



Prague, Czech Republic
10th Nov. to 14th Nov. 2008

R4-082880

Source: Samsung
Title: UE emission limit
Agenda Item: 6.1.2.2

Document for: Discussion

Contents

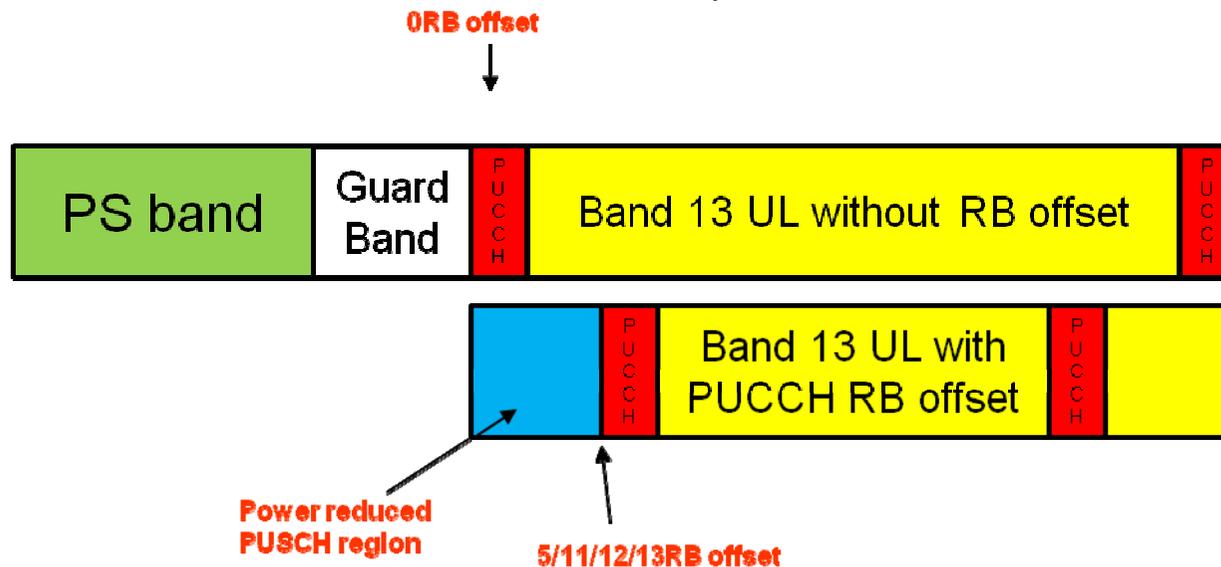
- Band 13 interference measurement to PS band
- Emission level consideration with possible solution to mitigate interference to PS band

Introduction

- In RAN4 #48 Jeju meeting, Analysis and measurement of UE emission were introduced[5][6][7].
- In RAN4 #48bis Edinburgh meeting, 3 solutions for solving UL/DL co-existence problem were introduced [2][3][4].
- In LS from RAN1 [1], all three options to solve UE emission problem were discussed. In order to understand problem and solution more clearly, RAN1 asked RAN4 about detailed features of 3 solutions such as
 - RB offset values,
 - The out-of-band emission level targets,
 - UE maximum power reduction values.
 - Range of the RB offset values.
 - RB offset conditioned on the UE maximum power reduction
 - RB offset reduction given larger MPR
- In this contribution, we will address issues on UE emission limit and analysis of RB shift values depending on Maximum Power Reduction

Measurement assumption

- We assumed that carrier leakage and Image reduction are 35dBc.
- We measured using a real PA and RFIC for 700MHz band
- We considered the serious cases in which large emission fall into PS band for measurement
 - PUCCH/PUCCH(1RB) : 0RB, 5RB, 11RB, 12RB, 13RB, 38RB, 44RB offset
 - 5RB offset: LO spurious emission is located in the edge of PS band
 - 11RB offset: Image spurious emission is located in the edge of PS band
 - 12RB or higher offset: LO and Image spurious emission are located out of PS band
 - PUSCH: Restricted RB allocation with max power, 24RB allocation(13-36RB)



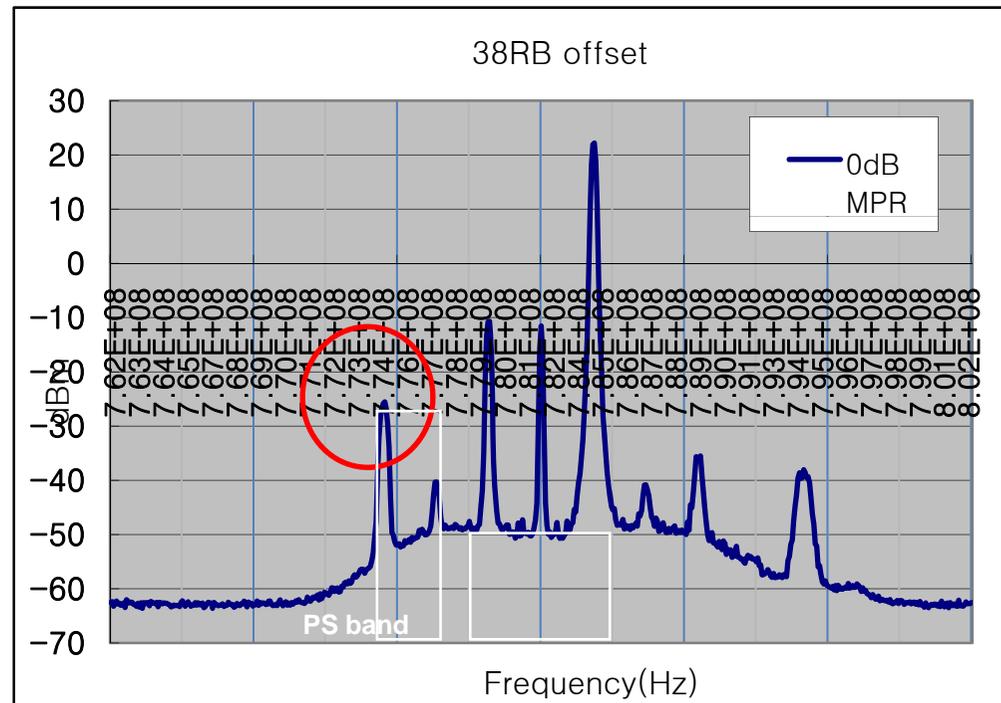
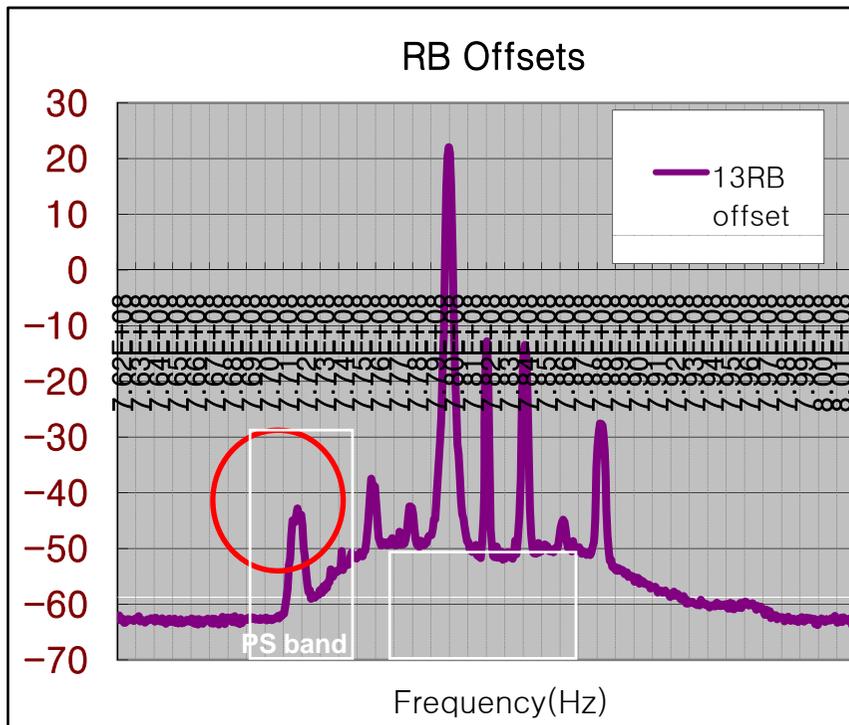
Summary of measurement

RB location	# of consecutive RBs	A-MPR(Max power = 23dBm)		
		-50dBm/100kHz	-40dBm/100kHz	-33dBm/100kHz
0	1	4dB	0	0
5	1	5dB	1dB	0
11	1	8dB	2dB	0
12	1	5dB	0	0
13	1	7dB	0	0
38	1	11dB	7dB	4dB
44	1	7dB	3dB	0
13-36(PUSCH)	24	9dB	1dB	0

- Due to duplex filter attenuation, MPR is increased as RB offset increases.
- To meet -50dBm/100KHz with max power, RB allocation should be restricted within 12.

Issues that need to be investigated.

- Currently, there is interesting part of spurious emission with real measurement
 - We are still investigating the cause of this symptoms.
 - Bigger Spurious emission which is located the other side of main tx signal.
 - RB with index 38 still make some interference to PS band
 - Third spurious emission is from inter-modulation of tx signal and image spurious.



Conclusion

- A-MPR proposed for different RB location and RB allocation
- A-MPR is still needed although RB location is 13RB away and even larger RB offset to satisfy -50dBm/100kHz requirement.
- To meet the emission requirement of -50dBm/100kHz, over-dimensioned PUCCH is not helpful at all.
- Proposed way forward.
 - Unify carrier to image or LO power ratio with [27/28/30/35]dBc
 - Recommend proponents bring real measurement data with PA and RFIC to finalize required A-MPR

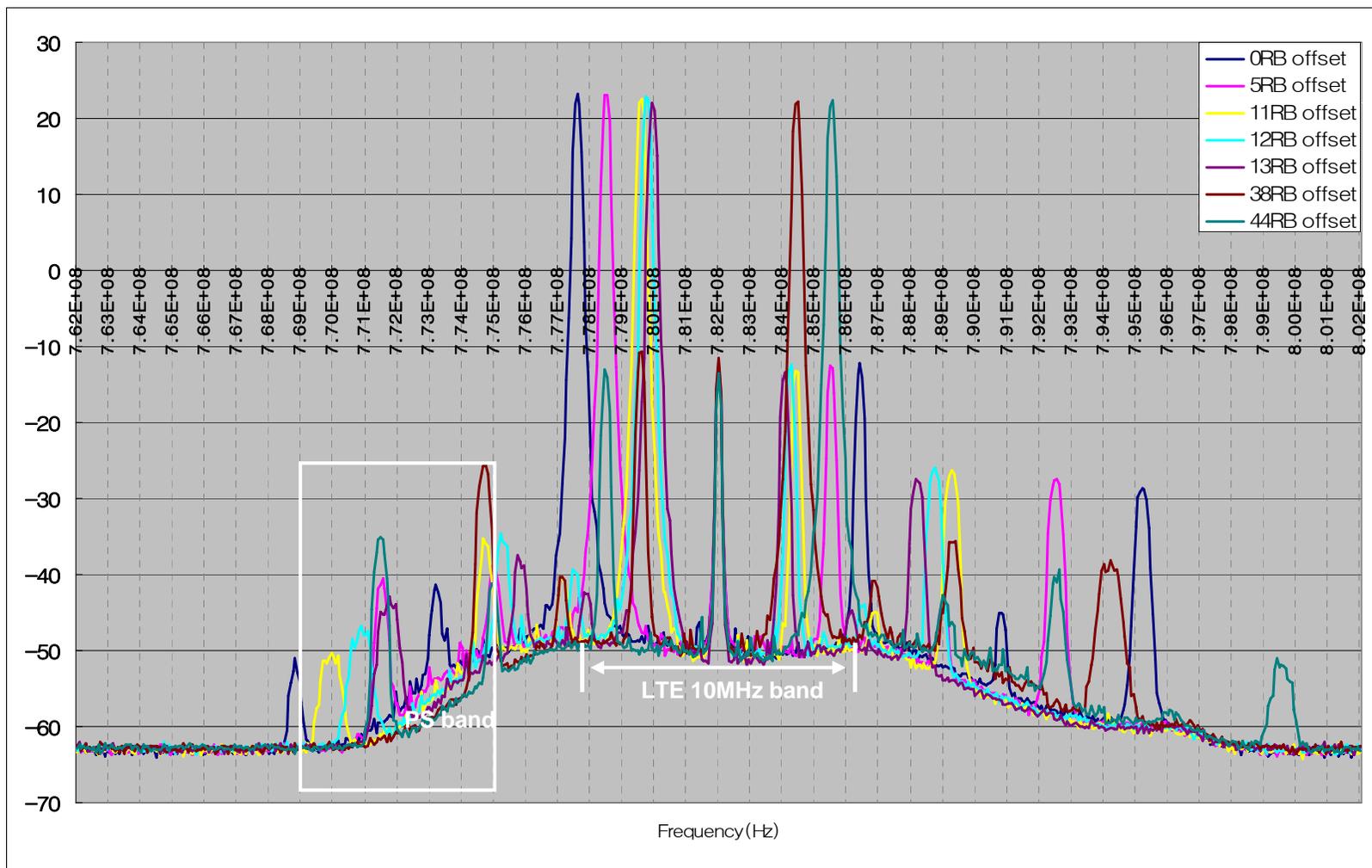
References

- [1] R1-084069, LS Response to LS on UE Emissions, TSG-RAN WG1.
- [2] R1-082372, BC13 issue analysis, Samsung
- [3] R4-082459, Spurious emission into adjacent bands, Ericsson
- [4] R4-082561, PUCCH options to address UL/DL co-existence , Motorola.
- [5]R4-082027, Adjacent Channel UL/DL Co-existence, Motorola
- [6]R4-081954, Band 13: Spurious emission and sensitivity, Ericsson
- [7]R4-082002, PS Band protection for Band XIII, Freescale

APPENDIX

spurious emission level (RB offsets)

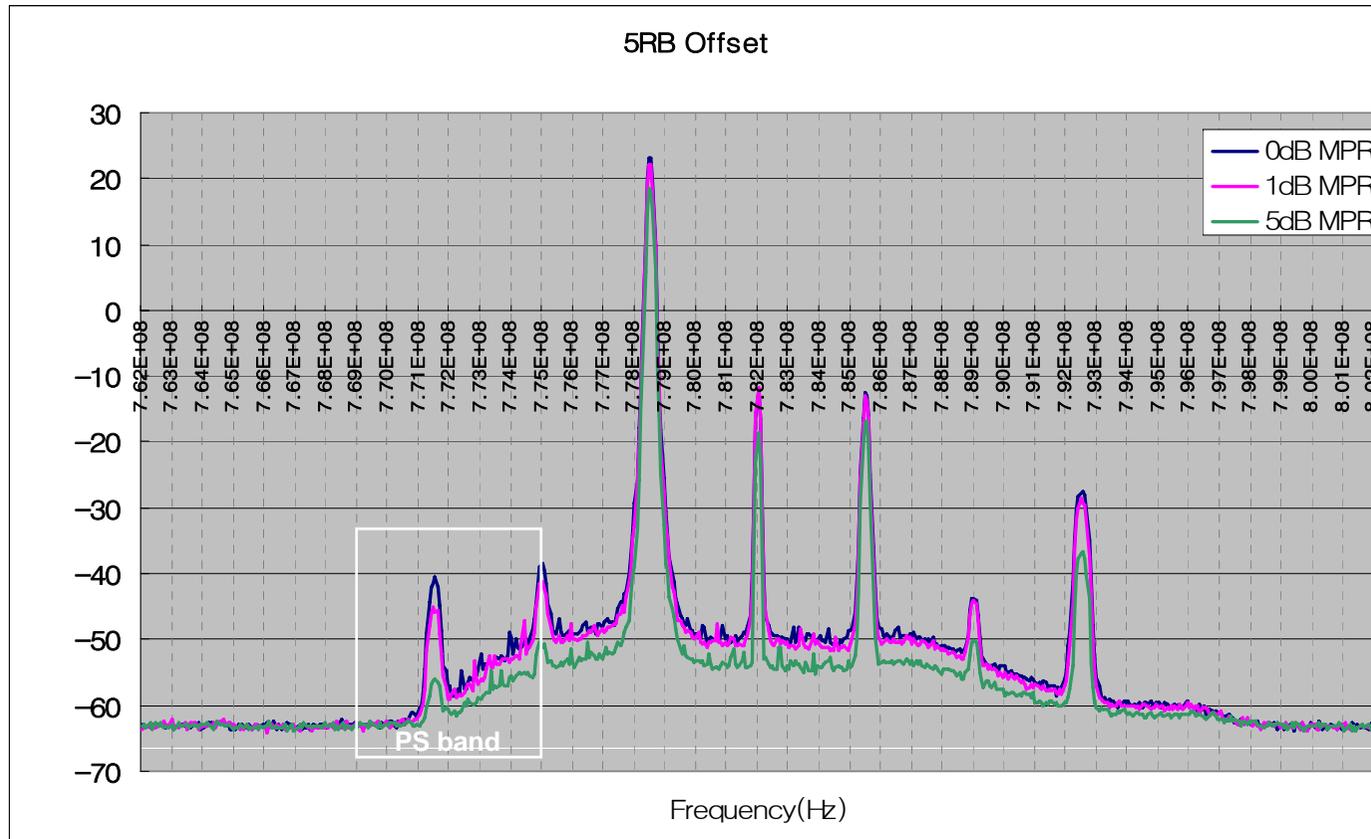
- Emission level(Pe)
 - 0RB offset : Pe < -40dBm, 5RB offset : Pe < -33dBm, 11RB offset : Pe < -33dBm
 - 12RB offset : Pe < -40dBm, 13RB offset : Pe < -40dBm
 - 38RB offset : Pe < -20dBm, 44RB offset : Pe < -33dBm



spurious emission level (5RB offset)

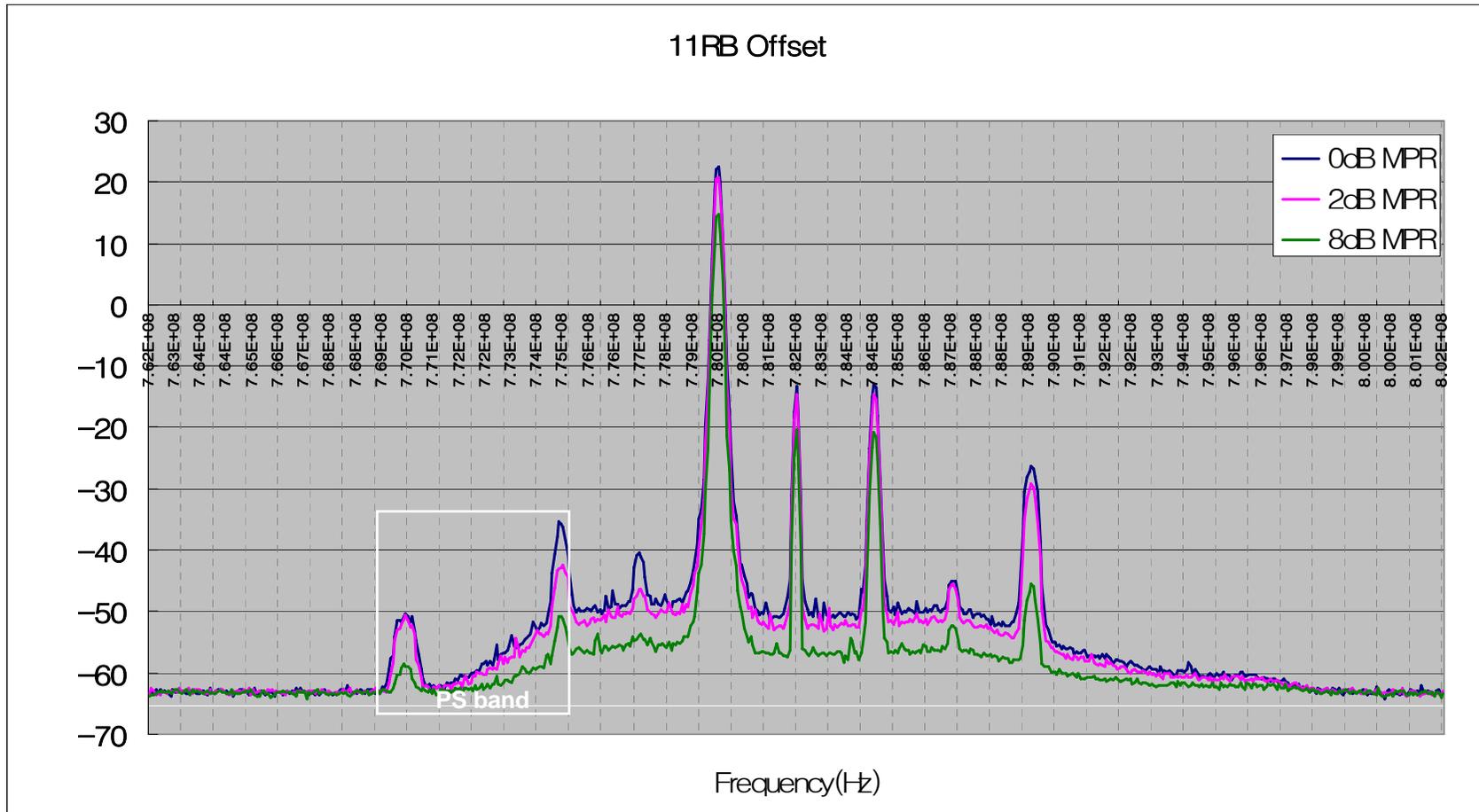
- Emission level**

- 0dB MPR : $P_e < -33\text{dBm}/100\text{KHz}$, 1dB MPR : $P_e < -40\text{dBm}/100\text{KHz}$,
- 5dB MPR : $P_e < -50\text{dBm}/100\text{KHz}$



spurious emission level (11RB offset)

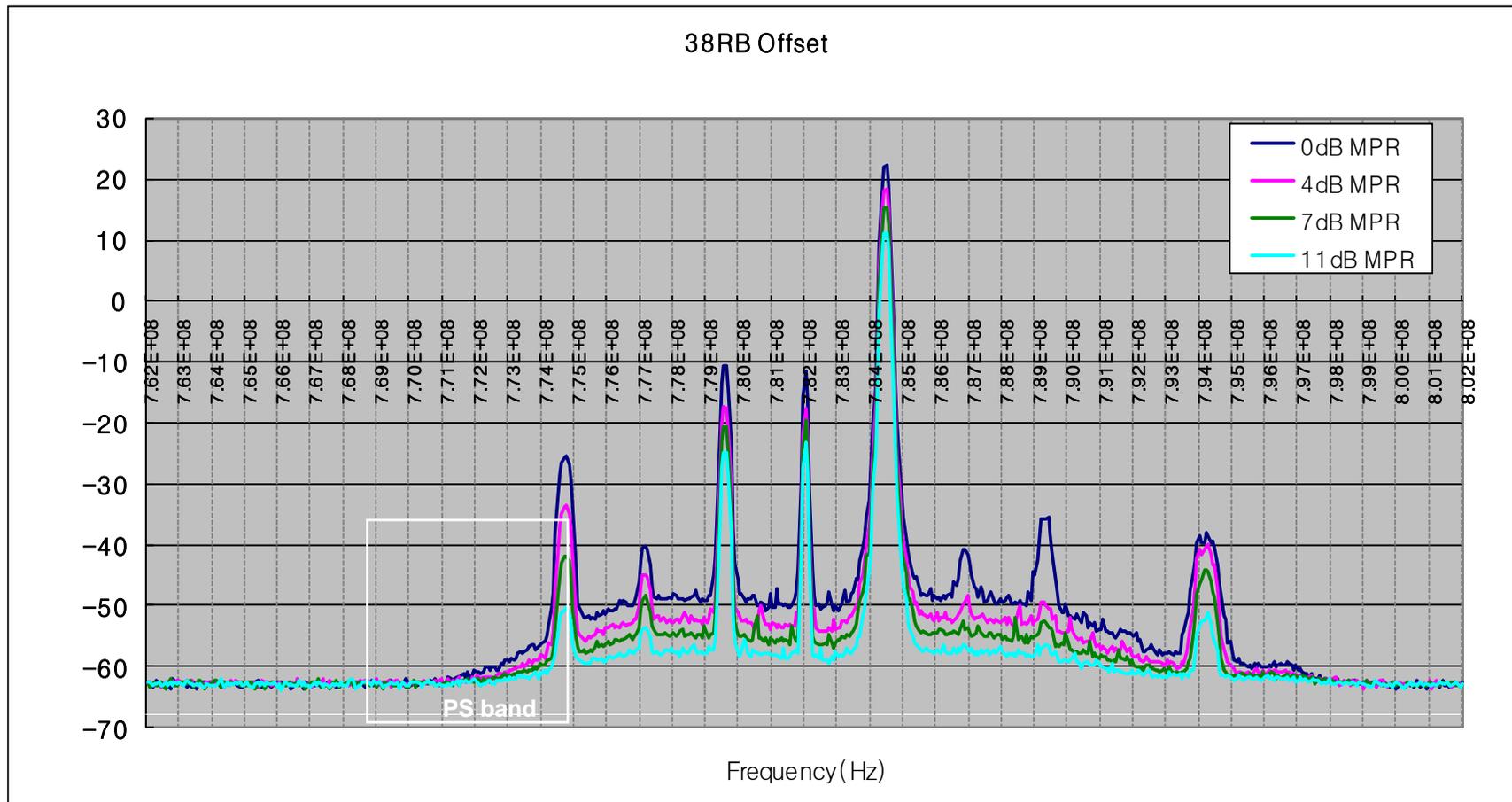
- Emission level
 - 0dB MPR : $P_e < -33\text{dBm}/100\text{KHz}$, 2dB MPR : $P_e < -40\text{dBm}/100\text{KHz}$,
 - 8dB MPR : $P_e < -50\text{dBm}/100\text{KHz}$



spurious emission level (38RB offset)

- Emission level**

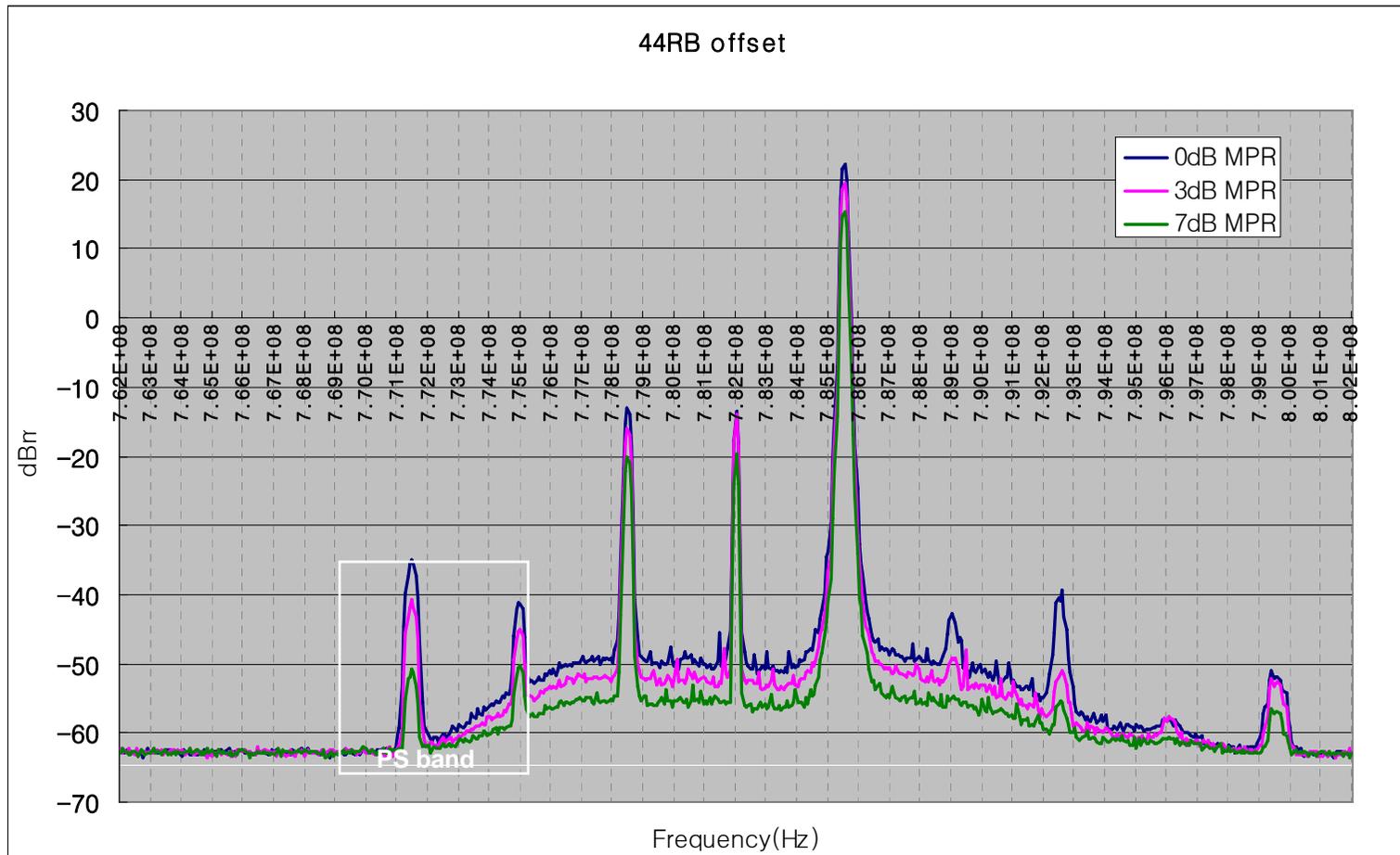
- 0dB MPR : $P_e < -20\text{dBm}/100\text{KHz}$, 4dB MPR : $P_e < -33\text{dBm}/100\text{KHz}$,
- 7dB MPR : $P_e < -40\text{dBm}/100\text{KHz}$, 11dB MPR : $P_e < -50\text{dBm}/100\text{KHz}$



spurious emission level (44RB offset)

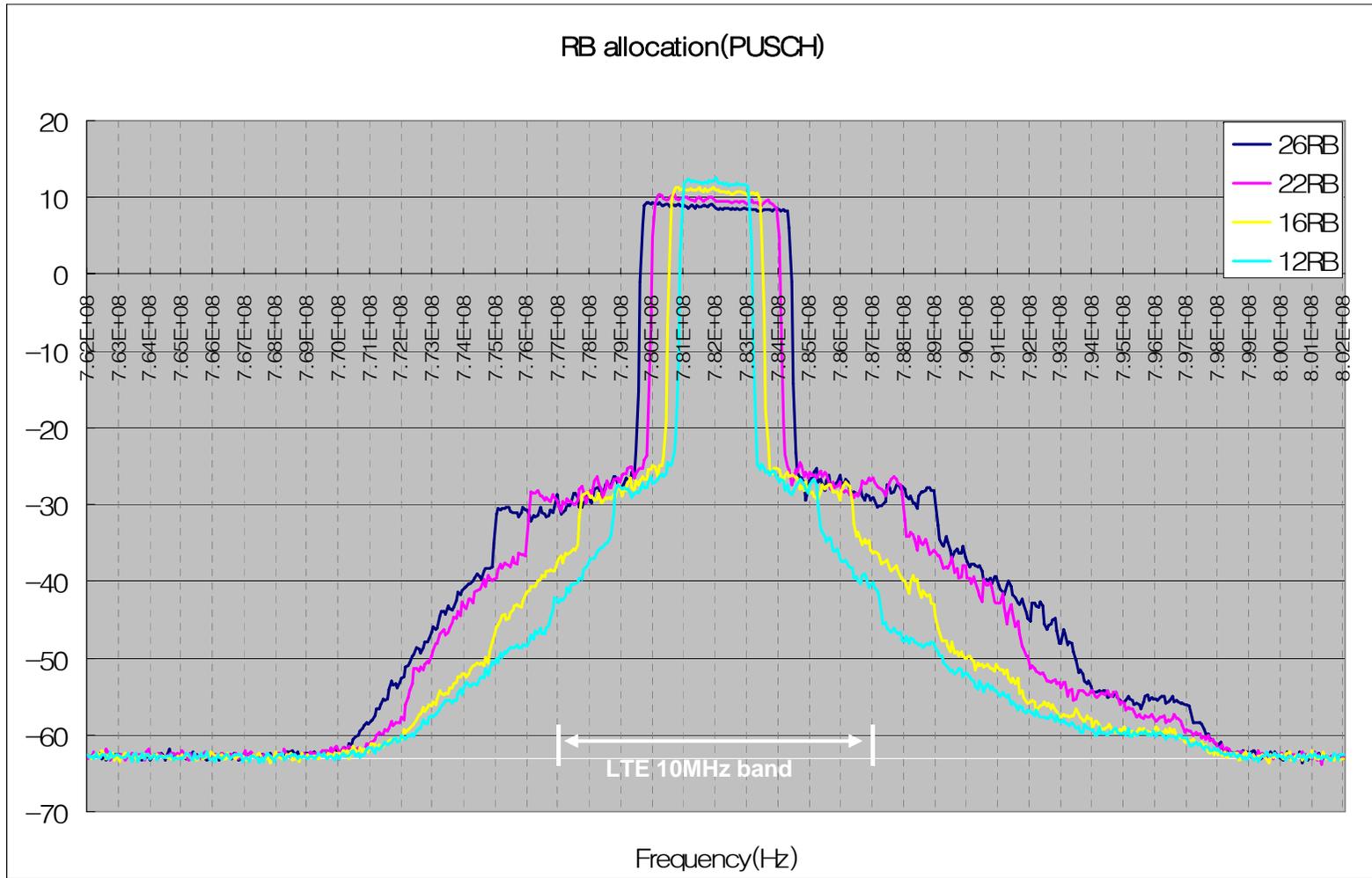
- Emission level**

- 0dB MPR : $P_e < -33\text{dBm}/100\text{KHz}$, 3dB MPR : $P_e < -40\text{dBm}/100\text{KHz}$,
- 7dB MPR : $P_e < -50\text{dBm}/100\text{KHz}$



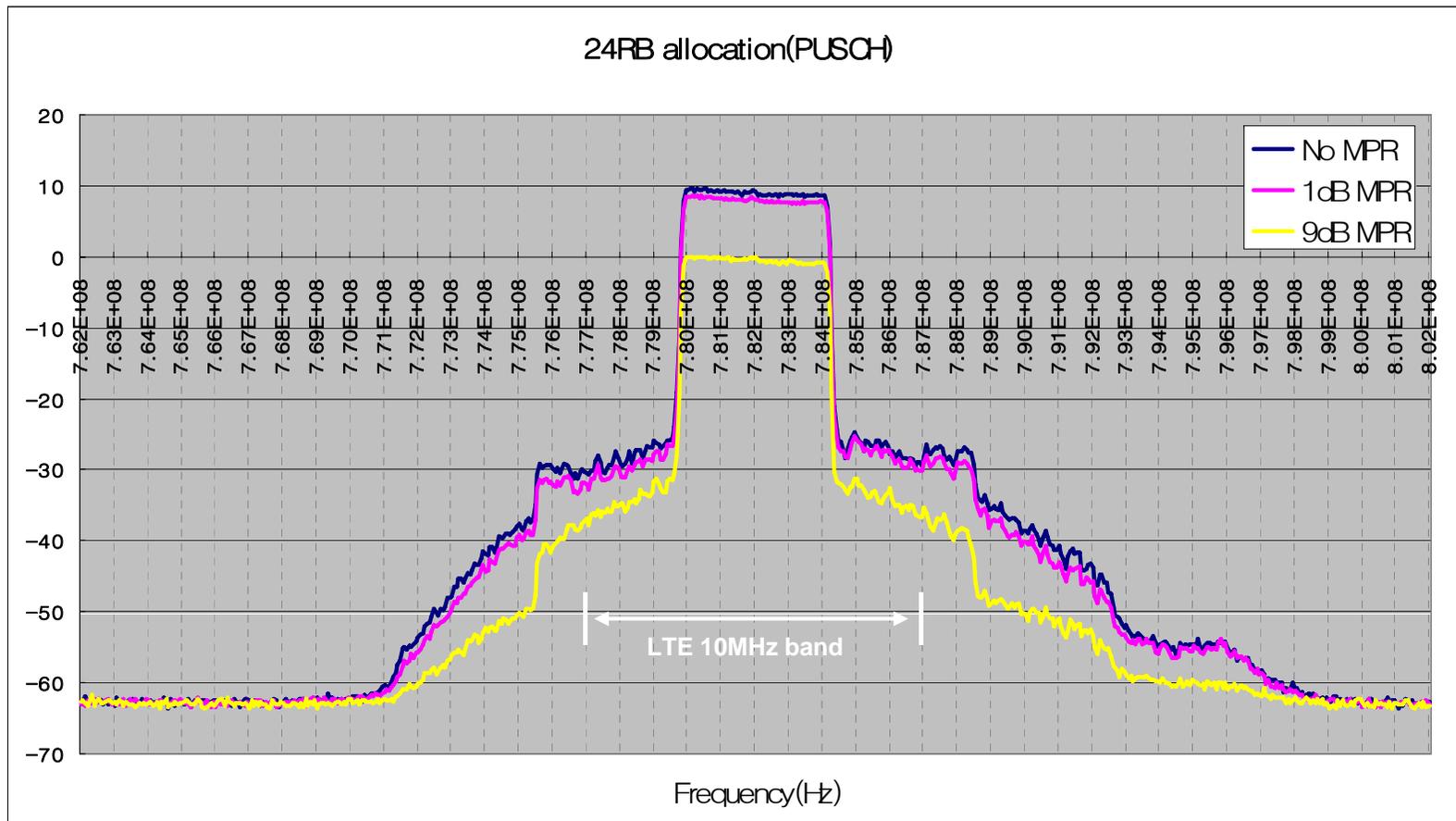
spurious emission level (PUSCH)(1/3)

- Emission level
 - To meet -50dBm/100KHz with max power, RB allocation should be restricted within 12.



spurious emission level (PUSCH)(2/3)

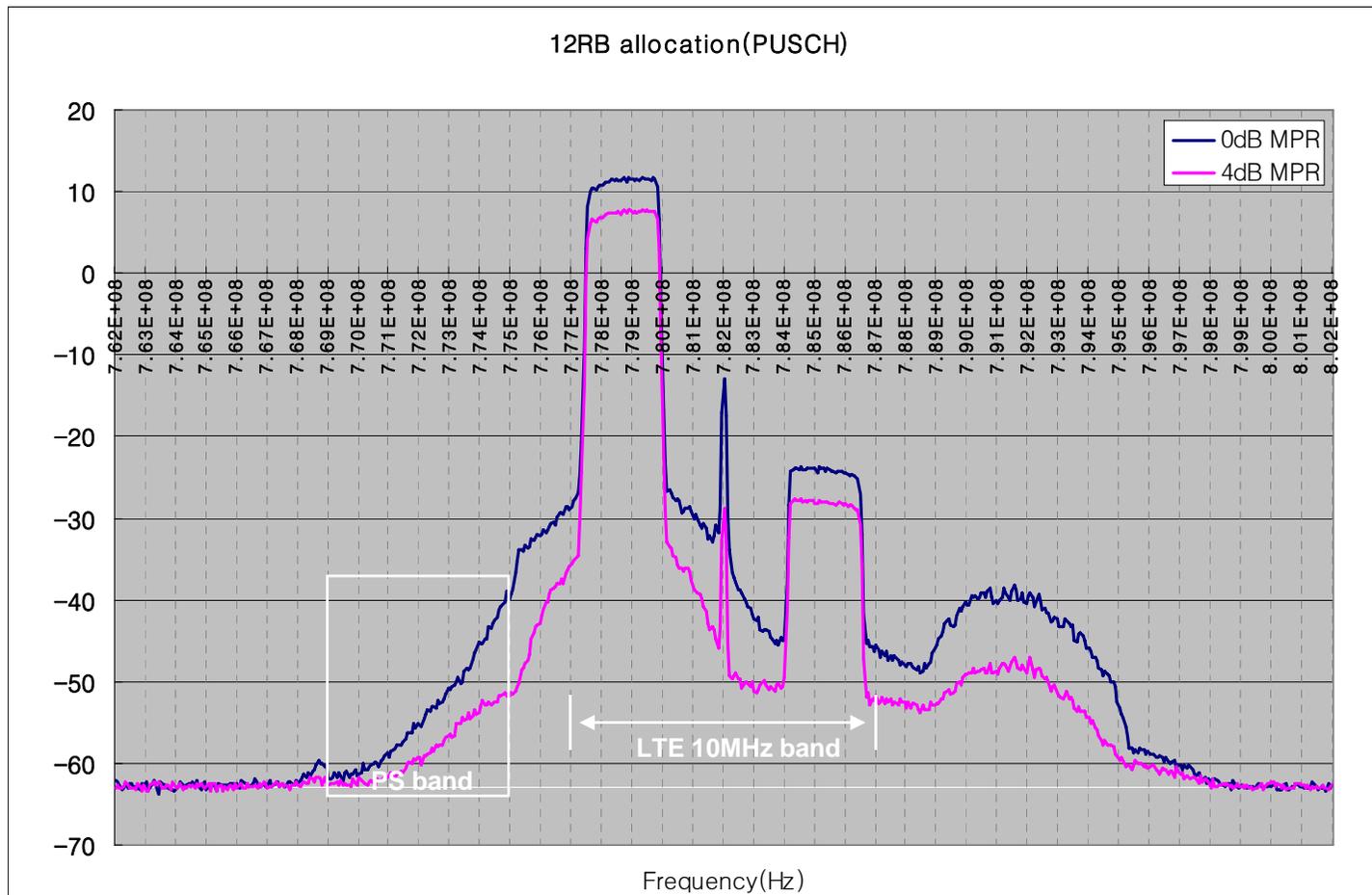
- Emission level
 - To meet -40dBm/100KHz with max power, 1dB MPR should be needed.
 - To meet -50dBm/100KHz with max power, 9dB MPR should be needed.



spurious emission level (PUSCH)(3/3)

- Emission level

- 0dB MPR : $P_e < -33\text{dBm}/100\text{KHz}$, 4dB MPR : $P_e < -50\text{dBm}/100\text{KHz}$



Coverage Decreases with MPR Increase

- ACK/NACK channel Coverage Analysis
 - 1bit A/N channel of interest, 23dBm max power
 - To achieve 98% coverage requirement
 - With ISD=1732m, around 7dB MPR is allowed
 - With ISD=3000m, even transmission at 23dBm is not enough
 - A/N repetition for ISD=3000m

