Olympus Target and Vacuum System

Jim Kelsey

Specifications

- Target cell is a 27mm x 9 mm ellipse x 60 cm long. It will be made of 100 micron thick pure aluminum.
- Target cell will be connected to a frame that will be attached to a cryo-head and allow cooling to 20 K.
- Target cell will be protected by an upstream tungsten collimator with a 25mm x 7mm opening.
- Hydrogen flow will be 1.5×10^{17} Atoms/sec.
- Window opening will accommodate in plane angles from 80° to 20° from ±20 cm from the target origin. It will accommodate 10° from the origin as well as ± 18° out of plane.

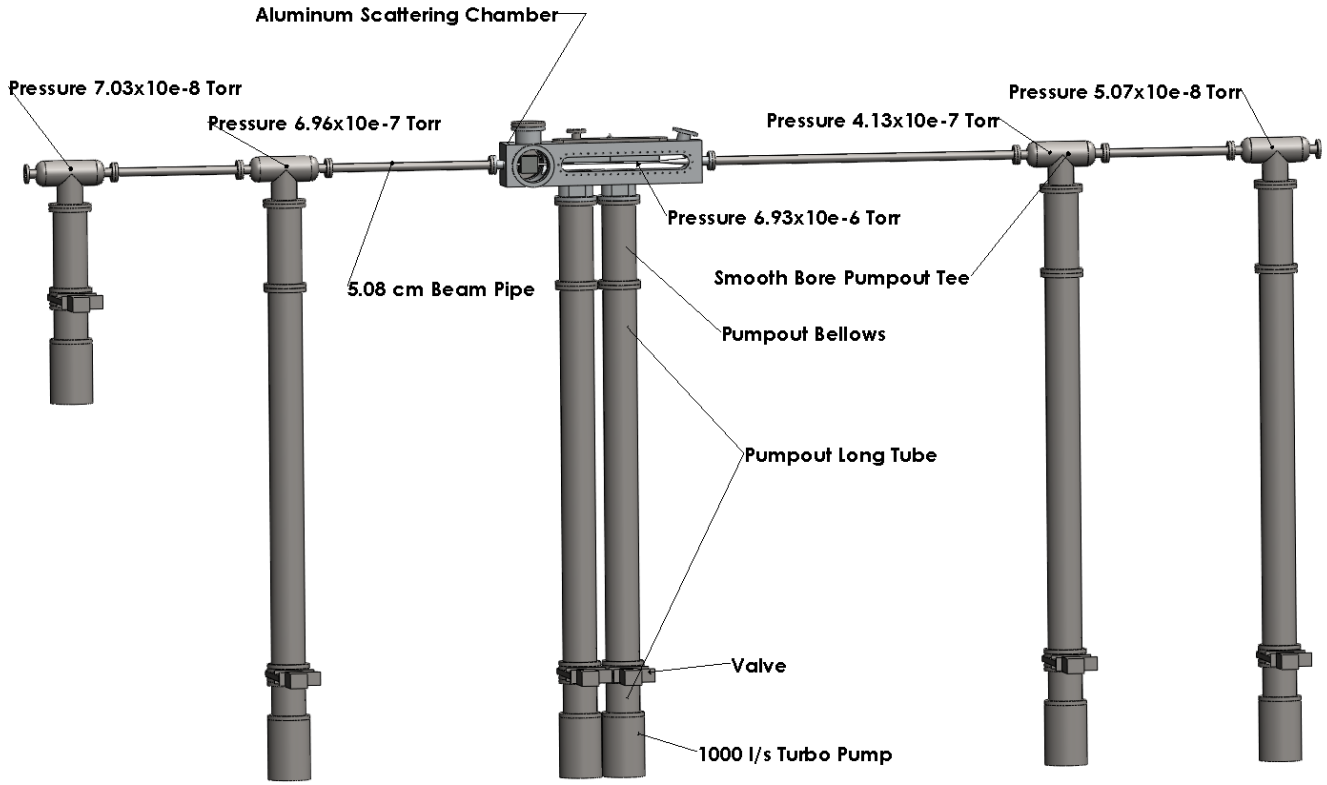
More Specs.

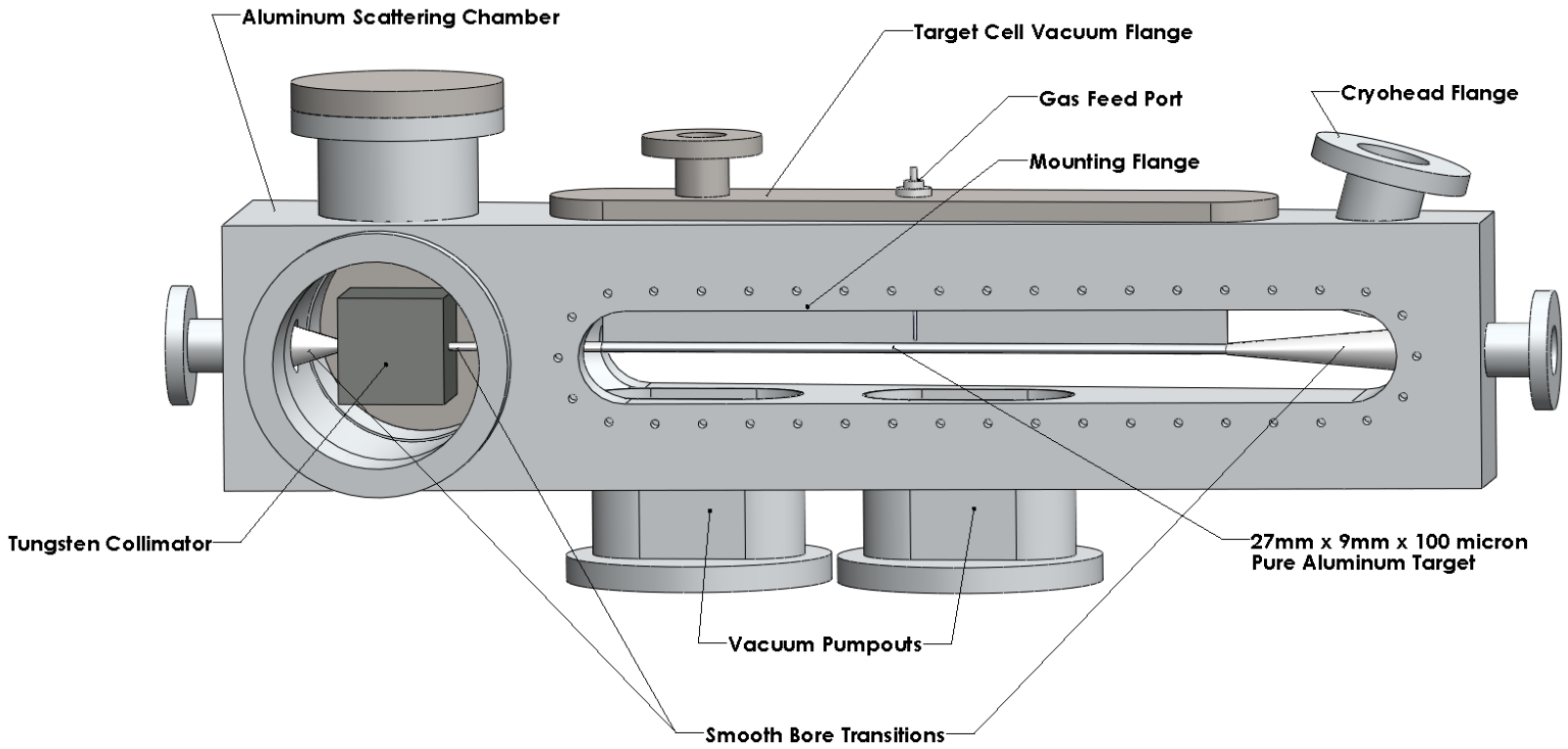
- Scattering Chamber windows will be 25 micron thick SS.
- Scattering Chamber will be made out of 6061 Aluminum.
- Vacuum system will be pumped using 5 stages of a “dry” system of Maglev turbos and hook and claw roughing pumps.
- Nominal vacuum will be in the 10e-8 scale at the end of these stages. This can be improved into the 10e-9 scale if necessary with the addition of NEG modules.
- Vacuum system will be all stainless steel. Supports will be 6061 aluminum.
- Beam line will be smooth bore throughout.

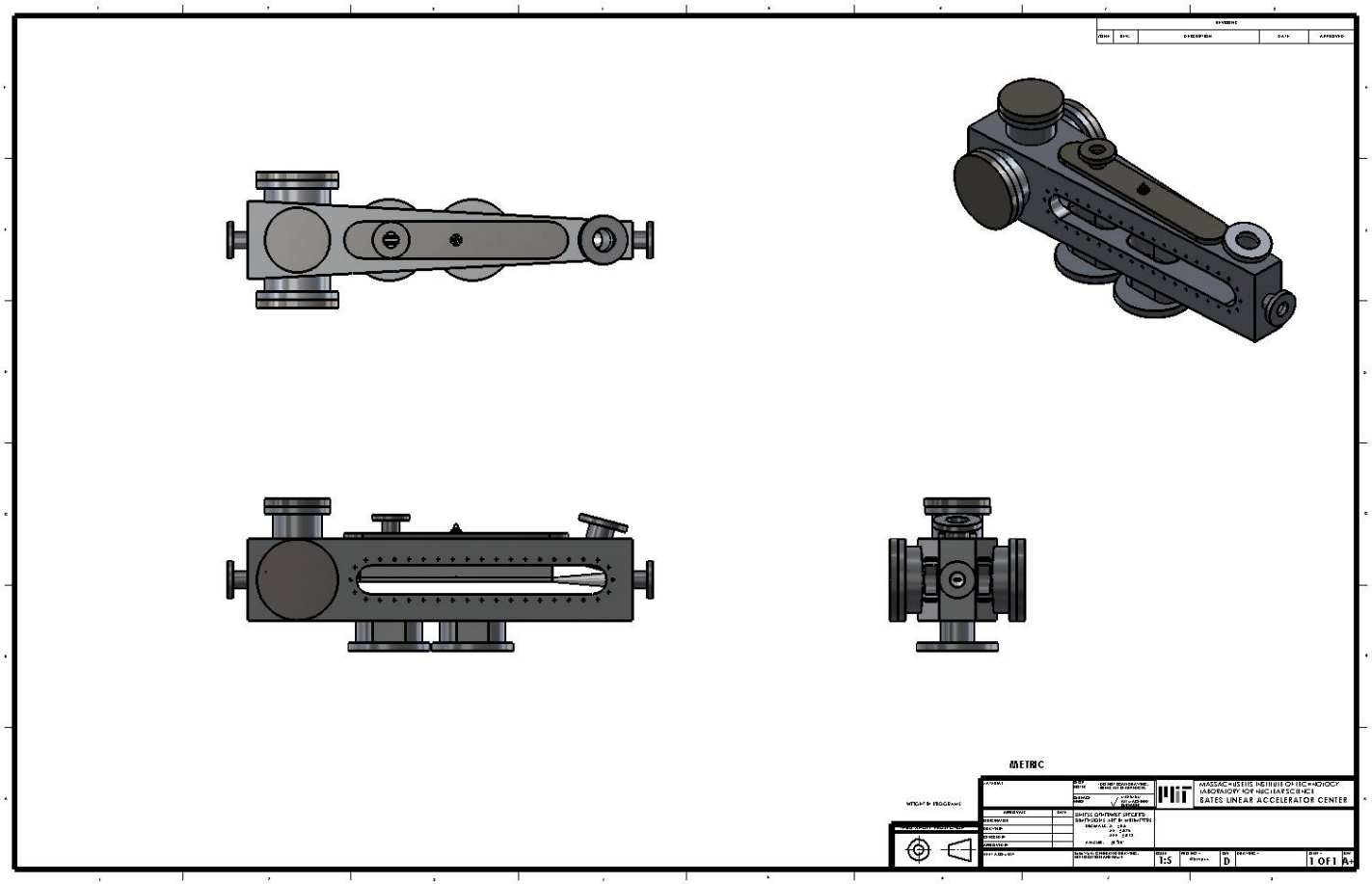
Alignment

- Target cell will be bore sighted in its “cold” state. We can then transfer these coordinates to the fiducials on the scattering chamber. We can then align the chamber to the interaction point and along the beam.
- Vacuum beam line can be surveyed at flanges and positioned to be centered on beam.

Vacuum system will have two configurations. One for beam tests and one for running with Olympus. These configurations mainly involve changing the height of the supports and the pump-out tube heights.




Aluminum Scattering Chamber
Target Cell Vacuum Flange
Gas Feed Port
Cryohead Flange
Mounting Flange
Tungsten Collimator
27mm x 9mm x 100 micron
Pure Aluminum Target
Vacuum Pumpouts
Smooth Bore Transitions


METRIC
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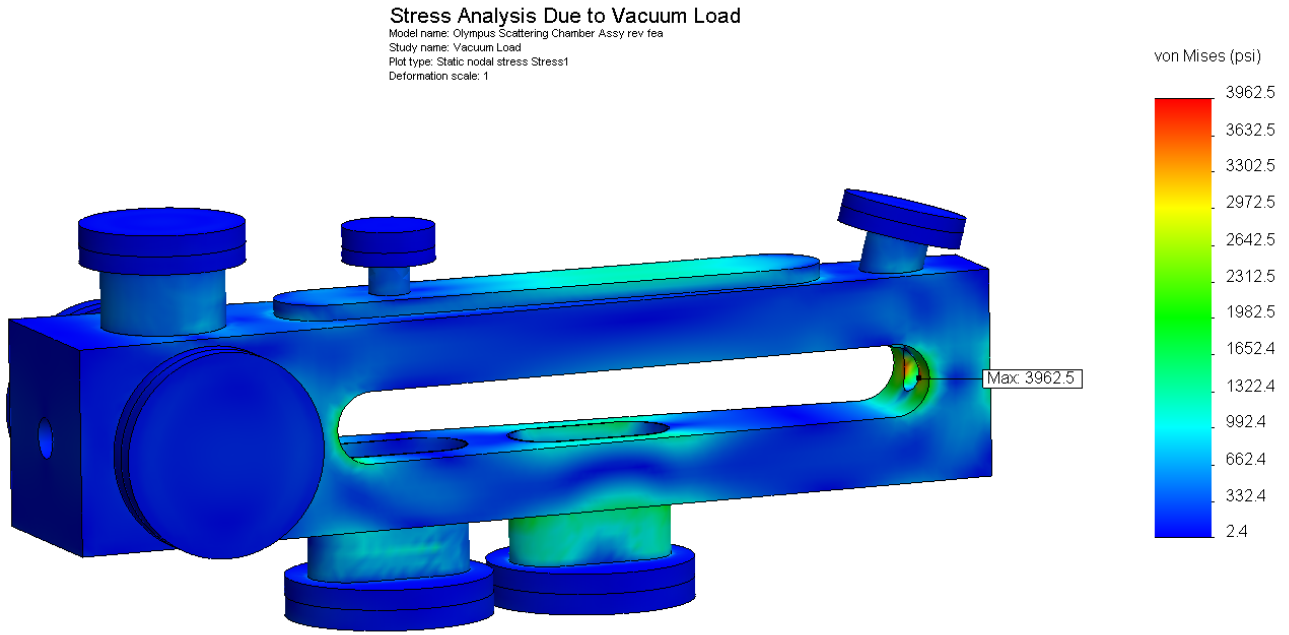
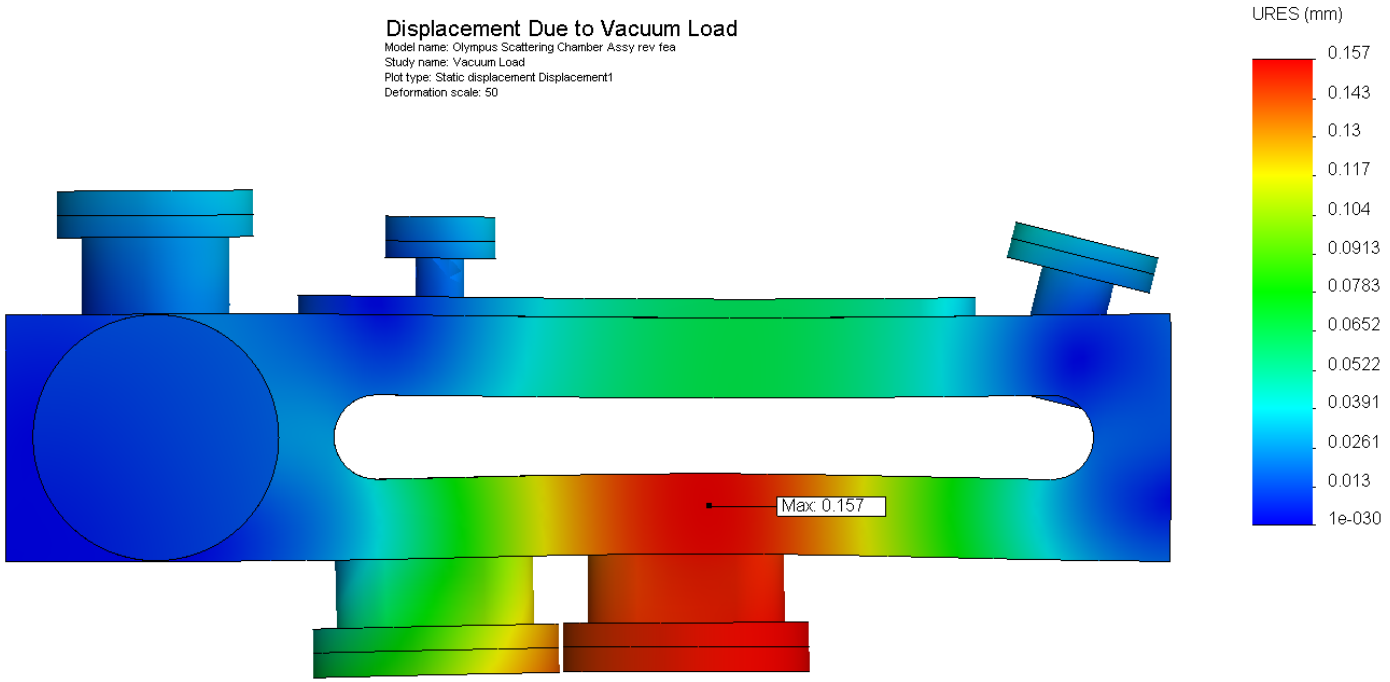

Stress Analysis Due to Vacuum Load
Model name: Olympus Scattering Chamber Assy rev fea
Study name: Vacuum Load
Plot type: Static nodal stress Stress1
Deformation scale: 1
von Mises (psi)
3962.5
3632.5
3302.5
2972.5
2642.5
2312.5
1982.5
1652.4
1322.4
992.4
662.4
332.4
2.4
Max: 3962.5


Displacement Due to Vacuum Load
Model name: Olympus Scattering Chamber Assy rev fea
Study name: Vacuum Load
Plot type: Static displacement Displacement1
Deformation scale: 50
URES (mm)
0.157
0.143
0.13
0.117
0.104
0.0913
0.0783
0.0652
0.0522
0.0391
0.0261
0.013
1e-030
Max: 0.157

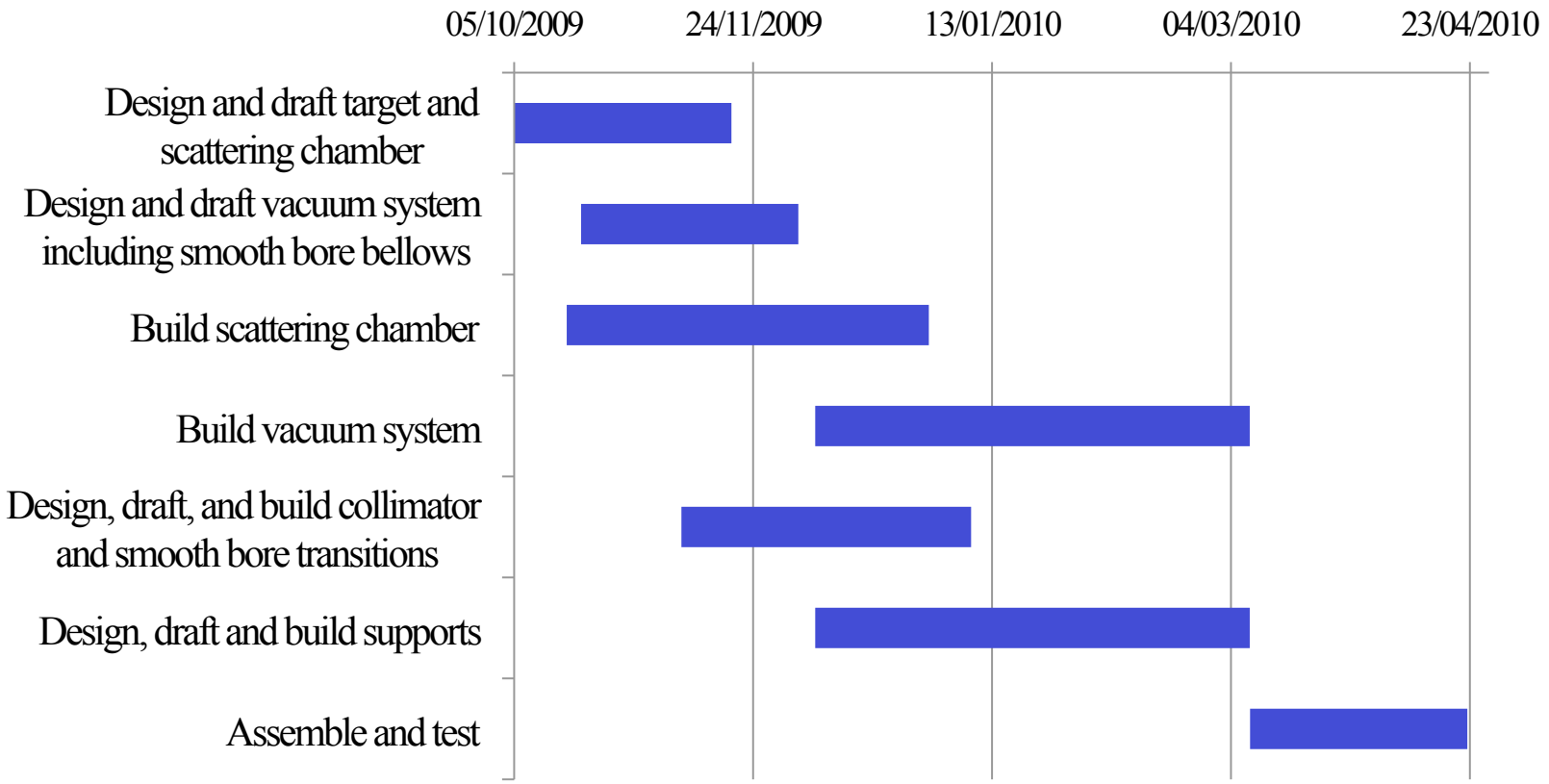
Target and Vacuum System Costs

	k$
Gas Feed System	30
Target Cell Cooling	30
Target Chamber	50
Wakefield Suppressors	10
Fixed Collimator	8
Control System	20
Vacuum System	75
Support Structure	50
Manpower	227
Total	500

Task Duration

Design and draft target and scattering chamber	1.5 months
Design and draft vacuum system including smooth bore bellows	1.5 months
Build scattering chamber	2 1/2 months
Build vacuum system	3 months
Design, draft, and build collimator and smooth bore transitions	2 months
Design, draft and build supports	3 months
Assemble and test	1.5 months

Schedule


05/10/2009
24/11/2009
13/01/2010
04/03/2010
23/04/2010
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Design and draft vacuum system including smooth bore bellows
Build scattering chamber
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