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Beta Attenuation Monitor

This is a method used by Horizons Regional Council to determine the PM_{10} concentration in the open air.

Summary of Method

Air is drawn into the inlet and deflected downwards into the acceleration jet of the impact unit. Because of their greater momentum, particles larger than the 10 micron cutpoint impact out and are retained in the middle plenum impaction chamber. Particles smaller than 10 microns are carried upward by the air flow and down the vent tubes to the beta gauge sampler.

After traversing the inlet configuration, the PM_{10} particles are deposited on a glass fibre filter tape. A low level of beta-rays is emitted from the source and passes through the filter tape and deposited particles. The increase of particles collected on the tape causes a lower beta-ray measurement in the measuring chamber, as illustrated in the drawing at the end of the page. This filter-spot position results in a continuous observation of the increasing particulate mass and corresponding concentration. A compensation chamber receives an equal portion of the beta-ray and is used as a reference by comparing the sample measurement in the measuring chamber with transmitted radiation through a compensation chamber foil that exhibits the same absorptivity as clean filter tape.

As particles collect on the filter, the differential reading changes, and the signal is converted by an onboard computer to PM_{10} concentrations.

Changes in temperature, pressure, and humidity affect the PM_{10} measurement on the filter tape; the measurements made through the compensation foil are affected to the same degree. Thus, the foil measurement supplies baseline information to the internal computer that allows the instrument to compensate for environmental effects.

By measuring the accumulated mass of particles on the tape and the volumetric flow rate of air through the instrument, the instrument can calculate the mass concentration of particles in the ambient air.

Output from the monitor may be in the form of visual display, on-board computer storage, telemetry, printout, or storage in an auxiliary disc. Output can be in digital or analogue form.



Anderson PM_{10} Beta gauge monitor

Measurement principle of the Anderson beta gauge monitor

