REPORT TO THE AAPM THERAPY PHYSICS COMMITTEE

March 16, 2009 - July 15, 2009

a) Administrative

Two RPC staff members have submitted their resignations in recent weeks and will be retiring at the end of August. Joye Roll, CMD, has worked at the RPC for 28 years and has been the Dosimetry Supervisor for the last 17 years. Cindy Davis is also a dosimetrist and has worked at the RPC for 17 years. Both Joye and Cindy are well known to clinical trials participants from their frequent interactions with institutions in regards to chart reviews and credentialing activities.

A decision will be made in the next few weeks about how to adjust from these retirements.

b) Studies and Results

The RPC presently monitors 1,667 megavoltage therapy sites in North America, Europe, and elsewhere in the world, that participate in cooperative group clinical trials funded by the NCI. The cooperative groups monitored include ACOSOG, ACRIN, CALGB, COG, ECOG, GOG, NABTT, NCCTG, NSABP, RTOG and SWOG. We also communicate regularly with the Cancer Trials Support Unit (CTSU) to assure that institutions participating through their programs are properly monitored. During 2007, the RPC reached an agreement with the NCI and the EORTC to make the RPC’s monitoring capability available to EORTC members, for a fee that covers our costs. Today, at least 45 EORTC members are taking advantage of this service.

International Harmonization:

A number of US study groups are looking overseas for participants in clinical trials. As a result, the RPC now monitors 78 international institutions that are members of US study groups. This number is expected to increase in coming years. In addition, US study groups are establishing cooperative relationships with international study groups, and opening trials through these groups. For example, the RTOG and the EORTC are about to open RTOG 0848, and the NCCTG and EORTC will open NCCTG 0577. For now, international participants in US NCI-funded clinical trials are expected to meet all the same auditing requirements as US members. However, it may be that some of the quality assurance offices in other countries might be able to provide this service in a manner that is considered equivalent to the RPC’s QA support. To investigate the possibility of such collaboration, and to evaluate whether or not auditing procedures can be harmonized, a number of meetings have been held between the RPC and other groups:

Representatives of the EORTC’s Radiation Oncology Group (ROG) attended the RTOG meetings in January and June of this year, and met with members of the Advanced Technology Consortium (ATC) RPC, ITC and RTOG Headquarters QA office.

Dr. Ibbott attended the International Conference on Advanced Radiation Oncology (ICARO), held by the IAEA in Vienna in April. Other representatives of the ATC were in attendance as well as participants from ROG, the Trans-Tasman Radiation Oncology Group (TROG), the Japanese Clinical Oncology Group (JCOG), the IAEA, the RTOG, and the NCI. As a result of this meeting, grant applications to the NCI and to the IAEA have been prepared to support this international collaboration.

While in Belgium for another purpose, Dr. Ibbott visited the headquarters of the EORTC and met with Akos Bulyban, the medical physicist member of the headquarters staff and a member of the ROG. Dr. Ibbott also met with Suzanne Radtke, the NCI’s liaison officer in Brussels. A follow-up meeting is scheduled for late August, in conjunction with the ESTRO conference.

On-Site Dosimetry Reviews: RPC physicists continue to make visits to US study group members to conduct on-site dosimetry reviews. During the last several years, additional procedures including measurement of small fields were added, to help evaluate IMRT.

In response to a mandate from the NCI, the RPC has developed procedures and assembled the equipment to conduct on-site dosimetry visits to proton facilities. The first complete visit was conducted in April and June to the F. H. Burr Proton Therapy Center at Massachusetts General Hospital. The report of this visit is presently in review. A visit to the Proton Therapy Center-Houston at MDACC is being conducted piece-meal as the procedures are developed.

TLD: During calendar 2008, 14,188 beams (distinct energies) were monitored with TLD at the monitored institutions. This number has increased steadily over the years. During the past 8 years, 4% of the irradiated TLD received doses that disagreed with the institution’s stated dose by more than 5%. However, these errors were distributed over a larger number of institutions; during the
past 8 years, on average, about 18% of the monitored US institutions had at least one beam outside our 5% (or 5 mm in depth dose) criteria for agreement. See Figure 1.

- During the last two years, the RPC has implemented its TLD system to evaluate proton beams. More than 30 irradiations with proton beams of many different ranges were conducted to commission the system. Measurements from routine monitoring of proton facilities are shown in Figure 2. Several outliers are apparent.

- During the last two years, the RPC has completed an evaluation of optically-stimulated luminescence (OSL) as a replacement for TLD. A graduate student, Jaclyn Homnick presented these data at the AAPM annual meeting in July 2008. The system has since been commissioned, and preliminary shipments of OSLs will begin soon. The RPC has a poster presentation at the 2009 AAPM meeting describing the results.

- Credentialing Processes: The RPC participates in the credentialing of institutions for protocols involving advanced technologies including brachytherapy, IMRT, stereotactic radiosurgery (SRS) and stereotactic body radiation therapy (SBRT). This activity is partially supported by a subcontract from the Advanced Technologies for Clinical Trials grant. For IMRT and SBRT, credentialing includes irradiation of an anthropomorphic phantom provided by the RPC that contains anatomic structures and dosimeters. Most data have been acquired with the head & neck phantom, and to date the phantom has been irradiated more than 650 times. About 25% of the institutions irradiating the phantom failed to meet the RPC/RTOG criteria (7%/4mm). The pass rate has improved somewhat in recent years, which is presumed to be at least in part due to improvements to Pinnacle software that facilitates the modeling of beam data. Figure 3 shows the number of phantoms shipped each year, with data for the first six months of 2009.

- To enable the RTOG to credential institutions for a spine-metastases protocol, the RPC developed a version of the lung phantom with a spine structure containing a PTV and appropriate OARs. Three models were built and have been distributed to institutions for evaluation. See Figure 4.

- Criticisms of RPC Phantoms: On several occasions over the years, institutions that have failed have tried to find fault with the phantom credentialing process. The RPC commissions every phantom built (now 60 phantoms in total) and conducts extensive testing of each new model. For example, the lung phantom has been irradiated at least 50 times at MDACC and other sites, under RPC control, to evaluate the consistency and accuracy of its performance. These irradiations have been consistent to well within the criteria established for passing, and support our confidence in the results. In contrast, institutions that fail sometimes point to measurements with a 2D-array QA device (often irradiated at one gantry angle), or measurements with a 0.6 cc chamber as evidence that there is a problem with the phantom. We have demonstrated through interviews that
many failures are due to inadequate beam modeling or to overly-modulated IMRT treatments.

- **CERR Software:** Since early 2007, the RPC has funded a subcontract with Dr. Joe Deasy at Washington University to develop software to enable the RPC to perform a 2D comparison, with a gamma-index analysis, of irradiations of our phantoms. While the software continues to develop, it is now being used routinely.

- **Phantom for Proton Beams:** As part of the mandate from the NCI, the RPC is investigating modifications to the anthropomorphic phantoms to make them suitable for proton beams. The first phantom to be modified is the pelvic phantom, for which a new dosimetry insert has been manufactured for the TLD and film dosimetry systems. Preliminary results show good agreement with the planning system.

- **Low-Energy Brachytherapy Sources:** Dr. Ibbott represents the RPC on a subcommittee and several task groups appointed by the AAPM to address the use of new sources. The RPC acts as a clearinghouse of information and makes available on a web site a list of sources currently meeting the AAPM dosimetric prerequisites.

- **Outreach:** Drs. Ibbott and Followill were presenters at the AAPM Summer School in Colorado Springs in July. In addition, Dr. Ibbott made presentations at meetings of the SCACAPM, the IAEA International Conference on Advanced Radiation Oncology (ICARO), the Saudi Arabian Medical Physics Society, and several study group meetings. Drs. Ibbott and Followill, Mr. Aguirre, and Ms. Alvarez have participated in IAEA activities related to RT QA and audits this year.

- **Planning Workstation:** An educational grant from Varian Corporation enabled the RPC to acquire an Eclipse treatment planning workstation. The TPS is being used to re-calculate institutions' treatment plans for verification.

- **Database:** An agreement was reached with ASTRO to help support an expansion of the RPC database to include all radiotherapy facilities in the US. During the past months, a staff member has contacted all facilities identified by Ballas et. al. (Int. J. Radiation Oncology Biol. Phys., Vol. 66, No. 4, pp. 1204–1211, 2006). This process has eliminated some errors in the work by Ballas, and has identified many additional facilities, with the result that the database now contains 2400 US facilities.

- **Webpage:** The RPC webpage continues to be updated. The most valuable feature continues to be credentialing information.

- **Clinical Advisory Committee:** A group of 5 radiation oncologists was formed as a clinical advisory committee. The Committee is contacted when questions arise regarding RPC operations.

### Participant Fee:

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<th>Description</th>
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<tr>
<td>Institutions invoiced FY09</td>
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<tr>
<td>No XRT/Canceled/Inactive</td>
<td>5</td>
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<td>Invoiced by RDS</td>
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<tr>
<td>Institutions paid</td>
<td>1394</td>
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### Publications and Abstracts

**Publications Accepted/Published (2005-present):**


Abstracts


**Invited Articles**


**Letters to the Editor/Newsletters**


**Book Chapters**


PRESENTATIONS
INTERNATIONAL ACTIVITIES
Geoffrey Ibbott attended the TROG Annual Scientific Meeting, NSW, Australia, March 25-28, 2009.

Geoffrey Ibbott attended the ICARO Conference, Vienna, Austria, April 27-29, 2009.


David Followill attended an IAEA Consultants’ Meeting, Vienna, Austria, June 8-12, 2009.


Geoffrey Ibbott and David Followill gave presentations at the AAPM Summer School, Colorado Springs, CO, June 21-25, 2009.

Geoffrey Ibbott gave a presentation at the RTOG Meeting, Chicago, IL, June 25, 2009.

Geoffrey Ibbott attended the IAEA Consultants’ Meeting, Vienna, Austria, July 13-17, 2009.

VISITS TO INSTITUTIONS

2. J. Francisco Aguirre performed radiological physics measurements and reviewed patient dosimetry at the University of California Davis Medical Center, Sacramento, CA, March 21-28, 2009.


5. Geoffrey Ibbott performed radiological physics measurements and reviewed patient dosimetry at the NE Proton Therapy Center, Boston, MA, April 20-23, 2009.

6. Ryan Grant performed radiological physics measurements and reviewed patient dosimetry at the NE Proton Therapy Center, Boston, MA, April 20-23, 2009.

7. Jessica Leif performed radiological physics measurements and reviewed patient dosimetry at the University of Kentucky-Maysville Radiation Treatment Center and the University of Kentucky Clinic, Maysville and Morehead, KY, April 27-30, 2009.


11. Geoffrey Ibbott performed radiological physics measurements and reviewed patient dosimetry at the NE Proton Therapy Center, Boston, MA, June 8-11, 2009.

12. Ryan Grant performed radiological physics measurements and reviewed patient dosimetry at the NE Proton Therapy Center, Boston, MA, April 20-23, 2009.

13. Paola Alvarez performed radiological physics measurements and reviewed patient dosimetry at University of Texas SW, Dallas, TX, June 29-July 2, 2009.

MEETINGS ATTENDED
(March 16, 2009 – July 15, 2009)


Respectfully submitted,

Geoffrey S. Ibbott, Ph.D.
EXPENDITURES OF THE RADIOLOGICAL PHYSICS CENTER
(RPC Grant and the Advanced Technology Consortium Subcontract)
March 16, 2009 – July 15, 2009

PERSONNEL (salaries, fringe benefits): $844,808.98
7 Physicists, 1 Supervisor of Quality Assurance Dosimetry Services, 1 Sr. QA Dosimetrist, 2 QA Dosimetrist, 1 Sr. Physics Assistant, 1 Physics Assistant, 1 Informatics Manager, 1 Database Administrator, 1 Programmer Analyst I, 1 Radiological Physics Supervisor, 4 Radiological Physics Technicians, 1 Coordinator of Research Data, 1 Department Administrator, 1 Office Manager, 1 Sr. Administrative Assistant, 1 Administrative Assistant, 1 Sr. Secretary, 1 Secretary and 5 Graduate Research Assistants.

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<thead>
<tr>
<th>Visits:</th>
<th>Date:</th>
<th>Institution/Location</th>
<th>Amount</th>
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<td>Aguirre, Francisco</td>
<td>3/21-28/09</td>
<td>Univ. of California Davis Med. Ctr., Sacramento, CA</td>
<td>$1,280.68</td>
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<td>Aguirre, Francisco</td>
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<td>Columbia Presbytarian Med. Ctr., New York, NY</td>
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<td>Alvarez, Paola</td>
<td>3/16-18/09</td>
<td>Riverside Cancer Center, Newport News, VA</td>
<td>$716.08</td>
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<td>Alvarez, Paola</td>
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<td>Univ. of Texas SW, Dallas, TX</td>
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<td>NE Proton Therapy Ctr., Boston, MA</td>
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**Total** $10,671.03

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<td>Aguirre, Francisco</td>
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<td>Biagas, Dorene</td>
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<td>NIH Regional Seminar, Las Vegas, NV</td>
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<td>Davis, Cynthia</td>
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<td>NSABP Meeting, San Diego, CA</td>
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<td>RTOG Meeting, Chicago, IL</td>
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<td>Leif, Jessica</td>
<td>7/15-18/09</td>
<td>GOG Meeting, Baltimore, MD</td>
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<td>Roll, Joye</td>
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<td>GOG Meeting, Baltimore, MD</td>
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<td>Siller, Elizabeth</td>
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<td>NIH Regional Seminar, Las Vegas, NV</td>
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<td>Wells, Nathan</td>
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<td>SWAAPM Spring Meeting 2009, San Antonio, TX</td>
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**Total** $11,136.46

CONSULTANTS $21,087.37

SUPPLIES: $124,285.24

Office supplies, laboratory and record keeping, TLD, TLD supplies, software, equipment, etc.
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<td>copying, computer fees, equipment</td>
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<td>repair, registration fees, tuition</td>
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<td>freight/delivery, etc.</td>
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<td>SPACE RENTAL:</td>
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**Total Expenditures March 16, 2009 – July 15, 2009**

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<td>Indirect costs @ 26%</td>
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### RPC Report to TPC July 2009

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<th>Special Projects</th>
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<td>National Surgical Adjuvant Breast and Bowel Project NSABP</td>
<td>RPC</td>
<td>IMRT Guidelines, Partial Breast RT Credentialing</td>
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<tr>
<td>North Central Cancer Treatment Group NCCTG</td>
<td>RPC</td>
<td>Rapid Review of Lung Study, 3D CRT Credentialing, Stereotactic Phantom, IMRT Credentialing</td>
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<td>Southwest Oncology Group SWOG</td>
<td>QARC</td>
<td>3D Benchmark Case</td>
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<td>Clinical Trial Support Unit CTSU</td>
<td>QARC, RPC, RTOG</td>
<td>RPC Institution List, RTF Numbers, TLD Monitoring, Review RT Facility Questionnaire</td>
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<tr>
<td>American College of Radiology Imaging Network ACRIN</td>
<td>N/A</td>
<td>Participate in the development of guidelines for quality assurance of institution participating in ACRIN CT Dose Measurements</td>
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<tr>
<td>American College of Surgeons Oncology Group ACOSOG</td>
<td>QARC</td>
<td>RPC Institution List</td>
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<td>Cancer and Acute Leukemia Group B CALGB</td>
<td>QARC</td>
<td>TRUS Prostate Approval Collaboration</td>
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<tr>
<td>Children’s Oncology Group COG</td>
<td>QARC</td>
<td>3D Benchmark Case, IMRT Benchmark Case/Phantom, CT/MRI Fusion Benchmark, International Participation</td>
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<td>Eastern Cooperative Oncology Group ECOG</td>
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<td>European Organization for Research and Treatment of Cancer EORTC</td>
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<td>Annual TLD Auditing, Phantom Credentialing</td>
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