3GPP TSG RAN WG1 #108-e R1-220XXXX

e-Meeting, February 21st – March 3rd, 2022

**Title:** [Draft] Reply LS on NR-U channel information and procedures

**Response to:** R3-216042

**Release:** Rel-16

**Work Item:** NR\_unlic-Core

**Source:** [Samsung,] RAN WG1

**To:** RAN WG3

**Cc:** RAN WG2

**Contact Person:**

**Name:** Hongbo Si

**E-mail Address:** Hongbo\_dot\_Si\_at\_samsung\_dot\_com

**1. Overall Description:**

RAN1 thanks RAN3 about the LS (R3-216042) on NR-U channel information and procedures. RAN1 discussed the questions in the LS, and would like to provide the following answers.

**Q1: How should an NR-U channel be represented?**

Answer from RAN1:

It is RAN1 understanding that RAN2 specification has specified “NR ARFCN” to indicate the center frequency and “Bandwidth” to indicate the bandwidth of a NR-U carrier, and ‘Channel ID’ does not exist in current specification.

It is RAN1 understanding that RAN4 specification has specified the allowed values of “NR ARFCN” for the corresponding “Bandwidth” of NR-U carriers (e.g. Table 5.4.2.3-2 and Table 5.4.2.3-3 in TS 38.101-1 for Band n46 and n96, respectively), wherein the allowed carrier bandwidths are 10/20/40/60/80 MHz.

From RAN1 perspective, it is specified in TS 37.213 (Section 4.0) that a NR-U “channel” refers to a carrier or a part of a carrier consisting of a contiguous set of resource blocks (RBs) on which a channel access procedure is performed in shared spectrum.

Moreover, for a NR-U carrier with a bandwidth of 20/40/60/80 MHz, RAN1 has also specified the support of configuring “RB-set” within the NR-U carrier, as described in TS 38.214 (Section 7), wherein an RB set corresponds to a NR-U “channel” with a bandwidth of 20 MHz and center frequency defined in RAN4 specification TS 38.101-1, and the NR-U “channel” is associated with the index of the corresponding RB set (e.g. a value from 0, 1, 2, 3). Whether such index is applicable for RAN3 use case is up to RAN3.

RAN1 also wants to clarify that the answers intentionally distinguish the use of “carrier” and “channel” to avoid potential confusion, and the corresponding interpretation of those wording in other WG may not be the same as RAN1.

**Q2: According to current specifications, is an NG-RAN node supposed to sense the NR-U channel even when no data needs to be transmitted or is channel sensing performed only when the NG-RAN node needs to exchange traffic over the NR-U channel?**

Answer from RAN1:

From RAN1 perspective, it is specified in TS 37.213 that a node (a gNB or a UE) shall perform the channel access procedures for accessing the channel(s) on which the transmission(s) are performed (as described in Section 4.1 for DL or Section 4.2 for UL, respectively).

RAN1 specification doesn’t specify whether a node (a gNB or a UE) needs to perform the channel access procedures when no date needs to exchange traffic over the channel(s), which implies the node (the gNB or the UE) is not required to and not prohibited to perform the channel access procedures for such case.

Moreover, a UE can be configured to perform RSSI measurement (not tied to the data transmission), and report RSSI and channel occupancy to the associated gNB on the channel indicated by *ARFCN-valueNR* in *rmtc-Config*. Whether the sensing in RSSI measurement is applicable for RAN3 use cases is up to RAN3.

**Q3: How is the ED threshold configured in RAN node?**

Answer from RAN1:

According to TS 37.213,

* a gNB shall set the ED threshold to be less than or equal to the maximum ED threshold, wherein the maximum ED threshold is computed based on the maximum output power on the channel, channel bandwidth, and etc., as in Section 4.1.5 of TS 37.213.
* a UE shall set the ED threshold to be less than or equal to the maximum ED threshold, wherein the maximum ED threshold is configured by the higher layer parameter *maxEnergyDetectionThreshold-r16*, if provided, or determined as a default maximum ED threshold computed based on the maximum output power on the channel, channel bandwidth, and etc., as in Section 4.2.3.1 of TS 37.213, with a potential offset configured by the higher layer parameter *energyDetectionThresholdOffset-r16*, if provided.

It is RAN1 understanding that the wording “configured” in Q3 may not be applicable in term of the gNB’s ED threshold according to RAN1 specification, and whether and how the contributing parameters in computing the ED threshold are “configured” between gNBs is up to RAN3.

**Q4: What is the ED threshold granularity (per channel, per cell, per UE…)?**

Answer from RAN1:

According to the answer to Q3, the ED threshold for both gNB and UE is applied per channel, with the definition of channel explained in the answer to Q1.

It is RAN1 understanding that when a UE determines the ED threshold, the higher layer parameters *maxEnergyDetectionThreshold-r16* and/or *energyDetectionThresholdOffset-r16*, if provided, are cell-specific information, and provided under the UE-specific higher layer parameter *ServingCellConfig*.

**2. Actions:**

**To RAN WG3.**

**ACTION:** RAN WG1 respectfully asks RAN WG3 to take the above information into consideration.

**3. Date of Next TSG-RAN WG1 Meetings:**

TSG-WG1 Meeting #109-e 16th– 27th May 2022 e-Meeting

TSG-WG1 Meeting #110 22nd– 26th August 2022 Toulouse, FR