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Approved Antenna Guide for
LXE 2.4 GHz Radio Products

QTY REQD	ITEM NO.	PART OR IDENTIFYING NUMBER	NOMENCLATURE OR DESCRIPTION			
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1. INTRODUCTION-----4
1.1 Purpose -----4
1.2 Scope-----4
1.3 Definitions -----4
1.4 References-----4

2. FCC RADIOS-----5
2.1 Approved Antennas-----5
2.2 RF Safety-----6

3. ETSI RADIOS-----7
3.1 Approved Antennas-----7
3.2 RF Safety-----7

1.0 INTRODUCTION

1.1 Purpose

The intent of this document is twofold. First, it is to formally identify antennas that are authorized for use on LXE radio products. Antennas that are not identified within this document should be considered unauthorized. Antennas will be added to this document after they have been approved for use by the appropriate agencies.

Secondly, this document provides information regarding the installation requirements of antennas used in LXE Spread Spectrum radios relative to the FCC's RF Safety requirements.

1.2 Scope

The scope of this document is limited to LXE 2.4GHz Spread Spectrum radio products, specifically LXE radio models 6430NXR1 and 6430NXR5, and LXE radio part numbers 480824-3300 and 480628-3700.

1.3 Definitions

480628-3700 - Lucent Technologies IEEE 802.11, PCMCIA Type 2, 2Mb/s, OEM radio.

480824-3300 - Proxim Inc. PCMCIA Type 2 OEM radio.

6430NXR1 - LXE Model 6430, 100mW Access Point. A productized Proxim Model 7510/20.

6430NXR5 - LXE Model 6430, 500mW Access Point. A productized Proxim Model 7521.

ETSI - European Technical Standards Institute

EU - European Union

FCC - Federal Communications Commission

FCC OET - FCC's Office of Engineering and Technology

MPE - Maximum Permissible Exposure

1.4 References

ETSI Test Report 97313730 - Indicates all antennas that have been approved for use in ETSI accepting countries on LXE Radio Part 480824-3300. Located in the Approvals Library.

ETSI Test Report 97313731 - Indicates all antennas that have been approved for use in ETSI accepting countries on LXE Radio Part 480824-3300. Located in the Approvals Library.

ETSI Test Report 98406530 - Indicates all antennas that have been approved for use in ETSI accepting countries on LXE Radio Part 480628-3700. Located in the Approvals Library.

FCC Part 15.247(b)(4) - Section of the FCC rules regarding RF Safety of Spread Spectrum Devices.

FCC OET Bulletin 65 - With Supplement C: Edition(97-01):Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic fields.

FCC Test Report(s) for FCC ID: IMKAP2-1121 - Indicates all antennas that have been approved for use in FCC accepting countries on the 6430NXR5. Located in the Approvals Library

FCC Test Report(s) for FCC ID: IMKAP2-1020 - Indicates all antennas that have been approved for use in FCC accepting countries on the 6430NXR1. Located in the Approvals Library

FCC Test Report(s) for FCC ID: KDZ4808243300M - Indicates all antennas that have been approved for use in FCC accepting countries on LXE Radio Part 480824-3300. Located in the Approvals Library

FCC Test Report(s) for FCC ID: KDZ480628-3700 - Indicates all antennas that have been approved for use on LXE Radio Part 480824-3300. Located in the Approvals Library

2.0 FCC RADIOS

2.1 Approved Antennas

The table below identifies by a ✓, the antennas approved for use with LXE 2.4 GHz Spread Spectrum Radio Products in FCC accepting countries. The use of alternate antennas is prohibited unless otherwise approved by the appropriate approval agencies.

Approved Antenna/Radio Combinations For FCC Radios						
Antenna Information			LXE Radio Products			
LXE P/N	Antenna Type	Gain (dBi)	6430 (100mW)	6430 (500mW)	Proxim Type 2	Lucent 802.11(2Mb/s)
153179-0001	Omni	0	✓	✓		✓
153325-0001	Omni	0	✓	✓		✓
153599-0001	Omni	3	✓	✓		✓
153600-0001	Omni	3	✓	✓		✓
480424-0400	Omni	0	✓	✓		
480424-3404	Omni	3	✓	✓		
480424-3402	Patch	6	✓	✓		
460602-3020	YAGI	15	✓			✓
480424-1702	Directional	6	✓	✓		
481246-2400	Patch	6	✓	✓		✓
153180-0001	Omni	0			✓	✓
460601-3020	YAGI	15	✓			✓
154803-0001	Patch	0			✓	
480426-0425	Patch	2.5				✓
155520-0001	Patch	0				✓
155846-0001	Omni	6		✓	✓	✓
155845-0001	Omni	3		✓	✓	✓
155522-0001	Omni	0				✓
155526-0001	Patch	0				✓
155814-0001	Patch	0				✓
154712-0001	Patch	0			✓	
480424-0411	Omni	9	✓	✓		✓
153139-0001	Omni	0			✓	
480424-3411	Patch	4&6	✓	✓		✓
155311-0001	Patch	4&6	✓	✓		✓
MPE DISTANCE			16.0cm	18.0cm	16.0cm	10.00cm

2.2 RF Safety

In accordance with the FCC rules regarding Maximum Permissible Exposure(MPE), the antennas given in the table in section 2.1 must be installed such that a minimum separation distance(MPE distance) is maintained between the antenna and the general population. The MPE separation distance is determined using a formula found in the FCC's OET Bulletin 65, Section 2 and given below for reference. The formula is based on the output power of the transmitter plus the highest gain of the approved antennas. Using the highest gain antenna in the formula ensures that the minimum MPE separation distance will always be maintained when any of the authorized antennas are in use. This requirement only applies to mobile or base station equipment and does not apply to LXE handheld equipment, therefore the minimum MPE separation distance is not required for such equipment. The MPE distance for each radio is given at the bottom of the respective column in the table.

The formula applied is:

$$S = \frac{PG}{4\pi \bullet R^2}$$

Where: S = Power Density of Electromagnetic Field given in mW/cm^2

P = Power Input to the Antenna(mW)

G = Power Gain of the Antennan(dBi)

R = Distance to the center of radiation of the antenna or MPE Distance.

To determine the minimum MPE distance of all approved antennas, the formula is solved for R resulting in the formula:

$$R = \sqrt{\frac{PG}{4\pi \bullet S}}$$

Example using the 6430NXR5, Power(P) = 500mW, assuming the highest gain antenna approved(G), using the maximum allowable power density for general population(S) areas, or $1mW/cm^2$. The variables become:

$S = 1mW/cm^2$ (Maximum Permissible Exposure Level for General Populations)

$P = 500mW$ or 27dBm

$G = 6dBi$ (Highest Gain Antenna Approved for use with the 6430NXR5)

$R = TBD$

Using Power Addition, $PG = 27dB + 6dB = 33dB$ or 1995mW

$$R = \sqrt{\frac{1995mW}{4\pi \bullet 1mWcm^2}}$$

The MPE Distance (R) for the 500mW 6430, using a 6dBi antenna is 12.60cm.

3.0 ETSI Radios

3.1 Approved Antennas

The table below identifies by a ✓, the antennas approved for use with LXE 2.4 GHz Spread Spectrum Radio Products in ETSI accepting countries. ETSI regulations limit the maximum EIRP for a system to 20dBm. This means that the radio power(dBm) plus the antenna gain(dBi) can not exceed 20dBm. The combinations given in the table will not exceed the 20dBm limit. The use of alternate antennas is prohibited unless otherwise approved by the appropriate approval agencies.

Approved Antenna/Radio Combinations For ETSI Radios					
Antenna Information			LXE Radio Products		
LXE P/N	Antenna Type	Gain (dBi)	6430 (100mW)	Proxim Type 2	Lucent 802.11(2Mb/s)
153179-0001	Omni	0	✓		✓
153325-0001	Omni	0	✓		✓
153599-0001	Omni	3			✓
153600-0001	Omni	3			✓
480424-0400	Omni	0	✓		✓
153180-0001	Omni	0		✓	✓
154803-0001	Patch	0		✓	
480426-0425	Patch	2.5			✓
155520-0001	Patch	0			✓
155845-0001	Omni	3			✓
155522-0001	Omni	0			✓
155526-0001	Patch	0			✓
155814-0001	Patch	0			✓
154712-0001	Patch	0		✓	
153139-0001	Omni	0		✓	

3.2 RF Safety

Currently there are no RF Safety requirements in place for ETSI accepting countries. Antennas have no MPE distance restrictions.