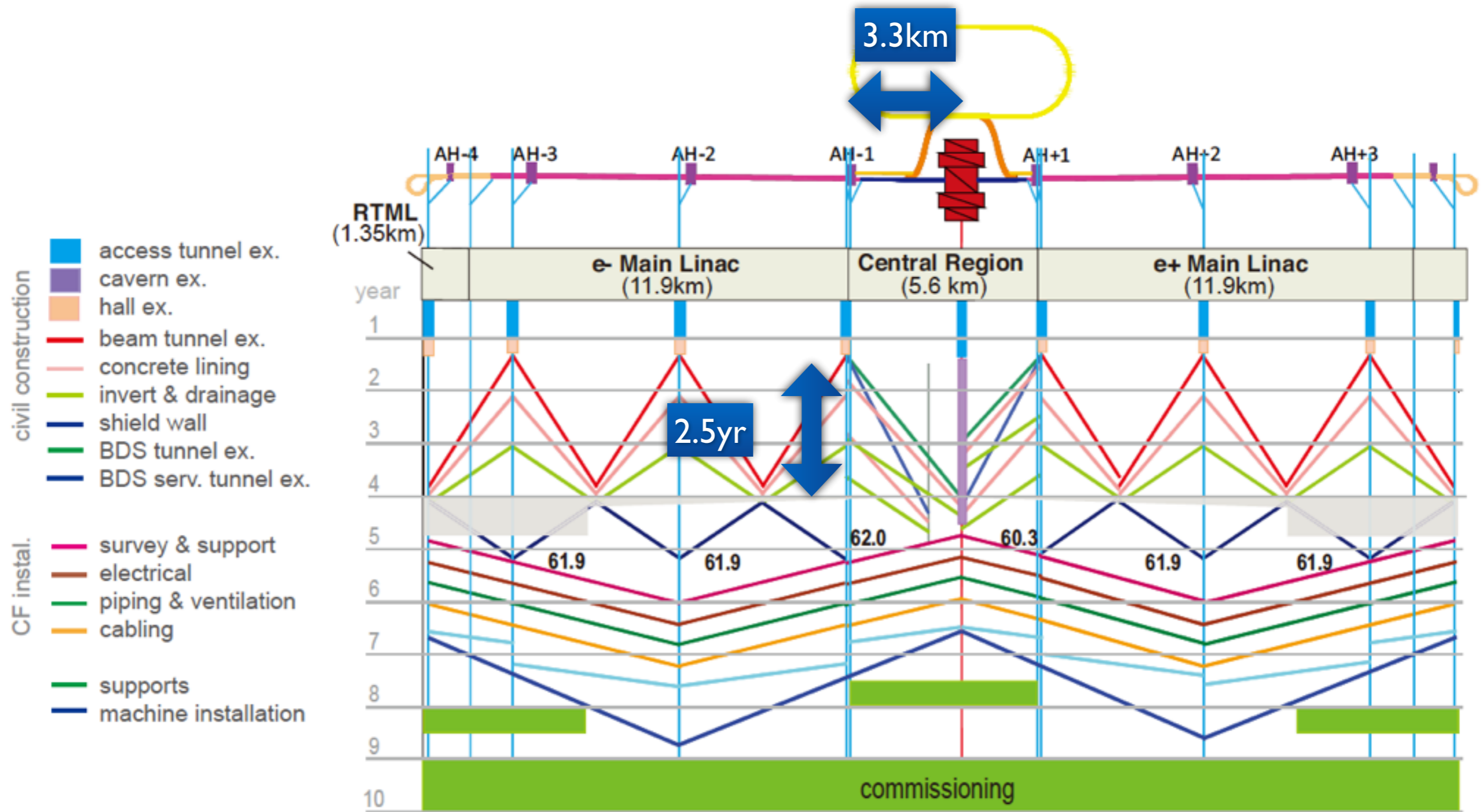


Impact of 1.5km LINAC Extension on CFS

Tomoyuki Sanuki (Tohoku University)

- ML-and BDS-tunnels have to meet different requirements.
- BDS tunnel will be busy. (magnets, muon wall, positron source, booster linac, , , each is “heavy”)
- Inserting additional 1.5km-long tunnels between AH ± 8 and IP, BDS tunnels gets longer (4.8km/3.8km). Excavation, installation and maintenance take time. (We have to walk 1.5km to reach the upstream part of BDS.)
- In case we need to install additional cryo-modules, we have to construct a new cryo-plant.



$$2.5 \text{ yr} / 3.3\text{km} \times (3.3\text{km} + 1.5\text{km}) = 3.6\text{yr}$$

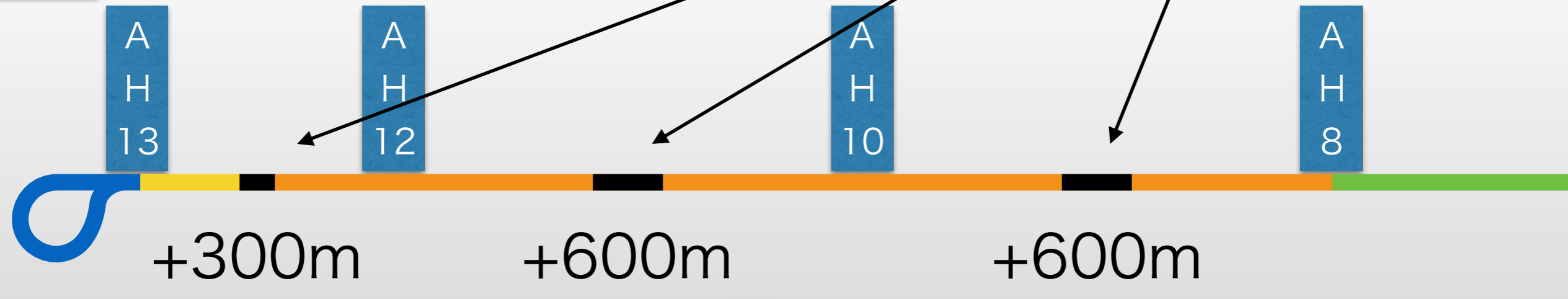
cf. partially double BDS tunnel :

$$2.5 \text{ yr} / 3.3\text{km} \times (3.3\text{km} + 1.5\text{km} + 1\text{km}) = 4.4\text{yr}$$

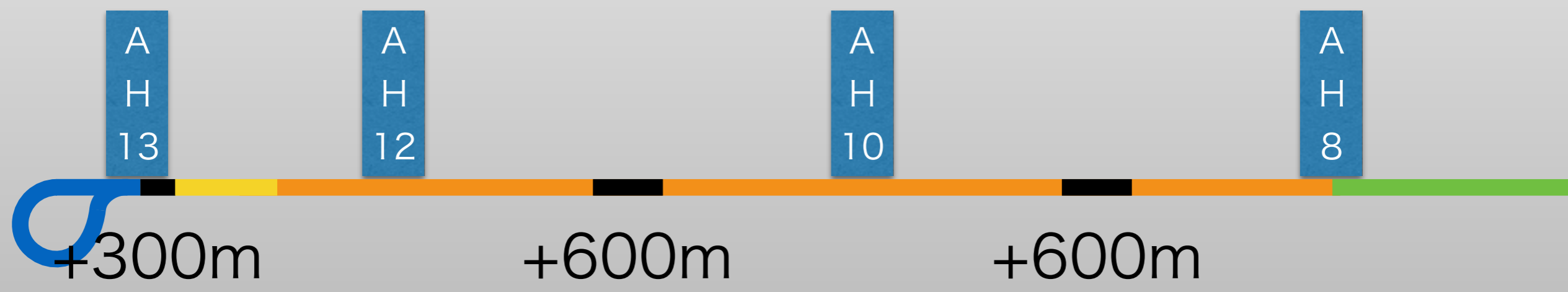
CR-004



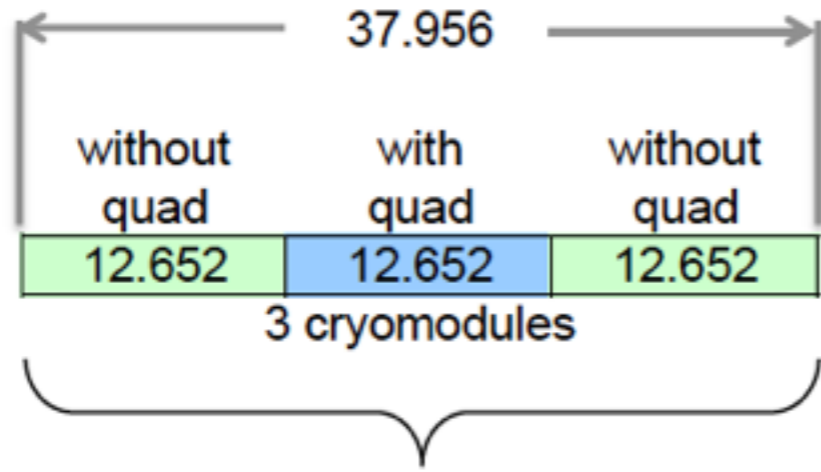
Proposal



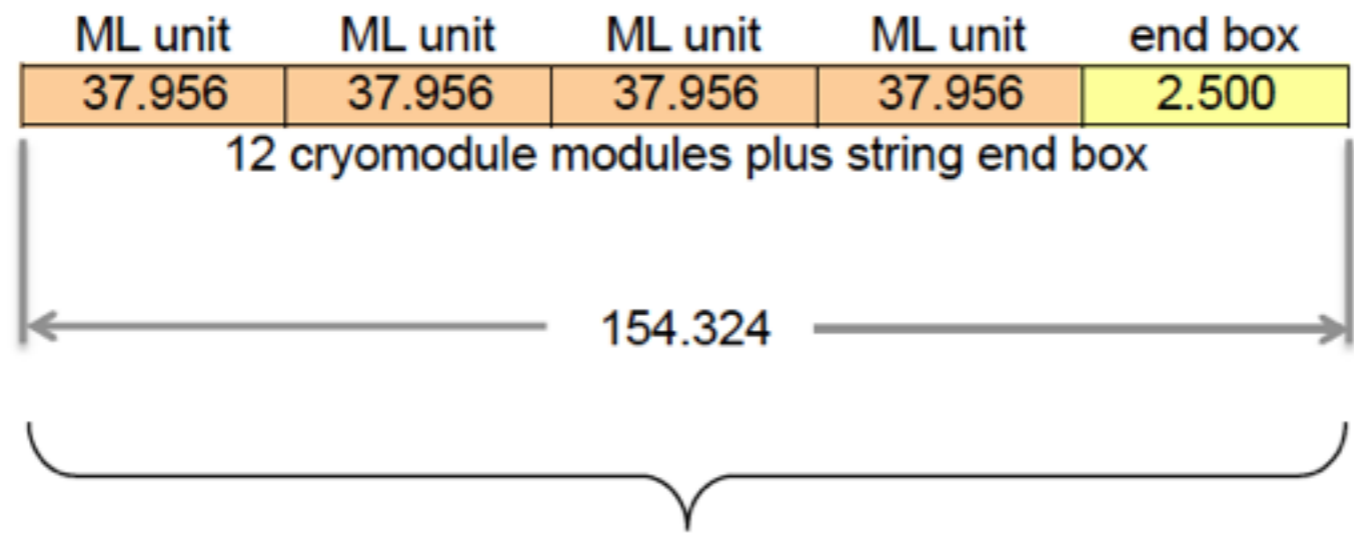
or



ML unit

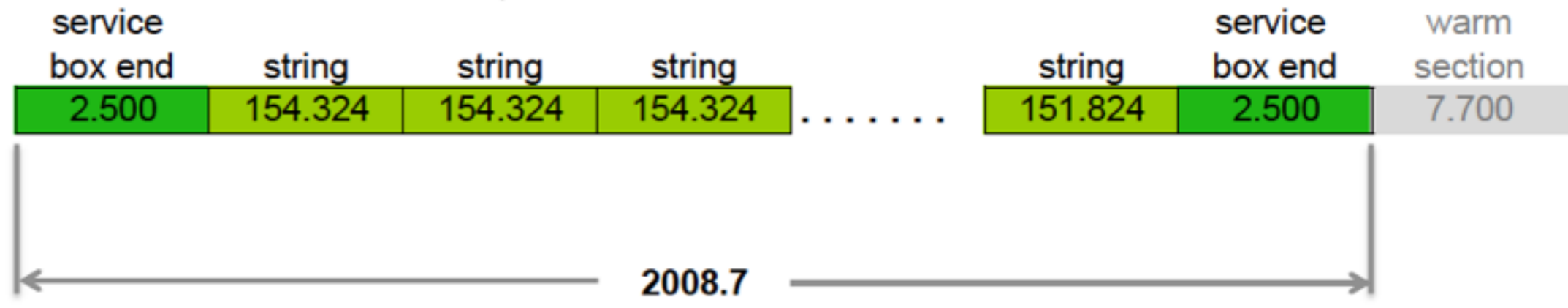


Cryo string (long)



Short string is 3 ML units
Length = 116.368

Cryo unit (standard)



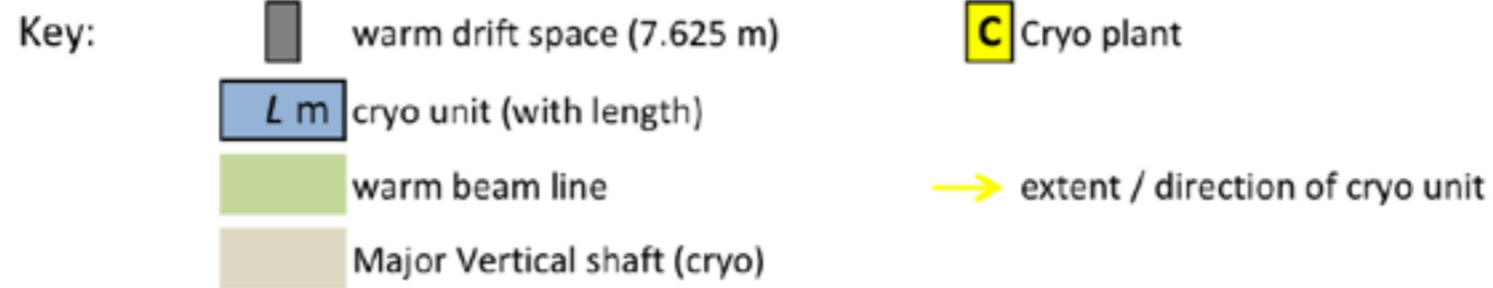
1 cryogenic unit = 13 strings x 4 ML units/string = 52 ML units
with string end boxes plus service boxes

If we fill +1.5km (1497m) with short strings,

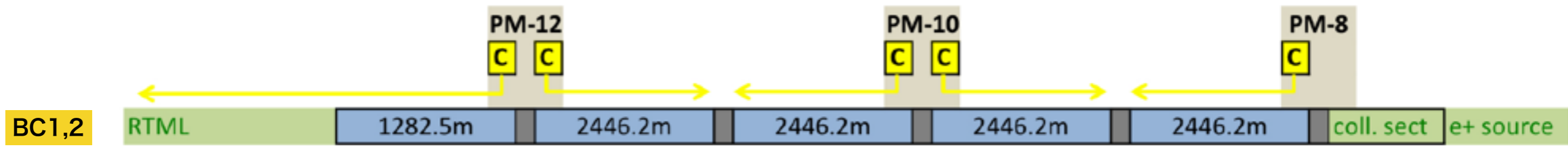
1497m \Leftrightarrow 12.9 short strings

$1497(m) / 116.368(m/\text{short string}) = 12.9$ short strings

distribute 12 short string to three places.

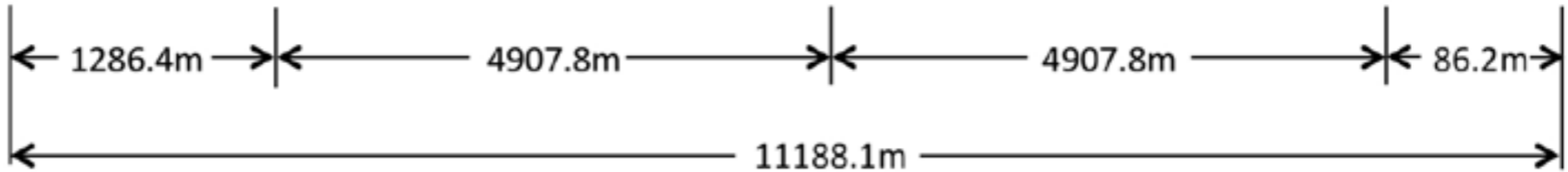


Electron Linac



BC1,2

	tot.						
Long strings	0	0	0	0	0	0	0
Equivalent to 6.3? strings	95	11	21	21	21	21	21
Cold boxes	90	10	20	20	20	20	20
ML units	285	33	63	63	63	63	63
Cryomodules	855	99	189	189	189	189	189
RF stations	190	22	42	42	42	42	42
Beam Energy	15	42.9	96.3	149.7	203.0	256.4	GeV

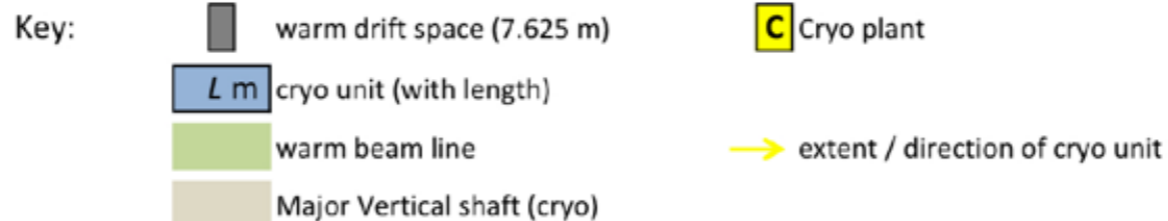


1+16
51

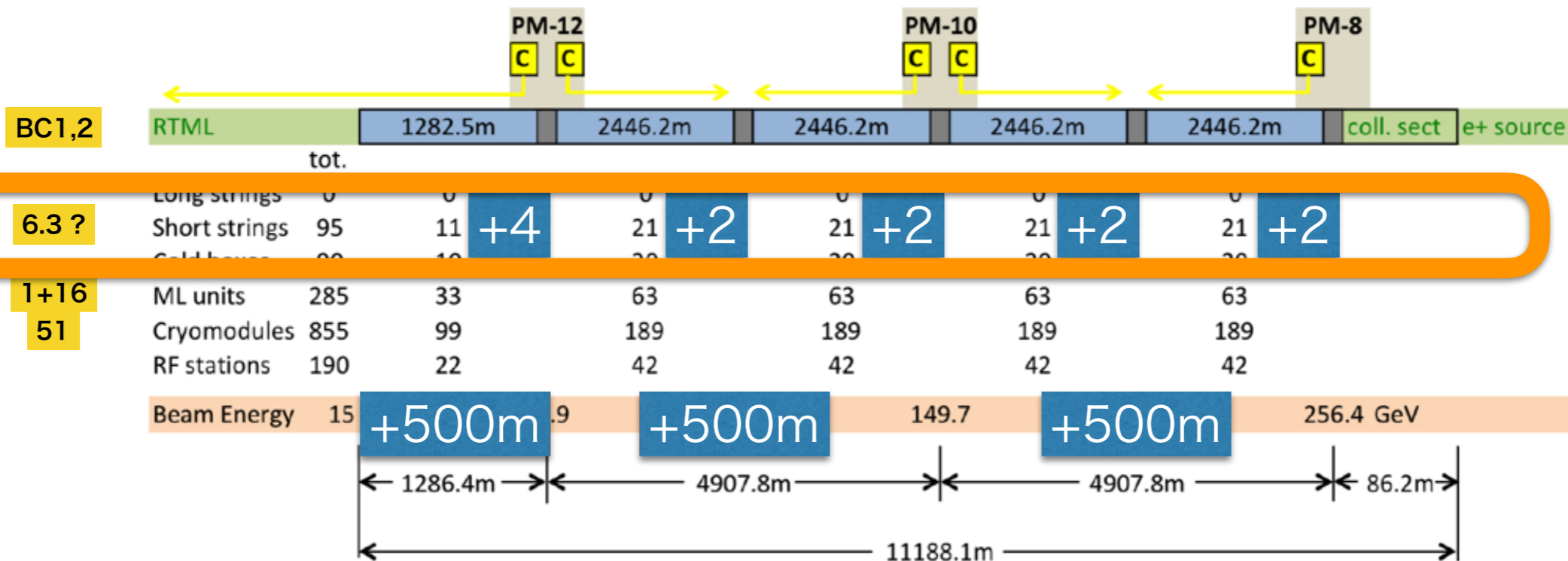


? Any other loads?

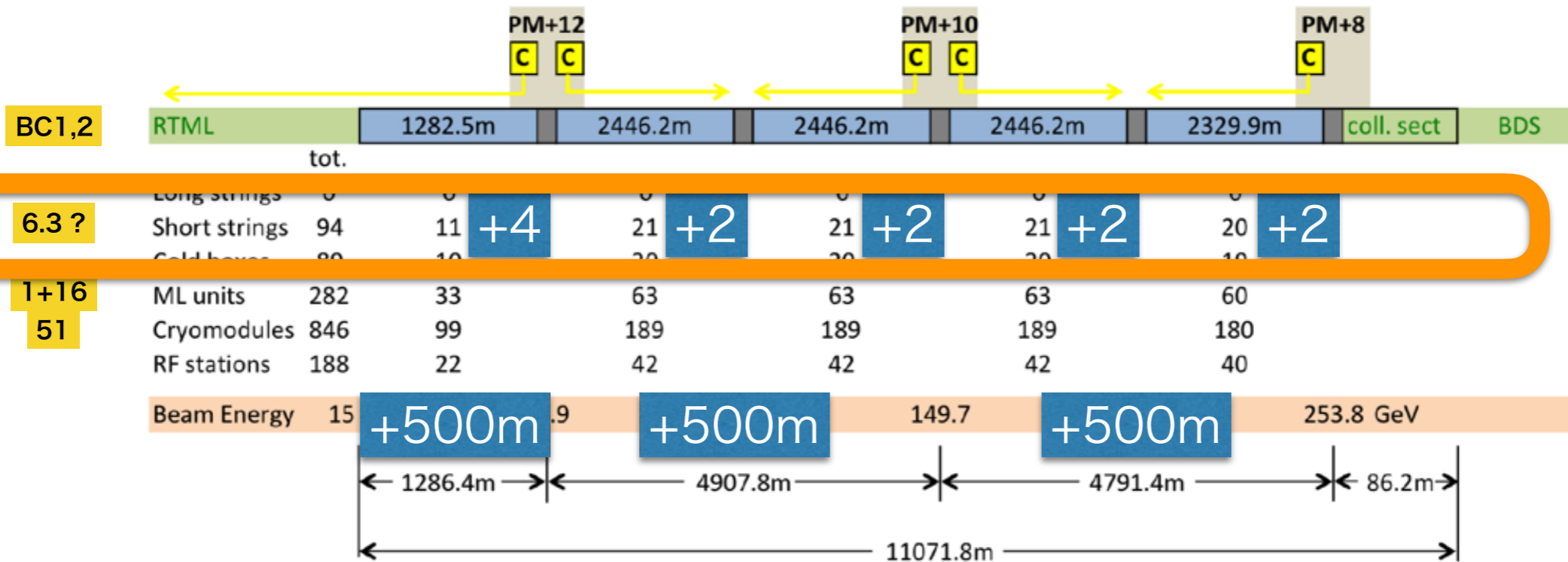
For example,



Electron Linac



Positron Linac



- ML-and BDS-tunnels can be separated by an AH.
- Installation and maintenance of BDS are same as was described in TDR.
- Total Tunnel length is same as was considered in CR-4.
- In case we need to install additional cryo-modules, we do not have to construct a new cryo-plant.
- Cryo-module, which can not reach the designed gradient, could be installed. (?)
- We need more powerful cryo-plants. $(21+2)/21=1.1$
- Cryo-plant cost increases. $1.1^{0.7}=1.07$ (?)

Questions

- Cryogenic loads besides cryomodules in RTML -, ML - and BDS - tunnels (BC's, booster linacs, sources, ...)
- BDS installation and maintenance
- Cryo-plant cost