Supersymmetric black holes as probes of quantum gravity
Arshiwalla, X.D.

Citation for published version (APA):
Arsiwalla, X. D. (2010). Supersymmetric black holes as probes of quantum gravity

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (http://dare.uva.nl)
Contents

1 Introduction

2 A Brief History of Black Holes in String Theory
   2.1 From Information to Thermodynamics
   2.2 BPS Black Holes
      2.2.1 The Entropy Function Formalism
   2.3 Holography
      2.3.1 A Principle of Quantum Gravity
      2.3.2 The Maldacena Conjecture
      2.3.3 AdS/CFT for Other Compactifications
      2.3.4 The OSV Conjecture
   2.4 Higher Dimensions & Multiple Centers
      2.4.1 Black Rings & Chern-Simons Charge Shifts
      2.4.2 4D/5D Connection & Multi-Center Geometries

3 5D Entropy Functions with Chern-Simons Terms
   3.1 The Black Ring Entropy Function & Spectral Flow
   3.2 The 5D Black Hole Entropy Function
   3.3 Charge Comparison: 4D & 5D Approaches
   3.4 Black Hole - Black Ring Interpolation
### CONTENTS

3.5 Conclusions and Discussion ........................................ 57

4 The 4D/5D Map and Multi-Center Geometries .................. 63

4.1 A Glance at 4D Black Hole Fragmentation ....................... 67
4.2 Black Ring from 4D/5D Duality ...................................... 69
4.3 Black Ring Fragmentation & Charge Splitting in 5D ............ 73

4.3.1 Charges & Harmonic Functions of Fragmenting Black Rings . 74
4.3.2 Angular Momenta from Black Ring Fragmentation .......... 79

4.4 Geometric Interpretation using Split-Spectral Flows ............ 83

4.4.1 Electric Charges and Split-Spectral Flows .................... 86
4.4.2 Angular Momenta and Split-Spectral Flows ................... 89

4.5 Conclusions and Discussion ......................................... 90

5 Continuum Solutions & Black Hole Levitrons .................... 93

5.1 Black Hole Levitation in Constant External Fields ............ 94
5.2 Continuum Limit of Multi-Center Solutions ..................... 97

5.3 Towards a Black Hole Levitron ..................................... 99

5.3.1 Comparison to a Levitron ...................................... 103

5.4 Conclusions and Discussion ......................................... 104

6 Testing OSV on a 2D q-Yang-Mills Dual ......................... 107

6.1 The Douglas-Kazakov Transition .................................. 110

6.2 The Phase Diagram of q-Deformed 2D YM ....................... 113

6.3 Instanton Analysis .................................................. 121

6.4 The Two-Cut Solution ............................................... 126

6.5 Conclusions and Outlook ............................................ 133

Summary ............................................................................. 149
CONTENTS

Samenvatting 153

Acknowledgements 157