Members in Attendance

- Josh Mendez (Sponsor/Advisor)
- Felix Moss
- Annika Boyd
- Eisa Alsharifi
- Nathan Truong

Questions

- What is the ownership of the IP going to look like?
- What kind of material should the electrodes be? Should we use gold or platinum coated electrodes to ensure their resistance to corrosion? Do we need to buy them at a certain place you recommend or what?
    - For these electrodes, I was thinking of drilling small holes into the sides of the tube that hold them, with insulating materials covering them on the parts that are not exposed to the dust particles.

Notes

GANTT CHART TIMELINE (AI GENERATED: USE AS BASELINE)

Month 1: Planning and Research

1. **Week 1**: Define project goals and specifications.
    - Identify the purpose of the analyzer (e.g., particle size, concentration).
    - Research existing designs and technologies (e.g., electrostatic precipitation, sensing methods).
    - Define the operating environment (e.g., indoor/outdoor, temperature, dust types).
2. **Week 2**: Identify requirements and constraints.
    - Establish performance metrics (sensitivity, range, accuracy).
    - Assess budget, materials, and tools required.
3. **Week 3-4**: Develop a project plan.
    - Create a timeline and milestones.
    - Source components and materials.
    - Consult standards or regulations (e.g., OSHA, environmental compliance).

Month 2: Design

1. **Week 1-2**: Conceptual design.
    - Sketch out high-level system architecture (e.g., electrodes, airflow system, sensors, housing).

- Decide on the sensing mechanism (e.g., charge collection, optical sensors).

2. **Week 3**: Detailed design and modeling.
   - Create schematics for the electrical circuits (e.g., signal conditioning, amplifiers).
   - Use CAD software for mechanical design of the housing and airflow path.
3. **Week 4**: Bill of Materials (BOM) and simulation.
   - Compile a BOM for all components.
   - Perform basic simulations of airflow, charge collection, and signal processing (e.g., CFD for airflow).

Month 3: Prototyping

1. **Week 1-2**: Assemble the prototype.
   - Construct the mechanical structure (e.g., housing, airflow path).
   - Assemble and solder the electronic circuits (e.g., HV power supply, charge sensing).
2. **Week 3-4**: Develop initial firmware/software.
   - Program the microcontroller for signal acquisition and processing.
   - Implement basic data visualization (e.g., on an LCD or computer interface).

Month 4: Testing

1. **Week 1-2**: Functional testing.
   - Test the analyzer's core functionality (e.g., dust charging, sensor readings).
   - Measure power consumption and safety aspects (e.g., HV isolation).
2. **Week 3-4**: Performance testing.
   - Evaluate accuracy using controlled dust samples.
   - Calibrate the device for various particle sizes and concentrations.
   - Identify issues with airflow, charge sensing, or software.

Month 5: Refinement

1. **Week 1-2**: Address issues from testing.
   - Modify the mechanical design for improved airflow or durability.
   - Optimize circuit performance for signal clarity.
2. **Week 3-4**: Enhance features and finalize software.
   - Add advanced data visualization or connectivity features (e.g., wireless data transmission).
   - Improve firmware for better accuracy or faster response.

Month 6: Finalization

1. **Week 1-2**: Final build.
    - Assemble the refined version of the analyzer.
    - Perform final calibration and testing.
2. **Week 3**: Documentation.
    - Create a user manual and technical documentation.
    - Include schematics, firmware source code, and calibration instructions.
3. **Week 4**: Deployment.
    - Deliver the analyzer for field testing or end use.
    - Gather feedback for potential future improvements.

- Are you going to follow a method, like Agile, or spiral, or ? Discuss what you plan to do.
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- What collaboration tools are you going to use?
    - Discord, Git, Google Suite
- What technical tools / languages / etc are you using? CAD, CAM, etc? Be specific if you can.
    - Coding microcontroller in C
    - Creating PCB in kicad
    - Machine shop at PSU

DURING MEETING

- Extend Prototyping and Testing, reduce finalization, refinements, and design
- Q is how many in a second
- Mostly measuring charge
- t may be smaller, so current may be larger ~uA
- Include feedback cap in first loop
- V = Q/C in cap
    - Using cap allows for longer time for measurement
    - Called integrator circuit (op amp with cap connecting (-) to output instead of resistor
- Vo = 1mV to 1000mV of first op amp acceptable
    - Q in this instance would be 0.10 pC
- Don’t use peak and hold, just use coulombmeter
- Range of charges = 1 fC to 1pC

- Open source IP, if it’s very nice we can publish in public domain
- Use copper first, then plate with plat/gold

- For next week,
    - modify circuit to integrate coulombmeter
    - MAX1032 ADC possible option
    - Consider adding multiple channels, focus on one
    - Op amps with low bias currents (fA to pA)
        - LMC641