Homework questions for the CLIC lecture 2013

1) Take the CLIC design at 3 TeV as described in the lecture (page 54 of the notes) as a starting point. Keep the same accelerating structure with the same accelerating gradient.
   What do you need to change if you want to build CLIC at 2.5 TeV instead?
   Tick the right answers:

	True	False
a) Lower the drive beam current by 16.7%	☐	☐
b) Decrease the drive beam current by SQRT(5/6)	☐	☐
c) Reduce the number of decelerating sectors from 24 to 20	☐	☐
d) Cut the drive beam length from 142μs to ~118μs	☐	☐
e) Decrease the Delay Loop length by 16.7%	☐	☐
f) Reduce the e+ and e- main linac lengths by 16.7% each	☐	☐

2) 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 $t_p = 120$ 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.)