

Microwaves

Series 5

Problem 1

We want to use a rectangular waveguide for the frequency band between 12.5 and 19 GHz. Give the dimensions of an adequate waveguide, supposing it is filled with air

Problem 2

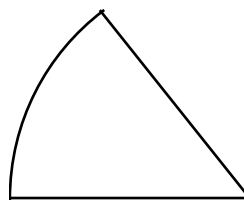
An attenuator can be made using a section of waveguide below cutoff. Consider the following set up : a waveguide of width a is connected to a waveguide of width $a/2$ and of length l . The latter is again connected to waveguide of width a . The height of all the guides is b .

If $a=2.286$ cm and the frequency is 12GHz, find the length l to get an attenuation of 100dB between the input and output guides. Ignore the reflection at the interfaces.

Problem 3

A waveguide made by a perfect electric conductor has a section formed by the sector of circle having an angle of 60° (see figure). The radius is given by a . Find (depending on a) the value of the cutoff frequency of the dominant mode, and of the first higher order mode.

Indication: start from the results of the circular waveguide. And remember that you are free to choose the excitation



a

Note : Zeros of the Bessel function of the first kind

n	p_{n1}	p_{n2}	p_{n3}
0	2.405	5.520	8.654
1	3.832	7.016	10.174
2	5.135	8.417	11.620

3	6.38016	9.76102	13.01520
4	7.58834	11.06471	14.37254
5	8.77142	12.33860	15.70017
6	9.93611	13.58929	17.0038

Zeros of the derivative of the Bessel function of the first kind :

n	p'_{n1}	p'_{n2}	p'_{n3}
0	3.832	7.016	10.174
1	1.841	5.331	8.536
2	3.054	6.706	9.970
3	4.2012	6.0152	11.3459
4	5.3175	9.2824	12.6819
5	6.4156	10.5199	13.9872
6	7.5013	11.7349	15.2682