

## **HEL Organisation**

#### A. Rossi for the HEL team

HL-LHC Hollow Electron Lens (production) kick-off meeting – 13 April 2021

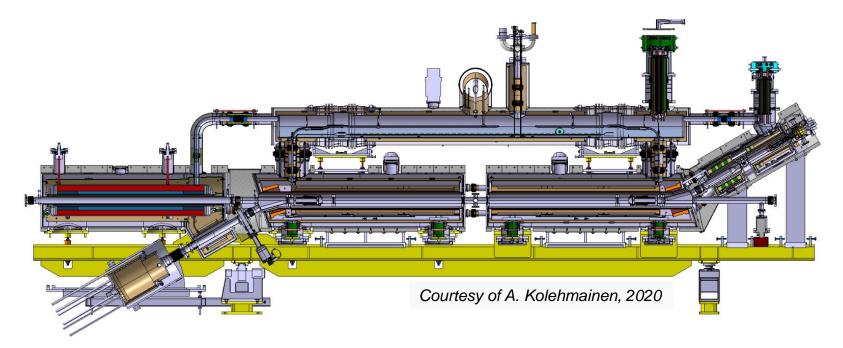
## Layout

- HEL Deliverables
- Scope (including testing)
- WBS and responsibilities and proposed sub-WP organisation (meetings etc.) and reporting lines to WP5/HL-LHC
- Timeline/planning and main milestones (including external design reviews etc.) – high level

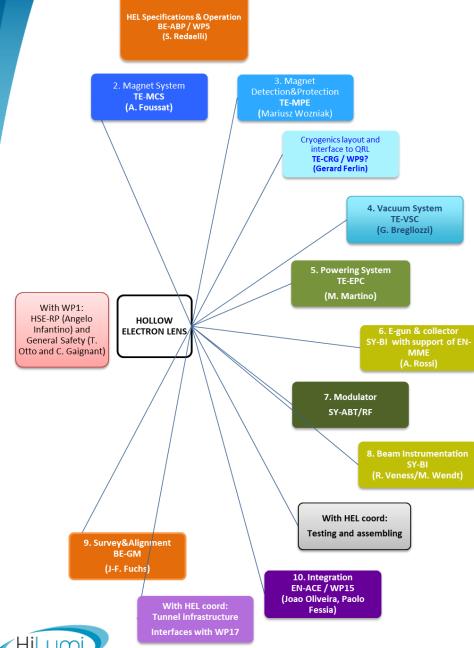


## **HEL Deliverables**

- 3 Hollow Electron Lens units, of which one spare
  - HEL.L4 and HEL.R4 are not entirely symmetric, spare prepared with magnetic system and vacuum (see Diego's and Joao's talk for details)







### Hollow Electron Lens organisation proposal

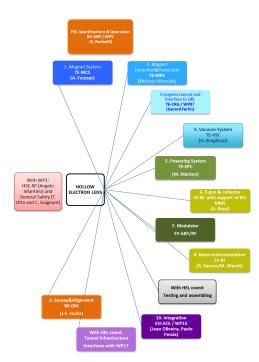
- Work subdivided by
  - HEL Subsystems
  - Tests
  - Integration/Installation/ Infrastructure
  - Safety
- Budgets with groups
- Integration, testing and installation budget with coordination
- Report to HL/WP5

Colour coding with department – group Responsible names to be confirmed by groups

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- WP5.2 Collimation Studies
  - HEL Specifications (S. Redaelli, R. Bruce BE-ABP)
- sWP5.3 Hollow Electron Lens
  - 1. Coordination (A. Rossi SY-BI)
  - 2. Magnet System (A. Foussat TE-MCS)
    - Magnetic Design (AF & D. Perini EN-MME)
    - Internal Busbars
    - Ext. Busbars (M. Martino SY-EPC)
    - Girder (AR & DP)
    - Cryogenics (G. Ferlin TE-CRG)
    - Magnet Assembly & Cold Testing (at Cryo-Facility = G. Riddone TE)
      - Metrology (Ahmed Cherif EN-MME)
      - Magnetic Measurements (?)

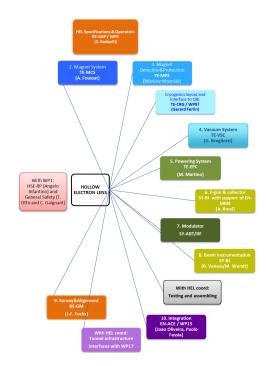
1.a Cold magnet testing (with coordination). If Cryo-facility (TBC) – G. Riddone (TE)





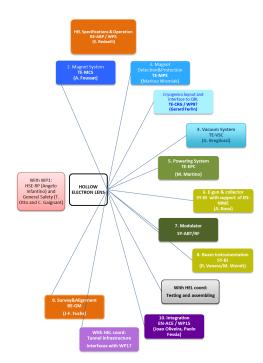
- 3. Magnet Detection & Protection (Mariusz Wozniak TE-MPE)
- ♦ Cryo Layout and QRL interface (G. Ferlin TE-CRG in WP9)
- 4. Vacuum System (G. Bregliozzi TE-VSC)
- 5. Powering System (M. Martino SY-EPC)
  - Magnet DC powering
  - HV (gun/modulator-collector) (D. Aguglia)
- 6. Electron Gun and Collector (AR SY-BI)
- 7. Gun Modulator (RF/ABT?)
- 8. Beam Instrumentation (SY-BI)
  - BPM (M. Wendt)
  - BGC (R. Veness)
- 1.b (with coordination) E-Beam Test Stand (S. Sadovich/ J. Cenede) for
  - Electron gun and collector
  - Beam instrumentation
  - Gun modulator
  - HV powering





#### 10. Survey & Alignment (J-F. Fuchs BE-GM)

- 11. Integration
  - Transport and installation
- ♦ Tunnel Infrastructure (interface with WP17)
  - Modification of green doors (Jordi Bossy EN-ACE)
  - Water Cooling&Ventilation EN-CV (M. Battistin)
  - Cabling EN-EL
    - Powering (D. De Luca)
    - Signals (G. Girardot)
    - Fibers (Jeremy Blanc)
    - 220V Sockets (Nuno de Santos)
- ♦ Safety With WP1
  - Radio-Protection (T. Otto)
  - General Safety (T. Otto & C. Gagnant)





	Group	In-kind	Acceptance Tests									
Magnets systems (solenoid, correctors, cryostats, leads)	TE-MSC	YES, built to spec (BINP)	BINP for procurement, final assembly / testing @CERN Cryo-facility									
Quench detection and Energy Extraction system	TE-MPE	NO										
Cryogenics system (connection to QRL)	TE-CRG	NO										
Supports and feet	SY-BI	YES, built to spec (BINP)										
Vacuum systems	TE-VCS	YES built to print (BINP) Pumps and vacuum instrumentation as standard LHC	Validation Y chamber @CERN Pre-assembly leak-test @BINP									
Beam instrumentation: BPM, BLM		YES built to print (BINP) Electronics in House	BPM @CERN EBTS* BLM standard LHC									
Beam instrumentation: BGC	SY-BI	YES (UK-CI) Electronics in House	BGC @CERN EBTS									
Gun and collector		YES built to print (BINP)	Gun & collector @CERN EBTS									
Power converters DC and HV	TE-EPC	NO	HV powering @CERN EBTS									
Anode Electron beam Modulators	SY-ABT or RF	In study	Modulator @CERN EBTS									
Cabling, integration, transport, cooling, alignment		NO										
Powering Interlock controllers		NO	HV powering @CERN EBTS									
* EBTS = Electron Beam Test Stand												



## **Timeline from now**

- Consolidate resources (budget and manpower) by end of May '21 and sub-WP structure
- Complete functional specs for all systems and ECR for installation by Nov. '21
- Validate list of milestones and deliverable per task
- Monthly/bimonthly meetings for all contributors
- Engineering reviews by subsystems (proposal), including testing
  - Dec. '21 Magnet System CERN functional design
  - Mar. '22 Gun CERN engineering design
  - Jun. '22 Modulator CERN design
  - Nov. '22 Collector CERN engineering design
  - Dec. '22 BLM, BGC and BPM CERN design/
  - Mar. '23 HV powering system

First half '23 integration review to finalise TDR

- May. '23 Magnet System BINP engineering design
- HEL Full Engineering Documentation date . . .
- Production review with BINP and UK collaborators . . .



# Overall planning to be worked out both internally and with BINP

Hollow Electron Lens: Overall Planning		2021				2022				2023			2024			2025			2026		
	JFM	AMJ	JASO	DND	JFM	A M J	JAS	OND	JFN	ANJJAS	OND	J F M A	I I M A	A S O	N D J	FMAM	JJAS	OND	JFMAM	JJASC	
Magnet System																					
1 CERN Functional Design					Integra	ted fun	ctional d	lesign re	view												
2 Manufacturing Design BINP							•						, î	-							
3 First of in-kind HEL0										nstall	ati	n	nrc	ha	hl	v in	20	26			
4 Series HEL1, HEL2										Istan	au		pre	00		уш	20	20			
5 Final HEL magnet sub-systems in-cryostat assembly	@ CERN						1														
6 Cold power surface commissioning b180															<	ady for inst	A starting				
Gun, Collector																					
7 Gun design, prototyping and tests @ CERN EBTS		4	-			1	Ż			Gun desi	gn valida	ted							<u>مرح</u>		
8 Gun drawings & production @ BINP							1	1											~1014-		
9 Gun testing @ CERN EBTS						1	1	1										2	11V		
0 Collector design, study, proto, tests @ CERN EBTS	design	study	prototyp	oing		test	s at EBTS	s 🔻		Collect	or desig	n validate	d				-0	BU			
1 Collector drawings & production @ BINP		- ' '	Î	J			1	1					Í			-	NTK		TIONS		
2 Collector testing @ CERN EBTS																c O	1.				
3 Tunnel infrastructure for HEL ready- Cable , rack and	d electror	nic														7.00					
Instrumentation														. 1	1 P						
4 BPM studies, prototyping and tests @ CERN EBTS						$\leftarrow$			7	BPM d	esign va	lidated, re	ady for B	BINR							
5 BPM drawings & production @ BINP + tests @ CERN	V												-N	Ν.							
6 BGC												-15	<b>2</b> 0								
7 Tunnel infrastructure for HEL ready- Cable , rack and	d electror	nic									-	LE!	~								
Modulator											N/										
8 Modulator design and test @ CERN EBTS			des	sign					test	is at EBTS 🕜	), , (	Modulat	or design	validate	d, read	y for BINP					
9 Modulator production at BINP ?							1	1		of.	1										
0 Modulator testing @ CERN EBTS									~(	105											
Power Converter								-	( ) )	Y											
1 Design and documentation							C	DY.	<b>`</b>												
2 Refurbishment of 120A and 600A DC PC from LHC							101				1										
3 Procurement of 600A DC for main solenoid						R	۲×	1			1										
4 HV power converters procurement					NI	ייא.	ļ	ļ			1						1				
5 HV power tests @ EBTS				11.	111.		1	1		test	s at EBTS										
6			-of	こう	•	ļ	1	1			1										
Cryogenics			pri							s at EBTS BE											
7 Cryogenic facility adaptation (BINP?)			•				1	1													
8 Installation of QRL cryomodules							1	1													
Cabling and asncillaries																					
9						1	1	1		1	1		1				1	1			
EBTS = Electron Beam Test Stand (resistive magnets)																					
reports / internal reviews																					



# Scope of the kick-off meeting

- Validate the HEL functional specifications:
  - Subsystem to specs
- Delineate a HEL reference design (as a starting point to organise the work),
- Describe the work break-down structure and responsibilities,
- Give a first estimate on budget/resources,
- Define what has to be done at CERN (and with what additional resources from in-kinds) and what can be outsourced including validation measurements, assembly and testing.
- Highlight open points



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