Decision #38 - Refrigerator Spacing

Drivers:
1) 2K temperature (pressure), Gradient, Q & 300 mm pipe diameter determine the maximum length of the pumping line.
2) Maximum coldbox size 25kW of 4.5 K equivalent

Options:
A) Pair of refrigerators at common locations each feeding a two ~3.5km sector. In this option we are limited by the 300 mm pipe pressure drop, figure #1.
B) Single larger refrigerator feeding two ~2.8km sectors. In this option we are limited by the Refrigerator size, figure #2.

BCD: Single refrigerator spaced 5.6km feeding two 2.8km sectors
Note: "Upgrade" spacing will be slightly less due to the high gradient

Pro:
1) Option B minimizes the pressure drops in the CM; both in the 300 mm pipe as well as the other 5 pipes.
2) This reduces the baseline warm-up unit length.

Con:
1) The TESLA design used option A; it permitted an initial half refrigeration installation
2) Increases the number of utility systems required: purifiers, LN_2 systems, LHe systems, GHe systems, ICW, etc

Required task: After the Decisions #3, 10, & 30 are chosen the ~5Km needs to be verified
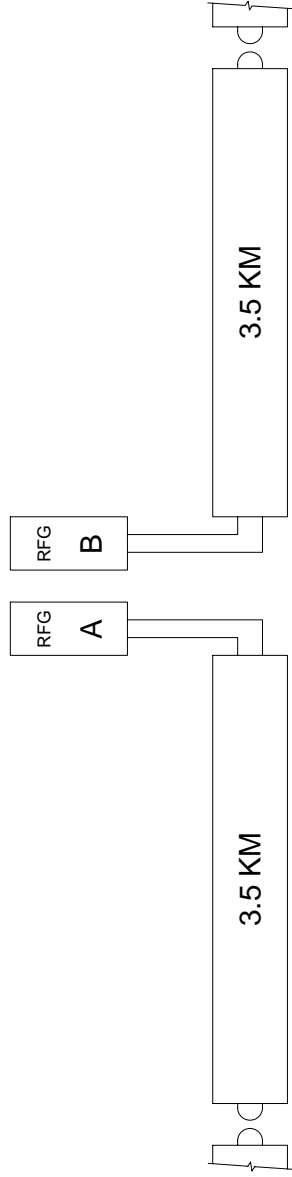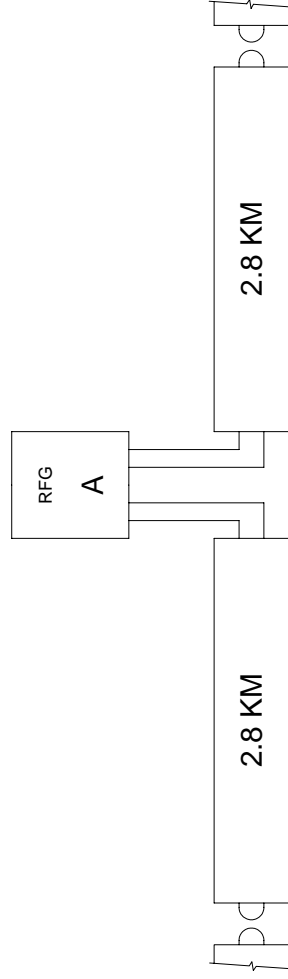
REFRIGERATION SPACING

RFG A

RFG B

3.5 KM

3.5 KM

FIGURE #1
7.0 km

RFG A

2.8 KM

2.8 KM

FIGURE #2
5.6 km