**3GPP TSG-RAN4 Meeting #116bis *R4-2514533***

**Prague, Czech Republic, 13rd – 17th October 2025**

**Agenda item:**  4.1.3

**Source:** Moderator (CMCC)

**Title:** Topic summary for [116bis][326] A-IoT\_Maintenance

**Document for:** Information

# Introduction

*This thread focuses on maintenance part of Rel-19 Ambient IoT in NR and corresponds to agenda 4.20.1, 4.20.2, 4.20.3.*

# Topic #1: RF requirements for A-IoT device

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513357 | CMCC | Observation 1: it seems hard to define one uniform backscatter power upper limit. Proponent are suggested to propose some reasonable value for this power limit.  Observation 2: M=6 seems OK for REFSENSE testing.  Proposal 1: RAN4 can only retain 1PRB and delete 2/3/4PRB configurations for measurement channel.  Observation 3: based on current RAN2 conclusion, TBS is 224bits totally.  Proposal 2: wait for RAN2 conclusion of whether SA3 information should be added or not before concluding TBS. |
| R4-2513359 | CMCC | Draft CR on 38.191 for A-loT device RF requirement   * Adding clause 6.1 the general part. * Updating sub-clause number for the remaining parts of clause 6 |
| R4-2513562 | vivo | draft CR on requirement applicability for bandwidth of AIoT device  1. Align the terminology of R2D channel bandwdith  2. Clarify the backscatter loss is applied to all devcie D2R channel bandwidth  3. Clarify the Reference sensitivity and EIS partial sphere coverage are applied to all R2D channel bandwidth. |
| R4-2514268 | ZTE Corporation, Sanechips | Draft CR to TS38.191: A-IoT device maintenance  1) Avoid the unused reference;  2) Remove the BS related description in the device specification in clause 5.3  3) Add more clarification on Annex B;  4) Improve the wording on Annex E; |
| R4-2514363 | Ericsson | draftCR for 38.191:Maintenance CR   * adding missing table in annex A |
| R4-2514416 | Huawei, HiSilicon | **Proposal 1: Use the test configuration in Table 2 for D2R measurement.**  Table 2: Test configuration for D2R measurement   |  |  | | --- | --- | | **Measurement parameter** | **Value** | | **CW frequency (FCW)** | According to TS 38.192 | | **Filter passband range for D2R upper sideband** | to | | **Filter passband range for D2R lower sideband** | to |   **Proposal 2: Use the FRC in Table 3 for REFSENS test.**  Table 3: Fixed Reference Channels for REFSENS   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Component | Parameter | Unit | Value | | | | | **General** | PRB | RBs | 1 | 2 | 3 | 4 | | SCS | kHz | 15 | 15 | 15 | 15 | | **SIP** | Bit length | Bits | 8 | 8 | 8 | 8 | | Mapping to OFDM | Chips/Symbol | 4 | 4 | 4 | 4 | | **CAP** | Bit length | Bits | 4 | 4 | 4 | 4 | | M | Chips/Symbol | 6 | 6 | 6 | 6 | | **PRDCH** | TBS | Bits | Depending on the size of the MAC PDU of A-IoT CFA paging message | | | | | CRC | Bits | 16 | 16 | 16 | 16 | | M | Chips/Symbol | 6 | 6 | 6 | 6 | | **Postamble** | Bit length | Bits | 4 | 4 | 4 | 4 | | M | Chips/Symbol | 6 | 6 | 6 | 6 | | **Padding** | Padding for last OFDM symbol | Chips | Depending on the TBS | | | |   **Proposal 3: Consider to use a larger M value (M=12 or 24) for PRDCH to test the maximum input level for devices. An example configuration is shown in Table 4.**  Table 4: Fixed Reference Channels for maximum input level   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Component | Parameter | Unit | Value | | | **General** | PRB | RBs | 2 | 3 | | SCS | kHz | 15 | 15 | | **SIP** | Bit length | Bits | 8 | 8 | | Mapping to OFDM | Chips/Symbol | 4 | 4 | | **CAP** | Bit length | Bits | 4 | 4 | | M | Chips/Symbol | 12 | 24 | | **PRDCH** | TBS | Bits | Depending on the size of the MAC PDU of A-IoT CFA paging message | | | CRC | Bits | 16 | 16 | | M | Chips/Symbol | 12 | 24 | | **Postamble** | Bit length | Bits | 4 | 4 | | M | Chips/Symbol | 12 | 24 | | **Padding** | Padding per OFDM symbol excluding SIP and Postamble | Chips | N/A | 2 | | **Padding** | Padding for last OFDM symbol | Chips | Depending on the TBS | |   **Proposal 4:** **Use the D2R RMC in Table 5 to test spurious emission requirement. Whether to use the same RMC for testing backscatter power and SEM is to be confirmed.**  Table 6: FRC for [backscatter power, SEM and] spurious emissions   |  |  |  | | --- | --- | --- | | **Parameter** | **Unit** | **Value** | | Transmission BW | kHz | 15 | | TBS | Bits | Depending on the length of AIoT device ID | | CRC | Bits | 16 | | FEC code rate |  | 1/3 | | Block repetition number |  | 1 | | Preamble length | Bits | 31 | | Midamble length | Bits | 31 | | Interval for midamble insersion | Bits | 48 | | Additional midamble insertion |  | No | | Small frequency shift | kHz | 480 | | Modulation |  | BPSK/OOK (NOTE1) | | NOTE 1: The modulation scheme used is up to device implementation. | | | |
| R4-2514417 | Huawei, HiSilicon | Draft CR Corrections for device RF requirements   * Add test configuration and FRC for D2R. Correct the error for R2D FRC and D2R channel bandwidth requirements. |

## Open issues summary

Most of draft CRs have been endorsed during last meeting.

### Sub-topic 1-1 Test configuration for A-IoT device

**Issue 1-1: backscatter power**

* Proposals:
  + Option 1: Use the test configuration in Table 2 for D2R measurement.(Huawei)

Table 2: Test configuration for D2R measurement

|  |  |
| --- | --- |
| **Measurement parameter** | **Value** |
| **CW frequency (FCW)** | According to TS 38.192 |
| **Filter passband range for D2R upper sideband** | to |
| **Filter passband range for D2R lower sideband** | to |

* + Option 2: others
* Recommended WF
  + FFS.

**Issue 1-2: REFSENSE**

* Proposals:
  + Option 1: The remaining issues for REFSENSE is M value, the PRB configuration and FRC PRDCH TBS.(CMCC)
    - M =6 or 8 are both OK
    - RAN4 can only retain 1PRB and delete 2/3/4PRB configurations for measurement channel
    - wait for RAN2 conclusion of whether SA3 information should be added or not before concluding TBS.
  + Option 2: (Huawei)
    - Option 2.1: Use the FRC in Table 3 for REFSENS test

Table 3: Fixed Reference Channels for REFSENS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Parameter | Unit | Value | | | |
| **General** | PRB | RBs | 1 | 2 | 3 | 4 |
| SCS | kHz | 15 | 15 | 15 | 15 |
| **SIP** | Bit length | Bits | 8 | 8 | 8 | 8 |
| Mapping to OFDM | Chips/Symbol | 4 | 4 | 4 | 4 |
| **CAP** | Bit length | Bits | 4 | 4 | 4 | 4 |
| M | Chips/Symbol | 6 | 6 | 6 | 6 |
| **PRDCH** | TBS | Bits | Depending on the size of the MAC PDU of A-IoT CFA paging message | | | |
| CRC | Bits | 16 | 16 | 16 | 16 |
| M | Chips/Symbol | 6 | 6 | 6 | 6 |
| **Postamble** | Bit length | Bits | 4 | 4 | 4 | 4 |
| M | Chips/Symbol | 6 | 6 | 6 | 6 |
| **Padding** | Padding for last OFDM symbol | Chips | Depending on the TBS | | | |

* Recommended WF
  + FFS.

**Issue 1-3: maximum input level**

* Proposals:
  + Option 1: Consider to use a larger M value (M=12 or 24) for PRDCH to test the maximum input level for devices. An example configuration is shown in Table 4.(Huawei)

Table 4: Fixed Reference Channels for maximum input level

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Parameter | Unit | Value | |
| **General** | PRB | RBs | 2 | 3 |
| SCS | kHz | 15 | 15 |
| **SIP** | Bit length | Bits | 8 | 8 |
| Mapping to OFDM | Chips/Symbol | 4 | 4 |
| **CAP** | Bit length | Bits | 4 | 4 |
| M | Chips/Symbol | 12 | 24 |
| **PRDCH** | TBS | Bits | Depending on the size of the MAC PDU of A-IoT CFA paging message | |
| CRC | Bits | 16 | 16 |
| M | Chips/Symbol | 12 | 24 |
| **Postamble** | Bit length | Bits | 4 | 4 |
| M | Chips/Symbol | 12 | 24 |
| **Padding** | Padding per OFDM symbol excluding SIP and Postamble | Chips | N/A | 2 |
| **Padding** | Padding for last OFDM symbol | Chips | Depending on the TBS | |

* + Option 2: Others
* Recommended WF
  + FFS.

**Issue 1-4: Other requirements**

* Proposals:
  + Option 1: Use the D2R RMC in Table 6 to test spurious emission requirement. Whether to use the same RMC for testing backscatter power and SEM is to be confirmed. (Huawei)

Table 6: FRC for [backscatter power, SEM and] spurious emissions

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Transmission BW | kHz | 15 |
| TBS | Bits | Depending on the length of AIoT device ID |
| CRC | Bits | 16 |
| FEC code rate |  | 1/3 |
| Block repetition number |  | 1 |
| Preamble length | Bits | 31 |
| Midamble length | Bits | 31 |
| Interval for midamble insersion | Bits | 48 |
| Additional midamble insertion |  | No |
| Small frequency shift | kHz | 480 |
| Modulation |  | BPSK/OOK (NOTE1) |
| NOTE 1: The modulation scheme used is up to device implementation. | | |

* + Option 2: Others
* Recommended WF
  + FFS.

### Sub-topic 1-2 recommendation for the draft CR provided in this meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **recommendation** |
| R4-2513359 | CMCC | * Adding clause 6.1 the general part. * Updating sub-clause number for the remaining parts of clause 6 | Further check it could be endorsed. |
| R4-2513562 | vivo | 1. Align the terminology of R2D channel bandwdith  2. Clarify the backscatter loss is applied to all devcie D2R channel bandwidth  3. Clarify the Reference sensitivity and EIS partial sphere coverage are applied to all R2D channel bandwidth. | Further check it could be endorsed. |
| R4-2514268 | ZTE Corporation, Sanechips | 1) Avoid the unused reference;  2) Remove the BS related description in the device specification in clause 5.3  3) Add more clarification on Annex B;  4) Improve the wording on Annex E; | Further check it could be endorsed. |
| R4-2514363 | Ericsson | draftCR for 38.191:Maintenance CR  adding missing table in annex A | Further check it could be endorsed. |
| R4-2514417 | Huawei, HiSilicon | Add test configuration and FRC for D2R. Correct the error for R2D FRC and D2R channel bandwidth requirements. | Wait for the agreements of the above issues |

# Topic #2: RF requirements for A-IoT BS and CW

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513358 | CMCC | Observation 1: RAN4 to further check whether it is necessary to modify above CW phase noise based on CW’s implementation performance. |
| R4-2513380 | Huawei, HiSilicon | **Proposal 1:** No need to define ACLR absolute limit for A-IoT BS.  **Proposal 2:** For A-IoT operation, A-IoT requirements for receiver and transmitter shall apply with a frequency offset **Foffset**as defined in Table 3 below where CBW is defined in 5.3.1 and 5.3.2 of TS38.194.  **Table 3 Foffset for A-IoT operation**   |  |  | | --- | --- | | **Carrier** | **Foffset** | | Ambient IoT | 100 kHz+CBW/2 |   **Proposal 3:** For 3.52M D2R CBW, correct the interfering signal center frequency offset to the lower/upper Base Station RF Bandwidth from +/-100kHz to +/-1500kHz.   * **Table 7.3.1.2-1: Base station ACS requirement**  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **A-IoT**  **channel bandwidth of the lowest/highest carrier received [kHz]** | **Wanted signal mean power [dBm]** | **Interfering signal mean power [dBm]** | **Interfering signal centre frequency offset to the lower/upper Base Station RF Bandwidth edge [kHz]** | **Type of interfering signal** | | 200 | PREFSENS + 6dB (Note) | -53 | ±100 | 5 MHz DFT-s-OFDM NR signal, 15 kHz SCS, 1 RB，closest to wanted signal | | 3520 | PREFSENS + 6dB (Note) | -53 | ±2500 | 5 MHz DFT-s-OFDM NR signal | | Note: PREFSENS depends on the sub-carrier spacing as specified in Table 7.2.2-1 | | | | |  * **Table 7.3.1.2-2: Base Station ACS interferer frequency offset values**  |  |  |  | | --- | --- | --- | | ***BS channel bandwidth* of the *lowest/highest carrier* received (kHz)** | **Interfering signal centre frequency offset from the lower/upper *Base Station RF Bandwidth edge* (kHz)** | **Type of interfering signal** | | 200 | ±100 | 5 MHz DFT-s-OFDM NR signal, 15 kHz SCS, 1 RB，closest to wanted signal | | 3520 | ±2500 | 5 MHz DFT-s-OFDM NR signal |   **Proposal 4:** Remove multi-band related sentence for A-IoT BS blocking requirements. Correct the interfering signal center frequency offset to the lower/upper Base Station RF Bandwidth to +/-7.5MHz.  **Table 7.3.2.2-1(in TS38.194): Base station general blocking requirement**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | ***BS channel bandwidth* of the *lowest/highest carrier* received (kHz)** | **Wanted signal mean power (dBm)  (Note 2)** | **Interfering signal mean power (dBm)** | **Interfering signal centre frequency minimum offset from the lower/upper *Base Station RF Bandwidth edge* (MHz)** | **Type of interfering signal** | | 200 | PREFSENS + 6 dB | -38 | ±7.5 | 5 MHz DFT-s-OFDM NR signal  15 kHz SCS, 15 RBs | | 3520 | PREFSENS + 6 dB | -38 | ±7.5 | 5 MHz DFT-s-OFDM NR signal  15 kHz SCS, 25 RBs | | NOTE 1: PREFSENS depends also on the *BS channel bandwidth* as specified in tables 7.2.2-1 | | | | |   **Proposal 5:** Remove multi-band related sentence for A-IoT BS narrowband intermodulation requirements. Correct the type of interfering signal from 3M LTE signal to 5M NR signal.  **Table 7.6.2-1: Narrowband intermodulation performance requirement for A-IoT Medium Range BS**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Channel bandwidth of the lowest/highest carrier received [kHz]** | **Wanted signal mean power [dBm]** | **Interfering signal mean power [dBm]** | **Interfering RB centre frequency offset from the lower/upper Base Station RF Bandwidth edge [kHz]** | **Type of interfering signal** | | 200 | PREFSENS + 6dB\* | -53 | ±340 | CW | | -53 | ±880 | 5MHz NR signal, 1 RB\*\* | | 3520 | PREFSENS + 6dB\* | -53 | ±270 | CW | |  |  | -53 | ±780 | 5MHz NR signal, 1 RB\*\* | | Note\*: PREFSENS depends on the sub-carrier spacing as specified in Table 7.2.2-1.  Note\*\*: Interfering signal consisting of one resource block positioned at the stated offset, the channel bandwidth of the interfering signal is located adjacently to the lower/upper Base Station RF Bandwidth edge. | | | | | |
| R4-2513381 | Huawei, HiSilicon | CR for TS38194 on A-IoT BS RF requirements   * Correct some typos and remove multi-band capable BS for A-IoT. |
| R4-2514269 | ZTE Corporation, Sanechips | Draft CR to TS 38.194: A-IoT BS and CW maintenance  1) Editorial updates in Table 5.3.2.3-1.  2) Update the note in 5.4.1.3-1.  3) Editorial changes in 6.2, 6.3, 6.4, 6.5, 7.3, 7.4,  4) Improve the clause 7.5 and 7.6;  5) Improve the clause 8.2, 8.4, 8.5, Annex A and B |
| R4-2514364 | Ericsson | draftCR for 38.194: Maintenance CR   * Typo corrected, adding side condition of CW signal for BS receiver test except the spurious test, adding CW RF frequecy points in channel raster |

## Open issues summary

### Sub-topic 2-1 A-IoT BS

**Issue 2-1-1: ACLR limit**

* Agreement from R4-2511800:
  + 100kHz offset, 40/45dB
  + ACLR absolute limit can be considered during the maintenance phase
* Proposals:
  + Option 1: No need to define ACLR absolute limit for A-IoT BS. (Huawei)
  + Option 2: Others
* Recommended WF
  + FFS.

**Issue 2-1-2: Foffset for A-IoT operation**

* Proposals:
  + Option 1: For A-IoT operation, A-IoT requirements for receiver and transmitter shall apply with a frequency offset Foffset as defined in Table 3 below where CBW is defined in 5.3.1 and 5.3.2 of TS38.194. (Huawei)

**Table 3 Foffset for A-IoT operation**

|  |  |
| --- | --- |
| **Carrier** | **Foffset** |
| Ambient IoT | 100 kHz+CBW/2 |

* + Option 2: Others
* Recommended WF
  + FFS.

**Issue 2-1-3: ACS**

* Proposals:
  + Option 1: For 3.52M D2R CBW, correct the interfering signal center frequency offset to the lower/upper Base Station RF Bandwidth from +/-100kHz to +/-1500kHz. (Huawei)
  + Option 2: Others
* Recommended WF
  + FFS.

**Issue 2-1-4: In-band blocking**

* Proposals:
  + Option 1: Remove multi-band related sentence for A-IoT BS blocking requirements. Correct the interfering signal center frequency offset to the lower/upper Base Station RF Bandwidth to +/-7.5MHz. (Huawei)
  + Option 2: Others
* Recommended WF
  + FFS.

**Issue 2-1-5: Narrowband intermodulation**

* Proposals:
  + Option 1: Remove multi-band related sentence for A-IoT BS narrowband intermodulation requirements. Correct the type of interfering signal from 3M LTE signal to 5M NR signal. (Huawei)
  + Option 2: Others
* Recommended WF
  + FFS.

### Sub-topic 2-2 A-IoT CW

**Issue 2-1-1: CW phase noise**

* Proposals:
  + Option 1: RAN4 to further check whether it is necessary to modify above CW phase noise based on CW’s implementation performance. (CMCC)
  + Option 2: Others
* Recommended WF
  + FFS.

### Sub-topic 2-3 recommendation for the draft CR provided in this meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **recommendation** |
| R4-2513381 | Huawei, HiSilicon | Correct some typos and remove multi-band capable BS for A-IoT. | Wait for the agreements of the above issues |
| R4-2514269 | ZTE Corporation, Sanechips | 1) Editorial updates in Table 5.3.2.3-1.  2) Update the note in 5.4.1.3-1.  3) Editorial changes in 6.2, 6.3, 6.4, 6.5, 7.3, 7.4,  4) Improve the clause 7.5 and 7.6;  5) Improve the clause 8.2, 8.4, 8.5, Annex A and B | Further check it could be endorsed. |
| R4-2514364 | Ericsson | Typo corrected, adding side condition of CW signal for BS receiver test except the spurious test, adding CW RF frequecy points in channel raster | Further check it could be endorsed. |

# Topic #3: RRM core requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513099 | OPPO | Observation 1: TD2R\_chip is different with different small frequency shift factor in case of FDM.  Proposal 1: For TD2R\_min, update TD2R\_chip as T’chip defined in clause 7.1.2 of TS 38.219. |
| R4-2514175 | Huawei, HiSilicon | **Proposal 1: Update the requirements for “when receiving A-IoT MSG2” to that “UE shall initiate the D2R message transmission as defined in clause 5.3.1”.**  **Proposal 2: Update the requirements for “when not receiving A-IoT MSG2” to that “UE shall not initiate any D2R transmission”.** |
| R4-2514176 | Huawei, HiSilicon | draftCR on RRM core requirements for A-IoT   * Update the random access requirements to get aligned with UE behaviour in 38.391. |

## Open issues summary

**Issue 3-1: TD2R\_min**

* Proposals:
  + Option 1: For TD2R\_min, update TD2R\_chip as T’chip defined in clause 7.1.2 of TS 38.219. (OPPO)
  + Option 2: Others
* Recommended WF
  + FFS.

**Issue 3-2: Correct behaviour when not receiving A-IoT MSG2**

* Proposals:
  + Option 1: (Huawei)
    - Update the requirements for “when receiving A-IoT MSG2” to that “UE shall initiate the D2R message transmission as defined in clause 5.3.1”.
    - Update the requirements for “when not receiving A-IoT MSG2” to that “UE shall not initiate any D2R transmission”.
  + Option 2: Others
* Recommended WF
  + FFS.

### Sub-topic 3-2 recommendation for the draft CR provided in this meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **recommendation** |
| R4-2514176 | Huawei, HiSilicon | Update the random access requirements to get aligned with UE behaviour in 38.391. | Wait for the agreements of the above issues |

# Topic #4: OTA test method for A-IoT device 1

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513360 | CMCC | Draft CR on 38.191 for A-loT device testing   * For sub-clause 8.4.3, 1)Delete brackets in clause 8.4.3. 2)add missing value of the CW incident power at the device antenna, i.e.10dB higher than the receiver sensitivity requirement. * For sub-clause 8.4.2, RF core requirement reference clause for backscatter power measurement is updated as clause 6. * For sub-clause 8.4.4, RF core requirement reference clause for unwanted emission measurement is updated as clause 6.3. |
| R4-2513409 | Huawei, HiSilicon | Draft CR to clause 8.4.3 in 38.191   * Proposal for a TBD value and to remove square bracket in a value |

## Open issues summary

### recommendation for the draft CR provided in this meeting

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **recommendation** |
| R4-2513360 | CMCC | * For sub-clause 8.4.3, 1)Delete brackets in clause 8.4.3. 2)add missing value of the CW incident power at the device antenna, i.e.10dB higher than the receiver sensitivity requirement. * For sub-clause 8.4.2, RF core requirement reference clause for backscatter power measurement is updated as clause 6. * For sub-clause 8.4.4, RF core requirement reference clause for unwanted emission measurement is updated as clause 6.3. | Further check it could be endorsed. |
| R4-2513409 | Huawei, HiSilicon | Proposal for a TBD value and to remove square bracket in a value | Further check it could be endorsed. |