Diagram of this discharge silencer is shown below

The area around the extended inlet pipe could be seen as a side branch.

1. Derive the expression of the acoustic impedance at the open end of the annular section of the device, that is, at the location where Z is marked on the diagram.

As is shown in the figure above, firstly derive the acoustic impedance of the side branch at x = L. The sum of the particle velocities of the positive and negative propagating waves should be zero:

so: 🡪

For the acoustic impedance of Z where x = 0:

1. Use this result to derive an expression for the sound power transmission coefficient of the reactive section of the device. (Note: the reactive section is where the annular section and the area change are located, the resistive section is where the porous material is located).
2. Plot the sound power transmission coefficient of the reactive section of the device as a function of kL for kL from 0 to 2pi. (Note that for any given value of L and since k = w/c = 2\*pi\*f/c, you are effectively plotting the performance of the silencer versus frequency)

of the side branch, where x = L, the total of the particle velocities associated with the positive and negative propagating waves must be zero