Specification of the Access Network Frequency Plan applicable to transmission systems used on the BT Access Network

Oftel Technical Requirement
OTR004:2000 Issue 1.1
Approved November 2000

Contents

Foreword

This document has been produced by the NICC Task Group on Digital Subscriber Line (DSL) – Spectrum Management Plan. Network Operators, switch and terminal equipment manufacturers, test laboratories, DTI (CII and RA), and OFTEL participated in the Task Group.

1 Scope

This specification defines the Access Network Frequency Plan (ANFP) applicable to transmission systems to be used on the BT access network. It is applicable to the whole of the BT access network provided using unscreened twisted metallic pairs (e.g. it does not apply to the access network provided by optical fibre).

To ensure the prevention of undue interference between transmission systems used on different metallic pairs in the same access cable, transmission systems (whether provided by BT, OLO or customer) connected to metallic pairs of the BT access network need to conform to this specification.

This specification is applicable to all BT switched and leased line analogue services, and to OLOs using the BT access network as defined in condition 83 of the public telecommunications operator's license issued to BT [13].

The limits specified in the ANFP apply when measured according to the associated reference measurement technique given in Annex 2.

This issue of this specification considers access to frequencies up to 1.1 MHz (e.g. for systems up to and including ADSL). The use of frequencies above 1.1 MHz has yet to be allocated and this specification restricts the use of these frequencies in order to protect their allocation later. It is planned that a future issue of the specification will be produced to use frequencies above 1.1 MHz (e.g. to include the use of VDSL).

It is recognised that a customer's installation may comprise wiring and a number of items of CPE. Further, there may be other items of equipment between the customer's installation and the metallic pair (i.e. on the network side of the NTP), e.g. filters or active line termination equipment. The limits in this ANFP apply at the interface to the metallic pair of the BT access cable.

Where a customer's installation causes, or can reasonably be foreseen to cause, harmful interference to transmission systems used on different metallic pairs in the same [or other] access cable[s], BT may require that the interference be prevented, for instance by means of mitigation measures (e.g. by the addition of a filter), or by requesting authorisation for disconnection under Article 7.4 of the RTTE directive [6] or other relevant powers.

Note 1: Although, from a regulatory perspective, it is not a mandatory requirement for customer premises equipment (CPE) to conform to this ANFP, since this would be contrary to the RTTE directive [6], it is strongly recommended that CPE does conform to this ANFP.

Note 2: This specification only considers the limits relevant to control of interference between DSL systems on different lines. There may be other limits also applicable, and conformance to this specification does not necessarily satisfy those limits. Such other limits may include, for example, safety limits on line voltages, RFI balance requirements, line sharing limits, and POTS band signals.

Note 3: Analogue leased lines and analogue POTS type functions of terminals may exceed the limits stated in this ANFP in the frequency range 100 Hz to 5 kHz where they would otherwise be acceptable under the provisions of the UK implementation of the RTTE directive [6]. It is intended that future issues of the ANFP will provide a more detailed specification in the frequency range 100 Hz to 5 kHz.

2 ANFP Construction

The ANFP as specified in this document was developed as a result of the proposals defined in the OFTEL Access to Bandwidth statement (November 1999) [8]. The construction of the ANFP was based on the criteria:

- set out in the OFTEL Access to Bandwidth statement
- defined by the DSL Task Group.

These criteria are documented in the ANFP User Guide (see Annex 4). This ANFP aligns with the OFTEL ANFP Determination (September 2000) [12].

In deciding the criteria to be used and the method of construction for the ANFP, the DSL Task Group took account of the work on this subject being undertaken in ANSI T1E1 [11] and ETSI TM6 [10].

The ANFP has been constructed using the following method:

- the management of the ANFP will be by hard Power Spectrum Density (PSD) masks [7].
- each interface giving access into the cable plant will have a PSD mask defined for it. Interfaces at different locations may have different masks.
- the mask will apply to any equipment connected at the location, irrespective of modem type[1].
- the mask will define the limit for power transmitted (or leaked) into the cable plant.
- at each frequency, the PSD of the transmitter must be at or lower than the permitted PSD mask.

The permitted PSD masks are produced as follows:

- The systems already deployed in significant volumes are identified[2]. These are taken as the existing noise environment (any transmission system will be permitted to be used on the BT access network provided that it conforms to the ANFP masks).
- A PSD mask is produced for each transmitter of each identified system.
- Locations are categorised according to which identified system transmitters may have been installed there.
- For each location category the permitted PSD mask is, at each frequency independently, the maximum of the masks for those transmitters which may have been installed there.

This method of construction is consistent with the work so far undertaken in ETSI TM6. It derives from the fact that the identified systems in the network have been deployed such that they will operate reliably in the presence of the crosstalk from other identified systems.

Any increase in the level of pollution that is permitted will directly result in decreased margin of performance in already deployed systems. Any substantial increase would cause these systems to fail.

[1] Strictly the ANFP is applied to the point of connection, so applies even in the absence of any equipment.

[2] The xDSL systems that have been taken into account in this ANFP specification are ISDN basic access, 2-pair and 3-pair 2 Mbit/s 2B1Q HDSL systems, and ADSL over POTS. All deployed as per BT's historical deployment rules. SDSL technology was also admitted, but limited to a selection of rates with minimal impact on the ANFP masks.

It should be noted that the ANFP is constructed with masks that are more realistic than those in current equipment standards. The equipment standards typically have a generous margin between what a system is limited to and what a real system actually produces, so a good implementation passes the standard easily. However some real systems already deployed would fail if their neighbours were to fully exploit a mask based on the equipment standards' masks. It has been necessary to use masks from FSAN[3] for the identified systems' transmitters. However every effort has been made to enable the deployment of the maximum variety of future DSL systems where this can be done without impact to the identified systems.

[3] Full Services Access Networks – a group of network operators and suppliers who co-operate in driving standards work towards specifying equipment that is usable by operators.

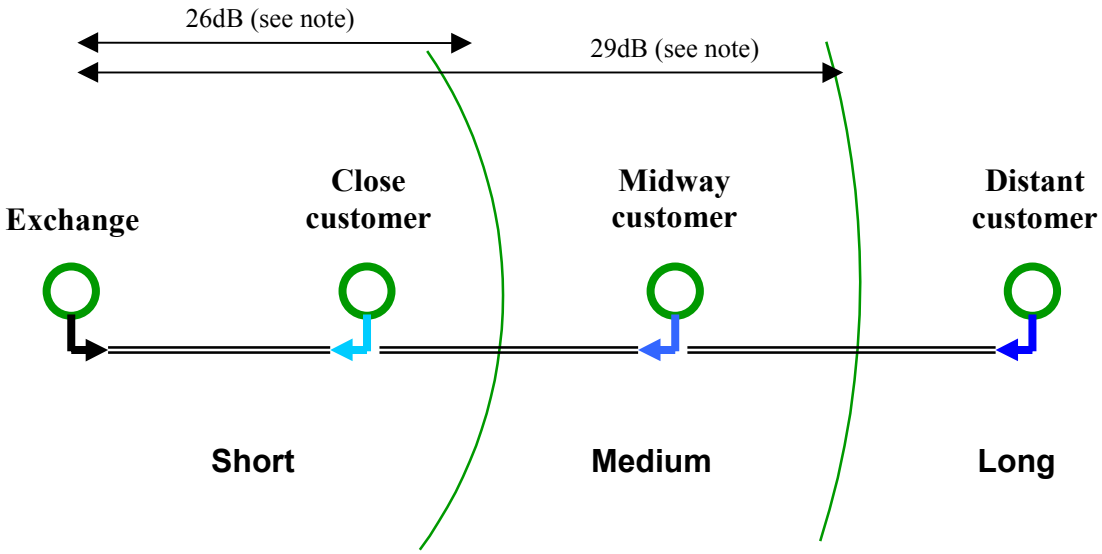
3 ANFP Specification

The ANFP is currently defined by a set of four PSDs.

mask name	defines PSD permitted at:
down exch	the MDF of the exchange
up short	the NTP of near customers
up medium	the NTP of mid distance customers
up long	the NTP of far customers

Mask 'down exch' is a downstream mask, for lines toward the customers. It is the only downstream mask currently defined. The other three masks are upstream masks, for lines toward the exchange.

The definition of 'near', 'mid distance' and 'far' customers is given in figure 1 and is based on BT's historical deployment of HDSL. Note, however, that neighbouring line ends should have the same limits, irrespective of the lengths of their respective pairs - this is because spectrum management is about limiting harm to neighbours, not directly about what a given line is capable of. Hence in general all lines sharing a given DP[4] will be in the same zone[5].



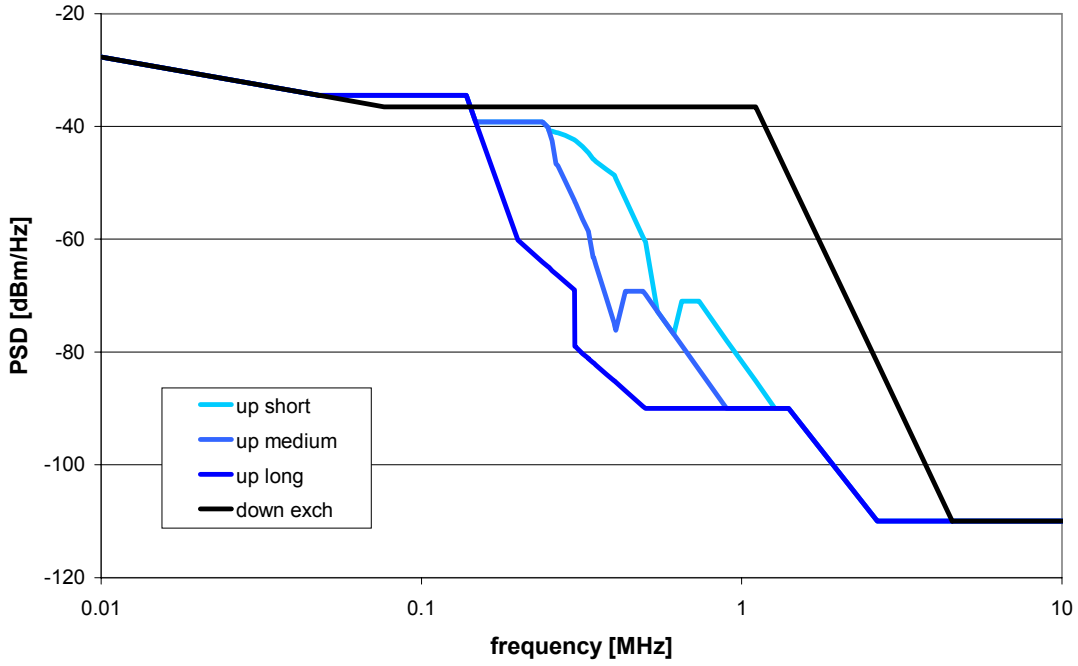
Note: The 26 and 29 dB insertion loss figures are defined at 100kHz and are nominal. In practice classification of loops into ANFP zones will be based on estimation and in particular all loops at a given DP will receive the same classification independent of individual loop lengths.

Figure 1 – ANFP Zone Definition

[4] Distribution Point – the final flexibility point in the BT access network before the line reaches its customer.

[5] The zone category of a given line will be determined once. The zone category will not be re-assessed unless there is a major cabling re-arrangement affecting the lines to that DP.

The set of 4 permitted masks is specified by the data given in Annex 1, which is definitive. Figure 2 illustrates this data. The data is also available in machine readable format [1].



Notes: best viewed in colour
all PSD masks are defined over the range 100 Hz to 30 MHz, although only a subset of this range is shown in the figure above.
where the PSD masks overlap only one is shown.

Figure 2 – Permitted PSD Masks

4 Key Features of the ANFP

The ANFP defined in this specification is able to fulfil the requirements for a spectral management plan as set out in licence condition 83 [13]. The ANFP controls the spectrum and power that can be launched into each of the Exchange end and the Customer premise end of the wire-pair. The limits vary with distance from the exchange, and a set of three zones is defined based on notional insertion loss at 100 kHz.

The ANFP does not preclude use of broadband equipment on any line, although serviceability on a line is subject to the electrical qualities of the line and the technical capability of the xDSL systems used. There will be some very long lines on which it will be difficult to give satisfactory service using ADSL or HDSL. However, future advances in xDSL may enable even these lines to have substantially more capability than currently provided by voiceband modems.

The ANFP balances the need for provision of symmetric services to the business (and residential) sector against the desire for widespread deployment of ADSL to mass-market residential customers, enabling the Government's vision of Broadband Britain.

The ANFP has been made as simple as possible whilst still being fit for purpose. It does not place any special restrictions on wire-pair selection, and in principle allows for 100% cable fill. (While it is unlikely that BT's network would reach 100% xDSL fill, there are credible situations that give equivalent interference.) Adopting a policy of no additional special pair selection processes means that engineering costs are minimised.

The ANFP is technology neutral, and as such is as future proof as possible. The PSDs used in the ANFP are consistent with the levels used by internationally standardised xDSL systems. This minimises the risk of introduction of rogue xDSL systems with strong line spectra that may cause objectionable radiated emissions.

The potential use of SDSL systems (as currently being defined in ETSI TM6) has been factored into the ANFP and will be permitted by the plan (the data rate that may be attempted by these SDSL systems will be dependent on the zone of the customer's end).

For further information on the features of the ANFP and guidance on conformance to the ANFP, see the ANFP User Guide (Annex 4)

5 Future Development

A change control process for this specification has been agreed, see Annex 6.

As indicated in the scope, the Task Group already plans to increase the scope of the plan to cover frequencies up to 30 MHz (i.e. to include VDSL). This change is not expected to impact existing systems deployed in conformance to this issue of the ANFP.

6 Abbreviations

ADSL	Asymmetric Digital Subscriber Line
ANFP	Access Network Frequency Plan
ANSI **ANSI T1E1.4**	American National Standards Institute T1E1.4 is their working group concerned with DSL Homepage: http://www.t1.org/t1e1/_e14home.htm
BT	British Telecommunications plc *(bridged taps are not discussed in this document)*
CPE	Customer Premises Equipment
CSV	Comma Separated Variable - a file format based on plain text, readable by many common spreadsheet programs.
DP	Distribution Point – the final flexibility point in the BT access network before the line reaches its customer
DSL	Digital Subscriber Line - any of the modem technologies which send high speed data over metallic telephone pairs. A DSL line has a dedicated modem at each end of the physical wire pair; typically one of these is in the exchange
DSL TG	Digital Subscriber Line Task Group A subcommittee of PNO-IG
ETSI **ETSI TM6**	European Telecommunications Standards Institute TM6 is the working group on Access Networks Homepage: http://webapp.etsi.org/tbhomepage/TBDetails.asp?TB_ID=240
FSAN	Full Services Access Networks – a group of network operators and suppliers who co-operate in driving standards work towards specifying equipment that is usable by operators
HDSL	High bit rate Digital Subscriber Line
MDF	Main Distribution Frame

MPF	Metallic Path Facility - a term used in the BT Licence Conditions for the loop available to OLOs
NICC	Network Interoperability Consultative Committee - a committee of UK industry set up to advise OFTEL homepage: http://www.oftel.gov.uk/NICC/
OLO	Other Licensed Operator
NTP	Network Termination Point
PBLC	Partial Baseboard Leased Circuit This term was used in [8] but subsequently changed to Metallic Path Facility in the BT Licence Conditions
PNO-IG	Public Network Operators Interest Group - an interest group within NICC
POTS	Plain Ordinary Telephone Service - analogue voiceband telephony
PSD	Power Spectral Density - [7]
RFI	Radio Frequency Interference
RTTE	Radio and Telecommunications Terminal Equipment - [6]
SDSL	Symmetric Digital Subscriber Line - in this document 'SDSL' refers to that technology currently being defined in ETSI TM6
VDSL	Very high rate asymmetric Digital Subscriber Line

7 References

[0] "Specification of the Access Network Frequency Plan applicable to transmission systems used on the BT Access Network"
Oftel Technical Requirement OTR004:2000 Issue 1.1
available at URL http://www.oftel.gov.uk/NICC/Public/anfp_1_1.pdf

Self reference to give a holder of a paper copy access to the electronic version.

[1] ANFP PSD Mask Definitions
available at URL http://www.oftel.gov.uk/NICC/Public/anfpmask.csv

This is a machine readable form of the table in Annex 1. *Read Annex 1 to interpret this data. Any discrepancies are errors, in which case Annex 1 is definitive.*

[2] "Essential requirements for terminal equipment intended for Connection to unstructured digital leased circuits of the public Telecommunications network using a CCITT Recommendation G.703 interface at a rate of 2048 kbit/s with a 75 Ω unbalanced presentation"
PD 7024: 1994
available from BSI, see URL http://www.bsi-global.com/

[3] EC, DIRECTORATE GENERAL XIII
"Informal Consolidated Text of the ONP Framework Directive"
10 June 1997
may be downloaded from http://www.ispo.cec.be/infosoc/legreg/docs/90387ecrev.html

Editor: as at 01 Dec 2000 this hyperlink seems dead. A perennial risk of using URLs as references.

This is a preliminary version of the revised ONP framework directive, being directive 90/387/EC as amended by 97/51/EC.

[4] ADLNB WG-2 (chairman C. P. Raymont)
"Guidance Notes on Measurement Uncertainty"
GN/WG2/1 issue 3 dated 19 March 1998
may be obtained from http://www.adlnb.com/

In the methods of [4] there is separation between requirements specification and the capabilities of any particular test house. ADLNB has recently been incorporated into a larger body, the "R&TTE Compliance Association"

[5] EC
"Directive 98/10/EC
of the European Parliament and of the Council of 26 February 1998
on the application of open network provision (ONP) to voice telephony and on universal service for telecommunications in a competitive environment "
Official Journal of the European Communities : OJ L 101/24 of 1.4.98

This is the Revised Voice Telephony Directive ("RVTD"). The text may be downloaded from http://www.ispo.cec.be/infosoc/telecompolicy/en/harmony.htm. Also of interest is http://www.dti.gov.uk/CII/rvtd/condoc.htm which sets out the UK Government's proposals for implementing the RVTD.

[6] EC
"Directive 99/5/EC
of the European Parliament and of the Council Relating to Radio Equipment and Telecommunications Terminal Equipment and the Mutual recognition of their Conformity"
Official Journal of the European Communities : OJ L 91, Vol. 41 of 7th April 1999
the full text may be downloaded from http://www.tapc.org.uk

The UK Statutory Instrument 2000 No 730 ("The RTTE Regulations") was published on 13 March 2000. It transposes the provisions of the Directive into UK law. It is also available at http://www.tapc.org.uk

[7] FSAN
"Interpretation of PSD for PSD masks"
TD 15 at the ETSI TM6 Meeting, Sophia Antipolis, 24-27 November, 1998

also presented to ANSI T1E1.4 as paper 98-327

[8] OFTEL
"Access to Bandwidth: Delivering Competition for the Information Age"
November 1999
may be downloaded from http://www.oftel.gov.uk/competition/a2b1199.htm

[9] "General requirements for the competence of testing and calibration laboratories"
ISO/IEC 17025: 1999

[10] ETSI TM6
"Part 1 : Definitions and Signals Library"
Permanent Document TM6(99)07

This is the first product of the ETSI TM6 Spectral Management project

[11] ANSI T1E1.4
"Spectrum Management For Loop Transmission Systems"
T1E1.4/2000-002R3 DRAFT T1.XXX-2000
may be downloaded from ftp://ftp.t1.org/pub/t1e1/e1.4/dir2000/0e140023.pdf

[12] OFTEL
"Access to Bandwidth: Determination on the Access Network Frequency Plan (ANFP) for BT's Metallic Access Network"
may be downloaded from http://www.oftel.gov.uk/competition/anfp1000.htm

[13] OFTEL
"REQUIREMENT TO PROVIDE ACCESS NETWORK FACILITIES"
April 2000
may be downloaded from http://www.oftel.gov.uk/competition/acnf0400.htm

This is condition 83 of the public telecommunications operator's license issued to BT by Oftel

8 Document History

Issue 1	First Issue, September 2000
Issue 1.1	Approved, November 2000.

The NICC Task Group on Digital Subscriber Line wishes to acknowledge its editors

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Annex 3		
Annex 4	Jeff Wheat	of Marconi
Annex 5	Jeff Wheat	of Marconi
Annex 6	Jeff Wheat	of Marconi

Annex 1 - ANFP PSD Mask Definitions

The masks are defined by the data given in this Annex. The tabulated data define the corners of each mask. Between the given corners the mask values are defined by interpolation (as a straight line on log frequency / linear dB axes). Frequency is in MHz; PSD is in dBm/Hz.

This data is also available in a machine readable format [1]. This version is made available to help prevent input errors when performing modelling evaluation. Note that the CSV file contains "a" for the blank fields (to be interpolated) in the table below. This has been done to increase compatibility with some applications which don't treat blank entries correctly.

Frequency	up short PSD	up medium PSD	up long PSD	down exch PSD
0.0001	-24.2438	-24.2438	-24.2438	-24.2438
0.001	-24.3086	-24.3086	-24.3086	-24.3086
0.002	-24.4406	-24.4406	-24.4406	-24.4406
0.003	-24.6366	-24.6366	-24.6366	-24.6366
0.004	-24.898	-24.898	-24.898	-24.898
0.005	-25.2272	-25.2272	-25.2272	-25.2272
0.006	-25.6302	-25.6302	-25.6302	-25.6302
0.007	-26.1266	-26.1266	-26.1266	-26.1266
0.047884			-34.5	
0.048147		-34.5		
0.048187	-34.5			
0.076391				-36.5
0.138	-34.5	-34.5	-34.5	
0.147654	-39.1935	-39.1935		
0.199722			-60.1591	
0.239	-39.2014	-39.2014		
0.248	-40.1521	-40.1521		
0.249819	-40.6974			
0.256		-42.5212		
0.262988		-46.6735		
0.266667		-46.9391		
0.281	-41.569			
0.3			-69	
0.301			-79	
0.303	-42.5516			
0.319	-43.5645			
0.333	-44.7054			
0.333333		-58.7391		
0.344065		-63.2129		
0.34445	-45.8415			
0.351		-64.6154		
0.378		-70.3487		
0.399		-74.958		
0.4	-48.7			
0.404253		-76.1821		
0.433333		-69.2391		
0.492		-69.2391		
0.5	-60.5		-90	
0.545545	-72.8087			
0.613094	-76.8423			
0.65	-71			
0.735	-71			
0.897226		-90		
1.104				-36.5
1.26891	-90			
1.4	-90	-90	-90	
2.64569	-110	-110	-110	
4.545				-110
30	-110	-110	-110	-110

Annex 2 - ANFP Laboratory Test Specification

Contents

1 Scope

This test specification defines tests to be used in a laboratory environment to determine conformance of telecommunications equipment to the requirements specified in the main body of the ANFP.

The tests here only relate to the requirements of the ANFP. Other limits, for example those related to safety, line balance, and interactions between systems on the same pair are out of scope.

Note 1: As stated in the scope of the ANFP, Issue 1 of the ANFP specification considers frequencies up to 1.1 MHz (e.g. for systems up to and including ADSL) and the specification restricts the use of higher frequencies in order to protect their future allocation. The NICC DSL Task Group plan a future issue of the ANFP specification to cover frequencies above 1.1 MHz (e.g. to include the use of VDSL). This Test Specification only covers Issue 1 of the ANFP.

Note 2: This test specification is for use in a laboratory environment only. The development of a test specification for use in the field is the subject of on-going work in the DSL Task Group.

Note 3: Strictly the ANFP specifies limits at the ports of the access network, not for individual equipment per se. This specification is to verify that when deployed equipment would not violate the ANFP.

Note 4: Section 5 of this document is based on the equivalent specification contained in the ANSI Spectrum Management For Loop Transmission Systems standard [11]. The use and reproduction of extracts from that standard is provided with kind permission of ANSI (American National Standards Institute).

2 Reference Model

The ANFP limits the power that may be injected into a metallic pair in the BT access network at two interfaces, the NTP[6] at the customer premises, and the MDF[7] at the exchange.

In the case of Local Loop Unbundling, there is a third interface, the HDF[8]. Managing crosstalk interference in the cabling between the HDF and the MDF is the responsibility of the network operator(s) using that cabling. The ANFP is applied at the MDF.

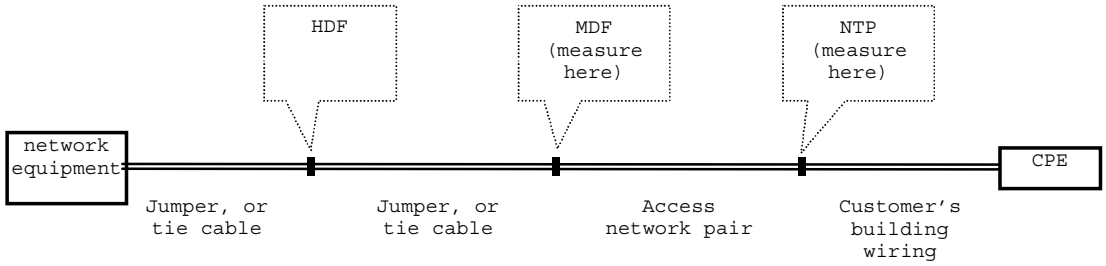

Figure 3 : Network Interfaces to which the ANFP applies

3 Test Configuration

The equipment under test ("EUT") will comprise the end equipment, any ancillaries which are always present[9], and a load to represent the access network.

The equipment at each end is tested independently.

Equipment will be tested in all modes which the operator proposes to use. Other modes, perhaps provided for use in other countries, need not be tested.

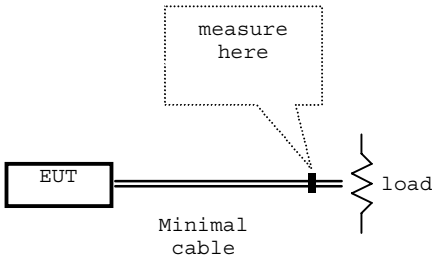

Figure 4 : Test configuration

[6] "Network Termination Point", is the legal demarcation between the network provider's cabling and the customer's in-house wiring. On a telephone line this point often has a master socket or NTE ("Network Termination Equipment").

[7] "Main Distribution Frame", is the equipment which terminates the access network cables.

[8] "Handover Distribution Frame", is the equipment which terminates the tie cables.

[9] For example splitter filters, and connecting leads which are part of the kit supplied with the end equipment

The limits applicable to each end vary depending where the end is. For exchange end equipment there is one set of limits. For customer end equipment there are three, for locations at different distances from the exchange. An end equipment shall be tested against all the limits applicable to those places where it is proposed to be deployed.

4 Measurement Conditions

The prospective operator shall declare his deployment intentions for the equipment under test. This determines which modes the equipment is tested in, and which ANFP mask(s) it is tested against.

The measurement conditions below are derived from ISO/IEC 17025 [9], "Guidance Notes on Measurement Uncertainty" [4], and PD 7024 [2]

4.1 Estimation of uncertainty of measurement

A laboratory or facility performing testing shall have and shall apply procedures for estimating uncertainty of measurement.

When estimating the uncertainty of measurement, all uncertainty components which are of importance in a given situation shall be taken into account using appropriate methods of analysis.

The test report or compliance statement shall include the uncertainty of measurement.

Note: 1 It is recommended that measurement uncertainty is calculated as defined in [4]

Note: 2 Sources contributing to uncertainty include, but are not necessarily limited to, the reference standards and reference materials used, methods and equipment used, properties and condition of the item being tested.

4.2 Compliance

Compliance to the requirements of this standard shall be reported on the shared risk principle as specified in [4] figures 1 to 3.

Compliance to these requirements shall be determined either by use of the test methods defined within this standard or by use of test methods and results obtained from other standards accompanied with a technical justification detailing how such results demonstrate compliance to this standard.

Note: Since the requirements of this standard are derived from a number of technology specific standards in many cases it will be sufficient to test equipment to the specific design standard for their technology , and make a compliance statement to this standard following technical review of the results. The technical review should not be omitted as some options of specific technologies are excluded from these requirements and would present non-compliant results to this standard.

4.3 Calibration of test equipment

Equipment and its software used for testing shall be capable of achieving the accuracy required. Calibration programs shall be established for values of the instruments where these properties have a significant effect on the result

The equipment shall be calibrated to provide a 95% confidence level in the accuracy of the results.

4.4 General Conditions for Test

If the supplier has specified a temperature range within which the TE will be operational, the testing shall be performed within this range. The testing shall be performed within the temperature range 15 ºC to 25 ºC, if consistent with the temperature range declared by the supplier.

If the supplier has specified a humidity range within which the TE will be operational, the testing shall be performed within this range. The testing shall be performed within the humidity range 45% to 75%, if consistent with the humidity range declared by the supplier.

For equipment that is directly powered from the mains supply all tests shall be carried out within ±5% of the normal operating voltage.

If the equipment is powered by other means and those means are not supplied as part of the equipment, (e.g. batteries, stabilized AC supplies, DC) all tests shall be carried out within the power supply limit declared by the supplier.

If the power supply is AC the tests shall be conducted within ±4% of the stated frequency as declared by the supplier.

4.5 Independence of polarity

The equipment shall conform independent of the polarity of the pair it uses. For a line powered EUT the tests shall be carried out twice, once with each polarity of connection of the power supply.

5 Conformance testing methodology below 5 kHz

No formal tests are currently specified here.

Note: The absence of tests here should not be interpreted as license : the ANFP does set limits below 5 kHz. Conformance testing methodology is for further study.

6 Conformance testing methodology above 5 kHz

The conformance testing methodology in this clause is derived from "Spectrum Management For Loop Transmission Systems" [11]. It shall be used to determine compliance with the signal power limitations requirements in the ANFP.

Note: Where the ANFP, Issue 1 makes no requirements (e.g. longitudinal output, nonstationary signals), this annex specifies no tests.

6.1 PSD measurement procedure

The limits applicable to a particular end equipment are discussed above, in section 4.2.

6.1.1 Test circuit for PSD measurement

A test set-up as pictorially shown in figure 5 shall be used for measuring PSD. Examples of specific embodiments of this test set-up are shown in figures 6 and 7. The difference between figures 6 and 7 is the input impedance of the instrument to be connected to V_{out}; figure 6 assumes a high-impedance port, figure 7 assumes a 50 Ω port (typical for a spectrum analyzer). The PSD may be tested while line powered or locally powered as required by the intended application of the EUT.

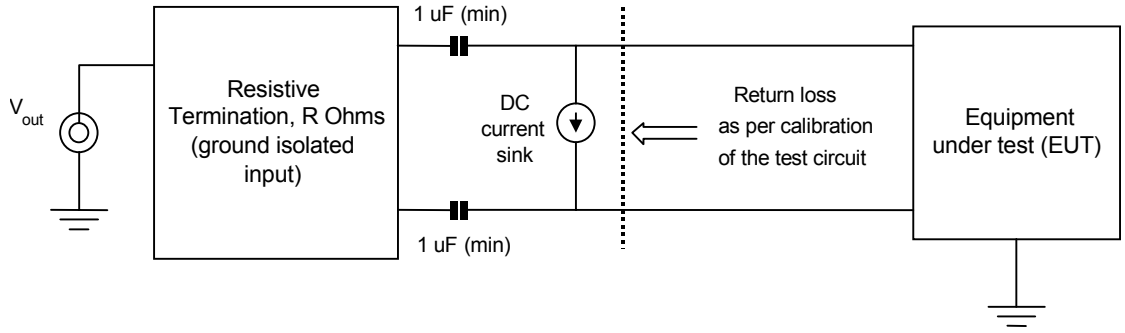

Figure 5 - PSD measurement set-up

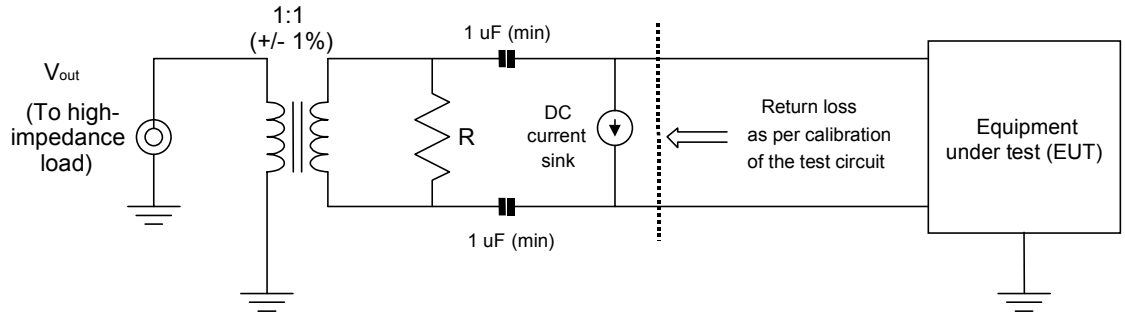

Figure 6 - Example PSD measurement set-up for high impedance instrument

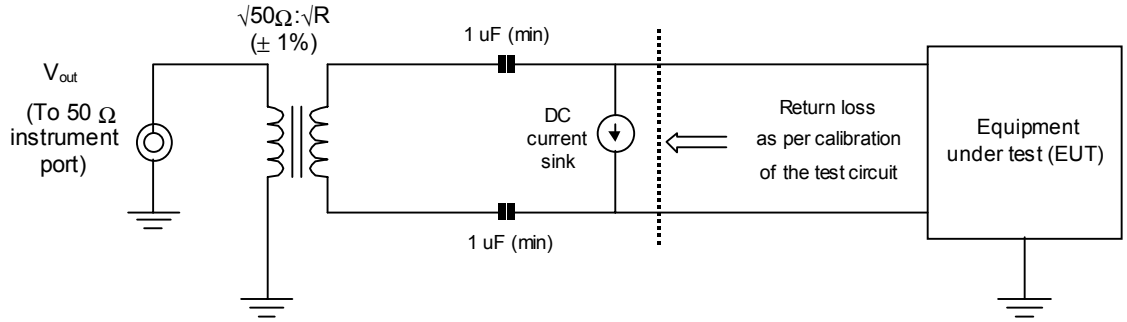

Figure 7 - Example PSD measurement set-up for 50 ohm instrument

If the EUT neither sources nor sinks power the blocking capacitors may be omitted, as may the current sink. If present the capacitors shall be matched in value to within 1%.

If the EUT is line powered then the test circuit shall contain provisions for DC power feed, instead of the current sink.

For line powered applications, if the EUT is a TU-C the test shall be performed with the line power supply activated and an appropriate DC current sink (with high AC impedance) attached to the test circuit. If the EUT is a TU-R the test shall be performed with power (DC voltage) applied at the line interface by an external voltage source feeding through an AC blocking impedance. Note that the DC current source/sink must present high impedance (at signal frequencies) to common ground. The test circuit contains provisions for transformer isolation for the measurement instrumentation. Transformer isolation of the instrumentation input prevents measurement errors from unintentional circuit paths through the common ground of the instrumentation and the EUT power feed circuitry. When the termination impedance of the test circuit seen by the EUT output meets the calibration requirements defined in 4.3 the test circuit will not introduce more than ± 0.25 dB error with respect to a perfect test load of exactly the specified resistance.

If the EUT is supplied with a voiceband splitter filter[10] then the tests shall be carried out with the splitter in circuit but with no voiceband signal applied. Where the splitter has a connector for the voiceband connection, this shall be open circuit during tests. Where voiceband equipment is integrated with the splitter this equipment shall be quiescent during tests.

The EUT shall be measured by equipment that is not synchronous with the transmitted symbols of the EUT, and there shall be no synchronization between the measurement equipment and the EUT. This is to avoid any cyclo-stationarity effects causing a misleading measurement.

6.1.2 Calibration of the test circuit and termination impedance

The nominal termination impedance of the test circuit as seen by the EUT output shall be resistive with a resistance of R between 100 Ω and 135 Ω. If the EUT has been designed to a published standard then the resistive impedance specified in that standard shall be used (providing it is between 100 Ω and 135 Ω). The minimum return loss with respect to the termination impedance R shall be 35 dB from 10 kHz to 2 MHz with a reduction of 20 dB/decade below and above these corner frequencies.

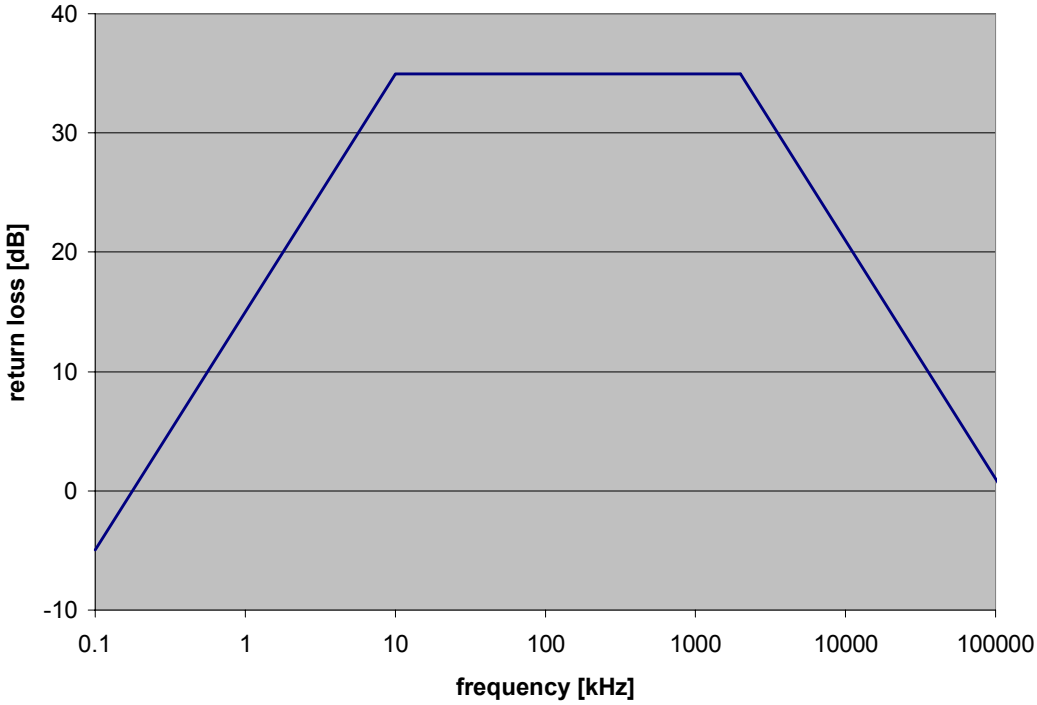

Figure 8 – Return loss mask

Figure 8 shows the return loss mask. The test circuit must exhibit this loss or higher at all frequencies.

Note 1: No passive circuit can exhibit a negative return loss, so calibration has implied limits on the frequency band to be measured over.

Note 2: 35 dB return loss will allow ±0.20 dB measurement error with respect to the nominal termination impedance value, R.

[10] e.g. to allow DSL and ordinary telephony to share the line

6.1.3 Operation of the EUT

The EUT shall be tested while it transmits maximum power and maximum PSD levels at all measured frequencies, which it can transmit data when deployed. The EUT shall have power cutback or boost configured to match the proposed deployment. The EUT shall be tested under steady state conditions, after all start-up and initialization procedures have been completed and while the EUT is transmitting data. To ensure that the EUT is in a steady-state condition, while undergoing test the EUT shall not have measured total average powers in distinct 1.25 millisecond time intervals that differ by more than 8 dB. The EUT input shall consist of a pseudo-random uniformly distributed data sequence, and the EUT output shall be a fully modulated transmit signal with all overhead, framing, coding, scrambling, modulation, filtering and all other operations performed on the data stream that the modem would normally perform while transmitting data.

Note: Although specific measurements of average power and PSD during start-up and other non-data transmission phases are not provided, a EUT that transmits inordinately high power or PSD levels during these phases may be considered to be in non-compliance with this standard.

6.1.4 Power spectral density (PSD) measurement procedure

6.1.4.1 PSD resolution bandwidth

The nominal frequency of a measurement will be the centre frequency of its resolution bandwidth. Instrument RBW shall be 10 kHz. Measurements will be at integer multiples of 10 kHz, starting at 10 kHz, so the lowest frequency measurement will be nominally 10 kHz and actually a window from 5 kHz to 15 kHz.

Inside the signal bands the measured values for each 10 kHz band shall be compared against the masks individually. Outside the signal bands the measured values will be averaged in overlapping groups of 100 10 kHz bands, to produce the effect of a 1 MHz RBW sliding window; the averaged values will be compared against the masks.

The mask value to be compared against shall be the maximum value the mask takes within the effective window. (Typically the first few steps of the 1 MHz sliding window will be compared against substantially higher values than the mask at the nominal centre frequency would suggest).

For the ANFP, Issue 1 masks this means:

Table 1 - Resolution bandwidth for measuring against the down exch mask

Frequency Band	Resolution Bandwidth
5 kHz to 3095 kHz	10 kHz
3095 kHz to 30005 kHz	1 MHz

Table 2 - Resolution bandwidth for measuring against the up short mask

Frequency Band	Resolution Bandwidth
5 kHz to 1265 kHz	10 kHz
1265 kHz to 30005 kHz	1 MHz

Table 3 - Resolution bandwidth for measuring against the up medium mask

Frequency Band	Resolution Bandwidth
5 kHz to 895 kHz	10 kHz
895 kHz to 30005 kHz	1 MHz

Table 4 - Resolution bandwidth for measuring against the up long mask

Frequency Band	Resolution Bandwidth
5 kHz to 505 kHz	10 kHz
505 kHz to 30005 kHz	1 MHz

In each band the PSD of an EUT shall be recorded with frequency spacing equal to 10 kHz.

6.1.4.2 PSD Integration Time

Measurements shall be averaged over a sufficiently long time that the contribution to measurement uncertainty shall be no worse than 0.1 dB with 95% confidence. (For some spectrum analysers this will imply limits on video bandwidth and sweep time).

7 References

Now integrated into the main document references. See section 7 of the main document.

A Informative Appendix : Nonstationary Signals

This appendix concerns equipment which only transmits power intermittently – typically when there is data to send. The significant impact of such signals is due to their power when transmitting, not an average over all time.

It is technically difficult to specify how to measure intermittent signals, unless the equipment has a continuous signal test mode (in which case it may be sufficient to conduct tests in that mode, as for normal equipment). Furthermore, at time of writing there is little practical interest in deploying such equipment under the ANFP. Therefore a normative laboratory test specification is not provided.

Note: The ANSI Spectrum Management specification [11] does specify some tests for such signals, in its section 6.4 “Short-term stationary conformance criteria”.

Annex 3 - ANFP Field Test Specification

Not yet defined. The NICC DSL Task Group is studying this subject but it is not yet clear if and when such a specification will be available.

Annex 4 - ANFP User Guide

Contents

1 Introduction

This user guide outlines the industry agreements reached to manage the connection of equipment to the BT copper access cables as part of the operational processes for Local Loop Unbundling in the UK.

1.1 Scope & Precedence

This User Guide is provided for information only. Every effort has been made to ensure consistency between this User Guide and other documentation produced by the NICC DSL Task Group and of the OPF Option 2 Implementation Group. However, in the event of any inconsistency or potential different interpretation, the words of the ANFP and the Access Network Facilities Service Contract form the normative text.

2 The ANFP for the UK

2.1 Line Categorisation

The ANFP defines different PSD masks for the customer end depending on primarily the electrical line length but also taking account the categorisation of other lines terminating at the same DP (Distribution Point).

This classification into short, medium and long will be undertaken for all existing BT lines prior to the service launch of the Metallic Path Facility. New BT lines will be classified upon completion of their installation. Once the classification has been undertaken, the classification for a given line is fixed and will only change if that line (or the lines terminating on the same DP) is subject to a significant engineering modification (e.g. re-routeing due to a road development scheme).

Like all other lines, the classification allocated to private circuits would be fixed and would only change if the lines forming that private circuit were subject to significant engineering modification.

2.2 How the various classes of DSL may fit the ANFP

In order to maximise the usefulness of the access network, based on the technologies in use or under consideration, three loop categories have been agreed: 'short', 'medium' and 'long'. Although, to a first approximation these categories are separated by loop length, there are other determining factors. Therefore the terms 'short', 'medium' and 'long' should be considered as labels rather than relative loop lengths.

Within these definitions table 5 names those standardised systems which were used in the construction of the ANFP, and which are intended to be admitted by design[11].

Table 5 – Designed-in systems

Short	Medium	Long
POTS	POTS	POTS
ISDN basic rate access	ISDN basic rate access	ISDN basic rate access
ADSL over POTS	ADSL over POTS	ADSL over POTS
SDSL (685.34 kBaud)	SDSL (501.67 kBaud)	SDSL (261.34 kBaud)
HDSL(2 pair E1) – 2B1Q	HDSL(3 pair E1) – 2B1Q	
HDSL (2 pair E1 - 1168 kbit/s) - CAP	HDSL (2 Pair E1 - 1168 kbit/s) - CAP	

Note: The SDSL standard is not yet frozen, but it is anticipated that SDSL at 685.34 kBaud will support 2048kbit/s (E1) on one pair[12].

[11] this is a statement of intent, for information. The definitive ANFP is annex 1

The ANFP does not exclude specific systems; it excludes by implication : one may not install a system which does not conform to the masks at each of its ends. For example the issue 1.1 ANFP would exclude the following standardised systems[13] from use on *any* BT access network line ('short', 'medium' or 'long'):

- A 1-pair 2Mbit/s HDSL system using 2B1Q or CAP
- ADSL over ISDN
- Reverse ADSL (i.e. with the high bandwidth implemented in the customer to exchange direction). This means that ADSL is precluded from use on private circuits.

3 Ensuring equipment conforms to the ANFP

All equipment connected to the BT metallic access network needs to comply with the ANFP. Hence this includes:

- BT equipment connected to the metallic access network
- network operator equipment connected to a Metallic Path Facility
- customer equipment connected to an analogue NTP that is either directly or indirectly connected to the BT metallic access network, to the extent that its behaviour is relevant to conditions present on the metallic access network itself.

The ANFP is currently enforced through the following measures.

3.1 Enforcement on Network Operators

The contract between BT and network operators for provision of Metallic Path Facility requires both parties to comply with the ANFP. Demonstration of compliance is via a system of self-declaration.

Note 1: A Test Specification (Annex 2) has been defined to test telecommunications equipment for conformance to the ANFP. The contract between BT and network operators requires network operators to "..ensure that Compliant Equipment to be connected to the Metallic Path Facility is tested, using the Access Network Frequency Plan Test Specification for compliance to the Access Network Frequency Plan" However it is up to the network operator whether it undertakes conformance testing itself or requires the supplier or a third party to undertake it.

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[12] SDSL line rate is cited in kBaud because this is the aspect of line rate which concerns the ANFP. A user may be more interested in nett data rate; there is also a gross data rate, which includes the modem pair's own overheads. In the current draft of the standard

gross data rate = nett + 8 kbit/s

and line baud rate = gross data rate ÷ 3

The rates used in the ANFP construction are

SDSL rates	Gross data rate	Symbol rate	Nett data rate
Minimum, all masks	64 kbit/s	21.33 kBaud	56 kbit/s
Maximum, 'long' mask	784 kbit/s	261.33 kBaud	776 kbit/s
Maximum, 'medium' mask	1505 kbit/s	501.66 kBaud	1497 kbit/s
Maximum, 'short' mask	2056 kbit/s	685.33 kBaud	2048 kbit/s

[13] This list is of course not exhaustive …

Whatever way conformance is demonstrated, the responsibility for the declaration and the correctness of that declaration resides with the network operator. In the event of a dispute on the conformance of a piece of telecommunications equipment, the Test Specification (Annex 2) will be used.

Note 2: as NTEs for analogue circuits are typically transparent to the signals generated by customer equipment, a customer's equipment that is non-complaint to the ANFP may cause undue interference on the BT access network. It is the responsibility of the network operator providing service to that customer to resolve any interference issues caused by non-compliant customer equipment.

3.2 Enforcement on Customer Equipment

The essential requirements that customer equipment must meet before that equipment is allowed to be connected to any public network is defined in the RTTE directive [6]. For customer equipment to be connected to a public fixed network, the essential requirements are currently limited to safety and EMC.

The Revised Voice Telephony Directive (RVTD [5]) requires network operators[14] to maintain the integrity of their network. Further, RVTD Article 13(2b) requires network operators to declare the conditions under which access to the network will be restricted or removed in order to protect the integrity of the network. Whilst the RVTD specifically applies to fixed public networks supporting voice telephony, Article 3(2) of the revised ONP framework directive [3] makes the same requirements applicable to non-voice telephony networks.

Hence network operators employing MPFs should declare that conformance to the ANFP by customer's equipment is a requirement for network integrity and that access to the network may be restricted if ANFP conformance is not maintained. Such a declaration should be made in the network operator's interface specifications for the relevant services. Publication of these interface specifications is a requirement under Article 4(2) of the RTTE Directive.

3.3 Enforcement on Equipment installed prior to the publication of the ANFP

As indicated in section 3, the ANFP has been developed taking account of existing equipment that has been deployed in significant volume. There may exist equipment deployed in relatively low volumes that does not comply with the ANFP e.g. existing CPE equipment approved for connection to analogue baseband circuits (q.v. OFTEL ANFP Determination [12]). It is intended that the ANFP should not be retrospectively applied to such equipment and such equipment will be allowed to continue working provided it does not cause undue interference to other systems. If one of these pre-ANFP systems is found to cause excessive interference, the resolution of the interference problem will be handled on a case-by-case basis.

If in the future the ANFP is amended, resulting in equipment that would have been compliant under the superseded edition of the ANFP not being compliant with the amended version of the ANFP, then the handling of such equipment needs to be taken into account as part of the considerations concerning the amendment of the ANFP.

[14] this means all network operators, not just the network owner

4 Policing the ANFP

4.1 Why are policing measures needed?

It should be stressed that if the interference preventive measures (e.g. ANFP conformance verification prior to implementation as outlined in section 3) are universally applied, then there should be relatively few instances of interference problems. However some are still anticipated, for example those due to:

- equipment faults resulting in abnormally high power to line
- nonconformant equipment, as discussed in section 3.3
- unusually high crosstalk coupling from normal causes. The ANFP is based on a statistical model of the network and access transmission systems with a 99% probability that conforming systems will not cause interference.

Considering this last point, it is possible that interference could be experienced even where all systems on an access cable conform to the ANFP. Furthermore, as more xDSL systems are deployed the noise level in an access cable will increase with a possible consequential impact on the performance of those systems already deployed.

4.2 What is covered by the policing measures?

Interference may be either: -

- Between pairs within the access network cables
  This may not only be caused by other xDSL systems but could also be via ingress of radio interference or from other non-xDSL customer CPE connected to other pairs in the cable.
- From or to systems external to the cable.

The ANFP covers only the interference between pairs within a cable and hence the ANFP policing measures only cover such situations. EMC regulations and measures within the Wireless Telegraphy Act cover interference from or to systems outside the cable.

4.3 What type of policing measures is to be adopted?

The development of pro-active measures or detailed procedures and specifications, which would be used very infrequently, is seen to be potentially expensive and unnecessary. Particularly in the early deployment where it is expected that there will be low numbers of systems in particular cables in most cases.

It has therefore been decided that the “Policing System” should be consumer complaint driven supported by a Code of Practice. The results of managing the interference complaints will provide feedback on the Code of Practice and hence this is likely to be changed as a result of experience.

4.4 Outline of Code of Practice

The policy has been adopted to try to eliminate all outside causes of a reported problem before expensive investigation of the multiple systems within a cable is undertaken. That may of necessity involve a number of operators within an MDF site and could cause the interruption of service to a potentially large group of their customers.

More detail of these measures is given in the Code of Practice but this would involve for example: -

- Questioning the customer concerning what other equipment is connected to their line.
- Checking that the reduction in service reported by the customer is a valid complaint by :-
  - Reviewing against the deployment rules to check that they have been followed.
  - Checking that the performance achieved does fall short of that in the service level agreement. It is possible that higher rates than those guaranteed by the ANFP could be achieved when the cable was lightly loaded with xDSL traffic but that this reduces as more users are added.
- Changing the DSLAM and Customer modems
- Possibly checking the MFP for any significant change from its initial measured parameters

4.5 The need for co-operation

It has been recognised that policing the ANFP and finding problems will only work if there is co-operation and trust between the operators involved. This will also require the rapid exchange of information concerning the technical details of the services being passed on pairs within an affected cable where the initial investigations, outlined above, fail to find the source of the problem.

Specifically co-operation will be required to investigate periodic interference or events that occur at specific times.

5 Evolution of the ANFP

Any changes to the ANFP can adversely affect (e.g. in terms of reduced reach, reduced performance) the transmission systems permitted in the original plan. Such changes would impact on the business cases not only of the network operator(s) using those adversely affected systems but also of the users (e.g. ISPs, Customers) using those systems. Hence the mechanism for the control of changes to the ANFP needs to be pre-defined so that users can assess the risks associated with possible changes.

The agreed change control procedure for the ANFP can be found in Annex 6.

Annex 5 – ANFP History & Background

Contents

1 Introduction

At the request of OFTEL, the Network Interoperability Consultative Committee (NICC) DSL Task Group was reconvened to address various technical aspects of local loop unbundling (LLU). This included the development of an Access Network Frequency Plan (ANFP) to control interference within the access network. The group started work in September 1999 and this issue of the ANFP covers phase 1 (up to 1.1 MHz). Work on stage 2 is now in progress and will cover additions for VDSL based systems

2 The need for an Access Network Frequency Plan

In order to maximise the capability of the systems deployed over the copper network the effects of their mutual interference must be minimised. Even in the case of a single operator network an overall cable management plan must be in place to achieve this objective. However where there are multiple operators over the same infrastructure, as in the case of an unbundled local loop access network such a plan is essential in order that:-

- Maximum benefits in terms of bandwidth and quality of service are obtained for the end user
- All operators can understand the limitations the network places on their service delivery capability.
- Installation is simplified by increasing the certainty of being able to deliver the required service
- Disputes may be minimised
- Disputes may be settled in a transparent way

3 The ANFP for the UK

The ANFP, Issue 1 as specified in the main part of this document was developed as a result of the proposals defined in the OFTEL Access to Bandwidth statement (November 1999). The construction of the ANFP was based on the criteria:-

- set out in the OFTEL Access to Bandwidth statement (these are reproduced in section 3.1)
- defined by the DSL Task Group (see section 3.2).
- defined in the OFTEL determination on the ANFP [12]

In deciding the criteria to be used and the method of construction for the ANFP, the DSL Task Group took account of the work on this subject being undertaken in ANSI T1.E1 and ETSI TM6.

A non-exhaustive list of generic xDSL systems that are permitted by the ANFP (Issue 1.1) is given in table 5 (part of Annex 4, the ANFP User Guide). This list is not definitive and is provided for guidance only.

3.1 OFTEL Statement

Extract from OFTEL's Access to Bandwidth Statement [8], concerning the requirements for the ANFP:

OFTEL's Spectral Management Plan Objectives

B31 OFTEL's high level objectives for the spectral management plan (SMP) are:

- High customer penetration
- Technology neutral
- Minimal management processes

B32 It is OFTEL's goal to ensure the availability of broadband access to the largest proportion of the UK population as possibly. Ideally this would be 100%, however as discussed in paragraph B23 this is unlikely to be achievable using only BT's copper access network, instead a trade-off between the quality of the PBLCs[15] and the potential penetration level is required. Based on consultations with various technical groups OFTEL considers that a customer penetration level of 80 - 85% should be used as the design objective for the SMP.

B33 To ensure that the SMP is flexible, non-restrictive and contains a degree of future proofing OFTEL believes that it should be defined in a technology neutral fashion. For this reason OFTEL would favour the use of power spectral density (PSD) masks to describe the signals that can be connected to the network at different locations. It is recognised that at the present time ADSL and HDSL are likely to be the main technologies deployed, indeed HDSL in two and three pair form is already widely deployed in the network. It is therefore considered that the PSD masks should allow for the deployment of these technologies.

B34 In order to minimise the management costs associated with option 2 and to ensure its timely introduction, OFTEL believes that the SMP should be produced in such a way as to avoid the need for complicated and restrictive management processes. To this end mix quotas for certain services within a binder group and binder group configuration control should be kept to a minimum and if possible avoided altogether.

3.2 The agreed approach to an ANFP for the UK

The following principles were agreed by the UK industry technical body as the basis for the management of DSL system deployment within a cable. The numbering does not represent any form of priority or hierarchy.

[15] PBLC – Partial Baseband Leased Circuit. This term was subsequently changed to Metallic Path Facility in the BT Licence Conditions

1. **No pair segregation management within the access cable**
   One approach to the problem of management of DSL system deployment, adopted by some countries, is to specify the numbers and types of system that may be deployed in a particular cable. Because crosstalk interference is principally only a major issue between adjacent pairs – (normally about 6/7 pairs) it could be possible to control these effects by careful allocation of the systems used on adjacent pairs. This possibility has been rejected for the UK because:-

   - Historically, a "random jointing" policy was adopted in the BT copper network.
     A typical cable is pulled into a duct in sections, and the sections later jointed. Random jointing means the relative positions of pairs are not maintained between sections. Hence adjacent pairs in one part of the cable may not be adjacent in another part of the cable. Pair segregation is not possible in the BT access network.
   - The implementation of such a management function would require an associated process to be developed which would be very complex, costly, time consuming and require nominated resources. Such a process would also have to take account of additions and alterations to both the transmission systems used on the cable and the cable itself.

2. **Any transmission system on any pair**
   The adoption of an Access Network Frequency Plan would allow any transmission system that conforms to the plan to be used on any pair in the access cable. This means that the ANFP would allow :-

   - any pair in an access cable to support any of the transmission systems allowed by the ANFP.
   - all pairs in the cable to support the same transmission system (i.e. 100% fill).

3. **ANFP will be under pre-defined change control**
   Any changes to an ANFP can adversely affect (e.g. in terms of reduced reach, reduced performance) the transmission systems permitted in the original ANFP. Such changes would impact on the business cases not only of the network operator(s) using those adversely affected systems but also of the users (e.g. ISPs, Customers) using those systems. Hence possible changes to the ANFP need to be taken into account in the risk assessment of any business case using the access network and such risks need to be quantifiable if the evolution of the access network is not to be stifled. Hence the mechanism for the control of changes to the ANFP needs to be pre-defined so that users of the ANFP can assess the risks associated with possible changes.
   A defined change control process is not a prerequisite for Issue 1 of the ANFP.

4. **Existing transmission systems in the BT access network should be included in Issue 1**
   Development of the ANFP for the BT Access Network in the unbundled local loop environment is not a 'green field' site. If existing customers are not to be adversely affected, it must take account of transmission systems that have already been implemented in significant quantities. That is not to say that there can't be changes in the future but these changes need to take place in a pre-defined manner governed by Principle 3 above.

5. **Technology Independent**
   Ideally the ANFP would be technology independent. Whilst this can be an objective, it is probably wishful thinking that the ANFP can be completely technology independent.

6. **Protection of working systems**
   The principal objective of the plan is to limit the behaviour of a system to protect its neighbours. This is the reason for a plan aimed at limiting spectra, since that's all a victim system will perceive. So the technical objective is indifferent to the technology from which the noise came (modulation scheme etc just don't matter).
   The objective of this principle is to ensure that a system permitted within the ANFP can operate with a predictable minimum level of performance and quality of service.

7. **Safety**
   The ANFP must also protect human safety and the physical integrity of the wires. Such issues are generally covered by existing international standards and these standards need only to be referenced.

8. ADSL over POTS is the chosen ADSL system

There are two variants of ADSL systems, ADSL designed to work over POTS and ADSL designed to work over ISDN. These are spectrally incompatible. The ANFP will allow the deployment of ADSL over POTS at the expense of ADSL over ISDN. ***This means that ADSL over ISDN will not be allowed by the ANFP and customers with ISDN wanting to also have ADSL will need a second metallic pair.***

9. ANFP Phased development

Taking account of the complexity in developing and specifying an ANFP and the need to have an ANFP published in the timetable required by the OFTEL Access to Bandwidth requirements, the development of the ANFP will be split into 2 phases. ANFP, Issue 1 will cover frequencies up to 1.1 MHz (i.e. include ADSL but not VDSL) and the transmit power allowed above 1.1 MHz will be set very low in order to protect that frequency spectrum for future allocation. Subsequent issues of the ANFP will specify frequencies up to 30 MHz (i.e. include VDSL).

Annex 6 – ANFP Change Control Procedure

The following ANFP Change Control Procedure is agreed and adopted by the NICC DSL Task Group[16].

Recognising that:

a) the implementation of the ANFP limits the type of telecommunications system that can be connected to the BT Access Network and the location of that connection.

b) the implementation of the ANFP limits the noise experienced by systems connected to the BT Access Network.

c) the business plans of network operators, service providers and customers may be affected by changes to the ANFP. Hence the stability of the ANFP (i.e. minimum period that could exist before the ANFP could be changed to the detriment of an organisations or individuals plans) needs to be defined in order that commercial risks can be assessed and investment decisions taken.

d) experience with the operation of the BT Access Network in a multi-operator environment may provide improved understanding of the complex crosstalk interaction between telecommunication systems operating on different metallic pairs within the BT Access Network. This improved understanding may result in the need to amend the ANFP.

the NICC DSL Task Group adopt the following change control procedure for the ANFP:

1. A proposal to amend the ANFP may be submitted at any time by any interested party. The proposal shall be submitted to OFTEL. It is recommended that OFTEL request the DSL Task Group to provide advice on the acceptability of the proposed amendment.
2. Any proposal to amend the ANFP should contain: -
   - an impact assessment statement on at least the telecommunication systems listed in table 5 (part of Annex 4, the ANFP User Guide)
   - a proposed date for implementation.
3. The NICC DSL Task Group will adopt a proposed ANFP amendment if there is consensus agreement i.e. there is no sustained objection from any member of the Task Group.
4. Any objection to a proposed amendment should be supported by technical data to support the reasons for the objection.
5. Where there is no consensus agreement, the proposed amendment shall be passed to OFTEL for determination.
6. Changes to this ANFP Change Control procedure shall be via consensus agreement in the NICC DSL Task Group. Failure to reach consensus agreement will result in the proposed ANFP Change Control amendment being passed to OFTEL for determination.

- End -

[16] The NICC DSL Task Group is not a permanent body and the Task Group will close once all the deliverables allocated to the group have been completed. The requirement to consider proposals to modify the ANFP may exist after the closure of the DSL Task Group. In this case, it is recommended that OFTEL ask an appropriate UK industry forum to consider the proposed amendment and that that UK industry forum adopts these change control procedures.