February 20, 2013

Office of the Secretary
Federal Communications Commission
445 12th Street SW, Room TW-A325
Washington, DC 20554, USA

Filed Electronically by ECFS

Subject: Comments on NPRM FCC 12-148

The Global TD-LTE Initiative is pleased to be able to respond to the NPRM of December 12th, 2012 In the Matter of Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band

The Global TD-LTE Initiative (“GTI”) was established in 2011 and is a virtual open platform to advocate cooperation among global operators to promote TD-LTE. GTI was formed to create value for stakeholders across the TD-LTE ecosystem for early adoption of the technology and convergence of TD-LTE and LTE FDD.

GTI was founded by leading international mobile network operators to meet the demands for growing mobile broadband and explore new opportunities across industry and public segments.

Mission and Objectives

GTI aims at bringing together the leading operators to steer the TD-LTE ecosystem as a major standard in mobile broadband technology and drive early development of next generation mobile broadband networks.

- Energizing the creation of a world-class and a growth-focused business environment
- Delivering great customer experience and bringing operational efficiencies
- Promoting convergence of TD-LTE and LTE FDD in order to maximize the economies of scale
Facilitating multilateral cooperation between and/or among operators

Accordingly we welcome the initiative by the FCC to open 100 MHz of the 3.5 GHz band for application to Small Cells which aligns with our interest in a technology called LTE Hi (for “Long Term Evolution for Hotspots and Indoor) which has already been considered by 3GPP as an important candidate feature for Release 12.

Motivation for LTE Hi

Currently 60% of voice traffic and 70% of data traffic originates within buildings, this will increase as smart phones and tablet computers become ever more popular. To accommodate the explosive growth of data traffic in such cases, the following methods need to be considered:

- Denser network deployments of low power nodes with proper coordination
- Easy to deploy low power nodes and access points
- Larger bandwidths and higher data modulation schemes (256 QAM)
- New technologies to improve spectrum efficiency and throughput.

These factors have been considered in the proposals for “LTE Hi”, and at WRC07 the 3.5 GHz band was recognized as being the most suitable global band, since it possessed an abundance of usable spectrum most suited to hotspot and indoor propagation. LTE technology was chosen as the most suitable technology to achieve these goals, but success in this venture will require some additional points to be accommodated.

Up to now, 3GPP Release 12 has completed the study item of scenario, meanwhile being studying the physical layer and high layer research.

Terminals and small cells for low power implementation

Since this band will not be used for ubiquitous coverage, but rather as a capacity layer in dense urban areas at hotspots or in buildings. Also, this band may be used for small cells, low-power or pico cell deployments. The incremental cost for small cell and adding this band into multi-mode multi-band terminals must be reasonable.

As large data rates and IMT-Advanced features are considered, there may be up to four antennas per device. As a result, we believe it is unreasonable to have a band plan which requires dual duplexers in terminals and in small cells, which is the case for FDD (see figure 1).

From the hardware perspective, we also believe that it is desirable to be able to implement the entire proposed band (3550-3650 MHz) in the same way i.e. with a TDD duplexing scheme.
**Sensitivity**

Since the path loss and wall penetration loss are greater at 3.5 GHz than in lower bands, the solution should be operational with small signal levels and therefore products should have the highest possible sensitivity. The following table from 3GPP TS 36.101 compares the reference sensitivity for both FDD and TDD options, and clearly shows the former has a receiver sensitivity 2 dB worse than the latter. This fact will be useful when designing modulation improvements to 256QAM.

<table>
<thead>
<tr>
<th>Channel bandwidth</th>
<th>E-UTRA Band</th>
<th>1.4 MHz (dBm)</th>
<th>3 MHz (dBm)</th>
<th>5 MHz (dBm)</th>
<th>10 MHz (dBm)</th>
<th>15 MHz (dBm)</th>
<th>20 MHz (dBm)</th>
<th>Duplex Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>22</td>
<td>-97</td>
<td>-94</td>
<td>-92.2</td>
<td>-91</td>
<td>FDD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>-99</td>
<td>-96</td>
<td>-94.2</td>
<td>-93</td>
<td>TDD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Industrial adoption and minimum size of the market**

Economies of scale have to be guaranteed, and therefore worldwide harmonization is desirable in order to achieve as much as possible one single set of chipsets and terminals, instead of the current situation where power amplifiers and filters in this band are costly due to small volumes involved.

Some countries like the United States of America and China have satellite and/or radar inside the band, which should lead to a TDD band plan using the same arguments that guided the choice of TDD for sub-band 3.6-3.8 GHz (Band 43) by the Electronics Communications Committee for CEPT decision 11(06).

Especially, First significant rollout for 3.5GHz has already started in UK (UK Broadband operator), which has provided WBB service since Feb 2012. It offers 4G TD-LTE
broadband and data services to wholesale partners, resellers and consumer customers within their coverage areas.

In Korea, the band 3400-3500 MHz is allocated to the fixed and mobile services on a primary basis. LTE-TDD eNB and terminals are already available in the market. We believe that a single or preferred TDD band plan is the only option that might be suitable to all those use case and lead to worldwide harmonization.

**Technology Roadmap Considerations**

This band must be practically implementable in the short term without requiring unreasonable costs, volumes or delays for developing the proper chipsets and components.

The 3.5 GHz interest group – which is a task force of the Global TD-LTE Initiative, has already started writing specifications for various types of LTE-TDD devices. Single-band chipsets and devices are already available, and multi-mode multi-band devices are expected in 2013. To our knowledge, there is no LTE FDD product or chipset available, and no visibility on any industrial roadmap.

**Efficient use of the spectrum**

TDD inherently allows configurable asymmetry. While this may be partly restricted if synchronization is implemented in a multi-operator context, the resulting common TDD ratio is still better suited to the needs than a 50% asymmetry hardwired in FDD, and can always be changed at any moment.

In a context where the effective DL/UL ratio may be up to 8:1, we consider that TDD allows a far more efficient use of the spectral resource. Inter-operator synchronization, based on commonly-used GPS system, has already been proven as viable in several countries. For the indoor scenario, the over-the-air method will also meet the requirement for synchronization.

TDD also shows additional advantages for spectrum sharing. TDD is more flexible to utilize the idle spectrum while FDD requires paired spectrum with fixed duplex gap. Thus, higher spectrum efficiency could be easily achieved for TDD which aligns with the motivation of Spectrum Access System.

Please find attached a document that provides more information on GTI’s position for LTE TDD systems and devices that may be relevant to your future decisions.

If you have a question, comment or suggestions regarding our submission, please send your feedback to my attention.

Yours truly,
GTI Secretariat
ADD: 21F, Innovation Building, No.32 Xuanwumenxi Ave, Xuanwu District, Beijing, 100053, PRC
E-mail: gti@lte-tdd.org