IEEE P802.11  
Wireless LANs

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| D3 Comment Resolution, brianh, part 3 | | | | |
| Date: 2012-09-18 | | | | |
| Author(s): | | | | |
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##### Baseline is 11ac D3.0. Changes indicated by a mixture of Word track-changes and instructions. For equation changes, Tex notation is sometimes used. E.g. a\_{xyz}^b denotes axyzb . Most changes require text from the baseline to be imported into the 11ac draft.

MAC CIDs: 6201, 6200, 6397

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 6201 | Brian Hart | 6.3.7.4.2 | 17.31 | New York Times: ""BERLIN -- Google, under pressure from privacy regulators in the Netherlands, said Tuesday that it had agreed to give people around the world the option of keeping the names and locations of their home or business Wi-Fi routers out of a company database. ... Under the agreement, which was announced by Google and the Dutch Data Protection Authority, owners of Wi-Fi routers can add "\_nomap" to the end of a router's name to tell Google that they do not want its information included." This chews up 6 octets and has other disadvantages. Ultimately 802.11 should control the semantics for frames/elements/fields defined by 802.11 | Define a new field decoupled from the SSID for this case | REJECTED - A presentation and discussion are required to make any progress on this topic. No such presentation was made in this letter ballot. Commenter is invited to re-submit the comment and bring a presentation |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 6200 | Brian Hart | E.1 | 355.56 | The description and interpretation of measurement and mgmt frames referencing channels#s do not handle 80+80 | Upgrade these descriptions and interpretations, e.g. by making use of operating class 130 (80+) [Assign to Brian Hart] | Revised. See changes in 12/1036<motionedRevision> under CID 6200 that provide the requested update |
| 6397 | Bo Sun | 10.39.1 | 161.23 | what is "80+"? | change to "80+80" | Revised. See changes in 12/1036<motionedRevision> under CID 6200 that correct the offending text |

***Note to reader, not for inclusion in the draft. From slide 12 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.5.12.2 Notify Channel Width frame | Single octet for channel width | Disallow Notify Channel Width frame being sent VHT to VHT  Not done in this doc |
| 8.4.2.23.2 Basic request | One channel number only, no operating class or 80+80 semantics.  Europe is allowing clients to be homologated to detect and report radar. | Add Extended Basic Request also containing Operating Class , and for 80+80 allow an optional subelement containing OpClass=“+80”, channel #  For simplicity, since this protocol is little used, clarify that the request BW just matches the BSS primary channel BW. |
| 8.4.2.24.2 Basic report | One channel number only, no operating class or 80+80 semantics. Europe is allowing clients to be homologated to report radar. Map for one channel only | Add Extended Basic Request with one Map per 20 MHz and “I am homologated for radar detection as a client” indication. And capability bit for this too.  11mc comment instead |
| 8.4.2.23.3 CCA request | One channel number only, no operating class or 80+80 semantics. Report refers to channel busy %, but modern CCA reports busy-ness on P20, S20, S40 and S80 | Clarify that the operating class is implicitly a 20 MHz operating class. |
| 8.4.2.24.3 CCA report | Ditto | Ditto |

**8.4.2.23.2 Basic request**

The Channel Number field is set to the channel number for which the measurement request applies where the Channel Number is a value from the “Channel set” column in Table E-4 (Global operating classes), in a row having the same value in the “Channel spacing (MHz)” column as the width of the primary channel of the BSS.

**8.4.2.24.2 Basic report**

The Channel Number field is set to the channel number to which the basic report applies where the Channel Number is a value from the “Channel set” column in Table E-4 (Global operating classes), in a row having the same value in the “Channel spacing (MHz)” column as the width of the primary channel of the BSS.

**8.4.2.23.3 CCA request**

The Channel Number field is set to the channel number for which the measurement request applies where the Channel Number is a value from the “Channel set” column in Table E-4 (Global operating classes), in a row having the same value in the “Channel spacing (MHz)” column as the width of the primary channel of the BSS.

**8.4.2.24.3 CCA report**

The Channel Number field contains the channel number to which the CCA report applies where the Channel Number is a value from the “Channel set” column in Table E-4 (Global operating classes), in a row having the same value in the “Channel spacing (MHz)” column as the width of the primary channel of the BSS.

***Note to reader, not for inclusion in the draft. From slide 13 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.4.2.23.4 RPI histogram request | One channel number only, no operating class or 80+80 semantics. No optional subelements allowed for pre-VHT. | Use the channel number to indicate the P20. When sent unicast to VHT only, allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the desired measurement spectrum for 40/80/160/80+80.  For simplicity, since this protocol is little used, clarify that the request BW just matches the BSS primary channel BW. |
| 8.4.2.24.4 RPI histogram report | Ditto | Ditto  As above |
| 8.4.2.23.5 Channel load request | OpClass+Ch# only, no primary channel indication for >40MHz (needed to specify which virtual carrier sense is used), no 80+80 semantics. | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the desired measurement spectrum for 80/160/80+80 . |
| 8.4.2.24.5 Channel load report | Ditto | Ditto. Measurement is for the whole bandwidth. |
| 8.4.2.23.6 Noise histogram request | OpClass+Ch# only, no primary channel indication for >40MHz (needed to specify which virtual carrier sense is used), no 80+80 semantics. | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the desired measurement spectrum for 80/160/80+80 . |
| 8.4.2.24.6 Noise histogram report | Ditto | Ditto |

**8.4.2.23.4 RPI histogram request**

The Channel Number field is set to the channel number for which the measurement request applies where the Channel Number is a value from the “Channel set” column in Table E-4 (Global operating classes), in a row having the same value in the “Channel spacing (MHz)” column as the width of the primary channel of the BSS.

**8.4.2.24.4 RPI histogram report**

The Channel Number field is set to the channel number to which the RPI histogram report applies where the Channel Number is a value from the “Channel set” column in Table E-4 (Global operating classes), in a row having the same value in the “Channel spacing (MHz)” column as the width of the primary channel of the BSS.

**8.4.2.23.5 Channel Load Request**

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>** Channel Number indicates the channel number for which the measurement request applies. Channel Number is defined within an operating Class as shown in Annex E.

NOTE – Examples of Operating Classes that encompass a primary channel but do not identify the location of the primary are operating classes with a value of 80 or 160 in the “Channel Spacing (MHz)” column.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement request applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-60—Optional subelement IDs for Channel Load Request

|  |  |  |  |
| --- | --- | --- | --- |
| 2-162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |

The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80, 160 or 80+80 MHz operating channel width.

**8.4.2.24.5 Channel Load Report**

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>** Channel Number indicates the channel number for which the measurement report applies. Channel Number is defined within an operating Class as shown in Annex E.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement report applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-83—Optional subelement IDs for Channel Load Report

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 0–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 237 |  |
| 222–255 | Reserved |  |  |

The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80, 160 or 80+80 MHz operating channel width.

**10.11.9.3 Channel Load Report**

If dot11RMChannelLoadMeasurementActivated is true and a station accepts a Channel Load Request, it

shall respond with a Radio Measurement Report frame containing one Measurement (Channel Load) Report

element. The Channel Load field is defined as the percentage of time, linearly scaled with 255 representing

100%, that the STA sensed the medium was busy, as indicated by either the virtual carrier sense mechanism or the physical carrier sense mechanism over the requested channel width (together referred to as the CS mechanism). This percentage is computed using the following formula:

Channel Load = Integer((channel busy time/(MeasurementDuration 1024)) 255)

where channel busy time is defined to be the number of microseconds during which the CS mechanism, as

defined in 9.3.2.1, has indicated a channel busy indication for the requested channel width.

If dot11RMChannelLoadMeasurementActivated is false, a station shall reject the received Channel Load

Request and shall respond with a Channel Load Report with the Incapable bit in the Measurement Report

Mode field set to 1.

If dot11RMChannelLoadMeasurementActivated is true and if a Channel Load Reporting Information

subelement is included in a Channel Load Request, the STA shall respond with a Channel Load Report if the

indicated Channel Load Reporting Condition is true. Otherwise, the STA shall not respond with a Channel

Load Report.

A non-VHT STA shall not include a Wide Bandwidth Channel Switch subelement in the Channel Load Request. A VHT STA shall not include a Wide Bandwidth Channel Switch subelement in the Channel Load Request sent to a non-VHT STA.

If the Wide Bandwidth Channel Switch subelement is included in a Channel Load Request or a Channel Load Report, then the Operating Class shall indicate a 40 MHz channel spacing.

**8.4.2.23.6 Noise Histogram Request**

The Measurement Request field corresponding to a Noise Histogram Request is shown in Figure 8-111.

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>**. Channel Number indicates the channel number for which the measurement request applies. Channel Number is defined within an Operating Class as shown in Annex E.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement request applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-62—Optional subelement IDs for Noise Histogram Request

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 0 | Reserved |  |  |
| 1 | Noise Histogram Reporting Information | 2 | Yes |
| 2–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 244 |  |
| 222–255 | Reserved |  |  |

***After Figure 8-112—Noise Histogram Reporting Information data field format***The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80, 160 or 80+80 MHz operating channel width.

**8.4.2.24.6 Noise Histogram Report**

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>**. Channel Number indicates the channel number for which the measurement report applies. Channel Number is defined within an Operating Class as shown in Annex E.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement report applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-85—Optional subelement IDs for Noise Histogram Report

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 0–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 237 |  |
| 222–255 | Reserved |  |  |

The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80, 160 or 80+80 MHz operating channel width.

**10.11.9.4 Noise Histogram Report**

***Note to reader, not for inclusion in the draft. The IPI request is passed without a bandwidth, so then implicitly IPI is calculated for the whole STA bandwidth. This is problematic if a 80 MHz STA receives a 40 MHz Noise Histogram request – e.g. a) the MLME should temporarily change the STA’s operating bandwidth to 40 MHz or b) the STA should provide an enhanced IPI interface to retrieve IPI per bandwidth. We leave this piece of the puzzle unspecified.***

To compute the IPI densities, the STA shall measure the IPI in the specified channel at the specified channel width as a function of time over the measurement duration when NAV is equal to 0 (when virtual CS mechanism indicates idle channel)

except during frame transmission or reception. The time resolution of the IPI measurements shall be in

microseconds. The IPI densities are then computed for each of the nine possible IPI values using:

***Insert as a new final para***

A non-VHT STA shall not include a Wide Bandwidth Channel Switch subelement in the Noise Histogram Request. A VHT STA shall not include a Wide Bandwidth Channel Switch subelement in the Noise Histogram Request sent to a non-VHT STA. If the Wide Bandwidth Channel Switch subelement is included in a Noise Histogram Request or a Noise Histogram Report, then the Operating Class shall indicate a 40 MHz channel spacing.

***Note to reader, not for inclusion in the draft. From slide 14 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.4.2.23.7 Beacon request | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics. Only one operating class.    Beacons should only be sent at 20 MHz, but rogues could do anything | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the desired measurement channel for 80/160/80+80 .  Also deal with the case of channel# = 0,255 |
| 8.4.2.24.7 Beacon report | Ditto | Ditto (includes all received beacons irrespective of bandwidth; specifies the *beacon* OpClass+Ch# and, if 80+80, then include the optional subelement too; not the *measurement* channel) |
| 8.4.2.23.8 Frame request | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics. | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the desired measurement channel for 80/160/80+80 . |
| 8.4.2.24.8 Frame report | Ditto | Ditto (includes all received frames irrespective of bandwidth) |

**8.4.2.23.7 Beacon Request**

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E. For Operating Classes that encompass a primary channel but do not identify the location of the primary channel, channel number is either 0 or 255; otherwise Channel Number is equal to 0, 255, or Channel Number indicates the channel number for which the measurement request applies and is defined within an Operating Class as shown in Annex E. For Operating Classes that identify the location of the primary channel, a Channel Number of 0 indicates a request to make iterative measurements for all supported channels in the Operating Class where the measurement is permitted on the channel and the channel is valid for the current regulatory domain. For Operating Classes that encompass a primary channel but do not identify the location of the primary channel, a Channel Number of 0 indicates a request to make iterative measurements for all primary channel positions within all requested and supported channels where the measurement is permitted on the channel and the channel is valid for the current regulatory domain. For Operating Classes that identify the location of the primary channel, aChannel Number of 255 indicates a request to make iterative measurements for all supported channels in the current Operating Class listed in the latest AP Channel Report received from the serving AP. For Operating Classes that encompass a primary channel but do not identify the location of the primary channel, a Channel Number of 255 indicates a request to make iterative measurements for all primary channel positions within all channels listed in the AP Channel Report subelement where the channel is supported, the measurement is permitted on the channel and the channel is valid for the current regulatory domain. The procedures for iterative measurements on multiple channels are described in 10.11.9.1.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement report applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-65—Optional subelement IDs for Beacon Request

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 51 | AP Channel Report | 1 to 237 |  |
| 52–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 237 |  |
| 222–255 | Reserved |  |  |

The Request, AP Channel Report, and Vendor Specific subelements have the same format as their

corresponding elements (see 8.4.2.13, 8.4.2.38, and 8.4.2.28, respectively). Multiple AP Channel Report and

Vendor Specific subelements can be included in the list of optional subelements. An AP Channel Report subelement containing an Operating Class with a 80+ Behavior Limit (as defined in Annex E) is interpreted in conjunction with following AP Channel Report elements as defined in 10.11.9.1 (Beacon Report).

**8.4.2.10 Country element**

Operating/Subband Sequence fields that contain an Operating Class field for which the “Channel Spacing (MHz)” column in Annex E equals 80 or 160 in contain zero Subband Triplet fields.

**10.39.1 Basic VHT BSS functionality**

A VHT STA uses the VHT Transmit Power Envelope element only for TPC of 80 MHz, 160 MHz and

80+80 MHz transmissions. In the Country element, a VHT STA shall include zero Subband Triplet fields in a Operating/Subband Sequence field that contains an Operating Class field for which the “Channel Spacing (MHz)” column in Annex E equals 80 or 160.

**8.4.2.24.7 Beacon Report**

Operating Class indicates the channel set of the received Beacon or Probe Response frame. Country, Operating Class, and Channel Number together specify the channel frequency and spacing of the received Beacon or Probe Response frame. Valid values of Operating Class are shown in Annex E.

Channel Number indicates the channel number of the received Beacon or Probe Response frame. Channel Number is defined within an Operating Class as shown in Annex E.

If the PPDU carrying the received frame comprises non-contiguous frequency segments, the Operating Class and Channel Number fields identify the zeroth frequency segment, and a Wide Bandwidth Channel Switch subelement is included.

Table 8-86—Optional subelement IDs for Beacon Report

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 2–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 237 |  |
| 222–255 | Reserved |  |  |

The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80+80 MHz operating channel width. The Wide Bandwidth Channel Switch subelement indicates the channel width of the PPDU carrying the received Beacon or Probe Response frame.

**10.11.9.1 Beacon Report**

On accepting an active or passive mode Beacon measurement request, a STA shall conduct measurements as

follows:

— If the Channel Number is 0, and the Operating Class identifies the location of the primary channel, a STA shall conduct iterative measurements on all supported channels in the specified Operating Class where the measurement is permitted on the channel and the channel is valid for the current regulatory domain.

— If the Channel Number is 0, and the Operating Class encompasses a primary channel but does not identify the location of the primary channel, a STA shall conduct iterative measurements on all primary channel positions within all requested and supported channels where the measurement is permitted on the channel and the channel is valid for the current regulatory domain.

— If the Channel Number is 255, the Operating Class identifies the location of the primary channel, and the Beacon Request includes AP Channel Report subelements, a STA shall conduct iterative measurements on all supported channels listed in the AP Channel Report subelements that are valid for the current regulatory domain. If there is no AP Channel Report subelement included in the Beacon Report request, a STA shall conduct iterative measurements on all supported channels listed in the latest AP Channel Report received from the serving AP that are valid for the current regulatory domain. If there are no AP Channel Report subelements included in the Beacon Request, and no AP Channel Report included in last received AP Beacon frame, the STA shall reject the Beacon Report request.

— If the Channel Number is 255, the Operating Class encompasses a primary channel but does not identify the location of the primary channel, and the Beacon Request includes AP Channel Report subelements, a STA shall conduct iterative measurements on all primary channel positions within all requested (in the AP Channel Report) and supported channels that are valid for the current regulatory domain. If there are no AP Channel Report subelements included in the Beacon Request, the STA shall reject the Beacon Report request.

— If the Channel Number is a value other than 0 or 255, a STA shall conduct iterative measurements on the requested channel, where the measurement is permitted on the channel and the channel is valid for the current regulatory domain.

***Insert new final paragraphs***

A non-VHT STA shall not include a Wide Bandwidth Channel Switch subelement in the Beacon Request. A VHT STA shall not include a Wide Bandwidth Channel Switch subelement in the Beacon Request or Beacon Report sent to a non-VHT STA.

If the Wide Bandwidth Channel Switch subelement is included in a Beacon Request, then the Operating Class shall indicate a 40 MHz channel spacing.

If *N* (where *N* >= 1) AP Channel Report subelements containing an Operating Class with a 80+ Behavior Limit (as defined in Annex E) are included contiguously in a Beacon Request, then the *N* subelements shall be followed by one AP Channel Report subelement containing an Operating Class without a 80+ Behavior Limit (as defined in Annex E). All *N*+1 Channel List fields in each of these subelements shall contain the same number *L* of channel numbers. This sequence of *N*+1 AP Channel Report subelements indicates a list of *L* non-contiguous channels comprising *N*+1 frequency segments, where the *l*th channel number in the *n*th Channel List field identifies the channel center frequency of the *n*th frequency segment.

**8.4.2.23.8 Frame request**

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>**. Channel Number indicates the channel number for which the measurement report applies. Channel Number is defined within an Operating Class as shown in Annex E.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement request applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-68—Optional subelement IDs for frame request

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 0 | Reserved |  |  |
| 1 | Noise Histogram Reporting Information | 2 | Yes |
| 2–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 244 |  |
| 222–255 | Reserved |  |  |

The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80, 160 or 80+80 MHz operating channel width.

**8.4.2.24.8 Frame Report**

If the Wide Bandwidth Channel Switch subelement is not included, Operating Class indicates the channel set for which the measurement request applies. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for which the measurement request applies. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>**. Channel Number indicates the channel number for which the measurement report applies. Channel Number is defined within an Operating Class as shown in Annex E.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the channel for which the measurement report applies, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

Table 8-87—Optional subelement IDs for Frame Report

|  |  |  |  |
| --- | --- | --- | --- |
| Subelement ID | Name | Length field (octets) | Extensible |
| 2–162 | Reserved |  |  |
| 163 | Wide Bandwidth Channel Switch | 3 | Yes |
| 164-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 244 |  |
| 222–255 | Reserved |  |  |

The Wide Bandwidth Channel Switch subelement has the same format as the corresponding element (see 8.4.2.163), with the constraint that the New Channel Width field indicates a 80, 160 or 80+80 MHz operating channel width.

***Note to reader, not for inclusion in the draft. Thus the Frame Report doesn’t provide any information about the channel width of individual frames. Easiest would be to add another subelement providing a histogram of the frame (or better, PPDU) channel widths. This work has not been undertaken.***

***Note to reader, not for inclusion in the draft. From slide 15 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.4.2.38 AP Channel Report element | No 80+80 semantics. | Clarify that the operating class can only be a 20 MHz operating class (since a STA will find an AP via its 20 MHz beacon)  Replace “find” to clarify it is about receiving a Beacon/Probe Response |
| 8.4.2.39 Neighbor Report element | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics. | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the BSS operating channel for 80/160/80+80 .  Instead of using Operating Class for 20/40, limit it to just the primary channel. Instead of the WBCS element, include VHT Op/Cap elements |
| 8.4.2.48 Multiple BSSID element | Contains Supported Operating Classes element etc | Upgrade to reflect any changes to Supported Operating Classes element etc  No change required |
| 8.4.2.54 DSE Registered Location element | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics; no optional subelements - not marked as extensible.  Yet, no 80/160 MHz spectrum with DSE (yet?) | No change.  When and if this is needed by a new “XHT” TG, use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the BSS operating channel for 80/160/80+80 (sent to a XHT STA only). |

**8.4.2.38 AP Channel Report element**

The AP Channel Report element contains a list of channels where a STA is likely to find an AP. The format

of the AP Channel Report element is shown in Figure 8-214. See 10.11.18 for details.

The Element ID field is equal to the AP Channel Report value in Table 8-54.

The Length field in octets is variable and depends on the number of channels reported in the Channel List.

The minimum value of the Length field is 1 (based on a minimum length for the channel list field of 0

octets).

Operating Class contains an enumerated value from Annex E, specifying the operating class in which the

Channel List is valid. An AP Channel Report only reports channels for a single operating class. Multiple AP

Channel Report elements are present when reporting channels in more than one operating class.

The Channel List contains a variable number of octets, where each octet describes a single channel number.

Channel numbering is dependent on Operating Class according to Annex E.

**10.11.18 AP Channel Report**

The AP Channel Report element contains a list of channels in an operating class where a STA is likely to

receive the Beacon or Probe Response frames sent by an AP, excluding the AP transmitting the AP Channel Report. An AP Channel Report element only includes channels that are valid for the regulatory domain in which the AP transmitting the element is operating and consistent with the Country element in the frame in which it appears. One AP Channel Report

element is included in the Beacon frame for each regulatory domain, which includes channels on which a STA is likely to receive the Beacon or Probe Response frames sent by an AP.

The contents of the AP Channel Report elements may be compiled from the list of unique operating/channel pairs found in the neighbor report. The contents of the AP channel report may be configured or obtained by other means beyond the scope of this standard.

**8.4.2.39 Neighbor Report element**

Operating Class indicates the channel set of the AP indicated by this BSSID. Country, Operating Class, and

Channel Number together specify the channel frequency and spacing for the channel on which the Beacon frames are being transmitted for the BSS being reported.

Valid values of Operating Class are shown in Annex E.

Channel Number indicates the last known primary channel of the AP indicated by this BSSID. Channel

Number is defined within an Operating Class as shown in Annex E.

Table 8-115—Optional subelement IDs for neighbor report

|  |  |  |  |
| --- | --- | --- | --- |
| **Subelement ID** | **Name** | **Length field (octets)** | **Extensible** |
| 72–190 | Reserved |  |  |
| 191 | VHT Capabilities | 12 | Yes |
| 192 | VHT Operation | 5 | Yes |
| 193-220 | Reserved |  |  |
| 221 | Vendor Specific | 1 to 238 |  |

***Note to reader, not for inclusion in the draft. From slide 16 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.4.2.55 Extended Channel Switch Announcement element | Only one operating class (inadequate for mixed clients), no 80+80 semantics. | Allow multiple ECSA elements to be included in containing frames. Define a new “+80” OpClass so ECSA elements for 20,40,80,80 and +80 indicate 20, 40, 80 and 80+80  Similar work done under 12/379 |
| 8.4.2.56 Supported Operating Classes element | No 80+80 semantics. | Define a new “+80” OpClass so 80,80, +80 can indicate 80,80+80.  Similar work done under 12/379; also generalize the fields in this element |
| 8.4.2.58.2 HT Capabilities Information field | “Supported Channel Width Set” is reserved if operating class isn’t a 40 MHz operating class | Flip this around – reserved only for 10/20 MHz operating classes  We don’t have 10 MHz 11n, so reserved for 20 MHz operating classes only |
| 8.4.2.60 20/40 Intolerant Channel report element | No 80+80 semantics. | No change.  Specific to 2.4 GHz |
| 8.4.2.69.4 Peer-to-peer Link event request | No 80+80 semantics. | Define a new “+80” OpClass so two subelements 80, +80 can indicate 80+80. |
| 8.4.2.70.4 Peer-to-peer Link event report | No 80+80 semantics. | To VHT STAs only, allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the peer channel for 80/160/80+80 .  Problem: there is no provision for subelements in this element, and it is not marked as extensible. Needs a volunteer to create an **Extended** P2P Link event report |

***Note to reader, not for inclusion in the draft. The Supported Operating Classes element has 4 purposes:***

1. ***For an AP (and mesh STA?) to figure out the capabilities of its clients when selecting a new channel for switching => Operating Classes field***
2. ***In shared spectrum where a STA could be homologated under one or the other of multiple rules (e.g. 15.247 or UNII in 5.8 GHz), to indicate under what rules the STA (AP, client, etc) is operating => Current Operating Class field***
   1. ***The Current Operating Class field sent by an AP describes the current characteristics of the AP. If an AP needs to use an operating class to express a command to its associated clients, then the command is expressed via operating classes in the Country element, not in the Supported Operating Classes element.***
   2. ***So arguably the Current Operating Class field only needs to be parsible by regulators, who can be expected to have the latest copy of the 802.11 baseline and its un-rolled-in amendments***
3. ***The Supported Operating Classes element also provides hints to clients as to which bands (or subbands) the AP could switch to. But the AP may not switch to that band for a year, or never (ditto mesh?). And with the enhanced 11ac channl switching protocol, the client learns what the new operating class(es) will be during the switch advertisement. So this aspect of the Supported Operating Classes element is not especially valuable.***
4. ***20/40 in 2.4 GHz (out of scope)***

***Meanwhile, an 80+80 STA is really following 20, 40, 80 and 80+80 MHz operating classes. So actually there is a set of current operating classes of the STA. But, in terms of regulators, an 80 MHz STA will be implicitly homologated for 20 and 40 MHz in the same subband also. Same for 160 or 80 + 80 MHz, where the STA would be certified for each subband and also certified for spanning the subbands. Thus just advertisting the widest Current Operating Class suffices, since parsibility or understanding is not so important given 2)b) and 3) above.***

***From 1), we do want to maintain parsibility of the Operating Classes field. Now no 11n device understands operating class 128-130, so would ignore 80+80 as well as 80 or 160 MHz. But if a new PHY adds a 80+40 or 80+20 mode, things get more complicated. For this reason, we propose to insert “zero” octets to aid in parsing multi-octet operating classes***

***The alternative is an Extended Supported Operating Classes element ... which does not seem desirable given this info is sent in Beacons and Probe Responses***

**8.4.2.56 Supported Operating Classes element**

The Supported Operating Classes element is used by a STA to advertise the operating classes that it is

capable of operating with in this country. The format of the Supported Operating Classes element is shown in Figure 8-246.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Optional | Optional |
|  | Element ID | Length | Current Operating Class | Operating Classes | Current Operating Class Extension Sequence | Operating Class Duple Sequence |
| Octets: | 1 | 1 | 1 | variable | variable | variable |

Figure 8-246—Supported Operating Classes element format

The value of the Length field of the Supported Operating Classes element is between 2 and 253.

The Current Operating Class field, concatenated with the Current Operating Class Extension field within the Current Operating Class Extension Sequence field if present, indicates the operating class in use for transmission and reception. If the operating class in use is a single octet, the Current Operating Class Extension Sequence field is not present. If the operating class in use is more that a single octet, then the Current Operating Class Extension Sequence field is present and the concatenation of the Current Operating Class field with the Current Operating Class Extension field comprises *N* (where *N* >= 0) Operating Class octets with a 80+ Behavior Limit followed by one Operating Class octet without a 80+ Behavior Limit (as defined in Annex E).

***Note to reader, not for inclusion in the draft. This creates some odd nomenclature: for 11ac, an 80+80 “operating class” is actually 2 Operating Class octets.***

The Operating Classes field lists in ascending order all single-octet operating classes that the STA is capable of operating with in this Country. The Operating Classes field terminates immediately before a OneHundredAndThirty Delimiter (see the Current Operating Class Extension Sequence field) or a Zero Delimiter (see the Operating Class Duple Sequence field) or the end of the element.

The format of the optional Current Operating Class Extension Sequence field is shown in Figure 8-246mmmm.

|  |  |  |
| --- | --- | --- |
|  |  | One or more entries |
|  | OneHundredAndThirty Delimiter | Current Operating Class Extension |
| Octets: | 1 | variable |

Figure 8-246mmmm— Current Operating Class Extension Sequence field format

The OneHundredAndThirty Delimiter field is set to 130.

***Note to reader, not for inclusion in the draft. 130 is the right value since a) for 11acD3.0 devices it is a well known as an illegal 1 octet operating class and b) therefore we can use it as a delimiter without consuming a operating class value***

The Current Operating Class Extension Sequence field comprises *N*-1 (where *N* > 1) Operating Class octets with a 80+ Behavior Limit followed by one Operating Class octet without a 80+ Behavior Limit (as defined in Annex E)

The format of the Operating Class Duple Sequence field is shown in Figure 8-246nnnn.

|  |  |  |
| --- | --- | --- |
|  |  | One or more entries |
|  | Zero Delimiter | Operating Class Duple List |
| Octets: | 1 | 2\*n |

Figure 8-246nnnn— Operating Class Duple Sequence field format

The Zero Delimiter is set to zero.

The Operating Class Duple List subfield lists all two-octet operating classes that the STA is capable of operating with in this Country. Each operating class in the Operating Class Duple List subfield contains an Operating Class octet with a 80+ Behavior Limit followed by one Operating Class octet without a 80+ Behavior Limit (as defined in Annex E). Operating classes are transmitted in ascending order using the first octet in the operating class as the primary sort key, and then the second octet in the operating class as the secondary sort key. If ther are no two-octet operating classes that the STA is capable of operating with in this Country, then the Operating Class Duple Sequence field is omitted from the Supported Operating Classes element. The Operating Class Duple List subfield terminates immediately before another zero octet or the end of the element.

***Note to reader, not for inclusion in the draft. This zero delimiter termination rule enables further extensions. Say 802.11 adds a new PHY with 4 frequency segments. Then just add a new “Operating Class Quartet Sequence” field at the end of this element, reusing 0 as the delimiter to indicate the start of a new “Operating Class \* Sequence” field***

***Note to reader, not for inclusion in the draft. It is clear what a legacy/VHT STA sends, and how a VHT STA parses this element. But how does a legacy STA parse the evolved element?***

***For a 20/40/80/160 MHz current operating class, the legacy STA sees the correct Current Operating Class (where 80 and 160 are unknown => ignore). For an 80+80 MHz current operating class, the legacy STA sees “80+” (where 80+ is unknown => ignore). So far so good.***

***The legacy STA can correctly parse the Operating Classes field, which is really the only interesting part of the element for the legacy STA. So far so good.***

***The legacy STA interprets the Current Operating Class Extension Sequence field and Operating Class Duple Sequence field as just more operating classes. These equal 0, 130, 80+,80 (where all these values are unknown => ignore) OR potentially to-be-assigned values.Now 80+80+80+80, 160+160 or 320 or whatever are OK - they are new/unknown values to legacy. Only the second octet in 20+20, 40+40, 80+20, 80+40 etc is bad. But we’ve chosen not to do any of these in 11ac, so little likelihood of them ever happening. And at worse, if they did happen, we just define new operating classes for the last 20 or 40 octet in a 20+20, 40+40, 80+20, 80+40 segmentation. So, all good.***

The use of this element is described in 10.10.2 and 10.11.9.1.

**8.4.2.58.2 HT Capabilities Info field**

Table 8-124—Subfields of the HT Capabilities Info field

|  |  |  |
| --- | --- | --- |
| Subfield | Definition | Encoding |
| Channel Width Set | Indicates the channel widths supported by the STA.  See 10.15. | Set to 0 if only 20 MHz operation is supported  Set to 1 if both 20 MHz and 40 MHz operation is supported  This field is reserved when the transmitting or receiving STA is operating in an Operating Class that includes 20 in the Channel spacing (MHz) column, as specified in Annex E. |

**8.4.2.69.4 Peer-to-Peer Link event request**

The Channel Number subelement(s) identify the channel for the Peer-to-Peer links to be reported. Excluding

this subelement from the Event Request element indicates a request for Peer-to-Peer Link events for any

channel. The format of the Channel Number subelement is shown in Figure 8-280. The identified channel is indicated by *N*+1 Channel Number subelements where the first *N* subelements contains anOperating Class octet with a 80+ Behavior Limit and the last subelement contains an Operating Class octet without a 80+ Behavior Limit (as defined in Annex E).

The Subelement ID field is equal to the Channel Number value in Table 8-136.

The value of the Length field is 2.

The Operating Class field indicates the channel set of the Peer-to-Peer link to be used for the Peer-to-Peer

Link event report. Operating Classes are defined in Annex E.

The Channel Number field indicates the channel number, or center frequency index of the frequency segment if the identified channel comprises non-contiguous frequency segments, of the Peer-to-Peer Link events requested and

included in the Peer-to-Peer Link event report. A Channel Number of 0 in all *N*+1 Channel Number subelements indicates a request to report any Peer-to-Peer Link event for any supported channel in the specified filtering Operating Class.

***Note to reader, not for inclusion in the draft: May need a mesh expert to review this last change.***

***Note to reader, not for inclusion in the draft: This document does not update 8.4.2.70.4 Peer-to-Peer Link event report for 80+80. The best way seems to be to add a new subclause 8.4.2.70.6a Extended Peer-to-Peer Link event report that is identical to 8.4.2.70.4 Peer-to-Peer Link event report except it allows for subelements. Then allow the WBCS subelement, so then you can report 80+80. Needs a volunteer.***

***Note to reader, not for inclusion in the draft. From slide 17 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.4.2.71.5 Diagnostic information subelement descriptions (AP Descriptor subelement format) | Only one operating class (inadequate for mixed recipients), no 80+80 semantics. | Since this seems to be just a terse indication of identity of the associated AP (e.g. no HT capabilities/operation elements), it suffices to just report the P20 or P20/40 MHz operating class and channel.  But it is diagnostics … which should be accurate. Allow for multiple such subelements |
| 8.4.2.73.3 Location Indication Channels subelement | No 80+80 semantics, but 80+80 is really interesting from a location perspective. | Define a new “+80” OpClass so a 80 OpClass,ch# pair then a , +80 OpClass,ch# pair can indicate 80+80. |
| 8.4.2.88 Channel Usage element | No 80+80 semantics. | Define a new “+80” OpClass so 80, +80 can indicate 80+80. |
| 8.5.8.3 Measurement Pilot frame format | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics; only one operating class (inadequate for mixed clients). | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the BSS operating channel for 80/160/80+80 . |
| 8.5.8.7 Extended Channel Switch Announcement frame format | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics; only one operating class (inadequate for mixed clients) | Use existing OpClass+Ch# to indicate the P20 or P20/40. Allow Wide Bandwidth Channel Switch element as an optional subelement to indicate the new BSS operating channel for 80/160/80+80. Country element also be optionally allowed  Similar work done under 12/379 |

**8.4.2.71.5 Diagnostic Information subelement descriptions**

The format of the AP descriptor subelement is described in Figure 8-290. The set of current operating classes and channel widths of the AP is indicated by *N*+1 AP descriptor subelements where the first *N* subelements contains anOperating Class octet with a 80+ Behavior Limit and the last subelement contains an Operating Class octet without a 80+ Behavior Limit (as defined in Annex E).

NOTE: An 80+80 MHz AP sends four AP descriptor subelements for 20/40 MHz, 80 MHz, 80+ MHz (for the secondary 80 MHz frequency segment) and 80 MHz (for the primary 80 MHz frequency segment)

***Note to reader, not for inclusion in the draft. We are duplicating the BSSID field, but this is a tolerable overhead***

The BSSID field is a 6-octet field, as described in 8.2.4.3.4, that identifies the BSS indicated in the AP

Descriptor subelement.

The Operating Class field contains an enumerated value from Annex E specifying a channel width or frequency segment index and width (if the indicated channel comprises non-contiguous frequency segments) as well as the frequency band in which the Channel Number is valid.

The Channel Number field indicates a current operating channel, or a center frequency index of the frequency segment (if the indicated channel comprises non-contiguous frequency segments), of the AP identified by the BSSID in the

AP Descriptor.

**8.4.2.73.3 Location Indication Channels subelement**

The Channel Entry field includes one or more Operating Class and Channel pair. The format Channel Entry field is shown in Figure 8-313.

The Operating Class field each indicates the frequency band on which a STA transmits Location Track Notification frames. All Operating Class field values are for the country specified in the Beacon frame. Valid values of the Operating Class field are defined in Annex E.

The Channel field includes the channel numbers on which a STA sends or an ESS expects to receive Location Track Notification frames. Valid values of the Channel field are defined in Annex E.

Channel Entry fields may be grouped together to identify a non-contiguous channel. A non-contiguous channel is indicated by a group of *N*+1 Channel Entry fields where the first *N* Channel Entry fields contain anOperating Class field with a 80+ Behavior Limit and the last Channel Entry field in the group contains an Operating Class octet without a 80+ Behavior Limit (as defined in Annex E).

**8.4.2.88 Channel Usage element**

The Channel Entry field includes zero or more Operating Class and Channel pairs. The format of the Channel Entry field is shown in Figure 8-313. Channel Entry fields may be grouped together to identify a non-contiguous channel as described in 8.4.2.73.3 (Location Indication Channels subelement).

**8.5.8.3 Measurement Pilot frame format**

If the Wide Bandwidth Channel Switch element is not included, Operating Class indicates the operating class value for the operating channel. Country, Operating Class, and Channel Number together specify the channel frequency and spacing for the operating channel. Valid values of Operating Class are shown in Annex E, excluding Operating Classes that encompass a primary channel but do not identify the location of the primary channel. **<Editor, note deletion of linefeed>**.

Channel Number indicates the operating channel. Channel Number is defined within an Operating Class as shown in Annex E.

If the Wide Bandwidth Channel Switch subelement is included, the fields in the Wide Bandwidth Channel Switch sub-element indicate the operating channel, and the Operating Class and Channel Number together specify the primary channel and primary 40 MHz channel within the channel identified by the Wide Bandwidth Channel Switch subelement.

***Note to reader, not for inclusion in the draft. From slide 18 of 12/297r1***

|  |  |  |
| --- | --- | --- |
| **Field/element/frame** | **Problem** | **Proposed fix** |
| 8.5.8.8 DSE Measurement Request frame format | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics; no optional subelements.  Yet, no 80/160 MHz spectrum with DSE (yet?) | No change.  When and if this is needed by a new “XHT” TG, use existing OpClass+Ch# to indicate the P20 or P20/40. Define an optional subelement formatted as EID,L, VHT Operation Information field to indicate the BSS operating channel for 80/160/80+80 (sent to a XHT STA only). |
| 8.5.8.9 DSE Measurement Report frame format | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics; no optional subelements.  Yet, no 80/160 MHz spectrum with DSE (yet?) | No change.  When and if this is needed by a new “XHT” TG, I have no idea how to extend this except via a new “Extended DSE Measurement Report frame format” |
| 8.5.13.7 TDLS Channel Switch Request Action field format | OpClass+Ch# only, no primary channel indication for >40MHz, no 80+80 semantics; no optional subelements. | Allow Wide Bandwidth Channel Switch element as an optional subelement , as is already addressed by 11acD2.0  i.e. no change |