International Telecommunication Union

TD-SCDMA and TD-SCDMA Forum

Dr. Li Wan Lin
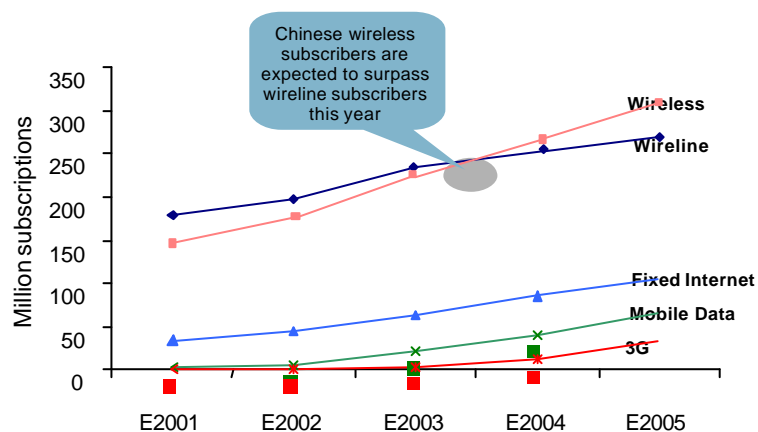### Vice Chairman of TD-SCDMA Forum

**ITU-BDT Regional Seminar on IMT-2000 for Arab region
Doha 29 September – 1 October 2003**

ITU-BDT

Chinese telecommunication market
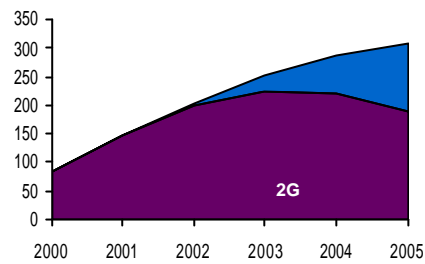
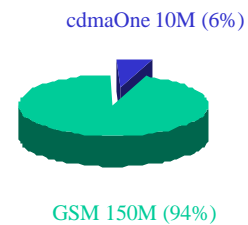The overall Chinese market reach 250 mobile subscriptions now!

Chinese wireless subscribers are expected to surpass wireline subscribers this year

Source ICM N Marketing

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Mobile subscriptions by technology in China

350		

In 2005 there are expected to be more than
100 million 2.5G/3G subscribers in China.

cdmaOne 10M (6%)

GSM 150M (94%)

Market share of 2G in China

Source: ICM N Marketing

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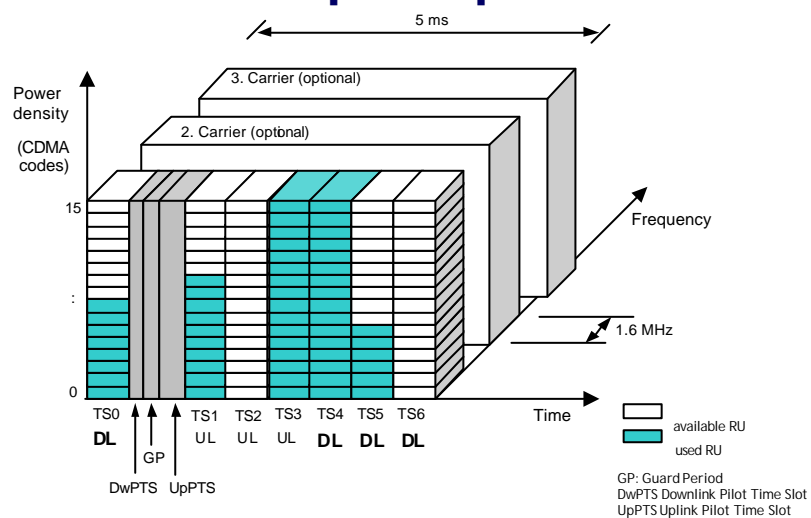---

What is TD-SCDMA ?

TD-SCDMA technology

o   is a proven high efficient 3G air interface
o   means a future proof road for the operator
o   offers a smooth and cost efficient introduction
   –   as stand alone start of 3G
   –   as migration from GSM/GPRS to 3G
   –   as complement to W-CDMA
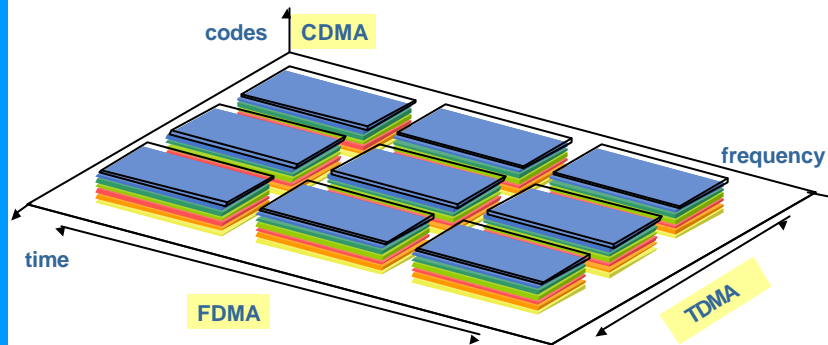o   suit for any network scenario – macro,micro,pico cell

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TD-SCDMA Key Features

o Time division Duplex-allows adaptive allocation of radio resources

o Code Division Multiple Access- allows simultaneous multiple user access

o Joint Detection– minimize the intra-cell interference

o Dynamic Channel Allocation-leads to a reduction of inter-cell interference

o Smart Antennas- further minimizes inter-cell interference

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TD-SCDMA Air interface principle

5 ms

Power density

(CDMA codes)

15

0

TS0   TS1   TS2   TS3   TS4   TS5   TS6
DL   UL   UL   UL   DL   DL   DL

DwPTS   UpPTS

GP

3. Carrier (optional)

2. Carrier (optional)

Frequency

1.6 MHz

Time

☐ available RU
▨ used RU

GP: Guard Period
DwPTS Downlink Pilot Time Slot
UpPTS Uplink Pilot Time Slot

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TD-SCDMA combines 4 Multiple Access Techniques

codes | CDMA

frequency

time

FDMA

TDMA

- o TD-SCDMA advanced radio interface takes advantage of all available Multiple Access techniques: TDMA , CDMA, FDMA, SDMA
- o TD-SCDMA provides an optimal and adaptive allocation of the radio resources

Joint Detection eliminates MAI I

o CDMA transmission is limited by **intra-cell** interference. TD-SCDMA, with its **16** codes can easily implement Joint Detection

Spread Signals

Energy

Σ-Energy of Spread Signals
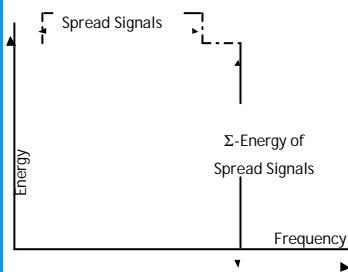
Frequency

All CDMA users share the same frequency channel

- Each CDMA user interferes with all the others
- **Multiple Access Interference** (**MAI**) or **Intra-cell Interference** is generated
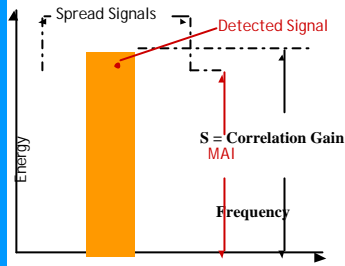
1 Received Signal =Σ Spread Signals

Joint Detection eliminates MAI II

What happens if Joint Detection is not implemented?

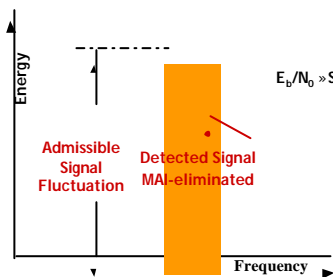After de-spreading, the **Detected Signal barely emerges from MAI**

2 **Detected Signal with MAI**

- The result is a '**weak**' signal (**low signal to noise ratio**)
- The admissible signal fluctuation is reduced to 1.5 dB
- The traffic load is seriously reduced

Joint Detection eliminates MAI III

TD-SCDMA uses an optimal **Joint Detection** Receiver!

After dispreading, **all CDMA signals are extracted in parallel**

3 **MAI eliminated signal**

- The result is a 'clear' signal (high signal to noise ratio)
- The near-far effect is not an issue
- The admissible signal fluctuation is increased to 20 dB
- The traffic load is considerably increased

$E_b/N_0 \gg S$

Smart Antenna generate multiple beam patterns
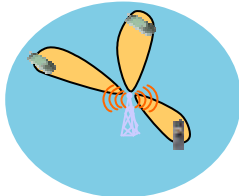
Without Smart Antennas

- Power is distributed over the whole cell

  - **Inter-cell interference** in all adjacent cells using the same RF carrier

With Smart Antennas

- Transmission and reception of signals is directed to and from the specific terminals Terminals are tracked throughout the cell

  - **Inter-cell interference** decreases considerably
    The **Link Budget** is optimised
    Capacity and **Cell Radius** increase

- TD-SCDMA offers optimum support to smart antenna implementation due to the radio path reciprocity by **downlink and uplink operating on the same carrier**
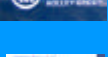
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Smart Antenna

25 cm

1 m

12

6
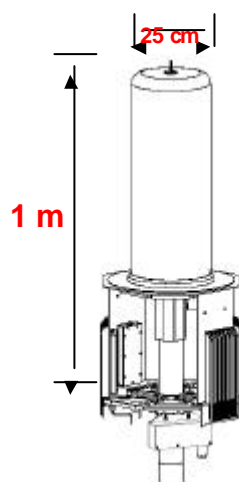
TD-SCDMA Alliance

o Founded on 30.10.02
o Fully supported by:

➔ SDPC (State Development Planning Committee)

➔ MII (Ministry of Information Industry)

➔ MOST (Ministry of Science and Technology)

o Datang   -> infrastructure terminal + chipsets
o Huawei, ZTE   -> infrastructure
o Legend   -> terminal (leading Chinese PC manufacturer)
o Holley,   -> terminal + chipsets (acquired Philips' CDMA terminal platform business)
o Soutec   -> terminal
o CEC Wireless   -> terminal design (acquired Philips' GSM terminal business)
o PTIC (China Putian) -> terminal/infrastructure (owns Eastcom, Capitel, Bird)

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TD-SCDMA Players
TD-SCDMA Development enjoys a growing Multi-vendor Support

TD-SCDMA Industry Alliance

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TD-SCDMA Network Infrastructure

o Since 1998 Siemens and CATT/DaTang are working together in the standardization and development of TD-SCDMA. The first TD-SCDMA products from this co-operation will be available in 2003.

o Fujitsu, together with South China University of Technology will develop TD-SCDMA mobile networks in China.

o UT Starcom entered a partnership agreement in November 2002 with CATT/Datang for the development of TD-SCDMA core network infrastructure equipment.
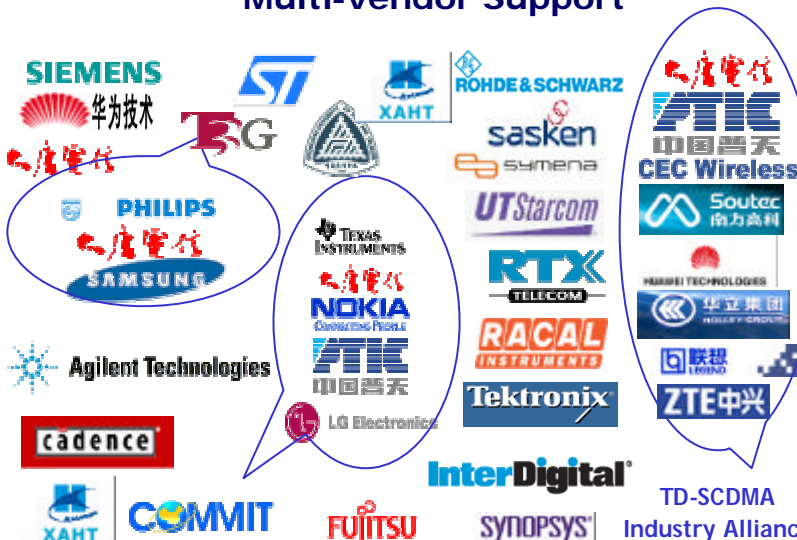
o Since October 2002, Datang Mobile and Xi'an Haitian Antenna Technologies are jointly on a research and development project of smart antenna system for TD-SCDMA.

o **Siemens and Huawei signed a MoU to form a joint venture to develop, manufacture and market TD-SCDMA technology in August 29,2003**.

Developers of TD-SCDMA UE (1)

o In January 2003, Philips Semiconductor, Datang Telecom, and Samsung established in Beijing T3G, with the goal to develop TD-SCDMA chipsets and handset platforms.

o Texas Instruments, CATT/Datang, Nokia, PTIC and LG Electronics established COMMIT Inc. (China Open Multimedia Information Terminal) on Feb. 2002, to develop open multimedia information product, based on China's TD-SCDMA standard.

o RTX Telecom, Denmark wireless solution developer, has been developing TD-SCDMA terminal platforms since August 2000 in close coordination with Siemens. The first commercial integrated GSM/GPRS/TD-SCDMA platform will be launched in B04.

Developers of TD-SCDMA UE (2)

o   Chongqing University of Post and Telecommunications set up a large group of researchers to concentrate on the development of a TD-SCDMA terminal, working closely with local companies affiliated with the university.

o   InterDigital is engaged in developing key TD-SCDMA modem and software solutions for TSM integrating TD-SCDMA capability into GSM wireless terminals. The solutions will support voice as well as high data rates and enable OEM's to offer multimode GSM/TD-SCDMA.

o   STMicroelectronics and Datang announced in January 2003 an agreement by which ST has licensed from Datang TD-SCDMA key know-how and intellectual property rights (IPR). ST will use the acquired know-how to develop mobile multimedia multimode TD-SCDMA/GPRS System-on-Chip products.

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TD-SCDMA Test Equipment & Tools (1)

o   Agilent Technologies launches its first TD-SCDMA test & measurement product in May 2002. Agilent has launched a software option for a signal generator in order to generate spectrally correct TD-SCDMA signals.

o   Racal Instruments developed with Datang a TD-SCDMA signal analysis tool, which allows the rapid design verification of TD-SCDMA transmitters. The T-AIR is the first of a series of TD-SCDMA testing measurements products.

o   Cadence Design Systems Inc. and Datang Mobile Communications Equipment Co. LTD cooperate to develop standards-based solutions.

o   Synopsys provides Design Conformance Lab software to verify the design of a TD-SCDMA based communications products. (e.g. User Equipment Receiver Performance Tests)

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TD-SCDMA Test Equipment & Tools (2)

o   Tektronix announced in March 2003 a partnership agreement with Datang Mobile to provide test and measurement equipment for the development of TD-SCDMA networks and elements.

o   Symena announced in February 2003 that it is committed to developing an optimization tool for TD-SCDMA 3G standard, called Capesso™ Red, which will incorporate both a highly efficient Smart Antenna modeling engine as well as automated network optimization.

o   Rohde & Schwarz acts as a RF Test Equipment vendor and manufacturer. It provides products which support TD-SCDMA, such as Vector Signal Generator and I/Q Modulation Generator AMIQ.

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3G Spectrum in China

Status: November 2002

FDD   **Frequency Division Duplex**
TDD   **Time Division Duplex**

Primary FDD frequency band   Secondary FDD frequency band

Primary TDD frequency band   Secondary TDD frequency band

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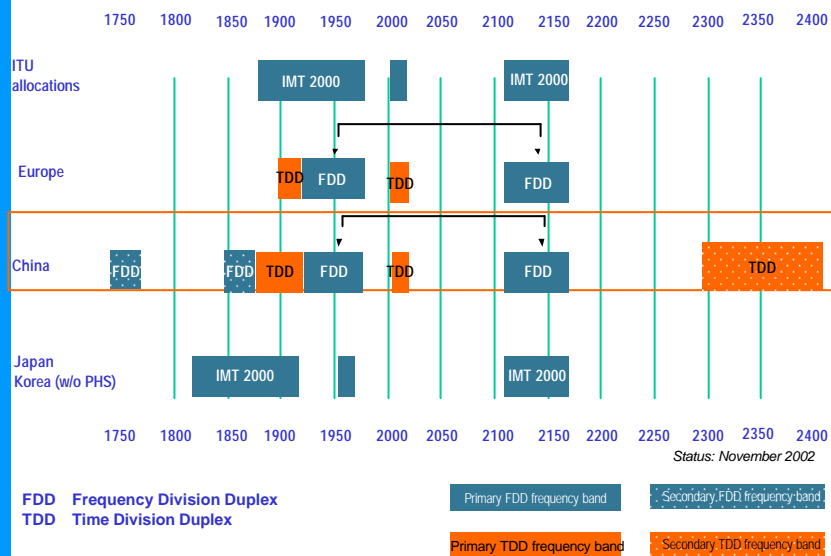
R&D Milestones Achieved in Beijing

Acceptance and Network Tests

o   High speed (125km/h) Demo with Video Transmission
o   Long Range (> 20 km) with Video Transmission
o   Mobile originated Calls over all Network Elements
o   MT-Net Trial Phase I successfully ended
o   Hand over Cell to Cell in Master Field Trial
o   TD-S Packet Data Calls over all Network Elements
o   MT-Net Trial Phase 1 ext. successfully ended
o   148kbit/s (PO) over all Network Elements
o   384kbit/s (PO) over all Network Elements

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Siemens TD-SCDMA Test Terminal

o   Full Hardware and Software integration, in conjunction with a Compaq iPAQ Pocket PC

o   Easy-to-use, intuitive User Interface, uses Multimedia capabilities of Windows Pocket PC 2002, such as Media Player, Internet Explorer, Outlook Mail
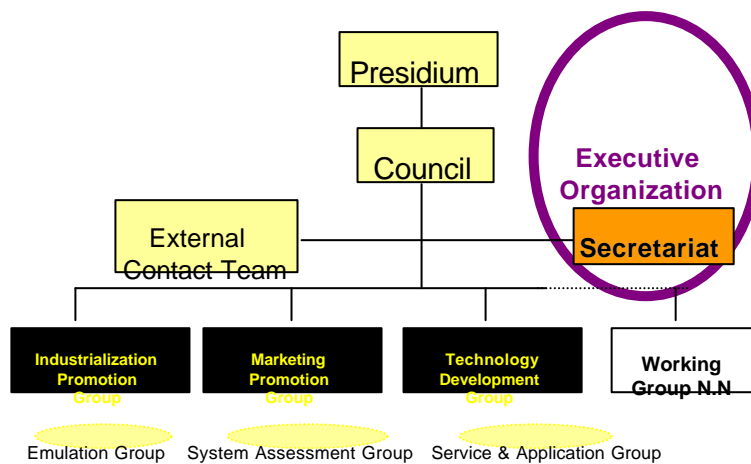
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TD-SCDMA Forum

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Council of TD-SCDMA Forum

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Senior Member of TD-SCDMA Forum

SAMSUNG

intel.

BenQ

LG Electronics

ANALOG DEVICES

FUJITSU THE POSSIBILITIES ARE INFINITE

PHILIPS

TEXAS INSTRUMENTS

ARRAYCOMM

Organization Chart of the Forum

Presidium

Council

Executive Organization

External Contact Team

Secretariat

Industrialization Promotion Group

Marketing Promotion Group

Technology Development Group

Working Group N.N

Emulation Group   System Assessment Group   Service & Application Group

Forum Members Status

Total Forum Members **410** *!*

Members Category

575 22 11

84

276

- operator
- R&D institutes and organization
  Manufacturers
- ICP
- Chip Provider
- VC investors
- Media
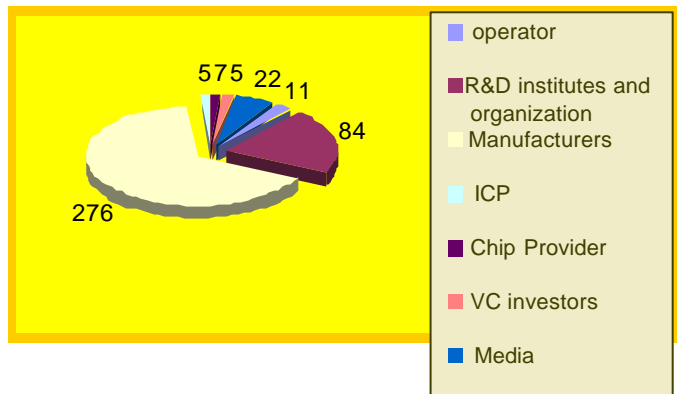
Activities of the Forum <cont.>

Foundation conference
Date: Dec, 12th 2000
Venue: Beijing,people's hall

Activities of the forum <cont.>

TD-SCDMA
Summit
September , 2001
Kerry Center, Beijing

Activities of the forum <cont.>

TD-SCDMA
Summit
August , 2003
Kerry Center, Beijing

Other Events / Activities

- **Regularly 3G Salon**

  - **TD-SCDMA Serial Seminars**

    - **TD-SCDMA Professional Training**

      - **Periodically TD-SCDMA Experts Online**

        - **Others**

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Web-s

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http://www.tdscdma-forum.org

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