11. PHY services

11.1 Overview

The PHY provides an interface between the MAC sublayer and the physical radio channel, via the RF firmware and the RF hardware. The PHY conceptually includes a management entity called the PLME. This entity provides the layer management service interfaces through which layer management functions may be invoked. The physical layer management entity (PLME) is also responsible for maintaining a database of managed objects pertaining to the PHY. This database is referred to as the PHY PAN information base (PIB).

Figure 11-1 depicts the components and interfaces of the PHY.

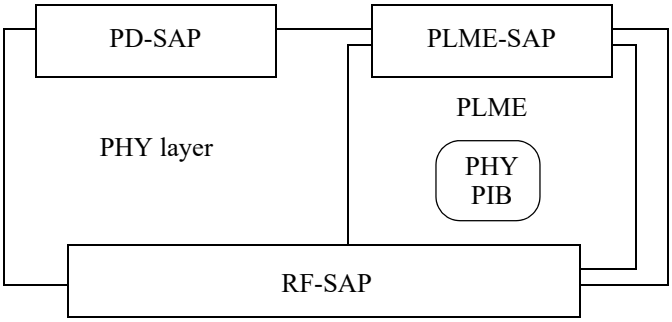

Figure 11-1—PHY reference model

The PHY provides two services, accessed through two SAPs: the PHY data service, accessed through the PHY data SAP (PD-SAP), and the PHY management service, accessed through the physical layer management entity service access point (PLME-SAP). The PD-SAP and PLME-SAP are not defined in this standard as they are not expected to be exposed in a typical implementation. The PHY PIB attributes are accessed through the MLME-SAP with the MLME-GET and MLME-SET primitives.

Constants and attributes that are specified and maintained by the PHY are written in italics. Constants have a general prefix of "a," e.g., *aMaxPhyPacketSize*, and are listed in Table 11-1. Attributes have a general prefix of "phy," e.g., *phyCurrentChannel*, and are listed tables in 11.3.

Attributes that have a prefix of "phyHrpUwb," e.g., *phyHrpUwbDataRatesSupported*, apply only to the HRP UWB PHY and are not used for other PHYs.

11.2 PHY constants

The constants that define the characteristics of the PHY are presented in Table 11-1. These constants are hardware dependent and cannot be changed during operation.

11.3 PHY PIB attributes

The PHY PIB includes the attributes required to manage the PHY of a device. The attributes contained in the PHY PIB are presented in Table 11-2, Table 11-3, Table 11-4, Table 11-5, Table 11-6, Table 11-7, Table 11-8, Table 11-9, Table 11-10, Table 11-11, and Table 11-12. Attributes marked with a dagger (†) are read-only attributes (i.e., attribute can only be set by the PHY), which can be read by the next higher layer using the MLME-GET.request primitive. All other attributes can be read or written by the next higher layer using the MLME-GET.request or MLME-SET.request primitives, respectively.

Table 11-1—PHY constants

Constant	Description	Value
aMaxPhyPacketSize	The maximum PSDU size (in octets) the PHY shall be able to receive.	2047 for the following PHYs: SUN, TVWS, RCC, LECIM FSK, and MSK with a 2000 kb/s data rate. For LECIM DSSS PHY, this is not a constant; refer to *phyLecimDsssPsduSize*. For the HRP UWB PHY, this is not a constant; refer to phyHrpUwbPsduSize. 127 for all other PHYs.
aTurnaroundTime	RX-to-TX or TX-to-RX turnaround time (in symbol periods), as defined in 10.2.2 and 10.2.3.	For the SUN, RS-GFSK, TVWS, and LECIM FSK PHYs, the value is 1 ms expressed in symbol periods, rounded up to the next integer number of symbol periods using the ceiling() function.[a] For the LECIM DSSS PHY, the value is 1 ms expressed in modulation symbol periods, rounded up to the next integer number of symbol periods using the ceiling() function. For the MSK PHY with a data rate of 2000 kb/s, the value is 384 symbol periods. For the HRP UWB PHY, the value is expressed in Tpsym units. The value is 12 for all other PHYs.
aLeipDelayTime	The delay between the start of the SFD and the LEIP, as described in 18.6.	0.815 ms
aCcaTime	The time required to perform CCA detection.	For the SUN PHYs other than SUN O-QPSK, the duration of 8 symbol periods, as defined in 6.1. For the SUN O-QPSK PHY, this value is defined in Table 21-24. For all other PHYs, the duration of 8 symbol periods.

[a]The function ceiling() returns the smallest integer value greater than or equal to its argument value.

Table 11-2—Generic PHY PIB attributes

Attribute	Type	Range	Description
phyCcaMode	Integer	1–6	The CCA mode, as defined in 10.2.8.
phyCurrentChannel	Integer	PHY dependent as defined in 10.1.3.	The RF channel to use for all following transmissions and receptions.
phyCurrentPage	Integer	Any valid channel page	This is the current PHY channel page. This is used in conjunction with *phyCurrentChannel* to uniquely identify the channel currently being used.
phyTxPower	Signed integer	—	Currently configured upper-bound level of the transmit power of the device that shall be equal or less than *phyMaxTxPower* in dBm.
phyRanging†	Boolean	TRUE, FALSE	TRUE if ranging is supported, FALSE otherwise.
phyCcaDuration	Integer	0–1000	The duration for CCA, specified in symbols for PHYs operating in the 920 MHz band.

Table 11-2—Generic PHY PIB attributes *(continued)*

Attribute	Type	Range	Description
phyBroadcastTxPower	Signed integer	—	Transmit power in dBm while broadcasting. This value is managed by an upper layer but shall be lower or equal to *phyTxPower*.
phyUnicastTxPower	Signed integer	—	Transmit power in dBm while sending a unicast. This value is managed by an upper later but shall be lower or equal to *phyTxPower*.
phyPeersTxPower	List of parameters as defined in Table 11-13	—	List of exceptions to the *phyUnicastTxPower* while transmitting to specific peer devices.
phyRxRmarkerOffset	Integer	0x00000000–0xffffffff	A count of the propagation time from the receive antenna to the ranging counter. The time units for this are as specified in 6.9.1.4.
phyTxRmarkerOffset	Integer	0x00000000–0xffffffff	A count of the propagation time from the ranging counter to the transmit antenna. The time units for this are as specified in 6.9.1.4.
phyFragmentSize	Integer	PHY dependent	The number of octets in each fragment.
phyPsduFragSecure	Boolean	TRUE, FALSE	When set to TRUE, a MIC shall be used as the FICS, as described in 7.4.2.9. When set to FALSE, the FICS shall be calculated as in 7.2.11.
phyFragmentFrameCounter	Integer	0x00 0000–0x3f ffff	The outgoing PSDU counter to use when *phyPSDUFragSecure* is TRUE. The counter is not used when *phyPSDUFragSecure* is FALSE.

Table 11-3—LECIM Related PIB attributes

Attribute	Type	Range	Description
phyCurrentLecimPhyType	Enumeration	DSSS, FSK	Specifies the LECIM PHY type in use.
phyLecimCurrentBand	Enumeration	169, 262, 433, 470, 780, 863, 915, 917, 920, 921, 922, 2450	The operating frequency band currently selected.
phyLecimChannelSpacing	Enumeration	12.5,100, 200, LECIMBASE, 2LECIMBASE, 4LECIMBASE, 8LECIMBASE	The channel spacingthat is used with *phyCurrentBand* and *phyCurrentChannel* to specify the frequency channel being used. 12.5 corresponds to 12.5 kHz, 100 corresponds to 100 kHz, 200 corresponds to 200 kHz, LECIMBASE corresponds to *lecimBaseMultiplier* kHz, 2LECIMBASE corresponds to 2 × *lecimBaseMultiplier* kHz 4LECIMBASE corresponds to 4 × *lecimBaseMultiplier* kHz and 8LECIMBASE corresponds to 8 × *lecimBaseMultiplier* kHz.

Table 11-3—LECIM Related PIB attributes *(continued)*

Attribute	Type	Range	Description
phyFrakProgressTimeout	Integer	—	The duration, in modulated symbols, at which to generate a Frak frame when Frak policy 1 is in use.
phyPsduFragPadValue	Integer	0–255	The value used to pad out the last fragment when MPDU fragmentation is enabled.
phyPsduFragmentatio-nEnabled	Boolean	TRUE, FALSE	When TRUE, PSDU fragmentation is enabled. See 23.3. When FALSE, PSDU fragmentation is disabled.
phyLecimFecTailBitin-gEnabled	Boolean	TRUE, FALSE	A value of TRUE indicates that tail biting is enabled. A value of FALSE indicates that it is disabled. This attribute is only valid for the LECIM DSSS PHY.
phyLecimFecEnabled	Boolean	TRUE, FALSE	A value of TRUE indicates that FEC is turned on. A value of FALSE indicates that FEC is turned off. This attribute is only valid for the LECIM FSK PHY.

Table 11-4—LECIM DSSS related PIB attributes

Attribute	Type	Range	Description
phyLecimDsssPpduModu-lationRate	Enumeration	100, 200, 400, 600, 800, 1000, 2000	The modulation rate measured in modulation kilo symbols per second. This attribute is only valid for the LECIM DSSS PHY.
phyLecimDsssPpduTxAt	Integer	0–[2^{32}–1]	The time, in modulation symbols, relative to the start of the beacon. This attribute is only valid for the LECIM DSSS PHY.
phyLecimDsssPsduSize	Enumeration	16, 24, 32	The size, in octets, of the PSDU. This attribute is only valid for the LECIM DSSS PHY.
phyLecimDsssPreamble-Size	Enumeration	0, 16, 32	The length of the preamble, as illustrated in Table 22-1. This attribute is only valid for the LECIM DSSS PHY.
phyLecimDsssSfdPresent	Boolean	TRUE, FALSE	A value of TRUE indicates that the SFD is present. A value of FALSE indicates that the SFD is not present. This attribute is only valid for the LECIM DSSS PHY.

Table 11-4—LECIM DSSS related PIB attributes *(continued)*

Attribute	Type	Range	Description
phyLecimDsssPsduSpreadingFactor	Integer	4–15	2^x chips per symbol where x is in the range 4 to 15, inclusive. This attribute is only valid for the LECIM DSSS PHY.
phyLecimDsssPsduOvsfSpreadingFactor	Integer	1–256	The length of the generated code in power of 2. A value of one indicates that OVSF is not enabled. This attribute is only valid for the LECIM DSSS PHY.
phyLecimDsssPsduOvsfCodeIndex	Integer	0, 1, …, N – 1	Specifies the desired code from the available set of codes. The value of N is given by *phyLecimDsssPSDUOVSFSpreadingFactor*. This attribute is only valid for the LECIM DSSS PHY.

Table 11-5—LECIM FSK related PIB attributes

Attribute	Type	Range	Description
phyLecimFskPreambleLength	Integer	0–64	The number of times the preamble contains the pattern defined in 23.2.2.2. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskPsduPositionMod	Boolean	TRUE, FALSE	Indicates whether position-based modulation is enabled. A value of TRUE indicates that position-based modulation is enabled. A value of FALSE indicates that it is not enabled. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSpreading	Boolean	TRUE, FALSE	A value of TRUE indicates that spreading is enabled. A value of FALSE indicates that spreading is disabled. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSpreadingFactor	Enumeration	1, 2, 4, 8, 16	The spreading factor to be used when *phyLecimFskSpreading* or *phyTvwsFskSpreadingEnabled* is TRUE. This attribute is only valid for the LECIM FSK and TVWS FSK PHY.
phyLecimFskSpreadingPattern	Enumeration	ALTERNATING_1/0, NON_ALTERNATING	Specifies the type of pattern used for spreading when spreading is enabled. This attribute is only valid for the LECIM FSK and TVWS FSK PHY.
phyLecimFskInterleavingEnabled	Boolean	TRUE, FALSE	A value of TRUE indicates that interleaving is turned on. A value of FALSE indicates that interleaving is turned off. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSplit	Boolean	TRUE, FALSE	Indicates use of split mode as defined in 23.1. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSplitBurstDistribution	Enumeration	FIXED, CUSTOM	The radio-burst distribution method to use as defined in 23.3.8. This attribute is only valid for the LECIM FSK PHY.

Table 11-5—LECIM FSK related PIB attributes *(continued)*

Attribute	Type	Range	Description
phyLecimFskSplitChannelMultiplier	Integer	1–255	Spacing between two channels actively used for transmission in split mode. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSplitFec	Enumeration	IR2-CC, IR3-CC, IR4-LDPC	FEC scheme to use as described in 23.3.5.3. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSfdSpreading	Boolean	TRUE, FALSE	A value of TRUE indicates that SFD spreading is enabled. A value of FALSE indicates that SFD spreading is disabled. This attribute is only valid for the LECIM FSK PHY.
phyLecimFskSymbolRate	Float	As defined in Table 10-3	The currently selected symbol rate in *k*-symbols per second. The valid symbol rates per band are given in Table 10-3.

Table 11-6—LRP UWB related PIB attributes

Attribute	Type	Range	Description
phyLrpUwbFixedDelayFactor	Integer	1–32 767	Define the reply delay factor that multiplies the *phyLrpUwbFixedReplyTime* to be used in multi-node ranging.
phyLrpUwbFixedReplyTime	Enumeration	FRT4, FRT8, FRT16, FRT32	For LRP-ERDEV this attribute selects the fixed reply time as specified in Table 18-15.
phyLrpUwbPrp	Integer	0–7	Selects the pulse repetition period (PRP) to used, as specified in 18.2.6. The value corresponds to the factor kPRP defined in Table 18-6.
phyLrpUwbSfdSelector	Integer	0–9	This attribute selects the SFD pattern to be used by the transmitter and receiver, as specified in 18.3.3.2 and Table 18-7.
phyLrpUwbSignaling	Integer	0–15	For the LRP UWB PHY, when attribute is non-zero, it configures the PHY to receive with the signaling scheme defined in Table 18-1.

Table 11-7—HRP UWB related PIB attributes

Attribute	Type	Range	Description
phyHrpUwbDataRatesSupported†	List of integers	—	A list of the data rates available in the operating channel as defined in Table 15-12.
phyHrpUwbCurrentPulseShape	Enumeration	MANDATORY, COU, CS, LCP	Indicates the current pulse shape setting of the HRP UWB PHY. The mandatory pulse is described in 15.4.4. Optional pulse shapes include CoU, as defined in 15.5.2; CS, as defined in 15.5.3; and LCP, as defined in 15.5.4.
phyHrpUwbLcpWeight1	Signed integer	0x00–0xff	The weights are represented in twos-complement form. A value of 0x80 represents –1 while a value of 0x7f represents 1.
phyHrpUwbLcpWeight2	Signed integer	0x00–0xff	The weights are represented in twos-complement form. A value of 0x80 represents –1 while a value of 0x7f represents 1.
phyHrpUwbLcpWeight3	Signed integer	0x00–0xff	The weights are represented in twos-complement form. A value of 0x80 represents –1 while a value of 0x7f represents 1.
phyHrpUwbLcpWeight4	Signed integer	0x00–0xff	The weights are represented in twos-complement form. A value of 0x80 represents –1 while a value of 0x7f represents 1.
phyHrpUwbLcpDelay2	Integer	0x00–0xff	The range is from 0 to 4 ns with a resolution is 15.625 ps. For example, a value of 0x00 represents 0 while 0x02 represents 31.25 ps, as defined in 15.5.4.
phyHrpUwbLcpDelay3	Integer	0x00–0xff	The range is from 0 to 4 ns with a resolution is 15.625 ps. For example, a value of 0x00 represents 0 while 0x02 represents 31.25 ps, as defined in 15.5.4.
phyHrpUwbLcpDelay4	Integer	0x00–0xff	The range is from 0 to 4 ns with a resolution is 15.625 ps. For example, a value of 0x00 represents 0 while 0x02 represents 31.25 ps, as defined in 15.5.4.
phyHrpUwbScanBinsPerChannel	Integer	0–255	Number of frequency intervals used to scan each HRP UWB channel (scan resolution). Set to zero for non-HRP UWB PHYs.
phyHrpUwbInsertedPreambleInterval	Enumeration	0, 4	The time interval between two neighboring inserted preamble symbols in the data portion, as defined in 15.6, for HRP UWB PHYs operating with CCA mode 6. The resolution is a data symbol period at a data rate of 850 kb/s for all channels. Set to four for HRP UWB PHY in CCA mode 6; otherwise, set to zero.

Table 11-7—HRP UWB related PIB attributes *(continued)*

Attribute	Type	Range	Description
phyHrpUwbCcConstraintLength	Enumeration	CL3, CL7	For HRP-ERDEV in the HPRF mode, this attribute specifies the constraint length of the convolutional code in use by the transmitter and receiver applying to the PHR and PSDU, that is selecting between the K = 3 and K = 7 convolution encoding specified in 15.3.3.3. When not in HPRF mode, the constraint length shall be three and this attribute shall be ignored.
phyHrpUwbPhrA0	Integer	0, 1	For HRP-ERDEVs in HPRF mode, this attribute specifies the value of the A0 field of the transmitted PHR, unless it is being used to extend the PHY payload length field as described in 15.2.7.3.
phyHrpUwbPhrA1	Integer	0, 1	For HRP-ERDEVs in HPRF mode, this attribute specifies the value of the A1 field of the transmitted PHR, unless it is being used to extend the PHY payload length field as described in 15.2.7.3.
phyHrpUwbPhrDataRate	Enumeration	DRMDR, DRBM_LP, DRBM_HP, DRHM_LR, DRHM_HR	When equal to DRMDR, the bit rate is specified by the DataRate parameter of the MCPS-DATA.request primitive, otherwise the transmit and receive bit rates for PHR and Data are selected by this attribute as specified in Table 15-14 and Table 15-22.
phyHrpUwbPsduSize	Integer	0–2	For HRP-ERDEVs in HPRF mode, this attribute specifies the use of the A0 and A1 fields of the PHR to extend the maximum PSDU length, as specified in 15.2.7.3 and Table 15-16.
phyHrpUwbPsr	Integer	0, 16, 24, 32, 48, 64, 96, 128, 256	When non-zero, this attribute specifies the length, in symbols, of the SYNC field to be sent by the transmitter and expected by the receiver in an HRP-ERDEV, see 15.2.6.2.
phyHrpUwbSfdSelector	Integer	0–4	This attribute selects the SFD pattern to be used by the transmitter and receiver, as specified in 15.2.6.3 and Table 15-11.
phyHrpUwbStsKey	16 octets	—	This attribute specifies the STS key used in the DRBG for generating the STS. When the DRBG is running, write access to this attribute shall be delayed until after packet transmission/reception.
phyHrpUwbStsPC2RxGap0	Integer	0–127	When *phyHrpUwbStsRxPacketConfig* is two, this attribute specifies the duration of an additional gap in units of 4 chips (~8 ns), between the PSDU and the STS, to be expected by the receiver, as per Table 15-15.

Table 11-7—HRP UWB related PIB attributes *(continued)*

Attribute	Type	Range	Description
phyHrpUwbStsPC2RxGap1	Integer	0–127	When *phyHrpUwbStsRxPacketConfig* is two, this attribute specifies the duration of an additional gap in units of 4 chips (~8 ns), between the PSDU and the STS, to be expected by the receiver, as per Table 15-15.
phyHrpUwbStsPC2RxGap2	Integer	0–127	When *phyHrpUwbStsRxPacketConfig* is two, this attribute specifies the duration of an additional gap in units of 4 chips (~8 ns), between the PSDU and the STS, to be expected by the receiver, as per Table 15-15.
phyHrpUwbStsPC2RxGap3	Integer	0–127	When phyHrpUwbStsRxPacketConfig is two, this attribute specifies the duration of an additional gap in units of 4 chips (~8 ns), between the PSDU and the STS, to be expected by the receiver, as per Table 15-15.
phyHrpUwbStsPC2TxGap	Integer	0–127	When phyHrpUwbStsTxPacketConfig is two, this attribute specifies the duration of an additional gap in units of 4 chips (~8 ns), between the PSDU and the STS, to be inserted by the transmitter, as per 15.2.7.3.
phyHrpUwbStsRxPacketConfig†	Integer	0–3	This attribute indicates the presence and position of the STS field in the PPDU expected by the receiver, as per Table 15-1.
phyHrpUwbStsRxSegLen†	Integer	0–3	This attribute indicates the length of active STS segment(s) in the PPDU expected by the receiver, as specified in Table 15-18.
phyHrpUwbStsRxSegNum†	Integer	0–3	This attribute indicates the number of STS segments in the PPDU expected by the receiver, as specified in Table 15-18.
phyHrpUwbStsTxPacketConfig†	Integer	0–3	This attribute indicate the presence and position of the STS field in the transmitted PPDU as per Table 15-1.
phyHrpUwbStsTxSegLen†	Integer	0–3	This attribute indicates the length of active STS segment(s) in the transmitted PPDU, as specified in Table 15-18.

Table 11-7—HRP UWB related PIB attributes *(continued)*

Attribute	Type	Range	Description
phyHrpUwbStsTxSegNum†	Integer	0–3	This attribute indicates the number of STS segments in the transmitted PPDU, as specified in Table 15-18.
phyHrpUwbStsVCounter	4 octets	—	This attribute provides read and write access to the 32-bit counter that supplies the least significant 32 bits of the 128-bit value V used in the DRBG for generating the STS. See 15.2.9. During packet transmission or reception, this attribute shall not be writable, and a read shall provide the initial state of the attribute at the beginning of packet transmission/reception.
phyHrpUwbStsVUpper96	12 octets	—	This attribute supplies the most significant 96 bits of the 128-bit value V used in the DRBG for generating the STS. See 15.2.9. This attribute shall not be modified during packet transmission or reception.

Table 11-8—TVWS related PIB attributes

Attribute	Type	Range	Description
phyTvwsFskSpreadingEnabled	Boolean	TRUE, FALSE	A value of TRUE indicates that spreading is turned on. A value of FALSE indicates that spreading is turned off. This attribute is only valid for the TVWS-FSK PHY.
phyTvwsFskWhiteningEnabled	Boolean	TRUE, FALSE	A value of TRUE indicates that whitening is turned on. A value of FALSE indicates that whitening is turned off. This attribute is only valid for the TVWS-FSK PHY.
phyTvwsSfdLength	Integer	16 or 24	Length of the TVWS SFD field in bits.This attribute is only valid for the TVWS-FSK PHY.
phyTvwsFskFecScheme	Integer	0–2	A value of zero indicates that the first FEC scheme as defined in 24.2.3 is employed. A value of one indicates that the second FEC scheme as defined in 24.2.3 is employed. A value of two indicates that the third FEC scheme as defined in 24.2.3 is employed. The attribute is only valid for the TVWS-FSK PHY
phyTvwsChannelAggregation	Boolean	TRUE, FALSE	A value of TRUE indicates that channel aggregation is enabled. A value of FALSE indicates that channel aggregation is disabled. This attribute is only valid for the TVWS-NB-OFDM PHY.

Table 11-9—RS-GFSK related PIB attributes

Attribute	Type	Range	Description
phyRsGfskShortPhrEnabled	Boolean	TRUE, FALSE	This attribute is only valid for the RS-GFSK PHY. It indicates whether the device is using Short PHR in its transmission as described in 31.1.5. If TRUE, the device is using Short PHR. If FALSE, it is using a Long PHR.
phyRsGfskPreambleLength	Integer	2–15	This attribute is only valid for the RS-GFSK PHY. It is the number of repetitions of 1-octet patterns, as described in 31.1.2, in the preamble of an RS-GFSK PHY.
phyRsGfskPrecode	Boolean	TRUE, FALSE	This attribute is only valid for the RS-GFSK PHY. If TRUE, differential encoding, as described in 31.2.3, is employed for the RS-GFSK PHY. If FALSE, it is not.
phyRsGfskSfd	Integer	0, 1	This attribute is only valid for the RS-GFSK PHY. It determines which group of SFDs is used, as described in Table 31-1.

Table 11-10—FSK related PIB attributes

Attribute	Type	Range	Description
phyFskFecEnabled	Boolean	TRUE, FALSE	A value of TRUE indicates that FEC is turned on. A value of FALSE indicates that FEC is turned off. This attribute is only valid for the SUN FSK, TVWS FSK, and RS-GFSK PHY.
phyFskFecInterleavingRsc	Boolean	TRUE, FALSE	A value of TRUE indicates that interleaving is enabled for RSC. A value of FALSE indicates that interleaving is disabled for RSC. This attribute is only valid for the SUN FSK and TVWS FSK PHY.
phyFskFecScheme	Integer	0, 1	A value of zero indicates that a non-recursive and non-systematic code (NRNSC) is employed. A value of one indicates that a recursive and systematic code (RSC) is employed. See 19.3.5 for more information on FEC. This attribute is only valid for the SUN FSK PHY.
phyFskPreambleLength	Integer	4–64	The number of repetitions of the preamble pattern, as described in 19.2.3.1 and 24.1.2.2, in the preamble. This attribute is only valid for the SUN FSK and TVWS FSK PHY.
phyFskScramblePsdu	Boolean	TRUE, FALSE	A value of FALSE indicates that data whitening of the PSDU is disabled. A value of TRUE indicates that data whitening of the PSDU is enabled. This attribute is only valid for the SUN FSK PHY.

Table 11-11—SUN FSK related PIB attributes

Attribute	Type	Range	Description
phyModeSwitchEnable	Boolean	TRUE, FALSE	A value of TRUE indicated that mode switch as described in 19.5 is enabled.
phyModeSwitchParameterEntries	Array	As defined in Table 11-13	An array of up to four rows, where each row consists of a set of ModeSwitchDescriptor entries. This attribute is only valid for the SUN FSK PHY.
phySunFskSfd	Integer	0, 1	Determines which group of SFDs is used, as described in Table 19-2. This attribute is only valid for the SUN FSK PHY.

Table 11-12—Other PHY related PIB attributes

Attribute	Type	Range	Description
phyOfdmInterleaving	Integer	0, 1	A value of zero indicates an interleaving depth of one symbol. A value of one indicates an interleaving depth of the number of symbols equal to the frequency domain spreading factor. This attribute is only valid for the SUN OFDM PHY.
phyCurrentCode	Integer	0–32	This value is zero for PHYs other than HRP UWB PHY or CSS PHY. For HRP UWB PHYs, this represents the current preamble code index in use by the transmitter and receiver, as defined in Table 15-7, Table 15-8, and Table 15-9. For the CSS PHY, the value indicates the subchirp, as defined in 14.3.
phyLmrCodingRate	Float	1/2, 2/3, 3/4, 7/8, 1	Controls which puncturing pattern is used for the PSDU, as described in 27.3. If the attribute value is one, then FEC shall not be applied.
phyCmbModulation	Enumeration	0, 1	The selected modulation type. This attribute is only valid for the CMB PHY. 0: CMB O-QPSK 1: CMB GFSK
phyFixedReplyTimeSupported	Boolean	TRUE, FALSE	A value of TRUE indicates the RDEV can support a fixed reply time. A value of FALSE indicates that the RDEV does not support a fixed reply time.

Table 11-13—Elements of ModeSwitchDescriptor

Name	Type	Valid range	Description
SettlingDelay	Integer	0–510	The settling delay, in μs, between the end of the final symbol of the PPDU initiating the mode switch and the start of the PPDU transmitted using the new PHY mode.
SecondaryFskPreambleLength	Integer	0–16	The number of 1-octet patterns, as described in 19.2.3.1, in the secondary preamble if the new mode is SUN FSK. This parameter does not apply if the new mode is SUN OFDM or SUN O-QPSK.
SecondaryFskSfd	Boolean	TRUE, FALSE	If the new mode is SUN FSK, a value of TRUE indicates that a secondary SFD is transmitted. A value of FALSE indicates that a secondary SFD is not transmitted. This parameter does not apply if the new mode is SUN OFDM or SUN O-QPSK.

Table 11-14—Parameter of *phyPeersTxPower*

Attribute	Type	Range	Description
deviceAddrMode	Enumeration	SHORT, EXTENDED	The addressing mode of the peer device.
deviceAddress	Short address or extended address	As specified by the deviceAddrMode parameter	Address of the peer device.
TxPower	Signed integer	—	The value to be placed in the *phyTxPower* PIB Attribute when the device is transmitting to the device with the address deviceAddress.