

**Dragon, Karen E. (CDC/NIOSH/EID)**

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**From:** DanMcKeel2@aol.com  
**Sent:** Monday, May 21, 2012 4:25 PM  
**To:** NIOSH Docket Office (CDC)  
**Cc:** danmckeel2@aol.com  
**Subject:** Docket 140 GSI: PETITIONER DOCUMENTS 3-8  
**Attachments:** McKeel\_ADD3.pdf+.zip

Dear NIOSH Docket 140 (GSI) Office:

→ Attachment: DOCUMENT 3: <McKeel\_ADD3.pdf> (288 KB)  
Attachment: DOCUMENT 4: <MCNPx\_memo\_3.22.12.pdf> (73 KB)  
Attachment: DOCUMENT 5: <McKeel\_Comment\_Allen2\_ADFD3.pdf> (477 KB)  
Attachment: DOCUMENT 6: <McKeel\_Part2\_Allen\_ADD-3.pdf> (411 KB)  
Attachment: DOCUMENT 7: <McKeel\_Comment\_3.28.12.pdf> (76 KB)  
Attachment: DOCUMENT 8: <DWM\_GSI\_email\_Katz\_4.26.12.pdf> (36 KB)

Please accept this submission to GSI Docket 140 for posting on the DCAS website. There are 6 small PDF files representing 6 separate communications from myself to the TBD-6000 work group and full Board.

Descriptions:

*MCKEEL PETITIONER DOCUMENT 3. FILE: McKeel\_ADD3.pdf (288 KB), dated March 19, 2012. Covers unresolved SC&A "SEC Issues" 5 and 6 as well as more realistic and time period-accurate surrogate concrete induced radioisotope activation data by the GSI Betatrons.*

*MCKEEL PETITIONER DOCUMENT 4. FILE: MCNPx\_memo\_3.22.12.pdf (76 KB); McKeel Email dated 3/22/12 to Ted Katz to distribute to TBD-6000 work group, DCAS and SC&A containing John Ramspott information about MCNPx with Dan McKeel comments.*

*MCKEEL PETITIONER DOCUMENT 5. FILE: McKeel\_Comment\_Allen2\_ADFD3.pdf (480 KB) dated 3/23/12. 2 page initial reaction to mistaken calculations in David Allen's Addendum 3 action items white paper following the 3/15/12 TBD-6000 work group meeting.*

*MCKEEL PETITIONER DOCUMENT 6. FILE: McKeel\_Part2\_Allen\_ADD-3.pdf (411 KB) dated 3/26/12. A critically important document showing that layout worker photon and neutron external radiation doses should be increased based on new knowledge they worked immediately outside the GSI new Betatron shooting room shielded only by a thin steel ribbon door that offered scant protection to them.*

*MCKEEL PETITIONER DOCUMENT 7. FILE: McKeel\_Comment\_3.28.12.pdf (80 KB) dated 3/28/12. McKeel read into the record of the 3.28.12 TBD-6000 work group meeting. Very important rebuttal to the DCAS and SC&A presentations at the same meeting.*

*MCKEEL PETITIONER DOCUMENT 8: FILE (PDF of email): DWM\_GSI\_email\_Katz\_4.26.12.pdf (40 KB) dated 4/26/12. McKeel added comments about the TBD-6000 work group 2 Yes (Ziemer, Munn), 1 No (Josie Beach, 1st ten years of covered period) recommendation on 3/28/12 to support NIOSH and to deny the GSI SEC-00105 petition for the entire covered period of 1953-June 1966.*

Sincerely,

-- Dan McKeel May 21, 2012

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**Addendum 3: Corrected Concrete Activation Isotopes, SEC Issues 5 and 6  
From the David Allen/DCAS October 2010 "Path Forward for GSI" Report**

By

Daniel W. McKeel, Jr., M.D.  
GSI SEC-00105 Co-Petitioner

March 19, 2012

This brief third Addendum to the McKeel 2/28/12 critique of the David Allen and DCAS January 2012 white paper on GSI Betatron Operations is an attachment to a post-3/15/12 TBD-6000 work group meeting e-mail Dan McKeel wrote to Paul Ziemer, work group chair, and to Ted Katz, DFO dated 3/19/12.

**Item #1. Corrected Betatron-induced concrete activation products.**

produced a table of isotopes generated in concrete by high Mev particle accelerators that would be more appropriate than the concrete formula used by Allen DCAS. The table from and replicated on page 20 and discussed on pages 18-20 in the McKeel 3/11/12 addenda 1 and 2 to his 2/28/12 critique is replicated below:

Isotope	Reaction	Half-life	Principal (( 's MeV (%)
152			
Eu 151Eu	(n,())152Eu	<b>13.4 y</b>	0.122 (37%), 0.344 (27%)
			0.779 (14%), 0.96 (15%)
			1.087 (12%), 1.11 (14%)
			1.408 (22%)
154			
Eu 153Eu	(n,())154Eu	<b>8.5 y</b>	0.12 (38%), 0.72 (21%)
			1.00 (31%), 1.278 (37%)
60			
Co 59Co	(n,())60Co	<b>5.27 y</b>	1.17 (100%), 1.33 (100%)
134			
Cs 133Cs	(n,())134Cs	<b>2.065 y</b>	0.57 (23%), 0.605 (98%)
			0.796 (99%)

**Item #2. Unaddressed Issues 5 and 6 of the October 2010 original Path Forward for GSI Document.**

The David Allen and DCAS 9 page Path Forward for GSI document alluded to the desire of the TBD-6000 work group chair to address 5 remaining "SEC Issues." Issues 5 and 6 as defined on page 9 of 9 by Allen are replicated below:

**Issue 5 – SC&A indicated there is no agreement between the appendix model and the film badge results. The path forward addresses developing new exposure models and reconciling them with the film badge data.**

**Issue 6 – SC&A points out again that there are other exposure scenarios not addressed in the appendix. The path forward addresses developing new exposure scenarios based on all the information that has come to NIOSH since the appendix was approved and using those scenarios to revise the dose estimates.**

**McKeel SEC Issue #5 comment.** At the 3/15/12 TBD-6000 meeting, Dan McKeel introduced a slide that compared 2007/8 with 2012 NIOSH-Allen and SC&A-external photon dose modeling results. The SC&A Betatron operator dose declined 90% from 2008 to 2012, whereas the SC&A Layout worker dose had escalated 9-fold over 2008 values for non-Betatron operators. SC&A and DCAS model results were much higher than the film badge data and diverged from each other. The overall agreement between 2012 SCA vs NIOSH results was less robust than was the case for 2007-8 when SC&A had concluded in its SEC-00105 review that Betatron doses bounded all other doses for Co-60 isotope operators, Layout workers specifically, and those doses in turn bounded doses for other workers including chainmen, grinders, burners, etc. Those 2008 results—Betatron higher than layout workers— were opposite to the 2012 "new model" SC&A results.

A comment had been made during the meeting that an agreement of 2-fold between models was acceptable and McKeel had vigorously challenged that statement. Rather, McKeel asserted, peer-reviewed journals always want models to include a comparison with real measured data, and that a variance of 200% would be too large and would in most instances be grounds for rejection of a manuscript. Refereed journal would like to see no more than 20% variance between a model and real measured data.

McKeel also calculated SCA/NIOSH ratios between 2012 model results for Betatron operators and Layout workers. Those ratios varied mostly by factors of 3 to 5-fold (300% to 500%), well above the stated 200% acceptable difference threshold for scientific acceptability.

There was no formal attempt at the 3/15 work group meeting or in the January 2012 Allen and DCAS white paper to reconcile 2012 modeled photon doses with the Landauer GSI program 2084 film badge results. David Allen mentioned his new models had been "normalized" to the film badge data without explaining exactly what that meant or the way normalized had been achieved. The logic was fuzzy from the co-petitioner's point of view.

**McKeel Comment on SEC Issue #6.** David Allen presented 15 New Betatron exposure scenarios, ten of which SC&A stated were not acceptable because they failed to comply with real world industrial radiography scenarios. Dan McKeel pointed out that the two David Allen white papers that have emerged to encompass the October 2010 Path Forward for GSI proposal failed to address several important components of the ten exposure models:

1. No new model for the Old Betatron had emerged. McKeel believes it is unacceptable to equate the Old and New Betatron buildings and machines by merely noting they were "similar," a very scientifically inexact and ambiguous term.

2. The GSI now proven Iridium-192 NDT source 1957-60 has not been modeled as it must be using OCAS-IG-003 guidance.

3. The two GSI 250 KVP portable industrial x-ray machines dose has not been determined by NIOSH with sufficient accuracy.

4. The two GSI radium-226 sources have not been determined with sufficient accuracy by real measured data (none exists), or by modeling with MCNP5 based on a now established Building 6 Radiography facility that lacked steel shielding and thicker concrete walls before June/July 1962 when the " " AEC license drawing annotations indicate they were made. A recently discovered, highly detailed, drawing of the complete GSI plant complex contributed by site expert dated 1/29/1957 clearly shows an inner "Radiograph Room" situated at the exact spot within the confines of Building 6, very near the Foundry #1 building.

McKeel showed at the 3/15/12 meeting added photon dose exposure scenarios existed in multiple locations both inside and outside the GSI building complex, as follows:

[1] Two heavily traveled main walkways bearing nonbadged worker traffic passed within 10 to 20 feet (affidavit and drawing distance measurement information) between the 6 building Radiography facility and the Foundry at least from 1957 through 1966, exposing these workers to Ra-226 (before 1962) and Co-60 (after 1962) external radiation.

[2] The main road ran between the Old and New Betatron buildings and passed within 30 feet of the New Betatron building. Doses from this exposure scenario have not been determined with sufficient accuracy. A sign on the Old Betatron building 300 feet distant from the new Betatron facility read "Do Not Approach This Building Within 100 Feet." McKeel photographed this sign in 2006. These 100 foot radium radiation fields that surrounded the Betatron building had not been determined by NIOSH with sufficient accuracy. Large numbers of not badged GSI workers passed through these radiation fields every day on their way to and from work.

[3] The GSI owned 10 to 20 Curie Ir-192 NDT gamma source has not been determined by NIOSH with sufficient accuracy. Worker testimony indicates this source was used in buildings 9 and 10 to x-ray inspect pipes, and was used in Building 6 to x-ray inspect railroad and transit car trucks (wheel and axle assemblies), and was portable and was stored in the Betatron buildings, including the New one. If true, that fact would place the Ir-192 at GSI as late as 1963 because that was the year the New Betatron building was constructed and placed into operation. These exposure scenarios have not been modeled and will be difficult to do because of missing facts that cannot be determined retrospectively.

[4] Realistic exposure scenarios for the two 250 Kvp GSI portable industrial NDT machines have not been determined nor have doses resulting from their use been determined quantitatively with sufficient accuracy, again as it must be under OCAS-IG-003. It is not defensible to bound dose based on vague information such as one worker testifying they were not used very much. One cannot assume the two x-ray units were put to similar use. If the work load for them was so small, why would GSI purchase two

such units? The logic NIOSH uses to avoid determining a sufficiently accurate dose for the two industrial x-ray units owned by GSI doesn't make sense. Moreover, NIOSH does not have sufficient facts at hand to make this determination.

For [1], [2], [3] and [4] above there are no plausible surrogate data or coworker model data. The GSI site, as first stated by Larry Elliott, former OCAS director, and later by others on the record, GSI is a "unique site." These import of these not adequately modeled scenarios and undetermined with sufficient accuracy multiple known GSI radiation sources argues strongly in 2012, as it did in 2005 when McKeel and first informed NIOSH, the ABRWH and SC&A that these multiple source terms existed, that GSI merits having SEC-00105 approved by the TBD-6000 work group at the 3/28/12 meeting and that this recommendation at that time be forwarded to the full Board.

We argue that the inability of NIOSH to produce a new exposure model for the Old Betatron building supports approving SEC-00105 for the entire GSI covered period of 1953 to 1966. The Old and New Betatron building and x-ray particle accelerators differed from one another in many significant ways. The New Betatron facility was built 10 years after the old facility, was closer to populated work areas, had different construction materials and shielded walls of different heights and configurations, and from the New Betatron x-ray unit that came from the Eddystone Division of GSI in 1963.

Respectfully submitted,



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