

LIST OF TABLES

2.1	Characteristics and Applications of LEO.	17
2.2	Characteristics and applications of MEO.	18
2.3	Characteristics and applications of GEO.	19
2.4	Applications of polar and sun-synchronous orbits.	20
3.1	Solution specifications.	50
3.2	Limitations table.	51
3.3	Input orbital parameters.	53
3.4	Known Orbital and Physical Constants	54
3.5	Computed Satellite Output Parameters	55
3.6	Interaction measurement mechanism.	73
3.7	Integrated system calibration measurement mechanism.	74
3.8	Reliability measurement mechanism.	75
4.1	Single file input parameters.	91
4.2	Constellation files input parameters part 1.	94
4.3	Constellation files input parameters part 2.	95
4.4	Ground station input parameters.	98
4.5	Link-Budget Input Parameters	101
5.1	Orbital parameters for propagation rate testing.	109
5.2	Manual calculation methodology and intermediate values	110
5.3	Satellite ground-track results from website testing (mean of 3 iterations.)	110
5.4	Detailed comparison of manual calculations vs. web application results.	111
5.5	Orbital parameters for train constellation simulation.	112
5.6	Comparison of expected vs. website results for forward train constellation.	112
5.7	Backward train constellation parameters.	113

5.8	Comparison of expected vs. website results for backward train constellation.	113
5.9	Time-based separation train constellation parameters.	113
5.10	Time-based separation calculation methodology	114
5.11	Comparison for time-separated forward train constellation.	114
5.12	Walker Delta constellation parameters.	115
5.13	Walker Delta calculation methodology.	115
5.14	Comparison of expected vs. website Walker Delta placement (sample satellites).	116
5.15	Baseline parameters for coverage area testing.	117
5.16	Coverage-area calculation methodology and intermediate values. . .	117
5.17	Test configuration for coverage validation.	118
5.18	Comparison of theoretical calculations and web-application results. .	119
5.19	Ground station transmitter parameters for uplink analysis.	120
5.20	Satellite receiver parameters for uplink analysis.	120
5.21	Uplink channel parameters.	121
5.22	Satellite transmitter parameters for downlink analysis.	121
5.23	User terminal receiver parameters for downlink analysis.	121
5.24	Downlink channel parameters.	122
5.25	System requirements and constellation design parameters.	122
5.26	Link budget calculation methodology.	123
5.27	Detailed comparison of uplink link budget calculations.	123
5.28	Detailed comparison of downlink link budget calculations.	124
5.29	System performance metrics comparison.	124
5.30	Satellite parameters for link testing.	126
5.31	Ground station location parameters.	126
5.32	Satellite access periods from web application (24-hour analysis.) . .	127
5.33	Statistical summary of access periods.	128
5.34	Comparison of theoretical calculations versus web application results.	128
5.35	Initial orbital parameters for comparative validation.	130
5.36	Web application ground track using analytical propagation.	131
5.37	NASA GMAT ground track using RK4 numerical integration. . . .	131
5.38	Position error analysis between analytical and numerical methods. .	132
5.39	Homepage UI/UX functionality test results (10 iterations per action).	135
5.40	Navigation menu UI/UX functionality test results (10 iterations per action).	136

5.41	Toolbar menu UI/UX functionality test results (10 iterations per action).	137
5.42	Sidebar menu UI/UX functionality test results (10 iterations per action).	138
5.43	Main content UI/UX functionality test results (10 iterations per action.)	139
5.44	New simulation creation UI/UX test results (10 iterations per entity type).	140
5.45	Cross-browser compatibility test results (10 iterations per browser).	141
5.46	Comparison of NASA GMAT and the developed web application part 1.	145
5.47	Comparison of NASA GMAT and the developed web application part 2.	146
5.48	Specification and realization comparison.	146