Summary of Collaboration “EOI’s” for the CLIC technical developments 2012-2016

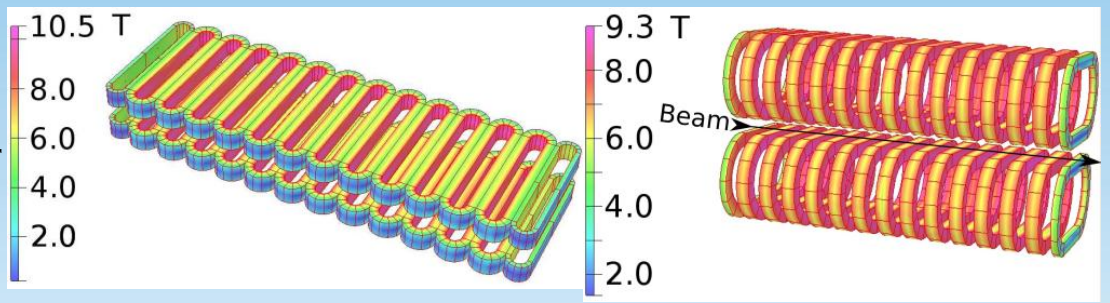
HS for CTC

CTC-WIG: Damping Rings Superconducting wiggler

WP: CTC-WIG: P.Ferracin	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1: Choice of cooling technique/topology of wiggler winding: ho.r or ver. racetrack	Careful designs of liquid helium bath cooled wiggler or cooled by conduction cooling	Designs	2011-2012
Task2:Choice of Sc cable (NbTi/Nb3Sn)	Higher field from Nb3Sn, more expensive and more difficult to machine	Designs	2011-2012
Task3: Production of prototype(s)	Construction of one hor. and one ver. Racetrack wigglers from NbTi cable in 2 cryostats (in Novosibirsk through ANKA) ; one ver. Racetrack coil from Nb3Sn at CERN.	3 prototype coils, 2 full cryostats	First complete magnet end 2012 for installation in ANKA (Karlsruhe)
Task 4: Experimental program at ANKA	Confirmation of simulations, choice for task 1 and 2, measurements of heat loads etc		2012-2014
Lead collaborator(s): ANKA/KIT; Novosibirsk			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF): (1)	1000	1000	200	200	100	2500
Personnel (FTE):	0.2	0.6	2	2	2	8

To be ready for beam in ANKA in the year 2012 this program will need a temporary loan of a PM wiggler for ANKA (CERN charge to find one)



News

- Well established collaboration with KIT (Karlsruhe, DE) and implicitly through KIT with Novosibirsk.
- Legally binding contract drafted by KIT (k-contract).
  Needs CERN FC approval in March 2012

CTC-SUR Survey and Alignment

WP: CTC-SUR: H.Mainaud	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1: development of sensors and actuators	Development of calibration benches Validation through inter-comparisons Qualification in accelerator environment, development of low cost versions, preparation of industrialization	Low cost precise and accurate sensors (WPS, inclinometers,…) Low cost linear actuators and cam movers	2011-2016
Task 2: tunnel metrology	Development of laser based alternatives Consolidation of stretched wire solution Validation through inter-comparisons	Simulations + experimental validation of laser based and stretched wire solutions.	2011-2016
Task 3: active pre-alignment of TBA modules	Validation on two beam modules in lab and CLEX Adaptation to new designs and new configurations Increasing performance of fiducialisation techniques & strategies	Mock-ups with associated technical reports on experimental tests	2011-2016
Task 4:active pre-alignment & monitoring in MDI	Development & qualification of solutions for: the determination of the position of QD0 w.r.t the 500m last meters, the relative monitoring of QD0 through the detectors, the re-adjustment within 6 DOF	Mock-ups with associated technical reports on experimental tests	2011-2016

Lead collaborator(s): CERN (Helene Mainaud-Durand et al.)- NIKHEF

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	1100	1250	1310	1220	1090	5970
Personnel (FTE):	12.3	14.3	12.8	11.8	10.4	61.6

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Survey and alignment:

➔2 possibilities of collaboration were discussed:

- ✓ with Ciemat (F. Toral) :
  - A Spanish technological centre TEKNIKER, is very interested to participate in the development of the alignment systems for two beam modules.
  - Funding could be by means of a National Program of the Spanish Ministry of science and Innovation, to be confirmed.
  - One possible project: manufacture of cam movers for the two beam modules.

- ✓ With JINR (M. Lyablin):
  - New concepts in the High precision large distance metrology are under investigation
  - Further technical discussion planned in December

➔ Technical collaboration with DESY: visit @ DESY planned week 46

➔ Collaboration with NIKHEF: Franck Linde could not attend this meeting, but will be at CERN week 47 to discuss Nikhef's longer term CLIC involvement.

CTC-QUA Quadrupole stability

WP: CTC-QUA: K.Artoos	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1:	Technology development	Rad hard sensors+actuators, vibration measurements and studies	2011-2016
Task 2:	Application to MB Quads	Prototypes for TBA module program, reports on experiments	2011-2016
Task 3:	Application to FF Quads	Prototypes for FF mock-ups program, reports on experiments	2011-2016
Task 4:	Integration	Controler designs, contribution to ATF2 experiments for feed-forward on ground motion.	2011-2016
Lead collaborator(s): LAPP – Lavista, SYMME, ASL, irfu CEA saclay			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	980	980	925	839	839	4565
Personnel (FTE):	11	9	8.9	8	8	44.9

CTC3 Quadrupole Stabilisation

Université Libre de Bruxelles (ULB), Belgium

CEA/ IRFU, Saclay, France

LAPP, SYMME, Annecy, France

WP: CTC-QUA: K.Artoos	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1:	Technology development	Rad hard sensors+actuators, vibration measurements and studies	2011-2016
Task 2:	Application to MB Quads	Prototypes for TBA module program, reports on experiments	2011-2016
Task 3:	Application to FF Quads	Prototypes for FF mock-ups program, reports on experiments	2011-2016
Task 4:	Integration	Controler designs, contribution to ATF2 experiments for feed-forward on ground motion.	2011-2016

⇔ Interaction with CD-MDI

⇔ Interaction with CD-SIM/ LUMI

CTC3 Quadrupole Stabilisation

	2012-2016 MoU		2012-2016 Possible	
	P (FTE)	M (kCHF)	P(FTE)	M (kCHF)
ASL/ ULB			5	
CEA/IRFU			1.5	~260
LAPP	8.4	~195		~195
SYMME	3	~13		

(In alphabetical order)
~ : Euro

CTC-TBM: two-beam module development

CLIC Linkperson: G. Riddone

WP: CTC-TBM	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1: Prototype design and fabrication	Engineering design of the two-beam modules, including eng. design of fully integrated components. Fabrication and assembly of components Girder R&D, integration of all module technologies	4 two-beam modules to be mechanically tested in a lab (generation 1) 3…6 two-beam modules to be mechanically tested in a lab (future generations) 3 two-beam modules to be tested with RF and beam in CLEX (generation 1) 3 two-beam modules to be tested with RF and beam in CLEX (future generations)	2011-2016
Task 2: Finite element simulations	Thermo-mechanical simulation of two-beam module behavior under different load conditions: estimation of resulting forces, deformations and stresses. Application of results to engineering design	Technical report with results of simulations; feedback to taks 1	2011 - 2016
Task 3: Experimental comparison of predicted and modeled performance	Experimental tests of technical system performance (vacuum, cooling, alignment,..) Experimental of overall module behavior under different load conditions Comparison measured with expected results Review of results and application to the engineering design	Realization of tests Analysis of results	2011-2016

CTC-TBM two-beam module development

WP: CTC-TBM: G.Riddone	Purpose/Objectives/Goals	Deliverables	Schedule
Task 4: Alternative designs	- Study of alternative module layout - Longer girders, common DB-MB girders, different materials - Longer RF structures - Permanent DB magnets - Mini-pumps replacing vacuum reservoir	New engineering design for the different options	2012-2016
Task 5: Industrialization	Towards cost optimization: - reduction of interconnections - reduction of components and module types Reduction of machining and assembly steps	New module layout New procedures	2013-2016
http://indico.cern.ch/categoryDisplay.py?categId=1794			
Lead collaborator(s): CERN (G. Riddone) , collaborators (HIP-K. Osterberg, NTUA-E. Gazis, CIEMAT-F. Toral, NCP-A.Nawaz,			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	2600	2850	2850	2850	2850	14000
Personnel (FTE):	16.5	16.5	17	17	17	84

Other comments: total modules considered for construction: 13-16 (see task 1);

All deliverables for modules (Alignment, Stabilization, BI, vacuum, RF structures etc) paid by TBA module budget.

- DUBNA-JINR
  - Engineering design and integration, QA: mechanical engineers at CERN
  - **Next**: extend the collaboration with the production of module components (dedicated meeting with top management on 14-15.11
- Greece – several universities
  - engineering design, databases, labview programming, alignment/supporting system studies, radiation tests
  - **Next**: organize a dedicated meeting to understand better the contribution
- CIEMAT
  - PETS for the two-beam modules in CLEX
  - **Next**: extend the collaboration to RF components and definition of quantities until 2016
- RRCAT
  - **Next**: PETS and RF components production – definition of the “addendum”

- ACAS
  - Module assembly and alignment
  - **Next**: dedicated meeting to finalize task and ressources
- HIP/NorduCLIC
  - FEA , cost study and industrialisation, test results analysis
  - **Next**: team will grow and new people will come to CERN
- NCP
  - Engineering design of module components and fabrication of vacuum components
  - **Next**: extend the collaboration to the production of the RF structures for the module (prototype parts already made at NCP) – Organization of a meeting to discuss details and results from prototype measurements

WP: CTC-WMP Warm Magnet Prototypes

WP: CTC-WMP: M.Modena	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1: Normal conducting Magnet Design Catalogue	First optimization of magnet designs for size, weight, power consumption, cost of series production.	Release a detailed study (the "Catalogue") for all magnet sub-systems in CLIC. Follow sub-systems design evolution	2011-2016
Task2:Prototypes and small magnets series for CLIC Module Test programs (LAB and CLEX)	Design and procure prototypes and magnets for 4 + 3 Modules to be installed in Lab and CLEX test programs (EM vesrions)	Minimum of 2 MBQ Type1 and 1 of Type4, 6 units of DBQ (EM version) needed for CLEX operation.	2011-2016
Task3:Hybrid Permanent magnet high gradient Quadrupole design and short prototyope	Design of QD0 magnets and anti-solenoid system for CLIC Experiments for integration studies in MDI (see aklso WP CTC-007)	Short prototype construction and eventually full size prototype construction. Beam test for validation if possible	2011-2016
Task4: Drive Beam Quadrupole Tunable PM prototypes	Design and procurement of prototypes magnets for DBQ based on alternative design (Tunable Permanent Magnet)	2 prototypes (High Gradient and Low Gradient range). The Low Gradient prototypes will be compatible with CLIC Modules layout for eventual test inCLEX Program	2011-2016
Lead collaborator(s): CERN-(M. Modena et al.); UK collaboration			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	320	320	320	370	320	1650
Personnel (FTE):	7	7	7	7	7	35

News

- None, but well established collaboration within the CERN-UK collaboration package.

CTC-BDI: Beam Instrumentation

WP: CTC-BDI: T.Lefevre	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1: Refinement of specifications	- From parameter to Functional specifications - R&D on intensity, polarization and luminosity measurements - Development of Damping ring instrumentation in collaboration with B-factories and light sources	-Functional specifications - Prototype of each monitor	- End of 2016 - End of 2016
Task 2: BPM development	- Demonstrate the high resolution of CLIC cavity BPM prototype (linac and BDS) and its read-out electronic - lab and beam test - Build and test DB decelerator strip line BPM and its read-out electronic – lab and beam test – Iteration for Cost optimization - Develop of narrow-band high frequency (1-2GHz) combiner diagnostic for Damping ring delay loop and test on CTF3 - RF simulations for estimation of wakefield effects and interference due to the presence of high field in PETS and Acc. Cav.	- Prototype of 14GHz cavity BPM - Prototype of a DB decelerator BPM - Prototype of a combiner BPM	- End of 2015 - End of 2014 - End of 2015 - End of 2013
Task 3a: Emittance measurements	-Design and integration of Laser Wire Scanner in BDS and Drive Beam complex -Technology development for high power fibre laser -Study alternative option for high spatial resolution non-destructive profile monitors (UV Diffraction radiation) -Develop and test imaging techniques for the high energy spread beam at the end of the DB decelerator	- Experimental validation of a CLIC Laser Wire Scanner on ATF2 with BPM -Experimental validation of a CLIC UV DR monitor on CESRTA -- Experimental validation of a DB decelerator imaging sytem on CTF3	- End of 2016 - End of 2013 -End of 2014

CTC-BDI: Beam Instrumentation

WP: CTC-BDI: T. Levefre	Purpose/Objectives/Goals	Deliverables	Schedule
Task 3b: Longitudinal Emittance measurements	- Development of 20fs time resolution longitudinal profile monitor using EO techniques - Development and test of cheap high resolution bunch length monitor based on Coherent Diffraction Radiation	- Prototype of each monitor	- End of 2014 - End of 2016
Task 4: BLM development	- Monte carlo Simulations - Develop a BLM only sensitive to charged particle for the Damping rings -Develop and Qualify a cost effective detector technology for CLIC modules	- Functional specifications -Prototype of each monitor	- End of 2016 - End of 2014 -End of 2015
Lead collaborator(s): CERN (L. Soby, S. Smith et al) – RHUL (S. Boogert et al) – Fermilab (M. Wendt)			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	1280	1265	1400	1430	1370	6745
Personnel (FTE):	16.3	16.5	17.65	17.4	16.4	84.25

Discussion on CLIC Beam instrumentation – 3/11/2011

- ***North-Western University of Illinois***: no more funding for CLIC but can provide Students

- ***LBNL***: Providing devices for imaging system for photons in the keV range: **Table received**
  - Devices to be tested as X-ray beam size monitors for Damping ring on existing light source and/or CESRTA

- ***RHUL/Oxford***: **Existing k-contra**ct for several developments : Cavity BPM / OTR / LWS and testing on ATF2

- ***University of Dundee / ASTeC-Daresbury***: **Existing k-contract** on Bunch length measurements using E-O techniques

- ***LAPP/Annecy***: Drive Beam BPM electronic, also part of the CLIC control workpackages – **Table received**

- ***U. Barcelona***: **Interest** to continue working on the CLIC Beam Position Monitor electronic . 1FTE

- ***IFIC***: Involve in the design of CTF3 / Drive Beam Beam Position Monitor also part of the CLIC0 instrumentation workpackages: **Table received**

WP: CTC-PCLD Beams disposal (post collision line and dumps)

WP: CTC-PCLD: E.Gschwendtner	Purpose/Objectives/Goals	Deliverables	Schedule
Task 1:Post Collision Line Design	Detailed designs by simulations/calculations	Feasibility Report of MB water dump by end 2012 Feedback from simulations on experiments background to dump line design. Integration study with BDS. Designs end 2014	2011-2014
Task2: Luminosity instrumentation	Choice of luminosity instrumentation; Evaluation of expected performance	Report on choice; simulations; signal quality of Luminosity signals. Feedback to beam dynamics.	
Task3: Water dump designs: -studies /design of MB dump -studies/design of DB dump - preparation of CLIC0	Detailed designs by simulations/calculations. Collaboration with ILC	Specifications for DB dumps (full DB power?) Designs, engineering for CLIC0 dump	2011-2016
Lead collaborator(s): Minsk (SOSNY institute)			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	200	200	200	200	200	1000
Personnel (FTE):	1.2	2.2	2.2	2.2	2.2	10

News

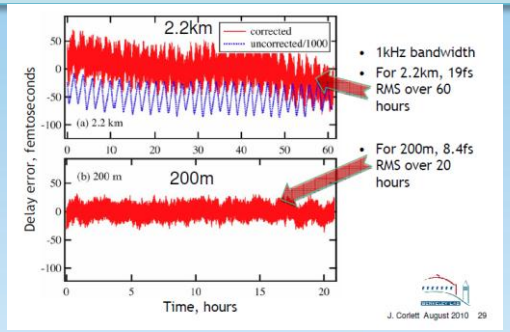
- Meeting with top management from Minsk (SOSNY institute) was planned during 3./4.-11. Meeting.
  → delayed by 2-3 weeks due to small accident of lab-director.
- Expect MoU for simulation work on beam dumps and potential prototype fabrications signed this year and project associates working at CERN from january 2012.

WP: CTC-CO Controls

WP: CTC-CO: M.Draper	Purpose/Objectives/Goals	Deliverables	Schedule
Task1: Timing reference , timing distribution and 10 fs synchronization	Review of specifications, design of fine-timing system, first practical realization	Specifications, Designs, Lab set-up of master-clock and distribution system, Timing reference for CTF3? Provide models for integrated studies	2011-2014
Task2 : Module read-out	Design of a generic read-out system for all TBA module systems: low power, rad-hard, compact.	Prototypes tested in CTF3	2014-2016
Task3: Design of complete control system	Design of system, better cost estimate, interface specifications for equipment	Designs, interface specifications	2014-2016
Lead collaborator(s):			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	120	500	1000	500	120	2240
Personnel (FTE):	1.5	3	5	3	1.5	

Collaborations (some planned) university of ANKARA, DESY, LNBL, PSI, LAPP



Controls WP

- Task 1: ft second timing: no support from external collaborators so this task has been dropped.

- Task 2: Module read-out:
  - Agreed to formalize collaboration between LAPP (S. Vilalte) and BE-CO (M. Vanden Eynden & J. Serrano).
    - Will collaborate on specifying and prototyping the Acquition Control Module (ACM) for all equipment classes (BI, Vacuum, RF, Power Converters, CV).
    - Propose the platform (microTCA, PCIe, ..), read-out electronic cards, the communications between the ACM and the front-end processing equipment (e.g. GBT in collaboration with PH),and the controls s/w needed .
  - LAPP will provide 2.5 FTE or electronics engineers + 0.5 FTE front-end s/w + 10-20kEuros/year.
  - BE-CO can provide 1 FTE (fellow from 1Q2012) + up to 1 FTE (across many people).
  - Start-up meeting between CERN and LAPP (10/11/2011) where technical issues/choices will be documented. Plan how work will be split between LAPP and CERN.
  - Define successive phases (iterative approach with functional prototype systems) to be installed on CTF3 and other Cern accelerators

- Task3: Design of control system: Will not start before 2014. Depends on Task 2.

WP: CTC- RF systems

WP: CTC-RF E.Jensen	Purpose/Objectives/Goals	Deliverables	Schedule
Task1: Prototypes of 15 MW 1 GHZ klystrons for DB generation	Contracts with at least 2 industry partners for the development of one (each partner) working 15 MW klystron at 1 GHz and 70% efficiency.	2 working prototypes, options for the procurement of more units	2011-2016
Task2 : Designs of DB accelerator/cavities	Overall DB design as a large power plant	Designs	2011-2016
Task3: DB LLRF design	Design of LLRF system for DB with optimization for phase and amplitude stability	Designs, measurements at other plants, modelization tools	2011-2016
Task 4: Further designs on DR RF system and feasibility review	Further study on 3 present design options	Design studies, review, decision	2012-2013
Lead collaborator(s):			

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	100	1000	1000	1500	1500	5100
Personnel (FTE):	5	5	5	5	5	25

Activity not started, needs people from BE-RF, needs dedicated WG with people from TE-EPC and EN-EG

News

- Proposal by INFN to work on combiner ring RF deflectors (task2)

WP: CTC-EPC powering

WP: CTC-EPC: S.Pittet	Purpose/Objectives/Goals	Deliverables	Schedule
Task1:Modulators for DB generation	Revision of specifications, design for highest efficiency for various pulse lengths, prototyping	Modelization tools Measurements at existing plants, development of high precision measurement systems 2 working modulators for DB klystrons	2011-2016
Task2 : Contribution to Designs of whole DB complex	Overall DB design as a large power plant (building, energy supply, cooling, interface to French power plants). Main electricity consumer: modulators for klystrons.	Designs of modulators/racks/controls/infrastructure	2011-2016
Task3: Powering schemes for CLIC complex	Follow up of CLIC design changes, designs for powering systems, space reservation, cost estimate	Designs and updated cost estimate	2011-2016
Task4: Module Magnets Powering Schemes	Alternatives electromagnets/permanent magnets with trims; optimization of total energy consumption; machine protection optimization	Designs	2011-2016
Task5:Rad Hard trimmers for strength	Design of trimmers for magnets in main tunnel (powered in series). Rad hard design and qualification	Design and qualification	2011-2016

Resources:	2012	2013	2014	2015	2016	Total
Material (kCHF):	505	860	1350	630	455	3800
Personnel (FTE):	8.1	10.1	12.1	10.1	6.6	47

Just starting activity, needs dedicated WG with people from BE-RF and EN-EL

News

- Expression of Interest by RRCAT (India) to build a prototype of the modulator for the high power 1 GHz klystron (Dr. P. Shrivastava)
  → will be followed up
- “we have several new collaborations close to be finalized” =
  quote S.Pittet (subjects not treated during this event).

Summary

- Not mentioned CTC workpackages have not been treated during this event, but collaborations exist.
- Large interest in collaborations with a high match of proposed activities to the real needs of the project.
- General tendency: Solid proposals or commitments for the next 2 years; Reluctance to go beyond.
- Sparse proposals for financial contributions; dominant EOI's are for manpower; this will need good organisation for follow-up and communication.