New Transport Line for 1GeV Linac

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1. Introduction

The construction of SPring-8 Linac was completed in August 1996. The linac is providing the electron beam to the booster synchrotron at the beam energy of 1 GeV for the storage ring commissioning. On the ordinary opereation after the commissioning, the linac will be operated twice a day for the beam injection as the injector. In the rest of the time, there are some plans of the linac utilization for various applications.

For some of application plans like a New SUBARU injection, an inverse Compton scattering, a parametrix X-ray generation and a slow positron generation, especially a single pass FEL operating in the Self Amplified Spontaneous Emission (SASE), we need an excellent quality of electron beam from the linac. This report is the design of the transport line for NewSUBARU (L3BT line) and some applications experiments (L4BT line). The beam transport design is shown in fig.1. In 1997, we will start the construction of their beamline, especially L3BT line for NewSUBARU ring.

2. L3 Beam Transport Line

Through the L3BT line, the 1 GeV electron beam is provided to the NewSUBARU ring. The L3BT line is composed by two bending magnet and 12 quadrupole magnet. The NewSUBARU ring is the 1.5 GeV storage ring of Himeji Institute of Technology [1]. The beam envelope is shown in fig.2. In this calculation, we suppose the transported beam natural emittance is 1μm·mrad. The magnetic lattice of this transport line is a double bend achromatic one. This beam line will use only single bunch mode (1 ns beam width) to achieve a higher injection efficiency. The NewSUBARU ring will accept the electron beam of maximum 1 Hz pulse repetition and 10^{10} electrons/pulse for the radiation problem.

3. L4 Beam Transport Line

This line is the R\&D beam line for the bunch compression aiming the single pass FEL. The beam envelope is shown in fig.3. This transport line is assembled isochronous magnetic lattice to preserve the micro bunch length. After 90 degree bend, there is a long straight line, about 35 m for a general purpose use. Some application experiments, like an inverse Compton scattering, parametrix X-ray generation and developments of the beam monitoring, will be done in the first half of this straight line. And in the second half of the straight line, we are planning the bunch compression experiments using a energy moduration accelerator tube and a chicane by 4 bending magnets. Finally, we are aiming 100 fs bunch length by the two section of bunch compression system. The changes of bunch length are shown in fig.3. In fig.3, we suppose the transported beam normalized emittance is 1πmm·mrad. This emittance for single pass FEL will be accomplished after the major reconstruction of the electron gun and some components.

References

[1]A. Ando et al., Proc. Particl Accl. Conf. (1997) to be publish.

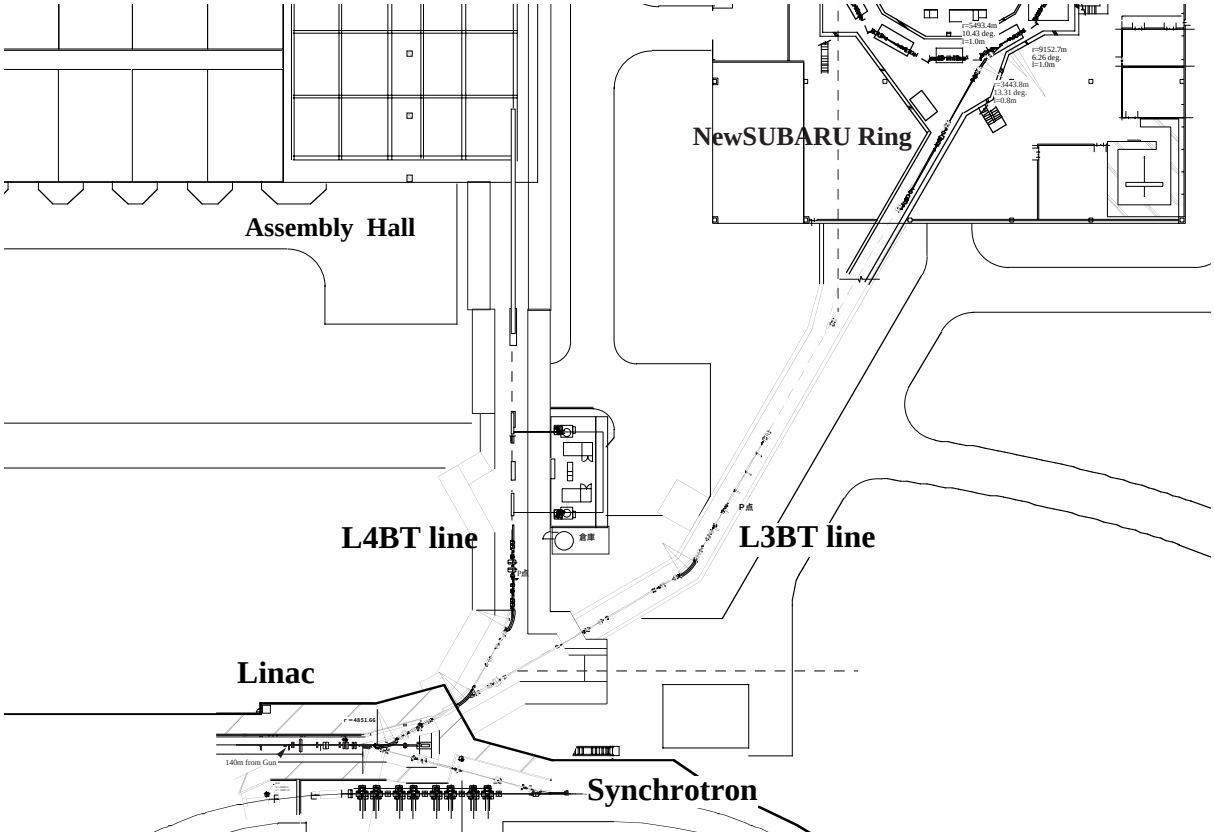

Fig.1 New beam transport line design

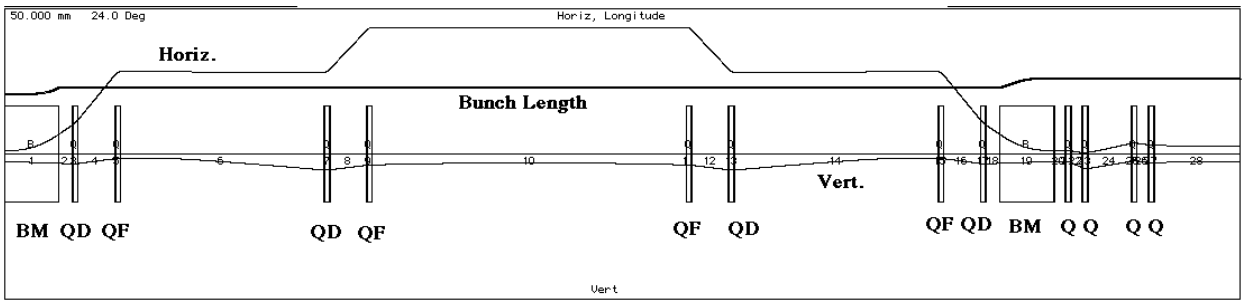

Fig.2 Envelope of L3BT (NewSUBARU transport)

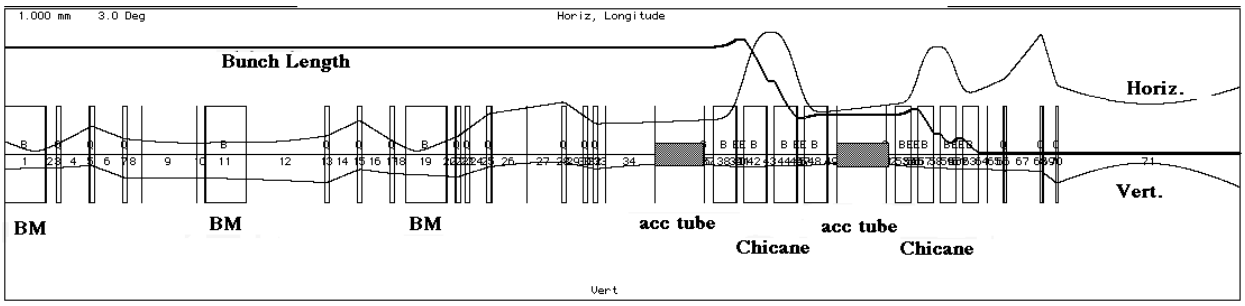

Fig.3 Envelope of L4BT