MICE Target Status

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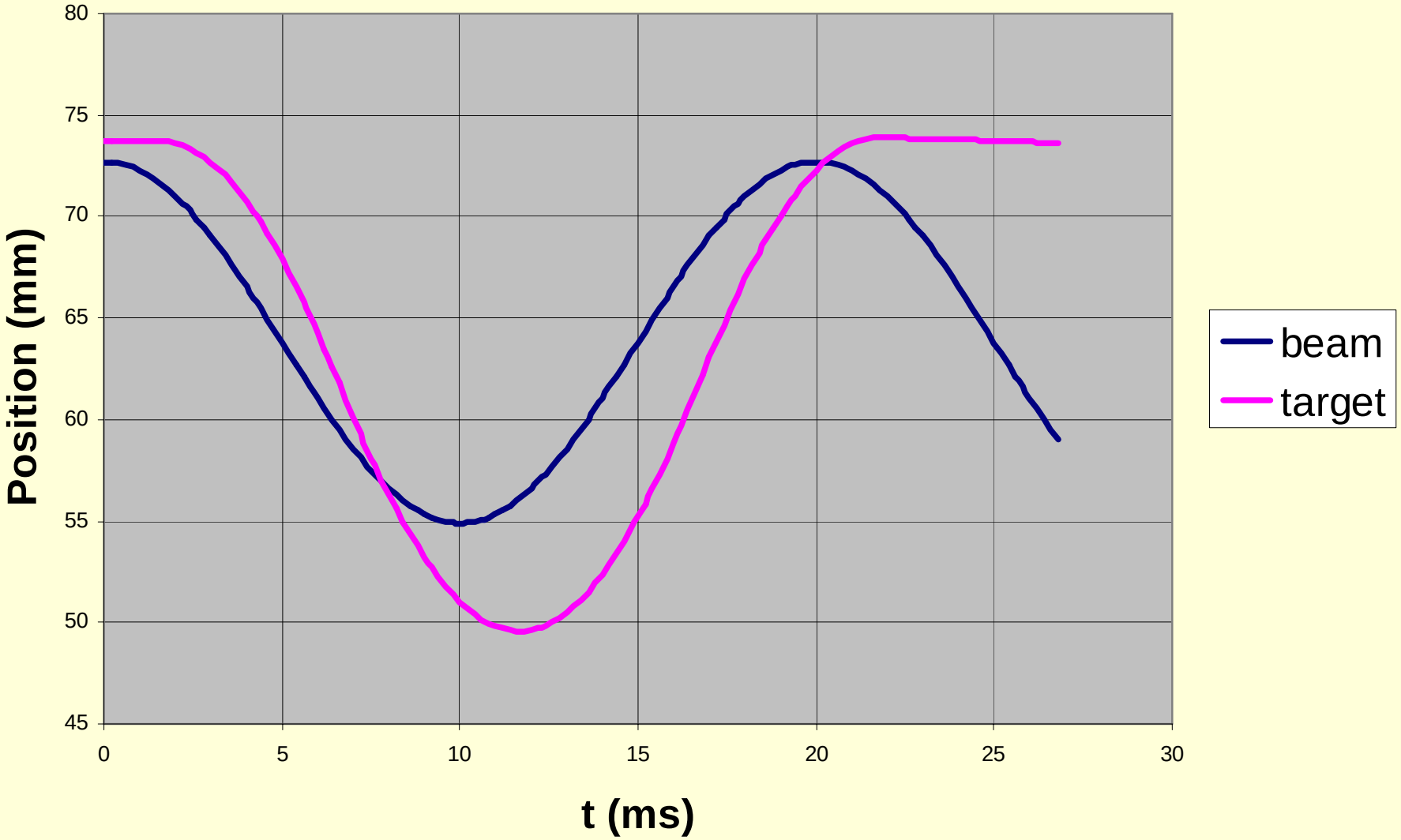
Status

- Rather slow progress (manpower …)
- Simple electromechanical modelling
  - Forces, accelerations etc
  - Springs (see later)
  - Cooling worries

With spring


Position (mm)
80
75
70
65
60
55
50
45
0
5
10
15
20
25
30
t (ms)
beam
target

Basic specifications

- Travel ~25 mm
- Peak acceleration (min.) ~1 mm ms^{-2}

  $=1000\ ms^{-2} = 100\ g$
- Rep. rate
  - o On demand 1 Hz → 10 Hz (→ 50Hz?)
  - o (Machine cycle length 20 ms)

Components (or tasks)

- Diaphragm springs: 25 mm travel
  (±12.5 or …?)
- Magnet & coil assembly
- Position sensing
- Power supply & control, feedback etc.
- Cooling?
- …

[What buy, what make?]

Discussions with Electrical and Electronic Engineering (EEE) in Sheffield:

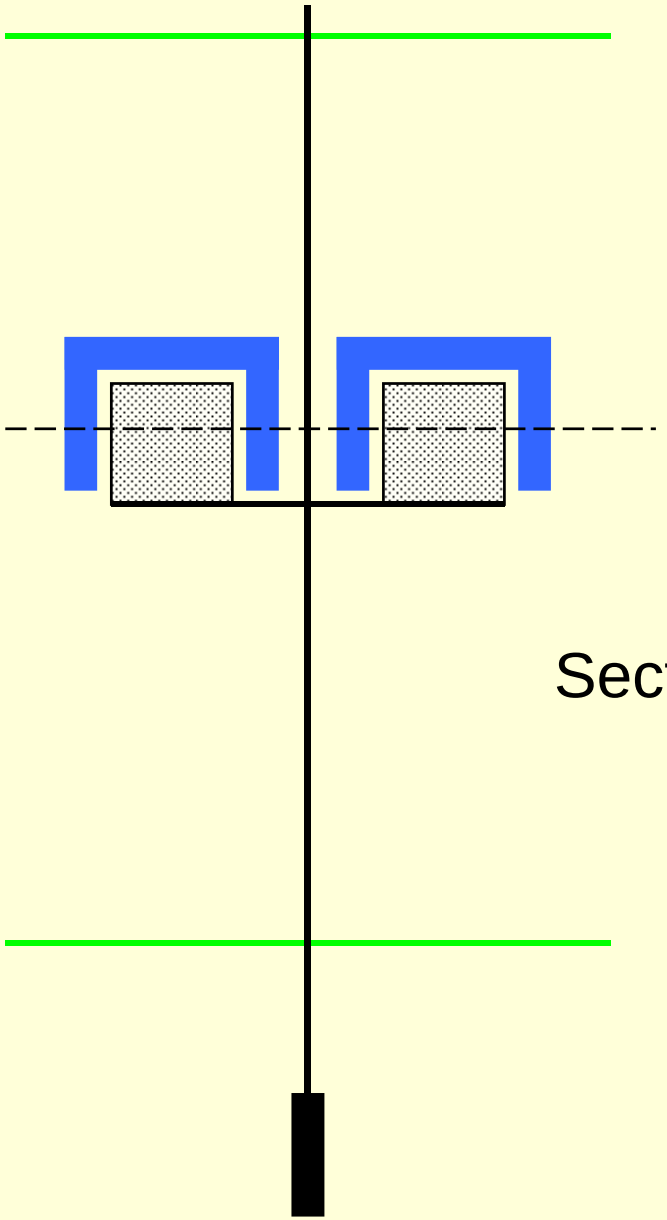
- Modified idea for linear motor drive

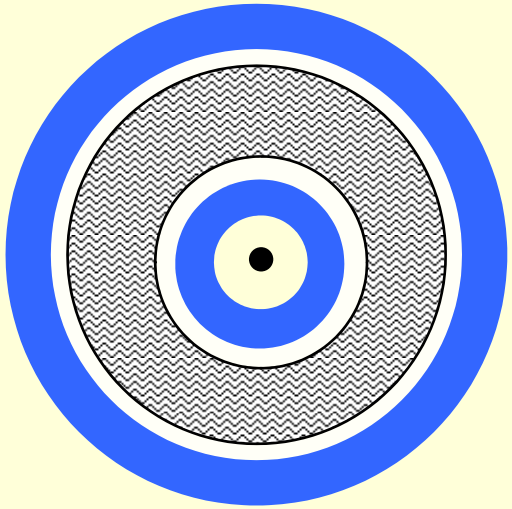
First design:

Moving coil

Diaphragm spring

Magnet (fixed)



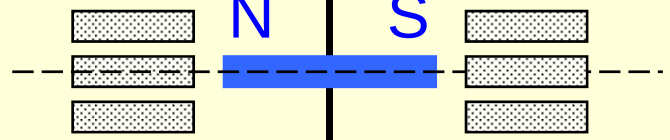


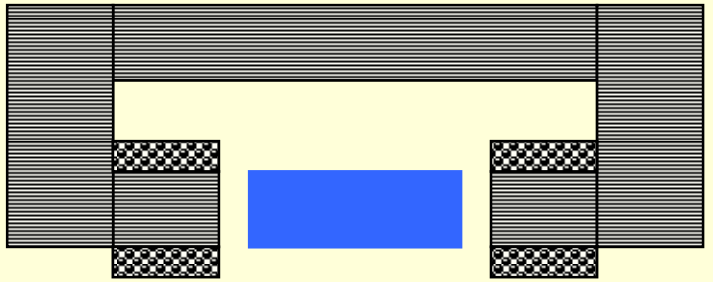
Section

Target

Diaphragm spring

Array of coils





Alternative design:

Moving magnet

Section

Target

Advantages

- Lower mass – light moving magnet (sintered neodymium-iron-boron)
- Stationary windings – more power, many cooling options
- Larger travel possible

Disadvantage

- Multiple coils
- More sophisticated power supply & control required
- Phase and amplitude control required

Control ideas

- 2 levels
  - Rapid hardware feedback to ensure stability and reproducibility
  - Pulse-to-pulse monitoring (software) of position, timing, etc. to provide slow adjustments

Open question – restoring spring?

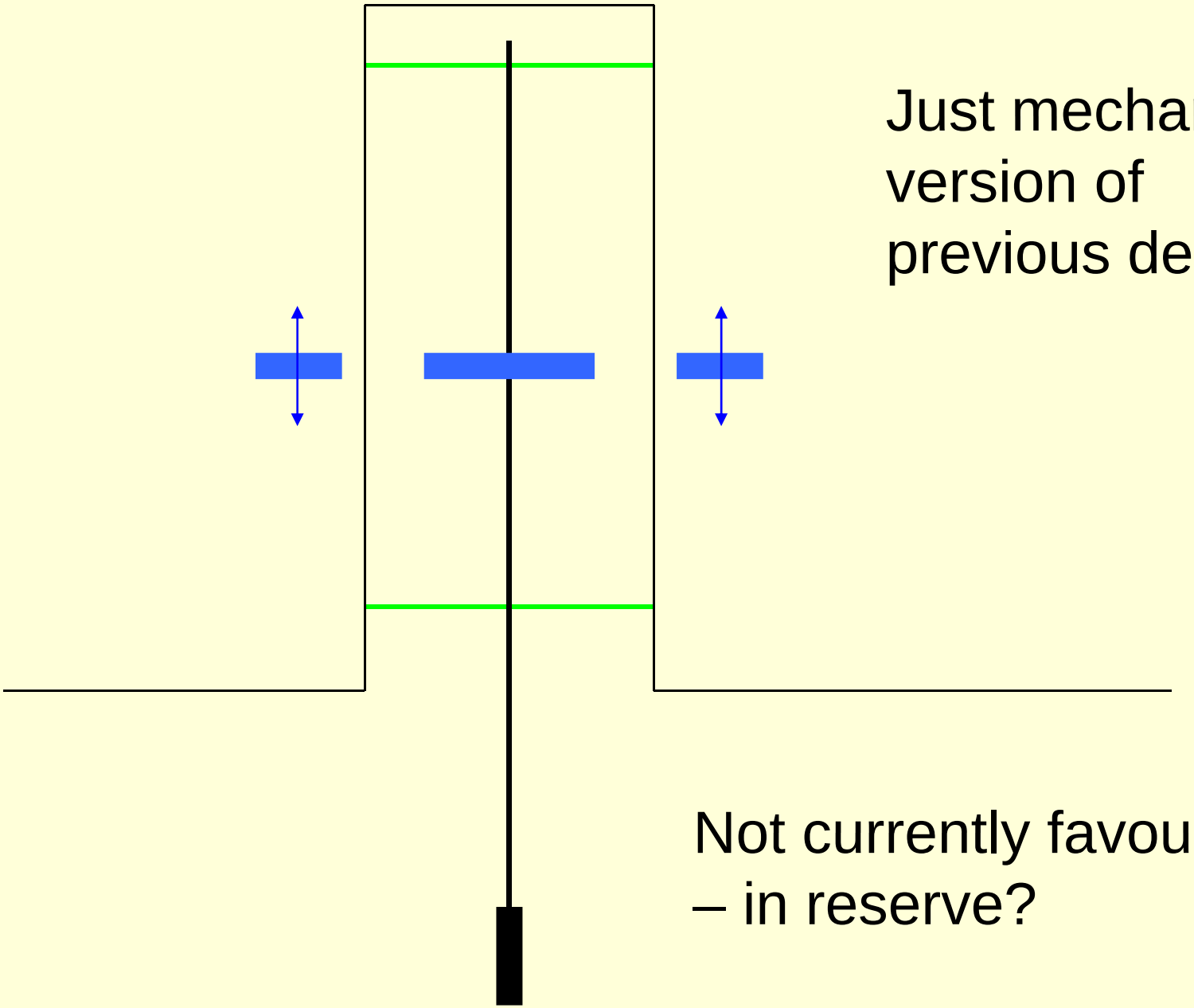
- Fail safe
- Lower average power in single-shot mode(?)
- More power at 50 Hz
- More sophisticated feedback to prevent instabilities?

Parallel studies – with Caburn Ltd

- Bellows, with solenoid/cam outside vacuum?

Fatigue!!

- Magnetic coupling through vacuum chamber?



Just mechanical version of previous design?

Not currently favoured – in reserve?

Next steps

- Reactivate activities with EEE
  - Build prototype magnet/coil system
- Design/make/acquire diaphragm springs with sufficient travel
- Develop opto-electric(?) position sensing
- Interface to power supply/driver
- Implement 2-stage feedback
- Test and characterise

Future

- Radiation-hard position sensing?
- Improved control and feedback
- Operation in vacuum
- Cooling?
- Long term stability (fatigue of springs?)
- ...

People!

- Research Associate – Lara Howlett – from April
- Hope to work with RAL trainee engineers
- News last week – CASE studentship starting October
  - Anyone know a good candidate?
  - Practical engineering skills + interest in particle physics?!

Timetable??

• First prototype	Summer 04
• Develop control	Autumn 04
• System tests	Winter 04-05
• Cooling, stability tests	Spring-Summer 05
• Rad-hard components	Spring-Summer 05
• Interfaces with ISIS	Spring-Summer 05
• Implement improvements	Summer 05
• Final device construct/test	Autumn-Winter 05
• Install	Winter-Spring 06