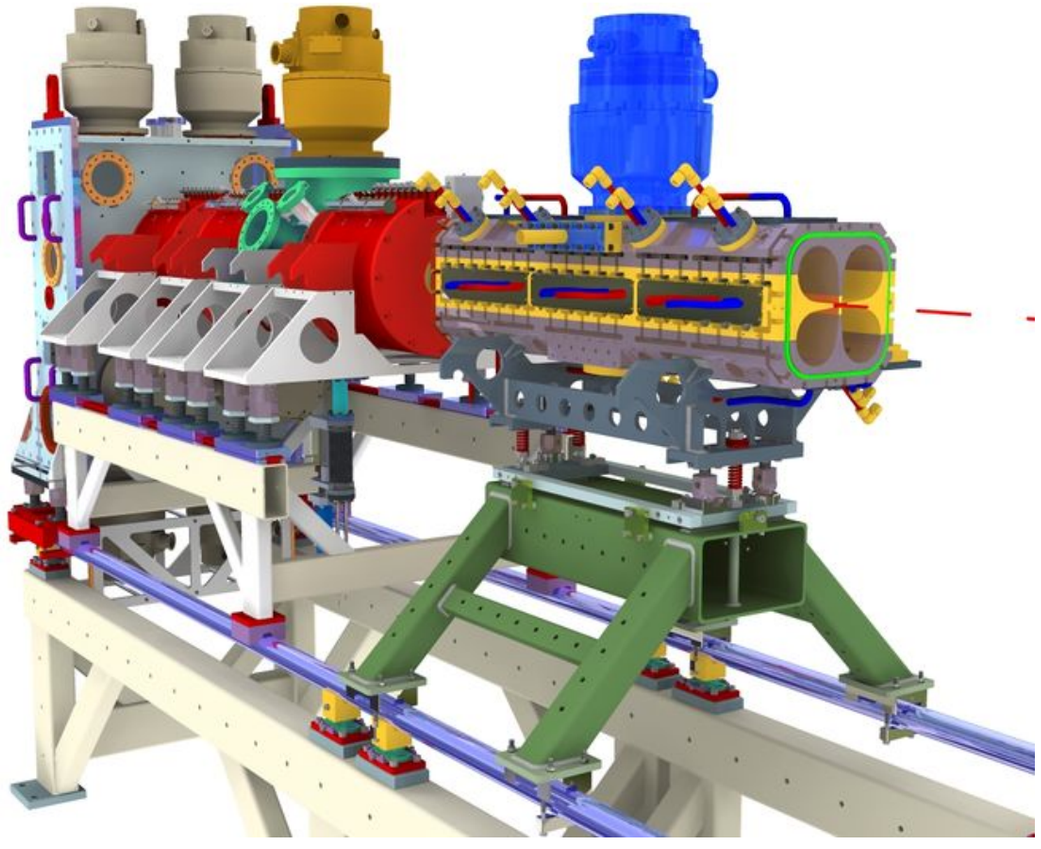
FETS Schedule Update

Thanks for major contributions from
Pete Savage & Mike Dudman

FETS Meeting, RHUL
15/10/2014

Outline

- Overview of status
- Main progress this month
- Imminent issues
- Avoiding schedule slippage



Why bother… ?

What use is a schedule?

- Recommended by Oversight Committee.
- We have limited time left: FETS grant expires in March 2015. We will apply and hope to be granted an extension to ~Sept 2016 to "complete" FETS.
- A schedule will be essential to help us organize ourselves effectively and progress efficiently:
  - Aims to give an quick, monthly visual overview of the project status:
    - Where do we stand on the different component development / manufacture / readiness? What tasks remain and how best can we use our resources to complete them?
  - Helps each Work Package manager to know when their components will be needed in R8 to integrate with the main installation sequence.
  - Identifies resource constraints / bottlenecks, where our resources are overstretched or duplicated. Aim to suggest ways to improve these.
  - Highlights timeline for key decisions to be made and impact on schedule if decisions are delayed.

Defining success…

What does it mean to "complete" FETS successfully?

- We really need to define our goals / aims until the end of the FETS project. Essentially:
  - E.g.: by Sept 2016 aim to have RFQ, MEBT and diagnostics installed with first beam through all components.
  - Demonstrate effective beam chopping / first laser diagnostics.
  - What value of key parameters do we aim to achieve?
    - Beam current / duty cycle / RFQ and MEBT transmission efficiency / chopping / diagnostic technique?
    - How will these parameters / goals be measured?

- Definition of clear, realistic goals is critical, so as not to waste effort or time trying to achieve more than is required before the end of the current FETS project. [Advanced aims can be part of PAA].

Schedule breakdown

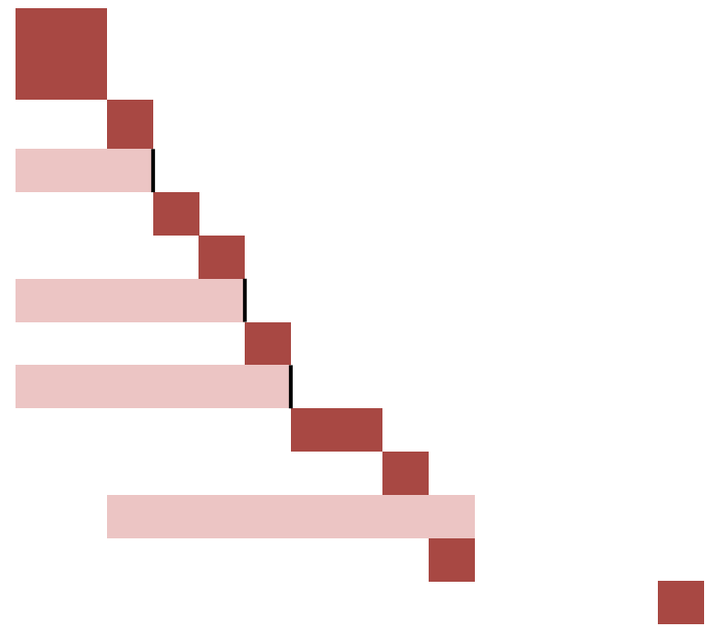
Breakdown schedule into two parts:

- R8 Installation (& Commissioning) Schedule
  - Timeline of infrastructure and components as they will be assembled in R8 and FETS beam line.
- Development Schedule
  - More details list of tasks required to develop / build the components, ready for installation.

- Also have discussed a *Readiness Log*
  - Many components will arrive for storage in R8 prior to assembly in FETS.
  - Suggest to create an organized storage bay in R8: aim to box and log the status of all major items, together with all their components needed for final assembly.

Shielding: status Sept FETS meeting

FETS R8 Installation Schedule	Wks 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	Notes
Shielding		
Source mobile crane & driver		Heavy gang / Trevor Pike, Mike Dudman
Survey and mark out floor for other walls		Adrian Hooper
Build North Wall, mobile crane		Heavy gang / Trevor Pike, Mike Dudman
Decide holes for RF cables in NE block		Barry after training or driver from company
Drill holes in NW block and install		
Build East Wall, R8 crane		
Decide size / number of cable trenches		Confirm with Paul Wright, safety radiation advisor
Cut trenches under South Wall		
Decide ESO's input: false floor, interlocks…		
Build South Wall, including entrance		
Build West Wall		
Request quote for roof slabs		Lead time is 12 weeks
Survey walls as built, modify / order roof sections		
Delivery and installation of RF half roof		Required for delivery of RF (lead time?)
Delivery and installation of complete roof		Only required when running the MEBT.



Key decisions needed last month:

- Train Barry (longer) or preferably hire crane with driver?
- Holes for RF cables in NE block? Needed before East wall can be built.
- Size and number of cable trenches? need to cut before south wall goes up.
  - Prompted meeting with Gary to define services cross section + cable lengths

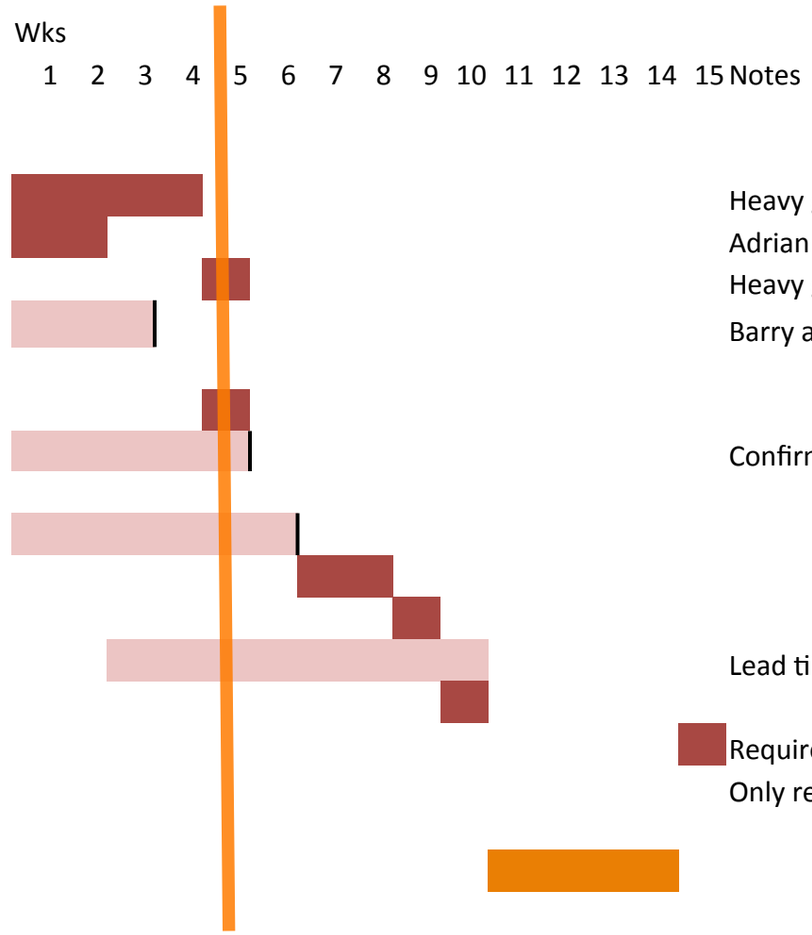
Main progress this month

Shielding

- Key decisions made:
  - Cables to be routed through 90 mm deep channels at top of wall.
  - Avoids the need to cut cables trenches under the wall and to drill one corner block for the RF cables (plan to use elbow fittings through standard channels instead).
- Start of wall build was delayed by two weeks due to cancelled availability of heavy gang.
- Recovered delay due to time saving of not cutting trenches / drilling block.
- Wall build started on Monday 13th and making good progress. Both North and East walls are expected to be built by end of Friday (only one week, not two).

Shielding: status today

FETS R8 Installation Schedule



		Notes
Shielding		
	Source mobile crane & driver	Heavy gang / Trevor Pike, Mike Dudman
	Survey and mark out floor for other walls	Adrian Hooper
	Build North Wall, mobile crane	Heavy gang / Trevor Pike, Mike Dudman
	Decide holes for RF cables in NE block	Barry after training or driver from company
	Drill holes in NE block and install	
	Build East Wall, R8 crane	
	Decide size / number of cable trenches	Confirm with Paul Wright, safety radiation advisor
	Cut trenches under South Wall	
	Decide ESO's input: false floor, interlocks…	
	Build South Wall, including entrance	
	Build West Wall	
	Request quote for roof slabs	Lead time is 12 weeks
	Survey walls as built, modify / order roof sections	
	Delivery and installation of RF half roof	Required for delivery of RF (lead time?)
	Delivery and installation of complete roof	Only required when running the MEBT.
Services (ESO)	Wall lighting, air circulation, false floor, doors, interlocks	

Key decisions needed this month:

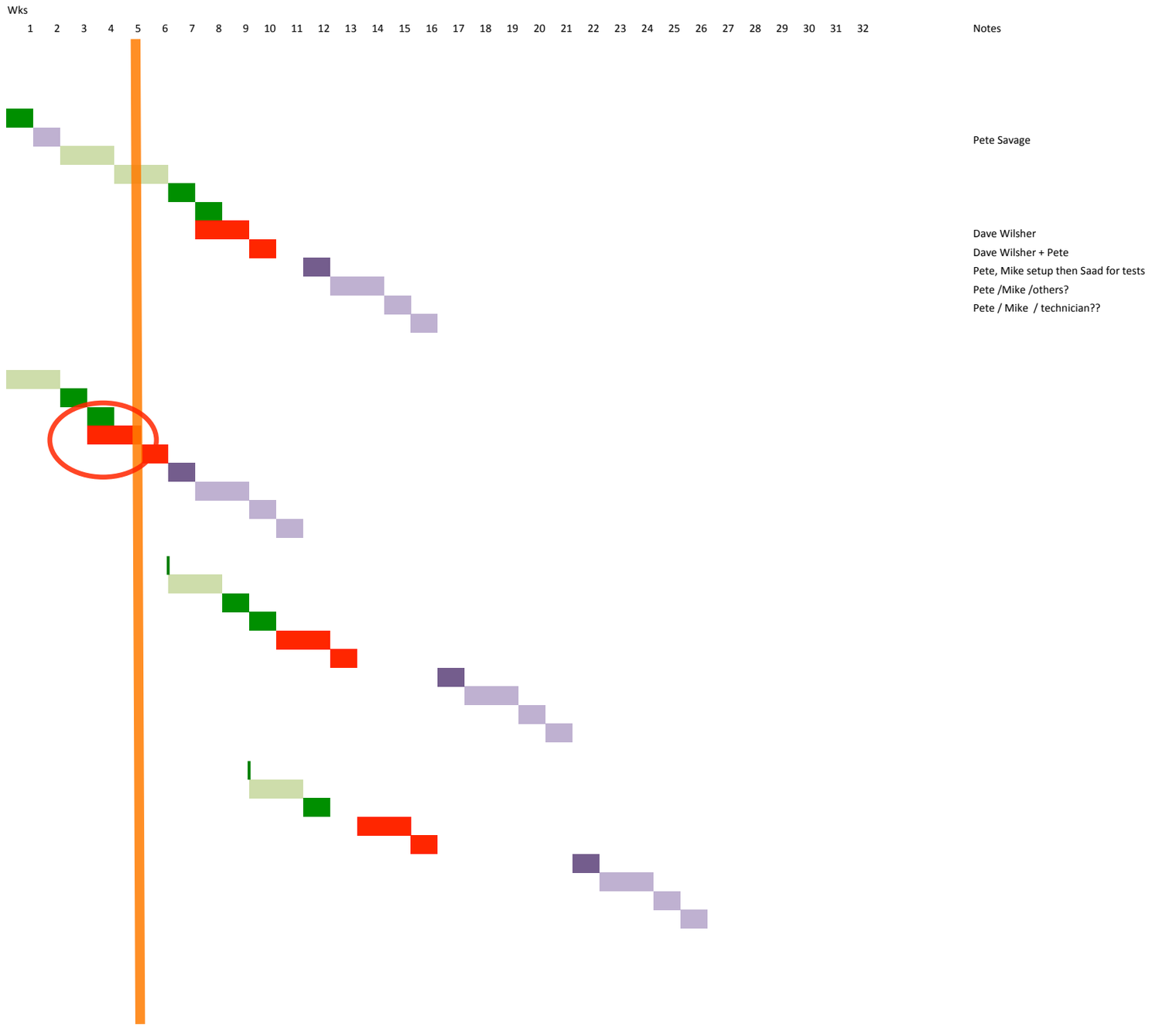
- Decide ESOs input on false floor, interlocks? Needed before South wall begins?
- Arrange for ESO wall lighting / air circulation, false floors, doors, interlock installation –time slot in end of Nov / early Dec?

R8 Installation Schedule (Draft v0)

		Notes
FETS R8 Installation Schedule	Wks 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	
Shielding		
	Source mobile crane & driver	Heavy gang / Trevor Pike, Mike Dudman
	Survey and mark out floor for other walls	Adrian Hooper
	Build North Wall, mobile crane	Heavy gang / Trevor Pike, Mike Dudman
	Decide holes for RF cables in NE block	Barry after training or driver from company
	Drill holes in NE block and install	
	Build East Wall, R8 crane	
	Decide size / number of cable trenches	Confirm with Paul Wright, safety radiation advisor
	Cut trenches under South Wall	
	Decide ESO's input: false floor, interlocks…	
	Build South Wall, including entrance	
	Build West Wall	
	Request quote for roof slabs	Lead time is 12 weeks
	Survey walls as built, modify / order roof sections	
	Delivery and installation of RF half roof	Required for delivery of RF (lead time?)
	Delivery and installation of complete roof	Only required when running the MEBT.
Services (ESO)	Walll lighting, air circulation, false floor, doors, interlocks	
RFQ		
Section 1	On rails in R8, align to beam axis, offset in Z for bead pull	Align RFQ sections with telescope to perpex cross hair
	Fit upstream flange and connect to upstream component	
Section 2	On rails in R8, align to beam axis, offset in Z for bead pull	
	Fit upstream flange and connect to upstream component	4 metre bead pull and tuning plan needs defining.
Section 3	On rails in R8, align to beam axis, offset in Z for bead pull	
	Fit upstream flange and connect to upstream component	Support needs to be designed.
Section 4	On rails in R8, align to beam axis, offset in Z for bead pull	
	Fit upstream flange and connect to upstream component	
	4m bead pull test	
	Tuning field flatness of 4 section RFQ	To be defined…

RFQ Development Schedule (v0)

	FETS Development Schedule	Notes
RFQ		
Section 1	*Status: Machined incorrectly - to be remachined*	
	Return RFQ1 to NAB in wooden crate	
	CAD work to define section 1 remachining	Pete Savage
	Remachined at NAB	
	Assemble, inspect, test frequeqncy and machine grooves, retest	
	Redelivered to RAL	
	Crate returned to NAB	
	Section 1 reinspection	Dave Wilsher
	Assemble 4 vanes	Dave Wilsher + Pete
	Bead pull test	Pete, Mike setup then Saad for tests
	Populate with O-ring, tuners, pick-ups, vacuum ports, cooling manifolds	Pete /Mike /others?
	Vacuum test	Pete / Mike / technician??
	Cooling leak test	
Section 2	NAB Machined internally, due at RAL in 2wks, box returned	
	Delivered to RAL	
	Crate returned to NAB	
	Section 2 inspection	
	Assemble 4 vanes	
	Bead pull test	
	Populate with O-ring, tuners, pick-ups, vacuum ports, cooling manifolds	
	Vacuum test	
	Cooling leak test	
Section 3	need results of section 2 to NAB	
	Machine at NAB	
	Delivery to RAL?	
	Crate returned to NAB	
	Section 3 inspection	
	Assemble 4 vanes	
	Bead pull test	
	Populate with O-ring, tuners, pick-ups, vacuum ports, cooling manifolds	
	Vacuum test	
	Cooling leak test	
Section 4	need results of section 2	
	Machine at NAB	
	Delivery to RAL?	
	Section 4 inspection	
	Assemble 4 vanes	
	Bead pull test	
	Populate with O-ring, tuners, pick-ups, vacuum ports, cooling manifolds	
	Vacuum test	
	Cooling leak test	
4m bead pull	Decide on specification	
	Simulation of field tuning?	
	Development of hardware to make 4m+ / multiple beads?	



Imminent issue: RFQ inspection

FETS Development Schedule

RFQ

Section 1

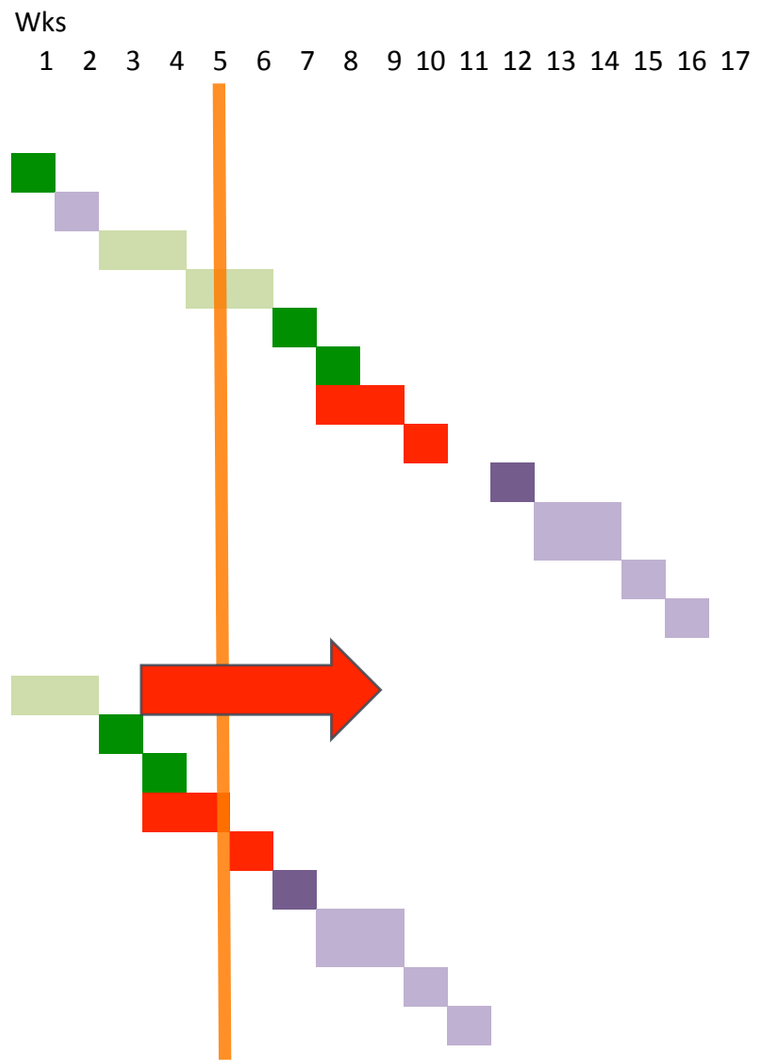
Status: Machined incorrectly - to be remachined
Return RFQ1 to NAB in wooden crate
CAD work to define section 1 remachining
Remachined at NAB
Assemble, inspect, test frequeqncy and machine grooves, retest
Redelivered to RAL
Crate returned to NAB
Section 1 reinspection
Assemble 4 vanes
Bead pull test

Populate with O-ring, tuners, pick-ups, vacuum ports, cooling manifolds
Vacuum test
Cooling leak test

Section 2

NAB Machined internally, due at RAL in 2wks, box returned
Delivered to RAL
Crate returned to NAB
Section 2 inspection
Assemble 4 vanes
Bead pull test

Populate with O-ring, tuners, pick-ups, vacuum ports, cooling manifolds
Vacuum test
Cooling leak test



- RFQ inspection:
  - Dave Wilsher has said he cannot inspect RFQ section 2 until at least the week beginning 3 November. This potentially delays the schedule by 5 weeks…
  - Recommend asking for Dave's continuous availability for the other sections?
- Possibly use time to make RFQ bead pull test with tuners? (Will lengthen overall schedule).

Other activities

RFQ Bead Pull and Tuning

- Meeting was held to define tuning procedure and bead pull measurements:
  - Scope of measurements defined, including dynamic range of movers.
  - Alan to implement Fourier analysis code for later conversion to LabView by RHUL project student.
  - Bead pull of section 2 to test procedure with manual tuners : off axis?
  - Ongoing tasks: please see Pete's document.

Chopper electronics

- Main tasks defined by Gary via discussions with Mike :
  - Task list ready for timelines to be added to schedule.

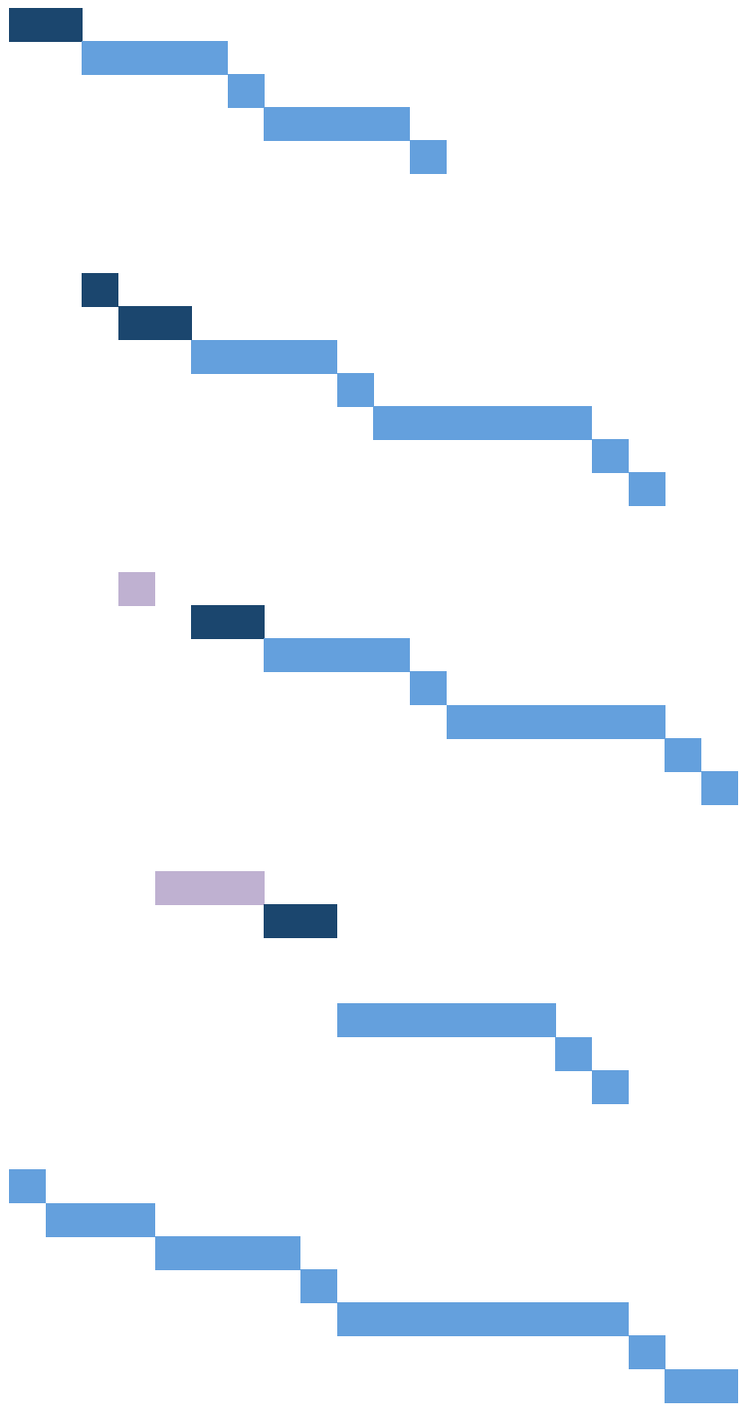
Readiness log

- Organized storage bay in R8: aim to box and log the status of all major items, together with all their components needed for final assembly.
  - First items now boxed in R8, with documentation attached.

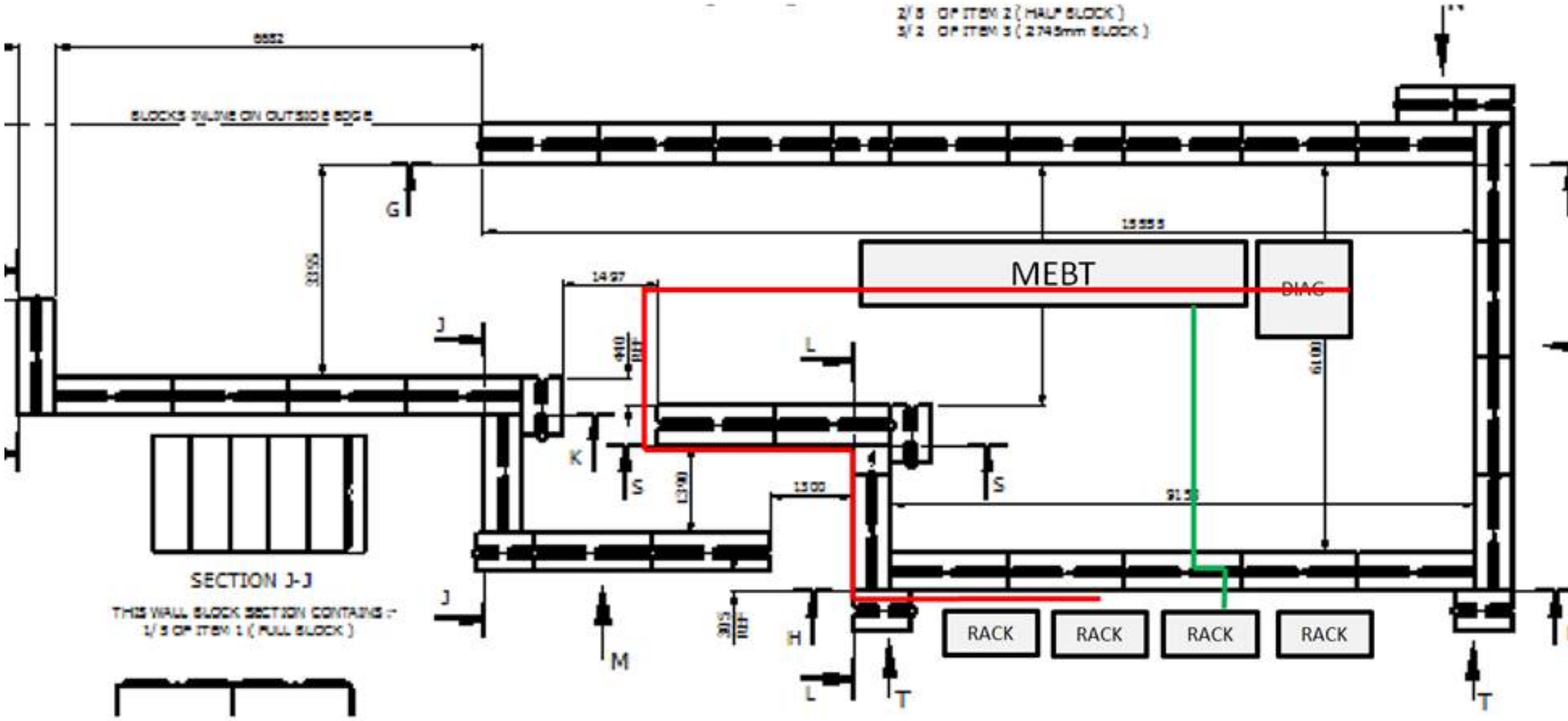
Back up

MEBT development schedule (v0)

MEBT	***MEBT Vacuum Manifold:***		
	Design		
	Details drawings		Dave Zakhar
	Request for quotes		Outside Manufacturer
	Place order		?
	Manufacture		TBA
	Delivery		
	Inspection		
	MEBT Support Frames		
	Design		Dave Zakhar
	Details drawings		Dave Zakhar
	Request for quotes		Outside Manufacturer
	Place order		
	Manufacture		TBA
	Delivery		
	Inspection		
	MEBT Vacuum vessels		
	Design		Pete Savage
	Details drawings		Dave Zakhar
	Request for quotes		OM
	Place order		?
	Manufacture		TBA
	Delivery		
	Inspection		
	MEBT Alignment systems		
	Design		Pete Savage
	Details drawings		Dave Zakhar
	Request for quotes		
	Place order		
	Manufacture		Imperial College
	Delivery		
	Inspection		
	MEBT Rebuncher Cavities		
	Design		Charles Evans
	Details drawings		Charles Evans?
	Request for quotes		Outside Manufacturer
	Place order		?
	Manufacture		TBA
	Delivery		
	Inspection		



Cable routing lengths



- BPM electrodes - very low level signals to start with, and we need to limit any further attenuation by having short cables and as low-loss as possible. Cables must be phase matched as far as possible (if we do time-of-flight measurement then we will need phase matching to 1cm or about 3 degrees)
- Quadrupoles - large DC currents are involved. We need very low voltage drop across the cable to reduce the load on the PSUs and drivers. Also lower V drop means less ohmic heating of the cable.
- Fast chopper - I'm assuming the fast chopper pulse generator (FPG) is outside the shielding and not within. This is a very fast signal (t-rise <2ns at 1400V) and will probably generate some stray RF. Long cable can 'smear' the pulse and reduce the effectiveness of the chopper. I will speak to Mike CG about the cable he has in mind for this. Even if the FPG rack is within the shielding we need to think carefully about the cable routing.