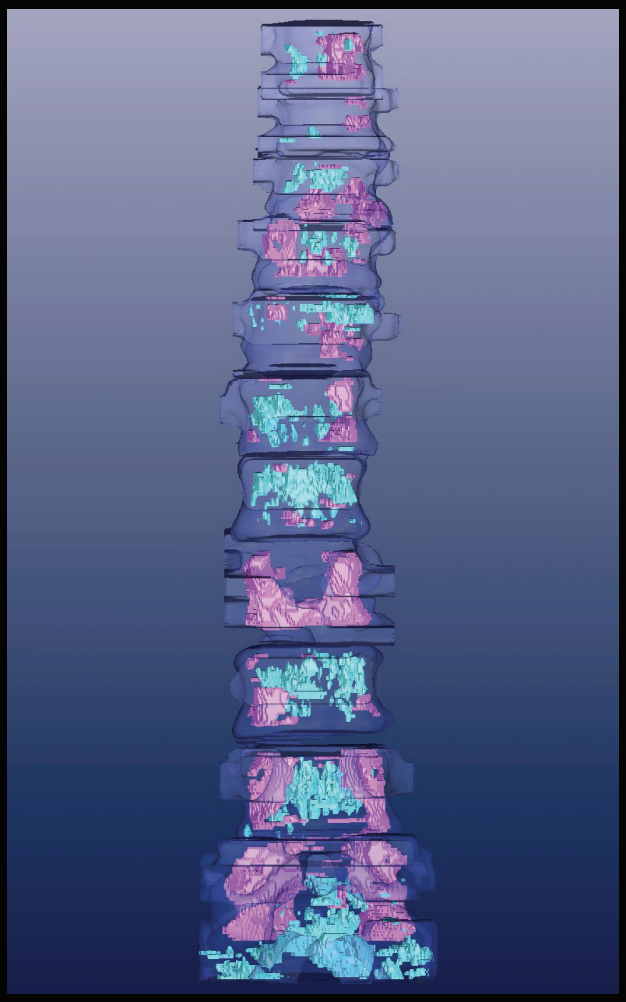
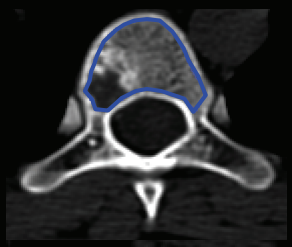
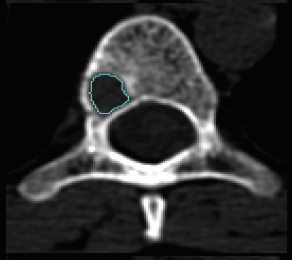
InterACTIONS

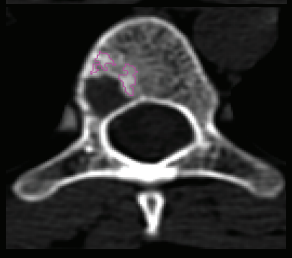
CANADIAN MEDICAL PHYSICS NEWSLETTER
Le BULLETIN CANADIEN de PHYSIQUE MÉDICALE

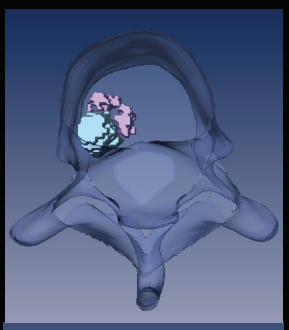
Automated characterization of spinal metastases

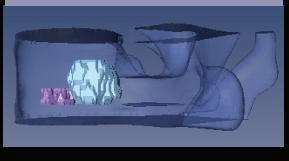


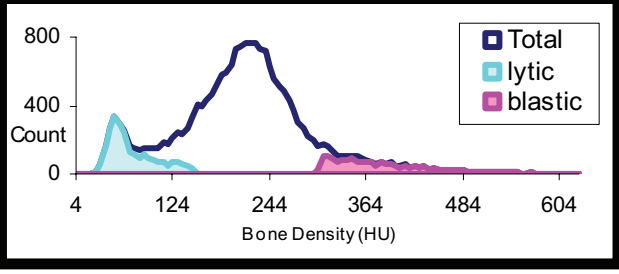












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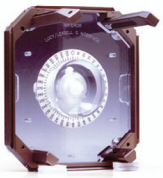
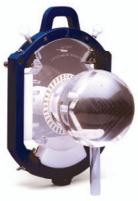
54 (3) juillet/July 2008

Tools of the Trade





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InterACTIONS

Volume 54, Number 3– juillet/July 2008

Cover Image

The vertebral column is the most frequent site of metastatic involvement of the skeleton, with up to 1/3 of all cancer patients developing tumours in the spine. The occurrence of spinal metastases causes considerable consequences for patients both in terms of morbidity and mortality. Currently patients with metastatic disease in bone are excluded from the majority of clinical trials assessing novel therapies due to a perceived inability to accurately quantify tumour burden, disease progression and treatment effect in bony structures. A highly automated 3D method was developed to accurately segment tumour-bearing vertebrae using demons deformable image registration and level set methods. By maintaining morphology of an atlas, the demons-level set composite algorithm is able to accurately differentiate between trans-cortical tumours and surrounding soft tissue of identical intensity. The algorithm successfully segments both the vertebral body and trabecular centrum of tumour-involved and healthy vertebrae. Automated histogram based analyses applied to the segmented vertebrae allow quantification of disease burden. Healthy vertebral CT scans used to establish a baseline characterization vertebral trabecular bone yield Gaussian distributions with intrapatient vertebral level similarity observed, indicating that a patient-specific healthy vertebral body histogram is able to characterize healthy trabecular bone throughout that individual's thoracolumbar spine. Metastatically involved vertebrae with focal lesions allowed the determination of the characteristics of the lytic and blastic bone voxels relative to the healthy bone and ideal lytic and blastic segmentation thresholds. Using the optimized thresholds to segment tumour tissue, a quantitative characterization of disease is possible to calculate tumour volumes, disease severity, and temporal progression or treatment effect throughout a patient's spine. This highly automated histogram-based method for characterizing spinal metastases shows great potential in extending the quantitative capacity of CT-based radiographic evaluations.

Image provided by Cari Whyne, Sunnybrook Health Sciences Toronto ON

COMP EXECUTIVE

Chair:
Jason Schella, M.Sc., FCCPM
Nova Scotia Cancer Centre
5820 University Avenue
Halifax, NS B3H 1V7
Tel: (902) 473-6011
Fax: (902) 473-6120
Jason.schella@cdha.nshealth.ca

Past Chair:
Stephen Pistorius, Ph.D.
CancerCare Manitoba
675 McDermot Avenue
Winnipeg, MB, R3E 0V9
Tel: (204) 787-4134
Fax: (204) 775-1684
stephen.pistorius@cancercare.mb.ca

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Secretary:
Patrick Rapley Ph.D., FCCPM
Medical Physics Program,
Thunder Bay Regional Health Sciences
980 Oliver Road
Thunder Bay, ON P7B 6V4
Tel: (807) 684-7327
Fax: (807) 684-5801
rapleyp@tbh.net

Treasurer:
Maryse Mondat, M.Sc., FCCPM
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5415 boulevard de l'Assomption
Montréal, PQ, H1T 2M4
Tel: (514) 252-3425
Fax: (514) 252-3558
Mmondat.hmr@ssss.gouv.qc.ca

Councillor for Communications:
Michelle Cottreau, M.Sc.
Queen Elizabeth Hospital
60 Riverside Dr. Box 6600
Charlottetown, PE, C1A 8T5
Tel: (902) 894-0203
Fax: (902) 894-2276
mjcottreau@ihis.org

Councillor for Professional Affairs:
Joseph E. Hayward, Ph.D., MCCPM
Dept. of Medical Physics,
Juravinski Cancer Centre,
699 Concession Street
Hamilton ON L8V-5C2
Tel: (905) 387-9711 Ext: 67040
Fax: (905) 575-6330
Joe.Hayward@hrcc.on.ca

CCPM BOARD

President:
Dick Drost, Ph.D., FCCPM
Nuclear Medicine Department
St. Joeseph's Health Care London
268 Grosvenor Street
London, ON. N6A 4V2
Tel: (519) 646-6100 x64141
FAX: (519) 646-6135
drost@lri.sjhc.london.on.ca

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The Ottawa Hospital
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Ottawa, ON. K1H 8L6
Tel: (613) 737-7700 x70010
FAX: (613) 247-3507
dawilkins@ottawahospital.on.ca

Registrar:
Wayne Beckham, Ph.D., FCCPM
Vancouver Island Cancer Centre
2410 Lee Street
Victoria, BC, V8R 6V5
Tel. (250) 370-8225
FAX: (250) 370-8697
wbeckham@bccancer.bc.ca

Chief Examiner:
Michael Evans, M.Sc., FCCPM
McGill University Health Centre
1650 avenue Cedar
Montréal, QC, H3G 1A4
Tel. (514) 934-8052
FAX: (514) 934-8229
mevans@medphys.mcgill.ca

Deputy Chief Examiner:
Robert Corns, Ph.D., FCCPM
BC Cancer Agency, Fraser Valley Centre
Medical Physics
13750-96 Avenue
Surrey, BC V3V 1Z2
Tel: (604) 930-4055 x4558
Fax: (604) 930-4042
rcorns@bccancer.bc.ca

Secretary-Treasurer:
Sherry Connors., M.Sc., FCCPM
Dept. Medical Physics
Cross Cancer Institute
11560 University Ave
Edmonton, AB T6G 1Z2
Tel: (780) 432-8775
Fax: (780)-432-8615
sconnors@ualberta.ca

General Board Members:
John Rowlands, Ph.D., FCCPM
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COMP/CCPM Office

COMP Secretariat
COMP/CCPM Office
P.O. Box 72024
Kanata North RPO
Ottawa, ON, K2K 2P4
Canada
Telephone:(613) 599-1948
Facsimile: (613) 599-1949
E-mail: admin@medphys.ca
Website: www.medphys.ca

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Parminder S. Basran, Ph.D., MCCPM
Sunnybrook Health Sciences Centre
2075 Bayview Avenue, TG-217
Toronto, ON, M4N 3M5
Email: parminder.basran@sunnybrook.ca
Phone: (416) 480-6100 Ext: 1087
Fax: (416) 480-6801

Members of the Editorial Board include:

Boyd McCurdy:
boyd.mccurdy@cancercare.mb.ca

Michelle Cottreau: mjcottreau@ihis.org

Please submit stories in Publisher 98, Word 6.0, Word 97, or ASCII text format. Hardcopy submissions will be scanned to generate an electronic document for inclusion in the Newsletter. Images in Tiff format at 300 dpi resolution are preferred.

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Message from the CCPM President:

The gain in professional knowledge and improved competency and patient care justifies the personal time and effort required to become board certified.

However, if one needs a monetary motive for becoming board certified, the 2007 AAPM salary survey tabulates a 40% higher salary for certified physicists compared to non certified physicists in both the US and Canada.

The same survey reveals that 26% of Canadian medical physicists are still not certified (the US number is 30%).

The large percentage of uncertified medical physicists supports the many scientific studies proving that we are not economically rational animals.

This disjoint between economically rational actions and emotionally motivated actions is one reason human societies have a legal system.

The US legislatures are currently dealing with the CARE (**C**onsistency, **A**ccuracy, **R**esponsibility, and **E**xcellence in Medical Imaging and Radiation Therapy Act of 2007. http://www.aapm.org/government_affairs/documents/CAREFAQs2008.pdf)

The large percentage of uncertified medical physicists supports the many scientific studies proving that we are not economically rational animals.

If this legislation is passed it will require that medical physicists in the US delivering medical care to patients reimbursed by federal money (Medicare and Medicaid) will have to meet federal standards for education and credentials.

Part of the recommended credentials for medical physicists will be board certification by the American Board of Radiology (ABR), the American Board of Medical Physics (ABMP), or the Canadian College of Physicists in Medicine (CCPM).

Therefore, in the US all medical physicists involved in patient care will need to be board certified.

In turn, this will add pressure in Canada to require that medical physicists are board certified if they are going to be involved in patient care.

The CAMPEP approved residency training requirement puts medical physicists on par with other medical professions

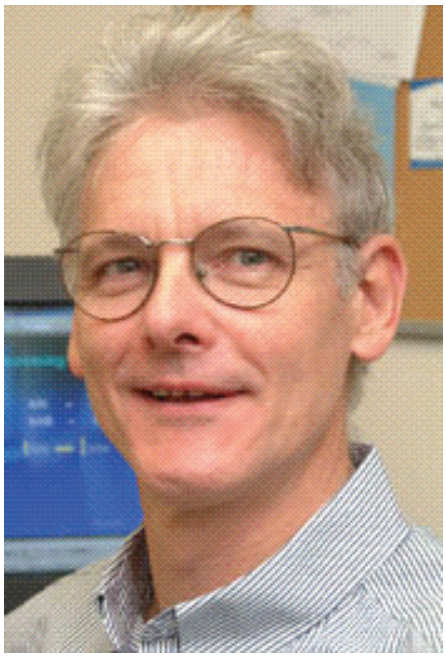
Otherwise, there is a potential for Canadian board certified physicists to move to the US to replace physicists that are not board certified who are moving to Canada.

Rational behavior within our profession would be to require board certification for all medical physicists involved in patient care in Canada. However, there is always legislation, provincial or federal.

The AAPM, as part of the promotion of the CARE bill, has pushed the ABR to adopt the requirement that by 2014 medical physicists applying for ABR board certification will have to be enrolled or already completed a 2 year CAMPEP approved residency training program.

The CAMPEP approved residency training requirement puts medical physicists on par with other medical professions and also illustrates how the medical physics profession is adopting the CARE philosophy.

The CCPM is currently discussing the bylaw changes required for implementing a CAMPEP residency training requirement for board certification.



Dr. Dick Drost,
CCPM President

Disclaimer: the CCPM is not and will not promote legislation or hiring practices that require board certification for medical physicists. That is the responsibility of individuals and groups such as the professional affairs committee within COMP.

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Message from the COMP Chair:

I am very excited to be assuming the duties of Chair at this year's Annual General Meeting. I would like to take this opportunity to give my deepest thanks to the outgoing chair, **Stephen Pistorius**. Stephen has effectively led our organization through a period of growth in which a number of initiatives have been. In particular, the Developing Country Travel Award has just finished its second year and will help spread Canadian medical physics knowledge and experiences to those areas of the world that can benefit the most. Stephen will be moving into the role of Past-Chair for the next 2 years and I will continue to rely on his experience as we move forward.

I would like to take this opportunity to thank **Peter O'Brien** who has just finished serving on the COMP Executive for the last 6 years as Chair-Elect, Chair, and Past Chair, as well as chairing the Local Arrangements Committee for the 2007

Stephen has effectively led our organization through a period of growth in which a number of initiatives have been.

COMP meeting in Toronto. I would also like to thank all the members of the executive, the various sub-committees, and all the other volunteers with whom the organization functions so well. In particular I would like to thank the Executive Director, Nancy Barrett, and her support staff for their help in bringing this organization to a whole new level.

Since I am writing this prior to the 2008 AGM, I am not able to name the incoming Chair-Elect by name, but I am certain that I will greatly value their willingness to take on this commitment.

This year's Annual Scientific Meeting in Québec City has been a great success thanks to the efforts of the Local Arrangements Committee (LAC) led by **Luc Beaulieu**. The work that is carried out by the LAC is instrumental to the success of these conferences and the many volunteers that work behind the scenes are greatly appreciated.

I would also like to thank all the members of the executive, the various sub-committees, and all the other volunteers with whom the organization functions so well.

Judging by the quality of scientific papers presented at this year's ASM, Canadian research in the field of Medical Physics is still among the best in the world. Thanks to the many volunteers who assisted me in refereeing and judging the large number of submissions received.

I would like to congratulate the winner of the 2008 COMP Gold Medal, **Dr. Ervin Podgorsak**, who has such a great impact on the lives and careers of so many Canadian Medical Physicists. His commitment to education and research has made him a much deserving winner of this award.

As was indicated in the last issue of Interactions, we continue to work on the action items generated by the feedback received from our Strategic Planning initiative in 2006. With the creation of the Science and Education Committee (SEC) we hope to increase the availability of education opportunities through refresher courses and workshops at the annual scientific meetings as well as "winter schools" given on topics of interest. With initiatives such as these we hope to increase membership in COMP through the added value these programs will offer.

Along with the other activities planned in the near future, it should prove to be a busy and satisfying couple of years.

As always, we welcome any help members of our community can give through volunteering. If you wish to help our organization grow, feel free to contact me at jason.schella@cdha.nshealth.ca or Nancy Barrett at nancy@medphys.ca.

Mr. Jason Schella
COMP President

...we hope to increase the availability of education opportunities through refresher courses and workshops at the annual scientific meetings as well as "winter schools" given on topics of interest.

Message from the Executive Director of COMP/CCPM:

Annual Scientific Meeting

By the time you read this issue of InterACTIONS, the 2008 ASM will be behind us. It was truly a pleasure working with Luc Beaulieu, Jason Schella and the LAC on this event. Every LAC brings its own spirit to the meeting and we are grateful for the hospitality of our colleagues in Quebec City. Thank you to our corporate sponsors - your generous support makes a great deal of difference to the medical physics community. Thank you to all participants for providing feedback via our evaluation survey. Your support helps us in our planning of future meetings. On that note, preparations are already underway for the 2009 meeting in Victoria. Mark your calendars for June 24 to June 27!

Website

We appreciate your continued patience as we implement the new features of the COMP website. One area that we are hoping to expand over the next few months is the online membership directory. Please note that this is an "opt-in" directory so if you would like to be listed, you must update the settings for your profile. The 2007 changes in the bylaws enabled us to implement electronic voting for the election of the next COMP Treasurer. The response was most positive to this new tool.

Professional Survey

We were pleased to work with the Professional Affairs Committee to develop this year's Professional Survey. This latest version incorporated the feedback received from the 2006 survey, and the results will be circulated in the near future.

Strategic Plan Implementation

Below is a list of the activities from our strategic plan that we will be working on in the next year. As you can see, the Secretary of the COMP Executive and the newly-formed Science and Education Committee have important roles to play in the coming months. I look forward to working with them on these initiatives.

Please feel free to contact me at nancy@medphys.ca or Gisele Kite at admin@medphys.ca at any time. We wish you a safe and happy summer.

Ms. Nancy Barrett,
COMP/CCPM Executive Director

Strategic Pillar	Strategic Plan Activity	Responsibility
Community	Identify potential membership categories and targets (including international)	Secretary/ED
	Research membership barriers and opportunities (e.g. academics)	Secretary/Past Chair/ED
	Develop and implement a recruitment strategy	Secretary/Past Chair/ED
	Implement Communications Strategy & Plan	Executive
	Explore the creation of an Academic Affairs Committee	Executive
Consensus	Develop guidelines to develop, approve and use consensus statements	Chair-Elect
Education	Consider adding refresher courses/workshops to the 2009 ASM	Science & Education Committee
	Conduct a feasibility study re: running a winter program	Science & Education Committee
	Explore running a formal track at future CARO meetings	Science & Education Committee
Profile	Revise promotional materials for the medical physicist profession	

Citation Award 2007

Submitted by: Michael Patterson
Juravinski Cancer Centre and McMaster University, Hamilton, Ontario

A few years ago I wrote an article for *Interactions* (Vol. 50, pp. 29-32) in which I suggested that the ground rules for the Sylvia Fedoruk Award should be changed. I argued that it is laborious and inevitably subjective to try to identify the "best" paper published in our field each year. I proposed a simple, objective solution that would recognize the paper published in a given year that was cited most often over the next ten years. The response to this suggestion was somewhat underwhelming but, nonetheless, I have announced an annual "winner" in *Interactions* for the past three years. The rules (invented by the author) are simple and similar to those established for the Sylvia Fedoruk Award: the work must have been performed mainly at a Canadian institution, only papers in peer-reviewed journals are considered, review or "popular" articles are not eligible, and the paper must be "medical physics" – for example, articles dealing with clinical application of a mature imaging technology are not included, even if medical physicists are co-authors. The winner is determined from data in the Science Citation Index. I believe that my search strategies are thorough, but I make no claim of infallibility.

For this year, we have a clear winner, cited 196 times from publication in 1997 to the end of 2007:

J. S. Gati, R. S. Menon, K. Ugurbil and B. K. Rutt, Experimental determination of the BOLD field strength dependence in vessels and tissue, Magnetic Resonance in Medicine 38: 296 – 302.

Abstract: High resolution functional MRI (fMRI) experiments were performed in human visual cortex at 0.5, 1.5, and 4 T to determine the blood oxygenation level dependent (BOLD) field strength response within regions of obvious venous vessels and cortical gray matter ("tissue"). T-2*-weighted FLASH images were collected in single- and multi-echo mode and used to determine the intrinsic BOLD parameters, namely, signal-to-noise ratio (Psi), the apparent transverse relaxation rate (R-2*) and the change in R-2* (Delta R-2*) between the activated and baseline states. The authors find the average percentage signal change (Delta S/S, measured at TE = T-2*) to be large in vessels (13.3 +/- 2.3%, 18.4 +/- 4.0%, and 15.1 +/- 1.2%) compared with that in tissue (1.4 +/- 0.7%, 1.9 +/- 0.7%, and 3.3 +/- 0.2%) at 0.5, 1.5, and 4 T, respectively, The signal-to-noise ratio in optimized, fully relaxed proton density weighted gradient echo images was found to increase linearly with respect to the static magnetic field strength (B-0), The predicted upper bound on BOLD contrast-to-noise ratio (Delta S/R)(max) as a function of field strength was calculated and found to behave less than linearly in voxels containing vessels larger than the voxel itself and greater than linearly in voxels containing a mixture of capillaries and veins/venules with a diameter less than that of the voxel.

For the record, here are the winners from previous years:

Year of publication	Winner	Citations in 10 years	Current total
1994	R. M. Henkelman, G. J. Stanisz, J. K. Kim and M. J. Bronskill, Anisotropy of NMR properties of tissues, Magnetic Resonance in Medicine 32: 592-601.	129	177
1995	D. W. O. Rogers, B. A. Faddegon, G. X. Ding, C.-M. Ma and J. Wei, BEAM: A Monte Carlo code to simulate radiotherapy treatment units, Medical Physics 22: 503-524.	310	427
1996	A. Kienle, L. Lilge, M. S. Patterson, R. Hibst, R. Steiner and B. C. Wilson, Spatially resolved absolute diffuse reflectance measurements for noninvasive determination of the optical scattering and absorption coefficients of biological tissue, Applied Optics 35: 2304-2314.	125	138

CNSC Feedback Forum

Submitted by: Kavita Murthy
CNSC Ottawa

Amendments made to Class II Nuclear Facilities and Prescribed Equipment Regulations

The Class II Nuclear Facilities and Prescribed Equipment Regulations and the Nuclear Substance and Radiation Devices Regulations were amended effective April 17, 2008. The amendment was officially made public in the April 30th 2008 issue of Canada Gazette Part II. You can access the office consolidation of the Class II Nuclear Facilities and Prescribed Equipment Regulations at the following web address:

http://laws.justice.gc.ca/en/showtdm/cr/SOR-2000-205 (ENGLISH)
or
http://laws.justice.gc.ca/fr/showtdm/cr/DORS-2000-205 (FRENCH)

There are several consequences to Class II medical facility licensees as a result of those amendments, the main ones are listed in Table 1.

In addition to those listed in Table 1, a number of other minor amendments have been made to the regulations in order to clarify regulatory expectations and/or to incorporate into the regulations certain licence conditions that were previously a part of your Class II licences. These are listed in a letter mailed to all affected licensees in May 2008. If you would like a full copy of the letter, or if you have any questions related to these amendments, please contact your CNSC contact person for Class II licenses or email me at kavita.murthy@cnsc-ccsn.gc.ca.

Amended regulation	Description	Commentary
Section 1 - Interpretation	Brachytherapy	According to the new definition, devices used to permanently implant radioactive sources in a patient are no longer Class II prescribed equipment. The use of these devices is now subject to the Nuclear Substance and Radiation Device Regulations.
Section 1 - Interpretation	Servicing	Servicing has been explicitly defined in the amended regulations. Any dismantling, installation, repair of Class II prescribed equipment, other than that described in the manufacturer's operating manual constituting routine operation, is considered servicing.
Subsection 8.(c)	Decommissioning Class II nuclear facilities	A licensee who wants to decommission facilities that contain a Radioactive Source Teletherapy Machine (Cobalt Teletherapy, Gammaknife, etc.) must first obtain a CNSC license to decommission.
Subsection 15.(6)	Area Radiation Monitoring Systems	Area radiation monitoring systems are no longer required for linear accelerator facilities.
Subsection 21.(6)	Source Changes and Records	A licensee must keep a record of the radiation survey made in accordance with paragraph (1) and (2) of Section 17 of the amended Regulations for 3 years after the earlier of the expiry date or the revocation date of the licence.

Ultrasound Imaging of Cancer Therapy Effects

Gregory J. Czarnota* 1,2,3,4
and Michael C. Kolios 3,4

1) Department of Radiation Oncology, and Imaging Research
Sunnybrook Health Sciences Centre,
2075 Bayview Aveneue
Toronto, Ontario
M4N 3M5

2) Department of Radiation Oncology,
University of Toronto

3) Department of Physics
Faculty of Engineering, Architecture and Science
Ryerson University
350 Victoria Street,
Toronto, Ontario
Canada M5B 2K3

4) Department of Medical Biophysics
University of Toronto

* Corresponding author
E-mail:
Gregory.Czarnota@sunnybrook.ca

Introduction

This article presents a recently developed method for the detection of cellular responses to DNA damage in terms of detecting the physiological process of apoptosis. Apoptosis is a normal programmed cell-death response to sufficiently toxic levels of DNA or cellular damage. Although it has been classically believed that cancer therapies result in oncotic necrosis there is emerging evidence that tumour cell apoptosis is an important cell death pathway that can be correlated to positive patient outcomes (1). Moreover, it is now recognized to be a potentially dominant pathway in response to chemotherapy, radiation therapy and experimental therapies such as photodynamic therapy.

The use of high-frequency ultrasound in the detection of programmed cell death has been demonstrated in a number of preclinical systems *in vitro*, *in situ*, and *in vivo* using a variety of different apoptosis inducing methods (2,3,4). This ultrasound method provides a useful image-based adjunct for the detection of programmed cell death in a laboratory setting as well as being a powerful potential preclinical tool which can be used to monitor tumour responses to treatment. Typical low-frequency medical ultrasound imaging devices operate at 1-10 MHz and provide mainly low resolution structural information and predominantly are used in obstetrics and cardiology.

In contrast, high-frequency ultrasound imaging devices operate at 20-50 MHz and offer increased resolution as well as the emerging capability to detect cells and tissues in different physiological states including those undergoing programmed cell death, or apoptosis (2-5). Individual cells cannot be resolved in this frequency range, however, changes in backscatter intensity and spectral parameters from cell ensembles can be measured and correlated to areas of cell damage. Data collected to date indicates that this capability of high-frequency ultrasound is based on interactions of high-frequency ultrasound waves with the chromosomal nuclear material in cells, which undergoes structural changes of condensation and subsequent fragmentation during the process of programmed cell death (1-2, 4, 5). We have demonstrated this experimentally *in vitro*, *in situ*, and *in vivo* using a number of different systems in which apoptosis is induced with physiological stimuli, chemotherapeutic drugs, radiation, or photodynamic therapy which are summarized here.

The ultrasound-based approach to detecting apoptosis has a number of potential applications which range from embryological studies of development where apoptosis plays an important role, to assessing organ viability for the purposes of transplantation, again a situation where the presence of programmed cell death is correlated to clinical outcome (6-13).

Ultrasound transducers detect primarily backscattered ultrasound. Most high-frequency ultrasound transducers are constructed to be broadband in nature to achieve good axial resolution. For instance, a transducer may have a characteristic frequency at 40 MHz at which it is most sensitive but it may also be able to generate and detect ultrasound frequencies from 20 to 60 MHz with appreciable efficiency. Hence Fourier-based spectral analysis of ultrasound data can be used to provide more information in comparison to ultrasound images which are fundamentally representations of only backscattered ultrasound amplitude (14).

Spectral analysis characterizes the changes in ultrasound amplitude over a range of frequencies and changes in spectral patterns may reflect important underlying physical changes in tissue structure. Mathematical analysis of spectral profiles of ultrasound can yield important parameters including effective ultrasound scatterer size, scatterer concentration and tissue attenuation properties (5,15-18). Such analyses have indicated the potential of such spectral analyses to be used in the study of neoplastic lesions. We have adapted them, as well as analyses based on the statistics of the backscattered signal, in our studies to the detection of cell death (15,18).

Here we present an overview of ultrasound spectroscopy experiments demonstrating the applicability of this methodology to preclinical oncologic imaging. In these recent studies we have tested the ability of high-frequency spectroscopic ultrasound to non-invasively monitor apoptotic response using three *in vivo* tumour xenograft models. In one *in vivo* system melanoma-bearing mice were treated with photodynamic therapy, in a second lymphoma-bearing mice were treated with CHOP chemotherapy, whereas in the third system a

(Continued on page 75)

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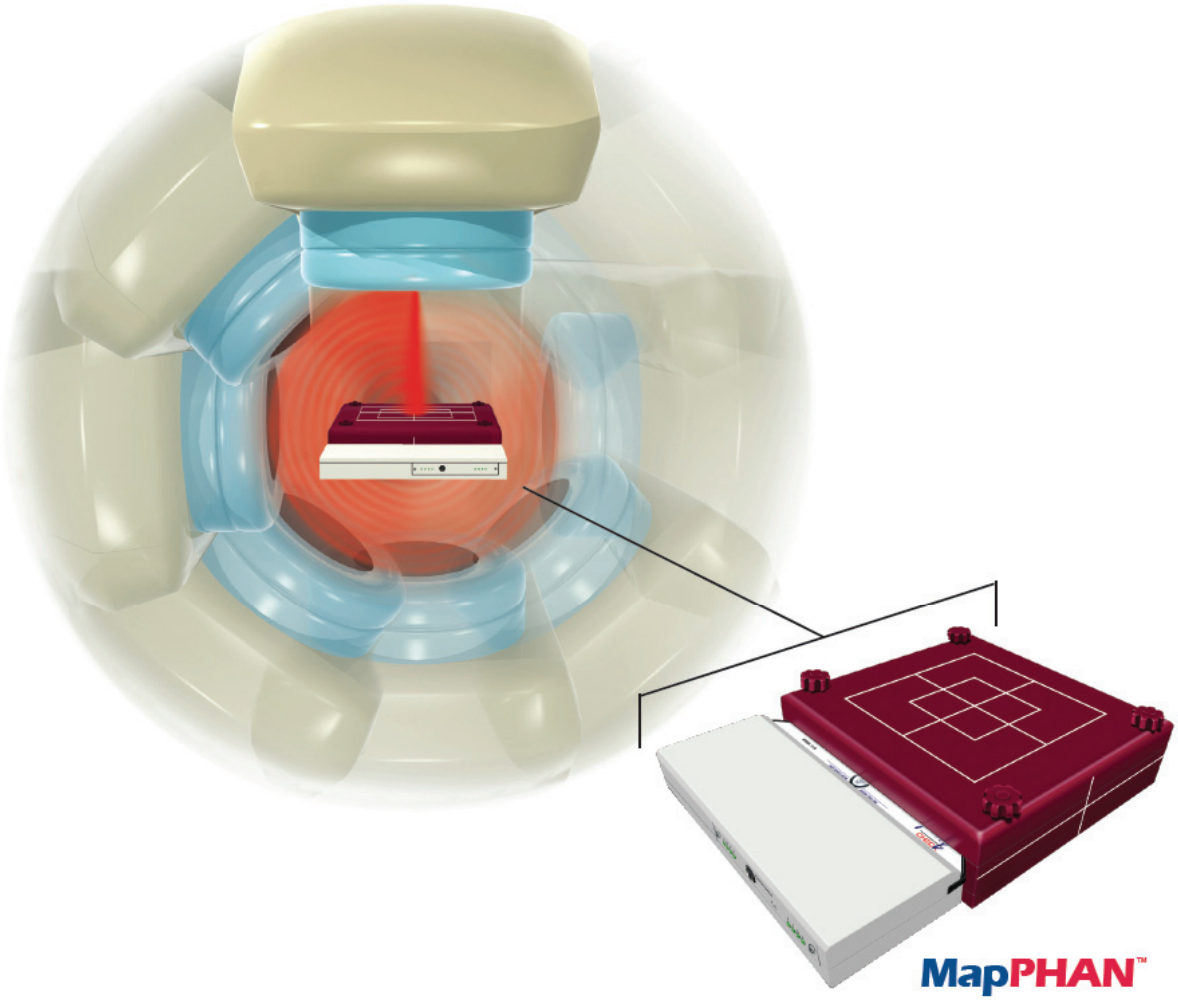

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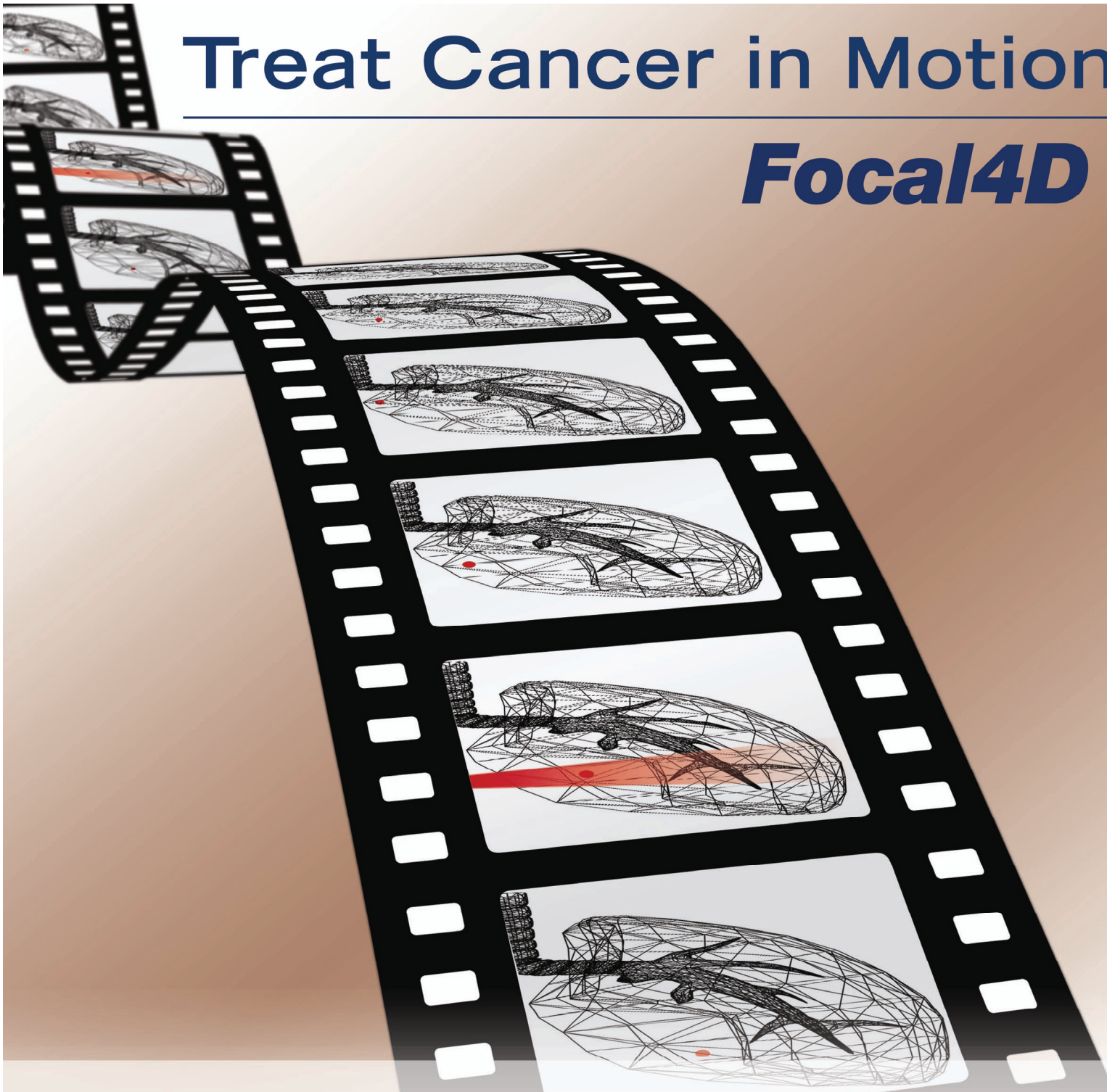

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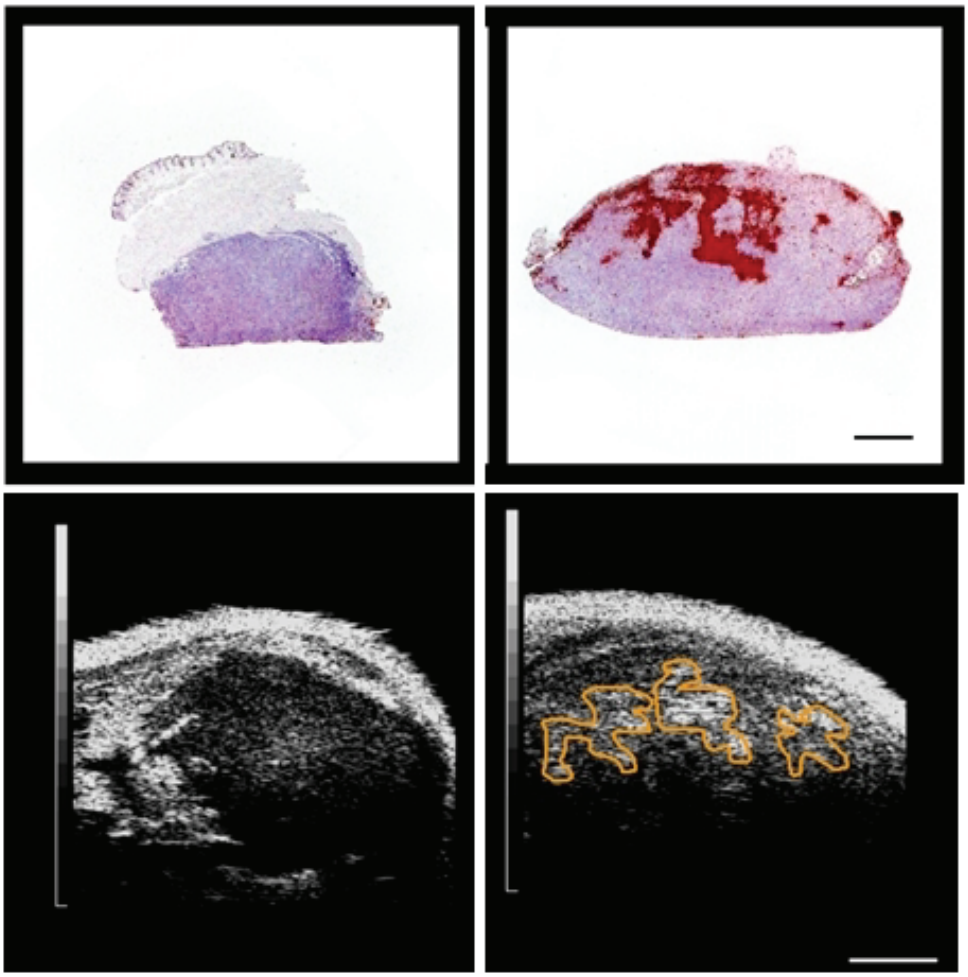

Figure 1. Representative Radiotherapy and Ultrasound Results. Left panels show results for 0 Gy treated animals and right panels for 8 Gy treated animals. Top rows present representative TUNEL histology staining for apoptosis and bottom rows present representative high-frequency (30 MHz) ultrasound images for the same tumours. Scale bars represent 2 mm.

(Continued from page 70)

number of tumour models were treated with radiation. Analyses were carried out using high-frequency ultrasound and spectroscopy as before and comparisons made to gold-standard immunohistochemical staining of apoptotic cells.

For the purposes of these experiments solid tumours were grown in SCID mice using a malignant human melanoma (n=26, HTB-67) and lymphoma (n= 36, CRL-2261) cell line. Mice also had PC3 tumours (n=50, and n=72) grown for radiation treatments. Melanoma tumours were treated with 110J/cm^2 of 633 nm laser light, 24 hours following exposure to 10mg/kg of Photofrin given i.p. as a photosensitizer. Lymphoma-bearing animals were treated with CHOP (cyclophosphamide, adriamycin, vincristine and prednisone) chemotherapy. Prostate (PC3)-bearing mice received radiotherapy alone at various doses.

Tumours were examined by 20 to 40 MHz high-frequency ultrasound prior to treatment and at different times after treatments. Ultrasound data collection consisted of acquiring tumour images in addition to spectroscopic data for quantitative analyses of backscattered ultrasound. Animals were sacrificed immediately after analysis and tumours excised for histopathologic analysis. Histological sections were examined by haematoxylin and eosin staining in addition to TUNEL for apoptosis. Ultrasound images and corresponding spectroscopic data were analyzed and tested for correlation with histopathological findings.

In terms of results we observed a time-dependant increase in ultrasound backscatter after treatment. For photodynamic therapy (PDT) treatments increases in backscatter findings correlated with morphological findings indicating increases in apoptotic cell death, which peaked at 24hrs after PDT. We observed 0%, 1.48%, 8.25%, 26.83%, 52.52% and 2.12% apoptosis in terms of cross-sectional tumour area from histopathology after 1, 3, 6, 12, 24 and 48 hours of PDT, respectively which corresponded to increases in backscatter intensity which reached a maximum of 12+/-1 dB at the 24 hour experimental time.

A different time-dependent increase in backscatter followed treatment with CHOP chemotherapy or radiotherapy. In several instances, the response in the tumor was heterogeneous and very localized, with “patches” of cell death detected both in histology and ultrasound imaging (Figure 1). At 24 hours after radiation treatment with doses ranging from 0 to 8Gy, the measured high intensity changes in ultrasound with spectral changes indicative of cell death reached an estimate of 15% apoptosis maximally at 24 hours. Representative mid-band fits (a measure of ultrasound backscatter which is integrated over the bandwidth of the transducer) representatively changed from -50 dBr to -38 dBr after treatment.

Image analysis demonstrated a correlation between the size of high intensity patches with spectral changes on high-frequency ultrasound analysis and immunohistochemical TUNEL staining of apoptotic areas (Figure 1). For animals treated with radiotherapy the response exhibited a dose dependence in terms of mid-band fit and 0-MHz intercept. Ultrasound estimates of

(Continued on page 76)

(Continued from page 75)
apoptotic areas correlated well with histopathological estimates and seemed to be positioned about areas of hypervascularity in tumours.

Conclusion

In conclusion, spectroscopic ultrasound analyses can be used to detect time-dependent apoptosis in *in vivo* melanoma and Non-Hodgkin's tumor models treated with photodynamic therapy and CHOP chemotherapy, respectively. Radiotherapy experiments in prostate and other cancer models, which were monitored with similar methods, also have indicated a similar correlation between frequency-dependent signal changes and histological changes. We have been able to observe a close correlation between therapy-induced apoptotic cell death and changes in mean backscatter intensity and other spectral parameters in these experimental systems indicating that estimates of cell death can be made non-invasively using high-frequency ultrasound.

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In Brief

The following COMP members will be named Fellows of the AAPM in 2008 for their distinguished contributions to Medical Physics

Muthana S. A. Al-Ghazi, PhD
Sam Beddar, Ph.D
X. Allen Li, Ph.D

Congratulations to our COMP members!

Dr. John R. Cunningham was recently awarded the inaugural Failla Award from the Radiological and Medical Physics Society of New York. This award is given to distinguished scientists in the field of medical or health physics. Congratulations!

IOMP List of Medical Physics Specialists

The International Organization of Medical Physicists (IOMP) is producing a list of medical physicists who are willing to serve as consultants for specific medical physics assignments, either in their own country or abroad.

The consultancies may be an IOMP task or a technical cooperation activity of an organization which has requested the IOMP for names of medical physicists for a specific mission. If you are willing and able to volunteer for such an activity, please visit the IOMP website at http://www.iomp.org and click on the "IOMP Specialist" list tab where you can download a copy of the application form and submit the completed form to Michael Stabin at michael.g.stabin@Vanderbilt.edu.

Jake Van Dyk, IOMP Science Committee

Dates to Remember

2-3 July 2008
Medical Image Understanding and Analysis; Dundee, Scotland

27-31 July 2008
AAPM 50th Annual Meeting; Houston, TX USA
American Association of Physicists in Medicine

28-30 August 2008
Int'l Conference of the Society for Medical Innovation and Technology (SMIT); Vienna, Austria

28-30 August 2008
Sino-American Network for Therapeutic Radiology and Oncology (SANTRO); Beijing, China

2-4 September 2008
IPEM Biennial Radiotherapy Meeting and Annual Scientific Meeting; Bath, U.K.
Institute of Physics and Engineering in Medicine

8-10 September 2008
Introduction to Physics and Administrative Aspects of Radiation Oncology for Administrative Staff; Houston, TX USA
Univ of Texas MD Anderson Cancer Short Course

10-12 September 2008
The 5th Korea-Japan Joint Meeting on Medical Physics; Jeju, Korea
In conjunction with the 37th Meeting of Korean Society of Medical Physics and
the 96th Meeting of Japan Society of Medical Physics

10-13 September 2008
World Molecular Imaging Congress (WMIC 2008); Nice, France
The Academy of Molecular Imaging (AMI) and the Society of Molecular Imaging (SMI)
Co-sponsored by the European Society for Molecular Imaging (ESMI) and
the Federation of Asian Societies for Molecular Imaging (FASMI)

15-19 September 2008
XTOP 2008: 9th Biennial Conference on High Resolution X-Ray Diffraction and Imaging; Linz, Austria

17-21 September 2008
European Conference on Medical Physics and Engineering 110 Years After the Discovery of Polonium; Krakow, Poland
Held with the 14th Congress of the Polish Society of Medical Physics and the EFOMP Council and Officers' Meeting

21-25 September 2008
ASTRO 50th Annual Meeting; Boston, MA USA
American Society for Therapeutic Radiology and Oncology

29 Sept - 3 Oct 2008
5th Int'l Conference on Radiotherapy Gel Dosimetry; Hersonissos, Crete, Greece

Editors Note: Embracing (loose) Change

Just like many of you across Canada, I am looking forward to warmer temperatures and experiencing life outside again. The flowers are blooming and there are 'changes' amidst. A recent example of change would be that of the COMP Chair: as **Dr Stephen Pistorius** leaves his well accomplished term, our new Chair, **Mr Jason Schella**, begins his (see his introductory message to the membership in this edition). I am sure that it will not be long before he too will tire from my constant barrage of e-mails pleading for contributions to the newsletter (but that just comes with the territory I suppose!).

Yes indeed, 'change' is ahead of us. If you are like me, you are probably getting a little tired of this over-used word (especially if you watch CCN!) that seems to creep into daily discussions in hospitals, cancer centres, and research facilities. Theoretically, I'm not old enough to be a curmudgeon just yet, but even in my short (read less than 10) years practicing, I involuntarily cringe or squint every time I hear the word. Perhaps the pace of technology does not agree with my inherent skepticism. The involuntary cringes turn to swinging fists when I hear 'embracing technology' or 'embracing change'. Buzzwords of the 21st century I suppose.

One measure of "intelligence" in a species is the ability to respond to fluctuations in the environment so as to allow for a natural progression of the species itself. Changing into cooler clothing is a good thing when the temperature increases. So generally, change is a good thing.

Much like life, the practice of medical physics is not a closed canonical system. Stimuli from a variety of sources can initiate changes in the medical physics environment. New toys from vendors, standards of care in other centres / provinces / countries, reimbursement or re-enumeration, and staffing levels all play a role in how the practice of medical physics may change. I will be the first to admit that most of the changes in the medical physics environment have been good. Digital Mammography? Good. CAMPEP Residency Programs? Probably Good. I do not think that we, as medical physicists, can argue that the *expectation* in the quality of care is worse than it was several decades ago.

In theory, medical physicists are health care professionals with specialized training in the medical applications of physics. In practice, medical physicist role epitomizes 'translational' research in a clinical environment: migrating physical concepts to a direct medical application. This often means that for many medical physicists, there is a balance in clinical and research roles in their jobs.

There is a presumption, however, that the species of medical physicists has the *capacity* for an intelligent response to environment. By capacity, I mean that medical physicists have the physical and intellectual resources to respond to the medical physics environment. Most of the changes in patient care require medical physicists to acquire new skills and commit additional resources. Again, this is a good thing: we work in a field where continuing education plays a fundamental role in our profession. While it is a renewable one, medical physicist resources are not infinite.

Given increased expectations in the quality of care of patients, the ratio of research and clinical duties may be subject to change. This might occur within the context of an individual's practice, where a medical physicist become more specialized in a specific clinical area or becomes more focused on his/her research, or on a broader scale where select centres become bastions of innovation and others become clinical service workhorses. How we, as medical physicists, respond to these changes today affects our role in health care tomorrow.

InterACTIONS Newsletter Editor Parminder S. Basran and son (latter with the flattering facial expression)

Whether we like it or not, 'change' is coming. Whether you embrace change or your boxing gloves is up to you.

For now, I'll stick to embracing the change in my trousers. Given the rising cost to gas nowadays, I'll need every penny for the trip out to Quebec at the COMP AGM. Judging by the scientific proceedings, it should prove to be an excellent conference.

I put my picture in this edition for those COMP members I haven't met yet. This way you'll know the fellow asking you to contribute to **your** newsletter is indeed the Editor. Please note, however, that my appearance may have *changed* since taking this picture. For one, I won't be carrying a little boy on my shoulders during the conference. Have a great summer and see you all at COMP!

WESCAN 2008

Submitted by: Marco Carlone
Cross Cancer Institute, Edmonton AB

The annual WESCAN conference was held March 12 – 14 at the Plaza 500 Hotel, in Vancouver, BC. It was hosted by the Medical Physics Department of the Vancouver Cancer Centre. The theme of this years meeting was "The Leading Edge," and this idea was explored by the Keynote speaker, **Dr. Ivo Olivotto**, from the Vancouver Island Cancer Centre.

This years meeting featured a wide variety of presentations including many from outside of traditional Medical Physics and Radiation Therapy. This included the description of a new state of the art biomedical prototyping facility at the Vancouver Cancer Centre, the experiences of a radiation therapist volunteering in a cancer centre in Karachi, Pakistan, an interesting presentation about the regulation of non Class II radiation facilities was also given by the CNSC, and a very interesting presentation from the department of Electrical Engineering at UBC on the modeling of prostate tissue elasticity and robot controlled delivery methods for prostate seed implants.

The meeting also featured presentations on a wide variety of traditional medical physics and radiation oncology subjects such as imaging, Monte Carlo, Radiobiology, Brachytherapy, Treatment Planning, and Radiation Protection. A very competitive student presentation competition was held, with a variety of student presenters (including students in Medical Physics, Radiation Therapy, and undergrad Physics and Engineering students) distinguished themselves. The winner was **Karl Bush**, of the Department of Physics and Astronomy, University of Victoria, for a very interesting talk about Monte Carlo methods for electron beam simulation in a linear accelerator. The meeting also featured center updates from all the western Canadian radiotherapy centres, which described the research and clinical activities of these centers.

For those participants that would like to spend time with our industry partners, or in developing collaborations with them, WESCAN is a very good forum to do this. At this years meeting, vendor participation was impressive, with 16 vendors setting up booths. This even included an IBA representative selling proton radiotherapy systems.

A definite highlight of the meeting was a description of a new and potentially significant technology in Radiotherapy. The new RapidArc technology featured by Varian was described by the inventor of the technique, **Dr. Karl Otto**, of the Vancouver Cancer Centre. Dr. Otto described in some detail the principles of the method, and demonstrated the impressive types of dose distributions that could be generated by the technique. Equally impressive was the description of a BC wide research effort to demonstrate the clinical utility, and to transition the research into clinical practice.

WESCAN is a Medical Physics and Radiation Oncology conference that is principally attended by western Canadian participants. Our eastern Canadian colleagues are always encouraged to attend this event, and we hope to see you there next year. For those interested, next years meeting will be held in Saskatoon. Hope to see you there!

Mark your calendar!

Canadian Organization of Medical Physics

Annual Meeting

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See www.medphys.ca for more details.

IMRT QA Fails and Plan Rejected

Submitted by: Parminder S. Basran

Many radiation physicists practicing IMRT QA often are faced with a difficult decision on what appropriate action to take when a specific IMRT QA fails a well established criteria.

Most often, the IMRT QA falls on the evening prior to treatment, leaving little time to re-plan the patient. Most often, another test is performed which may be used to justify acceptance of the plan, giving a more sensible result, and thereby allowing the radiation physicist to go home and have a good nights sleep.

The purpose of this submission is to report, perhaps for the first time, an outright rejection of an IMRT QA plan. No subsequent measurements were performed and the plan was simply rejected. Really. It is hoped that the reader may gain some insight on when it might be appropriate to reject a plan outright, and thus allowing the radiation physicist to have a better nights sleep.

The intended treatment fields were generated by from a common treatment planning system and delivered with step-and-shoot IMRT on a 4 mm leaf MLC-equipped 6 MV linear accelerator. IMRT QA measurements are performed using a 2D diode array system. A gamma index is used for quantitative evaluation of the measured and computed distributions at the plane of the diode array.

Figure 1 displays the (relative) intended IMRT dose pattern from one of the beams and Figure 2 displays the (relative) measured distribution. As you can see, the distributions are dis-similar. In fact, they don't look anything alike. But to really prove that they aren't the same, the gamma-index was used to compare the two distributions.

Initially, a percent difference of 50% and distance to agreement of 10 mm was used, resulting in about 97% of the measured points agreeing with calculation. So, theoretically, it passed the IMRT QA. Using a 3 mm and 3% threshold, approximately 9% of the measurement points agreed to the calculation. Given the complexity of the situation, we sought for expert opinions.

The measured and computed distributions were sent for critical review to a 5.3 year old boy. The 5.3 year old boy exclaimed "Oh Daddy, that's a monkey! It looks nice, can I have one?".

Because it is not advisable to mix monkeys and linear accelerators, the IMRT QA was rejected.

Figure 1: Colorwash image of intended IMRT distribution. Note how this image does not look like a monkey.

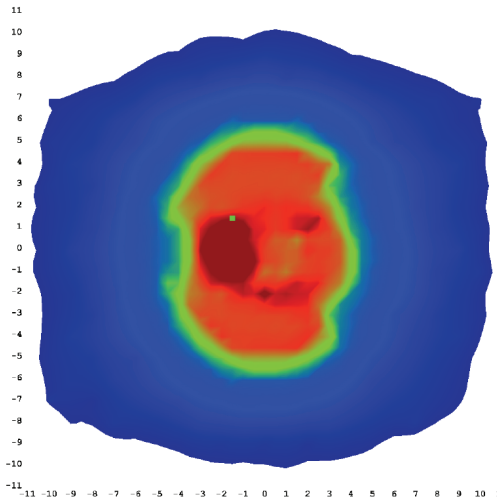

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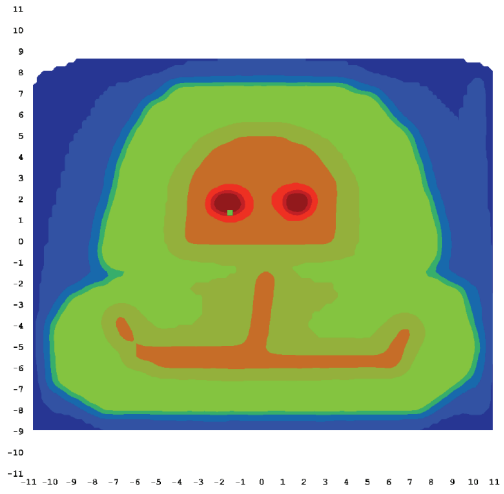
Figure 2: Colorwash image of measured IMRT distribution. Note how this image resembles that of a monkey.



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- computer generated dose calculations; working with Medical Physicists in the development and implementation of dose calculation algorithms;
- treatment measurement; dosimetry measurement of specialized treatments; managing the personnel dosimetry service;
- consulting with physicians and dosimetrists regarding treatment strategies;
- treatment planning; assisting as necessary with routine treatment planning;
- measuring and verifying dose levels and beam characteristics on the linear accelerator and the cobalt unit; measuring and verifying equipment performance with respect to accepted standards; participating in the chart check process to confirm the accuracy of dose calculation and plans;
- interacting with service personnel to arrange for corrective actions, and ensuring that all corrective actions are completed properly; helping service personnel to trouble-shoot difficult or unusual system problems;
- participating in the development of Quality Assurance protocols, policies and procedures;
- monitoring compliance with regulations governing the safe use of radiation, radioactive materials, and other hazardous materials (WHMIS);
- designing, developing, and fabricating specialized treatment devices; developing and implementing new clinical devices and techniques; helping to commission equipment for clinical use; assisting with the acceptance testing of new equipment;
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- Several years of experience in a clinical environment is required.
- Excellent organizational skills with an ability to identify priorities and reassess them frequently based on a dynamic workload are required.
- The successful applicant must have good manual dexterity and visual acuity, an understanding of all human anatomy related to treatment planning, good geometrical and spatial perception, an ability to communicate effectively both orally and written and the ability to work independently and as a member of a team.
- A thorough knowledge of physics and mathematics at the undergraduate level, a working knowledge of external beam process, an aptitude for working with computers, an understanding of radiation physics, dosimetry principles and protocols is essential.
- Applicants must have an understanding of the image process and a working knowledge of radiation safety.
- The successful applicant must have a good previous work and attendance record.
- The successful applicant must provide a satisfactory criminal records check prior to beginning employment.

We would like to thank all applicants for their interest; however, only those who are selected for an interview will be contacted.

THIS COMPETITION IS OPEN TO MALE AND FEMALE APPLICANTS

Salary Range: $24.48 - $30.01 per hour
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Closing Date: //

Please return forms to PEI Public Service Commission, P.O. Box 2000, Charlottetown, Prince Edward Island, C1A 7N8. Applications may be sent by fax to (902) 368-4383. IT IS THE RESPONSIBILITY OF THE APPLICANT TO CONFIRM RECEIPT OF THE APPLICATION, BY TELEPHONE OR IN PERSON PRIOR TO THE CLOSING DATE. Please ensure that the appropriate Posting ID number is stated on all application forms. You can apply online or obtain an application form by visiting our web site at www.gov.pe.ca/jobs. Forms may also be obtained by containing any PEI Government office, ACCESS PEI Centre, Regional Services Centre, or by telephone (902) 368-4080.

Comité Scientifique :

Mounir Besbes (Tunisie)
Jean-François Carrier (Canada)
Ahmed Ibn Seddik (Maroc)
Raphael Moeckli (Suisse)
Thierry Sarrazin (France)
Milan Tomsej (Belgique)
Abdelkader Toutaoui (Algérie)

Comité Organisateur :

Pierre Aletti (France)
Khalid Bouyakhlef (Maroc)
Jean-François Carrier (Canada)
Nasser Hejira (Suisse)
Ahmed Ibn Seddik (Maroc)
Brahim Idbelkas (Maroc)
Sofia Jebbari (Maroc)
Samir Mouatassim (Maroc)
Hicham Tamri (Maroc)
Milan Tomsej (Belgique)

Comité Logistique :

Vous trouverez sur le site les informations et conditions préférentiels négociés par la cellule Logistique pour notre Congrès.

Pour toutes vos réservations de Billets, de transferts ,d'hébergement ou autres, veuillez contacter Madame Bouchra Amari de l'Agence Altitude Voyages & Evénementiel sur ce mail :altitude@altitudevoyages.ma.

Droits D'inscriptions

	Etudiants Etrangers *	Etudiants Nationaux *	Participants Etrangers	Participants Nationaux
Inscriptions avant le 30/07/08	80 €	500 Dhs	200 €	1500 Dhs
Inscriptions après le 30/07/08	100 €	800 Dhs	250 €	1900 Dhs

* Les Etudiants sont tenus de remplir le Formulaire d'inscription (téléchargeable à partir du Site)

SOUS LE PATRONAGE DE SON ALTESSE ROYALE LA PRINCESSE LALLA SALMA

L' Association Marocaine de Physique Médicale

ORGANISE

Du 16 Au 18 Octobre 2008 à Marrakech

1er Appel à Communication

Le premier Congrès Francophone de Physique Médicale

Principaux thèmes :

Radiothérapie
Médecine Nucléaire
Imagerie médicale
Sûreté et Radioprotection

Comité d'organisation

P. Aletti (France), K. Bouyakhlef (Maroc), J.F. Carrier (Canada), N. Hejira (Suisse), A. Ibn Seddik (Maroc), B. Idbelkas (Maroc) S. Jebbari (Maroc), S. Mouatassim (Maroc) H. Tamri (Maroc) et M. Tomsej (Belgique)

Contact Ahmed Ibn Seddik E-mail : a.ibnseddik@menara.ma

Web www.asso-ampm.com

Avec le concours sfpm SBPH SSRPM SSRPM OCPM

Mot du President

Le Premier Congrès Francophone de Physique Médicale Marrakech Du 16 au 18 Octobre, 2008

Un Congrès Francophone de Physique Médicale était le souhait de plusieurs physiciens médicaux d'expression française partout dans le monde.

Discuter, échanger les expériences, se mettre au courant des dernières évolutions dans le domaine de physique médicale qui touche à la radiothérapie, l'imagerie médicale et la médecine nucléaire, sont les buts de ces journées scientifiques qui se veulent un lieu de rencontre pour tisser les bases des relations de collaboration entre les physiciens médicaux s'exprimant en langue française.

Ce premier Congrès Francophone de Physique Médicale a été voulu être ouvert à tous les thèmes de physique médicale pour encourager le maximum de physiciens exerçant dans les établissements hospitaliers ou ceux qui pratiquent l'enseignement et la recherche dans les établissements universitaires à participer activement chacun dans sa spécialité.

La radioprotection et la sûreté dans notre domaine sont devenues des sujets d'actualité même pour le grand public. Une session est dédiée à ces questions pour se mettre au courant des dernières dispositions.

L'Association Marocaine de Physique Médicale (AMPM), avec le concours de la SFPM (France), SBPM (Belgique), SSRPM (Suisse) et OCPM (Canada), a l'honneur et le plaisir d'organiser ce premier Congrès Francophone de Physique Médicale.

Le patronage du congrès par son Altesse Royale la Princesse Lalla Salma, première dame du royaume et présidente de l'association Lalla Salma de lutte contre le cancer, témoigne l'importance et l'intérêt que donne notre pays à cette manifestation.

Le choix de la ville de Marrakech pour abriter cette manifestation est fait pour ses infrastructures de haut standing ainsi que pour son charme qui laisse tout visiteur vivre un séjour inoubliable dans cette ville impériale de pure tradition marocaine.

Je vous donne rendez-vous donc à Marrakech les 16, 17 et 18 Octobre 2008 pour ce premier Congrès Francophone de Physique Médicale et je vous invite à venir nombreux pour y participer activement.
Marhaba.

Ahmed Ibn Seddik
Président AMPM

Le Premier Congrès Francophone de Physique Médicale Marrakech Du 16 au 18 Octobre, 2008

PROGRAMME SCIENTIFIQUE PRELIMINAIRE

Jeudi :

08H00 : Accueil des Participants et Inscription
09H00 : Mot de Bienvenue du Président de l'AMPM

Radiothérapie

08H30 : Conférence / Communications
10H15 : Discussion
10H30 : Pause Café + Visite des Stands
11H00 : Communications
12H30 : Discussions
13H00 : Déjeuner

Médecine Nucléaire

14H30 : Communications
15H30 : Discussions
16H00 : Pause Café + Visite des Stands
16H30 : Communications / Conférences
17H30 : Discussions
19H00 : Inauguration Officielle.

Vendredi :

Sûreté et Radioprotection

08H30 : Conférence / Communications
10H00 : Discussion
10H30 : Pause Café + Visite des Stands
11H00 : Communications
12H30 : Discussion
13H00 : Déjeuner

Imagerie Médicale

14H30 : Communications
15H30 : Discussion
16H00 : Pause Café + Visite des Stands
16H30 : Communications / Conférence
17H30 : Discussion
19H00 : Dîner de Gala

Samedi :

Radiothérapie

08H30 : Conférence / Communications
10H00 : Discussion
10H30 : Pause Café + Visite des Stands
11H00 : Présentation des Posters
12H00 : Discussion
12H30 : Clôture du Congrès.

Le Premier Congrès Francophone de Physique Médicale Marrakech Du 16 au 18 Octobre, 2008

Appel Aux Communications

Date limite de soumission des Résumés : Le 31 Juillet 2008
Au-delà de cette date aucune soumission ne sera acceptée

Thèmes des Communications Libres :

- Radiothérapie
- Médecine Nucléaire
- Imagerie Médicale
- Sûreté et Radioprotection

Instructions aux auteurs :

Le Comité Scientifique répartira les Communications Orales ou Posters en fonction de la cohérence des thèmes. Il prendra également en compte votre préférence.
Seul un nombre limité des Résumés sera prévu pour les présentations orales.

Présentation et mise en page :

Toutes les Communications devront être en langue française sur un logiciel de traitement de texte (Word) sur une seule page sous format A4.

Envoi :

Les résumés devront parvenir sous format électronique à l'adresse suivante : a.ibnseddik@menara.ma, et ce avant la date limite du 31 Juillet 2008.

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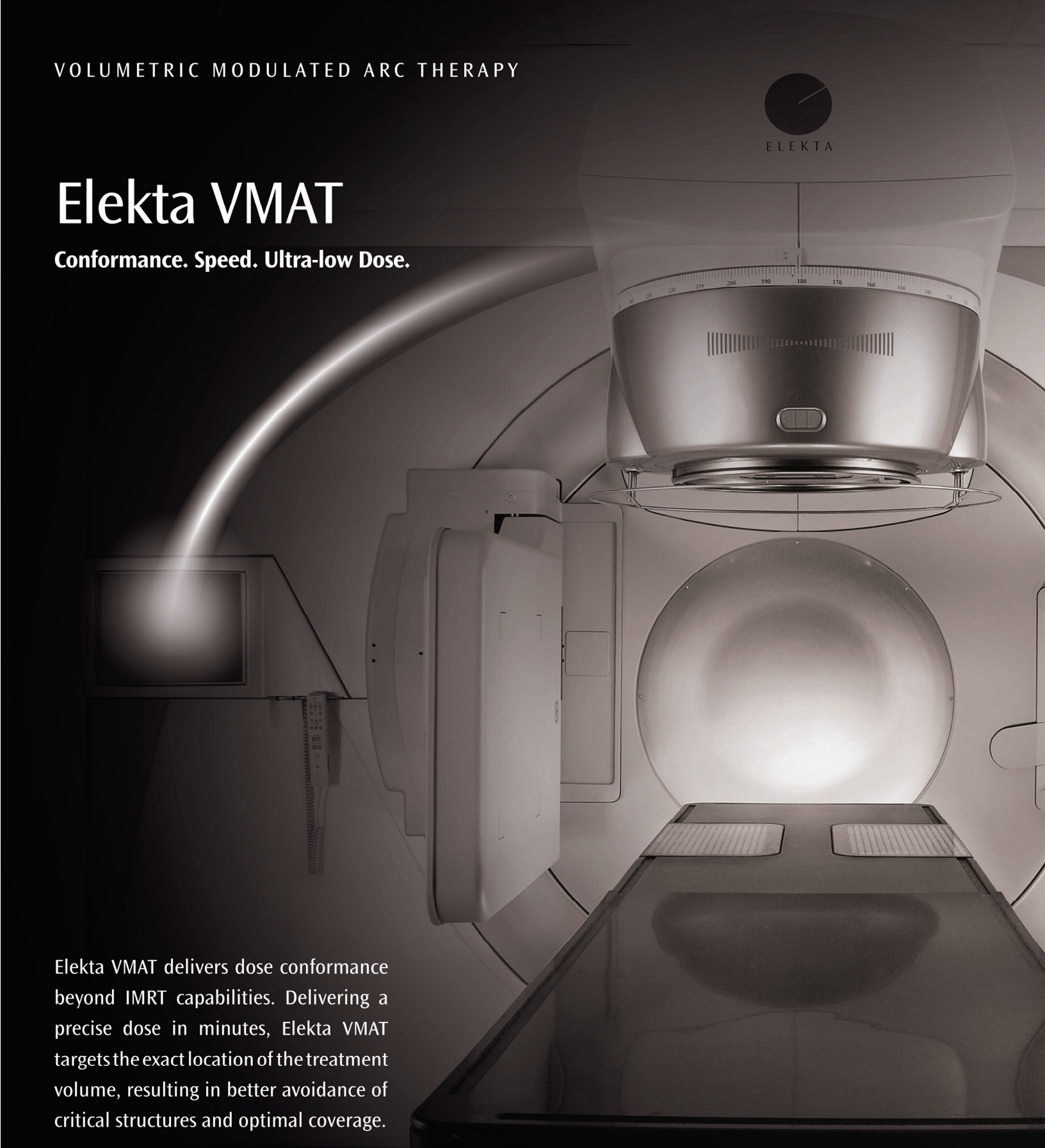

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Ultra-low Dose
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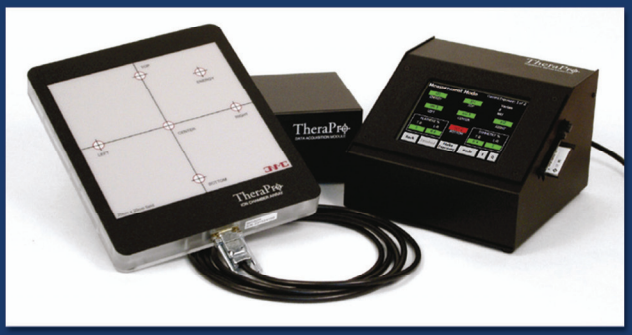
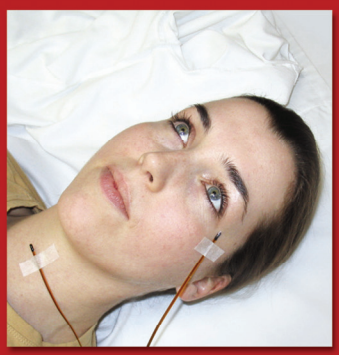


Accelerator QA

mobileMOSFET wireless dose verification system



- Routine in-vivo dosimetry
- One or multiple field measurements
- Treatment plan verification
- IMRT in-vivo, QA and phantom work
- Intracavitary measurement
- IGRT / Tomotherapy
- Brachytherapy
- Radiology

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