**3GPP TSG-RAN WG4 Meeting # 111 R4-24xxxxx**

**Fukuoka Meeting, May 20th – May 24th, 2024**

**Source: Skyworks, Murata, Qualcomm, Samsung, Nokia, (...)**

**Title:** **WF on HPUE MSD Simplification**

**Agenda item: 6.18.2**

**Document for: Approval**

1. Introduction

During RAN4#110bis and RAN4#111, guidelines to help proponents derive the PC2 1Tx and PC2 2Tx FDD MSD requirements were discussed for the MSD due harmonic interference [1,2,3,4,5]. Several challenges prevent delivering a consolidated set of guidelines for all MSD types for both intra-band CA and for inter-band CA:

For inter-band CA:

* So far, RAN4 has only discussed guidelines for MSD due to harmonic interference, and even under that reduced scope, a unified set of guidelines is difficult to define due to the impact of different RF-FE assumptions on the relationship between an agreed PC3 MSD level and a PC2 MSD level (1Tx/2Tx),
* Guidelines for cross-band isolation interference have not been discussed yet.

For intra-band CA, few discussions have been held so far.

Considering Rel-18 is close to completion and considering that Rel-19 may introduce more HPUE MSD analyses challenges due to say PC2 2Tx FDD + PC2 TDD inter-band CA cases, this WF brings a wide range of options that may help reduce RAN4 test burden, simplify MSD analysis and reduce RAN4 workload.

1. WF

As background information, up until now RAN4 must handle up to 6 different types of MSDs:

* Type 1: 1UL Intra-band MSD,
* Type 2: 2UL Intra-band MSD
* Type 3: Inter-band CA UL harmonic MSD,
* Type 4: Inter-band CA Rx harmonic mixing MSD,
* Type 5: Inter-band CA MSD due to dual-UL IMD interference, including triple beat,
* Type 6: Inter-band CA MSD due to cross-band isolation interference.

With the introduction of single PC2 FDD operation, several inter-band CA MSD test points need to be re-evaluated. Workload is heavy on RAN4.

**<Way forward on simplifying HPUE MSD Analyses>**

Interested companies are invited to share their views on the following options at the next meeting:

For all types of MSDs:

* Option 1: RAN 4 defines only the default power class inter-band CA and intra-band CA MSD requirements, and the new HPUE MSD requirements are no longer specified in the TS. The legacy agreed HPUE MSD test points are not impacted and are kept in the TS.
* Option 2: RAN 4 defines the default power class inter-band CA and intra-band CA MSD requirements, and RAN4 specifies equations or simplified guidelines (like in [3,4]) or lookup tables “LUT” (like in [5]) that define the relationship between the default power class MSD and the HPUE MSD requirements:
  + Option 2a: Equations/LUT are captured in the RAN4 TS,
  + Option 2b: Equations/LUT are not captured in the RAN4 TS and are provided to RAN5.
* Option 3: Keep the existing way of working, i.e. RAN4 analyses case by case all HPUE MSD requirements and experts flag TP for TRs for which MSD needs corrections/re-evaluations.
* Other options are not precluded.

References

1. R4-2405956, Guidelines for PC2 FDD Dual-TX MSD, 3GPP TSG-RAN WG4 Meeting # 110-bis, Changsha, China, Skyworks Solutions, Inc.
2. R4-2406574, WF on PC2 FDD MSD Guidelines, 3GPP TSG-RAN WG4 Meeting # 110-bis, Changsha, China, Skyworks Solutions, Inc., Qualcomm, Nokia.
3. R4-2407374, Simplified MSD calculation guidelines for PC2 FDD, 3GPP TSG-RAN WG4 Meeting # 111, Fukuoka, Japan, Murata Manufacturing Co Ltd.
4. R4-2408844, About FDD PC2 CA MSD, 3GPP TSG-RAN WG4 Meeting # 111, Fukuoka, Japan, Qualcomm, Inc.
5. R4-2407156, Guidelines for FDD PC2 Harmonic MSD Analysis, 3GPP TSG-RAN WG4 Meeting # 111, Fukuoka, Japan, Skyworks Solutions, Inc.,