# PRELIMINARY RESULTS OF THE APOLLO LUNAR SOUNDER EXPERIMENT,

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The Apollo Lunar Sounder Experiment (ALSE) was flown as part of the orbital science package on the Apollo 17 mission.

The ALSE consisted of a 3-frequency (HF:5 MHz and 15 MHz, VHF:150 MHz) coherent wide band radar, HF and VHF antennas, and optical recorder. The radar transmitter generated chirped (linear FM) pulses at a rate of 400 per second for the two HF frequencies and 2000 per second for the VHF frequency. The transmitted pulses were reflected from the lunar surface, as well as various subsurface structures, and monitored by the ALSE receivers. The received voltages were stored photographically on continuously moving film in the optical recorder. The film was recovered during the trans-earth EVA, developed at the Manned Spacecraft Center, and delivered to the Principal Investigator Team for analysis.

The data have been analyzed in four major scientific modes:

1. Sounding
2. Imaging
3. Profiling
4. Radio Astronomy (telemetry only)

The modes are discussed below:

1. Sounding: The film has been optically processed at ERIM, obtaining the required range resolution by compressing the chirped pulses and the required along-track resolution by either Doppler compression or narrow band Doppler filtering. The resultant images have been studied with particular attention paid to the mare basins. We have identified certain subsurface features and correlated these results with gravity data, surface photography, and spectral color maps.

2. Imaging: The VHF film data have been optically processed at ERIM to produce side-looking radar images. The imagery has been correlated with surface photography as well as earth based radar data.

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3. Profiling: The film has been digitized at JPL and the surface profile recovered. The results have been compared to laser altimeter data. Additionally, we have studied the profiles of specific surface features, such as wrinkle ridges, as an aid in understanding their origin.

4. Radio Astronomy: This mode utilized the ALSE HF receivers and HF antennas only; the noise power data were monitored by spacecraft telemetry channels. The front side of the Moon has a surprisingly large terrestrial component in the HF noise spectrum. However, using the Moon for RF blocking, we have computed the noise temperature under the following four noise conditions: Earth + Sun + cosmic, Earth + cosmic, Sun + cosmic, and cosmic only. These temperatures have been compared to previously published results. Additionally, we have studied the noise data for occultation events.