CBM Iron yoke and support design

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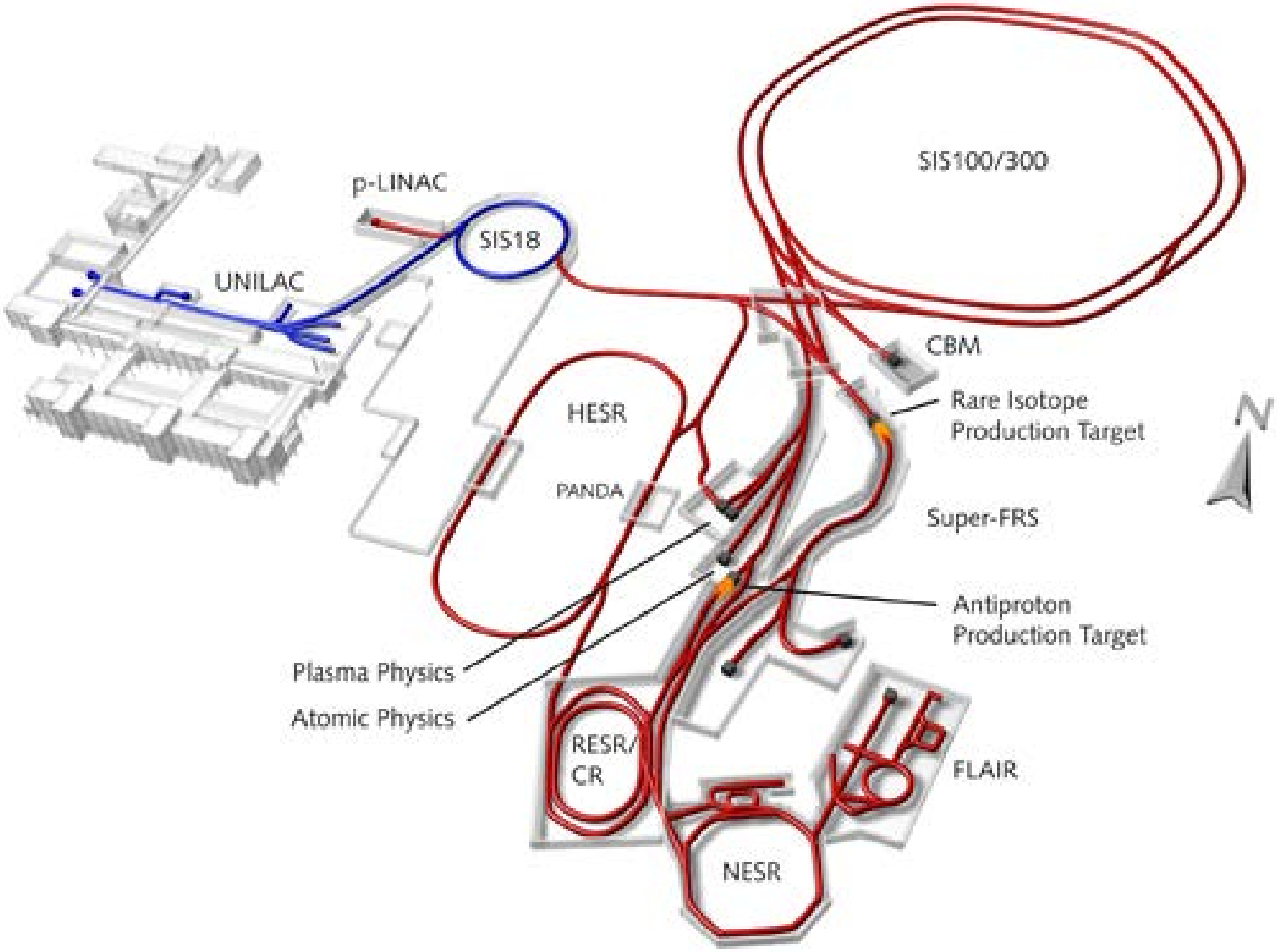
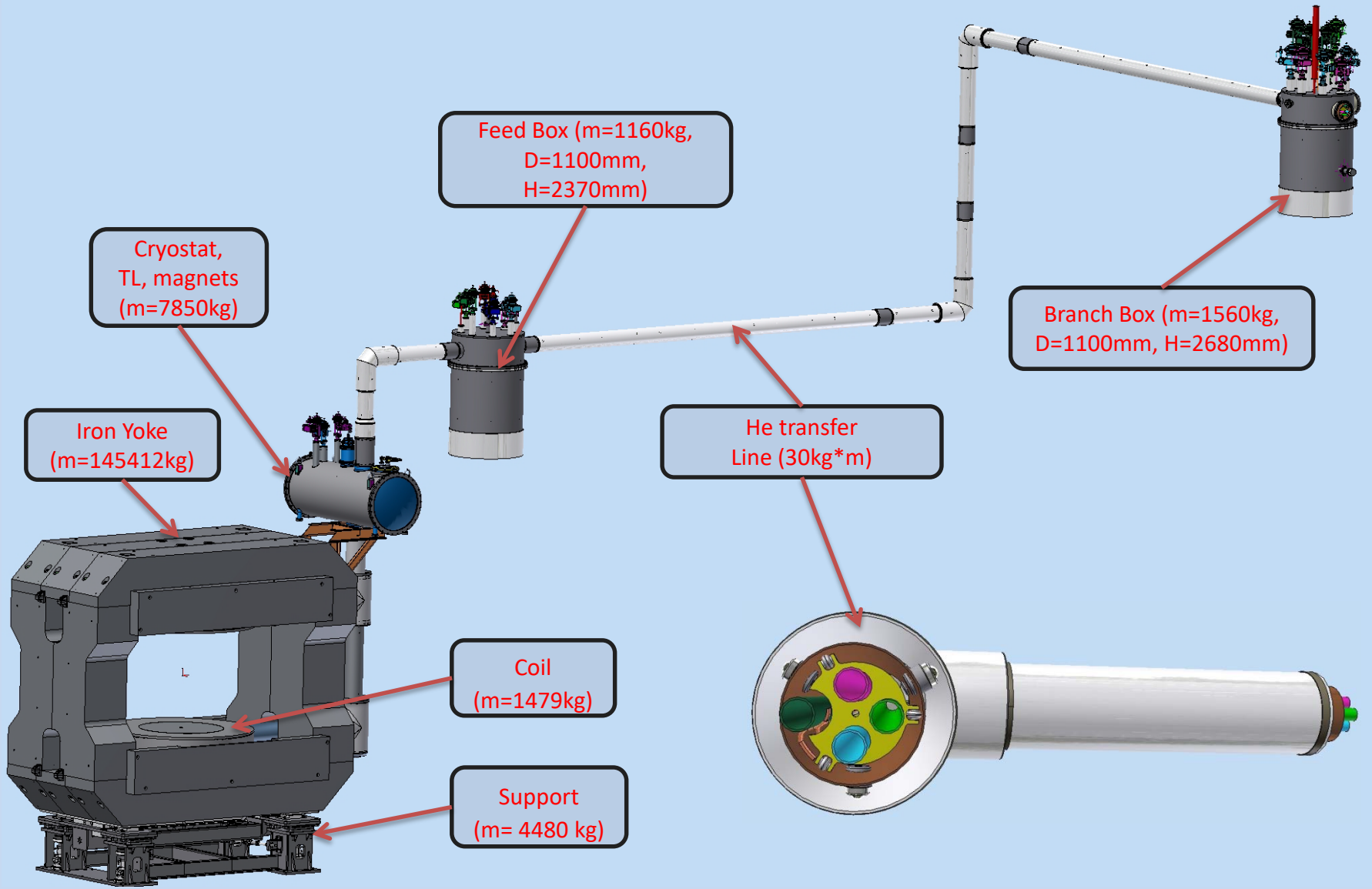
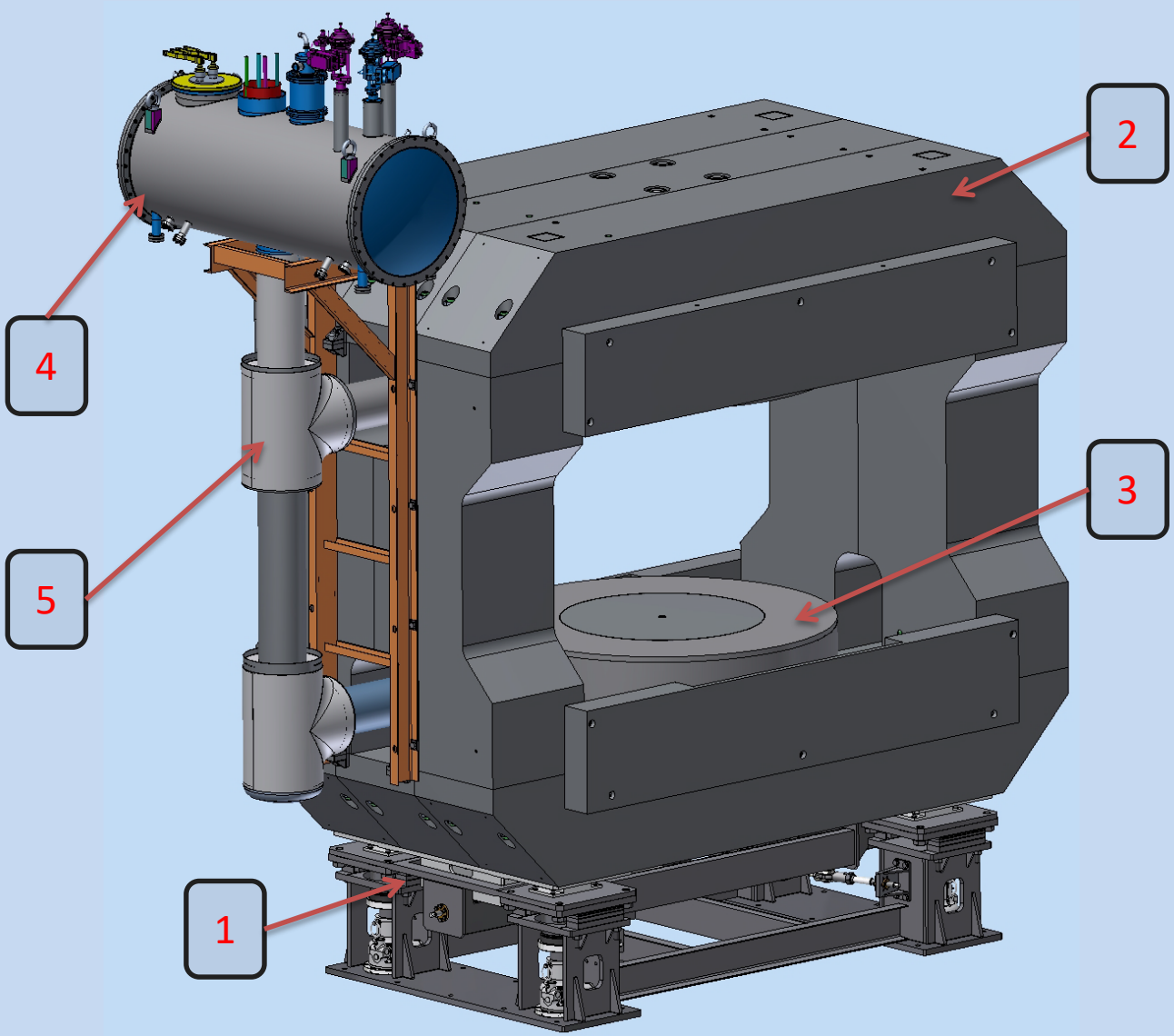
FAIR


SIS100/300
p-LINAC
SIS18
UNILAC
CBM
HESR
Rare Isotope
Production Target
PANDA
Super-FRS
N
Antiproton
Production Target
Plasma Physics
Atomic Physics
RESR/
CR
FLAIR
NESR

3D Model of CBM Magnet and cryosystem



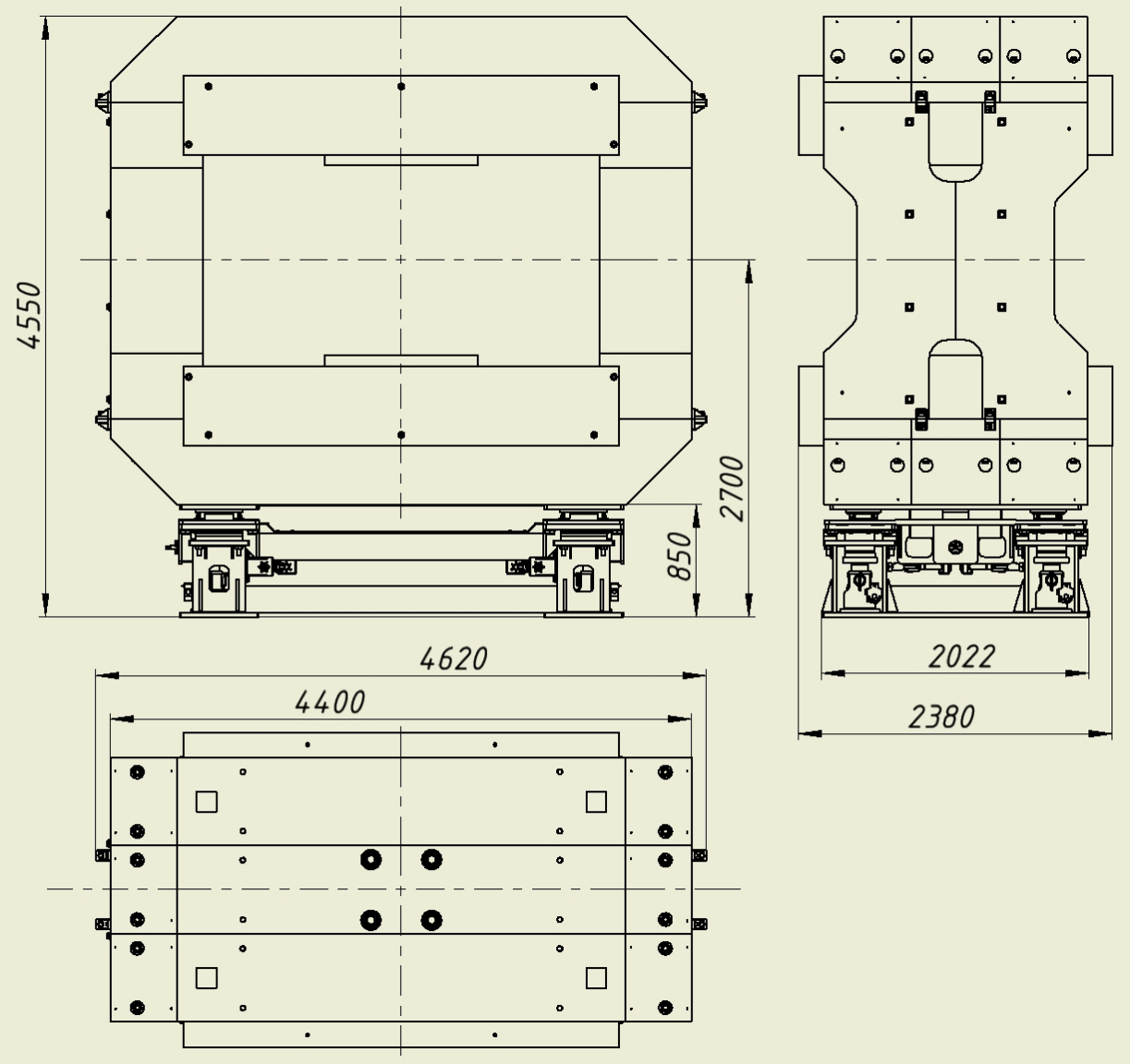
3D Model of CBM Magnet (new design)



1. Support m= 4480 kg
2. Iron Yoke m=145412kg
3. Coils m=3100kg
4. Cryostat m=940kg
5. Cryostats TL m=710kg

The support's load – 154 tons

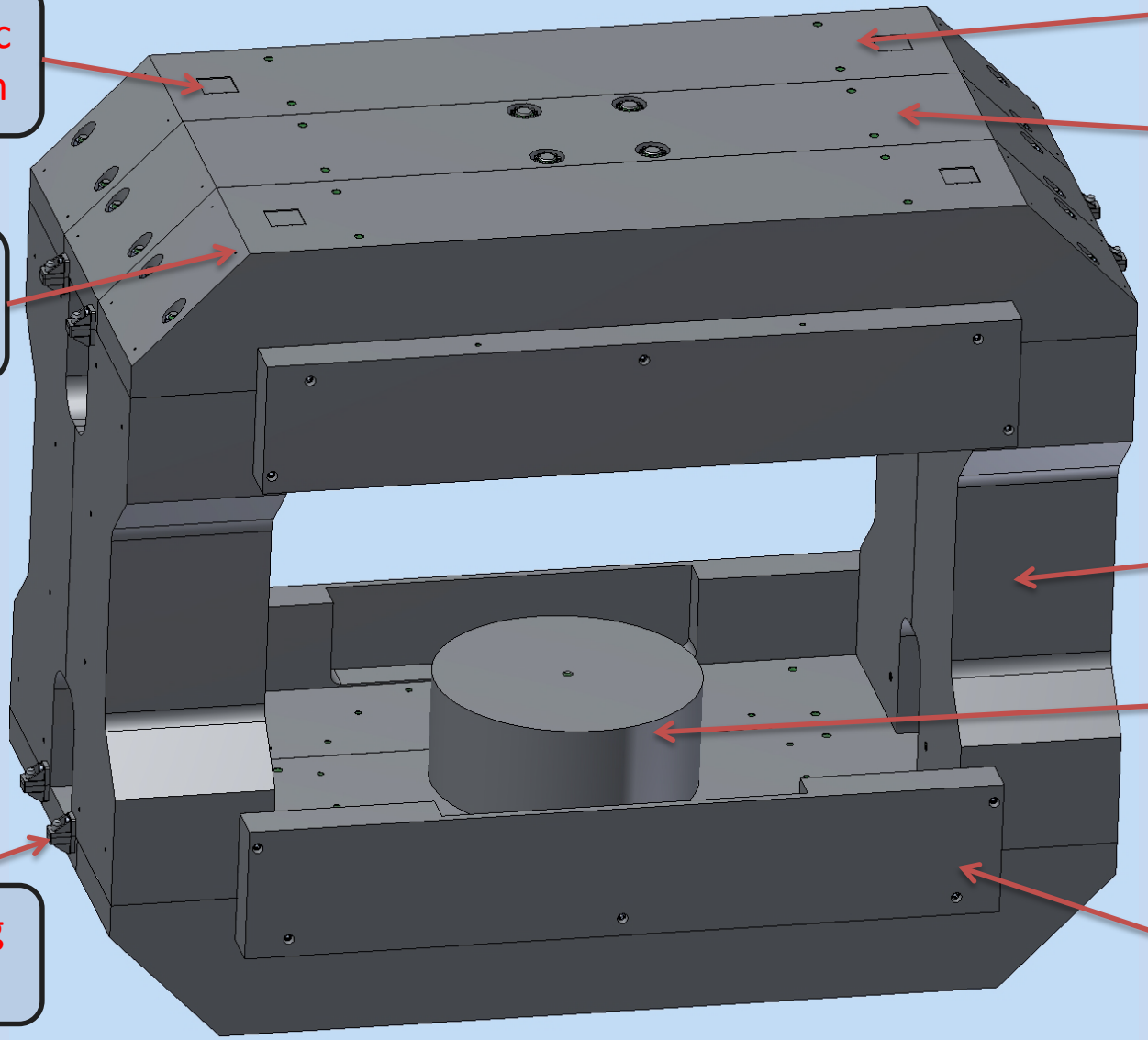
Iron Yoke and supports drawing



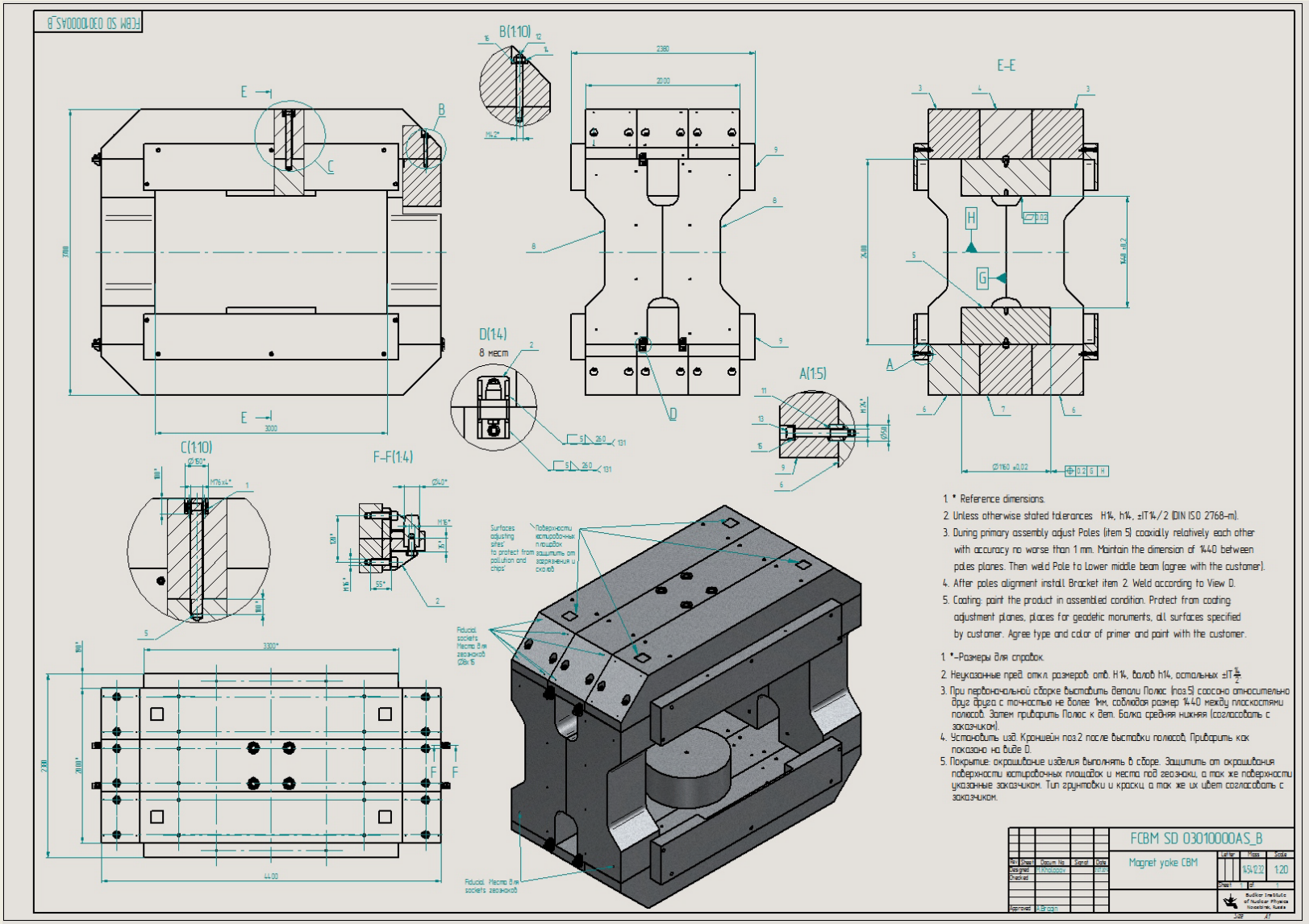
Weight and size

- m= 150000 kg
- L=4620mm
- W=2380mm
- H=4550mm

Iron Yoke 3D Model



Iron Yoke and supports drawing



Weight and size

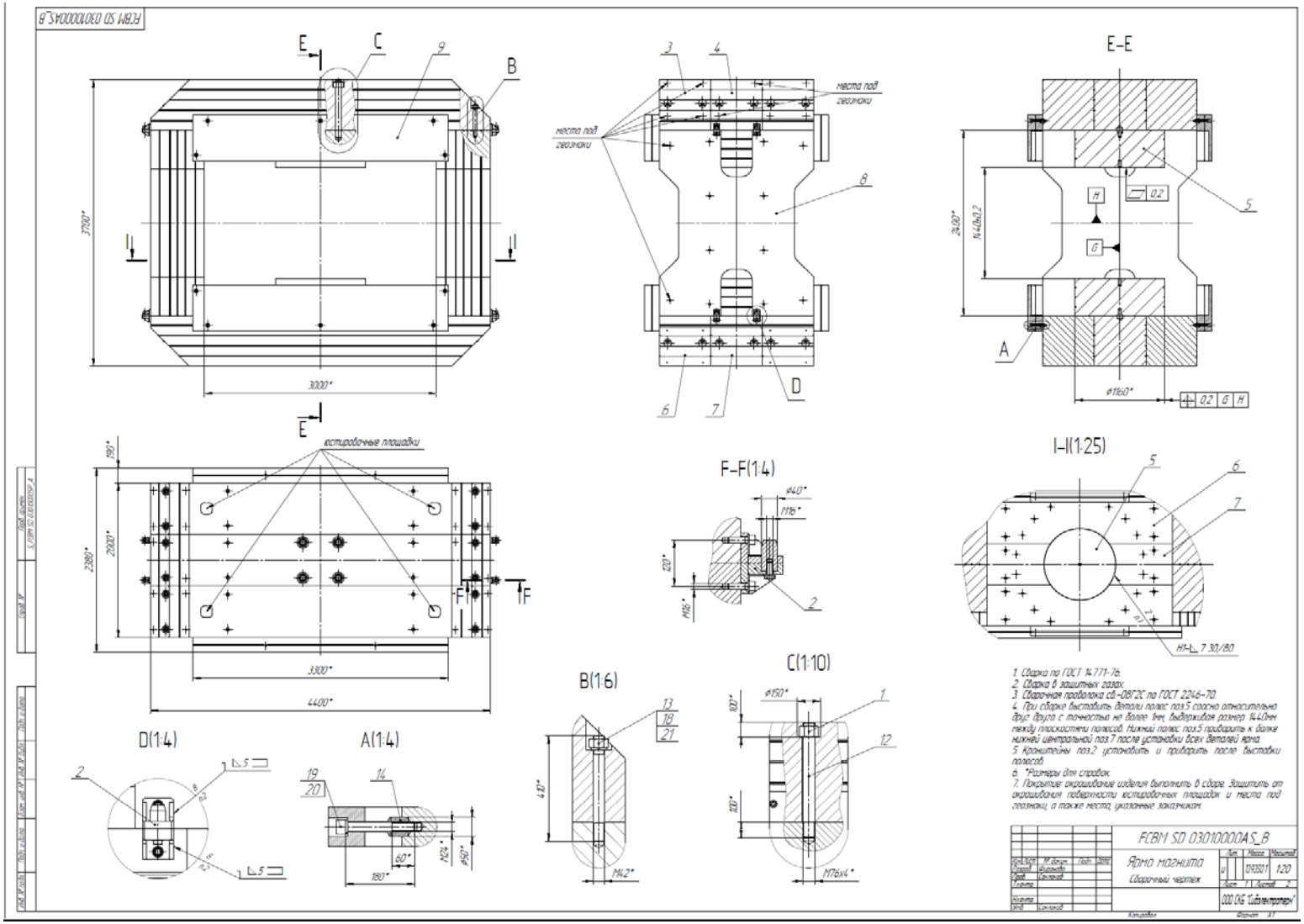
-m= 145412 kg

-L=4440mm

-W=2380mm

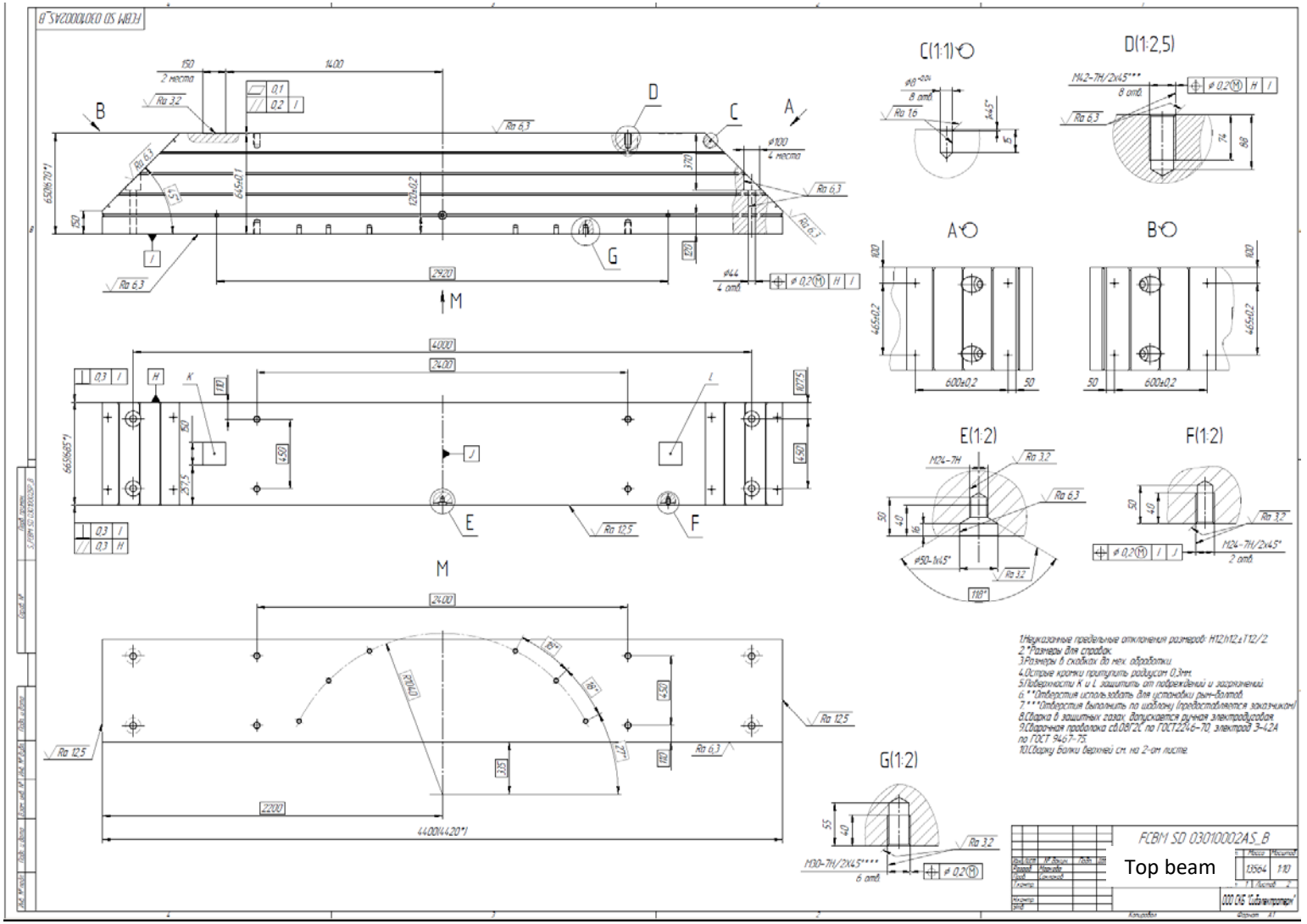
-H=3700mm

Iron Yoke production drawing



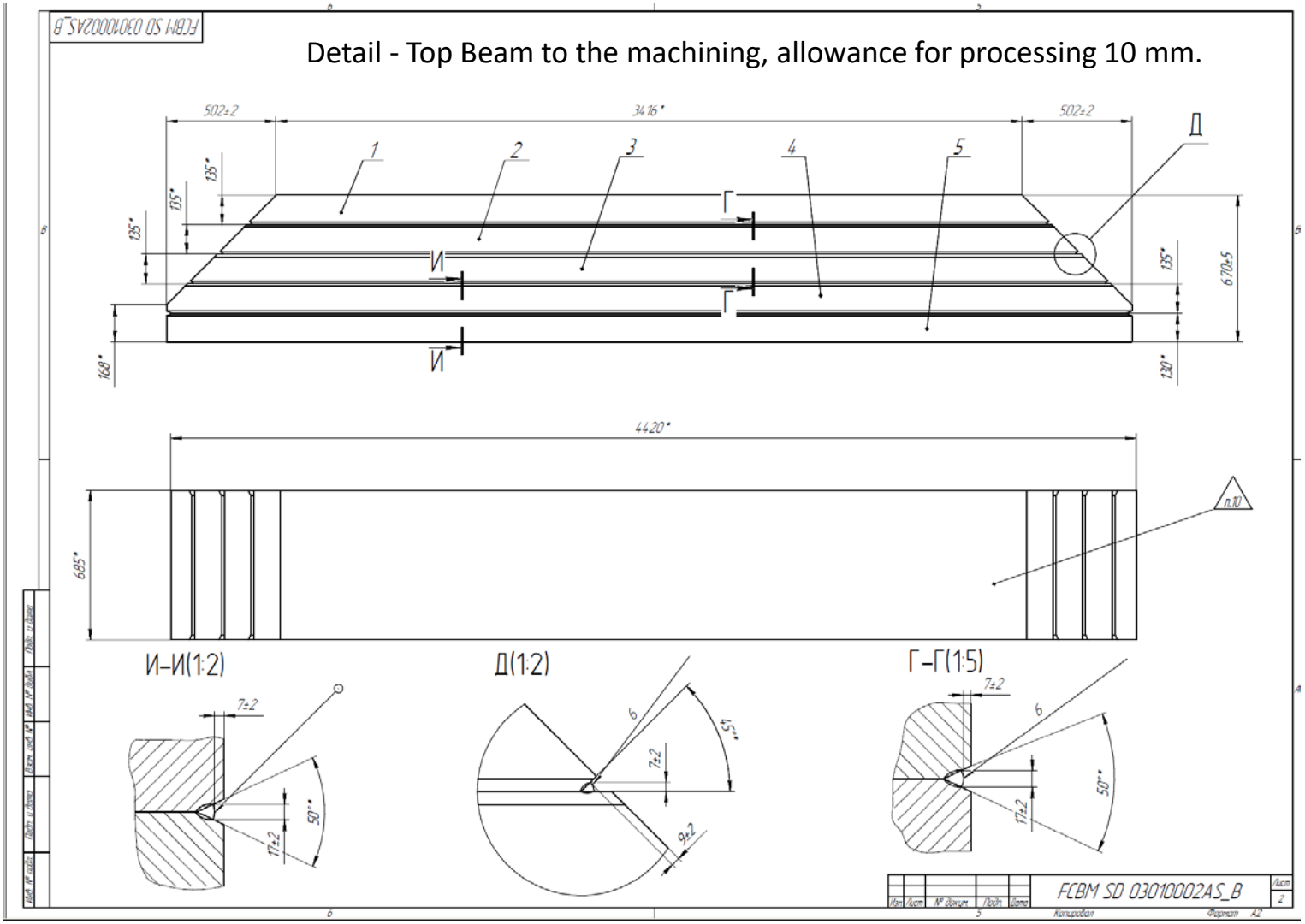
Drawings are processed in technologists and prepared for translation.

Iron Yoke production drawing



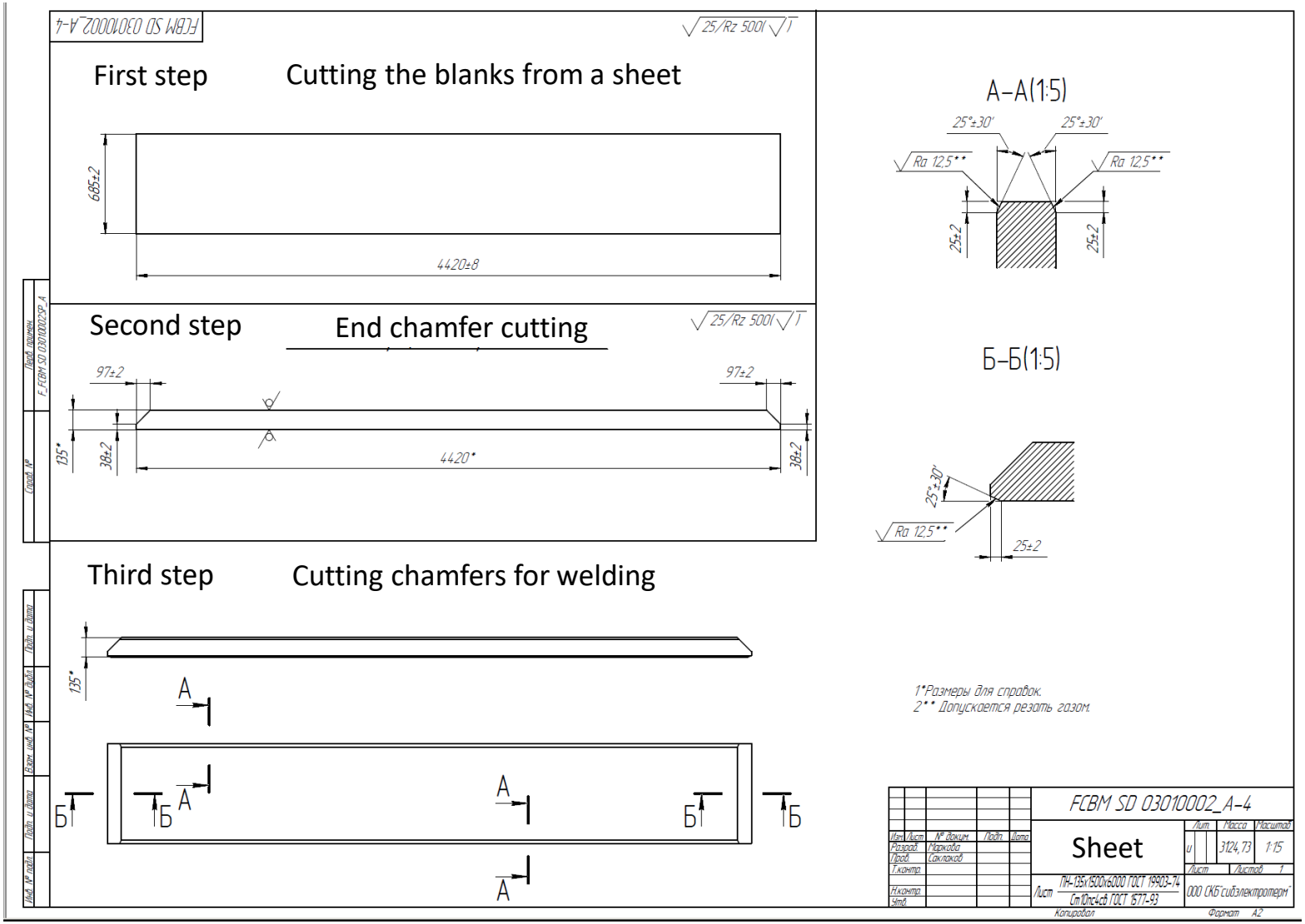
An example of the implementation of the yoke of sheet material.

Iron Yoke production drawing



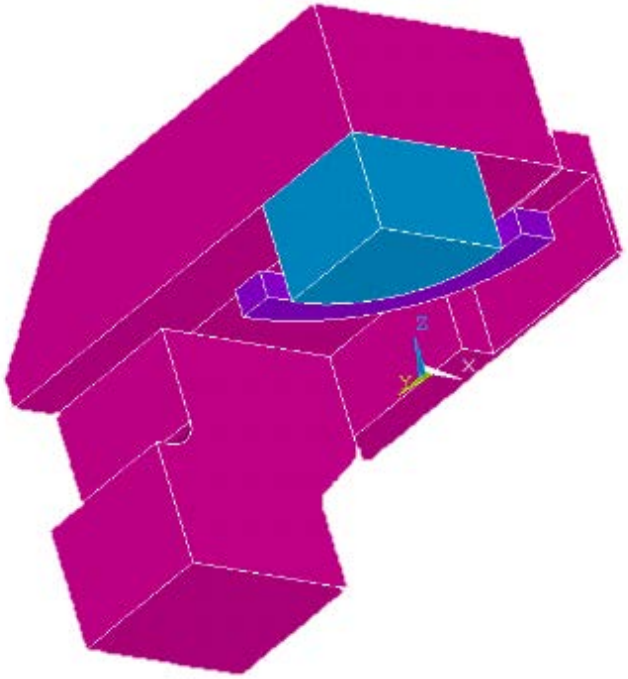
An example of the implementation of the yoke of sheet material.

Iron Yoke production drawing

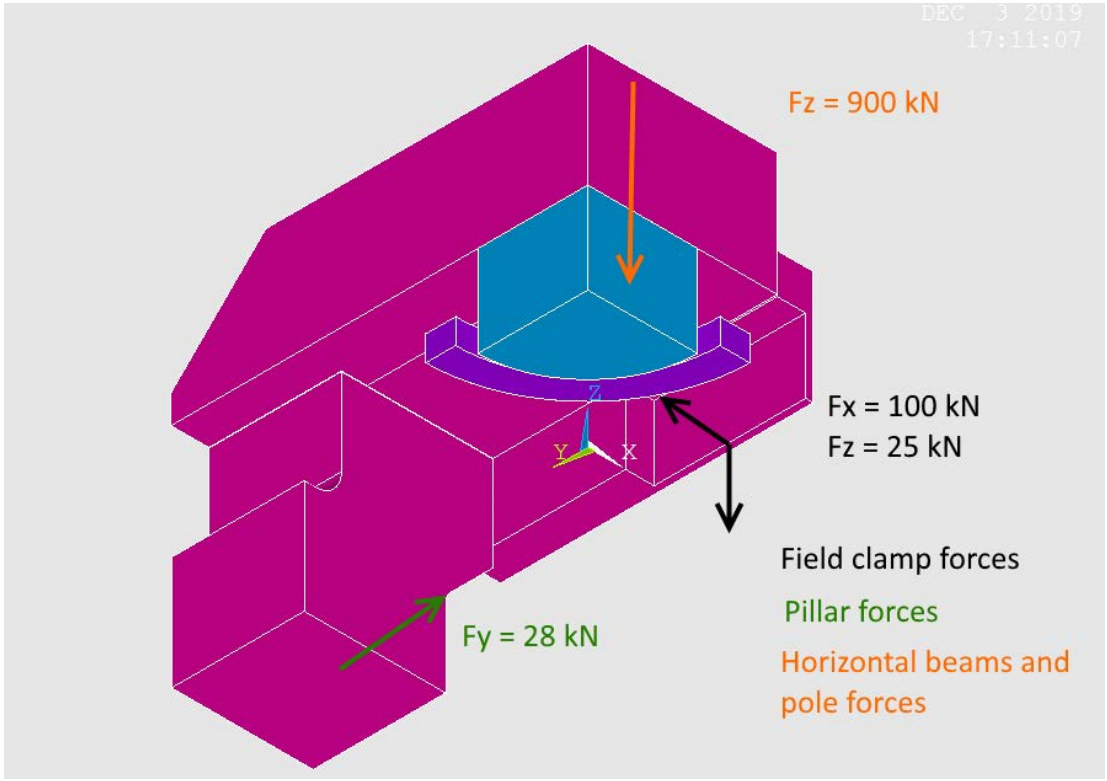


An example of the implementation of the yoke of sheet material.

Influence of the laminations on the magnetic field

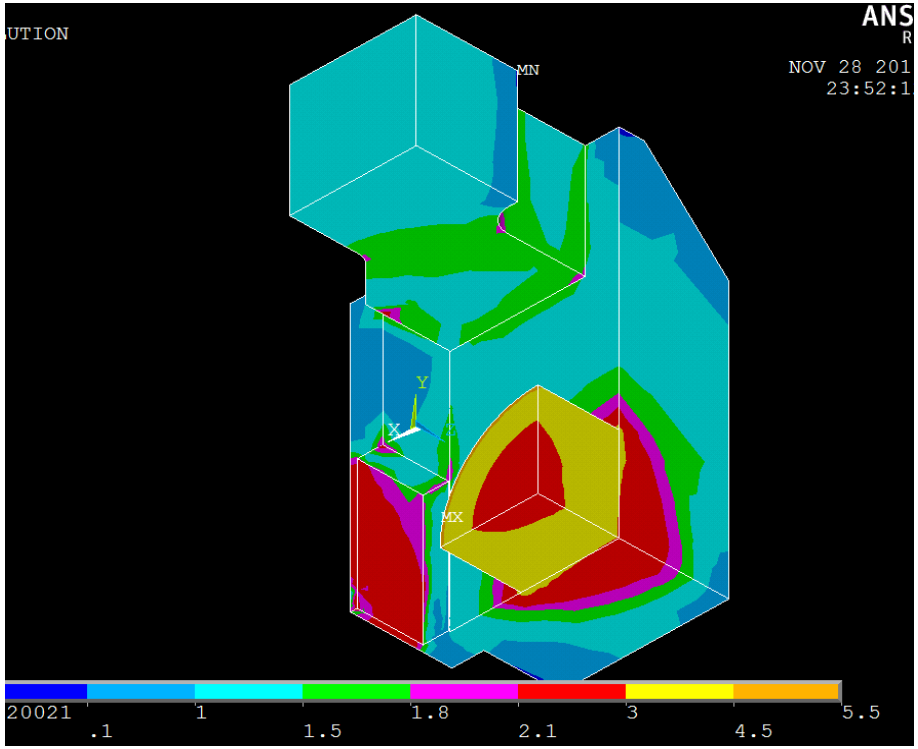


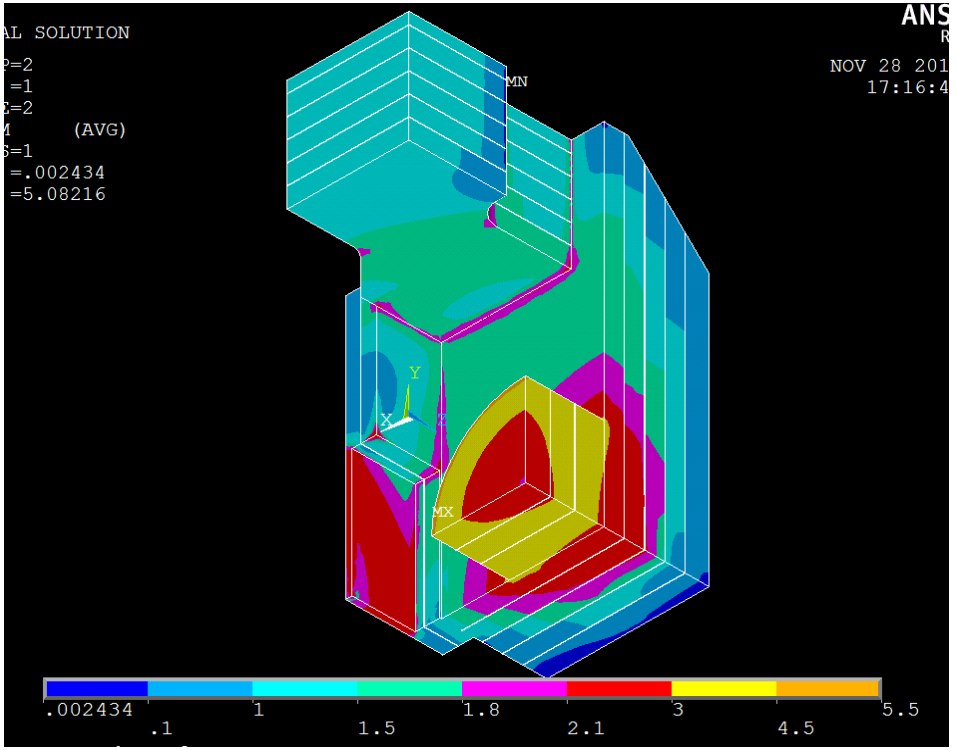
Model for the ANSYS magnetic field calculations



The Fz = 900 kN – is the force attracting the horizontal beams down: to opposite coil and to the pillars! This force is distributed in the whole volume of the iron block.

Comparison of the iron block with 3 mm gap of horizontal lamination

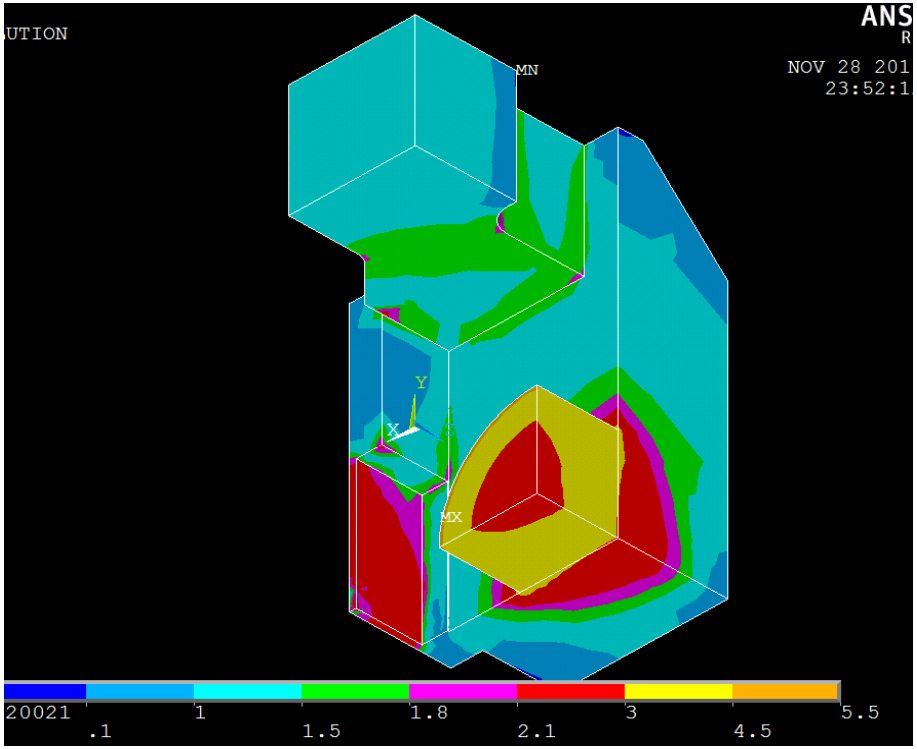




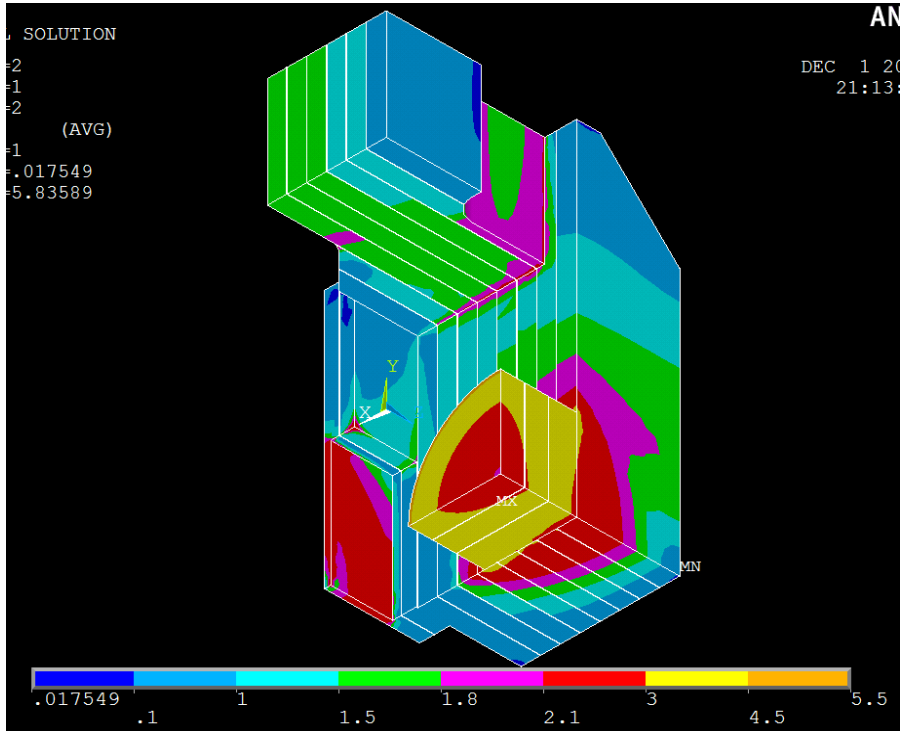
Without lamination

horizontal laminations with 3 mm gaps

Comparison of the iron block with 3 mm gap of vertical lamination



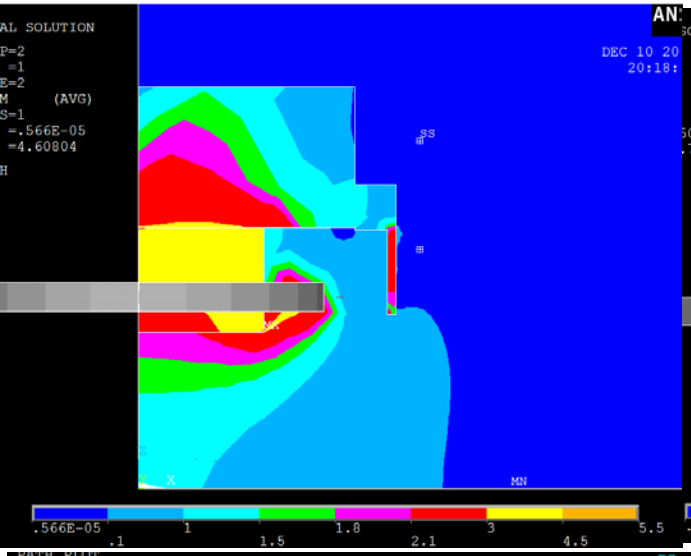
Without lamination

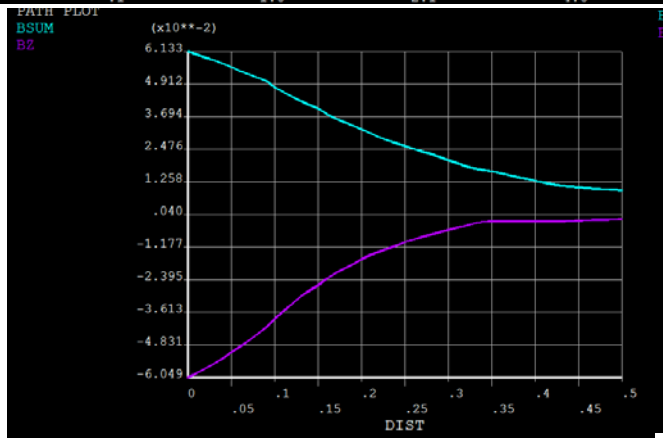


vertical laminations with 3 mm gaps

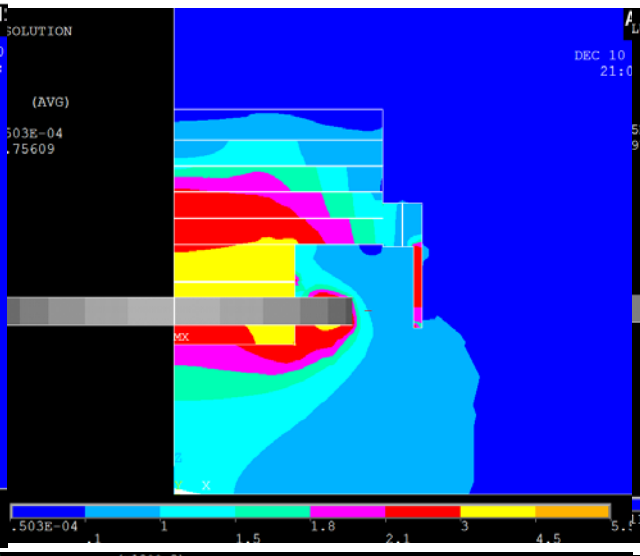
Influence on the stray fields

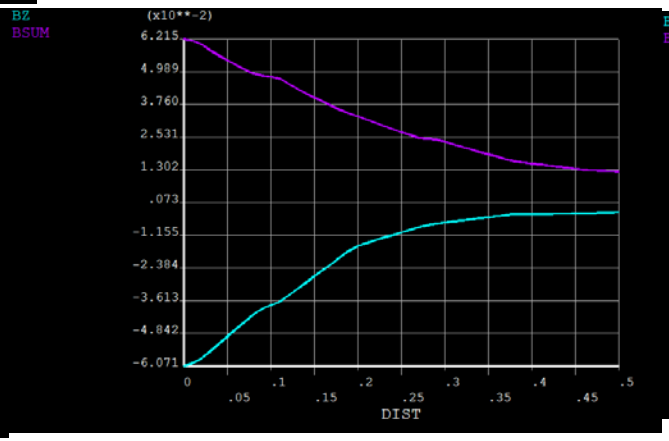
Non-laminated



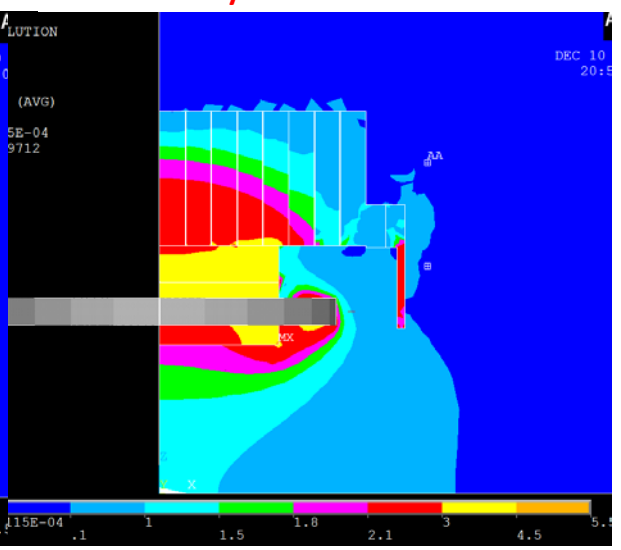


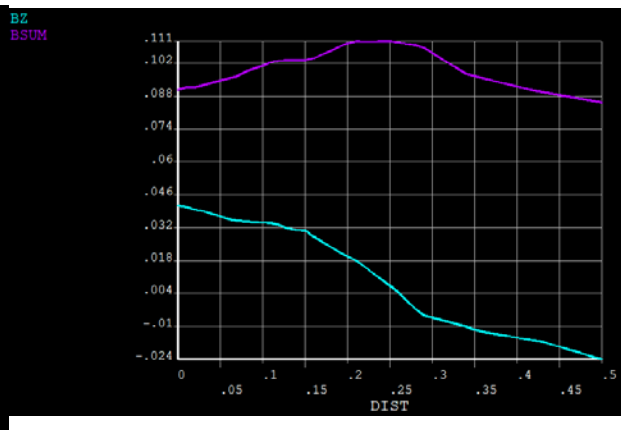
Horizontally laminated





vertically laminated





Stray field is 8 times higher!

Influence of the laminations on the main parameters of the magnet

Parameter	Base model	Horizontal lamination	Vertical lamination
Integ.B*ds, T*m	1.012	0.9995	0.9998
Bcenter, T	1.099	1.086	1.086
Stored energy, MJ	4.90	4.87	4.86

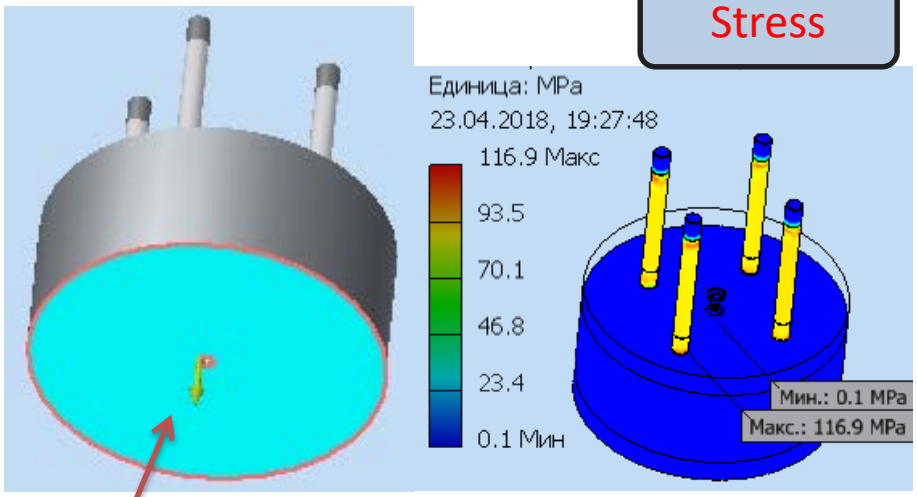
Conclusion:
The iron yoke works mostly as return yoke. The real lamination will give not much influence on the main parameters of the magnet. The manufacturer promises to obtain the gap < 0.3 mm.

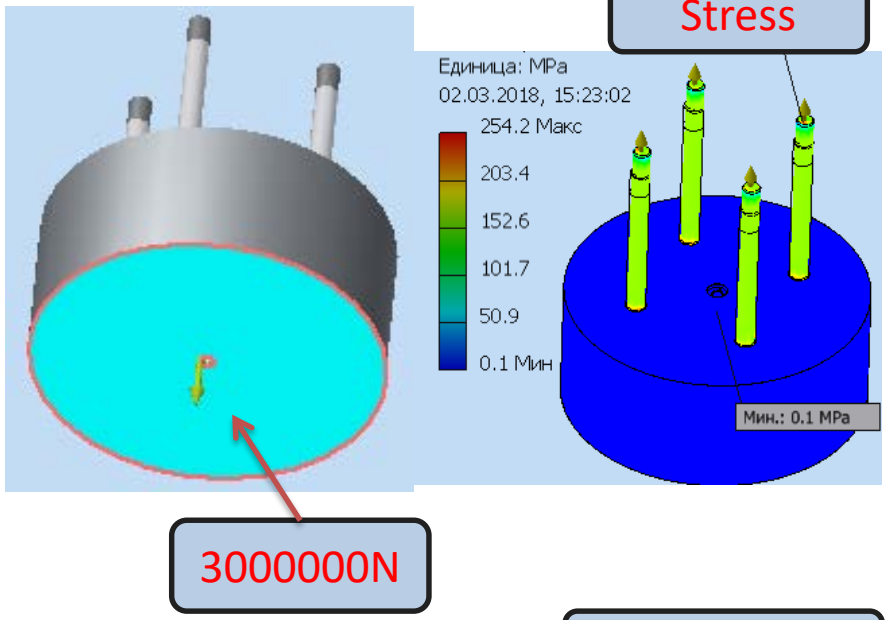
Stray field is much better in the horizontally laminated plates.

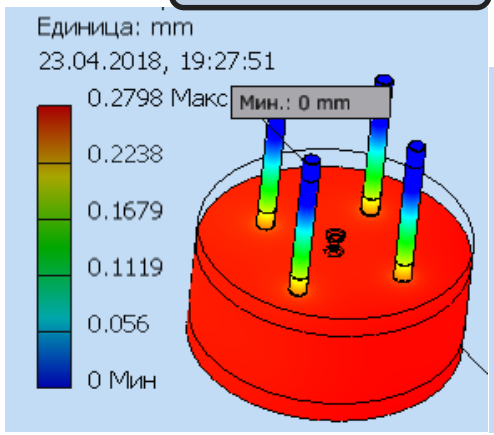
The iron sheets will be pressed by 100 t press before welding.

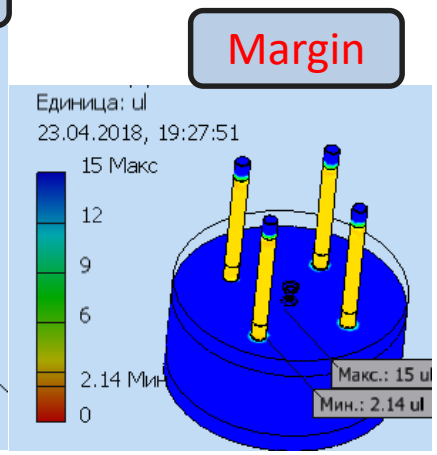
What kind of paint and color is needed for the iron yoke?

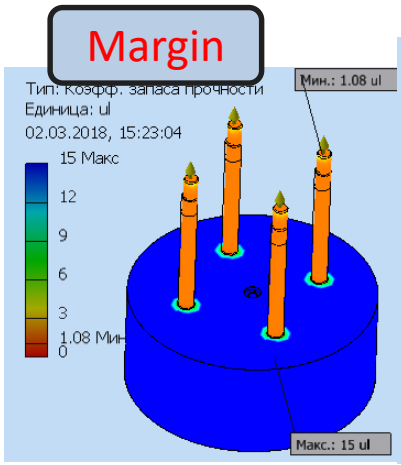
Calculation of studs for Pole CBM magnet

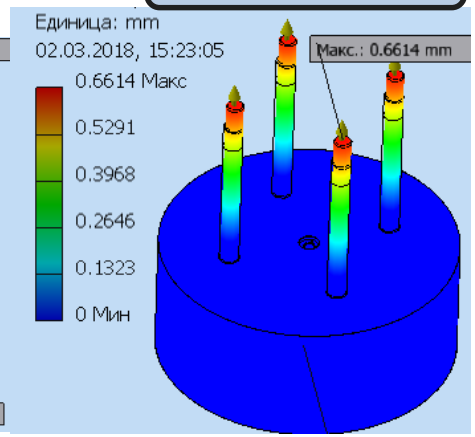




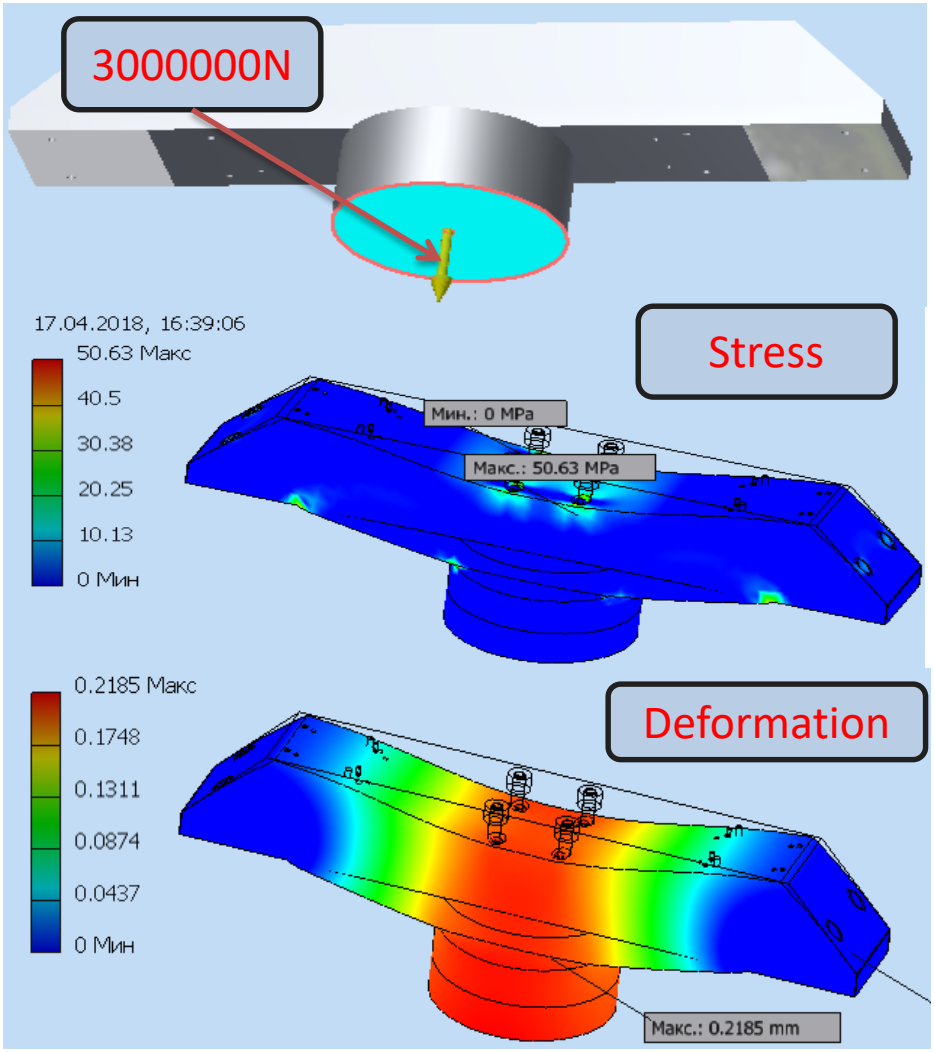




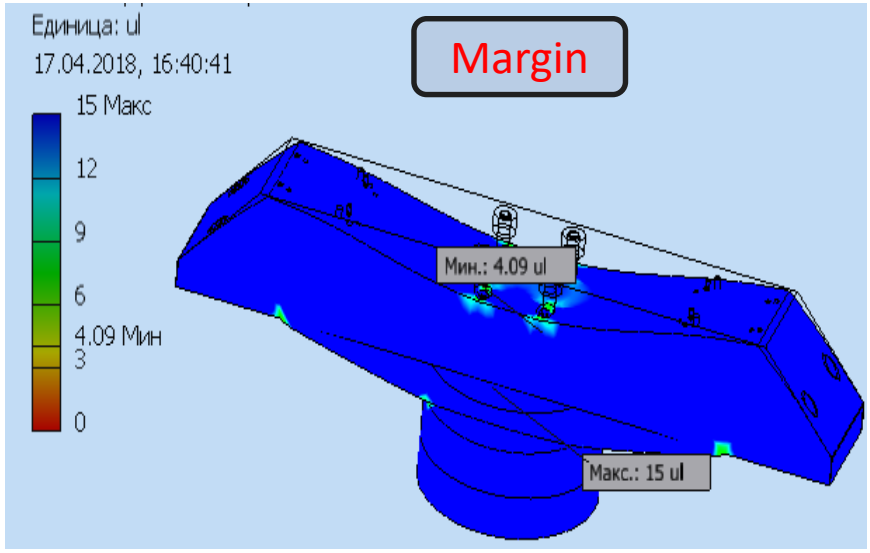




Calculation of Pole & crossbar CBM magnet



Имя	Low carbon steel	
General	Mass density	7.86 г/см^3
	Yield strength	207 МПа
	Ultimate tensile strength	345 МПа
stress	young modulus	220 ГПа
	poisson ratio	0.275 бр
	Shear modulus of elasticity	86.2745 ГПа



Thank you for your attention!