



# uOttawa

Master of Engineering  
Electrical and Computer Engineering

Assignment 6  
ELG7132D

**Topics in Electronics I: Simulation of Radio Frequency Circuits**

Submitted by

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- a) Sketch of two-dimensional grid showing of the box-truncated frequency spectrum for  $K_1 = 3$ , and  $K_2 = 5$ .

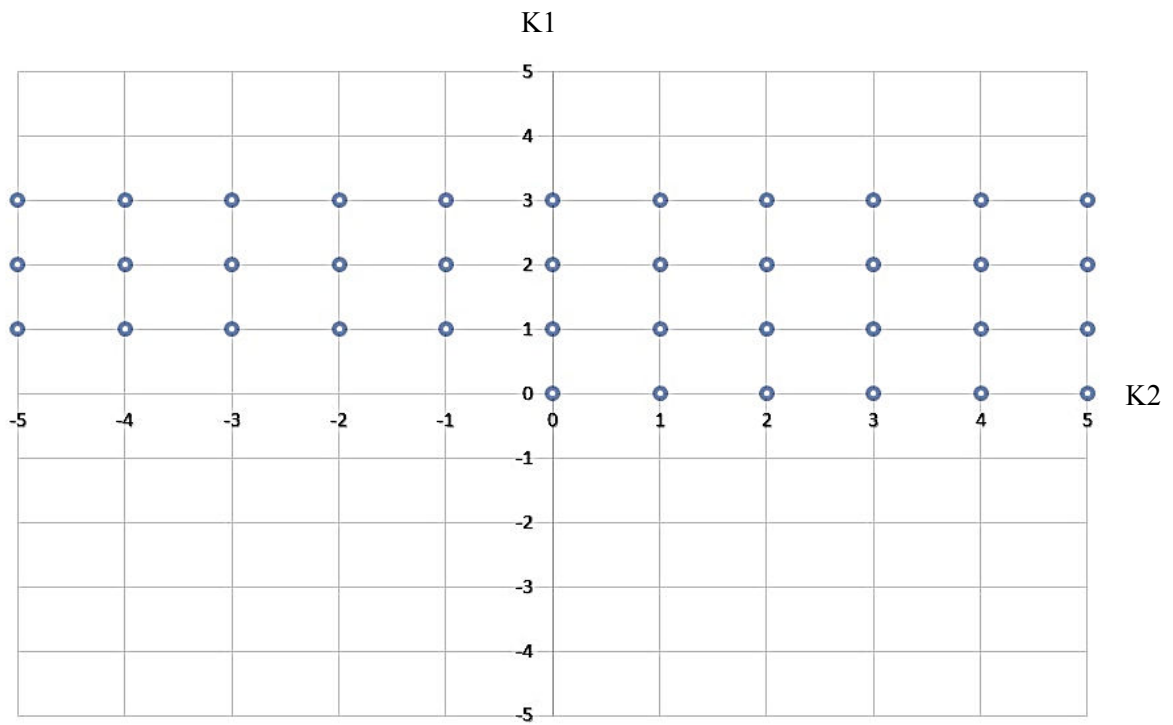


Fig1: Two-Dimensional Grid of Box Truncated Spectrum for  $K_1=3$  and  $K_2=5$

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- b) Set of Unique frequencies obtained through the box truncation scheme, including the DC frequency is given in the following table:

Index	$k_2$	$k_1$	$\omega$
0	0	0	0
1	1	0	$ \omega_2 $
2	2	0	$ 2\omega_2 $
3	-2	1	$ \omega_1-2\omega_2 $
4	-1	1	$ \omega_1-\omega_2 $
5	0	1	$ \omega_1 $
6	1	1	$ \omega_1+\omega_2 $
7	2	1	$ \omega_1+2\omega_2 $
8	-2	2	$ 2\omega_1-2\omega_2 $
9	-1	2	$ 2\omega_1-\omega_2 $
10	0	2	$ 2\omega_1 $
11	1	2	$ 2\omega_1+\omega_2 $
12	2	2	$ 2\omega_1+2\omega_2 $

- c) From the given netlist, it can be observed that AC source currents enter through the node ' $V_{L01}$ ', ' $V_{L02}$ ', ' $V_{RF1}$ ', ' $V_{RF1}$ ' which corresponds node index number 46,47,48 and 49. Also, the DC component ' $vdd1$ ', ' $vdd2$ ' and current source ' $I0$ ' enters through node number 44, 45 and 03. For numerical value, absolute value is taken. The format used for to represent co-efficient of source vector is followed:

$$B_{Harmonic\ Index, Node\ Index}^{DC, Cosine, Sin}$$

Non - zero entries of the B vector ordered in Harmonic-major/node-minor is given in the following table:

Index of Non-Zero Entries	Numeric Values (Absolute value)
$B_{0,3}$	0.01
$B_{0,44}$	15
$B_{0,45}$	15
$B_{1,48}^S$	0.0125
$B_{1,49}^S$	0.0125
$B_{5,46}^S$	0.125
$B_{5,47}^S$	0.125

d) Artificial Frequency Mapping

$$P = |k_1 + k_2(2K_1+1)|$$

Index	$\Omega_M$		$\Lambda_M$		
	P	$\omega$	$k_1$	$k_2$	$\Omega$
0	0	0	0	0	0
1	1	$1\lambda_0$	1	0	$ \omega_1 $
2	2	$2\lambda_0$	2	0	$ 2\omega_1 $
3	3	$3\lambda_0$	2	-1	$ 2\omega_1 - \omega_2 $
4	4	$4\lambda_0$	1	-1	$ \omega_1 - \omega_2 $
5	5	$5\lambda_0$	0	1	$ \omega_2 $
6	6	$6\lambda_0$	1	1	$ \omega_1 + \omega_2 $
7	7	$7\lambda_0$	2	1	$ 2\omega_1 + \omega_2 $
8	8	$8\lambda_0$	2	-2	$ 2\omega_1 - 2\omega_2 $
9	9	$9\lambda_0$	1	-2	$ \omega_1 - 2\omega_2 $
10	10	$10\lambda_0$	0	2	$ 2\omega_2 $
11	11	$11\lambda_0$	1	2	$ \omega_1 + 2\omega_2 $
12	12	$12\lambda_0$	2	2	$ 2\omega_1 + 2\omega_2 $

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