



Schedule and Milestones

Colin Whyte
STFC RAL

Collaboration Board
31st March 2016

Schedule: Step IV.

Data-taking until end 2016 – possible use of 2016/05 in Feb-March 2017.

Decay Solenoid. – completed.

Cooling water modifications

- Split warm magnets from Compressor cooling
- Temporarily move compressors to external cooler
- Repair roof mounted cooling and re-configure.
- Retain external cooler as ‘fail-over’

QP/QD

- New system designed by FNAL
- Increased complexity.
- New FPGA channels – reprogramming at FNAL
- Installation plan by S Griffiths @ DL
- New components – resistor/diode packs, contactors.
- commissioning starts May 2016.
- Emergency off procedure in approval.



Schedule: Step IV.

Hydrogen system

- X-ray investigation of internal absorber body 'crack'
- Preparation of second absorber body.
- Vacuum end-caps progressing through PED 5500.
- Heat load modelling in progress
- Ongoing co-operation with original designer Prof. Shigeru Ishimoto
 - New translation resource for documentation in Japanese.
- 2 off cryo-coolers prepared in R9 ready for either H2 cooling or Magnet cooling as required.
- Plan to pre-cool magnet coil before return to MICE Hall – save 21 day cool-down period.

Magnet re-alignment

- Dependant on appropriate hall access
- 2 parallel solutions – re-work of existing bellows
- New offsetable bellows design – out for quotes.



Schedule: Cooling Demo

Baseline schedule created from 'MICE Demonstration of Ionisation Cooling'

- Assume replacement for SSD is available in MICE Hall from Jan '18.

Key dates over the next few months are:

- BNL drawing package mid-March;
 - release drawings for tender for full quotes: 2 weeks end March;
 - Quotes returned : 6 weeks mid-May;
 - Make or buy decision: 4 weeks mid-June.
- 'Soft deadline' for end of data taking – end 2016.
- 3 options for MICE Cooling Demonstration presented:
 - Full Cost
 - Flat Cash + 10%
 - Flat Cash
 - Flat Cash 1RF power system
 - Stop at Step IV



Full Cost

ID	% Complete	WBS	Task Name	Start	Finish	Duration	Predecessors	Milestone watch	Gantt Chart (2016-2019)											
									2016 Qtr 1	2016 Qtr 2	2016 Qtr 3	2016 Qtr 4	2017 Qtr 1	2017 Qtr 2	2017 Qtr 3	2017 Qtr 4	2018 Qtr 1	2018 Qtr 2	2018 Qtr 3	2018 Qtr 4
0	37%	0	MICE_DoIC_Jan6th	01/09/08	31/03/20	2969.25 days?			[Gantt bar for MICE_DoIC_Jan6th]											
93	0%	3	DoIC	01/06/15	31/03/20	1239.25 days			[Gantt bar for DoIC]											
94	0%	3.1	Shipping	12/04/16	03/01/18	439 days			[Gantt bar for Shipping]											
109	0%	3.1.4	SSD	03/01/18	03/01/18	0 days			[Gantt bar for SSD]											
110	0%	3.1.4.1	SSD delivered to RAL	03/01/18	03/01/18	0 days		yes - Dash Board	[Gantt bar for SSD delivered to RAL]											
153	0%	3.3	DoIC Installation	01/06/15	08/03/18	701.75 days			[Gantt bar for DoIC Installation]											
176	0%	3.3.2	Return Yoke	03/07/17	30/01/18	149.61 days			[Gantt bar for Return Yoke]											
186	0%	3.3.2.3	North PRY Frame Legs and Plates - Cavities and SSD	17/01/18	30/01/18	9.5 days			[Gantt bar for North PRY Frame Legs and Plates - Cavities and SSD]											
187	0%	3.3.2.3.1	Survey Floor & PRY Legs	17/01/18	18/01/18	1 day 204			[Gantt bar for Survey Floor & PRY Legs]											
188	0%	3.3.2.3.2	Cut shim	18/01/18	18/01/18	0.5 days 187			[Gantt bar for Cut shim]											
189	0%	3.3.2.3.3	Install frame legs (inc drilling plates)	18/01/18	22/01/18	2 days 188			[Gantt bar for Install frame legs (inc drilling plates)]											
190	0%	3.3.2.3.4	Survey PRY legs	22/01/18	23/01/18	1 day 189			[Gantt bar for Survey PRY legs]											
191	0%	3.3.2.3.5	Fit North side yoke plates	23/01/18	30/01/18	5 days 190,393,408,20			[Gantt bar for Fit North side yoke plates]											
192	0%	3.3.2.3.6	North side SS return yoke installation complete	30/01/18	30/01/18	0 days 191			[Gantt bar for North side SS return yoke installation complete]											
193	0%	3.3.2.4	North Side PRY Installation complete	30/01/18	30/01/18	0 days 192		yes - Dash Board	[Gantt bar for North Side PRY Installation complete]											
204	0%	3.3.5	SSD installation	02/10/17	16/01/18	76 days			[Gantt bar for SSD installation]											
207	0%	3.3.5.3	Install Spectrometer Solenoid #2 and align	03/01/18	11/01/18	6.75 days 196,206,110			[Gantt bar for Install Spectrometer Solenoid #2 and align]											
417	0%	3.4	Re-install TOF2, KL & EMR	02/02/18	13/02/18	6.75 days 193,419			[Gantt bar for Re-install TOF2, KL & EMR]											
419	0%	3.6	Install tracker South Side wave guides	30/01/18	02/02/18	3 days 193,207			[Gantt bar for Install tracker South Side wave guides]											
420	0%	3.7	DoIC installation complete	13/02/18	13/02/18	0 days 193,417		yes - Dash Board	[Gantt bar for DoIC installation complete]											
421	0%	3.8	Commissioning	13/02/18	31/07/18	120 days			[Gantt bar for Commissioning]											
422	0%	3.8.1	Cooling Channel magnet Commissioning	13/02/18	31/07/18	6 mons 420			[Gantt bar for Cooling Channel magnet Commissioning]											
423	0%	3.8.2	RF Testing	03/07/18	31/07/18	20 days			[Gantt bar for RF Testing]											
424	0%	3.8.2.1	Test and condition cavities, with B field, 1MW	03/07/18	31/07/18	4 wks 420,422FF			[Gantt bar for Test and condition cavities, with B field, 1MW]											
425	0%	3.8.2.2	RF cavity testing with B field complete	31/07/18	31/07/18	0 days 424			[Gantt bar for RF cavity testing with B field complete]											
426	0%	3.9	Combined magnet and operational tests complete	31/07/18	31/07/18	0 days 425		yes - Dash Board	[Gantt bar for Combined magnet and operational tests complete]											
429	0%	3.12	Analysis	31/07/18	31/03/20	435 days 426			[Gantt bar for Analysis]											

Spectrometer solenoid remains on critical path for duration of project.

- RF complete, tested off-line, de-bugged in advance of SSD
- South PRY installed.
- Floor plates installed
- Translation stages installed.
- Civil works completed etc etc...
- 6 months 'Cooling channel commissioning'

Flat Cash + 10%

ID	% Complete	WBS	Task Name	Start	Finish	Duration	Predecessors	2016		2017		2018		2019	
								H1	H2	H1	H2	H1	H2	H1	H2
0	37%	0	MICE_DoIC_Jan6th	01/09/08	06/08/20	3054 days?									
93	0%	3	DoIC	01/06/15	06/08/20	1324 days									
153	0%	3.3	DoIC Installation	01/06/15	21/06/18	769 days									
212	0%	3.3.7	RF Installation	20/05/16	21/06/18	524 days									
213	0%	3.3.7.1	RF Controls Racks	20/05/16	01/05/18	487 days									
221	0%	3.3.7.1.2	RF Controls Rack #2	06/07/17	01/05/18	205 days									
224	0%	3.3.7.1.2.3	Install rack in MICE Hall	23/04/18	24/04/18	2 days 223,268									
225	0%	3.3.7.1.2.4	Terminate control cables at control rack	25/04/18	01/05/18	5 days 224									
253	0%	3.3.7.3	RF System #2 - Installation	04/05/17	21/06/18	287 days									
254	0%	3.3.7.3.1	4616 Amplifier system #2	04/05/17	11/05/18	258 days									
263	0%	3.3.7.3.1.9	Install 4616 Amplifier	02/04/18	06/04/18	5 days 262									
264	0%	3.3.7.3.1.10	Install 20kV HV Rack	09/04/18	09/04/18	1 day 263									
265	0%	3.3.7.3.1.11	Install Auxiliary Rack	10/04/18	10/04/18	1 day 264									
266	0%	3.3.7.3.1.12	Terminate 4616 Amplifier cables	11/04/18	12/04/18	2 days 265									
267	0%	3.3.7.3.1.13	Terminate HV Rack cables	13/04/18	17/04/18	3 days 266									
268	0%	3.3.7.3.1.14	Terminate Auxiliary Rack cables	18/04/18	20/04/18	3 days 267									
273	0%	3.3.7.3.2	TH116 Amplifier system #2	16/05/17	21/06/18	279 days									
280	0%	3.3.7.3.2.7	Install HV Rack	02/05/18	02/05/18	1 day 225									
281	0%	3.3.7.3.2.8	Install Auxiliary Rack	03/05/18	03/05/18	1 day 280									
282	0%	3.3.7.3.2.9	Install / Terminate HV Rack cables	04/05/18	10/05/18	5 days 281									
283	0%	3.3.7.3.2.10	Install / Terminate Auxiliary Rack cables	11/05/18	21/05/18	7 days 282									
284	0%	3.3.7.3.2.11	Install / Terminate TH116 Amplifier cables	22/05/18	28/05/18	5 days 283									
285	0%	3.3.7.3.2.12	Prepare TH116 Dummy Load	22/05/18	28/05/18	5 days 284SS									
286	0%	3.3.7.3.2.13	Commission Electrical system	29/05/18	07/06/18	8 days 271,285									
287	0%	3.3.7.3.2.14	Commission RF with Dummy Load	08/06/18	21/06/18	10 days 279,286									
288	0%	3.3.7.3.2.15	RF System#2 - Amplifier 4616 & TH116 available for oper	21/06/18	21/06/18	0 days 287									
420	0%	3.7	DoIC installation complete	21/06/18	21/06/18	0 days 193,417,288									
421	0%	3.8	Commissioning	22/06/18	06/12/18	120 days									
422	0%	3.8.1	Cooling Channel magnet Commissioning	22/06/18	06/12/18	6 mons 420									
423	0%	3.8.2	RF Testing	09/11/18	06/12/18	20 days									
424	0%	3.8.2.1	Test and condition cavities, with B field, 1MW	09/11/18	06/12/18	4 wks 420,422FF									
425	0%	3.8.2.2	RF cavity testing with B field complete	06/12/18	06/12/18	0 days 424									
426	0%	3.9	Combined magnet and operational tests complete	06/12/18	06/12/18	0 days 425									
429	0%	3.12	Analysis	07/12/18	06/08/20	435 days 426									

Delay RF installation in Hall by 10 months to reduce costs in 16/17 and 17/18.

- RF system #2 completed at DL in 2016/17, but not installed in MICE hall
- RF moves onto critical path in early 2018 – project delay of 4 months.
- RF off-line test completed to schedule - little change to risk reduction profile.
- Integrated cost increases ~£300k.
- SSD remains near critical path.

Flat cash

ID	%	WBS	Task Name	Start	Finish	Duration	Predecessors	Milestone watch	2016		2017		2018		2019	
									H1	H2	H1	H2	H1	H2	H1	H2
0	37%	0	MICE_DoIC_Jan6th	01/09/08	02/10/20	3094.31 days?										
17	23%	2	Step IV Commissioning	27/04/15	04/01/18	668.6 days?										
91	0%	2.12	End of STEP IV Operations	04/01/18	04/01/18	0 days	90,14	yes - Dash Board								
93	0%	3	DoIC	01/06/15	02/10/20	1364.31 days										
112	0%	3.2	Step IV De-Commissioning	02/11/15	27/04/18	619.55 days										
115	0%	3.2.2	Tracker Systems	04/01/18	11/01/18	5.7 days										
116	0%	3.2.2.1	Disconnect Northside Waveguides	04/01/18	08/01/18	2.7 days	91									
118	0%	3.2.2.3	Disconnect Southside Waveguides	04/01/18	08/01/18	2.7 days	116SS									
119	0%	3.2.2.4	Move South sideTracker Cryostat to R9	08/01/18	10/01/18	1.35 days	118									
120	0%	3.2.3	TOF, KL & EMR	10/01/18	17/01/18	5.4 days	119									
121	0%	3.2.3.1	Remove TOF1 & KL & EMR	10/01/18	16/01/18	4.05 days	119									
122	0%	3.2.3.2	Move TOF, KL & EMR to R9	16/01/18	17/01/18	1.35 days	121									
123	0%	3.2.4	Partial Return Yoke	17/01/18	12/02/18	18.15 days										
124	0%	3.2.4.1	Remove North side PRY	17/01/18	22/01/18	3 days	122									
126	0%	3.2.4.3	Remove South side PRY	02/02/18	07/02/18	3 days	134									
128	0%	3.2.4.5	Remove Downstream underfloor supports	07/02/18	12/02/18	2.7 days	126									
129	0%	3.2.4.6	PRY Material removed from the Hall	12/02/18	12/02/18	0 days	128									
130	0%	3.2.5	Magnets	22/01/18	02/02/18	9.45 days										
131	0%	3.2.5.1	Disconnect all magnet cooling lines, instrumentation and power	22/01/18	31/01/18	6.75 days	124									
132	0%	3.2.5.2	Move Downstream Spectrometer Solenoid magnet to R9	31/01/18	01/02/18	1.35 days	118,131									
133	0%	3.2.5.3	Move Focus Coil Magnet to R9	01/02/18	02/02/18	1.35 days	132,137									
134	0%	3.2.5.4	All Channel Magnets moved out of the Hall	02/02/18	02/02/18	0 days	133									
135	0%	3.2.6	Hydrogen System and Absorber	22/01/18	01/02/18	8.1 days										
136	0%	3.2.6.1	Disconnect transfer line, cooling and instrumentation	22/01/18	31/01/18	6.75 days	124									
137	0%	3.2.6.2	Move Absorber and transfer line to R9	31/01/18	01/02/18	1.35 days	136									
152	0%	3.2.8	Step IV De-Commissioning Complete	12/02/18	12/02/18	0 days	129	yes - Dash Board								
153	0%	3.3	DoIC Installation	01/06/15	17/09/18	830.05 days										
154	0%	3.3.1	MDIC Base plate installation	01/06/15	04/07/18	777.9 days										
155	0%	3.3.1.1	Remove step IV false floor plates	12/02/18	21/02/18	6.75 days	152									
156	0%	3.3.1.2	Begin drilling and tapping holes in the false floor sufficient for MDIC	21/02/18	08/03/18	10.8 days	155									
157	0%	3.3.1.3	Fit intermediate surface (tiled steel plates) for the false floor MDIC	08/03/18	16/03/18	6.75 days	156									
158	0%	3.3.1.4	RF Cavity Rolling Platform Installation (2 off)	01/06/15	27/04/18	729.9 days										
161	0%	3.3.1.4.3	Install RF Cavities base plates	16/03/18	06/04/18	15 days	157,160									
162	0%	3.3.1.4.4	Install RF Cavities rolling platforms	06/04/18	27/04/18	15 days	161									
163	0%	3.3.1.4.5	RF cavity rolling platforms installation complete	27/04/18	27/04/18	0 days	162									
164	0%	3.3.1.5	AFC#1 Rolling Platform Installation	27/04/18	25/05/18	20 days										
165	0%	3.3.1.5.1	Install AFC #1 base plate	27/04/18	11/05/18	10 days	163									
166	0%	3.3.1.5.2	Install AFC #1 rolling platform	11/05/18	25/05/18	10 days	165									
167	0%	3.3.1.5.3	AFC #1 rolling platform installation complete	25/05/18	25/05/18	0 days	166									
168	0%	3.3.1.6	AFC#2 Rolling Platform Installation	25/05/18	22/06/18	20 days										
169	0%	3.3.1.6.1	Install AFC #2 base plate	25/05/18	08/06/18	10 days	167									
170	0%	3.3.1.6.2	Install AFC #2 rolling platform	08/06/18	22/06/18	10 days	169									
171	0%	3.3.1.6.3	AFC #2 rolling platform installation complete	22/06/18	22/06/18	0 days	170									
172	0%	3.3.1.7	Spectrometer Solenoid floor plate installation	22/06/18	04/07/18	8 days										



Flat cash

ID	% Complete	WBS	Task Name	Start	Finish	Duration	Predecessors	Milestone watch	Timeline							
									2016	2017		2018		2019		
									H1	H2	H1	H2	H1	H2		
173	0%	3.3.1.7.1	Install Downstream Spectrometer Solenoid base plate	22/06/18	04/07/18	8 days	171									
174	0%	3.3.1.7.2	Spectrometer Solenoid base plate installation complete	04/07/18	04/07/18	0 days	173									
176	0%	3.3.2	Return Yoke	04/07/18	03/08/18	21.66 days										
186	0%	3.3.2.3	North PRY Frame Legs and Plates - Cavities and SSD	23/07/18	03/08/18	9.5 days										
187	0%	3.3.2.3.1	Survey Floor & PRY Legs	23/07/18	24/07/18	1 day	204									
188	0%	3.3.2.3.2	Cut shim	24/07/18	24/07/18	0.5 days	187									
189	0%	3.3.2.3.3	Install frame legs (inc drilling plates)	24/07/18	26/07/18	2 days	188									
190	0%	3.3.2.3.4	Survey PRY legs	26/07/18	27/07/18	1 day	189									
191	0%	3.3.2.3.5	Fit North side yoke plates	27/07/18	03/08/18	5 days	190,393,408,20									
192	0%	3.3.2.3.6	North side SS return yoke installation complete	03/08/18	03/08/18	0 days	191									
193	0%	3.3.2.4	North Side PRY Installation complete	03/08/18	03/08/18	0 days	192	yes - Dash Board								
194	0%	3.3.3	AFC Installation	04/07/18	17/09/18	52.15 days										
195	0%	3.3.3.1	Install AFC #2 rail system	04/07/18	09/07/18	2.7 days	174									
196	0%	3.3.3.2	Install AFC #2 supports to floor	09/07/18	12/07/18	2.7 days	195									
204	0%	3.3.5	SSD installation	04/07/18	23/07/18	12.15 days										
205	0%	3.3.5.1	Install Spectrometer Solenoid #2 rail system	04/07/18	09/07/18	2.7 days	174									
206	0%	3.3.5.2	Install Spectrometer Solenoid #2 supports to floor	09/07/18	12/07/18	2.7 days	205									
207	0%	3.3.5.3	Install Spectrometer Solenoid #2 and align	12/07/18	23/07/18	6.75 days	196,206,110									
417	0%	3.4	Re-install TOF2, KL & EMR	08/08/18	17/08/18	6.75 days	193,419									
419	0%	3.6	Install tracker South Side wave guides	03/08/18	08/08/18	3 days	193,207									
420	0%	3.7	DoIC installation complete	17/08/18	17/08/18	0 days	193,417,288	yes - Dash Board								
421	0%	3.8	Commissioning	17/08/18	01/02/19	120 days										
422	0%	3.8.1	Cooling Channel magnet Commissioning	17/08/18	01/02/19	6 mons	420									
423	0%	3.8.2	RF Testing	04/01/19	01/02/19	20 days										
424	0%	3.8.2.1	Test and condition cavities, with B field, 1MW	04/01/19	01/02/19	4 wks	420,422FF									
425	0%	3.8.2.2	RF cavity testing with B field complete	01/02/19	01/02/19	0 days	424									
426	0%	3.9	Combined magnet and operational tests complete	01/02/19	01/02/19	0 days	425	yes - Dash Board								
429	0%	3.12	Analysis	01/02/19	02/10/20	435 days	426									

Delay end of Step IV until Dec 17 – excellent data opportunities.

- Flat spend profile.
- Commissioning completion delayed by 6 months.
- All mechanical work returns to critical path.
- RF off critical path.
- SSD off critical path but remains close to critical path – could easily return to critical path should any risks be realised.
- Significant increase in integrated cost. > £1M addition.



Schedule to completion

Project includes offline testing of the RF cavities.

- RF staff resource requirement levelled due to re-planning caused by SS failure and repair plan.
- RF personnel supplemented with additional key staff in controls
- RF engineer co-operation with ISIS progressing well
- RF expert development through ISIS/Cern collaboration.
- Staff from IHEP, China, equivalent 1+FTE RF relevant
 - paperwork in progress (invite letter/visa/funding)
 - staff availability delayed to mesh with program

Mechanical installation

- confined space access and working considerations – potential knock-on effects.
- Design services/power for south PRY plate removal – potential knock-on effects.
- PRY design tolerances tightened where appropriate.
- Floor plates/translation stages ordered.
- RF co-axial line design advanced
- Clean room facility in procurement.
- Powered bellows design – feasibility
- Flange flatness measured – improvement?



Critical Path: project to completion

Step IV

- QD/QP upgrade
- Cooling water modifications
- Magnet re-alignment – 2 parallel processes.
- H2 system.
- SSD coil running – risk analysis.

Cooling

- Magnet system review outcome recommends
 - Improved quench protection with quench heaters in any new cold mass.
 - Improve quench detection/protection before further Step IV running.
 - **SSD recovery defines critical path – unless we chose to delay other items**
- RF Amplifier commissioning is a cost driving item due to the resource required.
- Installation of the first RF amplification system in the Hall as early as possible will enable off line testing of the RF modules and advance commissioning.
- RF cavity and RF power timings now mesh well.
- RF coupler tests at MTA successful.



Risk Register

ID	Risk Description	Potential impact on project	Risk score			Ownership	Proposed Action	Post-action risk score			Comment / Conclusion	Cost of mitigation		Likely retirement of requirement	Year	Q	Category
			L	I	LxI			L	I	LxI		Staff years	Non-staff (£k)				
MICE 3	Magnetic field effecting operation of electrical equipment relating to the continued operation of the cooling channel magnet systems and detectors.	Inability to operate the cooling channel	5	5	25	MICE - UK / MAP	Installation of a partial return yoke has mitigated the major risk. Movement of the control and power supply equipment to a dedicated room outside of the magnetic field.	1	4	4	Much work has been completed and provision of additional rack room has enabled the majority of the sensitive equipment to be moved away from the hall. The PRY has not yet been installed and so has not been tested, the residual risk still applies. Significant investment from UK and US to mitigate risk has been expended. Non staff risk persists in the event of additional material being required.	0.2	100	End of Cooling Demo commissioning - may 2018	2018	2	Technical
MICE 4	Extended period of re-training for the lattice of magnets for Step IV - SS1/AFC/SS2.	Timescales for the training period, cost of the amount of LHe required to carry out the training the availability of the LHe. Expert personnel required to be available for magnet operations over a protracted period of time.	4	5	20	MICE-UK / MAP	Discussions with BOC (or supplier) to agree delivery timescales and availability during heavy use periods. Magnet integration task force to define commissioning method to keep schedule and cost to a minimum.	4	4	16	Each re-cool and fill of the Spectrometer Solenoid can take up to 500L LHe, AFC remembers it's training. Each full lattice quench could cost in the region of £7K. Initial investigations with BOC show that the predicted amount of LHe will be available during the commissioning period.	1	100	End step IV commissioning - June 2016	2016	2	Technical
MICE 8	Resourcing issues from the STFC and national labs	Inability to complete significant sections of work on agreed time or cost scales.	4	5	20	MICE - UK / MAP	Realised. Escalation of the issue to the STFC and DOE.	2	4	8	Project scope has changed leading to a different labour profile required to complete the project.	2		Impacts Step IV and all other steps. March 2018	2018	1	Resource
MICE 9	Senior management of the MAP collaboration / MICE-US changes.	Leadership and direction of the construction team unfocused.	4	5	20	MAP	Discussion with senior MAP and MICE management	1	4	4	SSD repair TBA and funded. Oversight to completion required.			End of Cooling Demo June 2019	2019	2	Resource
MICE 10	Late delivery of the PRY and / or Cavities for Cooling Demo after advanced scheduling.	Standing army cost for period after hall preparations are complete and receipt of the PRY materials / Cavities	3	5	15	MICE-UK / MAP	Interaction with the MICE-US construction team.	1	5	5	Cost will need to be borne as releasing and then re-forming the team will be difficult with an unknown timescale. From the MAP schedule analysis the PRY and RF Modules will arrive well in advance of the requirement	£90k / Month		End of Cooling Demo construction march 2017	2017	1	Technical
MICE 11	US budget limits magnet manufacture, commissioning and delivery	Halting project installation and subsequent data taking. Loss of key personnel from the project. Inability to continue with full cooling program.	4	5	20	MAP	Discussion with senior STFC management and DOE management	2	4	8	DOE has assigned a budget profile of 6 / 3 for this and the next US financial years.			Impacts Step IV and Cooling Demo commissioning may 2017	2017	2	Financial
MICE 12	RF Power systems are not available for cavity testing	The critical path items following the RF system installation will extend in time. Testing of the cavities with and without B field. Commissioning of the channel and gaining data for the final step	4	5	20	MICE UK	Discussions with UK senior management to gain sufficient staff to carry out the work required on the RF systems and controls. Additional technical staff from collaborating institutes for installation work.	2	4	8	Successful completion of the RF power system installation will result in delays leading to the US collaborators being unable to contribute to the data taking period for Cooling Demo. Further interaction with STFC senior management to gain sufficient staffing for RF completion.	2	75	End of Cooling Demo commissioning may 2017	2017	2	Technical
MICE 14	Loss of key project and operational staff	Continuation of the funding to allow renewal of University contracts	3	5	15	MICE UK	Discussions with The STFC senior staff. Preparation of funding profiles, plans and staffing to completion of the Cooling Demo	1	5	5	Much of the key aspects of the operation of the Step IV stage of the project are carried out by University staff. Gaining replaceable resource from the national labs would be difficult	10	50 (LTA / Travel)	November 2015	2015	4	Resource
MICE 15	Restricted entry to the UK for key project and operational staff	Visa and invitation bureaucratic difficulties procluding non-EU engineers and scientific staff from entering the UK to carry out work at the STFC RAL.	3	5	15	MICE UK	Arrangements with the immigration department of the SBS and highlight / escalating difficulties to the STFC senior staff	2	5	10	Much of the key aspects of the operation of the Step IV stage of the project are carried out by University staff. Gaining replaceable resource from the national labs would be difficult	10	50 (LTA / Travel)	End of the Cooling Demo march 2018	2018	1	Resource
MICE 16	Failure of a Focus Coil Magnet	Internal cold mass or associated equipment deep within the assembly. LTS leads.	3	5	15	MICE UK	Follow all specific operational aspects as defined by the experts for the superconducting magnet	2	5	10	Transportation, dis-assembly, investigation, fix and reassembly would be extremely costly and extensive with regard to schedule. A spare magnet would be out of the reach of the project. A repair intervention would be 12 months including testing and commissioning and manufacture of new magnet system, test and commission around 2 years.	3	500	End of the Cooling Demo march 2018	2018	1	Technical
MICE 17	Failure of a Spectrometer Solenoid Magnet	Internal cold mass or associated equipment deep within the assembly. LTS leads.	3	5	15	MAP	Realised SSD.	3	5	15	The plan for the recovery of the functionality of SSD is as yet undefined.	3	500	End of the Cooling Demo march 2018	2018	1	Technical
MICE 17.1	Failure of Upstream Spectrometer Solenoid Magnet	Internal cold mass or associated equipment deep within the assembly. LTS leads.	4	5	20	MAP	New quench protection system	2	5	10	Has the same design issues as SSD	3	500	End of the Cooling Demo march 2018	2018	1	Technical
MICE 18	Inability to procure Lithium Hydride for secondary absorbers	Reduction in scientific output and resulting cooling effect.	3	5	15	MICE-UK / MAP	Following the MPB Oct 15, new avenues to advance the procurement have been identified. Currently awaiting updated quote from vendor. Financial instruments in place to complete purchase this year.	1	5	5	The design for the placement of the secondary absorber at the radiation shutter placement is complete. The changes to the design of the Helium window 'Top hat' will be small.	0.2	30	June 2016	2016	2	Financial
MICE 19	Failure of M2 in SSU.	Reduction in scientific output and resulting cooling effect.	3	4	12	MICE-UK / MAP	Maximise data collection before running M2.	2	4	8	Consider completing data set for one absorber.	0.2	30	December 16.	2016	4	Technical
MICE 20	Failure of Helium space feedthrough in SSU	Reduction in scientific output and resulting cooling effect.	3	4	12	MICE-UK / MAP	Limit number of quenches	2	4	8		0.2	30	December 16.	2016	4	Technical
MICE 21	Cannot agree program and budget	Only go to stepIV	3	5	15	MICE-UK / MAP	Work to agreed solution with partners - funding agencies	1	5	5	Programme funding issue	0.2	30	December 16.	2016	4	Financial
MICE 22	SSD delivery on schedule, quality & cost	Delays to programme and/or poor compromised data	4	5	20	MAP	Discussion with senior MAP and MICE management	2	4	8	SSD repair TBA and funded. Oversight to completion required.			End of Cooling Demo June 2019	2019	2	Financial



Project Risks

RLSR report notes project is now rated 'RED' for risk

MICE 17. Failure of a Spectrometer Solenoid Magnet.

Realised in the failure of M1 in SSD. The plan for recovery of SSD is as yet not fully defined.

MICE 17.1 Failure of Upstream Spectrometer Solenoid Magnet.

SSU carries many of the same design weaknesses as SSD. Enhanced QD/QP is required for protection and has been developed.

The current understanding of the failure of SSD indicates that the mode of operation and specific weaknesses in the fabrication process had a significant influence on the failure mechanism.

MICE 18. Inability to procure Lithium Hydride for secondary absorbers

The purchase stalled for some time due to an unresponsive contact in Y12, this problem now appears to be resolved though a close watch will be kept on progress and delivery.

MICE 19. Failure of M2 in SSU.

The current plan does not allow for the upgrade of SSU, as SSU carries many of the same design weaknesses as SSD it must be considered a high risk that SSU suffers a similar failure to SSD.

MICE 20. Failure of Helium space feed-through in SSU. – As above



Project Risks

MICE 21. Cannot agree program and budget.

- SSD recovery plan not yet fully defined.
- US-UK discussions continue but limited US funds make technical support for any replacement magnet in the UK difficult.
- Limited UK appetite to absorb risk transferred from the US program makes an agreed program a significant challenge.
- Discussions between US and UK funding agencies continue.

MICE 22. SSD delivery on schedule, quality & cost.

- US budget probably does not allow a commercial procurement.

