PRELIMINARY IMAGINES FOR THE PLANNING AND ITS SCIENTIFIC OBJECTIVES OF CHINA'S LUNAR RESEARCH STATION. Lin XU, Yongliao ZOU and Jiang WU, General Office of the Lunar and Deep-space Exploration, Chinese Academy of Sciences / National Space Science Center, Chinese Academy of Sciences, Zhongguancun Nanertiao 1, Haidian District, Beijing, 100190 (ylzou@nao.cas.cn)

Introduction: In 2002, China National Space Administration announced the China's Lunar Exploration Program (CLEP), named as the Change'E Project, to implement and complete the following three stages: "circling around the moon", "landing on the moon" and "returning from the moon" before 2020.

The fist stage includes two missions, Chang'E-1 and Chang'E-2. Chang'E-1 orbiter was launched on October, 24, 2007, carrying 8 scientific instruments such as the CCD stereo camera, microwave detector, etc., through working in the 20 km-high orbit more than 1 year, in attempt to complete the exploration of the topography and geomorphology, chemical composition, and soil temperature of lunar surface, and high-energy particles and low-energy ions, control impact on the moon and complete the preset science mission in 2009 on March 1. As a backup to Chagn'E-1 orbiter, Chang'E-2 orbiter was launched in October 1, 2010 and successfully entered the working orbit at the high of 100 km. With the pre-designed plan accomplished, the orbiter also obtained the images of topography with a resolution of 1.3 m of the landing zone for Chang'E-3, so it was called the guide satellite of Chang'E-3. Since then, Chang'E-2 satellite conducted an extended mission, especially with the close flyby of the 4179 asteroid Toutatis to obtain a 10 m-resolution image.

The second stage includes Chang'E-3 and Chang'E-4 missions. The Chang'E-3 spacecraft consists of a lander and a rover (named as Jade Rabbit), which was launched on December 2, 2013, successfully soft-landing and patrol detection. Chang'E-3 made a lot of progress in terms of shallow structural characteristics and the geological history of the Imbrium basin, the earth's plasmasphere in a global scale meridian view by the Extreme Ultra-Violet (EUV) camera, and monitoring variable stars, bright active galactic nuclei by a moon-based ultraviolet telescope (LUT). Chang'E-4 mission includes a telecommunication relay satellite, two mini satellites around the moon, a lander and a rover, which will be launched in 2018 and the lander and rover will land at the Aitken basin on the far side of the moon.

The third stage includes Chang'E-5 and Chang'E-6 missions. The main mission is to launch an automatic sampler, which land on the surface of the moon to collect lunar rock and soil samples, and return them to Earth for further analysis. The Chang'E-5 probe was going to be launched in November 2017. However, it has been delayed until 2019 due to a rocket failure.

Overall Scientific Goals: At present, after more than around three years of studies, Chinese scientists and technical experts have proposed an overall plan to preliminarily build a research station on the moon's South Pole by way of implementation the 3-4 missions during the period of 2020-2030. The overall scientific goals are: (1) to detect and study the distribution, content and source of water and volatile components; (2) to acquire the characteristics of the chemical composition of the deep part of the moon; (3) to study the age of the South Pole Aitken basin and the early impact history of the solar system; (4) to explore the surface environment of the lunar south pole; (5) to carry out lunar resource *in-situ* utilization tests; (6) to carry out bio-scientific experiment and study on the lunar surface; (7) to carry out observation and research on macro-geological phenomena in the base of the moon; and (8) to carry out the earth-moon VLBI test and observation.

Mission Design: The probe platform for the first mission was composed of a telecommunication relay, an orbiter, a lander, a rover and a flying detector. Its main scientific mission is to carry out detailed geological investigations on the landing zone, analyze water ice and its original source in the permanently shadow area. In order to complete these scientific tasks, the science payloads will be configured, for example, the orbiter will be equipped with spectrometers, lunar neutron and gamma ray spectrometers, radar, etc. The lander is to be equipped with a lunar energetic particle detector, a seismometer, etc. The rover is to be equipped with components and isotopic of volatile analysis systems, etc. The flying detector is to be equipped with a water molecule and hydrogen isotope analyzer, etc.

The probe platform of the second mission is basically the same as the Chang'E-5', whose main scientific task is to collect lunar samples, and return them to Earth for further analysis.

The third mission consists of a lander, a rover and a flying detector. The main scientific exploration tasks are to carry out the *in site* utilization of the resources, the moon-based scientific task on the lunar surface, and carry out observation and research on the base of the moon. We will carry out an *in site* rare-gas extraction test in the lunar soil, a 3D-printing test, etc. in order to provide technical support for future manned lunar landing and lunar resource utilization. A series of

small terrestrial ecosystem experiments on the lunar surface were carried out, with attempt of reveal the material circulation and energy flow of terrestrial ecosystem task in the lunar surface, to provide theoretical and technological support of life safeguard for future manned missions. To obtain the energy difference of the Earth's climate system, the moon-based radiometer and moon-based polarization imaging spectroradiometer will be payloaded. The ultra-violet camera is used to continuously obtain the data of soft X-ray on the top of the magnetosphere, the earth plasma layer and the ultra-violet of the ionosphere, to reveal the dynamics of the magnetosphere, the plasma layer, and the ionosphere.