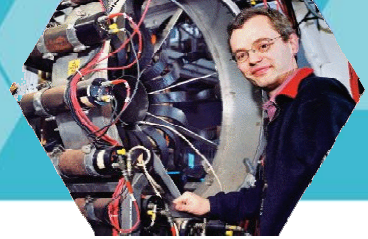
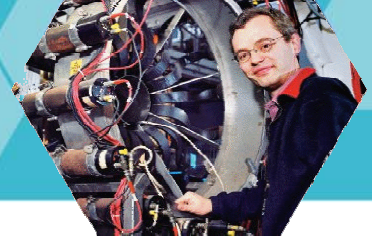


# A Muon JRA in FP7 – JRA5

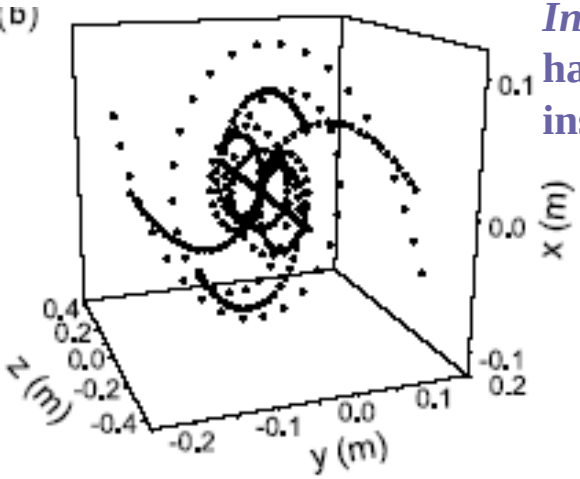
- Tasks
  1. (Management, dissemination and networking of the JRA)
  2. Technologies for high-field instruments
  3. Developing technologies for μSR at high pressures
  4. Novel resonance techniques and simulation codes for complex experiments
  5. Muon beamline control and modelling

- Partners:
  - University of Parma, Italy
  - University of Babes-Bolyai, Romania
  - PSI Continuous Muon Facility, Switzerland
  - ISIS Pulsed Muon Facility, UK (Coordinator)

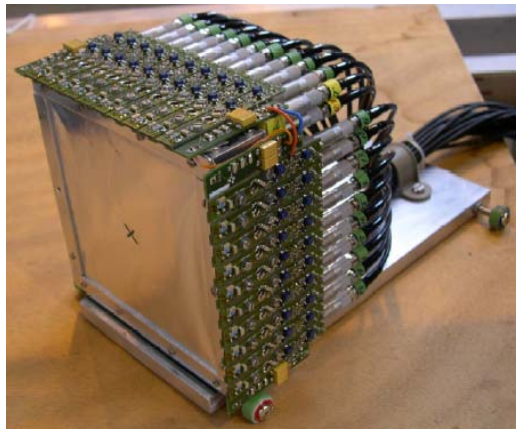
- Collaborators:
  - University of East Anglia (UK)
  - Dubna (Russia)
  - RIKEN-RAL (UK/Japan)
  - TRIUMF (Canada)

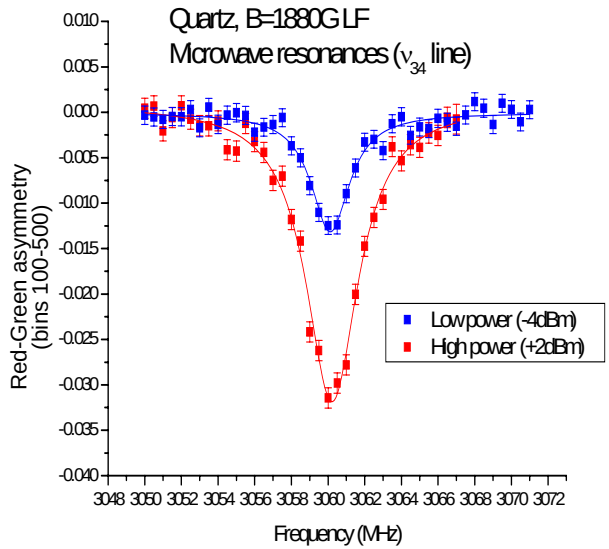


# FP7:
# Building on the Success of the Muon JRA in FP6…




***Instrument simulation package*** **has been used to design new instruments**

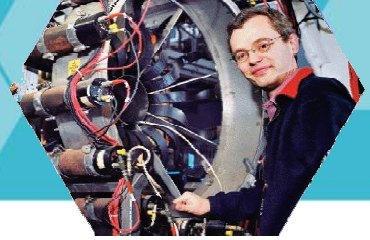




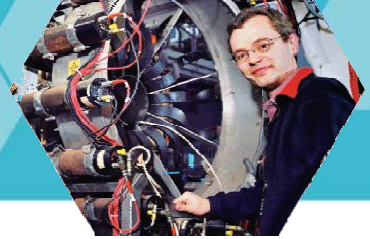

***Microwave techniques*** **provide a novel new experimental method**

**Scintillating fibre / avalanche photodiode (APD)** ***beam profile monitor*** **developed and used to test beam simulations**

**New PSI spectrometer using APDs – 1st muon instrument *ever* not to use photomultipliers**



# Tasks in the new JRA…



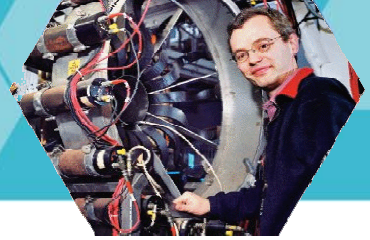
# 2. Technologies for high-field instruments

- Development of fast timing detectors for high transverse field applications:
  - *Prototype positron/muon detector with <100ps time resolution*
  - *Report summarising detector performance*

- Design document of a high transverse field instrument at PSI:
  - *Design document for a 10T transverse field spectrometer and detector array*

- Performance evaluation of high field operation at ISIS
  - *Document describing the performance of the 5T longitudinal field spectrometer at ISIS*
  - *Journal publication of instrument performance and test data*

*Partners: PSI, ISIS; Collaborators: Dubna*

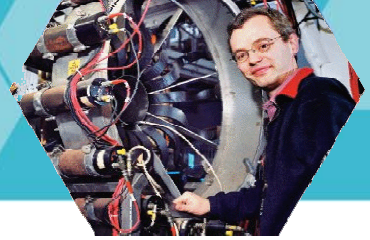


# 3. Developing technologies for μSR at high pressures

- Development of a solid sample pressure cell:
  - *Cell working at pressures exceeding 2.5GPa, with low measurement background*
  - *Report on cell performance, including demonstration experiments*

- Development of a gas-phase μSR sample cell with RF coils:
  - *Cell working at pressures exceeding 200 bar*
  - *Report on cell performance, including demonstration experiments*

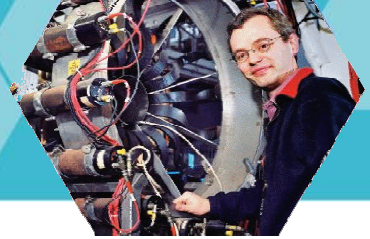
*Partners: Babes-Bolyai, ISIS, PSI; Collaborators: RIKEN-RAL; TRIUMF;*



# 4. Novel resonance techniques and simulation codes

- Demonstration of RFμSR experiments using NMR style pulsed techniques:
  - *Simultaneous stimulation of muon and nuclear spins (report)*
- Development of in-situ NMR spectrometer:
  - *Demonstration of a working in-situ NMR apparatus*
  - *Report of NMR performance and demonstration data*
- Assessment of simulation codes for supporting experiment analysis:
  - *Report discussing scope of simulation codes to support analysis*
  - *Development of code to augment existing packages, particularly for magnetic structure simulation*

*Partners: ISIS, PSI, Parma; Collaborators: East Anglia;*



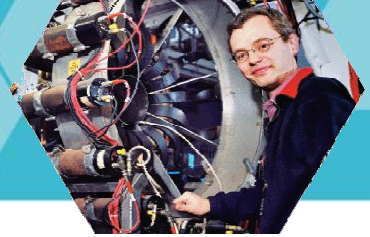
# 5. Muon beamline control and modelling

- Development of techniques for beamline diagnostics:
  - *Assessment of methods for providing better diagnostic information*
  - *CCD camera for beam imaging in high magnetic fields*

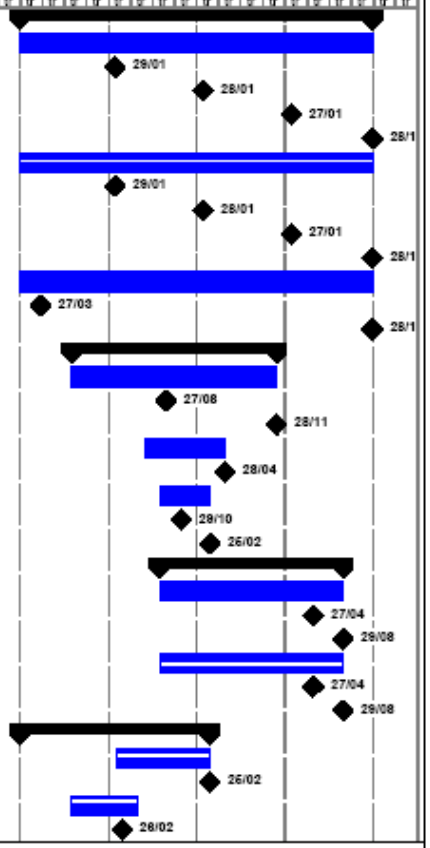
- Extension of simulation code to allow full instrument modelling
  - *Code to enable modelling of sample environment equipment*

- Extension of Nexus file format to capture full beamline and instrument parameters:
  - *Detailed Nexus Instrument Definition for ISIS and PSI*

*Partners: ISIS, PSI;*



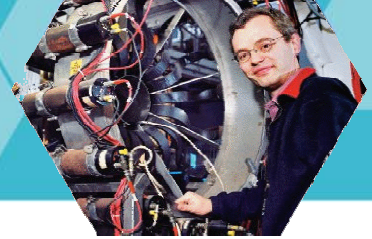
| ID | Task /Milestone /Deliverable | Task Name | Start | Finish |
|---|---|---|---|---|
| 1 | Task 20.1 | **Management, dissemination and networking of the JRA** | Thu 01/01/09 | Fri 28/12/12 |
| 2 | Sub task 20.1.1 | Annual reports | Thu 01/01/09 | Fri 28/12/12 |
| 3 | D 20.1.1.1 | 1st Annual report | Fri 29/01/10 | Fri 29/01/10 |
| 4 | D 20.1.1.2 | 2nd Annual report | Fri 28/01/11 | Fri 28/01/11 |
| 5 | D 20.1.1.3 | 3rd Annual report | Fri 27/01/12 | Fri 27/01/12 |
| 6 | D 20.1.1.4 | 4th Annual report | Fri 28/12/12 | Fri 28/12/12 |
| 7 | Sub task 20.1.2 | JRA meetings | Thu 01/01/09 | Fri 28/12/12 |
| 8 | D 20.1.2.1 | 1st JRA meeting minutes | Fri 29/01/10 | Fri 29/01/10 |
| 9 | D 20.1.2.2 | 2nd JRA meeting minutes | Fri 28/01/11 | Fri 28/01/11 |
| 10 | D 20.1.2.3 | 3rd JRA meeting minutes | Fri 27/01/12 | Fri 27/01/12 |
| 11 | D 20.1.2.4 | 4th JRA meeting minutes | Fri 28/12/12 | Fri 28/12/12 |
| 12 | Sub task 20.1.3 | Website | Thu 01/01/09 | Fri 28/12/12 |
| 13 | D 20.1.3.1 | Website launched | Fri 27/03/09 | Fri 27/03/09 |
| 14 | D 20.1.3.2 | Final results published on website | Fri 28/12/12 | Fri 28/12/12 |
| 15 | Task 20.2 | **Technologies for High Field Instruments** | Mon 03/08/09 | Mon 28/11/11 |
| 16 | Sub task 20.2.1 | Development of fast-timing detectors for high transverse field applications | Mon 03/08/09 | Mon 28/11/11 |
| 17 | D 20.2.1.1 | Demonstration of fast timing detector | Fri 27/08/10 | Fri 27/08/10 |
| 18 | D 20.2.1.2 | Report summarising detector performance | Mon 28/11/11 | Mon 28/11/11 |
| 19 | Sub task 20.2.2 | Design and simulation of a high field instrument for PSI | Tue 01/06/10 | Thu 28/04/11 |
| 20 | D 20.2.2.1 | Design document for a 10 T transverse field instrument detector array | Thu 28/04/11 | Thu 28/04/11 |
| 21 | Sub task 20.2.3 | Performance assessment of high-field operation at ISIS | Mon 02/08/10 | Fri 25/02/11 |
| 22 | D 20.2.3.1 | Document describing the performance of the 5 T longitudinal field spectrometer at ISIS ci | Fri 29/10/10 | Fri 29/10/10 |
| 23 | D 20.2.3.2 | Publication of instrument performance and test results in scientific journal | Fri 25/02/11 | Fri 25/02/11 |
| 24 | Task 20.3 | **Developing technologies for μSR at high pressures** | Mon 02/08/10 | Wed 29/08/12 |
| 25 | Sub task 20.3.1 | Development of a solid-sample pressure cell | Mon 02/08/10 | Wed 29/08/12 |
| 26 | D 20.3.1.1 | Low background solid-sample pressure cell working at pressures exceeding 2.5GPa | Fri 27/04/12 | Fri 27/04/12 |
| 27 | D 20.3.1.2 | Report of cell performance, including demonstration experiments | Wed 29/08/12 | Wed 29/08/12 |
| 28 | Sub task 20.3.2 | Development of gas-phase sample cell with RF coils | Mon 02/08/10 | Wed 29/08/12 |
| 29 | D 20.3.2.1 | Gas-phase pressure cell working at pressures exceeding 200 bar | Fri 27/04/12 | Fri 27/04/12 |
| 30 | D 20.3.2.2 | Report of cell performance, including demonstration experiments | Wed 29/08/12 | Wed 29/08/12 |
| 31 | Task 20.4 | **Novel resonance techniques and simulation codes for complex experiments** | Thu 01/01/09 | Fri 25/02/11 |
| 32 | Sub task 20.4.1 | Demonstration of RFμSR experiments using NMR style pulsed techniques | Mon 01/02/10 | Fri 25/02/11 |
| 33 | D 20.4.1.1 | Demonstration experiments showing simultaneous excitation of the muon and nuclear sp | Fri 25/02/11 | Fri 25/02/11 |
| 34 | Sub task 20.4.2 | Development of an in-situ NMR spectrometer | Mon 03/08/09 | Wed 28/04/10 |
| 35 | D 20.4.2.1 | In-situ NMR apparatus demonstrated | Fri 26/02/10 | Fri 26/02/10 |



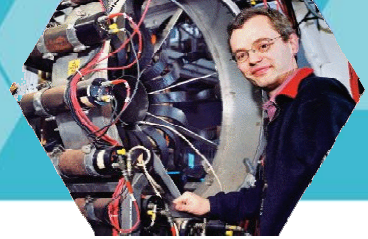

Project: muons
Date: Mon 14/01/08

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Page 1

# Cost breakdown by Partner…



| Partner | Staff effort (man months) | Staff cost | Consumables | Travel | Overhead Costs | Total | % | EU contribution |
|---|---|---|---|---|---|---|---|---|
| **STFC** | **36** | 130000 | 62000.00 | 25000.00 | 136500.00 | 353500.00 | 75% | 265125 |
| **PSI** | **36** | 200000 | 62000.00 | 25000.00 | 66500.00 | 353500.00 | 75% | 265125 |
| **BBU** | **24** | 50000 | 20000.00 | 10000.00 | 30000.00 | 110000.00 | 75% | 82500 |
| **UPR** | **12** | 25000 | 6000.00 | 4000.00 | 15000.00 | 50000.00 | 75% | 37500 |
| **TOTALS** | **108** | **405000** | **150000** | **64000** | **248000** | **867000** | **75%** | **650250** |