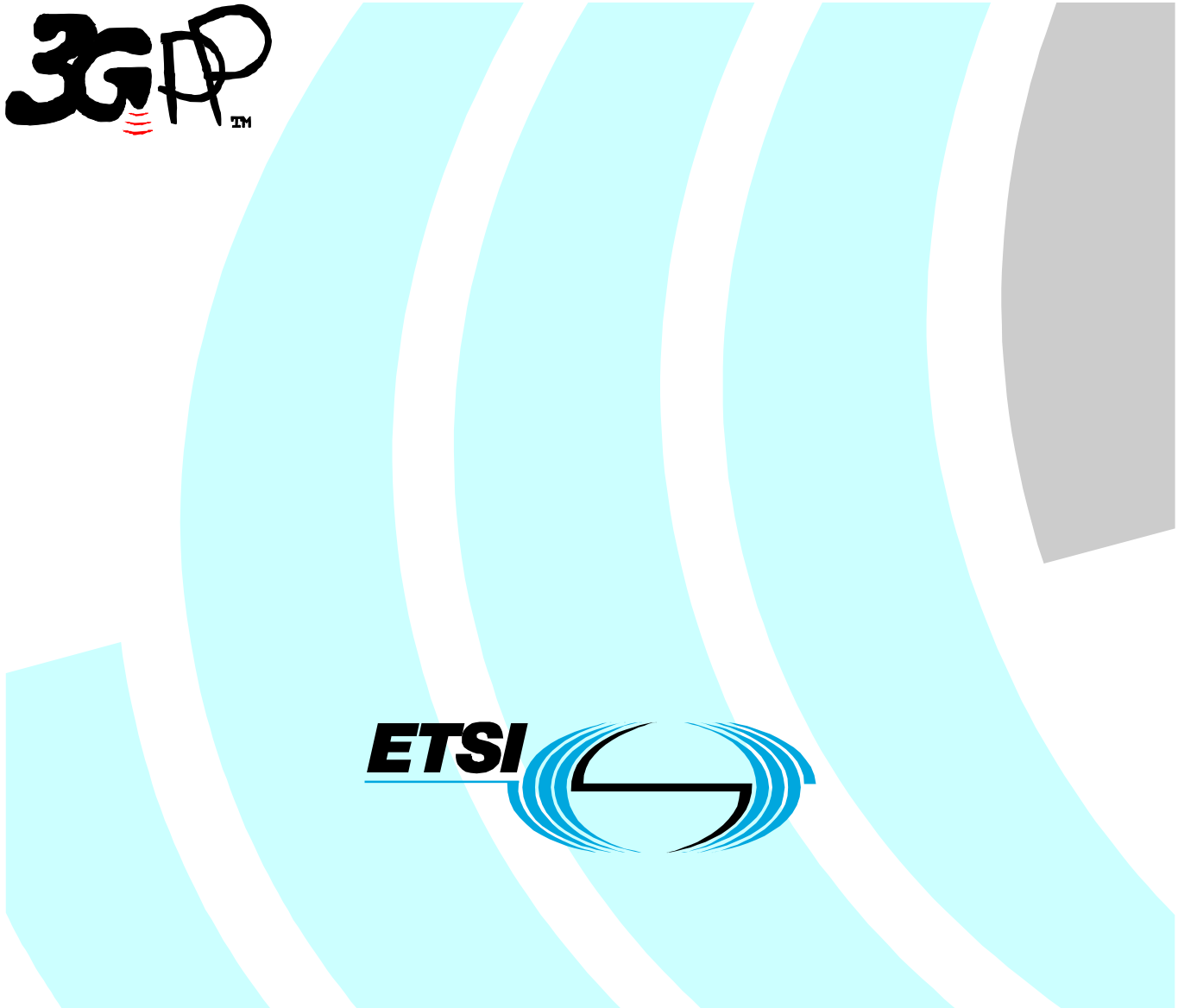
ETSI TS 125 461 V6.2.0 (2005-03)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
UTRAN Iuant interface: Layer 1
(3GPP TS 25.461 version 6.2.0 Release 6)



Reference
RTS/TSGR-0325461v620

Keywords
UMTS

ETSI

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Foreword

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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Version x.y.z

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  - 1 presented to TSG for information;
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  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the standards allowed to implement layer 1 on the Iuant interface.

The specification of transmission delay requirements and O&M requirements are not in the scope of the present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 25.462: "UTRAN Iuant interface: Signalling transport".

[2] ISO/IEC 8482 (1993): "Information technology - Telecommunications and information exchange between systems - Twisted pair multipoint interconnections".

[3] TIA/EIA TSB89: 'Application guidelines for TIA/EIA-485-A'.

3 Definitions and abbreviations

3.1 Definitions

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

On-Off-Keying: A modulation system in which a carrier is switched between two states, ON and OFF.

Common feeder cable: Feeder cable where some antenna line devices (e.g. RET, TMA) are connected via the same feeder cable.

3.2 Abbreviations

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

BS	Base Station
DC	Direct Current
DL	Downlink
FDD	Frequency Division Duplex
ISB	Idle-State Biasing
OOK	On-Off-Keying
RET	Remote Electrical Tilting
RF	Radio Frequency
TMA	Tower Mounted Amplifier
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access

4 Iuant layer 1

4.1 General

There are two layer 1 options:

- RS485 option: A screened multicore cable, which supports a conventional RS485 serial multi-drop bus.
- Modem option: A connection to a RET control unit by way of a coaxial cable which is shared with DC supply and RF signals.

Both layer 1 options support the connection of two-way serial data and DC power to the RET antenna device.

At least one of these two layer 1 options shall be supported.

The default data rate for both layer 1 options shall be 9.6 kbps. Higher data rates of 38.4 kbps for both layer 1 options and 115.2 kbps only for the RS485 layer 1 option may optionally be supported. Each unit communicates on one of the three data rates, but different units on the same interface may use different data rates.

After a reset, a secondary station shall alternate between supported data rates. When alternating between data rates, the data rate shall be held constant for 300 ms. After every correctly received device scan command (see [1]) independent of whether it matches or not, at one of the supported data rates, that data rate shall be held constant for 1.5 seconds. After successful reception of an address assignment frame, the secondary station shall use that data rate until it is reset.

Data rates:

- 9.6 kbps ± 3 %
- 38.4 kbps ± 3 %
- 115.2 kbps ± 3 %

The format of the data octet shall be as shown in figure 4.1.1:

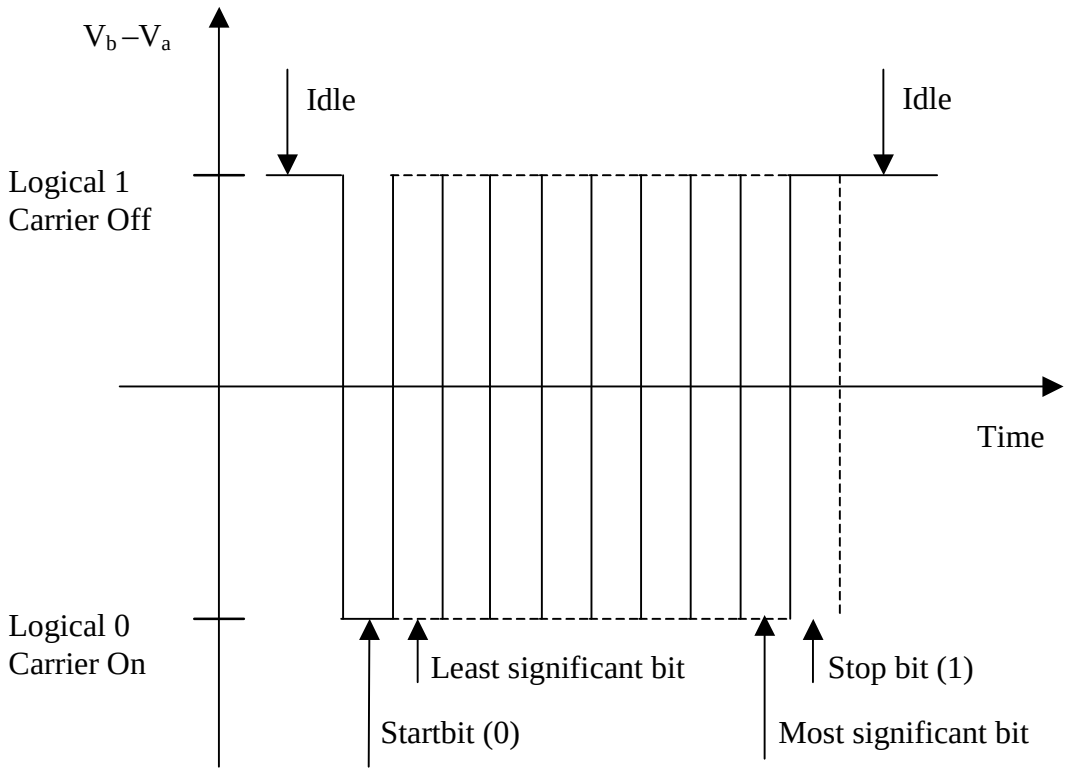

Figure 4.1.1: Format and order of transmitted data

4.2 RS485 option

This option is constituted by a two wire bi-directional multi-drop configuration conforming to [2]. The mapping of mark/space to logical one and zero as referred to in [2] shall be according to figure 4.1.1.

The use of ISB, also called idle-line failsafe in [3], is mandatory. The bias voltages shall be applied only by the primary station to any separate RS485 bus. The polarity of the idle-state bias is defined as a transmitted 1.

The RS485 transmitter shall be set to drive the bus before the first start bit is sent and held active until the last stop bit is sent. The RS485 transmitter shall stop driving the bus within 20 bit-times after the last stop bit is sent.

If a RET modem is used ISB shall be implemented by the RET modem.

4.3 Modem option

The connection to a RET control unit by way of a coaxial cable which is shared with DC supply and RF signals is provided by two modems, a BS modem and a RET modem. The BS modem shall be either connected to the antenna connector of the BS or integrated in the BS. It provides signal transmission to the RET modem and signal reception from the RET modem over the antenna feeder cable. The RET modem is located between the antenna feeder cable and the antenna. Modem configurations and reference points for modem characteristics are specified in figure 4.3.1 and figure 4.3.2. Unless otherwise stated, requirements in this section apply to both BS modem and RET modem.

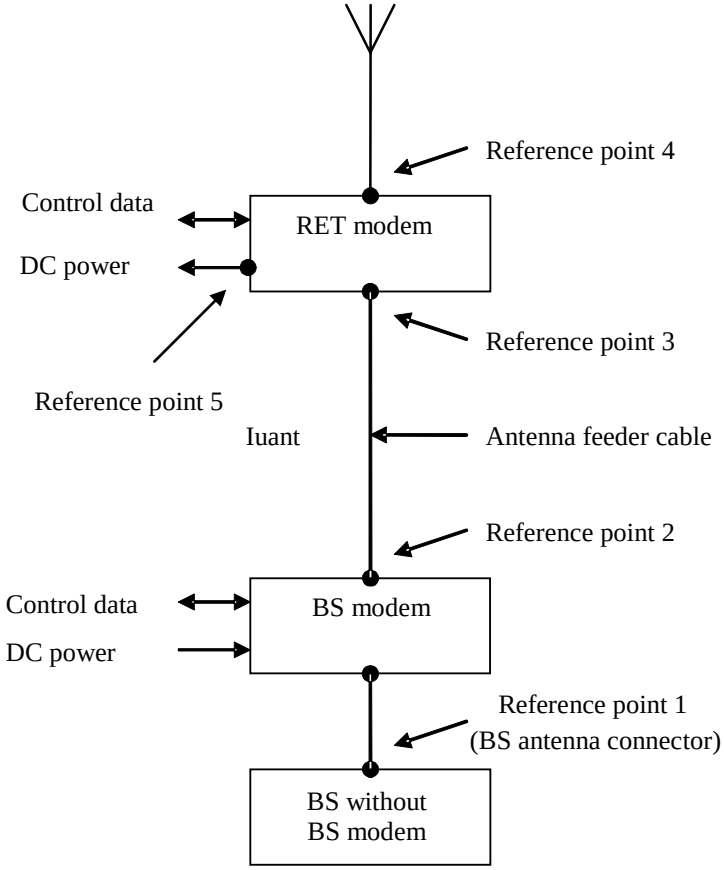

Figure 4.3.1: Modem configuration and modem reference points for a BS without BS modem

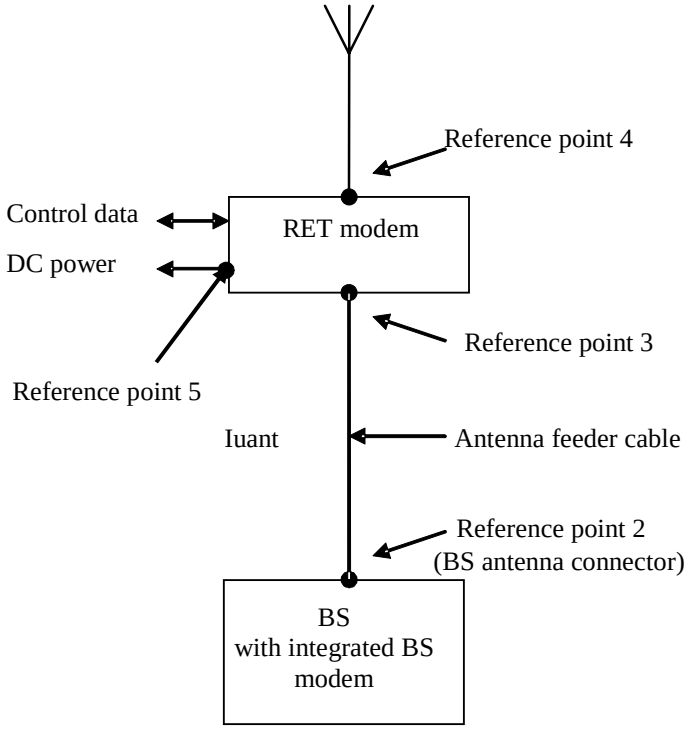

Figure 4.3.2: Modem configuration and modem reference points for a BS with integrated BS modem

4.3.1 Interference with existing systems

The modem circuit shall be capable of managing its transmitting characteristic according to subclause 4.3.5.

4.3.1.1 Carrier frequency and frequency stability

The following carrier frequency shall be used for this application:

2.176 MHz ± 100 ppm

4.3.1.2 Modem isolation and modem emissions

The BS modem shall provide at least 41 dB attenuation for frequencies below 400 MHz between reference point 2 and reference point 1 to protect the BS from emissions of the RET modem.

BS modem emissions at reference point 1 for frequencies below 400 MHz shall be at least 41 dB below the levels specified for the modem spectrum emission mask in subclause 4.3.4.2 to protect the BS from emissions of the BS modem.

The RET modem shall provide at least 41 dB attenuation for frequencies below 400 MHz between reference point 3 and reference point 4 to protect other radio systems from emission of the BS modem.

RET modem emissions at reference point 4 for frequencies below 400 MHz shall be at least 41 dB below the levels specified for the modem spectrum emission mask in subclause 4.3.4.2 to protect other radio systems from emission of the RET modem.

4.3.1.3 Modem intermodulation attenuation

BS modem and RET modem shall provide intermodulation attenuation of [TBD] at a interferer level of [TBD].

4.3.2 Recovery time

A minimum recovery time shall be allowed between receiving and transmitting messages on the bus. For this reason a minimum permitted response time is specified in subclause 4.5 in [1].

4.3.3 Impedance

The modem transceiver shall provide constant impedance in both transmitting and receiving modes:

- Nominal impedance Z_0: 50 Ω;
- Return loss at nominal modem carrier frequency > 6 dB;
- Return loss in external BS and RET modem operating bands > 20 dB.

4.3.4 Modulator characteristics

4.3.4.1 Levels

ON-Level: +3 dBm ± 2 dB

OFF-Level: ≤ -40 dBm

4.3.4.2 Spectrum emission mask

The modem spectrum emission mask is specified in figure 4.3.4.2.1. Intermediate values may be obtained by linear interpolation between the points shown. The corresponding measurement bandwidths are specified in table 4.3.4.2.1. For modem configurations according to figure 4.3.1 the BS modem shall meet the spectrum emission mask at reference point 2. For modem configurations according to figure 4.3.2 the BS with integrated BS modem shall meet the spectrum emission mask at reference point 2 only for frequencies below 400 MHz. RET modems shall meet the spectrum emission mask at reference point 3.

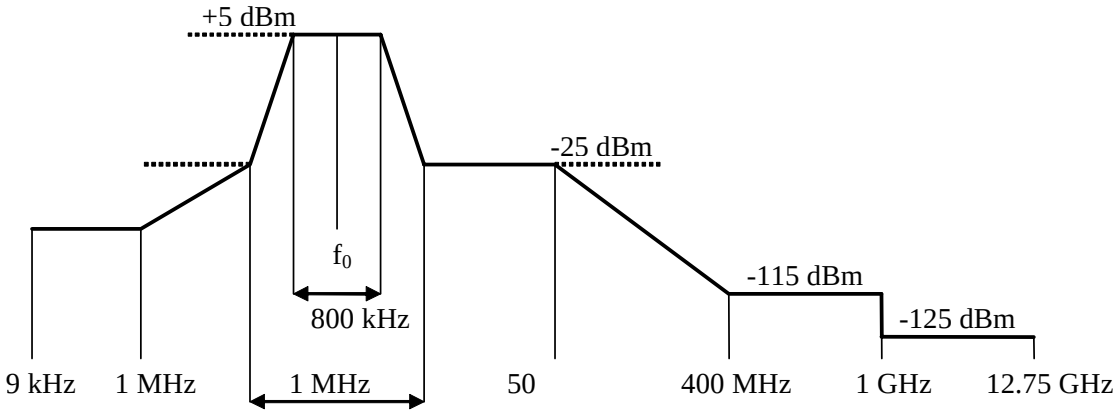

Figure 4.3.4.2.1: Modem spectrum emission mask.

Table 4.3.4.2.1: Modem spectrum emission mask measurement bandwidth

Band	Measurement Bandwidth
9 kHz - 150 kHz	1 kHz
150 kHz - 30 MHz	10 kHz
30 MHz - 1 GHz	100 kHz
1 GHz - 12.75 GHz	1 MHz

4.3.5 Demodulator characteristics

The demodulator shall fulfil the requirement in subclause 4.3.6 for a carrier ON-Level within +5 dBm to -12 dBm and a carrier OFF-Level less than -18 dBm. The levels within –12 dBm to –18 dBm are undefined.

4.3.6 Duty cycle variation

In order to guarantee proper transmission of data bits through the processes of modulation and demodulation, the following limit shall be met for the duty cycle variation:

$\Delta DC_{SYSTEM} = |DC_{RX} - DC_{TX}| \leq 10\ \%$

Where: ΔDC_{SYSTEM} is the difference between the duty cycles of the transmitted and received bit streams,

DC_{TX} = Duty cycle for the input bit stream, and

DC_{RX} = Duty cycle for the output bit stream.

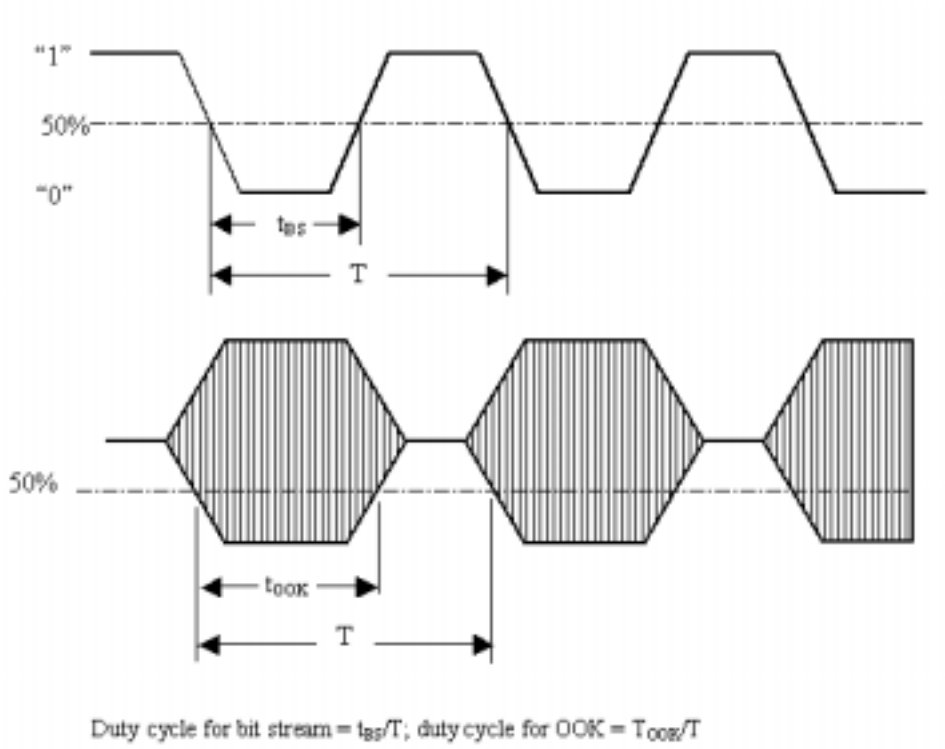

Figure 4.3.6.1: Duty cycles of the bit stream and OOK modulated subcarrier

For transmission through a coaxial cable, two converters are required, one from a bit stream to OOK (modulator) and one from OOK back to a bit stream (demodulator). Therefore half of the total duty cycle tolerance is available for each converter.

For an input bit stream with a duty ratio of 50 %, the cascaded modulator and demodulator shall provide an output bit stream with a duty ratio within the limits 40 % - 60 %, measured in each case at 0.5 times peak amplitude (see figure 4.3.6.1).

4.3.7 Operating bands

A UTRA/FDD BS or RET modem is designed to operate in one or several of the following paired frequency bands:

Table 4.3.7.1: Frequency bands

Operating Band	UL Frequencies UE transmit, Node B receive	DL frequencies UE receive, Node B transmit
I	1920 – 1980 MHz	2110 – 2170 MHz
II	1850 –1910 MHz	1930 – 1990 MHz
III	1710 – 1785 MHz	1805 – 1880 MHz
IV	1710 – 1755 MHz	2110 – 2155 MHz
V	824 – 849 MHz	869 – 894 MHz
VI	830 – 840 MHz	875 – 885 MHz

The operating bands of the BS or RET modem shall be declared by the manufacturer.

4.3.8 Time delay and accuracy

The time delay shall be declared by the manufacturer with ± 1 ns accuracy. The time delay shall not exceed [30] ns. This requirement is only applicable to external BS and RET modems.

4.3.9 Insertion Loss

The insertion loss in the external BS or RET modem operating band shall be ≤ [0.3] dB.

The actual insertion loss shall be declared by the manufacturer.

4.4 DC power supply

4.4.1 Power consumption

The DC supply requirements refers to reference points 3 and 5 in subclause 4.3.

The RET control unit and a RET modem shall be able to operate with a DC supply voltage range of 10 V – 30 V.

The RET control unit has two power consumption modes:

Table 4.4.1.1: Power consumption modes for RET control unit

Power mode	Maximum power consumption
High	< 13 W
Low	< 2 W

A RET modem maximum power consumption shall be < 2 W.

A RET modem shall impose a voltage drop less than 2 V between reference point 3 and 5.

4.4.2 Conducted emission

The levels of generated conducted noise and ripple on DC Power supply shall be within the limits given in table 4.4.2.1.

Table 4.4.2.1: Noise and ripple

Item	Limit	Frequency	Remarks
RET power mode High	70 mV_{pp}	0.15 - 30 MHz	Only one operating unit a time
RET power mode Low	20 mV_{pp}	0.15 - 30 MHz	

All RET units connected to a DC supply bus shall exhibit full performance up to the limit of 112 mV_{pp} total noise and ripple within 0.15 - 30 MHz.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
September 2004	TSG-RAN#25	RP-040344	_	_	presentation to TSG-RAN for information	_	1.0.0
September 2004	TSG-RAN#25	RP-040344	_	_	approved at TSG-RAN#25 and placed under change control	1.0.0	6.0.0
12/2004	26	RP-040444	1		DC power supply distribution	6.0.0	6.1.0
12/2004	26	RP-040444	2	1	Improved demodulator characteristics specification	6.0.0	6.1.0
12/2004	26	RP-040444	3	-	Requirements missing for when the RS485 bus shall not be driven by the secondary device	6.0.0	6.1.0
12/2004	26	RP-040444	4	1	RET DC power consumption modes	6.0.0	6.1.0
12/2004	26	RP-040444	5	-	Minor Corrections and editorial changes to 25.461	6.0.0	6.1.0
03/2005	27	RP-050061	7	1	Minor Corrections and editorial changes to 25.461	6.1.0	6.2.0
03/2005	27	RP-050061	8	1	Power consumption clarification of RET	6.1.0	6.2.0
03/2005	27	RP-050061	9		Modem Operating Bands	6.1.0	6.2.0
03/2005	27	RP-050061	10		Modem Return loss	6.1.0	6.2.0
03/2005	27	RP-050061	11		Modem Time Delay and Accuracy	6.1.0	6.2.0
03/2005	27	RP-050061	12		Modem Insertion Loss	6.1.0	6.2.0

History

Document history		
V6.0.0	September 2004	Publication
V6.1.0	December 2004	Publication
V6.2.0	March 2005	Publication