

Handling and Installation

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CERN

Background

CERN has concentrated on handling equipment (rather than installation as a whole which was covered by F Asiri et al):

- Information on cranes provided by I Ruehl for RDR
- Some studies and presentations on cryomodule underground transport after RDR as part of CES meetings – presented in Beijing .

This week discussion with F Asiri about RDR installation content :

- RDR used top-down approach extrapolated from cryomodules to provide overall time and cost estimate. Includes, for example, surface storage and interconnections

Installation Cost Estimate Results

WORK BREAKDOWN STRUCTURE

Rev. 12 Dated: Dec-2006

WBS					Component	Total Labor Hours	Mat. & Equip. k\$US	Total Cost k\$US
1	7	3			Installation	6,914,000	\$35,350	\$422,620
1	7	3	1		General Installation	1,020,000	\$33,350	\$96,450
1	7	3	2		Area System Installation	5,894,000	\$2,000	\$326,170

Rev. 12 Dated: Dec.-2006 Level 5

WBS					Component	Total Labor Hours	Mat. & Equip. k\$US	Total Cost k\$US
1	7	3	1		General Installation	1,020,000	\$33,350	\$96,450
				1	Logistics Management	140,000	\$700	\$8,400
				2	Engineering Support	280,000	\$5,350	\$20,750
				3	Equipment	80,000	\$8,000	\$12,400
				4	Vehicles	80,000	\$2,300	\$6,700
				5	Shipping-Receiving	80,000	\$2,000	\$6,400
				6	Warehousing	80,000	\$12,000	\$16,400
				7	Transportation	280,000	\$3,000	\$25,400
1	7	3	2		Area System Installation	5,894,000	\$2,000	\$326,170
				1	Electron Source	200,000		\$11,000
				2	Positron Source	766,000		\$42,130
				3	Damping Ring	1,216,000		\$66,880
				4	RTML Area	214,000		\$11,770
				5	Main Linac	2,700,000	\$2,000	\$150,500
				6	Beam Delivery	798,000		\$43,890
					labor @ 55.0 \$US per man-hour, 2000 man-hours per year			

Next priorities

Given limited resources and time we need to agree best way ahead – possibilities include:

- Fred Asiri has proposed adjustment of RDR cost and time estimates based on latest layouts and knowledge,
- Review of crane info,
- Verifications of cryomodule transport integration
- Assume standard equipment and techniques will be OK for the other transport operations.
- If time allows identify any other requirements that cannot be solved by conventional industrial handling equipment and investigate,

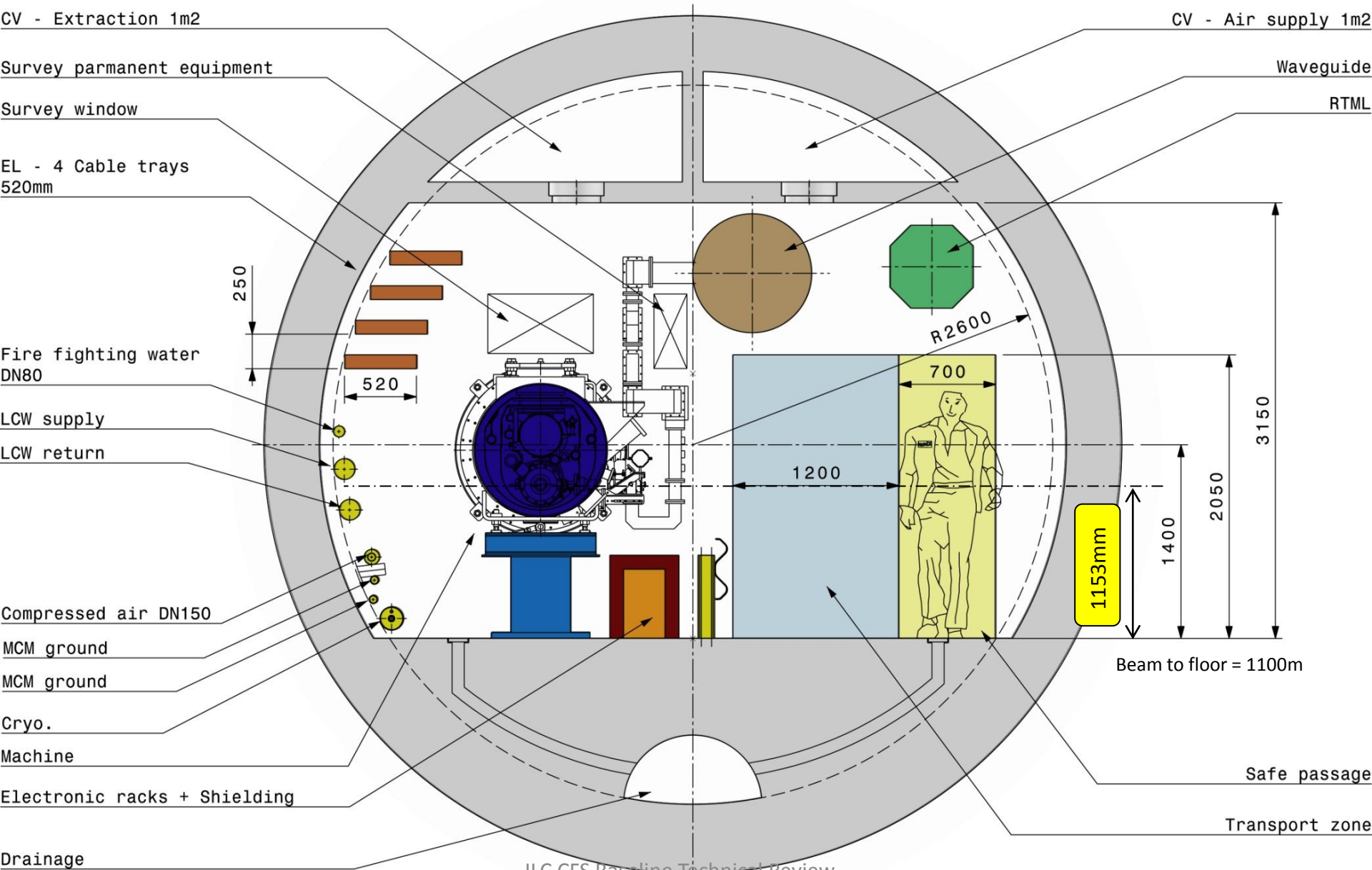
Example of cryomodule tunnel transport and transfer (onto supports)

- This is an input for (or allows validation of) tunnel cross sections (can be extended to shaft dimensions and liaison gallery dimensions)
- It follows on from previous presentations

Main inputs :

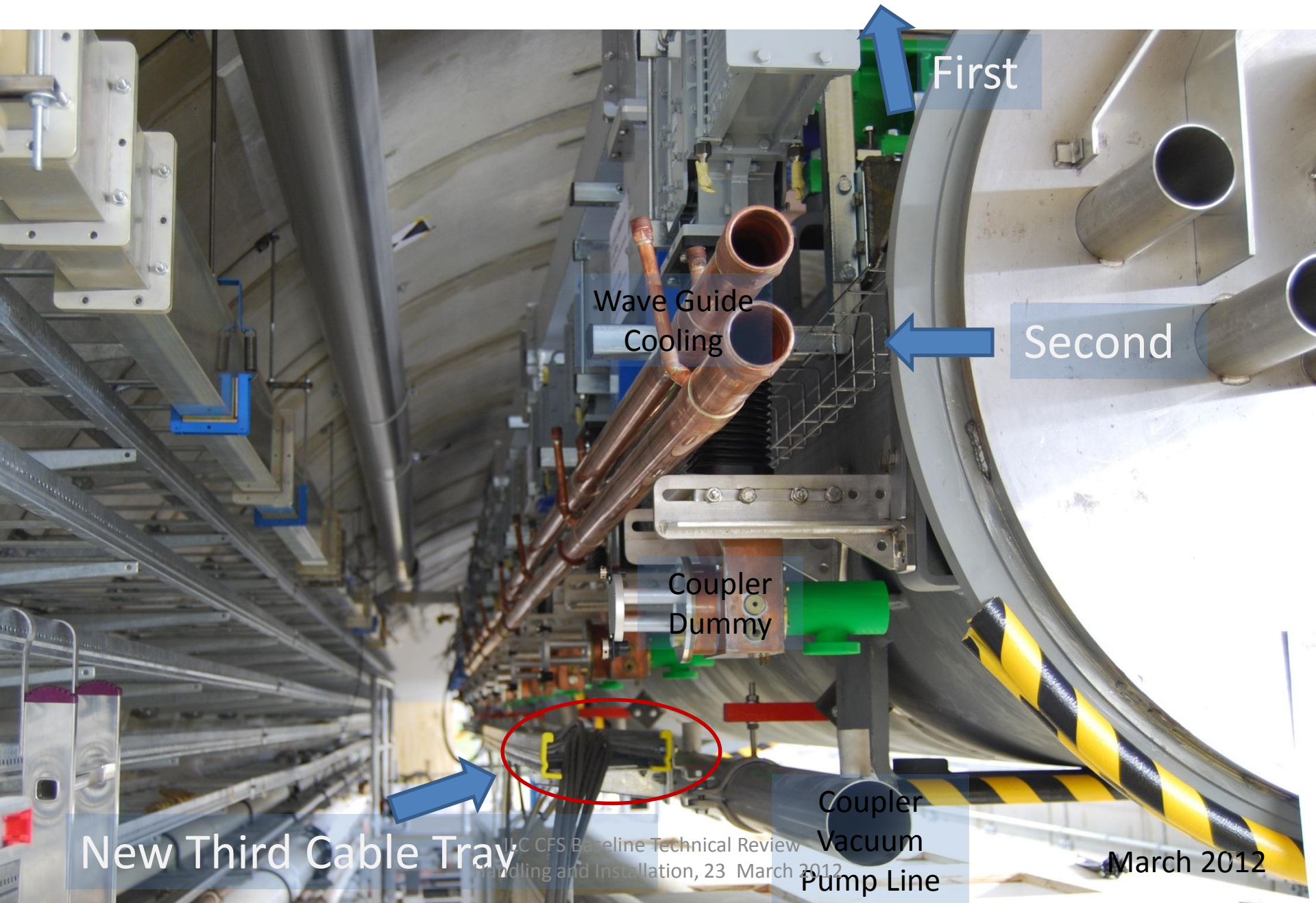
- Tunnel cross sections...
- Cryomodule transport conditions (especially what is attached to side of tank)
- Solution based on LHC warm magnet transport

Typical Main Linac Cross Section for Klycluster Scheme on the CERN Site



ILC CFS Baseline Technical Review -
 Handling and Installation, 23 March 2012
ILC - Typical Cross Section - Diameter 5200mm - Scale 1:25 (A3)

XFEL Dummy Module with Wave Guide and Cable Trays



First

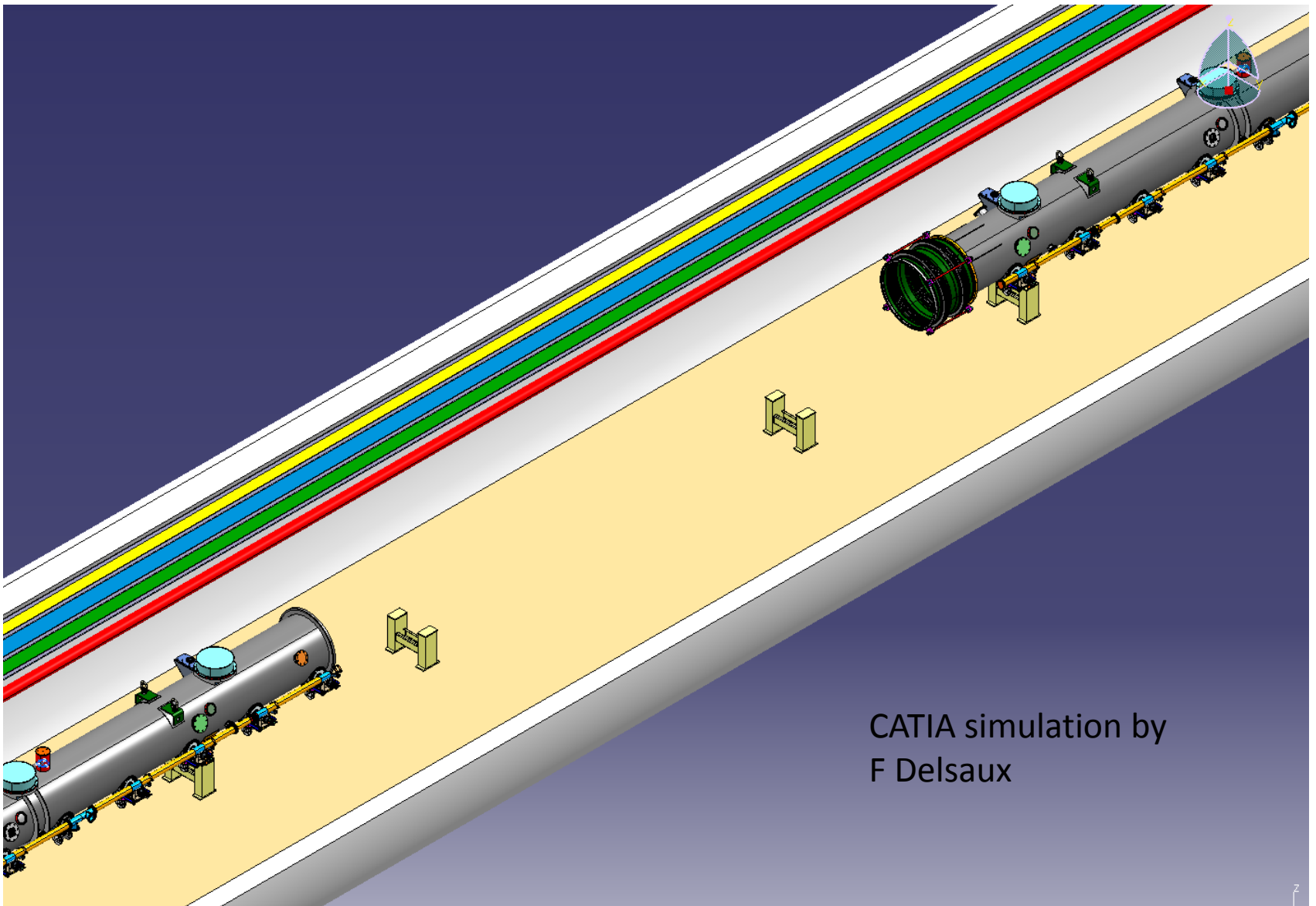
Wave Guide
Cooling

Second

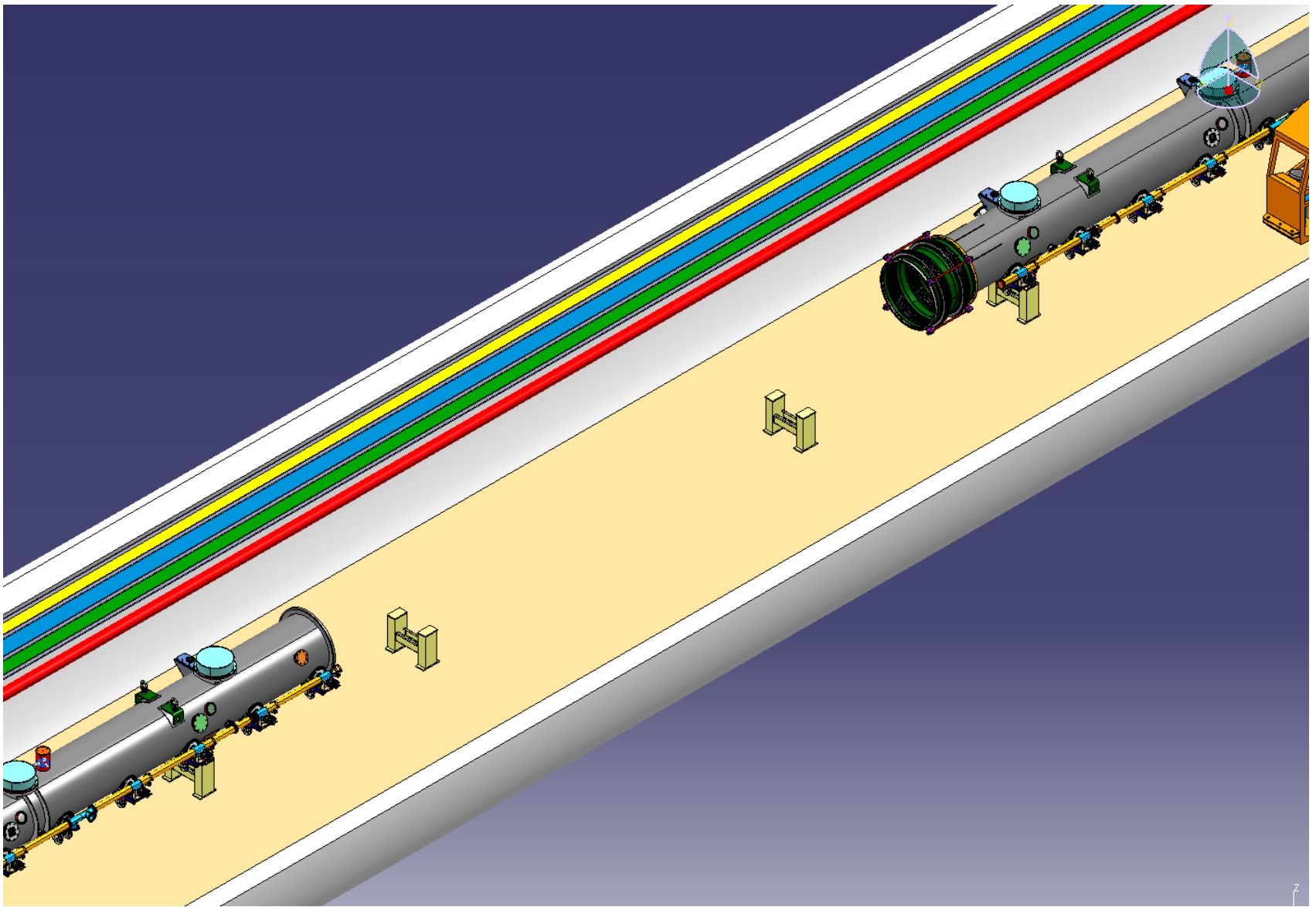
Coupler
Dummy

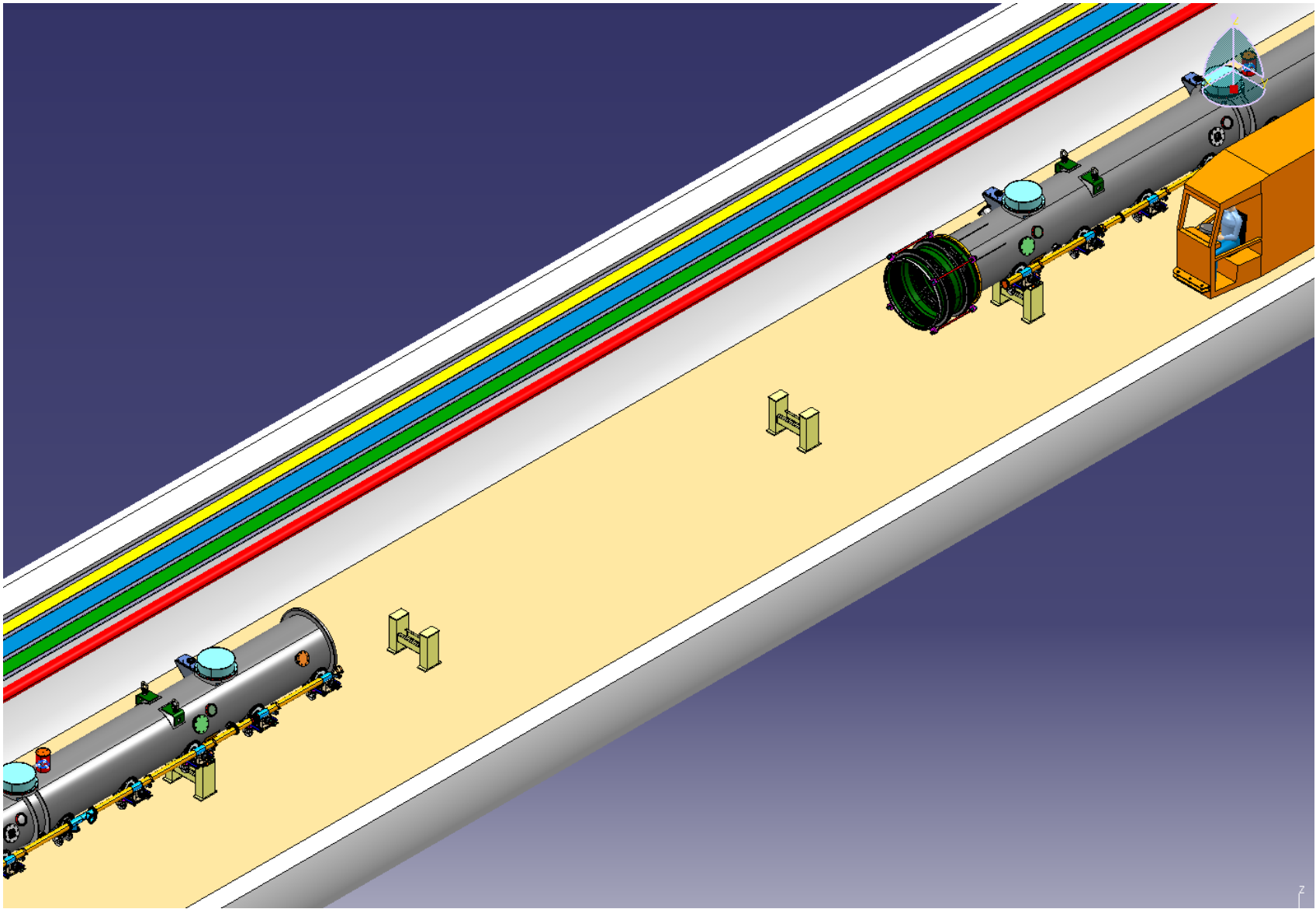
New Third Cable Tray

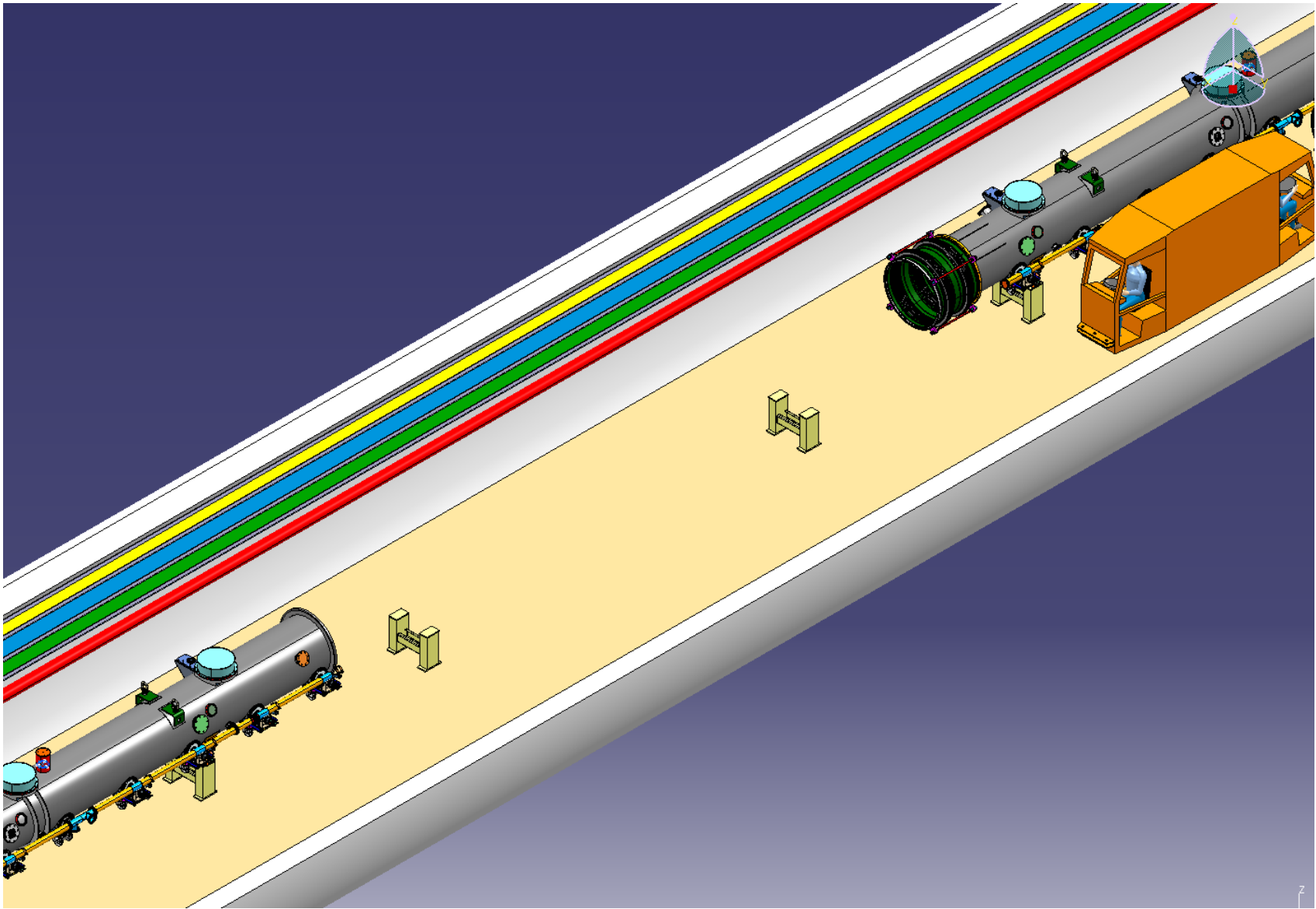
Coupler
Vacuum
Pump Line

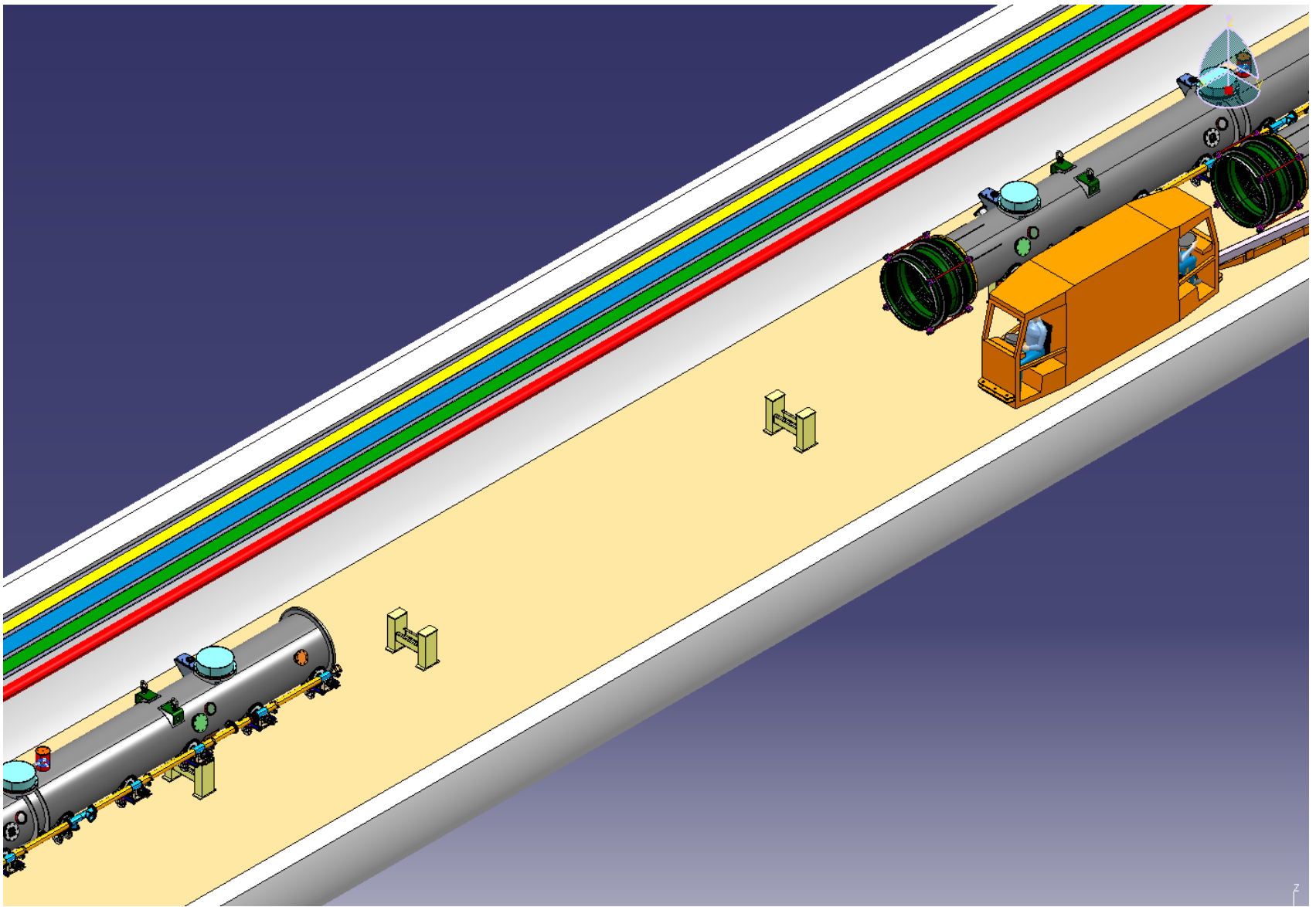


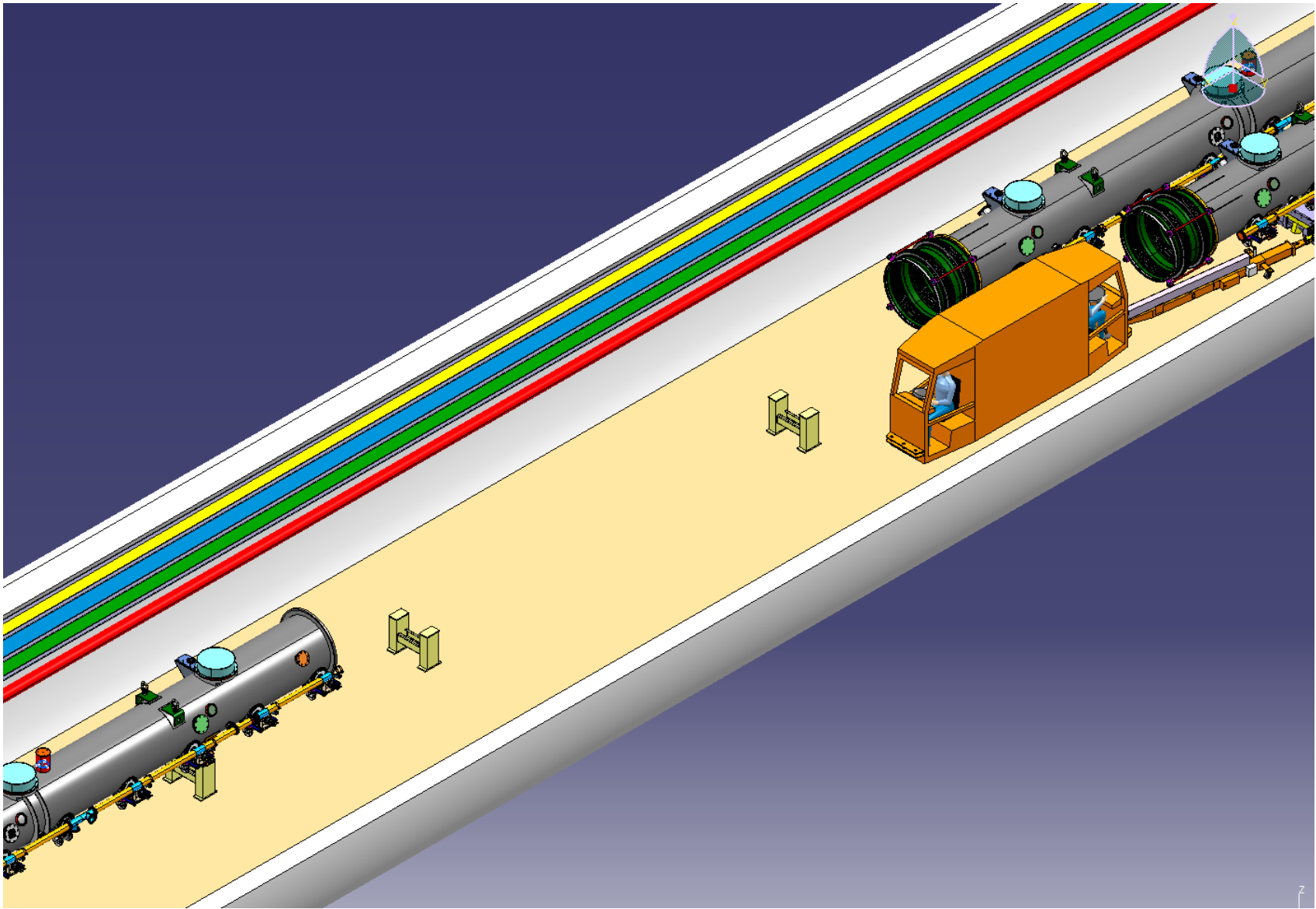
CATIA simulation by
F Delsaux

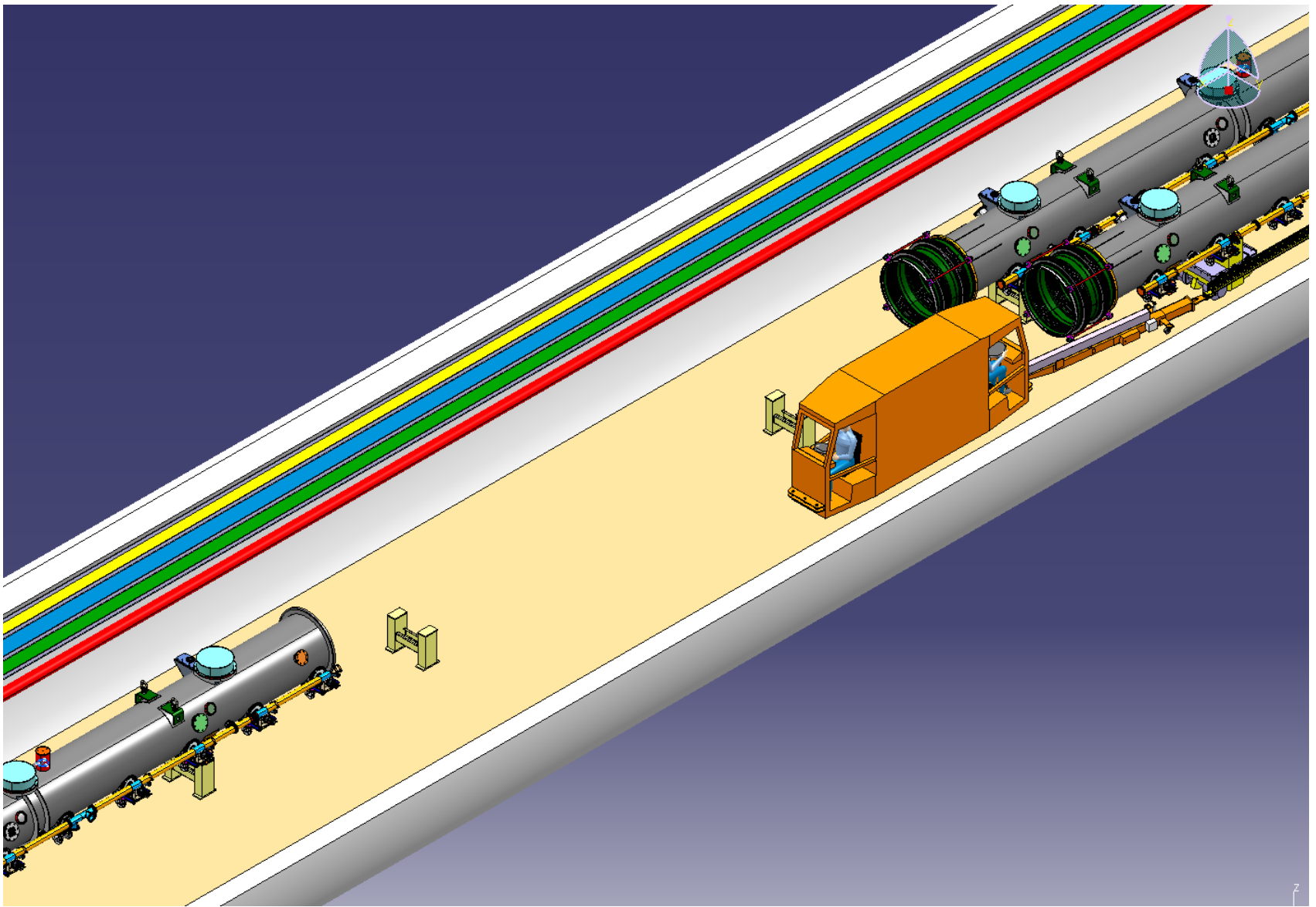


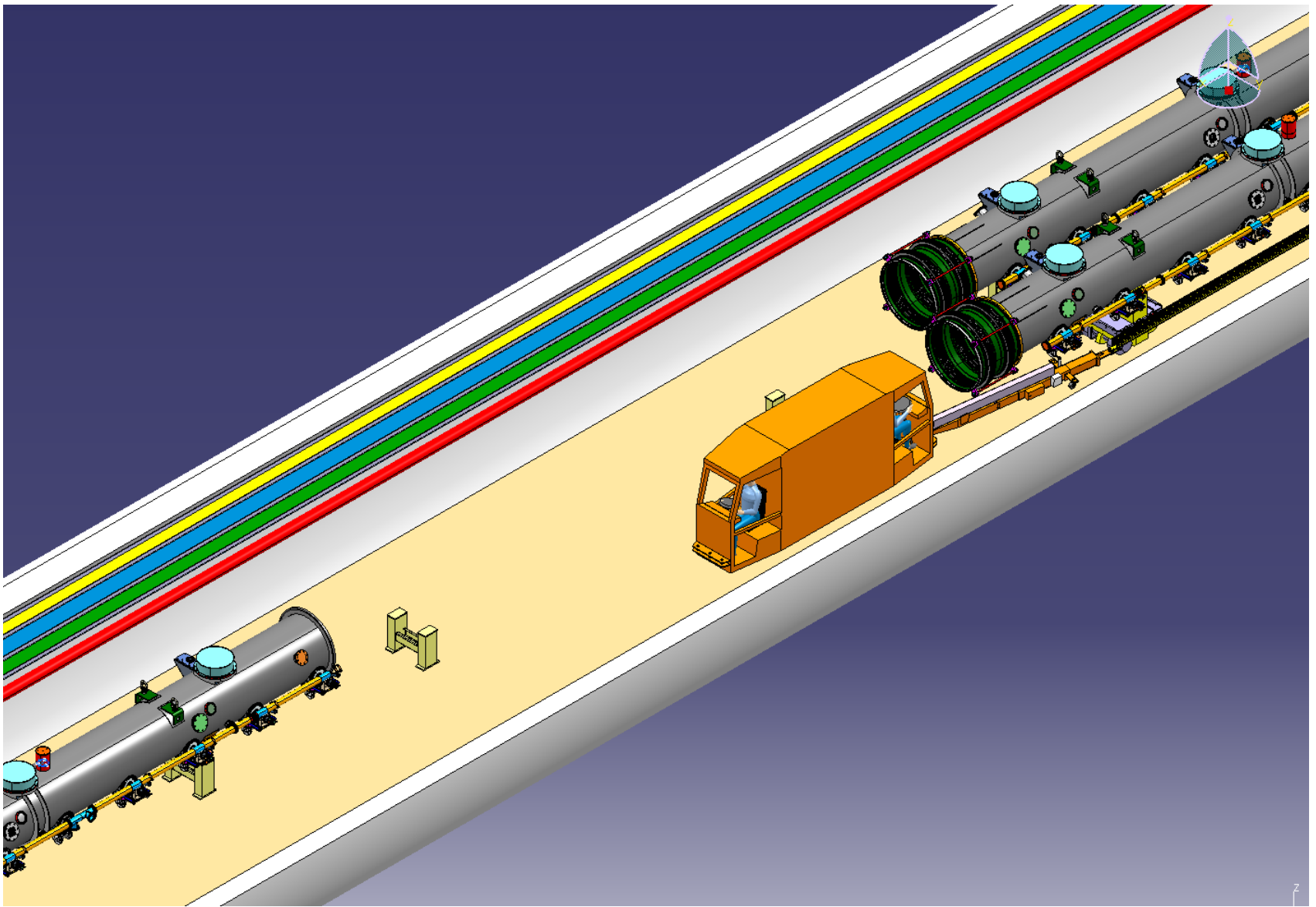


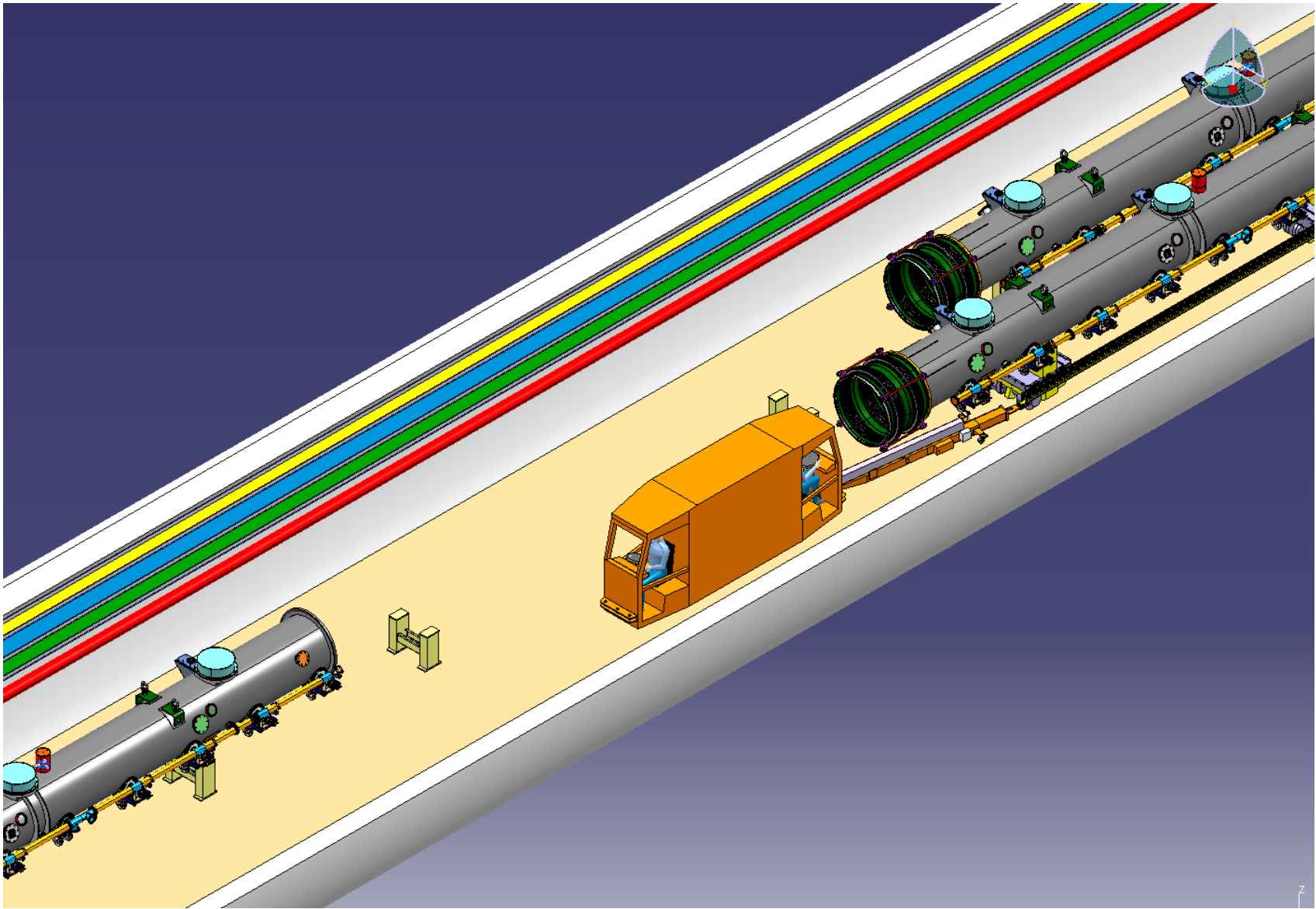


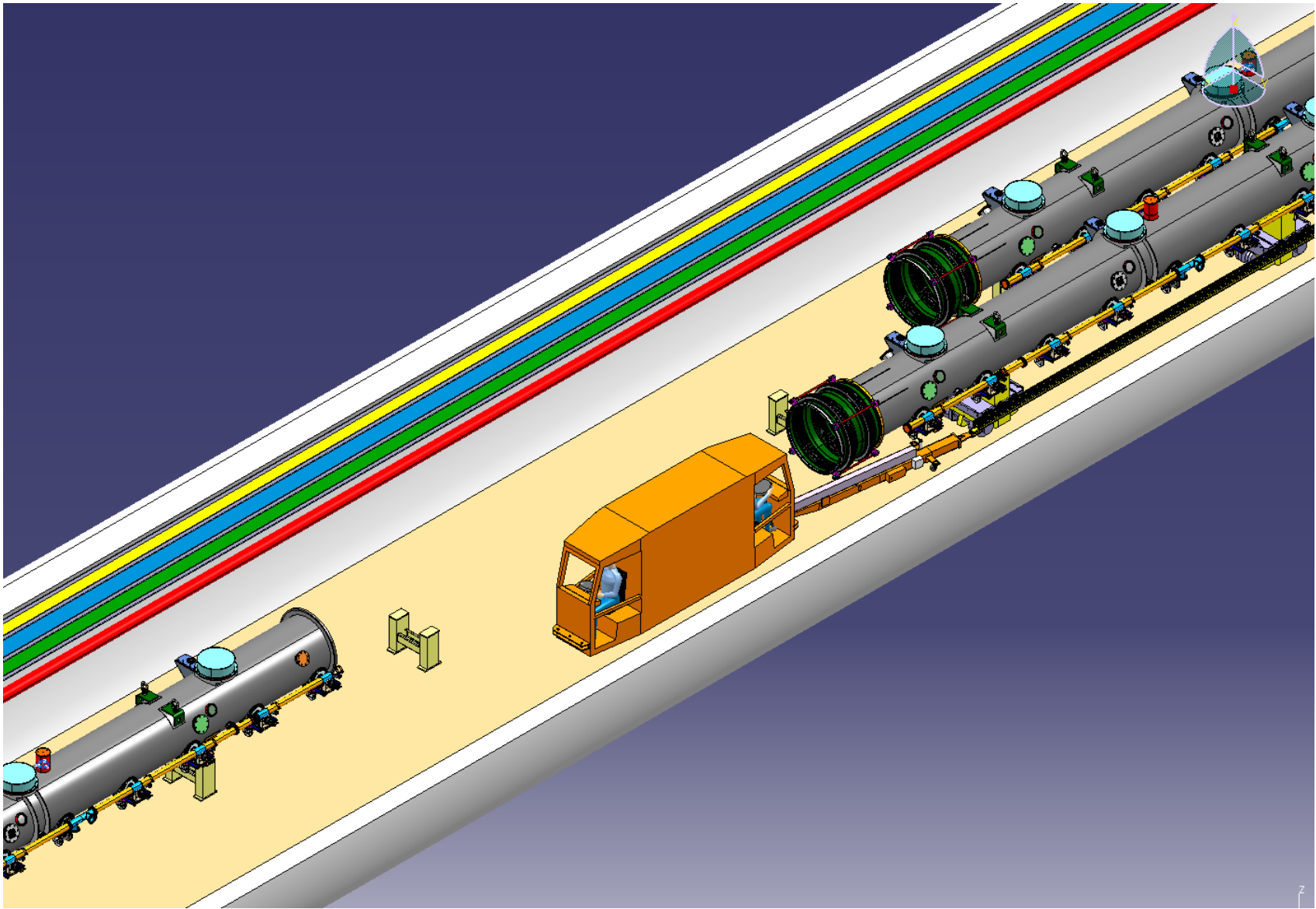


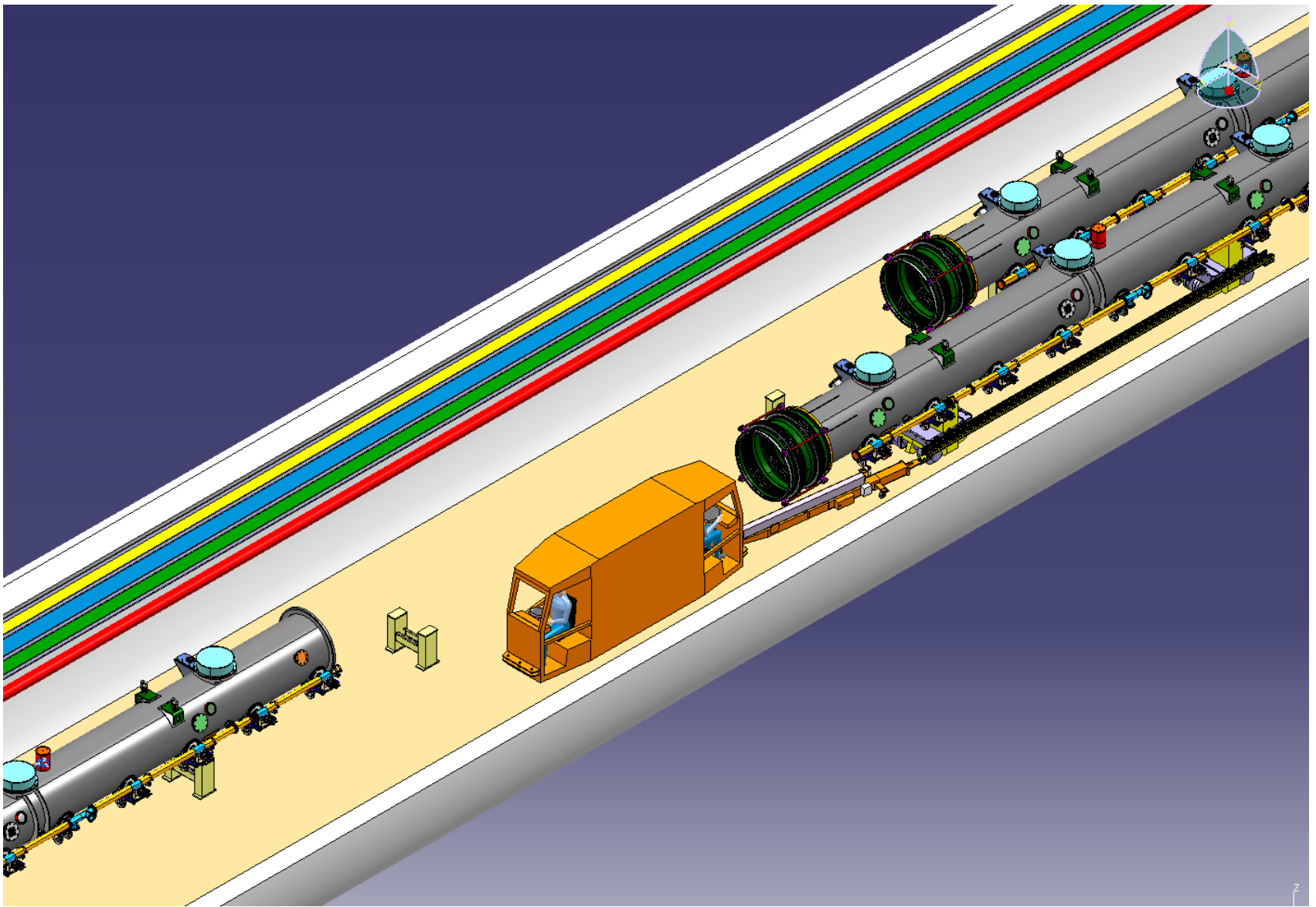


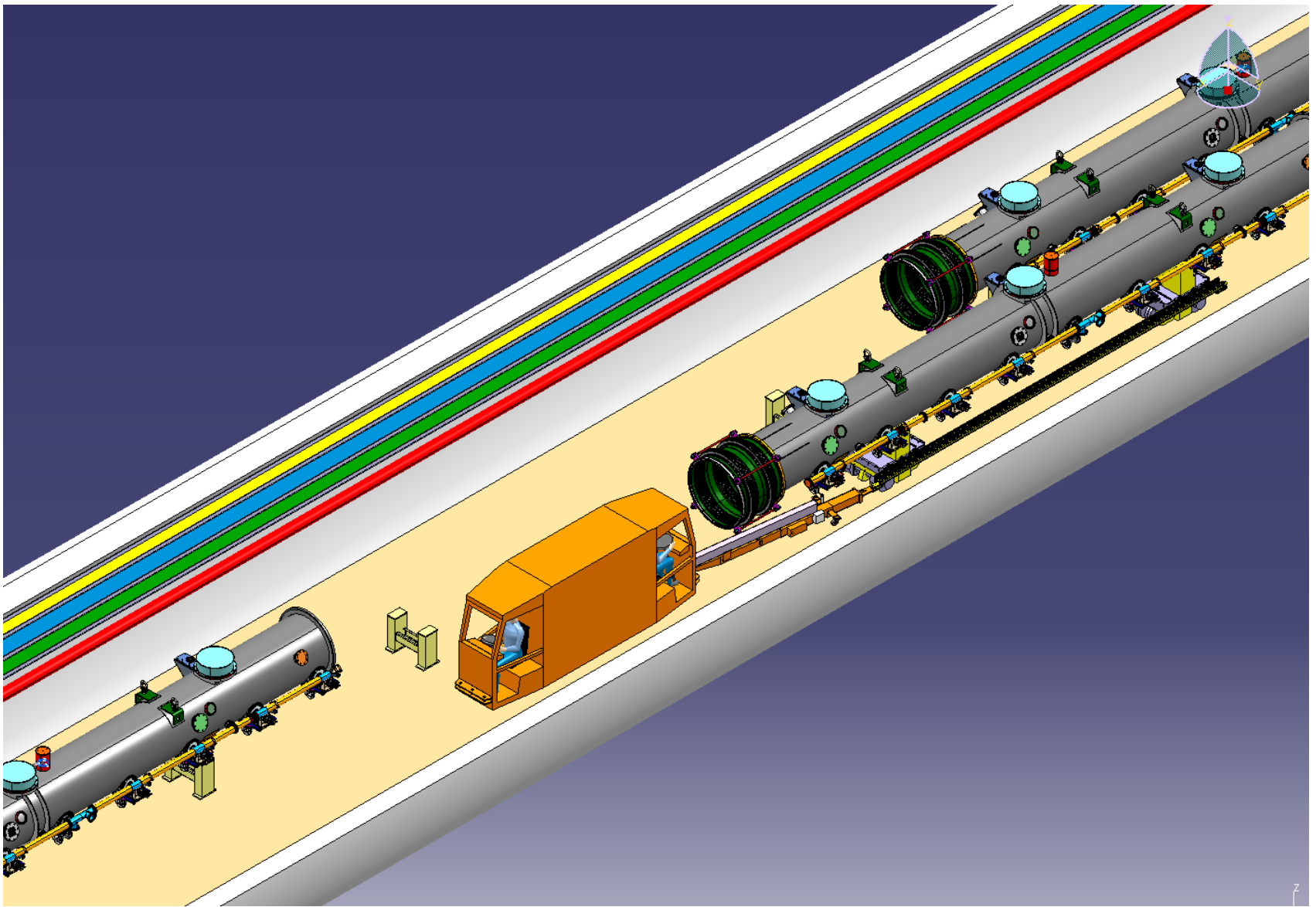


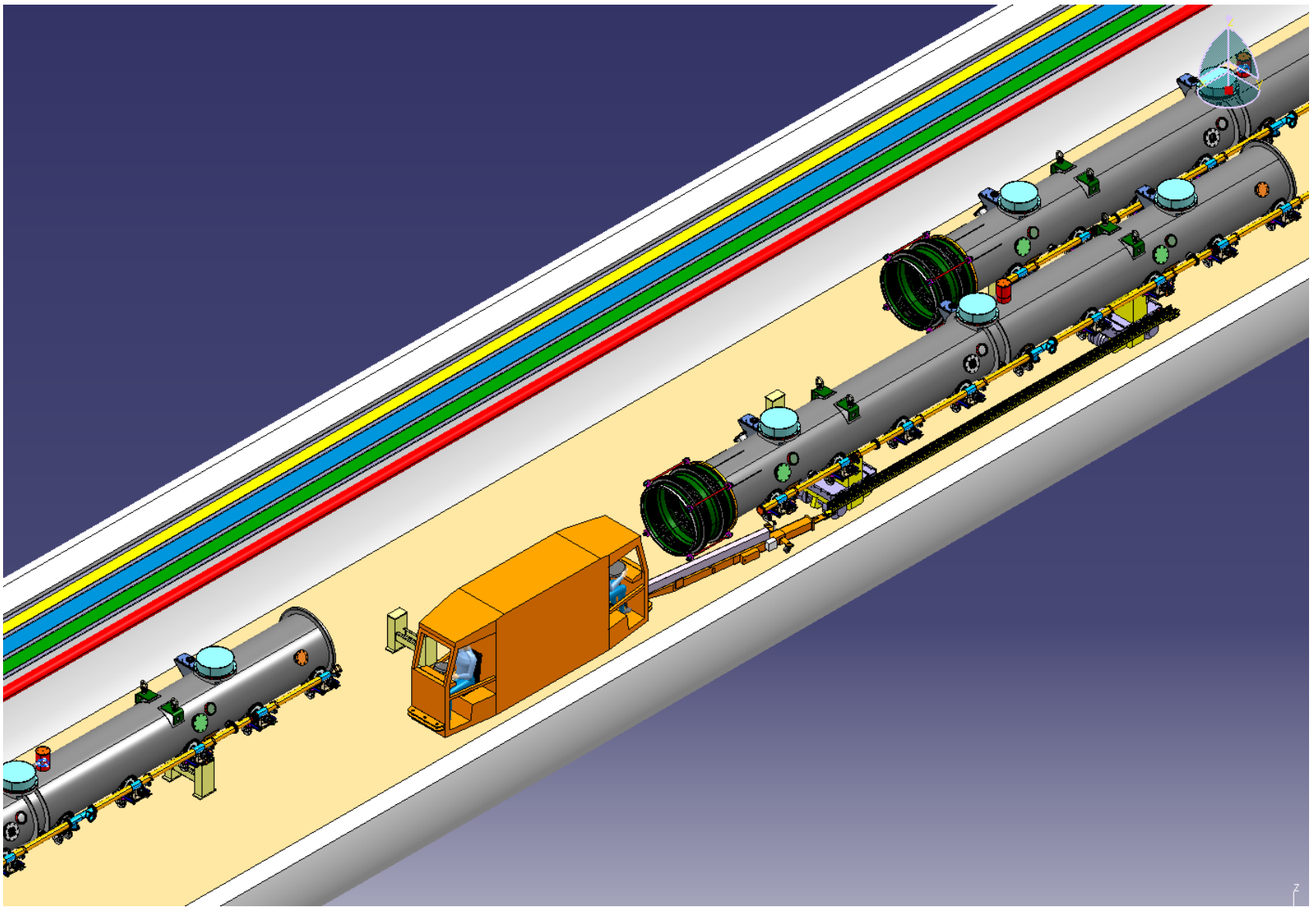


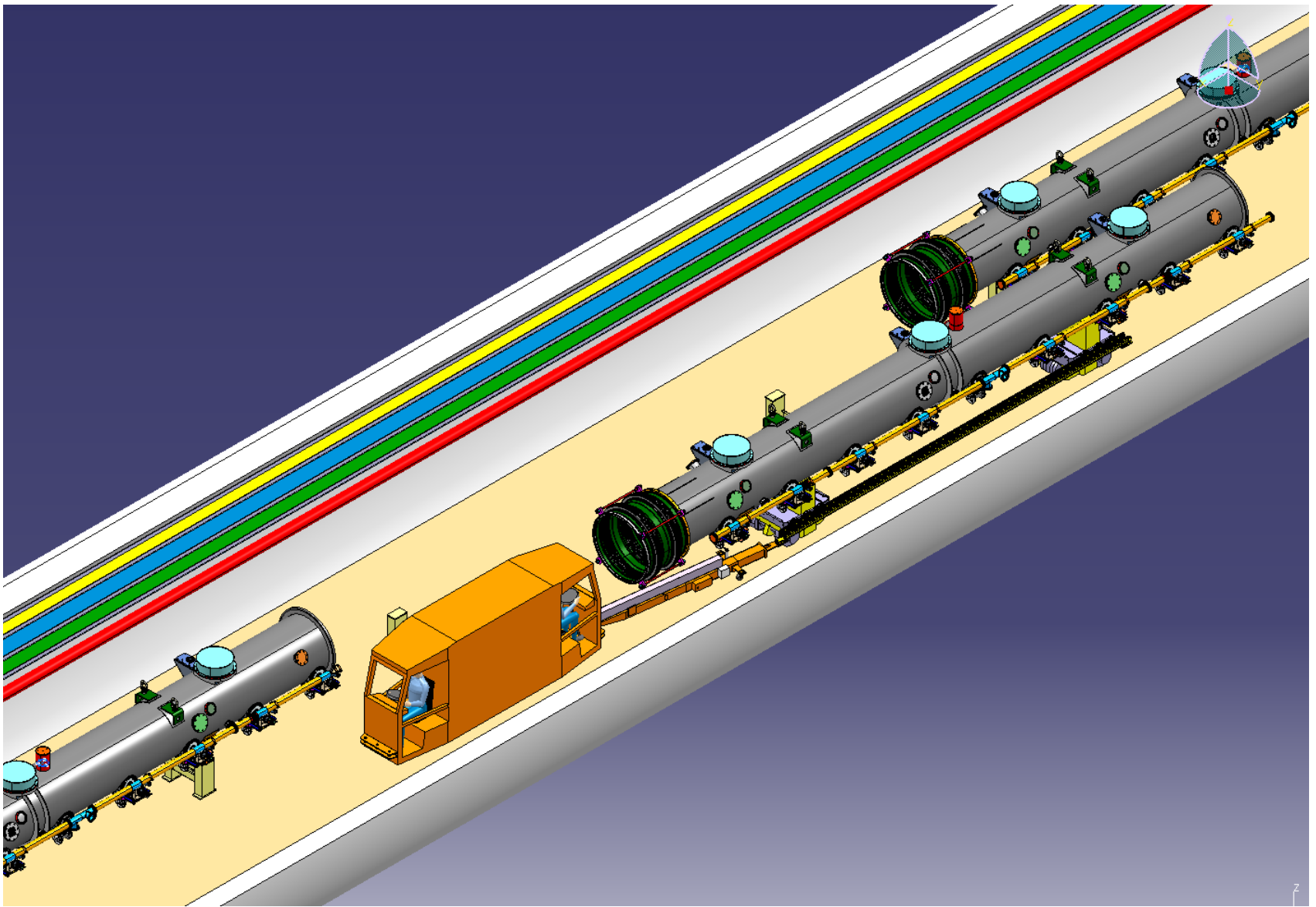


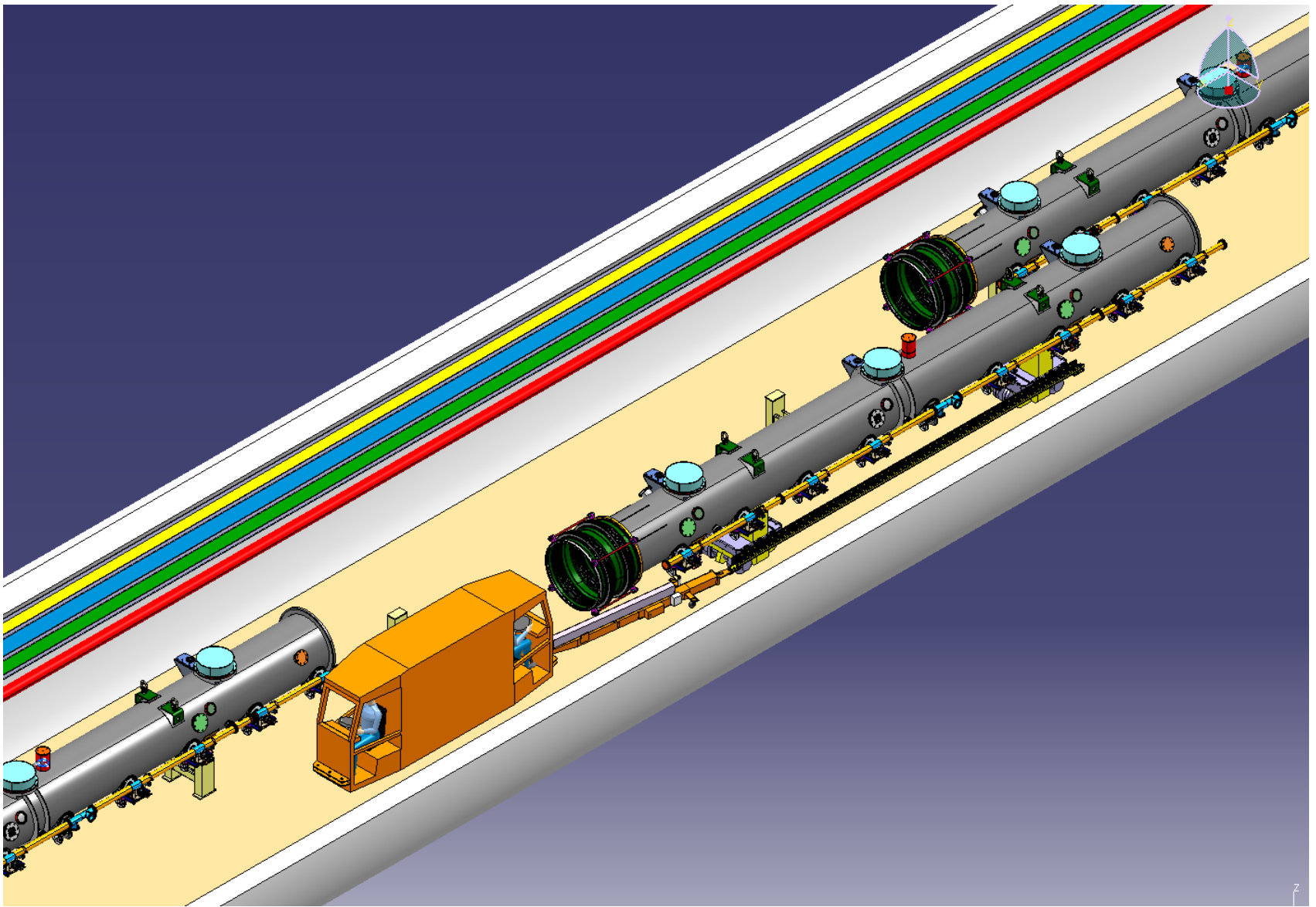


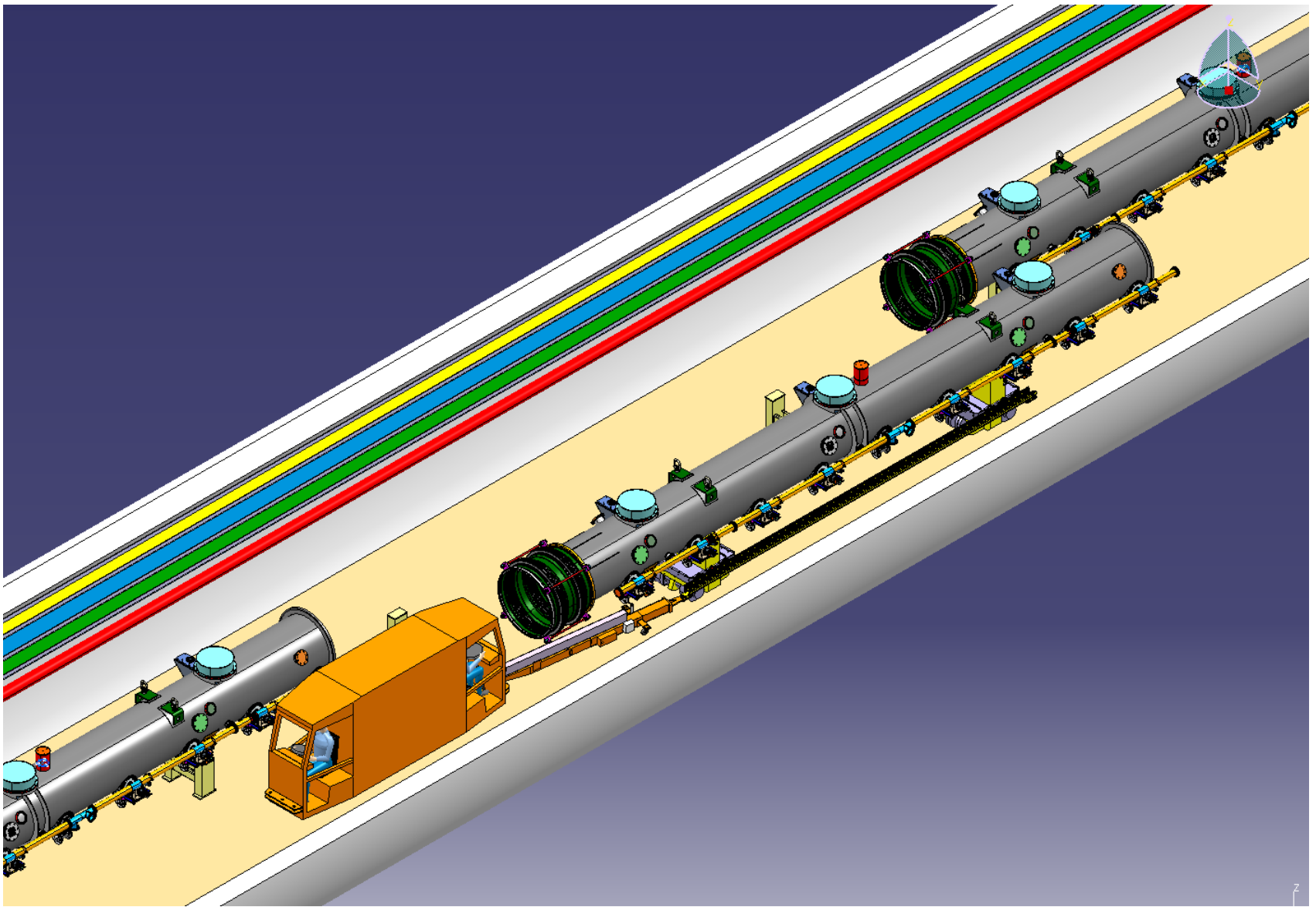


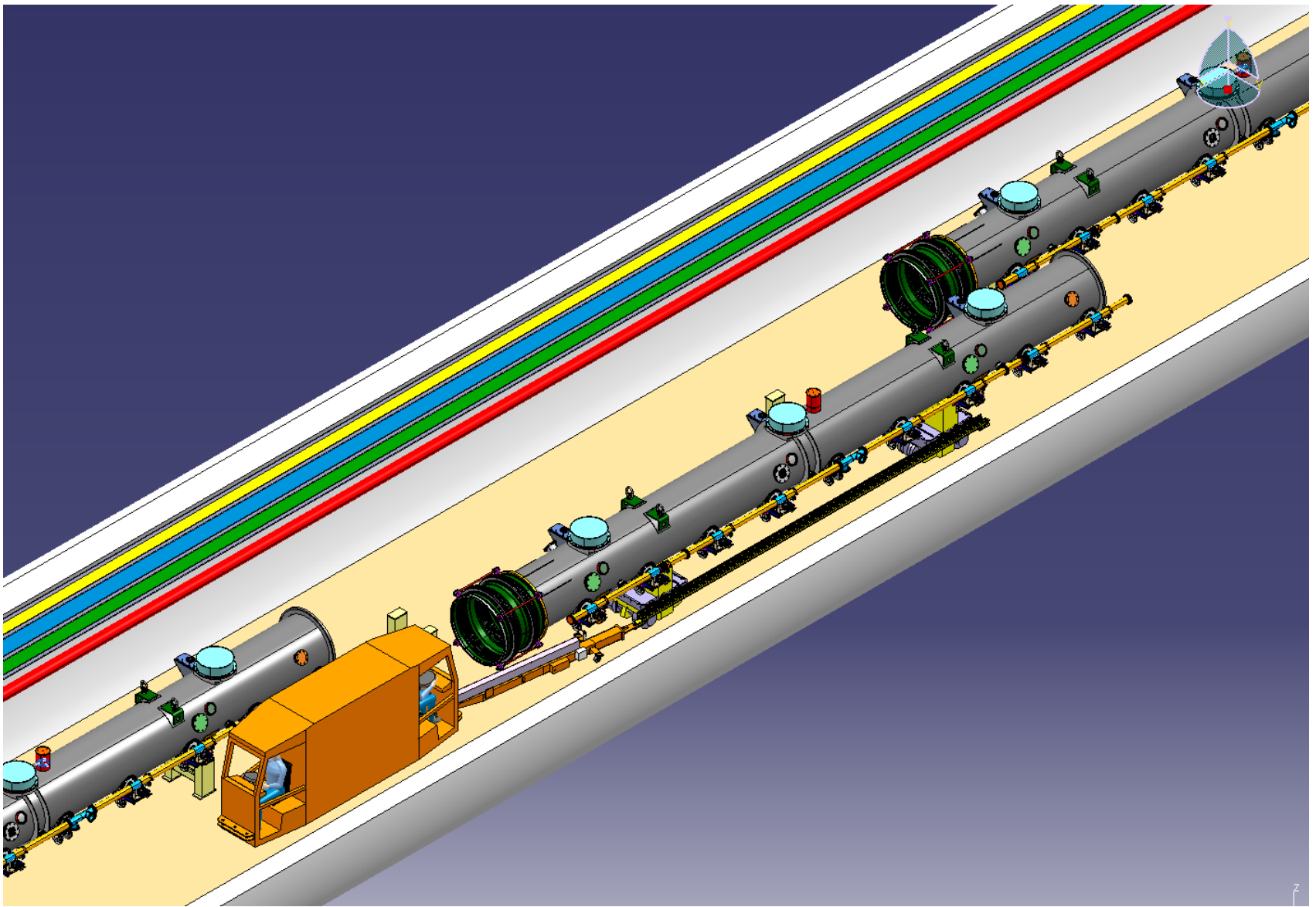


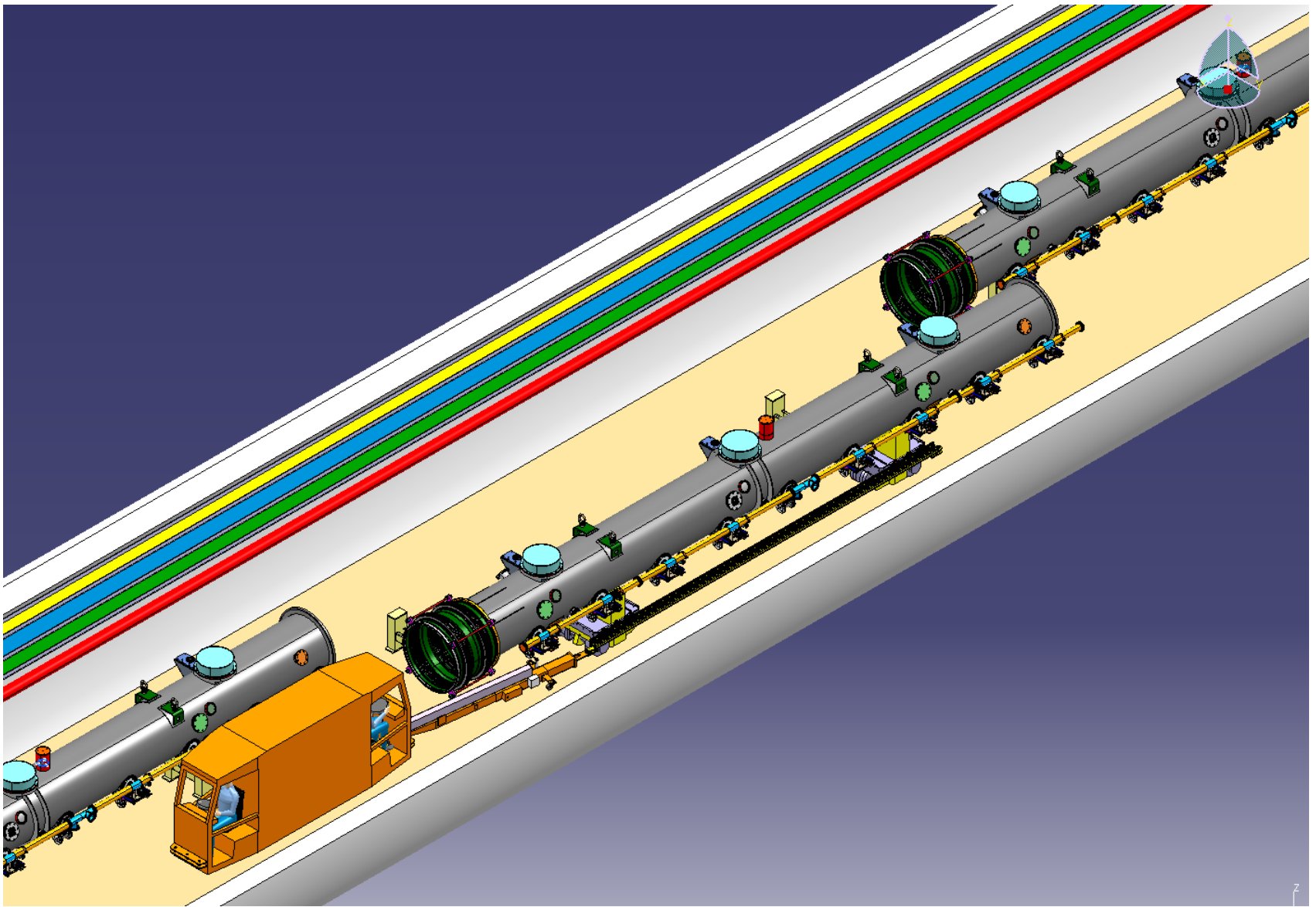


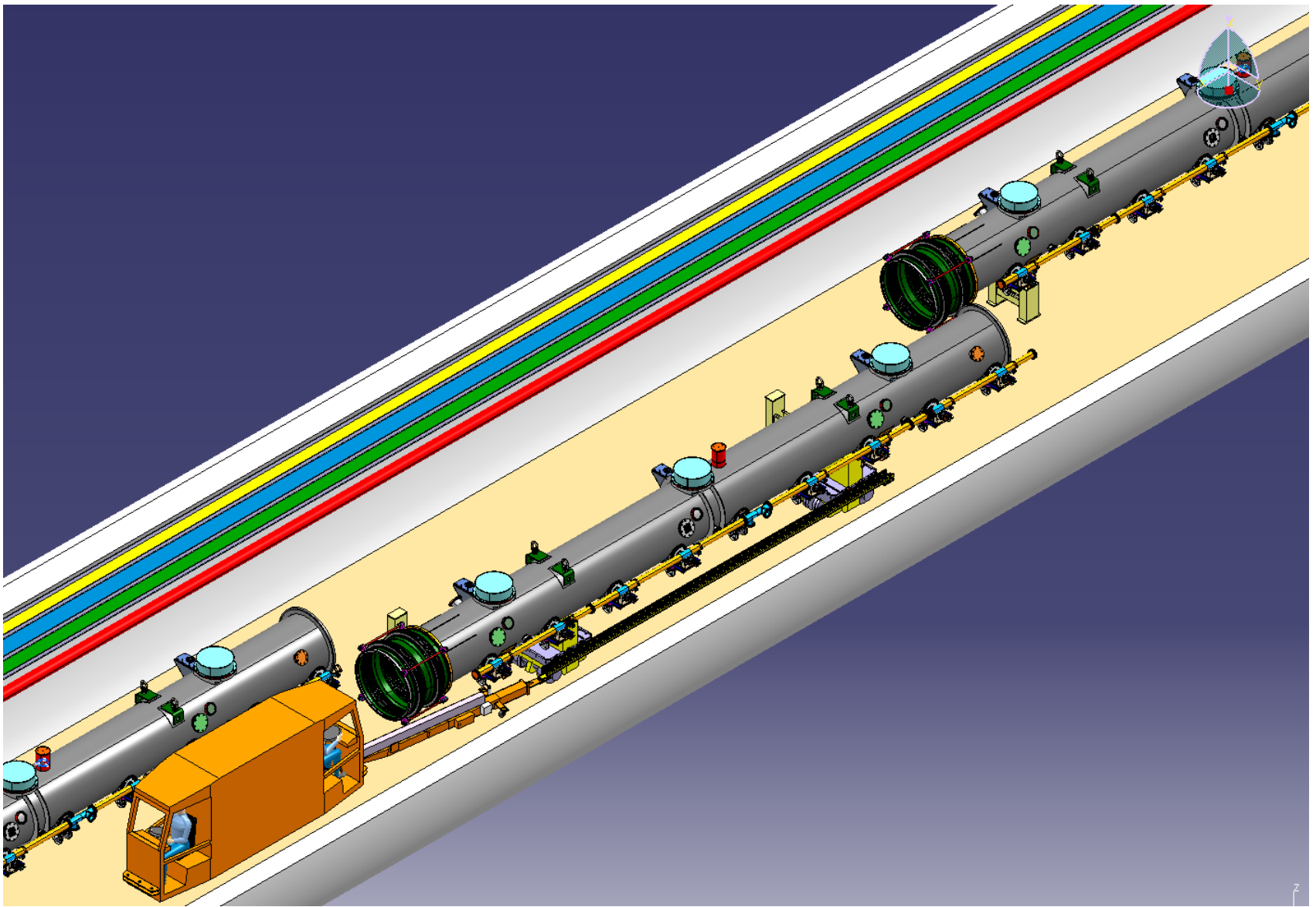


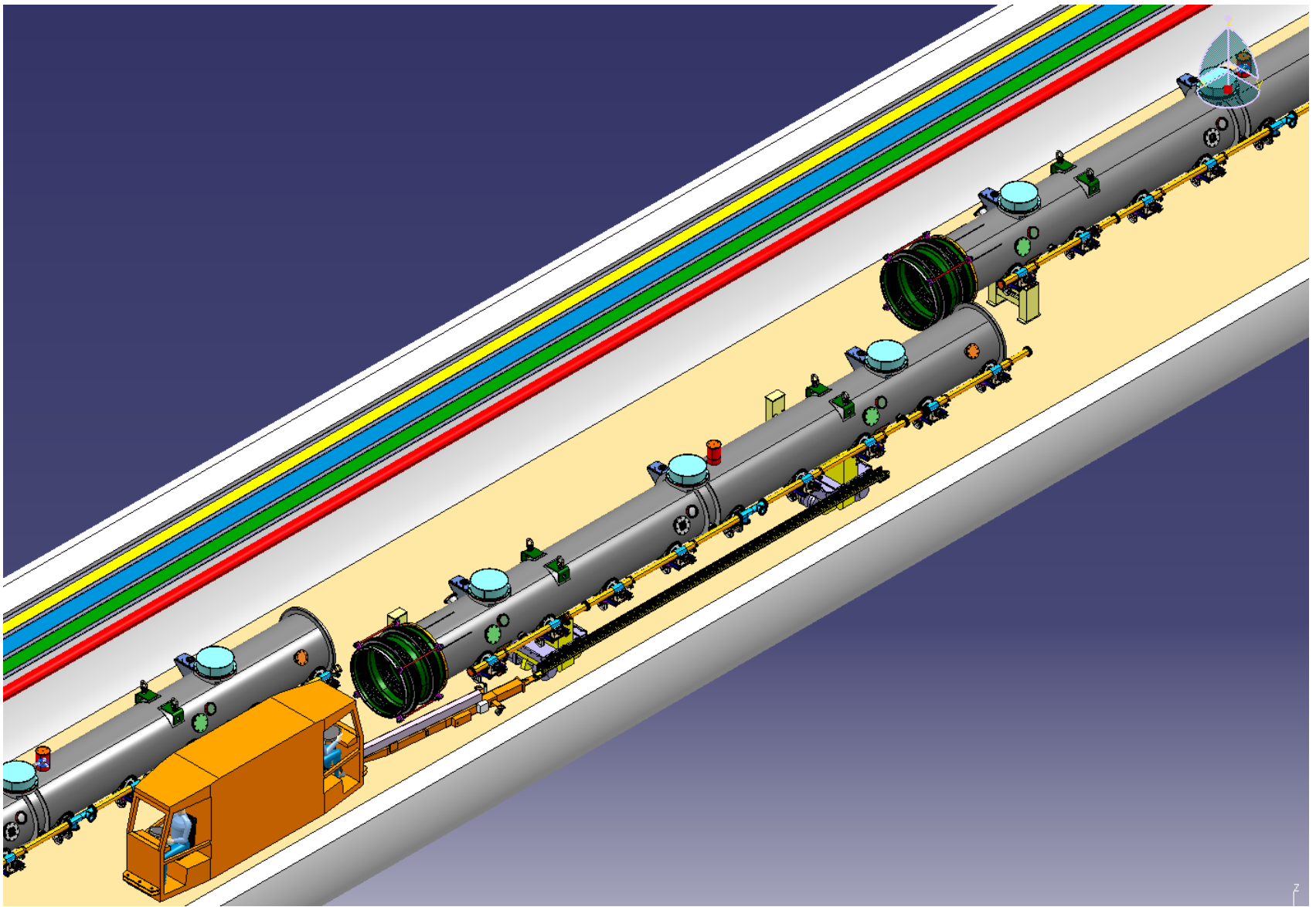


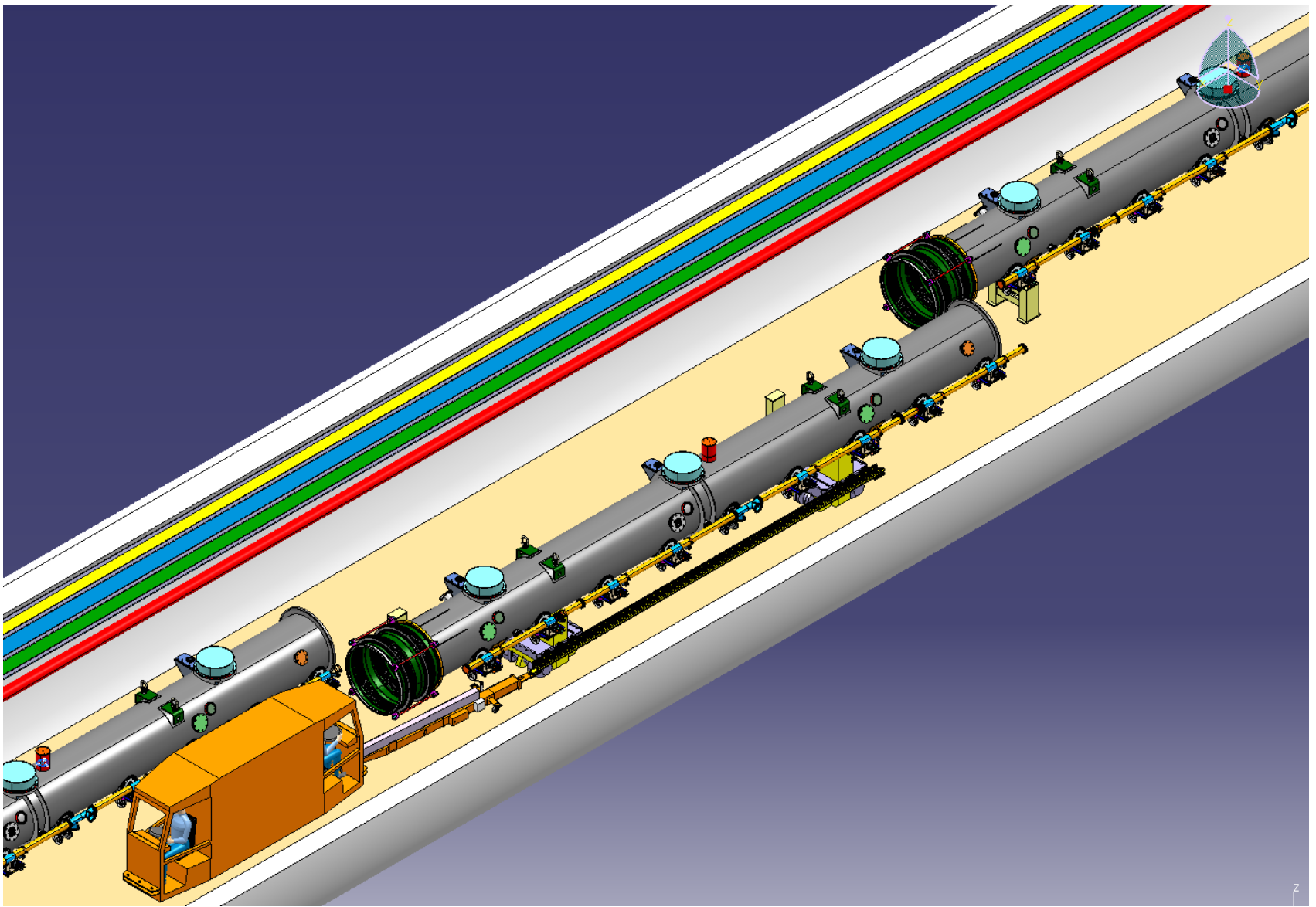


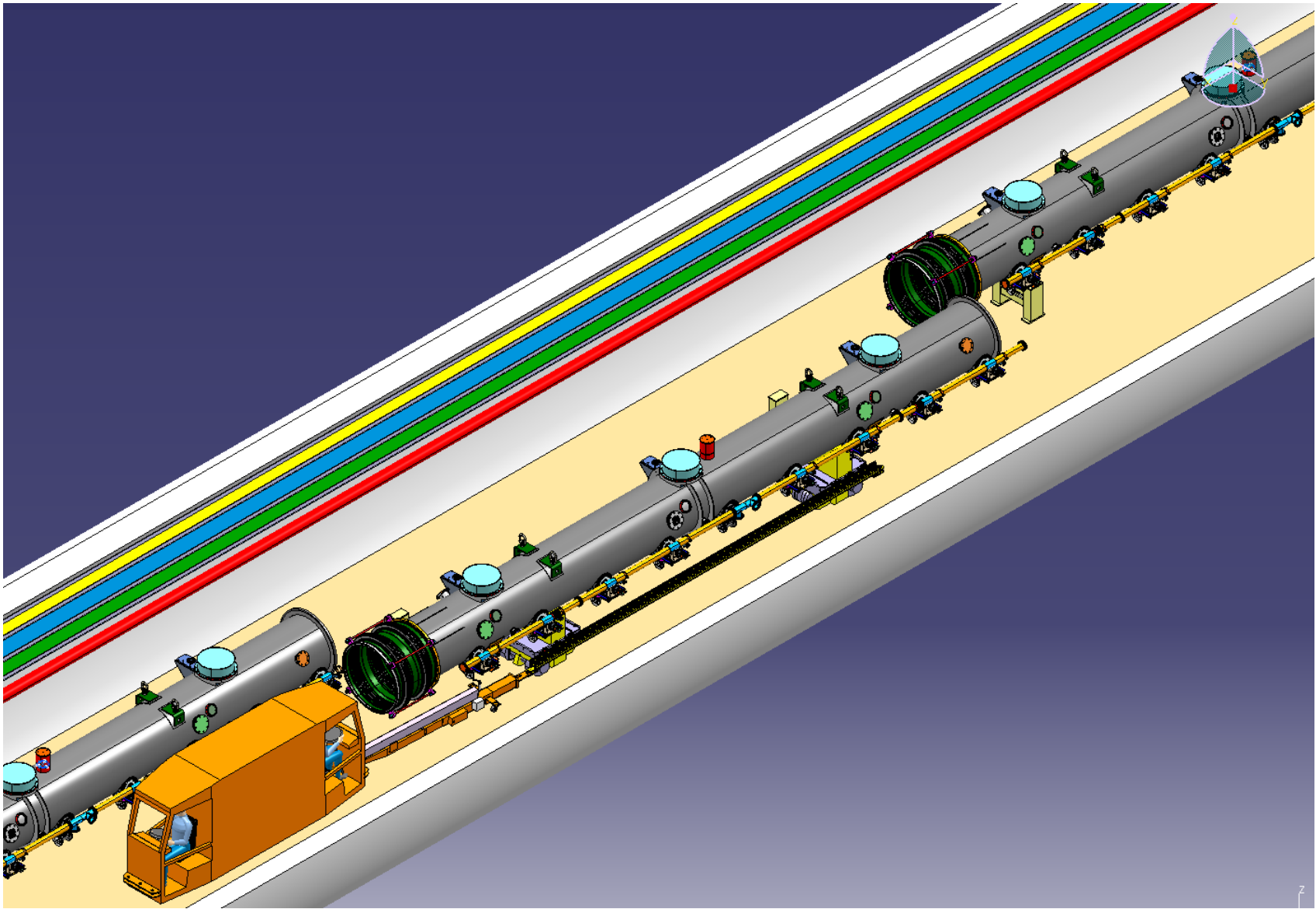


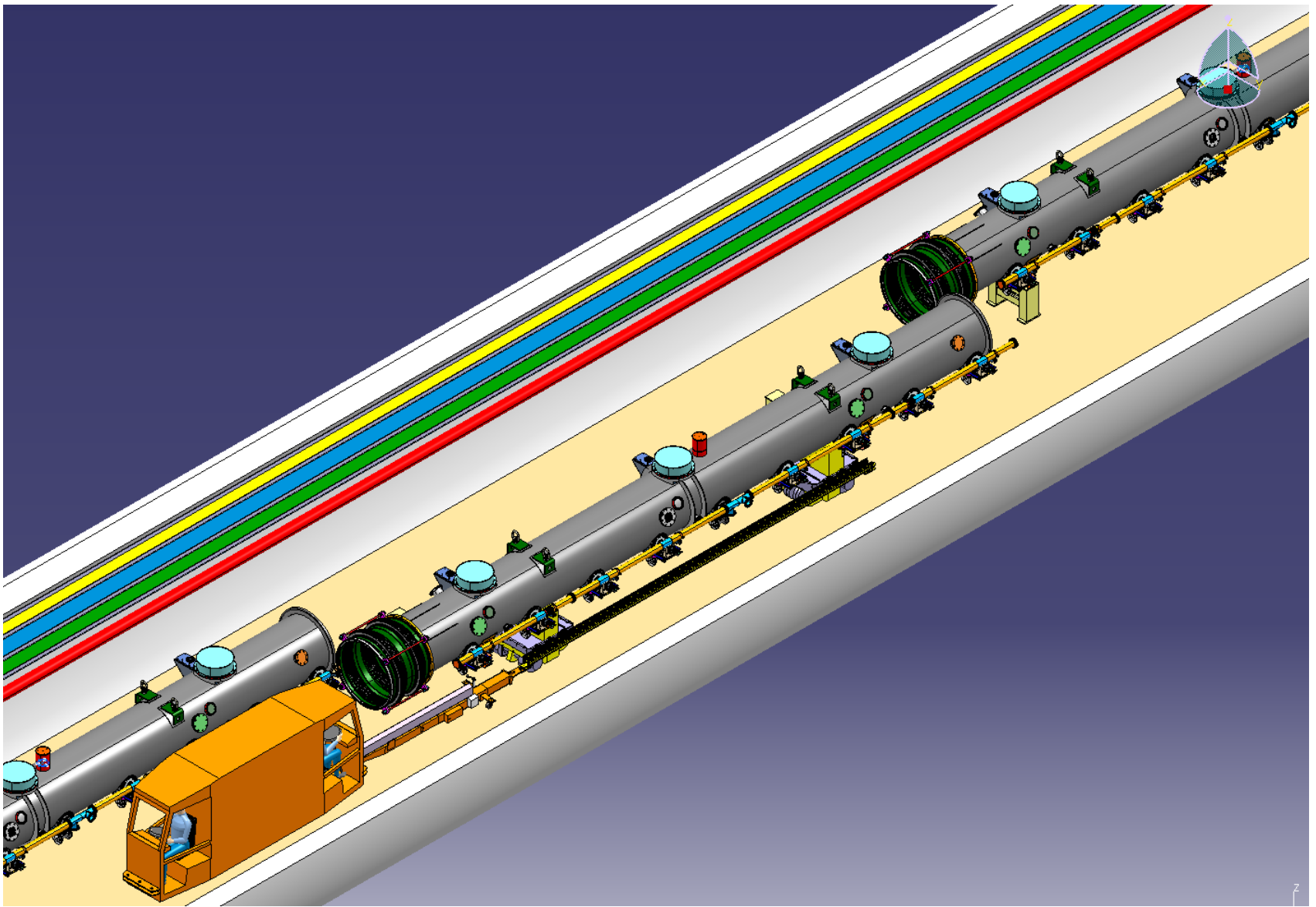


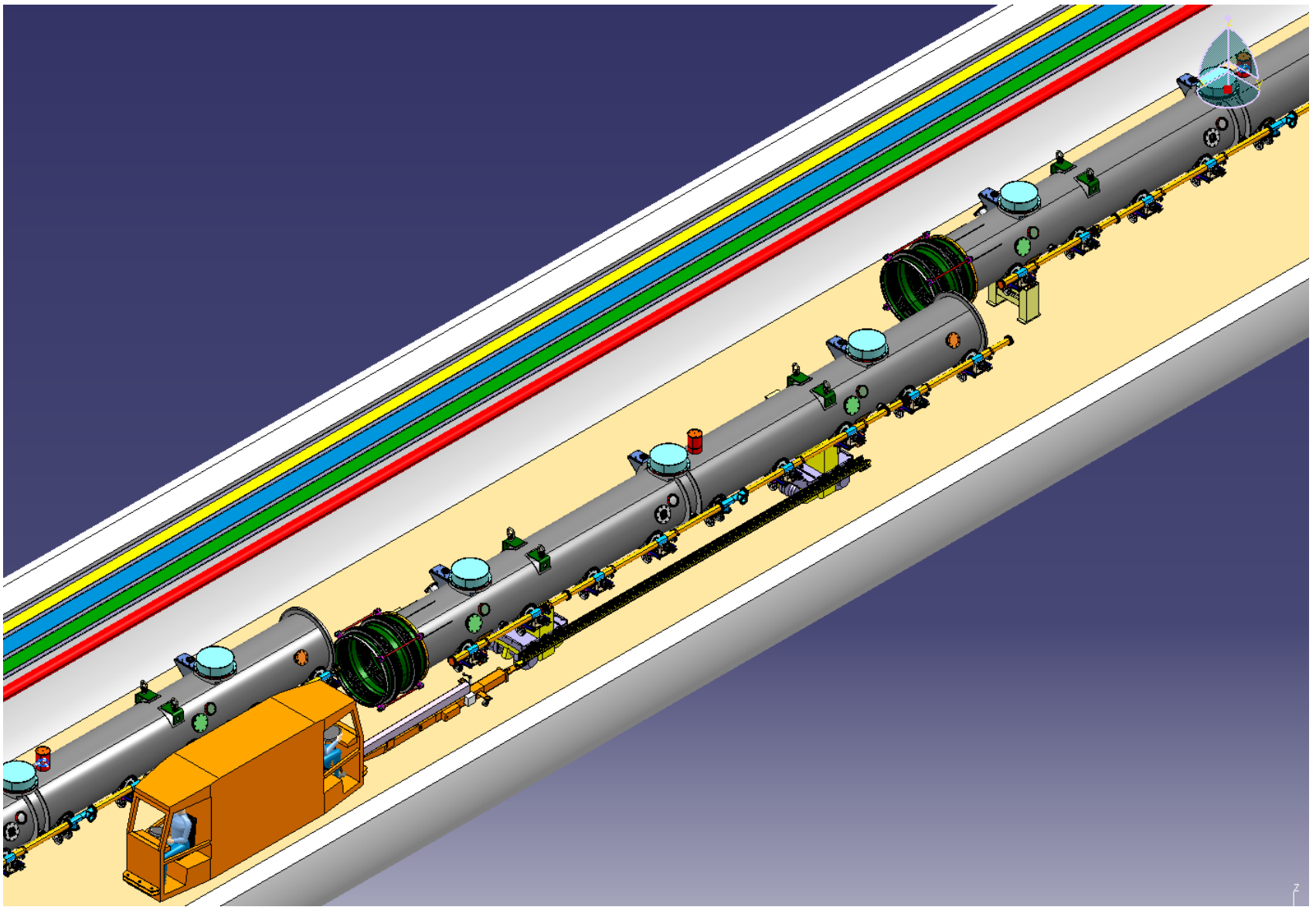


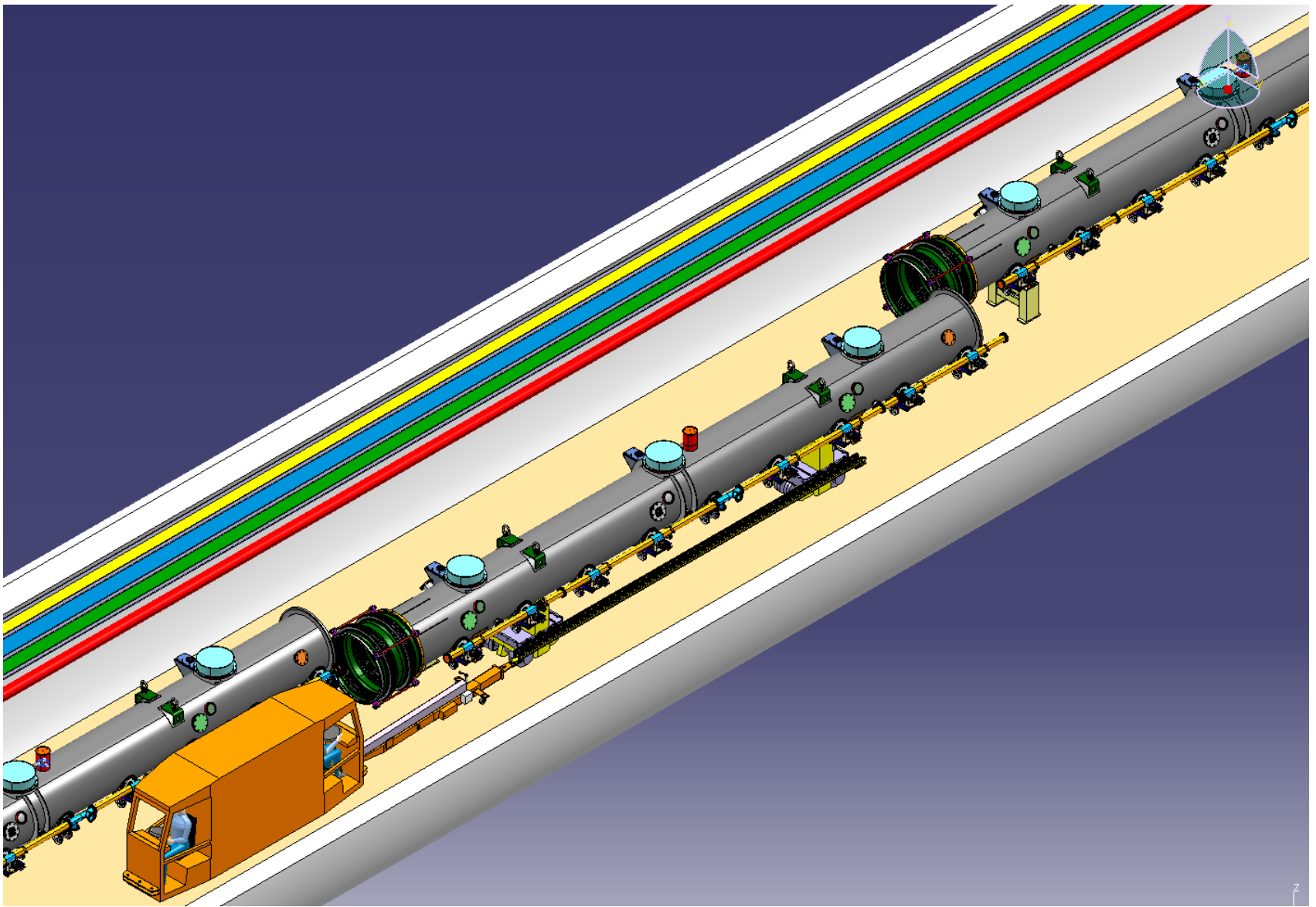


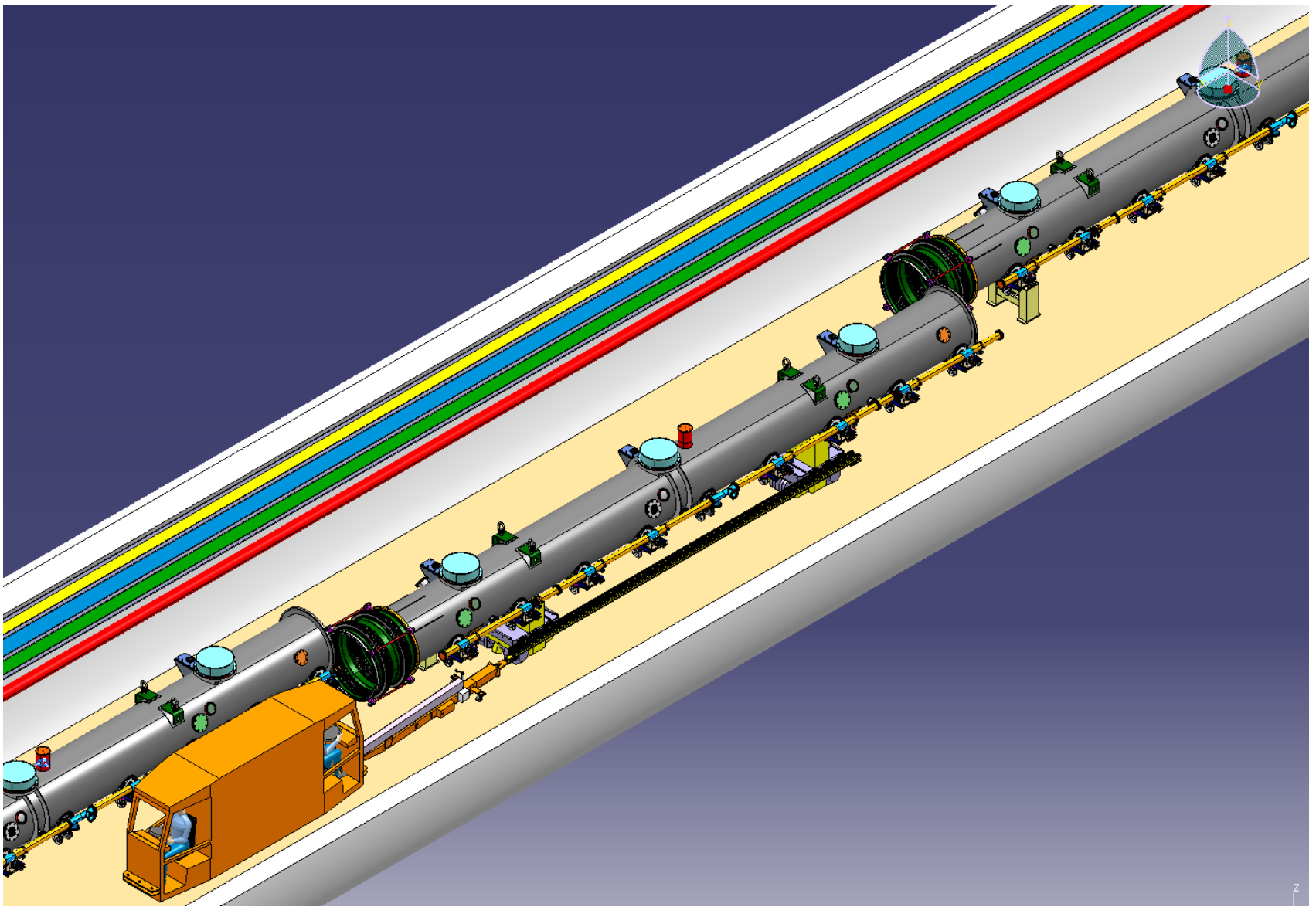


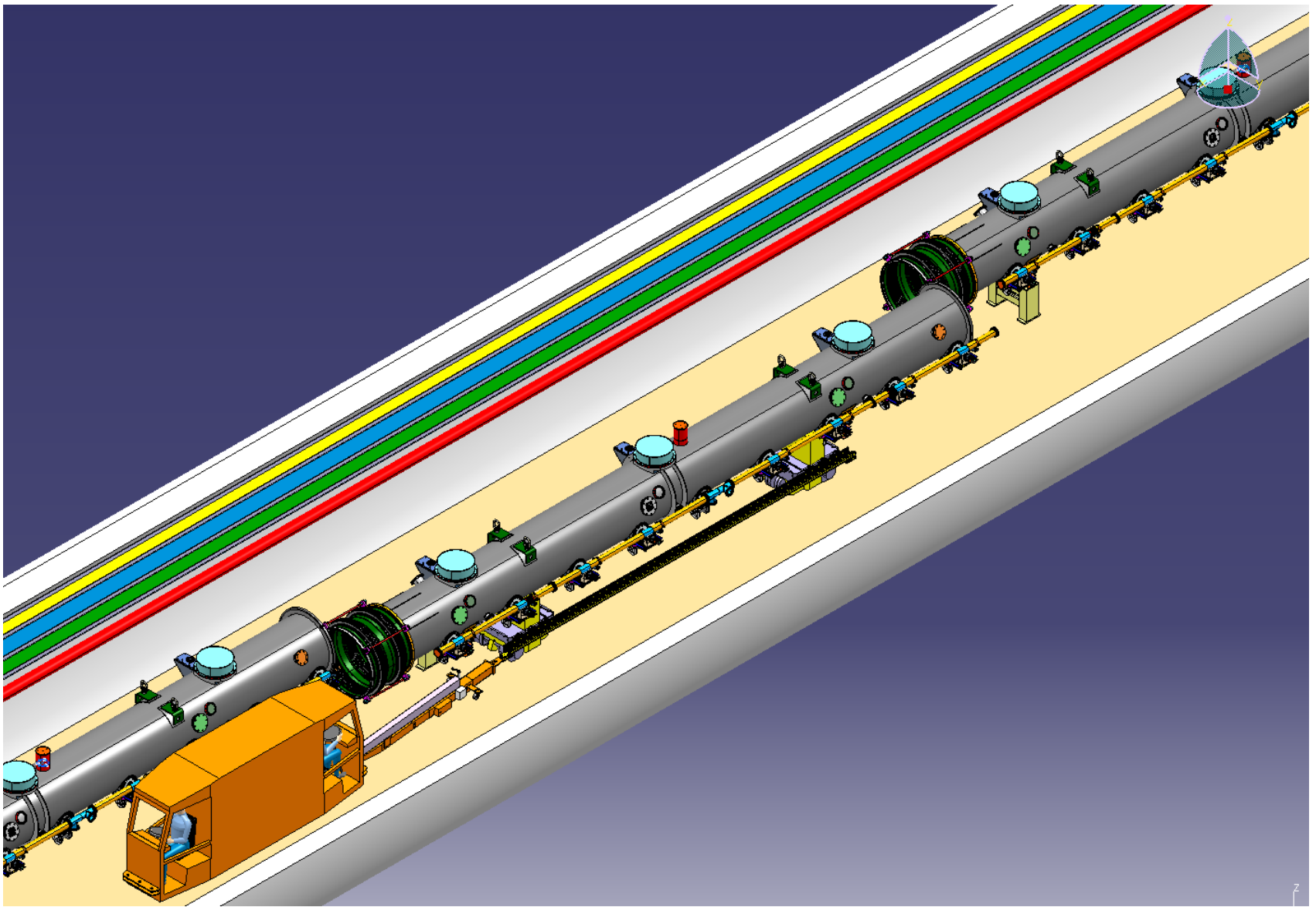


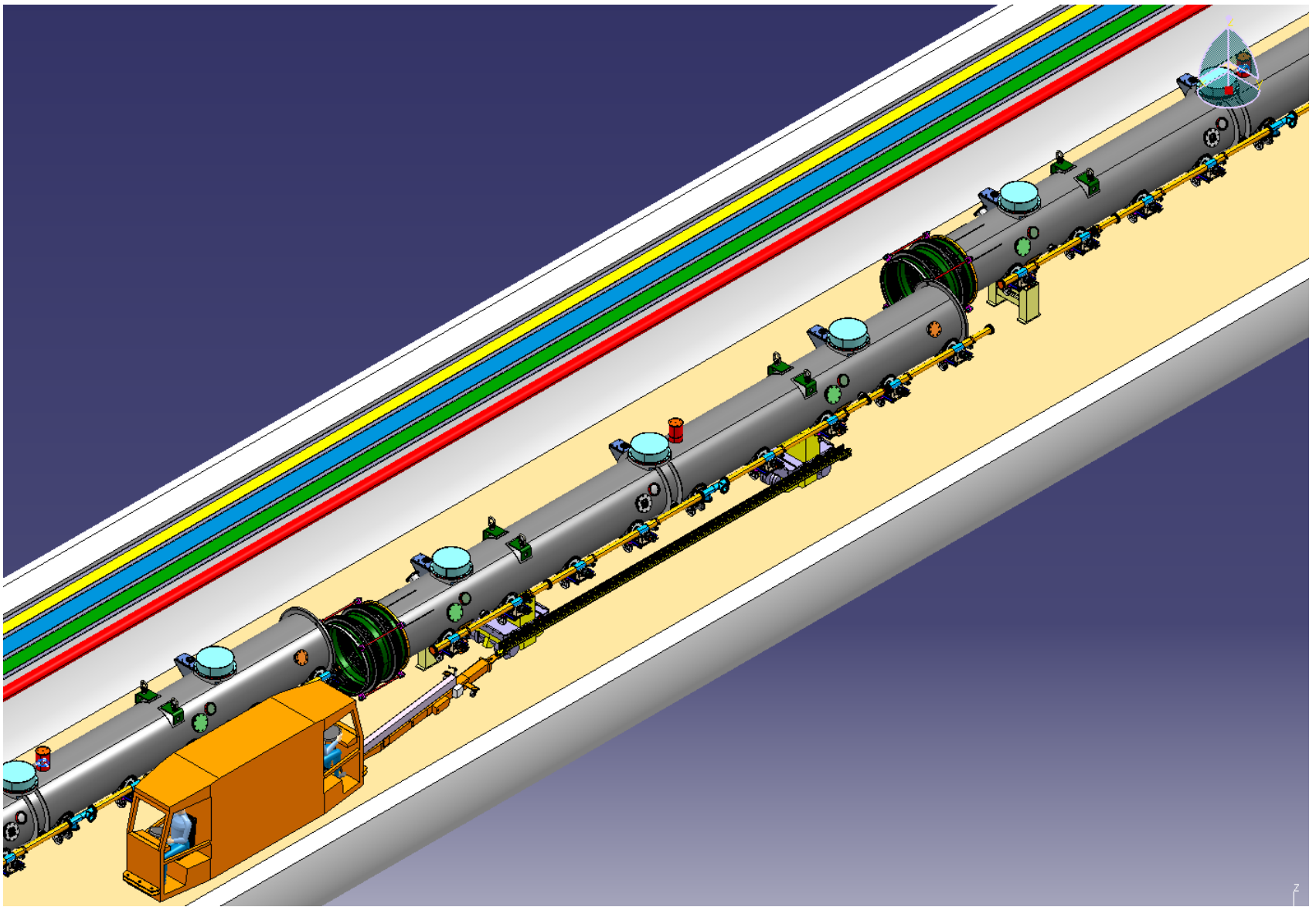


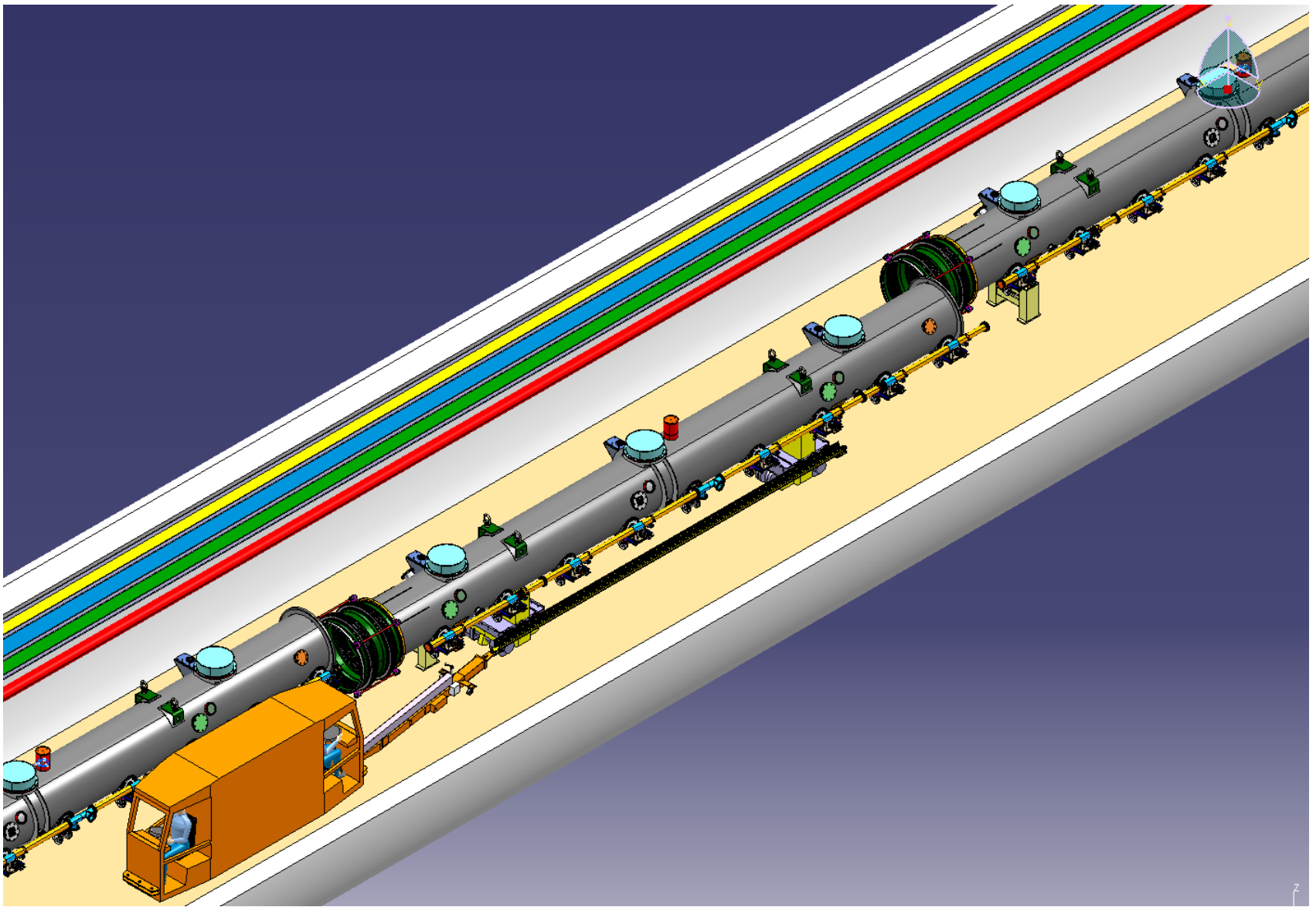


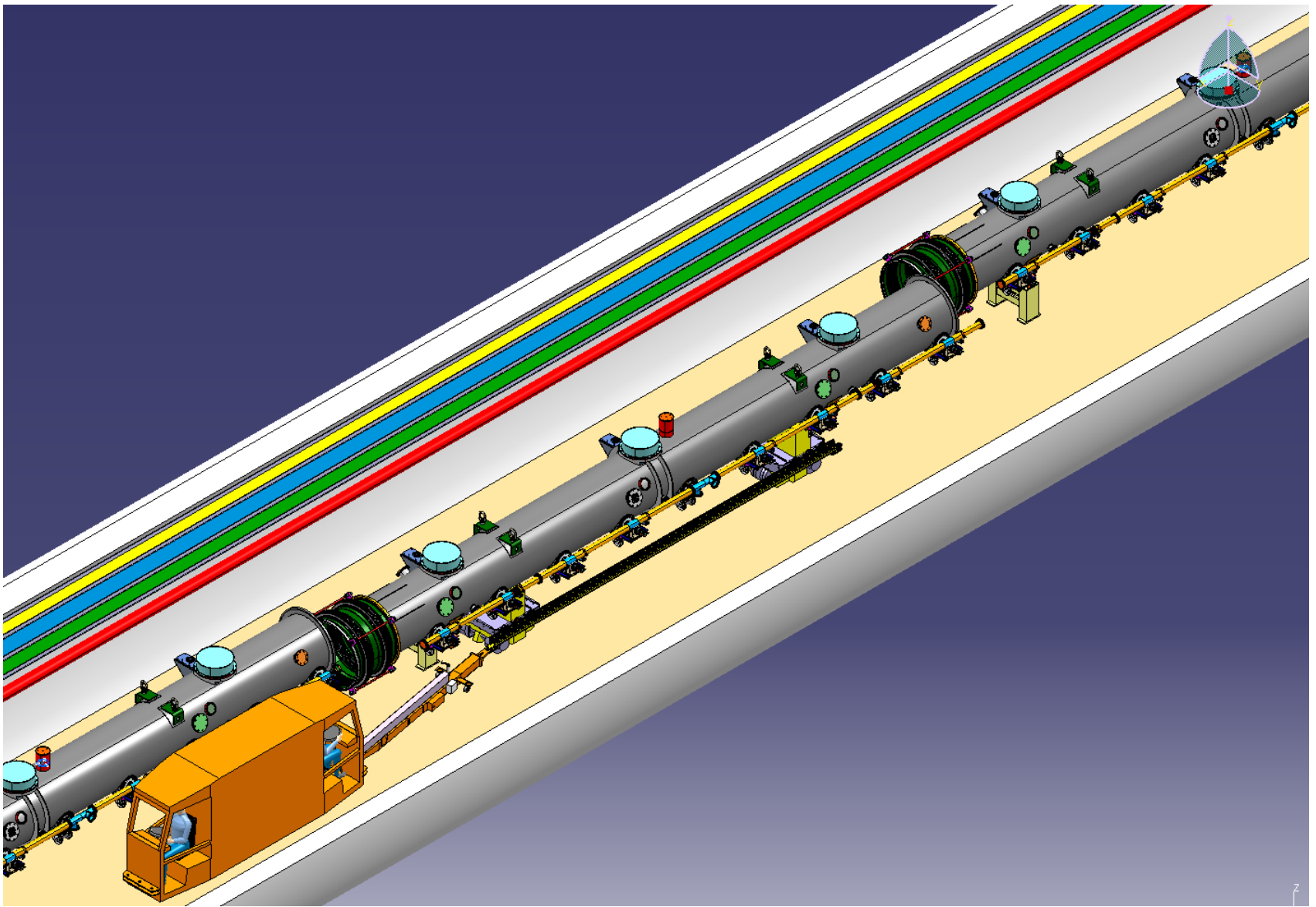


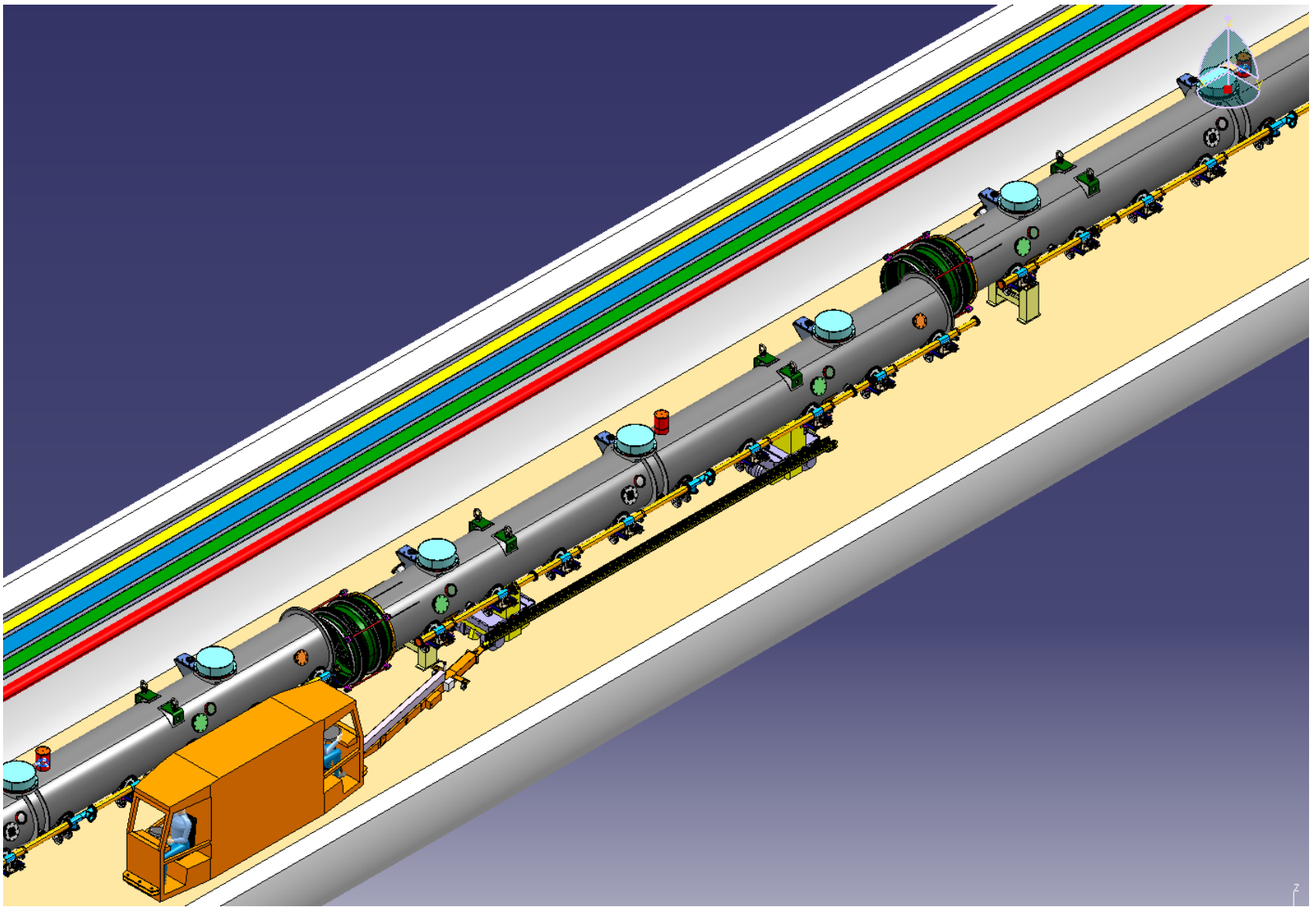


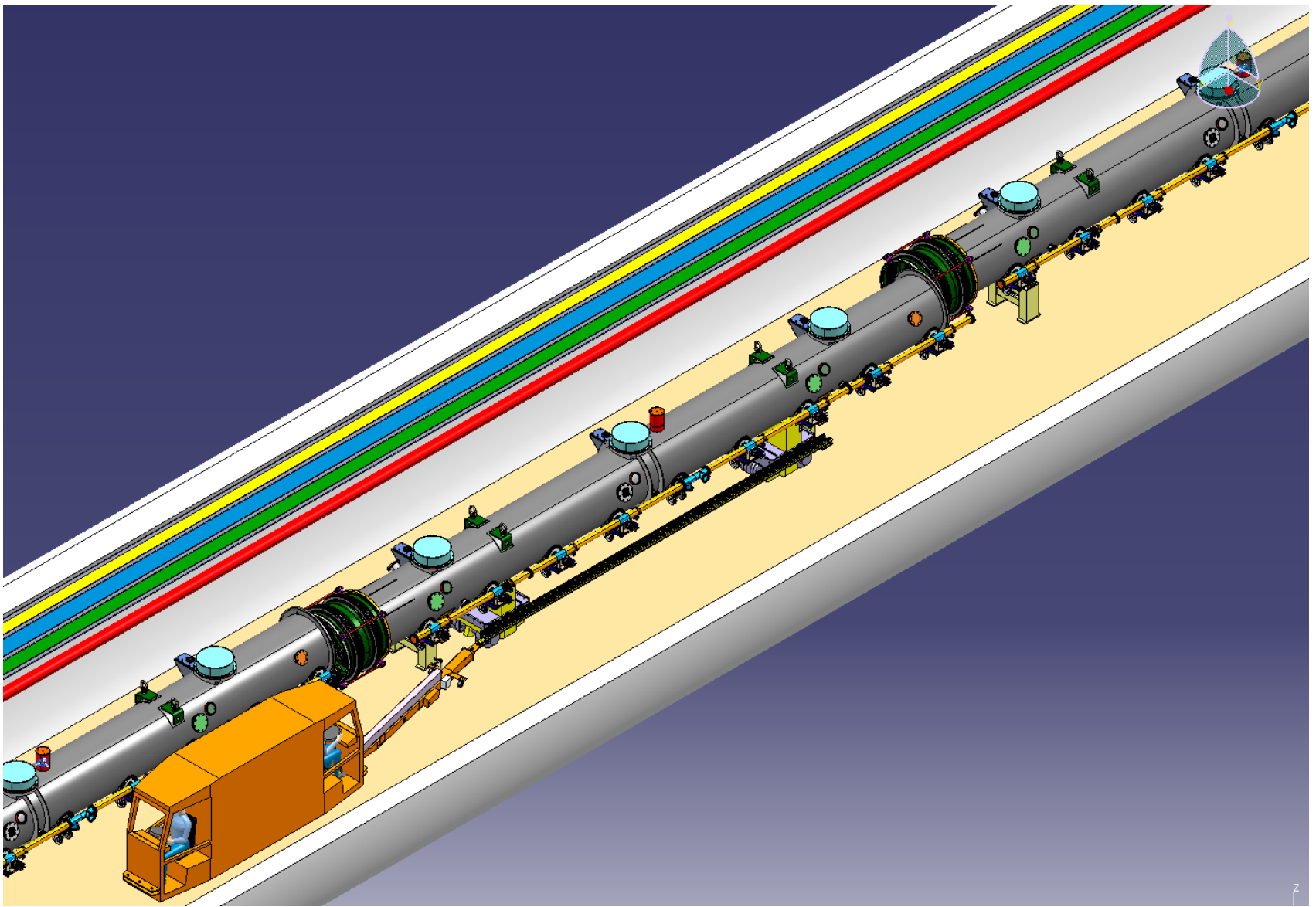


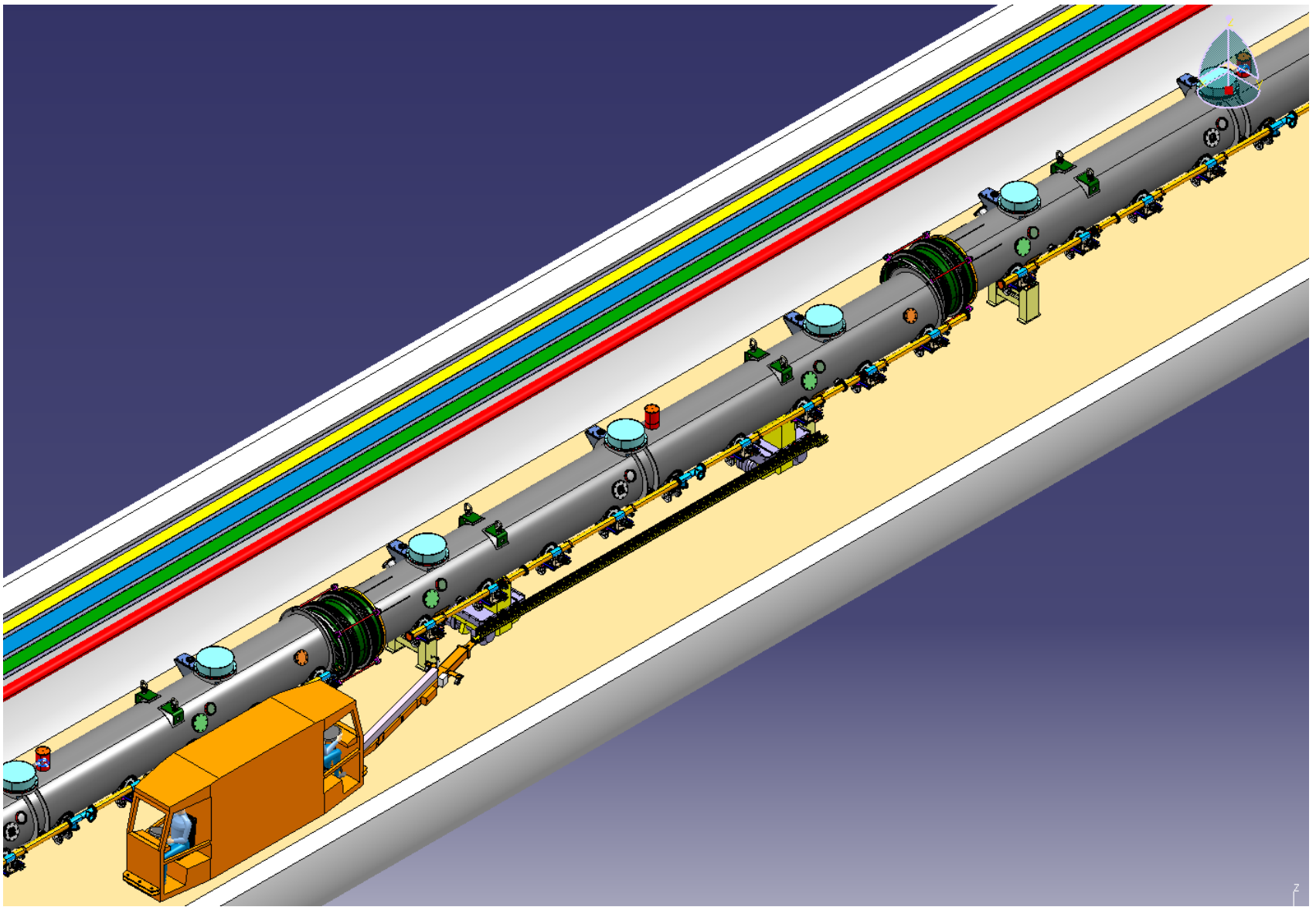


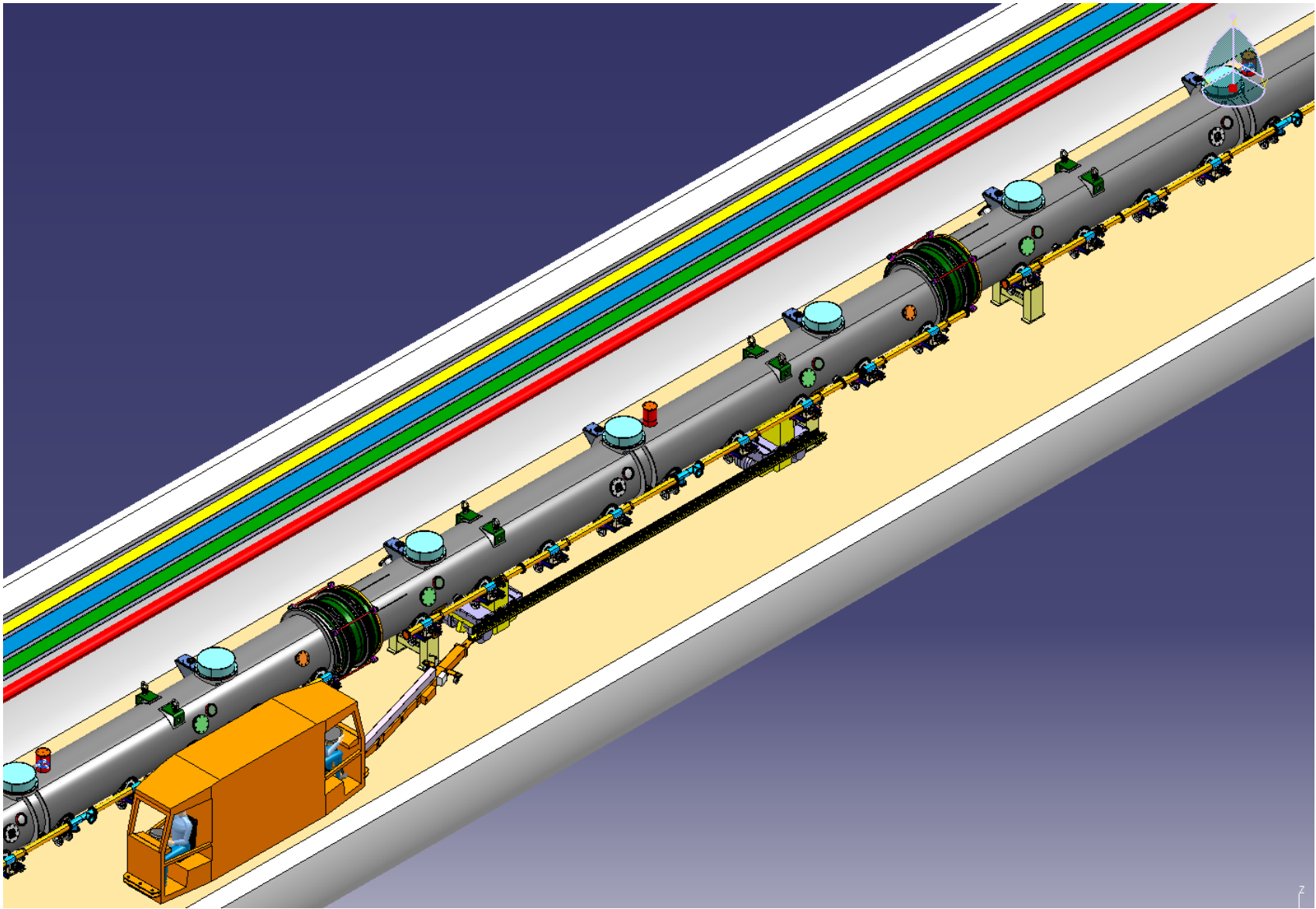


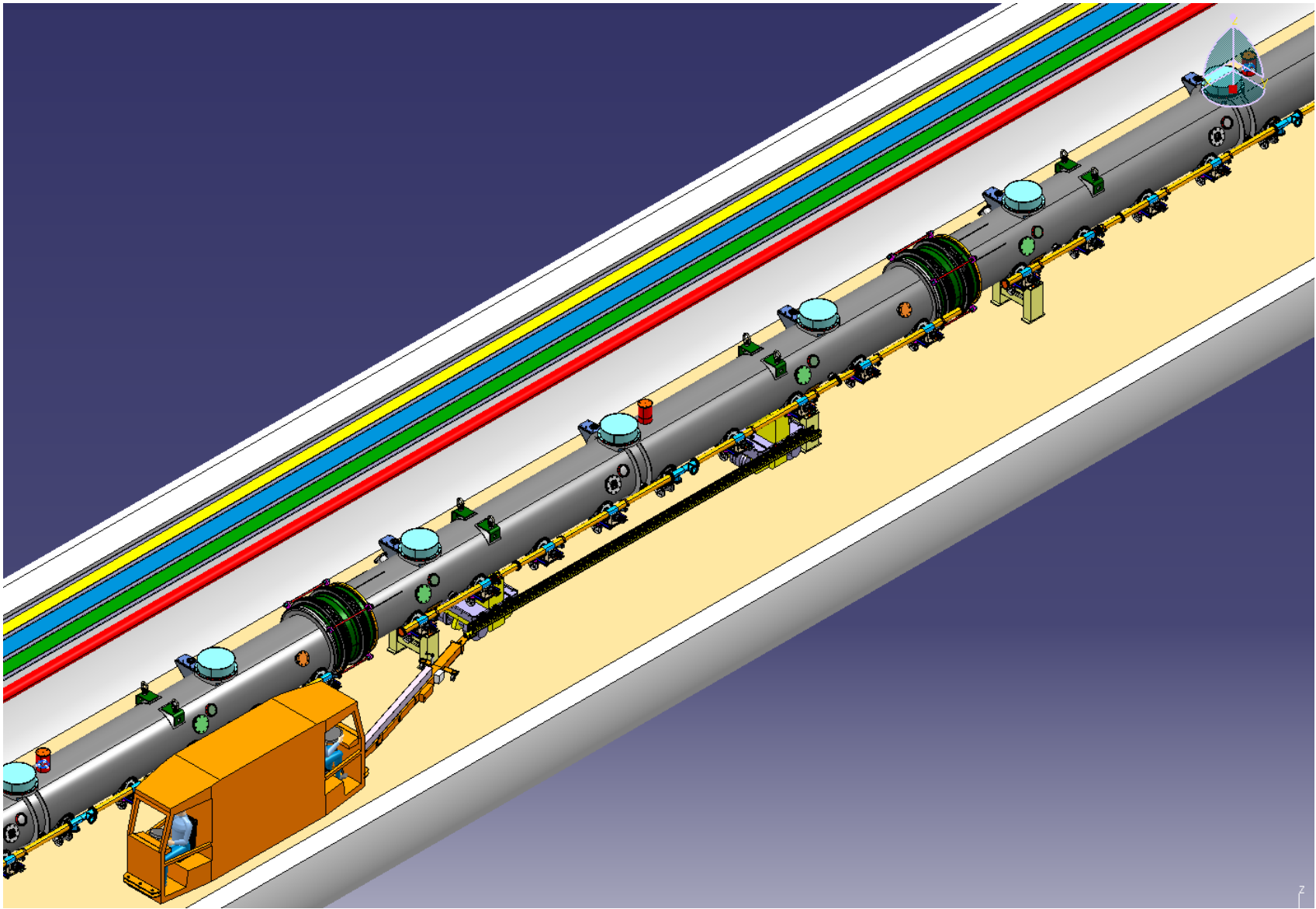


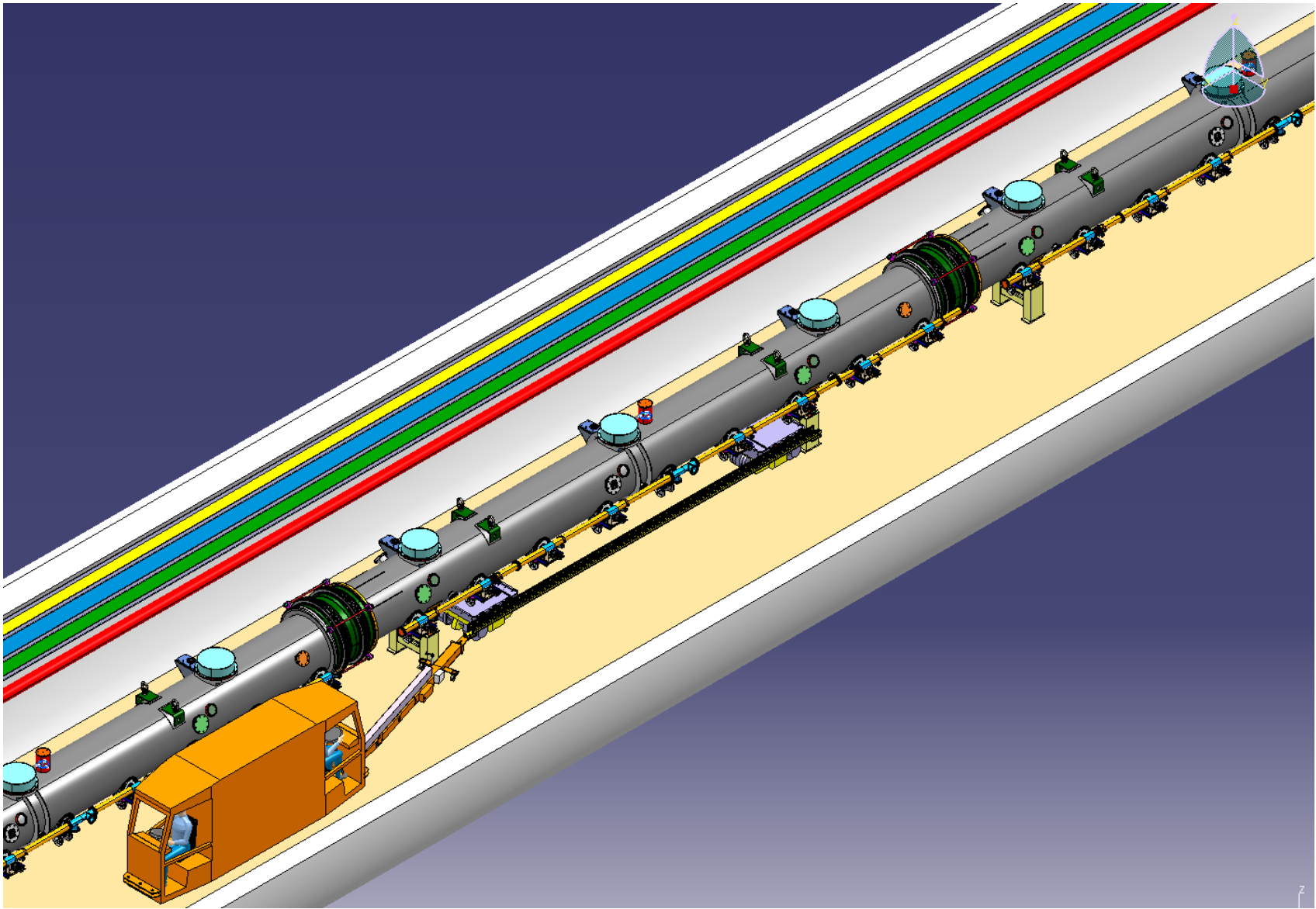


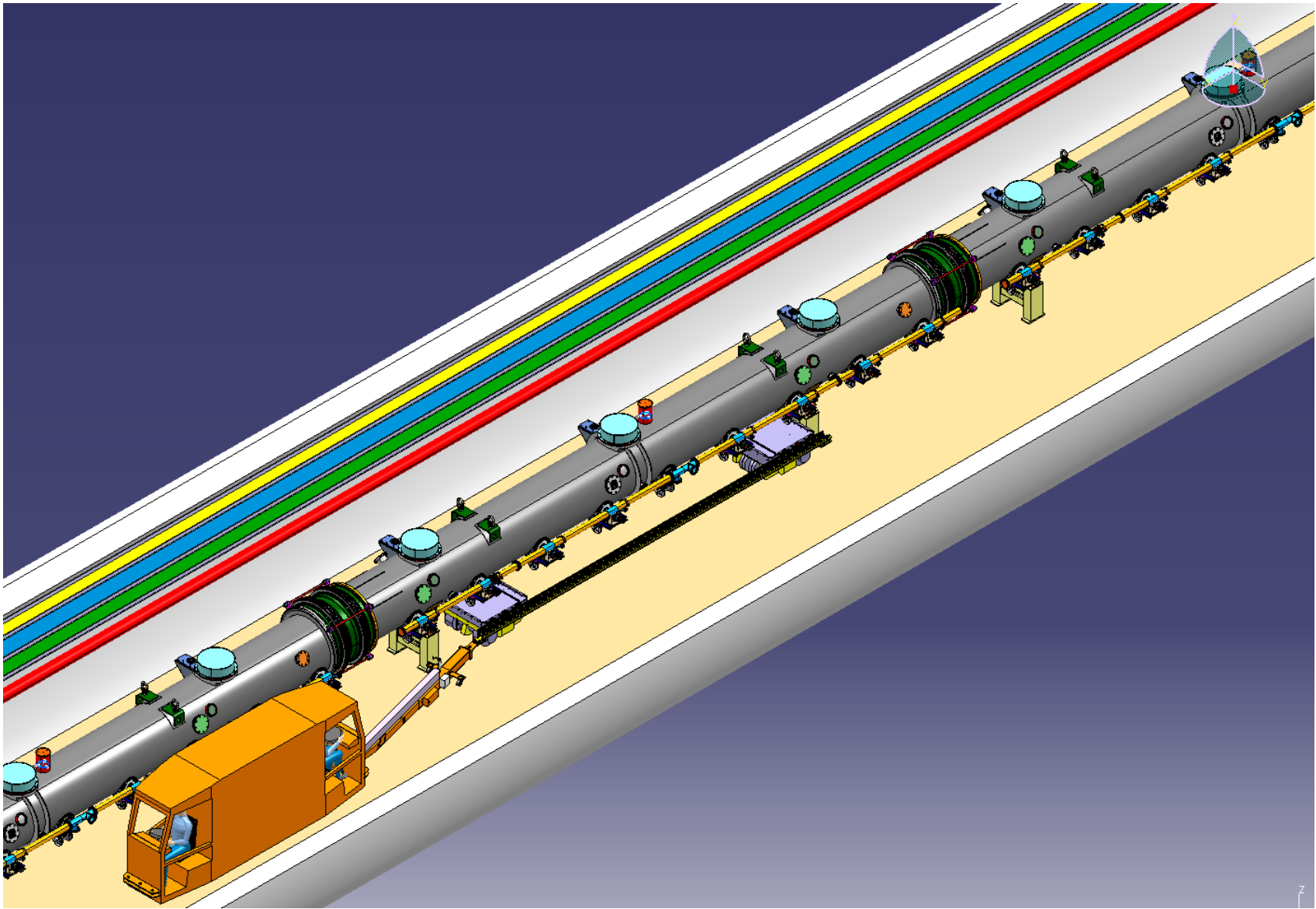


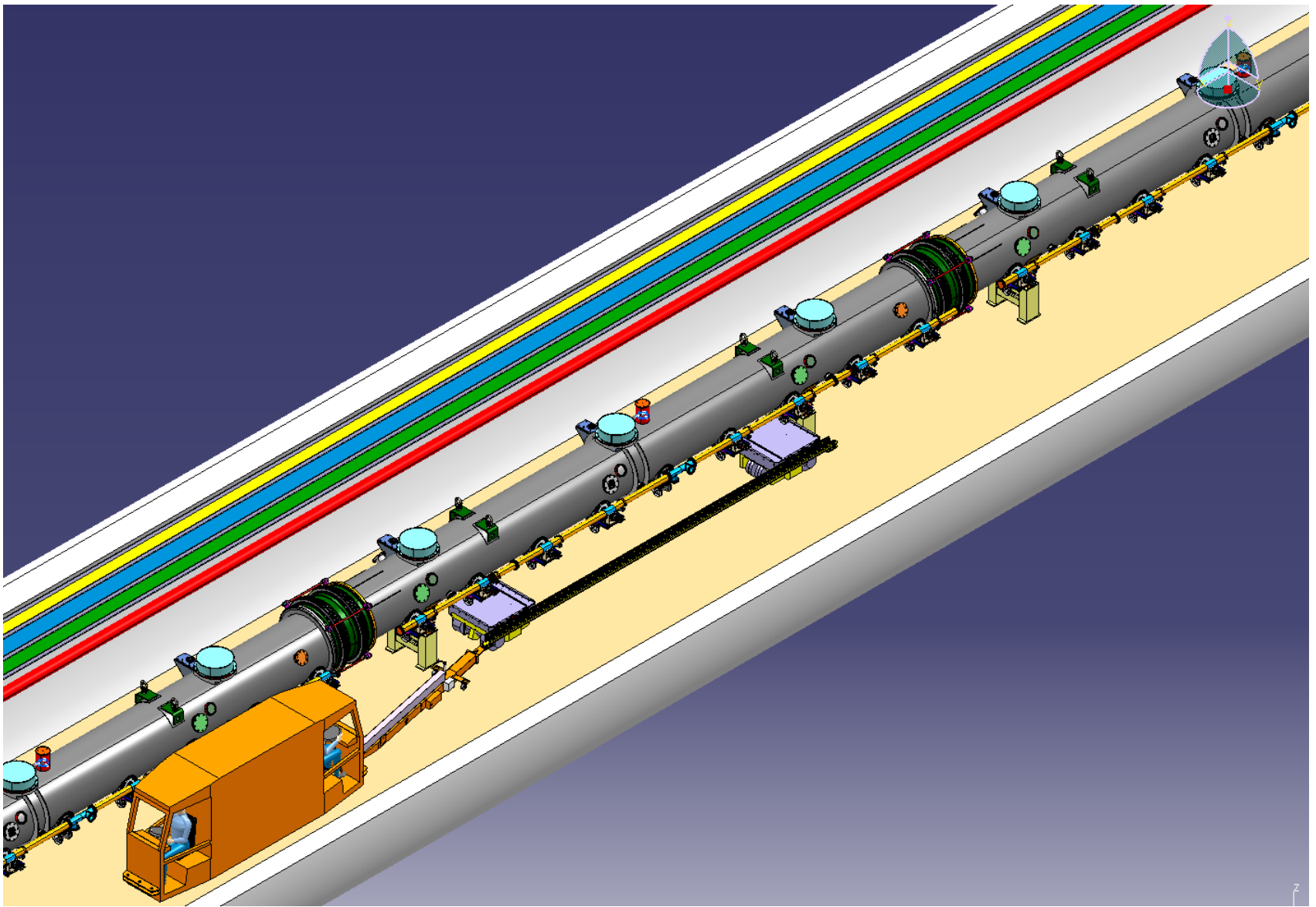


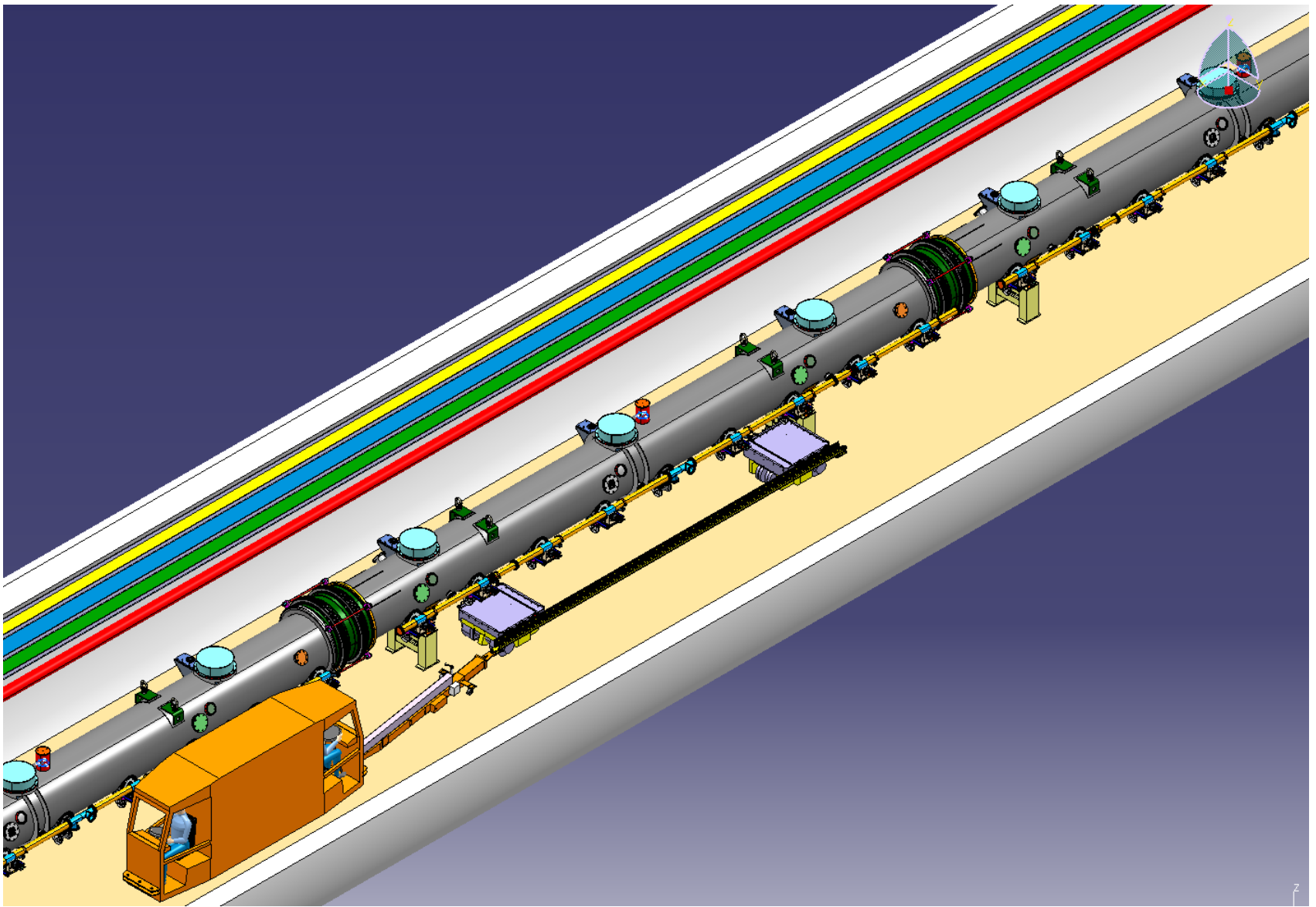


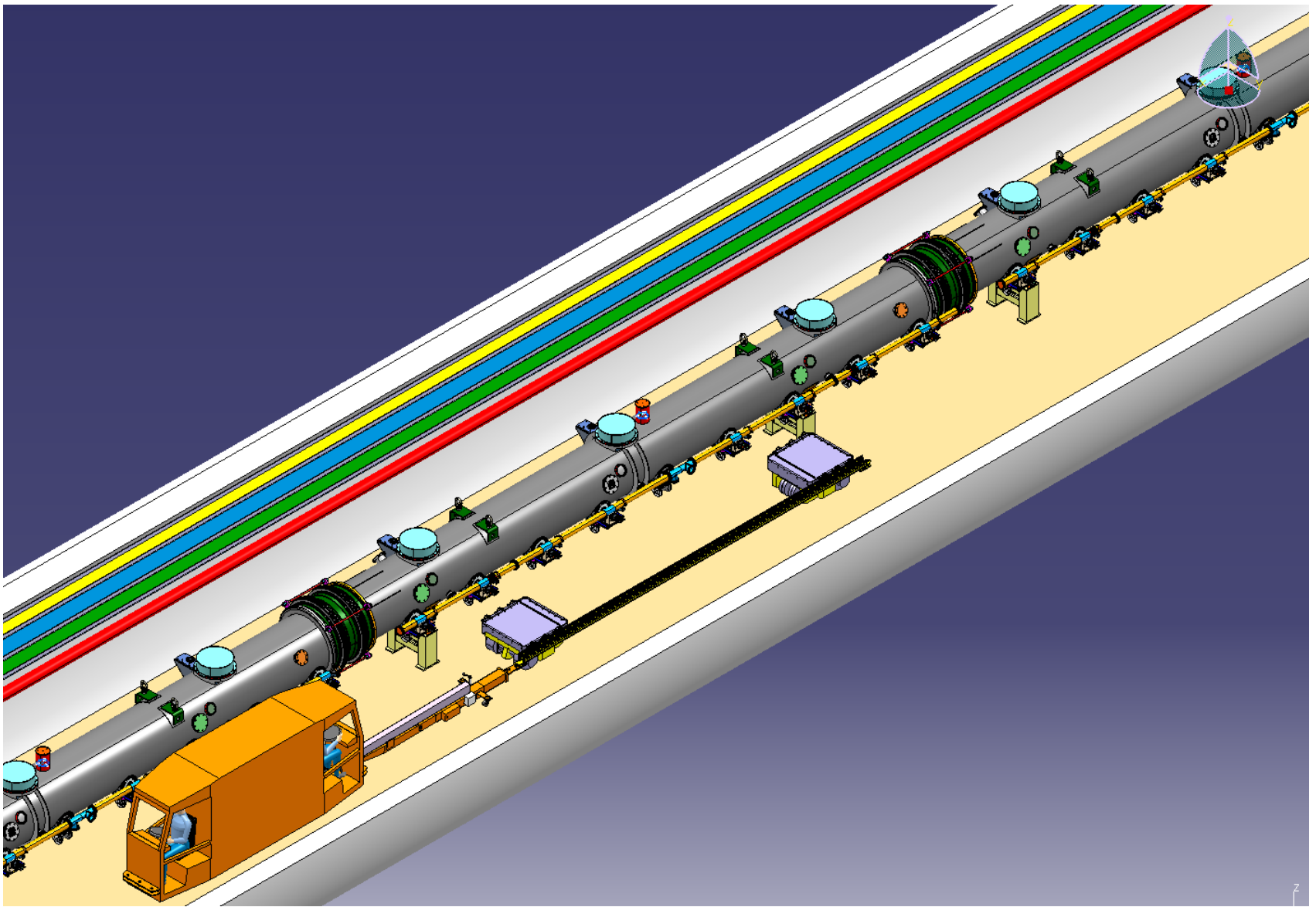


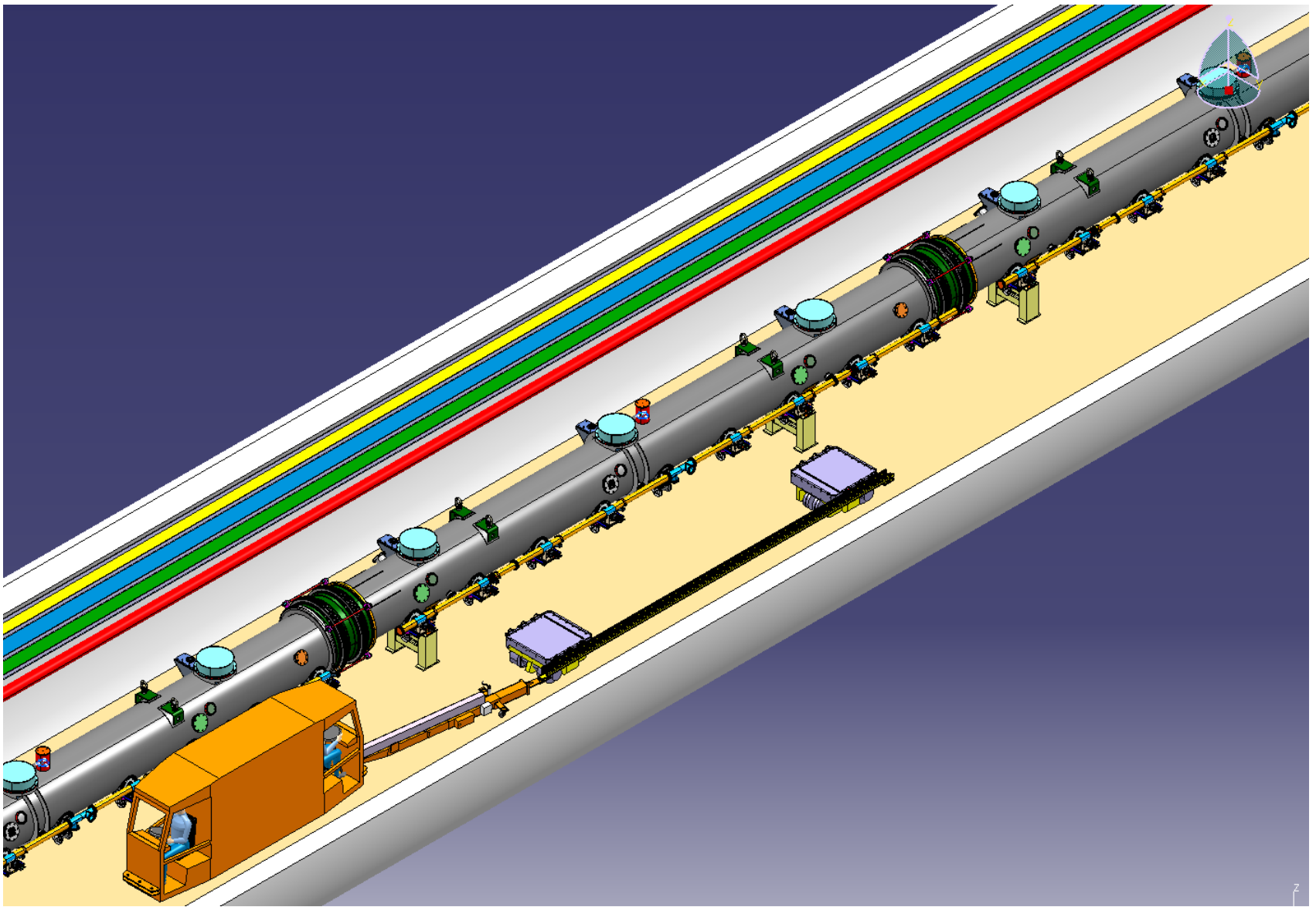


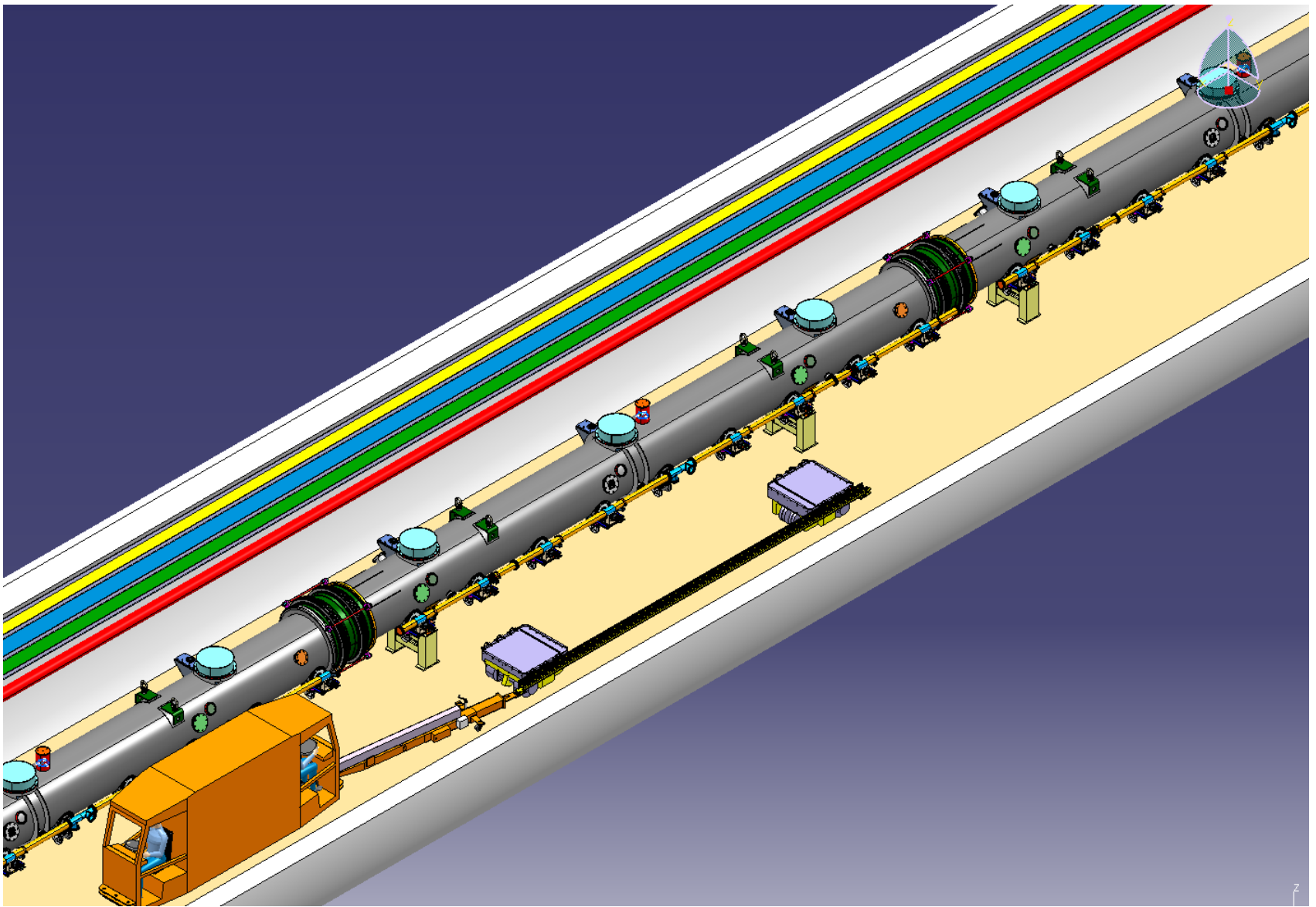


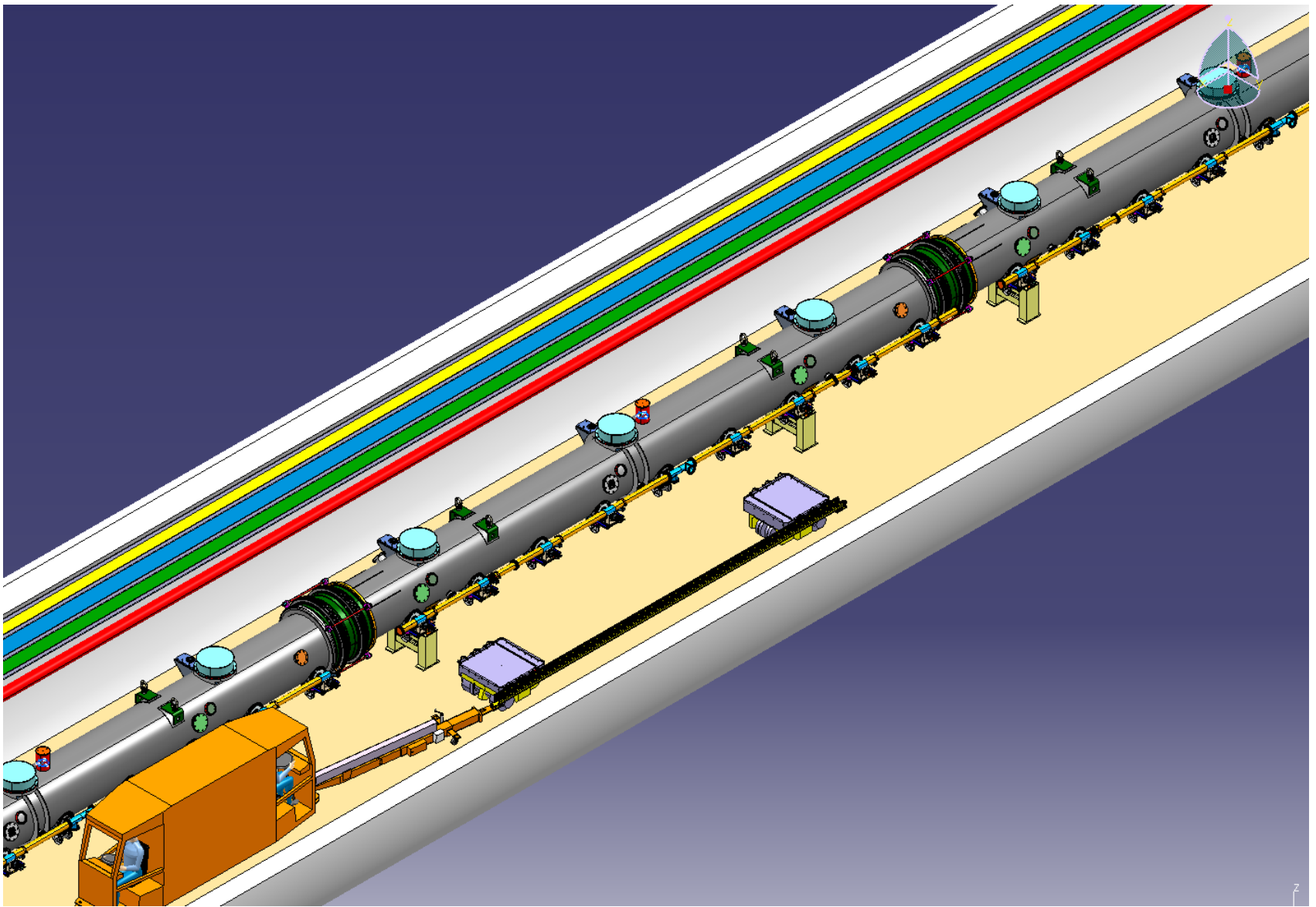


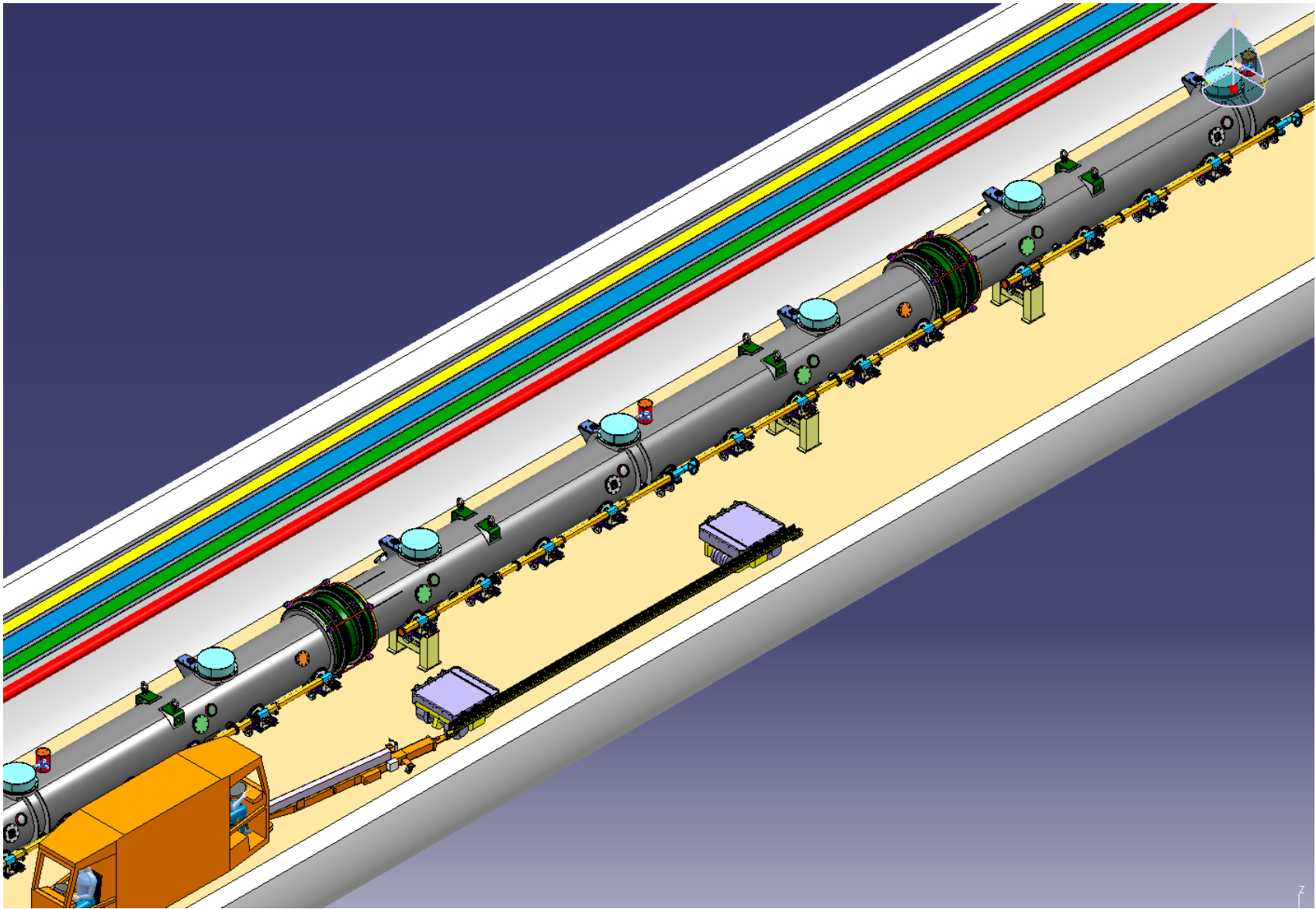


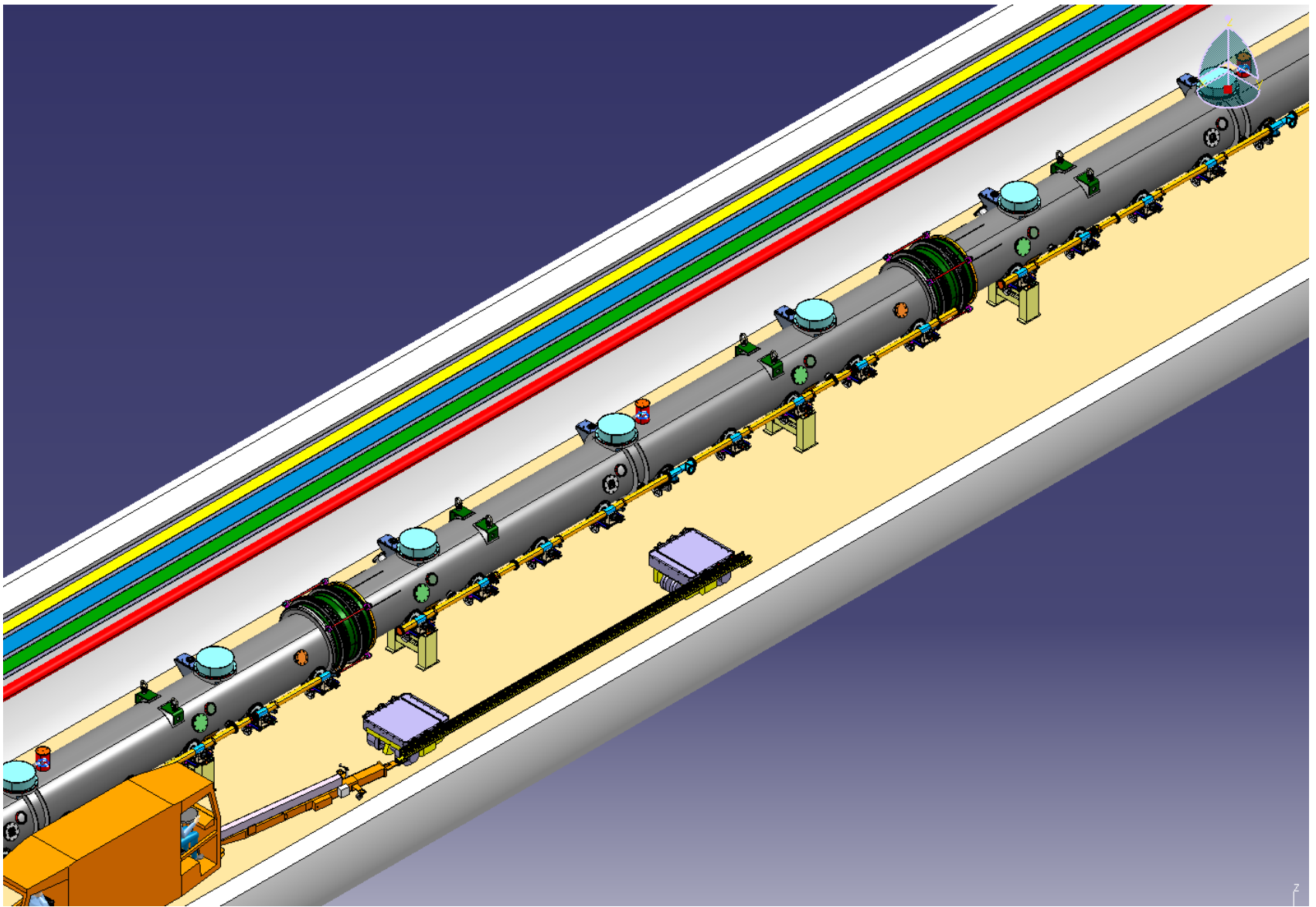


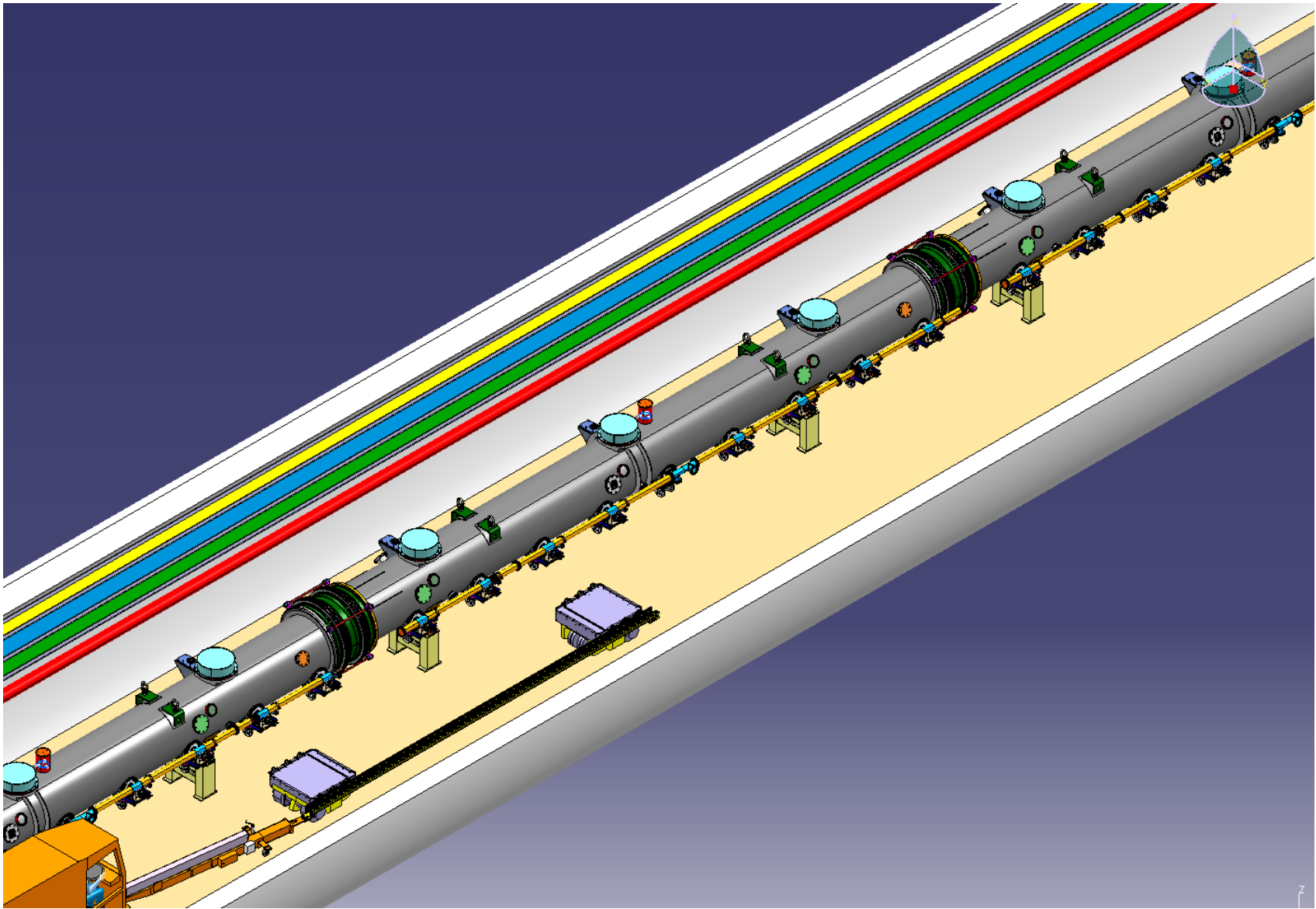


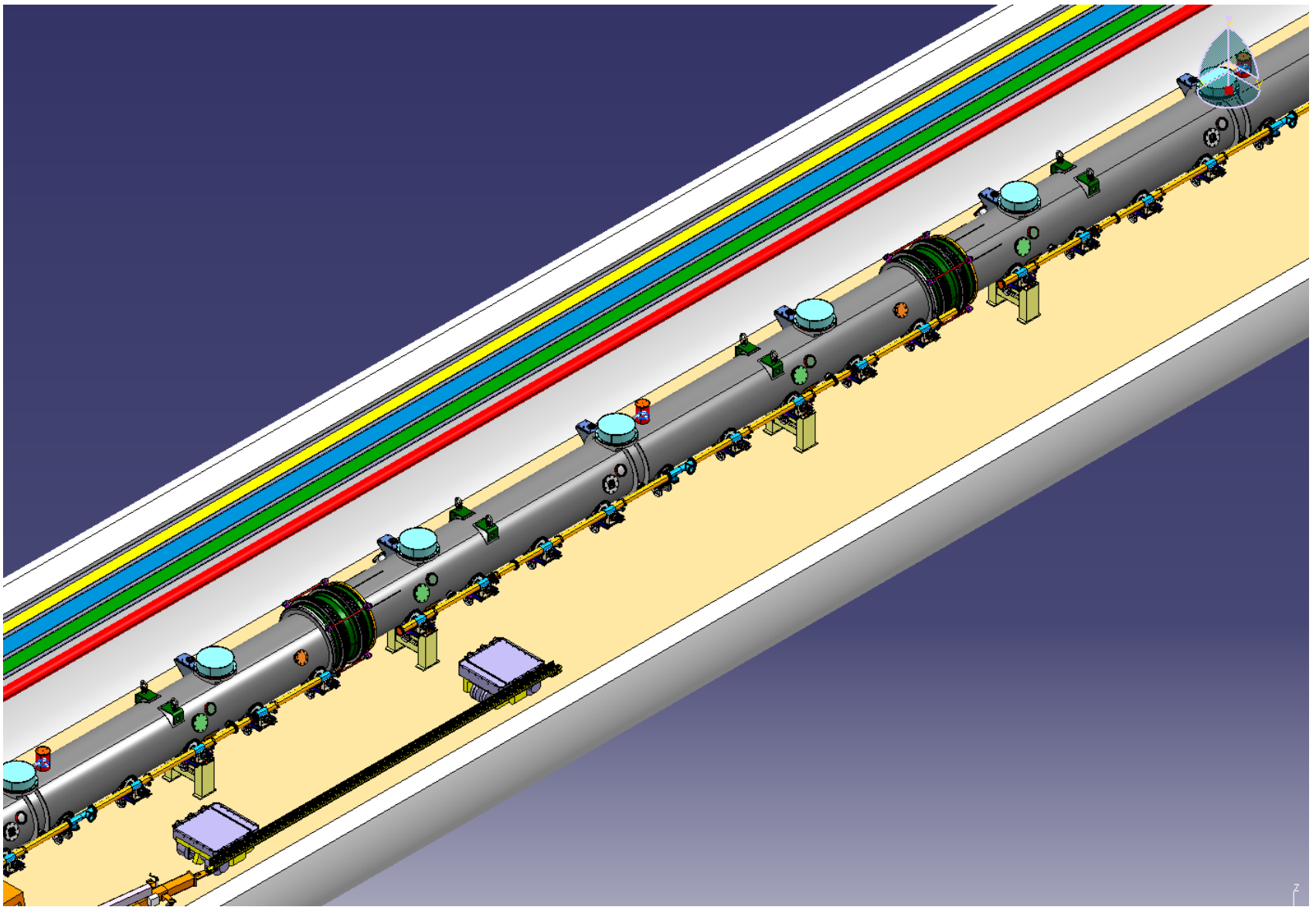


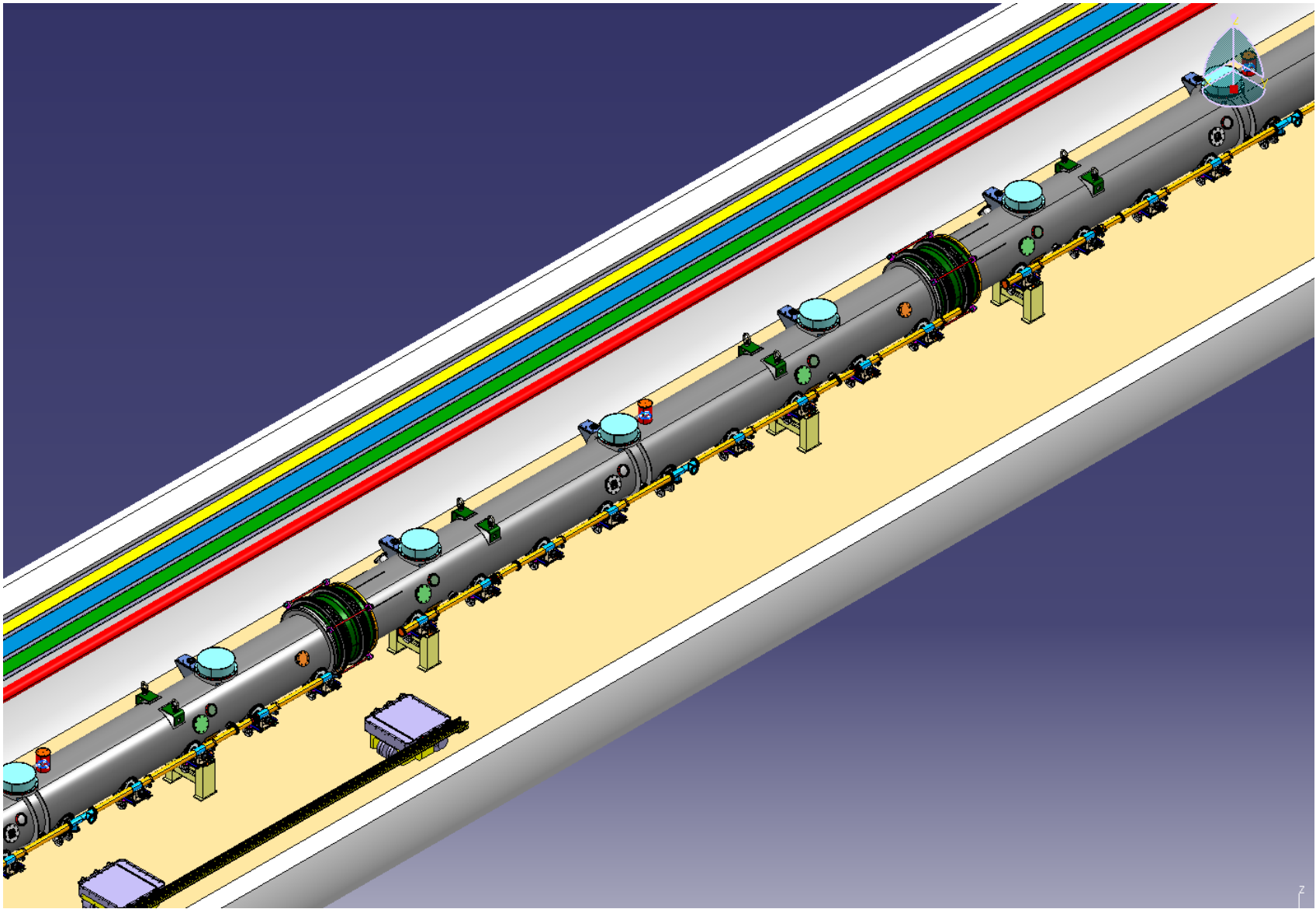


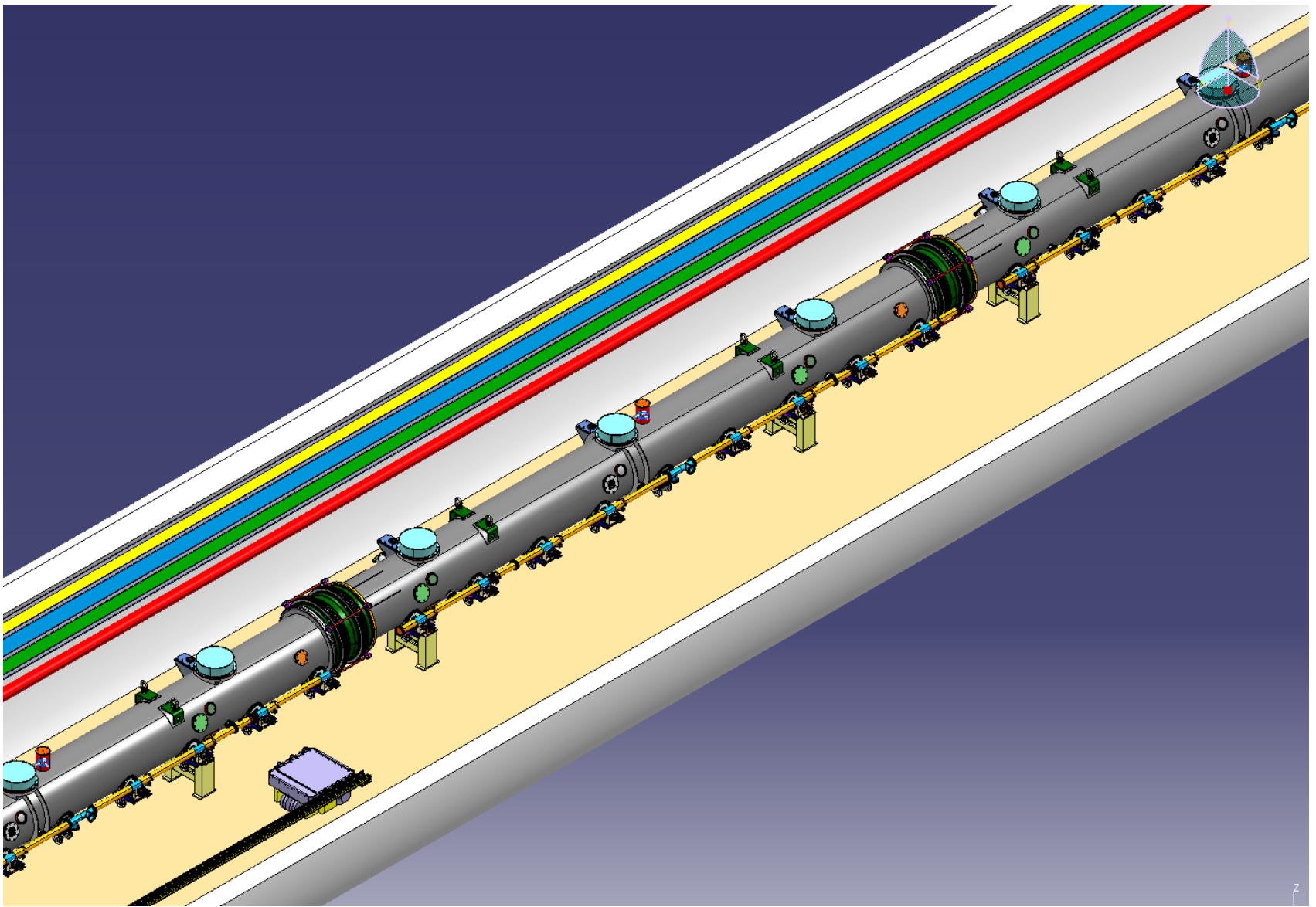


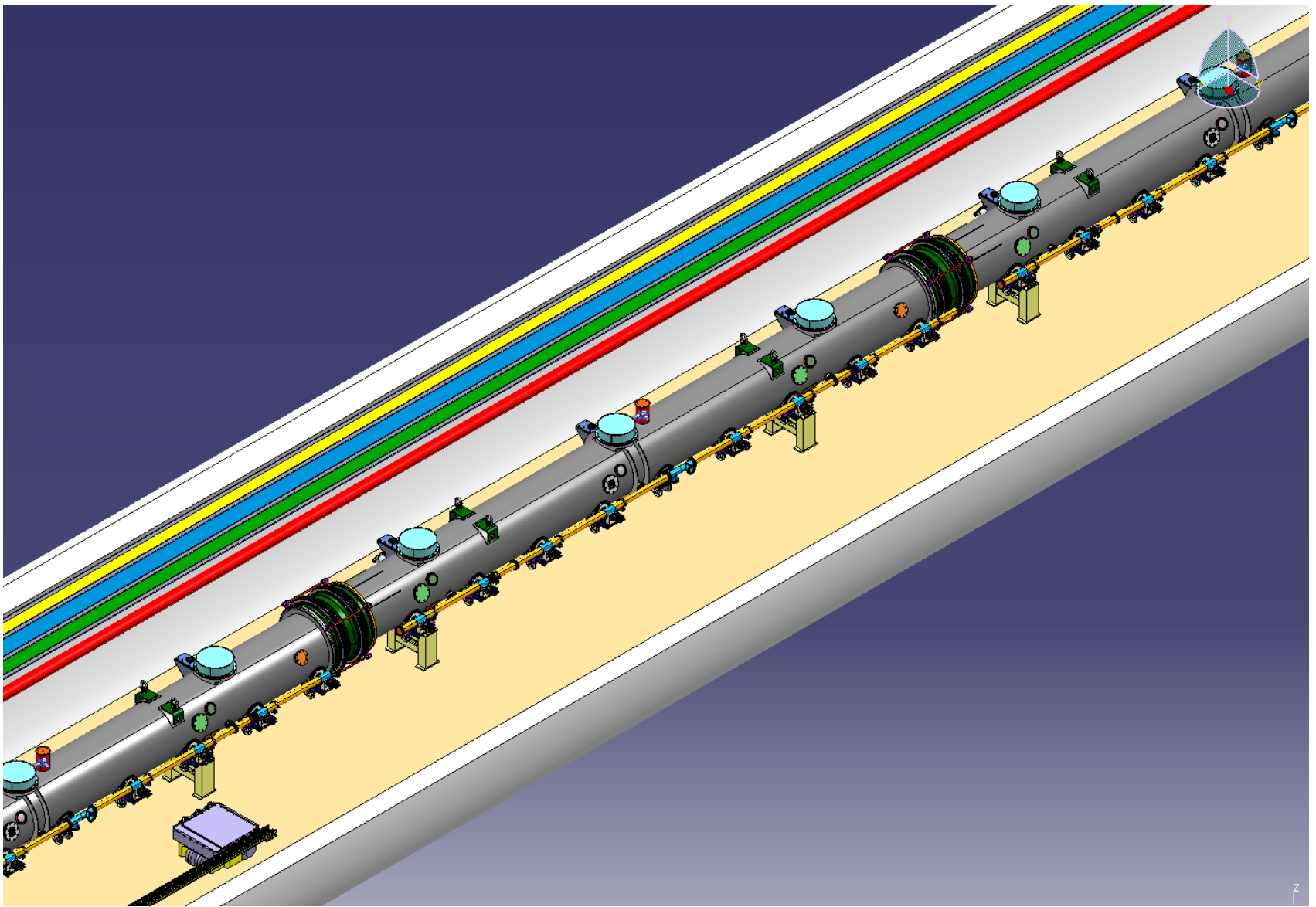


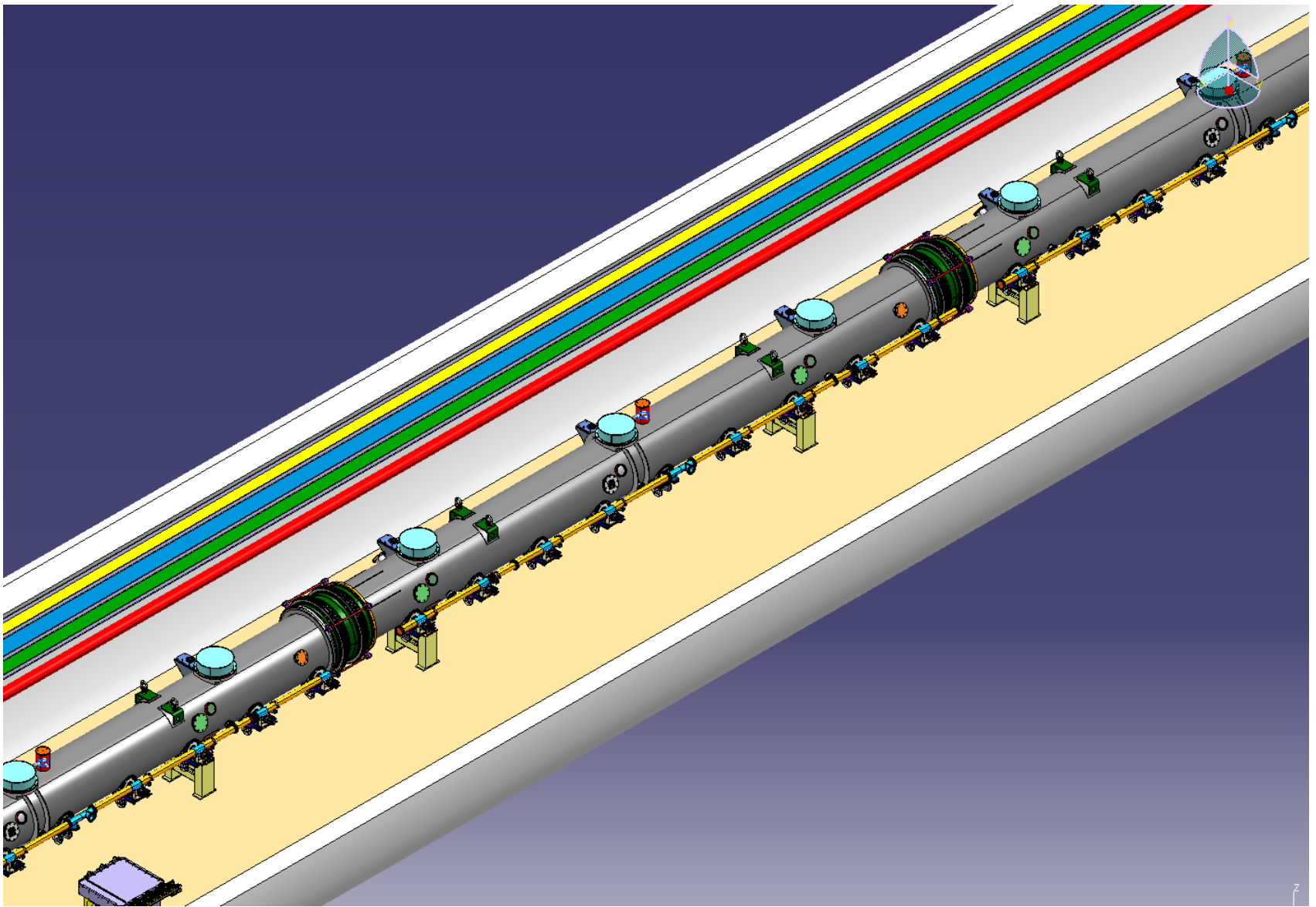


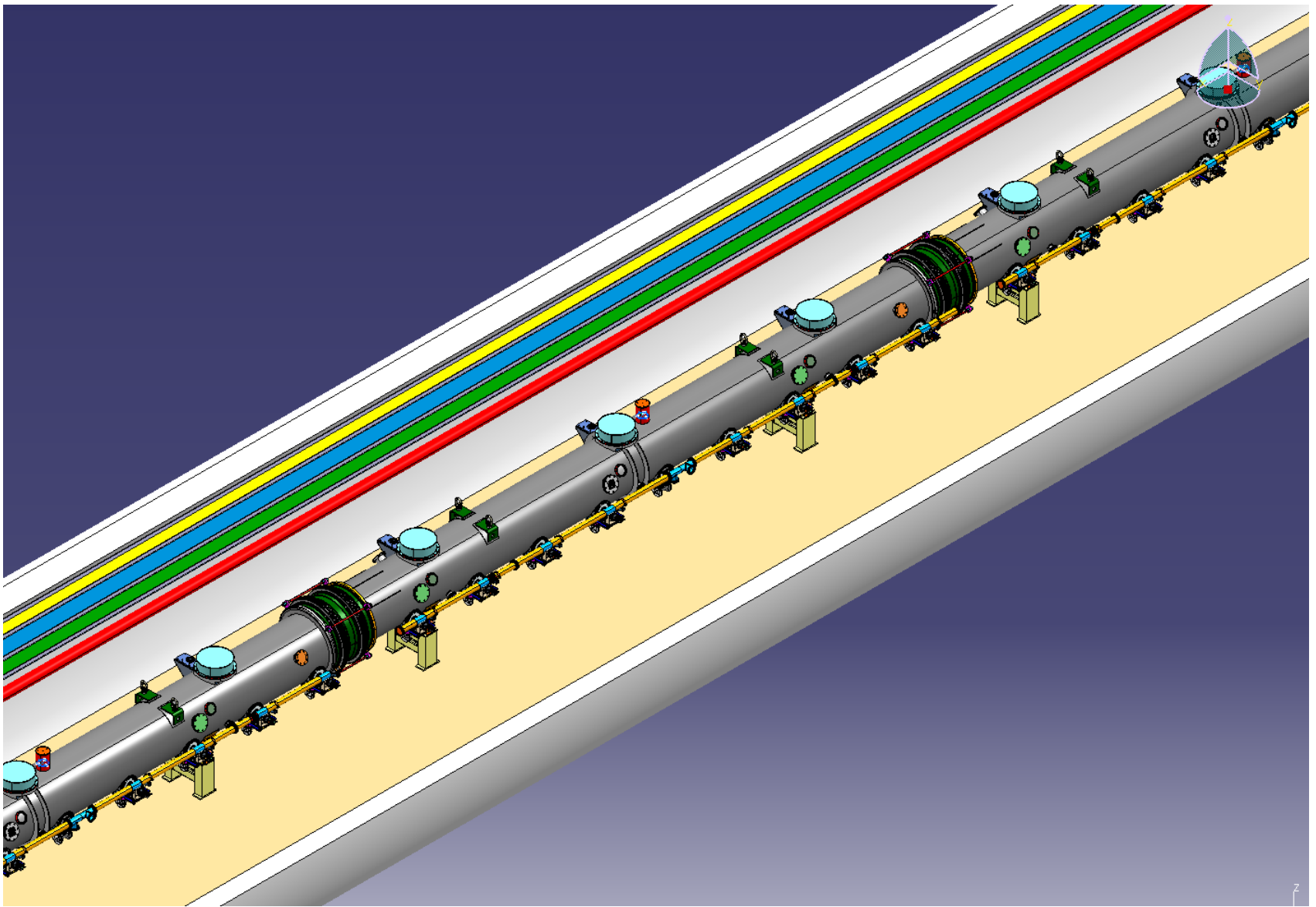












Notes from the sequence

- The solution shown minimises width requirements
- Confirm transport condition of cryomodule (mainly for overall dimensions)
- Confirm OK to support as shown
- Confirm space available on floor
- We can estimate costs as it is similar to existing equipment

One way ahead

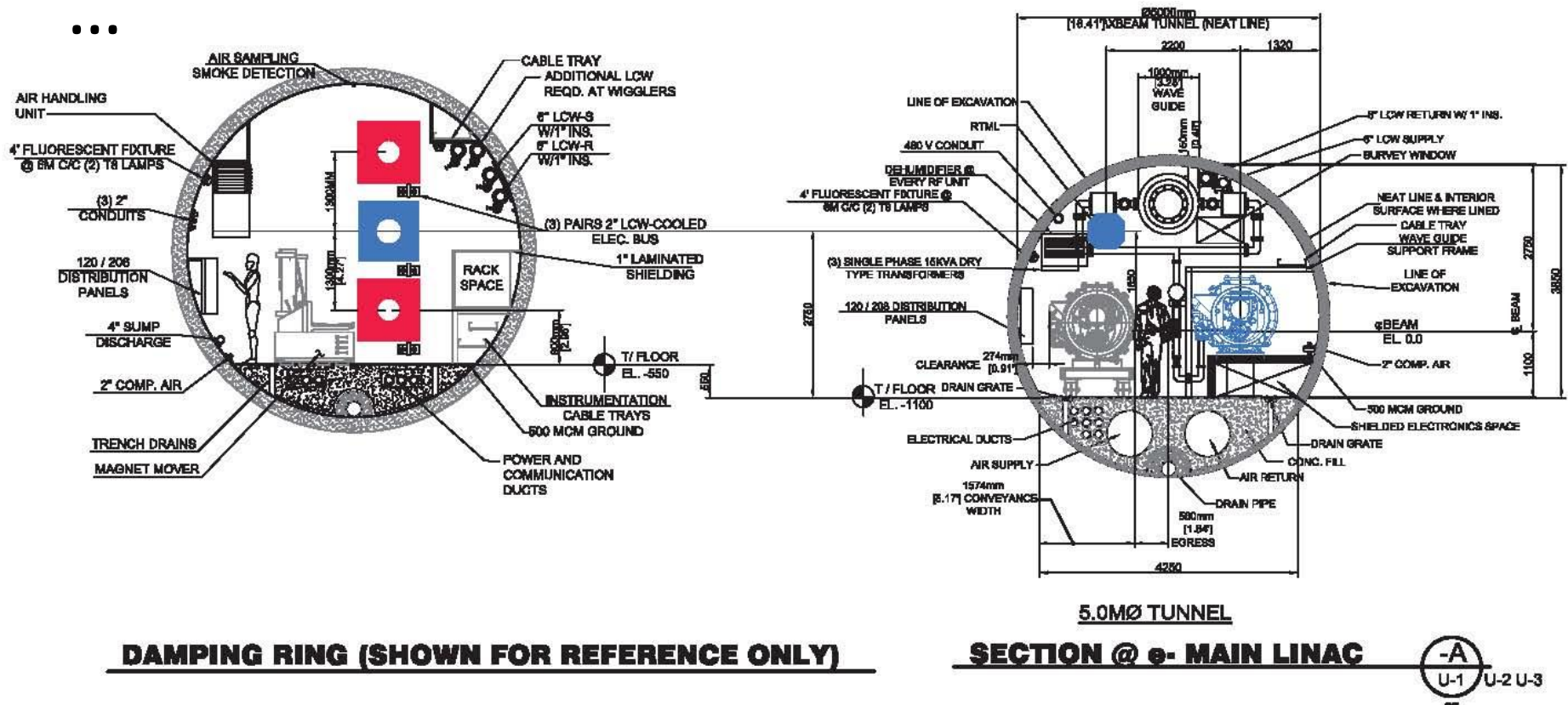
- Starting point – RDR installation cost / time estimates – a lot of work done for these.
- For TDR text – statement that RDR installation and cost estimates have been adjusted to take into account design changes since RDR (not starting from scratch)
- Fred and Keith to work on this:
 - WBS level 5 summary table
 - Identify basis that was used for each RDR line estimation then adjust based on changes since RDR (e.g. no. of magnets, km of tunnels etc)
- Output would be revised WBS level 5 table with explanatory comments

Conclusions

- There is plenty of scope for work to be done, but limited resources mean that a restricted scope needs to be agreed
- I will attend Korea meeting in April - this will give the chance to meet and work with ILC contributors
- We need to agree priorities, deadlines and especially resources.

Extra slides

Transport and transfer of other equipment see “magnet mover” in LH section below (From Tom Lackowski presentation)



Sloping tunnels

- ~1km 10%
 - Transport of equipment and personnel
- LHC
- Equipment:
 - Special equipment where necessary (space)
 - Tractors and trailers for smaller things
 - Personnel
 - Tractors and personnel trailers
 - Bicycles