



EMITTANCE SCANNER

ES-100.10K

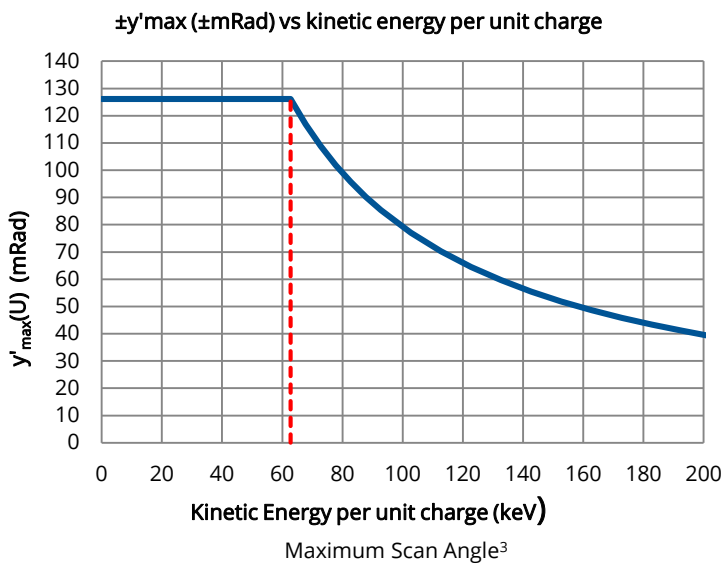
TRIUMF-Licensed¹ Emittance & Phase Space Scanner
Probe with Turnkey Controller and Analysis Software



- Measure magnitude of emittance for low-energy charged particles (<1 MeV)
- Water-cooled head for beam power³ up to 10 kW and 100 W/cm²
- Determine phase space ellipses by percentage of total beam or by RMS emittance
- Use data for modelling beam transport in ion-optical analysis software

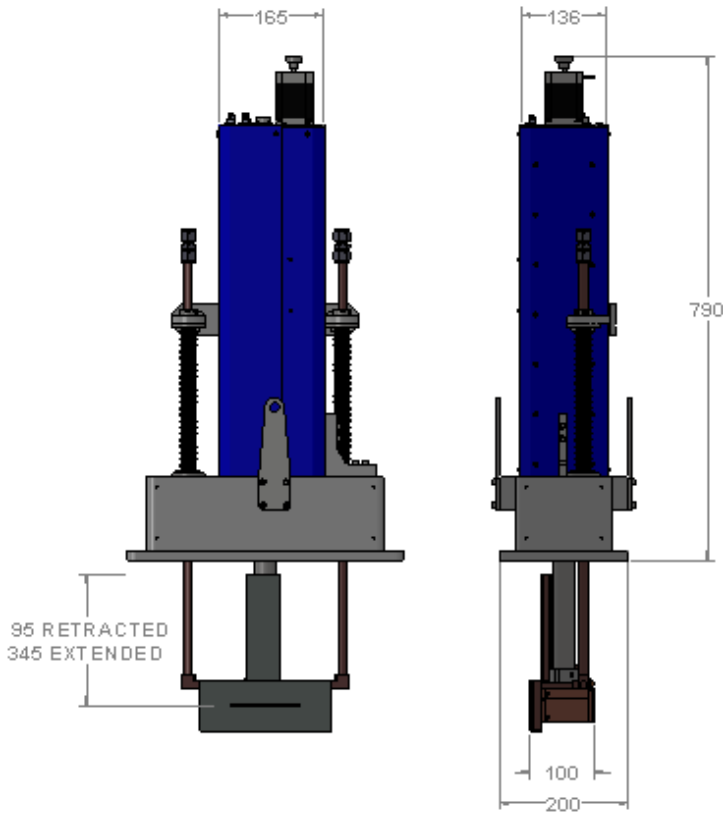
The **D-Pace Emittance and Phase Space Scanner System** is an Allison-type emittance scanner, combining an electric trajectory sweep technique with a mechanical position beam sweep, enabling the simultaneous measurement of position (y) and angle (y'). Two probes can be used to scan horizontal and vertical plane phase spaces, or a single head can be used by re-mounting the head on a port 90° to the first. The system includes probe, computer, software, power supplies, and instrumentation.

D-Pace acquisition and analysis software enables the operator to optimize scans for resolution and scan time, and plot beam profiles, 2D and 3D contours with and without emittance ellipses. Data can be exported.



SPECIFICATION: EMITTANCE PROBE

Maximum Travel	250 mm
Distance, Slit to Flange	95 mm to 345 mm
Flange	Custom, Rectangular, O-Ring
Y Resolution Y Step, Minimum	100 μ m 1 μ m
Y' Max Y' Resolution Y' Step, Minimum	\pm 126 mRad (for KE <65 keV) 1.2mRad 16 bit resolution over +/- Y' Max
Sweep Voltage	\pm 1250 V
Slit Width	100 μ m nominal Factory configurable 25 to 250 μ m
Slit Length	104 mm
Beam ϕ_{\max}	100 mm
Bias Voltage	-100 V
Electrode Gap	6.0 mm
Electrode Length	76 mm
Mass	36 kg
Cooling Water	15 LPM @ 200kPa (30 PSI) 18 LPM @ 270 kPa (39 PSI) 23 LPM @ 450 kPa (65 PSI)
Max Beam Power ³	10 kW
Max Beam Intensity ³	100 W/cm ² @ 10 kW Beam Power
Cooling Plate	Tantalum/ Copper
Slits	Tantalum/ Copper



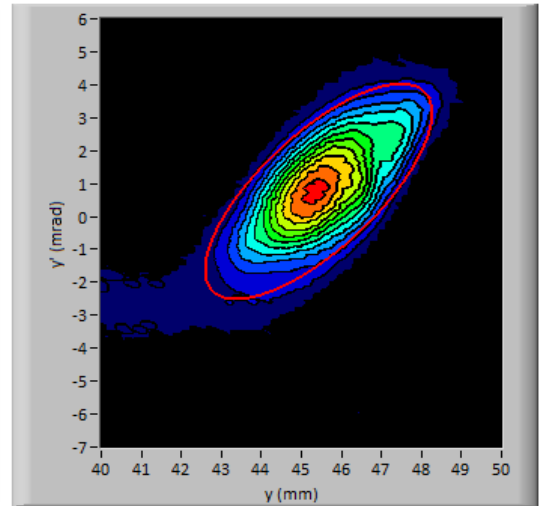
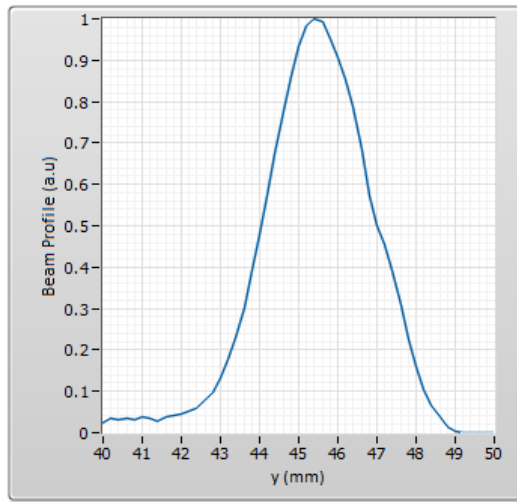
D-Pace can customize the Emittance Probe to customers' requirements. D-Pace provides custom vacuum boxes for single or dual scanners.²

SPECIFICATION: TURNKEY CONTROL SYSTEM

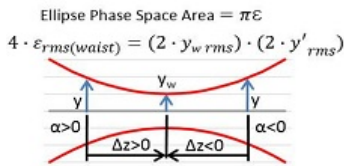
Instrument Rack	16U 19" rack, w/ keyboard, power bar
Platform	Industrial PC / Windows™ / LabView™
Typical Scan Time	< 1 minute for 30 step Y by 30 step Y' scan
Current Meter	2nA to 20mA (full scale) 5 pA (typical noise floor)
System Power	115 or 220 VAC, 600 W, 1Ø
Data Plots & Analysis	2D & 3D phase-space intensity distributions, computed emittance, RMS ellipses, Twiss Parameters
File Export	CSV, PDF
Dim (W x D x H)	545mm x 660mm x 785mm
Mass (approx.)	70 kg excluding probe

Phase Space Analysis System 2.0

File Name	
300keV 1mA H- V20	
Scan	
Date:	3/30/2014
Time:	4:55:03 PM
Beam Energy:	294 keV
# y	51 points
delta y	0.2 mm
# y'	101 points
delta y'	0.113451 mrad
Axis:	Vertical Top
Rejection Threshold	
4%	Emittance Mode
Beam Centroid	
y	45.422697 mm
y'	0.750859 mrad
TWISS Parameters	
β	1.264003 mm/mrad
γ	1.684777 mrad/mm
α	-1.062809
Beam Waist Location	
Δz	-0.630831 m



% Beam In Ellipse		% Beam Dimensions			Emittance		Transport Sigma Matrix		
%	n	y (mm)	y _w Waist (mm)	y' (mrad)	ϵ_N Normalized (mm*mrad)	ϵ Geometric (mm*mrad)	σ_{11} (mm ²)	$\sigma_{12}=\sigma_{21}$ (mm*mrad)	σ_{22} (mrad ²)
38.7123	1	1.4002	0.9595	1.6166	0.0388	1.5511	1.9606	1.6485	2.6132
62.8932	2	1.9802	1.3569	2.2861	0.0777	3.1022	3.9212	3.2970	5.2265
78.4950	3	2.4252	1.6619	2.8000	0.1165	4.6533	5.8817	4.9455	7.8397
87.3408	4	2.8004	1.9190	3.2331	0.1553	6.2044	7.8423	6.5940	10.4530
92.7853	5	3.1310	2.1455	3.6147	0.1942	7.7555	9.8029	8.2426	13.0662
95.8613	6	3.4298	2.3503	3.9597	0.2330	9.3065	11.7635	9.8911	15.6794
98.2886	8	3.9604	2.7139	4.5723	0.3107	12.4087	15.6847	13.1881	20.9059
98.8053	10	4.4278	3.0342	5.1120	0.3883	15.5109	19.6058	16.4851	26.1324



Screen shot of ES analysis software

1. Licenced from TRIUMF for exclusive world-wide distribution.
2. Vacuum boxes available. Contact D-Pace.
3. Higher power density can be achieved with lower total beam power. Contact D-Pace with beam requirements.
4. D-Pace reserves the right to update specifications as part of its ongoing product improvement program.