

## The Upgraded $8\pi$ Gamma-Ray Spectrometer: a Versatile Tool for Nuclear Beta-Decay Studies at TRIUMF-ISAC

G. C. Ball<sup>1</sup>, T. Achtzehn<sup>1</sup>, D. Albers<sup>1</sup>, J. S. Al Khalili<sup>2</sup>, C. Andreoiu<sup>3</sup>, A. Andreyev<sup>1</sup>, S. F. Ashley<sup>2</sup>, R. A. E. Austin<sup>4</sup>, J. A. Becker<sup>5</sup>, P. Bricault<sup>1</sup>, S. Chan<sup>1</sup>, R. S. Chakrawarthy<sup>1</sup>, R. Churchman<sup>1</sup>, H. Coombes<sup>1</sup>, E. S. Cunningham<sup>1</sup>, J. Daoud<sup>1</sup>, M. Domsbky<sup>1</sup>, T. E. Drake<sup>6</sup>, B. Eshpeter<sup>1</sup>, P. Finlay<sup>3</sup>, P. E. Garrett<sup>1,3</sup>, C. Geppert<sup>7</sup>, G. F. Grinyer<sup>3</sup>, G. Hackman<sup>1</sup>, V. Hanemaayer<sup>1</sup>, B. Hyland<sup>3</sup>, G. A. Jones<sup>2</sup>, K. A. Koopmans<sup>1,8</sup>, W. D. Kulp<sup>9</sup>, J. Lassen<sup>1</sup>, J.P. Lavoie<sup>10</sup>, J.R. Leslie<sup>11</sup>, J. A. Macdonald<sup>1\*</sup>, C. Mattoon<sup>12</sup>, D. Melconian<sup>13</sup>, A. C. Morton<sup>1</sup>, C. J. Osborne<sup>1</sup>, C. J. Pearson<sup>1</sup>, M. Pearson<sup>1</sup>, A. A. Phillips<sup>3</sup>, P. H. Regan<sup>2</sup>, J. J. Ressler<sup>14</sup>, F. Sarazin<sup>1,12</sup>, M. A. Schumaker<sup>3</sup>, J. Schwarzenberg<sup>15</sup>, H. C. Scraggs<sup>1</sup>, M. B. Smith<sup>1</sup>, C. E. Svensson<sup>3</sup>, J. J. Valiente-Dobon<sup>3</sup>, J. C. Waddington<sup>8</sup>, P. M. Walker<sup>2</sup>, K. Wendt<sup>7</sup>, S. J. Williams<sup>2</sup>, J. L. Wood<sup>9</sup>, E. F. Zganjar<sup>16</sup>

<sup>1</sup>TRIUMF, 4004 Wesbrook Mall, Vancouver, B. C., V6T 2A3, Canada

<sup>2</sup>Department of Physics, University of Surrey, Guildford, Surrey, GU2 7XH, UK

<sup>3</sup>Department of Physics, University of Guelph, Guelph, ON, N1G 2W1, Canada

<sup>4</sup>Dept. of Astronomy and Physics, St. Mary's University, Halifax, NS, B3H 3C3, Canada

<sup>5</sup>Lawrence Livermore National Laboratory, Livermore, CA 94551, USA

<sup>6</sup>Department of Physics, University of Toronto, Toronto, ON, M5S 1A7, Canada

<sup>7</sup>Johannes Gutenberg-Universitat Mainz, Staudinger Weg 7, 55099 Mainz, Germany

<sup>8</sup>Dept. of Phys. and Astronomy, McMaster University, Hamilton, ON, L8S 4M1, Canada

<sup>9</sup>School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, USA

<sup>10</sup>Department de Physique, Universite Laval, Quebec, QC, G1K 7P4, Canada

<sup>11</sup>Department of Physics, Queen's University, Kingston, ON, K7L 3N6, Canada

<sup>12</sup>Department of Physics, Colorado School of Mines, Golden, CO, 80401, USA

<sup>13</sup>Department of Physics, Simon Fraser University, Burnaby, B. C. V5A 1S6, Canada

<sup>14</sup>Department of Chemistry, Simon Fraser University, Burnaby, B. C., V5A 1S6, Canada

<sup>15</sup>Dept of Nuclear Physics, Univ. of Vienna, Währingerstrasse 17, Vienna, 1090 Austria

<sup>16</sup>Dept of Phys. and Astronomy, Louisiana State Univ., Baton Rouge, LA, 70803, USA

High-resolution gamma-ray spectroscopy is an essential tool needed to fully exploit the unique, high-quality beams available at the next generation of radioactive ion beam facilities such as the TRIUMF Isotope Separator and Accelerator (ISAC). The  $8\pi$  spectrometer, which consists of 20 Compton-suppressed HPGe detectors, has recently been reconfigured [1] for a vigorous research program in weak interaction and nuclear structure physics. With the addition of a variety of ancillary detectors it has become the world's most powerful device dedicated to  $\beta$ -decay studies. The sensitivity of the array was improved significantly by the addition of SCEPTAR (Scintillating Electron Positron Tagging Array), a compact  $\sim 4\pi$  array of 20 plastic scintillator detectors. An integral part of SCEPTAR is a moving tape collector system to remove long-lived daughter activities from the focus of the array. The upstream half of SCEPTAR can be replaced by a pentagonal array of SiLi detectors (PACES) for conversion electron spectroscopy measurements. Finally a ten-element BaF<sub>2</sub> array is under development that will provide fast timing for lifetime measurements. An overview of the apparatus, recent high-precision decay measurements for the superallowed emitters <sup>62</sup>Ga and <sup>18</sup>Ne and new results on the beta decay of the neutron-halo nucleus <sup>11</sup>Li will be presented.

\* Deceased

[1] C.E. Svensson *et al.*, Nucl. Instr. and Meth. **B204**, 660 (2003).