

# ***Homework of HLRF 1***

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# *Home Work Menu*

- Required RF Power overhead, more detail (in KCS and RDR)
- Cost saving of PDS, Klystron, Marx Generator etc.
- Catalogue local power distribution variants and conceptual designs.
- Estimate waveguide losses and heat loads

# *Starting Point*

- There are jig-jag developing history, originated by the evaluation change of the cavity performance variation and cost reduction discussion. Especially it was true for the PDS design.
- While, if Kamaboko tunnel concept is accepted, RDR design is very likely plan. If necessity of variable tap-offs is not serious, this situation is more accepting.

# *Current position of HLRF*

- There are two designs, RDR-like and KCS.
- For modulator and klystron, candidates of devices are the same, while in PDS, there are two different designs depending on the single tunnel layout.
- Therefore, there are two independent designs and hence independent cost estimations.
- Though this presentation is about the RFR-like HLRF design, there requires the effort to unify them into one,

# ***Cost saving of PDS, Klystron, Marx Generator etc.***

# *Key Points of Cost Saving in HLRF*

- Concerning with the details of cost saving, there will be the presentation in the session of costing held at Wednesday, April 25.
- There are several key points to save the cost in HLRF.
  - Mass production of the HLRF components requires vendor's facility investment which raises the cost. For certain devices, ILC must make a scenario to reduce this part of the cost. Klystron product and PDS product are in this case.
  - For the klystron production, manufacturing and processing are the important process, and latter process involves the not negligible facility investment and labor cost.
    - Concept of processing in hub-laboratory is important.
  - In production of PDS devices, there are tremendously large numbers of devices involved, and procedure of pre-assembling, pre-tuning and delivery should be introduced. This is also related with the installation work group and their cost evaluation.

# *Processing at Hub-laboratories of ILC*

- Akira hated the idea that klystron processing is done at ILC site considering the construction schedule. There may be conflicting among construction and processing.
- If the hub-laboratories can offer the big building with electricity and water plant (ex., assembly hall in KEK), it is possible for us to borrow and set 10 modulators and have a processing of the klystron without any new facility investment. After completion of processing, modulators are sent back to ILC.
- This scheme is applicable to not only one institute but also several institutes.
- It may be necessary to introduce automatic processing system, which relating with the software work for automatic processing.

# *Labor Fee in Hub-laboratories*

- From the information of Toshiba, one tube processing time was 4 weeks in the case of DESY MBK. Namely its time is 20hr. \*7days\*4 weeks=560hrs. This depends on the testing specification and data demand. If simpler data acquisition results in cheaper processing cost.
- How many engineers are required?
  - Fukuda is asking for how many engineers for actual processing.
  - Initial assembling, tuning the cavity and output power balance adjustment require several person. On the other hand, it is enough for a few engineers during the usual processing and by employing auto-processing it is possible to reduce the numbers of engineer.
- In anyway, maximum cost is 4M\ /tube which is evaluated in Toshiba.
- We are waiting for the basic date of Toshiba now.



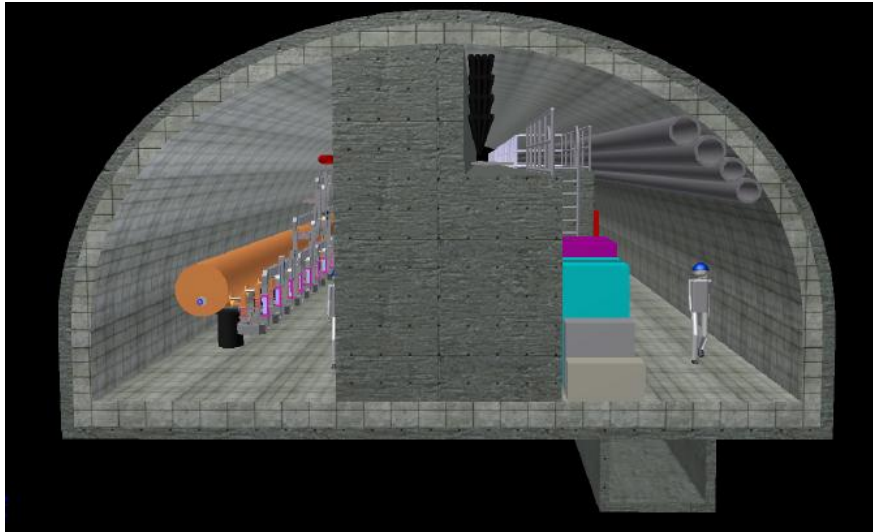
# *Some comments for PDS cost saving*

- Two schemes of PDS, RDR-like and KCS.
- Key-points of cost saving
  - Necessity of variable power dividers
    - Is LLRF control of Pk-QI really necessary?
    - How to evaluate the cavity variation and degraded effect?
    - Necessity of phase shifter
- More aggressive cost saving
  - Elimination of circulator by employing pairing power feeding to cavities

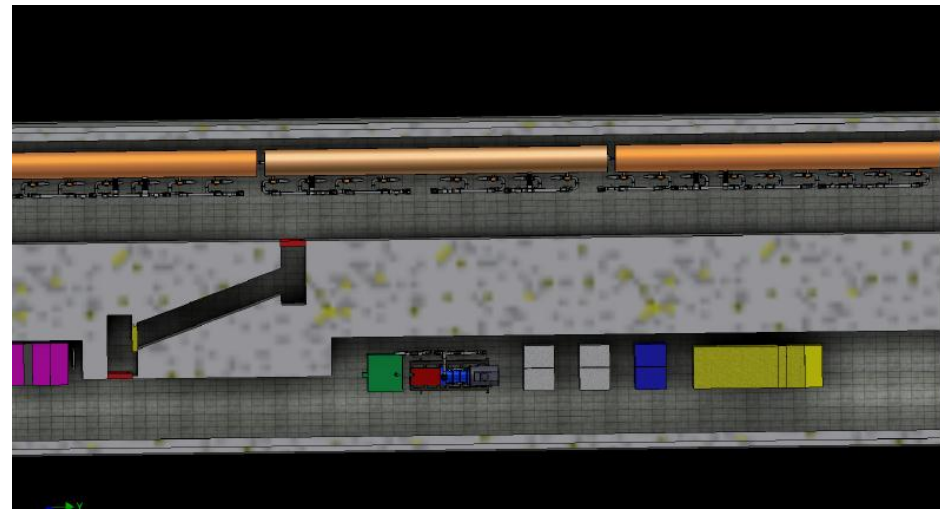
# *Latest RDR-like Plan (I)*

## *-Kamaboko Tunnel-*

- Latest Kamaboko tunnel plan is shown below



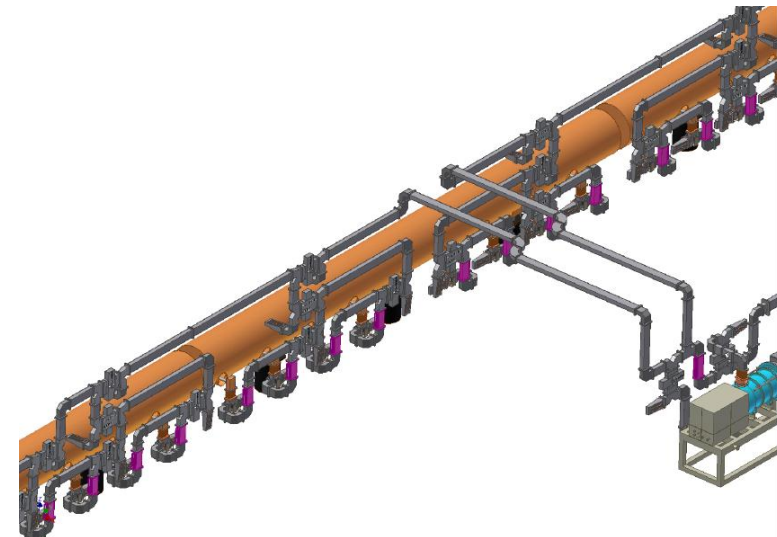
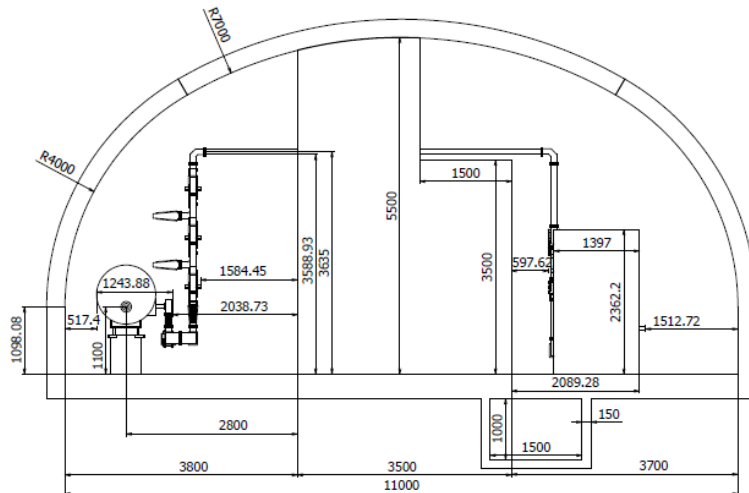
Cutaway view



Top view

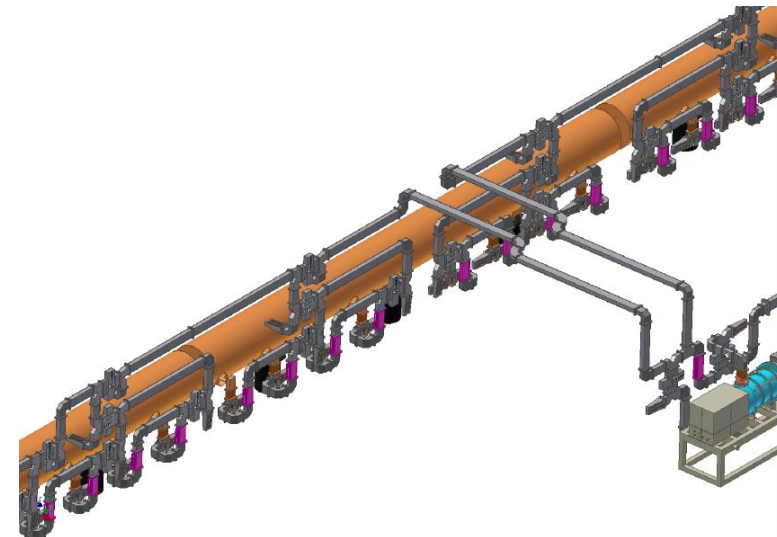
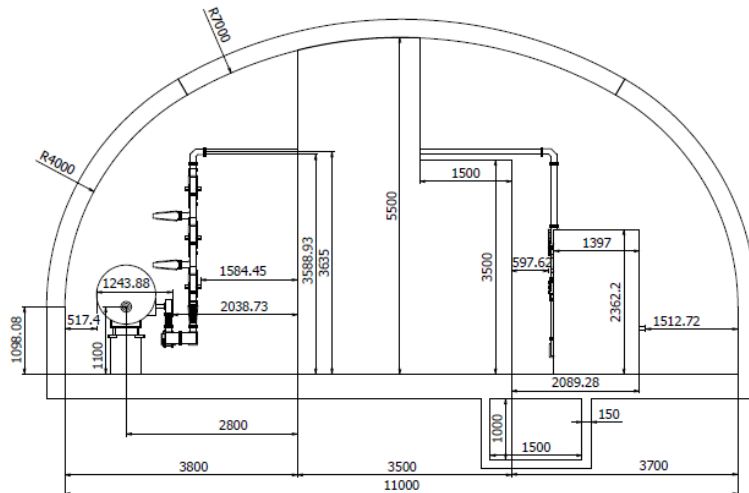
# Latest RDR-like Plan (II)

- Final design of the Kamaboko Tunnel is shown below, and tunnel width of 11 m is the very likely dimension. New shielding wall structure is introduced. More detail description is presented in the CFS session of KILC12.
- Based on the RDR-like configuration in the Kamaboko tunnel, components layout and list of the components are completed and 3D layout are shown below.



# Latest RDR-like Plan (III)

- Cost estimation for the RDR-like is performed based on the Furukawa Corp. in Japan. Some ambiguities are variable tap-offs and their remote control. Cross check among Japan and US is attempt. Supporting system of the waveguide systems are not estimated and we need to ask the information of DESY.
- It is pursued that unifying PDS of the RDR-like and the local PDS of KCS.



# *Unification for the Local PDS*

- In previous HLRF webex meeting, C. Nantista propose similar PDS using Kazakov's tap-off.
- Though we didn't fully evaluate his scheme and no 3D configuration, if his is reasonable and cost benefit, it is possible to unify the local PDS between RDR-like and KCS.

# Possible unifying pass

RDR-like

KCS

Use circulators and r.c. switches (as in combining circuit) respectively to shield KCS from reflections and, if necessary, to depower 1½ CM's.

