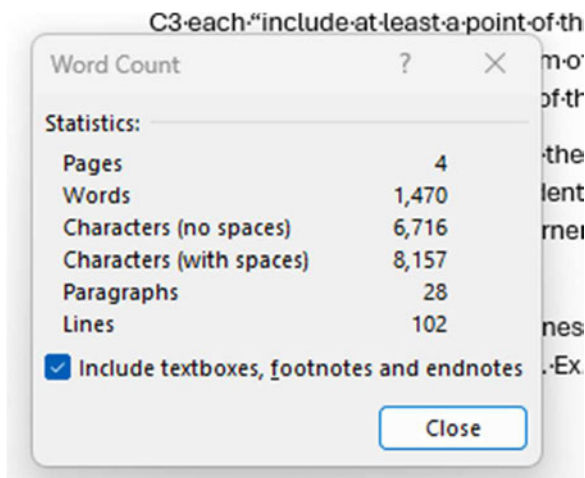




The Ciais-Quadband PIFA meet this limitation.

The '103 patent identifies a preferred embodiment wherein second grid G2 has nine columns. Ex.1001, 17:12-16. The Ciais-Quadband antenna has

dimensions 38.5 mm x 28.5 mm resulting in a rectangle. Ex.1014, Fig. 1(b), 1. Applying nine columns to the Ciais-Quadband antenna yields cell width of 4.28 mm (38.5 mm / 9).

Setting an odd number of five, seven, and nine rows to the Ciais-Quadband PIFA yields the following aspect ratios

Therefore, seven rows provide grid cells “as square as possible,” e.g., an aspect ratio closest to one. Ex.1001, 16:36-39, 16:58-17:35. Thus, grid G2 with nine (9) columns and seven (7) rows has cells “as square as possible[.]”

I superimpose G2 for the Ciais-Quadband PIFA (blue outline) over its antenna contour here:

In the image above, the sixteen (16) cells that do not “include at least a point of the antenna contour” are shaded yellow. Ex.1001, 18:37-45. Thus, the C2 cell count N2 is 47 (63 - 16).

168. The shaded cells above are completely within the quadband antenna contour (cells 1-14) or are completely outside the antenna contour (Cells 15-16). Therefore, cells 1-16 do not “include at least a point of the antenna contour.”

169. The '103 patent states that “in the present invention the boundary of the cell is also part of the cell[.]” Ex.1001, 18:40-41. As such, even if a grid cell only includes a single point of the antenna contour on its cell boundary, the cell must be counted for evaluating complexity factor because “it include[s] at least a point of the antenna contour.” The left edges of cells marked C1-C3 below match the left edge of the main patch (“Antenna contour segment 1” in red below), and thus cells C1-

C3 each “include at least a point of the antenna contour.” Similarly, the bottom of cells marked C4-C7 matches the bottom of patch no. 3 (“Antenna contour segment 2” in red), and thus “include at least a point of the antenna contour.”

The Ciais-Quadband PIFA feed for the lowest frequency operation is closest to the bottom right corner (“feed point corner” identified in green below) of the antenna rectangle, so G1 is placed from the bottom right corner below. Ex.1014, Fig. 1(a) (“feeding strip of main patch); Ex.1001, 17:54-18:23.

Grouping four G2 cells (blue grid lines) into a single G1 cell results in the 4 x 5 grid G1 shown in below (orange grid lines). Ex.1001, 18:24-27.

A single cell within G1 (yellow below) does not “include at least a point of the antenna contour.” Ex.1001, 18:37-44. Therefore, the G1 cell count N1 is 19 (20

The complexity factor F21 for the quadband antenna contour is thus:

Grid G3 (green outline below) is 14 rows by 18 columns so that four G3 cells comprise a single G2 cell (blue outline below). Ex.1001, 19:16-25. The G3 cells have width of 2.139 mm (38.5 mm / 18) and a height of 2.036 mm (28.5 mm / 14).

As shown below 112 numbered G3 cells for the Ciais-Quadband PIFA do not “include at least a point of the antenna contour.” Ex.1001, 19:26-32. As such the cell count N3 is 140 (252 – 112). The cells shaded yellow in the image below are completely within the quadband antenna contour (cells 1-99) or completely outside of the antenna contour (cells 100-112). Therefore, cells 1-112 do not “include at least a point of the antenna contour.” Ex.1001, 19:26-32.

Below, using annotated plots and a table summarizing relevant dimensions, I also provide an explanation for why certain G3 cells “include at least a point of the antenna contour” Ex.1014, Fig. 1(b), 1. The top edge of cells numbered 1-13 (yellow shaded cells) is 2.036 mm (a G3 cell height) from the top of the antenna rectangle. The proximate antenna contour edge (“segment 1” highlighted in red) is $W1 + S1 = 1.0 + 1.0$

The top edge of cells 1-13 in the image above is 2.036 mm (a G3 cell height) from the top of the antenna rectangle. The proximate antenna contour edge (segment 1 highlighted above in red) is 2 mm ($W1 + S1 = 1.0 + 1.0$) from the top of the antenna rectangle and therefore lies above the top edge of cells 1-13. Therefore, cells 1-13 do not “include at least a point of antenna contour.” Ex.1014, Fig. 1(b), 1.

The right edges of cells numbered C1-C10 are 6.417 mm (2.139×3 or three times the G3 cell width) from the right edge of the antenna rectangle. The proximate antenna contour edge (segment 2 highlighted in red above) is 6.5 mm ($W1 + S2 + W2 + S3 = 1 + 1 + 4 + 0.5$)

from the right edge of the antenna rectangle, and therefore lies inside cells C1-C10. Ex.1014, Fig. 1(b), 1. Cells C1-C10 therefore “include at least a point of the antenna contour.”

The top edges of C11-C18 are 4.072 mm (2.036×2 or two times the G3 cell height) from the bottom of the antenna rectangle. The proximate antenna contour edge (segment 3 highlighted in red above) is 4 mm—i.e., the width of parasitic patch no. 3) from the bottom of the antenna rectangle and thus within cells C11-C18. Ex.1014, Fig. 1(b), 1. C11-C18 therefore include the antenna contour passing through them and thus “include at least a point of the antenna contour.”

The left edge of cell C19 is 8.556 mm (2.139×4 or four times the G3 cell width), because C19 is at the fourth column from the right edge of the antenna rectangle. The proximate antenna contour edge (segment 4 highlighted in red above) is 8.5 mm ($W1 + S2 + W2 + S3 + D1 = 1 + 1 + 4 + 0.5 + 2$) from the right edge of the antenna rectangle. Ex.1014, Fig. 1(b), 1. This distance is confirmed by calculating it in another way: $D2 + S4 = 8.1 + 0.4 = 8.5$ mm. Thus, the proximate antenna contour edge lies *within* C19, i.e., goes through cell C19. Cell 19 therefore “include[s] at least a point of the antenna contour.” Ex.1014, Fig. 1(b), 1.

I note that the '103 patent states that “in the present invention the boundary of the cell is also part of the cell[.]” Ex.1001, 19:40-41. This means that even if a grid cell only includes points of the antenna contour on its cell boundary, e.g., the antenna contour matches the cell boundary and does not further extend into the cell, the cell still “include[s] at least a point of the antenna contour.” As shown below, the left edges of C20-C29 match the left edge of the main patch (“Antenna contour segment 5” in red below), and thus C20-C29 each “include at least a point of the antenna contour.” Likewise, the bottom of C20-C27 match the bottom of patch no. 3 (“Antenna contour segment 6” in red below) and thus “include at least a point of the antenna contour.”

Below, the purple portion of the main patch is a right triangle, as confirmed by calculating the vertical and horizontal sides using dimensions disclosed in Ciais-Quadband (reproduced in the plots below). Ex.1014, Fig. 1(b), 1.

The vertical side is taken as a line segment parallel to the left edge of the main patch, and its length is 16.25 ($25.50 - 1.00 - 1.00 - 2.70 - 3.05 - 0.50 - 1.00$). The length of the triangle's horizontal side (along the bottom of the main patch) is 16.25 mm ($18.25 - 2.00$). Because the vertical and horizontal sides are of equal length and perpendicular to each other, the triangle shaded in purple below must be an isosceles right triangle:

The top right corner of cell 45—i.e., P1 in the images above and

below—is 6.417 mm (2.139×3 or three times a G3 cell width) from the left edge of the antenna rectangle. P1 is also 12.216 mm (2.036×6) from the top of the Ciais-Quadband antenna rectangle.

Looking at the image above, relative to the purple triangle's x, y coordinates, P1's x-position is 4.417 mm ($6.417 - 2$) and its y-position is 4.466 mm ($12.216 - 1 - 1 - 2.7 - 3.05$). Further, for any point that lies on "segment 7"—i.e., the hypotenuse of the purple triangle (outlined in red above)—the horizontal (x) and vertical (y) offsets will be equal. Thus, when the x-position is 4.417 mm then so too will the y-position be 4.417 mm. This is less than P1's y-position. As such, at the same x-position as P1, the "segment 7" is closer to the top of the Ciais-Quadband antenna rectangle—i.e., above P1—meaning P1 lies below "segment 7" and is within the main patch and thus cell 45 is completely within the main patch does **not** "include at least a point of the antenna contour."out for