MC RF WG WP summary

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on behalf of MC RF WG

3rd muon community meeting

Objectives, Deliverables and Resources

Objectives
High-level Deliverables
1) Baseline design of the RF system for acceleration to high energy (SRF)
2) Application of high gradient SRF technology for muon accelerators (SRF)
3) Baseline design of the RF system for Muon cooling complex (NRF).
4) Conceptual design of the RF system for Muon Cooling Demonstrator (NRF).
5) RF test stand and test cavities for R&D on high gradient NRF in strong magnetic field (NRF).
6) Baseline design of RF power sources for muon collider RF systems

Resources	1	2	3		1	2	3
Staff	0.6 + 0.8	17.4		Student			
Postdoc	3 + 3	6		Material	2900(9500)		

Interested partners

1) CERN(resources in place), Uni of Rostock
2) CERN(?)
3) CEA, LBNL
4) CEA, LBNL
5) CEA, Uni of Strathclyde
6) Uni of Lancaster

Resources are given in total number of FTE-years for the whole duration and in kEuro for material

Tasks and Resources (1)

WP1 Priority	Task description	Resource estimate staff [FTEy]	 postdoc [FTEy]	 PhD [FTEy]	 material [kEuro]
1	Baseline design of the RF systems for RCSs including acceleration, longitudinal beam dynamics and stability, bunch length and energy spread control.	0.6	3		
1	Provide specifications for cavity design: frequency, R/Q, HOM suppression				
1	Provide specification for RF power sources: frequency, power,…				
1	Calculation of cavity parameters for fundamental mode parameters: R/Q, Vmax; as well as for HOMs and wakes for the baseline design	0.6	3		
2	RF design of the cavities for the RCSs				
2	Design of the RF cavities for LA and RLAs based on the specifications from HEC and BD				

WP2 Priority	Task description	Resource estimate staff [FTEy]	 postdoc [FTEy]	 PhD [FTEy]	 material [kEuro]
1	Provide limiting values for RF cavity and RF system design from SRF State of the Art: - Gradient and Q0 at different frequencies: 300 - 1300 MHz - Tolerances to magnetic fields, radiation and beam loss	0.2			
2	Synergy: Look for synergy in SRF technology with already ongoing projects and R&D activities. Direct them to the parameter space relevant for muon collider	0.2			
3	High gradient prototype at low frequency (~300 - 400 MHz) accelerating structure to target high gradient: >20 MV/m	?	?	?	?

Tasks and Resources (2)

WP3 Priority	Task description	Resource estimate staff [FTEy]	 postdoc [FTEy]	 PhD [FTEy]	 material [kEuro]
1	Collect specifications for the design of all RF cavities : frequency, gradient, length, B-field, aperture (window size and thickness)	0.4	2		
1	Based on available knowledge both experimental and theoretical, identify best concept for achievable accelerating gradient in magnetic field: material, pulse shape, temperature, gas.				
1	Calculate parameters of all cavities. Provide a consistent set of parameters of all RF cavities and associated RF systems				
2	Integration of RF cavities into cooling cell, adapting design if necessary	3			

WP4 Priority	Task description	Resource estimate staff [FTEy]	 postdoc [FTEy]	 PhD [FTEy]	 material [kEuro]
1	Collect specifications for the design of RF cavity for the MCD: frequency, gradient, length, B-field, aperture (window size and thickness), …	0.2	1		
1	Design the RF cavity using the concept identified				
1	Design of the associated RF systems for the MCD				
2	Engineering design of the cavity in its environment including multipackting, cooling, thermal and mechanical stability, alignment, RF diagnostic and tuning, RF coupler	3			
2	Integration of the RF cavity into the MCD cooling cell including SC solenoid, cryo, etc				

Tasks and Resources (3)

WP5 Priority	Task description	Resource estimate (CEA case) staff [FTEy]	 postdoc [FTEy]	 PhD [FTEy]	 material [kEuro]
2	Identify infrastructure available for potential use as (or setting up) an RF test stand for testing RF cavities in strong magnetic field: - RF power source, - SC solenoid, …	10			2900 MICE 3T solenoid OR 9500 MRI 7T solenod
2	Design and build RF test stand based on the available infrastructure and specified requirements.				
2	Propose test program adapted to potential test setup, considering possible limitations in terms of available frequency, power, magnetic field strength and size of a SC solenoid(s)				
2	Design and build test cavities				
2	Test the test cavities				

WP6 Priority	Task description	Resource estimate staff [FTEy]	 postdoc [FTEy]	 PhD [FTEy]	 material [kEuro]
2	Muon cooling complex RF system. Set target specifications and address potential issues including: - Large number of different frequencies, - High peak power requirements - High efficiency	0.6	3		
2	Baseline Design of high efficiency RF power source for muon collider to provide information on the peak power capability, efficiency and cost				