

3GPP TSG-RAN Meeting #91e

March 16-26, 2021

Agenda Item: 9.7.4

RP-210350

Qualcomm

Discussion of LTE CRS-IC for DSS

Qualcomm

Outline

CRS-IC

- **Limited effectiveness** due to SNR conditions favorable to CRS-IC present only in fraction of cell area and time
 - **Much greater implementation** impact in NR compared to LTE
-

DSS Overhead

- Depending on network configuration, ranges between **24% to 30%**
- Optimization opportunity to reduce overhead by **up to 14%**

DSS Performance Evaluation : Field Test

DSS Site & Spectrum

- 10 sites || 31 sector
- 10MHz DSS (Low-band)
- 12.5% MBSFN

RF Environment

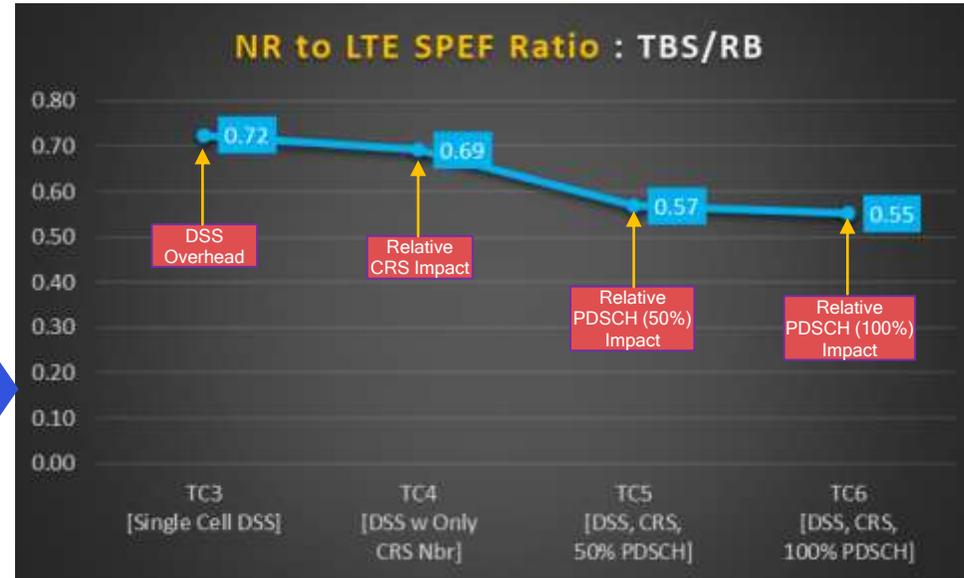
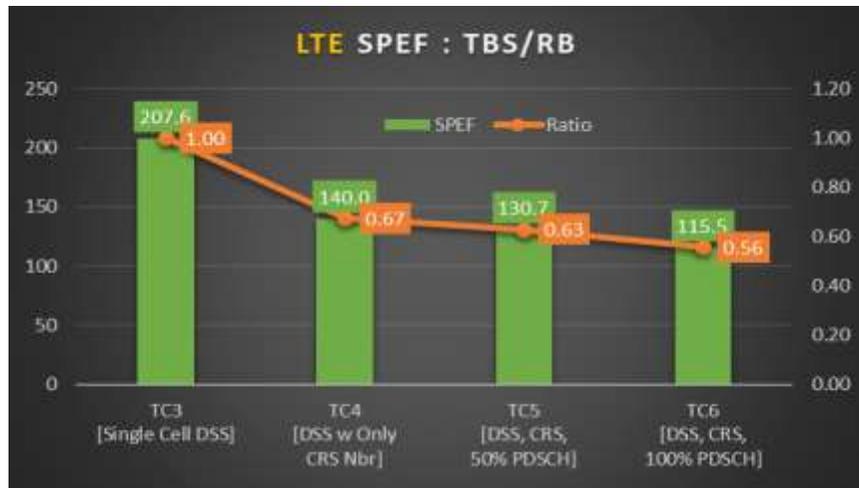
- **Near-cell** → Serving-cell stronger than neighbor by 20dB
- **Mid-cell** → Serving-cell stronger than neighbor by 12dB
- **Far-cell** → Serving-Cell stronger than neighbor by 2-3dB



- Testing with Ericsson in US operator network

Low-band channel || 12.5% MBSFN || Mostly TDM-scheduling

DSS Field Test : Performance Summary



Note : Results represent mix of near-cell (20%), mid-cell (60%) and far-cell (20%)

Takeaway-1 : DSS-OH along expected line

Takeaway-2 : CRS & PDSCH impact NR somewhat more

RF Scenario

- Near-cell : SINR >20dB
- Mid-Cell : SINR > 12dB
- Far-Cell : SINR > 3dB
- 60% mid-cell; 20% far-cell; 20% near-cell

Test Condition

- Stationary condition
- Simultaneous LTE & NR test
- Rotating table to randomize fading / shadowing

Test Definition – TC3

- Single-Cell, 10MHz DSS
- LTE, NR & DSS neighbor muted

Test Definition – TC4

- Embedded cell scenario
- All neighbors turned on with only CRS
- Testing at same cell & location

Test Definition – TC5

- TC4 + Nbr PDSCH 50% loaded
- Controlled test

Test Definition – TC6

- TC4 + Nbr PDSCH 100% loaded
- Controlled test

Relative Impact of Neighbor Interference (CRS & PDSCH) is higher to NR than LTE

Considerations for CRS-IC benefits

- CRS-IC is only effective if neighbor cell is unloaded
 - CRS-IC for interfering PDSCH+CRS makes no difference
 - CRS-IC is applicable in a certain (not necessarily small) fraction of time
- CRS-IC is mostly effective when neighbor cell CRS is within ~ 6 dB of serving
 - \rightarrow CRS-IC is not applicable to near-cell and mid-cell UEs (only to far cell)
 - This is in contrast with the fact that CRS impact itself is present in a large fraction of the cell area
 - CRS impact is significant even if CRS of unloaded neighbor is 6-12 dB below serving

Complexity of CRS-IC

- Even if the UE is dual mode LTE+NR, the CRS-IC capability doesn't exist in the NR part
 - Adding this capability is a non-trivial added complexity
- CRS-IC was not accounted for in the NR PDSCH processing timelines
 - Adding CRS-IC would require new set of timelines developed for DSS
- → CRS-IC would not be RAN4-only work

DSS Overhead Reduction - Recommendation

Feature	Description	Low-Band	Mid-Band
RM Around PSS/SSS	<ul style="list-style-type: none">NR-PDSCH rate-matching around LTE-PSS/SSS		
RM Around DL DCI	<ul style="list-style-type: none">NR-PDSCH in CCH symbol-2 with RM around CCE		
Colliding CRS	<ul style="list-style-type: none">Neighbor v-shift alignment		
Increase MBSFN	<ul style="list-style-type: none">Use up to 60% MBSFN subframes		
RM around Nbr CRS	<ul style="list-style-type: none">Use second CRS pattern (Rel-16) to rate-match around dominant neighbor CRS		

10%-15% DSS overhead reduction possible

Conclusions

- Limited expectations on CRS-IC benefits
- Use Rel-16 feature of rate matching around 2nd CRS pattern as baseline
 - Consider CRS-IC only if it is evaluated and show benefit over the Rel-16 solution
- Use optimized parameter settings for controlling overhead



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