

## Details of CARE Facility

**Name of CARE facility:** Scanning Mobility Particles Sizer (SMPS)

**Location:** Environmental Engineering Laboratory, Western Labs

**Total cost of equipment/facility:** 33 Lakhs

**Year of CARE funding:** 2005-06 and Operational since June 2006

**Support provided by CARE:** 31.8 Lakhs

**Name of Principal Investigator:** Dr. S N Tripathi ([snt@iitk.ac.in](mailto:snt@iitk.ac.in); Tel: 7845/8806)

**Participating Departments:** CE, EEM, ChE, AE, ME, EE

**Brief description and capability of CARE facility:**

SMPS include Electrostatics classifier and Condensation particles counter (CPC). Electrostatic classifier consists of impactor assembly, bipolar charger and differential mobility analyzer (DMA). First polydisperse particles enter through impactor where those larger than cut off size are removed. Then the aerosol particles enter into the Kr-85 bipolar charger, which exposes aerosol particles to bipolar ions. The sheath air and charged particles are introduced at the top of the DMA and both flow down without mixing with each other and by maintaining laminar flow. The DMA consists of two concentric metal cylinders. The inner rod maintains negative voltage and outer cylinder is grounded thus electric field is generated in annular space of DMA. Positive charged aerosol particles move towards the inner rod through sheath air. The aerosol particles are sized according to their electrical mobility. Nearly monodisperse aerosols then enter into the CPC. Here, the aerosol mixes with butanol vapor, undergoes super saturation resulting in condensation of vapor on aerosol surface. Consequently, the aerosol particles grow to a size that can be detectable by light scattering



### Technical Specifications:

Impactor orifice: 0.0457 cm, 0.0508 cm, 0.0701 cm, Particle Size: Long DMA: 10 -700 nm diameter, Nano DMA: 4 -150 nm. Both the DMAs can run at low and high flow rates (0.3 and 1.5 lpm) SMPS can measure particles up to  $2 \times 10^8$  particles  $\text{cm}^{-3}$ .

### Applications

Basic aerosol research

Nanotechnology research

Atmospheric and climate studies

Indoor-air-quality measurements

Smog chamber evaluations

Aerosol dynamics

Nucleation/condensation studies

Inhalation toxicology studies

Characterization of powders, and other generated aerosols

Mobile aerosol studies, Long-term unattended environmental monitoring

**Utilization of the facility:** a) PI: Outdoor and indoor aerosol measurements, Smoke from different combustion source, Fog Chamber studies

### b) Others:

Dr. Animanshu Ghatak (ChE): Filter efficiency of cigarette, Dr. Tarun Gupta (CE): Toxicology, Dr. M. Sharma (CE): Engine emission characterization: Dr. Askok Kumar (BSBE)

**Any difficulties that you faced in running CARE facility:** Few months after the installation we faced the problem of leakage because of faulty positioning of one of the blowers in the electrostatic classifier.

**Link to the website for the CARE facility, if any:** <http://home.iitk.ac.in/~snt/facilities.htm>