

Table of Contents

List of Figures	xxi
List of Tables	xxvii
Nomenclature	xxix
1 Introduction	1
1.1 The Background	1
1.2 Literature Review and the state-of-the-art	5
1.2.1 Rail Gun	6
1.2.2 Coil Gun or co-axial accelerator	7
1.2.3 LIM/ Tubular LIM/ LSM (or LPM)/ LSRM based Electromagnetic propulsion for heavy systems	8
1.2.4 Linear Synchronous (Permanent Magnet) motors	14
1.2.5 Effects of Joints in Reaction Rail on the Thrust of LIM	16
1.3 Motivation	17
1.4 Research objective	17
1.5 Thesis outline	18
2 Energy Machines	21
2.1 Introduction	21

2.2	Energy Machines	21
2.2.1	Operating Conditions of Energy Machines	24
2.2.2	Joules Limit Criterion	27
2.2.3	Thrust speed characteristics	28
2.2.4	Sheet secondary in LIM	28
2.3	Typical construction of Energy Machines	31
2.4	Windings	31
2.5	Conclusion	32
3	Design of SLIM for electromagnetic launch under constant current excitation	33
3.1	Introduction	33
3.2	Mathematical Model	33
3.3	Design of the LIM	41
3.3.1	Optimizing the Design Parameters	42
3.3.2	Experimental Results for Thrust	48
3.3.3	SLIM DESIGN	51
3.4	Conclusion	55
4	Electromagnetic launch under constant voltage excitation	57
4.1	Introduction	57
4.2	Three phase windings of SLIM for Energy Machines	57
4.3	Single-layer tooth windings with composite secondary	62
4.4	Performance of LIM for Case C, AA and CC.	68
4.5	Conclusion	75
5	Effects of Joints in Reaction Rail on the Thrust of LIM	77
5.1	Introduction	77
5.2	The 2-D FEM model of LIM	78

5.3	Effect of joint in secondary conducting sheet and back iron	79
5.3.1	Effect of joint under Dynamic condition	80
5.3.2	Effect of joint under Standstill condition	91
5.4	Effect of presence of ferromagnetic strip jutted out in the air-gap	96
5.5	Conclusions	98
6	Conclusions and Future Scopes	99
6.1	Conclusions	99
6.2	Future Work	100
References		107
List of Publications		113