

DL control design for overlaid BS

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Venue:

TGm SDD: DL control structure (11.7)

Base Contribution:

It is a contribution.

Purpose:

Discuss and adopt the proposed text for SDD

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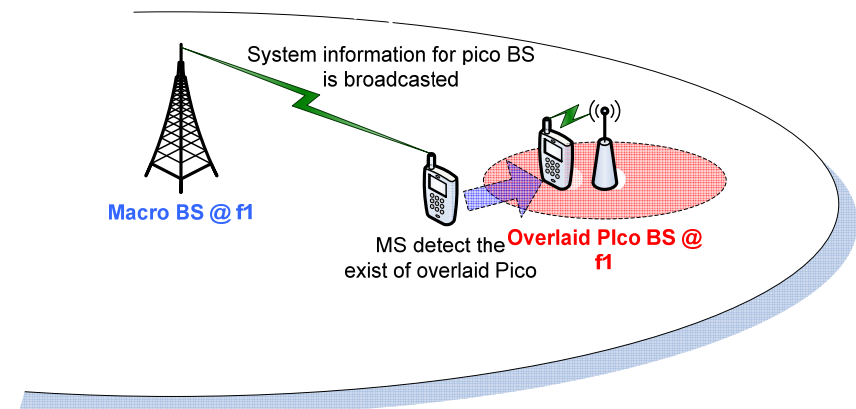
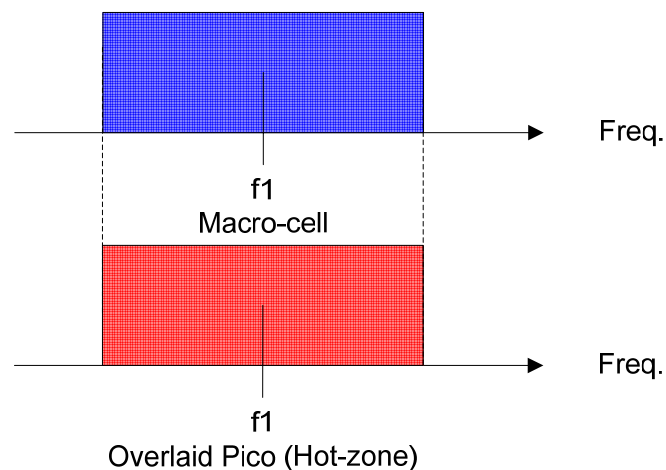
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Definition of Overlaid Picocell (Hot zone)

- A BS overlaid in a macro BS coverage with following properties
 - Public access for all users
 - Smaller coverage than macro one
 - The different or same operating frequency of the macro BS
 - Possibly installed outside in heavy traffic area
 - Possibly full functions of 802.16m BS



Motivation of Overlaid Picocell (Hot zone)

- Overlaid Picocell (Hot zone) is a good and simple solution to **increase system capacity in an area**

	Macro Only	Macro & O-Pico	
		Macro	O-Pico
DL Sector Throughput	100%	-5.03%	50.84%
DL 5% Edge Throughput	100%	-4.63%	32.48%
UL Sector Throughput	100%	7.76%	41.52%
UL 5% Edge Throughput	100%	23.08%	489.50%

Simulation Condition

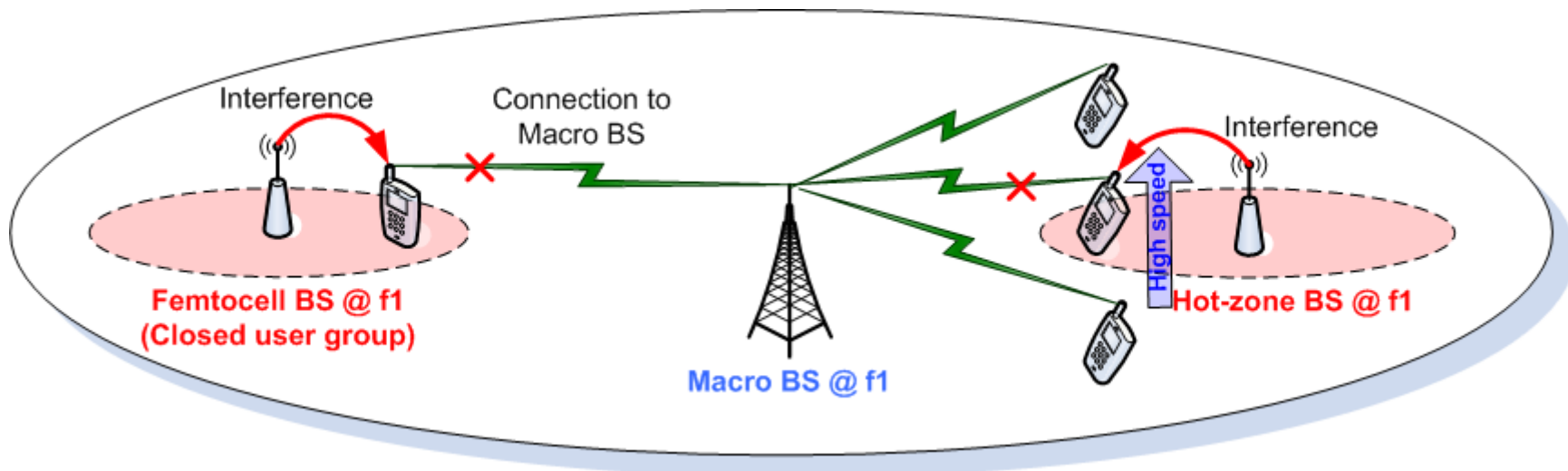
O-Pico Location : 0.75R Main robe

O-Pico DL power : 23dBm

- 802.16m SRD addressed the Overlaid Picocell (Hot zone) usage model
 - A.2.5 Very high data rates in smaller cells
 - Overlay, Same operating frequency, interference management

Problem definition for overlaid BS

- Service **discontinuity to MSs in Overlaid BS coverage**
 - A MS in Overlaid Pico (hot zone) coverage may not perform HO to Pico BS
 - High velocity of MS, Small cell size
 - Dwelling time at a Pico BS may be less than few (1~2) seconds
 - Similar cases in femtocell deployment
 - A MS in non-allowed CUG¹⁾ femto cell BS
 - A public femtocell BS installed outside
- **Need to keep connection** between macro BS and the MSs
 - System information
 - DL/UL traffic



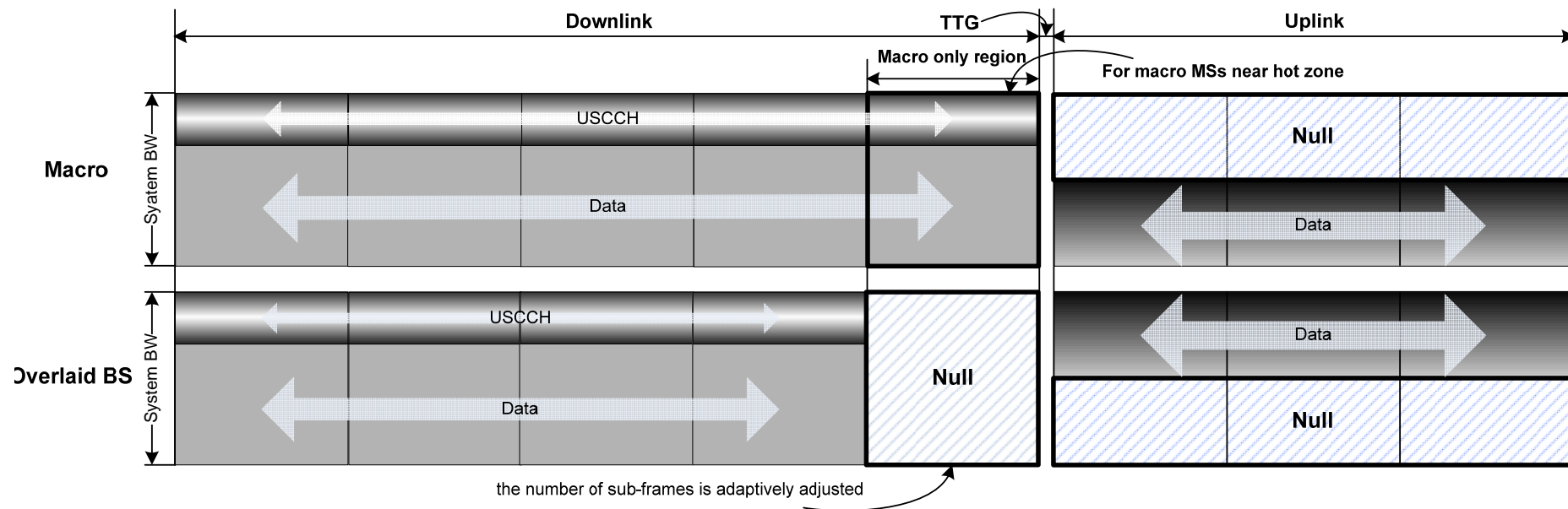
1) CUG: Closed User Group

Outline of our proposal

- Two solutions
 - MS approaching Hot zone makes **HO to Overlaid BS** (Pico/CSG Femto)
 - MS passing Overlaid BS **keeps connection to macro BS**
 - Overlaid **BSs reserve resources** for MSs connected to Macro BS
 - Overlaid BS does not transmit signal in the reserved resource
 - Macro BS allocate the reserved resource to the MSs
- Two schemes are used in hybrid manner depending on conditions
 - **MS detects overlaid BS**
 - MS decides **whether to make HO or keep connection**
 - HO to overlaid BS
 - Normal HO procedure
 - Keeping connection to BS
 - Overlaid BS reserves resources
 - MS signals BS to allocate the reserved resources
 - BS allocates the reserved resources to the MS

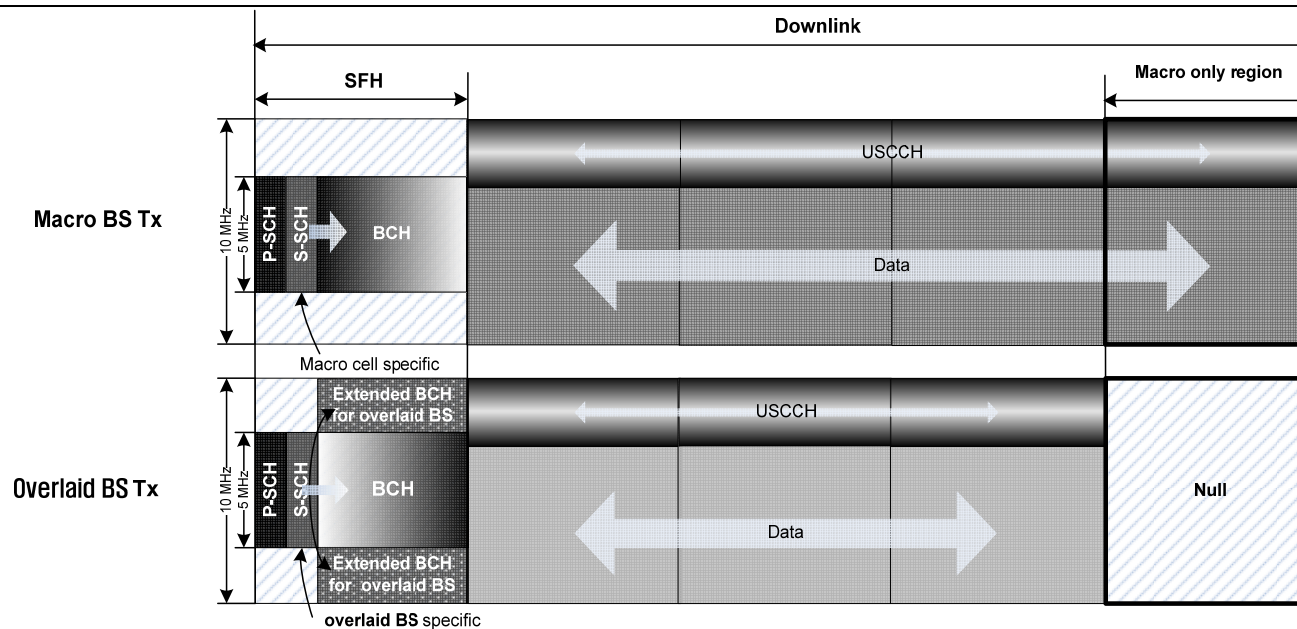
Resource Reservation for Reuse-1

- **Downlink**
 - Overlaid BS reserves sub-frames for DL traffic
 - It provides reliable reception of USCCH and traffic from Macro BS
 - Number of reserved sub-frames is varying depending on available MSs
- **Uplink**
 - Macro and Overlaid BS reserve resources in FDM manner for UL traffic
 - Each frequency partition provides traffic and control for macro and overlaid BS
 - FDM guarantees no loss in link budget for edge users



Resource Reservation for Reuse-1 (Cont')

- Overlaid BS transmits BCH and Extended BCH
 - BCH: the same information as Macro BS BCH
 - Ext. BCH: Overlaid BS specific information different from macro BS BCH
- In the coverage of Overlaid BS
 - A MS connected to Macro BS
 - Obtain necessary macro BS system information from Overlaid BS BCH
 - Then access the allocated sub-frames from macro BS
 - A MS connected to Overlaid BS
 - Obtain necessary Overlaid BS system info. From BCH and Ext. BCH
 - Then access the allocated sub-frames from Overlaid BS
- No change in macro BCH format and operation



Conclusions

- A BS is overlaid in a macro BS coverage
- Overlaid BS is a good solution to increase system capacity in an area
- However, it may cause service discontinuity to MSs in overlaid BS coverage
- For overlaid BS deployment, it is necessary to provide a scheme to keep connection between MS and macro BS in overlaid BS coverage
- We propose resource reservation to keep connection.
 - Accordingly, we propose extended BCH for overlaid BSs
- We also propose to assign part of cell ID indices for the fast detection of the overlaid BSs.

Proposed text

- *Directions*
 - *Delete*
 - *Add*
- *[Modify the text as follows]*
- *11.7.2.1.1 Synchronization channel requirements*

Cell ID set	The cell ID set is the set of unique SCH symbols for differentiating BS types like between macrocell/femtocell/sector/relay transmitters
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- *[Modify the text as follows]*
- 11.7.2.2.1 Primary Broadcast Channel (PBCH) and Secondary Broadcast Channel (SBCH)
- The Primary Broadcast Channel (PBCH) and the Secondary Broadcast Channel (SBCH) carry essential system parameters and system configuration information. The PBCH is transmitted every superframe. The SBCH may also be transmitted. When present, SBCH may be transmitted over one or more superframes. The information contents of PBCH and SBCH is FFS. [For overlaid BS, Extended PBCH \(EPBCH\) can be defined to carry additional system information specific to the overlaid BS.](#)

Appendix: Simulation conditions

- SLS parameters

Item	Value
Cell layout	7 cells (UL), 19 cells (DL) 3 sector/cell
ISD	1.5km
No. of MS's per sector/HZ	20
BS total TX power	43 dBm
BS antenna gain	17 dBi (16m EMD)
BS ant. 3dB beam width	70 deg
BS antenna spacing	-
MS TX power	23 dBm
HZ TX power	23 dBm
MS antenna gain	0 dBi (omni)
HZ antenna gain	0 dBi (omni)
MS ant. gain mismatch	0 dB
Cable loss (BS)	2dB
Path loss model (Macro)	$130.19+37.6\log_{10}(R)$
Path loss model(HZ)	Urban Micro cell
Shadowing std dev	8.0 dB
BS shadowing correlation	0.5

Item	Value
Operating frequency	2.5 GHz
Channel bandwidth	10 MHz
Tx method	SIMO
Frame duration	5 ms
MAP overhead	0.2
Macro UL IoT control	Load Control
Outer power control	YES
Target PER	0.1
Max. number of ReTx	3
Channel model	ITU channel Ped-B
MS speed	3 km
BS noise figure	5.0 dB
MS noise figure	7.0 dB
Thermal noise density	-174 dBm/Hz

Q&A

Thanks!