

# Tapered Double Height Waveguide Flange

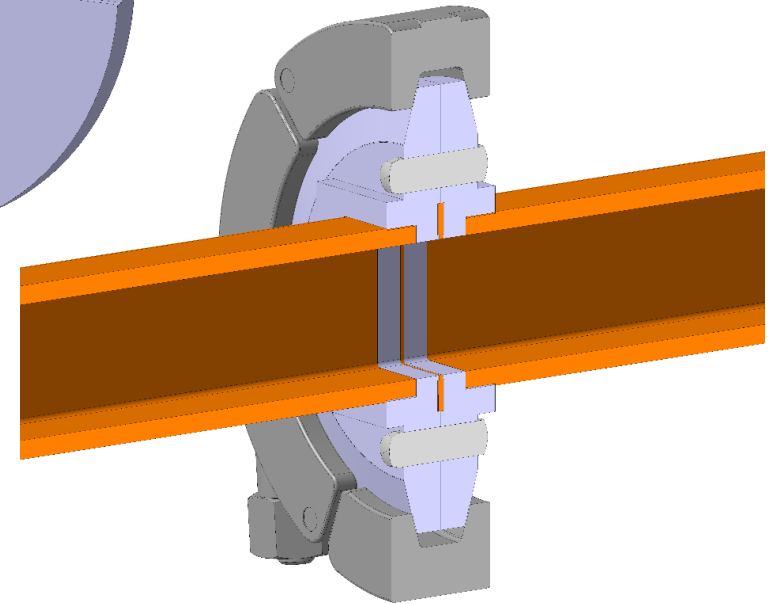
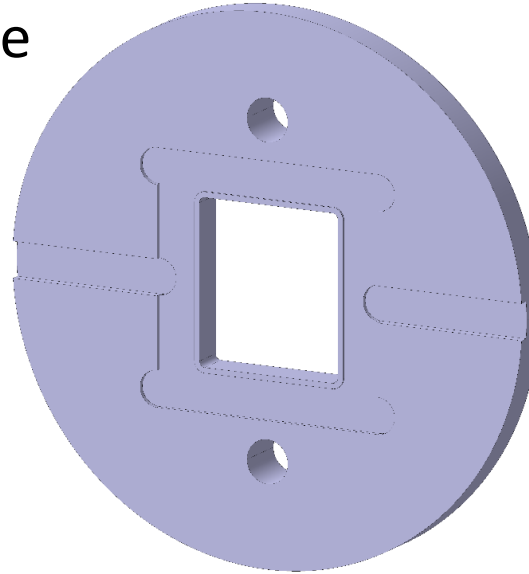
Matthew Capstick

04-03-21

# Alternative Flange Design

Markus suggested an alternative flange based around the:

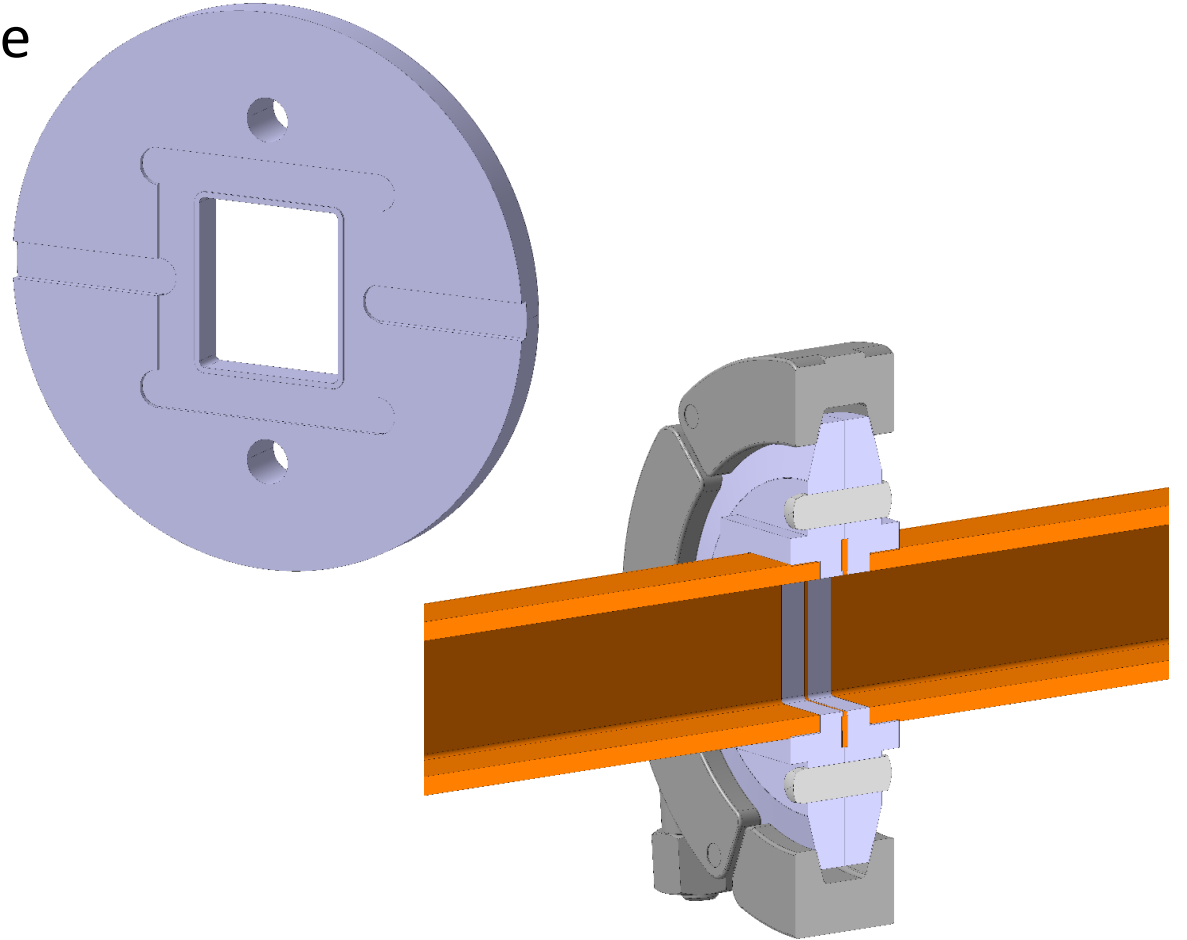
- IUWR90 gasket RF connection and vacuum seal
- KF50 equivalent external geometry
- Would require alignment features (pins or dowels) to fix rotation
- Whether the KF50 clamp would produce enough clamping force is unknown



# Alternative Flange Design

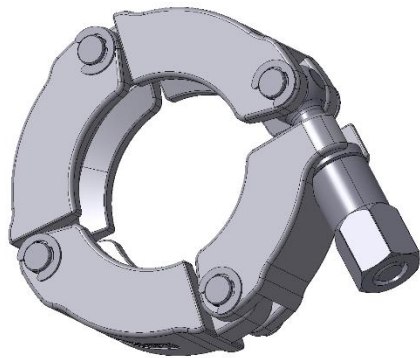
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# Clamping Force Calculations

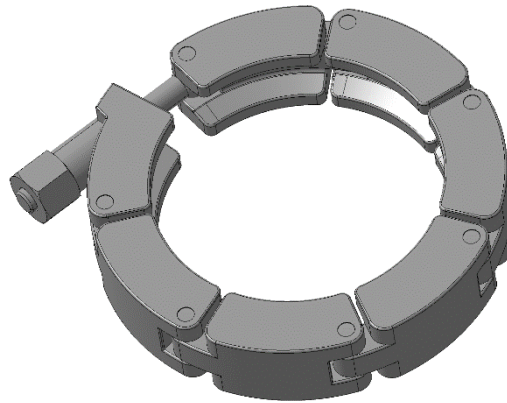
**KF40 Chain Vacom**



**QCF DN63 Chain Vacom**



**KF50 Chain Pfeiffer**



**KF50**



	<b>KF40 Chain</b>	<b>QCF DN63</b>	<b>KF50 Chain</b>	<b>KF50</b>
Axial Line Pressure: [N/mm]	250	565	244	140
Total Axial Force: [kN]	54	186	68	30

# Clamping Force Calculations

Copper CF Gaskets require a sealing pressure greater than 200N/mm (range 150N/mm – 600N/m) [Pfeiffer Vacuum](#)

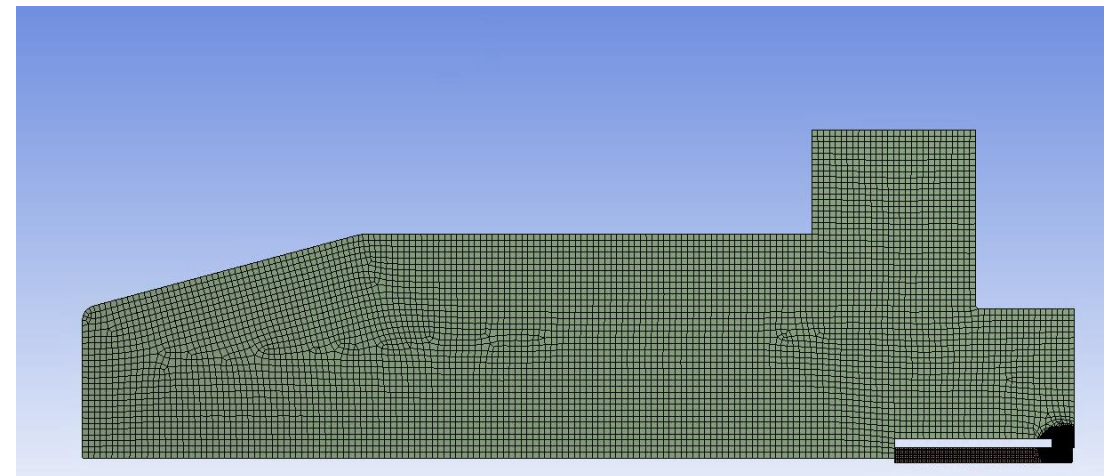
	<b>KF40 Chain</b>	<b>QCF DN63</b>	<b>KF50 Chain</b>	<b>KF50</b>
Axial Line Pressure: [N/mm]	250	565	244	140
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These Vacom chains are specifically designed for use with QCF connections are therefore CF copper gaskets.

Required clamping pressure is likely higher for the square knife-edge on this flange

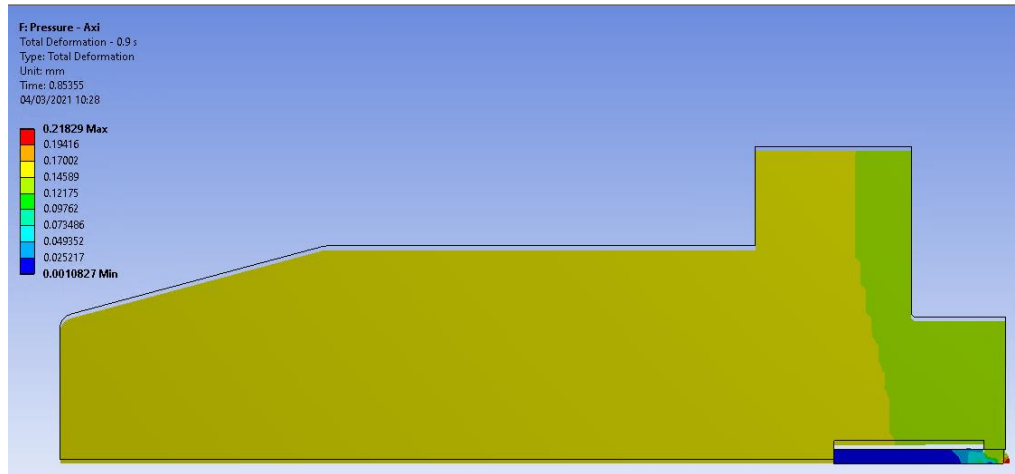
# Required Clamping Pressure

- First analyses:
  - A 2D section from the 'long edge', 'short edge', and through the corner
    - Treated axisymmetrically, correct for the loading but incorrect for the gasket
  - Manually calculated pressure applied to the taper
  - Gasket modelled with 'non-linear copper' from the materials database
  - Contact modelled as frictional with a relatively high coefficient of friction
    - $\mu = 0.5$ , found in previous flange analysis



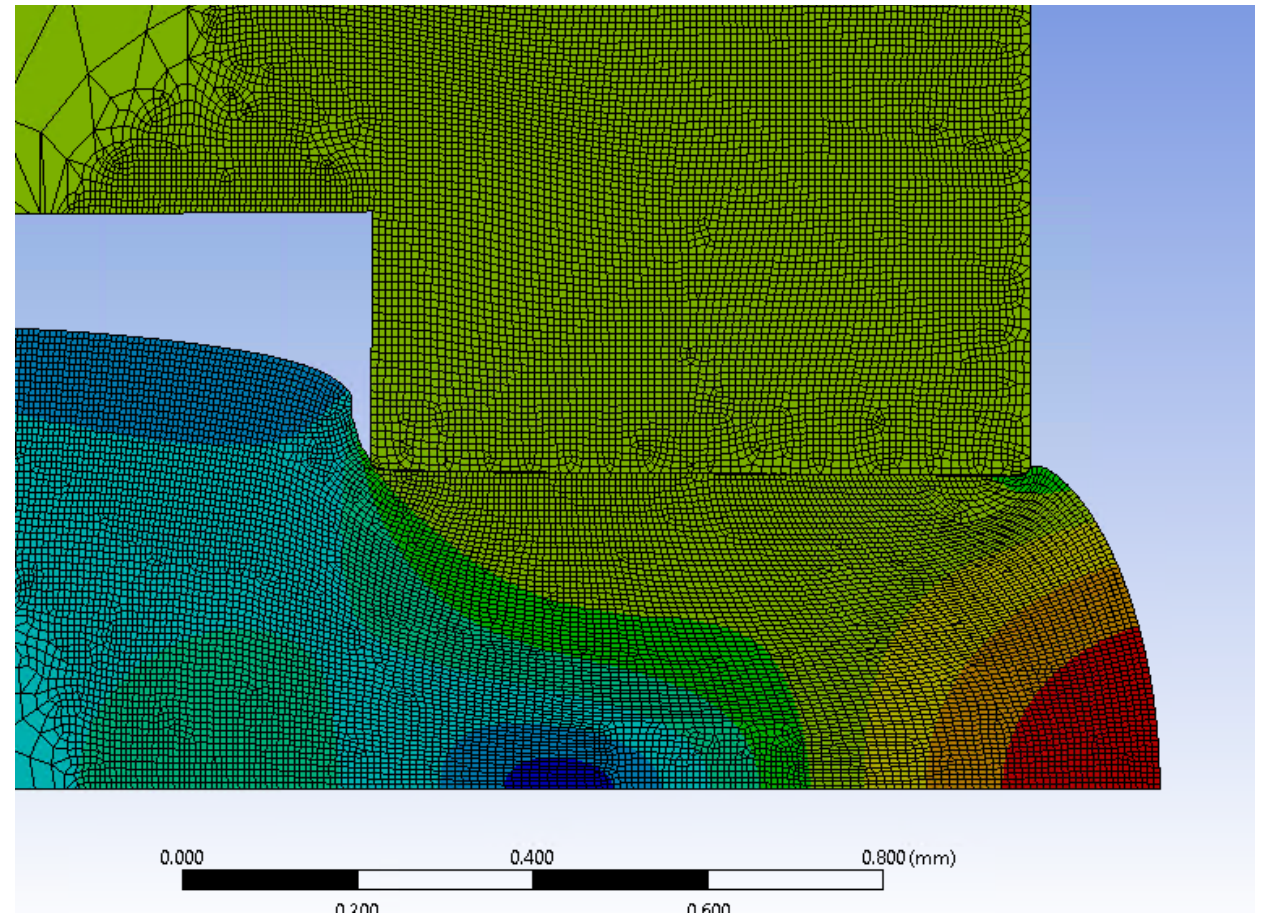
# Results

## Deformation



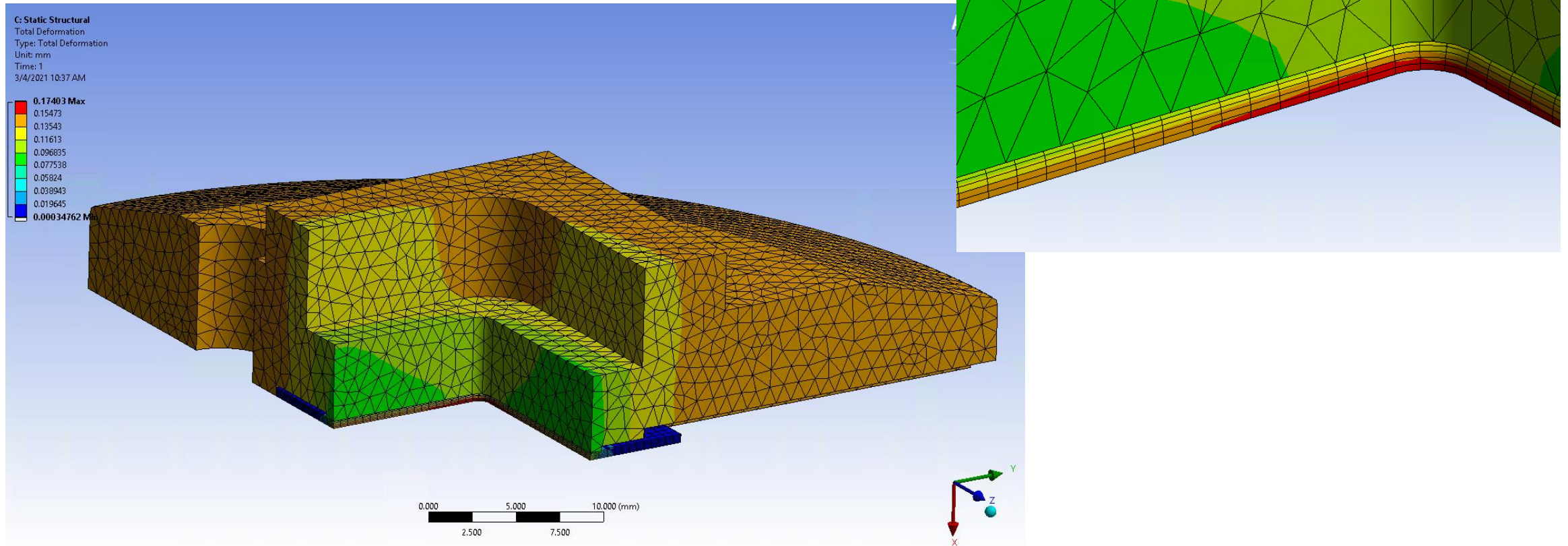
The flange reaches the centreline, and the gasket reaches maximum deformation at 85% of the maximum QCF DN63 Clamp pressure

## Gasket Deformation





# 3D



Low detail 3D model of the corner seems to backup the 2D analysis