

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T MOBILITY LLC, AT&T SERVICES INC., ERICSSON INC., NOKIA OF
AMERICA CORPORATION, T-MOBILE USA, INC.
Petitioners,

v.

DAINGEAN TECHNOLOGIES LTD.,
Patent Owner.

Case No. IPR2024-00510
U.S. Patent No. 10,484,976

DECLARATION OF DR. MARK MAHON

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I, Dr. Mark Mahon, declare as follows:

I. Introduction

1. I have been retained by Petitioners and their counsel, McKool Smith P.C. (“McKool Smith”), as an independent expert consultant in this proceeding regarding U.S. Patent No. 10,484,976 (“the ’976 Patent”) (EX1001). I have been asked to consider whether certain references disclose or suggest the limitations recited in claims 2 and 4 of the ’976 Patent (“the Challenged Claims”).

2. I am being compensated for my work in this proceeding at a rate of \$500 per hour and receiving reimbursement for expenses incurred in the course of my work. My compensation is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

3. This declaration is directed to the Challenged Claims of the ’976 Patent and sets forth certain opinions I have formed, the conclusions I have reached, and the bases for each. The conclusions I present are based on my own judgment. I am not an employee of the Petitioners, McKool Smith, the inventors of the ’976 Patent, or of any affiliated companies.

4. Based on my experience, knowledge of the art at the relevant time, and analysis of prior art references, it is my opinion that the Challenged Claims of the ’976 Patent are unpatentable over the prior art references discussed below.

II. Qualifications

A. Overview

5. I am a Teaching Professor in the School of Electrical Engineering and Computer Science at Pennsylvania State University, University Park, PA (“Penn State” or “PSU”). I have worked on telecommunications networks, including AMPS, IS-95, CDMA2000, GSM, EDGE, UMTS/WCDMA, LTE, and 5G cellular systems since 1988.

6. I received my B.S. in Electronics Engineering from the University of Scranton in 1987. I received my M.S. in Electrical Engineering and Ph.D. in Acoustics from Penn State in 1991 and 2001, respectively.

7. In 1988, after I received my bachelor’s degree, I joined the Central Intelligence Agency (CIA) while pursuing my M.S. degree at Penn State part-time. My first job at the CIA involved designing and testing systems to automatically capture and characterize telecommunication signals and emissions from various computer networking devices.

8. I returned to Penn State in early 1990 to pursue graduate research full-time and complete my M.S. degree. My graduate research work focused on wideband beamforming and adaptive signal processing. After completing my M.S. degree in Electrical Engineering in 1991, I accepted a full-time faculty research position at the Applied Research Lab at PSU, primarily working on classified

programs, and I began working on diverse radio frequency and acoustic sensor systems, including wireless communications and small wireless networks for acoustic tracking, source localization, and feature extraction.

9. I began pursuing my Ph.D. part-time in 1993 while continuing my faculty research position. In 1997, as part of my faculty research position, I began working on classified programs focused on mathematical analytical modeling of cellular communication networks and the development of hardware and software systems to test against cellular networks. My role was to develop the algorithms and write the code running on a specially developed embedded system. For this work, I received a letter of recognition as the “genius behind the VELA software algorithms” from the Director of National Reconnaissance Office (NRO) Systems Engineering and Technology Office. As part of this same work, I was extensively involved in protocol and signaling analysis as well as researching model-specific performance and unique functional characteristics associated with individual mobile devices. The work involved testing dozens of handsets from many manufacturers in controlled and real-world environments against network simulators and live operational networks for each research project.

10. In 2000 my research extended into utilizing non-orthogonal wavelets for improving detection and localization of cellular handsets from high altitude sensor systems. In 2001, I completed my Ph.D., and my research focused on the

utilization of advanced communication signals for wideband characterization and remote sensing of propagation channels.

11. Beginning in 1997 my cellular communications research work focused on CDMA, GSM, EDGE, UMTS, LTE, and 5G cellular systems primarily under grants sponsored principally by the Department of Defense. This classified research work required 3GPP protocol analysis and development of real-time embedded hardware and software systems capable of interacting with cellular networks and cellular handsets. A large portion of my work was directed at architectures, protocols, software, and signaling.

12. I have been working on classified projects since 1988. Before 1998, because the work was not deemed highly classified, I was able to publish eight journal and conference papers. Between 1999 and 2015, I published and presented about a dozen articles in classified settings, but I was only permitted to publish one article in an unclassified symposium. This is because during this period, the vast majority of my research was highly classified. As a result, nearly all of my research results were summarized in classified reports and not available to the general public. Further, because the U.S. government owns any intellectual property resulting from the sponsored research work, I did not pursue or file patent applications.

13. In 2015, I transferred to the School of Electrical Engineering and Computer Science at Penn State as a teaching faculty member. In that role, I have

continued teaching graduate and undergraduate courses, guiding Ph.D. and M.S. students in communication and mobile networking (including LTE and 5G cellular networks), and pursuing research in this and related areas. Since 2015, I have been an author on seven refereed papers as listed in my curriculum vitae (CV) (attached as Exhibit A).

14. Because of my decades of research and my continuing work at Penn State, I have intimate knowledge of telecommunication networks, including the technology involved in the patents in this case. I have been highly recognized as an expert in such systems within the research community. I was recognized twice by the NRO with commendation letters for work dealing with detecting cellular signals in low signal to noise ratio environments. The U.S. Government awarded me over \$12M in grants between 2003 and 2015 for projects focused on mobile communication devices and networks, in which I served as a Principal Investigator (PI), Co-PI, and/or technical lead.

15. Additionally, during my research career, I interacted extensively with computer scientists and engineers responsible for the design, development, and testing of telephony and data networking systems and testbeds. As a research faculty member, I oversaw engineers and computer scientists that executed many joint projects with development organizations. These interactions exposed me to a wide range of computer scientists and engineers working on telecommunication network

technologies. Since 2011, I have been teaching undergraduate and graduate classes in communication and mobile networking and am familiar with the curricula being taught to electrical engineers and computer scientists. The interactions with a wide range of computer scientists and engineers working on telecommunication network technologies and the familiarity with the classes taught to electrical engineers and computer scientists have allowed me to have a good understanding of the level of skills possessed by a person of ordinary skill in the field of cellular technology.

B. Experience with Cellular Networks

16. I have extensive experience with mobile networks in general and LTE and 5G specifically. While most of my research efforts between 1998 and 2015 are highly classified, I can state that they included detailed investigation of network architectures, signaling, and functional behavior. A typical research effort would involve studying 3GPP, 3GPP2, IEEE, and other protocol standards to fully comprehend all aspects of L1, L2, and L3 requirements including timing, bit-level construction of the control and user plane messages, and timing characteristics for a given standard as well as functional behavior of network components and user equipment.

17. From 2006 through 2015 my research focused specifically on LTE. My research continues to this day, although I am no longer operating in a classified environment. During this time, I investigated the performance and functional

differences of many varied network and handset devices to see how differing signaling and environmental factors influenced the behavior of user equipment in a given network environment. This included how synchronization, timing, and signal to interference plus noise ratio (SINR) for a given device would affect specific functional aspects including elements of the receiver structure, decoding and demodulation performance, calculation of parameters used by the device for making decisions and deriving parameters reported to the network.

18. As part of my research work, I built several custom CDMA, GSM, UMTS, and LTE platforms that implemented specific network-side and user equipment-side functionality including custom signal generation and processing structures, particularly the signal processing chains on both the transmit and receive sides. This equipment was developed using network simulation hardware in a laboratory environment and was later tested with corresponding networks in both controlled and fully operational environments. Implementing the transmit and receive chains for custom built protocol-enabled equipment required me to gain an intimate understanding of the relevant 3GPP protocol specifications and the underlying structures. Since 2015, I have been primarily focused on guiding graduate students pursuing research into multiple-input multiple-output (MIMO) techniques to improve throughput in dense-user environments, optimized distributed

processing algorithms, and the implementation of block chain coding techniques to improve handover security in 4G (LTE)/5G (NR) networks.

III. Materials Reviewed and Considered

19. My findings contained in this declaration are based on my education, research, experience, and background in the field of computer and communication networks, and specifically, in relation to wireless communication systems, as well as on my investigation and study of prior art references and other documents disclosed in this declaration, including the following:

Exhibit No.	Description
1001	U.S. Pat. No. 10,484,976 (“the ’976 Patent”)
1002	File History for U.S. Pat. No. 10,484,976
1003	Provisional Patent Application No. 62/443,464
1006	U.S. Pat. No. 10,959,218 (“Babaei”)
1007	Provisional Patent Application No. 62/421,821 (“Babaei Provisional”)
1008	International Publication No. WO 2016/130175 A1 (“Fwu”)
1009	U.S. Pat. Pub. No. 2018/0035332 (“Agiwal”)
1010	Provisional Patent Application No. 62/368,369 (“Agiwal Provisional”)
1011	U.S. Pat. No. 10,869,331 (“Lee”)
1012	International Publication No. WO 2017/171526 A1 (“Lee PCT Publication”)
1013	Certified translation of Lee PCT Publication
1014	Provisional Patent Application No. 62/403,061 (“Lee Provisional”)
1015	Certified translation of Lee Provisional

IV. My Understanding of Certain Patent Law Principles

20. As a technical expert, I am not offering any legal opinions. Rather I am offering technical assessments and opinions. In rendering my analysis, I have been informed by counsel regarding various legal standards for determining patentability. I have applied those standards in forming my technical opinions expressed in this declaration.

21. I understand that in this proceeding, Petitioners have the burden of proving that the Challenged Claims are invalid by a preponderance of the evidence. I understand that “preponderance of the evidence” means that a fact or conclusion is more likely true than not true.

22. The patent claims define the invention made by the inventors and define what the patent owner owns and what the owner may prevent others from using. I understand that an independent claim sets forth all the requirements that must be met to be covered by that claim. I further understand that a dependent claim does not itself recite all of the requirements of the claim but refers to another claim and incorporates all of the requirements of the claim to which it refers.

23. I understand that, in order for a patent to claim priority to an earlier-filed application, the earlier-filed application must provide full written description support for the later-claimed subject matter. I also understand that this written description requirement means that the earlier filed application must demonstrate that the inventors possessed all elements of the later claimed invention at the time of

filing. Finally, I understand that priority is limited to the subject matter actually disclosed.

24. I understand that a claim in an issued patent is unpatentable as anticipated if the recited invention is described in a single prior-art reference that discloses each limitation, either expressly or inherently.

25. It is my understanding that a claimed invention is unpatentable if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Obviousness, as I understand it, is based on the scope and content of the prior art, the differences between the prior art and the claim, and the level of ordinary skill in the art.

26. I understand that under 35 U.S.C. § 103, “[a] patent for a claimed invention may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

27. I understand that a patent claim may be unpatentable as obvious over a single prior art reference or in view of a combination of prior art references. I understand that prior art references may also be combined with the knowledge of a

person of ordinary skill in the art. I further understand that a person of ordinary skill in the art is presumed to know the relevant prior art. I understand that the obviousness analysis may take into account the inferences and creative steps that a person of ordinary skill in the art would employ.

28. I understand that when evaluating obviousness, one must not consider whether the claimed invention would have been obvious to a layman or to an expert; not use hindsight when comparing the prior art to the claimed invention; and not consider what was learned from the teachings of the patent. In particular, I understand that it is improper to use the patent claims as a road map for selecting and combining items of prior art. In other words, one should avoid using the challenged patent as a guide through the prior art references, combining the right references in the right way so as to achieve the result of the claims at issue. Instead, one must put oneself in the place of a person of ordinary skill at the time the invention was made and consider only what was known before the invention was made.

29. I understand that obviousness should be considered in light of the problems known to the person having ordinary skill in the art at the relevant time and the complexity of the alternatives for solving the problem. That individual elements of the claimed invention are disclosed in the prior art is not alone sufficient to reach a conclusion of obviousness.

30. I also understand that when considering the obviousness of a patent claim, one must consider whether a teaching, suggestion, or motivation to combine the references exists so as to avoid impermissibly applying hindsight when considering the prior art. I understand that a teaching, suggestion, or motivation may be found explicitly or implicitly: (1) in the prior art; (2) in the knowledge of those of ordinary skill in the art; or (3) from the nature of the problem to be solved. I also understand that the legal determination of the motivation to combine references allows recourse to logic, judgment, and common sense, but that any such motivation to combine references must still avoid the improper application of hindsight or reliance on the patentee's disclosure of his invention as found in the patent specification, drawings, and claims. In a similar vein, I understand that one should consider whether a person of ordinary skill in the art would have had a reasonable expectation of success in achieving the purported invention.

31. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of the invention, unexpected results of the invention, any long-felt but unresolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged

invention by others in the field. I understand that there must be a nexus—a connection—between any such secondary considerations and the alleged invention. I also understand that contemporaneous independent invention by others is a secondary consideration tending to show obviousness.

32. I understand that in determining whether a prior art reference would have been combined with other prior art or with other information within the knowledge of a person of ordinary skill in the art, the following are examples of approaches and rationales that may be considered:

- combining prior art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of a known technique to improve similar devices in the same way;
- applying a known technique to a known device ready for improvement to yield predictable results;
- applying a technique or approach that would have been “obvious to try,” i.e., choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or

other market forces if the variations would have been predictable to one of ordinary skill in the art;

- numerical ranges disclosed in the prior art that overlap with numerical limitations set forth in the challenged claims;
- whether certain aspects of the patented subject matter were result-effective, such that a person of ordinary skill in the art would know that such element is determinative as to the effectiveness of the patent subject matter; and
- some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. I understand that this teaching, suggestion, or motivation may come from prior art references or from the knowledge or common sense of one of ordinary skill in the art.

33. I have been informed by counsel that the Board construes claims according to the so-called “*Phillips*” standard. Under the *Phillips* standard, terms in a claim are given their ordinary and customary meaning, consistent with the patent’s specification, as understood by a person of ordinary skill in the art. I have been informed by counsel that what is to be considered includes the claims, the patent specifications and drawings, and the prosecution history, including any art listed by

the examiner or the Applicant. I have been informed by counsel that information external to the patent, including expert and inventor testimony and unlisted prior art, are to be considered if ambiguities remain.

V. Level of Ordinary Skill in the Art

34. It is my understanding that a person of ordinary skill in the art (POSITA) is a hypothetical person who analyzes the prior art without the benefit of hindsight. I have been instructed that the level of ordinary skill may be reflected by the prior art of record, and that a person of ordinary skill in the art to which the claimed subject matter pertains would have the capability of understanding the scientific and engineering principles applicable to the pertinent art. I have been instructed that there are multiple factors that may be considered in determining the level of ordinary skill in the art, including: (1) type of problems encountered in the prior art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. I also understand that a POSITA is also a person of ordinary creativity, not an automaton. They would be able to fit the teachings of multiple patents together like a puzzle and have the capability of understanding the scientific and engineering principles applicable to the pertinent art.

35. As stated in the '976 Patent, the "Technical Problem" to which the alleged invention is directed is providing "new signaling, procedures, user

equipment (UE) and base stations for uplink ultra-reliable low latency communications (URLLC).” EX1001 at 1:18-22. In other words, the ’976 Patent concerns systems and methods for a semi-persistently scheduled URLLC transmission.

36. I have been asked to provide a definition for the level or ordinary skill in the art for a POSITA in the field of the ’976 Patent at the time the priority application for the ’976 Patent was filed. To that end, I have been asked to assume for purposes of this declaration that the ’976 Patent is entitled to claim priority to January 6, 2017, which corresponds to the filing date of U.S. Provisional Application No. 62/443,464.

37. Based on my review of the subject matter of the ’976 Patent, as well as my experience in the field, I conclude a POSITA in reference to the ’976 Patent would possess (1) the equivalent of an undergraduate degree in Electrical Engineering or a related field; and (2) at least three years of experience in design, development, and/or testing of telecommunication systems. In addition, a POSITA would also have familiarity with the wireless standards and well-known protocols for data transmission and network management. It is also my opinion that this definition is flexible in the sense that additional education (*e.g.*, a PhD in Electrical Engineering, Computer Science, or Computer Engineering) could substitute for professional experience or *vice versa*.

38. I consider myself to have at least the credentials of a POSITA, and I am capable of addressing the issues from the perspective of such a person. As a result of my education, academic experience, and industrial experience, I am familiar with telecommunication systems, including the wireless standards on which they are based, and with the state of that technology on or around January 6, 2017.

39. All of my opinions in this declaration are from the perspective of a POSITA, as I have defined it above and during the relevant time frame.

VI. Technical Background

40. Prior to the filing date of the '976 Patent, wireless networks were well known and widely used. LTE Advanced was not only standardized but broadly deployed, and the industry had turned its focus to next generation wireless networks.

41. One of the widely accepted requirements for next generation wireless networks was the need for different kinds of services to address the needs of different kinds of devices. The network access required by a smart phone user that may consume hundreds of megabytes of data on demand each day is different from the network access required by a smart meter, which periodically uploads very small amounts of status information. Similarly, smart vehicle systems required extremely low latency access to accommodate critical navigation functions and more conventional network access to support in-car hotspot functions. The industry understood that, in order to accommodate these different data service requirements

in a single network, the new 5G standard would need to permit different UEs to communicate with different latencies and bandwidths. Additionally, higher-frequency bands were also anticipated for 5G, and it was widely understood that the LTE structures that worked well in the world's predominately sub-3GHz networks would need to be adjusted to accommodate 3-6 GHz and mmWave bands.

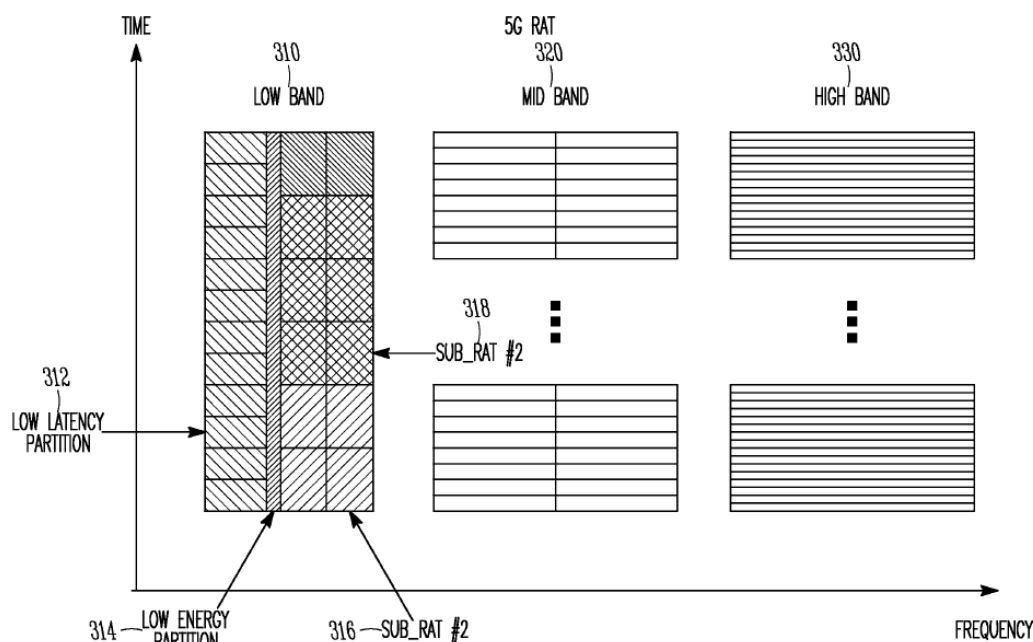
42. The widely accepted strategy for addressing these different demands was the use of different numerologies, such as set forth in Fwu. Numerology refers to the spacing between subcarriers in an OFDM system and the other signal characteristics that follow from subcarrier spacing. There is a well-known fundamental reciprocal relationship between subcarrier bandwidth and symbol duration. A narrower subcarrier bandwidth results in a longer duration OFDM symbol while a wider subcarrier bandwidth results in a shorter duration OFDM symbol. Additionally, in order to maintain orthogonality, subcarriers in an OFDM system must maintain a spacing relative to the subcarrier bandwidth. Numerologies with narrower subcarrier spacing could therefore accommodate more simultaneous transmissions, but with greater latency while numerologies with wider subcarrier spacing could accommodate fewer subcarriers within the same bandwidth but with resultant shorter symbol durations and thus lower latency.

43. The Doppler effect also dictated different subcarrier spacing in the new, higher frequency bands that would be served by 5G networks. The change in

frequency observed at a stationary receiver is proportional to both a transmitter's relative motion to a receiver and the frequency of transmission.¹ A subcarrier spacing that accommodates highway-speed transmitters at the sub-1GHz bands most LTE networks used would experience more than six times the Doppler shift at 6Ghz, and more than 24 times the Doppler shift at 24GHz. Wider subcarrier spacings at higher frequencies reduces the impact of this frequency shift on receiver performance.

44. Accordingly, the new 5G standard needed to accommodate different numerologies both to provide new kinds of services and to support new frequency bands. This is illustrated by Fwu Fig. 3, reproduced below.

¹ $\Delta f = \Delta v / c * f_0$ where Δf is the observed frequency shift, Δv is the relative velocity between observer and transmitter, c is the speed of light, and f_0 is the frequency of transmission.

**FIG. 3**

45. Additionally, in LTE and earlier wireless standards, one concern faced was the allocation of bandwidth to control signaling compared to data signaling. LTE provided a downlink control channel that took up 1, 2, or 3 OFDM symbols from each downlink subframe. Messages sent from the network to a UE were addressed using a radio network temporary identifier, or RNTI, assigned to the UE or to a group of UEs. A UE could verify that a received message was intended for it by applying its RNTI to the CRC² of the message and attempting to decode it. A message that is successfully decoded after applying an RNTI is considered to be

² A CRC, or cyclic redundancy check, is a set of bits that result from applying an algebraic operation to the bits in a message. If the message is accurately received, the algebraic operation will match the CRC. Some CRCs also allow errors to be corrected.

addressed to that RNTI, and the UE would then interpret the message in accordance with any rules that apply for messages sent using that RNTI.

46. A UE also does not know in advance when it will receive a message in the physical downlink control channel, and so applies its assigned RNTIs to the messages it receives and discards those messages not successfully decoded by its assigned RNTIs. This process of attempting to decode each received message is referred to as blind decoding.

47. To reduce the burden on the UE, not every transmission over the physical downlink control channel needed to be decoded. Instead, each UE would only attempt to decode messages received on a subset of the available time/frequency resources. The set of resources where a UE could receive a message in the physical downlink control channel was referred to as a search space.

48. LTE provided for two different kinds of search spaces: a common search space, where multiple UEs could receive a message, and a UE-specific search space, where messages directed to specific UEs could be found. UEs could determine where their search spaces could be found in each subframe based on their assigned RNTIs.

49. One challenge to LTE's approach is that different UEs could be mapped to the same search space. When this happened, only one UE could receive a message

in its UE-specific search space in that subframe, and other UEs mapped to the same search space would need to wait.

50. One strategy in LTE for reducing scheduling collisions between UEs is semi-persistent scheduling, or SPS. An SPS scheduling grant provides a UE with a periodic resource grant without needing to separately schedule each transmission. This is particularly useful when a UE has a persistent demand for data, for example when a UE is used to make a phone call. In LTE each subframe lasts 1ms, so even a short phone call would span tens of thousands of subframes. Allocating a UE a semi-persistent grant required only a single activation and deactivation message, and avoided the need for thousands of additional control messages.

51. Before the filing date of the '976 patent, it was known that the 5G standard would include a similar periodic scheduling mechanism, and it was proposed that the periodic scheduling mechanism would be applicable to URLLC transmissions, which employed the new low-latency numerologies. EX1001 at 2 (citing document directed to “Enhanced semi-persistent scheduling for 5G URLLC” dated Nov. 18, 2016 by the applicant).

VII. The '976 Patent

A. Overview of the '976 Patent

52. The '976 Patent is titled “Signaling, procedures, user equipment and base stations for uplink ultra reliable low latency communications.” As noted above, the alleged invention relates to a semi-persistently scheduled URLLC transmission.

53. For example, the '976 Patent describes “new signaling, procedures, user equipment (UE) and base stations for uplink ultra-reliable low latency communications (URLLC).” EX1001 at 1:19-22. URLLC was known in the art at the time of the '976 Patent, which for example, discloses that “Fifth generation (5G) cellular communications... envisions the use of time/frequency/space resources to allow for enhanced mobile broadband (eMBB) communication and ultra-reliable low latency communication (URLLC) services, as well as massive machine type communication (mMTC) like services.” *Id.* at 7:8-21.

54. The '976 Patent is directed to a UE, wherein the “UE includes receiving circuitry configured to receive, from a base station apparatus, a radio resource control message including first information used for configuring a periodicity for an uplink data transmission. The receiving circuitry is configured to receive on a physical downlink control channel, from the base station apparatus, second information used for indicating an activation for the uplink data transmission. The UE also includes transmitting circuitry configured to transmit, to the base station

apparatus, confirmation information Medium Access Control (MAC) Control Element (CE) for the second information. The transmitting circuitry is configured to perform on a physical uplink shared channel, to the base station apparatus, the uplink data transmission based on the first information and the second information. The receiving circuitry is also configured to receive on the physical downlink control channel, from the base station apparatus, third information used for indicating a deactivation for the uplink data transmission. The transmitting circuitry is also configured to transmit, to the base station apparatus, confirmation information MAC CE for the third information. A MAC protocol data unit subheader with the same index of logical channel identifier (LCID) is used for identifying the confirmation information MAC CE for the second information and the confirmation information MAC CE for the third information.” *Id.* at 2:30-55.

55. The Challenged Claims are directed to the signaling surrounding a periodic uplink resource grant that is configured by RRC and activated and deactivated by DCI formats scrambled using an RNTI different from a C-RNTI or an SPS-RNTI. For example, limitation [2c] reads “the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the

first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology.” *Id.* at Claim 2. However, this is not a main teaching of the ’976 Patent’s specification. In particular, the only reference to the requirement that “the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI” as recited by Claim 2, is found in a singular example in the body of the specification. This example reads that “for example, DCI format to which CRC (Cyclic Redundancy Check) parity bits scrambled by URLLC C_RNTI (i.e., different RNTI from SPS C-RNTI) are attached may be used for activating and/or deactivating UL data transmission (e.g., activating and/or deactivating UL data transmission (e.g., activating and/or deactivating (releasing) PUSCH resource for URLLC data transmission).” *Id.* at 8:41-46.

56. The alleged invention of the ’976 Patent merely combines the background concepts from the prior art outlined above. *See supra*, Section VI. The alleged invention is a semi-persistently scheduled URLLC transmission, which was well known in the art at the time of the invention.

57. Claim 2, exemplary of the ’976 alleged invention, is reproduced below. Claim 4 is a communication method reciting the steps that the base station of Claim 2 must be configured to perform. Limitations 2g, 2h, and 2i are identical to limitations 4g, 4h, and 4i, respectively.

2. A base station apparatus that communicates with a user equipment (UE), comprising:
 - transmitting circuitry configured to transmit a radio resource control (RRC) message comprising first information used for configuring a periodicity,
 - the transmitting circuitry configured to transmit a RRC message comprising second information used for configuring a numerology,
 - the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and
 - receiving circuitry configured to receive confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,
 - the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein
 - the receiving circuitry is configured to receive confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and
 - the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID),
 - the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and
 - the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

EX1001 at Claim 2.

B. Priority Date of the Challenged Claims

58. The '976 Patent, on its face, claims priority to Provisional Application No. 62/443,464 (the "'464 Application"). However, the '464 Application fails to provide written description for the Challenged Claims, and therefore the Challenged Claims cannot claim priority to the '464 Application.

59. In particular, claim limitations [2c] and [4c] of the Challenged Claims each require 2 things: "a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI)," and that the DCI Format be transmitted in a common search space.

60. The '464 Application addresses scrambling in only two places, and in each instance, the scrambling is performed using C-RNTIs. EX1003 at [0051] and [0069]. In the first instance, scrambling is disclosed using an SPS C-RNTI and a URLLC C-RNTI. *Id.* at [0051]. In the second instance, scrambling is disclosed using a C-RNTI. *Id.* at [0061]. There is no disclosure anywhere in the '464 Application of scrambling by any RNTI that is not a C-RNTI.

61. C-RNTIs (including SPS C-RNTIs and URLLC C-RNTIs as described in the '464 Application) define UE-specific search spaces. EX1003 at [0053]. In other words, they are unique identifiers assigned to specific UEs, each of which is a

C-RNTI. The Challenged Claims specifically require the “(DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), *the first RNTI being different from a Cell-RNTI (C-RNTI)*” (emphasis added). In the ’464 Application, none of the C-RNTI, SPS C-RNTI, nor the URLLC C-RNTIs disclosed for scrambling are *different from a C-RNTI* as required. Therefore, the ’464 Application does not provide written description for the Challenged Claims.

62. As another example of the ’464 Application failing to provide support for the Challenged Claims, the ’464 Application also fails to disclose that the common search space be used to send DCI formats with CRCs scrambled by an RNTI that is different from a C-RNTI or a semi-persistent scheduling C-RNTI, or using the common search space to send activation or deactivation messages. Rather, the ’464 Application only references the common search space twice throughout its disclosure. EX1003 at [0053] and [0137].

63. In the first instance, the ’464 Application makes reference to a common search space by disclosing that it is one of the search spaces a UE may monitor. EX1003 at [0053]. However, the ’464 Application is silent as to the BS transmitting the Challenged Claim’s DCI format on the common search space. Rather, the ’464 Application discloses separate search spaces which are specific to each UE and determined based on C-RNTI, SPS C-RNTI, and/or URLLC C-RNTI. *Id.* A POSITA

would understand from this disclosure that DCI format would be transmitted on separate search spaces, *not* the common search space.

64. In the second instance, the '464 Application discloses transmitting DCI messages in the common search space, but not the DCI format recited in the Challenged Claims. Rather, the '464 Application discloses transmitting a DCI format which communicates the association timing between the base station's downlink slot and uplink slot. EX1003 at [0137]. A POSITA would not understand this disclosure to describe transmitting the DCI format of the Challenged Claims on the common search space, because the disclosure is specific to what information is transmitted on the common search space, and it does not include the Challenged Claims' recitation.

65. For the reasons described above, the '464 Application does not provide written description for the claimed subject matter. Therefore, the Challenged Claims cannot claim priority to the '464 Application.

VIII. Claim Construction

66. I have been told that claim terms in an *inter partes* review proceeding are to be given their ordinary and accustomed meaning as understood by a person of ordinary skill in the art. In my analysis of the Challenged Claims, I have applied the plain and ordinary meaning as understood by a person of ordinary skill in the art at the relevant time. In my analysis, it was not necessary to construe any terms because

all limitations in the '976 Patent are disclosed in the prior art under any reasonable interpretation of the claim terms.

IX. Prior Art

A. US Patent No. 10,959,218 (“Babaei”)

1. Overview of Babaei

67. Babaei is directed to multicarrier communication systems, and in particular, to enabling operation of carrier aggregation through semi-persistent scheduling confirmation. EX1006 at 2:36-39. Babaei’s disclosure allows for the accommodation of a greater variety and number of services offered by communication systems/networks.

68. Babaei discloses that “A wireless device may receive configuration parameters for a plurality of periodic resource allocations. A downlink control information (DCI) may be received indicating activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations. In response to receiving the DCI, a medium access control (MAC) protocol data unit (PDU) may be transmitted. The MAC PDU may comprise a MAC subheader and the confirmation MAC CE. The MAC subheader may comprise a logical channel identifier indicating that the MAC PDU comprises a confirmation MAC control element (MAC CE). The confirmation MAC CE may comprise a field indicating

which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation.” EX1006 at Abstract.

69. Babaei further discloses that vehicular communication services, represented by V2X services, may be supported by multiple periodic uplink resources. EX1006 at 13:66-14:49, 16:64-17:8. Babaei specifically teaches that “In an example embodiment, SPS configurations may be enhanced to support transmission of various V2X traffic and/or voice traffic by a UE. There is a need to support multiple SPS configurations for a UE. For example, a UE supporting V2X may need to support multiple uplink SPS configurations for transmitting various periodic (or semi-periodic) traffic and/or voice traffic in the uplink. Other examples may be provided. For example, CAM messages in V2X may be semi-periodic. In some scenarios, CAM message generation may be dynamic in terms of size, periodicity and timing. Such changes may result in misalignment between SPS timing and CAM timing. There may be some regularity in size and periodicity between different triggers. Enhanced SPS mechanisms may be beneficial to transmit V2X traffic, voice traffic, and/or the like. In an example, various SPS periodicity, for example 100 ms and 1 s may be configured.” EX1006 at 17:54-18:3.

70. Babaei further teaches the use of RRC signaling to configure a UE for multiple different periodic resource allocations, and the activation/release of those

periodic resource allocations using a DCI Format scrambled with an SPS RNTI assigned for that purpose. EX1006 at 16:64-17:8, 19:16-31, 20:48-67.

71. Babaei teaches that, in response to a DCI formation activating/deactivating a periodic resource allocation, the UE transmits and the BS receives a MAC CE confirming the activation/release of the resource. EX1006 at 24:56-25:3, 29:4-33:4. Figure 18, reproduced below, depicts an example enhanced periodic resource allocation MAC CE and procedure for periodic resource allocation confirmation. This illustrates the signaling between the BS and the UE to configure, activate, release, and confirm activation/release of a periodic resource allocation.

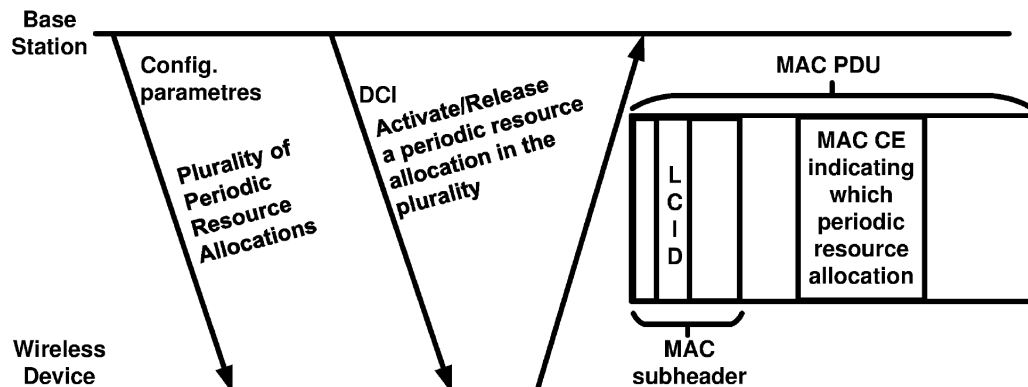


FIG. 18

EX1006 at Fig. 18.

2. Babaei is Entitled to its Provisional Filing Date

72. I understand that Babaei claims priority to U.S. Provisional Application No. 62/421,821, filed Nov. 14, 2016 and of U.S. Provisional Application No. 62/422,284, filed Nov. 15, 2016.

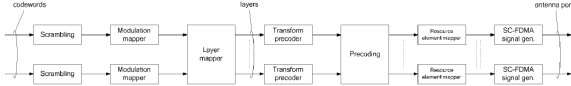
73. I have been informed by counsel and understand that because the filing dates of each of the two provisional applications which Babaei claims priority to are before the '976 Patent's earliest claimed priority date, Babaei is considered prior art if the subject matter relied upon from Babaei is supported by Babaei's earlier priority applications.

74. The subject matter relied upon from Babaei in my analysis below is supported in the Babaei Provisional Applications, as shown in the table below.

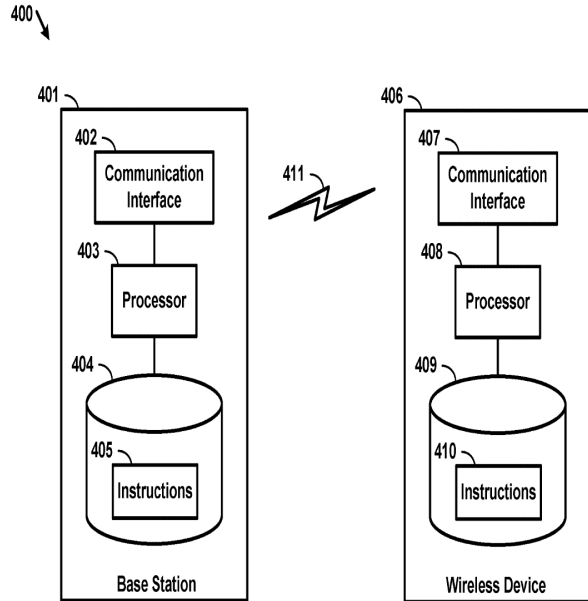
Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
A wireless device may receive configuration parameters for a plurality of periodic resource allocations. A downlink control information (DCI) may be received indicating activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations. In response to receiving the DCI, a medium access control (MAC) protocol data unit (PDU) may be transmitted. The MAC PDU may comprise a MAC subheader and the confirmation MAC CE. The MAC subheader may comprise a logical channel identifier indicating that the MAC PDU comprises a confirmation MAC control element (MAC CE). The confirmation MAC CE may comprise a field indicating which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation. Abstract	Pp. 50, 64-66, 68-69, 72-74, including for example: “In an example, SPS configuration IE may be enhanced and multiple downlink or uplink SPS may be configured for a cell. In an example, multiple SPS RNTI may be configured when a plurality of SPS is configured. In an example, RRC may comprise an index indentifying an SPS configuration for a cell.” P. 50 (see also example IE description on pp. 49-50). “In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may

³ The Babaei Provisional has multiple different page numbers in different portions of the document. I reference the page number in the combined document, such that page 50 refers to the 50th page in EX1007, which has a “7” at the bottom of the page.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	configure multiple SPS configurations for a given UE.” P. 64. “The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs.” Pp. 64-65. “In an example, the SPS confirmation MAC control element is identified by a MAC PDU sub-header with SPS confirmation LCID.” P. 73. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE.” P. 73. “And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI).” P. 74.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
PUCCH physical uplink control channel PUSCH physical uplink shared channel 3:9-10 FIG. 5A, FIG. 5B, FIG. 5C and FIG. 5D are example diagrams for uplink and downlink signal transmission as per an aspect of an embodiment of the present disclosure. FIG. 5A shows an example uplink physical channel. The base-band signal representing the physical uplink shared channel may perform the following processes. These functions are illustrated as examples and it is anticipated that other mechanisms may be implemented in various embodiments. The functions may comprise scrambling, modulation of scrambled bits to generate complex-valued symbols, mapping of the complex-valued modulation symbols onto one or several transmission layers, transform precoding to generate complex-valued symbols, precoding of the complex-valued symbols, mapping of precoded complex-valued symbols to resource elements, generation of complex-valued time-domain DFTS-OFDM/SC-FDMA signal for each antenna port, and/or the like. 4:65-5:14 PersistentListP1, and/or other parameters. In an example, SPS-ConfigUL IE may comprise semiPersistSchedIntervalUL, implicitReleaseAfter, p0-NominalPUSCH-Persistent, p0-UE-PUSCH-Persistent, twoIntervalsConfig, p0-PersistentSubframeSet2, p0-NominalPUSCH-PersistentSubframeSet2, p0-UE-PUSCH-and/or PersistentSubframeSet2, and/or other parameters. 15:49-55	Pp. 31, 49-51, 62-64, including for example:  p. 31 SPS-ConfigUL at pp. 49-50 “In an example, numberOfConfSPS-Processes may be the number of configured HARQ processes for downlink Semi-Persistent Scheduling. In an example, numberOfConfULSPS-Processes may be the number of configured HARQ processes for uplink Semi-Persistent Scheduling. In an example, E-UTRAN may configure this field for asynchronous UL HARQ. Otherwise it may not configure this field.” P. 51.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
In an example, numberOfConfSPS-Processes IE may be the number of configured HARQ processes for Semi-Persistent Scheduling. In an example, p0-NominalPUSCH-Persistent IE may be the parameter: $P_{O_NOMINAL_PUSCH}(0)$ used in PUSCH power control with unit in dBm and step 1. This field may be applicable for persistent scheduling. If choice setup is used and p0-Persistent is absent, the value of p0-NominalPUSCH for p0-NominalPUSCH-Persistent may be applied. If uplink power control subframe sets are configured by tpc-SubframeSet, this field may apply for uplink power control subframe set 1. In an example, p0-NominalPUSCH-PersistentSubframeSet2 IE may be the parameter: $P_{O_NOMINAL_PUSCH}(0)$ used in PUSCH power control with unit in dBm and step 1. This field may be applicable for persistent scheduling. If p0-PersistentSubframeSet2-r12 is not configured, the value of p0-NominalPUSCH-SubframeSet2-r12 may be applied for p0-NominalPUSCH-PersistentSubframeSet2. E-UTRAN may configure this field if uplink power control subframe sets are configured by tpc-SubframeSet, in which case this field may apply for uplink power control subframe set 2. In an example, p0-UE-PUSCH-Persistent IE may be the parameter: $P_{O_UE_PUSCH}(0)$ used in PUSCH power control with unit in dB. This field may be applicable for persistent scheduling. If choice setup is used and p0-Persistent is absent, the value of p0-UE-PUSCH may be applied for p0-UE-PUSCH-Persistent. If uplink power control subframe sets are configured by tpc-SubframeSet, this field may be applied for uplink power control subframe set 1. In an example, p0-UE-PUSCH-PersistentSubframeSet2 IE may be the parameter: $P_{O_UE_PUSCH}(0)$ used in PUSCH power control with unit in dB. This field may be applicable for persistent scheduling. If p0-PersistentSubframeSet2-r12 is not configured, the value of p0-UE-PUSCH-SubframeSet2 may be applied for p0-UE-PUSCH-PersistentSubframeSet2. E-UTRAN may configure this field if uplink power control subframe sets are configured by tpc-SubframeSet, in which case this field may apply for uplink power control subframe set 2. 16:4-42	

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
FIG. 4 is an example block diagram of a base station 401 and a wireless device 406, as per an aspect of an embodiment of the present disclosure. A communication network 400 may include at least one base station 401 and at least one wireless device 406. The base station 401 may include at least one communication interface 402, at least one processor 403, and at least one set of program code instructions 405 stored in non-transitory memory 404 and executable by the at least one processor 403. The wireless device 406 may include at least one communication interface 407, at least one processor 408, and at least one set of program code instructions 410 stored in non-transitory memory 409 and executable by the at least one processor 408. Communication interface 402 in base station 401 may be configured to engage in communication with communication interface 407 in wireless device 406 via a communication path that includes at least one wireless link 411. Wireless link 411 may be a bi-directional link. Communication interface 407 in wireless device 406 may also be configured to engage in a communication with communication interface 402 in base station 401. Base station 401 and wireless device 406 may be configured to send and receive data over wireless link 411 using multiple frequency carriers. According to aspects of an embodiment, transceiver(s) may be employed. A transceiver is a device that includes both a transmitter and receiver. Transceivers may be employed in devices such as wireless devices, base stations, relay nodes, and/or the like. Example embodiments for radio technology implemented in communication interface 402, 407 and wireless link 411 are illustrated are FIG. 1, FIG. 2, FIG. 3, FIG. 5, and associated text. 5:40-6:3	Pp. 7, 18 ([0020]), including for example:  p. 7.
13:7-49	Pp. 52-53 (describing how MAC entity response to RNTI-addressed DCI formats on PDCCH)
Vehicular communication services, represented by V2X services, may comprise of the following different types:	Pp. 64-67 (describing different kinds of V2X services and message types)

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
V2V, V2I, V2N and/or V2P. V2X services may be provided by PC5 interface (sidelink) and/or Uu interface (UE to base station interface). Support of V2X services via PC5 interface may be provided by V2X sidelink communication, which is a mode of communication whereby UEs may communicate with each other directly over the PC5 interface. This communication mode may be supported when the UE is served by E-UTRAN and when the UE is outside of E-UTRA coverage. The UEs authorized to be used for V2X services may perform V2X sidelink communication. The user plane protocol stack and functions for sidelink communication may be used for V2X sidelink communication. In order to assist the eNB to provide sidelink resources, the UE in RRC_CONNECTED may report geographical location information to the eNB. The eNB may configure the UE to report the complete UE geographical location information based on periodic reporting via the existing measurement report signaling. In an example, for V2X communication, k SPS (e.g. k=8 or 16, etc.) configurations with different parameters may be configured by eNB and SPS configurations may be active at the same time. The activation/deactivation of an SPS configuration may signaled via a PDCCH DCI and/or an RRC message by eNB. The logical channel prioritization for Uu may be used. For V2X communication, a UE may provide UE assistance information to an eNB. Reporting of UE assistance information may be configured by eNB transmitting one or more RRC messages. The UE assistance information may include parameters related to the SPS configuration. Triggering of UE assistance information transmission may be left to UE implementation. For instance, the UE may be allowed to report the UE assistance information when change in estimated periodicity and/or timing offset of packet arrival occurs. For V2X communication via Uu, SR mask as per legacy mechanism may be used. In an example, for unicast transmission of V2X messages, the V2X message may be delivered via Non-GBR bearers as well as GBR bearers. In order to meet the QoS requirement for V2X message delivery for V2X services, a Non-GBR QCI value and a GBR QCI value for V2X messages may be used. For broadcasting V2X messages, SC-PTM or MBSFN transmission may be used. In order to reduce SC-PTM/MBSFN latency, shorter (SC-)MCCH repetition period for SC-PTM/MBSFN, modification period for SC-PTM/MBSFN and MCH scheduling period for MBSFN may be supported. Reception of downlink broadcast of V2X messages in different carriers/PLMNs may be supported by having multiple receiver chains in the UE. 13:66-14:49	

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
CSS common search space 2:47 In an example embodiment, various DCI formats may be used for SPS scheduling. For example, the DCI format 0 may be used for uplink SPS. In an example, the fields for DCI format 0 may comprise one or more of the following fields: Carrier indicator e.g. 0 or 3 bits. Flag for format0/format1A differentiation e.g. 1 bit, where value 0 may indicate format 0 and value 1 may indicate format 1A. Frequency hopping flag, e.g. 1 bit. This field may be used as the MSB of the corresponding resource allocation field for resource allocation type 1. Resource block assignment and hopping resource allocation, e.g. $\lceil \log_2(N_{RB}^{UL}(N_{RB}^{UL}+1)/2) \rceil$ bits where N_{RB}^{UL} may be the uplink bandwidth configuration in number of resource blocks. Modulation and coding scheme and redundancy version e.g. 5 bits. New data indicator e.g. 1 bit. TPC command for scheduled PUSCH e.g. 2 bits. Cyclic shift for DM RS and OCC index e.g. 3 bits. UL index e.g. 2 bits (this field may be present for TDD operation with uplink-downlink configuration 0). Downlink Assignment Index (DAI) e.g. 2 bits (this field may be present for cases with TDD primary cell and either TDD operation with uplink-downlink configurations 1-6 or FDD operation). CSI request e.g. 1, 2 or 3 bits. The 2-bit field may apply to UEs configured with no more than five DL cells and to UEs that are configured with more than one DL cell and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI, UEs that are configured by higher layers with more than one CSI process and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI, UEs that are configured with two CSI measurement sets by higher layers with the parameter <i>csi-MeasSubframeSet</i>, and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI; the 3-bit field may apply to the UEs that are configured with more than five DL cells and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI; otherwise the 1-bit field may apply. SRS request e.g. 0 or 1 bit. This field may be present in DCI formats scheduling PUSCH which are mapped onto the UE specific search space given by the C-RNTI. Resource allocation type e.g. 1 bit. This field may be present if $N_{RB}^{UL} \leq N_{RB}^{DL}$ where N_{RB}^{UL} may be the uplink bandwidth configuration in number of resource blocks and N_{RB}^{DL} may be the downlink bandwidth configuration in number of resource blocks. In example, one or more fields may be added to a DCI for SPS to enhance SPS scheduling process. In example, one or more of the fields may be replaced with new fields, or new values, or may be interpreted differently for SPS to enhance SPS scheduling process.	Pp. 62, describing DCI formats that may be used for SPS scheduling and their fields, including: “CSI request - 1, 2 or 3 bits. The 2-bit field may apply to UEs configured with no more than five DL cells and to UEs that are configured with more than one DL cell and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI, UEs that are configured by higher layers with more than one CSI process and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI, UEs that are configured with two CSI measurement sets by higher layers with the parameter <i>csi-MeasSubframeSet</i>, and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI; the 3-bit field may apply to the UEs that are configured with more than five DL cells and when the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI; otherwise the 1-bit field applies”

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
14:50-15:31	
In an example, multiple downlink or uplink SPS may be configured for a cell. In an example, multiple SPS RNTIs may be configured when a plurality of SPSs is configured. A base station may transmit to a UE at least one RRC message comprising SPS configuration parameters comprising a first SPS RNTI and a second SPS RNTI. For example, a first SPS RNTI may be configured for a first SPS configuration (e.g. for VOIP), and a second SPS RNTI may be configured for a second SPS configuration (e.g. for V2X communications). The UE may monitor PDCCH for at least DCIs corresponding to the first SPS RNTI and the second SPS RNTI. 16:64-17:8	Pp.50, 64-68, including for example: “In an example, SPS configuration IE may be enhanced and multiple downlink or uplink SPS may be configured for a cell. In an example, multiple SPS RNTI may be configured when a plurality of SPS is configured. In an example, RRC may comprise an index indentifying an SPS configuration for a cell.” P. 50 (see also example IE description on pp. 49-50). “For example, a first SPS C-RNTI may be configured for SPS configuration to transmit voice traffic, a second SPS C-RNTI may be configured for SPS configuration to transmit a V2X traffic.” P. 66. “AUE configured with multiple SPS C-RNTIs may need to monitor search space of PDCCH for multiple SPS C-RNTIs, this mechanism may increase UE processing requirements and/or power consumption.” P. 66.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
In an example embodiment, SPS configurations may be enhanced to support transmission of various V2X traffic and/or voice traffic by a UE. There is a need to support multiple SPS configurations for a UE. For example, a UE supporting V2X may need to support multiple uplink SPS configurations for transmitting various periodic (or semi-periodic) traffic and/or voice traffic in the uplink. Other examples may be provided. For example, CAM messages in V2X may be semi-periodic. In some scenarios, CAM message generation may be dynamic in terms of size, periodicity and timing. Such changes may result in misalignment between SPS timing and CAM timing. There may be some regularity in size and periodicity between different triggers. Enhanced SPS mechanisms may be beneficial to transmit V2X traffic, voice traffic, and/or the like. In an example, various SPS periodicity, for example 100 ms and 1 s may be configured. In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. In an example, some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI. 17:54-18:18	Pp. 64-65, including for example: “In an example, SPS configurations may be used for transmission of various V2X traffic and/or voice traffic by a UE. In an example, a UE supporting V2X may need to support multiple uplink SPS configurations for transmitting various periodic (or semi-periodic) traffic and/or voice traffic in the uplink. Other examples may be provided. For example, CAM messages in V2X may be semi-periodic. In some scenarios, CAM message generation may be dynamic in terms of size, periodicity and timing. Such changes may result in misalignment between SPS timing and CAM timing. There may be some regularity in size and periodicity between different triggers. Enhanced SPS mechanisms may be beneficial to transmit V2X traffic, voice traffic, and/or the like. In an example, various SPS periodicity, for example 100 ms and 1s may be configured. In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
The UE may transmit traffic associated with multiple V2X services, which may require different periodicity and packet sizes. The SPS TB size and period may be adapted to different V2X services. Multiple parallel SPS processes may be activated at the UE. The SPS processes may differ in the amount of resource blocks (RBs) allocated and/or SPS period and may correspond to different types of V2X packets. Once the AS layer of UE receives the V2X packets from upper layer, the UE may trigger V2X packet transmissions on the corresponding SPS grant. Multiple UL SPS configurations may be configured for the UE. The eNB may configure different SPS C-RNTIs for different SPS processes of the UE. SPS activation and release mechanism may be implemented. Employing at least one or more SPS RNTIs, the eNB may trigger which SPS process is activated or released. In an example implementation, in order to support multiple SPS configurations different SPS C-RNTIs may be configured for different SPS traffic types. For example, a first SPS C-RNTI may be configured for SPS configuration to transmit voice traffic, a second SPS C-RNTI may be configured for SPS configuration to transmit a V2X traffic. An eNB may transmit one or more RRC messages comprising multiple SPS configuration parameters. The multiple SPS configuration parameters may comprise multiple SPS-RNTI parameters for multiple SPS traffic types (e.g. multiple UL SPS configurations). 19:5-31	P. 66, verbatim: “The UE may transmit multiple V2X services, which may require different periodicity and packet sizes. The SPS TB size and period may be adapted to different V2X services. Multiple parallel SPS processes may be activated at the UE. The SPS processes may differ in the amount of resource blocks (RBs) allocated and/or SPS period and may correspond to different types of V2X packets. Once the AS layer of UE receives the V2X packets from upper layer, the UE may trigger V2X packet transmissions on the corresponding SPS grant. Multiple UL SPS configurations may be configured for the UE. The eNB may configure different SPS C-RNTIs for different SPS processes of the UE. The legacy SPS activation and release mechanism may be reused. Based on the different SPS C-RNTIs, the eNB may trigger which SPS process is activated or released. In an example implementation, in order to support multiple SPS configurations a different SPS C-RNTI may be configured for different SPS traffic. For example, a first SPS C-RNTI may be configured for SPS configuration to transmit voice traffic, a second SPS C-RNTI may be configured for SPS configuration to transmit a V2X traffic.

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	An eNB may transmit one or more RRC messages comprising multiple SPS configuration parameters. The multiple SPS configuration parameters may comprise multiple SPS-RNTI parameters for multiple SPS configurations (e.g. multiple UL SPS configurations).”

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In an example, multiple SPSs may be activated in parallel. For example, a new service may be triggered while a previous service is on-going. In an example, the UE may transmit an assistance message to the base station indicating new information about new messages (SPS traffic) for transmission. The base station may provide a second SPS transmission grant for transmission of the new service/message(s). The UE may select the second SPS configuration and corresponding resources for transmission of new SPS traffic. In an example, a previous SPS grant and a new SPS grant may continue in parallel. In an example, a UE may transmit traffic associated with multiple V2X services, which may require different periodicity and packet sizes. The SPS TB size and period may be adapted to different V2X services. Multiple parallel SPS processes may be activated in parallel at the UE. Different SPS processes may differ in the number of allocated resource blocks (RBs) and/or SPS periodicity and may correspond to different types of V2X packets. Once the radio layer of UE receives the V2X packets from a V2X application, the UE may trigger V2X packet transmissions on the corresponding SPS grant. Multiple UL SPS configurations may be configured for a UE. When configuration of multiple SPSs are required, legacy mechanisms may be extended to support multiple SPSs. The base station may configure different SPS RNTIs for different SPS processes of the UE. SPS activation and release mechanism may be implemented. The base station may trigger which SPS process is activated or released employing at least one or more SPS RNTIs. In an example implementation, in order to support multiple SPS configurations different SPS RNTIs may be configured for different SPS configurations. For example, a first SPS RNTI may be configured for SPS configuration to transmit a first V2X traffic, a second SPS RNTI may be configured for SPS configuration to transmit a second V2X traffic. A base station may transmit one or more RRC messages comprising multiple SPS configuration parameters. The multiple SPS configuration parameters may comprise multiple SPS-RNTI parameters for multiple SPS configurations (e.g. multiple UL SPS configurations). Some of the example embodiments may implement multiple SPS RNTIs, and some may implement a single SPS RNTI.	Pp. 64-69, including for example: “In an example, multiple SPSs may be active in parallel. For example, a new service may be triggered while the previous service is on-going. In an example, the UE may indicate the new messages to the serving eNB. The eNB may provide another transmission grant for the new service/message(s). The UE may choose another SPS configuration and select the resources. In an example, the previous SPS grant and the new SPS grant may continue in parallel.” P. 65 “The UE may transmit multiple V2X services, which may require different periodicity and packet sizes. The SPS TB size and period may be adapted to different V2X services. Multiple parallel SPS processes may be activated at the UE. The SPS processes may differ in the amount of resource blocks (RBs) allocated and/or SPS period and may correspond to different types of V2X packets. Once the AS layer of UE receives the V2X packets from upper layer, the UE may trigger V2X packet transmissions on the corresponding SPS grant. Multiple UL SPS configurations may be configured for the UE.” P. 66 “The eNB may configure different SPS C-RNTIs for different SPS processes of

A UE configured with multiple SPS RNTIs may need to monitor search space of PDCCH for multiple SPS RNTIs. When the number of required SPS configurations increases, this mechanism may increase UE processing requirements and/or power consumption. Extension of legacy mechanisms, for implementation of multiple SPS configurations, increases UE processing requirements and battery power consumption. In an example, a UE may be configured with many SPS configurations (e.g. 4, or 8, etc) for different types of V2X traffic. There is a need to improve SPS configuration and activation/release mechanisms in a base station and wireless device when multiple SPSs are configured. Example embodiments may increase signaling overhead, however the potential benefits outweigh the increased overhead when V2X communication is enabled. Example embodiments improve base station and UE implementations, enhance network performance, reduce UE monitoring requirements, and reduce battery power consumption, when multiple SPSs are configured for a given UE for transmission of SPS traffic via an uplink (UL) or a sidelink (SL).

In an example, multiple SPSs may be activated in parallel. For example, a new SPS may be triggered while a previous SPS is on-going. In an example, the UE may transmit to a base station a message comprising assistant information indicating that the UE requires new SPS resources for transmission of new messages. The assistant information may comprise information about at least one SPS traffic type, e.g. logical channel, periodicity, message size, and/or the like. The base station may provide an SPS grant for the new service/message(s). The UE may employ an SPS configuration and a corresponding SPS resources for uplink transmission of a corresponding traffic. In an example, a previous SPS grant and a new SPS grant may be employed in parallel. FIG. 13 shows an example when multiple SPS grants are activated in parallel. A base station may transmit SPS grant 1 in a first subframe for transmission of a first SPS traffic. The base station may transmit SPS grant 2 in a second subframe for transmission of a second SPS traffic. The first SPS grant and the second SPS grant may have different parameters, for example, may comprise different RBs assignments, may have different periodicity, may have different DCI and RRC configuration parameter(s), and/or the like.

In an example, multiple downlink, uplink, and/or sidelink SPSs may be configured for a cell. In an example, one or more SPS RNTIs may be configured when a plurality of SPSs are configured. In an example, an RRC message may comprise an index identifying an SPS configuration of a cell. In an example, the DCI employing SPS RNTI and triggering an SPS may include the index of the SPS that is triggered (initialized, activated) or released (deactivated). For example, the DCI activating or releasing an uplink SPS corresponding to a V2X SPS traffic may comprise an UL SPS configuration index field (e.g. 3 bits) identifying the SPS configuration corresponding the SPS configuration index. SPS configuration index may indicate the index of one of one or more SL/UL SPS configurations. Using this enhanced mechanism multiple SPSs may be configured using the same SPS RNTI (e.g. for V2X traffic). This may reduce UE battery power consumption and provide flexibility in configuring multiple SPSs.

In an example embodiment, when one or more SPS grant configurations are configured for a UE, for example, when one or more SPS-ConfigUL and/or SPS-ConfigSL are configured on a cell or when one or more SPS grant configurations are configured within an SPS-ConfigUL and/or SPS-ConfigSL, RRC configuration parameters may comprise an

the UE. The legacy SPS activation and release mechanism may be reused. Based on the different SPS C-RNTIs, the eNB may trigger which SPS process is activated or released. In an example implementation, in order to support multiple SPS configurations a different SPS C-RNTI may be configured for different SPS traffic. For example, a first SPS C-RNTI may be configured for SPS configuration to transmit voice traffic, a second SPS C-RNTI may be configured for SPS configuration to transmit a V2X traffic. An eNB may transmit one or more RRC messages comprising multiple SPS configuration parameters. The multiple SPS configuration parameters may comprise multiple SPS-RNTI parameters for multiple SPS configurations (e.g. multiple UL SPS configurations).

A UE configured with multiple SPS C-RNTIs may need to monitor search space of PDCCH for multiple SPS C-RNTIs, this mechanism may increase UE processing requirements and/or power consumption. There is a need to improve eNB and UE implementation and enhance network performance when multiple SPSs are configured for a given UE. Some of the example embodiments may implement multiple SPS C-RNTI, and some may implement a single SPS C-RNTI.

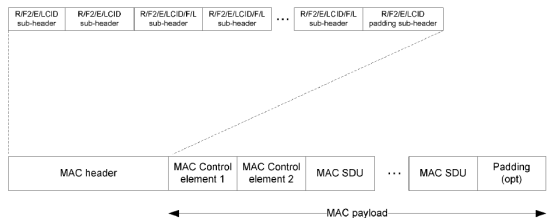
In an example embodiment, when multiple SPS grant types are configured for a UE, for example, when multiple

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SPS configuration index. One or more uplink SPS configuration parameters may be assigned to (associated with) the same SPS RNTI. Different SPS configurations (e.g. having different SPS periodicity) may be assigned to the same SPS RNTI, and may be identified by different SPS configuration indexes. In an example embodiment, one or more SPS configurations (e.g. multiple periodicity, MCS, and/or other parameters) may be triggered employing the same SPS RNTI, and using different SPS configuration indexes. FIG. 14 shows an example RRC configuration and example DCIs activating and releasing an SPS for an uplink or a sidelink. A similar mechanism may be applied to the downlink. 20:25-22:12	SPS-ConfigUL are configured on a cell or when multiple SPS grant types are configured within an SPS-ConfigUL, RRC configuration parameters may comprise an index (may be called SPS index, SPS identifier, SPS parameter, or any other name). Multiple uplink SPSs parameters may be assigned to (associated with) the same SPS C-RNTI. A different SPS configuration (e.g. having different periods) may be assigned to the same SPS C-RNTI, and may be identified by different SPS indexes. The example mechanism may also be applied to DL and/or Sidelink SPS configurations. In example embodiment, multiple SPS configurations (e.g. multiple periodicity, MCS, and/or other parameters) may be triggered employing the same SPS C-RNTI.” P. 66
activation and release. Different SPS configurations (e.g. having different periodicity) may be assigned to the same sidelink SPS RNTI, and may be identified by different SPS configuration indexes. In an example embodiment, one or more sidelink SPS configurations (e.g. multiple periodicity, MCS, and/or other parameters) may be triggered employing the same sidelink SPS RNTI for transmission of SPS V2X traffic via a sidelink. In an example, SPS-ConfigUL1 may be assigned SPS RNTI and SPS-ConfigIndex1, and SPS-ConfigUL2 may be assigned SPS RNTI and SPS-ConfigIndex2. A base station may transmit one or more RRC messages comprising configuration parameters of one or more cells (e.g. PCell and/or SCell(s)). The configuration parameters may comprise configuration parameters for one or more SPSs. The configuration parameters may comprise the SPS RNTI, SPS-ConfigIndex1 and SPS-ConfigIndex2.	Pp. 66, 68-9, including for example: “Multiple uplink SPSs parameters may be assigned to (associated with) the same SPS C-RNTI. A different SPS configuration (e.g. having different periods) may be assigned to the same SPS C-RNTI, and may be identified by different SPS indexes. The example mechanism may also be applied to DL and/or Sidelink SPS configurations. In example embodiment, multiple SPS configurations (e.g. multiple

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In an example, SPS-ConfigUL IE may comprise an SPS RNTI and an SPS-ConfigIndex1 and an SPS-ConfigIndex2. One or more first SPS configuration parameters may be associated with SPS-ConfigIndex1 and one or more second SPS configuration parameters may be associated with SPS-ConfigIndex2. Example of SPS configuration parameters maybe periodicity, HARQ parameter(s), MCS, grant size, and/or any other SPS configuration parameter presented in RRC SPS configuration. A base station may transmit one or more RRC messages comprising configuration parameters of one or more cells (e.g. PCell and/or SCell(s)). The configuration parameters may include configuration parameters for one or more SPSs. The configuration parameters may comprise the SPS RNTI, SPS-ConfigIndex1 and SPS-ConfigIndex2. 22:24-55 figuration index value. The SPS configuration parameter associated with the SPS configuration index may include, for example, SPS periodicity, MCS, radio resource parameters, and/or other SPS parameters included in SPS configurations. 23:22-26	periodicity, MCS, and/or other parameters) may be triggered employing the same SPS C-RNTI. In an example, SPS-ConfigUL1 may be assigned SPS C-RNTI and SPS-index1, and SPS-ConfigUL2 may be assigned SPS C-RNTI and SPS-Index2. An eNB may transmit one or more RRC messages comprising configuration parameters of one or more cells (e.g. PCell and/or SCell(s)). The configuration parameters may include configuration parameters for a plurality of SPSs. The configuration parameters may comprise the SPS C-RNTI, SPS-index1 and SPS-index2.” P. 66.
The UE configured with SPS configurations may monitor PDCCH and search for a DCI associated with the SPS RNTI (e.g. scrambled with SPS-RNTI). The base station may transmit a DCI associated to SPS RNTI to the UE to activate or release an SPS grant. The UE may decode a DCI associated with the SPS RNTI. The DCI may comprise one or more fields comprising information about the grant. The DCI may further comprise an SPS configuration index. The SPS configuration index may determine which one of the SPS configurations are activated or released. 22:56-65	Pp. 63, 66-68, including for example: “The UE configured with SPS configurations may monitor PDCCH and search for a DCI associated with the SPS C-RNTI (e.g. scrambled with SPS-CRNTI). The eNB may transmit a DCI associated to SPS C-RNTI to the UE to activate or release a SPS grant. The UE may decode a DCI associated with the SPS C-RNTI. The DCI may comprise one or more fields comprising information about the grant. The DCI may further comprise an SPS index. The SPS index may determine which one of the SPS configurations are activated or released.” Pp. 66-67.

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In an example, a SPS confirmation MAC CE may be triggered in response to receiving a DCI activating and/or reactivating and/or releasing a SPS. In an example, in response to a SPS confirmation being triggered and not cancelled and the MAC entity having UL resources allocated for new transmission for a TTI, the Multiplexing and Assembly entity of a MAC entity may generate a SPS confirmation MAC CE. The wireless device may cancel the triggered SPS confirmation. In an example, in response to the SPS confirmation being triggered by a SPS release, the MAC entity may clear the configured uplink grant immediately after first transmission of SPS confirmation MAC Control Element triggered by the SPS release. In an example, a SPS confirmation MAC CE may be identified by a MAC PDU sub-header with a specified LCID. 24:56-25:3	Pp. 72-77, including for example: “In an example, for a given SPS configuration, if SPS confirmation has been triggered and not cancelled and if the MAC entity has UL resources allocated for new transmission in a TTI on or after the SPS confirmation trigger (e.g., the TTI that the DCI is received), the MAC entity may instruct the Multiplexing and Assembly procedure to generate an SPS confirmation MAC CE and cancel the triggered SPS confirmation after its transmission. In an example, if the SPS confirmation MAC CE is triggered by a SPS release DCI, the MAC entity may clear the configured uplink grant associated with the released SPS after (e.g. as early as possible) first transmission of the SPS confirmation MAC CE.” P. 76. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to

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	identify an enhanced SPS confirmation MAC CE.” P. 73.
In an example, a MAC PDU may consist of a MAC header, zero or more MAC Service Data Units (MAC SDU), zero, or more MAC control elements, and optionally padding. In an example, the MAC header and the MAC SDUs may be of variable sizes. In an example, a MAC PDU header may consist of one or more MAC PDU subheaders. In an example, a subheader may correspond to either a MAC SDU, a MAC control element or padding. In an example, a MAC PDU subheader may comprise five or six header fields R/F2/E/LCID/(F)/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. In an example, the last subheader in the MAC PDU and subheaders for fixed sized MAC control elements may comprise four header fields R/F2/E/LCID. In an example, a MAC PDU subheader corresponding to padding may consist of the four header fields R/F2/E/LCID. In an example, MAC PDU subheaders may have the same order as the corresponding MAC SDUs, MAC control elements and padding. In an example, MAC control elements may be placed before a MAC SDU. In an example, the MAC header may be of variable size and may comprise the LCID, L, F, F2, E and R fields. In an example, LCID may be the Logical Channel ID field and may identify the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC control element or padding for the DL-SCH, UL-SCH and MCH respectively. In an example, there may be one LCID field for each MAC SDU, MAC control element or padding included in the MAC PDU. In an example, one or two 25:4-33	Pp. 58-60, including for example: “In an example, MAC PDU subheaders may have the same order as the corresponding MAC SDUs, MAC control elements and padding. In an example, MAC control elements may always be placed before any MAC SDU. In an example, Padding may occur at the end of the MAC PDU, except when single-byte or two-byte padding is required. In an example, padding may have any value and the MAC entity may ignore it. In an example, when padding is performed at the end of the MAC PDU, zero or more padding bytes are allowed. In an example, when single-byte or two-byte padding is required, one or two MAC PDU subheaders corresponding to padding are placed at the beginning of the MAC PDU before any other MAC PDU subheader. In an example, a maximum of one MAC PDU can be transmitted per TB per MAC entity. In an example, a maximum of one MCH MAC PDU may be transmitted per TTI.” P. 59.

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	“In an example, a MAC PDU subheader may consist of the five or six header fields R/F2/E/LCID/(F)/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. In an example, the last subheader in the MAC PDU and subheaders for fixed sized MAC control elements may consist solely of the four header fields R/F2/E/LCID. In an example, a MAC PDU subheader corresponding to padding may consist of the four header fields R/F2/E/LCID.” Pp. 58-59.  The diagram illustrates the structure of a MAC PDU. The top row shows a sequence of subheaders: R/F2/E/LCID sub-header, R/F2/E/LCID sub-header, R/F2/E/LCID/F/L sub-header, R/F2/E/LCID/F/L sub-header, followed by an ellipsis, then R/F2/E/LCID/F/L sub-header, and finally R/F2/E/LCID padding sub-header. A dashed line connects the last subheader to the padding element in the payload below. The bottom row shows the MAC payload structure: MAC header, MAC Control element 1, MAC Control element 2, MAC SDU, followed by an ellipsis, then MAC SDU, and finally Padding (opt). A double-headed arrow below the payload elements is labeled 'MAC payload'. Example of MAC PDU consisting of MAC header, MAC control elements, MAC SDUs and padding p. 60.
In legacy SPS mechanisms, a single SPS may be configured on a cell for a wireless device. When the wireless is configured with UL transmission skipping for the SPS (e.g., with a SkipUplinkTXSPS IE), the UE may transmit a SPS confirmation MAC CE after receiving a DCI indicating activation/reactivation/release/deactivation of the SPS. In an example, more than one SPS configurations with different configuration parameters (e.g., different periodicities, offset, etc.) may be simultaneously active (e.g., for a UE capable of V2X transmission). Current SPS and/or periodic resource allocation mechanisms need to be enhanced to distinguish the SPS in the MAC CE transmitted by a UE in response to receiving an SPS activation/reactivation/release DCI when the UE is configured with ULTXSkipping SPS. The embodiments enhance the SPS and/or periodic resource allocation confirmation mechanisms so that a wireless device indicates to the base station a confirmation/acknowledgement for a specific SPS/periodic resource allocation that is activated or released.	Pp. 72-77, including for example: “In an example, after a UE receives a SPS activation/reactivation/release DCI from the eNB, with the SPS configuration indicated in the DCI, if the UE is configured with SkipUplinkTXSPS (e.g., if SkipUplinkTXSPS is configured for the SPS index indicated in the DCI or if SkipUplinkTXSPS is configured for the configured SPS configurations), the UE may trigger the SPS confirmation.

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26:4-22	The MAC entity may instruct the Multiplexing and Assembly procedure to generate an SPS confirmation MAC CE in a TTI for which the MAC entity has a configured grant corresponding to the SPS configuration indicated in the DCI (the TTI may be a TTI for the next SPS grant) and cancel the triggered SPS confirmation after its transmission. In an example, the MAC entity may clear the configured uplink grants associated with a SPS configuration after (e.g., as early as possible) first transmission of the SPS confirmation MAC CE triggered by receiving a release DCI for the SPS configuration.” P. 76.
28:18-33:4	Pp. 72-77 (extensive discussion of confirmation MAC CEs in response to activation/deactivation DCIs)

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In an example embodiment, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOIP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation. 28:40-67	Pp. 69, 73-76, including for example: “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-

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	config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
In an example embodiment, the legacy SPS confirmation LCID may be employed along with the RRC configuration for SPS to determine whether a UE transmits the legacy MAC SPS confirmation or the enhanced MAC SPS confirmation. An example embodiment may reduce the number of required LCIDs for SPS confirmation (one LCID is used for identifying both legacy and enhanced SPS MAC CEs). When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOIP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation. Both MAC CEs may be identified by the same LCID. In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced MAC CE SPS confirmation may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). An example enhanced periodic resource allocation MAC CE and procedure for periodic resource allocation confirmation is shown in FIG. 18. 29:4-26	P. 74, including for example: “In an example, the legacy SPS confirmation LCID may be employed along with the RRC configuration for SPS to determine whether a UE transmits the legacy MAC SPS confirmation or the enhanced MAC SPS confirmation. An example embodiment may reduce the number of required LCIDs for SPS confirmation (one LCID is used for identifying both legacy and enhanced SPS MAC CEs). When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VoiP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE

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	for an enhanced SPS confirmation. Both MAC Ces may be identified by the same LCID. In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced MAC CE SPS confirmation may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI).” P. 74.
the SPS confirmation MAC CE corresponds to. In an example, with eight different SPS configurations, the LCIDs 01110, 01111, 10000, 10001, 10010, 10011, 10100 and 10101 may be used to identify the SPS configurations. This solution may require many LCIDs. 30:15-19	Pp. 74-75, including for example: “In an example, with eight different SPS configurations, the LCIDs 01110, 01111, 10000, 10001, 10010, 10011, 10100 and 10101 may be used to identify the SPS configurations. This solution may require many LCIDs.” Pp. 74-75.
In an example embodiment, two LCIDs may be employed for SPS confirmation. A first LCID may be employed for legacy SPS configuration with a MAC CE of zero bits. A second LCID may be employed for SPS confirmation of enhanced SPS configuration with MAC CE of zero bits. In an example, the legacy SPS configuration may be for VOIP traffic, and the enhanced SPS configuration may be for V2X traffic. One or more example embodiments may be used for SPS confirmation of the enhanced SPS configuration when the second LCID is employed. 30:27-36	P. 75, including for example: “In an example, two LCIDs may be employed for SPS confirmation. A first LCID may be employed for legacy SPS configuration with a MAC CE of zero bits. A second LCID may be employed for SPS confirmation of enhanced SPS configuration with MAC CE of zero bits. In an example, the legacy SPS configuration may be for VOIP traffic, and the enhanced SPS configuration

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	may be for V2X traffic. One or more example embodiments may be used for SPS confirmation of the enhanced SPS configuration when the second LCID is employed.” P. 75.
FIG. 24 is an example flow diagram as per an aspect of an embodiment of the present disclosure. At 2410, a wireless device may receive configuration parameters for a plurality of periodic resource allocations. At 2420, a downlink control information (DCI) may be received indicating activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations. At 2430, in response to receiving the DCI, a medium access control (MAC) protocol data unit (PDU) may be transmitted. The MAC PDU may comprise a MAC subheader and a confirmation MAC control element (MAC CE). The MAC subheader may comprise a logical channel identifier indicating that the MAC PDU comprises the confirmation MAC CE. The confirmation MAC CE may comprise a field indicating which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation. 35:43-58	Pp. 64-65, 72-76, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing ePDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitti€(E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65.

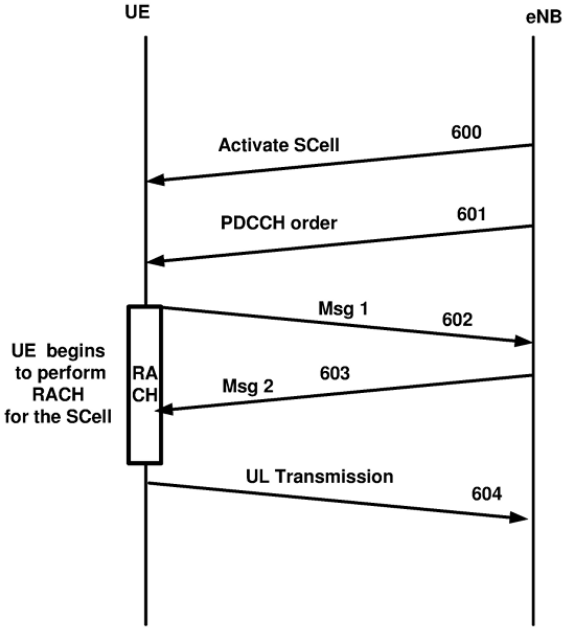
Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	“In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VoIP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC

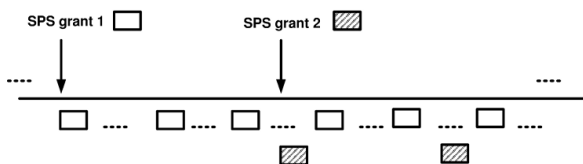
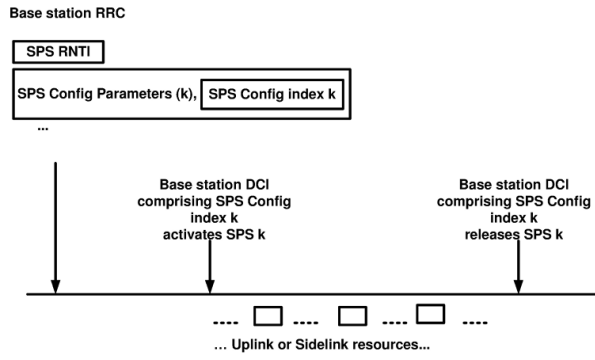
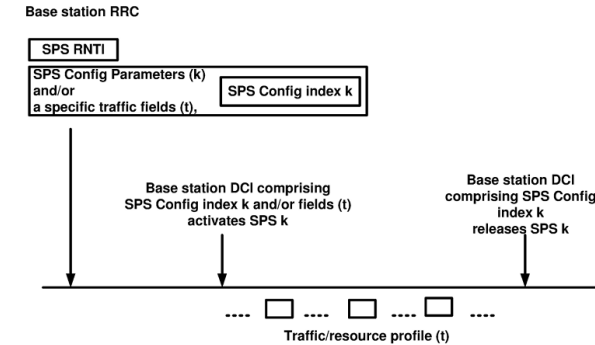
Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
FIG. 25 is an example flow diagram as per an aspect of an embodiment of the present disclosure. At 2510, a base station may transmit configuration parameters for a plurality of periodic resource allocations. At 2520, a downlink control information (DCI) may be transmitted. The DCI may indicate activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations. At 2530, in response to transmitting the DCI, a medium access control (MAC) protocol data unit (MAC PDU) may be received. The MAC PDU may comprise: a MAC subheader comprising a logical channel identifier indicating that the MAC PDU comprises a confirmation MAC control element (MAC CE); and the confirmation MAC CE comprising a field indicating which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation. 36:12-27	Pp. 64-65, 72-76, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting

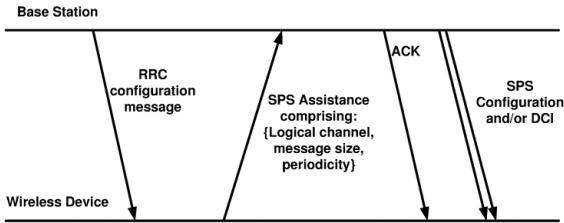
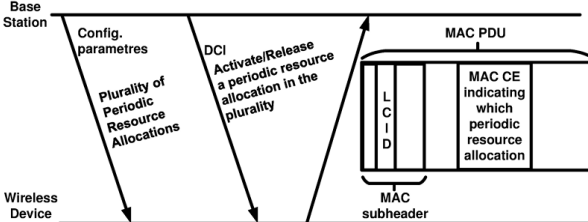
Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	(E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
FIG. 28 is an example flow diagram as per an aspect of an embodiment of the present disclosure. At 2810, a wireless device may receive first configuration parameters for a first periodic resource allocation and second configuration parameters for a second periodic resource allocation. The first configuration parameters may comprise a first logical channel identifier (LCID) and the second configuration parameters comprise a second LCID. At 2820, a downlink control information (DCI) may be received indicating activation or release of one of the first periodic resource allocation or the second periodic resource allocation. In response to receiving the DCI, a confirmation medium access control (MAC) control element (MAC CE) may be transmitted. The confirmation MAC CE may be identified by the first LCID in response to the DCI activating or releasing the first periodic resource allocation. The confirmation MAC CE may be identified by the second LCID in response to the DCI activating or releasing the second periodic resource allocation. FIG. 29 is an example flow diagram as per an aspect of an embodiment of the present disclosure. At 2910, a wireless device may receive configuration parameters of a plurality of periodic resource allocations comprising one or more first periodic resource allocations and one or more second periodic resource allocations. At 2920, a downlink control information (DCI) may be received. The DCI may indicate activation or release of a periodic resource allocation in the plurality of periodic resource allocations. In response to receiving the DCI, a medium access control (MAC) protocol data unit (MAC PDU) may be transmitted at 2930. The MAC PDU may comprise a logical channel identifier indicating that the MAC PDU comprises a confirmation MAC control element (MAC CE); and a first field indicating that the confirmation MAC CE is for which one of the one or more first periodic resource allocations or one or more second periodic resource allocations.	Pp. 64-65, 72-76, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be

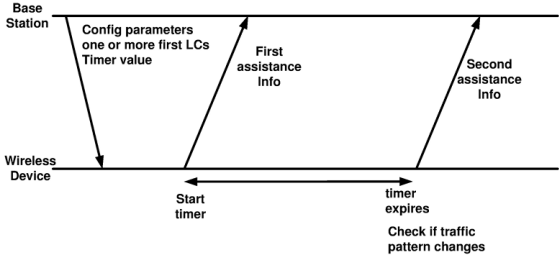
Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
37:19-54	performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
 FIG. 9 Fig. 9	Pp. 64-65, 72-76, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
 SPS grant 1  SPS grant 2          FIG. 13 Fig. 13  Base station RRC SPS RNTI SPS Config Parameters (k), SPS Config index k ... Base station DCI comprising SPS Config index k activates SPS k Base station DCI comprising SPS Config index k releases SPS k    Uplink or Sidelink resources... FIG. 14 Fig. 14  Base station RRC SPS RNTI SPS Config Parameters (k) and/or a specific traffic fields (t), SPS Config index k Base station DCI comprising SPS Config index k and/or fields (t) activates SPS k Base station DCI comprising SPS Config index k releases SPS k    Traffic/resource profile (t) FIG. 15	configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VoIP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
Fig. 15  FIG. 17 Fig. 17	(different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
 FIG. 18 Fig. 18	Pp. 60, 64-65, 72-76, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
	UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
 FIG. 23 Fig. 23	Pp. 60, 64-65, 72-76, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
Receive, by a wireless device, configuration parameters for a plurality of periodic resource allocations 2410 ↓ Receive a DCI indicating activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations 2420 ↓ Transmit, in response to receiving the DCI, a MAC PDU comprising a MAC subheader and the confirmation MAC CE. The MAC PDU may comprise a MAC subheader and a confirmation MAC CE. The MAC subheader may comprise a logical channel identifier indicating that the MAC PDU comprises the confirmation MAC CE. The confirmation MAC CE may comprise a field indicating which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation. 2430 FIG. 24 Fig. 24 Transmit, by a base station, configuration parameters for a plurality of periodic resource allocations 2510 ↓ Transmit a DCI indicating activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations 2520 ↓ Receive, in response to transmitting the DCI, a MAC PDU comprising: a MAC subheader comprising a logical channel identifier indicating that the MAC PDU comprises a MAC CE; and the confirmation MAC CE comprising a field indicating which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation 2530 FIG. 25 Fig. 25	dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65. “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or when SPS indexes are not configured. When the UE is configured with an

Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
Receive, by a wireless device, first configuration parameters for a first periodic resource allocation and second configuration parameters for a second periodic resource allocation, wherein the first configuration parameters comprise an LCID and the second configuration parameters comprise a second LCID <u>2810</u> Receive a DCI indicating activation or release of one of the first periodic resource allocation or the second periodic resource allocation <u>2820</u> Transmit, in response to receiving the DCI, a confirmation MAC CE wherein: the confirmation MAC CE is identified by the first LCID in response to the DCI activating or releasing the first periodic resource allocation; and the confirmation MAC CE is identified by the second LCID in response to the DCI activating or releasing the second periodic resource allocation <u>2830</u> FIG. 28 Fig. 28 Receive, by a wireless device, configuration parameters of periodic resource allocations comprising first periodic resource allocation(s) and second periodic resource allocation(s) <u>2910</u> Receive a DCI indicating activation or release of a periodic resource allocation in the periodic resource allocations <u>2920</u> Transmit, in response to receiving the DCI, a MAC PDU comprising a MAC subheader comprising: a logical channel identifier indicating that the MAC PDU comprises a confirmation MAC CE; and a first field indicating that the confirmation MAC CE is for which one of the first periodic resource allocation(s) or second periodic resource allocation(s) <u>2930</u> FIG. 29	enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.

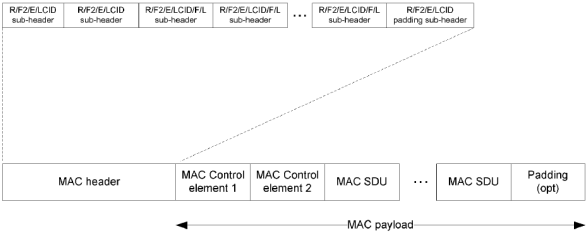
Subject Matter from EX1006 Cited in Analysis Below	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007) ³
Fig. 29	

75. It is also my opinion that Babaei's Claims are supported by the Babaei Provisional. The table below identifies subject matter that supports Babaei's Claims.

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
1. A method comprising: 2. receiving, by a wireless device, configuration parameters for a plurality of periodic resource allocations;	Pp. 64-69, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI." Pp. 64-65.

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
receiving downlink control information (DCI) that comprises an indication of activation or release of at least one periodic resource allocation of the plurality of periodic resource allocations; and	Pp. 64-69, including for example: In an example, multiple SPS configurations may be configured for UU and/or PC5 interface. An eNB may configure multiple SPS configurations for a given UE. In an example, SPS configuration specific MCS (e.g. MCS as a part of the RRC SPS-configuration) and/or SPS-configuration-specific periodicity may be configured. Some of the SPS configuration parameters may be the same across multiple SPS and some other SPS configuration parameters may be different across SPS configurations. The eNB may dynamically trigger/release the different SPS-configurations employing (E)PDCCH DCIs. In an example, the multiple SPS configurations may be indicated by eNB RRC signaling. The dynamical triggering and releasing may be performed by eNB transmitting (E)PDCCH DCI to the UE employing SPS C-RNTI.” Pp. 64-65.
sending, after receiving the DCI, a medium access control (MAC) protocol data unit (PDU) comprising:	Pp. 58-60, 72-76, including for example: “In an example, MAC PDU subheaders may have the same order as the corresponding MAC SDUs, MAC control elements and padding. In an example, MAC control elements may always be placed before any MAC SDU. In an example, Padding may occur at the end of the MAC PDU, except when single-byte or two-byte padding is required. In an example, padding may have any value and

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
	the MAC entity may ignore it. In an example, when padding is performed at the end of the MAC PDU, zero or more padding bytes are allowed. In an example, when single-byte or two-byte padding is required, one or two MAC PDU subheaders corresponding to padding are placed at the beginning of the MAC PDU before any other MAC PDU subheader. In an example, a maximum of one MAC PDU can be transmitted per TB per MAC entity. In an example, a maximum of one MCH MAC PDU may be transmitted per TTI.” P. 59. “In an example, a MAC PDU subheader may consist of the five or six header fields R/F2/E/LCID/(F)/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. In an example, the last subheader in the MAC PDU and subheaders for fixed sized MAC control elements may consist solely of the four header fields R/F2/E/LCID. In an example, a MAC PDU subheader corresponding to padding may consist of the four header fields R/F2/E/LCID.” Pp. 58-59.

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
	 Example of MAC PDU consisting of MAC header, MAC control elements, MAC SDUs and padding p. 60.
a confirmation MAC control element (MAC CE) comprising a plurality of fields, wherein at least one of the plurality of fields indicates receipt of the indication of activation or release by using a same value to indicate either the activation or the release; and	Pp. 60, 72-76, including for example: “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
	identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.
a logical channel identifier that indicates that the MAC PDU comprises the confirmation MAC CE.	Pp. 60, 72-76, including for example: “In an example, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOiP, and/or

Babaei Claim 1 (EX1006 at 39:49-64)	Supporting Corresponding Subject Matter in Babaei Provisional (EX1007)
	when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” Pp. 74-75.

B. International Publication No. WO 2016/130175 A1 (“Fwu”)

1. Overview of Fwu

76. Fwu is directed to “an eNodeB (eNB), user equipment (UE) and method of providing a flexible Radio Access Technology (FRAT) are generally described. The information (resource allocation, partition information and numerology) of at least one of a plurality of RATs used by the eNB is provided to a UE. Each RAT has a flexible subcarrier spacing and symbol duration, which are integer multiples of a base subcarrier spacing and symbol duration, and is associated with at least one of different temporal and frequency resources. The symbol and/or frame structure of

each RAT are independent. A Transmission Time Interval (TTI) boundary between the RATs is common, and the RATs comprise a common reference TTI duration. The information of the RATs is provided either via a different RAT than the RAT used by the UE for communication or via a dedicated carrier in the RAT used by the UE for communication.” EX1008 at Abstract. Figure 3, reproduced below, illustrates a 5G RAT with low band, mid-band, and high-band regions.

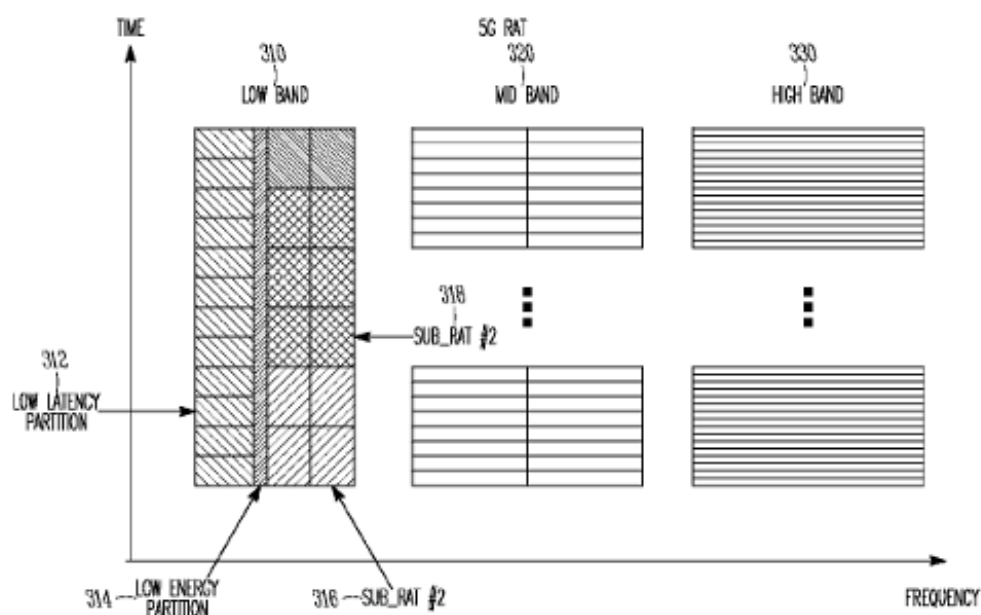


FIG. 3

EX1008 at Fig. 3.

77. The mid-band and high-band regions depicted in Figure 3 have different numerologies. *Id.* at Figure 3; [0040]. The low-band region depicted in Figure 3 consists of three numerologies, or sub_RATs, wherein the different numerologies support different services. *Id.* at [0040], [0044].

78. The low-band region consists of three different numerologies, called sub-RATS or partitions, with different numerologies suitable to different services. EX1008 at [0040], [0044]. Specifically, “particular RATs/sub-RATs/partitions may be used for different types of communications, with each having independently sized resource blocks.” *Id.* The different numerologies can be configured using RRC signaling. EX1008 at [0073], [0078], [0082], [0092]. Specifically, Fwu discloses that “the numerologies and/or resource partition for multiple RATs, sub-RATs or partitions may be predefined or configured by high layer signaling via a MIB, SIB or UE-specific dedicated RRC signaling.” *Id.*

2. Fwu is Prior Art to the '976 Patent

79. Fwu is prior art to the '976 Patent as an International Patent Publication published on August 18, 2016. EX1008 at 1.

C. US Patent No. 10,869,331 (“Lee”)

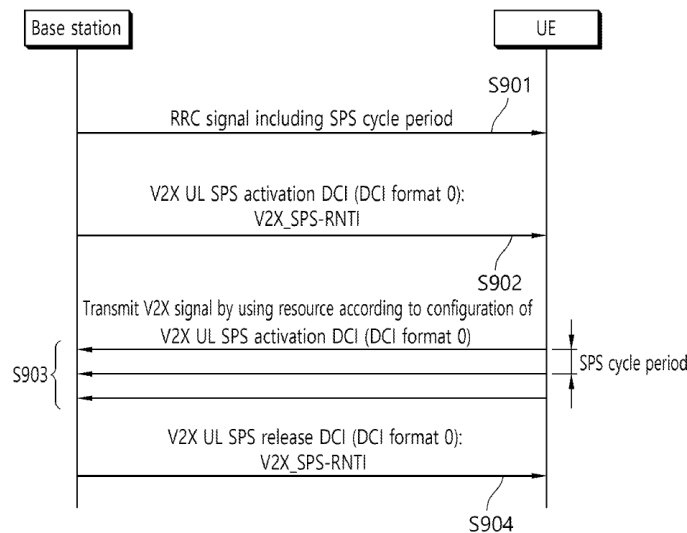
1. Overview of Lee

80. Lee is directed to “a method for transmitting downlink control information for sidelink scheduling in a wireless communication system and a wireless apparatus using the method. The method is characterized by: generating sidelink SPS activation/release DCI for indicating sidelink semi-persistent scheduling (SPS) activation or release; and transmitting the sidelink SPS activation/release DCI to a terminal, wherein the sidelink SPS activation/release DCI

further comprises a sidelink SPS activation/release field and a sidelink SPS configuration index field not present in sidelink dynamic DCI which is for dynamically scheduling the sidelink.” EX1011 at Abstract.

81. Lee teaches a system and method for the improvement and extension of late 4G and early 5G technology to accommodate services with different requirements, and in particular services that require periodic access to uplink resources, such as VoIP and V2X. EX1011 at Fig. 8; Fig. 9 13:56-14:35. Figure 9, reproduced below, illustrates a V2X UL SPS activation and release (deactivation). Ex. EX1011 at Fig. 9, 14:12-35.

FIG. 9



2. Lee is Entitled to its Provisional Filing Date

82. I understand that Lee claims priority to claims the benefit of U.S. Provisional Applications No. 62/317,393 filed on Apr. 1, 2016, No. 62/320,332 filed on Apr. 8, 2016, No. 62/333,778 filed on May 9, 2016, No. 62/335,658 filed on May 12, 2016, No. 62/374,737 filed on Aug. 12, 2016, No. 62/376,376 filed on Aug. 17, 2016, No. 62/401,186 filed on Sep. 29, 2016, No. 62/403,061 filed on Oct. 1, 2016, and No. 62/403,677 filed on Oct. 3, 2016.

83. I understand that because the filing dates of each of the nine provisional applications which Lee claims priority to are before the '976 Patent's earliest claimed priority date, Lee is considered prior art if the subject matter relied upon from Lee is supported by Lee's earlier priority applications.

84. It is my opinion that the subject matter relied upon from Lee in my analysis below is supported in the Lee Provisional Application No. 62/403,061, as shown in the table below.

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
Provided are a method for transmitting downlink control information for sidelink scheduling in a wireless communication system and a wireless apparatus using the method. The method is characterized by: generating sidelink SPS activation/release DCI for indicating sidelink semi-persistent scheduling (SPS) activation or release; and transmitting the sidelink SPS activation/release DCI to a terminal, wherein the sidelink SPS activation/release DCI further comprises a sidelink SPS activation/release field and a	pp. 15-19, including for example: “Title of Invention DCI Design for Multiple SL/UL SPS Processes” p. 15. “In a case where a plurality of SIDELINK (SL) and/or UPLINK (UL) SEMI-PERSISTENT SCHEDULING (SPS)

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
sidelink SPS configuration index field not present in sidelink dynamic DCI which is for dynamically scheduling the sidelink. Abstract	PROCESS(S)(/CONFIGURATION(S)) are configured (e.g., 'MULTIPLE SPS CONFIGURATION(S)(/PROCESS(S)) FOR UL (UL + SL), EX) ONE FOR VOIP, ONE FOR ITS'), the proposed methods that will hereinafter be described in detail propose methods for efficiently managing and operating such processes (e.g., SPS PROCESS (/CONFIGURATION) ACTIVATION/RELEASE, FREQUENCY RESOURCE REALLOCATION, HARQ RETRANSMISSION)." P. 15. "A (single) common (or shared) 'V2X_SPS-RNTI' is configured (/signaled) to a plurality of 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S)), and this method may identify (or distinguish) to which 'SL (and/or UL) SPS PROCESS (/CONFIGURATION)' the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a '(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI' that is decoded by using the corresponding RNTI (e.g., a 'SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)' field and/or a field announcing an 'LCID' being linked (/interconnected) to a 'SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)' (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a 'DM-RS CS (3 bit) field' (e.g., a case where a UL (and/or SL)-SPS)

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	(ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 0' type is (re-)used (for the purpose of a '(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) and/or a 'HARQ ID (3/4 bit)/RV (2 bit) field' (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 1/1A/2/2A/2B/2C/2D' type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) may be (re-)used." P. 16.
The above-described D2D communication may be expanded and applied to signal transmission and/or reception between vehicles. Most particularly, vehicle-related communication is referred to as vehicle-to-everything (V2X) communication. In V2X, the term 'X' may refer to a pedestrian, a vehicle, an infrastructure/network, and so on, which may be respectively indicated as V2P, V2V, and V2I/N. Meanwhile, a wireless communication system may transmit signals by using semi-persistent scheduling (SPS). Herein, semi-persistent scheduling (SPS) corresponds to a scheduling method that first determines in advance a cycle period for transmitting a signal through a higher layer signal and then transmits a signal by using a modulation and coding scheme (MCS), a resource, and so on, which are indicated by a control channel according to the pre-determined cycle period, while directing (or instructing) activation of SPS through the control channel when announcing (or notifying) a specific resource. The signal transmission according to the above-described SPS may also be used in the V2X communication. 2:8-26	pp. 15-19, 36, including for example: "A (single) common (or shared) 'V2X_SPS-RNTI' is configured (/signaled) to a plurality of 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S)), and this method may identify (or distinguish) to which 'SL (and/or UL) SPS PROCESS (/CONFIGURATION)' the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a '(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI' that is decoded by using the corresponding RNTI (e.g., a 'SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)' field and/or a field announcing an 'LCID' being linked (/interconnected) to a 'SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)' (that

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 1/1A/2/2A/2B/2C/2D’ type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) may be (re-)used.” P. 16. “For example, the proposed methods according to this invention may also be extendedly applied to D2D communication. Herein, for example, D2D communication refers to performing communication between a UE and another UE by using a direct wireless channel. And, herein, for example, although the UE refers to a user device, in case a network equipment, such as a base station, transmits/receives signals according to a communication method performed between UEs, the corresponding network equipment may also be viewed as a type of UE. Additionally, for example, the proposed methods according to this invention may also be limitedly applied only in Mode 2 V2X operations (and/or

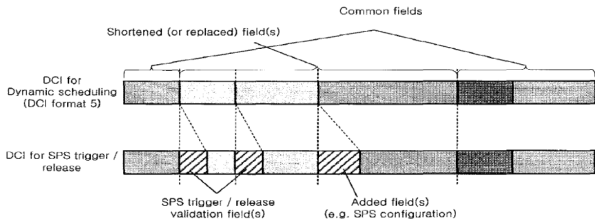
Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	Mode 1 V2X operations). Additionally, for example, in the proposed methods according to this invention, the ‘(SL- and/or UL-SPS) (ACTIVATION/RELEASE) DCI’ may be limitedly transmitted only through a ‘(PDCCH or EPDCCH) USS’ (or ‘PDCCH CSS’). Additionally, for example, in the proposed methods according to this invention, the wording ‘(SL- and/or UL-SPS) (ACTIVATION/RELEASE) DCI’ may also be interpreted as a ‘Mode 1 DCI’ (that is received from base station) (announcing PC5 (V2V) SPS related scheduling information).” P. 36
FIG. 1 shows a wireless communication system. The wireless communication system may be referred to as an Evolved-UMTS Terrestrial Radio Access Network (E-UTRAN) or a Long Term Evolution (LTE)/LTE-A system, for example. The E-UTRAN includes at least one base station (BS) 20 which provides a control plane and a user plane to a user equipment (UE) 10. The UE 10 may be fixed or mobile, and may be referred to as another terminology, such as a mobile station (MS), a user terminal (UT), a subscriber station (SS), a mobile terminal (MT), a wireless device, etc. The BS 20 is generally a fixed station that communicates with the UE 10 and may be referred to as another terminology, such as an evolved node-B (eNB), a base transceiver system (BTS), an access point, etc. 4:7-21	pp. 15-19, 36; including for example: “Related Technology Field Wireless Communications Related Specification LTE Advanced” p. 15. “Example of SPS ACTIVATION/RELEASE operations (related to WAN (VOIP(/UL)) communications) under existing LTE systems.” P. 16. “For example, although this invention is described based on a 3GPP LTE system for simplicity in the description, the scope of systems in which the proposed methods can be applied may be extended to diverse systems other than the 3GPP LTE system. For example, the proposed methods according to this invention may also be

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	extendedly applied to D2D communication. Herein, for example, D2D communication refers to performing communication between a UE and another UE by using a direct wireless channel. And, herein, for example, although the UE refers to a user device, in case a network equipment, such as a base station, transmits/receives signals according to a communication method performed between UEs, the corresponding network equipment may also be viewed as a type of UE.” P. 36
In the wireless communication system, the user equipment (UE) receives scheduling information, such as DL grant, UL grant, and so on, through the PDCCH, and, then, based on the received scheduling information, the UE performs operations of receiving the PDSCH and transmitting the PUSCH. Generally, the UL grant and the PDSCH are received within the same subframe. Thereafter, the PUSCH is transmitted after at least 4 subframes from the subframe that has received the UL grant. In addition to such dynamic scheduling, the LTE/LTE-A also provides semi-persistent scheduling (SPS). 10:30-40	pp. 17-18, 28, 35 including for example: “For example, in a case where a V2X UE performing the “SPS format” based V2X Mode 1 communication has received configuration (/signaling) of a (time/frequency) resource so that the corresponding V2X UE can respectively perform (TDM) transmission of the PSCCH and PSSCH over W and Q number of times, (A) if a pre-configured (/signaled) Sth (e.g., “S=1”) PSCCH transmission is performed and a (pre-defined) SPS release DCI format (this will be referred to as SPS_RELFMT) is received before an interconnected PSSCH transmission (in SF #N) (and/or if the SPS_RELFMT is received (in SF #N) while performing a (PSCCH/PSSCH) transmission operation that is related to a (specific) TB), (based on an assumption that the SPS resource has been released (after a

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	time point including (or not including) SF #(N+4)) settings may be made so that the subsequent transmission operations are not performed (through the corresponding SPS resource) (or settings may be made so that only the (specific) TB related transmission can be performed (/completed)). Herein, for example, for the release of the pre-configured (/signaled) (Mode 1) SPS resource and/or the suspension of the (PSCCH/PSSCH) transmission operation that is based on the corresponding (SPS) resource settings may be made so that SPS_RELFMT can be received before a preconfigured (/signaled) value (e.g., “4 MS”) from (at least) a first PSCCH transmission point that is related to a (specific) TB. Herein, for example, in a case where a V2X UE performing the “dynamic format” based V2X Mode 1 communication has received configuration (/signaling) of a (time/frequency) resource within a plurality of subframes for the transmission of the (specific) TB, if a DCI format (DYN_RELFMT) indicating the suspension of a (pre-defined) dynamic transmission is received (SF #J) while performing the (PSCCH/PSSCH) transmission operation that is related to the (specific) TB, (based on an assumption that the dynamic resource is not valid (or effective) (after a time point including (or not including) SF #(J+4)) settings may be made so that the subsequent transmission operations are not performed (or settings may be made so that only the (specific) TB related transmission can be

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	performed (/completed)). Herein, for example, for the invalidation (release) of the pre-configured (/signaled) (Mode 1) dynamic resource and/or the suspension of the (PSCCH/PSSCH) transmission operation that is based on the corresponding (dynamic) resource settings may be made so that DYN_REL FMT can be received before a pre-configured (/signaled) value (e.g., “4 MS”) from (at least) a first PSCCH transmission point that is related to a (specific) TB.” P. 35 (Note that the PDCCH and PDSCH have been translated as PSCCH and PSSCH, but it is clear from context that PSCCH and PSSCH refer to PDCCH and PDSCH respectively).
FIG. 8 shows an example of an existing uplink SPS process. Referring to FIG. 8, the base station transmits a higher layer signal including an SPS cycle period, e.g., a radio resource control (RRC) signal to the UE (S801). The base station may transmit, for example, an uplink SPS activation DCI for VoIP (this may be referred to as a VoIP UL SPS activation DCI) to the UE (S802). The VoIP UL SPS activation DCI may include a cyclic redundancy check (CRC), and the CRC may be scrambled by using an SPS-C-RNTI (hereinafter referred to as a first RNTI).	pp. 15-20, p. 28, including for example: “By configuring (/signaling) (part of) a different (new) ‘V2X_SPS-RNTI’ per ‘SL and/or UL SPS PROCESS (/CONFIGURATION)’, independent management and operation (e.g., SPS PROCESS (/CONFIGURATION) ACTIVATION/RELEASE, FREQUENCY RESOURCE REALLOCATION, HARQ RETRANSMISSION) may be achieved for each ‘SL and/or UL PROCESS (/CONFIGURATION)’. Herein, for example, in case the corresponding rule is applied, this may be interpreted as (part of) different ‘RNTI’ values being configured (/signaled) between a plurality of SL SPS

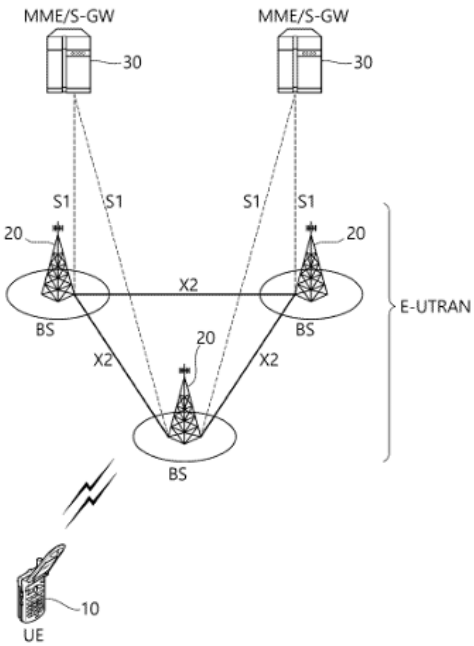
Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
The UE transmits a signal to the base station at an SPS cycle period by using a resource according to the configuration of a VoIP UL SPS activation DCI (S803). The UE receives a DCI that releases the VoIP UL SPS (this may be referred to as a VoIP UL SPS release DCI) (S804). The VoIP UL SPS release DCI may also include a CRC, and the CRC may be scrambled by using an SPS-C-RNTI (a first RNTI). The VoIP UL SPS activation DCI/VoIP UL SPS release DCI may be received through a physical downlink control channel (PDCCH) or an enhanced PDCCH (EPDCCH). FIG. 9 shows an example of a case where an uplink SPS process is applied to the V2X. Herein, the corresponding uplink SPS process will be referred to as a V2X uplink SPS process. Referring to FIG. 9, the base station transmits a higher layer signal including an SPS cycle period, e.g., a radio resource control (RRC) signal to the UE (S901). The base station may transmit, for example, an uplink SPS activation DCI for V2X (this may be referred to as a V2X UL SPS activation DCI) to the UE (S902). The V2X UL SPS activation DCI may include a cyclic redundancy check (CRC), and the CRC may be scrambled by using a V2X-SPS-RNTI (hereinafter referred to as a second RNTI). Herein, the second RNTI may correspond to another RNTI that is differentiated from the above-described first RNTI. The UE transmits a V2X signal to the base station at an SPS cycle period by using a resource according to the configuration of a V2X UL SPS activation DCI (S903). The UE receives a DCI that releases the V2X UL SPS (this may be referred to as a V2X UL SPS release DCI) (S904). The V2X UL SPS release DCI may also include a CRC, and the CRC may be scrambled by using a V2X-SPS-RNTI (a second RNTI). 13:56-14:35	PROCESS (/CONFIGURATION) (or UL SPS PROCESS (/CONFIGURATION)) and/or as (part of) different ‘RNTI’ values being configured (/signaled) between a SL SPS PROCESS (/CONFIGURATION) and an UL SPS PROCESS (/CONFIGURATION). Herein, as another example, (part of) different (or common) ‘RNTI’ values may also be configured (/signaled) between the existing (or conventional) WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) (e.g., ‘SPS C-RNTI’) and the (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or SL SPS PROCESS (/CONFIGURATION)).” P. 15. “For example, in case (a maximum of) ‘4’ ‘SL and/or UL SPS PROCESS(S) (/CONFIGURATION(S))’ may be ‘ACTIVATED/RELEASED’ at the same time, and, in case the ‘SL and/or UL SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ is expressed as ‘3 BIT(S)’, the corresponding field(s) may be implemented as ‘4’ fields each having the length of ‘3 BIT(S)’. Herein, for example, (According to the proposed method, in case ‘ACTIVATION’ (/RELEASE/FREQUENCY RESOURCE REALLOCATION/HARQ RETRANSMISSION) related to a plurality of ‘SL and/or UL SPS PROCESS(S) (/CONFIGURATION(S))’ are indicated (or instructed) at the same time, in order to reduce collision between ‘SL and/or UL

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)										
	SPS PROCESS(S) (/CONFIGURATION(S))' having the same 'cycle period value' and/or 'frequency (/time) resource position value', among the corresponding 'SL and/or UL SPS PROCESS(S) (/CONFIGURATION(S))' (that are simultaneously instructed (or indicated)),) the 'SF OFFSET' information per 'SL and/or UL SPS PROCESS (/CONFIGURATION)' may be configured through a 'SF OFFSET' information field per 'SL and/or UL SPS PROCESS(S) (/CONFIGURATION(S))' being (newly) defined within (A) a 'higher layer signaling (e.g., 'RRC')' or (B) a '(SL and/or UL-SPS) (ACTIVATION/RELEASE) DCI'." P. 20.  Figure 1. Common DCI format for dynamic scheduling and SPS (with special fields for SPS trigger release validation and SPS configuration field) p. 28. Table 1. Mapping of Cyclic shift DM RS field with V2X UL SPS configuration index <table><tr><th>Value of SPS configuration field in sidelink (E)PDCCH</th><th>Usage</th></tr><tr><td>'000'</td><td>sidelink dynamic scheduling</td></tr><tr><td>'001'</td><td>sidelink SPS configuration 0 for V2X</td></tr><tr><td>'010'</td><td>sidelink SPS configuration 1 for V2X</td></tr><tr><td>'011'</td><td>sidelink SPS configuration 2 for V2X</td></tr></table> p. 28	Value of SPS configuration field in sidelink (E)PDCCH	Usage	'000'	sidelink dynamic scheduling	'001'	sidelink SPS configuration 0 for V2X	'010'	sidelink SPS configuration 1 for V2X	'011'	sidelink SPS configuration 2 for V2X
Value of SPS configuration field in sidelink (E)PDCCH	Usage										
'000'	sidelink dynamic scheduling										
'001'	sidelink SPS configuration 0 for V2X										
'010'	sidelink SPS configuration 1 for V2X										
'011'	sidelink SPS configuration 2 for V2X										

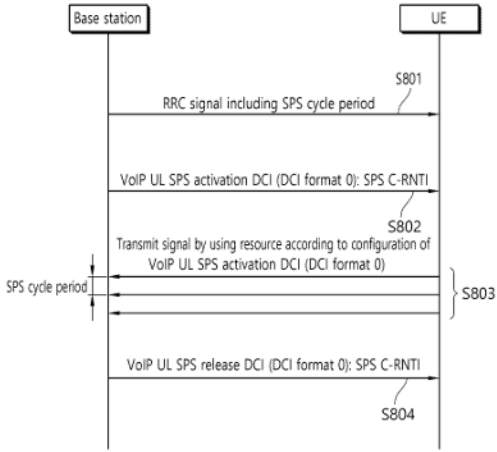
Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
FIG. 11 is a diagram showing a comparison between the existing (VoIP) uplink SPS activation/release DCI (first DCI) and the V2X uplink SPS activation/release DCI (second DCI) by applying the [Proposed Method #2]. As respectively described above with reference to FIG. 8 and FIG. 9, the first DCI may be CRC-scrambled by the SPS-C-RNTI (first RNTI), and the second DCI may be CRC-scrambled by the V2X-SPS-RNTI (second RNTI). Referring to FIG. 11, each of the first DCI and the second DCI includes a plurality of fields. The first DCI and the second DCI may include a plurality of common fields and a plurality of fields that are differentiated from one another. For example, the first DCI and the second DCI may commonly have a carrier indication field (0 bit or 3 bits), a resource block assignment and hopping resource assignment field, an MCS and redundancy version (RV) field, and so on. Conversely, the first DCI may include a cyclic shift (CS) field corresponding to a demodulation reference signal (DM-RS) (this will hereinafter be referred to as a DM-RS CS field), whereas the second DCI may include an uplink SPS configuration index field instead of the DM-RS CS field. In light of the RNTI, if the DCI is CRC-scrambled by the V2X-SPS-RNTI (second RNTI), it may be expressed that the DM-RS CS field (this refers to the above-described CS DM RS (3 bits) field) does not exist and that the uplink SPS configuration index field exists. Alternatively, it may also be expressed that, in the first DCI, the DM-RS CS field is used for its initial purpose, which corresponds to announcing (or notifying) the cyclic shift of the DM-RS, and that, in the second DCI, the DM-RS CS field is used as an uplink SPS configuration index field. FIG. 12 shows an example of a method for interpreting a specific field when decoding the first DCI and the second DCI. Referring to FIG. 12, the UE receives a DCI indicating uplink SPS activation or release (S310), and, then, in case the DCI is decoded based on a second RNTI, a DM-RS cyclic shift field of the DCI is interpreted as a UL SPS configuration index (S320). As described above in [Proposed Method #2] and FIG. 11, in the V2X uplink SPS activation/release DCI (second DCI), the DM-RS cyclic shift field included in the existing uplink SPS activation/release DCI (first DCI) may be interpreted as a UL SPS configuration index. As described above, this may also be expressed as the UL SPS configuration index field being included in the V2X uplink SPS activation/release DCI (second DCI) instead of the DM-RS cyclic shift field. 15:50-16:30	pp. 16, 19, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S)), and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the

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	(existing) ‘DCI format 1/1A/2/2A/2B/2C/2D’ type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., ‘3 bit’), and, in case a (maximum) number of ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ (SPS NUM) being configured (/signaled) (in the form of a ‘CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION’) from a network (or (serving) cell) can be varied (or changed), ‘(X_size - ceiling(LOG2(SPS NUM)))’ (and/or ‘(X_size - floor(LOG2(SPS NUM)))) bits (herein, for example, the ‘ceiling(X)’ and the ‘floor(X)’ may indicate a function drawing a ‘minimum integer value that is greater than or equal to X’ and a function drawing a ‘maximum integer value that is smaller than or equal to X’) may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’). Herein, for example, in case a common ‘RNTI’ value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) ‘(ACTIVATION/RELEASE) DCI’ having the same (payload) size is used), it may be

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	distinguished to which one of the existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., '1 bit') and/or (B) a pre-designated (/signaled) existing field within the '(ACTIVATION/RELEASE) DCI' being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the '(ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 0' type is (re-)used (refer to Table 3.3), an 'MCS/RV (5 bits) field (MSB (1 bit))' and/or a 'TPC (2 bits) field (MSB (1 bit))' and/or a 'CS DM RS (3 bits) field (MSB (1 bit))' may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the '(ACTIVATION/RELEASE) DCI' that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a 'VIRTUAL CRC') until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI." p. 16

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[Proposed Method #3] (For example, in case a (single) common ‘V2X_SPS-RNTI’ and ‘(activation/release) DCI format’ are used for the management and operation of a plurality of ‘sidelink and/or uplink SPS process(/configuration)’ a subframe (SF) set(/cell set) (and/or a search space (SS) type (CSS/USS) and/or a control channel (PDCCH/EPDCCH set) type) in which the related ‘(sidelink and/or uplink-SPS) (activation/release) DCI’ is received for each ‘sidelink and/or uplink SPS process(/configuration)’ may be differently (or independently) configured(/signaled). 17:13-22	pp. 16, 19, including for example: “[Proposed Method #3] (For example, in case a (single) common ‘V2X_SPS-RNTI’ and ‘(ACTIVATION/RELEASE) DCI format’ are used for the management and operation of a plurality of ‘SL and/or UL SPS PROCESS (/CONFIGURATION)’ a SUBFRAME (SF) SET (/CELL SET) (and/or a search space (SS) type (CSS/USS) and/or a control channel (PDCCH/EPDCCH SET) type) in which the related ‘(SL and/or UL-SPS) (ACTIVATION/RELEASE) DCI’ is received for each ‘SL and/or UL SPS PROCESS (/CONFIGURATION)’ may be differently (or independently) configured (/signaled).” P. 19.
	pp. 15-19, 23, including for example: “Title of Invention DCI Design for Multiple SL/UL SPS Processes” p. 15. “Related Technology Field Wireless Communications Related Specification LTE Advanced” p. 15. “Herein, for example, when considering such problem (/phenomenon), it may be difficult for the V2X UE to perform ‘V2X MESSAGE TX’ of high ‘reliability’ (and/or satisfying the ‘latency requirement’) through a specific cycle period and/or a time/frequency resource size and/or MCS of

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Fig. 1	a ‘single SPS configuration/process’, which is/are configured (/signaled) by the base station. Herein, for example, in order to resolve this problem, the cycle period related to the ‘single SPS configuration (/process)’ may be configured to be (extremely) short and a large size of the (time/frequency) resource may be assigned. However, in the aspect of efficient resource management, this method is not preferable. As a solution, the base station may configure (/signal) ‘multiple SPS configurations (/processes)’ (having different cycle periods and/or (time/frequency) resource sizes (and/or MCS)) to the V2X UE and, then, may also allow the V2X UE to report (part of) the following information. Herein, for example, the information report may be performed through a pre-defined (/signaled) channel (e.g., ‘PUSCH (/PUCCH)’, ‘SR’). The base station that has received (/been reported of) such information may ‘release’ (/‘de-activate’) the ‘SPS configuration (/process)’ that is not used by the corresponding V2X UE (or (most) inappropriate to the corresponding V2X UE), or the corresponding base station may newly configure (/signal) a (most) appropriate ‘SPS configuration (/process)’ to the corresponding V2X UE (or the cycle period and/or (time/frequency) resource size (and/or MCS) related to the (existing) ‘SPS configuration (/process)’). As another example, the base station that has received (/been reported of) such information may

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	(finally) instruct the corresponding V2X UE to perform switching to the (most) appropriate ‘SPS configuration (/process)’ among the ‘multiple SPS configurations (/processes)’. Herein, for example, the corresponding switching instruction may be performed through a pre-defined (/signaled) channel (e.g., ‘(E)PDCCH (/PDSCH)’). Herein, for example, this rule may be limitedly applied only to the ‘Mode 1 (i.e., a method according to which the base station controls (/signals) the ‘V2X MESSAGE TX’ related scheduling information)’ based V2X communication and/or ‘RC_CONNECTED(/IN-COVERAGE) V2X UE’.” P. 23.
 Fig. 8	pp. 15-19, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))’, and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field

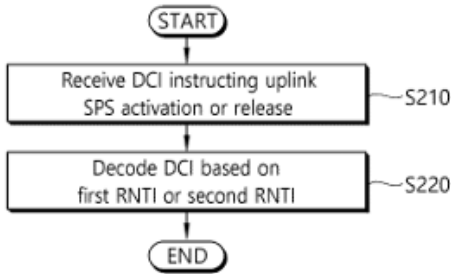
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	and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 1/1A/2/2A/2B/2C/2D’ type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., ‘3 bit’), and, in case a (maximum) number of ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ (SPS NUM) being configured (/signaled) (in the form of a ‘CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION’) from a network (or (serving) cell) can be varied (or changed), ‘(X_size - ceiling(LOG2(SPS NUM)))’ (and/or ‘(X_size - floor(LOG2(SPS NUM)))’ bits (herein, for example, the ‘ceiling(X)’ and the ‘floor(X)’

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	may indicate a function drawing a ‘minimum integer value that is greater than or equal to X’ and a function drawing a ‘maximum integer value that is smaller than or equal to X’) may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’). Herein, for example, in case a common ‘RNTI’ value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) ‘(ACTIVATION/RELEASE) DCI’ having the same (payload) size is used), it may be distinguished to which one of the existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., ‘1 bit’) and/or (B) a pre-designated (/signaled) existing field within the ‘(ACTIVATION/RELEASE) DCI’ being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the ‘(ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (refer to Table 3.3), an ‘MCS/RV (5 bits) field (MSB (1 bit))’ and/or a ‘TPC (2 bits) field (MSB (1 bit))’ and/or a ‘CS DM RS (3 bits) field (MSB (1 bit))’ may be (re-)used).

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	Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the ‘(ACTIVATION/RELEASE) DCI’ that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’) until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI.” p. 16
<pre>sequenceDiagram participant BS as Base station participant UE BS->>UE: RRC signal including SPS cycle period (S901) UE->>BS: V2X UL SPS activation DCI (DCI format 0): V2X_SPS-RNTI (S902) BS->>UE: Transmit V2X signal by using resource according to configuration of V2X UL SPS activation DCI (DCI format 0) (S903) UE->>BS: V2X UL SPS release DCI (DCI format 0): V2X_SPS-RNTI (S904)</pre> Fig. 9	pp. 16, 19, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))’, and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)

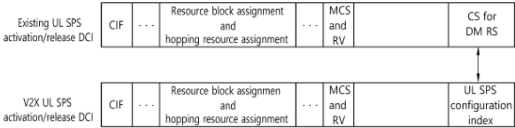
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	INDEX (/ID)' (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a 'DM-RS CS (3 bit) field' (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 0' type is (re-)used (for the purpose of a '(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) and/or a 'HARQ ID (3/4 bit)/RV (2 bit) field' (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 1/1A/2/2A/2B/2C/2D' type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., '3 bit'), and, in case a (maximum) number of 'SL (and/or UL) SPS PROCESS (/CONFIGURATION)' (SPS NUM) being configured (/signaled) (in the form of a 'CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION') from a network (or (serving) cell) can be varied (or changed), '(X_size - ceiling(LOG2(SPS NUM)))' (and/or '(X_size - floor(LOG2(SPS NUM))) bits (herein, for example, the 'ceiling(X)' and the 'floor(X)' may indicate a function drawing a 'minimum integer value that is greater than or equal to X' and a function drawing a

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	‘maximum integer value that is smaller than or equal to X’) may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’). Herein, for example, in case a common ‘RNTI’ value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) ‘(ACTIVATION/RELEASE) DCI’ having the same (payload) size is used), it may be distinguished to which one of the existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., ‘1 bit’) and/or (B) a pre-designated (/signaled) existing field within the ‘(ACTIVATION/RELEASE) DCI’ being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the ‘(ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (refer to Table 3.3), an ‘MCS/RV (5 bits) field (MSB (1 bit))’ and/or a ‘TPC (2 bits) field (MSB (1 bit))’ and/or a ‘CS DM RS (3 bits) field (MSB (1 bit))’ may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the

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	‘(ACTIVATION/RELEASE) DCI’ that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’) until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI.” p. 16
 <pre> graph TD START([START]) --> S210[Receive DCI instructing uplink SPS activation or release] S210 --> S220[Decode DCI based on first RNTI or second RNTI] S220 --> END([END]) </pre> Fig. 10	pp. 16, 19, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))’, and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the

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	above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 1/1A/2/2A/2B/2C/2D’ type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., ‘3 bit’), and, in case a (maximum) number of ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ (SPS NUM) being configured (/signaled) (in the form of a ‘CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION’) from a network (or (serving) cell) can be varied (or changed), ‘(X_size - ceiling(LOG2(SPS NUM)))’ (and/or ‘(X_size - floor(LOG2(SPS NUM)))’ bits (herein, for example, the ‘ceiling(X)’ and the ‘floor(X)’ may indicate a function drawing a ‘minimum integer value that is greater than or equal to X’ and a function drawing a ‘maximum integer value that is smaller than or equal to X’) may be processed with zero (or a specific pre-configured (/signaled)

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	value) padding (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’). Herein, for example, in case a common ‘RNTI’ value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) ‘(ACTIVATION/RELEASE) DCI’ having the same (payload) size is used), it may be distinguished to which one of the existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., ‘1 bit’) and/or (B) a pre-designated (/signaled) existing field within the ‘(ACTIVATION/RELEASE) DCI’ being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the ‘(ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (refer to Table 3.3), an ‘MCS/RV (5 bits) field (MSB (1 bit))’ and/or a ‘TPC (2 bits) field (MSB (1 bit))’ and/or a ‘CS DM RS (3 bits) field (MSB (1 bit))’ may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the ‘(ACTIVATION/RELEASE) DCI’ that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within

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	the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’) until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI.” p. 16
 Existing UL SPS activation/release DCI V2X UL SPS activation/release DCI Fig. 11	pp. 16, 19, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))’, and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE)

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	DCI' of the (existing) 'DCI format 0' type is (re-)used (for the purpose of a '(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) and/or a 'HARQ ID (3/4 bit)/RV (2 bit) field' (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 1/1A/2/2A/2B/2C/2D' type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., '3 bit'), and, in case a (maximum) number of 'SL (and/or UL) SPS PROCESS (/CONFIGURATION)' (SPS NUM) being configured (/signaled) (in the form of a 'CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION') from a network (or (serving) cell) can be varied (or changed), '(X_size - ceiling(LOG2(SPS NUM)))' (and/or '(X_size - floor(LOG2(SPS NUM))) bits (herein, for example, the 'ceiling(X)' and the 'floor(X)' may indicate a function drawing a 'minimum integer value that is greater than or equal to X' and a function drawing a 'maximum integer value that is smaller than or equal to X') may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be used for the purpose of a 'VIRTUAL CRC'). Herein, for example, in case a common 'RNTI'

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) ‘(ACTIVATION/RELEASE) DCI’ having the same (payload) size is used), it may be distinguished to which one of the existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., ‘1 bit’) and/or (B) a pre-designated (/signaled) existing field within the ‘(ACTIVATION/RELEASE) DCI’ being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the ‘(ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (refer to Table 3.3), an ‘MCS/RV (5 bits) field (MSB (1 bit))’ and/or a ‘TPC (2 bits) field (MSB (1 bit))’ and/or a ‘CS DM RS (3 bits) field (MSB (1 bit))’ may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the ‘(ACTIVATION/RELEASE) DCI’ that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-

Subject Matter from EX1011 Cited in Analysis Below	Supporting Corresponding Subject Matter in Certified Translation of Lee Provisional (EX1015)
	configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’) until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI.” p. 16

85. It is also my opinion that Lee’s Claims are supported by the Lee Provisional. The table below identifies subject matter that supports Lee’s Claims.

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
1. A method of transmitting downlink control information (DCI) by a base station in a wireless communication system, the method comprising: generating the DCI; and transmitting the DCI to a user equipment (UE),	pp. 15-19, 28, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))’, and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled)

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 1/1A/2/2A/2B/2C/2D’ type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., ‘3 bit’), and, in case a (maximum) number of ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ (SPS NUM) being configured (/signaled) (in the form of a ‘CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION’) from a network (or (serving) cell) can be varied (or changed), ‘(X_size - ceiling(LOG2(SPS NUM)))’ (and/or ‘(X_size - floor(LOG2(SPS NUM)))’ bits (herein, for example, the ‘ceiling(X)’ and the ‘floor(X)’ may indicate a function drawing a ‘minimum integer value that is greater than or equal to X’ and a function drawing a ‘maximum integer value that is smaller than or equal to X’) may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	used for the purpose of a ‘VIRTUAL CRC’). Herein, for example, in case a common ‘RNTI’ value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) ‘(ACTIVATION/RELEASE) DCI’ having the same (payload) size is used), it may be distinguished to which one of the existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., ‘1 bit’) and/or (B) a pre-designated (/signaled) existing field within the ‘(ACTIVATION/RELEASE) DCI’ being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the ‘(ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (refer to Table 3.3), an ‘MCS/RV (5 bits) field (MSB (1 bit))’ and/or a ‘TPC (2 bits) field (MSB (1 bit))’ and/or a ‘CS DM RS (3 bits) field (MSB (1 bit))’ may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the ‘(ACTIVATION/RELEASE) DCI’ that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-

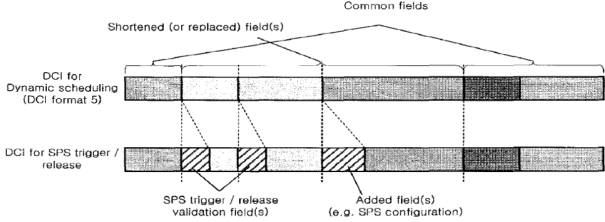
Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a ‘VIRTUAL CRC’) until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI.” p. 16
wherein based on the DCI being generated to activate a sidelink semi-persistent scheduling (SPS) between the UE and another UE for a Vehicle-to-Everything (V2X) communication, the DCI comprises (i) a sidelink SPS configuration index field and (ii) a sidelink SPS activation field,	pp. 16, 28-29, 36, including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S)), and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	(VOIP) UL (/downlink) (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 1/1A/2/2A/2B/2C/2D' type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., '3 bit'), and, in case a (maximum) number of 'SL (and/or UL) SPS PROCESS (/CONFIGURATION)' (SPS NUM) being configured (/signaled) (in the form of a 'CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION') from a network (or (serving) cell) can be varied (or changed), '(X_size - ceiling(LOG2(SPS NUM)))' (and/or '(X_size - floor(LOG2(SPS NUM)))) bits (herein, for example, the 'ceiling(X)' and the 'floor(X)' may indicate a function drawing a 'minimum integer value that is greater than or equal to X' and a function drawing a 'maximum integer value that is smaller than or equal to X') may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be used for the purpose of a 'VIRTUAL CRC'). Herein, for example, in case a common 'RNTI' value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) '(ACTIVATION/RELEASE) DCI' having the same (payload) size is used), it may be distinguished to which one of the

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., '1 bit') and/or (B) a pre-designated (/signaled) existing field within the '(ACTIVATION/RELEASE) DCI' being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the '(ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 0' type is (re-)used (refer to Table 3.3), an 'MCS/RV (5 bits) field (MSB (1 bit))' and/or a 'TPC (2 bits) field (MSB (1 bit))' and/or a 'CS DM RS (3 bits) field (MSB (1 bit))' may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the '(ACTIVATION/RELEASE) DCI' that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a 'VIRTUAL CRC') until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI." p. 16 "For example, in case a HARQ-ACK feedback corresponding to a 'SL (and/or UL)-SPS (ACTIVATION/RELEASE) DCI'

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	reception is defined, in case of a 'NACK', the V2X UE may be capable of performing a ((excluded) pool based) Mode 2 (fallback) operation (during a pre-configured (/signaled) period of time)). For example, in case a plurality of 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))' are configured (/signaled), a(n) (independent) ("open-loop" (and/or "closed-loop" (e.g., "separate TPC accumulation")))) power control may be managed and operated per 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S)) (SET)', through a pre-defined DCI format (e.g., "DCI 3 (/3A)" Format) (SPS_TPCDCI). Herein, for example, a plurality of (TPC) fields (having a preconfigured (/signaled) size) may exist within the (corresponding) SPS_TPCDCI, and an interconnection (/linkage) information between a specific field (in an index) and a '(specific) SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))' may be configured through a pre-defined (higher layer (/physical layer)) signaling. Herein, for example, the (corresponding) SPS_TPCDCI may (exclusively) indicate (or instruct) power control information (in a "cross carrier (/cell) scheduling format) corresponding to another cell (e.g., a SCELL) (other than a primary cell (and/or a cell in which the SPS_TPCDCI is received (e.g., a (PCELL) CSS))). Herein, for example, the (independent) ("open-loop" (and/or "closed-loop" (e.g., "separate TPC accumulation")))) power control per 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	(SET)' may be implemented by designating a "power offset value" within (part (or all of)) the 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S)) (SET)' through a pre-defined (higher layer (/physical layer)) signaling. As another example, in case a plurality of 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))' are configured (/signaled), the "open-loop" (and/or "closed-loop" (e.g., "separate TPC accumulation")) power control operation (/parameter) may be commonly applied (/managed and operated) between the plurality of 'SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))'." P. 36. "Additionally, for example, the proposed methods according to this invention may also be limitedly applied only in Mode 2 V2X operations (and/or Mode 1 V2X operations). Additionally, for example, in the proposed methods according to this invention, the '(SL-and/or UL-SPS) (ACTIVATION/RELEASE) DCI' may be limitedly transmitted only through a '(PDCCH or EPDCCH) USS' (or 'PDCCH CSS'). Additionally, for example, in the proposed methods according to this invention, the wording '(SL- and/or UL-SPS) (ACTIVATION/RELEASE) DCI' may also be interpreted as a 'Mode 1 DCI' (that is received from base station) (announcing PC5 (V2V) SPS related scheduling information)." P. 36.

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)										
wherein the sidelink SPS configuration index field informs a sidelink SPS configuration that is related to control information of the DCI that was generated to activate the sidelink SPS,	pp. 28-29, including for example:  Figure 1. Common DCI format for dynamic scheduling and SPS (with special fields for SPS trigger, release validation and SPS configuration field) p. 28 Table 1. Mapping of Cyclic shift DM RS field with V2X UL SPS configuration index <table><tr><th>Value of SPS configuration field in sidelink (E)PDCCH</th><th>Usage</th></tr><tr><td>'000'</td><td>sidelink dynamic scheduling</td></tr><tr><td>'001'</td><td>sidelink SPS configuration 0 for V2X</td></tr><tr><td>'010'</td><td>sidelink SPS configuration 1 for V2X</td></tr><tr><td>'011'</td><td>sidelink SPS configuration 2 for V2X</td></tr></table> p. 28. “To save the DCI fields in DCI format 5, the flexibility of resource allocation for SPS can be somewhat restricted. For scheduling of eNB indicated sidelink V2V (including SPS), according to the dependency of location between SA and data, the amount of DCI bits of the associated DCI field can be shortened and other information (e.g. SPS trigger / release validation or SPS configuration) can be filled alternatively as shown in Figure 1 or Figure 2. When SPS data is transmitted according to the T-RPT pattern, the T-RPT field, frequency hopping flag field and/or redundancy version field can be utilized. However, if every SPS (re)transmission follows the associated DCI, these DCI fields may not be necessary.” p. 29.	Value of SPS configuration field in sidelink (E)PDCCH	Usage	'000'	sidelink dynamic scheduling	'001'	sidelink SPS configuration 0 for V2X	'010'	sidelink SPS configuration 1 for V2X	'011'	sidelink SPS configuration 2 for V2X
Value of SPS configuration field in sidelink (E)PDCCH	Usage										
'000'	sidelink dynamic scheduling										
'001'	sidelink SPS configuration 0 for V2X										
'010'	sidelink SPS configuration 1 for V2X										
'011'	sidelink SPS configuration 2 for V2X										

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)										
wherein the sidelink SPS activation field informs an activation of the sidelink SPS configuration, and	pp. 28-29, including for example: Figure 1. Common DCI format for dynamic scheduling and SPS (with special fields for SPS trigger, release validation and SPS configuration field) p. 28 Table 1. Mapping of Cyclic shift DM RS field with V2X UL SPS configuration index <table><tr><th>Value of SPS configuration field in sidelink (E)PDCCH</th><th>Usage</th></tr><tr><td>'000'</td><td>sidelink dynamic scheduling</td></tr><tr><td>'001'</td><td>sidelink SPS configuration 0 for V2X</td></tr><tr><td>'010'</td><td>sidelink SPS configuration 1 for V2X</td></tr><tr><td>'011'</td><td>sidelink SPS configuration 2 for V2X</td></tr></table> p. 28. “To save the DCI fields in DCI format 5, the flexibility of resource allocation for SPS can be somewhat restricted. For scheduling of eNB indicated sidelink V2V (including SPS), according to the dependency of location between SA and data, the amount of DCI bits of the associated DCI field can be shortened and other information (e.g. SPS trigger / release validation or SPS configuration) can be filled alternatively as shown in Figure 1 or Figure 2. When SPS data is transmitted according to the T-RPT pattern, the T-RPT field, frequency hopping flag field and/or redundancy version field can be utilized. However, if every SPS (re)transmission	Value of SPS configuration field in sidelink (E)PDCCH	Usage	'000'	sidelink dynamic scheduling	'001'	sidelink SPS configuration 0 for V2X	'010'	sidelink SPS configuration 1 for V2X	'011'	sidelink SPS configuration 2 for V2X
Value of SPS configuration field in sidelink (E)PDCCH	Usage										
'000'	sidelink dynamic scheduling										
'001'	sidelink SPS configuration 0 for V2X										
'010'	sidelink SPS configuration 1 for V2X										
'011'	sidelink SPS configuration 2 for V2X										

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	follows the associated DCI, these DCI fields may not be necessary.” p. 29.
wherein based on the DCI being generated to activate an uplink SPS between the UE and the base station for a V2X communication, the DCI comprises a demodulation reference signal (DM-RS) cyclic shift field that informs an index of an uplink SPS configuration that is related to control information of the DCI that was generated to activate the uplink SPS.	pp. 16, 31-32 including for example: “[Proposed Method #2] A (single) common (or shared) ‘V2X_SPS-RNTI’ is configured (/signaled) to a plurality of ‘SL (and/or UL) SPS PROCESS(S) (/CONFIGURATION(S))’, and this method may identify (or distinguish) to which ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION)’ the corresponding control information is related through a (new) pre-defined (/signaled) specific field within a ‘(SL (and/or UL)-SPS) (ACTIVATION/RELEASE) DCI’ that is decoded by using the corresponding RNTI (e.g., a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ field and/or a field announcing an ‘LCID’ being linked (/interconnected) to a ‘SL (and/or UL) SPS PROCESS (/CONFIGURATION) INDEX (/ID)’ (that is configured (/signaled) through a pre-defined signaling)). Herein, for example, as field(s) being used for the above-described purpose, a ‘DM-RS CS (3 bit) field’ (e.g., a case where a UL (and/or SL)-SPS) (ACTIVATION/RELEASE) DCI’ of the (existing) ‘DCI format 0’ type is (re-)used (for the purpose of a ‘(SL (and/or (V2X) UL)-SPS) (ACTIVATION/RELEASE) DCI’) (refer to Table 3.3)) and/or a ‘HARQ ID (3/4 bit)/RV (2 bit) field’ (e.g., a case where a (VOIP) UL (/downlink) (and/or SL)-SPS)

Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	(ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 1/1A/2/2A/2B/2C/2D' type is (re-)used (for the purpose of a V2X) SL (and/or UL)-SPS (ACTIVATION/RELEASE) DCI') (refer to Table 3.3)) may be (re-)used. Herein, for example, a size (X_size) of the field being used for the corresponding purpose may be fixed to a pre-configured (/signaled) value (e.g., '3 bit'), and, in case a (maximum) number of 'SL (and/or UL) SPS PROCESS (/CONFIGURATION)' (SPS NUM) being configured (/signaled) (in the form of a 'CARRIER(/CELL)-SPECIFIC (PRE)CONFIGURATION') from a network (or (serving) cell) can be varied (or changed), '(X_size - ceiling(LOG2(SPS NUM)))' (and/or '(X_size - floor(LOG2(SPS NUM)))') bits (herein, for example, the 'ceiling(X)' and the 'floor(X)' may indicate a function drawing a 'minimum integer value that is greater than or equal to X' and a function drawing a 'maximum integer value that is smaller than or equal to X') may be processed with zero (or a specific pre-configured (/signaled) value) padding (e.g., this may be used for the purpose of a 'VIRTUAL CRC'). Herein, for example, in case a common 'RNTI' value is configured (/signaled) between an existing WAN (VOIP (/UL)) communication related SPS PROCESS (/CONFIGURATION) and a (V2X) UL SPS PROCESS (/CONFIGURATION) (and/or in case a (/an) '(ACTIVATION/RELEASE) DCI' having the same (payload) size is used), it may be distinguished to which one of the existing WAN (VOIP (/UL)) communication

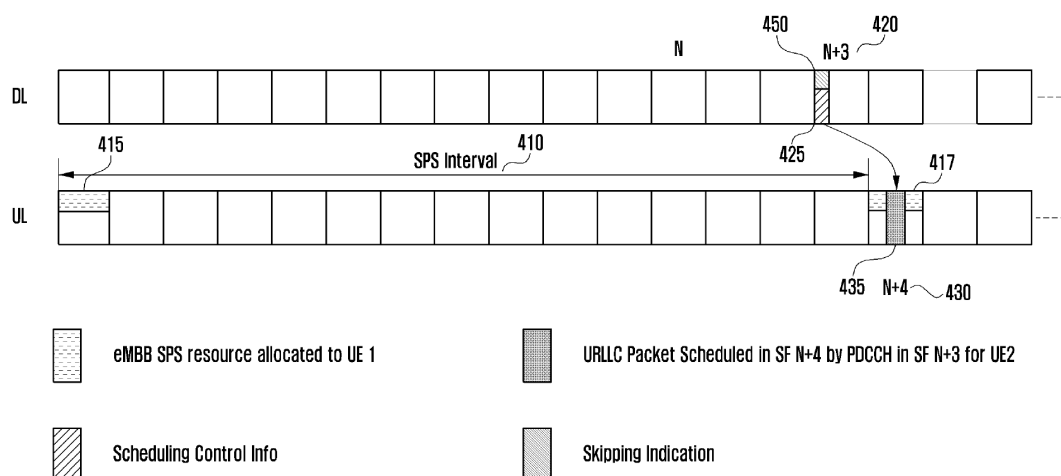
Lee Claim 1 (EX1011)	Supporting Disclosure from Lee Provisional (EX1015)
	related SPS PROCESS (/CONFIGURATION) and the (V2X) UL SPS PROCESS (/CONFIGURATION) the corresponding control information is related through (a re-usage of) (A) a pre-defined (/signaled) new field (e.g., '1 bit') and/or (B) a pre-designated (/signaled) existing field within the '(ACTIVATION/RELEASE) DCI' being decoded by using the corresponding common RNTI (C_V2XARDCI) (for example, in case the '(ACTIVATION/RELEASE) DCI' of the (existing) 'DCI format 0' type is (re-)used (refer to Table 3.3), an 'MCS/RV (5 bits) field (MSB (1 bit))' and/or a 'TPC (2 bits) field (MSB (1 bit))' and/or a 'CS DM RS (3 bits) field (MSB (1 bit))' may be (re-)used). Herein, for example, by defining a new field in the C_V2XARDCI, in case the (payload) size becomes larger than the '(ACTIVATION/RELEASE) DCI' that is related to the existing WAN (VOIP (/UL)) communication (that is transmitted within the same USS (/CSS)), in order to prevent an increase in the number of blind decoding sessions of the UE, zero (or a specific pre-configured (/signaled) value) padding may be performed (e.g., this may be used for the purpose of a 'VIRTUAL CRC') until the WANARDCI (payload) size becomes identical to the (payload) size of the C_V2XARDCI." p. 16

D. US Patent Pub. No. 2018/0035332 (“Agiwal”)

1. Overview of Agiwal

86. Agiwal is directed to improvements in late 4G and early 5G communications systems related to the expansion in available services, and the signaling parameters necessary to support those services. EX1009 at Abstract. Specifically, Agiwal states that in order “To meet the demand for wireless data traffic having increased since deployment of fourth generation (4G) communication systems, efforts have been made to develop an improved fifth generation (5G) or pre-5G communication system. Therefore, the 5G or pre-5G communication system is also called a ‘Beyond 4G Network’ or a ‘Post long term evolution (LTE) System.’” EX1009 at [0003].

87. Agiwal introduces a skip indication (i.e., a DCI Format with its CRC scrambled using a SKIP-RNTI) which can be monitored for possible collisions with URLLC transmissions. EX1009 at [0060]-[0061]. Figure 4, reproduced below, illustrates this skip indication. *Id.* at Figure 4.



EX1009 at Fig. 4.

88. Agiwal describes that “a UE (for example, the UE1) 220 may be allocated SPS resource 415, 417. The allocated SPS resource 415, 417 occur periodically every SPS interval 410. There is an urgent need to schedule the UE3 230 (for example, URLLC service). Accordingly, the UE3 230 is scheduled in same subframe N+4 430 by transmitting scheduling control information (i.e., PDCCH) 425 in subframe N+3 420. The URLLC packet resources 417 allocated to another UE (for example, the UE3) 230 using dynamic scheduling may collide with SPS resource 417. In this case, if URLLC packet 435 scheduled in time slot (e.g., a subframe) ‘X’ (for example, N+4 subframe) 430 overlaps with one or more SPS resource 417 then, the gNB/BS 210 transmits (broadcast or dedicated manner) an indication (for example, skipping indication) 450 to the UE1 220 in time slot ‘X-P’ (P>0)(for example, N+3 subframe) 420 to skip UL transmission in URLLC symbol(s) in time slot ‘X’ 430 OR drop UL packet transmission in time slot ‘X’ 430.

The UE1 220 skips UL transmission in the URLLC symbol(s) which overlaps with its the UL packet transmission or the UE1 220 drops UL packet transmission if it overlaps with URLLC symbol(s). The indication 450 is almost same as described above examples.” *Id.* at [0074]-[0075].

2. Agiwal is Entitled to its Provisional Filing Date

89. I understand that Agiwal Claims priority to claims the benefit of U.S. Provisional Application No. 62/368,369, filed on July 29, 2016.

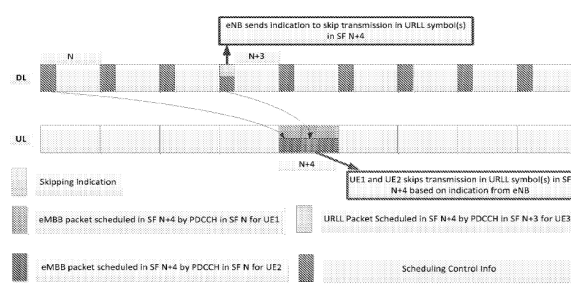
90. I have been informed by counsel and understand that because the filing dates of each of the Provisional Application to which Agiwal claims priority is before the '976 Patent's earliest claimed priority date, Agiwal is considered prior art if the subject matter relied upon from Agiwal is supported by Agiwal's earlier priority Application.

91. It is my opinion that the subject matter relied upon from Agiwal in my analysis below is supported in the Agiwal Provisional Application, as shown in the table below.

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
A communication method and a system for converging a 5th-Generation (5G) communication system for supporting higher data rates beyond a 4th-Generation (4G) system with a technology for Internet of Things (IoT) are provided. The system may be applied to intelligent services based on the 5G communication technology and the IoT-related technology, such as smart home, smart building, smart city, smart car, connected car, health care, digital education, smart retail, security and safety services. The method includes receiving, from a base station, scheduling information for a first uplink packet transmission in a first time slot, determining whether the first uplink packet transmission in the first time slot is restricted based on information corresponding to a second uplink packet transmission in the first time slot of another terminal, and if the first uplink packet transmission in the first time slot is restricted, skipping the first uplink packet transmission in a first time slot. Abstract	P. 21, including for example: “In the recent years several broadband wireless technologies have been developed to meet the growing number of broadband subscribers and to provide more and better applications and services. The second generation wireless communication system has been developed to provide voice services while ensuring the mobility of users. Third generation wireless communication system supports not only the voice service but also data service. In recent years, the fourth wireless communication system has been developed to provide high-speed data service. However, currently, the fourth generation wireless communication system suffers from lack of resources to meet the growing demand for high speed data services. So fifth generation wireless communication system is being developed to meet the growing demand for high speed data services, support ultra-reliability and low latency applications and support massive machine type communication. For uplink (UL) packet transmission user equipment (UE) is first allocated resources using scheduling control channel (e.g. Physical downlink common control channel (PDCCH)) in time slot (e.g. subframe) N and then UE transmits using the allocated resources in time slot N+P. The value of 'P' is different for different type of services/packets. For

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	enhanced mobile broadband (eMBB) service/packet 'P' is larger than ultra-low latency (URLL) service/packet. In order to support low latency 'P' is smaller for URLL packet. This may result in collision between URLL and eMBB packet transmissions from different UEs. In another scenario a UE may be allocated semi persistently scheduled (SPS) resource. The allocated SPS resource occur periodically every SPS interval. In this case URLL packet resources allocated to another UE using dynamic scheduling may collide with SPS resource.”
[0003] To meet the demand for wireless data traffic having increased since deployment of fourth generation (4G) communication systems, efforts have been made to develop an improved fifth generation (5G) or pre-5G communication system. Therefore, the 5G or pre-5G communication system is also called a 'Beyond 4G Network' or a 'Post long term evolution (LTE) System.' [0003]	p. 21, including for example: “In the recent years several broadband wireless technologies have been developed to meet the growing number of broadband subscribers and to provide more and better applications and services. The second generation wireless communication system has been developed to provide voice services while ensuring the mobility of users. Third generation wireless communication system supports not only the voice service but also data service. In recent years, the fourth wireless communication system has been developed to provide high-speed data service. However, currently, the fourth generation wireless communication system suffers from lack of resources to meet the growing demand for high speed data services. So fifth

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	generation wireless communication system is being developed to meet the growing demand for high speed data services, support ultra-reliability and low latency applications and support massive machine type communication."
[0008] Compared to existing 4G systems, 5G systems are expected to support more diversified services. For example, representative services may include enhanced mobile broad band (eMBB), ultra-reliable and low latency communication (URLLC), massive machine type communication (mMTC), and evolved multimedia broadcast/multicast service (eMBMS). A system providing URLLC services may be referred to as a URLLC system, a system providing eMBB services may be referred to as an eMBB system, and a system providing mMTC services may be referred to as an mMTC system. The words "service" and "system" may be used interchangeably. [0008]	pp. 21-22, including for example: "For uplink (UL) packet transmission user equipment (UE) is first allocated resources using scheduling control channel (e.g. Physical downlink common control channel (PDCCH)) in time slot (e.g. subframe) N and then UE transmits using the allocated resources in time slot N+P. The value of 'P' is different for different type of services/packets. For enhanced mobile broadband (eMBB) service/packet 'P' is larger than ultra-low latency (URLL) service/packet. In order to support low latency 'P' is smaller for URLL packet. This may result in collision between URLL and eMBB packet transmissions from different UEs. In another scenario a UE may be allocated semi persistently scheduled (SPS) resource. The allocated SPS resource occur periodically every SPS interval. In this case URLL packet resources allocated to another UE using dynamic scheduling may collide with SPS resource." "In this method of the proposed invention we proposed that, if URLL packet scheduled in time slot (e.g. subframe) 'X'

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	overlaps with one or more eMBB packet(s) then, eNB/BS transmits (broadcast or dedicated manner) an indication in time slot 'X-P' ($P > 0$) to skip UL transmission in URLL symbol(s) in time slot 'X' OR drop UL packet transmission in time slot 'X'. UE skips UL transmission in URLL symbol(s) which overlaps with its UL packet transmission or UE drops UL packet transmission if it overlaps with URLL symbol(s). 'P' can be in unit of symbols or subframes or time slots."
[0061] Referring to FIG. 1, an example of handling collision using method 1 is illustrated. As illustrated in FIG. 1, the gNB schedules UE1 and UE2 in subframe N+4 130 (for example, uplink eMBB packet transmission, 131, 133) by transmitting scheduling control information (i.e., PDCCH) 115 in subframe N 110. Later there is an urgent need to schedule UE3 (for example, URLLC service). The UE3 is scheduled in same subframe N+4 130 by transmitting scheduling control information (i.e., PDCCH) 125 in subframe N+3 120. In this case, the gNB/BS knows that it has already scheduled the UE1 and the UE2 in subframe N+4 130. To avoid collision, the URLLC service is prioritized over the eMBB service. The gNB/BS sends an indication 150 before the subframe N+4 130 indicating the UE1 and the UE2 to skip transmission (of the uplink eMBB packet) in the URLLC symbols 135 in the SF (subframe) N+4 130. Alternately, the gNB/BS sends an indication 150 before subframe N+4 130 indicating the UE1 and the UE2 to drop the UL packet transmission in the SF N+4 130. [0061]	pp. 23-25 (Figs. 1, 2, 4), including for example:  Figure 1 p. 23 (Fig. 1)

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	Figure 2 p. 24 (Fig. 2) Figure 4 illustrates message flows between UE and NB/BS for collision handling in case of SPS. Figure 4 p. 25 (Fig. 4)
[0058] In an embodiment of the present disclosure, the one or more time slots ‘X’ 130 can be explicitly indicated in the indication 150. In an alternate embodiment of the present disclosure, one or more time slots ‘X’ 130 can be at a fixed offset from time slot 120 in which indication 150 is transmitted by the gNB/BS. [0059] In an embodiment of the present disclosure, the one or more URLLC symbol(s) to be skipped in one or time slots ‘X’ 130 can be explicitly indicated in the indication 150 by the gNB/BS. In an alternate embodiment of the present disclosure, the one or more URLLC symbol(s) can be	p. 22, including for example: “In this method of the proposed invention we proposed that, if URLLC packet scheduled in time slot (e.g. subframe) ‘X’ overlaps with one or more eMBB packet(s) then, eNB/BS transmits (broadcast or dedicated manner) an indication in time slot ‘X-P’ (P>0) to skip

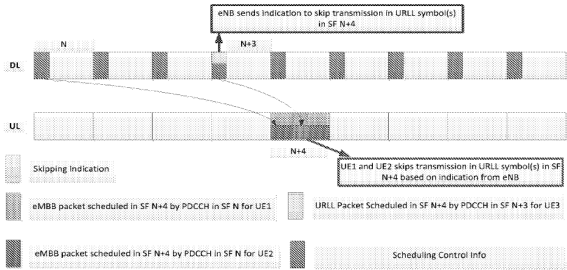
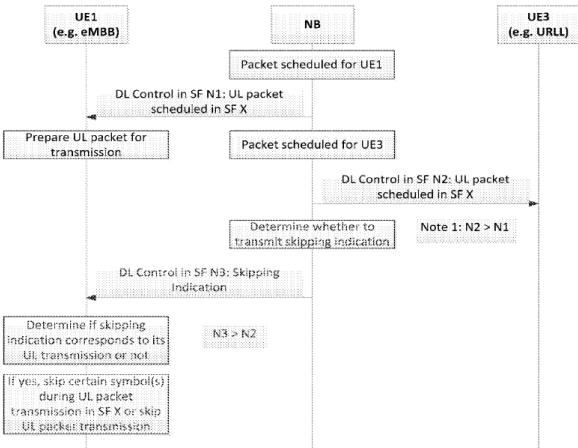
Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
pre-defined. In another embodiment of the present disclosure, the one or more URLL symbol(s) can be broadcasted in system information by the gNB/BS. [0060] In an embodiment of the present disclosure, the indication 150 can be signaled in broadcast or dedicated manner. In a case of dedicated signaling, the indication 150 can be addressed to UE's cell-radio network temporary identifier (C-RNTI). For example, if the scheduled resource for the UE1 and the scheduled resource for the UE3 only overlaps and the scheduled resource for the UE2 and the scheduled resource for the UE3 does not overlap, the indication 150 can be addressed to UE1's C-RNTI. Depending on whether collision is with one or multiple UEs, appropriate signaling method can be used by the gNB/BS. In a case of broadcast signaling, the indication 150 can be addressed to broadcast radio network temporary identifier (RNTI). Alternately, in a case of broadcast signaling, the indication 150 can be addressed to a new RNTI (e.g., skip-RNTI). The UEs which have been scheduled UL packet (and/or UL packet (e.g., eMBB) which has low priority compared to other packets (e.g., URLLC)) may only monitor indication 150 addressed to skip-RNTI. In an embodiment of the present disclosure, the indication 150 can be an radio resource control (RRC) message or medium access control (MAC) control element (CE) included in DL MAC packet data unit (PDU) or downlink control information (DCI) in PDCCH or group common DCI in PDCCH. In an embodiment of the present disclosure, the group common DCI for the skipping indication can be transmitted separately from group common DCI for slot format indication. In an embodiment of the present disclosure, the control resource set (CORESET) information for monitoring the group common DCI for the skipping indication can be signaled in system information or in RRC signaling. In an embodiment of the present disclosure, the monitoring interval for monitoring the group common DCI for the skipping indication can be signaled in system information or in RRC signaling. In an embodiment of the present disclosure, the indication 150 can also be signaled using broadcast channel (BCH). [0061] Referring to FIG. 1, an example of handling collision using method 1 is illustrated. As illustrated in FIG. 1, the gNB schedules UE1 and UE2 in subframe N+4 130 (for example, uplink eMBB packet transmission, 131, 133) by transmitting scheduling control information (i.e., PDCCH) 115 in subframe N 110. Later there is an urgent need to schedule UE3 (for example, URLLC service). The UE3 is scheduled in same subframe N+4 130 by transmitting scheduling control information (i.e., PDCCH) 125 in subframe N+3 120. In this case, the gNB/BS knows that it has already scheduled the UE1 and the UE2 in subframe N+4 130. To avoid collision, the URLLC service is prioritized over the eMBB service. The gNB/BS sends an indication 150 before the subframe N+4 130 indicating the UE1 and the UE2 to skip transmission (of the uplink eMBB packet) in the URLLC symbols 135 in the SF (subframe) N+4 130. Alternately, the gNB/BS sends an indication 150 before subframe N+4 130 indicating the UE1 and the UE2 to drop the UL packet transmission in the SF N+4 130.	UL transmission in URLL symbol(s) in time slot 'X' OR drop UL packet transmission in time slot 'X'. UE skips UL transmission in URLL symbol(s) which overlaps with its UL packet transmission or UE drops UL packet transmission if it overlaps with URLL symbol(s). 'P' can be in unit of symbols or subframes or time slots. In one embodiment the one or more URLL symbol(s) to be skipped in one or time slots 'X' can be explicitly indicated in the indication by NB/BS. In alternate embodiment, one or more URLL symbol(s) can be pre-defined. In another embodiment, one or more URLL symbol(s) can be broadcasted in system information by NB/BS. The indication can be signaled in broadcast or dedicated manner. In case of dedicated signaling, indication can be addressed to UE's C-RNTI. Depending on whether collision is with one or multiple UEs, appropriate signaling method can be used by NR/BS. In case of broadcast signaling indication can be addressed to broadcast RNTI. Alternately in case of broadcast signaling indication can be addressed to a new RNTI e.g. skip-RNTI. Ues which have been scheduled UL packet (and/or UL packet which has low priority compared to other packets (e.g. URLL)) may only monitor indication addressed to skip-RNTI. Indication can be an RRC message or

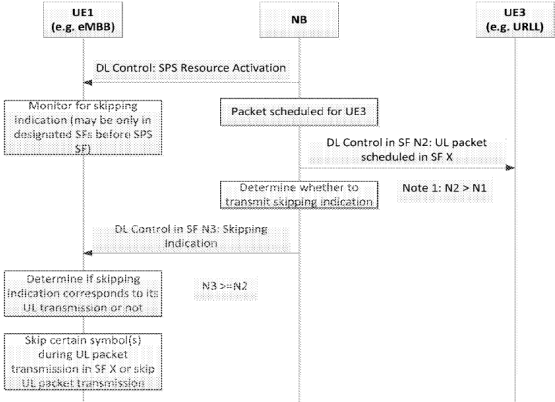
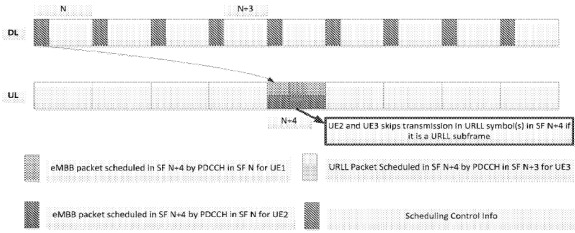
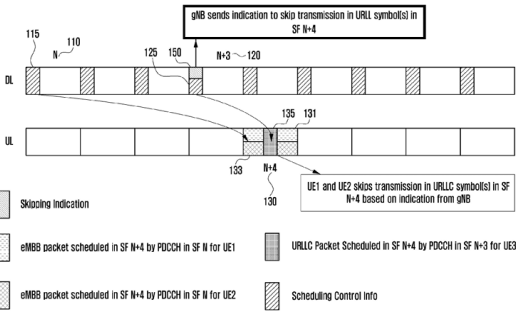
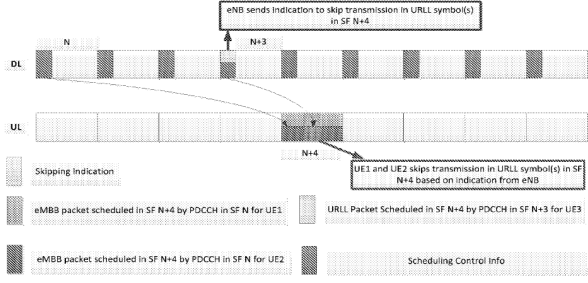
Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
[0058]-[0061]	MAC CE included in DL MAC PDU or DCI in PDCCH. Indication can also be signaled using BCH.”
[0060] In an embodiment of the present disclosure, the indication 150 can be signaled in broadcast or dedicated manner. In a case of dedicated signaling, the indication 150 can be addressed to UE's cell-radio network temporary identifier (C-RNTI). For example, if the scheduled resource for the UE1 and the scheduled resource for the UE3 only overlaps and the scheduled resource for the UE2 and the scheduled resource for the UE3 does not overlap, the indication 150 can be addressed to UE1's C-RNTI. Depending on whether collision is with one or multiple UEs, appropriate signaling method can be used by the gNB/BS. In a case of broadcast signaling, the indication 150 can be addressed to broadcast radio network temporary identifier (RNTI). Alternately, in a case of broadcast signaling, the indication 150 can be addressed to a new RNTI (e.g., skip-RNTI). The UEs which have been scheduled UL packet (and/or UL packet (e.g., eMBB) which has low priority compared to other packets (e.g., URLLC)) may only monitor indication 150 addressed to skip-RNTI. In an embodiment of the present disclosure, the indication 150 can be a radio resource control (RRC) message or medium access control (MAC) control element (CE) included in DL MAC packet data unit (PDU) or downlink control information (DCI) in PDCCH or group common DCI in PDCCH. In an embodiment of the present disclosure, the group common DCI for the skipping indication can be transmitted separately from group common DCI for slot format indication. In an embodiment of the present disclosure, the control resource set (CORESET) information for monitoring the group common DCI for the skipping indication can be signaled in system information or in RRC signaling. In an embodiment of the present disclosure, the monitoring interval for monitoring the group common DCI for the skipping indication can be signaled in system information or in RRC signaling. In an embodiment of the present disclosure, the indication 150 can also be signaled using broadcast channel (BCH). [0060]	pp. 21-25, including for example: “In this method of the proposed invention we proposed that, if URLL packet scheduled in time slot (e.g. subframe) ‘X’ overlaps with one or more eMBB packet(s) then, eNB/BS transmits (broadcast or dedicated manner) an indication in time slot ‘X-P’ (P>0) to skip UL transmission in URLL symbol(s) in time slot ‘X’ OR drop UL packet transmission in time slot ‘X’. UE skips UL transmission in URLL symbol(s) which overlaps with its UL packet transmission or UE drops UL packet transmission if it overlaps with URLL symbol(s). ‘P’ can be in unit of symbols or subframes or time slots. In one embodiment the one or more URLL symbol(s) to be skipped in one or time slots ‘X’ can be explicitly indicated in the indication by NB/BS. In alternate embodiment, one or more URLL symbol(s) can be pre-defined. In another embodiment, one or more URLL symbol(s) can be broadcasted in system information by NB/BS. The indication can be signaled in broadcast or dedicated manner. In case of dedicated signaling, indication can be addressed to UE's C-RNTI. Depending on whether collision is with one or

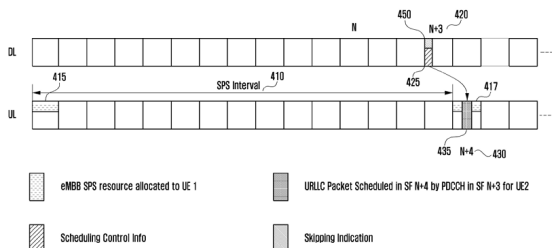
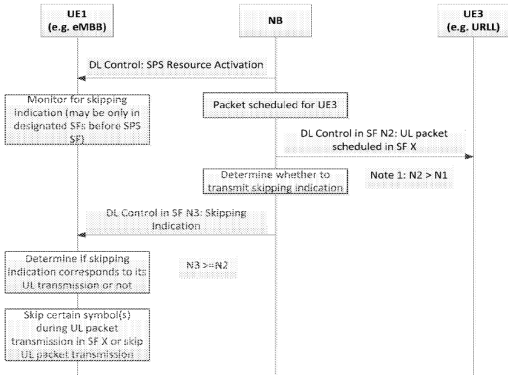
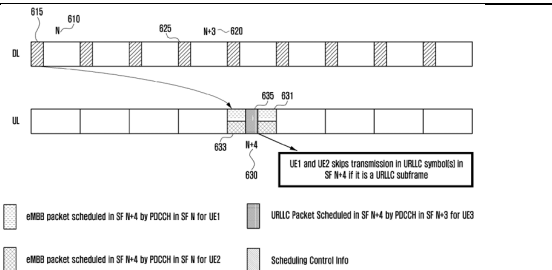
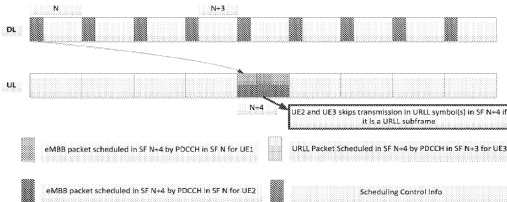
Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	multiple Ues, appropriate signaling method can be used by NR/BS. In case of broadcast signaling indication can be addressed to broadcast RNTI. Alternately in case of broadcast signaling indication can be addressed to a new RNTI e.g. skip-RNTI. Ues which have been scheduled UL packet (and/or UL packet which has low priority compared to other packets (e.g. URLL)) may only monitor indication addressed to skip-RNTI. Indication can be an RRC message or MAC CE included in DL MAC PDU or DCI in PDCCH. Indication can also be signaled using BCH.” Figure 1 p. 23 (Fig. 1)

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	Figure 2 p. 24 (Fig. 2) Figure 4 illustrates message flows between UE and NB/BS for collision handling in case of SPS. Figure 4 p. 25 (Fig. 4)
[0054] – [0102]	pp. 21-29, including for example: “In this method of the proposed invention we proposed that, if URLL packet scheduled in time slot (e.g. subframe) ‘X’ overlaps with one or more eMBB packet(s) then, eNB/BS transmits (broadcast or dedicated manner) an indication in time slot ‘X-P’ (P>0) to skip

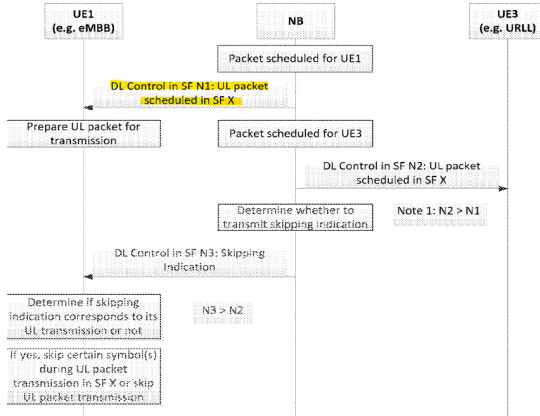
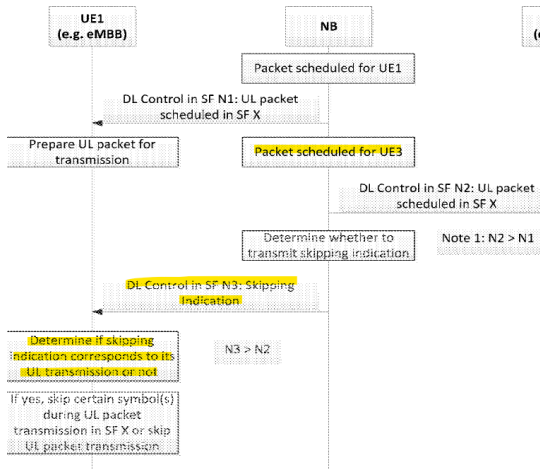
Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	UL transmission in URLL symbol(s) in time slot 'X' OR drop UL packet transmission in time slot 'X'. UE skips UL transmission in URLL symbol(s) which overlaps with its UL packet transmission or UE drops UL packet transmission if it overlaps with URLL symbol(s). 'P' can be in unit of symbols or subframes or time slots. In one embodiment the one or more URLL symbol(s) to be skipped in one or time slots 'X' can be explicitly indicated in the indication by NB/BS. In alternate embodiment, one or more URLL symbol(s) can be pre-defined. In another embodiment, one or more URLL symbol(s) can be broadcasted in system information by NB/BS. The indication can be signaled in broadcast or dedicated manner. In case of dedicated signaling, indication can be addressed to UE's C-RNTI. Depending on whether collision is with one or multiple Ues, appropriate signaling method can be used by NR/BS. In case of broadcast signaling indication can be addressed to broadcast RNTI. Alternately in case of broadcast signaling indication can be addressed to a new RNTI e.g. skip-RNTI. Ues which have been scheduled UL packet (and/or UL packet which has low priority compared to other packets (e.g. URLL)) may only monitor indication addressed to skip-RNTI. Indication can be an RRC message or

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	MAC CE included in DL MAC PDU or DCI in PDCCH. Indication can also be signaled using BCH.”  Figure 1 p. 23 (Fig. 1)  Figure 2 p. 24 (Fig. 2)

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
	Figure 4 illustrates message flows between UE and NB/BS for collision handling in case of SPS.  Figure 4 p. 25 (Fig. 4)  Figure 5 p. 27 (Fig. 5)
 Fig. 1	 Figure 1 p. 23 (Fig. 1)

Subject Matter from EX1009 Cited in Analysis Below	Supporting Corresponding Subject Matter in Agiwal Provisional (EX1010)
 Fig. 4	Figure 4 illustrates message flows between UE and NB/BS for collision handling in case of SPS.  Figure 4
 Fig. 6	 Figure 5
	p. 27 (Fig. 5)

92. It is also my opinion that Agiwal’s Claims are supported by the Agiwal Provisional. The table below identifies subject matter that supports Agiwal’s Claims.

Agiwal Claim 1 (EX1009)	Supporting Disclosure from Agiwal Provisional (EX1010)
1. A communication method of a terminal, the method comprising: receiving, from a base station, scheduling information for a first uplink packet transmission in a first time slot;	 Figure 2 Fig. 2 (DL Control in SF N1: UL packet scheduled in SF X)
determining whether the first uplink packet transmission in the first time slot is restricted based on information corresponding to a second uplink packet transmission in the first time slot of another terminal; and	 Figure 2 Fig. 2 (Packet scheduled for UE3; DL control in SF N3: Skipping Indication; Determine if skipping indication corresponds to its UL transmission or not)

Agiwal Claim 1 (EX1009)	Supporting Disclosure from Agiwal Provisional (EX1010)
if the first uplink packet transmission in the first time slot is restricted, skipping the first uplink packet transmission in a first time slot.	<pre>sequenceDiagram participant UE1 as UE1 (e.g. eMBB) participant NB as NB participant UE3 as UE3 (e.g. URLL) NB->>UE1: Packet scheduled for UE1 NB->>UE3: Packet scheduled for UE3 NB->>UE1: DL Control in SF N1: UL packet scheduled in SF X UE1->>NB: Prepare UL packet for transmission NB->>UE3: DL Control in SF N2: UL packet scheduled in SF X UE3->>NB: Determine whether to transmit skipping indication Note over UE3: Note 1: N2 > N1 NB->>UE1: DL Control in SF N3: Skipping Indication UE1->>NB: Determine if skipping indication corresponds to its UL transmission or not Note over UE1: Note 2: N3 > N2 UE1->>NB: If yes, skip certain symbol(s) during UL packet transmission in SF X or skip UL packet transmission UE1->>NB: If no, skip UL packet transmission</pre> Figure 2 Fig. 2 (If yes, skip certain symbol(s) during UL packet transmission in SF X or skip UL packet transmission)

X. Claims 2 and 4 are Unpatentable

A. Ground #1: The Challenged Claims are Rendered Obvious in View of Babaei and Fwu

1. A POSITA Would Have Been Motivated to Combine Babaei with Fwu with a Reasonable Expectation of Success

93. Babaei deals with the provision of new kinds of services, including vehicular communication (V2X) services over a 3GPP network. EX1006 at 13:66-14:10. Specifically, Babaei discloses that “Vehicular communication services, represented by V2X services, may comprise of the following different types: V2V, V2I, V2N and/or V2P. V2X services may be provided by PC5 interface (sidelink) and/or Uu interface (UE to base station interface). Support of V2X services via PC5

interface may be provided by V2X sidelink communication, which is a mode of communication whereby UEs may communicate with each other directly over the PC5 interface. This communication mode may be supported when the UE is served by E-UTRAN and when the UE is outside of E-UTRA coverage. The UEs authorized to be used for V2X services may perform V2X sidelink communication.” *Id.*

94. Babaei is also directed to scenarios where “multiple SPSs may be activated in parallel. For example, a new service may be triggered while a previous service is on-going. In an example, the UE may transmit an assistance message to the base station indicating new information about new messages (SPS traffic) for transmission. The base station may provide a second SPS transmission grant for transmission of the new service/message(s). The UE may select the second SPS configuration and corresponding resources for transmission of new SPS traffic. In an example, a previous SPS grant and a new SPS grant may continue in parallel.” EX1006 at 20:25-27. For UEs requiring two or more different services with multiple parallel UL SPS configurations, Babaei’s disclosure is specifically directed to these parallel SPS configurations with different grant amounts and periodicities which are tailored to the needs of different traffic types. *See* EX1006 at 20:25-21:20.

95. Fwu similarly addresses the improvement and configuration of 3GPP networks to provide new kinds of services with new requirements, such as increasing data rates and supporting an increase in the number of IoT and MTC-type devices.

EX1008 at [0032]. Specifically, Fwu addresses configurable numerologies, larger subcarrier spacing when low latency is desired, and reducing active time of UEs to reduce power consumption. *Id.* at [0036]-[0038]. In other words, Fwu discloses UEs with configurable numerologies for different time and frequency resources in order to better provide services suitable for different needs. *Id.* In another example, Fwu teaches providing low-latency services using a numerology with a wide subcarrier spacing to support vehicle-to-vehicle applications. *Id.* at [0052]. These examples discuss the same kind of services (V2X) that Babaei discusses improving.

96. Due to these similar purposes, a POSITA would be motivated to combine Babaei and Fwu in order to better configure UEs for different services with a range of periodicities and numerologies. Specifically, a POSITA would have been motivated to combine Babaei's multiple configurable periodicities with Fwu's multiple configurable numerologies.

97. Fwu teaches that "the inter-networking in the unified frame structure may include, in some embodiments, a Transmission Time Interval (TTI) boundary alignment between multiple RATs may be provided to allow seamless scheduling, fallback and support of different RATs. In some embodiments, a TTI is the smallest unit of time in which the eNB is capable of scheduling any UE for uplink or downlink transmission. In some embodiments, the TTI boundary alignment may occur at a subframe or frame boundary." EX1008 at [0035]. Because changes in

numerology change symbol time and as a result, possible TTIs available, any changes in the TTI would change the available periodicities.

98. A POSITA would expect to successfully combine these references, because configuring a recurring allocation reduces control signaling overhead compared to dynamic grants regardless of the periodicity or TTI the eNB configures. The combination of these disclosures would yield the predictable result of an eNB being able to configure a UE to transmit at both a periodicity and a numerology suitable for the demands of the UE's application.

2. The Challenged Claims are Obvious in View of *Babaei* and *Fwu*

a) Claim 2

1) [2pre] A base station apparatus that communicates with a user equipment (UE), comprising:

99. *Babaei* and *Fwu* each teach “a base station apparatus that communicates with a user equipment (UE).” For example, *Babaei* Figure 4 illustrates a base station. Figure 5C illustrates the physical downlink transmission chain from the base station. Each of Figures 9, 16, 18 and 23 show communication flows between a BS and a UE. *See* EX1006.

100. *Babaei*'s Figure 25 shows a method for configuring the UE with periodic resource allocations and then activating or deactivating one of these allocations.

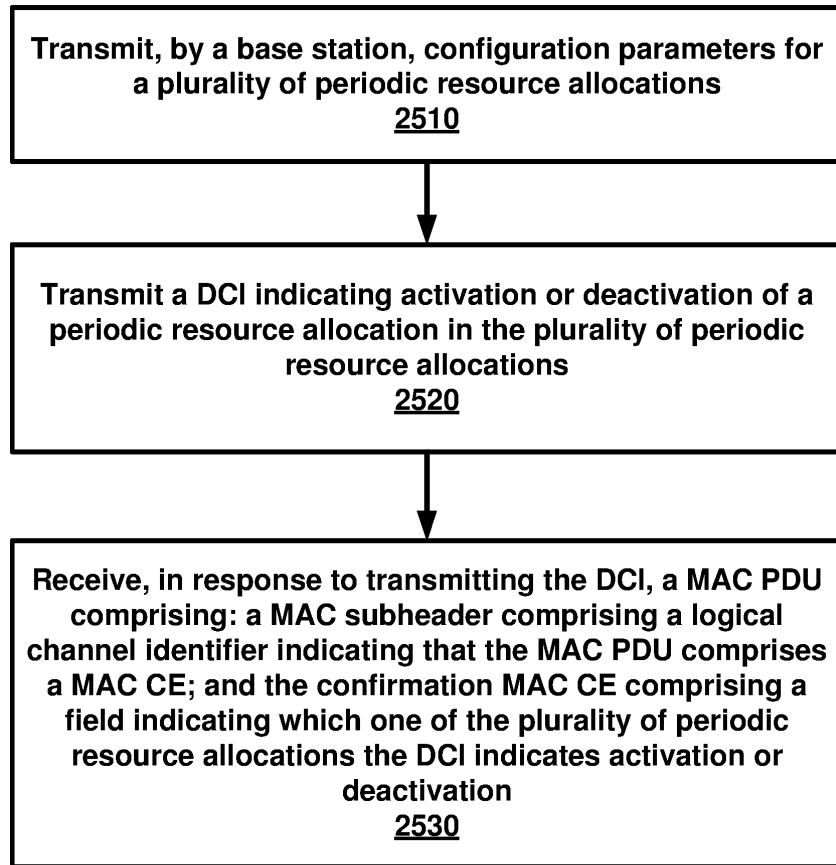


FIG. 25

EX1004 at Fig. 25.

101. Babaei explains that, with respect to Figure 4, “communication interface 402 in base station 401 may be configured to engage in communication with communication interface 407 in wireless device 406 via a communication path that includes at least one wireless link 411. Wireless link 411 may be a bi-directional link. Communication interface 407 in wireless device 406 may also be configured to engage in a communication with communication interface 402 in base station 401. Base station 401 and wireless device 406 may be configured to send and receive data

over wireless link 411 using multiple frequency carriers.” In other words, Babaei discloses that the base station both transmits and receives signals from the wireless device. *Id.*

102. Fwu also discloses base stations (eNBs) that communicate with UEs over bi-directional radio links. *See* EX1008 at Fig. 1, abstract, and Paragraphs 16-18.

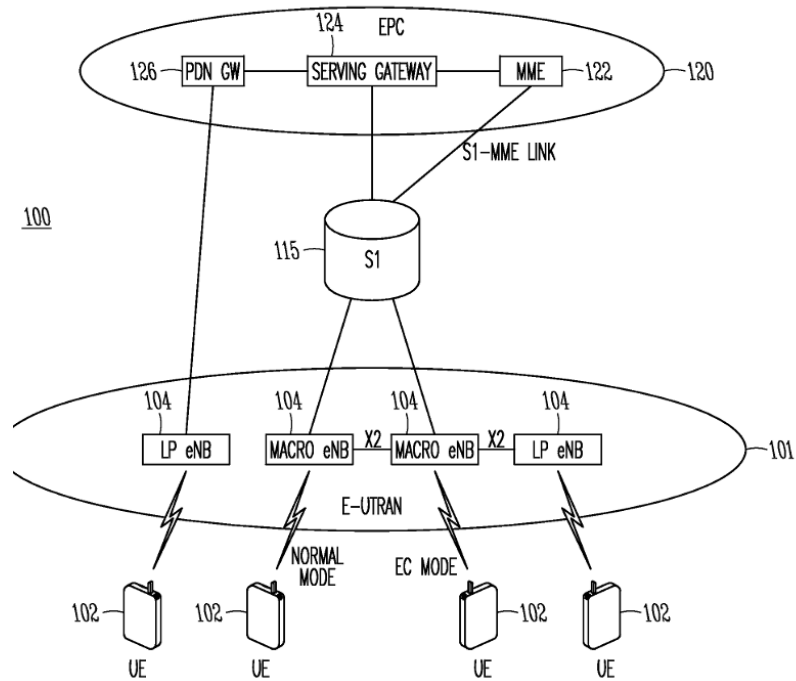


FIG. 1

EX1008 at Fig. 1.

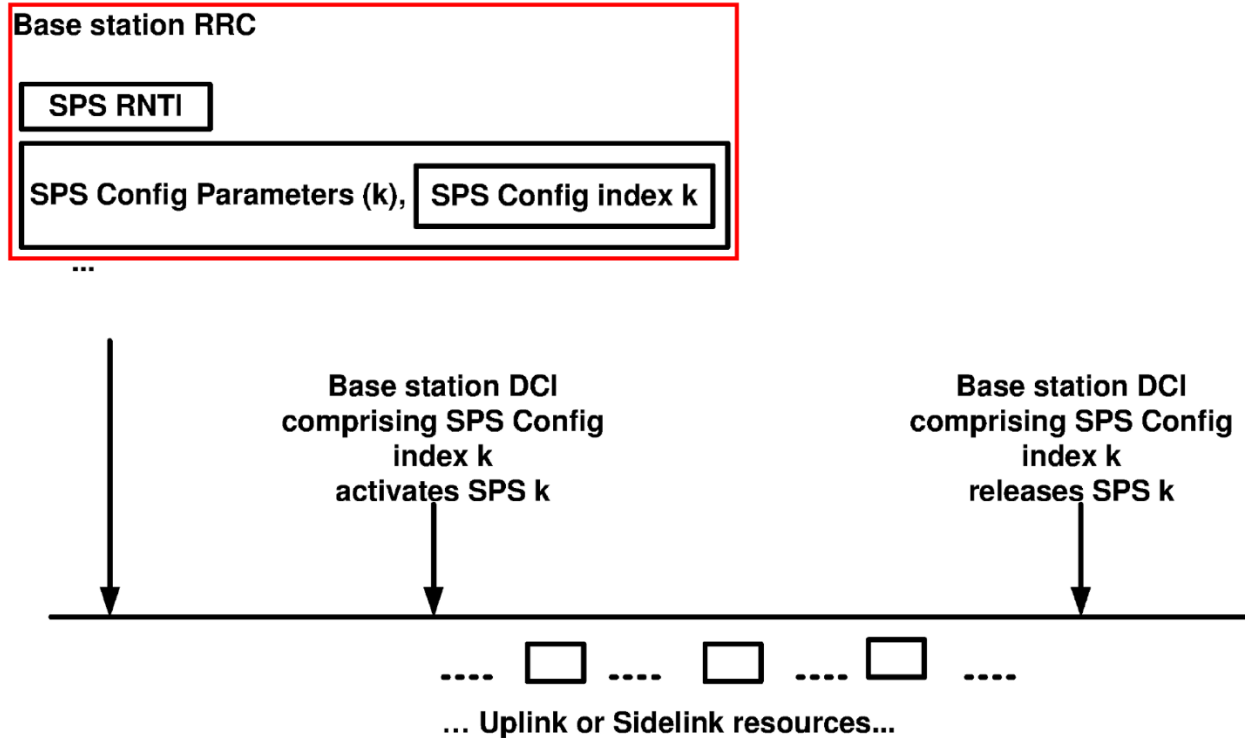
2) [2a] transmitting circuitry configured to transmit a radio resource control (RRC) message comprising first information used for configuring a periodicity,

103. *Babaei* and *Fwu* each teach “transmitting circuitry configured to transmit a radio resource control (RRC) message comprising first information used for configuring a periodicity.” As discussed above, both *Babaei* and *Fwu* disclose base stations that communicate with UEs, and these disclosures further include transmitting circuitry. *See* Section X.A.2.a).1).

104. *Babaei* teaches a base station and wireless device connected by a bi-directional wireless link, where both the base station and wireless device send and receive data using multiple frequency carriers. EX1006 at 5:40-6:3. A POSITA would understand that sending data necessarily requires transmitting circuitry. *Fwu* explicitly discloses circuitry for transmitting signals in a base station. EX1008 at [0026].

105. Additionally, *Babaei* teaches a base station using RRC signaling to configure two or more periodic SPS allocations, wherein each has its own periodicity. EX1006 at Figs. 14 and 15. In Fig. 14, reproduced below, *Babaei* illustrates the BS sending an RRC message, wherein the RRC messages included SPS configuration. *See also* EX1006 at 21:59-22:12 (“RRC configuring parameters may comprise an SPS configuration index. One or more uplink SPS configuration parameters may be assigned to (associated with) the same SPS RNTI. Different SPS

configurations (e.g. having different SPS periodicity) may be assigned to the same SPS RNTI...”).



EX1006 at Fig. 14.

106. Babaei further teaches that with multiple SPS configurations, each may have a different periodicity. *See* EX1006 at 17:55-18:18, 20:36-47, 21:21-43. “Periodicity” is one configuration parameter which may be configured by RRC messaging. *Id.* at 22:41-55, 23:22-26. This is illustrated in Figure 13.

107. Figures 18 and 25 depict methods for configuring two or more periodic allocations. Figure 18, reproduced and annotated below, depicts the configuration, activation/release, and confirmation signaling. The relevant signaling related to this limitation is highlighted for ease of reference.

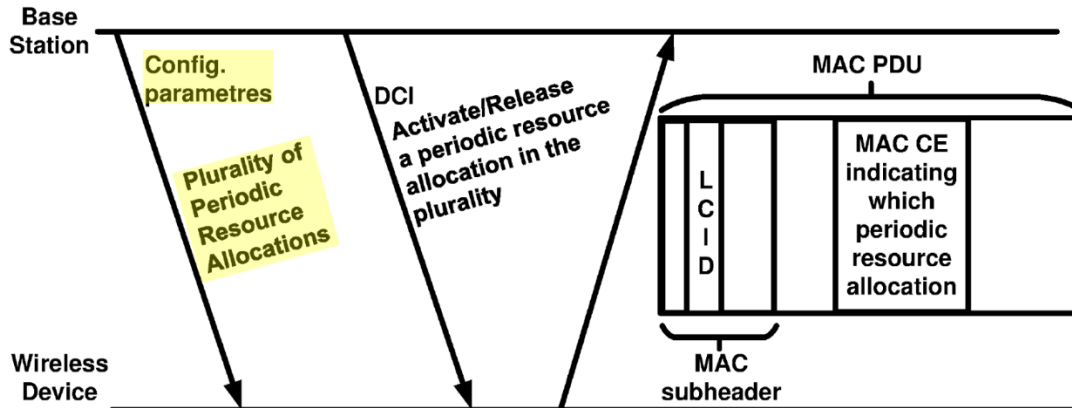


FIG. 18

EX1004 at Fig. 18.

108. Not only does Babaei disclose this limitation, but Fwu also teaches configuration of SPS by higher layer signaling before activation, reactivation, or release by DCI format. EX1008 at [0023]. A POSITA would recognize the SPS terminology used in the 3GPP specifications and would understand from this disclosure in Fwu that (1) the “higher layer signaling” refers to RRC signaling and (2) that configuration of SPS includes a configuration of the periodicity of the SPS uplink or downlink allocation. Therefore, limitation 2a is obvious over the teachings of each of Babaei and Fwu.

3) [2b] the transmitting circuitry configured to transmit a RRC message comprising second information used for configuring a numerology,

109. Fwu teaches “transmitting circuitry configured to transmit a RRC message comprising second information used for configuring a numerology” and, in combination with Babaei, renders it obvious. As I explained above, both Babaei and

Fwu disclose base stations that communicate with UEs, which include transmitting circuitry. *See* Sections X.A.2.a).1) and 2). Fwu teaches a method of providing a flexible Radio Access Technology (FRAT). EX1008 at Fig. 3, abstract.

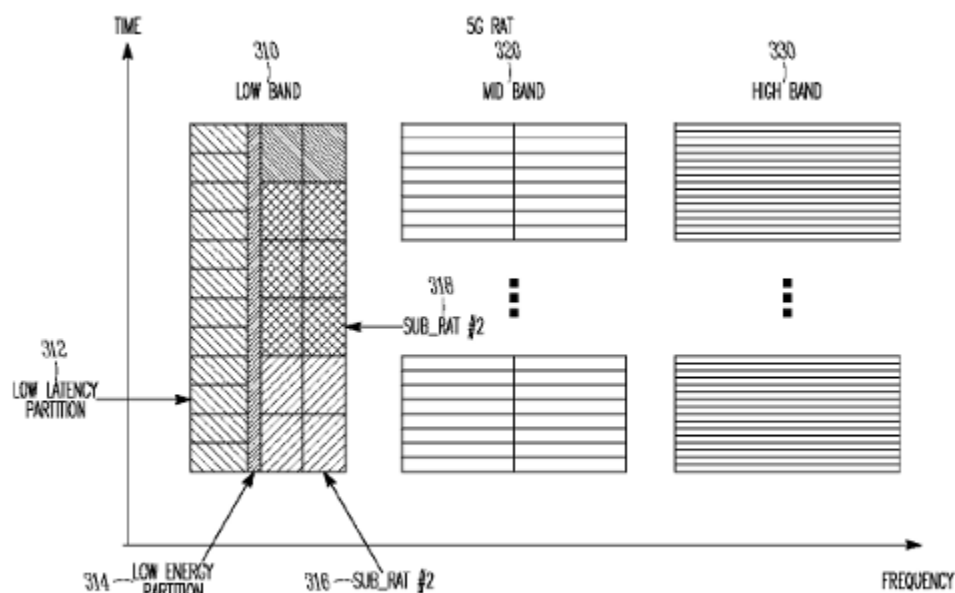


FIG. 3

EX1008 at Fig. 3.

110. Fwu discloses “an eNodeB (eNB), user equipment (UE) and method of providing a flexible Radio Access Technology (FRAT) are generally described. The information (resource allocation, partition information and numerology) of at least one of a plurality of RATs used by the eNB is provided to a UE. Each RAT has a flexible subcarrier spacing and symbol duration, which are integer multiples of a base subcarrier spacing and symbol duration, and is associated with at least one of different temporal and frequency resources. The symbol and/or frame structure of each RAT are independent. A Transmission Time Interval (TTI) boundary between

the RATs is common, and the RATs comprise a common reference TTI duration. The information of the RATs is provided either via a different RAT than the RAT used by the UE for communication or via a dedicated carrier in the RAT used by the UE for communication.” *Id.* at Abstract, Fig. 3 (above).

111. Fwu also discloses that the numerologies, resource allocation and partition information in the time domain for each RAT (or sub-RAT) may be configured by UE-specific RRC signaling. *See* EX1008 at [0041]-[0042], [0073], [0078], [0082], [0092]. Fwu also discloses multiplexing different RATs (or sub-RATs) in the same frequency resource or frequency band. *Id.* at [0034], [0041]-[0046]. This teaching allows different services (with different numerologies) to work with the same base station and resources.

112. For example, Fwu [0056] includes three tables showing example numerologies, reproduced below. EX1008 at [0056]. The base station assigns UEs to the MTC or the conventional numerology based on the UE’s capability and the kind of coverage the UE requires or requests. EX1008 at [0038]-[0039].

<3GHz (low power or MTC)	1.5KHz	10ms	OFDM	SC-FDMA
<3GHz	15KHz	1ms	OFDM	SC-FDMA
[3-6]GHz	75KHz	0.2ms	UW-OFDM	UW-DFT-s-OFDM
[6-30]GHz	480KHz	0.1ms	UW-OFDM	UW-DFT-s-OFDM
>30GHz	1.5MHz	0.1ms	DFT-s-OFDM	DFT-s-OFDM

Table 1: First 5G numerology example

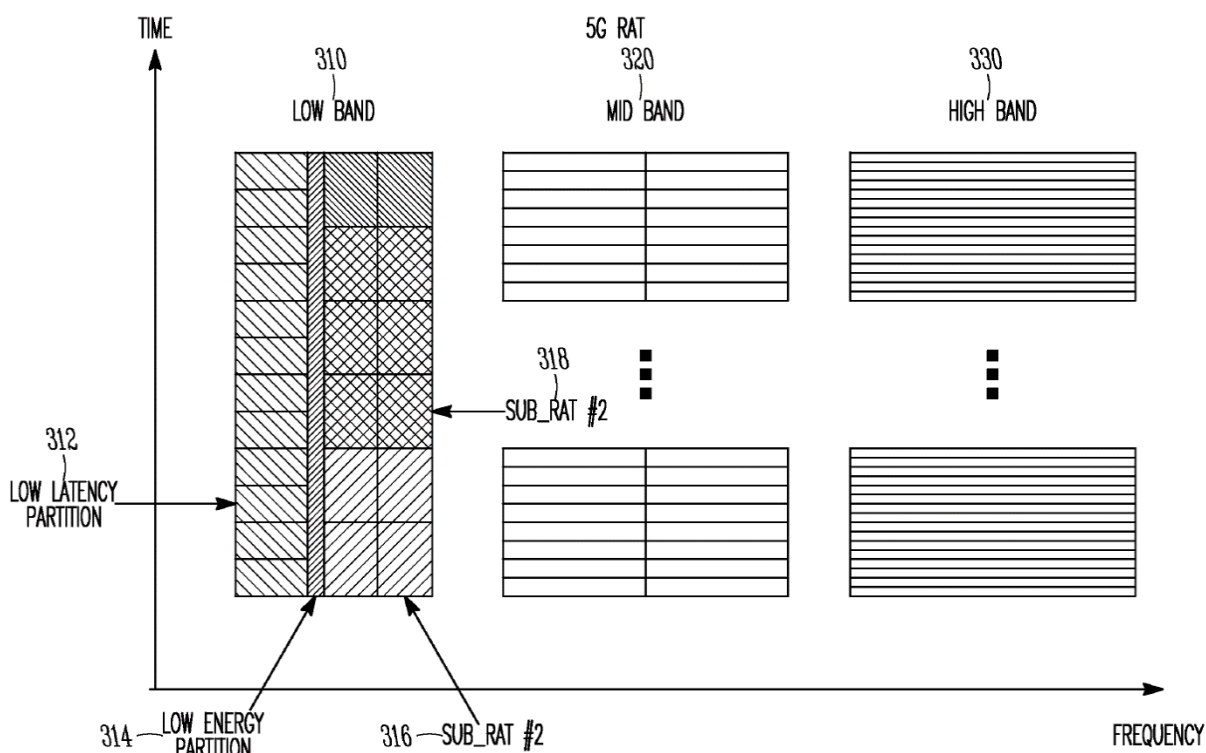
Frequency Band	Subcarrier spacing	TTI	DL waveform	UL waveform
<3GHz (low power or MTC)	1.5KHz	10ms	UW-OFDM	UW-OFDM
<3GHz	15KHz	1ms	UW-OFDM	UW-OFDM
[3-6]GHz	75KHz	0.2ms	UW-OFDM	UW-OFDM
[6-30]GHz	480KHz	0.1ms	UW-DFT-s-OFDM	UW-DFT-s-OFDM
>30GHz	1.5MHz	0.1ms	OFDM	OFDM

Table 2: Second 5G numerology example

Frequency Band	Subcarrier spacing	TTI	DL waveform	UL waveform
<3GHz (low power or MTC)	1.5KHz	10ms	OFDM	OFDM
<3GHz	15KHz	1ms	OFDM	OFDM
[3,6]GHz	75KHz	0.2ms	OFDM	OFDM
[6,30]GHz	480KHz	0.1ms	UW-DFT-s-OFDM	UW-DFT-s-OFDM
>30GHz	1.5MHz	0.1ms	UW-DFT-s-OFDM	UW-DFT-s-OFDM

Table 3: Third 5G numerology example

113. Figure 3, reproduced below, illustrates an embodiment of a FRAT of a 5G system with a third sub-RAT partition in the low band for low-latency communications.

**FIG. 3**

114. Fwu teaches that “The second TTI 720 shown in FIG. 7 may comprise a low latency TTI 720 with short symbol duration. Such a TTI 720 can be used for use cases such as mission critical MTC applications and Vehicle-to-Vehicle applications, among others. The UW 722 and symbol 724 may each be smaller than the first TTI 710. In this example, the subcarrier spacing may be 30KHz and the symbol duration 726 may be 33.3 μ s. For a TTI 720 of the same length as the first TTI (e.g., 200 μ s), a total of 6 short OFDM symbols 726 may be present.” EX1008 at [0052].

115. A POSITA would have been motivated to combine Fwu’s disclosures regarding different numerologies with Babaei’s disclosures regarding periodic

grants to arrive at the claimed invention. Babaei and Fwu are both directed to teaching strategies for adapting wireless networks to support new kinds of services with different service requirements. Babaei is focused on increasing number of periodic services at varying intervals (periodic grants). Fwu, on the other hand, is focused on demand for services at various latencies over a wider frequency range (different numerologies). See also my analysis regarding motivation to combine in section X.A.1, which I incorporate by reference here.

116. In view of the above, it would have been obvious to combine the teachings of Babaei and Fwu to obtain a wireless network capable of offering more and varied periodic services with varying latencies. Therefore, Fwu in view of Babaei renders obvious limitation 2b.

- 4) [2c] the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology; and**

117. Babaei teaches and, in combination with Fwu, renders obvious “the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic

redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology.” As discussed, both Babaei and Fwu disclose base stations that communicate with UEs, including transmitting circuitry. *See* Sections X.A.2.a).1) and 2). They also both teach activating and deactivating a periodic uplink allocation with a numerology using a DCI format with a CRC scrambled by the appropriate RNTI. EX1006 at 22:56-65; EX1008 at [0023]. At the time of the invention, scrambling the CRC of DCI formats using an RNTI was the known manner of addressing DCI formats to the UE/service.

118. Babaei teaches using DCI formats to activate or deactivate a previously configured uplink grant at Figs. 14, 15, 18, 24, 25, 28, and 29. For example, in Figure 18, reproduced and annotated below, Babaei illustrates an example periodic resource allocation confirmation procedure. In particular, here the DCI is transmitted to activate or deactivate (release) a previously configured periodic resource allocation (annotated in red).

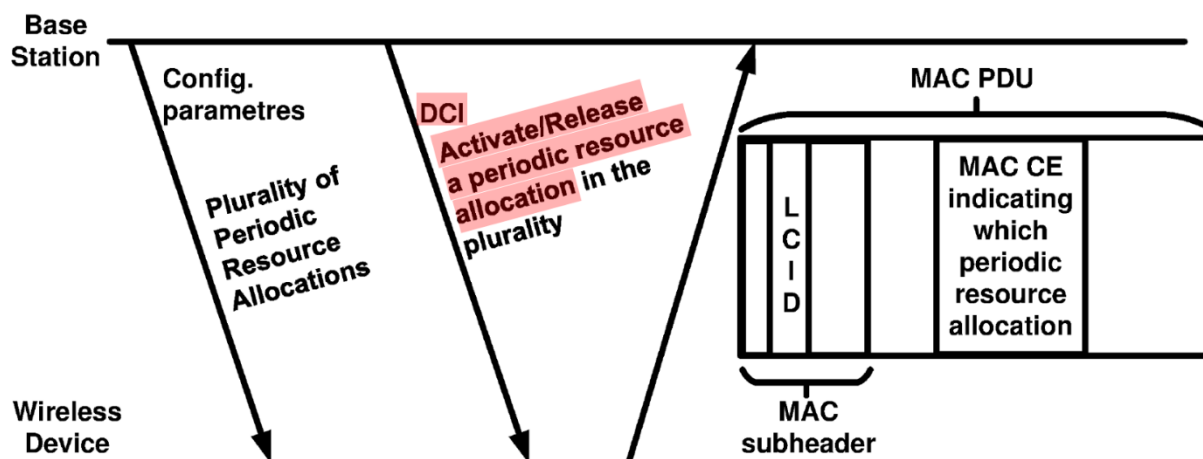


FIG. 18

EX1006 at Fig. 18.

119. Babaei and Fwu both also disclose using the same, distinct RNTI for the DCI formats that activate or deactivate (release) the periodic grant. EX1006 at 22:56-65; EX1008 at [0023]. The references further teach a common search space for DCI formats which apply to multiple UEs, and the use of UE-specific search spaces for those formats specific to a UE. EX1006 at 2:47, 14:50-15:31; EX1008 at [0023].

120. Babaei discloses that the DCI format may be used for uplink SPS, DCI Format 0. The DCI format fields may need to vary in size depending on whether the DCI format 0 is transmitted in a UE-specific search space. EX1006 at 2:47, 14:50-15:31. Accordingly, Babaei teaches or suggests, that the DCI format 0 could be sent in the common search space as required by limitation 2c.

121. Because Babaei is concerned with processing requirements and power consumption, a POSITA would have been motivated to use a common search space for SPS services to help with reducing these requirements. Specifically, multiple SPS RNTIs result in increased processing/power resources, and Babaei discusses configuring some UEs to use the same SPS RNTI for two or more SPS configurations in order to minimize this impact. *See, e.g.*, EX1006 at 22:32-40. In this scenario, the SPS configurations share the SPS RNTI and its search space.

122. A POSITA would recognize that different UEs could share the SPS RNTI and the corresponding search space (common search space), and each UE's SPS-ConfigIndex could determine to which UE the activation / deactivation DCI format should be applied. The cell's common search space (CSS) would be an obvious choice for this, since the UEs already receive/decode any DCI formats sent here.

123. Babaei and Fwu both disclose periodic uplink grants (grants to transmit data in the PUSCH). EX1008 at [0022]-[0023]; EX1006 at 3:9-10, 4:65-5:14, 15:49-55, 16:4-42. The references teach, and a POSITA would understand, that 3GPP eNBs provide for reception both a physical uplink control channel (PUCCH) and a physical uplink shared channel (PUSCH). Additionally, the SPS configurations taught by Babaei are for data transmission on the PUSCH. EX1006 at 15:49-55, 16:4-42. Therefore, Babaei (and Fwu) disclose grants to transmit data in the PUSCH.

124. Babaei discloses multiple (different) RNTIs for each SPS configuration. EX1006 at 16:64-17:8. Both of Babaei's RNTIs are different from the C-RNTI, as required by the Challenged Claims. EX1006 at 13:7-49.

125. Even if Patent Owner argues that the SPS RNTIs of Babaei are semi-persistent scheduling C-RNTIs, Babaei still satisfies the requirement that the "first RNTI" be "different from ... a semi-persistent scheduling C-RNTI" because Babaei teaches the configuration of multiple SPS RNTIs. EX1006 at 19:5-31. Babaei teaches that in order to support multiple SPS configurations, the SPS C-RNTIs for the different SPS configurations are "different." *Id.* at 19:20-31. The table below is illustrative:

RNTI	Use	Different from C-RNTI?	Different from First SPS RNTI?	Different from Second SPS RNTI?
C-RNTI ⁴	Dynamic scheduling	No	Yes	Yes
First SPS RNTI ⁵	Scheduling of periodic voice transmissions	Yes	No	Yes
Second SPS RNTI ⁶	Scheduling of periodic V2X transmissions	Yes	Yes	No

⁴ EX1006 at 13:7-49.

⁵ EX1006 at 19:23-24.

⁶ EX1006 at 19:24-26.

126. Therefore, Babaei teaches and, in combination with Fwu, renders obvious “the transmitting circuitry configured to transmit in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for an uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology.”

5) [2d] receiving circuitry configured to receive confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI,

127. Babaei teaches and, in combination with Fwu, renders obvious “receiving circuitry configured to receive confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI.” As discussed above, both Babaei and Fwu disclose base stations that communicate with UEs, including receiving circuitry. *See* Section X.A.2.a).1).

128. Babaei teaches the sending and the receiving of a confirmation MAC CE in response to a DCI activating or deactivating (releasing) a periodic uplink grant. EX1006 at Figures 18, 24, 25, 28, 29, 24:56-25:3, 26:4-22, 28:18-33:4; 35:43-58, 36:12-27, 37:19-54. For example, Figure 18, reproduced and annotated below, depicts receipt by the UE of the MAC CE in response to a DCI message activating a periodic resource grant. *Id.* at Fig. 18.

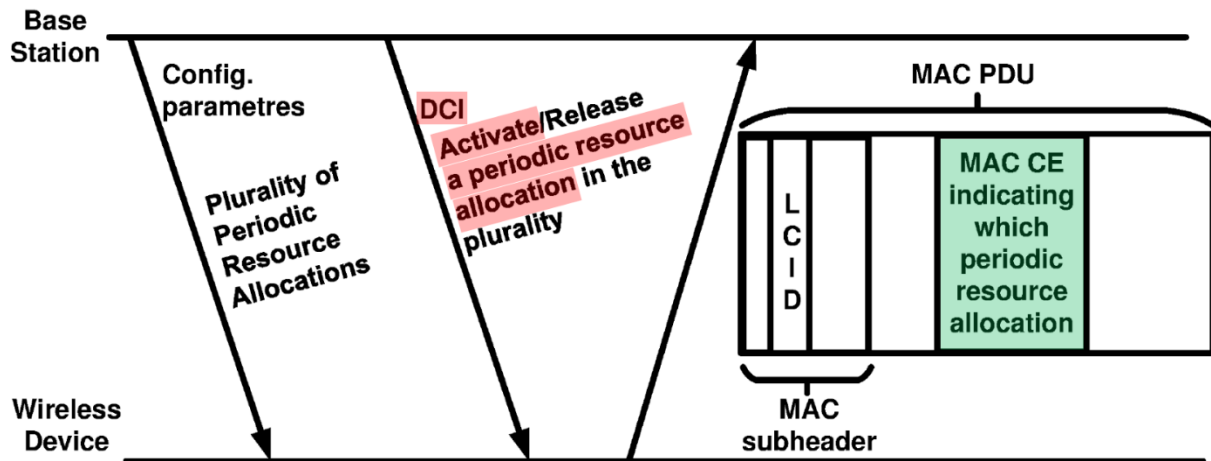


FIG. 18

EX1006 at Fig. 18.

129. Babaei teaches many embodiments of DCI activation/release messages and associated confirmation MAC CEs. and much of the variation involves UE behavior. EX1006 at Figure 25, 36:12-27. Babaei explains that “FIG. 25 is an example flow diagram as per an aspect of an embodiment of the present disclosure. At 2510, a base station may transmit configuration parameters for a plurality of periodic resource allocations. At 2520, a downlink control information (DCI) may

be transmitted. The DCI may indicate activation or deactivation of a periodic resource allocation in the plurality of periodic resource allocations. At 2530, in response to transmitting the DCI, a medium access control (MAC) protocol data unit (MAC PDU) may be received. The MAC PDU may comprise: a MAC subheader comprising a logical channel identifier indicating that the MAC PDU comprises a confirmation MAC control element (MAC CE); and the confirmation MAC CE comprising a field indicating which one of the plurality of periodic resource allocations the DCI indicates activation or deactivation.” *Id.*

130. This disclosure corresponds to limitation 2a, 2c (wherein the base station transmits a DCI to indicate activation or deactivation of one of the periodic resource allocations) and 2d, 2f-2i (“in response to transmitting the DCI,” the base station receives a MAC PDU comprising a confirmation MAC CE).

6) [2e] the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology, wherein

131. Babaei teaches and, in combination with Fwu, renders obvious “the receiving circuitry configured to receive, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology.” As previously established, both Babaei and Fwu disclose base stations that communicate with UEs, including receiving

circuitry. *See* Sections X.A.2.a).1) and 5). They also disclose periodic uplink data transmissions from UEs configured with periodic uplink grants. *See* Sections X.A.2.a).2) and 4).

132. A POSITA would understand that, after successful activation of a UL SPS as contemplated by both Babaei and Fwu, the receiving circuitry in the activating base station would then be configured to receive, at the assigned periodicity and on the assigned frequencies and times, the uplink data transmissions of the configured UE. Babaei Figures 14-16, reproduced below, illustrate the UE's use of allocated resources after allocation.

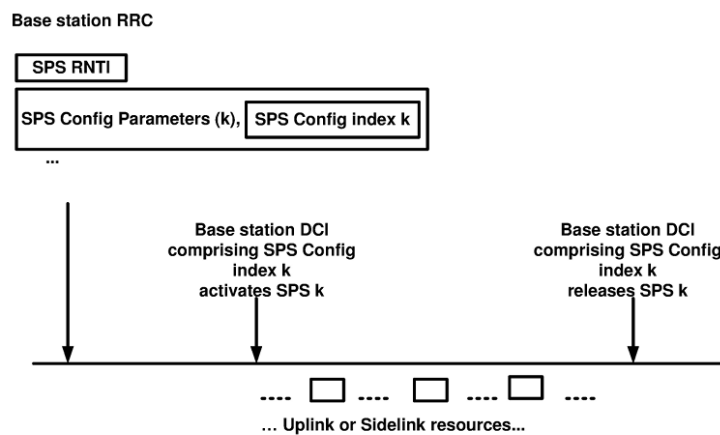


FIG. 14

EX1006 at Fig. 14.

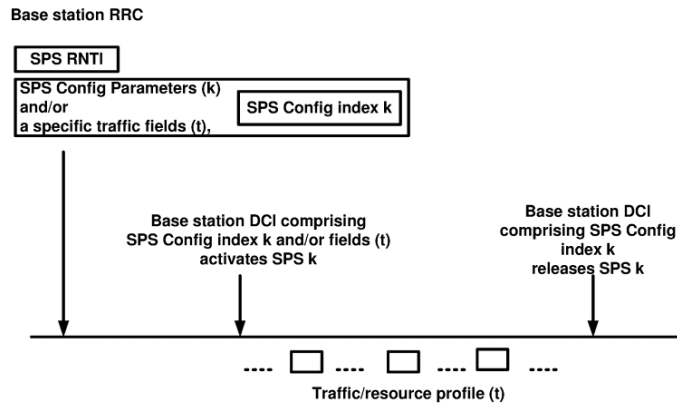


FIG. 15

EX1006 at Fig. 15.

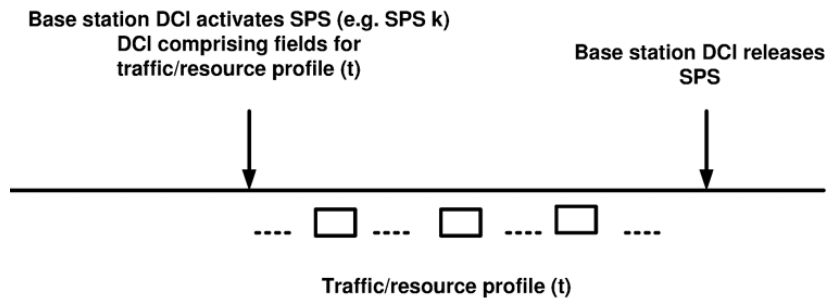


FIG. 16

EX1006 at Fig. 16.

- 7) [2f] the receiving circuitry is configured to receive confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, and

133. Babaei teaches and, in combination with Fwu, renders obvious “the receiving circuitry is configured to receive confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data

transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI.” As discussed above, both Babaei and Fwu disclose base stations that communicate with UEs, including receiving circuitry. *See* Sections X.2.a).1) and 5).

134. Babaei teaches the receiving of confirmation information MAC CEs in response to DCI format scrambled by the RNTI corresponding to a previously configured periodic uplink grant. This same disclosure teaches the receiving of a MAC CE in response to a DCI format that releases the uplink grant. For example, Figure 18 reproduced with annotations below, shows the receipt of the MAC CE in response to a DCI message activating a periodic resource grant.

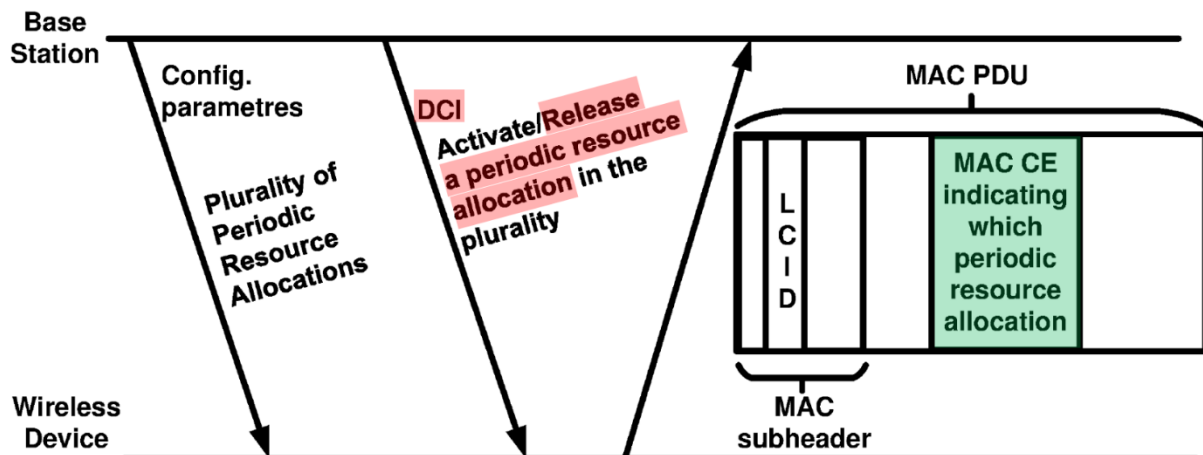


FIG. 18

EX1006 at Fig. 18.

135. As I explained above, Babaei teaches the sending and receiving of a confirmation MAC CE in response to a DCI either activating or deactivating

(releasing) a periodic uplink grant. EX1006 at Figs. 18, 24, 25, 28, 29, 24:56-25:3, 26:4-22, 28:18-33:4; 35:43-58, 36:12-27, 37:19-54. *See* Section X.A.2.a).5). Here, where the DCI format releases the periodic uplink grant, the eNB receives a confirmation MAC CE corresponding to the release uplink grant.

- 8) [2g] the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID), [2h] the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and**

136. Babaei teaches Limitations 2g and 2h Limitations 2g and 2h relating to how the confirmation information MAC CEs are received by the claimed base station. The MAC CE must be in a MAC protocol data unit (PDU) and identified by a MAC PDU subheader with a logical channel identifier (LCID), according to the Challenged Claims. This architecture is expressly disclosed by Babaei, as explained in more detail below.

137. Figure 18, reproduced and annotated below, depicts the MAC PDU that carrying the confirmation information MAC CE in response to a DCI format that activates or releases a periodic resource allocation. EX1006 at Fig. 18. The MAC PDU includes the confirmation information MAC CE, identified by a MAC subheader including an LCID.

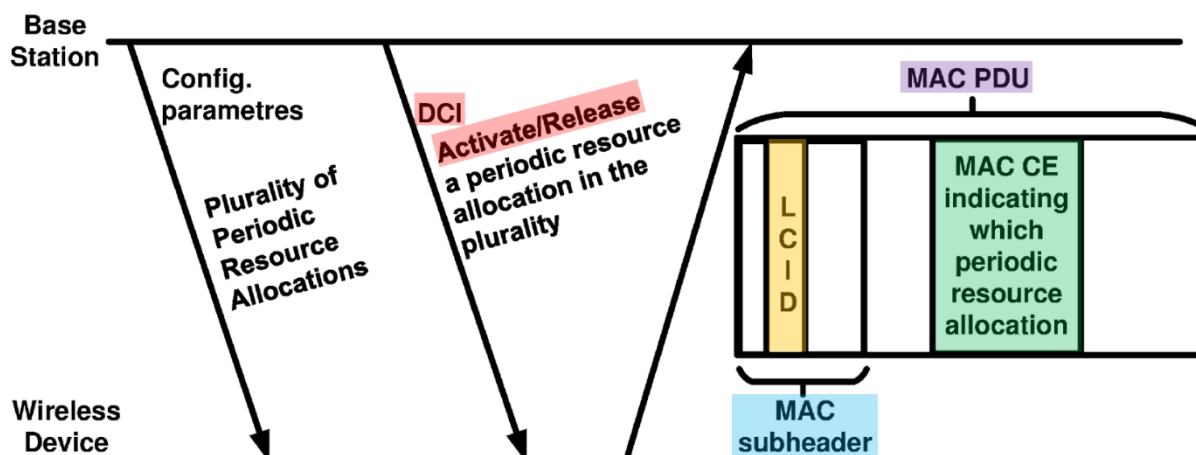


FIG. 18

EX1006 at Fig. 18.

138. Babaei teaches that “a MAC PDU may consist of a MAC header, zero or more MAC Service Data Units (MAC SDU), zero, or more MAC control elements, and optionally padding. In an example, the MAC header and the MAC SDUs may be of variable sizes. In an example, a MAC PDU header may consist of one or more MAC PDU subheaders. In an example, a subheader may correspond to either a MAC SDU, a MAC control element or padding. In an example, a MAC PDU subheader may comprise five or six header fields R/F2/E/LCID/(F)/L but for the last subheader in the MAC PDU and for fixed sized MAC control elements. In an example, the last subheader in the MAC PDU and subheaders for fixed sized MAC control elements may comprise four header fields R/F2/E/LCID. In an example, a MAC PDU subheader corresponding to padding may consist of the four header fields R/F2/E/LCID. In an example, MAC PDU subheaders may have the same order as

the corresponding MAC SDUs, MAC control elements and padding. In an example, MAC control elements may be placed before a MAC SDU.” EX1006 at 25:4-24.

139. Babaei also discloses that the LCID is 5 bits. Babaei further discloses that the LCDI identifies the logical channel instance of the corresponding MAC SDU or the type of the MAC CE. EX1006 at 25:27-30.

140. Babaei teaches that “[T]he SPS confirmation MAC CE is identified by a MAC PDU subheader with an LCID that corresponds to the SPS configuration for which the SPS confirmation MAC CE corresponds to.” EX1006 at 30:12-15. Babaei further discloses eight different LCIDs corresponding to eight different SPS configurations. This allows the base station to receive confirmation MAC CEs for up to eight different SPS configurations for a single UE. EX1006 at 30:15-19. In some instances, two SPS configurations are used, one for VOIP and one for V2X applications. Here, each SPS configuration has its own corresponding LCID. EX1006 at 30:27-36.

141. Babaei illustrates the sending and receiving of a confirmation MAC CE in Figures 24 and 25, reproduced below. These figures demonstrate that the base station receives a MAC PDU with a MAC subheader comprising a LCID indicating that the MAC PDU comprises a confirmation MAC CE confirming the activation or deactivation of the periodic resource allocation, as required by this limitation.

EX1006 35:51-55, 36:21-24. Therefore, Babaei teaches the receipt of a MAC PDU as claimed by limitations 2g and 2h.

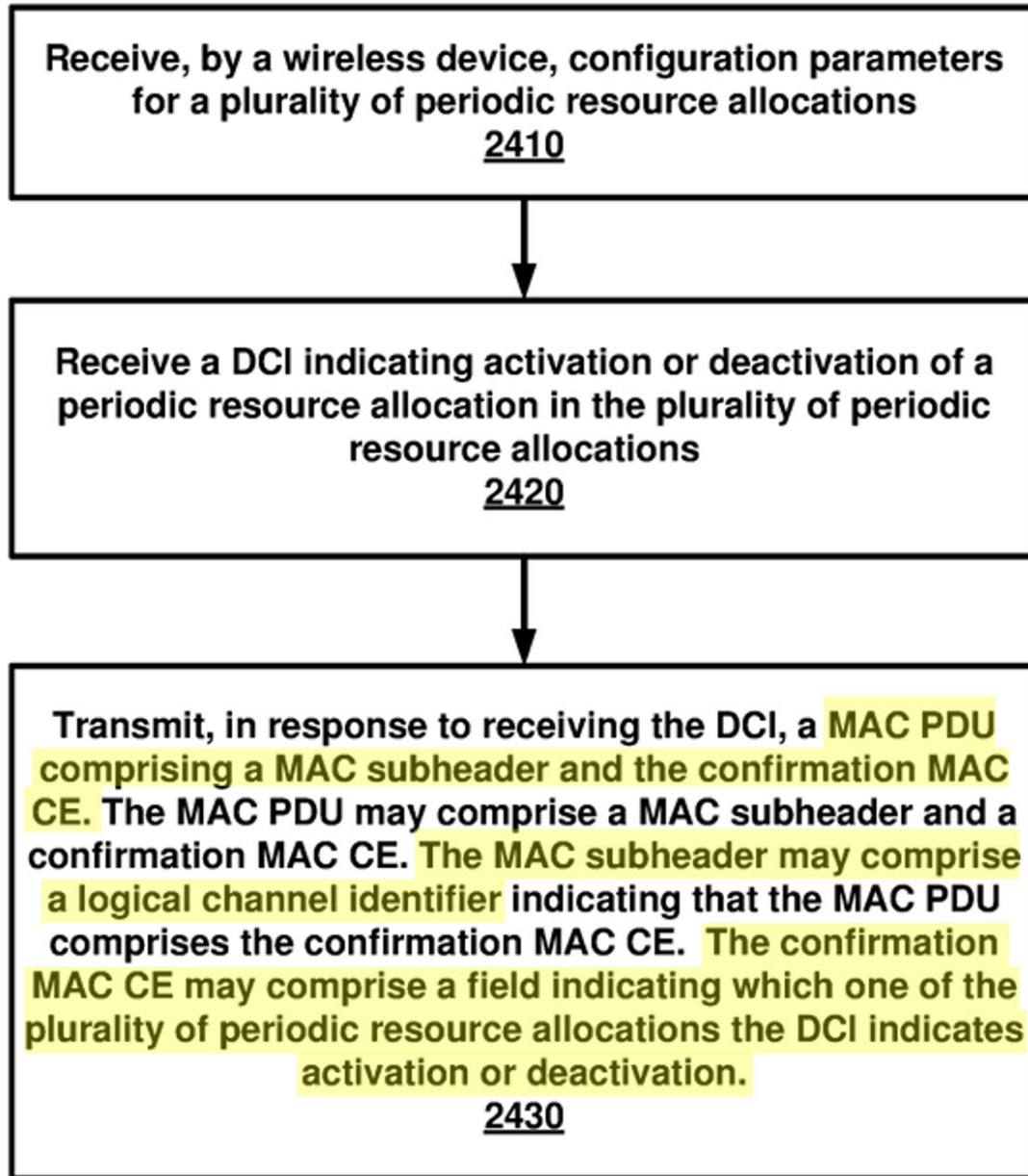


FIG. 24

EX1006 at Fig. 24.

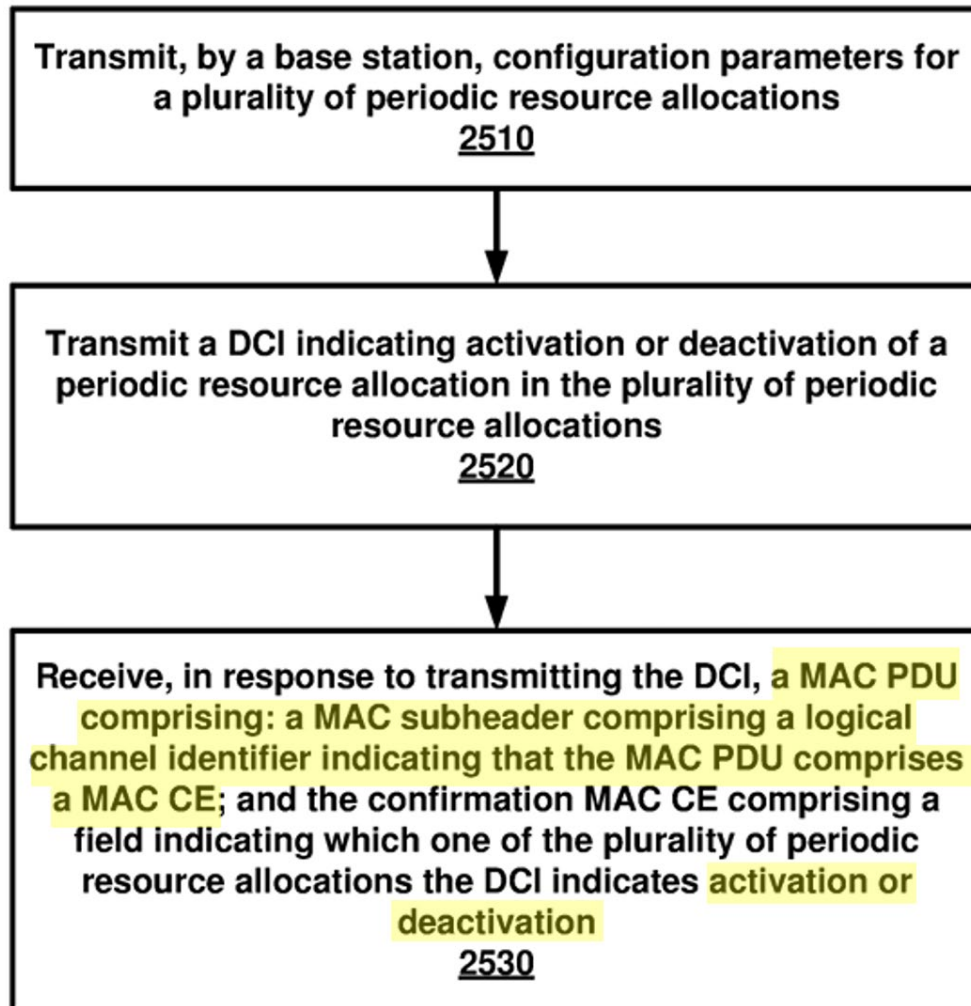


FIG. 25

EX1006 at Fig. 25.

- 9) [2i] the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.

142. Babaei teaches “the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third

information and the confirmation information MAC CE for the DCI format comprising the fourth information.” As I discussed with regard to limitations 2g and 2h, Babaei teaches a MAC PDU with a MAC subheader including an LCID that identifies the confirmation MAC CE. *See* Section X.A.2.a).8). Babaei also teaches that the LCID used for the confirmation MAC CE for both activation and deactivation (third and fourth information) should be the same, as required by this limitation.

143. In particular, Babaei discloses “an example embodiment, a new LCID may be pre-defined for a UE to identify a MAC CE for SPS configuration supporting multiple SPS configuration. The new LCID may be employed when SPS confirmation is transmitted for a particular SPS configuration. For example, when an RRC message configures an enhanced SPS configuration (e.g. multiple SPS configurations) an enhanced SPS confirmation LCID may be used to identify an enhanced SPS confirmation MAC CE. When a UE is configured with a predefined SPS configuration, MAC CE may have a fixed size of zero bits that may be identified by a first LCID. The predefined configuration for example, may be configuration of one SPS configuration (e.g. legacy SPS), or one SPS-RNTI, or configuration of legacy SPS-config, and/or configuration of SPS for VOIP, and/or when SPS indexes are not configured. When the UE is configured with an enhanced RRC SPS configuration, the UE may transmit an enhance MAC CE for an enhanced SPS

confirmation that may be identified by a second LCID (different from the first LCID). In an example, the legacy SPS confirmation MAC CE may be employed for confirming activation/release of the legacy SPS configuration (legacy SPS-config IE e.g. using a first RNTI). And the enhanced SPS confirmation MAC CE may be employed for confirming activation/release of the enhanced SPS configuration (enhanced SPS-config IE e.g. using a second RNTI). This mechanism may increase the number of LCIDs required for SPS confirmation.” EX1006 at 28:40-67. Babaei discloses an additional embodiment with the same feature of matching separate LCIDs for confirmation MAC CEs. *Id.* at 30:12-36. Further, Babaei contemplates using the same LCID for both legacy and enhanced SPS confirmation MAC CEs. *Id.* at 29:4-26. In this scenario, the content of the confirmation MAC CEs indicates which applies.

144. Babaei’s disclosures including one LCID for each SPS configuration *or* one LCID for all SPS configurations both satisfy the limitation because the confirmation MAC CE for both activation and deactivation or release be sent in a MAC PDU with a MAC subheader with an LCID that is the same for activation and deactivation or release. Therefore, Babaei teaches limitation 2i.

b) Claim 4

145. Claim 4 is substantively the same as claim 2, but is directed to a communication method of a base station rather than the base station itself. Therefore,

the same teachings of Babaei and Fwu that render the limitations of claim 2 obvious render the corresponding same/similar limitations in claim 4 obvious. This is because a POSITA would find it obvious both to configure a base station to perform a step and to have the base station actually perform the step.

1) [4pre] A communication method of a base station apparatus that communicates with a user equipment (UE), comprising:

146. Limitation 4pre recites a “communication method of a base station apparatus that communicates with a [UE].” Limitation 2pre recites a “base station that communicates with a UE.” The same disclosures and analysis that render limitation 2pre obvious therefore render limitation 4pre obvious. *See* Section X.A.2.a).1).

2) [4a] transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity;

147. Limitation 4a recites “transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity.” Limitation 2a recites “transmitting circuitry configured to transmit” the same RRC message. The same disclosures and analysis that render limitation 2a obvious therefore render limitation 4a obvious. *See* Section X.A.2.a).2).

3) [4b] transmitting a RRC message comprising second information used for configuring a numerology;

148. Limitation 4b recites “transmitting a radio resource control (RRC) message comprising first information used for configuring a periodicity.” Limitation 2b recites “transmitting circuitry configured to transmit” the same RRC message. The same disclosures and analysis that render limitation 2b obvious therefore render limitation 4b obvious. *See* Section X.A.2.a).3).

4) [4c] transmitting in a common search space of a physical downlink control channel, a downlink control information (DCI) format with cyclic redundancy check (CRC) scrambled by a first radio network identifier (RNTI), the first RNTI being different from a Cell-RNTI (C-RNTI) and a semi-persistent scheduling C-RNTI, the first RNTI being used for indicating an activation and a deactivation for the uplink data transmission on a physical uplink shared channel (PUSCH) based on the periodicity and the numerology;

149. Limitation 4c recites “transmitting ... a downlink control information (DCI) format ...” with certain requirements. Limitation 2c recites “transmitting circuitry configured to transmit” the same DCI format with the same requirements. The same disclosures and analysis that render limitation 2c obvious therefore render limitation 4c obvious. *See* Section X.A.2.a).4).

- 5) [4d] receiving confirmation information Medium Access Control (MAC) Control Element (CE) in a case that third information used for indicating the activation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI;**

150. Limitation 4d recites “receiving confirmation information Medium Access Control (MAC) Control Element (CE) ...” with certain requirements. Limitation 2d recites “receiving circuitry configured to receive” the same MAC CE with the same requirements. The same disclosures and analysis that render limitation 2d obvious therefore render limitation 4d obvious. *See* Section X.A.2.a).5).

- 6) [4e] receiving, based on a transmission of the DCI format comprising the third information, the uplink data transmission on the PUSCH based on the periodicity and the numerology;**

151. Limitation 4e recites “receiving ... the uplink data transmission on the PUSCH ...” Limitation 2e recites “receiving circuitry configured to receive” the same uplink transmission. The same disclosures and analysis that render limitation 2e obvious therefore render limitation 4e obvious. *See* Section X.A.2.a).6).

- 7) [4f] receiving confirmation information MAC CE in a case that fourth information used for indicating the deactivation for the uplink data transmission on the PUSCH is comprised in the DCI format with the CRC scrambled by the first RNTI, wherein**

152. Limitation 4f recites “receiving confirmation information MAC CE ...” with certain requirements. 2f, discussed above, recites “receiving circuitry configured to receive” the same MAC CE with the same requirements. Babaei renders that limitation obvious. The same disclosures and analysis that render limitation 2f obvious also render limitation 4f obvious. *See* Section X.A.2.a).7).

- 8) [4g] the confirmation information MAC CE for the DCI format comprising the third information is identified by a MAC protocol data unit (MAC PDU) subheader with a logical channel identifier (LCID), [4h] the confirmation information MAC CE for the DCI format comprising the fourth information is identified by the MAC PDU subheader with the LCID, and [4i] the same index of the LCID is used for the confirmation information MAC CE for the DCI format comprising the third information and the confirmation information MAC CE for the DCI format comprising the fourth information.**

153. Limitations 4g, 4h, and 4i are identical to limitations 2g, 2h, and 2i, respectively. Therefore, the same disclosure and analysis that I discussed above which render limitations 2g, 2h, and 2i obvious also render limitations 4g, 4h, and 4i obvious. *See* Sections X.A.2.a).8) and 9).

B. Ground #2: The Challenged Claims are Rendered Obvious in View of Babaei and Fwu in Further View of Lee

1. Motivation to Combine Lee with Babaei and Fwu

154. As I explained above, a POSITA would have been motivated to combine Babaei and Fwu. *See* Section X.A.1. A POSITA would also have been motivated to combine Babaei and Fwu with Lee, because these references are in the same field of endeavor (late 4G / early 5G cellular communications), and each address the problem of adding support for new services with different requirements to a radio access network.

155. Similarly to Babaei and Fwu, Lee also addresses the needs of semi-persistent scheduling for vehicle-related communication (i.e., vehicle-to-everything (V2X) communication). EX1011 at 2:8-26. Similarly to Babaei, Lee discusses the signaling necessary to configure, activate, and deactivate different periodic uplink grants. EX1011 at 13:59-14:11 (“The base station may transmit, for example, an uplink SPS activation DCI for VoIP (this may be referred to as a VoIP UL SPS activation DCI) to the UE (S802). The VoIP UL SPS activation DCI may include a cyclic redundancy check (CRC), and the CRC may be scrambled by using an SPS-C-RNTI (hereinafter referred to as a first RNTI). The UE transmits a signal to the base station at an SPS cycle period by using a resource according to the configuration of a VoIP UL SPS activation DCI (S803). The UE receives a DCI that releases the VoIP UL SPS (this may be referred to as a VoIP UL SPS release DCI) (S804). The

VoIP UL SPS release DCI may also include a CRC, and the CRC may be scrambled by using an SPS-C-RNTI (a first RNTI). The VoIP UL SPS activation DCI/VoIP UL SPS release DCI may be received through a physical downlink control channel (PDCCH) or an enhanced PDCCH (EPDCCH).”), 14:12-35 (“The base station may transmit, for example, an uplink SPS activation DCI for V2X (this may be referred to as a V2X UL SPS activation DCI) to the UE (S902). The V2X UL SPS activation DCI may include a cyclic redundancy check (CRC), and the CRC may be scrambled by using a V2X-SPS-RNTI (hereinafter referred to as a second RNTI). Herein, the second RNTI may correspond to another RNTI that is differentiated from the above-described first RNTI. The UE transmits a V2X signal to the base station at an SPS cycle period by using a resource according to the configuration of a V2X UL SPS activation DCI (S903). The UE receives a DCI that releases the V2X UL SPS (this may be referred to as a V2X UL SPS release DCI) (S904). The V2X UL SPS release DCI may also include a CRC, and the CRC may be scrambled by using a V2X-SPS-RNTI (a second RNTI).”).

156. Babaei discusses that “A UE configured with multiple SPS RNTIs may need to monitor search space of PDCCH for multiple SPS RNTIs. When the number of required SPS configurations increases, this mechanism may increase UE processing requirements and/or power consumption. The base station may trigger which SPS process is activated or released employing at least one or more SPS

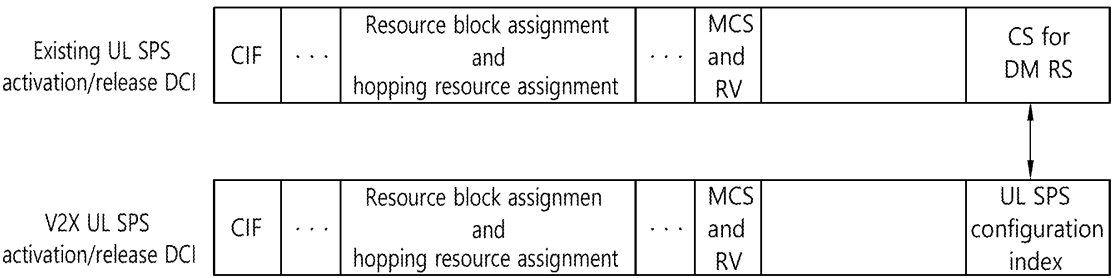
RNTIs. In an example implementation, in order to support multiple SPS configurations different SPS RNTIs may be configured for different SPS configurations. For example, a first SPS RNTI may be configured for SPS configuration to transmit a first V2X traffic, a second SPS RNTI may be configured for SPS configuration to transmit a second V2X traffic.” EX1006 at 21:1-10. Babaei additionally discloses that “different SPS configurations (e.g. having different periodicity) may be assigned to the same sidelink SPS RNTI, and may be identified by different SPS configuration indexes. In an example embodiment, one or more sidelink SPS configurations (e.g. multiple periodicity, MCS, and/or other parameters) may be triggered employing the same sidelink SPS RNTI for transmission of SPS V2X traffic via a sidelink.” *Id.* at 22:24-27.

157. A POSITA would understand that DCI Format messages are both compact and limited in terms of how many SPS configurations could be signaled. For example, a single bit may allow a DCI format with one SPS RNTI to signal one of two SPS configurations, two bits would allow for signaling of four configurations, etc. In scenarios where these bits are set aside solely for the purpose of distinguishing between SPS configurations, the bits would be lost for other purposes. Therefore, a POSITA would have been motivated to combine multiple SPS RNTIs (e.g., Lee’s SPS-C-RNTI and V2X-SPS-RNTI) with multiple SPS configurations per SPS

RNTI, such that the bits were not lost and the system could optimize DCI Format capacity.

158. Further, Lee teaches a first RNTI for conventional VoIP UL traffic (SPS-C-RNTI) and a second RNTI for V2X UL SPS traffic (V2X-SPS-RNTI). EX1011 at 13:59-14:35. Lee, similarly to Babaei, further teaches a UL SPS configuration index which allows multiple SPS configurations with a single RNTI. EX1011 at Figs. 11-12, 15:50-16:30.

FIG. 11



EX1011 at Fig. 11.

159. A POSITA would see Lee’s disclosure of two RNTIs for two different kinds of SPS traffic, and in turn be motivated to resolve Babaei’s concern over using too many SPS RNTIs. A POSITA would accomplish this by using Lee’s SPS-C-RNTI and V2X-SPS-RNTI solution discussed above.

2. The Challenged Claims are Obvious in View of Lee combined with Babaei and Fwu

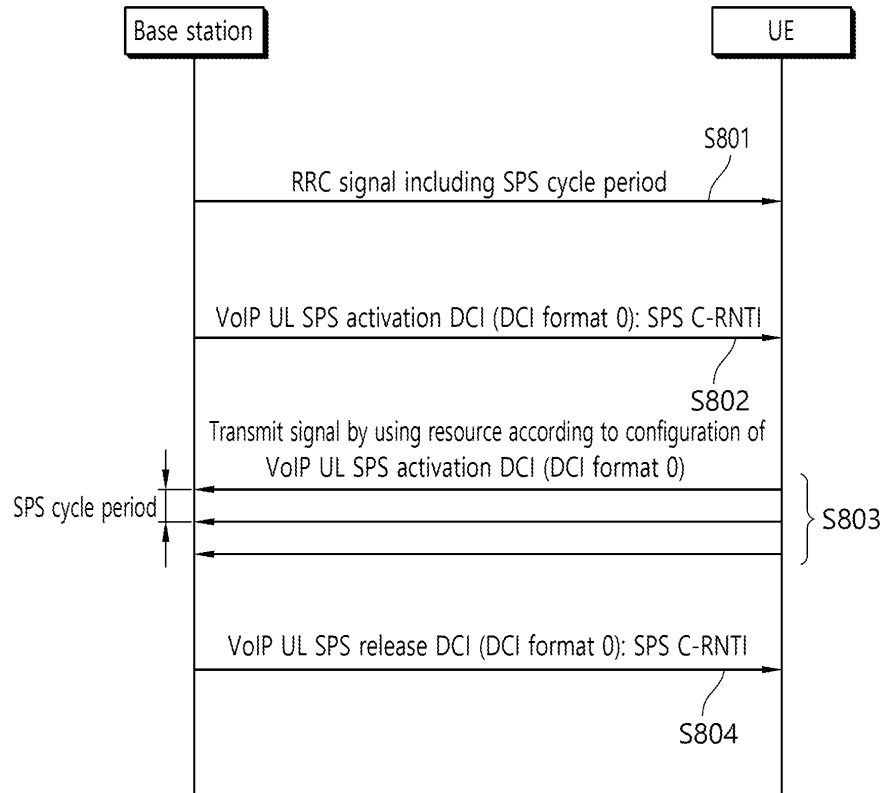
a) Claim 2

1) Limitations 2pre-2b and 2d-2i

160. As I discussed above in Ground 1, Claim limitations 2pre-2b and 2d-2i are rendered obvious by Babaei and Fwu without the benefit of Lee. *See* Sections X.A.2.a).1)-3) and 5)-9). Therefore, the same disclosures and arguments, made in further view of Lee, still render each of these limitations obvious, both because they are obvious without the benefit of Lee, and due to Lee's teachings discussed below.

161. Lee discloses a base station that communicates with UEs, as required by limitation 2Pre. *See* EX1011 at Figs. 1, 8, 9; 4:7-21. Lee also teaches a base station with transmitting circuitry that transmits an RRC message with information to configure the periodicity of a periodic uplink grant, as claimed by limitation 2a. *See* EX1011 at Figs. 8, 9; 13:59-61, 14:17-19. Finally, Lee further teaches a base station with receiving circuitry for receiving data periodically transmitted on the PUSCH in response to an activation DCI and a previously configured periodicity. EX1011 at Figs. 8, 9, 14:1-3, 14:28-30. Figure 8 is reproduced below.

FIG. 8



EX1011 at Fig. 8.

162. Lee does not address MAC CE confirmation signaling, but this is taught by Babaei as discussed above with respect to Ground 1.

2) Limitation 2c

163. Lee, in combination with Babaei and Fwu, renders limitation 2c obvious. Lee, like Babaei and Fwu, relates to the improvement and extension of late 4G and early 5G technology to accommodate services with different requirements,

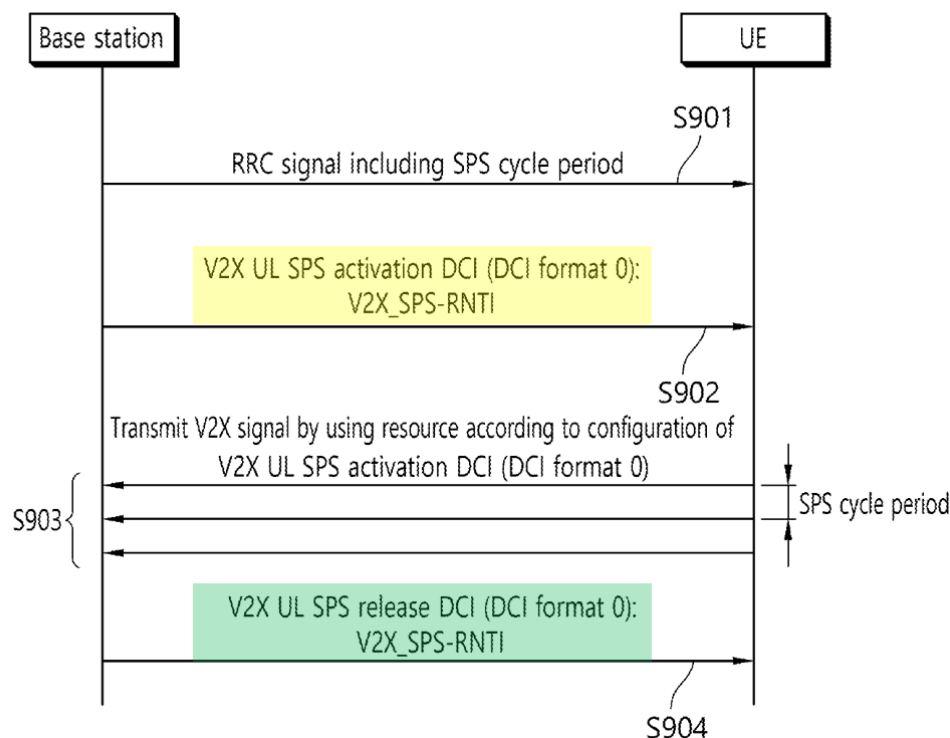
and in particular services that require periodic access to uplink resources, such as VoIP and V2X. EX1011 at Fig. 8; Fig. 9 13:56-14:35. A POSITA would find it obvious to combine Lee's V2X-SPS-RNTI and SPS-C-RNTI with Babaei's teaching of multiple RNTIs for periodic uplink grants and Babaei's use of SPS configuration indices to share RNTIs between configurations.

164. Lee's V2X-SPS-RNTI and SPS-C-RNTI disclosure teaches the requirements of limitation 2c. In particular, Figure 9 illustrates a V2X UL SPS activation and release (deactivation). EX1011 at Fig. 9, 14:12-35.

165. Lee discloses that "the base station may transmit, for example, an uplink SPS activation DCI for V2X (this may be referred to as a V2X UL SPS activation DCI) to the UE (S902). The V2X UL SPS activation DCI may include a cyclic redundancy check (CRC), and the CRC may be scrambled by using a V2X-SPS-RNTI (hereinafter referred to as a second RNTI). Herein, the second RNTI may correspond to another RNTI that is differentiated from the above-described first RNTI." EX1011 at 14:22-27. The "first RNTI" is the SPS-C-RNTI used for VoIP UL SPS. EX1011 at Fig. 8, 13:62-67.

166. Both of Lee's disclosed SPS-C-RNTI and V2X-SPS-RNTI are different from the C-RNTI used for dynamic scheduling. EX1011 at 10:35-40; Babaei at 13:7-49. Importantly, Lee's V2X-SPS-RNTI is different from an SPS-RNTI and a C-RNTI.

167. Figure 9, reproduced and annotated below, depicts a V2X-SPS-RNTI scrambled activation DCI (in yellow) and a V2X-SPS-RNTI scrambled release DCI (deactivating the periodic grant) in green. This RNTI is different from both an SPS-RNTI and a C-RNTI, as required by claim limitation 2c.



EX1011 at Fig. 9.

168. Lee further discloses “for example, in case a (single) common ‘V2X_SPS-RNTI’ and ‘(activation/release) DCI format’ are used for the management and operation of a plurality of ‘sidelink and/or uplink SPS process(/configuration)’ a subframe (SF) set(/cell set) (and/or a search space (SS) type (CSS/USS) and/or a control channel (PDCCH/EPDCCH set) type) in which the related ‘(sidelink and/or uplink-SPS) (activation/release) DCI’ is received for each

‘sidelink and/or uplink SPS process(/configuration)’ may be differently (or independently) configured(/signaled).” EX1011 at 17:13-22. In other words, the CSS can be used for DCI messages scrambled with the V2X-SPS-RNTI. EX1011 at 17:13-22.

169. Lee also discloses that “the user equipment (UE) receives scheduling information, such as DL grant, UL grant, and so on, through the PDCCH, and then, based on the received scheduling information, the UE performs operations of receiving the PDSCH and transmitting the PUSCH. Generally, the UL grant and the PDSCH are received within the same subframe. Thereafter, the PUSCH is transmitted after at least 4 subframes from the subframe that has received the UL grant. In addition to such dynamic scheduling, the LTE/LTE-A also provides semi-persistent scheduling (SPS).” EX1011 at 10:30-40.

b) Claim 4

1) Limitations 4pre-4b and 4d-4i

170. As I described above, Claim limitations 4pre, 4a, 4b and 4e are rendered obvious by Babaei and Fwu without the benefit of Lee. *See* Sections X.B.2.a).1), X.A.2.a).1)-3) and 5)-9), and X.A.2.b).1)-3) and 5)-9). The same disclosures and analysis, made in further view of Lee, still renders each of these claim limitations obvious.

2) Limitation 4c

171. Limitation 4c recites “transmitting ... a downlink control information (DCI) format ...” with certain requirements. Limitation 2c recites “transmitting circuitry configured to transmit” the same DCI format with the same requirements as limitation 4c. For the same reasons I described in my analysis of limitation 2c, Babaei, Fwu, and Lee render limitation 4c obvious. *See* Section X.B.2.a).2).

C. Ground #3: The Challenged Claims are Rendered Obvious in View of Babaei and Fwu in Further View of Agiwal

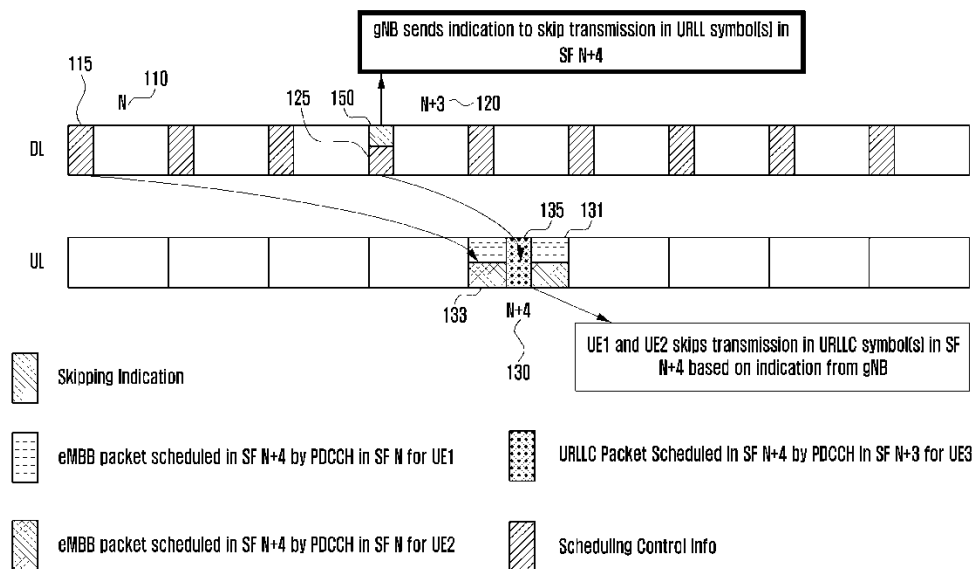
1. Motivation to Combine Agiwal with Babaei and Fwu

172. Similarly to Babaei and Fwu, as discussed in Section X.A.1 *supra*, Agiwal is also directed to improvements in late 4G and early 5G communications systems related to the expansion in available services, and the signaling parameters necessary to support those services. Specifically, Agiwal states that in order “To meet the demand for wireless data traffic having increased since deployment of fourth generation (4G) communication systems, efforts have been made to develop an improved fifth generation (5G) or pre-5G communication system. Therefore, the 5G or pre-5G communication system is also called a ‘Beyond 4G Network’ or a ‘Post long term evolution (LTE) System.’” EX1009 at [0003].

173. Specifically, Agiwal is concerned with resolving conflicts between enhanced Mobile Broadband (eMBB), ultra-reliable and low-latency communication (URLLC), massive machine type communication (mMTC), and

evolved multimedia broadcast/multicast service (eMBMS). EX1009 at [0008]. The first of three categories correspond to Fwu's low latency partition (URLLC), low energy partition (mMTC), and other (normal) sub-RATs in the sub-3GHz frequency space (eMBB). EX1008 at [0044].

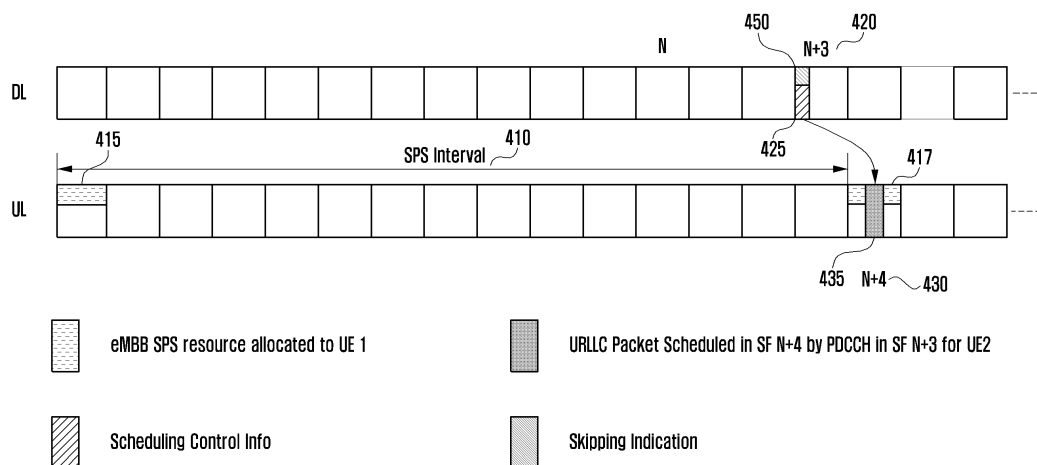
174. One problem of note throughout Agiwal's disclosure is the issue that can arise when two different numerologies are multiplexed in frequency, resulting in URLLC traffic colliding with eMBB traffic. EX1009 at [0054]-[0102]. These collisions can occur because the URLLC transmissions are lower latency and higher priority than eMBB transmissions, so at the time of scheduling the eMBB transmission, the URLLC transmission need may not yet be known. EX1009 at Fig. 1 (reproduced below).



EX1009 at Fig. 1.

175. Further, periodic and recurring SPS transmissions are scheduled in advance. *Id.* at Fig. 4.

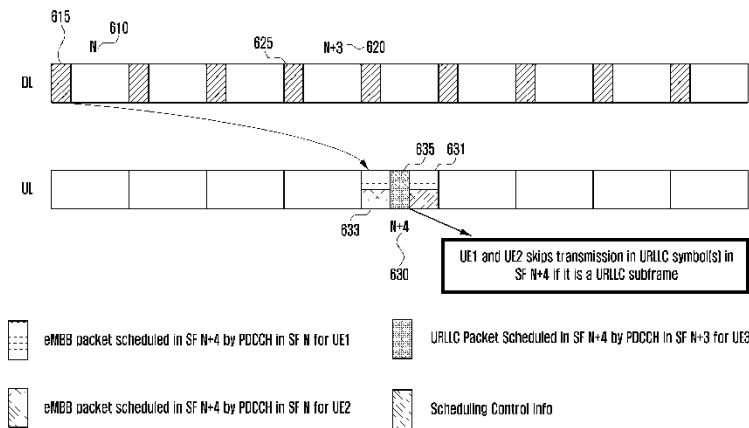
FIG. 4



EX1009 at Fig. 4.

176. In some instances, the interrupting URLLC packet may span many eMBB allocations as shown in Figure 6, reproduced below. *Id.* at Fig. 6.

FIG. 6



EX1009 at Fig. 6.

177. Agiwal's solution to avoid collisions is a skip indication. Specifically, "in a case of broadcast signaling, the indication 150 can be addressed to a new RNTI (e.g., skip-RNTI). The UEs which have been scheduled UL packet (and/or UL packet (e.g., eMBB) which has low priority compared to other packets (e.g., URLLC)) may only monitor indication 150 addressed to skip-RNTI. In an embodiment of the present disclosure, the indication 150 can be an radio resource control (RRC) message or medium access control (MAC) control element (CE) included in DL MAC packet data unit (PDU) or downlink control information (DCI) in PDCCH or group common DCI in PDCCH. In an embodiment of the present disclosure, the group common DCI for the skipping indication can be transmitted separately from group common DCI for slot format indication. In an embodiment of the present disclosure, the control resource set (CORESET) information for

monitoring the group common DCI for the skipping indication can be signaled in system information or in RRC signaling. In an embodiment of the present disclosure, the monitoring interval for monitoring the group common DCI for the skipping indication can be signaled in system information or in RRC signaling. In an embodiment of the present disclosure, the indication 150 can also be signaled using broadcast channel (BCH).” EX1009 at [0060]. Because the skip indication is transmitted in the common search space, each potentially impacted UE learns of the skip indication from the same DCI. *Id.*

178. A POSITA would have been motivated to combine Agiwal’s skip-RNTI (skip indication) with Babaei and Fwu’s SPS signaling and numerology configuration disclosures in order to allow multiplexing of different sub-RATs in a frequency range. In particular, a POSITA would recognize that URLLC’s high-priority, low-latency communication is not always necessary, and as a result, that permanently setting aside space to URLLC would prevent it from being used in other, more efficient ways. By adding Agiwal to the previously discussed combination of Babaei and Fwu, a POSITA would recognize a way to maximize bandwidth while avoiding collisions.

2. The Challenged Claims are Obvious in View of Agiwal combined with Babaei and Fwu

a) Claim 2

1) Limitations 2pre-2b and 2e

179. As I discussed in Ground 1, limitations 2pre-2b and 2e are each rendered obvious by the combination of Babaei and Fwu. *See* Sections X.A.2.a).1)-3) and 6). The same disclosures and arguments made for these limitations, made in further view of Agiwal, still render each of these claim limitations obvious.

2) Limitation 2c

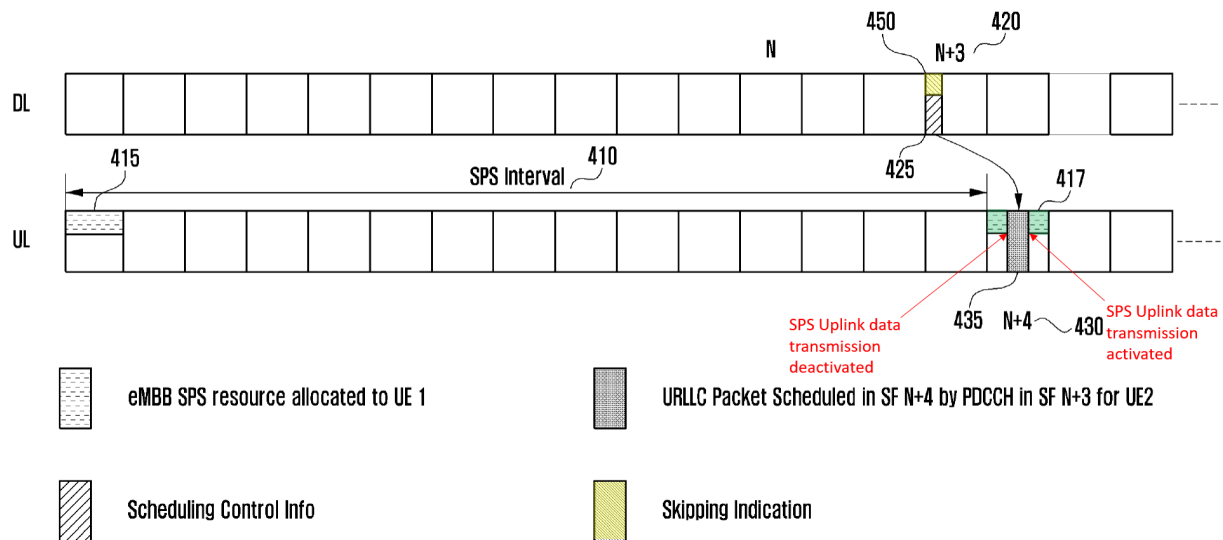
180. Limitation 2c is rendered obvious in view of Agiwal combined with Babaei and Fwu. Specifically, Agiwal's skip-RNTI scheme combined with the teachings of Babaei and Fwu set forth in my analysis provided for Ground 1, render limitation 2c obvious. *See* Section X.A.2.a).4). Agiwal discloses that the DCI format addressed to the skip-RNTI and broadcast in the common search space is a DCI format scrambled by an RNTI different from a C-RNTI or a semi-persistent scheduling C-RNTI that both activates and deactivates the uplink SPS transmission.

181. A POSITA would understand a DCI format to be addressed to an RNTI when the CRC for the DCI format is scrambled using the RNTI. This enables UEs to determine whether a received DCI format is intended for them as part of a blind decoding process. So, when Agiwal says the skip indication "can be addressed to a

new RNTI (e.g., skip-RNTI)” a POSITA would understand this to refers to a DCI format with its CRC scrambled using the skip-RNTI. EX1009 at [0060].

182. Agiwal further discloses that “the indication 150 can be an radio resource control (RRC) message or medium access control (MAC) control element (CE) included in DL MAC packet data unit (PDU) or downlink control information (DCI) in PDCCH or group common DCI in PDCCH.” EX1009 at [0060]. In other words, the skip indication may be broadcast in the common search space.

183. The skipping indication activates and deactivates the periodic uplink transmission configured for the SRS UE. This is shown Fig. 4, annotated and reproduced below.



EX1009, Figure 4 (annotations added).

3) Limitations 2d and 2f-2i

184. Limitations 2d and 2f-2i relate to the confirmation information MAC CE sent in response to a successfully received DCI Format activating or deactivating a periodic uplink grant. As I described in Ground 1, Babaei discloses the confirmation information MAC CEs for confirming DCI messages addressed to a UE's assigned RNTIs for one or more different SPS configurations. *See* Sections X.A.2.a).5) and 7)-8).

185. A POSITA would have found it obvious to send a confirmation information MAC CE to confirm receipt of the skip-RNTI disclosed by Agiwal in situations where the UE's scheduled allocation overlaps with the skipped region. Further, a POSITA would have realized that the BS would need to know whether the conflicting SPS UE will allow the transmission of the URLLC UE.

186. Babaei discloses that "LCID may be the Logical Channel ID field and may identify the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC control element or padding for the DL-SCH, UL-SCH and MCH respectively. In an example, there may be one LCID field for each MAC SDU, MAC control element or padding included in the MAC PDU." *See, e.g.,* EX1006 at 25:31-33. In other words, Babaei teaches that each of MAC CE is identified by a LCID. Therefore, the confirmation MAC CE for Agiwal's skip-RNTI comprises one confirmation MAC CE for both the third information (when to

activate SPS) and the fourth information (when to deactivate SPS). Further, this would have the same LCID. Accordingly, Agiwal combined with Babaei and Fwu renders obvious limitations 2d and 2f-2i.

b) Claim 4

1) Limitations 4pre-4b and 4e

187. As I described above, Claim limitations 4pre, 4a, 4b and 4e are rendered obvious by Babaei and Fwu without the benefit of Agiwal. *See* Sections X.A.2.a).1)-3) and 6) and X.A.2.b).1)-3) and 6). The same disclosures and analysis, made in further view of Agiwal, still renders each of these claim limitations obvious.

2) Limitation 4c

188. Limitation 4c recites “transmitting ... a downlink control information (DCI) format ...” with certain requirements. Limitation 2c recites “transmitting circuitry configured to transmit” the same DCI format with the same requirements as limitation 4c. For the same reasons I described in my analysis of limitation 2c, Babaei, Fwu, and Agiwal render limitation 4c obvious. *See* Section X.C.2.a).2).

3) Limitations 4d and 4f-4i

189. Limitation 4d recites “receiving confirmation information Medium Access Control (MAC) Control Element (CE) ...” with certain requirements. Limitation 2d recites “receiving circuitry configured to receive” the same MAC CE with the same requirements as limitation 4d. Similarly, limitation 4f recites

“receiving confirmation information MAC CE ...” with certain requirements. Limitation 2f recites “receiving circuitry configured to receive” the same MAC CE with the same requirements. Further, limitation 4g is identical to limitation 2g, limitation 4h is identical to limitation 2h, and limitation 4i is identical to limitation 2i.

190. Therefore, the same disclosure and analysis that renders limitations 2d and 2f-2i obvious similarly render limitations 4d and 4f-4i obvious. *See* Section X.C.2.a).3).

XI. Conclusion

191. The Challenged Claims simply recite concepts known in the art at the time. Thus, the Challenged Claims were either anticipated or rendered obvious by the prior art. Based on my experience, knowledge of the field at the relevant time, and a thorough analysis of prior art references, it is my expert opinion that the Challenged Claims of the '976 Patent are unpatentable.

Date: January 24, 2024

Executed: 