pmsm_12s10p_spm - Machine Report

Topology: PMSM
Generated: 2026-08-21 23:53:29 by Nabla

Operating point

Mechanical speed: 2000 RPM
Electrical frequency: 166.7 Hz
Simulated steps: 37 (field step 37)

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	2000.00	RPM	
Electrical Frequency	166.667	Hz	

DQ Quantities

Parameter	Value	Unit	Comments
D-axis Inductance (Ld)	804.328	uH	
Q-axis Inductance (Lq)	847.119	uH	
Saliency Ratio	0.949487	-	Ld/Lq

Flux and Voltage / Back-EMF

Parameter	Value	Unit	Comments
PM Flux Linkage 1st Harmonic Peak	0.0442394	Wb	
Back-EMF 1st Harmonic Peak	48.8077	V	peak of the fundamental
Back-EMF RMS	34.5218	V	fundamental + harmonics
Back-EMF THD	2.35273	%	percent of the fundamental
Phase Voltage 1st Harmonic Peak	51.6885	V	peak of the fundamental
Phase Voltage RMS	36.5636	V	fundamental + harmonics

Torque and Mechanical Performance

Parameter	Value	Unit	Comments
Average Torque	4.95592	N.m	
Torque Ripple (Peak-to-Peak)	0.184979	N.m	
Torque Ripple	3.73248	%	percent of average torque
Cogging Torque (Peak-to-Peak)	0.175969	N.m	
Torque Constant (Kt)	0.330394	N.m/A	

Power and Efficiency

Parameter	Value	Unit	Comments
Apparent Power	1.16280	kVA	S = V * I (RMS)
Active Power	1.12378	kW	P = V * I * cos(phi)
Reactive Power	0.298679	kVA	Q = V * I * sin(phi)
Mechanical Power	1.03796	kW	from average torque
Efficiency	91.6537	%	
Power Factor	0.966448	-	
Back-EMF Constant (Ke)	0.246794	V.s/rad	
Back-EMF Constant (Ke krpm)	25.8442	V/krpm	

Losses

Parameter	Value	Unit	Comments
Joule Losses (Winding)	90.7174	W	
Current Density	3.00292	A/mm^2	
Phase Resistance	268.792	mOhm	

Parameter	Value	Unit	Comments
Slot Fill Factor	0.420000	-	
Iron Losses (Stator)	3.78937	W	
Iron Losses (Rotor)	0.0137095	W	
Total Losses	94.5204	W	

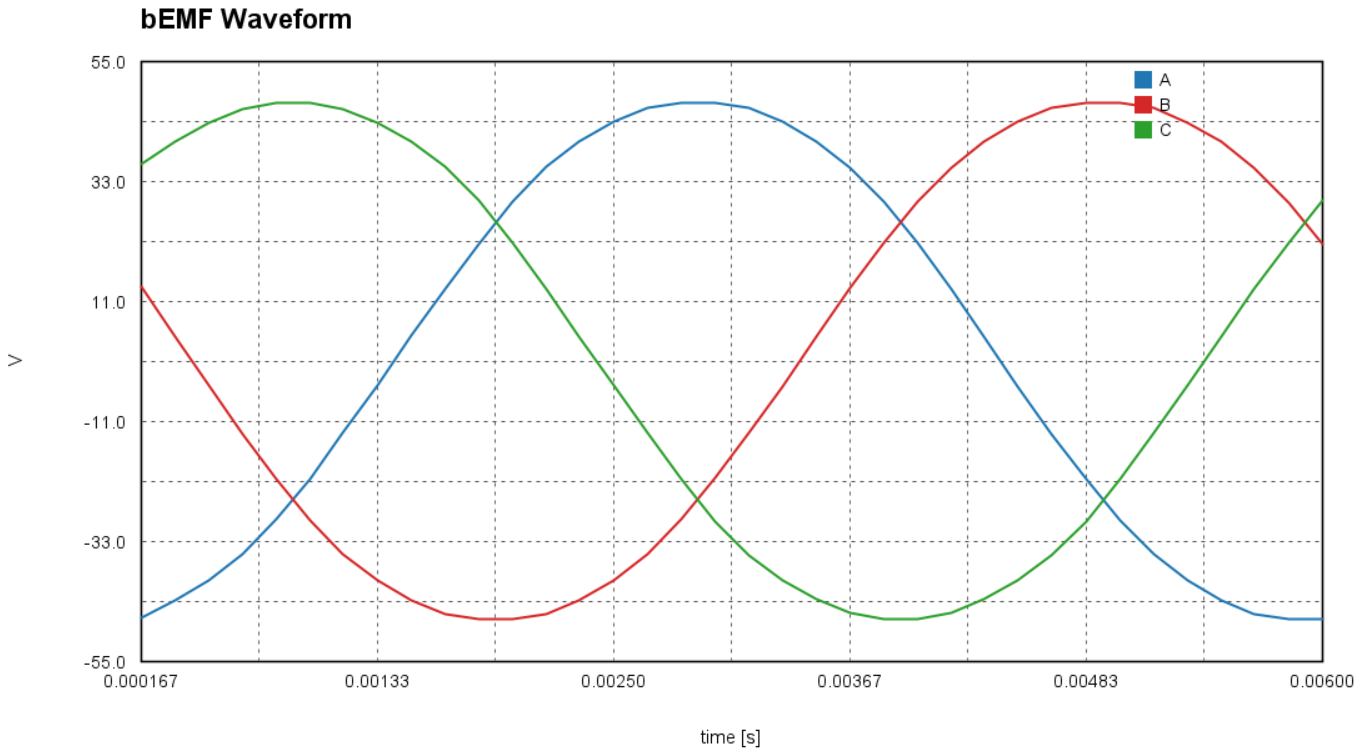
Flux Density Values

Parameter	Value	Unit	Comments
Max Flux Density (Stator Core)	0.810980	T	
Max Flux Density (Stator Tooth)	1.55822	T	
Max Flux Density (Rotor Core)	0.745079	T	

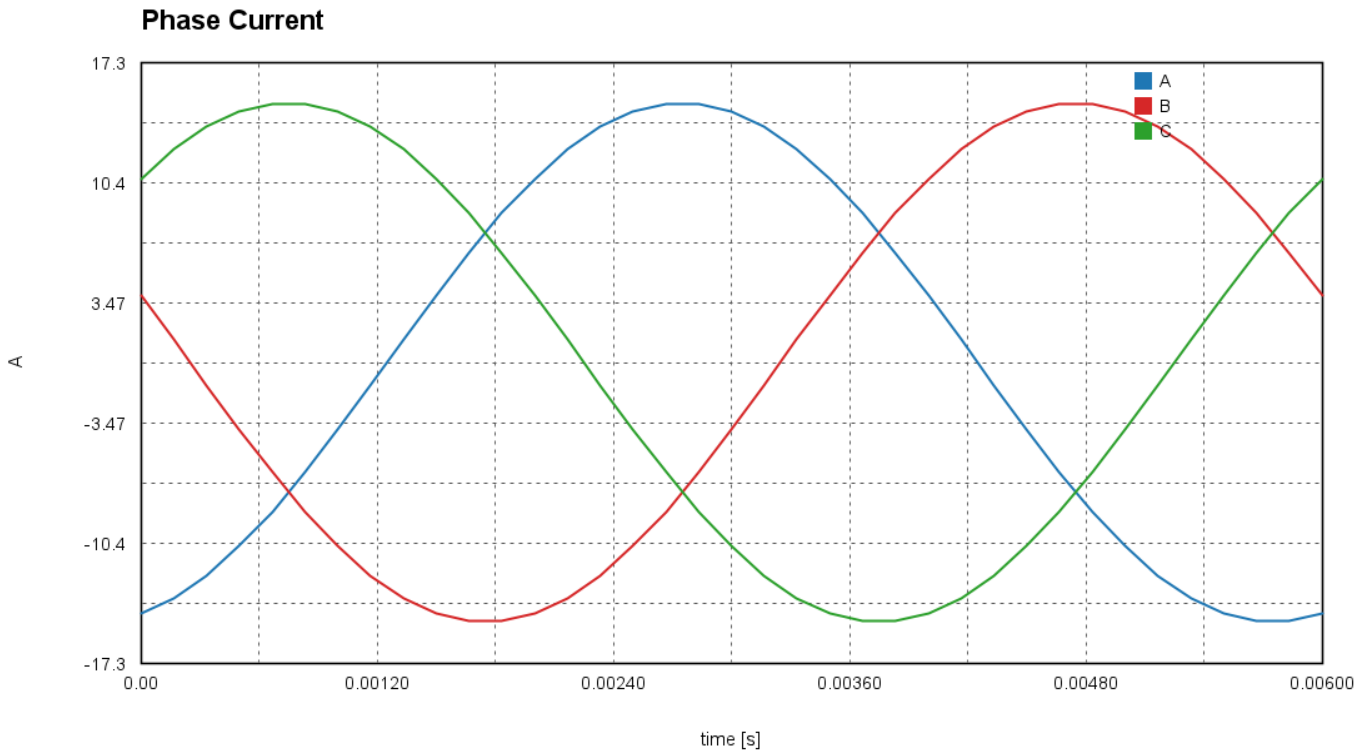
Mass Estimation

Parameter	Value	Unit	Comments
Stator Core Mass	1.43275	kg	area x axial length x density
Rotor Core Mass	0.384670	kg	
Winding Mass (In-Slot)	0.318944	kg	slot area x fill factor
End-Winding Mass	0.589379	kg	analytical, both axial ends
Magnet Mass	0.169559	kg	
Shaft Mass	0.221945	kg	
Sleeves / Wedges / Spacers Mass	0.0250050	kg	
Total Mass	3.14226	kg	sector scaled to full machine

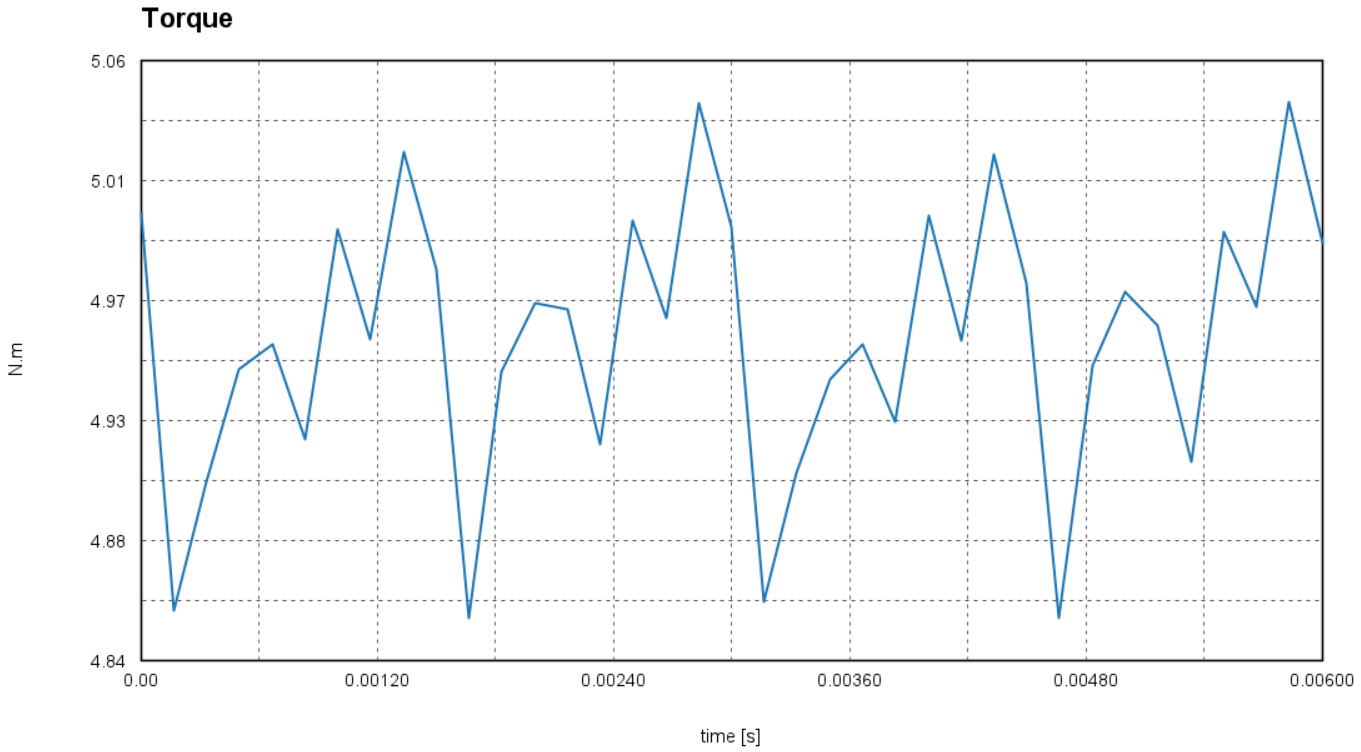
Key Waveforms



Full simulated range (36 samples). y-axis: V.

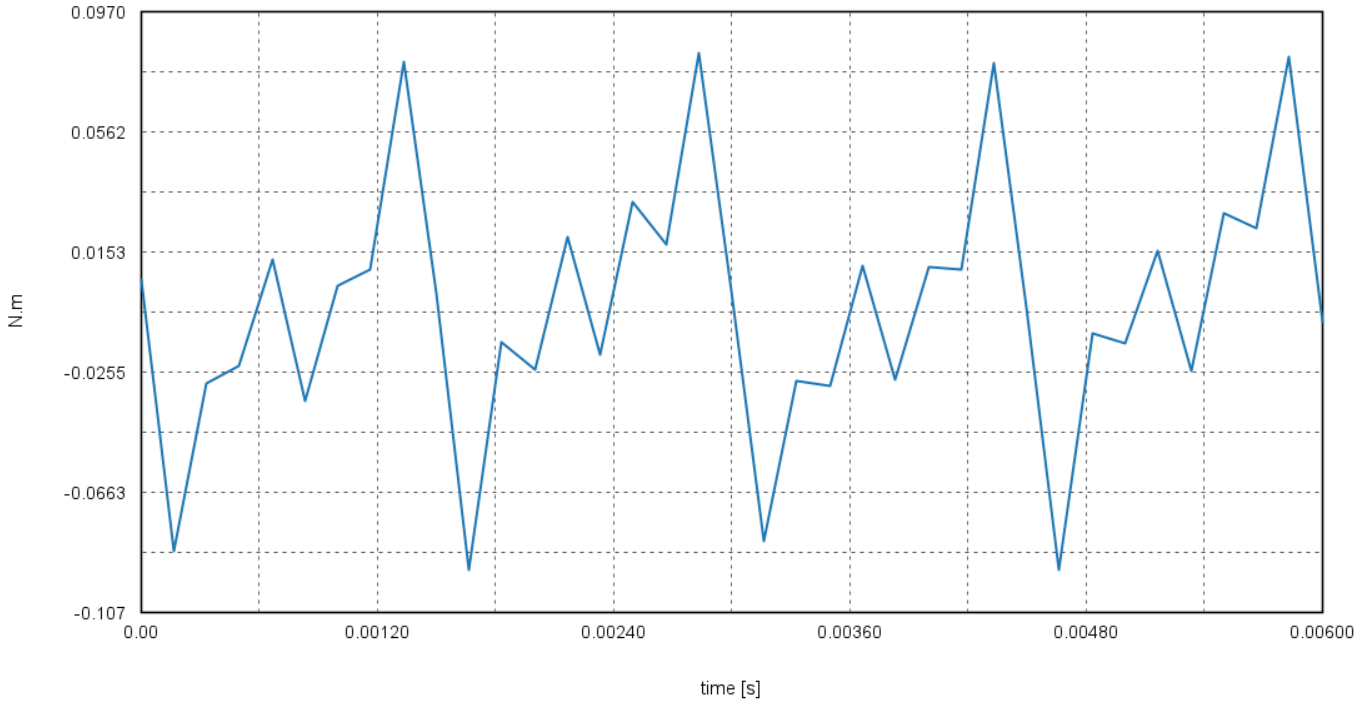


Full simulated range (37 samples). y-axis: A.



Full simulated range (37 samples). y-axis: N.m.

Cogging Torque

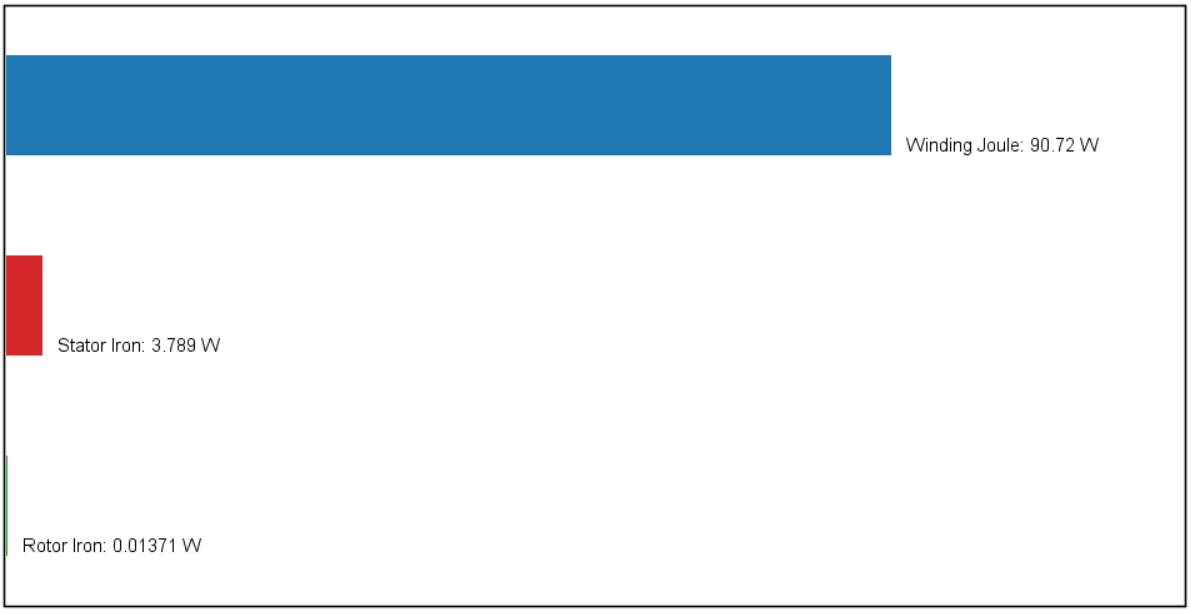


Full simulated range (37 samples). y-axis: N.m.

Loss Summary

Parameter	Value	Unit	Comments
Winding Joule	90.7174	W	
Stator Iron	3.78937	W	
Rotor Iron	0.0137095	W	
Total Losses	94.5204	W	
Efficiency	91.6537	%	
Power Factor	0.966448	-	

Loss Breakdown



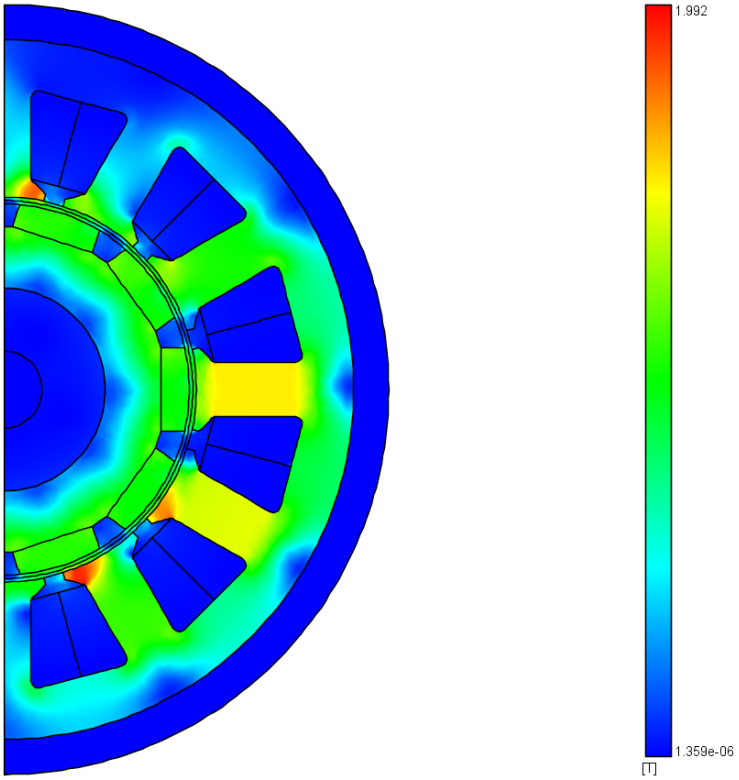
Total losses: 94.520 W

Performance Analysis

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

Field Images

Flux Density Magnitude |B|



step 37/37 | t = 0.00600000 s | rotor position = 0.00 deg