

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD., AND SAMSUNG ELECTRONICS
AMERICA, INC.,
Petitioners,

v.

HANNIBAL IP LLC,
Patent Owner.

U.S. Patent No. 11,368,911

Inter Partes Review No. IPR2025-01189

**DECLARATION OF DR. ROBERT AKL, D. SC. IN SUPPORT OF
PATENT OWNER'S RESPONSE**

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I. INTRODUCTION

1. My name is Robert Akl, and I have been retained as a technical expert by counsel for Patent Owner Hannibal IP LLC (“Hannibal” or “Patent Owner”) to provide expert opinion in the *Inter Partes* review of U.S. Patent No. 11,368,911 requested by Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (“Samsung” or “Petitioners”) in the above-captioned matter. I understand that my testimony herein may be used in support of the Patent Owner’s Response to the Petition for Inter Partes Review filed by the Petitioners.

2. I understand that the Patent Trial and Appeal Board (“PTAB”) has granted institution of an *Inter Partes* Review of U.S. Patent No. 11,368,911 (the “’911 Patent”), Claims 1-18 as shown in the Notice of Decisions on Institution dated December 23, 2025 (the “Institution Decision”).

3. In this Declaration, I set forth my analysis of the validity of Claims 1 – 18 of the ’911 Patent. I have reviewed the Petition, the Declaration of Apostolos K. Kakaes, Ph.D. (Ex. 1003) (“Kakaes Decl.”), and the other exhibits submitted with the Petition. I note that the PTAB did not provide any explanation for its Institution Decision. Therefore, herein I will be responding to the statements made in the Petition and/or Kakaes Declaration.

II. QUALIFICATIONS AND PROFESSIONAL BACKGROUND

4. I am an expert in the field of wireless telecommunication systems. I have studied, taught, practiced, and researched this field for over 30 years. This section summarizes my educational background, work experience, and other relevant qualifications. Attached hereto as Ex. A is a true and correct copy of my *curriculum vitae* describing my background and experience.

5. I earned two Bachelor of Science degrees in Electrical Engineering and Computer Science *summa cum laude* with a grade point average of 4.0/4.0 and a ranking of first in my undergraduate class from Washington University in St. Louis in 1994. In 1996, I earned my Master of Science degree in Electrical Engineering from Washington University in St. Louis with a grade point average of 4.0/4.0. I earned my Doctor of Science in Electrical Engineering from Washington University in St. Louis in 2000, again with a grade point average of 4.0/4.0, with a dissertation on “Cell Design to Maximize Capacity in Cellular Code Division Multiple Access (CDMA) Network.”

6. While a graduate student, from 1997 through 1999, I worked at MinMax Corporation in St. Louis, where I designed software packages that provided tools to flexibly allocate capacity in a CDMA communications network and maximize the number of subscribers. I also validated the hardware architecture for an Asynchronous Transfer Mode (ATM) switch capable of channel group switching,

as well as performed logical and timing simulations, and developed the hardware architecture for the ATM switch. I also worked with Teleware Corporation in Seoul, South Korea, where I designed and developed algorithms that were commercially deployed in a software package suite for analyzing the capacity in a CDMA network implementing the IS-95 standard to maximize the number of subscribers.

7. After obtaining my Doctor of Science degree, I worked as a Senior Systems Engineer at Comspace Corporation from October of 2000 to December of 2001. At Comspace, I designed and developed advanced data coding and modulation methods for improving reliability and increasing the available data rates for cellular communications. I coded and simulated different encoding schemes (including Turbo coding, Viterbi decoding, trellis coded modulation, and Reed- Muller codes) and modulation techniques using amplitude and phase characteristics and multilevel star constellations. This work further entailed the optimization of soft decision parameters and interleavers for additive white Gaussian and Rayleigh faded channels. In addition, I also extended the control and trunking of Logic Trunked Radio (LTR) to include one-to-one and one-to-many voice and data messaging.

8. In January of 2002, I joined the faculty of the University of New Orleans in Louisiana as an Assistant Professor in the Department of Electrical Engineering. While in this position, I designed and taught two new courses called "Computer Systems Design I and II." I also developed a Computer Engineering

Curriculum with a strong hardware-design emphasis, formed a wireless research group, and advised graduate and undergraduate students.

9. In September of 2002, I received an appointment as an Assistant Professor in the Department of Computer Science and Engineering at the University of North Texas (UNT), in Denton, Texas. In May of 2008, I earned tenure and was promoted to the rank of Associate Professor. Between January of 2015 and August of 2022, I was appointed to Associate Chair of Graduate Studies. In May of 2023, I was promoted to the rank of Professor.

10. As a faculty member, I have authored and co-authored over 100 journal publications, conference proceedings, technical papers, book chapters, and technical presentations in a broad array of communications-related technologies, including networking and wireless communication. I have also developed and taught over 100 courses related to communications and computer systems, including 2G, 3G, 4G, 5G, 6G, CDMA/WCDMA, GPS, GSM, LTE, NFC, NR, RFID, UMTS, VoIP, VPLS, ad-hoc networks, antenna design and beamforming, Bluetooth, call admission control, channel coding, channel estimation, communication interfaces and standards, compression, computer architecture, Internet protocols, MIMO systems, multi-cell network optimization, network security, packet-networks, ring-networks, switches and routers, telephony, Wi-Fi (802.11), 802.15.4, Zigbee, wireless

communication, and wireless sensors. A complete list of my publications and the courses I have developed and/or taught is also contained in my *curriculum vitae*.

11. I am also the director of the Wireless Sensor Lab (“WiSL”) at UNT. I am a member of the Center for Information and Cyber Security (CICS). It is the only program in the U.S. to be federally certified by the National Security Agency as a Center of Academic Excellence in Information Assurance Education and Research and Cyber Defense Research. I was also a member of the NSF Net-Centric & Cloud Software & Systems: Industry-University Cooperative Research Center (I/UCRC). Several of my research projects are funded by industry and the National Science Foundation and published in *IEEE* conference proceedings and journals.

12. In addition to advising and mentoring students at UNT, I was asked to join the faculty of the University of Arkansas in Little Rock as an Adjunct Assistant Professor from 2004 to 2008 in order to supervise the research of two Ph.D. graduate students who were doing research in wireless communications. At UNT, I have advised and supervised more than 250 undergraduate and graduate students, several of whom received a master’s or doctorate degree under my guidance.

13. Between 2005 and 2017, I have received over a million dollars in funding from the State of Texas, Texas Higher Education Coordination Board, the National Science Foundation, and industry to design and conduct robotics, video, and mobile gaming (*e.g.*, Xbox, PC, mobile device) programming summer camps

for middle and high school students at UNT. By using video and mobile gaming as the backdrop, participants have learned coding and programming principles and developed an understanding of the role of physics and mathematics in video game design.

14. Between 2011 and 2013, I was director of the Bio-Com Project that was funded by Raytheon. The project evaluated the feasibility study using Surface Electromyography (EMG) and bend resistive sensors, which are attached to each of the five fingers of the hand, for hand gesture recognition. This approach is sometimes known as a “data glove.” A prototype was developed and demonstrated at Raytheon, to help soldiers in close-combat situations communicate with hand gestures and hand signals that would be recognized and transmitted to other soldiers’ Head Up Display (HUD) without breaking radio silence.

15. In addition to my academic work, I have remained active in the communication industry through my consulting work. In 2002, I consulted for Input/Output Inc. and designed and implemented algorithms for optimizing the frequency selection process used by sonar for scanning the bottom of the ocean. In 2004, I worked with Allegiant Integrated Solutions in Ft. Worth, Texas to design and develop an integrated set of tools for fast deployment of wireless networks, using the 802.11 standard. Among other features, these tools optimize the placement of Access Points and determine their respective channel allocations to minimize

interference and maximize capacity. I also assisted the Collin County Sheriff's Office (Texas) in a double homicide investigation, analyzing cellular record data to determine user location.

16. My professional affiliations include services in various professional organizations and serving as a reviewer for a number of technical publications, journals, and conferences. I have also received a number of awards and recognitions, including the *IEEE* Professionalism Award (2008), UNT College of Engineering Outstanding Teacher Award (2008), and Tech Titan of the Future (2010) among others, which are listed in my *curriculum vitae*.

17. I have also served as an expert in certain legal proceedings. A list of cases in which I have testified at trial, hearing, or by deposition (including those during the past four years) is provided in my *curriculum vitae*. Over the years, I have been retained by both patent owners and petitioners, as well as plaintiffs and defendants.

18. I am being compensated for my work in this case at my standard rate of \$995 per hour (plus reimbursement for expenses) in connection with my preparation of this Declaration. This compensation is not contingent upon my performance, the outcome of this case, or any issues involved in or related to this case. I have no financial interest in this matter.

III. MATERIALS CONSIDERED

19. In reaching the opinions expressed in this report and conclusions reached, I have reviewed the '911 Patent and its prosecution history. I have also reviewed the Petition and the associated exhibits. I also rely on the other documents referenced herein. In the cited references all emphasis is added unless otherwise noted.

20. I have relied on years of education, teaching, research, and experience, and my understanding of the applicable legal principles.

21. Specifically, I have reviewed the following documents, and any other documents cited in this Declaration:

Exhibit	Description
Ex. 1005	International Patent Application Publication No. WO 2020/0130930 to Nimbalker et al. (" <i>Nimbalker</i> ")
Ex. 1007	3GPP TSG-RAN WG1 #96bis R1-1905031, "PDCCH-based power saving channel design" (2019) (" <i>R1-1905031</i> ")
Ex. 1008	3GPP TSG-RAN WG1 #96 R1-1903016, "Potential Techniques for UE Power Saving" (2019) (" <i>R1-1903016</i> ")
Ex. 1009	International Patent Application Publication No. WO 2019/135654 to Anil et al. (" <i>Anil</i> ")

22. I reserve the right to supplement and amend any of my opinions in this Declaration based on documents, testimony, and other information that becomes available to me after the date of this Declaration.

IV. SUMMARY OF OPINIONS

23. In this Declaration I consider Claims 1-18 of the '911 Patent. Below, I set forth the opinions I have formed, the conclusions I have reached, and the bases for these opinions and conclusions. I believe the statements contained in this Declaration to be true and correct to the best of my knowledge.

24. Based on my experience, knowledge of the art at the time of the applicable priority date of April 30, 2019, it is my opinion that Claims 1-18 of the '911 Patent are patent eligible and are not anticipated or rendered obvious based on any of Petitioner's Grounds 1-5.

V. UNDERSTANDING OF LEGAL PRINCIPLES

25. I am not a legal expert and offer no legal opinions. I have been informed by counsel, however, of the various legal standards that apply with respect to assessing the validity of a patent claim, and I have applied those standards in arriving at the conclusions expressed herein.

A. Priority Date

26. I have been informed that the "priority date" of a patent is the date on which it is filed. I further understand that a patent may be entitled to the filing date of an earlier-filed provisional application or foreign patent filing. I further

understand the claims of the patent are entitled to the filing date of the earlier filing to the extent the earlier filing provides written description support for the claims. Finally, it is my understanding that the written description provides sufficient support when it conveys to those of skill in the art that the inventor possessed the invention, and that not every detail of the invention must be spelled out in the specification.

B. Claim Construction

27. I have been informed that claim construction is a matter of law for the arbiter of law, in this case, the PTAB, to decide. Claim terms should be given their ordinary and customary meaning within the context of the patent in which the terms are used, *i.e.*, the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention in light of what the patent teaches.

28. I have been informed that to determine how a person of ordinary skill would understand a claim term, one should look to those sources available that show what a person of skill in the art would have understood that disputed claim language to mean. Such sources include the words of the claims themselves, the structure of the claim itself, the remainder of the patent's specification, including the drawings, the prosecution history of the patent (all considered "intrinsic" evidence), and "extrinsic" evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art. I have been further informed that the

meaning of a claim term may also be guided by “extrinsic evidence,” such as contemporaneous dictionaries and treatises, as well as the testimony of technically skilled witnesses such as myself.

29. I have been informed that words or terms should be given their ordinary and customary meaning. The specification must be consulted to determine whether the patentee has acted as his-or-her own lexicographer (*i.e.*, provided its own special meaning to any disputed terms). In addition, I have been informed that the specification and prosecution history must be consulted to determine whether the inventor(s) intentionally disclaimed, disavowed, or surrendered any claim scope.

C. Anticipation Under 35 U.S.C. § 102

30. I have been informed that a patent claim is invalid as “anticipated” if each and every limitation of the claim as construed by the Court is described in a single publication or patent that predates the claimed invention. I have been informed that, in patent law, these prior publications or patents are called “prior art.” I have been informed that in order to anticipate a claim, a prior art reference must do more than merely disclose each element of the claim, but rather the prior art reference must disclose all of the elements of the claimed invention arranged as is recited by the claim. I also understand that for a prior art reference to anticipate a claim of a patent, the reference must enable one of ordinary skill in the art at the time of the invention to practice the claim without undue experimentation.

D. Obviousness Under 35 U.S.C. § 103

31. I have been informed that a claim may be invalid if the invention recited in the claim would have been obvious to one of ordinary skill in the art at the time the invention was made in light of the prior art. In considering whether a claim is obvious, I have been informed that one must consider (1) the level of skill in the art at the time of the claimed invention; (2) the scope and content of the prior art; (3) any differences between the prior art and the claims of the patent-in-suit; and (4) any “secondary factors” tending to show non-obviousness of the claimed invention, including commercial success, long-felt but unresolved need, failure of others, copying, praise by others, unexpected results, and simultaneous invention by others.

32. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art. I also understand that obviousness should not be analyzed using the benefit of hindsight. Instead, it must be analyzed from the standpoint of what was known and understood by a person of ordinary skill in the art (“POSITA”) at the time of the claimed invention. I further understand demonstrating whether making a modification to a reference or whether combining multiple references would have been obvious requires providing a reason for why a POSITA would modify the reference or combine multiple references, and that reason must be

supported with some rationale underpinning. Merely pointing out that two references are similar or in the same field of endeavor is not sufficient.

E. Written Description Under 35 U.S.C. § 112

33. I have been informed that a patent must contain a sufficient written description of the invention. As mentioned previously, it is my understanding that the written description requirement is met if the patent specification describes the claimed invention in sufficient detail such that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention at the time the application was filed. I have been informed that in evaluating whether the specification meets the written description requirement, the specification should be considered as a whole. I also understand that in evaluating whether the specification meets the written description requirement, the following factors may be taken into account: (1) the nature and scope of the patent claims; (2) the complexity and predictability of the technology at issue; (3) existing knowledge in the field; and (4) the scope and content of the prior art.

34. I further understand that the scope of a patent claim is not limited to the embodiments described in the specification. Similarly, I have been informed the written description requirement does not demand either express examples or an actual reduction to practice. For example, I have been informed the specification need not include every detail. Rather, I have been informed the specification as a

whole need only allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed. Any part of the specification can support an enabling disclosure, even a background section that discusses, or even disparages, the subject matter disclosed therein.

35. I have been informed that it is not necessary to enable one of ordinary skill in the art to make and use a perfected, commercially viable embodiment. Detailed procedures for making and using the invention may not be necessary if the description of the invention itself is sufficient to permit those skilled in the art to make and use the invention. I have been informed that a patent need not teach what is well known in the art.

36. It is my understanding that the claims must be enabled by the patent's specification. I have been informed that the test for enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. However, I have been informed that the test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue. To make that determination, I have been informed *Wand* factors are used, which include, but are not limited to, the following:

- The breadth of the claims;
- The nature of the invention;

- The state of the prior art;
- The level of one of ordinary skill;
- The level of predictability in the art;
- The amount of direction provided by the inventor;
- The existence of working examples; and
- The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

37. I have been informed that it is improper to conclude that a disclosure is not enabling based on an analysis of only one of the above factors while ignoring one or more of the others.

VI. LEVEL OF ORDINARY SKILL IN THE ART

38. I understand there is a concept in patent law known as a person having ordinary skill in the art (POSITA). I understand that this concept refers to a person who is trained in the relevant technical field of a patent without possessing extraordinary or otherwise exceptional skill. I further understand that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, prior art solutions to those problems, and the speed at which innovations are made may help establish the level of skill in the art.

39. I have reviewed Dr. Kakaes's Declaration (Ex. 1003) regarding the '911 Patent and note that his statement of the definition of a POSITA is: "at least a

master's degree in electrical engineering or a similar field and at least two years of experience working with wireless mobile telecommunications systems. In my opinion, additional relevant work experience can compensate for less education, and vice versa.” Kakaes Decl. at ¶ 121. For the purposes of this Declaration in Support of Patent Owner's Response, I will use Dr. Kakaes's definition of a POSITA. However, I reserve the right to offer a different opinion as to a POSITA in subsequent declarations and/or future litigation.

40. Based at least on my educational and work experience, it is my opinion that my knowledge, expertise, educational background, and experience exceeds that of a POSITA. I further note that I was a person of at least ordinary skill in the art in the relevant time frame.

VII. OVERVIEW OF THE INVENTIONS OF THE '911 PATENT

41. The '911 Patent, titled “Method of Physical Downlink Control Channel Monitoring and Related Device” issued on June 6, 2022, and contains two independent claims, Claims 1 and 10. Claim 1 is a method claim directed to “A method for a user equipment (UE) monitoring a physical downlink control channel (PDCCH).” Ex. 1001, 13:40-43. Claim 10 is an apparatus claim that closely corresponds to Claim 1. The application for the '911 Patent was filed on Apr. 27, 2020, and claims priority to Provisional Application No. 62/840,451 filed on Apr.

30, 2019. Ex. 1001. The priority date for the '911 Patent is April 30, 2019, a fact not disputed by Petitioner. *See* Petition, p. 11, 84; Kakaes Decl. at ¶¶ 6, 51.

42. As described in the background section of the '911 Patent, “UE battery life is an important aspect of the user’s experience, which will influence the adoption of 5G handsets and/or services.” Ex. 1001, 1:26-28. The '911 Patent is directed at power saving operations using power saving signals and Discontinuous Reception (“DRX”).

43. In modern wireless communications, data is transmitted as blocks of certain time domain and frequency. For efficiency, instead of monitoring all possible time domains and frequencies for data, the UE is sent a Physical Downlink Control Channel (PDCCH) message that tells the UE the time and frequency to send or receive data. Therefore, the UE only needs to monitor for a PDCCH message. The PDCCH message, however, is not constantly sent to the UE. Therefore, “DRX operation [was] introduced as conventional UE power saving.” Ex. 1001, 2:23-24. DRX operation saves power by scheduling on and off periods for PDCCH monitoring such that “the UE does not have to continuously monitor PDCCH.” Ex. 1001, 2:23-59. More specifically, DRX operation creates a cycle of on periods and off periods. During DRX on duration, UE wakes up and monitors a search space for the PDCCH. Unless the UE receives a PDCCH during DRX on duration, the UE goes back to sleep and skips monitoring for the rest of the DRX cycle.

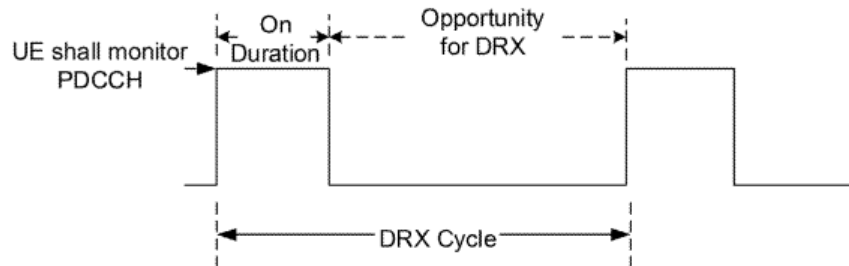


FIG. 1
(RELATED ART)

Ex. 1001 Fig. 1.

44. This prior art DRX operation suffers from drawbacks. For example, the prior DRX mechanism may keep the UE awake even without PDCCH scheduling or may still periodically trigger the UE to wake up causing “unnecessary power consumption.” Ex. 1001, 2:60-3:1. To address the issue of unnecessary power consumption the prior art DRX mechanism added “a power saving signal, namely wake-up signaling (WUS).” Ex. 1001, 3:2-6.

45. Instead of periodically waking up for a PDCCH monitoring, the UE periodically monitors for a WUS. The WUS, referred to as the “power saving signal” in the ’911 Patent (*e.g.*, Ex. 1001, Abstract), is a short signal sent before the PDCCH monitoring occasion which informs the UE whether it should wake up for PDCCH

monitoring. Ex. 1001, 3:9-12. The WUS allows the UE to sleep longer and wake up only when necessary, minimizing energy consumption. But WUS is not without issues. For example, the WUS signal may overlap with the PDCCH, creating situations in which “the UE may need to monitor both the PDCCH for scheduling as well as the WUS occasion simultaneously, which increases the power consumption of the UE.” Ex. 1001, 3:31-46.

46. The inventions of Independent Claims 1 and 10 (“the Challenged Independent Claims”) provide a novel and non-obvious method and equipment for managing DRX operation and WUS for PDCCH monitoring. The inventions improve the use of DRX and WUS by providing for configuring a first search space for regular PDCCH and a second separate search space for the WUS. Ex. 1001, Cls. 1, 10 (“first search space” and “second search space”). The inventions additionally provide for an improved mechanism for starting a DRX on-duration timer when no WUS is received. Ex. 1001, 13:55-57; 14:65-67. Specifically, the Challenged Independent Claims require “in response to not receiving the power saving signal while monitoring the second search space, [starting/start] a DRX on-duration timer of the DRX functionality.” Ex. 1001, 13:55-57; 14:65-67. It was the addition of this limitation that led the Examiner to allow the Claims. Ex. 1002, pp. 148-152. The Examiner expressly found no “prior art which solely or in combination with another reference teaches the limitation of: ... [starting/start] a DRX on-duration timer of the

DRX functionality in response to not receiving the power saving signal in the second search space.” *See* Ex. 1002, p. 111. This limitation is completely missing from the art relied upon by the Petitioner. Nor is this limitation obvious.

VIII. CLAIM CONSTRUCTION

47. I note that Petitioner has asserted that “no terms need construction to resolve controversy in this forum.” Petition at p. 18. But the Petition’s analysis of the claims contradicts this statement. As discussed below, *Nimbalker* does not disclose the limitation “in response to not receiving the power saving signal while monitoring the second search space, [starting/start] a DRX on-duration timer of the DRX functionality,” among other limitations.

48. Dr. Kakaes’s Declaration implicitly construes the phrase “in response to” to mean “any time after.” The dictionary definition of response supports that “response” is not solely temporal but must be a reply or reaction to something. For example, Merriam-Webster defines “response” as “something constituting a reply or reaction.” Exs. 2008, 2011, 2012. Other dictionaries provide similar definitions. Ex. 2009 (“an answer or reaction”); Ex. 2010 (“an answer or reply, as in words or in some action”). In the context of the ’911 Patent, this is how a POSITA would understand this term.

49. I have discussed the application of this construction where appropriate below.

IX. OVERVIEW OF PRIOR ART CITED IN PETITION

50. In forming my opinions, I reviewed the alleged prior art cited by Petitioner as the basis for Grounds 1-5, including the following.

A. *Nimbalker* (Ex. 1005)

51. *Nimbalker* discusses wireless communication techniques, focusing on wakeup signals, power saving, DRX operation, and related network procedures. With respect to DRX and power savings operations, *Nimbalker* specifically discusses conditional PDCCH monitoring.

B. *R1-1905031* (Ex. 1007)

52. *R1-1905031* discusses the design considerations, requirements, and proposed solutions for PDCCH-based power saving channels in NR, focusing on wake-up signaling and UE adaptation during active time to enhance power efficiency without compromising performance.

C. *R1-1903016* (Ex. 1008)

53. *R1-1905031* discusses potential techniques and design considerations for implementing UE power saving through PDCCH-based wake-up signaling in 3GPP NR (5G) systems.

D. *Anil* (Ex. 1009)

54. *Anil* focuses on methods and systems for beam failure recovery in 5G NR, focusing on secondary and special cells, PRACH configurations, and DRX operations.

55. Based on my review of the materials set forth above, including Petitioner's petition and the declaration of Dr. Kakaes and Mr. Rodermund, it is my opinion that none of the challenged claims would have been anticipated or rendered obvious by any of Petitioner's Grounds 1-5.

56. Specifically, I disagree with Dr. Kakaes's conclusions summarized in his Declaration at ¶ 133.

X. THE CHALLENGED CLAIMS ARE PATENT ELIGIBLE

57. In my opinion Claims 1-18 would not have been anticipated nor been rendered obvious by the prior art to one skilled in the art at the earliest priority date of the '911 Patent.

A. Grounds 1 and 2: Claims 1-3, 5, 6, 10-12, 14, and 15: *Nimbalker*

58. *Nimbalker* does not anticipate or render obvious Claims 1-3, 5, 6, 10-12, 14, or 15 of the '911 Patent.

1. Independent Claim 1

59. Claim 1 describes a power-savings improvement to the DRX mechanism to increase power savings. For example, the '911 Patent explains: "if the active time of the UE overlaps with the on duration of the next DRX cycle (e.g., 40 if an amount of time of the DRX inactivity timer is longer than the DRX cycle), the UE may keep monitoring the PDCCH for possible scheduling until the DRX inactivity timer expires. In this case, the UE may need to monitor the PDCCH for

scheduling as well as the WUS occasion simultaneously, which increases power consumption of the UE” but that by using the invention achieves “UE power saving by not monitoring the search space for scheduling the power saving signal (e.g., WUS) during the DRX active time.” ’911 Patent, 3:39-46 and 7:6-8.

60. In my opinion *Nimbalker* fails to anticipate or render obvious Claim 1 at least because it fails to disclose or render obvious Claim 1 limitation C.

a) **[1c]: “in response to not receiving the power saving signal while monitoring the second search space, starting a DRX on-duration timer of the DRX functionality;”**

61. In my opinion, *Nimbalker* does not anticipate or render obvious the claim limitation “in response to not receiving the power saving signal while monitoring the second search space, starting a DRX on-duration timer of the DRX functionality.”

62. First, in my opinion, *Nimbalker* does not disclose “starting a DRX on-duration timer.” Petitioner and Dr. Kakaes assert that because *Nimbalker* discloses an “ON duration” it must disclose a starting an DRX on-duration timer. However, none of the citations to *Nimbalker* pp. 8, 9, 12, or Fig. 3 disclose starting such a timer.

63. Instead of pointing to an express disclosure within *Nimbalker* disclosing starting a DRX on-duration timer, Dr. Kakaes points to the “ON duration” and then cites a number of other references to opine that one of ordinary skill in the

art the “disclosure of beginning an ON duration monitoring period discloses starting a ‘DRX on-duration timer.’” Kakaes Decl. at ¶¶ 153-155. I disagree with Dr. Kakaes’ conclusion.

64. In 5G NR, the UE can effectively have an ON duration without explicitly starting the onDurationTimer, because the UE can be in Active Time due to other DRX events. In those cases, the UE monitors PDCCH continuously even though the onDurationTimer itself was never started.

65. The UE is in Active Time if any of the following is running:

- onDurationTimer
- drx-InactivityTimer
- drx-RetransmissionTimer
- ra-ResponseWindow
- mac-ContentionResolutionTimer
- scheduling request pending
- pending HARQ retransmission

See generally EX. 1022, 3GPP TS 38.321 at 38-40.

66. In view of the above, in my opinion, the disclosure of an “ON duration” neither expressly nor inherently discloses “starting a DRX on-duration timer.”

67. Further, I disagree with Dr. Kakaes’ opinion that the disclosure of an “ON duration” would render obvious “starting a DRX on-duration timer.

68. For example, Dr. Kakaes opines that *Nimbalker* would render this limitation obvious because “it merely involves implementing 3GPP standards and recommendations.” Kakaes Decl. at ¶ 158. However, the scenarios described in ¶ 65

above are also based on 3GPP standards and recommendations but Dr. Kakaes offers no explanation with respect to finding that the “obvious” solution would be the one that happens to align with the language of Claim 1.

69. Further, Dr. Kakaes opines that that *Nimbalker* would render this limitation obvious because it “improves operation of the UE, and reduces power consumption.” Kakaes Decl. at ¶ 158. But Dr. Kakaes does not offer any explanation about how the particular implementation he contends is disclosed improves or reduces power consumption in a manner any better than the alternatives.

70. In view of the above, in my opinion, the disclosure of an “ON duration” does not render obvious “starting a DRX on-duration timer.”

71. Next, in my opinion, *Nimbalker* does not disclose starting a DRX on-duration timer “in response to not receiving the power saving signal” as required by Claim 1 limitation [1c].

72. *Nimbalker* discloses a “Conditional Wake-Up Signal Configuration for New Radio.” Ex. 1005, *Nimbalker* at Title.

73. Specifically, *Nimbalker* discloses determining whether to monitor the PDCCH in response to an additional condition, such as RSRP or WUS decoder reliability, not the receipt of the WUS itself. For example, *Nimbalker* states:

According to certain embodiments, a conditional WUS operation is provided, wherein if a device such as, for example, a UE does not detect the WUS in a WUS monitoring occasion, the UE may determine whether or not to monitor a Physical Downlink Control Channel

(PDCCH) based on an additional condition such as, for example, a Reference Signal Received Power (RSRP) condition or a WUS decoder reliability metric, thereby providing additional robustness when reliable detection of WUS cannot be ensured.

[W]ith the ‘successful/unsuccessful WUS detection’ criterion, the UE may use another reliability condition (e.g. whether RSRP measured by UE is above/below a certain threshold, or whether WUS-PDCCH decoder’s internal information suggests a presence of a compatibly encoded PDCCH) to determine whether to monitor/skip monitoring PDCCH in PDCCH monitoring occasion(s) corresponding to the WUS monitoring occasion.”

Ex. 1005, *Nimbalker* at pp. 8-9.

74. *Nimbalker* further explains:

According to certain embodiments, the UE may not detect WUS in a WUS monitoring occasion before a DRX ON duration. ***Instead of only relying on the lack of detecting a WUS***, the UE may further determine if the RSRP is larger than a RSRP threshold. If the RSRP exceeds the threshold, the UE may skip PDCCH monitoring for this ON duration and monitor for a WUS before the next ON duration. If the RSRP is lower than the threshold, the UE may monitor the PDCCH occasion during the ON duration even if a WUS is not detected in the WUS monitoring occasion, in a particular embodiment.

Ex. 1005, *Nimbalker* at p. 15.

75. As such, *Nimbalker* determines whether to monitor the PDCCH in response to the additional condition (such as RSRP or WUS decoder reliability), not the receipt of the WUS. *Nimbalker* further explains the purpose for using these additional conditions instead of the WUS:

According to certain embodiments, the UE may be configured with a conditional WUS operation. For example, certain embodiments described above include a procedure in which the UE skips monitoring the PDCCH in PDCCH monitoring occasion(s) (e.g. DRX ON

duration(s)), corresponding to the WUS monitoring occasion if the UE does not detect WUS in a WUS monitoring occasion. However, the reliability of WUS detection may depend on the UE propagation channel condition between the network node (e.g., a new radio network node, such as a gNB) that is transmitting the WUS and the UE and/or a detection threshold which may be fixed or adaptive for the corresponding WUS detector. In circumstances ***where WUS detection is less reliable, it may be desirable for the UE not to solely rely on a ‘unsuccessful WUS detection’ in a WUS monitoring occasion as the criterion for skipping PDCCH monitoring in PDCCH monitoring occasion(s) associated with that WUS monitoring occasion.***

Ex. 1005, *Nimbalker* at p. 12.

76. *Nimbalker* makes clear that monitoring for the PDCCH is in response to the status of another condition because WUS reception may be an unreliable indicator.

77. Even where that other condition is met, *Nimbalker* merely discloses that the UE *may* skip PDCCH monitoring. *Id.* (“If the RSRP exceeds the threshold, the UE *may* skip PDCCH monitoring for this ON duration and monitor for a WUS before the next ON duration.”).

78. Because the system in *Nimbalker* determines whether to monitor the PDCCH in response to the status of another condition (such as RSRP) and not the WUS, in my opinion, it does not disclose “in response to not receiving the power saving signal while monitoring the second search space, starting a DRX on-duration timer of the DRX functionality” as required by Claim 1 limitation [1c].

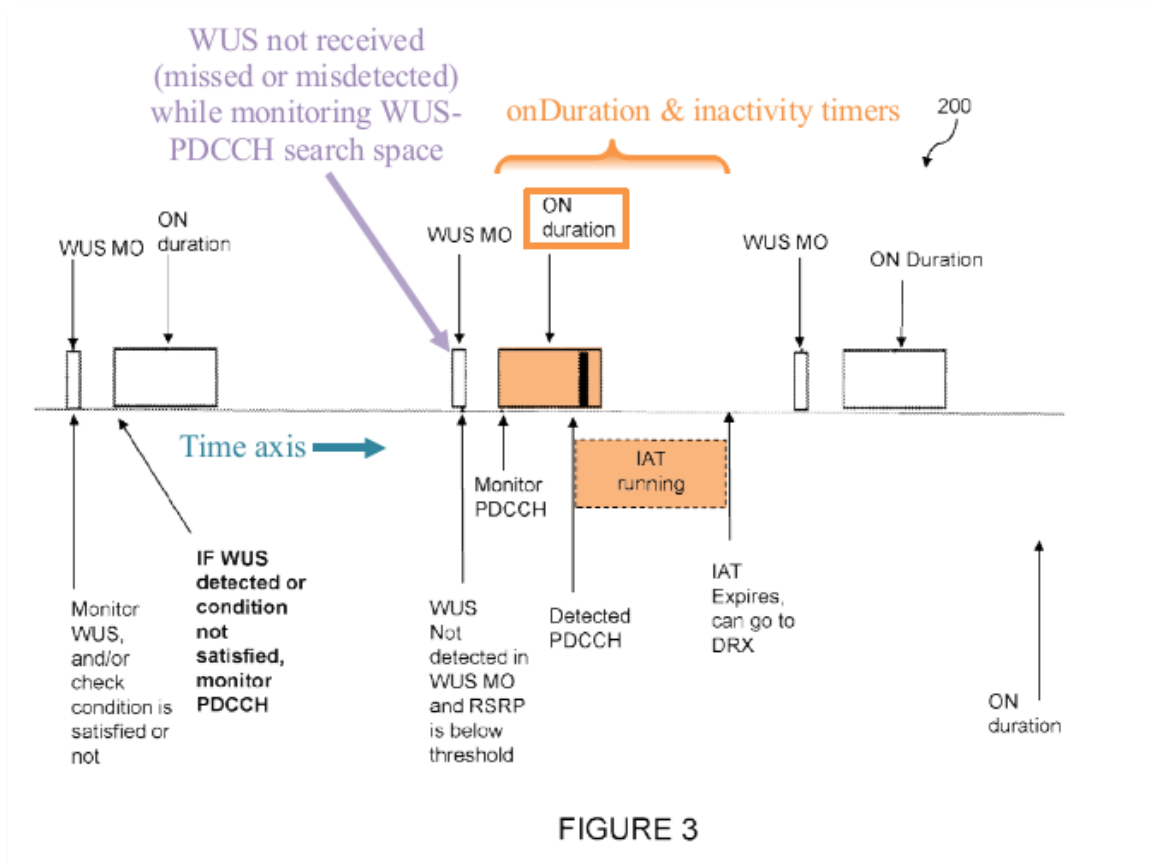
79. Further, in my opinion, *Nimbalker* actually cautions against determining whether to monitor the PDCCH based on WUS receipt because WUS receipt is allegedly an unreliable indicator. *See e.g.*, Ex. 1005, *Nimbalker* at p. 12. As such, a POSITA would not have been motivated to alter *Nimbalker* to behave in the manner required by Claim 1 limitation [1c].

80. Of note, monitoring based on additional conditions such as RSRP or WUS decoder reliability potentially incurs the expenditure of additional computational resources which would be counterproductive to the '911 Patent's goal of power savings.

81. Further, in my opinion, a POSITA would not understand starting a DRX on-duration timer as a result of a subsequent condition determined after the non-receipt of a WUS to be "in response" to the non-receipt of the WUS. This is because, as I explained above, a POSITA would understand the plain and ordinary meaning of the term "in response" to mean "in reply" or "as a reaction to" an event. *See* ¶¶ 47-49; exs. 2008-2012.Ex. 2011 and 2012.

82. Of note, in Figure 3 below, which Dr. Kakaes primarily relies upon in asserting that *Nimbalker* discloses this limitation, shows only that the DRX on-duration occurs at some point after "WUS [Wake-Up Signal] not detected in WUS MO and RSRP is below threshold." Figure 3 below, as annotated by Dr. Kakaes,

does not disclose that the DRX on-duration begins “in response to” not receiving the WUS.



Ex. 1003, Kakaes Decl. at 152.

83. For the reasons set forth above, it is my opinion that *Nimbalker* does not anticipate or render obvious Claim 1.

2. **Claim 2: “The method of claim 1, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”**

84. As explained above in ¶¶ 59-83, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1. Because Claim 2 depends from Claim 1, in my opinion *Nimbalker* fails to anticipate or render obvious Claim 2.

3. **Claim 3: “The method of claim 1, further comprising: determining whether to start a DRX on-duration timer of the DRX functionality according to the wakeup information.”**

85. As explained above in ¶¶ 59-83, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1. Because Claim 5 depends from Claim 1, in my opinion *Nimbalker* fails to anticipate or render obvious Claim 5.

86. Further, as explained above in ¶¶ 62-70, a POSITA would not have recognized *Nimbalker*’s disclosure of an “ON-duration” period as disclosing or rendering obvious “start[ing] a DRX on-duration timer” as required by Claim 3. For at least this additional reason, in my opinion, *Nimbalker* fails to disclose or render obvious Claim 3.

87. In my opinion, *Nimbalker* fails to anticipate or render obvious Claim 3.

4. **Claim 5: “The method of claim 1, wherein the power saving signal is not received in the second search space in response to when at least one of [i] the UE does not monitor the second search space and [ii] the UE unsuccessfully decodes the power saving signal.”**

88. As explained above in ¶¶ 59-83, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1. Because Claim 5 depends from Claim 1, in my opinion *Nimbalker* fails to anticipate or render obvious Claim 5.

5. **Claim 6: “The method of claim 1, wherein the not monitoring the second search space comprises: not monitoring the second search space while a DRX inactivity timer of the DRX functionality is running.”**

89. As explained above in ¶¶ 59-83, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1. Because Claim 6 depends from Claim 1, in my opinion *Nimbalker* fails to anticipate or render obvious Claim 6.

6. **Independent Claim 10**

90. In my opinion *Nimbalker* fails to anticipate or render obvious Claim 10 at least because it fails to disclose or render obvious Claim 10 limitation D.

- a) **[10d]: “in response to not receiving the power saving signal while monitoring the second search space, start a DRX on-duration timer of the DRX functionality;”**

91. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 1 limitation [1c] for Claim 10 limitation [10d]. *Nimbalker* fails to anticipate or render obvious Claim 10 limitation [10d] for the same reasons it fails to anticipate or render obvious Claim 1 limitation [1c] discussed above. See ¶¶ 59-83 above.

7. **Claim 11: “The UE of claim 10, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”**

92. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 2 for Claim 11. *Nimbalker* fails to anticipate or render obvious Claim 11 for the same reasons it fails to anticipate or render obvious Claim 2 discussed above. See ¶¶ 84 above.

8. **Claim 12: “The UE of claim 10, wherein the computer executable instructions further instruct the processor to: determine whether to start a DRX on-duration timer of the DRX functionality according to the wake-up information.”**

93. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 3 for Claim 12. *Nimbalker* fails to anticipate or render obvious Claim 12 for the same reasons it fails to anticipate or render obvious Claim 3 discussed above. See ¶¶ 85-87 above.

9. **Claim 14: “The UE of claim 10, wherein the computer executable instructions further instruct the processor to: not receive the power saving signal in the second search space in response to when at least one of [i] the UE does not monitor the second search space and [ii] the UE unsuccessfully decodes the power saving signal.”**

94. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 5 for Claim 14. *Nimbalker* fails to anticipate or render obvious Claim 14 for

the same reasons it fails to anticipate or render obvious Claim 5 discussed above.

See ¶¶ 88 above.

10. **Claim 15: “The UE of claim 10, wherein the computer executable instructions further instruct the processor to: not monitor the second search space while a DRX inactivity timer of the DRX functionality is running.”**

95. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 6 for Claim 15. *Nimbalker* fails to anticipate or render obvious Claim 15 for the same reasons it fails to anticipate or render obvious Claim 6 discussed above.

See ¶¶ 89 above.

B. Ground 3: Claims 2, 4, 11, and 13: *Nimbalker* in View of *R1-1905031*

96. In my opinion, the combination of *Nimbalker* and *R1-1905031* would not have rendered Claims 2, 4, 11, or 14 obvious.

1. **Claim 2: “The method of claim 1, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”**

97. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 3 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 2 fails because Claim 2 depends from Claim 1.

2. Claim 4: “The method of claim 1, wherein the power saving signal is further used for indicating a bandwidth part switch of a cell.”

98. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 3 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 4 fails because Claim 4 depends from Claim 1.

3. Claim 11: “The UE of claim 10, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”

99. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 2 for Claim 11. The combination of *Nimbalker* with *R1-1905031* fails to render obvious Claim 11 for the same reasons it fails to anticipate or render obvious Claim 2 discussed above. See ¶¶ 97 above.

4. Claim 13: “The UE of claim 10, wherein the power saving signal is further used for indicating a bandwidth part switch of a cell.”

100. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 4 for Claim 13. The combination of *Nimbalker* with *R1-1905031* fails to render obvious Claim 13 for the same reasons it fails to anticipate or render obvious Claim 4 discussed above. See ¶¶ 98 above.

C. Ground 4: Claims 2, 4, 11, and 13: *Nimbalker* in View of *R1-1903016*

101. In my opinion, a POSITA would not have found that the combination of *Nimbalker* and *R1-1903016* to render obvious Claim 2: “[t]he method of claim 1, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”

- 1. Claim 2: “The method of claim 1, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”**

102. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 4 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 2 fails because Claim 2 depends from Claim 1.

- 2. Claim 4: “The method of claim 1, wherein the power saving signal is further used for indicating a bandwidth part switch of a cell.”**

103. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 4 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 4 fails because Claim 4 depends from Claim 1.

3. **Claim 11: “The UE of claim 10, wherein the first search space includes at least one of a first time and a first frequency resource for the UE to monitor the scheduling signal, and the second search space includes at least one of a second time and a second frequency resource for the UE to monitor the power saving signal.”**

104. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 2 for Claim 11. The combination of *Nimbalker* with *R1-1903016* fails to render obvious Claim 11 for the same reasons it fails to anticipate or render obvious Claim 2 discussed above. See ¶¶ 102 above.

4. **Claim 13: “The UE of claim 10, wherein the power saving signal is further used for indicating a bandwidth part switch of a cell.”**

105. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 4 for Claim 13. The combination of *Nimbalker* with *R1-1903016* fails to render obvious Claim 13 for the same reasons it fails to anticipate or render obvious Claim 4 discussed above. See ¶¶ 103 above.

D. Ground 5: Claims 7-9 and 16-18: *Nimbalker* in View of *Anil*

106. In my opinion, the combination of *Nimbalker* and *Anil* would not render obvious Claims 7-9 or 16-18.

1. **Claim 7: “The method of claim 1, further comprising: not monitoring the second search space in response to the UE performing a random access procedure, wherein the UE performs the random access procedure in response to one of: [i] a random access response window is running after transmitting a first random access preamble; and [ii] the UE has not received the scheduling signal on the PDCCH indicating a new transmission addressed to a Cell Radio Network Temporary Identifier (C-RNTI) of the UE after successful reception of a random access response corresponding to a second random access preamble not selected by the UE among contention-based random access preambles.”**

107. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 5 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 7 fails because Claim 7 depends from Claim 1.

2. **Claim 8: “The method of claim 1, further comprising: not monitoring the second search space in response to at least one of [i] the UE performing a beam failure recovery procedure and [ii] the UE monitoring a third search space on the PDCCH, wherein the third search space is configured for the UE to monitor a beam failure response from the base station.”**

108. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 5 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 8 fails because Claim 7 depends from Claim 1.

3. Claim 9: “The method of claim 1, wherein the power saving signal is only received from a special cell (SpCell) of the base station.”

109. As explained above in ¶¶ 59-83 and ¶¶ 90-91, in my opinion *Nimbalker* does not anticipate or render obvious Claims 1 or 10. Further, Ground 5 does not challenge Claim 1. In view of this, it is my opinion that the challenge to Claim 9 fails because Claim 9 depends from Claim 1.

4. Claim 16: “The UE of claim 10, wherein the computer executable instructions further instruct the processor to: not monitoring the second search space in response to the UE performing a random access procedure, wherein the UE performs the random access procedure in response to one of: [i] a random access response window is running after transmitting a first random access preamble; and [ii] the UE has not received the scheduling signal on the PDCCH indicating a new transmission addressed to a Cell Radio Network Temporary Identifier (C-RNTI) of the UE after successful reception of a random access response corresponding to a second random access preamble not selected by the UE among contention-based random access preambles.”

110. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 7 for Claim 16. The combination of *Nimbalker* with *Anil* fails to render obvious Claim 16 for the same reasons it fails to anticipate or render obvious Claim 7 discussed above. See ¶¶ 107 above.

5. **Claim 17: “The UE of claim 10, wherein the computer executable instructions further instruct the processor to: not monitor the second search space in response to at least one of [i] the UE performing a beam failure recovery procedure and [ii] the UE monitoring a third search space of the PDCCH, wherein the third search space is configured for the UE to monitor a beam failure response from the base station.”**

111. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 8 for Claim 17. The combination of *Nimbalker* with *Anil* fails to render obvious Claim 17 for the same reasons it fails to anticipate or render obvious Claim 8 discussed above. See ¶¶ 108 above.

6. **Claim 18: “The UE of claim 10, wherein the power saving signal is only received from a special cell (SpCell) of the base station.”**

112. I note that Dr. Kakaes has solely relied on his analysis with respect to Claim 9 for Claim 18. The combination of *Nimbalker* with *Anil* fails to render obvious Claim 18 for the same reasons it fails to anticipate or render obvious Claim 9 discussed above. See ¶¶ 109 above.

XI. CONCLUSION

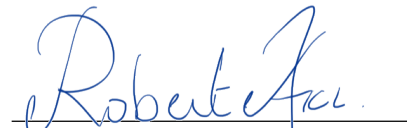
113. For the reasons set forth above, it is my opinion that one skilled in the art would not have found Claims 1-18 of the '911 Patent anticipated nor would one skilled in the art have found these claims obvious.

114. In signing this Declaration, I understand that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the

United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on March 16 , 2026 in Dallas, Texas.


Dr. Robert Akl, D.Sc.