

# ETSI TS 102 210 V1.2.1 (2005-01)

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*Technical Specification*

**Broadband Radio Access Networks (BRAN);  
HIPERMAN;  
System profiles**

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Reference

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## Foreword

This Technical Specification (TS) has been produced by ETSI Project Broadband Radio Access Networks (BRAN).

The present document describes the system profile specifications for High PERFORMANCE Radio Metropolitan Area Network (HiperMAN), which operate on frequencies below 11 GHz. System profiles provide recommended implementations of HiperMAN compliant systems.

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# 1 Scope

The present document specifies the HiperMAN system profiles. System profiles provide recommended implementations of HiperMAN compliant systems. Compliance with the HiperMAN specification does not require compliance with the present document.

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# 2 References

Void.

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# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**Base Station (BS):** generalized equipment consisting of one or more Base Station Controllers and one or more Base Station Transceivers

**guard time:** time at the beginning or end of each burst to allow power ramping up and down

**half duplex:** equipment that cannot transmit and receive at the same time

**Receive-Transmit Transition Gap (RTG):** time to switch from receive to transmit at the BS

**Subscriber Station (SS):** generalized equipment consisting of a Subscriber Station Controller and Subscriber Station Transceiver

**Transmit-Receive Transition Gap (TTG):** time to switch from transmit to receive at the BS

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

$BW$	Nominal channel bandwidth (Hz)
$T_b$	Useful OFDM symbol time (s)
$T_F$	Frame duration (ms)
$T_g$	OFDM symbol guard time or CP time (s)
$T_s$	OFDM symbol time (s)

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAS	Adaptive Antenna System
AES	Advanced Encryption Standard
ARQ	Automatic Repeat Request
BER	Bit Error Rate
BPSK	Binary Phased Shift Keying
BS	Base Station
BW	BandWidth
CBC	Cipher Block Chaining
CCM	CORBA Component Model

CID	Connection IDentifier
CP	Cyclic Prefix
CRC	Cyclic Redundancy Check
DES	Data Encryption Standard
DFS	Dynamic Frequency Selection
DHCP	Dynamic Host Configuration Protocol
DLC	Data Link Layer
FDC	Frame Duration Code
FDD	Frequency Division Duplexing
H-FDD	Half duplex Frequency Division Duplexing
HM	HiperMAN
PHY	Physical layer
PMP	Point to Multi Point
QPSK	Quadrature Phase Shift Keying
RSA	Rivest, Shamir and Adleman
RTG	Receive / Transmit transition Gap
Rx	Receive
SNMP	Simple Network Management Protocol
SS	Subscriber Station
TDD	Time Division Duplexing
TFTP	Trivial File Transfer Protocol
TTG	Transmit / receive Transition Gap
Tx	Transmit

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## 4 System profiles

A system profile consists of four components: a DLC profile, a PHY profile, a duplexing selection (FDD and/or TDD) and a power class selection. A system may implement multiple profiles of each component.

### 4.1 DLC profiles

#### 4.1.1 Basic packet PMP DLC profile

Profile identifier: prof\_HM\_DLC\_PMP.

Table 1 lists the optional DLC features and whether their implementation is required to comply with this profile.

**Table 1: Optional feature requirements prof\_HM\_DLC\_PMP**

Feature	Required?	Conditions / Notes
Packet convergence sublayer	Yes	
Payload header suppression	No	
Ipv4 over Ethernet	Yes	
Ethernet	Yes	
ATM convergence sublayer	No	
Provisioned connections	No	
Classification of packets on incoming physical port	No	
Multicast polling groups		
Multicast polling	Yes	
CRC functionality	Yes	Elective per connection
Dynamic services	Yes	
Unsolicited grant service functionality	No	
Real-Time Polling services	No	
Best effort services	Yes	
Non-Real-Time Polling services	Yes	
Crytographic suites:		
No data encryption, no data authentication and 3-DES with 128 bit key	No	
CBC-Mode 56 bit DES, no data authentication and 3-DES with 128 bit key	Yes	
No data encryption, no data authentication and RSA with 1 024 bit key	No	
CBC-Mode 56 bit DES, no data authentication and RSA with 1 024 bit key	No	
AES CCM-Mode, no data authentication and AES with 128-bit key	No	
Undecodable initial ranging feature	Conditional	Required for SS Not required for BS
ARQ	No	If used, a minimum of 8 simultaneous ARQ connections shall be supportable.
Mesh	No	If supported, apply prof_HM_DLC2
AAS	No	
BS capability for support of manageable SS (creating secondary management connections, DHCP, TFTP, SNMP, etc.)	Yes	

#### 4.1.2 Basic packet Mesh DLC profile

Profile identifier: prof\_HM\_DLC\_Mesh.

This profile shall only be used in combination with TDD duplexing.

Table 2 lists the optional DLC features and whether their implementation is required to comply with this profile.

Table 2: Optional feature requirements prof\_HM\_DLC\_Mesh

Feature	Required?	Conditions / Notes
Prof_HM_DLC1 for packet PMP	Yes	
Packet convergence sublayer	Yes	
Payload header suppression	No	
Ipv4 over Ethernet	Yes	
Ethernet	Yes	
ATM convergence sublayer	No	
Support of PVCs		
VC switched connections		
VP switched connections		
Provisioned connections	No	
Multicast polling groups		
Multicast polling	N/A	
CRC functionality	Yes	Elective per connection
Dynamic services	No	
Unsolicited grant service functionality	N/A	
Real-Time Polling services	N/A	
Best effort services	Yes	
Non-Real-Time Polling services	N/A	
ryptographic suites:		
No data encryption, no data authentication and 3-DES with 128 bit key	No	
CBC-Mode 56 bit DES, no data authentication and 3-DES with 128 bit key	Yes	
No data encryption, no data authentication and RSA with 1 024 bit key	No	
CBC-Mode 56 bit DES, no data authentication and RSA with 1 024 bit key	No	
AES CCM-Mode, no data authentication and AES with 128-bit key	No	
Undecodable initial ranging feature	N/A	
ARQ	Yes	
AAS	No	
DFS	Conditional	Required when intended for license exempt bands. Not required when intended for licensed bands.

Support of ARQ functionality is mandatory as a capability, but may be turned on or off on a per packet basis. ARQ shall be used when the reliability bit in the Mesh CID is set to 1, and shall not be used otherwise. ARQ parameters shall be set to:

- ARQ Window Size =  $64_{DEC}$ .
- ARQ Retry Timeout =  $\lceil 2T_F \rceil_{DEC}$ , with  $T_F$  the PHY dependent frame duration in  $\mu s$ .
- ARQ Fragment Lifetime =  $\lceil T_F / 2 \rceil_{DEC}$ , with  $T_F$  the PHY dependent frame duration in  $\mu s$ .
- ARQ RX Purge Time Timeout =  $\lceil 2T_F \rceil_{DEC}$ , with  $T_F$  the PHY dependent frame duration in  $\mu s$ .
- ARQ Sync Loss Timeout = 0.
- ARQ Deliver in Order = 0.



## 4.2 PHY profiles

Table 3 lists the common minimum performance requirements with which all PHY profiles shall comply.

**Table 3: Minimum performance requirements**

Capability	Minimum performance
Tx Dynamic range BS SS SS with sub-channelization	≥ 10 dB ≥ 30 dB ≥ 50 dB
Tx Power Level minimum adjustment step	≤ 1 dB
Tx Power Level minimum relative step accuracy	≤ ±50 % of step size, but not more than 4 dB
Tx Spectral flatness Absolute difference between adjacent carriers: Deviation of average energy in each carrier from the measured energy averaged over all 200 active tones: Carriers -50 to -1 and +1 to +50: Carriers -100 to -50 and +50 to +100:	≤ 0,1 dB ≤ ±2 dB ≤ +2 dB / -4 dB
Spectral mask (OOB)	Local regulation
Tx relative constellation error: BPSK-1/2 QPSK-1/2 QPSK-3/4 16QAM-1/2 16QAM-3/4 64QAM-2/3 64QAM-3/4	≤ -13,0 dB ≤ -16,0 dB ≤ -18,5 dB ≤ -21,5 dB ≤ -25,0 dB ≤ -28,5 dB ≤ -31,0 dB
Rx max. input level on-channel reception tolerance	≥ -30 dBm
Rx max. input level on-channel damage tolerance	≥ 0 dBm
Input Intercept Point	≥ -10 dBm
Adjacent channel rejection at BER = 10 <sup>-6</sup> for 3 dB degradation C/I 16QAM-3/4 64QAM-3/4	≥ 11 dB ≥ 4 dB
Non-adjacent channel rejection at BER = 10 <sup>-6</sup> for 3 dB degradation C/I 16QAM-3/4 64QAM-3/4	≥ 30 dB ≥ 23 dB
Out of band signal immunity $ f_{\text{blocker}} - f_{\text{signal}}  < 100 \text{ MHz}$  $100 \text{ MHz} <  f_{\text{blocker}} - f_{\text{signal}}  < 1 \text{ GHz}$ $1 \text{ GHz} <  f_{\text{blocker}} - f_{\text{signal}} $	Idem to non-adj. Channel rejection ≥ -30 dBm, ≥ 20 dB ≥ -10 dBm, ≥ 30 dB
Spurious emissions 30 MHz to 1 GHz (measurement BW: 100 kHz) 1 GHz to 26,5 GHz (measurement BW: 1 MHz)	≤ -57 dBm ≤ -50 dBm
TTG and RTG (TDD only)	≤ 50 μs
SSTTG and SSRTG	TDD ≤ 50 μs H-FDD ≤ 100 μs
Reference frequency tolerance BS Mesh system (TDD only)	≤ ±8 ppm ≤ ±20 ppm

### 4.2.1 1 MHz channelization PHY profile

Profile identifier: prof\_HM\_PHY1.75.

Mandatory features:

- Licensed band usage only.
- Channel bandwidth  $BW = 1,75$  MHz.
- Use with PMP only. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.

Systems implementing prof\_HM\_PHY1.75 shall meet the minimum performance requirements listed in table 4.

**Table 4: Minimum performance requirements for prof\_HM\_PHY1.75**

Capability	Minimum performance
$T_b$	= 128 $\mu$ s
BER performance threshold, BER= $10^{-6}$	
BPSK-1/2	$\leq -94$ dBm
QPSK-1/2	$\leq -91$ dBm
QPSK-3/4	$\leq -89$ dBm
16QAM-1/2	$\leq -84$ dBm
16QAM-3/4	$\leq -82$ dBm
64QAM-2/3	$\leq -77$ dBm
64QAM-3/4	$\leq -76$ dBm
Reference frequency tolerance	
SS to BS synchronization tolerance	$\leq 156,25$ Hz
Reference time tolerance	$\pm(T_b/32) / 2$
$T_g / T_b$	BS shall be capable of using at least one allowed value. SS shall be capable of detecting and using entire set of allowed values.

### 4.2.2 3 MHz channelization PHY profile

Profile identifier: prof\_HM\_PHY3.5.

Mandatory features:

- Licensed band usage only.
- Channel bandwidth  $BW = 3,5$  MHz.
- FDC set for mesh: {1}. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.

Systems implementing prof\_HM\_PHY3.5 shall meet the minimum performance requirements listed in table 5.

**Table 5: Minimum performance requirements for prof\_HM\_PHY3.5**

Capability	Minimum performance
$T_b$	= 64 $\mu$ s
BER performance threshold, BER= $10^{-6}$ BPSK-1/2 QPSK-1/2 QPSK-3/4 16QAM-1/2 16QAM-3/4 64QAM-2/3 64QAM-3/4  Threshold change of subchannelization used	 $\leq -91$ dBm $\leq -88$ dBm $\leq -86$ dBm $\leq -81$ dBm $\leq -79$ dBm $\leq -74$ dBm $\leq -73$ dBm  $10 \log(N_{subchannels}/16)$
Reference frequency tolerance SS to BS synchronization tolerance Mesh to Mesh synchronization tolerance (TDD only)	 $\leq 312,5$ Hz $\leq 468,75$ Hz
Reference time tolerance	$\pm(T_b/32) / 2$
$T_g / T_b$	BS shall be capable of using at least one allowed value. SS shall be capable of detecting and using entire set of allowed values.

### 4.2.3 7 MHz channelization PHY profile

Profile identifier: prof\_HM\_PHY7.

Mandatory features:

- Licensed band usage only.
- Channel bandwidth  $BW = 7$  MHz.
- FDC set for mesh:{1}. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.

Systems implementing prof\_HM\_PHY7 shall meet the minimum performance requirements listed in table 6.

**Table 6: Minimum performance requirements for prof\_HM\_PHY3**

Capability	Minimum performance
$T_b$	= 32 $\mu$ s
BER performance threshold, BER= $10^{-6}$ BPSK-1/2 QPSK-1/2 QPSK-3/4 16QAM-1/2 16QAM-3/4 64QAM-2/3 64QAM-3/4  Threshold change if subchannelization used	$\leq -88$ dBm $\leq -85$ dBm $\leq -83$ dBm $\leq -78$ dBm $\leq -76$ dBm $\leq -71$ dBm $\leq -70$ dBm  $10 \log(N_{subchannels}/16)$
Reference frequency tolerance SS to BS synchronization tolerance Mesh to Mesh synchronization tolerance (TDD only)	$\leq 625$ Hz $\leq 937,5$ Hz
Reference time tolerance	$\pm(T_b/32) / 2$
$T_g/T_b$	BS shall be capable of using at least one allowed value. SS shall be capable of detecting and using entire set of allowed values.

#### 4.2.4 10 MHz channelization PHY profile

Profile identifier: prof\_HM\_PHY10.

Mandatory features:

- License-exempt band usage only.
- Channel bandwidth  $BW = 10$  MHz.
- TDD operation.
- BS shall select Frame duration from code set PMP:{2, 4, 6}, Mesh:{1}. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.
- DFS capability.
- Ability to detect primary users with received signal strength in excess of -67 dBm.
- Ability to switch channel within 10 s.

Systems implementing prof\_HM\_PHY10 shall meet the minimum performance requirements listed in table 6.

Table 7: Minimum performance requirements for prof\_HM\_PHY3

Capability	Minimum performance
$T_b$	= 22 146 / 357 $\mu$ s
Spectral mask (IB):  $f_0 \pm 0$ MHz $f_0 \pm 4,75$ MHz $f_0 \pm 5,45$ MHz $f_0 \pm 9,75$ MHz $f_0 \pm 14,75$ MHz	Linear interpolation between points: 0 dBr 0 dBr -25 dBr -32 dBr -50 dBr
BER performance threshold, BER= $10^{-6}$ BPSK-1/2 QPSK-1/2 QPSK-3/4 16QAM-1/2 16QAM-3/4 64QAM-2/3 (If 64QAM supported) 64QAM-3/4 (if 64QAM supported)  Threshold change if subchannelization used	$\leq -86$ dBm $\leq -83$ dBm $\leq -81$ dBm $\leq -76$ dBm $\leq -74$ dBm $\leq -69$ dBm $\leq -68$ dBm  $10 \log(N_{subchannels}/16)$
Reference frequency tolerance SS to BS synchronization tolerance Mesh to Mesh synchronization tolerance (TDD only)	$\leq 892,5$ Hz $\leq 1\,339$ Hz
Reference time tolerance	$\pm (T_b/32) / 2$
$T_g / T_b$	BS shall be capable of using at least one allowed value. SS shall be capable of detecting and using entire set of allowed values.

### 4.3 Duplexing selection

A system shall implement TDD and/or FDD. A FDD SS system may be implemented as half-duplex. A FDD BS system must respect the half-duplex nature of half-duplex SSs.

### 4.4 Power class profiles

Table 8 lists the defined power classes. A power class is defined as the maximum mean transmit power  $P_{TX,max}$  using all non-guard carriers for which all transmitter requirements are met.

Table 8: Power classes

Class	Minimum performance
Prof_HM_PC0-14	$P_{TX,max} < 14$ dBm
Prof_HM_PC14-17	$14 \text{ dBm} \leq P_{TX,max} < 17$ dBm
Prof_HM_PC17-20	$17 \text{ dBm} \leq P_{TX,max} < 20$ dBm
Prof_HM_PC20-23	$20 \text{ dBm} \leq P_{TX,max} < 23$ dBm
Prof_HM_PC23	$P_{TX,max} \geq 23$ dBm

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## Annex A (informative): Bibliography

ETSI TS 102 177: "Broadband Radio Access Networks (BRAN); HIPERMAN; Physical layer".

ETSI TS 102 178: "Broadband Radio Access Networks (BRAN); HIPERMAN; Data Link Control (DLC) layer".

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## History

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