CLIC Drive Beam : Open Issues,'Work Packages', new problems, new ideas

Introductory material for discussion,

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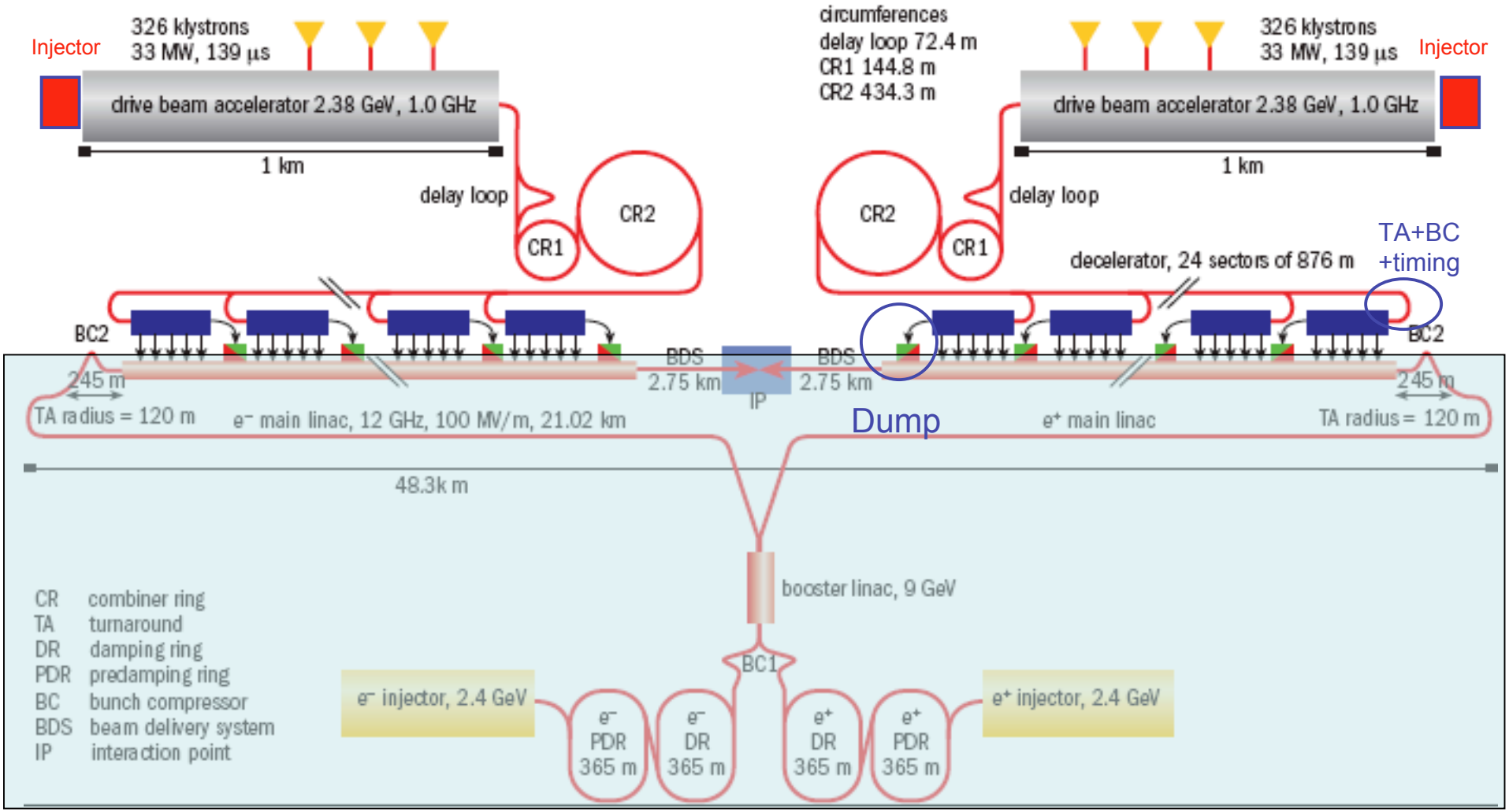
Injector
326 klystrons
33 MW, 139 μs
drive beam accelerator 2.38 GeV, 1.0 GHz
1 km
delay loop
CR1
CR2
circumferences
delay loop 72.4 m
CR1 144.8 m
CR2 434.3 m
326 klystrons
33 MW, 139 μs
Injector
drive beam accelerator 2.38 GeV, 1.0 GHz
1 km
delay loop
CR2
CR1
decelerator, 24 sectors of 876 m
TA+BC
+timing
BC2
245 m
TA radius = 120 m
BDS
2.75 km
IP
BDS
2.75 km
Dump
BC2
245 m
TA radius = 120 m
e⁻ main linac, 12 GHz, 100 MV/m, 21.02 km
e⁺ main linac
48.3k m
booster linac, 9 GeV
BC1
e⁻ injector, 2.4 GeV
e⁻ PDR 365 m
e⁻ DR 365 m
e⁺ DR 365 m
e⁺ PDR 365 m
e⁺ injector, 2.4 GeV
CR combiner ring
TA turnaround
DR damping ring
PDR predamping ring
BC bunch compressor
BDS beam delivery system
IP interaction point

Drive Beam , list of open issues by system

- INJECTOR
- INJECTION LINAC
  - RF Structures
  - Linear optics
  - Collective effects
  - dE/dz correlation for later compression
- DELAY LOOP & COMBINER RINGS
  - Train construction (rise time / flat section / Fall time)
  - Isochronous & achromatic optics, linear aberrations, dynamic alignment
- RF DEFLECTORS FOR DL, CR1, CR2
- TRANSFER LINE DOWN TO TUNNEL
  - Isochronous & achromatic optics
  - Collective effects
- LONG TRANSFER LINE
  - Optics & layout
  - Kick-out and matching to turnarounds
  - Beam-based alignment
- TURN-AROUND (see also DL+CR)
  - Matching to decelerator
  - Instrumentation of compressors
- DUMP
  - Conceptual design
  - Extraction section

Drive Beam , list of open issues by subject

- TIMING Drive Beam / Main Beam
  - Phase / time scale
- ALL SYSTEMS
  - Beam-based alignment in rings
  - SR and Coherent SR
  - Collective effects I = 100 A
    - Transverse feed-back
    - Longitudinal feed-back
  - Instrumentation
  - Signals traveling at light-speed
  - Beam loss physics, showering, collimation
  - fast kickers
  - Magnet design
  - Vacuum system

$\delta\phi = 0.1^{o}$ or $dt = 0.025$ ps @ 12GHz
$\Rightarrow$ $ds = cdt = 7\ \mu m$
Timing correction :
Cable length variation with temperature
$s = 10m$, $\Delta T = 1K$ $\Rightarrow$ $ds = \alpha_{cu} \Delta T\ s = 200\ \mu m$

Power/magnet ~ 5kW
$dE/E \sim [1.5\ 10^{-3} \cdot 7.5\ 10^{-3}]$ w/o shielding
Compare to spec $\sigma_E/E = 3\ 10\text{-}5$ for final compression &
$\Delta z = d(dE/E)R_{56} = 5\ 10^{-3} \times 0.2m = 1mm$

Suppression by vac.ch. helps, but in conflict with resistive wall instabilities (need large chamber)

Compare CSR $\delta E/E = 4\ 10^{-5}$ per magnet to $E_{\perp}/E = 6\ 10^{-5}$
No transverse CSR effects ?

Long Transfer Line :
$\cos\theta$ / $\cos 2\theta$ coil, no yoke