

From: Allan Bruce

To: Nimesh Sangani

Date: December 13, 2019

Subject: Additional Information Request

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Message:

Please find below responses to your questions of 11/20/19.

I also uploaded a revised PDF of the configuration, correctly identifying the frequency assignments from ground station to UAV,

The following answers are provided in response to FCC questions on the 2100 – 2200 MHz band request at the Apache City, CO site.

Ground Station Antenna Array: (Tx - 2100-2200 MHz)

1) What type of antenna(s) will be used for this testing?

? An antenna array, consisting of 64 transceivers, each with an individual patch antenna.

2) What is/are the antenna gain pattern(s) for the antenna(s)?

? A single patch antenna has an antenna gain of 7.5 dBi with about 60°; (3 dB range) angular width. The patch antenna array, has a beamforming gain of up to 18 dBi when all the antenna are combined in a single beam, plus an additional 18 dB from the transmitters. The array is designed to cover a sector of 60°; relative to the perpendicular.

3) How will the antenna(s) be pointed during the testing?

? The amplitude and phase of each of the 64 patch antennas in the array can be digitally controlled and pointed. In the tests, we will form a single beam and track the UAV via GPS.

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The following answers are provided in response to FCC questions on the 2110 – 2200 MHz band request at the Jornada Range site.

Ground Station Antenna Array: (Tx - 2110-2200 MHz)

1) What type of antenna(s) will be used for this testing?

? An antenna array, consisting of 64 transceivers, each with an individual patch antenna.

2) What is/are the antenna gain pattern(s) for the antenna(s)?

? A single patch antenna has an antenna gain of 7.5 dBi with about 60°; (3 dB range) angular width. The patch antenna array, has a beamforming gain of up to 18 dBi when all the antenna are combined in a single beam, plus an additional 18 dB from the transmitters. The array is designed to cover a sector of 60°; relative to the perpendicular.

3) How will the antenna(s) be pointed during the testing?

? The amplitude and phase of each of the 64 patch antennas in the array can be digitally controlled and pointed. In the tests, we will form a single beam and track the UAV via GPS.