

EXHIBIT – NECESSARY BANDWIDTH DESCRIPTION

The proposed research will utilize the unlicensed spectrum bands for the 802.11 and 802.16 IEEE, and corresponding bandwidth allotments and is intended to work with commercially available, “off the shelf” radios.

Modulating Signal (F)	Necessary Bandwidth
IEEE802.11b: DBPSK (1Mbps) DQPSK (2Mbps) CCK (5.5/11Mbps)	1 Mbps 2 Mbps 5.5 – 11 Mbps
IEEE802.11g: BPSK (6/9Mbps) QPSK (12/18Mbps) 16-QAM (24/36Mbps) 64QAM(48/54Mbps)	6-9 Mbps 12-18 Mbps 24-36 Mbps 48-54 Mbps
IEEE802.11a: BPSK (6/9Mbps) QPSK (12/18Mbps) 16-QAM (24/36Mbps) 64-QAM(48/54Mbps)	6-9 Mbps 12-18 Mbps 24-36 Mbps 48-54 Mbps