Project	IEEE 802.16 Broadband Wireless Access Working Group <**http://ieee802.org/16**>
Title	Problems with DBPC Messages and a Solution
Date Submitted	2005-01-13
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Re:	Supporting document for Comment 612 and Reply to Comment 084 (802.16-04/04r9)
Abstract	Changes required in order to enable good operation of 802.16 systems.
Purpose	The document is intended for consideration within the comments resolution process.
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Problems with DBPC Messages and a Solution

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January 2005

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] IEEE, "IEEE Draft Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems," IEEE P802.16-REVd/D5-2004.

Introduction

The changes proposed in this document are to correct errors in the specification and usage of the DBPC-REQ and DBPC-RSP messages as described in IEEE 802.16-2004 [1, 4]. This is in support of comment 612.

Description of Problem

The DBPC messages are sent by an SS when it receives data carried on a DIUC whose modulation is either more or less robust than the terminal estimates it can deal with. When the SS can receive data using a less robust modulation than the data it is receiving, it is REQUIRED [see 4, §6.3.10.1, page 202, line 16] to send a request to increase the data rate. This will include broadcast data. As a result broadcast data will cause a storm of DBPC-REQ messages flooding the uplink. The solution is not to exclude the message, as has been proposed in [2, 3], but to modify the description of the use of the DBPC-REQ/RSP messages (sections 6.3.2.3.20 and 6.3.2.3.21) and the associated STL diagrams and operational description in section 6.3.10.1. In this way the changes are also applicable to all PHY modes: certainly the OFDM PHY will suffer the problem along with the OFDMA PHY. Also, §6.3.2.3.20 page 74 line 17-19 seems to indicate the DBPC message is only for changing to more robust burst type. This is in contrast of §6.3.10.1 Furthermore, the text in **6.3.10.1:**

"If 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 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"

has an intrinsic problem: how do you define that data grant is available? Available at the instant the change in CINR has been detected? The next data grant might be available before the next available ranging slot. I think it is better to make the decision of which method to use implementation
specific to the SS.

Do Not Remove the Message

The changes in [2, 3] are not complete or appropriate for the following reasons:
The changes in [2, 3] are PHY specific: the problem is there regardless of the PHY mode.

According to section 6.3.10.1, the unsolicited RNG-REQ can only be sent in a contended Initial Ranging Interval, whereas the DBPC-REQ can be sent in allocated transmission opportunities.
A minimal RNG-REQ is much larger than the DBPC-REQ (40 bits cf 24 bits)).

Text Changes

Text changes are relative to [4].
Page 74, Line 11:
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.

Page 74 Line 17-19
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 DL burst profile ~~robust Data Grant Burst Type~~. The message format shall be as shown in Table 48.

Page 202 Line11-23
6.3.10.1 Downlink burst profile management
The downlink 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, the SS requests a change to a new 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 SS determines the optimal method. If 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 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~~ DL 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 SS applies an algorithm to determine its optimal burst profile in accordance with the threshold parameters established in the DCD message in accordance with Figure 81.

Page 203: Figure 79 needs to indicate action of SS in event of non-detection of DBPC-RSP.
Page 204: 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 a new timer (T28).
Also DL data may be on DIUC up to m, not at m. This requires a change to Figure 79 also.
Text change:
Page 203,
Change Figure 79 as indicated:

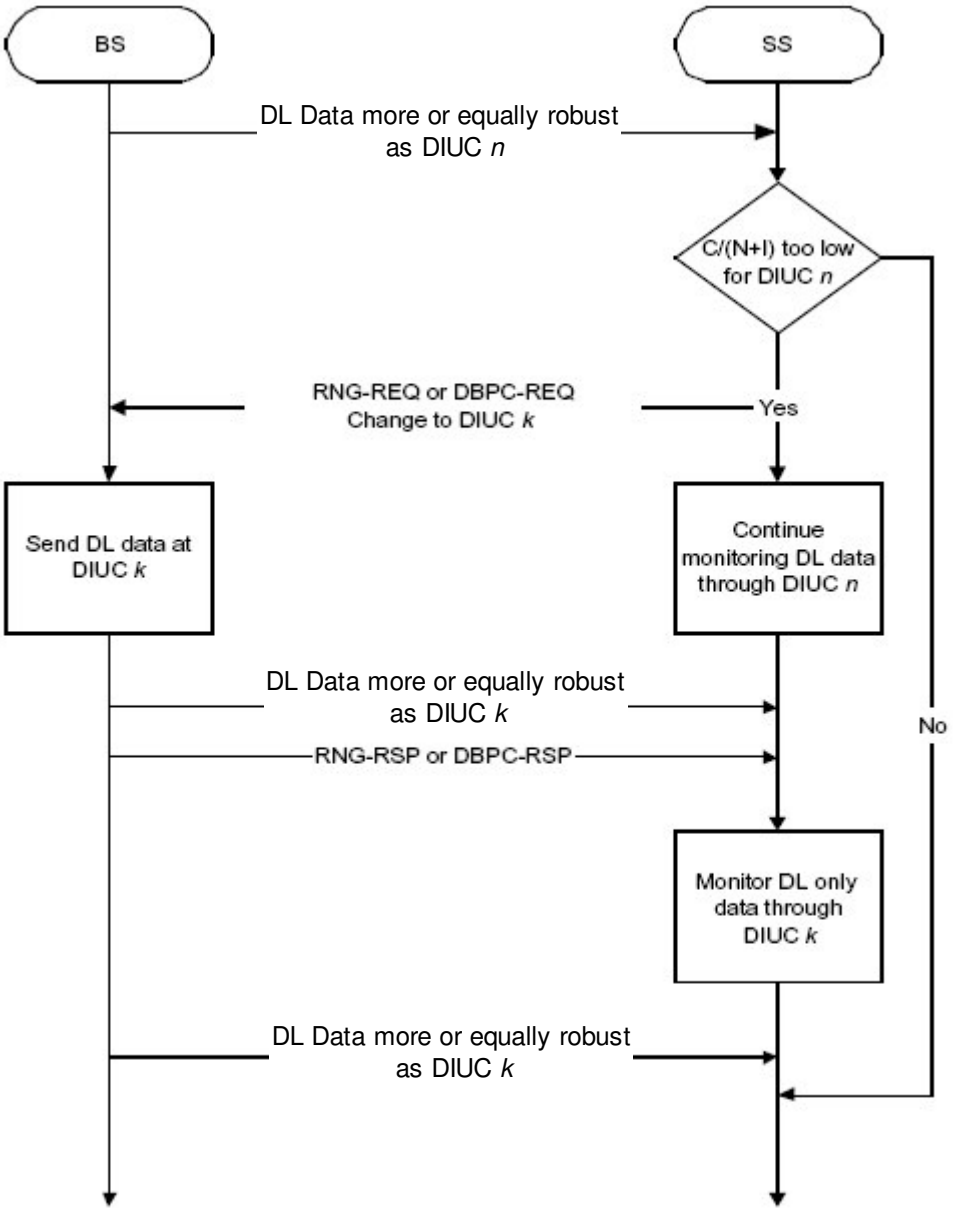

Figure 79—Transition to a more robust burst profile

Text Change:
Page 204.
Change Figure 80 as indicated, as RNG-REQ only to be used for transition to more robust cases when no grant is available (see 6.3.10.1).

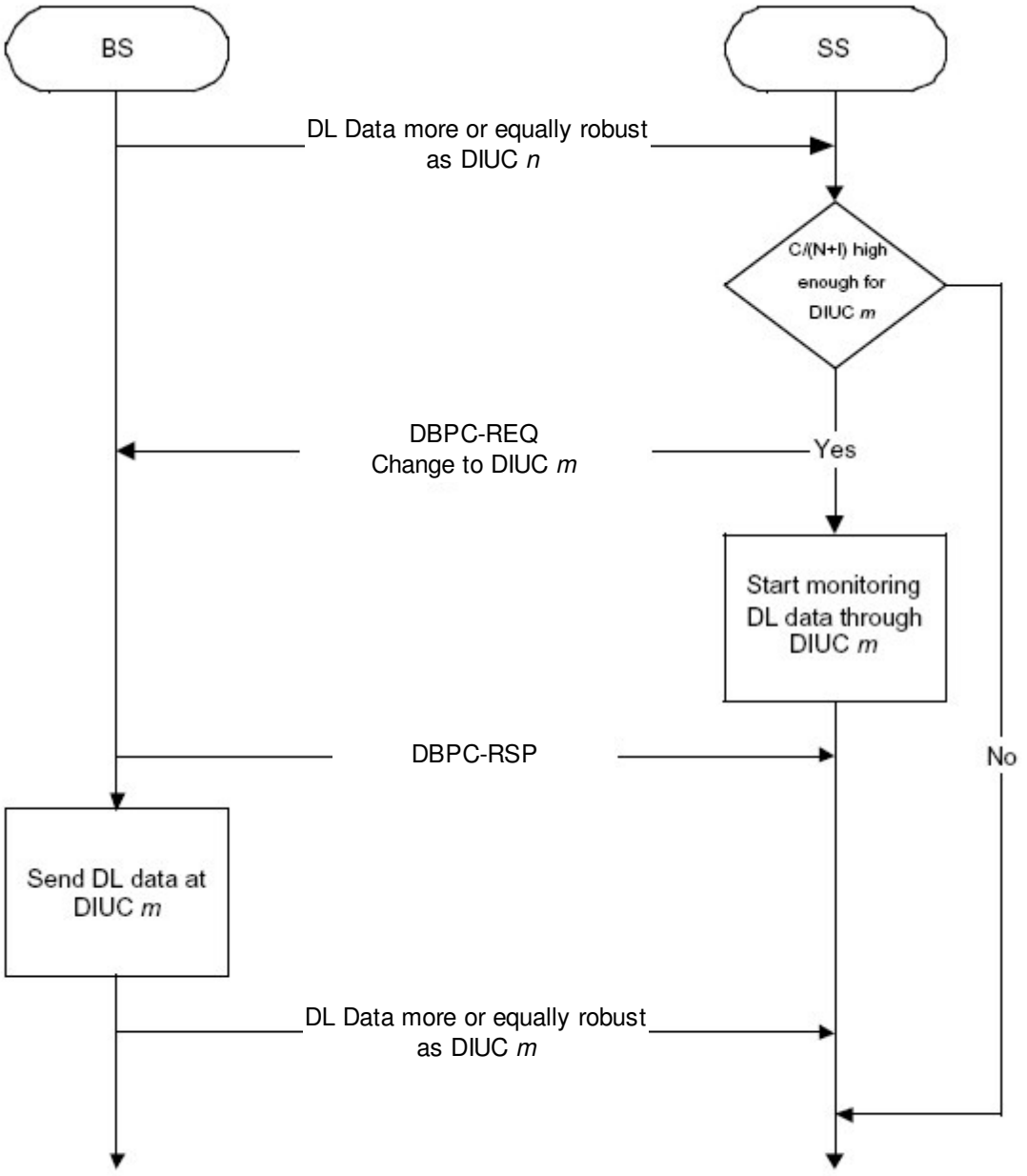

Figure 80—Transition to a less robust burst profile

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

Page 469, Line 32, change required because otherwise there is no direct formal link between OFDM UIUC and the concept of Data Grant Burst Type used, e.g. at page 74 when describing the sending of DBPC-REQ.
| 5–12 | Burst Profiles (Data Grant Burst Type) |

Page 535, Line 38, change required because otherwise there is no direct formal link between OFDMA UIUC and the concept of Data Grant Burst Type used, e.g. at page 74 when describing the sending of DBPC-REQ.

| 1–10 | Different burst profiles (Data Grant Burst Type) |

Page 642, Line 58, change to specify minimum value, and to make explicit its use in DBPC messages.

System	Name	Time reference	Minimum value	Default value	Maximum value
SS	T3	Ranging Response/DBPC-RSP reception timeout following the transmission of a Ranging Request/DBPC-REQ	200 ms	200 ms	200 ms

Page 644, Table 340, add after line 39:

System	Name	Time reference	Minimum value	Default value	Maximum value
SS	T28	Minimum Time between transmission of downlink burst profile control messages (RNG-REQ/DBPC-REQ).	200 ms	1 s	1 min

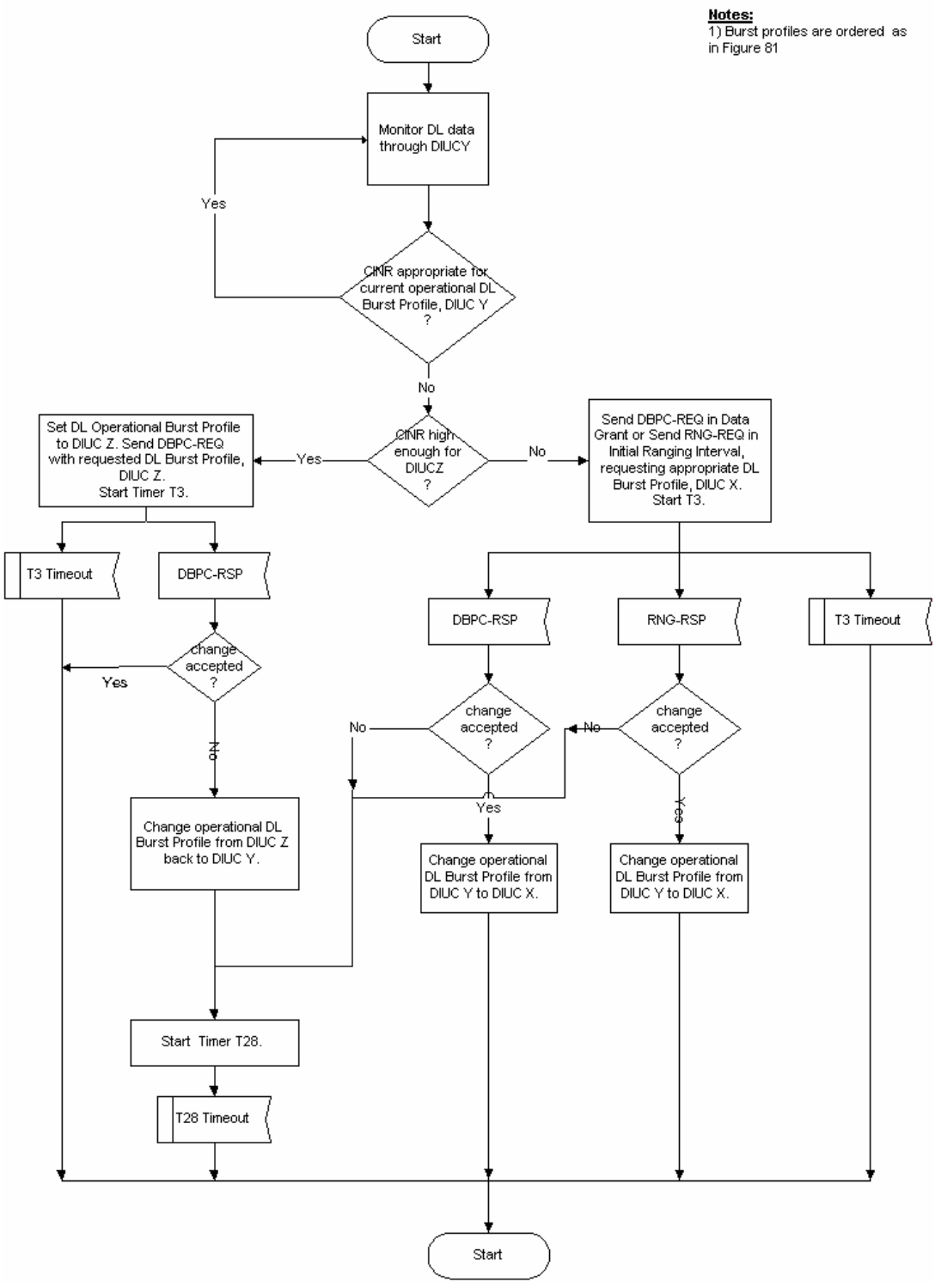

Figure 80a – State transition diagram for downlink burst profile management – SS