

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T SERVICES INC., T-MOBILE USA, INC.,
CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS,
ERICSSON, INC., AND
NOKIA OF AMERICA CORPORATION

Petitioners

v.

ASUSTEK COMPUTER INC.

Patent Owner

Patent No. 10,951,359

DECLARATION OF DR. ZYGMUNT J. HAAS

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I, Dr. Zygmunt J. Haas, declare as follows:

I. INTRODUCTION

1. I have been retained as an independent expert consultant on behalf of AT&T Services Inc., T-Mobile USA, Inc., Cellco Partnership d/b/a Verizon Wireless, Ericsson, Inc., and Nokia of America Corporation (collectively “Petitioners”) in this *Inter Partes* Review proceeding (“IPR”) before the Patent Trial and Appeal Board (“Board” or PTAB”) of the United States Patent and Trademark Office (“PTO”) regarding U.S. Patent No. 10,951,359 (“the ’359 Patent”) (Ex. 1001).¹ I am being compensated at my rate of \$550 per hour for the time that I spend on this matter, in addition to expenses. My compensation in this case 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.

2. This Declaration summarizes the opinions that I have formed to date and based on the material currently available to me. I reserve the right to modify my opinions, if necessary, based on further review and analysis of information that I receive subsequent to the filing of this Declaration, including in response to any

¹ In this Declaration, I reference documents by exhibit numbers that, as I understand, are attached as exhibits in this *Inter Partes* Review of the ’359 Patent.

positions taken by Asustek Computer Inc. (“Patent Owner”) or its experts that I have not been provided yet, including any secondary consideration evidence that Patent Owner or its expert may consider and present.

3. In my view, the prior art discloses or suggests the features recited in Claims 1-4, 6-9, 11-14, 16-19, and 21-23 (what I understand are the “Challenged Claims”) of the ’359 Patent. The ’359 Patent is invalid based on the following grounds that I understand are at issue in this IPR:

Ground	Claims	Basis for Unpatentability
1	1-3, 6-9, 11, and 22-23	§ 103 – Nogami (Ex. 1004)
2	4, 12-14, 16-19, and 21	§ 103 – Nogami (Ex. 1004) in view of Chatterjee (Ex. 1005) and NTT (Ex. 1019)
3	1-4, 6-9, 11-14, 16-19, and 21-23	§ 103 – Nogami (Ex. 1004) in view of 3GPP TS 38.213 v15.2.0 (“3GPP-Specification”) (Ex. 1006)

II. EDUCATIONAL BACKGROUND AND QUALIFICATIONS

4. I have briefly summarized in this section my educational background, career history, publications, and other relevant qualifications. I understand my full *curriculum vitae* is being submitted as Ex. 1003 to this proceeding.

5. I am a Professor and Distinguished Chair in Computer Science at the University of Texas in Dallas. I am also Professor Emeritus at the School of Electrical and Computer Engineering of Cornell University. In addition, I have provided technical consulting services on intellectual property matters, including matters involving computer networks and wireless communication technologies.

6. I received my Bachelor of Science Degree in Electrical Engineering, *summa cum laude*, from Technion (IIT), Israel, in 1979, and a Master of Science Degree in Electrical Engineering, *summa cum laude*, from Tel-Aviv University, Israel, in 1985. Subsequently, in 1988, I authored the thesis titled “Packet Switching in Fiber-Optic Networks” as part of earning my Ph.D. in Electrical Engineering from Stanford University, Stanford, California.

7. I have worked for about 35 years in the fields of Electrical Engineering and Computer Science. The primary focus of my work has been, in general, on communication and networking systems, with an emphasis on wireless communication and wireless and mobile networks.

8. Throughout my professional career, I have authored and co-authored

numerous technical papers and book chapters related to wireless communication networks. As shown in my curriculum vitae, I hold about twenty patents in the fields of high-speed networking, wireless networks, optical switching, etc. In my work, among other topics, I have researched wireless networks, in general, including protocols for routing in ad hoc networks. Specifically, I have written numerous papers on various schemes for wireless ad hoc networks systems.

9. Some of my works on ad hoc networking systems have received prominent awards. For instance, in 2016, I received the IEEE Communication Society (ComSoc) AHSN Recognition Award for “outstanding contributions to securing ad hoc and sensor networks.” Additionally, in 2012, I received the IEEE ComSoc WTC² Recognition Award, which recognizes individuals for outstanding technical contributions in the field for their service to the scientific and engineering communities. As another example, I received the “Best Paper Award” for the paper “Optimal Resource Allocation for UWB Wireless Ad Hoc Networks” from the IEEE International Symposium on Personal Indoor and Mobile Radio Communications (PIMRC) conference in 2005. Finally, in 2003, I received the “Highly Commended Paper Award” for co-authoring “Performance Evaluation of the Modified IEEE 802.11 MAC for Multi-Channel Multi-Hop Ad Hoc Network,” directed at advanced information networking and applications.

² Wireless Communications Technical Committee

10. Furthermore, many of my papers have been extensively cited by other authors, as indicated by various citation indices. For example, my paper on “Securing Ad Hoc Networks,” co-authored with a Ph.D. student at the time, has been cited over 4000 times by other publications according to the *Google Scholar* index.

11. I have also taught courses that cover wireless communications and networking technologies, at the graduate and the undergraduate levels. Some of those courses cover material on the evolution of 3GPP systems, including 5G systems and networks. In addition, I have been invited to many international conferences to make keynote speeches regarding wireless and mobile networks.

12. My employment history following my graduation from Stanford University began at the Network Research Department of AT&T Bell Laboratories in 1988. At AT&T Bell Laboratories, I pursued research on wireless communications, mobility management, network security, fast protocols, optical networks, and optical switching. During my tenure at AT&T, I also worked for the AT&T Wireless Center of Excellence, where I investigated various aspects of wireless and mobile networks. As part of my employment at AT&T, I also worked on multimedia conferencing systems.

13. In 1995, I joined the faculty of the School of Electrical & Computer Engineering at Cornell University, and with time was promoted to Tenured Full Professor. At Cornell, I headed the Wireless Networks Lab, a research group with

extensive contributions in the area of wireless communication systems and networks. In 2013, I retired from Cornell with the title of Emeritus Professor and joined the Computer Science Department at the University of Texas at Dallas with the title of Professor and Distinguished Chair in Computer Science. At Cornell and at the University of Texas, I have taught dozens of courses related to computer networking and wireless communications. I have also served on various committees for the benefit of the scientific community.

14. I am a member of the Institute of Electrical and Electronics Engineers (IEEE) and the Association for Computing Machinery (ACM). In 2007, I was elevated to an IEEE Fellow and, in 2021, I was elevated to an ACM Fellow, both well-known distinctions. For example, the total number of IEEE Fellows which are selected in any given year does not exceed 0.1% of the total number of voting members of IEEE. With respect to the ACM Fellow grade, ACM states that “ACM’s most prestigious member grade recognizes the top 1% of ACM members for their outstanding accomplishments in computing and information technology and/or outstanding service to ACM and the larger computing community.” See <https://awards.acm.org/fellows>. I have also been named a Fellow of the EAI (European Alliance for Innovation) and a Fellow of the IET (Institution of Engineering and Technology). I have been responsible for organizing several workshops and delivering numerous tutorials at major IEEE and ACM conferences.

I have served as editor of several publications including the IEEE Transactions on Networking, the IEEE Transactions on Wireless Communications, the IEEE Communications Magazine, the Springer “Wireless Networks” journal, the Elsevier “Ad Hoc Networks” journal, the “Journal of High Speed Networks,” and the Wiley “Wireless Communications and Mobile Computing” journal. I have also been a guest editor of IEEE Journal on Selected Areas in Communications for issues on “Gigabit Networks,” “Mobile Computing Networks,” and “Ad-Hoc Networks.” Finally, I have served as the Chair of the IEEE Technical Committee on Personal Communications (TCPC), now known as the IEEE Wireless Communications Technical Committee.

15. My curriculum vitae provides additional information regarding my education, technical experience, and publications.

III. MATERIALS REVIEWED AND TIME OF INVENTION

16. The opinions contained in this Declaration are based on the documents that I reviewed, my professional judgment, as well as my education, experience, and knowledge regarding technologies related to the '359 Patent.

17. In forming my opinions expressed in this declaration, I reviewed:

- a. The '359 Patent (Ex. 1001);
- b. File history of the '359 Patent (Ex. 1010);
- c. File history for the provisional application, U.S. Provisional Application No. 62/619,041, to which the '359 Patent claims priority ("the '041 Provisional") (Ex. 1011);
- d. U.S. Patent No. 10,945,251 ("Nogami") (Ex. 1004);
- e. U.S. Patent No. 11,025,456 ("Chatterjee") (Ex. 1005);
- f. 3GPP TS 38.213 v15.2.0 (2018-06), "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical layer procedures for control (Release 15)" ("3GPP-Specification") (Ex. 1006);
- g. U.S. Patent Publication No. 2018/0324770 ("Nogami-770") (Ex. 1008);
- h. File history for the provisional application, U.S. Provisional Application No. 62/501,494, to which Nogami-770 claims priority

(“Nogami-770-prov”) (Ex. 1020);

- i. “CORESET Configuration and search space design,” Huawei, HiSilicon, 3GPP TSG RAN WG1 Meeting #90bis, Prague, Czech Republic, Oct. 9-13, 2017, R1-1717062 (“Huawei-CORESET”) (Ex. 1009);
- j. File history of U.S. Provisional Application No. 62/586,378 (“Nogami-provisional”) (Ex. 1012);
- k. File history of U.S. Provisional Application No. 62/617,106 (“Chatterjee-provisional”) (Ex. 1013);
- l. International Publication No. WO2019/099388 (“Nogami-PCT”) (Ex. 1014);
- m. NTT Docomo, Inc., “Summary of key aspects for search space,” 3GPP TSG RAN WG1 Meeting 90bis, Prague, CZ, Oct. 9-13, 2017, R1-1718834 (“NTT”) (Ex. 1019); and
- n. Any other materials that I refer to in this Declaration in support of my opinions.

18. For Grounds 1 and 2 of the IPR, I have been asked to consider the time of the invention to be around January 18, 2018, which I understand is the filing date of the application (U.S. Provisional Application No. 62/619,041, the ‘041 Provisional) to which the ‘359 Patent claims priority. Ex. 1001, Cover. My opinions

reflect how a person of ordinary skill in the art (as I define in Section V below) would have understood the claims and the specification of the '359 Patent, the prior art to the '359 Patent, and the state of the art, at the time of the alleged invention.

19. Ground 3 relies on the 3GPP-Specification (Ex. 1006)—a technical specification published by the 3rd Generation Partnership Project as part of the 5G standard—as a secondary reference.

20. The Challenged Claims are not entitled to claim priority to January 18, 2018 because, as explained below, their full scope is not fully supported by the '041 Provisional.

21. As explained in Section VI, the full scope of the “interval” between two bit positions (as claimed in independent claims 1, 12, and 22, and thus all the Challenged Claims) includes the difference between bit positions, and also the number of bits between the bit positions. Specifically, regarding the “interval” claimed in independent claims 1, 12, and 22, the specification discloses that “[a]n interval or distance between two bit positions could be a number of bits between the two bit positions... [or] [a]lternatively, an interval or distance between two bit positions could be difference of the two bit positions.” Ex. 1001, 16:42-49. But the '041 Provisional only discloses that “[a]n interval or distance between two bit positions is [the] number of bit[s] between the two bit positions”—without disclosing anything about a difference of the two bit positions. Ex. 1011, 46

(internally paginated as 28).

22. A person of ordinary skill in the art (POSITA—as described below in Section V) reviewing the '041 Provisional would not have understood that the named inventors of the '041 Provisional were in possession of the subject matter recited in claims 1, 12, and 22 of the '359 Patent at the full scope of the claimed “interval,” namely, including the possibility of the claimed “interval” between two bit positions being the *difference* of the two bit positions. Therefore, the subject matter of claim 1 at its full scope is not disclosed in the '041 Provisional in accordance with the written description requirement.

23. Accordingly, the earliest effective filing date for the '359 Patent at the full scope of the term “interval” is January 7, 2019, which is the filing date of the U.S. Patent Application No. 16/241,368 that issued as the '359 Patent.

IV. LEGAL STANDARDS

1. Overview

24. I am not an attorney or a legal expert, and I do not opine on matters of law. All the legal standards, which are listed in this section and which I applied in reaching the conclusions expressed throughout this Declaration, were provided to me by counsel. In preparing this Declaration, I have endeavored to faithfully apply these legal standards. I do not intend to offer opinions on the law. Below, I describe the law that I applied in analyzing the claims of the '359 Patent.

25. I have been informed by counsel that an issued patent is presumed valid and that the challenger of a patent's validity bears the burden of proving invalidity of the patent.

2. Patent Claims

26. I have been informed by counsel that a patent claims describe the invention made by the inventors and describe what the patent owner owns and what the owner may prevent others from doing.

27. I have been informed by counsel that claims may describe products, such as machines or chemical compounds, or processes for making or using a product. Claims are usually divided into parts or steps called limitations.

28. I have been informed by counsel that there are two types of claims: independent claims and dependent claims. An independent claim sets forth all the requirements that must be met in order to be covered by that claim. Thus, it is not

necessary to look at any other claim to determine what an independent claim covers. A dependent claim does not itself recite all of the requirements of the claim, but refers to another claim for some of its requirements. In this way, a dependent claim depends on another claim. The law considers a dependent claim to incorporate all of the requirements of the claims to which it refers.

29. I have been informed by counsel that that a dependent claim then adds its own additional requirements. To determine what a dependent claim covers, it is necessary to look at both the dependent claim and any other claims to which it refers.

30. I have been informed by counsel that in a case where a dependent claim incorporates the limitations of an independent claim upon which it depends, if a reference fails to disclose any of the limitations of the independent claim, the claims which depend on that independent claim cannot be made invalid by such a reference. As a result, any of the references at issue in this proceeding that fail to disclose all of the limitations of an independent claim necessarily also fail to disclose all of the limitations of claims which depend on that independent claim.

3. Burden of Proof for Invalidity

31. I have been informed by counsel and I understand that the party challenging the validity of an issued U.S. patent in an IPR bears the burden of proving invalidity through facts supported by a preponderance of the evidence. I have been informed that a “preponderance of the evidence” means evidence

sufficient to prove that a fact is more likely true than it is not.

4. Claim Construction

32. I have been informed by counsel and I understand that the first step in determining validity is to properly construe the claims. I have further been informed by counsel that, in this proceeding, the Board must determine the scope of the claims by using the same claim construction standard that United States District Courts use. Under this standard, the words of a claim are given their “ordinary” and “customary” meaning as would have been understood by a person of ordinary skill in the art at the time of the invention. I have been informed that such a person looks to the claims, specification, and file history in understanding the meaning of the claim terms. I have applied this understanding in this declaration.

5. Person of Ordinary Skill in the Art

33. I have been informed by counsel and I understand that a person having ordinary skill in the art may be defined by factors such as, when considered at the time of the alleged invention: (a) the levels of education and experience of the inventor and other persons actively involved in the field; (b) the types of problems encountered in the field; (c) prior art solutions to those problems; (d) rapidity with which innovations are made; and (e) the sophistication of the technology.

6. Anticipation

34. I have been informed by counsel and I understand that a patent claim can be found invalid as anticipated if each and every element of the claim, as

properly construed, is found either explicitly or inherently in a single prior art reference. If the single prior art reference does not disclose explicitly or inherently any one claim limitation, then that claim is not anticipated. I have further been informed that the single prior art reference cannot merely disclose each element; rather, it must disclose all of the elements as arranged in the claim. I have been informed that for a prior art reference to “inherently” disclose something, the reference must necessarily function in accordance with, or include the claimed limitations, to anticipate. The missing descriptive matter cannot merely probably or possibly include the claimed limitations. I have further been informed by counsel that, with respect to an anticipation analysis, it is improper to combine separate, distinct embodiments of a single prior art reference.

35. I have been informed that for a reference to be anticipatory, the reference must contain an enabling disclosure. I have been informed that merely naming or describing the subject matter is insufficient if it cannot be produced without undue experimentation.

7. Obviousness

36. I have been informed by counsel that a patent claim can be found invalid as obvious if the differences between the claim and the prior art references would have been obvious to a person of ordinary skill in the art at the time of the invention, taking into account (1) the scope and content of the prior art, (2) the

differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any objective indicia of non-obviousness. I have further been informed by counsel that a claim can be found to be obvious in light of either a single prior art reference or multiple prior art references. I have been informed that references qualify as prior art for an obviousness determination only when they are analogous to the claimed invention. Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

37. I have been informed that to be obvious in light of a single prior art reference or multiple prior art references, there must be a reason either to modify the single prior art reference or to combine the two or more prior art references to achieve the claimed invention. I have been informed by counsel that this reason may come from a teaching, suggestion, or motivation to combine which may come from the reference or references themselves, the knowledge or "common sense" of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole.

38. I have been informed by counsel that the combination of familiar elements according to known methods is likely to be obvious when it does no more

than yield predictable results.

39. I have further been informed by counsel that there is no suggestion to combine, however, if a reference teaches away from its combination with another source. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant, or if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. If, when combined, the references would produce a seemingly inoperative device, then they teach away from their combination. I have been informed that it is improper to combine references where the references teach away from their combination.

40. I have been informed by counsel that the degree of teaching away will depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. I have been informed that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the applicant.

41. I have been informed by counsel that if the teachings of a prior art

reference would lead one skilled in the art to make a modification that would render another prior art device inoperable, then such a modification would generally not be obvious. I have been informed that if a proposed modification would render the prior art device unsatisfactory for its intended purpose, then the proposed modification would generally not be obvious.

42. I have been informed by counsel that it is improper to use hindsight in making the obviousness determination.

43. I have been informed by counsel that some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness must be made. I have been informed that, for example, there may be no rational underpinning to support the legal conclusion of obviousness where systems are already complete and the party challenging validity seeks to mix and match components, which each exist in the separate systems, from these complete systems.

V. PERSON OF ORDINARY SKILL IN THE ART (POSITA)

44. Based on my review of the '359 Patent, the types of problems encountered in the art at and prior to the time of the alleged invention, prior solutions to those problems, the pace with which innovations were made during the relevant time period, the sophistication of the technology, and the educational level of active professionals in the field, I believe that a person of ordinary skill in the art, at the time of the invention, would have had at least a Bachelor's degree in electrical engineering, computer science, or computer engineering; familiarity with the relevant 3GPP standards as of this time; and at least two years of work experience in research, design, development, and/or testing of cellular networks. More education could have substituted for less work experience and vice versa.

45. All of my opinions in this Declaration are from the perspective of a person of ordinary skill in the art, as I have defined it above and during the relevant time frame (e.g., early 2018). During that time frame, I possessed at least the qualifications of a POSITA, as defined above. In particular, I was quite knowledgeable about CORESET ("control resource set") at the time of the invention.

VI. CLAIM CONSTRUCTION

46. I understand that claim terms are typically given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the alleged invention. In considering the meaning of the claims, I also understand that one must consider the claim language, specification, prosecution history, and the knowledge of a person of ordinary skill in the art at the relevant time.

47. In my opinion, the term “interval” requires construction and all other terms should be given their ordinary and customary meaning. I applied this understanding in my analysis.

48. The term “interval,” which is recited in independent claims 1, 12, and 22, and dependent claims 3-5, 9, 10, 14, 15, 19, and 20, should be construed as “the difference between two bit positions or the number of bits between two bit positions.”

49. This construction is supported by the claim language. For example, the “interval” recited in the independent claims encompasses the foregoing two options, as shown by dependent claims 9 and 19 (both reciting “the interval is the difference between two bit positions”) and dependent claims 10 and 20 (both reciting “the interval is number of bits between two bit positions”). The claims do not specify any other options for the “interval,” and none of the claims are inconsistent with my

construction.

50. The above construction is also supported by the specification. The specification discloses that “[a]n interval or distance between two bit positions could be a number of bits between the two bit positions” and further discloses that “[a]lternatively, an interval or distance between two bit positions could be difference of the two bit positions.” Ex. 1001, 16:42-49. These are the only two options for the “interval,” according to the specification.

51. The scope of “interval” cannot be narrower, e.g., cannot encompass only one of the above two options, because the specification describes both options. Furthermore, the dependent claims (e.g., claims 9 and 10, or equivalently, claims 19 and 20) make clear that the independent claims must encompass both options.

VII. BACKGROUND OF THE RELEVANT TECHNOLOGY

52. The '359 Patent is titled “Method and Apparatus for Providing Control Resource Set Configuration in a Wireless Communication System.” Under the heading “Field,” the '359 Patent states that it “generally relates to wireless communication networks, and more particularly, to a method and apparatus for providing control resource set configuration in a wireless communication system.” Ex. 1001, 1:14-19. The '359 Patent’s “Background” section notes that “[a] new radio technology for the next generation (e.g., 5G) is currently being discussed by the 3GPP standards organization” and that “[a]ccordingly, changes to the current body of 3GPP standard are currently being submitted and considered to evolve and finalize the 3GPP standard.” *Id.*, 1:35-39.

53. The specification of the '359 Patent notes the existence of “one or more standards such as the standard offered by a consortium named ‘3rd Generation Partnership Project’ referred to herein as 3GPP,” including various standard-related documents. *Id.*, 2:24-39. For example, the '359 Patent mentions “3GPP TSG RAN WG1 Meeting #90bis.” *Id.*, 2:32-33. During prosecution, the Examiner cited one of the documents associated with that 3GPP meeting—specifically, the Huawei-CORESET document (Ex. 1009). Ex. 1010, 244-245. The '359 Patent explains that CORESET stands for “control resource set” (Ex. 1001, 1:47-48), and Huawei-CORESET discusses CORESETs in detail, including the following example of a

CORESET:

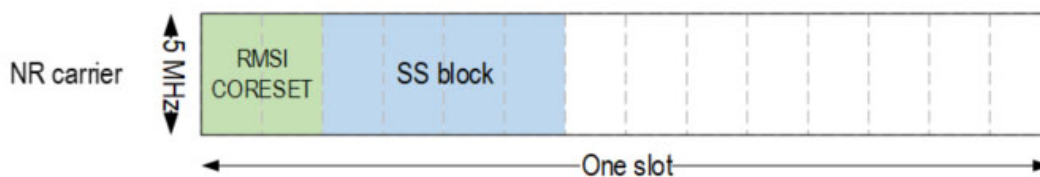


Figure 1 CORESET location in the case with 5 MHz system BW

Huawei-CORESET (Ex.1009), 1 (FIG. 1); *see also id.* (“the CORESET occupies the two OFDM symbols ahead of PSS, in the same PRBs occupied by the SS block”). As shown above, the depicted exemplary CORESET occupies a region in the time-frequency plane, here two symbols in the time domain (horizontal axis) and some number of physical resource blocks (PRBs) corresponding to 5 MHz bandwidth in the frequency domain (vertical axis). *Id.*

54. The '359 Patent states that “[i]n the Final Chairman’s Note of 3GPP TSG RAN WG1 Meeting #90bis, the following agreements and working assumptions were reached: ... [a] control-resource set consists of $N_{RB}^{CORESET}$ resource blocks in the frequency domain, given by the higher-layer parameter CORESET-freq-dom, and $N_{symb}^{CORESET} \in \{1,2,3\}$ symbols in the time domain, given by the higher-layer parameter CORESET-time-dur....” Ex. 1001, 4:57-59, 5:36-41.

55. Thus, the '359 Patent acknowledges that the use of a CORESET was known before the alleged invention of the '359 Patent. The '359 Patent explains that it was known to use a CORESET to indicate (1) time duration (duration in number of OFDM symbols) and (2) a bitmap indicating at least a starting OFDM symbol for

monitoring the CORESET in a slot:

In the current NR standard as disclosed in 3GPP R1-1721343 and TS 38.331, a CORESET can be configured by indicating time duration and a bit map. The bit map may indicate at least a starting OFDM symbol for monitoring the CORESET in a slot. Each bit in the bit map corresponds to an OFDM symbol in a slot. If a bit position in the bit map has a value of one, it represents a starting OFDM symbol for monitoring the CORESET. The CORESET may be monitored from at least a starting OFDM symbol(s) indicated by the bit map and occupying following OFDM symbol(s) until the configured time duration is reached. For example, ***if the time duration of a CORESET is configured as 2 and the bit map indicates 10000000000000, the UE may monitor the CORESET (receive at least a PDCCH) on OFDM symbol #0 and #1 in a slot.***

Ex. 1001, 15:41-55.³

56. Thus, the '359 Patent explains that it was known in then-current 3GPP NR standards that with an exemplary duration of 2 (i.e., 2 OFDM symbols) and exemplary bitmap of 10000000000000 (i.e., 14-bit bitmap corresponding to 14 symbols in a slot, with the most significant bit set to '1' and the remaining bits set to '0'), the user equipment (UE) will monitor the CORESET on the first two

³ In this Declaration, all emphases in cited materials are added, unless noted otherwise.

symbols—i.e., starting at the first symbol (called symbol #0) and extending to the second symbol (called symbol #1) because duration=2.

VIII. THE '359 PATENT

57. The '359 Patent states that “if a bit map indicates a starting OFDM symbol belonging to the following OFDM symbol(s) of previous starting OFDM symbol indicated by the bit map (e.g., time duration of a CORESET is 2 and the bit map is 1100000000000000), a UE may be confused about the configuration.” Ex. 1001, 15:56-61. The '359 Patent further states that “if the bit map indicates a starting OFDM symbol on the last few OFDM symbols of a slot, this may create a problem where the CORESET may be configured across a slot boundary,” and provides an example where “time duration of a CORESET is 2 and the bit map is 0000000000000001....” *Id.*, 15:63-16:17.

58. The '359 Patent addresses these problems by restricting the configuration of a CORESET:

According to one solution, a restriction on the configuration of a CORESET is established. The UE does not expect to receive a CORESET configuration with an overlap OFDM symbols indicated by a bit map indication and the CORESET duration and/or with a CORESET monitoring pattern across a slot boundary.

Id., 16:19-24; *see also id.*, 16:50-53 (“In one embodiment, the number is the time duration of the CORESET. Alternatively, the number is the time duration of the CORESET minus one. In another alternative, the number is the maximum time duration of the CORESET minus one”), 17:8-12 (“[A] base station does not

configure the UE with a bit map such that the interval (or distance) between two bit positions indicating value one in the bit map is smaller than the number (e.g., the bit map is 110000000000000 when the number is 1).”), 24:30-35 (“A base station does not configure a UE with a bit map such that the interval (or distance) between ... the last bit indicating 1 in the bitmap and the least significant bit in the bit map[] is smaller than the number (e.g., the bit map is 000000000000001).”), FIGS. 7-8.

59. Figures 7 and 8 show the solutions of the '359 Patent, at block 710 and 810, respectively:

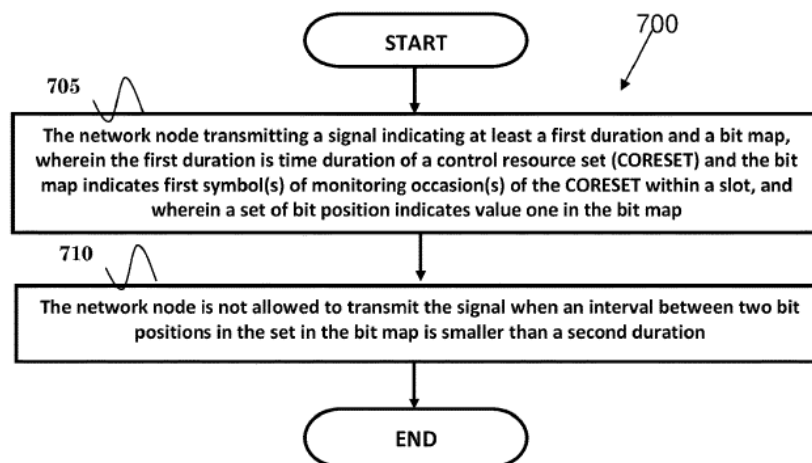


FIG. 7

Ex. 1001, FIG. 7.

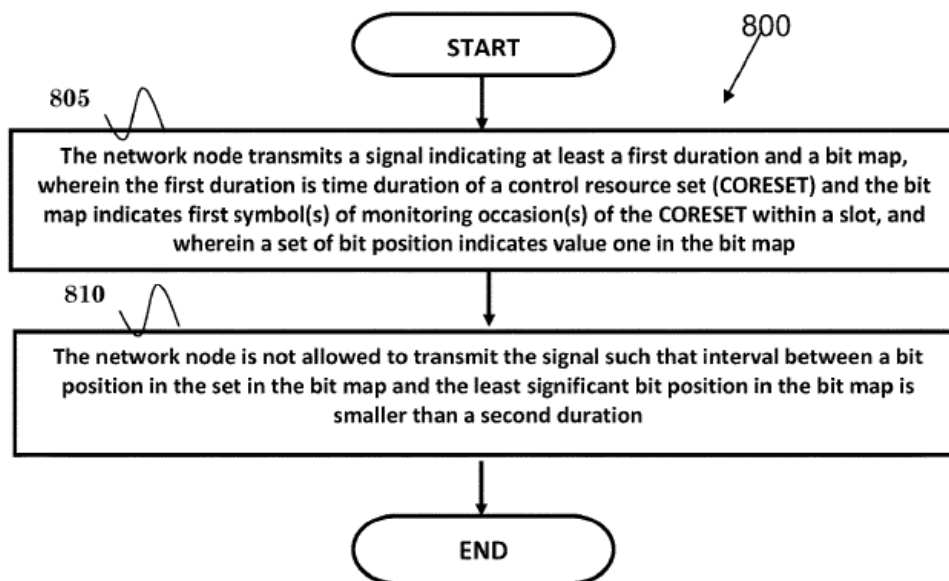


FIG. 8

Ex. 1001, FIG. 8.

IX. PROSECUTION HISTORY OF THE '359 PATENT

60. The Examiner initially rejected the claims as being anticipated by (or for some claims, as being obvious over) Huawei-CORESET (Ex. 1009). Ex. 1010, 244-249. After a few rounds of prosecution, the Examiner allowed the claims, stating in the Notice of Allowance that Huawei-CORESET “does not disclose the limitation *not allowing to transmit the signal such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration* as recited in claims 1, 13, and 24, and argued in the Remarks.” *Id.*, 158 (emphasis in original).

61. There is no indication in the prosecution history that the Examiner was aware of the prior art identified in the Grounds.

X. THE PRIOR ART REFERENCES

1. Nogami

62. Nogami is a patent entitled “User Equipments, Base Stations and Methods” and relates to wireless communication systems, including signaling, procedures, user equipment (UE) and base stations. Ex. 1004, Title, 1:14-18. Nogami discloses that a base station sends radio resource control (RRC) configuration information to a UE. *Id.*, 2:49-55 (“A base station is described. The base station includes a higher layer processor configured to send a first radio resource control (RRC) configuration....”); *see also id.*, Title, FIG. 1 (annotated below), 4:15-16 (“‘gNB’ may be used interchangeably herein to mean the more general term ‘base station.’”), 5:8-32 (describing gNBs 160), FIGS. 3, 5 (showing gNBs); Ex. 1012, 2 (Title), FIGS. 1, 3, 5, ¶¶[0002], [0007], [0012]-[0013].

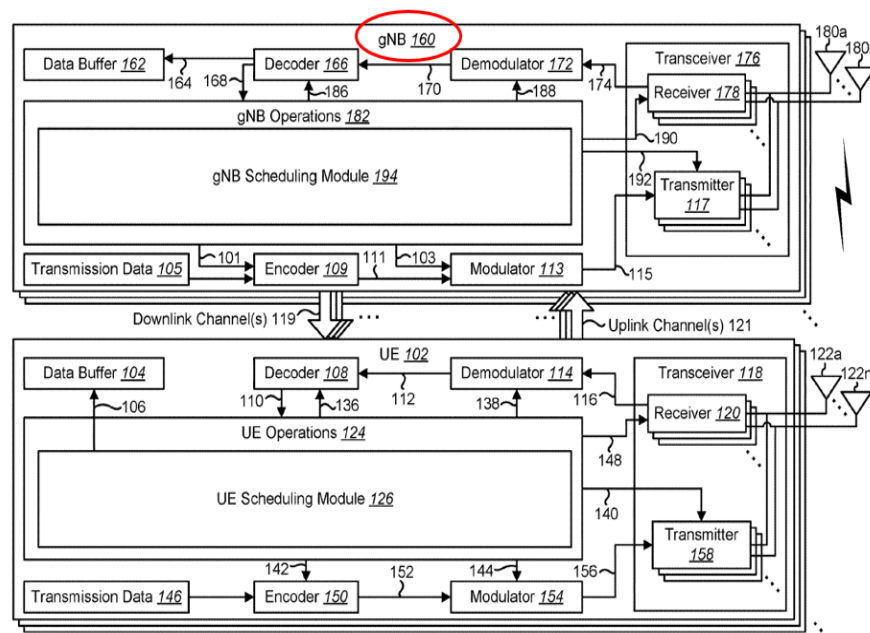
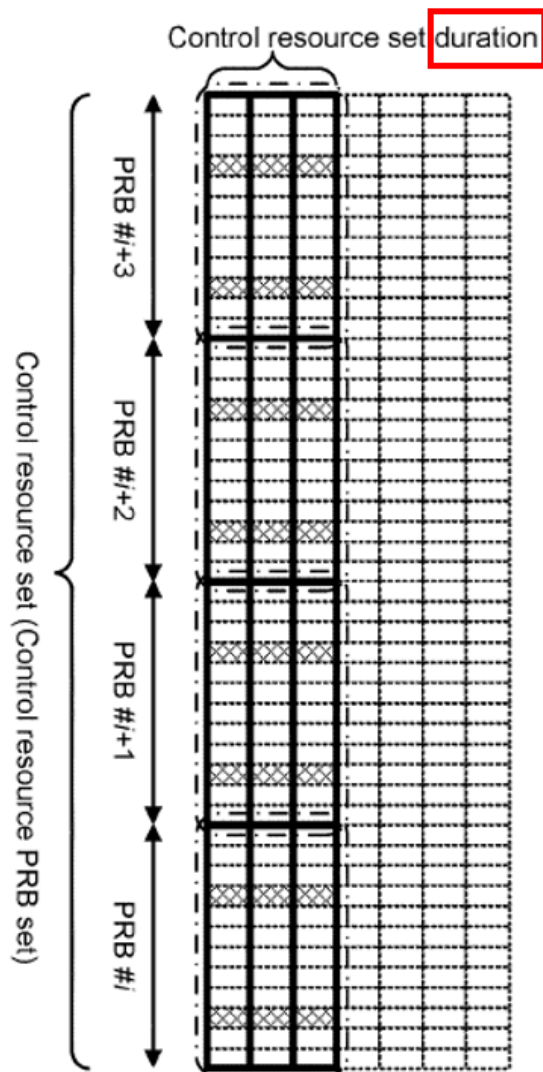


FIG. 1

Ex. 1001, FIG. 1 (annotated); Ex. 1004, FIG. 1 (annotated).

63. Nogami discloses using control resource set (CORESET) technology for resource configuration, including disclosing that the base station (gNB) sends CORESET duration and bitmap information to the UE. Ex. 1004, Abstract (“The UE includes a higher layer processor configured to acquire a first radio resource control (RRC) configuration including first information for indicating a control resource set (CORESET) duration, and to acquire second RRC configuration including second information [that] ... is bitmap information.”); *see also id.*, 2:49-63. Nogami explains that “[t]he control resource set may [] be defined, in time domain, as a set of OFDM symbol(s) [and] [i]t may also be referred to as a duration of the control resource set or just control resource set duration.” *Id.*, 26:50-54; *see also id.*, FIG. 14 (reproduced in part below); Ex. 1012, ¶¶[0002], [00110] (“CORESET-monitor-DCI-symbolPattern”), [00111], [00113], [00115]-[00116], FIGS. 16-17.



Ex. 1004, FIG. 14 (annotated in red regarding “duration”); Ex. 1012, FIG. 14 (annotated).

64. Nogami explains the bitmap with respect to Figure 17:

FIG. 17 illustrates PDCCH monitoring occasions for non-slot-based scheduling. ... [T]he higher layer parameters CORESET-monitor-DCI-symbolPattern are individually configured to search space set #2 and #3. The higher layer parameter CORESET-monitor-DCI-symbolPattern may indicate, using a *bitmap* scheme, OFDM symbol(s)

on which PDCCH is monitored. To be more specific, [t]he higher layer parameter CORESET-monitor-DCI-symbolPattern per search space set may consist of *14 bits, the 1st bit to 14th bit which correspond to OFDM symbol #0 to #13, respectively. Each of the bits indicates whether or not PDCCH is monitored on the corresponding OFDM symbol* (e.g. “0” indicates no PDCCH monitoring and “1” indicates PDCCH monitoring, or vice versa). In this example, the higher layer parameters CORESET-monitor-DCI-symbolPattern for search space set #2 indicates OFDM symbols #0 and #7 for PDCCH monitoring, [while] the higher layer parameters CORESET-monitor-DCI-symbolPattern for search space set #3 indicates OFDM symbols #0, #2, #4, #6, #8, #10, #12 for PDCCH monitoring.

Ex. 1004, 29:41-67; Ex. 1012, ¶¶[00112]-[00113]. I note that a POSITA would have understood the “O” in this quote to be “0” in the context of the whole sentence.

65. Nogami discloses with respect to Figure 17 that the bitmap is 10000001000000 for search space set #2, and it is 10101010101010 for search space set #3.

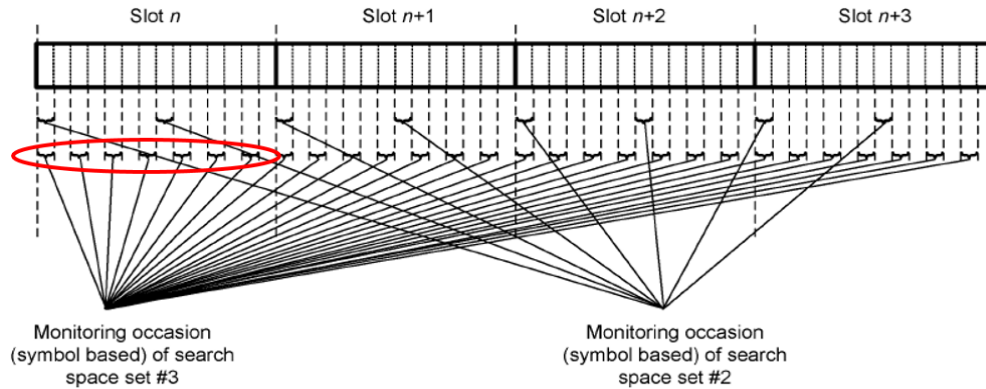


FIG. 17

Ex. 1004, FIG. 17 (annotated in red to show which bits are ‘1’ in Slot n regarding search space set #3 to indicate symbols for PDCCH monitoring); Ex. 1012, FIG. 17 (annotated).

66. Nogami discloses a situation in which adjacent PDCCH monitoring occasions are designated by the bitmap overlap:

[I]f the CORESET duration is more than 1 OFDM symbol and at least if any of two adjacent bits of the CORESET-monitor-DCI-symbolPattern are set to “1”, PDCCH monitoring occasions starting with OFDM symbols indicated by those two bits *partially overlap*.

Ex. 1004, 30:60-64; Ex. 1012, ¶[00117].

67. Nogami describes “several ways to handle [such] overlapping” (Ex. 1004, 30:64-65), and explains that “[t]he first approach is that the UE 102 is not expected to be configured with the CORESET-monitor-DCI-symbolPattern which causes overlapping between adjacent PDCCH monitoring occasions for a same

search space set.” *Id.*, 30:65-31:2; Ex. 1012, ¶[00117].

2. Chatterjee

68. Chatterjee is a patent entitled “Time Domain Resource Allocation for Mobile Communication” and relates to wireless communication, including time domain resource allocation for cellular communications. Ex. 1005, Title, 1:15-18. Chatterjee is directed to resource allocation for mobile communications systems, including 5G communication systems involving monitoring of PDCCH for CORESET resource configuration. *See* Ex. 1005, Title (“Time Domain Resource Allocation for Mobile Communication”), 1:15-18 (Field section stating: “Various embodiments of the present application generally relate to the field of wireless communications, and in particular, to time domain resource allocation for cellular communications.”), 1:20-36 (Background section describing 5G mobile communications), 2:9-13 (“Embodiments herein provide mechanisms for TDRA for DL and UL shared channels, for example, PDSCH and PUSCH, that may be *scheduled dynamically using DCI carried by PDCCH* or based on semi-static configurations, for example, DL SPS or UL transmissions without UL grant.”), 2:36-47 (describing 3GPP standards, including 5G standards), 6:49-53 (“In NR implementations, the UEs 101 *monitor* (or attempt to decode) respective sets of *PDCCH candidates* in one or more configured *monitoring occasions in one or more configured CORESETs* according to the corresponding search space

configurations.”); *see also* Ex. 1001, Title, Abstract (describing CORESET monitoring occasions), 1:16-19 (Field section stating: “This disclosure generally relates to wireless communication networks, and more particularly, to a method and apparatus for providing control resource set configuration in a wireless communication system.”); Ex. 1013, Title, 2-4, 7.

69. Chatterjee discloses that “the allocated symbols do not cross the slot-boundary.” Ex. 1005, 17:47-58; *see also* Ex. 1013, 6 (“Starting symbol = All possible starting locations within a slot possible for the lengths listed in the next bullet such that the allocated symbols do not cross the slot-boundary.”). Similarly, Chatterjee discloses making any symbol the start symbol for a physical downlink shared channel (PDSCH) subject to the constraint that “the allocation does not cross the slot boundary.” Ex. 1005, col. 19 (Table 15); *see also id.*, col. 65 (Table 29) (“An index giving valid combinations of start symbol and length (jointly encoded) as start and length indicator (SLIV). The network ***configures the field so that the allocation does not cross the slot boundary.***”). Chatterjee further explains that in a situation where a slot boundary would be crossed by a certain group of symbols, “such a transmission may need to be postponed.” *Id.*, 22:29-46, 35-39; *see also* Ex. 1013, 8 (“The described multi-mini-slot transmission procedure may lead to cases when mini-slot crosses slot boundary and/or collides with at least scheduled SRS transmission. For such cases, dropping and/or postponing rules may need to be

defined. In embodiments, in case a group of symbols in an aggregated multi-mini-slot transmission, i.e. aggregated PUSCH transmission of mapping type B, is going to cross the slot boundary, it may need to be postponed...”), 50 (“in case a group of symbols in an aggregated multi-mini-slot transmission, i.e. aggregated PUSCH transmission of mapping type B, is going to cross the slot boundary, the transmission is postponed...”). A POSITA implementing Nogami’s process/system would have understood that Chatterjee’s concern with resource allocation across a slot boundary may need to be addressed in Nogami’s process/system.

3. 3GPP-Specification

70. 3GPP-Specification is a 3GPP Technical Specification (3GPP TS 38.213 v15.2.0) that is part of the 5G / 3GPP 38.213 standard. 3GPP-Specification describes and specifies various aspects of the 38.213 standard, including CORESET-related details. *See* Ex. 1006, 7 (defining “DCI” as “Downlink Control Information” and defining “PDCCH” as “Physical downlink control channel”), 68 (“For each control resource set, the UE is provided the following by higher layer parameter ControlResourceSet:”), 88 (“For the SS/PBCH block and control resource set (CORESET) multiplexing pattern 1, a UE monitors PDCCH in the Type0-PDCCH common search space....”).

71. 3GPP-Specification discloses that a user equipment (UE) is provided a CORESET duration and bitmap. For example, 3GPP-Specification discloses that

“[f]or each control resource set, the UE is provided the following by higher layer parameter *ControlResourceSet*: ... a number of consecutive symbols provided by higher layer parameter *duration*” (Ex. 1006, 68 (emphasis in original)) and further discloses that “the UE is provided the following by higher layer parameter *SearchSpace*: ... a PDCCH monitoring pattern within a slot, indicating first symbol(s) of the control resource set within a slot for PDCCH monitoring, by higher layer parameter *monitoringSymbolsWithinSlot*” (*id.*, 69 (emphasis in original)). A POSITA would have understood that the parameters *duration* and *monitoringSymbolsWithinSlot* are the CORESET duration and bitmap described in Nogami, because they are described in the same manner in the two references. Therefore, given the similar subject matter in the two references, a POSITA implementing Nogami’s process/system would have looked to 3GPP-Specification for guidance regarding implementation strategies and details, particularly because 3GPP-Specification is a publication of the same standards organization (3GPP) described in Nogami. *See* Ex. 1004, 3:33-51. Indeed, 3GPP-Specification lists on its cover “Release 15” which is the same 3GPP standard that Nogami states that its systems/methods are applicable to. Ex. 1006, Cover; *see* Ex. 1004, 3:47-50.

72. 3GPP-Specification discloses, in the context of describing its bitmap (*monitoringSymbolsWithinSlot*), that:

A UE does not expect any two PDCCH monitoring occasions, for a same search space set or for different search space sets, in a same control resource set [CORESET] to be separated by a non-zero number of symbols that is smaller than the control resource set [CORESET] duration.”

Ex. 1006, 69.

73. 3GPP-Specification further discloses that “[a] UE does not expect to be provided a first symbol and a number of consecutive symbols for a control resource set that results to a PDCCH candidate mapping to symbols of different slots.” Ex. 1006, 69.

4. NTT

74. NTT Docomo, Inc., “Summary of key aspects for search space,” 3GPP TSG RAN WG1 Meeting 90bis, Prague, CZ, Oct. 9-13, 2017, R1-1718834 (“NTT”) (Ex. 1019) is a 3GPP working group meeting document. NTT discloses various issues relating to 5G/3GPP wireless communication, including CORESET configuration (Ex. 1019, 1-2), downlink control information (DCI) formats in the context of CORESET (*id.*, 3-4), and PDCCH blind decoding by the UE (*id.*, 6-7). Regarding time-domain allocation of a CORESET, NTT discloses that “[f]or non-slot-based scheduling, it is useful to enable CORESET starting at any OFDM symbol, where the *need of some restrictions on particular cases (e.g., whether a CORESET can span a slot boundary)* should be FFS [for future study].” *Id.*, 2.

XI. GROUND 1: NOGAMI (EX. 1004) DISCLOSES OR SUGGESTS ALL THE FEATURES OF CLAIMS 1-3, 6-9, 11, AND 22-23

1. Claim 1

a. “A method of a network node, the method comprising:”

75. To the extent that the preamble is limiting, Nogami discloses a method of a network node. *See* Sections XI.1.b-e (my discussion of remaining elements of this claim). For example, Nogami discloses that a base station (“network node”) sends radio resource control (RRC) configuration information to a user equipment (UE). Ex. 1004, 2:49-59 (“A base station is described. The base station includes a higher layer processor configured to send a first radio resource control (RRC) configuration...”); *see also id.*, Title (“User Equipments, Base Stations and Methods”), FIG. 1 (annotated below), 4:15-17 (“‘gNB’ may be used interchangeably herein to mean the more general term ‘base station.’”), 5:8-32 (describing gNBs 160), FIGS. 3, 5 (showing gNBs); Ex. 1012, 2 (Title), FIG. 1, ¶¶[0002], [0007], [0012]-[0013], FIGS. 3, 5.⁴

⁴ Citations herein to the specification of Nogami-provisional are with respect to the numbered paragraphs of the originally-filed specification beginning at page 13 of Ex. 1012.

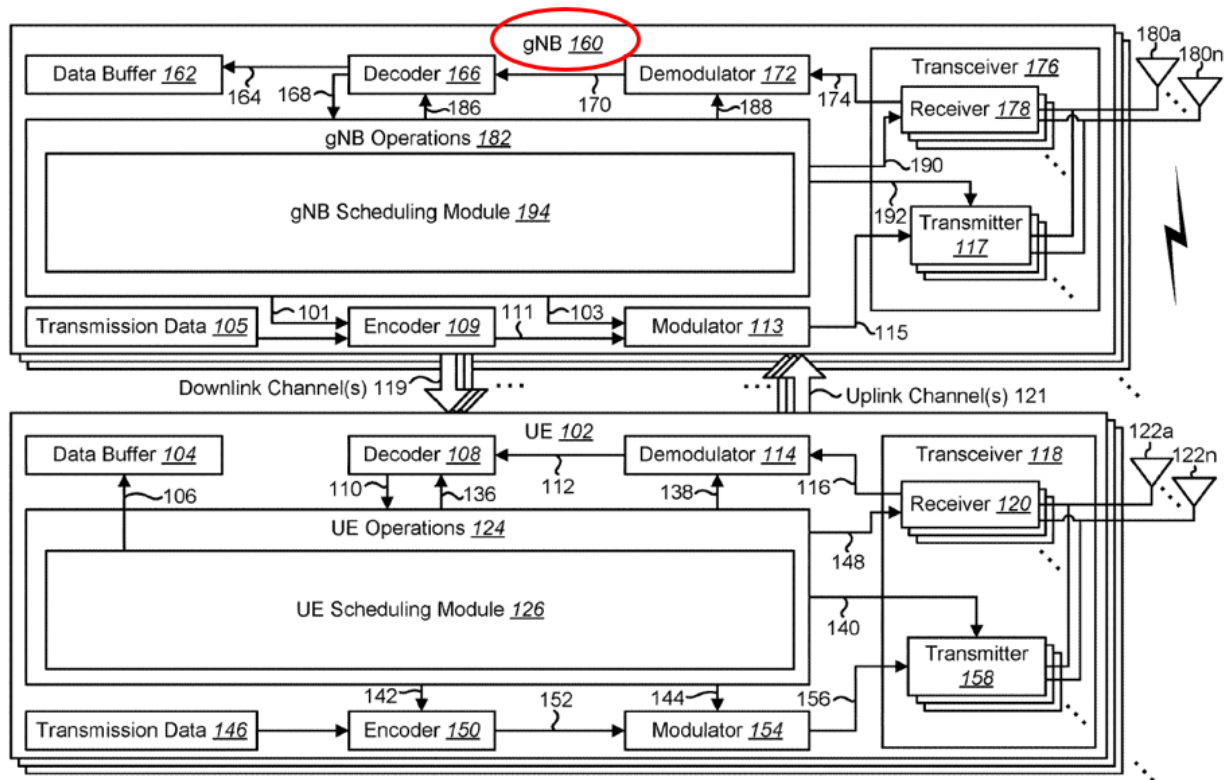


FIG. 1

Ex. 1004, FIG. 1 (annotated).

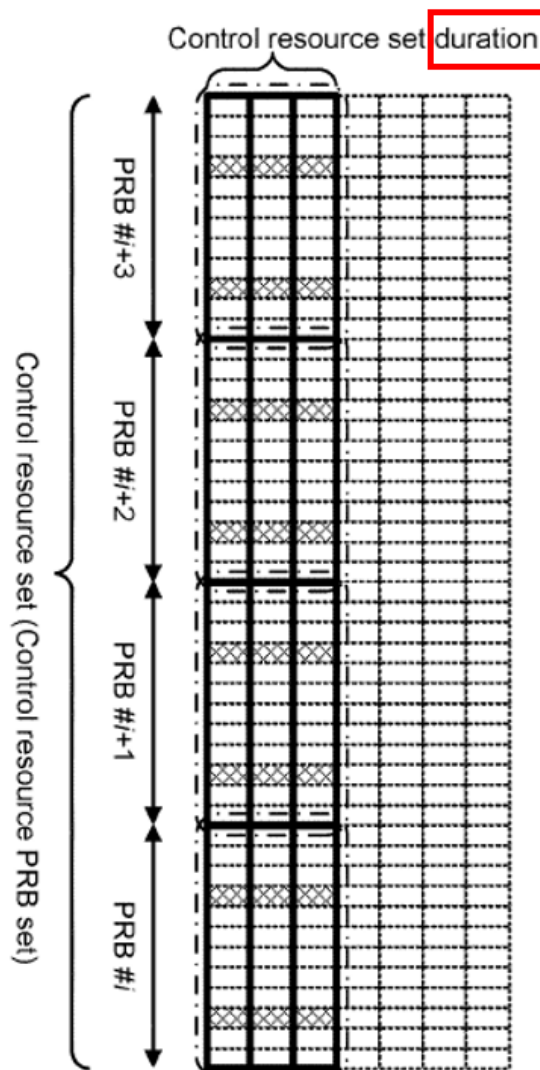
76. This mapping of “network node” is consistent with the ’359 Patent. Ex. 1001, Abstract (“a network node transmits a signal indicating at least a first duration and a bit map”), 15:18-22 (“BS: a network central unit or network node...BS may be referred to as ... gNB...”), 20:65-67 (“The configuration or indication can be transmitted by a base station to a UE.”).

b. “transmitting a signal indicating at least a first duration and a bit map,”

77. Nogami discloses this limitation. Nogami discloses that a base station transmits a signal indicating a control resource set (CORESET) duration (“first duration”) and a bitmap (“bit map”):

The base station includes a higher layer processor configured to *send a first radio resource control (RRC) configuration* including first information for *indicating a* control resource set (CORESET) *duration*, and to *send second RRC configuration including second information* for indicating physical downlink control channel (PDCCH) monitoring symbols. The base station also includes transmitting circuitry configured to transmit a PDCCH, based on the first information and the second information. The CORESET duration may be set to a value larger than 1. The *second information may be bitmap information*. Each bit of the bitmap information may correspond to a respective OFDM symbol in a slot. The bit of which value is set to 1 may indicate a start of a PDCCH monitoring occasion.

Ex. 1004, 2:49-63; *see also id.*, Abstract (“The UE includes a higher layer processor configured to acquire a first radio resource control (RRC) configuration including first information for indicating a control resource set (CORESET) *duration*, and to acquire second RRC configuration including second information [that] ... is *bitmap information*.”), 26:50-54 (“The control resource set may also be defined, in time domain, as a set of OFDM symbol(s). It may also be referred to as a *duration* of the control resource set or just control resource set *duration*.”), FIG. 14 (reproduced below); Ex. 1012, ¶¶[0002], [00110] (“CORESET-monitor-DCI-symbolPattern”), [00111], [00113], [00115]-[00116], FIGS. 16-17.



Ex. 1004, FIG. 14 (annotated in red regarding “duration”); Ex. 1012, FIG. 14.

78. Thus, Nogami’s base station sends the second information that is the bitmap information, and hence *transmits* the claimed signal. Ex. 1004, 2:49-54; Ex. 1012, ¶[0002].

79. Nogami explains the bitmap with respect to Figure 17:

FIG. 17 illustrates PDCCH monitoring occasions for non-slot-based scheduling. ... [T]he higher layer parameters CORESET-monitor-DCI-symbolPattern are individually configured to

search space set #2 and #3. The higher layer parameter CORESET-monitor-DCI-symbolPattern may indicate, using a *bitmap* scheme, OFDM symbol(s) on which PDCCH is monitored. To be more specific, [t]he higher layer parameter CORESET-monitor-DCI-symbolPattern per search space set may consist of *14 bits, the 1st bit to 14th bit which correspond to OFDM symbol #0 to #13, respectively. Each of the bits indicates whether or not PDCCH is monitored on the corresponding OFDM symbol* (e.g. “0” indicates no PDCCH monitoring and “1” indicates PDCCH monitoring, or vice versa). In this example, the higher layer parameters CORESET-monitor-DCI-symbolPattern for search space set #2 indicates OFDM symbols #0 and #7 for PDCCH monitoring, [while] the higher layer parameters CORESET-monitor-DCI-symbolPattern for search space set #3 indicates OFDM symbols #0, #2, #4, #6, #8, #10, #12 for PDCCH monitoring.

Ex. 1004, 29:41-67; Ex. 1012, ¶¶[00112]-[00113]. I note that a POSITA would have understood the “0” in this quote to be “0” in the context of the whole sentence. Thus, Nogami discloses with respect to Figure 17 that the bitmap is 10000001000000 for search space set #2, and it is 10101010101010 for search space set #3.

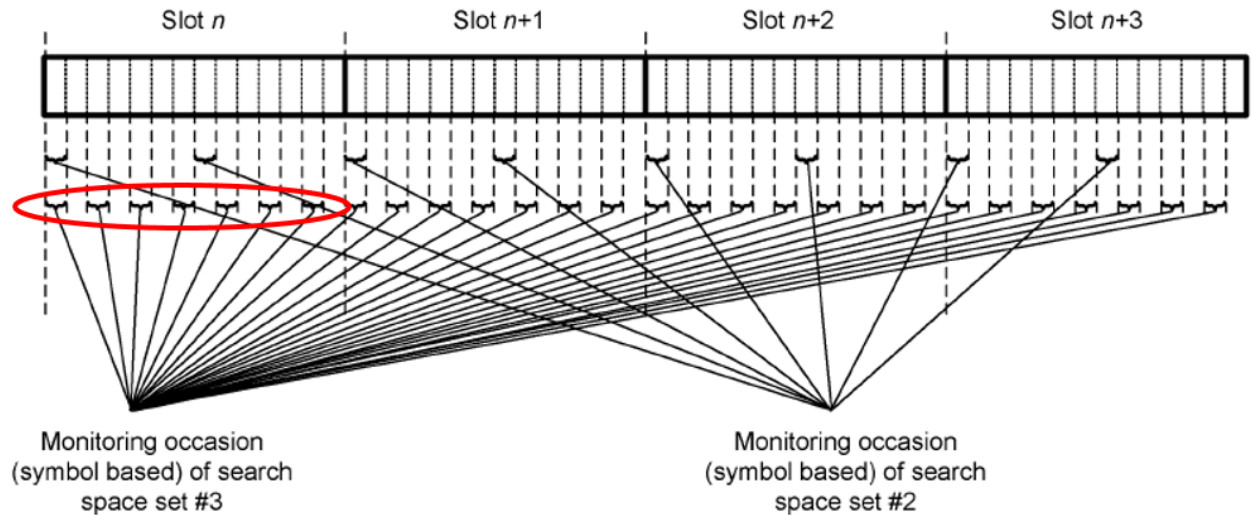


FIG. 17

Ex. 1004, FIG. 17 (annotated in red to show which bits are ‘1’ regarding search space set #3 to indicate symbols for PDCCH monitoring); Ex. 1012, FIG. 17.

c. “wherein the first duration is time duration of a control resource set (CORESET), and”

80. Nogami discloses this limitation, as explained above for limitation 1(b). *See above* at Section XI.1.b. For example, Nogami discloses that the duration is a “control resource set (CORESET) duration.” Ex. 1004, Abstract; *see also id.*, FIG. 14 (“Control resource set duration”), 29:28-29 (“CORESET-time-duration set to 3 symbols”), 30:60 (“CORESET duration”); Ex. 1012, ¶¶[0093]-[0094], [00116] (“CORESET duration”).

- d. “wherein the bit map includes a set of bit positions, where each bit position has a value of one or zero and each bit position with the value of one indicates a starting Orthogonal Frequency Division Multiplexing (OFDM) symbol of a monitoring occasion of the CORESET within a slot; and”

81. Nogami discloses this limitation, as explained above for limitation 1(b). *See* above at Section XI.1.b. For example, Nogami discloses with respect to Figure 17 that:

[t]he higher layer parameter CORESET-monitor-DCI-symbolPattern per search space set may consist of 14 bits, the 1st bit to 14th bit which correspond to OFDM symbol #0 to #13, respectively. Each of the bits indicates whether or not PDCCH is monitored on the corresponding OFDM symbol (e.g. “0” indicates no PDCCH monitoring and “1” indicates PDCCH monitoring, or vice versa). In this example, the higher layer parameters CORESET-monitor-DCI-symbolPattern for search space set #2 indicates OFDM symbols #0 and #7 for PDCCH monitoring, [while] the higher layer parameters CORESET-monitor-DCI-symbolPattern for search space set #3 indicates OFDM symbols #0, #2, #4, #6, #8, #10, #12 for PDCCH monitoring.

Ex. 1004, 29:54-67; Ex. 1012, ¶[00113]. I note that a POSITA would have understood the “0” in this quote to be “0” in the context of the whole sentence.

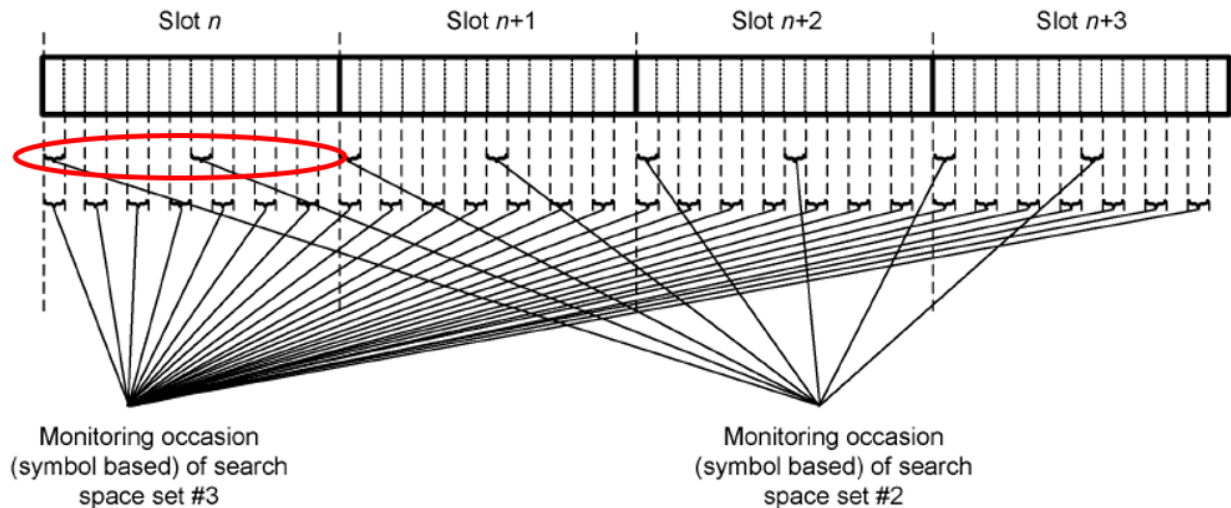


FIG. 17

Ex. 1004, FIG. 17 (annotated in red to show which bits are ‘1’ for search space set #2); Ex. 1012, FIG. 17.

82. Thus, each bit position with the value of ‘1’ (e.g., the 1st and 8th bit positions of the bitmap 10000001000000 for search space set #2, where the 1st bit position is the most significant bit) indicates a starting OFDM symbol of a monitoring occasion of the CORESET within a slot.

- e. “not allowing to transmit the signal such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration.”

83. Nogami in view of the knowledge of a POSITA discloses or suggests this limitation. Nogami describes an example of its bitmap and duration:

For example, the *CORESET-time-duration is set to 2 OFDM symbols* and the third bit of the CORESET-monitor-DCI-

symbolPattern is set to “1”, the UE 102 may have to monitor PDCCH candidates which are mapped on the *third and fourth OFDM symbols*. In other words, each bit of the CORESET-monitor-DCI-symbolPattern set to “1” *may indicate the starting symbol of one or more consecutive OFDM symbol(s)* on which PDCCH candidate(s) are mapped.

Ex. 1004, 30:51-69; Ex. 1012, ¶[00116].

84. Thus, a ‘1’ bit in the bitmap indicates a starting symbol, and the duration is used to determine additional symbol(s), for checking for potential presence of PDCCH (e.g., check the 3rd and 4th symbols in the example above). A POSITA would have understood that if another monitoring occasion overlaps with the above monitoring occasion (e.g., if the bitmap also indicates checking the 4th and 5th symbols, such that there is overlap at the 4th symbol), such an overlap situation in the context of CORESET is referred to in Nogami as explained below, and a POSITA would have sought to avoid such a situation.

85. A POSITA would have known that a CORESET is a mechanism for conveying certain control information (specifically, an allocation of a certain region in time-frequency space), such as in the Physical Downlink Control Channel (PDCCH). *See* Ex. 1008, ¶¶[0113]-[0115], [0263]-[0266]; Ex. 1020, ¶¶[0108]-

[0110], [0248]-[0251]; Ex. 1004, 26:46-52.⁵ An example of a CORESET is shown below, here occupying four physical resource blocks (PRBs) in the frequency domain and three downlink (DL) slots in the time domain:

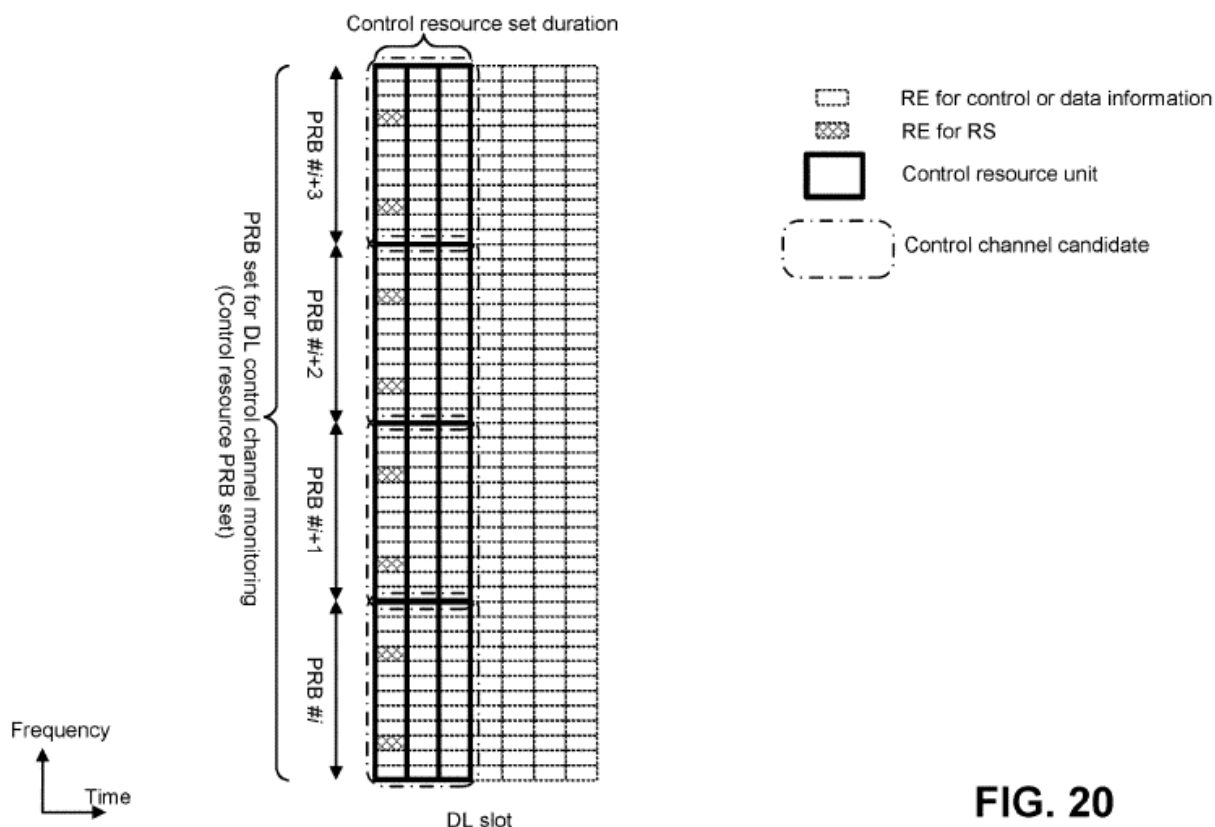


FIG. 20

Ex. 1008, FIG. 20; Ex. 1020, 23 (FIG. 20).

86. A POSITA would have known that downlink refers to transmission of

⁵ Nogami-770 (Ex. 1008) and Nogami-770-prov (Ex. 1020) demonstrate the knowledge of a POSITA. Nogami-770-prov is a provisional application filed May 4, 2017, before the earliest priority date of the '359 Patent, and paragraph [0001] of that provisional application is found at page 45 of Ex. 1020.

data from base stations (e.g., gNBs) to UEs. *See* Ex. 1008, ¶[0070]; Ex. 1020, ¶[0065]; Ex. 1004, 4:12-16; Ex. 1012, ¶[0007]. The PDCCH is a channel used to transmit downlink control information (DCI). Ex. 1008, ¶[0078] (“In downlink, PCCH (e.g., Physical Downlink Control Channel (PDCCH)) may be used for transmitting Downlink Control Information (DCI).”); *see also id.*, ¶¶[0114] (“the UE 102 attempts to decode each PDCCH in the set of PDCCH candidates in accordance with all of the DCI formats to be monitored”), [0263] (“The PDCCH may carry DCI format...”); Ex. 1020, ¶¶[0073], [0109], [0248]. A POSITA would have known that “a control resource set (CORESET) is, in the frequency domain, a set of PRBs within which the UE 102 attempts to blindly decode downlink control information (i.e., monitor downlink control information (DCI)).” Ex. 1008, ¶[0113]; *see also id.*, ¶[0264] (“The control resource set may also be defined, in time domain, as a set of OFDM symbol(s).”).

87. A POSITA would have further known that a UE monitors PDCCH in CORESETs. Ex. 1008, ¶[0264] (“The UE 102 may monitor PDCCH in one or more control resource sets.”); *see also id.*, ¶¶[0263] (“UE 102 may attempt blind decoding of one or more PDCCH ... candidates”), [0266] (“The gNB 160 may transmit a PDCCH intended for the UE 102 using one of those candidates.”); Ex. 1020, ¶¶[0248]-[0249], [0251]. A POSITA would have known that blind decoding refers to trying various possible locations (in time-frequency space) for where the PDCCH

could possibly be. For example, Figure 17 of Nogami shows two examples of search space sets, and in one of those (called search space set #3) the OFDM symbols at which PDCCH monitoring occurs are symbols #0, #2, #4, #6, #8, #10, and #12 (there are 14 symbols in each slot):

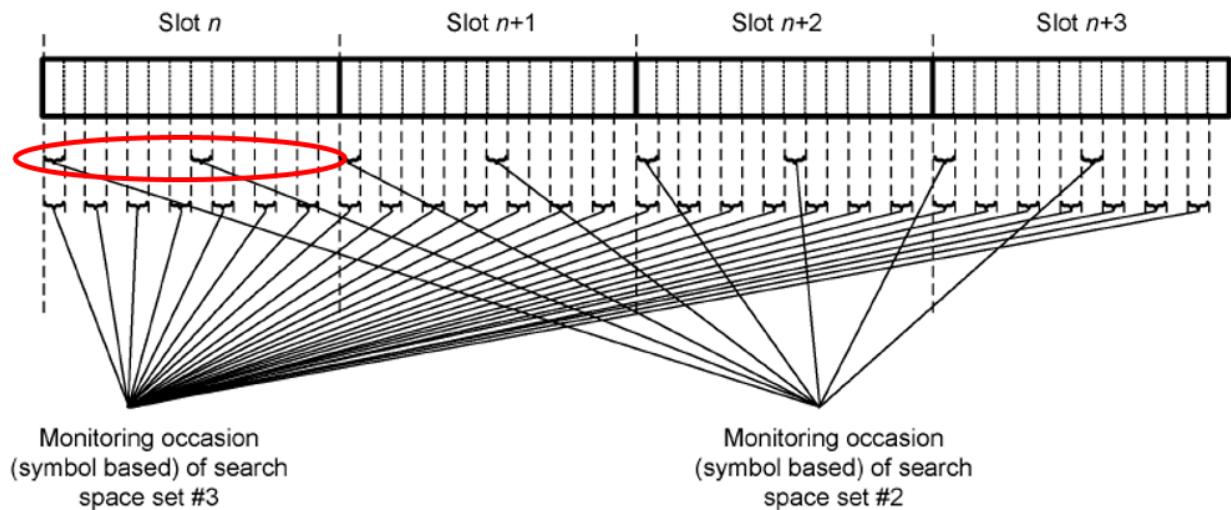


FIG. 17

Ex. 1004, FIG. 17 (annotated); *see also id.*, 29:49-67; Ex. 1012, FIG. 17, ¶¶[00112]-[00113].

88. Nogami notes that in the above example, the CORESET bitmap (called CORESET-monitor-DCI-symbolPattern) “consist[s] of 14 bits, the 1st bit to 14th bit which correspond to OFDM symbol #0 to #13, respectively,” where “[e]ach of the bits indicates whether or not PDCCH is monitored on the corresponding OFDM symbol (e.g. ‘0’ indicates no PDCCH monitoring and ‘1’ indicates PDCCH

monitoring...).”⁶ Ex. 1004, 29:54-61; Ex. 1012, ¶[00113]. In the example of search space set #3 which “indicates OFDM symbols #0, #2, #4, #6, #8, #10, #12 for PDCCH monitoring” (Ex. 1004, 29:64-67; Ex. 1012, ¶[00113]), a POSITA would have understood that the bitmap is 10101010101010. In other words, the 1st bit (most significant bit) having value ‘1’ indicates monitoring for PDCCH beginning at symbol #0, the 3rd bit having value ‘1’ indicates monitoring for PDCCH beginning at symbol #2, etc. Ex. 1004, Abstract (“The bit of which value is set to 1 indicates a start of a PDCCH monitoring occasion.”); Ex. 1012, ¶[00113]. The CORESET duration is some number of symbols—e.g., Nogami discloses that “[t]he CORESET duration is set to a value larger than 1,” and provides an example duration of three symbols. Ex. 1004, Abstract, 29:28-29; Ex. 1012, ¶[00111].

89. Nogami explicitly directs the reader’s attention to a situation in which adjacent PDCCH monitoring occasions designated by the bitmap overlap:

[I]f the CORESET duration is more than 1 OFDM symbol and at least if any of two adjacent bits of the CORESET-monitor-DCI-symbolPattern are set to “1”, PDCCH monitoring occasions starting with OFDM symbols indicated by those two bits *partially overlap*.

⁶ I note that a POSITA would have understood the “O” in this quote to be “0” in the context of the whole sentence.

Ex. 1004, 30:60-64; Ex. 1012, ¶[00117].

90. This potential for overlap is important enough that Nogami provides guidance right at the start of the specification's Detailed Description section, *in each of the first four paragraphs of that section*, about the overlap scenario. Ex. 1004, 2:46-48 ("The bitmap information may be set such that any two adjacent PDCCH monitoring occasions do not overlap with each other."), 2:63-65, 3:13-15, 3:30-32. And when Nogami describes "several ways to handle [such] overlapping" (Ex. 1004, 30:64-65), Nogami explains that "[t]he first approach is that the UE 102 is *not expected to be configured with the CORESET-monitor-DCI-symbolPattern which causes overlapping* between adjacent PDCCH monitoring occasions for a same search space set." *Id.*, 30:65-31:2; Ex. 1012, ¶[00117].

91. Thus, Nogami discloses that its signal may have an overlap situation such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration.

92. To the extent Nogami's guidance about the overlap situation does not explicitly disclose *not allowing to transmit* the signal such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration, a POSITA would have been motivated to, and found it predictable to, modify Nogami's process to implement this feature. A POSITA would have understood that it would be inappropriate for the base station (gNB) to

transmit such configurations in the first place, at least because such transmissions (1) would not be accepted by UE and would waste the transmission bandwidth, (2) would waste UE processing time, and (3) depending on UE design, might confuse the UE. Because it was known that a base station (gNB) transmits PDCCH, a POSITA would have found that *not allowing the base station to transmit* a signal indicating a bitmap corresponding to an overlap situation would have been a predictable and simple way to avoid the problem (noted in Nogami) of the UE having to deal with overlapping monitoring occasions. *See* above at Section XI.1.b; Ex. 1004, 2:49-55; Ex. 1012, ¶[00137]; Ex. 1008, ¶[0266]; Ex. 1020, ¶[0251]. In other words, a POSITA would have recognized that if the base station never transmits (due to not being allowed to transmit) a signal that corresponds to an overlap situation, then the UE (which performs blind decoding of PDCCH candidates based on the received signal) will never have to deal with the above-discussed problem of overlap. A POSITA would have had the capability to implement the above approach, because a POSITA would have known how to implement transmission or non-transmission of various signals. Such an implementation would have been well within the skills of POSITA and, therefore, a POSITA would have had a reasonable expectation of success regarding such an implementation.

2. Claim 2

- a. **“The method of claim 1, wherein the network node is not allowed to transmit the signal indicating that the first duration is 2 and the bit map is 11000000000000.”**

93. Nogami discloses or suggests this limitation. As discussed above for limitation 1(e), a POSITA would have found it predictable in view of Nogami to implement *not allowing the base station* (“network node”) *to transmit* a signal such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration. *See* above at Section XI.1.e. The features recited in claim 2—first duration is 2, and bitmap is 11000000000000—are just one instance of the general condition recited in limitation 1(e). For the bitmap 11000000000000, the interval between the 1st and 2nd bit positions (which have the value of ‘1’) is 1 (because 2-1=1) or alternatively 0 (because there are no bits between them), and that is smaller than the duration of 2. So for the same reasons that a POSITA would have found that Nogami discloses or suggests all the features of claim 1, a POSITA would have also found that Nogami discloses or suggests all the features of claim 2. Indeed, claim 2 falls squarely within the overlap situation noted by Nogami regarding “if the CORESET duration is more than 1 OFDM symbol and at least if any of two adjacent bits of the CORESET-monitor-DCI-symbolPattern are set to ‘1’.” Ex. 1004, 30:60-64; Ex. 1012, ¶[00117].

3. Claim 3

- a. **“The method of claim 1, wherein the interval between two bit positions in the set in the bit map shall be larger than or equal to the first duration.”**

94. Nogami discloses or suggests the feature of claim 3. I am assuming that “the interval between two bit positions in the set in the bit map” as recited in claim 3 is with respect to any two bit positions, and not the two bit positions in the phrase “an interval between any two bit positions with the value of one in the set of bit positions in the bit map” recited in claim 1, because if the same pairs of bit positions were used for claims 1 and 3, then the “interval” could not simultaneously be “smaller than the first duration” (as required for claim 1) and “larger than or equal to the first duration” (as required by claim 3). Claim 3 does not require any specific action to be taken when the “larger than or equal to the first duration” condition is met—the claim merely says that the condition of claim 3 has to be met. Under the foregoing assumption, it is my opinion that just as it would have been predictable in view of Nogami to implement *not allowing to transmit* the signal in a certain condition involving an interval between any two bit positions with the value of one as in claim 1, it was also predictable (and trivially satisfied, and readily apparent to a POSITA) that there would exist another interval between two bit positions (not the same ones as relied upon for in claim 1) where that certain condition does *not* hold true (I note that “larger than or equal to the first duration” in claim 3 is the logical

complement of “smaller than the first duration” in claim 1). Otherwise, there would not even be a point in imposing the restriction of claim 1.

95. For example, if the first duration is 3 symbols (as in one example in Nogami, *see* Ex-1004, 29:29-30; Ex-1012, ¶[00111]), a POSITA would have recognized that claim 3 is trivially and predictably met by considering the interval between bit positions 1 and 14 (“two bit positions” for claim 3), or various other pairs of two bit positions spaced sufficiently far apart (e.g., positions 2 and 12; or positions 5 and 10; etc).

96. On the other hand, to the extent that “the interval between two bit positions in the set in the bit map” as recited in claim 3 is understood to refer to the interval between every two bit positions with a value of one in the bitmap that the network node transmits in the first step of claim 1, Nogami likewise discloses or suggests the feature. That is, just as it would have been predictable in view of Nogami to implement *not allowing to transmit* the signal in a certain condition involving an interval between any two bit positions smaller than the first duration, it was also predictable and readily apparent to a POSITA for the network node *to transmit* a bitmap, in the complementary event when an interval between every two bit positions is greater than or equal to the first duration.

4. Claim 6

- a. “The method of claim 1, wherein the network node transmits a Physical Downlink Control Channel (PDCCH) candidate on monitoring occasion(s) of the CORESET.”

97. Nogami discloses this limitation. As discussed above for limitation 1(d), Nogami discloses with respect to Figure 17 that:

[t]he higher layer parameter *CORESET-monitor-DCI-symbolPattern* per search space set may consist of 14 bits, the 1st bit to 14th bit which correspond to OFDM symbol #0 to #13, respectively. *Each of the bits indicates whether or not PDCCH is monitored on the corresponding OFDM symbol* (e.g. “0” indicates no PDCCH monitoring and “1” indicates PDCCH monitoring, or vice versa). In this example, the higher layer parameters *CORESET-monitor-DCI-symbolPattern for search space set #2 indicates OFDM symbols #0 and #7 for PDCCH monitoring*, [while] the higher layer parameters *CORESET-monitor-DCI-symbolPattern for search space set #3 indicates OFDM symbols #0, #2, #4, #6, #8, #10, #12 for PDCCH monitoring*.

Ex. 1004, 29:54-67; Ex. 1012, ¶[00113]. I note that a POSITA would have understood the “0” in this quote to be “0” in the context of the whole sentence.

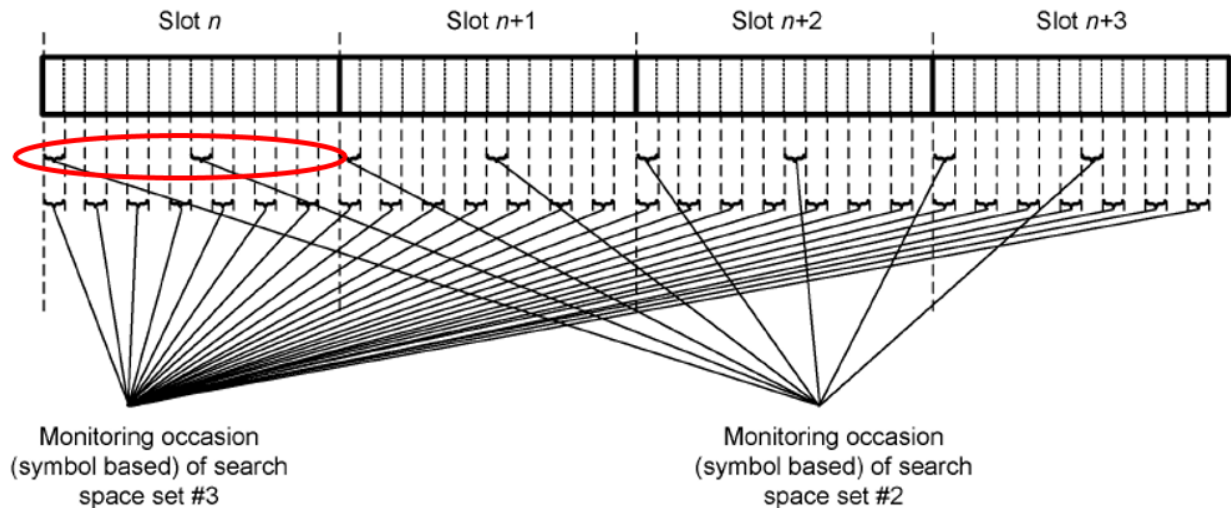


FIG. 17

Ex. 1004, FIG. 17 (annotated in red to show two monitoring occasions of the CORESET for search space set #2); Ex. 1012, FIG. 17.

98. Additionally, as discussed above for the preamble of claim 1, the base station (“network node”) transmits the first RRC configuration (indicating the CORESET duration) and second RRC configuration (including bitmap information). *See* above at Section XI.1.a; Ex. 1004, 2:49-63; Ex. 1012, ¶[00137]. Thus, a POSITA would have understood that Nogami discloses that the base station (“network node”) transmits a PDCCH candidate on monitoring occasions of the CORESET (e.g., monitoring occasions shown in Figure 17). Such understanding of a POSITA is consistent with the known use of CORESET. Ex. 1008, ¶¶[0114] (“[T]he UE 102 may monitor a set of PCCH (e.g., PDCCH) candidates.”), [0351] (“The UE 102 may monitor a set of PDCCH candidates within one or more control resource sets (also

referred to as CORESET).”), Abstract (“The UE also includes physical downlink control channel (PDCCH) receiving circuitry configured to monitor a PDCCH in the CORESET.”); Ex. 1020, ¶[0109], Abstract.

5. Claim 7

a. “The method of claim 1, wherein the signal indicates the configuration of the CORESET.”

99. Nogami discloses this limitation. As discussed above for limitation 1(b), Nogami’s “base station includes a higher layer processor configured to send a first radio resource control (RRC) *configuration* including first information for indicating a control resource set (**CORESET**) duration, and to send second RRC *configuration* including second information for indicating physical downlink control channel (PDCCH) monitoring symbols.” *See* above at Section XI.1.b; Ex. 1004, 2:49-63, Abstract; Ex. 1012, ¶[00137]. Thus, a POSITA would have understood that Nogami discloses that the signal, which indicates a CORESET duration and a bitmap specifying monitoring occasion start symbols, indicates the configuration of the CORESET. Such understanding of a POSITA is consistent with the known use of CORESET. Ex. 1008, Abstract (“The UE includes a higher layer processor configured to acquire a dedicated radio resource control (RRC) message ... including information for *indicating a configuration of a control resource set (CORESET)*.”); Ex. 1020, Abstract.

6. Claim 8

- a. **“The method of claim 1, wherein the signal is PDCCH-config information element.”**

100. Nogami discloses or suggests this limitation. The feature “the signal is PDCCH-config information element” merely refers to a particular variable name, and the specification of the ’359 Patent even admits that the choice of that variable name is found in a then-existing telecommunications standard. Ex. 1001, 12:16-22 (“In 3GPP TS 38.331, PDCCH-Config IE in the RRC standard is quoted as follows: ... The PDCCH-Config IE is used to configure UE specific PDCCH parameters such as control resource sets (CORESET), search spaces and additional parameters for acquiring the PDCCH.”), cols. 12-15 (showing the data structure named “PDCCH-Config”). A POSITA would have found it predictable to give the name of “PDCCH-Config” to a data structure indicating a CORESET duration and a bitmap for specifying PDCCH monitoring occasions, because such a data structure involves configuring PDCCH. Ex. 1004, 2:49-63; Ex. 1012, ¶[00137].

7. Claim 9

- a. **“The method of claim 1, wherein the interval is the difference between two bit positions.”**

101. Nogami discloses or suggests this limitation. As discussed above for limitation 1(e), a POSITA would have recognized that the overlap in adjacent monitoring occasions explicitly described by Nogami (Ex. 1004, 30:60-64; Ex. 1012, ¶[00117]) involves an interval (defined in this claim as the difference between

two bit positions) for adjacent ‘1’ bits that is insufficiently large, and that the interval between, e.g., the first and second instances of ‘1’ in 11000000000000 at the 1st and 2nd bits, respectively, can be considered to be 1 because $2-1=1$. And indeed, if Nogami’s CORESET duration is 2, there will be overlap between the two PDCCH monitoring occasions, meeting the limitation 1(e) not to transmit such signal. See above at Section XI.1.e. Such overlapping is disclosed by Nogami “... if the CORESET duration is more than 1 OFDM symbol and at least if any of two adjacent bits of the CORESET-monitor-DCI-symbolPattern are set to “1”, PDCCH monitoring occasions starting with OFDM symbols indicated by those two bits partially overlap.” Ex. 1004, 30:60-64. And Nogami states a possible solution to such an overlap “... first approach is that the UE 102 is not expected to be configured with the CORESET-monitor-DCI-symbolPattern which causes overlapping between adjacent PDCCH monitoring occasions for a same search space set.” Ex. 1004, 30:65-31:2.

102. To the extent Nogami does not explicitly state that the interval is the *difference between* two bit positions, this would have been predictable for a POSITA to implement because calculating a difference (subtraction) between two bit positions of the starting symbols of the two monitoring occasions would have been readily appreciated as an elementary, predictable way to keep track of the spacing between ‘1’ bits that specify monitoring occasions. A POSITA would have been

motivated, and found it predictable, to try this approach because it merely involved choosing from predictable options—e.g., calculate the difference between the bit positions, as opposed to checking how many bits are between them (which would be one fewer). This implementation would have been nothing more than grade school level arithmetic and easily within the ability of a POSITA, and therefore would have been reasonably expected to be successful.

8. Claim 11

- a. “The method of claim 1, wherein the CORESET is monitored on a number of consecutive OFDM symbol[s] provided by the first duration from the starting OFDM symbol.”

103. Nogami discloses this limitation. As discussed above for limitation 1(b), Nogami discloses that “[e]ach bit of the bitmap information may correspond to a respective *OFDM symbol* in a slot” and “[t]he bit of which value is set to 1 may indicate a *start of* a PDCCH monitoring occasion.” Ex. 1004, 2:60-63; Ex. 1012, ¶¶[0078], [0092]-[0094], [00137]. Nogami further discloses that “the configuration includes ... the *number of consecutive symbols* provided by higher layer parameter *CORESET-time-duration*” (Ex. 1004, 28:41-44) and “each bit of the *CORESET-monitor-DCI-symbolPattern* set to ‘1’ may indicate the *starting symbol of one or more consecutive OFDM symbol(s)* on which PDCCH candidate(s) are mapped” (*id.*, 30:55-59). Ex. 1012, ¶¶[00109], [00116]. Thus, a POSITA would have understood that in Nogami’s process and system, the CORESET is monitored on a

number of consecutive OFDM symbol provided by the first duration from the starting OFDM symbol.

9. Claim 22

a. “A network node, comprising;”

104. To the extent that the preamble is limiting, Nogami discloses a base station (“network node”), as explained above for claim 1. *See* above at Section XI.1.a; *see also* below at Sections XI.9.b-e (my discussion of remaining elements of this claim).

b. “a control circuit;”

105. Nogami discloses this limitation. Nogami discloses that “one or more of the elements or parts thereof included in the gNB(s) 160 and UE(s) 102 may be implemented in hardware” and “may be implemented as a chip, *circuitry* or hardware components, etc.” Ex. 1004, 9:59-10:3; *see also id.*, 36:18-20 (“The gNB 160 may comprise a higher layer processor configured to send a dedicated radio resource control (RRC) configuration...”), 41:24-30 (“one or more of the methods described herein may be implemented in and/or realized using a chipset, an application-specific integrated *circuit* (ASIC), a large-scale integrated *circuit* (LSI) or integrated *circuit*, etc.”), 41:46-51 (“A program running on the gNB 160 or the UE 102 according to the described systems and methods is a program (a program for causing a computer to operate) that controls a CPU and the like in such a manner as to realize the function according to the described systems and methods.”); Ex.

1012, ¶¶[0045], [00137], [00159], [00162]. Nogami further discloses that “gNB 160 may also include PDCCH transmitting *circuitry* which is configured to transmit a PDCCH based on the control resource set configuration.” Ex. 1004, 27:40-50; Ex. 1012, ¶[00103]. Thus, a POSITA would have understood that Nogami discloses a control circuit that controls functionality of the base station (also called gNB).

c. “a processor installed in the control circuit; and”

106. Nogami discloses this limitation for at least the reasons discussed above regarding limitation 22(b). *See* above at Section XI.9.b. For example, Nogami discloses that “gNB 160 may comprise a higher layer *processor* configured to send a dedicated radio resource control (RRC) configuration” and that “[a] program running on the gNB 160 or the UE 102 according to the described systems and methods is a program (a program for causing a computer to operate) that controls a *CPU*,” which a POSITA would have understood to be a central processing unit installed in the control circuit. *See* Ex. 1004, FIG. 3 (below), 36:18-22, 41:46-51; Ex. 1012, ¶¶[00103], [00137], [00162]. A POSITA would have understood that the processor is installed in the control circuit, e.g., because “one or more of the elements or parts thereof included in the gNB(s) 160 and UE(s) 102 may be implemented in hardware” and “may be implemented as a chip, circuitry or hardware components, etc.” and because Nogami describes its methods as being implemented/realized in circuitry. Ex. 1004, 9:59-10:3, 41:24-30; Ex. 1012, ¶¶[0045], [00159].

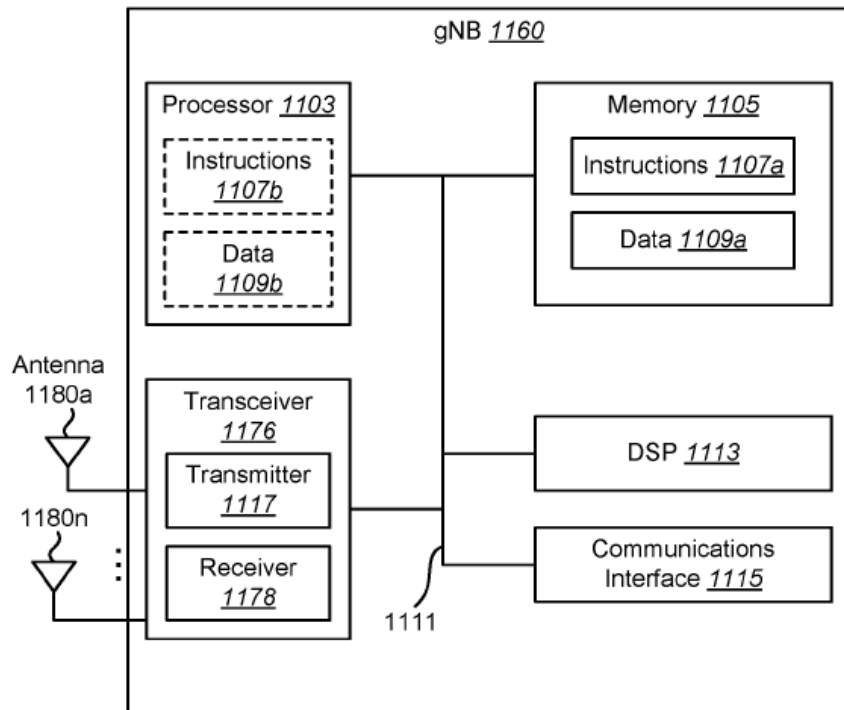


FIG. 3

Ex. 1004, FIG. 3 (showing processor 1103); Ex. 1012, FIG. 3.

d. “a memory installed in the control circuit and coupled to the processor;”

107. Nogami discloses this limitation for at least the reasons discussed above regarding limitations 22(b)-(c). *See* above at Sections XI.9.b-c. For example, Nogami discloses that “gNB 1160 includes a processor 1103 that controls operation of the gNB 1160,” and “[m]emory 1105 ... provides instructions 1107a and data 1109a to the processor 1103.” Ex. 1004, 10:45-52; Ex. 1012, ¶[0049]. A POSITA would have understood that the memory is installed in the control circuit, e.g., because “one or more of the elements or parts thereof included in the gNB(s) 160 and UE(s) 102 may be implemented in hardware” and “may be implemented as a

chip, circuitry or hardware components, etc.” and because Nogami describes its methods as being implemented/realized in circuitry. Ex. 1004, 9:59-10:3, 41:24-30; Ex. 1012, ¶¶[0045], [00159]. And as depicted in Fig. 3 of Nogami (annotated below), the memory 1105 in gNB 1160 is coupled to the processor 1103:

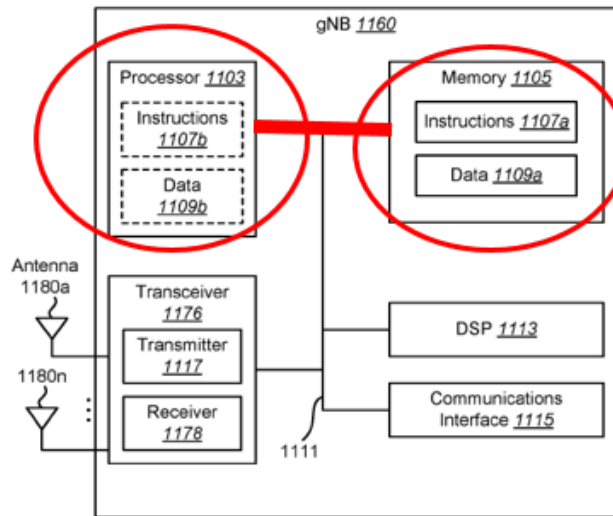


FIG. 3

Ex. 1004, FIG. 3 (annotated to show memory 1105 coupled to processor 1103); Ex. 1012, FIG. 3.

e. “wherein the processor is configured to execute a program code stored in the memory to:”

108. Nogami discloses this limitation for at least the reasons discussed above for limitations 22.b-d. *See* above at Sections XI.9.b-d. For example, Nogami discloses that “[m]emory 1105 ... provides instructions 1107a and data 1109a to the processor 1103” (Ex. 1004, 10:45-52) and “[a] program running on the gNB 160 or the UE 102 according to the described systems and methods is a program (a program

for causing a computer to operate) that controls a CPU and the like in such a manner as to realize the function according to the described systems and methods” (*id.*, 41:46-51). *See also* Ex. 1012, ¶¶[0049], [00162]. A POSITA would have understood that the program is program code implemented with instructions. This is also shown in Figure 3 of Nogami, where the Memory 1105 is shown to encompass Instructions 1107a and Data 1109a.

i. “transmit a signal indicating at least a first duration and a bit map,”

109. Nogami discloses this limitation for the reasons discussed above regarding the substantially identical limitation of claim 1. *See* above at Section XI.1.b.

ii. “wherein the first duration is time duration of a control resource set (CORESET), and”

110. Nogami discloses this limitation for the reasons discussed above regarding the substantially identical limitation of claim 1. *See* above at Section XI.1.c.

iii. “wherein the bit map includes a set of bit positions, where each bit position has a value of one or zero and each bit position with the value of one indicates a starting Orthogonal Frequency Division Multiplexing (OFDM) symbol of a monitoring occasion of the CORESET within a slot; and”

111. Nogami discloses this limitation for the reasons discussed above regarding the substantially identical limitation of claim 1. *See* above at Section

XI.1.d.

- iv. **“not allowing to transmit the signal such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration.”**

112. Nogami discloses or suggests this limitation for the reasons discussed above regarding the substantially identical limitation of claim 1. *See* above at Section

XI.1.e.

10. Claim 23

- a. **“The network mode of claim 22, wherein the CORESET is monitored on a number of consecutive OFDM symbol[s] provided by the first duration from the starting OFDM symbol.”**

113. Nogami discloses this limitation for the reasons discussed above regarding the limitation of claim 11. *See* above at Section XI.8.

XII. GROUND 2: NOGAMI (EX. 1004) IN VIEW OF CHATTERJEE (EX. 1005) AND NTT (EX. 1019) DISCLOSES OR SUGGESTS ALL THE FEATURES OF CLAIMS 4, 12-14, 16-19, AND 21

1. Claim 4

- a. **“The method of claim 1, wherein the network node is not allowed to transmit the signal such that [an] interval between any bit position in the set in the bit map and the least significant bit position in the bit map is smaller than the first duration minus one.”**

114. As discussed above, Nogami discloses or suggests the limitations of claim 1. *See* Section XI.1. Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 4. As discussed above for limitation 1(e), a POSITA would have found it predictable to implement the base station not to transmit the signal in a situation of overlapping monitoring occasions. *See* above at Section XI.1.e. A POSITA would have recognized that the monitoring occasion is to check if there is PDCCH actually conveyed in the ODFM symbols allocated to the CORESET for the purpose of conveying PDCCH candidates. A POSITA would have also recognized that a concern arises if the duration and the start symbol of a monitoring occasion are such that there will not be enough symbols left for the CORESET duration before the end of the slot is reached. For example, a POSITA would have known that for a 14-symbol slot (and a corresponding 14-bit CORESET bitmap), starting a 3-symbol-duration monitoring occasion at symbol 13 could not accommodate the CORESET duration because there are only two symbols remaining (i.e., symbols 13 and 14, if the first symbol is numbered as symbol 1)

before the end of the slot.

115. Chatterjee explicitly discloses this concern. Chatterjee, like Nogami, is directed to resource allocation for mobile communications systems, including 5G communication systems involving monitoring of PDCCH for CORESET resource configuration, and thus is analogous art to the '359 Patent. Ex. 1005, Title (“Time Domain Resource Allocation for Mobile Communications”), 1:15-18 (Field section stating: “Various embodiments of the present application generally relate to the field of wireless communications, and in particular, to time domain resource allocation for cellular communications.”), 1:20-36 (Background section describing 5G mobile communications), 2:9-13 (“Embodiments herein provide mechanisms for TDRA for DL and UL shared channels, for example, PDSCH and PUSCH, that may be *scheduled dynamically using DCI carried by PDCCH* or based on semi-static configurations, for example, DL SPS or UL transmissions without UL grant.”), 2:36-47 (describing 3GPP standards, including 5G standards), 6:49-53 (“In NR implementations, the UEs 101 *monitor* (or attempt to decode) respective sets of *PDCCH candidates* in one or more configured *monitoring occasions in one or more configured CORESETs* according to the corresponding search space configurations.”); Ex. 1001, Title, Abstract (describing CORESET monitoring occasions), 1:16-19 (Field section stating: “This disclosure generally relates to wireless communication networks, and more particularly, to a method and apparatus

for providing control resource set configuration in a wireless communication system.”); Ex. 1013, Title, 2-4, 7. For example, Chatterjee is in the same field as the ’359 Patent (e.g., resource configuration for mobile wireless communications) and is reasonably pertinent to the problem addressed by the ’359 Patent (e.g., configuring resources in a mobile 5G system in the CORESET context).

116. Chatterjee discloses that “the allocated symbols do not cross the slot-boundary.” Ex. 1005, 17:47-58; *see also* Ex. 1013, 6 (“Starting symbol = All possible starting locations within a slot possible for the lengths listed in the next bullet such that the allocated symbols do not cross the slot-boundary.”).⁷ Similarly, Chatterjee explicitly discloses making any symbol the start symbol for a physical downlink control shared channel (PDSCH) subject to the constraint that “the allocation does not cross the slot boundary.” Ex. 1005, col. 19 (Table 15); *see also id.*, col. 65 (Table 29) (“An index giving valid combinations of start symbol and length (jointly encoded as start and length indicator (SLIV). The network ***configures the field so that the allocation does not cross the slot boundary.***”). Chatterjee further explains that in a situation where a slot boundary would be crossed by a certain group of symbols, “such a transmission may need to be postponed.” *Id.*,

⁷ Citations herein to Chatterjee-provisional (Ex. 1013) are with respect to the internal pagination (at the bottom of the pages) of the originally-filed specification.

22:29-46, 35-39; *see also* Ex. 1013, 8 (“The described multi-mini-slot transmission procedure may lead to cases when mini-slot crosses slot boundary and/or ***collides with at least scheduled SRS transmission***. For such cases, dropping and/or postponing rules may need to be defined. In embodiments, in case a group of symbols in an aggregated multi-mini-slot transmission, i.e. aggregated PUSCH transmission of mapping type B, is going to cross the slot boundary, it may need to be postponed....”), 50 (“in case a group of symbols in an aggregated multi-mini-slot transmission, i.e. aggregated PUSCH transmission of mapping type B, is going to cross the slot boundary, the transmission is postponed...”).

117. A POSITA would have recognized in view of NTT that while the above disclosures of Chatterjee are in the context of physical downlink shared channel (PDSCH), the underlying concern regarding not transmitting symbols that would cross a slot boundary are applicable to CORESET monitoring for PDCCH candidates, too. NTT is a 3GPP working group meeting document that discloses various issues relating to 5G/3GPP wireless communication, including CORESET configuration (Ex. 1019, 1-2), downlink control information (DCI) formats in the context of CORESET (*id.*, 3-4), and PDCCH blind decoding by the UE (*id.*, 6-7). NTT, like Nogami, is directed to resource allocation for mobile communications systems, including 5G communication systems involving monitoring of PDCCH for CORESET resource allocation, and thus is analogous art to the ’359 Patent. For

example, NTT is in the same field as the '359 Patent (e.g., resource configuration for mobile wireless communications) and is reasonably pertinent to the problem addressed by the '359 Patent (e.g., configuring resources in a mobile 5G system in the CORESET context). Given the repeated references in Nogami to 3GPP, a POSITA would have been motivated to consult the teachings of NTT, which is a 3GPP working group meeting document, especially because, like Nogami, NTT is directed to resource allocation for mobile communications systems, including 5G communication systems involving monitoring of PDCCH for CORESET resource allocation.

118. Regarding time-domain allocation of a CORESET, NTT discloses that “[f]or non-slot-based scheduling, it is useful to enable CORESET starting at any OFDM symbol, where the *need of some restrictions on particular cases (e.g., whether a CORESET can span a slot boundary)* should be FFS [for future study].” *Id.*, 2. A POSITA would have known that implementing a CORESET involves monitoring a PDCCH in the CORESET. *See, e.g.*, Ex. 1008, Abstract (“monitor a PDCCH in the CORESET”); Ex. 1020, 139 (Abstract, disclosing “a physical downlink control channel (PDCCH) in the control resource set”).

119. Therefore, a POSITA would have recognized, based on NTT’s explicit mention of a restriction in the situation of CORESET spanning a slot boundary, that it would have been undesirable to use symbols that cross a slot boundary for

CORESET monitoring of PDCCH candidates. For example, a POSITA would have understood that for slot-based scheduling, where a search space is not present in the next slot (for example, as for Slot $n+1$ in Fig. 16 of Nogami with only search space set #0 present), the symbols at the beginning of the next slot could be allocated to PDSCH for example, a situation that would lead to a collision with the across slot-boundary CORESET scheduling. As another example, a POSITA would have understood that if CORESET monitoring of PDCCH candidates would extend to the next slot (i.e., across slot-boundary), there might be overlap with search spaces that are located at the beginning of the next slot; e.g., for CORESET bitmap 10000000000001 and duration of 2.

120. Thus, a POSITA would have found it predictable, and would have been motivated, in view of Chatterjee and NTT to configure Nogami's base station ("network node") so that it is not allowed to transmit the signal such that an interval between any bit position in the set in the bit map having a value of '1' and the least significant bit position in the bit map is smaller than the first duration minus one. A POSITA would have recognized that such a small interval corresponds to a situation where there are insufficient symbols in the present slot, and a slot boundary would (undesirably) need to be crossed to provide for the CORESET duration. A POSITA would have been motivated to consider the teachings of Chatterjee and NTT when implementing Nogami's system/process because these references are in analogous

fields and because Chatterjee and NTT provide teachings about why scheduling across a slot boundary should be avoided, including in the context of monitoring a PDCCH in a CORESET.

121. For example, a POSITA would have understood that with a 14-symbol slot (with a corresponding 14-bit bitmap), starting a 3-symbol-duration monitoring occasion at symbol 13 would correspond to the bitmap having a '1' at the 13th bit position, such that an interval between the 13th bit position and the least significant bit position (here, 14th bit position) is $14-13=1$, which is smaller than the first duration minus one (i.e., is smaller than $3-1=2$). As discussed above, such a situation is problematic due to insufficient symbols (only two symbols, not three as required by the duration) in the present slot, such that a symbol in the next slot would also be needed for the CORESET. Chatterjee and NTT would have motivated a POSITA to configure the base station (disclosed in Nogami) not to transmit the signal in such a situation. Given Chatterjee's explicit disclosure about postponing a transmission that would cross a slot boundary and NTT's explicit disclosure about a restriction in the situation of CORESET spanning a slot boundary, a POSITA would have found it predictable and desirable to implement the base station to not be allowed to transmit the signal in such a situation, and, because such an implementation would have been well within the skills of POSITA, a POSITA would have had a reasonable expectation of success regarding such an implementation.

2. Claim 12

a. **“A method of a network node, the method comprising:”**

122. To the extent that the preamble is limiting, Nogami discloses a method of a base station (“network node”) for the same reasons discussed above regarding the preamble of claim 1. *See* above at Section XI.1.a; *see also* Sections XII.2.b-e (my discussion of the remaining elements of this claim).

b. **“transmitting a signal indicating at least a first duration and a bit map,”**

123. Nogami discloses this limitation for the same reasons discussed above regarding the limitation of claim 1. *See* above at Section XI.1.b.

c. **“wherein the first duration is time duration of a control resource set (CORESET), and”**

124. Nogami discloses this limitation for the same reasons discussed above regarding the limitation of claim 1. *See* above at Section XI.1.c.

d. **“wherein the bit map includes a set of bit positions, where each bit position has a value of one or zero and each bit position with the value of one indicates a starting Orthogonal Frequency Division Multiplexing (OFDM) symbol of a monitoring occasion of the CORESET within a slot; and”**

125. Nogami discloses this limitation for the same reasons discussed above regarding the limitation of claim 1. *See* above at Section XI.1.d.

- e. **“not allowing to transmit the signal such that [an] interval between any bit position with the value of one in the set of bit positions in the bit map and the least significant bit position in the bit map is smaller than the first duration minus one.”**

126. Nogami in view of Chatterjee and NTT discloses or suggests this limitation for the same reasons discussed above regarding the substantially identical limitation of claim 4. *See* above at Section XII.1.a.

3. Claim 13

- a. **“The method of claim 12, wherein the network node is not allowed to transmit the signal indicating that the first duration is 2 and the bit map is 00000000000001.”**

127. Nogami in view of Chatterjee and NTT discloses or suggests this limitation. Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12, as I explained in Section XII.2 above. As discussed above for claim 4, it would have been predictable and desirable in view of Nogami, Chatterjee, and NTT to implement the base station (“network node”) *to be not allowed to transmit* a signal such that an interval between any bit position with the value of one in the set in the bitmap and the least significant bit position in the bitmap is smaller than the first duration minus one. *See* above at Section XII.1.a. The features recited in claim 13—that the first duration is 2, and the bitmap is 00000000000001—are just one instance of the general condition recited in claim 4. For the bitmap 00000000000001, the interval between the 14th bit position (which has the value of ‘1’) and the least significant bit position (which is the same, i.e., 14th bit position) is 0 (because 14-

14=0), and that is smaller than the first duration minus one (i.e., smaller than $2-1=1$). So for the same reasons that a POSITA would have found the features of claim 4 disclosed or suggested by Nogami, Chatterjee, and NTT, a POSITA would have also found that Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 13.

4. Claim 14

- a. **“The method of claim 12, wherein the interval between a bit position in the set in the bit map and the least significant bit position in the bit map shall be larger than or equal to the first duration minus one.”**

128. Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12, as I explained in Section XII.2 above. The additional feature of claim 14 would have been predictable in view of these references for similar reasons as discussed above for claim 3 in Ground 1. I am assuming that “the interval between a bit position in the set in the bit map and the least significant bit position in the bit map” as recited in claim 14 is with respect to any bit position and the least significant bit position, and not the bit positions in the phrase “interval between any bit position with the value of one in the set of bit positions in the bit map and the least significant bit position in the bit map” recited in claim 12. Claim 14 does not require any specific action to be taken when the “larger than or equal to the first duration minus one” condition is met—the claim merely says that the condition of claim 14 has to be met. Under the foregoing assumption, it is my opinion that just as it would have

been predictable in view of Nogami, Chatterjee, and NTT to implement *not allowing to transmit* the signal in a certain condition involving an interval as in claim 12 (i.e., the condition that the interval between any bit position in the set in the bit map and the least significant bit position in the bit map is smaller than the first duration minus one), it was also predictable (and trivially satisfied, and readily apparent to a POSITA) that there would exist another interval where that certain condition does *not* hold true.

129. For example, if the first duration is 3 symbols (as in one example in Nogami, Ex. 1004, 29:29-30; Ex. 1012, ¶[00111]), a POSITA would have recognized that claim 14 is trivially and predictably met by considering the interval between bit positions 1 and 14 (e.g., bit position 14 is the least significant bit position when there are 14 bits in the bitmap as in Nogami); or positions 2 and 14; or positions 3 and 14; etc.

130. On the other hand, to the extent that “the interval” between a bit position “in the set in the bit map and the least significant bit position in the bitmap” as recited in claim 14 is understood to refer to the interval between every bit position with a value of one in the bitmap and the least significant bit position in the bitmap that the network node transmits in the first step of claim 12, Nogami likewise discloses or suggests the feature. That is, just as it would have been predictable in view of Nogami to implement *not allowing to transmit* the signal in a certain

condition involving an interval as in claim 12 (i.e., the condition that the interval between any bit position with a value of one and the least significant bit position in the bit map is smaller than the first duration minus one), it was also predictable and readily apparent to a POSITA for the network node *to transmit* a bitmap, in the complementary event when the interval between every bit position with a value of one and the least significant bit position in the bit map is greater than or equal to the first duration minus one.

5. Claim 16

- a. **“The method of claim 12, wherein the network node transmits a Physical Downlink Control Channel (PDCCH) candidate on monitoring occasion(s) of the CORESET.”**

131. Nogami discloses this limitation for the reasons discussed above regarding the limitation of claim 6. *See* above at Section XI.4.a. Also, Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12, as I explained in Section XII.2 above.

6. Claim 17

- a. **“The method of claim 12, wherein the signal indicates the configuration of the CORESET.”**

132. Nogami discloses this limitation for the reasons discussed above regarding the limitation of claim 7. *See* above at Section XI.5.a. Also, Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12, as I explained in Section XII.2 above.

7. Claim 18

- a. **“The method of claim 12, wherein the signal is PDCCH-config information element.”**

133. Nogami discloses or suggests this limitation for the reasons discussed above regarding the limitation of claim 8. *See* above at Section XI.6.a. Also, Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12, as I explained in Section XII.2 above.

8. Claim 19

- a. **“The method of claim 12, wherein the interval is the difference between two bit positions.”**

134. Nogami in view of Chatterjee and NTT discloses or suggests this limitation for reasons similar to those discussed above regarding claim 9 (*see* above at Section XI.7.a), and Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12 (*see* above at Section XII.2). The “interval” of claim 19 refers to the “interval” recited in claim 12. Just as I discussed above for claim 9 (whose “interval” refers to the “interval” of claim 1), it would have been predictable for a POSITA to implement the “interval” of claim 19 as the *difference between* two bit positions, because calculating a difference (subtraction) between two bit positions of the starting symbols of the two monitoring occasions would have been readily appreciated as an elementary, predictable way to keep track of the spacing between a ‘1’ bit and the least significant bit position. A POSITA would have been motivated, and found it predictable, to try this approach because it merely involved

choosing from predictable options—e.g., calculate the difference between the bit positions, as opposed to checking how many bits are between them (which would be one fewer). This implementation would have been nothing more than grade school level arithmetic and easily within the ability of a POSITA, and therefore would have been reasonably expected to be successful.

9. Claim 21

- a. **“The method of claim 12, wherein the CORESET is monitored on a number of consecutive OFDM symbol provided by the first duration from the starting OFDM symbol.”**

135. Nogami discloses this limitation for the reasons discussed above regarding the limitation of claim 11. *See* above at Section XI.8.a. Also, Nogami in view of Chatterjee and NTT discloses or suggests the features of claim 12, as I explained in Section XII.2 above.

XIII. GROUND 3: NOGAMI (EX. 1004) IN VIEW OF 3GPP-SPECIFICATION (EX. 1006) DISCLOSES OR SUGGESTS ALL THE FEATURES OF CLAIMS 1-4, 6-9, 11-14, 16-19, AND 21-23

1. Claim 1

136. I have been asked to analyze whether Nogami in view of 3GPP-Specification discloses or suggests the features of claims 1-4, 6-9, 11-14, 16-19, and 21-23. I present my analysis in this part of the Declaration. 3GPP-Specification is a technical specification for a 5G standard developed within the 3rd Generation Partnership Project (3GPP)—and the '359 Patent discusses mobile communication technologies being developed by 3GPP for 5G. *See, e.g.*, Ex. 1001, 1:35-39, 2:14-39. Among other topics, 3GPP-Specification, like Nogami, is directed to resource allocation for mobile communications systems, including 5G communication systems involving monitoring of PDCCH for CORESET resource allocation, and thus is analogous art to the '359 Patent. *See* Ex. 1006, 7 (defining “DCI” as “Downlink Control Information” and defining “PDCCH” as “Physical downlink control channel”), 68-69 (“For each control resource set, the UE is provided the following by higher layer parameter ControlResourceSet:”), 88 (“For the SS/PBCH block and control resource set (CORESET) multiplexing pattern 1, a UE monitors PDCCH in the Type0-PDCCH common search space....”); *see also* Ex. 1004 (Nogami), 3:33-55 (discussing 3GPP). For example, 3GPP-Specification is in the same field as the '359 Patent (e.g., resource configuration for mobile wireless

communications) and is reasonably pertinent to the problem addressed by the '359 Patent (e.g., configuring resources in a mobile 5G system in the CORESET context). Given the repeated references in Nogami to 3GPP, a POSITA would have been motivated to consult the teachings of the 3GPP-Specification.

137. 3GPP-Specification discloses that a user equipment (UE) is provided a CORESET duration and bitmap. For example, 3GPP-Specification discloses that “[f]or each control resource set, the UE is provided the following by higher layer parameter *ControlResourceSet*: ... a number of consecutive symbols provided by higher layer parameter *duration*” (Ex. 1006, 68 (emphasis in original)) and further discloses that “the UE is provided the following by higher layer parameter *SearchSpace*: ... a PDCCH monitoring pattern within a slot, indicating first symbol(s) of the control resource set within a slot for PDCCH monitoring, by higher layer parameter *monitoringSymbolsWithinSlot*” (*id.*, 69 (emphasis in original)). A POSITA would have understood that the parameters *duration* and *monitoringSymbolsWithinSlot* correspond to the CORESET duration and bitmap described in Nogami, because they are described in the same manner in the two references. Therefore, given the similar subject matter in the two references, a POSITA implementing Nogami’s process/system would have looked to 3GPP-Specification for guidance regarding implementation strategies and details, particularly because 3GPP-Specification is a publication of the same standards

organization (3GPP) described in Nogami. Ex. 1004, 3:33-51. Indeed, 3GPP-Specification lists on its cover “Release 15” which is the same 3GPP standard that Nogami states that its systems/methods are applicable to. Ex. 1006, Cover; *See* Ex. 1004, 3:47-50.

138. Limitations 1(a)–1(d) are disclosed by Nogami for the reasons that I explained in the discussion above with respect to Ground 1 (Sections XI.1.a–XI.1.d). Limitation 1(e) recites: “not allowing to transmit the signal such that an interval between any two bit positions with the value of one in the set of bit positions in the bit map is smaller than the first duration.” With respect to limitation 1(e), the 3GPP-Specification discloses, in the context of describing its bitmap (*monitoringSymbolsWithinSlot*), that:

A UE ***does not expect*** any two PDCCH monitoring occasions, for a same search space set or for different search space sets, in a same [CORESET] to be ***separated by a non-zero number of symbols that is smaller than the [CORESET] duration.***

Ex. 1006, 69.

139. In other words, like Nogami, 3GPP-Specification describes a condition that should be avoided. Given that Nogami’s bitmap has bits that correspond to respective symbols (with a bit value of ‘1’ indicating a start of a monitoring occasion), a POSITA would have found the foregoing disclosure of 3GPP-Specification to provide valuable guidance regarding a situation to be avoided

by not allowing signal transmission in such a situation. More specifically, since the 3GPP-Specification teaches that the UE is not expected to receive particular configurations of the PDCCH monitoring occasions (i.e., *separated by a non-zero number of symbols that is smaller than the [CORESET] duration*), a POSITA would have understood that it would be inappropriate for the base station (“network node”) to transmit such configurations in the first place, at least because such transmissions (1) would not be accepted by UE and would waste the transmission bandwidth, (2) would waste UE processing time, and (3) depending on UE design, might confuse UE. Thus, the disclosure of “does not expect” in the 3GPP-Specification would have taught or suggested to a POSITA the feature of *not allowing to transmit the signal*, as required by element 1(e) of claim 1.

140. As an example, let’s consider the bitmap of 10010000000000 and CORESET duration of 3. The 3GPP-Specification teaches that in such a case, the UE is not expected to receive such a configuration, as the CORESET duration is 3 and the number of symbols separating the first monitoring opportunity (at bit position #1) and the second monitoring opportunity (at bit position #4) is 2 (i.e., the two ‘0’ bits between the two ‘1’ bits), and $2 < 3$. And, indeed, limitation 1(e) also disallows transmission of such a configuration—the interval between the two bit positions with the value of one is smaller than the duration of the CORESET (“the first duration”).

141. In my opinion, a POSITA would have been motivated to implement a system which is not allowed to transmit the signal such that an interval between any two bit positions (where the interval is the number of bits between the bit positions) with the value of one in the set of bit positions in the bit map is smaller than the first duration. This would have been a predictable implementation of Nogami's process, particularly considering the close correspondence between the technologies described in Nogami and 3GPP-Specification, and because such an implementation would have been well within the skills of POSITA, a POSITA would therefore have had a reasonable expectation of successfully achieving such an implementation.

2. Claims 2, 3, 6-9, and 11

142. These dependent claims are disclosed or suggested by Nogami in view of 3GPP-Specification for at least the reasons discussed above regarding the respective dependent claims in Ground 1, and the reasons discussed above in Ground 3 regarding base claim 1. *See* above at Sections XI.2-8, Section XIII.1.

143. Additionally, regarding claim 2, it would have been predictable and desirable to implement the feature of the base station ("the network node") not allowed to transmit the signal indicating that the first duration is 2 and the bit map is 11000000000000. As noted above in Ground 1 for claim 2, the features recited in claim 2 are just one instance of the general condition recited in limitation 1(e), and it would have been predictable and desirable in view of 3GPP-Specification to

implement the limitation 1(e) feature for the reasons discussed above in Section XIII.1. A POSITA would have recognized that the disclosure in 3GPP-Specification about spacing two PDCCH monitoring occasions sufficiently far apart (*see* my discussion above in Section XIII.1) reflects a broader concern about avoiding overlapping monitoring occasions, and that such a broader concern is also applicable to the narrower instance recited in claim 2.

144. Additionally, regarding claim 9, it would have been predictable and desirable to implement the feature “the interval is the difference between two bit positions” in Nogami’s process in light of 3GPP-Specification’s disclosure that “[a] UE does not expect any two PDCCH monitoring occasions ... in a same [CORESET] to be *separated by a non-zero number of symbols that is smaller than the [CORESET] duration*” (Ex. 1006, 69) because the 3GPP-Specification’s condition of “separated by a non-zero number of symbols” is more restrictive than the claimed feature of “the interval is the difference between two bit positions.”

145. A POSITA would have recognized that because each bit position in Nogami’s bitmap corresponds to a symbol (where a bit value of ‘1’ indicates a monitoring occasion as explained above in Ground 1 for claim 1), 3GPP-Specification’s disclosure about avoiding separating two monitoring occasions by a nonzero number of symbols less than the CORESET duration is relevant to Nogami’s bitmap. For example, if Nogami’s bitmap begins with 101... and the

duration is 3, 3GPP-Specification instructs a POSITA that such a bitmap is undesirable because the first two ‘1’ bits (at the 1st and 3th bit positions) are separated by a non-zero number (i.e., 1) of symbols that is smaller than the duration (i.e., 3). A POSITA would have seen that in such an instance, the difference between the ‘1’ bit positions is $3-1=2$. Thus, a POSITA would have understood that it is desirable to not allow transmitting the signal in the above example where the difference between the two bit positions with the value of one is smaller than the first duration. This would have been a straightforward implementation for a POSITA because it would have merely involved elementary arithmetic (namely, a simple subtraction) which would have been well within the skills of POSITA, and thus a POSITA would have had a reasonable expectation of success regarding such an implementation.

3. Claim 4

146. Nogami in view of 3GPP-Specification discloses or suggests this claim. As discussed above for claim 1 in Ground 3, a POSITA would have had reason to look to the teachings of 3GPP-Specification when implementing Nogami’s process/system. *See* above at Section XIII.1. 3GPP-Specification discloses that “[a] UE *does not expect* to be provided a first symbol and a number of consecutive symbols for a control resource set that results to *a PDCCH candidate mapping to symbols of different slots.*” Ex. 1006, 69. Thus, a POSITA would have understood that 3GPP-Specification is describing a cross-slot-boundary situation that should

have been avoided.

147. In light of 3GPP-Specification's foregoing disclosure about the situation that should be avoided of a PDCCH candidate mapping to symbols of different slots, a POSITA would have found it predictable, and would have been motivated, to configure Nogami's base station ("network node") so that it is not allowed to transmit the signal such that an interval between any bit position in the set in the bit map having a value of '1' and the least significant bit position in the bit map is smaller than the first duration minus one. A POSITA would have recognized that such a small interval corresponds to a situation where there are insufficient symbols in the present slot, and a slot boundary would (undesirably) need to be crossed to provide all the symbols needed for the PDCCH candidates.

148. For example, a POSITA would have understood that with a 14-symbol slot (and a corresponding 14-bit CORESET bitmap), starting a 3-symbol-duration monitoring occasion at symbol 13 would correspond to the bitmap having a '1' at the 13th bit position, such that an interval between the 13th bit position and the least significant bit position (here, 14th bit position) is $14-13=1$, which is smaller than the first duration minus one (i.e., is smaller than $3-1=2$). As discussed above, such a situation is problematic due to insufficient symbols (only two symbols, not three as required by the duration) in the present slot, such that a symbol in the next slot would also be needed for the CORESET. 3GPP-Specification would have motivated a

POSITA to configure the base station not to transmit the signal in such a situation. More specifically, since the 3GPP-Specification teaches that the UE is not expected to receive particular configurations of the PDCCH monitoring occasions (i.e., a PDCCH candidate mapping to symbols of different slots, Ex. 1006, 69), a POSITA would have understood that it would be inappropriate for the base station (“network node”) to transmit such configurations in the first place, at least because such transmissions (1) would not be accepted by UE and would waste the transmission bandwidth, (2) would waste UE processing time, and (3) depending on UE design, might confuse the UE. Thus, disclosure of “does not expect” in the 3GPP-Specification would have taught or suggested to a POSITA the feature of not allowing to transmit the signal, as required by claim 4.

4. Claim 12

149. As discussed above in Section XII.2 for Ground 2, Nogami discloses the preamble of claim 12 and limitations 12(b)-(e) (*see* above at Sections XII.2.a-e for claim language). It would have been predictable and desirable in view of 3GPP-Specification to configure Nogami’s process to implement the feature of limitation 12(e) (*see* above at Section XII.2.e for claim language) for the reasons discussed above regarding claim 4 (which is substantially identical to limitation 12(e)) in Ground 3. *See* above at Section XIII.3.

5. Claims 13-14, 16-19, and 21

150. These dependent claims are disclosed or suggested by Nogami in view of 3GPP-Specification for at least the reasons discussed regarding the respective dependent claims in Ground 2, and the reasons discussed above in Ground 3 regarding base claim 12. *See* above at Sections XII.3-9, XIII.4.

6. Claim 22

151. As discussed above in Section XI.1.e for Ground 1, Nogami in view of the knowledge of a POSITA discloses or suggests all the limitations of claim 22, including limitation 22(e)(iv) (*see* above at Section XI.9.e.iv for claim language). Furthermore, it would have been predictable and desirable to a POSITA, in view of 3GPP-Specification, to configure Nogami's process to implement this feature for the reasons discussed above regarding claim 1 in Ground 3. *See* above at Section XIII.1.

7. Claim 23

152. This dependent claim is disclosed or suggested by Nogami in view of 3GPP-Specification for at least the reasons discussed regarding claim 23 in Ground 1 and claim 22 in Ground 3. *See* above at Sections XI.10, XIII.6.

XIV. CONCLUSION

153. This Declaration represents the opinions that I have formed up to date based on the material currently available to me. I reserve the right to revise, supplement, and/or amend my opinions stated in this Declaration based on new information that becomes available to me and on my continuing analysis of the materials available to me.

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

Dated: May 31, 2024



Dr. Zygmunt J. Haas