



MEIDEN TECHNICAL CENTER NORTH AMERICA LLC

Model Validation Using Torsional Excitation



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Rediscover The Technology Leader – Meidensha Corporation



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- Low inertia permanent magnet dynamometers can be utilized to excite rotating drivelines to verify torsional models.
- A permanent magnet dynamometer (315kW MEIDEN PCDY-II) is used to excite drivelines and damper systems at up to 350 Hz.





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- The rapid response time of a liquid cooled permanent magnet dynamometer allows torsional testing to be performed in a NVH test environment.
- This allows verification of excitation and damping models without the interference and noises produced by the system prime mover or add on hydraulic devices.



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- Testing with multi-piece propeller shafts, rear drive modules and half shafts has shown both predicted torsional modes and harmonics.
- Testing of damping devices has allowed the simple verification of damping coefficients and damping frequency band width.





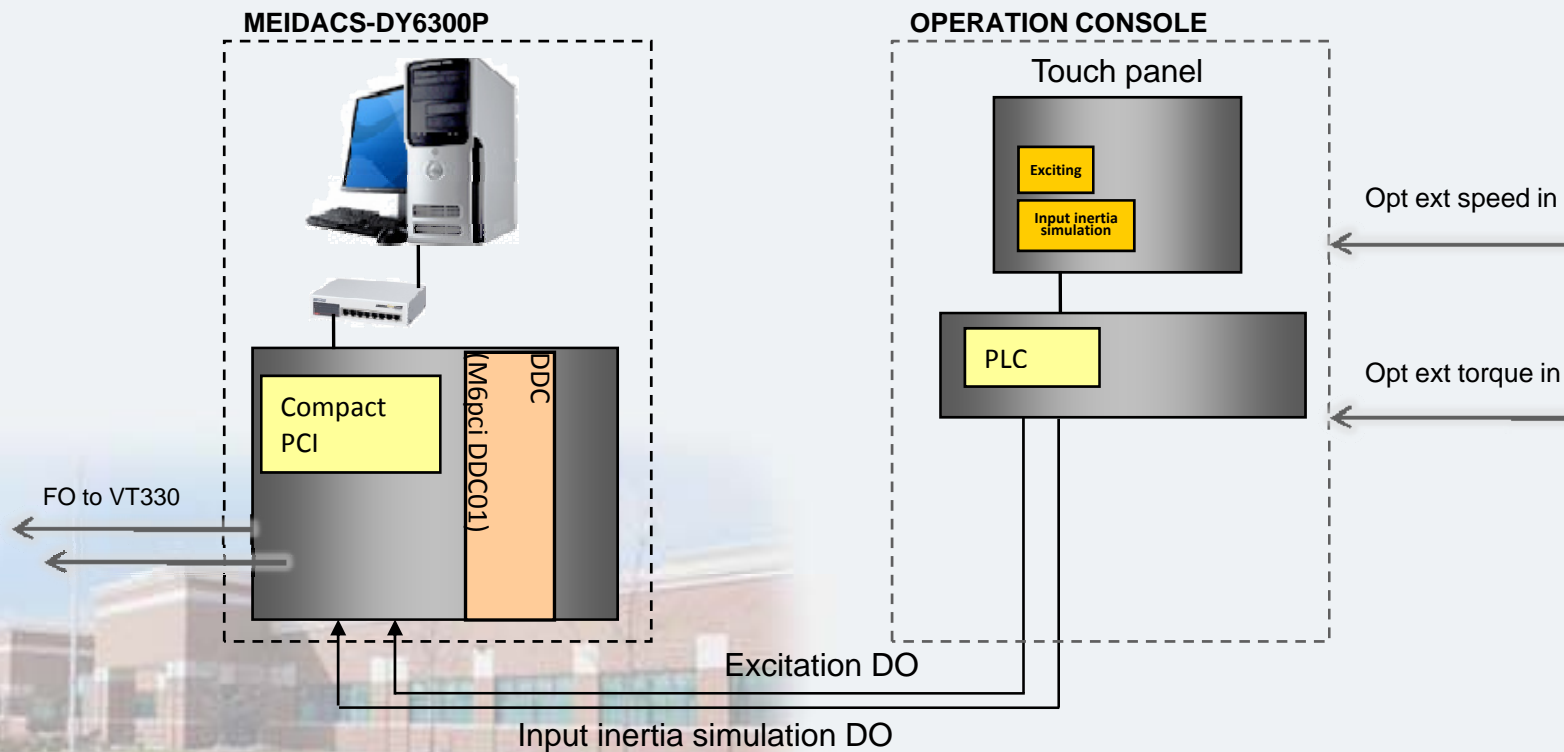
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Testing Methodology



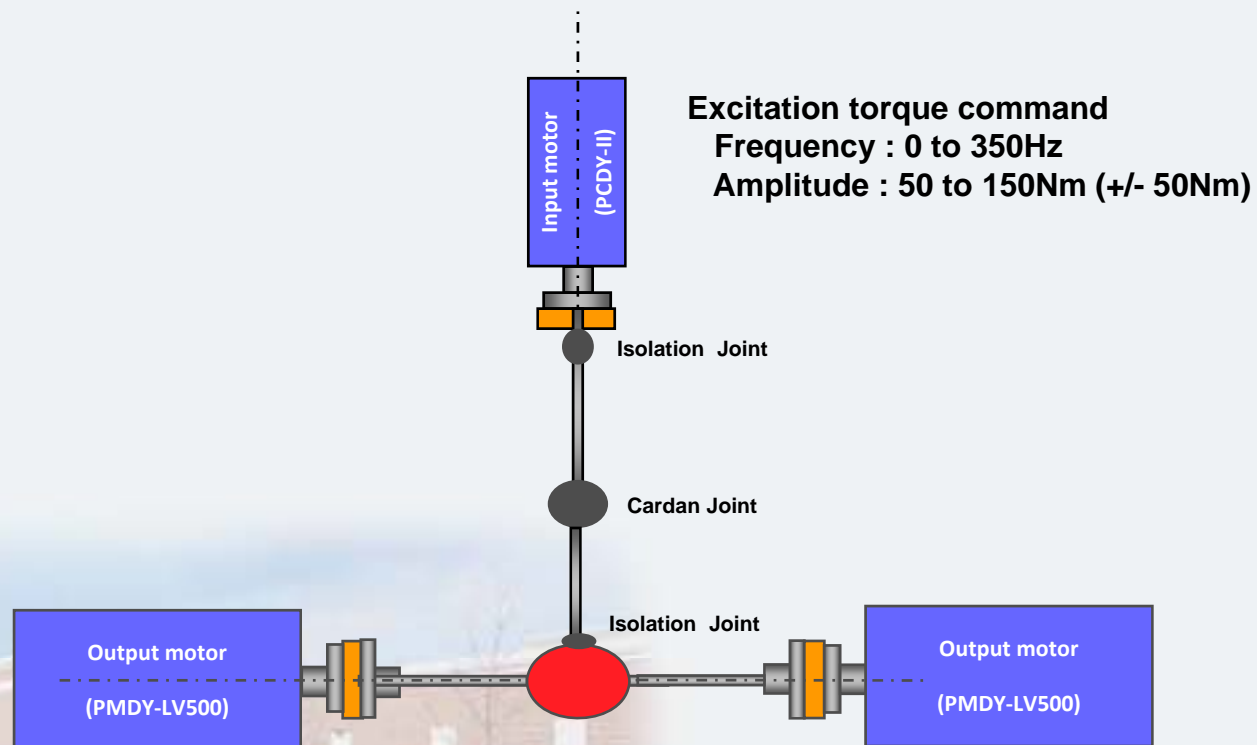
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Torsional Excitation Control Interface



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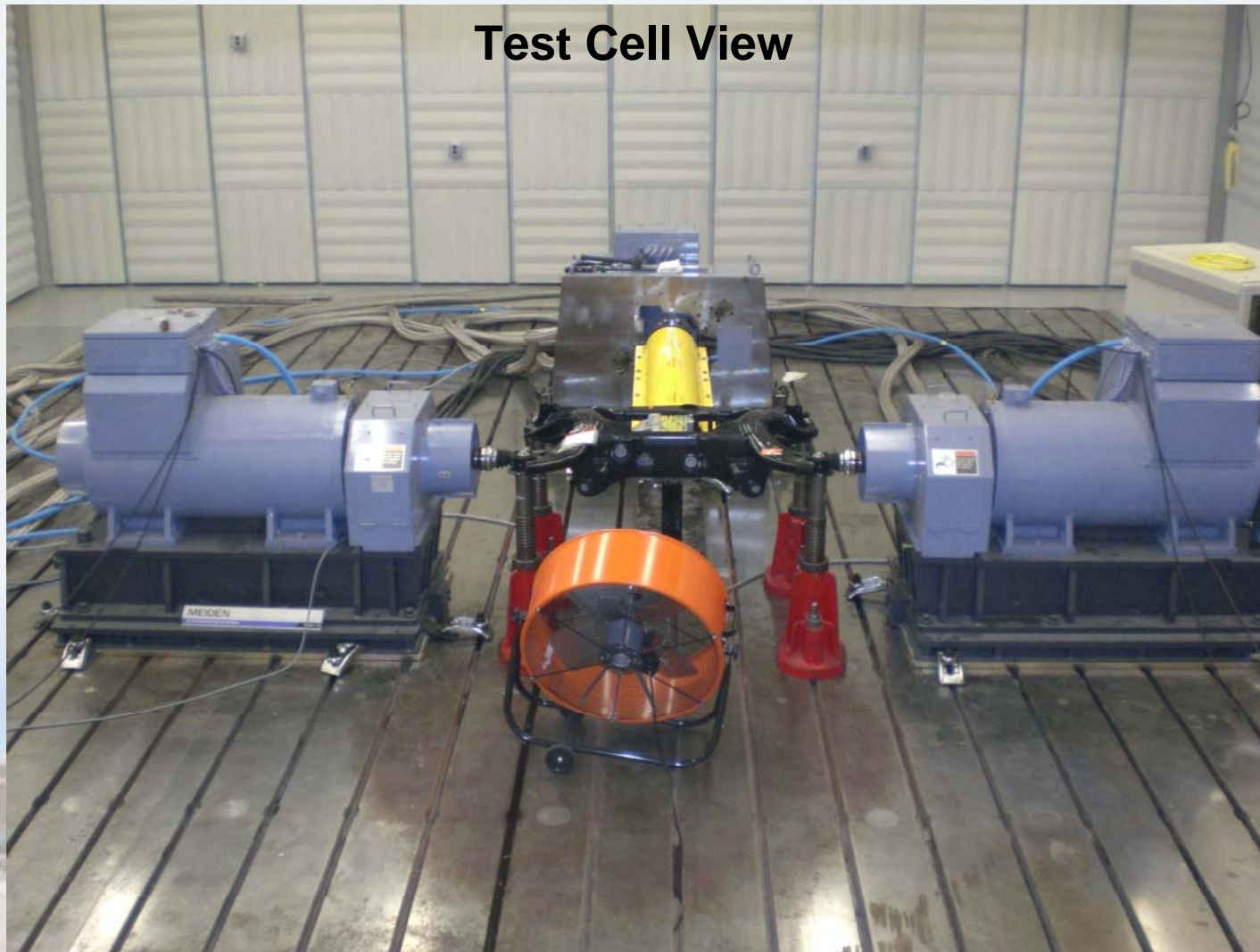
Test Component Arrangement





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Measurement Setup

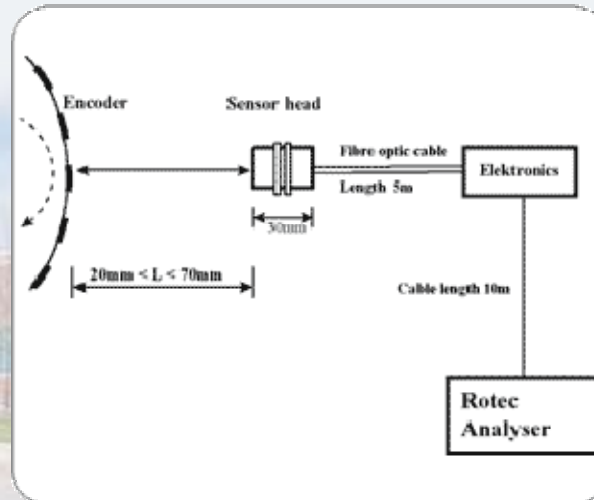
Laser Pickup with 100 ppr Stripe



Rotec RAS Measurement System



Laser Pickup Schematic



Input signal from Dyno 360ppr Encoder



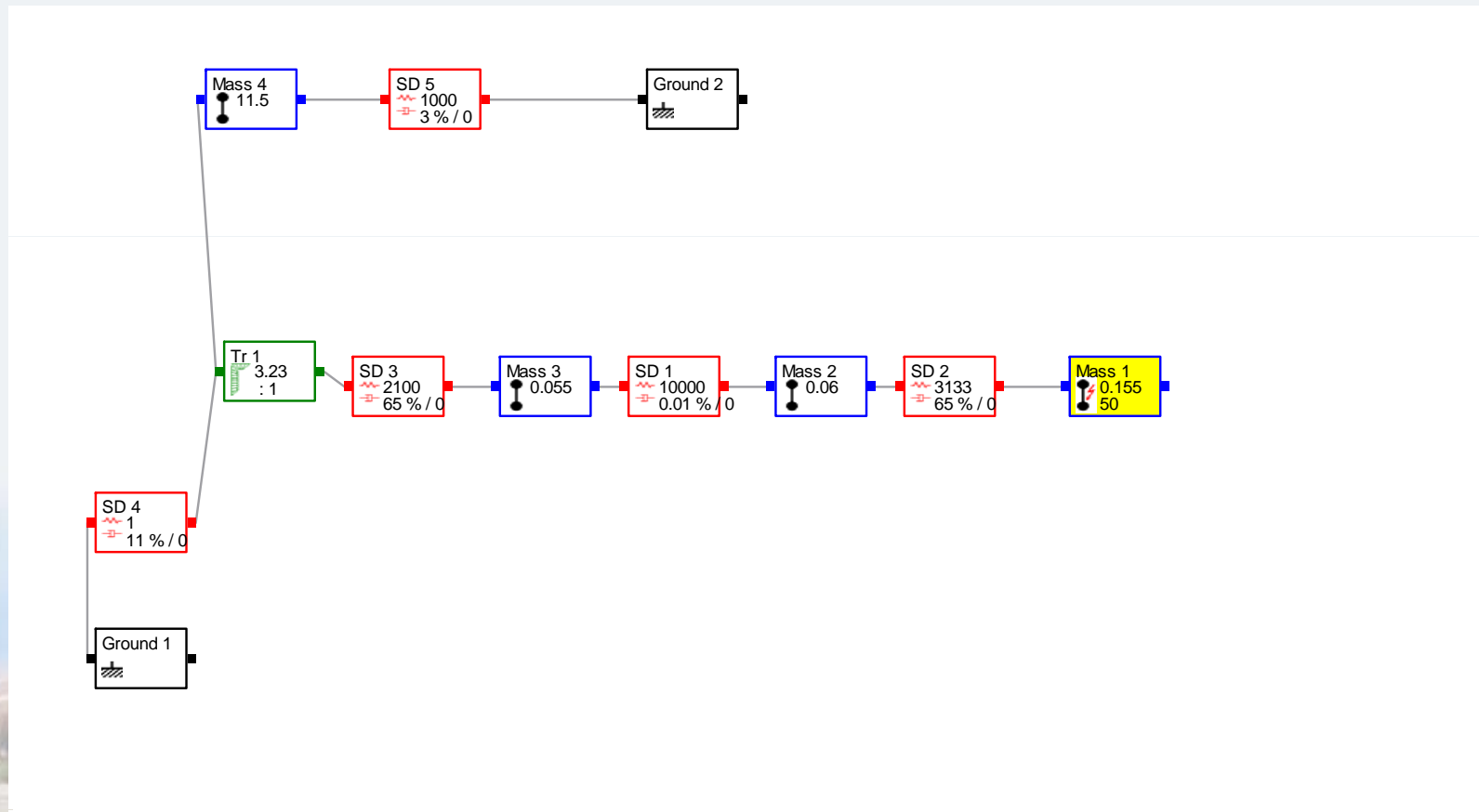
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Test Results



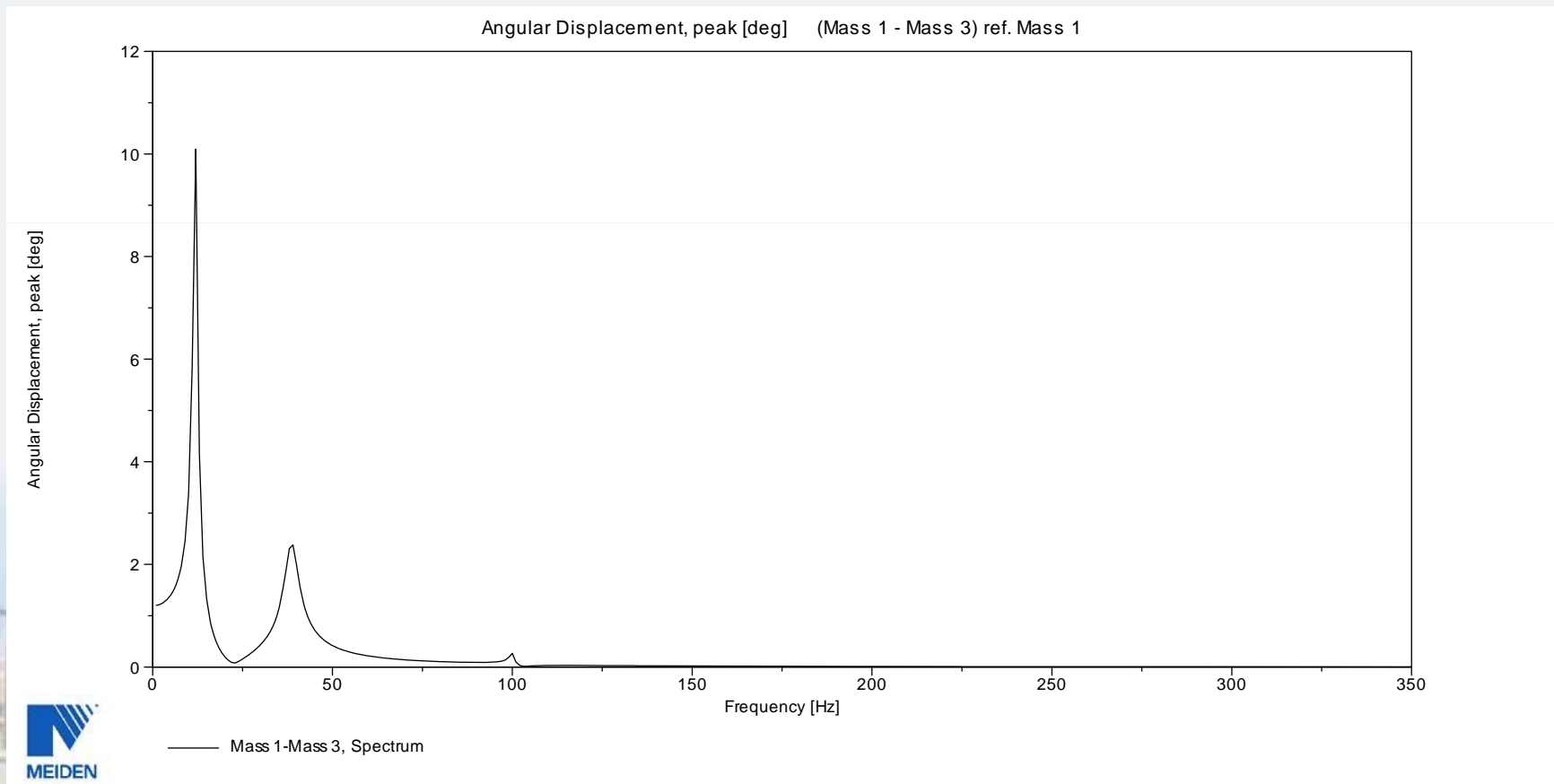
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Simplified Dyno-Shaft-RDM Torsional Model



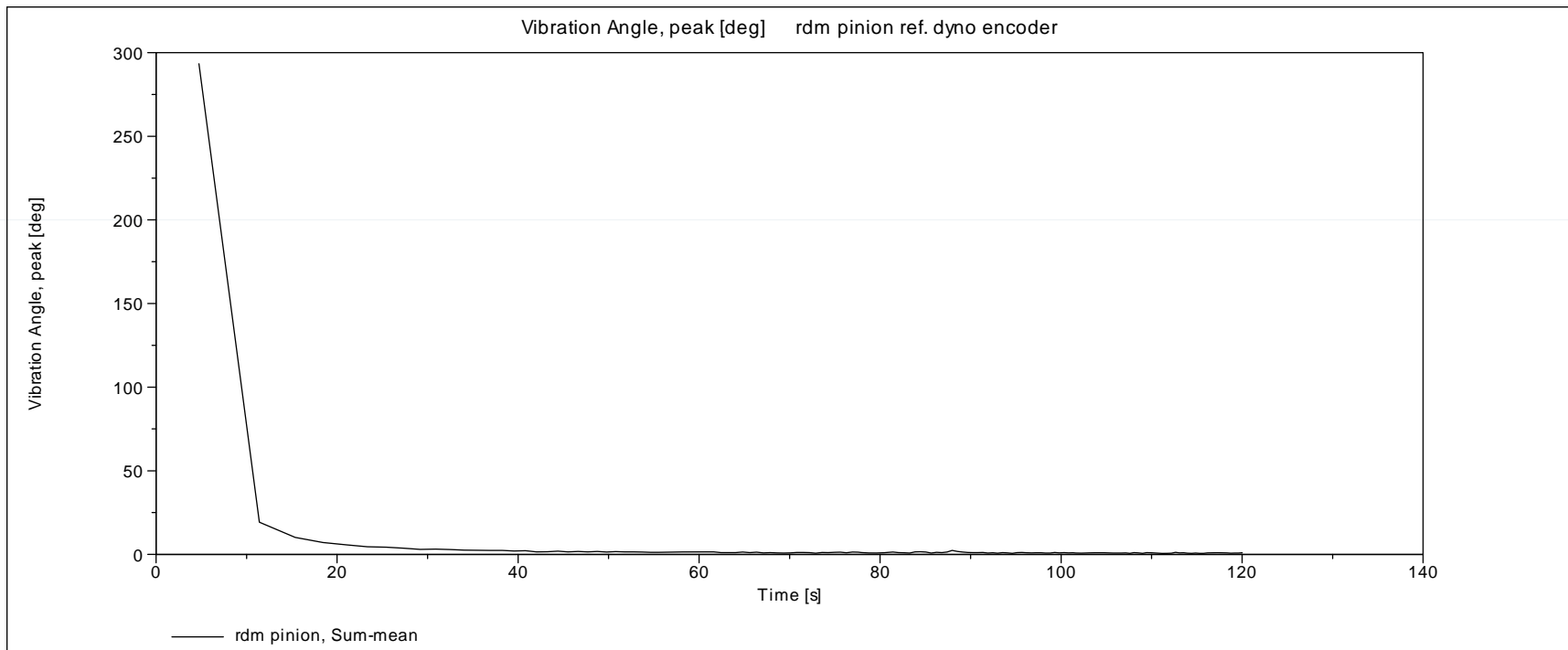
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Calculated Response for Torsional Model



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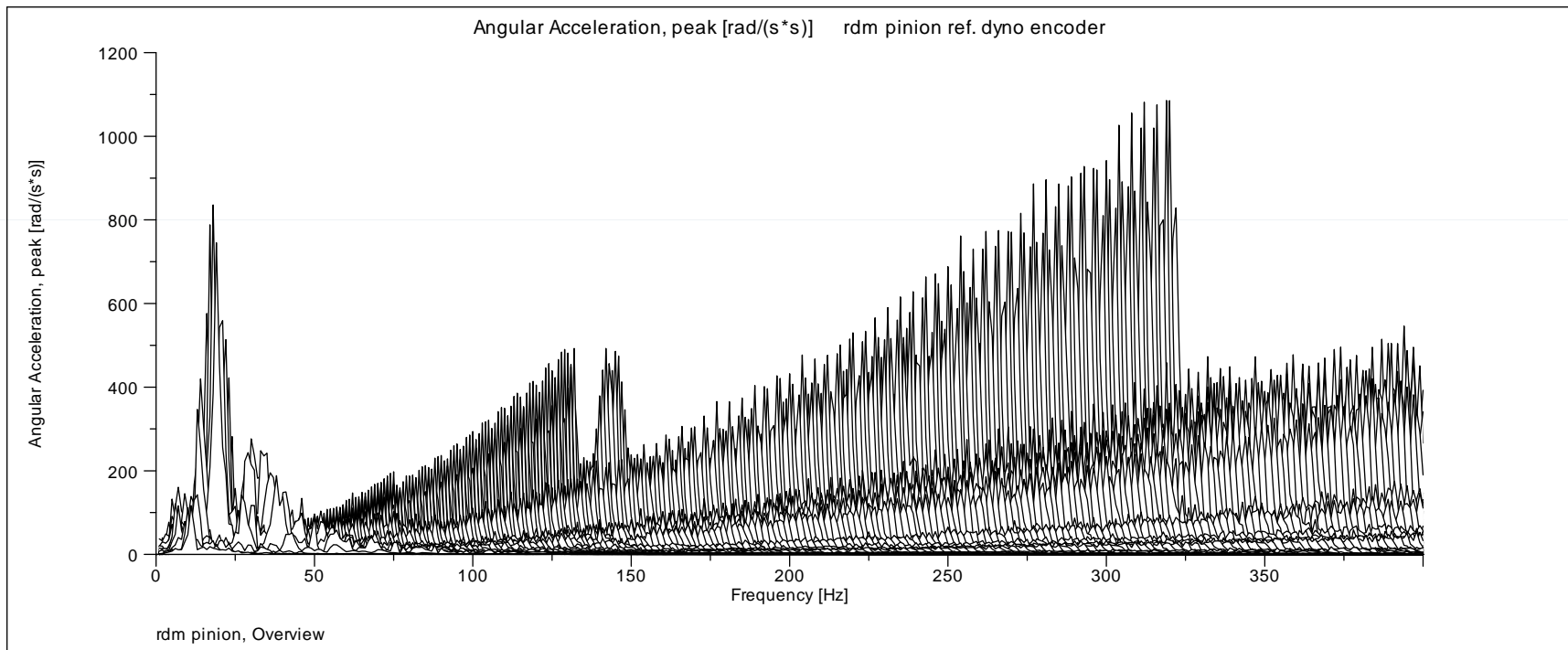
Time Domain Vibration Angle




rotec <small>emh</small>		Prüfsysteme für den Maschinenbau		Kastenvbauerstraße 2 81677 München	
Customer:	Operator:	Test Specimen: propshat torsion rdm pinion 0-300 0-300 rpm	Measurement: C:\rotec\user\MEIDEN\TE Master\of\data\ROTMEAS73067 10/6/08 22:20 PM V5.30	Range: 0.634888	120.025 293.432

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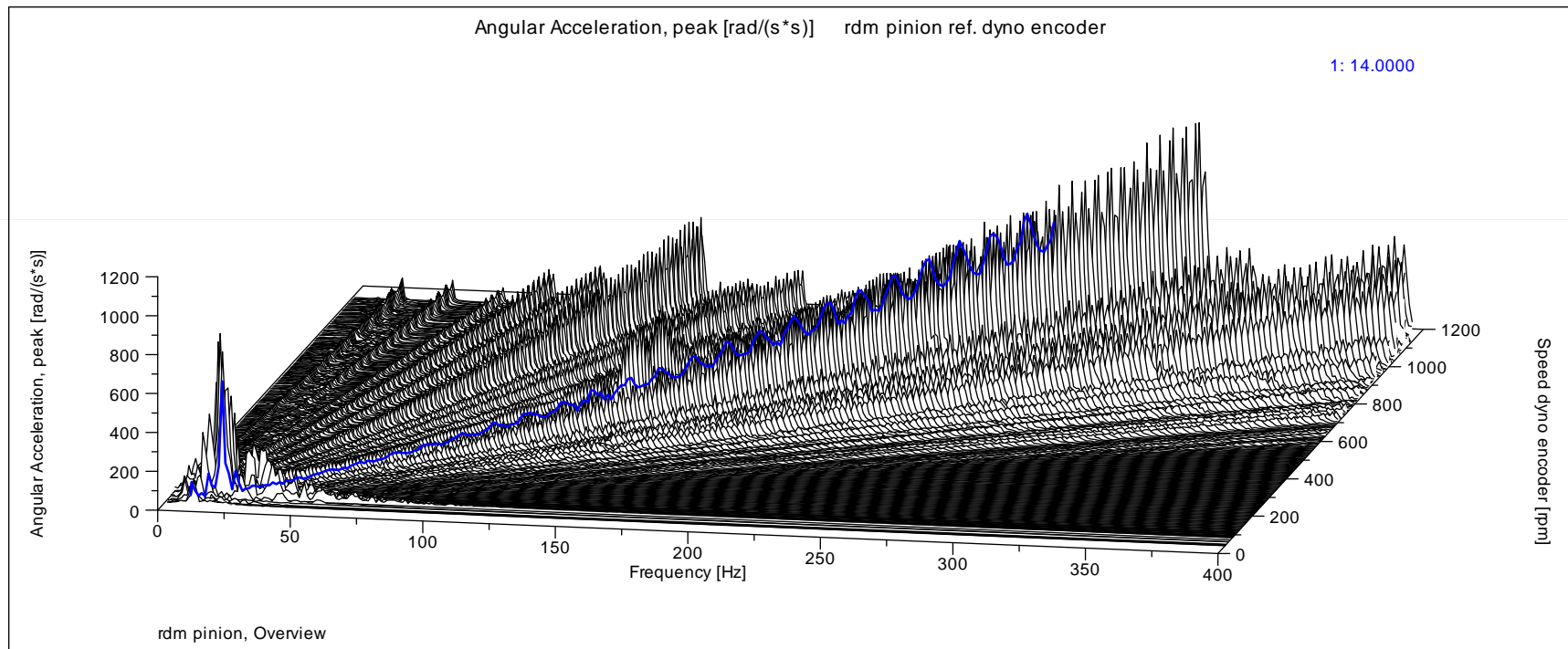
Frequency Domain Angular Acceleration



		Prüfsysteme für den Maschinenbau		Kastenbauerstraße 2 81677 München	
Customer:	Operator:	Test Specimen:	Measurement:	Range:	
		propshat torsion rdm pinion 0-300 0-300 rpm	C:\rotec\user\MEIDEN\TE Master\of\data\ROTMEAS.31 10/6/08 22:20 PM V5.30	41.6754 0.00071292	400 1134.86 1085.51

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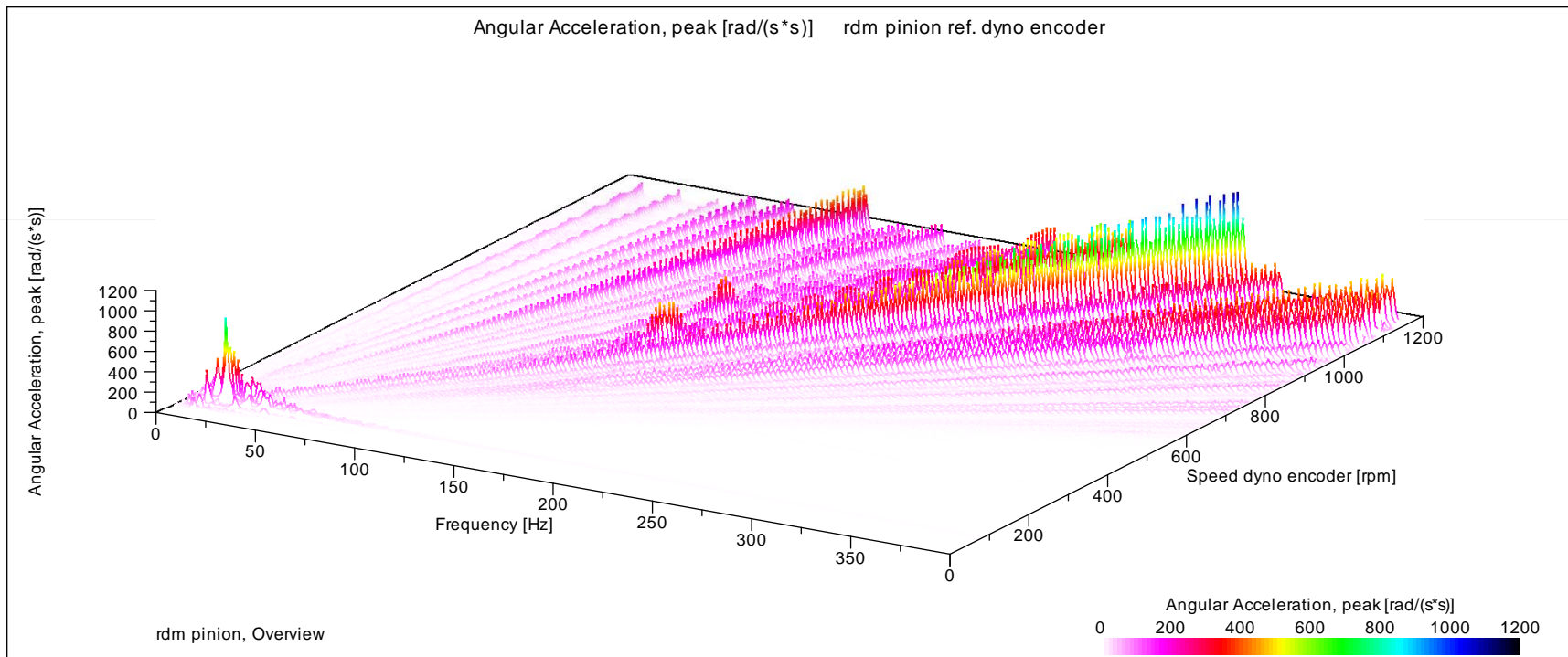
Waterfall With Order Marker



rotec <small>emh</small>		Prüfsysteme für den Maschinenbau		Kastenbauerstraße 2 81677 München	
Customer:	Operator:	Test Specimen: propshat torsion rdm pinion 0-300 0-300 rpm	Measurement: C:\rotec\user\MEIDEN\TE Master\of\data\ROTMEAS.31 10/6/08 22:20 PM V5.30	Range: 400 1134.86 0.00071292 1085.51	

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Multiple Orders



		Prüfsysteme für den Maschinenbau		Kastenbauerstraße 2 81677 München	
Customer:	Operator:	Test Specimen:	Measurement:	Range:	
		propshat torsion rdm pinion 0-300 0-300 rpm	C:\rotec\user\MEIDEN\TE Master\of\data\ROTMEAS.31 10/6/08 22:20 PM V5.30	400 1134.86 0.00071292 1085.51	

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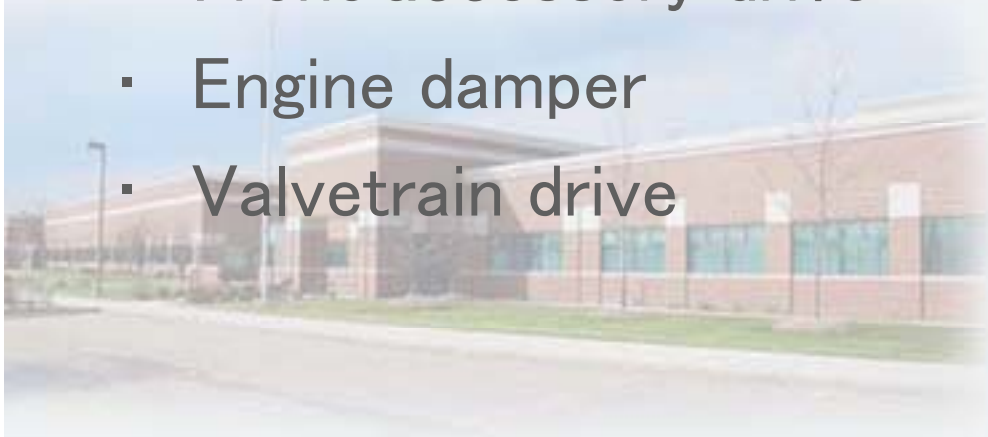
Future Work



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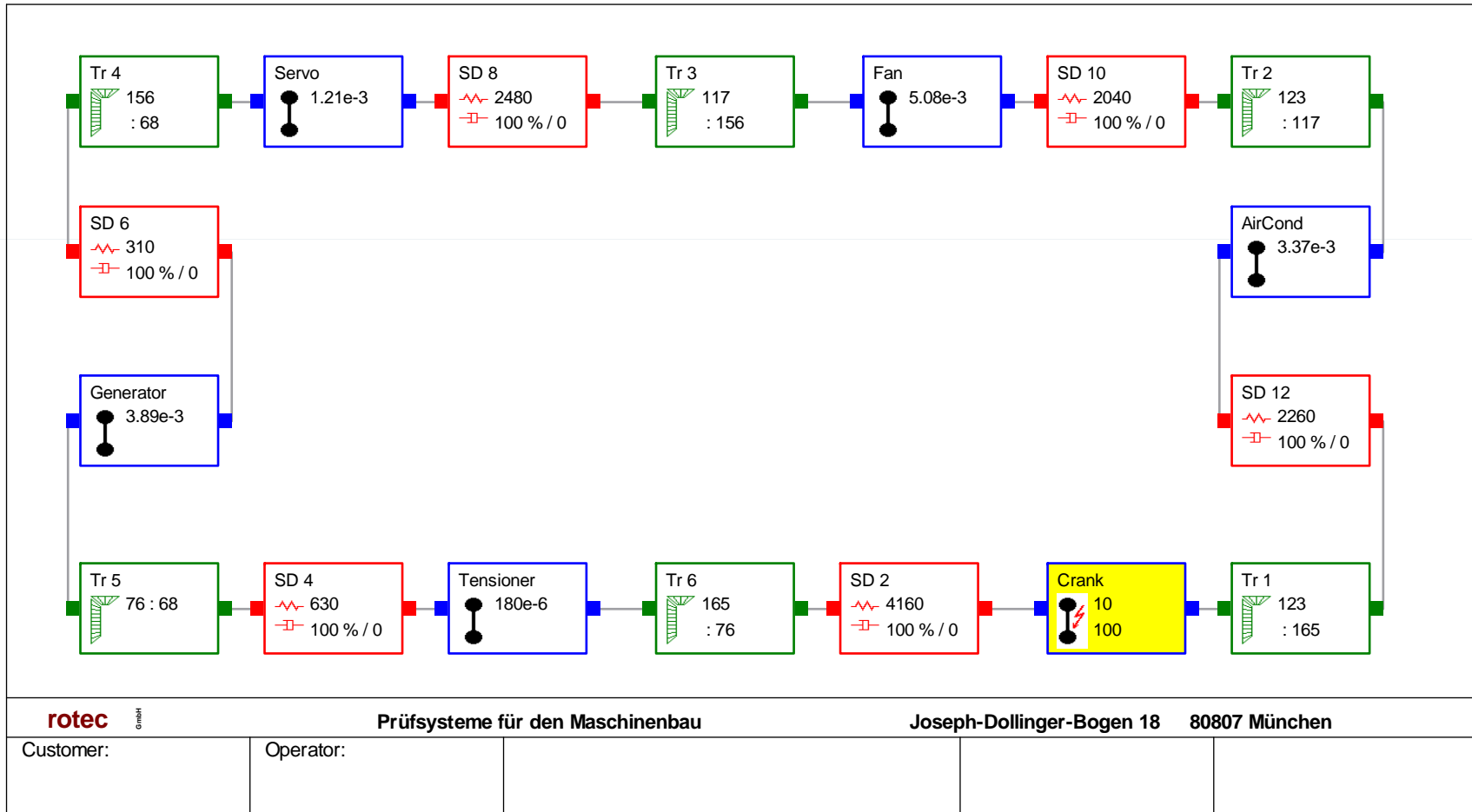
The quiet and predictable operation of the system along with the speed, torsional amplitude and high base torque of the system show promise in the areas of:

- Driveline torsional analysis
- Front accessory drive
- Engine damper
- Valvetrain drive



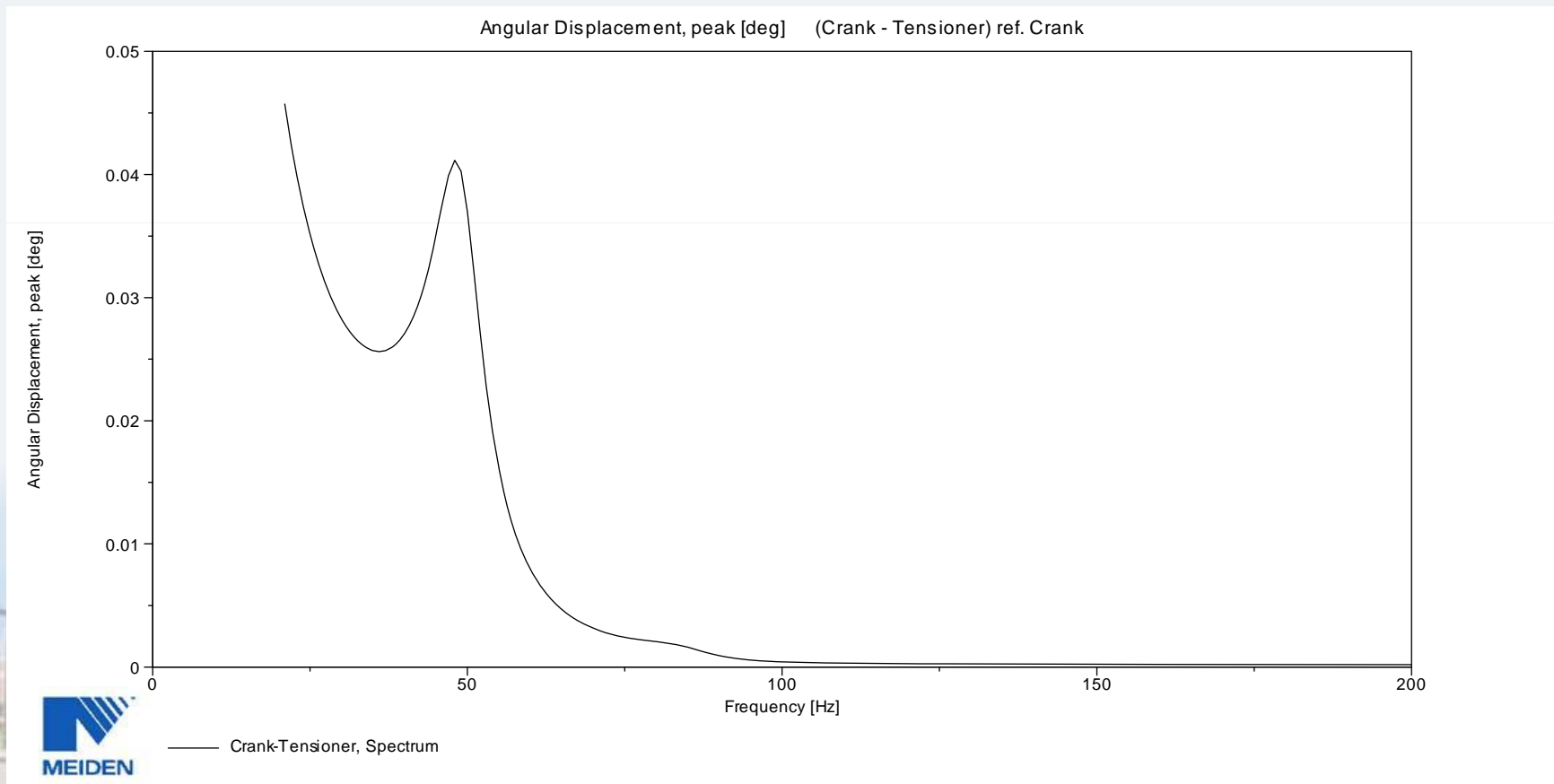
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Accessory Belt Torsional Model



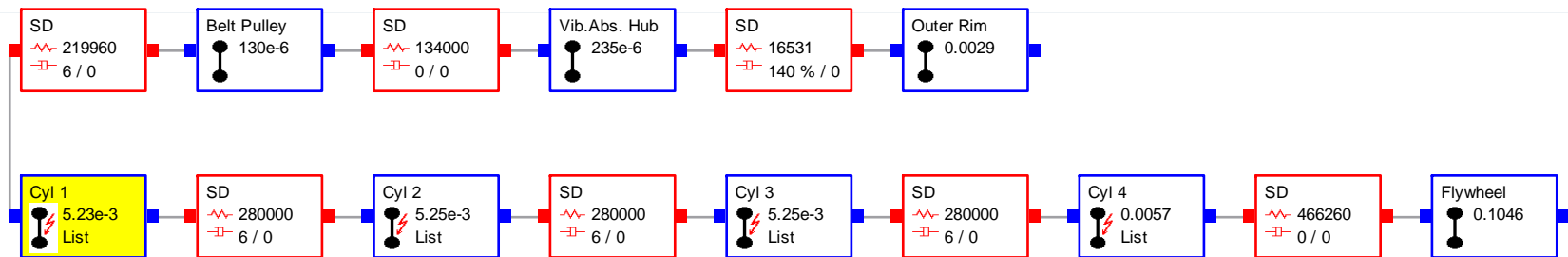
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Accessory Belt Simulated Torsional Response



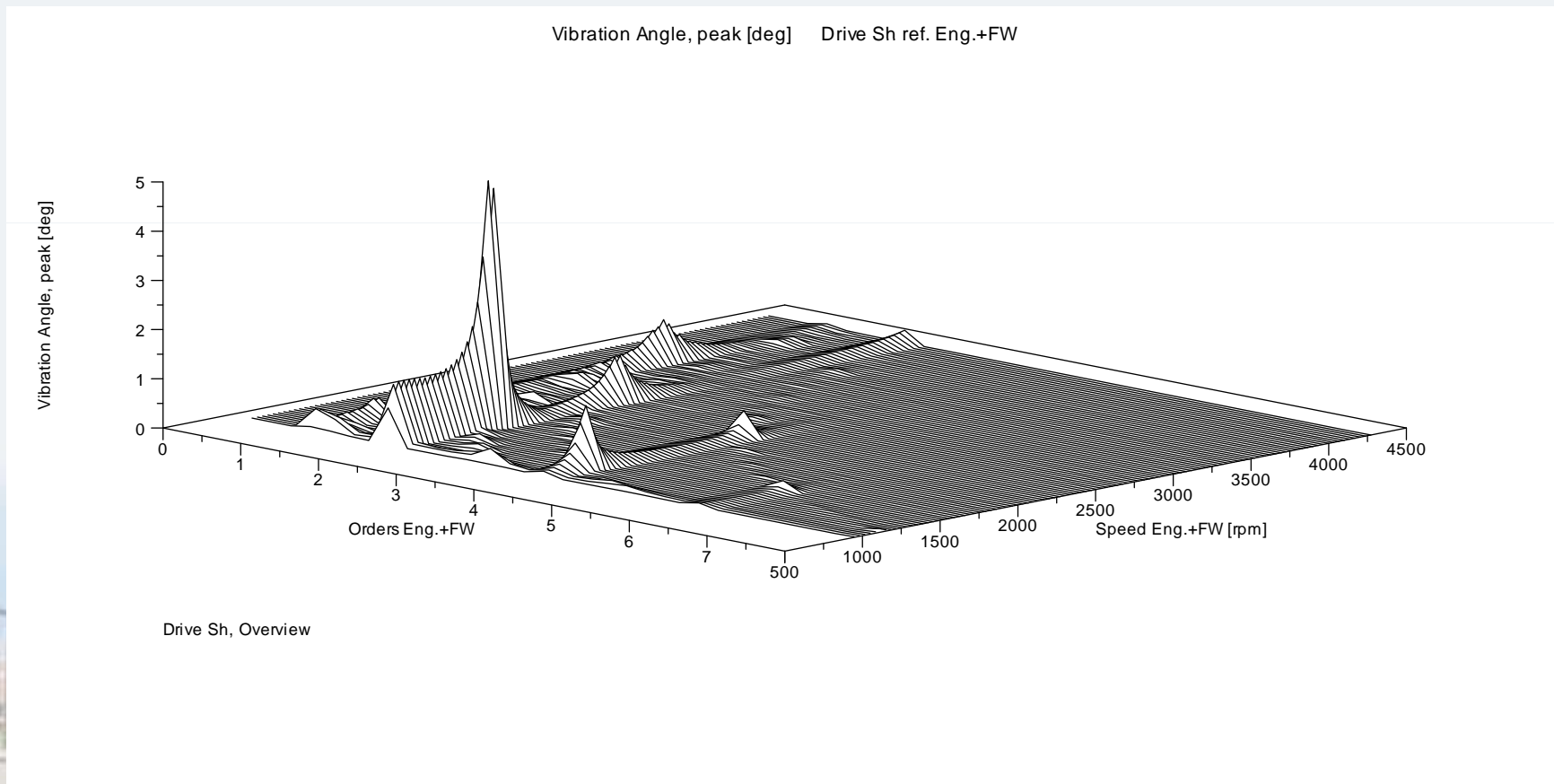
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Engine Damper Model



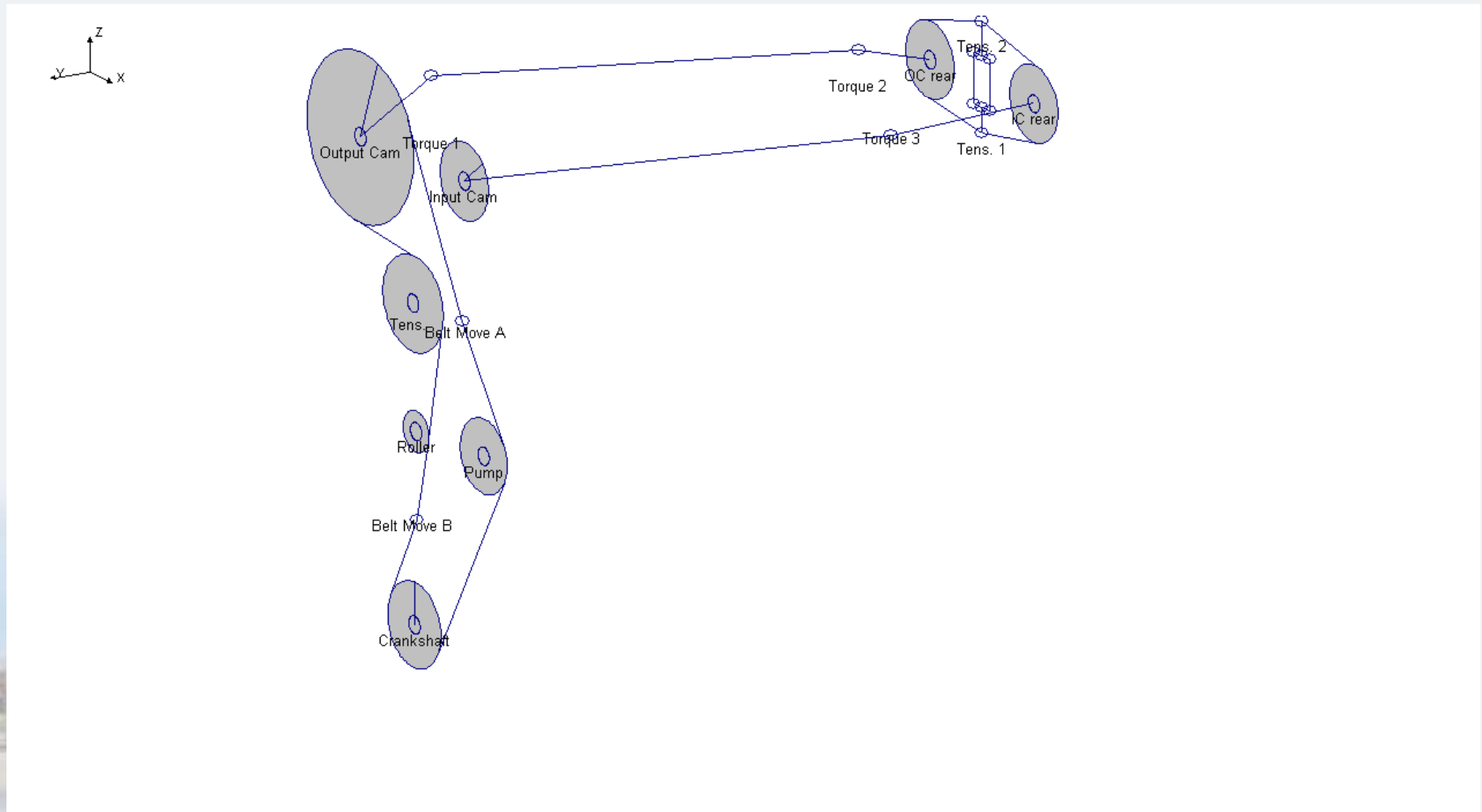
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Simulated Damper Response



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Valvetrain Drive Model





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