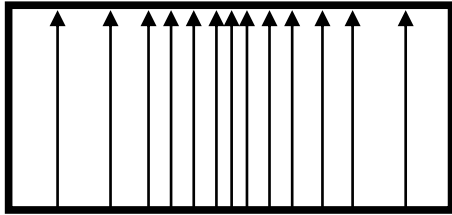
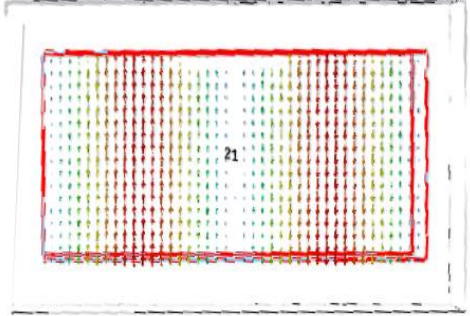
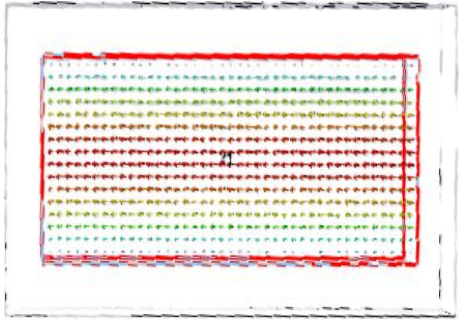
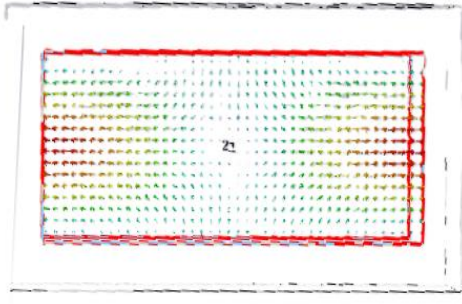


- a) For the waveguide filled with air, find and order the 4 TE modes with lowest cut-off frequency; for each of them specify if present some degeneracy.

Mode 1	TE₁₀	Mode 2	TE₂₀
Cut-off frequency	5 GHz	Cut-off frequency	10 GHz
Sketch of the electric field lines		Sketch of the electric field lines	
Degeneracy	NO	Degeneracy	NO

Mode 3	TE₀₁	Mode 4	TE₁₀
Cut-off frequency	5 GHz	Cut-off frequency	5 GHz
Sketch of the electric field lines		Sketch of the electric field lines	
Degeneracy	NO	Degeneracy	YES

- b) Fill the inner region of the metallic waveguide with Teflon and assume as working frequency $f = 10.7\text{GHz}$. Discuss what are the differences with respect to the case of air-filled waveguide.