3GPP TSG-RAN WG4 Meeting #76 **R4-154919**
Beijing, China, 24 – 28 August, 2015

Source: **NEC**

Title: **TP on OTA sensitivity**

Agenda item: **7.2.3 OTA sensitivity requirements**

Document for: **Approval**

Introduction

OTA sensitivity requirements were discussed intensively [1-8] during RAN4#75-AAS-AH in Venice and a contribution which summarized the agreements during the Ad-Hoc was technically endorsed in [9].

This contribution provides the text proposal based on the agreements.

Text Proposal

7.2.1 OTA sensitivity

The OTA sensitivity requirement applies to the AAS base station operating as a system; i.e. including combining of received signals from all active receivers

7.2.1.1 Requirement definition

The OTA sensitivity requirements are based upon a manufacturer declaration. For the purpose of minimum and optional declaration, following concept is defined.

"OTA Sensitivity Direction Range" (OSDR) is used for the purpose of OTA sensitivity declaration. An OSDR may consist of three components:

- A minimum EIS level
- Sensitivity RoAoA
- Redirection range (option)

A minimum EIS level represents the value above which a specified throughput (E-UTRA) or BER (UTRA) requirement is met in the sensitivity RoAoA/redirection range.

Sensitive RoAoA is a set of angles of arrival in θ and φ within which a specified throughput (E-UTRA) or BER (UTRA) shall be met when the EIS of the arriving signal is equal to or greater than the declared minimum EIS level. It is expected that the AAS BS shall be able to receive signals from anywhere within a sensitivity RoAoA without any need for reconfiguration.

A redirection range is an optional component which is a set of angles of arrival in θ and φ within which a sensitivity RoAoA may be positioned. The redirection range may be larger than the range bounded by the θ and φ captured with any single RoAoA. Reconfiguration of the AAS BS is expected to receive signals within the redirection range but outside of a range that can be covered by the configured sensitivity RoAoA.

The way how to declare the sensitive RoAoA and redirection range is FFS.

7.2.2 The core requirements

The manufacturer shall declare a minimum EIS level and a sensitivity RoAoA that is intended as the "cell wide coverage" for which the specified throughput or BER requirement is met. "Cell wide coverage" is a coverage area where services by the AAS BS are supposed. As an example "cell wide coverage" area would correspond to an area that is typical covered by a non-AAS BS fitted with a passive antenna. For E-UTRA, the requirement is to meet or exceed the throughput when the AAS BS is presented with a specified stimulus signal transmitted through a specified channel at the specified received signal level.

For UTRA, the requirement is to meet or achieve a lower BER when the AAS BS is presented with a specified stimulus signal transmitted through a specified channel at the specified received signal level.

The stimulus signal is the fixed reference measurement channel (FRC) for target throughputs or BER as specified in non-AAS requirements in TS25.141 for UTRA FDD, TS25.142 for UTRA TDD and TS36.141 for E-UTRA. FRC for non-fading conditions/no multipath will be used. Criteria for identifying the sensitivity requirement are FFS.

As an optional declaration, the manufacturer can also declare additional areas where the minimum EIS level is equal to or better than the declared value above. Only one of these areas, or the area declared above can be "active" wholly at any time. OTA sensitivity requirement shall be met anywhere within the "active" area, but does not need to be able to meet for signals arriving from an "inactive" area. Such additional areas are allowed to overlap.

It is not excluded that the manufacturer declares additional minimum EIS levels and corresponding areas.

7.2.3 The conformance requirements

For conformance testing purposes, the manufacturer shall declare the reference direction of the sensitivity RoAoA and four maximal extent directions that bound the sensitivity RoAoA. The four maximal directions shall be defined as follows:

- The maximum extent from the reference direction in the positive φ direction while maintaining the reference direction θ value.
- The maximum extent from the reference direction in the negative φ direction while maintaining the reference direction θ value.
- The maximum extent from the reference direction in the positive θ direction while maintaining the reference direction φ value.
- The maximum extent from the reference direction in the negative θ direction while maintaining the reference direction φ value.

A specified throughput (E-UTRA) or BER (UTRA) requirement is met at the four maximal extent direction points with the declared minimum EIS value.

The received signal level can be represented as a field-strength or EIS power level. The relation between field-strength and EIS is:

$$EIS = E - 20\log_{10}(f) + 77.2 \quad \text{[dBm]}$$

,where E is the field strength in units of dBμV/m and f is carrier frequency in MHz.

References

[1] R4-75AH-AAS-0050, Proposal on Declaration for AAS OTA Sensitivity requirements, NEC

[2] R4-75AH-AAS-0009, How to weight and combine the received signals for OTA sensitivity requirement, NTT DOCOMO

[3] R4-75AH-AAS-0010, Consideration on how to define OTA sensitivity requirements, NTT DOCOMO

[4] R4-75AH-AAS-0013, On OTA sensitivity, SEI

[5] R4-75AH-AAS-0019, OTA sensitivity framework, Ericsson

[6] R4-75AH-AAS-0028, Declarations relating to the OTA sensitivity requirement, Ericsson

[7] R4-75AH-AAS-0073, OTA sensitivity terminology discussion, Huawei

[8] R4-75AH-AAS-0086, Consideration of directions for AAS OTA coverage area, Nokia Networks

[9] R4-75AH-AAS-0091, Agreements on OTA sensitivity, NEC, Ericsson, Huawei, SEI, ALU.