

U.S. Patent No. 8,456,365 Claim Limitation Comparison Chart

I. LIMITATIONS [15PRE]-[15I], [15L]-[15M]

Ref	Limitation	Ref	Corresponding limitation
[15PRE]	A mobile communication device, comprising:	[1PRE]	A mobile communication device, comprising:
[15A]	a device housing;	[1A]	a device housing;
[15B]	a printed circuit board,	[1B]	a printed circuit board,
[15C]	the printed circuit board comprising: a ground plane layer;	[1C]	the printed circuit board comprising: a ground plane layer;
[15D]	a feeding point;	[1D]	a feeding point;
[15E]	a communication circuitry, the communication circuitry being mounted on the printed circuit board;	[1E]	a communication circuitry, the communication circuitry being mounted on the printed circuit board;
[15F]	wherein the communication circuitry is coupled to the feeding point and to the ground plane layer;	[1F]	wherein the communication circuitry is coupled to the feeding point and to the ground plane layer;
[15G]	a multi-band antenna capable of operating at multiple frequency bands, the multi-band antenna including an antenna element;	[1G]	a multi-band antenna capable of operating at multiple frequency bands, the multi-band antenna including an antenna element;
[15H]	wherein the antenna element is coupled to the feeding point and operates in cooperation with the ground plane layer;	[1H]	wherein the antenna element operates in cooperation with the ground plane layer;

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[15I]	the antenna element comprising: a first conductor, the first conductor comprising a first radiating arm having a grid-dimension section shaped according to a grid-dimension curve;	[1I]	the antenna element comprising: a common conductor; a first radiating arm connected to the common conductor; a second radiating arm connected to the common conductor;
		[1L]	wherein the first radiating arm is at least partially shaped according to a grid-dimension curve; and
[15J]	a second conductor arranged at a predetermined distance from the first conductor and electromagnetically coupled to the first conductor,		
[15K]	the second conductor comprising a planar section; and		
[15L]	wherein the printed circuit board, the communication circuitry, and the multi-band antenna are arranged inside the device housing.	[1M]	wherein the printed circuit board, the communication circuitry, and the multi-band antenna are arranged inside the device housing.

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II. Claims 19-21, 23, 25, 27

Ref	Limitation	Ref	Corresponding limitation
19	The mobile communication device according to claim 15, wherein the grid-dimension curve features a grid dimension larger than 1.3.	7	The mobile communication device according to claim 1, wherein the grid-dimension curve has a grid dimension larger than 1.3.
[20A]	The mobile communication device according to claim 15, wherein the grid-dimension curve comprises at least ten connected segments;	4	The mobile communication device according to claim 2, wherein the first plurality of segments comprises at least ten segments.
[20B]	wherein said segments are each smaller than 1/10 of a lowest operating free-space wavelength of the multi-band antenna;	[2B]	wherein each segment of the first plurality of segments is smaller than 1/10 of a lowest operating free-space wavelength of the multi-band antenna;
[20C]	wherein the segments are spatially arranged such that no two adjacent and connected segments form another longer straight segment;	[2D]	wherein none of said segments intersect with another segment other than to form a closed loop.
[20D]	wherein none of said segments intersect with another segment other than to form a closed loop;	[2E]	wherein none of said segments intersect with another segment other than to form a closed loop.

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Ref	Limitation	Ref	Corresponding limitation
[20E]	wherein each pair of adjacent segments forms a corner; and	[2C]	wherein the segments are spatially arranged such that each pair of adjacent segments forms a corner; and
[20F]	wherein any portion of the grid-dimension curve that is periodic along a fixed straight direction of space is defined by a non-periodic curve that includes at least ten connected segments in which no two adjacent and connected segments define a straight longer segment.	[1L]	wherein the first radiating arm is at least partially shaped according to a grid-dimension curve; and
21	The mobile communication device according to claim 15, wherein the multi-band antenna comprises: a dielectric mounting structure having a plurality of surfaces; wherein at least a portion of the first radiating arm is arranged on a first surface of said plurality of surfaces; and wherein at least a portion of the second conductor is arranged on a second surface of said plurality of surfaces, the second surface being different from the first surface.	[13A]	The mobile communication device according to claim 1, comprising: a dielectric mounting structure having a plurality of surfaces;
		[13B]	wherein at least a portion of the first radiating arm is arranged on a first surface of said plurality of surfaces; and wherein at least a portion of the second radiating arm is arranged on a second surface of said plurality of surfaces, the second surface being different from the first surface.
23	The mobile communication device according to claim 21, wherein the first surface and the	14	The mobile communication device according to claim 13, wherein the first surface and the

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Ref	Limitation	Ref	Corresponding limitation
	second surface are two opposite surfaces of the dielectric mounting structure.		second surface are opposite surfaces of the dielectric mounting structure.
25	The mobile communication device according to claim 15, wherein the antenna element further comprises: a common conductor; a second radiating arm connected to the common conductor; and wherein the first radiating arm is connected to the common conductor.	[11]	the antenna element comprising: a common conductor; a first radiating arm connected to the common conductor; a second radiating arm connected to the common conductor;
27	The mobile communication device according to claim 25, wherein the second radiating arm comprises a second grid-dimension section, the second grid-dimension section being shaped according to a second grid-dimension curve.	9	The mobile communication device according to claim 1, wherein the second radiating arm is at least partially shaped according to a second grid-dimension curve.

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III. Claim 31

Ref	Limitation	Ref	Corresponding limitation
[31PRE]	A mobile communication device, comprising:	[1PRE]	A mobile communication device, comprising:
[31A]	a device housing;	[1A]	a device housing;
[31B]	a printed circuit board,	[1B]	a printed circuit board,
[31C]	the printed circuit board comprising: a ground plane layer;	[1C]	the printed circuit board comprising: a ground plane layer;
[31D]	a feeding point;	[1D]	a feeding point;
[31E]	a communication circuitry, the communication circuitry being mounted on the printed circuit board;	[1E]	a communication circuitry, the communication circuitry being mounted on the printed circuit board;
[31F]	wherein the communication circuitry is coupled to the feeding point and to the ground plane layer;	[1F]	wherein the communication circuitry is coupled to the feeding point and to the ground plane layer;
[31G]	a multi-band antenna capable of operating at multiple frequency bands, the multi-band antenna including:	[1G]	a multi-band antenna capable of operating at multiple frequency bands, the multi-band antenna including an antenna element;

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[31H]	a dielectric mounting structure having a plurality of surfaces;	[13A]	The mobile communication device according to claim 1, comprising: a dielectric mounting structure having a plurality of surfaces;
[31I]	an antenna element, the antenna element being coupled to the feeding point and operating in cooperation with the ground plane layer;	[1G]	a multi-band antenna capable of operating at multiple frequency bands, the multi-band antenna including an antenna element;
		[1H]	wherein the antenna element operates in cooperation with the ground plane layer;
		[1I]	the antenna element comprising: a common conductor; a first radiating arm connected to the common conductor; a second radiating arm connected to the common conductor;
		[1J]	wherein the common conductor includes a feeding port, the feeding port being coupled to the feeding point;
[31J]	wherein the antenna element comprises a first radiating arm arranged on two or more surfaces of the plurality of surfaces of the dielectric mounting structure;		

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[31K]	the first radiating arm comprising: a first section shaped according to a grid-dimension curve;	[1L]	wherein the first radiating arm is at least partially shaped according to a grid-dimension curve; and
[31L]	a second section connected to the grid-dimension section, the second section having a width different from a width of the first section; and		
[31M]	wherein the printed circuit board, the communication circuitry, and the multi-band antenna are arranged inside the device housing.	[1M]	wherein the printed circuit board, the communication circuitry, and the multi-band antenna are arranged inside the device housing.

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IV. Claims 41-42

Ref	Limitation	Ref	Corresponding limitation
41	The mobile communication device according to claim 31, wherein an orthogonal projection of a footprint of the antenna element on a plane of the printed circuit board overlaps the ground plane layer in less than 50% of an area of said footprint.	12	The mobile communication device according to claim 1, wherein an orthogonal projection of a footprint of the antenna element on a plane of the printed circuit board overlaps the ground plane layer in less than 50% of an area of said footprint.
42	The mobile communication device according to claim 37, wherein the second radiating arm comprises a plurality of segments.	[5A]	The mobile communication device according to claim 2, wherein the second radiating arm comprises a second plurality of segments;