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Kyoto, Japan

Source: TSG RAN WG1 Chairman

Summary of Capacity Results of USTS

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USTS Gain in Ped A & B (*R1-010746*)

	Pedestrian A				Pedestrian B			
Uplink orthogonality factor	1	0.1	0.1	0.1	1	0.5	0.5	0.5
# of scrambling codes	1	3	2	1	1	3	2	1
Capacity [Erlang/cell]	80	92	100	140	108	121	123	153
Capacity improvement [%]	0	15	25	75	0	12	14	42

- 12.2 kbps with activity factor=1
- cell radius=1000m
- **51 channelisation codes per tree with SF=64 & equal sharing among scrambling codes**

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USTS Gain as a Function of Penetration Ratio

Table 5.3 Number of users and USTS gain as a function of penetration ratio

Penetration	Normal	40 %	60 %	80 %	100 %
No of users	58	62	67	77	90
USTS gain [%]	-	7	16	33	55

- 12.2 kbps with activity factor=1
- Candidate 4 for SHO
- Micro cell (cell radius=577m), Pedestrian A
- **Capacity increase due to 84 (rather than 51) channelisation codes per tree with SF=128 & sequential packing among multiple scrambling codes**

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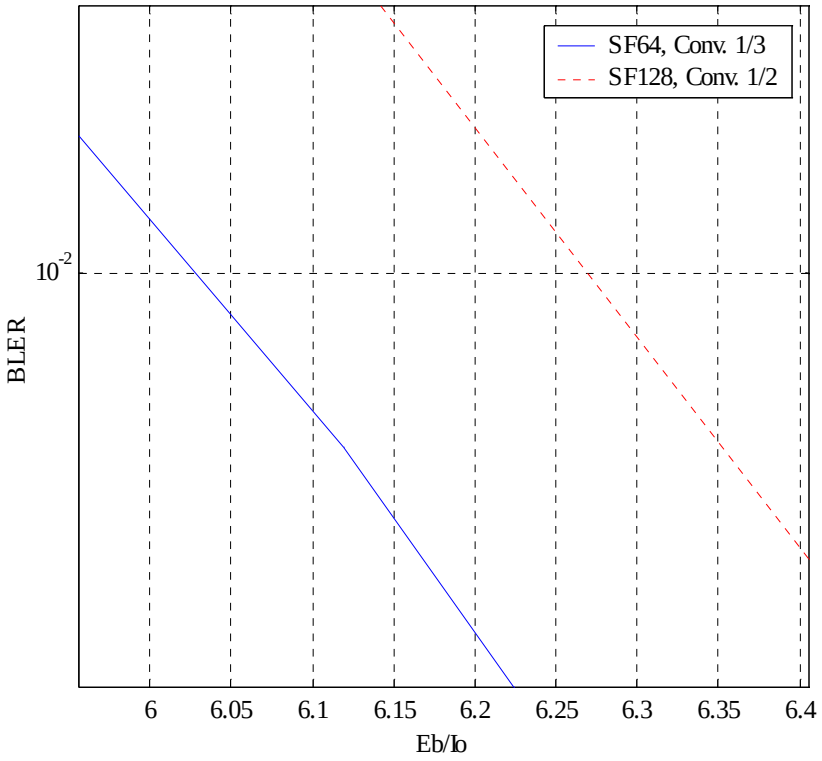
Eb/No Impact of using SF=128 instead of 64

- With BLER = 1%, there is only 0.3 dB degradation in Eb/No



Parameter	Value	Comments
Traffic	Data	12.2 kbps
	Control	2.4 kbps
Propagation condition	Single path	Pedestrian A (3 km/h)
Fast fading model	Jakes spectrum	
Closed loop power control	ON	Step size = 1 dB No TPC error (Perfect)
Channel estimation	Perfect	
Channel coding	1/3 rate convolutional	SF=64
	1/2 rate convolutional	SF=128
Antenna diversity	2-branch	
Noise power	-174 dBm	

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USTS Gain in Ped A Environment

SF	Number of rx Antennas	Voice activity factor	Users without USTS	Users with USTS	Gain
64	1	1.0	27.2	34.8	27.9%
64	1	0.5	54.3	62.4	14.9%
64	2	1.0	60.6	71.0	17.1%
64	2	0.5	121.2	131.7	8.6%
128	1	1.0	27.2	34.8	27.9%
128	1	0.5	54.3	68.6	26.3%
128	2	1.0	60.6	78.1	28.8%
128	2	0.5	121.2	138.3	14.1%

- 12.2 kbps with voice activity factor of 0.5 & 1
- 51 channelisation codes per tree with SF=64, 85 channelisation codes per tree with SF=128, sequential packing
- Same AC for USTS and non-USTS cases → better gain with modified RRM?
- Possible overestimation of capacity (more than 120 ??) → code shortage → reduce USTS gain

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Conclusions

- System level & link level simulations done & their results discussed
  - Simulations done by 4 companies
  - Multiple scrambling codes considered
  - Handover issues discussed & considered (Multiple cell)
  - Uplink orthogonality factor considered
  - Capacity gain varies from 14% to 55 %, depending on AC and on code shortage level due to voice activity factor, antenna diversity, supportable # of users per cell
- Technical report TR25.854v5.0.0
  - Overall techniques described including timing control, code usage, and soft handover
  - Complexity discussed/described including timing control, code usage, SHO, CLPC, and Timing
  - Performance discussed/described (refer to the following slides)
  - Impacts to WG2/3 included
- WG1 conclusion: Open items reported closed and WG1 view is that WI could be started
- WG3 conclusion: USTS is feasible given a low mobility environment (RP-010292, R3-01-3709)

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