JOINT GDE, ILC-HIGRADE AND JINR CFS Meeting

CONVENTIONAL FACILITIES AND SITING GROUP

OVERVIEW OF CFS TUNNEL CONFIGURATION STUDY AND OPPORTUNITIES FOR JINR/GSPI PARTICIPATION

V. Kuchler

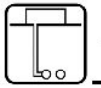
Outline

- Overview of the Current CFS Tunnel Configuration Effort
- Expectations for the Review of the GSPI Soil Boring Report for the Dubna ILC Site
- Suggestions for JINR/GSPI Participation and Contribution to the CFS Tunnel Configuration Effort
- Discussion Topics for Continued JINR/GSPI Participation in ILC CFS Effort
- Closing Remarks

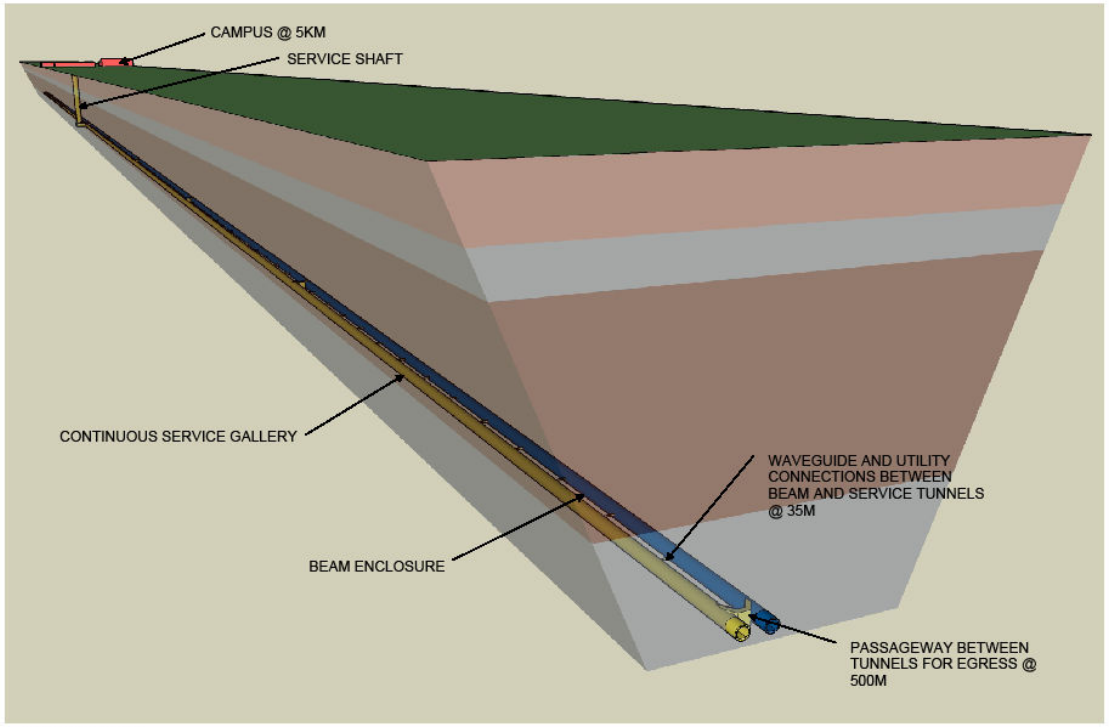
CFS Tunnel Configuration Study

- The ILC RDR Preparation Included Five Siting Areas
  - Asian Sample Site - Twin Tunnel Deep
  - American Sample Site - Twin Tunnel Deep
  - European Sample Site - Twin Tunnel Deep
  - DESY Site - Shallow Bored Single Tunnel
  - Dubna Site - Shallow Bored Tunnel with Surface Level Gallery
- Surface Level and Cut and Cover Solutions were also Considered but Not Developed to the Same Level of Detail
- In Addition the Experience of Similar Projects Could also be Investigated
  - XFEL - Shallow Bored Single Tunnel
  - Project X - Cut and Cover Tunnel with Surface Gallery
- As Part of the Value Engineering Phase, a Comprehensive Review of all Reasonable Enclosure Combinations was Considered Appropriate

Tunnel Configurations



TWIN DEEP TUNNELS; VERTICAL ACCESS



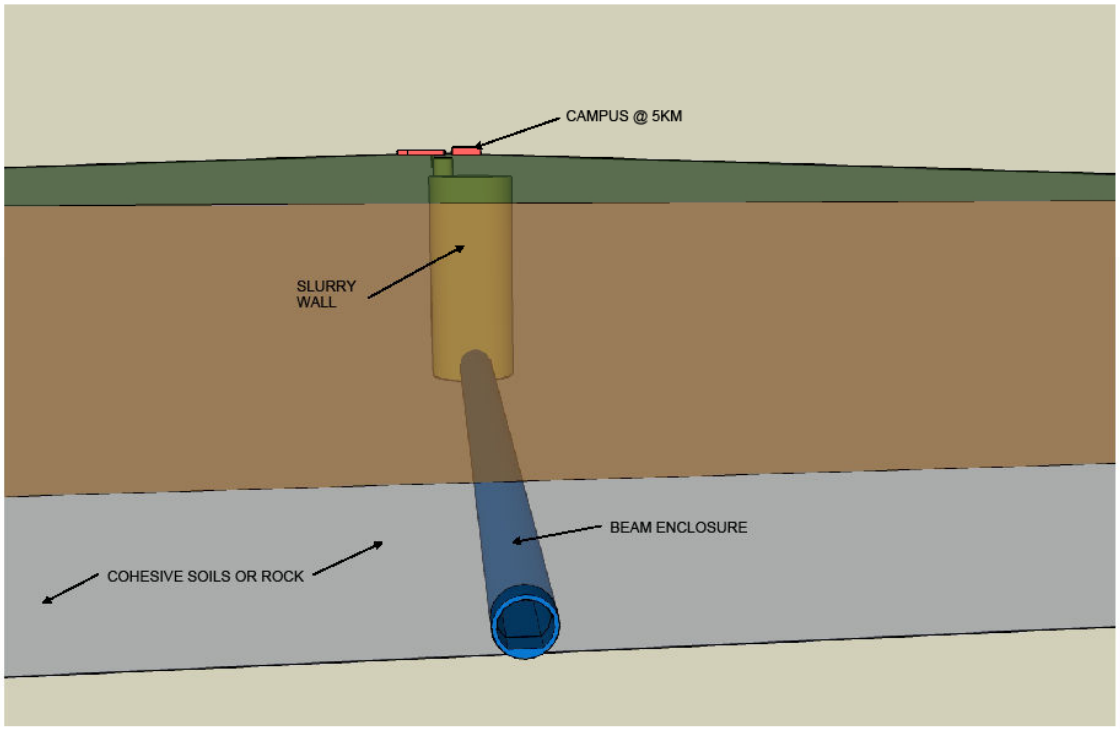
PERSPECTIVE

DRAFT 2/27/2009

- THIS IS THE RDR BASE-LINE PROFILE.
- THE TWIN TUNNEL IS APPROPRIATE FOR DISTRIBUTED RF.
- THERE ARE SHAFTS, CAVERNS AND SURFACE CAMPUSES SITUATED EVERY 5 KM.
- THE TUNNELS ARE EXCAVATED USING OPEN FACED TUNNEL BORING MACHINES (TBM). CAVERNS ARE EXCAVED USING ROAD HEADERS OR DRILL AND BLAST METHODS.
- LIFE SAFETY EMPLOYS THE ADJACENT TUNNEL FOR SAFE EGRESS PAS-SAGE.
- POWER AND COOLING FOR THE RF IS DISTRUBUTED TO THE LOADS ALONG THE LENGTH OF THE TUNNEL. PENETRA-TIONS DUCT THE RF AND SERVICES BETWEEN TUNNELS.

Tunnel Configurations

SINGLE NEAR SURFACE TUNNEL



PERSPECTIVE

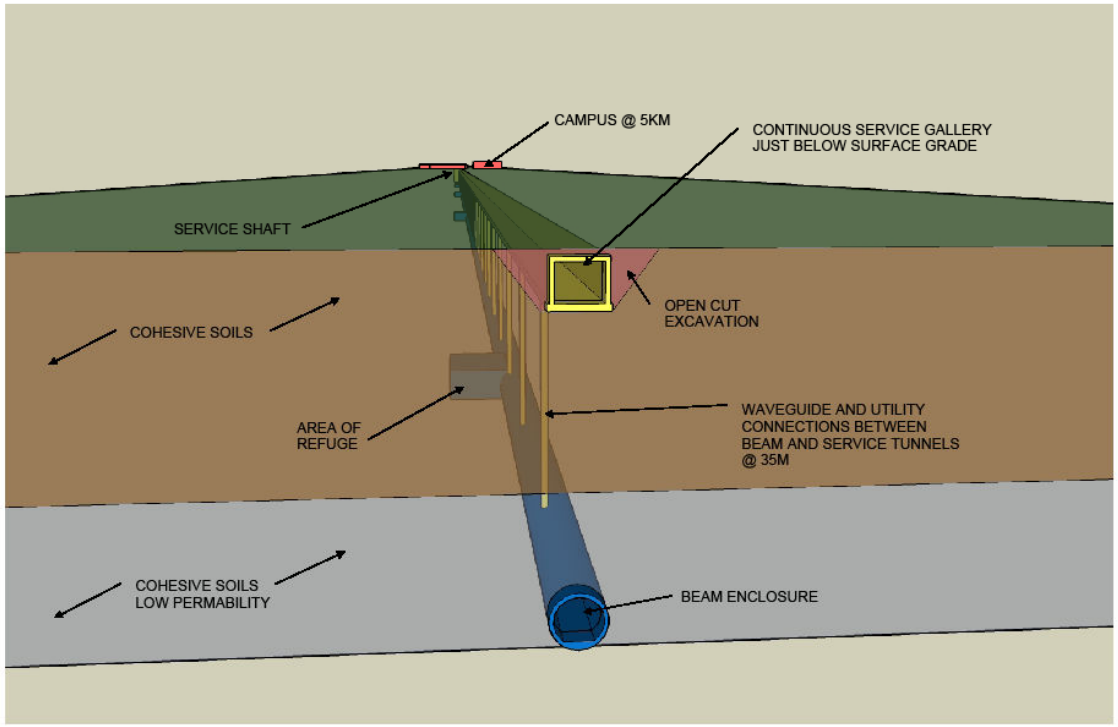
DRAFT 2/27/2009

- THIS REPERESENTS A SINGLE NEAR SURFACE TUNNEL CONSTRUCTED IN NON-COHESIVE SOILS, (THIS IS SOILS THAT CAN NOT SUPPORT ITSELF EVEN FOR SHORT DURATIONS)
- THE TUNNEL IS EXCVAVTED USING SHIELDED TUNNEL BORING MACHINES AND IS LINED WITH WATERPROOF SEGMENTAL PRECAST LINER.
- THE APPROPRIATE RF TECHNOLOGY IS EITHER CLUSTERED WITH RF DISTRIBUTED TO THE BEAM-LINE VIA SUPER WAVEGUIDES OR KLYSTRONS IN THE BEAM TUNNEL SERVED BY MODULATORS LOCATED CLUSTERED ON THE SUR-FACE FOR DISTRIBUTED RF.
- THERE ARE SHAFTS, CAV-ERNS AND SURFACE CAMPUSES SITUATED EVERY 5 KM.
- LIFE SAFETY EGREE IS VIA THE TUNNEL EMPLOYING COMPARTMENTALIZATION.

Tunnel Configurations

30M

SINGLE NEAR SURFACE TUNNEL; CONTINUOUS AT SURFACE SERVICE GALLERY



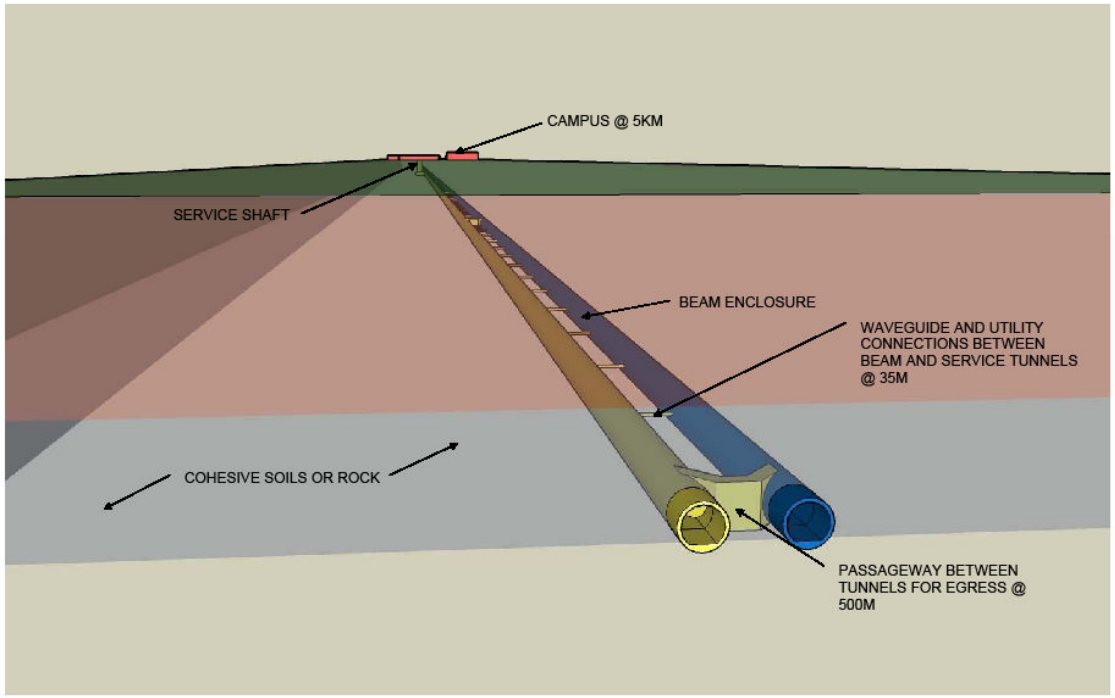
PERSPECTIVE

DRAFT 2/27/2009

- THIS REPRESENTS A SINGLE NEAR SURFACE TUNNEL CONSTRUCTED IN COHESIVE SOILS THAT ALLOW FOR PENETRATIONS FROM THE SURFACE TO BE REASONABLY DRILLED.
- THE TUNNEL IS EXCAVED WITH EITHER A SHIELDED OR OPEN FACE TBM DEPENDING ON CONSISTENCY OF SOIL CONDITIONS. THE TUNNEL WILL BE LINED WITH A STRUCTURAL SEGMENTAL PRECAST LINER.
- THE SERVICE TUNNEL IS AT OR JUST BELOW THE SURFACE GRADE.
- CAVERNS CAN BE EXCAVATED TO THE SIDES OF THE ENCLOSURES AND THUS AREAS OF REFUGE CAN BE EMPLOYED FOR LIFE SAFETY ALONG THE TRAVEN PATH TO THE SHAFTS.
- THERE ARE SHAFTS, CAVERNS AND SURFACE CAMPUSES SITUATED EVERY 5 KM

Tunnel Configurations

TWIN NEAR SURFACE TUNNELS



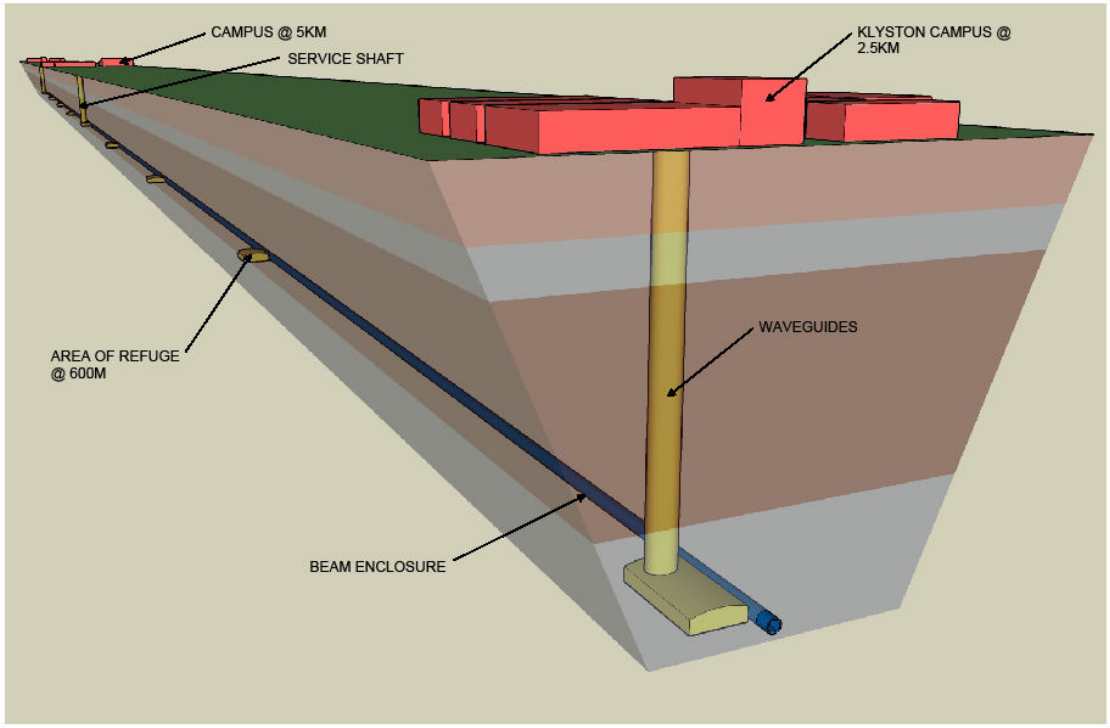
PERSPECTIVE

DRAFT 2/27/2009

- THIS REPRESENTS NEAR SURFACE TWIN TUNNELS EXCAVATED IN COHESIVE SOILS OR ROCK.
- THE TUNNEL IS EXCAVED WITH EITHER A SHIELDED OR OPEN FACE TBM DEPENDING ON CONSISTENCY OF SOIL CONDITIONS. THE TUNNEL WILL BE LINED WITH A STRUCTURAL SEGMENTAL PRECAST LINER.
- THERE ARE SHAFTS, CAVERNS AND SURFACE CAMPUSES SITUATED EVERY 5 KM.
- LIFE SAFETY EMPLOYS THE ADJACENT TUNNEL FOR SAFE EGRESS PASSAGE. POWER AND COOLNG FOR THE RF IS DISTRUBUTED TO THE LOADS ALONG THE LENGTH OF THE TUNNEL.
- PENETRATIONS DUCT THE RF AND SERVICES BETWEEN TUNNELS.

Tunnel Configurations

SINGLE DEEP TUNNEL; VERTICAL ACCESS



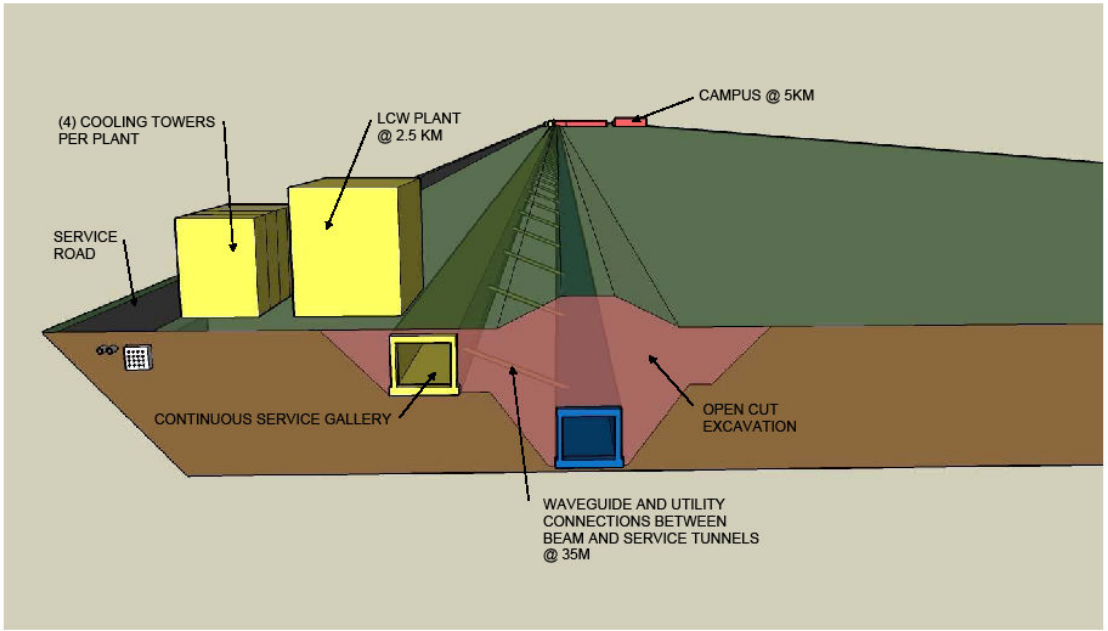
PERSPECTIVE

DRAFT 2/27/2009

- THE SINGLE TUNNEL IS APPROPRIATE FOR RF TECHNOLOGY THAT IS EITHER CLUSTERED WITH RF DISTRIBUTED TO THE BEAM-LINE VIA SUPER WAVEGUIDES OR KLYSTRONS IN THE BEAM TUNNEL SERVED BY MODULATORS LOCATED
- CLUSTERED ON THE SUR-FACE. THERE ARE SHAFTS, CAVERNS AND SURFACE CAMPUSES SITUATED EVERY 5 KM.
- THE TUNNELS ARE EXCAVATED USING OPEN FACED TUNNEL BORING MACHINES (TBM). CAVERNS ARE EXCAVED USING ROAD HEADERS OR DRILL AND BLAST METHODS.
- CAVERNS EXCAVATED TO THE SIDES OF THE ENCLOSURES SERVES AS AREAS OF REFUGE CAN BE EMPLOYED FOR LIFE SAFETY ALONG THE TRAVEN PATH TO THE SHAFTS.
- POWER AND COOLNG FOR THE RF IS CLUSTERED AT THE SURFACE OF EACH SHAFT.

Tunnel Configurations

ENCLOSURE IN OPEN CUT EXCAVATION; CONTINUOUS AT SURFACE ENCLOSURE



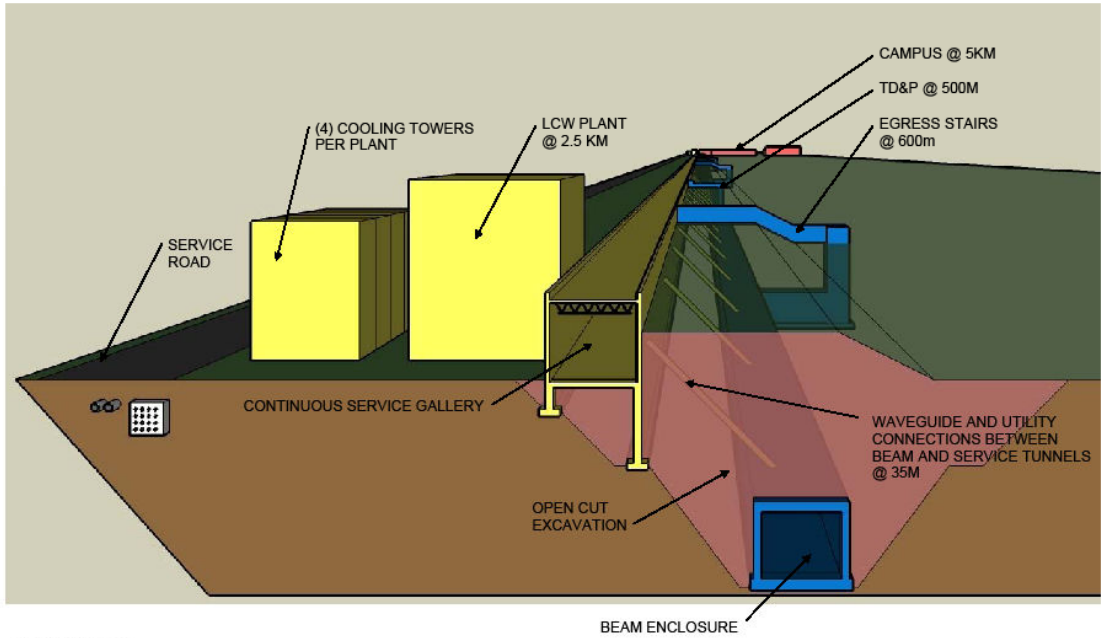
PERSPECTIVE

DRAFT 2/27/2009

- THIS IS A NEAR SURFACE BEAM ENCLOSURE USING THE CUT AND COVER METHOD OF CONSTRUCTION.
- A PARRELLEL ENCLOSURE HOUSING THE DISTRIBUTED RF.
- THE ENCLOSURES ARE CONSTRUCTED OF STRUCTURAL REININFORCED CONCRETE.
- THERE ARE SURFACE CAMPUSES SITUATED EVERY 5KM. POWER AND COOLING FOR THE RF IS DISTRIBUTED ALONG THE LENGTH OF THE SURFACE GALLERY.
- LIFE SAFETY EMPLOYS STAIRS TO THE SURFACE ALONG THE LENGTH OF THE ENCLOSURE.
- PENETRATIONS DUCT THE RF AND SERVICES BETWEEN THE BEAMLINE ENCLOSURE AND THE SURFACE ENCLOSURE

Tunnel Configurations

ENCLOSURE IN OPEN CUT EXCAVATION; CONTINUOUS SERVICE GALLERY

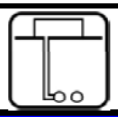
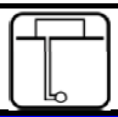
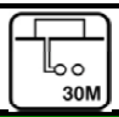
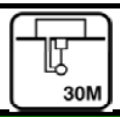
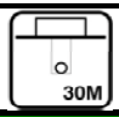
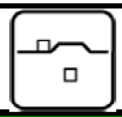


PERSPECTIVE

DRAFT 2/27/2009

- THIS IS A NEAR SURFACE BEAM ENCLOSURE USING THE CUT AND COVER METHOD OF CONSTRUCTION.
- A PARRELLEL SURFACE GALLEY HOUSES THE DISTRIBUTED RF. THE ENCLOSURE IS CON-STRUCTED OF STRUCTURAL REINFORCED CONCRETE.
- THERE ARE SURFACE CAM-PUSES SITUATED EVERY 5KM.
- POWER AND COOLING FOR THE RF IS DISTRIBUTED ALONG THE LENGTH OF THHE SURFACE GALLERY.
- LIFE SAFED EMPLOYS STAIRS TO THE SURFACE ALONG THE LENGTH OF THE ENCLOSURE.
- PENETRATIONS DUCT THE RF AND SERVICES BETWEEN THE BEAMLINE ENCLOSURE AND THE SURFACE GALLERY

Tunnel Configuration Comparison Matrix

							
	DEEP		NEAR SURFACE				
	Twin Deep Tunnels	Single Deep Tunnel	Twin Near Surface Tunnels	Near Surface Tunnel, at Surface Gallery	Single near Surface Tunnel	Enclosure in Open Cut, Cont. Gallery	Enclosure & Cont. Gallery in Open Cut
EXCAVATION	TBM	TBM	TBM	TBM & OPEN CUT	TBM	OPEN CUT	OPEN CUT
No of TUNNELS	TWO-TUNNEL	ONE-TUNNEL	TWO-TUNNEL	TWO-TUNNELS	ONE-TUNNEL	ONE-TUNNEL	TWO-TUNNELS
SHAFT SOIL	VARIES	VARIES	VARIES	VARIES	SOFT / SLURRY	NA	NA
TUNNEL SOIL	ROCK	ROCK	COHESIVE SOIL or ROCK	COHESIVE SOIL -Low permeability	Saturated Sand & Gravel	SOILS VARIES	SOILS VARIES
SERVICE SPACE	SECOND TUNNEL	SURFACE BUILDINGS	SECOND TUNNEL	CONTINOUS SERVICE GALLERY	AT CAMPUSES	CONTINOUS SERVICE GALLERY	CONTINOUS SERVICE GALLERY
ILC Technology	DISTRIBUED RF	CLUSTERED RF	DISTRIBUED RF	DISTRIBUED RF	CLUSTERED RF	DISTRIBUED RF	DISTRIBUED RF
SIMILAR TO	RDR Sample Sites	RDR & CLIC	RDR	Dubna ILC	XFEL	Project X	Project X
ACCESS	Vertical Shaft	Vertical Shaft	Vertical Shaft	Vertical Shaft	Vertical Shaft	Hatch	Hatch

Suggestions for Report Discussion

- Content of Report
  - Soil Boring Logs
  - Type of Soil Encountered and Comparison to Other Site Investigations
  - Is There Constructability Analysis or Suggested Preliminary Design Criteria ?
- Role of JINR/GSPI in Tunnel Configuration Study
  - Preliminary Design for Dubna Site Solution
  - Unit Cost Values for Underground Construction
  - Value Engineering for Dubna Site Design
  - Contribution of Design Data for the Shallow Bored Dubna Site Solution

Continued JINR/GSPI and ILC CFS Efforts

- How Can the JINR/GSPI Efforts be Sustained Over Time into Preliminary Design and Detailed Cost Estimation Efforts Through the TDR Phase
- Unit cost Development for the Dubna Site Design Should be Consistent with the Unit Costs Developed for the RDR Sample Sites and the DESY Site
- Exiting Strategies and Life Safety Aspects for the Dubna Site Solution Can be Included into the Comprehensive Life Safety Document Currently Being Developed by the CFS Group
- Participation in the Accelerator Design and Integration Effort Would also be an Important Consideration for the Dubna Site Solution
- Development of Criteria for Process Water Cooling, HVAC and Electrical Distribution is also Important to Fully Understand the Dubna Site Solution
- Can We Establish Consistent Participation in On-going CFS Meetings

Concluding Remarks

- We Continue to Regard the JINR/GSPI Participation as an Important Part of the ILC CFS Effort
- Funding is a Difficult Aspect of the Work in All Regions
- We Need to Establish Realistic Expectations for JINR/GSPI Participation in CFS Efforts
- The Next ILC/GDE Meeting will be in Albuquerque In September, 2009 and Planning is Needed to Present a Complete ILC CFS Progress Report
- We Welcome the Forthcoming Discussions