PRECISE ^{82}RB INFUSION SYSTEM FOR CARDIAC PERFUSION MEASUREMENT USING 3D POSITRON EMISSION TOMOGRAPHY

by

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A thesis submitted to the

Faculty of Graduate and Postdoctoral Studies

in partial fulfillment of the requirements for the degree of

Master of Applied Science

in Electrical and Computer Engineering

Ottawa-Carleton Institute for Electrical and Computer Engineering
School of Information Technology and Engineering (Electrical & Computer Engineering)

Faculty of Engineering
University of Ottawa

February, 2005

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Credits

I wish to extend my gratitude to Robert deKemp and Andy Adler for guiding me through this project. Their mentoring, support, and friendship have made this a memorable experience.

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Abstract

Introduction: Quantitative myocardial perfusion measurements using positron emission tomography (PET) can be improved by introducing diagnostic tracers at a constant rate of activity. ^{82}Rb can be produced cost effectively by eluting a ^{82}Sr/^{82}Rb generator with saline; however, it exhibits an undesirable, but reproducible, activity rate variation. Previously, a threshold-comparison algorithm controlled saline flow through either generator or bypass line using an on/off valve, to simulate constant-activity elutions. **Methods:** In this work a mechanical system and control software is developed to control tracer infusion. The valve is cycled at 5Hz and its duty-cycle controlled by a predictive-corrective algorithm in order to reduce measurable activity rate fluctuations. **Results:** Precision increases (RMS error improves from >40% to ~14%) as does the range of relative activities that can be eluted from the generator. **Conclusion:** The proposed method demonstrates superior precision and flexibility. However, further tests must be conducted to ensure that the precision of the system does not deteriorate over time.

Key Words: Rubidium-82, ^{82}Sr/^{82}Rb generator, cardiac, perfusion, positron emission tomography, PET, predictive control.

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