A dual-band reflectarray for X- and Ka-bands

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The motivation for this work was the convergence of two recent research interests at NASA and the Jet Propulsion Laboratory (JPL): the development of Ka-band communication systems, and the development of inflatable reflectarray antennas, both of which are being investigated for potential application in future deep-space missions.

The main benefits of Ka-band communication systems are faster data rates and smaller antennas (for a given directivity). The biggest disadvantage of communication at Ka-band, of course, is significantly higher loss. Inflatable structures offer a large, lightweight aperture that can be stowed in a small volume for launch. Reflectarray antennas offer a flat antenna geometry, which can be integrated more readily with inflatable deployment mechanisms than other curved surfaces. The combination of these two technologies would allow for smaller and lighter spacecraft designs, which would also reduce launch costs.

NASA/JPL currently use mainly X-band in deep-space communications, but anticipate moving to Ka-band in the future. However, X-band will still be used for some time, so there will likely be a period where communications at both X- and Ka-bands will be necessary while Ka-band systems are being phased in. It is proposed that X-band will be used in the up-link at 7.115GHz, and Ka-band in the down-link at 32GHz.

This presentation will present preliminary work being done to develop a dual-band circularly-polarized reflectarray for use at both 7.115GHz and 32GHz. Two versions of the Ka-band reflectarray will be presented: one using square patches of variable size, and the other using rotated stub-tuned patches. The X-band reflectarray uses crossed dipoles of variable size located on a layer above and interlaced between the Ka-band patches. The reflectarrays will be tested separately to determine the baseline performance of each band, and then combined to determine the impact on performance of one band on the other. The presentation will include comparisons of calculated and measured results for the individual X- and Ka-band reflectarrays, and measured results for each reflectarray in the presence of the other.

Suggested Topic: *Microstrip and printed antennas, phase array antennas*

Session Organizer: *John Huang*

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