

Liaison from IEEE 802.11 Working Group to 3GPP TSG RAN WG1

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SUBJECT: Use of no/short LBT in the 3GPP NR-U specification

DATE: 18 January 2019

Dear Dr. Chen,

The IEEE 802.11 WG is delighted that 3GPP RAN/RAN1 has agreed to participate in the Coexistence Workshop that is now scheduled to be coincident with the IEEE 802 Plenary meeting in Vienna in July 2019. We will provide further logistical details in another Liaison Statement.

While the Coexistence Workshop will be an important event in the process of assisting the IEEE 802.11 WG and 3GPP RAN/RAN1 to build consensus together on various coexistence related issues, we believe it is still important to address potential topics as soon as they arise between now and the time of the Coexistence Workshop in July 2019. This Liaison Statement contains information and a request about a topic that IEEE 802 and 3GPP RAN/RAN1 were discussing as far back as 2016.

This Liaison Statement from the IEEE 802.11 WG requests that 3GPP RAN1 agree to restrict the use of no/short LBT for Short Control Signalling and support the proposed refined rules in EN 301 893 that are currently under discussion in ETSI BRAN.

- **Situation**

- ETSI BRAN has asked 3GPP RAN1 for feedback on a proposal for restrictions on the use of no/short LBT.
- The use of short LBT for LAA-DRS was a topic of liaisons between IEEE 802 and 3GPP RAN/RAN1 in 2016.
- The liaisons in 2016 ended with an understanding the use of short LBT for LAA-DRS would be revisited.

- **Problem**
 - 3GPP RAN1 is apparently now considering more extensive use of short LBT as part of NR-U.
 - The IEEE 802.11 WG is concerned that increased use of short LBT promotes unfair access and increased contention.
 - The increased use of short LBT by NR-U appears to have been insufficiently justified in 3GPP RAN1.
- **Solution**
 - In contrast, the use of Category 4 LBT has a long history of success.
 - The IEEE 802 WG requests 3GPP RAN1 consider supporting the ETSI BRAN proposed restrictions on no/short LBT.

ETSI BRAN has asked 3GPP RAN1 for feedback on a proposal for restrictions on the use of no/short LBT

The IEEE 802.11 WG is aware of a recent discussion in ETSI BRAN related to a proposal to further restrict the use of no LBT or a short (25µs) LBT for Short Control Signalling in the next revision of EN 301 893. The proposal is to ban the use of no LBT and to reduce the use of the short LBT mechanism from about 5% of the time for a particular device to about 1% of the time. We understand that ETSI BRAN has sent a Liaison Statement to 3GPP RAN1 requesting feedback on the proposal.

The use of short LBT for LAA-DRS was a topic of liaisons between IEEE 802 and 3GPP RAN1/RAN in 2016

The use of no/short LBT was the topic of a number of liaison exchanges between IEEE 802 and 3GPP RAN/RAN1 in 2016. At the time, IEEE 802 expressed a concern that the use of short LBT for LAA-DRS signals (also using a lower ED threshold) was contrary to the fundamental principles of LBT based sharing, particularly if multiple DRSs were sent by multiple eNBs operating independently on the same channel.

The liaisons in 2016 ended with an understanding the use of short LBT for LAA-DRS would be revisited

3GPP RAN1 responded to IEEE 802's concerns by noting that the use of a short LBT for LAA-DRS would be very limited in practice. This assertion was based on the observation that LAA-DRS would often be multiplexed with PDSCH and use regular Category 4 LBT for access.

3GPP RAN1 also noted that LAA-DRS transmissions from eNBs operated by the same operator would be coordinated to be transmitted in a very small window. Ultimately, IEEE 802 suggested that the issue be revisited after LAA deployment experience.

3GPP RAN1 is apparently now considering more extensive use of short LBT as part of NR-U

While there has been limited LAA deployment experience to date, the IEEE 802.11 WG understands that 3GPP RAN1 is proceeding to specify NR-U during 2019. As part of that specification work, the IEEE 802.11 WG has been made aware of proposals in 3GPP RAN1 to make more extensive use of short LBT by NR-U devices (e.g. NR-U TR 38.889 in Tables 7.2.1.3.1-1 and 7.2.1.3.1-4).

In particular, we understand there have been proposals for:

- Transmission of DRS by the gNB up to 5% of the time when the total duration of such transmissions is up to 1 ms

- UEs to use short LBT for Random Access, HARQ-ACK, Scheduling Request, Channel State Information, etc.

The IEEE 802.11 WG is concerned that increased use of short LBT promotes unfair access and increased contention

The use of short LBT promotes unfair access to the medium to those devices that use it. The IEEE 802.11 WG is concerned that these proposals will significantly increase, compared to LAA, the time the medium is accessed using short LBT and thus the likelihood of unfair access.

As the number of independent devices using short LBT increases, there is also an increased likelihood of unnecessary contention, particularly because devices using short LBT will tend to synchronise transmissions immediately after a previous transmission, to the detriment of all devices. It is worth noting that NR-U will result in the deployment of a significantly increased number of independent devices attempting to access the medium compared to LAA, because anyone can operate a NR-U network whereas LAA networks must be deployed in conjunction with one of a very small number of licensed operators at each location.

The increased use of short LBT by NR-U appears to have been insufficiently justified in 3GPP RAN1

The IEEE 802.11 WG understands that at least some 3GPP RAN1 participants justified the increased use of short LBT during the specification of LAA on the basis that 802.11 uses short LBT for the transmission of Beacons. This belief is incorrect. Beacons are always transmitted using Category 4 LBT in 802.11. Unfortunately, the use of short LBT by LAA has now been used to justify its use in NR-U, despite most 3GPP RAN1 participants understanding the faulty justification of its use in LAA.

The increased use of short LBT has also been justified by simulations that show it has no impact on sharing with 802.11 systems. However, a significant issue with these simulations is that they do not appear to address common and important dense deployment scenarios, particularly with multiple overlapping and uncoordinated NR-U systems. The simulations also do not appear to model the impact if 802.11ax (or some other systems) suddenly making more use of short LBT too.

In contrast, the use of Category 4 LBT has a long history of success

It is the IEEE 802.11 WG's longstanding position that fair sharing of unlicensed spectrum by independent systems is best supported by the universal use of Category 4 LBT. Certainly this approach to sharing seems to have assisted Wi-Fi achieve significant socio-economic impact globally in 2018. It is also worth noting that every attempt over the years to depart from this position by 802.11 stakeholders has failed.

The IEEE 802.11 WG requests 3GPP RAN1 consider supporting the proposed restrictions on no/short LBT in ETSI BRAN

The IEEE 802.11 WG requests that 3GPP RAN1 consider supporting the proposal in ETSI BRAN to ban the use of no LBT and restrict the use of short LBT (to about 1%). Alternatively, the IEEE 802.11 WG would be interested in working with 3GPP RAN1 to come to a consensus on more compelling evidence that increased use of short LBT will not have an adverse effect on 802.11 or other systems using unlicensed spectrum.

The IEEE 802.11 WG notes that the proposal in ETSI BRAN to restrict the use of short LBT from about 5% to about 1% per device should be backward compatible with LAA, based on 3GPP RAN1's assertion in R1-1613694 in November 2016 that the use of short LBT for LAA-DRS is *limited in practice*.

We look forward to your response.

Regards,

/s/

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IEEE 802.11 Working Group Chair