



# ExcelMAX Enhanced C9 Platform 3650 – 3700 MHz

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## 1 CHANGE HISTORY

REVISION	DATE	EDITOR	DESCRIPTION
0.1	26-Feb 2010	Oscar Somerlock	First Draft

## 2 INTRODUCTION

The ExcelMAX C9 AP and CPE provide for TDD communication over the 3650-3700 MHz band. In the United States this band is a “lightly licensed” band, in that, operators must register with the Federal Communications Commission (FCC) in order to utilize this band, however, no spectrum license need be purchased and multiple operators in the same region may use the band. The FCC has specified regulatory requirements for devices operating in this band which identifies two classes of devices: those using so-called restricted contention-based protocols and those using unrestricted contention-based protocols. These two categorizations are explained in the following section. Regulatory bodies in other countries (e.g. Canada) are also drafting their own regulations for this band but, to-date, those regulations have not yet been published.

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### 3 Unrestricted Contention versus Restricted Contention

The FCC defines “restricted contention” based protocols as “those capable of avoiding interference only to other co-frequency devices using the same protocol”. Scheduled time-synchronized protocols, such as the standard WiMAX MAC protocol, would fall into this category. Devices employing a “restricted contention” based protocol are only permitted to operate within the lower 25 MHz of the band (3650-3675 MHz).

According to FCC regulations, an “unrestricted contention” based protocol must be “broadly compatible and function to prevent interference even with other, dissimilar contention technologies on the market.” A listen-before-talk technology, such as that used by WiFi, is an example of an unrestricted contention based protocol. Devices employing an unrestricted contention based protocol are permitted to operate over the entire 50 MHz of the band (3650-3700 MHz).

Axxcelera’s ExcelMAX system is one of only a few WiMAX based products on the market today that meet FCC requirements for unrestricted contention based access and qualify for operation over the entire 3650-3700 MHz band.

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## 4 The Axxcelera Advantage

As described above, listen-before-talk technologies like WiFi meet FCC requirements for unrestricted contention based access. However, WiFi based systems suffer from some inherent limitations when operating in a wide-area wireless network environment. The asynchronous transmission scheme and random back-off period employed by WiFi systems often result in excessive collisions between user transmissions and periods of dead-time where all devices are in a back-off state. As a result, WiFi systems are not spectrally efficient and cannot provide adequate QoS for many applications in wide-area wireless network environments.

ExcelMAX employs a hybrid approach that uses naturally occurring gaps in WiMAX transmissions to listen for co-channel transmissions by other systems. This design allows ExcelMAX to offer the efficiency and QoS of a WiMAX scheduler while also enabling operators to utilize the entire 50 MHz of the band. ExcelMAX also provides operators with the flexibility to configure the duration of the back-off period to be used when co-channel transmissions are detected, so the system may be tuned to optimize performance based on the operating environment.

ExcelMAX supports stable network growth without loss of network efficiency or reliability. The capacity and spectral efficiency of a WiFi system will degrade as the network expands and new access points are added due to collisions in the wireless domain resulting from the asynchronous transmission timing of WiFi access points. Conversely, the transmit and receive intervals for each ExcelMAX Access Point are synchronized via precise timing information derived from the GPS network. Thus, co-located ExcelMAX Access Points can operate without the data loss caused by self-induced collisions. The transmission timing of the ExcelMAX system is tightly orchestrated and does not suffer from the scalability risks associated with a WiFi solution.