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TECHNICAL REVIEW OF SRT-CMA-930058 REVALIDATION STUDIES OF MARK 16 EXPERIMENTS: J70

by

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SAVANNAH RIVER TECHNOLOGY CENTER

Applied Technology Section

SRT-CMA-930073

Applied Physics Group

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REVIEWING
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KEYWORDS:

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TECHNICAL REVIEW OF SRT-CMA-930058 Revalidation Studies of Mark 16 Experiments: J70 (U)

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INTRODUCTION & SUMMARY

This study (Reference 1) is a reperformance of a set of MGBS-TGAL criticality safety code validation calculations previously reported by Clark (Reference 2). The reperformance was needed because the records of the previous calculations could not be located in current APG files and records. As noted by the author, preliminary attempts to reproduce the Clark results by direct modeling in MGBS and TGAL were unsuccessful. Consultation with Clark indicated that the MGBS-TGAL (EXPT) option within the KOKO system (Reference 3) should be used to set up the MGBS and TGAL input data records.

The results of the study indicate that the technique used by Clark has been established and that the technique is now documented for future use. File records of the calculations have also been established in APG files.

The review was performed per QAP II-14 of 1Q34 (References 4 and 5). Since the reviewer was involved in developing the procedural technique used for this study, this review can not be considered a fully independent review, but should be considered

- a verification that the document contains adequate information to allow a new user to perform similar calculations,
- a verification of the procedure by performing several calculations independently with identical results to the reported results, and
- a verification of the readability of the report.

DISCUSSION

The MGBS-TGAL (EXPT) option in KOKO expects the INPUT.KOKO.MGEX.?NAME.?N record. KOKO converts the relatively basic and simple input of that record, describing a uniform array of fuel assemblies in water, into detailed MGBS and TGAL input records. KOKO also performs automatically and consistently the many tedious calculations required to provide the MGBS and TGAL input data. If not performed by KOKO, such calculations must be performed by hand by the user preparatory to MGBS record preparation. Such calculations include the calculation of fuel tube contents (uranium isotopes and aluminum) in g/cc given only the ^{235}U loading (gm/ft) and uranium isotopes (%). KOKO also specifies all options found most applicable to criticality calculations. Having allowed KOKO to generate the MGBS and TGAL records and calculate a reactivity for the uniform array, the user, for cases not fully represented by the uniform array, can easily modify the TGAL input records to model the array accurately, including presence of poison regions in the array.

The review consisted of

- a careful reading of the draft document and reference documents,
- examination of consistency of numerical values reported in the draft document with data provided in reference documents and the calculations,
- extensive discussion with the author of editorial comments to improve the document readability,
- review of the microfiche output for each calculation reported in the report to verify input data agreement with Clark's document and accurate transcription of calculated results , and
- independent calculations of several cases reported in the document following the procedure specified in the document, incorporating the physical and experimental data specified in Clark's document (and included in the reviewed document).

The independent calculations were performed for cases other than those provided as examples in the report and resulted in the same answers as reported in the document. Those calculations are not detailed here, but the microfiche output (Jobs 458, 459, and 464) are available in APG files (referenced to this review document).

The report is not intended to be an NCSE as defined by WSRC-IM-93-13 (Reference 6).

A draft copy of the report is not included in this review document since :

- many editorial changes have been made to the report during the review process,
- the report is long (29 pages), and
- a copy of the report will be maintained in APG files in addition to site files.

SUMMARY AND CONCLUSIONS

A technique of using the KOKO module and the associated criticality code modules MGBS and TGAL has been established that essentially reproduces the results reported by Clark for MGBS-TGAL calculations of experimental lattices. The procedure has been described in sufficient detail, with example calculations, to enable a new user to model similar lattices using the criticality safety modules. The report established equivalence of results with Clark's reported results.

REFERENCES

1. S. Y. Lee, "Revalidation Studies of Mark 16 Experiments: J70 (U)", SRT-CMA-930058, Draft (10/21/93)
2. H. K. Clark, "Correlations with Mark 16 Experiments", DPST-83-1025, November 29, 1983
3. H. K. Clark, **Users's Manual, JOSHUA Nuclear Criticality Safety Modules**, DPSTM-86-700-3, March, 1987
4. **MANUAL 1Q34, NRTSC QUALITY ASSURANCE MANUAL**, January 1991
5. NRTSC QA Procedure QAP II-14, "TECHNICAL REVIEW", August, 1991
6. **WSRC-IM-93-13, WSRC Nuclear Criticality Safety Manual**, Revision 1, July 1, 1993

ATTACHMENT 1 - SRT-CMA-930073

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NRTSC REVIEW SHEET

OSR 24-K7

TASK TITLE <u>REVALIDATION STUDIES OF MARK 16 EXPERIMENTS: J70</u>	TASK NUMBER <u>N/A</u>
ITEM REVIEWED <u>SRT-CMA-930058</u> (Attach additional pages as necessary; marked-up pages are acceptable.)	PAGE 1 OF 1

1. Areas reviewed (*identify clearly each area reviewed*).

Logic of presentation
Clarity of presentation
Accuracy of presentation
Applicability of presentation
Consistency of data values referenced to reference values
Usability of the procedure presented

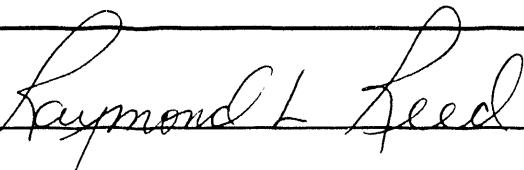
2. Approaches used to perform the review.

Read the document carefully.
Read the references carefully and ensured data values were accurately repeated.
Performed calculations per the indicated procedure.
Ensured the readability of the presentation and agreement of intent with material as presented.
Extensively discussed editorial variances and readability with author

3. Questions, comments to be resolved.

<input checked="" type="checkbox"/> I agree with the technical content	<input type="checkbox"/> I disagree with the technical content.
<input checked="" type="checkbox"/> I accept the conclusions and recommendations	
<input type="checkbox"/> I do not accept the conclusions and recommendations for the following reasons:	

Reviewer Signature



Date 10/25/93

The image consists of several high-contrast black and white shapes. At the top, there are four vertical rectangles arranged in a 2x2 grid: the top-left and bottom-left rectangles are white, while the top-right and bottom-right are black. Below this is a single, thick black horizontal bar. A diagonal black line starts from the bottom-left corner of the bar and extends upwards and to the right. At the very bottom of the image is a large, dark, irregular shape that resembles a wide, shallow U or a large inverted triangle. Inside this dark shape is a white, rounded rectangular area that looks like a shield or a cap. In the center of this white area, there is a small black dot.

DATE

