

**Agenda item:**

**Source:** Ericsson

**Title:** Proposal for update of Common Pilot Channel description in 25.211

**Document for:** Decision

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## 1 Introduction

This paper proposes some updates to the Common Pilot Channel description in 25.211, Section.5.3.3.1.

- The description has been somewhat more aligned to the description of other downlink physical channels. As an example, a frame-format figure has been added.
- The Common Pilot Channel does no longer consist of “two parts” as this seems to be an incorrect terminology.
- It is no longer specified that the common pilot channel *should* be used for channel estimation as this seems to be an implementation issue that should not be covered by the specification.
- It is explicitly stated that the Common Pilot Channels (Primary and Secondary respectively) are the phase references for other downlink physical channels. Note that this proposal assumes that the AICH and PICH are always transmitted in the same antenna lobe as the Primary CPICH, i.e. broadcast over the entire cell. We believe this to be a reasonable assumption.
- Some editorial updates have been made

Some additional things to consider (not part of the text proposal):

- Should the description of the channelization code and scrambling code used for Primary and Secondary CPICH instead be part of 25.213?
- Should the pilot patterns be described as bit patterns and not as symbol patterns, to align with the pilot-pattern description of other physical channels?

## 2 Text proposal for TS 25.211

### 5.3.3.1 Common Pilot Channel (CPICH)

The CPICH is a fixed rate (30 kbps, SF=256) downlink physical channel that carries a pre-defined bit/symbol sequence.

Figure X shows the frame structure of the CPICH.

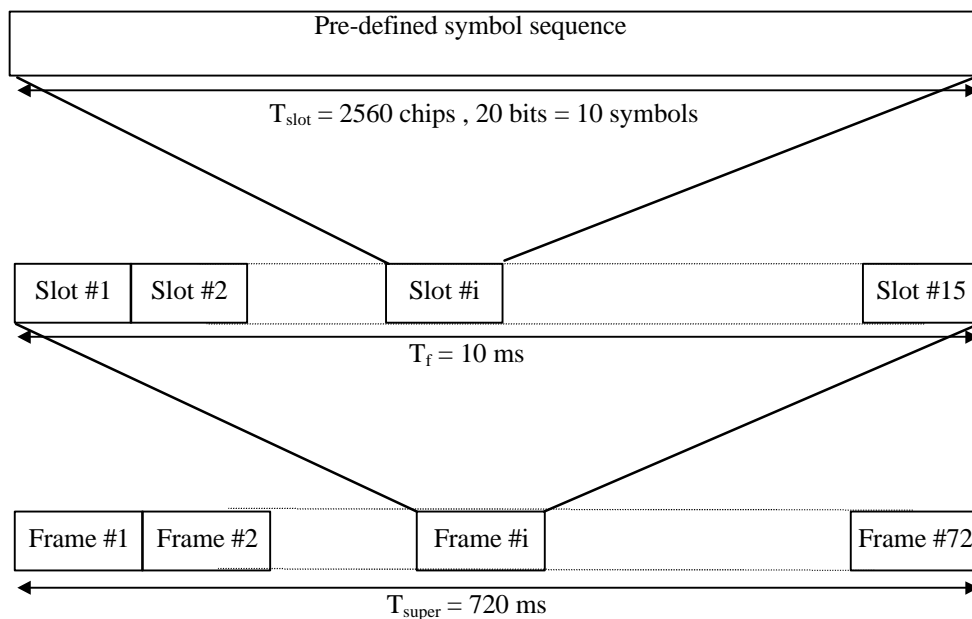


Figure X Frame structure for Common Pilot Channel

In case of Transmit Diversity (open or closed loop), the CPICH should be transmitted from both antennas using the same channelization and scrambling code. In this case, the pre-defined symbol sequence of the CPICH is different for Antenna 1 and Antenna 2, see Figure 14. In case of no Transmit Diversity, the symbol sequence of Antenna 1 in Figure 14 is used.

This physical channel consists of two parts:

- Antenna 1 common pilot (always present) and
- Antenna 2 common pilot (in the case of open and closed loop Tx diversity)

These are continuous channels with the same spreading and scrambling codes transmitted on the different antennas in the case of downlink transmit diversity. The spreading factor is always 256. They differ only in the modulation pattern used. The modulation patterns are shown in Figure 14.

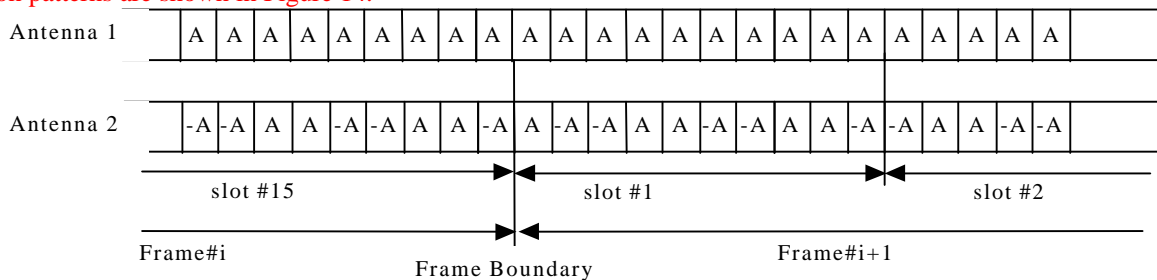


Figure 1: Modulation pattern for Common Pilot Channel (with  $A = 1+j$ )

Additionally, there are two types of Common pilot channels, the Primary CPICH and Secondary CPICH; they differ in their use and there are some limitations placed on their physical features.

When receiving a physical channel transmitted with the same antenna characteristics as a common pilot the UE should use this common pilot for its channel estimation.

### 5.3.3.1.1 Primary Common Pilot Channel

The Primary Common Pilot Channel has the following characteristics is a specific case of the Common Pilot Channel as defined above with the following limitations:

- The same channelization code is always reserved for this channel, see [4] defined in [4].
- Scrambled by Assigned the primary scrambling code, see [4]
- One per cell,
- Broadcast over the entire cell.

The Primary CPICH is the phase reference for the following downlink channels: SCH, Primary CCPCH, AICH, PICH. The Primary CPICH is also the *default* phase reference for all other downlink physical channels.

#### 5.3.3.1.2 Secondary Common Pilot Channel

~~A~~The Secondary Common Pilot Channel ~~has is a specific case of the Common Pilot Channel as defined above with~~ the following characteristics:

- ~~Assigned~~Can use an arbitrary channelization code ~~of SF=256, see [4]~~
- ~~Scrambled by~~Can be assigned either the primary or a secondary scrambling code, ~~see [4]~~
- ~~Zero, one, or several per cell~~There may exist any number of these.
- May be transmitted over only a part of the cell.

A Secondary CPICH may be the reference for the Secondary CPCCH and the downlink DPCH. If this is the case, the UE is informed about this by higher-layer signalling.