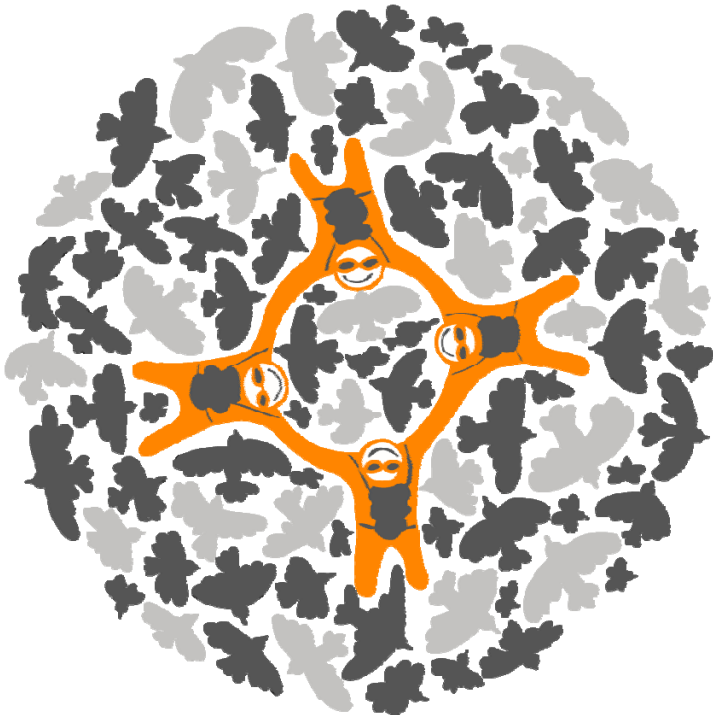

IMT caracteristics and spectrum specificity

Halina Uryga, Deputy Director Spectrum

Orange – France Telecom Group

ITU Cross Regional Seminar
on Broadband Access (Fixed, Wireless including Mobile)
for CIS, ASP and EUR Regions

Chisinau (Republic of Moldova), 4-6 October 2011

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ORANGE GLOBAL ACTIVITIES

mobile

- presence in 35 countries
- 27 million customers in France
- 59 million customers in Africa & the Middle East (+23%)

business services

- presence in 220 countries and territories
- 3,750 multinational business customers
- 28 business customer service centres

and 210 million customers worldwide

internet and fixed

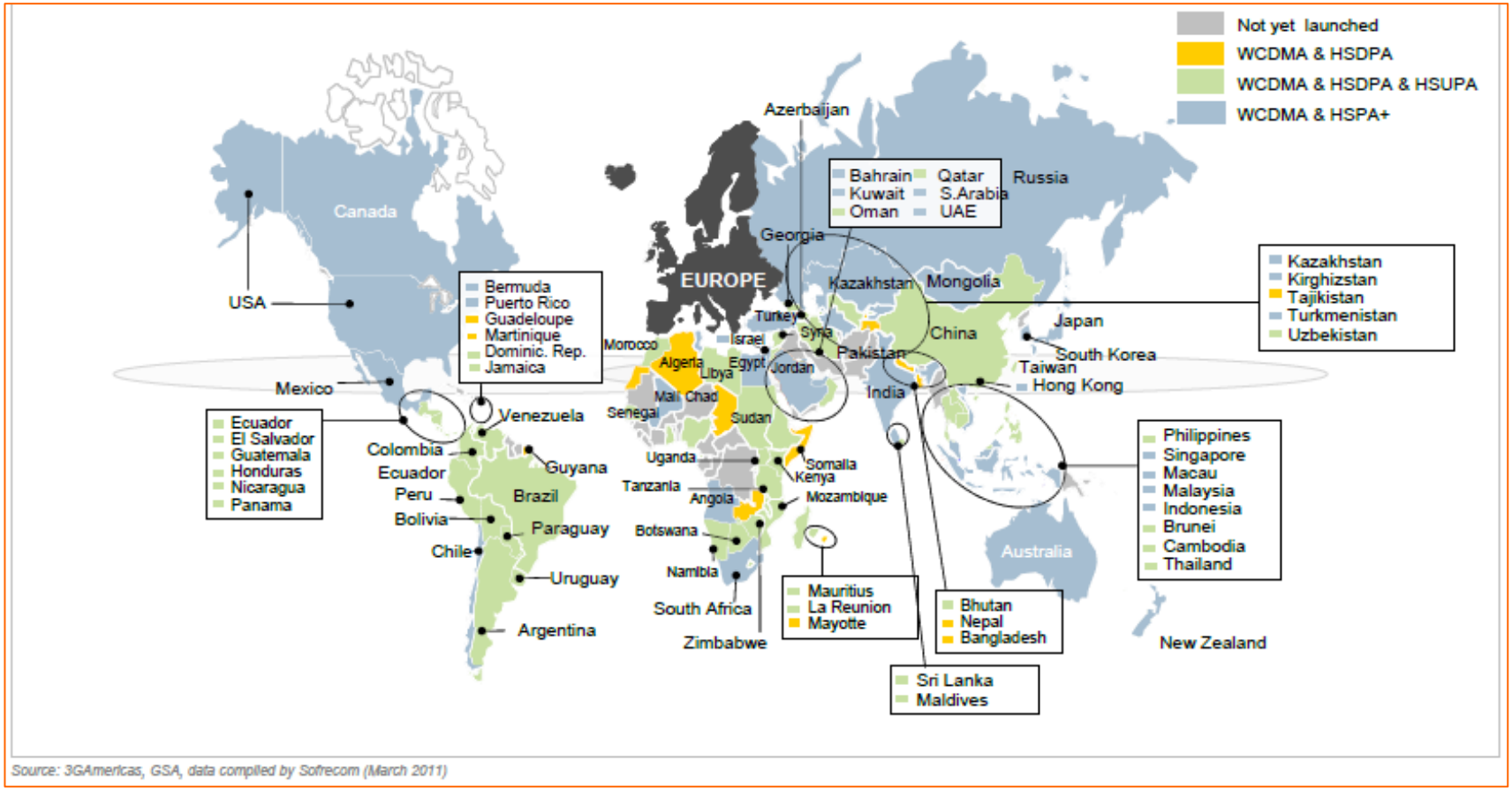
- 9.2 million Liveboxes
- 8.3 million VoIP customers
- 4.1 million IPTV customers

networks and R&D

- 150,000 km of submarine cables laid
- 3G networks deployed in 23 countries
- portfolio of 7,800 patents

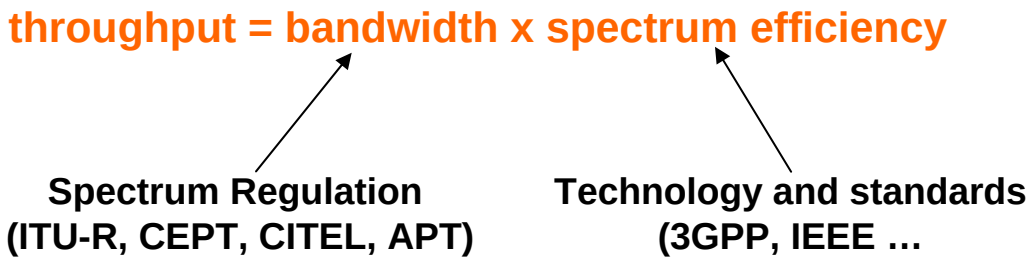
mobile broadband networks: W-CDMA & HSPA map

as of March 2011, 409 mobile operators were operating W-CDMA networks in 157 countries, in which 385 operators have already upgraded networks to HSDPA, 283 operators to HSUPA and 131 to HSPA+



Source: 3GAmericas, GSA, data compiled by Sofrecom (March 2011)

spectrum and technology



spectrum is identified for IMT :

– IMT-2000 and

– IMT-Advanced

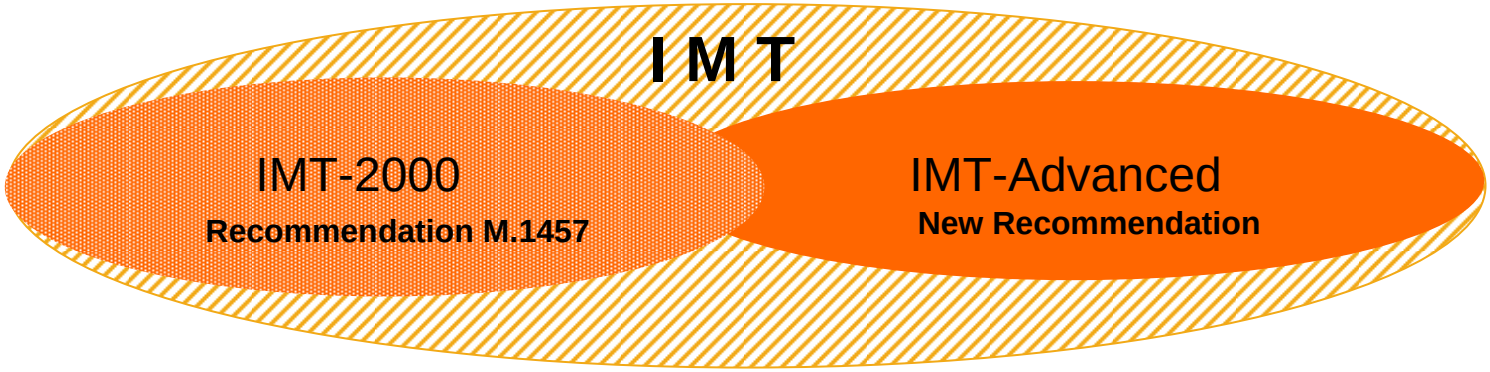
technology is included in :

– IMT-2000 (Rec. M.1457) e.g. LTE Release 8 or

– IMT-Advanced (new Recommendation: IMT.RSPEC) e.g. LTE-A (LTE Rel.10 & beyond)

IMT Family

- IMT is the ITU generic name for both families of technology IMT-2000 and IMT-Advanced
- IMT-Advanced is expected to provide a significant improvement in performance and quality of service over IMT-2000



ITU offers global framework to **harmonise spectrum** and to limit the number of radio interfaces for IMT

LTE within IMT Family

- LTE is considered as the successor to the UMTS technology, based upon WCDMA, HSDPA, HSUPA, and HSPA which will provide significantly faster data rates for both uploading and downloading
- LTE can be deployed in any of a wide variety of different spectrum bands, however, 700MHz, 800MHz, 1800MHz and 2.6GHz are likely to be the most common LTE bands
- four main operators choices
  - roll-out using the digital dividend (700MHz in the U.S., 800 MHz in Europe)
  - deployment in the new bands (2.6GHz)
  - use of re-farmed spectrum (850MHz/900MHz/1800MHz/1900MHz/2100 MHz)
  - new LTE spectrum at 3.6GHz
- in Europe and Asia, 2.6GHz has emerged as the key preferred LTE spectrum for crowded areas
- 800 MHz band is now increasingly allocated in Europe to deploy LTE services in rural areas where fixed broadband is generally not available

Europe: regulatory situation for LTE

Source: Crédit Suisse, Barclays capital, regulators, Analys mason (March 2011)

accelerating global LTE commitments and commercial launches

- 2010 was marked by the commercial launch of LTE networks worldwide, notably in the U.S., Japan and Europe
  - according to the GSA figures released during the Mobile World Congress, 17 operators have commercially launched LTE networks
- in March 2011 the GSA counts 200 operators in 70 countries which are testing LTE technologies, noting 140 firm commitments to deploy commercial services across 56 countries
- GSA estimates that 73 operators will have live networks by year 2012
- LTE ecosystem is developing with the handsets from vendors such as Motorola, Samsung, HTC, ZTE …
- most LTE licenses should be auctioned in 2011-2012

example of LTE in Japan

- Docomo launched commercially the LTE service, branded ‘Xi’ (pronounced ‘crossy’) on 24 Dec 2010 in Tokyo, Nagoya and Osaka with approx. 1,000 stations
- Docomo plans to spend ¥305bn in total by March 2013 to increase coverage to 40% POP (15,000 LTE- enabled stations)
- the service is for data connectivity to PC dongles only but Docomo plans to offer LTE-compatible handsets, which would enable voice
- according to Docomo, the service delivers downlink speeds of up to 37.5 Mbps and uplink speeds of up to 12.5 Mbps, though in certain indoor service areas, such as Tokyo airport, those downlink speeds can reach 75 Mbps

other LTE deployments

- LTE is a great means to cope with the exploding data traffic, the migration to all-IP networks and better management of users' sessions across devices and networks
- Latin America could see its first networks in 2011
  - Columbia has allocated LTE licenses in 2010, which suggest that UNE Telecom would start LTE this year
- Africa launched already LTE
  - Globacom, Nigeria's second largest operator launched Africa's first LTE network in January 2011 across around 100 sites in Lagos
- Some WiMAX operators decided to deploy LTE e.g.
  - Yota (currently 700,000 WiMAX subs) announced that it will build a giant LTE network that will cover 180 cities by 2014

from IMT to IMT-Advanced technologies

- completion of the consensus building phase of the IMT-Advanced process (ITU-R WP 5D, 13-20 October 2010) and decision on the candidates Radio Interface Technologies (RITs) accepted for inclusion in standardisation phase

- some technical characteristics of the candidate RITs
  - compliant to requirements (Report M.2134):
    - peak spectral efficiency (DL: 15bit/s/Hz & UL: 6.75bit/s/Hz)
    - bandwidth: up to & including 40MHz (scalability: support of at least three bandwidth)
    - user latency: less than 10ms

IMT-Advanced technologies

- IMT-Advanced technologies
  - LTE-Advanced developed by 3GPP as Release 10 & beyond
  - WirelessMAN-Advanced developed by IEEE (specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m)
- ITU-R WP 5D concluded (13-20 October 2010) that both the 3GPP and IEEE technologies :
  - are acknowledged to individually satisfy the requirements of Resolution ITU-R 57 for the required number of the test environments (requirements specified in Report ITU-R M.2133) and
  - are accepted for inclusion in the standardisation phase of the IMT-Advanced process and should proceed to Step 8
- LTE-Advanced is an evolution of LTE (Release 8)
  - provides enhancements, especially regarding higher capacity and interference management
  - is backwards compatible with LTE

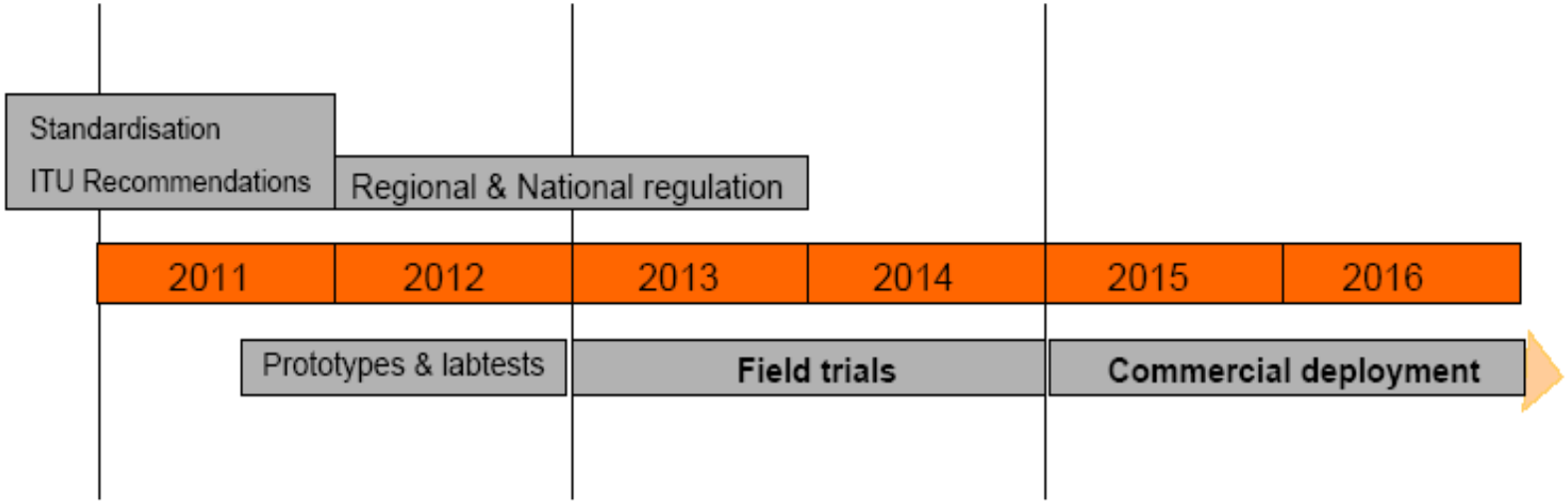
IMT-Advanced specifications

- key document under finalisation : the draft Recommendation ITU-R M.[IMT.SPEC] "Detailed specifications of the terrestrial radio interfaces of IMT-Advanced"
  - GSC (Global Core Specification) proponents : 3GPP and IEEE
  - Proposed structure
    - Recommendation
    - specifications of LTE-Advanced in Annex A
    - specifications of WirelessMAN-Advanced in Annex B
  - the detailed information provided or referenced in these Annexes will be recommended as the complete set of standards for the terrestrial radio interfaces of IMT-Advanced

specifications : schedule

- schedule for the completion of the first release of [IMT.RSPEC]
  - finalisation planned in 5D meeting in October 2011
  - consideration by Study Group 5 in November 2011
  - final approval expected at the Radiocommunications Assembly in 2012
  - initial release in 2012
- a yearly up-date process is proposed for future revisions
  - framework for a Revision Procedure was drafted
- new proposals for candidate radio interface technologies will follow the process used for the initial IMT-Advanced technologies

timing



IMT- Advanced deployments targeted around year 2015/20

DOCOMO begins field experiments of LTE-Advanced system

- DOCOMO has already confirmed the performance of LTE-Advanced technologies using radio environment simulators in its R&D center, achieving transmission data rates of approximately 1 Gbps in the downlink and 200 Mbps in the uplink
- NTT DOCOMO announced on 7 February 2011, that on 27 January it was pre-licensed for field experiments of LTE-Advanced
  - when the license is issued, DOCOMO will begin field experiments of LTE-Advanced in real radio environments in the cities of Yokosuka and Sagamihara in Kanagawa Prefecture
  - in the field experiments, the performance of key technologies for LTE-Advanced implemented in the experimental equipment will be evaluated in indoor and outdoor environments
  - performances are expected to be presented after the summer conference of IEICE (Institute of Electronics, Information and Communication Engineers)

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spectrum for IMT-Advanced

- IMT-Advanced will provide a significant improvement in performance and quality of service over IMT-2000 :
  - systems supporting low to high mobility applications and a wide range of data rates (100Mb/s & 1Gb/s respectively)
  - will operate in the bands identified for IMT

- bands identified in the Radio Regulations for IMT
  - current mobile bands from 450 to 2690 MHz including digital dividend
  - 2300-2400 MHz
  - 3400-3600 MHz

IMT spectrum specificity

- case of digital dividend in Europe : early deployments
- bands not identified in the Radio Regulations but allocated for mobile in Europe e.g. 3600-3800 MHz
- frequency arrangements defined for IMT : it gives operators freedom in their choice of technology (IMT-2000 or IMT-Advanced)
- R&D activities on features such as spectrum aggregation (i.e. support of non contiguous spectrum allocations) considering the current spectrum availability for IMT systems

digital dividend in Europe

- CEPT harmonised band plan for 790 to 862 MHz with a preferred frequency arrangement of 2 x 30 MHz (ECC/DEC/(09)03)
  - many European administrations have committed to awarding the Digital Dividend band for mobile broadband IMT services in line with the CEPT band plan
  - awards have already taken place in Europe e.g. in Germany, Sweden and Spain
  - France, Denmark, Italy, Portugal, Norway and Ireland plan to award the 800 MHz band in 2011-2012
- the current award process in Europe and other Region 1 countries should continue and follow the preferred CEPT band plan (2 x 30 MHz)
- other Regions :
  - Asia Pacific : 703 to 803 MHz
  - Americas : 698 to 806 MHz band

digital dividend: bilateral agreements

- Finland and Russia agreed on 800 MHz frequency range usage in the border area of the two countries
  - in Russia, the 800 MHz band is used by aeronautical radionavigation systems
  - in Finland, the 800 MHz band is very well suited for the provision of broadband services in sparsely-populated areas
  - new agreement enables the construction of new mobile networks to begin before completion of the work by WRC-12
  - mobile network can be constructed with full coverage at the distance of 55 km from the Russian border
  - in the best scenario, the BS may be built at the distance of 12 km from the border and customers may use mobiles at the distance of 4 km from the border
  - agreement includes limitations to ensure that the Russian aeronautical radionavigation systems will not suffer from interference in the border area
  - FICORA granted the first radio licences for testing LTE networks in 800MHz in July 2011

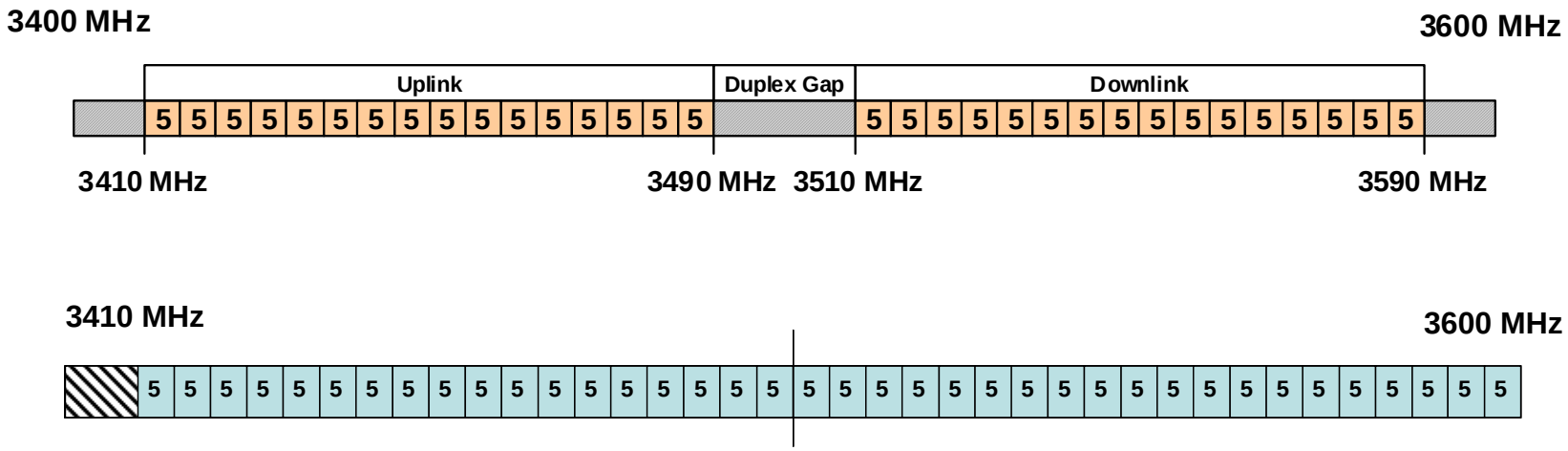
IMT spectrum : case of 3400 – 3600 MHz

- band 3400-3600 MHz identified in the Radio Regulations for IMT

- frequency arrangements under finalisation at :
  - ITU-R WP 5D, Recommendation M.1036, FDD & TDD frequency arrangements up-dated on the basis of the CEPT input (particularly the FDD plan, starting at 3410 MHz, based on 2x80 MHz with 20 MHz duplex gap)
  - ECC/PT1, draft ECC Decision (11)HH

- ECC will make decision, in its meeting to be held in December 2011 in Kazan, between two options which still remain after the Public Consultation (August) and Resolution meeting (September):
  - Option A : puts both frequency arrangements for the 3400-3600 MHz band on an equal basis
  - Option B : gives the preference to the unpaired (TDD) arrangement

option A in the draft ECC Decision (11)HH, for the 3400-3600 MHz band



option A in the draft ECC Decision (11)HH, for the 3400-3600 MHz band

- provides enough clarity and flexibility for the implementation of IMT and IMT-Advanced while taking into account current national licensing and market situations
- encourages market based developments and removes the risk of selecting a solution which may result in a market failure, e.g. due to technical and operational uncertainties
- will enable, taking into account further work from ECC PT1 and market evolution, the choice of the best duplex mode, via a review in a short timeframe of both the Decision and the current uses in the band (the latter will assess how systems with large bandwidth channels can be accommodated)
- provides appropriate level of harmonisation to both FDD and TDD arrangements defining block sizes and duplex gap

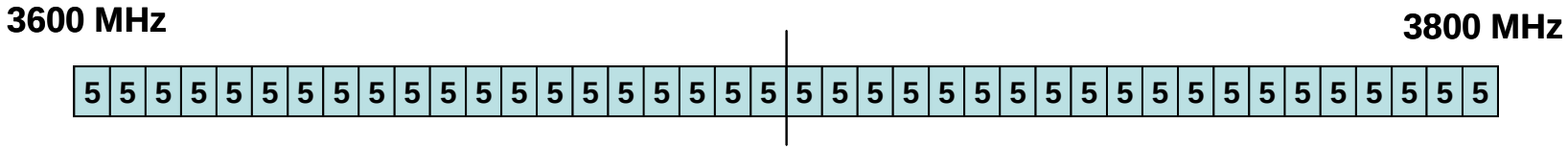
3GPP: UMTS-LTE 3500 MHz Work Item Technical Report (Release 10)

- 3GPP conclusion from the ERO survey (section 5.1.8) is that an FDD arrangement where 3410-3500 MHz is paired with 3510-3600 MHz covers a substantial part of the existing band arrangements in Europe

- 3GPP completed its work on FDD & TDD and approved :
  - E-UTRA TDD in 3400 – 3600 MHz and 3600 – 3800 MHz
  - E-UTRA FDD and UTRA FDD in 3410 – 3490 MHz (uplink) paired with 3510 – 3590 MHz (downlink)

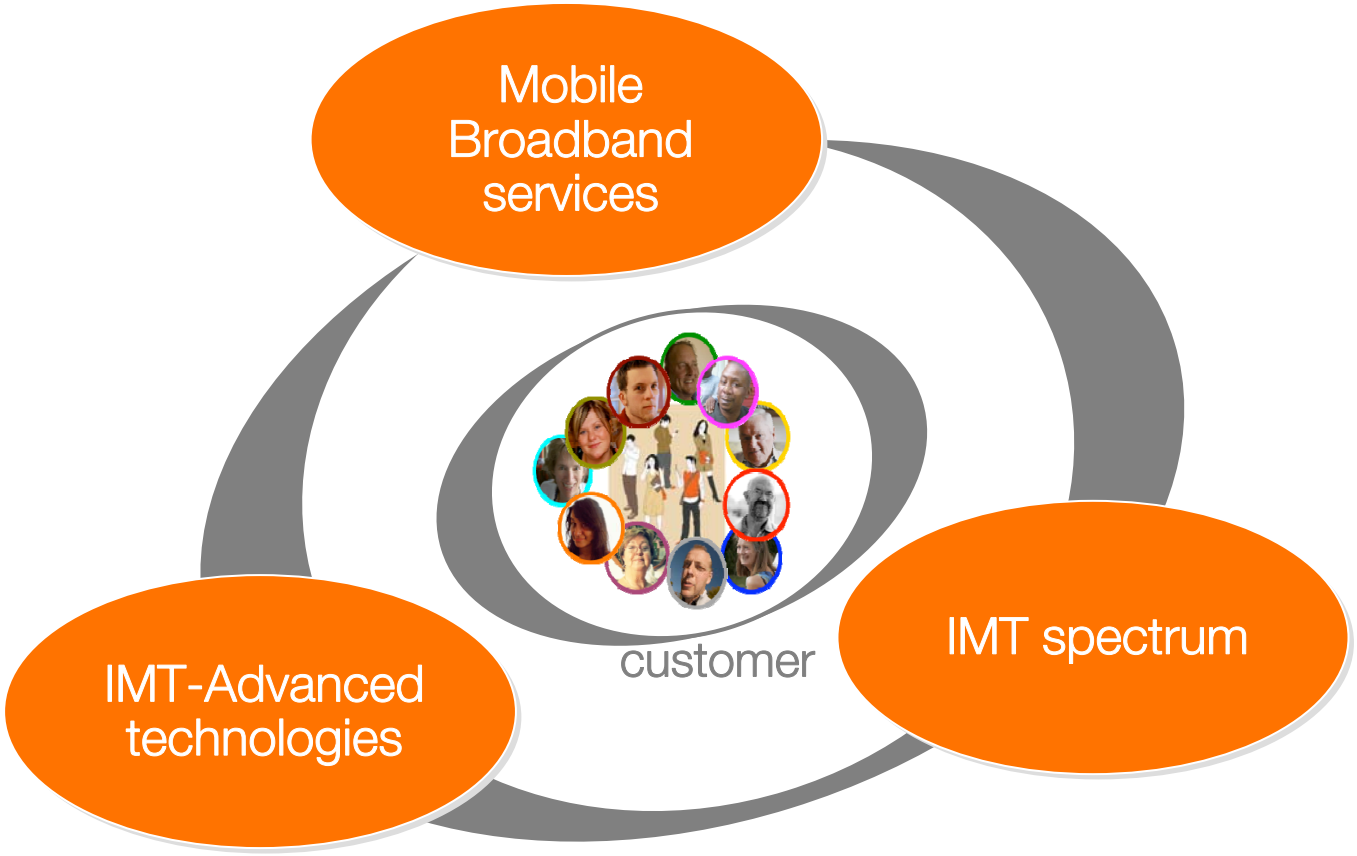
case of 3600 – 3800 MHz in Europe

- band 3600-3800 MHz not identified in the Radio Regulations for IMT however could be used for IMT
- current European Regulatory framework:
  - availability of 3400-3800 MHz for BWA (Fixed, Nomadic and Mobile) including IMT
  - ECC Decision of 30 March 2007 (ECC/DEC/(07)02)
  - EC Decision of 21 May 2008 (2008/411/EC)
- ECC/PT1 agreed on the harmonised frequency arrangement (TDD) in the draft ECC Decision (11)HH for administrations wishing to implement MFCN (including IMT) in the 3600 – 3800 MHz band



LTE-Advanced “carrier aggregation” on commercial equipment

- Carrier aggregation is a key feature of LTE-Advanced that enables operators to create larger “virtual” carrier bandwidths
- Nokia Siemens Networks has conducted the world’s first successful demonstration of LTE-Advanced carrier aggregation on commercial equipment
- LTE-Advanced carrier aggregation demo was presented at the Mobile World Congress
- Demo shows an increase in LTE data rates of 90% using a combination of 800 MHz and 2.6 GHz bands, a scenario relevant to the spectrum allocations of many operators



IMT user-friendly technologies with improved file transfer capacity will respond customer needs

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conclusions

- IMT mobile broadband penetration is growing dramatically on a global basis with new service offerings and explosion in mobile data traffic
- to answer these constantly increasing market needs Orange FT Group adopts an optimistic vision for the coming decade in terms of :
  - evolution of mobile services
  - radio traffic
  - requirements for higher throughputs
  - available technical innovations
  - spectrum needs
- innovations may help operators to still increase their capacity and coverage within available spectrum, however more resources will be required in the future, thus WRC-12 should take it into account under Agenda Item 8.2

thank you