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Re:	Document to support comment to Letter Ballot #17	
Abstract	Changes required to prevent DBPC message flooding of 802.16 systems	
Purpose	The document is intended for consideration in comment resolution process of LB #17.	
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Problems with DBPC Messages and a Solution

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Introduction

The changes proposed in this document are to solve the problems in the specification and usage of the DBPC-REQ and DBPC-RSP messages as described in IEEE 802.16-2004[1,4].

Description of Problem

The problems of current DBPC-REQ/RSP mechanism are summarized as follows:

1) Problems with DBPC-REQ flooding for broadcast or multicast data

Note that DBPC_REQ must be sent by an SS according to its Downlink Operational Burst Profile (for short here default DIUC). Default DIUC is the one used by BS to send management messages to the SS. Figure 79 and 80 however seem to indicate that the DBPC/RNG-REQ messaging is triggered by comparing current received DIUC with the CINR currently measured. A DBPC/RNG-REQ is send when the current CINR would recommend another DIUC then the current one received. This will lead to a flood of DBPC/RNG-REQ messages send to the BS. As an example consider multicast/broadcast groups: consider a set of SS's belonging to same multicast group but operate at different default DIUCs. The BS will choose the most robust default DIUC to ensure that all SS's belonging to the same broadcast/multicast group can operate correctly. Consequently, the SS that can choose a lesser robust burst profile will periodically send DBPC-REQ. Moreover, the DBPC-REQ message is sent by the SS to the BS on the SS's *Basic CID* (see 6.3.2.3.20). Thus, if the SS intends to request to change the DIUC of the *multicast or broadcast transport connection*, the BS will consider that the SS intends to change the DIUC (Default DIUC) for the *unicast* transport connection or the *management* connections and therefore approve the request.
The remedy is to clarify that the DBPC/RNG-REQ is triggered by changes of the CINR w.r.t. to the default DIUC only.

2) Problems with DBPC-REQ/RNG-REQ flooding

The BS may chooses to ignore the request and enhance the transmission by means of repetition, boosting, etc., which is described in [3].

3) Problem with DBPC-REQ lost

There is no timer to handle the lost of DBPC-REQ or DBPC-RSP. This may occur for the nomadic operation.

4) Problem with DBPC-REQ/RNG-REQ request re-try interval

For some reasons, which are explained in [3], the BS may reject the request from SS to change DL burst profile, the SS should set a timer to try it again later. Additionally, under the multicast data scenario described above, even if the BS has approved the request DIUC the SS still should set a timer to delay the consecutive DBPC-REQs for

avoiding the DBPC-REQ flooding. However, there is no such re-try timer.

5) Problem with how to define that data grant is available (see 6.3.10.1, line 18)

According to [5], it is better to let the SS decide to use DBPC-REQ or RNG-REQ.

6) When asking for change of less robust burst profile the SS should only use DBPC-REQ since initial ranging slot is a scarce resource and should be utilized carefully

Figure 1 summarizes the scenarios of the flooding problem, and the suggested remedies (T28/T29).

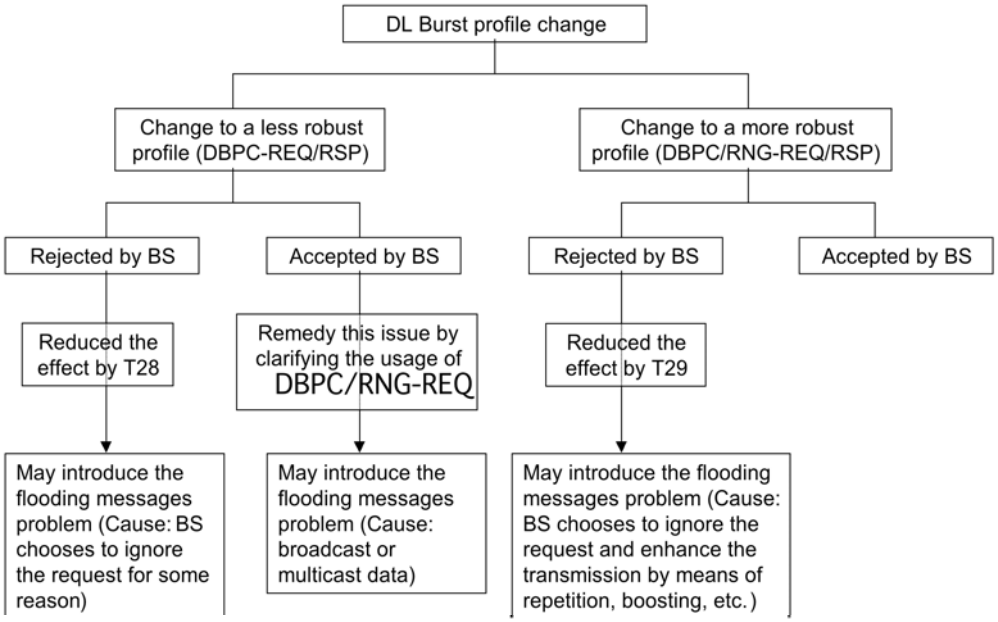

Figure 1

Text Changes

Text changes are relative to [4].

Page 15, Line 58, insert:

6.3.2.3.20 Downlink Burst Profile Change Request (DBPC-REQ) message

Change the first paragraph as indicated:

The DBPC-REQ message is sent by the SS to the BS on the SS's Basic CID to request a change of the least robust downlink burst profile used by the BS to transport data to the SS (i.e. the Downlink Operational Burst Profile).

Change the second paragraph as indicated:

The DBPC-REQ message shall be sent at the current operational Data Grant Burst Type for the SS. If the SS detects ~~fading~~ changes of the channel conditions on the downlink, the SS uses this message to request transition to a more appropriate Data Grant Burst Type ~~robust Data Grant Burst Type~~. The message format shall be as shown in Table 48.

Page 27, Line 5:

6.3.10.1 Downlink burst profile management

Change the first paragraph as indicated:

The downlink operational burst profile is determined by the BS according to the quality of the signal that is received by each SS. To reduce the volume of uplink traffic, the SS monitors the CINR and compares the average value against the allowed range of operation. This region is bounded by threshold levels. If the received CINR goes outside of the allowed operating region for the downlink operational profile, the SS requests a change to a new operational burst profile using one of two methods. In the first method the SS uses an allocated data grant to sent a DBPC-REQ. In the second method the SS uses the initial ranging interval to send a RNG-REQ. The second method can only be used in context with a request to change to a more robust profile.The SS determines the optimal method. If the first method is used and the SS has been granted uplink bandwidth (a data grant allocation to the SS's Basic CID), the SS shall send a DBPC-REQ message in that allocation. The BS responds with a DBPC-RSP message. If ~~a grant is not available~~ the second method is used and the SS requires a more robust burst profile on the downlink, the SS shall send a RNG-REQ message in an Initial Ranging interval. With either method, the message is sent using the Basic CID of the SS. The coordination of message transmit and receipt relative to actual change of ~~modulation~~ operational burst profile is different depending upon whether an SS is transitioning to a more or less robust burst profile. Figure 79 shows the case where an SS is transitioning to a more robust type. Figure 80 shows transition to a less robust burst profile.
The following changes need to be applied to [1]:
Page 200: Figure 79 needs to indicate action of SS in event of non-detection of DBPC-RSP.
Page 201: Figure 80 needs to indicate action of SS in the event of the BS refusing the DBPC-REQ to move to a less robust modulation. State transition diagrams are needed here, so rather than complicate these diagrams, we introduce a separate figure. This diagram requires timers, so that the BS is not flooded with requests. The diagram (Figure 80a) indicates the actions for the SS, and includes new timers (T28, T29, and T30).
Also DL data may be on DIUC up to m, not at m. This requires a change to Figure 79, too.
RNG-REQ only to be used for transition to more robust cases (see 6.3.10.1).

This requires a change to Figure 80. This leads to the following text changes in [4]:
Page 27, Line 11, insert:

Change Figure 79 as indicated:

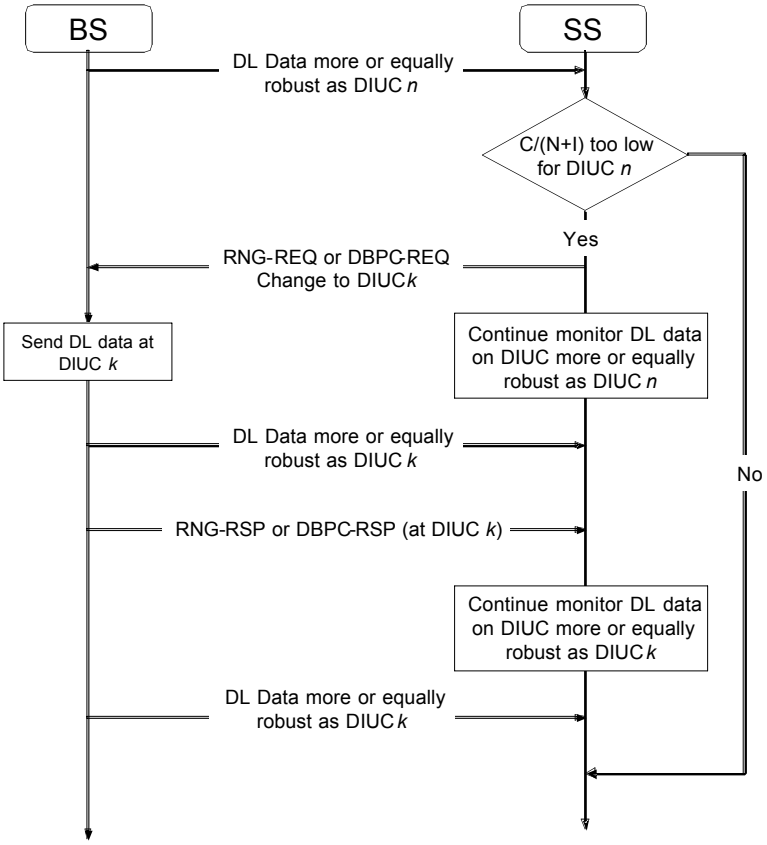

Figure 79—Transition to a more robust operational burst profile

Change Figure 80 as indicated:

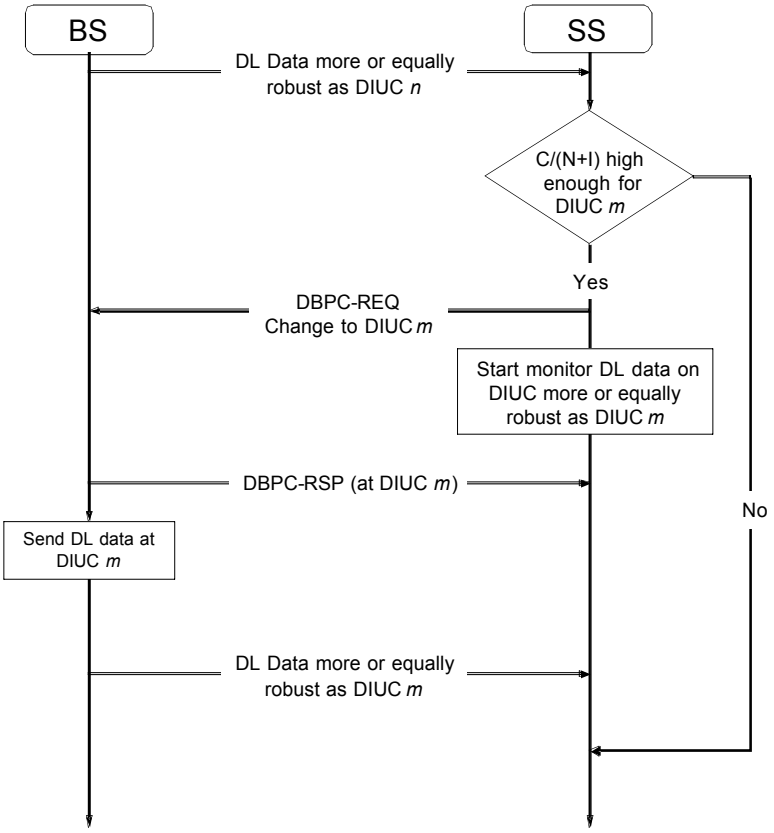

Figure 80—Transition to a less robust operational burst profile

Insert new Figure 80a (see end of contribution).

10.1 Global values

In Table 342, Line56, add following entries:

System	Name	Time reference	Minimum value	Default value	Maximum value
SS	T28	DBPC-REQ re-try timer for requesting less robust burst profile after rejection by the BS.	200 ms	1 s	1 min
SS	T29	RNG-REQ/DBPC-REQ re-try timer for requesting more robust burst profile after rejecting by the BS.	200 ms	1s	30s
SS	T30	DBPC-RSP reception timeout following the transmission of a DBPC-REQ.	200 ms	200 ms	200 ms

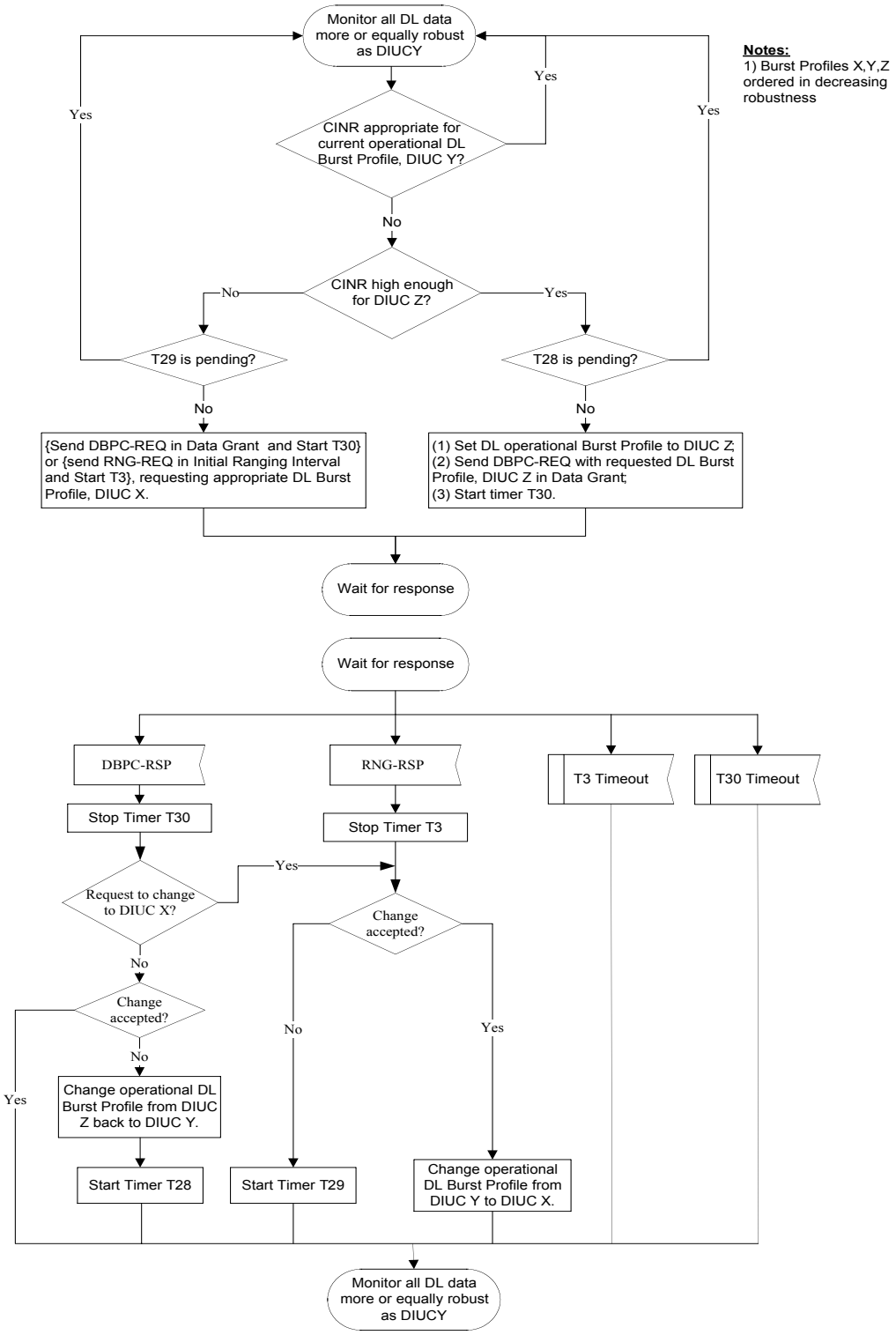

Figure 80a – State transition diagram for downlink burst profile management – SS

References

[1] IEEE, “IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems,” IEEE Std 802.16-2004.
[2] Yuval Lomnitz, Comment 084, 802.16maint-04/04r9.
[3] Yuval Lomnitz, Yigal Eliaspur, Dov Andelman , “DL Burst profile selection unsuitable for OFDMA,” IEEE C802.16maint-04/13, 2004-08-19.
[4] Corrigendum to “IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems,” IEEE P802.16 -2004/Cor1/D1.
[5] David A Castelow, Gavin Meakes, Eyal Verbin etc., “Problems with DBPC Messages and a Solution”, IEEE C802.16maint-04/49r1