

U.S. Patent No. 11,349,200 Claim Limitation Comparison Chart

I. Claim 6

| REF | Limitation | REF | Limitation |
|-------|--|-------|---|
| 6.PRE | A wireless device comprising: | 1.PRE | A wireless device comprising: |
| 6.a | an antenna system comprising a ground plane and at least two antennas within the wireless device, the antenna system comprising: | 1.a | an antenna system comprising a ground plane and at least two antennas within the wireless device, the antenna system comprising: |
| 6.b | a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards, | 1.b | a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane, |
| | | 1.d | the first antenna being configured to transmit and receive signals from a 4G communication standard |
| 6.c | 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, | 1.c | the first antenna being 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, |
| 6.d | the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna, and | 1.e | the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna, |

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| REF | Limitation | REF | Limitation |
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| 6.e | 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; and | 1.f | 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; and, |
| 6.f | a second antenna configured to operate in at least one frequency band being used by a 4G communication standard, | 1.g | a second antenna proximate to a first long side of the ground plane rectangle, |
| | | 1.h | and wherein the second antenna is configured to receive signals from a 4G communication standard. |
| 6.g | the second antenna defining 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, | 2 | 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. |

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| REF | Limitation | REF | Limitation |
|------------|--|------------|---|
| 6.h | and 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. | 1.b | a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane, |

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III. Claim 12

| Ref | Limitation | Ref | Corresponding limitation |
|------------|--|------------|--|
| 11.PRE | A wireless device comprising: | 1.PRE | A wireless device comprising: |
| 11.a | an antenna system comprising a ground plane and at least two antennas within the wireless device, the antenna system comprising: | 1.a | an antenna system comprising a ground plane and at least two antennas within the wireless device, the antenna system comprising: |

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| Ref | Limitation | Ref | Corresponding limitation |
|------|---|-----|---|
| 11.b | a first antenna configured to provide operation in at least three frequency bands being used by 4G communication standards, | 1.b | a first antenna proximate to a first short side of a ground plane rectangle enclosing the ground plane, |
| | | 1.c | the first antenna being 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, |
| | | 1.d | the first antenna being configured to transmit and receive signals from a 4G communication standard, |
| | | 6.b | a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards, |
| 11.c | the first antenna defining an antenna contour comprising an entire perimeter of the first antenna, | 1.e | the first antenna defining a first antenna contour comprising an entire perimeter of the first antenna, |
| 11.d | the antenna contour comprising at least twenty segments, | | |

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| Ref | Limitation | Ref | Corresponding limitation |
|------|---|-----|---|
| 11.e | wherein 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, | 1.f | 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; and |
| 11.f | and wherein the first antenna 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; and | 2 | 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, 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. |
| 11.g | a second antenna configured to provide operation in a first wireless service, | | |

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|------|--|-----|--|
| 11.h | the second antenna being proximate to a side of a ground plane rectangle enclosing the ground plane. | 1.g | a second antenna proximate to a first long side of the ground plane rectangle, |
| | | 6.h | and 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. |

IV. CLAIMS 3, 9

| Claim | Limitation | Claim | Corresponding limitation |
|-------|--|-------|--|
| 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 diagonal of the antenna rectangle. | 9 | The wireless device of claim 6, 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 diagonal of the antenna rectangle. |

V. CLAIMS 4, 12

| Claim | Limitation | Claim | Corresponding limitation | Ref | Corresponding limitation |
|-------|---|-------|--|-----|--|
| 4 | The wireless device of claim 1, wherein the first antenna is configured to support at least four frequency bands. | 12 | The wireless device of claim 11, wherein the first antenna is configured to support at least four frequency bands. | 6.b | a first antenna configured to provide operation in at least four frequency bands being used by 4G communication standards. |

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VI. CLAIM 7

| Claim | Limitation | Ref | Corresponding limitation |
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| 7 | The wireless device of claim 6, wherein the first antenna contour comprises at least 20 segments. | 11.d | the [first] antenna contour comprising at least twenty segments, |

VII. Claim 8

| Ref | Limitation | Ref | Corresponding limitation |
|-----|--|-----|--|
| 8 | The wireless device of claim 6, wherein at least one of the first and second antennas is close to a first long side of the ground plane rectangle. | 1.g | a second antenna proximate to a first long side of the ground plane rectangle, |