

associated with the detected first WUS.

7. The method of Claim 6, further comprising:

determining, based on the detected first WUS, to send the acknowledgement signal to the network node.

8. The method of any one of Claims 1 to 7, wherein monitoring the downlink control channel during the downlink control channel monitoring occasion associated with the detected first WUS comprises monitoring the downlink control channel during an ON duration associated with the first WUS monitoring occasion.

9. The method of any one of Claims 1 to 7, further comprising:

while abstaining from monitoring for the second WUS in the second WUS monitoring occasion, monitoring the downlink control channel during at least one additional downlink control channel monitoring occasion associated with the second WUS monitoring occasion.

10. A method performed by a wireless device (510) configured with Discontinuous Reception, DRX, the method comprising:

monitoring (1804) for a first wakeup signal, WUS, during a first WUS monitoring occasion;

in response to not detecting the first WUS during the first WUS monitoring occasion:

determining (1804) whether a condition is met;

based on determining that the condition was met, monitoring (1804) the downlink control channel during a downlink control channel monitoring occasion associated with the first WUS monitoring occasion.

11. The method of Claim 10, wherein the at least one condition is met when a metric is above a threshold value.

12. The method of Claim 10, wherein the metric comprises a quality metric and the condition is met when the quality metric is above a predetermined threshold, wherein the quality metric is based on one or more of a Reference Signal Received Power, RSRP, a Reference Signal Received Quality, RSRQ, a Channel State Information, CSI, condition, and a synchronization condition.

13. The method of any one of Claims 10 to 12, further comprising: receiving, from

a network node (560), information from which the wireless device obtains the condition that the wireless device is to use in determining whether the condition is met.

14. A method performed by a network node (560), the method comprising:

transmitting (2802) a first wakeup signal, WUS, to a wireless device (510) configured with Discontinuous Reception, DRX, during a first WUS monitoring occasion;

transmitting (2804) a downlink signal on a downlink control channel during a downlink control channel monitoring occasion associated with the first WUS monitoring occasion; and

abstaining (2806) from transmitting a second WUS to the wireless device until after a predetermined period of time.

15. The method of Claim 14, wherein abstaining from transmitting the second WUS to the wireless device until after the predetermined period of time comprises abstaining from transmitting the second WUS in a second WUS monitoring occasion based on a condition.

16. The method of Claim 15, wherein the condition comprises the second WUS monitoring occasion overlapping an active time.

17. The method of Claim 16, wherein the active time comprises a time slot during which the wireless device is monitoring the downlink control channel.

18. The method of any one of Claims 14 to 17, wherein the predetermined period of time is based on a preconfigured time period during which the wireless device abstains from monitoring for the second WUS.

19. The method of any one of Claims 14 to 18, further comprising transmitting, to the wireless device, an indication to not monitor for the second WUS.

20. The method of any one of Claims 17 to 19, further comprising:

sending a configuration to the wireless device, wherein the configuration comprises instructions for the wireless device, instructing the wireless device to, in response to detecting the downlink signal while monitoring the downlink control channel:

set an inactivity timer after detecting the downlink signal; and

abstain from monitoring for the second WUS while the inactivity timer is running; and

reset the inactivity timer in response to detecting a subsequent downlink signal in the downlink control channel before the inactivity timer expires.

21. The method of any one of Claims 14 to 20, further comprising:

in response to the wireless device detecting the first WUS during the first WUS monitoring occasion, receiving an acknowledgement signal associated with the detected first WUS from the wireless device.

22. The method of any one of Claims 14 to 21, further comprising configuring the wireless device to monitor the downlink control channel during an ON duration associated with the first WUS monitoring occasion.

23. A method performed by a network node (560), the method comprising:

transmitting (2402), to a wireless device (510) configured with Discontinuous Reception, DRX, information indicating that, in response to the wireless device failing to detect a first wakeup signal, WUS, during a first WUS monitoring occasion and at least one condition being met, the wireless device is to monitor a downlink control channel during a downlink control channel monitoring occasion associated with the first WUS monitoring occasion.

24. The method of Claim 23, wherein the at least one condition is met when a metric is above a threshold value.

25. The method of any one of Claims 23 to 24, wherein the metric comprises a quality metric and the condition is met when the quality metric is above a predetermined threshold, wherein the quality metric is based on one or more of a Reference Signal Received Power, RSRP, a Reference Signal Received Quality, RSRQ, a Channel State Information, CSI, condition, and a synchronization condition.

26. The method of any one of Claims 23 to 25, further comprising: transmitting information comprising or indicating the condition to the wireless device.

27. A wireless device (510) configured for Discontinuous Reception, DRX, the wireless device (510) comprising:

processing circuitry (520) configured to:

monitor for a first wakeup signal, WUS, during a first WUS monitoring occasion;

in response to the wireless device detecting the first WUS during the first WUS monitoring occasion:

monitor a downlink control channel during a downlink control channel monitoring occasion associated with the detected first WUS; and

abstain from monitoring for a second WUS in a second WUS monitoring occasion based on a condition.

28. The wireless device of Claim 27, wherein the condition comprises the first WUS monitoring occasion overlapping an active time.

29. The wireless device of Claim 28, wherein the active time comprises a time slot during which the wireless device is monitoring the downlink control channel.

30. The wireless device of any one of Claims 27 to 29, wherein the abstaining from monitoring for the second WUS based on the condition is in response to receiving an indication from a network node (560) to not monitor for wakeup signal, WUS, during a predetermined period of time.

31. The wireless device of any one of Claims 27 to 30, wherein in response to detecting the first WUS, the processing circuitry (520) is configured to:

detect a downlink signal while monitoring the downlink control channel;

after detecting the downlink signal, set an inactivity timer associated with a predetermined period of time;

abstain from monitoring for the second WUS while the inactivity timer is running during the predetermined period of time; and

reset the inactivity timer in response to detecting a subsequent downlink signal in the downlink control channel before the inactivity timer expires.

32. The wireless device of any one of Claims 27 to 31, wherein the processing circuitry (520) is configured to:

in response to the wireless device detecting the first WUS during the first WUS monitoring occasion, transmit, to a network node, an acknowledgement signal associated with the detected first WUS.

33. The wireless device of Claim 32, wherein the processing circuitry (520) is

configured to determine, based on the detected first WUS, to send the acknowledgement signal to the network node (560).

34. The wireless device of any one of Claims 27 to 33, wherein the processing circuitry (520) being configured to monitor the downlink control channel during the downlink control channel monitoring occasion associated with the detected first WUS comprises the processing circuitry (520) being configured to monitor the downlink control channel during an ON duration associated with the first WUS monitoring occasion.

35. The wireless device of any one of Claims 27 to 34, wherein the processing circuitry (520) is configured to:

while abstaining from monitoring for the second WUS in the second WUS monitoring occasion, monitor the downlink control channel during at least one additional downlink control channel monitoring occasion associated with the second WUS monitoring occasion.

36. A wireless device (510) configured for Discontinuous Reception, DRX, the wireless device comprising:

processing circuitry (520) configured to:

monitor for a first wakeup signal, WUS, during a first WUS monitoring occasion;

in response to not detecting the first WUS during the first WUS monitoring occasion:

determine whether a condition is met;

based on determining that the condition was met, monitor the downlink control channel during a downlink control channel monitoring occasion associated with the first WUS monitoring occasion.

37. The wireless device of Claim 36, wherein the at least one condition is met when a metric is above a threshold value.

38. The wireless device of Claim 37, wherein the metric comprises a quality metric and the condition is met when the quality metric is above a predetermined threshold, wherein the quality metric is based on one or more of a Reference Signal Received Power, RSRP, a Reference Signal Received Quality, RSRQ, a Channel State

Information, CSI, condition, and a synchronization condition.

39. The wireless device of any one of Claims 36 to 38, wherein the processing circuitry (520) is configured to receive, from a network node (560), information from which the wireless device is configured to obtain the condition that the wireless device is to use in determining whether the condition is met.

40. A network node (560) comprising:

processing circuitry (570) configured to:

transmit a first wakeup signal, WUS, to a wireless device (510) configured for Discontinuous Reception, DRX, during a first WUS monitoring occasion;

transmit a downlink signal on a downlink control channel during a downlink control channel monitoring occasion associated with the first WUS monitoring occasion; and

abstain from transmitting a second WUS to the wireless device until after a predetermined period of time.

41. The network node of Claim 40, wherein the processing circuitry (570) being configured to abstain from transmitting the second WUS to the wireless device until after the predetermined period of time comprises the processing circuitry (570) being configured to abstain from transmitting the second WUS in a second WUS monitoring occasion based on a condition.

42. The network node of Claim 41, wherein the condition comprises the first WUS monitoring occasion overlapping an active time.

43. The network node of Claim 42, wherein the active time comprises a time slot during which the wireless device is monitoring the downlink control channel.

44. The network node of any one of Claims 40 to 43, wherein the predetermined period of time is based on a preconfigured time period during which the wireless device abstains from monitoring for the second WUS.

45. The network node of any one of Claims 40 to 44, wherein the processing circuitry (570) is configured to transmit, to the wireless device, an indication to not monitor for the second WUS.

46. The network node of any one of Claims 17 to 19, wherein the processing circuitry (570) is configured to:

send a configuration to the wireless device, wherein the configuration comprises instructions for the wireless device, instructing the wireless device to, in response to detecting the downlink signal while monitoring the downlink control channel:

set an inactivity timer after detecting the downlink signal; and
abstain from monitoring for the second WUS while the inactivity timer is running; and

reset the inactivity timer in response to detecting a subsequent downlink signal in the downlink control channel before the inactivity timer expires.

47. The network node of any one of Claims 40 to 46, wherein the processing circuitry (570) is configured to:

in response to the wireless device detecting the first WUS during the first WUS monitoring occasion, receive an acknowledgement signal associated with the detected first WUS from the wireless device.

48. The network node of any one of Claims 40 to 47, wherein the processing circuitry (570) is configured to configure the wireless device to monitor the downlink control channel during an ON duration associated with the first WUS monitoring occasion.

49. A network node (560) comprising:
processing circuitry (570) configured to:

transmit, to a wireless device (510) configured for Discontinuous Reception, DRX, information indicating that in response to the wireless device failing to detect a first wakeup signal, WUS, during a first WUS monitoring occasion and at least one condition being met, the wireless device is to monitor a downlink control channel during a downlink control channel monitoring occasion associated with the first WUS monitoring occasion.

50. The network node of Claim 49, wherein the at least one condition is met when a metric is above a threshold value.

51. The network node of any one of Claims 49 to 50, wherein the metric comprises

a quality metric and the condition is met when the quality metric is above a predetermined threshold, wherein the quality metric is based on one or more of a Reference Signal Received Power, RSRP, a Reference Signal Received Quality, RSRQ, a Channel State Information, CSI, condition, and a synchronization condition.

52. The network node of any one of Claims 49 to 51, wherein the processing circuitry is configured to transmit information comprising or indicating the condition to the wireless device.

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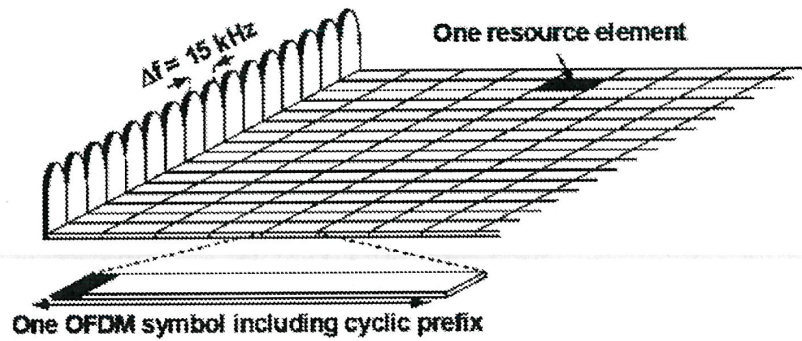


FIGURE 1

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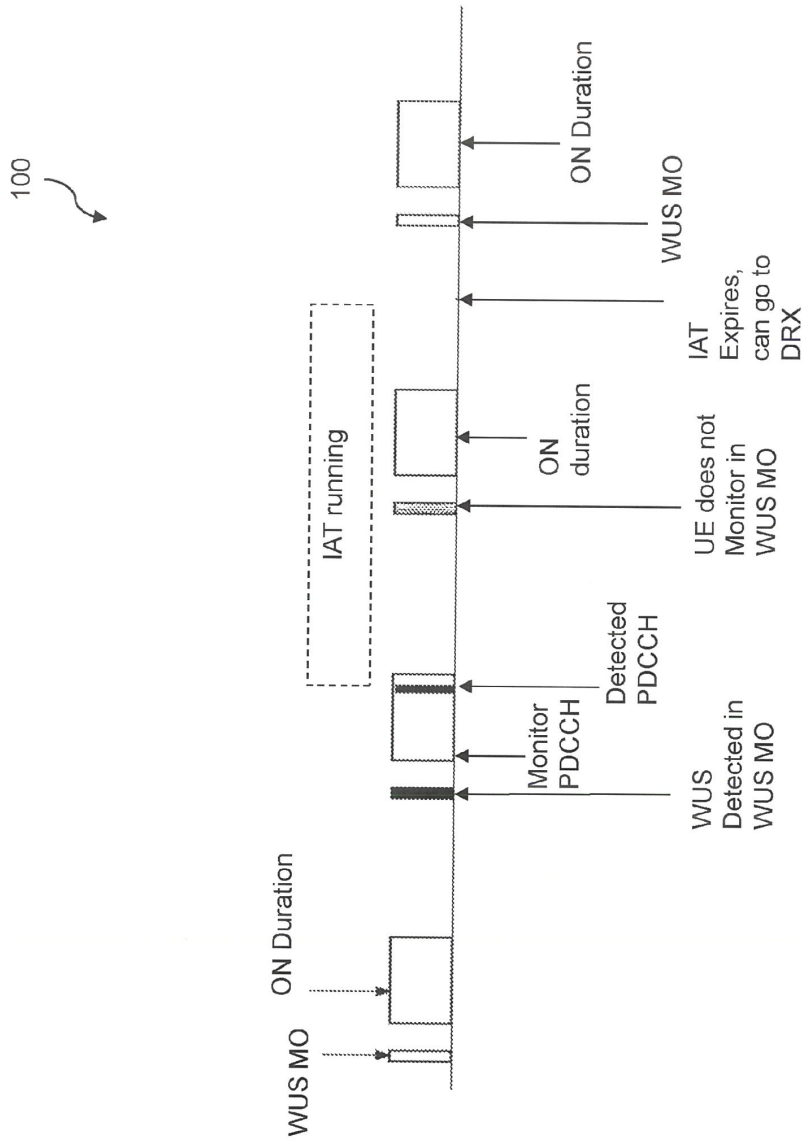


FIGURE 2

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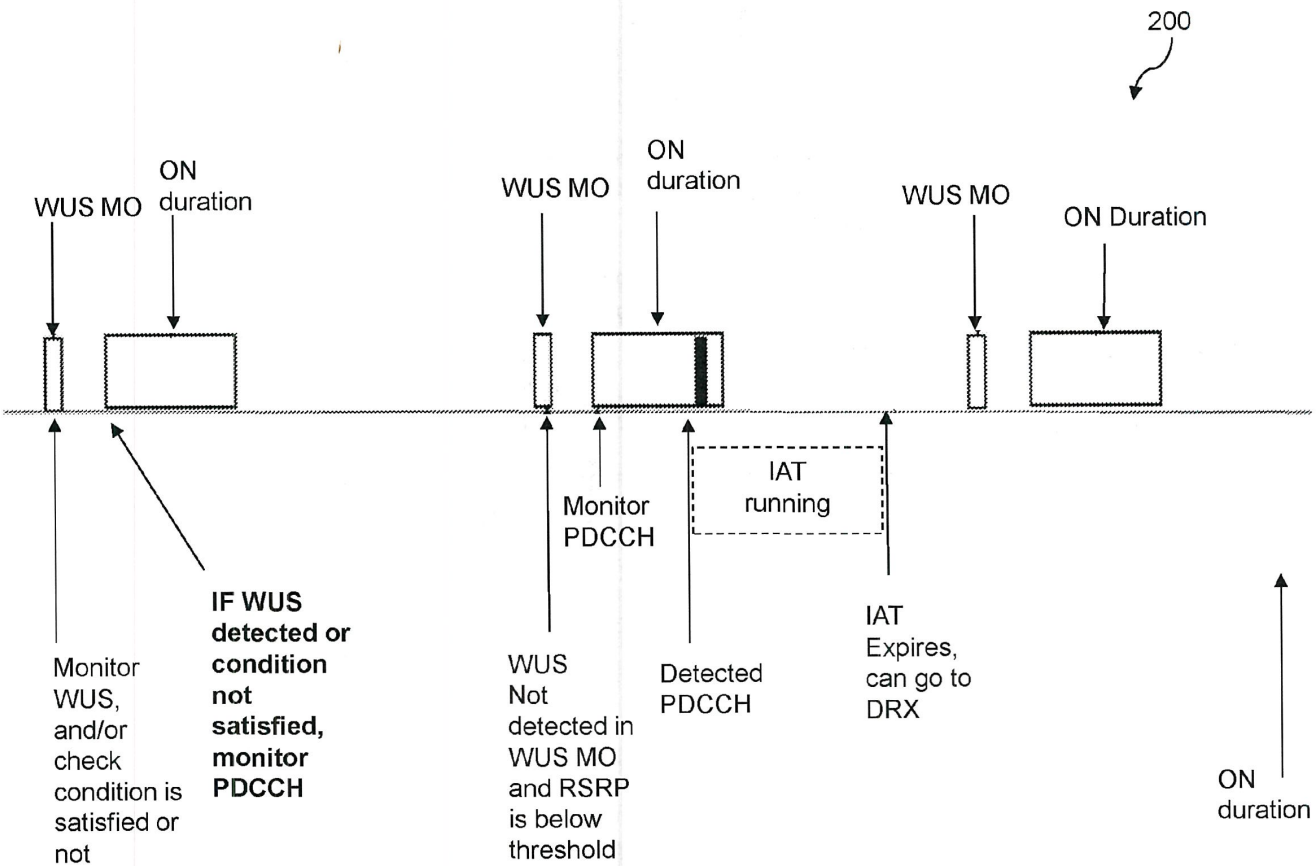


FIGURE 3

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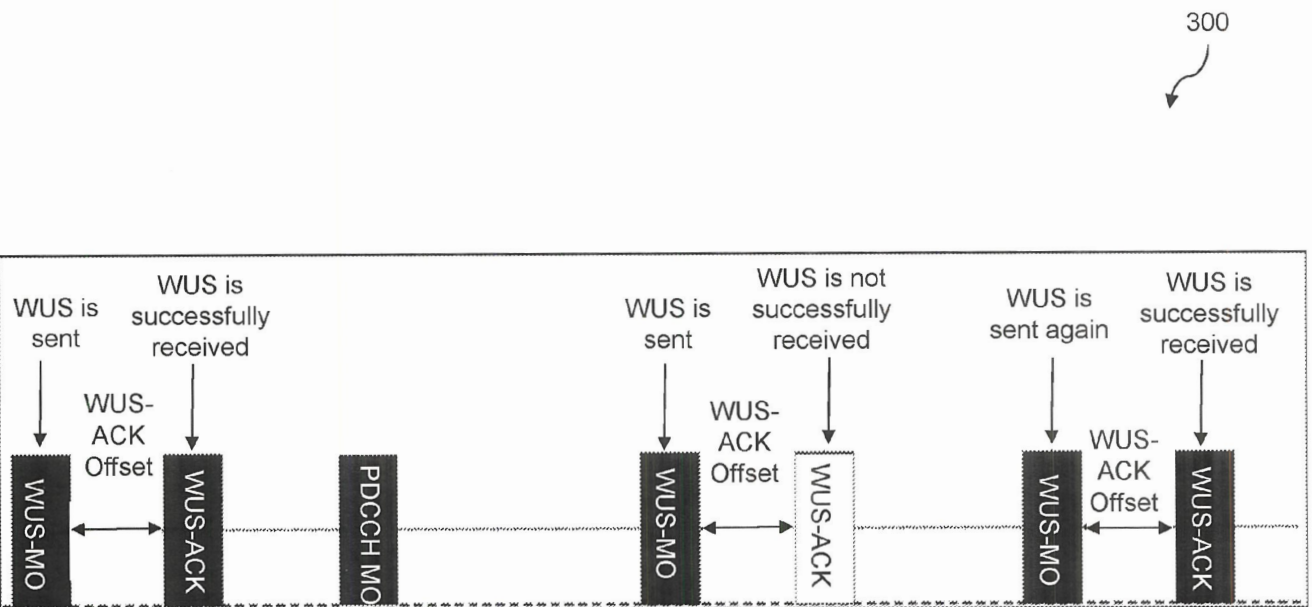


FIGURE 4

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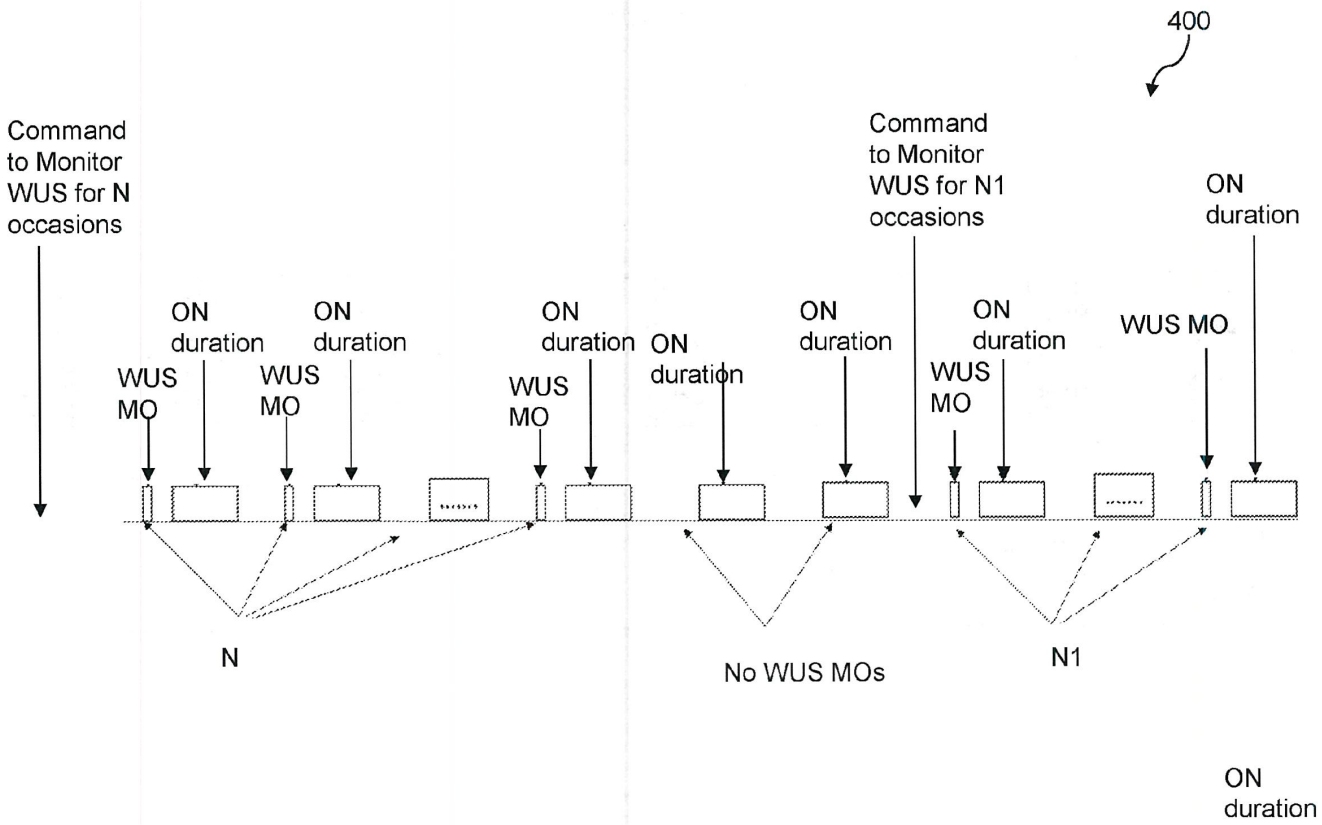


FIGURE 5

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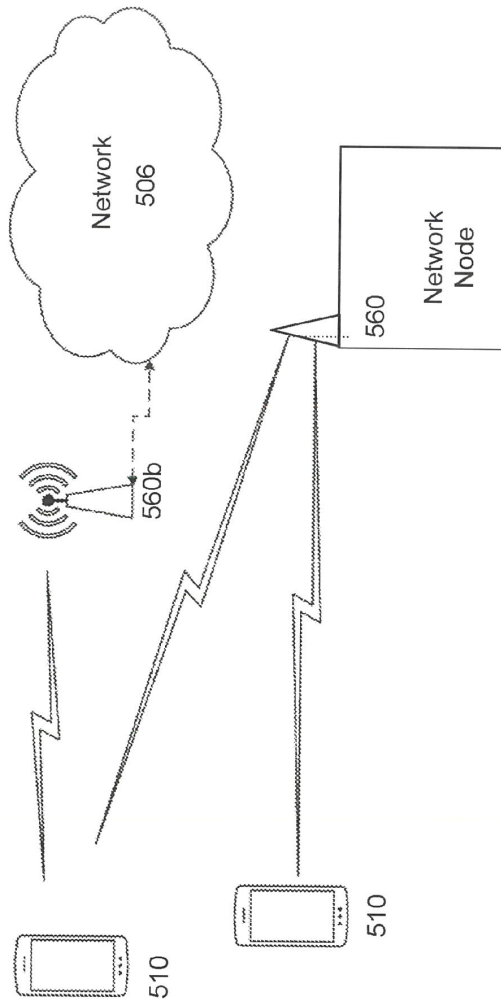


FIGURE 6

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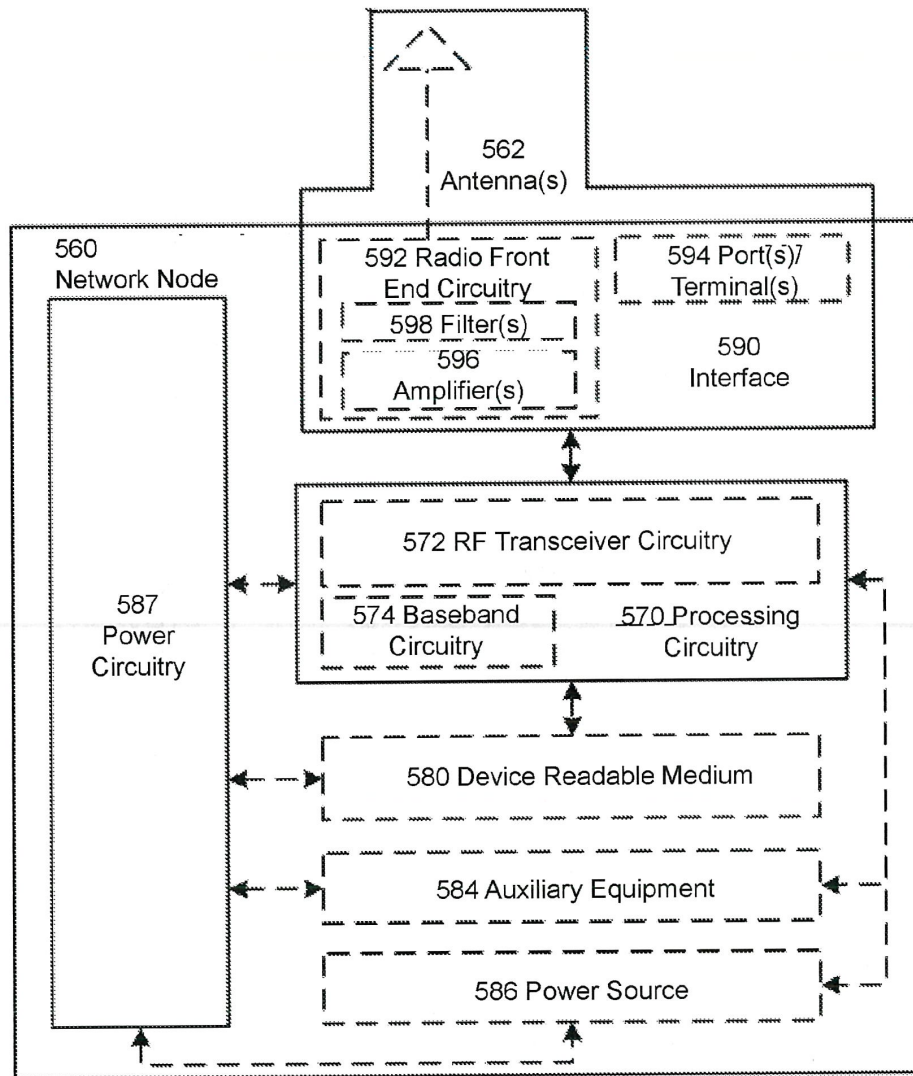


FIGURE 7

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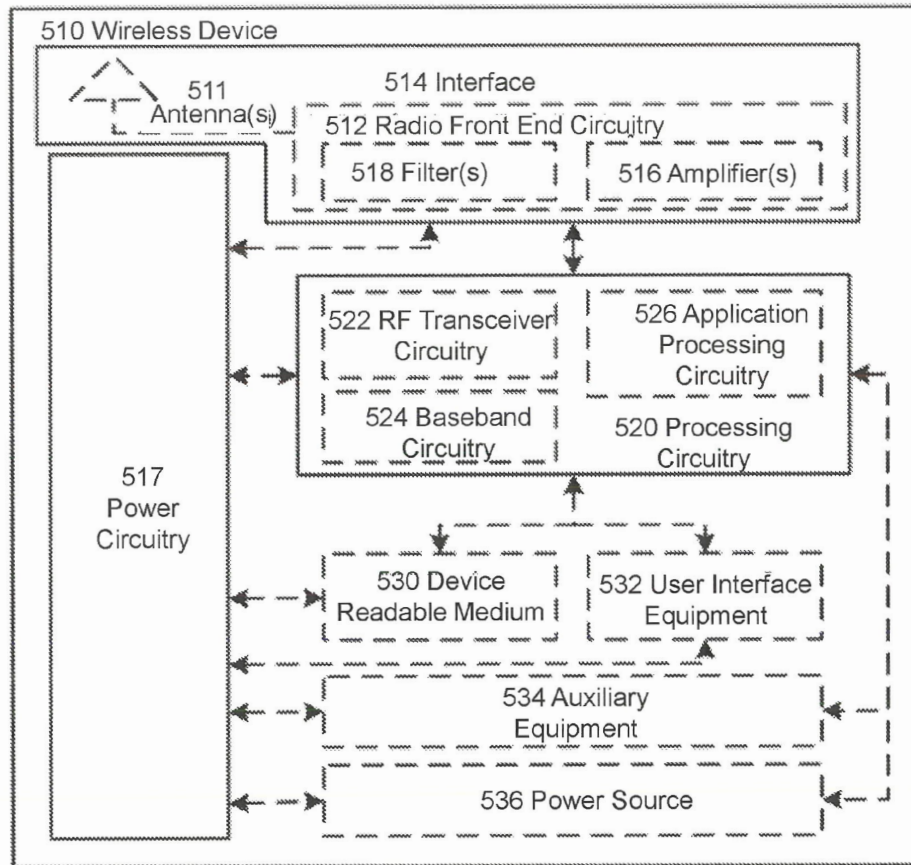


FIGURE 8

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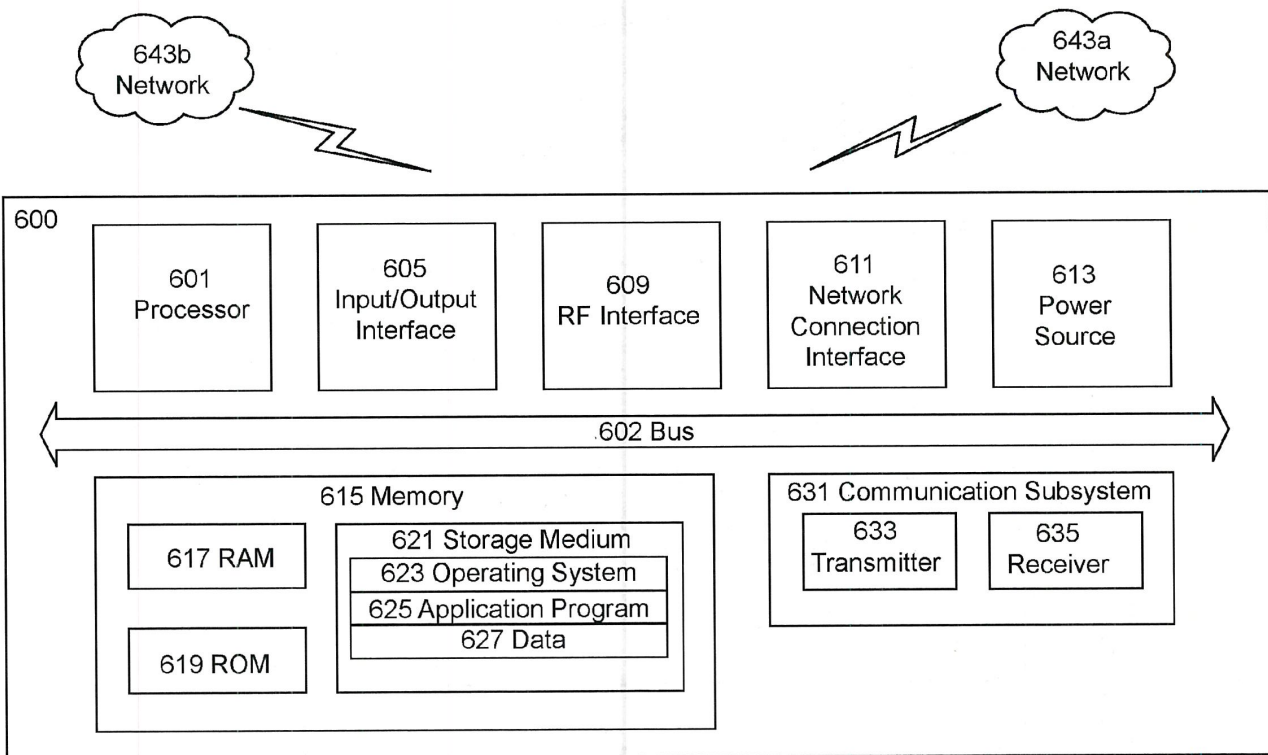


FIGURE 9

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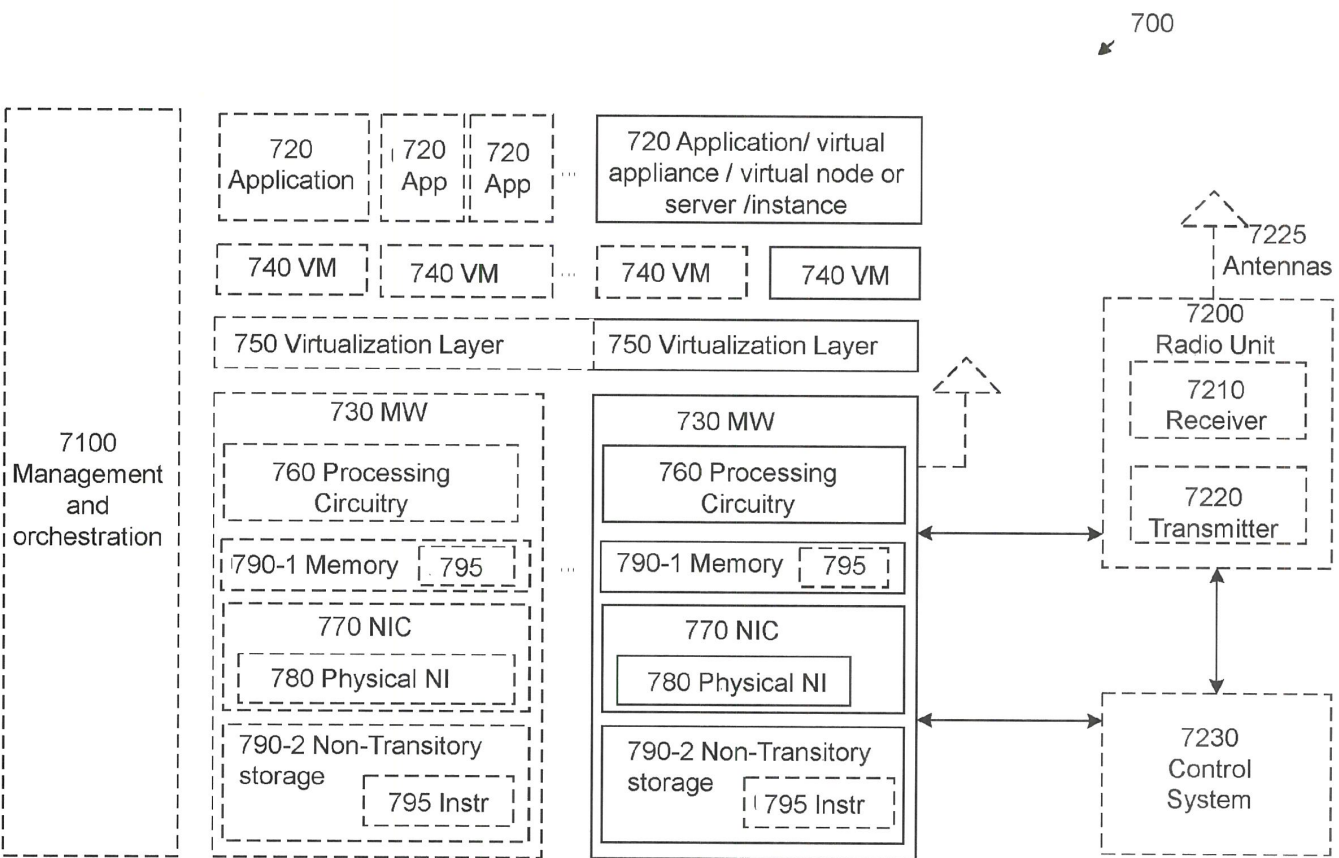


FIGURE 10

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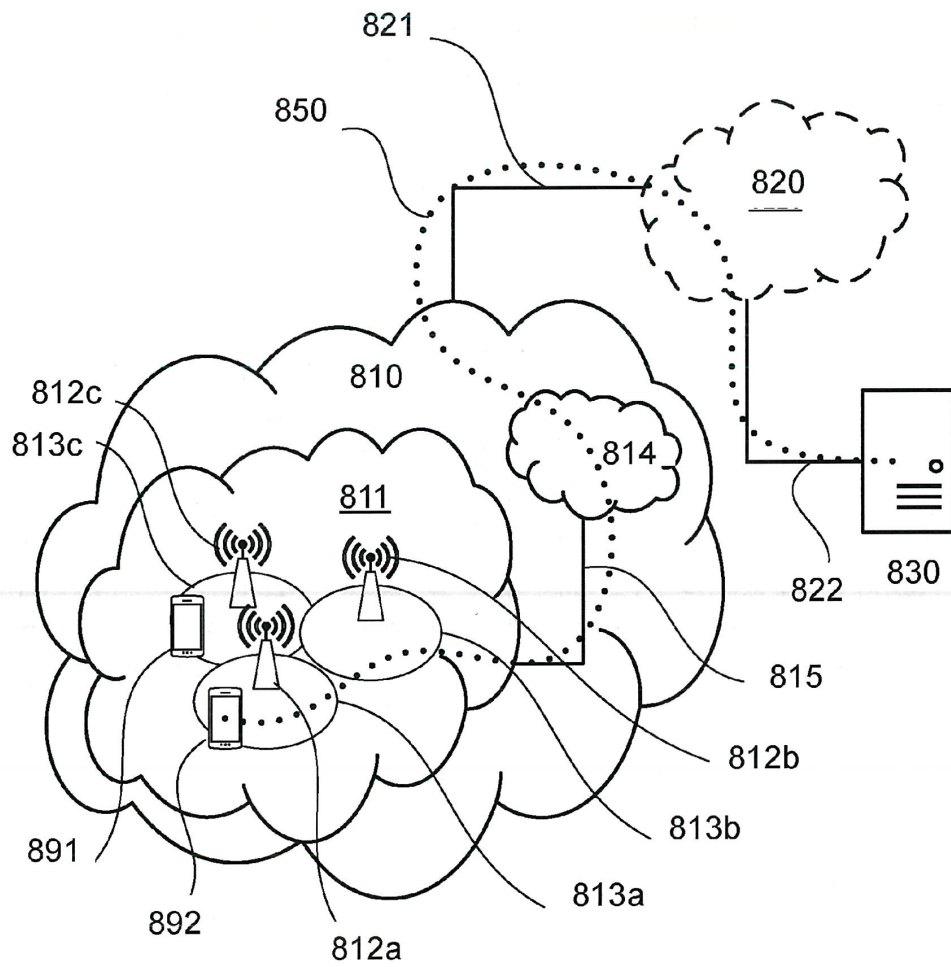


FIGURE 11

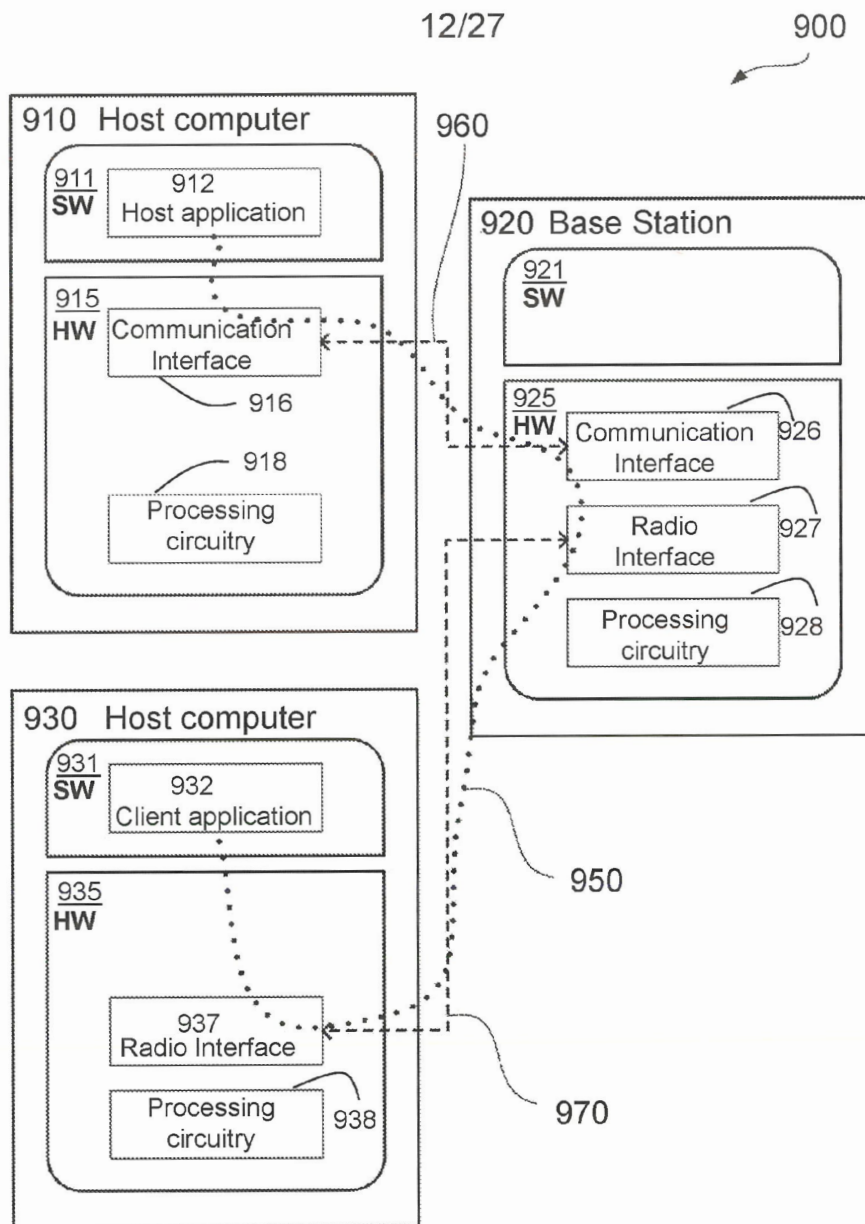


FIGURE 12

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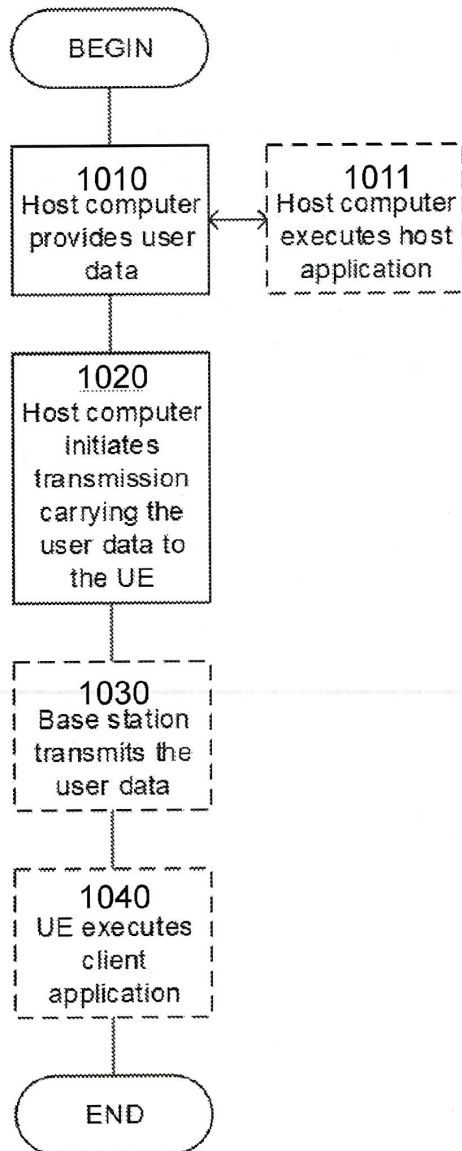


FIGURE 13

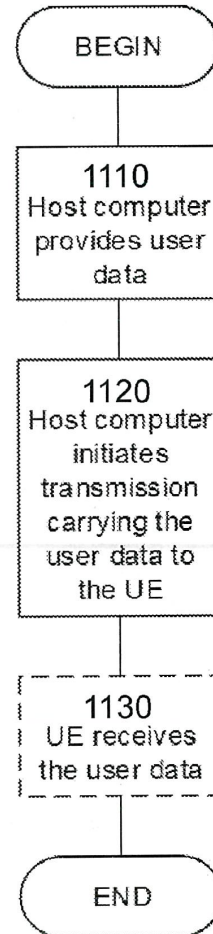


FIGURE 14

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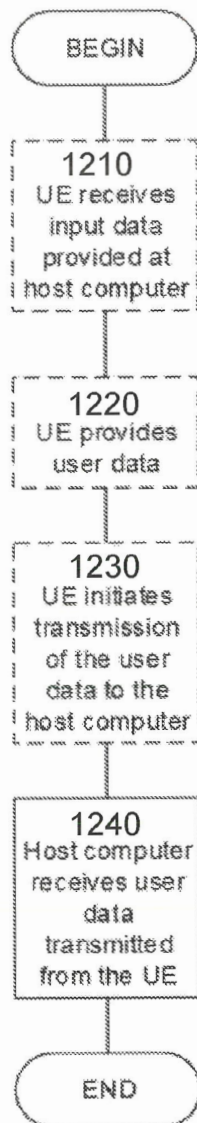


FIGURE 15

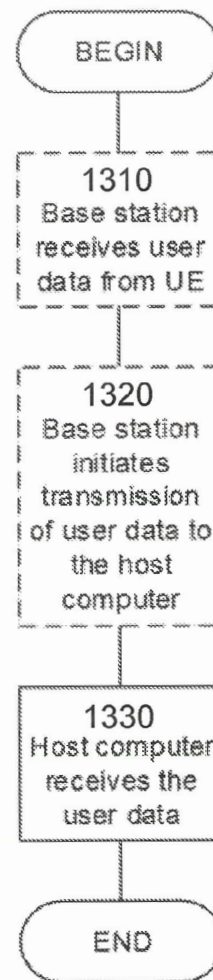


FIGURE 16

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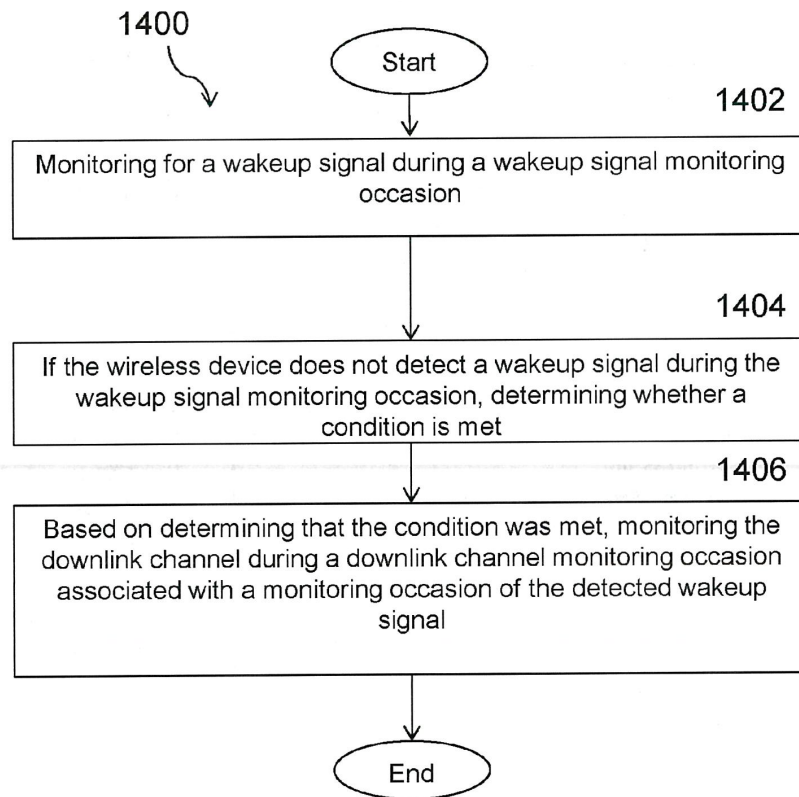


FIGURE 17

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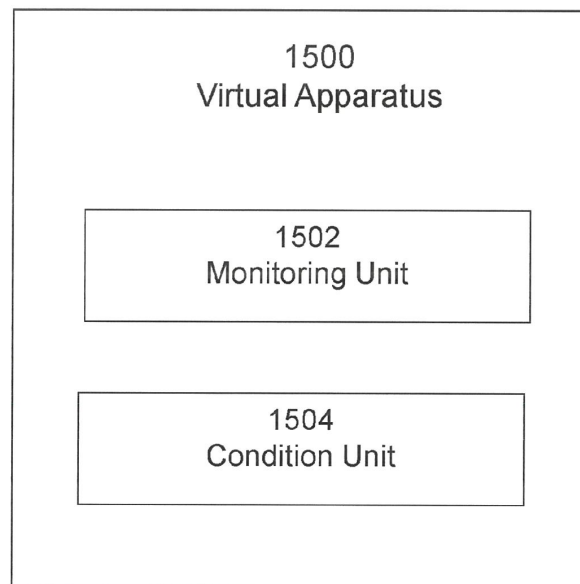


FIGURE 18

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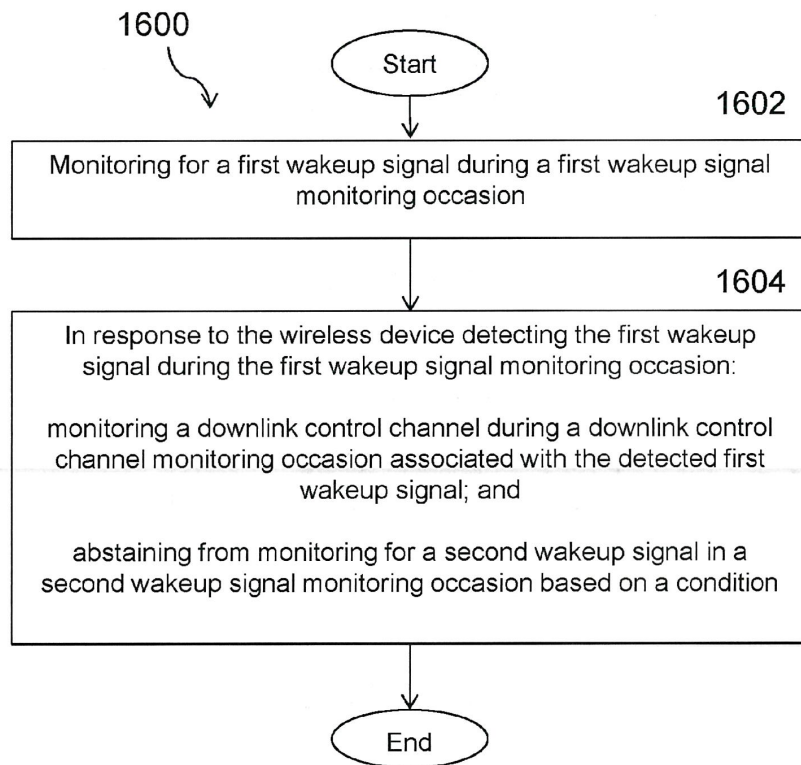


FIGURE 19

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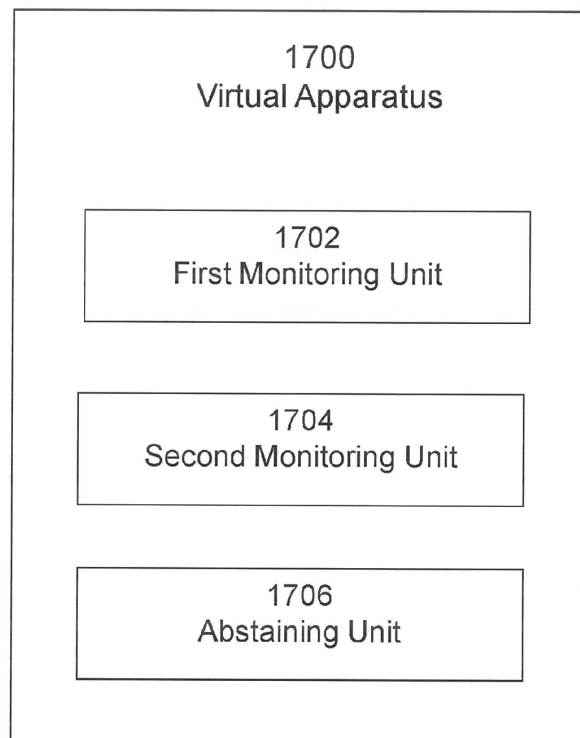


FIGURE 20

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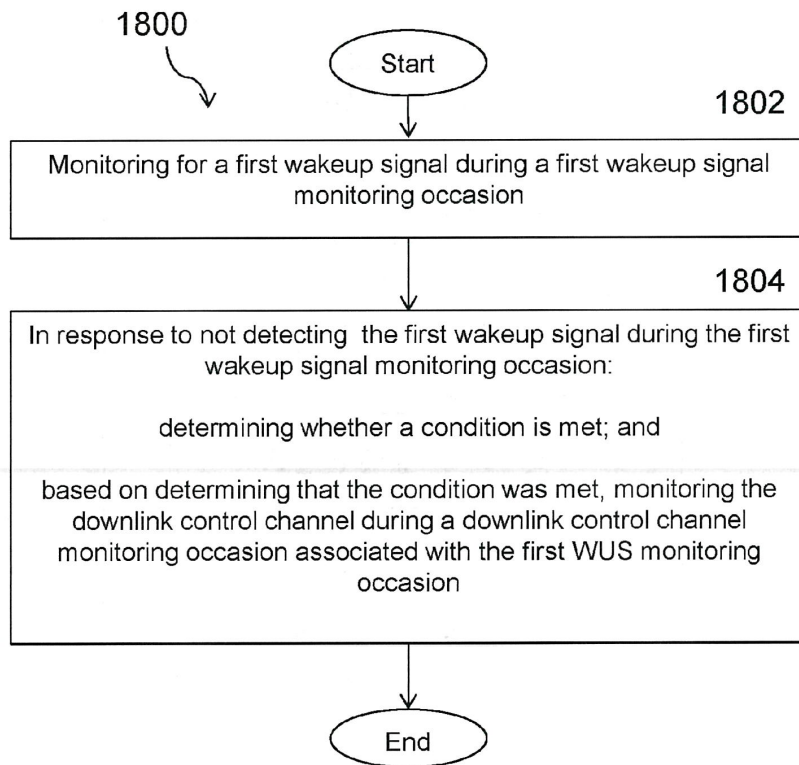


FIGURE 21

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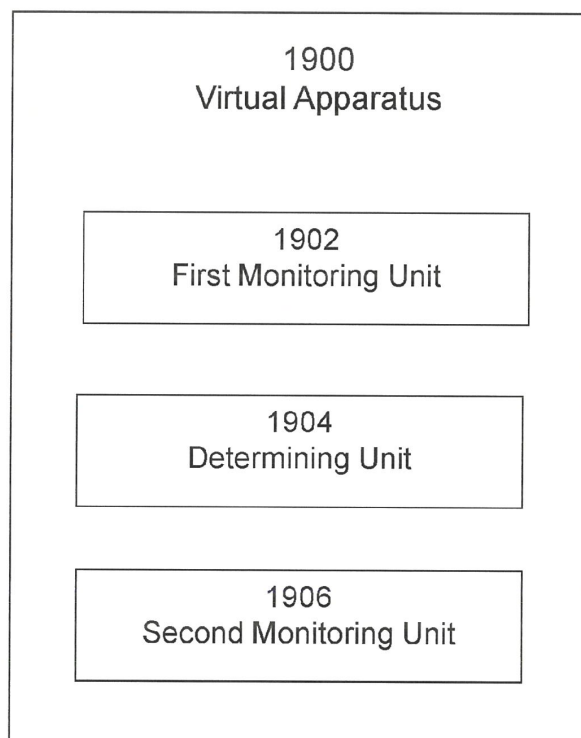


FIGURE 22

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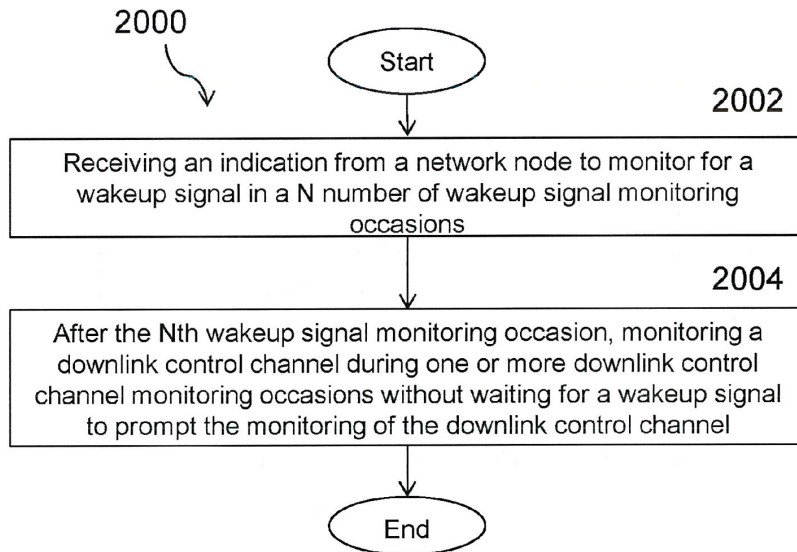


FIGURE 23

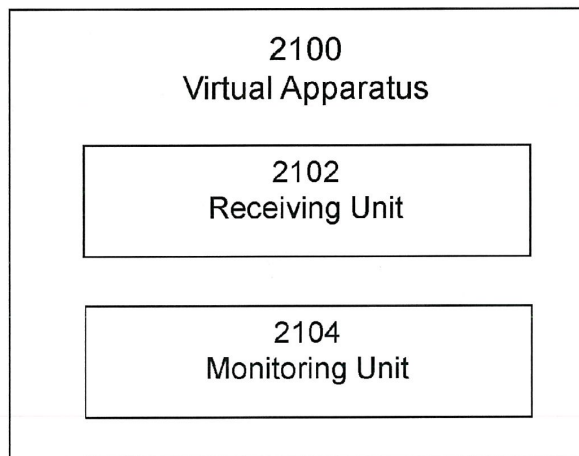


FIGURE 24

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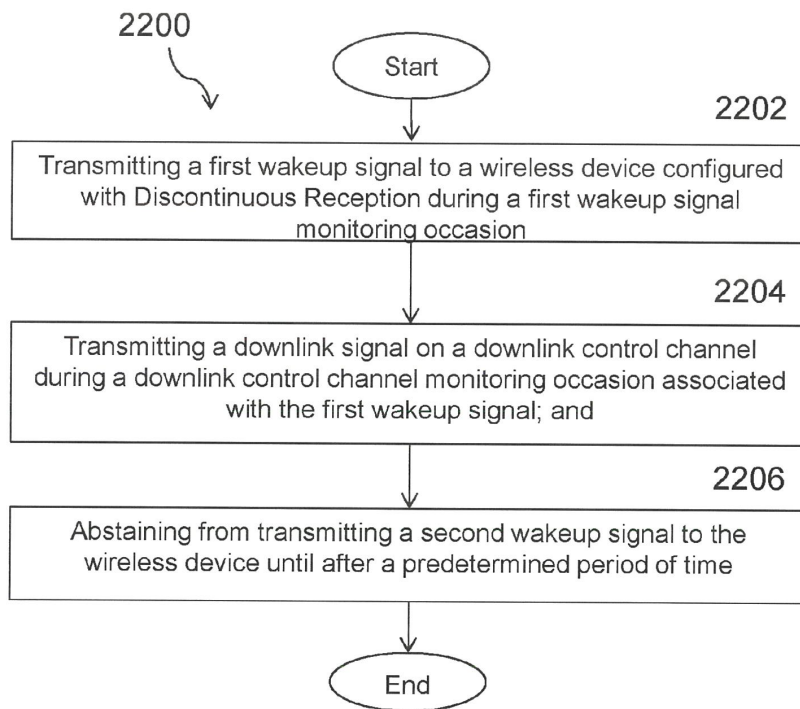


FIGURE 25

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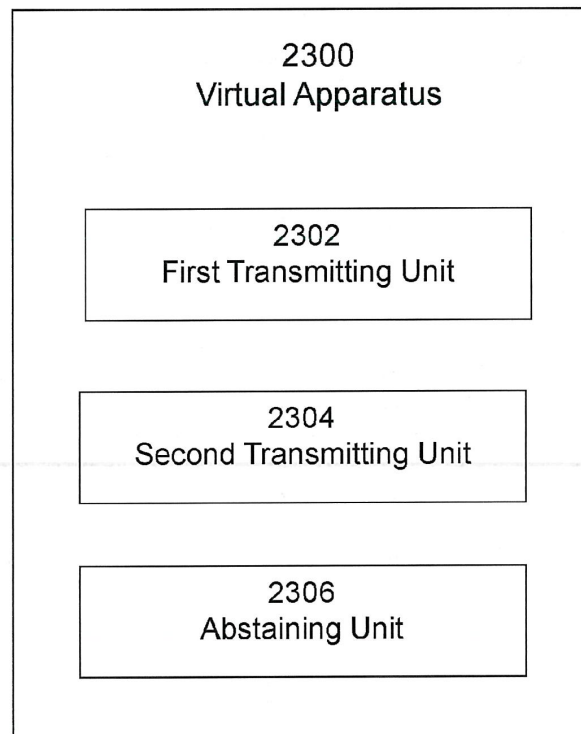


FIGURE 26

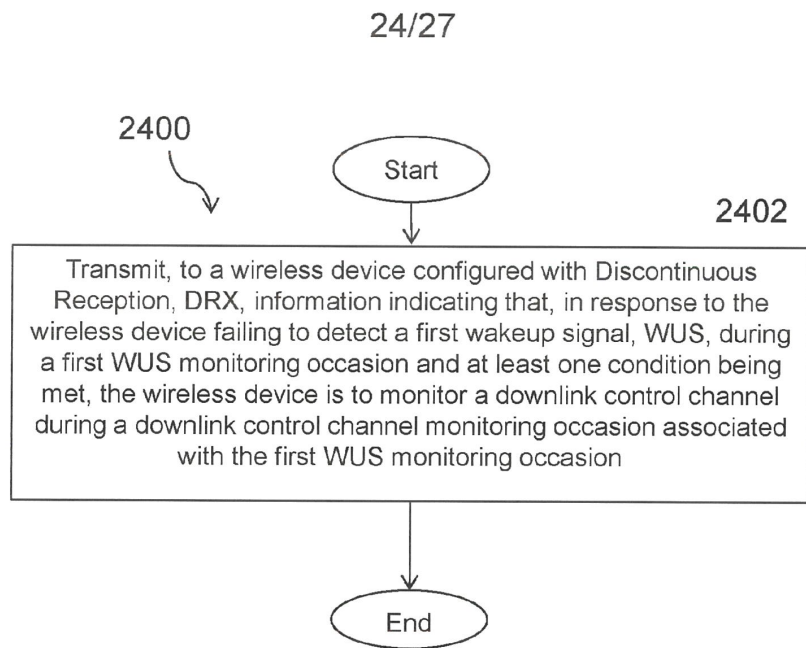


FIGURE 27

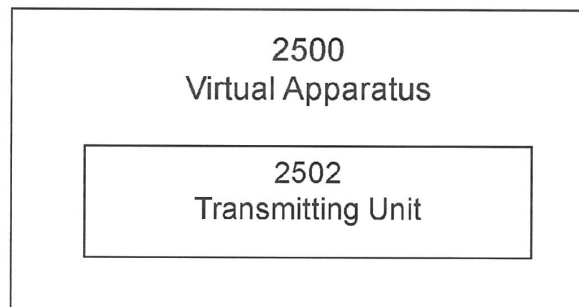


FIGURE 28

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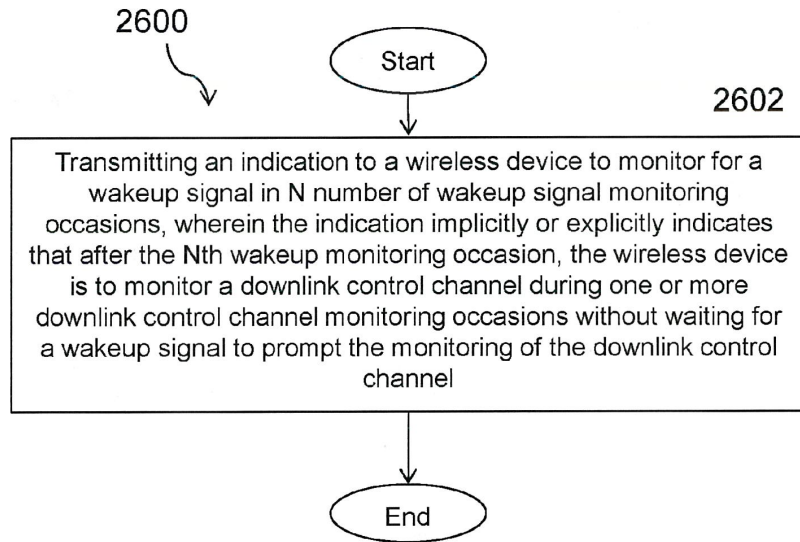


FIGURE 29

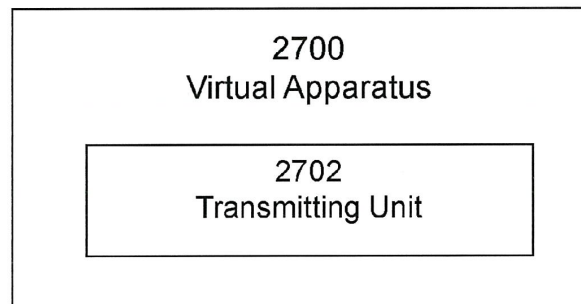


FIGURE 30

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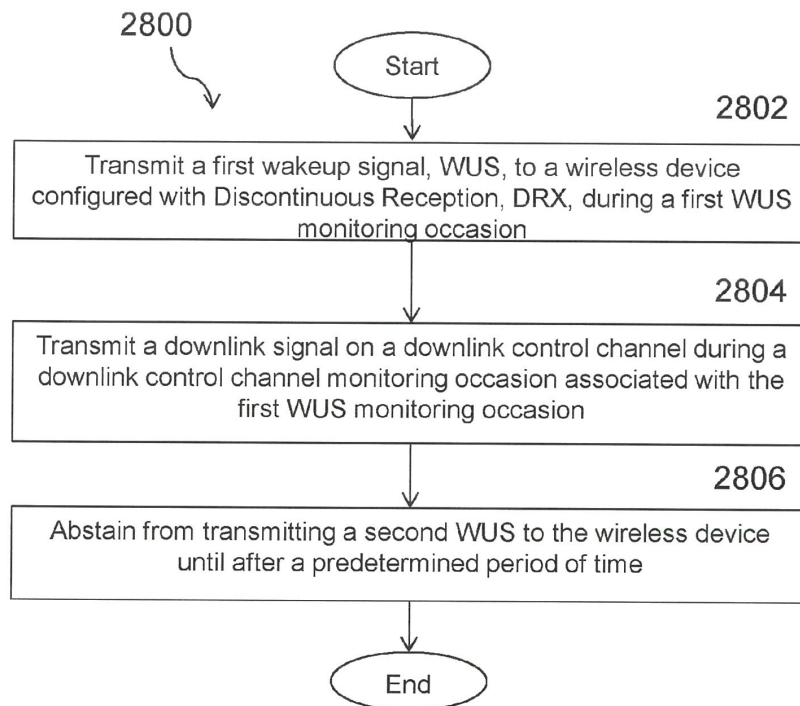


FIGURE 31

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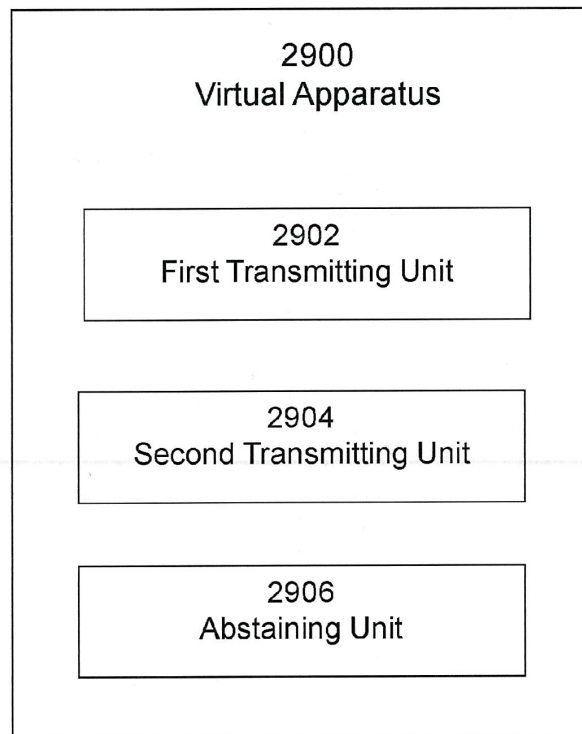


FIGURE 32

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2019/051344A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W52/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 2018/174635 A1 (LG ELECTRONICS INC [KR]) 27 September 2018 (2018-09-27) paragraphs [0125], [0141] - [0144] ----- -/--	1-4, 14-17, 27-30, 40-43 5-9, 18-26, 31-35, 44-52

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

5 March 2020

Date of mailing of the international search report

17/03/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Fax: (+31-70) 340-3016

Authorized officer

Amorotti, M

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page 1 of 2

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INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2019/051344

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	INTERDIGITAL ET AL: "Discussion on Triggering of Power Mode Adaptation", 3GPP DRAFT; R1-1813244 UE ADAPTATION BASED ON TRAFFIC_FINAL, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. Spokane, USA; 20181112 - 20181116 3 November 2018 (2018-11-03), XP051479531, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg%5Fran/WG1%5FRL1/TSGR1%5F95/Docs/R1%2D1813244%2Ezip [retrieved on 2018-11-03] paragraph [0002] -----	10-13, 36-39

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/SE2019/051344

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2018174635 A1	27-09-2018	NONE	

Form PCT/ISA/210 (patent family annex) (April 2005)

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