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FETS collaboration summary

by

Juergen Pozimski

OsC meeting 5th December 2013

Overview and Aims

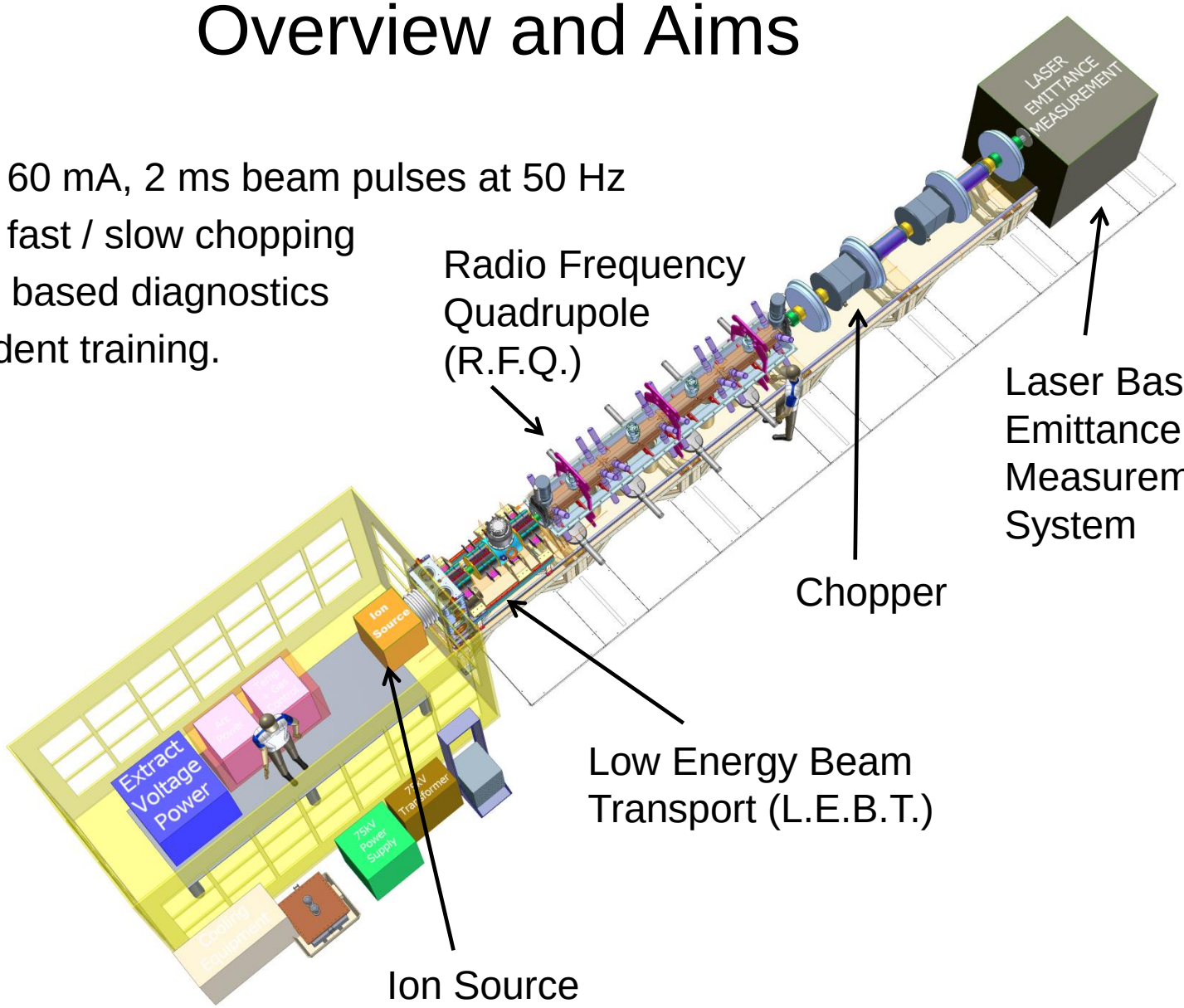
Aims :

Demonstrate 60 mA, 2 ms beam pulses at 50 Hz

Demonstrate fast / slow chopping

Test of Laser based diagnostics

Staff and student training.



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Historical Background

Funding for the FETS collaboration started as part of the UK Neutrino factory effort approximately 10 years ago.

While the funding for FETS staff was in this period stable, only in the early years capital funding via the NF effort was available.

From ~ 2007 until March 2012 no direct capital funding was available with sporadic (parasitic) funding via ISIS. This strongly limited the progress on hardware development.

Since April 2013 a 3 years proposal was funded fully. Some increase of funding for technical staff and engineering. Capital funding is at requested level but without overheads and working margin (and only part of VAT). The 3 year funding period was seen as very ambitious and an extension of 1-1.5 years envisaged.

Major achievements

- High reliability ion source operation, all specifications achieved but not simultaneously.
- Correction of LEBT miss alignment.
- Experimental determination of rise time of space charge compensation.
- First section of RFQ at RAL, all auxiliaries (except HP couplers) ready.
- MEBT lattice refined and main engineering tasks underway.
- MEBT quadrupoles in tender process.
- Cavity design mature. Plating test in preparation.
- Toroid ready and tested, BPM design evolving.
- Laser characterized, LD design in progress, scanning mechanics and Laser under test at CERN, Laser safety defined and in preparation.
- R8 infrastructure (cooling plant, stores, RF distribution, Klystron cage, RFQ cooling water). R8 was ~ 5 month unavailable due to building works.
- Radiation shielding & safety defined, large part of shielding delivered.
- Circulator tests successfully performed, RF amplifier on order, last parts for RF distribution on order.

Financial Summary

Staff spending mainly according to plan, minor differences at university level.

Capital spend on target so far :

								Spend	Expectation
Ion source development									
Source body * 2				15.00			15.00	0	+ 0
Powersupply						15.00	15.00	0	+10
Plasma diagnostics		15.00					15.00	20	+ 0
Diagnostics									
Dipole		30.00					30.00	0	+ 30
Detector Laser emittance				25.00			25.00	10	+ 15
Readout electronics						20.00	20.00	0	+ 10
RFQ									
RF components		30.00					30.00	30	+ 5
Parts for commissioning / replacement				10.00		10.00	20.00	0	+ 10
Chopper									
Slow chopper Material and construction				50.00		30.00	80.00	0	+ 80
Slow chopper electronics		60.00					60.00	60	+ 0
Fast chopper Material and construction				45.00		25.00	70.00	0	+ 70
Fast chopper electronics		55.00					55.00	60	+0
Medium-energy beam transport									
Vacuum generation and V diagnostics		60.00		15.00			75.00	60	+ 0
QP magnets		25.00					25.00	0	+ 130
QP Powersupply PS				25.00			25.00	25	+ 0
RF cavities				35.00			35.00	0	+ 30
RF generation						80.00	80.00	80 (ordered since)	+ 0
Diagnostics		10.00		20.00		10.00	40.00	30	+ 10
Infrastructure									
Cooling, Power distribution, Controls, mechanics		20.00		20.00		20.00	60.00	40	+ 30
Shielding and safety		50.00		50.00			100.00	40	+ 50
Inflation		*8.87*		*15.69*		*16.15*	*40.72*		
Eqipment total		363.88		325.69		226.15	915.72	**455**	**+480 = 935**
VAT		72.78		65.14		45.23	183.14		
Working margin (10%)		43.67		39.08		27.14	109.89		
Contingency (20%)		87.33		78.17		54.28	219.77		
Consumables		5.00		5.00		5.00	15.00		
Travel		10.00		10.00		10.00	30.00	**15**	**+15 = 30**
								Total :	**~ 965 £k**

Lead time of components might make it difficult to balance this and next years spend.

Milestones and deliverables

Ion source and LEBT: Work schedule on target.

RFQ : 18 month delay of RFQ delivery all other work finished on target except HP coupler (originally thought to be delivered by ESS Bilbao, now designed in house)

MEBT : Delays at finalizing MEBT design due the necessity to include beam diagnostics and to include longer choppers. Engineering mostly done in parallel, on track for assembly in first quarter 2015.

Diagnostic : Initial delays on some tasks now recovered. Conventional diagnostics partly tested and available for installation or will be available until end 2014. Laser diagnostics assembled in early 2015, system test and data taking with reconstruction of emittance in extension period.

Infrastructure : Initial delay due to R8 building works. Significant progress since then, expected to be finished end 2014. Strong integration effort.

RF : RF generation and distribution on track.

Future of FETS : Good progress but limited due to available staff resources.

Deliverables and Milestone table updated for 1st. OsC meeting today.

Staff

- Alberto Garbayo (Engineer Bilbao / ISIS) left mid 2012
- Michael Dudman (Engineer ISIS) joint mid 2012, part time, mainly infrastructure , R8, couplers
- Stephen Gibson (Lecturer RHUL / JAI) joint January 2013, working on LD, 0 % funded by FETS, leading now Diagnostic WP
- Richard D'Arcy(Postdoc UCL / PASI) joint autumn 2012, BPM's
- Konstantin Kruchinin (PhD student RHUL, JAI) joint mid 2013, LD

=> staff resources are overall sufficient but limited engineering resources defining hardware progress. Outsourcing of tasks was only partly successful due to the required experience. Lessons learned and strategy will be changed but a stronger ISIS engineering support might be more valuable in terms of time.

Summary and Outlook

- Significant progress in nearly all fields.
- Collaborations with ESS Bilbao, CERN, Fermi lab,...
- Delivery of RFQ 18 month delayed. Installation of MEBT now expected to be finished March 2015.
- Proposal for an extension of 18 month for beam experiments in preparation. (Staff & 50-100 k£ capital)
- Spending so far on target, with risk of overspend at MQP identified (50-100 k£ see above).