Spectrum for IMT – outlook towards 2020

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Manager Spectrum Technology
Telefonica O₂ Europe

LS Summit 2008
July 2\textsuperscript{nd} 2008, Lichtenau
Agenda

1. IMT / IMT-2000 / IMT-Advanced
2. Spectrum for IMT
3. RA-07 / WRC-07
4. Spectrum and Technology
5. Outlook and Conclusion
Resolution 228 (Rev. WRC-03) notes that appropriate naming is to be developed for the future development of IMT-2000 and systems beyond IMT-2000. Thus the term “systems beyond IMT 2000” has been used as a temporary name.

Resolution ITU-R 56 (WRC-07) “Naming for IMT” resolves that the term “IMT-2000” encompasses also its enhancements and future developments¹; that the term “IMT-Advanced” be applied to those systems, system components, and related aspects that include new radio interface(s) that support the new capabilities of systems beyond IMT-2000; that the term “IMT” is the root name that encompasses both IMT-2000 and IMT-Advanced collectively.

¹ The detailed specifications of the IMT-2000 radio interfaces are in recommendation ITU-R M.1457.
“IMT-2000” and “IMT-Advanced”

Denotes interconnection between systems via networks or the like, which allows flexible use in any environments without making users aware of constituent systems.

Dark gray color indicates existing capabilities, medium gray color indicates enhancements to IMT-2000, and the lighter gray color indicates new capabilities of Systems Beyond IMT-2000.

The degree of mobility as used in this figure is described as follows: Low mobility covers pedestrian speed, and high mobility covers high speed on highways or fast trains (60 km/h to ~250 km/h, or more).
Spectrum for IMT
Phases and expected timeline for IMT-Advanced

WRC-07
22.10.-16.11.2007

IMT-Advanced „Vision“

- Data rates up to 1000 MBit/s
- Super high mobility up to 250 km/h
- Carrier Bandwidth 100 MHz

New elements to offer new capabilities of systems beyond IMT-2000

Other Radio Systems

IMT-2000 and Future Development

2000
2003
2006
2009
2012
2015

Systems Deployment

Spectrum Implementation

Requirements Definition

Standards Development

Standards Enhancement

Evolution / Integration with other Radio Systems

Systems Deployment

The sloped dotted lines indicate that the exact starting point of the particular subject can not yet be fixed.

▲ : Expected spectrum identification at WRC07

*: possible wide deployment around the year 2015 in some countries

Slide 7 21.05.2008
### ITU-R major deliverables for IMT

<table>
<thead>
<tr>
<th>„Name“</th>
<th>Document</th>
<th>Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>„Naming“</td>
<td>Res. 56 (WRC-07)</td>
<td>Naming for International Mobile Telecommunications</td>
<td>2007</td>
</tr>
<tr>
<td>„Principles“</td>
<td>Res. 57 (WRC-07)</td>
<td>Principles for the process of development of IMT-Advanced</td>
<td>2007</td>
</tr>
</tbody>
</table>
Spectrum Estimation of Mobile Services

Report ITU-R M.2078 presents the results of the calculation of spectrum requirements for RAT Group 1 (pre-IMT, IMT-2000 and its enhancements) and RAT Group 2 (IMT-Advanced) in 2010, 2015 and 2020.

**Remark:**
- RAT Group 3: Existing radio LANs and their enhancements
- RAT Group 4: Digital mobile broadcasting systems and their enhancements

<table>
<thead>
<tr>
<th>Market setting</th>
<th>Spectrum requirement for RATG 1</th>
<th>Spectrum requirement for RATG 2</th>
<th>Total spectrum requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher market setting</td>
<td>840</td>
<td>880</td>
<td>880</td>
</tr>
<tr>
<td>Lower market setting</td>
<td>760</td>
<td>800</td>
<td>800</td>
</tr>
</tbody>
</table>

**NOTE:** When more than one network is present in a country, the total spectrum requirement may be higher in order to account for packaging the spectrum (integer multiples of 40 MHz for RATG1)

How much additional spectrum is needed?
"Needed Spectrum" = "Required Spectrum" – "Existing Spectrum"

**Existing Spectrum**

<table>
<thead>
<tr>
<th>ITU</th>
<th>Region 1 (Europe)</th>
<th>Region 3 (e.g. China)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Band</td>
<td>Spectrum</td>
</tr>
<tr>
<td>806 - 960 MHz</td>
<td>154 MHz No. 5.317A, Res. 224</td>
<td>GSM 900 2x35 MHz</td>
</tr>
<tr>
<td>1710 - 1885 MHz</td>
<td>175 MHz No. 5.384A, Res. 223</td>
<td>GSM 1800 2x75 MHz</td>
</tr>
<tr>
<td>1885 - 2025 MHz</td>
<td>140 MHz No. 5.388, Res. 212</td>
<td>DECT 20 MHz</td>
</tr>
<tr>
<td>2110 - 2200 MHz</td>
<td>90 MHz No. 5.388, Res. 212</td>
<td>UMTS 2100 2x60+20+15 MHz</td>
</tr>
<tr>
<td>2500 - 2690 MHz</td>
<td>190 MHz No. 5.384A, Res. 223</td>
<td>UMTS 2500 2x70+60 MHz</td>
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<td></td>
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<tr>
<td><strong>Sum</strong></td>
<td><strong>749 MHz</strong></td>
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</tbody>
</table>

Needed Spectrum → Europe (L): 1280 MHz – 585 MHz = 695 MHz
Needed Spectrum → Europe (H): 1720 MHz – 585 MHz = 1135 MHz
Needed Spectrum → China (H): 1720 MHz – 665 MHz = 1055 MHz

Where to find the needed spectrum?
Candidate Bands

Report ITU-R M.2079 evaluates suitable frequency ranges to fulfil the vision for the future development of IMT-2000 and IMT-Advanced. It includes also a list of pros and cons:

- 4400 – 4990 MHz
- 590 MHz
- 3400 – 4200 MHz
- 2700 – 2900 MHz
- 200 MHz
- 2300 – 2400 MHz
- 100 MHz
- 200 MHz
- 3400 – 4200 MHz
- 800 MHz
- 4400 – 4990 MHz
- 590 MHz

Needed spectrum (695 / 1135 MHz) ↔ Candidate spectrum (2220 MHz)

It is understood, that only parts of these bands are / will be available for IMT-Advanced

But different regions:

- Different markets and regulations
- Different existing services and spectrum assignments
- Different usage of technologies
Objectives

ITU

The ITU is the leading United Nations agency for information and communication technologies. As the global focal point for governments and the private sector, ITU's role in helping the world communicate spans 3 core sectors: Radiocommunication, Standardization and Development. ITU is based in Geneva, Switzerland, and its membership includes 191 Member States and more than 700 Sector Members and Associates.

Radio Assembly (RA)

The Radio Assembly meets prior to each World Radio Conference to review the structure of the ITU-R and to make decisions on any issues that have not been resolved by the ITU-R Study Group(s) during the Study Period (between WRCs).

World Radio Conference (WRC)

World Radio Conferences review the global Radio Regulations (RRs). RRs define which services and systems can use specified spectrum bands.
6th RTT for IMT-2000: “OFDMA TDD WMAN”

ITU-R SG8 couldn’t conclude on Rev. 6 of ITU-R M.1457:

- RA-07 finally adopted “WiMax” (IEEE 802.16e) as the 6th RTT for IMT-2000 as “IMT-2000 OFDMA TDD WMAN” following approval of ITU-R M.1457-6, ITU-R M.1580-1 and ITU-R M.1581-1

**Chairman notes remark**

“The urgent work with regard to the Annex 6 on IMT-2000 OFDMA TDD WMAN in each of the Recommendations ITU-R M.1580 and ITU-R M.1581 to address emission mask and ACLR to ensure geographical coexistence with other IMT-2000 radio interfaces, should commence in early 2008 and be progressed expeditiously.”
Circular Letter on IMT-Advanced

RA-07 approved the process for a circular letter (CL) on IMT-Advanced:

- On 07.03.2008 the 1st part of the ITU CL was sent out to ask the industry to provide Radio Technology candidates for IMT-Advanced.

- The technical detailed information (requirements and evaluation criteria) is planned to be sent out after June meeting of WP5D

- However, this is somewhat academic because the RA also approved **Resolution 56** on naming, calling IMT-2000 / IMT-Advanced by the root name “IMT”, which is now what is referenced in the RRs

**Resolution 57** on the “Principles for the process of development of IMT-Advanced” was also approved, resolving (amongst others)

- that the process for developing Recommendations and Reports for IMT-Advanced shall give equal opportunity to all proposed technologies to be evaluated against the requirements

- to develop the Recommendations and Reports for IMT-Advanced, including Recommendation(s) for radio interface specifications;

- to define the minimum technical requirements and evaluation criteria
ITU established a special web-page for IMT-Advanced

http://www.itu.int/ITU-R/go/rsg5-imt-advanced

Steps in radio interface development process:

Step 1: Issuance of the circular letter
Step 2: Development of candidate RITs and SRITs
Step 3: Reception of the RIT and SRIT submissions and acknowledgment of receipt
Step 4: Evaluation of candidate RITs and SRITs by evaluation groups
Step 5: Review and coordination of outside evaluation activities
Step 6: Review to assess compliance with minimum requirements
Step 7: Consideration of evaluation results, consensus building and decision
Step 8: Development of radio interface Recommendation(s)

Critical milestones in radio interface development process:

(0): issue an invitation to propose RITs
March 2008
(1): ITU proposes cut-off for submission of candidate RIT proposals
October 2009
(2): Cut off for evaluation report to ITU
June 2010
(3): WP 5D decides framework and key characteristics of IMT-Advanced RITs and SRITs
October 2010
(4): WP 5D completes development of radio interface specification Recommendations
February 2011

IMT-Advanced A2-01
ITU-R structure for the study period 2007-2011

In Annex 1 to “RA-07 Resolutions” the ITU-R working structure agreed for the study period 2007-2011 can be found:

<table>
<thead>
<tr>
<th>SG</th>
<th>Spectrum Management</th>
<th>Chairperson</th>
<th>Vice Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG 1</td>
<td>Spectrum Management</td>
<td>Mr. R. Haines (United States)</td>
<td>see Resolutions</td>
</tr>
<tr>
<td>SG 3</td>
<td>Radiowave Propagation</td>
<td>Mr. B. Arbesser-Rastburg (ESA)</td>
<td></td>
</tr>
<tr>
<td>SG 4</td>
<td>Satellite Services</td>
<td>Dr. V. Rawat (CAN)</td>
<td></td>
</tr>
<tr>
<td>SG 5</td>
<td>Terrestrial Services</td>
<td>Dr. A. Hashimoto (JPN)</td>
<td></td>
</tr>
<tr>
<td>SG 6</td>
<td>Broadcasting Services</td>
<td>Mr. C. Dosch (DE)</td>
<td></td>
</tr>
<tr>
<td>SG 7</td>
<td>Science Services</td>
<td>Mr. V. Meens (F)</td>
<td></td>
</tr>
<tr>
<td>CCV</td>
<td>Coordination Committee for V</td>
<td>Mr. N. Kisrawi (Syrian Arab Republic)</td>
<td></td>
</tr>
</tbody>
</table>

Remark: “JTG 5-6” was established to study and consider sharing studies in the band 790-862 MHz by mobile applications and by other services.
## Draft structure for ITU-R SG 5 “Terrestrial Services”

<table>
<thead>
<tr>
<th>Proposal</th>
<th>Working Party</th>
<th>Acting Chairman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land mobile other than IMT and amateur/amateur-satellite</td>
<td>WP 5A (LMS except IMT, and Amateur services) (former WP 8A)</td>
<td>Mr. J. Costa</td>
</tr>
<tr>
<td>Maritime mobile</td>
<td>WP 5B (MMS, AMS and RDS) (former WP 8B)</td>
<td>Mr. T. Ewers</td>
</tr>
<tr>
<td>Aeronautical mobile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiodetermination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed wireless systems</td>
<td>WP 5C (FS) (former WP 9B+ WP 9C+ WP 9D and WP 4-9S(**))</td>
<td>Mr. C. Glass</td>
</tr>
<tr>
<td>HF systems (*)</td>
<td></td>
<td>Mr. S. Blust</td>
</tr>
<tr>
<td>Land mobile (IMT)</td>
<td>WP 5D (IMT) (former WP 8F)</td>
<td></td>
</tr>
</tbody>
</table>

(*) HF systems in the FS and the land MS.

(**) Sharing studies are to be conducted through collaboration between two concerned groups, establishing a joint group as required.

(***)) Fixed service aspect only

### Next meetings:
- **WP5D**: 24.06. - 01.07.2008, Dubai
- **JTG 5-6**: 03.11. - 07.11.2008, Geneva
- **SG5**: 10.11. - 11.11.2008, Geneva
WORLD RADIOCOMMUNICATION CONFERENCE
PROVISIONAL FINAL ACTS

Geneva, 22 October-16 November 2007

http://www.itu.int/md/R07-WRC07-R-0001/en
(488 pages)
Difficulties

- UHF spectrum has traditionally been used globally by politically powerful broadcast concerns.
- At the start of 2007, only a small handful of countries in North America and Western Europe believed that any UHF spectrum should be allocated to IMT applications at WRC-07.
- In January 2007, Europe (including Russia) voted resoundingly for ‘no change’ in the UHF band in order to allow broadcasters access to more TV channels.
- In February 2007, the WRC-07 preparatory meeting voted for ‘no change’ in every region of the world in UHF.

Milestones

1. February 2007: WRC-07 preparatory meeting was to prove the low-water mark for the industry.
2. April/May 2007: European countries began to become more supportive and the European Commission more vocal: UHF frequencies must be used to lower the Digital Divide.
3. June 2007: the African Telecommunication Union (ATU) proposed the first allocation of the band on a regional basis. Africa would continue to lead consent on this band throughout Region 1 (Africa, Europe and the Middle East).
4. August 2007: the Americas (CITEL) proposed a further allocation in UHF.
5. October 2007: European countries began WRC-07 still supporting ‘no change’, despite strong support from France, the UK and others.
6. November 2007: European compromise is achieved, supporting identification of 790-862MHz for IMT, echoing African position. Europe united with Africa were able to influence the conference and ensure the same identification is supported in Asia. This, in turn, means larger markets are drawn together for mass production of mobile phones: cheaper for the consumer.
Allocated IMT Bands

Under AI 1.4 globally harmonized spectrum was identified for use by IMT. In addition to the existing 2G / 3G spectrum, various additional bands were allocated resulting in 392 MHz (EU, Africa, Asia) / 428 MHz (Americas, CHN, KOR, IND, JPN, NZL, a.o.):

- 20 MHz in the band 450–470 MHz
- 72 MHz in the band 790–862 MHz in Region 1 (EU, Africa) and 3 (Asia). Region 2 (Americas) and 9 Asian countries allocated 108 MHz in the band 698–806 MHz.
- 100 MHz 2.3–2.4 GHz band
- 200 MHz 3.4–3.6 GHz band: no global allocation, but accepted by many countries with some obligations (e.g. cross-border deployment and power limitations)

**Remark:** This spectrum will not be available immediately, but become available following further collaborative work on international, regional and national level (e.g. digital dividend in EU >2012)
Have the requirements been met?

WRC-07 updated the “Table of Frequency Allocations” in the ITU Radio Regulations

But regional exceptions / adjustments (e.g. CEPT) are possible:

<table>
<thead>
<tr>
<th>ITU</th>
<th>Region 1 (Europe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band</td>
<td>Spectrum</td>
</tr>
<tr>
<td>450 - 470 MHz</td>
<td>20 MHz</td>
</tr>
<tr>
<td>790 - 862 MHz</td>
<td>72 MHz</td>
</tr>
<tr>
<td>806 - 960 MHz</td>
<td>154 MHz</td>
</tr>
<tr>
<td>1710 - 1885 MHz</td>
<td>175 MHz</td>
</tr>
<tr>
<td>1885 - 2025 MHz</td>
<td>140 MHz</td>
</tr>
<tr>
<td>2110 - 2200 MHz</td>
<td>90 MHz</td>
</tr>
<tr>
<td>2300 - 2400 MHz</td>
<td>100 MHz</td>
</tr>
<tr>
<td>2500 - 2690 MHz</td>
<td>190 MHz</td>
</tr>
<tr>
<td>3400 - 3600 MHz</td>
<td>200 MHz</td>
</tr>
<tr>
<td>Sum</td>
<td>1141 MHz</td>
</tr>
</tbody>
</table>

Plain figures

Needed Spectrum for IMT

\[
\begin{align*}
\text{1280 MHz} - \text{1141 MHz} &= 139 \text{ MHz} \quad \text{(lower setting)} \\
\text{1720 MHz} - \text{1141 MHz} &= 579 \text{ MHz} \quad \text{(higher setting)}
\end{align*}
\]

→ Europe (L): \[
\begin{align*}
\text{1280 MHz} - \text{1167 MHz} &= 113 \text{ MHz}
\end{align*}
\]

→ Europe (H): \[
\begin{align*}
\text{1720 MHz} - \text{1167 MHz} &= 553 \text{ MHz}
\end{align*}
\]
Review of the 2500-2690 MHz band

Agenda item 1.9 reviewed the technical, operational and regulatory provisions applicable to the use of the band 2500-2690 MHz by space services in order to facilitate sharing with current and future terrestrial services without placing undue constraint on the services to which the band is allocate.

Results

1. Power flux density limits in the RR have been revised, resulting in more stringent limits for satellite services (not applicable to existing ones)

2. In footnote 5.384A additional spectrum for IMT-2000 is identified as IMT:

   → This opens the door to a future refarming of this spectrum from IMT-2000 towards IMT-Advanced.
Other WRC-07 results

Maritime Procedures

WRC-07 successfully reviewed international regulations related to the maritime mobile service, bringing them in line with current maritime communications technology, including distress and safety transmissions within the Global Maritime Distress and Safety System (GMDDS).

Aeronautical services

Aimed at aeronautical security and modernization of civil aviation telecommunication systems:

- Upgrade radiolocation service to primary allocation status in the bands 9000–9200 MHz and 9300–9500 MHz
- Allocate additional spectrum for aeronautical telemetering and high bit-rate aeronautical telemetry
- Add new allocations for the aeronautical mobile (M) service

Earth-exploration satellite service (EES)

WRC-07 extended existing primary frequency allocations for EESS, facilitating research and exploration of Earth resources and environmental elements. This was linked to furthering the development of science services. EESS are global assets that provide key services to monitor the planet as well as to predict and monitor natural disasters, meteorology, and climate change.

WRC-07 also approved proposals concerning the use and further development of satellite systems using highly inclined orbits, high altitude platforms, as well as the compatibility and sharing between different space and terrestrial services.

Worldwide Plan for fixed-satellite service (FSS)

WRC-07 revised the technical and regulatory provisions for fixed-satellite service in the 800 MHz bandwidth used in different regions under varying climatic conditions for applications such as communications, TV, Internet, etc. The revised Plan, based on the latest technological achievements, improves the effectiveness of the Plan and facilitates access to the spectrum for FSS systems.

Emergency and disaster relief

WRC-07 advocated the development of spectrum management guidelines for radiocommunication in emergency and disaster relief as well as the identification and maintenance of available frequencies for use in the very early stages of humanitarian assistance intervention in the aftermath of disaster. ITU will develop a database for frequency management in disaster situations.

WRC-07 calls for enhancement of radio services

- Enhancement of the international spectrum regulatory framework
- Spectrum harmonization for use by terrestrial electronic news gathering (ENG)
- Short Range Radio Devices, including devices using ultra-wideband (UWB) technologies, radio-frequency identification devices (RFID), and other similar applications that generate and use radio frequencies locally.
Spectrum and Technology
Different technologies influence Spectrum

For IMT-2000 different IMT-2000 radio interfaces are used all over the world:

- W-CDMA (e.g. Europe)
- CDMA2000 (e.g. America)
- TD-SCDMA (e.g. China)

resulting in regional differences in spectrum allocation and licensing.

"IMT-2000 enhancements" (e.g. LTE) and "IMT-Advanced" will bring

- Additional channel bandwidths (10 / 20 / 40 / 100 MHz)
- Resulting in variable bandwidths of (1,25 / 2,5 / 5 / 10 / 20 / 40 / 100 MHz)
- New modulation schemes

Spectrum assignment will depend on technological and regional conditions
Different 2G technologies within Telefonica O₂

Vivo, Brazil
An additional GSM network was constructed in parallel to existing CDMA-2000 network until customers move to 3G services
New technologies will emerge and further influence the market and consequently the spectrum management.
### Various Candidates for IMT-Advanced

<table>
<thead>
<tr>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3GPP GSM EDGE Radio Access Network Evolution</strong></td>
<td></td>
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<td></td>
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<tr>
<td><strong>EDGE</strong>&lt;br&gt;DL: 474 kbps&lt;br&gt;UL: 474 kbps</td>
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<tr>
<td><strong>Enhanced EDGE</strong>&lt;br&gt;DL: 1.3 Mbps&lt;br&gt;UL: 653 kbps</td>
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<tr>
<td><strong>3GPP UMTS Radio Access Network Evolution</strong></td>
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<tr>
<td><strong>HSDPA</strong>&lt;br&gt;DL: 14.4 Mbps&lt;br&gt;UL: 384 kbps In 5 MHz</td>
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<tr>
<td><strong>HSDPA/HSUPA</strong>&lt;br&gt;DL: 14.4 Mbps&lt;br&gt;UL: 5.76 Mbps In 5 MHz</td>
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<tr>
<td><strong>HSPA Evolution</strong>&lt;br&gt;DL: 28 Mbps&lt;br&gt;UL: 11.5 Mbps In 5 MHz</td>
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<td><strong>3GPP Long Term Evolution</strong></td>
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<tr>
<td><strong>LTE</strong>&lt;br&gt;DL: 100 Mbps&lt;br&gt;UL: 50 Mbps In 20 MHz</td>
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<td><strong>LTE+</strong></td>
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<tr>
<td><strong>CDMA2000 Evolution</strong></td>
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<tr>
<td><strong>EVDO Rev 0</strong>&lt;br&gt;DL: 2.4 Mbps&lt;br&gt;UL: 153 kbps In 1.25 MHz</td>
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<tr>
<td><strong>EVDO Rev A</strong>&lt;br&gt;DL: 3.1 Mbps&lt;br&gt;UL: 1.8 Mbps In 1.25 MHz</td>
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<tr>
<td><strong>EVDO Rev B</strong>&lt;br&gt;DL: 14.7 Mbps&lt;br&gt;UL: 4.9 Mbps In 5 MHz</td>
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<tr>
<td><strong>EVDO Rev C</strong>&lt;br&gt;DL: 100 Mbps&lt;br&gt;UL: 50 Mbps In 20 MHz</td>
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<tr>
<td><strong>UMB</strong></td>
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<tr>
<td><strong>802.16m</strong>&lt;br&gt;1000 Mbps In 100 MHz</td>
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</tbody>
</table>

Note: Throughput rates are peak network rates. Radio channel bandwidths indicated. Dates refer to initial network deployment.

Basis chart by courtesy of GSA.
Multidimensional Convergence

Technologies
- 2G/3G cellular -> B3G/4G
- Wireless Local Loop (WLL)
- Wireless LAN
- Broadband Wireless Access (BWA)
- Satellite Wireless
- Microwave Link
- Specialized wireless

Applications
- Wireless telephony
- Wireless internet
- Wireless Data
- Specialized services

Standards
- ITU IMT-Advanced
- ITU IMT-2000
- 3GPP LTE
- TIA IS 41/95/136
- MMDS/LMDS/WCS
- ETSI BRAN
- IEEE 802.11/15/16/20/22

Services
- Free mobile (drive)
- Restricted mobile (walk)
- Fixed wireless trunking
- Fixed wireless extension
- Fixed wireless access
- Nomadic wireless
- broadcast

Business
- CDG
- WATM WG
- 3GPP/3GPP2
- MWIF
- WCA
- PCIA
- WAP/OMA
- WWRF
Outlook and Conclusion
Future World Radio Conferences

WRC-11 RESOLUTION [COM6/7] (WRC-07)

Agenda Item 1.17

- to consider results of sharing studies between the mobile service and other services in the band 790-862 MHz in Regions 1 and 3, in accordance with Resolution [COM4/13] (WRC-07), to ensure the adequate protection of services to which this frequency band is allocated, and take appropriate action;

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- to consider possible additional allocations to the mobile-satellite service, in accordance with Resolution [COM6/21] (WRC-07);

WRC-15 RESOLUTION [COM6/22] (WRC-07)

- Agenda Item 1: to take appropriate action in respect of those urgent issues that were specifically requested by WRC 11;

- Agenda Item 7: to identify those items requiring urgent action by the Radiocommunication Study Groups;
Conclusion

- Spectrum requirements for IMT / IMT-Advanced have been defined
- WRC-07 was a major milestone for the spectrum assignment for IMT systems, but there’s still a way to go
- Multi-regional mobile operators have to manage their spectrum very carefully, depending on the regional markets

Let’s not only predict the future but shape it !!
Any questions?

Thank you very much for your attention

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