IEEE P802.15
Wireless Personal Area Networks

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Re:	[]	
Abstract	[Suggested optional headers for AV OFDM PHY.]	
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1. MAC frame formats

1.1 General frame format

Figure 1 illustrates the general MAC frame format for WVAN frames.

Subframe 7	Subframe 6	…	Subframe 2	Subframe 1	MAC header

Figure 1—Header of general frame

The collection of subframes in a single frame is referred to as the frame Body field.

The gap between the MAC header and the first subframe is filled with the HCS that is defined in 4.3. The frame Body field of a MAC frame may have one to seven, inclusive, subframes of varying sizes.

1.1.1 MAC header format

The HRP MAC Header shall be formatted as illustrated in Figure 2.

Octets: 16	**24**	**5**	**12**	**10**
Reserved	Video header	Security header	MAC extension header	MAC header

Figure 2—HRP MAC header format

The LRP MAC Header shall be formatted as illustrated in Figure 3.

Octets: 5	**12**	**10**
Security header	MAC extension header	MAC header

Figure 3—LRP MAC header format

The MAC extension header, Security header, and Video header are present only if their corresponding control bits are set in the MAC control header.

The MAC header for HRP frames shall have the MAC Extension Header, Security Header, and Video Header. Therefore, the HRP MAC header always has a fixed size.

1.1.1.1 MAC extension header

The MAC Extension Header field is illustrated in Figure 4.

bits: 8	**4**	**4**	**…**	**4**
ACK groups	Reserved	Type 7	…	Type 1

Figure 4—MAC extension header format

The Type field indicates the type of data that is contained in the subframe. Valid values for the Type field are:

— 0x0 → Control
— 0x1 → Data

— 0x2 –› Audio
— 0x3 –› Video
— 0x4–0xF –› Reserved

The ACK Groups field shall be formatted as illustrated in Figure 5.

Bits: 1	**1**	**…**	**1**	**1**
lsb FCS	Subframe 7	…	Subframe 1	Subframe 1

Figure 5—ACK groups field format

The bit for a subframe shall be set to one if the subframe is in the same ACK group as the previous (i.e., lower numbered subframe). Otherwise, it is the first subframe in an ACK group and its bit shall be set to zero. The first bit, corresponding to subframe 1, shall always be set to zero as it is always the start an ACK group. No more than 5 ACK groups shall be defined, therefore, the number of bits set to zero among the subframe bits shall not exceed five.

The lsb FCS field shall be set to one if the lsb FCS is part of the calculation to determine if a subframe was correctly received, as defined in <xref>. It shall be set to zero if the lsb FCS is ignored in determining if a subframe was correctly received. The setting of this field applies only to those subframes which are sent with a UEP HRP mode. For all other subframes, the lsb FCS field shall be set to zero.

1.1.1.2 Security header

The Security Header shall be formatted as illustrated in Figure 6.

Octets: 2	**3**
Secure frame counter	Security control

Figure 6—Security header format

The Security Control field shall be formatted as illustrated in Figure 7.

Bits: 2	**…**	**2**	**2**	**8**
Subframe 1 security	…	Subframe 7 security	Reserved	SECID

Figure 7—Security control field format

The SECID field is used to identify the key set that is used to encrypt and/or authenticate the data in the frame, as defined in <xref>.

The Subframe Security field indicates the type of security that is applied to a subframe. Valid values are:

— 0b00 –› No security applied
— 0b01 –› Encryption and integrity code
— 0b10–0b11 –› Reserved

The Secure Frame Counter field is defined in <xref>.

1.1.1.3 Video header

The Video Header shall be formatted as illustrated in Figure 8.

Octets: 4	**5**	**5**	**5**	**5**
Reserved	Video control 4	Video control 3	Video control 2	Video control 1

Figure 8—Format of the Video header

If fewer than four video subframes are present in the current frame, the unused Video Control fields shall be set to zero. Unless otherwise stated, the numbers for all of the fields begin with zero, e.g., the first video frame is number zero, then number one, etc.

The Video Control field shall be formatted as illustrated in Figure 9.

Bits: 4	**1**	**3**	**16**	**16**
Reserved	Interlace field indication	Video frame number	H-position	V-position

Figure 9—Video control field format

The Interlaced Field Indication field shall be set to one if the video subframes carry pixels for the bottom field. It shall be set to zero if the video subframes carry pixels for the top field or if the video subframes carry pixels for non-interlaced video modes.

The Video Frame Number field contains a counter that keeps track of the video frame to which the pixels in the subframe belong. The video frame number is calculated follows:

— For progressive video, the Video Frame Number field shall be incremented sequentially. After reaching the max value of 0x7, the next value shall be zero. All frames belonging to the same video frame have identical Video Frame Number values.
— For interlaced video, the Video Frame Number field shall be incremented in a step of two. Thus, each video frame has two frame numbers. All frames belonging to the first field have even Video Frame Numbers and all frames belonging to the second field have odd Video Frame Numbers. For example, for the first uncompressed video frame, the frames belonging to the first field have a Video Frame Number set to zero, and the frames belonging to the second field have a Video Frame Number set to one. Therefore, the same video frame has two Video Frame Numbers.

The H-position field contains the horizontal position, prior to any pixel partitioning, of the first pixel in the subframe where zero is on the left side of the screen.

The V-position field contains the vertical position prior to any pixel partitioning, of the first pixel in the subframe where zero corresponds to the top of the screen. For interlaced formats, the V-position of the lines range from 0-539 independent of status as even or odd frame number.

1.1.2 Subframe format

The subframes in the MAC frame, with the exception of LRP Data subframes shall be formatted as illustrated in Figure 10.

Octets: 8	variable	2
Combined FCS	Subframe payload	CP subframe header

Figure 10—Subframe format

LRP Data subframes shall be formatted as illustrated in Figure 11.

Octets: 4	variable
FCS	Subframe payload

Figure 11—LRP data subframe format

The Subframe Payload field contains the data to be transmitted. If the subframe has an integrity codes, as indicated by the Subframe Security field, then Subframe payload field shall be formatted as illustrated in Figure 12.

Octets: 8	variable
Integrity code	Payload data

Figure 12—Subframe payload with integrity code

The Integrity Code field is defined in <xref>.

The Combined FCS field shall be formatted as illustrated in Figure 13.

Bits:4	4	…	4	4	4	4
lsb FCS 8	msb FCS 8	…	lsb FCS 2	msb FCS 2	lsb FCS 1	msb FCS 1

Figure 13—Combined FCS field format

The lsb FCS field contains the FCS, as defined in <xref>, calculated over the four lsbs of each octet in the the Subframe Payload field. The lsb FCS field occupies the lsbs of the Combined FCS field.

The msb FCS field contains the FCS, as defined in <xref>, calculated over the four msbs of each octet in the CP Subframe Header, if present, and Subframe Payload field. The msb FCS field occupies the msbs of the Combined FCS field.

The FCS field contains the FCS, as defined in <xref>, calculated over the CP Subframe Header, if present, and Subframe Payload field.

Subframes with frame type other than data do not support aggregation or fragmentation.

Subframes with frame type data support the aggregation of MSDUs or the fragmentation of MSDUs in their payloads. The format of a subframe payload field for a subframe with frame type data is illustrated in Figure 14.

Octets: variable	…	variable	variable
Sub-payload N	…	Sub-payload 2	Sub-payload 1

Figure 14—Subframe payload field with aggregation

Each sub-payload field shall be formatted as shown in Figure 15.

Bits: variable	1	1	10	20
MSDU	First fragment	Last fragment	Sequence number	Length

Figure 15—Sub-payload field format

The Length field indicate the length of the MSDU field in octets.

The Sequence Number field is incremented for each fragment, regardless if it is of the same or different MSDU.

The fragment fields shall be set as indicated in Table 1

Table 1—Fragment field settings

Fragment type	Last fragment field	First fragment field
First fragment	0	1
Last fragment	1	0
Middle fragment	0	0
Complete MSDU	1	1

The MSDU field for subframes with frame type data shall be formatted as defined in 7.3.5.

1.1.3 Composite

The Composite frame shall be formatted as illustrated in Figure 16.

Octets: variable	…	variable	variable
Subframe N	…	Subframe 2	Subframe 1

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MAC header

Figure 16—Composite frame format

The Composite frame has one to seven, inclusive, subframes. The subframe format is defined in 1.1.2.

1.1.4 Normal

The HRP Normal frame shall be formatted as illustrated in Figure 17.

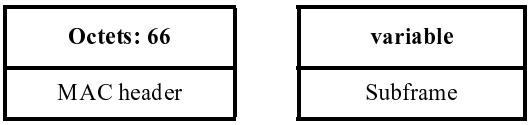

Figure 17—HRP normal frame format

The LRP Normal frame shall be formatted as illustrated in Figure 18.

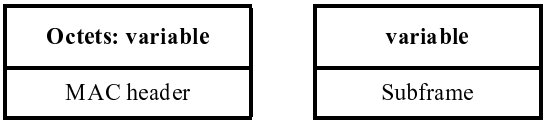

Figure 18—LRP normal frame format

The subframe format is defined in 1.1.2.

1.1.5 Directional ACK

The Directional ACK frame format is defined in <xref>. The Directional ACK frame is used to acknowledge HRP frames and beam formed LRP frames.