

**Agenda Item:**

**Source:** Panasonic

**Title:** TSTD(Time Switched Transmit Diversity) scheme for SCH

**Document for:**

**Reference:**

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## 1. Introduction

At the Ad Hoc 6 (Transmit diversity), STTD encoding for PCCPCH proposed by Texas Instruments[1][2] has been discussed. In this document, we propose the introduction of TSTD(Time Switched Transmit Diversity) scheme for SCH combined with STTD encoding for PCCPCH (Perch channel).

**Reference:**

[1] Texas Instruments, "STTD encoding for PCCPCH", Tdoc 83/99, 3GPP RAN WG1#2, Feb. 22th - 26th 1999, Yokohama, Japan

[2] Texas Instruments, "STTD encoding for PCCPCH", 3GPP RAN WG1 reflector, March 4th, 1999

## 2. Proposal

Table 1 shown below was proposed on the document [2]. On this table, it is proposed both primary SCH and secondary SCH are transmitted from a fixed antenna. This scheme means cell search can not obtain the any benefit from transmit diversity. The transmit diversity gain should be also given to SCH. But it is difficult (maybe impossible) to apply STTD scheme to SCH. Therefore, we propose to employ TSTD scheme for SCH because of the low complexity to implement and no impact to mobile station.

Nomenclature	STTD encoding
Primary SCH	No
Secondary SCH	No
Data symbols of PCCPCH ( $N_{data} = 5$ symbols)	Yes
SCCPCH ( $N_{data} = 36$ symbols)	Yes
DPCH channels	Yes
L3 message on BCCH indicating presence/absence of diversity antenna	Yes

Table 1: Proposed STTD encoding for different physical channels[2]

The effect of TSTD scheme as transmit diversity technique is obvious from the comparison of open loop mode before WG1 2nd meeting. We think this proposal has no hardware impact and no additional requirement to mobile station. Of course there is no degradation of performance on sell search since the same propagation delay from the two antennas to the mobile station can be assumed as same as STTD scheme.

On the discussion of open loop mode for Dedicated physical channel (DPCH), power amplifier (PA) balance between STTD and TSTD(TDTD-PD) was argument point. But from this point of view, there is no PA issue for SCH transmission because the power ratio of SCH to the maximum total transmission power of base station is not so large. Therefore, TSTD scheme for SCH has negligible PA unbalanced issue unlike TSTD for DPCH.

Table 1(Revised) gives the proposed Tx diversity scheme for different physical channels.

Nomenclature	Tx-diversity scheme
Primary SCH	TSTD
Secondary SCH	TSTD
Data symbols of PCCPCH ( $N_{data} = 5$ symbols)	STTD
SCCPCH ( $N_{data} = 36$ symbols)	STTD
DPCH channels	STTD
L3 message on BCCH indicating presence/absence of diversity antenna	STTD

Table 1(Revised): Proposed Tx-diversity for different physical channels

As a first proposal (Proposal 1), Primary SCH (P-SCH) and Secondary SCH (S-SCH) are transmitted from same antenna. The total transmission power of both P-SCH and S-SCH is maybe set higher than that of PCCPCH. When the STTD is used for PCCPCH, the transmission power of PCCPCH per one antenna can be reduced by diversity gain and this leads to less power requirement of PA.

Furthermore, from the point of view of PA complexity, we also propose P-SCH and S-SCH are transmitted from different antenna as a second proposal (Proposal 2). This proposal is more attractive than the first proposal from PA complexity point of view if it is not assumed for cell search of mobile station that P-SCH and S-SCH were transmitted from same base station antenna.

Figure 1 (a) and (b) show the multiplexing scheme of SCH and PCCPCH, for Proposal 1 and for Proposal 2 respectively. And Figure 2 (a) and (b) show the structure of SCH and PCCPCH, for Proposal 1 and for Proposal 2 respectively.

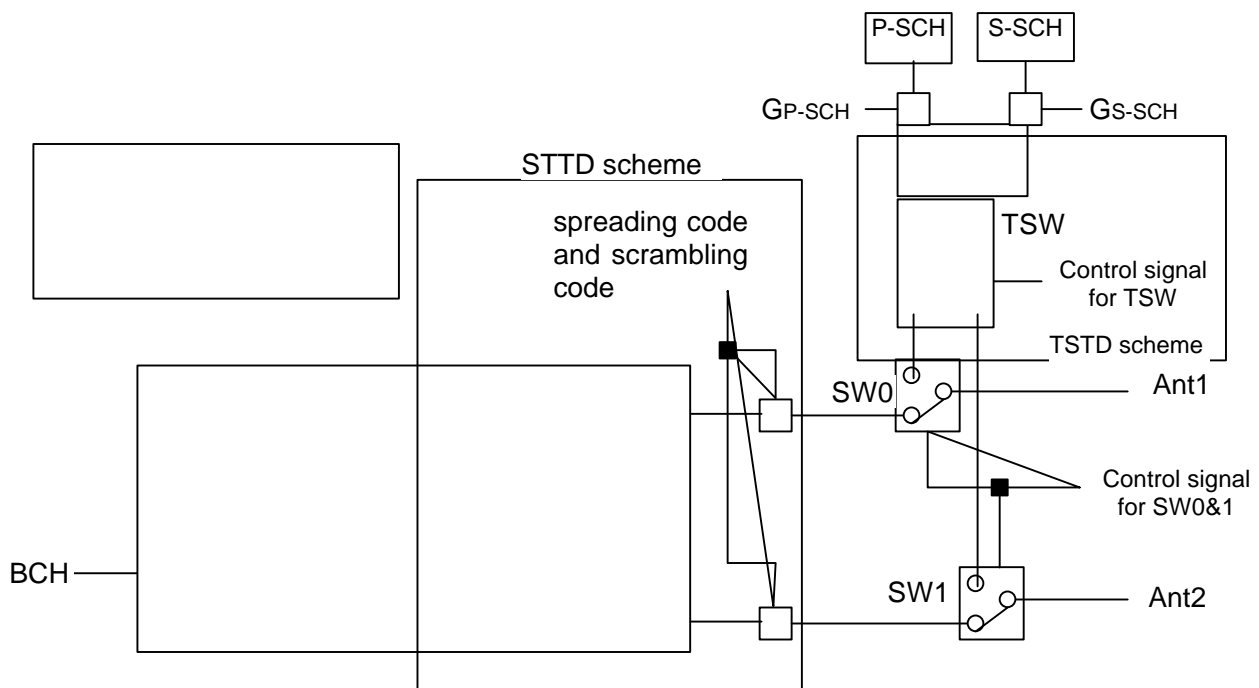


Figure 1(a) Multiplexing of SCH and PCCPCH (Proposal 1)

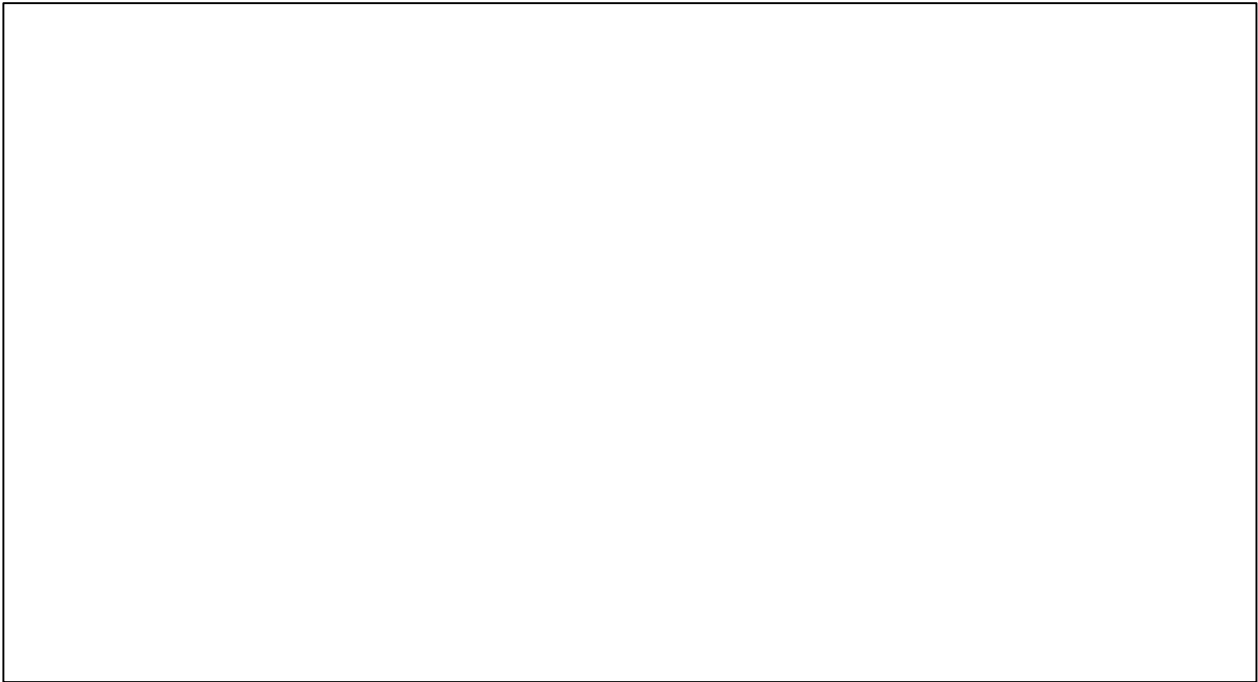


Figure 1(b) Multiplexing of SCH and PCCPCH (Proposal 2)



Figure 2(a) Structure of SCH and PCCPCH for Tx diversity (Proposal 1)



Figure 2(b) Structure of SCH and PCCPCH for Tx diversity (Proposal 2)

### **3. Conclusion**

We propose to employ two TSTD schemes for SCH as follows.

Proposal 1: Primary SCH and Secondary SCH are transmitted from same antenna.

Proposal 2: Primary SCH and Secondary SCH are transmitted from different antenna.

The merits achieved by these schemes are summarised as follows.

- (1) Possible to reduce the interference to other channels (due to the decrease of SCH transmission power)
- (2) No impact to the mobile station
- (3) Decrease of PA complexity on base station