LTE GUIDE FOR 2015

Introduction

Up until the start of 2015, 1800MHz was the primary band used for LTE for those within 5km of a base station. With demand for mobile data increasing, a plan was needed to cater for network capacity, increased speed and greater coverage.

The solution for carriers was to re-farm existing spectrum or purchase new spectrum in a different band. The ACMA auctioned off the 700 and 2600 bands to provide a solution, with both Telstra and Optus purchasing licences in each band. Vodafone decided to re-farm their existing 850 band for LTE.

From early 2015 the carriers have started rolling out the new frequencies within their network and by mid-year plan to have most of the country covered.

The LTE Bands

Band	Frequency Band (MHz)	Uplink (MHz)	Downlink (MHz)	Mode
3	1800	1710 – 1785	1805 – 1880	FDD
5	850	824 – 849	869 – 894	FDD
7	2600	2500 – 2570	2620 – 2690	FDD
28	APT 700	703 – 748	758 – 803	FDD
40	2300	2300 – 2400	2300 – 2400	TDD

Benefits of the New Bands

Increased Range
Signal transmitted on the lower mobile frequencies will travel a much further distance than those sent over the higher frequency bands. As an example 1800 MHz towers have a range of around 5km, whilst 700 MHz towers can extend out past 80km.

Better Indoor Coverage
The lower frequencies bands also have increased ability to penetrate solid objects such as walls. This leads to better mobile coverage indoors.

Greater Capacity
The new frequency allocation has allowed for a wider bandwidth with 40 MHz channels. This basically provides a larger pipe for user communication, resulting in less drop outs, faster data speeds and less network downtime.

Faster Data speeds
Having larger bandwidth increases the pipe size which data travels down. The new frequency allocation has resulted in 20-40MHz channels becoming available to carry the data. Having LTE transmitted on multiple bands has also opened up a technology called 'Carrier Aggregation', whereby the signal is transmitted on two or more frequencies. Having multiple channels or pipes to send the data down virtually doubles the data speeds up to around 100mbps with 2 channels or up to 480mbps with 4 channels. This technology is also known at LTE Advanced.

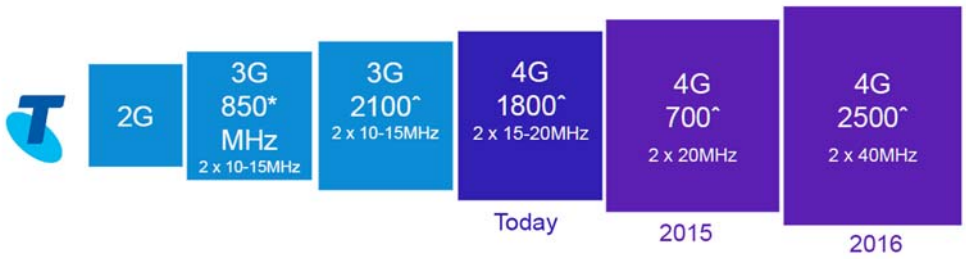
The Carriers

Optus
Network Name: 4G Plus
LTE Frequencies: APT700, 1800, 2300, 2600 (coming soon)
LTE Advanced - Carrier Aggregation: 2 x 20 MHz channels of 2.3 GHz spectrum
Data Speeds: Up to 100mbps

Telstra
Network Name: 4GX
LTE Frequencies: APT700, 1800, 2600 (coming soon), 900 (testing)
LTE Advanced - Carrier Aggregation: 20 MHz of 700 MHz spectrum and 20 MHz of 1.8 GHz spectrum
Data Speeds: Up to 100mbps

Vodafone
Network Name: 4G+
LTE Frequencies: 850, 1800
LTE Advanced - Carrier Aggregation: No mention at the time of publication. We expect 850 MHz and 1800 MHz will be used in the near future.

Future LTE Bands
This year we will see the carriers increasing the use of carrier aggregation with more frequencies and with four channels. Parts of the GSM 900 spectrum with be re-farmed for LTE and the 2600 band will become more wide spread in city areas. Telstra are currently testing 900 MHz and 1800 MHz aggregation in some areas. Both Optus and Telstra are testing four channel aggregation.



Current Devices that Support the New Bands

The biggest problems at the moment is finding devices that support the many bands used for LTE. The carriers are ahead of the game and device manufacturers are trying to catch up.

Phones
Nearly all the phone manufacturers are releasing their high end phones with the 700 band included.

These include models from:

Apple - iPhone 6 and 6 Plus
Samsung: Galaxy S5 mini, S5, Note Edge and Note 4
Sony: Xperia Z3, Z3 Compact
HTC: One (M8), Desire 510, Desire 816
Nokia: Lumia 830
LG: G3
Huawei: Ascend P7

Modems

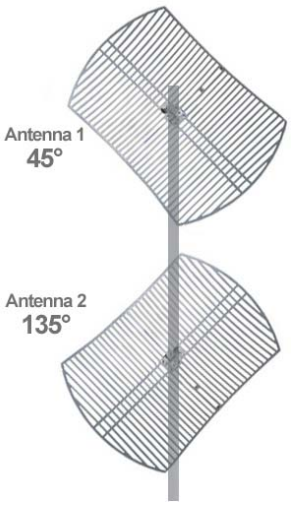
Huawei: E5377, E5786 (Telstra Advanced Pro X)

Antennas for the LTE Bands

When selecting an external antenna to boost the LTE bands the game has changed. In order to take advantage of the faster data speeds the following needs to be considered:

Band Support
The antenna may need to support all bands from 700 up to 2600 to take advantage of carrier aggregation. As the carriers are mostly using the higher frequencies for carrier aggregation, antennas for use in rural areas may not need to support multiple bands. Instead finding the LTE frequency used in your local area and matching the antenna may suit.

MIMO
Two antenna may be needed to obtain a MIMO connection. MIMO enables two channels back to the tower. By using one antenna at a 45 degree angle and another at a 135 degree angle, the tower can provide two channels, virtually doubling the data speed. It is often hard to achieve MIMO when you are a long distance from the tower and may only benefit from having a single antenna.



LTE benefits greatly by having two antennas. Two separate streams of data can be sent and received at a time. Having two streams of data virtually doubles the data speeds.

LTE signals are slant polarised, represented by a diagonal wave pattern. In order to help separate the two data streams, antenna one needs to be mounted at 45 degrees and antenna two at 135 degrees.

MIMO is turned on and off by your modem. If the signal drops below a certain signal level MIMO is switched off.

If using multiple antennas is not an option, then you can still just connect one external antenna to main antenna port of your modem.

Antenna's for Carrier Aggregation & MIMO

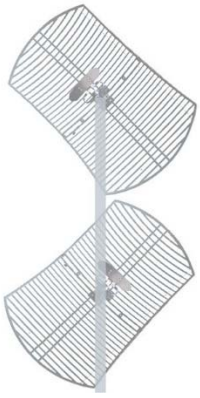
These antenna are available for purchase from http://www.powertec.com.au

Powertec WIDEBAND Yagi – 700-2700Mhz

RFI Log Periodic– 700-3000Mhz

RFI PANEL Antenna– 700-2700Mhz

700 Band Specific Grid Antennas



1800 Band Specific Grid Antennas