Status of the new separator project at JYFL

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Background

Gas-filled separator RITU in operation since 1993

Heavy workload on RITU
3000 h of beam time in 1997
(90 papers in refereed journals)

Having two recoil separators would

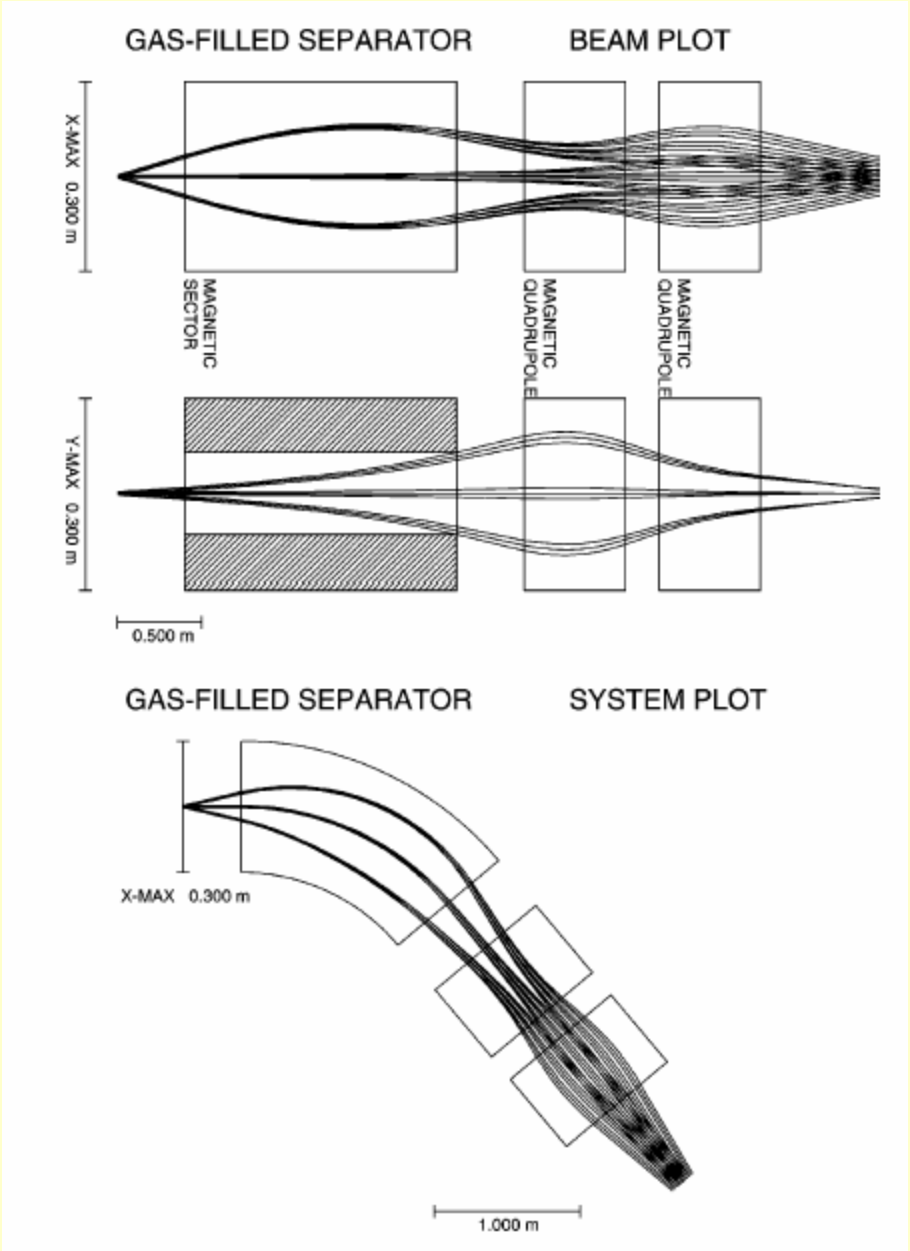
- reduce the need for switching between detector systems
- Possibly open up new fields of research at JYFL
  (Most notably in the region A ~ 100)

Starting point

RITU works very well in the region of the heavy and the heaviest elements; Keep it as is

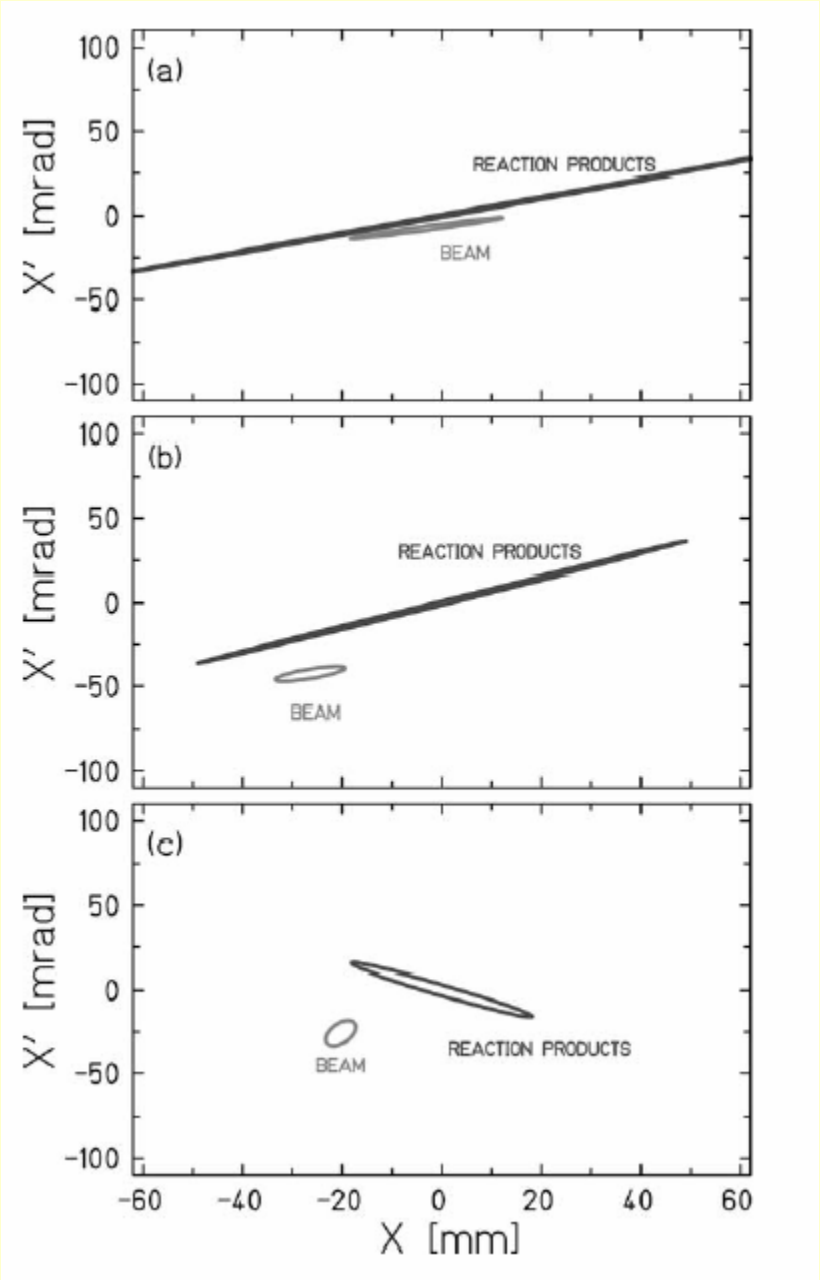
Alternatives for a second separator:

- a second RITU
- Gas-filled separator for the medium-mass region
  (EMIS-14 T. Enqvist *et al.* NIM B **204**, 138 (2003)
- A vacuum device



Second gas-filled separator for JYFL (not realized)

$D_hQ_vQ_h$	
radius	1.85 m
bending angle	50°
field index	~ 3
gap	130 mm
dispersion mm/%	15
length	4.8 m



Separation in (x,x') plane between beam and evaporation residues (after the dipole magnet)

a) RITU

b) new separator with $B_n = 0$

c) new separator with $B_n = -4$

Difference in Bρ 4%

Vacuum device - benefits

- Possibility to go down in mass: A ~ 80-100, Z ~ N (Enthusiastic response from the nuclear structure community)

- Local support from the IGISOL community

- Possibility to introduce new know-how to JYFL

Main characteristics

- Mass resolving power significantly better than 100 in the A = 100 region

- Angular acceptance 5-10 msr

- Energy acceptance ±7%

- Possibility to do RDT with Ge arrays

- Moderate length, cost

Design

Many alternatives
Our starting point: Suggestion from Dubna - QQQEM

Main characteristics:

Deflector

radius	4.00 m
gap	12 cm
Max V	±200 kV

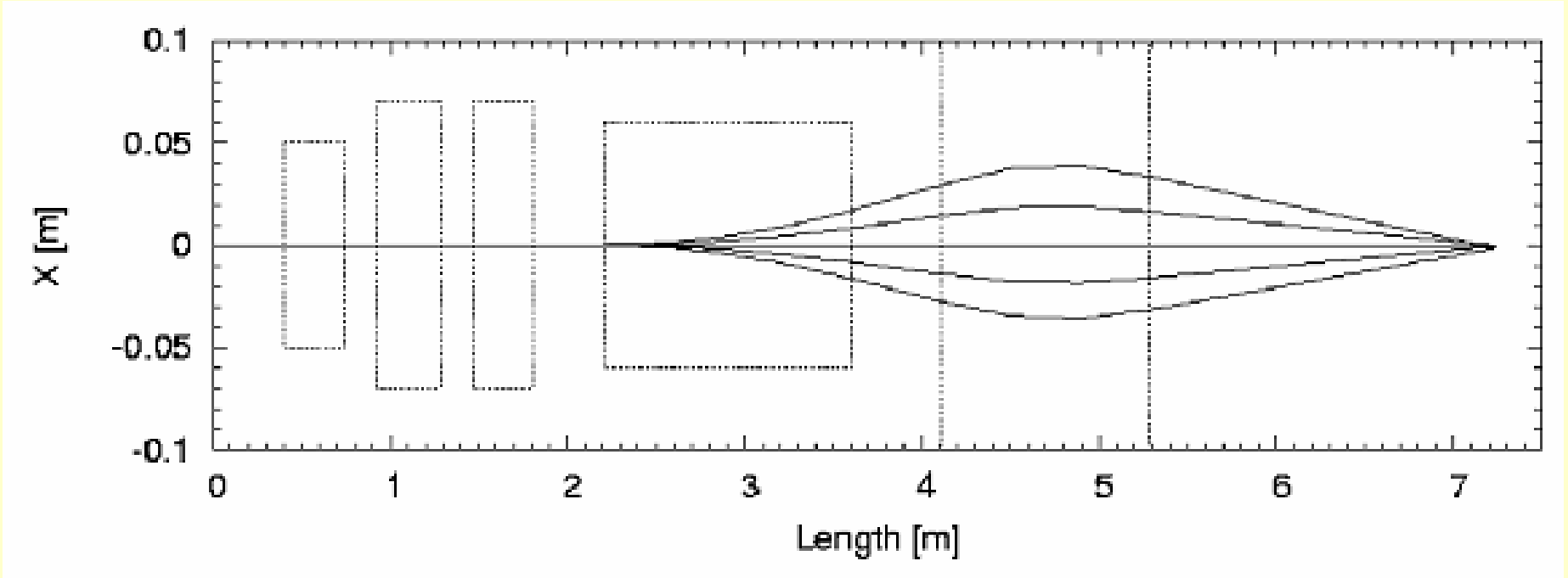
Magnetic dipole

radius	1.50 m
Defl. angle	45°
Entr. angle	8°
Exit angle	8°
EFB radii	2.80 m
gap	10 cm
Max B	1.0 T

Further characteristics

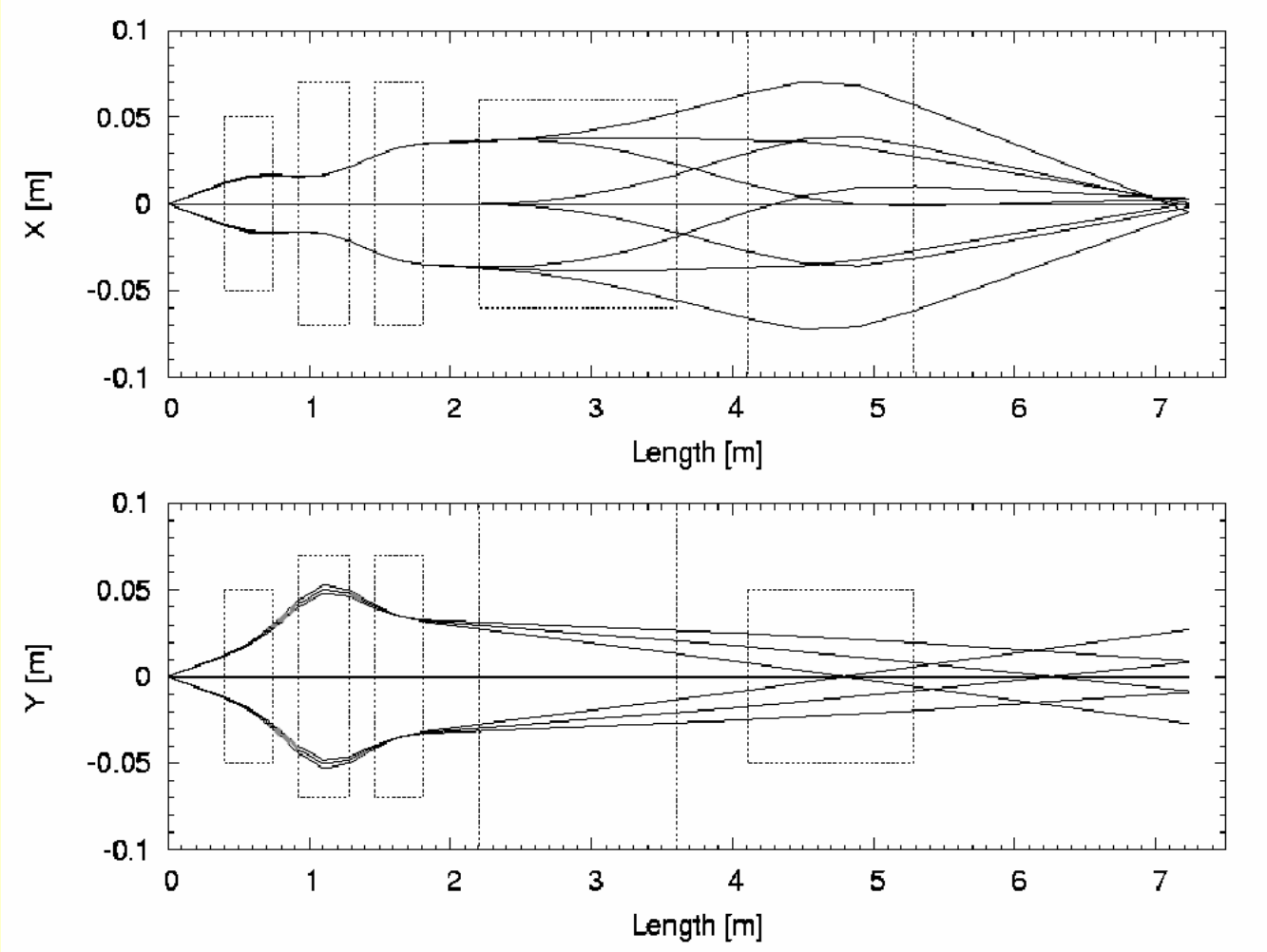
Angular acceptance	y ±30 mrad
Angular acceptance	x ±30 mrad
Energy acceptance	±7%
Momentum dispersion	10 mm/%
Mass resolving power	250
Beam spot size	x = ±1 mm
	y = ±1 mm
3 charge states accepted	

Energy focus



$\delta_E = 0, \pm 3.5\%, \pm 7\%$

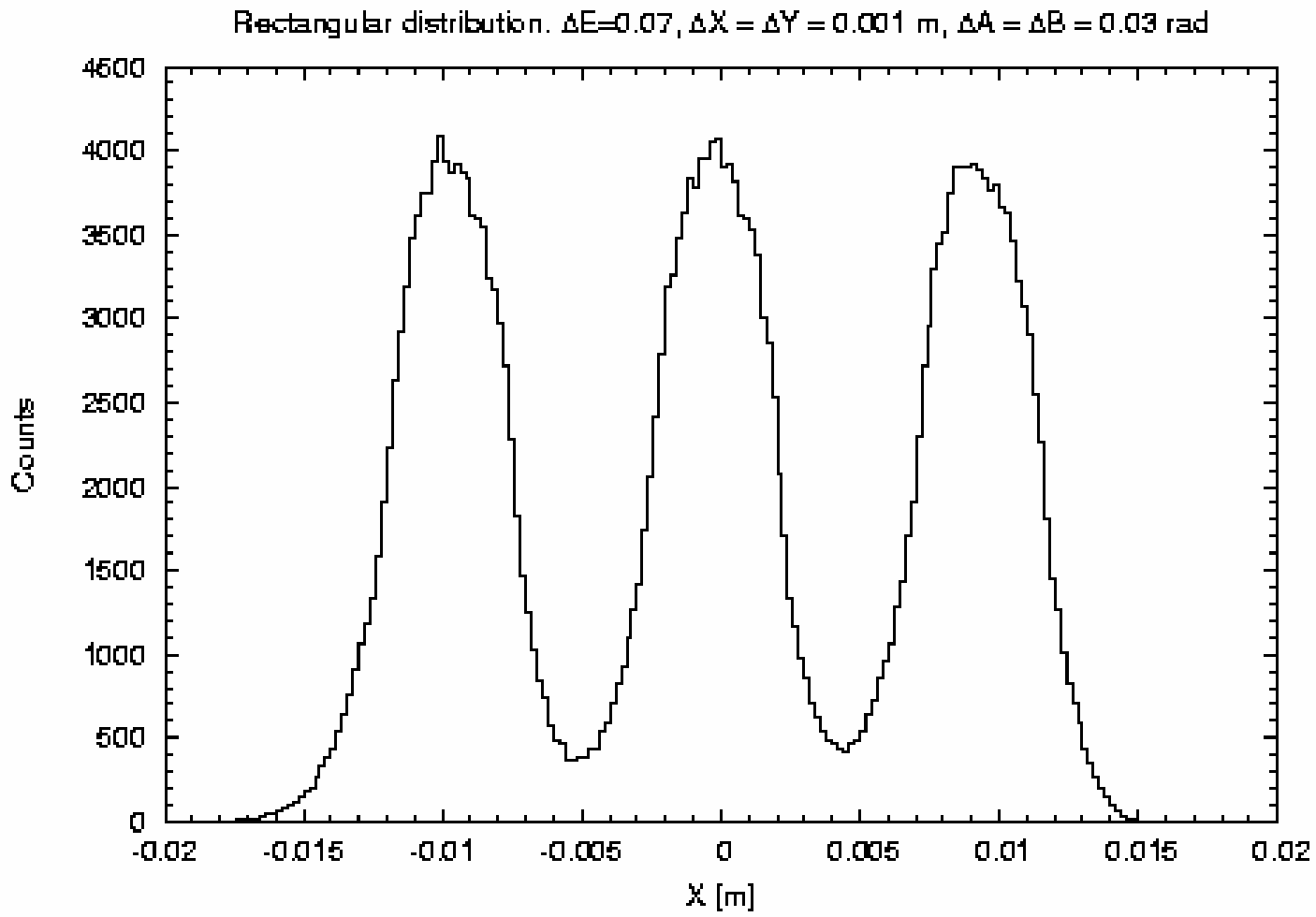
Trajectories



angles 0, ±30 mrad

$\delta_E = 0, \pm 7\%$

Mass resolving power



A =
99, 100, 101

Ref. particle
A = 100
q = 26e
E = 100 MeV

$\delta_E \leq 0.07$
$\delta x \leq 0.001$ m
$\delta y \leq 0.001$ m
$|\delta\alpha| \leq 0.03$ rad
$|\delta\beta| \leq 0.03$ rad

Manpower

Local group

- C. Scholey
- J. Uusitalo
- (P. Kuusiniemi)
- J. Sarén
- M. Leino
- Gamma and RITU groups

Additional help: GSI, ANL, JINR, U.K. institutes and universities

Time and money

Construction period: 2004-2006

100 k€ available to get started in 2004

150 k€/y available from JYFL Accelerator Laboratory's budget in 2005-2006

External funding additional