FP7 JRA on High-Gradient Linac Technology

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Introduction

FP7 will fund activities occurring in the years 2009, 2010, 2011 and 2012.

The plot as we expect it,

We will be actively pursing accelerating structure and PETS feasibility demonstrations in the years 2009 and 2010.

By 2010 we show feasibility – which means the gradient/power/pulse length in reasonably efficient fully featured structures.

The next goal will be to work towards optimally-efficient and cost-minimized structures which are correctly integrated into full-performance cost-effective modules and represent that are needed for a fully-etc. CLIC.

To do this work – serious and complex engineering - we will need achieve a rather good understanding of the limits, scalings and interplays between:

breakdown
fatigue
geometry
damping type
beam dynamics
phase stability
wakefield measurement
tolerances
assembly
material
material state
preparation
manufacturing tolerances
assembly tolerances
active alignment
vibration/stabilization
cooling
etc. etc. etc.

The high-gradient linac technology JRA is dedicated to making the detailed studies necessary for our next goal.

BUT

The EU funding is for collaborations, and we are only starting with European collaborators on structure development projects of any size. Also no one else in Europe has a broad (normal-conducting) structure development program.

The FP7 call is for investment in existing infrastructure not general development work.

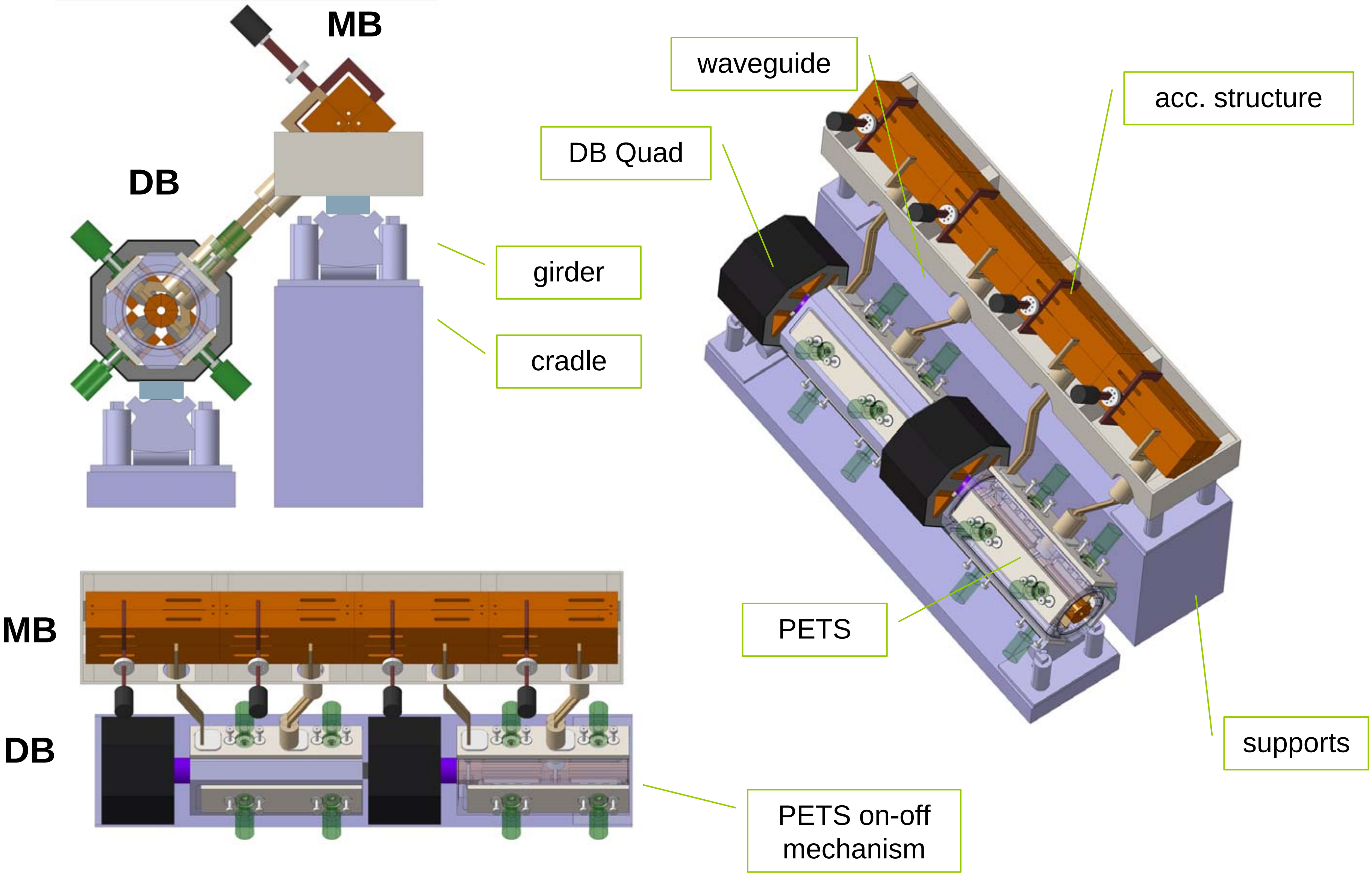
WHICH MEANS

This JRA will be structured such that CERN takes largish central role and we will try to include as many collaborators as possible. The specific activates which appear in the JRA are largely driven by the expertise of the collaborators – the expertise must be relevant of course.

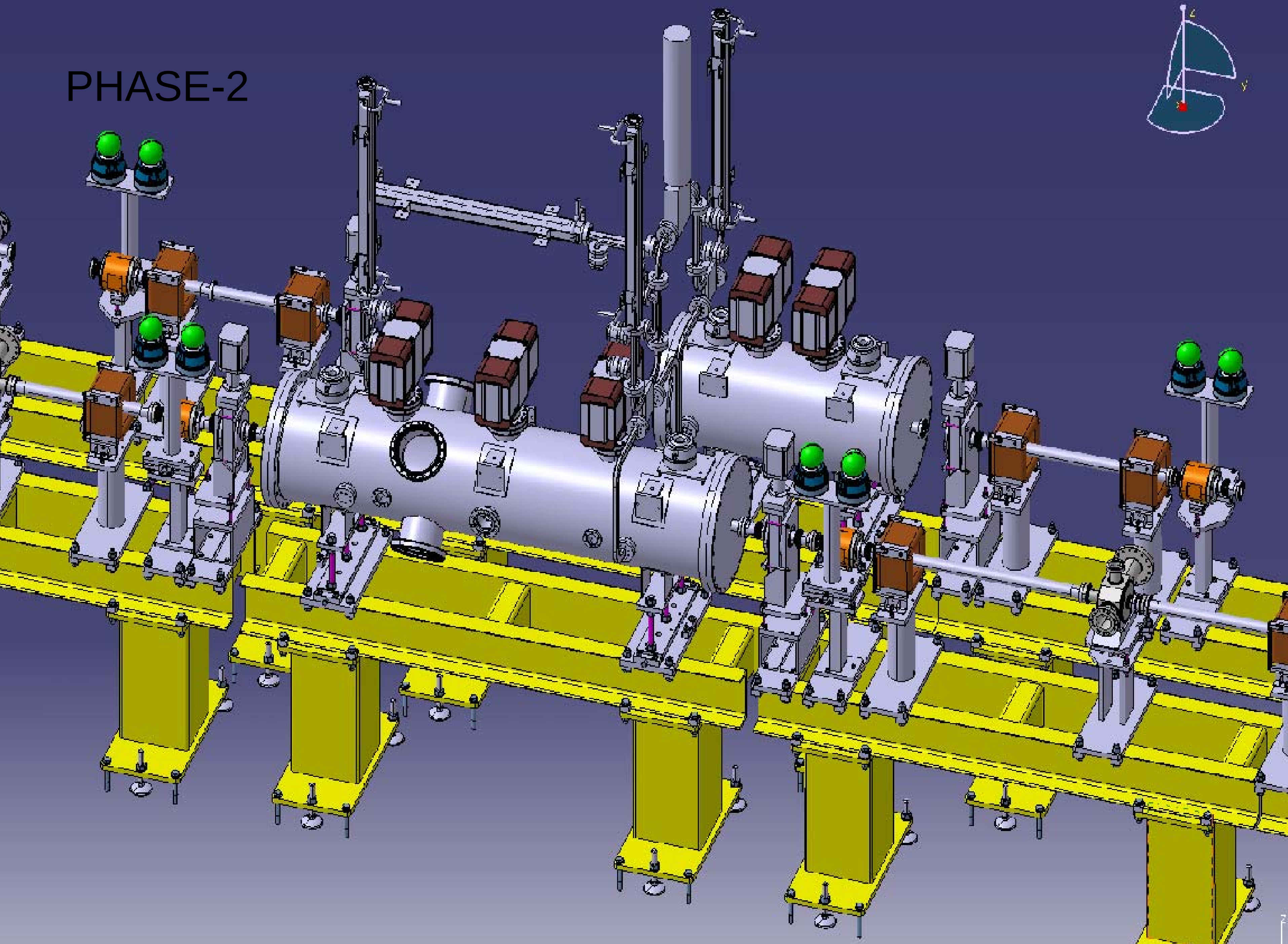
We focus our deliverables on the 2BTS in CTF3 and the test module which is currently in LED.
I will give a very brief introduction to the test module - Daniel will focus further in his presentation and bravo to him for seeing clearly the utility of a test module.

We will also integrate EUtube as an 'existing' infrastructure.

Standard module



PHASE-2



Some of what can we specifically test:

- Accelerating structure high-grad performance
- PETS high-power performance
- rf network high-power performance
- kick during breakdown
- Accelerating structure alignment on girder using probe beam
- Cooling system especially dynamics due to beam loss and power flow changes
- Wakefield monitor performance in low and high power conditions (and after a breakdown)
- Alignment and stabilization systems in a dynamic accelerator environment
- Overall phase stability
- rf network phase stability especially independent alignment of linacs
- Vacuum system performance especially dynamics with rf
- Practical stuff like longer term operation, assembly, activation, maintenance etc.

Likely collaborators

Ciemat

Manchester/Cockcroft

HIP/Finland

DAPNIA

IAP Ukraine

Uppsala

INFN Frascati

NIKHEF

PSI

Lancaster

Ciemat – PET design optimization, studying geometry, scaling or fabrication improvements. Study PETS as beam position monitors. New PETS prototype including vacuum tank, cooling and alignment systems, will be designed, manufactured and tested.

Manchester/Cockcroft - HOM damping. Long-range and short-range wake-fields. Alignment will be delineated. For the long-range wake-fields, trapped modes in particular will be focused upon. PETs damping.

HIP/Finland – Breakdown theory. Atomistic simulations of atom migration enhanced by the electric field or by bombarding particles, to understand what kind of roughening mechanisms may lead to the sharp features. We will also simulate the buildup of damage which results after the initial breakdown. Mechanics/Alignment/high-level mechanical engineering.

DAPNIA – Surface preparation for high-gradients. Accelerating structure design and wakefield monitor.

IAP Ukraine – dc spark. Surface treatment. Breakdown modeling especially discharge/plasma. Materials.

Uppsala – Experimental breakdown studies

INFN Frascati – rf design

NIKHEF – Active alignment system

PSI – Beam position monitor

Lancaster – Neutrino factory high-grad