TD-LTE Industry Briefing

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GTI Successfully Held the 5th TD-LTE Spectrum Workshop in Budapest

The 5th TD-LTE Technology and Spectrum Workshop, jointly hosted by ITU, GTI, China Mobile and TDIA, was successfully held on October 12th in Budapest, Hungary during ITU Telecom World 2015.

This workshop brought together government leaders, regulator officers, CEOs of operators and chairmen of international associations to share their views on mobile broadband development and strategies of global unified spectrum allocation.

Keynote

Mr. Zhao Houlin, Secretary-General, ITU
As part of the next stage in mobile network development, LTE technology, including TD-LTE, has the potential to provide users with much faster data speeds than we have today. TDD will play an important role in IMT-2020.

Mr. Mo Wei, Member of CPC Leadership Group and Director-General of General Office, MIIT
Four suggestions for working closer with all countries' government and industry in mobile broadband to achieve rapid global ICT development: **First**, accelerate the centralized frequency planning. **Second**, quicken the pace of LTE development and evolution. **Third**, jointly promote the high-speed broadband mobile network development along the "Silk Road Economic Belt and 21st-Century Maritime Silk Road". **Fourth**, achieve closer 5G cooperation worldwide.

Mr. Jaime Afonso, Vice Chairman, CEPT ECC
There are more than 1200 MHz available spectrum in Europe for wireless broadband, where large contribution of 3.5 GHz band, and 3.5GHz band is TDD preferred.

Mr. Li Zhengmao, EVP, China Mobile
China Mobile has made great achievements on TD-LTE development, and is actively promoting 4G evolution and 5G development. China Mobile calls for three initiatives to the regulatory agencies and the global industry. **First**, unified allocation of 1.9G/2.3G/2.6G/3.5G as mainstream TDD spectrum. **Second**, make the best of the advantages of TDD technology in 4G Evolution and expand TD-LTE deployment worldwide. **Third**, unified standard and new market of 5G.

Mr. Dongmyun Lee, CTO, KT
4G is pervasive all around the world and it's time to consider next technology 5G. Softwarized infra and innovative radio access techs are key enablers for evolution towards 5G era in 2020.

GTI Successfully Held the 5th TD-LTE Spectrum Workshop in Budapest

Keynote

Mr. Roberto Ercole, Senior Spectrum Director, GSMA
Spectrum is a vital input to modern economies, driving jobs, growth and innovation. Spectrum cost benefit studies need to be done on a national basis, as well as feeding into a long term strategy internationally, to ensure harmonized spectrum is available when required.

Mr. Herkole Sava, WG Co-chair, GTI
The explosive growth of mobile data traffic results in global scarcity of spectrum. TDD spectrum becoming a key resource and the advantages and value of TDD have been highlighted against such a backdrop.

Mr. Sean Sugiura, Secretary General, XGP Forum
Operators in Japan have achieved great success in TD-LTE, with over 10 million TD-LTE subscribers. As for 5G, the field test will be in 2017 and will commercially launch 5G in 2020.

Mr. Gustav Schoeman, CTO, MultiSource
Mobile subscriptions, smartphone adoption and networks in Africa are growing with the explosive traffic growth. In 2019, the number of LTE subscriptions across Africa is expected to surpass 100 million.

Mr. Rino Buccio, CTO, Linkem
An inclusive digital society requires affordable and inclusive residential services. The network of Linkem covers 40% population in Italy and can deliver up to 20M/2M unlimited traffic services. (Oct.2015)

Panel

Mobile broadband development and future spectrum prospect

Delegates: ITU, GTI, PCCW-HKT, China Mobile, Huawei, Nokia and ZTE

Future spectrum requirements and allocation strategies
• Speed up TDD release with larger blocks
• Explore more TDD future resources in WRC-15

5G development
• 5G technologies, scenarios, new markets and roadmap
• It is believed that the whole industry should work together to promote the development of 5G industry and products to satisfy the demand created by explosive traffic growth

The 14ᵗʰ GTI Workshop Held in Budapest

The 14th GTI (Global TD-LTE Initiative) Workshop took place during Oct. 12-13, 2015 in Budapest, Hungary, gathering more than 66 industrial leaders and experts from 17 operators and 20 industrial partners and organizations to share latest progress and discuss key issues about TD-LTE commercialization, highlighting VoLTE end-to-end solution and deployment and High Power UE on Band 41 to be further addressed through a newly set project.

Operators and vendors also presented updates on eMBMS technology and business models, LTE TDD/FDD convergence, carrier aggregation, 3.5GHz industry and roaming, which provoked intense discussions on common concerns.

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Optus first in the world to launch 3CC TDD-FDD Carrier Aggregation

In August, Optus became the first telecommunications provider in the world to commercially launch 3 Component Carrier (3CC) Carrier Aggregation (CA) between TDD and FDD (2xTDD+1xFDD carriers).

Optus switched on 3CC CA in selected Newcastle suburbs on 14 August, followed by the Melbourne CBD on 3 September. The Sydney CBD will launch early next year, followed by the Brisbane and Adelaide CBDs from mid-2016.

Customers require the latest category 9 smartphones in order to benefit from 3CC CA, such as the Samsung Galaxy S6 edge+ and Samsung Galaxy Note 5.

Dennis Wong, Acting Managing Director Optus Networks, said mobile data download speeds of 317Mbps were achieved on the live network using a category 9 device at Mayfield West in Newcastle.

"Aggregating 2xTDD + 1xFDD carriers on a commercial network with a commercial device is a world first for Optus. It is a more efficient use of our spectrum bands and will provide a more consistent and better experience for our customers." Mr Wong said.

Optus is aggregating two 20 MHz wide carriers at 2300 MHz (TDD) with one 15 MHz paired carrier at 1800 MHz (FDD).

Optus first launched 2CC CA on its TDD network in September 2014, followed by 2CC FDD CA earlier this year. 2CC CA is now available on the Optus network in selected areas of Sydney, Melbourne, Brisbane, Perth, Adelaide, Canberra, Hobart and Darwin as well as 20 major regional centres.

Mr Wong said "We are working with global standards bodies and global vendors to continue our technology leadership by pushing the boundaries of LTE-Advanced and TDD-FDD convergence. With our metro spectrum assets, going from 3CC CA to 4CC and even 5CC is possible in the future."

Optus worked with its vendor partner Huawei to launch 3CC CA.

One of the 3CC sites at Lambton, Newcastle
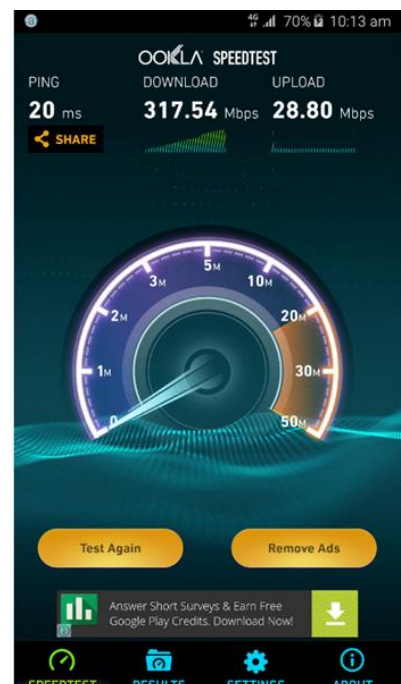
317 Mbps achieved on Ookla speedtest

200° Beamwidth Antenna Improves Small Cell Coverage and Capacity

Small cell deployments continue to grow, and fitting antennas to existing street furniture such as on top of lighting poles is a common antenna mounting approach. A 360° OMNI is a popular choice, either placing this on top or to the side of a pole.

The problem with 360° OMNI's

Top Mounting

- Planning regulations may not allow it.

- Many poles do not have a suitable fitting.

- Eight metres is a typical height for good antenna performance; many poles are higher than this!

Side Mounting

- Reflections from the pole create return loss failures.

- Increases probability of PIM.

- Pole creates a shadow in the coverage pattern

A 200° beamwidth antenna addresses these issues

To solve these problems we adapted our 360° pseudo OMNI antenna into a 200° beamwidth antenna. It can be mounted flush against a pole or wall minimising unwanted reflections and PIM.

Using a single 200° antenna

Only a single antenna is needed for many urban areas.
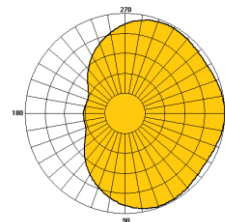
Mounting two 200° antennas back to back

Or if you need a full 360° of coverage just mount two of them back to back on a pole to increase site capacity.

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ZTE Launched VMAX
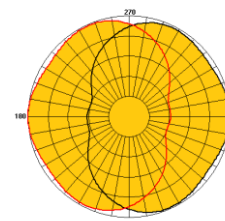# the Smart Wireless Network Optimization System

Recently, ZTE launched the VMAX system, which is a service-driven wireless network optimization system providing functions such as associated analysis of KQIs and KPIs, root cause location, and automatic coverage optimization. This system effectively breaks down and merges various indicators, performs drill-down analysis on KQIs, KPIs, coverage indicators, and interference indicators, level by level, and provides auto-optimization to meet specified network requirements. This system guarantees an automatically closed network optimization loop, which involves discovering, analyzing, and resolving problems about multi-level network quality indicators, and verifying optimization results.

The VMAX system can save solutions into the database for self-learning and self-training to continuously improve system performance and solution accuracy, and optimize networks through big data ideas. With the implementation of this system, centralized network analysis, optimization, and assessment can be achieved, and network optimization efficiency can be improved with fewer network optimization experts required.

Currently, the ZTE VMAX system has been tested in scale in campuses and business zones. Test results show that, in the existing TDD system, the VMAX system can locate root causes based on Call Detail Records (CDRs), meaning that the VMAX system can analyze user CDRs and obtain the proportion of each problem such as grid-level interference, weak coverage, insufficient capacity, and others in a cell. Traditional network optimization systems provide only qualitative analysis, meaning cell-based root cause location, but the VMAX system has reached a milestone in additionally providing quantitative analysis, thereby truly pinpointing problems and accomplishing automatic network optimization. Tests also show that the cell packet loss rate reduced eighty to ninety percent of the original rate, the delay is reduced by over thirty percent, and weak coverage areas and low-rate users are also greatly reduced. In the future, the VMAX system will provide an integrated solution to interference, capacity, and dispatching problems to improve overall network performance.

Rohde & Schwarz
Consistently Facilitates the TD-LTE Device Interoperability and Strengthens the Ecosystem

The latest TD-LTE device interoperability status reported by China Mobile shows strong progress in particular in the test case packages

•VoLTE (audio and video)   •Roaming   •Carrier Aggregation

Device NS-IOT Validation Status-Summary								
	TP_001	TP_002	TP_003	TP_004	TP005	TC Val	TC Num	Per Val
P1	558	397	558	558	NA	558	558	100%
P2	818	61	829	788	NA	846	857	99%
VoLTE	244	0	245	235	51	245	246	100%
Roaming	46	0	50	0	NA	62	91	68%
CA	28	0	29	29	NA	29	29	100%
Total	1694	458	1711	1610	51	1740	1781	98%

All categories and in particular the categories "VoLTE" (including video testing), "Roaming" and "Dual Standby" out of the China Mobile interoperability project are very important for the commercialization of TD-LTE devices in the market by providing interoperability with legacy technologies but also international interoperability (roaming).

The progress in test case validation is mainly supported by using the Rohde & Schwarz Test System for Performance Quality Analysis of Mobile Terminal Equipment R&S®CMW-PQA together with the VTE (Video Tester) that is labeled as TP_003 in the table above.

Rohde & Schwarz device interoperability test solutions support tests in different areas of VoLTE:

   -VoLTE NS-IOT (China Mobile), VoLTE power consumption, VoLTE Audio (MOS), VoLTE video, VoLTE PCT (Protocol Conformance Tests; R&S leading in GCF validation), and Carrier Aggregation

   -CA NS-IOT (China Mobile), CA RF/RRM (also for UL CA), CA PCT CA (leading in GCF validation)

Proven by leading operators the Rohde & Schwarz' TD-LTE Device Interoperability test capabilities help driving the adoption and the commercialization of the global radio technology TD-LTE and strengthening the overall LTE ecosystem by ensuring interoperability in different directions (interoperability with legacy technologies but also concerning international roaming). The GSA (Global mobile Suppliers Association) reported in June 2015 that 219 VoLTE capable devices (incl. 198 smartphones) are commercially available.

TD-LTE Global Market Overview

Global Deployment as the Mainstream Mobile Broadband Technology

63 TD-LTE commercial networks have been launched

Additionally, over 91 TD-LTE commercial networks are in progress or planned

Source: GTI
As of July, 2015
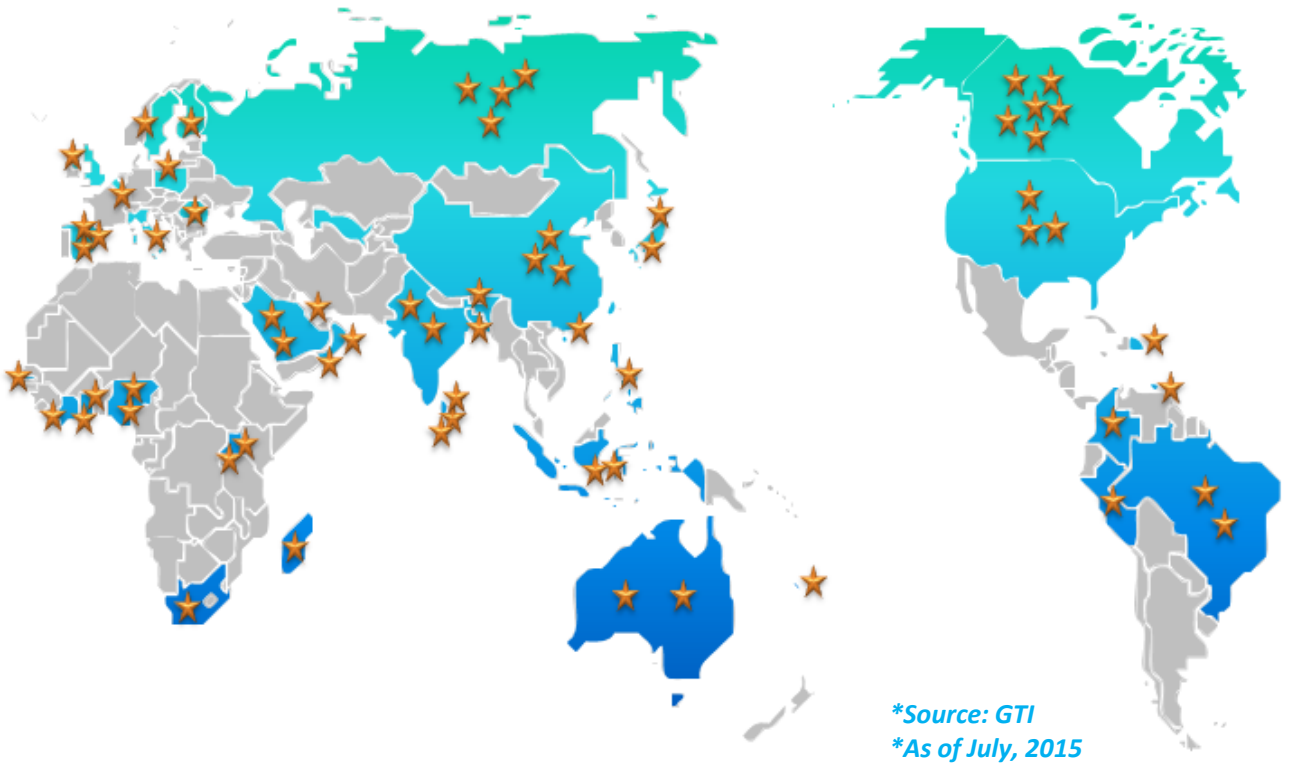
LTE Multi-mode Multi-band Terminals Have Reached Full Maturity

320+ suppliers have launched 2055+ TD-LTE terminals,
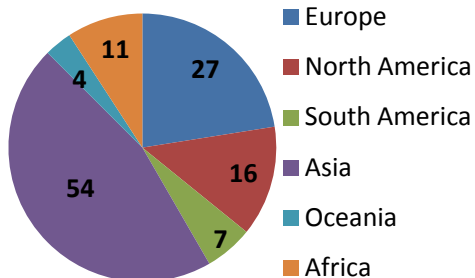*including 1447+ TD-LTE Smartphones.*

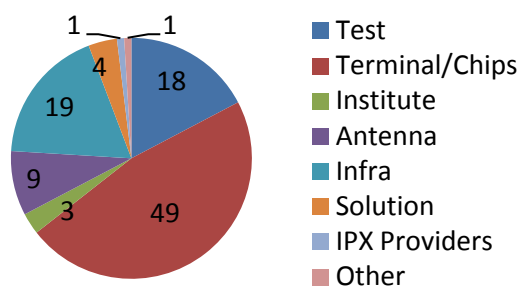| TD-LTE Device Type	Quantity	TD-LTE Device Type	Quantity
USB modems	101	Smartphones	1447+
MiFi/CPE	391	Mobile Tablets	47

Source: GTI, GSA, TDIA

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GTI Development Overview

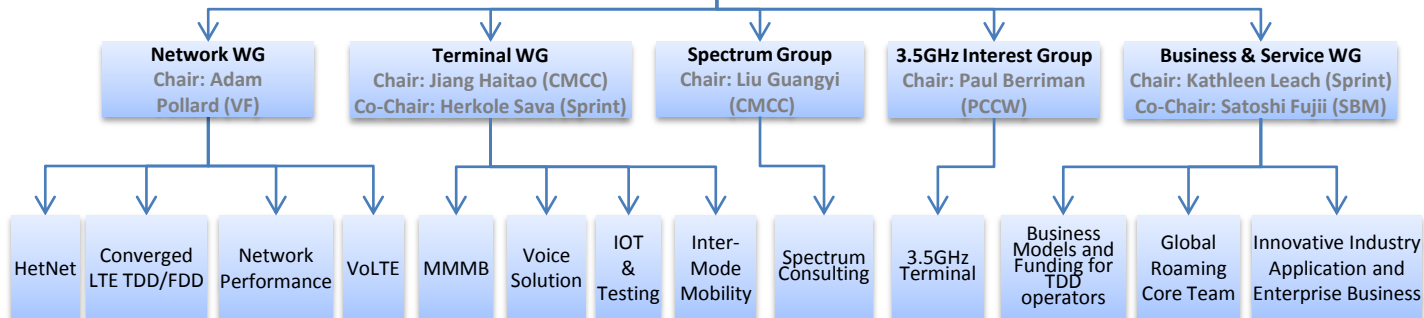## 120 Operators and 104 Partners Joined GTI by November 2015

120 Operators

- Europe: 27
- North America: 16
- South America: 7
- Asia: 54
- Oceania: 4
- Africa: 11

104 Industry Partners

- Test: 18
- Terminal/Chips: 49
- Institute: 3
- Antenna: 9
- Infra: 19
- Solution: 4
- IPX Providers: 1
- Other: 1

GTI Established 4 Working Groups, 1 Interest Group Covering 12 Task Forces and 1 Core Team

GTI Technical & Product Work

Network WG	Terminal WG	Spectrum Group	3.5GHz Interest Group	Business & Service WG
Chair: Adam Pollard (VF)	Chair: Jiang Haitao (CMCC) Co-Chair: Herkole Sava (Sprint)	Chair: Liu Guangyi (CMCC)	Chair: Paul Berriman (PCCW)	Chair: Kathleen Leach (Sprint) Co-Chair: Satoshi Fujii (SBM)

Task forces:
- HetNet
- Converged LTE TDD/FDD
- Network Performance
- VoLTE
- MMMB
- Voice Solution
- IOT & Testing
- Inter-Mode Mobility
- Spectrum Consulting
- 3.5GHz Terminal
- Business Models and Funding for TDD operators
- Global Roaming Core Team
- Innovative Industry Application and Enterprise Business

GTI Activities

2016

	Feb/Mar	Apr/May	Jun/Jul	Oct/Nov
Summit (2)	23 Feb (MWC) Barcelona, Spain **GTI Summit**		TBD (MWCS) Shanghai, China **GTI Summit-Shanghai**	
Workshop (3)	18-19 Feb Barcelona, Spain **The 15th GTI Workshop**		TBD (MWCS) Shanghai, China **The 16th GTI Workshop**	TBD TBD **The 17th GTI Workshop**
Exhibition (2)	22-25 Mar (MWC) **Barcelona, Spain**		27 Jun - 1 Jul (MWCS) **Shanghai, China**	

Appendix 1 – Welcome to Join GTI
(to operators)

More Information about GTI

To find out more information about GTI, please visit www.lte-tdd.org or email us.

How to Join GTI

GTI Operators (with TDD Spectrum)

1. Fill out the application form (download from http://www.lte-tdd.org/joinUs.html), and return to GTI Secretariat: GTI_Secretariat_list@lte-tdd.org and/or GTI@lte-tdd.org;

2. Sign the Accession Form and return the signed copy to 5 initiators;

3. Once the participation process finishes, a GTI website account and associated password will be assigned to the new participant.

GTI Observers (without TDD Spectrum)

1. Fill out the application form (download from http://www.lte-tdd.org/joinUs.html), and return to GTI Secretariat: GTI_Secretariat_list@lte-tdd.org and/or GTI@lte-tdd.org;

2. Sign the declaration form and return the hard copy to GTI Secretariat;

3. Once the participation process finishes, a GTI website account and associated password will be assigned to the new participant.

Appendix 2 – Welcome to Join GTI Partner Forum (to non-operators)

More Information about GTI Partner Forum

To find out more information about GTI and GTI Partner Forum, please visit www.lte-tdd.org or email us.

How to Join GTI Partner Forum

1. Fill out the application form (download from http://www.lte-tdd.org/joinUs.html), and return to GTI Secretariat: GTI_Secretariat_list@lte-tdd.org and/or GTI@lte-tdd.org; GTI Secretariat and Working Group Chairmen will review;

2. Sign the Declaration Form and return the signed hard copy to GTI Secretariat;

3. Once the participation process finishes, a GTI website account and associated password will be assigned to the new participant.

CONTACT GTI:

If you have any questions, comments, suggestions regarding TD-LTE or general enquiries regarding GTI, please contact:

GTI@lte-tdd.org