



3GPP TSG-RAN WG4 Meeting #83  
Hangzhou, China, May 15-19, 2017  
Agenda Item: 13

R4-1704650

# Motivation for a WI proposal: LTE CRS-IM Performance Requirements for Single RX Chain UEs

Intel Corporation

# Work Item Justification

## Single RX Chain Devices

Many LTE IOT devices are expected to be equipped with single RX chain in order to achieve

- Cost reduction
- Reduced power consumption
- Smaller device size

Single RX chain IOT devices use cases:

- Low cost IOT (MTC, eMTC, NB IOT): Low data rate, low power, low complexity/cost  
MTC use cases such as smart metering, building automation, smart city, etc
- Wearables (FeMTC, Cat 1 UE + 1RX): More high end use cases, which still require reduced power consumption, but support higher data rate and have more flexibility in terms of the baseband complexity.

# Work Item Justification

## Advanced Receivers for Single RX Chain

In the LTE Rel.11-14, multiple enhancements of UE advanced receiver for the interference-limited environments were introduced

- Key enhancements: LMMSE-IRC, CRS-IM, SU-MIMO IS/IC, NAICS, and others.
- Features introduced for high-end UEs with either 2 or 4 RX chains

### Single RX chain UEs

- All existing performance requirements for 1 RX chain UEs are defined for the noise limited scenarios and are based on MRC processing.
- Advanced IS/IC receivers can be used to improve the performance in the interference-limited conditions.
- Wearable devices are capable to support increased baseband complexity comparing to Low-cost MTC and can potentially support some IS/IC features.

# Work Item Justification

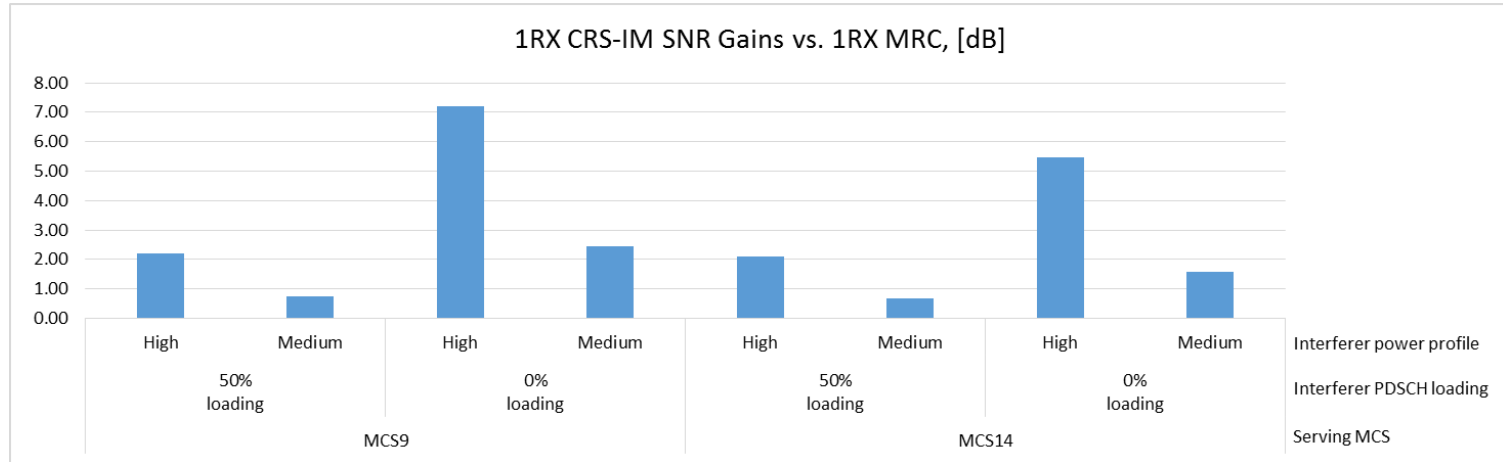
## CRS-IM for Single RX chain

CRS-IM can be used for Single RX chain UEs to improve performance in the interference-limited scenarios

- Single RX chain UEs cannot apply the linear interference suppression (e.g. MMSE-IRC).
- Non-linear interference suppression and cancellation (IS/IC) techniques can be used to improve the performance in the interference-limited conditions.
- CRS-IM is the main candidate to improve the 1RX chain UEs performance in the interference-limited scenarios considered in the Rel-13 CRS-IM and Rel-14 Enhanced CRS-IM work items
- Comparing to other IC techniques, CRS-IM functionality has relatively limited complexity and power consumption impacts

# Work Item Justification

## CRS-IM for Single RX chain



*CRS-IM can provide substantial performance gains for the 1 RX chain UEs in the interference-limited scenarios with the dominant CRS interference*

# Work Item Justification

## Summary

### Conclusions

- Single RX capable UEs are emerging in the market
- Inter-cell interference is one of the key factor to limit the DL performance
- CRS-IM receivers can provide substantial performance improvement for the 1RX capable UEs.

### Proposal

- Organize Rel-15 RAN4-led WI to introduce CRS-IM performance requirements for the single RX chain UEs with the focus on the wearable use cases

# Work Item Objectives

Investigate feasibility of CRS-IM receivers for the UEs equipped with 1 RX chain

- Identify target scenarios including deployment scenarios, interference models, and others.
  - Reuse Rel-13/14 CRS-IM assumptions as the starting point.
- Identify reference CRS-IM receiver structure assumptions including at least number of cancelled interference cell(s)
- Evaluate the CRS-IM performance benefits for the Single RX chain UEs

Specify UE demodulation and CSI reporting performance requirements for the UEs equipped with 1 RX chain

The work should be done under the following assumptions:

- Target device types
  - Rel-14 “Cat 1 UE + 1RX” capable devices
  - Rel-14 FeMTC capable devices
- Consider both 2 and 4 CRS APs scenarios
- Focus on the Non-colliding CRS scenarios

