# EoI. No. 13i: Beam Diagnostic Data Acquisition for FAIR – Super FRS

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What is included? / EoI-Definition

Interfaces

Schedule

Resources: Manpower / Funds

Existing EoIs

Open questions

# What is included?

**Data Acquisition (DAQ):**

Equipment and Software required to control, digitize, pre-process and transmit detector signals to the accelerator control system.

**The DAQ consists of:**

- Embedded controller / industrial PC
- Data concentrator / DSP board
- ADC, scaler/counter, digitizer, I/O board
- RF equipment (RSA, NWA)
- DAQ software

**Additionally included:**

- 'Slow Controls' (stepping motor, pressured air drive, hv supply, detector gas supply)

**NOT included:**

- E.g. detectors (mechanics, analog electronics), vacuum parts, drive mechanics, **'long' cables (!)**

# Work Breakdown Structure

Updated costbook: Subdivision of a beam diagnostic system <m.n> of S-FRS (2.4.6.*) into sub-components with separate psp-codes:

| psp-code | sub-component |
|---|---|
| 2.4.6.m.n.1. | Detector |
| 2.4.6.m.n.2 | Vacuum Chamber |
| 2.4.6.m.n.3 | Mechanics |
| 2.4.6.m.n.3.1 | Stepping-motor Drive |
| 2.4.6.m.n.3.2 | Pneumatic Drive |
| 2.4.6.m.n.3.3 | Other |
| 2.4.6.m.n.4 | Long Cables |
| 2.4.6.m.n.5 | Subsystems |
| 2.4.6.m.n.5.1 | High-voltage Supply |
| 2.4.6.m.n.5.2 | Compressed Air Control |
| 2.4.6.m.n.5.3 | Stepping-motor Control |
| 2.4.6.m.n.5.4 | Detector Gas |
| 2.4.6.m.n.6 | Data Acquisition (per channel) |

Subject of International EoIs

German contribution EoI no. 13i

***An updated work breakdown structure is necessary to define responsibilities for beam diagnostics!***

# Interfaces

**Interfaces**

(Detector side):

- Signal level
- Time structure
- Bus systems (GigE, IEEE1394...)

**Interfaces**

(Accelerator control system):

- Software standard:
  **F**ront-**E**nd **S**oftware **A**rchitecture, FESA (CERN)
- Data protocols / timing definition
- Fieldbus definition
- Alarms / interlocks specification

**Standardized Components**

- Embedded controllers / electronic boards
- Network protocols
- Form factors
- Connectors, cables

# Schedule

| Due Date | Milestone |
|---|---|
| 03/2009 | Creation of DAQ team<br>FESA training |
| 06/2009 | Specification & Requirements finished |
| 06/2010 | Definition of standard hardware & procurement of pre-series hardware |
| 09/2010 | Start FESA implementation |
| 2011 | Start hardware procurement |
| 2012 | Integration tests of in-kind components & SAT in-kind components |
| 2013 | Commissioning w/o, with beam |

# Resources: Manpower

GSI- Beam Diagnostic Department

M. Schwickert, P. Forck

| | | |
|---|---|---|
| DSW | Detectors&Software | 6.8 FTE |
| LCM | Low current Meas. | 2.8 FTE |
| RFT | RF Techniques | 4.6 FTE |
| MSR | Mainten.&Service | 5 FTE |
| MEC | Mechanics&Constr. | 2.8 FTE |
| EXT | External Projects | 2 FTE |

Current total staff: 26 FTE

+

**New EoI-DAQ Team:**

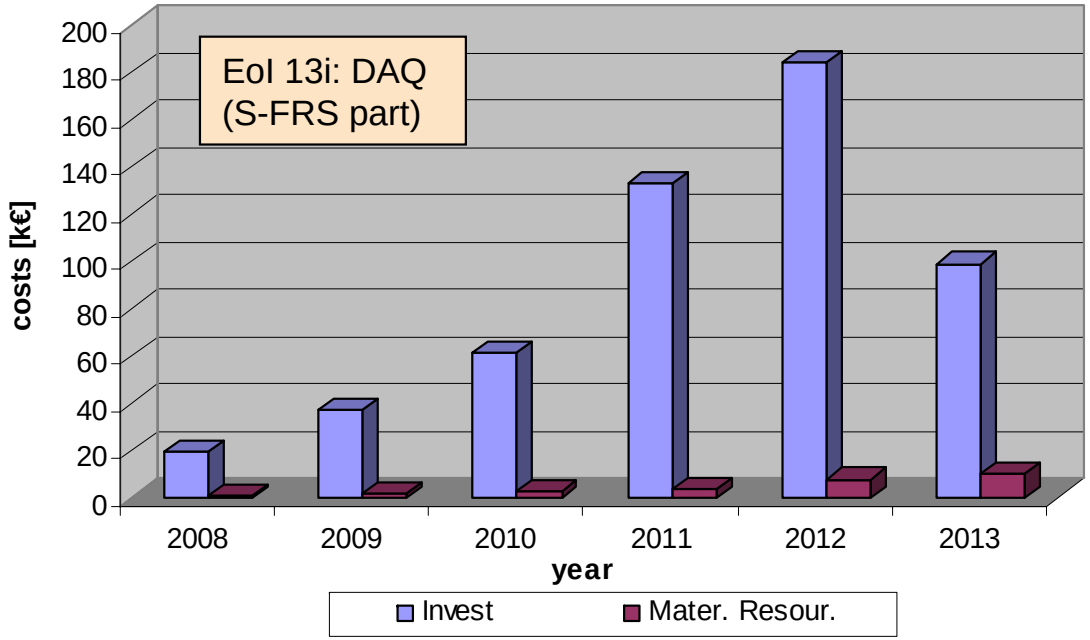
- +1 (2) FTE Physicist
- +2 (5) FTE Engineer (analog/digital/software)
- +1 (4) FTE Technician

Technical support for EoI-Team

Numbers in brackets refer to final manpower in EoI-DAQ-Team

| EoI DAQ | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Sum |
|---|---|---|---|---|---|---|---|---|
| Required staff [FTE/yr] | 1.2 | 2.1 | 3.4 | 4.8 | 9.0 | 10 | 10.5 | 40.5 |

# Resources: Funds




**At present: cost numbers only for 'standard' detectors**

| | |
|---|---|
| *2.4.6.1.1* | *SEETRAM counters* |
| *2.4.6.1.2* | *Beam Induced Fluorescence* |
| *2.4.6.1.3* | *Multi Wire Gas Detectors* |
| *2.4.6.1.4* | *Current Grids* |
| *2.4.6.1.5* | *Pick Ups* |
| *2.4.6.1.7* | *Resonant Transformer* |
| *2.4.6.1.8* | *Cryogenic Current Comparator* |

| | | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Sum | |
|---|---|---|---|---|---|---|---|---|---|---|
| S-FRS | Mater. resour. | 1 | 2 | 3 | 4 | 8 | 10 | -- | 27 | k€ |
| S-FRS | Investment | 20 | 38 | 61 | 133 | 184 | 99 | -- | 535 | k€ |
| All | Mater. resour. | 21 | 42 | 68 | 96 | 200 | 220 | 250 | 897 | k€ |
| All | Investment | 500 | 950 | 1550 | 2860 | 4660 | 2000 | 1000 | 13520 | k€ |

# Existing EoIs

## WBS 2.4.6: Beam Diagnostics for S-FRS

| Diagnostic System | pcs. | Costs [k€] | psp-code | Contributor | Country |
|---|---|---|---|---|---|
| Data Acquisition(*) | all | 535 | 2.4.6.?.?.6 | GSI | Germany |
| + ... ? | | | | | Finland |
| | | | | | |
| | | | | | |

**(*) subject to ongoing discussions, clarification necessary**

# Open Questions

- Clarification of responsibilities for S-FRS beam diagnostics /DAQ (definition of borderline: accelerator $\Leftrightarrow$ experiment)
- Availability of additional EoIs?
- Definition of testing procedures (Factory acceptance tests / Site acceptance tests)
- Definition of standards (electronics, signals, test software....)
- Responsibility for cabling
- Clarification on materials resources / travel costs for EoIs
- Formal agreement on provision of manpower at GSI