

TSG-RAN Working Group 1 meeting #7  
Hannover, Germany  
Aug 30<sup>th</sup> – Sept 3<sup>rd</sup>, 1999

***TSGR1#7(99)D81***

**Agenda item:**

**Source:** Nokia

**Title:** Common pilot terminology clarification – a text proposal.

**Document for:** Decision

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## **1 Abstract**

This Contribution attempts to clarify the text in 25.211 describing the common pilot channel. It redefines the common pilot channel as a generic physical channel consisting of possibly two signals on the same scrambling and channelization codes each transmitted from different antenna. The text then defines the primary and secondary common pilot channels as special cases of the generic definition.

## 2 Introduction

Currently the text defining the common pilot channel in specification TS 25.211[1] is misleading and somewhat incomplete, this contribution contains a text proposal which attempts to address these shortcomings.

## 3 Details of shortcomings

Section 5.3.3.1 of [1] describes the common pilot channel, it talks about a Primary and Secondary common pilot channels with no explanation as to difference between them and what their function is. In particular it is not clear that there are actually four types of channels, namely:

1. Primary Common Pilot channel with a constant modulation pattern,
2. Primary Common Pilot channel with a non-constant modulation pattern (in case of Tx diversity),
3. Secondary Common Pilot channels with a constant modulation pattern (may be used for beamforming) &
4. Secondary Common Pilot channels with non-constant modulation pattern (beamforming and Tx diversity)

It is also not clear that which codes are assigned to these channels and what spreading factors are used.

## 4 Proposed terminology

It is proposed here to firstly define a ‘common pilot channel’, and then extend this to the specific cases of primary and secondary common pilot channels.

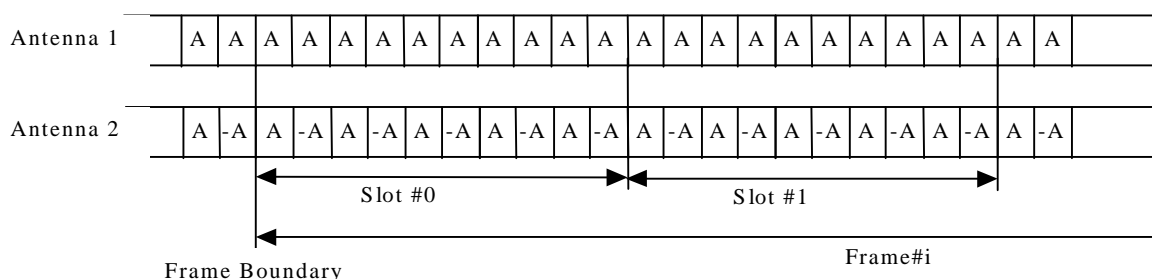
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This physical channel consists of two parts:

- Antenna 1 common pilot (always present) and
- Antenna 2 common pilot (only present in the case of STTD and FB 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 as follows:



Where  $A = 1+j$

### Definition of ‘Primary Common Pilot Channel’ physical channel

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

- Assigned channelization code  $c_{256,0}$  as defined in [2],

- Assigned the primary scrambling code,
- One per cell,
- Broadcast over entire cell.

#### Definition of 'Secondary Common Pilot Channel' physical channel

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

- Assigned an arbitrary channelization code,
- Can be assigned either the primary or a secondary scrambling code,
- There may exist any number of these.

The Secondary Common Pilot Channel is to allow the possibility of beamforming.

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 Text proposal for TS 25.211

### 5.3.3.1 Common Pilot Channel

~~A Common Pilot Channel (CPICH) is a downlink physical channel with pre defined modulation, used as a phase reference for other DL physical channels. In the normal case, the modulation on a Common Pilot Channel is the all-one sequence {..., D and FB TX diversity, a different modulation pattern is used for a Common Pilot Channel on a diversity antenna.~~

~~<Editors note: The exact modulation pattern is FFS.>~~

~~There may be two types of Common Pilot Channels in a cell:~~

~~—There is always one and only one Primary Common Pilot Channel in each cell. The Primary Common Pilot consists of 300 bits per frame, is spread by a pre defined channelization code with SF=256 and is scrambled by the primary scrambling code.~~

~~<Editors note: Which channelisation code to be used is FFS.>~~

~~—There may also be one or several Secondary Common Pilot Channels in a cell. A Secondary Common Pilot Channel may be spread by an arbitrary channelization code and is scrambled by the primary or a secondary scrambling code.~~

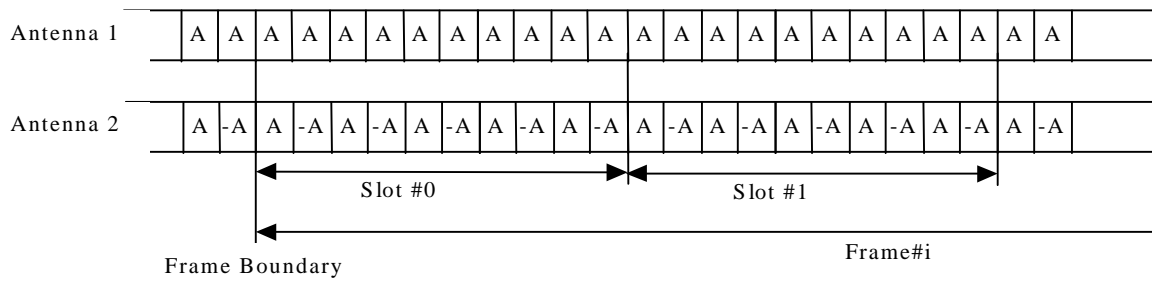
~~<Editors note: The code allocation for the Common Pilot Channels should be described in 25.213.>~~

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 as follows:



Where  $A = 1+j$

Additionally there are two types of Common pilot channels, the primary and secondary, 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.

### Primary Common Pilot Channel

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

- Assigned channelization code  $c_{256,0}$  as defined in [2].
- Assigned the primary scrambling code.
- One per cell.
- Broadcast over entire cell.

### Secondary Common Pilot Channel

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

- Assigned an arbitrary channelization code.
- Can be assigned either the primary or a secondary scrambling code.
- There may exist any number of these.

## **6 References**

- [1] TSG RAN WG1, "TS 25.211 Physical channels and mapping of transport channels onto physical channels (FDD)"  
 [2] TSG RAN WG1, "TS 25.213 Spreading and Modulation (FDD)"