EMITTANCE SCANNER

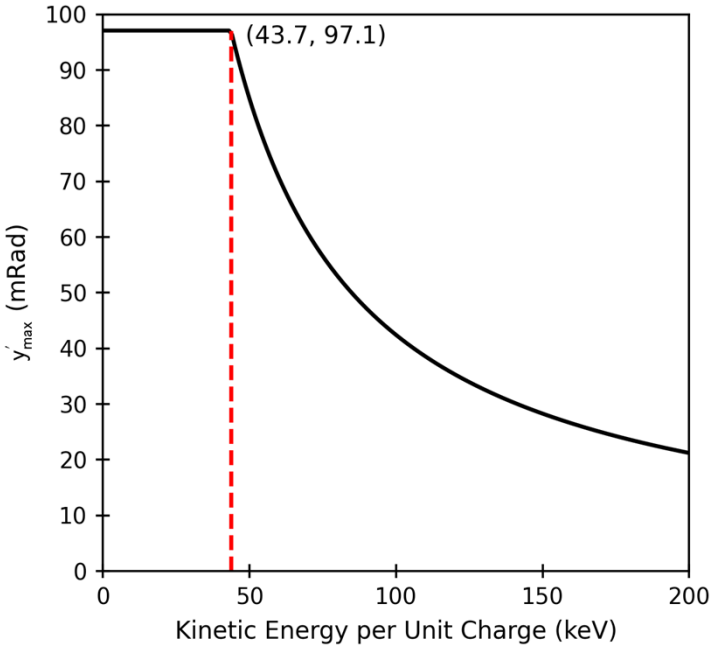
ES-4/CTRL-ES-11.A

A system for characterizing the distribution of current and particle trajectory in continuous-wave, low-energy beams

Probe (ES-4).

- Measures the magnitude of emittance for low-energy charged particles (<1 MeV)
- Water-cooled head can intercept beams with power densities up to 500 W/cm^2 and 1500 W total power
- Included analysis software determines phase-space ellipses by percentage of total beam or RMS emittance
- Provides crucial data for use in ion-optical analysis software to model beam transport
- TRIUMF-licensed technology[2]

The **Emittance Scanner** is of the Allison-type design, mechanically traversing the cross-section of a beam while pausing at set positions (y) to make electric trajectory sweeps, which capture the current from particles travelling at various angles (y'). The complete system is provided ready to operate, with a probe to be installed on the beamline and a remote-control unit that incorporates the power supplies, motion controller, picoammeter, and data logger. More sophisticated configurations, which include a second probe to scan the phase space along a perpendicular axis, are also available. The instrument is well-suited to ion sources, cyclotrons, and other continuous-wave applications.

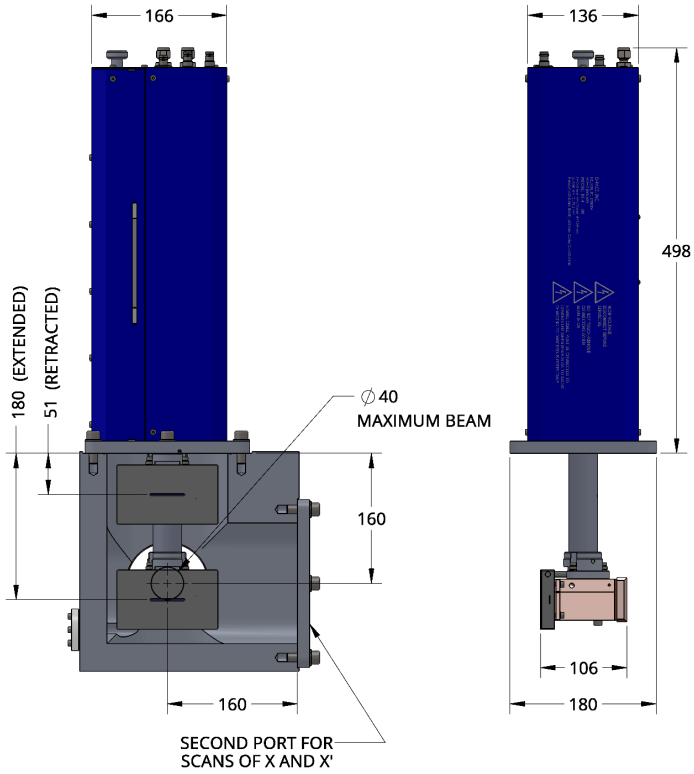


Maximum scan angle as a function of kinetic energy per unit charge[3].

SPECIFICATION[1]: PROBE (ES-4)	
Maximum Travel	130 mm
Distance, Slit to Flange	50 mm to 180 mm
y Resolution y Step, Minimum	100 µm 10 µm
y'_{max} y' Resolution y' Step, Minimum	±97 mRad (for K.E. <44 keV) 1.3 mRad 16-bit resolution over $\pm y'_{max}$
Sweep Voltage	±1000 V
Slit Width	100 µm
Slit Length	40 mm
Maximum Beam Diameter	40 mm
Bias Voltage	-100 V
Electrode Gap	4.0 mm
Electrode Length	76 mm
Mass	19 kg
Cooling Water	2 LPM 85 psi (586 kPa) maximum De-ionized not required
Maximum Beam Power	1500 W
Maximum Power Density	500 W/cm^2
Cooling Plate	Molybdenum/copper
Slits	Molybdenum

The included D-Pace acquisition and analysis software runs on the operator's computer and provides a communication link to the controller for the system. Adjustable settings enable the scan time and resolution to be optimized, while the graphical display of the results plots beam profiles as well as 2D and 3D contours with and without emittance ellipses. Recorded data can also be exported to use as inputs for ion-optical calculations or for generating publication-quality plots in third-party applications.

SPECIFICATION[1]: CONTROLLER (CTRL-ES-11.A)	
Platform	Embedded Linux
Compatibility	Windows/Linux/EPICS
Typical Scan Time	<1 minute for a 30-step y by 30-step y' scan
Current Measurement Range	2 nA to 2 mA (full scale), 5 pA typical noise floor
Power	100-240 VAC, 50/60 Hz, single phase, 400 W
Data Plots and Analysis	2D & 3D phase-space intensity distributions, computed emittance, RMS ellipses, Twiss parameters
File Export	.csv
Dimensions (W x D x H)	3U rackmount chassis 19 x 22 x 5.5 (inches)
Mass	12 kg



Mounting dimensions (millimeters)[4].

Controller (CTRL-ES-11.A)

Screenshot of the analysis software presenting results from a scan of a 1 mA, 300 keV H- beam.

1. D-Pace, Inc. reserves the right to update specifications without notice as part of the continuous improvement program for its products.
2. D-Pace, Inc. has licensed the Emittance Scanner from TRIUMF for exclusive world-wide distribution.
3. Contact D-Pace to discuss beam requirements.
4. Standard dual-probe vacuum box is shown. Custom boxes for single and dual-scanner systems are available. Contact D-Pace.