CLIC module layout discussion

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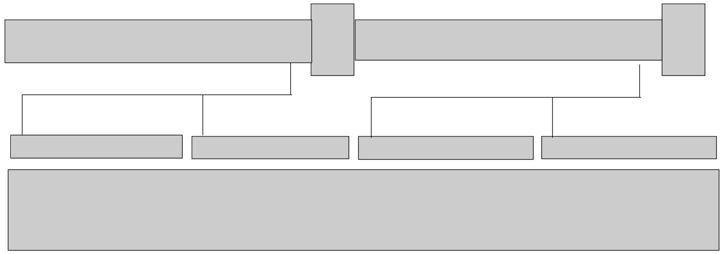
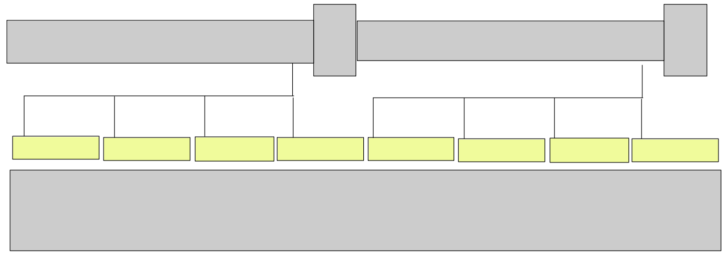
#1. Original CLIC module layout 2 PETS x 4 TDS:



#2. New CLIC module layout 2 PETS x 8 TWS:



#2. The CLIC accelerating structure is dramatically modified. From layout point of view the most modification concerns the structure length, in general it is twice shorter than TDS. To keep PETS design as conservative as possible it will be reasonable to adopt 2 PETS x 8 TWS configuration as an initial starting point for the layout revision.

#3. More than 1 000 000 different accelerating structures were examined! We should choose One! The certain selection providing highest $\mathcal{L}\times\eta$ factor was done, but still amongst them we see big spread of parameters affecting PETS design. We tried to fix what we would like to keep, concerning drive beam and PETS performance:

- Drive beam current: ~ 150 A (as before)
- RF pulse length: ~ 60 ns (about half of original one)
- Highest RF to beam efficiency, to minimize PETS RF power flow (and so - current)
- The longer TWS the better, the same as for PETS.

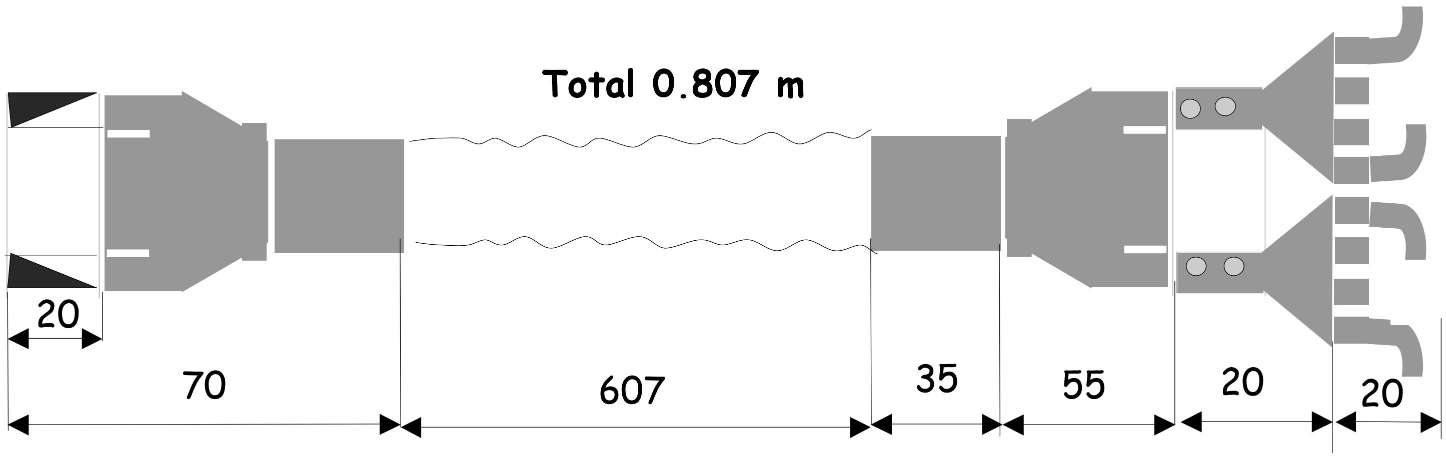
Layout N1 (conservative): 1 PETSx4 structures

This Week Structure #1. (max Eff.)
- Efficiency : 29.5 %
- L_bx: 0.93×10^{34} $1/m^2$
- Cells number: 80
- Phase advance/ cell: 110 degrees
- RF power / structure: 132 MW
- Trf: 55.6 ns
- Structure physical length:
  - 80x3.055 = 244.4 mm /reg. Part
  - 2x3.055= 6.11 mm /input cells
  - 2x4.32= 8.64 mm / coupler WG
  - 20 mm? / structure spacing

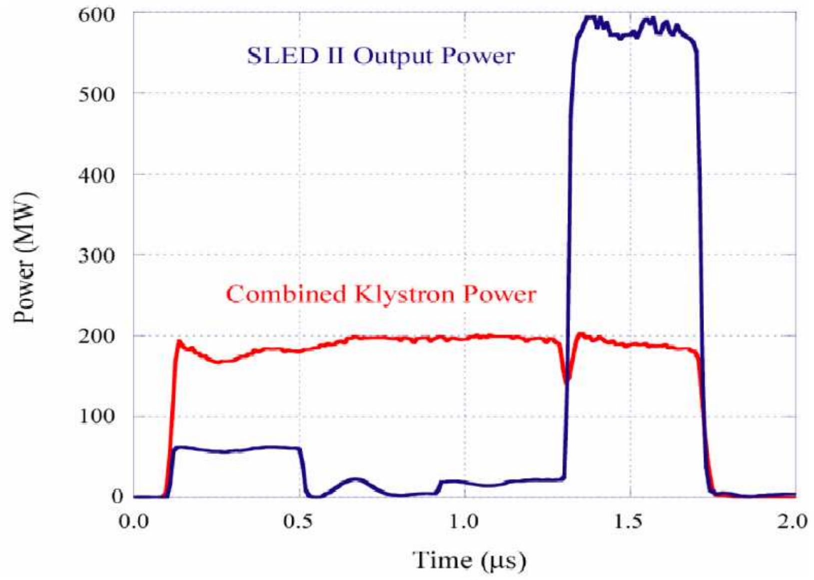
total: **279.15** mm

PETS Unit length to fit 4 str. - **1.117** m
PETS Q+BPM – 0.31 m (Daniel's old data)
PETS active length:
1.117-0.31-0.20 = **0.607** m (185 cells)
PETS power: 132x4/0.95= **556** MW
Drive beam current: **207** A (PETS detuned)
Drive beam energy: **1.22** GeV

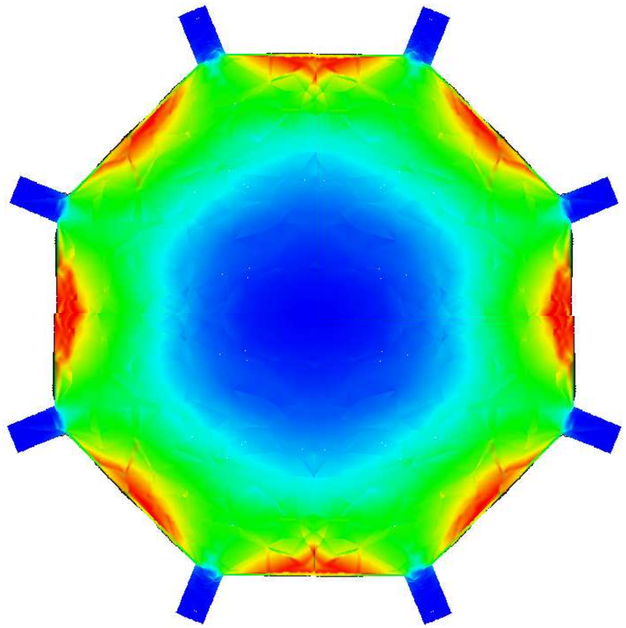
Variations:
#1. One Q serves 2 PETS, feeding 8 str.
(gives 15.5 cm PETS active length increase)
Drive beam current: **165** A (*weak focusing*)
#2. Three beams scheme (1 PETSx2 structures),
RF power/ PETS = **278** MW
Drive beam current: **147** A



#1. RF power: 556 MW x 55.6 ns
NLC data; **590 MW x 400 ns!**
(over-moded waveguide)



PETS RF power flux density



Discussion:
We may consider that RF power flux in PETS is represented by 8 individual streams that later on are extracted into 8 waveguides and individually delivered to 4 structures. Hence the problem can be reduced to the discussion of standard waveguide powered by 556/8 ~ 70 MW.

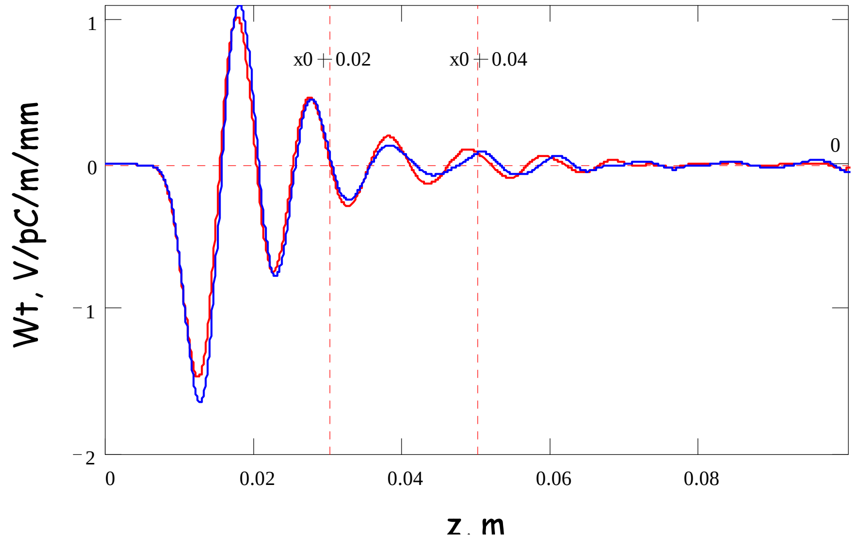
Challenges. Drive beam current

#1. We should revise the PETS design:

Aperture:	22.5 mm	25mm
R/Q, Ω/m	333*	219(200)
Vg/C	0.8333	0.8624
I, A	157	207
E (GeV)	1.61	1.22

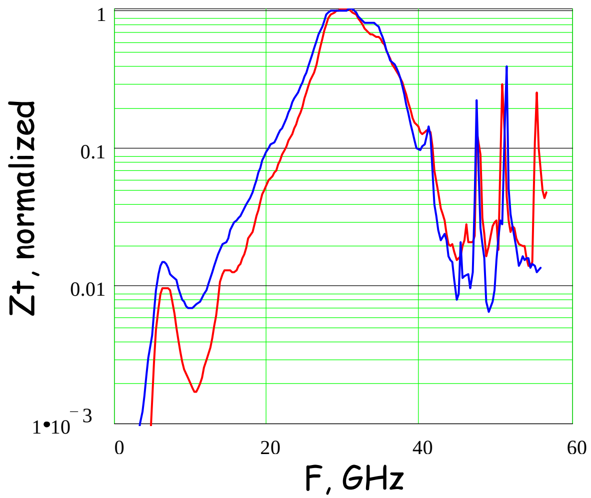
*- no detuning

On/Off capability improved



With 2.5 mm of aperture reduction, the short range wake increases by 45%, while wake at the positions of consequent bunches practically does not changes (may be even 20 mm?).

The beam stability simulations are needed!



#2. Do we need the input load (70 mm!)?

	With load	No load
22.5 mm	157 A - 1.61 GeV	140 A - 1.79 GeV
25.0 mm	207 A - 1.22 GeV	186 A - 1.36 GeV

Conclusions

•The 2x8 scheme based on proposed TWS and modified PETS can be adopted.
•The next generation of TWS can be expected to be longer, that will allow us to establish some margins.
•The drive beam parameters (current and energy) are kept similar to original design values.