LTE1336 Interference-aware UL Power Control

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Key Functionality

- Interference characteristics in LTE UL

Interference in LTE UL plays critical role determining the throughput

- UL interference is coming from neighboring cell UEs
  - It cannot be predicted since we do not know how the UEs will be distributed
  - Contributions to interference are most prominent from cell-border UEs
- As a result the role of PC is to provide the required SINR while controlling at the same time the interference caused to neighboring cells
- Looking at the UL SINR formula…

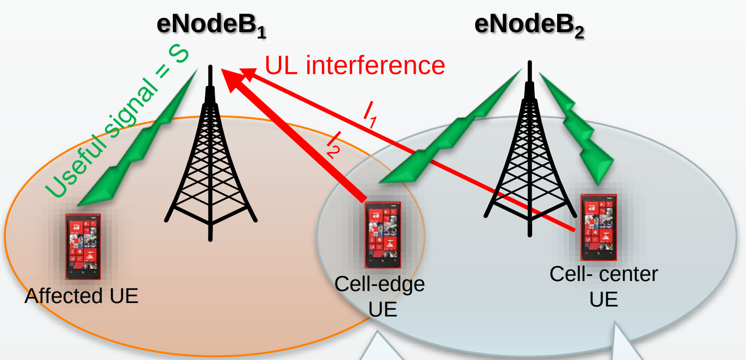
$$SINR = \frac{S}{I+N} = \frac{S}{\Sigma(I_1, I_2, \dots I_n)}$$

Useful signal is already close to maximum

Noise *N* is negligible in interference limited scenarios: $I >> N$

… it is clearly visible that it's better to minimize the interference than improve the useful signal if we want to get better SINR

UL Power control illustration



Cell edge users inject as much interference to neighboring eNB as to their serving eNB. Therefore **contributions to interference in adjacent cells are most prominent from cell-border UEs**

Minor UL interference to eNodeB$_1$

Key Functionality

- Interference-aware UL Power Control motivation

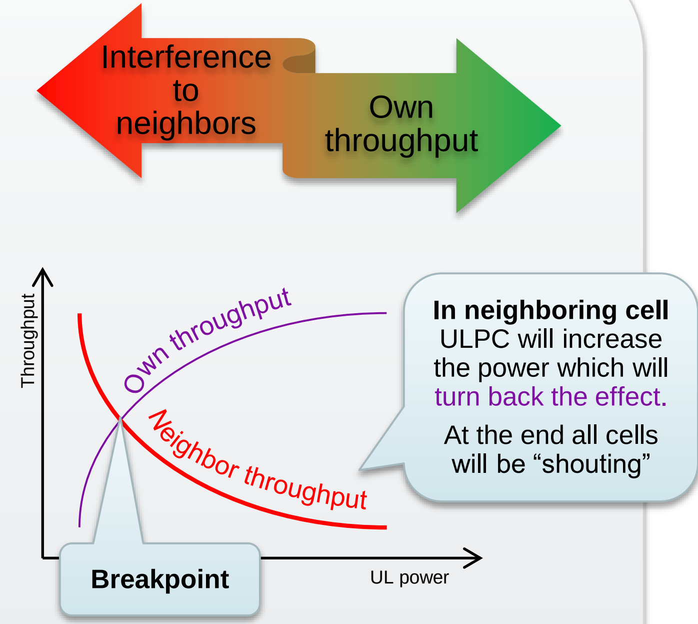
LTE1336 optimizes tradeoff between the throughput achieved in the own cell and the uplink interference injected to neighbor cells

- UL power control is **trade-off** between **inter-cell interference** and **own cell throughput**
  - Increase of UL power brings additional useful signal for own cell UEs, but adds additional interference for neighboring cells
  - Reduction of UL power decrease useful signal but also lowers the interference
- **NSN research invented the algorithm which** achieves higher throughput in a whole range of cells, at reduced UL power settings (especially for cell-edge UEs)
- ***Interference-aware ULPC*** (***IAwPC***) or so called ***Interference Penalty Algorithm*** (***IPA***) feature exploits that concept by implementation of new UL closed-loop power control

LTE1336

- ✔ **Maximized UE throughput with proportional fair scheduler**
- ✔ **Improved average and cell-edge throughput**

UL power-control dilemma



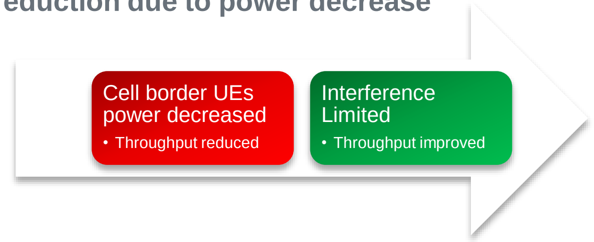
Key Functionality

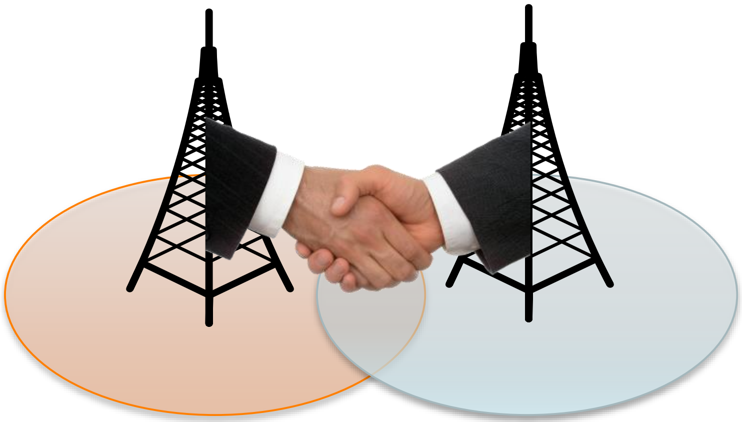
- Feature delimitations

- The mechanism is kind of a **deal** between neighboring eNBs:
  - This means: the feature only works (has benefit) with a multitude of eNBs with feature being activated
  - Conversely: LTE1336 can give no gain over OL-PC if cells are not coupled (without coverage overlap)
- More details in the deployment aspects section

"Dear neighbors, if I reduce your interference (at a loss of my own throughput), and if you then do the same (i.e. not use all of your improved link budget for higher throughput), there will be benefit for all of us.„

Throughput improvement is higher than reduction due to power decrease





Key Functionality

- SINR definitions in IAwPC

Interference-aware UL-PC deals with various SINR values which might easily be confused

UL SINR

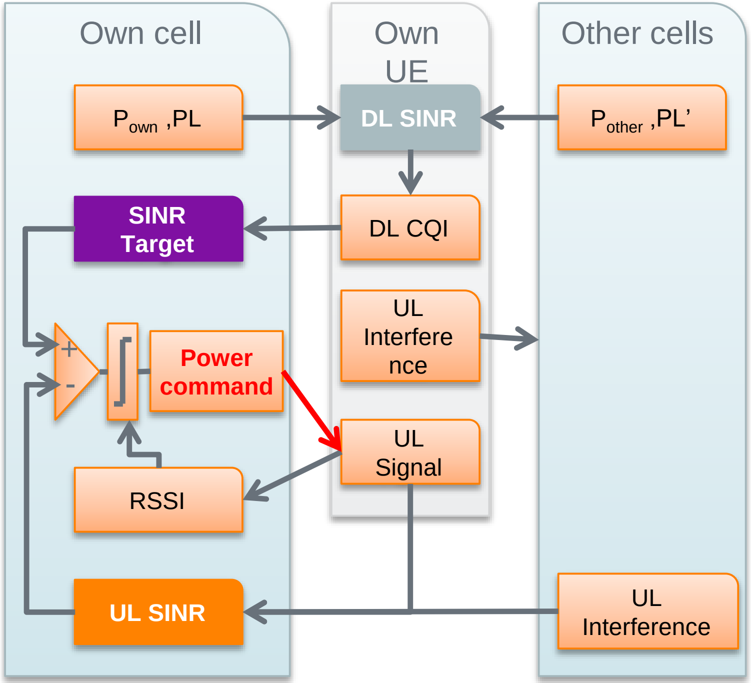
- UE-specific SINR of the UL transmission, **received at the eNB**
- UL SINR is one of the inputs into the control loop, and is compared to a variable threshold, SINR_Target

SINR Target

- UE-specific **target value for the UL SINR** calculated by LTE1336
- IAwPC calculates the transmit power-up/down commands to its UEs such that **UL SINR is kept as close as possible to SINR_Target**
- Depends (among other data) on a ratio PL'/PL of pathlosses at the UE's location, which the eNB derives from DL SINR (CQI)

DL SINR

- DL SINR **received at the UE's location**
- It is a measure of the **ratio of the pathloss from the UE towards the eNB** representing the **most prominent DL interference source**, and the pathloss towards the own eNB
- Reflected in the UE's CQI reports which are used in **SINR_Target** calculation



Key Functionality

- SINR target idea

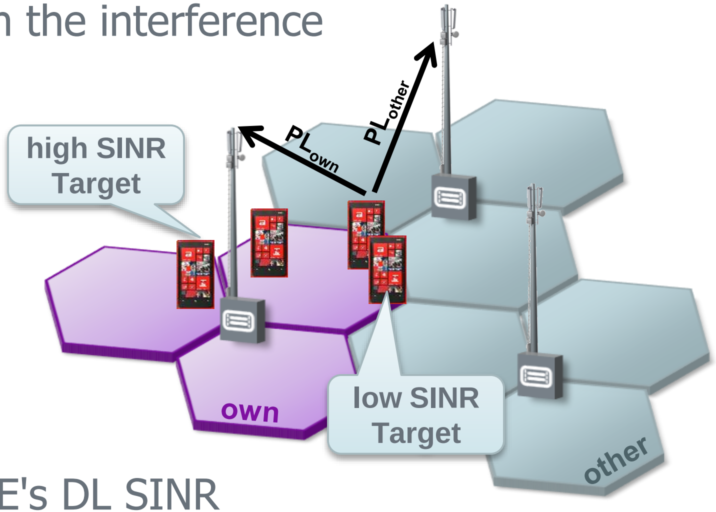
- SINR Target is compared against measured UL SINR
  - difference values are time-filtered and then taken to determine the power commands
- Target SINR is chosen such that an upper limit is placed on the interference that the UE injects into its next neighboring eNB
  - This is done on the basis of UE's pathloss ratio, eg. :

$$\frac{PL_{other}}{PL_{own}} \gg 1$$

UE is far away from other eNB/close own eNB cell center, so give it **high SINR_Target**

$$\frac{PL_{other}}{PL_{own}} \sim 1$$

UE is near the cell border interfering the neighbor significantly, so give it **low SINR_Target**



- Pathloss ratio is not directly available but is contained in UE's DL SINR
- A measure of DL SINR is contained in DL CQI. DL CQI is reported to eNB
  - eNB takes as input the UE’s DL CQI and computes a UE-specific target SINR.

Key Functionality

- LTE1336 calculation of the SINR target

The SINR$_{Target}$ formula takes following input:

LNCEL:**ulpcRefPwrIAw** LNCEL:**ulpcCEBalanceIAw** LNCEL:**ulpcMinQualIAw**

$$sinr_{Target} = \min\left\{ sinr_{\max}, \frac{p_{0,IAw}}{i+n_T} * \max\left[\left(sinr_{DL} \right)^{ceBalance}, Q_{\min} \right] \right\}$$

- ***ceBalance***: cell-center to cell-edge balancing, similiar to ***ulpcAlpha***
  - Parameter *LNCEL:ulpcCEBalanceIAw*
- $p_{0,IAw}$: reference power value for interference-aware UL-PC, per used PRB, linear
  - Calculated from *LNCEL:ulpcRefPwrIAw* parameter as $p_{0,IAw}$ = 10^(ulpcRefPwrIAw/10)
  - Should not be mistaken for *p0NomPuschIAw*, which is related to OLPC part, not to SINR target calculation !
- Q_{min}: Minimum quality
  - parameter *LNCEL:ulpcMinQualIAw*
- $sinr_{max}$: UL SINR which corresponds to the maximum MCS allowed in the cell, per used PRB
  - Based on Link Level simulations (SINR → MCS mapping table, slide 22) and max MCS configuration
- $sinr_{DL}$: DL SINR in linear terms, per used PRB, experienced by the UE under the condition that neighbor cells are fully loaded in DL direction.
  - Derived from DL CQI reports
- $i+n_T$: interference and thermal noise power per PRB
  - Filtered *I* + *N* from UL PHY measurements

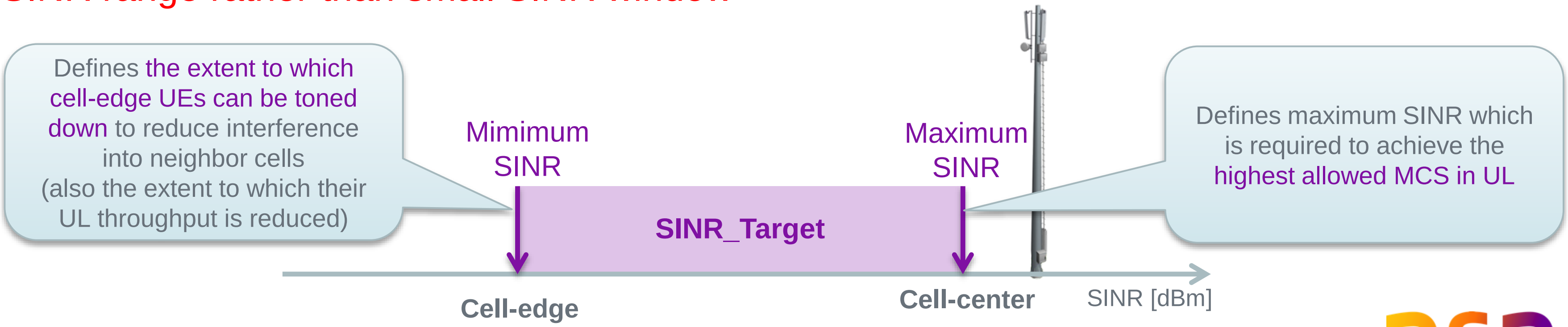
nsn

Key Functionality

- SINR Target boundaries

SINR target is calculated per UE basis and it has predefined boundaries

- Cell-edge UEs are allowed a **minimum SINR** even if they create excessive interference (more that would be allowed by pathloss ratio)
  - Defined by Q_{min} = *LNCEL:ulpcMinQualIAw*, determines the lower limit for SINR_Target in linear scale
- **Maximum SINR** ($sinr_{max}$) is the upper limit for SINR_Target and indicates the SINR required to achieve the highest allowed MCS in UL
  - Its value depends on the eNB configuration (see next slide)
- These settings should not be mixed with CLPC SINR window, since they set bounds for entire SINR range rather than small SINR window



Key Functionality

- Maximum SINR ($sinr_{max}$) calculation

- **SINR_target** calculation considers additional margin so that UEs can successfully transmit with this **highest allowed MCS** (maxAllowedMcs)
  - The highest allowed MCS in Uplink, can be found from the parameter *LNCEL:actModulationSchemeUL*, which restricts it to either **MCS10**, **MCS20**, or **MCS24**
  - With *LTE44 64 QAM in UL*, maxAllowedMcs is **MCS28** for TDD

- eNB keeps a static table (from real channel estimates) of MCS vs. required SINR mapping, called 'ideal SINR', for MCS > 5
  - SINRMaxMcs is the SINR that corresponds to maxAllowedMcs in this table
  - The table of is based on a least-square linear fit performed on the simulation result for an ETU70 cell, at 25 PRB allocation size, 2 antennas, SINR = 0.915 * MCS -5.909
- **Deviations between the “ideal SINR” table and field performance** (due to e.g. different configuration, #of antennas or channel characteristics) are covered during **SINRdelta** calculation
- SINRMaxMcs is calculated for each PUSCH transmission that uses an MCS in the **available range** (5 < MCS <= maxAllowedMcs – 1)
- Please note that due to some problems in the field Max MCS calculation could be changed

MCS	SINR
6	-0.42
7	0.50
8	1.41
9	2.33
10	3.24
11	4.16
12	5.07
13	5.99
14	6.90
15	7.82
16	8.73
17	9.65
18	10.56
maxAllowedMcs	SINRMaxMcs
20	12.40
21	13.31
22	14.23
23	15.14
24	16.06
25	16.97
26	17.89
27	18.80
28	19.72

Key Functionality

- Maximum SINR ($sinr_{max}$) calculation

Animated slide

- **Deviations between the "ideal SINR" table and field performance** (due to e.g. different configuration, #of antennas or channel characteristics) are covered by **SINRdelta**
- The exemplary SINRmax calculation with current UE MCS = MCS15, and maxAllowedMcs = MCS24, would look as follows:

Get current SINR

- look up the 'ideal' SINR in the table, using the UE's MCS as index. MCS15 ➔ SINR 7.82

Calculate a SINRDelta

- ***SINRDelta*** *= UE's SINR (from the PHY M4 measurement) – 'ideal' SINR from the table*

Feed SINRDelta into averaging exponential filter

- ***SINRDeltaAvg (t)*** *= SINRDelta(t) × 1/TavgSdelta + (1-1/TavgSdelta) × SINRDeltaAvg(t-1)*

Calculate SINRmax

- ***SINRmax*** = *SINRMaxMcs* + *SINRDeltaAvg* + *rdTopMargin* ➔ e.g.

Note
TavgSdelta and *rdTopMargin* are R&D parameters

MCS	SINR
6	-0.42
7	0.50
8	1.41
9	2.33
10	3.24
11	4.16
12	5.07
13	5.99
14	6.90
15	7.82
16	8.73
[illegible]	9.65
[illegible]	10.56
19	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
23	15.14
24	16.06
26	17.89
27	18.80
28	19.72

Lookup range

Measured SINR

SINRDelta

➔SINRDeltaAvg

+

SINRmax = *SINRMaxMcs* + *SINRDeltaAvg*

maxAllowedMcs SINRMaxMcs

nsn

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Configuration and Deployment Aspects

- LTE1336

- Affected parameter

ulpcAlpha	**Alpha**
Object: LNCEL **Range:** alpha 0 (0), alpha 0.4 (1), alpha 0.5 (2), alpha 0.6 (3), alpha 0.7 (4), alpha 0.8 (5), alpha 0.9 (6), alpha 1 (7) **Step:** **Unit:** **Default:** alpha 1 (7) **Multiplicity:** 1 **Modification:** On-line **Category:** basic **Hidden:** No	Used as a fractional path loss compensation factor. It controls received SNR variance (fairness) for user data and sounding reference symbol. **In principle this parameter controls power trade-off between cell edge and cell center UEs** **Rule:** With LTE1336 activated, the *ulpcAlpha* needs to be set to value 1

Configuration and Deployment Aspects

- LTE1336

- Affected parameter

dlamcEnable	Enable DL AMC
Object: LNCEL **Range:** false; true **Step:** **Unit:** **Default:** true **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**This parameter switches on/off dynamic radio channel adaptation by MCS.** **Rule:** With LTE1336 DL link adaptation needs to be activated (parameter set to value true)

Configuration and Deployment Aspects

- LTE1336

- Affected parameter

dlOlqcEnable	**Enable OLQC**
Object: LNCEL **Range:** true, false **Step:** **Unit:** **Default:** true **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**This parameter controls the activation of the Open Loop Quality Control for the DL link adaptation** The purpose of OLQC is to adapt/correct CQI values, delivered by UE and later on used by DL link adaptation (DL LA) and DL scheduler (DL SCH), The target of this adaptation is certain target block error ratio (BLER) of the first HARQ transmission **Rule:** With LTE1336 OLQC needs to be activated (parameter set to value true)

Configuration and Deployment Aspects

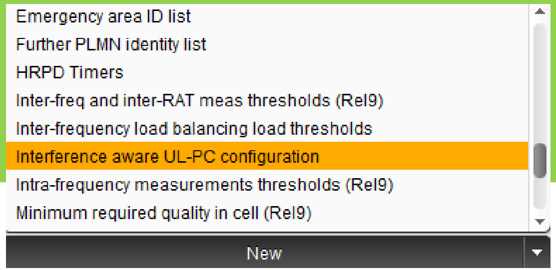
- LTE1336

- Affected parameter

deltaTfEnabled	**Enabled TB size impact to UE PUSCH power calculation**
Object: LNCEL **Range:** true, false **Step:** **Unit:** **Default:** false **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**This parameter switches on/off ULPC formula addon from UL AMC.** Parameter activates Transport Block size impact switch for UE PUSCH power calculation. **Rule:** With LTE1336 deltaTF needs to be deactivated(parameter set to value false)

- New parameter structure

ulpclawConfig	Interference-aware UL-PC configuration
Object: LNCEL **Range:** structure **Step:** **Unit:** **Default:** **Multiplicity:** 1 **Modification:** On-line **Category:** Basic **Hidden:** No	**Configures interference-aware uplink power control** This is basic structure under LNCEL, which contains all majority of LTE1336-related parameters



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- New parameter

p0NomPuschIAw (ulpclawConfig)	**Nominal PUSCH P0 for interference-aware UL-PC**
Object: LNCEL **Range:** -110, -109, ... -70, **Step:** 1 **Unit:** dBm **Default:** -100 **Multiplicity:** 1 **Modification:** On-line **Category:** basic **Hidden:** No	**P0 setting that is broadcast in SIB2 if interference-aware UL-PC is activated** **Rule:** To limit the confusion the LTE1336 introduces its own P0 parameter for PUSCH. However the rules for it's setting remain the same as for *LNCEL:p0NomPusch*. Due to fact that *LNCEL:ulpcAlpha* is set to value 1, the P0 should have the value around the -100.

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- New parameter

ulpcCEBalanceIAw (ulpcIawConfig)	**Cell-center/edge balancing for interference-aware UL-PC**
Object: LNCEL **Range:** 0.5, 0.6, ..., 1.4, **Step:** 0.1 **Unit:** **Default:** 1 **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**Controls Target SINR in interference-aware UL-PC: provides a tilt in the balancing between Target SINR in cell-center and Target SINR at cell-edge.** Target SINR determines the max. throughput, therefore higher values increase cell-center throughput at the cost of cell-edge throughput, and vice versa. **Rule:** •The value 1 provides equal balance between cell-edge and cell-center •The value higher than 1, promote the cell-center UEs cannibalizing the cell-edge throughput

Main Menu

- New parameter

ulpcMinWaitForPc (ulpclawConfig)	**Minimum waiting time for next UL-PC decision**
Object: LNCEL **Range:** 6, 7, 8, ... 80 **Step:** 1 **Unit:** ms **Default:** 25 **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**Minimum number of TTIs (ms) that must pass before another UL power decision is made for a UE.** Together with the number of PUSCH reception (UL SINR samples), the parameter defines the TPC command periodicity **Note:** All the simulations have been taken with value 50 (similar to *LNCEL:ulpcReadPeriod*) **Rule:** •Power control should work with slower pace than Link Adaptation •Lower value → higher control of the LTE1336 over the UE transmission power •High value → low TPC command periodicity, and smaller impact of the LTE1336 algorithm over the UE Tx power

- New parameter

ulpcMinQualIAw (ulpcIawConfig)	Minimum UL quality for interference-aware UL-PC
Object: LNCEL **Range:** 0, 0.2, ... 5, **Step:** 0.2 **Unit:** **Default:** 1 **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**Minimum quality measure for interference-aware UL-PC.** Target SINR for UEs in poor conditions cannot go below a limit defined by this parameter even if they generate higher UL interference. **Rule:** •Capacity decreases with higher values for parameter •The smaller *ulpcMinQualIAw*, the larger the peak performance •Too high values of the parameter shall be avoided ! •During the simulation campaigns the optimum value has been found to be **2 (3 dB)**

- New parameter

ulpcRefPwrIAw (ulpcIawConfig)	Reference UL power value for interference-aware UL-PC
Object: LNCEL **Range:** -110..-70, **Step:** 0.5 **Unit:** dBm **Default:** -90 **Multiplicity:** 1 **Modification:** On-line **Category:** basic **Hidden:** No	**Controls Target SINR in interference-aware UL-PC:** provides an equal shift of Target SINR for all UEs in the cell, regardless of their pathloss ratios. **Rule:** •Capacity increases with higher value of Reference Power •The coverage drops significantly when choosing a high value (>= -100dBm) •The Reference power has a strong influence on the lower (<10%) end throughput figures •The higher ulpcRefPwrIAw, the smaller the cell edge TP. Similar to P0 setting for OLPC

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- New parameter

ulpcRssiMaxIAw	Maximum RSSI for interference-aware UL-PC
Object: LNBTS **Range:** -90, -85, ... -60 **Step:** 5 **Unit:** dBm **Default:** -70 **Multiplicity:** 1 **Modification:** On-line **Category:** advanced **Hidden:** No	**Sets an upper limit for RSSI received from a UE.** If exceeded, the next power command indicates -1 dB UL power change even if the current UL power is insufficient for reaching Target SINR. The parameter is introduced as protection for receiver inputs (with a view on particular operators using LTE repeaters) **Rule:** Too low value of this parameter can lead to decreased UL power (consecutive -1 dB TPC commands). The parameter shall be optimized for the repeater sensitivity level.

- New parameter

actUlpcMethod	Method for UL power control
Object: LNCEL **Range:** PuschOLPucchOL, PuschOLPucchCL, PuschCLPucchOL, PuschCLPucchCL, PuschCLSrsPucchOL, PuschCLSrsPucchCL, **PuschIAwPucchOL, PuschIAwPucchCL** **Step:** **Unit:** **Default:** PuschOLPucchOL **Multiplicity:** 1 **Modification:** On-line **Category:** basic **Hidden:** No	**Selects a working mode for UL power control.** Offers various combinations between open-loop and closed-loop control for PUCCH and PUSCH/SRS power. This parameter replaces previously used UL PC activation parameters (see next slide) **Rule:** • If the PUCCH CLPC algorithm is to be used (ulpcPucchEn was set to true), then the ***PuschIAwPucchCL*** value should be used to activate the LTE1336 •Otherwise the **PuschIAwPucchOL** will set the OL mode in the PUCCH along with the New IAwPC in the PUSCH Closed Loop **Note:** •Interference-aware UL PC provides the highest gains in the conditions in the presence of UL interference. Therefore joint activation with Interference-aware Scheduler (*ulsSchedMethod*) will result in lower gains for LTE1336.

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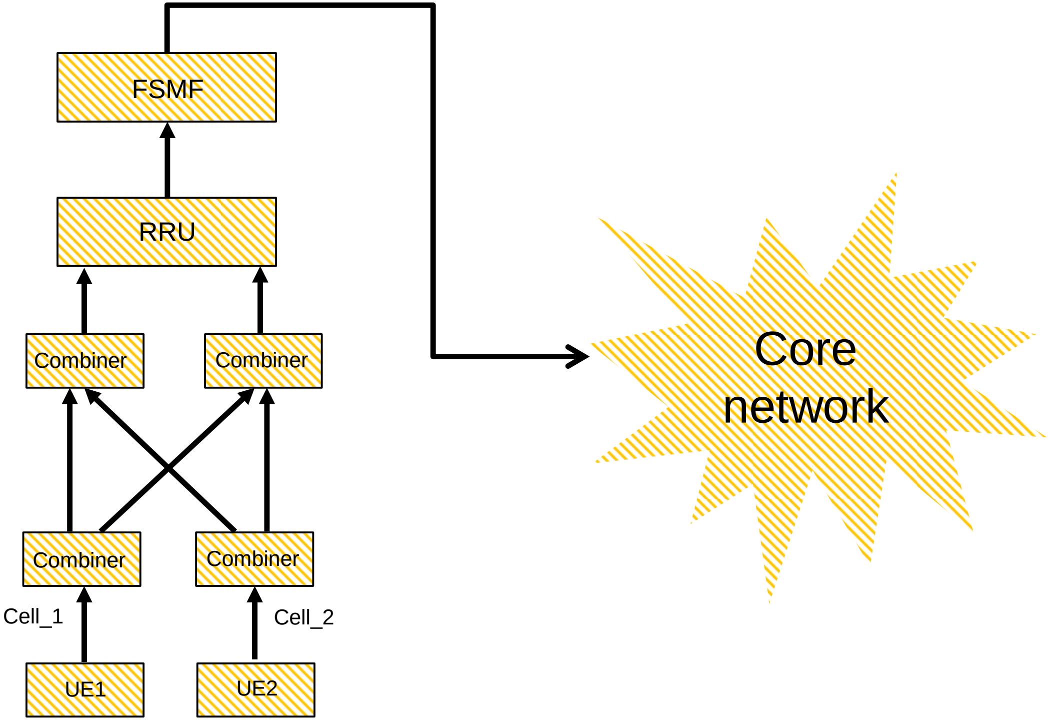
Topology of operational lab test

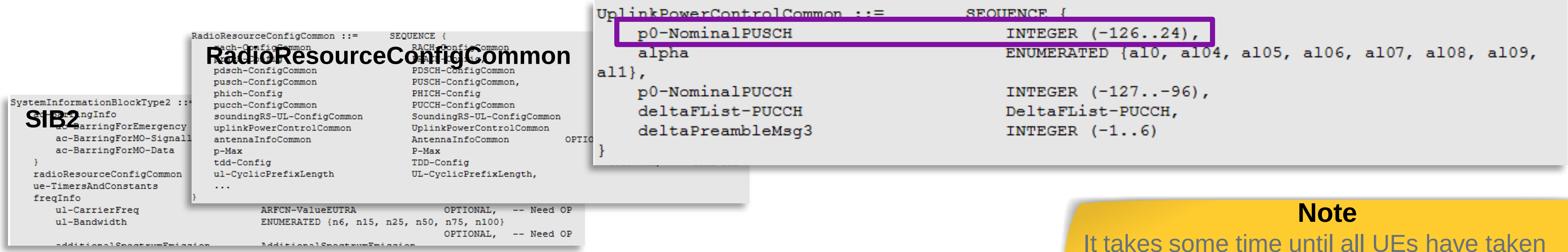


Operational Hints and Guidelines

LTE1336

Interference-aware UL-PC provides an own P0 parameter

- The **P_0** value for a cell is broadcast on SIB2 (subtable 5) and together with *LNCEL:ulpcAlpha* it forms the base values for UE's open loop UL power control
  - If LTE1336 is activated (at cell startup or during runtime), SIB2 is sent with the *LNCEL:p0NomPuschIAw* value as **P_0**
  - When LTE1336 is deactivated, SIB2 shall be updated with the **P_0** setting from OLPC: *LNCEL:p0NomPusch*

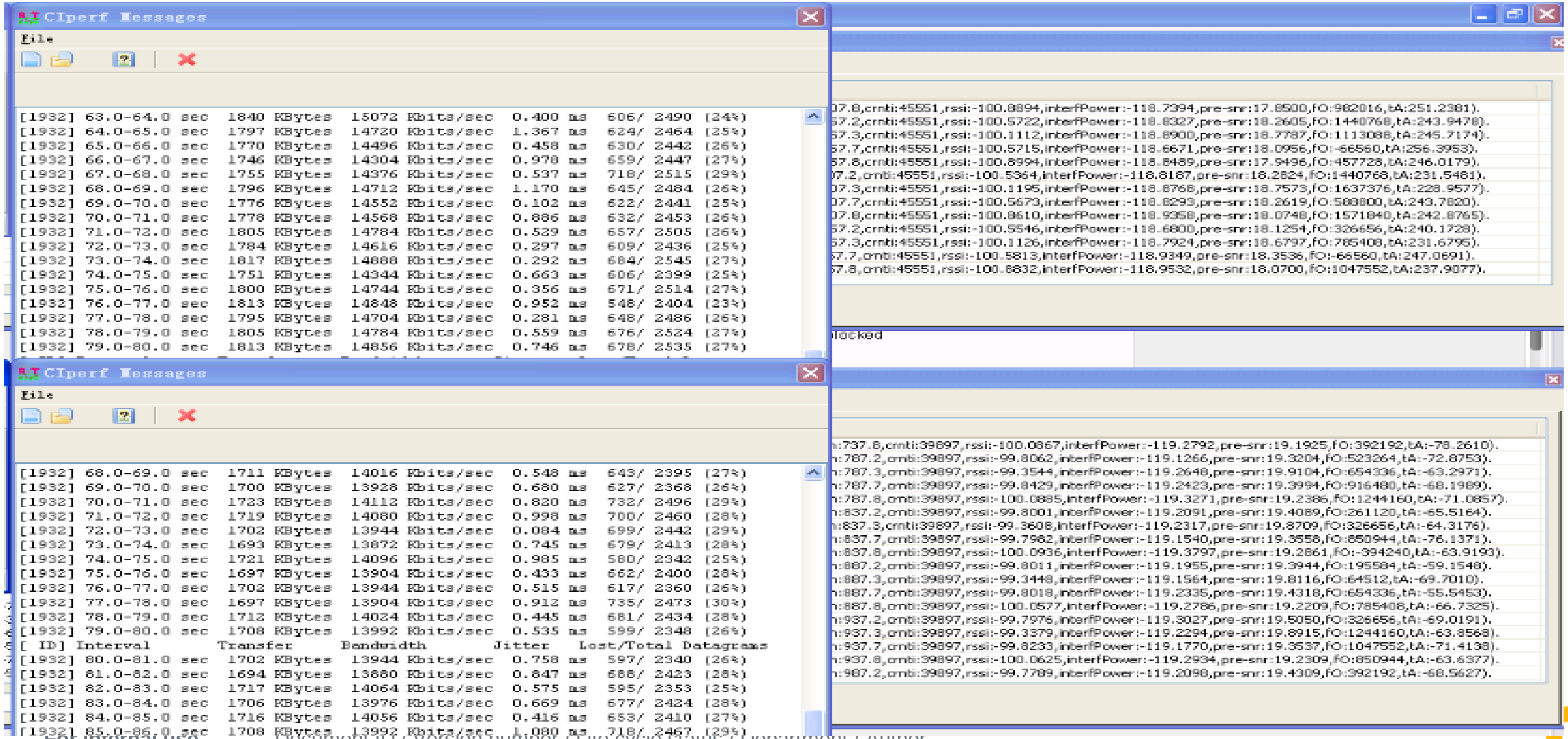


- Activation/deactivation of LTE1336 and also modifications to the *p0NomPuschIAw* and *ulpcAlpha* parameters lead to SIB modifications
  - After 31 SIB occurrences within 3 hours, the SIB valueTag rolls over the 0
  - If a UE leaves the cell but stores the SIB value tag, comes back later and finds it unchanged and therefore has no trigger to re-read SIB.

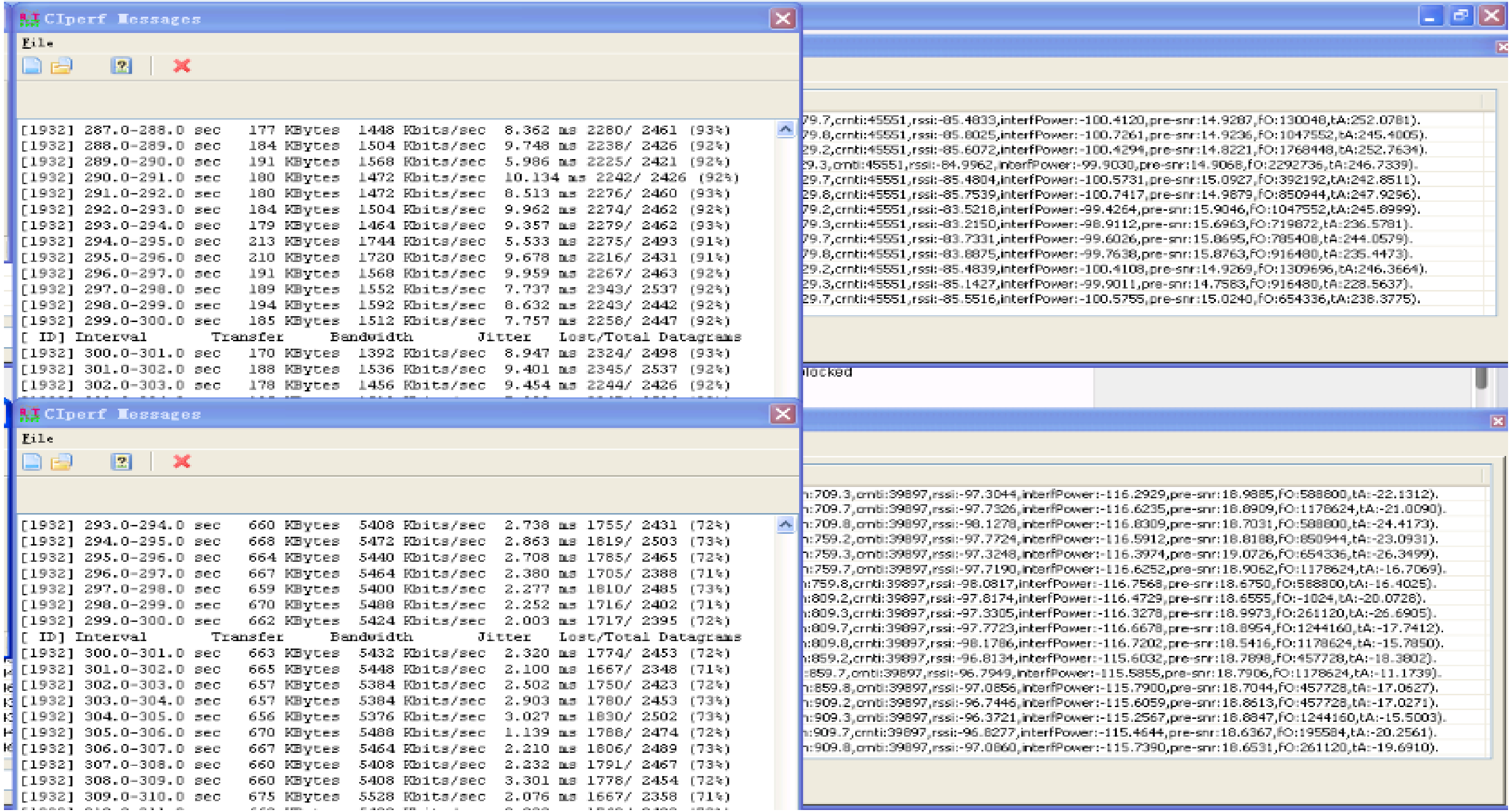
Note

It takes some time until all UEs have taken notice of a change in SIB. The worst case is defined by maximum DRX off-time and the number of SIB repetitions required for the UE to correctly decode the SIB information. Therefore, changes to SIB values do not take immediate effect.

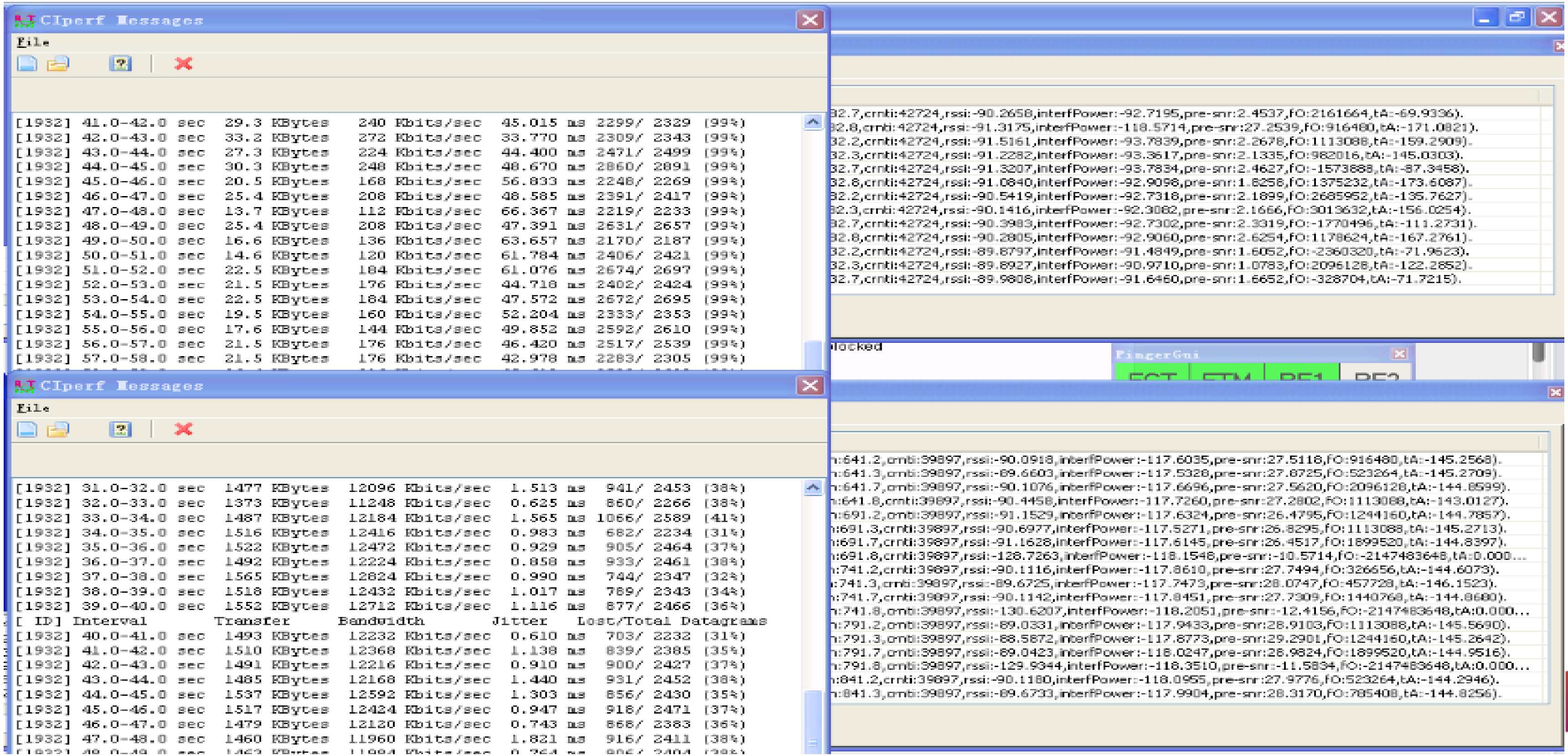
No interference



Close loop


CIperf Messages
File
[1932] 287.0-288.0 sec 177 KBytes 1448 Kbits/sec 8.362 ms 2280/ 2461 (93%)
[1932] 288.0-289.0 sec 184 KBytes 1504 Kbits/sec 9.748 ms 2238/ 2426 (92%)
[1932] 289.0-290.0 sec 191 KBytes 1568 Kbits/sec 5.986 ms 2225/ 2421 (92%)
[1932] 290.0-291.0 sec 180 KBytes 1472 Kbits/sec 10.134 ms 2242/ 2426 (92%)
[1932] 291.0-292.0 sec 180 KBytes 1472 Kbits/sec 8.513 ms 2276/ 2460 (93%)
[1932] 292.0-293.0 sec 184 KBytes 1504 Kbits/sec 9.962 ms 2274/ 2462 (92%)
[1932] 293.0-294.0 sec 179 KBytes 1464 Kbits/sec 9.357 ms 2279/ 2462 (93%)
[1932] 294.0-295.0 sec 213 KBytes 1744 Kbits/sec 5.533 ms 2275/ 2493 (91%)
[1932] 295.0-296.0 sec 210 KBytes 1720 Kbits/sec 9.678 ms 2216/ 2431 (91%)
[1932] 296.0-297.0 sec 191 KBytes 1568 Kbits/sec 9.959 ms 2267/ 2463 (92%)
[1932] 297.0-298.0 sec 189 KBytes 1552 Kbits/sec 7.737 ms 2343/ 2537 (92%)
[1932] 298.0-299.0 sec 194 KBytes 1592 Kbits/sec 8.632 ms 2243/ 2442 (92%)
[1932] 299.0-300.0 sec 185 KBytes 1512 Kbits/sec 7.757 ms 2258/ 2447 (92%)
[ID] Interval Transfer Bandwidth Jitter Lost/Total Datagrams
[1932] 300.0-301.0 sec 170 KBytes 1392 Kbits/sec 8.947 ms 2324/ 2498 (93%)
[1932] 301.0-302.0 sec 188 KBytes 1536 Kbits/sec 9.401 ms 2345/ 2537 (92%)
[1932] 302.0-303.0 sec 178 KBytes 1456 Kbits/sec 9.454 ms 2244/ 2426 (92%)
CIperf Messages
File
[1932] 293.0-294.0 sec 660 KBytes 5408 Kbits/sec 2.738 ms 1755/ 2431 (72%)
[1932] 294.0-295.0 sec 668 KBytes 5472 Kbits/sec 2.863 ms 1819/ 2503 (73%)
[1932] 295.0-296.0 sec 664 KBytes 5440 Kbits/sec 2.708 ms 1785/ 2465 (72%)
[1932] 296.0-297.0 sec 667 KBytes 5464 Kbits/sec 2.380 ms 1705/ 2388 (71%)
[1932] 297.0-298.0 sec 659 KBytes 5400 Kbits/sec 2.277 ms 1810/ 2485 (73%)
[1932] 298.0-299.0 sec 670 KBytes 5488 Kbits/sec 2.252 ms 1716/ 2402 (71%)
[1932] 299.0-300.0 sec 662 KBytes 5424 Kbits/sec 2.003 ms 1717/ 2395 (72%)
[ID] Interval Transfer Bandwidth Jitter Lost/Total Datagrams
[1932] 300.0-301.0 sec 663 KBytes 5432 Kbits/sec 2.320 ms 1774/ 2453 (72%)
[1932] 301.0-302.0 sec 665 KBytes 5448 Kbits/sec 2.100 ms 1667/ 2348 (71%)
[1932] 302.0-303.0 sec 657 KBytes 5384 Kbits/sec 2.502 ms 1750/ 2423 (72%)
[1932] 303.0-304.0 sec 657 KBytes 5384 Kbits/sec 2.903 ms 1780/ 2453 (73%)
[1932] 304.0-305.0 sec 656 KBytes 5376 Kbits/sec 3.027 ms 1830/ 2502 (73%)
[1932] 305.0-306.0 sec 670 KBytes 5488 Kbits/sec 1.139 ms 1788/ 2474 (72%)
[1932] 306.0-307.0 sec 667 KBytes 5464 Kbits/sec 2.210 ms 1806/ 2489 (73%)
[1932] 307.0-308.0 sec 660 KBytes 5408 Kbits/sec 2.232 ms 1791/ 2467 (73%)
[1932] 308.0-309.0 sec 660 KBytes 5408 Kbits/sec 3.301 ms 1778/ 2454 (72%)
[1932] 309.0-310.0 sec 675 KBytes 5528 Kbits/sec 2.076 ms 1667/ 2358 (71%)

Interference aware in PUSCH open loop in PUCCH



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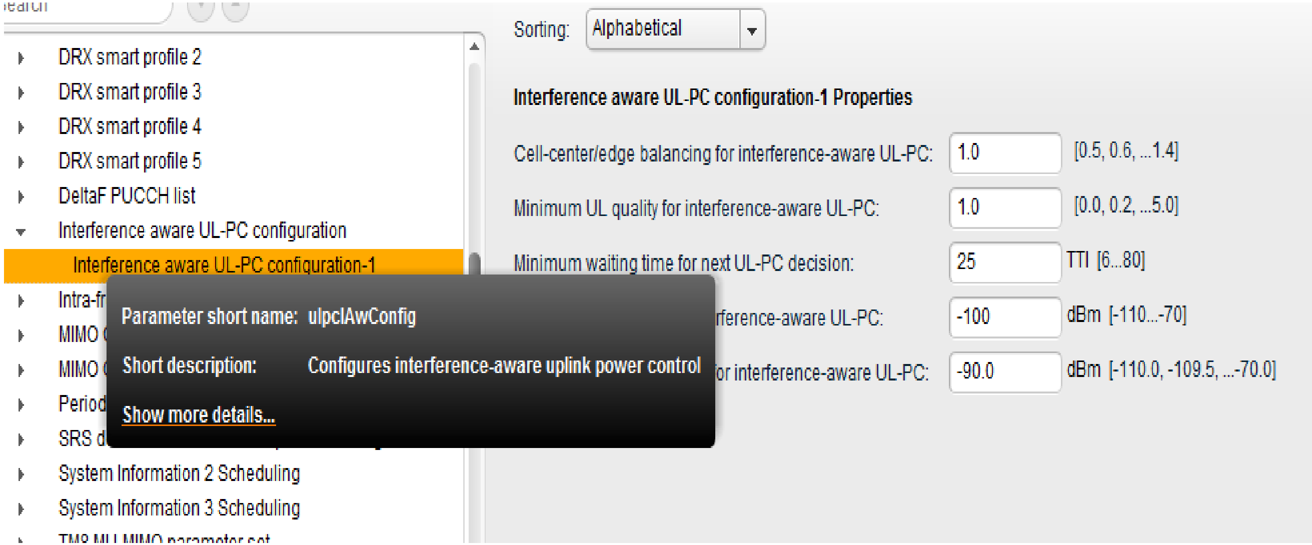
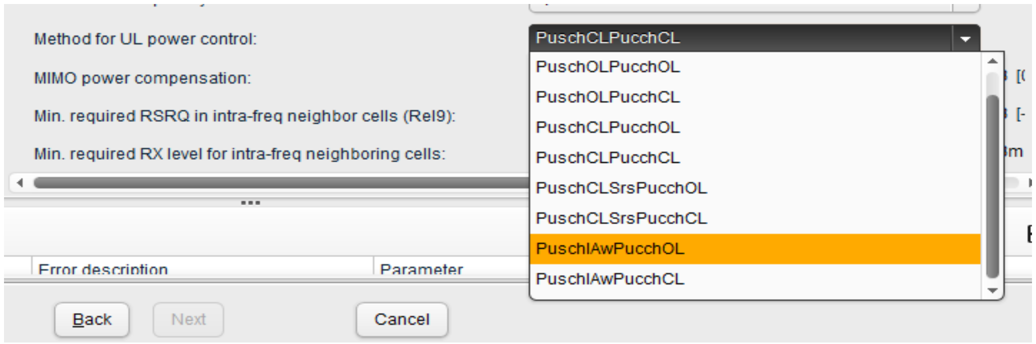
nsn

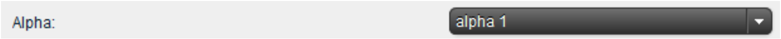
New object of ulpcIAwConfig needs to be created under LNCEL
Relevant parameters setting list on the right side



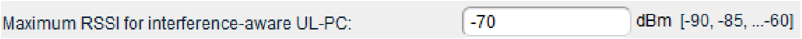
Two different method of IAW control mode can be used base on the requirement under LNCEL
PuschIAwPucchOL ➔ PUCCH controlled by OLPC (LTE27)
PuschIAwPucchCL ➔ PUCCH controlled by CLPC (LTE28)



The *LNCEL:ulpcAlpha* needs to be set to value 1



The *LNBTS:ulpcRssiMaxIAw* needs to configured



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Hints for Troubleshooting

- To check RSSI, Power and SNR, debug flags need to be enabled in swconfig which related to ULPHY
- If UPIAW doesn’t work as expected, check the parameters settting in configuration file.
- Benefit gain could be observed in lab, in the field testing with multiple UE, gain was not so impressive as still on the correcting.