

James Cook University

Electrical and Computer Engineering

EE4306 RF Design Assignment

Aim

The aim of this assignment is to firstly provide some more experience in the design and optimisation of RF circuits and secondly to provide some experience in measuring the performance of a resulting design.

Requirements:

Each student is given an individual design task. Several students work on a similar design task, like mixer1 or Filter2, there being six separate design tasks in total. One of each of these six designs, (Mixer 1, Mixer2, Filter1, Filter2, Coupler1, Coupler2) are produced and their performance is measured by students working on that design task. Each student has to write a report providing full design and optimisation details of the design, together with the measured performance and comments on that for the group hardware. The table below indicates the individual task required of each student.

	Surname	Given Names	Email	RF Assignment
BAKHASH	JOSEPH	Joseph.Bakhash@jcu.edu.au	Mixer1 800 MHz	
BERESFORD	JULIAN CHARLES	Julian.Beresford@jcu.edu.au	Mixer1 850 MHz	
CLARK	JAC ERLE MCKENNA	Jac.Clark@jcu.edu.au	Mixer1 900 MHz	
CLARKE	TYSON ARTHUR	Tyson.Clarke@jcu.edu.au	Mixer1 950 MHz	
COEY-BRADDON	DAILE STEWART	Daile.Coeybraddon@jcu.edu.au	Mixer1 1000 MHz	
DEVIN	GEOFFREY IAN	Geoffrey.Devin@jcu.edu.au	Mixer2 1750 MHz	
DISCHER	TIMOTHY WILLIAM	Timothy.Discher@jcu.edu.au	Mixer2 1700 MHz	
DREW	COHAN WARREN	Cohan.Drew@jcu.edu.au	Mixer2 1650 MHz	
ESPOSITO	REMO	Remo.Esposito@jcu.edu.au	Mixer2 1600 MHz	
GRASSO	ANTHONY JOSEPH	Anthony.Grasso@jcu.edu.au	Mixer2 1550 MHz	
HARRING	ANDREW	Andrew.Harring@jcu.edu.au	Filter1 800 MHz	
JONES	RHYS	Rhys.Jones@jcu.edu.au	Filter1 850 MHz	
LAMARI	ROBERT GINO	Robert.Lamari@jcu.edu.au	Filter1 900 MHz	
LIDSTONE	JAMES DONALD	James.Lidstone@jcu.edu.au	Filter1 950 MHz	
MCCAULEY	TERRY JAMES	Terry.Mccauley@jcu.edu.au	Filter1 1000 MHz	
MCGRATH	JONATHON VINCENT	Jonathon.Mcgrath@jcu.edu.au	Filter2 1750 MHz	
MURPHY	ELIZABETH MARIE	Elizabeth.Murphy@jcu.edu.au	Filter2 1700 MHz	
NEWTON	SHAUN BRUCE	Shaun.Newton@jcu.edu.au	Filter2 1650 MHz	
PALMER	THOR ADAM	Thor.Palmer@jcu.edu.au	Filter2 1600 MHz	

PUSEY	NATHAN JOHN	Nathan.Pusey@jcu.edu.au	Filter2 1550 MHz
RUMMERY	KI DAVID	Ki.Rummery@jcu.edu.au	Coupler1 800 MHz
SCOTT	DAVID EDWARD	David.Scott@jcu.edu.au	Coupler1 700 MHz
SINGH-SAMRA	KIRENPAL	Kirenpal.Singhsamra@jcu.edu.au	Coupler1 800 MHz
SQUIRES	CHRISTOPHER DAVID	David.Squires@jcu.edu.au	Coupler1 900 MHz
VANG	YOUA	Youa.Vang@jcu.edu.au	Coupler1 1000 MHz
VIGOR	ADAM EDWARD	Adam.Vigor@jcu.edu.au	Coupler2 70 MHz
VLEESHOUWER	JAMIE MARK	Jamie.Vleeshouwer@jcu.edu.au	Coupler2 100 MHz
WALSH	JOHN PATRICK	John.Walsh@jcu.edu.au	Coupler2 130 MHz
WILKIE	MATTHEW MCPHAIL	Matthew.Wilkie@jcu.edu.au	Coupler2 160 MHz

Mixer 1 and Mixer 2. Good performance mixers are required to operate at the frequency concerned. The design should include a full simulation of the mixer and include calculations of the conversion loss and spectra using readily available Schottky barrier diodes suitable for mixers. The mixers should occupy as small a PCB board area as practicable without sacrificing performance or the ability to manufacture the mixer.

Filter 1 should have a bandwidth of 50 MHz, a low insertion loss and an attenuation at 200 MHz away from the carrier of more than 60 dB. The input and output impedances are to be 50 ohm.

Filter 2 should have a bandwidth of 100 MHz, a low insertion loss and an attenuation at 400 MHz away from the carrier of more than 60 dB. The input and output impedances are to be 50 ohm.

Coupler 1 and Coupler 2 are to consist of a 20dB forward power coupler and a 20dB reverse power coupler. These are to be used for measuring the output power of an amplifier and the return loss from a load. The coupler should have very good isolation and at least a 50% bandwidth. The coupling should be within ± 0.5 dB over this bandwidth.

The design to be produced by each student should include a full PCB payout and its corresponding Gerber plot file. All the circuits are to be designed using Rogers RO4003 PCB. The board that is available is 0.032 inch thick and has 1 oz copper cladding. See C. J. Kikkert for details of the connectors to be used.

One of each of the devices is to be made ie one Mixer1, one Mixer2 etc. Confer with the others working on a similar design. The selected design is to be produced and the performance measured by the group and included in the report. Comments need to be made by each student individually comparing the calculated and measured performance.

The Assignment is due at 9am on the 28th of October. To achieve that the simulations need to be completed by 9am on the 16th of October, to allow the technicians three days to produce the boards, so that you can populate them, make measurements and finalise the written documentation.

C. J. Kikkert, 24 Sep 02