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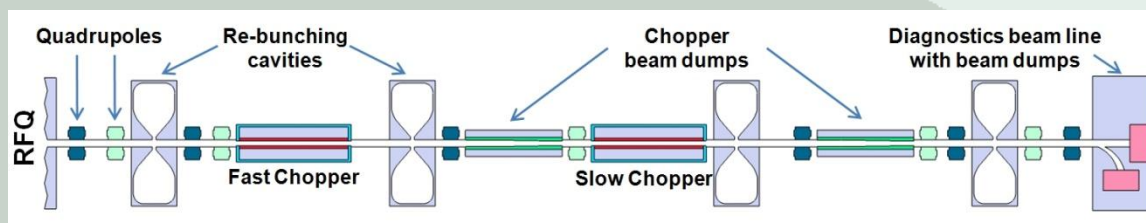
Imperial College  
London



# Project Engineering for the FETS MEBT

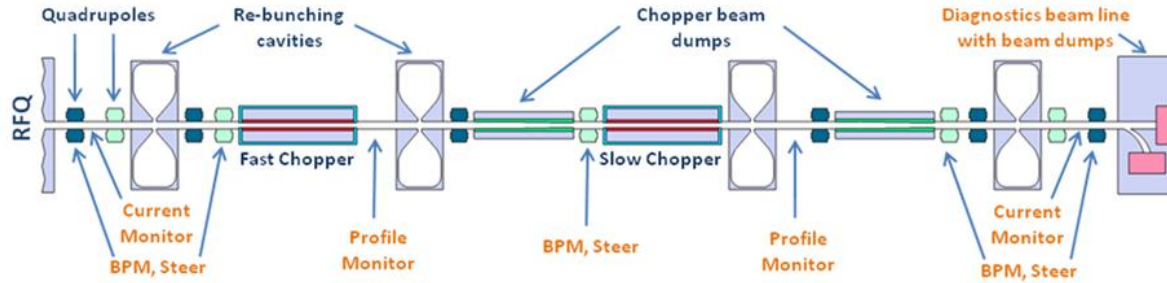
by Pete and Juergen

*n<sup>th</sup> February 2012*

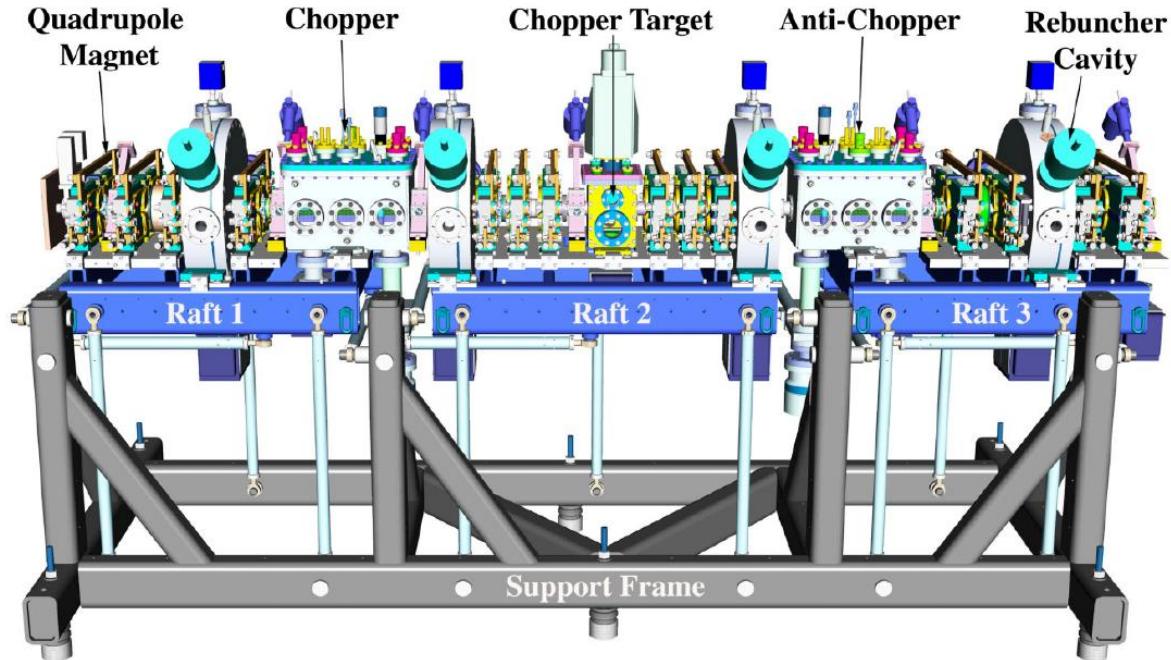




We have this.....



But what we need is something like this.....





## List of MEBT tasks and people

If Simon can find funding from 1/2 and RA post then UCL will find the other half. Simon is evaluating possible collaborations with ESS both in Lund and Bilbao.

### Areas where the FETS/Bilbao MEBT will have similar design to ESS (assuming ESS decide on a MEBT)

- Rebuncher cavities?
- Diagnostics?

### MEBT work already completed

- Electromagnetic design of rebuncher cavities (simple)

- Chip

### MEBT work partially completed

- Electromagnetic design of rebuncher cavities (full, including all features)
- Thermal simulations of rebuncher cavities
- Mechanical design of rebuncher cavities
- Optics design of MEBT
- Beam dynamics simulations of MEBT (needs to be revisited with real RFQ beam)
- Chopper design

- Chip
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- Pete / anyone else?
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- Chip / soon to be Morteza
- Mike

### MEBT work not yet started

- MEBT rebuncher cavity cold model design/construction
- MEBT alignment tolerance study
- EM design of MEBT quadrupoles
- Mechanical design of Quads (outsourcing ?)
- Engineering layout of MEBT (getting all elements (pumps, valves, cavities, quads, chopper dumps etc.) into the "beam dynamics space")
- On-line diagnostics (those that will exist as part of the completed linac) \*
- Commissioning diagnostics (those needed only while we commission the RFQ/MEBT/chopper) \*

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- internal or company?
- company
- internal
- don't know what this is



## The FETS team must decide what they want from the diagnostics.

### Commissioning Diagnostics

On the topic of "commissioning diagnostics", I had in mind that we may be able to re-use our existing diagnostics, but we may not. The difference in beam size between the ion source and the RFQ exit is significant, as is the beam current and power: we've seen the hardest scintillator we know of (pure quartz) buckle and melt when we focus the LEBT beam down to RFQ injection size. It may be that what we have will work, but it may not: either way it needs thinking about.

### Temporary Diagnostics

It may also be that we need temporary diagnostics, such as a movable current monitor or beam dump, that we don't have right now but that we won't keep for the final installation. I think this is Chip's diagnostics bench. I wanted to add all these things in, as I can imagine there will be diagnostics systems that we'll need temporarily that may not be off the shelf items. A profile monitor is probably a case in point: it may be that Christoph's laser profile monitor is ready to go by the time we have beam out of the RFQ, but I would bet that we would like a corroborative measurement as well. It would be nice to have a traditional measurement of the profile to compare, assuming such a thing is possible with our beam current of course.



## Where do we want to be by Summer 2012?

### General

1. To be in control of the RFQ build
2. To have planning in place for services installation: cooling, power, RF, shielding

### MEBT

1. To know the MEBT parameters – table 1 plus beam diameter, chopper interfaces, beam stop interfaces etc.
2. To know who will be our partners on the cavity design, what are their goals / timescales?
3. To understand better what is expected from the various diagnostics.
4. To approach some quadrupole manufacturers to request a prototype.
5. To start producing the MEBT engineering layout.
6. To start designing a prototype cavity \*\*

Table 1: MEBT parameters

Element type	No.	Length	Attributes
Quadrupoles	11	70 mm	G = 9-33 T/m
Buncher cavities	4	200 mm	V = 75-160 kV
Fast Chopper	1	450 mm	V = +/- 1.3 kV
Slow Chopper	1	450 mm	V = +/- 1.5 kV
Beam Dumps	2	450 mm	-

### How will the FETS MEBT engineering project be run?

1. Managed by FETS engineers – Pete, Alberto and Phil
2. Overall assembly design controlled by FETS engineers.
3. Working in partnership to develop cavities.
4. Working in partnership with industry to make quads.
5. Support structure to be designed in-house.
6. Chopper engineering to be discussed with Mike.
7. Assembly and commissioning by FETS team.
8. Items such as cavity tuners and couplers and diagnostic items can be made in HEP, Imperial
9. Existing network of manufacturers in place for production.

### \*\*Do we want a cavity cold model?

- Why? What do we hope to learn?
- Made from which material and to which scale?
- To do what with – bead pull? LLRF?