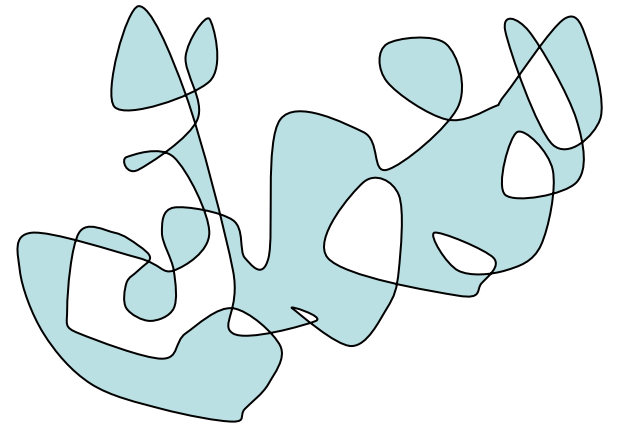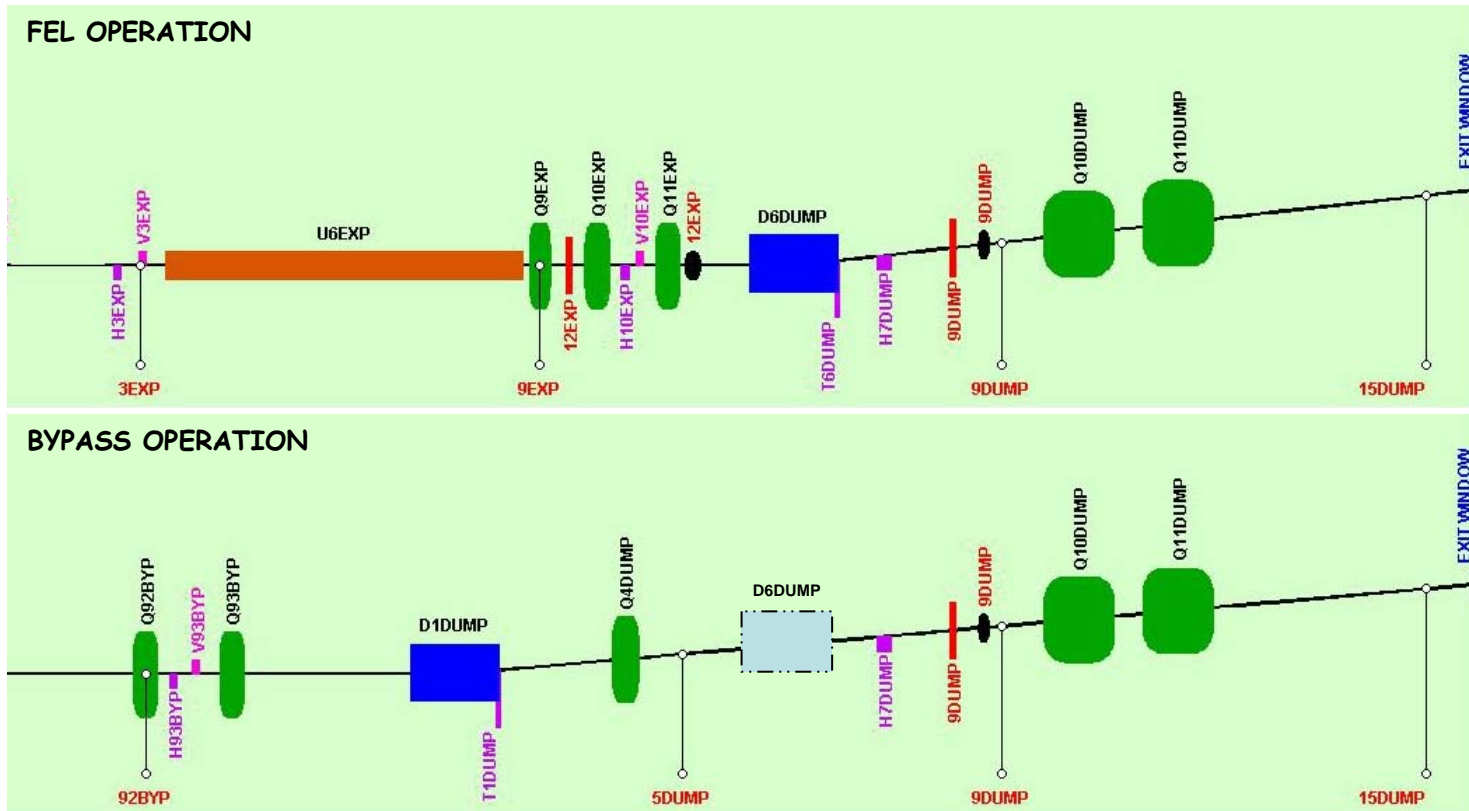# Optics of Dump Line for 9mA Run
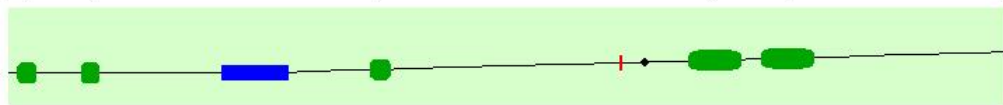
Nina Golubeva & Vladimir Balandin
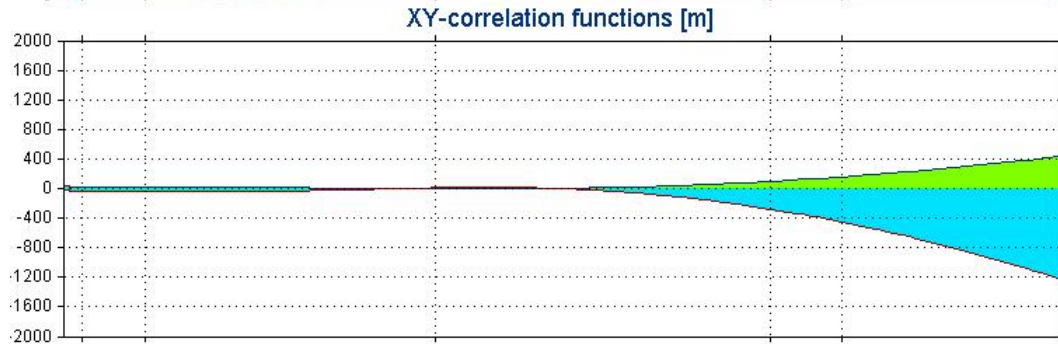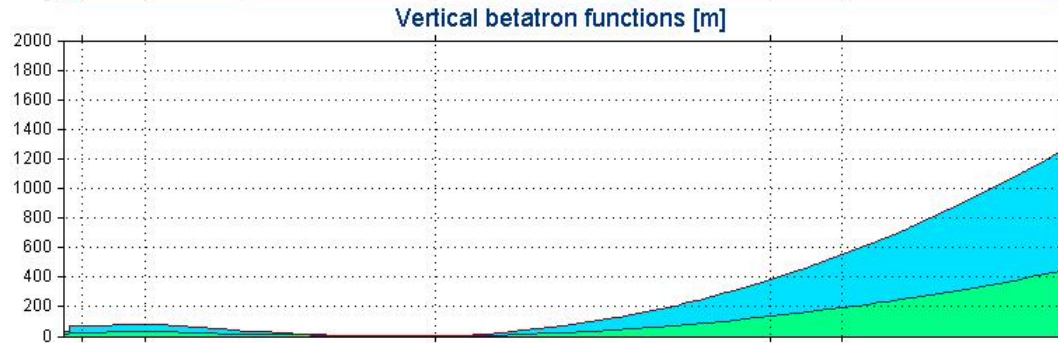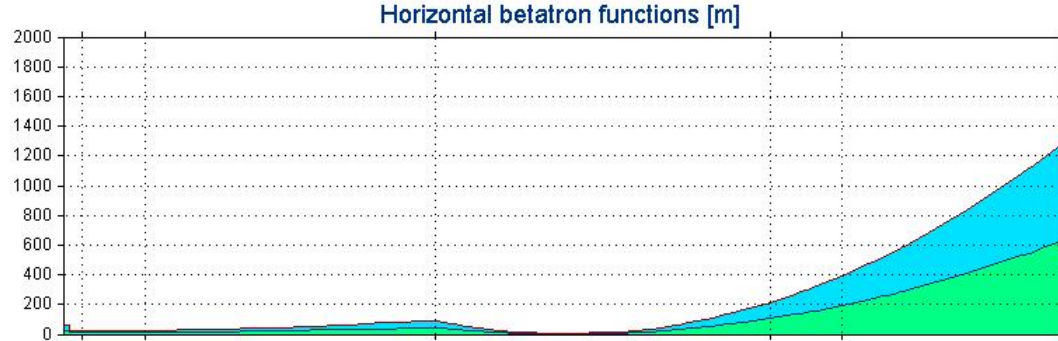
Dump Line Layout

Although dispersion at the exit window location helps to enlarge the beam spot area, it is better to keep it about zero to ensure independence of beam position at the window and dump on beam energy fluctuations. Together with constraints on beam spot area at the exit window, it almost fix the setting of quadrupoles Q10/11DUMP for the FEL operation.
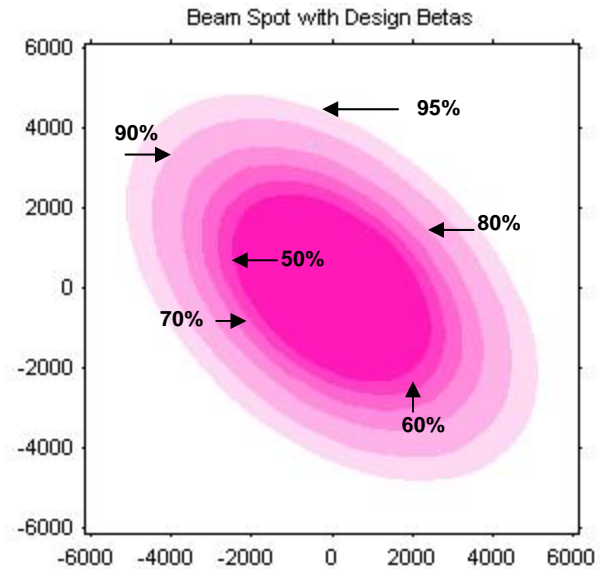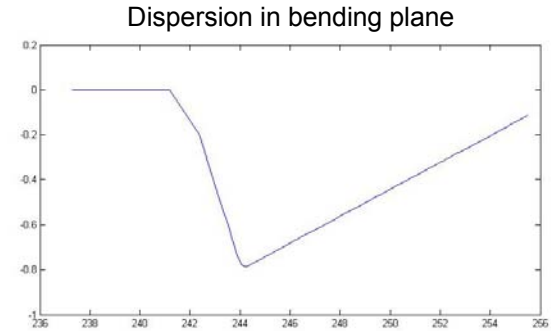
Original design concept for the BYPASS optics was to keep the setting of Q10/11DUMP quadrupoles the same for both operational modes. In this case, as it was thought at the beginning, after switching from FEL to BYPASS operation one simply has to put trajectory in the dump line back to the same position using beam position monitors 9DUMP and 15DUMP and screen 9DUMP (assuming that some "good trajectory" was already found during FEL operation).

Optics solution which somewhat follows this design concept was used in the first 9mA shifts (now having opposite thought in mind: use "good trajectory" found during 9mA run later on for the long bunch train FEL operation), but nothing prevents us from establishing special optics for 9mA run without usage of these quadrupoles. In fact, such optics was already developed and tested during last 9mA shifts.

Dump Line Optics with Q10DUMP and Q11DUMP set to zero field (already tested in the last 9mA shifts)

Horizontal betatron functions [m]

Vertical betatron functions [m]

XY-correlation functions [m]

contribution of horizontal emittance

contribution of vertical emittance

Dispersion in bending plane

Beam Spot with Design Betas

95%

90%

80%

50%

70%

60%

E = 900 MeV, enx = eny = 4 mm · mrad,
Spot area = 3.65 mm · mm,
$\sigma x \approx \sigma y \approx 2$ mm (2.2 mm required ?).

Spot area could be adjusted to needed value
having actual emittance measurement
data and observing beam image on screen 9DUMP.

Sextupoles at the Bypass Entrance

Steering Magnets and Dipole Correction Coils

Beam Position Monitors
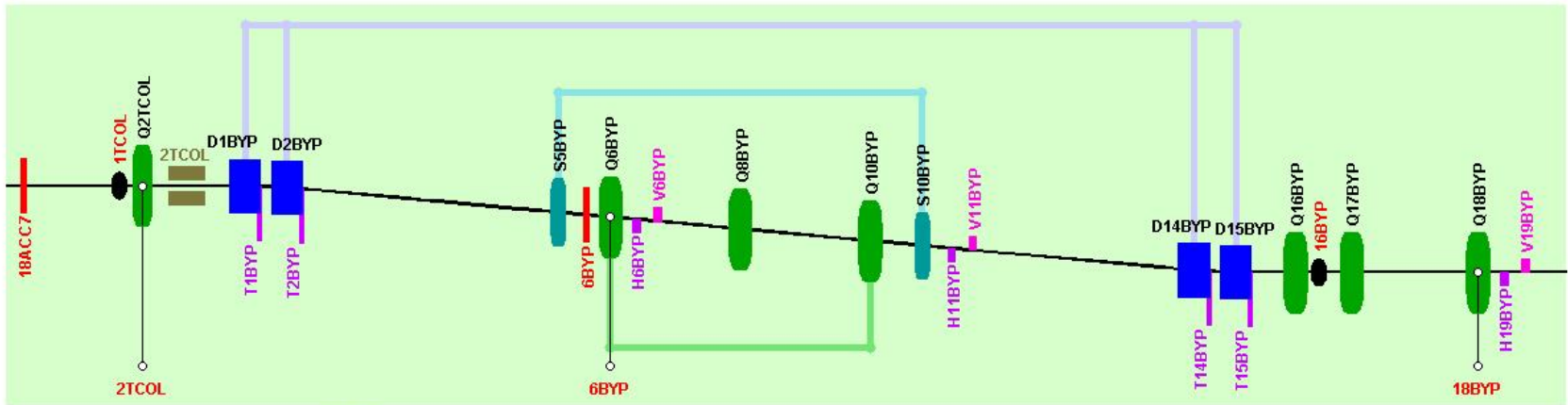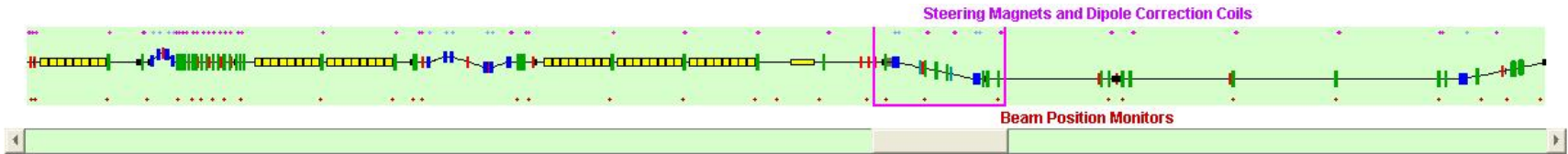
NAME:	S5BYP
TYPE:	SEXTUPOLE
ENTRANCE POSITION (X, Y, Z):	-0.17715 m, 0.46522 m, 150.3164 m
CENTRE POSITION (X, Y, Z):	-0.18182 m, 0.47746 m, 150.4231 m
(EFFECTIVE) LENGTH:	0.215 m
TILT (DEGREE):	-69.15
MAGNET TYPE:	TSB
POWER SUPPLY:	+S5BYP

Currently mounted as "skew sextupoles" with respect to the beam bending plane. Will be good to have them remounted as "normal sextupoles" in order to be able to dump second order dispersion, which will increase bypass energy acceptance.