INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.992.1
Amendment 1
Corrigendum 1
(12/2003)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS
Digital sections and digital line system – Access networks

Corrigendum 1 to G.992.1 Amendment 1

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU [had/had not] received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

Corrigendum 1 to G.992.1 Amendment 1

1. Correct §C.7.3.2 as shown with revision control below:

C.7.3.2 MS messages (supplements 10.3.2)

Table C.6/G.992.1 – ATU-R MS message NPar(2) bit definitions for Annex C

NPar(2) bit	Definition
DBM	If set to ZERO, this bit shall indicate Bitmap-N_R and Bitmap-N_C are enabled (Dual Bitmap mode) and are used to transmit data. If set to ONE, this bit shall indicate Bitmap-N_R and Bitmap-N_C are disabled (FEXT Bitmap mode), i.e. only Bitmap-F_R and Bitmap-F_C are used to transmit data by ATU-C and ATU-R respectively. This mode selection shall be only performed by ATU-C. This bit shall be set to ONE if it was set to ONE in a previous CL message (only applicable for G.992.1 Annex C). (Note 1)
Profile 1	If set to ONE, this bit shall indicate that the ATU-R is selecting Profile 1
Profile 2	If set to ONE, this bit shall indicate that the ATU-R is selecting Profile 2
Profile 3	If set to ONE, this bit shall indicate that the ATU-R is selecting Profile 3
Profile 4	If set to ONE, this bit shall indicate that the ATU-R is selecting Profile 4
Profile 5	If set to ONE, this bit shall indicate that the ATU-R is selecting Profile 5
Profile 6	If set to ONE, this bit shall indicate that the ATU-R is selecting Profile 6
SPar(2) bit	**Definition**
C-PILOT	If set to ONE, this bit shall indicate that the ATU-R wishes to select a pilot tone and TTR indication signal. This bit shall be set to ONE to select one of the profiles defined in §C.3.4.
NPar(3) bit	**Definition**
$n_{C\text{-}PILOT1}$=64	If set to ONE, this bit shall indicate that the ATU-R is selecting the pilot tone on subcarrier 64 (Note 2).
$n_{C\text{-}PILOT1}$=48	If set to ONE, this bit shall indicate that the ATU-R is selecting the pilot tone on subcarrier 48 (Note 2).
$n_{C\text{-}PILOT1}$=32	If set to ONE, this bit shall indicate that the ATU-R is selecting the pilot tone on subcarrier 32 (Note 2).
$n_{C\text{-}PILOT1}$=16	If set to ONE, this bit shall indicate that the ATU-R is selecting the pilot tone on subcarrier 16 (Note 2).
A_{48} / B_{48}	If set to ONE, this bit shall indicate that the ATU-R is selecting the TTR indication signal A_{48} / B_{48} (Note 2).
A_{24} / B_{24}	If set to ONE, this bit shall indicate that the ATU-R is selecting the TTR indication signal A_{24} / B_{24} (Note 2).
C-REVERB33-63	If set to ONE, this bit shall indicate that the ATU-R is selecting the TTR indication signal C-REVERB33-63 (Note 2).
C-REVERB6-31	If set to ONE, this bit shall indicate that the ATU-R is selecting the TTR indication signal C-REVERB6-31 (Note 2).
Note~~:~~ 1 – The DBM bit is only used to maintain backward compatibility with G.992.1 Annex C 1999. Note 2 – One and only one pilot tone bit, and one and only one TTR indication signal bit shall be set in an MS message	

2. Correct §I.7.2 as shown with revision control below:

I.7.2 Handshake – ATU-C (supplements 10.2)

I.7.2.1 CL messages (supplements 10.2.1)

See Table I.8.

Table I.8/G.992.1 – ATU-C CL message NPar(2) bit definitions for Annex I

NPar(2) bit	Definition
DBM	If set to ZERO, this bit shall indicate Bitmap-N_R and Bitmap-N_C are enabled (Dual Bitmap mode) and are used to transmit data. If set to ONE, this bit shall indicate Bitmap-N_R and Bitmap-N_C are disabled (FEXT Bitmap mode), i.e. only Bitmap-F_R and Bitmap-F_C are used to transmit data by ATU-C and ATU-R respectively. This mode selection shall be only performed by the ATU-C. If it is set to ONE in a CL message, it must be set to ONE in subsequent MS messages from either the ATU-C or ATU-R.
Spectral Shaping Downstream #1 (shaped ssvi)	This bit shall be set to ONE.
Spectral Shaping Downstream #2 (flat ssvi)	This bit shall be set to ONE.
Spectrum Shaping Downstream #3 (ATU-C selected ssvi)	If this bit is set to ONE, it indicates that the ATU-C supports downstream inband spectrum shaping selectable by the ATU-C using the exchange of ssv_i values according to I.4.8.7.
SPar(2) bit	**Definition**
C-PILOT	This bit shall be set to ONE to indicate that the ATU-C supports negotiation of the optional pilot tone.
Spectrum Shaping Downstream	If this bit is set to ONE, it indicates that the ATU-C is specifying a downstream inband spectral shape using the exchange of ssv_i values according to I.4.8.7.
NPar(3) bit	**Definition**
$n_{C\text{-}PILOT1}$=64	This bit shall be set to ONE, indicating that the ATU-C supports transmission of pilot tone on subcarrier 64.
$n_{C\text{-}PILOT1}$=128	This bit shall be set to ONE, indicating that the ATU-C supports transmission of pilot tone on subcarrier 128.
A_{48}	This bit shall be set to ONE, indicating that the ATU-C supports transmission of TTR indication signal A_{48}.
Subcarrier index/log_ssv_i	A parameter block of pairs of a subcarrier index and the spectrum shaping log_ssv_i value at that subcarrier. Pairs shall be transmitted in ascending subcarrier index order. Each pair shall be represented as 4 octets. The parameter block length shall be a multiple of 4 octets. Codepoints shall be structured as: • The subcarrier index shall be a 12-bit unsigned value, indicating subcarrier index 1 to 2*NSCds-1, coded in bits 6 down to 1 in octet 1, bits 6 down to 1 in octet 2; • The spectrum shaping log_tssi values shall be represented in logarithmic scale as a 7-bit unsigned value in -0.5 dB steps, ranging from 0 dB (value 0) to –62.5 dB (value 125), coded in bit 1 of octet 3 and bits 6 down to 1 in octet 4. Value 126 and 127 are reserved.

I.7.2.2 MS messages (supplements 10.2.2)

See Table I.9.

Table I.9/G.992.1 – ATU-C MS message NPar(2) bit definitions for Annex I

NPar(2) bit	Definition
DBM	If set to ZERO, this bit shall indicate Bitmap-N_R and Bitmap-N_C are enabled (Dual Bitmap mode) and are used to transmit data. If set to ONE, this bit shall indicate Bitmap-N_R and Bitmap-N_C are disabled (FEXT Bitmap mode), i.e. only Bitmap-F_R and Bitmap-F_C are used to transmit data by ATU-C and ATU-R respectively. This mode selection shall be only performed by ATU-C. This bit shall be set to ONE if it was set to ONE in a previous CL message.
Spectral Shaping Downstream #1 (shaped ssvi)	If set to ZERO, this bit shall indicate that "shaped ssvi"is not selected. If set to ONE, this bit shall indicate that "shaped ssvi"is selected. This mode selection shall only be performed by the ATU-C (Note 2).
Spectral Shaping Downstream #2 (flat ssvi)	If set to ZERO, this bit shall indicate that "flat ssvi"is not selected. If set to ONE, this bit shall indicate that "flat ssvi"is selected. This mode selection shall only be performed by the ATU-C (Note 2).
Spectrum Shaping Downstream #3 (ATU-C selected ssvi)	If set to ZERO, this bit shall indicate that "ATU-C selected ssvi"is not selected. If set to ONE, this bit shall indicate that "ATU-C selected ssvi"is selected. This mode selection shall only be performed by the ATU-C (Note 2).
SPar(2) bit	**Definition**
C-PILOT	This bit shall be set to ONE to indicate that the ATU-C wishes to select a pilot tone.
Spectrum Shaping Downstream	This bit shall be set to ZERO.
NPar(3) bit	**Definition**
$n_{C\text{-}PILOT1}$=64	If set to ONE, this bit shall indicate that the ATU-C is selecting the pilot tone on subcarrier 64 (Note 1).
$n_{C\text{-}PILOT1}$=128	If set to ONE, this bit shall indicate that the ATU-C is selecting the pilot tone on subcarrier 128 (Note 1).
A_{48}	This bit shall be set to ONE.
Note 1 – One and only one pilot tone bit shall be set in an MS message. Note 2 – One and only one Npar(2) spectrum shaping downstream bit shall be set in an MS message.	

3. Correct §I.7.3 as shown with revision control below:

I.7.3 Handshake – ATU-R (supplements 10.3)

I.7.3.1 CLR messages (supplements 10.3.1)

See Table I.10.

Table I.10/G.992.1 – ATU-R CLR message NPar(2) bit definitions for Annex I

NPar(2) bit	Definition
DBM	This bit shall be set to ONE.
Spectral Shaping Downstream #1 (shaped ssvi)	This bit shall be set to ONE.
Spectral Shaping Downstream #2 (flat ssvi)	This bit shall be set to ONE.
Spectrum Shaping Downstream #3 (ATU-C selected ssvi)	If this bit is set to ONE, it indicates that the ATU-R supports downstream inband spectrum shaping selectable by the ATU-C using the exchange of ssv_i values according to I.4.8.7.
SPar(2) bit	**Definition**
C-PILOT	This bit shall be set to ONE to indicate that the ATU-R supports negotiation of the optional pilot tone.
Spectrum Shaping Downstream	This bit shall be set to ZERO.
NPar(3) bit	**Definition**
$n_{C\text{-}PILOT1}$=64	This bit shall be set to ONE, indicating that the ATU-R supports reception of pilot tone on subcarrier 64.
$n_{C\text{-}PILOT1}$=128	If set to ONE, this bit shall indicate that the ATU-R supports reception of pilot tone on subcarrier 128.
A_{48}	This bit shall be set to ONE.

I.7.3.2 MS messages (supplements 10.3.2)

Table I.11.

Table I.11/G.992.1 – ATU-R MS message NPar(2) bit definitions for Annex I

NPar(2) bit	Definition
DBM	If set to ZERO, this bit shall indicate Bitmap-N_R and Bitmap-N_C are enabled (Dual Bitmap mode) and are used to transmit data. If set to ONE, this bit shall indicate Bitmap-N_R and Bitmap-N_C are disabled (FEXT Bitmap mode), i.e. only Bitmap-F_R and Bitmap-F_C are used to transmit data by ATU-C and ATU-R respectively. This mode selection shall be only performed by ATU-C. This bit shall be set to ONE if it was set to ONE in a previous CL message.
Spectral Shaping Downstream #1 (shaped ssvi)	If set to ZERO, this bit shall indicate that "shaped ssvi"is not selected. If set to ONE, this bit shall indicate that "shaped ssvi"is selected. This mode selection shall only be performed by the ATU-C (Note 2).
Spectral Shaping Downstream #2 (flat ssvi)	If set to ZERO, this bit shall indicate that "flat ssvi"is not selected. If set to ONE, this bit shall indicate that "flat ssvi"is selected. This mode selection shall only be performed by the ATU-C (Note 2).
Spectrum Shaping Downstream #3 (ATU-C selected ssvi)	If set to ZERO, this bit shall indicate that "ATU-C selected ssvi"is not selected. If set to ONE, this bit shall indicate that "ATU-C selected ssvi"is selected. This mode selection shall only be performed by the ATU-C (Note 2).
SPar(2) bit	**Definition**
C-PILOT	This bit shall be set to ONE to indicate that the ATU-R wishes to select a pilot tone.
Spectrum Shaping Downstream	This bit shall be set to ZERO.
NPar(3) bit	**Definition**
$n_{C\text{-}PILOT1}$=64	If set to ONE, this bit shall indicate that the ATU-R is selecting the pilot tone on subcarrier 64 (Note 1).
$n_{C\text{-}PILOT1}$=128	If set to ONE, this bit shall indicate that the ATU-R is selecting the pilot tone on subcarrier 128 (Note 1).
A_{48}	This bit shall be set to ONE.
Note 1 – One and only one pilot tone bit shall be set in an MS message. Note 2 – One and only one Npar(2) spectrum shaping downstream bit shall be set in an MS message.	

I.7.3.3 MP messages (new)

Table I.11a.

Table I.11a/G.992.1 – ATU-R MP message NPar(2) bit definitions for Annex I

NPar(2) bit	Definition
DBM	If set to ZERO, this bit shall indicate Bitmap-N_R and Bitmap-N_C are enabled (Dual Bitmap mode) and are used to transmit data. If set to ONE, this bit shall indicate Bitmap-N_R and Bitmap-N_C are disabled (FEXT Bitmap mode), i.e. only Bitmap-F_R and Bitmap-F_C are used to transmit data by ATU-C and ATU-R respectively. This mode selection shall be only performed by ATU-C. This bit shall be set to ONE if it was set to ONE in a previous CL message.
Spectral Shaping Downstream #1 (shaped ssvi)	If set to ONE, this bit shall indicate that the ATU-R is proposing the use of "shaped ssvi".
Spectral Shaping Downstream #2 (flat ssvi)	If set to ONE, this bit shall indicate that the ATU-R is proposing the use of "flat ssvi".
Spectrum Shaping Downstream #3 (ATU-C selected ssvi)	If set to ONE, this bit shall indicate that the ATU-R is proposing the use of "ATU-C selected ssvi".
SPar(2) bit	**Definition**
C-PILOT	This bit shall be set to ONE to indicate that the ATU-R wishes to propose a pilot tone.
Spectrum Shaping Downstream	This bit shall be set to ZERO.
NPar(3) bit	**Definition**
$n_{C\text{-}PILOT1}$=64	If set to ONE, this bit shall indicate that the ATU-R is proposing the use of pilot tone on subcarrier 64 (Note 1).
$n_{C\text{-}PILOT1}$=128	If set to ONE, this bit shall indicate that the ATU-R is proposing the use of pilot tone on subcarrier 128 (Note 1).
A_{48}	This bit shall be set to ONE.
Note 1 – One and only one pilot tone bit shall be set in an MP message.	

4. Correct §I.7.4.1 as shown with revision control below:

I.7.4.1 C-PILOT1 (supplements 10.4.2)

The ATU-C shall start the N_{SWF} (sliding window frame) counter from 0 immediately after entering C-PILOT1, and increment the N_{SWF} counter modulo 345 after transmission of each DMT symbol. According to the sliding window function and this counter, the ATU-C decides to transmit all of the subsequent symbols in either $FEXT_R$ or $NEXT_R$ symbols (for example, see Figures I.11, I.19 and I.23).

C-PILOT1 has two signals.

The first signal is the pilot tone, a single frequency sinusoid at $f_{C\text{-}PILOT1}$ defined as:

$$X_k = \begin{cases} 0, & k \neq n_{C-PILOT1}, 0 \leq k \leq NSC \\ A_{C-PILOT1}, & k = n_{C-PILOT1} \end{cases}$$

The frequency of the pilot tone shall be selected from one of the following choices during G.994.1 as:

1. $f_{\text{C-PILOT1}}$ = 276 kHz ($n_{\text{C-PILOT1}}$ = 64).
2. $f_{\text{C-PILOT1}}$ = 552 kHz ($n_{\text{C-PILOT1}}$ = 128).

Transmitters that support Annex I shall support both of these pilot tones.

The second signal is the TTR indication signal used to transmit NEXT_R/FEXT_R information. The ATU-R can detect the phase information of the TTR_C from this signal. The TTR indication signal shall be selected during G.994.1 as:

A_{48} signal –the constellation encoding of the 48th carrier with 2-bit constellation as follows:

(+ , +) to indicate a FEXT_R symbol;

(+ , –) to indicate a NEXT_R symbol.

5. Correct §C.7.4.1 as shown with revision control below:

C.7.4.1 C-PILOT1 (supplements 10.4.2)

The ATU-C shall start the N_{SWF} (sliding window frame) counter from 0 immediately after entering C-PILOT1, and increment the N_{SWF} counter modulo 345 after transmission of each DMT symbol. According to the sliding window function and this counter, the ATU-C decides to transmit all of the subsequent symbols in either FEXT_R or NEXT_R symbols (for example, see Figures C.11, C.15 and C.19).

C-PILOT1 has two signals.

The first signal is the pilot tone as a single frequency sinusoid.

For Profiles 1 & 2, the frequency of the pilot tone shall be selected from one of the following choices:

1. $f_{\text{C-PILOT1}}$ = 276 kHz ($n_{\text{C-PILOT1}}$ = 64);
2. $f_{\text{C-PILOT1}}$ = 207 kHz ($n_{\text{C-PILOT1}}$ = 48).

For Profiles 3 to 6, the frequency of the pilot tone shall be selected from one of the following choices:

1. $f_{\text{C-PILOT1}}$ = 276 kHz ($n_{\text{C-PILOT1}}$ = 64);
2. $f_{\text{C-PILOT1}}$ = 207 kHz ($n_{\text{C-PILOT1}}$ = 48);
3. $f_{\text{C-PILOT1}}$ = 138 kHz ($n_{\text{C-PILOT1}}$ = 32);
4. $f_{\text{C-PILOT1}}$ = 69 kHz ($n_{\text{C-PILOT1}}$ = 16).

For modems not using any of the profiles defined in §C.3.4, the frequency of the pilot tone shall be:

$f_{C\text{-}PILOT1}$ = 276 kHz ($n_{C\text{-}PILOT1}$ = 64)

Transmitters that use any of the profiles defined in §C.3.4 shall support all of the~~se~~ pilot tones specified for the supported profiles. For backwards compatibility, receivers shall support $n_{C\text{-}PILOT1}$ = 64. Support of the other pilot tones by a receiver is optional. The pilot tone shall be selected during G.994.1.

The second signal is the TTR indication signal used to transmit $NEXT_R$/$FEXT_R$ information. The ATU-R can detect the phase information of the TTR_C from this signal.

For Profiles 1 & 2, the TTR indication signal shall be selected from one of the following choices:

1. A_{48} signal –the constellation encoding of the 48th carrier with 2-bit constellation as follows:

   (+ , +) to indicate a $FEXT_R$ symbol;

   (+ , –) to indicate a $NEXT_R$ symbol.

2. C-REVERB33-63 – subcarriers 33 through 63 of C-REVERB, transmitted only in the first four DMT symbols of each hyperframe in C-PILOT1 to indicate the beginning of the hyperframe.

For Profile 3, the TTR indication signal shall be selected from one of the following choices:

1. B_{48} signal – the constellation encoding of the 48th carrier with 2-bit constellation as follows:

   (+ , –) to indicate the first and the last symbol in consecutive $FEXT_R$ symbols;

   (+ , +) to indicate the other symbols in consecutive $FEXT_R$ symbols.

2. B_{24} signal – the constellation encoding of the 24th carrier with 2-bit constellation as follows:

   (+ , –) to indicate the first and the last symbol in consecutive $FEXT_R$ symbols;

   (+ , +) to indicate the other symbols in consecutive $FEXT_R$ symbols.

3. C-REVERB6-31 – subcarriers 6 through 31 of C-REVERB, transmitted only in the first four DMT symbols of each hyperframe in C-PILOT1 to indicate the beginning of the hyperframe.

For Profiles 4 to 6, the TTR indication signal shall be selected from one of the following choices:

1. A_{48} signal – the constellation encoding of the 48th carrier with 2-bit constellation as follows:

   (+ , +) to indicate a $FEXT_R$ symbol;

   (+ , –) to indicate a $NEXT_R$ symbol.

2. A_{24} signal – the constellation encoding of the 24th carrier with 2-bit constellation as follows:

   (+ , +) to indicate a $FEXT_R$ symbol;

   (+ , –) to indicate a $NEXT_R$ symbol.

3. C-REVERB6-31 – subcarriers 6 through 31 of C-REVERB, transmitted only in the first four DMT symbols of each hyperframe in C-PILOT1 to indicate the beginning of the hyperframe.

For modems not using any of the profiles defined in §C.3.4, the TTR indication signal shall be:

A_{48} signal – the constellation encoding of the 48th carrier with 2-bit constellation as follows:

(+ , +) to indicate a $FEXT_R$ symbol;

(+ , –) to indicate a $NEXT_R$ symbol.

Transmitters that use any of the profiles defined in §C.3.4 shall support all of the~~se~~ TTR indication signals specified for the supported profiles. For backwards compatibility, receivers shall support TTR indication signal A_{48}. Support for the other TTR indication signals by a receiver is optional. The TTR signal shall be selected during G.994.1.

6. Modify the note in §C.7.6.2 and add the following text before the note as shown with revision control below:

For modems that use any of the profiles defined in §C.3.4, the PRD sequence generator at the transmitter shall continue to be updated during $NEXT_R$ symbols when Bitmap-N_R is disabled (FEXT Bitmap mode).

NOTE - For modems not using any of the profiles defined in §C.3.4~~At the transmitter~~, the PRD sequence generator at the transmitter is either always updated or always stopped during $NEXT_R$ symbol when Bitmap-N_R is disabled (FEXT Bitmap mode). The receiver should be able to support both modes of transmitter operation.

7. Replace the note in §I.7.6.2 with the following text as shown with revision control below:

~~NOTE - At the transmitter, the PRD sequence generator is either always updated or always stopped during $NEXT_R$ symbol when Bitmap-N_R is disabled (FEXT Bitmap mode). The receiver should be able to support both modes of transmitter operation.~~

At the transmitter, the PRD sequence generator shall continue to be updated during $NEXT_R$ symbols when Bitmap-N_R is disabled (FEXT Bitmap mode).

8. Add new §I.7.4.4.1 after §I.7.4.4 as follows:

I.7.4.4.1 Power Cut-back (supplements 10.4.5.1)

For Annex I, see A.3.1.

9. Add new §I.7.9.1.2 after §I.7.9.1.1 as follows:

I.7.9.1.2 Estimated average upstream loop attenuation (supplements 10.8.9.1)

For Annex I, see A.3.2.

10. Add new §I.7.10.2.2 after §I.7.10.2.1 as follows:

I.7.10.2.2 Estimated average downstream loop attenuation (supplements 10.9.8.1)

For Annex I, see A.3.3.

11. Revise §I.5.5 by adding the following new sub-clauses after §I.5.5.2:

I.5.5.3 Nyquist frequency (supplements 8.11.1.2)

The Nyquist frequency for Annex I is specified in A.2.5.

I.5.5.4 Modulation by the inverse discrete Fourier transform (supplements 8.11.2)

For Annex I, see A.2.1.

I.5.5.5 Synchronization symbol (supplements 8.11.3)

For Annex I, see A.2.2.

12. Add new §I.5.7 after §I.5.6 as follows:

I.5.7 Cyclic prefix (supplements 8.12)

For Annex I, see A.2.3.

13. Correct §I.4.8.5 as shown with revision control below:

I.4.8.5 Alternative Flat Shaped Spectrum

On short loops that would normally require~~requiring power~~ a substantial amount of power cut back, the flat PSD spectrum may be used to better utilize the capacity in the higher frequency bins. Table I.4 and Table I.5 define the ssv_i values for the flat shaped non-overlapped and overlapped PSDs.

Table I.4: Corner points for the flat non-overlapped nominal in-band PSD shape

Tone Index	Log_ssv_i (dB)	Comments
32	~~0~~ -11.3	138 kHz defines the beginning of the inband region. No shaping is applied throughout the passband.
511	~~0~~ -11.3	2208 kHz

Table I.5: Corner points for the flat overlapped nominal in-band PSD shape

Tone Index	Log_ssv$_i$ (dB)	Comments
6	~~0~~ -11.3	25 kHz defines the beginning of the inband region. No shaping is applied throughout the passband.
511	~~0~~ -11.3	2208 kHz

The specification of power cutback for this spectral shape is for further study.

14. Add new §I.9 as follows:

I.9 POTS splitter

For operation according to G.992.1 Annex I, the Annex E.4/G.992.3 requirements applying over a frequency band up to 1104 kHz, shall be met over a frequency band up to 2208 kHz.

15. Add new §I.4.8.7 as follows:

I.4.8.7 ATU-C selectable downstream inband spectral shaping (supplements I.4.8.3)

As an optional extension to the fixed downstream inband spectral shape defined in I.4.8.3 by Tables I.2 (non-overlapped spectrum) and I.3 (overlapped spectrum), an ATU-C may specify a downstream inband spectral shape by passing subcarrier indices and Log_ssv$_i$ values to the ATU-R in a G.994.1 CL message.

The optional downstream inband spectral shaping parameters are defined in I.7.2 and I.7.3. If the spectrum shaping downstream Spar(2) bit is set to ONE in a CL message, the associated subcarrier index and Log_ssv$_i$ Npar(3) parameters define an inband spectral shape.

An ATU-C (ATU-R) may indicate support for this option by setting the spectrum shaping downstream #3 (ATU-C selected ssvi) Npar(2) bit to ONE in a CL (CLR) message.

The ATU-C (ATU-R) shall select the downstream inband spectral shape to be used by setting one of the spectrum shaping downstream #n Npar(2) bits in an MS message. If no CLR/CL exchange transaction is included in the G.994.1 session, and spectrum shaping downstream #3 (ATU-C selected ssvi) is selected, the spectrum shaping indicated in the last previous CLR/CL exchange shall apply.

The spectral shaping for each subcarrier i (ssv$_i$) shall be defined as a function of the frequency breakpoints and spectral scalings exchanged during G.994.1 for all sub-carriers, index 1 to 2*NSC-1, as:

- The spectral shaping (log_ssvi, dB value) of the lowest breakpoint frequency if the subcarrier is below the lowest breakpoint frequency (i.e., flat extension to lower frequencies);
- The spectral shaping (log_ssvi, dB value) of the highest breakpoint frequency if the subcarrier is above the highest breakpoint frequency (i.e., flat extension to higher frequencies);
- Otherwise interpolated between spectral shaping of the lower and higher breakpoint frequency with linear relationship between the spectral shaping (log_ssvi, dB value) and linear frequencies (Hz)(i.e., interpolation with constant dB/Hz slope).

16. Modify the note in §C.7.8.3 and add the following text before the note as shown with revision control below:

For modems that use any of the profiles defined in §C.3.4, the PRU sequence generator at the transmitter shall continue to be updated during $NEXT_C$ symbols when Bitmap-N_C is disabled (FEXT Bitmap mode).

NOTE - For modems not using any of the profiles defined in §C.3.4~~At the transmitter~~, the ~~PRD~~ PRU sequence generator at the transmitter is either always updated or always stopped during ~~$NEXT_R$~~ $NEXT_C$ symbol when Bitmap-~~N_R~~ N_C is disabled (FEXT Bitmap mode). The receiver should be able to support both modes of transmitter operation.

17. Replace the note in §I.7.8.3 with the following text as shown with revision control below:

~~NOTE - At the transmitter, the PRD sequence generator is either always updated or always stopped during $NEXT_R$ symbol when Bitmap-N_R is disabled (FEXT Bitmap mode). The receiver should be able to support both modes of transmitter operation.~~

At the transmitter, the PRU sequence generator shall continue to be updated during $NEXT_C$ symbols when Bitmap-N_C is disabled (FEXT Bitmap mode).

18. Correct editorial error in Appendix V

The Table V.1 first row: "0 < f <10" should be corrected into "0< f <4".