

Lunar Exploration Orbiter (LEO)

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The Moon is an integral part of the Earth-Moon system, it is a witness to more than 4.5 b. y. of solar system history, and it is the only planetary body except Earth for which we have samples from known locations. The Moon is our closest companion and can easily be reached from Earth at any time, even with a relatively modest financial budget. Consequently, the Moon was the first logical step in the exploration of our solar system before we pursued more distant targets such as Mars and beyond. The vast amount of knowledge gained from the Apollo and other lunar missions of the late 1960's and early 1970's demonstrates how valuable the Moon is for the understanding of our planetary system. Even today, the Moon remains an extremely interesting target scientifically and technologically, as ever since, new data have helped to address some of our questions about the Earth-Moon system, many questions remained. Therefore, returning to the Moon is the critical stepping-stone to further exploring our immediate planetary neighborhood. In this concept study, we present scientific and technological arguments for a national German lunar mission, the Lunar Explorations Orbiter (LEO). Numerous space-faring nations have realized and identified the unique opportunities related to lunar exploration and have planned missions to the Moon within the next few years. Among these missions, LEO will be unique, because it will globally explore the Moon in unprecedented spatial and spectral resolution. LEO will significantly improve our understanding of the lunar surface composition, surface ages, min-

erology, physical properties, interior, thermal history, gravity field, regolith structure, and magnetic field. The Lunar Explorations Orbiter will carry an entire suite of innovative, complementary technologies, including high-resolution camera systems, several spectrometers that cover previously unexplored parts of the electromagnetic spectrum over a broad range of wavelengths, microwave and radar experiments, a very sensitive magnetometer and gradiometer, a subsatellite, and a state-of-the-art optical communication system. The Lunar Explorations Orbiter concept is technologically challenging but feasible, and will gather unique, integrated, interdisciplinary data sets that are of high scientific interest and will provide an unprecedented new context for all other international lunar missions. In fact, the Lunar Explorations Orbiter will further establish Germany as a leader among space-faring nations and will demonstrate expertise and technological know-how, which is "Made in Germany". With its high visibility, LEO will foster the growing acceptance of space exploration in Germany and will capture the imagination of the general public.