

Lat-Lon Mini Solar Tracking Unit

Infringement where the main antenna is
considered the first antenna

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Geotab Exhibit 1053
Geotab v. Fractus

~~CONFIDENTIAL - PROTECTIVE ORDER MATERIAL~~

US 11,349,200 - Lat-Lon Mini Solar Tracking Unit

Claim 11

[11-preamble] A wireless device comprising:

[11-preamble] Wireless device

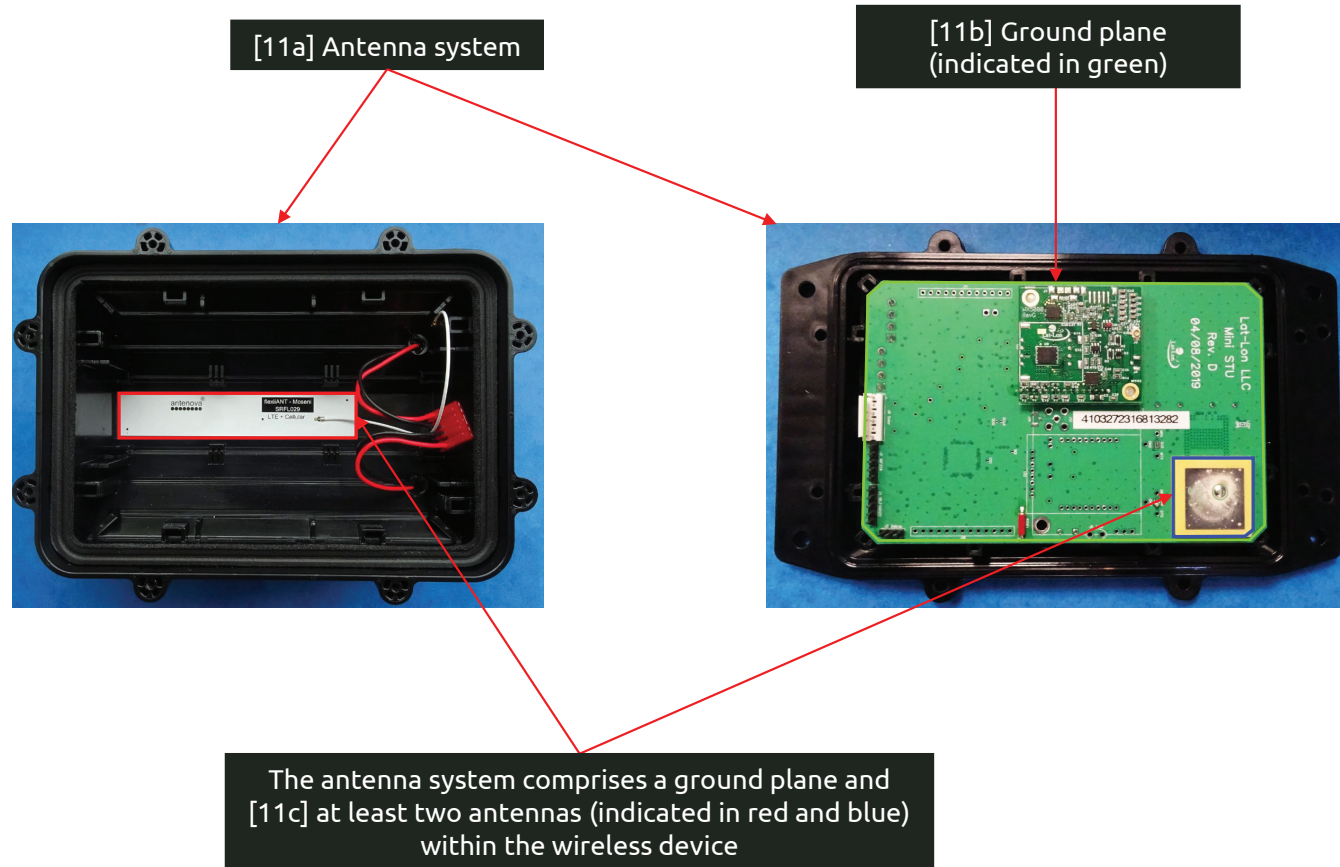


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Claim 11

[11a] an antenna system comprising
[11b] a ground plane
and
[11c] at least two antennas within the wireless device, the antenna system comprising:



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Claim 11

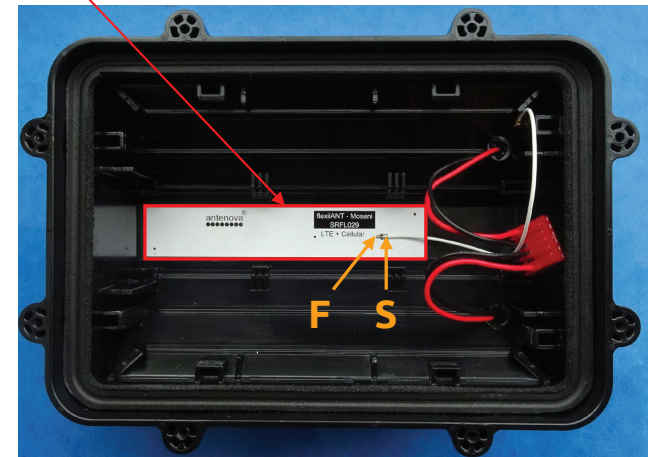
[11d] a first antenna configured to provide operation in at least three frequency bands being used by 4G communication standards,

[11d] The antenna system comprises a first antenna (indicated in red) configured to provide operation in at least LTE 700(B12)/1700-2100(B4)/1900(B2)



| Product | 4G bands | 3G bands | 2G bands |
|-----------|--------------------------|----------|----------|
| LE910-SV1 | FDD B2, B4, B13 | - | - |
| LE910-NA1 | FDD B2, B4, B5, B12, B13 | B2, B5 | - |

Source: Cellular Module User Guide



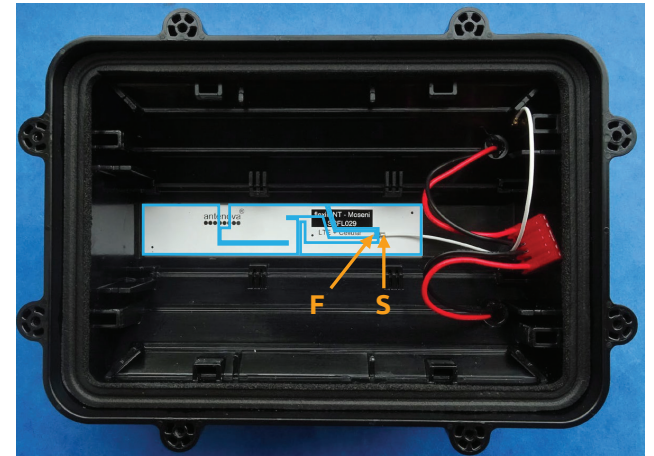
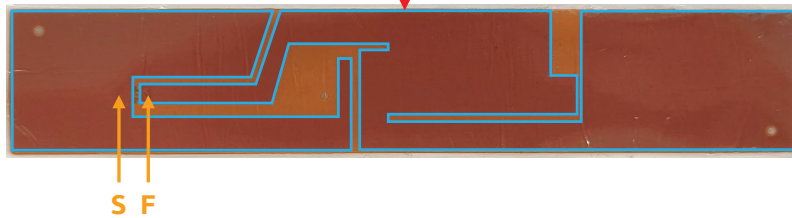
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Claim 11

[11e] the first antenna defining an antenna contour comprising an entire perimeter of the first antenna,

[11e] The first antenna defines an antenna contour (indicated in blue) comprising an entire perimeter of the first antenna



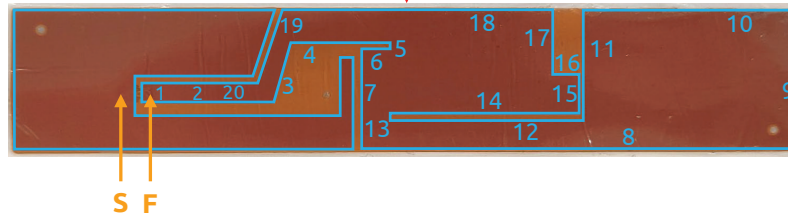
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Claim 11

[11f] the antenna contour comprising at least twenty segments,

[11f] The antenna contour comprises at least 20 segments



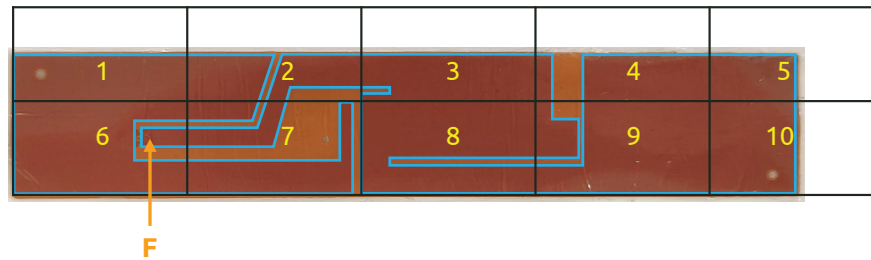
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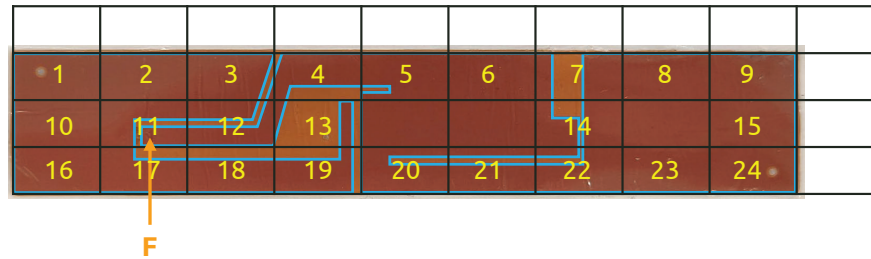
Claim 11

[11g] wherein the antenna contour has a level of complexity defined by complexity factor F_{21} having a value of at least 1.20 and

[11g] The antenna contour has a level of complexity defined by complexity factor F_{21} having a value of at least 1.20



$N_1 = 10$ cells



$N_2 = 24$ cells

$$F_{21} = -\frac{\log(N_2) - \log(N_1)}{\log(1/2)} = -\frac{\log(24) - \log(10)}{\log(1/2)} = 1.26 \geq 1.20$$

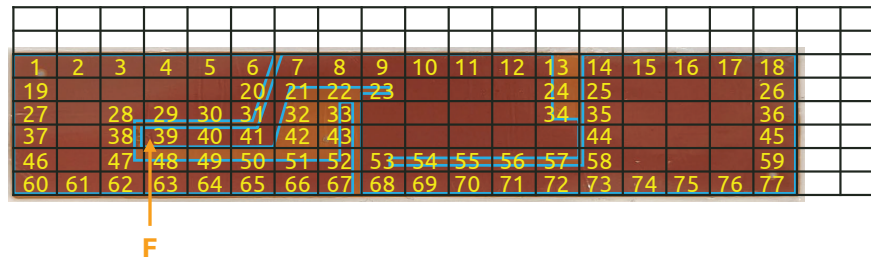
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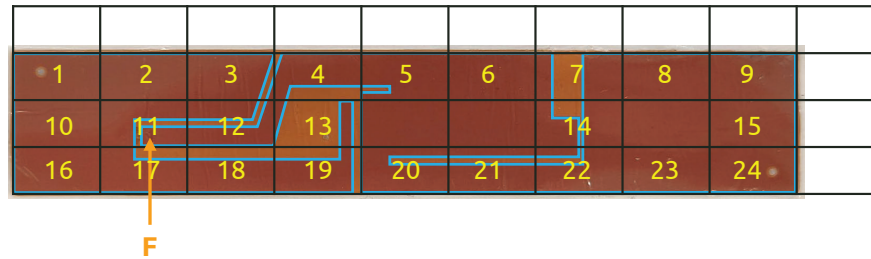
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[11h] complexity factor F_{32} having a value of at least 1.35, and

[11h] The antenna contour has a level of complexity defined by complexity factor F_{32} having a value of at least 1.35



$N_3 = 77$ cells



$N_2 = 24$ cells

$$F_{32} = -\frac{\log(N_3) - \log(N_2)}{\log(1/2)} = -\frac{\log(77) - \log(24)}{\log(1/2)} = 1.68 \geq 1.35$$

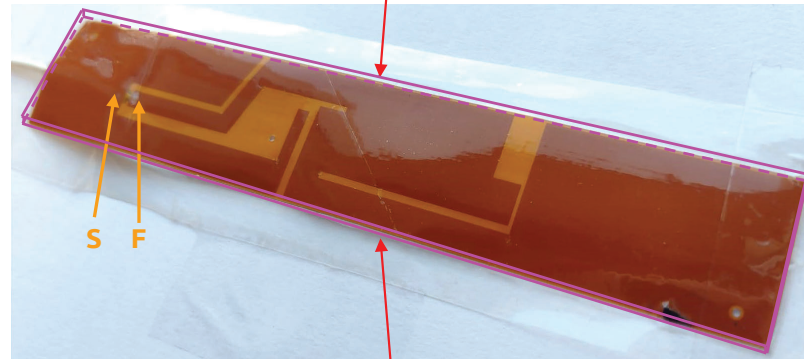
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Claim 11

[11i] wherein the first antenna defines an antenna box that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna and
[11j] wherein each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna,

[11i] The first antenna defines an antenna box (outlined in pink) that is a minimum-sized parallelepiped that completely encloses a volume of the first antenna



[11j] Each face of the minimum-sized parallelepiped is tangent to at least one point of the volume of the first antenna

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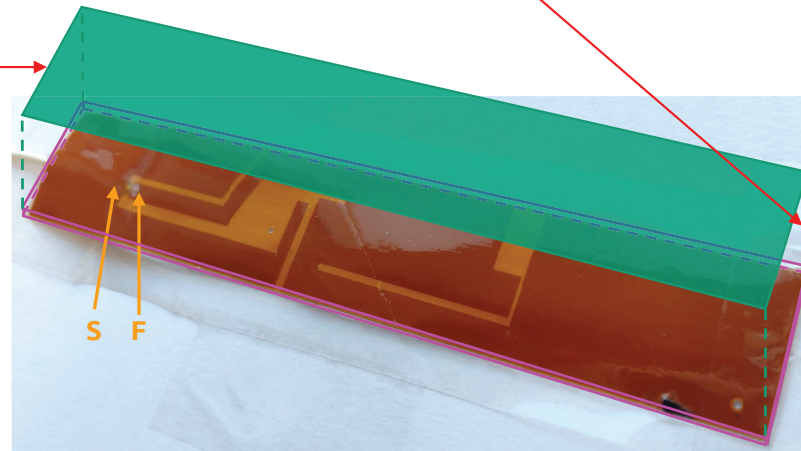
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Claim 11

[11k] an orthogonal projection of the antenna box along a normal to a face with a largest area of the first antenna defining [11l] an antenna rectangle,

[11l] Antenna rectangle (filled in green)

[11k] Orthogonal projection of the antenna box along a normal to a face* with a largest area of the first antenna



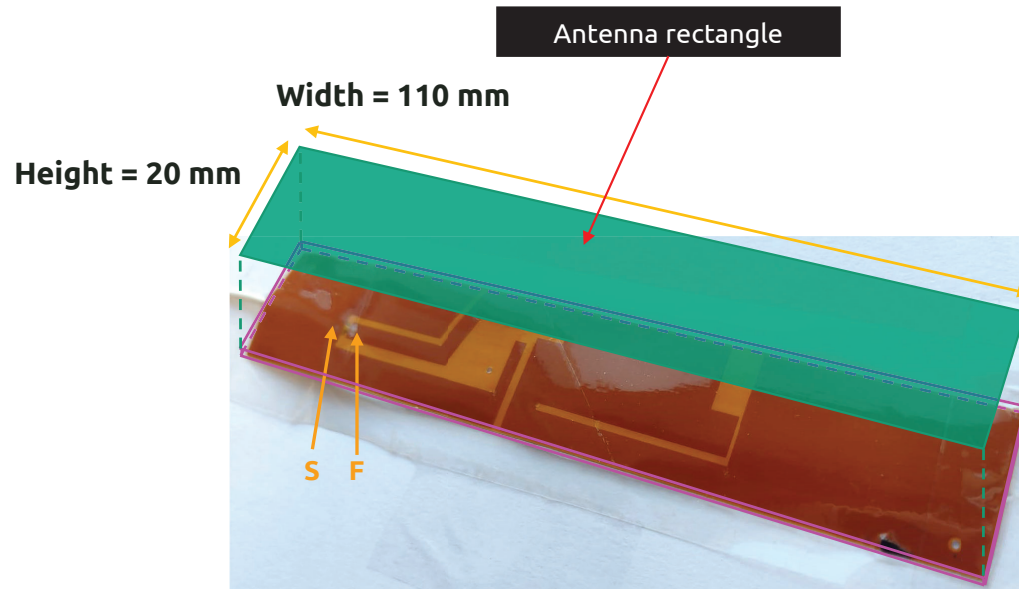
*Normal to a face means perpendicular to the face

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Claim 11

[11m] 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



[11m] Aspect ratio of the antenna rectangle = $110/20 = 5.5 \geq 2$

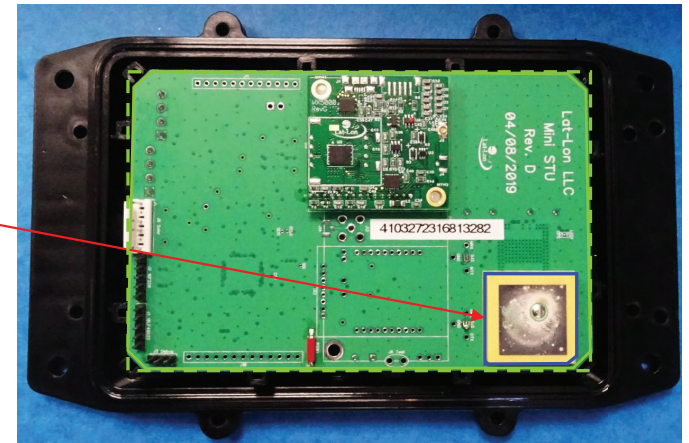
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Claim 11

[11n] a second antenna configured to provide operation in a first wireless service, [11o] the second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane.

[11n] The antenna system comprises a second antenna (indicated in blue) configured to provide operation in at least a first wireless service: GPS, and [11o] is proximate to a side of a ground plane rectangle (indicated with a dashed green line) enclosing the ground plane



Customizable Sensors

- More than GPS: Customize sensors to your unique business needs

Source: Brochure

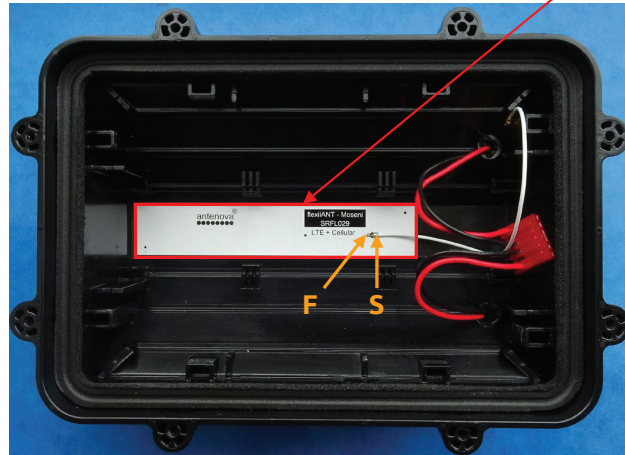
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Claim 12

[12a] The wireless device of claim 11, wherein the first antenna is configured to support at least four frequency bands.

[12a] The first antenna (indicated in red) is configured to support at least LTE 700(B12)/850(B5)/1700-2100(B4)/1900(B2)



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