RF Spectrum Ad Hoc Closing Report

Steve Shellhammer (Qualcomm)

Straw Poll #1

- Do you support the following statement?

- An exclusion sub-band can be characterized by a start sub-carrier index and a number of sub-carriers

- Yes   26
- No   0

Straw Poll #2

- Do you support the following statement?

- An exclusion sub-band may be mapped onto any of the available OFDM subcarriers within an OFDM channel, with the restriction that there is at least one modulated subcarrier between exclusion sub-bands (for DS).

- Yes   21
- No   1
- Abstain   7

Motion #3

- An exclusion sub-band is characterized by a start sub-carrier index and an integer number of sub-carriers

- Moved: Steve
- Second: Bill K
- Yes: 24
- No: 0
- Abstain: 4

- Technical Motion >= 75%

Motion #4

- In the downstream an exclusion sub-band shall be mappable onto any of the OFDM subcarriers within an OFDM channel, with the restriction that there is at least one modulated subcarrier between exclusion sub-bands.

- Moved: Saif
- Second: Tom
- Yes: 21
- No: 1
- Abstain: 6

- Technical Motion >= 75%

Motion #5

- In the downstream, there shall be at most 16 exclusion sub-bands in a single 192-MHz OFDM channel

- Moved: Jorge

- Second: Bill K.

- Yes   23

- No   1

- Abstain   5

- Technical Motion >= 75%

EPON Protocol over Coax

Motion #6

- For an FDD system, the EPoC standard shall support operation over the following frequency ranges:
  - Downstream: 54 MHz to at least 1212 MHz
  - Upstream: 10 MHz to at least 234 MHz
- Actual frequencies in use on the coax will depend on the diplexer, region, etc.
- Downstream operation above 1212 MHz to 2610 MHz is for further study.

- Moved: Jorge
- Second: Leo
- Yes: 23
- No: 0
- Abstain: 6
- Technical Motion >= 75%

Motion #7

- For a TDD system, the EPoC standard shall support operation in a passive cable plant from 10 MHz up to at least 1800 MHz

- Moved: Jorge
- Second: Bill P.
- Yes: 16
- No: 0
- Abstain: 13

- Technical Motion >= 75%

Motion #21

- The standard shall support a lower TDD frequency band from 10 MHz to 277 MHz

- Moved: Jorge
- Second: Saif
- Yes: 9
- No: 0
- Abstain: 13

- Technical Motion >= 75%

Motion #22

- The standard shall support an upper TDD frequency band from 750 MHz to 1800 MHz

- Moved: Jorge
- Second: Saif
- Yes: 11
- No: 0
- Abstain: 12

- Technical Motion >= 75%

Backup – eStraw Polls

Task Force eStraw Poll #rfspectrum_3

Number of internal exclusion sub-bands Question:

What value do you prefer for this fixed number of internal exclusion sub-bands in a single 192-MHz OFDM channel in the transmitted signal?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 2:	0	(0.0%)
1) 4:	2	(13.3%)
2) 6:	8	(53.3%)
3) 8:	0	(0.0%)
4) 16:	2	(13.3%)
5) Other (provide answer in Comments):	3	(20.0%)

Total votes = 15

EPON Protocol over Coax

Comments: rfspectrum_3

Marek Hajduczenia
- I do not understand why we need to have these limited at all

Mike Darling
- We don't expect to need many exclusion sub-bands, but would prefer flexibility.

Keiji Tanaka
- Not decided yet

Saifur Rahman
- 32...192/6

EPON Protocol over Coax

Limit on internal exclusion sub-band spectrum Question:

Do you agree on having a limit on the amount of spectrum in a 192-MHz OFDM channel covered by internal exclusion sub-bands?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes:	11	(78.6%)
1) No:	2	(14.3%)
2) Abstain:	1	(7.1%)
3) Other (provide answer in Comments):	0	(0.0%)

Total votes = 14

Task Force eStraw Poll #rfspectrum_5

Internal Exclusion sub-bands maximum occupied spectrum Question:

What is the maximum of percentage of occupied spectrum can be covered by internal exclusion sub-bands? Where "occupied spectrum" is the difference between the frequency of the highest modulated subcarrier and the frequency of the lowest modulated subcarrier, of the of OFDM channel.

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 20%:   2   (16.7%)

1) 30%:   3   (25.0%)

2) 40%:   1   (8.3%)

3) Other percentage value :   6   (50.0%)

Total votes = 12

Comments: rfspectrum_5

Marek Hajduczenia

* I do not understand why this needs to be limited by the standard in any way. This does not affect IOP between devices

William Keasler

* 50% 192 = 6 x 32, 50% allows up to 16 6MHz channels" to be excluded(It would be useful to have input from "global" operators regarding their expectations/requirements for "exclusion bands")(specifically during early adopter phase and transition from analog or QAM distribution to IP based "video")"

Avi Kliger

* This is a redundant specification as there is already a decision that minimal available bandwidth is 24 MHz

Duane Remein

* This is already covered by our rule of minimum 24 MHz contiguous spectrum

Saifur Rahman

* 25%

eStraw Poll #rfspectrum_6

Exclusion sub-band mapping Question:

Do you support the following statement?: An exclusion sub-band can be mapped onto any of the available OFDM subcarriers within an OFDM channel, with the restriction that there is at least one modulated subcarrier between exclusion sub-bands. [Note: this does not include continuous pilots as per Motion #30 from 5/16/13, TD #67.]

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes: 9   (60.0%)

1) No: 1   (6.7%)

2) Abstain: 2   (13.3%)

3) Other (provide answer in Comments):   3   (20.0%)

Total votes = 15

EPON Protocol over Coax

Comments: #rfspectrum_6

Marek Hajduczenia

- The straw poll text is unclear

Duane Remein

- If there is a requirement on the size of an internal exclusion band I can see no reason to require one or more modulated sub-carriers between internal exclusion bands. Also what about external exclusion band and internal exclusion bands? I'm not convinced I see a need to limit exclusion bands as this series of polls implies

Bill Powell

- I support this in principle. However, I don't think we should allow an exclusion band to be mapped into an area that we may specify for the PLC (ex. - the center of a 6/8 MHz channel, to allow quick PLC searching). However, if the PLC is spec'd to reside in the 24 MHz minimum contiguous EPoC required BW, and no exclusion bands are allowed in this 24M spectrum, then I would vote "yes" to this poll."

Saifur Rahman

- Isn't having just one subcarrier between exclusion sub-band too restrictive

eStraw Poll #rfspectrum_7

4K FFT exclusion sub-band increment Question:

The increment in subcarriers for an internal exclusion sub-band above the minimum 20 subcarriers, for 4K FFT should be: [Note: increment beyond the 1 MHz minimum as per Motion #19 5/16/13, TD #58.]

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 1 subcarrier (50 kHz):	9	(69.2%)
1) 2 subcarriers (100 kHz):	1	(7.7%)
2) 4 subcarriers (200 kHz):	0	(0.0%)
3) 5 subcarriers (250 kHz):	0	(0.0%)
4) 10 subcarriers (500 kHz):	0	(0.0%)
5) 20 subcarriers (1 MHz):	1	(7.7%)
6) Other (provide answer in Comments):	2	(15.4%)

Total votes = 13

Comments: #rfspectrum_7

Marek Hajduczenia

- abstain

Duane Remein

- I could agree with any of the above but would like it be the same for 4k & 8k FFT sizes. IF this is not the case MDIO register meaning will be dependent on FFT size and I think that is an unnecessary complication. It's bad enough we have two FFT sizes

8K FFT exclusion sub-band increment Question:

The increment in subcarriers for an internal exclusion sub-band above the minimum 40 subcarriers, for 8K FFT should be: [Note: increment beyond the 1 MHz minimum as per Motion #19 5/16/13, TD #58.]

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 25 kHz: 7   (53.8%)

1) 50 kHz: 2   (15.4%)

2) 100 kHz: 1   (7.7%)

3) 200 kHz: 0   (0.0%)

4) 250 kHz: 0   (0.0%)

5) 500 kHz: 0   (0.0%)

6) 1 MHz: 1   (7.7%)

7) Other (provide answer in Comments):   2   (15.4%)

Total votes = 13

Comments: #rfspectrum_8

Marek Hajduczenia

- Abstain

Duane Remein

- Any one of the above except 25 kHz (see my answer to the rfspectum_7 ePoll)

Bill Powell

- Note: Above choices in kHz. Poll asks about #subcarriers.

eStraw Poll #rfspectrum_9

FDD downstream lower band edge Question:

The FDD downstream lower frequency band edge supported by the PHY should be:

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 85 MHz:	2	(16.7%)
1) 108 MHz:	5	(41.7%)
2) 120 MHz:	0	(0.0%)
3) 174 MHz:	0	(0.0%)
4) 240 MHz:	0	(0.0%)
5) 252 MHz:	1	(8.3%)
6) 300 MHz:	0	(0.0%)
7) 550 MHz:	0	(0.0%)
8) Other (provide answer in Comments):	4	(33.3%)

Total votes = 12

Comments: #rfspectrum_9

Michel Allard

- 54 MHz i.e. lowest usable frequency for systems with 42/54Mhz mid-split

William Keasler

- "very low" (Assuming the specification for an 802.3bn PHY is intended to cover both legacy and "high split" deployment scenarios)"

Keiji Tanaka

- 70 MHz

Duane Remein

- 0 MHz (or something close to it). If there is a strong technical reason to limit this I would like to hear the argument. This is the way it's been done in the past" is not a technical reason (imho)."

eStraw Poll #rfspectrum_10

Two classes of FDD devices based on upper band edge Question:

Do you support two classes of FDD devices where the two classes are differentiated by the downstream upper band edge?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes: 7   (53.8%)

1) No: 3   (23.1%)

2) Abstain: 3   (23.1%)

3) Other (provide answer in Comments):   0   (0.0%)

Total votes = 13

Comments: #rfspectrum_10

Duane Remein

- If widely separated to accommodate the Japanese desire for very high frequency band use (>2.5 GHz) and there is a reasonable cost savings.

Bill Powell

- I think this is going to happen anyway due to economics. Thus, if we don't come up with a bonding method, we're going to have a mess of device incompatibilities.

eStraw Poll #rfspectrum_11

The standard will specify an FDD upstream frequency band with lower and upper band edges. A PHY will be required to support the entire FDD upstream frequency band.

The FDD upstream lower frequency band edge supported by the PHY should be:

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 5 MHz:		11	(91.7%)
1) 10 MHz:		0	(0.0%)
2) 15 MHZ:		1	(8.3%)
3) Other (provide answer in Comments):		0	(0.0%)

Total votes = 12

Comments: #rfspectrum_11

Matthew Schmitt

- There's no reason not to support down to 5 MHz, although there should be frequency agility to allow you to set the lower band edge higher than this

EPON Protocol over Coax

eStraw Poll #rfspectrum_12

EPoC RF Spectrum for FDD Question:

The EPoC standard for "upstream below downstream" Node +1 or higher operation shall support operation over the following frequency ranges:

- Downstream: 54 MHz to 1212 MHz
- Upstream: 5 MHz to 234 MHz

The DS / US overlap region requires a diplexer. The EPoC specification will accommodate regionalization.

This does not exclude above 1212 MHz, "high band overlay FDD", adjustment for TDD compatibility.

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Agree: 14   (93.3%)

1) Disagree: 1   (6.7%)

2) Abstain: 0   (0.0%)

Total votes = 15

EPoN Protocol over Coax

Comments: #rfspectrum_12

Bill Powell

- As noted in the notes above, this does not exclude an FDD high-band overlay for a node+0 deployment case

John Ulm

- I don't see any reason why the downstream FDD spectrum needs to start at 54MHz, rather it should start around 300 or 400MHz, reducing # of octaves needed. If legacy services are present, they will be in the 54-400MHz range. If no legacy services present but multiple EPoC networks, maybe upstream should be 5 to 400MHz.

Keiji Tanaka

- This is a good compromise solution. We need an option of a 2.6 GHz frequency band for FDD.

eStraw Poll #rfspectrum_13

High Band Overlay US/DS Question:

Should the EPoC standard support a high-band overlay (where the EPoC US/DS are both above the HFC spectrum), in a Node+0 manner?

(This would allow deploying EPoC above the current HFC cable plant, without changing any of the actives, by adding a separation diplexer at the last active to add/remove EPoC spectrum).

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes: 12   (85.7%)
1) No: 2   (14.3%)
2) Abstain: 0   (0.0%)
Total votes = 14

Comments: #rfspectrum_13

Mike Darling

- TDD only

Bill Powell

- I think this is an important deployment case to be able to deliver high data BW (enterprise, etc) to the last Active, without disrupting the current US/DS HFC plant & Actives

eStraw Poll #rfspectrum_14

High-band Overlay for TDD and/or FDD Question:

Should the standard support this high-band overlay for FDD and/or TDD?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) TDD only: 3   (21.4%)

1) FDD only: 1   (7.1%)

2) Both TDD and FDD: 7   (50.0%)

3) None: 2   (14.3%)

4) Abstain: 1   (7.1%)

Total votes = 14

Comments: #rfspectrum_14

Bill Powell

- Both modes - for maximum flexibility

eStraw Poll #rfspectrum_15

Two TDD Frequency Bands Question:

Should the standard include two TDD frequency bands: a lower band and an upper band?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes: 3   (37.5%)

1) No: 1   (12.5%)

2) Other (please add comments):   3   (37.5%)

3) Abstain: 1   (12.5%)

Total votes = 8

Comments: #rfspectrum_15

- ## Bill Powell
  - It would provide the most flexibility to support a single, large, low-to-high frequency band for operators that want to use their whole cable spectrum (or any particular part of it) for TDD mode EPoC.

- ## Leo Montreuil
  - Upper and a single large full band

- ## Matthew Schmitt
  - If a lower band is a requirement for some regions of the world, it makes sense to include it. However, if there is not a specific requirement from a specific region to include a lower band, I would change my vote and prefer only an upper band.

- ## Duane Remein
  - Two bands, possibly with some overlap.

eStraw Poll #rfspectrum_16

Lower TDD Band Question:

Should the standard include a lower TDD band approximately 10 to several hundred MHz?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes: 8 (100.0%)

1) No: 0 (0.0%)

2) Other (please add comments): 0 (0.0%)

3) Abstain: 0 (0.0%)

Total votes = 8

Comments: #rfspectrum_16

- Bill Powell
  - Yes, low (~10 MHz) to >1.2 GHz

eStraw Poll #rfspectrum_17

Single TDD band support full RF bandwidth Question:

For a TDD standard-compliant device should the standard require support for a single TDD band that covers the full RF bandwidth we are considering, from around 10 MHz to over 1 GHz?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes:	3	(42.9%)
1) No:	2	(28.6%)
2) Other (please add comments):	0	(0.0%)
3) Abstain:	2	(28.6%)

Total votes = 7

Comments: #rfspectrum_17

- Matthew Schmitt
  - That seems an unreasonable requirement, and will make devices overly expensive. If there are 2 bands, IMHO devices should support one or the other.

- Duane Remein
  - I think this should be determined by the Vendor and/or Operator and not a required part of the standard.

eStraw Poll #rfspectrum_18

Two band TDD support Question:

If the standard specifies two bands, a lower band and an upper band, should a standard-compliant TDD device be required to support:

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Either the lower or the upper band: 5   (62.5%)

1) Both the lower and the upper bands: 2   (25.0%)

2) Other (please add comments):   1   (12.5%)

3) Abstain: 0   (0.0%)

Total votes = 8

EPON Protocol over Coax

Comments: #rfspectrum_18

- Marek Hajduczenia
  - Two band support should be disallowed

EPON Protocol over Coax

eStraw Poll #rfspectrum_19

Upper TDD Frequency Band Question:

The standard shall support an upper TDD frequency band from approximately 500 MHz to 1700 MHz

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) Yes: 8   (100.0%)

1) No: 0   (0.0%)

2) Other (please add comments):   0   (0.0%)

3) Abstain: 0   (0.0%)

Total votes = 8

eStraw Poll #rfspectrum_20

TDD lower band, lower edge Question:

What lower band edge do you prefer for the TDD lower band?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 5 MHz:	5	(62.5%)	
1) 10 MHz:	2	(25.0%)	
2) 15 MHz:	1	(12.5%)	
3) 20 MHz:	0	(0.0%)	

Total votes = 8

eStraw Poll #rfspectrum_21

TDD lower band, upper edge Question:

What upper band edge do you prefer for the TDD lower band?

Vote type: Single answer selection per voter.

Summary of votes per answer (percent of total):

0) 234 MHz: 4   (50.0%)

1) 277 MHz: 4   (50.0%)

2) 500 MHz: 0   (0.0%)

Total votes = 8