
Title: Proposed Changes to TIA/EIA 136-131 to include TDMA Half-Rate Speech Codec

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Abstract:

This contribution proposes changes to TIA/EIA 136-131, [1], to include TDMA half-rate speech codec. The changes are based on Lucent Technologies' TDMA half-rate speech codec proposal, [2], and serve to complete the description of Lucent's proposal. The document indicates the changes required within each section of TIA/EIA 136-131.

Recommendation:

FYI.

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1 Discussion

2 This contribution proposes changes to the TIA/EIA 136-131 to include TDMA half-rate speech codec.
3 The changes are based on Lucent Technologies' TDMA half-rate speech codec proposal [1], and serve to
4 complete the description of Lucent's proposal. The document indicates the changes required within each
5 section of TIA/EIA 136-131. The section numbering follows the numbering scheme described in
6 TIA/EIA 136-131. In the case where an entire section does not require any changes, we only include the
7 top-most section heading. We also note that table and figure numbering will need to change after the new
8 text is included in the document.

9 References

- 10 1. TIA/EIA 136-131 (1999), Digital Traffic Channel Layer 1.
- 11 2. UWCC.GTF.HRP.99.05.26_, Lucent Technologies, (1999), *Lucent Technologies half-rate speech*
12 *codec*.

1. Digital Traffic Channel Structure

No change to TIA/EIA 136-131.

1.1. Shortened Burst Definition

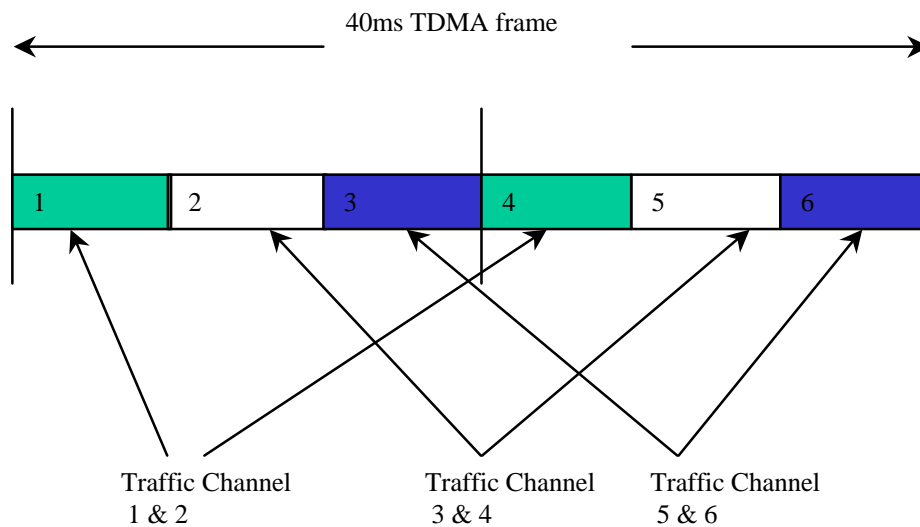
No change to TIA/EIA 136-131.

1.2. Frame Length

The following description should be added after the second paragraph.

When the half-rate slot assignment is for the downlink (base-to-mobile), two slots per half-rate channel may be assigned. However, the assigned slots must be co-shared with another half-rate traffic channel. Figure 1.2-1 illustrates slot co-sharing between two half-rate traffic channels.

Figure 1.2-1: Slot co-sharing for TDMA half-rate solution in the downlink



1.2.1. Standard Offset Reference

No change to TIA/EIA 136-131.

1 **1.3. Gross Rate for the Traffic Channel**

2 No change to TIA/EIA 136-131.

3 **1.4. Guard and Power Ramp Up Interval**

4 No change to TIA/EIA 136-131.

5 **1.5. Synchronization Word/Time Slot Identifier**

6 No change to TIA/EIA 136-131.

7 **1.6. Coded Digital Verification Code**

8 No change to TIA/EIA 136-131.

9 **1.7. Coded Digital Control Channel Locator**

10 No change to TIA/EIA 136-131.

11 **1.8. DATA**

12 No change to TIA/EIA 136-131.

13 **1.8.1. Channel Encoding**

14 The following text is added at the end of the paragraph.

15 For TDMA half-rate speech codec, a punctured rate $\frac{1}{2}$, $K=7$, convolutional code is
16 used.

17 **1.8.1.1. Channel Encoding for $\pi/4$ DQPSK Modulation**

18 No change to TIA/EIA 136-131.

19 **1.8.1.2. Channel Encoding for 8-PSK Modulation**

20 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
21 coder (for instance the specification in [2]).

1 **1.8.2. Interleaving**

2 No change to TIA/EIA 136-131.

3 **1.8.2.1. Interleaving for $\pi/4$ DQPSK Modulation**

4 No change to TIA/EIA 136-131.

5 **1.8.2.2. Interleaving for 8-PSK Modulation**

6 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
7 coder (for instance the specification in [2]).

8 **1.9. Pilot Symbol Fields (Pn)**

9 No change to TIA/EIA 136-131.

10 **1.9.1. Power Ramp (PRAMP)**

11 No change to TIA/EIA 136-131.

12 **1.9.2. $\pi/4$ DQPSK for ACELP (CC2)**

13 No change to TIA/EIA 136-131.

14 **1.10. 8-PSK**

15 No change to TIA/EIA 136-131.

16 **1.11. Fast Power Control (F)**

17 No change to TIA/EIA 136-131.

18 **1.12. Reserved (RSVD)**

19 No change to TIA/EIA 136-131.

2. Digital Voice and Data Signal –Mobile Station

No change to TIA/EIA 136-131.

2.1. Modulation

No change to TIA/EIA 136-131.

2.1.1. $\pi/4$ DQPSK Modulation

No change to TIA/EIA 136-131.

2.1.2. 8-PSK modulation

For TDMA half-rate speech coder the absolute phase Φ shall be determined according to the following Table.

Table 2.1.2-1: 8-PSK symbol phases for half-rate speech codec

X_k	Y_k	Z_k	Φ
0	0	0	0
0	0	1	$\pi/4$
1	0	1	$\pi/2$
1	0	0	$3\pi/4$
1	1	0	π
1	1	1	$-3\pi/4$
0	1	1	$-\pi/2$
0	1	0	$-\pi/4$

1 **2.1.3. Modulation Accuracy**

2 No change to TIA/EIA 136-131.

3 **2.1.3.1. Description of the Technique used to specify the Modulation Accuracy**
4 **Requirement**

5 No change to TIA/EIA 136-131.

6 **2.1.3.2. Average Frequency Error Definition**

7 No change to TIA/EIA 136-131.

8 **2.1.3.3. Error Vector Magnitude Requirement- $\pi/4$ DQPSK**

9 No change to TIA/EIA 136-131.

10 **2.1.3.4. Error Vector magnitude Requirement-8-PSK**

11 The following table describes the sequence B(k) for the TDMA half-rate speech codec.

12 **Table 2.1.3.4- 8-PSK mapping for B(k) for half-rate speech codec**

X _k	Y _k	Z _k	B(k)
0	0	0	0
0	0	1	1
1	0	1	2
1	0	0	3
1	1	0	4
1	1	1	5
0	1	1	6
0	1	0	7

1 **2.2. Demodulation**

2 No change to TIA/EIA 136-131.

3 **2.2.1. $\pi/4$ DQPSK Modulation**

4 No change to TIA/EIA 136-131.

5 **2.2.2. 8-PSK Modulation**

6 No change to TIA/EIA 136-131

7 **2.3. De-Interleaving**

8 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
9 coder (for instance the specification in [2]).

10 **2.4. Convolutional Decoding**

11 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
12 coder (for instance the specification in [2]).

13 **2.5. Cyclic Redundancy Check**

14 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
15 coder (for instance the specification in [2]).

16 **2.6. Downlink Power Control Requirements**

17 No change to TIA/EIA 136-131.

3. Digital Voice and Data Signals-Base Station

No change to TIA/EIA 136-131.

3.1. Modulation

No change to TIA/EIA 136-131.

3.1.1. Channel Sharing

The following text should be added after the last paragraph.

As an alternate form of channel sharing, applicable to half-rate traffic channels, a time-slot for receiving data from the base station will be assigned to two mobile stations (two slots per TDMA frame). Both mobile stations must be able to demodulate the entire data contained within the slot and then select the data corresponding to their assigned traffic channels.

3.1.2. $\pi/4$ DQPSK Modulation

No change to TIA/EIA 136-131.

3.1.3. 8-PSK Modulation

No change to TIA/EIA 136-131.

3.2. Demodulation

No change to TIA/EIA 136-131.

3.2.1. $\pi/4$ DQPSK Modulation

No change to TIA/EIA 136-131.

3.2.2. 8-PSK Modulation

No change to TIA/EIA 136-131.

1 **3.3. Speech Coding**

2 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
3 coder (for instance the specification in [2]).

4 **3.4. De-Interleaving**

5 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
6 coder (for instance the specification in [2]).

7 **3.5. Convolutional Decoding**

8 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
9 coder (for instance the specification in [2]).

10 **3.6. Speech Decoding**

11 For TDMA half-rate speech codec refer to TIA/EIA standard covering half-rate speech
12 coder (for instance the specification in [2]).

13 **3.7. Downlink Power Control Requirements**

14 No change to TIA/EIA 136-131.

15 **3.8. Delay Interval Requirements**

16 No change to TIA/EIA 136-131.

1 **4. Change History for TIA/EIA-136-131**

2 Changes will reflect the inclusion of TDMA half-rate speech coder.