (AMCERS ↔ container ↔ earth station).

**AMCERS:** Each rover is designed according to their specific payloads and respective mission objective. All the major system components i.e. the locomotive arrangement, real time imaging camera, electric drives etc. remains the same for all the AMCERS and they vary only with the payload and power source. ALPHA and BETA are powered by solar cells, provided with nanocomposite battery backup[2]. AMCERS GAMMA is powered by RTG. There is no directional constraint in the AMCERS locomotion, having all degrees of freedom. Each AMCERS is equipped with two long range high definition cameras and the payload includes, ALPHA – Astrophotometer (Measurement and study of light level), BETA - MicroR Meter (Detection of

Helium-3 presence), GAMMA – RADOM( Radiation Dose Monitor Experiment) [3]

The moon rover is made to survive at all condition i.e. varying temperature range (-233°C to 123°C), hazardous radiation prone area etc. Due to the low gravitational pull the traction should be maintained for this special type of wheels are designed.

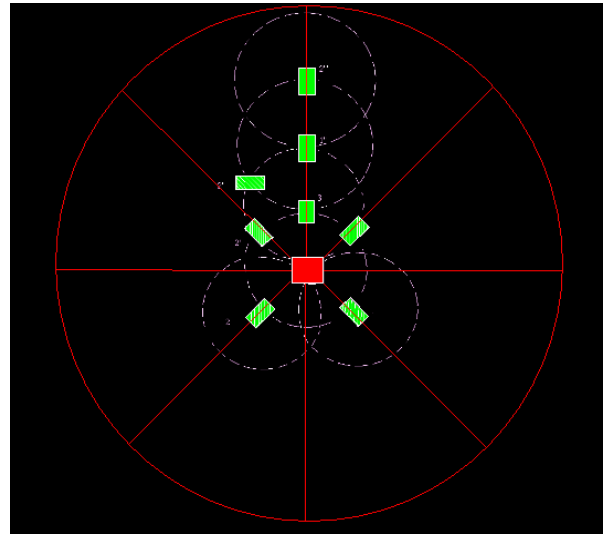


Figure2: AMCERS exploration range coverage.

The communication limit gives the range of the exploration area. The DATA CONTAINER is supposed to have a range of 20 km due to its high gain antenna. Each AMCERS is supposed to have a communication range of 15 km. From the mode of path followed here, the exploration range can go up to an area of **13,266.5 km<sup>2</sup>**.

**CONCLUSION:** The moon rover are designed to the given constraints. The entire span of the AMCERS will be about 2 years and can also be extended. So with this the low cost exploration of moon can be accomplished.

**References:** [1] ILLUMINATION CONDITIONS AT THE LUNAR POLES. D.B.J. Bussey<sup>1</sup>, M.S. Robinson<sup>2</sup>, and P.D. Spudis<sup>3</sup>, retrieved on 26-07-2007 [2] Victor L. Pushparaj\*, Manikoth M. Shaijumon\*, Mildred S. Dresselhaus, MIT, Cambridge, MA, July 11, 2007 (received for review February 23, 2007) .[3] ISRO chandrayan1.