TSG-RAN Working Group 1(Radio) meeting #6
Espoo, Finland, 13-16 July 1999

TSGR1#6(99)896

Agenda Item: **AH15, AH03**

Source: **Panasonic (Matsushita Communication Industrial Co., Ltd.)**

Title: **Text proposal for RACH transmission (25.211 5.2.2)**

Document for: **Discussion & Decision**

1.Introduction

Due to the harmonisation, the frame structure will be changed to 15 time slots within 1 frame. And it is necessary that RACH part of TS25.211 will be revised to fit the harmonisation. Currently there are two candidates of access slot structure, which are 7 access slots within 1 frame and 15 access slots within 2 frames. Therefore this document gives two alternative text proposals depending on the access slot structures.

2.Text Proposal

----- Modifications to TS25.211, 5.2.2 where 7 access slots within 1 frame (excluding FAUSCH and CPCH) -----

5.2.2 Common uplink physical channels

5.2.2.1 Physical Random Access Channel

The Physical Random Access Channel (PRACH) is used to carry the RACH.

[The Physical Random Access Channel (PRACH) is used to carry the RACH and the FAUSCH.]

5.2.2.1.1 RACH transmission

The random-access transmission is based on a Slotted ALOHA approach with fast acquisition indication. The UE can start the transmission at a number of well-defined time-offsets, relative to the frame boundary of the received BCH of the current cell. The different time offsets are denoted *access slots* and are spaced 1.333~~1.25~~ ms apart or 2 ms just before frame boundary as illustrated in Figure 2. Information on what access slots are available in the current cell is broadcast on the BCH.

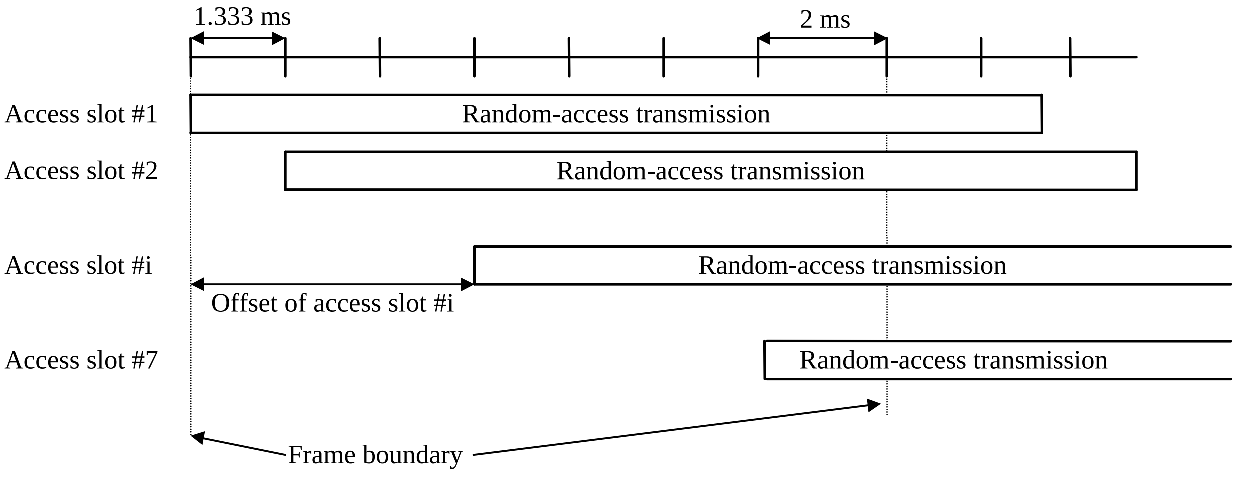

Figure 2: PRACH allocated for RACH access slots.

The structure of the random-access transmission of Figure 2, is shown in Figure 3. The random-access transmission consists of one or several *preambles* of length 1.067(=16/15)~~1~~ ms and a *message* of length 10 ms.

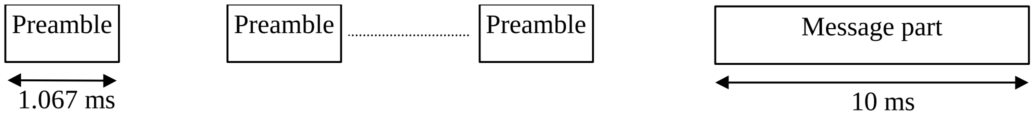

Figure 3: Structure of the random-access transmission.

Figure 4 shows where all access slots are used for preamble transmission. 7 access slots are allocated within 1 frame. The time slots just before frame boundary are not allocated as an access slot. The access slots are allocated for every frame in the same way. The access slot structure for the message part is same with the preamble part.

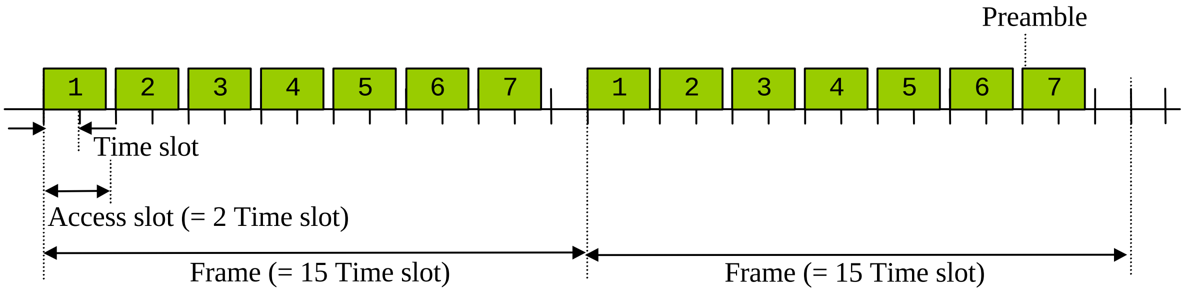

Figure 4: Access slot structure for the preamble part

5.2.2.1.2 RACH preamble part

<Note: WG1 decided to use a different spreading code scheme. An additional set of differential signatures has been decided. A detailed description of the preamble spreading and of the signatures is given in TS 25.213.>

The preamble part of the random-access burst consists of a *signature* of length 16 complex symbols ±1(+j). There are a total of 16 different signatures, based on the Orthogonal Gold code set of length 16 (see TS 25.213 for more details).

5.2.2.1.3 RACH message part

Figure 5~~4~~ shows the structure of the Random-access message part. The 10 ms message is split into 15~~16~~ slots, each of length T_{slot} = 0.666~~0.625~~ ms. Each slot consists of two parts, a data part that carries Layer 2 information and a control part that carries Layer 1 control information. The data and control parts are transmitted in parallel.

The data part consists of $10*2^k$ bits, where k=0,1,2,3. This corresponds to a spreading factor of 256, 128, 64, and 32 respectively for the message data part.

The control part consists of 8 known pilot bits to support channel estimation for coherent detection and 2 bits of rate information. This corresponds to a spreading factor of 256 for the message control part. The total number of rate-information bits in the random-access message is thus 15~~16~~*2 = 30~~32~~. The rate information indicates the spreading factor or, equivalently, the number of bits of the data part of the random-access message. The coding of the rate information is the same as that of the TFCI, see further TS 25.212, Section 4.3.

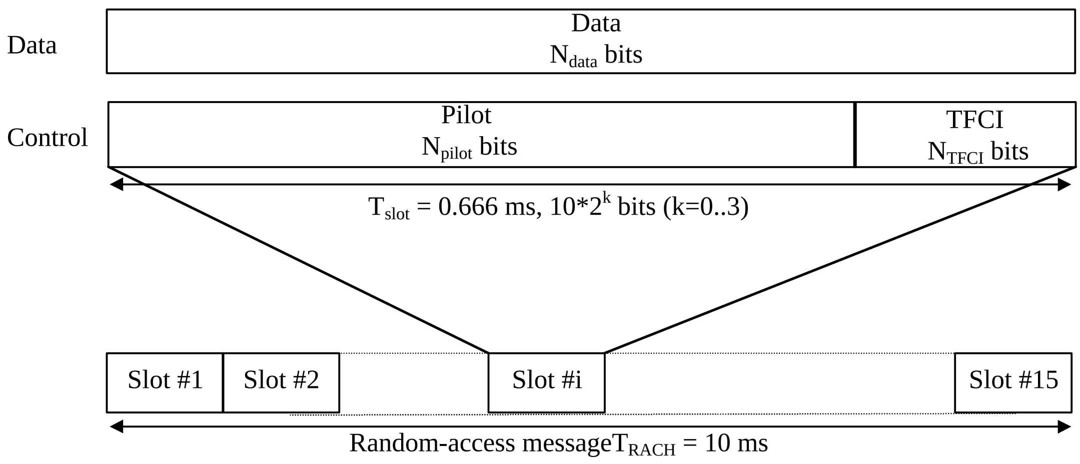

Figure 54: Structure of the random-access message part.

Table 6: Random-access message data fields

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{data}
15~~16~~	15~~16~~	256	150~~160~~	10	10
30~~32~~	30~~32~~	128	300~~320~~	20	20
60~~64~~	60~~64~~	64	600~~640~~	40	40
120~~128~~	120~~128~~	32	1200~~1280~~	80	80

Table 7: Random-access message control fields

Channel Bit Rate (kbps)	Channel Symbol Rate (ksps)	SF	Bits/ Frame	Bits/ Slot	N_{pilot}	N_{TFCI}
15~~16~~	15~~16~~	256	150~~160~~	10	8	2

----- Modifications to TS25.211, 5.2.2 where 15 access slots within 2 frames (excluding FAUSCH and CPCH) -----

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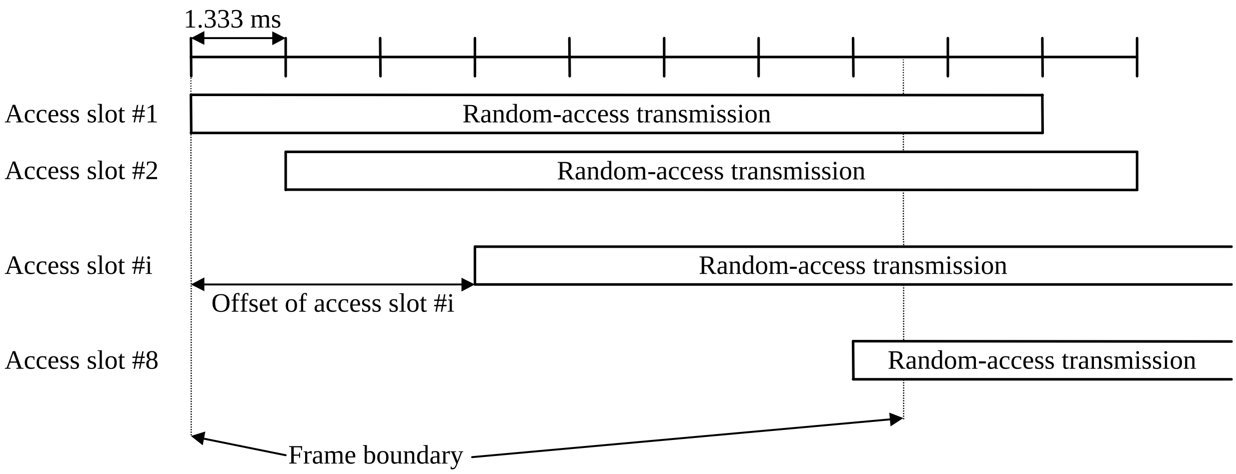

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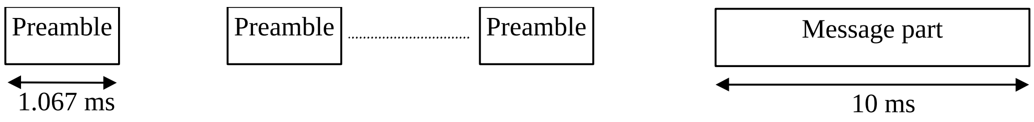

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Figure 4 shows where all access slots are used for preamble transmission. 15 access slots are allocated within a pair of odd and even frame. The access slot structure for the message part is same with the preamble part.

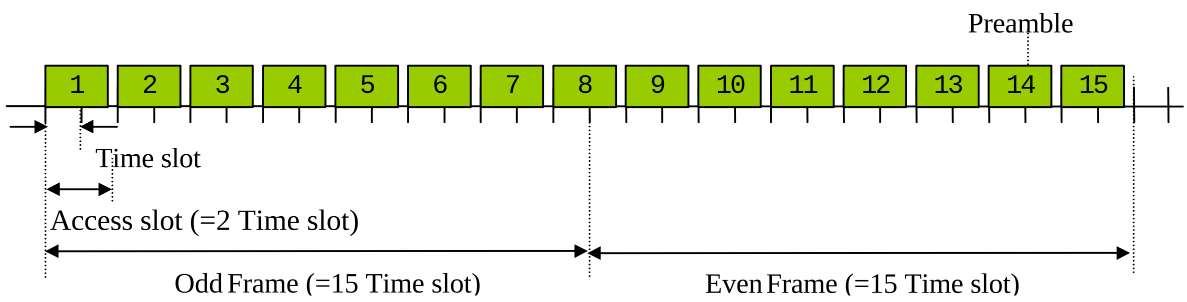

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Figure 5 shows the structure of the Random-access message part. The 10 ms message is split into 15~~16~~ slots, each of length T_{slot} = 0.666~~0.625~~ ms. Each slot consists of two parts, a data part that carries Layer 2 information and a control part that carries Layer 1 control information. The data and control parts are transmitted in parallel.

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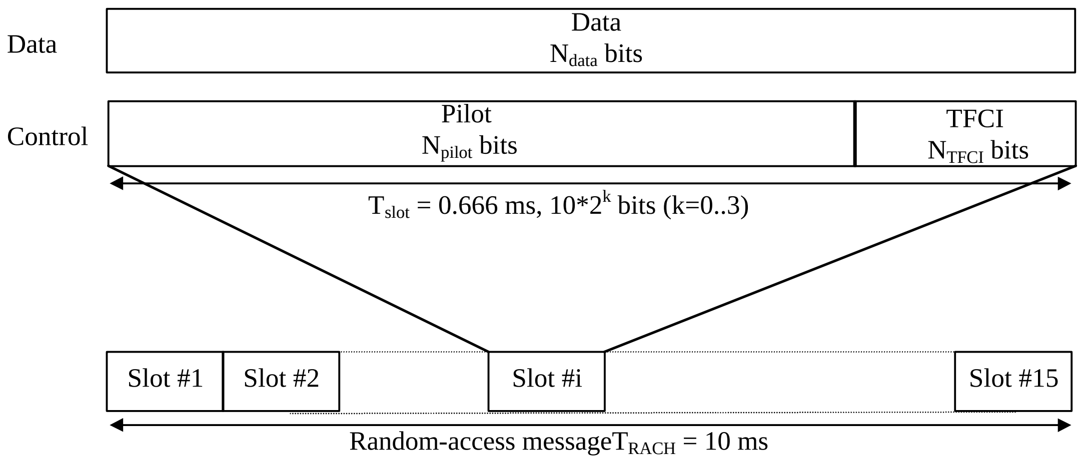

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