

EXHIBIT J-01

**Summary of Invalidity Analysis of U.S. Patent No. 9,894,644 in view of
International Publication No. WO 2015/018075 (“Zhuang”)**

International Publication No. WO 2015/018075 (“Zhuang”), published on February 12, 2015, and was filed on August 9, 2013. Therefore, Zhuang qualifies as prior art to the ’644 Patent under at least 35 U.S.C. §§ 102(a). As described in the following claim chart, at least under Pegasus’s apparent infringement theory, the asserted claims of the ’644 Patent are invalid as expressly and/or inherently anticipated by Zhuang.

To the extent that Zhuang is found not to anticipate, expressly or inherently, one or more of the asserted claims of the ’644 Patent, at least under Pegasus’s apparent infringement theory, these claims are invalid as obvious in view of Zhuang in view of the background knowledge and ordinary creativity of a person having ordinary skill in the art at the time of the alleged invention, or in combination with other prior art identified in the cover pleading, herein, or as disclosed in Defendants’ Invalidity Contentions and accompanying charts and appendices. A person of ordinary skill would have been motivated to combine Zhuang and any other prior art references, including but not limited to the other prior art identified in the cover pleading or herein, with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

Defendants reserve the right to amend or supplement this invalidity chart at a later date.

1. Claim 1

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
1[pre]	A method for receiving, by a terminal, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes, the method comprising:	To the extent the preamble is limiting, at least under Pegasus's apparent infringement theory, Zhuang discloses a method for receiving, by a terminal, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. <u>FIELD OF INVENTION</u> This disclosure relates generally to wireless communications and, more particularly, to determine the starting subframe of data channel reception or transmission. Zhuang at 1:4-6.

		<u>BACKGROUND OF THE INVENTION</u> Machine-to-Machine (M2M) applications required low-cost devices and improved coverage other than current cellular communication system. For example, some smart-metering devices suffer a significantly larger path-loss (e.g., 20dB path loss) than that in the typical operation condition of normal devices, which are often installed in the basements of residential buildings or locations shielded by foil-backed insulation, metalized windows, or traditional thick-walled building construction. In order to serve these devices, 3rd generation partnership project (3GPP) RAN working group have studied for coverage improvement and cost reduction for these MTC devices in coverage hole scenario. Some potential solutions have been identified such as repetition of the physical channels to improve the coverage. In addition, cost reduction techniques are studied, including reducing the data buffer size and operation bandwidth, reducing receiving the antenna number and so on. With repetition of most of the physical channels, there may be misunderstanding between base station and mobile station on the start time of the transmission of some physical channels. Therefore, it is important to have a method to determine the start subframe of the physical channels. The benefit of determining the start subframe is not limited to the examples above. Zhuang at 1:8-23. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. Figure 1 illustrates a mobile communication network 100 in accordance with one novel aspect. In Figure 1, the wireless communication system 100 includes one or more fixed base infrastructure units forming a network distributed over a geographical region. The base unit may also be referred to as an access point, access terminal, base station, Node-B, eNode-B, or by other terminology used in the art. In Figure 1, the one or more base stations 101 and 102 serve a number of mobile stations 103 and 104 within a serving area, for example, a cell, or within a cell sector. In some systems, one or more base stations are communicably coupled to a controller forming an access network that is communicably coupled to one or more core networks. The disclosure however is not
--	--	---

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		intended to be limited to any particular wireless communication system. Zhuang at 3:8-17. Generally, the serving base station 101 and 102 transmit downlink communication signals 112 and 113 to mobile station in the time and/or frequency domain. Mobile station 103 and 104 communicate with one or more base units 101 and 102 via uplink communication signals 113 and 114. In Figure 1, the mobile communication network 100 is an OFDM/OFDMA system comprising a base station eNB 101 eNB 102 and a plurality of mobile station 103 and mobile station 104. When there is a downlink packet to be sent from eNodeB to mobile station, each mobile station gets a downlink assignment, e.g., a set of radio resources in a physical downlink shared channel (PDSCH). When a UE needs to send a packet to eNodeB in the uplink, the mobile station gets a grant from the eNodeB that assigns a physical downlink uplink shared channel (PUSCH) consisting of a set of uplink radio resources. The mobile station gets the downlink or uplink scheduling information from a physical downlink control channel (PDCCH) or an enhanced physical downlink control channel (EPDCCH) that is targeted specifically to that mobile station. The downlink or uplink scheduling information and the other control information, carried by PDCCH, is referred to as downlink control information (DCI). In current L TE system, PDCCH or EPDCCH is transmitted in one subframe and PDSCH is transmitted in the same subframe. PUSCH start to transmit 4 subframes after the subframe transmitting PDCCH or EPDCCH for FDD. For TDD, different subframe gaps between PUSCH and the PDCCH conveying the uplink scheduling information or corresponding or Physical Hybrid ARQ Indicator Channel (PRICH) are defined for different uplink-downlink configurations in 3GPP TS 36.213. More than one transmission timing interval (TTI) can be bundled for a PUSCH transmission. Zhuang at 3:18-4:4. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. Referring now to Figure 2, Figure 2 illustrates an example of starting subframe of data channel determining in accordance with embodiments of the present invention. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates, for example channel candidate 211 and 212, wherein each candidate occupies radio resources 221, 222 from a plurality of subframes 201, 202 and 203; decoding a control channel intended for the mobile station, for example, the control channel candidate 211 is decoded by the mobile station; determining the starting subframe of a data channel 231 from the decoded control channel 211. The control channel candidate may occupy radio resources for more than one subframe. For example, the control channel candidate 211 occupies radio resources 221 in subframe 201 and 202 and the control channel candidate 212 occupies radio resources 222 from subframe 201, 202 and 203. The mobile station blindly detects for a control channel intended for the mobile station. For example, the mobile station may detect the control channel candidates 211 and 212, but only decodes the control channel 211. In one embodiment, the data channel 231 and 232 is uplink data channel. In another embodiment, the data channel 231 and 232 is downlink data channel. In one embodiment, the control channel 211 or 212 is PRICH.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

In another embodiment, the control channel is PDCCH or EPDCCH. Zhuang at 7:34-8:16.

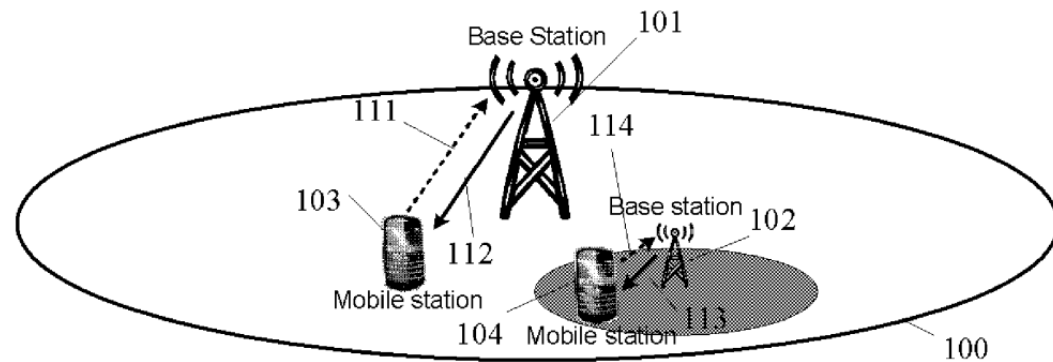


FIG. 1

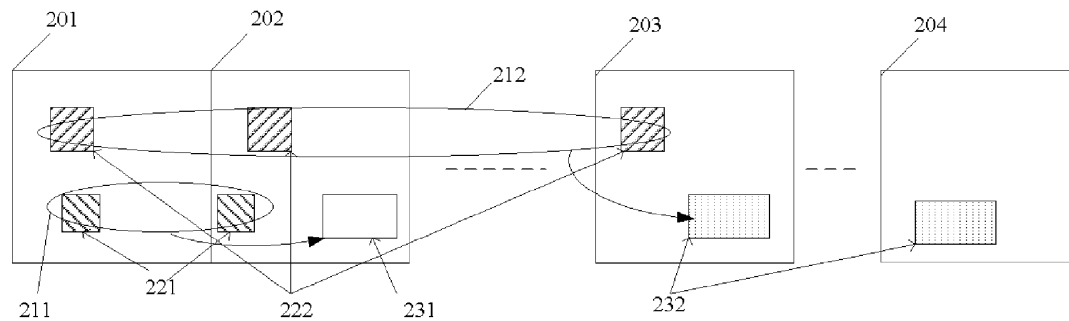


FIG. 2

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1[a]	receiving configuration information relating to the plurality of subframes through higher layer signaling;	At least under Pegasus's apparent infringement theory, Zhuang discloses receiving configuration information relating to the plurality of subframes through higher layer signaling. For example, Zhuang discloses this limitation based on the following exemplary citations: In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. The number of the plurality of subframes occupied by the each control channel candidate may be unknown to the mobile station before successfully decoded one or more of the control channel candidates (i.e., the decoded control channel intended for the mobile station). The mobile station needs to detect the number of subframes occupied by the decoded control channel. In another embodiment, determining the starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control channel and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). The gap equal to zero is a special case, which means the data channel starts on the end subframe of the decoded control channel. The gap can also be smaller than zero, and this means the data channel starts before the end subframe of the decoded control channel. In this case, the mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. When the gap is bigger than zero, the data channel starts after the end subframe of the decoded control channel. For uplink data channel transmission, the gap is always bigger than zero. Zhuang at 5:28-6:10.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. Referring now to Figure 4, Figure 4 illustrates an example of starting subframe of data channel determining with the detected number of subframes occupied by the decoded control channel and a know gap in accordance with embodiments of the present invention. In another embodiment of the disclosure, determining the starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes 400 occupied by the decoded control channel 421; and determining the starting subframe (e.g., subframe 411, 412, 413) of the data channel (e.g., 423, 424, 422) based on the detected number of subframes 400 occupied by the decoded control channel 411 and a known gap (e.g., 402, 403, 401) from the starting subframe (e.g., 411,412,413) of the data channel (e.g., 423,424,422) to the end subframe (412) of the decoded control channel 412. Zhuang at 9:3-12. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23. To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1[b]	receiving downlink control channels repeatedly allocated in the plurality of subframes and combining the received downlink control channels on the basis of the configuration information; and	At least under Pegasus's apparent infringement theory, Zhuang discloses receiving downlink control channels repeatedly allocated in the plurality of subframes and combining the received downlink control channels on the basis of the configuration information. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. <u>BACKGROUND OF THE INVENTION</u> Machine-to-Machine (M2M) applications required low-cost devices and improved coverage other than current cellular communication system. For example, some smart-metering devices suffer a significantly larger path-loss (e.g., 20dB path loss) than that in the typical operation condition of normal devices, which are often installed in the basements of residential buildings or locations shielded by foil-backed insulation, metalized windows, or traditional thick-walled building construction. In order to serve these devices, 3rd generation partnership project (3GPP) RAN1 working group have studied for coverage improvement and cost reduction for these MTC devices in coverage hole scenario. Some potential solutions have been identified such as repetition of the physical channels to improve the coverage. In addition, cost reduction techniques are studied, including reducing the data buffer size and operation bandwidth, reducing receiving the antenna number and so on. With repetition of most of the physical channels, there may be misunderstanding between base station and mobile station on the start time of the transmission of some physical channels. Therefore, it is important to have a method to determine the start subframe of the physical channels. The benefit of determining the start subframe is not limited to the examples above. Zhuang at 1:8-23. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. It is noted that, with the number of subframes occupied by the decoded control channel and the gap from the starting time of the data channel to the end of the decoded control channel, the gap from the starting time of the data channel to the starting time of the decoded control channel can be calculated and is also known to the mobile station. However, the number of subframes occupied by the decoded control channel may be unknown to the mobile. The mobile station needs to detect the number of subframes occupied by the decoded control channel. Zhuang at 5:22-27.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

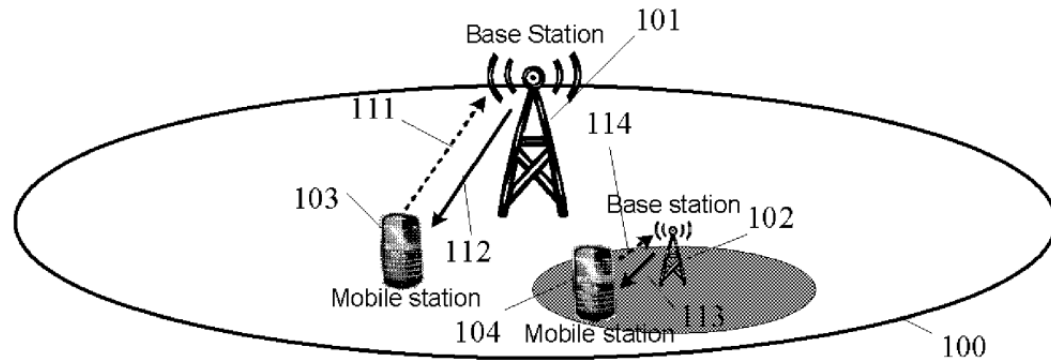


FIG. 1

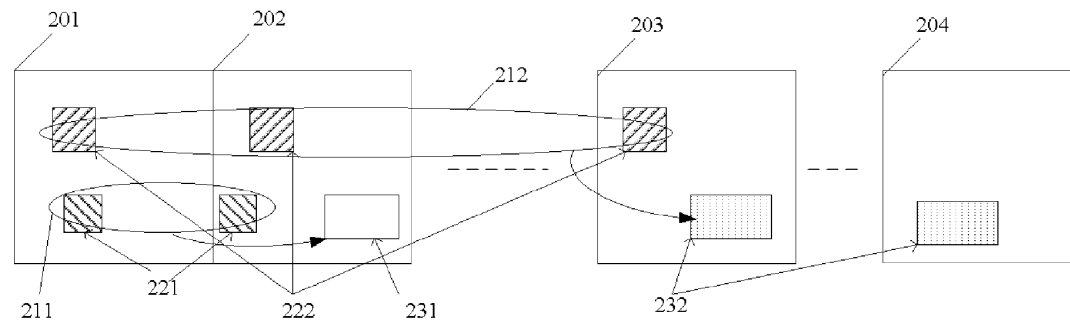
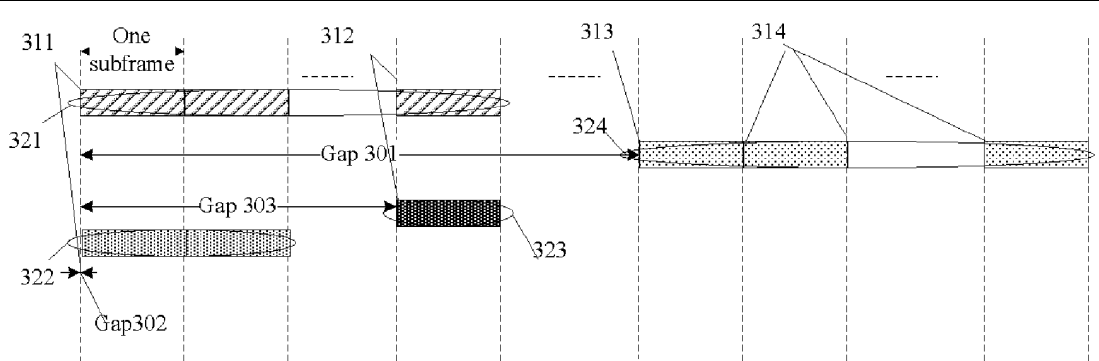
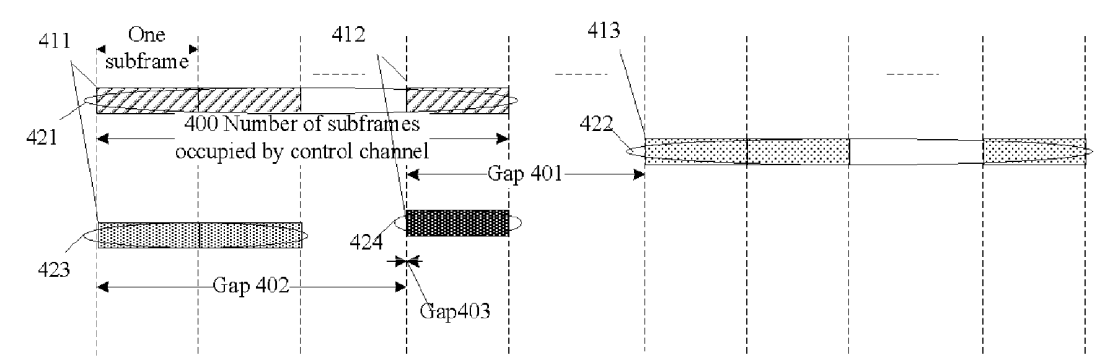


FIG. 2

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG. 3  FIG. 4 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1[c]	extracting the downlink control information from the combined downlink control channels, wherein:	At least under Pegasus's apparent infringement theory, Zhuang discloses extracting the downlink control information from the combined downlink control channels. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. Referring now to Figure 2, Figure 2 illustrates an example of starting subframe of data channel determining in accordance with embodiments of the present invention. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates, for example channel candidate 211 and 212, wherein each candidate occupies radio resources 221, 222 from a plurality of subframes 201, 202 and 203; decoding a control channel intended for the mobile station, for example, the control channel candidate 211 is decoded by the mobile station; determining the starting subframe of a data channel 231 from the decoded control channel 211. The control channel candidate may occupy radio resources for more than one subframe. For example, the control channel candidate

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		211 occupies radio resources 221 in subframe 201 and 202 and the control channel candidate 212 occupies radio resources 222 from subframe 201, 202 and 203. The mobile station blindly detects for a control channel intended for the mobile station. For example, the mobile station may detect the control channel candidates 211 and 212, but only decodes the control channel 211. In one embodiment, the data channel 231 and 232 is uplink data channel. In another embodiment, the data channel 231 and 232 is downlink data channel. In one embodiment, the control channel 211 or 212 is PRICH. In another embodiment, the control channel is PDCCH or EPDCCH. Zhuang at 7:34-8:16. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23.

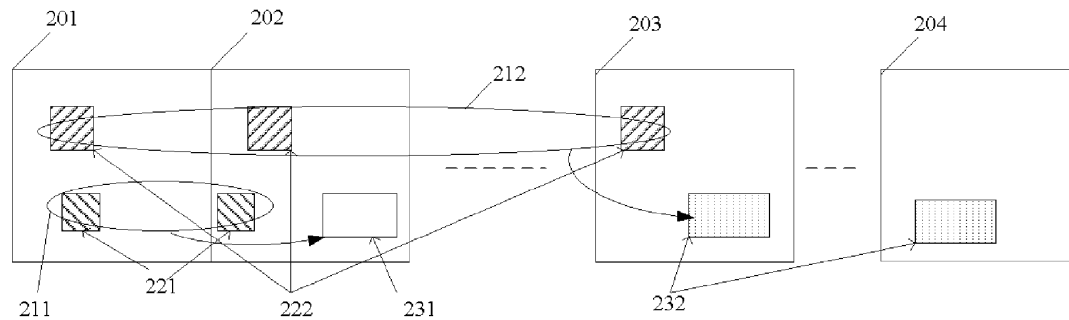


FIG. 2

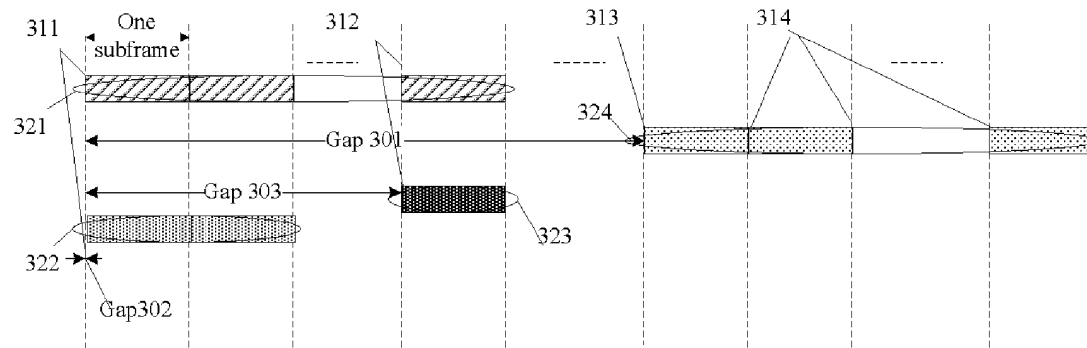
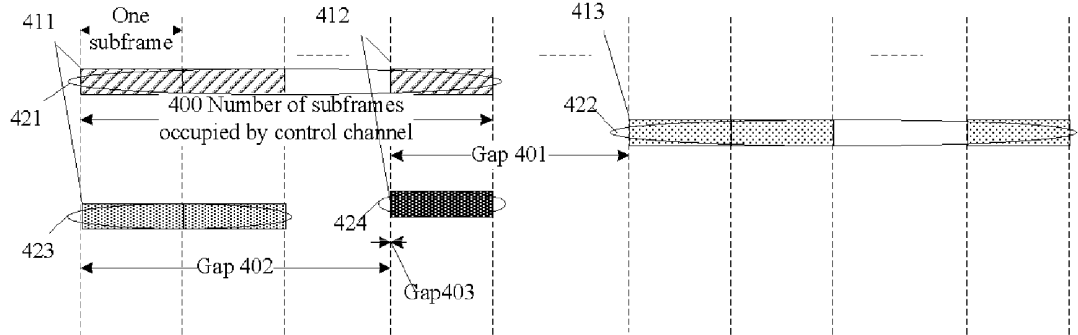


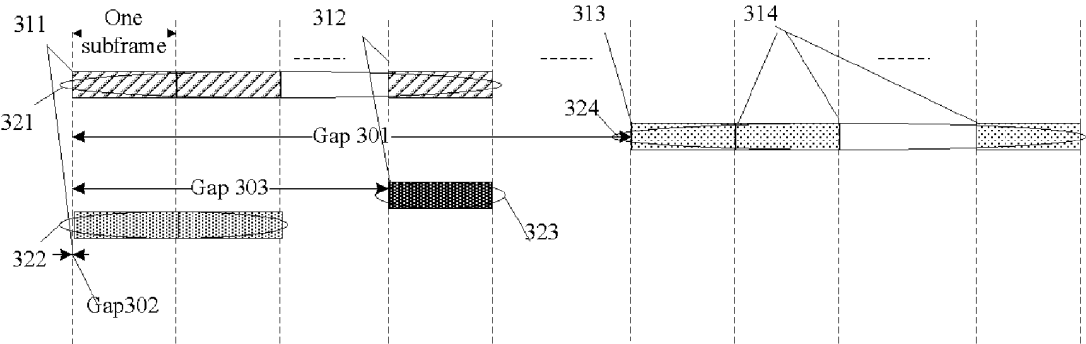
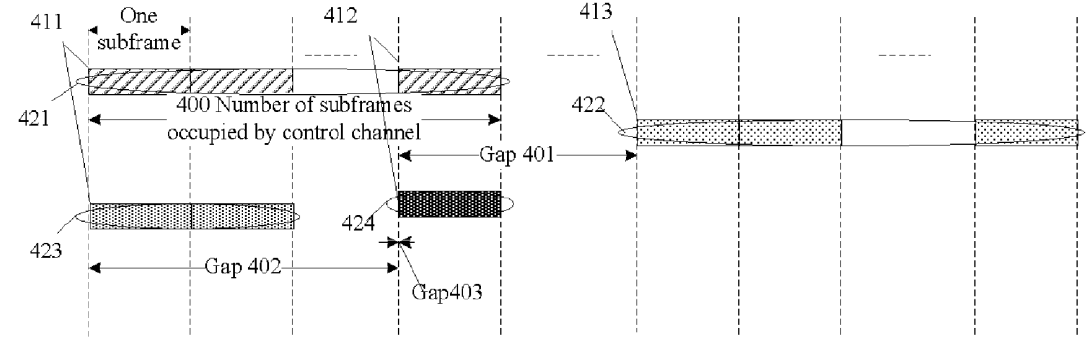
FIG. 3

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG. 4 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1[d]	the configuration information comprises information on a start subframe of the plurality of subframes; and	At least under Pegasus's apparent infringement theory, Zhuang discloses wherein the configuration information comprises information on a start subframe of the plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG. 3  FIG. 4 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1[e]	the downlink control information comprises information on the number of the plurality of subframes.	At least under Pegasus's apparent infringement theory, Zhuang discloses wherein the downlink control information comprises information on the number of the plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. It is noted that, with the number of subframes occupied by the decoded control channel and the gap from the starting time of the data channel to the end of the decoded control channel, the gap from the starting time of the data channel to the starting time of the decoded control channel can be calculated and is also known to the mobile station. However, the number of subframes occupied by the decoded control channel may be unknown to the mobile. The mobile station needs to detect the number of subframes occupied by the decoded control channel. Zhuang at 5:22-27. The number of the plurality of subframes occupied by the each control channel candidate may be unknown to the mobile station before successfully decoded one or more of the control channel candidates (i.e., the decoded control channel intended for the mobile station). The mobile station needs to detect the number of subframes occupied by the decoded control channel. In another embodiment, determining the

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control channel and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). The gap equal to zero is a special case, which means the data channel starts on the end subframe of the decoded control channel. The gap can also be smaller than zero, and this means the data channel starts before the end subframe of the decoded control channel. In this case, the mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. When the gap is bigger than zero, the data channel starts after the end subframe of the decoded control channel. For uplink data channel transmission, the gap is always bigger than zero. Zhuang at 5:28-6:10. The mobile station can detect the number of subframes occupied by the decoded control channel. However, the control channel may be transmitted in more subframes than the mobile station detected. For example, the control channel may be repeated in plurality of subframes with the repetition of the same contented. As a result, the mobile station may early decode the control channel. In this case, there may be a misunderstanding between the mobile station and the base station about the number of subframes occupied by the decoded control channel. Therefore, the number of subframes occupied by the decoded control channel needs to be pre-defined or configured. In one embodiment, the number of subframes occupied by the control channel is configured by a higher-layer message. In another embodiment, the number of subframes occupied is indicated in the decoded control channel. Zhuang at 6:11-20. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		FIG. 3 FIG. 4 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

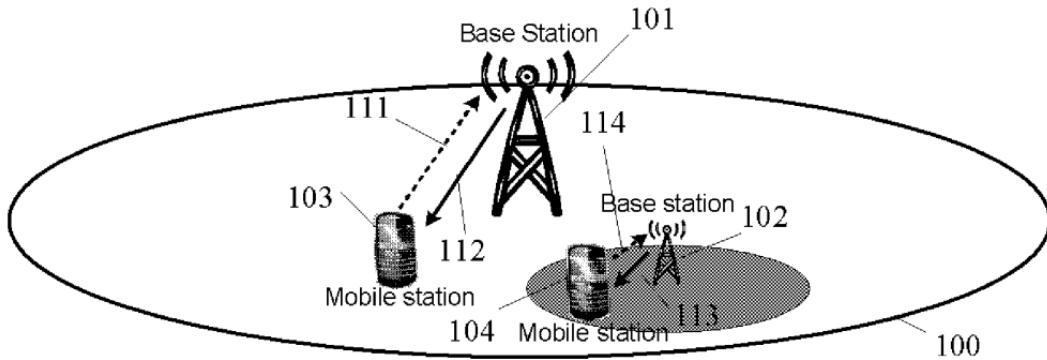
2. Claim 2

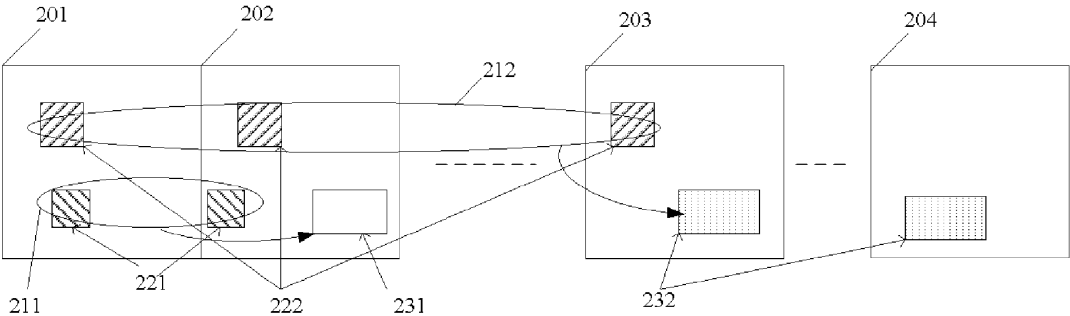
Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
2[pre]	A method of transmitting, by a base station, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes, the method comprising:	To the extent the preamble is limiting, at least under Pegasus's apparent infringement theory, Zhuang discloses a method of transmitting, by a base station, downlink control information through downlink control channels repeatedly allocated in a plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. <u>FIELD OF INVENTION</u> This disclosure relates generally to wireless communications and, more particularly, to determine the starting subframe of data channel reception or transmission. Zhuang at 1:4-6. <u>BACKGROUND OF THE INVENTION</u> Machine-to-Machine (M2M) applications required low-cost devices and improved coverage other than current cellular communication system. For example, some smart-metering deceives suffer a significantly larger path-loss (e.g., 20dB path loss) than that in the typical operation condition of normal devices, which are often installed in the basements of residential buildings or locations shielded by foil-backed insulation, metalized windows, or traditional thick-walled building construction. In order to serve these devices, 3rd generation partnership project (3GPP) RANI working group have studied for coverage improvement and cost reduction for these MTC devices in coverage hole scenario. Some potential solutions have been identified such as repetition of the physical channels to improve the coverage. In addition, cost reduction techniques are studied, including reducing the data buffer size and operation bandwidth, reducing receiving the antenna number and so on. With repetition of most of the physical channels, there may be misunderstanding between base station and mobile station on the start time of the transmission of some physical channels. Therefore, it is important to have a method to determine the start subframe of the physical channels. The benefit of determining the start subframe is not limited to the examples above. Zhuang at 1:8-23. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. Figure 1 illustrates a mobile communication network 100 in accordance with one novel aspect. In Figure 1, the wireless communication system 100 includes one or more fixed base infrastructure units forming a network distributed over a geographical region. The base unit may also be referred to as an access point, access terminal, base station, Node-B, eNode-B, or by other terminology used in the art. In Figure 1, the one or more base stations 101 and 102 serve a number of mobile stations 103 and 104 within a serving area, for example, a cell, or within a cell sector. In some systems, one or more base stations are communicably coupled to a controller forming an access network that is communicably coupled to one or more core networks. The disclosure however is not intended to be limited to any particular wireless communication system. Zhuang at 3:8-17. Generally, the serving base station 101 and 102 transmit downlink communication signals 112 and 113 to mobile station in the time and/or frequency domain. Mobile station 103 and 104 communicate with one or more base units 101 and 102 via uplink communication signals 113 and 114. In Figure 1, the mobile communication network 100 is an OFDM/OFDMA system comprising a base station eNB 101 eNB 102 and a plurality of mobile station 103 and mobile station 104. When there is a downlink packet to be sent from eNodeB to mobile station, each mobile station gets a downlink assignment, e.g., a set of radio resources in a physical downlink shared channel (PDSCH). When a UE needs to send a packet to eNodeB in the uplink, the mobile station gets a grant from the eNodeB that assigns a physical downlink uplink shared channel (PUSCH) consisting of a set of uplink radio resources. The mobile station gets the downlink or uplink scheduling information from a physical downlink control channel (PDCCH) or an enhanced physical downlink control channel (EPDCCH) that is targeted specifically to that mobile station. The downlink or uplink scheduling information and the other control information, carried by PDCCH, is referred to as

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		downlink control information (DCI). In current L TE system, PDCCH or EPDCCH is transmitted in one subframe and PDSCH is transmitted in the same subframe. PUSCH start to transmit 4 subframes after the subframe transmitting PDCCH or EPDCCH for FDD. For TDD, different subframe gaps between PUSCH and the PDCCH conveying the uplink scheduling information or corresponding or Physical Hybrid ARQ Indicator Channel (PRICH) are defined for different uplink-downlink configurations in 3GPP TS 36.213. More than one transmission timing interval (TTI) can be bundled for a PUSCH transmission. Zhuang at 3:18-4:4. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. Referring now to Figure 2, Figure 2 illustrates an example of starting subframe of data channel determining in accordance with embodiments of the present invention. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates,

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		for example channel candidate 211 and 212, wherein each candidate occupies radio resources 221, 222 from a plurality of subframes 201, 202 and 203; decoding a control channel intended for the mobile station, for example, the control channel candidate 211 is decoded by the mobile station; determining the starting subframe of a data channel 231 from the decoded control channel 211. The control channel candidate may occupy radio resources for more than one subframe. For example, the control channel candidate 211 occupies radio resources 221 in subframe 201 and 202 and the control channel candidate 212 occupies radio resources 222 from subframe 201, 202 and 203. The mobile station blindly detects for a control channel intended for the mobile station. For example, the mobile station may detect the control channel candidates 211 and 212, but only decodes the control channel 211. In one embodiment, the data channel 231 and 232 is uplink data channel. In another embodiment, the data channel 231 and 232 is downlink data channel. In one embodiment, the control channel 211 or 212 is PRICH. In another embodiment, the control channel is PDCCH or EPDCCH. Zhuang at 7:34-8:16.  FIG. 1

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG. 2 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
2[a]	transmitting configuration information relating to the plurality of subframes through higher layer signaling; and	At least under Pegasus’s apparent infringement theory, Zhuang discloses transmitting configuration information relating to the plurality of subframes through higher layer signaling. For example, Zhuang discloses this limitation based on the following exemplary citations: In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. The number of the plurality of subframes occupied by the each control channel candidate may be unknown to the mobile station before successfully decoded one or more of the control channel candidates (i.e., the decoded control channel intended for the mobile station). The mobile station needs to detect the number of subframes occupied by the decoded control channel. In another embodiment, determining the starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of

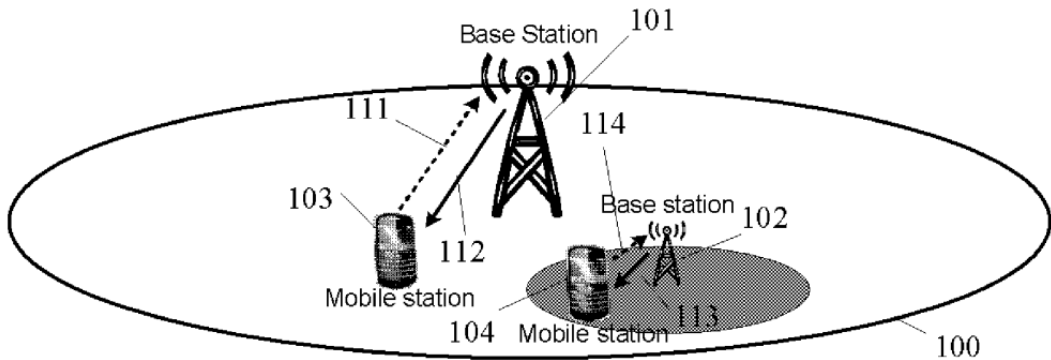
Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		subframes occupied by the decoded control channel and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). The gap equal to zero is a special case, which means the data channel starts on the end subframe of the decoded control channel. The gap can also be smaller than zero, and this means the data channel starts before the end subframe of the decoded control channel. In this case, the mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. When the gap is bigger than zero, the data channel starts after the end subframe of the decoded control channel. For uplink data channel transmission, the gap is always bigger than zero. Zhuang at 5:28-6:10. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. Referring now to Figure 4, Figure 4 illustrates an example of starting subframe of data channel determining with the detected number of subframes occupied by the decoded control channel and a know gap in accordance with embodiments of the present invention. In another embodiment of the disclosure, determining the starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes 400 occupied by the decoded control channel 421; and determining the starting subframe (e.g., subframe 411, 412, 413) of the data channel

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		(e.g., 423, 424, 422) based on the detected number of subframes 400 occupied by the decoded control channel 411 and a known gap (e.g., 402, 403, 401) from the starting subframe (e.g., 411,412,413) of the data channel (e.g., 423,424,422) to the end subframe (412) of the decoded control channel 412. Zhuang at 9:3-12. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23. To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
2[b]	transmitting the downlink control information through the downlink control channels	At least under Pegasus's apparent infringement theory, Zhuang discloses transmitting the downlink control information through the downlink control channels repeatedly

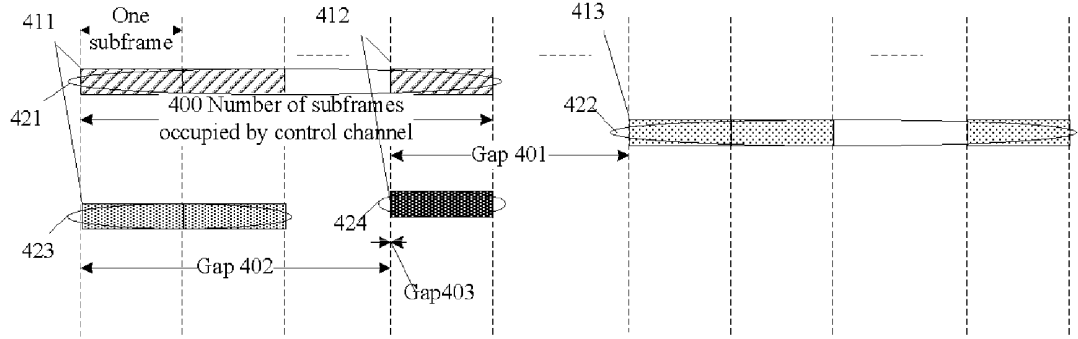
Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
	repeatedly allocated in the plurality of subframes, wherein	allocated in the plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. <u>BACKGROUND OF THE INVENTION</u> Machine-to-Machine (M2M) applications required low-cost devices and improved coverage other than current cellular communication system. For example, some smart-metering devices suffer a significantly larger path-loss (e.g., 20dB path loss) than that in the typical operation condition of normal devices, which are often installed in the basements of residential buildings or locations shielded by foil-backed insulation, metalized windows, or traditional thick-walled building construction. In order to serve these devices, 3rd generation partnership project (3GPP) RAN working group have studied for coverage improvement and cost reduction for these MTC devices in coverage hole scenario. Some potential solutions have been identified such as repetition of the physical channels to improve the coverage. In addition, cost reduction techniques

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		are studied, including reducing the data buffer size and operation bandwidth, reducing receiving the antenna number and so on. With repetition of most of the physical channels, there may be misunderstanding between base station and mobile station on the start time of the transmission of some physical channels. Therefore, it is important to have a method to determine the start subframe of the physical channels. The benefit of determining the start subframe is not limited to the examples above. Zhuang at 1:8-23. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. It is noted that, with the number of subframes occupied by the decoded control channel and the gap from the starting time of the data channel to the end of the decoded control channel, the gap from the starting time of the data channel to the starting time of the decoded control channel can be calculated and is also known to the mobile station. However, the number of subframes occupied by the decoded control channel may be unknown to the mobile. The mobile station needs to detect the number of subframes occupied by the decoded control channel. Zhuang at 5:22-27.  FIG. 1

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		FIG. 2 FIG. 3

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG. 4 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
2[c]	the configuration information comprises information on a start subframe of the plurality of subframes; and	At least under Pegasus’s apparent infringement theory, Zhuang discloses wherein the configuration information comprises information on a start subframe of the plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

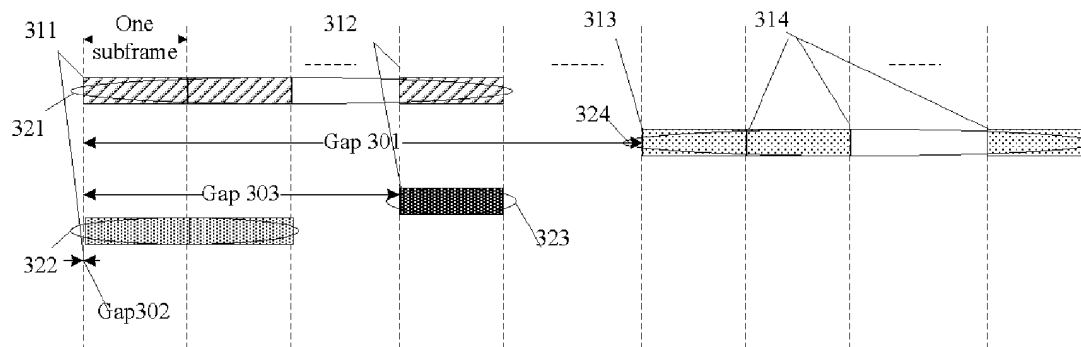


FIG. 3

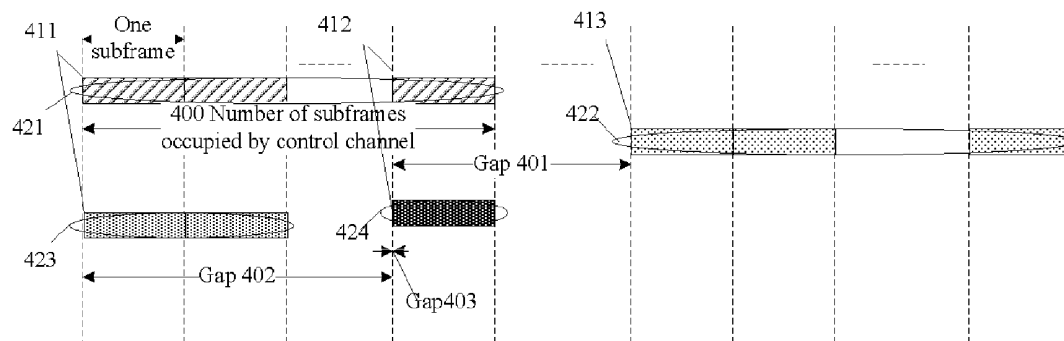


FIG. 4

To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
2[d]	the downlink control information comprises information on the number of the plurality of subframes.	At least under Pegasus's apparent infringement theory, Zhuang discloses wherein the downlink control information comprises information on the number of the plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. It is noted that, with the number of subframes occupied by the decoded control channel and the gap from the starting time of the data channel to the end of the decoded control channel, the gap from the starting time of the data channel to the starting time of the decoded control channel can be calculated and is also known to the mobile station. However, the number of subframes occupied by the decoded control channel may be unknown to the mobile. The mobile station needs to detect the number of subframes occupied by the decoded control channel. Zhuang at 5:22-27. The number of the plurality of subframes occupied by the each control channel candidate may be unknown to the mobile station before successfully decoded one or more of the control channel candidates (i.e., the decoded control channel intended for the mobile station). The mobile station needs to detect the number of subframes occupied by the decoded control channel. In another embodiment, determining the

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control channel and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). The gap equal to zero is a special case, which means the data channel starts on the end subframe of the decoded control channel. The gap can also be smaller than zero, and this means the data channel starts before the end subframe of the decoded control channel. In this case, the mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. When the gap is bigger than zero, the data channel starts after the end subframe of the decoded control channel. For uplink data channel transmission, the gap is always bigger than zero. Zhuang at 5:28-6:10. The mobile station can detect the number of subframes occupied by the decoded control channel. However, the control channel may be transmitted in more subframes than the mobile station detected. For example, the control channel may be repeated in plurality of subframes with the repetition of the same contented. As a result, the mobile station may early decode the control channel. In this case, there may be a misunderstanding between the mobile station and the base station about the number of subframes occupied by the decoded control channel. Therefore, the number of subframes occupied by the decoded control channel needs to be pre-defined or configured. In one embodiment, the number of subframes occupied by the control channel is configured by a higher-layer message. In another embodiment, the number of subframes occupied is indicated in the decoded control channel. Zhuang at 6:11-20. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

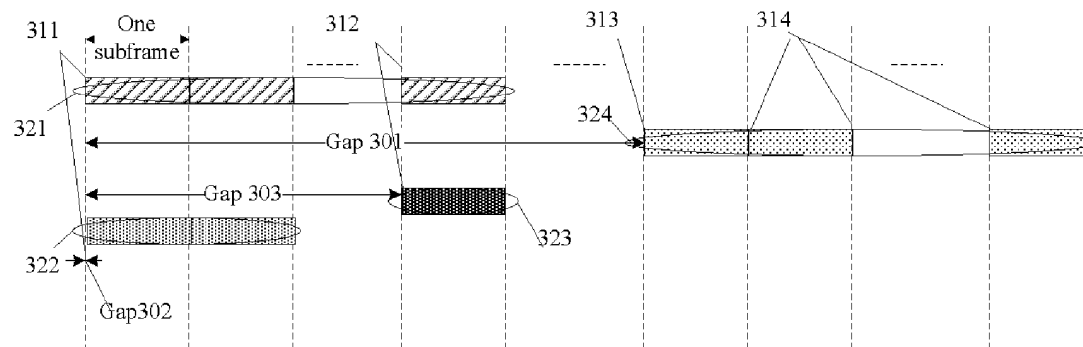


FIG. 3

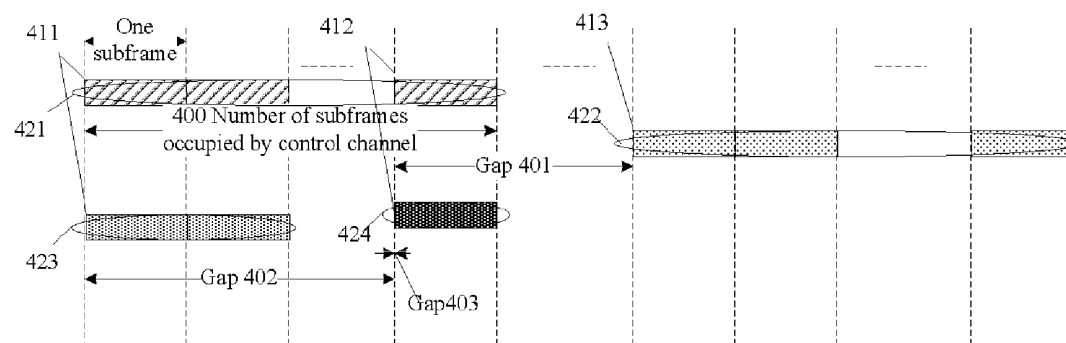


FIG. 4

To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

3. Claim 3

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
3[pre]	A terminal for receiving downlink control information through downlink control channels repeatedly allocated in plurality of subframes, the terminal comprising:	To the extent the preamble is limiting, at least under Pegasus's apparent infringement theory, Zhuang discloses a terminal for receiving downlink control information through downlink control channels repeatedly allocated in plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. <u>FIELD OF INVENTION</u> This disclosure relates generally to wireless communications and, more particularly, to determine the starting subframe of data channel reception or transmission. Zhuang at 1:4-6. <u>BACKGROUND OF THE INVENTION</u> Machine-to-Machine (M2M) applications required low-cost devices and improved coverage other than current cellular communication system. For example, some smart-metering deceives suffer a significantly larger path-loss (e.g., 20dB path loss) than that in the typical operation condition of normal devices, which are often installed in the basements of residential buildings or locations shielded by foil-backed insulation, metalized windows, or traditional thick-walled building construction. In order to serve these devices, 3rd generation partnership project (3GPP) RANI working group have studied for coverage improvement and cost reduction for these MTC devices in coverage hole scenario. Some potential solutions have been identified such as repetition of the physical channels to improve the coverage. In addition, cost reduction techniques are studied, including reducing the data buffer size and operation bandwidth, reducing receiving the antenna number and so on. With repetition of most of the physical channels, there may be misunderstanding between base station and mobile station on the start time of the transmission of some physical channels. Therefore, it is important to have a method to determine the start subframe of the physical channels. The benefit of determining the start subframe is not limited to the examples above. Zhuang at 1:8-23. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. Figure 1 illustrates a mobile communication network 100 in accordance with one novel aspect. In Figure 1, the wireless communication system 100 includes one or more fixed base infrastructure units forming a network distributed over a geographical region. The base unit may also be referred to as an access point, access terminal, base station, Node-B, eNode-B, or by other terminology used in the art. In Figure 1, the one or more base stations 101 and 102 serve a number of mobile stations 103 and 104 within a serving area, for example, a cell, or within a cell sector. In some systems, one or more base stations are communicably coupled to a controller forming an access network that is communicably coupled to one or more core networks. The disclosure however is not intended to be limited to any particular wireless communication system. Zhuang at 3:8-17. Generally, the serving base station 101 and 102 transmit downlink communication signals 112 and 113 to mobile station in the time and/or frequency domain. Mobile station 103 and 104 communicate with one or more base units 101 and 102 via uplink communication signals 113 and 114. In Figure 1, the mobile communication network 100 is an OFDM/OFDMA system comprising a base station eNB 101 eNB 102 and a plurality of mobile station 103 and mobile station 104. When there is a downlink packet to be sent from eNodeB to mobile station, each mobile station gets a downlink assignment, e.g., a set of radio resources in a physical downlink shared channel (PDSCH). When a UE needs to send a packet to eNodeB in the uplink, the mobile station gets a grant from the eNodeB that assigns a physical downlink uplink shared channel (PUSCH) consisting of a set of uplink radio resources. The mobile station gets the downlink or uplink scheduling information from a physical downlink control channel (PDCCH) or an enhanced physical downlink control channel (EPDCCH) that is targeted specifically to that mobile station. The downlink or uplink scheduling information and the other control information, carried by PDCCH, is referred to as downlink control information (DCI). In current L TE system, PDCCH or EPDCCH is

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		transmitted in one subframe and PDSCH is transmitted in the same subframe. PUSCH start to transmit 4 subframes after the subframe transmitting PDCCH or EPDCCH for FDD. For TDD, different subframe gaps between PUSCH and the PDCCH conveying the uplink scheduling information or corresponding or Physical Hybrid ARQ Indicator Channel (PRICH) are defined for different uplink-downlink configurations in 3GPP TS 36.213. More than one transmission timing interval (TTI) can be bundled for a PUSCH transmission. Zhuang at 3:18-4:4. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. Referring now to Figure 2, Figure 2 illustrates an example of starting subframe of data channel determining in accordance with embodiments of the present invention. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates, for example channel candidate 211 and 212, wherein each candidate occupies radio

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		resources 221, 222 from a plurality of subframes 201, 202 and 203; decoding a control channel intended for the mobile station, for example, the control channel candidate 211 is decoded by the mobile station; determining the starting subframe of a data channel 231 from the decoded control channel 211. The control channel candidate may occupy radio resources for more than one subframe. For example, the control channel candidate 211 occupies radio resources 221 in subframe 201 and 202 and the control channel candidate 212 occupies radio resources 222 from subframe 201, 202 and 203. The mobile station blindly detects for a control channel intended for the mobile station. For example, the mobile station may detect the control channel candidates 211 and 212, but only decodes the control channel 211. In one embodiment, the data channel 231 and 232 is uplink data channel. In another embodiment, the data channel 231 and 232 is downlink data channel. In one embodiment, the control channel 211 or 212 is PRICH. In another embodiment, the control channel is PDCCH or EPDCCH. Zhuang at 7:34-8:16. Figure 9 illustrates simplified block diagrams of system structure 900, wherein comprising a base station 901 and a mobile station 911 in accordance with embodiments of the present invention. The one or more base station may comprise one or more transmitters and one or more receivers that serve the mobile stations. The mobile stations may be fixed or mobile user terminals. The mobile stations may also be referred to as subscriber units, users, terminals, remote units, subscriber stations, user equipment (UE), user terminals, or by other terminology used in the art. The mobile stations may also comprise one or more transmitters and one or more receivers. The mobile stations may have half duplex (HD) or full duplex (FD) transceivers. Half-duplex transceivers do not transmit and receive simultaneously whereas full duplex terminals do. Zhuang at 12:11-20.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

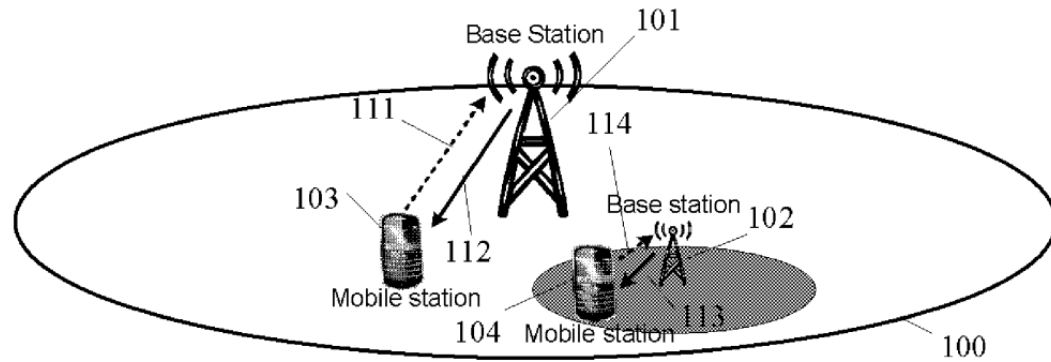


FIG. 1

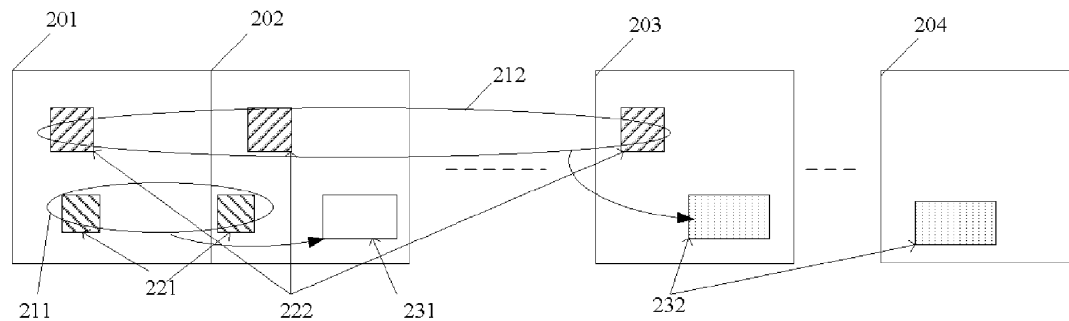


FIG. 2

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

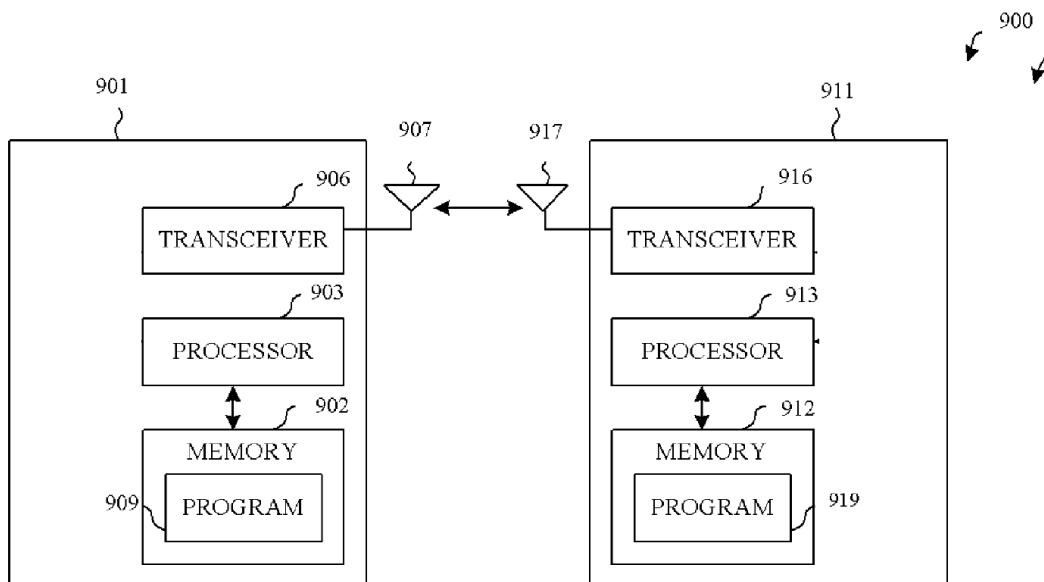


FIG.9

To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
3[a]	a receiver configured to receive configuration information comprising information on a start subframe of the plurality of subframes through higher layer signaling, to receive the downlink control channels repeatedly allocated in the plurality of subframes, and to combine the received downlink control channels based on the configuration information; and	At least under Pegasus's apparent infringement theory, Zhuang discloses a receiver configured to receive configuration information comprising information on a start subframe of the plurality of subframes through higher layer signaling, to receive the downlink control channels repeatedly allocated in the plurality of subframes, and to combine the received downlink control channels based on the configuration information. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. <u>BACKGROUND OF THE INVENTION</u> Machine-to-Machine (M2M) applications required low-cost devices and improved coverage other than current cellular communication system. For example, some smart-metering devices suffer a significantly larger path-loss (e.g., 20dB path loss) than that in the typical operation condition of normal devices, which are often installed in the basements of residential buildings or locations shielded by foil-backed insulation,

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		metalized windows, or traditional thick-walled building construction. In order to serve these devices, 3rd generation partnership project (3GPP) RAN1 working group have studied for coverage improvement and cost reduction for these MTC devices in coverage hole scenario. Some potential solutions have been identified such as repetition of the physical channels to improve the coverage. In addition, cost reduction techniques are studied, including reducing the data buffer size and operation bandwidth, reducing receiving the antenna number and so on. With repetition of most of the physical channels, there may be misunderstanding between base station and mobile station on the start time of the transmission of some physical channels. Therefore, it is important to have a method to determine the start subframe of the physical channels. The benefit of determining the start subframe is not limited to the examples above. Zhuang at 1:8-23. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. It is noted that, with the number of subframes occupied by the decoded control channel and the gap from the starting time of the data channel to the end of the decoded control channel, the gap from the starting time of the data channel to the starting time of the decoded control channel can be calculated and is also known to the mobile station. However, the number of subframes occupied by the decoded control channel may be unknown to the mobile. The mobile station needs to detect the number of subframes occupied by the decoded control channel. Zhuang at 5:22-27. The number of the plurality of subframes occupied by the each control channel candidate may be unknown to the mobile station before successfully decoded one or more of the control channel candidates (i.e., the decoded control channel intended for the mobile station). The mobile station needs to detect the number of subframes occupied by the decoded control channel. In another embodiment, determining the starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control channel and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. In

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). The gap equal to zero is a special case, which means the data channel starts on the end subframe of the decoded control channel. The gap can also be smaller than zero, and this means the data channel starts before the end subframe of the decoded control channel. In this case, the mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. When the gap is bigger than zero, the data channel starts after the end subframe of the decoded control channel. For uplink data channel transmission, the gap is always bigger than zero. Zhuang at 5:28-6:10. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23. Figure 9 illustrates simplified block diagrams of system structure 900, wherein comprising a base station 901 and a mobile station 911 in accordance with embodiments of the present invention. The one or more base station may comprise one or more transmitters and one or more receivers that serve the mobile stations. The mobile stations may be fixed or mobile user terminals. The mobile stations may also be referred to as subscriber units, users, terminals, remote units, subscriber stations, user equipment (UE), user terminals, or by other terminology used in the art. The

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		mobile stations may also comprise one or more transmitters and one or more receivers. The mobile stations may have half duplex (HD) or full duplex (FD) transceivers. Half-duplex transceivers do not transmit and receive simultaneously whereas full duplex terminals do. Zhuang at 12:11-20. For base station 901, antenna 907 transmits and receives radio signals. RF transceiver module 906, coupled with the antenna, receives RF signals from the antenna, converts them to baseband signals and sends them to processor 903. RF transceiver 906 also converts received baseband signals from the processor, converts them to RF signals, and sends out to antenna 907. Processor 903 processes the received baseband signals and invokes different functional modules to perform features in base station 901. Memory 902 stores program instructions and data 909 to control the operations of the base station. Zhuang at 12:21-27. Similar configuration exists in mobile station 911 where antenna 917 transmits and receives RF signals. RF transceiver module 916, coupled with the antenna, receives RF signals from the antenna, converts them to baseband signals and sends them to processor 913. The RF transceiver 916 also converts received baseband signals from the processor, converts them to RF signals, and sends out to antenna 917. Processor 913 processes the received baseband signals and invokes different functional modules to perform features in mobile station 911. Memory 912 stores program instructions and data 919 to control the operations of the mobile station. Zhuang at 12:28-13:2. The base station 901 and mobile station 911 also include several functional modules to carry out some embodiments of the present invention. The different functional modules can be implemented by software, firmware, hardware, or any combination thereof. The function modules, when executed by the processors 903 and 913 (e.g., via executing program codes 909 and 919), for example, allow base station 901 to encode and transmit control channels to mobile station 911, and allow mobile station 911 to receive and decode the control channels accordingly. In one example, base station 901 configures a set of radio resources for control channels; encode the control channel via

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		processors 903, for example a control module. In one embodiment, the base station 901 inserts indicators to each control channel via processors 903, for example a control module. The data channels are modulated and encoded via data channel module 904. The base station 901 transmits the encoded control channels and data channels by transceiver 906 via antenna 907. Mobile station 911 receives the control channels and data channels by transceiver 916 via antenna 917. Mobile station 911 monitors the control channel candidates, decodes a control channel intended for mobile station 911. In one embodiment, mobile station 911 determines the starting subframe of a data channel from the decoded control channel processors 913, for example a control module or a determining module. In another embodiment, mobile station 911 obtains the indicator in the decoded control channel via processors 913, for example a control module. Based on this subframe indicator, mobile station 911 determines the starting subframe of the data channel via processors 913, for example a control module. From the determined starting subframe of the data channel, mobile station 911 starts to receive the data channel via antenna 917 and decode the data channel via processors 913, for example a data channel module. In another embodiment, the data channel is modulated and encoded via processors 913, for example a data channel module, and transmitted by transceiver 916 via antenna 917 from the determined starting subframe of the data channel by mobile station 911. Zhuang at 13:3-37.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

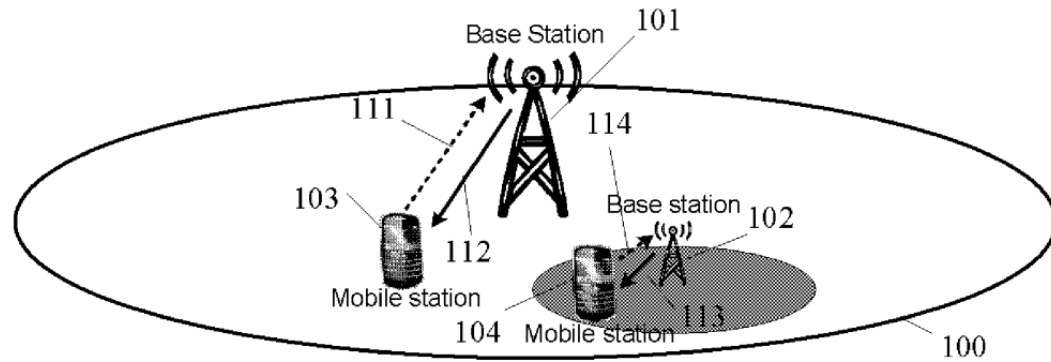


FIG. 1

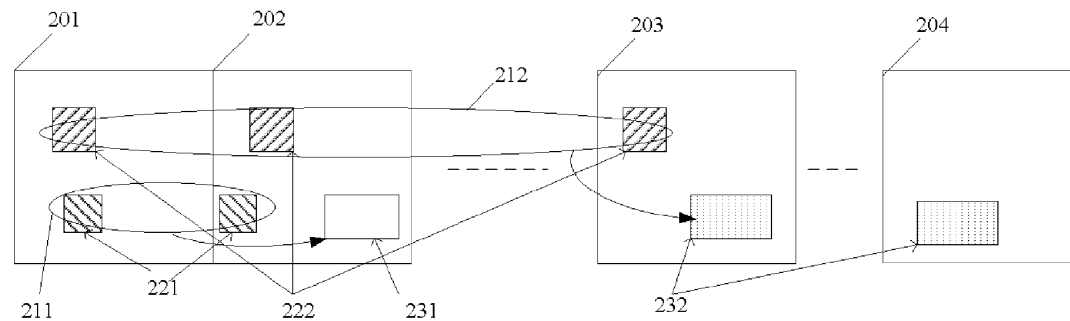
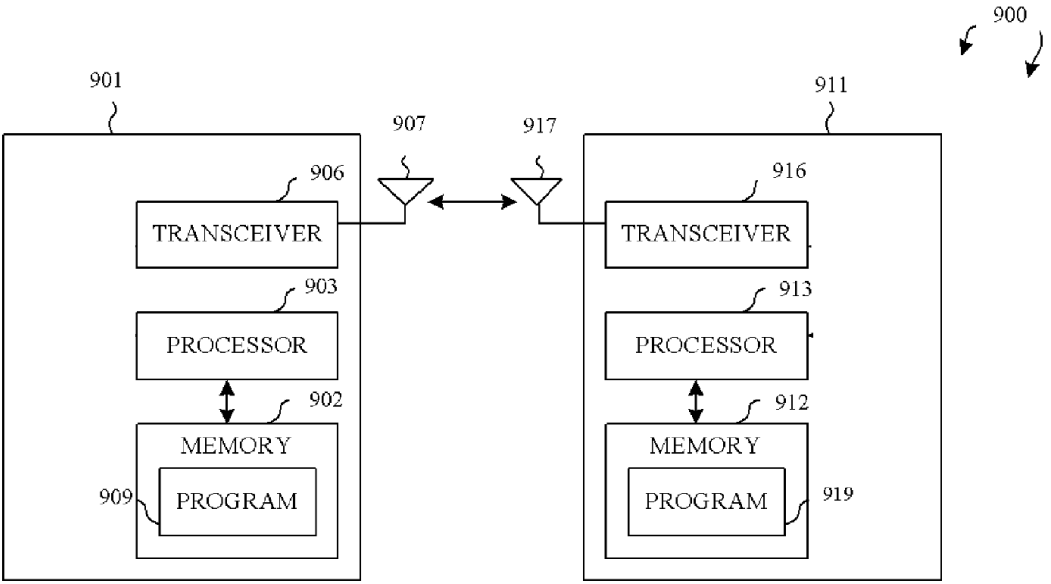


FIG. 2

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG.9 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
3[b]	a controller configured to extract downlink control information from the combined downlink control channels,	At least under Pegasus's apparent infringement theory, Zhuang discloses a controller configured to extract downlink control information from the combined downlink control channels. For example, Zhuang discloses this limitation based on the following exemplary citations: These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; determining the starting subframe of a data channel from the decoded control channel. In one example, the data channel is downlink data channel (e.g., PDSCH in LTE system). In another example, the data channel is uplink data channel (e.g., PUSCH in LTE system). The control channel is PDCCH or EPDCCH in LTE system. Alternatively, the control channel can be a physical channel for hybrid ARQ indicator transmission (e.g., PRICH in LTE system). Zhuang at 4:25-33. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. Referring now to Figure 2, Figure 2 illustrates an example of starting subframe of data channel determining in accordance with embodiments of the present invention. In one embodiment of the disclosure, a method for a mobile station to determine the starting subframe of a data channel includes: monitoring a set of control channel candidates, for example channel candidate 211 and 212, wherein each candidate occupies radio resources 221, 222 from a plurality of subframes 201, 202 and 203; decoding a control channel intended for the mobile station, for example, the control channel candidate 211 is decoded by the mobile station; determining the starting subframe of a data channel 231 from the decoded control channel 211. The control channel candidate may occupy radio resources for more than one subframe. For example, the control channel candidate 211 occupies radio resources 221 in subframe 201 and 202 and the control channel candidate 212 occupies radio resources 222 from subframe 201, 202 and 203. The mobile station blindly detects for a control channel intended for the mobile station. For example, the mobile station may detect the control channel candidates 211 and 212, but only decodes the control channel 211. In one embodiment, the data channel 231 and 232 is uplink data channel. In another embodiment, the data channel 231 and 232 is

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		downlink data channel. In one embodiment, the control channel 211 or 212 is PRICH. In another embodiment, the control channel is PDCCH or EPDCCH. Zhuang at 7:34-8:16. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a know gap in accordance with embodiments of the present invention. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25. The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23. Figure 9 illustrates simplified block diagrams of system structure 900, wherein comprising a base station 901 and a mobile station 911 in accordance with embodiments of the present invention. The one or more base station may comprise one

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		or more transmitters and one or more receivers that serve the mobile stations. The mobile stations may be fixed or mobile user terminals. The mobile stations may also be referred to as subscriber units, users, terminals, remote units, subscriber stations, user equipment (UE), user terminals, or by other terminology used in the art. The mobile stations may also comprise one or more transmitters and one or more receivers. The mobile stations may have half duplex (HD) or full duplex (FD) transceivers. Half-duplex transceivers do not transmit and receive simultaneously whereas full duplex terminals do. Zhuang at 12:11-20. For base station 901, antenna 907 transmits and receives radio signals. RF transceiver module 906, coupled with the antenna, receives RF signals from the antenna, converts them to baseband signals and sends them to processor 903. RF transceiver 906 also converts received baseband signals from the processor, converts them to RF signals, and sends out to antenna 907. Processor 903 processes the received baseband signals and invokes different functional modules to perform features in base station 901. Memory 902 stores program instructions and data 909 to control the operations of the base station. Zhuang at 12:21-27. Similar configuration exists in mobile station 911 where antenna 917 transmits and receives RF signals. RF transceiver module 916, coupled with the antenna, receives RF signals from the antenna, converts them to baseband signals and sends them to processor 913. The RF transceiver 916 also converts received baseband signals from the processor, converts them to RF signals, and sends out to antenna 917. Processor 913 processes the received baseband signals and invokes different functional modules to perform features in mobile station 911. Memory 912 stores program instructions and data 919 to control the operations of the mobile station. Zhuang at 12:28-13:2. The base station 901 and mobile station 911 also include several functional modules to carry out some embodiments of the present invention. The different functional modules can be implemented by software, firmware, hardware, or any combination thereof. The function modules, when executed by the processors 903 and 913 (e.g., via executing

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		program codes 909 and 919), for example, allow base station 901 to encode and transmit control channels to mobile station 911, and allow mobile station 911 to receive and decode the control channels accordingly. In one example, base station 901 configures a set of radio resources for control channels; encode the control channel via processors 903, for example a control module. In one embodiment, the base station 901 inserts indicators to each control channel via processors 903, for example a control module. The data channels are modulated and encoded via data channel module 904. The base station 901 transmits the encoded control channels and data channels by transceiver 906 via antenna 907. Mobile station 911 receives the control channels and data channels by transceiver 916 via antenna 917. Mobile station 911 monitors the control channel candidates, decodes a control channel intended for mobile station 911. In one embodiment, mobile station 911 determines the starting subframe of a data channel from the decoded control channel processors 913, for example a control module or a determining module. In another embodiment, mobile station 911 obtains the indicator in the decoded control channel via processors 913, for example a control module. Based on this subframe indicator, mobile station 911 determines the starting subframe of the data channel via processors 913, for example a control module. From the determined starting subframe of the data channel, mobile station 911 starts to receive the data channel via antenna 917 and decode the data channel via processors 913, for example a data channel module. In another embodiment, the data channel is modulated and encoded via processors 913, for example a data channel module, and transmitted by transceiver 916 via antenna 917 from the determined starting subframe of the data channel by mobile station 911. Zhuang at 13:3-27.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

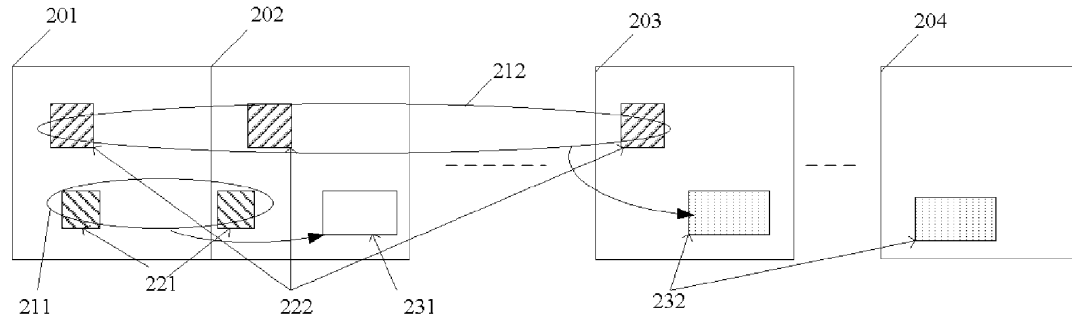


FIG. 2

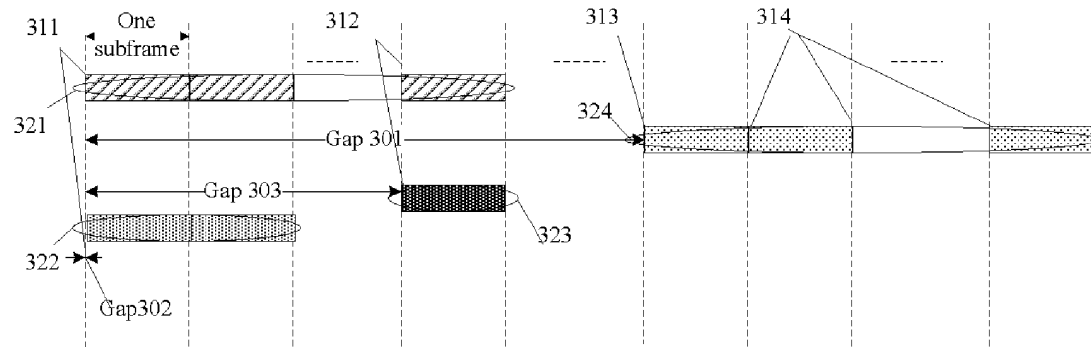
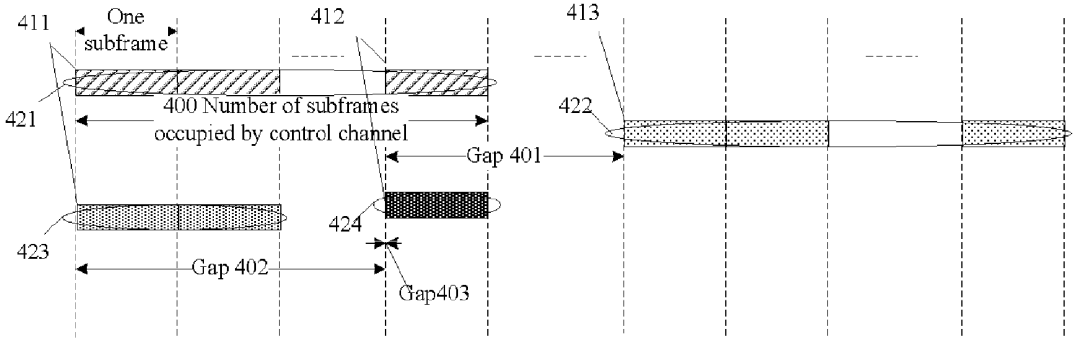


FIG. 3

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		 FIG. 4

Invalidity of U.S. Patent 9,894,644 in view of Zhuang

Claim Language

Exemplary Citations to Zhuang

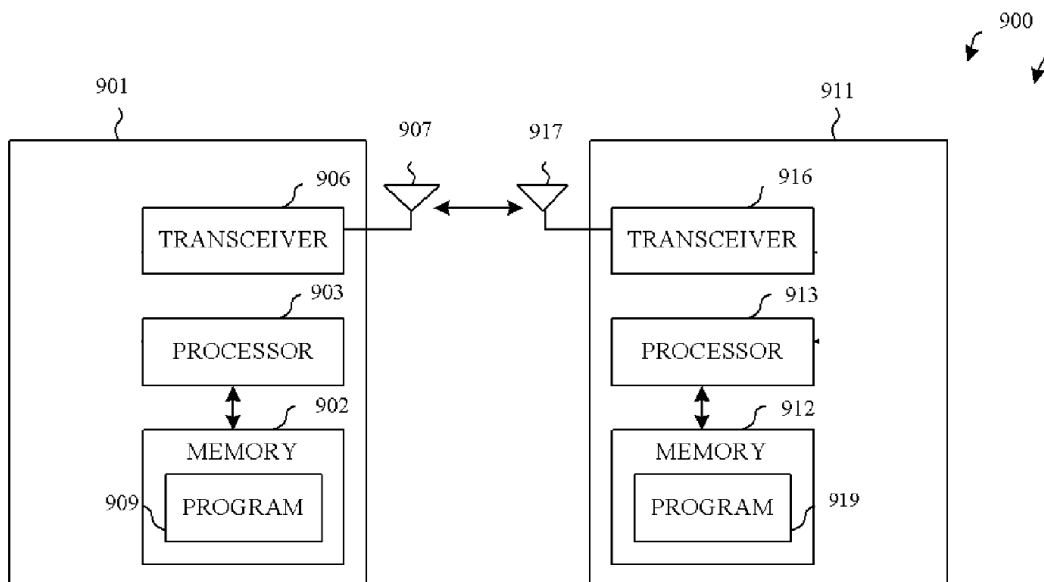


FIG. 9

To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

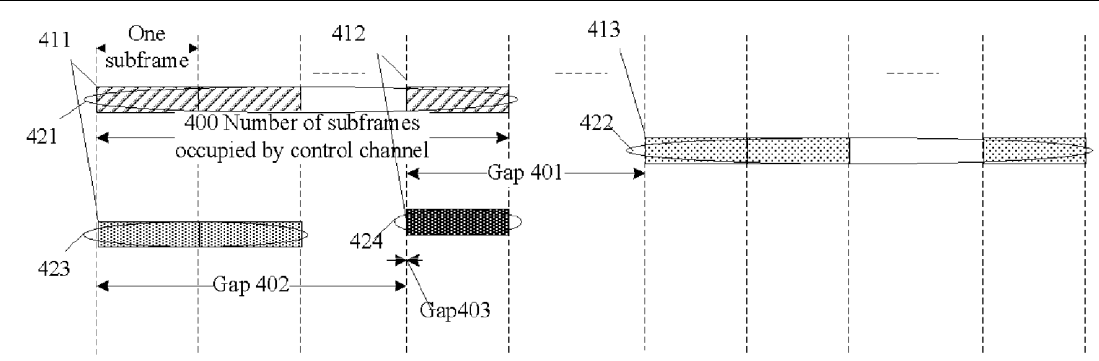
Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
3[c]	wherein the downlink control information comprises information on the number of the plurality of subframes.	At least under Pegasus's apparent infringement theory, Zhuang discloses wherein the downlink control information comprises information on the number of the plurality of subframes. For example, Zhuang discloses this limitation based on the following exemplary citations: In one novel aspect, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. Zhuang at 1:28-31. In one example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: determining the starting subframe of the channel based on the starting subframe of the control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. Zhuang at 1:32-2:2. For coverage hole devices, PDCCH or EPDCCH may need repetitions across multiple subframes. In the meanwhile, the PDSCH and/or PUSCH of the devices may also need across subframe (re)transmission (or repetitions). The repetitions number (or the number of subframes occupied by data channel or control channel) may or may not be the same. Therefore, a method to determine the starting subframe of data channel reception or transmission is necessary. Zhuang at 4:20-24. These disclosed embodiments describe a method for a mobile station to determine the starting subframe of a data channel, the method comprising: monitoring a set of control channel candidates wherein each candidate occupies radio resources from a plurality of subframes; decoding a control channel intended for the mobile station; and determining the starting subframe of a data channel from the decoded control channel. In one embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the control channel. In another embodiment, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: obtaining a subframe indicator in the decoded control channel; and determining the starting subframe of the data channel based on the subframe indicator and a known gap from the starting subframe of the data channel to the end subframe of the control channel. Zhuang at Abstract. In another example, wherein determining the starting subframe of a data channel from the decoded control channel further comprising: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. Zhuang at 2:3-7. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further includes: determining the starting subframe of the data channel based on the starting subframe of the decoded control channel and a known gap from the starting subframe of the data channel to the starting subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system). Because the gap is known to the mobile station, the mobile station knows the starting subframe of the data channel corresponding to each control channel candidate when the mobile station monitors the set of control channel candidates. In one embodiment, the gap is big enough to insure the starting subframe of data channel is always after the end subframe of the decoded control channel, especially for uplink data channel transmission. The mobile station may obtain the resource allocation (or the uplink grant) of the data channel in each subframe in the decoded control channel. The mobile station may only receiving or buffer the data channel resources indicated

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		by the decoded control channel. In another embodiment, the mobile station may not know the resource allocation for the data channel. For example, the starting subframe of the data channel is before the end subframe of the decoded control channel, or mobile station cannot decode the control channel intended for the mobile station conveying the resource allocation of the data channel in time. The mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. The potential data channel resources may be the whole resources in one subframe. Alternatively, the potential data channel resources is a subset of the whole resources and the subset is known to the mobile station. The subset may be pre-defined or configured by a higher-layer message. Zhuang at 4:34-5:21. It is noted that, with the number of subframes occupied by the decoded control channel and the gap from the starting time of the data channel to the end of the decoded control channel, the gap from the starting time of the data channel to the starting time of the decoded control channel can be calculated and is also known to the mobile station. However, the number of subframes occupied by the decoded control channel may be unknown to the mobile. The mobile station needs to detect the number of subframes occupied by the decoded control channel. Zhuang at 5:22-27. The number of the plurality of subframes occupied by the each control channel candidate may be unknown to the mobile station before successfully decoded one or more of the control channel candidates (i.e., the decoded control channel intended for the mobile station). The mobile station needs to detect the number of subframes occupied by the decoded control channel. In another embodiment, determining the starting subframe of a data channel from the decoded control channel further includes: detecting the number of subframes occupied by the decoded control channel; and determining the starting subframe of the data channel based on the detected number of subframes occupied by the decoded control channel and a known gap from the starting subframe of the data channel to the end subframe of the decoded control channel. In one example, the gap is predefined. Alternatively, the gap is configured by a higher-layer message (e.g., Radio Resource Control (RRC) message in LTE system).

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		The gap equal to zero is a special case, which means the data channel starts on the end subframe of the decoded control channel. The gap can also be smaller than zero, and this means the data channel starts before the end subframe of the decoded control channel. In this case, the mobile station needs to buffer all the potential data channel resources from the starting subframe of the data channel. When the gap is bigger than zero, the data channel starts after the end subframe of the decoded control channel. For uplink data channel transmission, the gap is always bigger than zero. Zhuang at 5:28-6:10. The mobile station can detect the number of subframes occupied by the decoded control channel. However, the control channel may be transmitted in more subframes than the mobile station detected. For example, the control channel may be repeated in plurality of subframes with the repetition of the same contented. As a result, the mobile station may early decode the control channel. In this case, there may be a misunderstanding between the mobile station and the base station about the number of subframes occupied by the decoded control channel. Therefore, the number of subframes occupied by the decoded control channel needs to be pre-defined or configured. In one embodiment, the number of subframes occupied by the control channel is configured by a higher-layer message. In another embodiment, the number of subframes occupied is indicated in the decoded control channel. Zhuang at 6:11-20. Referring now to Figure 3, Figure 3 illustrates an example of starting subframe of data channel determining with the starting subframe of the decoded control channel and a known gap in accordance with embodiments of the present invention. In one embodiment, the determining the starting subframe of a data channel from the decoded control channel further comprising further includes: determining the starting subframe of the data channel (e.g., data channel 322, 323, 324) based on the starting subframe 311 of the control channel 321 and a known gap (shown as gap 301, 303, 304) from the starting subframe (e.g., subframe 311, 312, 313) of the data channel 322, 323, 324 to the starting subframe (e.g., subframe 311) of the decoded control channel. Zhuang at 8:17-25.

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		The gap can be predefined, for example, 4 subframes gap between the starting subframe of an uplink data channel and the end subframe of the corresponding control channel conveying the uplink grant for the uplink data channel. In another example, one subframe gap between the starting subframe of data channel and the end of the corresponding control channel. With this one subframe gap, the mobile station can decode the control channel and obtain the radio resources information of the data channel. Therefore, the mobile station can only receive and buffer the radio resources of the data channel. This will save the mobile station buffer size and give the base station more flexibility for scheduling. The radio resources information of the data channel can be the number of subframes occupied by the data channel, the physical resource block in each subframe and so on. Alternatively, the gap is configured by higher-layer message, for example RRC message. Zhuang at 9:13-23. FIG. 3

Invalidity of U.S. Patent 9,894,644 in view of Zhuang		
Claim Language		Exemplary Citations to Zhuang
		
		FIG. 4 To the extent it is found that Zhuang does not expressly disclose this limitation, the limitation is inherent. Moreover, to the extent it is found that Zhuang does not anticipate this claim, Zhuang renders it obvious, either alone, in combination with the knowledge of a person of ordinary skill in the art, and/or in combination with other prior art references identified in the cover pleading or herein. A person of ordinary skill in the art would have been motivated to combine Zhuang with any of the other prior art references identified in the cover pleading or herein with a reasonable expectation of success because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.