**MARSHALL SPACE FLIGHT CENTER STUDENT COLLABORATION PROJECTS**

**OBJECTIVES**

* Identify a roadmap, strategic knowledge gap, or decadal surveys that enables or enhances a return to the Moon by 2024

Response:

NASA Roadmap 2015 – TA 5.5.1.1, Intelligent, Multipurpose Software Defined Radio

Software-based communications and navigation functions in a reprogrammable signal processing platform, which sense and adapt to link and system conditions, to efficiently increase data transfer and reduce user burden.

Mention LEAG – SKG Theme 1-D Polar Resources 7 (slide 18)

-Survey surface-correlated OH at >65 degrees through orbital mapping; correlate with exospheric measurements, and use results to determine the temporal and spa6al distribu6on of water and other vola6le species in lunar surface-bound exosphere.

-More orbital measurements (resolved imaging spectrometer capable of detec6ng OH and H2O over long temporal baselines) and long-­‐lived ALSEP-­‐style instrument packages required to close this gap.

* Innovative applications of ongoing academic research/technology development to the space community

Response:

This really has two parts. (1) Identify the ongoing academic research/technology development. (2) Apply it to the space community.

(1) Using same antenna for communication/radar. Expanding NRT to other communication systems to reduce reliance on external time references. Use this NRT to electronically form the beam and transmit/track satellite.

(2) Reduce required SWaP while improving technical merit is priority here. Electronic beam-steering for inter-formation tracking and communication networking has not been demonstrated previously, see NASA small satellite database.

\*weak\*Argue that communication improvements benefit all missions (rising tide that floats all boats)

* Build partnerships and collaboration with promising academic students and their research professor(s) with an emphasis on those working on innovations not yet directly targeting space applications

Response:

Remote Sensing Center. Talk over key points and strategies.

* Help young technologists build proposing skills to market R&D to stakeholders and funding sources

**SCORING CRITERIA**

* Technical merit of the research and application (40 pts)
  + Are the technical objects of the research and application clearly defined?
    - What is the problem you are addressing?

**(1) Software-based communications and navigation that senses and adapts radiation pattern for networking and precise navigation and timing**

**(2) Demonstrate system capable of electronic beam-steering for inter-formation networking for communication and precise navigation and timing**

* + - What are the key performance parameters?

**(1) SWaP**

**(3) NASA-STD-4009A w/ change 1 compliance**

**(4) Output Power**

**(5) Frequency Accuracy**

**(6) Spurious Emissions**

**(a) Harmonic Output Power**

**(b) RX local oscillator leakage**

**(7) Deviation and modulation bandwidth**

**(8) Rx sensitivity**

**(9) Rx selectivity**

**(10) Current consumption**

* + Does the innovation significantly impact the state of the art?
    - What is the quantitative gain over current technologies?

**(2) Communication and navigational capabilities**

**(a) Data rate**

**(b) Radar gives significant probability of detection**

**(c) Improvement of state estimate**

* Alignment with NASA technology and science goals (40 pts)
  + Is mapping to NASA technology roadmaps and/or mission and science need (SKGs, decadal surveys, etc.) clearly defined and relevant?
* Budget and Implementation approach (20 pts)
  + Is a simple budget defined and appropriate for the proposed work?
  + Is a simple work plan defined and appropriate for the requested budget?

**I expect about 22 weeks/891 hours/11 sprints.**

**I see two basic risks.**

**(1) My inexperience. (This captures wideband).**

**(2) A common timing source.**