ITU/BDT Regional Seminar on Broadband Wireless Access for Rural and Remote Areas for CIS, CEE and Baltic Countries Moscow (Russia), 26-29 November 2007

BWA Standards Developed by ETSI BRAN

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ETSI BRAN – Main Areas of Activity
(ETSI Technical Committee Broadband Radio Access Networks)

1. Base specs for interoperable systems
"Interoperable": to ensure communication between devices from different vendors
- PHY and DLC layers for the air interface
- HiperMAN (WiMAX air interface)
- HiperAccess (for backhauling)
- Radio LANs

harmonization

Selected external relations

IEEE 802.16

2. Test specifications
- Protocol conformance testing
- Radio conformance testing
- Networking (by ETSI, tbd)

cooperation

WiMAX Forum
(test specs used for certification)

3. Regulatory Activities
- Harmonized Standards (EN, R&TTE)
- System Reference Documents

MoU

CEPT ECC

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ETSI BRAN - Main Areas (1 of 3)
Interoperable Systems

❑ **Interoperable systems for Broadband Wireless Access (BWA)**
  ➢ **HiperAccess (for cellular and hotspot backhauling)**
  ➢ **HiperMAN (fixed/nomadic wireless-DSL like system, also appropriate for rural and remote areas)**

❑ **Base specifications (PHY layer, DLC layer, management)**

❑ **Test specifications (radio and protocol conformance)**

❑ **International cooperation**
  ➢ **Harmonization with IEEE 802.16**
  ➢ **Co-operation with WiMAX Forum**

❑ **First publications in 2002 (HA) and 2004 (HM)**

Definition of „Interoperability": to ensure communication between devices (base stations, terminals) from different vendors

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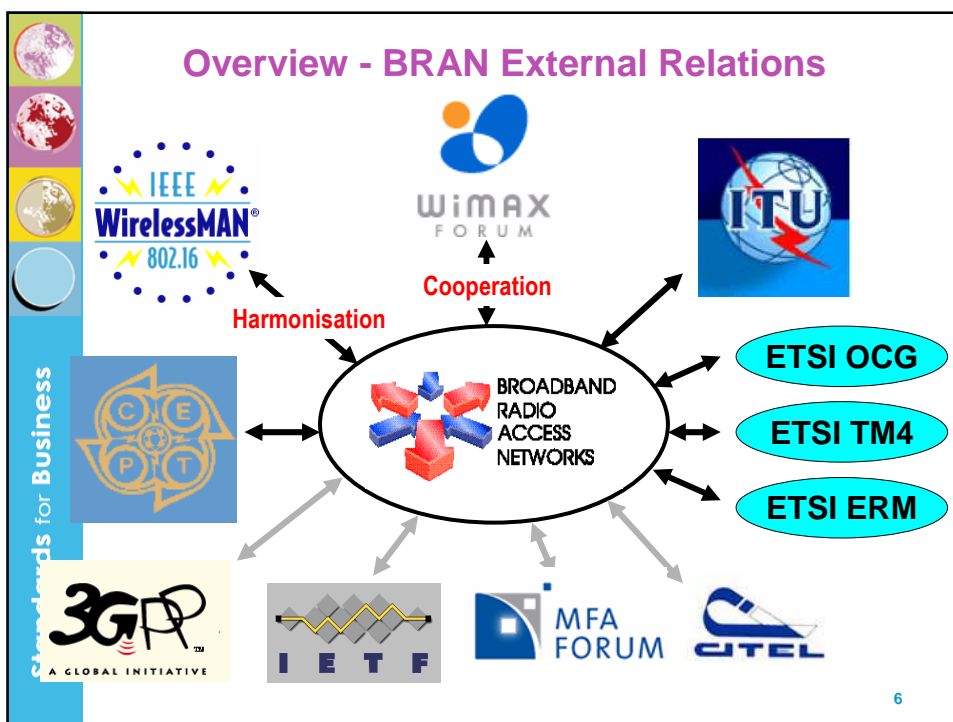# ETSI BRAN - Main Areas (2 of 3)
Testing

❑ **Coverage**
  ➢ **Radio Conformance Testing (RCT)**
  ➢ **Protocol Conformance Testing (PCT)**

❑ **Relevance of Specifications**
  ➢ **Normative part of standard**
  ➢ **Open work approach as for base specs**
  ➢ **Actual testing and certification is left to industry and their fora**

❑ **Good results from using advanced spec methods and languages**

❑ **Work is progressed through STFs (Special Task Force)**
  ➢ **STF funded by ETSI, operating under the guidance of BRAN**
  ➢ **STF led & managed by ETSI CTI (Centre for Testing&Interoperability)**

❑ **Cooperation with Industry Forums (WiMAX)**
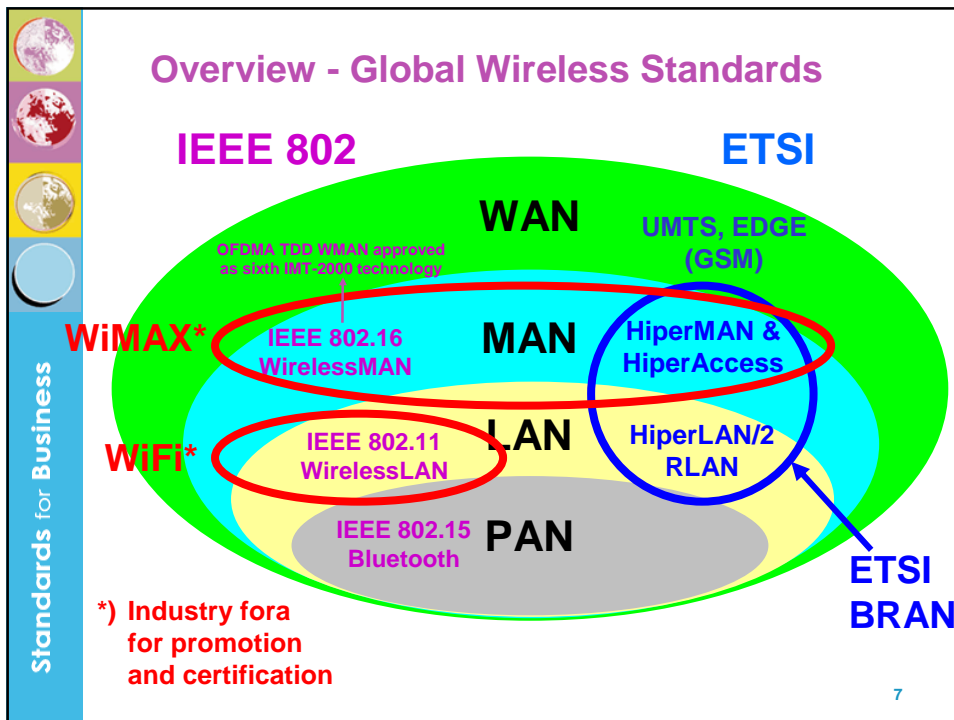 ➢ **Protocol conformance test specs, co-funded by WiMAX Forum**

ETSI BRAN - Main Areas (3 of 3)
Regulatory Activities

❑ **Regulatory competence working group (RCWG)**
  ➢ **Established in 2004, as „horizontal" group**
  ➢ **Coordination of all spectrum related and regulatory issues**
  ➢ **Assistance to regulatory bodies to define spectrum requirements and radio conformance specifications for new broadband radio networks**

❑ **Deliverables**
  ➢ **Development of Harmonised Standards covering essential requirements under article 3.2 of the R&TTE directive (HEN)**
  ➢ **System Reference Documents (SRDoc)**

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Overview - BRAN External Relations

Harmonisation

Cooperation

ETSI OCG

ETSI TM4

ETSI ERM

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Overview - Global Wireless Standards

IEEE 802   **ETSI**

WAN

UMTS, EDGE (GSM)

OFDMA TDD WMAN approved as sixth IMT-2000 technology

WiMAX*   IEEE 802.16 WirelessMAN   **MAN**   HiperMAN & HiperAccess

WiFi*   IEEE 802.11 WirelessLAN   **LAN**   HiperLAN/2 RLAN

IEEE 802.15 Bluetooth   **PAN**

ETSI BRAN

*) Industry fora for promotion and certification

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HiperMAN (1 of 2)
Basic Features

❑ **Includes only OFDM / OFDMA PHY modes**

❑ **HiperMAN 1.2.1 – Harmonized with IEEE 802.16-2004**

❑ **HiperMAN 1.3.2 – Harmonized with IEEE 802.16e-2005**

❑ **HiperMAN 1.4.1 – Harmonized with IEEE 802.16-Corr2/D4**

❑ **PMP and Mesh architecture**

❑ **Optimized for...**

    ➢ **frequency bands below 11 GHz without LOS**

    ➢ **IP traffic**

    ➢ **FDD and TDD**

❑ **Existing profiles: 1.75, 3.5, 7 and 10 MHz bandwidth**

    ➢ **Can be extended up to 28MHz**

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HiperMAN (2 of 2)
Advanced Features

❑ **Large cell size, suitable for Rural/Remote applications**
  ➢ **Up to 50 km with directive antennas**
    • **Beam-forming also supported**
  ➢ **Robust (against high multi-path and interference environments)**
  ➢ **Space-Time coding (2 diversity antennas on BS give 5-7dB)**
  ➢ **Turbo-coding (2.5 dB more)**
  ➢ **Collaborative MIMO (4*4 quadruples efficiency, 2*2 is more economical and gives 7 bit/s/Hz)**
  ➢ **Low power consumption (allows solar batteries)**
❑ **Adaptive modulation and coding (from QPSK to 64-QAM)**
❑ **Achieves 12...18 dB more system gain for same CPE TX power**
❑ **High security TEK encryption algorithms**
❑ **Load balancing between Base Stations**

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ETSI – WiMAX Co-operation Agreement

❑ **Harmonization of test specs… the way towards the agreement**
  ➢ **Both ETSI BRAN and WiMAX Forum started developing their respective protocol conformance test specs**
  ➢ **In September 2004 ETSI BRAN and WiMAX Forum proposed the way to start harmonizing the work and profit from joint efforts**
❑ **Signature of the agreement**
  ➢ **The initial version of the agreement was signed in April 2005**
  ➢ **New amendments covering work agreed for 2006 and 2007**
❑ **By the agreement, ETSI and WiMAX**
  ➢ **… confirmed their common interest to perform and promote standardization towards a global market**
  ➢ **… co-operate for testing and certification, standards development and regulatory activities to provide the necessary spectrum**
❑ **Roles at a glance**
  ➢ **of WiMAX: to control the certification scheme to assure interoperability**
  ➢ **of ETSI: to develop protocol test specs used for certification and to contribute to validation together with test tool vendors and certification labs**

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The HiperMAN / WiMAX Testing Project

❑ **The project reports both to ETSI BRAN and WiMAX Forum**
❑ **Main areas of activity in 2008**
  ➢ **MAC protocol conformance testing (PCT) – started in 2005**
  ➢ **Network conformance testing (NCT) – Work item approved in September 2007**
❑ **Seven experts worked in the team in 2007**
❑ **The project team is led and managed by the ETSI CTI (Centre for Testing & Interoperability)**
❑ **Will continue in 2008 and beyond**
  ➢ **About 1 M€ funding for PCT and NCT in 2008**

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Status of Test Specifications

❑ **HiperMAN1.2.1 / IEEE802.16-2004**
  ➢ **The first WiMAX Forum CERTIFIED products were announced in January 2006.**
  ➢ **As of May 2006, fourteen products have already been certified by independent test labs.**
  ➢ **The second wave is due to start shortly with over 300 test cases for which the validation is being completed**

❑ **HiperMAN1.3.1 / IEEE802.16e-2005 (including Corr1)**
  ➢ **The development and validation of first 200 test cases is ongoing**
  ➢ **The start of wave 1 certification should be Q3 2007**
  ➢ **WiMAX Forum has selected a total of over 500 test cases to be developed and validated this year**

❑ **HiperMAN 1.4.1 / IEEE 202.16-Corr2/D4**
  ➢ **Will be addressed in 2008**

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HiperMAN / WiMAX Testing and ETSI Involvement - Overview

Type of testing	ETSI role
Protocol Conformance Testing (PCT) Network Conformance Testing (NCT)	Both PCT and NCT test specs are developed in TC BRAN through an STF lead and managed by ETSI CTI, joint approval mechanism, joint funding
Radio Conformance Testing (RCT) Interoperability Testing	n/a n/a
…all the above is used for the certification of "WiMAX Forum compliant" devices	n/a (the certification scheme is under full control of WiMAX)
Infrastructure Interoperability Testing (IIOT)	ETSI is developing test scripts covered by a commercial agreement (ETSI TBs are not involved)

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RCWG Overview (1 of 3)

❑ **5 GHz Harmonized EN 301 893 (Radio LAN)**
- ➢ **To be used for European type approval in < 5.725 GHz**
- ➢ **Revisions for higher throughput technologies (MIMO, bonding), latest version is 1.4.1**
- ➢ **Revisions to address reported interference cases into weather radars for 5.250-5.350 and 5.470-5.725 GHz bands are under planning as follows**
  - • **Rev 1.5.1 DFS to detect pulse widths down to 0.8µs and staggered PRF**
  - • **Rev 1.6.1 DFS to detect pulse widths down to 0.5µs**

❑ **Additional reports related to EN 301 891**
- ➢ **TR 102 439 ETSI template for an EN 301 893 test report**
- ➢ **TR 102 741 Voluntary test report form for testing of EN 301 893 v1.4.1 under development**
- ➢ **TR 102 651 Guide to the implementation of Dynamic Frequency Selection (DFS) under development**

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RCWG Overview (2 of 3)

❑ **2.6 GHz Harmonized EN 302544 (Personal broadband systems)**
  ➢ **Under development, intensive discussions since early 2006**
  ➢ **Scope: Broadband Data Transmitting System equipment operating in the frequency range 2500-2690 MHz**
  ➢ **Technology-neutral, mainly addressing mobile WiMAX technology based on IEEE 802.16e-2005 and ETSI BRAN HiperMAN1.3.1.**
  ➢ **Split into four parts (Base station / user equipment, TDD / FDD)**
  ➢ **Main current focus is on TDD**
  ➢ **Considering ECC Dec(05)05**
  ➢ **Liaisons with CEPT ECC PT1 (compatibility studies are considered necessary by some ETSI members to avoid harmful interference to other systems)**
  ➢ **Coordination with ERM/MSG TFES (EN 301 908)**

❑ **SRDoc TR 102 453 (Converged Fixed-Nomadic BWA)**
  ➢ **Part 1 (3.4 - 3.8 GHz) finished, has been used by ECC for the preparation of ECC Dec(07)02**
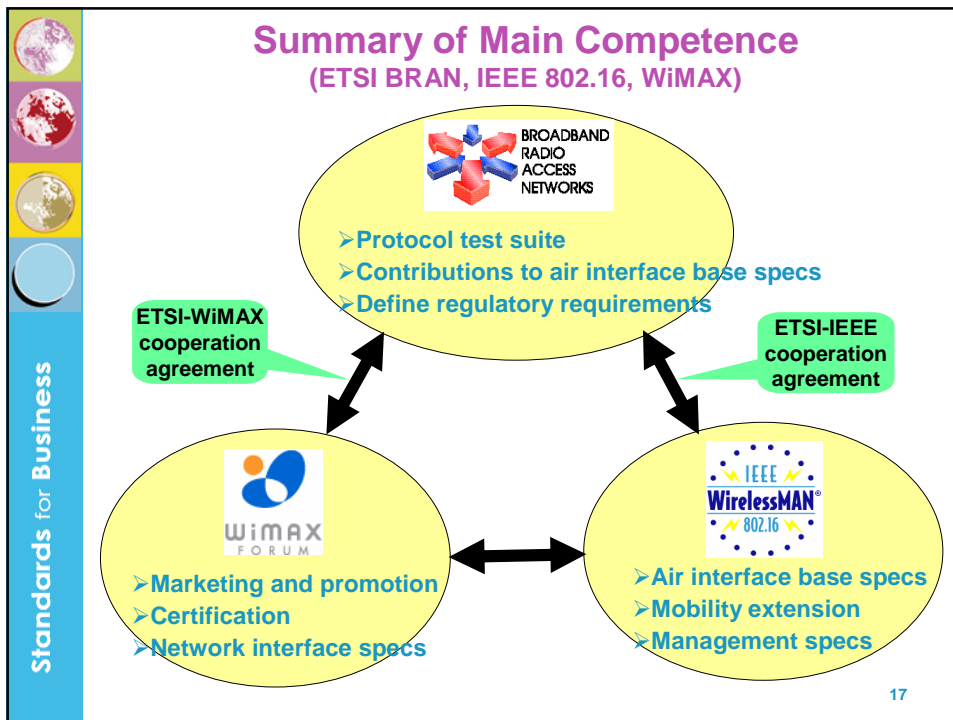 ➢ **Part 2 (< 3.4 GHz, excluding 2.6 GHz, also addressing mobility) under development**

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RCWG Overview (3 of 3)

❑ **SRDoc TR 102 742 (Requirements for mobiles in 3.4 - 3.8 GHz)**
  ➢ **Work started mid 2007**
  ➢ **Related to ECC Dec(07)02**
  ➢ **Perhaps to be continued with an EN in future**

❑ **5.8 GHz Harmonized EN 302 502 (Fixed Wireless Access)**
  ➢ **To be used for European type approval in 5.725 - 5.875 GHz**
  ➢ **DFS features based on EN 301 893**
  ➢ **Revision to relax spectrum mask under development**
  ➢ **Perhaps extension towards mobility in future**

❑ **Wireless Gigabit Systems @ 60 GHz**
  ➢ **Adressing multiple-gigabit short range WPAN systems using directional high gain antennas**
  ➢ **SRDoc TR … was forwarded to ECC WG FM in mid 2006**
  ➢ **Harmonized EN 302 567 under development**

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Summary of Main Competence
(ETSI BRAN, IEEE 802.16, WiMAX)

BROADBAND RADIO ACCESS NETWORKS

➢ Protocol test suite
➢ Contributions to air interface base specs
➢ Define regulatory requirements

ETSI-WiMAX cooperation agreement

ETSI-IEEE cooperation agreement

WiMAX FORUM

➢ Marketing and promotion
➢ Certification
➢ Network interface specs

IEEE WirelessMAN 802.16

➢ Air interface base specs
➢ Mobility extension
➢ Management specs

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Coexistence of Different Technologies

❑ ETSI develops specifications related to WiMAX (and has also a good track record in GSM/UMTS standardization).

❑ ETSI and WiMAX agree to have a common interest in performing and promoting standardization with the aim of global markets.
   ➢ This does not imply that all ETSI members are committed to WiMAX technology or agree on all claimed performance data.
   ➢ ETSI as a regular SDO does not engage in supporting any marketing activities of Industry fora.

❑ There is a trend towards flexible spectrum allocations (remove linkages between technologies, bands & applications)
   ➢ However, the efficient use of spectrum as a scarce resource shall be a top-level objective.
   ➢ Ensure compatibility of different technologies if used in adjacent bands, in particular this applies to the 2.6 GHz band (impact on ETSI HEN, ECC, regulators, etc.)

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Conclusions

- ❑ **Wireless Broadband industry needs GLOBAL standards**
  - ➢ **Drive costs down!!!**

- ❑ **ETSI BRAN supports harmonization efforts with other parallel standardization bodies**

- ❑ **IEEE 802.16 - BRAN co-operation shows**
  - ➢ **What can be achieved**
  - ➢ **How standard bodies can contribute to each other**

- ❑ **WiMAX Forum - BRAN co-operation**
  - ➢ **Important signal to the market**
  - ➢ **ETSI benefits from WiMAX marketing and certification**
  - ➢ **WiMAX Forum benefits from ETSI experience and work approach**

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Thank You!

- ❑ **More details can be found on**
  - ➢ **http://portal.etsi.org/bran/summary.asp**
  - ➢ **http://www.etsi.org/WebSite/Technologies/BWA.aspx**

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