

Contents

Declaration	i
Certificate	ii
Abstract	iv
Acknowledgments	ix
List of Tables	xiii
List of Figures	xv
1 A brief review of high-energy nuclear collisions	1
1.1 Introduction	1
1.2 Nucleus-nucleus collision at high-energy	5
1.2.1 Kinematics of high-energy interaction	8
1.2.2 Geometry of nucleus-nucleus collision	12
1.2.3 Stopping in nucleus-nucleus collision	15
1.2.4 Evolution of nucleus-nucleus collision	18
1.2.5 Thermodynamics of the fireball	19
1.2.6 Hydrodynamics of the fireball	23
1.2.7 QCD phase diagram	28
1.3 QGP signals	30
1.4 Multiparticle production	34
1.4.1 Multiplicity distribution	34
1.4.2 Pseudorapidity distribution	36
1.4.3 Transverse momentum distribution	37
1.4.4 Azimuthal angle distribution	38
2 Experiment and simulation	45
2.1 Introduction	45
2.2 Properties of emulsion tracks	46
2.3 Scanning of emulsion plates	50
2.4 Measurement methods	51
2.5 Data characteristics	54

2.5.1	Event selection	55
2.5.2	Track classification	55
2.6	Advantages and disadvantages of emulsion experiments	56
2.7	Simulation	58
2.7.1	Modeling Bose-Einstein correlation	61
2.7.2	Sampling the simulated events	64
2.8	Basic distributions	65
3	Intermittency and related issues	69
3.1	Introduction	69
3.2	Literature review	71
3.3	Scaled factorial moments	73
3.3.1	Intermittency in $1d$	76
3.3.2	Intermittency in $2d$	83
3.4	Factorial correlators	88
3.5	Oscillatory moments	92
3.6	Erraticity moments	94
3.7	Summary	102
4	Multifractality and related issues	109
4.1	Introduction	109
4.2	Literature review	111
4.3	Hwa's multifractal moment	113
4.4	Takagi's multifractal moment	118
4.5	Detrended multifractal moments	121
4.5.1	Detrended methods and multifractal parameters	124
4.5.2	Results of MFDFA and MFDMA methods	125
4.6	Visibility graph and sandbox algorithm	131
4.6.1	Visibility graph	131
4.6.2	Degree distribution of visibility graph	133
4.6.3	Sandbox method of multifractality analysis	136
4.7	Summary	145
5	Ring-jet structure and wavelet analysis	151
5.1	Introduction	151
5.2	Literature review	153
5.3	Ring and jet-like structures	154
5.4	Wavelet analysis	161
5.5	Summary	169
6	Multiplicity fluctuation and forward-backward multiplicity correlation	172
6.1	Introduction	172
6.2	Literature review	173

6.3	Roughness in η -distribution	175
6.4	Forward-backward multiplicity correlation	177
6.5	ω -measure	182
6.6	Φ -measure	183
6.7	Summary	186
Concluding remarks		190
List of publications		196