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# A Note on Radar Imaging

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## Editorial

The upper surface of Mars contains diverse textures and dielectric characteristics, according to radar imagery from ground-based telescopes. The most noticeable radar feature, which was first discovered in the 3.5-cm-wavelength synthetic imaging data, is an exceptionally low-reflectivity zone near the equator known as "Stealth." Its unusually low reflectivity indicates a low-density, low-permittivity surface with few wavelength-sized pebbles imbedded. Much of the Stealth region corresponds to mapped exposures of the Medusae Fossae Formation, a large equatorial deposit spanning 140 to 240 degrees E longitude. This deposit features multiple yardangs, slope streaks, and dunes, and has been significantly wind eroded, consistent with a very fine-grained low-density material, according to optical imaging. Pyroclastic volcanic deposits are the most likely source, but additional possibilities include aeolian deposits or relic polar deposits containing ice.

During the 2005–2012 oppositions, Arecibo Observatory's S-band (12.6 cm) radar scans of Mars produced 3-km-resolution dual-polarization images. The Tharsis volcanoes, Olympus Mons, and Elysium Mons are surrounded by radar-bright lava flows. CPR values near and exceeding 1.0 indicate that rough, blocky (on a centimetre to metre scale) lava flows must be common on Mars. Channels and changes in flow texture are shown by changes in radar backscatter along the flows. West of the Tharsis volcanoes, radar-dark fan-shaped deposits correlate to deposits assumed to be glacial in origin. The low reflectance indicates that these deposits are covered in fine-grained material like dust or ash, with only a few centimeter-sized or larger pebbles imbedded. The Marte Vallis channel connects the Cerberus plains with Amazonis Planitia and is likely to be a water-carved canal that was later filled with lava. Both of these plains sections display clear lava flow features in the radar imagery, while being dust-covered in optical imagery [1].

Radar can discriminate between different types of targets (for example, a bird and an aeroplane), and some systems can recognise specific target classes (for example, a commercial airliner as opposed to a military jet fighter). Target recognition is performed by monitoring the target's size and speed, as well as seeing the target in one or more dimensions with high resolution. Propellers and jet engines alter aircraft radar echo, which can aid in target recognition. The flapping of a bird's wings in flight produces a distinctive modulation that can be used to detect the presence of a bird or to differentiate one type of bird from another [2].

Synthetic aperture radar is based on cross-range resolution and range resolution gained from Doppler frequency (SAR). SAR creates a scene image that is comparable to but not identical to that of an optical photograph. The image seen by radar "eyes" will not be identical to the image seen by optical eyes. Each one delivers unique information. The gap between radar and optical images is due to the significant difference in frequency; optical frequencies are 100,000 times higher than radar frequencies. Long-range SAR can function through clouds and other atmospheric factors that limit optical and infrared imaging sensors [3].

A SAR image's resolution can be made independent of range, which is an advantage over passive optical imaging, where resolution degrades as range increases. Synthetic aperture radars can provide information about the nature of the terrain and what is on the surface by mapping areas of the Earth's surface with resolutions of a few metres.A SAR images fixed objects or planetary surfaces from a moving vehicle, such as an aircraft or spacecraft. Because Doppler resolution is based on relative motion, high resolution (in cross range) can be achieved even if the radar is stationary and the target is moving. Inverse synthetic aperture radar is the technical term for this (ISAR). ISAR allows both the target and the radar to move [4].

The antenna receives the high-power signal generated by the transmitter. An antenna, in a sense, serves as a "transducer," coupling electromagnetic energy from the transmission line to space radiation and vice versa. The duplexer is a fast-acting switch that protects the delicate receiver from the transmitter's high power by allowing alternate transmission and receiving with the same antenna. The receiver selects and amplifies radar echoes before displaying them on a television-like screen for the human operator or processing them by a computer. The signal processor distinguishes between signals reflected by potential targets and undesired noise. Then, if the echo exceeds a predefined threshold, a human operator or a digital computer circuit makes a decision [5].

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## Conflict of Interest

The author shows no conflict of interest towards this manuscript.

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