

ESD Safety Device Using a Mill-Type Electrostatic Field Sensor

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The purpose of this project is to research a method of measuring electrostatic field, and it's use in ensuring ESD safety.

To achieve this, our device will be equipped with a mill-type sensor, a signal conditioning circuit and a microcontroller .

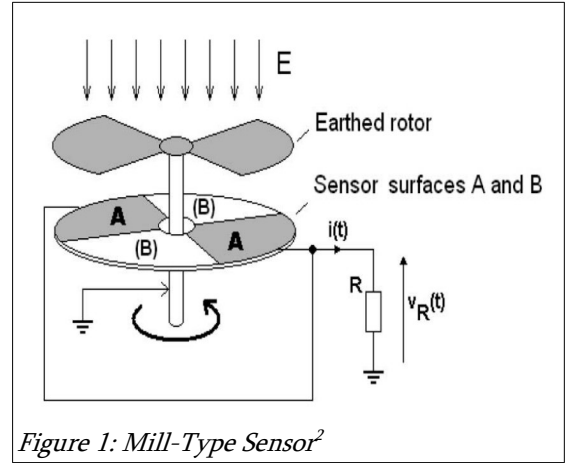


Figure 1: Mill-Type Sensor²

The mill-type sensor consists of two conductive plates, of which one is a stationary sensor surface and the other fulfills the role of an earthed rotor.

The earthed rotor periodically shields from and exposes to an electrostatic field the stationary sensor plate. This causes the charge-discharge cycle of the sensor plate, in form of the current flowing to the ground ¹.

$$i(t) = \frac{dQ(t)}{dt} = \epsilon_0 E \frac{dS(t)}{dt}$$

References

- [1] Y. Cui, H. Yuan, X. Song, L. Zhao, Y. Liu, and L. Lin, "Model, Design and Testing of Field Mill Sensors for Measuring Electric Fields under High-Voltage Direct Current Power Lines," *IEEE Transactions on Industrial Electronics*, DOI: 10.1109/TIE.2017.2719618.
- [2] P. Tant, B. Bolsens, T. Sels, D. Van Dommelen, J. Driesen, and R. Belmans, "Design and Application of a Field Mill as a High-Voltage DC Meter," *IEEE Transactions on Instrumentation and Measurement*, vol. 56, no. 4, pp. 1459-1464, Aug. 2007, Fig. 1, doi: 10.1109/TIM.2007.900157.