

Phillips Connect StealthNet

Infringement where the main antenna is considered the first antenna

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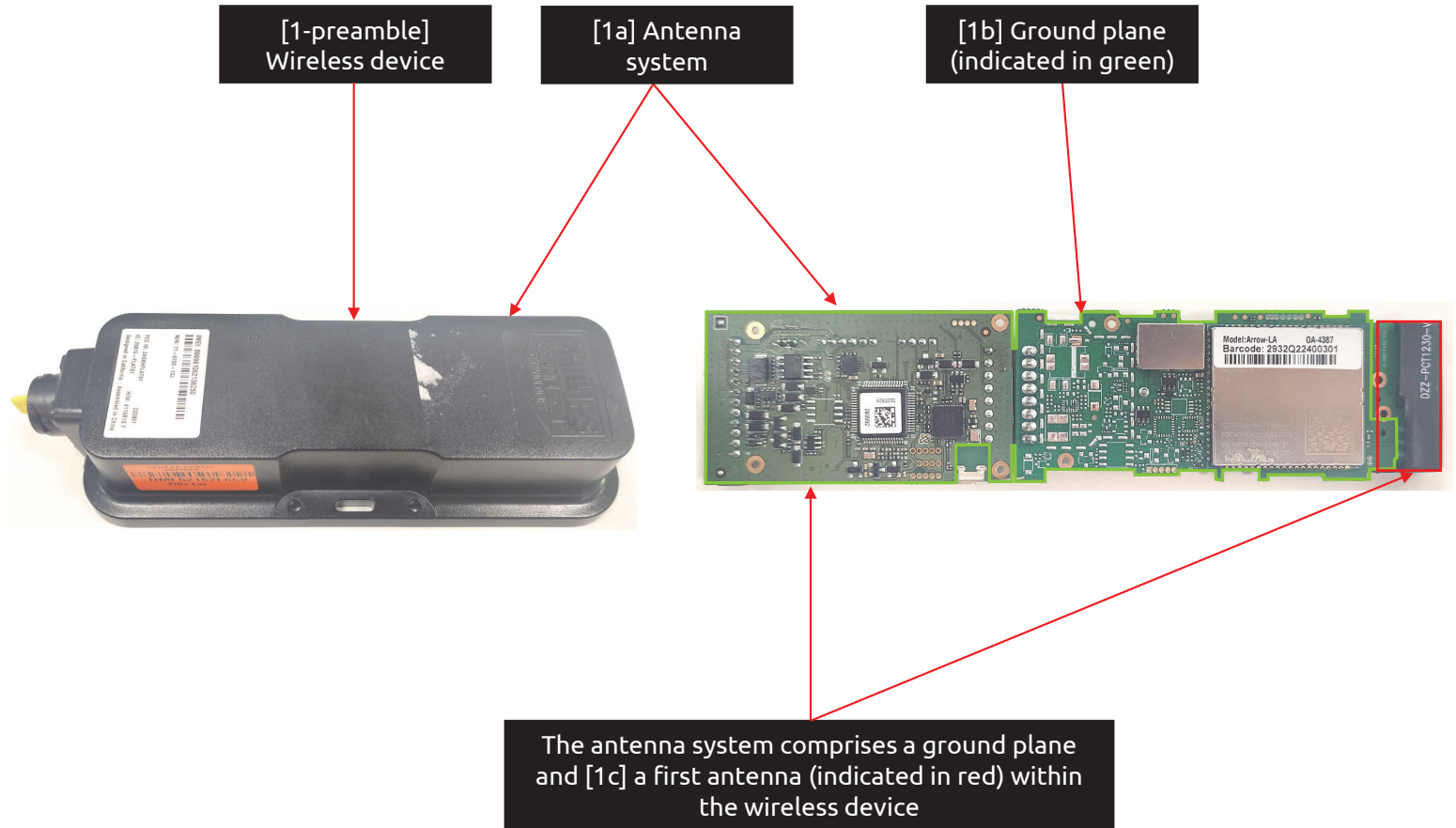
Geotab Exhibit 1048
Geotab v. Fractus

~~CONFIDENTIAL - PROTECTIVE ORDER MATERIAL~~

US 11,031,677 - Phillips Connect StealthNet

Claim 1

[1-preamble] A wireless device comprising:
[1a] an antenna system comprising:
[1b] a ground plane;
[1c] a first antenna within the wireless device and

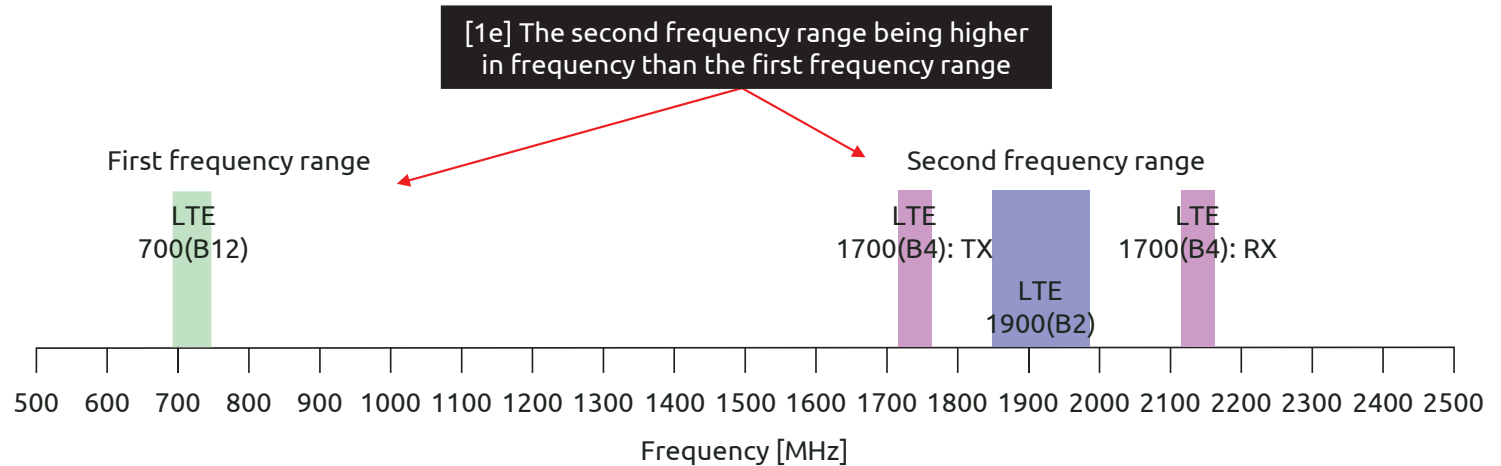


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Claim 1

[1d] configured to support at least three frequency bands contained within first and second frequency ranges of the electromagnetic spectrum, [1e] the second frequency range being higher in frequency than the first frequency range and [1f] at least one of the three frequency bands being associated with a 4G communication standard,



[1d] At least three frequency bands are contained within first (filled in red) and second frequency ranges (filled in blue) of the electromagnetic spectrum

[1f] At least one of the three frequency bands being associated with a 4G communication standard

LTE Cat 1	EC21-A
Region/Operator	North America
Dimensions (mm)	29.0 × 32.0 × 2.4
Temperature Range	
Operation Temperature	-35 °C to +75 °C
Extended Temperature	-40 °C to +85 °C
Frequency Bands	
LTE-FDD	B2/4, 12
LTE-TDD	-
WCDMA	B2/4/5
GSM/EDGE	-
GNSS (Optional)	GPS/GLONASS/BDS/Galileo/QZSS

Source: Cellular module datasheet

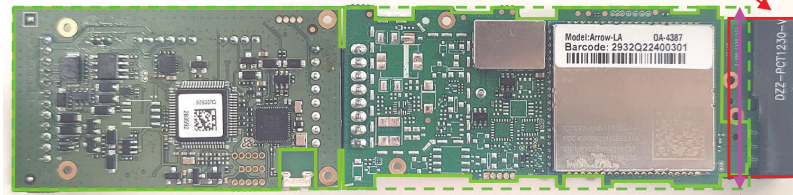
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Claim 1

[1g] the first antenna being proximate to a first short side of a ground plane rectangle enclosing the ground plane and

[1g] The first antenna (indicated in red) is proximate to a first short side of a ground plane rectangle (indicated with a dashed green line) enclosing the ground plane



First short side
(indicated in pink)

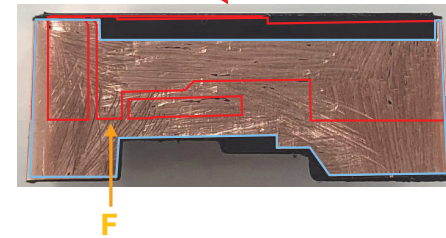
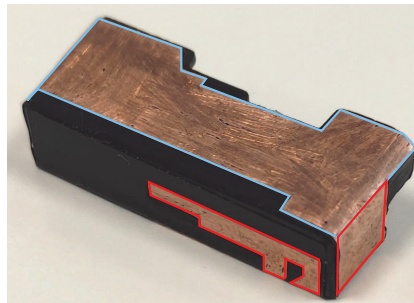
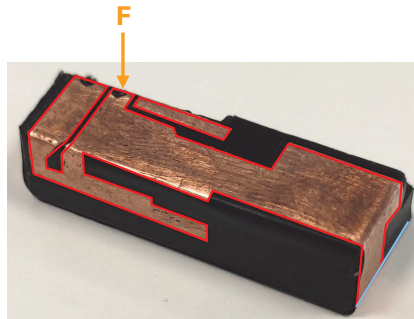
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Claim 1

[1h] defining a first antenna contour comprising an entire perimeter of the first antenna,

[1h] The first antenna defines a first antenna contour (indicated in blue and red) comprising an entire perimeter of the first antenna



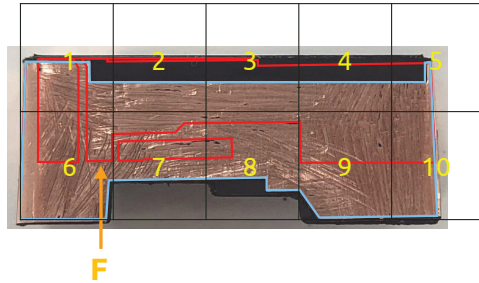
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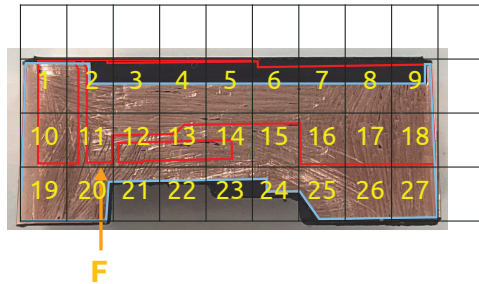
Claim 1

[1i] wherein the first antenna contour has a level of complexity defined by complexity factor F_{21} having a value of at least 1.20 and

[1i] The first antenna contour has a level of complexity defined by complexity factor F_{21} having a value of at least 1.20



$N_1 = 10 \text{ cells}$



$N_2 = 27 \text{ cells}$

$$F_{21} = -\frac{\log(N_2) - \log(N_1)}{\log\left(\frac{1}{2}\right)} = \frac{\log(27/10)}{\log(2)} = 1.43 \geq 1.20$$

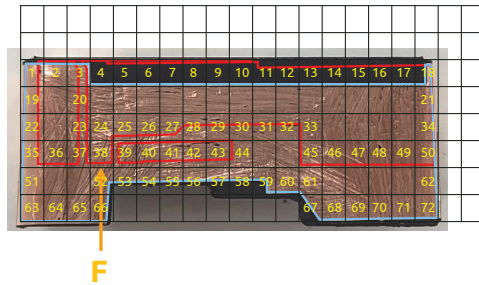
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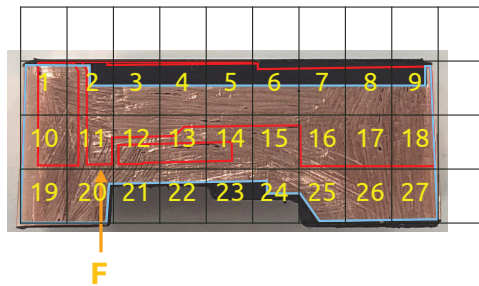
Claim 1

[1j] complexity factor F_{32} having a value less than 1.75; and

[1j] The first antenna contour has a level of complexity defined by complexity factor F_{32} having a value less than 1.75



$N_3 = 72$ cells



$N_2 = 27$ cells

$$F_{32} = -\frac{\log(N_3) - \log(N_2)}{\log\left(\frac{1}{2}\right)} = \frac{\log(72/27)}{\log(2)} = 1.42 < 1.75$$

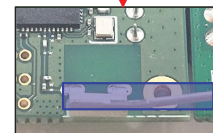
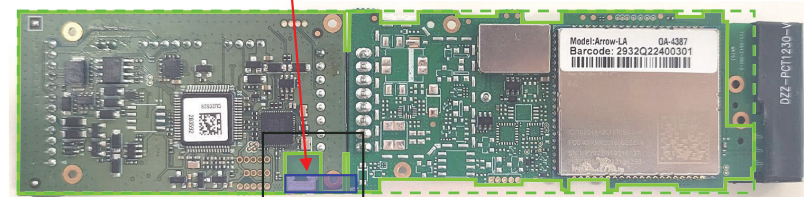
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Claim 1

[1k] a second antenna within the wireless device and

[1k] Second antenna (indicated in blue) within the wireless device



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Claim 1

[1l] configured to support at least one frequency band different from the at least three frequency bands supported by the first antenna, [1m] the second antenna being arranged completely within the ground plane rectangle.

[1l] The second antenna is configured to support at least one frequency band (2.4 GHz) different from the at least three frequency bands supported by the first antenna

[1m] The second antenna is arranged completely within the ground plane rectangle

CELLULAR TECHNOLOGY

LTE Cat 1
Integrated high sensitivity antenna
Auto register to packet network

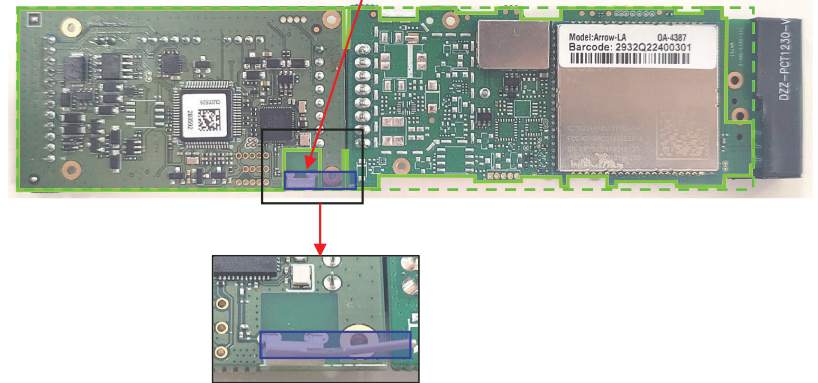
GPS FUNCTIONALITY

Channels: 56
Tracking Sensitivity: -162 dBm
Acquisition Sensitivity: -148 dBm
Location Accuracy: 2.5 CEP

BLUETOOTH

Low Energy (BLE)
Version 4.2

Source: Brochure

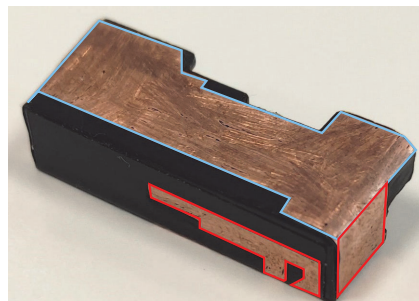
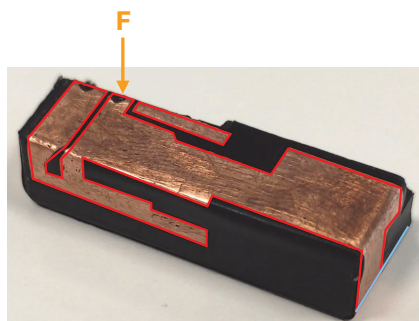


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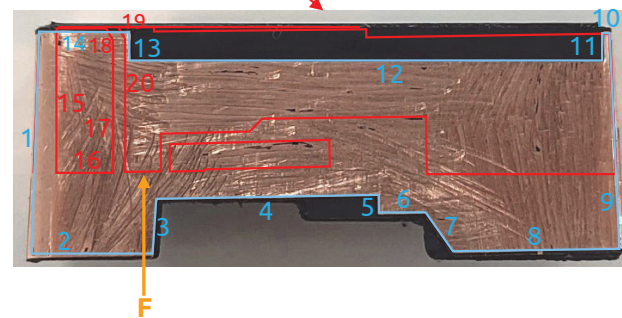
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Claim 2

[2a] The wireless device of claim 1, wherein the first antenna contour comprises at least 20 segments.



[2a] The first antenna contour (indicated in blue and red) comprises at least 20 segments



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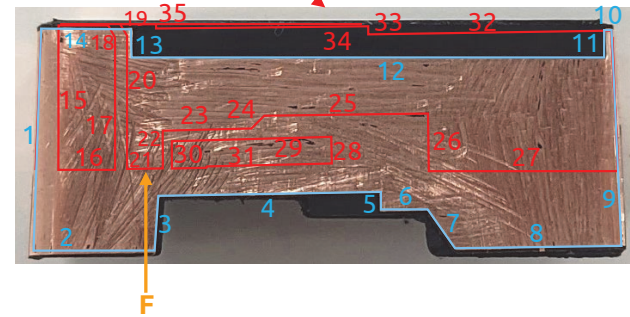
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Claim 3

[3a] The wireless device of claim 2, wherein the perimeter of the first antenna contour comprises at least 35 segments.



[3a] The perimeter of the first antenna contour (indicated in blue and red) comprises at least 35 segments



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