

**Definitions of Managed Object Extensions
for Very High Speed Digital Subscriber Lines (VDSL) Using
Single Carrier Modulation (SCM) Line Coding**
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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 (DSL Forum) has been taken into consideration [[DSLFT95](#)] and [[DSLFT96](#)].

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](#)].

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2.1 Relationship of this MIB Module to other MIB Modules

The relationship of the VDSL Line MIB module to other MIB modules and in particular to the IF-MIB, as 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 -- (VTUC) transceiver at near (Central) end of line
- B. Vtur -- (VTUR) transceiver 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 of the 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)
```

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```
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

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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 "200501160000Z" -- January 16, 2005

ORGANIZATION "ADSLMIB Working Group"

CONTACT-INFO "WG-email: adslmib@ietf.org"

Info: <https://www1.ietf.org/mailman/listinfo/adslmib>

Chair: Mike Sneed
Sand Channel Systems
Postal: P.O. Box 37324
Raleigh NC 27627-732
Email: sneedmike@hotmail.com
Phone: +1 206 600 7022

Co-Chair: Bob Ray
PESA Switching Systems, Inc.
Postal: 330-A Wynn Drive
Huntsville, AL 35805
USA
Email: rray@pesa.com
Phone: +1 256 726 9200 ext. 142

Co-editor: Menachem Dodge
ECI Telecom Ltd.
Postal: 30 hasivim St.
Petach Tikva 49517,
Israel.
Email: mbdodge@ieee.org
Phone: +972 3 926 8421

Co-editor: Bob Ray
PESA Switching Systems, Inc.
Postal: 330-A Wynn Drive
Huntsville, AL 35805
USA
Email: rray@pesa.com
Phone: +1 256 726 9200 ext. 142

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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 -- (VTUC) transceiver at near (Central) end of line
Vtur -- (VTUR) 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

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-- RFC Ed.: replace XXXX with assigned number & remove this note
REVISION "200501160000Z" -- January 16, 2005
DESCRIPTION "Initial version, published as RFC XXXX."
-- RFC Ed.: replace XX with assigned number & remove this note
 ::= { transmission XX } -- To be assigned by IANA
-- RFC Ed.: we suggest to put it under { transmission 227 } because
-- this is the first available number, transmission 228
-- would be used for the MCM MIB.
vdsllLineExtSCMMib OBJECT IDENTIFIER ::= { vdslExtSCMMIB 1 }
vdsllLineExtSCMMibObjects OBJECT IDENTIFIER ::=
 { vdsllLineExtSCMMib 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

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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.

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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 }
```

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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.

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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
}
```

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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 }

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vdsLineSCMPhysBandCurrConstellationSize 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

::= { vdsLineSCMPhysBandEntry 5 }

vdsLineSCMPhysBandCurrPSDLevel 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

::= { vdsLineSCMPhysBandEntry 6 }

vdsLineSCMPhysBandCurrSnrMgn 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."

::= { vdsLineSCMPhysBandEntry 7 }

vdsLineSCMPhysBandCurrAtn 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."

::= { vdsLineSCMPhysBandEntry 8 }

-- conformance information

vdsLineExtSCMConformance OBJECT IDENTIFIER ::=

{ vdsLineExtSCMMib 2 }

vdsLineExtSCMGroups OBJECT IDENTIFIER ::=

{ vdsLineExtSCMConformance 1 }

vdsLineExtSCMCompliances OBJECT IDENTIFIER ::=

{ vdsLineExtSCMConformance 2 }

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```
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 earlier draft of the VDSL MIB [[RFC3728](#)]. As such any credit for the text

found within should be fully attributed to the authors of that document.

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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.

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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 is kindly requested to assign the value of the MODULE-IDENTITY. The authors suggest transmission 227, see [section 4](#).

[8.](#) References

[8.1.](#) Normative References

- [DSLFT57] DSL Forum TR-057, "VDSL Network Element Management", February 2003.
- [DSLFWT96] DSL Forum WT-096, "SCM Specific Managed Objects In VDSL Network Elements".
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- [ETSI2702] ETSI TS 101 270-2 V1.1.1, "Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very high speed Digital Subscriber Line (VDSL); Part 1: Transceiver specification", February 2001.
- [ITU9931] ITU-T G.993.1, "Very-high-speed digital subscriber line foundation", November 2001.
- [ITU9971] ITU-T G.997.1, "Physical layer management for Digital

Subscriber Line (DSL) Transceivers", July 1999.

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Authors' Addresses

Menachem Dodge

ECI Telecom Ltd.
30 Hasivim St.

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Petach Tikva 49517,
Israel.

Phone: +972 3 926 8421
Fax: +972 3 928 7342
Email: mbdodge@ieee.org

Bob Ray
PESA Switching Systems, Inc.
330-A Wynn Drive
Huntsville, AL 35805
USA

Phone: +1 256 726 9200 ext. 142
Fax: +1 256 726 9271
EMail: rray@pesa.com

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