



# ***Latest Local PDS and Installation Idea in ILC***

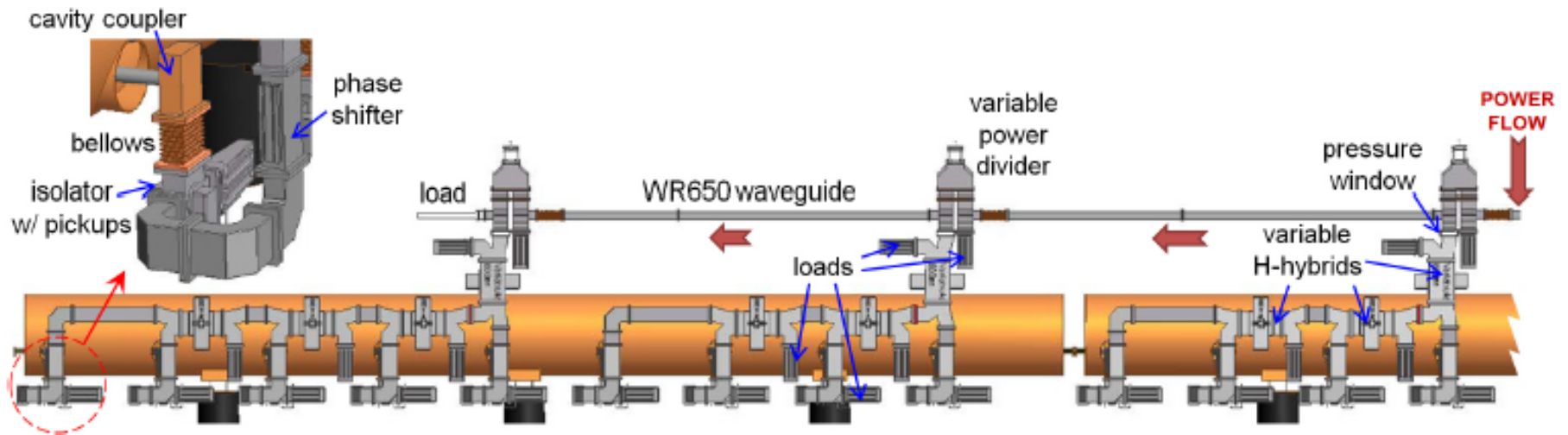
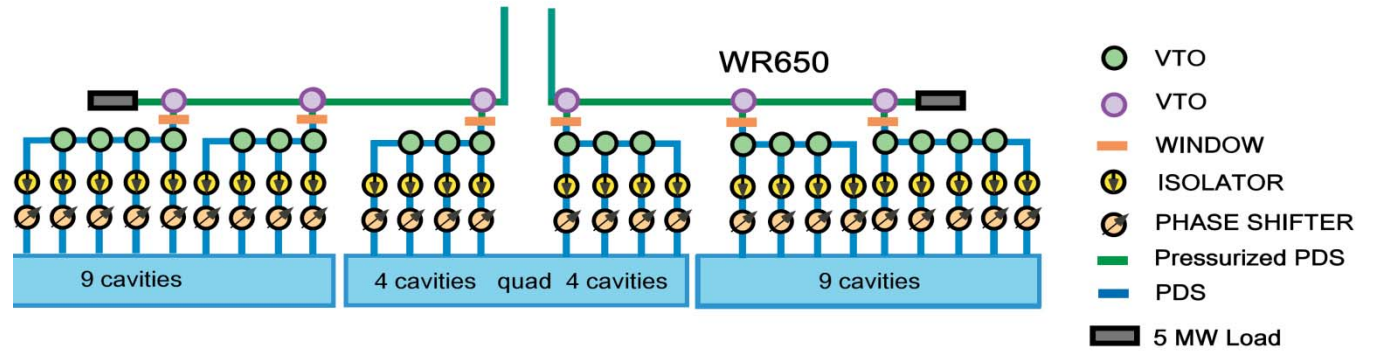
*KEK Fukuda*

## *Contents*

- *Review of local PDS in TDR*
- *What is the cost effective way to install PDS*
- *Mechanical concept of local PDS Supporting to cryomodule*
- *Transportation and Installation*



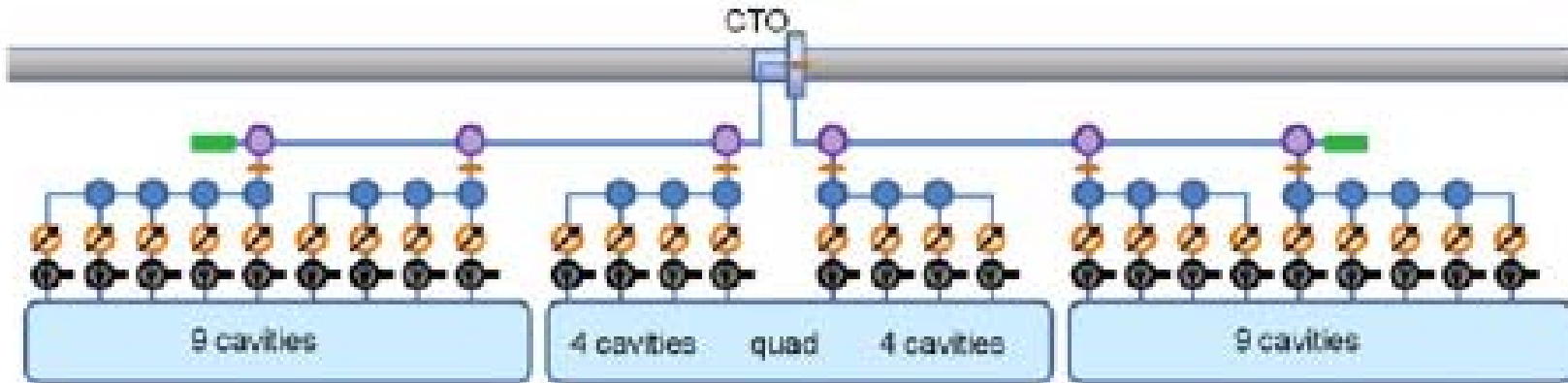
# Unified Local PDS among KCS and DKS





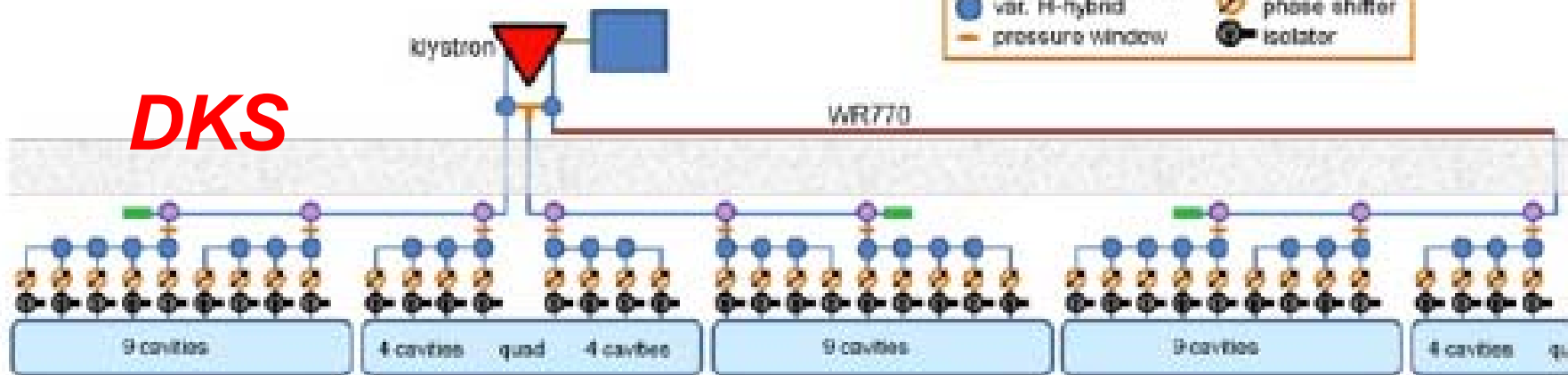
# Common Local PDS

## KCS



var. power divider	5 MW load
var. H-hybrid	phase shifter
pressure window	isolator

## DKS

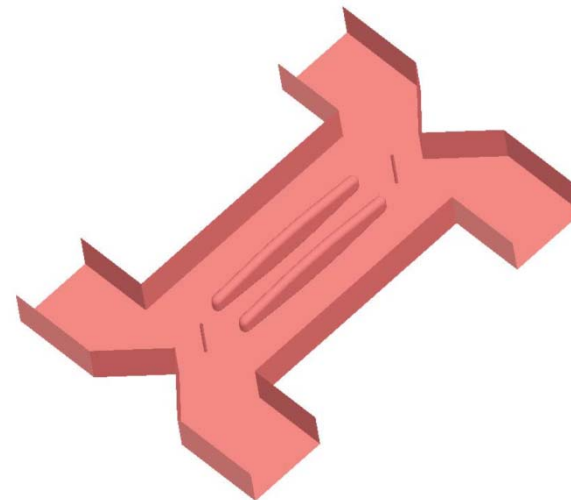
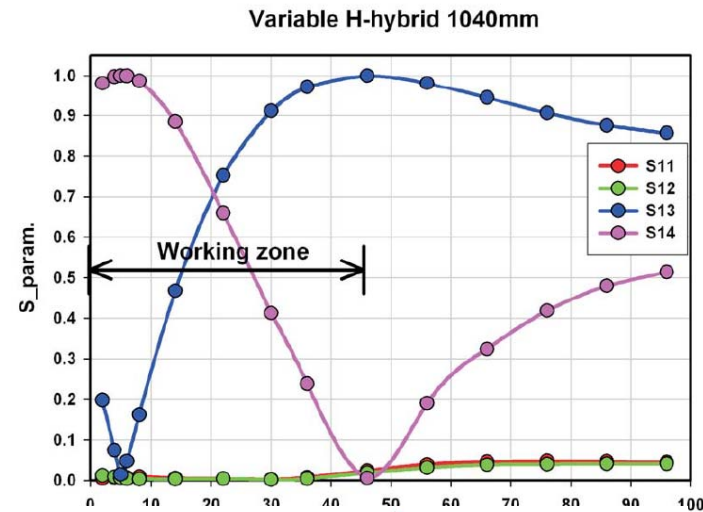




# Variable Power Divider

by S. Kazakov/(KEK)

- *Variable power divider developed by kazakov.*
- *High power capability*
- *By changing the length of interaction region, variable range is changed.*
- *Interaction region of 1040mm, 0-100 % variable range is achieved.*
- *This type was used in S1-global test sucessfully.*

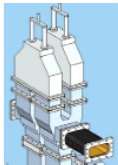




# High Power VTO by Chris Nantista/SLAC

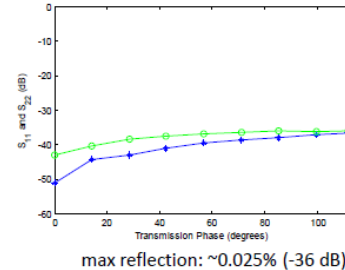
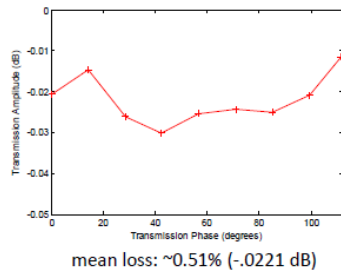
## U-bend Phase Shifter

SLAC  
Nantista

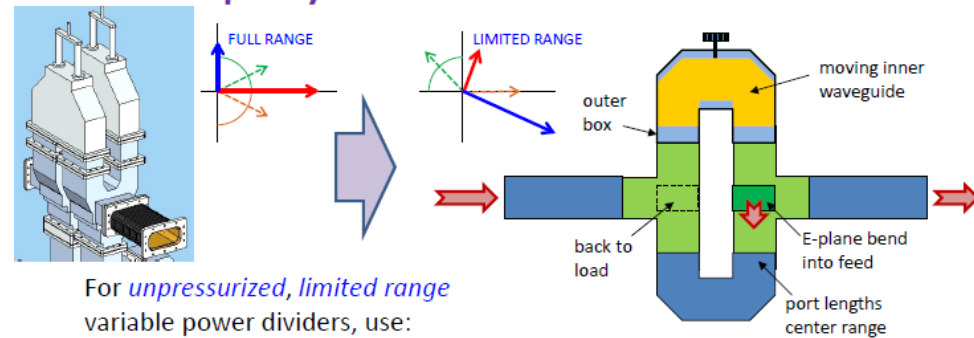


Tested to **2 MW**

- No significant field enhancement or mismatch.
- Rate of phase change with mechanical position independent of position



## Simplify Most Power Dividers



- *non-pressurizable* waveguide (after windows)
- *ordinary* (not folded) magic-T's
- a *single* trombone + a U-bend (need phase shifters)

nominal coupling	$\Delta\phi$ range	coupling range ( $\cos^2\Delta\phi/2$ )
20%	81.9°–171.9°	0.5–57.0%
25%	75°–165°	1.7–62.9%
33%	64.5°–154.5°	4.9–71.5%
50%	45°–135°	14.6–85.4%

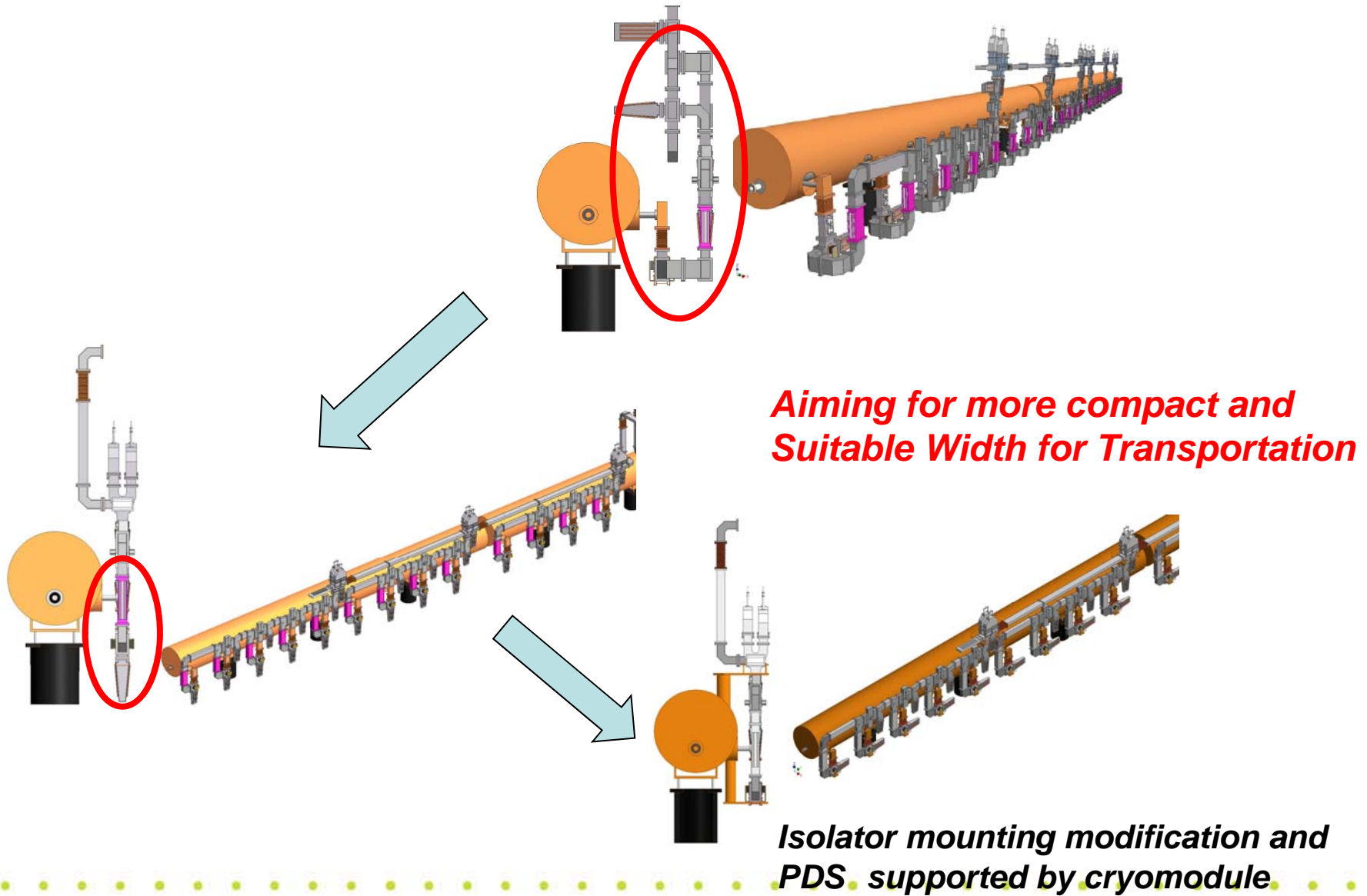
Set cavity phases right for nominal couplings by input waveguide length (spacers on E-plane U-bend).

Each divider can introduce a phase change of up to  $\pm 22.5^\circ$ .

Phase shifters have a range of  $\sim 130^\circ$  ( $\pm 65^\circ$ ), so it's possible, but unlikely to get out of range by the 5<sup>th</sup> cavity in a group of 5.



# Revision of common local PDS





# Layout of Cryomodule with PDS in XFEL



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2012/10/25

LCWS12 (Fukuda)

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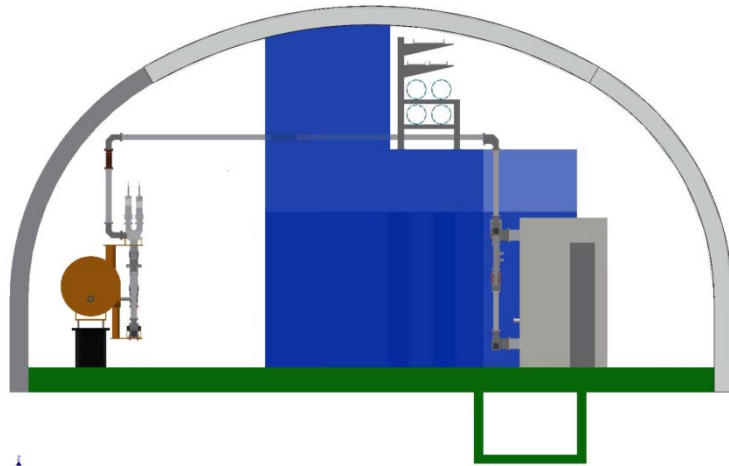
## *What is the cost effective way to install PDS?*

- Pre-installation of Local PDS at the another place makes us possible to pre-measure the low level RF and check/adjust the PDS. Increase of the reliability is expected.
- Bolting the flange at the sc tunnel results in involving the mistakes and high labor cost due to the work in the narrow space. Cost effective and reliable installation are expected.
- We can avoid the contamination of dust or other undesired material which likely exist in the tunnel.

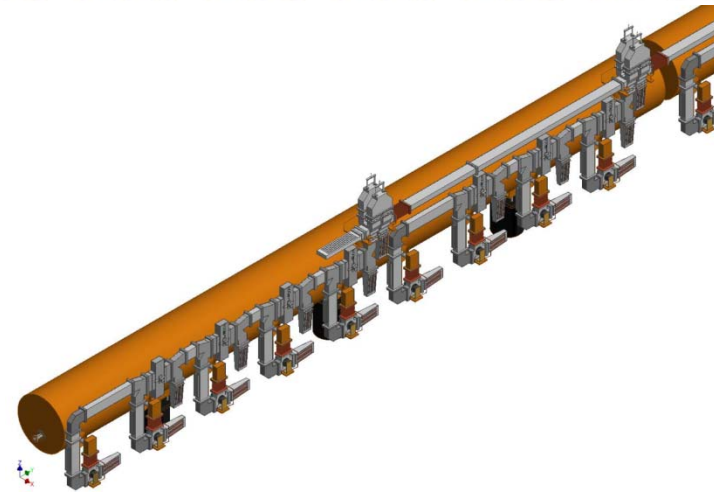




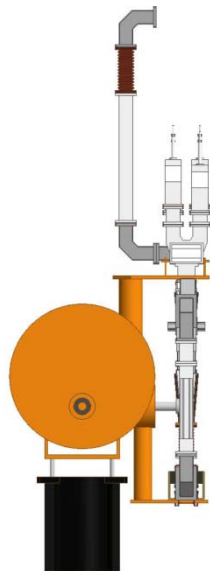
# Layout of Recent DKS



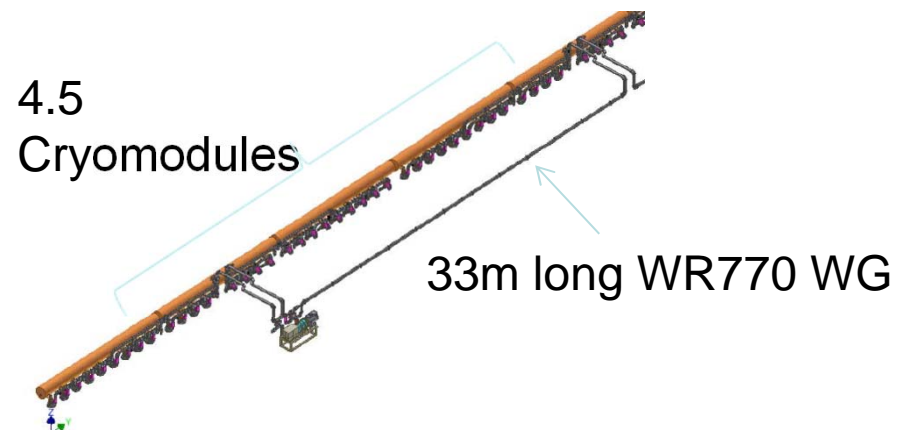
Layout of Kamaboko Tunnel



Local Power Distribution System which is common for DKS and KCS



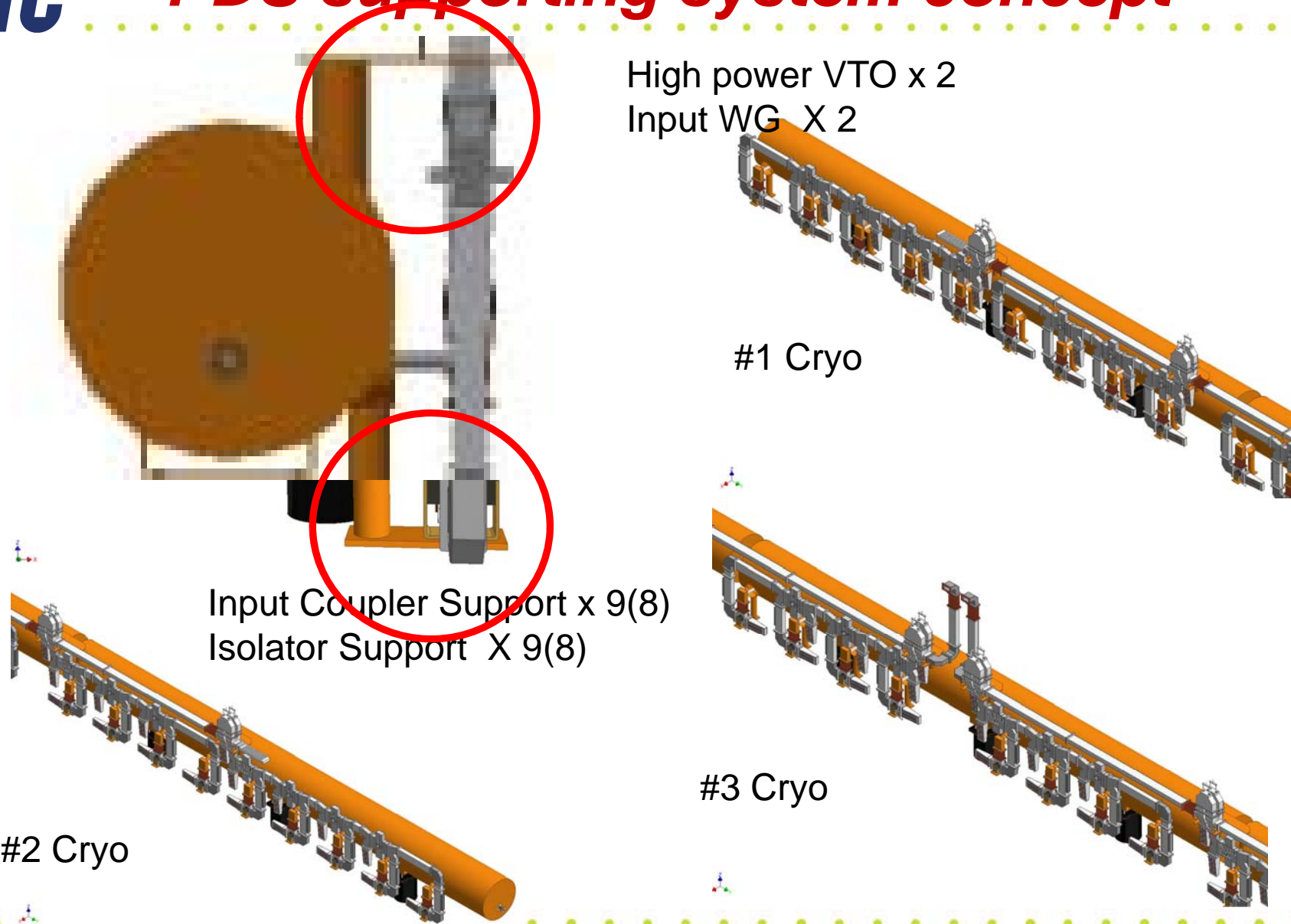
LPDS Cross Section View



Low Power Baseline RF Unit of DKS



# PDS supporting system concept



High power VTO x 2  
Input WG X 2

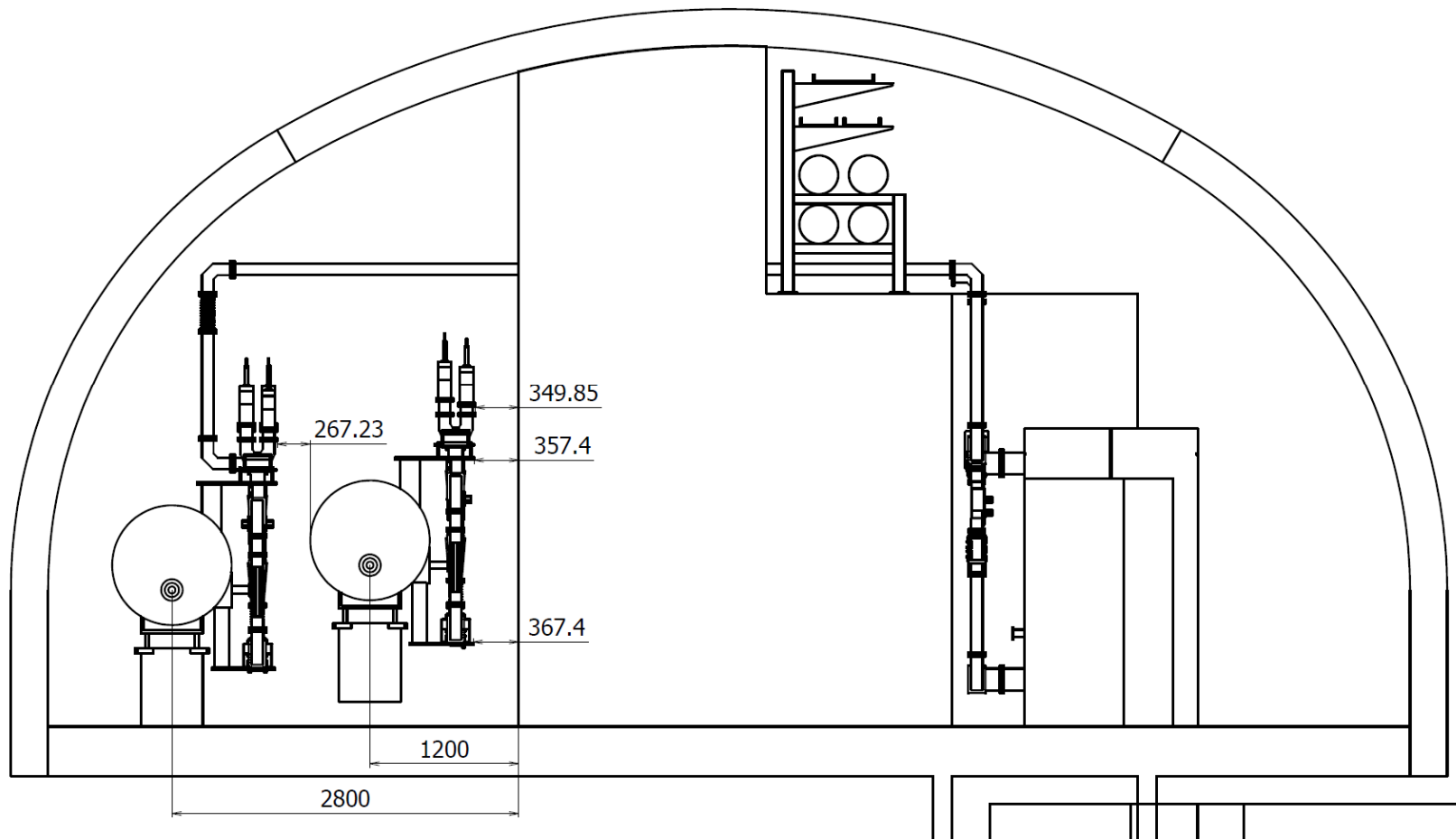
#1 Cryo

Input Coupler Support x 9(8)  
Isolator Support X 9(8)

#3 Cryo

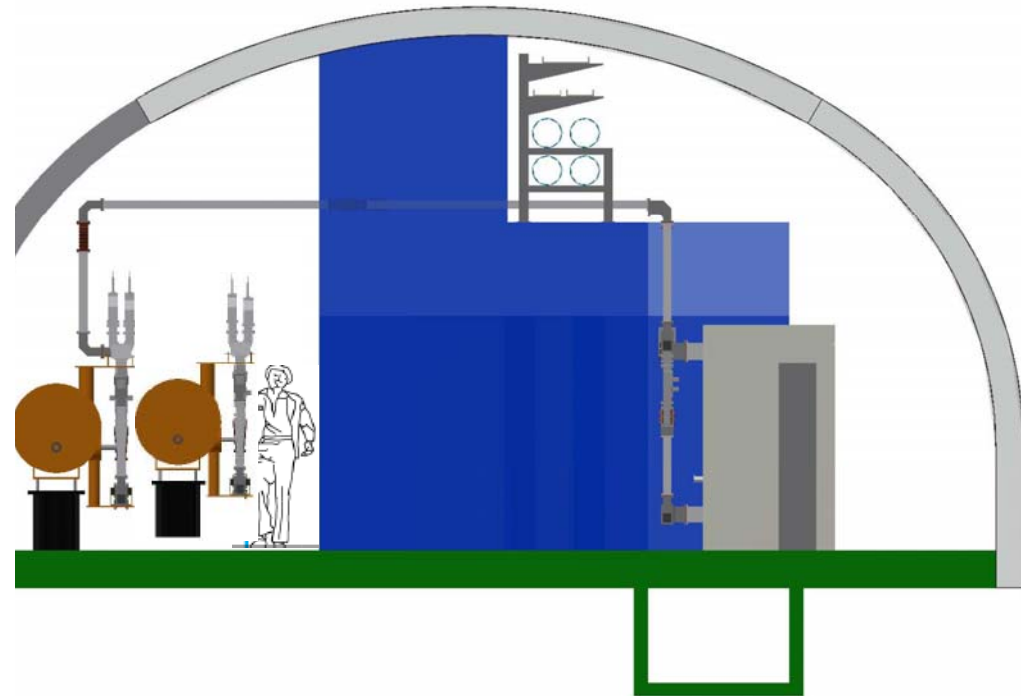
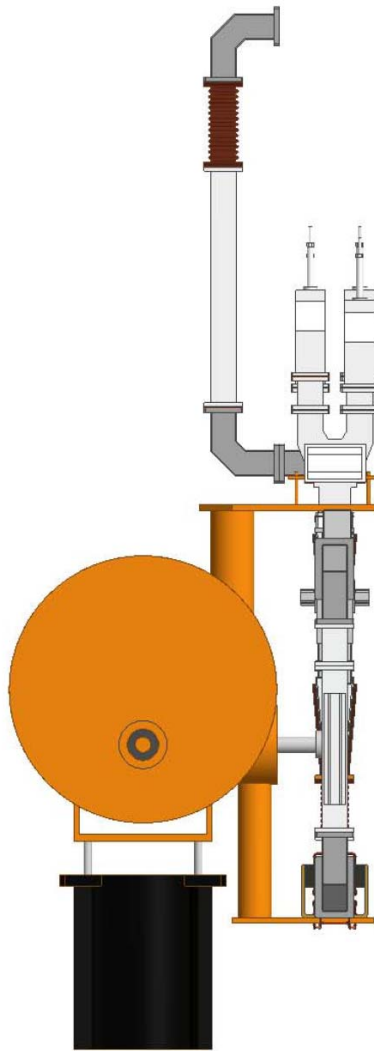
#2 Cryo

# **Transportation of Cryo-PDS Module** **-Corridor Dimension-**





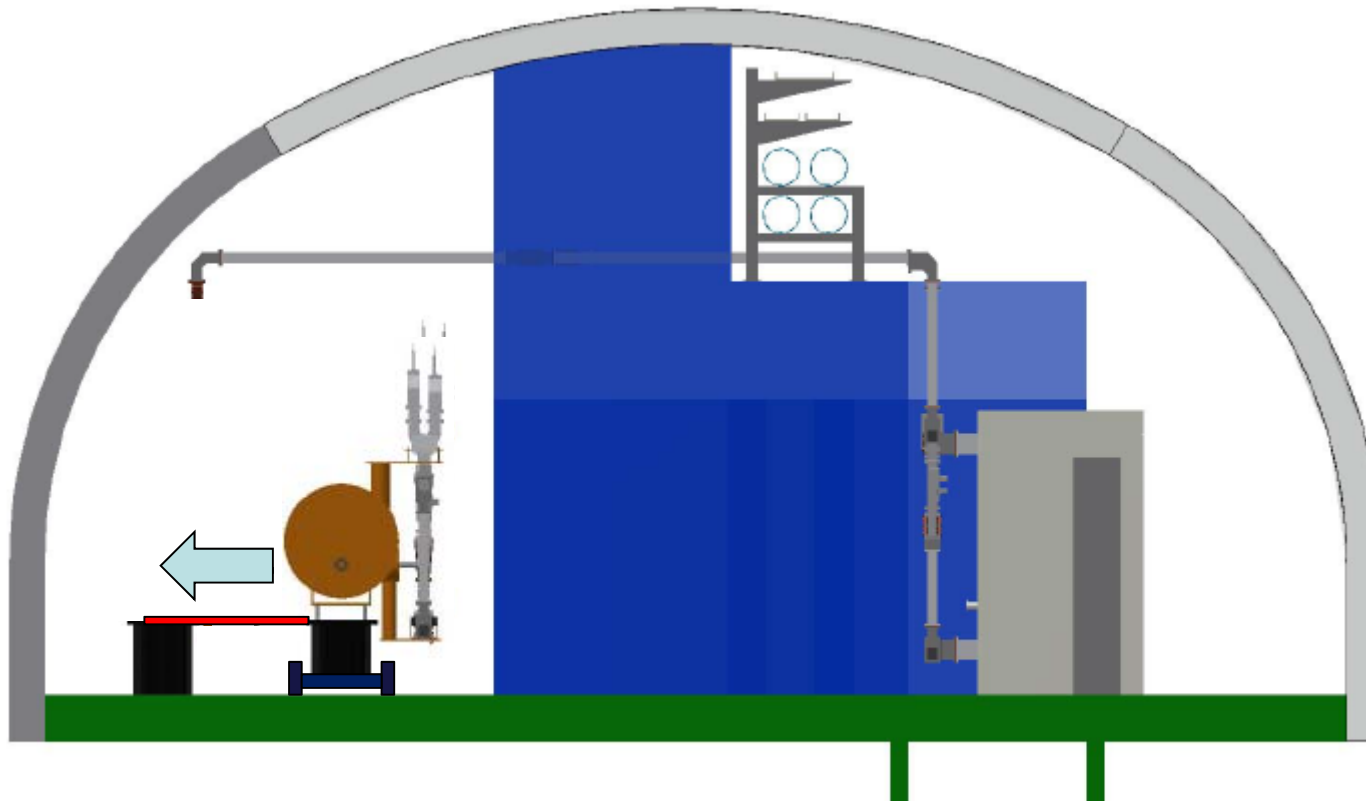
# Transportation of Cryo-PDS Module



Keeping the area where man can escape during  
The transportation when accident occurs.



## Installation of the Cryo-PDS Assembly

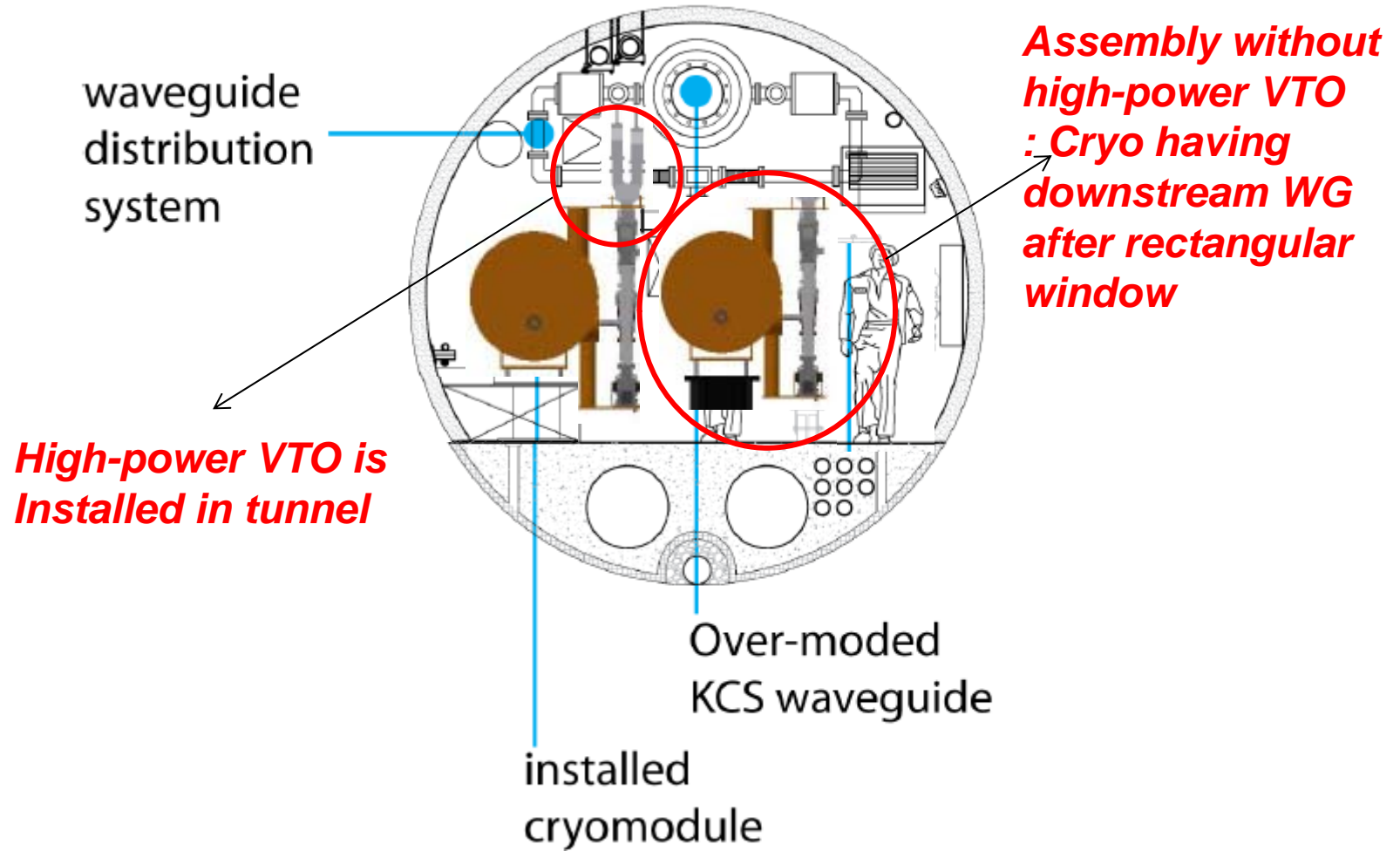


2~3 ideas for transportation of cryomodule-PDS Assembly

- For two girders case, assembly on the carrier girder is carried by vehicle and shifted to locally fixed girder
- Assembly on the girder system is carried by roller system



# Application of this idea to KCS Single Tunnel (rough check of dimension)





# Experience of existing facility is useful

Thanks for Dr. Keith Kershaw (CERN)



DESY's "Dwarsloeper" has a Rail to transfer CERN "Buggies" is attractive and possible to apply directly



## *Summary*

- Latest local power distribution system, which is used in KCS and DKS is presented.
- Conceptual assembly which is useful to install are described. Local power distribution is holded by the cryomodule system, which has many advantages such as reliability and cost effectiveness.
- Transportation of this assembly and installation are considered.