



Mound Technical Solutions, Inc.

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Tritium Monitoring Tech Note 0410

MoundTech offers:

- Extensive Tritium Expertise
- Comprehensive Technical Support
- Installation and Sampling Consultation
- Full-Service Maintenance and Calibration
- Training for Operators and HP Metrology
- Customization





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MRB500 Tritium Bubbler
also ^{14}C



RPB100
HTO



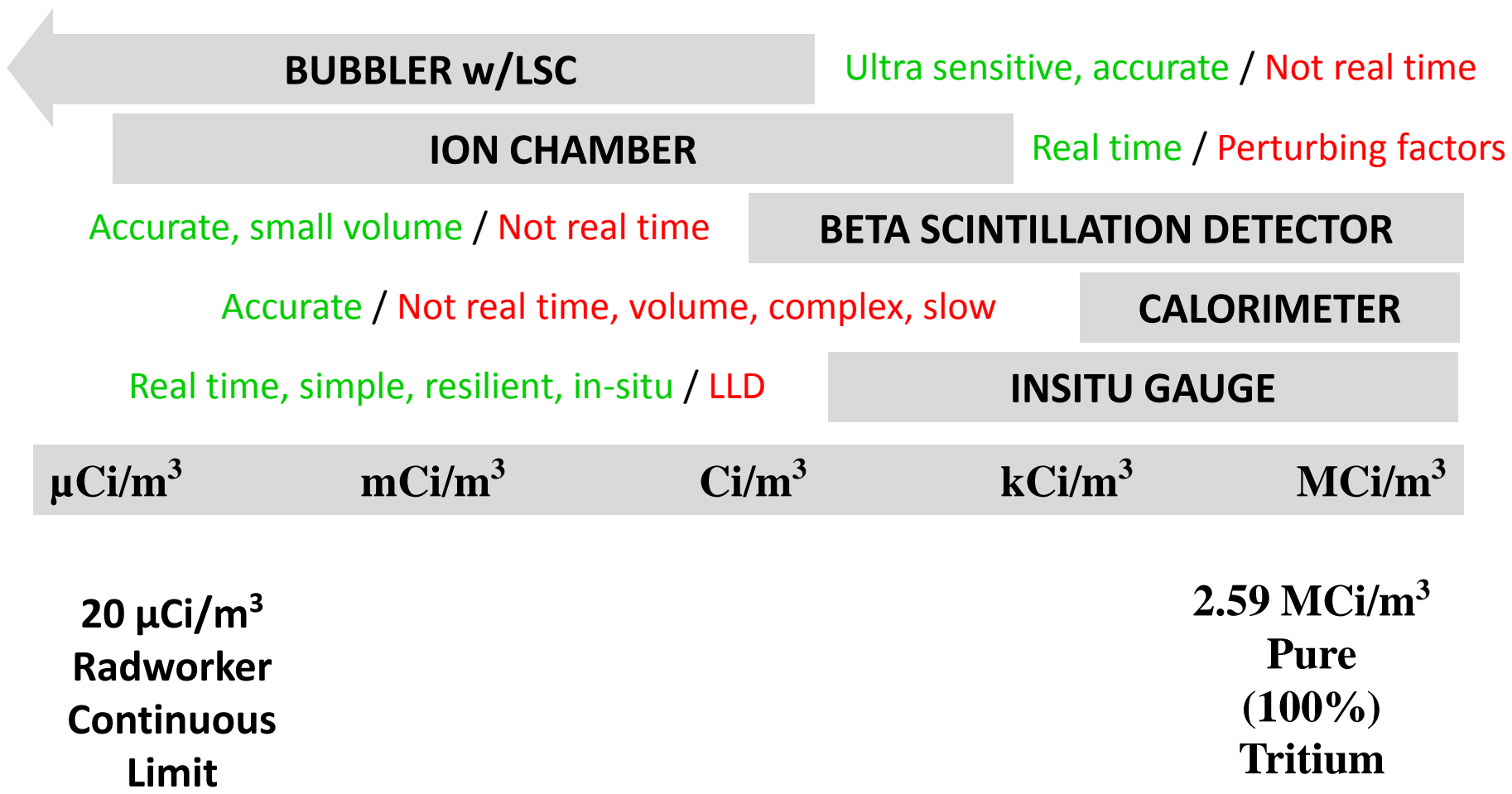
BSD275
Beta Scintillation



InSitu Gage
LANL



Tritium Measurement Technologies



Ion Chamber Current Calculation:

$$I_g = \frac{C_g * V_e * E * e * K * F_a * F_c}{W}$$

I_g Ionization Current (A)

C_g Tritium Activity (Ci/m³)

V_e Volume of Ion Chamber (m³)

E Average Beta Energy (5.65 keV)

e Electronic Charge (1.6x10⁻¹⁹ coulomb)

K 3.7x10¹⁰ (disintegrations / Ci / sec.)

F_a Fraction Beta Energy Absorbed By Gas

F_c Fraction Beta Energy Collected

W Mean energy per ion pair (eV)

ION CHAMBER PERTURBING FACTORS

➤ Interfering ion sources

- Smoke
- Aerosols

➤ Background sources

- Radon 1 pCi/l Rn ~ 1 μCi/m³ T₂
- Gamma uR/hr ~ 0.1 μCi/m³ T₂
- Other radiation

➤ Memory

- Moisture - condensation
- Tritiated ammonia, organics

➤ Electrical / mechanical

- AC and DC line noise
- Vibration

➤ Sample gas composition

- HT in Ar measures > HT in Air



Tritium Bubbler

- **Most sensitive & accurate measurement of tritium**
- **Environmental measurements at stacks or boundaries**
- **Used to report to regulators (EPA, NRC, etc.)**
- **Popular & effective choice of instrument for:**

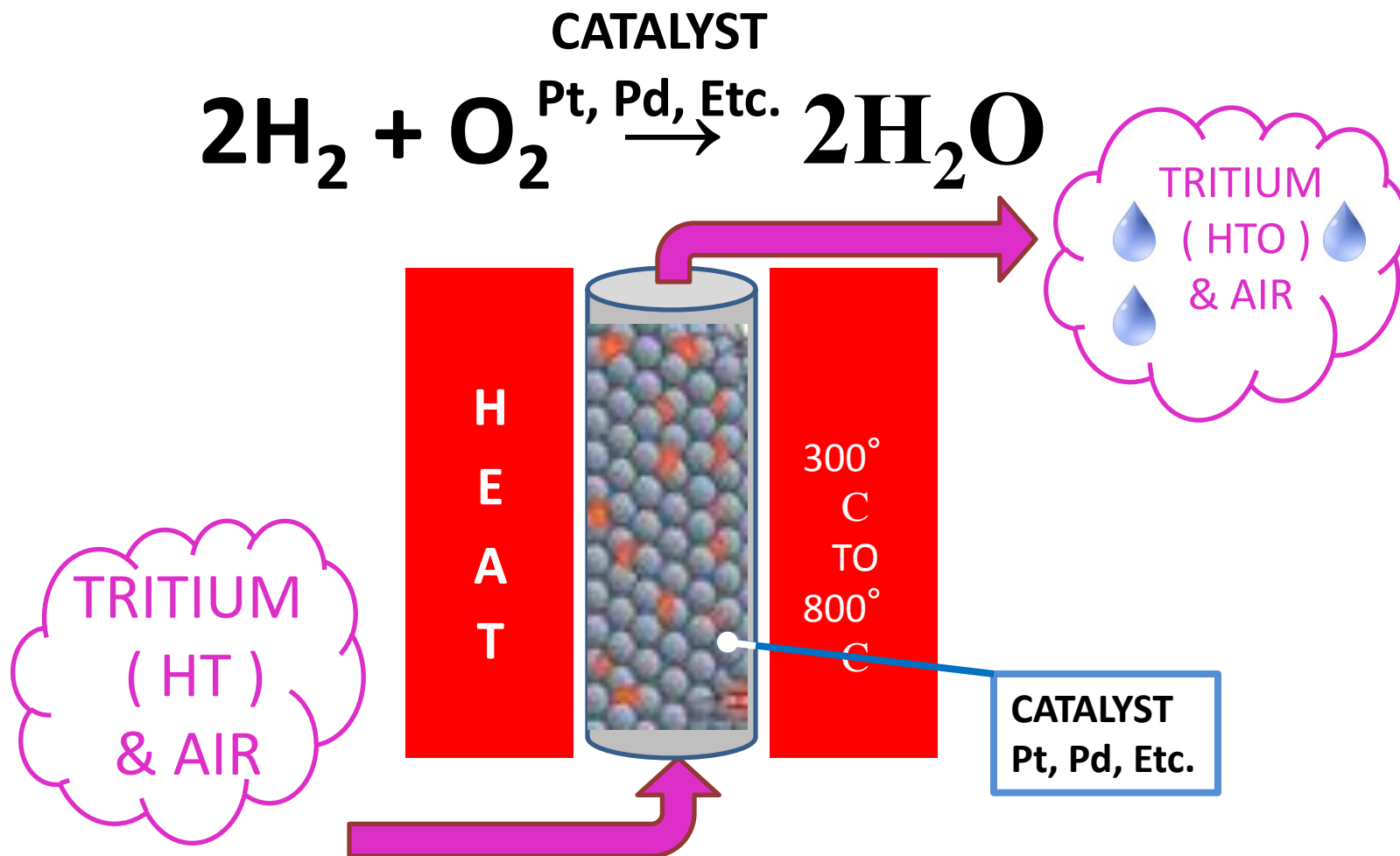


- **DOE facilities**
- **Commercial Tritium Users**
- **Nuclear Power Plants**



Oxidation

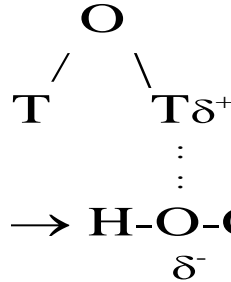
Heated catalyst promotes the oxidation of HT & T_{Organics}





Water Collection

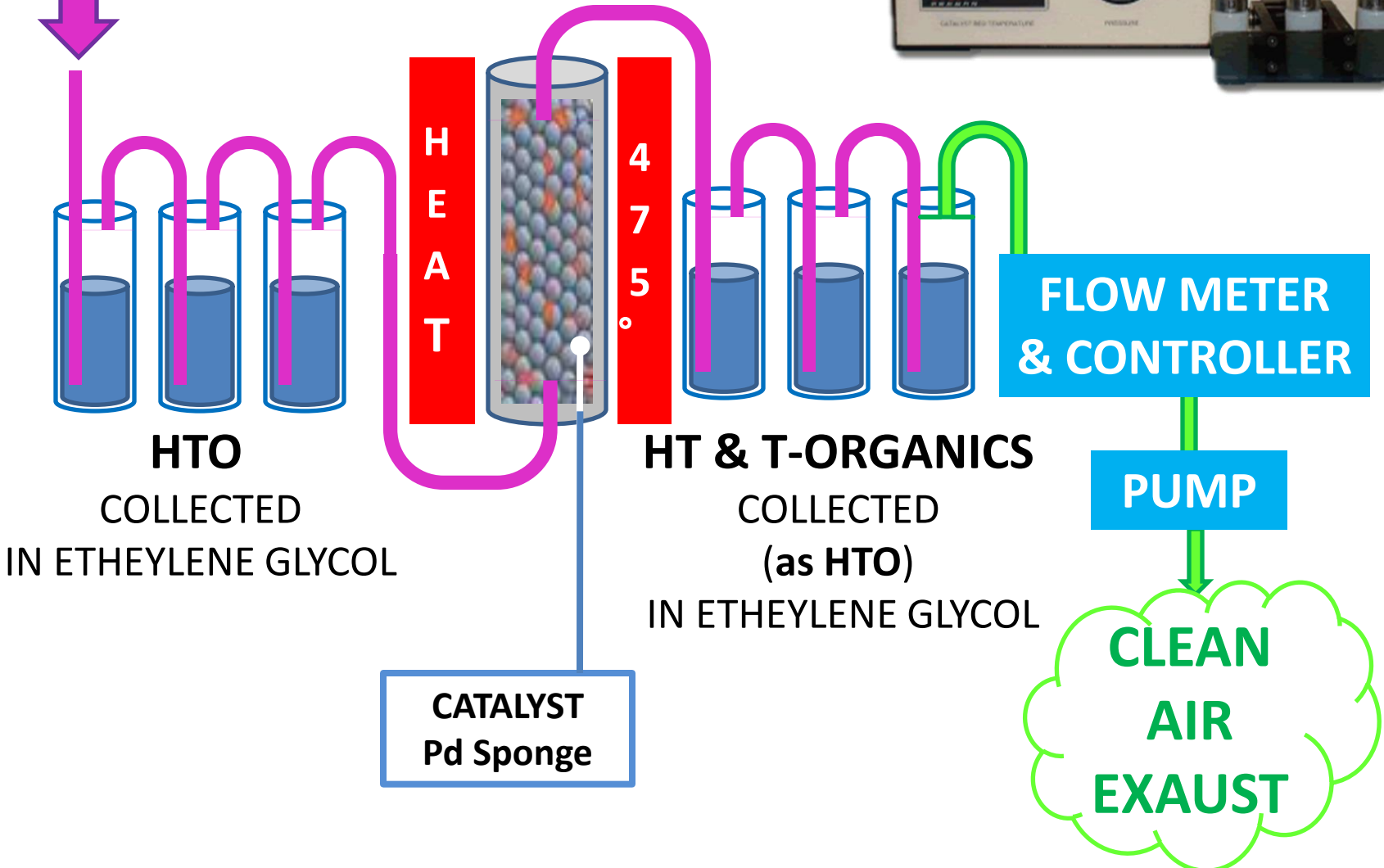
Ethylene Glycol captures tritiated water via Hydrogen Bonding



- Collects Tritium in Ethylene Glycol (Superior to silica gel or water)
- Differentiates Species : HT, HTO, T-ORGANICS
- Uses Liquid Scintillation Counter to Measure Samples
1cc (of 10cc) Ethylene Glycol /10cc Ultima Gold
- Continuously Samples 150 cc Fraction of Gas Stream
- Adjustable Sample periods from minutes to 1 week



**SAMPLE
AIR & TRITIUM
(HTO, HT, T-ORGANIC)**





SPECIFICATIONS

- Accuracy: Better than $\pm 5\%$ considering accuracy of LSC measurement
- Sensitivity: At least $1\text{E-}10\text{uCi/cc}$
~10,000 Times more sensitive than ion chamber
- Collection efficiency: $>99\%$