**3GPP TSG-RAN WG4 Meeting #116 R4-2512603**

**Bengalura, India, Aug 25th – 29th, 2025**

**Title:** Way Forward for [116][335] A-IoT\_demod

**Agenda Item:** 7.22.1

**Source:** Huawei, CMCC

**Document for:** Approval

# 1 General

**Issue 1-1: Deployment and topology**

* Agreement
* The assumed deployment and topology D1T1-B for A-IoT demodulation requirements discussion in R19
	+ No need to capture it in RAN4 specification

**Issue 1-2: Operation mode**

* Agreement
* Standalone and in-band operation for Device 1
	+ Same demodulation performance requirements for standalone and in-band operation.
	+ How to capture it in the specification can be discussed during the CR drafting if necessary
* Standalone operation for BS

# 2 Device 1 demodulation requirements

**Issue 2-1: Whether to define PRDCH demodulation requirements for Ambient-IoT**

* Way forward
* Option 1: Define PRDCH demodulation requirement.
* Option 2: Not define PRDCH demodulation requirements for Ambient-IoT considering that it can be verified by the RF REFSENS requirement

**If RAN4 agreed to introduce PRDCH demodulation requirements, further discuss the following open issues:**

**Issue 2-2: Test methodology**

* Agreement
* 10% BLER with $BLER=1− \frac{Number of responsed Message 1}{Number of transmitted Message 0 }$ or $BLER=1− \frac{Number of responsed Message 3}{Number of transmitted Message 2 }$

for testing

* + During countering the number of responsed Message 1 or 3, the TE should check if the responsed Message 1 or Message 3 is the correct response of Message 0 or Message 2 by checking the device ID
	+ Further discuss the message type to be tested

**Issue 2-3: Multiplexing**

* Agreement
* Single device

**Issue 2-4: Antenna configuration**

* Agreement
* 1T1R

**Issue 2-5: Numerology**

* Agreement
* 15kHz SCS

**Issue 2-6: R2D message structure for testing**

* Agreement
* R-TAS (SIP+CAP) + PRDCH + Postamble

R-TAS PRDCH Postamble

**Issue 2-7: TBS**

* Way forward
* Option 1: 20 bits
* Option 2: 96 bits

**Issue 2-8: R2D coding**

* Agreement
	+ R2D line coding to define the corresponding PRDCH requirement

**Issue 2-9: Waveform**

* Agreement
	+ DFT-s-OFDM with OOK-4

**Issue 2-10: M-chips for OOK**

* Way forward
	+ Option 1: 6
	+ Option 2: 24

**Issue 2-11: Repetition**

* Agreement
	+ No repetition configured

**Issue 2-12: Channel Bandwidth**

* Way forward
	+ Option 1: 2 PRBs
	+ Option 2: 3 PRBs

**Issue 2-13: Channel model**

* Agreement
	+ TDLA30-10

**Issue 2-14: Specification structure**

* Way forward
	+ Option 1: RAN4 should specify the Ambient IoT device demodulation requirements in “Ambient IoT device radio transmission and reception”
	+ Option 2: The demodulation requirements can be captured in clause 10 of TS 38.191

# 3 BS demodulation requirements

**Issue 3-1: Whether to define PDRCH demodulation requirement for Ambient-IoT**

* Way forward
	+ Option 1: Define PDRCH demodulation requirement.
	+ Option 2: Not define PDRCH demodulation requirements

**Issue 3-2: D2R message type for testing**

* Way forward
	+ Option 1: Define PDRCH demodulation requirements with Message 1 reception
	+ Option 2: Define PDRCH demodulation requirements with Message 3 reception

**Issue 3-3: D2R message structure for testing**

* Agreement
	+ Option 1: Short D2R transmission without midamble with 31 bits Preamble
	+ Option 2: Long D2R transmission with midamble inserted with 31 bits Preamble and 31 bits Midamble

**Issue 3-4: Reader detection assumption**

* Agreement
	+ Coherence detection

**Issue 3-5: Antenna configuration**

* Agreement
	+ Option 1: 1T1R
	+ Option 2: 1T2R

**Issue 3-6: Numerology**

* Agreement
	+ 15kHz SCS

**Issue 3-7: Modulation**

* Way forward
	+ Option 1: Both BPSK and OOK modulation scheme
	+ Option 2: OOK modulation

**Issue 3-8: Waveform**

* Way forward
	+ Option 1: backscattering a carrier wave (CW)
	+ Option 2: Unmodulated single tone (CW)

**Issue 3-9: Channel coding and FEC**

* Agreement
	+ Channel coding with 1/3 Convolutional Coding

**Issue 3-10: Repetition**

* Agreement
	+ Block-level repetition as 2

**Issue 3-11: SFO assumption**

* Way forward
	+ Option 1: 104 ppm~105 ppm
	+ Other options

**Issue 3-12: Device sampling rate**

* Way forward
	+ Option 1: 1.92MHz device sampling rate
	+ Other options

**Issue 3-13: TBS**

* Way forward
	+ Option 1: 96 bits
	+ Other options

**Issue 3-14: CBW**

* Way forward
	+ Option 1: further discuss how to select the proper CBW
	+ Option 2: postpone the channel bandwidth and (Tb, Tc, R) discussion until related core part is stable

**Issue 3-15: Channel model**

* Agreement
	+ TDL-A30-10

**Issue 3-16: Test methodology**

* Agreement
* 10% BLER with $BLER=1− \frac{Number of responsed Message 0}{Number of transmitted Message 1 }$ or $BLER=1− \frac{Number of responsed Message 2}{Number of transmitted Message 3 }$

for testing

* + During countering the number of responsed Message 0 or 2, the TE should check if the responsed Message 0 or Message 2 is the correct response of Message 1 or Message 3

**Issue 3-17: Specification structure**

* **Way forward**
	+ Option 1: Specify the Ambient IoT BS demodulation requirements in “Ambient IoT Base Station (BS) and Carrier-Wave (CW) node radio transmission and reception” and “Ambient IoT Base Station (BS) and Carrier-Wave (CW) node conformance testing” if RAN4 agreed to define the Ambient IoT BS demodulation requirements.
	+ Option 2: The demodulation requirements can be captured in clause 10 of TS 38.191