

James Cook University
Electrical and Computer Engineering
EE4306 RF Design Assignment Townsville

Aim

The aim of this assignment is to firstly provide some experience in the design and optimisation of RF circuits. This assignment is worth 20% of the total mark for the subject.

Requirements:

Design an Interdigital filter to be fabricated on a microstrip RF substrate. The filter is to have a variation in passband attenuation of less 3 dB over a bandwidth of 5% of the centre frequency. The filter has to have an attenuation of more than 20 dB when the frequency is more than 5% above or below the centre frequency. The input and output impedances shall be 50 Ω and the return loss at the centre frequency shall be more than 15 dB. The filter is to have an attenuation of more than 30 dB at all frequencies from 1.5 to 3.5 times the centre frequency.

A microwave RF substrate RO4003 made by Rogers is to be used for the PCB. The RO4003 board has a thickness of the dielectric material of 0.8128 mm and has a relative dielectric constant of 3.38, with a loss tangent of 0.0027. The board has a 1 oz copper cladding (0.035mm thick).

The design to be produced by each student should include a full PCB layout and its corresponding Gerber plot file. PCB mounting BNC connectors are to be used for the connectors to get the signals in and out of the board. These connectors can be in any suitable configuration, but they must be able to provide a good RF connection and be soldered directly to the board. The circuit is to occupy the smallest possible printed circuit board area.

Each student has to write a report providing full design, layout and optimisation details of the design. The circuit schematic design must be verified using computer simulation. A paper copy of the design report is to be submitted by **10 am Monday 23 October 2006** to A/Prof Kikkert. The Microwave Office and Gerber Plot files are to be Zipped and the Zip file should be submitted using digital drop box in LearnJCU by the same deadline. The report (doc or txt) file is to be submitted using Safe-assign in LearnJCU. The MWO files must have your name and student number as text in the Schematic file. **Safe-assign will detect plagiarism.**

Hint: The filter can be designed using the coupling calculations described in: <http://www.eng.jcu.edu.au/Staff/Profiles/keith-kikkert/research/PID128981-Fil.pdf> or the lecture notes.

Each student is given a different filter to design, according to the following table:

Name		Centre Frequency MHz
ARNEL	ROWAN WAYNE	600
COX	JOEL DANIEL	625
DE WITT	MATTHEW WILLIAM	650
DUBEY	BRAJBHUSHAN JAWAHERLAL	675
FITZPATRICK	ANDREW ROBERT	700
FRASER	DAVIN IAN	725
HAIGH	RYAN JOSIRE	750
HARRINGTON	WILLIAM LEONARD	775
HUTLEY	DANIEL JOHN	800
KENNEDY	STUART LEIGH	825
LEE	MATTHEW	850
LIM	WAEI AAN	875
MURPHY	JAMES CHRISTOPHER	900
PARNELL	REBECCA AILEEN	925
PENGILLY	NICHOLAS JOHN	950
RYAN	BEN RODNEY	975
SWEETLAND	WILLIAM ROBERT	1000
TAN	DANIEL EUWEI	1025
VOLLUGI	JOHN ROBERT	1050
WARREN	MATTHEW STEPHEN	1075

The marking scheme is on the next page and that page must be attached to your assignment, to permit the appropriate feedback.

C. J. Kikkert
5 Aug 2006

RF Assignment Marking Scheme

6 marks will be given for documentation outlining the operation of the circuit.

Your documentation should include all the circuit diagrams, and screen shots of the performance of the circuit.

7 marks will be given for the RF design i.e. the performance of the filter.

These marks will include the following performance indicators:

- 1 How well does the circuit work as a filter ?
- 2 How well does it meet or exceed the specifications ?
- 3 How costly is it to manufacture (size, tolerances required etc) ?
- 4 Is the frequency range correct ?

5 marks will be given for the circuit layout.

Factors to be considered here are the overall size of the circuit, the real estate utilisation, the avoidance of unwanted coupling and the shielding provided by the ground-plane.

2 marks will be given for the Gerber plot files.

Minus 3 marks will given if the Documentation and Gerber Plot files are not clearly labelled with your name and student number.

Name:

	Max	Mark	Comment
Documentation	6		
RF design	7		
Layout	5		
Plot files	2		
Name in Docs	-3		
Total			