



TIARA WP4 activity report

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- Objective
- Tasks
- Schedule
- KARA/KTI
- Status
- Next steps

Mid-term meeting of the TIARA-PL group

27-28 September, 2012



- Identify the Key Accelerator Research Areas and the Key Technical R&D Issues
- Develop a common methodology and procedure for initiating, costing and implementing collaborative R&D projects in a sustainable way
- Define a joint R&D Programme to be carried out with the European distributed accelerator R&D infrastructure, proposed by TIARA



D4.1 KIR

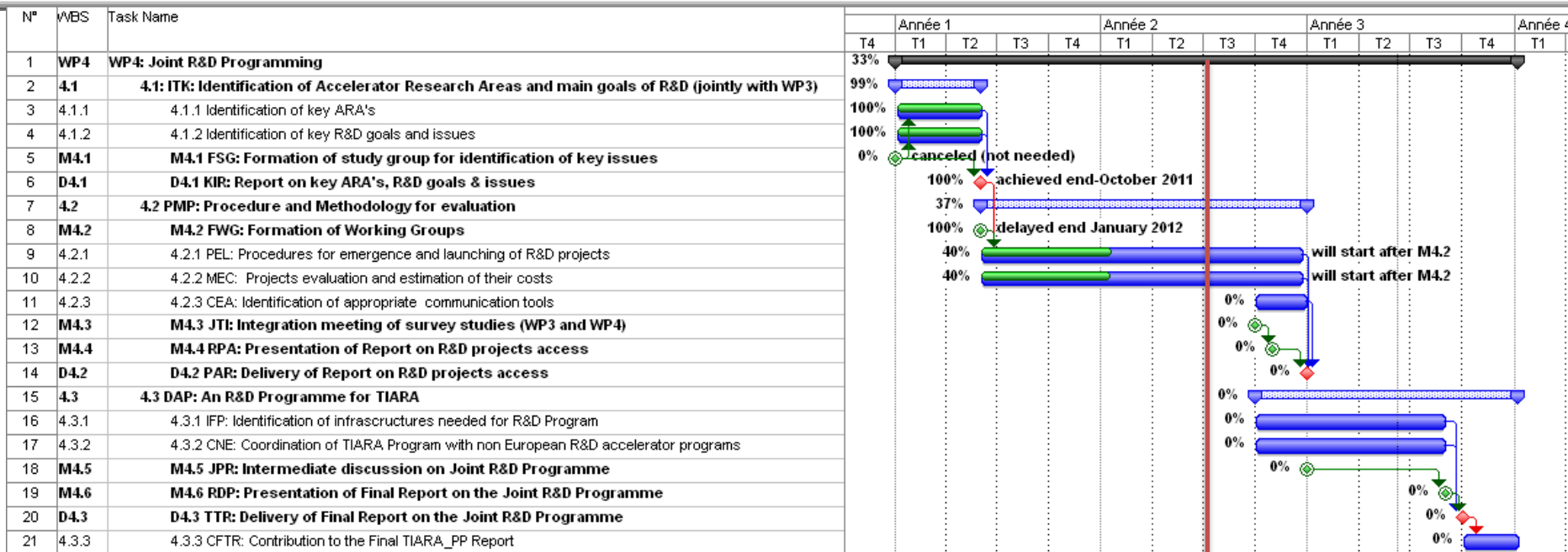
- **General Report on Key Accelerator Research Areas and Key R&D Issues**
- **Foreseen on M5, delivered M12 after GC validation**

D4.2 PAR

- **R&D Projects Access Report. Procedure for Identifying, defining and launching of collaborative R&D Projects, including common methodology for scientific/technical evaluation and costing**
- **Due M24**

D4.3 TTR

- **Toward Tiara. Final Plan of the Collaborative R&D Program**
- **Due M33**



- Due before end of 2012:
 - **09/2012 MS15**, JTI (Integration meeting WP3+WP4)
 - **10/2012 MS16**, RPA (Presentation on Report on Project Access)
 - 12/2012 Delivery of D4.2 PAR (Delivery of Report on R&D project access)
 - **12/2012 MS17**, JPR (Intermediate report R&D Programme)



1. Accelerator Components

2. Accelerator Technologies

3. Accelerator Concepts



KARA/KTI list: Accelerator Components



For each of these KARA, a further level (Key Technical Issues) is provided.

Accelerator Components

Domain	KARA	KTI
Accelerator Components	Sources and Injectors	High Brightness Photo Injectors High Intensity Heavy Ion Injectors High Intensity Proton Injectors High-polarization electron/positron sources Hollow beams for proton beam collimation RFQ development Beam funneling
	RF structures	High Gradient Acceleration at Low RF Breakdown Rates Development and engineering of C-Band and X-Band Structures Consolidation of the Nb Technology for Maximum Yield at Highest Gradients Improvements of the "Low Beta" Cavity Technology Coupler for SRF Cavities at High Average Power Overcoming the Performance Limits of Bulk Niobium Crab cavity Developments RF Structures for 6D Muon Beam Cooling Variable Frequency Resonators for Synchrotrons or FFAG
	RF systems	Optimization of RF Systems for high brilliance damping rings X-Band and C-Band RF Systems Precision LLRF control
	SC magnets	Material and Technologies for the 20 T Range and Beyond Fast Cycling SC Magnets Engineering Challenges for High Field Magnets Cryogen-free magnet systems High-Field short period undulators High Field Small Magnets using rare-earth pole tips
	Conventional NC magnet systems	Compact Magnets Radiation Resistant Magnets Insertion Devices for X-Ray Production and Damping Rings Pulsed Magnets and Kickers Insertion devices for damping and X-Ray production Transparent Injection in Top-Up Schemes Fast pulsed quadrupole magnets for beam lines
	Diagnostics and instrumentation	Beam Position Monitor Development Beam Size and Emittance Monitor Devices Development Synchronization, fs or sub-fs Radiation hard electronics components and design
	Targetry	Challenges for High Power Targets for Secondary Particle Production Radiation Damage Phenomena in Target Materials Monte Carlo Particle Transport Codes Validation Collimation Systems Bent Crystal channelling
	Radiation issues	Determination of Prompt Radiation Levels Component Activation Handling Compact Shielding



Facilities need a complex technological infrastructure for operation

Domain	KARA	KTI
Accelerator Technologies	Electronics and Software	xTCA Standards
		LLRF cost, performance
	UHV	Radiation-Induced Outgassing and Secondary Particle Generation
		Low Outgassing Rates to Limit Pumping Times
		Wall Chamber Conductivity and Eddy Currents
	RF sources	Energy efficiency
		Solid State Technology RF Sources
	Cryogenics	Cryoplant Efficiency Improvements
		Cryogenic Distribution and Cryostat Insulation
	Alignment and Stabilization	Laser and Wire Positioning Systems
		Nanometer Level Stabilization



KARA/KTI list: Accelerator Concepts



Design issues for future facilities or promising technologies, not yet implemented in facilities

Domain	KARA	KTI
<h1 style="writing-mode: vertical-rl; transform: rotate(180deg);">Accelerator Concepts</h1>	Accelerator Design	Design for Reliability and Availability
		Beam Losses and Machine Protection at High Beam Power
		Compactness and Simplicity
	Beam Dynamics	Energy Efficiency and Storage
		Enhanced Beam Modeling Tools
		High Luminosity and High Energy Hadron and Lepton Colliders
		Beam Stability and Lifetimes in Circular Accelerators
		Small Emittance Beam Generation and Transport
		Transport of electrons in plasma accelerating structures
		Low Losses in High Intensity Linacs
		High Reliability Operation
		Laser-Beam Interaction for Acceleration and X-Ray Production
		Fast Acceleration for Unstable Particles
	FEL processes	Develop New Seeding Techniques for FELs
		Circularly Polarized X-Ray FELs
		Attosecond Pulse Generation
	Beam cooling	Electron and Stochastic Cooling for Heavy Ion Beams
		Ionization Cooling
	New techniques for high gradient acceleration (laser-plasma etc.)	Self Injection Laser Wake-Field Acceleration
		External Injection in Laser Plasma Waves Below Wave Breaking
		External Injection in Particle Wake-Field Acceleration
		Proton and light Ion Generation with Laser Driven Plasmas
	Medical and Industrial Accelerators	Improvement in Dose Delivery for Hadron Therapy
		Image Guided Radiation Therapy
		Cost and Complexity Reduction of Medical Accelerators
		Boron Neutron Capture Therapy
		Production of PET Isotopes and Tracers
		Acceleration Driven Systems for Nuclear Waste Transmutation
Accelerators for Fusion		
Industrial and Societal Applications		
Environmental Applications		
Accelerators for Detection of Illegal Nuclear Material		



KARA - projects mapping



Domain	Projects	ESFRI Project List					Flavour Factories (SuperB)	Neutrino Factories Muon Colliders	High Intensity Hadron Facilities (Eurusol, ADS/MYRRHA, IFMIF)	3 rd Generation radiation sources	4 th Generation radiation sources, FEL, ERL	5 th Generation radiation sources
		XFEL	FAIR	ESS	LHC Upgrades (HL-HE)	Linear Colliders (ILC, CLIC)						
	KARA											
Accelerator Components	Sources and Injectors	x	x	x	x	x	x	x	x	x	x	
	RF Structures	x	x	x	x	x	x	x	x		x	
	RF Systems	x		x		x	x		x		x	
	SC Magnets		x		x	x	x	x				
	Conventional NC Magnet Systems		x			x				x	x	x
	Diagnostic and Instrumentation	x	x	x	x	x	x	x	x	x	x	x
	Targetry		x	x	x	x		x	x			
	Radiation Issues		x	x	x	x		x	x			
Accelerator Technologies	Electronics and Software	x	x	x	x	x	x	x	x	x	x	x
	UHV	x	x	x	x	x	x	x	x	x	x	x
	RF Sources	x	x	x	x	x	x	x	x	x	x	x
	Cryogenics	x	x	x	x	x		x	x			
	Alignment and Stabilization	x	x	x	x	x	x	x	x	x	x	x
Accelerator Concepts	Accelerator Design	x	x	x		x	x	x	x			x
	Beam Dynamics	x	x	x	x		x	x	x			x
	FEL Processes	x									x	x
	Beam Cooling		x					x				
	New Techniques for High Gradient Acceleration					x						x



Test infrastructure and Accelerator Research Area

DELIVERABLE

General Report on Key Issues

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This work is part of TIARA Work Package 4: Joint R&D Programming

The electronic version of this TIARA Publication is available via the TIARA web site
<http://www.eu-tiara.eu/database/test/index.php>

D4.1 - KIR General Report on Key Issues

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Will define:

- A common methodology and procedure for initiating, costing and implementing collaborative R&D projects in a sustainable way.
- A methodology and procedure for scientific and technical evaluation of projects and for their costing to enable the emergence and the launching of collaborative R&D activities.
- In addition, appropriate communication tools for effective knowledge exchange (in connection with WP5) and for assistance in legal questions (through WP2) will be identified and implemented.



- 4.2 PMP

Procedure for initiating and methodology for costing and implementing collaborative R&D Projects

- 4.2.1 PEL: Procedure for enabling the Emergence and the Launching of collaborative R&D projects in a sustainable way
- 4.2.2 MEC: Common Methodology for project's scientific and technical Evaluation and for their Costing
- 4.2.3 CEA: Identification and implementation of appropriate Communication tools for effective knowledge Exchange (with WP5) and Assistance in legal questions (with WP2) – will be started after the two subtasks above.



- "Methodology for initiating, costing and implementing R&D projects"
 - **PEL**: Started with survey of current «collaborative» procedures at national and international level
 - **MEC**: No common methodology for evaluation and costing exists in our community yet, but start with survey of existing
- Fulfilled MS14: FWG (Formation of Working Groups)
 - **PEL**: *Pierini*, Garvey, Obradors, Bocian, Kallberg, Schulte
 - **MEC**: *Omet*, Pierini, Napoly, Laune, Smith, Lilje
- Deliverable 4.2 R&D Project Access Report: 12/2012



- **MS17: JPR at M24 is a review of D4.1**
 - Consolidation of KARA/KTI background work
 - Collecting «institutional interest» by WP members
- **Interactions with WP3**
 - Provide input for CMLIN 3.2.1
 - Definition of timelines for R&D infrastructure needs:
 - » **Current**, for realization phase (few years from now)
 - » **Medium**, for TDR (5 years from now)
 - » **Long**, for CDR (at least 10 years from now)
 - Collecting WP4 member assessment for delivery to WP3
- **Start of WP4.2 Task**



Next steps



- D4.1 consolidation towards Joint R&D Programme
 - Add KARA/KTI's actually not in the list
 - WP members add path / way to complete the KTI's
- Progress towards D4.2
 - Discussion of PEL/MEC tasks and decisions
 - Drafts of both have been prepared
- Match with infrastructure WP3
 - Identification of the needed timescale for the solution to the critical R&D items
 - Tagging urgent, mid-priority, long-term issues (CMLIN)

Thank P. Pierini for sharing his slides



Backup Slides



Acronyms



- KARA - Key Accelerator Research Area
- KTI - Key Technological Issues
- ESFRI - European Strategy Forum on Research Infrastructures
- CMLIN - current, medium- and long-term accelerator R&D needs