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Definitions of Managed Object Extensions for Very High Speed Digital Subscriber Lines (VDSL) Using Single Carrier Modulation (SCM) Line Coding

Status of This Memo

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Abstract

This document defines a portion of the Management Information Base (MIB) module for use with network management protocols in the Internet community. In particular, it describes objects used for managing the Line Code Specific parameters of Very High Speed Digital Subscriber Line (VDSL) interfaces using Single Carrier Modulation (SCM) Line Coding. It is an optional extension to the VDSL-LINE-MIB, RFC 3728, which handles line code independent objects.

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1. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

2. Overview

This document describes an SNMP MIB module for managing the Line Code Dependent, Physical Medium Dependent (PMD) Layer of SCM VDSL Lines. These definitions are based upon the specifications for VDSL as defined in T1E1, European Telecommunications Standards Institute (ETSI), and International Telecommunication Union (ITU) documentation [T1E1311, T1E1011, T1E1013, ETSI2701, ETSI2702, ITU9931, ITU9971]. Additionally the protocol-dependent (and line-code dependent) management framework for VDSL lines specified by the Digital Subscriber Line Forum (DSLF) has been taken into consideration [DSLFTR57] and [DSLFWT96].

The MIB module is located in the MIB tree under MIB-2 transmission.

The key words "MUST", "MUST NOT", "RECOMMENDED", and "SHOULD" in this document are to be interpreted as described in [RFC2119].

2.1. Relationship of this MIB Module to Other MIB Modules

The relationship of the VDSL Line MIB module to other MIB modules, in particular to the IF-MIB presented in RFC 2863 [RFC2863], is discussed in the VDSL-LINE-MIB, RFC 3728 [RFC3728]. This section outlines the relationship of this VDSL Line Extension MIB to the VDSL-LINE-MIB, RFC 3728 [RFC3728].

2.2. Conventions Used in the MIB Module

2.2.1. Naming Conventions

A. Vtuc -- VDSL transceiver unit at near (Central) end of line
B. Vtur -- VDSL transceiver unit at Remote end of line
C. Vtu -- One of either Vtuc or Vtur
D. Curr -- Current
F. Atn -- Attenuation
J. LCS -- Line Code Specific
K. Max -- Maximum
Q. Mgn -- Margin
S. PSD -- Power Spectral Density
T. Rx -- Receive
T. Snr -- Signal to Noise Ratio
U. Tx -- Transmit

2.3. Structure

The SCM VDSL Line Extension MIB contains the following MIB group:

o vdslSCMGroup :

This group supports MIB objects for defining configuration profiles and for monitoring individual bands of Single Carrier Modulation (SCM) VDSL modems. It contains the following tables:

- vdslLineSCMConfProfileTxBandTable
- vdslSCMPhysBandTable

If the SCM VDSL Line Extension MIB is implemented then all objects in this group MUST be implemented.

Figure 1 below displays the relationship of the tables in the vdslSCMGroup to the vdslGroup and to the ifEntry:

```
ifEntry(ifType=97)  ----> vdslLineTableEntry 1:(0..1)

 vdslLineTableEntry (vdslLineCoding=SCM)
       ----> vdslPhysTableEntry 1:(0..2)
           ----> vdslSCMPhysBandTable 1:(0..5)

 vdslLineConfProfileEntry(vdslLineConfProfileName)
               ----> vdslLineSCMConfProfileBandTable 1:(0..5)
```

Figure 1: Table Relationships

When the object vdslLineCoding is set to SCM, vdslLineConfProfileName is used as the index to vdslLineSCMConfProfileBandTable. The existence of an entry in any of the tables of the vdslSCMGroup is optional.

2.4. Persistence

All read-create objects defined in this MIB module SHOULD be stored persistently. Following is an exhaustive list of these persistent objects:

- vdslLineSCMConfProfileBandId
- vdslLineSCMConfProfileBandUsage
- vdslLineSCMConfProfileBandCenterFrequency
- vdslLineSCMConfProfileBandSymbolRate
- vdslLineSCMConfProfileBandConstellationSize
- vdslLineSCMConfProfileBandTransmitPSDLevel
- vdslLineSCMConfProfileBandRowStatus
- vdslLineSCMPhysBandId
- vdslLineSCMPhysBandUsage
- vdslLineSCMPhysBandCurrPSDLevel
- vdslLineSCMPhysBandCurrSymbolRate
- vdslLineSCMPhysBandCurrConstellationSize
- vdslLineSCMPhysBandCurrCenterFrequency
- vdslLineSCMPhysBandPerformanceBandId
- vdslLineSCMPhysBandPerformanceBandUsage
- vdslLineSCMPhysBandPerformanceBandSnrMgn
- vdslLineSCMPhysBandPerformanceBandAtn

Note also that the interface indices in this MIB are maintained persistently. View-based Access Control Model (VACM) data relating to these SHOULD be stored persistently as well [RFC3415].

3. Conformance and Compliance

An SCM based VDSL agent does not have to implement this MIB to be compliant with RFC 3728 [RFC3728]. If the SCM VDSL Line Extension MIB is implemented then the following group is mandatory:

- vdslSCMGroup

4. Definitions

```
VDSL-LINE-EXT-SCM-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY,
OBJECT-TYPE,
Integer32,
transmission,
Unsigned32                      FROM SNMPv2-SMI         -- [RFC2578]
TEXTUAL-CONVENTION,
TruthValue,
RowStatus                       FROM SNMPv2-TC          -- [RFC2579]
MODULE-COMPLIANCE,
OBJECT-GROUP                    FROM SNMPv2-CONF        -- [RFC2580]
ifIndex                         FROM IF-MIB             -- [RFC2863]
vdslLineConfProfileName         FROM VDSL-LINE-MIB;     -- [RFC3728]

vdslExtSCMMIB MODULE-IDENTITY
   LAST-UPDATED "200504280000Z" --     April 28, 2005
   ORGANIZATION "ADSLMIB Working Group"
   CONTACT-INFO "WG-email:  adslmib@ietf.org
         Info:      https://www1.ietf.org/mailman/listinfo/adslmib

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          "

   DESCRIPTION
      "The VDSL-LINE-MIB found in RFC 3728 defines objects for the
      management of a pair of VDSL transceivers at each end of the VDSL
      line.  The VDSL-LINE-MIB configures and monitors the line code
      independent parameters (TC layer) of the VDSL line.  This MIB
      module is an optional extension of the VDSL-LINE-MIB and defines
      objects for configuration and monitoring of the line code specific
      (LCS) elements (PMD layer) for VDSL lines using SCM coding.  The
      objects in this extension MIB MUST NOT be used for VDSL lines
      using Multiple Carrier Modulation (MCM) line coding.  If an object
      in this extension MIB is referenced by a line which does not use
      SCM, it has no effect on the operation of that line.

      Naming Conventions:

         Vtuc -- VDSL transceiver at near (Central) end of line
         Vtur -- VDSL transceiver at Remote end of line
         Vtu  -- One of either Vtuc or Vtur
         Curr -- Current
         Atn  -- Attenuation
         LCS  -- Line Code Specific
         Max  -- Maximum
         Mgn  -- Margin
         PSD  -- Power Spectral Density
         Rx   -- Receive
         Snr  -- Signal to Noise Ratio
         Tx   -- Transmit

      Copyright (C) The Internet Society (2005).  This version
      of this MIB module is part of RFC 4069: see the RFC
      itself for full legal notices."
              REVISION "200504280000Z" --     April 28, 2005
              DESCRIPTION "Initial version, published as RFC 4069."
          ::= { transmission 228 }

          vdslLineExtSCMMib    OBJECT IDENTIFIER ::= { vdslExtSCMMIB 1 }
          vdslLineExtSCMMibObjects OBJECT IDENTIFIER ::=
                                                  { vdslLineExtSCMMib 1 }
   --
```

```
   -- textual conventions used in this MIB
   --

   VdslSCMBandId ::= TEXTUAL-CONVENTION
       STATUS       current
       DESCRIPTION
          "This data type is used as the syntax for the VDSL SCM Band
           Identity.  Attributes with this syntax identify the SCM Band
           referred to.  Specified as an INTEGER, the possible values
           are:

           optionalBand (1)  -- the optional Band range [25kHz - 138kHz]
           firstDownstreamBand (2)  -- first Downstream Band
           firstUpstreamBand (3)    -- first Upstream Band
           secondDownstreamBand (4) -- second Downstream Band
           secondUpstreamBand (5)   -- second Upstream Band
           thirdDownstreamBand (6)  -- third Downstream Band
           thirdUpstreamBand (7)    -- third Upstream Band"


       SYNTAX      INTEGER       {  optionalBand (1),
                                    firstDownstreamBand (2),
                                    firstUpstreamBand (3),
                                    secondDownstreamBand (4),
                                    secondUpstreamBand (5),
                                    thirdDownstreamBand (6),
                                    thirdUpstreamBand(7) }

   --
   -- Single carrier modulation (SCM) configuration profile tables
   --

   vdslLineSCMConfProfileBandTable OBJECT-TYPE
       SYNTAX       SEQUENCE OF VdslLineSCMConfProfileBandEntry
       MAX-ACCESS   not-accessible
       STATUS       current
       DESCRIPTION
          "This table contains transmit band descriptor configuration
           information for a VDSL line.  Each entry in this table
           reflects the configuration for one of possibly many bands
           of a single carrier modulation (SCM) VDSL line.  For each
           profile which is associated with a VDSL line using SCM
           line coding, five entries in this table will exist, one for
           each of the five bands.  Bands which are not in use will be
           marked as unused.  These entries are defined by a manager
           and can be used to configure the VDSL line.  If an entry in
```

```
            this table is referenced by a line which does not use SCM,
            it has no effect on the operation of that line."
        ::= { vdslLineExtSCMMibObjects 1 }

    vdslLineSCMConfProfileBandEntry OBJECT-TYPE
        SYNTAX       VdslLineSCMConfProfileBandEntry
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
           "Each entry consists of a list of parameters that
            represents the configuration of a single carrier
            modulation VDSL modem transmit band.

            A default profile with an index of 'DEFVAL', will
            always exist and its parameters will be set to vendor
            specific values, unless otherwise specified in this
            document.

            All read-create objects defined in this MIB module SHOULD be
            stored persistently."

        INDEX { vdslLineConfProfileName,
         vdslLineSCMConfProfileBandId }
        ::= { vdslLineSCMConfProfileBandTable 1 }

    VdslLineSCMConfProfileBandEntry ::=
        SEQUENCE
           {
           vdslLineSCMConfProfileBandId                VdslSCMBandId,
           vdslLineSCMConfProfileBandInUse             TruthValue,
           vdslLineSCMConfProfileBandCenterFrequency   Unsigned32,
           vdslLineSCMConfProfileBandSymbolRate        Unsigned32,
           vdslLineSCMConfProfileBandConstellationSize Unsigned32,
           vdslLineSCMConfProfileBandTransmitPSDLevel  Unsigned32,
           vdslLineSCMConfProfileBandRowStatus         RowStatus
           }

    vdslLineSCMConfProfileBandId OBJECT-TYPE
        SYNTAX      VdslSCMBandId
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
           "The BandId for this entry, which specifies which band
            is being referred to."
        ::= { vdslLineSCMConfProfileBandEntry 1 }
```

```
   vdslLineSCMConfProfileBandInUse OBJECT-TYPE
       SYNTAX       TruthValue
       MAX-ACCESS   read-create
       STATUS  current
       DESCRIPTION
          "Indicates whether this band is in use.
           If set to True this band is in use."
       ::= { vdslLineSCMConfProfileBandEntry 2 }

   vdslLineSCMConfProfileBandCenterFrequency OBJECT-TYPE
       SYNTAX       Unsigned32
       UNITS        "Hz"
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
          "Specifies the center frequency in Hz"
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMConfProfileBandEntry 3 }

   vdslLineSCMConfProfileBandSymbolRate OBJECT-TYPE
       SYNTAX       Unsigned32
       UNITS        "baud"
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
          "The requested symbol rate in baud."
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMConfProfileBandEntry 4 }

   vdslLineSCMConfProfileBandConstellationSize OBJECT-TYPE
       SYNTAX       Unsigned32 (0..16)
       UNITS        "log2"
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
          "Specifies the constellation size."
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMConfProfileBandEntry 5 }
```

```
   vdslLineSCMConfProfileBandTransmitPSDLevel OBJECT-TYPE
       SYNTAX       Unsigned32
       UNITS        "-0.25 dBm/Hz"
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
          "The requested transmit power spectral density for the VDSL
           modem.  The Actual value in -0.25 dBm/Hz."
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMConfProfileBandEntry 6  }

   vdslLineSCMConfProfileBandRowStatus OBJECT-TYPE
       SYNTAX       RowStatus
       MAX-ACCESS   read-create
       STATUS       current
       DESCRIPTION
          "This object is used to create a new row or modify or
           delete an existing row in this table.

           A profile activated by setting this object to `active'.
           When `active' is set, the system will validate the profile.

           None of the columns in this row may be modified while the
           row is in the `active' state.

           Before a profile can be deleted or taken out of
           service, (by setting this object to `destroy' or
           `notInService') it must be first unreferenced
           from all associated lines."

       ::= { vdslLineSCMConfProfileBandEntry 7 }

   --
   -- SCM physical band
   --

   vdslLineSCMPhysBandTable OBJECT-TYPE
       SYNTAX       SEQUENCE OF VdslLineSCMPhysBandEntry
       MAX-ACCESS   not-accessible
       STATUS       current
       DESCRIPTION
          "This table provides one row for each SCM Vtu band.  This
           table is read only as it reflects the current physical
           parameters of each band.  For each ifIndex which is
           associated with a VDSL line using SCM line coding, five
           entries in this table will exist, one for each of the
           five bands.  Bands which are not in use will be marked
           as unused."
```

```
        ::= { vdslLineExtSCMMibObjects 2 }

    vdslLineSCMPhysBandEntry OBJECT-TYPE
        SYNTAX        VdslLineSCMPhysBandEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
           "An entry in the vdslLineSCMPhysBandTable."
        INDEX { ifIndex,
                vdslLineSCMPhysBandId  }
        ::= { vdslLineSCMPhysBandTable 1 }

    VdslLineSCMPhysBandEntry ::=
        SEQUENCE
            {
            vdslLineSCMPhysBandId                    VdslSCMBandId,
            vdslLineSCMPhysBandInUse                 TruthValue,
            vdslLineSCMPhysBandCurrCenterFrequency   Unsigned32,
            vdslLineSCMPhysBandCurrSymbolRate        Unsigned32,
            vdslLineSCMPhysBandCurrConstellationSize Unsigned32,
            vdslLineSCMPhysBandCurrPSDLevel          Unsigned32,
            vdslLineSCMPhysBandCurrSnrMgn            Integer32,
            vdslLineSCMPhysBandCurrAtn               Unsigned32
            }

    vdslLineSCMPhysBandId OBJECT-TYPE
        SYNTAX      VdslSCMBandId
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
            "The BandId for this entry, which specifies which band
             is being referred to."
        ::= { vdslLineSCMPhysBandEntry 1 }

    vdslLineSCMPhysBandInUse OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
           "Indicates whether this band is in use.
            If set to True this band is in use."
        ::= { vdslLineSCMPhysBandEntry 2 }
```

```
   vdslLineSCMPhysBandCurrCenterFrequency OBJECT-TYPE
       SYNTAX       Unsigned32
       UNITS        "Hz"
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
          "The current center frequency in Hz for this band."
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMPhysBandEntry 3 }

   vdslLineSCMPhysBandCurrSymbolRate    OBJECT-TYPE
       SYNTAX       Unsigned32
       UNITS        "baud"
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
          "The current value of the symbol rate in baud for this
           band."
      REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
      ::= { vdslLineSCMPhysBandEntry 4 }

   vdslLineSCMPhysBandCurrConstellationSize OBJECT-TYPE
       SYNTAX       Unsigned32 (0..16)
       UNITS        "log2"
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
          "The current constellation size on this band."
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMPhysBandEntry 5 }

   vdslLineSCMPhysBandCurrPSDLevel    OBJECT-TYPE
       SYNTAX       Unsigned32
       UNITS        "- 0.25 dBm/Hz"
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
          "The transmit power spectral density for the
           VDSL modem."
       REFERENCE    "T1E1.4/2000-011R3"    -- Part 2, SCM
       ::= { vdslLineSCMPhysBandEntry 6 }
```

```
   vdslLineSCMPhysBandCurrSnrMgn OBJECT-TYPE
       SYNTAX        Integer32
       UNITS         "0.25 dB"
       MAX-ACCESS    read-only
       STATUS        current
       DESCRIPTION
          "Noise margin as seen by this Vtu and band with respect
           to its received signal in 0.25 dB."
       ::= { vdslLineSCMPhysBandEntry 7 }

   vdslLineSCMPhysBandCurrAtn OBJECT-TYPE
       SYNTAX        Unsigned32 (0..255)
       UNITS         "0.25 dB"
       MAX-ACCESS    read-only
       STATUS        current
       DESCRIPTION
          "Measured difference in the total power transmitted by
           the peer Vtu on this band and the total power received
           by this Vtu on this band in 0.25 dB."
       ::= { vdslLineSCMPhysBandEntry 8 }

   -- conformance information

   vdslLineExtSCMConformance OBJECT IDENTIFIER ::=
                                              { vdslLineExtSCMMib 2 }
   vdslLineExtSCMGroups OBJECT IDENTIFIER ::=
                                       { vdslLineExtSCMConformance 1 }
   vdslLineExtSCMCompliances OBJECT IDENTIFIER ::=
                                       { vdslLineExtSCMConformance 2 }

   vdslLineExtSCMMibCompliance MODULE-COMPLIANCE
       STATUS  current
       DESCRIPTION
          "The compliance statement for SNMP entities which
           manage VDSL interfaces."

       MODULE  -- this module

       MANDATORY-GROUPS
       {
         vdslLineExtSCMGroup
       }

       ::= { vdslLineExtSCMCompliances 1 }
```

```
   -- units of conformance

   vdslLineExtSCMGroup    OBJECT-GROUP
       OBJECTS
           {
           vdslLineSCMConfProfileBandInUse,
           vdslLineSCMConfProfileBandTransmitPSDLevel,
           vdslLineSCMConfProfileBandSymbolRate,
           vdslLineSCMConfProfileBandConstellationSize,
           vdslLineSCMConfProfileBandCenterFrequency,
           vdslLineSCMConfProfileBandRowStatus,
           vdslLineSCMPhysBandInUse,
           vdslLineSCMPhysBandCurrPSDLevel,
           vdslLineSCMPhysBandCurrSymbolRate,
           vdslLineSCMPhysBandCurrConstellationSize,
           vdslLineSCMPhysBandCurrCenterFrequency,
           vdslLineSCMPhysBandCurrSnrMgn,
           vdslLineSCMPhysBandCurrAtn

           }
       STATUS      current
       DESCRIPTION
          "A collection of objects providing configuration
           information for a VDSL line based upon single carrier
           modulation modem."
       ::= { vdslLineExtSCMGroups 1 }

   END
```

5. Acknowledgments

This document contains many definitions taken from an early version of the VDSL MIB [RFC3728]. As such, any credit for the text found within should be fully attributed to the authors of that document.

6. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

```
   vdslLineSCMConfProfileBandTable
   vdslLineSCMConfProfileBandInUse,
   vdslLineSCMConfProfileBandTransmitPSDLevel,
   vdslLineSCMConfProfileBandSymbolRate,
```

vdslLineSCMConfProfileBandConstellationSize,
vdslLineSCMConfProfileBandCenterFrequency,
vdslLineSCMConfProfileBandRowStatus

VDSL layer connectivity from the Vtur will permit the subscriber to manipulate both the VDSL link directly and the VDSL embedded operations channel (EOC) for their own loop. For example, unchecked or unfiltered fluctuations initiated by the subscriber could generate sufficient notifications to potentially overwhelm either the management interface to the network or the element manager.

Additionally, allowing write access to configuration data may allow an end-user to increase their service levels or affect other end-users in either a positive or negative manner. For this reason, the tables and objects listed above should be considered to contain sensitive information.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP. These are the tables and objects and their sensitivity/vulnerability:

vdslLineSCMPhysBandInUse,
vdslLineSCMPhysBandCurrPSDLevel,
vdslLineSCMPhysBandCurrSymbolRate,
vdslLineSCMPhysBandCurrConstellationSize,
vdslLineSCMPhysBandCurrCenterFrequency,
vdslLineSCMPhysBandCurrSnrMgn,
vdslLineSCMPhysBandCurrAtn

Read access of the physical band parameters may provide knowledge to an end-user that would allow malicious behavior, for example the application of an intentional interference on one or all of the physical bands in use.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of a MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

7. IANA Considerations

The IANA has assigned the transmission value 228 to VDSL-LINE-EXT-SCM-MIB.

8. References

8.1. Normative References

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[T1E1013] ANSI T1E1.4/2001-013R4, "VDSL Metallic Interface, Part 3: Technical Specification for a Multi-Carrier Modulation (MCM) Transceiver", November 2000.

8.2. Informative References

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