NRRPT® NEWS

National Registry of Radiation Protection Technologists

Spring 2004 Edition | Incorporated April 12, 1976

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Message from the Chair


Kelli Gallion

Greetings to you all! As I begin my tenure as Chair, I would like to first reflect on the contributions of my predecessor John Molner not only as chairman for the past 3 years, but also during his 23 (and continuing) years of devotion to the NRRPT. Notably, John was instrumental in obtaining the recommendation from the American Council on Education (ACE), which gives up to 30 college credits for passing the NRRPT exam. I am personally taking advantage of the ACE recommendation through Thomas Edison State College. Thanks John! Before his term as Board Chair, John was the Chairman of the Exam Panel for 6 years. John has also over the years remained in close ties with the Health Physics Society (HPS), the American Board of Health Physics (ABHP), and the American Academy of Health Physics (AAHP). Although he is modest in his achievements, we recognize and appreciate John's dedication not only to the Board and Panel, but also to the Registry as a whole. So where is John now? Not far. John's new position is Chairman of the Executive Committee, where he will be focusing on the strategic plans for the future of the NRRPT.

I am proud to announce that as of February 2004, our Registry totals 4,722 members. Congratulations and welcome to the new members who passed the February exam!

The NRRPT concluded it's 61st Board and Panel meetings that were held in conjunction with the ISOE ALARA Symposium (IAS) in Coral Gables, Fl. Below are some highlights from the meeting.

- Bob Farnam, Bill Peoples, and Paul Lovendale have been recommended to serve a new 4-year term on the Panel of Examiners to begin January 1, 2005.

- Dick Warnock from the San Onofre Nuclear Generating Station SONGS) was the recipient of the prestigious Arthur F. Humm, Jr. Memorial Award. Some of you may be asking yourself "who is Arthur Humm Jr.?" Arthur F. Humm, Jr. was the first Chairman of the Exam Panel of the NRRPT. "Arti" was a firm believer in a strong program to increase the training and skills of Health Physics Technologists, not only for those with whom he worked, but industry wide. His vision was to dedicate himself to achieving that goal. A small group, headed by Don Marshall, the Chairman, was the core to start the Registry. Arti's task was one of the most difficult to do in the formative years of the Registry. Arti was challenged to develop the first NRRPT exam and, with the help of others, he rose to the occasion. To accomplish this required enormous number of hours, days, and weeks of his time. This included time on the telephone with a multitude of people, personally meeting with exam consultant companies, coordinating with other members of the core team, finding questions, getting advise on the exam questions, helping to establish the frame work for the exam, obtaining meeting places and other myriad details. He also had the difficult job of setting up multiple exam sites, obtaining proctors, establishing security measures and locating a company to score, evaluate and assess the efficacy of the exam and provide results to the Exam Panel. Throughout all the difficulties Arti never lost sight of his goals – that registration would mean much more than paying a fee but would identify high quality Health Physics Technologists. Arti was Exam Panel Chairman until January 1981, was made a member Emeritus in June 1984 and passed away October 1984. Arti would be very proud to see his goal being realized by the NRRPT. This award was established in 1985 in memory of Arthur F. Humm Jr. and is presented to persons who have demonstrated outstanding support and service to the NRRPT. Dick has been a long time supporter and continues to promote the Registry and provide financial support for Board and Panel members. He also maintains SONGS as a Silver Corporate Sponsor.

- An ad hoc committee was appointed to further develop an equivalent Canadian Radiation Protection exam. Those appointed were: Dave Biela, Dwaine Brown, and Tim Kirkham.

- Professional Enrichment Program (PEP) Course Committee Chairman, Tim Kirkham reported that three PEP courses were presented; the topics were NRRPT Question Development, ALARA and Containment, and Transportation Regulations and the ALARA Principal. Positive feedback was received from the attendee's. We would like to continue offering the PEP courses and encourage all RRPTs to consider presenting a PEP session which range from 2-4 hours. Additionally, 0.25 point(s) is given toward your Registration Maintenance for each PEP course attended. For more information or to sign up for a presentation, please contact Tim Kirkham at Timothy.J.Kirkham@constellation.com.

- A "special thanks" goes out to RRPT Keith Consani for attending the NRRPT Board of Directors meeting. All members are welcome to attend the Board of Directors meetings. I would also like to thank all the RRPTs who attended the 4-day conference in Coral Gables, Fl. As a reminder, the IAS meeting is a good forum for collecting ideas and benchmarking data that you can bring back to your work place and implement to help improve your overall programs. Topics and presentations cover a variety of subjects applicable to all disciplines within the **NRRPT:** medical, DOE, Decon and Decommissioning, and Power Reactors. It is also a great place to network. And did I mention that you get 2 points toward your Registration Maintenance for attending the 4-day conference?

I am honored that I have been elected the opportunity to serve as your Chair. I look forward to the many challenges that I know I will face, but more so, I look toward the reward that will result when the challenges are met.

Our next Board of Directors and Panel of Examiners meeting will be held in Washington, D.C. in conjunction with the 49th Annual Health Physics Society Meeting July 10-13, 2004. I look forward to serving you and "thank you" for your continued support.

Respectfully,
Kelli A. Gallion

Kelli Gallion Presents Outgoing Chairman John Molner with a Gavel Plaque

Welcome New Members

Congratulations to the following individuals who successfully passed the **NRRPT** February 21, 2004 examination:

Joseph G. Archer
Andrew J. Arroyos
Nathan L. Bridges
Edward Dean Butler
Chris R. Cheatham
Timothy L. Cook
Donald L. Crady, Jr.
Eduardo del Barrio Schettino
Michael L. Dhabolt
Daniel L. Frey
Patrick C. Glisson
Albert J. Guidotti
Jody L. Jacobs
Paul A. Kellogg
Kenneth H. Kingston
Mark J. Kruse
Micheal J. Lemons
Robert L. Marshall
Michael J. McLain
Roderick R. Miller
Mario D. Mudek
Samuel L. Page, Jr.
Patrick G. Patterson
Paule W. Patterson
Charles W. Peach
Marna K. Porter
Bruce G. Schuster
Michael D. Sullivan
Michael V. Taylor
Raymond W. Thomson
Bruce W. Vogel
Stephen L. Vrooman
Asa S. Wallace
Brett A. Weller
Edward P. Williams
Joseph D. Wright

New Members: If you do not have access to the private side of the web page please contact the Executive Secretary (nrrpt@nrrpt.org), she must have your email address on file in order for you to gain access.

Technical Basis for the Determination of A_1 and A_2 Values for Transportation of Radioactive Materials

Dwaine Brown – Halliburton Energy Services, Inc.-Houston, TX
Steve Woods – Halliburton Energy Services, Inc. Duncan, OK

The International Atomic Energy Agency estimates that between 18 and 38 million packages containing radioactive materials are transported each year throughout the world. This material may be radioactive waste, medical isotopes, industrial radiography sources, well logging sources, research materials, and of course nuclear fuel cycle materials. These shipments are made by land transport, air, or by sea.

There are various agencies that regulate the commercial movement of radioactive materials and with minor variations primarily related to how a shipment is documented. The requirements are consistent for the control of exposure to radiation between the International Civil Aviation Organization (ICAO) as implemented through the International Air Transport Association (IATA) regulations, the International Maritime Organization (IMO) as implemented through the International Maritime Dangerous Goods (IMDG) Code, and specific country regulations that address the ground transportation of radioactive materials such as the United States Department of Transportation (USDOT).

Each agency has adopted requirements for the control of package contents and external radiation levels based on the criteria presented in IAEA Safety Standards Series, Requirements, No. TS-R-1 (ST-1 Revised) and it is the basis of these Regulations that will be discussed in this document.

Prior to 1959 the United States Interstate Commerce Commission regulations served as the basis for the various national and international controls for the transport of radioactive materials. The rapid growth of the nuclear industry made the development of controls for the transport of all types and quantities of radioactive materials the highest priority of the IAEA shortly after its formation.

The general outline of these regulations was:

- ⇒ Introduction
- ⇒ Definitions
- ⇒ General Provisions
- ⇒ Activity Limits and Material Restrictions
- ⇒ Requirements and Controls for Transport
- ⇒ Requirements for Radioactive Material and for Packagings and Packages
- ⇒ Test Procedures
- ⇒ Approval and Administrative Requirements

This paper will discuss the development and implementation of the Activity Limits commonly referred to as the A_1 and A_2 values for specific isotopes. Therefore, the first order of business will be to define the A_1 and A_2 values as well as a selected few additional terms prior to entering into a discussion as to how these values were derived.

A_1 – The maximum activity of special form material that is permitted in a type of package called a Type A package.

A_2 – The maximum activity of other than special form material that is permitted in a Type A package.

Special Form – Either an indispersible solid radioactive material or a sealed capsule containing radioactive material which has undergone very stringent testing to confirm that if the material was released in an accident the physical integrity of the special form capsule would make it unlikely that there would be any associated contamination hazard from the radioactive contents of the capsule. This allows larger quantities of special form material to be shipped in any Type A package.

Type A Package – Designed and tested to provide a safe and economical means of transporting Type A (A_1 or A_2) quantities of radioactive material. These packages must maintain their integrity under the kind of abuse or mishandling which may be encountered under normal conditions of transport. The testing of these packages simulates transportation related events which a package could be subjected to in handling or accident conditions.

The objective of the regulations is to provide assurance of the protection of individuals, property, and the environment from any harmful affects of radiation during the operations surrounding the transport of radioactive materials. Foremost in the provision of this assurance is the well-defined limits of quantities of material that may be contained and transported in specific package designs, specifically the A1 and A2 quantities of materials. The A_1 and A_2 quantities for each isotope define the amount of any material that may be transported in each type of container be it Excepted Packaging, Type A packaging, or Type B packaging. Stated in another way, the regulations as written provide guidance toward maintaining the exposure to individuals, property, and the environment As Low As Reasonably Achievable (ALARA).

There are basically 3 limits imposed relative to the activity of a package with radioactive contents.

- ⇒ A_1 and A_2 in Bq (or multiples thereof).
- ⇒ Activity concentration for exempt material in Bq/q.
- ⇒ Activity limits for exempt consignments in Bq

For this presentation we will focus on the A_1 and A_2 value determination and save any discussion of exempt packages or consignment for a later date.

The values of A_1 and A_2 presented in the regulations evolved from what was known in the late 1970s as the Q-System. The Q-System was developed in support of the 1985 edition of the regulations to provide justification from a dosimetric standpoint for the A_1 and A_2 values and has been retained through the current regulations.

The limits presented within the regulations to control and mitigate the release of radioactive material from transport packages are based upon the activity limits for Type A packages. These same limits are also used for specifying Type B and Type C package activity leakage limits LSA materials, and excepted package content limits.

Initially radionuclides were segregated into 7 groups for transport purposes with each group having a package content limit for special form radioactive material and for material in all other forms. In 1973 the regulations the group classification system evolved into the A_1/A_2 system where each nuclide had 2 Type A package content limits, A_1 and A_2.

The dosimetric basis of the A_1/A_2 system relied on a number of assumptions. A whole body dose limit of 3 REM (30 mSv) was assumed in deriving the A_1. In calculating the A_1 values the exposure was limited to 3 R (» 30 mGy) at a distance of 3 meters in a period of 3 hours, an intake of 10^{-6} X A_2 was assumed in the derivation of A_2 as the result of a median accident. This intake would result in one-half of the maximum permissible intake for a radiation worker.

The median accident is defined as one which for a Type A package results in a complete loss of shielding and to a release of 10^{-3} of the package contents in such a manner that 10^{-3} of the released material was subsequently taken in by a bystander.

The Q-System developed for the 1985 regulations reassessed and modified for the 1996 regulations considers a broader range of specific exposure pathways than the earlier A_1/A_2 system. The Q-System continued to use the same assumptions as those used in the original Q-System, however in exposures related to the intake of radioactive material use was made of new data and concepts recommended by the ICRP particularly subjective assumptions were made regarding the extent of package damage and release of contents without reference to the median accident.

The Q –System considers a series of exposure routes for individuals in the vicinity of a Type A package involved in a severe transport accident. This led to five contents limit values:

- ⇒ Q_A for external photon dose
- ⇒ Q_B for external beta dose
- ⇒ Q_C for inhalation dose
- ⇒ Q_D for skin and ingestion dose due to contamination transfer
- ⇒ Q_E for submersion dose

The A1 value for special form material was the lesser of the 2 values QA and QB, while the A2 value for non-special form radioactive material was the lesser of A1 and the remaining Q values.

The exposure pathways used in the determination of Q values are based on the following radiological criteria:

1. The effective or committed dose to an individual exposed near a transport package following and accident should not exceed a reference dose of 50 mSv.
2. The dose or committed dose equivalent received by individual organs, including the skin, of an individual involved in the accident should not exceed 0.5 Sv, or in the special case of the lens of the eye, 0.15 Sv.
3. An individual is unlikely to remain at 1 meter from the damaged package for more than 30 minutes.

The Q-System lies within the domain of exposures that are not expected to be delivered with any certainty but may result from either an accident at a source or from an event or sequence of events such as equipment failure and operating errors.

The earlier reference dose of 50 mSv used in the development of the A_1/A_2 values used in the 1985 regulations is no longer valid for these exposures however this value has been retained within the current Q-System with the consideration that historically actual accidents involving Type A packages have led to very low exposures. These exposures may be considered once in a lifetime exposures since most individuals will never be exposed. When considered with the previously cited dose limits the limiting dose rate from a damaged Type A package for whole body photon exposure is assumed to be 100 mSv/h at a distance of 1 meter.

Current Q value assumptions:

Q_A – External dose due to photons

Calculated using the complete X-Ray and gamma emission spectrum for each radionuclide from ICRP Publication 38

Q_B – External dose due to beta emitters

Calculated using the complete beta spectra for each radionuclide from ICRP Publication 38

Q_C – Internal dose via inhalation

The accident scenario used in this determination assumed a storeroom or cargo handling bay with a free air volume of 300 cubic meters with 4 room air changes per hour. With an adult breathing rate of 3.3 X 10^{-4} m^3/s this resulted in an uptake factor of approximately 10^{-3} for a 30 minute exposure period. Alternatively, another accident scenario may involve a transport vehicle with an interior free air volume of 50 m3 with 10 air changes per hour reveals an uptake factor of 2.4 X 10^{-3} which is of the same order of magnitude as the warehouse/cargo bay scenario.

For accidents occurring outdoors the dispersion parameters for a ground release with an exposure distance of 100 meters were used with resulting dilution factors of 7 X 10^{-4} to 1.7 X 10^{-2} s/m^3 resulting in uptake factors in the range of 2.3 X 10^{-7} to 5.6 X 10^{-6} for the previously cited adult breathing rate. Reduction of the exposure distance to 10 meters increases these uptake factors by approximately a value of 30 indicating that as the point of exposure approaches a few meters the uptake factors would approach the 10^{-4} to 10^{-3} range used in the Q-System.

Therefore, uptake factors in the range of 10^{-4} to 10^{-3} appeared to be reasonable for the determination of Type A package content limits.

When this range of uptake fractions is considered with the release fractions of 10^{-3} to 10^{-2} the overall intake factor for a Type A package becomes 10^{-6}, representing a combination of releases in the range of 10^{-3} to 10^{-2} of the package contents as a respirable aerosol combined with an uptake factor of 10^{-4} to 10^{-3} of the released material.

The calculation of Q_C was made using the most restrictive chemical form and dose coefficients and aerosol characterization used an aerosol median aerodynamic diameter (AMAD) of 1 micron.

Q_D – Skin contamination and ingestion doses

This value is determined by considering the beta dose to the skin of a person contaminated with non-special form radioactive material during handling of a damaged Type A package.

Calculated using the assumption that:

- ⇒ 1% of the package contents are spread uniformly over an area of 1 square meter
- ⇒ Handling of contaminated debris results in contamination of the hands to 10 % of the released quantity
- ⇒ The affected individual was not wearing gloves but would be aware of the contamination potential and decontaminate the hands within a period of 5 hours.
- ⇒ Beta spectra and discrete electron emissions from ICRP Publication 38 were used.

These same models were used in the determination of estimating the possible uptake of activity via the ingestion pathway.

It was assumed that an individual may ingest all of the contamination from 10 cm2 of skin over a 24 hour period and that the resultant intake is 10-6 Q_D compared with the earlier derivation of 10-6 Q_C. Due to the consideration that the dose per unit intake for inhalation is generally of the same or greater order as that of ingestion the inhalation pathway will generally be more limiting for internal contamination due to beta emitters.

Q_E – Submersion dose due to gaseous isotopes

The Q_E value for gaseous isotopes external to the body following their release in an accident is based on the following assumptions:

⇒ 100 % release of the package contents into a storeroom or cargo handling bay with a free air volume of 300 cubic meters with 4 air changes per hour.
⇒ Resulting airborne concentration of $Q_E/300\ m^{-3}$
⇒ Ventilation decay constant of 4 h^{-1} over a subsequent 30 minute exposure period resulting in a mean concentration of 1.44 X 10^{-3} X $Q_E\ m^{-3}$

Earlier issues of the regulations cited 4000 X DAC (Bq/m^3) as recommended by the ICRP for 40 hours per week and 50 weeks per year for occupational exposure in a 500 m^3 room, the use of the DAC was deemed to be inappropriate and the modified Q-System uses an effective dose for submersion in a semi-infinite cloud from USEPA Federal Guidance Report No 12.

The initial premise of the Q system utilized a maximum duration of transport of 50 days and thereby assumed that radioactive decay products with less than 10 day half-lives were in equilibrium with the longer lived parent. The Q values were then determined for the parent and progeny and the limiting value was used for the determination of the A_1 and A_2 values. For those isotopes whose progeny had a half life greater than 10 days or greater than the half life of the parent these were then considered as a mixture. This criterion has been retained in today's determinations of A_1 and A_2 values.

Alpha emitting radionuclides do not warrant the determination of Q_A or Q_B values due to their relatively weak gamma and beta emissions. The 1973 edition of the regulations assigned an arbitrary limit of 10^3 x A_2 for this material with no dosimetric justification. Based on the latest values from the ICRP for alpha emitters which resulted in a reduction of the Q_C values a tenfold increase in the arbitrary value was used in the modified Q system resulting in an additional Q value for alpha emitters QF which is 10^4 x Q_C. With the evaluation of internal dose due to ingested alpha emitters similar arguments to those of beta emitters apply regarding Q_D and the inhalation rather than the ingestion pathway is always more restrictive.

The 1973 A_1 and A_2 values were subject to an upper limit of 37 TBq (1000 Ci) to protect against the possible effects of bremsstrahlung radiation. This value was retained in the current regulations, recognizing that this was an arbitrary cut off point, at 40 TBq (1081 Ci). Bremsstrahlung evaluated in a manner consistent with the determination of Q_A and Q_B shows the aforementioned value to be reasonable. It does remain however that the explicit inclusion of bremsstrahlung within the Q system might limit A_1 and A_2 for some nuclides to about 541 Curies (20 TBq), a factor of 2 lower. The A_1 and A_2 values tabulated in the 1973 edition of the regulations have been retained within the current regulations.

Noble gases to which the QE value has been applied since they are not incorporated into the body and whose progeny are either a stable nuclide or another noble gas. The dosimetric routes other than submersion within a radioactive cloud and the related whole body exposure are realized when evaluating ^{222}Ra where the lung dose due to the inhalation of short-lived progeny. This exposure has received special consideration by the ICRP. The corresponding Q_C value in the original Q System was calculated to be 97 Curies (3.6 TBq) based on the 100 % release of radon as opposed to the 10^{-3} – 10^{-2} aerosol release incorporated into the QC model. This results in a reduction to a Q_C value in the range of 97.3 to 973 milliCuries (3.6 X 10^{-3} to 3.6 X 10^{-2} TBq). Evaluating ^{222}Ra as a noble gas resulted in a Q_E value of 114 milliCuries (4.2 X 10^{-3} TBq) which is near the low end of Q_C values. The value which is used for Type A packages.

Low specific activity (LSA) materials such as ^{238}U, ^{232}Th, ^{235}U, ^{nat}U, and ^{nat}Th fall into a category of radioactive material where the specific activities are so low that it is inconceivable that an intake presenting a significant radiological hazard could occur. The model assumed that it was unlikely that an individual would remain in a dusty atmosphere long enough to inhale more than 10 mg of material with a resulting mass intake of 10^{-6} A_2 which would not present a greater hazard than any quantity allowable for transport in a Type A Package.

This model lends itself to an LSA criterion of 10^{-4} $Q_C g^{-1}$ resulting in a Q value for these materials below this limit as unlimited. Compliance with this criterion presents an effective dose equivalent of less than 5000 milliREM (50 mSv). Additionally, the latest calculations using current dose coefficients by the ICRP show that unirradiated uranium enriched to less than 20% will also satisfy this criteria. Irradiated reprocessed uranium A_1 and A_2 values must be calculated using the mixtures equation considering the uranium radionuclides and fission products.

Another consideration of LSA material was the QD derivation for skin contamination and the model used was based on the assumption that 1 to 10 mg/cm2 of dirt present on the hands would be readily visible and removed promptly by wiping or washing without regard to the presence of radioactivity. Based on this assumption, the upper extreme of the range for a cut-off resulted in a LSA limit of $10^{-5} Q_D g^{-1}$, which retains the unlimited Q value for this value.

Key Points to Remember:

The lesser of the values for Q_A and Q_B determines the limiting A_1 value for special form material.

The least of the A_1 value and the remaining Q values determines the A_2 value for non-special form material.

The A_1 limit is defined by Q_A, the external dose due to photons.

The upper limit for alpha emitters where Q_F is substituted for Q_A determines the A_1 limit for alpha emitters.

Q_B, the external dose due to beta emitters, determines the A_1 limit for beta emitters

QC, the internal dose due to inhalation, defines the A2 limit.

The A_2 limit is defined by Q_D, the skin contamination and ingestion limit or Q_E, the submersion dose due to gaseous isotopes

Basically, if a radionuclide is in special form, larger quantities may be transported in a Type a package than the same radionuclide in non-special form there are however some cases where the A_1 and A_2 values are equal.

In all cases however, the Q System and the derived A_1 and A_2 values have been structures in such a manner that under most conditions incident to transportation the potential exposure to material handlers, the general public, and the environment is maintained ALARA when material is properly classified, packaged, marked and labeled prior to shipment as shown in the preceding discussion.

Arthur F. Humm, Jr. Award
Presented to Richard Warnock

Humm Award Presented to Richard Warnock (left)

The Arthur F. Humm Jr. award was created to honor and acknowledge the efforts of "Arti" Humm who worked long hours day after day and on weekends to see his (and our) dream come true. That is, creating a vehicle through which exceptional technologists might be recognized and to encourage their professional development.

This award is presented to individuals who have been of exceptional service in promoting and sustaining the national Registry. Mr. Richard Warnock has been a supporter of the Registry since its inception. Through his continuing efforts, four people have been or are now part of the board of directors or exam panel. Our present Chairperson, Kelli Gallion, is here because of his efforts. In addition, he is responsible for SONGS becoming a silver sustaining supporter. Mr. Warnock's support has been crucial to the continuing success of the registry.

The National Registry of Radiation Protection Technologists Board of Directors is pleased to present the Arthur F. Humm, Jr. award to Mr. Richard Warnock.

CANADIAN COMMITTEE UPDATE

An Ad Hoc Committee was formed to pursue the development of an examination for Canada. The committee has been in the process of reviewing the Canadian regulations to identify the specific regulatory requirements for Canada. In addition to this review, Canadian representatives have been invited to attend Board of Director and Panel of Examiner meetings to introduce them to the examination development and the process for administering the examinations. As might be surmised, we are in the preliminary stages of this process and as the process evolves additional information will be forthcoming. For those of you that are interested the Canadian regulations and licensing guidance, information may be found at the URL below.

http://www.nuclearsafety.gc.ca/eng/regulatory_information/

Watch for additional information in the next newsletter edition!

The Use of Laser Kinetic Phosphorescence (KPA) for the Assessment of Exposures to Total Uranium

Robert Wills, RRPT
Manager Nuclear Industrial Programs
General Engineering Laboratories, LLC

Joe Davis
Senior Health Physicists
General Engineering Laboratories, LLC

In the world of Health Physics we tend to be focused on methods and techniques for the problems we face in the workplace. It is my hope that this article will find interest to all RRPT's. The area of bioassay is well understood for the individuals working at fuel facilities, DOE sites, isotope production laboratories, and waste processors facilitates. Bioassay tends to be much less utilized by our members in the nuclear power arena and in commercial decommissioning.

It is our intention to give RRPT's a basic understanding of the tools available should they be faced with a work environment that requires personnel monitoring for exposure to Uranium. In this edition we will take a look at Laser Kinetic Phosphorescence (KPA) as a screening tool for exposure to uranium.

What benefits and disadvantages does Laser Kinetic Phosphorescence (KPA) have compared to alpha spectroscopy?

1. KPA can process a large number of samples in short order
2. KPA can detect very low levels of Uranium with smaller sample volumes
3. KPA is much less costly and requires fewer labor hours in processing
4. KPA can not identify different isotopes of Uranium making its use for dose assessment limited
5. For dose assessment the RRPT should utilize Alpha Spectroscopy for U-233/234, U-235/236 and U-288
6. KPA is used as screening tool prior to alpha spectroscopy. KEP is usually less than $50.00 per sample and alpha spectroscopy can cost $200.00 per sample.

How KPA Works:

KPA is simply the analysis of urine by subjecting a sample to a known frequency of laser light which excites the uranium atoms. The uranium when exposed to the laser is excited to a higher energy state which undergoes fluorescence as the molecule returns to ground state. This takes place when relaxation of the intermediate singlet electronic state with the emission of a photon. Phosphorescence involves a similar process except the relaxation incorporates a triplet electronic state. The subsequent return to ground state with emission of a photon is stopped so the relaxation lifetimes range form microseconds to hours.

As the uranium atoms recover to ground state they provide an emission at a wavelength of 515 nm which is recorded by the spectroscopy unit. The analytical range for uranium by KPA runs from about 0.01 ppb to 50,000 ppb total uranium.

What Steps Would an RRPT Take for Worker Exposure to Uranium:

1. Have the individual provide a urine sample within 3 to 4 hours of the exposure.
2. This is a one time void sample requiring about 500 ml of urine collected in a sample bottle.
3. The RRPT should make sure the sample has all required sample information such as date, time, name of individual etc.

4. Additional samples should be taken as 24hr void samples. The results of the 24 hour voids will be utilized to determine the excretion rate of uranium from the worker.

5. Please note that we all have natural uranium in our bodies that will be picked up via KPA. Therefore the results must be normalized to background generally given as .02 ugm/day.

6. In most cases it is necessary to take more than one void sample to calculate an excretion rate and determine the class of nuclide ICRP-30 (D, W, Y) or ICRP-66 (F,M,S).

7. The excretion rate will allow for accurate biological half life calculation which are used to calculate total organ dose.

8. NRC Regulatory guide 8.9 provides additional information on bioassay models, excretion fractions, etc.

Conclusions:

Laser Kinetic Phosphorescence (KPA) is a cost effective approach utilized for screening uranium uptakes in workers. The benefits of this screening method are fast sample turnaround, low laboratory costs, the ability to perform excretion studies easily and in most case the ability to perform the analysis to large populations with limited analytical equipment.

Additionally, if the ratios of uranium isotopes within the sample are known dose evaluations can be made, however, alpha spectroscopy is by fair the better of the two methods for does evaluations.

NRRPT PEP Sessions

Three Professional Enrichment Program courses were presented on Sunday, January 11, 2004 at the ISOE International ALARA program. The courses were NRRPT Question Development; ALARA and Containment; and Transportation Regulations and the ALARA Principle. The attendance was very good and the comments about the courses were even better.

We found that the NRRPT members are hungry for Health Physics technical and operational sessions. Input is needed from our members as to what sort of courses you would like to participate in. Some of the suggestions have been:

- Internal Dosimetry for Technicians
- Just what is Passive Monitoring?
- Shielding
- Sections of the Exam
- Current topics in Health Physics (NEI 2020 RP initiative, Operating Experience, etc).

The PEP committee is also interested in members that are willing to present material. The lectures may either be a topic given to you by our PEP committee or a topic that is of special interest to you or your organization. Many organizations are performing nice studies of current problems and these would be very beneficial to share with other members. Perhaps input is needed into a given study – this would be an excellent venue for a roundtable discussion on a particular problem.

This is new for the organization and we welcome input to make this useful to the membership. Please send all comments, questions or suggestions to Tim Kirkham at timothy.j.kirkham@constellation.com or call 410-495-6885.

You Can Help!

Rick Rasmussen

During the past year, I have had the opportunity to observe a number of exercises in many different locations and one problem is common to almost all of them-the lack of radiological training to allow the first responders to provide an adequate and proper response. Some of the problems that I have seen are: people frisking with the probe upside down, instruments brought to the scene but never turned on, instruments that didn't have batteries in them, improper frisking distance or speed, and even the improper instrument (but that's what I grabbed!) When talking with the responders, I basically get the same reply; "We just got these and haven't had training on how to use them yet."

Over the last couple of years (since 9-11), many new response units are having to consider, train for, and come up to speed on emergency response including responses for radiological emergencies. Also, local fire departments, police departments and other local entities are now being provided, or are purchasing different types of radiation detection equipment for field use. Many departments are receiving grants to purchase radiation detection equipment, so radiation detection equipment is being purchased as fast as manufacturers can produce it. Personnel in the departments are given equipment to use, sometimes without any training, or with inadequate training. As it turns out, there is often no money for training or, more frequently there's a lack of qualified and experienced personnel to do the training.

Now you know the issue - so how can you help? Your imagination and energy are about the only limitations! Check with your local fire and police departments and see what detection equipment they are currently carrying. Introduce yourself and volunteer to provide hands on training for them or serve as a form of reach-back for technical support. Think about it, just explaining natural background radiation can go a long way towards allaying fears and helping people understand what they're dealing with and what true hazards are. You can also provide assistance to other entities (hospitals, local government emergency operations centers, etc), ask around to find out what facilities are in your area. A final suggestion is volunteering to be an observer at a local exercise and provide feedback. You all have unique training, knowledge, and resources that would be very valuable in making your local first responders more capable in responding to a radiological emergency. You Can Help! If you're already helping or have other suggestions, I would love to hear from you. I can be contacted at either rickras@comcast.net or 505-667-7440.

** BIO ON OUR CHAIR **

Kelli A. Gallion

Kelli's career in Radiation Protection started directly out of High School. Commencing in 1986 she has moved into progressively challenging assignments starting in dosimetry on through her current assignment as an HP Technical Specialist. Her development and experience has included dosimetry, radioactive material control, HP technician, HP Planning and HP instructor. She became a Registered Radiation Protection Technologist in 1998 and is currently using the American Council on Education's NRRPT credit recommendation to complete a BS degree in Radiation Protection from Thomas Edison State College.

Kelli's diverse background made her a natural fit for the NRRPT Panel of Examiners. She was nominated by the San Onofre plant management and selected by the NRRPT Board of Directors in 2000. Kelli has served on the NRRPT's Marketing Committee and is a member of both the Health Physics Society and the North American – Young Generation in Nuclear (NA-YGN) organization.

Elected to the NRRPT Board of Directors in 2003, Kelli holds the distinction of being the first woman elected as Chairman of the Board.

EXCELSIOR COLLEGE

FOR IMMEDIATE RELEASE
October XX, 2003

Contact: William M. Stewart	Or	Eileen Smith
Excelsior College		Sawchuk, Brown Associates
(518) 464-8775		518-462-0318, ext. 123
wstewart@excelsior.edu		smithe@sawchukbrown.com

EXCELSIOR COLLEGE EXPANDS ACCESSIBILITY TO NUCLEAR ENGINEERING TECHNOLOGY DEGREES

Approves College Credit for Accredited Nuclear Power Plant Training

ALBANY, N.Y. – Excelsior College announced today that it has increased accessibility to Nuclear Engineering Technology degrees for employees of nuclear power plants by making it possible for them to obtain college credit for completion of college-level workplace training programs.

To determine whether training at nuclear power plants was equivalent to college-level courses, Excelsior reviewed the training programs conducted at nuclear power facilities that are accredited by the National Nuclear Accrediting Board of the National Academy for Nuclear Training. Review teams also visited a sampling of nuclear sites and obtained additional input from the nuclear power industry to complete the analysis. Excelsior then assigned credit equivalencies for the content that was common across the utility training programs.

"Nuclear plant employees need degrees to advance in an industry where demand is high for qualified employees," said Dr. Jo-Ann Rolle, dean of business and technology at Excelsior College. "This is an important step that enables them to obtain college degrees in their field without having to leave their jobs."

Excelsior, which has a long history of awarding college credit to individuals who successfully complete the U.S. Navy's nuclear power training program, has offered a Bachelor of Science degree in Nuclear Engineering Technology for 20 years. Today's announcement enables civilian nuclear plant employees to earn between 15 and 37 core credits, and 24 to 52 total credits toward this 124 credit bachelor's degree, depending on the specific accredited work-place training program they complete. Excelsior's Bachelor of Science degree in Nuclear Engineering Technology is accredited by the Technology Accreditation Commission (TAC) of the Accreditation Board for Engineering and Technology (ABET).

EXCELSIOR EXPANDS ACCESSIBILITY TO NUCLEAR ENGINEERING TECHNOLOGY DEGREES

In addition, credit earned by successfully completing any of the 10 evaluated nuclear utility training programs may be used to toward the requirements of any Excelsior undergraduate degree, including its other bachelor's and associate degrees in engineering technology.

This program is the latest in a series of efforts by Excelsior College to recognize college-level education that occurs in the workplace. Excelsior has forged collaborations with numerous associations in areas that dovetail with Excelsior's curriculum for adult learners. Other programs to assess industry training for college credit have been completed for the insurance/risk management industry, criminal justice/police academy training, and military training.

Excelsior College www.excelsior.edu is a recognized leader in the field of distance education. Founded in 1971, it is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools. Excelsior's Bachelor of Science degrees in Nuclear Engineering Technology and Electrical Engineering Technology are accredited by the Technology Accreditation Commission (TAC) of the Accredition Board for Engineering and Technology (ABET). Recognizing that college-level knowledge can be obtained in many ways, Excelsior provides access to many different avenues for earning college credit, focusing on what students know, rather than on where or how they learned it. Undergraduate credits are earned through a variety of accredited sources, including traditional classroom courses, for-credit exams, distance learning and online courses, and military and corporate training. Excelsior's graduate degrees are delivered online. Through these means, the college makes associate, baccalaureate, and master's degrees more accessible to busy, working adults. The American Council on Education (ACE) recognizes all Excelsior College Examinations for the award of college-level credit.

Excelsior College History

Excelsior College (www.excelsior.edu) is the only institution in the country offering degree programs based exclusively on outcomes-based assessment of learning. Recognizing that college-level knowledge can be obtained in many ways, Excelsior provides access to many different avenues for earning college credit, focusing on what students know, rather than on where or how they learned it. Undergraduate credits are earned through a variety of accredited sources, including traditional classroom courses, for-credit exams, distance learning and online courses, and military and corporate training. The college's graduate programs are offered entirely online through coursework designed by and delivered by our faculty. Through these means, the college makes associate, bachelor's and master's degrees more accessible to busy, working adults.

In 1971, the New York State Board of Regents founded Regents College (now known as Excelsior College) as its external degree program. From 1971 until 1998, Regents College operated as a program of the Board of Regents (which also served as its board of trustees) and under the authority of The University of the State of New York by which degrees and diplomas were awarded during that period. In 1998, the Board of Regents granted the College a charter to operate as a private, independent institution and on January 1, 2001, Regents College changed its name to Excelsior College. As are all colleges in the State of New York, Excelsior College is a Member of the University of the State of New York. Today, an independent board of trustees governs Excelsior College and it is comprised of prominent individuals in the fields of education, business and the professions from across the United States.

To meet faculty-determined degree criteria, students can use credit earned from a variety of sources including that earned at other accredited colleges and universities, by taking recognized college-level proficiency examinations such as Excelsior College Examinations and CLEP, and by using certain recognized training obtained in corporate training programs or training obtained while serving in the U.S. military that has been evaluated as college-level equivalent.

Accreditation

Excelsior College (and under its former name, Regents College) has been continuously accredited since 1977 by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 9104, 215-662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation (CHEA).

Our associate, baccalaureate, and master's degree programs in nursing at Excelsior College are accredited by the National League for Nursing Accrediting Commission (NLNAC), 61 Broadway, New York, NY 10006, 800-669-1656. The NLNAC is a specialized accrediting agency for nursing recognized by the U.S. Secretary of Education.

The baccalaureate degree programs in electronics engineering technology and nuclear engineering technology are accredited by the Technology Accreditation Commission (TAC) of the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202, 410-347-7700. TAC of ABET is a specialized accrediting agency recognized by the U.S. Secretary of Education.

All the College's academic programs are registered (i.e., approved) by the New York State Education Department.

Excelsior College Examinations

Founded on the philosophy that "what you know is more important than where or how you learned it," Excelsior College offers a series of college-level proficiency examinations whereby students may demonstrate competence in various subjects. Excelsior College Examinations (formerly known as Regents College Examinations) are recognized by the American Council on Education (ACE), Center for Adult Learning and Educational Credentials, for the award of college-level credit. Excelsior College Examinations in nursing are the only nursing exams approved by ACE.

Excelsior College Examinations are used by our own students to earn credit toward their degrees. More than 1,000 other colleges and universities across the country accept credit awarded through successful completion of Excelsior College Examinations.

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Detroit Edison operates the Fermi 2 Nuclear Power Plant located in Monroe, MI along the shores of Lake Erie. Fermi is a 1200 MW power plant supplying electricity to the metropolitan Detroit area. Fermi's USA Supplier of the Year TLD lab provides dosimetry services to USA facilities and other non-power plant entities.

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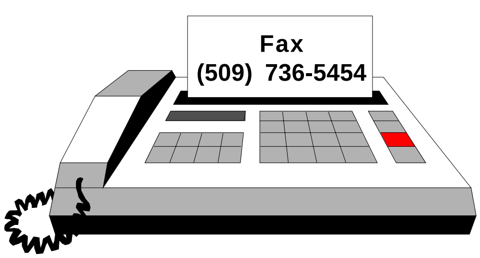

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