

PROF. ANDREA CAVALLINI

CURRICULUM VITAE

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SUMMARY

Andrea Cavallini got the master and PhD degrees in electrical engineering from the University of Bologna. From 1995 to 1998 he was assistant professor at the University of Ferrara. Since 1998 he is associate professor at the University of Bologna. He teaches the course of, *Predictive Maintenance and Diagnostics of Electrical Systems*.

As a Ph.D. student and later assistant professor, he worked in power quality, with an emphasis on harmonic distortion. He developed tools to predict harmonic currents injected by AC/DC converters, and models for probabilistic harmonic flow. Besides, he investigated flicker due to arc furnaces, active and passive filters, non-parametric load forecasting tools.

He became associate professor in 1998 and, since then, he works on endurance modelling and diagnostics of insulation systems. His research focuses on partial discharges detection and identification in diverse types of apparatus (cables, rotating machines, transformers, GIS) through innovative detection system. Artificial intelligence techniques are used to achieve PD source identification.

Currently, the physics of partial discharge phenomena and the degradation rate of electrical insulation systems subjected to PWM voltage waveforms is his principal line of investigation. Insulation systems of low voltage rotating machines, resin-cast/oil-filled transformers, and silicone gels are considered. In particular, the impact of thermal aging, temperature and pressure on inception of and endurance under partial discharge under repetitive surges is dealt with in depth due to its strong impact in the automotive and aerospace industry. As a new line of investigation, a contract was signed recently with ST-Microelectronics concerning the evaluation of insulation systems for microelectronics.

Other topics are the influence of VLF voltage waveforms on PD activity and treeing inception in cables, the behaviour of PD in paper-oil insulation subjected to mixed AC+DC waveforms, PD detection in HVDC cables.

He is co-author of about 250 scientific papers and 15 international patents, co-founder of the University spin-off Techimp and is active in IEEE (DEIS Adcom member 2010-2016, DEIS Education c.tte chair from 2010, DEIS Italy Chapter President, member of insulating materials endurance WG), CIGRE (Italian national representative 2004-2008, convener of WG D1.43 and D1.74 both regarding electrical insulation under repetitive voltage surges), and IEC TC 2 MT 10 (project leader of IEC 60034-18-41 Ed. 2).



(Andrea Cavallini)

BIO DATA AND FULL CORRESPONDENCE ADDRESS

First name: Andrea	Associate Prof. Andrea Cavallini
Last name: Cavallini	School of Engineering, University of Bologna
Born: 21.12.1963	Viale del Risorgimento 2, 40146 Bologna, Italy
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BIBLIOMETRIC DATA

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ACADEMIC QUALIFICATIONS

Degree	University	Period	Title/ Remarks
Degree in Electrical Engineering	Univ. of Bologna	1984-1990	Equivalent to BSc and MSc
Ph.D. in Electrical Engineering	Univ. of Bologna	1992-1995	

AREA OF EXPERTISE (SHORT SUMMARY)

- a) Electrical Insulation Systems,
- b) Condition Monitoring and Partial Discharge Measurement,
- c) Dielectrics characterization

WORK

Employer	From	To	Positions
University of Ferrara	1995	1998	Assistant professor
University of Bologna	1998	Present date	Associate professor
TechImp HQ	1999	2012	R&D

EU PROJECTS

- Local coordinator of EU FP7 Project SyrNemo
- Local coordinator of EU H2020 Project RAISE
- Partner of FastTran (National Research Council of Norway)

ACTIVITIES IN TECHNICAL SOCIETIES

Position	Society	From	To
Member of IEEE DEIS Adcom	IEEE DEIS	2010	2016
Chair of DEIS Education committee	IEEE DEIS	2010	---
CIGRE Italian representative	CIGRE Italy	2004-	2010
Chairman of IEEE ICSD	IEEE DEIS	2013	2013
Convenor CIGRE WG D1.43	CIGRE	2012	2015
Convenor CIGRE WG D1.74	CIGRE	2019	
Responsible for Univ. of Bologna, EU FP7 Project "SyrNemo"	European Union	2013	2016
Italian DEIS Chapter chair	IEEE	2016	---
Representative for the university of Bologna in IEC TC 2 MT 10	IEC	2017	2019
Responsible for Univ. of Bologna, EU H2020 Project "RAISE"	European Union	2018	2020
Italian representative in in IEC TC 2 MT 10	IEC	2019	---
Project Leader of IEC 60034-18-41 Ed. 2	IEC	2021	---

COURSES TAUGHT OUTSIDE THE UNIVERSITY OF BOLOGNA

- TechImp international course on Partial Discharge testing (2008)
- Teacher PhD short courses at Carlos IIIo University, Madrid (2011,2012)

- Training of ENEL Personnel on Partial Discharge testing (2012)
- Teacher at Sichuan University Immersion program (2014)
- Course on dielectrics and electrical insulation for Federal Mogul
- Teacher at Sichuan University Immersion program (2017)
- Teacher at Sichuan University Immersion program (2018)
- Course on Partial Discharge Detection: Theory and Practice, (2018)

CONSULTANCY ACTIVITIES

- Co-founder of University spin off TechImp (1999)
- Evaluation of insulating fluids for Dupont (2013)
- Support in the evaluation of low voltage motor insulation (CAME, 2015)
- Evaluation of HVDC materials for Alstom grid and, lately, General Electric (Present)
- Development of Partial Discharge detection systems for electric power train quality control (Loccioni, 2018-2021)
- Member of TechImp board of experts (2016-2018)

PATENTS

Device And Method For Locating Partial Discharges	<u>Brpi1006494 (A2)</u>	2016-03-15
Instrument And Method For Measuring Partial Electrical Discharges In An Electrical System	<u>Cn103809088 (A)</u>	2014-05-21
Diagnostic Method And Apparatus For Assessing The Insulation Condition Of Electrical Equipment Insulated With Oil	<u>Kr20120115527 (A)</u>	2012-10-18
Method And Device For Deriving The Concentration Of A Gas Dissolved In An Electrical Insulation Oil	<u>Us2012291521 (A1);</u> <u>Us8616045 (B2)</u>	2012-11-22
Device And Method For Detecting And Processing Signals Relating To Partial Electrical Discharges	<u>Kr20120089703 (A)</u>	2012-08-13
Device And Method For Locating Partial Discharges	<u>Cn102365555 (A);</u> <u>Cn102365555 (B)</u>	2012-02-29
A Method And An Apparatus For Monitoring An Activity Of Partial Electrical Discharges In An Electrical Apparatus Powered With Direct Voltage	<u>Es2366307 (T3)</u>	2011-10-19
Method And Apparatus For Evaluating The Level Of Superficial Pollution Of A Medium/High Voltage Outdoor Insulator	<u>Es2366229 (T3)</u>	2011-10-18
A Method For Detecting, Identifying And Locating Partial Discharges Occurring In A Discharge Site Along An Electric Apparatus	<u>Es2364882 (T3)</u>	2011-09-16
A Method For Processing Data Pertaining To An Activity Of Partial Electrical Discharges	<u>Es2355316 (T3)</u>	2011-03-24
Procedimento Per Rilevare Segnali Prodotti Da Scariche Elettriche Parziali Avenuti Luogo In Un Trasformatore Di Misura In Alta Tensione In Esercizio Connesso A Terra Mediante	<u>Itpr20070005 (A1)</u>	2008-08-09

Instrument And A Method For Detecting Partial Electrical Discharges Occurring In An Electric Apparatus	<u>Itpr20070061 (A1)</u>	2009-01-27
Procedimento Per Rilevare Segnali Prodotti Da Scariche Elettriche Parziali Aveni Luogo In Un Cavo Elettrico In Media O In Alta Tensione	<u>Itpr20070060 (A1)</u>	2009-01-27
Metodo Per L'analisi Di Un Sistema Elettrico Mediante Lo Studio Di Scariche Elettriche Parziali	<u>Itbo20010133 (A1)</u>	2002-09-13
A Method For Detecting Signals Produced By Partial Electric Discharges Occurring In A Medium Or High Voltage Electric Cable Or In An Operating High Voltage Measuring Transformer Grounded By Means Of A Conductive Base	<u>Wo2008096298 (A2)</u> ; <u>Wo2008096298 (A3)</u>	2008-08-14

SPOKEN LANGUAGES

- English
- Spanish
- Italian (mother tongue)

LIST OF PUBLICATIONS (JOURNALS ONLY, CONFERENCES ARE NOT LISTED HERE)

1. M. Cacciari, G. C. Montanari, L. Simoni, A. Cavallini and A. Motori, "Long-term electrical performance and life model fitting of XLPE and EPR insulated cables," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 7, no. 2, pp. 634-641, Apr 1992.
2. M. Loggini, G. C. Montanari, A. Cavallini , "Generation of uncharacteristic harmonics in electrical plants with AC/DC converters," *European Transactions on Electrical Power Engineering*, Vol. 4, n. 3, 187-194, June 1994.
3. M. Loggini, G. C. Montanari, A. Cavallini , "Behaviour of harmonic current vectors generated by 6-pulse AC/DC converters as function of plant parameters," *European Transactions on Electrical Power Engineering*, Vol. 4, n. 3, 195-203, June 1994.
4. A. Cavallini, M. Cacciari, M. Loggini and G. C. Montanari, "Evaluation of harmonic levels in electrical networks by statistical indexes," in IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, vol. 30, no. 4, pp. 1116-1126, Jul/Aug 1994.
5. G. C. Montanari, M. Loggini, A. Cavallini, L. Pitti and D. Zaninelli, "Arc-furnace model for the study of flicker compensation in electrical networks," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 9, no. 4, pp. 2026-2036, Oct 1994.
6. A. Cavallini and G. C. Montanari, "Compensation strategies for shunt active-filter control," in IEEE TRANSACTIONS ON POWER ELECTRONICS, vol. 9, no. 6, pp. 587-593, Nov 1994.
7. A. Cavallini, M. Loggini and G. C. Montanari, "Comparison of approximate methods for estimate harmonic currents injected by AC/DC converters," in IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, vol. 41, no. 2, pp. 256-262, Apr 1994.
8. A. Cavallini, G. C. Montanari, L. Pitti, D. Zaninelli, "ATP simulation for arc-furnace flicker investigation", *European Transactions on Electrical Power Engineering*, Vol. 5, n. 3, 165-172, June 1995.

9. A. Cavallini, G. C. Montanari and M. Cacciari, "Stochastic evaluation of harmonics at network buses," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 10, no. 3, pp. 1606-1613, Jul 1995.
10. G. C. Montanari, G. Mazzanti, A. Cavallini and M. Cacciari, "Application of the Kalman filter for electrical endurance characterization of insulating materials and systems," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 3, no. 1, pp. 56-63, Feb 1996.
11. A. Cavallini, G. C. Montanari, G. Mazzanti, "Probabilistic investigation of the life behavior of power capacitors operating under distorted supply voltage", *Lifetime Data Analysis*, Vol. 3, n. 1, 47-61, February 1997
12. A. Cavallini and G. C. Montanari, "A deterministic/stochastic framework for power system harmonics modeling," in IEEE TRANSACTIONS ON POWER SYSTEMS, vol. 12, no. 1, pp. 407-415, Feb 1997.
13. A. Cavallini, G. Mazzanti, G. C. Montanari and C. Romagnoli, "Design of shunt capacitor circuits for power factor compensation in electrical systems supplying nonlinear loads: a probabilistic approach," in IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, vol. 34, no. 4, pp. 675-681, Jul/Aug 1998.
14. Y. Baghzouz ET AL., "Time-varying harmonics. I. Characterizing measured data," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 13, no. 3, pp. 938-944, Jul 1998.
15. A. Cavallini, I. Ghinello, G. Mazzanti and G. C. Montanari, "Considerations on the life performance and installation practice of shunt capacitors in the presence of harmonics generated by AC/DC converters," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 14, no. 1, pp. 227-234, Jan 1999.
16. G. C. Montanari, A. Contin and A. Cavallini, "Random sampling and data processing for PD-pulse height and shape analysis," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 7, no. 1, pp. 30-39, Feb 2000.
17. Y. Baghzouz ET AL., "Time-Varying Harmonics: Part II-Harmonic Summation and Propagation," in IEEE POWER ENGINEERING REVIEW, vol. 21, no. 10, pp. 64-64, Oct. 2001.
18. Y. Baghzouz ET AL., "Time-varying harmonics. II. Harmonic summation and propagation," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 17, no. 1, pp. 279-285, Jan 2002.
19. A. Contin, A. Cavallini, G. C. Montanari, G. Pasini and F. Puletti, "Digital detection and fuzzy classification of partial discharge signals," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 9, no. 3, pp. 335-348, Jun 2002.
20. A. Cavallini, D. Fabiani, G. Mazzanti and G. C. Montanari, "Life model based on space-charge quantities for HVDC polymeric cables subjected to voltage-polarity inversions," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 9, no. 4, pp. 514-523, Aug 2002.
21. A. Cavallini ET AL., "Behavior of CdTe and CdZnTe detectors following electron irradiation," in IEEE TRANSACTIONS ON NUCLEAR SCIENCE, vol. 49, no. 4, pp. 1598-1602, Aug 2002.
22. A. Cavallini, A. Contin, G. C. Montanari and F. Puletti, "Advanced PD inference in on-field measurements. I. Noise rejection," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 10, no. 2, pp. 216-224, April 2003.
23. A. Cavallini, G. C. Montanari, A. Contin and F. Puletti, "A new approach to the diagnosis of solid insulation systems based on PD signal inference," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 19, no. 2, pp. 23-30, March-April 2003.
24. A. Cavallini, M. Conti, A. Contin and G. C. Montanari, "Advanced PD inference in on-field measurements. II. Identification of defects in solid insulation systems," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 10, no. 3, pp. 528-538, June 2003.
25. J. Borghetto ET AL., "Partial discharge inference by an advanced system. Analysis of online measurements performed on hydrogenerator," in IEEE TRANSACTIONS ON ENERGY CONVERSION, vol. 19, no. 2, pp. 333-339, June 2004.
26. D. Fabiani, G. C. Montanari, A. Cavallini and G. Mazzanti, "Relation between space charge accumulation and

- partial discharge activity in enameled wires under PWM-like voltage waveforms," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 11, no. 3, pp. 393-405, Jun 2004.
27. A. Cavallini, M. Conti, G. C. Montanari, C. Arlotti and A. Contin, "PD inference for the early detection of electrical treeing in insulation systems," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 11, no. 4, pp. 724-735, Aug. 2004.
 28. A. Cavallini, G. C. Montanari, F. Puletti and A. Contin, "A new methodology for the identification of PD in electrical apparatus: properties and applications," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 12, no. 2, pp. 203-215, April 2005.
 29. A. Cavallini, F. Ciani, G. Mazzanti and G. C. Montanari, "First electron availability and partial discharge generation in insulation cavities: effect of light irradiation," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 12, no. 2, pp. 387-394, April 2005.
 30. A. Cavallini, G. C. Montanari and F. Puletti, "A fuzzy logic algorithm to detect electrical trees in polymeric insulation systems," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 12, no. 6, pp. 1134-1144, Dec. 2005.
 31. W. Hauschild, A. Cavallini and G. C. Montanari, "Effect of supply voltage frequency on testing of insulation system," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 13, no. 5, pp. 1189-1191, Oct. 2006.
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 35. A. Cavallini, S. Chandrasekar, G. C. Montanari and F. Puletti, "Inferring ceramic insulator pollution by an innovative approach resorting to PD detection," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 14, no. 1, pp. 23-29, Feb. 2007.
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 38. M. Tozzi, G. C. Montanari and A. Cavallini, "PD detection limits in extruded power cables through wide and ultra-wide bandwidth detectors," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 15, no. 4, pp. 1183-1189, August 2008.
 39. A. Cavallini, D. Fabiani and G. C. Montanari, "A novel method to diagnose PWM-fed induction motors," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 15, no. 5, pp. 1313-1321, October 2008. doi: 10.1109/TDEI.2008.4656239
 40. M. Tozzi, A. Cavallini, G. C. Montanari and G. L. G. Burbui, "PD detection in extruded power cables: an approximate propagation model," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 15, no. 3, pp. 832-840, June 2008.
 41. S. Chandrasekar, C. Kalaivanan, A. Cavallini and G. C. Montanari, "Investigations on leakage current and phase angle characteristics of porcelain and polymeric insulator under contaminated conditions," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 16, no. 2, pp. 574-583, April 2009.

42. A. Cavallini, E. Lindell, G. C. Montanari and M. Tozzi, "Off-line PD testing of converter-fed wire-wound motors: when IEC TS 60034-18-41 may fail?" in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 17, no. 5, pp. 1385-1395, October 2010.
43. A. Cavallini, D. Fabiani and G. C. Montanari, "Power electronics and electrical insulation systems - Part 3: Diagnostic properties," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 26, no. 5, pp. 30-40, September-October 2010.
44. M. Tozzi, A. Cavallini and G. C. Montanari, "Monitoring off-line and on-line PD under impulsive voltage on induction motors - part 1: standard procedure," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 26, no. 4, pp. 16-26, July-Aug. 2010.
45. A. Cavallini, X. Chen, G. C. Montanari and F. Ciani, "Diagnosis of EHV and HV Transformers Through an Innovative Partial-Discharge-Based Technique," in IEEE TRANSACTIONS ON POWER DELIVERY, vol. 25, no. 2, pp. 814-824, April 2010.
46. S. Chandrasekar, C. Kalaivanan, G. C. Montanari and A. Cavallini, "Partial discharge detection as a tool to infer pollution severity of polymeric insulators," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 17, no. 1, pp. 181-188, February 2010.
47. A. Cavallini, D. Fabiani and G. C. Montanari, "Power electronics and electrical insulation systems - Part 1: Phenomenology overview," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 26, no. 3, pp. 7-15, May-June 2010.
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49. A. Cavallini, G. C. Montanari and M. Tozzi, "PD apparent charge estimation and calibration: A critical review," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 17, no. 1, pp. 198-205, February 2010.
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51. M. Tozzi, A. Cavallini and G. C. Montanari, "Monitoring off-line and on-line PD under impulsive voltage on induction motors - Part 2: testing*," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 27, no. 1, pp. 14-21, January-February 2011.
52. M. Tozzi, A. Cavallini and G. C. Montanari, "Monitoring off-line and on-line PD under impulsive voltage on induction motors - Part 3: Criticality," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 27, no. 4, pp. 26-33, July-August 2011.
53. L. Wang, A. Cavallini, G. C. Montanari and L. Testa, "Evolution of pd patterns in polyethylene insulation cavities under AC voltage," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 19, no. 2, pp. 533-542, April 2012.
54. G. C. Montanari and A. Cavallini, "Partial discharge diagnostics: from apparatus monitoring to smart grid assessment," in IEEE ELECTRICAL INSULATION MAGAZINE, vol. 29, no. 3, pp. 8-17, May-June 2013.
55. P. Wang, A. Cavallini, G. C. Montanari and G. Wu, "Effect of rise time on PD pulse features under repetitive square wave voltages," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 20, no. 1, pp. 245-254, February 2013.
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- Rotating Machines Controlled by Power Electronics," in IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS, vol. 61, no. 12, pp. 7105-7112, Dec. 2014.
58. P. Wang, A. Cavallini and G. C. Montanari, "The influence of repetitive square wave voltage parameters on enameled wire endurance," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 21, no. 3, pp. 1276-1284, June 2014.
 59. P. Wang, A. Cavallini and G. C. Montanari, "Characteristics of PD under square wave voltages and their influence on motor insulation endurance," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 22, no. 6, pp. 3079-3086, December 2015.
 60. A. Cavallini, R. Karthik and F. Negri, "The effect of magnetite, graphene oxide and silicone oxide nanoparticles on dielectric withstand characteristics of mineral oil," in IEEE TRANSACTIONS ON DIELECTRICS AND ELECTRICAL INSULATION, vol. 22, no. 5, pp. 2592-2600, October 2015.
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 63. Jian Wang; Peng Wang; Hongying Xu; Andrea Cavallini;, "Novel Repetitive Square Wave Voltage Generator Used for the Insulation Evaluation of Rotating Machines Driven by Power Electronics", to be published in *IEEE Transactions on Dielectrics and Electrical Insulation*, 2017
 64. S. Babicz, S. Ait-Amar, G. Vélú, A. Cavallini and P. Mancinelli, "Behavior of anodized aluminum strip under sine and square wave voltage," in IEEE Transactions on Dielectrics and Electrical Insulation, vol. 24, no. 1, pp. 39-46, Feb. 2017.
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frequency on RPDIV in partial vacuum," in IEEE Transactions on Dielectrics and Electrical Insulation, vol. 25, no. 3, pp. 873-882, June 2018.

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