



September 27<sup>th</sup>, 2016

MEMORANDUM for AFTRCC Coordination for FCC application: File No.: 0091-EX-CN-2016

To whom it may concern,

This antenna installation will be used to perform RF testing in support of SpaceX's Commercial Crew Transportation Contract with NASA. The specific event covered is the [CREW-VE-106](#) verification event as specified in CCT-REQ-1130: ISS Crew Transportation and Services Requirements, Revision D, Revision F, SSP 50808: ISS to COTS Interface Requirements Document. See technical details in following section.

Government Contract #: NNK14MA74C

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*Technical information:*

Test Antenna:

A small test antenna independent of the tracking dish specified in the FCC Application will be used for calibrating the tracking antenna. The antenna used will be a [UL-235A-498](#), made by antennas.us. This antenna will be mounted on the roof of our Hawthorne facility near the tracking antenna. The transmitter used will be an [Ettus Research X310 USRP](#). The transmitter's maximum power output before compression is 0dBm and the signal will not be amplified further.

The frequencies of concern to AFTRCC that we plan to radiate are illustrated in the following table:

*Table 1: Table of Frequencies desired for open loop testing on factory roof.*

| Lower Freq    | Upper Freq    | Output power | ERP     | Tolerance | Emission Designator | Modulating Signal |
|---------------|---------------|--------------|---------|-----------|---------------------|-------------------|
| 2368.0625 MHz | 2372.9375 MHz | 1mW          | 6.095mW | 0.001%    | 4M87F1D             | PCM/FM            |
| 2380.0625 MHz | 2384.9375 MHz | 1mW          | 6.095mW | 0.001%    | 4M87F1D             | PCM/FM            |

The antenna will be located at a latitude of 33° 55' 14 N and a longitude of 118° 19' 41 W at a height of approximately 65ft AGL. The equipment will be operated during testing operations as required. Typical radiation times are on the order of minutes.

Mobile emitters:

SpaceX will perform RF checkouts with the Falcon vehicle inside the factory. The antenna used is a proprietary SpaceX built antenna used on the Falcon, P/N 00716147. The transmitter used is a Quasonix, P/N QSX-VSR-110-20S.

The antennas will be located at a latitude of 33° 55' 14 N and a longitude of 118° 19' 41 W inside the factory at ground level. The equipment will be operated during testing operations as required. Typical radiation times are on the order of minutes.

*Table 2: Table of Frequencies desired for vehicle testing inside factory.*

| Lower Freq    | Upper Freq    | Output power | ERP | Tolerance | Emission Designator | Modulating Signal |
|---------------|---------------|--------------|-----|-----------|---------------------|-------------------|
| 2368.0625 MHz | 2372.9375 MHz | 20W          | 40W | 0.001%    | 4M87F1D             | PCM/FM            |
| 2380.0625 MHz | 2384.9375 MHz | 20W          | 40W | 0.001%    | 4M87F1D             | PCM/FM            |