

# Summary of AWG4: Beam Dynamics

A. Latina (CERN), N. Solyak (FNAL)

# Overview

## We had three sessions:

- Tuesday afternoon: **Key Issues** (*joint with System tests*)
- Wednesday: **ATF2** (*joint with BDS+MDI and System Tests*)
- Thursday: this summary (*joint with System tests*)

## Topics presented: 10 talks

1. Design and performance optimization
2. Experimental verification of Beam-Based Alignment
3. Developments in Linear Collider Diagnostics
4. Experimental program
  - CTF3 outlook
  - Plans for the future

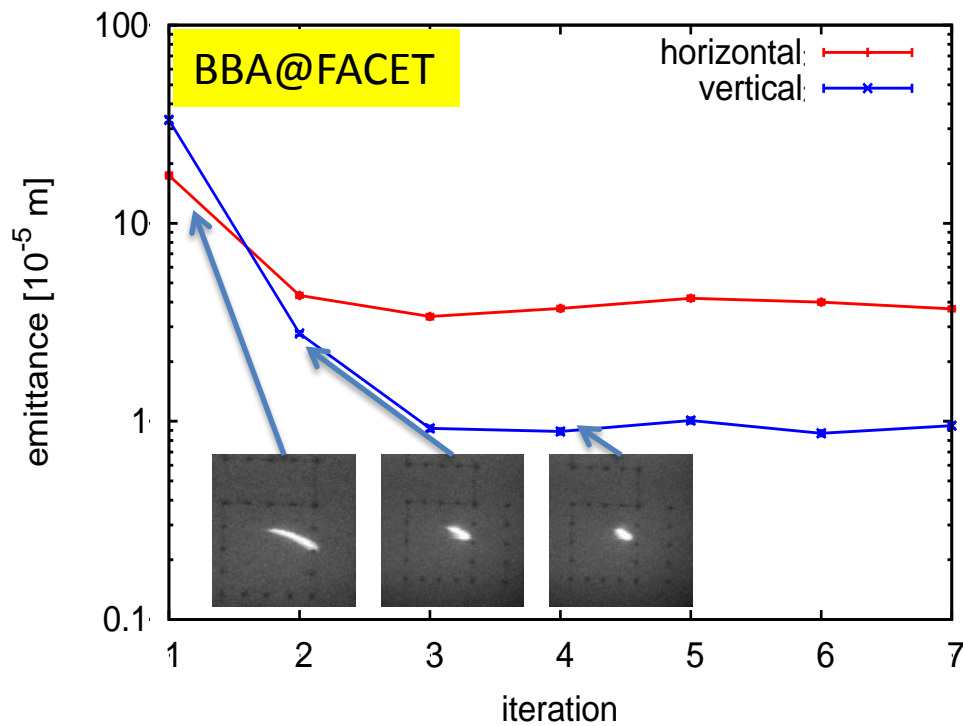
# Design & Optimization

- **RTML** (S. Seletskiy, R. Apsimon)
  - Re-evaluation of the ILC BC and extraction lines design from RDR to TDR, reassessing key parameters
  - CLIC feed-forward for beam jitter correction - complete design, already looking at hardware requirements
- **CLIC Drive beam** (R. Apsimon, J. Esberg)
  - Turnaround Loops Design being optimized toward more simplicity and cost reduction
  - Optimization of the performance is ongoing, including gun simulation and detailed tracking including CSR w/shielding

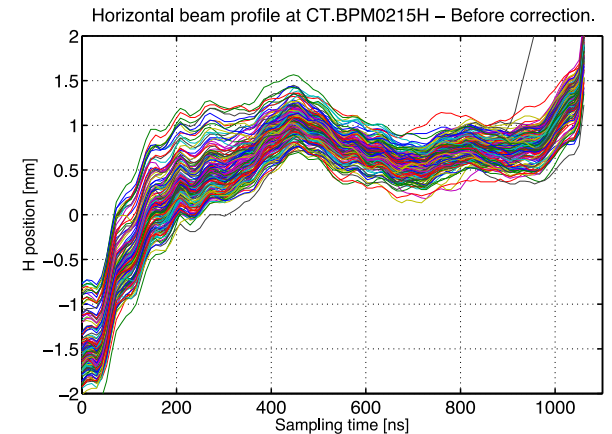
# Experimental verification of Beam-Based Alignment

Automatic **Beam-Based Alignment** techniques are being tested with **very successful** results:

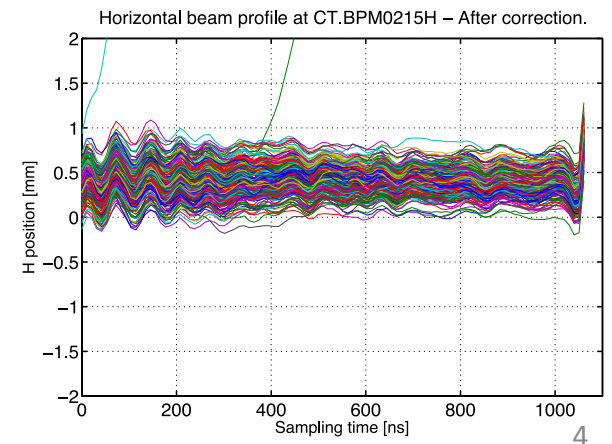
- **FACET** (A. Latina) : Dispersion-free Steering; Wakefield-free Steering reduced significantly the emittance
- **CTF3** (D. Gamba) : BBA in progress, and more



## BBA@CTF3



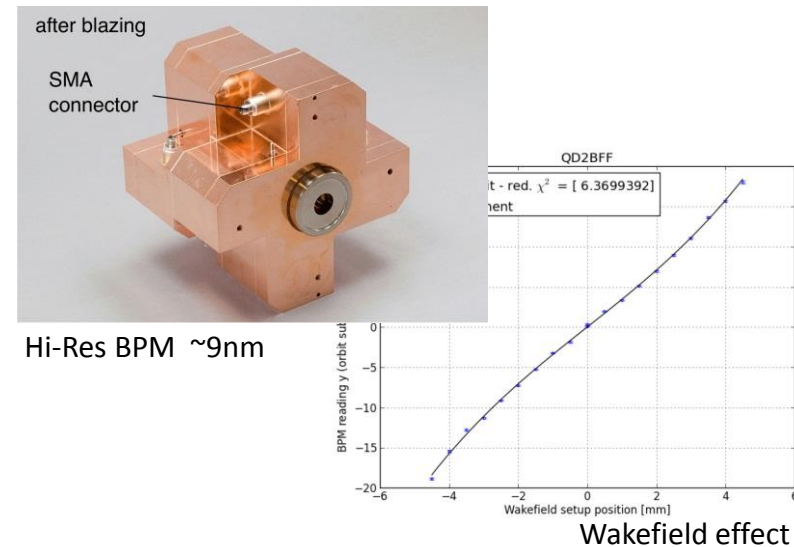
## Beam-based correction of the RF pulse



# Linear Collider Beam Diagnostics

(M. Wendt)

- LC beam diagnostics is a very active R&D area, relying on large collaborations
- No fundamental feasibility issues, but many technical challenges in a wide range of disciplines:
  - *Electronics, RF, sensors, radiation hardness, lasers & optics, high precision manufacturing & polishing, ...*
- Consolidated technologies exist, but lively R&D is ongoing in many areas:
  - increase simplicity and reduce costs**
    - Can OTR/ODR replace LWS?
    - Development of bunch length monitor based on Electro-Optical Sensors to replace costly, invasive RF deflector
    - **Cavity BPMs show good performance, but do they harm the impedance budget of the linac?**
    - **EMI issues in the CLIC main linac?**
      - Observation of EMI noise from the drive beam limits resolution of the MB diagnostics!
- We need to start thinking about large amount of devices to be build and operate
- **No R&D without test facilities**



# CTF3 and beyond

## CTF3: (T. Persson, F. Tecker)

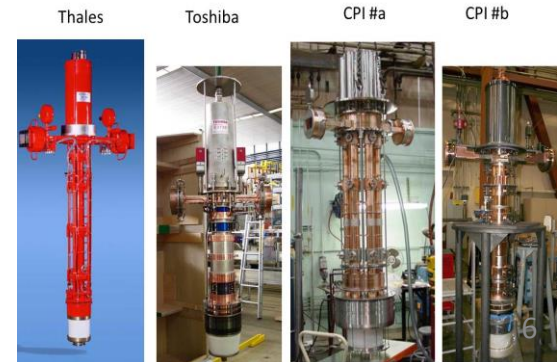
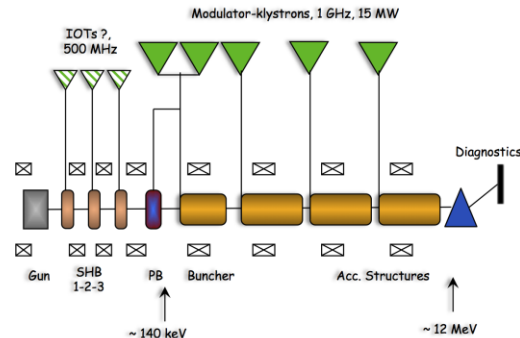
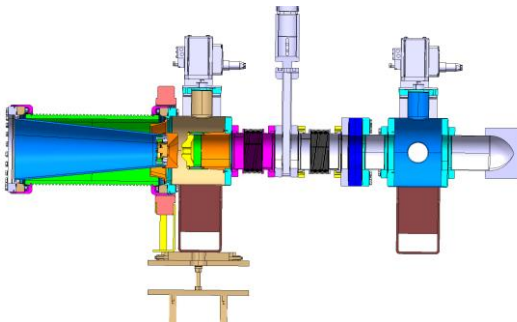
- Overview on the Results and Outlook on the R&D
- CTF3 will operate until 2016

## CLIC Drive Beam Front-end R&D: (S. Döbert)

- Front-end R&D is starting to address high beam current/power handling issues and begin the industrialization process, hardware development
- Front-end goals for 2017-2018

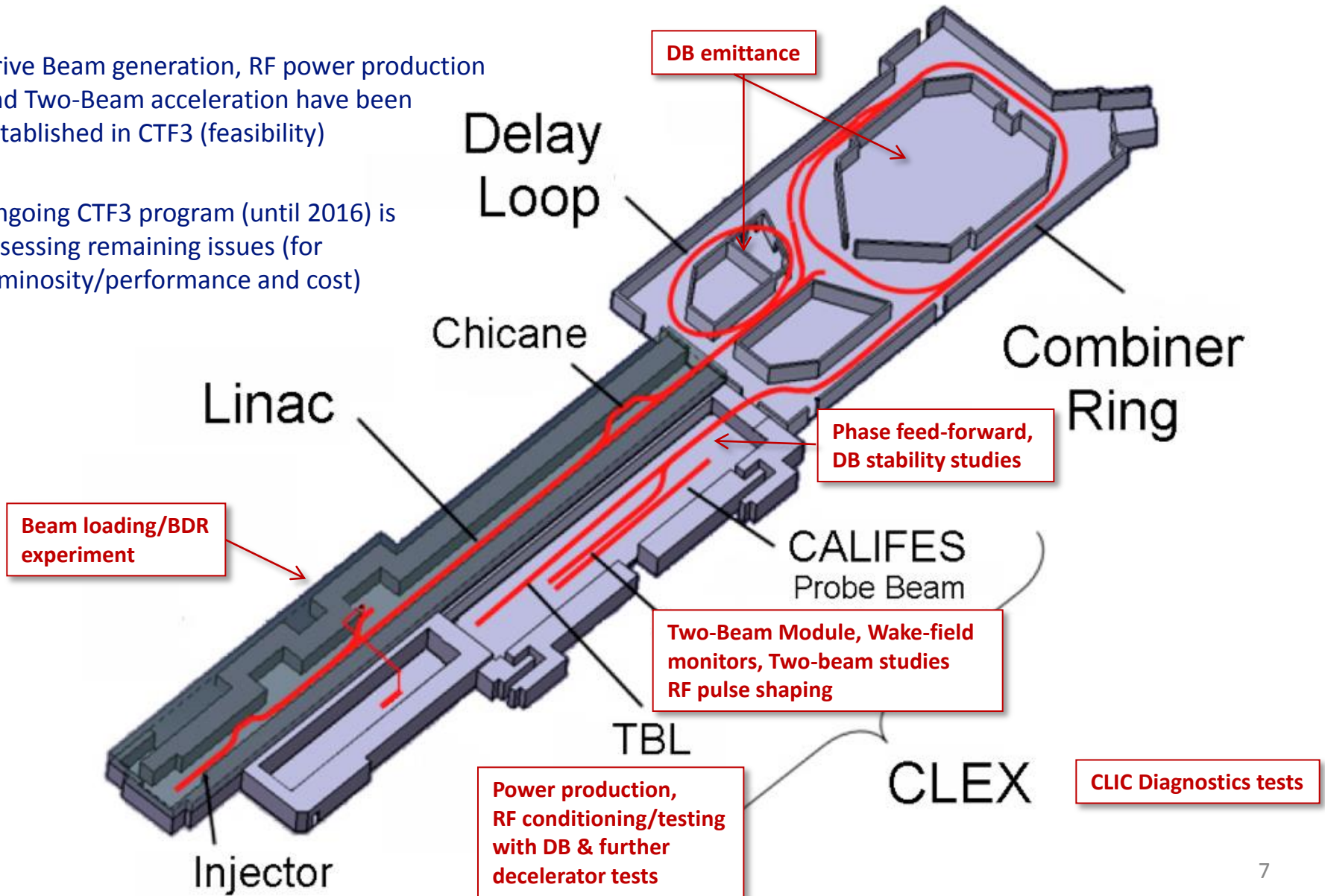
## Beyond: System tests

- Complete system tests foreseen for next phase, and comprehensive documentation of the results at CERN (CTF3) and elsewhere
- Strategy for further system verification before construction (XFEL, connected to light-sources, further drive-beam verifications) or as part of initial machine strategy
- CLIC Drive Beam Front-End will open for larger facilities beyond 2018 if necessary



# CTF3 R&D program in 2013-2016

- Drive Beam generation, RF power production and Two-Beam acceleration have been established in CTF3 (feasibility)
- Ongoing CTF3 program (until 2016) is assessing remaining issues (for luminosity/performance and cost)



# Conclusions

- **Good progress since last workshop**
  - Advanced optimization of the designs: for reliability and cost
  - Performance assessment with realistic conditions
  - Important CTF3 and diagnostics R&D ongoing
  - Beam-based alignment experimental demonstration
- **Trends**
  - Numerous system tests are on-going (CTF3, FACET, ATF2, ... )
  - More integration between design, simulation, hardware tests
- **Issues**
  - More studies are required for the RTML (emittance target not met reached)
  - Integrated start-to-end simulations are needed
  - Pursue more realistic assumptions about errors, possibly coming from hardware tests (LWS, measurement stations, wakefields, couplers, ... )
  - More resources would be welcomed