



AIDA

WP5, 6, 7 Report Transnational Access to DESY, CERN and European Irradiation Facilities

Laurent Serin (for Marko Mikuž)

AIDA General Plenary, DESY, March 30, 2012

TA facilities offered under AIDA

- WP5, DESY: test beams
- WP6, CERN: test beams, PS irradiation
- European Irradiation Facilities
 - 7.1 Jožef Stefan Institute, Slovenia
 - Reactor neutrons, gammas
 - 7.2 UC Louvain, Belgium
 - Accelerator neutrons & protons, gammas
 - 7.3 KIT, Karlsruhe, Germany
 - Accelerator protons

TA & USP Meetings on Thursday

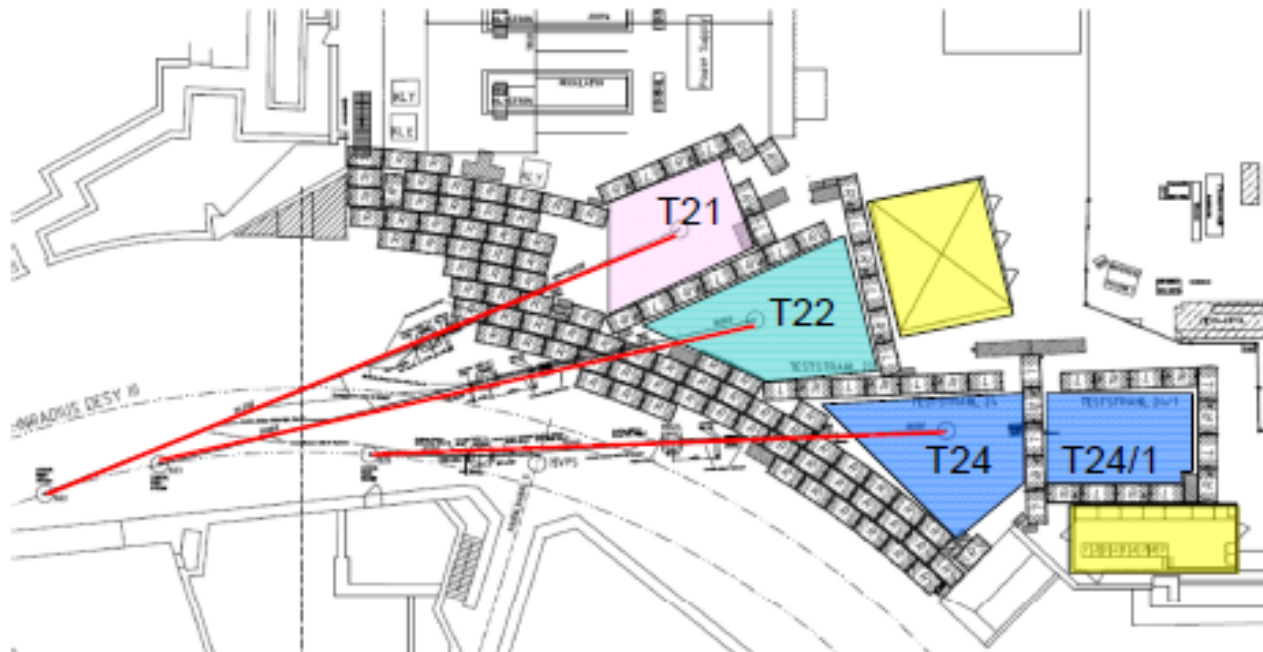
- Reports from TA sites
 - Review progress in Y1
 - Flag problems
- Served the User Selection Panel as introduction to their follow-up meeting

WP5,6,7 User Selection Panel	
<i>Sem 3, DESY</i>	16:30 - 17:30

TA Access introduction	<i>MIKUZ, Marko</i>
Report from WP5: DESY TB	
<i>Sem 3, DESY</i>	14:10 - 14:30
Report from WP6: CERN TB	<i>BREUKER, Horst</i> 
<i>Sem 3, DESY</i>	14:30 - 14:50
Report from WP7.1: JSI	
<i>Sem 3, DESY</i>	14:50 - 15:10
Report from WP7.2: UCL	
<i>Sem 3, DESY</i>	
Report from WP7.3: KIT	
<i>Sem 3, DESY</i>	15:30 - 15:50
Discussion on TA Issues	
<i>Sem 3, DESY</i>	15:50 - 16:00

WP5 - DESY

DESY Test Beam Layout



DESY provides three test beam lines (21, 22 and 24). These electron or positron beams are converted into bremsstrahlung beams from carbon fibre targets in the lepton synchrotron DESY II with up to 5000 particles per cm^2 (depending on beam line and target), and with an energy variable from 1 to 6 GeV and an energy spread of $\sim 5\%$.

WP5 - DESY

Actual & Planned Test Beam Campaigns for 2012

Up to now:

AIDA-DESY-2012-06: ATLAS insertable B-layer Project

AIDA-DESY-2012-05: ATLAS planar Pixel Upgrade

AIDA-DESY-2012-04: ATLAS 3D Pixel R&D collaboration

AIDA-DESY-2012-03: Commissioning of the CALICE Silicon-Tungsten ECAL technical Prototype

AIDA-DESY-2012-02: DEPFET Collaboration

AIDA-DESY-2012-01: Commissioning of the ALIBAVA System

Further 4 projects are already planned.

We expect in 2013 much more TA projects and we received already now over 12 pre-requests

WP5 - 1st year performance

- WP5 DESY

	User-projects (see Annex 2 for details)		Users supported (see Annex 3 for details)	Units of access (DESY = TB week)
	Eligible submissions	Selected		
Year 1 (M1-M12)	4	4	20	9
Foreseen for project (M1-M48)	25		130	40

Planning, deviations and corrective actions

Task on schedule		Ahead of schedule		Minor delay	✓	Significant delay	
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The demand for financial support in the framework of the Transnational Access was originally higher, however not all users were eligible within the TA funding scheme, since they originated from Germany universities and institutions, which are not eligible for funding.

WP6 - CERN

Line	Momentum range	Momentum resolution	Particles	Nominal Intensity ([*])	Intensity range (relative)	Remarks
T7	1-10 GeV/c (±)	0.4%	mixed	$0.3 - 1.0 \cdot 10^6$	$\sim 1.0 \cdot 10^{-3} - 5$	
T8	24 GeV/c	0.015%	protons	$5 - 20 \cdot 10^{10}$	from MCR	primary
T9	1-15 GeV/c (±)	0.6%	mixed	$0.3 - 1.0 \cdot 10^6$	$\sim 0.02 - 6$	
T10	1-7 GeV/c (±)	0.5%	mixed	$0.3 - 1.0 \cdot 10^6$	$\sim 0.02 - 4$	
T11	1-3.6 GeV/c (±)	~1%	mixed	$0.3 - 1.0 \cdot 10^6$	$\sim 0.02 - 5$	
Inrad1	24 GeV/c	0.015%	proton	$8 - 30 \cdot 10^{10}$	from MCR	primary
Inrad2	several MeV	unselected	neutrons			depends on T8

^{*}) Intensity is for 1% momentum bite, nominal target and $2 \cdot 10^{11}$ ppp on target and intensity collimator(s) wide opened.

- Spill 400 ms (could be > 500 ms at 20 GeV/c)
- Some more intensity control exists for the primary beam (0.5-1.0) and via the target efficiency (~0.02-1.0).

WP6 - CERN

WP6 TA to Testbeams and Irradiation at CERN

- AIDA units : 600 in Testbeams; 200 in Irradiation Facility;
- 1 unit = 1 day;
- Reimbursement : 138 CHF/day x person (Subsistence) + max 400 CHF/travel x person;
- WP6-TA is operational, with appropriate communications and a selection board;
- WP6 is still in agreement with the projected schedule concerning the allocated budget;
- The total budget is 197900 CHF.

WP6 - CERN

Performance of the EHN1 beams

Beam Line	p_{\max} (GeV/c)	Intensity/pulse for 10^{12} ppp incident	Beam type
H2	400	$9 \cdot 10^7 \pi^+$ at 200 GeV/c $3 \cdot 10^7 \pi^-$ at 200 GeV/c $4 \cdot 10^6 e^\pm$ at 150 GeV/c $1 \cdot 10^5 \text{Pb}$ at 400 GeV/Z	High-energy hadron or electron beam for physics or tests *) Heavy ion beam
H4	400	$9 \cdot 10^7 \pi^+$ at 200 GeV/c $3 \cdot 10^7 \pi^-$ at 200 GeV/c $4 \cdot 10^6 e^\pm$ at 150 GeV/c $> 10^7 \text{p}$ at 400 GeV/c $1 \cdot 10^5 \text{Pb}$ at 400 GeV/Z	High-energy hadron or electron beam for physics or tests, Att. proton beam Heavy ion beam
H6	200	$1 \cdot 10^8 \pi^+$ at 150 GeV/c $4 \cdot 10^7 \pi^-$ at 150 GeV/c	Medium energy hadron beam, also for tertiary test beams
H8	400	$1 \cdot 10^7 \text{p}$ at 400 GeV/c $2 \cdot 10^8 \pi^+$ at 200 GeV/c $7 \cdot 10^7 \pi^-$ at 200 GeV/c $1 \cdot 10^5 \text{Pb}$ at 400 GeV/Z	Att. proton beam High-energy hadron or electron beam for physics or tests, *) Heavy ion beam

WP6.1 - 1st year performance

	User-projects (see Annex 2 for details)		Users supported (see Annex 3 for details)	Units of access (CERN = 8-hour shift)
	Eligible submissions	Selected		
Year 1 (M1-M12)	14	13	64	512
Foreseen for project (M1-M48)	20		160	600

6.1 Test beam

Planning, deviations and corrective actions

Task on schedule	✓	Ahead of schedule		Minor delay		Significant delay	
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Since no test beam activities at CERN are planned for the entire year of 2013, all activities on test beams are compressed into AIDA years 1 and 2.

WP6.2 - 1st year performance

	User-projects (see Annex 2 for details)		Users supported (see Annex 3 for details)	Units of access (CERN = 8-hour shift)
	Eligible submissions	Selected		
Year 1 (M1-M12)	0	0	0	0
Foreseen for project (M1-M48)	20		40	200

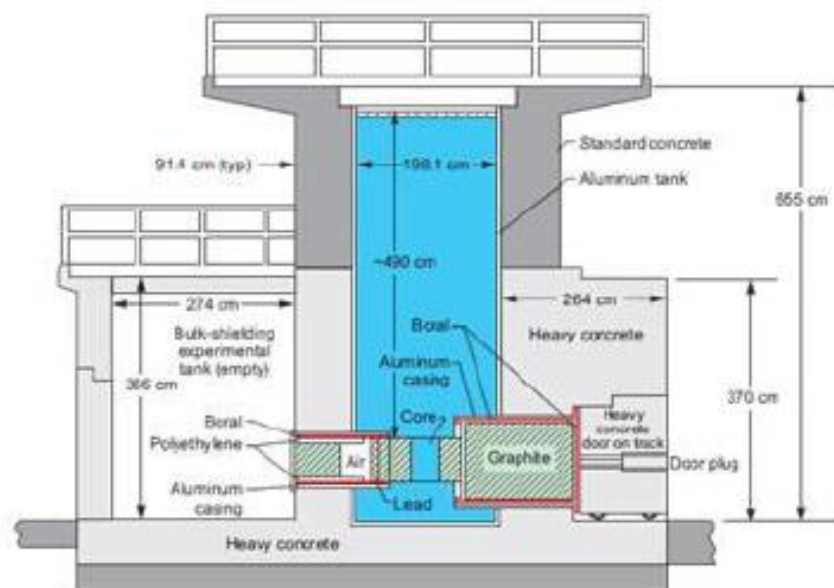
6.2 Irradiations

The use of the irradiation facility at the PS is a small part of the WP6-TA. The facility is in use during about 90% of the yearly PS operation time. Usually several samples provided by the users are being irradiated simultaneously. These activities may stretch over long periods of time and users do not have to be present at the facility, as it is mainly operated by CERN personnel. This, together with an initial lack of advertisement, makes communication with the users much more complicated and is the reason for the delay. The situation should be improved for AIDA year 2.

WP7.1 - JSI

Irradiations with neutrons at TRIGA_Mark III reactor

The reactor research centre is a part of Jožef Stefan Institute,



WP7.1 - JSI

Reactor: 250 kW maximum power, can be regulated to few W.
 Total flux at maximum power is $4 \times 10^{12} \text{ cm}^{-2}\text{s}^{-1}$ (central channel).
 NIEL (in Si) damage constant is 0.9 for fast neutrons.
 Several in-core and ex-core irradiation channels
 Maximum uninterrupted irradiation time is 16h.
 All irradiations done in two irradiation tubes.
 Accuracy of fluence is $\pm 10\%$

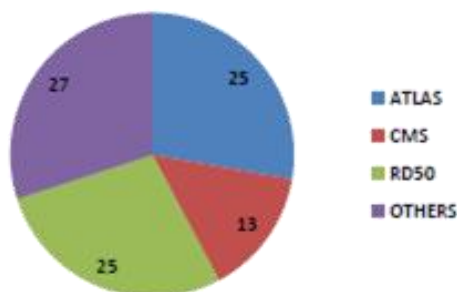
1st year:

- 16 projects completed
- 90 irradiations
- 140 units of reactor- (540 foreseen in 4 years)

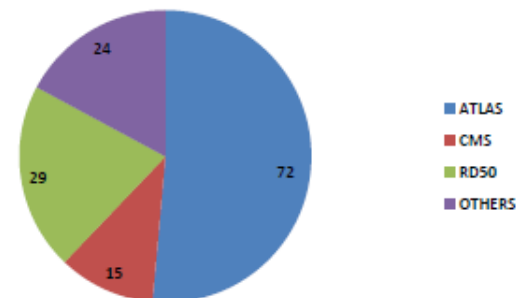
Number of projects:



Number of irradiations :



Hours of reactor:



WP7.1 - 1st year performance

	User-projects (see Annex 2 for details)		Users supported * (see Annex 3 for details)	Units of access (JSI = reactor operation hour)
	Eligible submissions	Selected		
Year 1 (M1-M12)	23	21	29	140
Foreseen for project (M1-M48)	90		54	540

* Users supported = remote users using the infrastructure by sending samples to the facility

Planning, deviations and corrective actions

Task on schedule	✓	Ahead of schedule		Minor delay		Significant delay	
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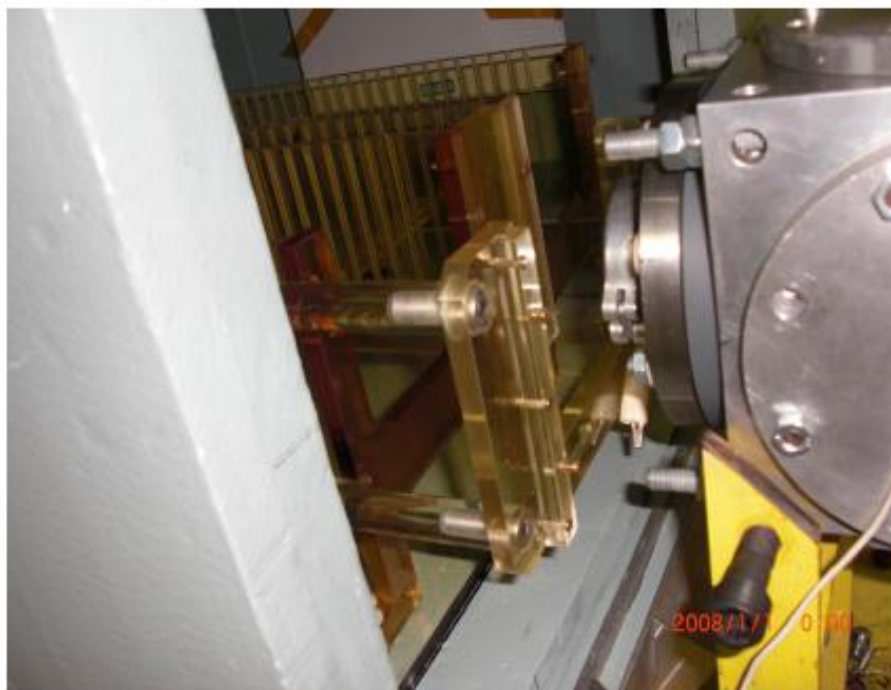
WP7.2 - UCL

High Flux Neutron beam line (HF-NIF)



For example : the support was extended outside the box, to reach very high fluences, at 5 cm from the Be target and the devices (diamond detectors) were monitored for 15 hours

Total fluence:
 $8 \times 10^{15} \text{ n/cm}^2$



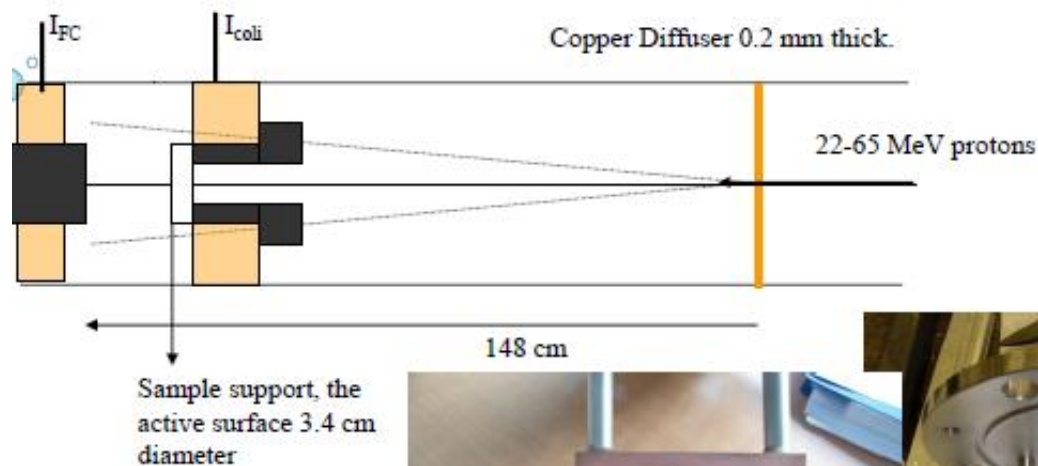
Obila Militaru, UCL Belgium

WP7.2 - UCL

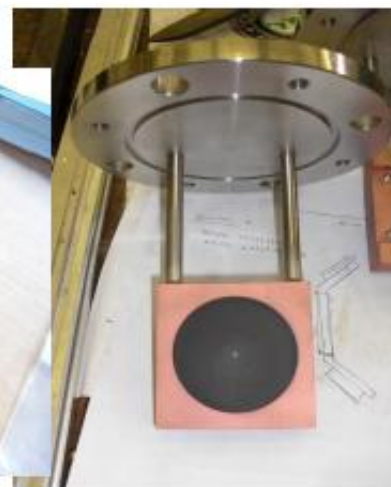
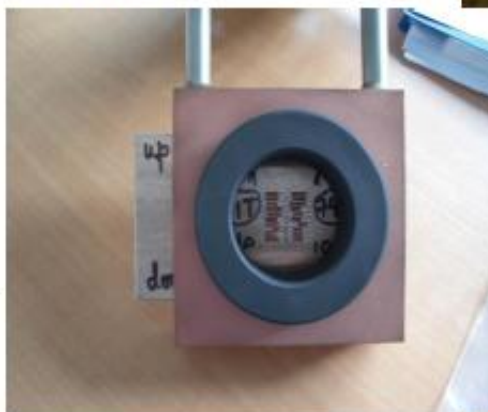
2012:

A new high flux proton setup was developed, on the same extension of the Cyclotron, and the first AIDA irradiation was done in **March 2012** for 7 hours (for NA62 experiment).

High Flux Proton beam line (HF-PIF)



Both the beam dump (FC) and the collimator are cooled with room T water



WP7.2 - UCL

High flux Neutron Irradiation Facility (NIF)

- current up to 12 μA
- for samples that need cooling (Si), a fluence of 4×10^{14} 1MeV eq. can be reached 12 hours.
- for other samples, 10^{16} n/cm² in < 5 h

new High Flux Proton Irradiation Facility (PIF);

- monoenergetic proton beam 26-63 MeV
- current up to 5 μA
- samples on supports of 3.4 cm diameter, 10^{17} p/cm² ~ 8 hours
for HL-LHC fluences ~ several minutes

Possibility to scan with beam across sample, can cover $\sim 10 \times 10$ cm²

WP7.2 - 1st year performance

	User-projects (see Annex 2 for details)		Users supported (see Annex 3 for details)	Units of access (UCL = Beam hour)
	Eligible submissions	Selected		
Year 1 (M1-M12)	1	1	4	15
Foreseen for project (M1-M48)	25		25	250

Planning, deviations and corrective actions

Task on schedule		Ahead of schedule		Minor delay	√	Significant delay	
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During the first year of AIDA, only one project has been submitted to our task. We are not worried because the beams we provide are more suitable, both in flux and size, to test radiation hardness of complex systems that will be produced in a later phase of the project.

WP7.3 - KIT

The Karlsruhe Proton Cyclotron KAZ

- Run by private company ZAG
- We are customers and have to pay per beam time
- Proton energy at extraction: 25.3 MeV
- Energy at samples: ~23 MeV in first layer
- Typical proton current: 1.5 μ A
- Temperature in box: ~ -25°C
- Beam spot ~ 7 mm (varying)
- Flux ~ 2.5×10^{13} p/(s·cm²)



Sample box on XY-stage with beam line



Man placing LN₂ box



Control room

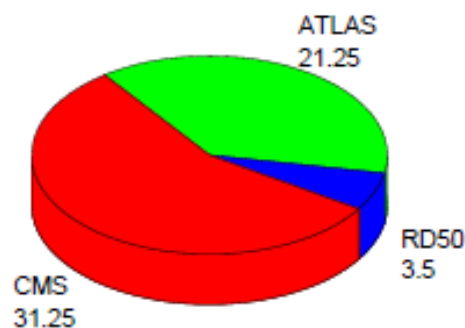
WP7.3 - KIT



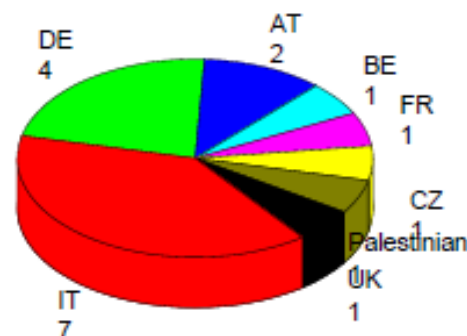
Irradiation Summary

- 10 projects with a total of 56 hours beam time
- 18 users
- No visitors

- We mainly had high fluence irradiations of $1e15 - 1e16 \text{ n}_{eq}/\text{cm}^2$



Beam time per experiment (in hours)



Users per nationality

WP7.3 - 1st year performance

	User-projects (see Annex 2 for details)		Users supported (see Annex 3 for details)	Units of access (KIT Beam hour)
	Eligible submissions	Selected		
Year 1 (M1-M12)	10	10	18	56
Foreseen for project (M1-M48)	40		40	160

Planning, deviations and corrective actions

Task on schedule	√	Ahead of schedule		Minor delay		Significant delay	
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Summary

- TA scheme in AIDA had a swift take off in Year 1
 - Except WP 6.2 (CERN irradi) and 7.2 (UCL), corrective actions under way
- User support not in demand for irradiations
 - Reallocate funds to manpower and additional irradiations
- User Selection Panel pleased with TA performance
 - Some bias towards ATLAS usage observed, but not considered excessive