Deliverable: D3.2, due by June 2019 (M18).

Title: Review report on bunch compression techniques and phase space linearization
M. Croia (INFN-LNF), S. Di Mitri (Elettra), A. Faus-Golfe (LAL), A. Giribono (INFN-LNF), Y. Han (LAL), A. Latina (CERN), X. Liu (CERN), C. Vaccarezza (INFN-LNF).

1. Theoretical Background

1.2 Basics of Magnetic Compression
1.3 RF Linearization
1.4 Passive Linearization
1.5 Magnetic Compressor Geometries
1.6 Jitter Budget
1.7 RF Bunching

2. Determination of the Compression Scheme for CompactLight

2.1 Choice of RF compression
   Velocity bunching is is recommended for the CL injector

2.2 Choice of Injector RF frequency
   The all-C-band injector with K-band linearizer is therefore selected as the nominal injector for CL.

2.3 Choice of magnetic compressor geometry
   Magnetic chicanes with RF linearization is therefore considered the nominal compression scheme for CL.

3. CompactLight FEL Working Point

3.1 Electron Beam Parameters
3.2 Compressor Parameters vs. Bunch Length
3.3 Compressor Parameters vs. Beam Emittance
3.4 One-Dimensional Particle Tracking

4. Magnetic Compressors Specifications and Tolerance Budget

5. Electron Beam Manipulation in Magnetic Compressors Specifications and Tolerance Budget

1.4 Yanliang, Angeles:
   summary of the theory of passive linearizers, and specifications of the device for an equivalent action of linearization to that one from the harmonic cavity

4. Cristina:
   summary of techniques to be implemented in the chicanes for longitudinal shaping of the current profile, and minimization of CSR effects;
   [Tracking, optimize linear optics (ref. Di Mitri). Second, optimize weak sextupole magnet for current shaping (ref. Charles). Third, add skew and normal quads and optimize all together (ref. Guetg)]

5. Andrea, Edu, Raquel:
   design a realistic geometry of the two chicanes, possibly with (analytical?) tolerances on field quality, stability, etc.
Funded by the European Union

50 pC
160 MeV
0.2 um emit
60 A
LH = 6 keV

S-band Injector + X-band linearizer.
SX & HX @ 100 Hz

Possible Configuration

100 Hz MODE

VAR. POL.
0.25 – 1.0 keV
1.0 – 2.0 keV
VARIABLE POL.
8.0 – 16.0 keV

INJECTOR
X-BAND
X-BAND

SX

BC1
BC2

HXR

4.3 – 4.8 GeV
0.2 um
6 kA (core)
6 fs fwhm

6.5 – 7.5 GeV
0.2 um
6 kA
6 fs fwhm
Summary

1. Tentative initial e-parameters (at the injector exit) were identified
2. Tentative final e-parameters (at the linac exit) were identified
3. Tentative Linac and compressors setting was identified for SX & HX @ 100 Hz
4. D3.2 contributions to be finalized
5. From LiTrack (1-D) to Placet (3-D) ongoing
6. SX @ 1kHz has to be investigated yet (RF gradient, injector performance)