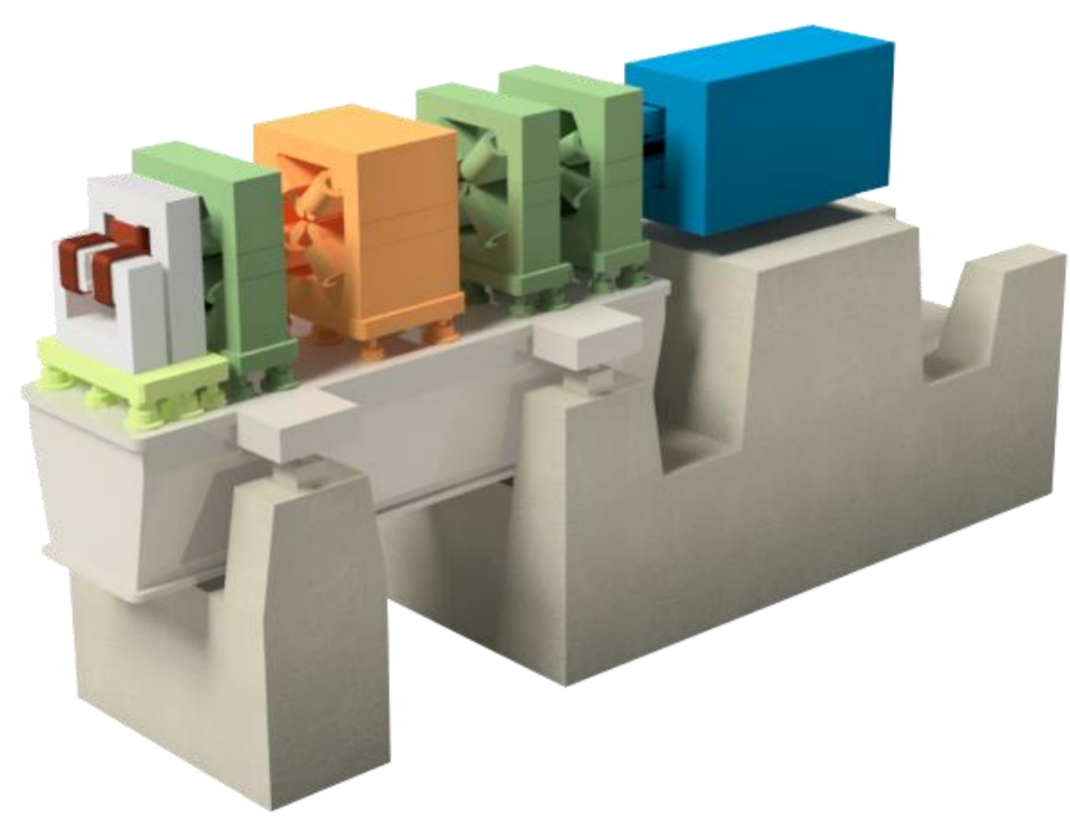


Abstract

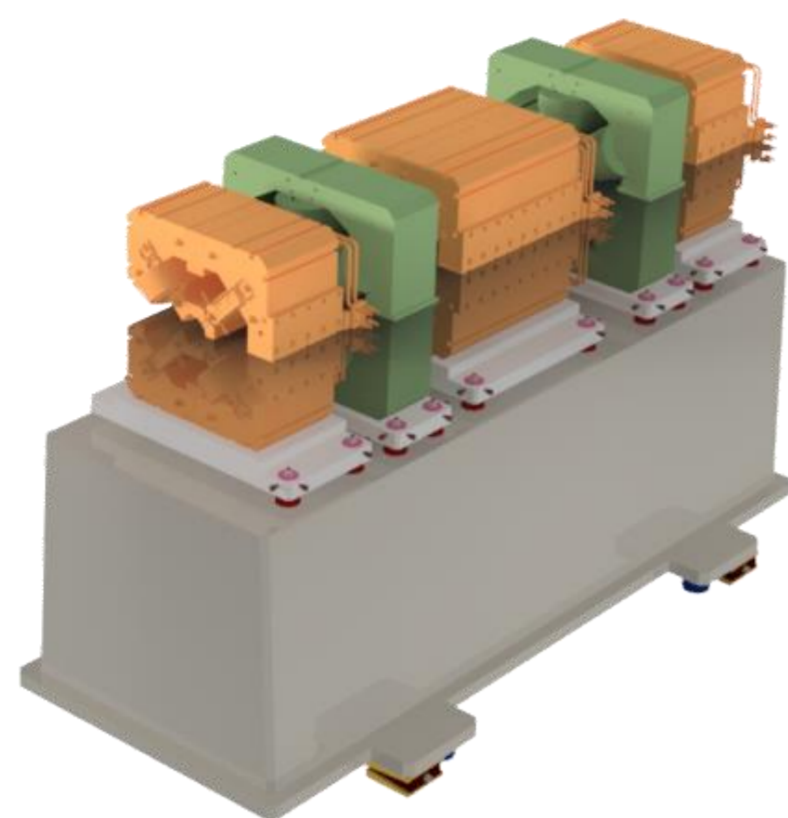
Sirius is a 4th generation synchrotron light source under construction in Brazil, with a bare emittance of 250 picometer rad, scheduled to have the first beam late this year. One of the most important aspects for this ultra-low emittance machine is the stability of the components, especially the magnets. This paper describes the main characteristics of the girder system, including the concrete pedestal, the leveling units, the girder itself, the clamping mechanism for the magnets and the measurements procedures. Each detail was considered in the design phase and the result is a high rigidity setup with a first horizontal mode close to 170 Hz.

Conceptual Designs

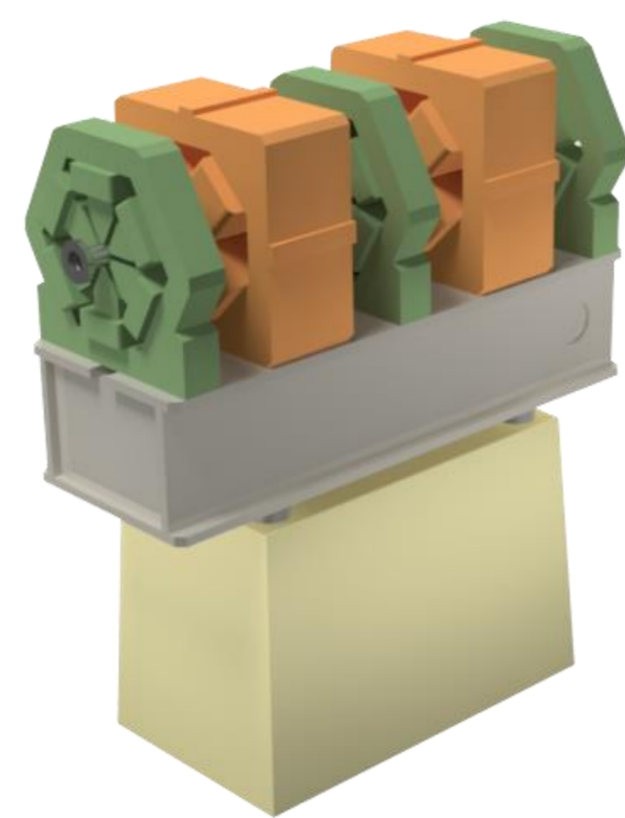
The project started to be sketched around 10 years ago...



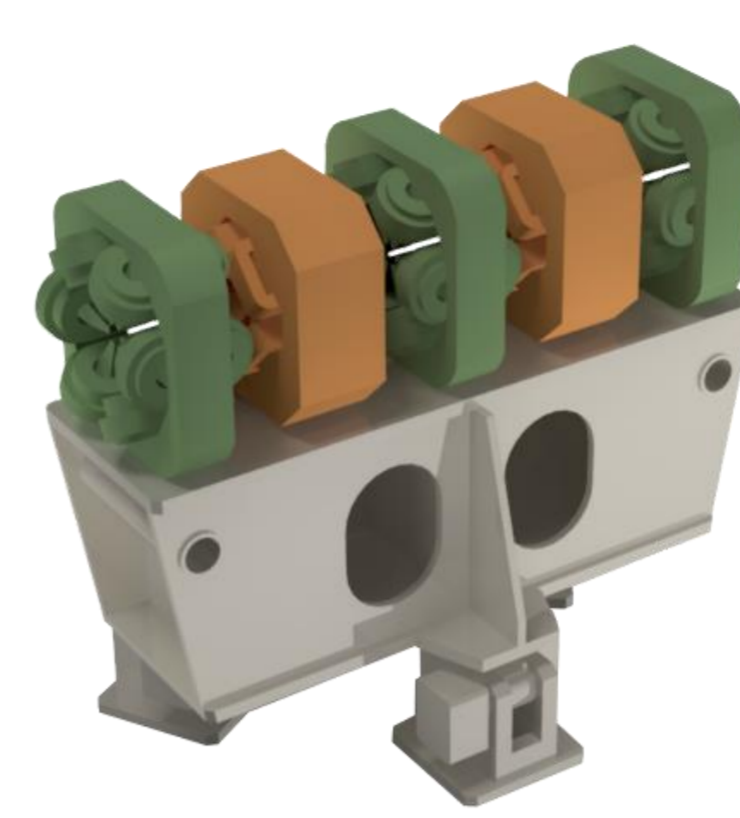
2010
Concrete Pedestal + Metallic Girder



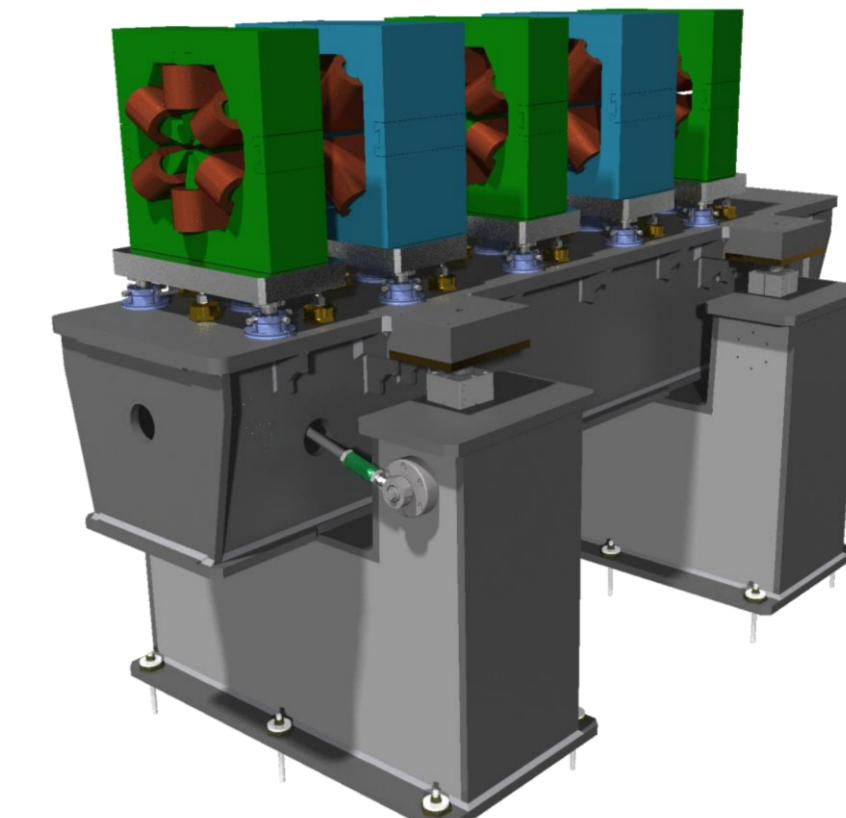
2011
Metallic Girder



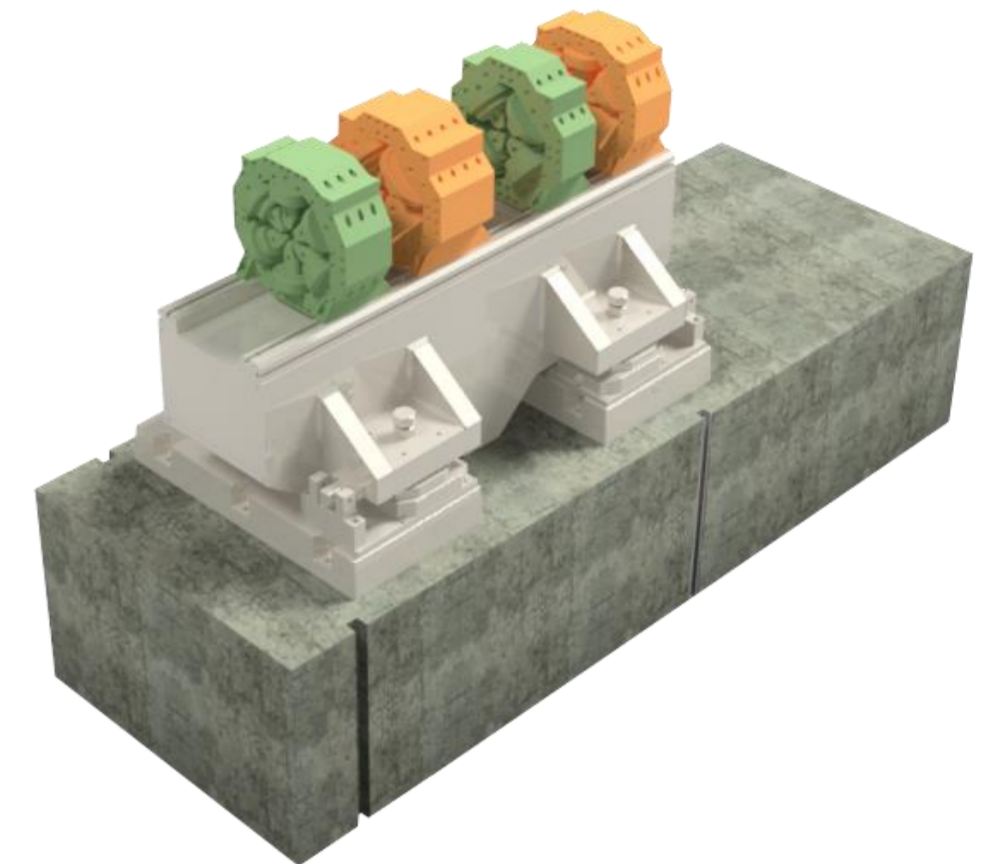
2012
Concrete Pedestal + Metallic Girder



2012
Metallic Pedestal + Metallic Girder



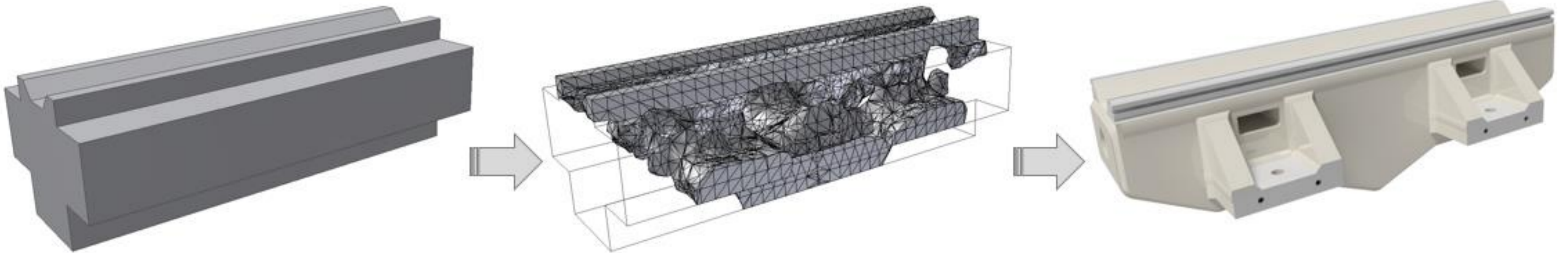
2013
Metallic Girder



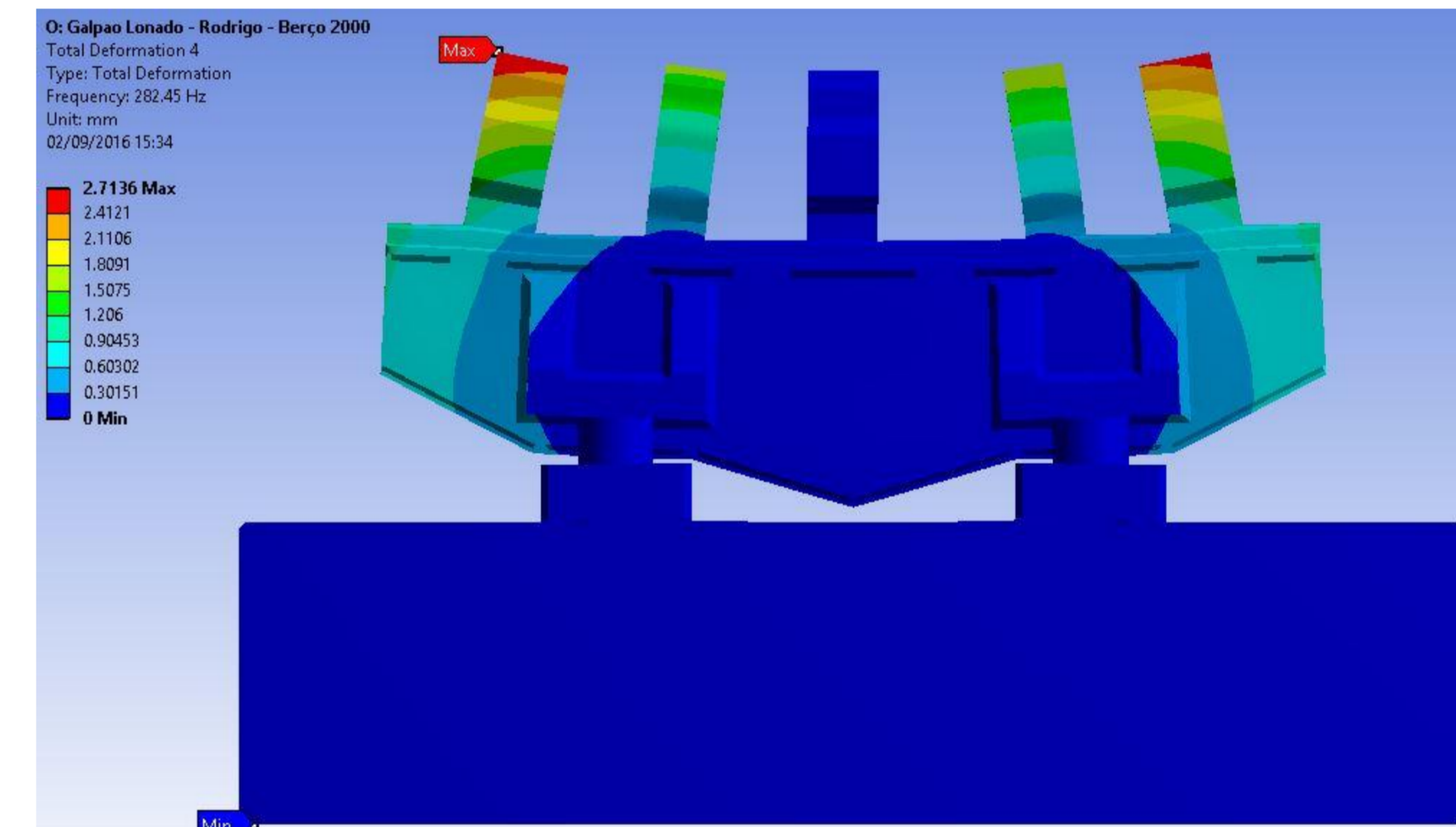
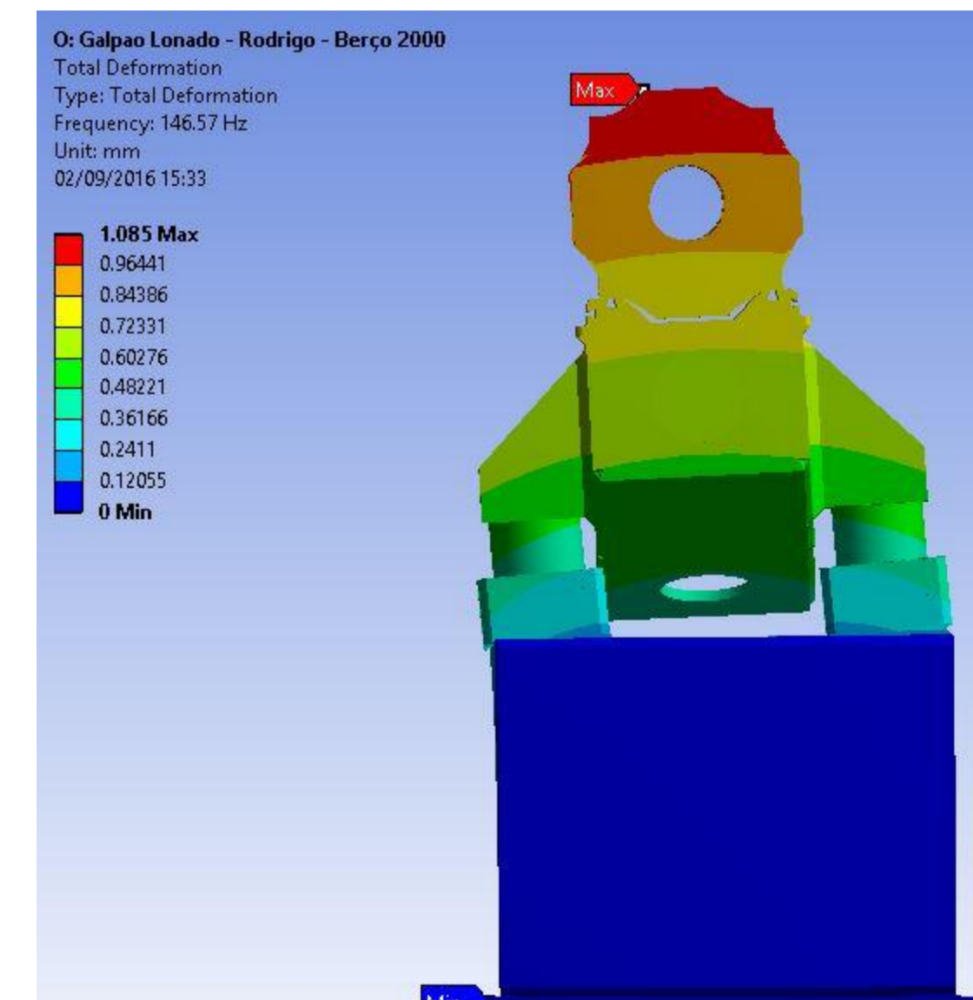
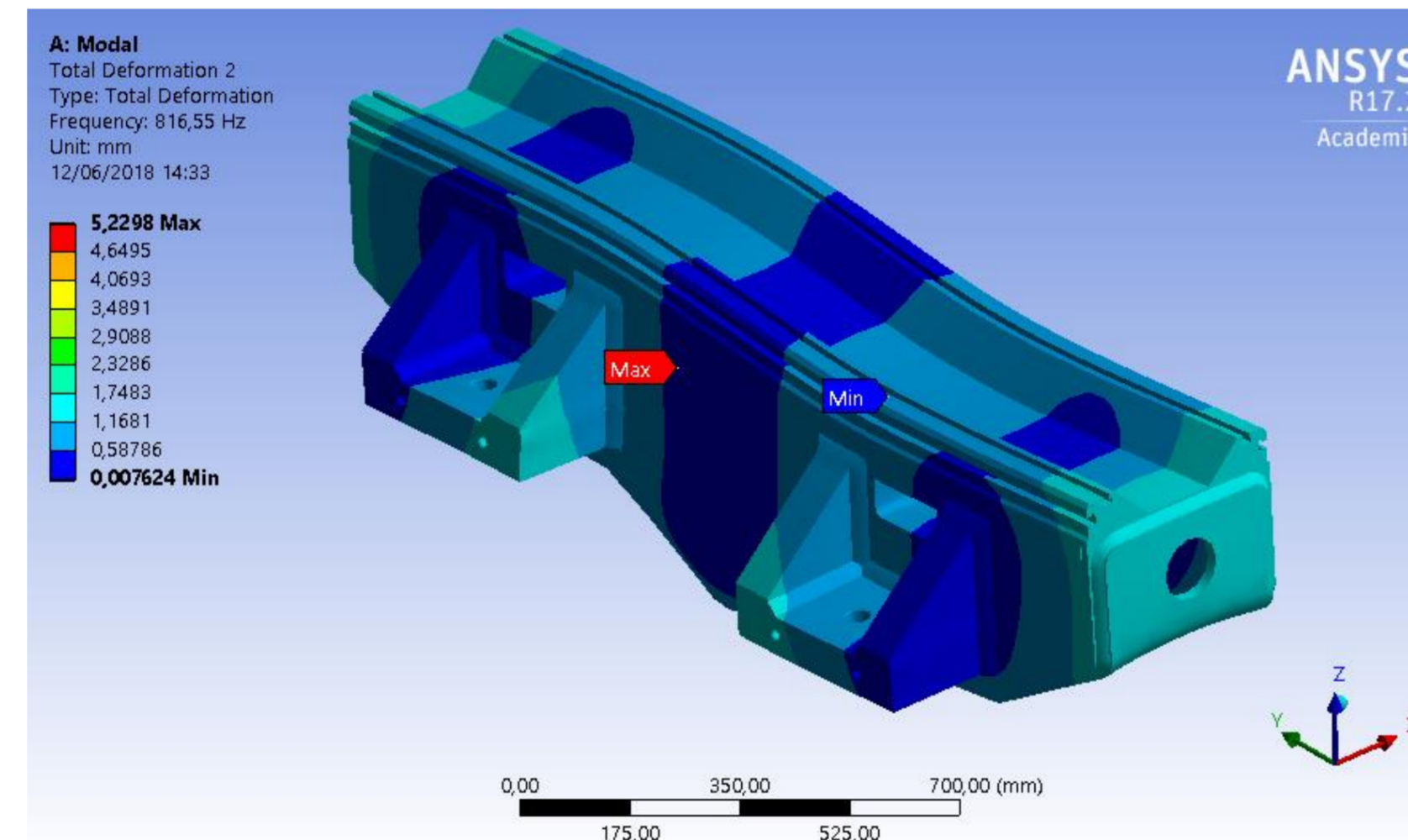
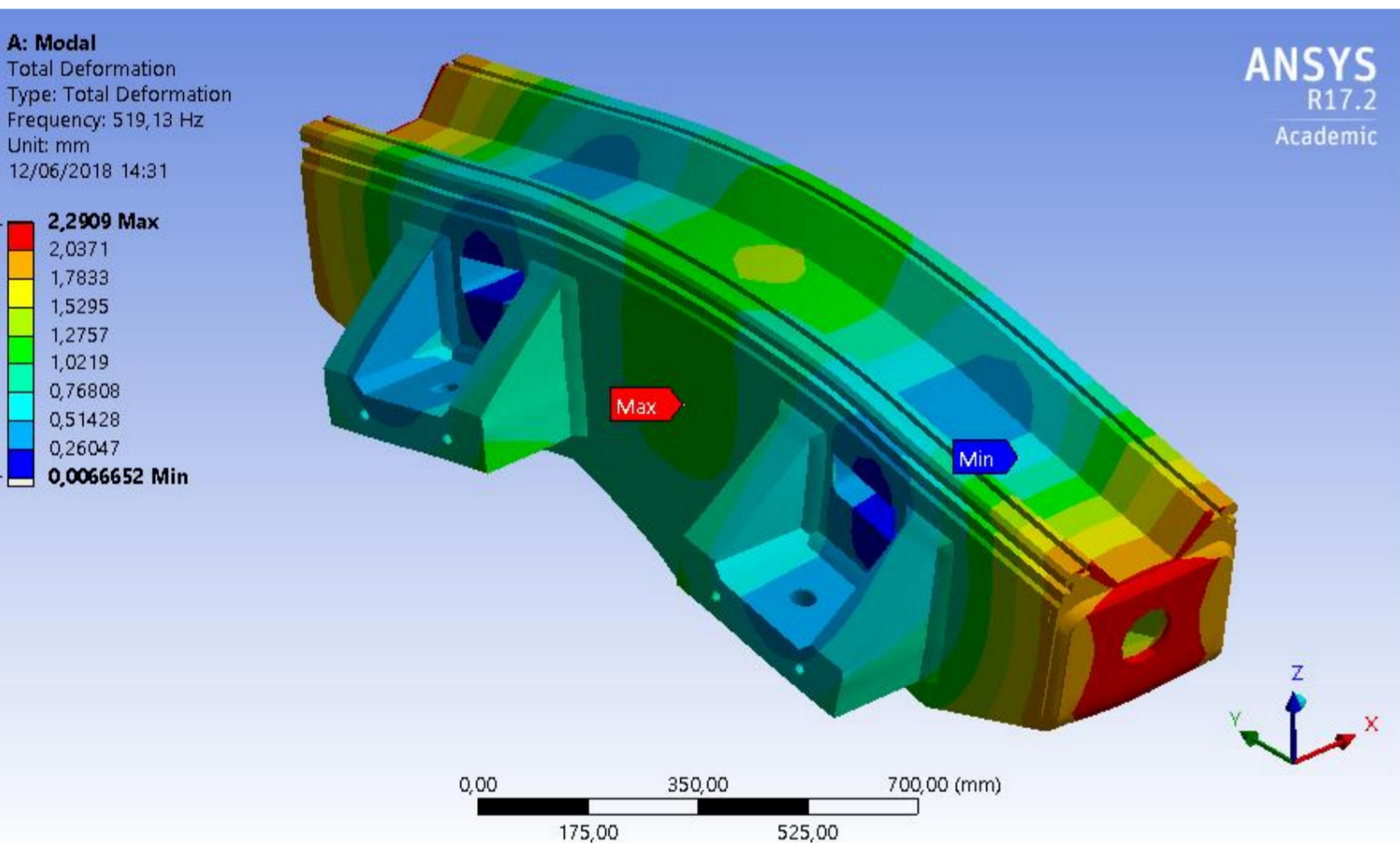
2014
Concrete Pedestal + Metallic Girder

Topology Optimization

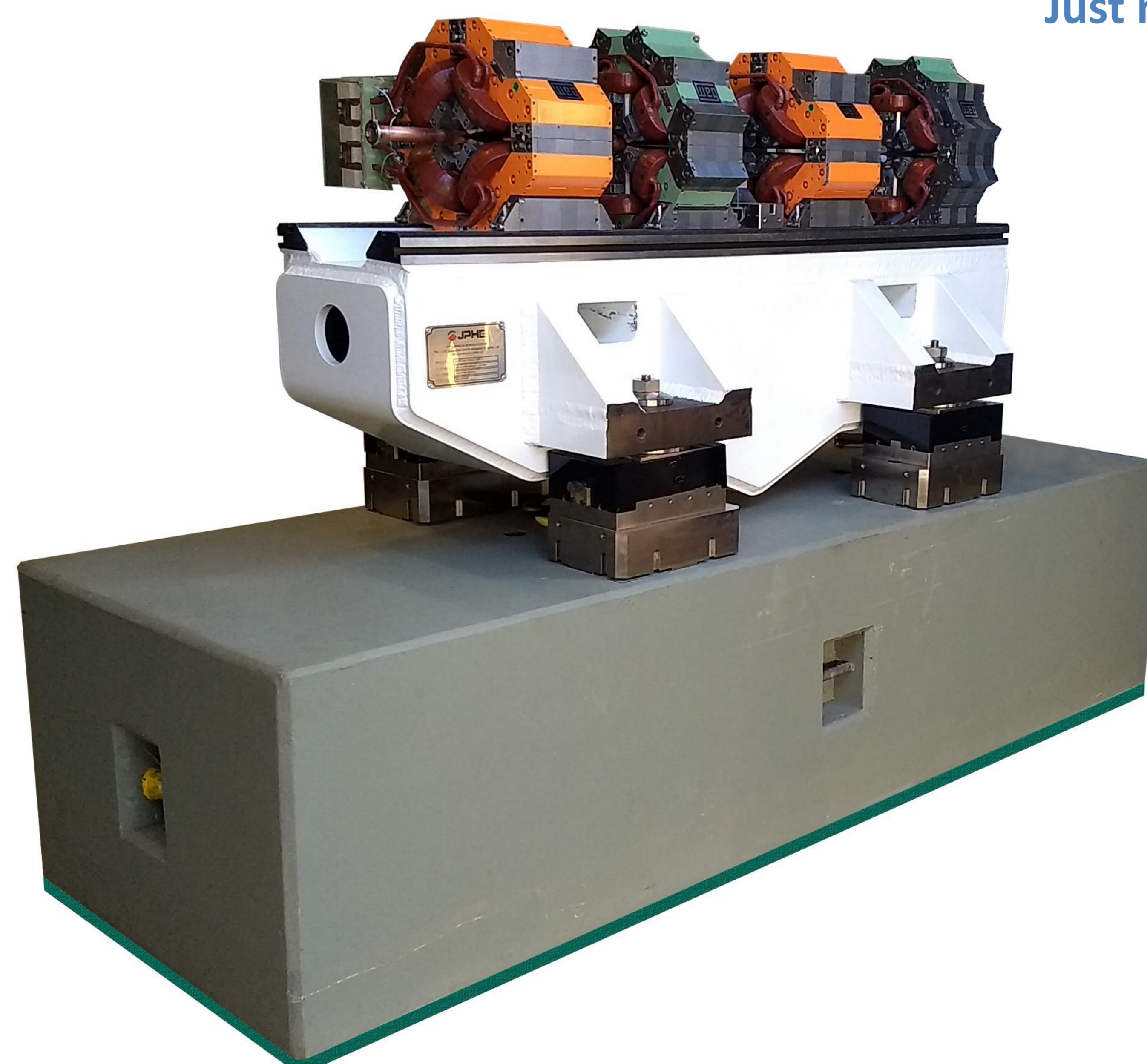
The optimization reduced the mass of the girder in 75 % (the girder weights 1,100 kg)



Modal Analyses: Girder and Girder System



Adopted Design



What's the recipe to make a girder system that resonates at 168 Hz horizontally and 270 Hz vertically?

Just mix the following ingredients:

- Very compact and precise magnets;
- A girder that is flat to 10 μm ;
- Rigid couplings;
- Levelling units that deform only 10 μm under a load of 50 kN;
- A concrete pedestal with elastic modulus of 60 GPa and compressive strength above 100 MPa;
- A resin with elastic modulus of 7 GPa.