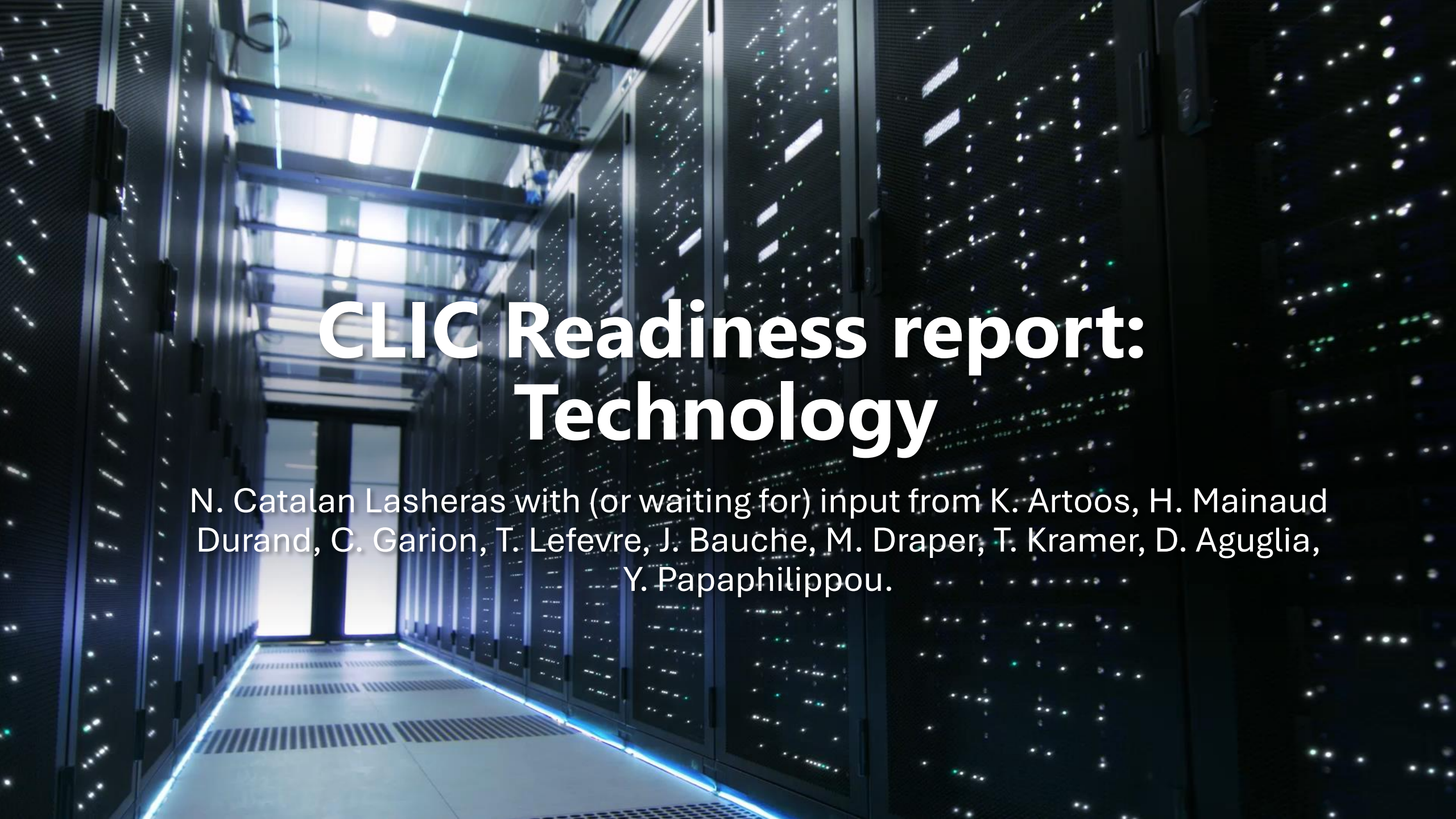
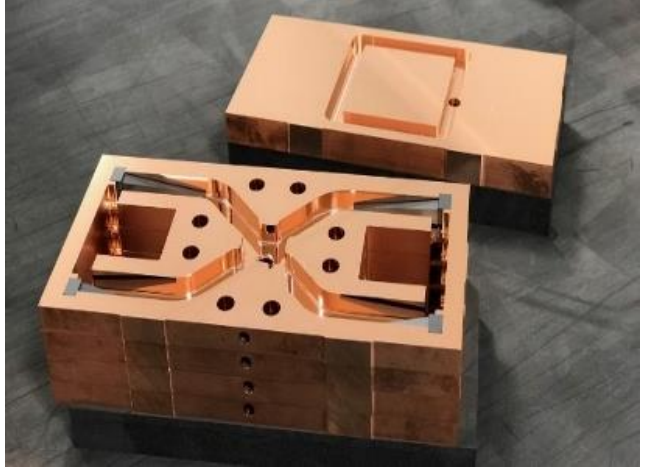


CLIC Readiness report: Technology

N. Catalan Lasheras with (or waiting for) input from K. Artoos, H. Mainaud Durand, C. Garion, T. Lefevre, J. Bauche, M. Draper, T. Kramer, D. Aguglia, Y. Papaphilippou.

Rationale

- What type of technology has been specially developed for CLIC?
- What is the current status?
- Have we a prototype?
- Anything new since the PiP (2019)?
- Has this technology been used/proposed for other projects?
- New publications



15th International Particle Accelerator Conference,Nashville, TN

-247-9 ISSN: 2673-5490 doi: 10.1842

-EFFICIENCY KLYSTRONS FROM A DREAM TO A

. Lasheras†, I. Syratchev, Z. Un Nisa, P. Alonso Arias, C. Marrelli, O.
Geneva, Switzerland
A. Baig, G. Burt, University of Lancaster
ai, University of Electronic Science and Technology of China, Cheng
T. Anno, CETD, Otawara, Japan
A. Beunas, K. Haj Khlifa THALES, Vélizy-Villacoublay, Franc

THE DREA

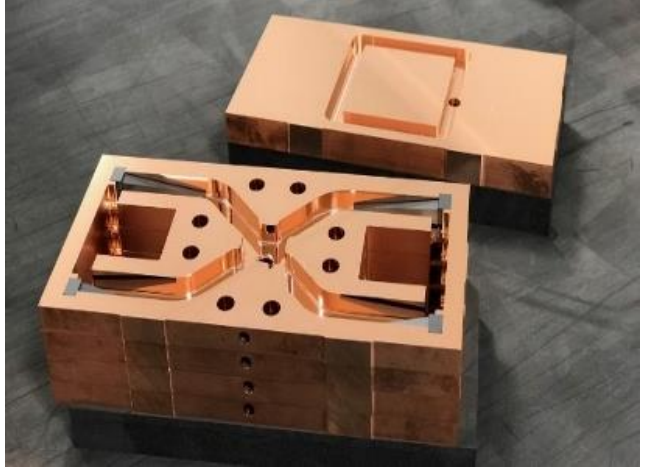
ast decade a comprehensive R&D program
ıcy klystrons has been carried out in collab-
dustry. The first prototypes are being tested

The high efficiency klystrons p

Radiofrequency systems

- PETS to transfer the drive beam LINAC. Nothing new since 2019
- High R/Q structures for beam loading. New development for damping rings. Design finished. Under prototyping
- High Gradient normal conducting structures for the main LINAC. New prototypes for 380 GeV. Smart disks. Used in DESY, PSI, Eindhoven
- (High stability modulators)
- High efficiency Klystrons. Strong development since 2109. New prototypes for CLIC test benches, L-band design. HL-LHC klystrons
- Pulse compressors. New design and prototype

Many new papers!



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Many new papers

Injection

- (Inductive adder) New measurements in Alba
- (Strip-line electrodes for homogeneous field)

Controls

- Many controls under development in 2019 has been implemented or being in production. Waiting for input

Stabilization

- Stabilization systems. Could benefit FCC
- Inertial sensors
- Nothing new from PIP since PACMAN prototype

Injection

- (Inductive adder) New measurements in Alba
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Controls

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Stabilization

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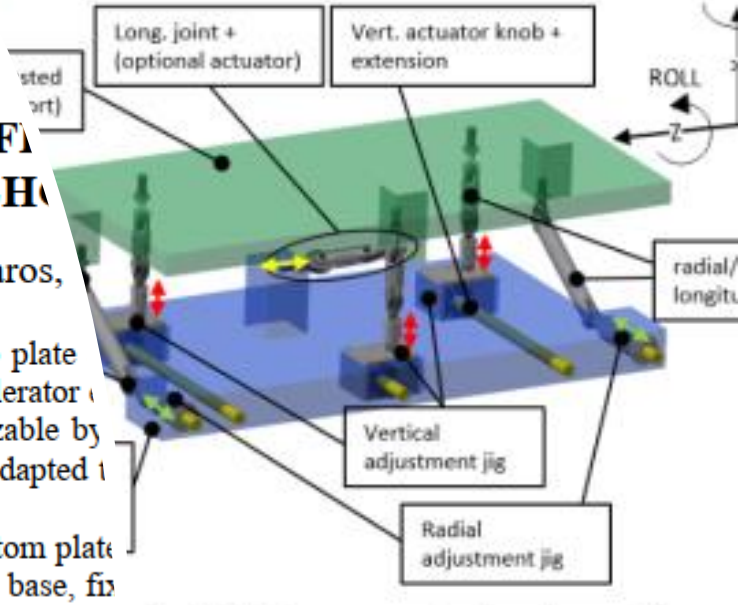
- Inertial sensors
- Nothing new from PIP since PACMAN prototype

Alignment

- WPS (Wire Position System): new shape, far-away electronics.
- New line of sensors for FSI (frequency Scanning interferometry)
- Optimisation or 6-D adjustment platform
- +3 publications

<u>All new developments for HL-LHC</u>



1: UAP conceptual schematic.

ator Conf. IPAC2019, Melbourne,
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D STUDY OF A 6 DEGREE-OF-F
MENT PLATFORM FOR HL-LH

zyk, H. Mainaud Durand, A. Herty, J. Jaros,

e safe and easy alignment of
ive areas is a main concern.
s magnets and collimators,
rgonomic way to decrease
he personnel. Each equip-
t of requirements such as
on accuracy. The two op-
d, a simple and time-con-

- The Top plate
the accelerator
customizable by
can be adapted
ment;
- The Bottom plate
platform base, fix
part includes adju
also customizable

. Conf. IPAC2021, Campinas, SP, Brazil
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ST OPTICAL INSTRUMENTATION F
IENT USING FREQUENCY SCANNIN

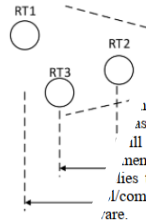
Mainaud Durand, F. Micolon, V. Rude, J. M. Rutk

alignment of components inside particle
an important engineering challenge in high-
cs. Optical interferometry, being a precise,
ice measurement technique, is often a method
such applications. However, classical fringe-
nterferometers present several drawbacks in
system complexity. Due to the increasing
ty of broadband, high-speed, sweeping laser
Frequency Scanning Interferometry (FSI) based
s, using Fourier analysis of the interference signal,

TE ALIGNMENT SYSTEM FOR THE HIGH-LUMINOSITY LARGE HADRON COLLIDER HL-LHC

Blanco Vinuela, C. Cala Franco, J. Cobas, M. Di Castro, M. Donze, J. Falcao
rgier, B. Fernandez Adiego, A. Herty, J. Kampp, F. Klumb, W. Jasonek#, M.
inaud Durand, A. Masi, M. Noir, P. Peronnard, B. Schofield, P. Sollander, M.
Sosin, V. Rude, CERN, Geneva, Switzerland
#AGH University of Science and Technology, Krakow, Poland

ity Large Hadron Collider (HL-LHC)
the LHC to achieve instantaneous
or five larger than the LHC nominal
Long Shutdown 3, scheduled between
arly 1.2 km of accelerator components
y new ones, relying on key innovative
Full Remote Alignment System (FRAS)
ed to perform the remote alignment of
HC components. FRAS will enhance the
formance, decrease the required orbit
ths, all of this while limiting the radiation
veyors working in the tunnel, therefore
more frequent alignment campaigns.
olutions for the remote adjustment and
termination of the components are being
cluding the internal monitoring of the position
ass and crab cavities inside their cryostat. This
ll provide a status of the systems under
ment and qualification, from the sensors and motor
ies to the low level / high level acquisition and
l/command systems and their corresponding
are.



Figur
sche

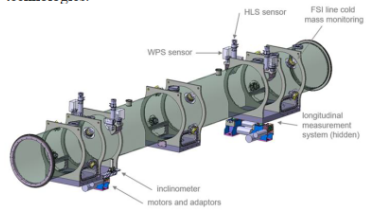
INTRODUCTION

The Full Remote Alignment System (FRAS) for the HL-LHC project [1][2] will perform the remote alignment of components located on both sides of the Interaction Points

strategy, from the solutions to perform the remote position determination and their motorized adjustment to the acquisition and control/command systems and associated software. It will conclude with the qualification plan of this new alignment concept.

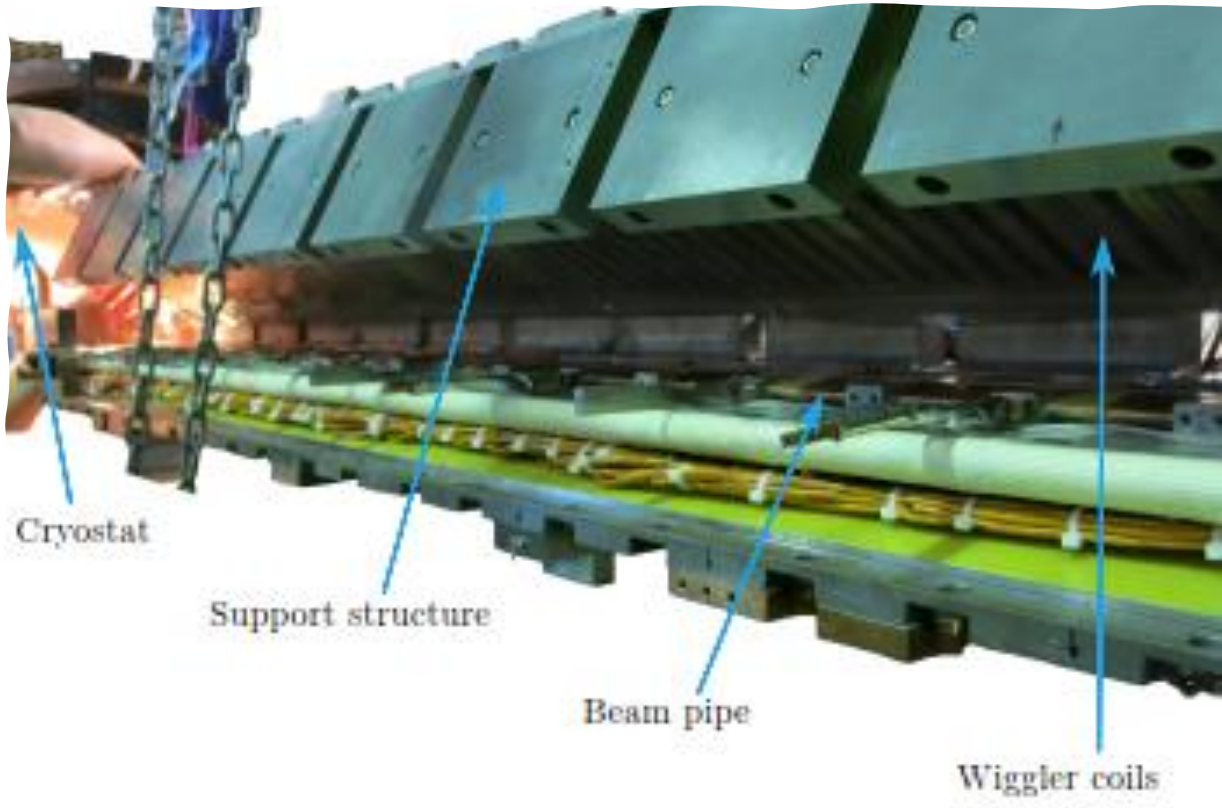
SOLUTIONS FOR REMOTE POSITION DETERMINATION

The remote determination of the components position will be performed by a redundant configuration of different types of sensors, using diverse technologies, namely: Wire Positioning Sensors (WPS) based on a capacitive technology, Hydrostatic Levelling Sensors (HLS), based on Frequency Scanning Interferometry (FSI) technology [4] and inclinometers, based on both FSI and capacitive technologies.



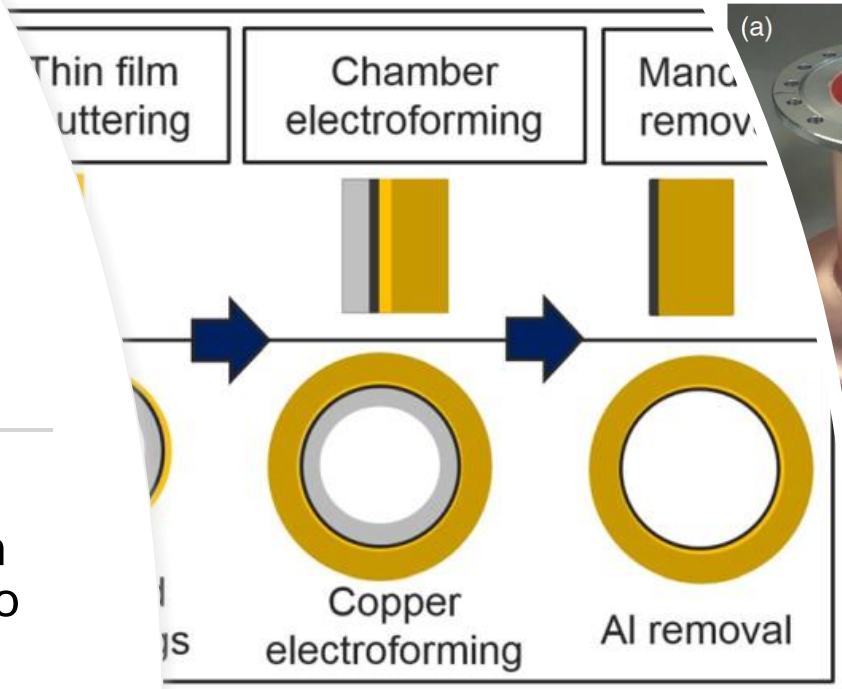
Magnets

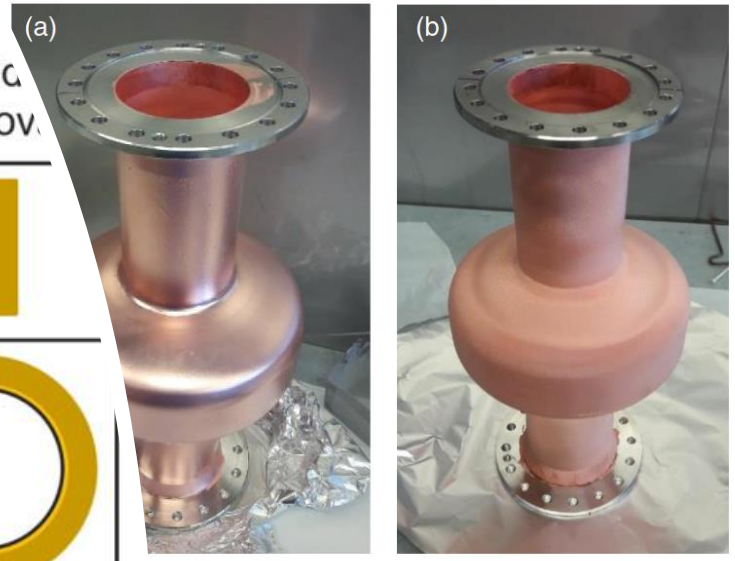
- (Tuneable permanent magnets) Diamond?
- (Small magnetic measurement probes)
- (Longitudinal variable permanent magnets) Prototype for CLIC finished
- (Superconducting damping wiggler) Experimental results in KIT



Vacuum

- Low aperture copper vacuum pipes with NEG coating. Some new publications. No application yet but some interest from institutes (PSI)
- SMA connector not developed for CLIC but could be used. Some additional publications. Used in HL-LHC and proposed for FCC.
- Deformable RF Bridge: It is used currently in CLIC and will be used in HL-LHC warm and cryogenic sections. Under consideration for FCC
- + 9 publications!!





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Electrodeposition of copper applied to the manufacture of seamless superconducting rf cavities

L. Lain Amador, * P. Chiggiato, L. M. A. Ferreira, E. Garcia-Tabares, T. Koettig, M. S. Meyer, A. T. Perez-Fontenla, K. Puthran, G. Rosaz, and M. Taborelli
CERN, 1211 Geneva 23, Switzerland

(Received 6 May 2021; accepted 26 July 2021; published 16 August 2021)

Niobium thin film coated copper superconducting radio frequency elliptical cavities have demonstrated for many years their strong potential as an alternative to bulk niobium cavities. The thin film lower performance at high rf field is often attributed to the defects observed in the elaborated Nb layer, sometimes originated from defects inherited from the substrate itself. The currently used methods of manufacturing the copper elliptical substrates include several steps of electron-beam welding in order to join the half cells and the cutoffs which can contribute to defects and porosities. Seamless methods are nowadays developed in order to avoid welding steps and to decrease the global manufacturing cost of the cavities. We propose in this study an innovative alternative route in which the cavity is formed by electrodeposition of copper on a sacrificial aluminum mandrel. The strength of the process relies on the total absence of welding joints. Two different electroforming techniques using either direct current or pulsed plating have been investigated. The electroformed copper exhibited similar mechanical robustness, cryogenic properties

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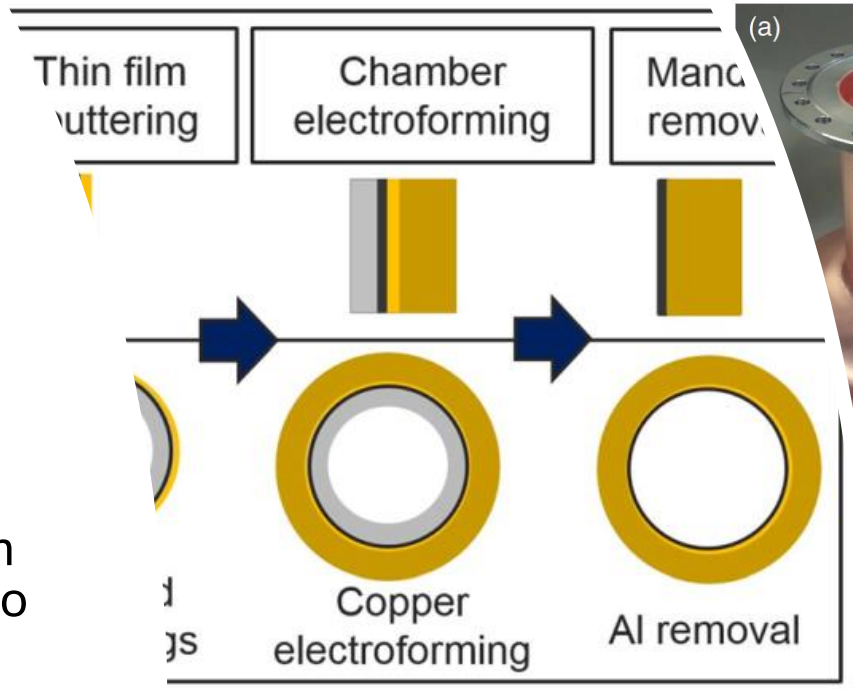

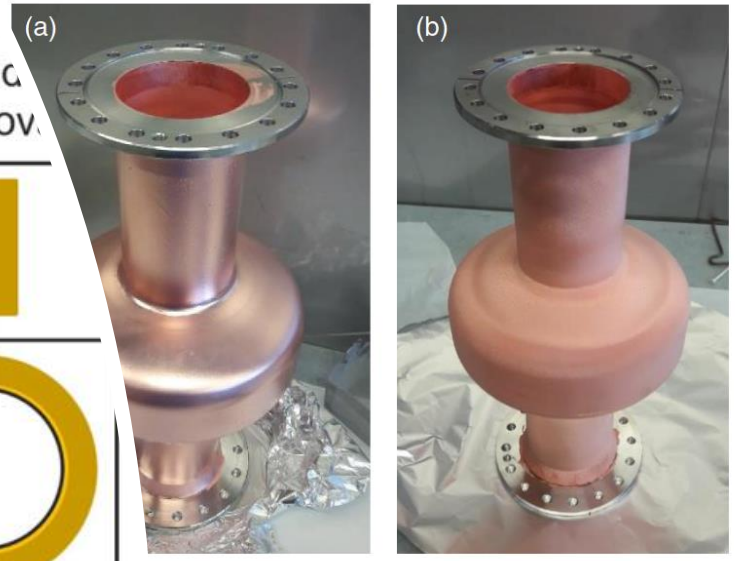

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Beam Instrumentation

- Low Q cavity BPM
- Short bunch length monitor Using RF and EO techniques. Also developed for AWAKE and FCC
- Polarisation radiation techniques studied in ATF2
- Beam loss monitoring techniques using distributed detectors in long optical fibres. Also developed for NACONS and FCC
- Waiting for details and publications

Other systems

- Smarts solutions that are also used/needed by other accelerators and for which we have not prototyped anything special
  - Interlocks, Controls, Alignment, Dumps, Collimators, Photon absorbers, Compact and radiation resistant controls, efficient CV systems, timing, data management systems, compact magnets
- Also mention commercially available systems (uTCA, Ion/NEG pumps, DIOTS, CAM movers)
- Anything else?

Work to be done

- Finish compiling new developments, prototypes, results, publications on technology since 2019
- Write new paragraphs for each item, add them to the existing ones and probably shorten the text

- Make sure that the technologies mentioned have been introduced in the systems chapters

Thanks!!