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JONAH ALGORITHMS: C-2 The Ratio Option

JoAnn Rego

February 1, 1979

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JoAnn Rego^{*}
Nuclear Chemistry Division
Lawrence Livermore Laboratory
Livermore, California 94556

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1. DATA ACQUISITION

- A. Source Selection. All data entries are scanned for a match on nuclide and source requested. If source is omitted, the first source found is used.
- B. Source Hierarchy. When PROPHET must obtain data, as a result of an implicit calculation, where no source can be given by the user, the code will use a predefined source hierarchy to select the data. The hierarchy is 3, 4, 5, 6, 8. The program will attempt to get data for the first source in the hierarchy. If the data does not exist for a given pot for the source being searched, the program will get data for that pot from the next source in the hierarchy. Therefore, it is possible to use data from mixed sources.
- C. Replicate Data
1. Data with replicate pot labels are averaged within a pot (i.e. 1, 1A, 1B, 1X).
 2. The latest date for entry will be used if duplicate data is present. The higher category is used if duplicate data is present with the same date of entry. The last entry is used if all other criteria are the same.
 3. Replicate error is the largest error determined from

$$a) \% \text{ propagated error} = \frac{100}{\bar{x}} * \sqrt{\frac{\sum \sigma Z Z A A A^2}{n}} ; \text{ or}$$

$$b) \% \text{ standard deviation} = \frac{100}{\bar{x}} * \sqrt{\frac{\sum (\bar{x} - x_i)^2}{n(n-1)}}$$

D. Defaults

1. SPECIES 56140 OPTION A/ML, A/F, F/F, BF, A, A/A,
F/A, AR, TN, NET
SPECIES 94261 OPTION F, K, R
SPECIES 60147 OPTION F/ML
2. BF TRACER 94261 OPTION F, K, R, A, A/A, F/A, TN
3. FISSION INDICATOR 60147 SOURCE 4 EXCLUDE A/ML, AR
4. R VALUE 56140 OPTION R, F/F, F/ML

E. A and B Values

1. Data is available for the calculation of the standard fission product yields based on the following nuclides only: 92233, 92235, 92238, 94000(94261), and 90232.
2. If both A-Value and B-Value are present and non-zero, the A-Value is used and the B-Value set to zero for a specific nuclide.
3. If the A-Value is equal to zero, the B-Value is used.
4. If the A-Value is equal to zero and all the fission product yield B-Values are zero or absent, the default is 20% for each fission product yield nuclide (BVAL = .20).

II. JONAH - ALGORITHMS ONLY

All calculations represent one pot of a pot-by-pot determination.

A. Atoms/Milliliter (A/ML)

The general form is:

$$A/ML(ZZAAA) = C_1 * A/ML_1 + C_2 * A/ML_2 + C_3 * A/ML_3 + C_4 * A/ML_4$$

1. Simple: Nuclides that require no other calculations

REQUEST ZZAAA GET $C_1 * A/ML(ZZAAA)$ WHERE $C_1 = 1$.

2. Compound:

REQUEST	ZZAAA	GET	$C_1 * A/ML_1$	$+ C_2 * A/ML_2$	$+ C_3 * A/ML_3$	$+ C_4 * A/ML_4$
92237		1	92247			
92239		1	93239			
92259	-0.000057		92238	1	92234	
92260	-0.007253		92238	1	92235	
92261	-0.00731		92238	1	92235	1 92236 1 92234
†92262		1				
92263		1	92235	1	92234	1 92236
92264		1	92238	1	93239	1 92237 1 92240
94000		1	94239	1	94240	
94261		1	94239	1	94240	

3. Special: Nuclides 10000, 36000, 54000

1220

69570, 72181, 73182, 91533

91531

†Cannot be calculated by REQUEST.

925xx
 926xx
 927xx

} xx* = 34, 35, 38, 62, 63, 64

92238, NET only

94742

95741

* 926xx = 927xx when xx = 33, 36, 37, 60, 61 and soil correction = 0.

a. STABLE GAS CORRECTION

REQUEST BF ZZAAA GET A/ML(ZZ000), FI(fi), ZZ000 ϕ , A/ML(18000),

NORMAL AIR RATIO $\frac{ZZ000}{18000}$.

ZZ only 10, 36, 54

CALCULATE

$$A/ML(ZZ000)_c = A/ML(ZZ000) - \left(\frac{ZZ000}{18000} \right)_{air} * A/ML(18000)$$

$$\sigma_{(ZZ000)_c} = \frac{\sqrt{\sigma_{(ZZ000)}^2 + \sigma_{(18000)}^2 * \left(\frac{ZZ000}{18000} \right)_{air}^2}}{A/ML(ZZ000)_c}$$

$$BF(ZZ000) = \frac{A/ML(ZZ000)_c}{ZZ000\phi}$$

$$\sigma_{BF(ZZ000)} = \frac{\sigma_{(ZZ000)_c}}{BF(ZZ000)}$$

b. D₂O TRACER CORRECTION

REQUEST BF 1220 GET A/ML(1102), 1002_φ, $\left(\frac{1002}{1001}\right)_{22}$ $\left(\frac{1002}{1001}\right)_{23}$

subscripts identify specific sources for data.

CALCULATE

$$A/ML(1220)_c = A/ML(1220) * \left\{ \left(\frac{1002}{1001}\right)_{22} - \left[1 - \left(\frac{1002}{1001}\right)_{22} \right] * \left(\frac{1002}{1001}\right)_{23} \right\}$$

$$\sigma(1220)_c = \frac{\left[A/ML(1102) * \left(1 + \left(\frac{1002}{1001}\right)_{22} \right) * \left(\frac{1002}{1001}\right)_{22} \right] * \left[A/ML(1102) - \left(\frac{1002}{1001}\right)_{23} \right] + \left[\left(\frac{1002}{1001}\right)_{23} \left(\frac{1002}{1001}\right)_{22} \right]}{A/ML(1220)_c}$$

$$BF(1220) = \frac{A/ML(1220)_c}{1002_\phi}$$

$$\sigma_{BF(1220)} = \frac{\sigma(1220)_c}{BF(1220)}$$

c. SOIL CORRECTION FOR DETECTOR NUCLIDES

REQUEST ZZ5AA GET A/ML(ZZAAA), A/ML(65160)

only ZZAAA = 69170, 72181, 73182, or 91233

CALCULATE

$$A/ML(ZZ5AA) = A/ML(ZZAAA) - (\text{soil constant}(ZZAAA) * A/ML(65160))$$

$$\sigma(ZZ5AA) = \sqrt{\frac{A/ML(ZZAAA)^2 + (A/ML(65160) * \sigma_{SOIL})^2 + (\text{soil constant}(ZZAAA) * \sigma(65160))^2}{A/ML(ZZ5AA)}}$$

d. PROTACTINIUM CORRECTION

REQUEST 91531 GET A/ML (91233), $\frac{91231}{91233}_R$, A/ML (92235), A/ML (92264),

A/ML (92261), FI(fi), Coru, BVAL (92261),

BVAL (92238), 92238_ϕ , 92261_ϕ

CALCULATE

$$\text{Device 38} = \frac{92238_\phi}{92261_\phi} * \text{A/ML}(92261) + \frac{\text{FI}(fi)}{\text{Coru}} * \left[\frac{92238_\phi}{92261_\phi} * \text{BVAL}(92261) - \text{BVAL}(92238) \right]$$

$$\text{A/ML}(92535) = \text{A/ML}(92235) - ((\text{A/ML}(92264) - \text{Device 38}) * 0.007253)$$

$$\text{A/ML}(91531) = \left(\frac{91231}{91233} \right)_R * \text{A/ML}(91233) - ((\text{A/ML}(92235) - \text{A/ML}(92535)) * 4.62 \times 10^{-5})$$

$$\sigma(92235 * C)^2 = [\sigma_{92235}^2 - \sigma_{92535}^2] * (4.62 \times 10^{-5})^2$$

$$\sigma_{91531} = \sqrt{\frac{\text{A/ML}(91531)^2 * \left(\frac{\sigma_{91231}}{91233} \right)^2 + \left(\frac{91231}{91233} \right)_R^2 + (\sigma_{91233})^2 * \sigma(92235 + C)^2}{\text{A/ML}(91531)}}$$

e. DIRT CORRECTION

REQUEST 925xxx GET A/ML (922xx), 92238_ϕ , 92261_ϕ ,

BVAL(92261), BVAL(92238), Coru

CALCULATE where xx = 34, 35, 36, 38

$$\text{Device 38} = \frac{92238}{92261} \phi * A/ML(92261) + \frac{FI(fi)}{Coru} * \left[\frac{92238}{92261} \phi * BVAL(92261) - BVAL(92238) \right]$$

$$\sigma_{\text{Device 38}} = \sqrt{\left(\frac{92238}{92261} \phi * \sigma_{92261} \right)^2 + \frac{\sigma_{fi}^2}{FI(fi)^2} + \left(\frac{\sigma_{Coru}^2}{Coru} \right) + \left[\frac{FI(fi)}{Coru} * \frac{92238}{92261} \phi (BVAL(92261) - BVAL(92238)) \right]^2}$$

$$A/ML(92534) = A/ML(92234) - A/ML(92262) * 0.000057$$

$$A/ML(92535) = A/ML(92235) - A/ML(92262) * 0.007253$$

$$A/ML(92538) = \text{Device 38}$$

$$A/ML(92262) = A/ML(92264) - \text{Device 38}$$

$$A/ML(92563) = A/ML(92534) + A/ML(92235) + A/ML(92236)$$

$$A/ML(92564) = \text{Device 38}$$

$$\sigma_{92534} = (0.000057 * \sigma_{92262}) \quad \text{iff} \quad A/ML(92234) = 0 \quad \text{else}$$

$$\sigma_{92534} = \sqrt{(\sigma_{92234})^2 + (0.000057 * \sigma_{92262})^2}$$

$$- \left[2 * \frac{A/ML(92534)}{A/ML(92235)} * 0.000057 * \sigma_{92234} * \sigma_{92262} \right]$$

$$\sigma_{92535} = \sqrt{(\sigma_{92235})^2 + (0.007253 * \sigma_{92262})^2}$$

$$- \left[2 * \frac{A/ML(92535)}{A/ML(92235)} * 0.007253 * \sigma_{92235} * \sigma_{92262} \right]$$

$$\sigma_{92538} = \sigma_{\text{Device 38}}$$

$$\sigma_{92262} = \sqrt{(\sigma_{92264})^2 + (\sigma_{\text{Device 38}})^2}$$

$$\sigma_{92263} = \sqrt{(\sigma_{92534})^2 + (\sigma_{92535})^2 + (\sigma_{92236})^2 + (\sigma_{92534} * \sigma_{92535}) + (\sigma_{92534} * \sigma_{92236}) + (\sigma_{92535} * \sigma_{92236})}$$

$$\sigma_{92264} = \sigma_{\text{Device 38}}$$

f. VOLATILITY CORRECTION

REQUEST 926xx GET A/ML(922xx), Coru

CALCULATE

$$A/ML(926xx) = A/ML(922xx) * \text{Coru}$$

$$\sigma_{926xx} = \sqrt{A/ML(922xx)^2 * \text{Coru}^2 * \left[\frac{\sigma_{\text{Coru}}^2}{\text{Coru}^2} + \frac{\sigma_{922xx}^2}{A/ML(922xx)^2} + \frac{\sigma_{\text{Coru}}^2 * (\sigma_{922xx})^2}{\text{Coru}^2 * A/ML(922xx)^2} \right]}$$

g. DIRT AND VOLATILITY CORRECTIONS

REQUEST 927xx GET A/ML(925xx), Coru

CALCULATE

$$A/ML(92734) = A/ML(92534) * \text{Coru}$$

$$A/ML(92735) = A/ML(92535) * \text{Coru}$$

$$A/ML(92738) = \text{Device 38} * \text{Coru}$$

$$A/ML(92762) = A/ML(92264) - (\text{Device 38} * \text{Coru})$$

$$A/ML(92763) = A/ML(92734) + A/ML(92735) + A/ML(92235)$$

$$A/ML(92764) = \text{Device 3B} * \text{Coru}$$

h. NET 94238 CORRECTION

REQUEST NET 94238 GET A/ML(94742), A/ML(94238),

$$\sum_{g=1}^{30} (94238)_{\phi}^{PRI},$$

$$\sum_{g=31}^{47} (94238)_{\phi}^{BF}, \quad \sum_{g=31}^{47} (94242)_{\phi}^{BF}$$

CALCULATE

$$BF(94742) = \frac{A/ML(94742)}{\sum_{g=31}^{47} (94242)_{\phi}^{BF}}$$

$$\sigma_{BF(94742)} = \frac{\sigma(94742)}{BF(94742)}$$

If all data available,

$$A. \text{ ATOMS}(94238)_C = \frac{A/ML(94238) - \left[BF(94742) * \sum_{g=31}^{47} (94238)_{\phi}^{BF} \right]}{BF(BFTN)}$$

$$\sigma_{\text{ATOMS}_C} = \frac{\sqrt{(A/ML(94238) * \sigma(94238))^2 + [BF(94742) * \sigma_{BF(94742)}]^2 * \left(\sum_{g=31}^{47} (94238)_{\phi}^{BF} \right)^2}}{\text{ATOMS}(94238)_C}$$

$$\text{NET}(94238) = \text{ATOMS}(94238)_C - \sum_{g=1}^{30} (94238)_O^{PRI}$$

$$\sigma_{NET} = \sigma_{ATOMS}_C * \left(\frac{ATOMS(94238)_C}{NET(94238)} \right)$$

If no $\sum_{g=31}^{47} (94242)_{\phi}^{BF}$ or A/ML(94242), use

$$B. \quad ATOMS(94238)_C = \frac{A/ML(94238)}{BF(BFTN)}$$

$$\sigma_{ATOMS(94238)}_C = \frac{\sigma(94238)}{BF(BFTN)}$$

$$NET(94238) = ATOMS(94238)_C - \sum_{g=1}^{30} (94238)_O^{PRI} - \sum_{g=31}^{47} (94238)_{\phi}^{BF}$$

$$\sigma_{NET} = \sigma_{ATOMS(94238)}_C * \frac{ATOMS(94238)_C}{NET(94238)}$$

i. Pu242 CORRECTION

REQUEST 94742 GET A/ML(94242), A/ML(94261), A/ML(fi), AVAL(94242),
BVAL(94242), 94261_φ

CALCULATE

$$BF(94261) = (A/ML(94261) + BVAL(94261)*FI(fi)) / (94261_{\phi} - AVAL(94261))$$

$$A/ML(94742) = A/ML(94242) - (BF(94261)*AVAL(94242))$$

$$\sigma_{BF} = \sqrt{(A/ML(94261)*\sigma_{94261_{\phi}})^2 + (BVAL(94261)*\sigma_{FI}*FI(fi))^2 / (A/ML(94261) + BVAL*FI(fi))^2}$$

$$\sigma_{94742} = \frac{\sqrt{[(BF(94261) * \sigma_{94261})]^2 + [BVAL(94261) * \sigma_{FI} * FI(fi)]^2}}{A/ML(94742)}$$

j. AMERICIUM CORRECTION

REQUEST 95741 GET A/ML(94261), A/ML(fi), AVAL, BVAL, 94261_φ,
Cm Corr, A/ML(95242)

CALCULATE

$$BF(94261) = \{A/ML(94261) + BVAL(94261) * FI(fi)\} / (94261_{\phi} - AVAL(94261))$$

$$A/ML(95741) = A/ML(95241) - \{BF(94261) * AVAL(95241)^{\dagger\dagger}\} + A/ML(96242) * Cm Corr.$$

$$\sigma_{BF} = \frac{\sqrt{[\sigma_{94261} * A/ML(94261)]^2 + [BVAL(96241) * \sigma_{fi} * FI(fi)]^2}}{A/ML(94261) + BVAL(94261) * FI(fi)}$$

$$\sigma_{95741} = \frac{\sqrt{[\sigma_{BF} * BF(94261)]^2 + [A/ML(96242) * \sigma_{96242}]^2 + [A/ML(95241) * \sigma_{95241}]^2}}{A/ML(95741)}$$

B. FISSIONS (F)

REQUEST ZZAAA GET A/ML(ZZAAA), AVAL, A/ML(fi), BFTN_φ, BVAL

CALCULATE

$$FISY(ZZAAA) = \frac{(BFTN_{\phi} - AVAL(BFTN))}{(A/ML(ZZAAA)/FI(fi)) + BVAL(BFTN)}$$

^{††}Not the usual definition of AVAL.

$$\sigma_{FISY} = A/ML(ZZAAA) * \frac{\sqrt{(\sigma_{BFTN})^2 + (\sigma_{fi})^2}}{A/ML(ZZAAA) + BVAL(BFTN)*FI(fi)}$$

C. KILOTON YIELD (K)

REQUEST ZZAAA GET A/ML(ZZAAA), AVAL(BFTN), BVAL(BFTN),
BFTN_φ, A/ML(fi)

CALCULATE

$$FISY(ZZAAA) = \frac{BFTN_{\phi} - AVAL(BFTN)}{\frac{A/ML(ZZAAA)}{FI(fi)} + BVAL(BFTN)}$$

K = FISY(ZZAAA) * KT conversion factor

$$\sigma_K = A/ML(ZZAAA) * \frac{\sqrt{(\sigma_{BFTN})^2 + (\sigma_{fi})^2}}{A/ML(ZZAAA) + BVAL(BFTN) + FI(fi)}$$

D. BARIUM R-VALUE (R)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(fi)

CALCULATE

$$FI(ZZAAA) = A/ML(ZZAAA)/(Qfact(BFTN) * SFY(BFTN) * .01)$$

$$RCLC = Qfact(BFTN)/Qfact(Mo99)$$

$$R(ZZAAA) = FI(ZZAAA)/(FI(fi) * \frac{1}{RCLC})$$

$$\sigma_R = \sigma_{ZZAAA}^2 + \sigma_{fi}^2$$

E. ATOMS/FISSION (A/F)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(fi)

CALCULATE

$$A/F(ZZAAA) = A/ML(ZZAAA)/FI(fi)$$

$$\sigma_{A/F} = \sqrt{\sigma_{ZZAAA}^2 + \sigma_{fi}^2}$$

F. FISSIONS/FISSION (F/F)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(fi)

CALCULATE

$$FI(ZZAAA) = A/ML(ZZAAA)/(Qfact(BFTN)*SFY(BFTN)*.01)$$

$$F/F(ZZAAA) = FI(ZZAAA)/FI(fi)$$

$$\sigma_{F/F} = \sqrt{\sigma_{ZZAAA}^2 + \sigma_{fi}^2}$$

G. BOMB FRACTION (BF)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(fi), AVAL(BFTN), BVAL(BFTN)

CALCULATE

$$BF(ZZAAA) = \frac{A/ML(ZZAAA) + BVAL(BFTN) * FI(fi)}{BFTN_{\phi} - AVAL(BFTN)}$$

$$\sigma_{BF} = \sqrt{\frac{(\sigma_{ZZAAA} * A/ML(ZZAAA))^2 + (BVAL(BFTN) * \sigma_{fi} * FI(fi))^2}{BF(ZZAAA)^2}}$$

H. FISSION/MILLILITER (F/ML)

REQUEST ZZAAA GET A/ML(ZZAAA)

CALCULATE

$$FI(ZZAAA) = \frac{A/ML(ZZAAA)}{(Q_{fact}(BFTN) * SFY(BFTN) * .01)}$$

I. ATOMS (A)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(BFTN), A/ML(fi), AVAL, BVAL

CALCULATE

$$BF(BFTN) = \frac{A/ML(BFTN) + BVAL(BFTN) * FI(fi)}{BFTN_{\phi} - AVAL(BFTN)}$$

$$\sigma_{BF} = \sqrt{\frac{BFTN * A/ML(BFTN)^2 + BVAL(BFTN) * \sigma_{fi} * FI(fi)^2}{A/ML(BFTN) + BVAL(BFTN) * FI(fi)}}$$

$$\text{Atoms}(\text{ZZAAA}) = \text{A/ML}(\text{ZZAAA})/\text{BF}(\text{BFTN})$$

$$\sigma_{\text{Atoms}} = \sqrt{\sigma_{\text{ZZAAA}}^2 + \sigma_{\text{BF}}^2}$$

J. ATOM/ATOM (A/A')

REQUEST ZZAAA(A) and ZZAAA (A') GET A/ML(A=numerator),
 A/ML(A'=denom)
 EXCLUDE Ratios Source 9

CALCULATE

$$\text{A/A} = \text{A/ML}(\text{A})/\text{A/ML}(\text{A}')$$

$$\sqrt{\sigma_{\text{a/a}}^2} = \sqrt{\sigma_{\text{A}}^2 + \sigma_{\text{A}'}^2}$$

K. FISSION/ATOM (F/A)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(fi)

CALCULATE

$$\text{FI}(\text{ZZAAA}) = \text{A/ML}(\text{ZZAAA})/(\text{Qfact}(\text{fi}) * \text{SFY}(\text{fi}) * .01)$$

$$\text{F/A}(\text{ZZAAA}) = \text{FI}(\text{ZZAAA})/\text{A/ML}(\text{BFTN})$$

$$\sigma_{F/A} = \sqrt{\sigma_{ZZAAA}^2 + \sigma_{BFTN}^2}$$

L. ATOM RATIO (AR)

REQUEST ZZAAA/ZZXXX GET Ratios Source 9 (406 card data)

CALCULATE

No further calculations.

M. TOTAL ATOMS FORMED (NET)

REQUEST ZZAAA GET A/ML(ZZAAA), A/ML(BFTN), A/ML(fi), AVAL, BVAL

CALCULATE

$$BF(BFTN) = \frac{A/ML(BFTN) + BVAL(BFTN)}{BFTN_{\phi} - AVAL(BFTN)}$$

$$\sigma_{BF} = \frac{\sqrt{\sigma_{BFTN} * A/ML(BFTN)}^2 + (BVAL(BFTN) * \sigma_{fi} * FI(fi))^2}{A/ML(BFTN) + BVAL(BFTN) * FI(fi)}$$

$$Atoms(ZZAAA) = A/ML(ZZAAA)/BF(BFTN)$$

$$\sigma_{Atoms} = \sqrt{\sigma_{BFTN}^2 + \sigma_{ZZAAA}^2}$$

$$NET = Atoms(ZZAAA) - ZZAAA_{\phi}$$

$$\sigma_{\text{NET}} = \sigma_{\text{Atoms}} * \left(\frac{\text{Atoms}(\text{ZZAAA})}{\text{NET}(\text{ZZAAA})} \right)$$

N. THERMONUCLEAR CALCULATION (TN)

REQUEST ZZAAA GET A/ML(ZZAAA)

ONLY Nuclide list: 21044 (or 21344)

39088

40089

41092 (or 41392)

63150 (or 63350)

69168

71174

79196

90231 (or 91531)

92237 (or 92737)

CALCULATE

$$1. \text{BF}(\text{BFTN}) = \frac{\text{A/ML}(\text{BFTN}) + \text{BVAL}(\text{BFTN}) + \text{FI}(\text{fi})}{\text{BFTN}_{\phi} - \text{AVAL}(\text{BFTN})}$$

$$\sigma_{\text{BF}} = \frac{\sqrt{(\sigma_{\text{BFTN}} * \text{A/ML}(\text{BFTN}))^2 + (\text{BVAL}(\text{BFTN}) * \sigma_{\text{fi}} * \text{FI}(\text{fi}))^2}}{\text{A/ML}(\text{BFTN}) + \text{BVAL}(\text{BFTN}) * \text{FI}(\text{fi})}$$

$$\text{Atoms}(\text{ZZAAA}) = \text{A/ML}(\text{ZZAAA}) / \text{BF}(\text{BFTN})$$

$$\sigma_{\text{Atoms}} = \sqrt{\sigma_{\text{BFTN}}^2 + \sigma_{\text{ZZAAA}}^2}$$

2. Externally loaded detectors only

$$a/a_{\phi} = \overline{\text{Atoms}(\text{ZZAAA})/\text{ZZAAA}}$$

$$\phi = (a/a_{\phi}) / (K * C(\text{ZZAAA}))$$

$$\text{Fluence} = \frac{4\pi R^2 * \phi}{T}$$

III. Appendix:

Terminology

A/ML(ZZAAA) = atoms/millimeter of species requested.

$\overline{\text{Atoms}}$ = pot by pot average for the species requested converted to atoms.

$a\phi$ = atoms loaded for external TN tracer.

BFTN = bomb fraction tracer nuclide.

BVAL(92261) = BVAL(92235) - 0.00731*BVAL(92238)

C(ZZXXX) = constant for denominator in TN calculation.

cm corr = Curium correction factor

Coru = See paper by H. Hicks (Coca 75-121)

$$\text{Device 38} = \frac{92238}{92261} \phi * A/ML(92261) + \frac{FI(fi)}{Coru} * \left[\frac{92238}{92261} \phi * 3VAL(92261) - BVAL(92238) \right]$$

FI = atoms/ml converted to fissions/ml

= A/ML(ZZAAA)/(Qfact(BFTN)*SFY(BFTN)*.01) or

= A/ML(fi)/(Qfact(fi)*SFY(fi)*.01)

fi = fission indicator nuclide

K = cross section for TN nuclide

$$KT \text{ conversion factor} = 2.614 \times 10^{25} / (BVAL(BFTN * \text{energy}(BFTN)))$$

Conversion factor from fissions to kt.

	<u>MeV/fission</u>	<u>kt/fission</u>	<u>fissions/kt</u>
U233	179	6.848 E-24	1.452 E+23
U235	180	6.886 E-24	1.452 E+23
U238	180	6.886 E-24	1.452 E+23
Pu	186	7.116 E-24	1.405 x 10 ²³

ZZAAA_φ = nuclide load-preshot

Qfact(ZZ) = standard value for nuclide in Q & R LIB TABLE.

SFY(ZZ) = standard value for fission yield in Q & R LIB TABLE.

RCLC = calculated R-value

σ = sigma or error determined = (% error (ZZAAA) * A/ML)*.01

T = neutron transmission factor input for TN calculation