

TD-LTE Industry Briefing

August, 2011 | No. 10

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World's First Batch of Multi-Mode TD-LTE Commercial Terminals Released

The World's First Commercial Multi-Mode Terminals Released

In late July 2011, ZTE and Huawei announced **the world's first batch of multi-mode TD-LTE commercial terminals.**

ZTE MF880

ZTE is to provide the **MF880, a TD-LTE/LTE FDD/UMTS/EDGE multi-mode dongle.** It is expected to be launched in **Q3 2011** for Hi3G in Sweden .



| Specification | | | |
|---------------|--|----------------|--|
| Protocol | LTE: Rel. 8 | Dimension | 94x37x14.5 mm |
| Interface | USB 2.0, UICC | Peak Data Rate | TD-LTE: DL/UL 68M/17 Mbps (Cat 3) LTE FDD: DL/UL 100M/50 Mbps |
| Bandwidth | LTE: 10, 20MHz | DL MIMO | 2x2 SU-MIMO |
| Radio | TD-LTE B40,B38 (2.3/2.6G); LTE FDD B7, B20 (2.6G/800M) UMTS B1,B8 (900/2100M); EDGE/GSM B3, B8(900/1800M) | | |

Huawei E392

Huawei announced **E392, a TD-LTE/LTE FDD/UMTS/GSM/CDMA multi-mode data card,** which would be **commercially available in Q3 2011.**



| Specification | | | |
|---------------|---------------------------------------|---------|--|
| Radio | TD-LTE/LTE FDD UMTS GSM CDMA | Feature | Cat.3, LTE 100M/50Mbps @ 20M Bandwidth USB 2.0 Full Speed Micro SD Card Slot |
| Chipset | Qualcomm | OS | Windows 200/XP/Vista/7, MAC OS X10.4/10.5 or higher |

TD-LTE Multi-Mode Dual-Standby Handset Demonstrated

The Latest Achievement In TD-LTE Handset Industry

On August 19th, 2011, the test sample of **TD-LTE/TD-SCDMA/GSM** multi-mode dual-standby **smart phone** made its first appearance in the 26th Universiade. It demonstrated various services such as voice call, high-speed internet surfing and online video streaming.

Features:

Display: LCD 3.5" TFT, FWVGA;

OS: Android 2.3;

Network: **TD-LTE** 2300-2400MHz/2570-2620MHz

TD-SCDMA 2010-2025MHz/1880-1920MHz

GSM 850/900/1800/1900MHz

Highlights:

- **Simultaneously standby** at TD-SCDMA/GSM and TD-LTE
- **Simultaneously support** TD-SCDMA/GSM **voice service** and TD-LTE high-speed **data service**

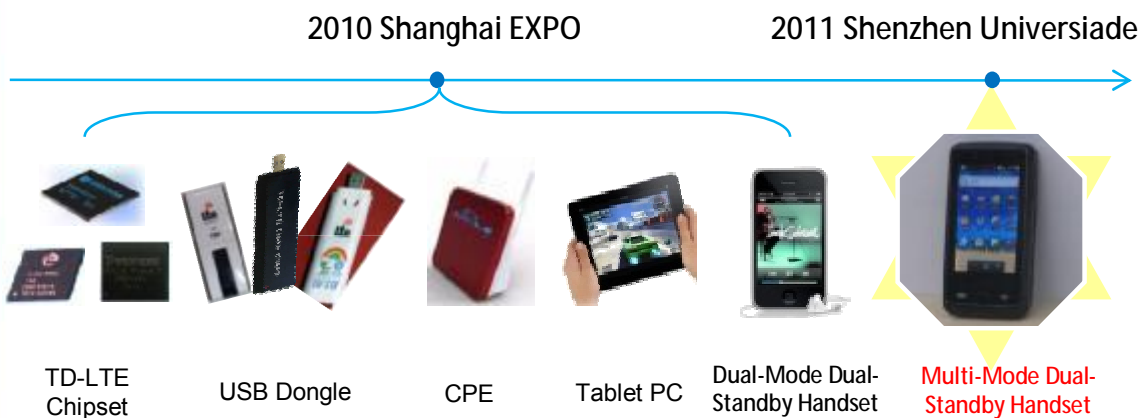


Multi-mode Smart Phone Test Sample

Advantages:

- Low complexity and low cost for network deployment and upgrade
- Good service experience
- Strong global roaming capability

TD-LTE Terminal Evolution



TD-LTE Compact Smart Antenna R&D Makes Significant Progress

Background

Existing Challenges:

- Antenna construction spatial limitations
- Multi-antenna technology application
- Multiple system coexistence



Requirements:

- High performance assurance
- Effective antenna size control to lower construction complexity

High gain compact antenna based on wideband dual polar smart antenna technology is the direction of future TD-LTE antenna evolution

Key Features, Indicators and Parameters

Compared with traditional multi-path antenna, compact antenna with higher radiation unit design can obtain over 1dB radiation gain. Thus, the compact antenna can **decrease its size by 50%** with the **gain only slightly decrease** by around 1.5dB. Other key indicators, such as cross polarization ratio and side-lobe suppression ratio etc. , remain the same with traditional multi-path antenna to assure the performance of multi-path antenna technique.

Additional features to support TD-LTE deployment:

1. Wideband: support **1.9GHz, 2.1GHz, 2.6GHz TDD frequency** bands
2. Multi-mode: support antenna techniques such as **MIMO/Beamforming** simultaneously
3. Multi-path: **8 path dual-polar** design, compatible with traditional Beamforming algorithm

Industry Status

- 4 antenna manufacturers** are actively engaged in compact antenna R&D, including Tongyu, Comba, RFLake and Mobi.
- 3 frequency band combinations are supported: (1.9+2.1)GHz, 2.6GHz and (1.9+2.1+2.6)GHz.
- Key performance indicators** such as Beamforming gain, cross polarization ratio and upper side-lobe suppression ratio are **close to or match the requirements**.

Engineering Parameters Comparison

| Type | Windforce | Antenna Size | | | Weight | Gain | Connectors |
|---------------------------------------|-----------|--------------|-----|-----|--------|------|------------|
| | | L | W | H | | | |
| GSM900 Antenna | 100 % | 1294 | 258 | 103 | 6 | 15 | 2 |
| Traditional dual-polar 8 path Antenna | 125% | 1366 | 310 | 100 | 11.0 | 16.5 | 9/2 |
| Compact Antenna | 62% | 650 | 330 | 55 | 6 | 15 | 2 |



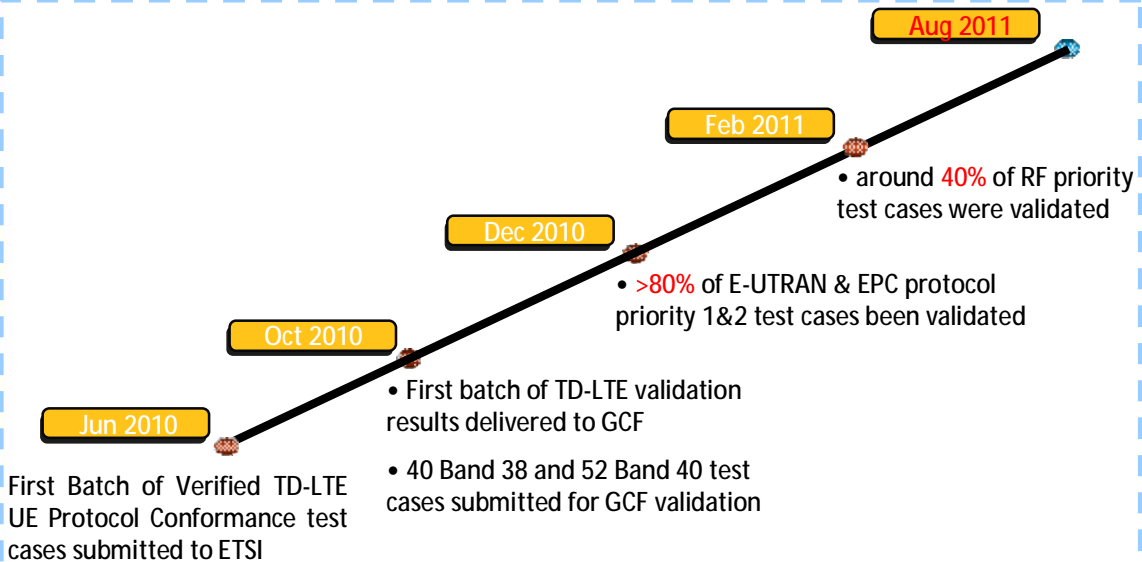
GCF Launches Certification For TD-LTE Devices

TD-LTE Band 38 Obtained GCF Certification

The Global Certification Forum (GCF) announced the extension of GCF Certification to TD-LTE mobile devices that operate in the 2570-2620MHz band.

This is a new milestone in the GCF LTE certification program. Designated E-UTRA Band 38 by 3GPP, the 2570-2620MHz band has been allocated for TD-LTE in a number of important markets.

Certification Roadmap



First Batch of TD-LTE Validation Results Delivered to GCF

GCF approved TD-LTE Validation Plan

Verification, Acceptance and Certification of TD-LTE test cases for RF

In Brief

TD-LTE Trial in China Update – Latest Purchase Status

TD-LTE Technical Trial in China Update

General Status:

- **10** infrastructure and **6** chipset vendors completed TD-LTE technical trial and were admitted to TD-LTE Large Scale Trial.



- **28 pairs** of infrastructure (10 vendors) and terminal (6 vendors) IOT tests completed

Chipset and Terminal Purchase Status

The first purchase of single mode data card has been completed for TD-LTE large scale trial. This purchase volume is around **1500 devices** which has been allocated to Large Scale Trial cities. The dispatch will start accordingly.

Winning Bidders and Device Parameters:

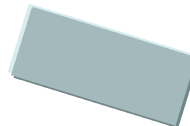
- Bandwidth: 20MHz
- Frequency Band: Band 38 & 40
- Multi-Antenna Modes: Support TM2/3/7



HiSilicon



Innofidei



Samsung (Qualcomm)



ZTE (Qualcomm)

The TD-LTE test equipment purchase was initiated in late June 2011, and is planned to be completed in August 2011.

7 types, 33 equipments from 24 vendors have been tested and evaluated.

7 Types of Test Equipments

- Large Scale Trial test terminal
- Signal Monitoring Instrument
- Air Interface Monitoring Instrument
- Portable Frequency Spectrum Analyzer
- Frequency Sweep Meter
- Signal Generator
- Road Test software

TD-LTE Trial in China Update – Progress and Latest Trial Results

TD-LTE Large Scale Trial in China Update

Core network, bearer, transmission and security tests completed:

- Basic functionalities of products from all the vendors are verified
- Qualified for **wireless and terminal test** in Phase 1 and **complex functional verification in Phase 2**

Over **30%** of Radio Access Network tests completed:

- Some vendors completed over 50%
- The majority of vendors have initiated multi-terminal, multi-cell load test

TD-LTE Large Scale Trial – Test Results

| Network Performance Test (W/O) | KPI | | | | |
|----------------------------------|-------------------|------------------|-------------------|---------------|-----------------------|
| Test Item | Attach | Connection Setup | Paging | Dropping Rate | Handover Success Rate |
| Large Scale Trial Standard | >=95% | >=95% | >=95% | <=4% | >=95% |
| Result (Ratio) | 99.39% | 99.56% | 97.08% | 0.22% | 98.97% |
| Handover Latency Test (unloaded) | Handover Latency | | | | |
| | Control Plane(ms) | User Plane(ms) | | | |
| | | Uplink | Downlink | | |
| NGMN Requirement | - | 300 | 300 | | |
| Average Latency | 27~62 | 61~188 | | 61~204 | |
| Peak Data Rate | | | | | |
| Timeslot Configuration | 2DL:2UL | | 3DL:1UL | | |
| Reference | Theoretical Value | Test Result | Theoretical Value | Test Result | |
| DL Peak Data Rate(Mbps) | 61 | 59~60.5 | 81 | 79~80.5 | |
| UL Peak Data Rate(Mbps) | 20 | 15~16 | 10 | ~8 | |

HD Live Broadcast By TD-LTE Technology during Universiade 2011 Shenzhen

The World Premier Large Scale Application of TD-LTE Network

August 12th-23rd, 2011, TD-LTE was deployed to provide HD video broadcasting and communication services for the 26th Universiade in Shenzhen, China.

TD-LTE Services:

- HD Shoot & Play
- Smart Phone Video Call
- HD Video On Demand
- HD Telepresence



Scenes:

- Torch Relay
- Opening/Closing Ceremony
- Live Game Broadcasts



TD-LTE Coverage:

- Universiade Stadium
- Universiade Center
- Media Center
- Universiade Village
- CBD Central Business Area
- Civilian Center
- High-Tech Center

| Superior Features of TD-LTE | | |
|-----------------------------|--------|---------|
| Key Features | TD-LTE | 3G |
| Internet Surfing Speed | 50Mbps | 1~2Mbps |
| 1G HD Movie Download | 10mins | 3~4hrs |

Field Test Results

Comparison between TV live and TD-LTE live

On August 12th, 2011, the live broadcast of Universiade opening ceremony was transmitted by TV and TD-LTE at the same time at China Mobile Shenzhen branch OMC center.

Comparison between TV live and TD-LTE live



TV Live
President Hu's opening speech before the opening ceremony.

VS

TD-LTE Live
Fireworks display during the opening ceremony

Compared with traditional TV, TD-LTE provided the same HD and fluent video, with **much shorter delay**.

New Features of GTI Website Online

New Channel: Industry Status Channel showcases TD-LTE products



8 vendors contributed **information on 15 products** to Industry Status Channel of GTI website, which covers Terminal, Chipset, Infrastructure and Test Instrument.

The **Industry Status Channel** provides the **latest TD-LTE product information**, such as:

- Product gallery
- Vendors' official websites
- Specifications
- Release date/Availability

If you would like to publish TD-LTE related product information on Industry Status Channel, please feel free to contact: webmaster@lte-tdd.org

TD-LTE Weekly News Brings TD-LTE to the Globe

Converging highlighted News, Events and Product information in TD-LTE ecosystem, TD-LTE weekly newsletter focuses on promoting the latest industry trends and progresses via a weekly news feed.

- Over 150** global operators and organizations
- Over 400** individual recipients
- Free** to all organizations and individuals (with subscription to gti@lte-tdd.org)



GTI Website in A Glance

9 Target Groups: Global Operators (incl. non-GTI operators), Domestic & International Vendors, Global Telecommunication Organizations and Research Institutes, Regulatory Authorities, Media, Consulting Agencies, Investment Companies and the Publics

5 Functions: Home, Foot Page, Search, User Account, Administration Tool



8 Channels: News, Events, Reports, Statistics, Working Space, Industry Status, About GTI, Join GTI

















80+ Features: Banner advertising, Search, Download, Announcement, Survey, etc.

Appendix 1 – TD-LTE E2E Product Overview

TD-LTE Terminal

World's First Batch of Commercial Multi-Mode Terminals

| | | | |
|---|--|---|--|
|  ZTE | TD-LTE/LTE FDD/UMTS/EDGE Features: TD-LTE: DL/UL 68M/17Mbps (Cat 3) LTE FDD: DL/UL 100M/50Mbps Available: Commercially Q3 2011 |  Huawei | TD-LTE/LTE FDD/UMTS/GSM/CDMA Features: Cat.3, LTE 100M/50Mbps @ 20M Bandwidth Available: Commercially Q3 2011 |
|---|--|---|--|

| Data Cards | | Other Types of Data Terminals | |
|--|---|--|---|
|  ZTE |  Huawei | GSM/TD-LTE Multi-Mode Dual-Standby Handset |  ZTE |
|  Altair |  Hisilicon | GSM/TD-LTE Dual-Mode Dual-Standby Handset |  CoolPad |
|  Innofidei |  Qualcomm | Pad |  Quanta |
|  Quanta |  Samsung | Booklet |  Nokia |
|  Sequans |  ST-Ericsson | CPE |  HiSilicon |
| | | CPE |  Innofidei |

TD-LTE Test Equipment

- Most test equipments have common platform for LTE TDD/FDD.

| | |
|-------------|---------------------|
| RF | Baseband |
| Simulator | Signaling Monitor |
| Performance | Channel Measurement |
| Field Test | Terminal Related |

GCF

- TDD synchronized with FDD
- **GCF Launched TD-LTE certification in July,2011**

| Test Case | FDD/TDD Validation Progress | |
|----------------|-----------------------------|------|
| | FDD | TDD |
| Protocol P1&P2 | >90% | >90% |
| RF P1 | >80% | >80% |
| RRM P1 | >80% | >80% |

TD-LTE Infrastructure

- 2010.Q2: 2.3GHz products released
- 2010.Q3: 2.6GHz products released

| Features | No. of support vendors |
|----------------------------|------------------------|
| Frequency Band 40 (2.3GHz) | ●●●●●●●● |
| Frequency Band 38 (2.6GHz) | ●●●●●●●● |
| Bandwidth 20MHz | ●●●●●●●● |
| 2T2R MIMO | ●●●●●●●● |
| Beamforming | ●●●●●●●● |

Newly Updated

| Features | No. of support vendors |
|--------------------------|------------------------|
| FDD/TDD Common Platform | ●●●●●●●● |
| 2G/3G Interworking PS HO | ●●●● |
| Synchronization by 1588 | ●●●● |
| Tx Power 40W | ●●●●●●●● |
| Self configuration | ●●●●●●●● |

Appendix 2 – TD-LTE Vendor Overview

TD-LTE Infrastructure Vendors



TD-LTE Terminal and Chipset Vendors



TD-LTE Test Equipment Vendors



Newly Updated

Incomplete Statistics

Appendix 3 – TD-LTE Large Scale Trial in China Overview

Cities & Vendors
 6+1 cities with 83M population: Shanghai
 Guangzhou Shenzhen Nanjing Hangzhou
 Xiamen and Beijing
 10 Infrastructure Vendors
 6 Chipset Vendors: Qualcomm, Hisilicon,
 Innofidei, Altair, Sequans, ZTE



Spectrum
 Indoor : 2350~2370MHz 2570~2620MHz
 Outdoor: 2570~2620MHz

TD-LTE Large Scale Trial Progress

- Core network, bearer, transmission and security tests completed:
 - Basic Functionalities of products from all the vendors are verified
 - Qualified for **wireless and terminal test** in Phase 1 and **complex functional verification in Phase 2**
- Over **30%** of Radio Access Network tests completed:
 - Some vendors completed over 50%
 - The majority of vendors have initiated multi-terminal, multi-cell load test

Plan



| Terminal Function and Performance Test Plan | |
|---|---|
| TD-LTE single-mode terminal | TD-LTE multi-mode terminal |
| <ul style="list-style-type: none"> • TD-LTE basic protocol signaling, function and performance test; • TD-LTE key technology test: i.e. multi-antenna technology; • Terminal mobility test: i.e. reselection and handover; • Multi-UE access and performance test | <ul style="list-style-type: none"> • Test and optimization of various RAT functions and performances; • Bearer capability of multimode terminal communication • Test and optimization of multimode terminal's WiFi access, routing, other features and performance |
| Infrastructure Test Plan | |
| <ul style="list-style-type: none"> • Network performance test • Antenna test: performance and comparison between different types • Indoor coverage test • Transmission / EPC / carrier network / security test | <ul style="list-style-type: none"> • Services, IOT, roaming, IPv6, 3G to TD-LTE upgrade, dual-layer Beamforming, and parameter optimization etc. |

Appendix 4 – TD-LTE Global Market Overview

TD-LTE Global Trial / Commercial Networks

TD-LTE Trial Networks★

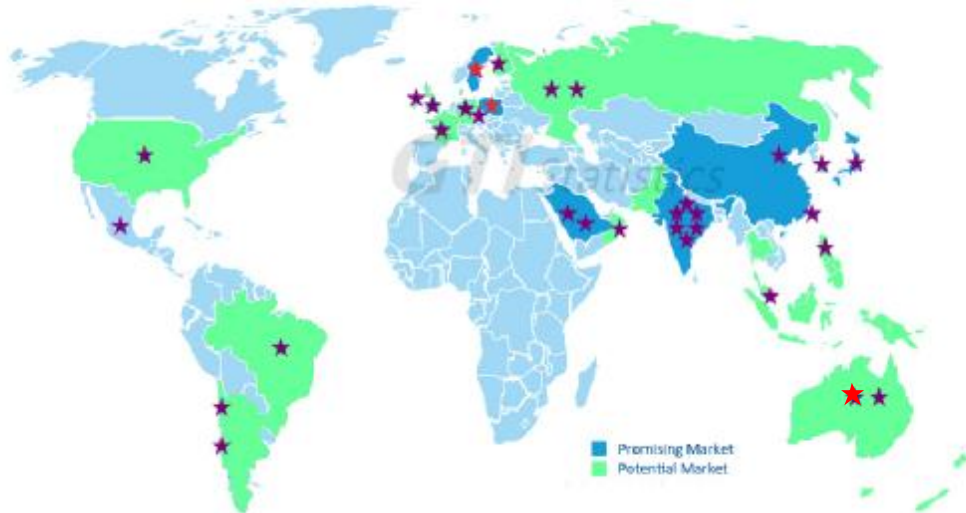
32 Trial Networks * * August, 2011



TD-LTE Potential Commercial Networks★

3 publicly announced commercial contracts for LTE TDD/FDD

- Hi3G: Sweden, Denmark
- AERO2: Poland
- NBN Co.: Australia



10+ operators released TD-LTE commercial deployment plan

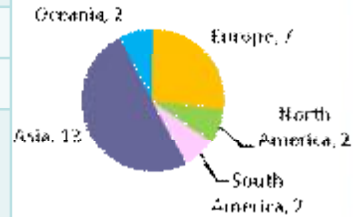
5+ commercial networks are under construction

Appendix 5 – GTI Development Overview

26 Operators Joined GTI by August 2011

26 operators joined GTI, with more operators in process of joining GTI.

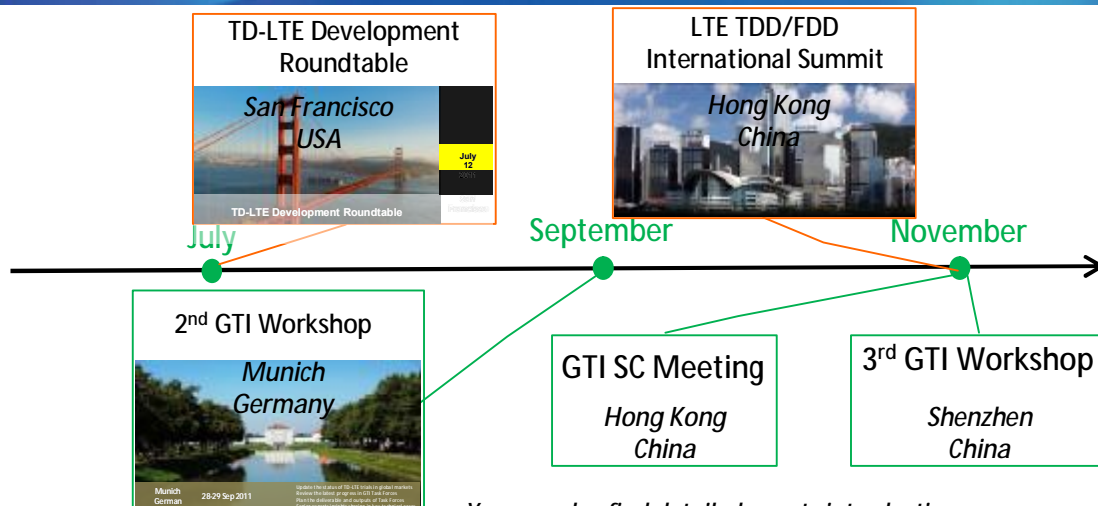
| | |
|---------------|--|
| Europe | Aero2, E-Plus, Datame, Smoltelecom, UK Broadband, Bolloré Telecom, Vodafone |
| North America | Clearwire, NextWave |
| South America | NII, WIND Telecom |
| Asia | BellTel, Bharti Airtel, CMCC, KT, SKT, Omantel, Mobily, P1, Cybernet, FITEL, FarEasTone, SoftBank, Tatung InfoComm |
| Oceania | Vividwireless, Woosh |



GTI established 8 Task Forces to cover 5 important areas

| Area | Technical Topics | Leader |
|-------------------------------|--|---------------|
| Spectrum | Coexistence TD-LTE & FDD-LTE | Clearwire |
| | Coexistence WiMAX with LTE (TD-LTE and FDD-LTE) | Clearwire |
| Terminal | Voice Solution for TD-LTE Handset | Bharti Airtel |
| | Multi-mode multi-band solution (including roaming) | Clearwire |
| Test | IOT and Terminal test | CMCC |
| Infrastructure | BF infrastructure and antenna solution | Softbank |
| Technology & Network Planning | Network Planning: Frequency Planning & UL/DL configuration | CMCC |
| | Handover between TD-LTE and LTE FDD | E-PLUS |

Major GTI Activities (Since June 2011)



You can also find detailed events introduction on GTI website: <http://www.lte-tdd.org/events>

Welcome to Join GTI

More information about GTI

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

How to join GTI

Fill out the application form (download from <http://www.lte-tdd.org/join/apply>), and return to GTI Secretariat:

GTI_Secretariat_list@lte-tdd.org and/or GTI@lte-tdd.org;

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

Once the participation process finishes, an account and associated password will be assigned to the new participant.

CONTACT GTI:

For general enquiries regarding GTI, please contact:

GTI@lte-tdd.org

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If you have any questions, comments or suggestions regarding TD-LTE, please send your feedback to the contact persons of China Mobile.

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