Title (WP#)	Muon (WP17)
Responsible	Stephen Cottrell, STFC
Period	Months 19-30
Activity type	**Coord** / **RTD**
Tasks	**Task 17.0: JRA Management Activities** The website continues to have a vital role in communicating the activities of the JRA. Minutes of meetings are posted as a record of the JRA's work, while reports and publications are made available as deliverables are achieved. Presentations at the recent International MuSR Conference (μSR 2014) provided an ideal way of publicising the work of the JRA. Meetings of the JRA were held 11/2011 and 12/2012, with a further meeting planned for 7/2014. **Task 17.1: Software Development for Muon Data Analysis** The scope of new routines for improving the efficiency of data analysis for high field experiments, and the benefits gained from linking simulation and analysis codes were explored in two reports completed earlier in the project (D17.1.1.1 and D17.1.2.1). Ideas from this work are being developed, with key routines now being coded to augment existing muon data analysis software. Prototype code has been developed for the analysis of high field ALC measurements (contributing to deliverable D17.1.1.3), providing a user-friendly interface for baseline subtraction and peak fitting. The code has been implemented and released within the Mantid framework. Further analysis codes are likely to be developed to complete this deliverable, including a Mantid algorithm to implement a rotating reference frame transform for the visualisation of high frequency muon precession signals. Work is well advanced in developing a link between the highly successful Quantum simulation package and the Mantid analysis framework. This will form a key component of deliverable D17.1.2.3, enabling users to fit experimental data modelling the interaction of the muon with neighbouring spins through the density matrix method. Links to other simulation codes are likely to be developed as part of this work, including methods for refinement of the muon site. Techniques based on both dipolar field calculations and DFT methods are being explored, the latter being the subject of a recent meeting held at RAL (3/2014). **Task 17.2: Concept Studies for Future Muon Sources** Work during this period has focussed on evaluating muon target technologies using results from simulation codes based on GEANT4. A discussion meeting with Bob Cywinski (Huddersfield University), held early 2013, led to a comprehensive report on target technologies and their optimal configuration for muon production (D17.2.2.1). Work associated with deliverable D17.2.2.2 originally intended to take a forward look at options for a muon source at the ESS. Since a muon source is not currently planned at this facility, this deliverable is now likely to be met through a workshop considering more general options for developing future high intensity muon sources. This is likely to be held at Huddersfield

	University early 2015, with Bob Cywinski, Rob Edgecock and ISIS as co-organisers. This would be a joint meeting with the FP7 Accelerator Applications Network, creating a valuable dialog between accelerator physicists and 'end-user' condensed matter scientists. Work considering how a practical muon micro-beam might be realised has continued. The outcome of this study is due to report later in the contact (D17.2.1.2, M36). A two year feasibility study was started at PSI – termed HiMB – examining the possibility of extracting a surface muon beam from the neutron spallation target SINQ. The basic idea is to use the muons stemming from the decays of pions that stopped in the entrance window of the spallation target. These surface muons can then be guided away from the spallation target using a suitable magnetic beamline. Envisaged rates achievable at SINQ are of the order of 10^{10} muons per second and would thus constitute an improvement by two orders of magnitude with respect to presently available beams. **Task 17.3: Detector Technologies for Pulsed Muon Sources** Good progress has been made evaluating the application of SiPM technologies to pulsed muon sources. A test system was specified early in the project (fullfilling part of deliverable D17.3.1.2), configured particularly for evaluating the deadtime of these devices – a key parameter for this application. On beam tests have been carried out and preliminary results reported at μSR 2014. A project planning meeting held 3/2014 considered requirements for a prototype detector array for the ISIS high field instrument (sub task 17.3.2). It's anticipated that the design document (to complete deliverable D17.3.1.2) will be finalised 7/2014, when work with the test system has been completed. The prototype detector array will be developed during the ISIS long shutdown, with the array being evaluated on-beam M36 onwards.
Deviations from Description of work (Annex 1) & corrective action	Work associated with deliverables D17.1.1.1 and D17.1.2.1 in Task 17.1 proved more complex than expected, and were completed later than anticipated. However, work relating to subsequent deliverables (D17.1.1.3 and D17.1.2.3) is now in-hand, both are expected to be achieved as originally scheduled. Work associated with deliverable D17.2.2.2 originally intended to take a forward look at options for a muon source at the ESS. Since a muon source is not currently planned at this facility, this deliverable is now likely to be met through a workshop considering more general options for developing future high intensity muon sources. The need to revise deliverables relating to Task 17.3 was highlighed during early project planning. The design document originally scheduled for M12 (D17.3.1.2) is now being delivered in two parts, with the first part completed in M12 of the project. The second part is now anticipated M32 of the project, with subsequent deliverables following as planned.

Deliverable	Due date	Expected/ Achieved Date
D17.1.1.1	M8	Achieved M22

D17.1.2.1 **D17.2.2.1** **D17.3.1.2**	M18 M24 M12	Achieved M22 Achieved M30 Rescheduled as two parts, part 1 achieved M12

A) Total Person Months (PM) allocated to project (including facility contribution) per contributing partner (Annex 1, Part A, p.96) **B) Total staff effort charged to project per contributing partner** (Annex 1, Part B p.32) **C) Staff effort charged to project in period (Month n – n+6)**	**Beneficiary**	**A**	**B**	**C**
	STFC **PSI**	**12** **12**	**12** **12**	**N/A** **N/A**

Meetings/Conferences/Workshops attended (financed by NMI3)	Second meeting of the JRA in FP7-II, 19th September 2013, PSI, focussing on Task 17.1 – 'Software Development for Muon Data Analysis' NMI3 Business meeting, Munich, November 2013 Target technologies discussion meeting with Bob Cywinski and Sue Kilcoyne, Huddersfield University (2/2014) Muon site calculation meeting, RAL (3/2014) MuSR 2014 (13th International Conference) Grindelwald (6/2014)