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Submission Title: [Comment resolutions for FEC]

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Re: []

Abstract: [This document provides resolutions to comments for FEC]

Purpose: [This document provides resolutions to comments of LB51]

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FEC CID 684 and 686

- Comment 684:
 - Only FEC disabled is discussed - what about CRC, AES, and whitening, for example? Add further specifications.
- Response: Reject
- Resolution:
 - CRC is required and AES and whitening do not effect PER.

- Comment 686:
 - FEC disabled" does not specify payload or header. Specify Payload/Header/Both.
- Response: Reject
- Resolution:
 - Coding ON and OFF for header and payload is together.

FEC CID 757, 760, 762, 764, 765(1/2)

- Comment:
 - **757:** PHR coding and Payload coding should not be independently chosen.
 - **760:** Add a note in bottom of the Table 8 saying something like "For MR-FSK, when coding is enabled, the FEC shall be applied over the entire PPDU (PHR+PSDU) as a single block of data, as described in Clause 6.12a.1.3."
 - **762:** Remove "or not supported" in Table 8.
 - **764:** Don't need PHR coding parameter, based on description of FEC in 6.12a,b,c.
 - **765:** Consider merging PHR and Payload coding.
- Response: Accept in principle
- Resolution: change PHR coding to PPDU Coding

PPDUCoding	Boolean	TRUE or FALSE	A value of FALSE indicates that PPDU (PHR+PSDU) is uncoded, and a value of TRUE indicates that PPDU (PHR+PSDU) is coded as a single block of data.
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Text to be changed: Page 26, line 51 to Page 27 line 2.

FEC CID 757, 760, 762, 764, 765(2/2)

- Change to

If the PPDUCoding parameter of the PD-DATA.request primitive specifies that FEC coding is to be applied to the {PHR + PSDU} but the feature is either disabled or not supported, the PHY entity will issue the PD-DATA.confirm primitive with a status of NOT_SUPPORTED_PPDU_FEC.

FEC CID 1234

- Comment: *Either terminated the PHR filed by a tail bit sequence, or consider using a dedicated block code for the PHR field.*
- Response: Reject
- Reason: In case of a non mode switching PPDU, trace back with sufficient reliability is feasible since the minimum number of PSDU bits is 16. (since K is only 4, trace back depth of 16 will suffice). In case of a mode switching PPDU, decoding the 1st bit can also be reliable done and the bit-length of "PHR" (i.e., Mode Switching Frame) is a priori known.

FEC CID 1236

- Comment: *There should be a better option for the mandatory mode to perform, in which case the FEC should be mandatory and not the opposite.*
- Response: Reject
- Reason: **On the one hand, FEC can be used to increase the receiver sensitivity, and so the communication range, in situations where the channel is noisy and/or has a high level of interferences, at the expense of additional overhead. In particular, FEC is useful for high data rates and very long PPDU, which is not the majority of operating situations of wireless SUN. On the other hand, the use of FEC can increase the power consumption; this stresses the lifetime of battery-powered devices. Additionally, transmission in a good channel can be done without FEC and thus obtaining lower power consumption performance.**

In this regard, mandating FEC for MR-FSK SUNs operating at 50 kbps is not recommended. Making FEC optional gives more flexibility to the system designers to deal with performance versus cost tradeoffs and it better address battery operated devices

FEC CID 1238

- Comment: *Inserting 3 tail bits after the PHR will enable the PHR to be reliably decoded, but the overhead of the tails bits is significant in relation to the 16 data bits. This results in 38 bits being transmitted for every 16 data bits, which presumably motivated the encoding as single block of data in the first place. Nevertheless, the disadvantages to the decoder are such that I recommend to either separately terminate the PHR with its own tail bits or consider using a systematic BCH(40,16) instead.*
- Resolution: **Defer. Work in progress.**

FEC CID 1239

- Comment: *Add a MAC command to exchange the PHY capabilities between devices so that the devices will know the details of any optional modes that can be used between the devices. Relying on setting the PIB will not work.*
- Response: Reclassify this comment as “MAC subgroup”.
- Resolution: James and Daniel to provide text with description of required MAC functionalities and commands.

FEC CID 1240

- Comment: *Remove references to convolutional coding and associated PIB attributes. Replace with LDPC for FEC.*
- Response: Reject
- Reason: LDPC requires large block size to achieve good coding gain. For low data rate system it results in large processing delay. Comparing to LDPC, the convolutional coding is more suitable for low data rate SUN system.

FEC CID 1241

- Comment: *Two convolutional coding options are unnecessary. Doc. 10-112 states that both offer same bit-error performance, same free distance. Having one option and using systematic coding maximizes potential for interoperability. Remove references to NRNSC coding option. Remove references to pkyFSKFECscheme PIB attribute. Limit convolutional coding to RSC.*
- Resolution: Withdrawn by the commenter.

FEC CID 1243

- Comment: *Interleaving should be mandatory for coded {PHR+PSDU}. Align with industry practice. restate interleaving as required when coding is used. Remove references to phyFSKFECInterleaving PIB attribute.*
- Response: Reject
- Reason: The effect of interleaver depends on the situation of application. It is not necessary to take interleaver as mandatory.

FEC CID 1244

- Comment: *"When the SFD pattern indicates a coded packet, FEC shall be employed on the PHR and PSDU bits, applying either a $\frac{1}{2}$ rate systematic or non-systematic convolution coding with constraint length $K = 4$ and using the generator polynomials shown in Equation (8) and Equation (9)." is already covered in the previous text.*
- Response: Accept in principle.
- Resolution: Resolution is provided in revised document xx-0266-04-xx.

FEC CID 1245

- Comment: *Constraint length $K = 4$ is short given that code is not concatenated. Does not align with related standards. Use $K = 7$. Update necessary parameters.*
- Response: Reject
- Reason: Longer constraint length means higher complexity. It is not necessary to increase the constraint length if the required performance can be achieved with short constraint length codes.

FEC CID 1247, 1248, 1249, 1250, 1251, 1258 (1/2)

- Comment : *Equation (10) needs is too long and needs to be reformatted. Also, it purports to deal with elements b_i , but they don't . Explain the equation, P_i and p_i are not defined, what do they mean?(1247)*
- Response: Accept in principle.
- Resolution: resolution provided in revised document xx-0266-04-xx.

FEC CID 1247, 1248, 1249, 1250, 1251, 1258 (2/2)

- Comments with “same resolution as 1247”
 - **1248:** *Bit nomenclature should be aligned with standard convolutional encoder terminology eg. OFDM.*
 - **1249:** *Use resolution proposed in document 15-10-0266-00-004g.*
 - **1250:** *The end of the equation is difficult to read.*
 - **1251:** *Equation number "(10)" should be in the next line.*
 - **1258:** *There is a mismatch between the name of the variable used to represent the output of the convolutional coding scheme in Figure 65c and the name of the variable used in Equation (10).*
- Response: Accept in principle
- Resolution: resolution provided by the revised document xx-0266-04-xx

FEC CID 1252

- Comment: *The purpose of Table 75b is not clear. What is meant by SFD pattern?*
- Response: Accept in principle
- Resolution: *Page 48 line 53 change to:*

Depending on the value of the selected SFD

Table 75b – SFD value and MR-FSK coding option

SFD Value	PHR +PSDU	Comment
See Table 28a	uncoded	Mandatory mode
See Table 28a	coded	optional mode; PHR and PSDU coded as a single block of data

- *Page 49 line 20 change to:*

When the SFD value indicates a coded packet, FEC shall be employed on the PHR and PSDU bits,...

FEC CID 1253, 1254

- Comment ID:
 - **1253:** *Consider using a single type of FEC.*
 - **1254:** *The RSC has the advantage of being systematic, which tips the scales in favor of its adoption. Propose to adopt RSC only.*
- Resolution:
 - **1253:** Withdrawn by the commenter.
 - **1254:** Withdrawn by the commenter.

FEC CID 1255

- Comment: *Add ", and termination sequence (tail bits)" at end of sentence.*
- Response: Accept in principle.
- Resolution: Same resolution as 1247: resolved by revised document xx-0266-04-xx.

FEC CID 1259, 1271, 1274

- Comment ID:
 - **1259:** Re-design the interleaver as a bit-interleaver.
 - **1271:** The text does not provide sufficient information on the interleaving procedure to so as to achieve proper implementation.
 - **1274:** Explain. Consider having interleaving always enabled in case FEC is enabled. Consider using a bit-interleaver instead of a symbol interleaver.
- Resolution:
 - **1259:** Withdrawn by the commenter.
 - **1271:** Resolution provided in document xx-0266-04-xx
 - **1274:** Reject (same resolution as 1243)
 - Reason: The effect of interleaver depends on the situation of application. It is not necessary to take interleaver as mandatory.

FEC CID 1261, 1262, 1272

- Comment 1261: Why is there a specific bit sequence for the stuffing bits? Provide explanation for the specific sequence.
- Response: Accept in principle
- Response: Resolution provided in document xx-0266-04-xx.

- Comment 1262: Why is there a specific bit sequence for the stuffing bits?
- Resolution: same as 1261

- Comment 1272: What is the reason to specify this particular kind of stuffing bits (i.e. non-zero bits)? They are usually zero.
- Resolution: same as 1261.

FEC CID 1267, 1268, 1269, 1270

- Comment 1267
 - There seems to be an error in the interleaver figure since Document 182 r1 has the agreed figure, and then Document 182 r2 was uploaded on afternoon on the last day of the Orlando meeting with a re-drawn figure and was not presented.
- Requested resolution: Use the figure that was agreed in the FEC subgroup and during the Orlando meeting in document 182 r1 for the interleaver.
- Resolution: Accept in principle.
- Response: use text from document xx-0266-04-xx

- Comment 1268
 - There seems to be an error in the interleaver figure since Document 182 r1 has the agreed figure, and then Document 182 r2 was uploaded on afternoon on the last day of the Orlando meeting with a re-drawn figure and was not presented.
- Resolution: same as 1267

- Comments 1269 & 1270: similar to 1268
- Resolution: same as 11267

Open FEC comments: CID 208, 250, 267

- Comment 208
 - Use of "see clause 6" in all figures showing frame structure is odd. Replace with a better reference - (i.e. to an equation, etc.)
- Resolution: "Resolved by comment 190".

- Comment 250
 - The use of FEC is not unique to the OFDM PHY. This should be captured as a more general feature for the overall SG amendment.
- Resolution: Accept.
- Response: Classify as minor T&G.

- Comments 267
 - Isn't this remark also applicable to the OQPSK and OFDM PHY's?
- Resolution: "Resolved per comment 266."