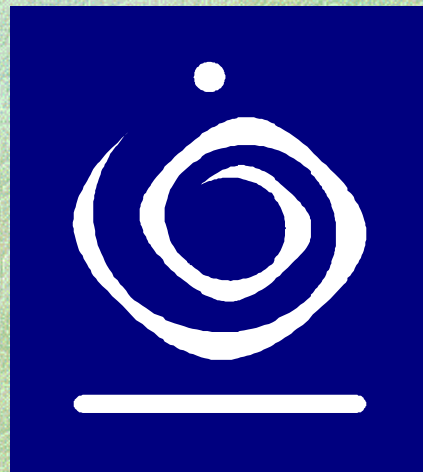


**TSG SA#3 TDOC SP-99 175**



**UMTS  
Forum**

**3GPP TSG SA (Plenary) #3  
Yokohama, 26 - 28 April 1999**

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**UMTS Forum  
Report to 3GPP TSG SA (Plenary) #3  
On Spectrum Activities**

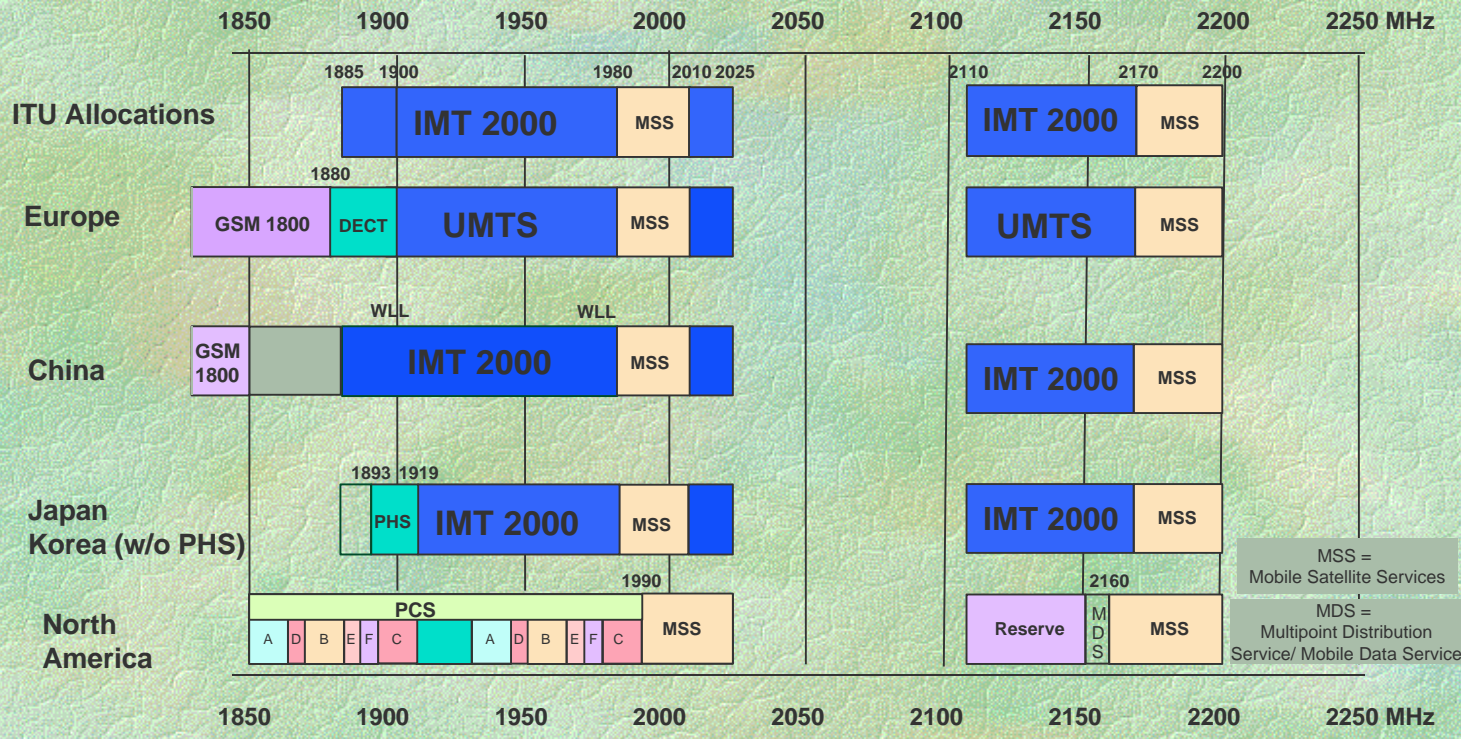
**Andy Watson**

Technical Advisor to UMTS Forum  
Liaison Officer to TSG SA (Plenary)



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# Frequency bands for IMT 2000



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## Identified Spectrum for Mobile Services



### Terrestrial:

**IMT2000: 170 MHz**  
(In Europe, 155MHz due to 15 MHz Allocation to DECT)

**GSM 900: 70MHz**

**GSM 1800: 150Mz**

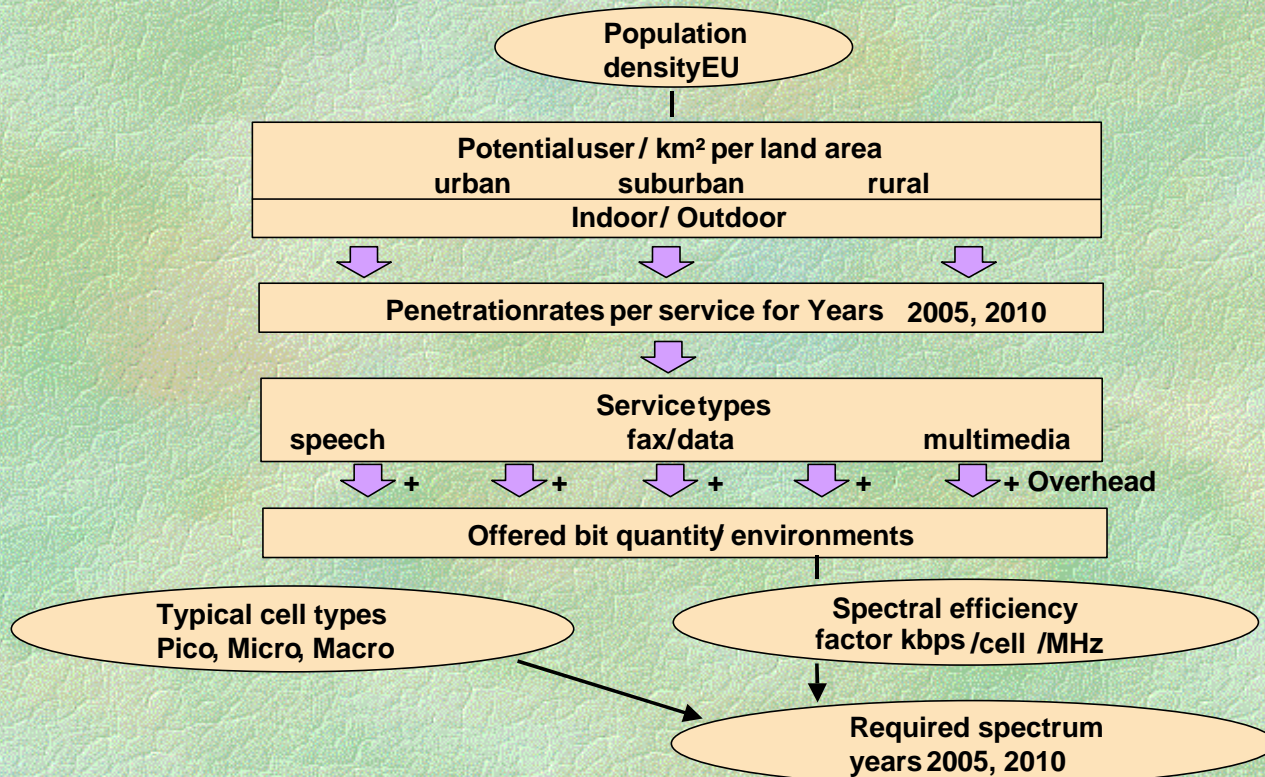
**DECT: 20MHz**

**Total: 410MHz**

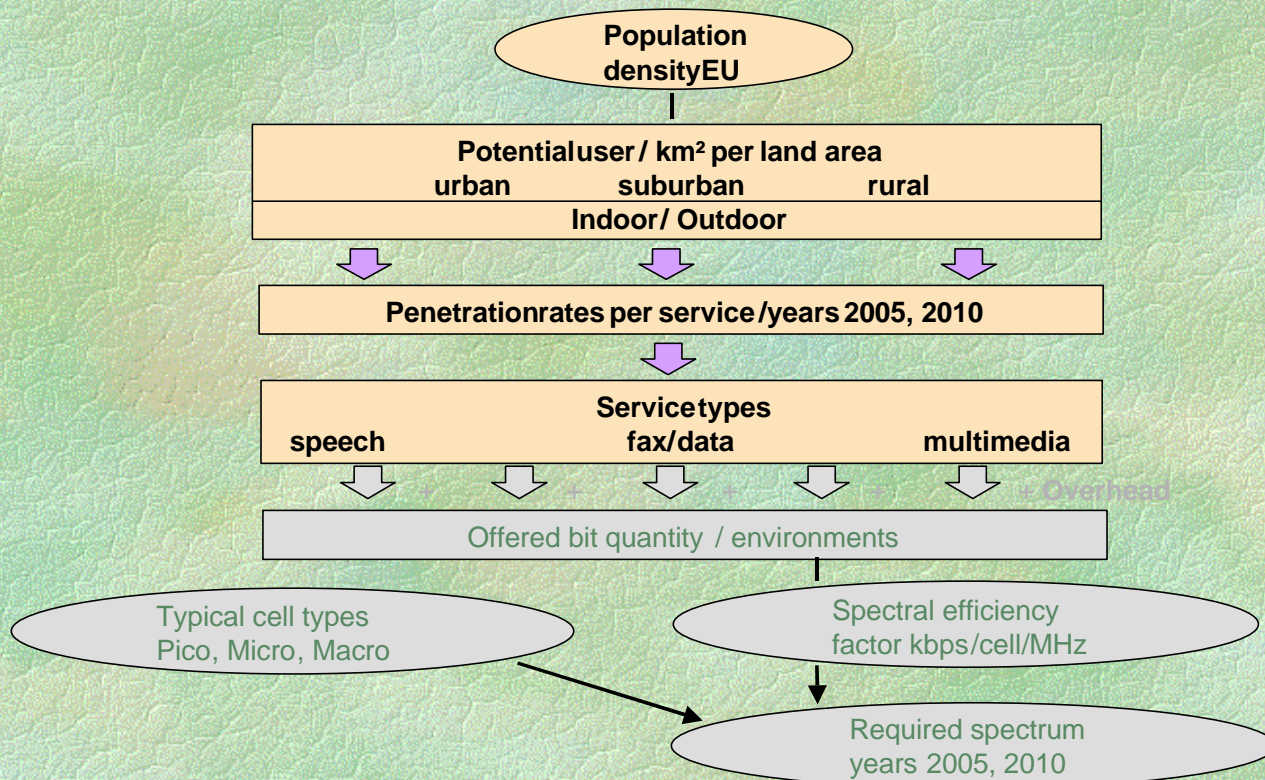
### Satellite:

**IMT200: 60MHz**

## Calculation Method for UMTS Spectrum



## First Part - Market Forecast



FINAL REPORT FOR  
EC DGXXIII

UMTS Market  
Forecast Study

Analysys



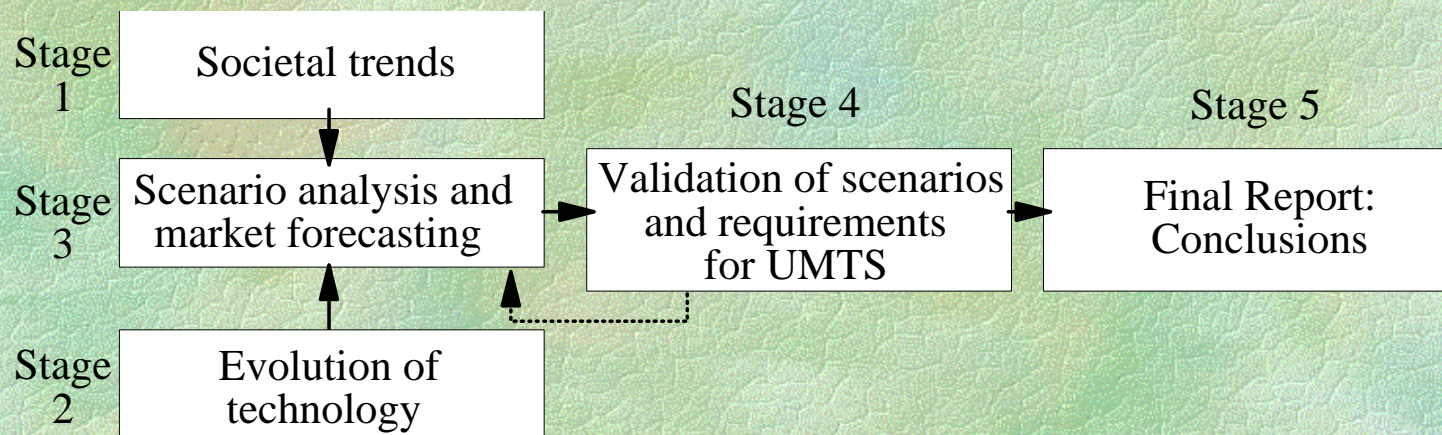
Analysys/Intercal Report Number 57561  
12 February 1997

See Also UMTS Forum  
Report No. 8

<http://www.umts-forum.org>



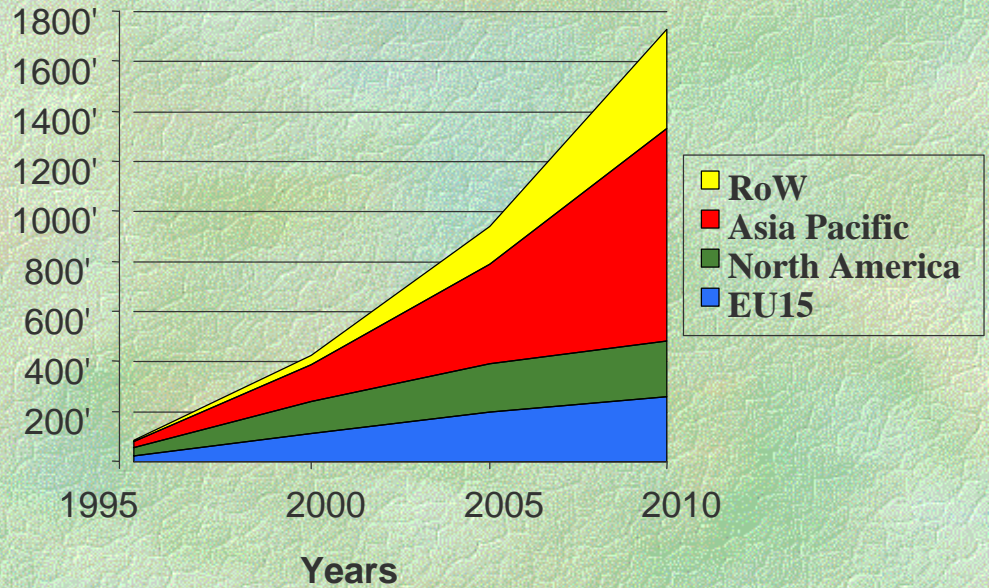
## Market Forecast Methodology



# World Mobile Subscribers

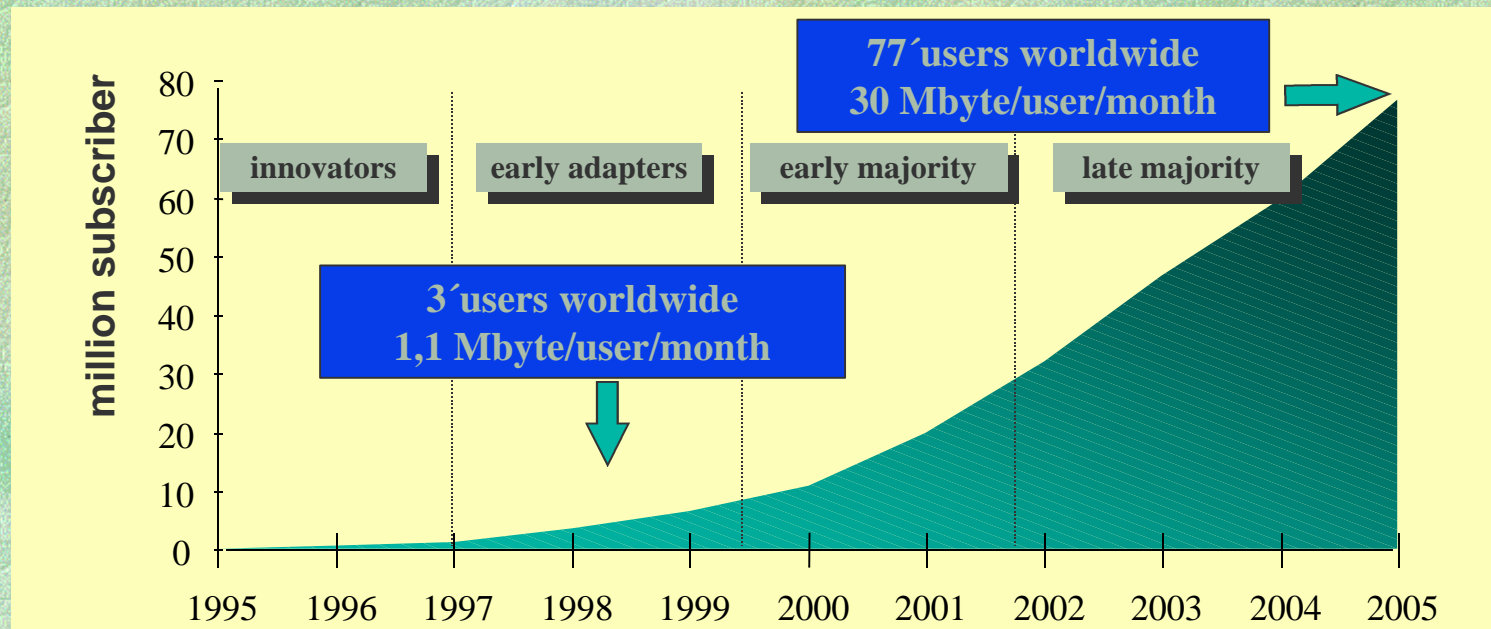


Mio  
Subscriber



# Mobile data market worldwide

## Exceptionally strong growth of subscribers and usage

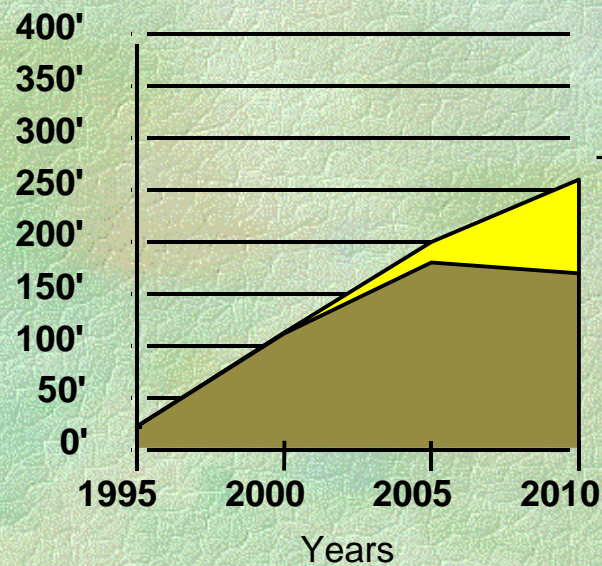


- Growth in mobile data is expected to be 70% p.a. in the next 5 years
- Multimedia data will account for up to 60% of total mobile traffic in 2005.

## Terrestrial and Satellite Mobile Market Forecast Europe (EU 15)



Mio Subscriber



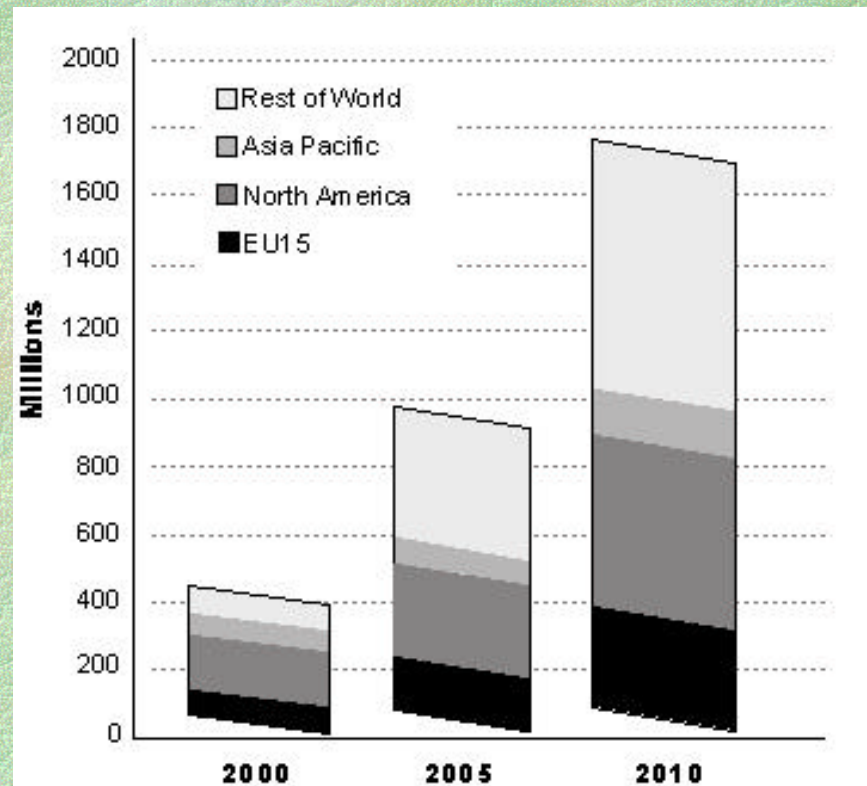
Total subscribers year 2005: 200 mio  
year 2010: 260 mio

Total mobile subscribers

Mobile subscribers using the whole range of multimedia applications

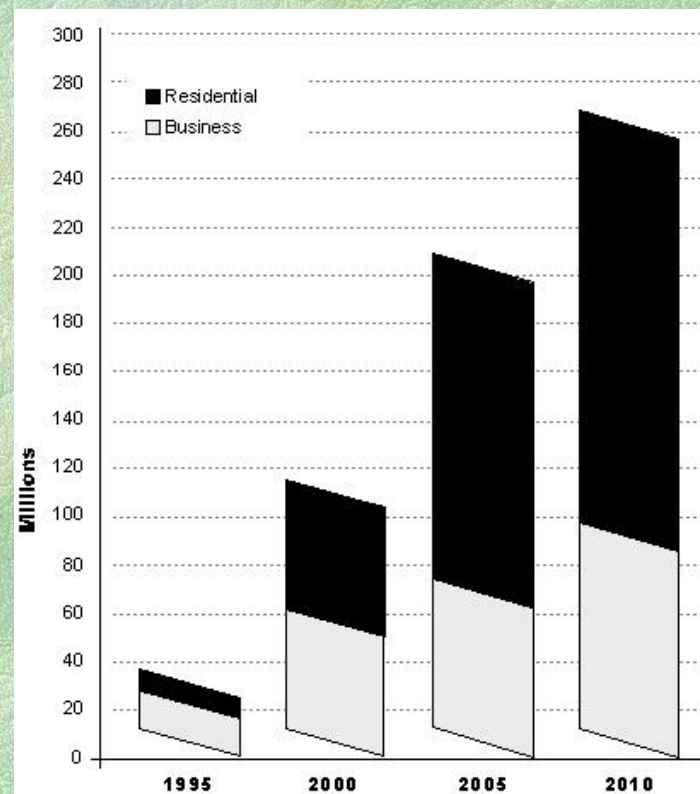
Mobile subscribers using voice and low rate data

## World Mobile Subscribers

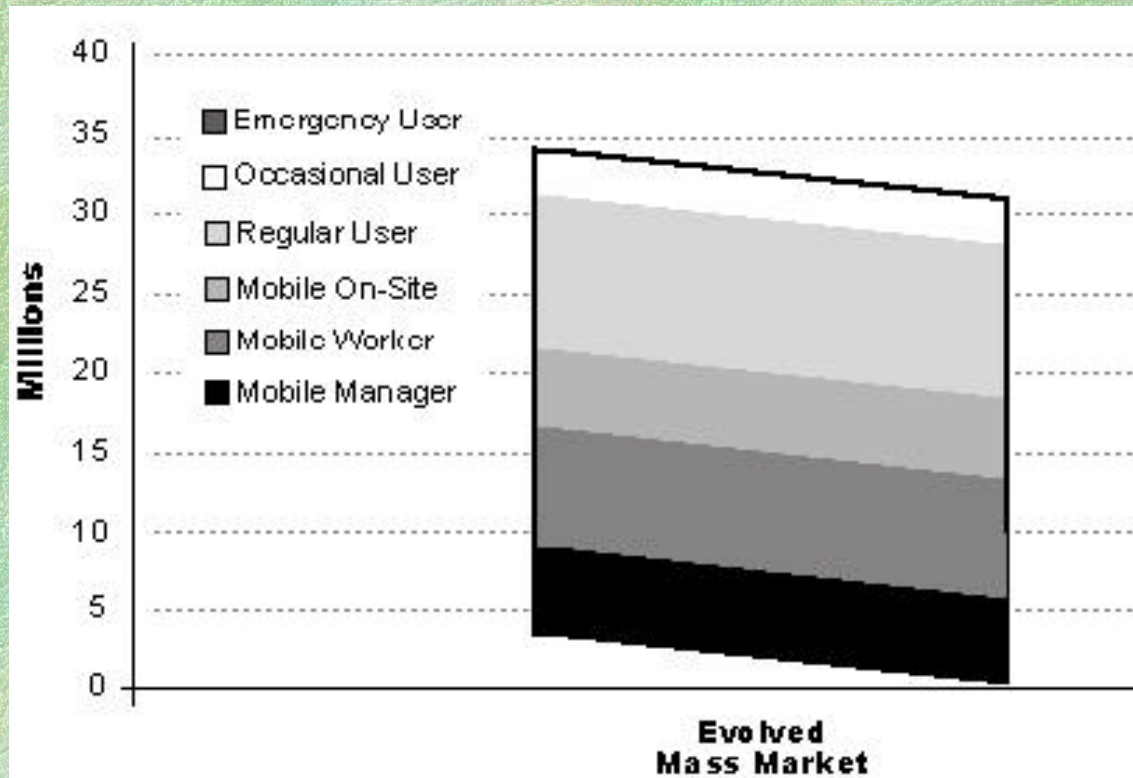


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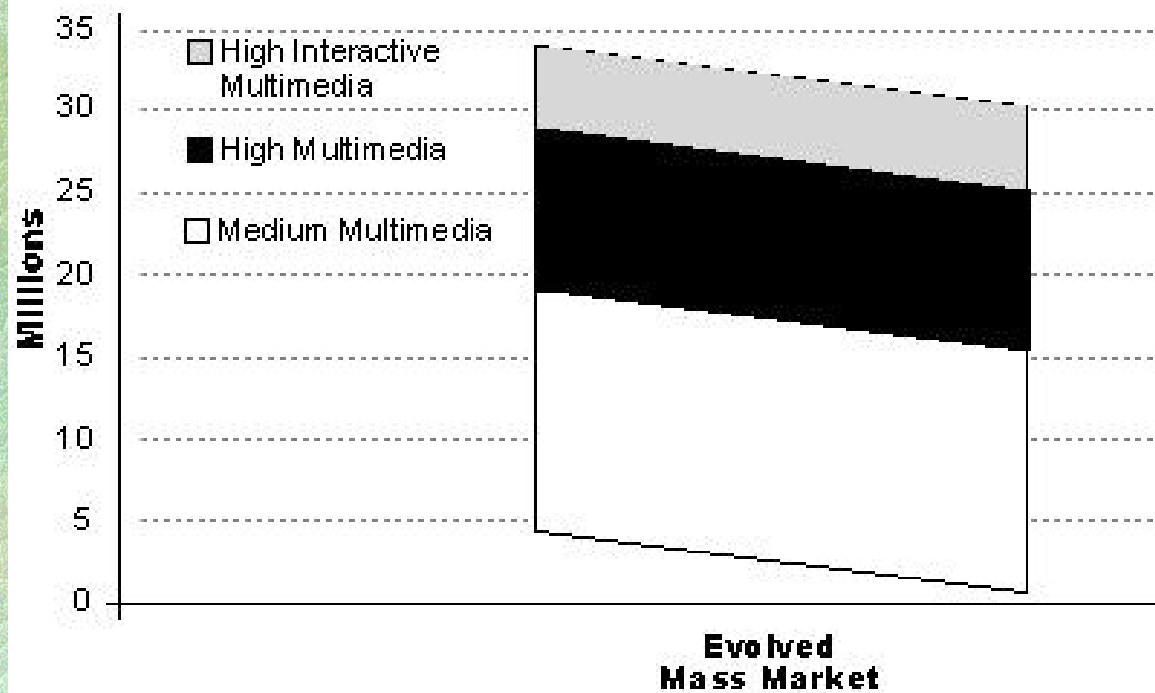
## EU Subscribers



# EU Mobile Multimedia Subscribers (Year 2005)



### EU MOBILE MULTIMEDIA SUBSCRIBERS BY SERVICE TYPE (YEAR 2005)





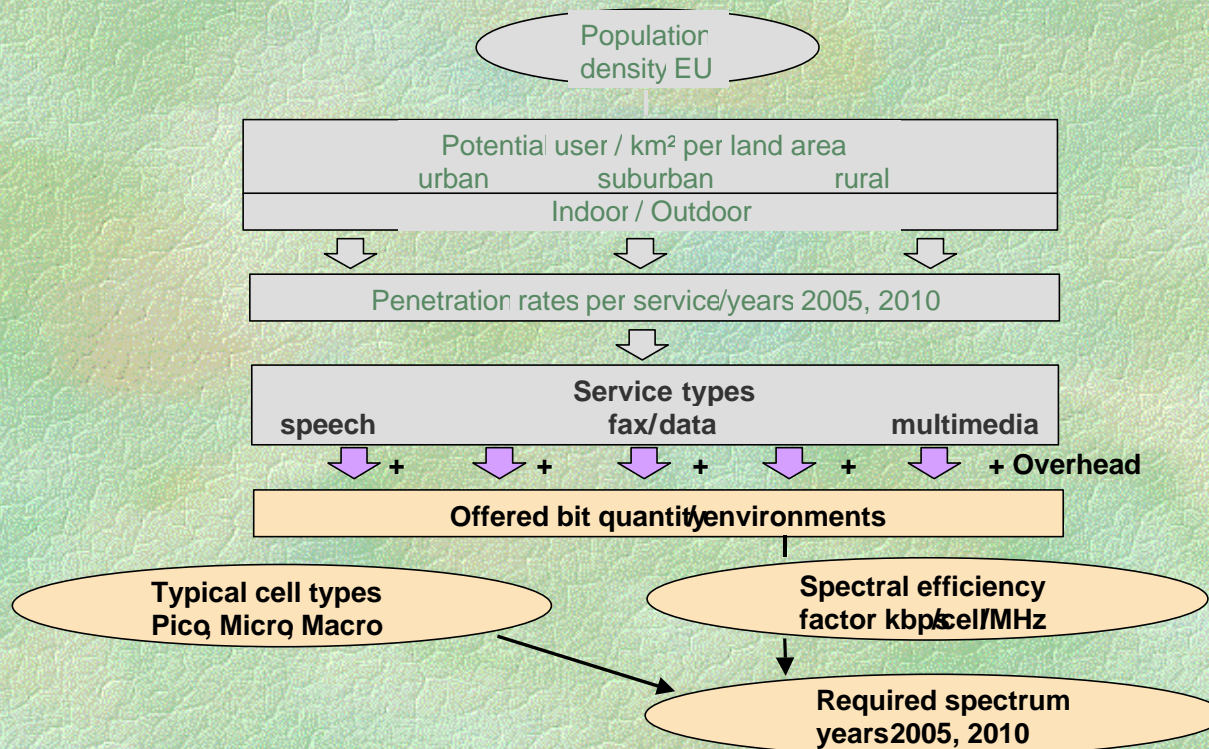
## Service Characteristics



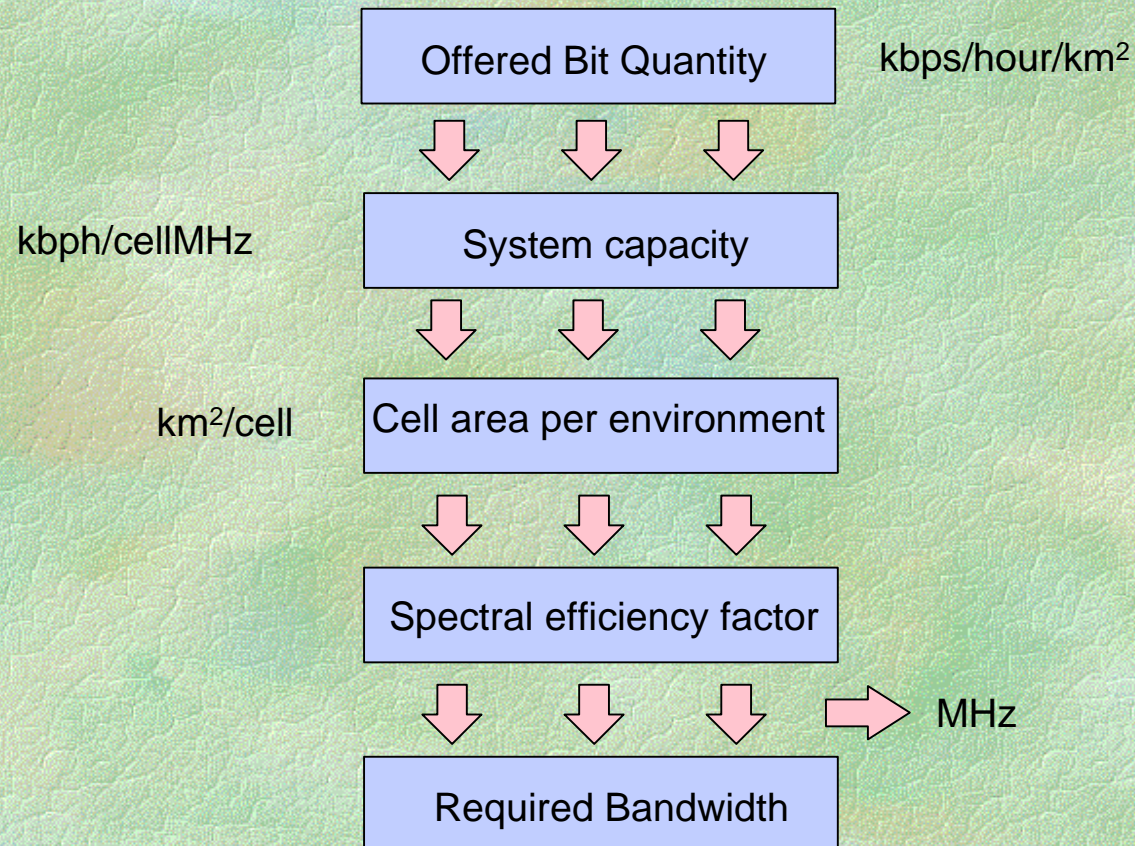
<b>Services</b>	<b>User nominal bit rate [kbit/s]</b>	<b>Effective call duration [s]</b>	<b>User net bit rate [kbit/s]</b>	<b>Coding factor</b>	<b>Asymmetry factor</b>	<b>Service bandwidth* [kbit/s]</b>
High interactive MM	128	144	128	2	1/1	256/256
High MM	2000	53	1509	2	0.005/1	15/3200
Medium MM	384	14	286	2	0.026/1	15/572
Switched data	14	156	14.4	3	1/1	43/43
Simple messaging	14	30	10.67	2	1/1	22/22
Speech	16	60	16	1,75	1/1	28/28

\* The service bandwidth is the product of user nominal bit rate, coding factor and asymmetry factor.

## Second Part - Spectrum Calculation



# Terrestrial Spectrum Calculation Methodology



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## Density of Users per Operating Environment and the Corresponding Cell Types



Operational environments	Density of potential users/km <sup>2</sup>	Cell Type
1.) CBD/Urban(in building)	180 000	Micro/pico
2.) Suburban (in building or on street)	7 200	Macro
3.) Home (in building)	380	Pico
4.) Urban (pedestrian)	108 000	Macro/micro
5.) Urban (vehicular)	2 780	Macro/micro
6.) Rural in- & out-door	36	Macro

## Cell Dimensions per Operating Environment



Operational environments	Sectors per base	Cell radius (km) [2005]	Sectored Hexagon Cell Area (km <sup>2</sup> ) [2005]	Cell radius (km) [2010]	Sectored Hexagon Cell Area (km <sup>2</sup> ) [2010]
1.) CBD/Urban(in building)	3	0.075	0.005	0.075	0.005
2.) Suburban (in building or on street)	3	3	7.79	2.0	3.46
3.) Home (in building)	1	0.02	0.001	0.02	0.001
4.) Urban (pedestrian)	3	0.7	0.424	0.6	0.312
5.) Urban (vehicular)	3	0.7	0.424	0.6	0.312
6.) Rural in- & out-door	3	8	55.43	8	55.4



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## Busy Hour Call Attempts (BHCA)



Services	2005			2010		
	CBD in building	Urban pedestrian	Urban vehicular	CBD in building	Urban pedestrian	Urban vehicular
High interactive MM	0.12	0.06	0.004	0.24	0.12	0.008
High MM	0.12	0.06	0.004	0.12	0.06	0.004
Medium MM	0.12	0.06	0.004	0.12	0.06	0.004
Switched data	0.06	0.03	0.002	0.06	0.03	0.002
Simple messaging	0.06	0.03	0.002	0.06	0.03	0.002
Speech	1	0.6	0.6	1	0.85	0.85

## Result of Terrestrial Spectrum Requirement Calculations



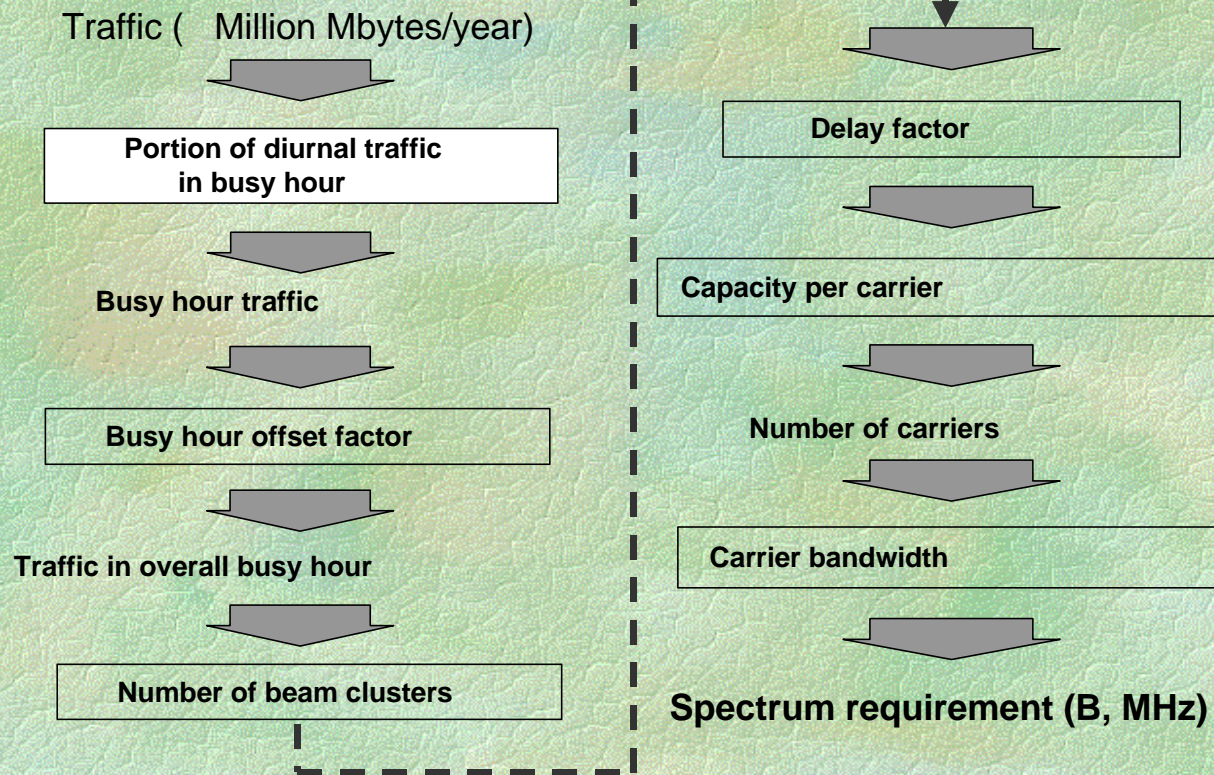
Services	Year 2005	Year 2010
High interactive MM	35 MHz	85 MHz
Medium & high MM	102 MHz	227 MHz
Switched data	14 MHz	10 MHz
Simple messaging	2 MHz	2 MHz
Speech	214 MHz	230 MHz
Total	366 MHz <sup>1</sup>	554 MHz <sup>1</sup>
Total(allowing for spectrum division <sup>2</sup> )	403 MHz	582 MHz

Notes:

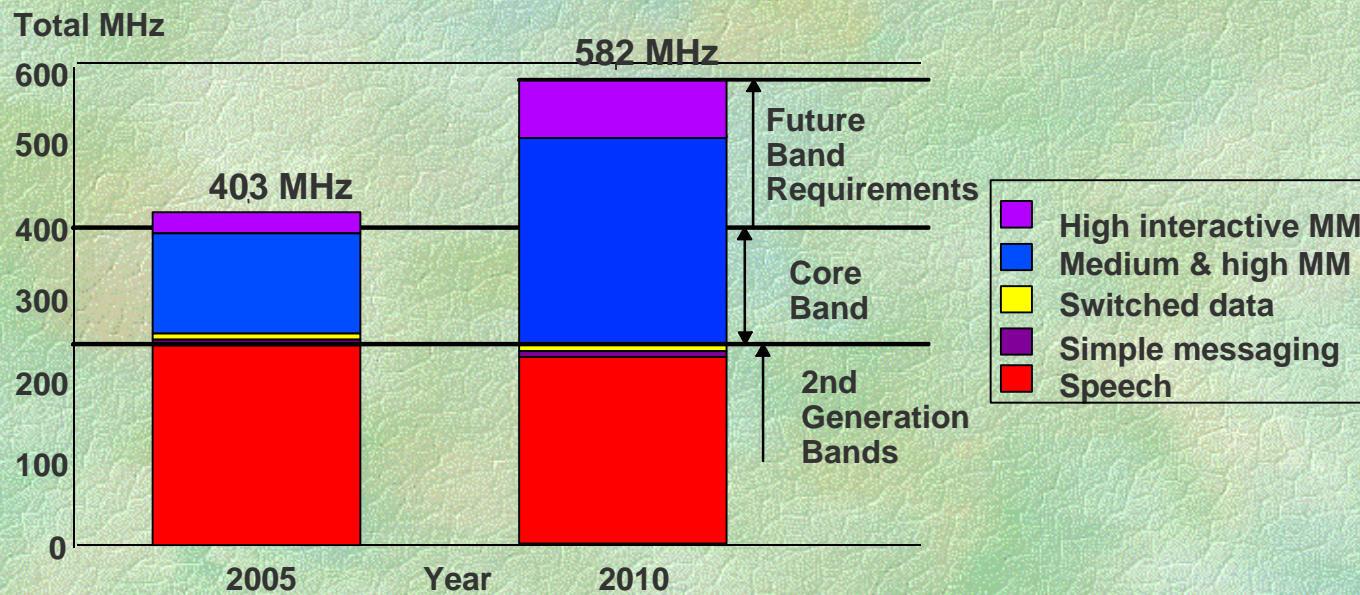
- 1 Includes existing 2<sup>nd</sup> generation spectrum.
- 2 Trunking inefficiency and guard bands must be allowed for, due to multiple operators, and public/private and service category segmentation. This is assumed to improve from 10 % in the year 2005 to 5 % in the year 2010.



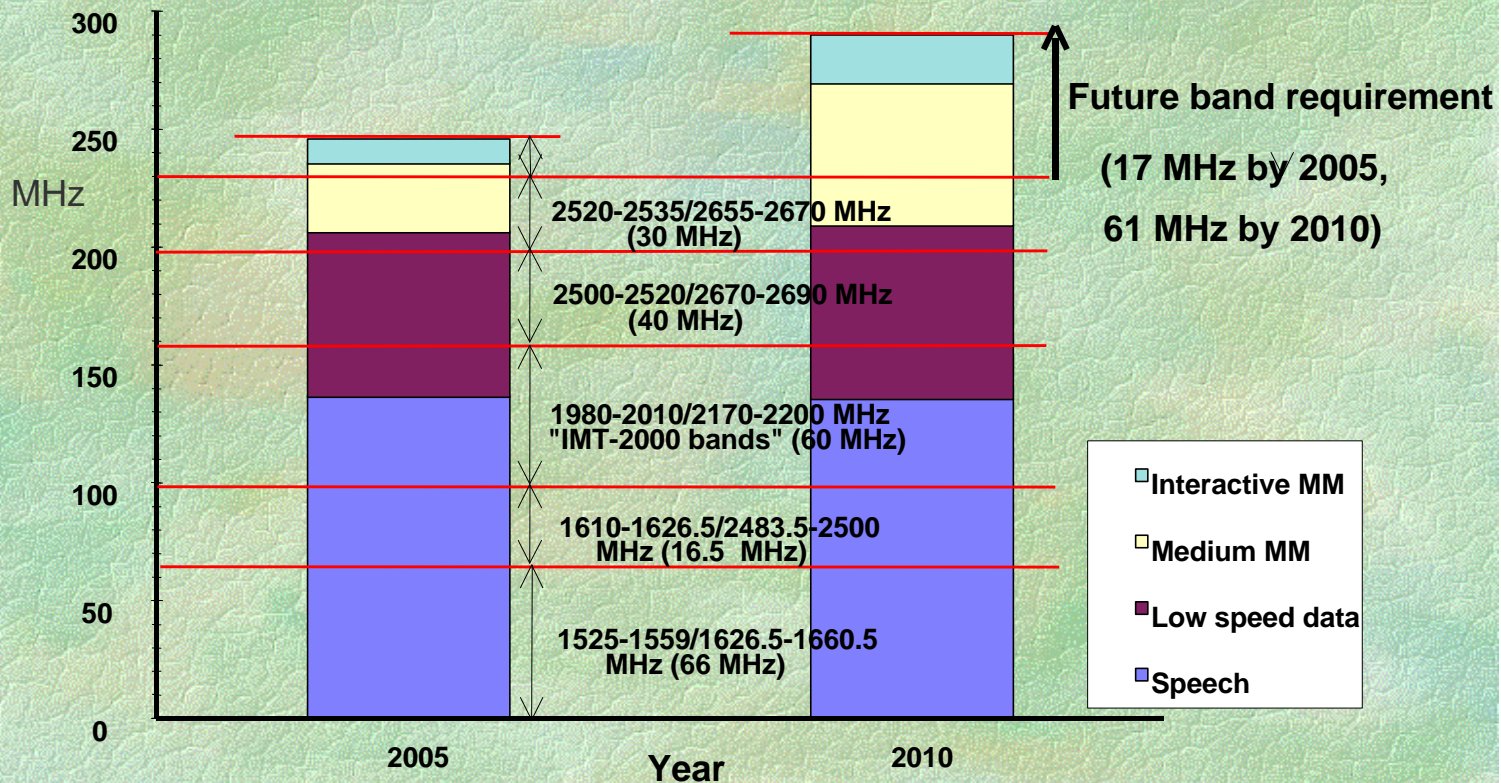
# Satellite Spectrum Calculation Methodology



# Terrestrial Spectrum Estimates for the Years 2005/2010 (EU 15)

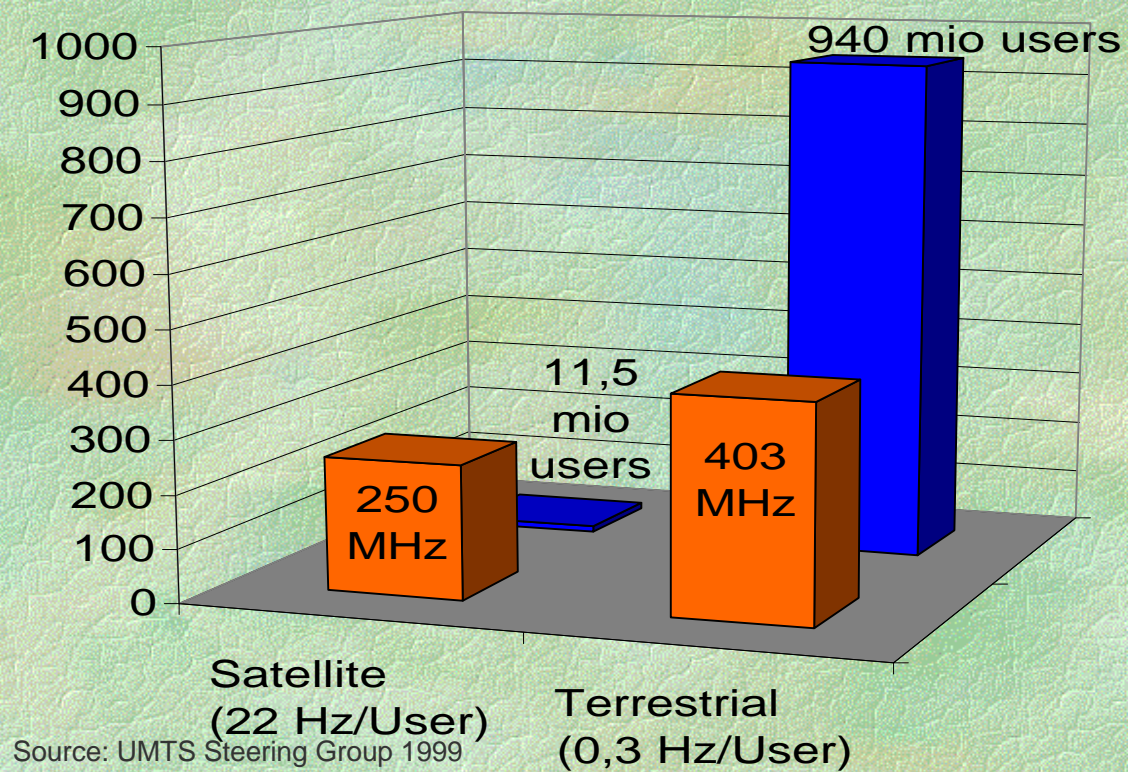


## Satellite Spectrum Estimates for the Years 2005/2010 (EU 15)



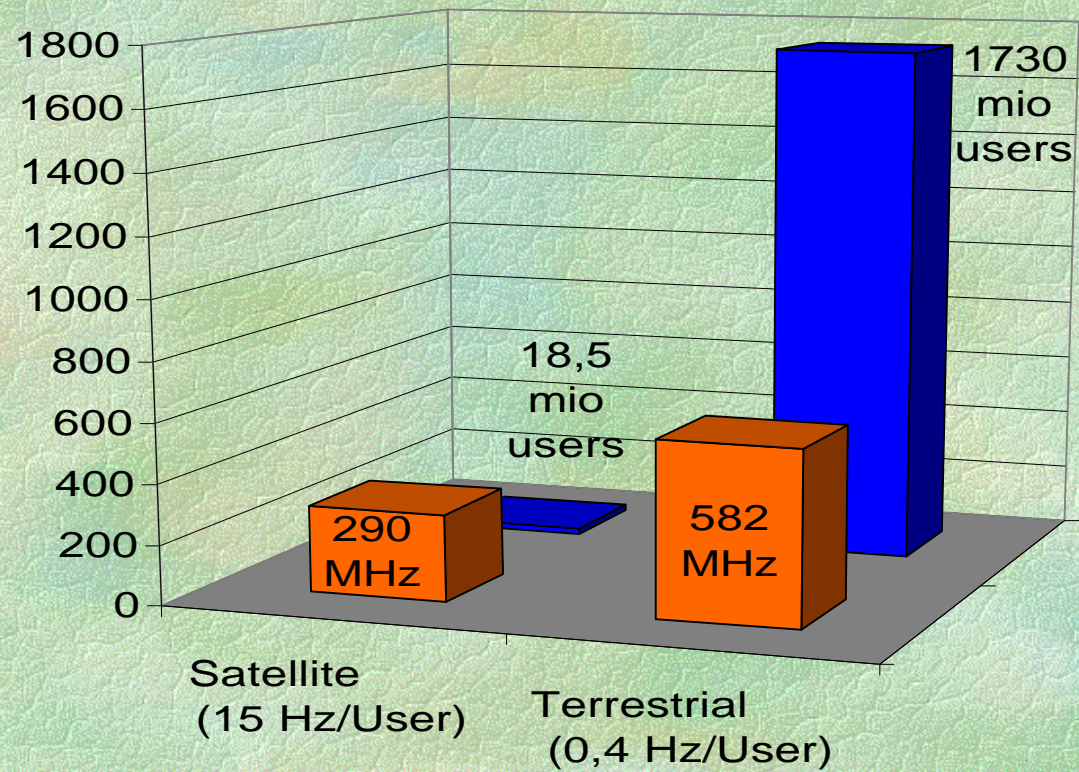
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## Total Spectrum Mobile Services Market Year 2005



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## Total Spectrum Mobile Services Market Year 2010



## Conclusions

**Spectrum Calculations Have Been Based on:  
An Extensive Market Forecast Followed by Rigorous Calculations.**

**Additional Spectrum Requirements for Terrestrial:**

**For Year 2005: 10MHz**

**For Year 2010: 185MHz (EU15 Countries).**

**Or Where Full IMT2000 + GSM900 + 1800 Available: 170MHz**

**Additional requirements for Satellite:**

**For Year 2005: 2x8.5MHz**

**For Year 2010: 2x30.5MHz (Global Hot Spot)**

**Or 2x23.5MHz (EU 15 Countries)**

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## Results So Far



**At March 1999 meeting of the International Telecommunications Union's Task Group 8/1 (ITU TG8/1) in Fortaleza, Brazil, ITU member countries reached consensus on a worldwide additional terrestrial spectrum requirement of 160MHz to support IMT2000 services.**

**UMTS FORUM WELCOMES ITU DECISION ON 3G SPECTRUM - Decision in line with UMTS Forum forecasts to satisfy global demands for the Wireless Information Society.**

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**UMTS Forum spectrum Aspects Group is Working on the  
Identification of Candidate Extension Bands for UMTS.**

**Member states administrations from the European regulatory  
body CEPT are proposing to identify the frequency band  
2520 - 2670 MHz as a global extension band for the  
terrestrial IMT-2000 component.**



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## Next Steps



**ITU World Radio Conference WRC2000**

**To be Held in Turkey**

**To Include a UMTS Demonstrator**

**Concentrating on Services**

**Halina Uryga - France Telecom**

**The Support of the Industry is Requested!**