Homework questions for the CLIC lecture 2015

1.) General understanding:

a) Stupid question: Why do you use first a Delay Loop upstream the Combiner Rings in the CLIC scheme (i.e. why don't you use only Combiner Rings that provide higher combination factors)?

b) Imagine you have built CLIC for 380 GeV with one Drive Beam linac complex. Now the LHC has found a new particle with m=760 GeV/c^2. So you want to double the collision energy by doubling the length of the main linacs. Keeping a single Drive Beam linac complex, what do you need to change in there and the Drive beam?

2.) CLIC Test Facility – Drive Beam Generation

Assume you want to build a CLIC two-beam test facility with a Delay Loop and one Combiner Ring to produce a I_f = 30 A high-current Drive Beam with a bunch repetition frequency of f_f = 15 GHz. The final RF pulses (= final Drive Beam bunch train pulse length) must have a length of t_p = 125 ns. Assume you can build a Drive Beam source with a maximum initial beam current $I_i \leq 5$ A and an initial bunch repetition frequency in the range of f_i = 0.5 – 1.5 GHz.

(Hint: not all questions are based on the previous. If you get stuck, have a look if you can solve another one.)

a) With the parameters above, what multiplication factor you need for the Combiner Ring (CR)?
(Remember to keep the multiplication factor in the Combiner Ring ≤ 5.)

b) What is your initial bunch repetition frequency? What are the frequencies of the RF deflectors?

c) What is your initial beam current?

d) What is the initial Drive Beam pulse length?

e) What is the approximate length of the Delay Loop and the Combiner Ring?
(You can neglect the condition that you have to match the ring length precisely to a fractional part of the deflector wavelength.)