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Guide for SDEC Set up

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Disclaimer

Guide for SDEC Set up

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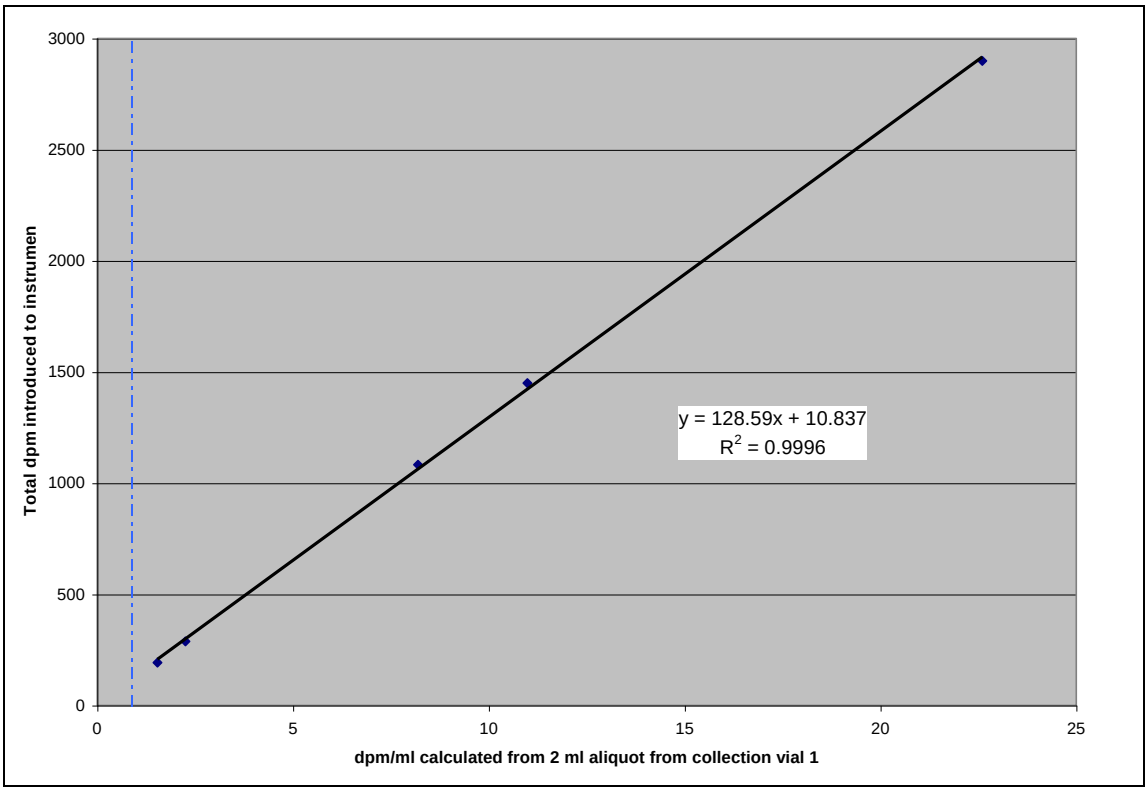
1. **Instrument Set-up**: The instrument has four collection vials that must be filled with ethylene glycol before operation. Each of the four vials should be labeled 1 through 4 and the empty weights recorded. Fill each vial with 80 mL of ethylene glycol and record the weight again. In order for the instrument to operate properly, the collection vials should always have less than 160 mL of total liquid in them. After completing a sample run, remove the collection vials, use a transfer pipette to remove any liquid that might still be on the air paddler, wipe off any condensation from the exterior of the collection vial and record weight. From the instrument, record the ending volume and the time of operation.
2. **Efficiency Curve**: The solution mixed in the scintillation vial will be 2 ml of a 95% to 50% ethylene glycol to water mixture. To determine the efficiency of counting at all of these concentrations, a series of vials should be set up that consist of 18 ml of Ultima Gold LLT cocktail mixed with standard, regular deionized water and ethylene glycol. The following chart shows the amounts I used to determine my curve (standard value of 4895 dpm/ml of ^{3}H):

Vial #	% ethylene	Amount std.	Amount H2O	Amount ethylene	Amount Ultima
1	95%	0.100 ml	0.00 ml	1.90 ml	18 ml
2	90%	0.100 ml	0.10 ml	1.80 ml	18 ml
3	85%	0.100 ml	0.20 ml	1.70 ml	18 ml
4	80%	0.100 ml	0.30 ml	1.60 ml	18 ml
5	75%	0.100 ml	0.40 ml	1.50 ml	18 ml
6	70%	0.100 ml	0.50 ml	1.40 ml	18 ml
7	65%	0.100 ml	0.60 ml	1.30 ml	18 ml
8	60%	0.100 ml	0.70 ml	1.20 ml	18 ml
9	55%	0.100 ml	0.80 ml	1.10 ml	18 ml
10	50%	0.100 ml	0.90 ml	1.00 ml	18 ml

3. The efficiency curve should be counted in the 'Low Level' count mode with the Luminescence Correction ON and the Color Quench Correction ON. Once the tSIE values are determined, chart the cpm against the tSIE numbers and find the best fit for the data. The resulting equation is to be used to converting tSIE values from the collection vials to efficiency.
4. **Activity Calculation**: To determine the background cpm value of the ethylene glycol, count a 2 ml sample of ethylene glycol with 18 ml of Ultima Gold for 100 minutes.
5. To determine the total activity of the sample, take two 2 ml aliquots of sample from the first vial and place in separate scintillation vials. Record the weight of each aliquot. Determine the percentage of total sample each aliquot represents by dividing the aliquot weight by the total solution weight from the vial. Also, determine the percentage of ethylene glycol in the sample by dividing the initial solution weight by the final solution weight and multiplying by 100.
6. Add 18 ml of Ultima Gold to each vial and proceed to count for 100 minutes in a 'Low Level' count mode.

7. Before performing a calculation on the dpm value of each aliquot, a subtraction should be made for the background count rate of the ethylene glycol. Based on the background cpm, multiply the background cpm value by the percentage of ethylene glycol in the collection vial.
8. Once the background value is subtracted, calculate the dpm value of the sample based on the tSIE conversion to efficiency. This will produce a dpm value. To convert this to a total activity of the sample, divide the aliquot dpm value by the decimal percentage of total sample the aliquot represents. This gives the total activity of the sample solution. Take the average of both aliquots as a final result.
9. To convert the total activity from the solution in vial one to activity in air, an empirical formula is used to convert activity/gram from vial one to total activity introduced into the system.



After calculation the final result for the vial, divide the total by the mass of the sample in vial one. This gives dpm/g (labeled C_m). To convert this to total dpm measured,

$C = (128.59 * Cm + 10.837)/V$

Where: C = Tritium concentration in air (dpm/m^3)

C_m = measured tritium concentration from vial 1 (dpm/g)

V = Volume of air sampled through instrument (m^3)

C is the final value of tritium concentration in air.