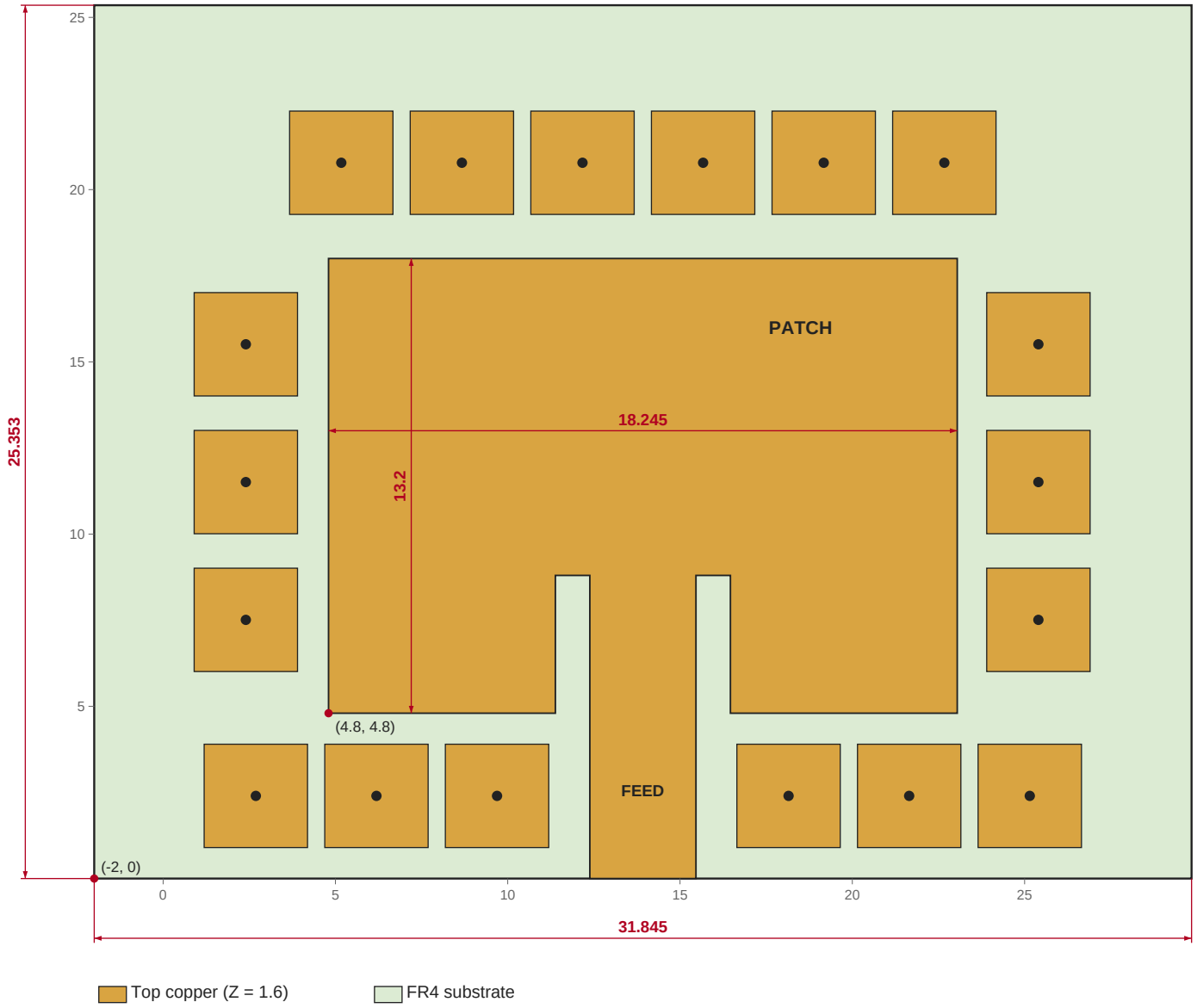
Mushroom EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

Overall layout and main dimensions

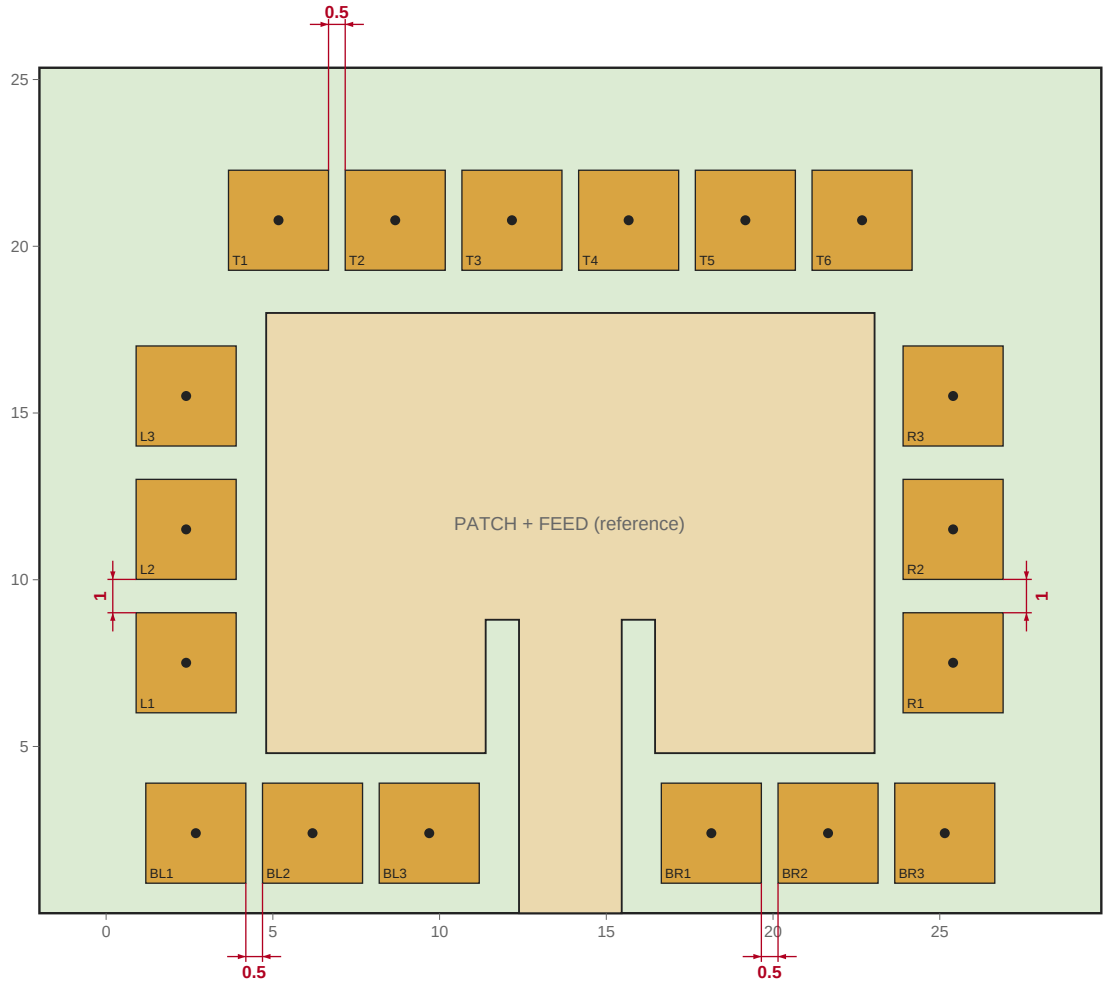


Object	Start (X, Y, Z)	Size (X × Y × Z)
Substrate FR4 epoxy (Er 4.4)	(-2, 0, 0)	31.845 × 25.353 × 1.6
Ground plane (solid, no cutouts)	(-2, 0, 0)	31.845 × 25.353
Microstrip patch	(4.8, 4.8, 1.6)	18.245 × 13.2
Notch 1 (cut from patch)	(11.3825, 4.8, 1.6)	1 × 4
Notch 2 (cut from patch)	(15.4625, 4.8, 1.6)	1 × 4
Feed line (edge at Y = 0)	(12.3825, 0, 1.6)	3.08 × 8.8
EBG cells × 18	see page 2	3 × 3
Vias × 18 (pad to ground)	see page 2	Ø 0.30 × 1.6

Mushroom EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

EBG cell positions (lower-left corner of each 3 × 3 cell)



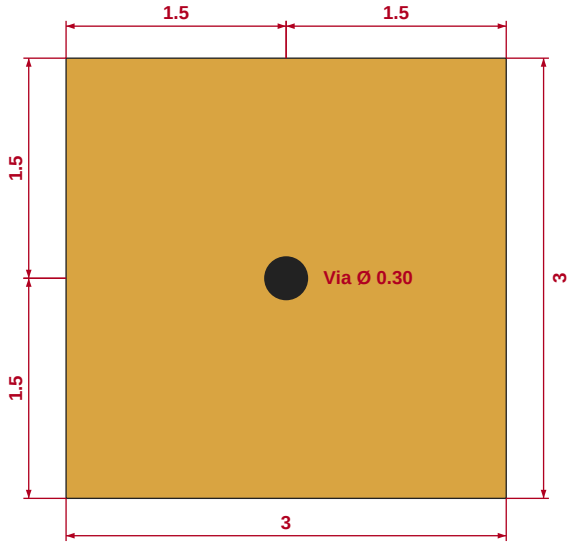
Pad	Pad X	Pad Y	Via X (centre)	Via Y (centre)	Via Ø	Via height
EBG_L1	0.9	6.01	2.4	7.51	0.30	1.6
EBG_L2	0.9	10.01	2.4	11.51	0.30	1.6
EBG_L3	0.9	14.01	2.4	15.51	0.30	1.6
EBG_R1	23.9	6.01	25.4	7.51	0.30	1.6
EBG_R2	23.9	10.01	25.4	11.51	0.30	1.6
EBG_R3	23.9	14.01	25.4	15.51	0.30	1.6
EBG_T1	3.67	19.28	5.17	20.78	0.30	1.6
EBG_T2	7.17	19.28	8.67	20.78	0.30	1.6
EBG_T3	10.67	19.28	12.17	20.78	0.30	1.6
EBG_T4	14.17	19.28	15.67	20.78	0.30	1.6
EBG_T5	17.67	19.28	19.17	20.78	0.30	1.6
EBG_T6	21.17	19.28	22.67	20.78	0.30	1.6
EBG_BL1	1.19	0.9	2.69	2.4	0.30	1.6
EBG_BL2	4.69	0.9	6.19	2.4	0.30	1.6
EBG_BL3	8.19	0.9	9.69	2.4	0.30	1.6
EBG_BR1	16.65	0.9	18.15	2.4	0.30	1.6
EBG_BR2	20.15	0.9	21.65	2.4	0.30	1.6
EBG_BR3	23.65	0.9	25.15	2.4	0.30	1.6

Mushroom EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

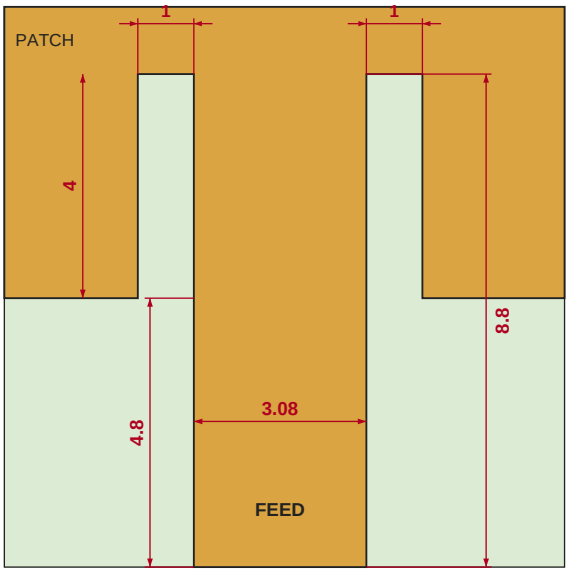
Unit cell, feed detail, ground plane and layer stack

Unit cell (identical for all 18 cells; L1 shown, lower-left (0.9, 6.01))



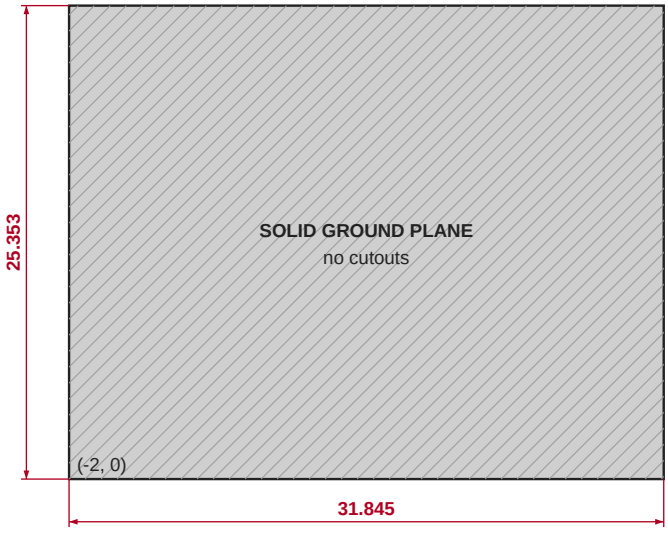
Via at pad centre, height 1.6 (pad to ground)
Pad origin (0.9, 6.01) | Via centre (2.4, 7.51)

Detail A – feed line and patch notches

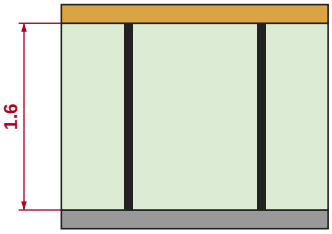


Notch 1 X 11.3825, Y 4.8 | Notch 2 X 15.4625, Y 4.8
Feed start (12.3825, 0) | Patch start (4.8, 4.8)

Ground plane (bottom layer, Z = 0)



Layer stack (side view, thickness not to scale)



Top copper (patch, feed, cells)
Z = 1.6

FR4 epoxy, Er 4.4

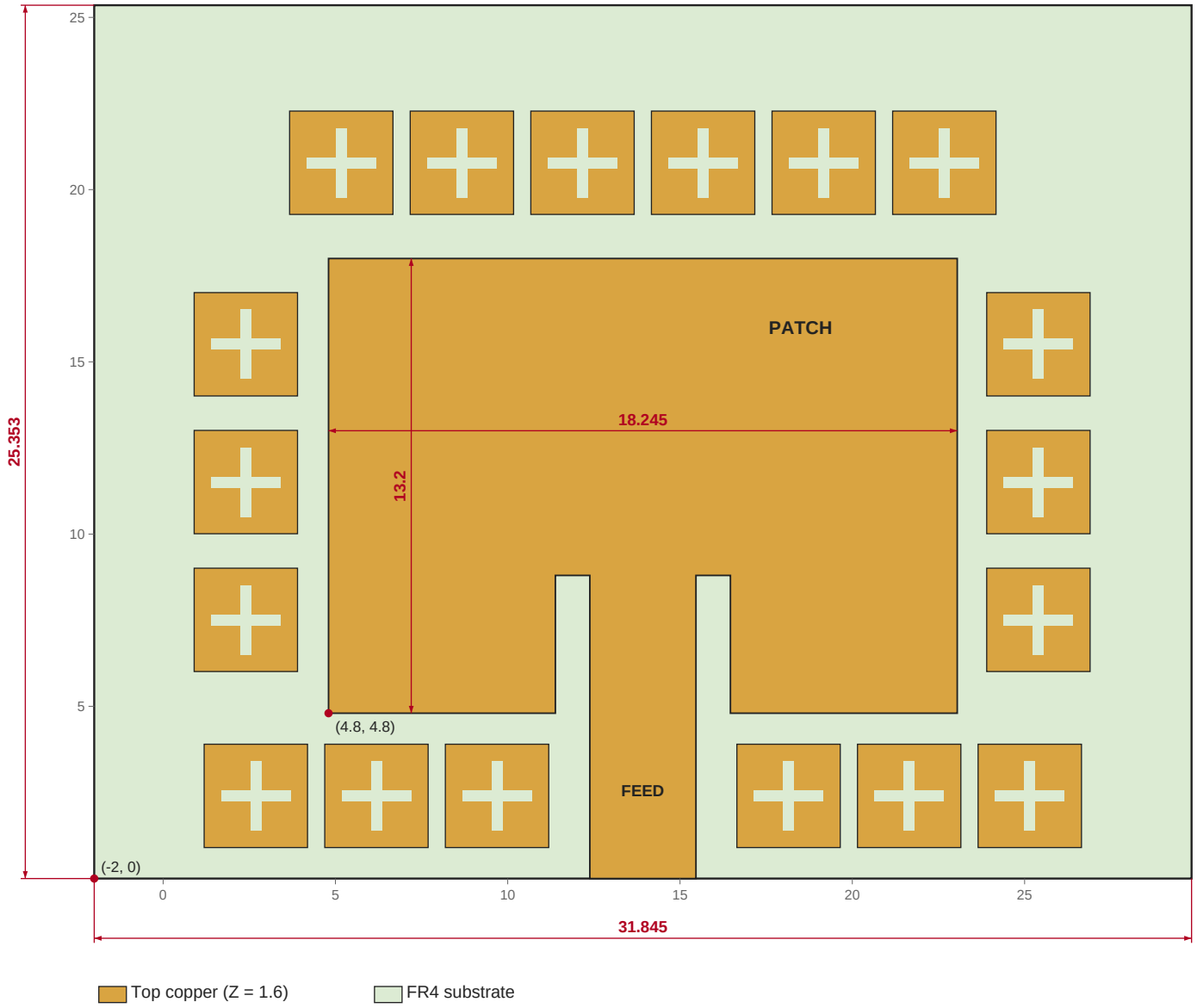
Vias Ø 0.30 (plated)

Ground, Z = 0

UC-EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

Overall layout and main dimensions

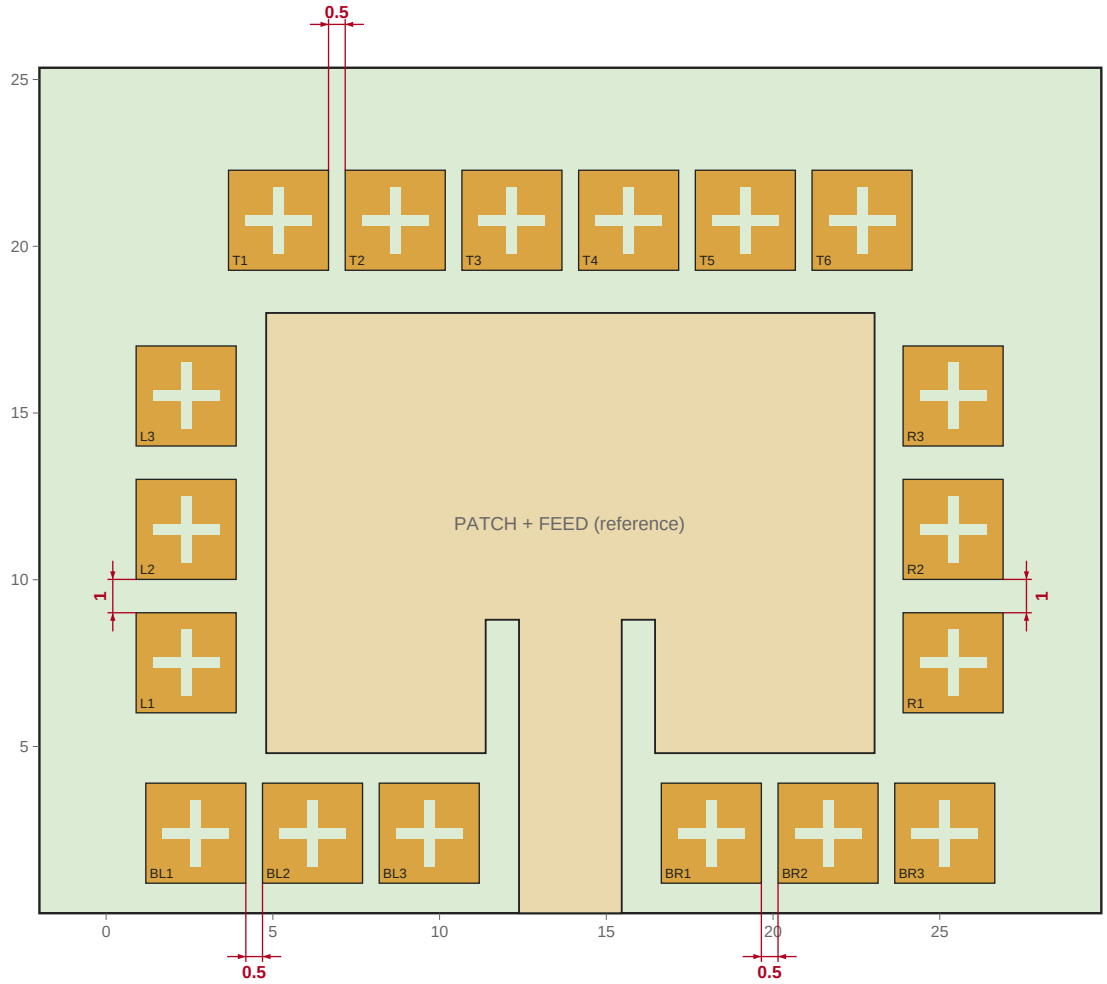


Object	Start (X, Y, Z)	Size (X × Y × Z)
Substrate FR4 epoxy (Er 4.4)	(-2, 0, 0)	31.845 × 25.353 × 1.6
Ground plane (solid, no cutouts)	(-2, 0, 0)	31.845 × 25.353
Microstrip patch	(4.8, 4.8, 1.6)	18.245 × 13.2
Notch 1 (cut from patch)	(11.3825, 4.8, 1.6)	1 × 4
Notch 2 (cut from patch)	(15.4625, 4.8, 1.6)	1 × 4
Feed line (edge at Y = 0)	(12.3825, 0, 1.6)	3.08 × 4.8
EBG cells × 18	see page 5	3 × 3
Cross slots × 36 (2 per cell)	see page 5	2 × 0.3 and 0.3 × 2
Vias	none	cells not connected to ground

UC-EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

EBG cell positions (lower-left corner of each 3 × 3 cell)



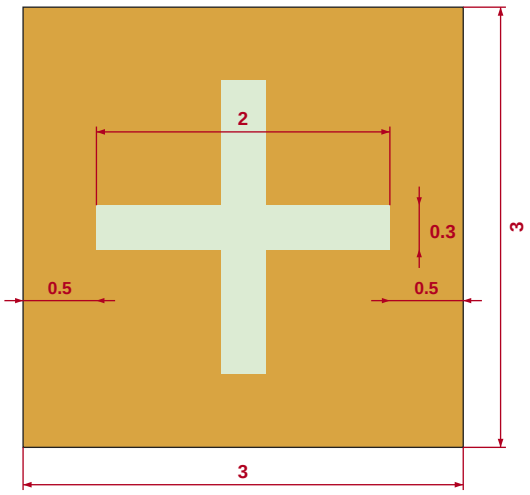
Cell	Cell X	Cell Y	Centre X	Centre Y	H-slot X	H-slot Y	V-slot X	V-slot Y
UC_L1	0.9	6.01	2.4	7.51	1.4	7.36	2.25	6.51
UC_L2	0.9	10.01	2.4	11.51	1.4	11.36	2.25	10.51
UC_L3	0.9	14.01	2.4	15.51	1.4	15.36	2.25	14.51
UC_R1	23.9	6.01	25.4	7.51	24.4	7.36	25.25	6.51
UC_R2	23.9	10.01	25.4	11.51	24.4	11.36	25.25	10.51
UC_R3	23.9	14.01	25.4	15.51	24.4	15.36	25.25	14.51
UC_T1	3.67	19.28	5.17	20.78	4.17	20.63	5.02	19.78
UC_T2	7.17	19.28	8.67	20.78	7.67	20.63	8.52	19.78
UC_T3	10.67	19.28	12.17	20.78	11.17	20.63	12.02	19.78
UC_T4	14.17	19.28	15.67	20.78	14.67	20.63	15.52	19.78
UC_T5	17.67	19.28	19.17	20.78	18.17	20.63	19.02	19.78
UC_T6	21.17	19.28	22.67	20.78	21.67	20.63	22.52	19.78
UC_BL1	1.19	0.9	2.69	2.4	1.69	2.25	2.54	1.4
UC_BL2	4.69	0.9	6.19	2.4	5.19	2.25	6.04	1.4
UC_BL3	8.19	0.9	9.69	2.4	8.69	2.25	9.54	1.4
UC_BR1	16.65	0.9	18.15	2.4	17.15	2.25	18	1.4
UC_BR2	20.15	0.9	21.65	2.4	20.65	2.25	21.5	1.4
UC_BR3	23.65	0.9	25.15	2.4	24.15	2.25	25	1.4

UC-EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

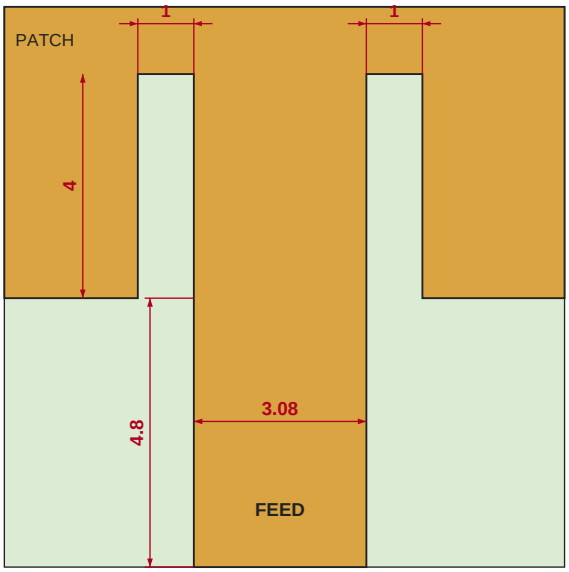
Unit cell, feed detail, ground plane and layer stack

Unit cell (identical for all 18 cells; L1 shown, lower-left (0.9, 6.01))



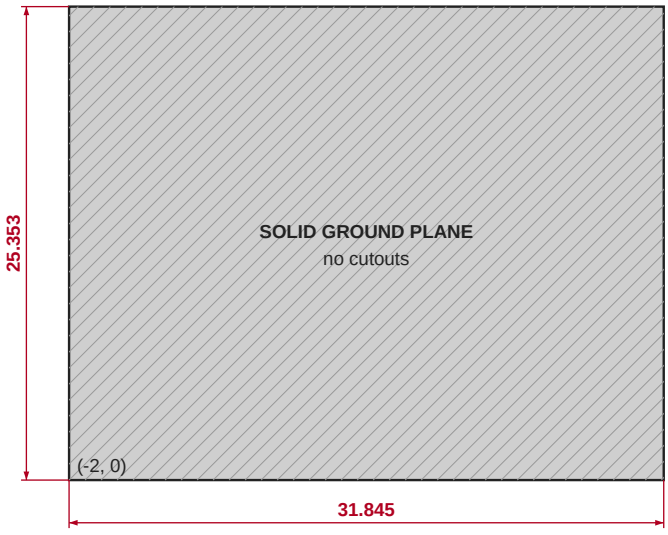
H slot start = cell + (0.5, 1.35) | V slot start = cell + (1.35, 0.5)
Cell origin (0.9, 6.01) | H slot (1.4, 7.36) | V slot (2.25, 6.51)

Detail A – feed line and patch notches

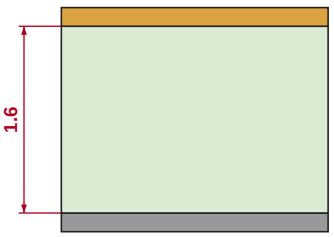


Notch 1 X 11.3825, Y 4.8 | Notch 2 X 15.4625, Y 4.8
Feed start (12.3825, 0) | Patch start (4.8, 4.8)

Ground plane (bottom layer, Z = 0)



Layer stack (side view, thickness not to scale)



Top copper (patch, feed, cells)
Z = 1.6

FR4 epoxy, Er 4.4

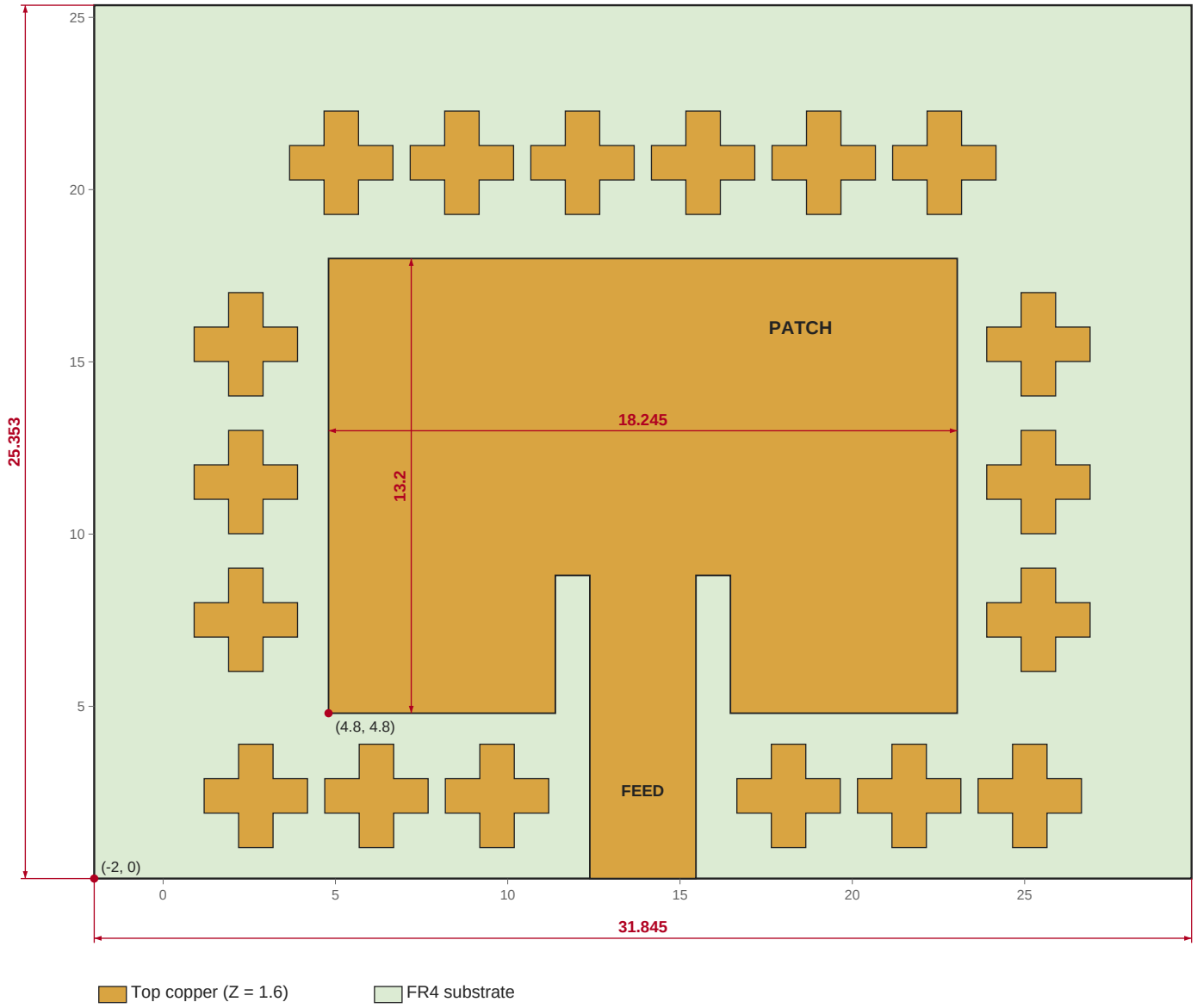
No vias

Ground, Z = 0

Plus-Shaped EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

Overall layout and main dimensions

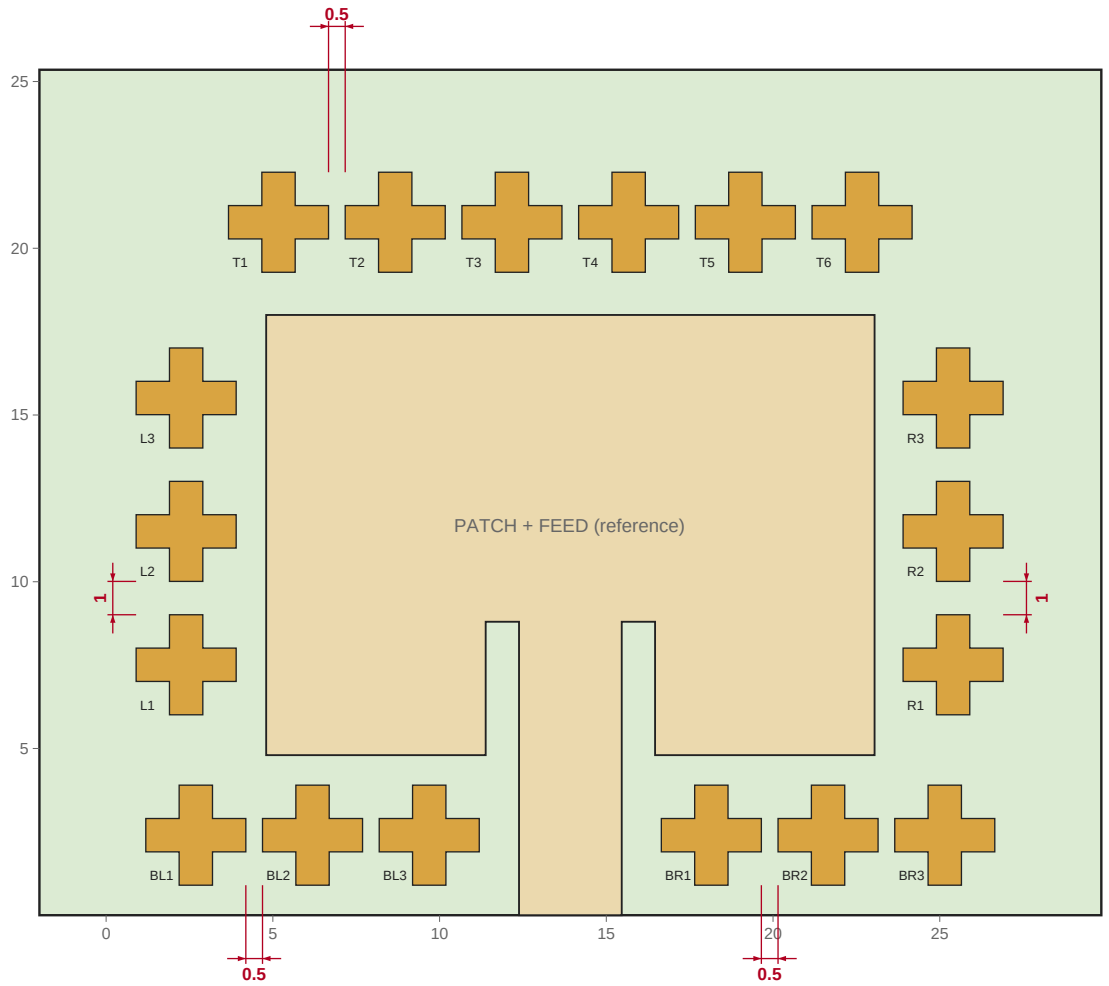


Object	Start (X, Y, Z)	Size (X × Y × Z)
Substrate FR4 epoxy (Er 4.4)	(-2, 0, 0)	31.845 × 25.353 × 1.6
Ground plane (solid, no cutouts)	(-2, 0, 0)	31.845 × 25.353
Microstrip patch	(4.8, 4.8, 1.6)	18.245 × 13.2
Notch 1 (cut from patch)	(11.3825, 4.8, 1.6)	1 × 4
Notch 2 (cut from patch)	(15.4625, 4.8, 1.6)	1 × 4
Feed line (edge at Y = 0)	(12.3825, 0, 1.6)	3.08 × 4.8
EBG cells × 18	see page 8	3 × 3
Plus bars × 36 (united, 2 per cell)	see page 8	3 × 1 and 1 × 3
Vias	none	cells not connected to ground

Plus-Shaped EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

EBG cell positions (lower-left corner of each 3 × 3 cell)



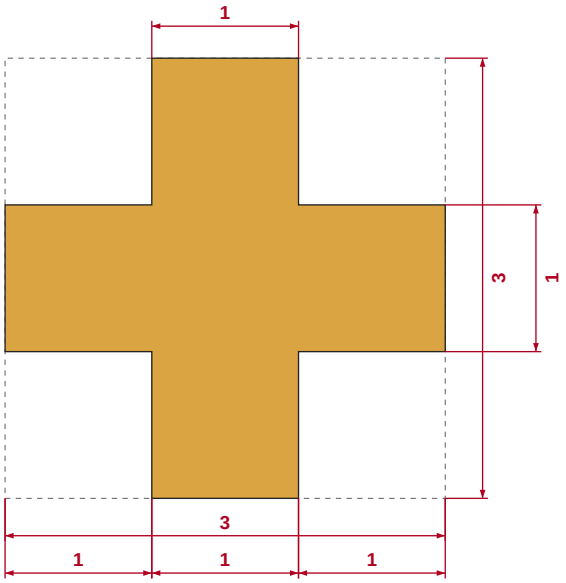
Cell	Cell X	Cell Y	Centre X	Centre Y	H-bar X	H-bar Y	V-bar X	V-bar Y
Plus_L1	0.9	6.01	2.4	7.51	0.9	7.01	1.9	6.01
Plus_L2	0.9	10.01	2.4	11.51	0.9	11.01	1.9	10.01
Plus_L3	0.9	14.01	2.4	15.51	0.9	15.01	1.9	14.01
Plus_R1	23.9	6.01	25.4	7.51	23.9	7.01	24.9	6.01
Plus_R2	23.9	10.01	25.4	11.51	23.9	11.01	24.9	10.01
Plus_R3	23.9	14.01	25.4	15.51	23.9	15.01	24.9	14.01
Plus_T1	3.67	19.28	5.17	20.78	3.67	20.28	4.67	19.28
Plus_T2	7.17	19.28	8.67	20.78	7.17	20.28	8.17	19.28
Plus_T3	10.67	19.28	12.17	20.78	10.67	20.28	11.67	19.28
Plus_T4	14.17	19.28	15.67	20.78	14.17	20.28	15.17	19.28
Plus_T5	17.67	19.28	19.17	20.78	17.67	20.28	18.67	19.28
Plus_T6	21.17	19.28	22.67	20.78	21.17	20.28	22.17	19.28
Plus_BL1	1.19	0.9	2.69	2.4	1.19	1.9	2.19	0.9
Plus_BL2	4.69	0.9	6.19	2.4	4.69	1.9	5.69	0.9
Plus_BL3	8.19	0.9	9.69	2.4	8.19	1.9	9.19	0.9
Plus_BR1	16.65	0.9	18.15	2.4	16.65	1.9	17.65	0.9
Plus_BR2	20.15	0.9	21.65	2.4	20.15	1.9	21.15	0.9
Plus_BR3	23.65	0.9	25.15	2.4	23.65	1.9	24.65	0.9

Plus-Shaped EBG Microstrip Patch Antenna

Microstrip Patch Antenna using EBG Structure for Wireless Applications | Units: mm | HFSS global coordinates, plan view from +Z

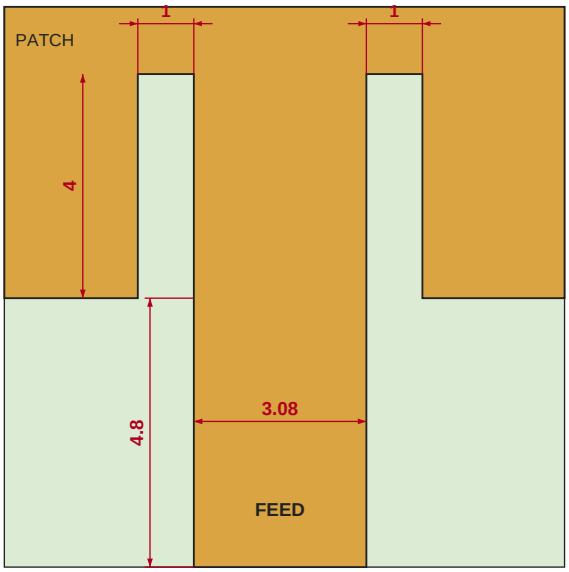
Unit cell, feed detail, ground plane and layer stack

Unit cell (identical for all 18 cells; L1 shown, lower-left (0.9, 6.01))



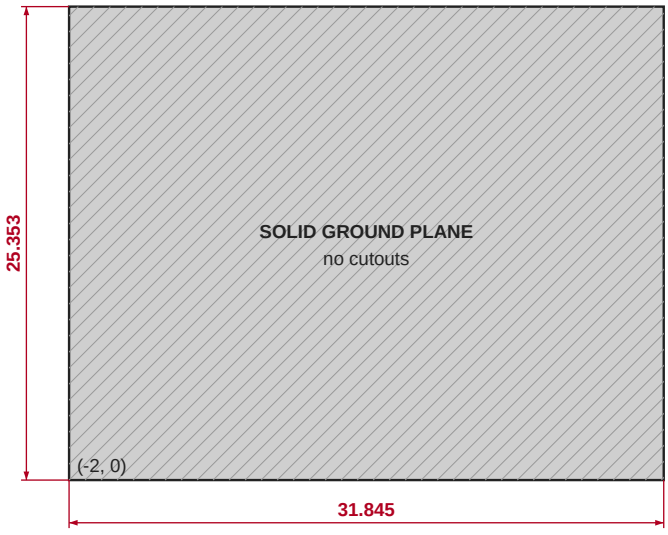
H bar 3 × 1 start = cell + (0, 1) | V bar 1 × 3 start = cell + (1, 0)
Cell origin (0.9, 6.01) | H bar (0.9, 7.01) | V bar (1.9, 6.01)

Detail A – feed line and patch notches



Notch 1 X 11.3825, Y 4.8 | Notch 2 X 15.4625, Y 4.8
Feed start (12.3825, 0) | Patch start (4.8, 4.8)

Ground plane (bottom layer, Z = 0)



Layer stack (side view, thickness not to scale)

