

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		<i>See</i> http://web.archive.org/web/20060425030931/http://www1.us.dell.com/content/products/productdetails.aspx/latitude_d820?c=us&cs=04&l=en&s=bsd&~section=specs#tabtop
11[a]	an antenna system comprising	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Dell D820 includes an antenna system comprising a ground plane (red below) and at least two antennas (blue and green below) within the wireless device.

Exhibit – E – 05

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		 Source:https://guide-images.cdn.ifixit.com/igi/fSfwfOnclBrPnZUF.huge

Exhibit – E – 05



Exhibit – E – 05

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		Source: https://guide-images.cdn.ifixit.com/igi/n1Tm12WPbYRVt4m6.huge
11[b]	a ground plane and	D820 expressly or inherently discloses this claim element. <i>See Claim 11[a].</i>
11[c]	at least two antennas within the wireless device, the antenna system comprising:	D820 expressly or inherently discloses this claim element. <i>See Claim 11[a].</i>
11[d]	a first antenna configured to provide operation in at least three frequency bands being used by 4G communication standards,	D820 expressly or inherently discloses this claim element. The antenna system of the Dell D820 includes a first antenna (blue below) configured to provide operation in at least three frequency bands being used by 4G communication standards,

Exhibit – E – 05

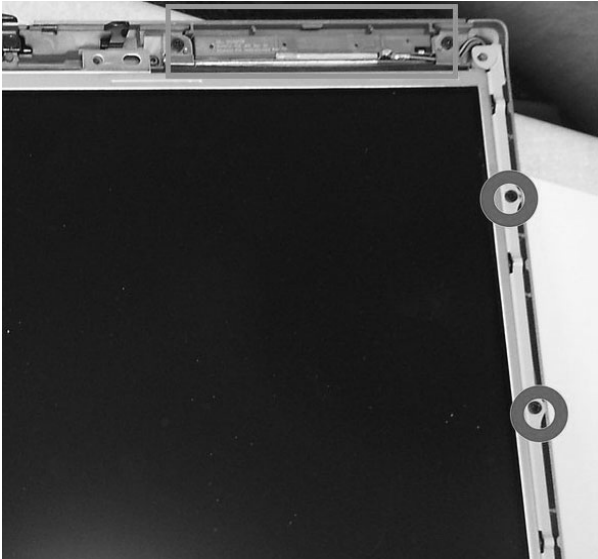
Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		

Exhibit – E – 05

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		CONNECTIVITY: Wired: Wired: 56K v924 Internal Modem 10/100/1000 Gigabit⁴ Ethernet network interface adaptor Wireless: Dell Wireless 5500 Mobile Broadband 3G HSDPA (Cingular US) Dell Wireless 5700 Mobile Broadband CDMA EVDO (Verizon Wireless US) WLAN Intel® 3945 WiFi 802.11a/g, Dell Wireless 1390 802.11g, Dell Wireless 1490 802.11a/g Dual-Band Mini-Cards, Internal Bluetooth (optional) For instance, the first antenna of the Dell D820 is configured to support at least three frequency bands contained between 880-960 MHz, 1710-1990 MHz, and 2010-2025 MHz.
11[e]	the first antenna defining an antenna contour comprising an entire perimeter of the first antenna,	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The complexity factor calculation is performed according to the method in the patent. The first antenna of the Dell D820 defines a first antenna contour comprising an entire perimeter of the first antenna, wherein the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35. The first antenna includes first and second sides including the perimeter of the first antenna: First antenna, first side:

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Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		First antenna, second side: The first antenna contour includes parts of the perimeter that are on the first side and the orthogonal projection onto the plane of the first side of the parts of the perimeter that are on the second side: N1=10

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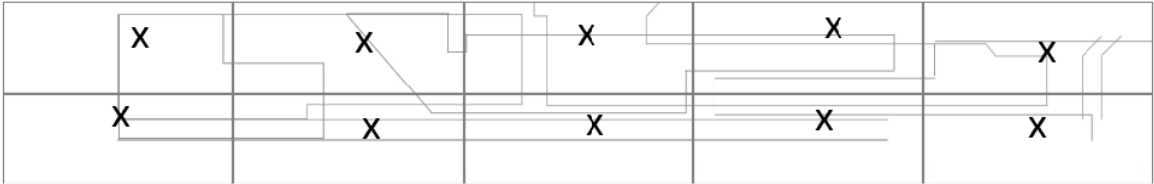
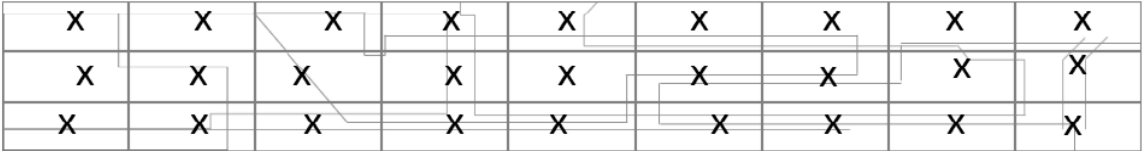
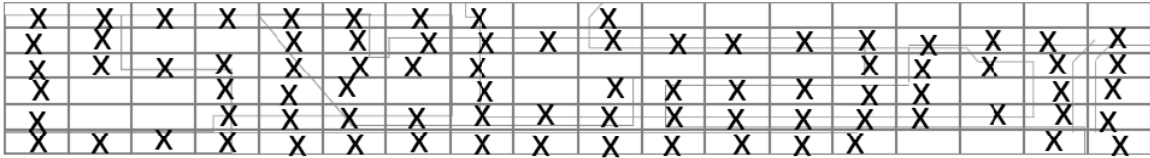
Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		 N2=27  N3=86  $F21 = \log(27/10)/\log(2) = 1.43$ $F32 = \log(83/27)/\log(2) = 1.62$
11[f]	the antenna contour comprising at	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i>

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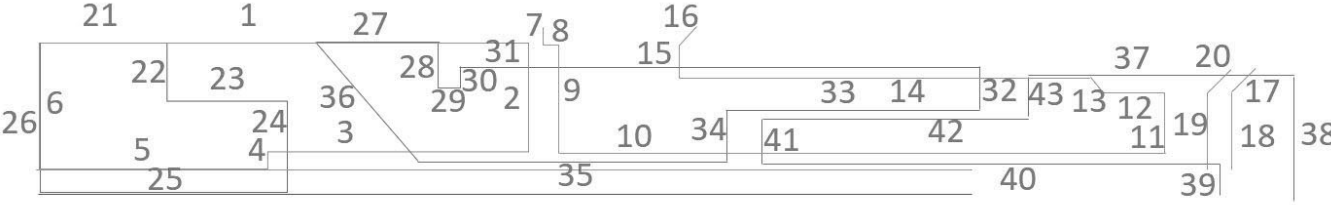
Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
	least twenty segments,	 The antenna contour has at least 43 segments.
11[g]	wherein the antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	D820 expressly or inherently discloses this claim element. See Claim 11[g].
11[h]	complexity factor F32 having a value of at least 1.35, and	D820 expressly or inherently discloses this claim element. See Claim 11[g].
11[i]	wherein the first antenna defines	D820 expressly or inherently discloses this claim element.

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Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
	an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and	<i>See, e.g.,</i> The first antenna of the Dell D820 defines an antenna box (purple below) that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna. First antenna, first side (top photo), second side (middle photo), third side (bottom photo): 
11[j]	wherein each face of the minimum-sized parallelepiped is tangent to at	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i>

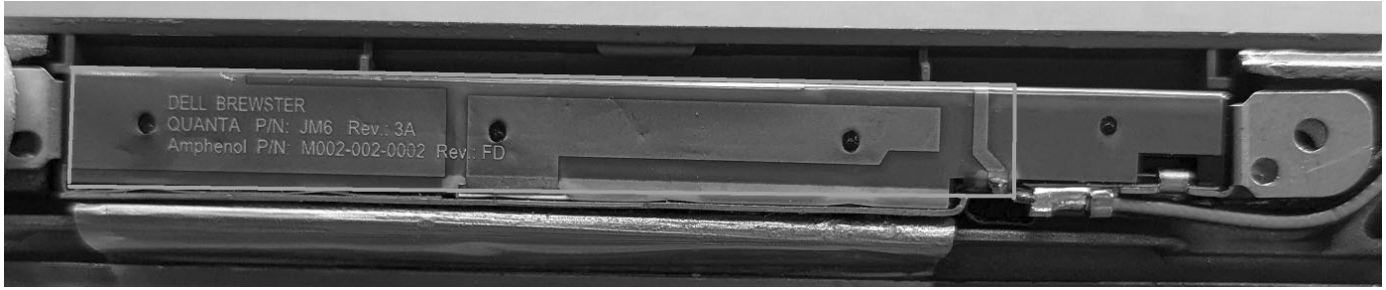
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Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
	least one point of the volume of the first antenna,	Each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna. 
11[k]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> An orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna (orange below).

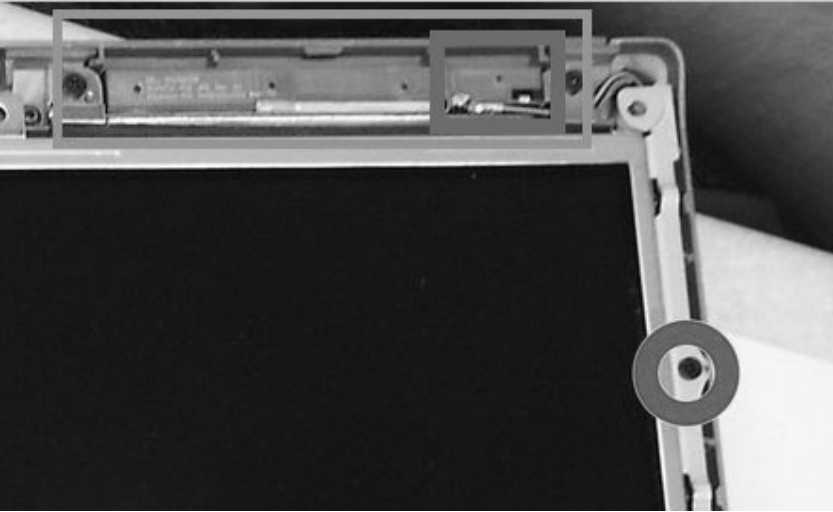
Exhibit – E – 05

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		
11[l]	an antenna rectangle,	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> An orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defines an antenna rectangle (orange below). 
11[m]	an aspect ratio of the antenna	D820 expressly or inherently discloses this claim element.

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Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
	rectangle being defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2; and	<i>See, e.g.,</i>  The width of the antenna rectangle is at least twice as long as the height of the antenna rectangle.
11[n]	a second antenna configured to provide operation in a first wireless service,	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Dell D820 includes a second antenna (purple below)⁸ configured to provide operation in a first wireless service.

⁸ The blue box contains two antennas: one cellular antenna and one WiFi antenna. The cellular antenna is the “first antenna” and the WiFi antenna is the “second antenna.”

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		 CONNECTIVITY: Wired: Wired: 56K v924 Internal Modem 10/100/1000 Gigabit⁴ Ethernet network interface adaptor Wireless: Dell Wireless 5500 Mobile Broadband 3G HSDPA (Cingular US) Dell Wireless 5700 Mobile Broadband CDMA EVDO (Verizon Wireless US) WLAN Intel[®] 3945 WiFi 802.11a/g, Dell Wireless 1390 802.11g, Dell Wireless 1490 802.11a/g Dual-Band Mini-Cards, Internal Bluetooth (optional)

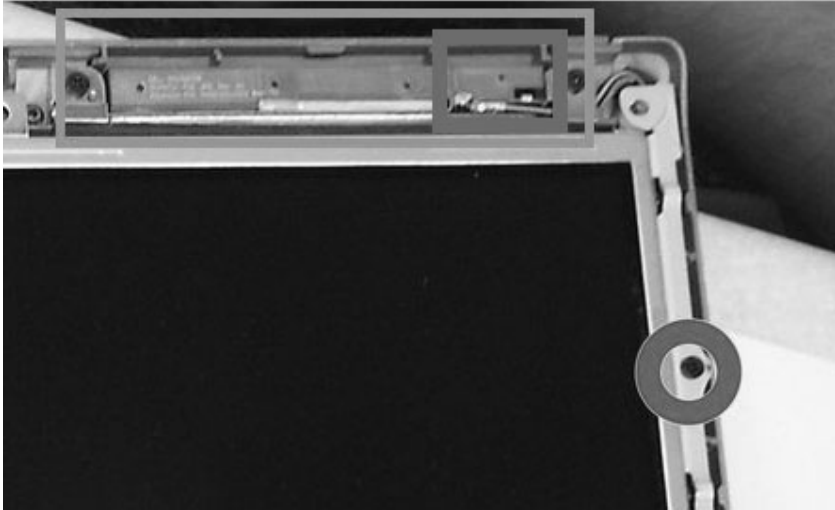
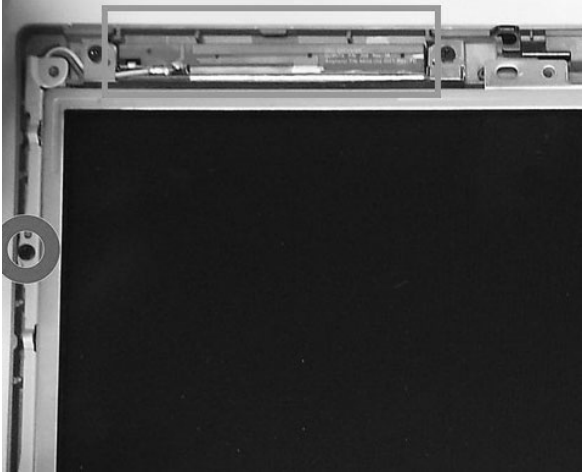
Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
11[o]	a second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Dell D820 includes a second antenna (purple below) proximate to a side of a ground plane rectangle enclosing the ground plane. 

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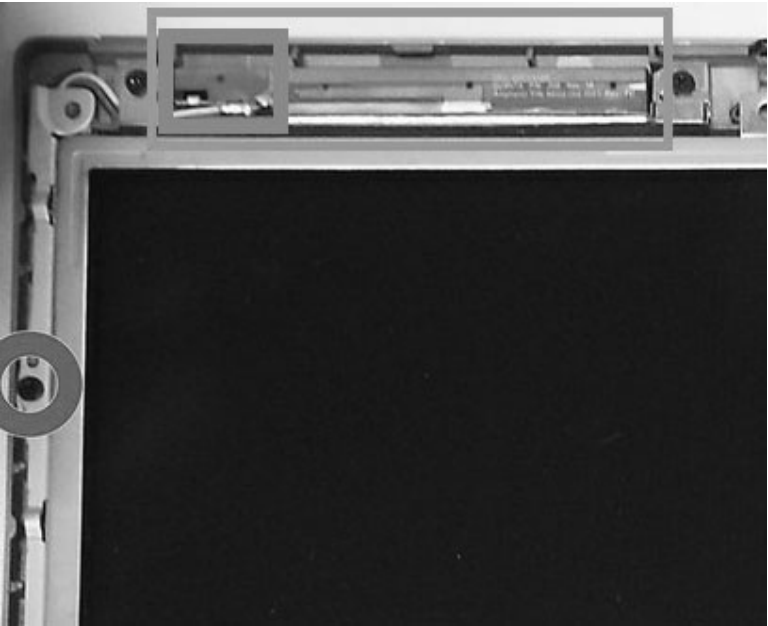
Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		
Claim 12		
12	The wireless device of claim 11, wherein the first antenna is configured to support at least four frequency bands.	D820 expressly or inherently discloses this claim element. <i>See Claim 11[d].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
Claim 13		
13	The wireless device of claim 11, wherein the first wireless service is a WiFi communication standard.	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> CONNECTIVITY: Wired: Wired: 56K v924 Internal Modem 10/100/1000 Gigabit⁴ Ethernet network interface adaptor Wireless: Dell Wireless 5500 Mobile Broadband 3G HSDPA (Cingular US) Dell Wireless 5700 Mobile Broadband CDMA EVDO (Verizon Wireless US) WLAN Intel® 3945 WiFi 802.11a/g, Dell Wireless 1390 802.11g, Dell Wireless 1490 802.11a/g Dual-Band Mini-Cards, Internal Bluetooth (optional)
Claim 15		
15	The wireless device of claim 11, wherein the antenna system comprises a third antenna.	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Dell D820 includes a third antenna (green below).

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Claim 17		
17	The wireless device of claim 15, wherein the third antenna is configured to provide operation in a second wireless service.	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		CONNECTIVITY: Wired: Wired: 56K v924 Internal Modem 10/100/1000 Gigabit⁴ Ethernet network interface adaptor Wireless: Dell Wireless 5500 Mobile Broadband 3G HSDPA (Cingular US) Dell Wireless 5700 Mobile Broadband CDMA EVDO (Verizon Wireless US) WLAN Intel® 3945 WiFi 802.11a/g, Dell Wireless 1390 802.11g, Dell Wireless 1490 802.11a/g Dual-Band Mini-Cards, Internal Bluetooth (optional)
Claim 19		
19	The wireless device of claim 15, wherein the antenna system comprises a fourth antenna.	D820 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Dell D820 includes a fourth antenna (brown below).

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Claim No.	U.S. Patent No. 11,349,200 B2	Dell Latitude D820
		

INVALIDITY CONTENTIONS FOR U.S. PATENT NO. 11,349,200 B2
BASED ON THE BLACKBERRY 7290 (“BLACKBERRY 7290”)

Based upon Plaintiff’s Complaint, Infringement Contentions, and apparent claim constructions and application of the claims to Geotab’s accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious some or all of claims 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 17, and 19 (the “’200 Asserted Claims”)¹. These invalidity contentions are not an admission by Geotab that the accused products are covered by or infringe the Asserted Claims, particularly when these claims are properly construed and applied.

AIA law applies because the application that issued as the ’200 Patent was filed on April 30, 2021, after the AIA came into force on March 16, 2013.

Research in Motion’s (“RIM”) Blackberry 7290, as publicly demonstrated, known, offered for sale, sold, and/or used by RIM and/or customers of RIM, or otherwise available to the public, including in this country, (“Blackberry 7290”) was in public use and/or on sale in the U.S. at least by 2004. Specifically, the Blackberry 7290 was approved for use in the United States on September 29, 2004², and was available for purchase in the United States from AT&T Wireless no later than December 31, 2004, which is prior to the critical date of the ’200 Patent. Thus, the Blackberry 7290 is available as prior art at least under at least pre-AIA 35 U.S.C. § 102(a)-(b), or (g)(2) and/or AIA 35 U.S.C. § 102(a)(1). At least the following documents provide evidence as to the date the Blackberry 7290 was “offered for sale or publicly used or known,” “the date the offer or use of the item took place or the information became known”, and the “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known”³:

¹ Geotab understands that, by not charting claims 5, 8, 14, 16, 18, and 20 in its Infringement Contentions, Plaintiff does not assert these claims against Geotab.

² See Cingular Wireless Website, archived on December 7, 2005 at:

https://web.archive.org/web/20041207142355/http://www.attwireless.com/smallbusiness/products/all_phones.jhtml (last accessed June 16, 2025); see also Blackberry Website - Press Release (Sept. 28, 2004): http://www.blackberry.com/news/press/2004/pr-28_09_2004-04.shtml (last accessed June 11, 2025); AT&T Wireless Website, Archived December 7, 2004 at: https://web.archive.org/web/20041207142355/http://www.attwireless.com/smallbusiness/products/all_phones.jhtml (last accessed June 11, 2025); Blackberry Website - Press Release (Sept. 28, 2004): http://www.blackberry.com/news/press/2004/pr-28_09_2004-04.shtml (last accessed June 11, 2025).

³ Geotab does not yet have complete information regarding the dates by which this product was publicly disclosed, made, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the particular individuals involved in such activities. Geotab anticipates that the actual dates, circumstances, and identities of individuals will be the subject of third party discovery during this lawsuit. Geotab therefore reserves the right to amend and/or supplement its Invalidity Contentions and this chart if additional information becomes available during the course of discovery. The date the Blackberry 7290 was “offered for sale or publicly used or known,” as well as “the date the offer or use of the item took place or the information became known” is at least as early as the dates identified in the published documents. The “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known” includes at least those persons associated with the publication(s), press releases, and conference attendees, or other

- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “L6A”; Product Code: “RAP40GW”; Record Option: 3/5 “Detail”; Attachment: “Manual Statements” (last accessed June 16, 2025) (“FCC User Manual Safety and Product Info – Blackberry 7290”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “L6A”; Product Code: “RAV20CW”; Record Option: 3/5 “Detail”; Attachment: “Internal Photos 1” (last accessed June 16, 2025) (“FCC Internal Photos – Blackberry 7130e”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “NM8HHH06C”; Product Code: “NM8HHH06C”; Record Option: 1/7 “Detail”; Attachment: “Users Manual” (last accessed June 16, 2025) (“HP iPAQ hw6515 User Manual”).
- AT&T Wireless Website, archived on December 7, 2005 at: https://web.archive.org/web/20041207142355/http://www.attwireless.com/smallbusiness/products/all_phones.jhtml (last accessed June 16, 2025)
- Blackberry Website - Press Release (Sept. 28, 2004): http://www.blackberry.com/news/press/2004/pr-28_09_2004-04.shtml (last accessed June 11, 2025)
- CNET Website, “HP Compaq nc6400 (Core Duo) review: HP Compaq nc6400 (Core Duo)” (May 8, 2006) at: <https://www.cnet.com/reviews/hp-compaq-nc6400-core-duo-review/> (last accessed June 11, 2025).
- Phonescoop.com, *Blackberry 7290*, <https://www.phonescoop.com/phones/phone.php?p=625> (last accessed June 13, 2025)
- GSMarena.com, *Blackberry 7290*, https://www.gsmarena.com/blackberry_7290-1348.php (last accessed June 13, 2025)
- PhoneDB.com, *Blackberry 7290*, https://phonedb.net/index.php?m=device&id=1476&c=rim_blackberry_7290 (last accessed June 13, 2025)
- PhoneArena.com, *Blackberry 7290*, https://www.phonearena.com/phones/BlackBerry-7290_id963 (last accessed June 13, 2025)
- Wikipedia.com, *Blackberry 7290*, https://en.wikipedia.org/wiki/List_of_BlackBerry_products (last accessed June 13, 2025)
- Keith Elder, “Cingular Blackberry 7290 First Impression – Review (Nov. 29, 2004): <http://keithelder.net/2004/11/29/blackberry-7290-arrived/> (last accessed June 11, 2025)
- Mobile Tracker Website, *BlackBerry 7130e with EV-DO on Verizon Wireless*, <http://www.mobiletracker.net/archives/2005/11/21/blackberry-7130e-verizon> (last accessed June 16, 2025)

As described in the following claim chart, the asserted claims of U.S. Patent No. 11,349,200 (the “’200 Patent”), are invalid as anticipated by Blackberry 7290. To the extent that Blackberry 7290 is found not to anticipate one or more of the asserted claims of the ’200 Patent, these claims are invalid as obvious in view of Blackberry 7290 alone or as modified in view of or in combination with other prior art references disclosed in Defendants’ Invalidity Contentions and accompanying charts, including without limitation as set forth below.

documents associated with each version on the Blackberry 7290. Geotab also reserves the right to rely on the public use, offer for sale, sale, or installation of the devices described in the publications identified herein once Geotab has had a fair opportunity to take discovery on these subjects.

- Cingular 8125/HTC Wizard⁴
- Blackberry 7130e⁵
- U.S. Patent No. 7,548,208 to Dou et al. (“Dou ’208”)
- Siemens SX66/HTC Blue Angel⁶
- HP iPAQ hw6515⁷

One of ordinary skill in the art, as of the priority date of the ’200 Patent, would have known to combine or modify the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

These invalidity contentions are not an admission that Geotab concedes or acquiesces to any claim construction implied or suggested by Plaintiff’s Complaint or Infringement Contentions. Nor is Geotab asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature. Geotab reserves the right to update its constructions and contentions in view of this Court’s claim construction order.⁸

⁴ The Cingular 8125 is a wireless device that was available for purchase in the United States no later than February 15, 2006. *See* Cingular Website, Archived on February 15, 2006 at: https://web.archive.org/web/20060215183508/http://www.cingular.com/8125_consumer (last accessed June 16, 2025).

⁵ The Blackberry 7130e is a wireless device that was available for purchase in the United States no later than December 1, 2005, which is prior to the critical date of the ’200 patent. *See* Mobile Tracker Website, *BlackBerry 7130e with EV-DO on Verizon Wireless*, <http://www.mobiletracker.net/archives/2005/11/21/blackberry-7130e-verizon> (last accessed June 16, 2025).

⁶ The Siemens SX66/HTC Blue Angel was available for purchase in the United States no later than December 31, 2004. *See* Mobile Tracker Website, “Siemens SX66 Launched by Cingular (Dec. 11, 2004) at: http://www.mobiletracker.net/archives/2004/12/11/siemens_sx66_la.php (last accessed June 16, 2025).

⁷ The HP iPAQ hw6515 was available for purchase in the United States no later than October 24, 2005. *See* Cingular Website, Archived on October 24, 2005 at: <https://web.archive.org/web/20051024012805/http://www.cingular.com:80/sbusiness/pocketpc> (last accessed June 16, 2025).

⁸ Geotab reserves the right to supplement and/or alter this chart based on further investigation and ongoing discovery.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
Claim 1		
1[pre]	A wireless device comprising:	To the extent the preamble is limiting, Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7290 is a wireless device. <i>See</i> Keith Elder, “Cingular Blackberry 7290 First Impression – Review (Nov. 29, 2004): http://keithelder.net/2004/11/29/blackberry-7290-arrived/ (last accessed June 11, 2025)

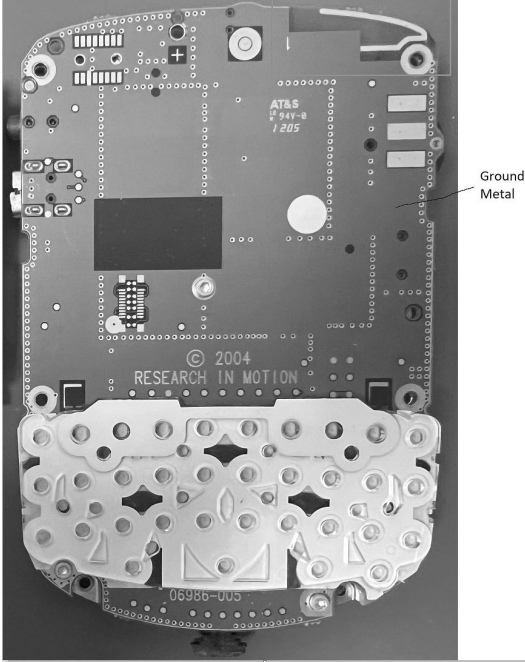
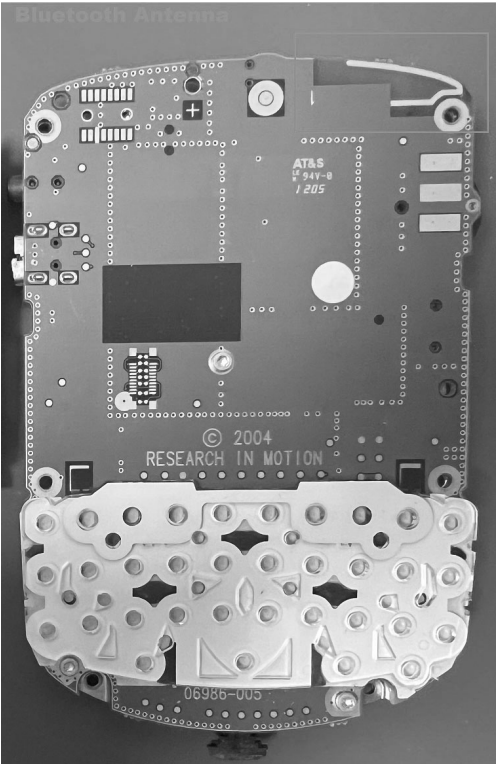
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
1[a]	An antenna system comprising	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7290 includes an antenna system comprising a ground plane and at least two antennas within the Blackberry 7290.  The at least two antennas within the Blackberry 7290 include a cellular antenna and a Bluetooth antenna.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 A photograph showing the internal components of a Blackberry 7290. The main component is a silver-colored metal housing with a central rectangular area containing a barcode and text. The text includes "PROD-12842-001", "RAPADON", "CE 0168", "UL", "LTD", "UR LIMITED", "BREMEN", "Made in HUNGARY", and "DIN 123456789". To the right of the main housing is a black plastic component labeled "Cellular Antenna".

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		
1[b]	a ground plane and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
1[c]	at least two antennas within the wireless device, the antenna system comprising:	Blackberry 7290 expressly or inherently discloses this claim element. <i>See</i> Claim 1[a].
1[d]	a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7290 includes a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane, which is a cellular antenna.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 The image shows the back cover and battery assembly of a Blackberry 7290. The back cover is a dark, textured plastic piece with a circular camera lens and flash at the top. The battery assembly is a silver-colored metal frame with a black battery insert. The battery insert has a label with the following text: "PROD-12842-001 RAPADON", "BLACKBERRY 7290", "CE 0168", "UL LISTED", "LTD. BY", "UL LISTED", "BURN", "BT MAC:00:0F:85:7B:7B:AC", "PART NO. 12842-001", "DATE: 25/02/2006", "MADE IN HUNGARY". The battery assembly is shown next to the back cover, which is labeled "Cellular Antenna" at the top.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		First Short Side 
1[e]	the first antenna being configured to support at least three frequency bands contained within first and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290												
	second frequency ranges of the electromagnetic spectrum,	The first antenna of the Blackberry 7290 includes a first antenna is configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum, the second frequency range being higher in frequency than the first frequency range. <table><tr><th colspan="2">Radio specifications</th></tr><tr><th colspan="2">BlackBerry 7290 Wireless Handheld</th></tr><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></table> See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													
1[f]	the second frequency range being higher in frequency than the first frequency range,	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 1[e].												
1[g]	the first antenna being configured to transmit and receive signals from a 4G communication standard,	Blackberry 7290 expressly or inherently discloses this claim element. See, e.g., The first antenna of the Blackberry 7290 is configured to transmit and receive signals from a 4G communication standard. For instance, the frequency bands in which the Blackberry 7290 is configured to transmit and receive signals are from a 4G communication standard.												

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290												
		<table><tr><th colspan="2">Radio specifications</th></tr><tr><td colspan="2">BlackBerry 7290 Wireless Handheld</td></tr><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></table>	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													
1[h]	the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The complexity factor calculation is performed according to the method in the patent. The first antenna of the Blackberry 7290 defines an antenna contour comprising an entire perimeter of the first antenna, wherein the antenna contour of the first antenna of the Blackberry 7290 has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35.												

Exhibit – E – 06

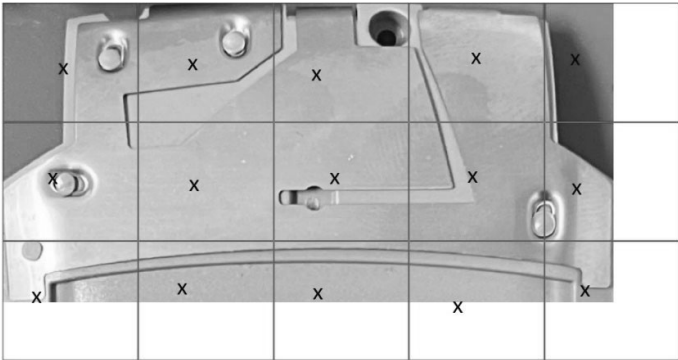
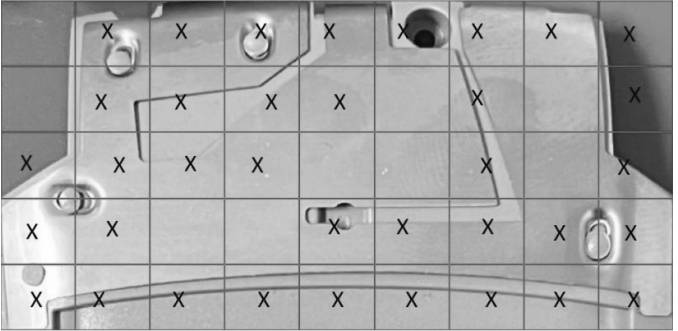
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 N1 = 15  N2=36

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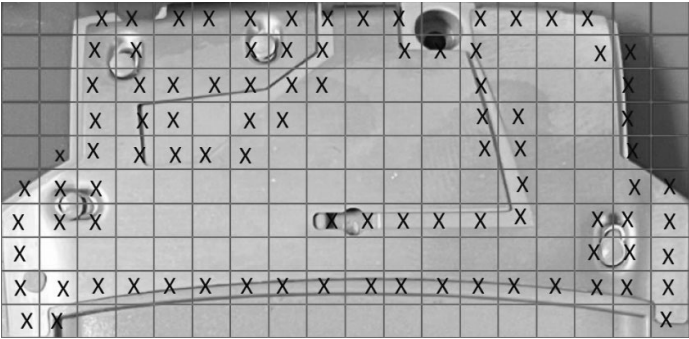
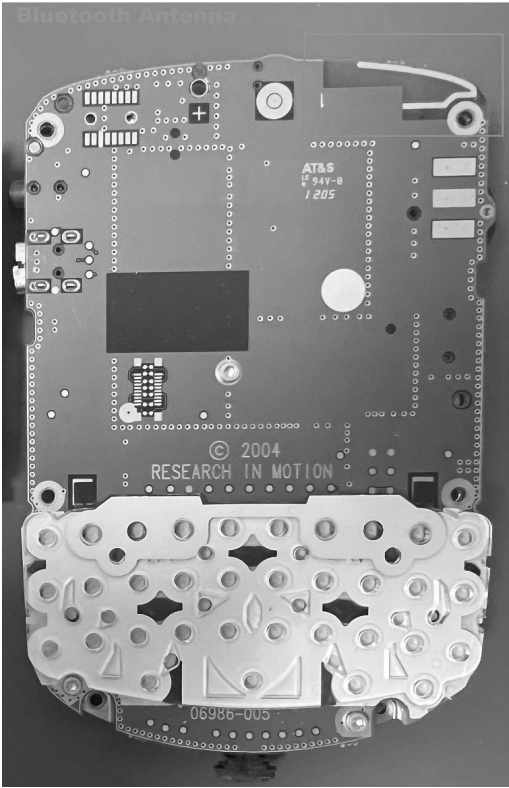
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 N3 = 92 $F21 = \log(36/15)/\log(2) = 1.26$ $F32 = \log(92/36)/\log(2) = 1.35$
1[i]	wherein the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 1[h].
1[j]	complexity factor F32 having a value of at least 1.35; and	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 1[h].

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
1[k]	a second antenna proximate to a first long side of the ground plane rectangle, and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Blackberry 7290 also includes a second antenna, which is a Bluetooth antenna that is proximate to a first long side of the ground plane rectangle.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290								
		First Short Side First Long Side  The second antenna of the Blackberry 7290 is configured to receive signals from a 4G communication standard. <table><tr><th colspan="2">Bluetooth Radio</th></tr><tr><td>Single-band support</td><td>ISM 2.4 GHz</td></tr><tr><td>Power class</td><td>Bluetooth class 2(1 mW)</td></tr><tr><td>Transmitting and receiving frequency</td><td>2402 to 2480 MHz</td></tr></table>	Bluetooth Radio		Single-band support	ISM 2.4 GHz	Power class	Bluetooth class 2(1 mW)	Transmitting and receiving frequency	2402 to 2480 MHz
Bluetooth Radio										
Single-band support	ISM 2.4 GHz									
Power class	Bluetooth class 2(1 mW)									
Transmitting and receiving frequency	2402 to 2480 MHz									

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		See FCC User Manual Safety and Product Info – Blackberry 7290 at 10. To the extent that the Blackberry 7290 does not disclose or render obvious this limitation alone, it would have been obvious to include a WLAN antenna proximate the first long side of the ground plane rectangle of the Blackberry 7290 in view of the Cingular 8125/HTC Wizard. The Cingular 8125 includes an antenna system including a cellular antenna proximate to a first short side of the ground plane rectangle, like the first antenna of the Blackberry 7290. 

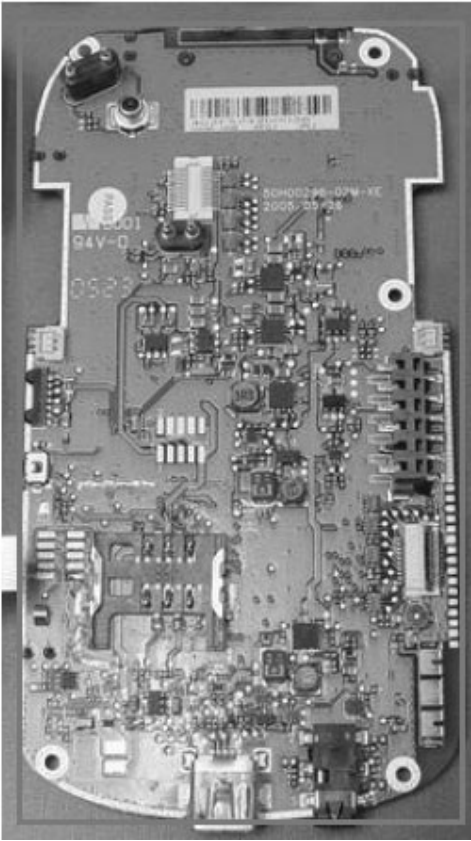
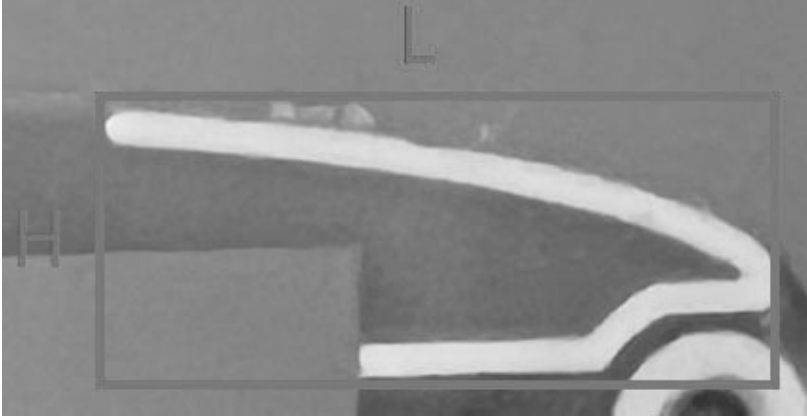
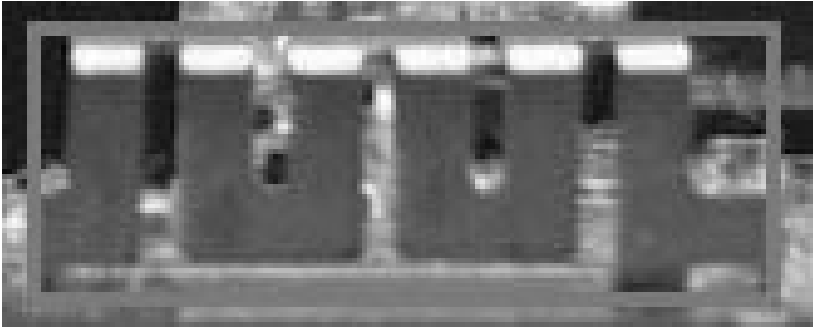
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		First Short Side  The Cingular 8125 also includes a second antenna, which is a WLAN antenna, proximate to a first long side of the ground plane rectangle enclosing the ground plane.

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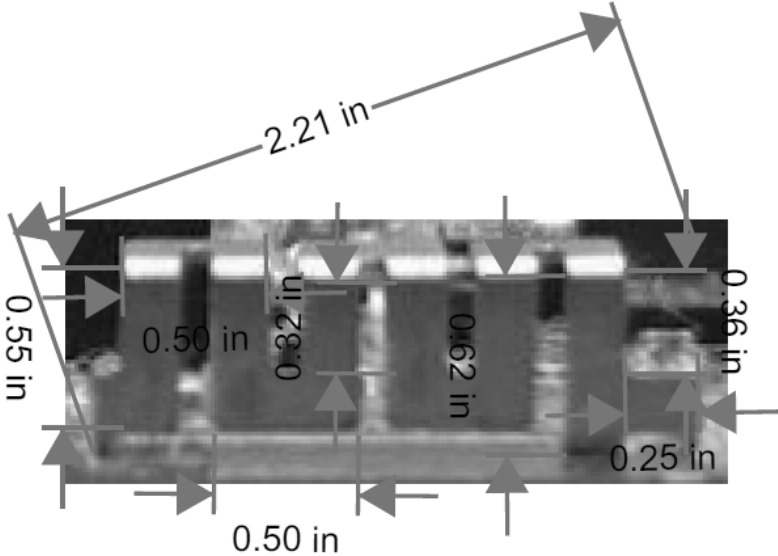
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		The second antenna of the Cingular 8125 is configured to receive signals from a 4G communication standard.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		➤ Integrated 802.11b support <i>See Cingular Website, Archived on February 15, 2006 at:</i> https://web.archive.org/web/20060215183508/http://www.cingular.com/8125_consumer (last accessed June 16, 2025). It would have been obvious to include a WLAN antenna, as disclosed in the Cingular 8125, in the Blackberry 7290 to provide integrated 802.11b WiFi support. Like the Cingular 8125, the Blackberry 7290 is a personal digital assistant (PDA) phone that user Internet connectivity to access features such as e-mail and web browsing. Adding WiFi support would have expanded the number of locations where users of the Blackberry 7290 could access a high speed internet connection, including locations where cell service was poor or outside of locations served by the user's network. Moreover, there would have been a reasonable expectation of success in including a WLAN antenna in the Blackberry 7290 without significant interference between the antennas. The Cingular 8125 includes cellular and Bluetooth antennas that are positioned in locations similar to the cellular and Bluetooth antennas of the Blackberry 7290 (i.e., cellular antenna proximate to the first short side and Bluetooth antenna underneath the cellular antenna). Moreover, circuitry to operate the WLAN antenna to transmit and receive signals was widely available in the marketplace. Including a WLAN antenna in the Blackberry 7290 as in the Cingular 8125 would have been combining prior art elements according to known methods to yield predictable results.
1[1]	wherein the second antenna is configured to receive signals	Blackberry 7290 expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
	from a 4G communication standard.	<i>See</i> Claim 1[k].
Claim 2		
2[a]	The wireless device of claim 1, wherein the second antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> In the Blackberry 7290, the second antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna, an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining an antenna rectangle, an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 Moreover, this limitation is satisfied by the Blackberry 7290 as modified in view of the Cingular 8125. 
2[b]	an orthogonal projection of the antenna box along a normal to	Blackberry 7290 expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
	a face with a largest area of the second antenna defining	<i>See</i> Claim 2[a].
2[c]	an antenna rectangle,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See</i> Claim 2[a].
2[d]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See</i> Claim 2[a].
Claim 3		
3	The wireless device of claim 2, wherein the second antenna defines a second antenna contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> To the extent the Blackberry 7290 does not disclose or render obvious this limitation alone, the Blackberry 7290 as modified in view of the Cingular 8125 satisfies this limitation.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
	diagonal of the antenna rectangle.	The second antenna of the modified Blackberry 7290 defines a second antenna contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle:  $4 \times D = 2.21 \times 4 = 8.84$ $L > 6(0.55) + 5(0.5) + 4(.32) + 6(.36) > 9.24$
Claim 4		
4	The wireless device of claim 1, wherein the first antenna is	Blackberry 7290 expressly or inherently discloses this claim element.

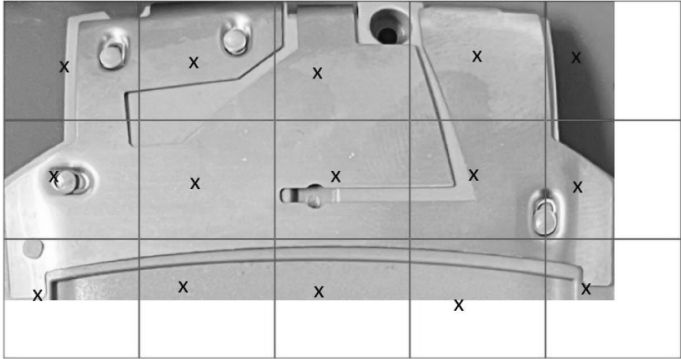
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290												
	configured to support at least four frequency bands.	<i>See, e.g.,</i> The first antenna of the Blackberry 7290 is configured to support at least four frequency bands. <table><tr><th colspan="2">Radio specifications</th></tr><tr><th colspan="2">BlackBerry 7290 Wireless Handheld</th></tr><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></table> <i>See</i> FCC User Manual Safety and Product Info – Blackberry 7290 at 10.	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													
Claim 6														
6[pre]	A wireless device comprising:	Blackberry 7290 expressly or inherently discloses this claim element. <i>See</i> Claim 1[pre].												
6[a]	an antenna system comprising	Blackberry 7290 expressly or inherently discloses this claim element. <i>See</i> Claim 1[a].												

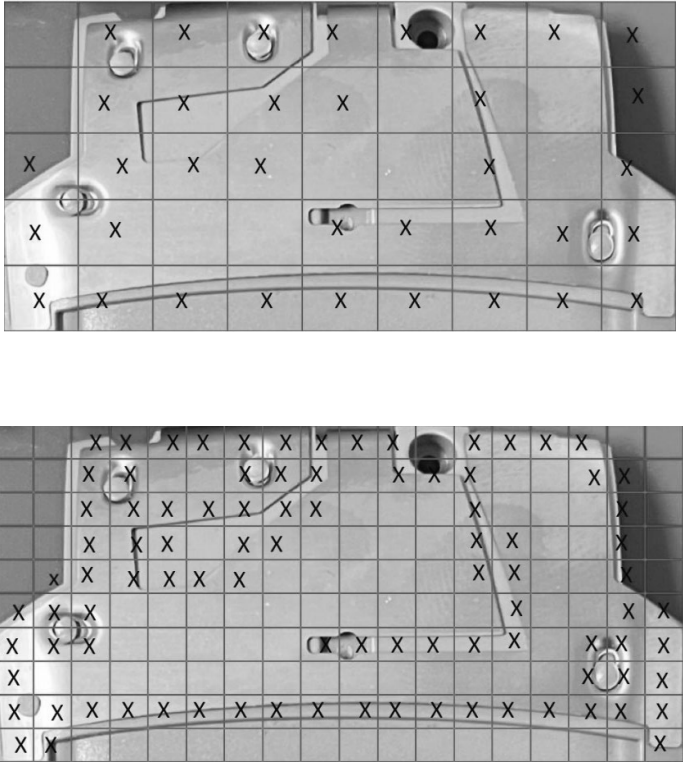
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
6[b]	a ground plane and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[c]	at least two antennas within the wireless device, the antenna system comprising:	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[d]	a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards, wherein	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7290 includes a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards, wherein at least two of the at least four frequency bands are contained within a first frequency range and at least two of the four frequency bands are contained within a second frequency range, the first frequency range being lower in frequency than the second frequency range.

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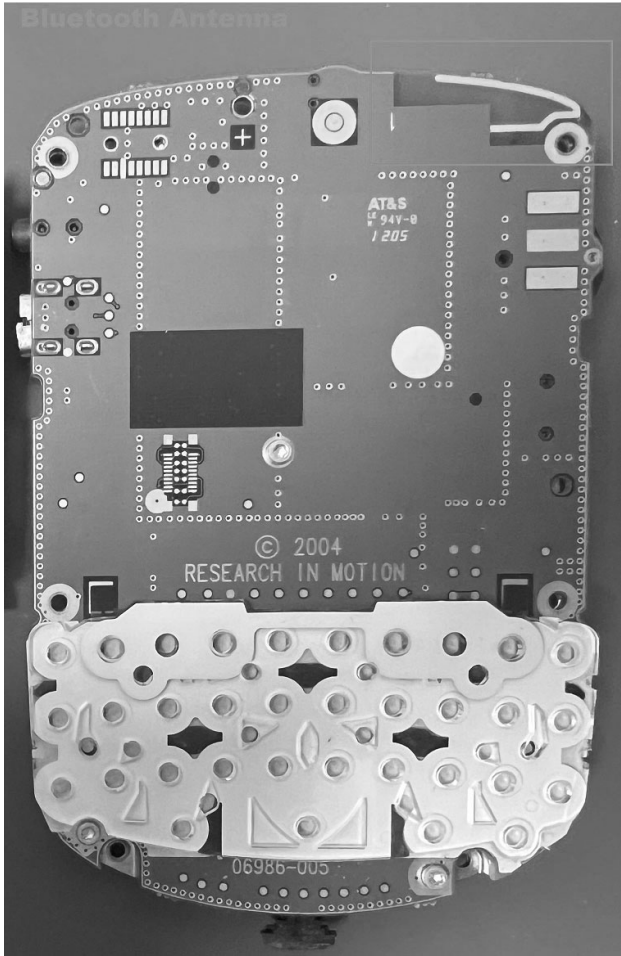
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290												
		<table><tr><th colspan="2">Radio specifications</th></tr><tr><td colspan="2">BlackBerry 7290 Wireless Handheld</td></tr><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></table> See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													
6[e]	at least two of the at least four frequency bands are contained within a first frequency range and	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 6[d].												
6[f]	at least two of the four frequency bands are contained within a second frequency range,	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 6[d].												
6[g]	the first frequency range being lower in frequency than the second frequency range,	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 6[d].												

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
6[h]	the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna, and wherein	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The complexity factor calculation is performed according to the method in the patent. The first antenna of the Blackberry 7290 defines an antenna contour comprising an entire perimeter of the first antenna, wherein the antenna contour of the first antenna of the Blackberry 7290 has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35.  N1 = 15

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 N2 = 36 N3=92 F21=1.26 F32=1.35
6[i]	the first antenna contour has a level of complexity defined by	Blackberry 7290 expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290								
	complexity factor F21 having a value of at least 1.20 and	See Claim 6[h].								
6[j]	complexity factor F32 having a value of at least 1.35; and	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 6[h].								
6[k]	a second antenna configured to operate in at least one frequency band being used by a 4G communication standard,	Blackberry 7290 expressly or inherently discloses this claim element. See, e.g., The antenna system of the Blackberry 7290 also includes a second antenna, which is a Bluetooth antenna that is configured to operate in at least one frequency band being used by a 4G communication standard. <table><tr><th colspan="2">Bluetooth Radio</th></tr><tr><td>Single-band support</td><td>ISM 2.4 GHz</td></tr><tr><td>Power class</td><td>Bluetooth class 2(1 mW)</td></tr><tr><td>Transmitting and receiving frequency</td><td>2402 to 2480 MHz</td></tr></table> See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.	Bluetooth Radio		Single-band support	ISM 2.4 GHz	Power class	Bluetooth class 2(1 mW)	Transmitting and receiving frequency	2402 to 2480 MHz
Bluetooth Radio										
Single-band support	ISM 2.4 GHz									
Power class	Bluetooth class 2(1 mW)									
Transmitting and receiving frequency	2402 to 2480 MHz									

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		To the extent the Blackberry 7290 does not disclose or render obvious this limitation, it would have been obvious to include a second antenna in the Blackberry 7290 configured to operate in at least one frequency band being used by a 4G communication standard in view of the Blackberry 7130e. The Blackberry 7130e is a wireless device that was available for purchase in the United States no later than December 1, 2005, which is prior to the critical date of the '200 patent. See Mobile Tracker Website, BlackBerry 7130e with EV-DO on Verizon Wireless, http://www.mobiletracker.net/archives/2005/11/21/blackberry-7130e-verizon (last accessed June 16, 2025). The Blackberry 7130e includes a second antenna configured to operate in at least one frequency band being used by a 4G communication standard, which is a cellular antenna.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 <i>See FCC Internal Photos – Blackberry 7130e at 2.</i> It would have been obvious to include the second antenna of the Blackberry 7130e in the Blackberry 7290 to achieve cellular antenna diversity for improving the data rate, as taught by Dou '208:

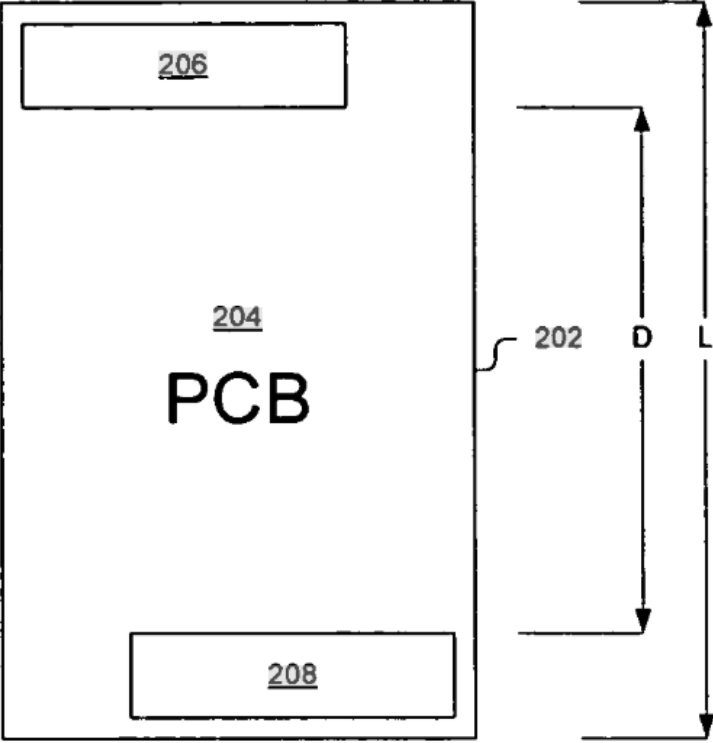
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		<u>200</u>  Dou '208 (Abstract) teaches “an internal diversity antenna architecture.” According to Dou '208 (3:54-58), “first internal antenna 206 and the second internal antenna 208 may be used to implement various spatial diversity techniques to improve communication of wireless signals across one or more wireless frequency bands of wireless shared media.” For example (3:26-31),

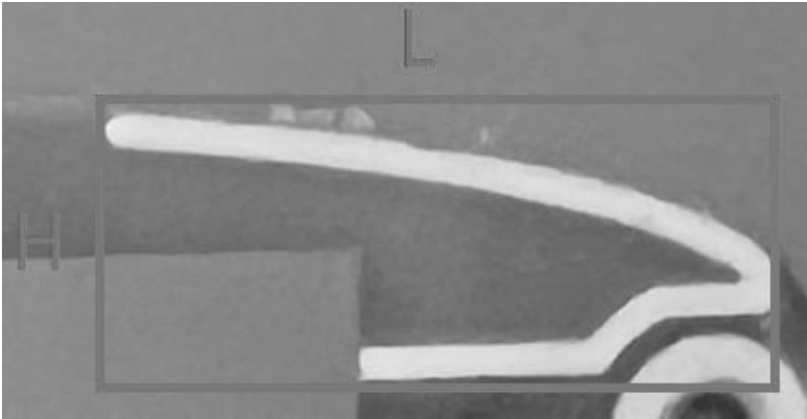
Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		“the primary antenna (e.g., first internal antenna 206) may be configured for transmission and both the primary antenna (e.g., first internal antenna 206) and the secondary antenna (e.g., second internal antenna 208) may be configured for reception. Such an arrangement may be used in a cellular phone for improving data rate. As another example (3:32-35), “the primary antenna (e.g., first internal antenna 206) and the secondary antenna (e.g., second internal antenna 208) may be configured for both transmission and reception.” The result of the modification would have included the cellular antenna of the BlackBerry 7290 as the first internal antenna 206 and the cellular antenna of the BlackBerry 7130e as the second internal antenna 208. 

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 A black and white photograph of the back cover of a Blackberry 7290. The cover is black and has a circular camera lens at the top. A white label with the text "007B 13" is affixed to the cover. Below this, another white label contains the text: "Part#: POP-08V83-007 Rev B, CPM 917", "Build Date: 07/28/05", and "Property of Research In Motion". At the bottom of the cover, there is a small rectangular label with the number "1".

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		There would have been a reasonable expectation of success because the Blackberry 7290 and 7130e implement cellular service using each cellular antenna individually, and Dou '208 further teaches how to implement the two antennas together in a diversity architecture, such as how far apart to space the two antennas from one another, and circuitry to operate the two cellular antennas in a diversity architecture. There is also considerable technical overlap between the Blackberry 7290, the Blackberry 7130e, and Dou'208 . For example, the cellular antennas of the Blackberry 7290 and 7130e are located at the top and bottom of the devices, respectively, as taught for the internal antennas 206, 208, respectively, in Dou '208. Also, Dou '208 (3:42-47) teaches that the internal antennas 206, 208 may operate in the GSM 800 and PCS 1900 frequency bands, in which the cellular antennas of the Blackberry 7290 and 7130e already operate. Moreover, Dou '208 (3:50-62) teaches that the internal antennas 206, 208 may be designed for Evolution Data Optimized (EVDO) diversity in the 800 MHz and 1900 MHz bands, and the Blackberry 7130e is designed for EVDO cellular service. <i>See</i> Mobile Tracker Website, <i>BlackBerry 7130e with EV-DO on Verizon Wireless</i>, http://www.mobiletracker.net/archives/2005/11/21/blackberry-7130e-verizon (last accessed June 16, 2025).
6[l]	the second antenna defining an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the Blackberry 7290 defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna, an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining an antenna rectangle, an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 The width L of the antenna rectangle is at least twice as long as the height H of the antenna rectangle. Moreover, this limitation is satisfied by the Blackberry 7290 as modified in view of the Blackberry 7130e.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 The width W of the antenna rectangle is at least twice as long as the height H of the antenna rectangle.
6[m]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 6[l].</i>
6[n]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 6[l].</i>
6[o]	an antenna rectangle,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 6[l].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
6[p]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2, and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 6[l].</i>
6[q]	wherein at least one of the first and second antennas is close to a first short side of a ground plane rectangle enclosing the ground plane.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> At least one of the first and second antennas of the Blackberry 7290 is close to a first short side of a ground plane rectangle enclosing the ground plane.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 The image shows the internal components of a Blackberry 7290. The main component is the cellular antenna, which is a large, rectangular, metallic structure with a complex internal circuitry. It is labeled "Cellular Antenna" at the top. Below the antenna is a battery compartment with a label that includes the CE mark, the number "0168", and a barcode. The battery compartment is labeled "BATTERY" and "BLACKBERRY 7290". To the right of the battery compartment is a small, rectangular component labeled "CELLULAR ANTENNA". The entire assembly is housed within a metallic frame.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		First Short Side 
Claim 7		
7	The wireless device of claim 6, wherein the first antenna contour comprises at least 20 segments.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna contour of the first antenna of the Blackberry 7290 includes at least 20 segments.

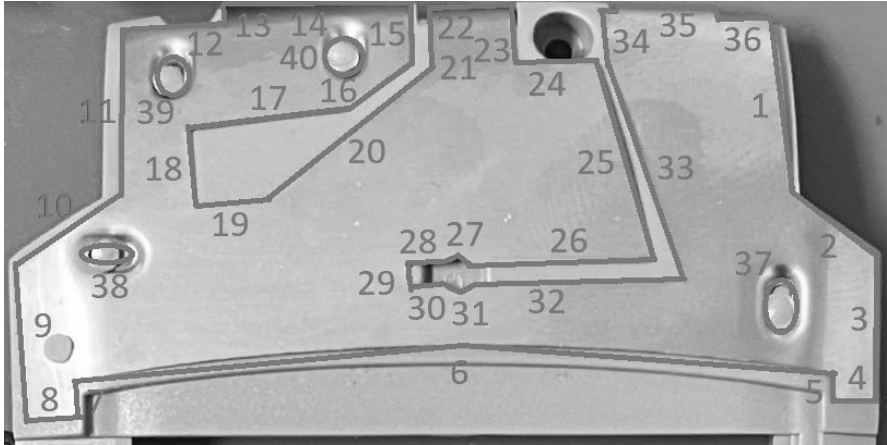
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		
Claim 9		
9[a]	The wireless device of claim 6, wherein the second antenna defines a second antenna contour comprising an entire perimeter of the second antenna,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> To the extent the Blackberry 7290 does not disclose or render obvious this limitation alone, the Blackberry 7290 as modified in view of the Blackberry 7130e satisfies this limitation. The second antenna defines a second antenna contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.

Exhibit – E – 06

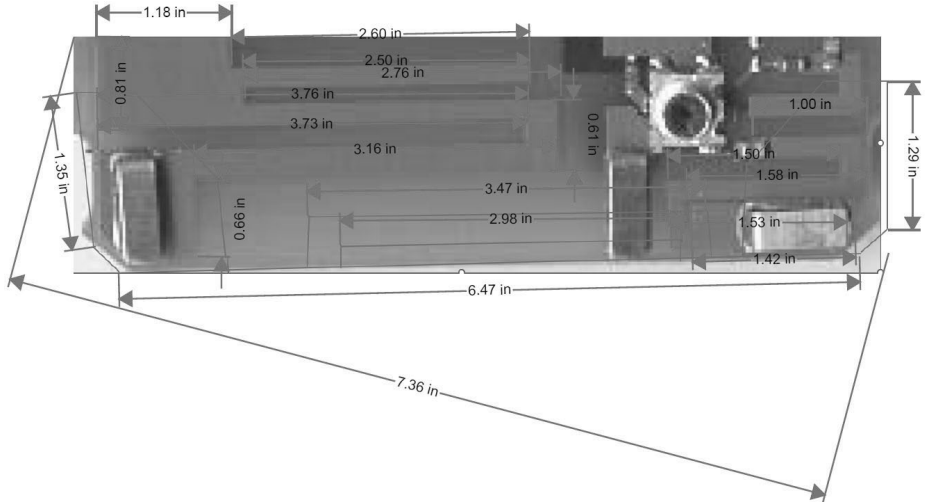
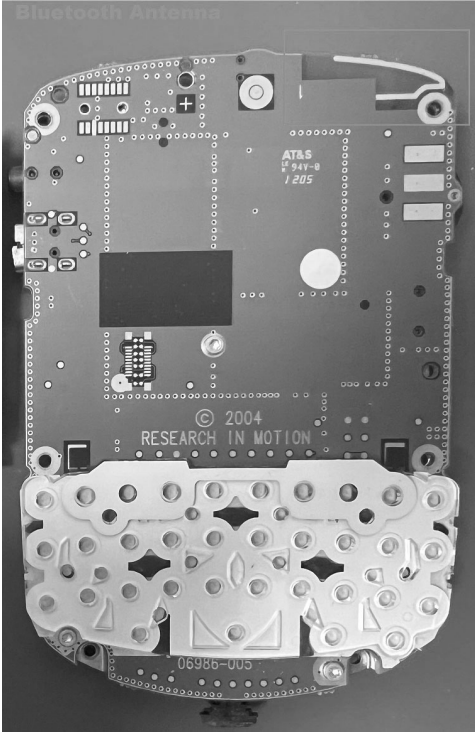
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 $4D = 7.36(4) = 29.44$ $L > 1.18 + 2.6 + 2.5 + 2.76 + 3.76 + 3.73 + .81 + .61 + 3.16 + .66 + 1 + 1.5 + 1.58 + 1.53 + 1.42 + 1.29 + 3.47 + 2.98 + 6.47 + 1.3 > 44.36 > 29.44$
9[b]	wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 9[a].
Claim 10		
10	The wireless device of claim 6, wherein the antenna system comprises a third antenna	Blackberry 7290 expressly or inherently discloses this claim element.

Exhibit – E – 06

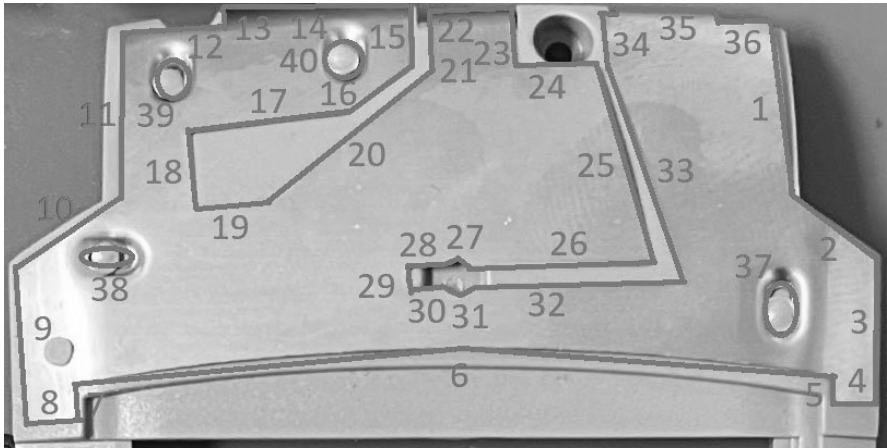
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
	configured to provide operation in a wireless communication standard.	<i>See, e.g.,</i> To the extent the Blackberry 7290 does not disclose or render obvious this limitation alone, the Blackberry 7290 as modified in view of the Blackberry 7130e satisfies this limitation. For example, where the cellular antenna of the Blackberry 7130e is the second antenna, the Bluetooth antenna of the Blackberry 7290 is a third antenna configured to provide operation in a wireless communication standard.

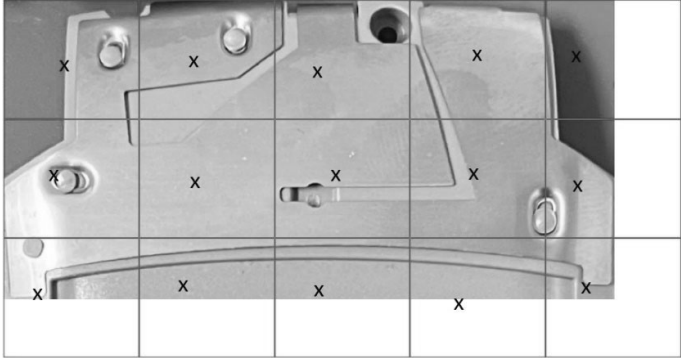
Exhibit – E – 06

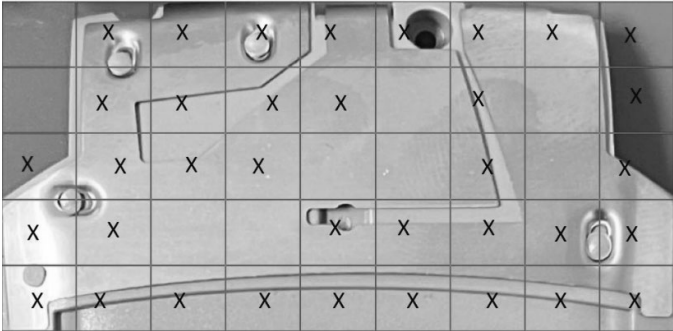
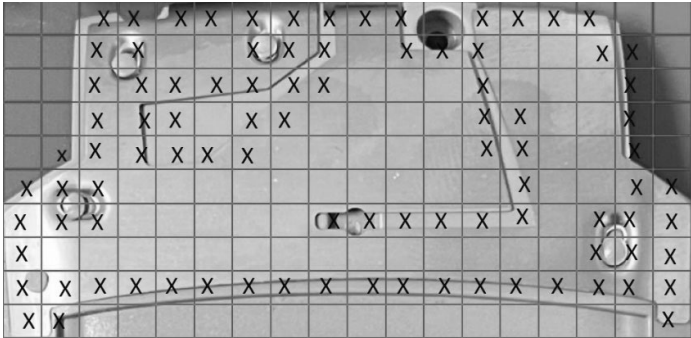
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		
Claim 11		
11[pre]	A wireless device comprising:	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290												
11[a]	an antenna system comprising	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 1[a].												
11[b]	a ground plane and	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 1[a].												
11[c]	at least two antennas within the wireless device, the antenna system comprising:	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 1[a].												
11[d]	a first antenna configured to provide operation in at least three frequency bands being used by 4G communication standards,	Blackberry 7290 expressly or inherently discloses this claim element. See, e.g., The Blackberry 7290 includes a first antenna that is a cellular antenna configured to provide operation in at least three frequency bands being used by 4G communication standards. <table><tr><th colspan="2">Radio specifications</th></tr><tr><td colspan="2">BlackBerry 7290 Wireless Handheld</td></tr><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></table>	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													

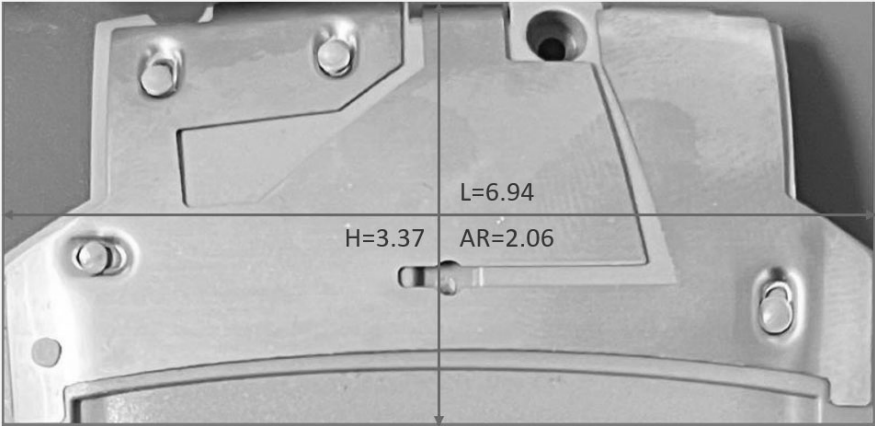
Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.
11[e]	the first antenna defining an antenna contour comprising an entire perimeter of the first antenna,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the Blackberry 7290 defines an antenna contour comprising an entire perimeter of the first antenna, the antenna contour comprising at least twenty segments. 
11[f]	the antenna contour comprising at least twenty segments,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 11[e].</i>

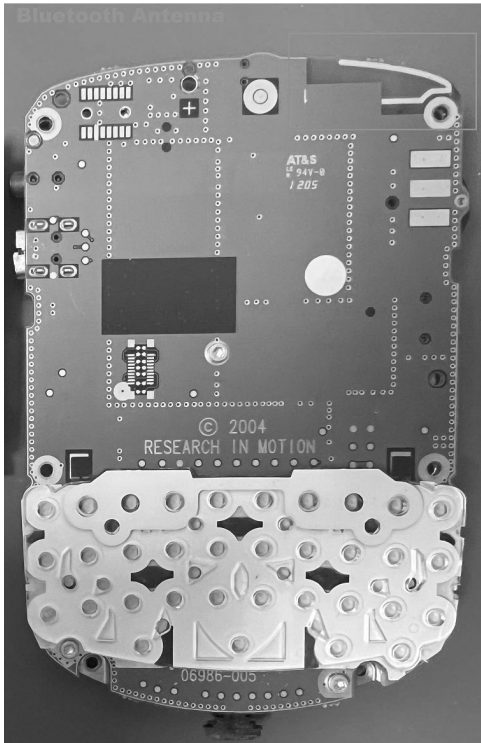
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
11[g]	wherein the antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The complexity factor calculation is performed according to the method in the patent. The antenna contour of the first antenna of the Blackberry 7290 has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35.  N1 = 15

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 N2 = 36  N3 = 92 F21 = 1.26 F32 = 1.35

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
11[h]	complexity factor F32 having a value of at least 1.35, and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 11[g].</i>
11[i]	wherein the first antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the Blackberry 7290 defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna, an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining an antenna rectangle, an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		
11[j]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 11[i].</i>
11[k]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 11[i].</i>
11[l]	an antenna rectangle,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 11[i].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
11[m]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2; and	Blackberry 7290 expressly or inherently discloses this claim element. <i>See Claim 11[i].</i>
11[n]	a second antenna configured to provide operation in a first wireless service,	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7290 includes a second antenna that is a Bluetooth antenna configured to provide operation in a first wireless service, the second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290								
		 The image shows the internal components of a Blackberry 7290. At the top, a label reads "Bluetooth Antenna". Below it, various electronic components are visible, including a chip labeled "AT&S 949-0 1205". In the center, there is a copyright notice: "© 2004 RESEARCH IN MOTION". At the bottom, a white plastic component with multiple circular holes is visible, labeled "06986-005". <table><tr><th colspan="2">Bluetooth Radio</th></tr><tr><td>Single-band support</td><td>ISM 2.4 GHz</td></tr><tr><td>Power class</td><td>Bluetooth class 2(1 mW)</td></tr><tr><td>Transmitting and receiving frequency</td><td>2402 to 2480 MHz</td></tr></table> See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.	Bluetooth Radio		Single-band support	ISM 2.4 GHz	Power class	Bluetooth class 2(1 mW)	Transmitting and receiving frequency	2402 to 2480 MHz
Bluetooth Radio										
Single-band support	ISM 2.4 GHz									
Power class	Bluetooth class 2(1 mW)									
Transmitting and receiving frequency	2402 to 2480 MHz									

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290												
11[o]	a second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.	Blackberry 7290 expressly or inherently discloses this claim element. See Claim 11[n].												
Claim 12														
12	The wireless device of claim 11, wherein the first antenna is configured to support at least four frequency bands.	Blackberry 7290 expressly or inherently discloses this claim element. See, e.g., The first antenna of the Blackberry 7290 is configured to support at least four frequency bands. <table border="1"><thead><tr><th colspan="2">Radio specifications</th></tr><tr><th colspan="2">BlackBerry 7290 Wireless Handheld</th></tr></thead><tbody><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></tbody></table> See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290								
Claim 13										
13	The wireless device of claim 11, wherein the first wireless service is a WiFi communication standard.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the Blackberry 7290 is configured to support the ISM 2.4 GHz band from 2402 MHz to 2480 MHz, which is used by the IEEE 802.11b WiFi communication standard. <table><tr><th colspan="2">Bluetooth Radio</th></tr><tr><td>Single-band support</td><td>ISM 2.4 GHz</td></tr><tr><td>Power class</td><td>Bluetooth class 2(1 mW)</td></tr><tr><td>Transmitting and receiving frequency</td><td>2402 to 2480 MHz</td></tr></table> <i>See</i> FCC User Manual Safety and Product Info – Blackberry 7290 at 10. Moreover to the extent this limitation is not disclosed or rendered obvious by the Blackberry 7290 alone, it would have been obvious to include, in the Blackberry 7290, a second antenna proximate to a side of a ground plane rectangle enclosing the ground plane, which is configured to provide operation in a first wireless service that is a WiFi communication standard as in the Cingular 8125 discussed above. For instance, the WLAN antenna of the Cingular 8125 is configured to provide operation in IEEE 802.11b, which is a WiFi communication standard. Alternatively, it would have been obvious to include, in the Blackberry 7290, a second antenna proximate to a side of a ground plane rectangle enclosing the ground plane, which is configured to provide operation in a first wireless service that is a WiFi communication standard as in the HTC Blue Angel. The reasons for including the WiFi antenna of the HTC Blue Angel are similar to those discussed above in connection with the Cingular 8125.	Bluetooth Radio		Single-band support	ISM 2.4 GHz	Power class	Bluetooth class 2(1 mW)	Transmitting and receiving frequency	2402 to 2480 MHz
Bluetooth Radio										
Single-band support	ISM 2.4 GHz									
Power class	Bluetooth class 2(1 mW)									
Transmitting and receiving frequency	2402 to 2480 MHz									

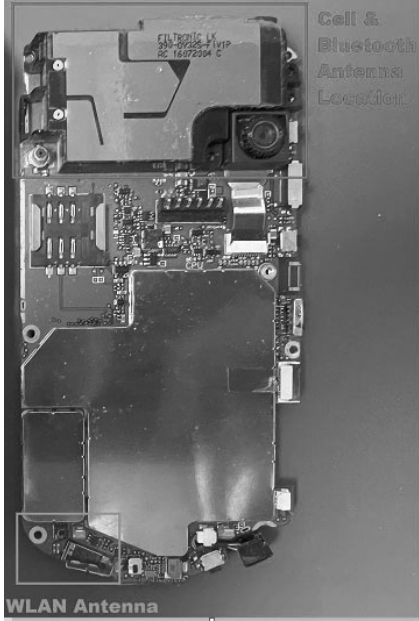
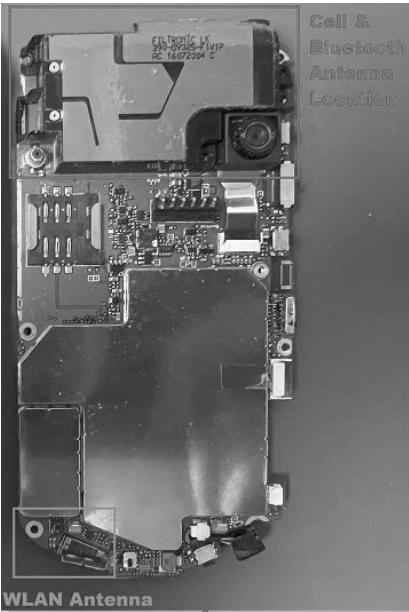
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 The WLAN antenna of the HTC Blue Angel is configured to provide operation in IEEE 802.11b, which is a WiFi communication standard.
Claim 15		
15	The wireless device of claim 11, wherein the antenna system comprises a third antenna.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i>

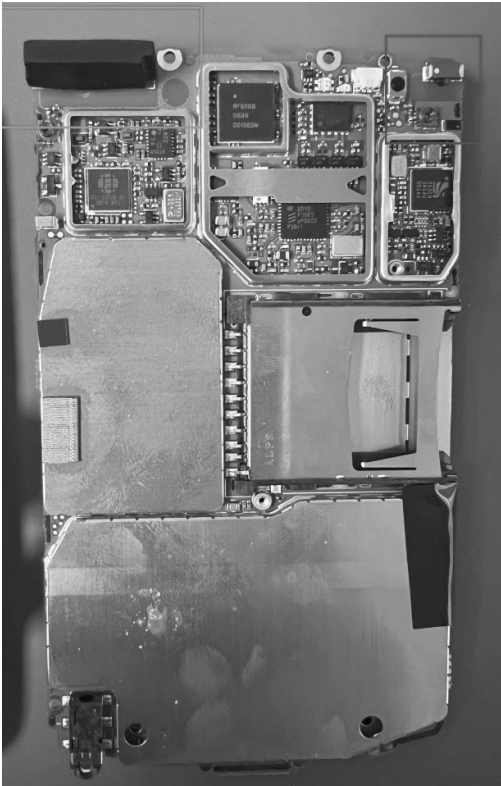
Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		To the extent that the Blackberry 7290 does not disclose or render obvious this limitation, the Blackberry 7290 as modified in view of the Cingular 8125 or HTC Blue Angel satisfies this limitation. For example, where the WLAN antenna of the Cingular 8125 or HTC Blue Angel is the second antenna, the Bluetooth antenna of the Blackberry 7290 is a third antenna of the antenna system.  The image shows the internal circuitry of a Blackberry 7290. A label 'Cell & Bluetooth Antenna Location' points to a component at the top right. Another label 'WLAN Antenna' points to a component at the bottom left. The circuit board is populated with various components including capacitors, resistors, and integrated circuits.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290								
Claim 17										
17	The wireless device of claim 15, wherein the third antenna is configured to provide operation in a second wireless service.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> To the extent the Blackberry 7290 does not disclose or render obvious this limitation alone, the Blackberry 7290 modified in view of the Cingular 8125 or HTC Blue angel satisfies this limitation. For instance, where the WLAN antenna of the Cingular 8125 or the HTC Blue Angel is the second antenna, the Bluetooth antenna of the Blackberry 7290 is a third antenna configured to provide operation in a second wireless service, which is a Bluetooth wireless service. <table><tr><td colspan="2">Bluetooth Radio</td></tr><tr><td>Single-band support</td><td>ISM 2.4 GHz</td></tr><tr><td>Power class</td><td>Bluetooth class 2(1 mW)</td></tr><tr><td>Transmitting and receiving frequency</td><td>2402 to 2480 MHz</td></tr></table> <i>See FCC User Manual Safety and Product Info – Blackberry 7290 at 10.</i>	Bluetooth Radio		Single-band support	ISM 2.4 GHz	Power class	Bluetooth class 2(1 mW)	Transmitting and receiving frequency	2402 to 2480 MHz
Bluetooth Radio										
Single-band support	ISM 2.4 GHz									
Power class	Bluetooth class 2(1 mW)									
Transmitting and receiving frequency	2402 to 2480 MHz									
Claim 19										
19	The wireless device of claim 15, wherein the antenna system comprises a fourth antenna.	Blackberry 7290 expressly or inherently discloses this claim element. <i>See, e.g.,</i> To the extent the Blackberry 7290 does not disclose or render obvious this limitation alone or in combination with the Cingular 8125 or HTC Blue Angel,								

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		it would have been obvious to include a fourth antenna in the Blackberry 7290 for GPS reception as the HP iPAQ hw6515 (shown below). See Cingular Website, Archived on October 24, 2005 at: https://web.archive.org/web/20051024012805/http://www.cingular.com:80/sbusiness/pocketpc (last accessed June 16, 2025). 

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 A black and white photograph showing the internal components of a Blackberry 7290. The image displays the main circuit board with various chips, capacitors, and connectors. A large, rectangular battery is visible in the center, and a smaller, rectangular component, possibly a camera or sensor, is located at the top. The device is shown from the back, with the outer casing removed.

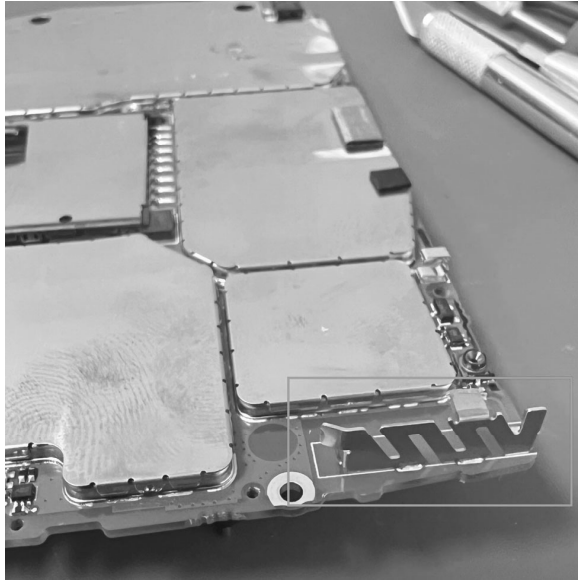
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		 One reason to have included the GPS antenna of the HP iPAQ hw6515 in the Blackberry 7290 would have been to provide navigation functionality in the device as in the HP iPAQ hw6515.

Exhibit – E – 06

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7290
		GPS Receiver Integrated high sensitivity GPS receiver with HP iPAQ Quick GPS Connection Utility. Quick GPS Connection is a software application residing on the device that enables a faster connection time for enhanced GPS performance. • GPS Navigation software is included with HP iPAQ hw6500 models sold in Europe. It comes with the ability to download one city map from a pre-defined list of cities in the United States, Western Europe and Canada. A full set of maps are available for purchase at www.tomtom.com/gpsnavigation. • For customers in other parts of the world, GPS navigation application and maps are available for purchase at www.hp.com/go/gpsnavigation. NOTE: While the GPS radio on your device is able to connect to the GPS satellites without enabling the Quick GPS Connection, it may take a few minutes longer and even up to five minutes to locate the satellites without using the Quick GPS Connection. The user is required to enable Quick GPS Connection updates. <i>See HP iPAQ hw6515 User Manual.</i> Another reason to have included the GPS antenna of the HP iPAQ hw6515 would have been to include assisted GPS (AGPS) functionality, as per the FCC's 911 requirement to make cell phone location data available to emergency call dispatchers. AGPS functionality using a dedicated GPS antenna is included, for example, in the Blackberry 7130e.

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INVALIDITY CONTENTIONS FOR U.S. PATENT NO. 11,349,200 B2
BASED ON THE BLACKBERRY 7130c (“Blackberry 7130c”)

Based upon Plaintiff’s Complaint, Infringement Contentions, and apparent claim constructions and application of the claims to Defendants’ accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious some or all of claims 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 17, and 19 (the “’200 Asserted Claims”)¹. These invalidity contentions are not an admission by the Defendants that the accused products are covered by or infringe the Asserted Claims, particularly when these claims are properly construed and applied.

AIA law applies because the application that issued as the ’200 Patent was filed on April 30, 2021, after the AIA came into force on March 16, 2013.

Research in Motion’s (“RIM”) Blackberry 7130c, as publicly demonstrated, know, offered for sale, sold, and/or used by RIM and/or customers of RIM, (“Blackberry 7130c”) was approved by the FCC on May 2, 2006² and first announced in June 2006³. Thus, the Blackberry 7130c is available as prior art at least under at least pre-AIA 35 U.S.C. § 102(a)-(b), or (g)(2) and/or AIA 35 U.S.C. § 102(a)(1). At least the following documents provide evidence as to the date the Blackberry 7130c was “offered for sale or publicly used or known,” “the date the offer or use of the item took place or the information became known”, and the “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known”⁴:

- PhoneScoop.com, *Blackberry 7130c*, <https://www.phonescoop.com/phones/phone.php?p=963> (last accessed June 18, 2025)
- PhoneArena.com, *Blackberry 7130c*, https://www.phonearena.com/phones/BlackBerry-7130c_id1587 (last accessed June 18, 2025)

¹ Defendants understand that, by not charting claims 5, 8, 14, 16, 18, and 20 in its Infringement Contentions, Plaintiff does not assert these claims against Defendants.

² See PhoneScoop.com, *Blackberry 7130c*, <https://www.phonescoop.com/phones/phone.php?p=963> (last accessed June 18, 2025); PhoneArena.com, *Blackberry 7130c*, https://www.phonearena.com/phones/BlackBerry-7130c_id1587 (last accessed June 18, 2025).

³ See GSMarena.com, *Blackberry 7130c*, https://www.gsmarena.com/blackberry_7130c-1623.php (last accessed June 18, 2025).

⁴ Defendants do not yet have complete information regarding the dates by which this product was publicly disclosed, made, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the particular individuals involved in such activities. Defendants anticipate that the actual dates, circumstances, and identities of individuals will be the subject of third party discovery during this lawsuit. Defendants therefore reserve the right to amend and/or supplement their Invalidity Contentions and this chart if additional information becomes available during the course of discovery. The date the Blackberry 7130c was “offered for sale or publicly used or known,” as well as “the date the offer or use of the item took place or the information became known” is at least as early as the dates identified in the published documents. The “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known” includes at least those persons associated with the publication(s), press releases, and conference attendees, or other documents associated with each version on the Blackberry 7130c. Defendants also reserve the right to rely on the public use, offer for sale, sale, or installation of the devices described in the publications identified herein once Defendants have had a fair opportunity to take discovery on these subjects.

- GSMArena.com, *Blackberry 7130c*, https://www.gsmarena.com/blackberry_7130c-1623.php (last accessed June 18, 2025)
- Engadget, “Cingular launches BlackBerry 7130c” (June 8, 2006) at: <https://www.engadget.com/2006-06-08-cingular-launches-blackberry-7130c.html?guccounter=1> (last accessed June 18, 2025).
- Wikipedia, “List of BlackBerry products” at: https://en.wikipedia.org/wiki/List_of_BlackBerry_products (last accessed June 18, 2025).
- CNET Website, “Cingular and RIM announce BlackBerry 7130c” (June 8 2006) a: <https://www.cnet.com/tech/mobile/cingular-and-rim-announce-blackberry-7130c/> (last accessed June 18, 2025).
- Cingular, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025).
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “L6A”; Product Code: “RBA40GW”; Record Option: 1/3 “Detail”; Attachment: “Internal Photos” (last accessed June 17, 2025) (“FCC Internal Photos”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “L6A”; Product Code: “RBA40GW”; Record Option: 1/3 “Detail”; Attachment: “External Photos” (last accessed June 17, 2025) (“FCC External Photos”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “L6A”; Product Code: “RBA40GW”; Record Option: 1/3 “Detail”; Attachment: “Test Report” (last accessed June 17, 2025) (“FCC Test Report”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “L6A”; Product Code: “RBA40GW”; Record Option: 1/3 “Detail”; Attachment: “User Manual 3 of 3” (last accessed June 17, 2025) (“FCC User Manual and Product Info”)

As described in the following claim chart, the asserted claims of U.S. Patent No. 11,349,200 (the “’200 Patent”), are invalid as anticipated by Blackberry 7130c. To the extent that Blackberry 7130c is found not to anticipate one or more of the asserted claims of the ’200 Patent, these claims are invalid as obvious in view of Blackberry 7130c alone or as modified in view of or in combination with other prior art references disclosed in Defendant’s Invalidity Contentions and accompanying charts, including without limitation as set forth below.

- Cingular 8125/HTC Wizard
- Blackberry 7130c
- Blackberry 7290
- Dou208 (U.S. Pat. 7,548,208)

One of ordinary skill in the art, as of the priority date of the ’200 Patent, would have known to combine or modify the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

Exhibit – E – 08

These invalidity contentions are not an admission that the Defendants concede or acquiesce to any claim construction implied or suggested by Plaintiff's Complaint or Infringement Contentions. Nor are Defendants asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature. Defendants reserve the right to update their constructions and contentions in view of this Court's claim construction order.⁵

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
Claim 1		
1[pre]	A wireless device comprising:	To the extent the preamble is limiting, 7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i>

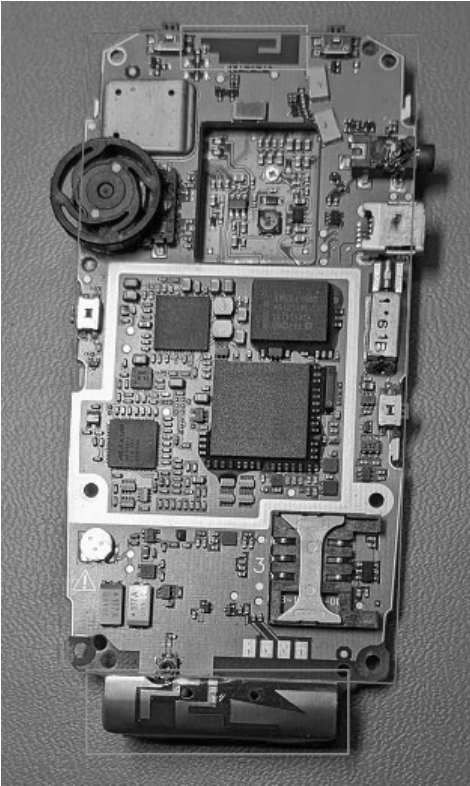
⁵ Defendants incorporate herein any related work performed by or on behalf of an author or an inventor in the United States under 35 U.S.C. § 102(g). Defendants reserve the right to supplement and/or alter this chart based on further investigation and ongoing discovery.

Exhibit – E – 08

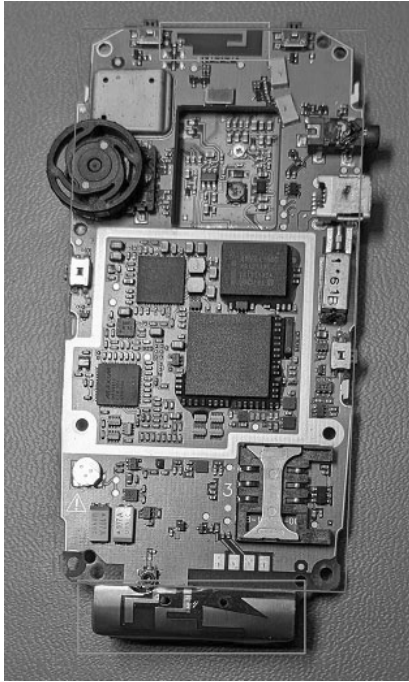
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 A black and white photograph of a BlackBerry 7130c smartphone. The device is shown from the front, oriented vertically. It features a full QWERTY keyboard at the bottom, a trackball in the center, and a large screen at the top. The screen displays the BlackBerry OS interface, including the time (12:21 PM), date (THU, MAY 12), and various application icons such as Messages, Calendar, and Browser. The Cingular logo is visible at the bottom of the screen. The BlackBerry logo is printed above the screen.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		<i>See</i> FCC External Photos at 1. <i>See also</i> Engadget.com, Cingular Launches Blackberry 7130, (June 8, 2006) https://www.engadget.com/2006-06-08-cingular-launches-blackberry-7130c.html (last accessed June 18, 2025); CNET Website, “Cingular and RIM announce BlackBerry 7130c” (June 8 2006) a: https://www.cnet.com/tech/mobile/cingular-and-rim-announce-blackberry-7130c/ (last accessed June 18, 2025); Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025).
1[a]	An antenna system comprising	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7130c includes an antenna system including a ground plane (red below) and at least two antennas (blue and green below) within the 7130c.

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
1[b]	a ground plane and	7130c expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		<i>See</i> Claim 1[a].
1[c]	at least two antennas within the wireless device, the antenna system comprising:	7130c expressly or inherently discloses this claim element. <i>See</i> Claim 1[a].
1[d]	a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7130c includes a first antenna (blue below) proximate to a first short side of a ground plane rectangle (red below) enclosing the ground plane.

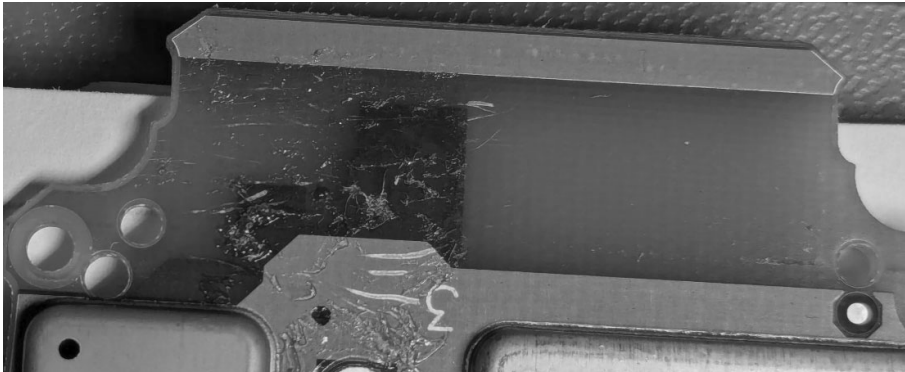
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
1[e]	the first antenna being configured to support at least three frequency bands contained	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the BlackBerry 7130c is configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum. The second frequency range is higher in frequency than the first frequency range

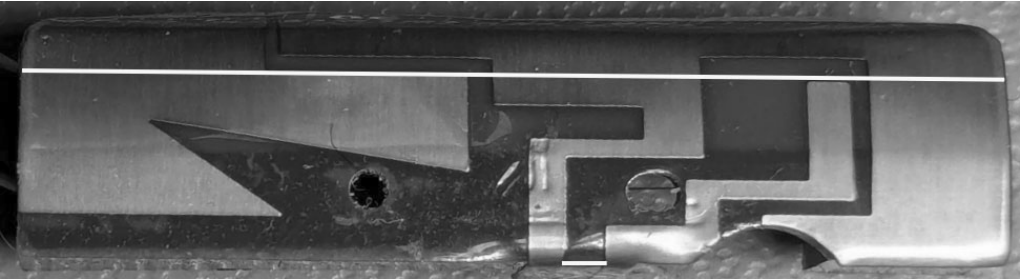
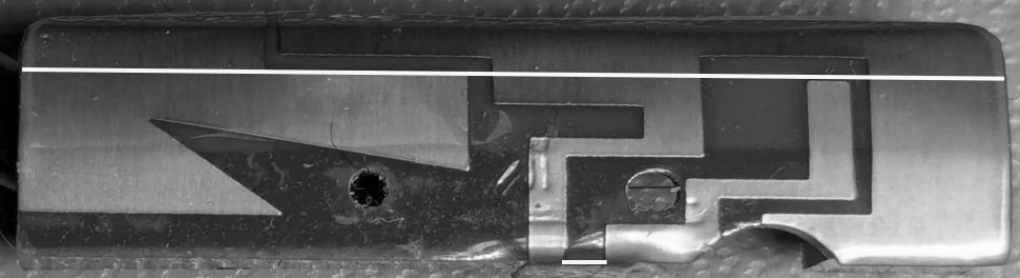
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	within first and second frequency ranges of the electromagnetic spectrum,	BlackBerry 7130c Superior Domestic and International Coverage 850 MHz 900 MHz 1800 MHz 1900 MHz See Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025).
1[f]	the second frequency range being higher in frequency than the first	7130c expressly or inherently discloses this claim element. See Claim 1[e].

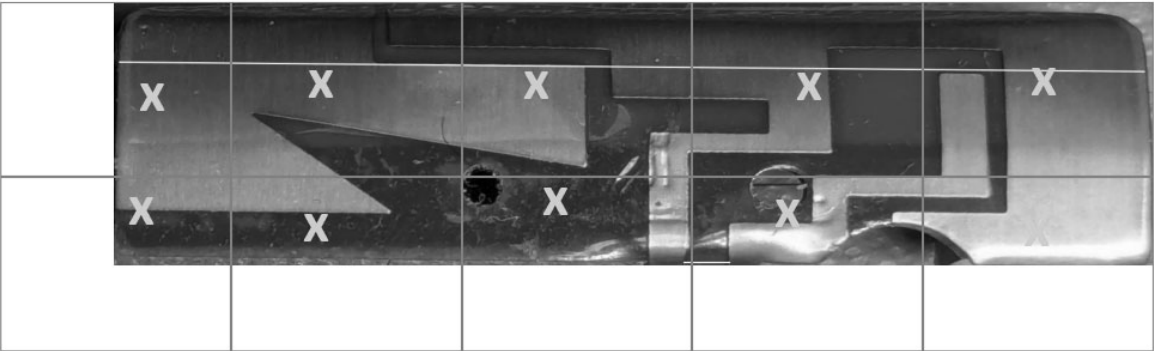
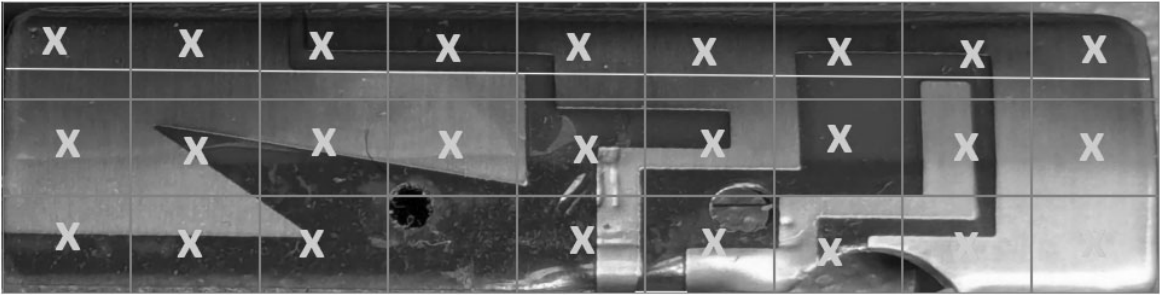
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	frequency range,	
1[g]	the first antenna being configured to transmit and receive signals from a 4G communication standard,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> BlackBerry 7130c Superior Domestic and International Coverage 850 MHz 900 MHz 1800 MHz 1900 MHz

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		See Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025). The first antenna of the Blackberry 7130c is configured to transmit and receive signals from a 4G communication standard.
1[h]	the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the Blackberry 7130c defines a first antenna contour comprising an entire perimeter of the first antenna. The first antenna of the Blackberry 7130c includes first and second sides including the perimeter of the first antenna: First antenna, first side:

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 First antenna, second side:  The first antenna contour includes parts of the perimeter that are on the first side and the orthogonal projection onto the plane of the first side of the parts of the perimeter that are on the second side:

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
1[i]	wherein the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35.  N1=10

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 N2=26  N3=83

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 $F21 = \log(26/10)/\log(2) = 1.38$ $F32 = \log(83/26)/\log(2) = 1.67$
1[j]	complexity factor F32 having a value of at least 1.35; and	7130c expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
1[k]	a second antenna proximate to a first long side of the ground	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose a second antenna proximate to a first long side of the ground plane rectangle, it would have been obvious for the antenna system of the Blackberry 7130c to include a second antenna proximate to a first long side of the ground plane rectangle as disclosed in the Cingular 8125/HTC Wizard.

Exhibit – E – 08

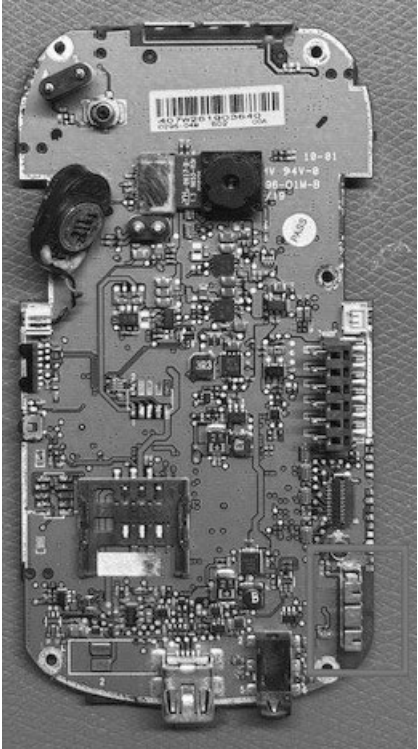
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	plane rectangle, and	<i>See, e.g.,</i> The Cingular 8125 includes a second antenna (red below) proximate to a first long side of the ground plane rectangle. 

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		It would have been obvious to include the second antenna of the Cingular 8125 in the Blackberry 7130c to add WLAN functionality to the 7130c. The Blackberry 7130c and Cingular 8125 were both smartphone devices in which WLAN functionality was well known and desired by users, e.g., for Internet access. There would have been a reasonable expectation of success at least in view of the Blackberry 7130e, which has a Bluetooth antenna operating in the same frequency range and in the same relative location as the WLAN antenna of the Cingular 8125, and is located near a cellular antenna that is similar to the first antenna of the Blackberry 7130e.

Exhibit – E – 08

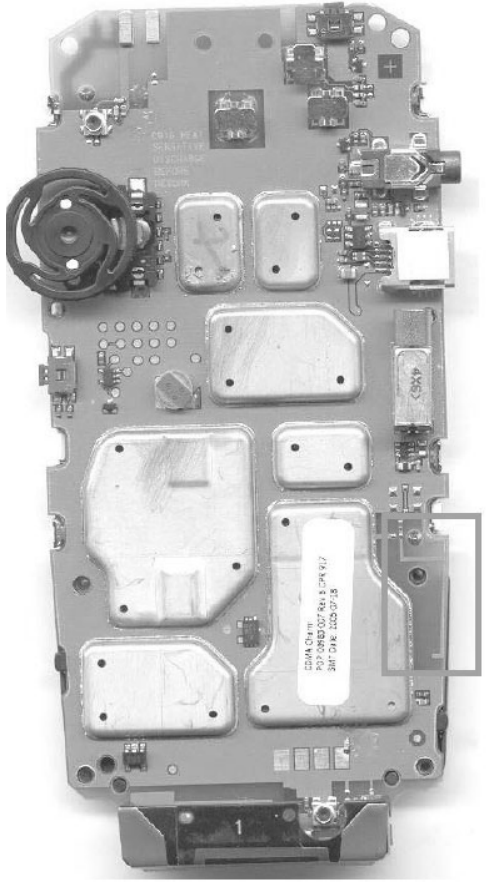
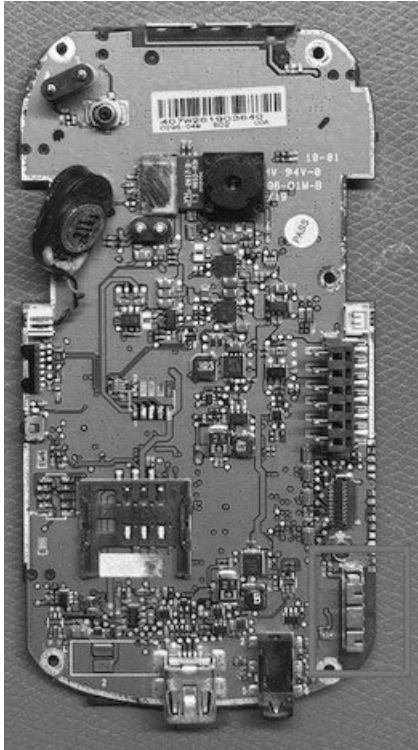
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		

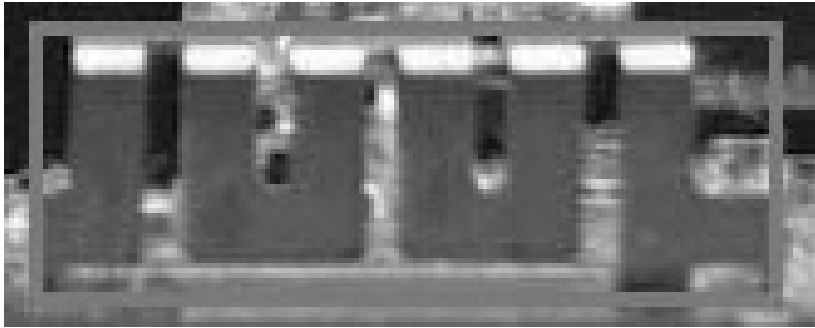
Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
1[1]	wherein the second antenna is configured to receive signals from a 4G communication standard.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose that the second antenna is configured to receive signals from a 4G communication standard, it would have been obvious for the second antenna to be configured to receive signals from a 4G communication standard in view of the Cingular 8125. <i>See, e.g.,</i>

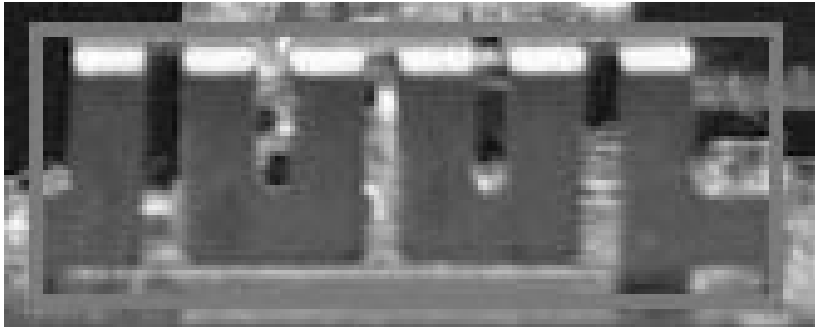
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		✧ Integrated 802.11b support See Cingular Website; archived on February 15, 2006 at: https://web.archive.org/web/20060215183508/http://www.cingular.com/8125_consumer (last accessed June 11, 2025).

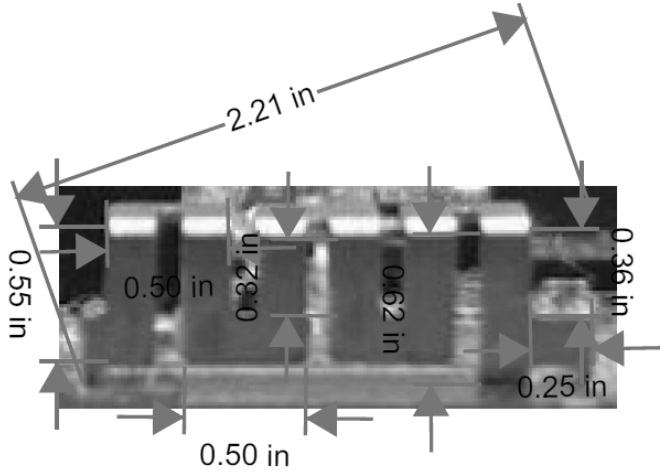
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
Claim 2		
2[a]	The wireless device of claim 1, wherein the second antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125. <i>See, e.g.,</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	of the second antenna,	 In the Cingular 8125, a minimum-sized parallelepiped of rectangular faces that completely encloses a volume of the second antenna defines an antenna box, and an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 An aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2. A width of the antenna rectangle is at least twice a height of the antenna rectangle.
2[b]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125. <i>See Claim 2[a].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
2[c]	an antenna rectangle,	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125. <i>See Claim 2[a].</i>
2[d]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125. <i>See Claim 2[a].</i>
Claim 3		

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
3	The wireless device of claim 2, wherein the second antenna defines a second contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna defines a second contour comprising an entire perimeter of the second antenna.  A length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 $4xD=2.21*4=8.84$ $L>6(0.55)+5(0.5)+4(.32)+6(.36)>9.24$
Claim 4		
4	The wireless device of claim 1, wherein the first antenna is configured to support at least	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	four frequency bands.	BlackBerry 7130c Superior Domestic and International Coverage 850 MHz 900 MHz 1800 MHz 1900 MHz See Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025). The first antenna of the Blackberry 7130c is configured to support at least four frequency bands.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
Claim 6		
6[pre]	A wireless device comprising:	7130c expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>
6[a]	an antenna system comprising	7130c expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[b]	a ground plane and	7130c expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[c]	at least two antennas within the wireless device, the antenna	7130c expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	system comprising:	
6[d]	a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards, wherein	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7130c includes a first antenna (blue below) configured to provide operation in at least four frequency bands being used by 4G communication standards. At least two of the at least four frequency bands are contained within a first frequency range and at least two of the four frequency bands are contained within a second frequency range. The first frequency range is lower in frequency than the second frequency range.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		BlackBerry 7130c Superior Domestic and International Coverage 850 MHz 900 MHz 1800 MHz 1900 MHz See Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025).
6[e]	at least two of the at least four frequency bands are contained within a first	7130c expressly or inherently discloses this claim element. See Claim 6[d].

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	frequency range and	
6[f]	at least two of the four frequency bands are contained within a second frequency range,	7130c expressly or inherently discloses this claim element. <i>See Claim 6[d].</i>
6[g]	the first frequency range being lower in frequency than the second frequency range,	7130c expressly or inherently discloses this claim element. <i>See Claim 6[d].</i>
6[h]	the first antenna defining a first antenna contour comprising an	7130c expressly or inherently discloses this claim element. <i>See Claim 1[h].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	entire perimeter of the first antenna, and wherein	
6[i]	the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	7130c expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
6[j]	complexity factor F32 having a value of at least 1.35; and	7130c expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
6[k]	a second antenna configured to operate in at	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290.

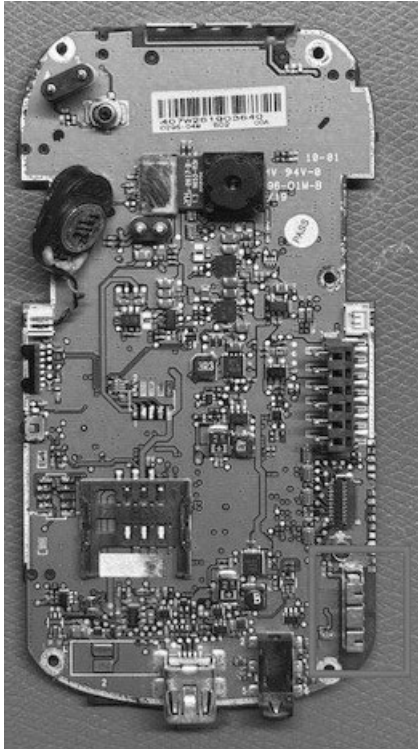
Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	least one frequency band being used by a 4G communication standard,	<i>See, e.g.,</i> The Cingular 8125 includes a second antenna (red below) configured to operate in at least one frequency band being used by a 4G communication standard. ➤ Integrated 802.11b support

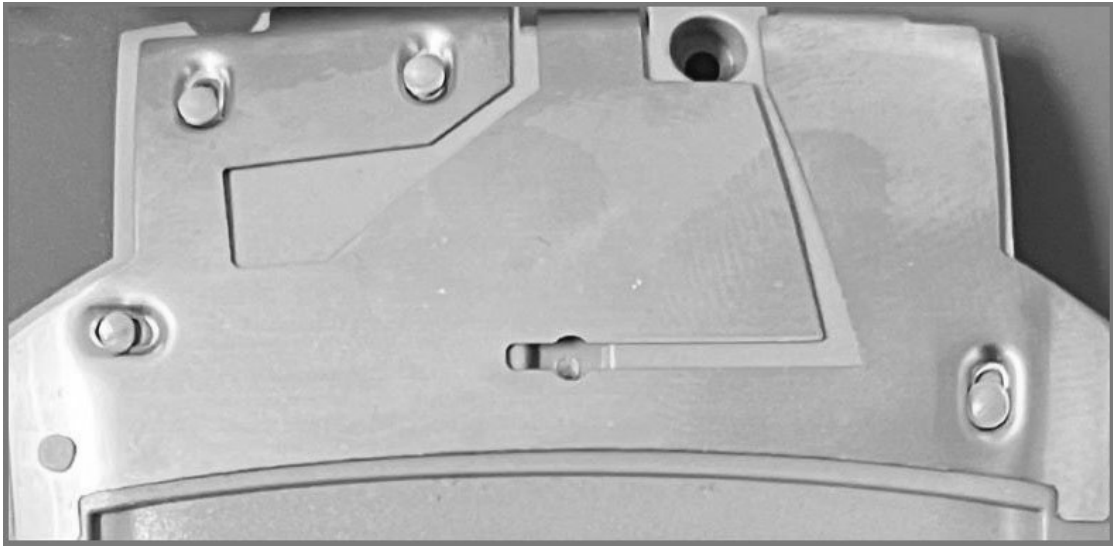
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		<i>See</i> Cingular Website; archived on February 15, 2006 at: https://web.archive.org/web/20060215183508/http://www.cingular.com/8125_consumer (last accessed June 11, 2025). It would have been obvious to include the second antenna of the Cingular 8125 in the Blackberry 7130c to add WLAN functionality to the 7130c. The Blackberry 7130c and Cingular 8125 were both smartphone devices in which WLAN functionality was well known and desired by users, e.g., for Internet access. There would have been a reasonable expectation of success at least in view of the Blackberry 7130e, which has a Bluetooth antenna operating in the same frequency range and in the same relative location as the WLAN antenna of the Cingular 8125, and is located near a cellular antenna that is similar to the first antenna of the Blackberry 7130e. Alternatively or additionally, the Blackberry 7290 includes a second antenna (red below) configured to operate in at least one frequency band being used by a 4G communication standard.

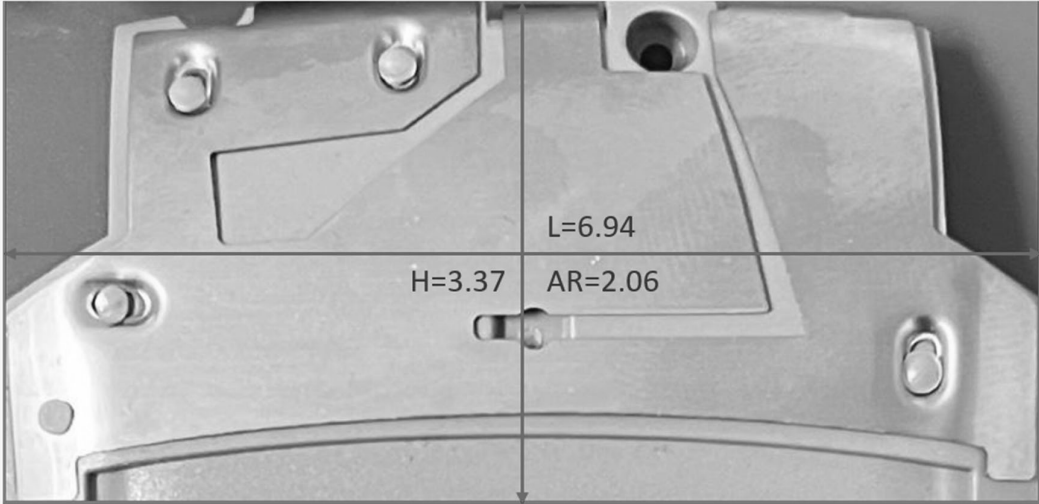
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c												
		 Cellular Antenna <table><tr><th colspan="2">Radio specifications</th></tr><tr><th colspan="2">BlackBerry 7290 Wireless Handheld</th></tr><tr><td>Quad-band support</td><td>GSM 850, GSM 900, DCS 1800, PCS 1900 MHz</td></tr><tr><td>Power class</td><td>Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06</td></tr><tr><td>Transmitting frequency</td><td>GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz</td></tr><tr><td>Receiving frequency</td><td>GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz</td></tr></table>	Radio specifications		BlackBerry 7290 Wireless Handheld		Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz	Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06	Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz	Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz
Radio specifications														
BlackBerry 7290 Wireless Handheld														
Quad-band support	GSM 850, GSM 900, DCS 1800, PCS 1900 MHz													
Power class	Class 1 (DCS 1800, PCS 1900), Class 4 (GSM 850) as defined in GSM 5.05, Class 4 (GSM 900) as defined in GSM 02.06													
Transmitting frequency	GSM 824 to 849 MHz, GSM 880-915 MHz, DCS 1710 to 1785 MHz, PCS 1850 to 1910 MHz													
Receiving frequency	GSM 869 to 894 MHz, GSM 925-960 MHz, DCS 1805 to 1880 MHz, PCS 1930 to 1990 MHz													

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		<i>See</i> FCC User Manual Safety and Product Info at 10.
6[1]	the second antenna defining an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See, e.g.,</i> In the Cingular 8125, a minimum-sized parallelepiped of rectangular faces that completely encloses a volume of the second antenna defines an antenna box, and an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 A black and white photograph of the internal circuit board of a Blackberry 7130c. The board is populated with various electronic components, including a large central processor, memory chips, and a battery connector. A barcode label is visible near the top center, and a circular component, likely a camera lens, is on the left side. The board is shown against a dark, textured background.

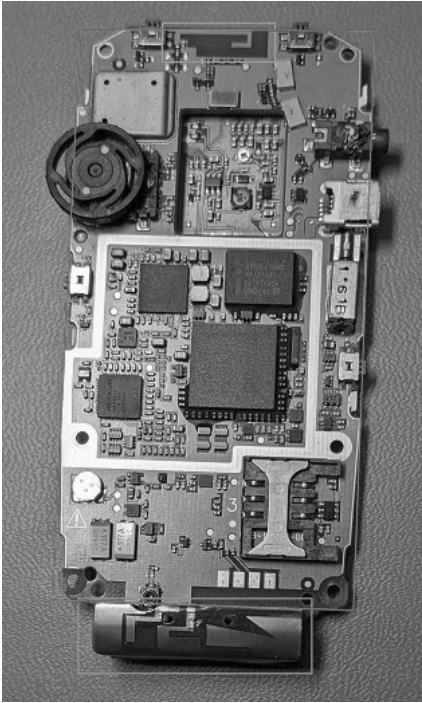
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		An aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2. A width of the antenna rectangle is at least twice a height of the antenna rectangle. In the Blackberry 7290, a minimum-sized parallelepiped of rectangular faces that completely encloses a volume of the second antenna defines an antenna box, and an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle.

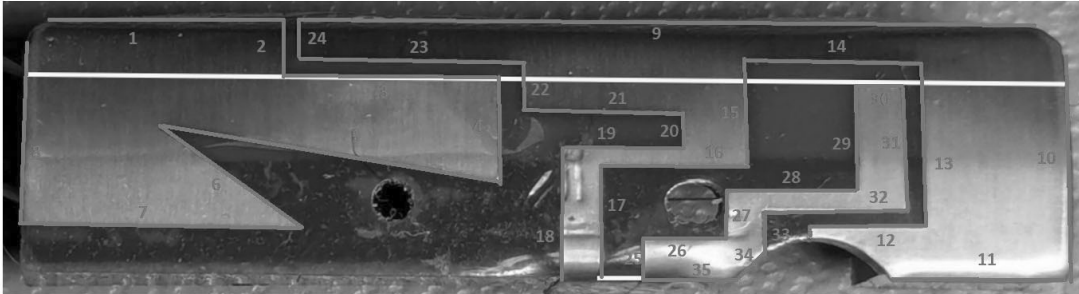
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 An aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 A width of the antenna rectangle is at least twice a height of the antenna rectangle.
6[m]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See Claim 6[l].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	of the second antenna,	
6[n]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See Claim 6[l].</i>
6[o]	an antenna rectangle,	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See Claim 6[l].</i>
6[p]	an aspect ratio of the antenna rectangle being defined as a ratio between a	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See Claim 6[l].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2, and	
6[q]	wherein at least one of the first and second antennas is close to a first short side of a ground plane rectangle enclosing the ground plane.	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> At least one of the first and second antennas is close to a first short side of a ground plane rectangle (red below) enclosing the ground plane.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
Claim 7		
7	The wireless device of claim 6, wherein the first antenna	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	contour comprises at least 20 segments.	The first antenna contour comprises at least 35 segments. 
Claim 9		
9[a]	The wireless device of claim 6, wherein the second antenna defines a second antenna contour comprising an entire perimeter of	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See, e.g.,</i> In the Cingular 8125, the second antenna defines a second antenna contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.

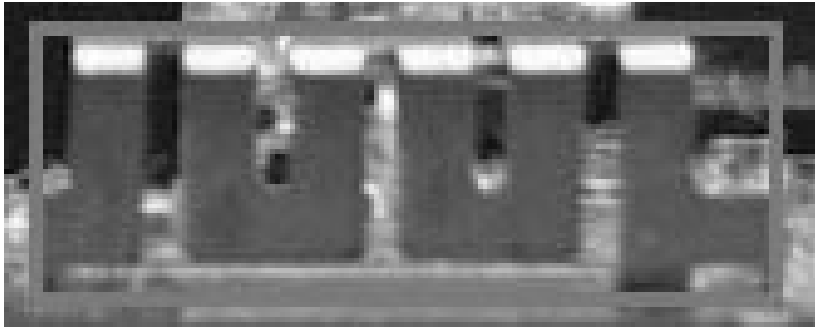
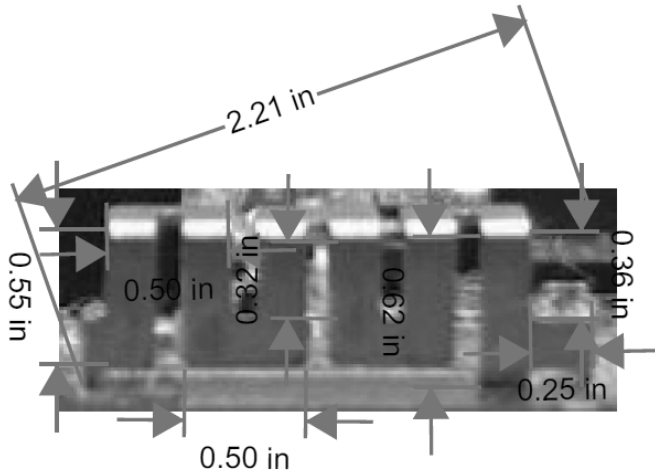
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	the second antenna,	  $4 \times D = 2.21 \times 4 = 8.84$

Exhibit – E – 08

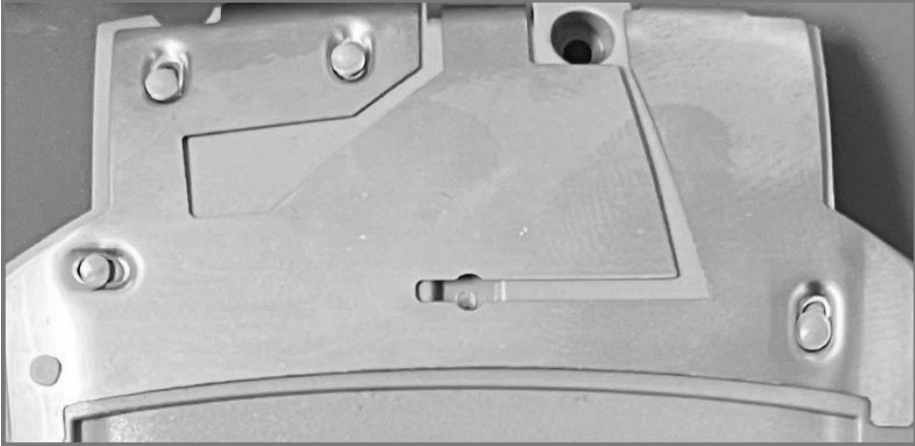
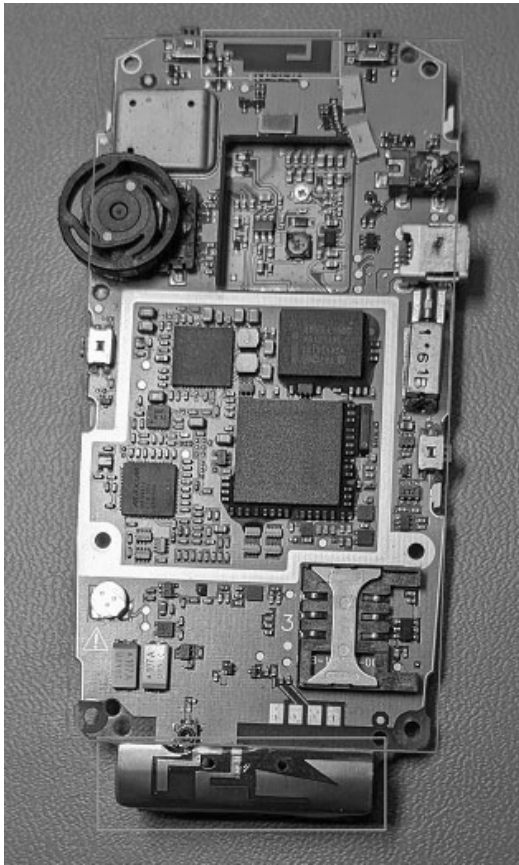
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		$L > 6(0.55) + 5(0.5) + 4(.32) + 6(.36) > 9.24$ In the Blackberry 7290, the second antenna defines a second antenna contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle. 

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		D=7.9 4D=4*7.9=31.6 L>1.4+.83+1.55+.52+.65+1.33+.64+.62+1.76+.47+.66+.48+1.7+1.52+1.71+1.9+.41+.81+.39+1.46+.88+1.24+3.24+3.06+.45+1.32+1.08>32.08

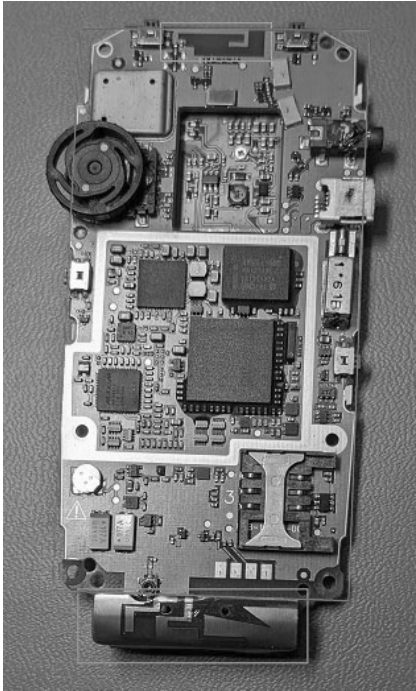
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
9[b]	wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not expressly or inherently disclose this claim element, this claim limitation would have been obvious in view of the Cingular 8125, or in view of the Blackberry 7290. <i>See</i> Claim 9[a].
Claim 10		
10	The wireless device of claim 6, wherein the antenna system comprises a third antenna configured to provide operation in a wireless communication standard.	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Blackberry 7130c includes a third antenna (green below) configured to provide operation in a wireless communication standard. The third antenna is configured to provide operation in a Bluetooth wireless communications standard.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 A black and white photograph showing the internal components of a BlackBerry 7130c. The image displays the main circuit board with various chips, capacitors, and connectors. A large, circular component, likely a camera lens or flash, is visible on the left side. The device is shown from the back, with the battery cover removed, revealing the internal hardware.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
Claim 11		
11[pre]	A wireless device comprising:	7130c expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>
11[a]	an antenna system comprising	7130c expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[b]	a ground plane and	7130c expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[c]	at least two antennas within the wireless device, the antenna	7130c expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	system comprising:	
11[d]	a first antenna configured to provide operation in at least three frequency bands being used by 4G communication standards,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Blackberry 7130c includes a first antenna (blue below) configured to provide operation in at least three frequency bands being used by 4G communication standards. BlackBerry 7130c Superior Domestic and International Coverage 850 MHz 900 MHz 1800 MHz 1900 MHz

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		See Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025). 
11[e]	the first antenna defining an	7130c expressly or inherently discloses this claim element. See Claim 1[h].

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	antenna contour comprising an entire perimeter of the first antenna,	
11[f]	the antenna contour comprising at least twenty segments,	7130c expressly or inherently discloses this claim element. <i>See Claim 7.</i>
11[g]	wherein the antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	7130c expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
11[h]	complexity factor F32	7130c expressly or inherently discloses this claim element.

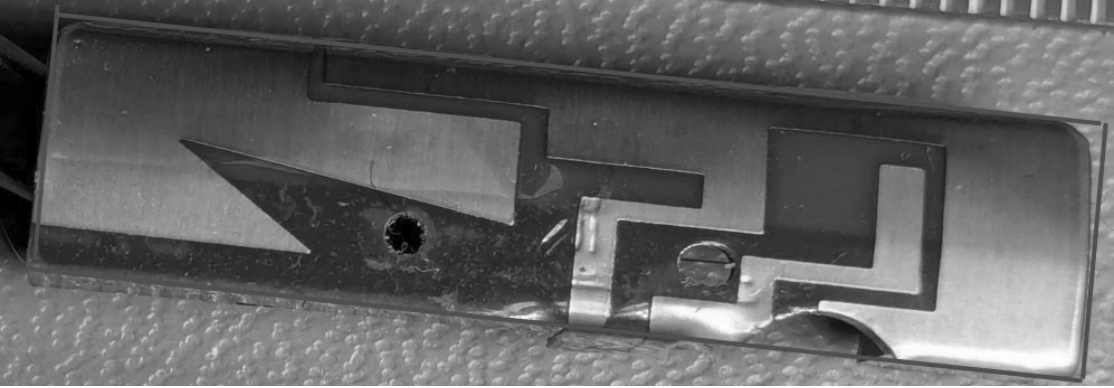
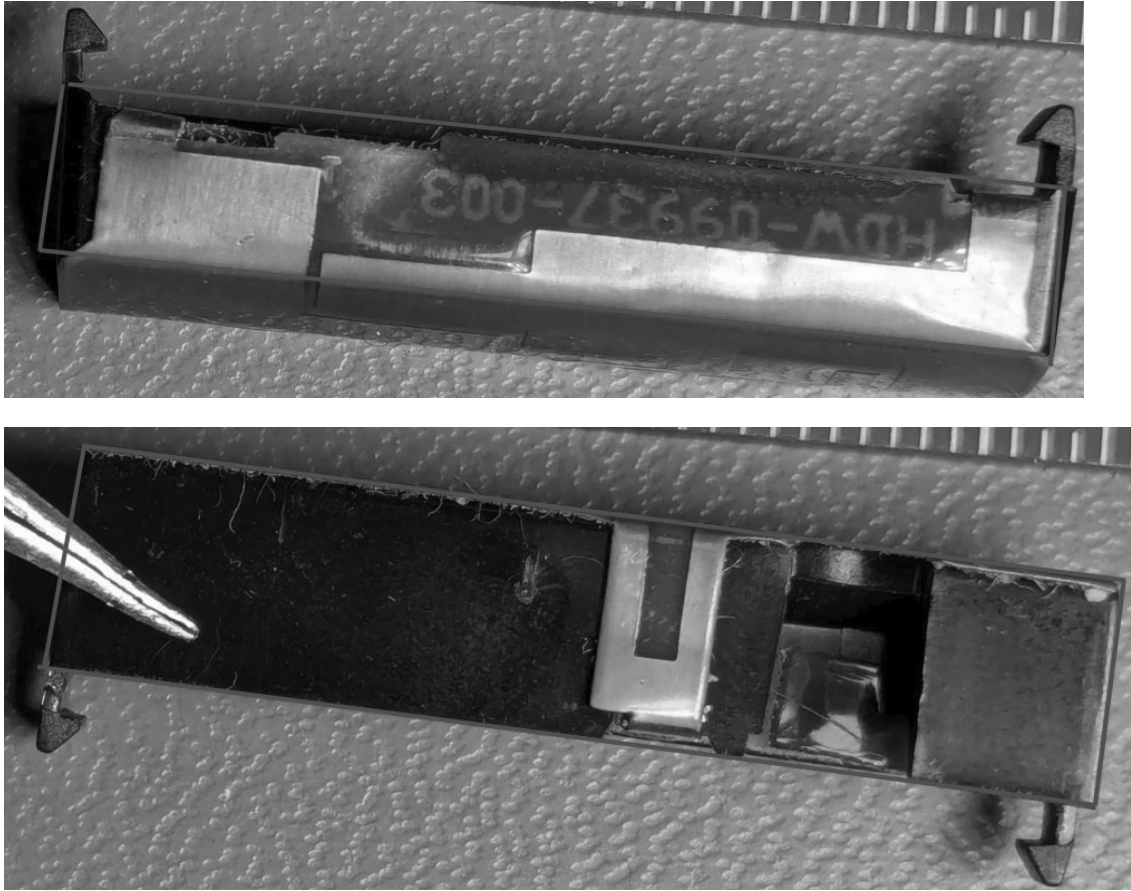
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	having a value of at least 1.35, and	<i>See</i> Claim 1[i].
11[i]	wherein the first antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna defines an antenna box (purple below) that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna. 

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		

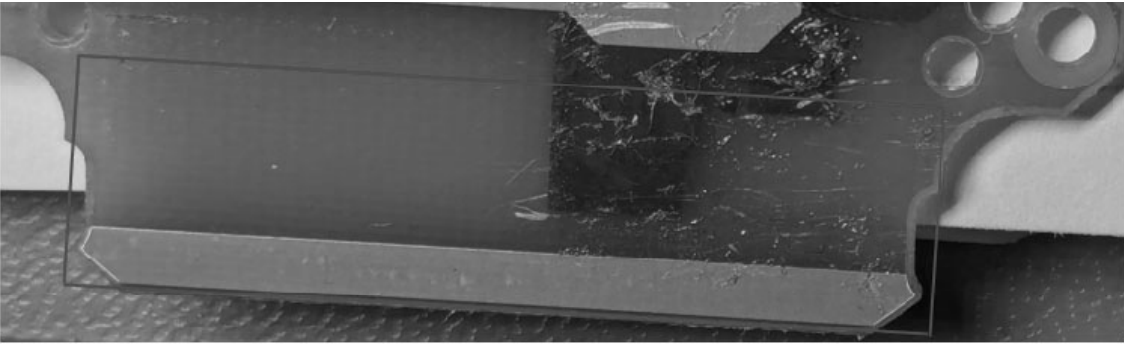
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
11[j]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> Each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna.

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		

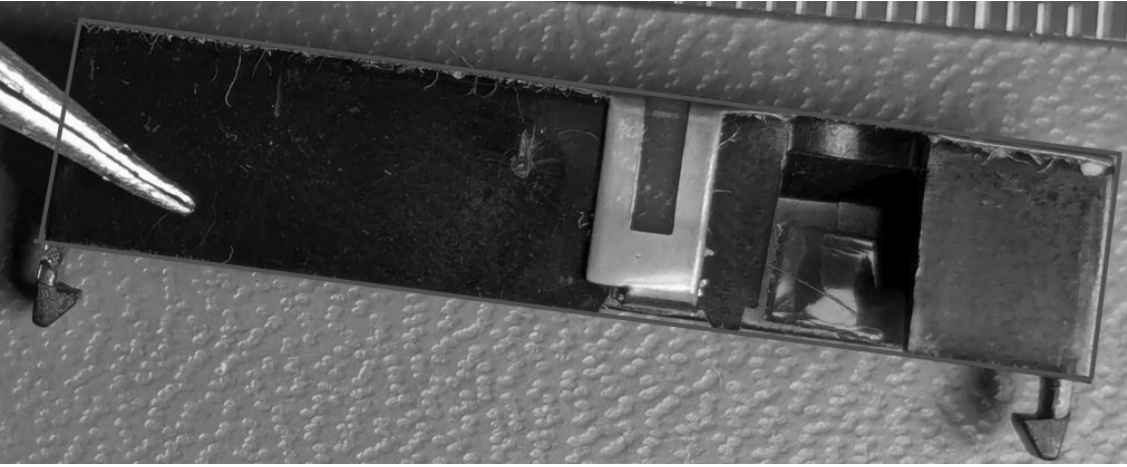
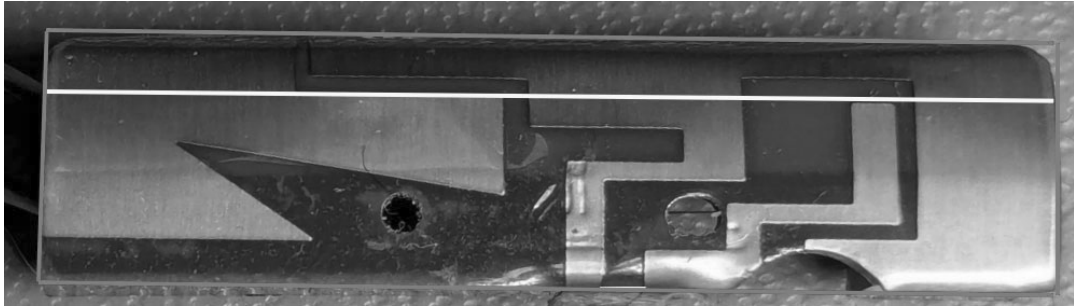
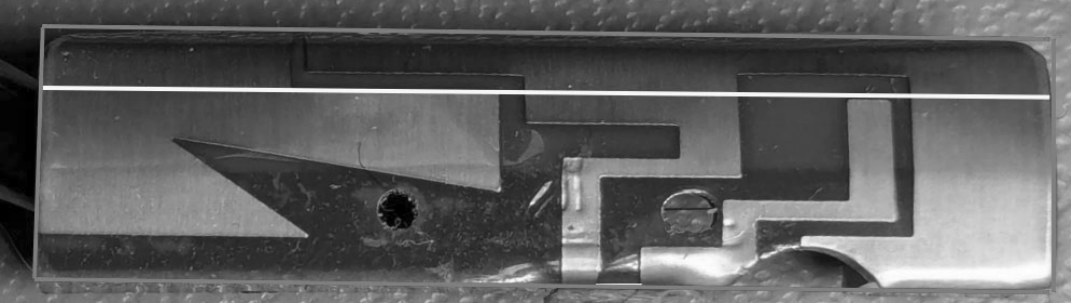
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
11[k]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> An orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna is shown below (in red).

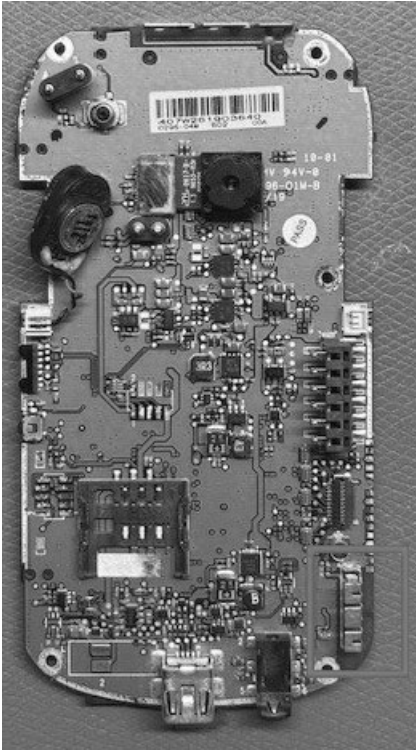
Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
11[l]	an antenna rectangle,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i> The orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defines an antenna rectangle (red below). 
11[m]	an aspect ratio of the antenna	7130c expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	rectangle being defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2; and	<i>See, e.g.,</i> An aspect ratio of the antenna rectangle is defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2. A width of the antenna rectangle is at least twice a height of the antenna rectangle. 
11[n]	a second antenna configured to provide operation in a first wireless service,	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125. <i>See, e.g.,</i> The Cingular 8125 includes a second antenna (red below) configured to provide operation in a first wireless service.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		✧ Integrated 802.11b support See Cingular Website; archived on February 15, 2006 at: https://web.archive.org/web/20060215183508/http://www.cingular.com/8125_consumer (last accessed June 11, 2025).

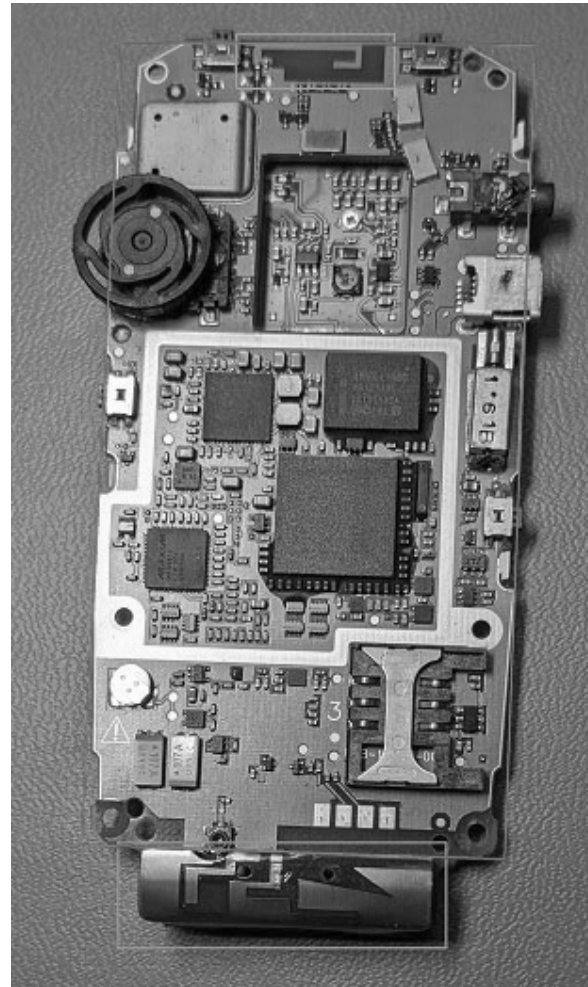
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		It would have been obvious to include the second antenna of the Cingular 8125 in the Blackberry 7130c to add WLAN functionality to the 7130c. The Blackberry 7130c and Cingular 8125 were both smartphone devices in which WLAN functionality was well known and desired by users, e.g., for Internet access. There would have been a reasonable expectation of success at least in view of the Blackberry 7130e, which has a Bluetooth antenna operating in the same frequency range and in the same relative location as the WLAN antenna of the Cingular 8125, and is located near a cellular antenna that is similar to the first antenna of the Blackberry 7130e.
11[o]	the second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125. <i>See, e.g.,</i> The second antenna of the Cingular 8125 is proximate to a side of a ground plane rectangle enclosing the ground plane.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		
Claim 12		
12	The wireless device of claim 11,	7130c expressly or inherently discloses this claim element. <i>See, e.g.,</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
	wherein the first antenna is configured to support at least four frequency bands.	The first antenna of the Blackberry 7130c is configured to support at least four frequency bands. BlackBerry 7130c Superior Domestic and International Coverage 850 MHz 900 MHz 1800 MHz 1900 MHz See Cingular Website, “BlackBerry handheld comparison,” archived June 13, 2006) at: https://web.archive.org/web/20060613170143/http://cingular.com:80/business/blackberry_comparison_popup (last accessed June 18, 2025).
Claim 13		

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
13	The wireless device of claim 11, wherein the first wireless service is a WiFi communication standard.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125. <i>See, e.g.,</i> The first wireless service is a WiFi communication standard. ➤ Integrated 802.11b support <i>See</i> Cingular Website; archived on February 15, 2006 at: https://web.archive.org/web/20060215183508/http://www.cingular.com/8125_consumer (last accessed June 11, 2025).
Claim 15		
15	The wireless device of claim 11, wherein the antenna system comprises a third antenna.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125. <i>See, e.g.,</i> The antenna system of the Blackberry 7130c comprises a third antenna (green below).

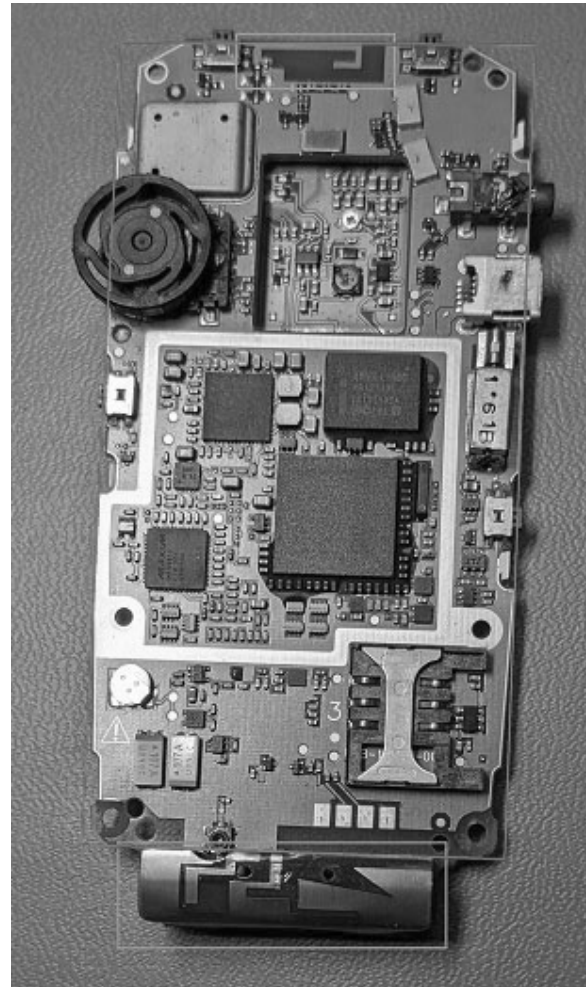
Exhibit – E – 08



Claim 17

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
17	The wireless device of claim 15, wherein the third antenna is configured to provide operation in a second wireless service.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125. <i>See, e.g.,</i> The third antenna of the Blackberry 7130c is configured to provide operation in a second wireless service (e.g., a Bluetooth wireless service).

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Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		The transmit frequency bands operating in North America for the Handheld are: GSM 824 to 849 MHz, PCS 1850 to 1910 MHz and Bluetooth 2402 to 2480 MHz. <i>See</i> FCC Test Report at 4.
Claim 19		
19	The wireless device of claim 15, wherein the antenna system comprises a fourth antenna.	7130c expressly or inherently discloses this claim element. To the extent the Blackberry 7130c does not explicitly or inherently disclose this claim limitation, this claim limitation would have been obvious in view of the Cingular 8125, and further in view of the Blackberry 7290. <i>See, e.g.,</i> The Blackberry 7290 includes a fourth antenna (red below).

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Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		The image shows the internal components of a BlackBerry 7130c. A large, rectangular cellular antenna is visible, with the text 'Cellular Antenna' printed above it. The antenna is connected to the main circuit board. Other components visible include a battery, a SIM card slot, and various electronic components. The text 'CE0168' is visible on the main circuit board. It would have been obvious to include the fourth antenna of the Blackberry 7290 in the Blackberry 7130c to achieve cellular antenna diversity for improving the data rate, as taught by Dou208 (U.S. Pat. 7,548,208):

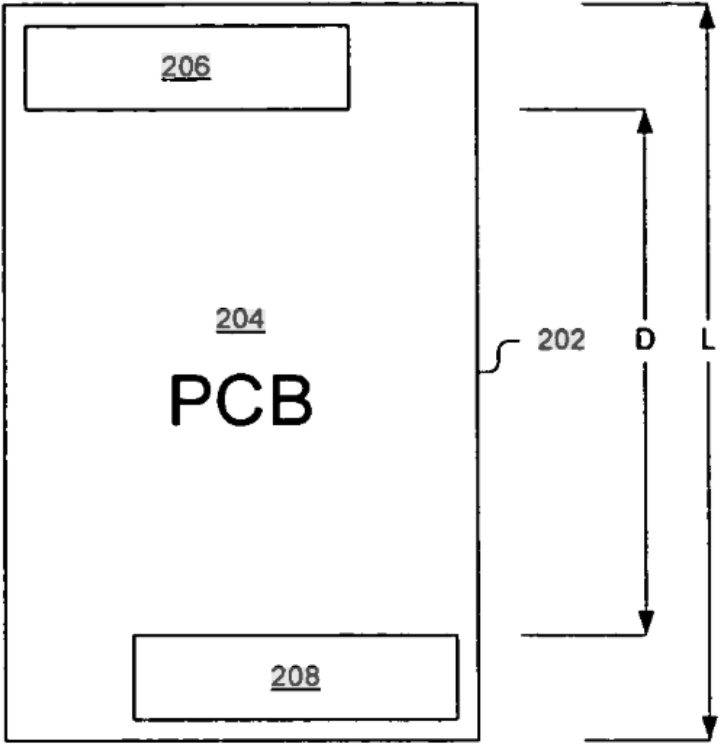
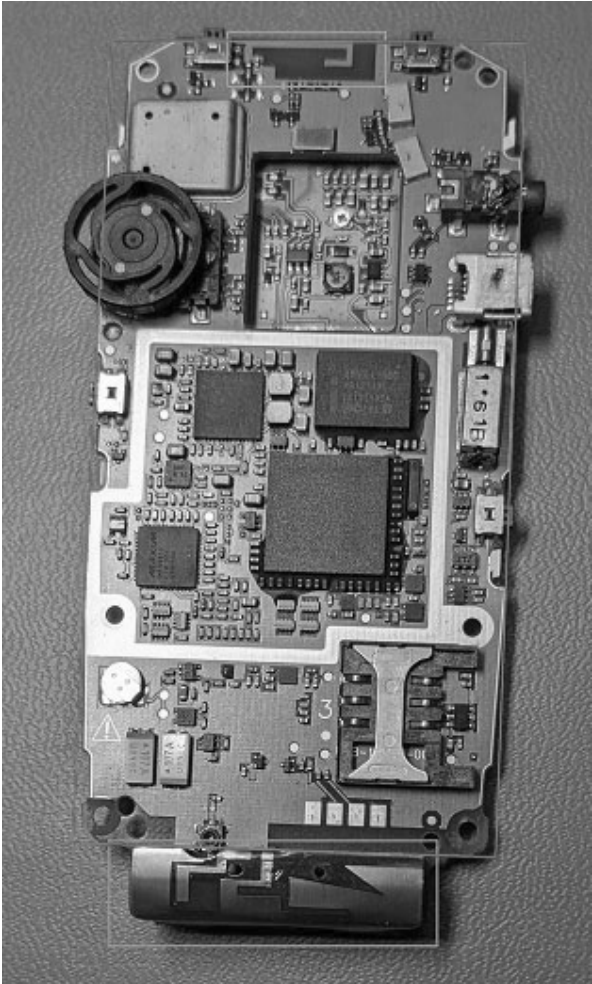
Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		<u>200</u>  Dou208 (Abstract) teaches “an internal diversity antenna architecture.” According to Dou208 (3:54-58), “first internal antenna 206 and the second internal antenna 208 may be used to implement various spatial diversity techniques to improve communication of wireless signals across one or more wireless frequency bands of

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		wireless shared media.” For example (3:26-31), “the primary antenna (e.g., first internal antenna 206) may be configured for transmission and both the primary antenna (e.g., first internal antenna 206) and the secondary antenna (e.g., second internal antenna 208) may be configured for reception. Such an arrangement may be used in a cellular phone for improving data rate. As another example (3:32-35), “the primary antenna (e.g., first internal antenna 206) and the secondary antenna (e.g., second internal antenna 208) may be configured for both transmission and reception.” The result of the modification would have included the cellular antenna of the BlackBerry 7290 as the first internal antenna 206 and the cellular antenna of the Blackberry 7130e as the second internal antenna 208. 

Exhibit – E – 08

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		 A black and white photograph showing the internal components of a Blackberry 7130c. The image displays the main circuit board with various chips, capacitors, and connectors. A large, circular component, likely a camera lens or flash, is visible on the left side. The device is shown from the back, with the battery cover removed, revealing the internal structure.

Claim No.	U.S. Patent No. 11,349,200 B2	Blackberry 7130c
		There would have been a reasonable expectation of success because the Blackberry 7130c and 7290 implement cellular service using each cellular antenna individually, and Dou208 further teaches how to implement the two antennas together in a diversity architecture, such as how far apart to space the two antennas from one another, and circuitry to operate the two cellular antennas in a diversity architecture. There is also considerable technical overlap between the Blackberry 7130c, the Blackberry 7290, and Dou208. For example, the cellular antennas of the Blackberry 7130c and 7290 are located at the top and bottom of the devices, respectively, as taught for the internal antennas 206, 208, respectively, in Dou208. Also, Dou208 (3:42-47) teaches that the internal antennas 206, 208 may operate in the GSM 800 and PCS 1900 frequency bands, in which the cellular antennas of the Blackberry 7290 and 7130e already operate. Moreover, Dou208 (3:50-62) teaches that the internal antennas 206, 208 may be designed for Evolution Data Optimized (EVDO) diversity in the 800 MHz and 1900 MHz bands, which would be achievable using the frequencies at which the Blackberry 7130c and 7290 cellular antennas already operate.

INVALIDITY CONTENTIONS FOR U.S. PATENT NO. 11,349,200 B2
BASED ON THE SONY ERICSSON Z520a (“Z520a”)

Based upon Plaintiff’s Complaint, Infringement Contentions, and apparent claim constructions and application of the claims to Geotab’s accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious some or all of claims 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 17, and 19 (the “’200 Asserted Claims”)¹. These invalidity contentions are not an admission by Geotab that the accused products are covered by or infringe the Asserted Claims, particularly when these claims are properly construed and applied.

AIA law applies because the application that issued as the ’200 Patent was filed on April 30, 2021, after the AIA came into force on March 16, 2013.

Sony Ericsson Mobile Communications AB’s (“Sony Ericsson”) Sony Ericsson Z520a, as publicly demonstrated, known, offered for sale, sold, and/or used by Sony Ericsson and/or customers of Sony Ericsson, or otherwise available to the public, including in this country, (“Z520a”) was announced and released in June 2005.² Thus, the Z520a is available as prior art at least under pre-AIA 35 U.S.C. § 102(a)-(b), or (g)(2) and/or AIA 35 U.S.C. § 102(a)(1). At least the following documents provide evidence as to the date the Z520a was “offered for sale or publicly used or known,” “the date the offer or use of the item took place or the information became known”, and the “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known”³.

- GSMArena.com, *Sony Ericsson Z520a*, https://www.gsmarena.com/sony_ericsson_z520-1202.php (last accessed June 18, 2025)

¹ Geotab understands that, by not charting claims 5, 8, 14, 16, 18, and 20 in its Infringement Contentions, Plaintiff does not assert these claims against Geotab.

² See GSMArena.com, *Sony Ericsson Z520a*, https://www.gsmarena.com/sony_ericsson_z520-1202.php (last accessed June 18, 2025); PowerPage.org, “Sony Ericsson Releases First Quad-Band Phone” (June 20, 2005) <https://www.powerpage.org/sony-ericsson-releases-first-quad-band-phone/> (last accessed June 18, 2025).

³ Geotab does not yet have complete information regarding the dates by which this product was publicly disclosed, made, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the particular individuals involved in such activities. Geotab anticipates that the actual dates, circumstances, and identities of individuals will be the subject of third party discovery during this lawsuit. Geotab therefore reserves the right to amend and/or supplement its Invalidity Contentions and this chart if additional information becomes available during the course of discovery. The date the Z520a was “offered for sale or publicly used or known,” as well as “the date the offer or use of the item took place or the information became known” is at least as early as the dates identified in the published documents. The “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known” includes at least those persons associated with the publication(s), press releases, and conference attendees, or other documents associated with each version on the Z520a. Geotab also reserves the right to rely on the public use, offer for sale, sale, or installation of the devices described in the publications identified herein once Geotab has had a fair opportunity to take discovery on these subjects.

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- PowerPage.org, “Sony Ericsson Releases First Quad-Band Phone” (June 20, 2005) <https://www.powerpage.org/sony-ericsson-releases-first-quad-band-phone/> (last accessed June 18, 2025)
- Phonscoop.com, *Sony Ericsson Z520*, <https://www.phonscoop.com/phones/phone.php?p=765> (last accessed June 18, 2025)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “PYA”; Product Code: “AC052014”; Record Option: 1/3 “Detail”; Attachment: “08 User Manual 1” (last accessed June 11, 2025) (“FCC User Manual”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “PYA”; Product Code: “AC052014”; Record Option: 2/3 “Detail”; Attachment: “03 External Photos” (last accessed June 11, 2025) (“FCC External Photos”)
- FCC ID Search, <https://www.fcc.gov/oet/ea/fccid> (Grantee Code: “PYA”; Product Code: “AC052014”; Record Option: 2/3 “Detail”; Attachment: “06 Test Report” (last accessed June 11, 2025) (“FCC Test Report”)

As described in the following claim chart, the asserted claims of U.S. Patent No. 11,349,200 (the “’200 Patent”), are invalid as anticipated by Z520a. To the extent that Z520a is found not to anticipate one or more of the asserted claims of the ’200 Patent, these claims are invalid as obvious in view of Z520a alone or as modified in view of or in combination with other prior art references disclosed in Geotab’s Invalidity Contentions and accompanying charts, including without limitation as set forth below.

One of ordinary skill in the art, as of the priority date of the ’200 Patent, would have known to combine or modify the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

These invalidity contentions are not an admission that Geotab concedes or acquiesces to any claim construction implied or suggested by Plaintiff’s Complaint or Infringement Contentions. Nor is Geotab asserting any claim construction positions through these charts, including whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature. Geotab reserves the right to update its constructions and contentions in view of this Court’s claim construction order.⁴

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
Claim 1		

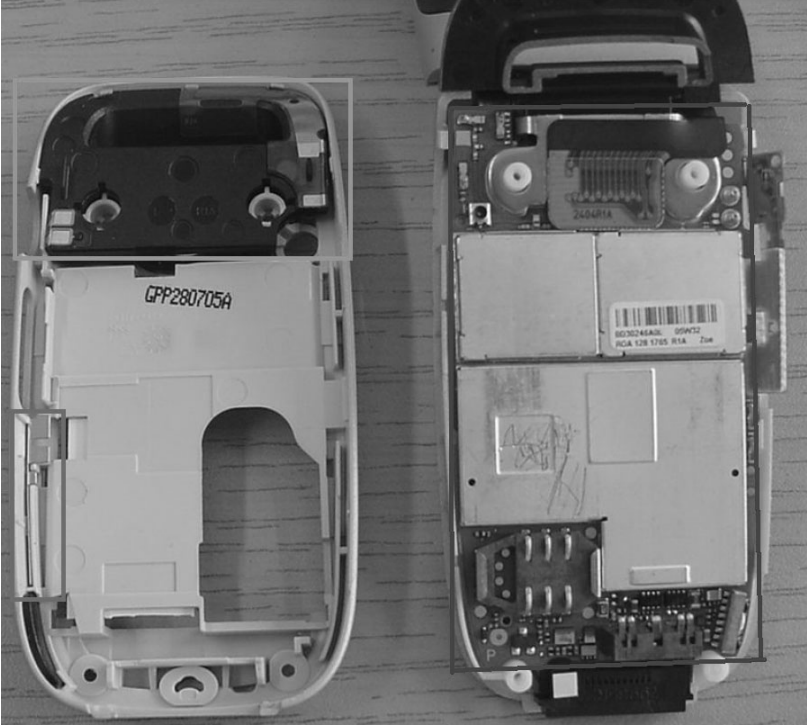
⁴ Geotab reserves the right to supplement and/or alter this chart based on further investigation and ongoing discovery.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
1[pre]	A wireless device comprising:	To the extent the preamble is limiting, Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> <i>See FCC External Photos at 7.</i>

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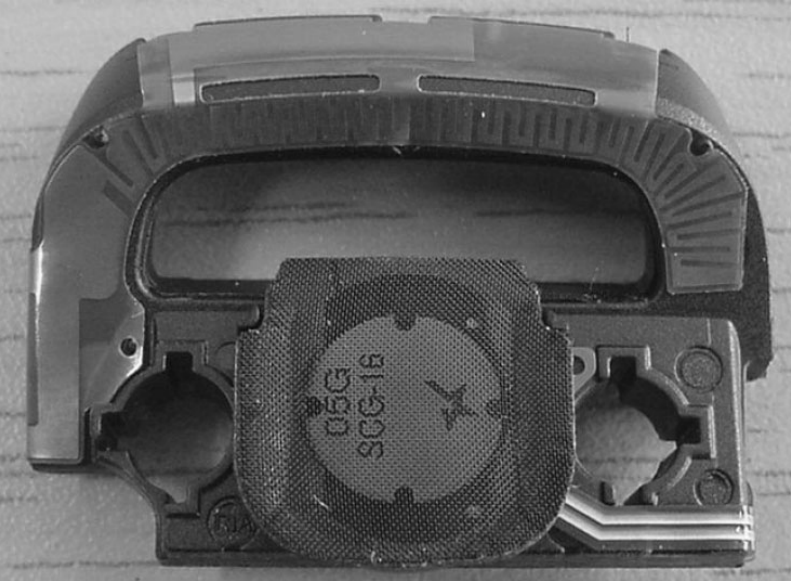
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
1[a]	An antenna system comprising	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Z520a includes an antenna system including a ground plane (red below) and a first antenna within the z520a (blue below). 

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
1[b]	a ground plane and	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> See Claim 1[a].
1[c]	at least two antennas within the wireless device, the antenna system comprising:	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> See Claim 1[a].
1[d]	a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane,	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the z520a includes a first antenna (blue below) proximate to a first short side of a ground plane rectangle (red below) enclosing the ground plane.

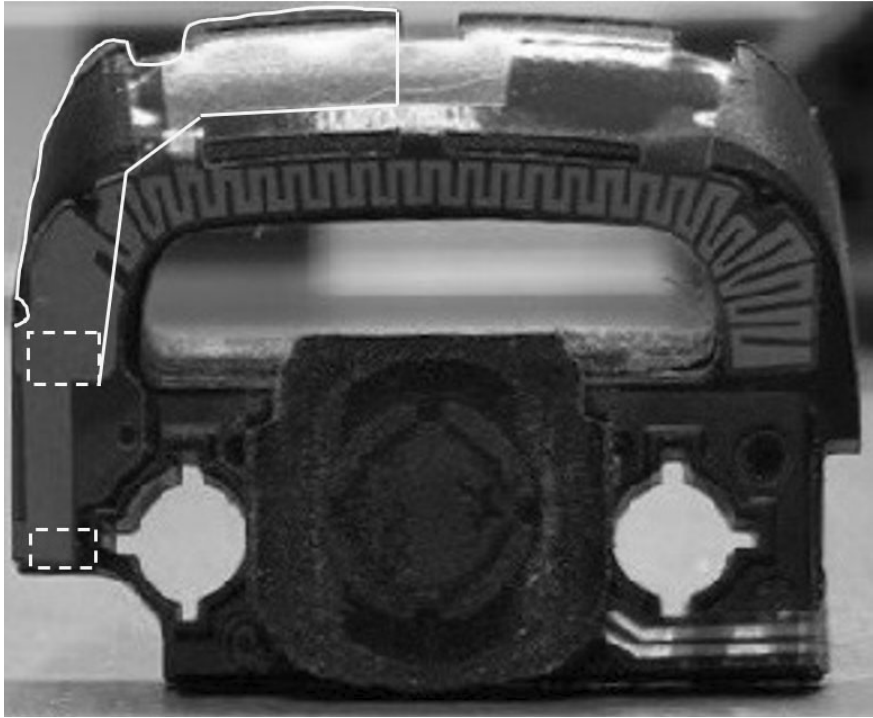
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
1[e]	the first antenna being configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum,	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the z520a is configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum. The second frequency range is higher in frequency than the first frequency range.

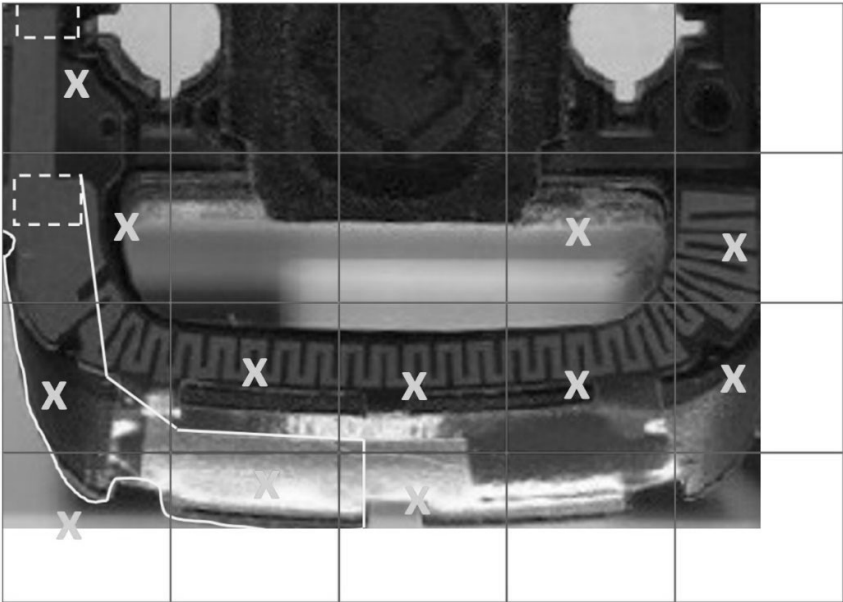
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		Sony Ericsson GSM 850/900/1800/1900 <i>See FCC User Manual at 2.</i>
1[f]	the second frequency range being higher in frequency than the first frequency range,	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[e].</i>
1[g]	the first antenna being configured to transmit and receive signals from a 4G communication standard,	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the z520a is configured to transmit and receive signals from a 4G communication standard. Sony Ericsson GSM 850/900/1800/1900 <i>See FCC User Manual at 2.</i>
1[h]	the first antenna defining a first antenna contour	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i>

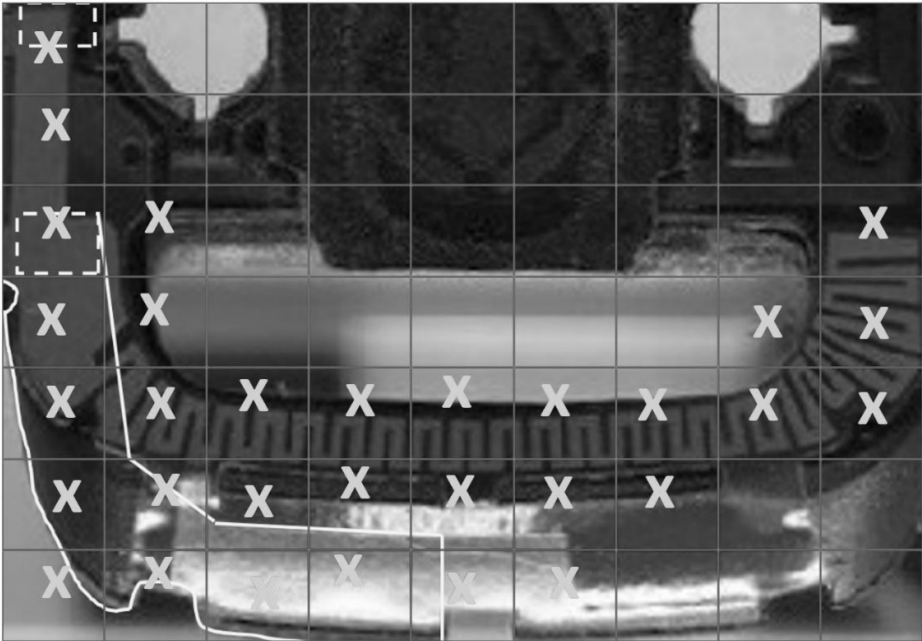
Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
	comprising an entire perimeter of the first antenna,	The first antenna of the z520a defines a first antenna contour comprising an entire perimeter of the first antenna. The first antenna includes first and second sides including the perimeter of the first antenna: First antenna, first side:  First antenna, second side:

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		The first antenna contour includes parts of the perimeter that are on the first side and the orthogonal projection onto the plane of the first side of the parts of the perimeter that are on the second side onto the first side:

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
1[i]	wherein the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value less than 1.75.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		The complexity factor calculation is performed according to the method in the patent. N1=12  N2=31

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 N3=97

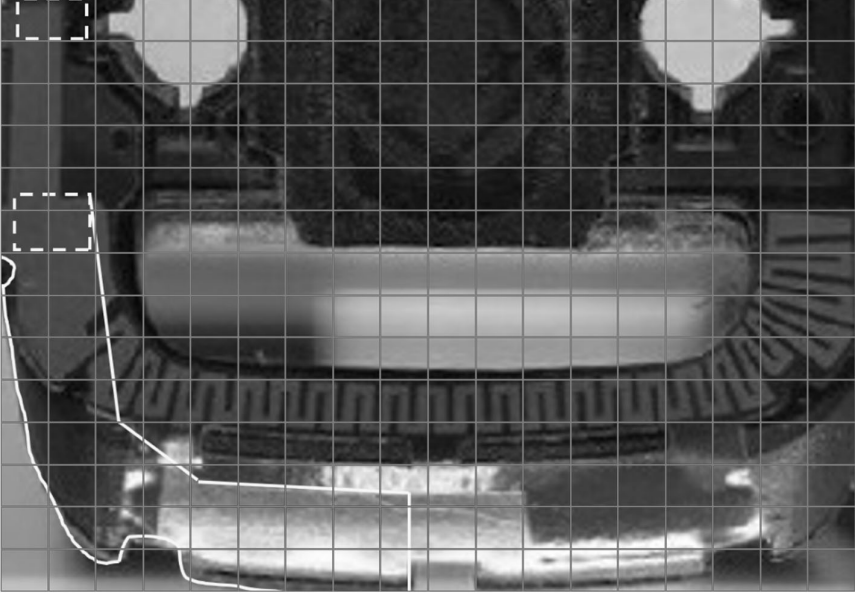
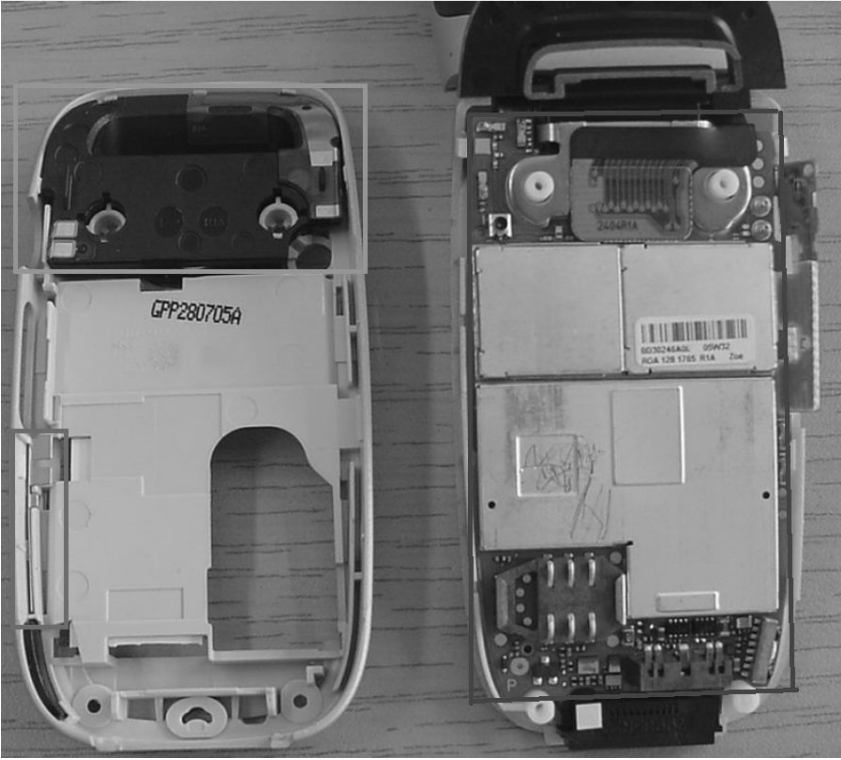
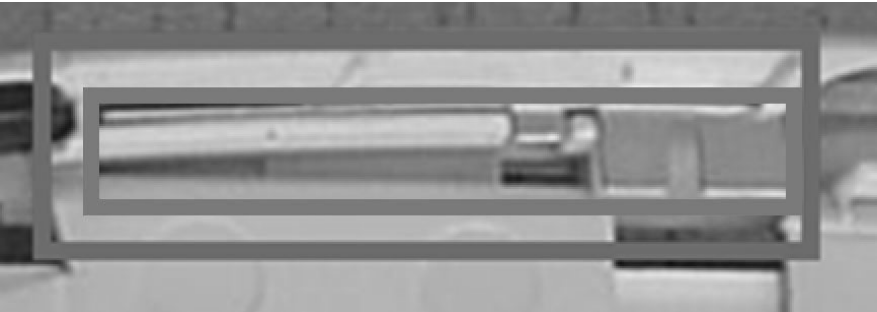
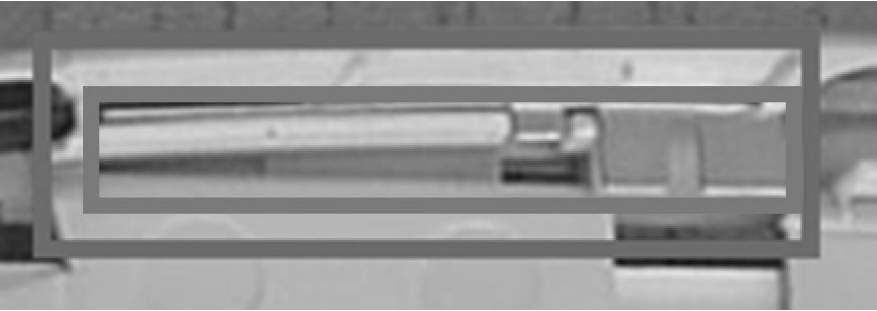
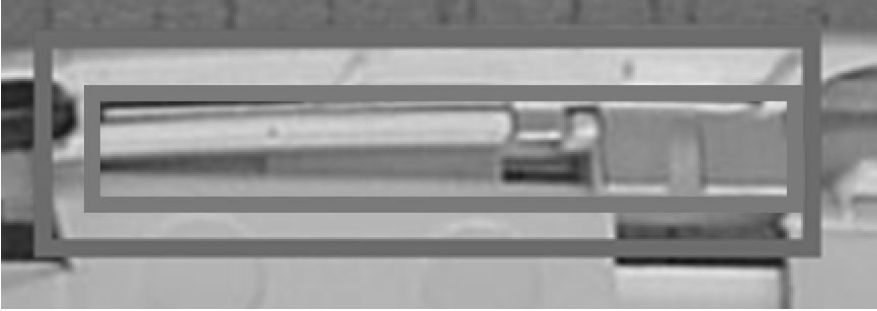
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 $F21 = \log(31/12)/\log(2) = 1.37$ $F32 = \log(97/31)/\log(2) = 1.64$
1[j]	complexity factor F32 having a value of at least 1.35; and	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
1[k]	a second antenna proximate to a first long side of the ground plane rectangle, and	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the z520a includes a second antenna (purple below) proximate to a first long side of the ground plane rectangle (red below). 

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
1[l]	wherein the second antenna is configured to receive signals from a 4G communication standard.	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the z520a is configured to receive signals from a 4G communication standard. 1.5 Test Item Type of equipment : Quad band Mobile Phone with Bluetooth (850/900/1800/1900 MHz) <i>See FCC Test Report at 5.</i> To the extent that the Z520a does not expressly or inherently disclose this claim element, it would have been obvious to configure the second antenna for WLAN operation under 802.11b, as the second antenna already operates in a frequency band used for 802.11b WiFi communication. A person of ordinary skill in the art would have done so to add WiFi functionality. Thus, this claim element would have been obvious.
Claim 2		
2[a]	The wireless device of claim 1, wherein the second antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> A minimum-sized parallelepiped that completely encloses a volume of the second antenna is shown below in red. Each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
	sized parallelepiped is tangent to at least one point of the volume of the second antenna,	
2[b]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> An orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna is shown below in red. 
2[c]	an antenna rectangle,	Z520a expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		<i>See, e.g.,</i> The orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle (red below). 
2[d]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> An aspect ratio of the antenna rectangle is defined as a ratio between a width and a height of the antenna rectangle. The aspect ratio has a value of at least 2. A width of the antenna rectangle is at least twice a height of the antenna rectangle.

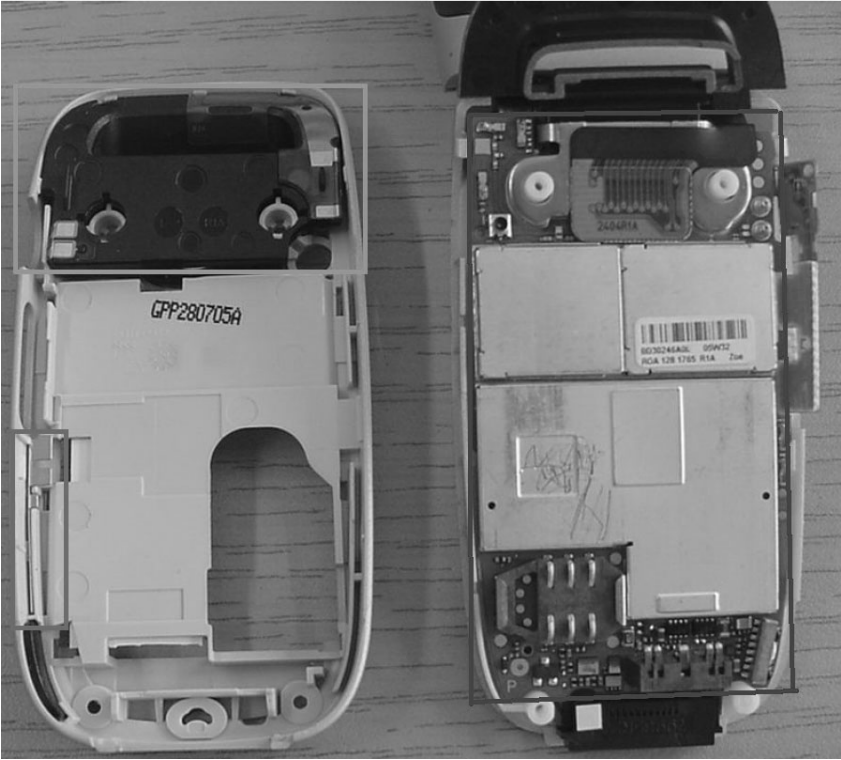
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
Claim 3		
Claim 4		
4	The wireless device of claim 1, wherein the first antenna is configured to support at least four frequency bands.	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the z520a is configured to support at least four frequency bands. Sony Ericsson GSM 850/900/1800/1900 <i>See FCC User Manual at 2.</i>
Claim 6		

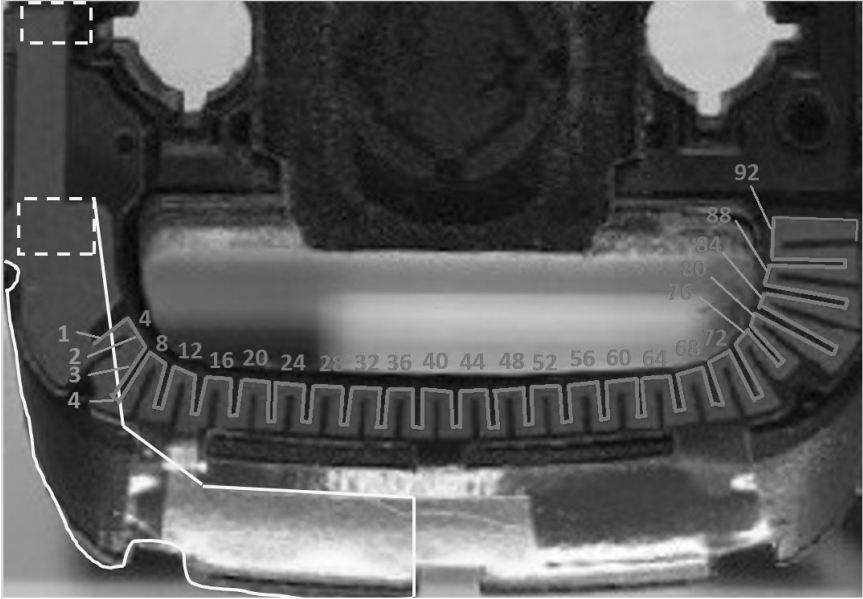
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
6[pre]	A wireless device comprising:	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>
6[a]	an antenna system comprising	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[b]	a ground plane and	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[c]	at least two antennas within the wireless device, the antenna system comprising:	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[d]	a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards, wherein	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the z520a includes a first antenna (blue below) configured to provide operation in at least four frequency bands being used by 4G communication standards. At least

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		two of the at least four frequency bands are contained within a first frequency range. At least two of the four frequency bands are contained within a second frequency range. The first frequency range is lower in frequency than the second frequency range. Sony Ericsson GSM 850/900/1800/1900 <i>See FCC User Manual at 2.</i>
6[e]	at least two of the at least four frequency bands are contained within a first frequency range and	Z520a expressly or inherently discloses this claim element. <i>See Claim 6[d].</i>
6[f]	at least two of the four frequency bands are contained within a second frequency range,	Z520a expressly or inherently discloses this claim element. <i>See Claim 6[d].</i>
6[g]	the first frequency range being lower in frequency than the second frequency range,	Z520a expressly or inherently discloses this claim element. <i>See Claim 6[d].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
6[h]	the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna, and wherein	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[h].</i>
6[i]	the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
6[j]	complexity factor F32 having a value of at least 1.35; and	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
6[k]	a second antenna configured to operate in at least one frequency band being used by a 4G communication standard,	Z520a expressly or inherently discloses this claim element. To the extent that the Z520a does not expressly or inherently disclose this claim element, this claim element would have been obvious. <i>See Claim 1[l].</i>
6[l]	the second antenna defining an antenna box that is a minimum-sized parallelepiped that completely encloses a	Z520a expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
	volume of the second antenna and	
6[m]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna,	Z520a expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>
6[n]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining	Z520a expressly or inherently discloses this claim element. <i>See Claim 2[b].</i>
6[o]	an antenna rectangle,	Z520a expressly or inherently discloses this claim element. <i>See Claim 2[c].</i>
6[p]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2, and	Z520a expressly or inherently discloses this claim element. <i>See Claim 2[d].</i>

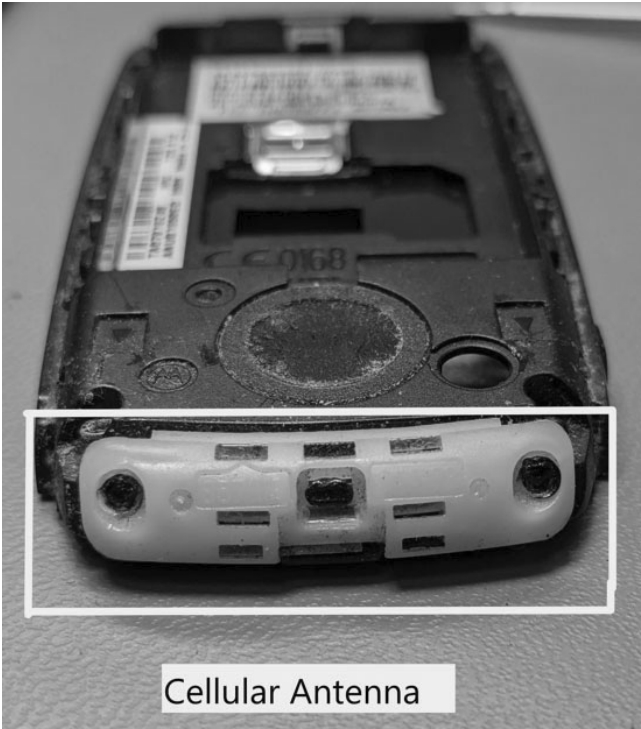
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
6[q]	wherein at least one of the first and second antennas is close to a first short side of a ground plane rectangle enclosing the ground plane.	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> At least one of the first and second antennas of the z520a is close to a first short side of a ground plane rectangle (red below) enclosing the ground plane. 

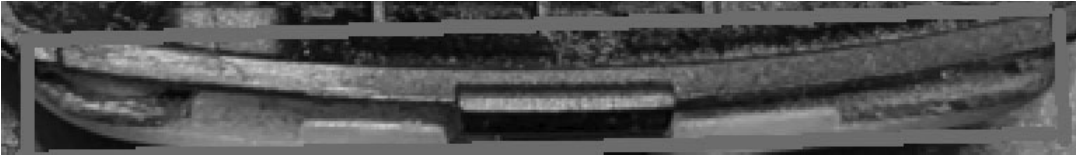
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
Claim 7		
7	The wireless device of claim 6, wherein the first antenna contour comprises at least 20 segments.	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna contour comprises at least 92 segments. 

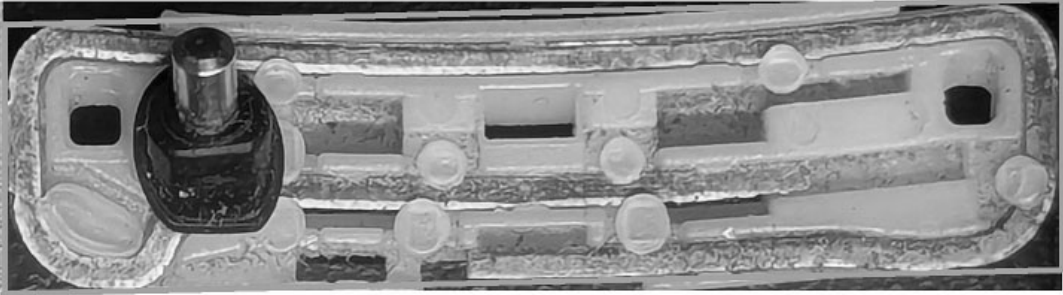
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
Claim 9		
9[a]	The wireless device of claim 6, wherein the second antenna defines a second antenna contour comprising an entire perimeter of the second antenna,	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of U.S. 2005/0259011 to Vance. <i>See, e.g.,</i> The Motorola V360 includes a second antenna (yellow below) within the V360 and configured to operate in at least one frequency band being used by a 4G communication standard.

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 The image displays two views of a silver Sony Ericsson Z520a flip phone. The left view is the front of the phone, showing a black screen with the 'MOTOROLA' logo above it. Below the screen is a circular navigation pad with a central button, surrounded by several function keys. At the bottom is a standard 12-key numeric keypad. The model number 'V350' is visible at the very bottom. The right view is the back of the phone, featuring a large rectangular camera lens in the upper center, a small flash to its right, and the Motorola logo at the top. The bottom of the back cover has a small circular port.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 Cellular Antenna The second antenna of the Motorola V360 defines an antenna contour comprising an entire perimeter of the second antenna.

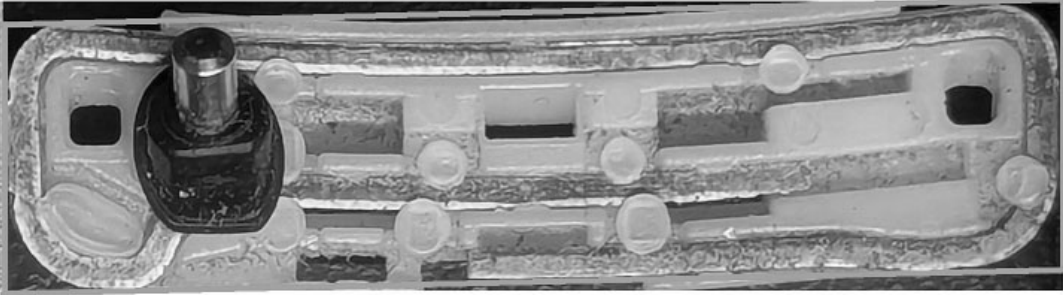
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 A minimum-sized parallelepiped of rectangular faces that completely encloses a volume of the second antenna defines an antenna box (purple below).  An orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle (orange below).

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 An aspect ratio of the antenna rectangle is defined as a ratio between a width and a height of the antenna rectangle. The aspect ratio has a value of at least 2. A width of the antenna rectangle is at least twice a height of the antenna rectangle. It would have been obvious to include the second antenna of the Motorola V360 in the z520a to reduce variation in performance of the z520a between the open and closed states as taught in Vance. Vance teaches “clamshell type wireless terminals,” in which “a first low-band antenna 1420 is located approximate to the intermediate portion 1410 of the multi-band clamshell type wireless terminal 1400. A second low-band antenna 1425 is located proximate to the bottom portion 1415, which is distal from the first low-band antenna 1420 and separate therefrom.” (11:35-44) According to Vance “‘clamshell’ type radiotelephones (radiotelephones that open/close) may present particular design challenges in providing effective multi-band performance. In particular, in the case of a clamshell type radiotelephone, it is known that placing an internal antenna at the bottom of the radiotelephone may allow for relatively small shifts in performance of the radiotelephone between the open and closed states. However, the bandwidth for such antennas (located at the bottom of these clamshell telephones) may tend to be rather narrow. In contrast,

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		when the antenna is placed near an intermediate portion of the clamshell (e.g., near the hinge) the bandwidth may be improved, but the performance in the open and closed states may vary dramatically.” (1:29-42). FIGURE 14A FIGURE 14B One of ordinary skill in the art would have included the second antenna of the Motorola V360 in the bottom portion of the clamshell, with the first antenna of the z520a near the intermediate portion of the clamshell. Doing so would have benefitted from the wide bandwidth of the z520a

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		first antenna and from the consistent performance of the second antenna of the V360 as taught in Vance. There would have been a reasonable expectation of success in including the second antenna of the Motorola V360 in the z250a because each antenna is located in the same relative position in the resulting device as in the individual devices. Moreover, Vance teaches how to position the two cellular antennas in the device. Thus, this claim limitation would have been obvious in view of the Motorola V360 and Vance.
9[b]	wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of U.S. 2005/0259011 to Vance. <i>See, e.g.,</i> A length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		

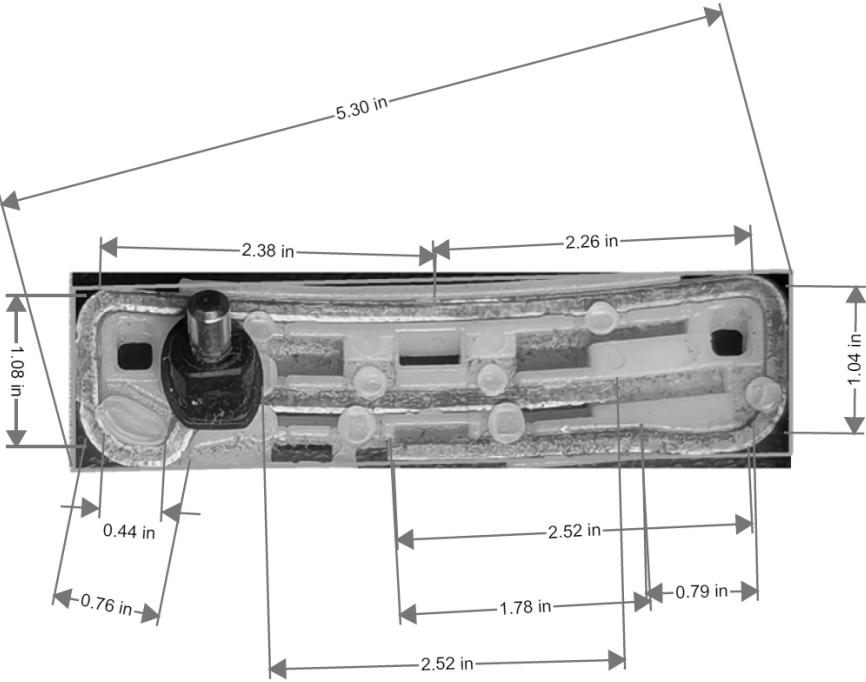
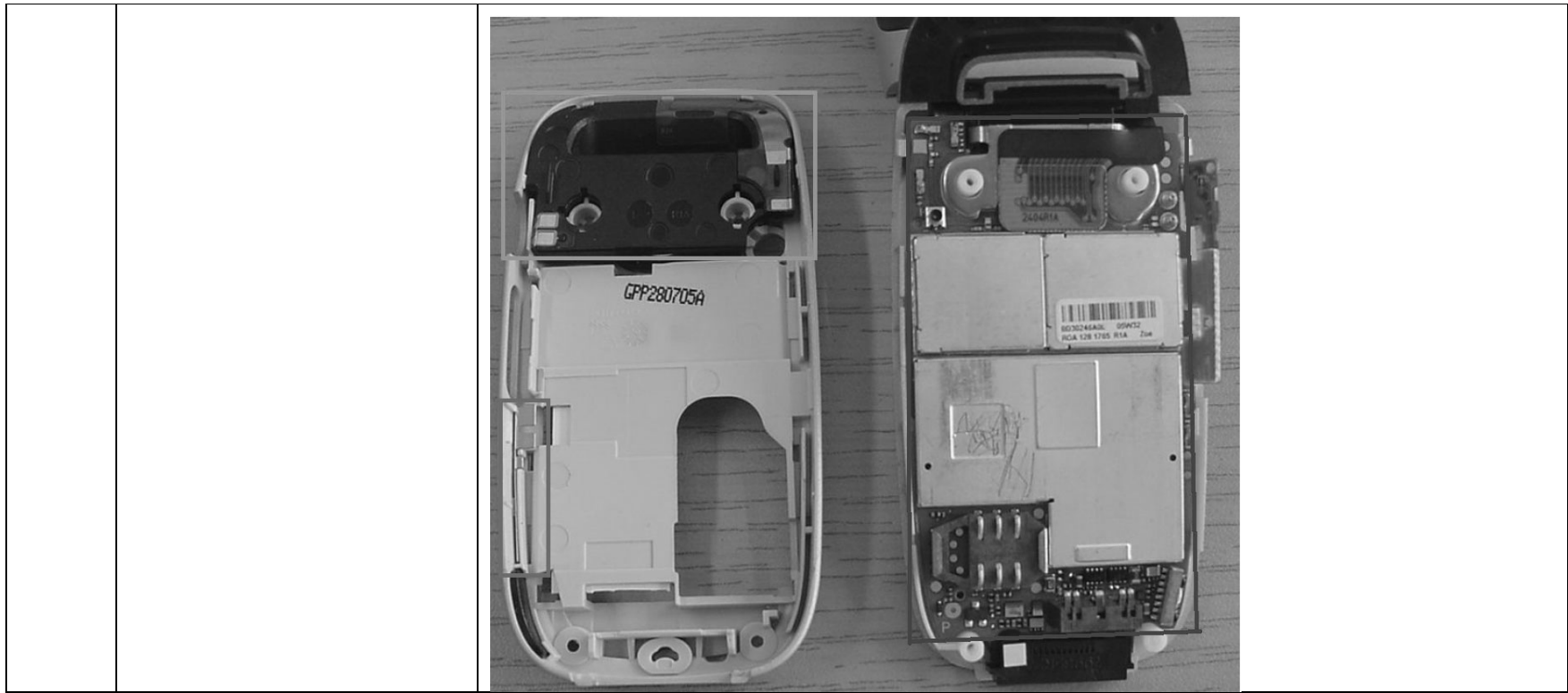
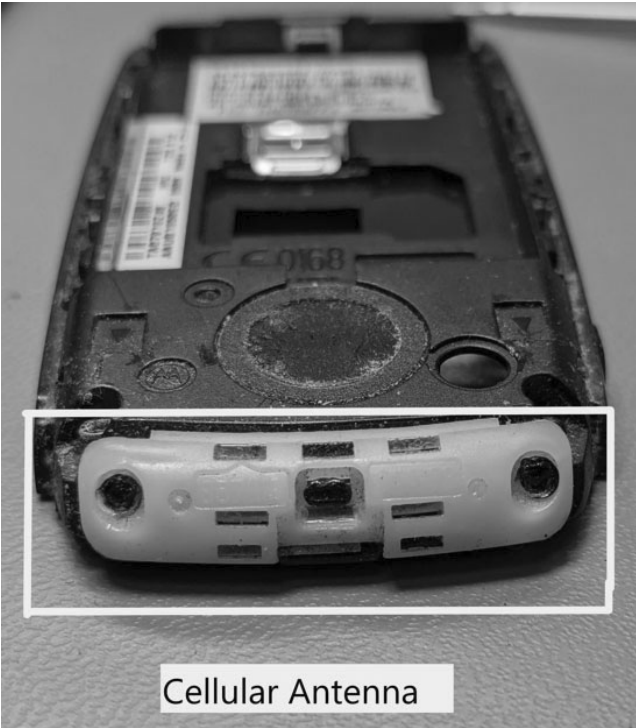
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 Technical drawing of a Sony Ericsson Z520a mobile phone, showing dimensions in inches. The drawing includes a perspective view and a top-down view. Dimensions are labeled as follows: - Overall length: 5.30 in - Overall width: 1.08 in - Top section width: 2.38 in - Bottom section width: 2.26 in - Left side width: 0.44 in - Right side width: 0.76 in - Bottom section width: 2.52 in - Bottom section width: 1.78 in - Bottom section width: 0.79 in - Bottom section width: 2.52 in - Bottom section width: 1.04 in D=5.3 4D=4*5.3=21.2 L>2.38+2.26+1.04+.79+1.78+2.52+1.04+2.26+2.38+1.08+.44+2.52+2.52>23.01
Claim 10		

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
10	The wireless device of claim 6, wherein the antenna system comprises a third antenna configured to provide operation in a wireless communication standard.	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of U.S. 2005/0259011 to Vance. <i>See, e.g.,</i> In view of the Motola V360 and Vance, the cellular antenna of the V360 (e.g., yellow below) or the Bluetooth antenna of the z520a is the second antenna, and the other of the cellular antenna of the V360 and the Bluetooth antenna of the z520a is a third antenna configured to provide operation in a wireless communication standard.

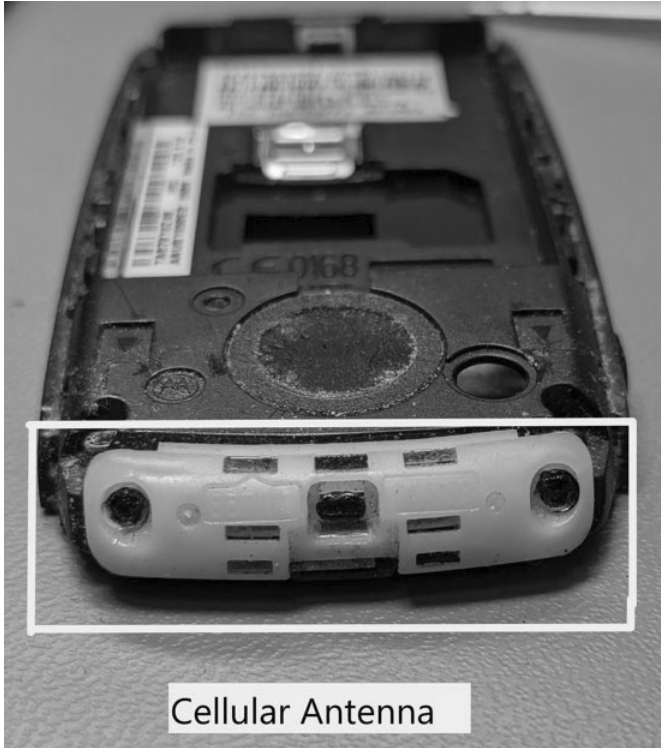
Exhibit – E – 09



Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		 Cellular Antenna
Claim 11		
11[pre]	A wireless device comprising:	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
11[a]	an antenna system comprising	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[b]	a ground plane and	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[c]	at least two antennas within the wireless device, the antenna system comprising:	Z520a expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[d]	a first antenna configured to provide operation in at least three frequency bands being used by 4G communication standards,	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. The Motorola V360 includes a first antenna (yellow below) configured to provide operation in at least three frequency bands being used by 4G communication standards.

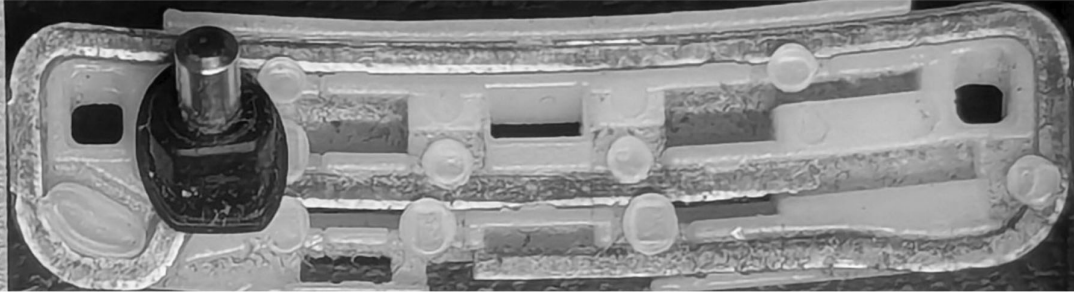
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		We tested the triband (GSM 850/1800/1900; EDGE) Motorola V360 on the T-Mobile network in San Francisco. We encountered decent call

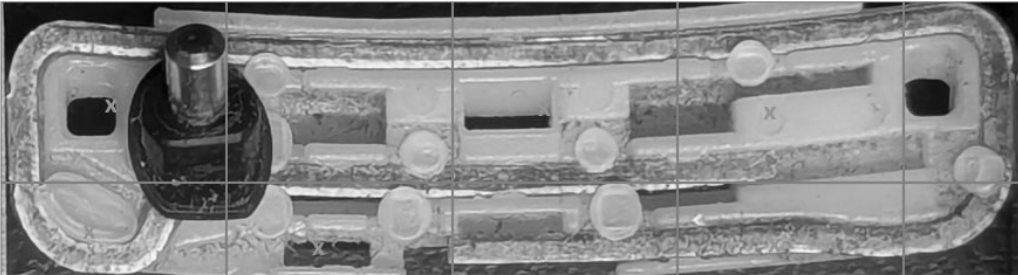
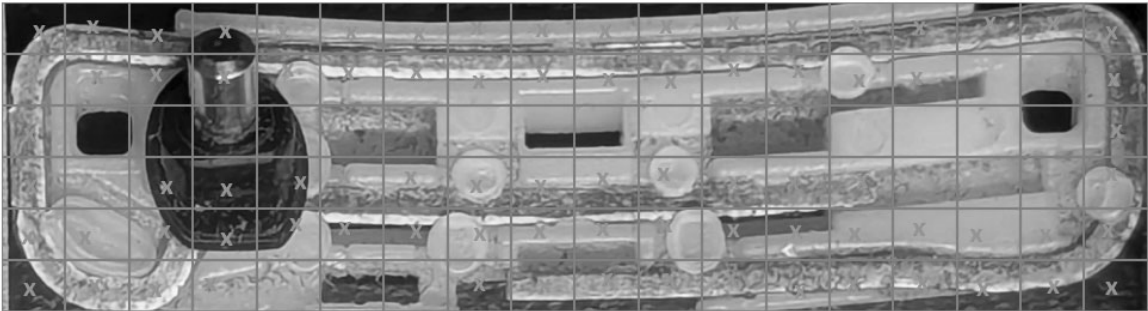
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		<i>See</i> CNET.com, “Motorola V360 T Mobile Review” https://www.cnet.com/reviews/motorola-v360-t-mobile-review/ (last accessed June 18, 2205).  Cellular Antenna It would have been obvious to include the first antenna of the Motorola V360 in the z520a to reduce variation in performance of the z520a between the open and closed states as taught in Vance.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		Vance teaches “clamshell type wireless terminals,” in which “a first low-band antenna 1420 is located approximate to the intermediate portion 1410 of the multi-band clamshell type wireless terminal 1400. A second low-band antenna 1425 is located proximate to the bottom portion 1415, which is distal from the first low-band antenna 1420 and separate therefrom.” (11:35-44) According to Vance “‘clamshell’ type radiotelephones (radiotelephones that open/close) may present particular design challenges in providing effective multi-band performance. In particular, in the case of a clamshell type radiotelephone, it is known that placing an internal antenna at the bottom of the radiotelephone may allow for relatively small shifts in performance of the radiotelephone between the open and closed states. However, the bandwidth for such antennas (located at the bottom of these clamshell telephones) may tend to be rather narrow. In contrast, when the antenna is placed near an intermediate portion of the clamshell (e.g., near the hinge) the bandwidth may be improved, but the performance in the open and closed states may vary dramatically.” (1:29-42).

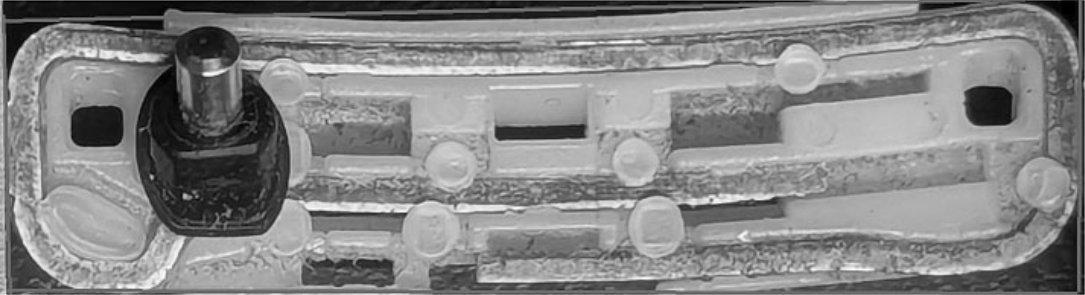
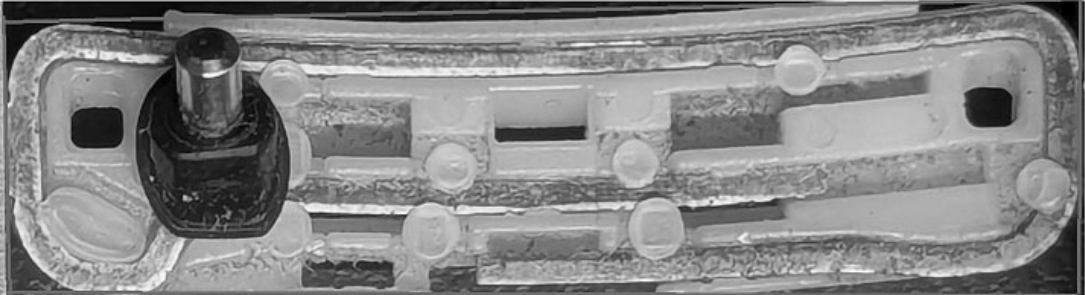
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		FIGURE 14A FIGURE 14B One of ordinary skill in the art would have included the first antenna of the Motorola V360 in the bottom portion of the clamshell, with the cellular antenna of the z520a near the intermediate portion of the clamshell. Doing so would have benefitted from the wide bandwidth of the z520a cellular antenna and from the consistent performance of the first antenna of the V360 as taught in Vance.

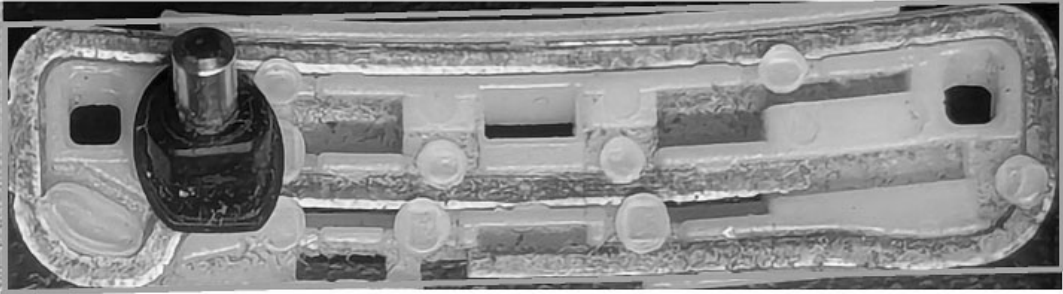
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		There would have been a reasonable expectation of success in including the first antenna of the Motorola V360 in the z250a because each antenna is located in the same relative position in the resulting device as in the individual devices. Moreover, Vance teaches how to position the two cellular antennas in the device. Thus, this claim limitation would have been obvious in view of the Motorola V360 and Vance.
11[e]	the first antenna defining an antenna contour comprising an entire perimeter of the first antenna,	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See e.g.,</i> The first antenna of the Motorola V360 defines an antenna contour comprising an entire perimeter of the first antenna. 

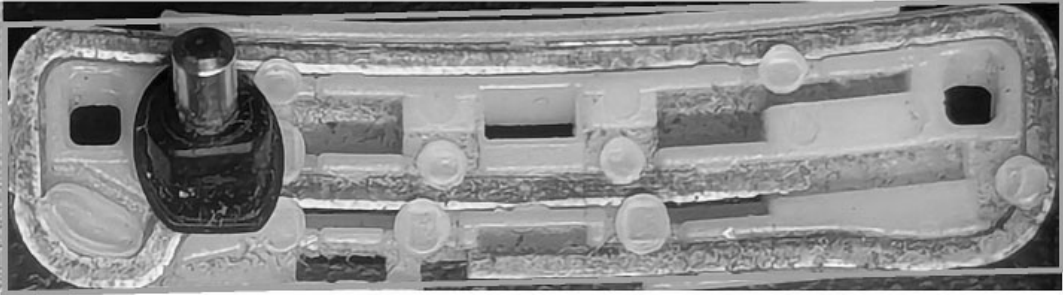
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
11[f]	the antenna contour comprising at least twenty segments,	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See e.g.,</i> The antenna contour of the first antenna of the Motorola V360 includes at least twenty segments 
11[g]	wherein the antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See e.g.,</i> The antenna contour of the first antenna of the Motorola V360 has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35. The complexity factor calculation is performed according to the method in the patent.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		N1=10  N2=26  $F21=\log(26/10)/\log(2)=1.37$

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		$F32 = \log(83/26) / \log(2) = 1.67$
11[h]	complexity factor F32 having a value of at least 1.35, and	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See Claim 11[g].</i>
11[i]	wherein the first antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See, e.g.,</i> A minimum-sized parallelepiped of rectangular faces that completely encloses a volume of the second antenna defines an antenna box (purple below). 

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
11[j]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna,	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See, e.g.,</i> Each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna. 

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
11[k]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See, e.g.,</i> An orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna is shown below (in orange). 
11[l]	an antenna rectangle,	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See, e.g.,</i> The orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle (orange below).

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
11[m]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2; and	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See, e.g.,</i> An aspect ratio of the antenna rectangle is defined as a ratio between a width and a height of the antenna rectangle. The aspect ratio has a value of at least 2. A width of the antenna rectangle is at least twice a height of the antenna rectangle.

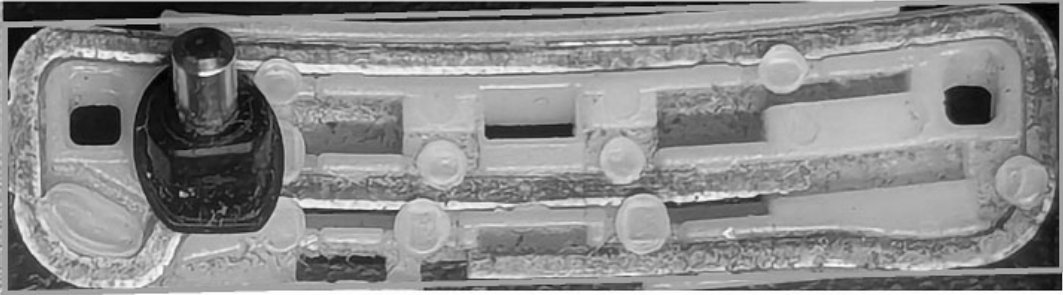
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
11[n]	a second antenna configured to provide operation in a first wireless service,	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the z520a includes a second antenna (purple below) configured to provide operation in a first wireless service.

Exhibit – E – 09

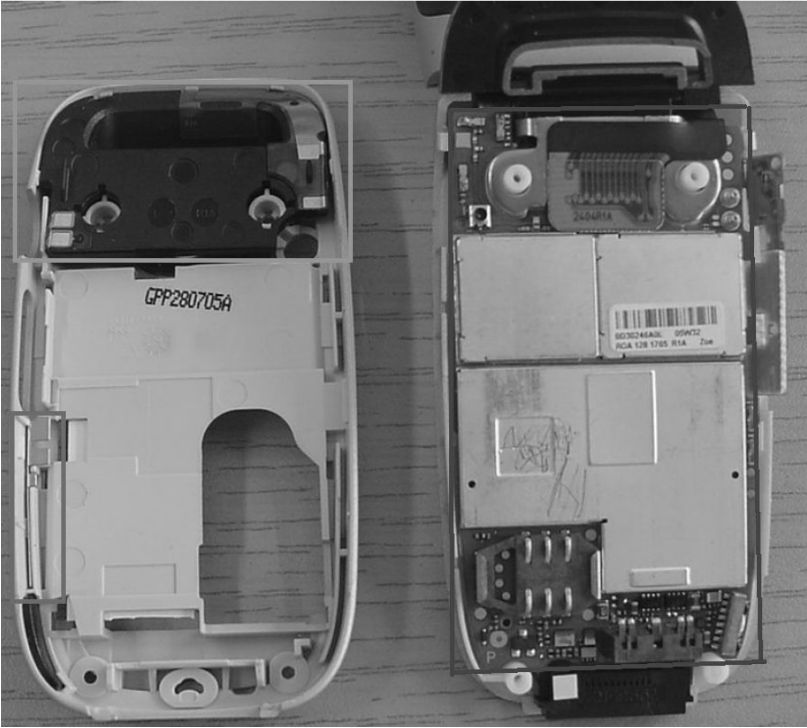
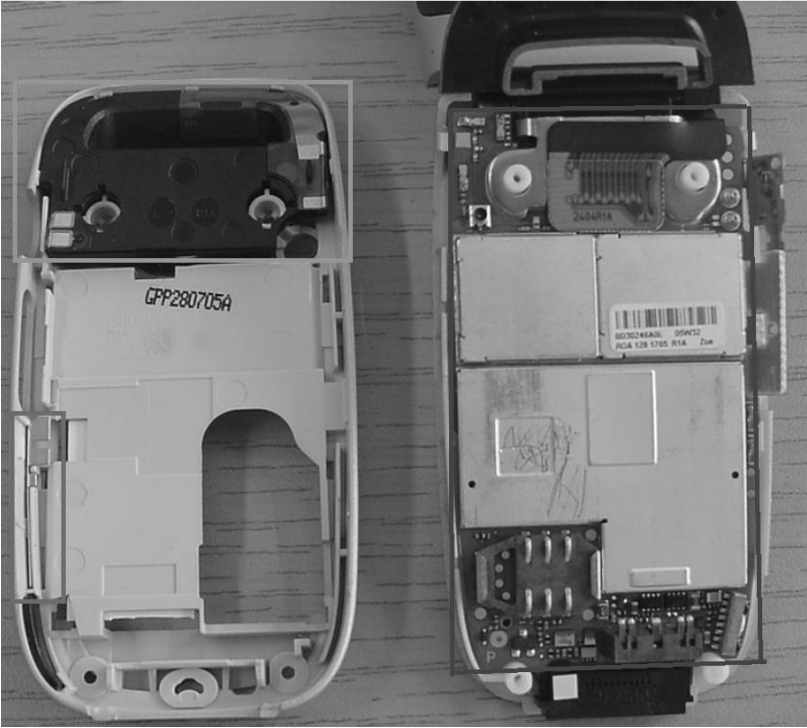
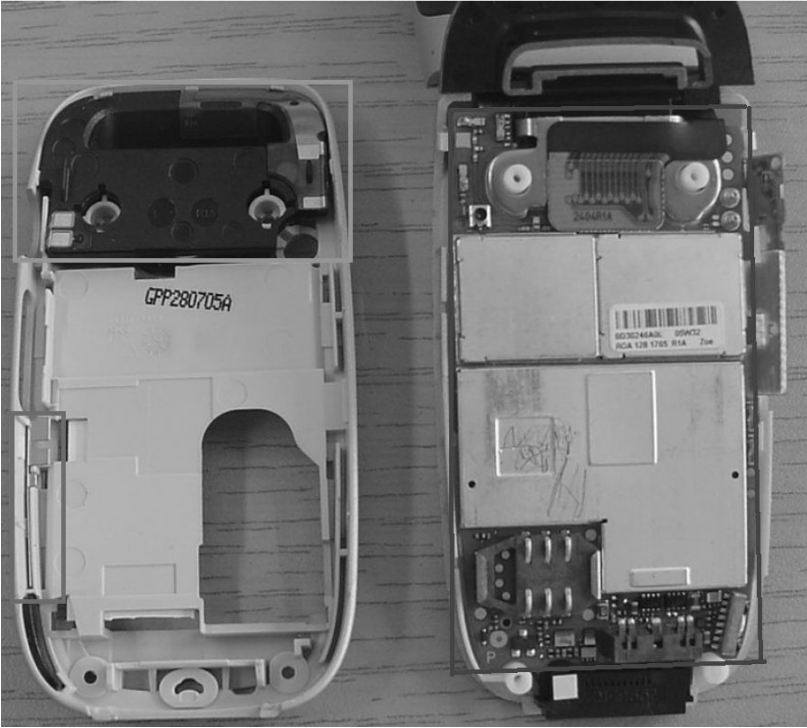
Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
11[o]	a second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.	Z520a expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the z520a is proximate to a side of a ground plane rectangle (red below) enclosing the ground plane.

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
Claim 12		
Claim 13		
13	The wireless device of claim 11, wherein the first wireless	Z520a expressly or inherently discloses this claim element. To the extent that the Z520a does not expressly or inherently disclose this claim element, it would have been obvious to configure the second antenna for WLAN operation under 802.11b, as the second antenna already operates in a

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
	service is a WiFi communication standard.	frequency band used for 802.11b WiFi communication. A person of ordinary skill in the art would have done so to add WiFi functionality. Thus, this claim element would have been obvious.
Claim 15		
15	The wireless device of claim 11, wherein the antenna system comprises a third antenna.	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance. <i>See, e.g.,</i> The z520a includes a third antenna (blue below).

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
		
Claim 17		
17	The wireless device of claim 15, wherein the third antenna is configured to provide	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious in view of the Motorola V360 and further in view of Vance.

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
	operation in a second wireless service.	<i>See, e.g.,</i> The third antenna of the z520a is configured to provide operation in a second wireless service (e.g., cellular service). 
Claim 19		

Exhibit – E – 09

Claim No.	U.S. Patent No. 11,349,200 B2	Sony Ericsson Z520a
19	The wireless device of claim 15, wherein the antenna system comprises a fourth antenna.	Z520a expressly or inherently discloses this claim element. To the extent the z520a does not expressly or inherently discloses this claim element, this claim element would have been obvious. For instance, it would have been obvious to include a fourth antenna for GPS connectivity, such as for E911 geolocation and/or for navigation, as were used in similar devices in the art.

INVALIDITY CONTENTIONS FOR U.S. PATENT NO. 11,349,200 B2
BASED ON THE LENOVO T60 (“T60”)

Based upon Plaintiff’s Complaint, Infringement Contentions, and apparent claim constructions and application of the claims to Geotab’s accused products, as best as they can be deciphered, the reference charted below anticipates or at least renders obvious some or all of claims 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 17, and 19 (the “’200 Asserted Claims”)¹. These invalidity contentions are not an admission by Geotab that the accused products are covered by or infringe the Asserted Claims, particularly when these claims are properly construed and applied.

AIA law applies because the application that issued as the ’200 Patent was filed on April 30, 2021, after the AIA came into force on March 16, 2013.

Lenovo Group Limited’s (“Lenovo”) T60/T60p (performance), as publicly demonstrated, known, offered for sale, sold, and/or used by Lenovo and/or customers of Lenovo, or otherwise available to the public, including in this country, (“T60”) was released by at least February 2006². Thus, the T60 is available as prior art at least under pre-AIA 35 U.S.C. § 102(a)-(b), or (g)(2) and/or AIA 35 U.S.C. § 102(a)(1). At least the following documents provide evidence as to the date the T60 was “offered for sale or publicly used or known,” “the date the offer or use of the item took place or the information became known”, and the “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known”³:

¹ Geotab understands that, by not charting claims 5, 8, 14, 16, 18, and 20 in its Infringement Contentions, Plaintiff does not assert these claims against Geotab.

² See Your Gadgets Website, “The Thinkpad T Series – the Development and History of a Renowned Technology Branding,” Archived on Feb. 5, 2012, available at: <https://web.archive.org/web/20120205012630/http://www.your-gadgets.com/apple/5747-the-thinkpad-t-series-the-development-and-history-of-an-renowned-technology-branding.php> (last accessed June 18, 2025); Wikipedia.com, “Thinkpad T60” https://en.wikipedia.org/wiki/ThinkPad_T60 (last accessed June 18, 2025).

³ Geotab does not yet have complete information regarding the dates by which this product was publicly disclosed, made, used, sold, or offered for sale, the circumstances under which the research, design, and development activities were conducted, and the identities of the particular individuals involved in such activities. Geotab anticipates that the actual dates, circumstances, and identities of individuals will be the subject of third party discovery during this lawsuit. Geotab therefore reserve the right to amend and/or supplement their Invalidity Contentions and this chart if additional information becomes available during the course of discovery. The date the T60 was “offered for sale or publicly used or known,” as well as “the date the offer or use of the item took place or the information became known” is at least as early as the dates identified in the published documents. The “identity of the person or entity which made the use or which made and received the offer, or the person or entity which made the information known or to whom it was made known” includes at least those persons associated with the publication(s), press releases, and conference attendees, or other documents associated with each version on the T60. Geotab also reserve the right to rely on the public use, offer for sale, sale, or installation of the devices described in the publications identified herein once Geotab has had a fair opportunity to take discovery on these subjects.

- Your Gadgets Website, “The Thinkpad T Series – the Development and History of a Renowned Technology Branding,” Archived on Feb. 5, 2012, available at: <https://web.archive.org/web/20120205012630/http://www.your-gadgets.com/apple/5747-the-thinkpad-t-series-the-development-and-history-of-an-renowned-technology-branding.php> (last accessed June 18, 2025).
- Wikipedia.com, “*Thinkpad T60*” at: https://en.wikipedia.org/wiki/ThinkPad_T60 (last accessed June 18, 2025)
- NotebookCheck Website, “*Thinkpad T60*” at: <https://www.notebookcheck.net/Review-IBM-Lenovo-Thinkpad-T60.1294.0.html> (last accessed June 18, 2025)
- NotebookCheck Website, “*Thinkpad T60p*” at: <https://www.notebookcheck.net/Lenovo-Thinkpad-T60p.1401.0.html> (last accessed June 18, 2025)
- NotebookReview Website, “Lenovo ThinkPad T60p Review (pics, specs)” (Apr. 5, 2006) at: <https://web.archive.org/web/20060407172813/http://www.notebookreview.com/default.asp?newsID=2864&Review=Lenovo+ThinkPad+T60p> (last accessed June 18, 2025)
- CNET Website, “Lenovo ThinkPad T60” (Mar. 10, 2006) at: https://web.archive.org/web/20080519075517/http://reviews.cnet.com/laptops/lenovo-thinkpad-t60-1951/4505-3121_7-31641904-2.html (last accessed June 18, 2025)
- PCMag Website, “Lenovo ThinkPad T60” (Mar. 6, 2006) at: <https://web.archive.org/web/20060409125520/http://www.pcmag.com/article2/0,1895,1933669,00.asp> (last accessed June 18, 2025)
- LaptopMag Website, “Lenovo ThinkPad T60” (May 6, 2006) at: <https://web.archive.org/web/20060615095136/http://laptopmag.com/Review/Lenovo-ThinkPad-T60.htm> (last accessed June 18, 2025)

As described in the following claim chart, the asserted claims of U.S. Patent No. 11,349,200 (the “’200 Patent”), are invalid as anticipated by T60. To the extent that T60 is found not to anticipate one or more of the asserted claims of the ’200 Patent, these claims are invalid as obvious in view of T60 alone or as modified in view of or in combination with other prior art references disclosed in Geotab’s Invalidity Contentions and accompanying charts, including without limitation as set forth below.

One of ordinary skill in the art, as of the priority date of the ’200 Patent, would have known to combine or modify the prior art elements disclosed by the foregoing references using known methods, and to use these elements according to their established functions in order to achieve a known and predictable result.

These invalidity contentions are not an admission that Geotab concedes or acquiesces to any claim construction implied or suggested by Plaintiff’s Complaint or Infringement Contentions. Nor is Geotab asserting any claim construction positions through these charts, including

whether the preamble is a limitation. The portions of the prior art reference cited below are not exhaustive but are exemplary in nature. Geotab reserves the right to update their constructions and contentions in view of this Court’s claim construction order.⁴

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 1		
1[pre]	A wireless device comprising:	To the extent the preamble is limiting, T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> 

⁴ Geotab reserves the right to supplement and/or alter this chart based on further investigation and ongoing discovery.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		See Notebook Review Website, Archived April 7, 2006 at: https://web.archive.org/web/20060407172813/http://www.notebookreview.com/default.asp?newsID=2864&Review=Lenovo+ThinkPad+T60p (last accessed June 18, 2025).
1[a]	An antenna system comprising	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The Lenovo T60 includes a ground plane (purple below) and at least two antennas within the wireless device.

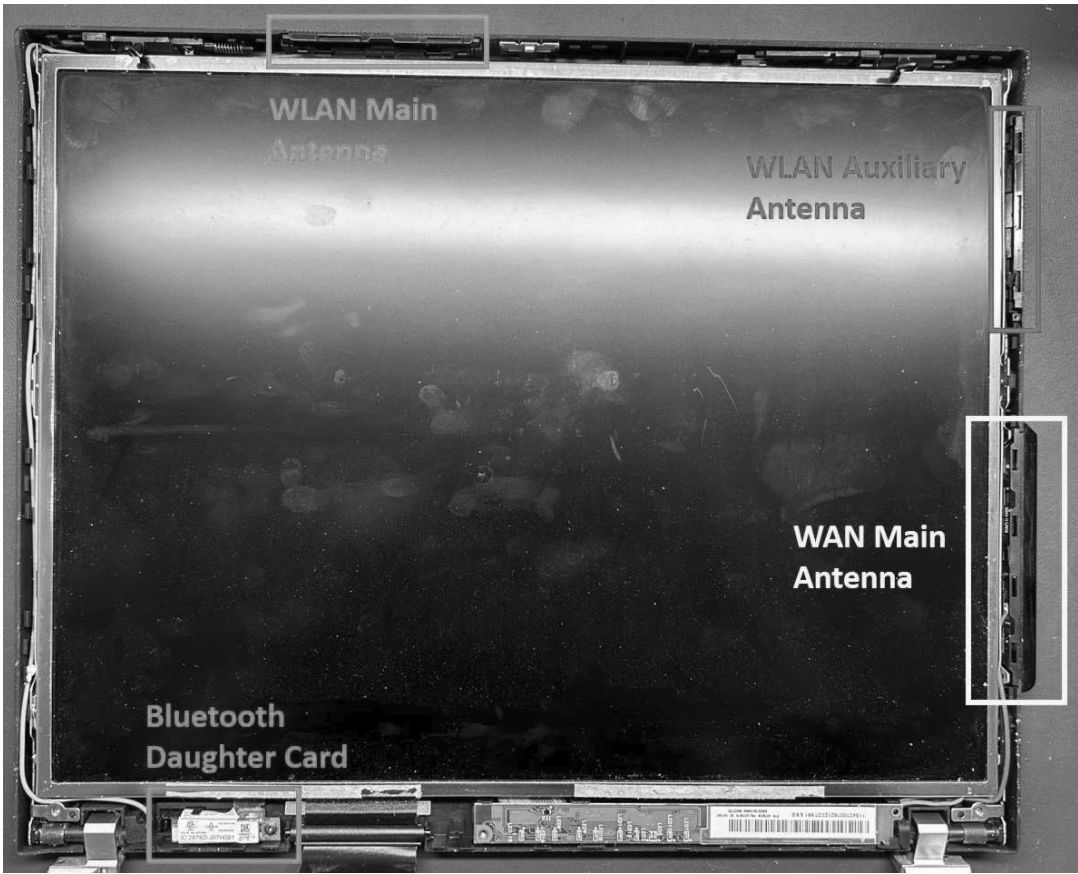
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		

Exhibit – E – 10

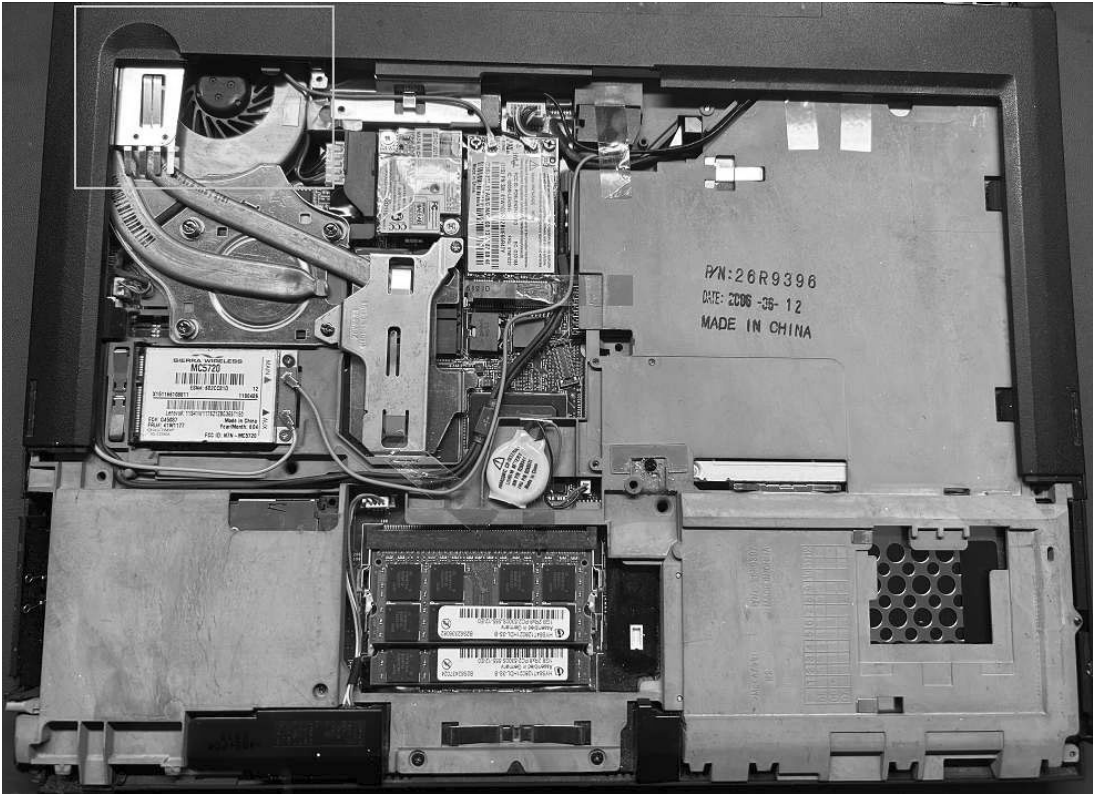
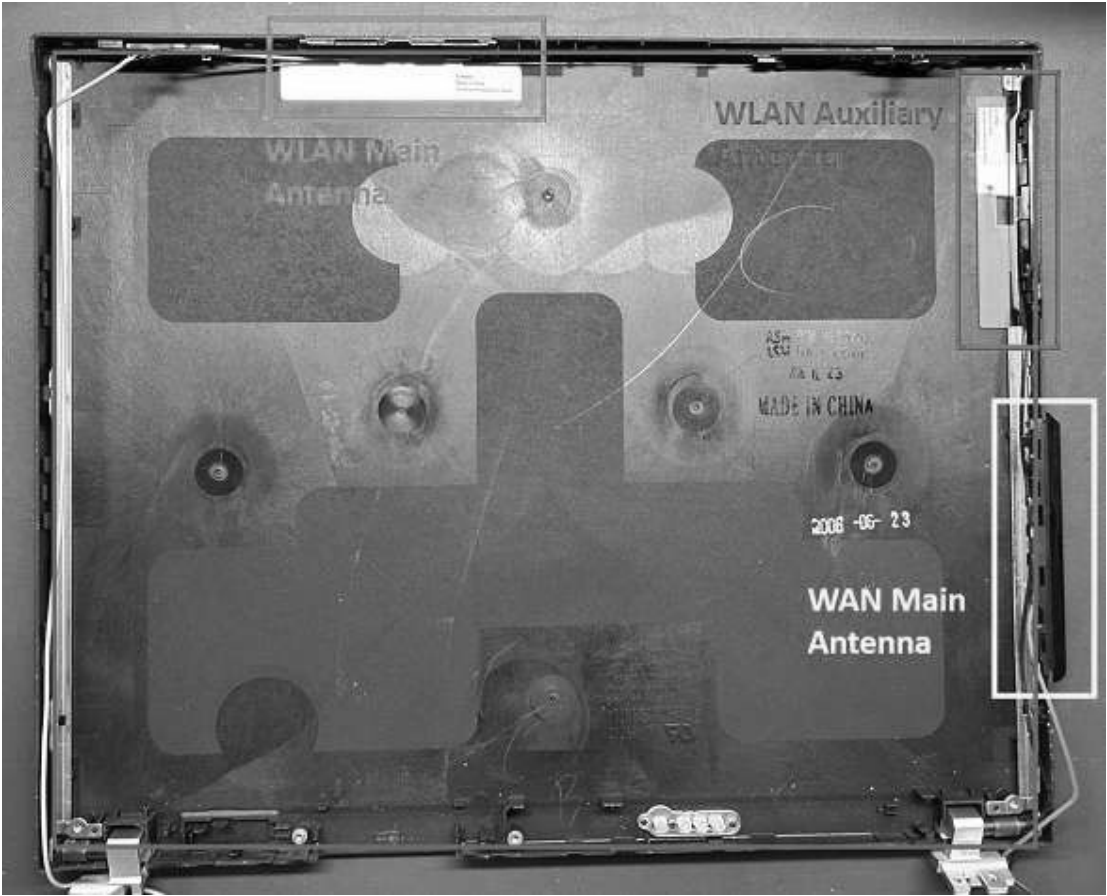
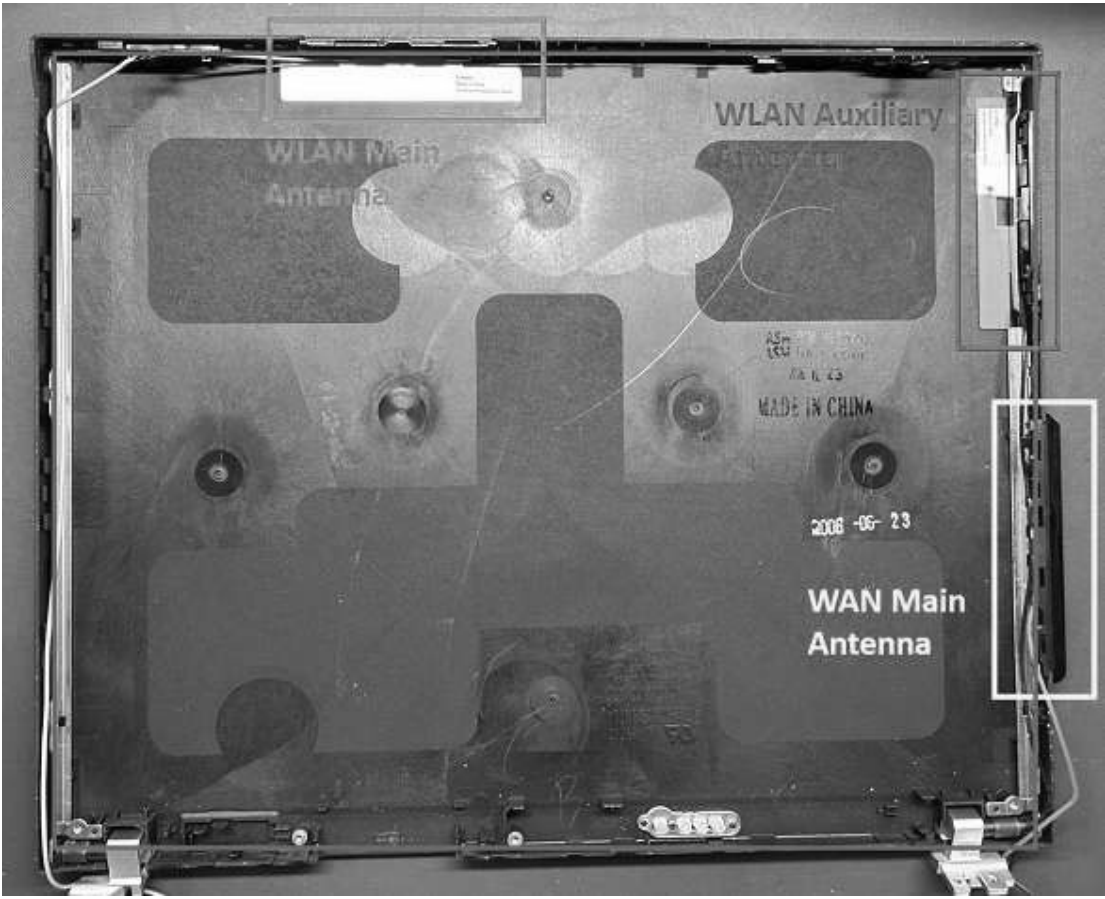
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal components of a Lenovo T60 laptop. A black box highlights the cooling fan and its associated wiring. Other visible components include the battery, various electronic modules, and the main circuit board. Text on the battery and other components is visible, including 'P/N: 26R9396', 'DATE: 2006-05-12', and 'MADE IN CHINA'.

Exhibit – E – 10

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 A black and white photograph of the internal chassis of a Lenovo T60 laptop. The image shows the layout of various components, including antennas. Labels include "WLAN Main Antenna" in the upper left, "WLAN Auxiliary" in the upper right, and "WAN Main Antenna" in the lower right. A date stamp "2008-06-23" is visible. A small label in the center reads "MADE IN CHINA". A white rectangular box highlights a component on the right edge, and another white rectangular box highlights a component at the top center. The chassis is dark, and various screws and mounting points are visible.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
1[b]	a ground plane and	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
1[c]	at least two antennas within the wireless device, the antenna system comprising:	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
1[d]	a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Lenovo T60 includes a first antenna (yellow below) proximate to a first short side of a ground plane rectangle (purple below) enclosing the ground plane.

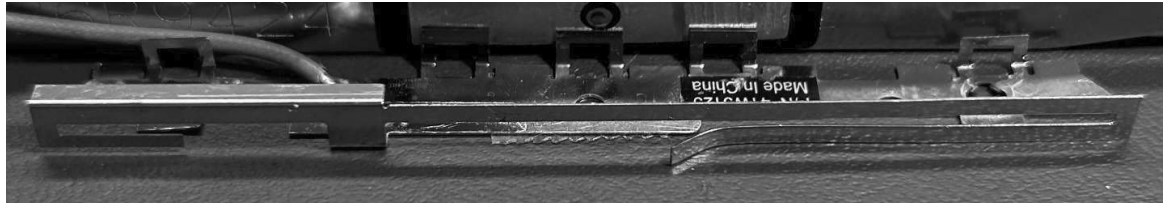
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal chassis of a Lenovo T60 laptop. Key components labeled include the 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, and the 'WAN Main Antenna' at the bottom right. A date stamp '2006-05-23' is visible near the bottom right. A white box highlights a component on the right edge, and a black box highlights a component at the top center. The text 'MADE IN CHINA' is also visible in the center of the chassis.

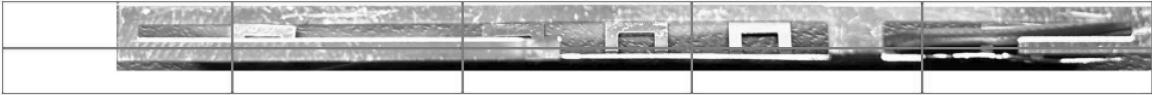
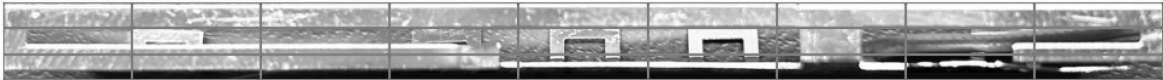
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 First antenna – side view
1[e]	the first antenna being configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the Lenovo T60 is configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum. The second frequency range is higher in frequency than the first frequency range. Network • 1Gb Ethernet installed on systems via the system board. • Intel 802.11abg Mini PCI Express wireless adapter on selected models. • ThinkPad 802.11abg(3945) Mini PCI Express wireless adapter on selected models. • Bluetooth/Modem combo card on selected models. • Integrated Sierra Wireless CDMA2000 Network Adapter for Verizon Wireless Broadband Access on selected models. <i>See</i> Lenovo Website, https://support.lenovo.com/us/en/solutions/pd008795-detailed-specifications-thinkpad-t60-t60p (last accessed June 18, 2025). The first antenna is configured to support at least three frequency bands contained within 824-894 MHz and 1710-2170 MHz.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60																																												
		Table 1: Frequency bands within 1690-2250 MHz. <table><tr><th>Band</th><th>Range (MHz)</th></tr><tr><td>DCS1800</td><td>1710-1880</td></tr><tr><td>PCS1900</td><td>1850-1990</td></tr><tr><td>UMTS Band I</td><td>1920-2170</td></tr><tr><td>UMTS Band II</td><td>1850-1990</td></tr><tr><td>UMTS Band III</td><td>1710-1880</td></tr><tr><td>UMTS Band IV</td><td>1710-2155</td></tr><tr><td>UMTS Band a</td><td>1900-1920, 2010-2025</td></tr><tr><td>UMTS Band b</td><td>1850-1910, 1930-1990</td></tr><tr><td>UMTS Band c</td><td>1910-1930</td></tr><tr><td>LTE Band 1</td><td>1920-2170</td></tr><tr><td>LTE Band 2</td><td>1850-1990</td></tr><tr><td>LTE Band 3</td><td>1710-1880</td></tr><tr><td>LTE Band 4</td><td>1710-2155</td></tr><tr><td>LTE Band 9</td><td>1749.9-1879.9</td></tr><tr><td>LTE Band 10</td><td>1710-2170</td></tr><tr><td>LTE Band 33</td><td>1900-1920</td></tr><tr><td>LTE Band 34</td><td>2010-2025</td></tr><tr><td>LTE Band 35</td><td>1850-1910</td></tr><tr><td>LTE Band 36</td><td>1930-1990</td></tr><tr><td>LTE Band 37</td><td>1910-1930</td></tr><tr><td>LTE Band 39</td><td>1880-1920</td></tr></table> X. Jing et al., “Compact Planar Monopole Antenna for Multi-band Mobile Phones,” 2005 Asia-Pacific Microwave Conference Proceedings, vol. 4, pp. 2657-2660, IEEE, 2005 (“Jing”), 2658 (DCS, PCS, UMTS);	Band	Range (MHz)	DCS1800	1710-1880	PCS1900	1850-1990	UMTS Band I	1920-2170	UMTS Band II	1850-1990	UMTS Band III	1710-1880	UMTS Band IV	1710-2155	UMTS Band a	1900-1920, 2010-2025	UMTS Band b	1850-1910, 1930-1990	UMTS Band c	1910-1930	LTE Band 1	1920-2170	LTE Band 2	1850-1990	LTE Band 3	1710-1880	LTE Band 4	1710-2155	LTE Band 9	1749.9-1879.9	LTE Band 10	1710-2170	LTE Band 33	1900-1920	LTE Band 34	2010-2025	LTE Band 35	1850-1910	LTE Band 36	1930-1990	LTE Band 37	1910-1930	LTE Band 39	1880-1920
Band	Range (MHz)																																													
DCS1800	1710-1880																																													
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LTE Band 39	1880-1920																																													

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		ETSI TS 145 005 V4.3.0 (2001-14) Technical Specification: Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (3GPP TS 45.005 version 4.3.0 Release 4), 8-9 (DCS1800, PCS1900); Pages from E. Dahlman et al., 3G Evolution: HSPA and LTE for Mobile Broadband (Academic Press 2d ed. 2008) (“Dahlman”), 139 (reference [100] identifies HSDPA specifications), 497-501, 599 (reference [100] is 3GPP TS 25.308 (Dahlman)); ETSI TS 125 308 V6.2.0 (2004-09) Technical Specification: Universal Mobile Telecommunications System (UMTS); UTRA High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2 (3GPP TS 25.308 version 6.2.0 Release 6) (UMTS HSDPA description); ETSI TS 121 101 V6.0.0 (2004-12) Technical Specification: Universal Mobile Telecommunications System (UMTS); Technical Specifications and Technical Reports for a UTRAN-based 3GPP system (3GPP TS 21.101 version 6.0.0 Release 6), 11-12 (UMTS standard comprises TS 25.101 (ETSI TS 125 101 V6.5.0 (2004-09) Technical Specification: Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 6.5.0 Release 6)), 25.102 (ETSI TS 125 102 V6.0.0 (2003-12) Technical Specification: Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (TDD) (3GPP TS 25.102 version 6.0.0 Release 6)), 25.308 (Dahlman)); ETSI TS 125 101 V6.5.0 (2004-09) Technical Specification: Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 6.5.0 Release 6), 12-13 (Table 5.0 “UTRA FDD frequency bands”); ETSI TS 125 102 V6.0.0 (2003-12) Technical Specification: Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (TDD) (3GPP TS 25.102 version 6.0.0 Release 6), 11 (UTRA/TDD frequency bands)⁵; 3GPP TS 36.101 v8.4.0 (2008-12) Technical Specification: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (Release 8), 2008, 13, Table 5.5-1 (“E-UTRA operating bands” defining LTE bands); Ericsson white paper, “LTE—an introduction,” no. 284 23-3124 Uen Rev B (June 2009), 11 (listing LTE FDD and TDD bands).

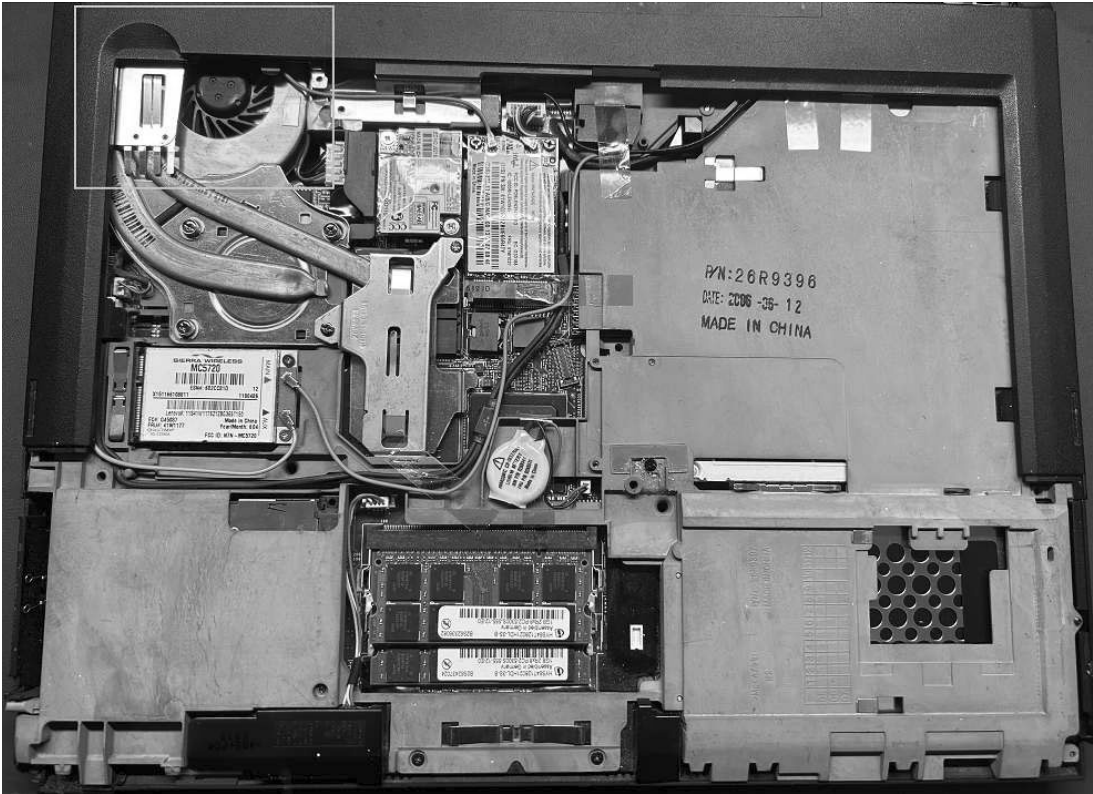
⁵ While Dou refers to “WCDMA/UMTS” in 1710-2170 MHz (Dou, [0022]), as shown in Table 1 the standard defines at least seven distinct “bands” within the 1710-2170 MHz frequency range.

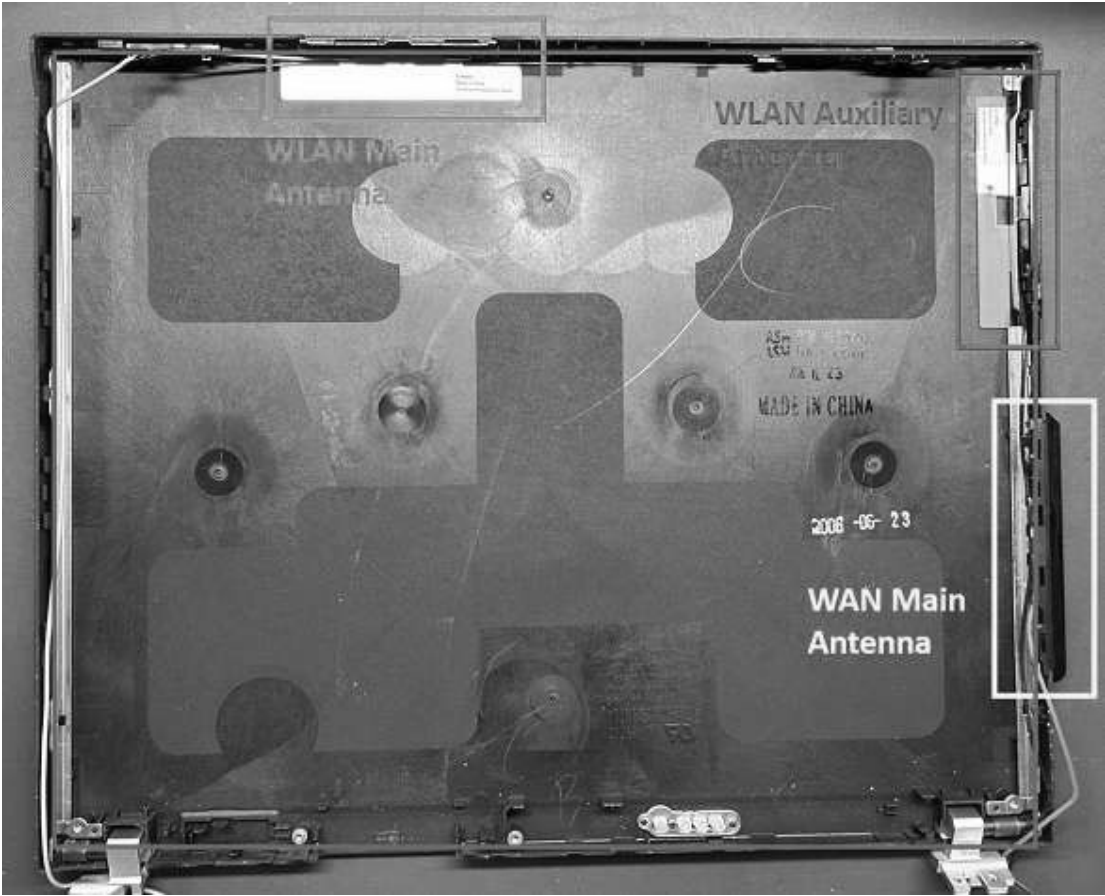
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
1[f]	the second frequency range being higher in frequency than the first frequency range,	T60 expressly or inherently discloses this claim element. <i>See Claim 1[e].</i>
1[g]	the first antenna being configured to transmit and receive signals from a 4G communication standard,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna is configured to transmit and receive signals from a 4G communication standard. The first antenna is configured to transmit and receive signals at least in frequency bands contained within 824-894 MHz and 1710-2170 MHz. <i>See Claim 1[e].</i>
1[h]	the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> 

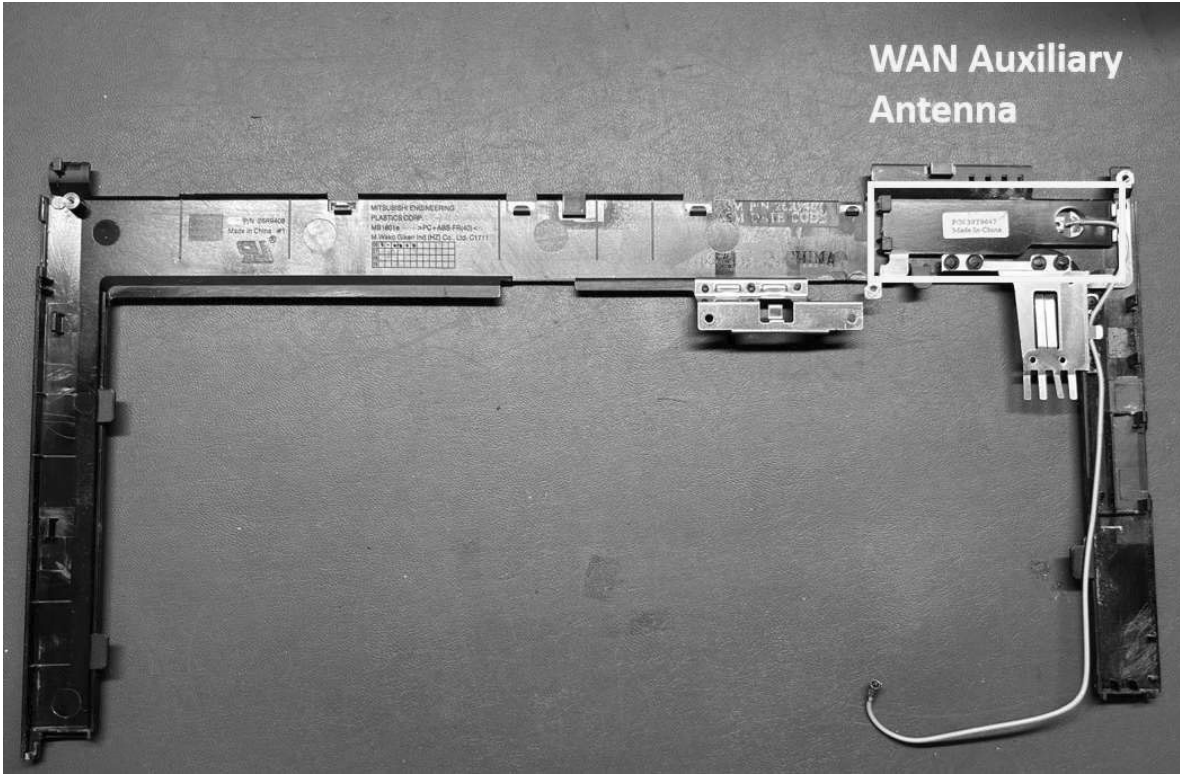
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		
1[i]	wherein the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35. N1=10  N2=23  N3=67  $F21 = \log(23/10)/\log(2) = 1.2$ $F32 = \log(67/23)/\log(2) = 1.54$ The complexity factor calculation is performed according to the method in the patent.

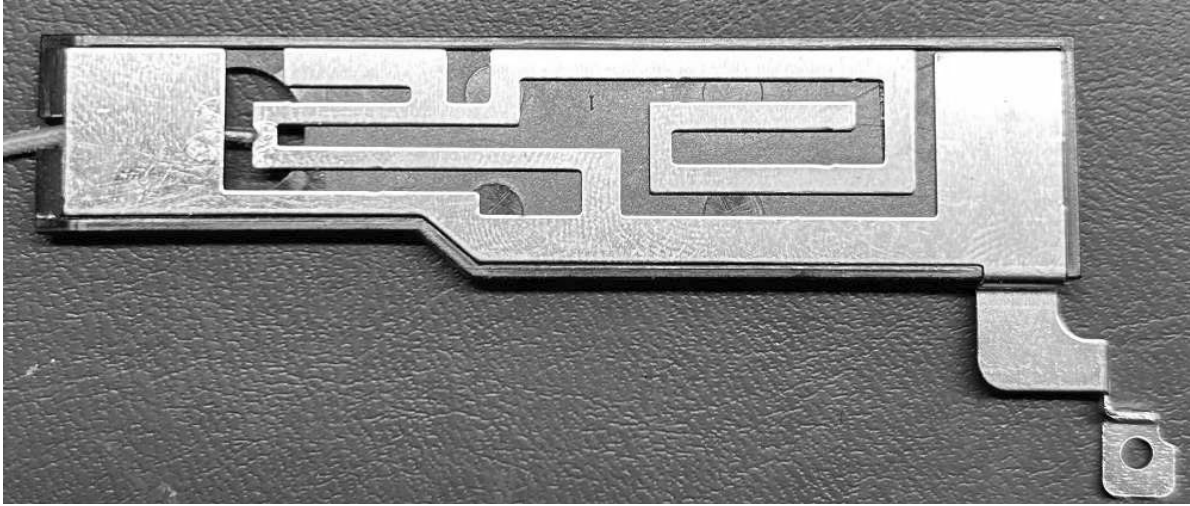
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
1[j]	complexity factor F32 having a value of at least 1.35; and	T60 expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>
1[k]	a second antenna proximate to a first long side of the ground plane rectangle, and	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Lenovo T60 includes a second antenna (pink below) proximate to a first long side of the ground plane rectangle (purple below).

Exhibit – E – 10

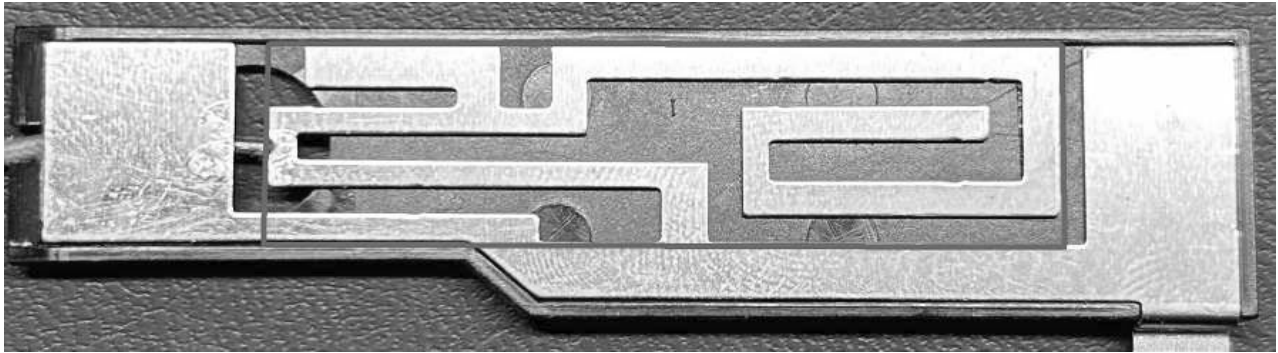
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal components of a Lenovo T60 laptop. A cooling fan is visible in the upper left, with a bracket and heat pipe assembly. A battery is located in the center, with a label that includes 'MCS720' and 'Lenovo'. To the right, a large metal plate has the text 'P/N: 26R9396', 'DATE: 2006-05-12', and 'MADE IN CHINA'. Below the battery, there are two memory modules (RAM) with labels. The entire assembly is housed within a metal chassis with various mounting points and connectors visible.

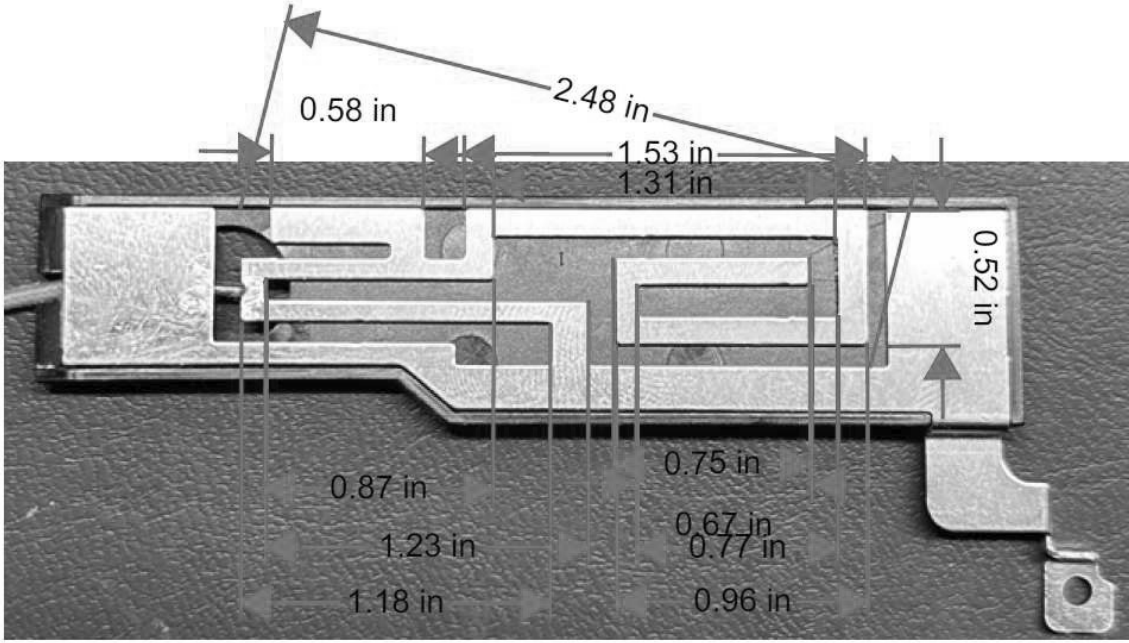
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal chassis of a Lenovo T60 laptop. Several components are labeled: 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, and 'WAN Main Antenna' at the bottom right. A date stamp '2008-06-23' is visible near the bottom right. A small label with 'MADE IN CHINA' is also present. A white box highlights a component on the right side, and another white box highlights a component at the top center. The chassis is dark-colored with various mounting points and screws visible.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		
1[l]	wherein the second antenna is configured to receive signals from a 4G communication standard.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the Lenovo T60 is configured to receive signals from a 4G communication standard. The second antenna of the Lenovo T60 is configured to receive signals within 880-960 MHz and 1850-1990 MHz. <i>See</i> Claim 1[d].

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 2		
2[a]	The wireless device of claim 1, wherein the second antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the Lenovo T60 defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna. An orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defines an antenna rectangle (purple below). 
2[b]	an orthogonal projection of the antenna box along a normal to a face with a largest area	T60 expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>

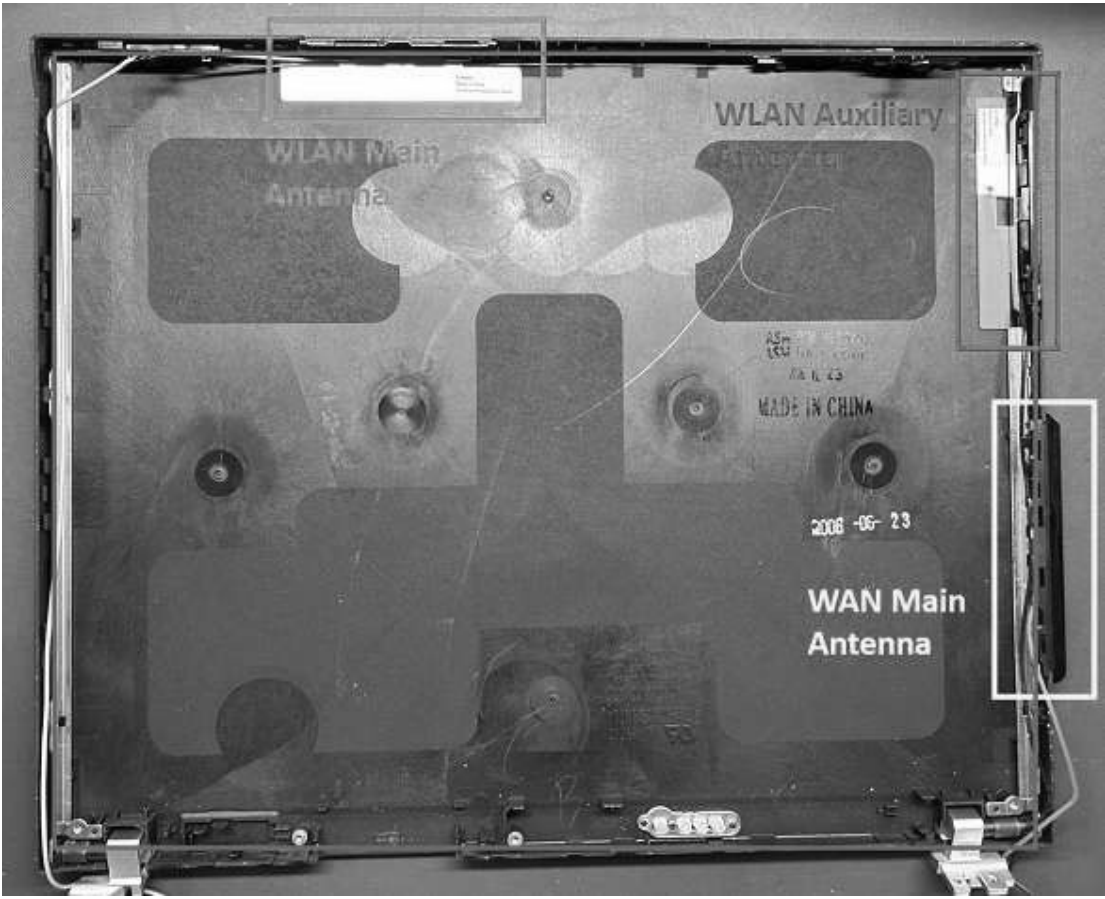
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	of the second antenna defining	
2[c]	an antenna rectangle,	T60 expressly or inherently discloses this claim element. <i>See</i> Claim 2[a].
2[d]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, and wherein the aspect ratio has a value of at least 2.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> An aspect ratio of the antenna rectangle is defined as a ratio between a width and a height of the antenna rectangle. The aspect ratio has a value of at least 2.  A width of the antenna rectangle is at least twice a height of the antenna rectangle.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 3		
3	The wireless device of claim 2, wherein the second antenna defines a second contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna of the Lenovo T60 defines a second contour comprising an entire perimeter of the second antenna, wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle. 

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		$D=2.48$ $4*D=4*2.48=9.92$ $L>.58+1.53+1.31+.52+.75+.67+.77+.96+.87+1.23+1.18>10.37$
Claim 4		
4	The wireless device of claim 1, wherein the first antenna is configured to support at least four frequency bands.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the Lenovo T60 is configured to support at least four frequency bands. Network • 1Gb Ethernet installed on systems via the system board. • Intel 802.11abg Mini PCI Express wireless adapter on selected models. • ThinkPad 802.11abg(3945) Mini PCI Express wireless adapter on selected models. • Bluetooth/Modem combo card on selected models. • Integrated Sierra Wireless CDMA2000 Network Adapter for Verizon Wireless Broadband Access on selected models. <i>See</i> Lenovo Website, https://support.lenovo.com/us/en/solutions/pd008795-detailed-specifications-thinkpad-t60-t60p (last accessed June 18, 2025). The first antenna is configured to support at least four frequency bands contained within 824-894 MHz and 1710-2170 MHz. <i>See</i> Claim 1[e].

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 6		
6[pre]	A wireless device comprising:	T60 expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>
6[a]	an antenna system comprising	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[b]	a ground plane and	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[c]	at least two antennas within the wireless device, the antenna system comprising:	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
6[d]	a first antenna configured to provide operation	T60 expressly or inherently discloses this claim element.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	in at least four frequency bands being used by 4G communication standards, wherein	<i>See, e.g.,</i> The antenna system of the Lenovo T60 includes a first antenna (yellow below) configured to provide operation in at least four frequency bands being used by 4G communication standards. At least two of the at least four frequency bands are contained within a first frequency range and at least two of the four frequency bands are contained within a second frequency range. The first frequency range is lower in frequency than the second frequency range. <i>See Claim 1[e].</i>

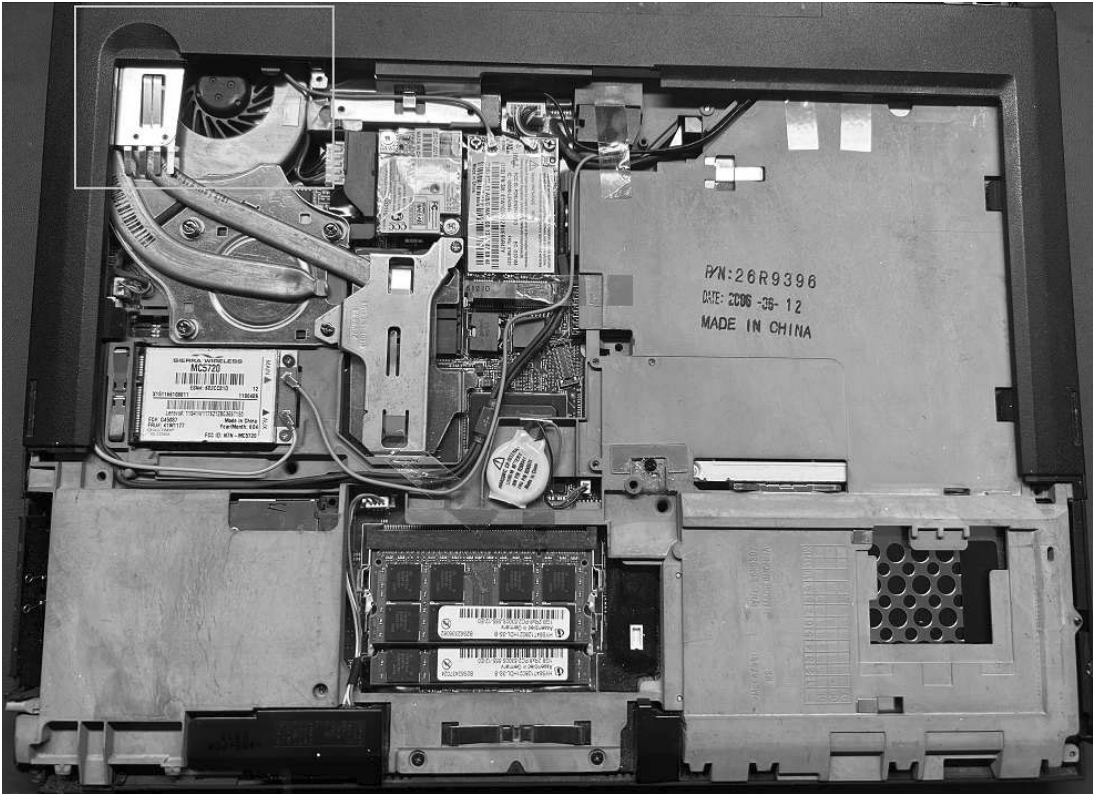
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal chassis of a Lenovo T60 laptop. Key components labeled include the 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, and the 'WAN Main Antenna' at the bottom right. A date stamp '2006-05-23' is visible near the bottom right. A white rectangular box highlights a component on the right edge, and a smaller white box highlights a component at the top center. The text 'MADE IN CHINA' is also visible in the center of the chassis.

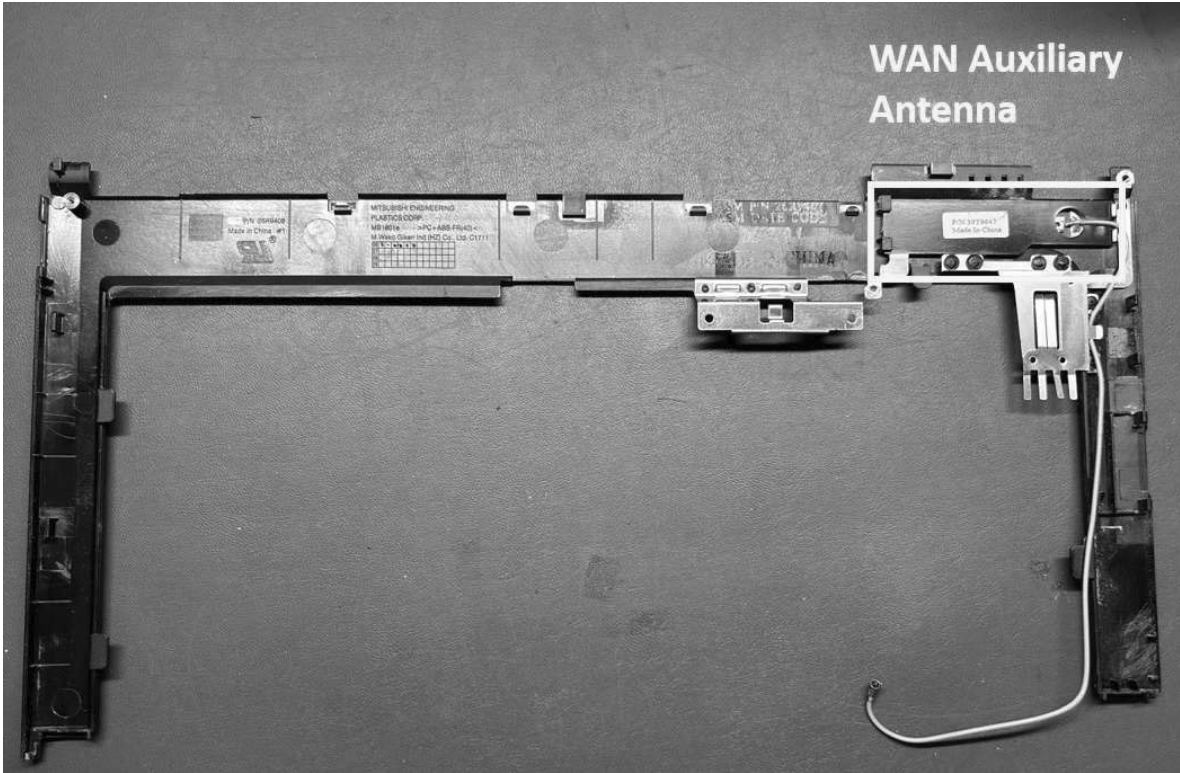
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 Network • 1Gb Ethernet installed on systems via the system board. • Intel 802.11abg Mini PCI Express wireless adapter on selected models. • ThinkPad 802.11abg(3945) Mini PCI Express wireless adapter on selected models. • Bluetooth/Modem combo card on selected models. • Integrated Sierra Wireless CDMA2000 Network Adapter for Verizon Wireless Broadband Access on selected models. See Lenovo Website, https://support.lenovo.com/us/en/solutions/pd008795-detailed-specifications-thinkpad-t60-t60p (last accessed June 18, 2025). The first antenna is configured to support at least four frequency bands contained within 824-894 MHz and 1710-2170 MHz.
6[e]	at least two of the at least four frequency bands are contained within a first frequency range and	T60 expressly or inherently discloses this claim element. See Claim 6[d].
6[f]	at least two of the four frequency bands are contained	T60 expressly or inherently discloses this claim element. See Claim 6[d].

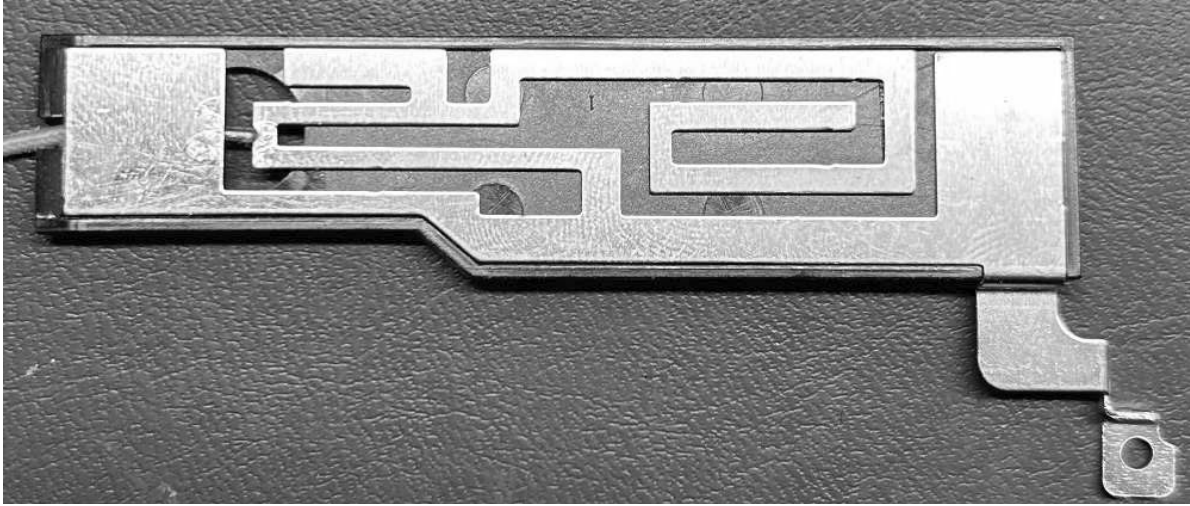
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	within a second frequency range,	
6[g]	the first frequency range being lower in frequency than the second frequency range,	T60 expressly or inherently discloses this claim element. <i>See Claim 6[d].</i>
6[h]	the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna, and wherein	T60 expressly or inherently discloses this claim element. <i>See Claim 1[h].</i>
6[i]	the first antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	T60 expressly or inherently discloses this claim element. <i>See Claim 1[i].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
6[j]	complexity factor F32 having a value of at least 1.35; and	T60 expressly or inherently discloses this claim element. <i>See</i> Claim 1[i].
6[k]	a second antenna configured to operate in at least one frequency band being used by a 4G communication standard,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Lenovo T60 includes a second antenna (pink below) configured to operate in at least one frequency band being used by a 4G communication standard.

Exhibit – E – 10

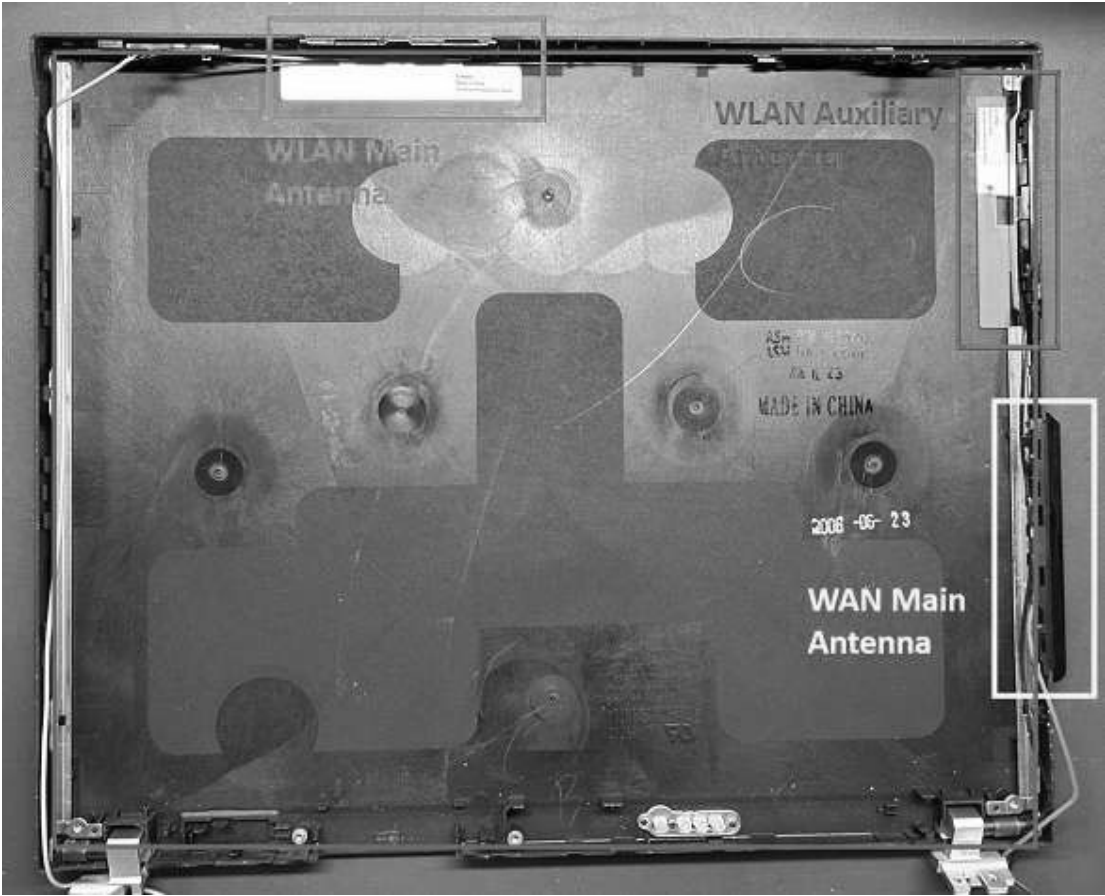
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 A black and white photograph showing the internal components of a Lenovo T60 laptop. The image is taken from the bottom of the chassis, looking up. Key components visible include a cooling fan at the top left, a battery pack in the center, and a motherboard at the bottom. A label on the right side of the chassis reads "P/N: 26R9396", "DATE: 2006-05-12", and "MADE IN CHINA". Another label on the battery pack reads "MCS720". The chassis is made of metal and has various screws and connectors visible.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 WAN Auxiliary Antenna

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The second antenna is configured to operate in at least one frequency band within 880-960 MHz and 1850-1990 MHz.
6[1]	the second antenna defining an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the second antenna and	T60 expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
6[m]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the second antenna,	T60 expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>
6[n]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the second antenna defining	T60 expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>
6[o]	an antenna rectangle,	T60 expressly or inherently discloses this claim element. <i>See Claim 2[a].</i>
6[p]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle,	T60 expressly or inherently discloses this claim element. <i>See Claim 2[d].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	and wherein the aspect ratio has a value of at least 2, and	
6[q]	wherein at least one of the first and second antennas is close to a first short side of a ground plane rectangle enclosing the ground plane.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> At least one of the first and second antennas is close to a first short side of a ground plane rectangle enclosing the ground plane.

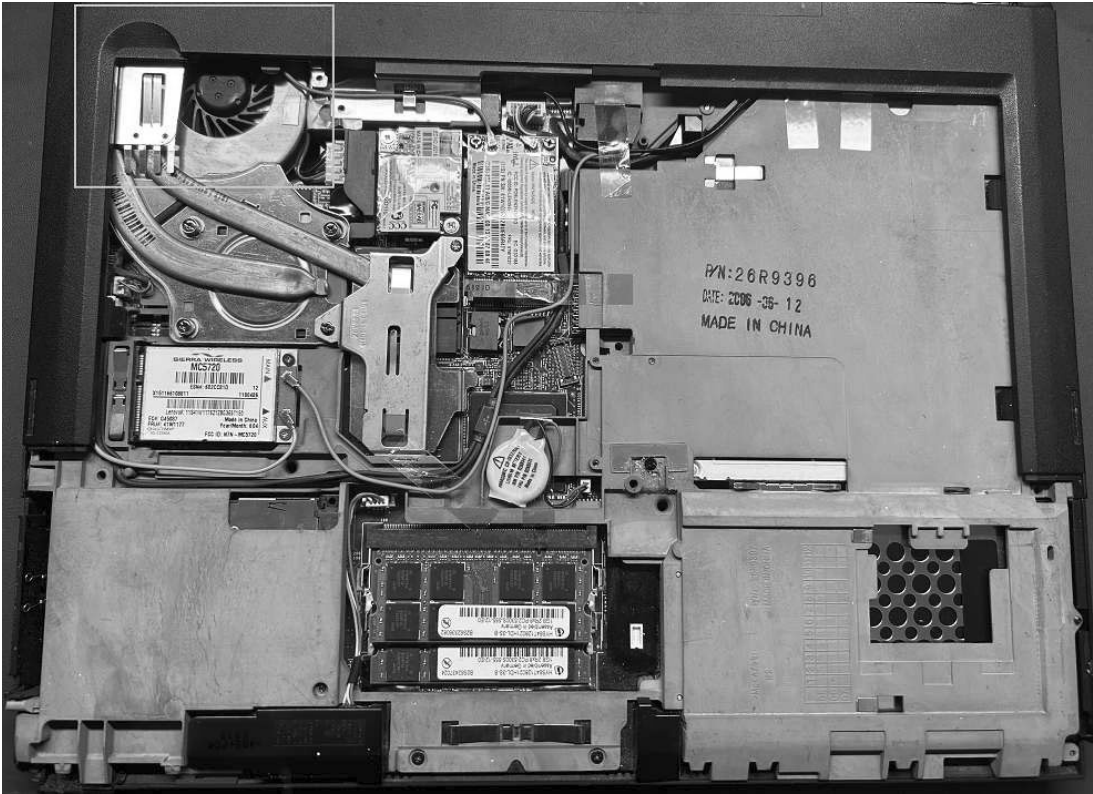
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal chassis of a Lenovo T60 laptop. Key components labeled include the 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, and the 'WAN Main Antenna' at the bottom right. A date stamp '2008-06-23' is visible near the bottom right. A small label with 'MADE IN CHINA' is also present. A white rectangular box highlights a component on the right side of the chassis, and another white rectangular box highlights a component at the top center. The chassis is dark-colored with various mounting points and screws visible.

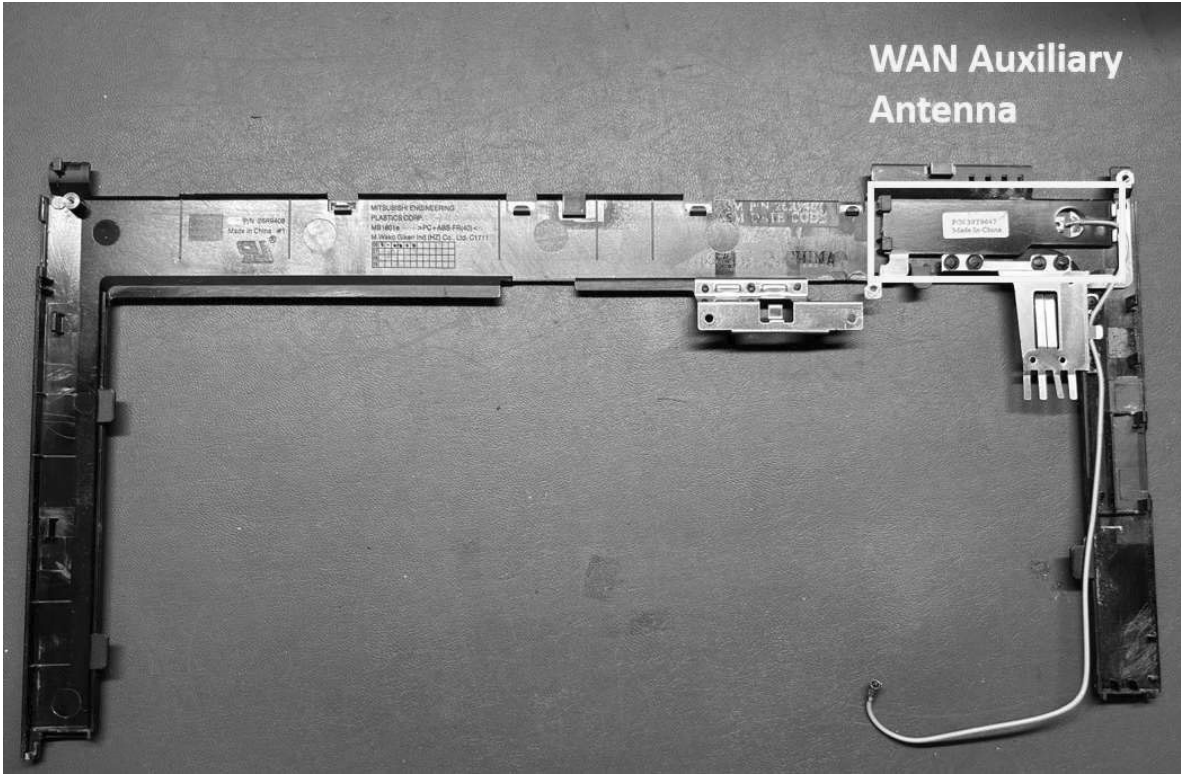
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 9		
9[a]	The wireless device of claim 6, wherein the second antenna defines a second antenna contour comprising an entire perimeter of the second antenna,	T60 expressly or inherently discloses this claim element. <i>See Claim 3.</i>
9[b]	wherein a length of the second antenna contour is greater than four times a diagonal of the antenna rectangle.	T60 expressly or inherently discloses this claim element. <i>See Claim 3.</i>
Claim 10		
10	The wireless device of claim 6, wherein the antenna system comprises a third antenna configured to provide operation in a wireless	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Lenovo T60 comprises a third antenna (blue below) configured to provide operation in a wireless communication standard.

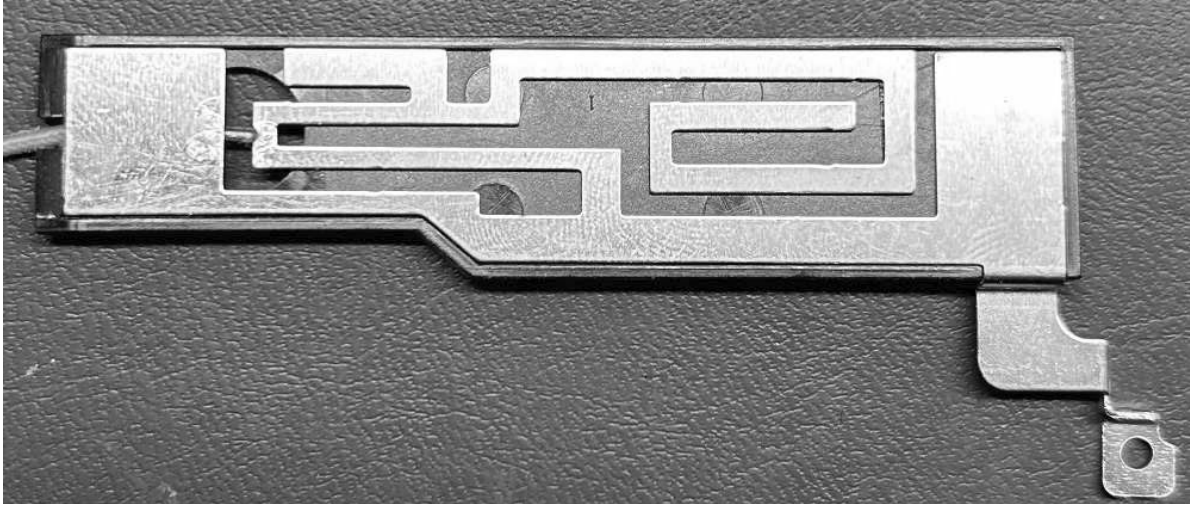
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	communication standard.	 The image shows the internal components of a Lenovo T60 laptop. A large black rectangular area in the center is labeled "WLAN Main Antenna". To its right, a smaller rectangular area is labeled "WLAN Auxiliary Antenna". Below the main antenna, a small circuit board is labeled "Bluetooth Daughter Card". On the right side of the image, a vertical component is labeled "WAN Main Antenna". The components are mounted on a metal chassis with various wires and connectors visible.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 11		
11[pre]	A wireless device comprising:	T60 expressly or inherently discloses this claim element. <i>See Claim 1[pre].</i>
11[a]	an antenna system comprising	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[b]	a ground plane and	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[c]	at least two antennas within the wireless device, the antenna system comprising:	T60 expressly or inherently discloses this claim element. <i>See Claim 1[a].</i>
11[d]	a first antenna configured to provide operation	T60 expressly or inherently discloses this claim element.

Exhibit – E – 10

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	in at least three frequency bands being used by 4G communication standards,	<i>See, e.g.,</i> The antenna system of the Lenovo T60 includes a first antenna (pink below) configured to provide operation in at least three frequency bands being used by 4G communication standards. 

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The first antenna is configured to provide operation in at least three frequency bands within 880-960 MHz and 1850-1990 MHz.
11[e]	the first antenna defining an antenna contour comprising an entire perimeter of the first antenna,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna defines an antenna contour comprising an entire perimeter of the first antenna.

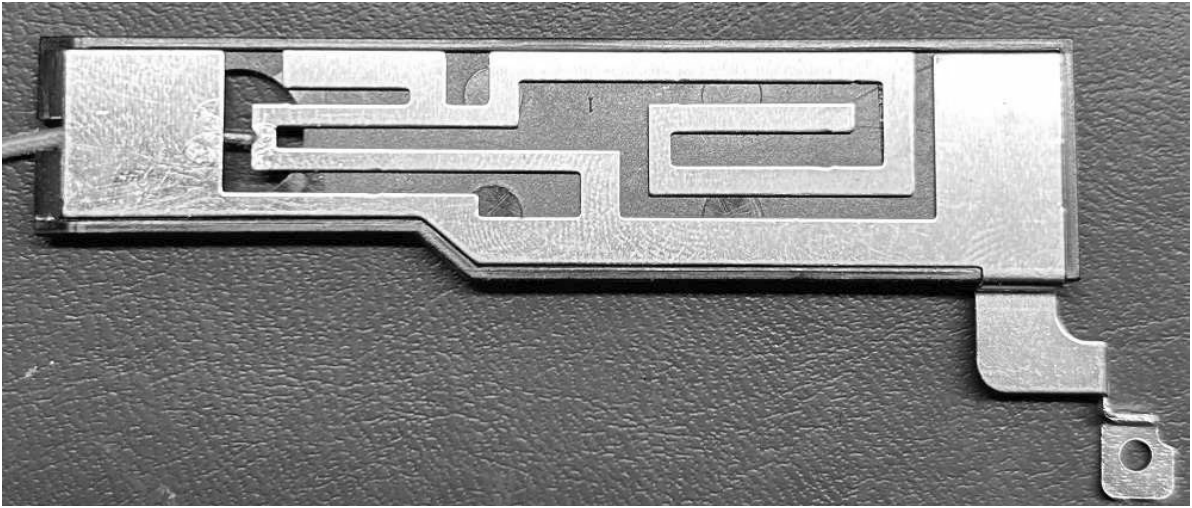
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		
11[f]	the antenna contour comprising at least twenty segments,	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna contour includes at least 27 segments.

Exhibit – E – 10

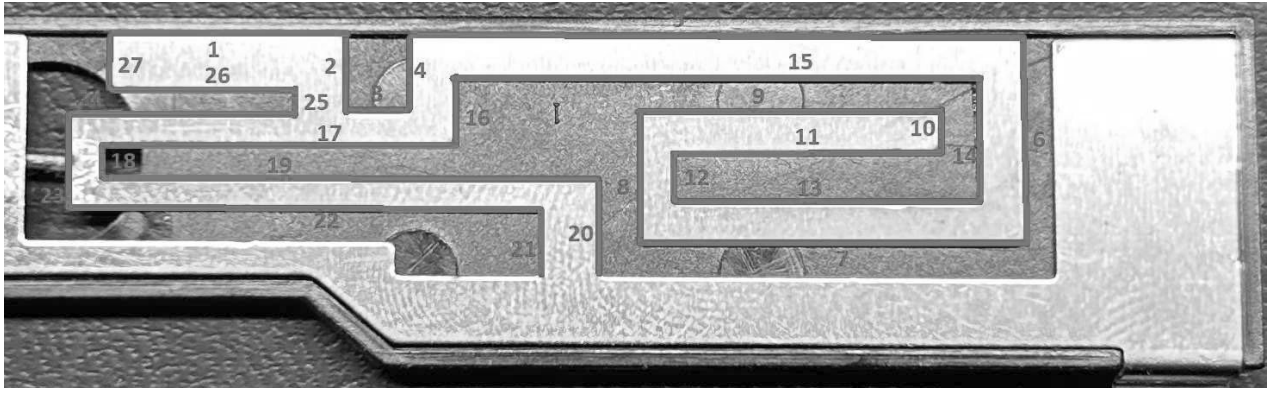
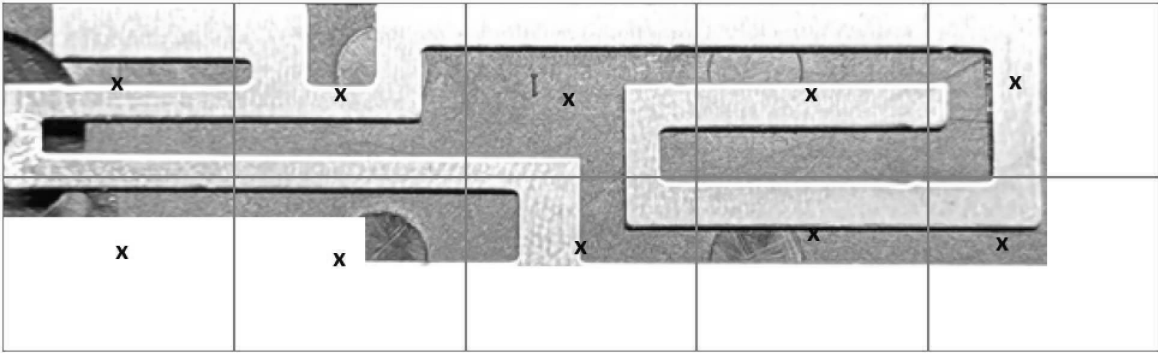
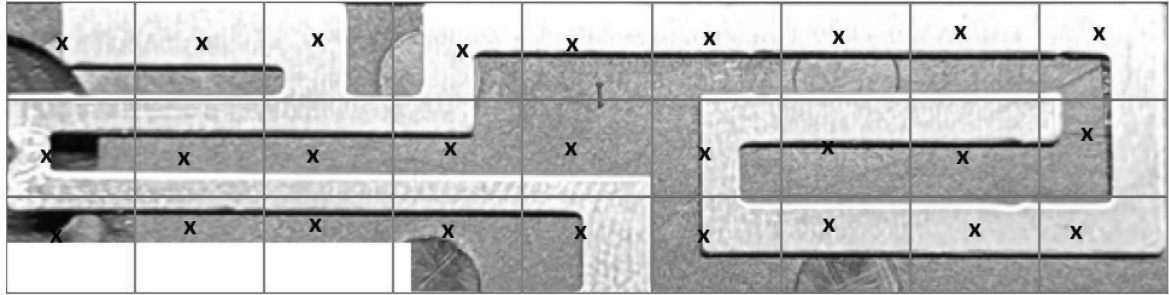
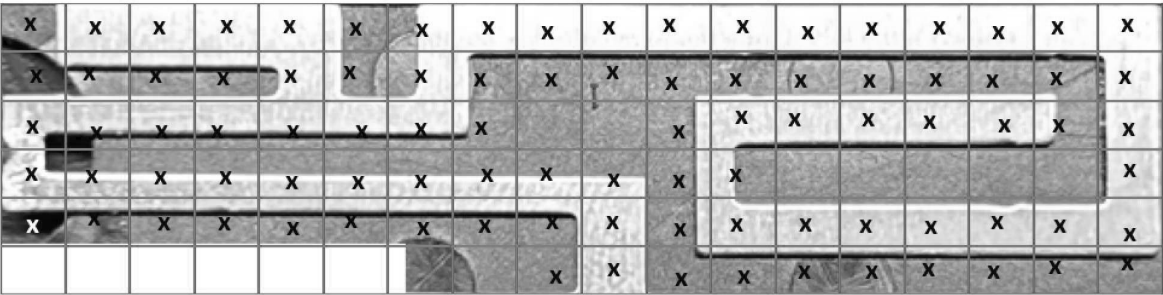
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		
11[g]	wherein the antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna contour has a level of complexity defined by complexity factor F21 having a value of at least 1.20 and complexity factor F32 having a value of at least 1.35. N1=10

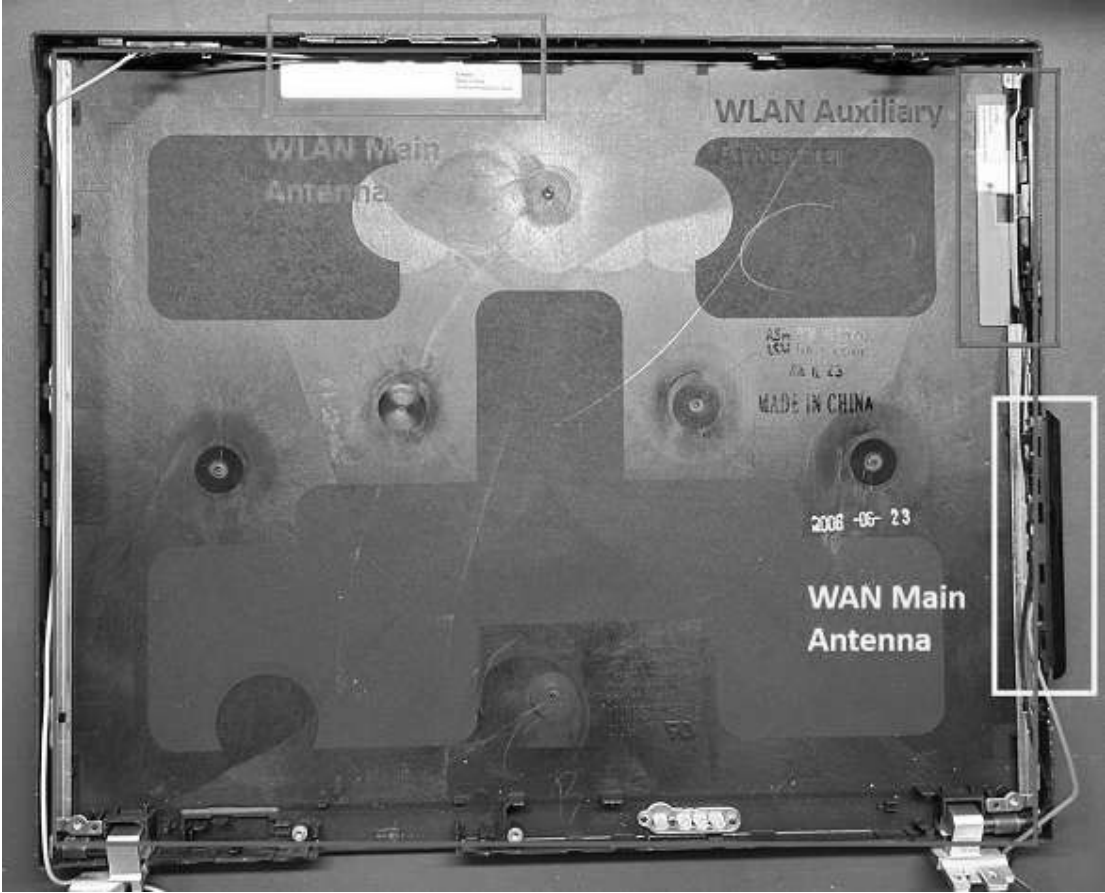
Exhibit – E – 10

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 N2=27  N3=93

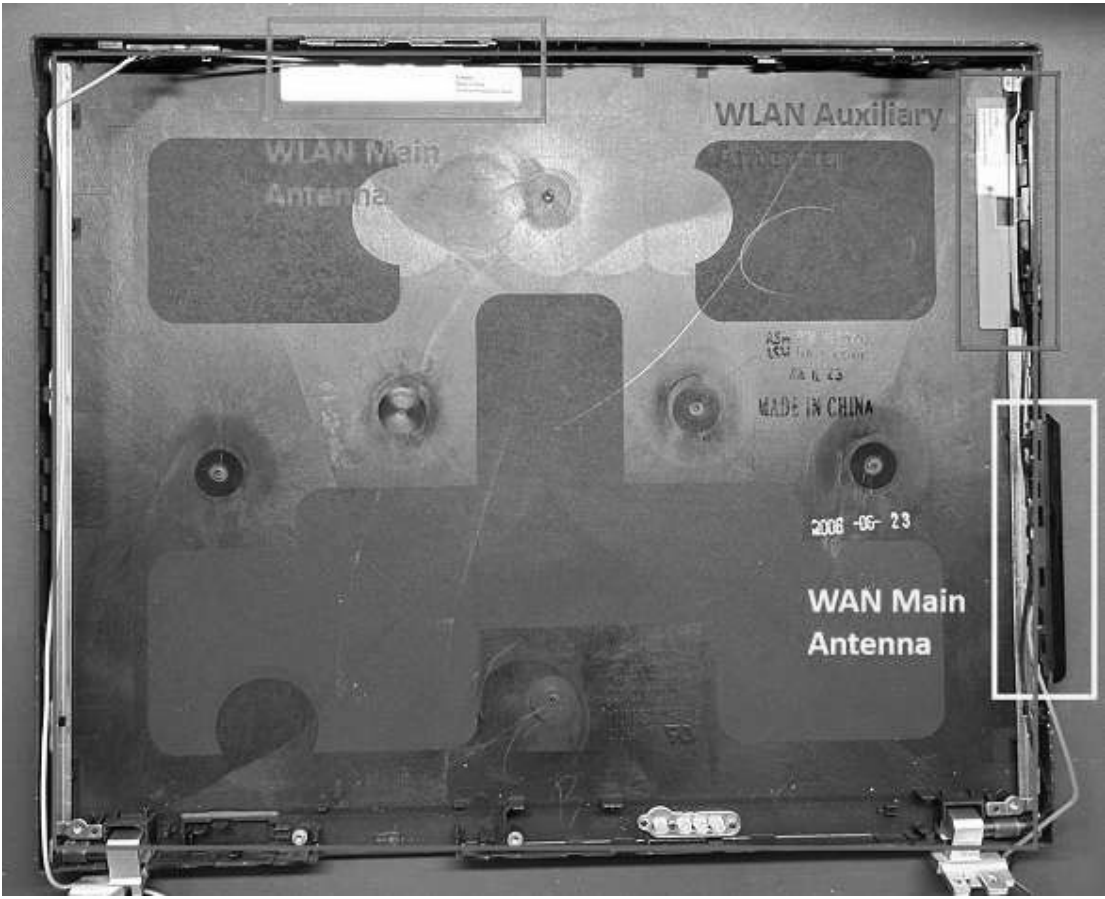
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 $F21 = \log(27/10)/\log(2) = 1.43$ $F32 = \log(93/27)/\log(2) = 1.78$
11[h]	complexity factor F32 having a value of at least 1.35, and	T60 expressly or inherently discloses this claim element. <i>See</i> Claim 11[g].
11[i]	wherein the first antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna of the Lenovo T60 defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna. An orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defines an antenna rectangle (purple below).

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		
11[j]	wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna,	T60 expressly or inherently discloses this claim element. <i>See Claim 11[i].</i>
11[k]	an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining	T60 expressly or inherently discloses this claim element. <i>See Claim 11[i].</i>

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
11[l]	an antenna rectangle,	T60 expressly or inherently discloses this claim element. <i>See</i> Claim 11[i].
11[m]	an aspect ratio of the antenna rectangle being defined as a ratio between a width and a height of the antenna rectangle, wherein the aspect ratio has a value of at least 2; and	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> An aspect ratio of the antenna rectangle is defined as a ratio between a width and a height of the antenna rectangle. The aspect ratio has a value of at least 2.  A width of the antenna rectangle is at least twice a height of the antenna rectangle.
11[n]	a second antenna configured to provide operation	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i>

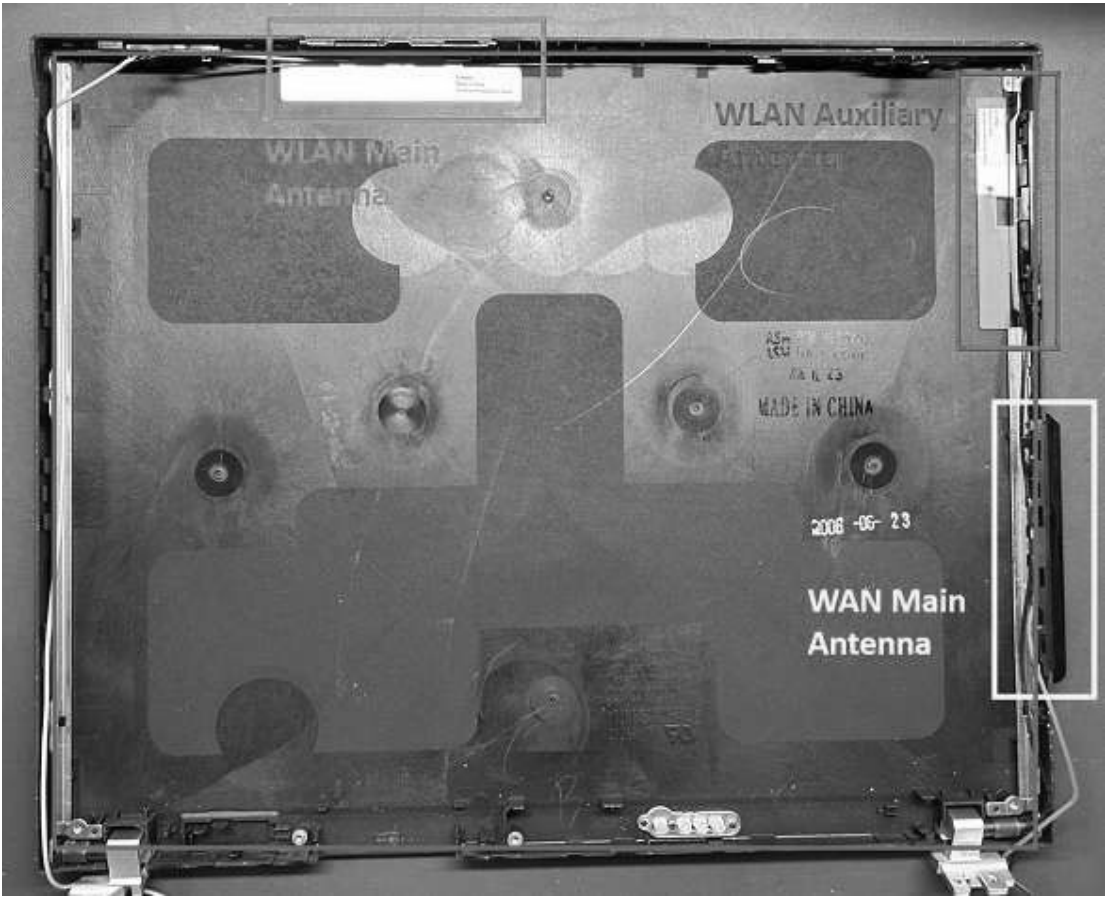
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	in a first wireless service,	The antenna system of the Lenovo T60 includes a second antenna (blue below) configured to provide operation in a first wireless service (e.g., a WiFi communication standard). 

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The second antenna is configured to provide operation in at least 2.4-2.484 GHz, 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.725-5.875 GHz.
11[o]	a second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The second antenna (blue below) is proximate to a side of a ground plane rectangle (purple below) enclosing the ground plane.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal chassis of a Lenovo T60 laptop. Key components labeled include the 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, and the 'WAN Main Antenna' at the bottom right. A date stamp '2006-05-23' is visible near the bottom right. A white rectangular box highlights a component on the right edge, and a smaller white box highlights a component at the top center. The text 'MADE IN CHINA' is printed on the central metal plate.

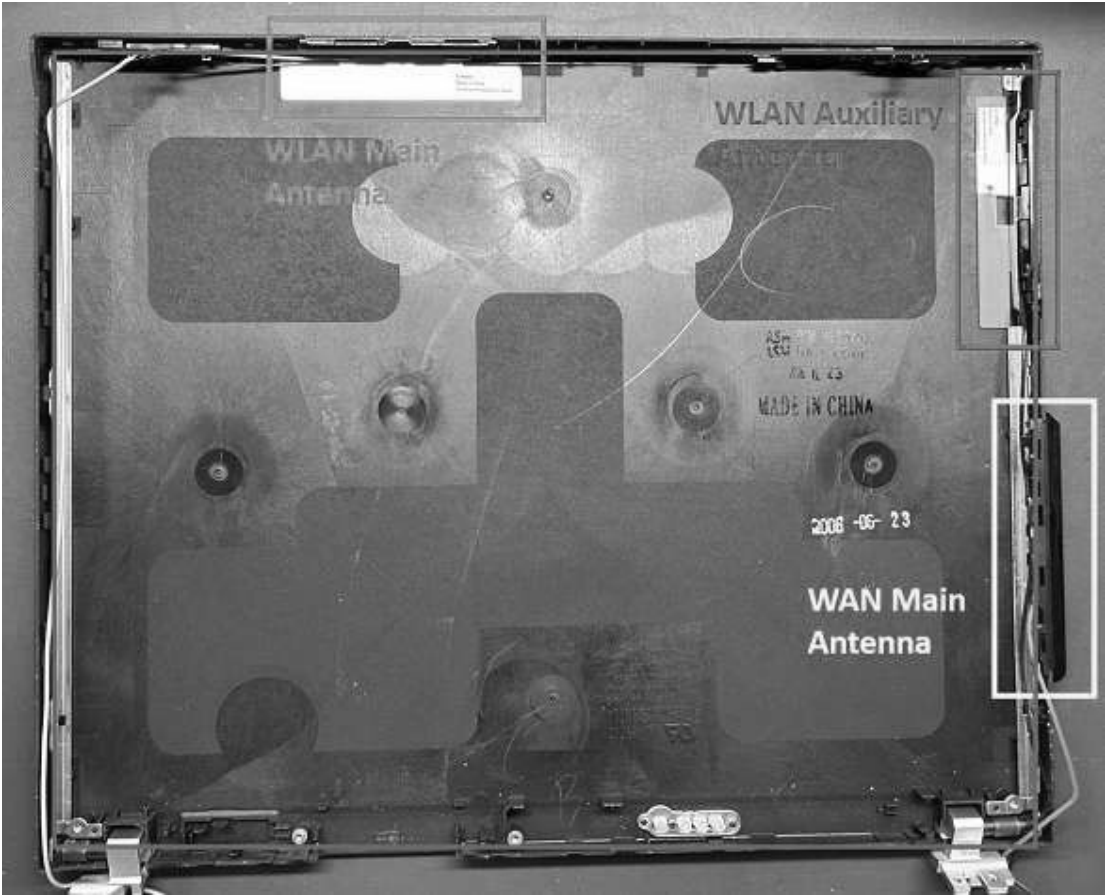
Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 12		
12	The wireless device of claim 11, wherein the first antenna is configured to support at least four frequency bands.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first antenna is configured to support at least four frequency bands. The first antenna is configured to support at least four frequency bands within 880-960 MHz and 1850-1990 MHz.
Claim 13		
13	The wireless device of claim 11, wherein the first wireless service is a WiFi communication standard.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The first wireless service is a WiFi communication standard. Network • 1Gb Ethernet installed on systems via the system board. • Intel 802.11abg Mini PCI Express wireless adapter on selected models. • ThinkPad 802.11abg(3945) Mini PCI Express wireless adapter on selected models. • Bluetooth/Modem combo card on selected models. • Integrated Sierra Wireless CDMA2000 Network Adapter for Verizon Wireless Broadband Access on selected models.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		See Lenovo Website, https://support.lenovo.com/us/en/solutions/pd008795-detailed-specifications-thinkpad-t60-t60p (last accessed June 18, 2025).
Claim 15		
15	The wireless device of claim 11, wherein the antenna system comprises a third antenna.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Lenovo T60 comprises a third antenna (red below).

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
		 The image shows the internal chassis of a Lenovo T60 laptop. Key components labeled include the 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, and the 'WAN Main Antenna' at the bottom right. A date stamp '2006-05-23' is visible near the bottom right. A white rectangular box highlights a component on the right edge, and a smaller white box highlights a component at the top center. The text 'MADE IN CHINA' is also visible in the center of the chassis.

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
Claim 17		
17	The wireless device of claim 15, wherein the third antenna is configured to provide operation in a second wireless service.	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The third antenna is configured to provide operation in a second wireless service (e.g., a WiFi communication standard). Network • 1Gb Ethernet installed on systems via the system board. • Intel 802.11abg Mini PCI Express wireless adapter on selected models. • ThinkPad 802.11abg(3945) Mini PCI Express wireless adapter on selected models. • Bluetooth/Modem combo card on selected models. • Integrated Sierra Wireless CDMA2000 Network Adapter for Verizon Wireless Broadband Access on selected models. <i>See</i> Lenovo Website, https://support.lenovo.com/us/en/solutions/pd008795-detailed-specifications-thinkpad-t60-t60p (last accessed June 18, 2025).
Claim 19		
19	The wireless device of claim 15, wherein the antenna system	T60 expressly or inherently discloses this claim element. <i>See, e.g.,</i> The antenna system of the Lenovo T60 comprises a fourth antenna (yellow below).

Exhibit – E – 10

Claim No.	U.S. Patent No. 11,349,200 B2	Lenovo T60
	comprises a fourth antenna.	 A black and white photograph of the internal chassis of a Lenovo T60 laptop. The image shows various components including antennas, a battery, and other electronic parts. Labels are visible: 'WLAN Main Antenna' at the top left, 'WLAN Auxiliary' at the top right, 'WAN Main Antenna' at the bottom right, and 'MADE IN CHINA' in the center. A date stamp '2006-05-23' is also present. A white rectangular box highlights a component on the right side of the chassis, which is the fourth antenna mentioned in the claim.