pmsm_outrunner_custom_rotor - Machine Report

Topology: PMSM - Outrunner
Generated: 2026-08-22 22:10:26 by Nabla

Operating point

Mechanical speed: 3000 RPM
Electrical frequency: 200.0 Hz
Simulated steps: 49 (field step 49)

All values are read from the selected completed simulation. Missing or non-finite quantities are shown as "-".

Machine Parameters

Operating Point

Parameter	Value	Unit	Comments
Mechanical Speed	3000.00	RPM	
Electrical Frequency	200.000	Hz	

DQ Quantities

Parameter	Value	Unit	Comments
D-axis Inductance (Ld)	410.735	uH	
Q-axis Inductance (Lq)	915.575	uH	
Saliency Ratio	0.448609	-	Ld/Lq

Flux and Voltage / Back-EMF

Parameter	Value	Unit	Comments
PM Flux Linkage 1st Harmonic Peak	0.0706950	Wb	
Back-EMF 1st Harmonic Peak	91.0204	V	peak of the fundamental
Back-EMF RMS	65.9532	V	fundamental + harmonics
Back-EMF THD	22.3797	%	percent of the fundamental
Phase Voltage 1st Harmonic Peak	89.6829	V	peak of the fundamental
Phase Voltage RMS	64.6968	V	fundamental + harmonics

Torque and Mechanical Performance

Parameter	Value	Unit	Comments
Average Torque	8.03844	N.m	
Torque Ripple (Peak-to-Peak)	3.75168	N.m	
Torque Ripple	46.6717	%	percent of average torque
Cogging Torque (Peak-to-Peak)	0.583941	N.m	
Torque Constant (Kt)	0.443472	N.m/A	

Power and Efficiency

Parameter	Value	Unit	Comments
Apparent Power	2.69982	kVA	S = V * I (RMS)
Active Power	2.66018	kW	P = V * I * cos(phi)
Reactive Power	-0.460942	kVA	Q = V * I * sin(phi)
Mechanical Power	2.52535	kW	from average torque
Efficiency	94.5253	%	
Power Factor	0.985318	-	
Back-EMF Constant (Ke)	0.285470	V.s/rad	
Back-EMF Constant (Ke krpm)	29.8943	V/krpm	

Losses

Parameter	Value	Unit	Comments
Joule Losses (Winding)	140.084	W	
Current Density	3.82593	A/mm^2	
Phase Resistance	233.473	mOhm	

Parameter	Value	Unit	Comments
Slot Fill Factor	0.420000	-	
Iron Losses (Stator)	6.18018	W	
Iron Losses (Rotor)	2.12918e-05	W	
Total Losses	146.264	W	

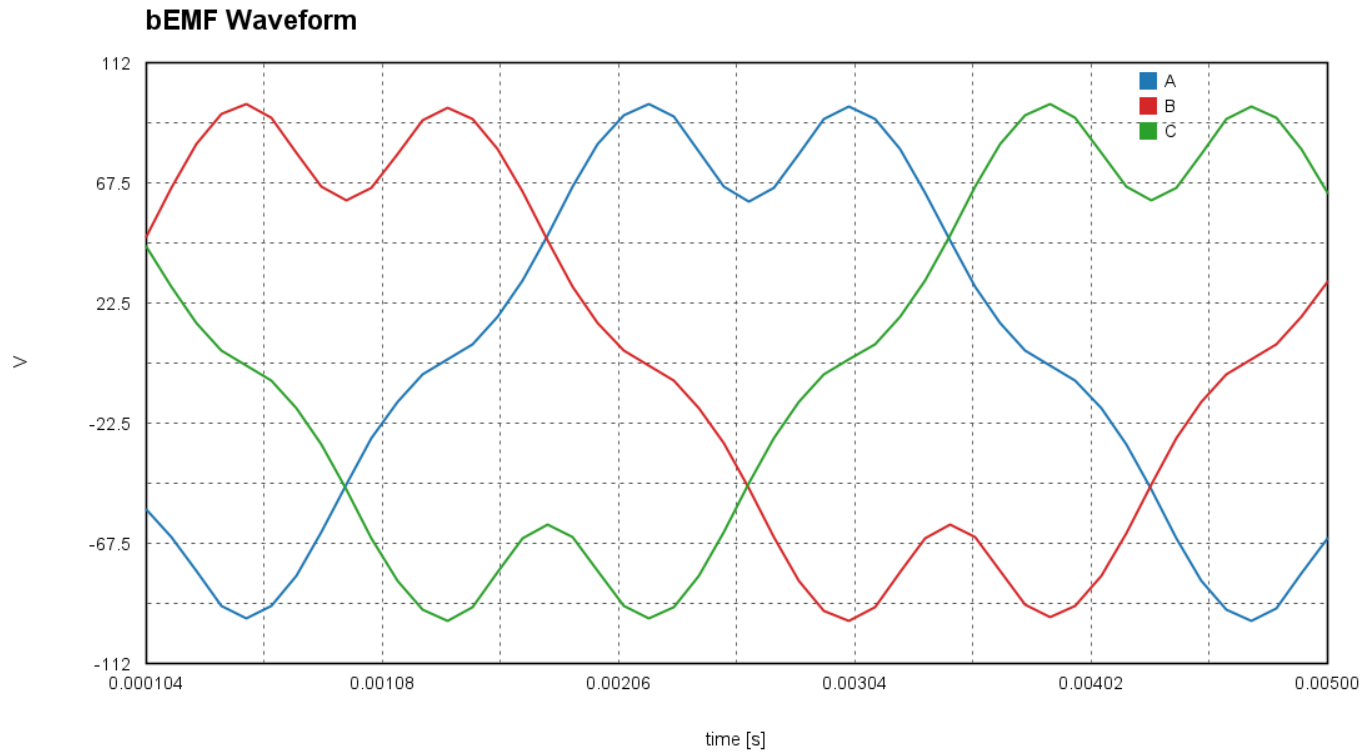
Flux Density Values

Parameter	Value	Unit	Comments
Max Flux Density (Stator Core)	1.22249	T	
Max Flux Density (Stator Tooth)	1.86962	T	
Max Flux Density (Rotor Core)	0.874841	T	

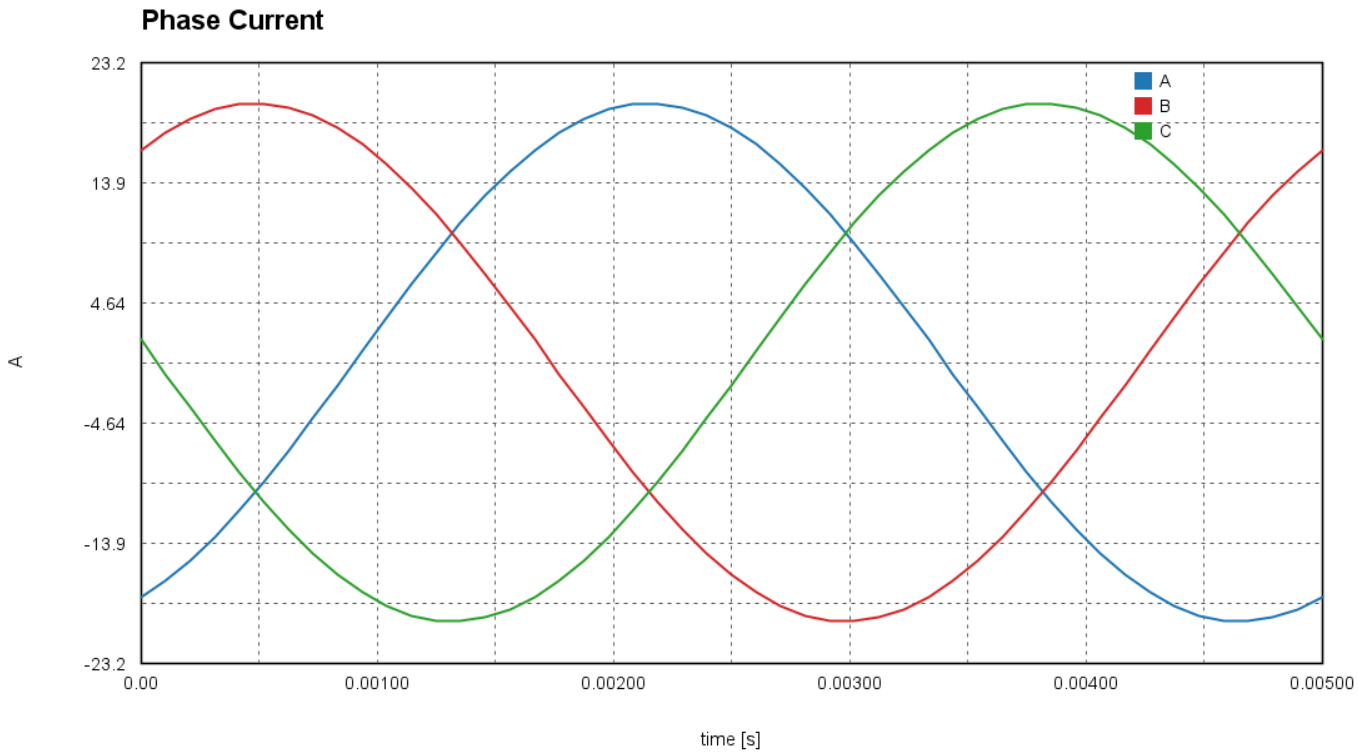
Mass Estimation

Parameter	Value	Unit	Comments
Stator Core Mass	1.16877	kg	area x axial length x density
Rotor Core Mass	0.00000	kg	
Winding Mass (In-Slot)	0.300461	kg	slot area x fill factor
End-Winding Mass	0.614245	kg	analytical, both axial ends
Magnet Mass	0.00000	kg	
Sleeves / Wedges / Spacers Mass	0.00257020	kg	
Total Mass	2.08605	kg	sector scaled to full machine

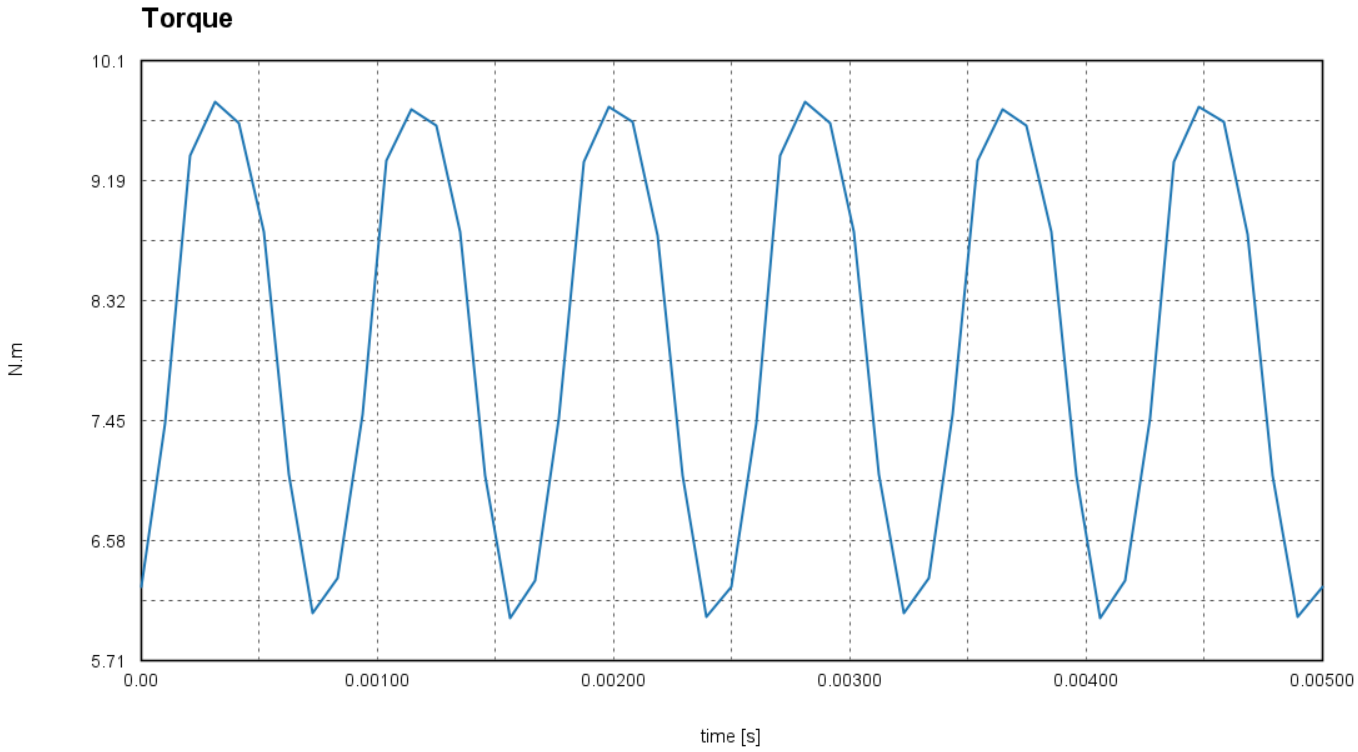
Key Waveforms



Full simulated range (48 samples). y-axis: V.

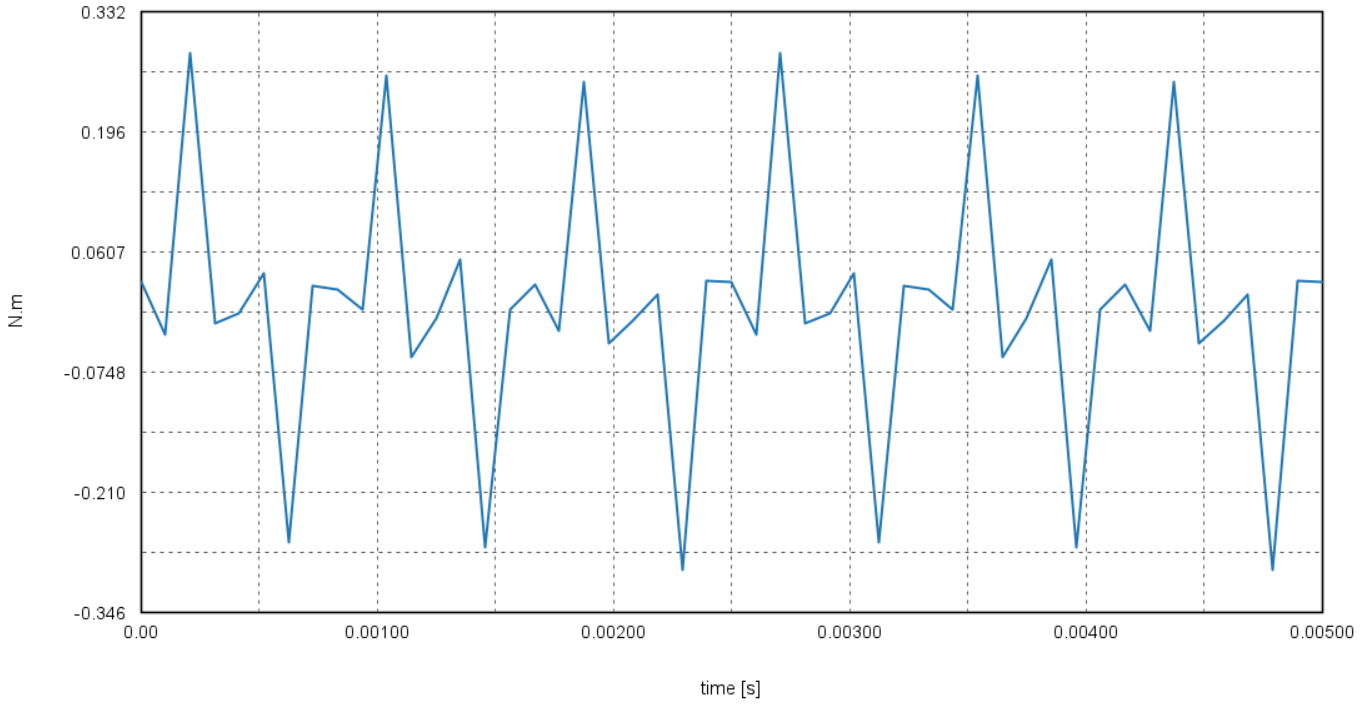


Full simulated range (49 samples). y-axis: A.



Full simulated range (49 samples). y-axis: N.m.

Cogging Torque

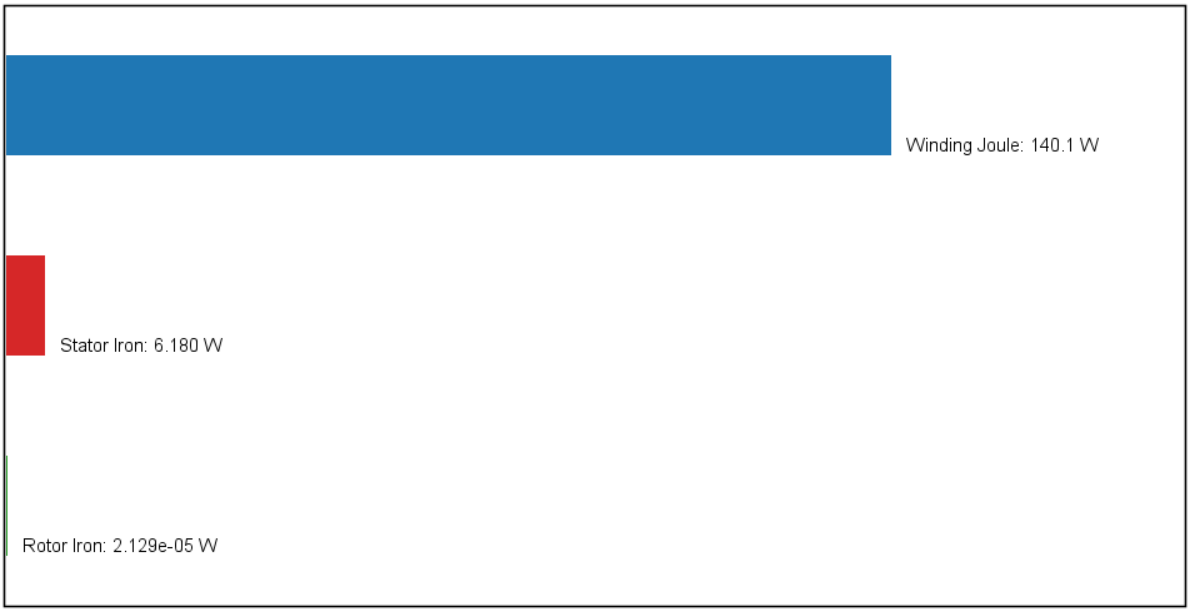


Full simulated range (49 samples). y-axis: N.m.

Loss Summary

Parameter	Value	Unit	Comments
Winding Joule	140.084	W	
Stator Iron	6.18018	W	
Rotor Iron	2.12918e-05	W	
Total Losses	146.264	W	
Efficiency	94.5253	%	
Power Factor	0.985318	-	

Loss Breakdown



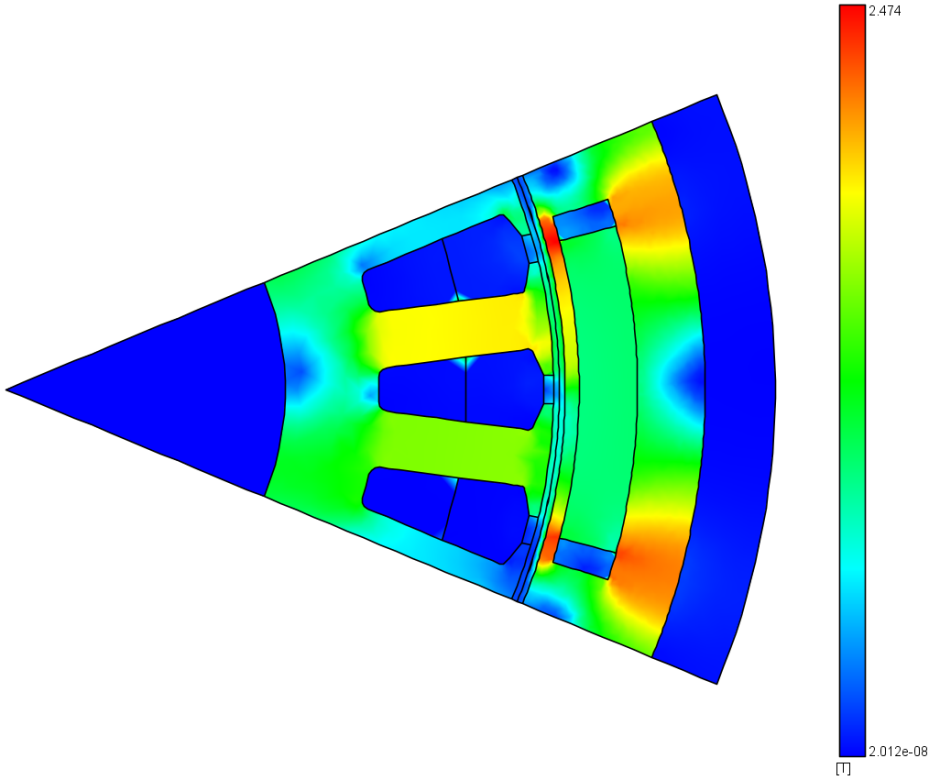
Total losses: 146.26 W

Performance Analysis

No performance-analysis items produced a result for this run.

Field Images

Flux Density Magnitude |B|



step 49/49 | t = 0.00500000 s | rotor position = 0.00 deg