ECE Capstone program
Spring 2018
Project Abstract & Info

Please provide the following information to be shared with on capstone information exchange platform:

1. Project number:

01

2. Project title (as will appear on the poster):

Phased Patch L-Band Antenna Array

3. Team members: Alexander Cid
   Daniel Toth
   Marissa Navarro
   Cameron Greene
   Stephen Dahl

4. Adviser(s) name(s):

Dr. Anand Sarwate
Dean Telson (L3Harris)
Alejandro Pieroni (Cellgain)

5. Up to 5 keywords that will help to classify the project scope:

Ground-station
Communication
Satellite
Phased-Array
L-Band

6. Project abstract (up to 250 words) to be shared with judges:

(General guidelines: The abstract should include: (a) A background review of the state of the art in the relevant field; (b) The problem addressed in the project; (c) Objective of the proposed projects; and (d) The adopted approach)

The next decade will experience a massive surge in the amount of satellites located in lower earth orbit – 5 times the amount of satellites launched within the past 60 years. The majority of which will be delivered as satellite constellations, such as SpaceX’s Starlink and Amazon’s Project Kuiper. The ambition of the two mentioned and many other complementary companies is to provide communications, including internet access, that will be available worldwide. Inevitably, this surge will create crowding in higher frequency bands ranging from L (1.5 GHz) to Ka (up to 40 GHz). Our project
seeks to fill the need for a low-cost solution to tracking and acquiring satellite signals in support of this future infrastructure. Traditionally, ground stations that have been designed over the years are mechanically steered, clunky, and high cost. Taking a note from cutting-edge 5G cellular networks, we propose a light-weight solution by using digital beamforming techniques through a phased array to implement electronic steering and improved signal-to-noise ratio. For processing incoming satellite signals, the phased array ground station will have onboard DSP through a fusion of rising trends in software defined radios and GPU accelerated programming techniques. Overall, the techniques discussed will be synthesized together in a standalone system using the NVIDIA Jetson Nano for computing and low-cost SDRs, LNAs and patch antennas for RF to form a lightweight solution with respectable signal fidelity.