

A.2: Particle source part II(10, December, 2013) by Masao KURIKI
Answer the following questions.

- Q.A2.7 It is hard to find positron in nature and we have to generate artificially. What is the fundamental process to generate positron? Among them, what is the appropriate way? What is the reason?
- Q.A2.8 In undulator positron production of ILC, the system has to satisfy some condition on the path length. Please explain the condition and why any timing adjustments do not work.
- Q.A2.9 Let us assume 20 MeV gamma ray energy as 1st cut off is required for positron generation. How much drive beam energy is required for undulator radiation and laser-Compton scattering, respectively? Please assume 10mm undulator period with $K = 1$ and $1\mu\text{m}$ laser wavelength for each method.
- Q.A2.10 Conventional choice of e+ booster is S-band (2.6 GHz) because a wide variety of device such as klystrons, waveguides, are available. However, S-band is not suitable for ILC e+ booster by considering ILC DR acceptance. Please explain the reason. If we optimize the system by adjusting the accelerator RF frequency, what is the most optimized frequency? Please ignore energy spread of initial positron distribution and consider only energy spread by RF curvature.
- Q.A2.11 Positrons at the end of the injector section (250 MeV) are distributed $\pm 20\text{ps}$ in z and $\pm 20\text{MeV}$ in energy. Please show this bunch does not fit to the DR acceptance (5.0 GeV energy, 1.5% in energy spread, and 70 mm in z) by assuming S-band 2.6 GHz accelerator for e+ booster.
- Q.A2.12 By considering an EC(Energy Compressor) before DR injection, the beam phase-space distribution can be fit to DR acceptance. Please obtain an appropriate EC design (R_{56}) to give a good matching of the beam given in Q.A2.11.