

Contents

List of Publications	v
List of Figures	xi
List of Tables	xvi
1 Introduction	1
1.1 Description of a nuclear reactions	2
1.1.1 Elastic scattering	2
1.1.2 Inelastic scattering	2
1.1.3 Transfer reactions	4
1.1.4 Knock-out reactions	4
1.1.5 Compound nuclear reactions	5
1.2 Motivation of the thesis work	8
1.2.1 Study of threshold / breakup threshold anomaly	8
1.2.2 Studies of elastic, quasi elastic and transfer angular distribution involving weakly ${}^6,7\text{Li}$ and tightly ${}^{10,11}\text{B}$ projectiles ${}^{232}\text{Th}$ system	15
1.3 Objective of the thesis	18
1.4 Brief literature survey	18
1.5 Structure of the thesis	19
2 Experimental methods and theoretical Models	21
2.1 Introduction	21

2.2	Accelerator facility	22
2.2.1	The pelletron accelerator	22
2.2.2	FOTIA accelerator	25
2.3	Types of detectors	27
2.3.1	Gas detectors	27
2.3.2	Scintillator detectors	29
2.3.3	Organic scintillator detectors	30
2.3.4	Semiconductor detectors for charge particle detection	32
2.4	Interaction of charge particles with matter	34
2.5	Particle identification	35
2.6	Experimental setup	38
2.6.1	Experimental arrangement	40
2.6.2	Electronic setup description	43
2.7	Theoretical models used in the thesis	47
2.7.1	Nuclear models	47
2.7.2	Optical model	48
2.8	Method to obtain the elastic scattering cross-sections	53
2.9	Dispersion relation	55
2.10	Study of channel-coupling and polarization potential by elastic scattering	58
3	Elastic scattering and comparison of reaction cross section with fusion- fission cross section of the ${}^{6,7}\text{Li} + {}^{232}\text{Th}$ systems	59
3.1	Introduction	59
3.1.1	Present work	60
3.2	Data analysis of the elastic scattering angular distribution	64
3.2.1	Analysis using the Woods-Saxon potential	64
3.2.2	Analysis using the double-folding Sao Paulo Potential (SPP)	70
3.2.3	Dispersion Relation Analysis	74

3.3	Comparison of fission-fusion and total reaction cross section	77
3.4	Results and Discussion	80
4	Measurement of quasi elastic and transfer angular distribution of	
	$^{10,11}\text{B} + ^{232}\text{Th}$ systems	81
4.1	Introduction	81
4.2	Data analysis	85
4.2.1	Optical model analysis of quasi elastic scattering and dispersion relation	85
4.2.2	Analysis of the transfer angular distribution	93
4.3	Reduced total reaction cross section calculation	97
4.4	Results and Discussion	99
5	Summary, conclusions and future outlook	100
5.1	Summary and conclusions	100
5.1.1	Measurement of elastic scattering angular distribution and inves- tigation of TA/BTA for $^{6,7}\text{Li} + ^{232}\text{Th}$ systems.	100
5.1.2	Study of quasi elastic scattering and transfer angular distribution of $^{10,11}\text{B} + ^{232}\text{Th}$ systems.	101
5.2	Future outlook	102