

**TSG-RAN Working Group1 meeting #7bis      TSGR1#7bis(99)f78**  
**Kyongju, Korea**  
**October 4 – October 5, 1999**

**Source:** Samsung  
**Title:** EMC Test in Gated Transmission of DPCCH  
**Document for:** Discussion

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## 1. Introduction

At the last 3GPP TSG-RAN WG1 #7 Hannover meeting [1], the use of DPCCH gating became a working assumption, and companies were asked to present contributions in Kyongju meeting if they had concerns on EMC issues. Recently, Ericsson distributed some EMC test results of uplink gated transmission in control only substate [2], where they showed how the uplink power gating at 300Hz and 500Hz is perceived through a common hearing aid apparatus with recorded sound file. According to the e-mail from Ericsson [2], they performed the EMC test on a number of common electronic devices and the maximum output power level 16dBm and the distance between the electronic device and the transmit antenna is 0.1~3m. As a test result, they claimed that the gated transmission affects some devices according to their sensitivity and suggested that the uplink gating mode should be removed from the current specification. However, there are only two sound files and the distance between the antenna and the test device are not clearly specified. So Samsung, as a proponent of gating mode, also performed the EMC test with the same test environments to calibrate the test done by Ericsson. In this document, we present our test results and compare with the Ericsson's results.

Based on our test results, we believe that the EMC due to gated transmission is not a serious problem when the UE stays apart from hearing aid more than 10cm. In addition, UTRA TDD mode DTX transmission is used in multiple switching point configuration with approximately 700Hz and even with much higher output power. If DPCCH gating operation has an EMC problem as claimed by Ericsson, then UTRA TDD mode must have even more serious EMC problem.

## 2. Test Parameters and Environments

Tests have been performed based on the parameters listed in Table 1, which are similar to the test parameters used by Ericsson. We generated the gated RF signal controlled by computer and normal hearing people listen to the sound through electronic devices such as AM/FM radio, tape recorder, and hearing aid, etc. Note that the random gating pattern is also tested to assess the randomization effect of the gating pattern.

**Table 1. EMC Test Parameters and Environments**

Parameters	Value	Unit
Maximum output power level	16	dBm
Carrier frequency	2	GHz
Gating rate	300/500	Hz
Gating pattern	Fixed/random	
Distance from antenna to device	0/10/20	cm
Tested device	FM radio Hearing aid	
Test person	Normal hearing	

## 3. Test Scenario and Discussion on the Test Results

Table 2 is the EMC test scenarios we performed with the parameters given in Table 1.

**Table 2. EMC Test Scenarios**

	Fixed Gating Pattern			Random Gating Pattern		
	0cm	10cm	20cm	0cm	10cm	20cm
<b>300Hz</b>	↗	X	X	↘	X	X
<b>500Hz</b>	↗	X	X	↘	X	X

↗: Audible    ↘: Random noise-like    X: Inaudible

There was no problem with the AM/FM radio and tape recorder regardless of the distance.

In case of hearing aid, if the distance between the hearing aid and the transmit antenna is more than 10cm, then it is hard to listen to the interfering sound. Because the gated DPCCH is only applicable to packet data, the distance between UE and the hearing aid may be more than 30cm. With the random gating pattern, the sound was noticeable when the distance is 0cm, but it was random noise-like.

So we concluded that the EMC problem is not so serious in practical situation as Ericsson pointed out.

#### 4. Conclusion

We conclude that the EMC problem is not so serious in real situation. If companies still have concerns on this EMC problem, then we can minimise the problem by adding random gating pattern to the specification in spite of slight degradation in link performance. Specific gating operation mode such as gating rate and gating pattern can be determined by UTRAN depending on the operating environment.

#### 5. References

- [1] TWGR1#7(99)d74, "Ad Hoc 14 report"
- [2] E-mail from Ericsson, "AH14: Gated transmission EMC", 30. Sep. 1999