

Ruggedized Electrostatic Radionuclide Aerosol Collection as Part of RASA 2.0

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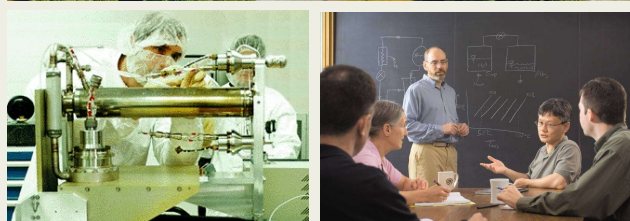
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Introduction to Create's Facilities and People

- Contract Engineering R&D
 - Creating New Technology and Products
 - Diverse Technical Experience
 - Extensive Facilities
- Industrial and U.S. Federal Client Base
- Founded in 1961
- Located in Hanover, NH, USA
- Privately Held
- Commercialization
 - Licensing/Partnering
 - Spin-Off Companies
 - Custom Products



- Total Staff 175+
- 70+ Engineers (55% Ph.D., 30% M.S.)
 - Disciplines

Mechanical	Materials
Electrical	Aerospace
Nuclear	Physics
Chemical	Biomedical
 - Schools

MIT	Brown	Case Western
Purdue	Princeton	Ohio State
Stanford	Michigan	Clarkson
Cornell	Texas	Wisconsin
Virginia	Virginia Tech	Dartmouth
Caltech	RPI	Minnesota
- 40+ Technical Staff (30% B.S., 30% A.S.)
 - Mechanical Technicians
 - Electronics Technicians
 - Machinists
 - Drafters/Designers
 - Computer Specialists
 - Inspectors/QA

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RASA History and Next Generation RASA (RASA 2.0)

History

- Radionuclide Aerosol Sampler/Analyzer (RASA) 1.0 started in 1992 at PNNL
- CTBT Radionuclide (RN) Network started in 2000
- Uses impact/HEPA style filter

Need

- Faster results to match Xenon gas systems
- Higher flow rate
- Lower power consumption

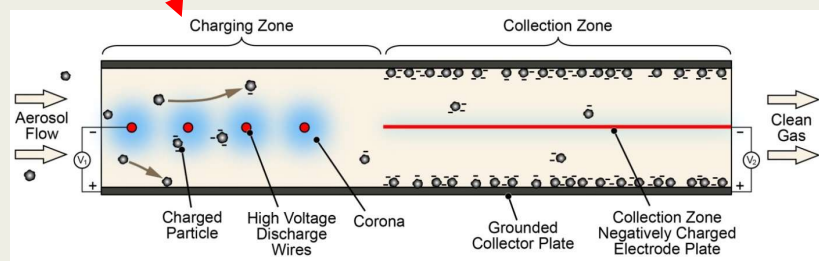
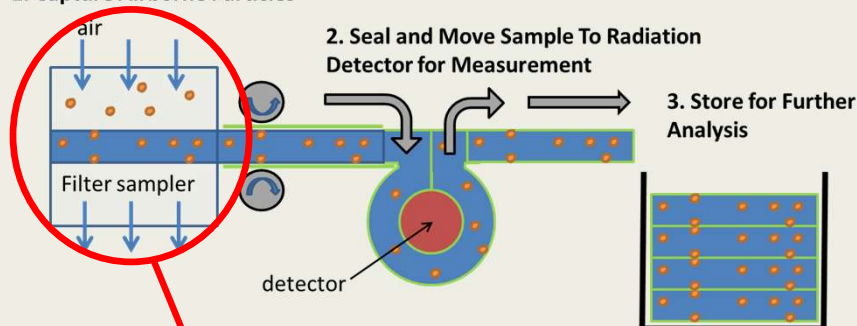
Results

- Creare has developed multiple systems using electrostatic precipitators (ESPs)
- Higher flow rate with at least 80% collection efficiency
- Reduced collection time (if needed)
- Reduced power consumption
- Multiple samples/day while preserving original sensitivity
- Flexible design

Electrostatic Precipitator: Concept

Radionuclide Aerosol Sampler Analyzer (RASA) Impact Filter Replacement

1. Capture Airborne Particles



Advanced Electrostatic Precipitator Design

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Advantages

High and Tunable Collection Efficiency
Low Pressure Drop and Low Power Draw
Collection on Thin Material

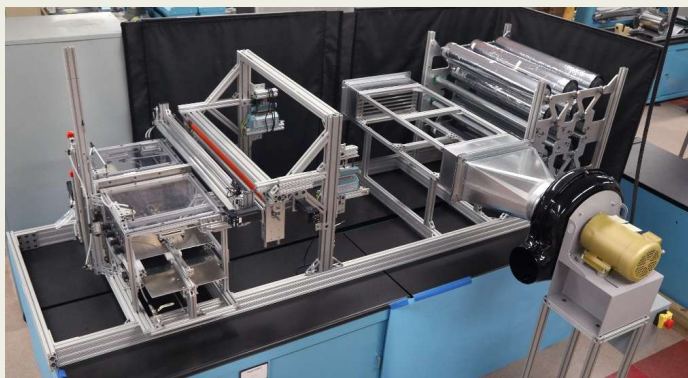
Challenges

Requires High Voltage
Trace Ozone Produced

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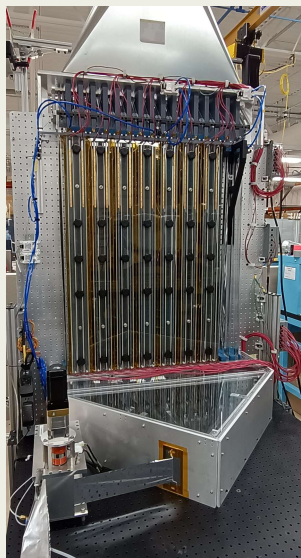
Electrostatic Precipitator: Design, Build, and Test

Generation 0
2018



Proof of Principle System

Generation 1
2022



Full Scale
Prototype

Generation 2
2025



Size, Efficiency, and
Power Improvements

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Electrostatic Precipitator: Design, Build, and Test

Flexible Design

- Number, length, and height of flow channels
- Air flow rates
- Corona wire and E-field plate voltages
- Optional stand-alone version for manual stations

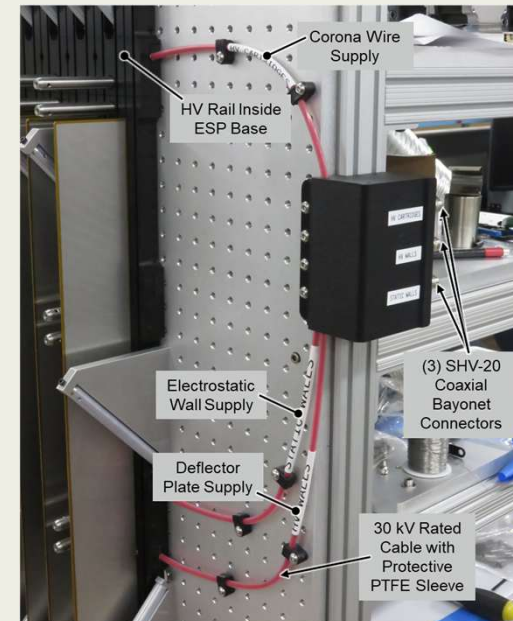
System Highlights

- Flexible webs
- Compatible with single or dual detectors
- ~600 samples between spool reloading
- Compact design
- Prototype size: 2.4 m (8 ft) from floor to duct



Front Side

High Voltage Rail/Wiring



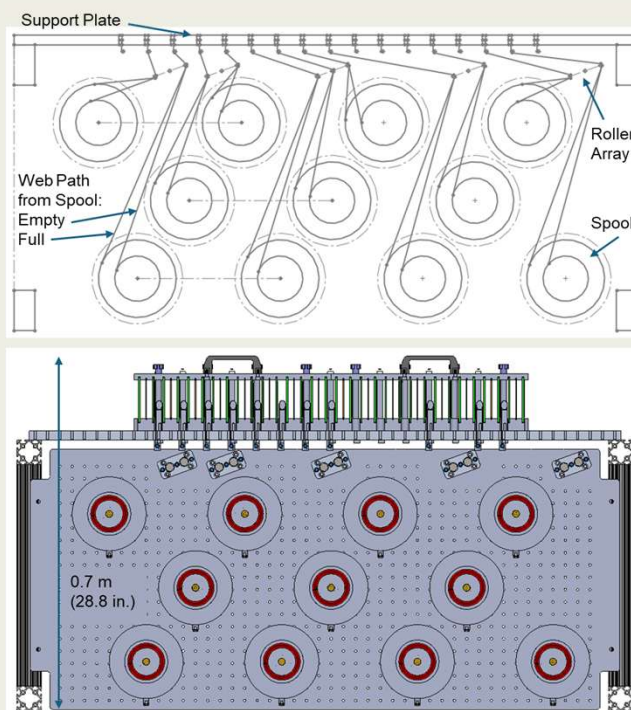
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Electrostatic Precipitator: Design, Build, and Test

Web Design

- Multiple webs on three shelves (~600 samples)
- Fold into flow area
- Combine and fold out of flow area

Combined Webs



Back Side



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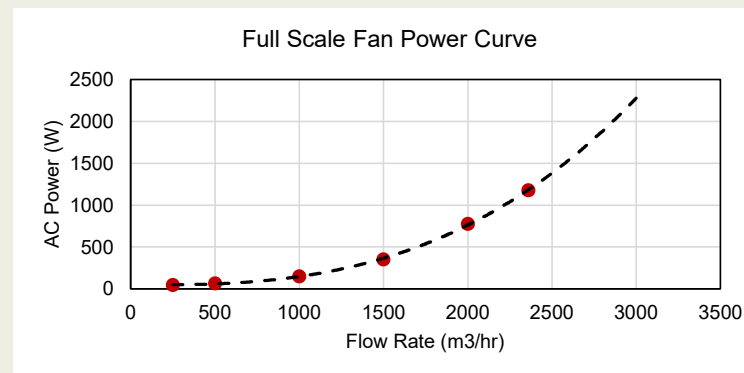
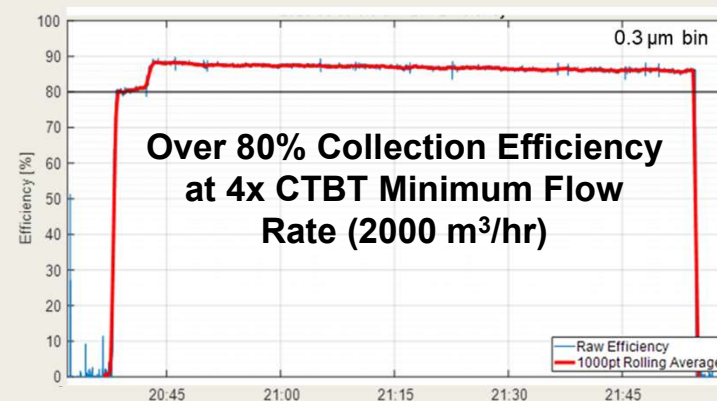
Electrostatic Precipitator: Design, Build, and Test

Particle Collection

- Well over 80% collection efficiency at flow rates > 2000 m³/hr
- Live continuous measurement at inlet and outlet
- Tested in high humidity and high atmospheric particle concentration

Power Draw

- Able to run on a series of small box fans (quiet)
- Under 100W (Collection System) for CTBT min of 500 m³/hr (not including computer or detector)
- Under 1kW (Collection System) for 2000 m³/hr



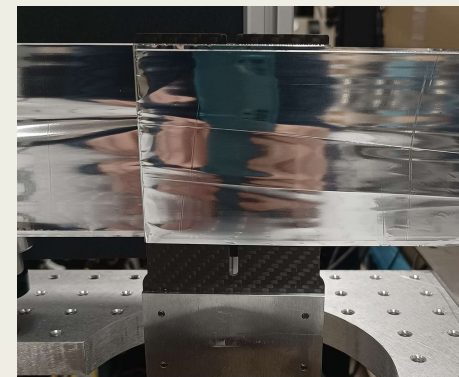
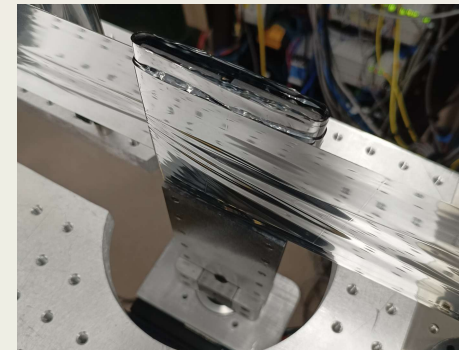
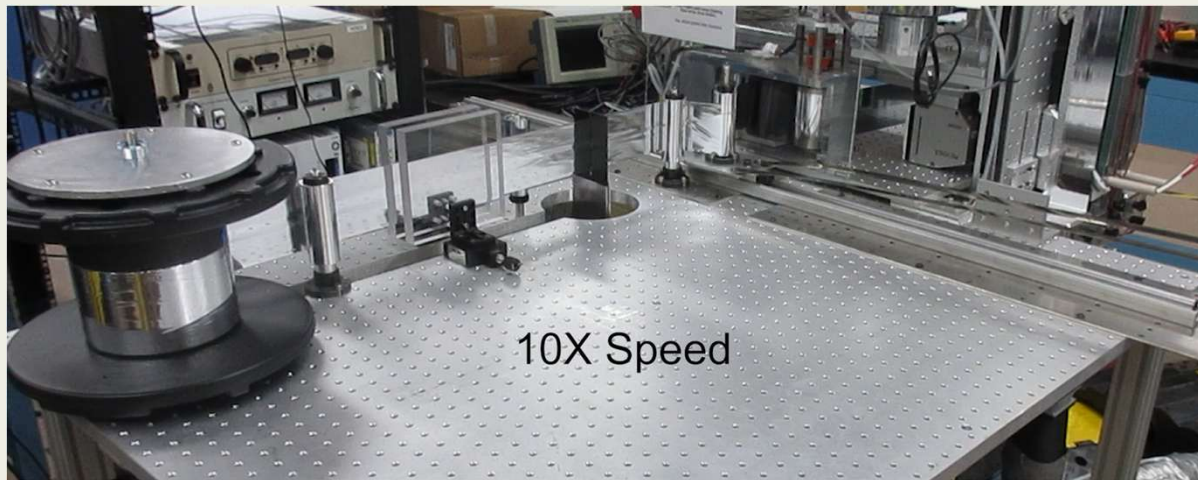
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Electrostatic Precipitator: Sample Packaging

Prototype Design

- Compact presentation to detector(s)
- Flexible for multiple different sample intervals
- Ensures Sample Integrity
- Worked with University Capstone projects on design concepts



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Electrostatic Precipitator: Next Steps

Testing and Demonstration

- Testing in Variety of Weather Conditions
- Demonstration in Relevant Environment

System Integration

- Combine ESP with Sample Packaging System and Detector(s)
- Full Automation

Collaboration/Funding

- U.S. Defense Threat Reduction Agency (DTRA)
- Pacific Northwest National Laboratory (PNNL)
- Desert Research Institute (DRI)

CTBT SnT2025 Posters

- P3.2-880 RASA 2.0: A Next Generation Aerosol Sampler/Analyzer Update – Lance Lidey (PNNL)
- P3.2-176 Acoustic Agglomeration of Aerosol Particles in Benefit of RASA 2.0 Michael Swanwick (Creare)



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