

---

# ND1604:2006/09

---

## **Specification of the Access Network Frequency Plan applicable to transmission systems used on the KCH Access Network**

---

Issue 2

Network Interoperability Consultative Committee  
Ofcom  
Riverside House,  
2a Southwark Bridge Road,  
London SE1 9HA  
UK  
<http://www.nicc.org.uk>

## **Normative Information**

© 2006 Ofcom copyright  
**NOTICE OF COPYRIGHT AND LIABILITY**

### **Copyright**

All right, title and interest in this document are owned by Ofcom and/or the contributors to the document unless otherwise indicated (where copyright be owned or shared with a third party). Such title and interest is protected by United Kingdom copyright laws and international treaty provisions.

The contents of the document are believed to be accurate at the time of publishing, but no representation or warranty is given as to their accuracy, completeness or correctness. You may freely download, copy, store or distribute this document provided it is not modified in any way and it includes this copyright and liability statement.

You may not modify the contents of this document. You may produce a derived copyright work based on this document provided that you clearly indicate that it was created by yourself and that it was derived from this document and provided further that you ensure that any risk of confusion with this document is avoided.

### **Liability**

Whilst every care has been taken in the preparation and publication of this document, NICC, nor any committee acting on behalf of NICC, nor any member of any of those committees, nor the companies they represent, nor any person contributing to the contents of this document (together the "Generators") accepts liability for any loss, which may arise from reliance on the information contained in this document or any errors or omissions, typographical or otherwise in the contents.

Nothing in this document constitutes advice. Nor does the transmission, downloading or sending of this document create any contractual relationship. In particular no licence is granted under any intellectual property right (including trade and service mark rights) save for the above licence to copy, store and distribute this document and to produce derived copyright works.

The liability and responsibility for implementations based on this document rests with the implementer, and not with any of the Generators. If you implement any of the contents of this document, you agree to indemnify and hold harmless the Generators in any jurisdiction against any claims and legal proceedings alleging that the use of the contents by you or on your behalf infringes any legal right of any of the Generators or any third party.

None of the Generators accepts any liability whatsoever for any direct, indirect or consequential loss or damage arising in any way from any use of or reliance on the contents of this document for any purpose.

If you have any comments concerning the accuracy of the contents of this document, please write to:

The Technical Secretary, Network Interoperability Consultative Committee,  
Ofcom,  
2a Southwark Bridge Road,  
London SE1 9HA.

## Contents

1	Foreword.....	4
2	Scope.....	4
3	ANFP Construction.....	4
4	ANFP Specification.....	5
4.1	PSD Mask and Interface Categories.....	5
4.1.1	Interface Categories.....	5
4.1.2	PSD Masks.....	6
4.2	Alternative Voiceband Specification.....	7
5	Key features of the ANFP.....	7
6	Future Development.....	8
7	Abbreviations.....	8
8	References.....	9
9	History.....	10
	Annex 1 ANFP PSD Mask definitions.....	11
	Annex 2 ANFP Laboratory Test Specification.....	15
	Annex 3 ANFP Field Test Specification.....	16
	Annex 4 ANFP User Guide.....	17
	Annex 5 ANFP History and Background.....	20
	Annex 6 ANFP Change Control Procedure.....	21

## 1 Foreword

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

This issue of the ANFP is a revision of KCH ANFP, Issue 1 (ND1604:2003/01) [1] to take account of developments in DSL technology, particularly ADSL2+ and is backwards compatible.

In the interests of consistency and to ensure ease of use for Local Loop Unbundling operators, a style and format similar to that used by the NICC DSL Task Group for the definition of the BT Access Network Frequency Plan [2] has been adopted.

## 2 Scope

This specification defines the Access Network Frequency Plan (ANFP) applicable to transmission systems to be used on the KCH access network. It is applicable to the whole of the KCH access network provided using unscreened twisted metallic pairs within the geographic area defined by annex B of the licence granted to KCH on the 30<sup>th</sup> November 1987 under section 7 of the Telecommunications Act 1984 and amended by SI 2455 1999.

To ensure the prevention of undue interference between transmission systems and equipment (KCH, Communications Service Provider (CSP) and End User customer owned) used on different metallic pairs in the same access cable, transmission systems connected to metallic pairs of the KCH access network need to conform to this specification.

This specification is applicable to all KCH switched and leased line analogue services, and those of CSPs and Customers using the KCH access network.

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

This issue of this specification considers access to frequencies up to 30.0 MHz to enable systems up to and including ADSL2+ [3] but does not provide for VDSL equipment at this stage. The NICC DSL Task Group has produced a harmonised ANFP for use on both full and sub-loops within the BT access network [4]. Kingston notes the future requirement to provide sub loop connections and similar information will be developed for the KCH access network and incorporated into a future document. This future document will enable the deployment of technologies such as VDSL at a Sub Loop Connection point.

The limits in this Interim ANFP apply at the interface to the metallic pair of the KCH access cable and are applicable at the KCH MDF and Customer or End User (EU) NTP.

Where a customer or EU 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], KCH 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 RE & TTE Regulations [5] or other relevant powers.

## 3 ANFP Construction

The methodology behind the development of this frequency plan remains as described in ND1604:2003/01 (Issue 1) [1].

The downstream frequency plan has been revised explicitly to enable variants of ADSL to be deployed at the MDF and to enable improved downstream delivery.

This specification only considers the limits relevant to control of interference between DSL systems on different lines. Other limits are applicable, such as safety limits on line voltages, but these are outside the scope of this document.

## 4 ANFP Specification

The ANFP is defined by a set of categories for access interfaces, each having a PSD, and by voiceband specifications based on ETSI standards applicable to CPE.

For frequencies at and below 200kHz, equipment compliant with this ANFP must either meet the requirements defined in section 4.1 or section 4.2 of this document. For frequencies above 200kHz, the requirements of section 4.1 apply.

Note: equipment that has been approved under the UK terminal equipment approval regime that existed prior to the implementation of the R&TTE Regulations [5] is deemed to be compliant with this interim ANFP.

It should be noted that all equipment connected to the KCH access network (i.e. KCH equipment, LLU Operator Equipment and CPE) needs to comply with this document.

Demonstration of compliance is via a system of self-declaration to KCH. It is the responsibility of the organisation implementing and operating the equipment to ensure and maintain its compliance.

### 4.1 PSD Mask and Interface Categories

#### 4.1.1 Interface Categories

Each interface is assigned one of four categories determined by its location. One category is for the interfaces in an exchange, the others are for customers at various distances from the exchange. The controlled interfaces are the MDF in the exchange for the CSP and the NTP at the customer or End User's premises.

The categorisation of customers' locations is in terms of the physical distance from the exchange defined by the length of a nominal line to the exchange. The categories are defined in table 1 and illustrated in figure 1

Category Name	Location
down	the MDF of an exchange
up short	the customer NTP where the nominal line length is 0.74 km or less
up medium	the customer NTP where the nominal line length is 1.68 km or less but over 0.74 km
up long	the customer NTP where the nominal line length is over 1.68 km

**Table 1 - ANFP Interface Category Definitions**

The definition of 'short', 'medium' and 'long' continues to be based on the accommodation of SHDSL [6] technology operating at different line rates.

In order to limit cross talk interference between neighbouring pairs, neighbouring line interfaces sharing a given DP (distribution point) will be given the same categorisation.

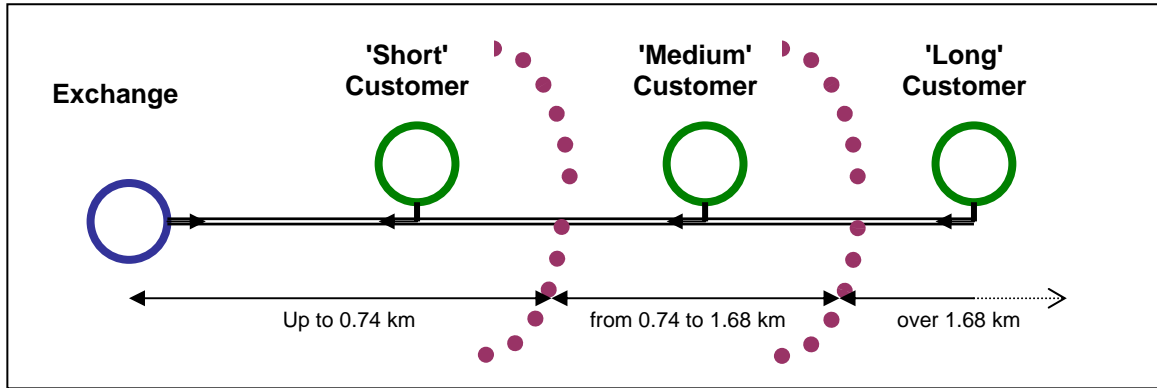


Figure 1 - The ANFP Interface Categories

4.1.2 PSD Masks

Each interface category has a PSD mask which defines the limits of the signals that can be injected at each interface location. The 'down' mask applies to the direction of transmission from the exchange to the customer and the three 'up' masks - 'up short', 'up medium' and 'up long' - apply to the direction of transmission from a customer location within each category towards the exchange.

The set of permitted masks is specified by the data in Annex 1 and illustrated in Figure 2.

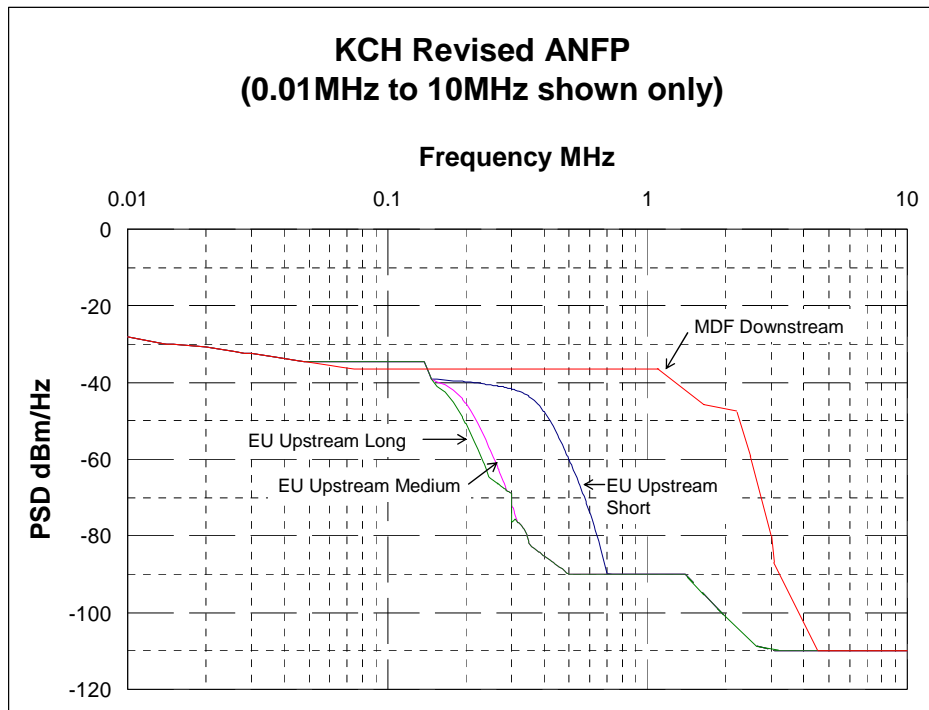


Figure 2 - Permitted PSD Masks

Note: All PSD masks are defined over the range 100Hz to 30MHz, although only a subset of this range is shown in the figure above: where the PSDs overlap, only one is shown. The definitive description of the masks is given at Annex 1 rather than within Figure 2.

## 4.2 Alternative Voiceband Specification

For frequencies at and below 200 kHz, compliance to this ANFP may be demonstrated by conformance to the requirements in this section as an alternative to meeting the requirements of section 4.1. The requirements are applicable at both the customer end (irrespective of category) and exchange end of an MPF.

Note: 1. The requirements in this section are drawn from ETSI voiceband CPE standards<sup>1</sup>. However, any type of equipment may use these requirements (and associated tests) instead of the requirements in section 4.1 to demonstrate compliance to this ANFP.

Equipment compliant to this ANFP shall meet the requirements of the following Clauses of TBR 21 [7] (Note 2):

- Clause 4.7.3.1 (Mean sending level);
- Clause 4.7.3.2 (Instantaneous voltage);
- Clause 4.7.3.3 (Sending level in a 10 Hz bandwidth) as modified by TR 103 000-2-1 [8] (See Notes 3 and 4);
- Clause 4.7.3.4 (Sending level above 4.3 kHz) as modified by TR 103 000-2-1 [8];
- Clause 4.8.2.2.1 (DTMF Absolute Sending Levels) (See Note 5).

Note 2. The intent of these requirements is to control the level of crosstalk. TBR21 deals with other aspects but only those requirements relating to the control of crosstalk have been included in this ANFP.

Note 3. The requirements of this clause below 100 Hz do not apply in this ANFP.

Note 4. As described in EN 301 437 Annex C [9], it is not necessary to test the requirements of this clause if the terminal is a voice terminal (e.g. has a handset) and requires voice stimulation to perform the test.

Note 5. Only applicable if the equipment has a DTMF sender.

## 5 Key features of the ANFP

The ANFP describes the spectrum and power that can be launched into each of the Exchange end and the Customer premise end of the wire-pair.

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.

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

There are no special restrictions on wire-pair selection, and in principle allows for 100% cable fill. (While it is unlikely that KCH'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.

---

<sup>1</sup> Various technical standards have set voiceband limits for CPE but include TBR 21 [7], EN 301 437 [9], EG 201 121 [10] and TR 103 000-2-1 [8] all published by ETSI.

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 use of SDSL (SHDSL) systems (as defined in international standards) has been factored into the ANFP and will be permitted by the plan (the data rate that may be attempted by these systems will be dependent on the categorisation of the line as described above in 4.1.1).

The ANFP will continue support all voice-band equipment that was previously permitted to be connected to the KCH access network prior to the development of ND1604:2003/01 (Issue 1) [1] and this document.

## 6 Future Development

The change control process for the BT ANFP has been adopted for this specification. See Annex 6.

A harmonised ANFP will be developed that will enable the deployment of systems on sub-loops. The resulting ANFP will cover frequencies up to 30 MHz (i.e. including VDSL masks) and a document providing Full and Sub Loop information will be published to supersede this document. The future Harmonised ANFP is not expected to impact on systems deployed in conformance to this document.

## 7 Abbreviations

ANFP	Access Network Frequency Plan
CPE	Customer Premise Equipment
CSP	Communications Service Provider
DSL	Digital Subscriber Line
EC	European Community
ETSI	European Telecommunications Standards Institute
EU	End User
ISDN	Integrated Services Digital Network
MDF	Main Distribution Frame
MPF	Metallic Path Facility
NICC	Network Interoperability Consultative Committee
NTP	Network Terminating Point
OFCOM	Office of Communications
OFTEL	Office of Telecommunications (predecessor of OFCOM)
POTS	Plain Old Telephone Service
PSD	Power Spectral Density
RE & TTE	Radio Equipment and Telecommunications Terminal Equipment
SHDSL	Symmetric High Speed Digital Subscriber Line (TC-PAM line code)
VDSL	Very High Speed Digital Subscriber Line



## 8 References

Reference	Title	Date
[1]	NICC ND 1604:2003/01: "Specification of the Access Network Frequency Plan applicable to transmission systems used on the KCH Access Network" Issue 1 Available at <a href="http://www.nicc.org.uk/nicc-public/publication.htm">http://www.nicc.org.uk/nicc-public/publication.htm</a>	January 2003
[2]	NICC ND 1602:2002/11: "Specification of the Access Network Frequency Plan applicable to transmission systems used on the BT Access Network" OfTel Technical Requirement OTR004:2002 Issue 2 Available at <a href="http://www.nicc.org.uk/nicc-public/publication.htm">http://www.nicc.org.uk/nicc-public/publication.htm</a>	November 2002
[3]	ITU-T Recommendation G.992.5 (01/2005) "Asymmetric Digital subscriber Line (ADSL) transceivers – Extended Bandwidth ADSL2 (ADSL2+)" Available through <a href="http://www.itu.int/publications/default.aspx">http://www.itu.int/publications/default.aspx</a>	January 2005
[4]	NICC ND 1602:2005/08: "Specification of the Access Network Frequency Plan applicable to transmission systems used on the BT Access Network" Available at <a href="http://www.nicc.org.uk/nicc-public/publication.htm">http://www.nicc.org.uk/nicc-public/publication.htm</a>	August 2005
[5]	"The Radio Equipment and Telecommunications and Terminal Equipment Regulations 2000" Internet version: <a href="http://hms.o.gov.uk/si/si2000/20000730.htm">http://hms.o.gov.uk/si/si2000/20000730.htm</a>	13 March 2000
[6]	TU-T Recommendation G.991.2 Single Pair High Speed Digital Subscriber Line (SHDSL) Transceivers Available through <a href="http://www.itu.int/publications/default.aspx">http://www.itu.int/publications/default.aspx</a>	December 2003
[7]	TBR 21 "Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signalling" Available through <a href="http://www.etsi.org/services_products/freestandard/home.htm">http://www.etsi.org/services_products/freestandard/home.htm</a>	January 1998
[8]	TR 103 000-2-1 "Advisory Notes to Standards Harmonizing Terminal Interface; Generally applicable Advisory Notes; Modification to sending spectral density requirements" Available through <a href="http://www.etsi.org/services_products/freestandard/home.htm">http://www.etsi.org/services_products/freestandard/home.htm</a>	February 2002
[9]	EN 301 437 "Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE supporting the voice telephony service in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signalling" Available through <a href="http://www.etsi.org/services_products/freestandard/home.htm">http://www.etsi.org/services_products/freestandard/home.htm</a>	June 1999
[10]	EG 201 121 "A guide to the application of TBR 21" Available through <a href="http://www.etsi.org/services_products/freestandard/home.htm">http://www.etsi.org/services_products/freestandard/home.htm</a>	February 2000
[11]	NICC ND1404:2005/07 "Guidelines for any inter-network interference issues between DSL operators in the same access network" Available at <a href="http://www.nicc.org.uk/nicc-public/publication.htm">http://www.nicc.org.uk/nicc-public/publication.htm</a>	Issue 2, March 2002

- 
- [12] NICC ND1403:2005/07 "Guidelines for any external network interference issues to radio users due to radiated emissions from fixed public networks" Issue 1, March 2002  
Available at <http://www.nicc.org.uk/nicc-public/publication.htm>
- [13] ITU-T Recommendation G.992.1 Asymmetric Digital Subscriber Line (ADSL) Transceivers July 1999  
Available through <http://www.itu.int/publications/default.aspx>
- [14] ITU-T Recommendation G.992.2 Splitterless Asymmetric Digital Subscriber Line (ADSL) Transceivers July 1999  
Available through <http://www.itu.int/publications/default.aspx>
- [15] ITU-T Recommendation G.992.3 Asymmetric Digital Subscriber Line Transceivers (ADSL2) January 2005  
Available through <http://www.itu.int/publications/default.aspx>
- [16] ITU-T Recommendation G.992.4 Splitterless Asymmetric Digital Subscriber Line Transceivers (Splitterless ADSL2) January 2005  
Available through <http://www.itu.int/publications/default.aspx>

## 9 History

Date	Issue	Comments
January 2003	Issue 1	First Issue
September 2006	Issue 2	Update to allow deployment of ADSL2+

## Annex 1 ANFP PSD Mask definitions

The masks are defined by the data given in the following table. Figures in **RED** define variation from ND1604:2003/01 (Issue 1) [1].

Frequency MHz	Up Short NTE	Up Medium NTE	Up Long NTE	DownM DF
0.00010	-24.24	-24.24	-24.24	-24.24
0.000400	-24.26	-24.26	-24.26	-24.26
0.001000	-24.31	-24.31	-24.31	-24.31
0.002000	-24.44	-24.44	-24.44	-24.44
0.003000	-24.64	-24.64	-24.64	-24.64
0.004000	-24.90	-24.90	-24.90	-24.90
0.004010	-24.90	-24.90	-24.90	-24.90
0.005000	-25.23	-25.23	-25.23	-25.23
0.006000	-25.63	-25.63	-25.63	-25.63
0.006058	-25.66	-25.66	-25.66	-25.66
0.007000	-26.13	-26.13	-26.13	-26.13
0.007177	-26.23	-26.23	-26.23	-26.23
0.009000	-27.30	-27.30	-27.30	-27.30
0.01	-28	-28	-28	-28
0.014	-30	-30	-30	-30
0.015	-30.1	-30.1	-30.1	-30.1
0.02	-30.76	-30.76	-30.76	-30.76
0.025875	-31.97	-31.97	-31.97	-31.97
0.028	-32.33	-32.33	-32.33	-32.33
0.029769	-32.48	-32.48	-32.48	-32.48
0.03	-32.5	-32.5	-32.5	-32.5
0.037	-33.35	-33.35	-33.35	-33.35
0.045	-34.2	-34.2	-34.2	-34.2
0.047884	-34.5	-34.5	-34.5	-34.52
0.048147	a	a	a	-34.54
0.048187	a	a	a	-34.54
0.06	a	a	a	-35.45
0.06666	a	a	a	-36.05
0.074273	a	a	a	-36.5
0.075	a	a	a	a
0.1001	a	a	a	a
0.138	-34.5	-34.5	-34.5	a
0.145222	-38.04	-38.04	-38.04	a
0.147654	-39.15	-39.19	-39.19	a
0.155286	-39.23	-39.89	-40.93	a
0.166091	-39.36	-40.63	-42.53	a

Cont.

Frequency MHz	Up Short NTE	Up Medium NTE	Up Long NTE	Down MDF
0.179	-39.51	-41.96	-45.17	a
0.193467	-39.71	-44.18	-48.9	a
0.194696	-39.72	-44.4	-49.25	a
0.199722	-39.8	-45.38	-50.67	a
0.2	-39.8	-45.44	-50.75	a
0.208333	-39.92	-47.24	-53.19	a
0.21561	-40.04	-48.96	-55.36	a
0.222373	-40.15	-50.64	-57.4	a
0.23345	-40.35	-53.51	-60.77	a
0.235084	-40.38	-53.94	-61.26	a
0.239	-40.46	-54.98	-62.46	a
0.246148	-40.6	-56.89	-64.65	a
0.248	-40.63	-57.39	-64.86	a
0.249819	-40.66	-57.87	-65.02	a
0.250067	-40.66	-57.94	-65.04	a
0.256	-40.75	-59.54	-65.55	a
0.25627	-40.76	-59.61	-65.58	a
0.262988	-40.87	-61.43	-66.14	a
0.263	-40.87	-61.44	-66.14	a
0.265315	-40.9	-62.06	-66.33	a
0.266667	-40.93	-62.43	-66.44	a
0.267397	-40.94	-62.63	-66.5	a
0.268	-40.95	-62.79	-66.55	a
0.271	-41	-63.61	-66.79	a
0.272638	-41.03	-64.06	-66.92	a
0.273	-41.04	-64.16	-66.95	a
0.278421	-41.14	-65.64	-67.38	a
0.281	-41.19	-66.35	-67.58	a
0.283116	-41.24	-66.93	-67.74	a
0.286003	-41.3	-67.73	-67.96	a
0.287008	-41.32	-68.01	-68.04	a
0.291333	-41.41	-68.36	-68.36	a
0.292485	-41.44	-68.45	-68.45	a
0.295483	-41.51	-68.67	-68.67	a
0.299161	-41.6	-68.94	-68.94	a
0.3	-41.62	-69	-69	a
0.301	-41.65	-71.94	-76.44	a
0.303	-41.7	-72.52	-76.24	a
0.303982	-41.73	-72.8	-76.14	a
0.307	-41.81	-73.67	-75.85	a
0.308232	-41.84	-74.03	-75.73	a
0.310322	-41.9	-74.64	-75.59	a

Cont.

Frequency MHz	Up Short NTE	Up Medium NTE	Up Long NTE	Down MDF
0.318586	-42.16	-76.46	-76.46	a
0.319	-42.18	-76.5	-76.5	a
0.327566	-42.49	-77.37	-77.37	a
0.333	-42.71	-77.92	-77.92	a
0.333143	-42.72	-77.93	-77.93	a
0.333333	-42.72	-77.95	-77.95	a
0.3367	-42.87	-78.28	-78.28	a
0.344065	-43.23	-79.78	-79.78	a
0.34445	-43.25	-79.89	-79.89	a
0.349963	-43.54	-81.46	-81.46	a
0.351	-43.6	-81.75	-81.75	a
0.358742	-44.08	-82.8	-82.8	a
0.366157	-44.58	-83.25	-83.25	a
0.378	-45.51	-83.94	-83.94	a
0.38	-45.68	-84.05	-84.05	a
0.382919	-45.93	-84.22	-84.22	a
0.384295	-46.05	-84.3	-84.3	a
0.399	-47.47	-85.11	-85.11	a
0.4	-47.57	-85.16	-85.16	a
0.404253	-48.02	-85.39	-85.39	a
0.404794	-48.07	-85.42	-85.42	a
0.404807	-48.08	-85.42	-85.42	a
0.423859	-50.24	-86.42	-86.42	a
0.427391	-50.67	-86.6	-86.6	a
0.433333	-51.39	-86.9	-86.9	a
0.441289	-52.39	-87.29	-87.29	a
0.452464	-53.82	-87.83	-87.83	a
0.456865	-54.4	-88.04	-88.04	a
0.469474	-56.06	-88.63	-88.63	a
0.479432	-57.38	-89.09	-89.09	a
0.482646	-57.81	-89.23	-89.23	a
0.487516	-58.47	-89.45	-89.45	a
0.492	-59.07	-89.65	-89.65	a
0.494218	-59.37	-89.75	-89.75	a
0.5	-60.15	-90	-90	a
0.501667	-60.37	a	a	a
0.50365	-60.64	a	a	a
0.508812	-61.34	a	a	a
0.515146	-62.2	a	a	a
0.520871	-62.98	a	a	a
0.523446	-63.33	a	a	a
0.534365	-64.82	a	a	a
0.545545	-66.35	a	a	a

Cont.

Frequency MHz	Up Short NTE	Up Medium NTE	Up Long NTE	Down MDF
0.548595	-66.76	a	a	a
0.564058	-68.89	a	a	a
0.57	-69.72	a	a	a
0.579787	-71.08	a	a	a
0.582667	-71.49	a	a	a
0.6	-73.95	a	a	a
0.602626	-74.32	a	a	a
0.613094	-75.84	a	a	a
0.625055	-77.61	a	a	a
0.630511	-78.43	a	a	a
0.65	-81.45	a	a	a
0.661743	-83.36	a	a	a
0.697042	-89.77	a	a	a
0.735	-90	a	a	a
1.104	a	a	a	-36.5
1.4	-90	-90	-90	a
1.489432	-91.95	-91.95	-91.95	a
1.499983	-92.17	-92.17	-92.17	a
1.622	a	a	a	-46.5
1.63	-94.78	-94.78	-94.78	a
1.96	-100.57	-100.57	-100.57	a
2.208	a	a	a	-47.8
2.5	a	a	a	-59.4
2.645685	-108.79	-108.79	-108.79	a
2.92	-109.43	-109.43	-109.43	a
3.0015	a	a	a	-80
3.0861	a	a	a	-86.893
3.093	-109.81	-109.81	-109.81	a
3.637	-110	-110	-110	a
4.545	a	a	a	-110
30	-110	-110	-110	-110

**Table A.1 Customer NTE and MDF PSD Mask Specification**

The data defines the mask frequencies. The symbol "a" in the table means that the value for this frequency can be obtained by linear interpolation on a log frequency scale of the values in the preceding and following rows that contain a numerical value.

The contributing PSDs were as follows:

As detailed in ND1604:2003/01 (Issue 1) [1], plus systems conforming to ITU-T Recommendation G.992.5 [3]

## **Annex 2 ANFP Laboratory Test Specification**

Test methods to enable the determination of the conformance of telecommunications equipment against an ANFP were agreed by the NICC DSL Task Group. These are incorporated within ND1602:2005/08 [4]. The applicable network interfaces for testing against the Kingston ANFP and this document are defined by the Full Loop Scenario shown in Section 4 Figure 2 of ND1602:2005/08 [4].

## **Annex 3 ANFP Field Test Specification**

Test methods to enable the determination of the conformance of telecommunications equipment against the KCH ANFP requirements in the MPF field environment have not been defined by the NICC DSL Task Group.

In order to help resolve any inter-network interference complaint, the NICC DSL Task Group have produced Guidelines on the Inter-network Interference Management [11]. In addition, recognising the potential for interference to external systems (e.g. radio) due to unintentional radiation of signals from MPFs supporting xDSL systems, the DSL Task Group has produced Guidelines on External Interference Management [12].



## Annex 4 ANFP User Guide

All equipment connected to the KCH access network (i.e. KCH equipment, LLU Operator Equipment and CPE) needs to comply with this document. Demonstration of compliance is via a system of self-declaration.

The principles as outlined in ND1602:2002/11 Annex D.1, D.3, D.4 and D.5 [2] continue to generally apply to the KCH ANFP. Annex D.2 is not relevant to the KCH network and the following applies:

### Line Categorisation

The ANFP defines different PSD masks for the customer end depending on distance from the exchange - primarily the physical 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 is applied to all existing KCH line ends based on an estimate of the physical length of a line to the exchange. New KCH lines will be classified upon completion of their installation. Once the classification has been undertaken, the classification for a given end 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-routing due to a road development scheme) or to an ANFP category check process that results in a change in the category.

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.

### How the various classes of DSL may fit the ANFP

The following table names the standardised systems which were used in the construction of the KCH ANFP, and which were intended to be admitted by design.

Short Line	Medium Line	Long Line
POTS	POTS	POTS
ISDN Basic Rate Access	ISDN Basic Rate Access	ISDN Basic Rate Access
ADSL over POTS	ADSL over POTS	ADSL over POTS
64kbps AMI	64 kbps AMI	64 kb/s AMI
64 - 256 kbit/s 2B1Q	64 - 256 kbit/s 2B1Q	64 - 256 kbit/s 2B1Q
SDSL/SHDSL	SDSL/SHDSL	SDSL/SHDSL
64 - 2312kbit/s gross rate	64 - 1160 kbit/s gross rate	64 - 1032 kbit/s gross rate
ADSL2 (See notes below)	ADSL2 (See notes below)	ADSL2 (See notes below)
ADSL2+(see notes below)	ADSL2+(see notes below)	ADSL2+(see notes below)

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 ANFP would exclude the following standardised systems from use on *any* KCH access network line ('short', 'medium' or 'long'):

- A 1-pair 2.3 Mbit/s HDSL system using 2B1Q or CAP
- A 2 or 3 pair 2.3 Mbit/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.

## ADSL2 and ADSL2+

The ITU-T standards family G.992.1 [7], G.992.2 [8], G.992.3 [9] and G.992.4 [10] use the same frequency spectrum: ADSL2 systems may therefore be considered with ADSL systems. G.992.5 systems (ADSL2+) [3] use an extended frequency spectrum and requires separate consideration. Generally, the annexes to the standards specify the sub-carriers and their associated transmission power levels using a coherent Annex naming convention to designate the same area of concern and similar use of sub-carriers.

ITU-T G.992.x Annex	1-5	6-31	32-64	65-255	265-512*	ADSL G.992.1	ADSL2 G.992.3	ADSL2+ G.992.5
A	POTS	UP	DOWN	DOWN	DOWN	YES	YES	YES
B	ISDN	ISDN	UP	DOWN	DOWN	YES	YES	YES
C	TCM ISDN	UP	DOWN	DOWN	DOWN	YES	YES	YES
I	UP	UP	DOWN	DOWN	DOWN	N/A	YES	YES
J	UP	UP	UP	DOWN	DOWN	N/A	YES	YES
L	POTS	UP**	DOWN**	DOWN	DOWN	N/A	YES	NO
M	POTS	UP	UP	DOWN	DOWN	N/A	YES	YES

Use of tones applies to the non-overlapped PSD masks only

\* ADSL2+ only

\*\* Not all tones are used

N/A Not Applicable

Table A4-1 ADSL Standard Annexes and Use of Tones

## ADSL2 Compliance

Summary of compliance to the ND1604:2003/01 (Issue 1) and this Interim document is:

ITU-T G.992.x Annex	1-5	6-31	32-64	65-255
A	POTS		DOWN	DOWN
B	ISDN	ISDN		DOWN
I			DOWN	DOWN
J				DOWN
L	POTS		<i>DOWN</i>	DOWN
M	POTS			DOWN

Table A4-2 ADSL2 v MDF (Downstream) ANFP

The higher launch limit of Annex L option exceeds the ANFP limit and thus is not supported without downstream spectrum shaping.

ITU-T G.992.x Annex	1-5	6-31	32-64	65-255
A	POTS	UP		
B	ISDN	ISDN	UP	
I		UP		
J			UP	
L	POTS	UP**		
M	POTS	UP	UP	

Table A4-3 ADSL2 v Customer End NTE (Upstream) ANFP

Annex B: ATU-R PSD limits are non-compliant against all upstream masks.

Annex J: provides a family of PSD masks. PSD shaping is required for compliance to meet the appropriate line classification mask for the majority of line option combinations.

Annex L: Upstream Mask 1 and 2 PSDs exceed the permitted PSD and are not supported without appropriate PSD shaping.

Annex M: as per Annex J comment.

### ADSL2+ Compliance

Summary of compliance to the this document is:

ITU-T G.992.x Annex	1-5	6-31	32-64	65-255	265-512*
A	POTS	UP	DOWN	DOWN	DOWN
B	ISDN	ISDN		DOWN	DOWN
I			DOWN	DOWN	DOWN
J				DOWN	DOWN
L	N/A	N/A	N/A	N/A	N/A
M	POTS			DOWN	DOWN

Table A4-4 ADSL2+ v MDF (Downstream) ANFP

ITU-T G.992.x Annex	1-5	6-31	32-64	65-255	265-512*
A	POTS	UP			
B	ISDN	ISDN	UP		
I	UP	UP			
J	UP	UP	UP		
L	N/A	N/A	N/A	N/A	N/A
M	POTS	UP	UP		

Table A4-5 ADSL2+ v Customer End NTE (Upstream) ANFP

## **Annex 5 ANFP History and Background**

No specific history or background is provided for the KCH ANFP.

## **Annex 6 ANFP Change Control Procedure**

The ANFP Change Control Procedure(s) as agreed by the NICC DSL Task Group apply: see Section 6 of ND1602:2005/08 [4].

- End -