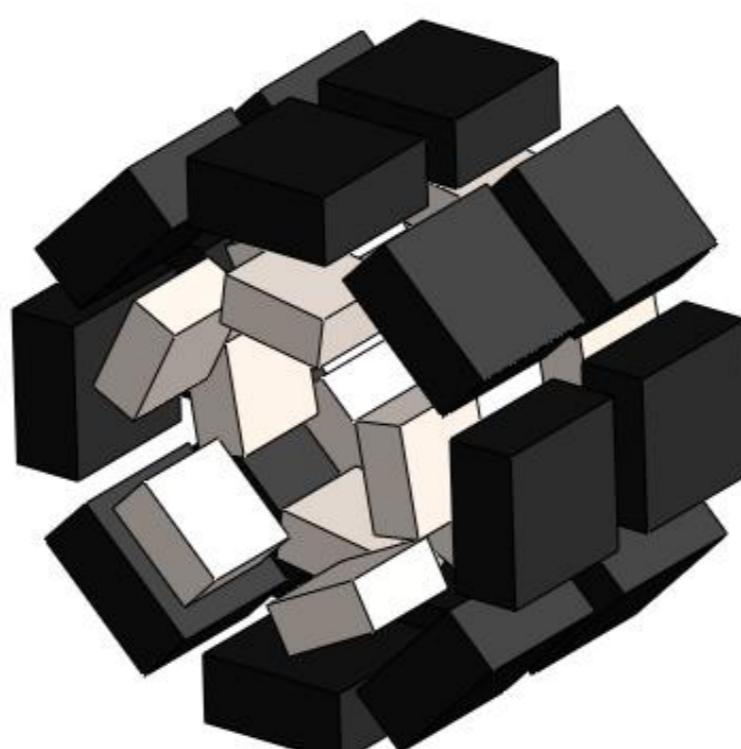


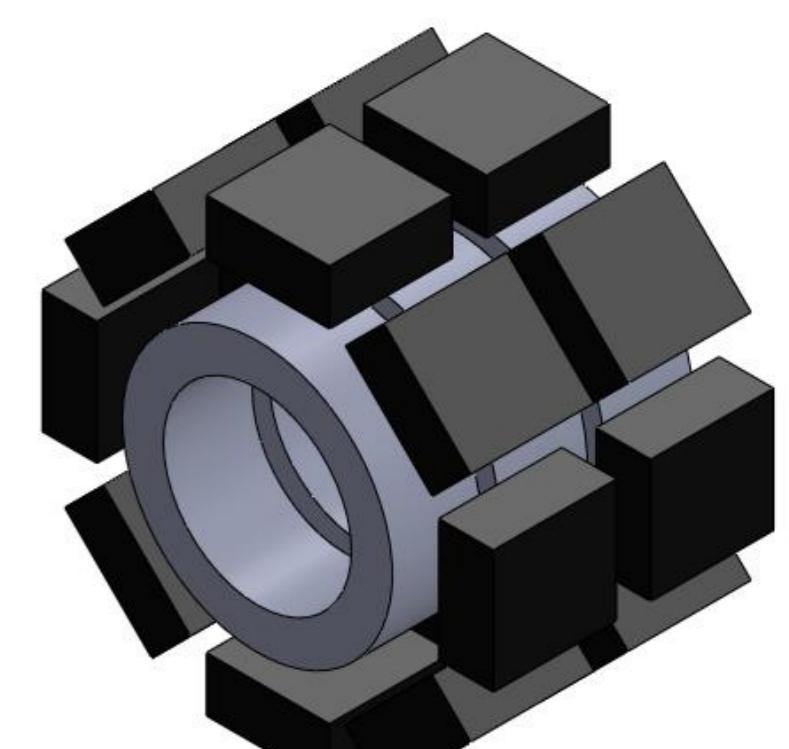
Motivations

- Base on the improved levitation & reduced loss ZFC geometry in [1-2].
- From the ZFC YBCO Magnetic Bearing with discontinuous PM rotor studied in [3,4]:
 - i. Reduce discontinuities in rotating magnetic fields;
 - ii. Increase levitation and guidance forces;
 - iii. Improve security by increasing the air gap size.

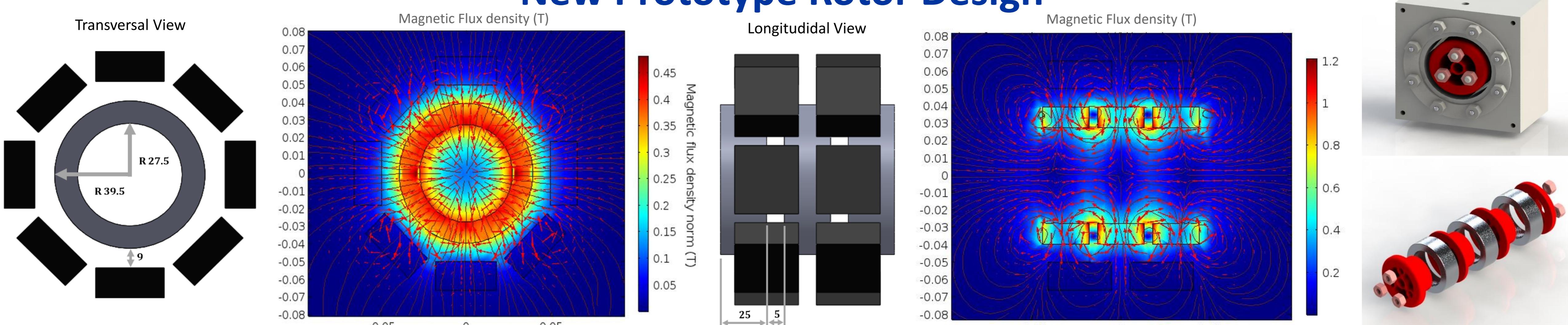


Goals

- Design and conception of a new lower diameter rotor including contínuos PM rings.
- FE simulation and experimental evaluation of levitating & guidance forces with the new rotor.
- Study of vibrations and rotor dynamics.
- Compare results with previous rotor.



New Prototype Rotor Design



Lifting and Guidance Forces

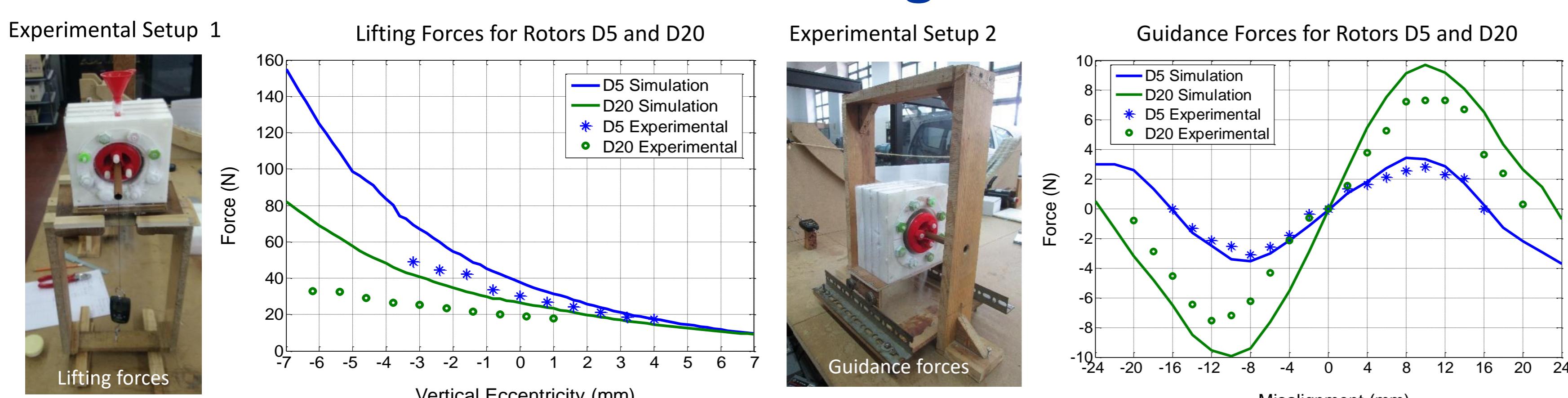


Table I: Lifting and maximum Guidance Forces

	Lifting force Centered rotor		Maximum Guidance forces	
	SIMULATION	EXPERIMENTAL	SIMULATION	EXPERIMENTAL
Rotor D5				
Disc PMs	26.91 N	18.97 N	3.12 N	2.16 N
Ring PMs	37.62 N	30.26 N	3.43 N	3.10 N
Diff. (%)	139.8%	159.5%	109.9 %	143.5 %

Vibrations

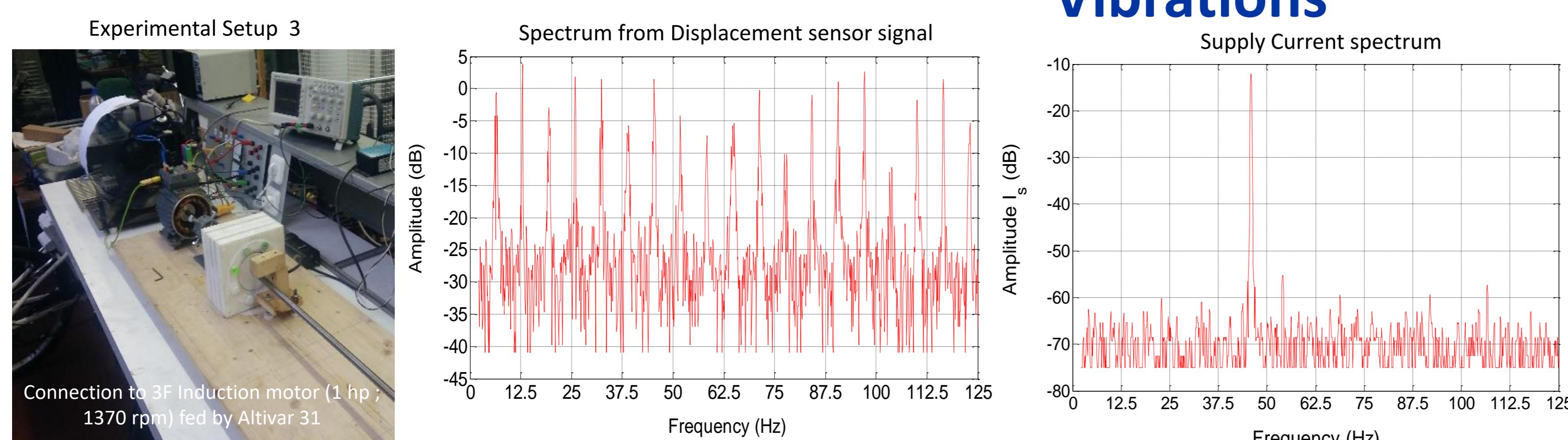
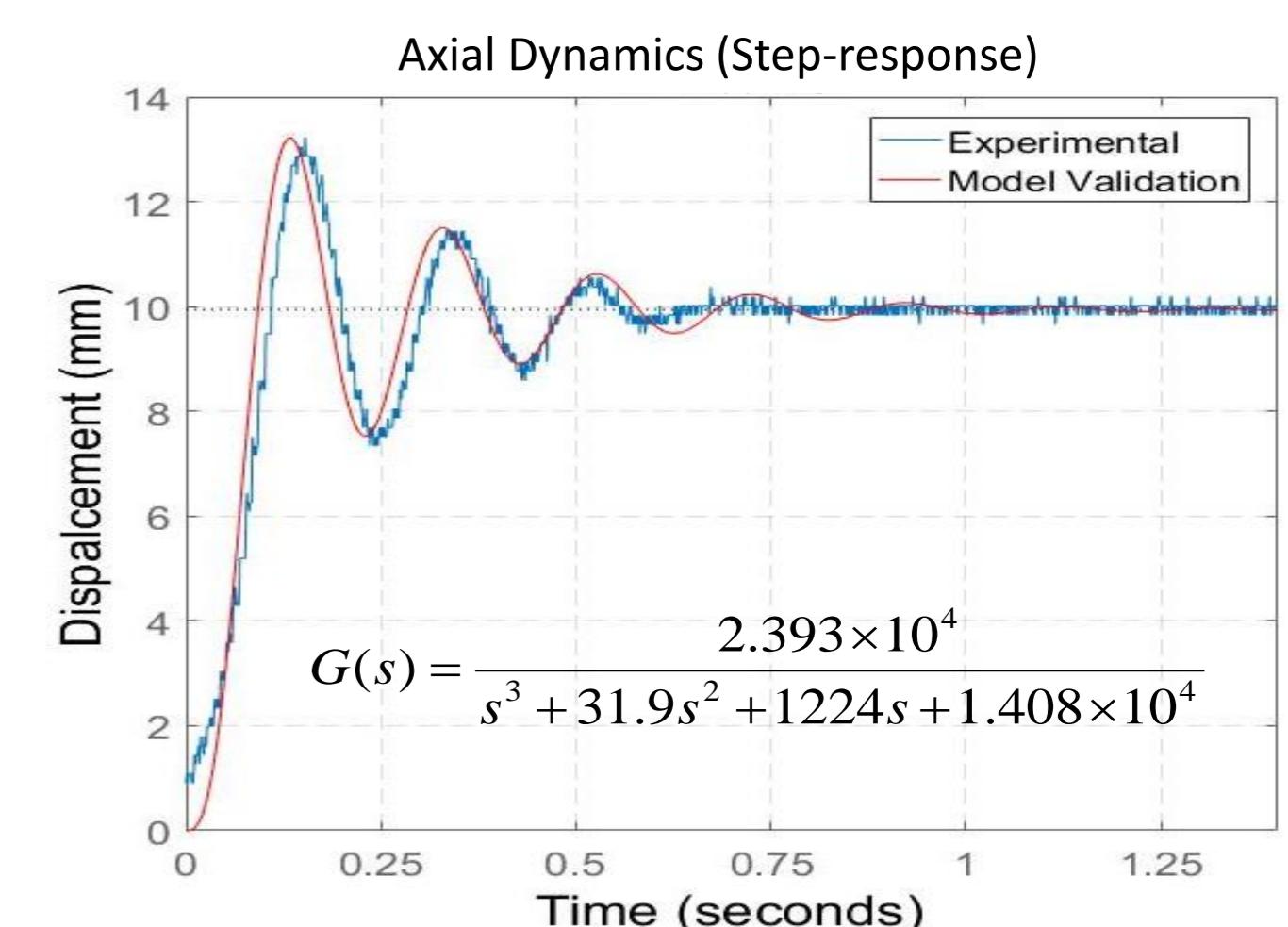
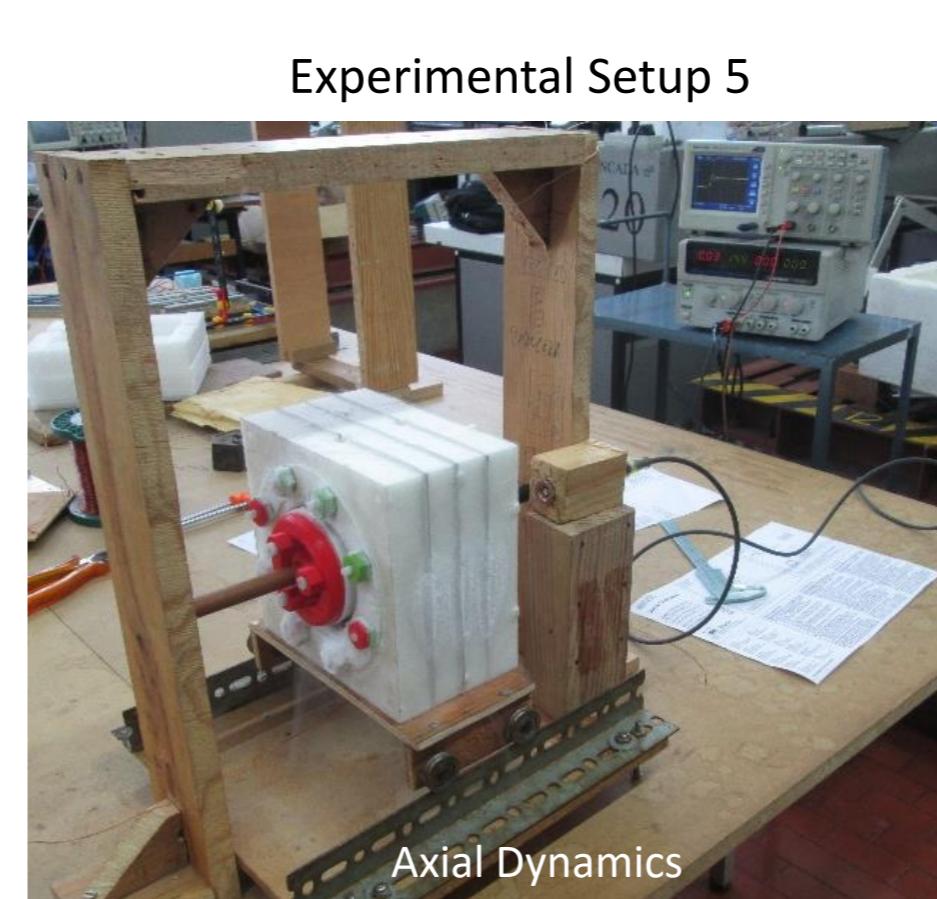
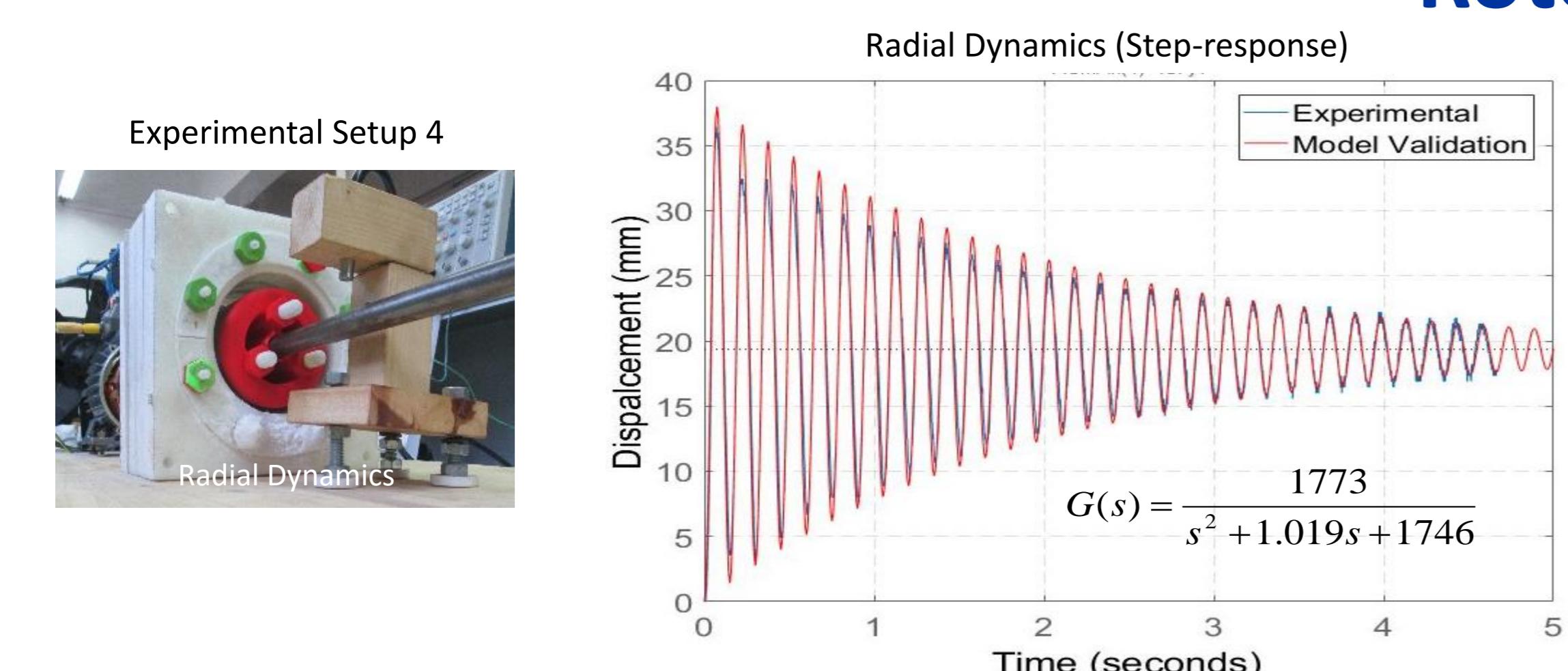


Table II: Vibrations for Continuous and Discontinuous PM rotors

ROTOR D5	$f_R \text{ (Hz)} = \frac{\text{RPM}}{60}$	SENSOR $f_{S1} \text{ (Hz)}$	CURRENT $f_{C1} \text{ (Hz)}$	SLIP $s \text{ (\%)}$
Discontinuous D5	9.17 Hz (550 rpm)	6.16	47	61
	13.2 Hz (820 rpm)	11.96	50	47.2
Continuous D5	4.17 Hz (250 rpm)	4.39	17	50.9
	8.33 Hz (500 rpm)	7.64	25	33.4
	15 Hz (900 rpm)	14.61	40	25

$$S = \frac{f_{C1} - p f_R}{f_{C1}}$$

Rotor Dynamics



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ACKNOWLEDGMENT

This work was supported by FCT, through IDMEC, under LAETA, projects UID/EMS/50022/2013 and PTDC/EEI-EEL/4693/2014 – HTSISTELEC, and by the FCT fellowship SFRH/BD/117921/2016 granted to António J. Arsénio as a PhD student in Univ. Lisboa - IST. To Mitera & Fablab-EDP.