

# Youla Parameterized Adaptive Regulation against Sinusoidal Exogenous Inputs Applied to a Benchmark Problem

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## I. SIMULATION RESULTS

TABLE I  
SIMULATION RESULTS - SIMPLE STEP TEST

LEVEL 1							
Frequency (Hz)	GA (dB)	DA (dB)	MA (dB@Hz)	N <sup>2</sup> T ( $\times 10^{-3}$ )	N <sup>2</sup> R ( $\times 10^{-3}$ )	MV ( $\times 10^{-3}$ )	TD (ratio)
50	34.4	41.2	7.0@53.1	12.4	3.6	16.8	1.14
55	34.5	44.6	5.7@60.9	10.0	3.6	19.1	1.08
60	34.5	49.2	5.8@54.7	9.6	3.7	19.2	1.10
65	34.6	45.8	5.8@75.0	9.3	3.7	18.9	1.09
70	34.6	47.8	6.4@62.5	9.5	3.7	19.4	1.12
75	34.2	48.1	6.8@67.2	10.4	3.9	20.9	1.12
80	34.5	44.3	6.4@71.9	11.2	3.8	21.7	1.13
85	34.1	43.0	6.3@92.2	11.7	3.7	23.8	1.10
90	32.8	40.4	3.4@75.0	15.3	3.7	27.2	1.10
95	26.9	39.5	4.8@75.1	17.1	3.6	29.5	1.18
LEVEL 2							
Frequency (Hz)	GA (dB)	DA (dB)-(dB)	MA (dB@Hz)	N <sup>2</sup> T ( $\times 10^{-3}$ )	N <sup>2</sup> R ( $\times 10^{-3}$ )	MV ( $\times 10^{-3}$ )	TD (ratio)
50-70	40.1	40.9 - 46.7	7.3@53.1	30.4	3.8	26.6	1.45
55-75	39.7	44.9 - 49.3	5.4@90.6	30.5	4.0	30.3	1.34
60-80	39.8	51.6 - 44.8	7.1@53.1	23.9	4.0	33.9	1.18
65-85	39.7	46.5 - 45.1	8.3@92.2	27.9	3.9	36.3	1.09
70-90	39.4	48.1 - 41.8	6.0@76.6	37.5	3.8	40.6	1.14
75-95	35.6	46.9 - 39.4	7.0@82.8	33.3	4.4	44.4	1.07
LEVEL 3							
Frequency (Hz)	GA (dB)	DA (dB)-(dB)-(dB)	MA (dB@Hz)	N <sup>2</sup> T ( $\times 10^{-3}$ )	N <sup>2</sup> R ( $\times 10^{-3}$ )	MV ( $\times 10^{-3}$ )	TD (ratio)
50-65-80	42.6	40.9 - 44.2 - 42.0	11.1@93.8	53.7	4.3	44.7	1.08
55-70-85	43.3	45.1 - 48.4 - 41.5	6.7@76.6	32.4	3.9	49.6	1.10
60-75-90	42.1	47.4 - 47.9 - 42.0	6.1@67.2	41.4	4.3	52.8	1.08
65-80-95	41.6	44.7 - 43.9 - 39.9	6.5@71.9	58.3	3.9	59.1	1.07

TABLE II  
SIMULATION RESULTS - CHIRP TEST

Profile	Mean Square $\times 10^{-6}$		Maximum $\times 10^{-3}$	
	↗	↘	↗	↘
Level 1	10.3	9.8	13.0	16.6
Level 2	11.9	11.4	14.7	11.8
Level 3	11.7	11.5	12.3	10.3

TABLE III  
SIMULATION RESULTS - STEP FREQUENCY CHANGES TEST

	Frequency (Hz)	N <sup>2</sup> T ( $\times 10^{-3}$ )	MV ( $\times 10^{-3}$ )
Level 1	<b>Sequence - 1</b>		
	60→70	10.2	22.6
	70→60	10.7	24.1
	60→50	14.1	21.9
	50→60	13.7	22.3
	<b>Sequence - 2</b>		
	75→85	12.2	25.5
	85→75	12.0	24.0
	75→65	9.5	21.6
	65→75	10.9	25.5
	<b>Sequence - 3</b>		
	85→95	12.7	23.8
	95→85	14.7	23.5
	85→75	12.1	26.1
	75→85	11.1	25.0
Level 2	<b>Sequence - 1</b>		
	[55-75]→[60-80]	20.1	36.9
	[60-80]→[55-75]	28.8	33.4
	[55-75]→[50-70]	28.2	27.2
	[50-70]→[55-75]	29.0	36.4
	<b>Sequence - 2</b>		
	[70-90]→[75-95]	21.8	26.4
	[75-95]→[70-90]	30.8	30.7
	[70-90]→[65-85]	20.1	30.0
	[65-85]→[70-90]	29.4	34.3
Level 3	<b>Sequence - 1</b>		
	[55-70-85]→[60-75-90]	52.0	58.3
	[60-75-90]→[55-70-85]	52.2	59.7
	[55-70-85]→[50-65-80]	53.4	59.5
	[50-65-80]→[55-70-85]	55.3	57.6
	<b>Sequence - 2</b>		
	[60-75-90]→[65-80-95]	45.2	52.9
	[65-80-95]→[60-75-90]	51.1	55.0
	[60-75-90]→[55-70-85]	50.6	61.9
[55-70-85]→[60-75-90]	51.5	59.3	