DRIVE SYSTEM DESIGN

OUR EXPERTISE DRIVES INNOVATION

EVS35 OSL2022

Challenges in Optimising System NVH Performance of Electrified Powertrains through Developing Correlated Component Models

Speaker: George Scott

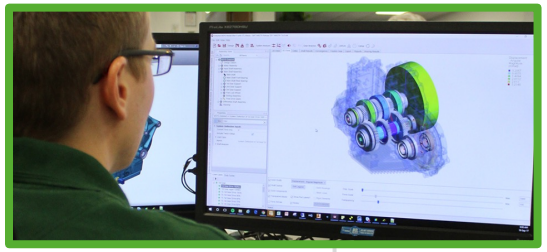
14th June 2022

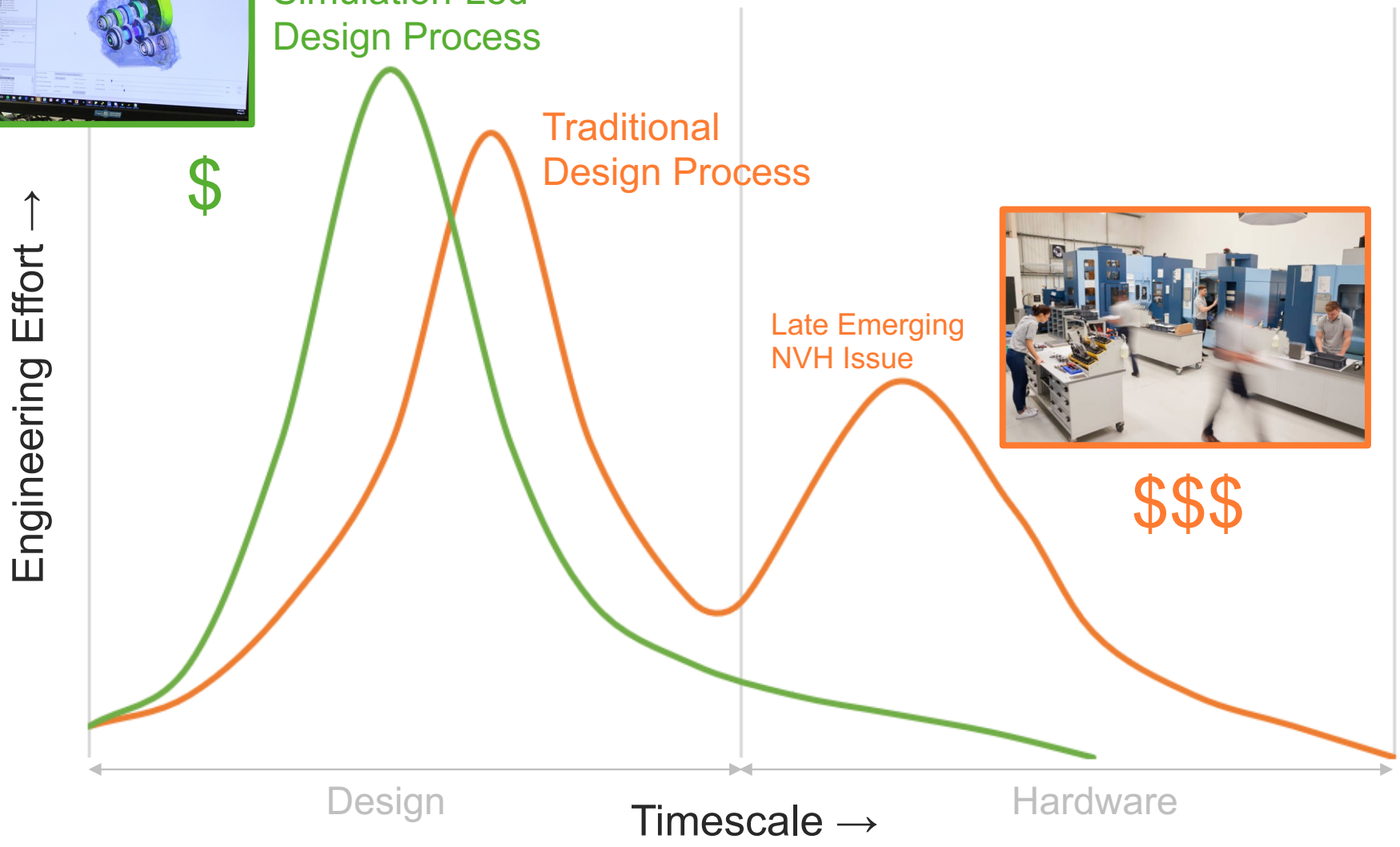
Why Simulation-Led Design for NVH?

- Faster product to market

- Reduced development cost

- Improved reputation

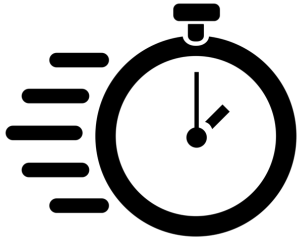


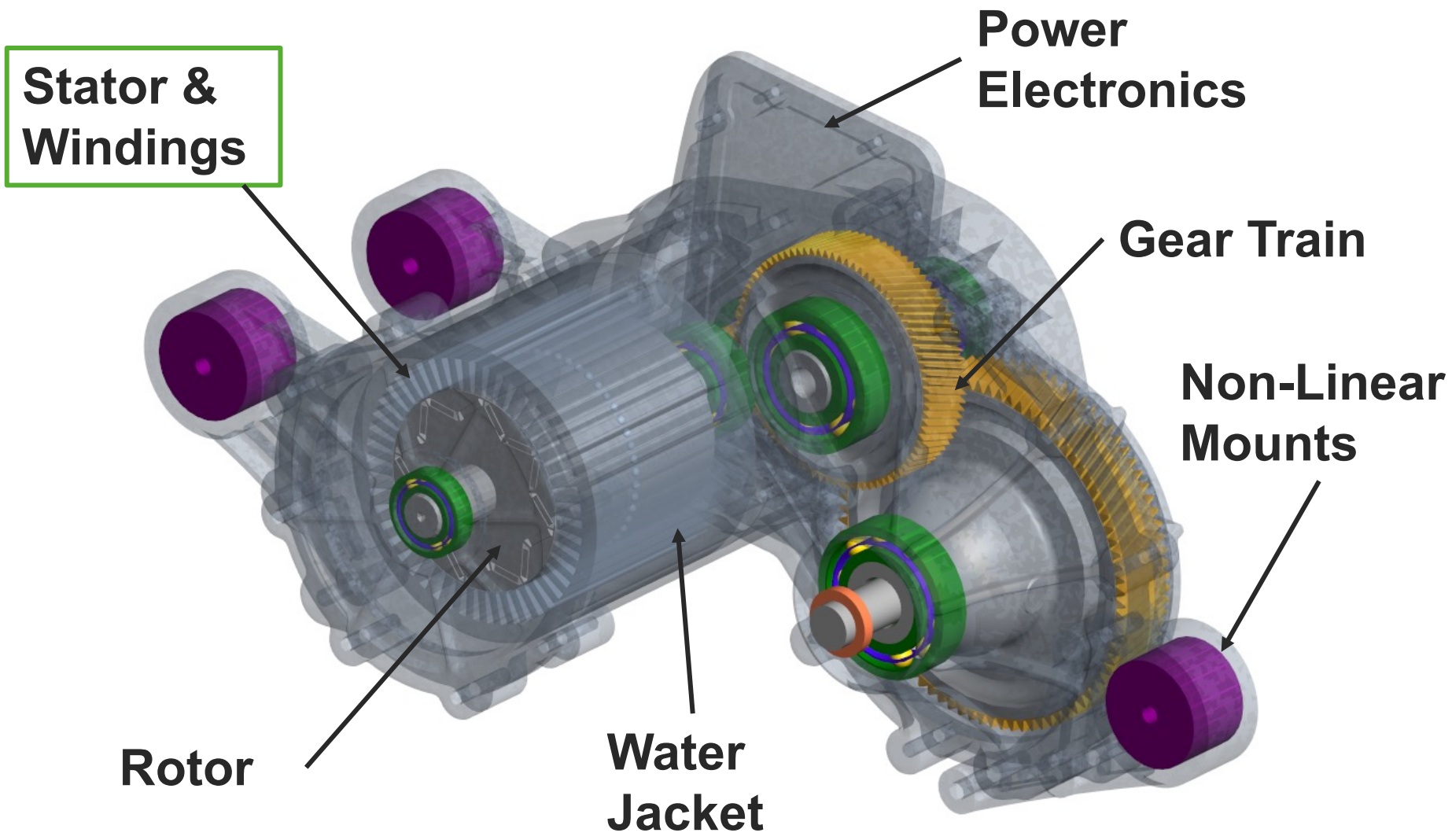


System Level Modelling Approach

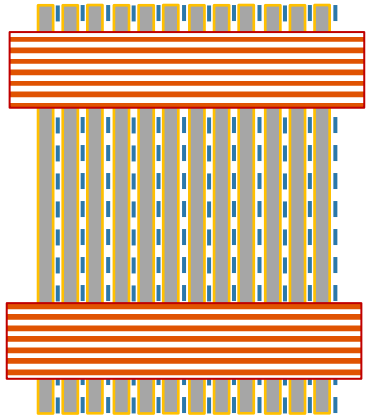
- Accurate simulation

- Fast solution times





Challenges in Modelling Joints and Contacts



Steel Laminations

Bonding

Copper Wire

FE Joints/Contacts

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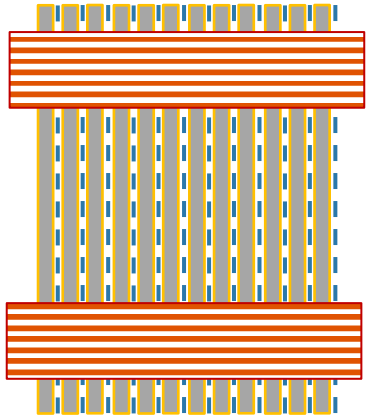

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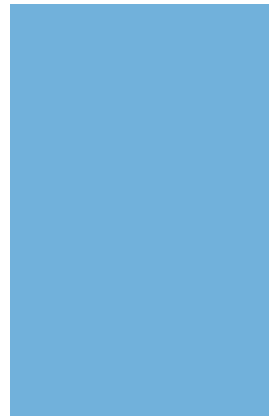
Isotropic

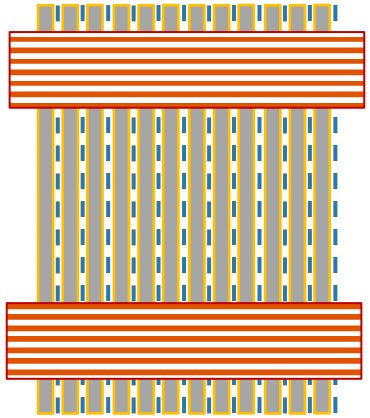


Material Properties

$E_1 = E_2 = E_3$

$G_{12} = G_{13} = G_{23}$

Challenges in Modelling Joints and Contacts



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Orthotropic/Anisotropic

Solution

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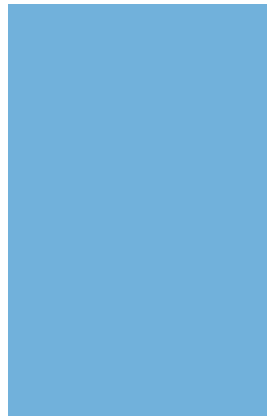
- Accurate



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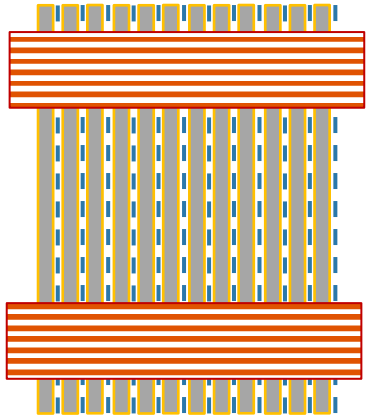

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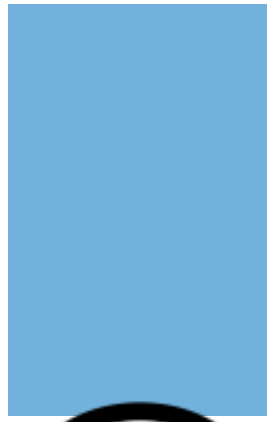

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Modal Testing & Simulation Correlation

Inputs to System Model

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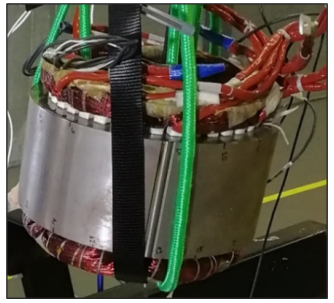
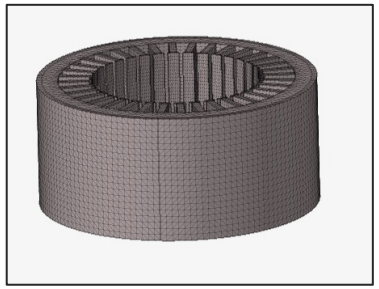
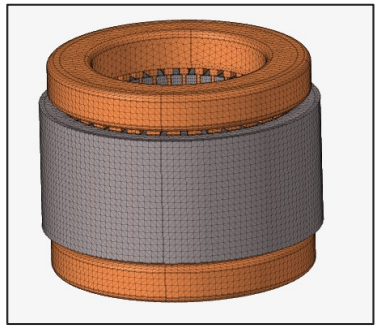
Modal Testing



Modal Simulation





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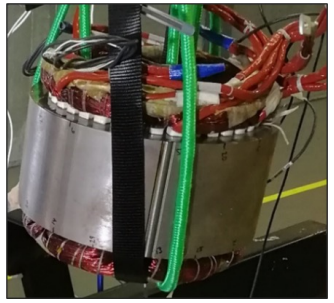

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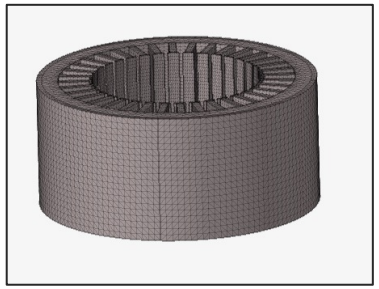
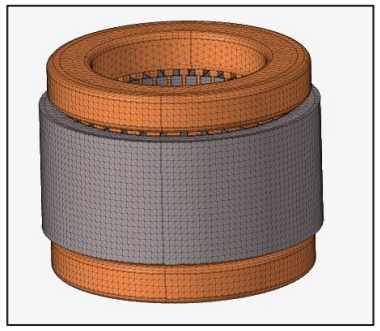
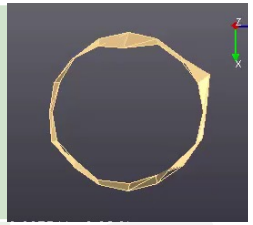
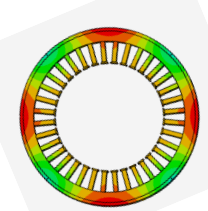




Simulation Correlation

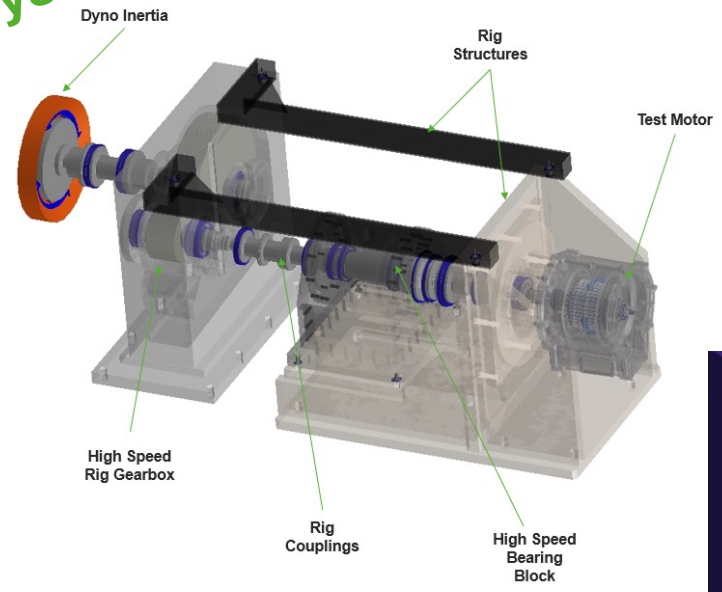
Mode	#1 Ring 2,0 Mode	#2 Bending 2,1 Mode	#3 Tri-lobe 3,0 Mode
Tested Frequency (Hz)	675	780	1808
Simulated Frequency (Hz)	678	777	1775

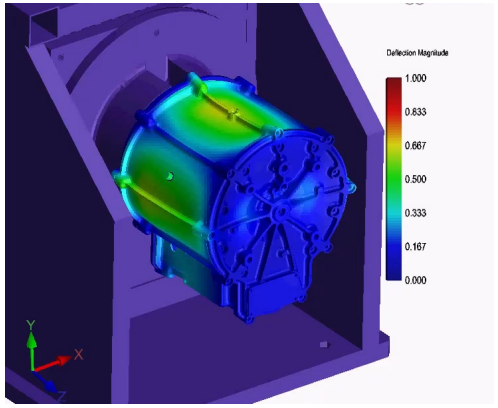




System NVH Response Correlation

Sub-System/System Simulation





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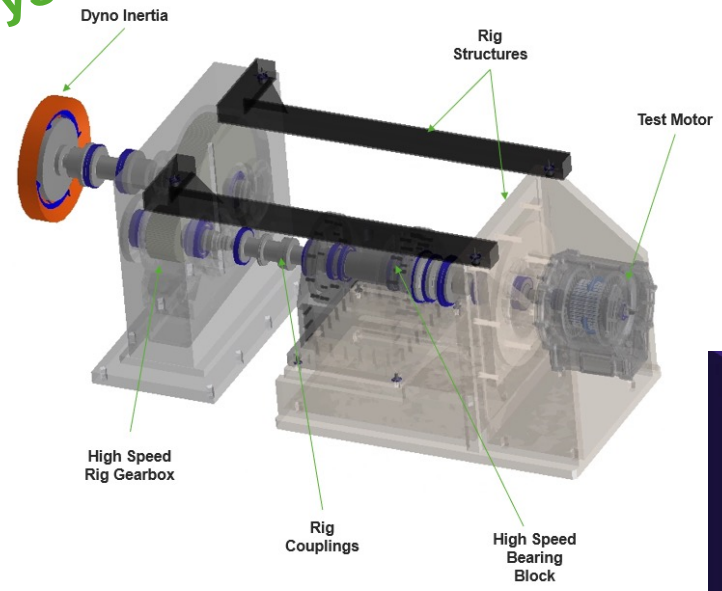
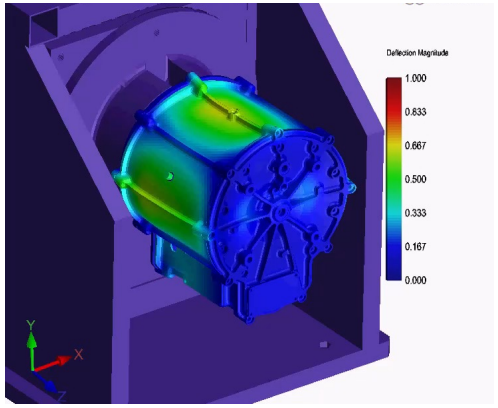
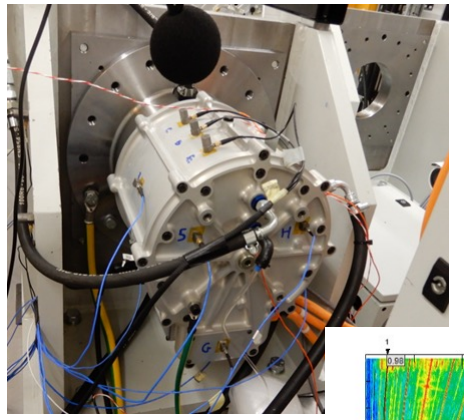
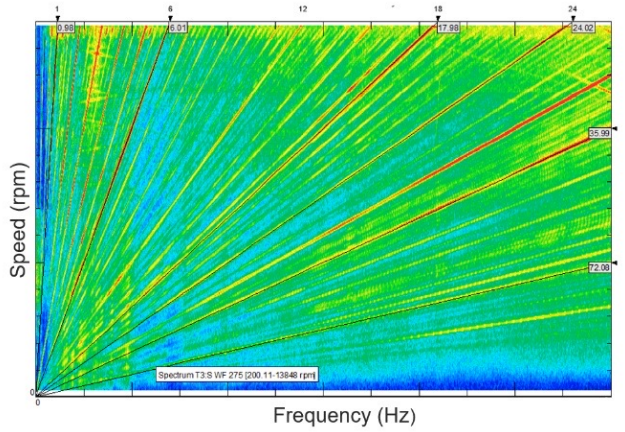


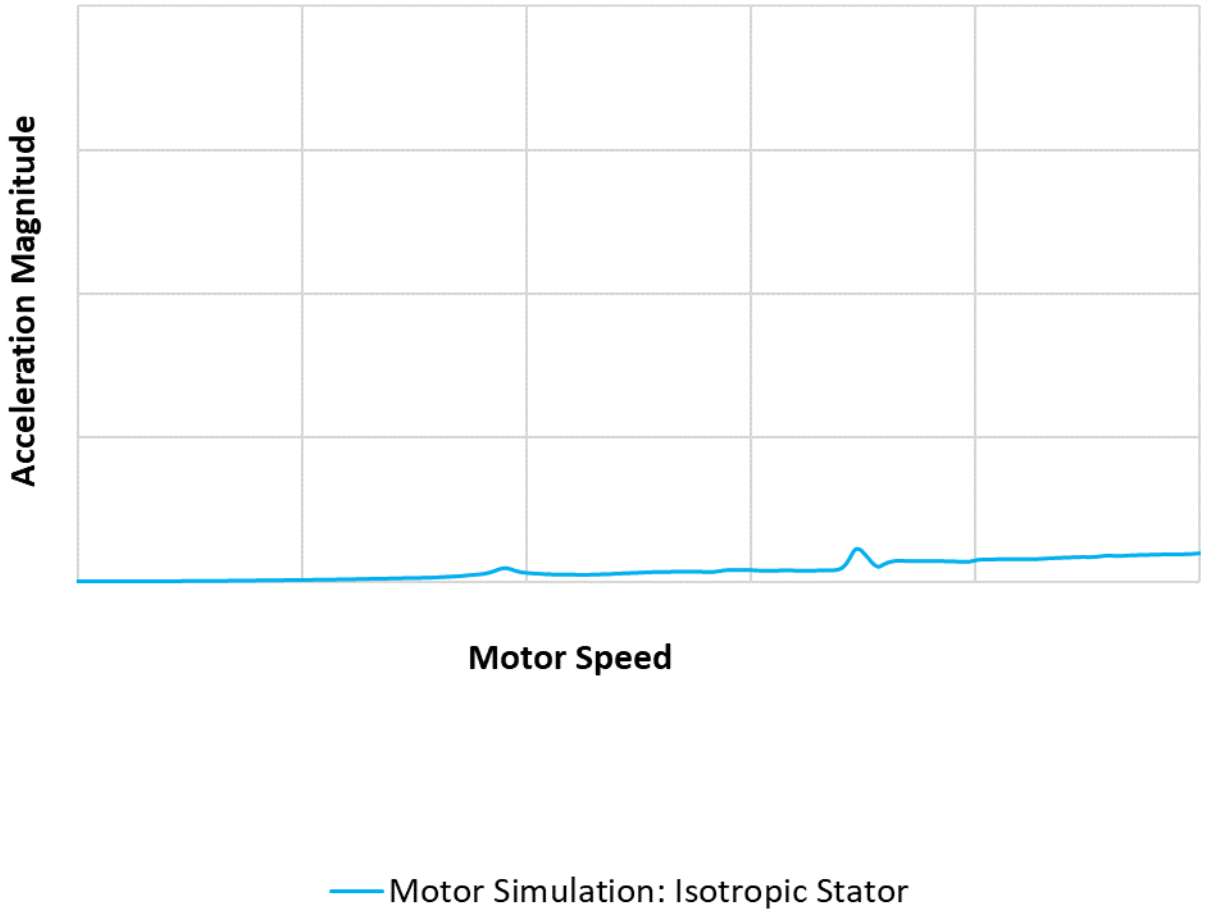


Sub-System/System Testing





Motor NVH Response Correlation – 6th Order



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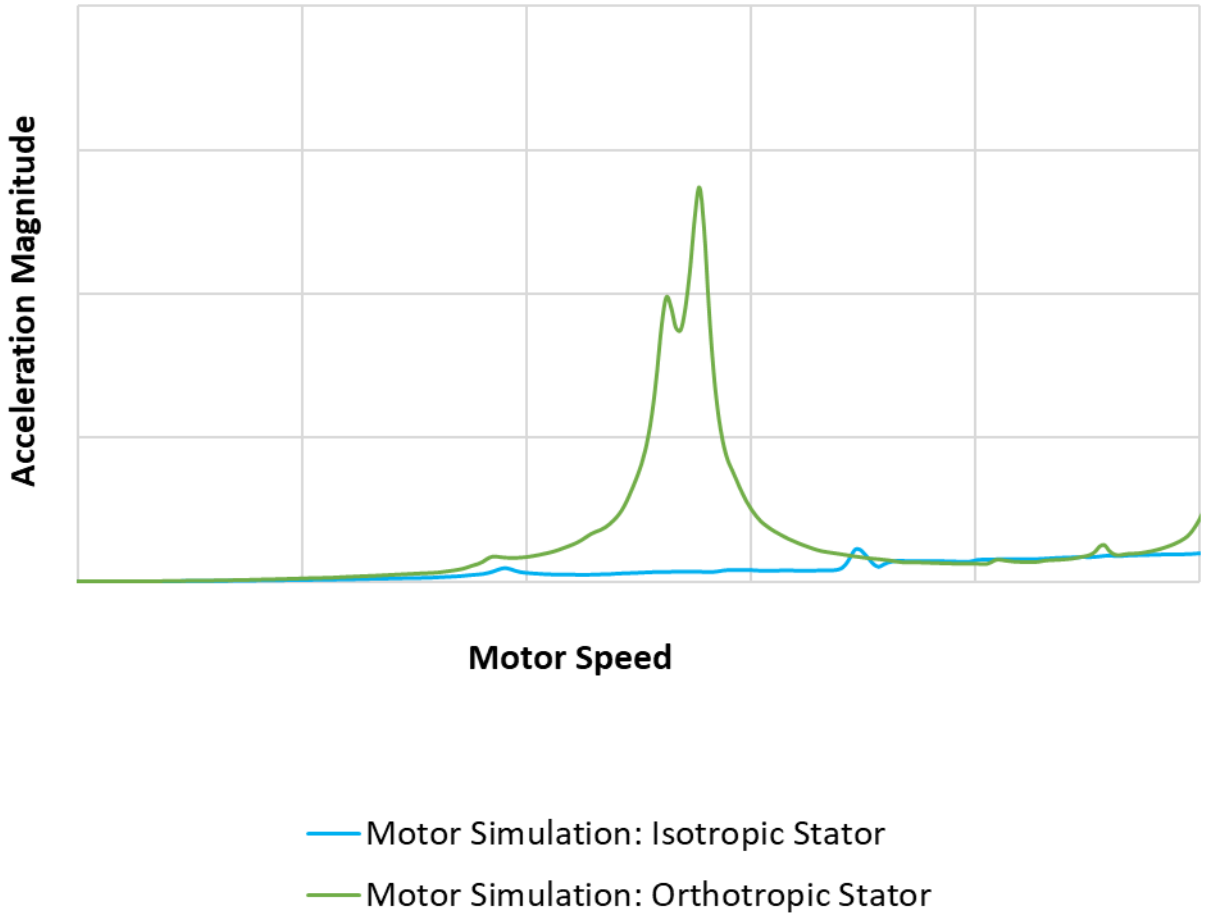

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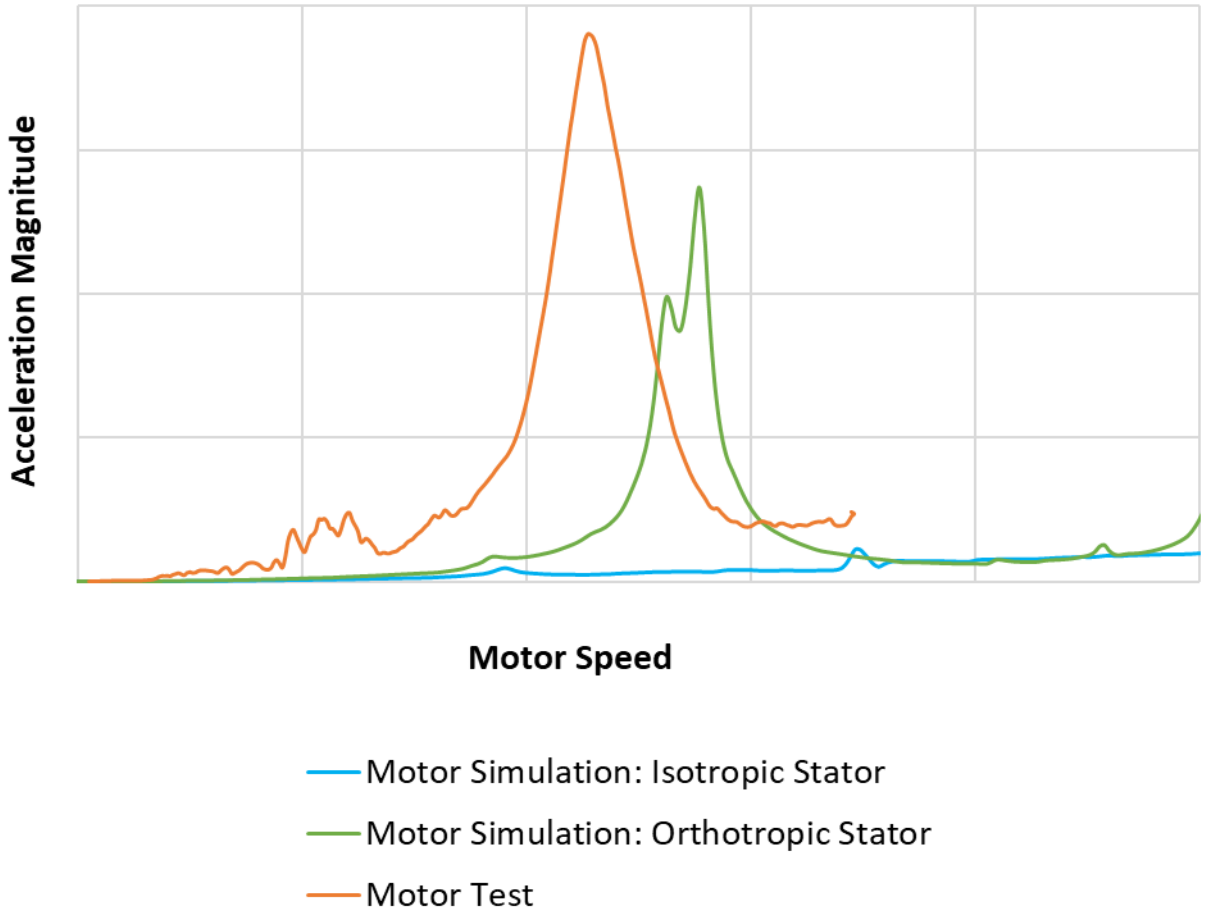
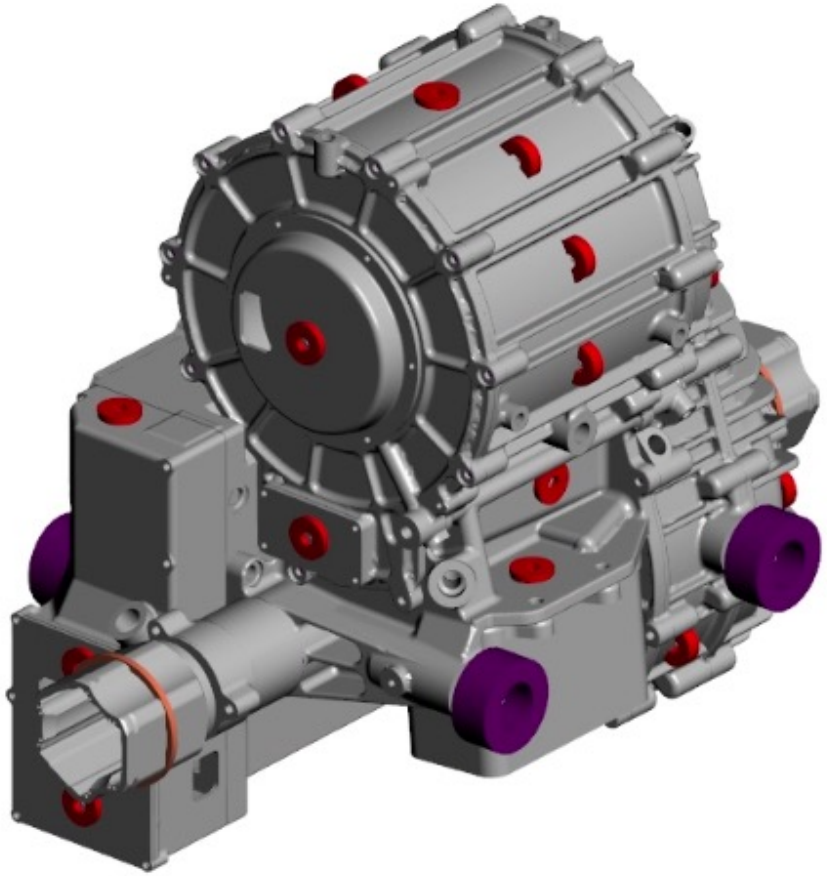
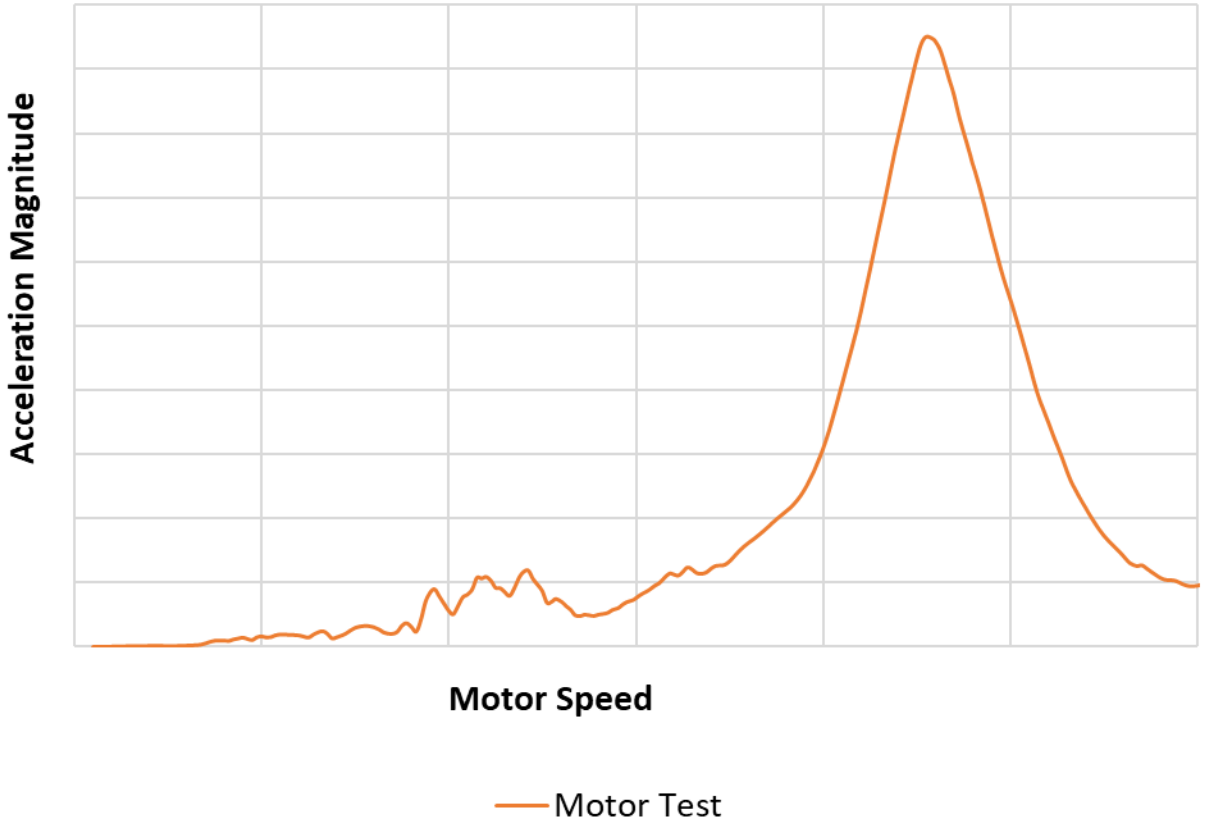


EDU System Response – 6th Order





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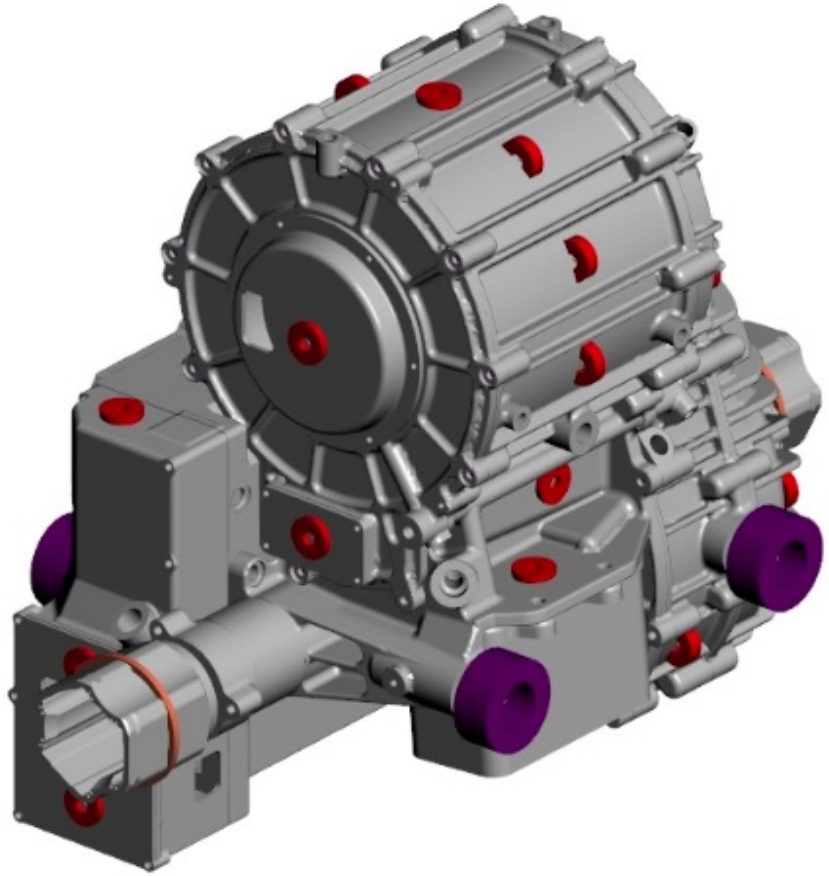

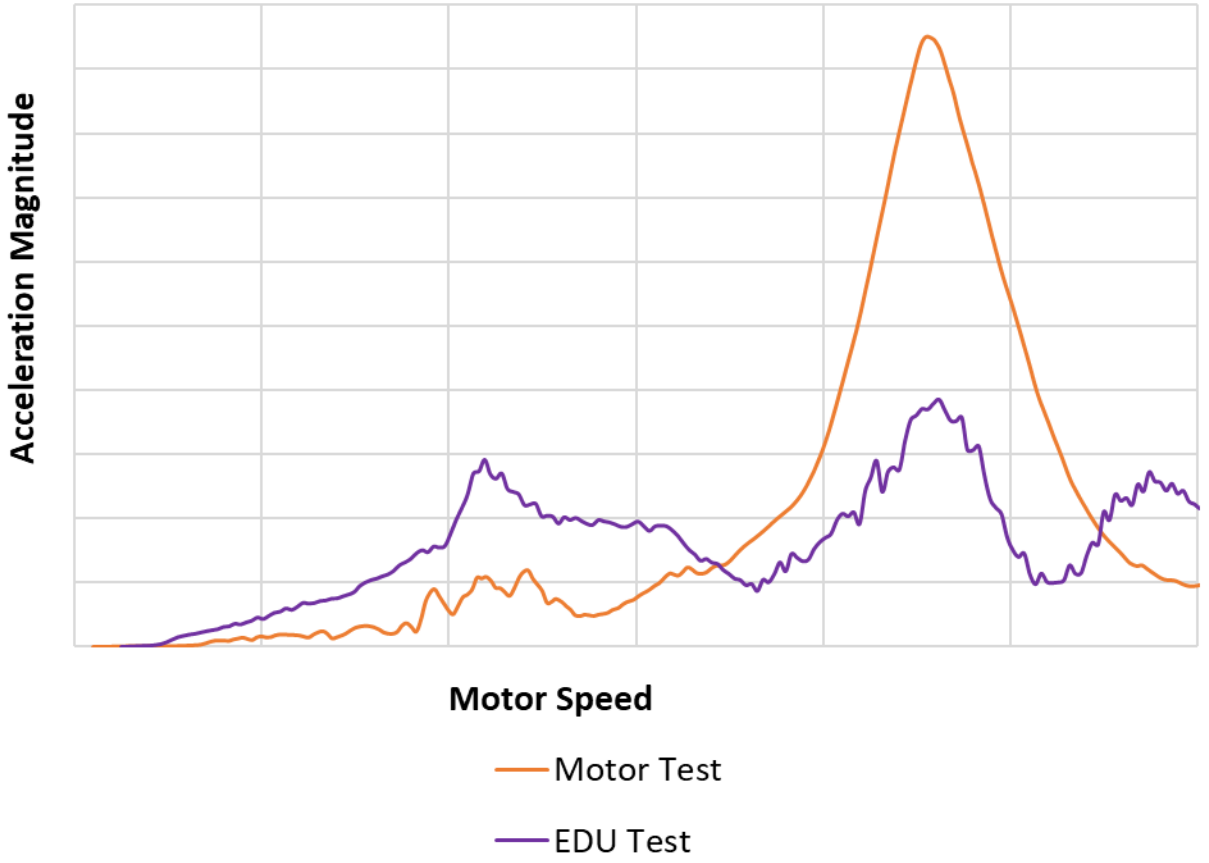

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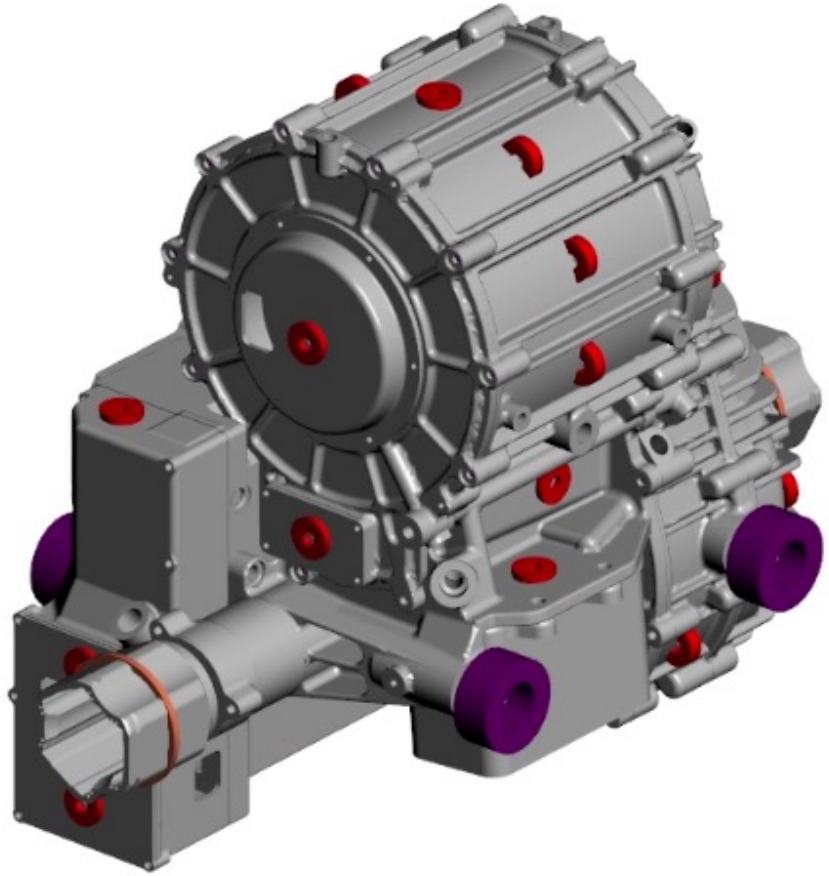

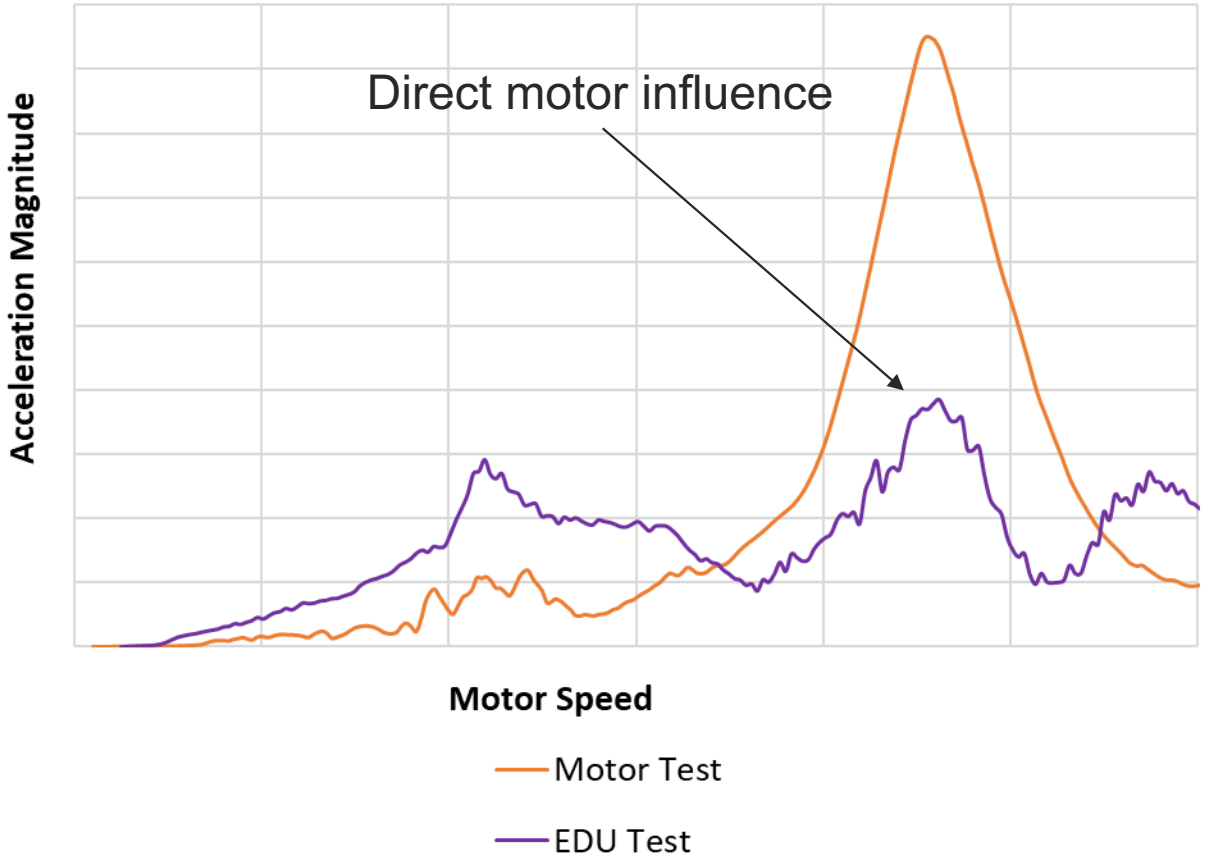

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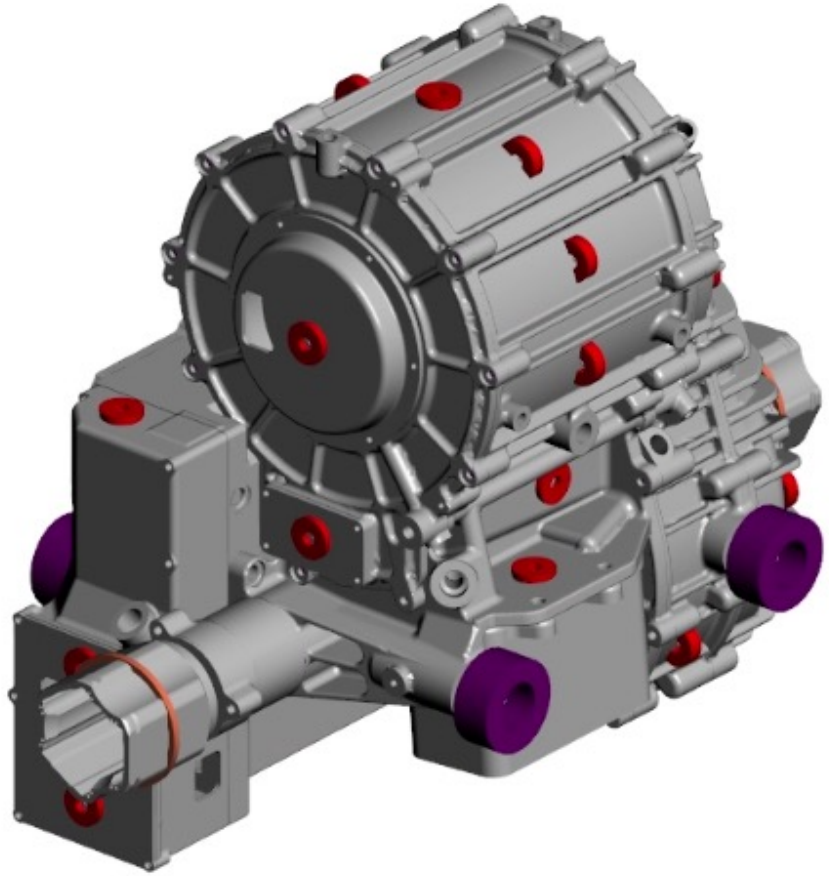

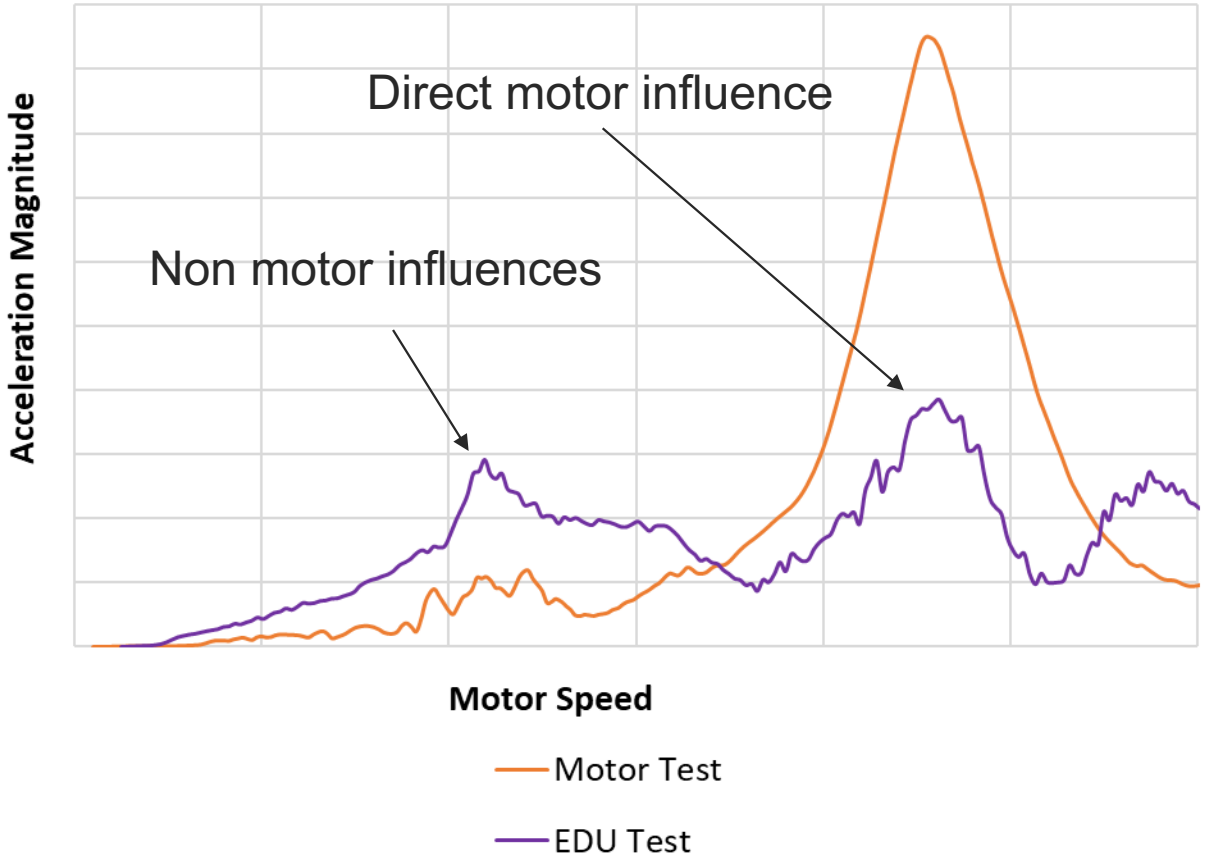

In Conclusion

- Isotropic materials and joint simplifications are not adequate for system NVH modelling.

- Our process, using developed orthotropic material data in particular for stator components, allows NVH issues to be identified and rectified early in the design process.

- This enables:

faster product to market

reduced development cost

improved reputation

Please come see us after the session, or contact us:

info@drivesystemdesign.com