CONTENTS

TITLE PAGE I
ABSTRACT II
ACKNOWLEDGEMENTS III
CONTENTS IV

CHAPTER 1: INTRODUCTION 1
1.1: The vacuum spark 1
1.2: Hot spot formation in a vacuum spark discharge 3
1.3: The outline of this thesis 5

CHAPTER 2: THE VACUUM SPARK SYSTEM (UMVS) 7
2.1: Trigger system 7
2.2: The experimental setup 11

CHAPTER 3: DIAGNOSTICS AND INSTRUMENTATION 15
3.1: Measurement of the dl/dt signal 15
3.2: PIN diode as an x-ray detector 16
3.3: Soft x-ray detector 21
3.4: X-ray imaging 24
3.4.1: X-ray pinhole camera 24
3.4.2: X-ray slit-wire camera 28
3.5: Convex crystal x-ray spectrometer 32
3.6: X-ray transmission 35

IV
CHAPTER 4: QUALITATIVE STUDY ON THE DISCHARGE CHARACTERISTICS OF UMVS

4.1: Characteristics of each setup

4.2: Characteristics of various cathode aperture with same A-C gap

4.3: Characteristics of various A-C gap with same cathode aperture

4.4: Discussion and summary

CHAPTER 5: STUDY OF THE PLASMA X-RAY EMISSION

5.1: Determination of plasma parameters

5.1.1: Determination of electron temperature using the two-foil absorption method

5.1.2: Estimation of electron density

5.1.3: Calculation of emission spectrum and the total energy emitted

5.2: The steady-state corona model

5.3: X-ray emission from the vacuum spark discharge

5.4: Estimation of hot spot diameter and electron density

5.5: Calculated emission power and energy

5.6: Spectral analysis of the discharge

CHAPTER 6: DISCUSSION AND CONCLUSION

6.1: Discussion

6.2: Conclusion

6.3: Suggestions for future work

REFERENCES