

**Design project****Project no. 1**

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## 1 - stepped-impedance low-pass filter with equal electric length transmission line segments ( $45^\circ$ )

Layout due :

**June 8<sup>th</sup>, 2017**(send it by e-mail to [paola.pirinoli@polito.it](mailto:paola.pirinoli@polito.it) and [andrea.massaccesi@polito.it](mailto:andrea.massaccesi@polito.it))**Report due:****End of the summer examination session (July 28<sup>th</sup>)**

Using a circuit board dielectric material with  $\epsilon_r = 4$ ,  $h = 2$  mm, design a microstrip filter according to the specifications in Table 1. In particular:

- Design the prototype filter and apply the required frequency and impedance transformations (consider both a T and  $\pi$  network).
- Design the filter using the *stepped-impedance* technique with equal electric length transmission line segments ( $45^\circ$ ). Please allow a segment of input and output microstrip line for the connection to the connectors.
- Simulate the frequency response of the filter.
- Using AWR, print the GERBER file of both the top and the bottom layers of the microstrip circuit.
- Measure the frequency response of the filter (amplitude of  $S_{11}$  and  $S_{21}$ ).

**Table 1**

Filter type	Low-pass
Response type	Equal-ripple (0.5 dB)
$f_1$ [GHz]	2.4
$R_0$ [ $\Omega$ ]	50
Insertion loss [dB] @ $f = 4.8$ [GHz]	> 30 dB