

Attachment for Special Temporary Authority Application

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The table provided below is the technical summary of what is being requested from the FCC in support of cognitive radio networking demonstrations and experiments for public safety communications to be conducted at the Idaho National Lab (INL). The project is funded by the National Science Foundation Enhanced Access to Radio Spectrum (EARS) and NIJ CoE programs. This is a collaborative effort between Stevens Institute of Technology and Dynamic Spectrum LLC. Authorization to conduct experiments and demonstrations is requested for October 27, 2013--November 9, 2013, inclusive.

The sites for experiments are the following locations within the Idaho National Laboratory (2525 Fremont Ave Idaho Falls, ID 83401):

- Building CFA-1609
- Gate 1
- Building CFA-609

Below are the lat/long coordinates and antenna height AGL for the transmitter locations at the INL:

CFA-1609 (location of 2.4 GHz and 4.9 GHz WiFi APs that will be communicating with the end user device)

43 deg 31' 52.64" N, 112 deg 56' 42.17" W, 7.5 m (25') AGL

Gate 1 (location 2.4 GHz and 4.9 GHz APs that will be communicating with the Wireless HD video camera)

43 deg 30' 39.97" N, 112 deg 53' 45.67" W, 7.5 m (25') AGL

CFA-609 (location of 4G Mobile WiMAX (3.5 GHz))

43 deg 31' 33.73" N, 112 deg 56' 56.10" W, 15.25 m (50') AGL

Equipment information

RF Band and Transmitted Bandwidth	RF Equipment	Notes
2.4 GHz WiFi Bands (2400 – 2490 MHz)	Ettus Research xcvr2450 (USRP daughter board) COTS Wi-Fi RF boards (unmodified Part 15 Certified)	2.4GHz daughterboard specific information: http://www.ettus.com/downloads/ettus_ds_USRP_TXRX_v5b.pdf
5 GHz WiFi Bands	COTS Wi-Fi RF boards (unmodified, Part 15 Certified)	COTS Wi-Fi RF boards (unmodified, Part 15 Certified)
4.9 GHz Bands	Strix Mobile Wireless System and Ubiquiti	Equipment specific information: http://www.strixsystems.com/ http://www.ubnt.com/
3.5GHz WiMax	BreezeMAX	http://www.alvarion.com

Radio parameters

Requested Frequencies/Bands: 2400 - 2490 MHz

Transmitted Bandwidth of Equipment: 20 MHz

Modulation Type: OFDMA per 802.11a, b, g

Power Output Range (X-X dBm): 25

Equipment Power Step (dB): 0.1

Desired E.I.R.P. (Watts): 5 W

Duty Cycle of Transmitter: 100%

Number of Sectors: 2 (1 omni at each site)

Antenna Model and Type

(OMNI, Folded Dipole, Yagi, etc.): Omni

Antenna gain (dBi): TBD (up to 12 dBi) [we have 9dBi but 12dBi should be better]

Antenna height above ground (m): 7.5

Antenna azimuths (30-150-270): N/A

Antenna down tilt (0-0-0): 0-0 all sites

Duration of transmissions each day: 8 hours

Requested Frequencies/Bands: 5.15 – 5.35 and 5.725 – 5.825 GHz

Transmitted Bandwidth of Equipment: 20 MHz

Modulation Type: OFDMA per 802.11a, b, g

Power Output Range (X-X dBm): 25

Equipment Power Step (dB): 0.1

Desired E.I.R.P. (Watts): 5 W

Duty Cycle of Transmitter: 100%

Number of Sectors: 2 (1 omni at each site)

Antenna Model and Type

(OMNI, Folded Dipole, Yagi, etc.): Omni

Antenna gain (dBi): up to 12 dBi

Antenna height above ground (m): 7.5

Antenna azimuths (30-150-270):	<u>N/A</u>
Antenna down tilt (0-0-0):	<u>0-0 all sites</u>
Requested Frequencies/Bands:	<u>4940 - 4990 MHz</u>
Transmitted Bandwidth of Equipment:	<u>20 MHz</u>
Modulation Type:	<u>OFDMA per 802.11a QPSK/16QAM/64QAM</u>
Power Output Range (X-X dBm):	<u>26</u>
Equipment Power Step (dB):	<u>0.1</u>
Desired E.I.R.P. (Watts):	<u>6.4 W</u>
Duty Cycle of Transmitter:	<u>100%</u>
Number of Sectors:	<u>2 (1 omni at each site)</u>
Antenna Model and Type (OMNI, Folded Dipole, Yagi, etc.):	<u>Omni</u>
Antenna gain (dBi):	<u>up to 12 dBi</u>
Antenna height above ground (m):	<u>7.5</u>
Antenna azimuths (30-150-270):	<u>N/A</u>
Antenna down tilt (0-0-0):	<u>0-0 all sites</u>
Requested Frequencies/Bands:	<u>3545-3600 MHz, 3400 -3525 MHz</u>
Transmitted Bandwidth of Equipment:	<u>10 MHz</u>
Modulation Type:	<u>TDD SOFDMA Adaptive Modulation QPSK-64QAM</u>
Power Output Range (X-X dBm):	<u>24-34</u>

Equipment Power Step (dB):	<u>0.1</u>
Desired E.I.R.P. (Watts):	<u>125</u>
Duty Cycle of Transmitter:	<u>100%</u>
Number of Sectors:	<u>9 (3 at each site</u>
Antenna Model and Type (OMNI, Folded Dipole, Yagi, etc.):	<u>MTI MT-404007 60° vertically polarized, flat pannel</u>
Antenna gain (dBi):	<u>17</u>
Antenna height above ground (m):	<u>15.25</u>
Antenna azimuths (30-150-270):	<u>Gate1: 20-140-260, CFA: 10-120-230, EBR: 30-150-270</u>
Antenna down tilt (0-0-0):	<u>0-0-0 all sites</u>

Authorization requested:

Stevens Institute of Technology and Dynamic Spectrum needs authorization: (1) to transmit via experimental prototype in 2.4/5 GHz Wi-Fi bands; (2) to operate COTS 4.9GHz radios; (3) to operate COTS 3.5GHz Mobile WiMax radios. Wi-Fi radios operate in unlicensed Part-15 spectrum. COTS end user radios do not require a license.

Demonstration overview:

- Demonstrate and test advanced multi-layer spectrum and network sensing based cognitive radio technologies.
- Demonstrate and test performance of multimedia applications over the cognitive radio network.
- Emulate various public safety communication scenarios and measure the performance of the cognitive radio experimental prototype.