

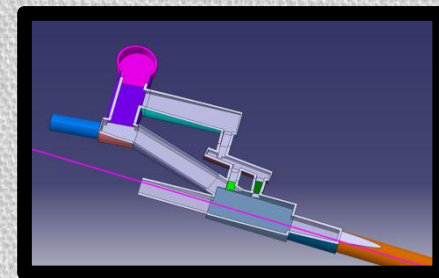
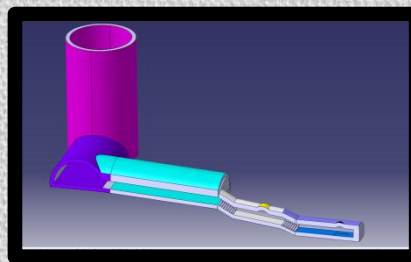


# Secondary beam layout for LAGUNA- LBNO project

Diamanto Smargianaki  
(CERN EN/MEF/LE)

&

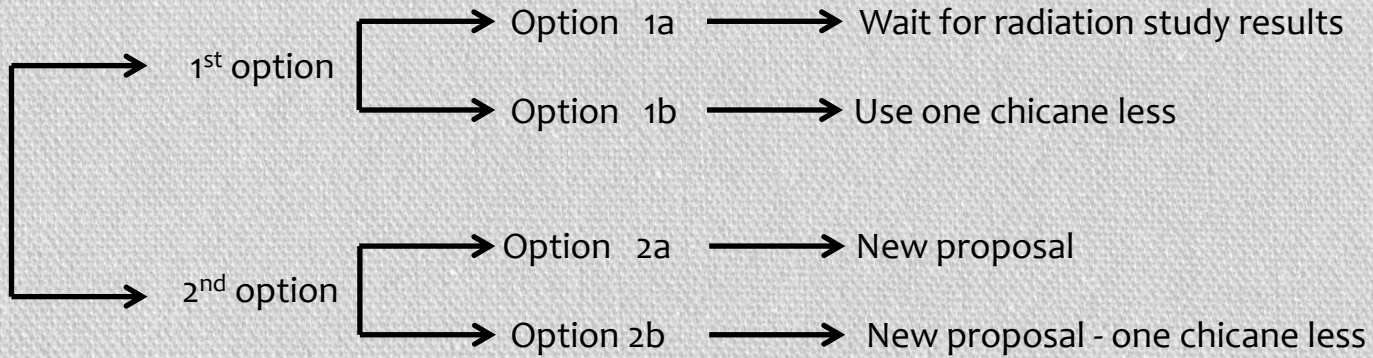
Ilias Efthymiopoulos (CERN)





# Introduction

❖ 2 options



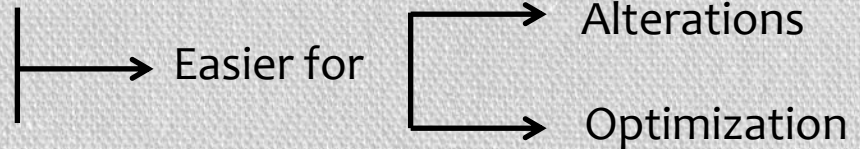
❖ Comparison of the 2 options

❖ Next steps

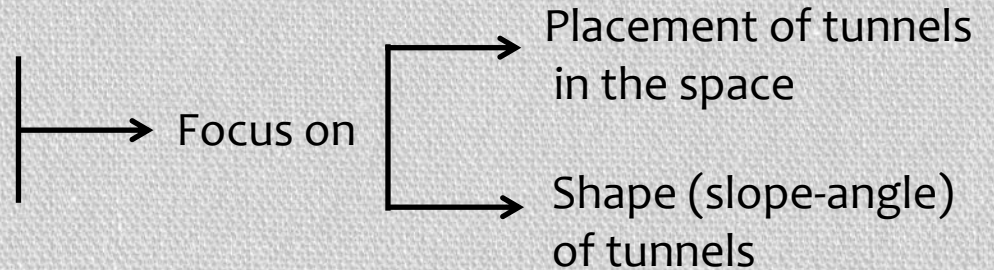


# Useful information

- Models have been designed using values and formulas in the software



- No inner details shown
- No dimensions mentioned

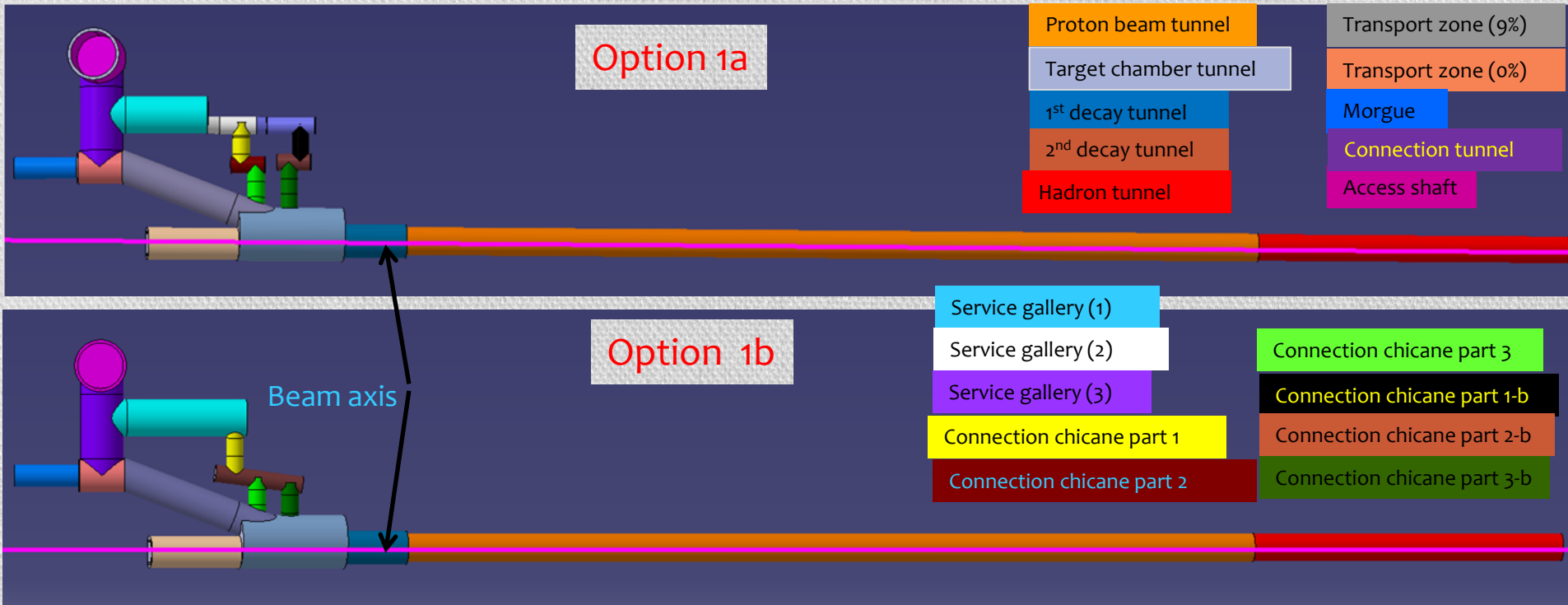


- \* Dimensions ???
- Slopes ???
- Angles ???
- More details ???

See presentations of previous meetings :

- <https://espace.cern.ch/project-laguna-lbno/SitePages/Home.aspx>
- <https://indico.cern.ch/categoryDisplay.py?categId=4376>

# Top view



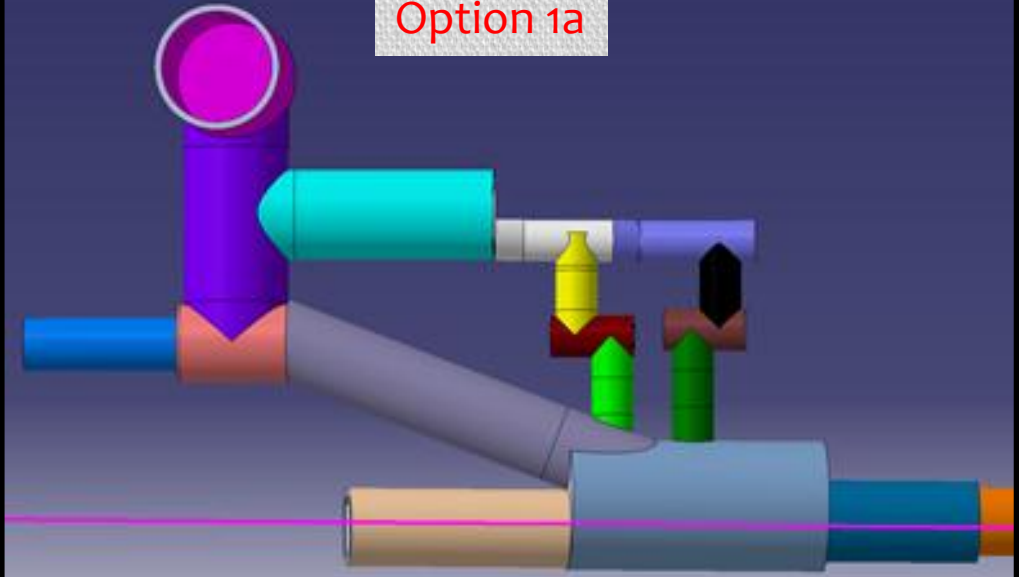
- Reminder
- Option 1a: Radiation study in progress
- Option 1b: One chicane less

- Distance between target chamber tunnel and service gallery tunnel between 28-30 m so that we can compare the models



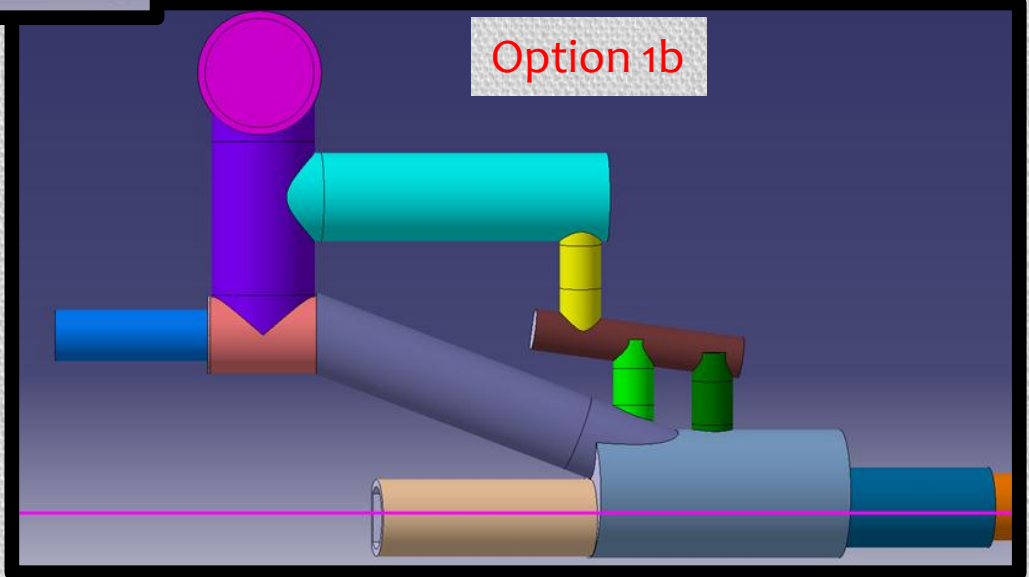
# Closer top view

Option 1a

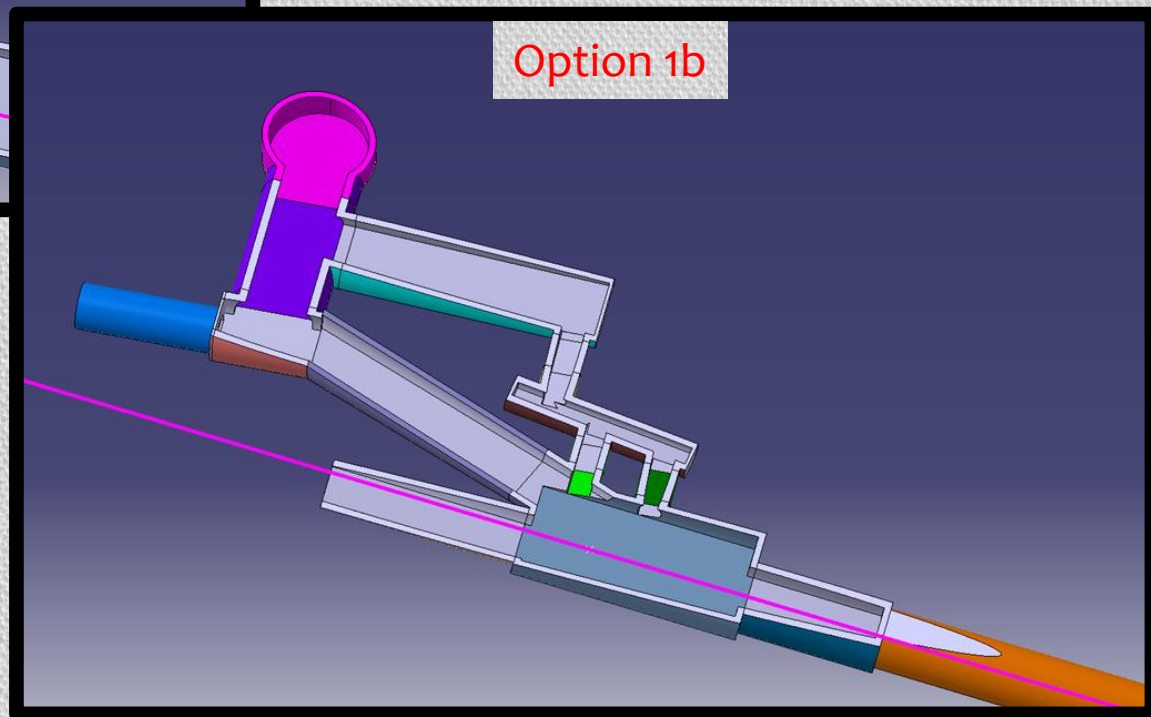
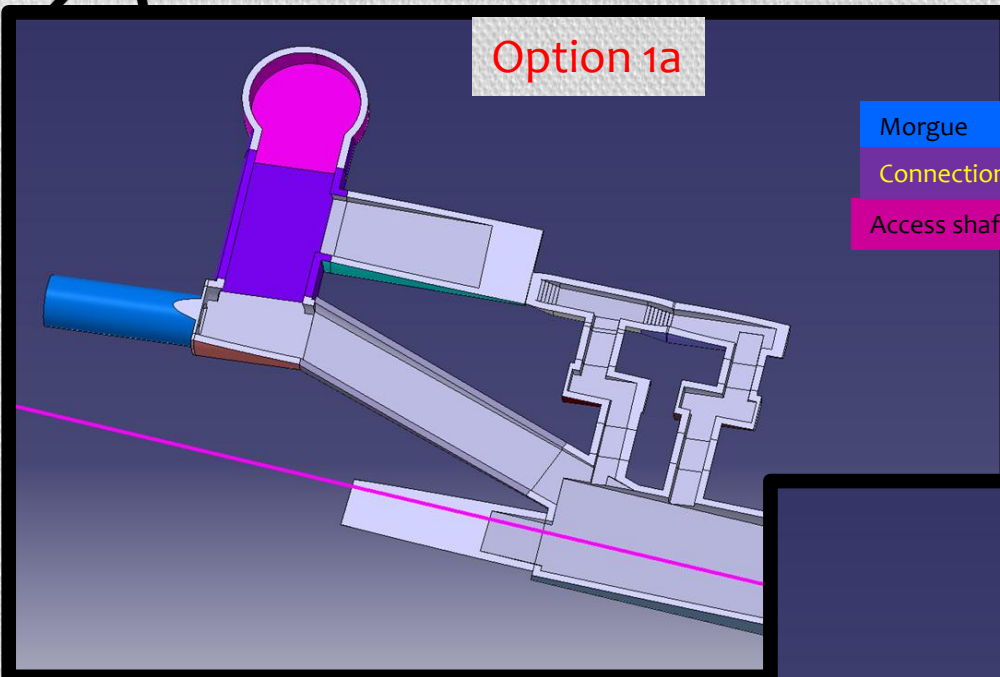


- Transport zone (9%)
- Transport zone (0%)
- Morgue
- Connection tunnel
- Access shaft
- Service gallery (1)
- Service gallery (2)
- Service gallery (3)
- Connection chicane part 1
- Connection chicane part 2
- Connection chicane part 3
- Connection chicane part 1-b
- Connection chicane part 2-b
- Connection chicane part 3-b

Option 1b

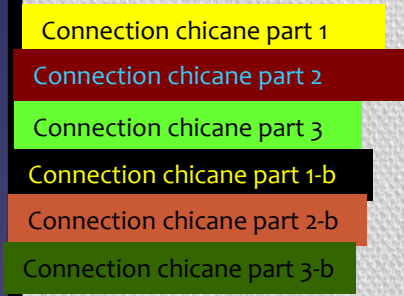
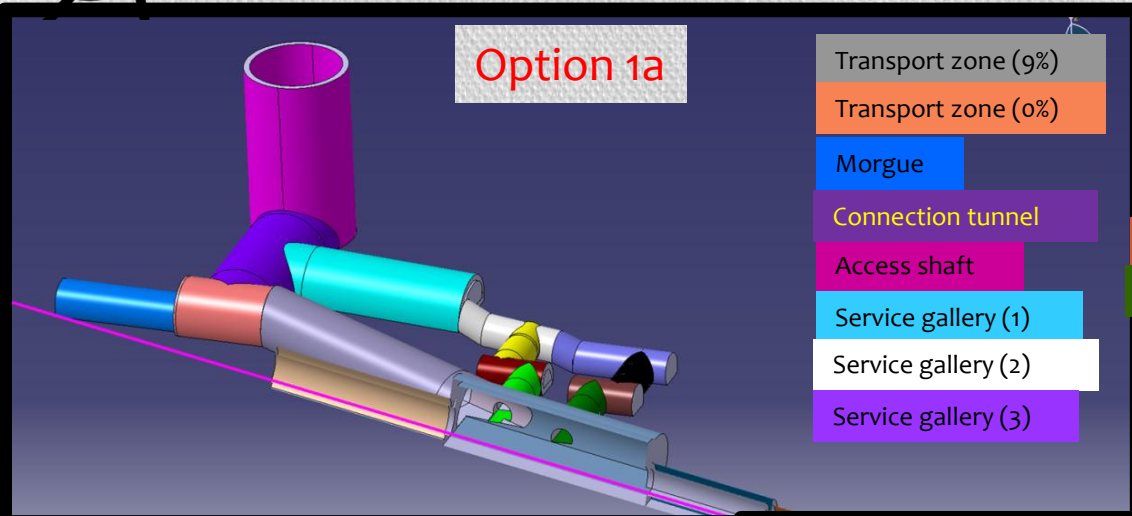


# Cut of the top view

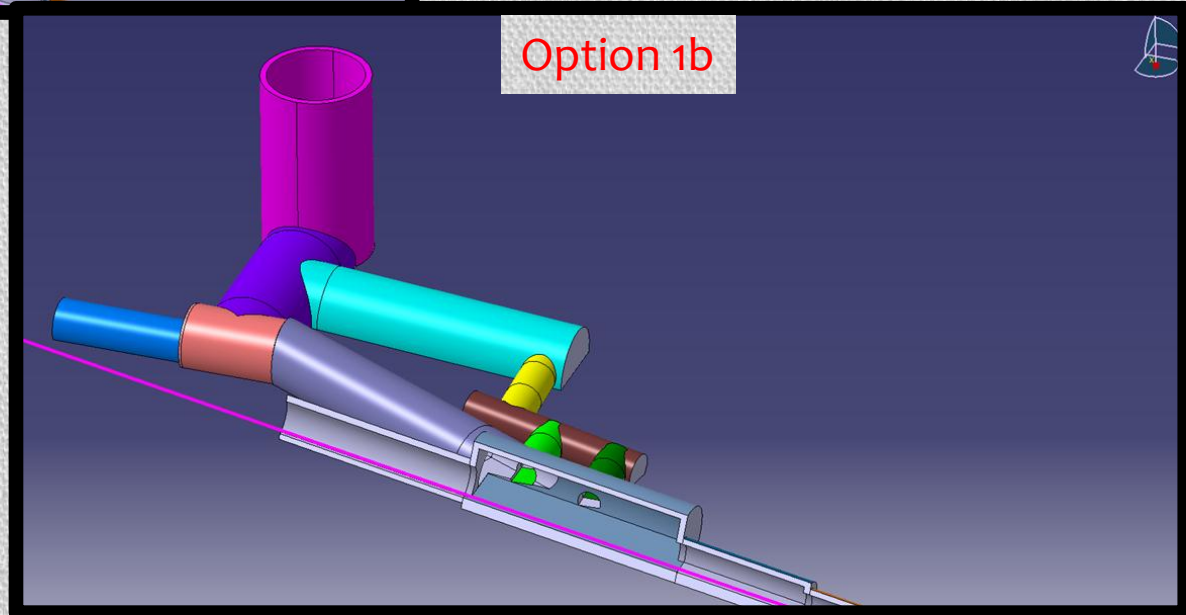


- No need of stairs for option 1b
- One chicane only can be used- depends on the radiation study

# Side view

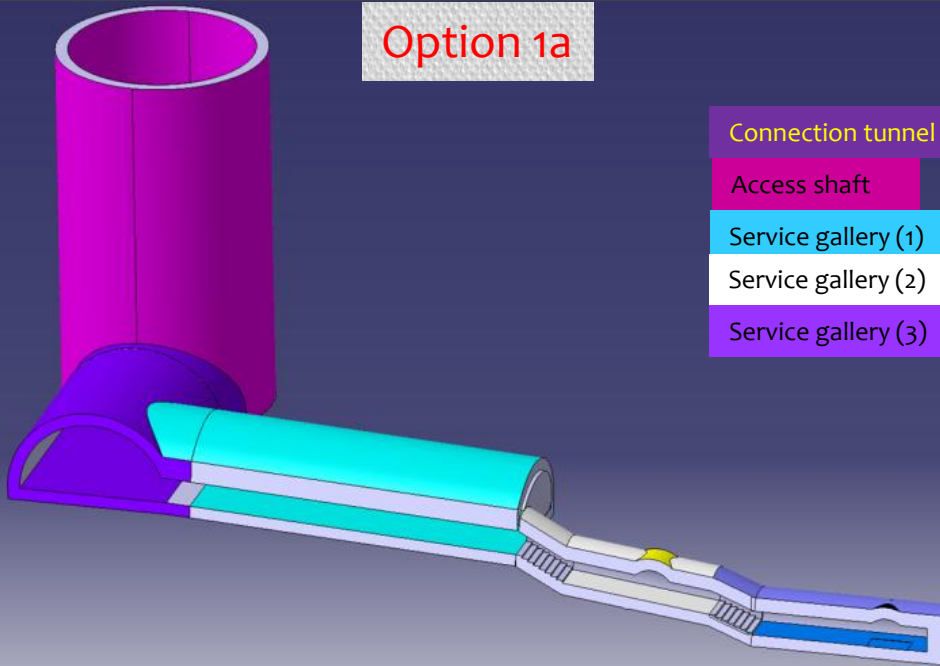


- No change at the connection with the target chamber tunnel

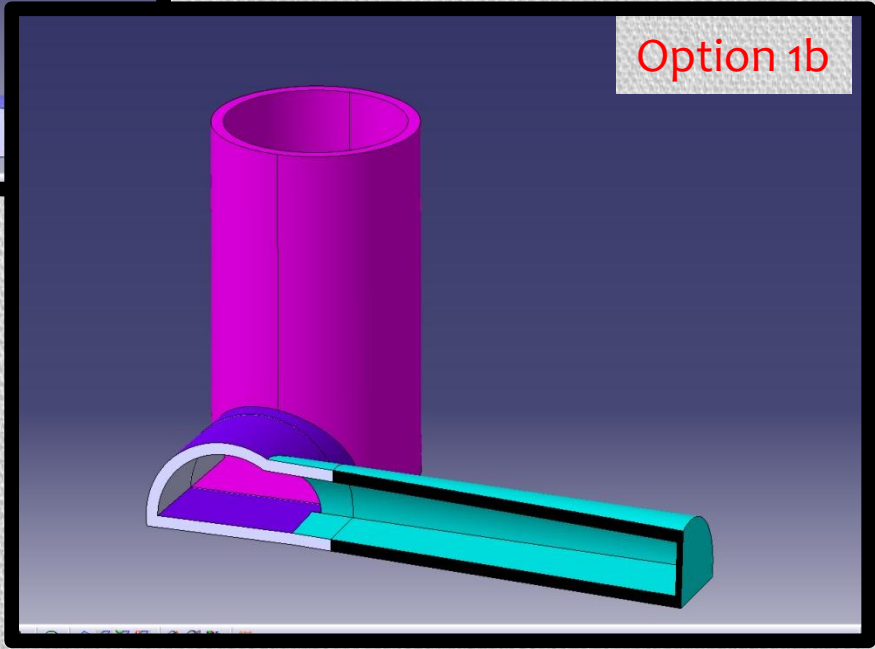


# Side view

Option 1a



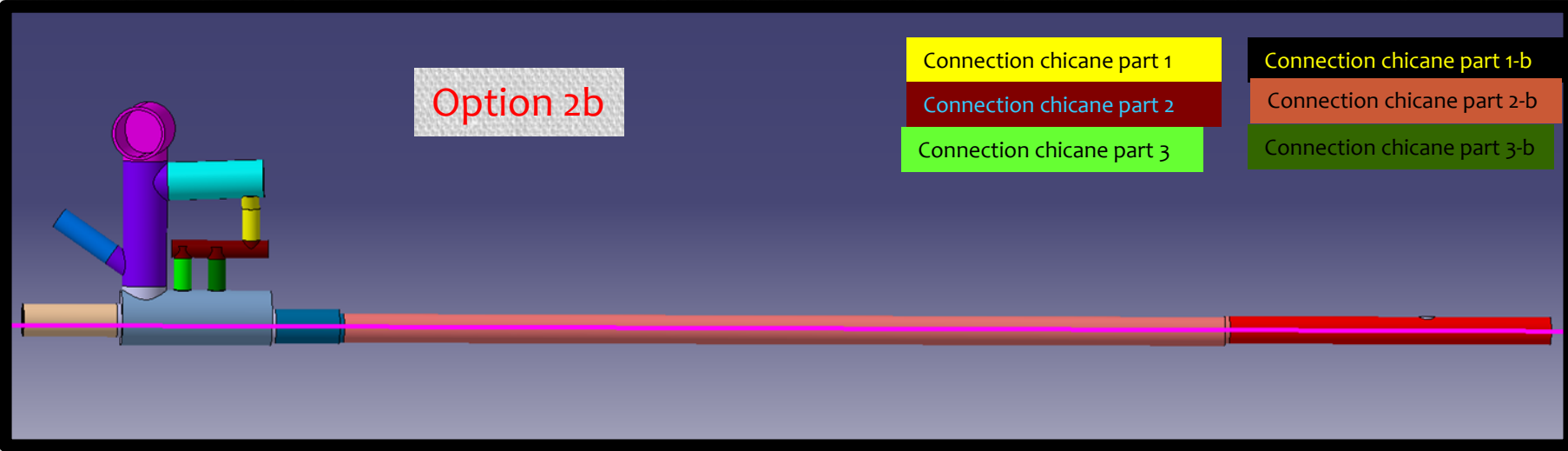
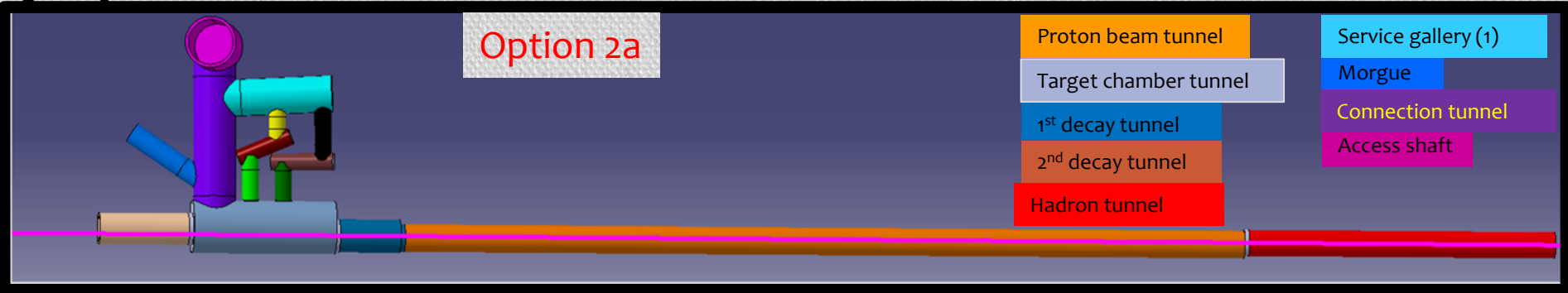
Option 1b



- Smaller service gallery tunnel for option 1b
- No need of stairs for option 1b



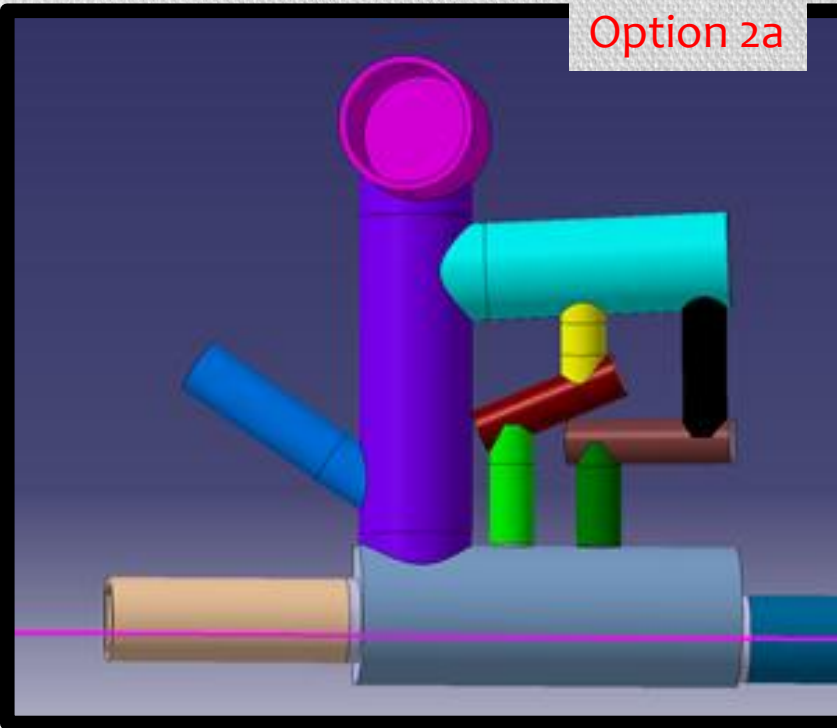
# Top view



- Distance between target chamber tunnel and service gallery tunnel between 28-30 m so that we can compare the models

# Closer top view

Option 2a



Proton beam tunnel

Target chamber tunnel

1<sup>st</sup> decay tunnel

2<sup>nd</sup> decay tunnel

Service gallery (1)

Morgue

Connection tunnel

Access shaft

Connection chicane part 1

Connection chicane part 2

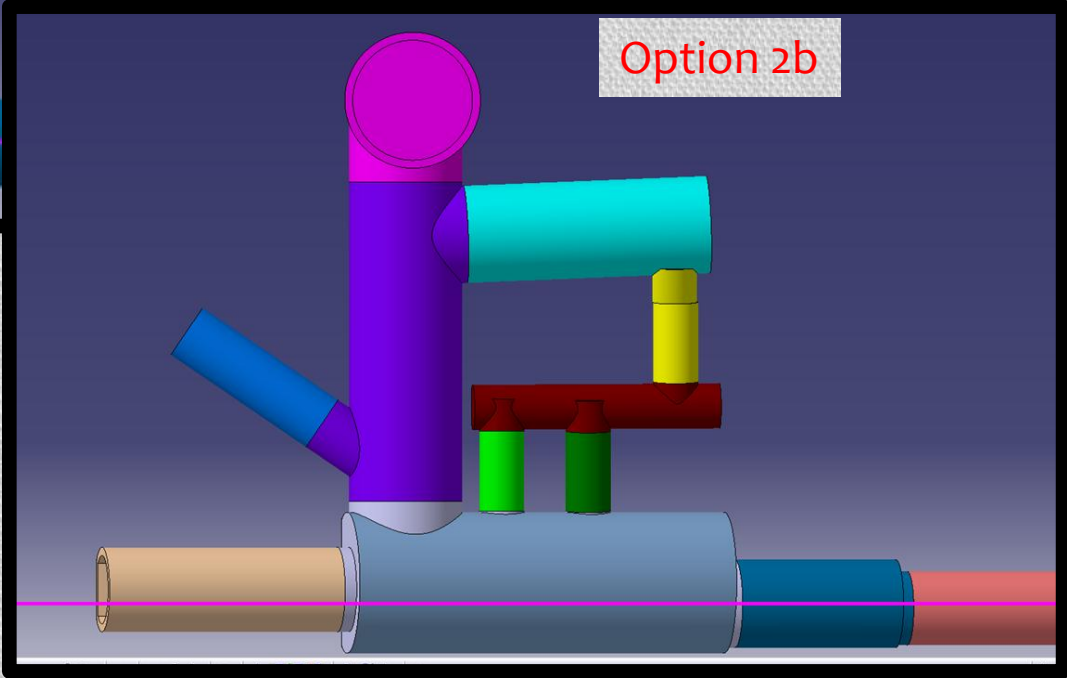
Connection chicane part 3

Connection chicane part 1-b

Connection chicane part 2-b

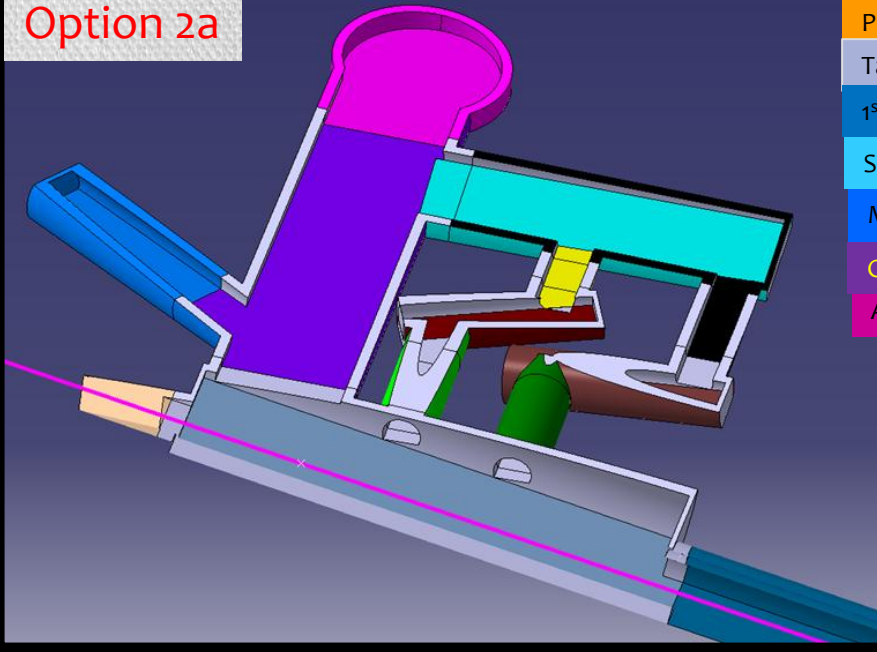
Connection chicane part 3-b

Option 2b



# Cut of the top view

Option 2a



Proton beam tunnel

Target chamber tunnel

1<sup>st</sup> decay tunnel

Service gallery (1)

Morgue

Connection tunnel

Access shaft

Connection chicane part 1

Connection chicane part 2

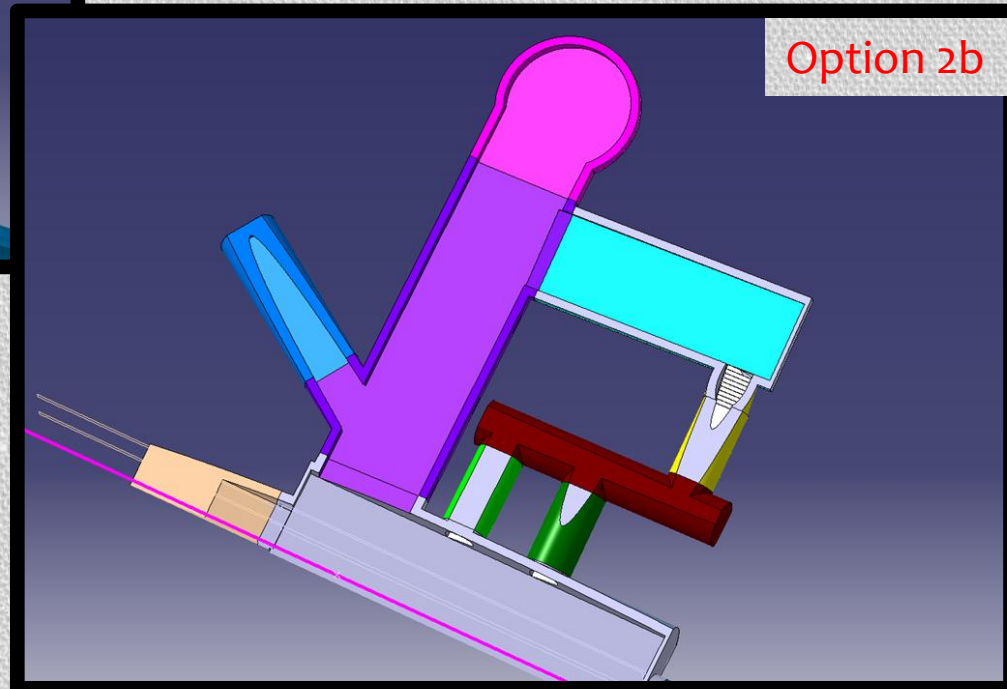
Connection chicane part 3

Connection chicane part 1-b

Connection chicane part 2-b

Connection chicane part 3-b

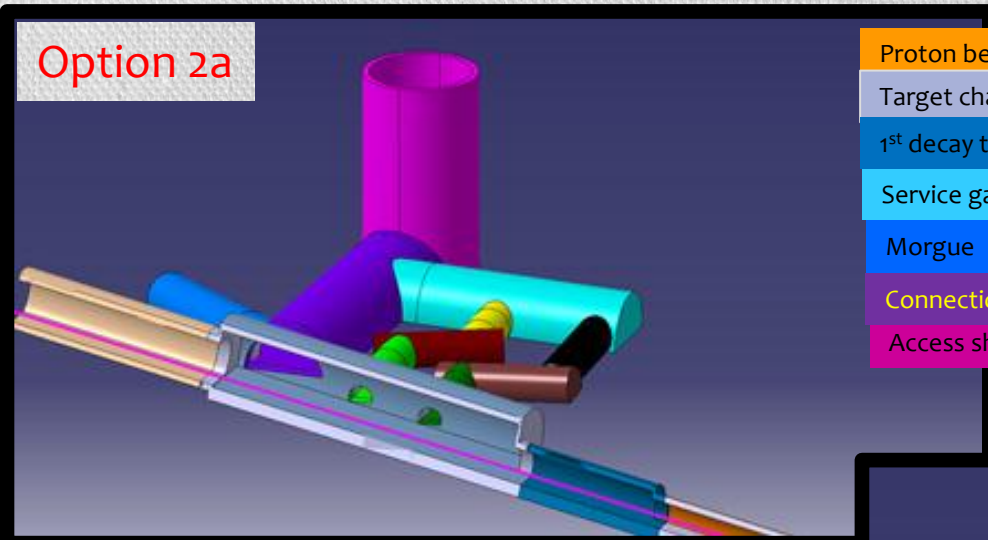
Option 2b



- All transportations at horizontal surface
- Connection tunnel can be deeper
- Crane can be used to lift objects
- One chicane only can be used – depends on the radiation study

# Side view

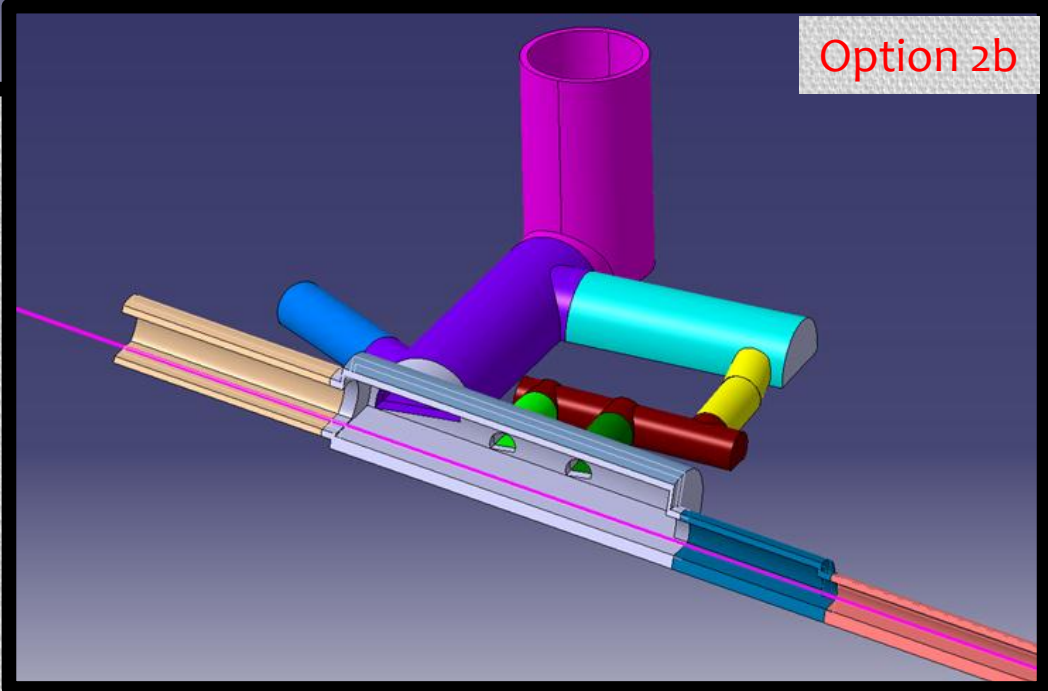
Option 2a



- Proton beam tunnel
- Target chamber tunnel
- 1<sup>st</sup> decay tunnel
- Service gallery (1)
- Morgue
- Connection tunnel
- Access shaft
- Connection chicane part 1
- Connection chicane part 2
- Connection chicane part 3
- Connection chicane part 1-b
- Connection chicane part 2-b
- Connection chicane part 3-b

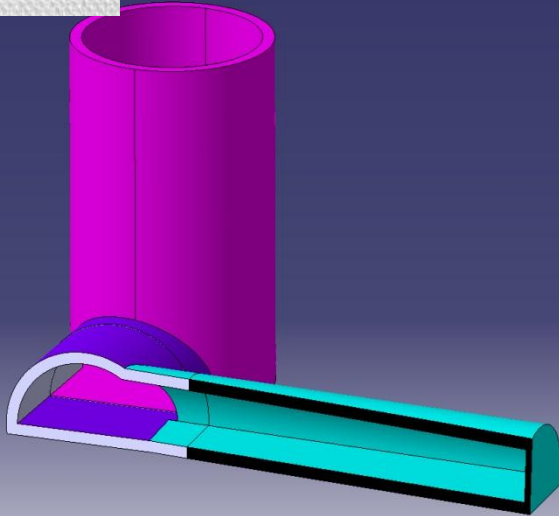
- No change at the connection with the target chamber tunnel

Option 2b



# Closer top view

Option 2a

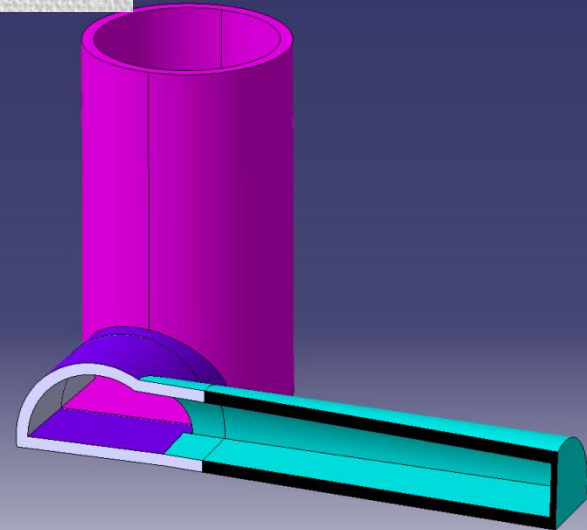


Service gallery (1)

Connection tunnel

Access shaft

Option 2b



- No remarkable change at the service gallery



# Comparison

## Option 1-2

Tunnel Name	Slope		Length (m)		Slope		Length (m)	
	Option 1a	Option 2a	Option 1a	Option 2a	Option 1b	Option 2b	Option 1b	Option 2b
Proton beam	18.0%	18.0%	-	-	18.0%	18.0%	-	-
Target Chamber	18.0%	18.0%	35.0	47.00	18.0%	18.0%	35.0	47.00
1 <sup>st</sup> decay	18.0%	18.0%	21.0	21.00	18.0%	18.0%	21.0	21.00
2 <sup>nd</sup> decay	18.0%	18.0%	283.0	283.00	18.0%	18.0%	283.0	283.00
Hadron	18.0%	18.0%	103.0	103.00	18.0%	18.0%	103.0	103.00
Transport zone (9%)	9.0%	-	35.0	-	9.0%	-	35.0	-
Transport zone (0%)	0.0%	-	15.5	-	0.0%	-	15.5	-
Morgue	0.0%	0.0%	21.0	21.00	0.0%	0.0%	21.0	21.00
Connection	0.0%	0.0%	23.0	50.00	0.0%	0.0%	23.0	50.00
Access shaft	0.0%	0.0%	30.0	28.00	0.0%	0.0%	30.0	28.00
Service gallery (1)	5.2%	0.0%	28.0	33.50	7.4%	6.7%	41.0	31.50
Service gallery (2)	12.0%	-	16.0	-	-	-	-	-
Service gallery (3)	0.0%	-	9.0	-	-	-	-	-
Connection chicane-part 1	0.0%	10.0%	10.5	5.90	9.0%	9.0%	10.8	15.00
Connection chicane-part 2	0.0%	3.5%	11.1	17.00	9.0%	8.8%	28.0	31.00
Connection chicane-part 3	0.0%	9.0%	7.0	14.50	0.0%	0.0%	9.1	10.90
Connection chicane-part 1b	0.0%	9.0%	6.0	16.00	-	-	-	-
Connection chicane-part 2b	0.0%	9.0%	11.0	22.00	-	-	-	-
Connection chicane-part 3b	0.0%	9.0%	10.0	10.00	9.0%	9.0%	7.5	10.80
Total length			675.1	671.90			662.9	652.20



# Comparison

## 1. Total length (No remarkable difference)

	Option 1a	Option 2a	Option 1a	Option 2a	Option 1b	Option 2b	Option 1b	Option 2b
Total length			675.1	671.90			662.9	652.20

## 2. Slopes

	Option 1a	Option 2a	Option 1b	Option 2b
Transport zone (9%)	9.0%	-	9.0%	-
Transport zone (0%)	0.0%	-	0.0%	-
Morgue	0.0%	0.0%	0.0%	0.0%
Connection	0.0%	0.0%	0.0%	0.0%
Access shaft	0.0%	0.0%	0.0%	0.0%
Service gallery (1)	5.2%	0.0%	7.4%	6.7%

- All transportations will be done through horizontal tunnels at the second option



# Next steps

- Information in order to place the model at the space
- Restrictions
  - proton beam tunnel (placement)
  - inner operation of the tunnels (evaluation of width and height)
  - radiation study
  - construction (max.dig slope of roadheader, cranes, rails, etc)
- Cost calculation
- Evaluation – Find solutions of potential problems (support walls, safe transportation and placement of all objects, etc)
- Improvement of outer design & Inner design
- Optimization of cost, shape, functionality and other restrictions.



# Thank you ... questions?

Thank  
you

