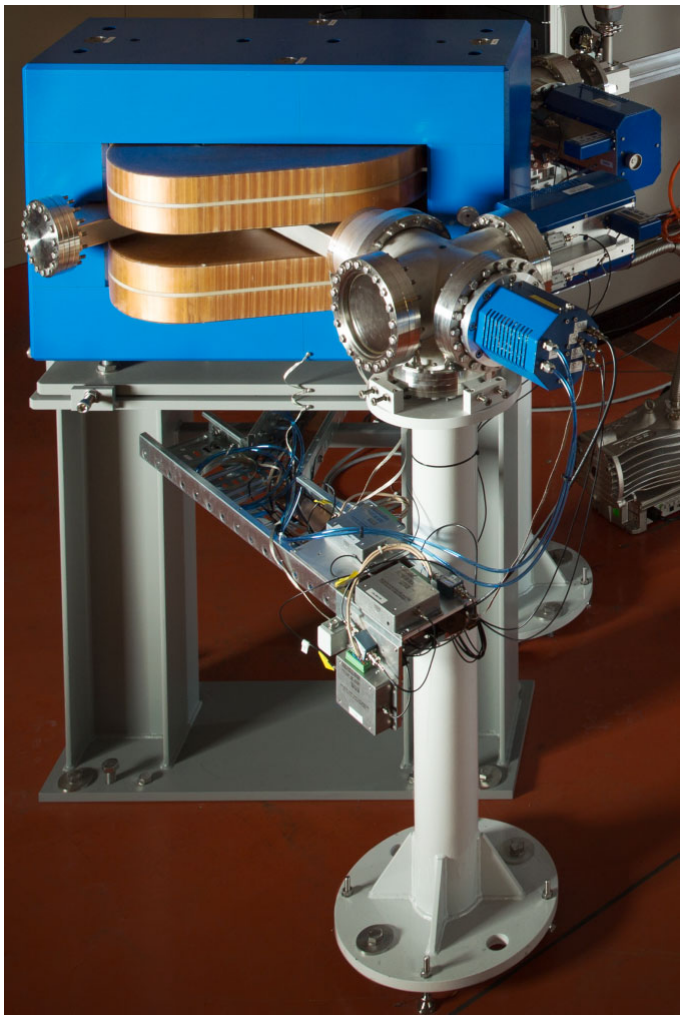
1:500 MASS/ENERGY SPECTROMETER

SPEC-500

Resolves ion beams to better than 1 part in 500.



- Energy resolution finer than 1:500 with 1 mm slit gap and small divergence beams, 1:45 with 5 mm slit gap and large divergence beams.
- Example Maximum Beam Energy & Particle Mass: T = 30 keV, q = 1, M = 76 A.M.U.
- Magnet: 90° Dipole, R = 191 mm, Mass = 2 Tonnes
- Upstream/Downstream Precision Slits:
  - 50 mm beam height
  - 0 - 20 mm manually adjustable gap, accurate to ± 0.05 mm

The **D-Pace 1:500 Mass/Energy Spectrometer System** has been designed for resolving charged particle beams with Bρ = 0.2196 T•m to better than 1 part in 500 in energy. The system comes complete with all stands, vacuum chambers, slits, Faraday cup, spectrometer magnet, power supply and control system. Installation, commissioning, and training can also be provided. Custom modifications can also be undertaken to meet your particular beam kinetic energy, charge state, particle mass, and beam current conditions.

SPECIFICATIONS	
Mass (Weight)	~2200 kg
Bend Radius/θ/B_{max} Bρ	191 mm / 90° / 1.15 Tesla 0.2196 T•m
Ent./Exit Slit to Magnet Distance	500 mm / 615 mm
Vacuum Chamber	316 Stainless Steel, UHV
Magnet Gap	50 mm (V-Box Gap 42 mm)
Ent. & Exit Pole Angle	34.79°
Effective Length	300 mm
Beam Axis Height	1050 mm
Thermal Switches: Trip Temperature:	One per coil strip (4 total) 70 °C
Qty 2 Slits Qty 1 Fixed F-Cup, or Qty 1 Actuated F-Cup	D-Pace Spec 2120017 D-Pace Spec 2120022 D-Pace Spec 2120011
Cooling Water Connections	2.6 L/min total @ 20 °C Ø10 mm tube Fitting
Power Supply Output: Remote Control Current Control	100 A, 60 V, ±10 ppm RS232 1 – 100%
Power Supply Input (Other inputs possible)	400 VAC, Three Phase + neutral, 47/63 Hz

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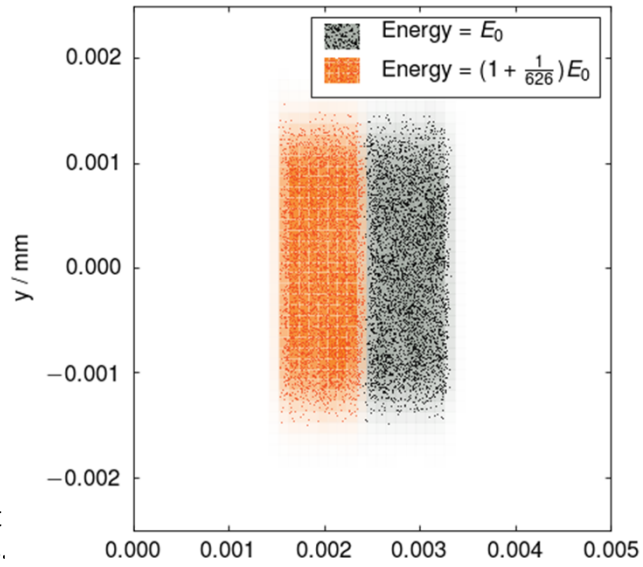
n	OBJECT SLIT				IN MAGNET		IMAGE SLIT	OPTICAL PARAMETERS		
	$\|x\|_{max}$ $[mm]$	$\|y\|_{max}$ $[mm]$	$\|x'\|_{max}$ $[mrad]$	$\|y'\|_{max}$ $[mrad]$	$\|x\|_{max}$ $[mm]$	$\|y\|_{max}$ $[mm]$	$\|x\|_{max}$ $[mm]$	M factor Magnification	D $[mm]$ Dispersion	Resolving Power $\frac{E}{\Delta E}$
1	0.5	1	4.4	4.4	3.2	2.8	0.4	0.9	570	500
2	3	5	35	26	24.4	15.8	3.2	1.1	550	83
3	3	5	69	33	48.3	19.5	4.6	1.5	630	68
4	5	5	35	24	27.0	14.6	4.8	1.0	570	58
5	5	5	66	33	47.5	19.2	5.9	1.2	570	45

TABLE 1: Spectrometer resolving power as a function of accepted beam size in vacuum box for charged particle beams.

- All sizes are given as maximum dimension from a center point (half-widths and half-heights).
- The magnification (M factor) of the system is the width of the beam at the object slit divided by the width of the beam at the image slit.
- The resolving power of the system is related to the dispersion (D) and magnification (M) and half-width of the image slit (s) as: $R = D2Ms$
- For the case of unrestricted wide beams through the magnet, aberrations cause the effective resolving power to decrease.

Object-n1: Shows the beam density at the plane of the image slit, with particles colour-coded by energy for the n = 1 high resolution case from Table 1.



Beam-n5: Shows the n = 5 case from Table 1 (largest beam sizes in magnet) with two just-resolved beams.