CEPC Civil Engineering (Changsha)

环形正负电子对撞机(CEPC)项目 长沙场址

www.msdi.cn

中国电建集团中南勘测设计研究院有限公司

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This is Changsha, Hunan

秋风万里芙蓉国

坐标:北纬 28° ,东经 112°

地处中国中南部, 三面环山, 北临洞庭湖 处于东部沿海地区和中西部地区的过渡带、

长江开放经济带和沿海开放经济带的结合部

,具有承东启西、连南接北的枢纽地位。

Hunan is a beautiful land

Coordinates: 28 $^{\circ}$ N, 112 $^{\circ}$ E

Located in central and southern China, surrounded by mountains on three sides and adjacent to Dongting Lake in the north. It is located in the transitional zone between the eastern coastal areas and the central and western regions, and the junction of the Yangtze River open economic belt and the coastal open economic belt.





This is Changsha, Hunan

2处世界自然遗产:

2 World Natural Heritage Sites:

张家界: 峭壁、怪石, 一根根拔地而起的石柱, 形成一片奇特的峰林, 这样的地貌, 无论在世界的任何地方, 它都叫张家界地貌。

Zhangjiajie: cliffs, grotesque rocks, stone pillars rising from the ground, forming a strange peak forest. Such a landform, no matter in any part of the world, is called Zhangjiajie landform.

崀山: 崀山山水地貌得天独厚,风光旖旎,丹霞瑰宝。

Langshan: Langshan Mountain is endowed with unique landscape, beautiful scenery and Danxia treasure.





1

This is Changsha, Hunan

芙蓉镇: 挂在瀑布上的千年古镇, 拥有两千多年历史。

Furong Town: an ancient town with a history of more than 2000 years.

凤凰古城:热情的湘西小城。

Fenghuang ancient city: a warm small town in Western Hunan.

2019年全年游客超过8亿人次。

In 2019, there are more than 800 million tourists in Hunan.



This is Changsha, Hunan

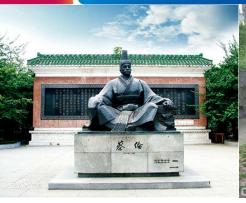




湖南旅游资源丰富, 拥有22个国家 级风景名胜区、7个5A级景区 Hunan has rich tourism resources, with 22 national scenic spots and 7 5A scenic spots



1 This is Changsha, Hunan







惟楚有材,于斯为盛

The Mountains and Rivers make a cradle of talent, but none could match the bright minds of Changsha.



3

This is Changsha, Hunan

名校纵横,人才荟萃

Many famous schools and tatents in Changsha.









This is Changsha, Hunan

中国 (大陆) 国际形象最佳城市、世界"媒体艺术之都"、东亚文化之都。

The best international image city of China (mainland), the UNESCO Creative City of Media Arts and the Culture City of East Asia.



1

This is Changsha, Hunan

最具幸福感的城市 The happiest City





全球产量最高的超级水稻
The world's highest yield super rice

天河二号超级计算机 Tianhe-2 supercomputer



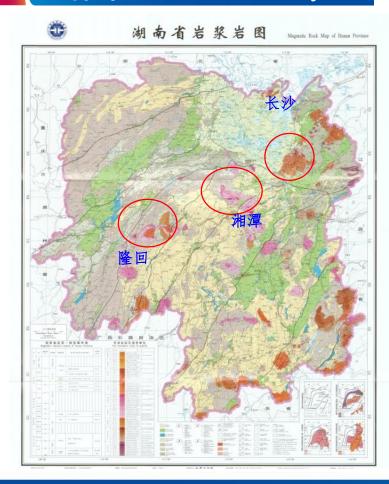


全球驰骋最快的高速列车 The fastest high speed train in the world

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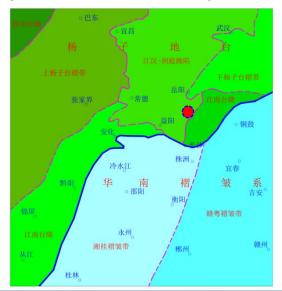
2 总体布置 Overall layout

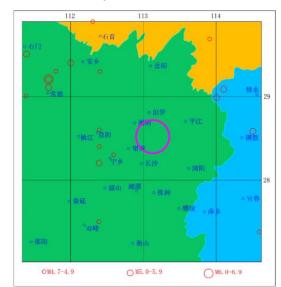


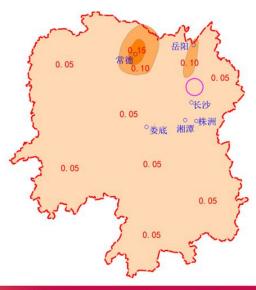


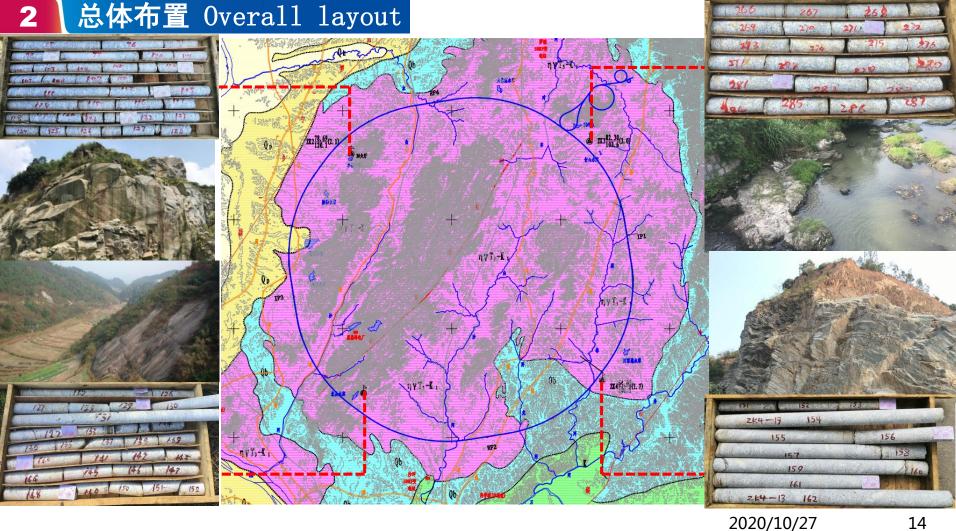
■ 总体布置 Overall layout

- 区域地质与地震 Regional Geology and Seismicity
- 长沙场址及其周边现今和历史地震活动微弱,近场区无活动断裂分布,场址地震动峰值加速度为50 gal,地震基本烈度为VI度,区域构造稳定性好。
- Changsha site and its surroundings have slight seismic activity in history, and are free of active faults. The peak ground acceleration is 50 gal, and the seismic intensity is VI. The tectonic structure is stable.





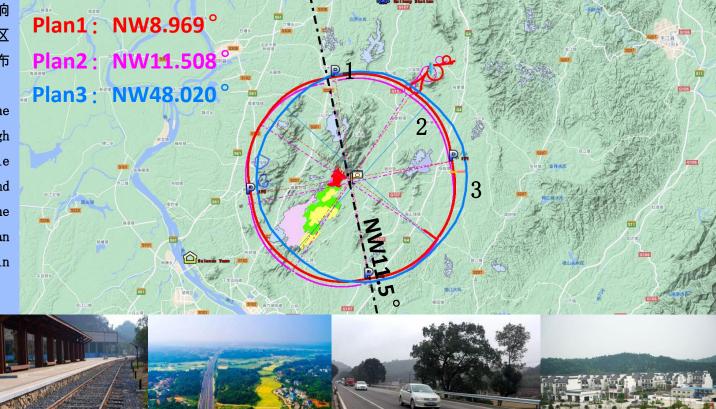




总体布置 Overall layout

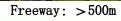
主环朝向考虑地磁场对高频腔的影响 ,从物理的角度RF2与RF4两个高频区 连线的最佳角度为NW11.5°,实际布 置时可进行小范围调整。

Considering the influence of the geomagnetic field on the high frequency cavity, the best angle of the connection between RF2 and RF4 is NW11.5 from the physical point of view, and can be adjusted in a small range in the actual layout.

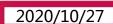




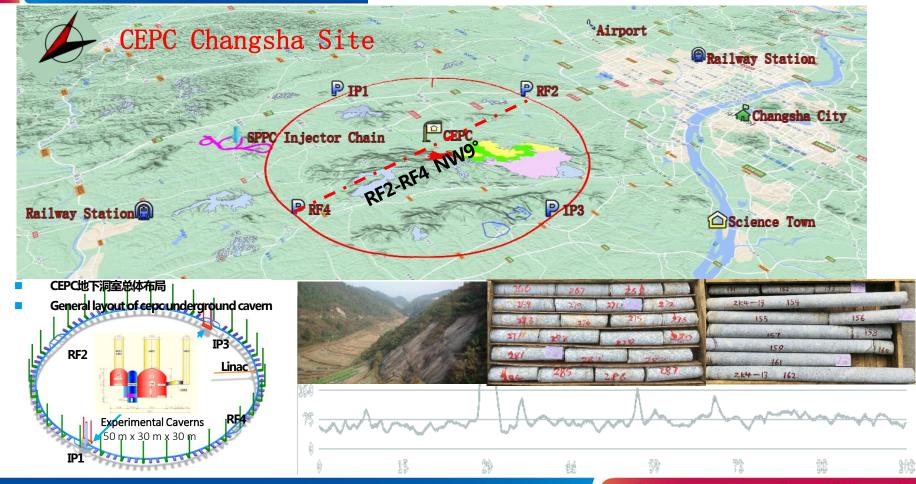








Avoid towns



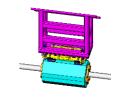
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■ 主环主要设备 The equipment of the main ring

主环隧道设备组装一览表 Equipment assembly list of main ring

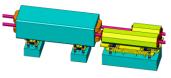
=qaipment assembly not or main ring											
序号	部位	设备名称	设备数量	备注							
No.	Section	Equipment name	Number	Remark							
1		BEND(二极铁)	1528×8	8个一组							
1	Booster	DEND(二似钛)	1320 ^ 0	Eight as a group							
2		QUAD (四极铁)	1882								
3		BEND(二极铁)	11600								
4		QUAD (四极铁)	2388								
5	Collider	SEXT (六极铁)	928								
6		BRF(静电分析器)	4×8	8个一组							
				Eight as a group							





Booster QUAD

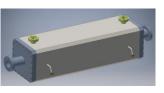
Booster BEND







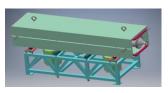
Collider BEND



Kicker



主环BPM Main ring BPM



静电分析器 BRF

■ 直线段主要设备 The equipment of the LINAC

直线加速器设备组装一览表 **Assembly list of linear accelerator**

序号	部位	设备名称	设备数量	序号	部位	设备名称	设备数量	
No.	Section	Name	Number	No.	Section	Name	Number	
1	1	CSBEND	4	23		CSBEND	3	
2		EDRIFT	8	24		EDRIFT	81	
3	EBTL	EHKICK	2	25		EHKICK	25	
4	EDIL	EVKICK	6	26	SAS	EVKICK	25	
5		MONI	8	27	SAS	MONI	38	
6		QUAD(四极铁)	24	28		QUAD (四极铁)	126	
7		EDRIFT	61	29		KICKER	1	
8		EHKICK	14	30		RFCW	64	
9	FAS	EVKICK	14	31		CSBEND	1	
10	FAS	MONI	15	32		EDRIFT	114	
11		QUAD(四极铁)	42	33	TAS	EHKICK	16	
12		RFCW	84	34	IAS	EVKICK	16	
13		AMD	1	35		MONI	17	
14		CSBEND	5	36		QUAD (四极铁)	48	
15		EDRIFT	32	37		RFCW	112	
16		EHKICK	1	38		Dipole	32	
17	PSPAS	SPAS EVKICK 1 39 L2 MONI 6 40 QUAD (四极铁) 10 41		L2B	Drift	96		
18				40		Initial	1	
19				41		QUAD (四极铁)	62	
20		KICKER	3	42		BPM	14	
21		RFCW	2			Dipole	32	
	Damping	GUAD		44	Transport line	Drift	108	
22	ring	ring QUAD		45	(运输线)	Initial	2	
	阻尼环	(四极铁)		46		QUAD (四极铁)	48	



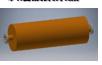




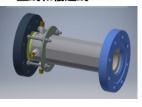
Magnet_32LQ



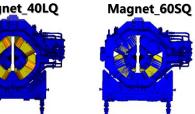
次谐波聚束器



直线和输运线BPM



Magnet_40LQ





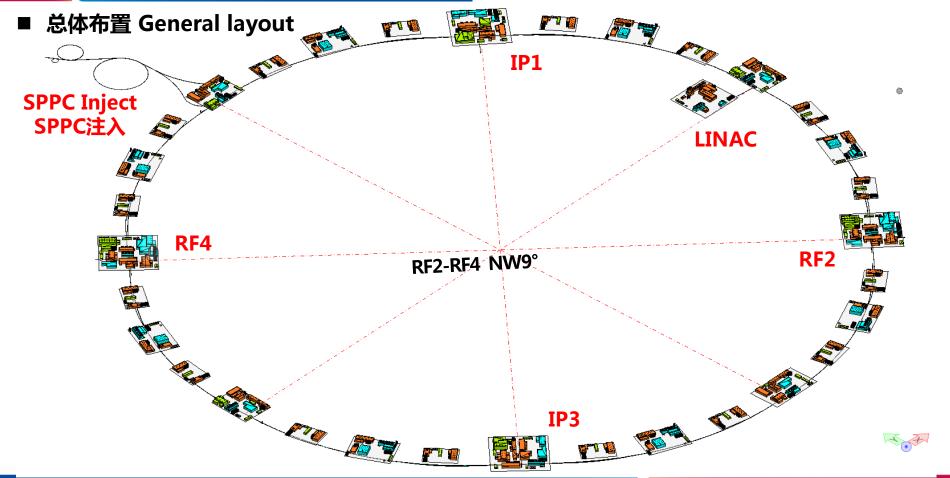


MAGNET_B

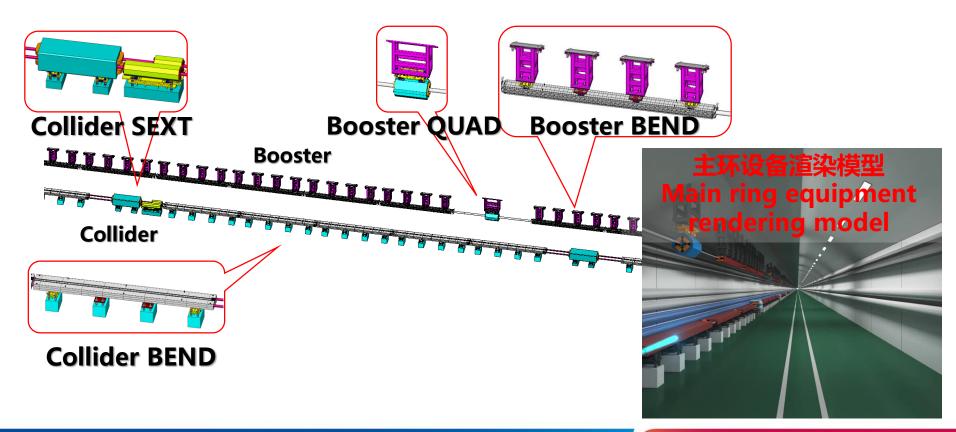


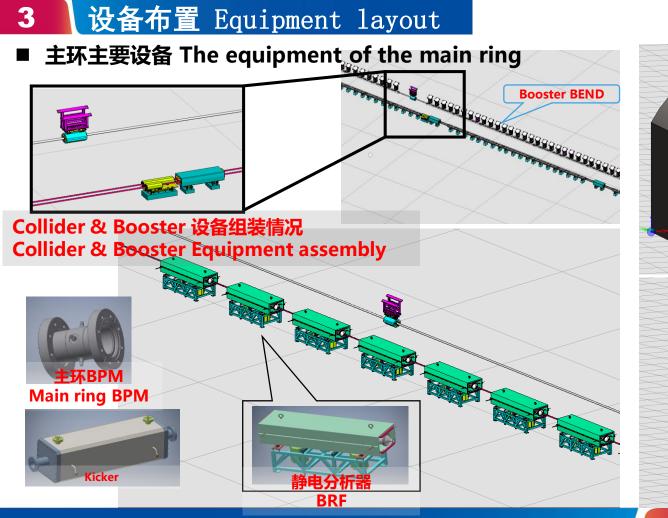
MAGNET_CB1

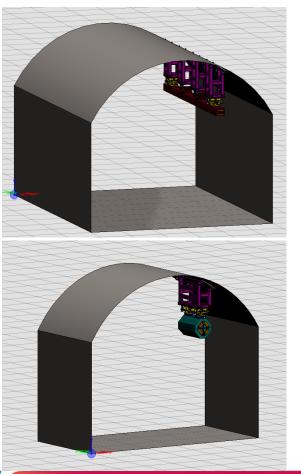




■ 主环主要设备 The equipment of the main ring





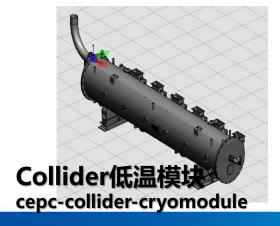


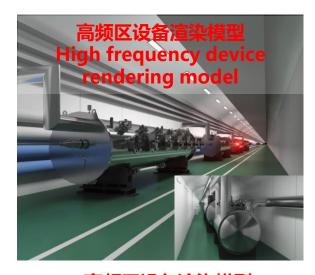
■ 主环主要设备 The equipment of the main ring



同类区域画及由 cepc-refrigerator-coldbox

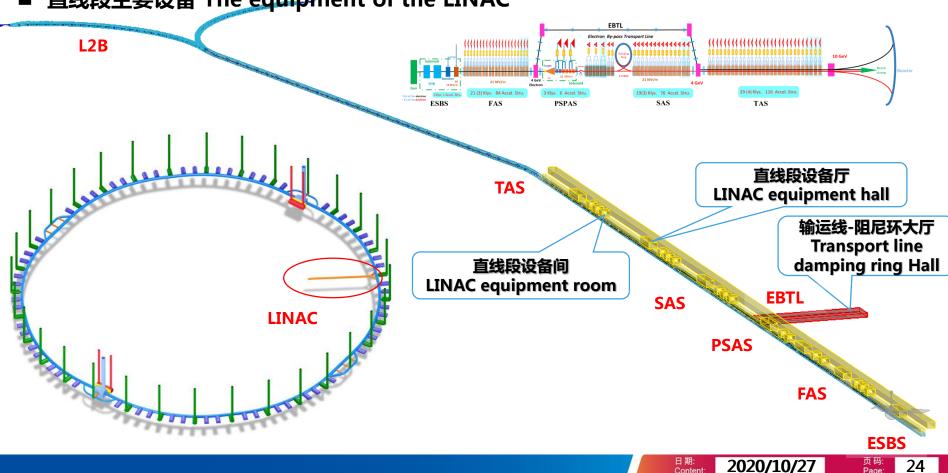




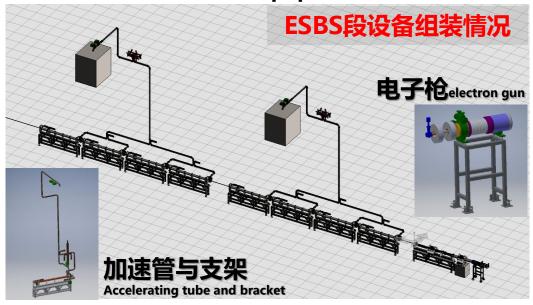


高频区设备渲染模型
High frequency device
rendering model

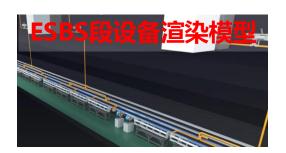
■ 直线段主要设备 The equipment of the LINAC



■ 直线段主要设备 The equipment of the LINAC



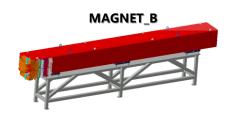






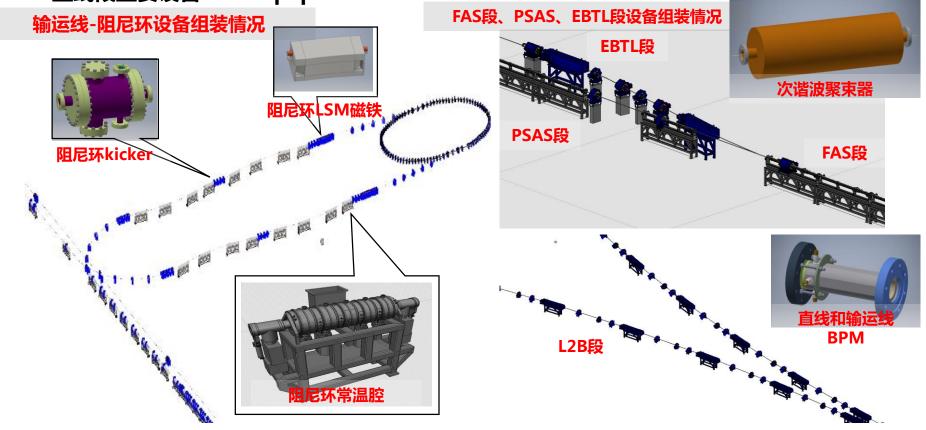








■ 直线段主要设备 The equipment of the LINAC



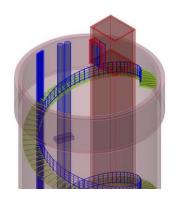
■辅助设备 Auxiliary equipment

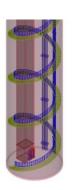
● 根据目前CEPC布置方案,竖井中布置楼梯和通风通道,电缆通道,电梯。

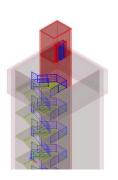
According to the current cepc layout scheme, stairs and ventilation channels, cable channels and elevators are arranged in the shaft.

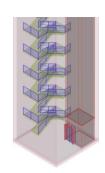
● 辅助短隧道一层布置操作室及卫生间,二层布置SPPC预留机柜。

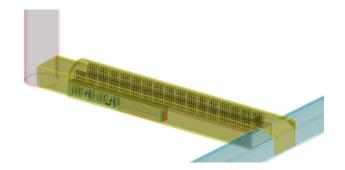
The Operation room and toilet are arranged on the first floor of the auxiliary short tunnel, and the SPPC reserved cabinet is arranged on the second floor.











3

设备布置 Equipment layout

■ 辅助设备布置情况 Land Occupation Survey

● 四条光束线长度调整。

Length adjustment of four beam lines.

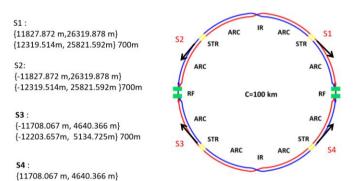
光束线隧道3×3m。光束线终点坐标,即Door在隧道一侧的表面,Door厚度1米。束线S1和S2的大厅处,需载货电梯,电梯:2m×2m×3m高,载重大于2吨。少量线缆需从电梯的竖井,由大厅接到地面。

The beam line tunnel is $3 \times 3M$. The coordinates of the end point of the beam line, that is, the surface of the door on one side of the tunnel, and the door thickness is 1 m. At the hall of bundle line S1 and S2, a cargo elevator is required, with a height of $2m \times 2m \times 3M$ and a load of more than 2T. A small amount of cables need to be connected from the elevator shaft to the ground from the hall.

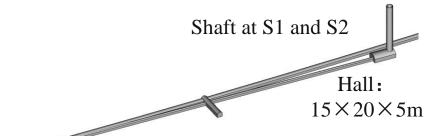
● 直线段布置垃圾桶传输线及配套洞室。

Garbage can transmission line and supporting cavern are arranged in straight section.

Four beam lines: S1,S2,S3,S4 The starting coordinates are as follows:



{12203.657m, 5134.725m} 700m

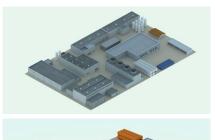


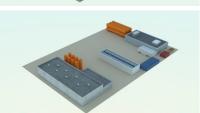
Beam line: L=700m

■ 优化地面建筑物模型及布置 Optimization of ground buildings and layout CEPC对撞区跟探测器相关的地面建筑

序号	建筑物	尺寸 (W*H*L)	备注
1	探测器装配大厅 (16m竖井位于此厅中 央)	25*25*100 m	Detector assembly hall
2	控制/值班楼	10*11*30 m	Control Room/Administrator Building
3	气体房	15*4*40 m	Detector gas room
4	数据中心	20*10*40 m	Data Center
5	加工及修配车间	30*12*15 m	Machining and maintenance workshop
6	低温厅(隔音)	15*12*40 m	Cryogenic hall
7	通风机房	25*14*40 m	Ventilation station
8	电源间	20*6*80 m	Power supply room
9	变电站	25*14*40 m	Power substation
10	门卫室	10*4*10 m	Security room



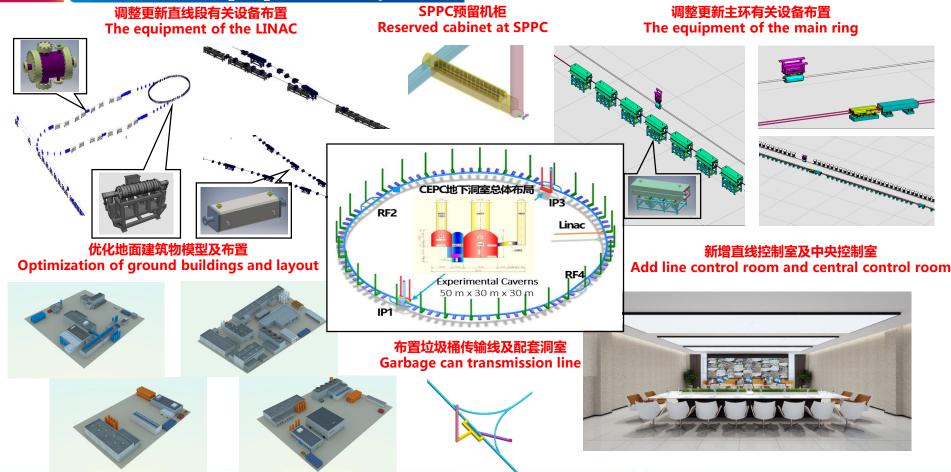






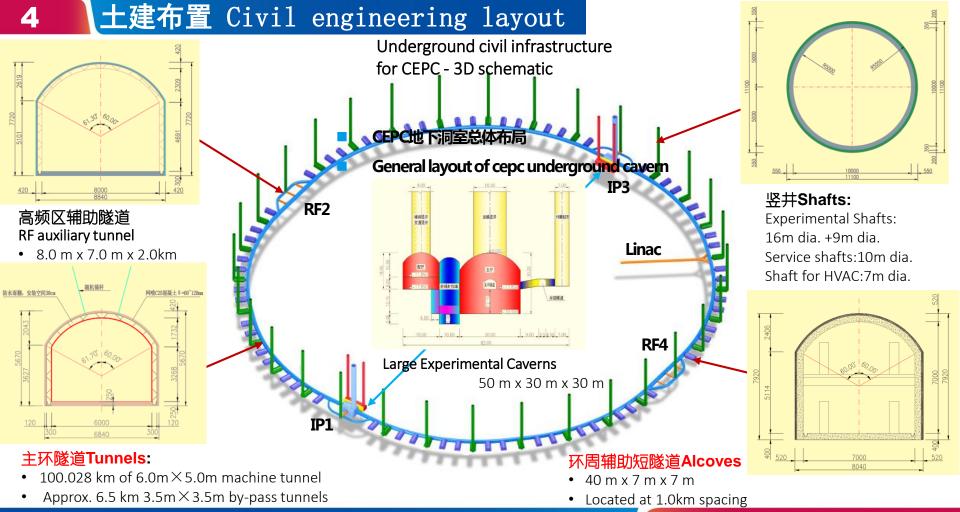






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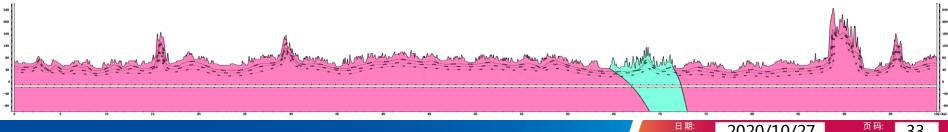
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土建布置 Civil engineering layout

- 布置原则 Layout Principles
- 隧道埋深与竖井高度之间的平衡。 Balance between the tunnel buried depth and shaft height
- 地面建筑避开环境敏感因素。 The surface structures should avoid the environmentsensitive factors
- 竖井距离铁路>500m, 距离高速公路、国道>200m. Shafts shall be over 500 m away from railways, and over 200 away from highways or national-level roads.
- 避开集镇、工厂、水库等已有大型建筑物 Existing large structures such as towns, factories and reservoirs shall be avoided
- 大厅顶拱高程为-5.0m,竖井平均高度约90m。
- The vault elevation of the hall is -5.0m, and the average height of the shaft is about 90m.

No.	Description	Qty.	diame ter	Average height (m)	
1	Ventilation shaft	16	7m	96	
2	Access and cable shafts	12	10m	80	
3	Vehicle shaft	2	15m	75	
4	Access shaft	6	6m	107	
5	Bypass tunnel shaft	2	7m	95	
6	Main hall vehicle shaft	2	16m	87	
7	CEPC auxiliary hall vehicle shaft	2	9m	87	
8	CEPC auxiliary hall access shaft	2	6m	87	
9	SPPC main hall shaft	2	16m	87	
10	SPPC auxiliary hall shaft	2	10m	87	



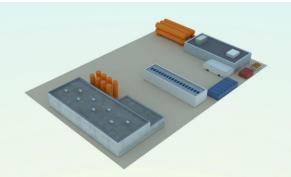
4

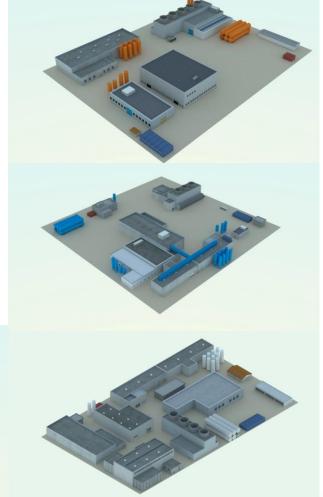
土建布置 Civil engineering layout

Surface Structure		Location									合计			
Surface Structure		P1	P2	P3	P4	P5	P6	P7	P8	C1-8	V1-16	LINAC	BT	Total
Control and duty rooms	m ²	1200	300	300	300	1200	300	300	300			400		4600
Magnet power source	m ²	2000	1500	1500	1500	2000	1500	1500	1500			500	400	13900
High-frequency power source	m ²			4000				4000				8400		16400
110kV substation	m ²	1500	1500	2500	1500	1500	1500	2500	1500					14000
10kV substation	m ²	600	500	1000	500	600	500	1000	500	2400	3200	400		11200
HVAC system	m ²	800	600	800	600	800	600	800	600	4800	3200	600	300	14500
Low-temperature system (helium compression system)	m ²	1000		4000		1000		4000						10000
Cooling water system	m ²	800	600	1500	600	800	600	1500	800	3200		500	200	11100
Experimental assembly hall	m ²	1500				1500								3000
Magnet assembly hall	m ²	1500				1500								3000
Transfer system	m ²	200	200	200	200	200	200	200	200	1600		200	150	3550
Air compression system	m ²	150	150	150	150	150	150	150	150			150		1350
Water cooling system	m ²	1500	1200	1200	1200	1500	1200	1200	1200	8000		500		18700
Electronic room	m ²	1000	600	600	600	1000	600	600	600			450	100	6150
Miscellaneous	m ²	500	500	500	500	500	500	500	500	2400	2400	200		9000
Total	m ²	15750	7650	18250	7650	12750	7650	18250	7850	22400	8800	12300	1150	140450
											-			

Note: C1-8 refer to surface structures corresponding to the ventilation & access shaft in the middle of each curved section, and V1-16 refer to surface structures corresponding to the ventilation shaft at each curved section.







4 土建布置 Civil engineering layout

■ 支护方案 Support

主环隧道:Ⅱ、Ⅲ类围岩锚喷支护(占全环96%),Ⅲ类围岩设防水雨棚;IV类围岩防水混凝土衬砌。

Main tunnel: rockbolts and shotcrete for Class II and III surrounding rock (accounting for 96% of the total), and canopy for Class III surrounding rock; and concrete lining for Class IV surrounding rock.

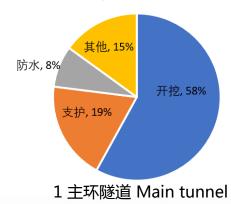
竖 井: Ⅱ、Ⅲ类围岩锚喷支护(占74%), IV、 V 类围岩设钢筋混凝土衬砌。

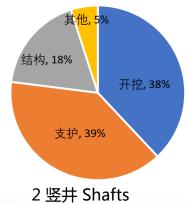
Shafts: rockbolts and shotcrete for Class II and III surrounding rock (accounting for 74% of the total); and reinforced concrete lining for Class IV and V surrounding rock.

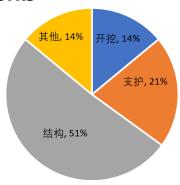
实验大厅:锚喷支护加钢筋混凝土衬砌。防辐射隔墙需要回填10m厚的C30混凝土。

Experimental halls: shotcrete and rock bolts with reinforced concrete lining. The radiation barrier shall be backfilled with C30 concrete in 10m thickness.

■ 主要工程量投资占比 Percent of total cost estimate for different works





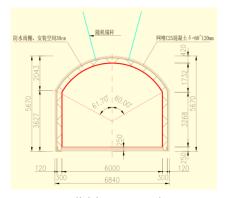


3 实验大厅 Experiment halls

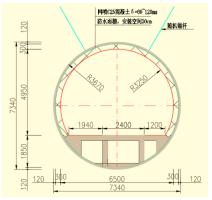
土建布置 Civil engineering layout

■ 主环隧道断面形式比较

Main tunnel form comparison



Drill-blast tunnel $(6.0m \times 5.0m)$



TBM tunnel (D6.5m)

项目Item	单位Unit	城门洞型 Inverted D- shaped	圆形TBM
净空断面 The clearance cross section	m²	27. 00	33. 20
开挖单价 Excavation unit price	元/m³ Yuan/m³	278. 28	617. 00
施工工期 Construction duration	月 Month	<mark>50</mark>	52

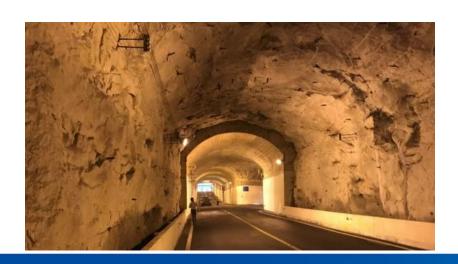
投资:圆形断面较城门洞型增加20亿元,综合比较本阶段采用钻爆法施工。

Investment: the TBM tunnels cost 2 billion yuan more than the drill-blast tunnels. Therefore, the drill-blast tunneling method is recommended.

钻爆法施工在向机械化与智能化发展,长沙铁建重工研制的全电脑三臂凿岩台车机械化程度高、钻进速度快,不仅可用于隧道开挖,而且广泛用于钻孔、锚喷支护、固结灌浆中。

The drill-blast tunneling is developing toward mechanization and intelligence. The computer-based three-jib drill rig developed by Changsha Railway Construction Engineering is highly mechanized and rapid, which serves for tunnelling, drilling, gunite support, and consolidation grouting.

- 场址附近隧洞多干燥,洞壁无渗水。
- The tunnels near the site are mostly dry without water seepage.
- 地下大厅工类围岩洞壁渗水量为0.00041m³/(m²•d),主 环隧道工类围岩洞壁渗水量为0.00062m³/(m²•d)。
- The results show that the wall water seepage of the underground hall is $0.00041m^3/(m^2 \cdot d)$ and that of the main ring tunnel is $0.00062 \,\mathrm{m}^3/(\mathrm{m}^2 \cdot \mathrm{d})$.



5	Tayout				
	工程部位 Project location	围岩类别 Type of surrounding rock	综合占比(%) Comprehensive proportion	估算涌水量最大值 Estimated maximum water inflow L/(m²-d)	
	地下大厅	Ⅲ类	90	0.00041	
	Underground Hall	Ⅲ类	10	0.00255	
		Ⅲ类	74.2	0.00062	
	主环隧道 Main ring tunnel	Ⅲ类	24.6	0.00377	
		IV类	0.7	0.01559	
		V类	0.5	0.29596	
	x				





■ 地下洞室防水 Water proofing for underground caverns

• 地下洞室防水等级为一级,具体标准为不允许渗水,结构面无湿渍。

The underground caverns are of waterproof Class I, i.e., no seepage or wet stain on structural plane.

● 工程区岩体完整,透水性微弱,Ⅱ、Ⅲ类围岩采用喷混凝土防水,局部设置彩钢瓦+防潮墙。(占隧道长度的98.7%)

The project area has intact rock and slight permeability. Class II and III surrounding rock mass (accounting for 98.7% of the total tunnel length) will be water proofed with shotcrete, and locally with color steel tile plus moisture proof wall.

■ IV类围岩及大量渗水洞段设防水混凝土衬砌。洞内通过通风系统达到防潮除湿的效果。

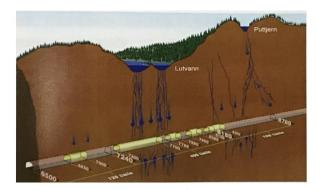
Class IV surrounding rock mass and the tunnel section with high permeability will be water proofed with concrete lining. The ventilation system will be used to achieve the dehumidification effect for the tunnels.



1 无渗水洞段不设防水措施 No waterproof measures shall be taken in the section without water seepage.



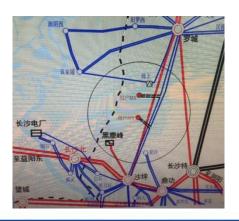
2 少量渗水设彩钢瓦+防潮墙
Color steel tile and damp proof wall are set for a small amount of water seepage.

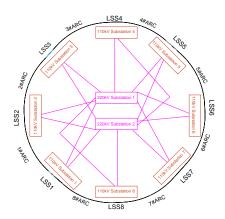


3 渗水洞段针对性设防水混凝土 Waterproof concrete shall be set up for seepage tunnel section.

■ 供电电源的选择 Selection of Power Supplies

- 本阶段规划**设置2个220kV中心变电站**作为CEPC项目供电电源, 互为备用,每个的容量能满足整个CEPC项目用电需要。 It is planned to **set up two 220 kV central substations** for the CEPC, standby for each other. The capacity of each substation can satisfy the power demand of the whole CEPC.
- 进线电源拟采用4回220kV线路分别引自岳阳罗城、长沙沙坪500kV变电站, 距离18~20km。
 Four 220 kV incoming will be led from two 500 kV substations, one in Luocheng of Yueyang and the other in Shaping of Changsha, which are 18 km to 20 km away from the CEPC.
- 在主环隧道的8个直线段竖井地面出口附近各设置1个110kV分区变电站,附近的地面建筑物及地下隧道用电负荷供电。 One subzone substation will be set up near each of the shafts on the 8 straight sections of the main tunnel, supplying power for the surface structures and underground tunnel nearby.





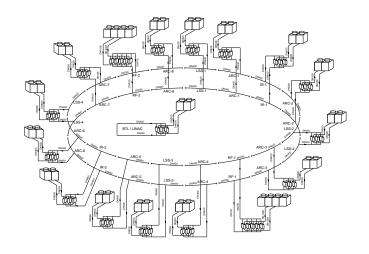
	G 4 6 TT	Location and Power Requirement (MW)						T . 1
	System for Higgs (30 MW /beam)	Collider	Booster	Linac	BTL	IR	Surface building	Total (MW)
1	RF Power Source	103.8	0.15	5.8				109.75
2	Cryogenic System	15.67	0.89			1.8		18.36
3	Vacuum System	9.784	3.792	0.646				14.22
4	Magnet Power Supplies	47.21	11.62	1.75	1.06	0.26		61.9
5	Instrumentation	0.9	0.6	0.2				1.7
6	Radiation Protection	0.25		0.1				0.35
7	Control System	1	0.6	0.2	0.005	0.005		1.81
8	Experimental Devices					4		4
9	Utilities	31.79	3.53	1.38	0.63	1.2		38.53
10	General Services	7.2		0.2	0.15	0.2	12	19.75
	Total	213.554	20.972	10.276	1.845	7.385	12	270.37

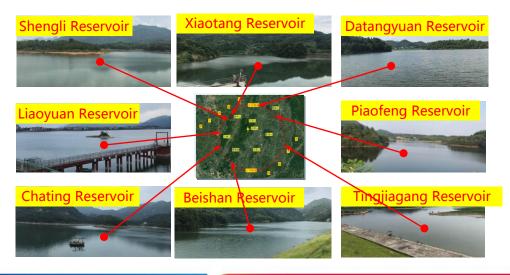
■ 冷却水系统布置 Arrangement of Cooling Water System

● 主环隧洞共设置16个冷却供水单元,每个冷却供水单元设置2根沿主环隧洞敷设的总管。

The main tunnel will be provided with 16 cooling water supply units, and each cooling water supply unit will be provided with two mains along the main tunnel.

● 主环隧道**附近分布8座小、中型水库和12个集镇**,可供冷却水初次取水,后期补水可从市政水网补充。
Around the main tunnel, there are 8 small- and medium-sized reservoirs and 12 towns, which can provide initial water withdrawal for the cooling water system. The later water replenishment may be supplied from the municipal water network.





● 地下空间空调系统 Underground Air-Conditioning System

地下环形廊道分成32个送回风段,每段廊道长度约为3km,由竖井连接的地面空调系统设备与地下送、回风管路组成。

The underground ring gallery consists of 32 air supply and return sections, 3km long each. The surface air conditioning system equipment is connected to the underground air supply and return pipelines via shafts.

● 消防设计 Fire Protection Design

地面设施的电气设备间、控制室以及地下设施中的辅助隧洞和实验大厅等区域采用**气体灭火的方式**,其他地面设施采用水消防系统。 主环隧洞设干粉灭火器。

Gas extinguishing is adopted for the electrical equipment rooms and control rooms of surface facilities and the auxiliary tunnels and experiment halls of underground facilities. For other surface facilities, the water sprinkler system is adopted. Dry powder extinguishers are used for the main tunnel.

● 排水设计 Drainage Design

在辅助短隧道及实验大厅内设置集水井,通过水泵将收集的围岩渗水抽排至地面。

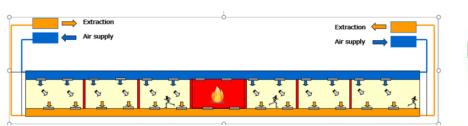
Sumps are provided inside the auxiliary tunnels and experiment halls, and the seepage water from surround rock is pumped to the ground surface.

● 永久运输和起重设备 Permanent Transporting and Lifting Equipment

每个实验大厅布置两台桥机,起吊重量分别为300t和20t,大厅上方探测器装配大厅内布置起吊重量1000t的龙门吊。

Each experiment hall will be provided with two bridge cranes, with a lifting capacity of 300 t and 20 t respectively. Inside the detector assembly hall, a

1000t-capacity grantry crane will be provided.

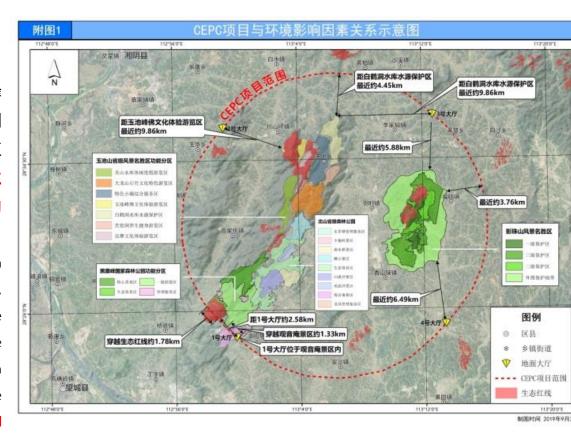




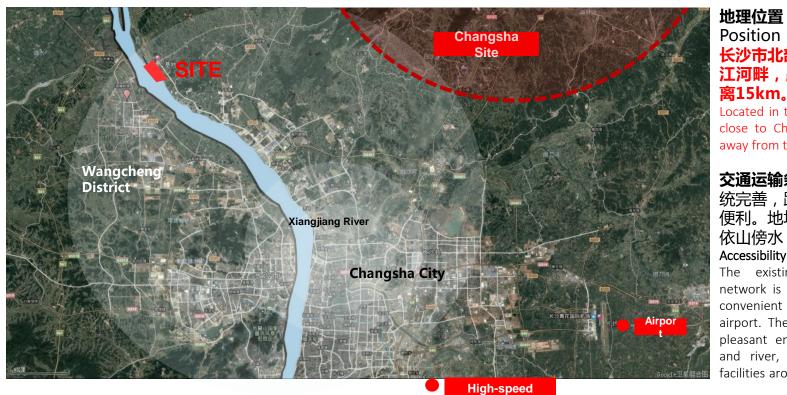
■环境影响因素 Environmental Impact **Factors**

CEPC项目主环线路西南部从生态保护红线及黑麋峰 森林公园、北山省级森林公园、鹅形山省级森林公园 地下穿越, 地面建筑物及竖井出口不涉及生态保护红 线,所涉北山森林公园观音庵景区不属核心景区,生 态保护红线及森林公园均不对项目建设形成法规制约

The main tunnel route will go from the ecological protection red line through the provincial-level forest parks of Heimifeng, Beishan and E'xingshan in its southwest part. The surface structures and shaft portals will not be affected by the ecological protection red line. The Buddhist Godness Guanyin Temple of Beishan Forest Park to be involved is not of the core scenery area. Therefore, the ecological protection red line and forest parks are not restraints to the CEPC.



■ 湘江科学城 Xiangjiang Science Town



railway station

地理位置: Geographical Position 长沙市北部,紧临长沙城区,湘 江河畔,距离CEPC主环直线距

Located in the north of Changsha City, close to Changsha downtown, 15 km away from the main tunnel of CEPC.

交通运输条件:现状交通路网系统完善,距离市区、机场均十分便利。地块视线开阔,环境优美,依山傍水,周边配套设施成熟。Accessibility and transport conditions:
The existing transport and road network is sound and complete, with convenient access to downtown and airport. The site has open landform, pleasant environment with mountain and river, and complete supporting facilities around.



山水环、耀星城 Picturesque Scenery, Brilliant Changsha

- 在宜居的生态中进行智慧的碰撞; Colliding wisdom in a livable ecology;
- 在宜业的氛围中开拓未来!
 Developing a bright future in an industrial atmosphere!
- 通过思想的碰撞,孕育集科研创新、开放交互、人文科技于一体具有国际影响力的智慧科技城。
 Incubating an international smart science and technology town incorporating scientific research and innovation, opening-up and exchange, humanities and sciences, through the collision of thoughts.



Contents

This is Changsha, Hunan
 Overall layout
 Equipment layout
 Civil engineering layout
 Summary

5 结语 Summary

长沙场址完成了土建工程概念设计工作,并进行了一些专业设备的组装布置,主要结论如下:

Changsha site has completed the conceptual design of civil engineering and carried out the assembly and layout of some professional equipment. The main conclusions are as follows:

- 湖南省地理位置优越,旅游资源丰富,国际化程度高,满足CEPC土建选址要求。
 Hunan Province has superior geographical location, rich tourism resources and high degree of internationalization, which meets the requirements of CEPC civil engineering site selection.
- 长沙场址总体布置考虑地磁场对超导高频腔的影响,RF2与RF4方位角为NW8.969°, 主环及大厅基本位于花岗岩体内,地形地质条件优越。
 - The influence of geomagnetic field on superconducting high frequency cavity is considered in the general layout of Changsha site. The azimuth angle of RF2 and RF4 is NW8.969 ° and the main ring and hall are basically located in granite body, with favorable terrain and geological conditions.
- 预留SPPC注入链布置区域地形平坦,交通便利。
 The reserved SPPC injection chain layout area has flat terrain and convenient transportation.
 - 长沙场址紧跟物理最新研究成果,对BIM模型进行了更新。
 Following the latest research results of physics, the BIM model of Changsha site has been updated.
- 下一步重点对影响土建投资的隧洞支护和防水形式开展研究,优化投资。
 - The next step focuses on the tunnel support and waterproof forms which affect the civil engineering investment, and optimize the investment.



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