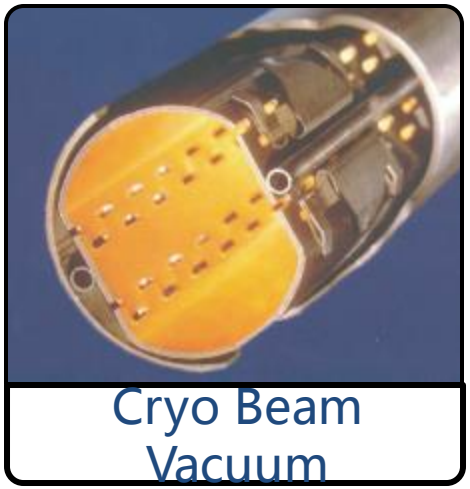
WP4
Cryogenic Beam Vacuum System Conception



Summary

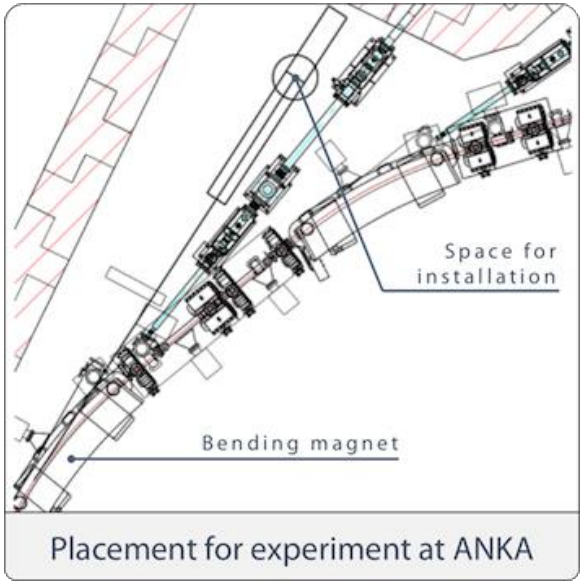
Francis Perez

Objectives

To develop the technical design concept for the cryogenic vacuum beam pipe,
with constrains:

- Beam screen
- Cryogenics
- Magnet core bore

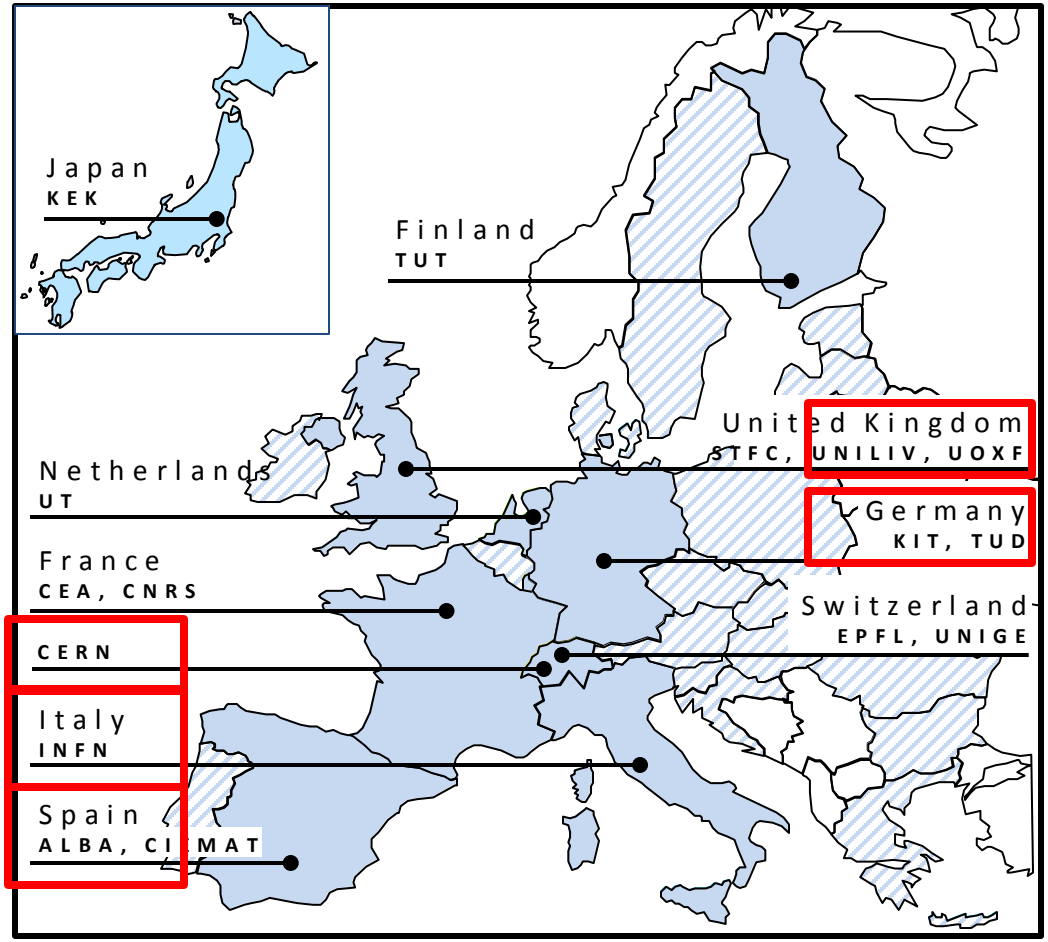
To test a beam screen prototype in the ANKA light source with similar synchrotron light conditions



Team

CERN	IEIO
KIT	Germany
INFN	Italy
ALBA	Spain
CIEMAT	Spain
STFC	United Kingdom

Man power, hardware cost is not included in EuroCirCol



Tasks

Task 4.1: Work Package Coordination

Task 4.2: Study beam induced vacuum effects

Task 4.3: Mitigate beam induced vacuum effects

Task 4.4: Study vacuum stability at cryogenic temperature

Task 4.5: Develop conceptual design for cryogenic beam vacuum system

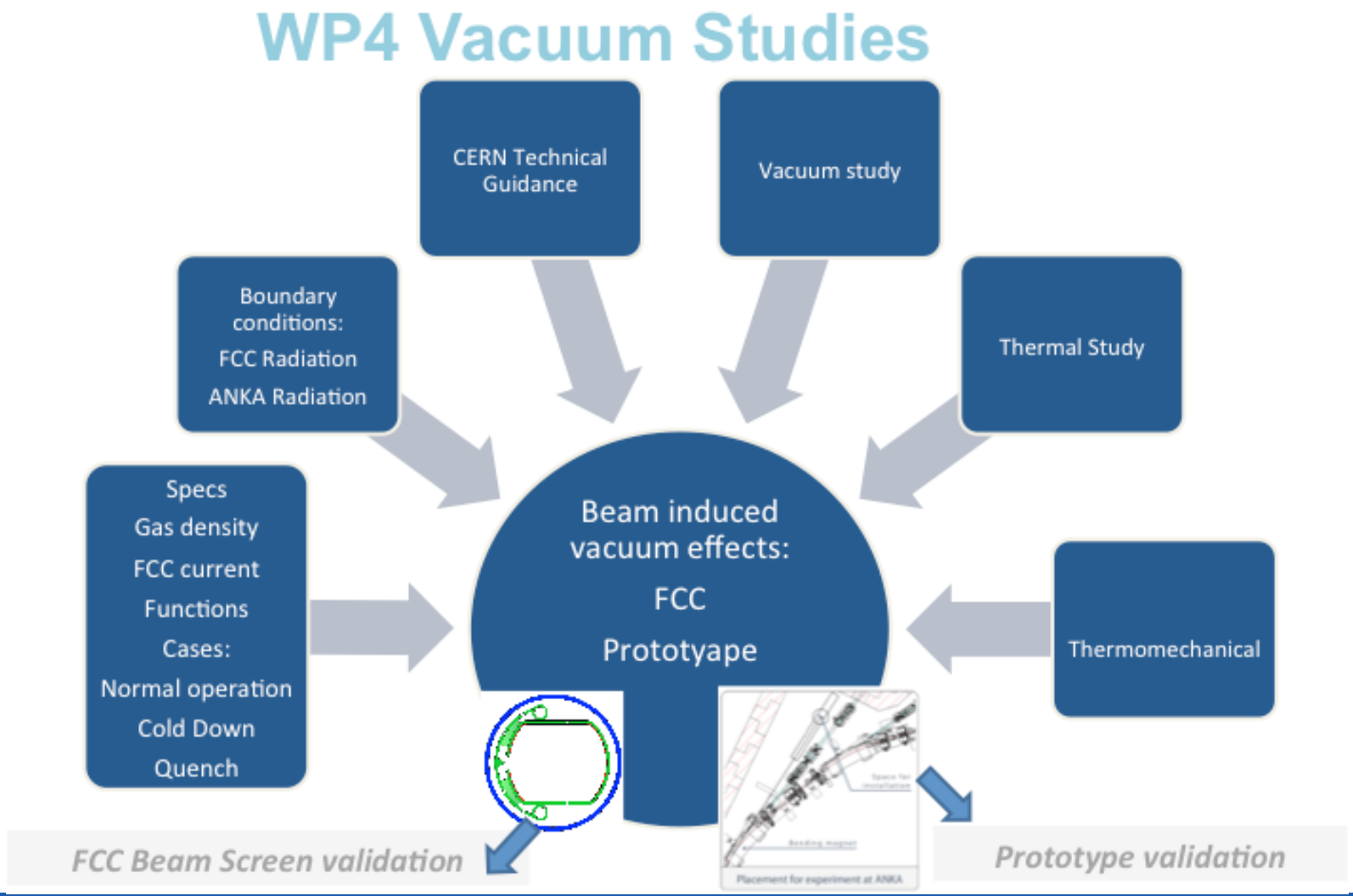
Task 4.6: Measurements on cryogenic beam vacuum system prototype

Task 4.1: Work Package Coordination (ALBA)

ALBA with the assistance of CERN coordinates the work of all other tasks of this work package to ensure consistency of the work according to the project plan and to coordinate the WP technical and scientific scope with the tasks carried out by the other WPs.

Video meeting	each 2 months
On person meeting	each 6 months week before the FCC Week
Specific Meetings	when required

Task 4.2: Study beam induced vacuum effects (**ALBA**, CERN)



Task 4.3: Mitigate beam induced vacuum effects (**STFC**, CERN)

STFC will study different coatings to mitigate beam induc n instabilities

Compatibility of these coatings with cryogenics temperatures has to b demonstrated, in particular sticking and flaking of coatings after seve n and warm up cycles.

Tests Laser Surface Treatment

- Prototype samples of SS+Cu 150-300 um

Investigate other coatings:

- NEG, Carbon … coatings

Task 4.4: Study vacuum stability at cryogenic temperature (**INFN**, CERN)

INFN Frascati will determine vacuum stability and adsorption isotherms at different cryogenic beam screen operating temperature ranges.

It will perform complementary studies on beam induced stimulated desorption phenomena by photons, electrons and ions.

Absortion isotherms
- Validation of temperature window: 20-80 K
- Cryoabsortion surface

PSD + PEY (at room temp) (in relation with task 4.6)
Photon reflectivity (in relation with task 4.6)
- Synchrotron Radiation in grazing incidence

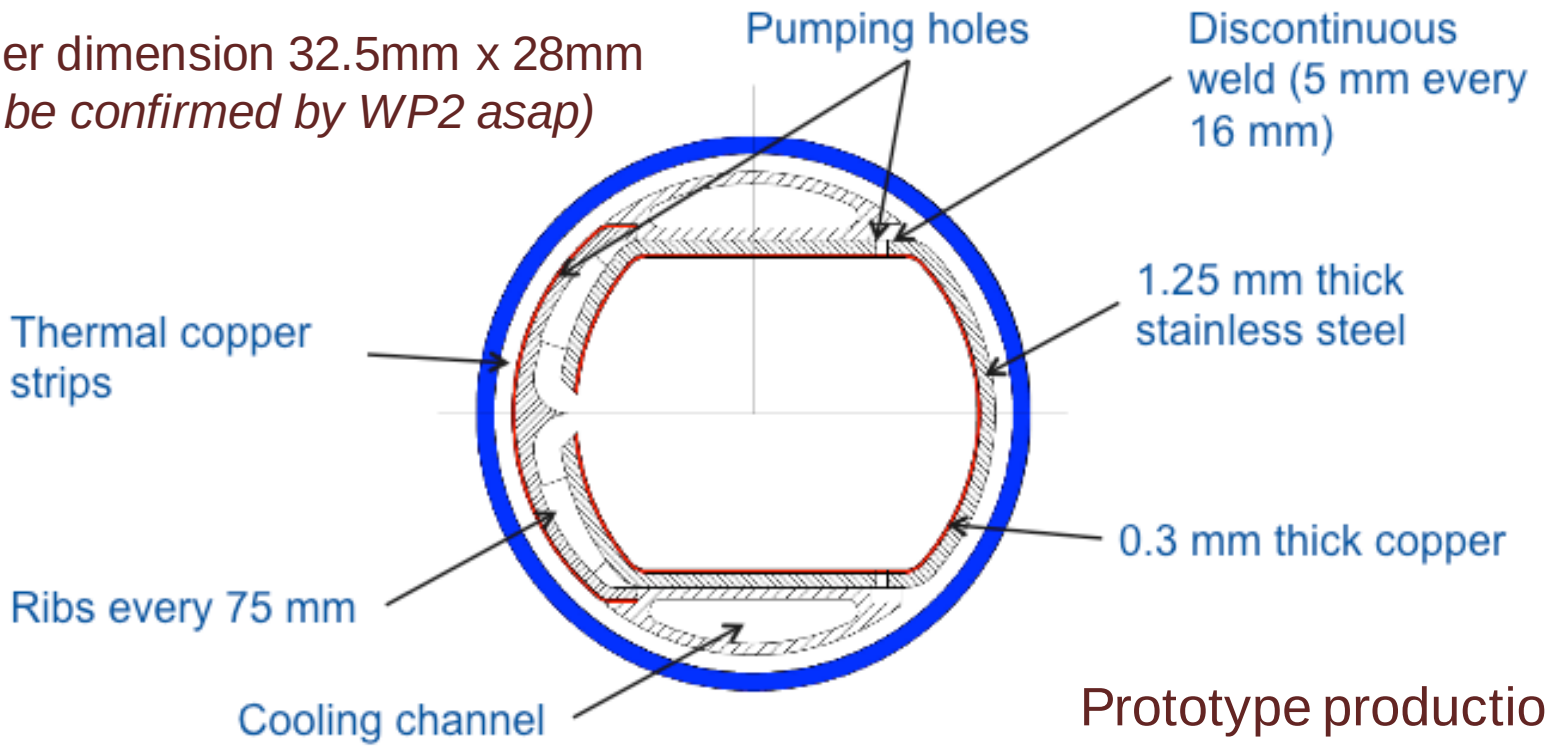
PSD + PEY at LN2 (in relation with task 4.6)

Beam Screen with absorber

Last version under study

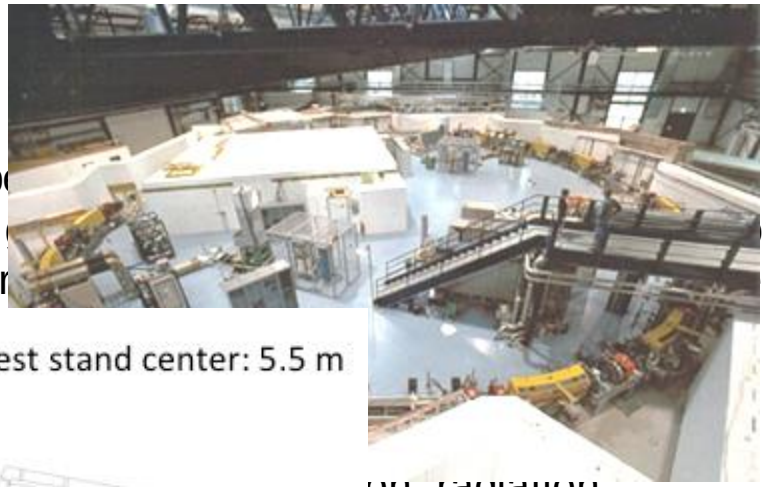
Coil diameter 50 mm (from WP5)

Inner dimension 32.5mm x 28mm
(to be confirmed by WP2 asap)



Prototype production

Task 4.6: Measurements on cryogenic beam vacuum system prototype (**KIT**, INFN, CERN)



KIT will be responsible for the "b
prototype supplied by CERN. The
heat loads and photoelectrons gener
n
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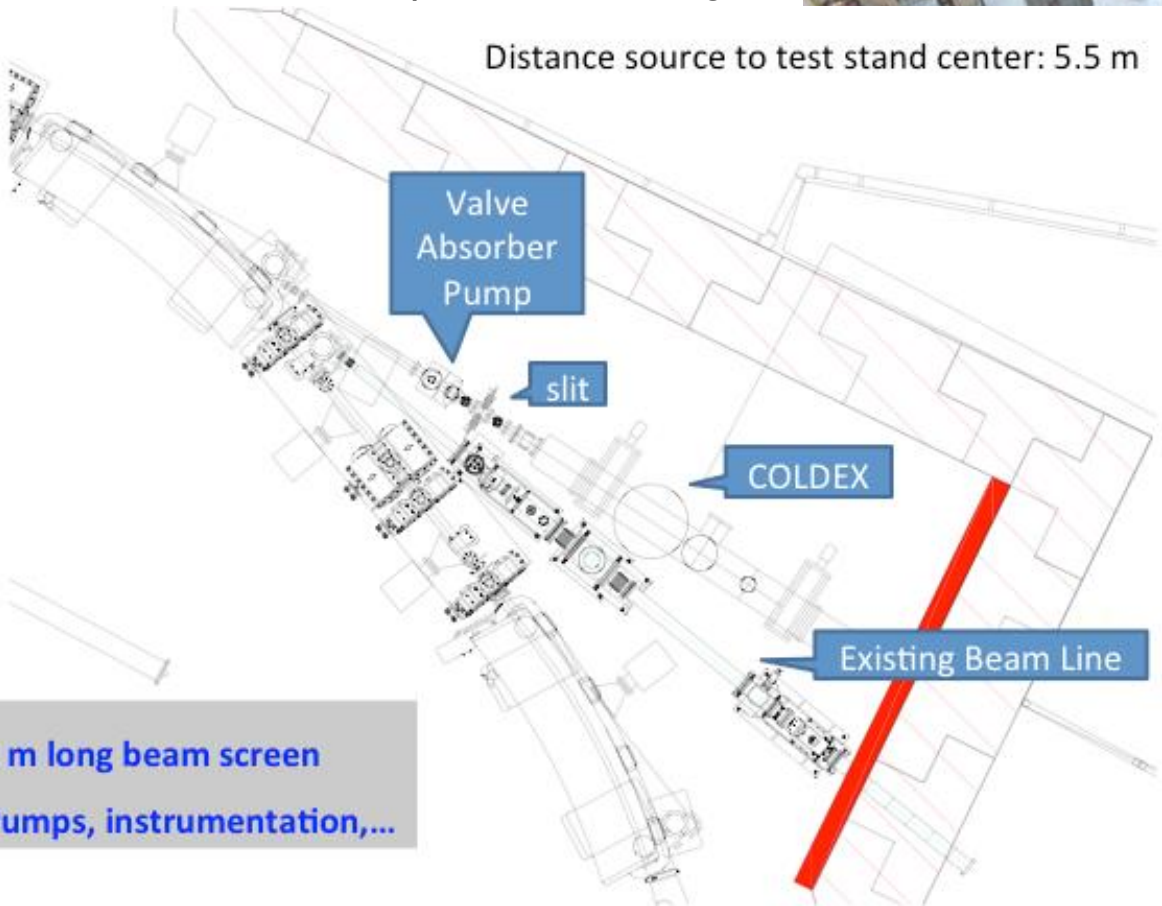


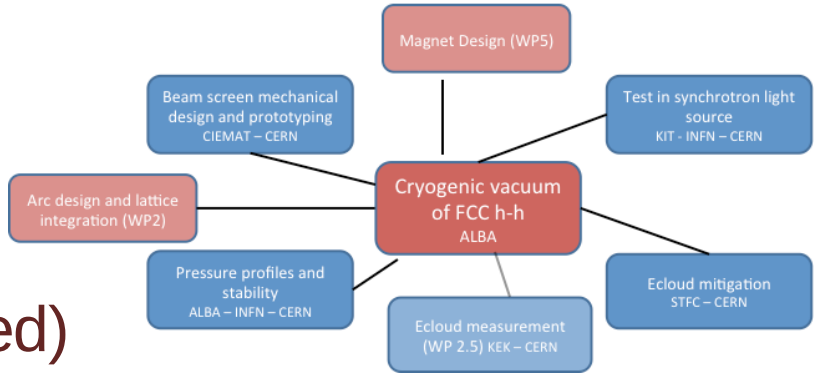
on radiation.

OLDEX carried out by
and perform the

Does it fit, 2 m long beam screen

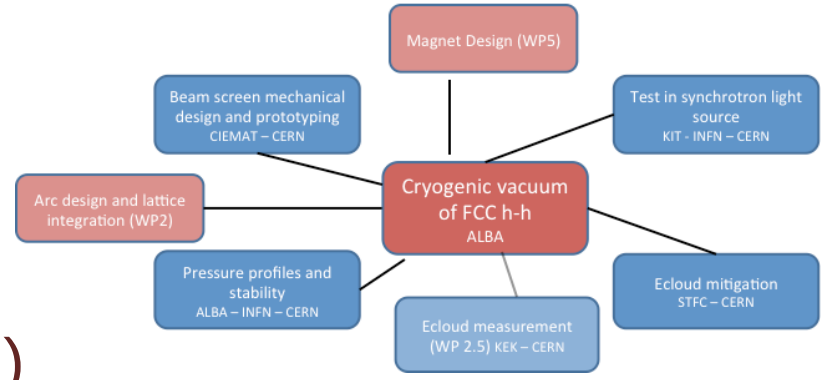
Front end, Pumps, instrumentation,...

Design to be started immediately



WP2 + WP4 (close follow needed)

- Dimensions agree
  - Injection concern
  - Vertical orbit sensitivity
- e-cloud
  - Proper data for PEY & reflectivity for simulation
- Input needed for Gas density/lifetime
- Impedance
  - Need of real Cu data for simulation



WP5 + WP4 (close follow needed)

- Coil inner diameter agree (50+- 2 mm)
- Baseline temperature for WP5 is 4.2K
  but for WP4 is 1.9K
- Beam shall pass through the center of the magnets
- Test of quench feasible with 2 T room temperature pulsed magnet and beam screen cryo-cooled.

Re-schedule needed…

Careful analysis in following weeks