Table 2. LightSAR Dual Frequency Design Comparison

Operational Mode:	HiresX	HiresL	Repeat-pass I/F	Quad-pol	Dual-pol	ScanSAR
Frequency	X-Band	L-Band	L-Band	L-Band	L-Band	L-Band
Resolution (m)	1	3 or 5	40	25	25	100
Swath (km)	10	10	90	30, 60	50	280
Looks	2	1-2	8-16	3-4	8	8
Quantization	(8, 2) BFPQ	(8, 4) BFPQ	(8, 4) BFPQ	(8, 4) BFPQ	(8, 4) BFPQ	(8, 4) BFPQ
Incidence Angle	25 - 45°	25 - 45°	25 - 45°	20 - 40°	25 - 52°	20 - 52°
Polarizations	HH	HH or HH + VV	HH or VV	HH, HV, VH, VV	HH, HV or VV, VH	HH, HV
PRF (Hz)	12308-16166	2576-4143	1589-1916	3043-3547	1986-2641	1164-2000
Pulse Length (ms)	15	10	15	3	10	2.8-15
Average RF Power (W)	15-1900	210-330	190-230	73-80	160-210	30-130
Data Rate (Mbps)	9-1100	98-163	72-88	101-163	93-113	21-40

development. This approach is also gathering experience from previous commercial space-based imaging radar efforts. [7]

The LightSAR designs presented are non-optimized engineering solutions, formulated as a costed-design, which has been examined in sufficient depth to establish confidence that it can be produced and will meet a broad set of science requirements. The LightSAR designs achieve reduced costs by using advanced radar technology components with a proven commercial spacecraft bus, by using commercial launch and operations services, and by following a lean, fast-paced schedule. Conclusions from the LightSAR design exercise are: 1) LightSAR is technically feasible; and 2) LightSAR costs can be reduced by 25 percent of those of any previous free-flying, space-based imaging radar (including launch services).

Because of its planned long-term (3-5 year) operation, LightSAR would collect large amounts of information about our changing planet. It would provide an important contribution to NASA's Mission To Planet Earth (MTPE) program and to civilian environmental operational monitoring programs. [8] This project is a long-term research effort designed to provide better understanding of how the Earth is changing, how human activities cause or contribute to these changes, and how the changes affect us. In addition, the information from LightSAR could potentially help us address a range of issues.

One example would be measuring motion of the Earth's surface to help better understand earthquakes and volcanoes and to support emergency management efforts. Other possibilities include: studying the movements and changing size of glaciers and ice floes to better understand long-term climate variability; developing highly detailed and accurate elevation maps; monitoring floods and predicting where they are likely to occur; assessing terrain for the likelihood of discovering oil or other natural resources; early recognition and monitoring of oil spills; assessing the health of crops and forests; planning urban development and understanding its likely effects; studying land cover and land-use change. Because of advances in radar and spacecraft technology, the LightSAR spacecraft under study would be much smaller and less expensive and provide greater capability than comparable systems that are now in orbit.

The LightSAR satellite would provide nearly complete coverage of the Earth's surface every 8-10 days. This repeating coverage would give LightSAR the unique capability of continuously monitoring changes in the Earth's topography as small as a few millimeters. Capabilities under study would enable the radar to measure features as small as 1-3 meters, offering significant potential for commercial use in topographic mapping, land management, planning, and development.

MISSION DESCRIPTION

LightSAR will generate data for commercial, Earth science, and civilian applications. It will allow mapping of surface change, because its repeat-pass interferometry technique will enable continuous monitoring of Earth's dynamic topography to a height accuracy of a few millimeters. Moreover, LightSAR will have the ability to map large areas of the surface of the Earth, especially oceans, using the ScanSAR technique described for the SRTM mission. To provide both high-resolution measurements for commercial interests and large-scale geophysical measurements a dual frequency (L- and X-band) configuration was investigated as well as a single