# Technical Article 4
# General Information on
# Bipolar Ionizers

## Bipolar Ionizers can be used to eliminate the following :

1. Electrostatic attraction which causes particles to be attracted to surfaces and thus creates contamination
2. ESD events which can cause damage to circuits/dies on wafers, MR heads etc
3. Microprocessor / Robotic lockup which can result in the lost of yield and high downtime

## Information required prior to evaluation or purchase of ionizers :

1. Effective coverage area required (the type of ionizer selected will depend on the area to be effectively covered by ionization)
2. Purpose of having ionization (Contamination control , ESD control or for microprocessor lock up)
3. Specification of ionizers in terms of balance/swing voltage, decay times (1000V to 100V or 1000V to 50V decay) - This depends a little on the damage threshold of the part or component based on the human body model or charged device model – used to ascertain the ESD damage threshold)
4. Environmental conditions like Temperature, RH (the lower the RH , the higher the probability of producing static) and airflow velocity in cleanrooms .
5. Ceiling height of facility

## General specifications for ionizers for the different industry :

***Wafer Fab / Disk Media (Class 10 or better)***

Recommended for general room ionization : Bipolar pulsed DC ionizers (#5509, #5511, #5512 ceiling emitters or #5285, #5585 aerobars)
Purpose of ionizers : To prevent contamination/electrostatic attraction, ESD damage and microprocessor lockup
Swing voltage : ±150 volts
Decay (1000V to 100V) : < 60 secs [provided airflow velocity within 0.45m/s at point of measurement, ceiling ht less than 10 ft (3 m) ]

***Disk Drive / Head Mfg (for MR head operations)***

Recommended : Steady state DC overhead ionizers (#5802, #5802i Single fan ionizer or the #5810, #5810i overhead ionizers)
Purpose of ionizers : To control ESD damage and microprocessor lockup
Balance voltage : < ±5 volts (can achieve ±1V balance with use of feedback sensor, eg : Credence model : CTC037 Ionizer controller)
Decay (1000V to 50V) : < 15 secs (cleanroom airflow velocity not an issue but airflow parallelism can effect the balance and decay time readings)
Charged plate monitor to ionizer distance : < 2 ft (610mm)

*NB : Or alpha sources can be used to achieve zero balance*

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## How to measure the performance of ionizers ?

a. Basically a charged plate monitor (CPM) is used to measure the balance/swing voltage and decay time of ionizers
b. An electrostatic fieldmeter can also be used to measure surface charges in the vicinity of ionizers (the ionizer should be able to reduce a charged insulator after introducing it into the ionized environment, a before and after measurement using the electrostatic fieldmeter can show this)

## What affects the performance of ionizers ?

1. Large grounded objects in the vicinity of the ionizer (this absorbs the ions produced by the ionizer)
2. Airflow velocity (for pulsed DC ionizers without built in fans) and the type of cleanroom design, ie, unidirectional or non-unidirectional airflow cleanroom
   a. Generally the airflow velocity should be within 0.45m/s at point of measurement .
   b. If the velocity is lower the decay time will increase substantially upto even about 120 secs for a decay from 1000V to 100V in unidirectional airflow cleanrooms .
   c. For non-unidirectional airflow cleanrooms, the decay time for a discharge from 1000V to 100V can also increase upto 180 to 240 secs depending on the airflow velocity at the point of measurement .
3. Build up of dirt and particles on emitter point of ionizers (this is a normal phenemenon because of the process of corona ionization)
4. Obstruction of airflow in cleanrooms
5. Ceiling height .

## What kind of maintenance needs to be done ?

Basically the emitter points of the ionizer needs to be cleaned with electronic grade IPA and foam/polyester swabs .
*Frequency of cleaning* : Anything from 1 month to 3 months interval depending on the type of ionizer, the working environment (cleanroom, non-cleanroom, presence of chemicals or solvents in working environment etc) and the type of manufacturing process being carried out within the facility (eg wafer fab, disk drive etc)
Typically, the emitter points (Tungsten, Titanium, Silicon) should be replaced between every 2 to 3 yrs depending on level of erosion or degradation . For disk drive / head operations, it is recommended that emitter points should be replaced every 18 months

## General Coverage considerations for ceiling ionizers ?

Generally the ionizers are spaced anything from 1.2m to 2.4m apart depending on the sensitivity of the process, type of cleanroom design, presence of large machinery, airflow velocity, ceiling height and electrostatic potential desired within the workspace .
For eg : In Litho and Reticle areas, the ionizers are normally spaced 1.2m apart to ensure better specifications can be met