



January 4, 2005

TRITIUM LABORATORY

Data Release #05-016
Job # 1985

MACTEC
TRITIUM SAMPLES

A handwritten signature in black ink, appearing to read "James D. Happell". The signature is written over a horizontal line.

Dr. James D. Happell
Assistant Research Professor

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GENERAL COMMENTS ON TRITIUM RESULTSTritium Scale New Half-life

Tritium concentrations are expressed in TU, where 1 TU indicates a T/H abundance ratio of 10^{-18} . The values refer to the tritium scale recommended by U.S. National Institute of Science and Technology (NIST, formerly NBS), and International Atomic Energy Agency (IAEA). The TU-numbers are based on the NIST tritium water standard #4926E. Age corrections and conversions are made using the recommended half-life of **12.32 years**, i.e., a decay rate of $\lambda = 5.626\% \text{ year}^{-1}$. In this scale, 1 TU is equivalent to 7.151 dpm/kg H₂O, or 3.222 pCi/kg H₂O, or 0.1192 Bq/kg H₂O (Bq = disint/sec).

TU values are calculated for date of sample collection, REFDATE in the table, as provided by the submitter. If no such date is available, date of sample arrival at our laboratory is used.

The stated errors, eTU, are one standard deviation (1 sigma) including all conceivable contributions. In the table, QUANT is quantity of sample received, and ELYS is the amount of water taken for electrolytic enrichment. DIR means direct run (no enrichment).

Remark: From 1 Jan 1994 through 31 Dec 2001 we used the previously recommended value for the half-life, 12.43 years. The use of the new number, 12.32 years will in practice increase the reported TU-values by 0.9 %. This is insignificant since our reported values carry 1 sigma uncertainties of 3 % or more.

It is interesting to note that before 1994 we used the older, then recommended value of 12.26 years.

Very low tritium values

In some cases, negative TU values are listed. Such numbers can occur because the net tritium count rate is, in principle the difference between the count rate of the sample and that of a tritium-free sample (background count or blank sample). Given a set of "unknown" samples with no tritium, the distribution of net results should become symmetrical around 0 TU. The negative values are reported as such for the benefit of allowing the user unbiased statistical treatment of sets of the data. For other applications, 0 TU should be used.

Additional information

Refer to Services Rendered (Tritium), Section II.8, in the "Tritium Laboratory Price Schedule; Procedures and Standards; Advice on Sampling", and our Web-site www.rsmas.edu/groups/tritium.

Tritium efficiencies and background values are somewhat different in each of the nine counters and values are corrected for cosmic intensity, gas pressure and other parameters. For tritium, the efficiency is typically 1.00 cpm per 100 TU (direct counting). At 50x enrichment, the efficiency is equivalent to 1.00 cpm per 2.4 TU. The background is typically 0.3 cpm, known to about ± 0.02 cpm. Our reported results include not only the Poisson statistics, but also other experimental uncertainties such as enrichment error, etc.

End

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Purchase Order: 47540.9100.15.1
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Cust	LABEL INFO	JOB.SX	REFDATE	QUANT	ELYS	TU	eTU
MACTEC	- SW31-01	1985.01	041014	1000	273	2.80	0.11
MACTEC	- SW31-02	1985.02	041014	1000	275	2.73	0.10
MACTEC	- RP-76A-01	1985.03	041014	1000	275	0.32*	0.09
MACTEC	- RGPZ-15B-01	1985.04	041019	1000	275	0.09	0.09
MACTEC	- RP-107D-01	1985.05	041021	1000	275	0.00	0.09
MACTEC	- RGP2-26-01	1985.06	041026	1000	275	-0.01	0.09
MACTEC	- RGPZ-16D-01	1985.07	041104	1000	275	0.05	0.09
MACTEC	- RP-65B-01	1985.08	041014	1000	275	0.29*	0.09

* Average of duplicate runs