

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JinkoSolar Co., Ltd.,
Petitioner,

v.

LONGi Green Energy Technology Co. Ltd.,
Patent Owner.

Case No. IPR2025-00859
Patent No. 9,515,214

**DECLARATION OF DR. HAMID TOLİYAT IN SUPPORT OF PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,515,214**

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I. INTRODUCTION

1. I, Hamid Toliyat, declare as follows.

2. I have been retained as a technical consultant on behalf of JinkoSolar Co., Ltd. (“Jinko” or “Petitioner”), which I understand to be the petitioner in the present proceeding. I have been asked to consider whether the references listed as Exhibits 1004-1012 below disclose or render obvious the limitations recited in claims 1-11 of U.S. Patent No. 9,515,214 (Ex. 1001, “’214 patent”). I have also been asked to consider the state of the art and the “prior art,” i.e., references, available before the time of the alleged invention of the ’214 patent. My opinions are provided in this declaration.

3. I am being compensated at my standard consulting rate for my time. My compensation is in no way contingent on the results of these or any other proceedings relating to the ’214 patent.

II. BACKGROUND AND QUALIFICATIONS

4. I am currently the Robert Kennedy ’26 Chair Professor of Electrical Engineering at Texas A&M University. A description of my professional background and qualifications is provided below. An additional account of my work experience and qualifications is included in my *curriculum vitae*, which is attached as Appendix A.

5. I have over 35 years of experience in the field of energy systems, power supply schemes, and solar-powered technologies.

6. I received my B.S. from Sharif University of Technology in 1982, M.S. degree from West Virginia University in 1986, and Ph.D. degree from the University of Wisconsin-Madison in 1991, all in electrical engineering.

7. In March 1994 I joined the Department of Electrical and Computer Engineering at Texas A&M University, where I am currently the Robert Kennedy '26 Chair Professor of Electrical Engineering.

8. I received the Nikola Tesla Field Award for “outstanding contributions to the design, analysis and control of fault-tolerant multiphase electric machines” from IEEE in 2014, the Cyril Veinott Award in Electromechanical Energy Conversion from the IEEE Power Engineering Society in 2004, Patent and Innovation Award from Texas A&M University System Office of Technology Commercialization’s in 2020, 2016 and 2007, TEES Faculty Fellow Award in 2006, Distinguished Teaching Award in 2003, E.D. Brockett Professorship Award in 2002, Eugene Webb Faculty Fellow Award in 2000, and Texas A&M Select Young Investigator Award in 1999. I also received the Space Act Award from NASA in 1999, and the Schlumberger Foundation Technical Awards in 2001 and 2000.

9. I was an Editor of IEEE Transactions on Energy Conversion. I also was Chair of the IEEE-IAS Industrial Power Conversion Systems Department of IEEE-

IAS, and am a member of Sigma Xi. I am a Life Fellow of the IEEE, the recipient of the 2008 Industrial Electronics Society Electric Machines Committee Second Best Paper Award as well as the recipient of the IEEE Power Engineering Society Prize Paper Awards in 1996 and 2006, and IEEE Industry Applications Society Transactions Third Prize Paper Award and Second Prize Paper Award in 2006 and 2016, respectively. I was the General Chair of the 2005 IEEE International Electric Machines and Drives Conference in San Antonio, Texas.

10. My main research interests and experience include power electronics, microcontrollers, analysis and design of electrical machines, variable speed drives for traction and propulsion applications, fault diagnosis of electric machinery, and sensorless variable speed drives.

11. In addition to my expertise in power electronics and electric machinery, I have substantial experience in renewable energy systems, including photovoltaic energy. My professional interests include distributed energy systems such as surface wave energy, wind turbines, microturbines, and photovoltaic systems. I have contributed to research and development in power electronic converters designed specifically for renewable energy applications, including scalable soft-switching photovoltaic inverters. I have also published and lectured on topics relating to renewable energy systems integration, smart grids, and high-frequency link power converters for solar applications.

12. I have supervised more than 120 graduate students, post docs, and research engineers. I have published over 555 technical papers, presented more than 100 invited lectures all over the world, and have 22 issued and pending U.S. patents. My publications are highly cited by colleagues—more than 33,000 times.

13. I have purposely taught courses in two different areas within my department: power electronics, and electric machinery. I have developed and taught three new courses in the field. These are:

- ECEN 611 General Theory of Electromechanical Motion Devices, 3 credits.
- ECEN 612 Computer Aided Design of Electromechanical Motion Devices, 4 credits.
- ECEN 442/742 DSP-Based Electromechanical Motion Control, 3 credits.

III. MATERIALS REVIEWED

14. I am not an attorney and offer no legal opinions. However, in my work, I have had experience studying and analyzing patents and patent claims from the perspective of a person skilled in the art. *See* Section VI.C below for the level of ordinary skill in the art for this declaration.

15. In preparing this declaration, I reviewed the '214 patent, including the claims of the patent in view of the specification; the prosecution history of the '214

patent; and numerous publications and technical references from and preceding the time of the alleged invention. More specifically, I have reviewed each of the following:

Exhibit	Description
1001	U.S. Patent No. 9,515,214
1002	File History for U.S. Patent No. 9,515,214
1003	Declaration of Dr. Hamid Toliyat
1004	J. E. Boretz et al., <i>Study To Establish Criteria For A Solar Cell Array For Use As A Primary Power Source For A Lunar-Based Water Electrolysis System</i> (1971) (“Boretz”)
1005	Certified Translation of Japanese Patent Application Publication No. JP H07-106619 (“Maehane”)
1006	Japanese Patent Application Publication No. JP H07-106619 (“Maehane”)
1007	Certified Translation of Chinese Patent Application Publication No. CN 201171051 Y (“Zhang”)
1008	Chinese Patent Application Publication No. CN 201171051 Y (“Zhang”)
1009	Indian Patent Application No. 1328/KOL/2007 (“Ravi328”)
1010	Indian Patent Application No. 1260/KOL/2008 (“Ravi260”)
1011	U.S. Patent Publication No. 2007/0295381A1 (“Fujii”)
1012	Narayanan Krishnamurthy, <i>Dynamic Modelling of CubeSat Project MOVE</i> (2008) (“Krishnamurthy”)
1013	Markvart et al., <i>Solar Cells, Materials, Manufacture and Operation</i> (2005) (“Markvart”)
1014	D. W. Cunningham et al., <i>Reaching Grid Parity Using BP Solar Crystalline Silicon Technology</i> (2010) (“Cunningham”)
1015	U.S. Patent No. 8,709,154
1016	European Patent Application Publication No. EP1796177A1
1017	R. H. Josephs, <i>Solar Cell Array Design Handbook, Volume I</i> (1976) (“Josephs”)
1018	U.S. Patent No. 8,871,169
1019	M. Gillanders, <i>Pilot Production and Testing of High Efficiency Wraparound Contact Solar Cells</i> (1981) (“Gillanders”)
1020	European Patent Application Publication No. EP1564816A1

Exhibit	Description
1021	A. Goetzberger et al., <i>Photovoltaic Solar Energy Generation</i> (2005) (“Goetzberger”)
1022	U.S. Patent No. 7,951,640

IV. RELEVANT LEGAL STANDARDS

16. For the purposes of this declaration, I have been informed about certain aspects of the law that are relevant to forming my opinions. I have applied the following understanding of the law.

17. I have been informed that a patent claim may be “anticipated” if each element of that claim is present either explicitly or inherently in a single prior art reference, and that the elements should be arranged in the reference as in the claim. Petitioner’s counsel has informed me that for a claimed limitation to be inherently present, the prior art need not expressly disclose the limitation, so long as the claimed limitation necessarily flows from a disclosure in the prior art.

18. I have been informed that a patent claim can be considered to have been obvious to a person of ordinary skill in the art at the time the application was filed. This means that, even if all of the requirements of a claim are not found in a single prior art reference, the claim is not patentable if the differences between the subject matter in the prior art and the subject matter in the claim would have been obvious to a person of ordinary skill in the art at the time the application was filed.

19. I have been informed that a determination of whether a claim would have been obvious should be based upon several factors, including, among others:

- the level of ordinary skill in the art at the time the application was filed;
- the scope and content of the prior art; and
- what differences, if any, existed between the claimed invention and the prior art.

20. I have been informed that a single reference can render a patent claim obvious if any differences between that reference and the claims would have been obvious to a person of ordinary skill in the art. Alternatively, the teachings of two or more references may be combined in the same way as disclosed in the claims, if such a combination would have been obvious to one having ordinary skill in the art. In determining whether a combination based on either a single reference or multiple references would have been obvious, it is appropriate to consider, among other factors:

- whether the teachings of the prior art references disclose known concepts combined in familiar ways, and when combined, would yield predictable results;
- whether a person of ordinary skill in the art could implement a predictable variation, and would see the benefit of doing so;

- whether the claimed elements represent one of a limited number of known design choices, and would have a reasonable expectation of success by those skilled in the art;
- whether a person of ordinary skill would have recognized a reason to combine known elements in the manner described in the claim;
- whether there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; and
- whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way.

21. I have been informed that one of ordinary skill in the art has ordinary creativity and is not an automaton. I have been informed that in considering obviousness, it is important not to determine obviousness using the benefit of hindsight derived from the patent being considered.

22. I understand that various objective or “real world” factors may be indicative of non-obviousness. I understand that such factors include:¹

- the commercial success of the claimed invention;

¹ I am not aware of any objective evidence of non-obviousness having been identified in connection with the '214 patent.

- the existence of a long-felt, unresolved need for a solution to the problem solved by the claimed invention;
- failed attempts to solve the problem solved by the claimed invention;
- copying of the claimed invention;
- unexpected results of the claimed invention;
- praise for the claimed invention by others in the relevant field; and
- willingness of others to accept a license under the patent because of the merits of the claimed invention.

V. TECHNOLOGY BACKGROUND

23. Solar photovoltaic (PV) modules generate electrical power by connecting multiple solar cells into an array. Each solar cell, commonly made of crystalline silicon, produces direct current (DC) electricity when exposed to sunlight. To achieve usable voltages and currents, individual solar cells must be electrically connected.

24. In conventional module designs, solar cells are connected primarily in series, meaning the positive terminal of one cell connects to the negative terminal of the next. Connection in series increases the overall voltage of the module while maintaining the current of a single cell. Cells may also be connected in parallel. In parallel connections, multiple strings of cells are connected such that the voltages remain constant while the current outputs are summed. Many modern modules use

a series-parallel configuration, where groups of series-connected cells are connected in parallel to optimize both voltage and current output and improve resilience to partial shading.

25. Each solar cell generally includes two types of electrodes: (1) bus electrodes (or busbars), which are wider conductive strips that collect and transport the electric current generated by the cell; and (2) finger electrodes (or grid lines), which are narrow, fine lines that collect charge carriers across the surface of the cell and feed them into the busbars. An exemplary configuration of such busbar electrodes (depicted below in red) and grid line electrodes (depicted below in green) can be seen in Figure 4 of Ravi328:

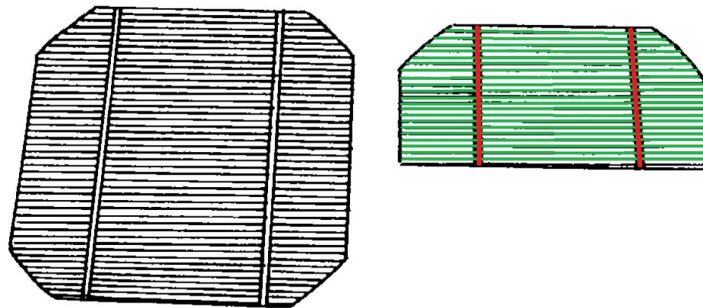


Fig. 4

Ravi328, Fig. 4 (annotated).

26. Typically, multiple bus electrodes are formed across the light-receiving (front) surface of the cell, oriented parallel to one edge of the cell (usually the shorter

side in rectangular cells). These bus electrodes guide collected electrons toward the cell's external connection points.

27. For connection between cells, metallic ribbons (interconnectors) are typically soldered across the bus electrodes of adjacent cells. The front side of one cell is connected to the rear side of the next cell, thereby achieving a series connection. In some designs, rear-side bus electrodes are formed directly opposite the front-side bus electrodes to simplify alignment and connection.

28. Reducing resistive losses in the interconnectors is critical for maximizing module efficiency. Resistive losses scale with the square of the current (I^2R). To mitigate these losses, one well-known solution is to lower the current itself by reducing the effective size of each cell.

29. One method to achieve this is cell splitting, where full-size cells are divided into two or more smaller, substantially rectangular cells (commonly called "half-cells"). By halving the size of the cell, the current flowing through each cell and each interconnector is also halved, resulting in one-quarter of the resistive losses (since power loss is proportional to current squared). Modules built from split cells thus demonstrate higher efficiency without sacrificing active light-absorbing area.

30. As photovoltaic module designs matured, different electrical connection schemes were developed to optimize module voltage and current outputs. In early modules prior to the '214 patent, solar cells were commonly connected

purely in series, where the positive terminal of one cell was connected to the negative terminal of the next. As explained above, series connections increase the total voltage while keeping the current the same as that of a single cell.

31. The series-parallel arrangement was developed next, prior to the '214 patent. In a series-parallel arrangement, two or more series strings of cells are connected in parallel. This increases the module's current output while maintaining a reasonable operating voltage, helping to balance power characteristics for compatibility with external systems such as inverters and charge controllers. The series-parallel-series configuration was developed next, again prior to the '214 patent. In such configuration, groups of parallel-connected series strings are further connected in series. This architecture offers greater flexibility, allowing module designers to fine-tune the voltage and current output to meet a wider range of system requirements and improve fault tolerance under partial shading or cell mismatch conditions.

32. These developments in cell structure, connection methods, and wiring configurations reflect a broader industry trend toward maximizing the electrical efficiency, mechanical durability, and manufacturability of photovoltaic modules.

VI. OVERVIEW OF U.S. PATENT NO. 9,515,214

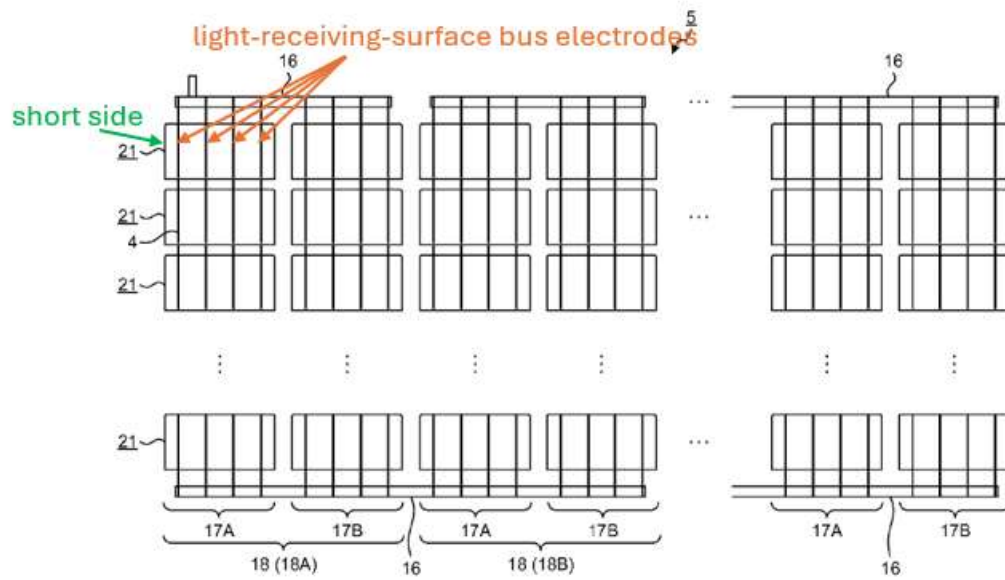
A. Summary

33. The '214 patent is entitled “Solar Battery Module and Manufacturing Method Thereof” and names Koji Shimasaki and Masayoshi Suzuki as inventors. The '214 patent is generally directed to a solar battery module composed of a plurality of rectangular solar cells and a method of manufacturing such modules. '214 patent, Abstract.

34. A stated object of the '214 patent is to “provide a solar battery module that can improve an output without increasing a cross-sectional area of an interconnector, and a manufacturing method thereof.” '214 patent, 1:40-57. The patent purports to address the problem of increased resistive losses in interconnectors caused by rising current levels in higher-efficiency solar cells. '214 patent, 1:27-30.

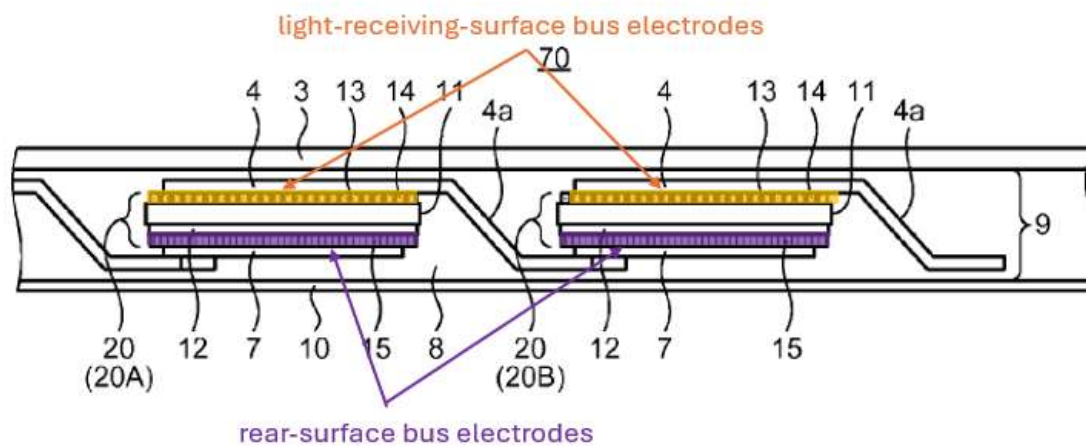
35. The patent describes a solar battery module in which each solar cell has a substantially rectangular shape with the ratio of the short side length to the long side length being $1/n:1$ (where n is an integer equal to or greater than 2). '214 patent, 1:61-67. Each cell includes a plurality of light-receiving-surface bus electrodes formed parallel to the short side of the rectangle on the light-receiving surface, and corresponding rear-surface bus electrodes on the non-light-receiving surface. '214 patent, 1:67-2:9.

FIG.12



'214 patent, Fig. 12 (annotated).

FIG.8



'214 patent, Fig. 8 (annotated).

36. The solar cells are electrically connected such that the light-receiving-surface bus electrodes of one cell are connected to the rear-surface bus electrodes of an adjacent cell via an interconnector. '214 patent, 2:5-10. By dividing a conventional square solar cell into smaller rectangular cells and connecting them in this manner, the patent teaches that the current flowing through each interconnector is reduced, thereby reducing resistive losses without increasing interconnector size. '214 patent, 2:10-30.

37. The '214 patent includes eleven claims: two independent claims (claims 1 and 10) and nine dependent claims (claims 2–9 and 11).

B. Priority Date of the '214 Patent

38. I have been asked to assume that the earliest possible priority date for the '214 patent is July 2, 2010, the filing date of related PCT Application No. PCT/JP2010/061334, as listed on the face of the '214 patent. I have therefore analyzed the prior art as of that date or somewhat before that date.

C. Level of Ordinary Skill in the Art

39. It is my understanding that factors defining the level of ordinary skill in the art include: (1) the types of problems encountered in the art; (2) the prior art solutions to those problems; (3) the rapidity with which innovations are made; (4) the sophistication of technology; and (5) the educational level of active workers in the field.

40. A person of ordinary skill in the art (“POSITA”) as of July 2010 would have had a bachelor’s degree in engineering, physics, or a related or equivalent field, and two or more years of experience researching, developing, designing, and/or evaluating photovoltaic cells or solar module systems. A person with less or different education but more relevant practical experience, or vice versa, may also meet this standard.

41. I met this definition of a POSITA as of July 2010. I applied this definition of a POSITA in forming my opinion in this declaration.

D. Claim Construction

42. I understand that in this proceeding, the claims should be construed in accordance with their ordinary and customary meaning in light of the specification, as understood by one of ordinary skill in the art. After reviewing the specification and the prosecution history, I do not believe that any constructions other than the plain and ordinary meaning of the claim terms of the ’214 patent are necessary at this stage of the current proceeding. I have therefore applied those plain and ordinary meanings in my analysis.

VII. OVERVIEW OF THE PRIOR ART

A. Study To Establish Criteria For A Solar Cell Array For Use As A Primary Power Source For A Lunar-Based Water Electrolysis System (“Boretz”)

43. I understand that Boretz is prior art because it was published on September 15, 1971, well before the '214 patent's earliest effective filing date, which is July 2, 2010.

44. Boretz was not cited or discussed during prosecution of the '214 patent.

45. Boretz discloses the development of three prototype solar cell panel Engineering Test Models (ETM) using various substrate materials. These configurations were designed to achieve power-to-weight ratios of 12 to 18 watts per pound. Boretz, 3-1.

46. Figure 2.2 illustrates the solar cell sub-module arrangement within the Prototype Test Module, with the strategic layout of solar cells. The cells are arranged in a flat laydown configuration, using 2 cm x 4 cm silicon cells bonded with RTV-118 adhesive. The configuration includes seven sub-groupings of cells, each with two cells in parallel and 66 cells in series, totaling 924 cells. The connections are made using Kovar ribbons. Boretz, 4-1-4-3.

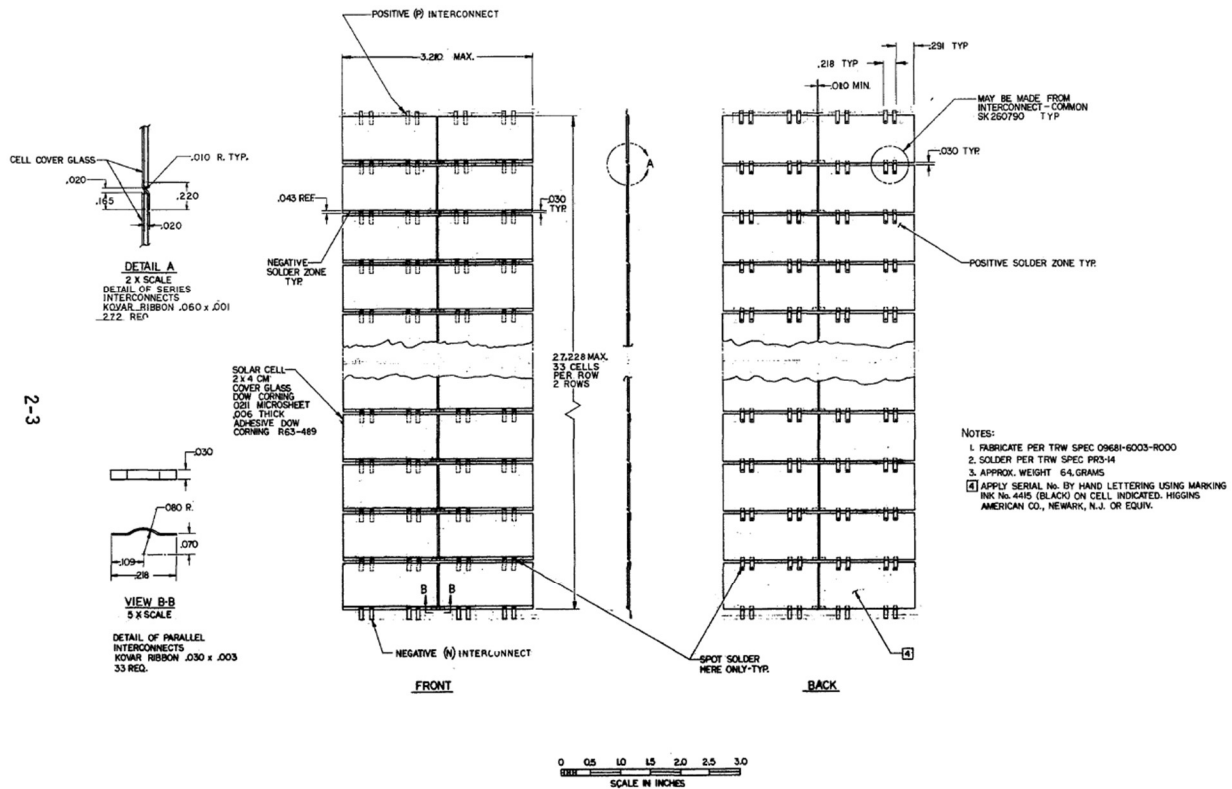


Figure 2.2 Prototype Test Module-Solar Cell Sub-Module Arrangement

Boretz, Fig. 2.2.

B. JPH 07106619 (“Maehane”)

47. I understand that Maehane (JP 07106619) is prior art because it was filed on October 7, 1993, and published on April 21, 1995, well before the '214 patent's earliest effective filing date, which is July 2, 2010.

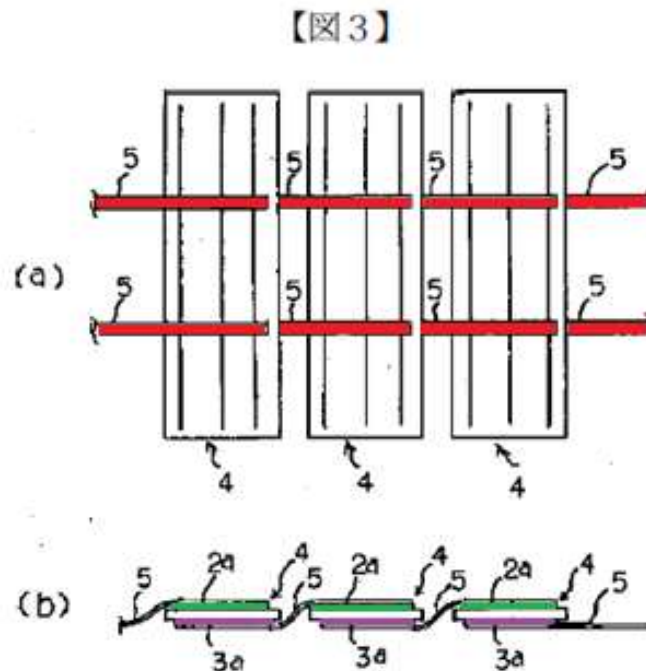
48. I understand that Maehane was cited during prosecution of the '214 patent, but that the examiner's objections were overcome on other grounds related to limitations that Maehane was not cited for disclosing. *See, e.g., Ex. 1002, 550–54.*

49. Maehane discloses a method for manufacturing solar cells aimed at preventing short-circuiting during the electrical connection of segmented solar cell elements. Maehane, Abstract. The method involves forming surface electrodes on the light-receiving side of a semiconductor substrate, where the connection regions terminate inside the periphery of the small power generation regions. Maehane, [0008]. Rear electrodes are similarly formed on the opposite side. The semiconductor substrate is then segmented into smaller solar cell elements. These elements are electrically connected using connection members that link the surface electrode of one element to the rear electrode of an adjacent element. Maehane, [0008].

50. Maehane addresses the challenge of preventing short circuits in solar cells, which can occur when solder used for electrical connections overflows and inadvertently connects the surface and rear electrodes. Maehane, Abstract. By positioning the connection regions within the internal periphery, the risk of solder overflow causing short circuits is mitigated. Maehane, [0010].

51. Maehane's method enhances the effective area contributing to power generation by confining connection regions within the internal periphery, rather than extending them to the outer edges. Maehane, [0022]. This design also provides improved connection strength, as the soldering across the entire connection region ensures robust electrical connections. Maehane, [0023].

52. Figure 3 illustrates the embodiment of segmented solar cell elements on a semiconductor substrate, highlighting the strategic placement of surface electrodes and split cells to prevent short circuits. Maehane, [0016]. The semiconductor substrate, labeled as component 1, is initially divided into multiple small power generation regions, each forming a solar cell element 4. Maehane, [0012]-[0016]. These regions, are segmented along lines parallel to the vertical edges of the substrate, allowing for individual solar cell elements to be created, each with its own surface electrode 2 and rear electrode 3. Maehane, [0015]. The surface electrodes 2 include connection region parts 2a that are strategically placed just inside the outer periphery of each small power generation region, which is crucial to prevent unwanted short circuits. Maehane, [0013], [0018]. The solar cell elements are connected in series using electrical connection members 5 (annotated in red below), typically made of metal foil. Maehane, [0016]-[0018]. These members connect the surface electrode's connection region parts 2a (green) of one solar cell element to the rear electrode's connection region parts 3a (purple) of an adjacent solar cell element. Maehane, [0012]-[0018]. This series connection enhances the overall performance of the solar cells by ensuring efficient electrical flow between them. Maehane, [0016].



Maehane, Fig. 3 (annotated).

C. CN 201171051 Y (“Zhang”)

53. I understand that Zhang (CN 201171051 Y) is prior art because it was filed on January 31, 2008, and published on December 24, 2008, well before the '214 patent's earliest effective filing date, which is July 2, 2010.

54. Zhang was not cited or discussed during prosecution of the '214 patent.

55. Zhang discloses a photovoltaic (PV) module designed to output higher power while reducing manufacturing costs. The module comprises photovoltaic glass, interconnect strips, and a packaging backplate, all encapsulated in a transparent laminating material. Zhang, Abstract. The photovoltaic cells used are 125 mm x 125

mm mono-crystalline or poly-crystalline solar cells. Zhang, Abstract. These cells are connected in series to form series connection groups. Zhang, Abstract. The two ends of these groups are then connected in parallel to form a series-parallel combination. This combination is subsequently connected in series to form the output terminal of the module. Zhang, 3.

56. Zhang addresses the challenge of increasing the power output of PV modules without significantly increasing manufacturing costs. By utilizing smaller 125 mm x 125 mm cells instead of larger ones, Zhang's design reduces the overall cost of production while maintaining high power output. The use of series-parallel connections allows for both an increase in output voltage and current, resulting in a more powerful module without relying solely on increasing the size of the cells or the number of cells in series. This method contrasts with traditional approaches, which either increase cell size (raising costs) or add more series-connected cells (which only boosts voltage, not current, limiting power output). Zhang, 3.

57. An exemplary embodiment from Zhang is depicted below.

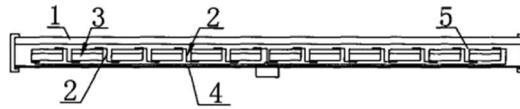


图 1

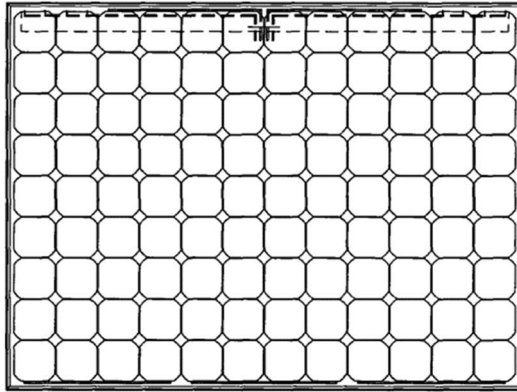


图 2

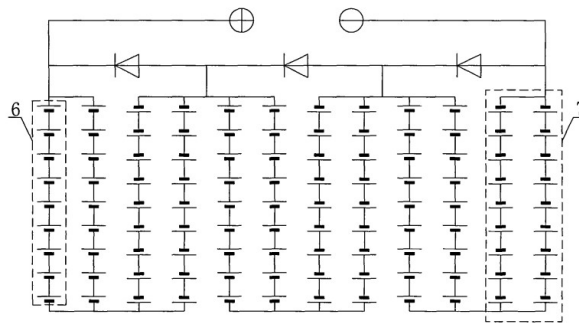


图 3

Zhang, Figs. 1-3.

58. Figure 1 shows the structural components of the photovoltaic module, including the photovoltaic glass, interconnects, and encapsulation materials. Zhang, 4. Figure 2 provides a vertical view of the assembled module, while Figure 3 depicts the electrical connection diagram illustrating the series and parallel configurations that enable the higher power output. Zhang, 4.

D. Indian Patent Application No. 1328/KOL/2007 (“Ravi328”)

59. I understand that Ravi328 (Indian Patent Application No. 1328/KOL/2007) qualifies as prior art because it was published on October 4, 2009, before the earliest effective filing date of the '214 patent, which is July 2, 2010.

60. Ravi328 was not cited or discussed during prosecution of the '214 patent.

61. Ravi328 discloses a photovoltaic (PV) module architecture composed of 108 half-cut, 125-mm mono-crystalline silicon solar cells, arranged to form a 12-volt, 120-watt output module. Ravi328, 3. The full-size 125-mm square cells are laser-cut into two equal halves to create rectangular sub-cells. “3 strings each of 18 half-cut cells are paralleled and then connected in series with another set of 18*3 strings.” Ravi328, 5. Electrical connection is achieved via tinned copper ribbons soldered to the front and rear busbars of the half-cells, allowing current to flow from the front of one cell to the rear of the next. Ravi328, 5. The cell strings are mounted using a custom-designed Phenyl Resin Bonded Cotton Fibre (PRBCF) lay-up jig, then encapsulated between high-transmission tempered glass, EVA encapsulant layers, and a Tedlar-based back sheet. Ravi328, 5. The entire assembly is vacuum laminated, framed in anodized aluminum, and fitted with a junction box for external connections. Ravi328, 5.

62. Ravi328 addresses the manufacturing limitations and market constraints posed by short supply of 156-mm wafers and production lines designed only for 125-mm cells. Ravi328, 3. By replacing 36 full-sized 156-mm cells (typically used in conventional 12V, 120W modules) with 108 half-cut 125-mm cells, the design maintains comparable voltage and power output while enabling use of more readily available materials and fabrication tools. Ravi328, 4. Moreover, the reduction in individual cell current contributes to minimized resistive losses and enhanced module efficiency, making the design suitable for compact and efficient module architectures.

63. An exemplary embodiment from Ravi328 is depicted below.

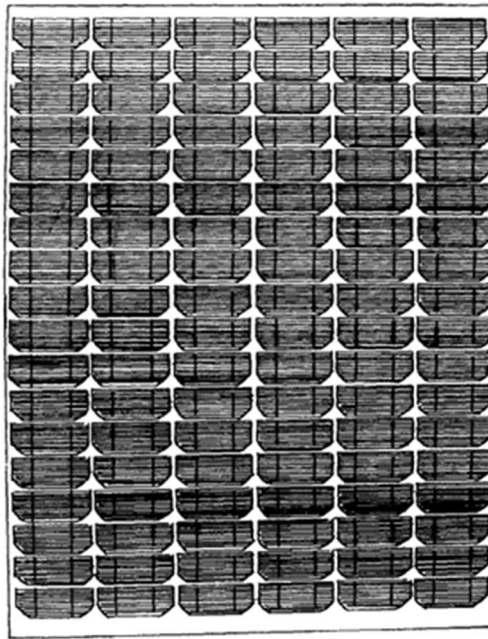


Fig. 6

Ravi328, Fig. 6.

64. Ravi328's Figure 6 illustrates a finished 120-watt PV module comprising 108 half-cut 125-mm mono-crystalline silicon solar cells. Ravi328, 4. The figure shows the series-parallel configuration of two groups of cells, each comprising three strings of 18 half-cells each, further connected to each other in series. Ravi328, 5.

E. Indian Patent Application No. 1260/KOL/2008 ("Ravi260")

65. I understand that Ravi260 (Indian Patent Application No. 1260/KOL/2008) qualifies as prior art because it was published on January 29, 2010, before the earliest effective filing date of the '214 patent, which is July 2, 2010.

66. Ravi260 was not cited or discussed during prosecution of the '214 patent.

67. Ravi260 discloses a method for fabricating a photovoltaic (PV) module rated at 12 volts and 80 watts, incorporating 72 one-third cut 156-mm multi-crystalline silicon solar cells. Ravi260, 1. The method involves laser cutting full-size 156-mm solar cells into one-third portions, connecting the one-third cut cells into strings using tinned copper interconnects soldered on the front busbars, and laminating the connected cells between layers of Ethylene Vinyl Acetate (EVA), tempered high-transmission glass, and a Tedlar-based backsheet. Ravi260, 1–2. The assembly is vacuum laminated, framed with anodized aluminum, and fitted with a junction box for external connections. Ravi260, 5–6.

68. Ravi260 addresses the need to develop PV modules using 156-mm solar cells due to the diminishing availability of 125-mm cells and the manufacturing shift toward 156-mm wafers. Ravi260, 3. By utilizing 72 one-third cut 156-mm cells arranged in two sets, each comprising two parallel strings of one-third cut cells (i.e., 2×18 cells each), connected to each other in series, the design achieves the desired 12V, 80W output. Ravi260, 4–5. This configuration maximizes use of available material, reduces waste, and maintains module efficiency and size comparable to prior 125-mm cell modules. The reduction in individual cell current also minimizes resistive losses, improving overall module performance. Ravi260, 6.

69. An exemplary embodiment from Ravi260 is depicted below.

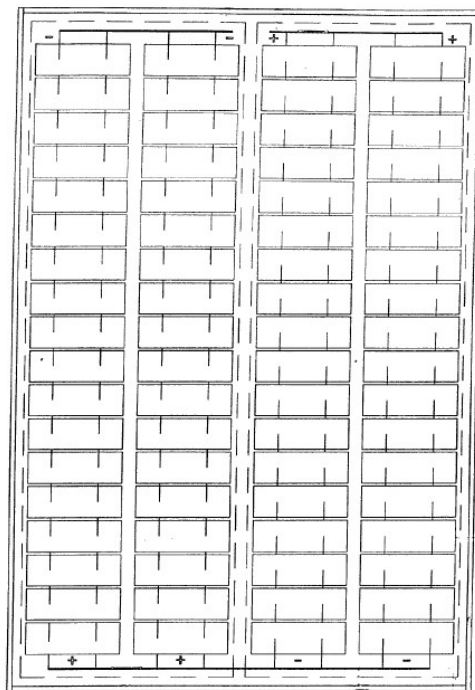


Fig. 6

80WATTS PV MODULE MADE WITH 72 NOS.
OF ONE-THIRD CUT 156 MM SOLAR CELLS.

Ravi260, Fig. 6.

70. Ravi260's Figure 6 illustrates a completed 80-watt PV module comprising 72 one-third cut 156-mm multi-crystalline silicon solar cells. Ravi260, 5. The figure shows the series-parallel configuration of two strings of 18 sub-cells each, connected into two parallel sets, which are then connected in series. This arrangement enables the module to achieve the required voltage and power output. Ravi260, 5.

F. U.S. Patent Publication No. 20070295381A1 ("Fujii")

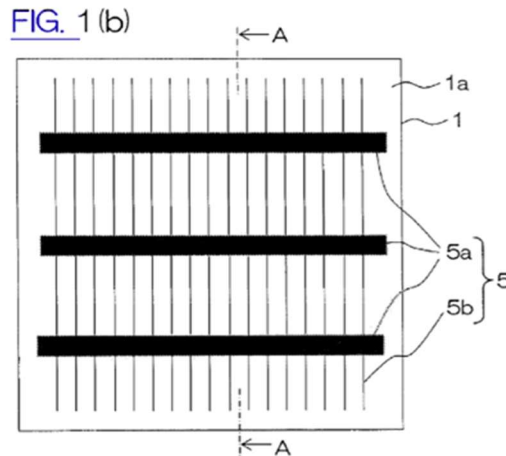
71. I understand that Fujii (US20070295381A1) is prior art because it was published on December 27, 2007, before the '214 patent's priority date.

72. Fujii was not cited or discussed during prosecution of the '214 patent.

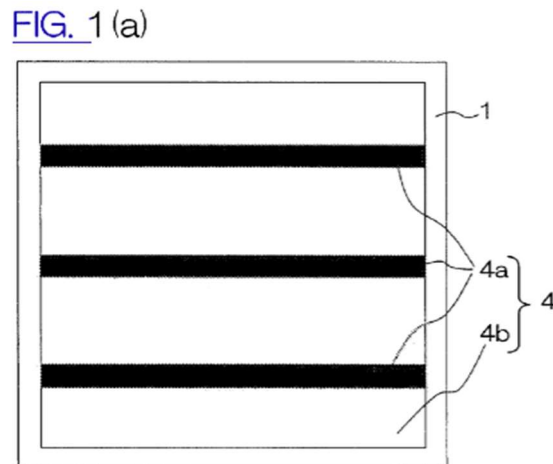
73. Like the '214 patent, Fujii is directed to solar modules composed of connected solar battery cells, with an emphasis on improving conversion efficiency and optimizing current collection. Fujii discloses that individual solar cells typically generate low voltages and thus must be electrically connected in series or parallel to form a functional solar module. Fujii, ¶¶ [0012], [0026].

74. Fujii discloses the detailed structure of both the light-receiving surface (front side) and non-light-receiving surface (rear side) of the solar cell element. As shown in FIG. 1(b), the light-receiving surface includes surface busbar electrodes and fine surface finger electrodes which are patterned perpendicular to the busbars to efficiently collect photocurrent. *See* Fujii, ¶ [0120]. These electrodes are part of the

front-side “surface electrode.” Fujii, ¶ [0102]. Fujii specifies dimensions for these electrodes, with busbar widths between 0.5 mm and 2 mm, and finger electrode widths between 0.05 mm and 0.1 mm. Fujii, ¶¶ [0125]-[0127].



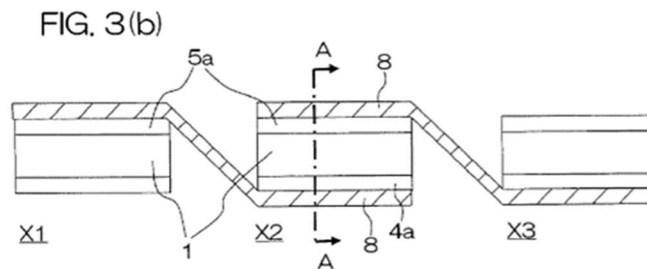
75. The rear side of the solar cell element, shown in FIG. 1(a), includes back surface busbar electrodes and back surface power collecting electrodes, collectively referred to as the “back surface electrode.” Fujii, ¶ [0102]. These are connected to the front surface of adjacent cells via wiring members 8. *See* Fujii, ¶¶ [0026], [0137].



Fujii, Fig. 1(a).

76. Fujii discloses that the wiring members connect the surface busbar electrode of one cell to the back surface busbar electrode of the next, thereby forming series electrical connections between cells. These series connections enhance output voltage as required in practical solar modules. Fujii, ¶¶ [0026]-[0027], [0137].

77. An exemplary connection scheme in Fujii is shown below, where the surface busbar electrode of one cell is connected to the back surface busbar electrode of the adjacent cell using wiring members 8:



Fujii, Fig. 3(b).

78. The solar battery cells described in Fujii have a rectangular planar shape, with sides ranging from 100 mm to 350 mm. Fujii, ¶ [0046].

G. *Dynamic Modelling of CubeSat Project MOVE* (“Krishnamurthy”)

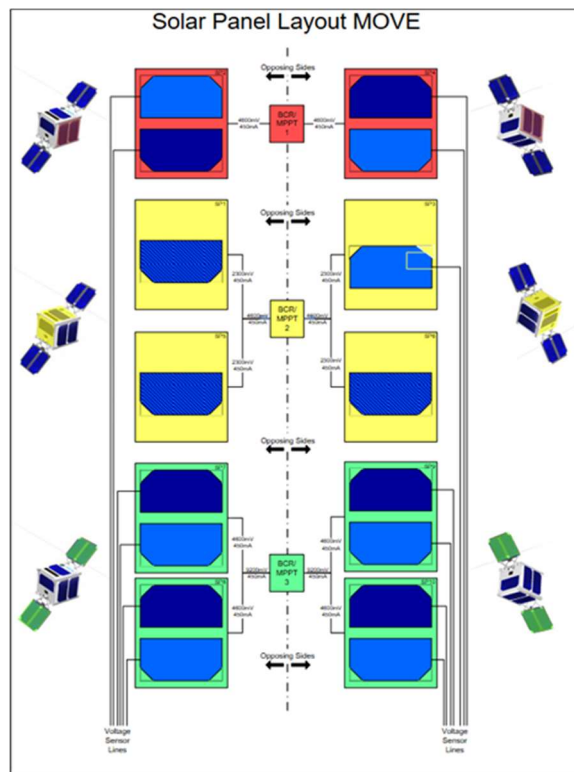
79. I understand that Krishnamurthy (*Dynamic Modelling of CubeSat Project MOVE*) is prior art because it was published in 2008, before the '214 patent's priority date.

80. Krishnamurthy was not cited or discussed during prosecution.

81. Like the '214 patent, Krishnamurthy is directed to photovoltaic systems composed of connected rectangular solar cells arranged in string configurations to optimize power generation. The reference details the design and layout of solar arrays for a CubeSat, a mini-satellite, including electrical connections and physical positioning of solar cells on both fixed and deployable panels.

82. Krishnamurthy discloses the use of rectangular GaAs (gallium arsenide)/GaInP (indium gallium phosphide)/Ge (germanium) solar cells manufactured by EADS-Astrium, each having dimensions of 40 mm × 80 mm, corresponding to a 1:2 short-to-long side ratio. Krishnamurthy, 52.

83. Importantly, Krishnamurthy teaches that only one long side of each solar cell has chamfered corners (a small corner cut), while the opposite long side does not—i.e., chamfered corners are present on both ends of only the first long side, while the second long side remains square. Krishnamurthy, Fig. 6-5. This asymmetry in cell geometry is visually evident from Figure 6-5.



Krishnamurthy, Fig. 6-5.

84. Krishnamurthy further discloses a solar cell arrangement in which adjacent cells in a string are placed such that the first long side (with chamfered corners) of one cell does not face the second long side (without chamfered corners) of the next cell. As shown in Figure 6-5, cells are arranged with a consistent orientation across the string, ensuring that non-chamfered edges of adjoining cells face each other.

Krishnamurthy, Fig. 6-5.

VIII. CLAIMS ANALYSIS

A. Ground 1: Claims 1-5, 8, and 11 Are Obvious over Boretz and Maehane

1. Motivation to Combine Boretz and Maehane

85. A POSITA when seeking to utilize the solar module technology disclosed in Boretz would realize that Boretz does not expressly disclose any significant detail about the electrodes which would necessarily be included on both front and rear faces of each solar cell. It is well-established that a battery cell is comprised of at least two electrodes—an anode and a cathode. It is further well-established that to connect multiple battery cells in series, an interconnector must connect a positive electrode to a negative electrode. In Boretz, as explained further below with respect to claim limitation 1[c], these connections are made from the front of one solar cell to the back of an adjoining solar cell in a string of cells. However, Boretz does not explicitly identify the shape and orientation of these electrodes on the surfaces of the cells.

86. In my opinion, a POSITA would be motivated to supplement the disclosure of Boretz based on the disclosure of Maehane. Maehane discloses a common industry design for an electrode configuration on the front and back surfaces of a solar cell. Maehane's electrode configuration includes a series of grid lines positioned over the expanse of the cell surface to efficiently collect and conduct the current generated from exposure to the sun. These grid electrodes work in concert together with a series of bus electrodes, which further direct the collected current into

channels to be effectively communicated to the next adjoining solar cell. By adopting this electrode configuration, a POSITA would recognize that the Boretz solar module would be able to benefit from these well-known advantages. Moreover, a POSITA would have seen incorporating these disclosures in Maehane to Boretz as simply applying the well-known technique of Maehane's electrode configuration to the known devices of Boretz's solar cells.

87. A POSITA would have reasonably expected success in combining Boretz and Maehane. While Boretz discloses a solar module design with connections between cells, it does not provide specific details on the electrode configuration for the front and rear faces of each solar cell. Given the well-established understanding that solar cells require both an anode and a cathode, and the necessity of connecting these electrodes across cells in series, a POSITA would recognize the importance of incorporating a suitable electrode design. Maehane's electrode configuration, which is commonly used in the industry, includes grid lines over the cell surface to efficiently collect current, in combination with bus electrodes to direct current flow between cells. A POSITA would understand that adopting Maehane's electrode configuration in Boretz's design would improve the electrical performance and efficiency of the module. This integration would be a routine and predictable modification, enhancing Boretz's solar module by ensuring efficient current collection and connection, resulting in a more reliable and functional photovoltaic system.

2. Claim 1

88. Boretz in view of Maehane renders claim 1 obvious.

a) **Limitation 1[pre]: “A solar battery module comprising:”**

89. To the extent the preamble is limiting, Boretz teaches or suggests a “*solar battery module*.” The reference, titled “Study to Establish Criteria for a *Solar Cell Array* for Use as a Primary *Power Source* for a Lunar-Based Water Electrolysis System” describes the design and manufacturing specifications of a solar battery module. More particularly, Boretz expressly discloses that the completed prototype is a “Solar Array Module” comprised of 924 cells, or batteries. Boretz, 5-2.

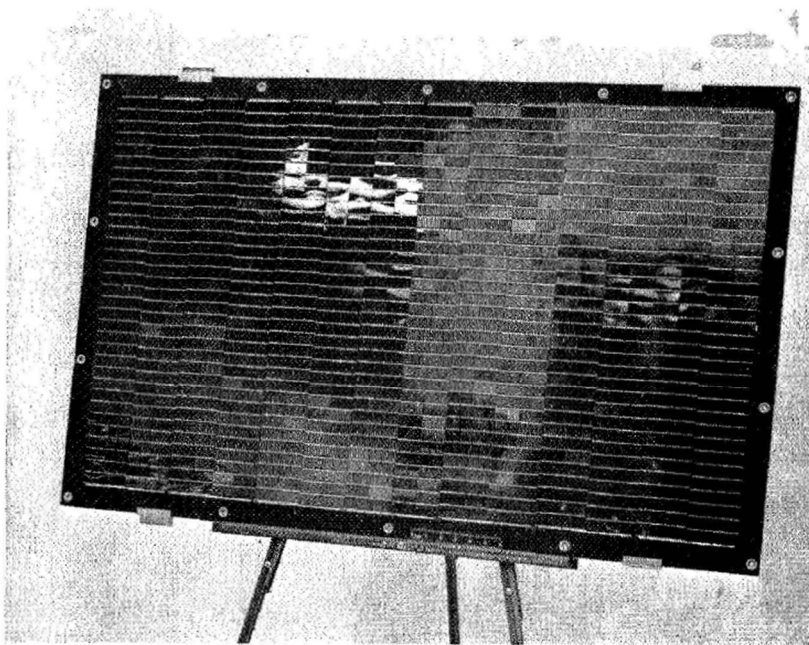


Figure 5.1 Phase IV Prototype Solar Array Module

Boretz, Figure 5.1.

90. Accordingly, to the extent that the preamble of claim 1 of the '214 patent is limiting, Boretz teaches it.

b) Limitation 1[a]: “a plurality of solar battery cells, a plain shape of each being a substantial rectangle, and a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1 (n is an integer equal to or larger than 2),”

91. Boretz teaches or suggests this limitation.

92. Boretz discloses a solar battery module that includes a “cellstack design [that] was based upon the use of 2 cm x 4 cm silicon cells utilized in a flat laydown configuration.” Boretz, 2-1. With each cell in the cellstack measuring 2 cm x 4 cm, the solar module disclosed by Boretz teaches a plurality of solar battery cells where the ratio of a short side length and a long side length is in the form of 1/n:1, where $n = 2$ (i.e., 1/2:1). Figure 2.2 also teaches that the solar battery cells in the module disclosed by Boretz are in the shape of a substantial rectangle (as depicted by a single cell annotated in red):

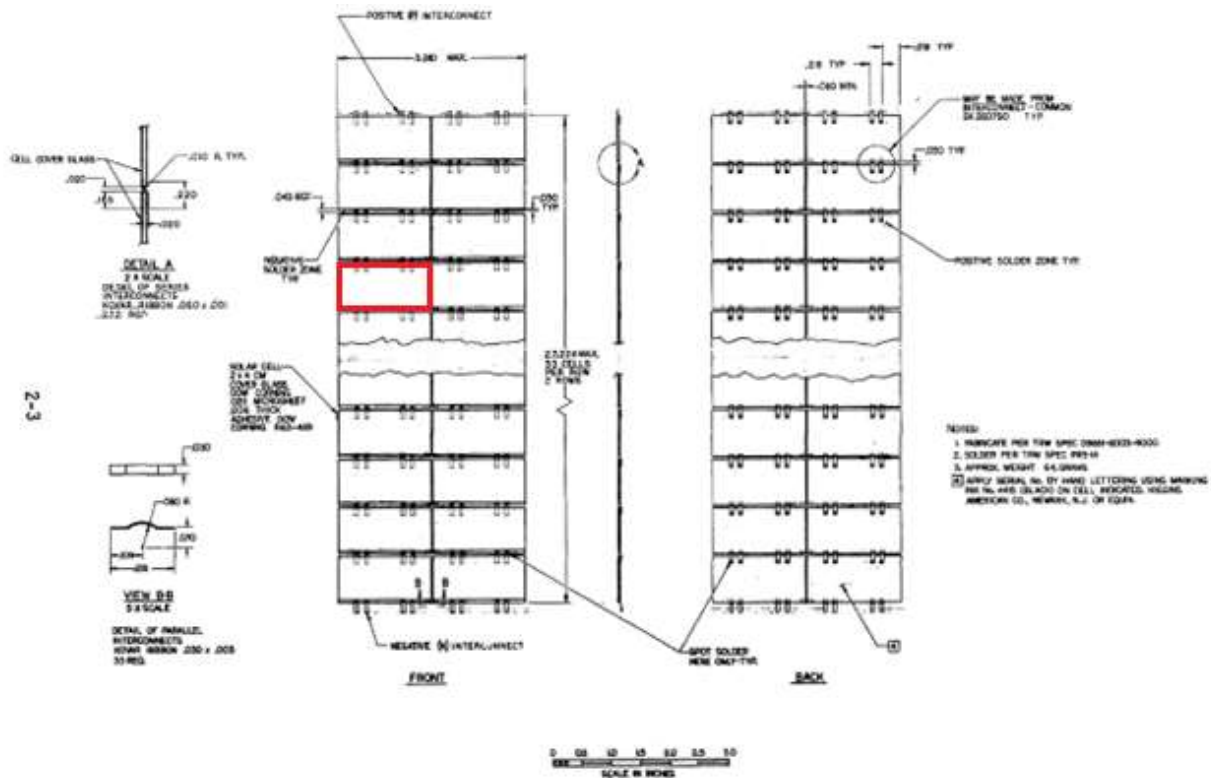


Figure 2.2 Prototype Test Module-Solar Cell Sub-Module Arrangement

Boretz, Figure 2.2 (annotated).

93. Accordingly, Boretz teaches limitation 1[a] of the '214 patent.

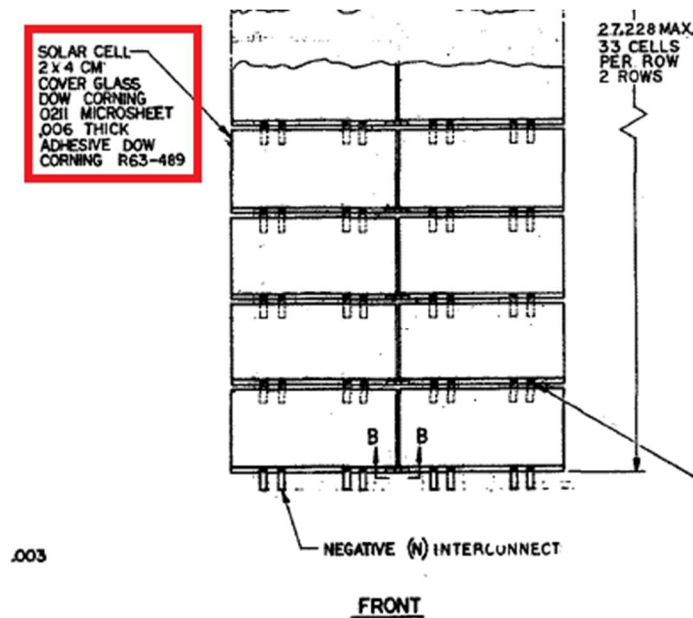
- c) **Limitation 1[b]: “includes a plurality of light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle on a light-receiving surface, and includes rear-surface bus electrodes each at a position on a non-light-receiving surface corresponding to each of the light-receiving-surface bus electrodes; and”**

94. Boretz in view of Maehane teaches or suggests this limitation.

“a plurality of light-receiving-surface bus electrodes . . . on a light-receiving surface”
and “rear-surface bus electrodes . . . on a non-light-receiving surface”

95. Boretz teaches “a plurality of light-receiving-surface bus electrodes . . . on a light-receiving surface” and “rear-surface bus electrodes . . . on a non-light-receiving surface.”

96. Boretz discloses that one front face of the solar cell array is a “light-receiving-surface” and the opposite rear face of the solar cell array is a “non-light-receiving surface.” A POSITA would readily understand that at least one face of a solar cell is a light-receiving surface to provide energy from the sun. In Boretz, this light-receiving surface is the “front” face of the solar cells. This is confirmed by the use of a “cover glass” material over the “front” faces, as depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt) (annotated). Similarly, Table 2.1, which provides the “Prototype Test Module Design Characteristics,” describes the use of a coverglass microsheet:

Cellstack

◦ Coverglass	Dow Corning 0211 microsheet; 0.006 in. thick.
◦ Coverglass Adhesive	Dow Corning R6-3489.
◦ Silicon Cell	2 cm. x 4 cm. x 0.014 inches thick.
◦ Cell-to-Substrate Adhesive	G.E. RTV-118
◦ Dielectric	0.001 in. thick Kapton.
◦ Interconnects	0.0015 in. Kovar.
◦ String Collector Bars	0.003 in. Kovar.

Boretz, Table 2.1 (excerpt). Boretz further teaches that this coversheet material is used as “coverslide materials” which are “bond[ed] . . . to the silicon cell.” Boretz, 3-2. These coverslides help “protect the silicon cells from ultra-violet radiation degradation” at the cost of “a decrease in the transmissible solar intensity,” further confirming these solar cell faces are light-receiving surfaces. Boretz, 3-2.

97. Boretz further teaches that the back face of the solar cells are non-light-receiving surfaces. Specifically, Boretz discloses that the cells were “mounted on the substrate.” Boretz, 5-1. In other words, while the front faces of the cells are light-receiving and expected to draw energy from the sun, the back faces of the cells are inset into a back surface of the module which is not intended to receive light from the sun.

98. Boretz’s description of the manufacturing of the substrate and cell bonding with this substrate further confirms these teachings. Boretz teaches that the substrate is comprised of a “light-weight aluminum honeycomb core” with “graphite

composite face sheets,” which are not transparent materials. Boretz, 2-1. This is confirmed in Table 2.1, which provides the “Prototype Test Module Design Characteristics”:

Substrate

- Face Sheets Morganite Type II; 2 plys of 0.003 in. thick unidirectional graphite fibers crosslaid with 1 ply of No. 112 fiberglass cloth between graphite composite plies using Narmco No. 5505 Epoxy impregnation; total thickness approximately 0.009 in.
- Core 1/4" x 5052 x .007P-16 x 0.375" thick aluminum honeycomb; approximately 1.6 lb./ft³.
- Adhesive Narmco No. 252; approximately 0.0015 thick.

Boretz, Table 2.1 (excerpt). Further, Boretz confirms that the cells were “bonded to [the substrate]” using adhesives. Boretz, 4-2.

99. This substrate material is also depicted in Figure 5.1, around the edges of the cellstack where the cells are mounted onto the substrate:

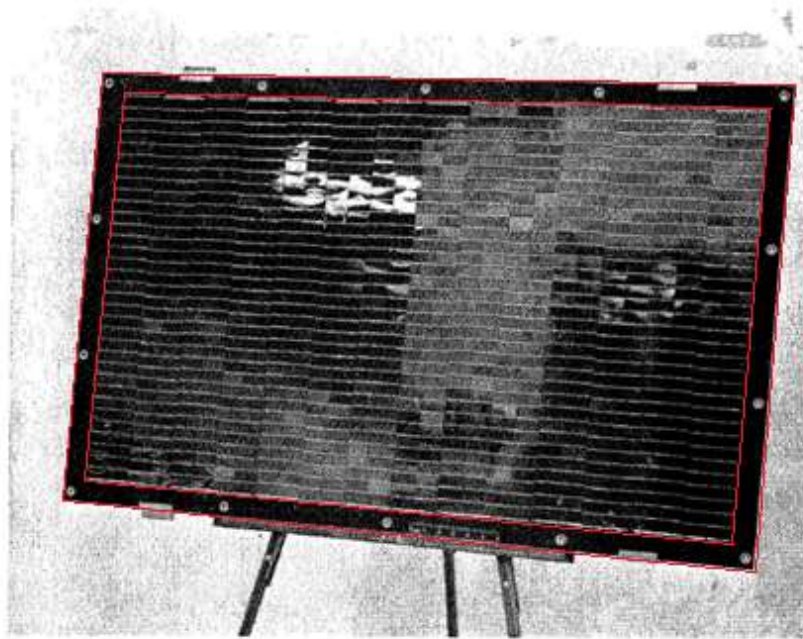
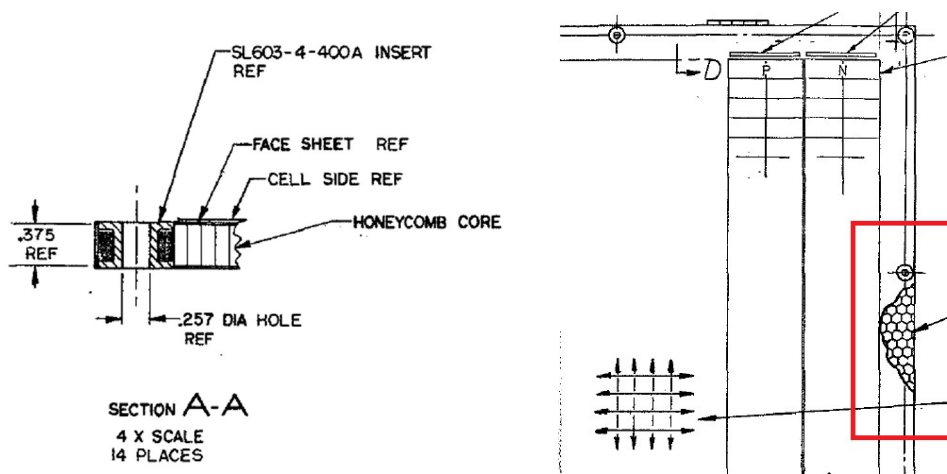


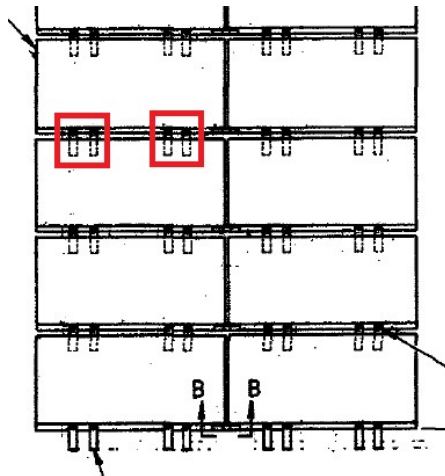
Figure 5.1 Phase IV Prototype Solar Array Module

Boretz, Fig. 5.1 (annotated). Figure 2.1 further confirms this configuration, where the cells are mounted onto a substrate comprising a contact face sheet and a honeycomb core:



Boretz, Fig. 2.1 (excerpts) (annotated).

100. A POSITA would also understand that both the front “*light-receiving surface[s]*” and the rear “*non-light-receiving surface[s]*” each include a surface bus electrode. As explained further below with respect to limitation 1[c], an interconnector electrically connects the front and rear surfaces of cells in series along a cell string. In order to allow for electrical current to flow through the cell string, the interconnectors must be connected to both an electrode on a front (light-receiving) surface of the cells and an electrode on a rear (non-light-receiving) surface of the cells. A POSITA would understand that these electrodes would align with the four interconnector ribbons connecting each adjoining cell in series in the cell strings:



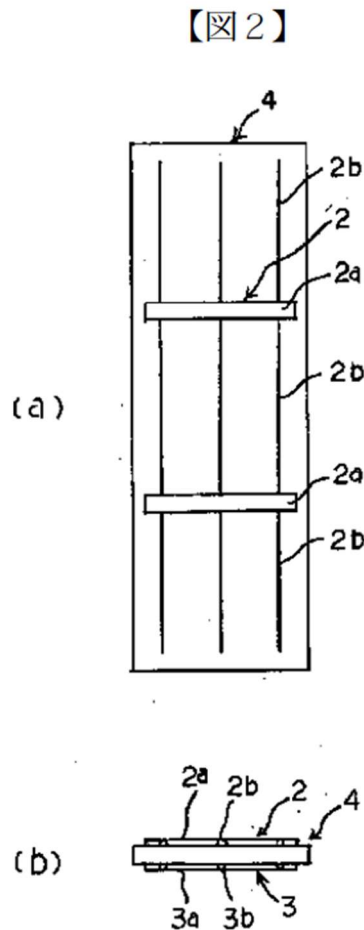
Boretz, Fig. 2.2 (excerpt) (annotated).

101. Thus, Boretz teaches “*a plurality of light-receiving-surface bus electrodes . . . on a light-receiving surface*” and “*rear-surface bus electrodes . . . on a non-light-receiving surface.*”

“...light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle . . . , and includes rear-surface bus electrodes each at a position . . . corresponding to each of the light-receiving-surface bus electrodes”

102. Boretz does not expressly disclose the exact shape and orientation of these bus electrodes. However, Maehane teaches *“a plurality of light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle on a light-receiving surface, and includes rear-surface bus electrodes each at a position on a non-light-receiving surface corresponding to each of the light-receiving-surface bus electrodes.”*

103. Figure 2 of Maehane discloses the front face of an exemplary solar cell in an array of cells connected in series:



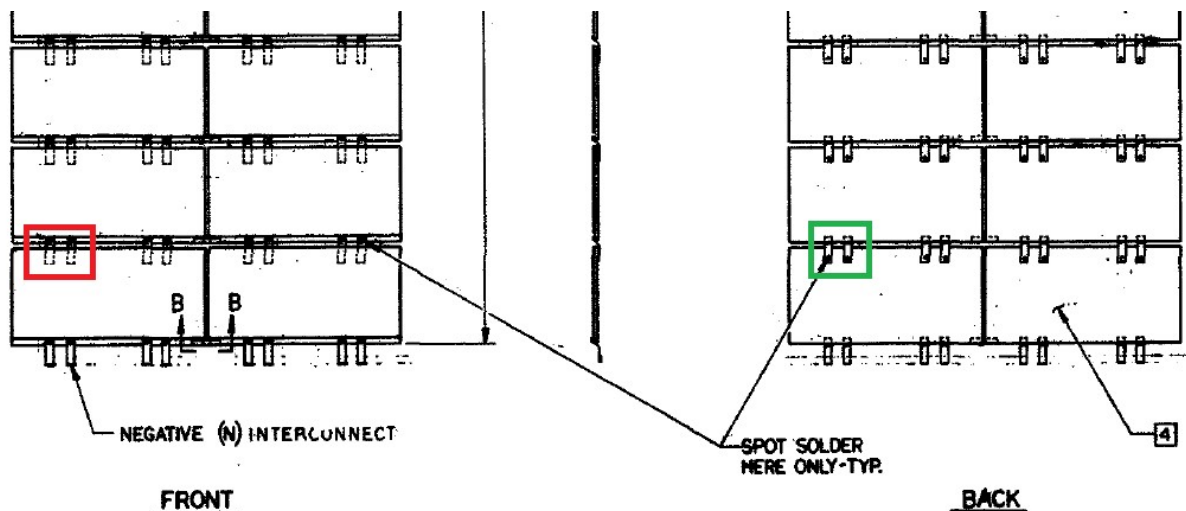
Maehane, Fig. 2. Maehane discloses that elements 2a are electrode “connection region[s]” on a front face of the cell. Maehane, [0013]. Similarly, elements 3a are formed on the rear surface with the same “aforementioned shape.” Maehane, [0013]. Both sets of these electrodes 2a and 3a are parallel to a short side of a substantial rectangle shape of a cell.

104. Accordingly, Boretz in view of Maehane teaches or suggests limitation 1[b] of the '214 patent.

- d) **Limitation 1[c]: “an interconnector that electrically connects the light-receiving-surface bus electrodes of a first one of the solar battery cells to the rear-surface bus electrodes of an adjacent second one of the solar battery cells,”**

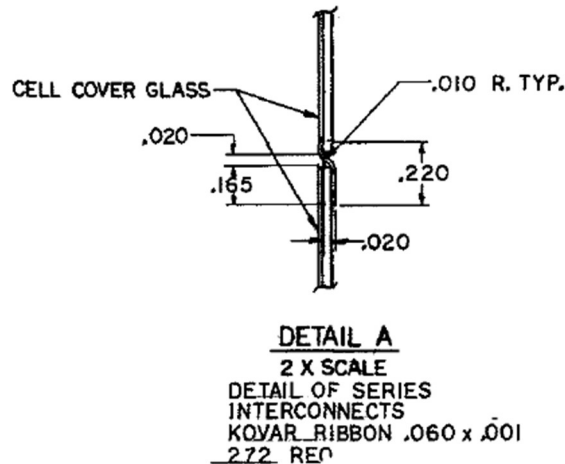
105. Boretz teaches or suggests this limitation.

106. Boretz teaches an interconnector that electrically connects the light-receiving-surface bus electrodes of a first one of the solar battery cells to the rear-surface bus electrodes of an adjacent second one of the solar battery cells. According to Boretz, the solar module is comprised of columns of cells, where each column is comprised of 66 cells which are connected to each other in series. Boretz, 2-1, 4-1, 5-1. This is depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt) (annotated). As the excerpt shows, interconnectors connect the front face of a first cell (red connection point) to the back face of a second cell

(green connection point). This can further be seen in greater detail in “Detail A” of Figure 2.2:



Boretz, Fig. 2.2 (excerpt). These interconnects are connected to the light-receiving surface bus electrodes and rear surface bus-electrodes as described above with respect to limitation 1[b].

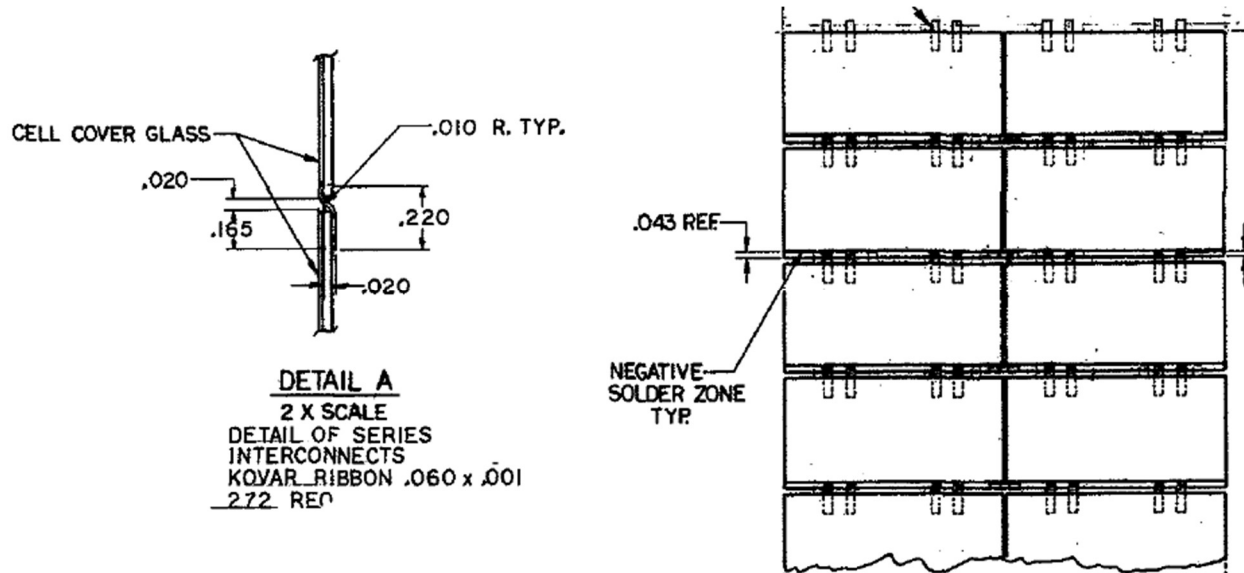
107. Accordingly, Boretz teaches limitation 1[c] of the '214 patent.

- e) **Limitation 1[d]: “wherein a predetermined number of the solar battery cells are serially connected to each other, thereby configuring a cell string,”**

108. Boretz teaches or suggests this limitation.

109. As described above with respect to limitation 1[c], Boretz discloses that a predetermined number of solar battery cells are serially connected to each other, configuring a cell string. According to Boretz, the solar module is comprised of columns of cells, where each column is comprised of 66 cells which are connected

to each other in series—forming a cell string. Boretz, 2-1, 4-1, 5-1. This is depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt). As “Detail A” of Figure 2.2 confirms—providing a cross-section or profile view of the connection between two cells in a cell string—the depicted interconnect connects the cells in each column (cell string) in series, connecting the front of a first cell on top with the back of a second cell.

110. Accordingly, Boretz teaches limitation 1[d] of the '214 patent.

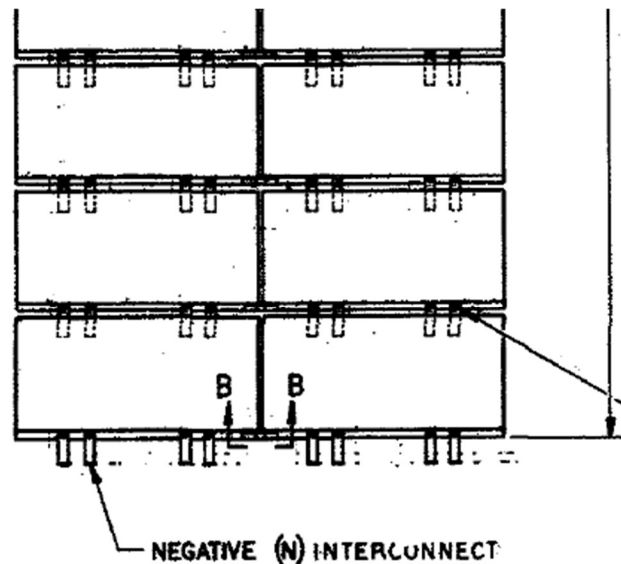
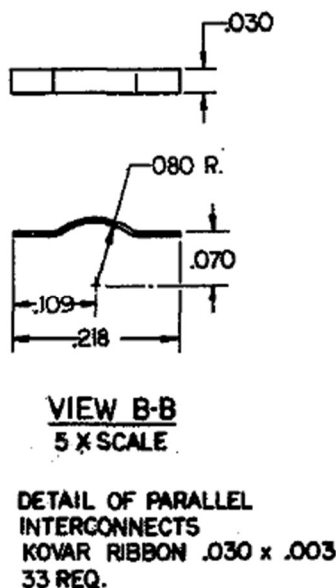
- f) **Limitation 1[e]: “n columns of the cell strings are connected in parallel by a first string connector at one end of the n columns, the n in the number of columns of the cell strings connected in parallel being equal to the n in the ratio of the long side length to the short side length, and”**

111. Boretz teaches or suggests this limitation.

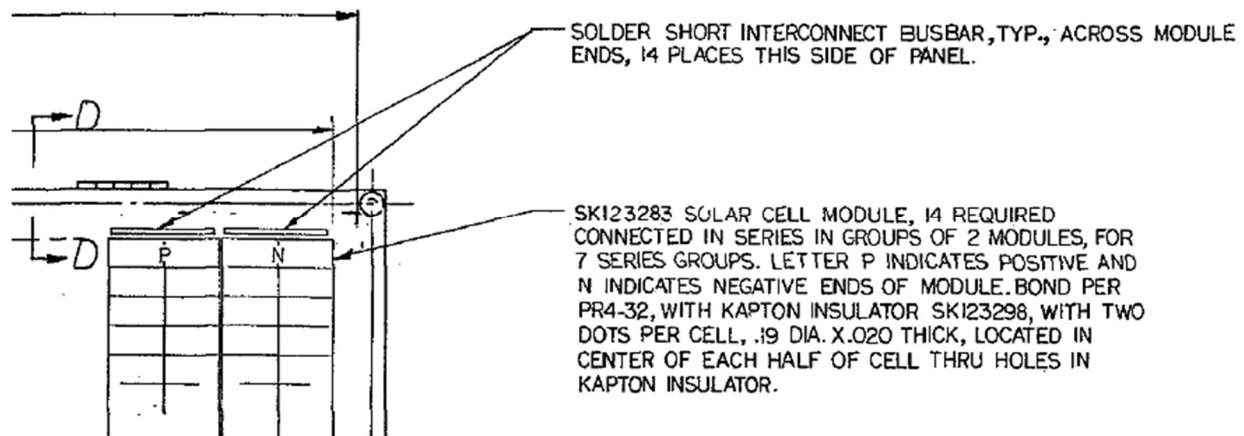
112. Boretz teaches that its depicted solar module comprises n columns of cell strings connected in parallel by a first string connector at one end of the n columns, where the n in the number of columns of cell strings connected in parallel is equal to the n in the ratio of the long side length to the short side length.

113. As I explain above with respect to limitation 1[a], the solar cells in the Boretz module are 2 cm x 4 cm (i.e., a ratio of $1/n:1$ where $n = 2$). Boretz also discloses 2 columns ($n = 2$) of cell strings connected in parallel by a first string connector at one end of the 2 columns. Specifically, Boretz teaches that the solar module is comprised of a series of sub-modules, where each sub-module “employ[s] two cells in parallel and 66 cells in series.” Boretz, 2-1; *see also* Boretz, 4-1, 5-1 (disclosing same).

114. This parallel configuration is further depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt). As Detail B describes, each sub-module contains a parallel interconnect (first string connector) at one end of 2 columns. This is further depicted in Figure 2.1, which shows two such sub-modules inset into the larger solar module:



Boretz, Fig. 2.1 (excerpt). The excerpt depicts two sub-modules, each comprising 2 columns of cell strings, with a first sub-module oriented such that both positive ends of the 2 columns of cell strings are at the top, and a second sub-module oriented such that both negative ends of the 2 columns of cell strings are at the top. As Boretz depicts, each sub-module includes an interconnect busbar (first string connector) connecting both positive ends (the first sub-module, on the left) or both negative ends (the second sub-module, on the right) of the 2 columns of cell strings to each other in parallel.

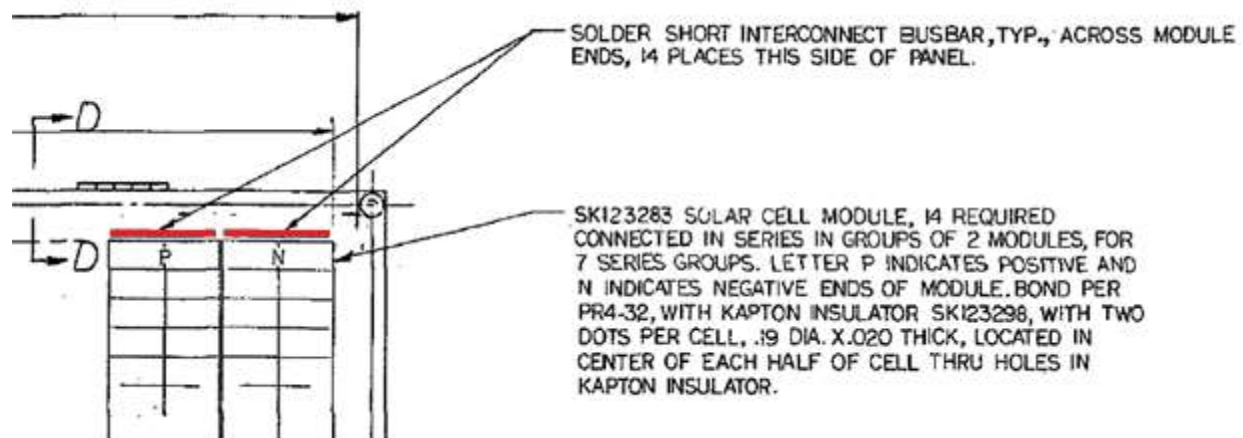
115. Accordingly, Boretz teaches limitation 1[e] of the '214 patent.

- g) **Limitation 1[f]: “the n-column parallel-connected cell strings are further serially connected to another n-column parallel-connected cell strings by a second string connector at an opposite end of the n columns, thereby configuring an entire cell array.”**

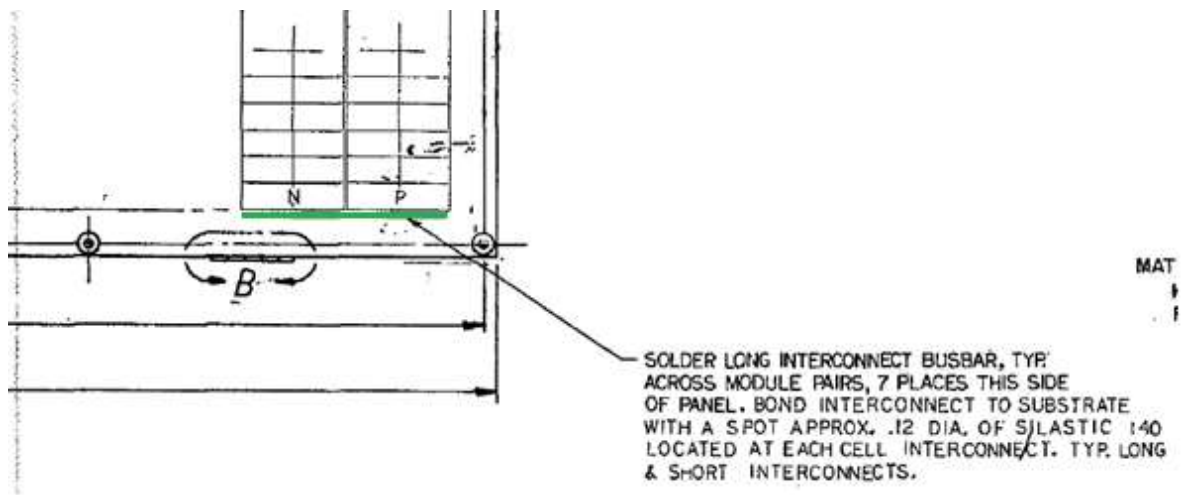
116. Boretz teaches or suggests this limitation.

117. Boretz teaches that the 2-column parallel-connected cell strings are further serially connected to another 2-column parallel-connected cell strings by a second string connector at an opposite end of the 2 columns, configuring an entire cell array.

118. As explained above with respect to limitation 1[e], Boretz discloses a first string connector (two such connectors depicted in red below) connecting 2 columns in parallel in each sub-module, as depicted in Figure 2.1:



Boretz, Fig. 2.1 (excerpt) (annotated). At the opposite end of these columns of cell strings, a second string connector (depicted in green below) further connects adjoining sub-modules to each other in series:



Boretz, Fig. 2.1 (excerpt) (annotated).

119. As the excerpt depicts, the opposite ends of the sub-modules are comprised of a negative end of 2 columns of cell strings (a first sub-module) and a positive end of 2 columns of cells strings (a second sub-module). These ends are connected by the long interconnect busbar (second string connector), making a positive-to-negative connection between the sub-modules in series.

120. Accordingly, Boretz teaches limitation 1[f] of the '214 patent.

3. **Claim 2: “The solar battery module according to claim 1, wherein a predetermined number of the solar battery cells are serially connected, thereby configuring a cell string, two columns of the cell strings are connected in parallel, and the two-column parallel-connected cell strings are further serially connected, thereby configuring an entire cell array.”**

121. Boretz in view of Maehane renders claim 2 obvious.

122. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1.

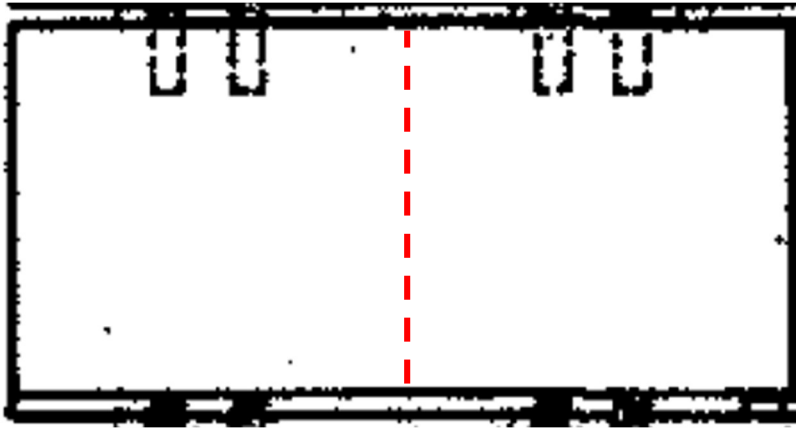
123. The additional limitation of claim 2 requires that the n columns of cell strings connected in parallel (as required by claim 1) are specifically two columns of cell strings connected in parallel (i.e., $n = 2$). Because Boretz in view of Maehane renders Claim 1 obvious through a combination where $n = 2$, claim 2 is similarly rendered obvious for the same reasons as described above with respect to claim 1.

4. **Claim 3: “The solar battery module according to claim 1, wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.”**

124. Boretz in view of Maehane renders claim 3 obvious.

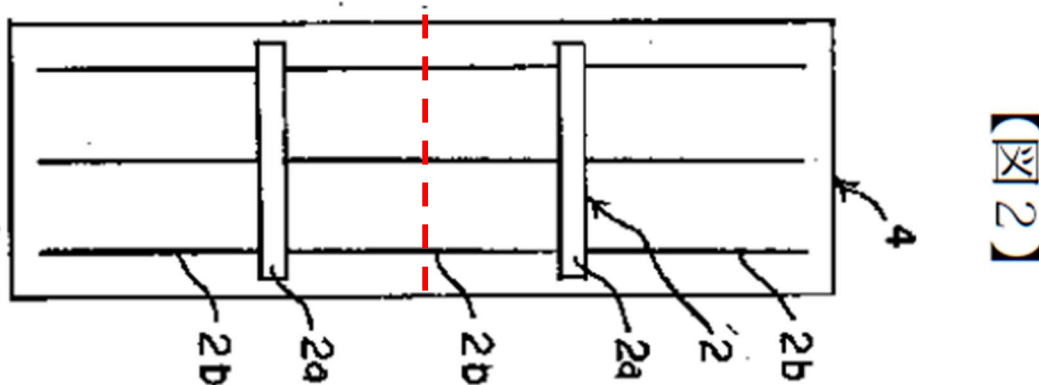
125. Boretz in view of Maehane teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1. Boretz in view of Maehane further teaches or suggests the additional limitation of claim 3 “*wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.*”

126. As explained above with respect to limitation 1[b], a POSITA would understand that Boretz teaches light-receiving-surface bus electrodes which connect to the interconnector tabs on the front face of each cell, as depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt) (annotated). The dashed red line indicates “*a line passing through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.*” As the excerpt of Figure 2.2 depicts, the four bus electrodes connected to the interconnects are positioned line-symmetrical with this dashed red line.

127. As explained above with respect to limitation 1[b], Boretz does not expressly disclose the exact shape of the bus electrodes connected to each interconnector. Maehane further depicts bus electrodes which are line-symmetrical with “*a line passing through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.*”



Maehane, Fig. 2 (excerpt) (rotated) (annotated). As Figure 2 of Maehane illustrates, the bus electrodes 2a are line-symmetrical with the dashed red line, which passes through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.

128. Accordingly, Boretz in view of Maehane renders obvious claim 3 of the '214 patent.

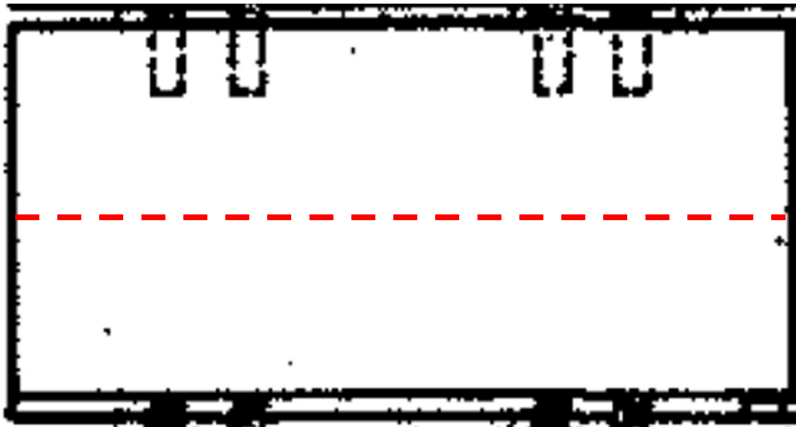
5. **Claim 4: “The solar battery module according to claim 1, wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side parallel to the light-receiving-surface bus electrodes and perpendicular to the light-receiving-surface bus electrodes.”**

129. Boretz in view of Maehane renders claim 4 obvious.

130. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1.

Boretz in view of Maehane further teaches or suggests the additional limitation of claim 4 “*wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side parallel to the light-receiving-surface bus electrodes and perpendicular to the light-receiving-surface bus electrodes.*”

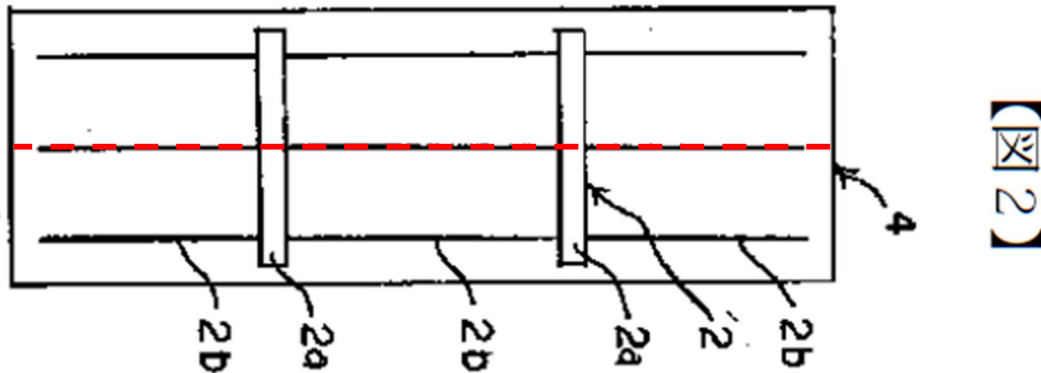
131. As explained above with respect to limitation 1[b], a POSITA would understand that Boretz teaches light-receiving-surface bus electrodes which connect to the interconnector tabs on the front face of each cell, as depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt). As the excerpt of Figure 2.2 depicts, the four bus electrodes connected to the interconnects are positioned line-symmetrical with this dashed red line.

132. As explained above with respect to limitation 1[b], Boretz does not expressly disclose the exact shape of the bus electrodes connected to each interconnector. Maehane further depicts bus electrodes which are line-symmetrical

“with respect to a line passing through a middle point of a side parallel to the light-receiving-surface bus electrodes and perpendicular to the light-receiving-surface bus electrodes.”



Maehane, Fig. 2 (excerpt) (rotated) (annotated). The dashed red line indicates “a line passing through a middle point of a side parallel to the light-receiving-surface bus electrodes and perpendicular to the light-receiving-surface bus electrodes.” As Figure 2 of Maehane illustrates, the bus electrodes 2a are line-symmetrical with the dashed red line.

133. Accordingly, Boretz in view of Maehane renders obvious claim 4 of the '214 patent.

6. **Claim 5: “The solar battery module according to claim 1, wherein each of the solar battery cells includes an area where the light-receiving-surface bus electrodes and the rear-surface bus electrodes are not formed within a predetermined dimension from an edge toward a central direction of the cell at an outer circumferential edge portion thereof.”**

134. Boretz in view of Maehane renders claim 5 obvious.

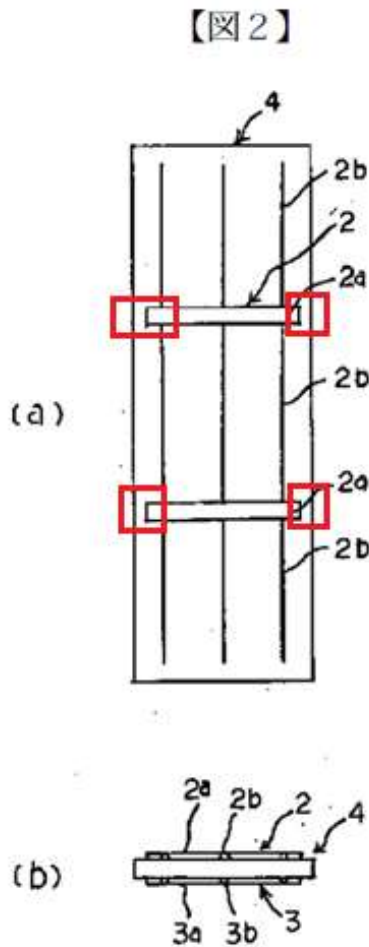
135. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1. Boretz in view of Maehane further teaches or suggests the additional limitation of claim 5 “*wherein each of the solar battery cells includes an area where the light-receiving-surface bus electrodes and the rear-surface bus electrodes are not formed within a predetermined dimension from an edge toward a central direction of the cell at an outer circumferential edge portion thereof.*”

136. As explained above with respect to limitation 1[b], a POSITA would understand that Boretz teaches light-receiving-surface bus electrodes which connect to the interconnector tabs on the front face of each cell, as depicted in Figure 2.2:



Boretz, Fig. 2.2 (excerpt).

137. As explained above with respect to limitation 1[b], Boretz does not expressly disclose the exact shape of the bus electrodes connected to each interconnector. Maehane further depicts an area of bus electrodes where “*the light-receiving-surface bus electrodes and the rear-surface bus electrodes are not formed within a predetermined dimension from an edge toward a central direction of the cell at an outer circumferential edge portion thereof.*” This portion of the cells where the bus electrodes are not formed is depicted in Figure 2 of Maehane by the annotated red boxes:



Maehane, Fig. 2 (annotated).

138. Maehane also expressly teaches leaving this portion of the cell uncovered by the bus electrode as a means to help prevent short circuits. Specifically, Maehane discloses that “the connection region portion is located immediately inside the outer periphery of the solar cell element, so undesired short circuiting does not occur.” Maehane, [0010]; *see also* Maehane, [0017]. Maehane teaches that this same cell region uncovered by the bus electrodes is present on the back face (rear-surface bus

electrodes) as well, Maehane, [0018], which have the same “aforementioned shape” as the light-receiving-surface bus electrodes on the front face, Maehane, [0013].

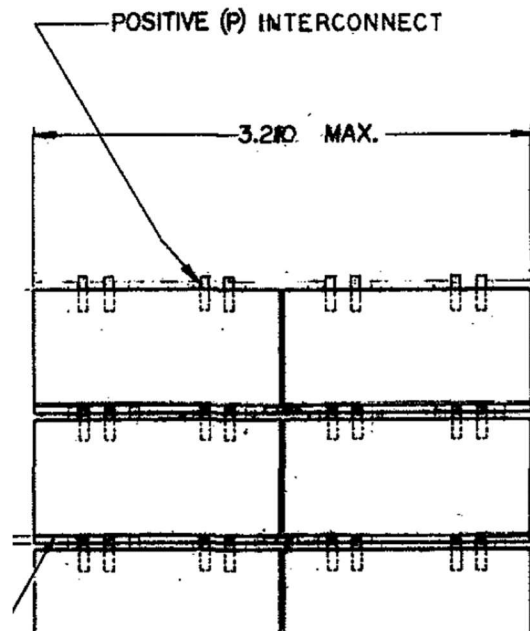
139. Accordingly, Boretz in view of Maehane renders obvious claim 5 of the '214 patent.

7. **Claim 8: “The solar battery module according to claim 1, wherein the interconnector is joined to the light-receiving-surface bus electrode of a solar battery cell nearest to the second string connector of the n-column parallel-connected cell strings, and is connected to the second string connector, and the second string connector is connected to a rear surface lead at the rear-surface bus electrode of a head solar battery cell nearest the second string connector of the another n-column parallel-connected cell strings.”**

140. Boretz in view of Maehane renders claim 8 obvious.

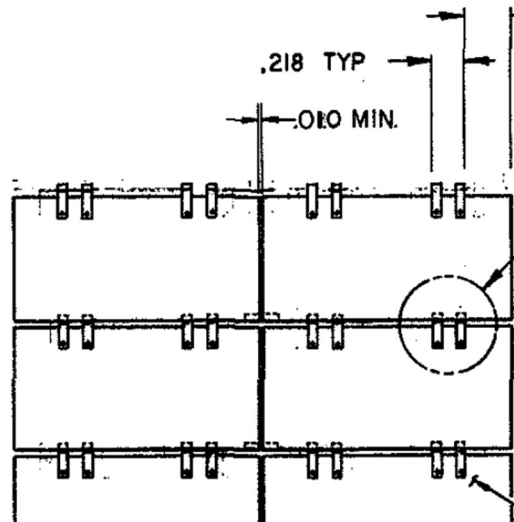
141. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1. Boretz further teaches or suggests the additional limitation of claim 8 “*wherein the interconnector is joined to the light-receiving-surface bus electrode of a solar battery cell nearest to the second string connector of the n-column parallel-connected cell strings, and is connected to the second string connector, and the second string connector is connected to a rear surface lead at the rear-surface bus electrode of a head solar battery cell nearest the second string connector of the another n-column parallel-connected cell strings.*”

142. Figure 2.2 of Boretz depicts the interconnector joined to the light-receiving-surface bus electrode nearest to the second string connector of the 2-column parallel-connected cell strings:



Boretz, Fig. 2.2 (excerpt). As the excerpt shows, the cells at the “end” of the cell strings (depicted here at the top) which, as explained above with respect to claim limitation 1[f], are connected to a second string connector, include the same four interconnects used for connecting each cell string in series. These interconnectors must necessarily connect with the long interconnect busbars (second string connectors), as described above with respect to claim limitation 1[f], to allow the flow of electrical current between each sub-module as Boretz teaches.

143. Similarly, Figure 2.2 depicts the rear surface leads at the head of the solar battery cells nearest the second string connector:



Boretz, Fig. 2.2 (excerpt). Here, too, the rear surface leads extend from the top of the cells at the top end of the cell strings. As with the interconnects extending from the front faces of the cells, these rear surface leads must also necessarily connect with the long interconnect busbars (second string connectors), as described above with respect to claim limitation 1[f], to allow the flow of electrical current between each sub-module as Boretz teaches.

144. Accordingly, Boretz in view of Maehane renders obvious claim 8 of the '214 patent.

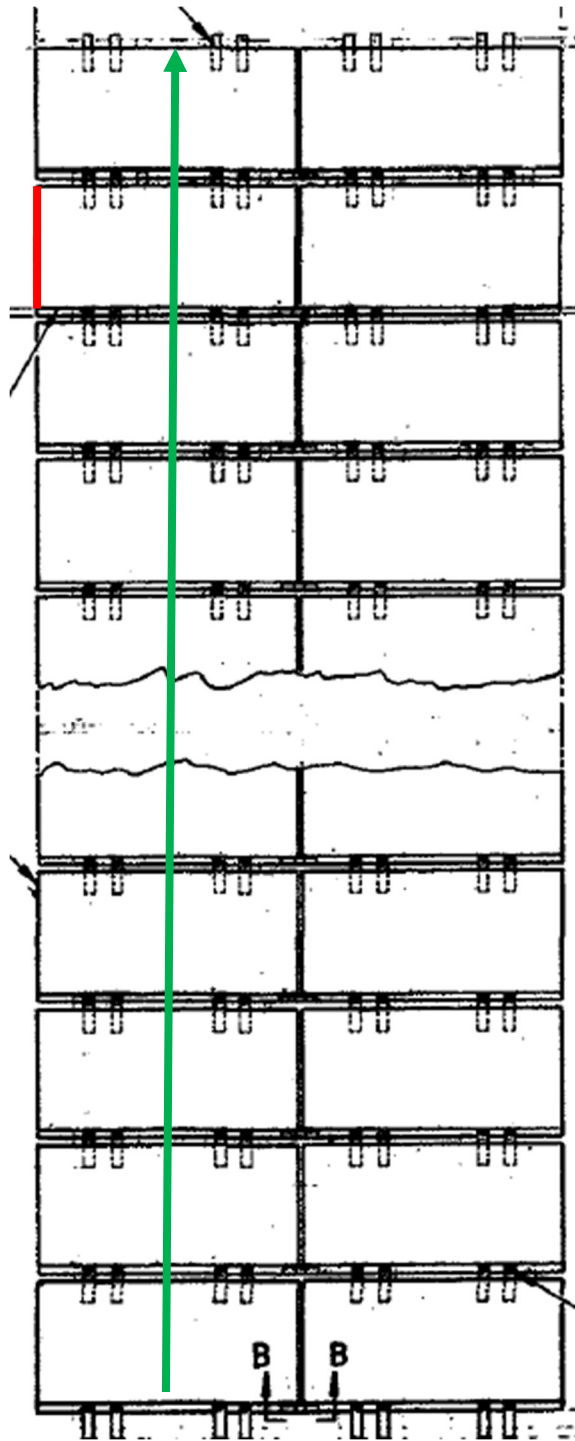
8. **Claim 11: “The solar battery module according to claim 1, wherein the solar battery cells in the cell array are arranged so that the short side lengths are parallel to the extension of the n-column parallel-connected cell strings.”**

145. Boretz in view of Maehane renders claim 11 obvious.

146. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1.

Boretz further teaches or suggests the additional limitation of claim 11 “*wherein the solar battery cells in the cell array are arranged so that the short side lengths are parallel to the extension of the n-column parallel-connected cell strings.*”

147. Specifically, Boretz teaches that the solar battery cells in the cell array are arranged so that the short side lengths are parallel to the extension of the 2-column parallel-connected cell strings. This is depicted clearly in Figure 2.2:



Boretz, Fig. 2.2 (excerpt) (annotated). As the excerpt shows, the short side lengths (red) of the solar battery cells are parallel to the extension of the two-column parallel-connected strings (green).

148. Accordingly, Boretz in view of Maehane renders obvious claim 11 of the '214 patent.

B. Ground 2: Claim 6 is Obvious over Boretz, Maehane, and Ravi328

1. Motivation to Combine Boretz, Maehane, and Ravi328

149. A POSITA would be motivated to combine Boretz, Maehane, and Ravi328. A common industry practice, utilized for at least the past 60 years, to manufacture solar cells involves a process known as the Czochralski method. *See, e.g.,* Ex. 1013 at 78–79 (“The most common method for the growth of single crystalline ingots consists of pulling an oriented seed slowly out of the molten silicon contained in a pure quartz crucible. The method is well known and extensively described in literature.”). In this method, crystalline cells are first grown in a cylindrical log shape known as a “boule”:

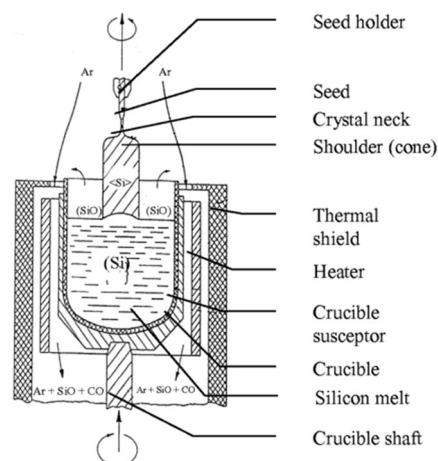


Fig. 3.1. Principle of the Czochralski growth technique

Ex. 1021 at Fig. 3.1; *see also* Ex. 1015, 1:51–55; Ex. 1022, 2:18–23.

150. Next, thin discs, or wafers, are cut from these boules, which are ultimately used to form the solar cells. *See* Ex. 1022, 2:24–26. However, the natural shape of these wafers as cut from the cylindrical boules is necessarily a circle, or a disk. *See* Ex. 1016, [0003]. As a POSITA would have well understood, a circle generally serves as a poor shape for a solar cell that is intended to be incorporated in an array of a solar module. *Id.* (“A high module packing ratio, where the module packing ratio is defined as the proportion of the total area of photovoltaic power generation cells relative to the plane area of a photovoltaic power generation module (hereinafter, also called a ‘solar cell module’ or a ‘module’), cannot be achieved if solar cells are merely arranged on the plane without being changed in shape from their disk form.”). In order to maximize the reactive surface of the array exposed to sunlight, the solar cells are formed in shapes which naturally tessellate, a purpose for which circles are poorly adapted. *See* Ex. 1017, 1.2-3 (“By 1958 space applications forced cell shapes to be rectangular or square for enhanced packing density . . .”); Ex. 1018, 8:48-49 (favorable shapes can be “‘tiled’ edge-to-edge”).

151. As a result, silicon wafers are generally formed from these circles into a square shape, or often “pseudo-squares,” with small portions removed from the corners to minimize the amount of wasted silicon wafer. *See* 1021 at 24 (“The round crystals are usually shaped into squares with rounded corners in order to obtain a better usage of the module area.”); Ex. 1013 at 72 (“However, in order to maximise the power

density of the modules, wafers are square, or pseudo-square in the case of monocrystalline silicon, that is cylinders are shaped as squares with rounded off corners. This reduces the surface area of the wafers by between 2% and 5% compared with a full square of same dimensions.”). To the extent a half-cell shape is desired, such as for the reasons I explain below in Section VIII.D.1, these square cells are then further divided in half. *See, e.g.*, Ex. 1019 at 28 (square silicon wafers were “diced into two 2 x 4 cm cells” for use by NASA, the same dimension as the solar cells in Boretz).

152. A POSITA would thus recognize that half-cells such as those disclosed in Boretz would commonly be produced through splitting a substantially square cell, such as taught by Ravi328. Following common industry practices, cells produced according to the Czochralski method would readily be understood to be formed into a substantially square shape. Then, to produce the half-cells as shown in Boretz, a POSITA would be motivated to split these substantially square cells, as taught in Ravi328. To a POSITA, implementing this teaching from Ravi328 to Boretz would be readily understood as simply applying the well-known technique of splitting square silicon wafers into rectangular half-cells to Boretz, which itself teaches the known use of such rectangular cells, in order to yield predictable results.

153. A POSITA would have further been motivated to combine Boretz and Ravi328 with Maehane for the same reasons discussed above in Section VIII.A.1.

154. A POSITA would have reasonably expected success in combining Boretz, Maehane, and Ravi328. Boretz, in combination with Maehane, discloses a solar module with rectangular cells, while Ravi328 teaches achieving such rectangular cells by splitting cells in a substantially square shape. A POSITA would readily recognize that producing these rectangular cells by splitting cells first shaped into a square would follow common industry practices, and thus would represent a predictable and straightforward improvement.

2. Claim 6

155. Boretz in view of Maehane and Ravi328 renders claim 6 obvious.

a) Limitation 6[pre]: “The solar battery module according to claim 1,”

156. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1.

b) Limitation 6[a]: “The solar battery module according to claim 1, which is obtained by dividing a basic solar battery cell with a plane shape thereof being a substantial square,”

157. Ravi328 teaches or suggests the additional limitation of claim 6[a] “*which is obtained by dividing a basic solar battery cell with a plane shape thereof being a substantial square.*”

158. Ravi328 discloses a solar module built using solar battery cells that are derived by dividing full-sized substantially square cells. Specifically, it states: “laser

cutting of 125-mm full solar cells into two half solar cells.” Ravi328, 3. This division process is depicted in Figure 4, where the full-sized substantially square cell is depicted on the left, and a half-cut cell is depicted on the right:

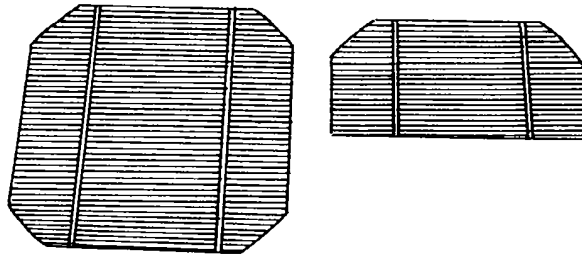


Fig. 4

Ravi328, Fig. 4.

159. Accordingly, Ravi328 teaches limitation 6[a] of the '214 patent.

- c) **Limitation 6[b]: “which includes n light-receiving-surface electrode areas in each of which a plurality of light-receiving-surface bus electrodes parallel to a side of the substantial square . . . are provided”**

160. Ravi328 teaches or suggests the additional limitation of claim 6[b] “*which includes n light-receiving-surface electrode areas in each of which a plurality of light-receiving-surface bus electrodes parallel to a side of the substantial square . . . are provided.*”

161. As explained above with respect to limitation 6[a], Ravi328 discloses solar cells which are created by splitting a first solar battery cell into half-cells. As

shown in Figure 4 of Ravi328, a full-sized square cell may be split into two light-receiving-surface electrode areas ($n = 2$ in the illustrated half-cut case).

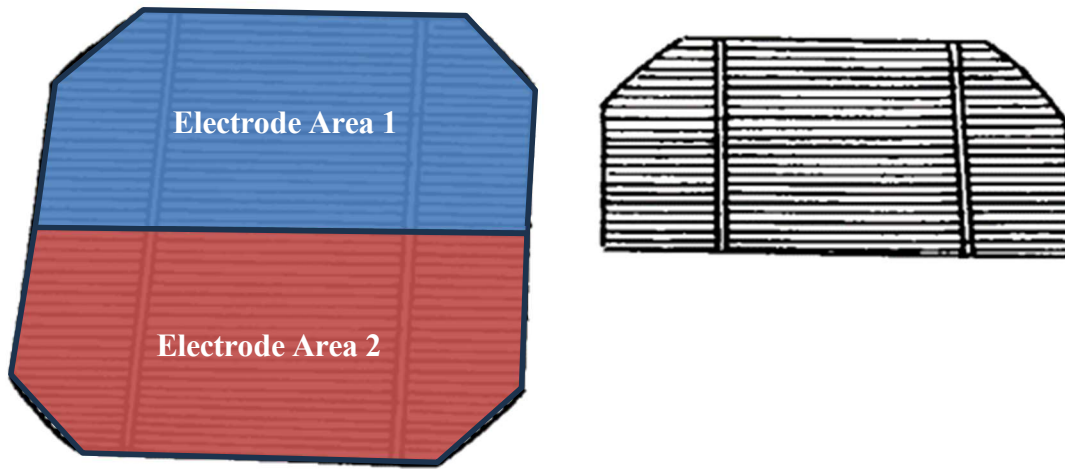


Fig. 4

Ravi328, Fig. 4 (annotated).

162. Ravi328 further states: “Tinned copper interconnects are soldered on the front busbars of matched solar cells in terms of output current.” Ravi328, 5. Also shown in Figure 4 of Ravi328, each of the light-receiving-surface bus electrodes (annotated in red) in the two electrode areas is parallel to a side of the substantial square (annotated in green).

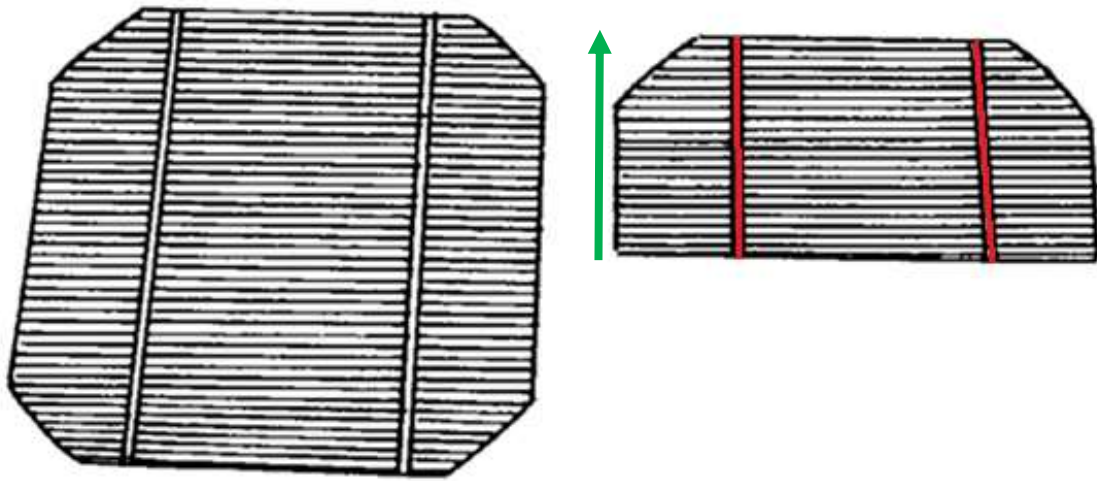


Fig. 4

Ravi328, Fig. 4 (annotated).

163. Accordingly, Ravi328 teaches limitation 6[b] of the '214 patent.

- d) **Limitation 6[c]: “and a plurality of grid electrodes perpendicular to the light-receiving-surface bus electrodes are provided on a light-receiving surface side and includes rear-surface bus electrodes each at a position on a non-light-receiving surface side corresponding to each of the light-receiving-surface bus electrodes into n respective boundaries of the n light-receiving-surface electrode areas.”**

164. Ravi328 teaches or suggests the additional limitation of claim 6[b] that
“a plurality of grid electrodes perpendicular to the light-receiving-surface bus electrodes are provided on a light-receiving surface side and includes rear-surface bus electrodes each at a position on a non-light-receiving surface side corresponding to

each of the light-receiving-surface bus electrodes into n respective boundaries of the n light-receiving-surface electrode areas.”²

165. As seen in Figure 4, the front surface of each solar cell includes a conventional grid layout, where fine grid electrodes (the thin horizontal lines, depicted below in green) are arranged perpendicular to the vertical busbars (red). This forms a standard front contact pattern on crystalline silicon solar cells:

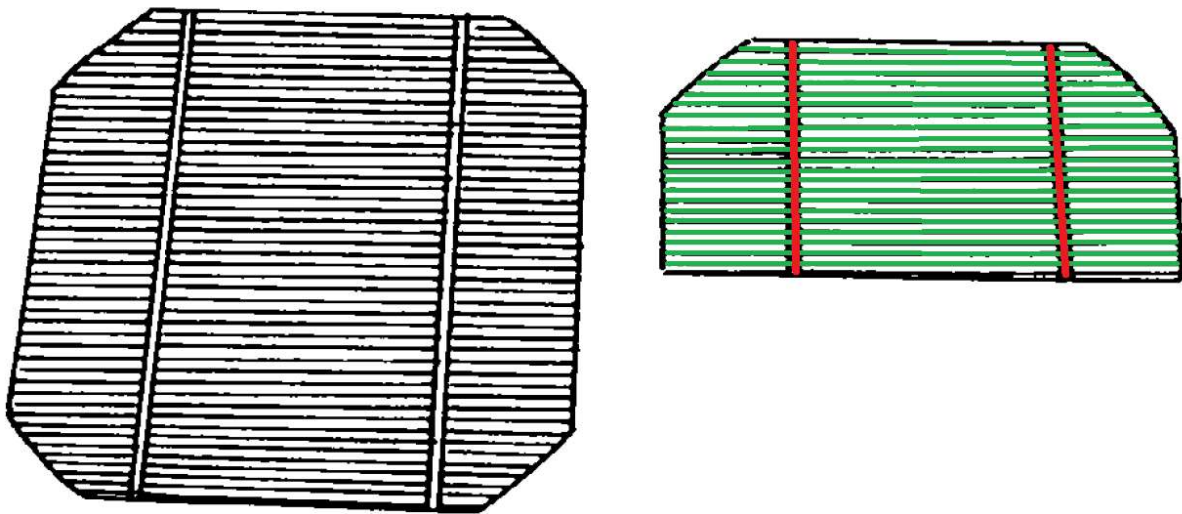


Fig. 4

Ravi328, Fig. 4 (annotated).

² I have been instructed by the Petitioner that the claim language “ *n respective boundaries of the n light-receiving-surface electrode areas*” should be understood to refer to the n cell regions created by splitting the basic solar battery cell with a plane shape thereof being a substantial square cell of limitation 6[a].

166. Ravi328 also discloses that “[b]usbars (Silver-aluminium) are printed on the back side for facilitating solder contacts, and rest of the area is covered with aluminium paste to create the back surface field (BSF).” Ravi328, 4.

167. A POSITA would understand that these rear-side busbars correspond in position to the front-side busbars, such that each front busbar has a matching rear busbar for interconnection. These are located at the same position on the rear-side as the light-receiving-surface electrodes. This front-to-back correspondence is consistent with standard crystalline silicon cell architecture to enable efficient front-to-back connections.

168. Accordingly, Ravi328 teaches limitation 6[c] of the ’214 patent, and Boretz in view of Maehane and Ravi328 renders obvious claim 6 of the ’214 patent.

C. Ground 3: Claim 7 is Obvious over Boretz, Maehane, and Ravi260

1. Motivation to Combine Boretz, Maehane, and Ravi260

169. A POSITA would be motivated to combine Boretz, Maehane, and Ravi260 to address structural issues in Boretz’s solar module design, particularly concerning the second string connector. While Boretz discloses multiple busbars for interconnection, it acknowledges problems with the second string connectors, such as bending or displacement during testing, due to limited interconnect support. *See* Boretz, 6-1, 6-3, 6-4. Maehane offers a well-established electrode configuration for

efficient current collection but does not resolve the mechanical concerns regarding the string connectors. Ravi260 provides a solution by disclosing a second string connector that extends continuously across the entire cell array, ensuring greater structural stability with additional interconnect connections. *See* Section VIII.C.2. A POSITA would recognize that incorporating this continuous connector from Ravi260 into Boretz's design would address the noted mechanical weaknesses and improve the overall strength and durability of the module. To a POSITA, implementing this teaching from Ravi260 to Boretz would be readily understood as simply applying the well-known technique of extending a string connector continuously across the entire array of a cell to Boretz, which itself teaches the use of string connectors and acknowledges the issue with mechanical strength, in order to yield predictable results.

170. A POSITA would have reasonably expected success in combining Boretz, Maehane, and Ravi260. Boretz identifies structural issues with its second string connectors, which Ravi260 directly addresses by teaching a continuous connector that spans the entire cell array, offering increased support and preventing bending or displacement. Given the well-established benefits of such a continuous connector in improving mechanical stability, a POSITA would expect that implementing Ravi260's design into Boretz's module would provide a more robust connection, strengthening the interconnects across all sub-modules. The

combination of Maehane's efficient electrode configuration would further enhance the module's performance, making this integration a logical and predictable improvement to Boretz's solar module.

2. Claim 7: “The solar battery module according to claim 1, wherein the second string connector extends continuously across the entire cell array.”

171. Boretz in view of Maehane and Ravi260 renders claim 7 obvious.

172. Boretz in view of Maehane teaches or suggests a “solar battery module according to claim 1” for the same reasons as I discuss above with respect to claim 1. Ravi260 teaches or suggests the additional limitation of claim 7 “*wherein the second string connector extends continuously across the entire cell array.*”

173. Ravi260 teaches an array of solar cells in a series-parallel configuration. Specifically, Ravi260 discloses a configuration wherein the second string connector (which serially connects each group of 2-columns of parallel cell strings) extends continuously across the entire cell array.

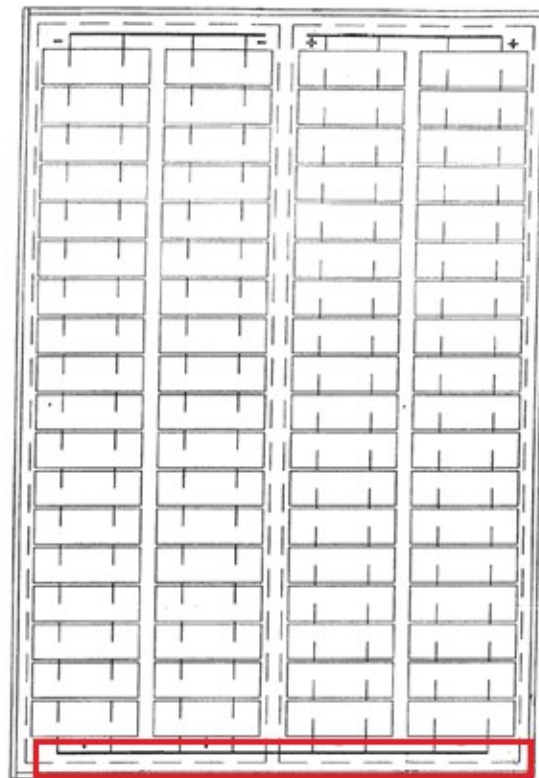


Fig. 6

60 WATTS PV MODULE MADE WITH 72 NOS.
OF ONE-THIRD CUT 156 mm SOLAR CELLS.

Ravi260, Fig. 6 (annotated). The annotated red box depicts this second string connector.

174. A POSITA would recognize that connecting each sub-module in Boretz with seven different busbars versus using a single busbar as taught in Ravi260 would help to improve Boretz. Boretz noted problems encountered during testing wherein the second string connectors (referenced as the “collector strips”) were accidentally knocked about or bent by technicians. *See* Boretz, 6-1, 6-3, 6-4. Further, Boretz acknowledged that the “interconnects supporting these collector strips” would be understood to help support the strength of the string connectors, but the four to eight

interconnect connections were not sufficient. Thus, a POSITA viewing Ravi260 would readily understand that using a string connector which extends continuously across the entire cell array would help to further support the strength of the connector by providing seven times the same number of interconnect connections (for each of the seven sub-modules).

175. Accordingly, Boretz in view of Maehane and Ravi260 renders claim 7 of the '214 patent obvious.

D. Ground 4: Claims 9 and 10 Are Obvious over Boretz, Maehane, and Krishnamurthy

1. Motivation to Combine Boretz, Maehane, and Krishnamurthy

176. A POSITA when seeking to utilize the solar module technology disclosed in Boretz would be motivated to incorporate solar cells with chamfered edges like those disclosed by Krishnamurthy. As I explain above in Section VIII.B.1, a common industry practice used to manufacture solar cells involves the Czochralski method. *See* Section VIII.B.1. Furthermore, the wafer discs cut from the boules naturally formed by the Czochralski method are necessarily in the shape of a circle, or disk, which is poorly suited for use as the basis of a solar cell in an array due to its poor tessellation. *See* Section VIII.B.1. However, the need to pick a cell shape which tessellates must be balanced against the desire to avoid as much waste of the silicon wafers as possible. As a result, it is common in the industry to form solar

cells in a “pseudo-square” shape wherein small corners are cut from the silicon wafers, leaving it in a substantial square shape. *See* Section VIII.B.1. These corners are known as “chamfered” corners. *See* Ex. 1020 at [0018] (“By way of example, the single photovoltaic cell 20 is substantially square-shaped with chamfered corners (pseudosquare) . . .”). These pseudo-square cells may then be further cut into smaller segments depending on the needs of a given solar module. *See, e.g.,* Ex. 1019 at 28 (square silicon wafers were “diced into two 2 x 4 cm cells” for use by NASA, the same dimension as the solar cells in Boretz).

177. A POSITA would recognize the benefit to adopting chamfered solar cells as disclosed in Krishnamurthy in Boretz. As I explain above, a POSITA would readily recognize that the chamfered edges of the Krishnamurthy cells help to prevent waste of each silicon wafer during manufacture while simultaneously maintaining a shape which easily tessellates. Using such cells in Boretz would similarly help to reduce cell wafer waste and thus help to maximize the utilization of the silicon crystal for purposes of the solar module. To a POSITA, implementing this teaching from Krishnamurthy in Boretz would be readily understood as simply applying the well-known technique of producing solar cells that minimize silicon wafer waste to Boretz, which itself teaches the known use of silicon solar cells.

178. Krishnamurthy further teaches that, when aligning chamfered half-cells in a solar array, it is a common design choice to align the cells in such a way that the

non-chamfered edges from adjoining half-cells are aligned together. As I mention above, it is well understood that the solar cells in an array should be positioned in a manner that helps to maximize the reactive cell area exposed to sunlight. A POSITA prior to the priority date of the purported invention of the '214 patent would readily recognize that this goal is commonly met by adopting a configuration of solar cells which tessellate, as I describe above. Once an appropriate cell shape is selected, the cells must then actually of course be arranged in such a pattern that maximizes the utilization of the module area. For half-cells, this is easily and commonly achieved by arranging the cells in a simple grid, such as in Boretz. There are a limited number of ways to orient the chamfered half-cells in this arrangement. One such arrangement is that depicted by Krishnamurthy in Figure 6-5, wherein the non-chamfered edges of adjoining half-cut solar cells are aligned together, uniformly mimicking the visual representation of the cells as they would appear in a full pseudo-square format. Though a finite number of other orientations of the chamfered half-cells in this grid arrangement could conceivably be selected—by flipping some of cells 180 degrees—this would confer no additional benefit over the orientation disclosed in Krishnamurthy so long as the surface bus electrodes are symmetrical to a center line—which is true here, as I discuss above with respect to claim 3—as the '214 patent appears to expressly acknowledge. *See* '214 patent, 10:46–60. Thus, a POSITA would recognize that, when adopting solar cells with chamfered edges in

Boretz, for the reasons I discuss above, the alignment of such chamfered half-cells as taught by Krishnamurthy would be further improved by the alignment of these cells as taught in Krishnamurthy as well.

179. A POSITA would have further been motivated to combine Boretz and Krishnamurthy with Maehane for the same reasons discussed above in Section VIII.A.1.

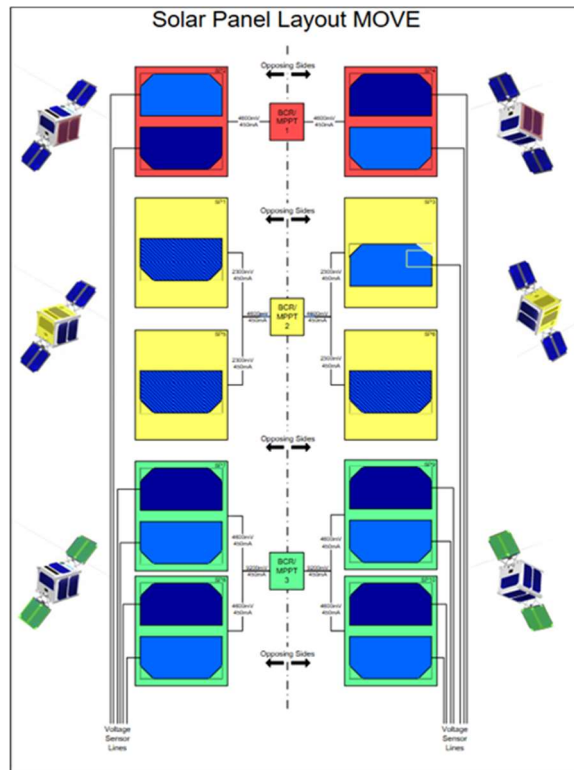
180. A POSITA would have reasonably expected success in combining Boretz, Maehane, and Krishnamurthy. Boretz, in combination with Maehane, discloses a solar module with rectangular cells, while Krishnamurthy teaches the configuration of cells with chamfered edges, helping to maximize the utilization surface of the solar module. This modification would be a predictable and straightforward improvement, utilizing common industry practices for the production of solar cells and their further arrangement within a solar module.

2. **Claim 9: “The solar battery module according to claim 1, wherein long sides of the substantial rectangle include a first long side and a second long side, the substantial rectangle has chamfered corners on both ends of only the first long side such that the second long side is without chamfered corners, and wherein the first one of the solar battery cells and the second one of the solar battery cells are arranged in the cell array such that the first long side and the second long side of the first one and the second one of the solar battery cells do not face each other.”**

181. Boretz in view of Maehane and Krishnamurthy renders obvious claim 9.

182. As explained above with respect to claim 1, Boretz in view of Maehane renders obvious a solar module wherein the solar cells are in the shape of a substantial rectangle. However, neither Boretz nor Maehane expressly disclose solar cells with chamfered corners wherein the first one of the solar battery cells and the second one of the solar battery cells are arranged in the cell array such that the first long side (chamfered edge) and the second long side (non-chamfered edge) of the first one and the second one of the solar battery cells do not face each other.

183. Krishnamurthy discloses this configuration of chamfered edges. As shown in Fig. 6-5 of Krishnamurthy, the module layout arranges rectangular solar cells such that the first long side (with chamfered corners) and the second long side (without chamfered corners) of adjacent cells do not face each other. This results in a consistent orientation across the cell array, promoting better visual uniformity and mechanical consistency.



184. A POSITA would have been motivated to adopt this asymmetric chamfering and arrangement into Boretz's layout to improve module alignment, avoid mechanical stress at edges, and simplify automated assembly.

185. Accordingly, Boretz in view of Maehane and Krishnamurthy renders obvious claim 9 of the '214 patent.

3. Claim 10

a) Limitation 10 ``` [pre]: "A solar battery module comprising:" ```

186. Boretz in view of Maehane and Krishnamurthy renders claim 10 obvious.

187. To the extent, the preamble is limiting, Boretz teaches or suggests a solar battery module.

188. See discussion of limitation 1[pre].

- b) **Limitation 10[a]: “plurality of solar battery cells, a plain shape of each being a substantial rectangle, and a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1 (n is an integer equal to or larger than 2),”**

189. Boretz teaches or suggests this limitation.

190. See discussion of limitation 1[a].

- c) **Limitation 10[b]: “includes a plurality of light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle on a light receiving surface, and includes rear-surface bus electrodes each at a position on a non-light-receiving surface corresponding to each of the light-receiving-surface bus electrodes; and”**

191. Boretz in view of Maehane teaches or suggests this limitation.

192. See discussion of limitation 1[b].

- d) **Limitation 10[c]: “an interconnector that electrically connects the light-receiving-surface bus electrodes of a first one of the solar battery cells to the rear-surface bus electrodes of an adjacent second one of the solar battery cells,”**

193. Boretz teaches or suggests this limitation.

194. See discussion of limitation 1[c].

- e) **Limitation 10[d]: “wherein long sides of the substantial rectangle include a first long side and a second long side, the substantial rectangle has chamfered corners on both ends of only the first long side such that the second long side is without chamfered corners, and”**

195. Boretz in view of Maehane and Krishnamurthy teaches or suggests this limitation.

196. See discussion of Claim 9.

- f) **Limitation 10[e]: “the first one of the solar battery cells and the second one of the solar battery cells are arranged in the module such that the first long side and the second long side of the first one and the second one of the solar battery cells do not face each other.”**

197. Boretz in view of Maehane and Krishnamurthy teaches or suggests this limitation.

198. See discussion of Claim 9.

E. Ground 5: Claims 1-4, 6, 8, and 11 Are Obvious over Zhang and Ravi328

1. Motivation to Combine Zhang and Ravi328

199. A POSITA would have been motivated to combine Zhang and Ravi328.

200. Although Zhang discloses a solar module structure that connects the front of one solar cell to the rear of an adjacent solar cell, it does not provide a detailed description of the electrode arrangements on the surfaces of the individual cells. A POSITA would understand that a functioning solar cell must include both an anode and a cathode, and that interconnecting multiple cells in series requires connecting the

positive side of one cell to the negative side of the next. While Zhang conveys the general idea of these connections, it does not elaborate on the specific shapes, patterns, or layout of the electrodes themselves.

201. In my opinion, a POSITA would be motivated to supplement the disclosure of Zhang based on the disclosure of Ravi328. Ravi328 discloses a common industry design for an electrode configuration on the front and back surfaces of a solar cell. Ravi328 further discloses an electrode design including a fine-line grid pattern of conductive material (e.g., silver) printed on the front surface of the solar cell. *See* Ravi328, 4. This grid structure is optimized to reduce contact resistance while simultaneously maximizing light absorption, thereby improving the cell's overall efficiency. Ravi328, 4. The grid lines work in coordination with rear busbars that collect and direct the current along a defined path to neighboring cells. Ravi328, 4. By utilizing such a familiar and efficient electrode configuration, a POSITA would readily recognize that the solar module disclosed in Zhang could achieve more effective current collection and enhanced performance.

202. Further, Zhang uses full-sized square cells, which, without modification, could limit electrical optimization. Ravi328 discloses using half-cut (split) rectangular solar cells derived from 125-mm square wafers. Ravi328, 3. A POSITA would recognize these half-cut cells, arranged in series-parallel layouts, minimize current through each string, thereby reducing resistive losses and boosting overall module

efficiency. *See* Ex. 1014, 2 (“[A] module has been designed where the cell size is optimized to reduce these losses and boost performance as well as increase shade tolerance over a traditional assembly. This has been achieved by sectioning the cells into two halves, reducing interconnect losses, and recombining the current at the cables. In reducing cell current by reducing cell size, the I^2R losses in the front tab and tab extension are also reduced. This leads to an improved fill factor. We call this the reduced or optimized series resistance design.”). A POSITA would have reasonably expected that incorporating half-cells as taught in Ravi328 into Zhang would result in the predictable outcome of passing these same module efficiency improvements on to Zhang.

203. Thus, in my opinion, a POSITA would be motivated to integrate Ravi328’s half-cut cell structure into Zhang’s photovoltaic (PV) module.

204. A POSITA would have had a reasonable expectation of success in implementing Ravi328’s electrode configuration and half-cut cell structure into Zhang’s solar module design. As noted above, Ravi328’s electrode pattern and cell structure are common in the solar industry and have been shown to enhance efficiency through better current collection and reduced resistive losses. Furthermore, the use of half-cut cells to minimize resistive losses and improve overall module performance was well-known at the time of the ’214 patent. Given the familiarity of these approaches and their routine application in the field, a POSITA would have

appreciated that integrating Ravi328's electrode and cell structure into Zhang's module would improve the module's overall efficiency and performance. This would have constituted nothing more than the use of a known technique (i.e., Ravi328's electrode configuration and half-cut cell structure) in a device ready for improvement (i.e., Zhang's solar module), and would have been squarely within the ability of a POSITA.

2. Claim 1

205. Zhang in view of Ravi328 renders claim 1 obvious.

a) Limitation 1[pre]: "A solar battery module comprising:"

206. To the extent the preamble is limiting, Zhang teaches or suggests a solar battery module.

207. Specifically, Zhang discloses a "photovoltaic (PV) module." The module comprises "photovoltaic glass, unit cells connected by interconnection strips, and a package backsheet, which are packaged as a whole by a transparent laminated material." Zhang, Abstract. The photovoltaic cells used are "125x125 mm monocrystalline or polycrystalline solar cells." Zhang, Abstract.

208. Accordingly, to the extent that the preamble of claim 1 of the '214 patent is limiting, Zhang teaches it.

- b) Limitation 1[a]: “a plurality of solar battery cells, a plain shape of each being a substantial rectangle, and a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1 (n is an integer equal to or larger than 2),”**

209. Zhang in view of Ravi328 teaches or suggests this limitation.

210. Zhang teaches the use of a plurality of solar battery cells in a PV module but does not disclose that a plain shape of each is a “*substantial rectangle, and a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1 (n is an integer equal to or larger than 2).*” Rather, Zhang discloses a solar module with an array of photovoltaic cells with each measuring 125x125 mm.

211. However, Ravi328 discloses a plurality of solar battery cells where a plain shape of each is “*a substantial rectangle, and a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1 (n is an integer equal to or larger than 2).*” Ravi328 teaches “a method for fabrication of Photovoltaic (PV) modules of rating 12-volt, 120-watt incorporating 108 half-cut, 125-mm size mono crystalline silicon solar cells.” Ravi328, 3.

212. A half-cut cell indicates a 1/2:1 aspect ratio ($n = 2$) of a short side length to a long side length of the cell. Figure 4 of Ravi328 further confirms this, depicting a full cell (left) and half cell (right) reflecting this ratio and having substantially rectangular geometry:

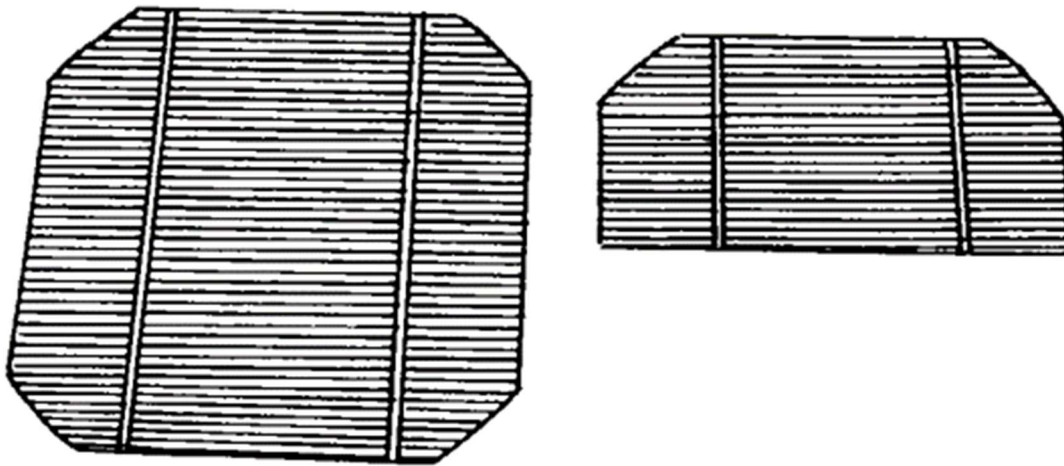


Fig. 4

Ravi328, Fig. 4.

213. Accordingly, Zhang in view of Ravi328 teaches or suggests limitation 1[a] of the '214 patent.

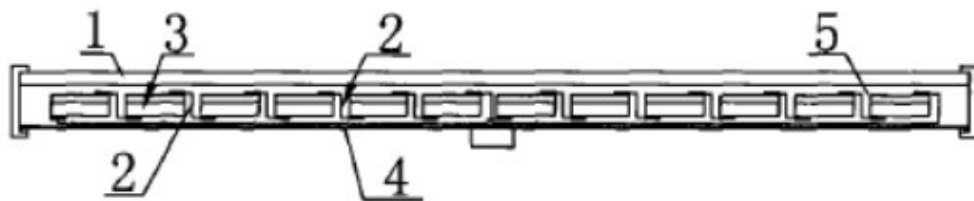
- c) **Limitation 1[b]: “includes a plurality of light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle on a light-receiving surface, and includes rear-surface bus electrodes each at a position on a non-light-receiving surface corresponding to each of the light-receiving-surface bus electrodes; and”**

214. Zhang in view of Ravi328 teaches or suggests this limitation.

“a plurality of light-receiving-surface bus electrodes . . . on a light-receiving surface”
and “rear-surface bus electrodes . . . on a non-light-receiving surface”

215. Zhang teaches “a plurality of light-receiving-surface bus electrodes . . . on a light-receiving surface” and “rear-surface bus electrodes . . . on a non-light-receiving surface.”

216. Zhang discloses that one front face of the solar cell array is a “light-receiving-surface” and the opposite rear face of the solar cell array is a “non-light-receiving surface.” A POSITA would readily understand that at least one face of a solar cell is a light-receiving surface to provide energy from the sun. In Zhang, a first side of each solar cell corresponds to the light-receiving surface. This is confirmed by the use of a “photovoltaic glass” material over one side of the solar cell array, as depicted in Figure 1 of Zhang:



Zhang, Fig. 1.

217. Zhang further teaches that a second side of each solar cell is a non-light-receiving surface. Figure 1 above confirms that the other side of the module, opposite the photovoltaic glass 1, is a “package backsheet 4.” Zhang, 4. In other words, a first side of each solar cell is a light-receiving-surface covered by photovoltaic glass,

intending to receive energy from the sun, while the opposite side of each solar cell is a non-light-receiving surface covered by a backsheet.

218. A POSITA would also understand that both the front “*light-receiving surfaces*” and the rear “*non-light-receiving surfaces*” each include a surface bus electrode. As explained further below with respect to limitation 1[c], an interconnector electrically connects the front and rear surfaces of cells in series along a cell string. In order to allow for electrical current to flow through the cell string, the interconnectors must be connected to both an electrode on a front (light-receiving) surface of the cells and an electrode on a rear (non-light-receiving) surface of the cells. A POSITA would understand that these electrodes would align with the interconnection strips 2 connecting each adjoining cell in series in the cell strings, as shown in Figure 1 above.

219. Thus, Zhang teaches “*a plurality of light-receiving-surface bus electrodes . . . on a light-receiving surface*” and “*rear-surface bus electrodes . . . on a non-light-receiving surface.*”

“*. . . light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle . . . , and includes rear-surface bus electrodes each at a position . . . corresponding to each of the light-receiving-surface bus electrodes*”

220. Zhang does not expressly disclose the exact shape and orientation of these bus electrodes. However, Ravi328 teaches “*a plurality of light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle on a light-receiving*

surface, and includes rear-surface bus electrodes each at a position on a non-light-receiving surface corresponding to each of the light-receiving-surface bus electrodes.”

221. Ravi328 discloses solar cells having bus electrodes on both the front (light-receiving) and rear surfaces. For example, Ravi328 teaches “[f]ront and back contacts on the wafer surface are established by screen printing a suitable metallic pastes on them. A fine-line grid pattern (Silver) is formed on the front side which is designed to reduce the contact resistance and at the same time increase the aperture for light absorption. Busbars (Silver-aluminium) are printed on the back side for facilitating solder contacts, and rest of the area is covered with aluminium paste to create the back surface field (BSF).” Ravi328, 4. As shown below, these contacts (annotated in red) are aligned parallel to the short side (green) of the substantially rectangular cell:

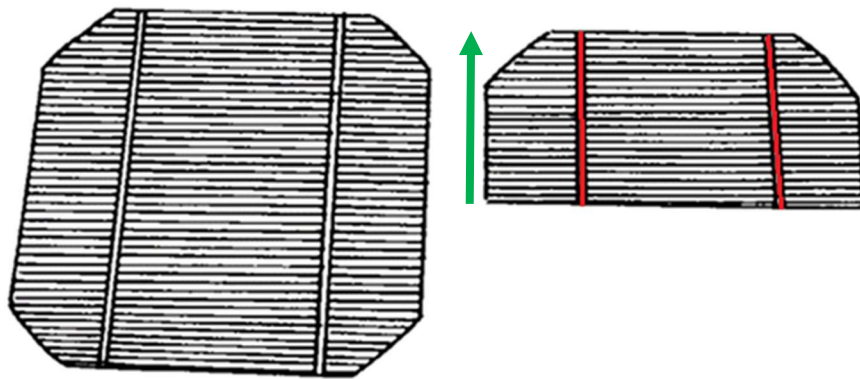


Fig. 4

Ravi328, Fig. 4 (annotated).

222. The location of the rear contacts directly corresponds to the location of the front contacts, thereby enabling front-to-back interconnection between adjacent cells using copper interconnects. Specifically, Ravi328 explains that “[t]inned copper interconnects are soldered on the front busbars of matched solar cells in terms of output current. These are strung together (front contact of one cell connected to the back contact of the next cell through the interconnects) in a specially designed lay-up jig, terminating in positive and negative output leads.” Ravi328, 5.

223. Accordingly, Zhang in view of Ravi328 teaches or suggests limitation 1[b] of the ’214 patent.

d) Limitation 1[c]: “an interconnector that electrically connects the light-receiving-surface bus electrodes of a first one of the solar battery cells to the rear-surface bus electrodes of an adjacent second one of the solar battery cells,”

224. Zhang teaches or at least suggests this limitation.

225. Zhang discloses a module wherein “unit cells 3 are connected in series to form a series group 6” by “interconnection strips 2.” Zhang, 4. As shown in Figure 1 below, the module includes interconnection strips 2 that electrically connect adjacent unit cells 3. These strips run between the front surface of one cell and the rear surface of the next, enabling current flow through the series string:

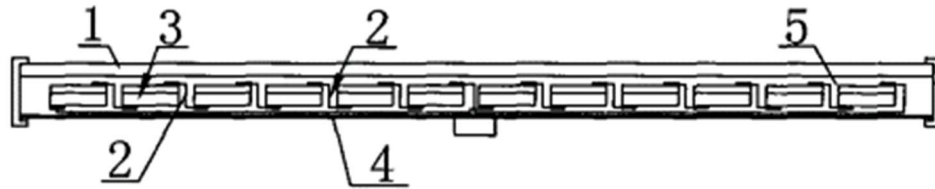


图 1

Zhang, Fig. 1.

226. Further shown in Zhang's Figure 1, interconnection strips 2 extend between adjacent unit cells 3, which are stacked in a flat, encapsulated arrangement. A POSITA would recognize this as a standard cross-sectional depiction of a photovoltaic module, where light enters from the top side (the "*light-receiving surface*"), passing through the transparent photovoltaic glass 1. This transparent layer is consistently positioned above the solar cells, indicating that the top surface of each solar cell faces the light source.

227. Given that light enters from the top through the photovoltaic glass 1, a POSITA would understand the top face of each unit cell 3 to be the light-receiving surface, and the bottom face to be the rear, non-light-receiving surface. The interconnection strips 2 link the upper portion of one cell to the lower portion of the next cell in series. This physical arrangement necessarily connects the front-side bus electrode (on the light-receiving surface of a first solar cell) to the rear-side electrode (on the non-light-receiving surface of the adjacent solar cell), consistent with the

claimed “*interconnector that electrically connects the light-receiving-surface bus electrodes of a first one of the solar battery cells to the rear-surface bus electrodes of an adjacent second one.*” This is a conventional and well-understood interconnection practice in the solar cell packaging art.

228. Accordingly, Zhang teaches limitation 1[c] of the '214 patent.

e) **Limitation 1[d]: “wherein a predetermined number of the solar battery cells are serially connected to each other, thereby configuring a cell string,”**

229. Zhang teaches or suggests this limitation.

230. Zhang discloses that the unit cells are “125×125mm monocrystalline or polycrystalline solar cells” and “are connected in series to form a series group.” Zhang, Abstract. Specifically, “the series group is formed by nine cells connected in series, and there are six series combinations that are connected in series to form the module.” Zhang, 3.

231. Figure 3 depicts a cell string comprised of a number of solar battery cells serially connected to each other. “FIG. 3 shows nine series groups. Endpoints of two series groups 6 are connected in parallel to form a parallel-series combination 7, and then six parallel-series combinations 7 are connected in series to form an output end of the module.” Zhang, 4.

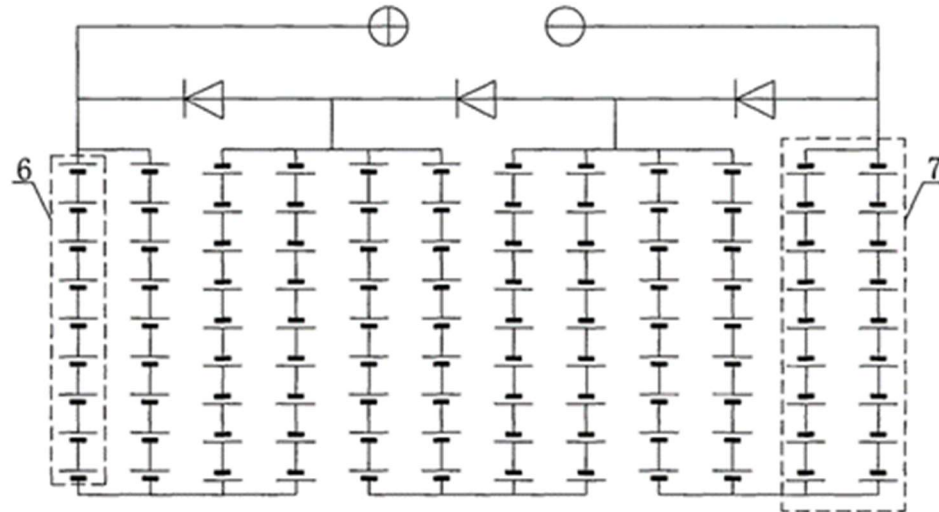


图 3

Zhang, Fig. 3.

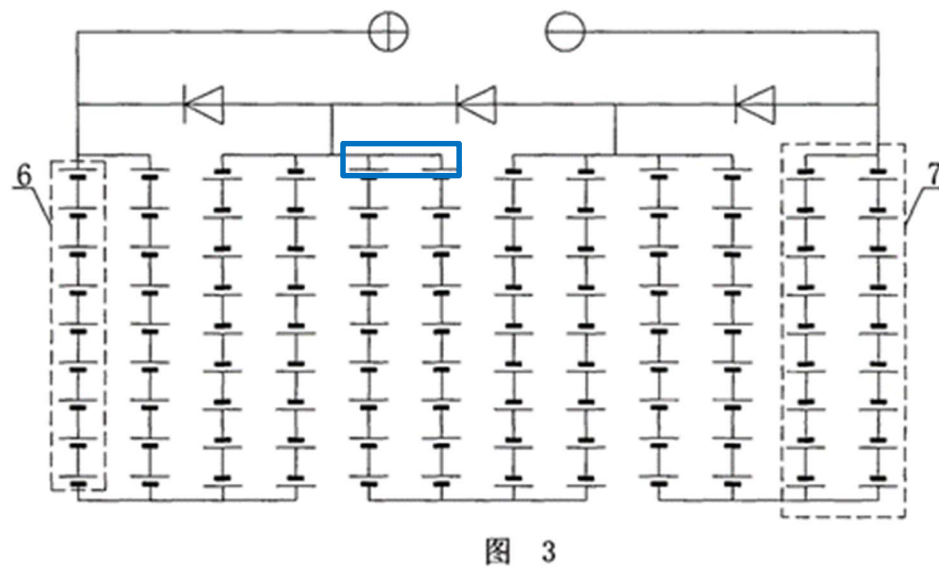
232. Accordingly, Zhang teaches limitation 1[d] of the '214 patent.

f) **Limitation 1[e]: “n columns of the cell strings are connected in parallel by a first string connector at one end of the n columns, the n in the number of columns of the cell strings connected in parallel being equal to the n in the ratio of the long side length to the short side length, and”**

233. Zhang in view of Ravi328 teaches or suggests this limitation.

234. As shown in Zhang's Figure 3, two vertically aligned strings (series groups 6) are connected in parallel at one end to form a parallel-series combination 7. See Zhang, 4 (“FIG. 3 shows nine series groups. Endpoints of two series groups 6 are connected in parallel to form a parallel-series combination 7, and then six parallel-series combinations 7 are connected in series to form an output end of the module.”).

235. Zhang's two series groups ("*n columns of the cell strings*") are connected in parallel by a first string connector (highlighted in the blue box) to form "*the n-column parallel-connected cell strings*", where $n = 2$. And, each is formed by connecting two vertical strings in parallel at the end of their series group.



Zhang, Fig. 3 (annotated).

236. As explained above with respect to limitation 1[a], Zhang in view of Ravi328 teaches or suggests "*a plurality of solar cells . . . [having] a ratio of a short side length and a long side length of the substantial rectangle being $1/n:1$,*" where $n = 2$. Therefore, in light of these teachings and for the reasons explained above in regards limitation 1[a], Zhang in view of Ravi328 further suggests "*n columns of the cell strings are connected in parallel by a first string connector at one end of the n columns,*

the n in the number of columns of the cell strings connected in parallel being equal to the n in the ratio of the long side length to the short side length,” where n = 2.

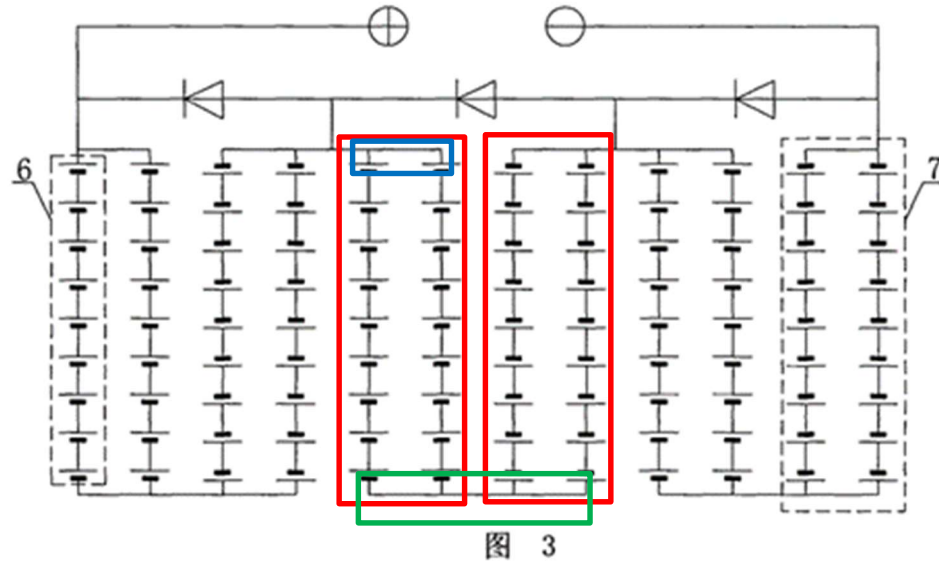
237. Accordingly, Zhang in view of Ravi328 teaches or suggests limitation 1[e] of the '214 patent.

g) Limitation 1[f]: “the n-column parallel-connected cell strings are further serially connected to another n-column parallel-connected cell strings by a second string connector at an opposite end of the n columns, thereby configuring an entire cell array.”

238. Zhang in view of Ravi328 teaches or suggests this limitation.

239. As explained above with respect to limitation 1[a], Zhang in view of Ravi328 teaches or suggests “*a plurality of solar cells . . . [having] a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1,*” where n = 2. As shown in the middle portion of Zhang’s Figure 3 (below), two vertically aligned groups of cells that are serially connected are connected in parallel with another such group, “*thereby configuring a cell string.*” See *supra*, limitation 1[e].

240. Two columns of parallel-connected cell strings (highlighted in the red boxes) are connected by a second string connector (highlighted in the green box) at the opposite end of the n columns, relative to the first string connector (highlighted in the blue box).



Zhang, Fig. 3 (annotated). Therefore, in light of these teachings, Zhang in view of Ravi328 further suggests “the n -column parallel-connected cell strings are further serially connected to another n -column parallel-connected cell strings by a second string connector at an opposite end of the n columns, thereby configuring an entire cell array,” where $n = 2$.

241. Accordingly, Zhang in view of Ravi328 teaches or suggests limitation 1[f] of the '214 patent.

3. **Claim 2: “The solar battery module according to claim 1, wherein a predetermined number of the solar battery cells are serially connected, thereby configuring a cell string, two columns of the cell strings are connected in parallel, and the two-column parallel-connected cell strings are further serially connected, thereby configuring an entire cell array.”**

242. Zhang in view of Ravi328 renders claim 2 obvious.

243. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1.

244. The additional limitation of claim 2 requires that the n columns of cells strings connected in parallel (as required by claim 1) are specifically two columns of cell strings connected in parallel (i.e., $n = 2$).

245. Because Zhang in view of Ravi328 renders claim 1 obvious through a combination where $n = 2$, claim 2 is similarly rendered obvious for the same reasons as described above with respect to claim 1.

4. **Claim 3: “The solar battery module according to claim 1, wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.”**

246. Zhang in view of Ravi328 renders claim 3 obvious.

247. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1. Ravi328 further teaches or suggests the additional limitation of claim 3 “*wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side perpendicular to an extended line of the light-receiving-surface bus electrodes and parallel to the light-receiving-surface bus electrodes.*”

248. Ravi328 explains that “[t]inned copper interconnects are soldered on the front busbars of matched solar cells in terms of output current.” Ravi328, 5. As shown in Figure 4, the front busbars are the two thick vertical lines positioned on the light-receiving surface of both full and half-cut cells.

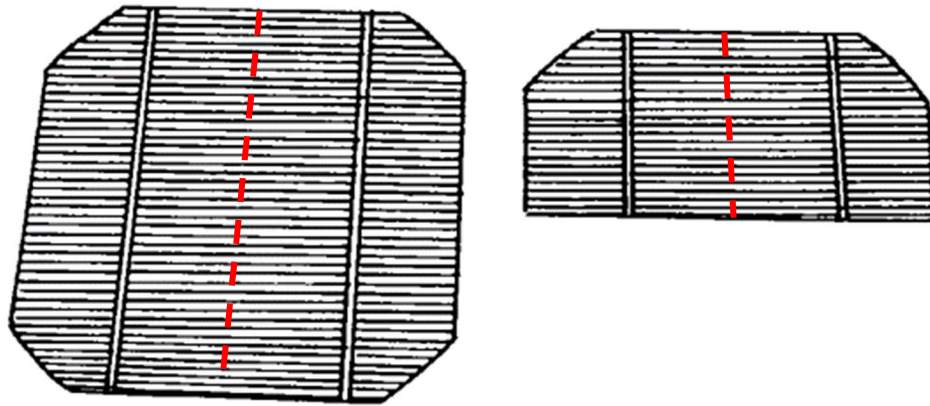


Fig. 4

Ravi328, Fig. 4 (annotated).

249. Figure 4 illustrates that these busbars are parallel to the short side of the substantially rectangular half-cut cell and are line-symmetrical with respect to a central vertical axis—that is, the dashed red line passing through the middle point of the long side (which is perpendicular to the busbar orientation and parallel to the busbars themselves).

250. Accordingly, Zhang in view of Ravi328 renders claim 3 of the '214 patent obvious.

5. **Claim 4: “The solar battery module according to claim 1, wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side parallel to the light-receiving-surface bus electrodes and perpendicular to the light-receiving-surface bus electrodes.”**

251. Zhang in view of Ravi328 renders claim 4 obvious.

252. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1. Ravi328 further teaches or suggests the additional limitation of claim 4 “*wherein the light-receiving-surface bus electrodes of each solar battery cell are formed at positions that are line-symmetrical with respect to a line passing through a middle point of a side parallel to the light-receiving-surface bus electrodes and perpendicular to the light-receiving-surface bus electrodes.*”

253. As discussed above with respect to claim 3, Ravi328 discloses front-side busbars that are arranged parallel to the short side of the rectangular solar cells and symmetrically placed across the central axis of the cell.

254. Fig. 4 also shows symmetry with respect to a line passing through a middle point of the short side of the substantially rectangular solar cell (parallel to the sides of the busbars), and perpendicular to the busbars (dashed red line, below). This reflects line-symmetry across both the horizontal and vertical centerlines of the cell surface.

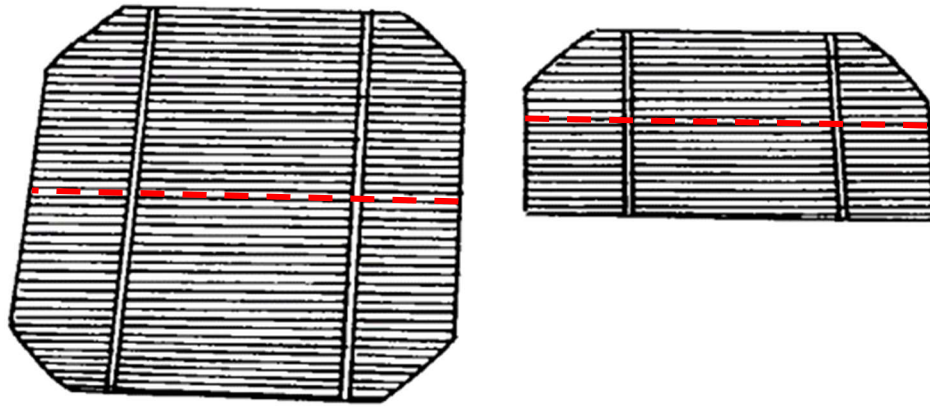


Fig. 4

Ravi328, Fig. 4 (annotated).

255. Accordingly, Zhang in view of Ravi328 renders claim 4 of the '214 patent obvious.

6. Claim 6

a) Limitation 6[pre]: “The solar battery module according to claim 1,”

256. Zhang in view of Ravi328 renders claim 6 obvious.

257. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1.

b) Limitation 6[a]: “The solar battery module according to claim 1, which is obtained by dividing a basic solar battery cell with a plane shape thereof being a substantial square,”

258. Ravi328 teaches or suggests the additional limitation of claim 6[a] “*which is obtained by dividing a basic solar battery cell with a plane shape thereof being a substantial square.*”

259. Ravi328 discloses a solar module built using solar battery cells that are derived by dividing full-sized square cells. Specifically, it states: “laser cutting of 125-mm full solar cells into two half solar cells.” Ravi328, 3.

260. Accordingly, Ravi328 teaches limitation 6[a] of the '214 patent.

c) Limitation 6[b]: “which includes n light-receiving-surface electrode areas in each of which a plurality of light-receiving-surface bus electrodes parallel to a side of the substantial square and”

261. Ravi328 teaches or suggests the additional limitation of claim 6[b] “*which includes n light-receiving-surface electrode areas in each of which a plurality of light-receiving-surface bus electrodes parallel to a side of the substantial square . . . are provided.*”

262. As shown in Figure 4 of Ravi328, full-sized square cell includes two light-receiving-surface electrode areas ($n = 2$ in the illustrated half-cut case).

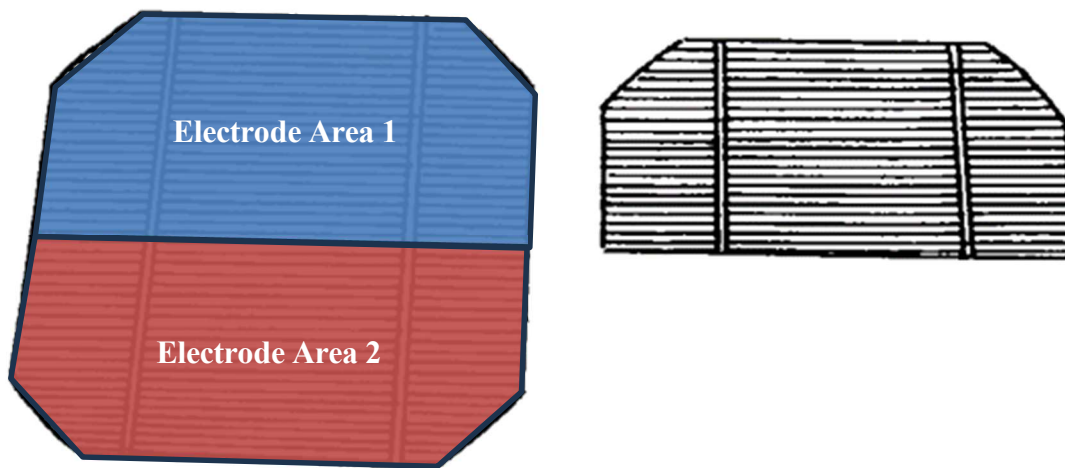


Fig. 4

263. Ravi328 further states: “Tinned copper interconnects are soldered on the front busbars of matched solar cells in terms of output current.” Ravi328, 5. Also show in Figure 4 of Ravi328, each of the light-receiving-surface bus electrodes (annotated in red) in the two electrode areas is parallel to a side of the square (annotated in green).

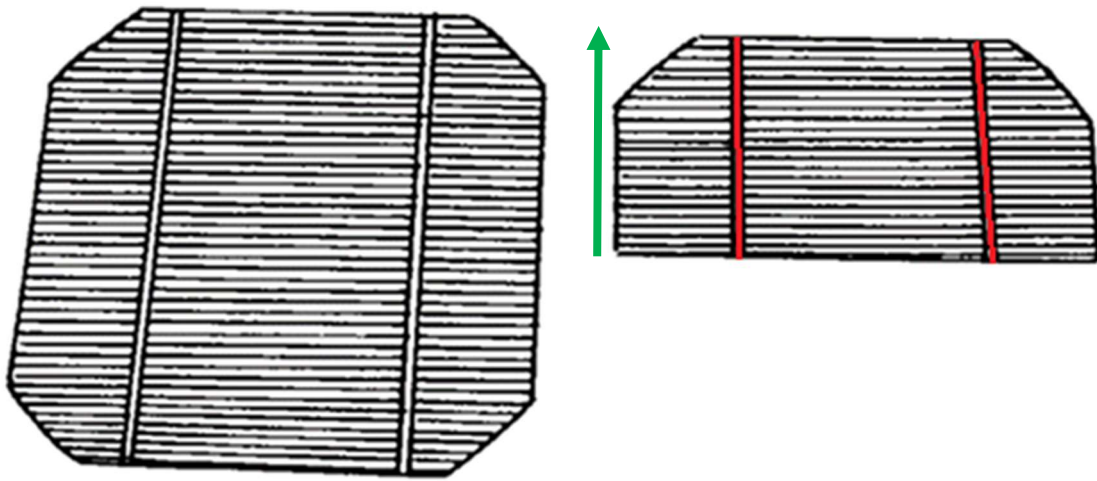


Fig. 4

Ravi260, Fig. 4 (annotated).

264. Accordingly, Ravi328 teaches limitation 6[b] of the '214 patent.

- d) **Limitation 6[c]: “a plurality of grid electrodes perpendicular to the light-receiving-surface bus electrodes are provided on a light-receiving surface side and includes rear-surface bus electrodes each at a position on a non-light-receiving surface side corresponding to each of the light-receiving-surface bus electrodes into n respective boundaries of the n light-receiving-surface electrode areas.”**

265. Ravi328 teaches or suggests the additional limitation of claim 6[c] that
“a plurality of grid electrodes perpendicular to the light-receiving-surface bus electrodes are provided on a light-receiving surface side and includes rear-surface bus electrodes each at a position on a non-light-receiving surface side corresponding to

each of the light-receiving-surface bus electrodes into n respective boundaries of the n light-receiving-surface electrode areas.”³

266. As seen in Figure 4, the front surface of each solar cell includes a conventional grid layout, where fine grid electrodes (the thin horizontal lines, depicted below in green) are arranged perpendicular to the vertical busbars (red). This forms a standard front contact pattern on crystalline silicon solar cells:

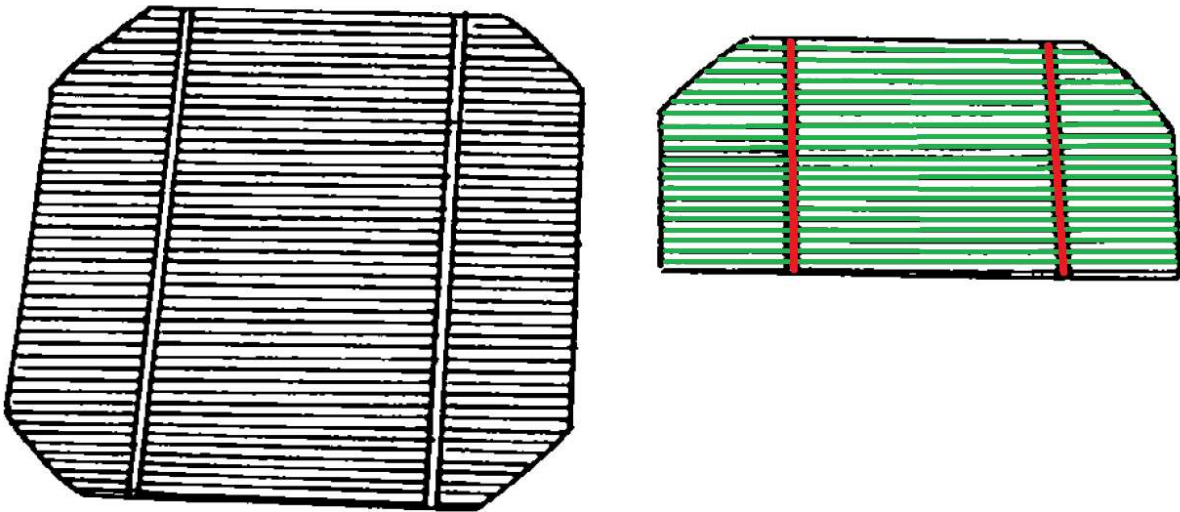


Fig. 4

³ I have been instructed by the Petitioner that the claim language “ *n respective boundaries of the n light-receiving-surface electrode areas*” should be understood to refer to the n cell regions created by splitting the basic solar battery cell with a plane shape thereof being a substantial square cell of limitation 6[a].

267. Ravi328 also discloses that “[b]usbars (Silver-aluminium) are printed on the back side for facilitating solder contacts, and rest of the area is covered with aluminium paste to create the back surface field (BSF).” Ravi328, 4.

268. A POSITA would understand that these rear-side busbars correspond in position to the front-side busbars, such that each front busbar has a matching rear busbar for interconnection. These are located at the same position on the rear-side as the light-receiving-surface electrodes. This front-to-back correspondence is consistent with standard crystalline silicon cell architecture to enable efficient front-to-back interconnects. *See supra*, limitation 1[c].

269. Accordingly, Ravi328 teaches limitation 6[c] of the '214 patent.

7. **Claim 8: “The solar battery module according to claim 1, wherein the interconnector is joined to the light-receiving-surface bus electrode of a solar battery cell nearest to the second string connector of the n-column parallel-connected cell strings, and is connected to the second string connector, and the second string connector is connected to a rear surface lead at the rear-surface bus electrode of a head solar battery cell nearest the second string connector of the another n-column parallel-connected cell strings.”**

270. Zhang in view of Ravi328 renders claim 8 obvious.

271. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1. Zhang further teaches or suggests the additional limitation of claim 8 “*wherein the interconnector is joined to the light-receiving-surface bus electrode of a solar battery*

cell nearest to the second string connector of the n-column parallel-connected cell strings, and is connected to the second string connector, and the second string connector is connected to a rear surface lead at the rear-surface bus electrode of a head solar battery cell nearest the second string connector of the another n-column parallel-connected cell strings.”

272. Zhang’s Figure 1 shows “photovoltaic glass 1, unit cells 3 connected by interconnection strips 2, and a package backsheet 4, which are packaged as a whole by a transparent laminated material 5.” Zhang, 4. The interconnection strips 2 are visibly shown spanning across solar cells in a staggered layout, connecting the top (light-receiving) surface of one cell to the next. This layout is consistent with connecting cells front-to-back, allowing current to flow through the series.

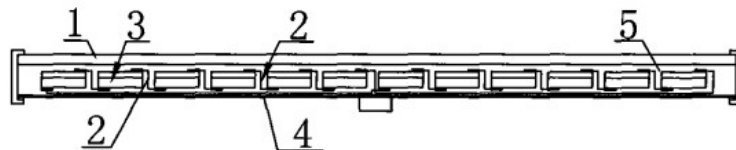


图 1

273. A POSITA would understand from this configuration that the front busbar of the last cell in a group would be connected to an adjacent interconnect extending toward the second string connector, such as the horizontal conductor shown in Zhang’s Figure 3. Moreover, a POSITA would understand that the rear

busbar of the head cell in a group would be connected to an adjacent interconnect extending toward the second string connector.

274. Accordingly, Zhang in view of Ravi328 renders claim 8 of the '214 patent obvious.

8. Claim 11: “The solar battery module according to claim 1, wherein the solar battery cells in the cell array are arranged so that the short side lengths are parallel to the extension of the n-column parallel-connected cell strings.”

275. Zhang in view of Ravi328 renders claim 11 obvious.

276. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1. Ravi328 further teaches or suggests the additional limitation of claim 11 “*wherein the solar battery cells in the cell array are arranged so that the short side lengths are parallel to the extension of the n-column parallel-connected cell strings.*”

277. As shown in Figure 6 (below), the module is constructed using half-cut rectangular solar cells arranged in vertical columns of 18 cells each, across six columns, forming a 6×18 cell array. Each half-cut cell has a long horizontal edge and a short vertical edge. The cells are arranged such that the short sides are oriented vertically, and the cell strings run in that same vertical direction.



Fig. 6

Ravi328, Fig. 6.

278. Accordingly, Zhang in view of Ravi328 renders claim 11 of the '214 patent obvious.

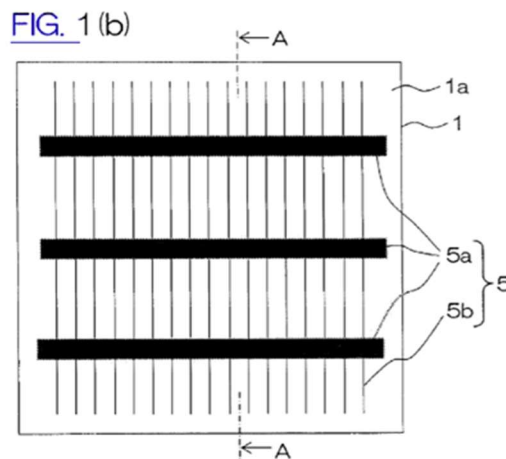
F. Ground 6: Claim 5 Is Obvious Based on Zhang, Ravi328, and Fujii

1. Motivation to Combine Zhang, Ravi328, and Fujii

279. A POSITA would have been motivated to combine Zhang, Ravi328, and Fujii.

280. A POSITA would have been motivated to adopt Fujii's teachings regarding margin spacing into both the module architecture disclosed by Zhang and Ravi328. Fujii teaches a solar cell module structure in which solar cells are arranged with minimal but intentional spacing between the busbar electrodes and other elements of the cells. As Fujii explains, the dimensions and spacing of the electrodes can be

configured to strike a good balance between the desires to help reduce the resistance from the busbar electrodes and simultaneously avoid reduction of the light receiving surface in order to preserve the conversion efficiency of the cell. Fujii, ¶¶ [0118]–[0126]. In keeping with these teachings, the busbar electrodes 5a in Fujii do not extend fully to the perimeter of the cells and leave a small gap, as pictured, for example, in Figure 1(b):



Fujii, Fig. 1(b). A POSITA would also have readily understood that such a configuration as disclosed in Fujii would be beneficial to help prevent short circuits in the connections between adjoining cells. *See, e.g.*, Maehane, [0010], [0017].

281. As discussed above, while Zhang and Ravi328 collectively teach the physical form of rectangular solar cells and parallel/series interconnection schemes, neither specifically addresses the spatial considerations of balancing resistance losses against reduction of active solar cell area, or short circuit prevention. To a POSITA, implementing this teaching from Fujii to Zhang and Ravi328 would be readily

understood as simply applying the well-known technique of leaving a small gap between the edge of the busbar electrodes and the perimeter of the solar cells, an improvement which was known to yield the predictable result of balancing resistance losses against reduction of active solar cell area and helping to prevent short circuits.

282. A POSITA would have had a reasonable expectation of success in integrating the teachings of Zhang, Ravi328, and Fujii. As discussed above, Zhang and Ravi328 provide the foundational architecture of the solar module, disclosing a parallel-series interconnection scheme using half-cut rectangular cells, while Fujii addresses the critical issue of electrode spacing for helping to maximize conversion efficiency of a cell and short circuit prevention. Fujii's teachings regarding margin spacing, which ensure proper electrical insulation and prevent mechanical cracking, are directly applicable to the module architecture disclosed by Zhang and Ravi328. Given that Fujii and Ravi328 both implement substantially the same electrode configuration common to the industry which utilizes both a fine-line grid pattern of conductive material and busbars that collect and direct the current along a defined path to neighboring cells, a POSITA would recognize that incorporating Fujii's margin spacing into Zhang and Ravi328's configuration would be a straightforward modification. Thus, a POSITA would reasonably expect that the combination of these references would yield predictable and beneficial results, such as enhanced module performance and reduction in long-term failures due to short circuits. Implementing

these teachings would have been nothing more than the application of a known technique (i.e., Fujii's cell spacing techniques) in a device ready for improvement (i.e., the Zhang solar module as modified by Ravi328).

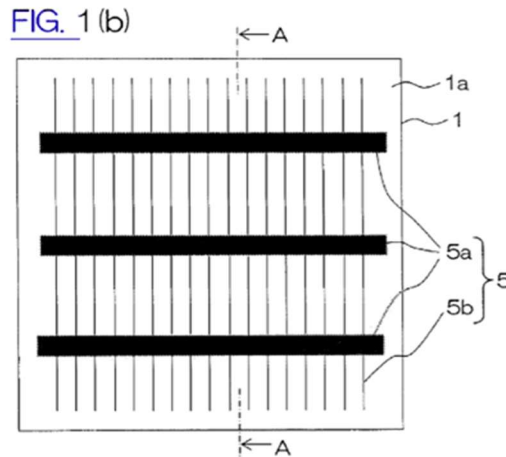
2. **Claim 5: "The solar battery module according to claim 1, wherein each of the solar battery cells includes an area where the light-receiving-surface bus electrodes and the rear-surface bus electrodes are not formed within a predetermined dimension from an edge toward a central direction of the cell at an outer circumferential edge portion thereof."**

283. Zhang in view of Ravi328 and Fujii renders claim 5 obvious.

284. Zhang in view of Ravi328 teaches or suggests a "*solar battery module according to claim 1*" for the same reasons as I discuss above with respect to claim 1. Fujii further teaches or suggests the additional limitation of claim 5 "*wherein each of the solar battery cells includes an area where the light-receiving-surface bus electrodes and the rear-surface bus electrodes are not formed within a predetermined dimension from an edge toward a central direction of the cell at an outer circumferential edge portion thereof.*"

285. Fujii discloses solar cells arranged with minimal spacing between the busbar electrodes and other elements of the cells, which leaves a small but deliberate gap between the outer edges of the busbar electrodes 5a and the perimeter of the cells. In particular, Figure 1(b) of Fujii shows the light-receiving surface of the solar cell element, where three busbar electrodes 5a and finger electrodes 5b are formed

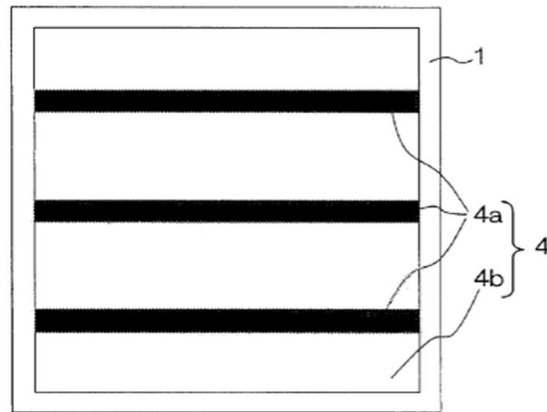
inward from the peripheral edges, leaving a clear margin at the outer circumferential edge of the cell where no electrodes are present.



Fujii, Fig. 1(b).

286. Likewise, Figure 1(a) of Fujii illustrates the rear surface of the cell. As shown and described in ¶ [0119], the rear-surface busbar electrodes 4a and the back surface power collecting electrode 4b are also not formed at the outer edge region. Fujii shows and describes a similar uncovered margin on the rear surface, leaving space between the electrodes and the outer edge of the substrate 1.

FIG. 1 (a)



Fujii, Fig. 1(a).

287. It would have been obvious to incorporate Fujii's margin design into Ravi328's one-third cut cell layout, especially because Ravi328 contemplates a similar grid electrode/busbar electrode configuration. A POSITA would understand the need to leave a margin between the electrodes and the cell edge in such configurations to avoid electrical shorts and help maximize the total utilization of the solar module. *See* Section VIII.F.1.

288. Accordingly, Zhang in view of Ravi328 and Fujii renders obvious claim 5 of the '214 patent.

G. Ground 7: Claim 7 Is Obvious Based on Zhang, Ravi328, and Ravi260

1. Motivation to Combine Zhang, Ravi328, and Ravi260

289. A POSITA would have been motivated to combine Zhang, Ravi328, and Ravi260.

290. Ravi328 and Ravi260 share common inventors and both disclose inventions directed to photovoltaic modules using split solar cells arranged in series-parallel configurations. Given the close relationship between these references, a POSITA would naturally consider them together and would recognize that each provides complementary teachings regarding cell array design and wiring configurations.

291. Ravi260 teaches an array of solar cells in a series-parallel configuration. Specifically, Ravi260 discloses a configuration wherein the second string connector (which serially connects each group of 2-columns of parallel cell strings) extends continuously across the entire cell array.

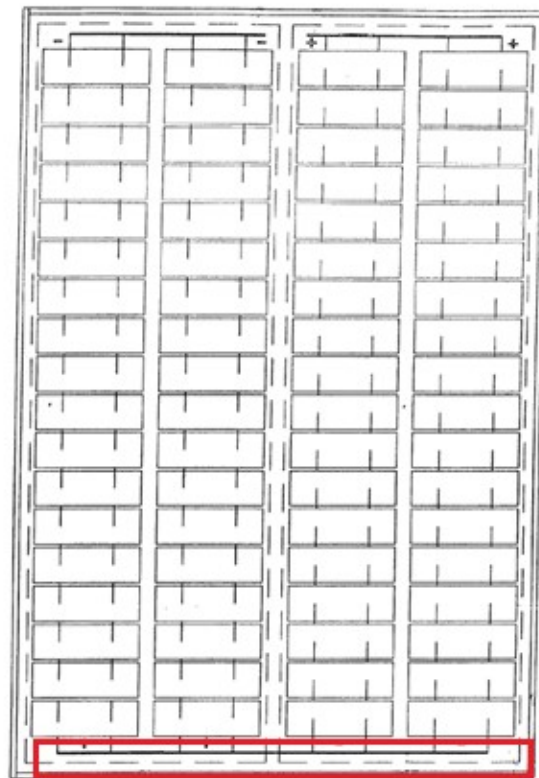


Fig. 6

60 WATTS PV MODULE MADE WITH 72 NOS.
OF ONE-THIRD CUT 156 mm SOLAR CELLS.

Ravi260, Fig. 6 (annotated). The annotated red box depicts this second string connector.

292. Zhang's second string connectors are arranged between two adjacent columns of parallel-connected cell strings. However, these connectors do not extend continuously across the entire module. A POSITA would recognize that incorporating Ravi260's disclosure of a second string connector extending across the entire length of the cell array would enhance the structural integrity of the string connector and help prevent connection defects.

293. At the time of the purported invention of the '214 patent, it was well known in the art that maintaining the integrity of connection points between solar cells was a critical consideration in photovoltaic (PV) module design. This concern was particularly acute at the boundaries of the cell array, where external interference and handling risks are greater, as with the string connectors contemplated by the claims of the '214 patent. Moreover, these connection points are often formed of thin metallic strips, which are susceptible to bending, splitting, or breakage if not adequately supported. For example, as discussed above, Boretz addressed this exact issue, noting that busbars connecting neighboring strings of solar cells were prone to breakage, and that additional connection points to the cell strings would help reinforce the busbar structure.

294. The same reasoning applies to Zhang. By adopting a second string connector that extends continuously across the entire length of the cell array, as taught in Ravi260, Zhang's string connector would gain additional reinforcement at each intersection with the cell strings across the module, improving mechanical stability and reducing the likelihood of connection failures. To a POSITA, implementing this teaching from Ravi260 to Zhang and Ravi328 would be readily understood as simply applying the well-known technique of extending a string connector continuously across the entire array of a cell in order to yield predictable results.

295. A POSITA would have had a reasonable expectation of success in combining Zhang, Ravi328, and Ravi260. Ravi328 and Ravi260 both disclose photovoltaic modules with series-parallel configurations of split solar cells, with Ravi260 teaching a second string connector that extends continuously across the entire cell array. Zhang's design, which uses string connectors between adjacent cell strings, would benefit from adopting Ravi260's continuous connector to enhance structural integrity and prevent connection defects. Given the importance of maintaining connection point integrity, especially at array boundaries, a POSITA would recognize that this modification would improve mechanical stability, reduce failure risks, and result in a more reliable module. This would have constituted nothing more than the application of a known technique (i.e., Ravi260's string connector) to a device ready for improvement (i.e., Zhang's solar module as modified by Ravi328).

2. Claim 7: “The solar battery module according to claim 1, wherein the second string connector extends continuously across the entire cell array.”

296. Zhang in view of Ravi328 and Ravi260 renders claim 7 obvious.

297. Zhang in view of Ravi328 teaches or suggests a “*solar battery module according to claim 1*” for the same reasons as I discuss above with respect to claim 1. Ravi260 teaches or suggests the additional limitation of claim 7 “*wherein the second string connector extends continuously across the entire cell array.*”

298. Ravi260 discloses a configuration wherein the second string connector extends continuously across the entire cell array.

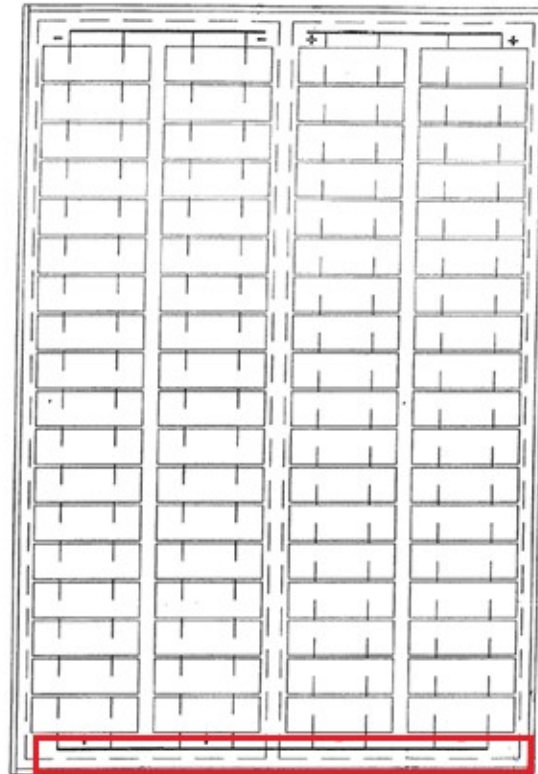


Fig. 6

60 WATTS PV MODULE MADE WITH 72 PMS-
OF ONE-THIRD CUT 156 mm SOLAR CELLS.

Ravi260, Fig. 6 (annotated). The annotated red box depicts this second string connector.

299. As discussed above, a POSITA would have been motivated to adopt this string connector that extends continuously across the entire length of the cell array into Zhang's module. A POSITA would have had a reasonable expectation of success in making this modification, because the use of string connectors in solar modules would have been squarely within the skill of a POSITA. This would have been

nothing more than the application of a known technique (i.e., Ravi260's string connector) to a device ready for improvement (i.e., Zhang's solar module as modified by Ravi328).

300. Accordingly, Zhang in view of Ravi328 and Ravi260 renders claim 7 of the '214 patent obvious.

H. Ground 8: Claims 9 and 10 Are Obvious Based on Zhang, Ravi328, and Krishnamurthy

1. Motivation to Combine Zhang, Ravi328, and Krishnamurthy

301. A POSITA would have been motivated to combine Zhang, Ravi328, and Krishnamurthy.

302. A POSITA when seeking to utilize the solar module technology disclosed in Zhang would be motivated to incorporate solar cells with chamfered edges like those disclosed by Krishnamurthy. As I explain above in Section VIII.B.1, a common industry practice used to manufacture solar cells involves the Czochralski method. *See* Section VIII.B.1. Furthermore, the wafer discs cut from the boules formed by the Czochralski method are necessarily in the shape of a circle, which is poorly suited for use as the basis of a solar cell in an array due to its poor tessellation. *See* Section VIII.B.1. However, the need to pick a cell shape which tessellates must be balanced against the desire to avoid as much waste of the silicon wafers as possible. As a result, it is a common industry practice to form solar cells in a

“pseudo-square” shape wherein small corners are cut from the silicon wafers, leaving it in a substantial square shape. These corners are known as “chamfered” corners. These pseudo-square cells may then be further cut into smaller segments depending on the needs of a given solar module.

303. A POSITA would further recognize the benefit to adopting chamfered solar cells as disclosed in Krishnamurthy in Zhang. As I explain above, a POSITA would readily recognize that the chamfered edges of the Krishnamurthy cells help to prevent waste of each silicon wafer during manufacture while simultaneously maintaining a shape which easily tessellates. Using such cells in Zhang would similarly help to reduce cell wafer waste and thus help to maximize the utilization of the silicon crystal for purposes of the solar module. To a POSITA, implementing this teaching from Krishnamurthy and Ravi328 in Zhang would be readily understood as simply applying the well-known technique of producing solar cells that minimize silicon wafer waste to Zhang.

304. Krishnamurthy further teaches that, when aligning chamfered half-cells in a solar array, it is a common design choice to align the cells in such a way that the non-chamfered edges from adjoining half-cells are aligned together. As I mention above, it is well understood that the solar cells in an array should be positioned in a manner that helps to maximize the reactive cell area exposed to sunlight. A POSITA prior to the priority date of the purported invention of the '214 patent would readily

recognize that this goal is commonly met by adopting a configuration of solar cells which tessellate, as I describe above. Ravi328 depicts one such configuration in Figure 6, where adjoining half-cells are aligned from chamfered edge to non-chamfered edge. This maintains the tessellation of the effectively rectangle shape provided by the chamfered half-cells. Another such configuration is that depicted by Krishnamurthy in Figure 6-5, wherein the non-chamfered edges of adjoining half-cut solar cells are aligned together. This also maintains the tessellation of the effectively rectangle shape provided by the chamfered half-cells. A POSITA would recognize that, when adopting solar cells with chamfered edges in Zhang, the alignment of the chamfered half-cells represents a simple design choice wherein the designer could utilize either the configuration taught in Krishnamurthy or Ravi328 to achieve the same results.

305. A POSITA would have further been motivated to combine Zhang and Krishnamurthy with Ravi328 for the same reasons discussed above in Section VIII.D.1.

306. A POSITA would have had a reasonable expectation of success in combining Zhang, Ravi328, and Krishnamurthy. As discussed, Ravi328 discloses the use of half-cut solar cells with chamfered corners. Krishnamurthy further teaches that the half-cut cells with chamfered corners could additionally be oriented in such a manner that the non-chamfered edges of adjoining cells are aligned, maintaining the

tessellation required to maximize the utilization surface of the module. A POSITA would understand that modifying Zhang to incorporate chamfered half-cells in the orientation taught Krishnamurthy would be a straightforward modification representing a simple design choice. This would have constituted nothing more than the application of a known technique (i.e., Krishnamurthy's chamfered cells) to a device ready for improvement (i.e., Zhang's solar module as modified by Ravi328).

2. **Claim 9: “The solar battery module according to claim 1, wherein long sides of the substantial rectangle include a first long side and a second long side, the substantial rectangle has chamfered corners on both ends of only the first long side such that the second long side is without chamfered corners, and wherein the first one of the solar battery cells and the second one of the solar battery cells are arranged in the cell array such that the first long side and the second long side of the first one and the second one of the solar battery cells do not face each other.”**

307. Zhang in view of Ravi328 and Krishnamurthy renders claim 9 obvious.

308. As explained above with respect to claim 1, Zhang in view of Ravi328 renders a solar module wherein the solar cells are in the shape of a substantial rectangle obvious. As also discussed above, Ravi328 discloses a solar module comprising rectangular half-cut cells arranged in vertical strings, as shown in Figure 6 of Ravi328. The cells clearly include chamfered corners only on one of the two long sides, creating an inherently asymmetric geometry.

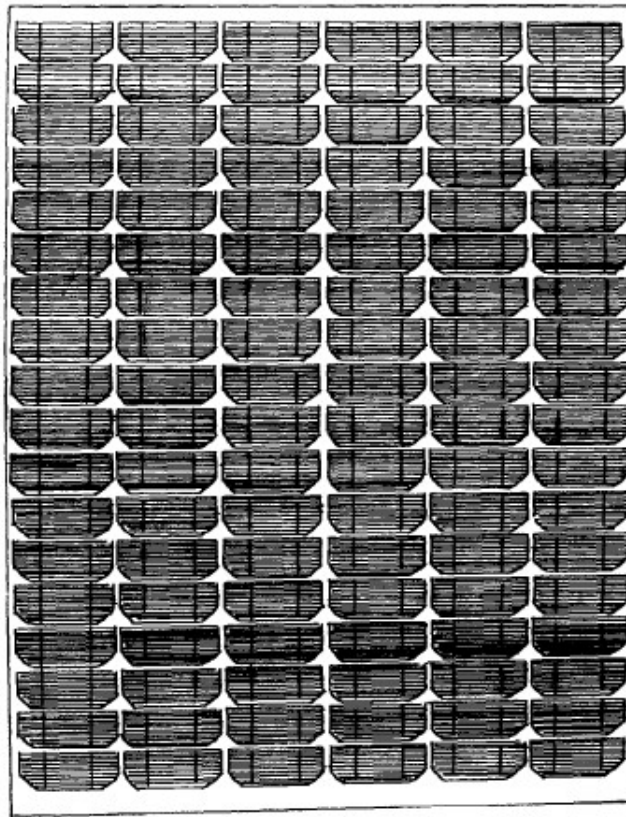
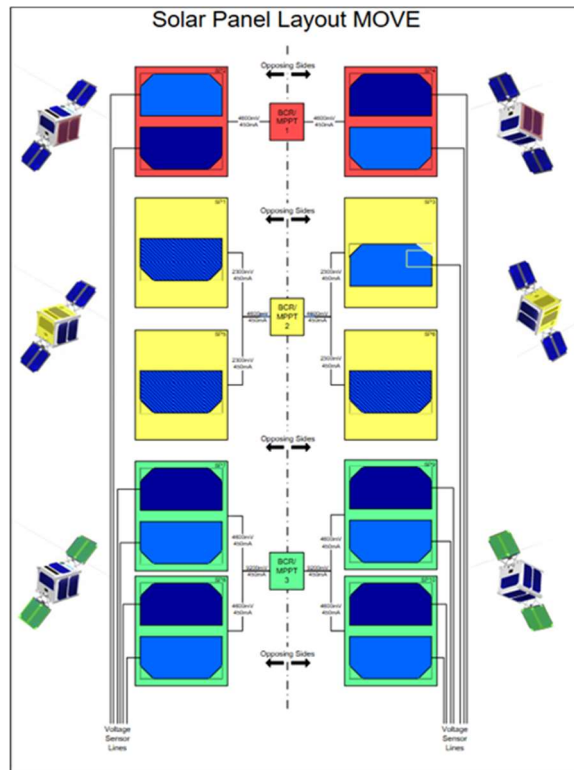


Fig. 6

Ravi328, Fig. 6.

309. As shown in Krishnamurthy, Fig. 6-5 (below), the module layout arranges rectangular solar cells such that the first long side (with chamfered corners) and the second long side (without chamfered corners) of adjacent cells do not face each other. This results in a consistent orientation across the cell array, promoting better visual uniformity and mechanical consistency.



Krishnamurthy, Fig. 6-5.

310. A POSITA would have been motivated to adopt this asymmetric chamfering arrangement into Ravi328's layout to improve module alignment, avoid mechanical stress at edges, and simplify automated assembly. A POSITA would have had a reasonable expectation of success in making this modification, because the use of such cell arrangements would have been squarely within the skill of a POSITA. This would have been nothing more than the application of a known technique (i.e., Krishnamurthy's chamfered cell arrangement) to a device ready for improvement (i.e., Zhang's solar module as modified by Ravi328).

311. Accordingly, Zhang in view of Ravi328 and Krishnamurthy renders claim 9 of the '214 patent obvious.

3. Claim 10

a) Limitation 10[pre]: “A solar battery module comprising:”

312. To the extent, the preamble is limiting, Zhang teaches or suggests a solar battery module.

313. See discussion of limitation 1[pre].

b) Limitation 10[a]: “plurality of solar battery cells, a plain shape of each being a substantial rectangle, and a ratio of a short side length and a long side length of the substantial rectangle being 1/n:1 (n is an integer equal to or larger than 2),”

314. Zhang in view of Ravi328 teaches or suggests this limitation.

315. See discussion of limitation 1[a].

c) Limitation 10[b]: “includes a plurality of light-receiving-surface bus electrodes parallel to the short side of the substantial rectangle on a light receiving surface, and includes rear-surface bus electrodes each at a position on a non-light-receiving surface corresponding to each of the light-receiving-surface bus electrodes; and”

316. Zhang in view of Ravi328 teaches or suggests this limitation.

317. See discussion of limitation 1[b].

- d) **Limitation 10[c]: “an interconnector that electrically connects the light-receiving-surface bus electrodes of a first one of the solar battery cells to the rear-surface bus electrodes of an adjacent second one of the solar battery cells,”**

318. Zhang teaches or suggests this limitation.

319. See discussion of limitation 1[c].

- e) **Limitation 10[d]: “wherein long sides of the substantial rectangle include a first long side and a second long side, the substantial rectangle has chamfered corners on both ends of only the first long side such that the second long side is without chamfered corners, and”**

320. Zhang in view of Ravi328 and Krishnamurthy teaches or suggests this limitation.

321. See discussion of Claim 9.

- f) **Limitation 10[e]: “the first one of the solar battery cells and the second one of the solar battery cells are arranged in the module such that the first long side and the second long side of the first one and the second one of the solar battery cells do not face each other.”**

322. Zhang in view of Ravi328 and Krishnamurthy teaches or suggests this limitation.

323. See discussion of Claim 9.

IX. CONCLUSION

324. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and

further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

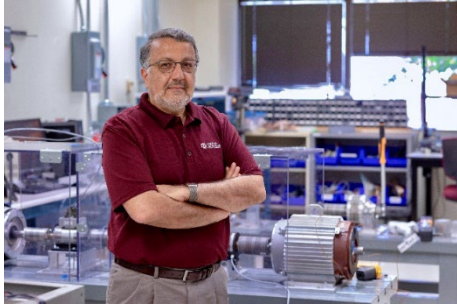
Executed on April 17, 2025



Hamid Toliyat

APPENDIX A

Short Biography



Prof. Toliat received the B.S. degree from Sharif University of Technology, Tehran, Iran in 1982, the M.S. degree from West Virginia University, Morgantown, WV in 1986, and the Ph.D. degree from University of Wisconsin-Madison, Madison, WI in 1991, all in electrical engineering. Following receipt of the Ph.D. degree, he joined the faculty of Ferdowsi University of Mashhad, Mashhad, Iran as an Assistant Professor of Electrical Engineering. In March 1994 he joined the Department of Electrical and

Computer Engineering, Texas A&M University where he is currently Robert Kennedy '26 Endowed Chair Professor.

Dr. Toliat has received the prestigious Nikola Tesla Field Award for “outstanding contributions to the design, analysis and control of fault-tolerant multiphase electric machines” from IEEE in 2014, the Cyril Veinott Award in Electromechanical Energy Conversion from the IEEE Power Engineering Society in 2004, Faculty Star Award in 2022, Engineering Genesis Award from TEES in 2021, Patent and Innovation Award from Texas A&M University System Office of Technology Commercialization in 2022, 2020, 2018, 2016 and 2007, the TEES Faculty Fellow Award in 2006, the Distinguished Teaching Award in 2003, the E.D. Brockett Professorship Award in 2002, the Eugene Webb Faculty Fellow Award in 2000, and the Texas A&M Select Young Investigator Award in 1999. He has also received the Space Act Award from NASA in 1999, and the Schlumberger Foundation Technical Awards in 2001 and 2000.

Prof. Toliat work with his students is highly cited by his colleagues, with more than 33000 citations and an H-index of 87. Dr. Toliat was an Editor of IEEE Transactions on Energy Conversion. He was Chair of the IEEE-IAS Industrial Power Conversion Systems Department of IEEE-IAS, and is a member of Sigma Xi. He is a Life Fellow of the IEEE, the recipient of the 2008 IEEE Industrial Electronics Society Electric Machines Committee Second Best Paper Award as well as the recipient of the IEEE Power Engineering Society Prize Paper Awards in 1996 and 2006, and IEEE Industry Applications Society Transactions Third Prize Paper Award and Second Prize Paper Award in 2006 and 2016, respectively. His main research interests and experience include analysis and design of electrical machines, variable speed drives for traction and propulsion applications, fault diagnosis of electric machinery, and magnetic gear integrated electric machines. Prof. Toliat has supervised more than 120 graduate students, post docs, and research engineers. He along with his students have published over **175** journal and **380** conference papers, presented more than 100 invited lectures all over the world, and have 21 issued and pending US patents. He is the co-author of 11 books and book chapters including DSP-Based Electromechanical Motion Control, CRC Press, 2003, the co-editor of Handbook of Electric Motors - 2nd Edition, Marcel Dekker, 2004, and the co-author of Electric Machines – Modeling, Condition Monitoring, and Fault Diagnosis, CRC Press, Florida, 2013.

He was the General Chair of the 2005 IEEE International Electric Machines and Drives Conference in San Antonio, Texas. Dr. Toliat is a Professional Engineer in the State of Texas.

Resume

Hamid A. Toliyat

Office:

Dept. of Electrical & Computer Engineering
Texas A&M University
College Station, TX 77843
Phone: (979) 862-3034
E-mail: toliyat@tamu.edu

Residency Status:

US Citizen

Professional Engineer in the State of Texas, P.E. # 97974

Awards/Honors:

1. Robert Kennedy '26 Endowed Chair Professor, Texas A&M University, Feb. 1, 2024.
2. IEEE Life Fellow for "Contributions to the Design, Analysis and Control of Multi-Phase Fault Tolerant Electric Machines", 2023.
3. Faculty Star Award, Department of Electrical and Computer Engineering, Texas A&M University, 2022.
4. Patent and Innovation Award, Texas A&M University System Office of Technology Commercialization, 2022.
5. TEES Engineering Genesis Award, Texas A&M University 2021.
6. IEEE Fellow Committee, IEEE Power Electronics Society, 2020 -2022.
7. Patent and Innovation Award, Texas A&M University System Office of Technology Commercialization's, 2020.
8. Honorary Co-Chair, 13th Edition of the IEEE International Symposium on Diagnostics for Electric Machines, Power Electronics and Drives (SDEMPED 2021), Aug. 22-25, Dallas, Texas.
9. IEEE Fellow Committee, IEEE Power Electronics Society, Oct. 2010-Dec. 2016.
10. Patent and Innovation Award, Texas A&M University System Office of Technology Commercialization's, 2018.
11. Best Paper Second Prize Award, IEEE IAS Electric Machines Technical Committee, 2016.
12. Patent and Innovation Award, Texas A&M University System Office of Technology Commercialization's, 2016.
13. IEEE Nikola Tesla Field Award, For outstanding contributions to the design, analysis and control of fault-tolerant multiphase electric machines, IEEE, \$10,000.0 prize award, 2014.
14. Distinguished Lecturer, IEEE Industry Applications Society, 2014-2015.
15. Guest Co-Editor, IEEE Journal of Emerging and Selected Topics in Power Electronics, Special Issue on Advanced Control of Electric Motor Drives, December 2013.

16. Distinguished Lecturer, IEEE Vehicular Technology Society, July 1, 2012- June 31, 2014.
17. IEEE Fellow Committee, IEEE Industry Applications Society, Oct. 2010-Dec. 2016.
18. Best Paper Second Prize Award, IEEE Industrial Electronics Society, Electrical Machine Technical Committee, IECON 2008.
19. Raytheon Endowed Professor of Electrical and Computer Engineering, 2008- 2024.
20. IEEE Fellow for “Contributions to the Design, Analysis and Control of Multi-Phase Fault Tolerant Electric Machines”, 2007.
21. IEEE Industry Applications Society Executive Board, Member, Jan. 2008- Dec. 2009.
22. Prize Paper Award, IEEE Power Engineering Society (PES), 2007.
23. Prize Paper Award, IEEE Power Engineering Electric Machinery Committee, 2007.
24. Patent and Innovation Award, Texas A&M University System Office of Technology Commercialization’s, 2007.
25. Texas A&M TEES Fellow Award, Texas Engineering Experiment Station (TEES), \$5000.0 prize award, Fall 2006.
26. Third Prize Transactions Paper Award, IEEE Industry Applications Society, 2006.
27. Professional Engineer, State of Texas, P.E. # 97974, 2006.
28. Chair, Industrial Power Conversion Systems Department of IEEE Industry Applications Society, 2008-2010.
29. Outstanding Professor Award, Department of Electrical and Computer Engineering, Texas A&M University, \$5000.0 prize award, Fall 2005.
30. Cyril Veinott Electromechanical Energy Conversion Award, IEEE Power Engineering Society, \$5000 prize award, 2004.
31. General Chair, International Electric Machines and Drives Conference (IEEE-IEMDC’05), May 15-18, 2005, San Antonio, Texas.
32. Texas A&M TEES Fellow Award, Texas Engineering Experiment Station (TEES), \$5000.0 prize award, Fall 2004.
33. Listed in Marquis Who’s Who is the World, 24th Edition, 2007.
34. Editor, IEEE Transactions on Energy Conversion, 2001-2010.
35. Distinguished Achievement Award, in recognition of distinguished achievements in teaching, Association of Former Students, Texas A&M University, Fall 2003, \$2000 prize award.
36. Associate Editor, IEEE Transactions on Power Electronics, 1999-2002.
37. E.D. Brockett Professorship Award, Texas Engineering Experiment Station (TEES), \$4000.0 prize award, 2002-2003.
38. Appeared on People’s Agenda talk show of KERA 90.1 Dallas/Fort Worth/Denton on “Fuel Cell Research and other Aspects of Automotive Research,” January 7, 2003, 10:00 AM-11:00 AM.
39. Member of Editorial Board, The Institution of Engineering and Technology, Electric Power Applications, United Kingdom, Sep. 2007 – Dec. 2013.
40. Member of Editorial Board, Electric Power Components and Systems Journal, 2000-2003.
41. Member of Editorial Board, Journal of Electrical Engineering – Romania.

42. Schlumberger Foundation Technical Awards, \$25,000 prize award, April 2001.
43. Eugene E. Webb'43 Faculty Fellow Award, Texas Engineering Experiment Station (TEES), \$5000.0 prize award, for "Overall contribution to the Engineering Program including classroom instruction, scholarly activities and professional service", 2000-2001.
44. Select Young Investigator Award, Texas Engineering Experiment Station (TEES), \$5000.0 stipend, 1999.
45. Schlumberger Foundation Technical Awards, \$30,000.0 prize award, April 2000.
46. Space Act Award by NASA Inventions and Contributions Board, \$250.0 prize award, April 1999.
47. Prize Paper Award, Electric Machinery Committee of the IEEE Power Engineering Society, Best Transactions paper, 1996.
48. Listed in Marquis Who's Who in American Education, 6th Edition.
49. Member of ASEE, Nov. 1999.
50. Listed in Marquis Who's Who in Science and Engineering, 5th Edition.
51. Listed in Marquis Who's Who in Science and Engineering, 4th Edition.

Patents, Patent Applications and Patent Disclosures:

Patents:

1. Method and System for Brushless Wound Field Synchronous Machines, H.A. Toliyat, M.C. Gardner, and D. Talebi, United States Patent No.: 11,476,786 B2, Oct. 18, 2022.
2. Methods and Apparatus for Medium-Voltage Electronic Power Conversion, H.A. Toliyat, and M. Moosavi, United States Patent No.: 10,998,825, May 4, 2021.
3. Method and Apparatus for Compact Axial Field Magnetically Geared Machines, H.A. Toliyat, M. Johnson, and M. Gardner, United States Patent No. 10,476,349 B2, Nov. 11, 2019.
4. Sparse and Ultra-Sparse Partial Resonant Converters, H.A. Toliyat, and M. Amirabadi, United States Patent No.: 9,543,853 B2, Jan. 10, 2017.
5. System and Method for Controlling Multiphase Electric Motors, H.A. Toliyat, M. Hajiaghajani, V. Sundaram, N. Nzeocha, Y. Deshpande, and M.M. Rahimian, United States Patent No.: 9,543,879 B2, Jan. 10, 2017.
6. DC Capacitors-Less Power Converters, H.A. Toliyat, and M. Amirabadi, United States Patent No.: 8,988,900 B2, Mar. 24, 2015.
7. Unipolar Drive Topology for Permanent Magnet Brushless DC Motors and Switched Reluctance Motors, H.A. Toliyat, and T. Gopalarathnam, United States Patent No.: 7,049,786 B1, May 23, 2006.
8. Multiphase Induction Motor Drive System and Method, H.A. Toliyat, R. Shi, H. Xu, United States Patent No.: 6,426,605 B1, July 30, 2002.

Patent Applications:

9. Magnetic Gear Systems, Methods, and Apparatuses, H.A. Toliyat, B. Praslicka, D. Zamarron, M.C. Gardner, M.C. Johnson, A. Goodarzi, E. Bauk, A. Nguyen, S. Hasanpour, G.Y. Duan, and S. Khan, United States Patent Application: 2024/0297563 A1, Sep. 5, 2024.
10. Self-Excited Synchronous Machine with Compensated Wound Field Windings, H.A. Toliyat, M. Seyedi, and D. Talebi, United States Patent Application 2023/0369929 A1, Nov. 16, 2023.

11. High Torque Density Electric Machine with Directly Cooled End Windings, H.A. Toliyat, M.C. Gardner, P.J. Shamburger, M. Benedict, J.C. Grunlan, D.S. Antao, B.P. Rasmussen, J.R. Felts, and P.N. Enjeti, PCT/US2021/032304, United States Patent Application 2023/0179066 A1, June 8, 2023.
12. Dual-Rotor Axial Flux Magnetic Gear and Related Apparatus and Systems, H.A. Toliyat, B. Praslicka, S. Sheshaprasad, F. Saemi, M.C. Gardner, and M.C. Johnson, United States Patent Application No.: 2023/0327533 A1, Oct. 12, 2023.
13. An Antenna Device and a Detecting Device Having the Same, A. Darwish, S.S. Khalil, H. Abu-Rub, and H.A. Toliyat, PCT/QA2020/050014, 3/30/2021, United States Patent Application No.: 2022/0393366 A1, Dec 8, 2022.
14. Method and System for Brushless Wound Field Synchronous Machines, H.A. Toliyat, M.C. Gardner, D. Talebi, United States Patent Application No. 2021/0336574 A1, Oct. 28, 2021.
15. Methods and Apparatus for Medium-Voltage Electronic Power Conversion, H.A. Toliyat, and M. Moosavi, United States Patent Application No.: US 2019/0252989 A1, Aug. 15, 2019.
16. Method and Apparatus for Compact Axial Field Magnetically Geared Machines, H.A. Toliyat, M. Johnson, and M. Gardner, International Application WO 2017/062654 A1, United States Patent Application 2017/0104388 A1, April 13, 2017.
17. System and Method for Controlling Multiphase Electric Motors, H.A. Toliyat, M. Hajiaghajani, V. Sundaram, Y. Deshpande, M.M. Rahimian, and N. Nzeocha, United States Patent Application No.: 2015/0270747 A1, Sep. 24, 2015.
18. System and Method for Controlling Multiphase Electric Motors, H.A. Toliyat, M. Hajiaghajani, V. Sundaram, N. Nzeocha, Y. Deshpande, and M.M. Rahimian, United States Patent Application No.: 2015/0270799 A1, Sep. 24, 2015.
19. Sparse and Ultra-Sparse Partial Resonant Converters, H.A. Toliyat, and M. Amirabadi, United States Patent Application No.: 2014/0286059 A1, Sep. 25, 2014
20. DC Capacitor-less Power Converters, H.A. Toliyat, and M. Amirabadi, United States Patent Application No.: 2012/0307531 A1, Dec. 6, 2012.
21. System, Apparatus and Method for Driving a Permanent Magnet Motor, R. Khopkar, S.M. Madani, M. Hajiaghajani, and H.A. Toliyat, United States Patent Application No.: 2006/0267527 A1, Nov. 30, 2005.

Provisional Patent Applications Filed:

22. Misalignment Resistant Multi-phase Wireless Power Transfer Coil and Methods, H.A. Toliyat, and Y. Chen, United States Provisional Patent Application No.: 63/557,951, Feb. 26, 2024.
23. Method to Reduce the DC Link Capacitance and Improve the Reliability of Converters, P. Enjeti, H.A. Toliyat, and M. Gardner, United States Provisional Patent Application No.: 63/618,197, Jan. 5, 2024.
24. Magnetic Gear Systems, Methods, and Apparatuses, H.A. Toliyat, B. Praslicka, M.C. Johnson, D. Zamarron, S. Hasanpour, and M. Gardner, United States Patent Application No.: 18/273,941, Jul. 24, 2023.
25. Cycloidal Radial Flux Magnetic Gear with Balanced Magnetic Moments, H.A. Toliyat, B. Praslicka, M.C. Johnson, D. Zamarron, M. Gardner, United States Patent Application No. 63/141,130, Jan. 25, 2021.
26. High-Frequency-Link Power Converter Topologies with Soft-switching Operation, H.A. Toliyat, and H. Keyhani, TAMUS 3974, January 30, 2014, United States Provisional Patent Application No.: 62/036,176, Aug. 12, 2014

Patent Disclosures to TAMUS:

27. PCB Rotor Brushless Magnet-Free Wound Field Synchronous Machine, H.A. Toliyat, D. Talebi, and S.M. Seyedi, 6664TEES25.
28. Method and Apparatus for Cost-Effective Fabrication of Electric Machine Coils, H.A. Toliyat, D. Talebi, S.M. Seyedi, M.C. Gardner, P. Knauer, and S. Haase, 6506TEES24.
29. Electric Machines Manufacturing Imperfections and Methods to Compensate, H.A. Toliyat, D. Talebi, S.M. Seyedi, M.C. Gardner, 6505TEES24, Apr. 19, 2024.
30. Rotary Electric Machines Apparatus and Post-Assembly Fault Tolerance Methods for Enhanced Performance, H.A. Toliyat, D. Talebi, M. Seyedi, 6486TEES24, Mar. 11, 2024.
31. A Misalignment Resistant Multi-Phase Wireless Power Transfer Coil and Methods, HA. Toliyat, and Y. Chen,
32. Integrated Magnetically Geared Machine and Trans-rotary Magnetic Gear and Related Apparatus and Systems, S. Sheshaprasad, H. Tao, and H.A. Toliyat, 6376TEES24, Sep. 20, 2023.
33. Methods to Reduce the DC Link Capacitance and Improve the Reliability of Converters, P. Enjeti, H.A. Toliyat, and M. Gardner, 6323TEES23, July 13, 2023.
34. Regulated High Frequency Link Power Converters, F. Naghavi, and H.A. Toliyat, 6277TEES23, May 30, 2023.
35. Method of Magnet Arrangement for Magnetic Gears and Related Systems, T. Stefanelli, A. White, N. Palmer, B. Praslicka, and H.A. Toliyat, 6056TEES22, April 27, 2022.
36. Method and Apparatus for Axial Flux Magnetic Gear, D. Knight, B. Praslicka, and H.A. Toliyat, 6053TEES22, April 20, 2022.
37. Self-Excited Synchronous Machine with Compensated Wound Field Windings, H.A. Toliyat, M. Seyedi, and D. Talebi, 5987TEES22, Jan. 18, 2022.
38. Method and Apparatus for Integrated Multiple Stage Magnetic Gears, Multiple Stage Magnetic Gear Integrated Machine, and Related Systems, D. Knight, B. Praslicka, L. Smith, D. Zamarron, and H.A. Toliyat, 5883TEES22, Nov. 8, 2021.
39. A Flux Modulator for Radial Flux Cycloidal Type Magnetic Gears, A. White, N. Palmer, B. Praslicka, and H.A. Toliyat, 5882TEES22, Nov. 8, 2021.
40. Apparatus for Soft Magnetic Counterweight in Cycloidal-Type Magnetic Gear, B. Praslicka, D. Zamarron, and H.A. Toliyat, 5780TEES21, Apr. 8, 2021.
41. Alternative Cycloidal Type Magnetic Gear Topologies and Methods Thereof, M.C. Johnson, M. Gardner, S. Hasanpour, B. Praslicka, and H.A. Toliyat, 5759TEES21, March 11, 2021.
42. Method and Apparatus for Surface Permanent Magnet Cycloidal Type Magnetic Gear, B. Praslicka, M.C. Johnson, D. Zamarron, A. Goodarzi, E. Bauk, A. Nguyen, and H.A. Toliyat, 5708TEES21, March 1, 2021.
43. Cycloidal Type Radial Flux Magnetic Gear with Multiple Rotor Segments, H.A. Toliyat, B. Praslicka, M.C. Johnson, D. Zamarron, M. Gardner, 5675TEES21, Dec. 16, 2020.
44. A Synergistically Excited Brushless Wound Field Synchronous Machine, H.A. Toliyat, M.C. Gardner, D. Talebi, 5492TEES20, Apr. 6, 2020.
45. Brushless Wound Field Synchronous Machines and Methods, H.A. Toliyat, 5464TEES20, March 2, 2020.

46. A High Torque Density Axial Flux Machine with Directly Cooled End Windings, H.A. Toliyat, M.C. Gardner, P.J. Shamberger, M. Benedict, J.C. Grunlan, D.S. Antao, B.P. Rasmussen, J.R. Felts, and P.N. Enjeti, 5493TEES20, Apr. 26, 2020.
47. Method for Achieving Wide Constant Power Speed Range for Motors with Multiple Modular Stators, H.A. Toliyat, M.C. Gardner, 5451TEES20, Feb. 18, 2020.
48. CPW-Fed Annular Monopole Antenna for External Partial Discharge Sensing in Gas Insulated Switchgear, A. Darwish, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, Sep. 2019.
49. Method and Apparatus for Retaining Magnets in a Magnetic Gear, H.A. Toliyat, M.C. Gardner, and M.C. Johnson, 5247TEES19, Aug. 13, 2019.
50. Modular Axial Flux Solid Rotor Induction Machine with Printed Circuit Board, H.A. Toliyat, M.C. Gardner, and M.C. Johnson, 5192TEES19, April 18, 2019.
51. A Multistage Coaxial Magnetic Gearbox Capable of Achieving Very High Gear Ratios, H.A. Toliyat, M. Gardner, 4761TEES17, July 3, 2017.
52. Multiphase Motor Drives with High Acceleration Capability, H.A. Toliyat, and A.K. Morya, 4705TEES17, Apr. 7, 2017.
53. Variable Gear Ratio Trans-Rotary Magnetic Gear with a Magnetic Clutch, H.A. Toliyat, S. Pakdelian, M. Gardner, M. Johnson, 4114 TEES15, Sep. 24, 2014.
54. Rotary to Linear and Linear to Rotary Magnetic Transmission System, H.A. Toliyat, and S. Pakdelian, TAMUS 4066, Aug. 12, 2014.
55. Damper Windings for the Magnetic Gear, H.A. Toliyat, and N. Frank, TAMUS 3279, Oct. 27, 2010.
56. Condition Monitoring and Fault Diagnosis of Electric Motors and Generators Apparatus and Methods, H.A. Toliyat, and B. Akin, TAMUS 2495, Feb. 22, 2007.
57. An Integrated Alternator/Active Filter for Wind Power Applications, H.A. Toliyat, M.T. Abolhassani, TAMUS2376, April 2006.
58. Current Source Inverter with Simple Commutation Method and Apparatus, H.A. Toliyat, and S. Kwak, TAMUS 2130, April 2004.
59. Fault Tolerant Permanent Magnet Motor Drives with High Specific Torque, H.A. Toliyat, L. Parsa, 2093TEES04, November 2003.
60. A Multiphase Synchronous Reluctance Motor Drive with High Specific Torque, H.A. Toliyat, and R. Shi, TAMUS 1589, April 2000.
61. A Four-quadrant Soft-switched Brushless Permanent Magnet Motor Drive and Method, H.A. Toliyat, J.C. Moreira, S. Waikar, and M.S. Arefeen, TAMUS 1567, March 2000.

Books:

1. Electric Machines – Modeling, Condition Monitoring, and Fault Diagnosis, H.A. Toliyat, S. Nandi, S. Choi, and H. Meshgin-Kelk, CRC Press, Florida, 2013, 272 pages.
2. DSP-Based Electromechanical Motion Control, H.A. Toliyat, S. Campbell, CRC Press, Florida, 2003, 344 pages.
3. Handbook of Electric Motors, H.A. Toliyat, G. Kliman, 2nd Edition, Marcel Dekker, New York, 2004, 805 pages.

4. Electric Machines – Modeling, Condition Monitoring, and Fault Diagnosis, H.A. Toliyat, S. Nandi, S. Choi, and H. Meshgin-Kelk, CRC Press, in Chinese, 2015.

Books Chapters:

5. Contributor to Compendium on Electromagnetic Analysis, Editor: Y. Sozer, World Scientific, 2020, pp. 389-420.
6. Contributor to Power Electronic Converters and Systems – Frontiers and applications, Edited by A.M. Trzynadlowski, IET Press, 2016, pp. 75-110.
7. Contributor to Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications, H. Abu-Rub et al., Wiley & Sons, 2014, pp. 107-135.
8. Contributor to the Third Edition of: Power Electronics Handbook”, Muhammad H. Rashid, Butterworth-Hinemann Publishing, 2011, pp. 1155-1176.
9. Contributor to the Second Edition of: Power Electronics Handbook”, Muhammad H. Rashid, Academic Press, 2006.
10. Contributor to “The Power Electronics Handbook”, Timothy L. Skvarenina, Editor-in-chief, CRC Press, 2002.
11. Contributor to “Comprehensive Dictionary of Electrical Engineering”, Phillip Laplante, Editor-in-chief, CRC Press, 1999.

Professional Interests:

- Distributed Energy Systems; Surface Wave Energy, Wind Turbines, Microturbines, Photovoltaic Systems
- Smart Grids and their Components
- DC and AC Power Supplies, Wide Band Gap Converters using SiC and GaN Devices
- Wireless Power Transfers for Land, Sea, and Air Vehicles
- Condition Monitoring and Fault Diagnosis of Electric Machines and Power Converters
- Advanced Electronically Controlled Electromagnetic Powertrains
- Electric and Hybrid Electric Powertrains for Land, Air, and Sea vehicles
- Power Dense and Torque Dense Electric Motors and generators
- Advanced Sensorless Control of Electric Motor Drives
- Submersible Motors and Power Converters for Harsh Environments
- Microcontroller-Based Power Electronics Systems
- High Speed Electromechanical Energy Storage Systems
- Active Power Filters for Power Systems Network

Educational Background:

Ph.D., Electrical and Computer Engineering, University of Wisconsin-Madison, Madison, Wisconsin, USA, 1991.

M.S., Electrical and Computer Engineering, West Virginia University, Morgantown, West Virginia, USA, 1986.

B.S. in Electrical Engineering, Sharif University of Technology, Tehran, Iran, 1982.

Teaching:

I stress the use of interdisciplinary ideas in my teaching. Rather than teaching students to specialize in a narrow area, I try to provide valuable perspective on how ideas relate with concepts students have already seen in other classes. With these interdisciplinary goals in mind, I have purposely taught courses in two different areas within my department: power electronics, and electric machinery. I have developed and taught three new courses in the area of electromechanical motion devices. These are:

1. ECEN 611 General Theory of Electromechanical Motion Devices, 3 credits
2. ECEN 612 Computer Aided Design of Electromechanical Motion Devices, 4 credits
3. ECEN 442/742 DSP-Based Electromechanical Motion Control, 3 credits

August 2003- Present

Raytheon Professor of Electrical & Computer Engineering,
Teaching undergraduate and graduate courses and performing research in Power Electronics and Electric Machinery, Texas A&M University, College Station, TX.

August 2000- August 2003

Associate Professor of Electrical Engineering

January 1995- August 2000

Assistant Professor, of Electrical Engineering

March 1994- December 1994

Visiting Assistant Professor, Teaching Power Electronics and Electric Machines and performing research in the related fields, Texas A&M University, College Station, TX.

September 1991 - January 1994

Assistant Professor, Electrical Machines, Teaching Power Electronics, Modern Control courses at Graduate and Senior Undergraduate levels, conducting research in the related fields, developed two graduate courses in the area of electrical machinery and power electronics, Ferdowsi University of Mashhad, Mashhad, Iran.

September 1990 - December 1990

Teaching Assistant, ECE 504, "Electric Machine & Drive System Laboratory", 2-3 credits, senior/graduate course, UW-Madison, Madison, WI, USA

June 1990 - August 1990

Teaching Assistant, ECE 306, "Linear active Circuits Laboratory", 1 credit, UW-Madison.

January 1990 - May 1990

Lecturer, ECE 511, "Analysis and Control of Synchronous Machines", 3 credits, senior/graduate course, UW-Madison.

September 1987 - December 1989

Lecturer, ECE 375, "Electrical Engineering Laboratory II", UW Madison.

September 1979 - June 1980

Teaching Assistant of Electrical Measurement Laboratory, Sharif University of Technology, Tehran, Iran.

Industrial Experience:

January 1991 - May 1991

General Motors Corporation, Electro-Motive Division, LA Grange, IL, USA

Worked on the EMD research project on the design of a concentrated winding machine for a DC locomotive traction alternator.

June 1989 - September 1989

Allen-Bradley Company, Motion Control Division, Milwaukee, WI, USA

Worked on the improvement of a new product called: "High Performance AC Drive, Bulletin 1336".

June 1982 - February 1984

Engineering Department, Khorasan Regional Electric Company, Mashhad, Iran.

Conducted design and construction of high voltage substations including the auxiliary power supplies.

June 1980 - December 1981

Electrical Engineering Division, Neka Thermal Power Plant

Worked on the turbo-generator exciter and auxiliary systems such as inverters and rectifiers.

Lectures and Short Courses:

1. Invited Lecture, PM-Free Brushless Machines Topologies, Tokyo Institute of Technology, Tokyo, Japan, April 30, 2024.
2. Plenary Lecture, Kansas Power & Energy Conference 2021, Multi-input Multi-output ac Link Power Converter, Manhattan, KS, Apr. 19-20, 2021.
3. Plenary Lecture, NSF Workshop on Future and Opportunities for Power Electronics in an Electrified Transportation Industry, Washington, DC, Oct. 18-19, 2018.
4. Invited Webinar, IEEE Industry Applications Society, Nov. 1, 2017, Motivation for Magnetic Gear and Magnetically Geared Machines.

5. Invited seminar, May 11, 2017, Seoul, South Korea, Hyundai Motor Co., Recent Advances in Electric Machines and Power Electronics at EMPE Lab.
6. Invited Distinguished Colloquium Series Speaker, Apr. 28, 2017, ECE Dept., University of Maryland, College Park, MD, Compact Modular Medium Voltage Power Converters
7. Invited Seminar, Apr. 5, 2017, College Station, TX, Texas A&M, ECE Dept.- Analog Group, Recent Advances in Electric Machines and Power Electronics at EMPE Lab.
8. Invited seminar, Oct. 28, 2016, Dallas, TX, Unitron, Capacitor-less Power Converters.
9. Invited seminar, Oct. 27, 2016, Dallas, TX, Texas Instruments Inc., Permanent Magnet Assisted Synchronous Reluctance Motors.
10. Invited lecture, Feb. 17th, 2016, TVS Inc., Bengaluru, India, Recent Advances in Electric Machines.
11. Invited lecture, Dec. 18th, 2014, Emerson Electric Motors, St. Louis, MO, Permanent Magnet Assisted Synchronous Reluctance Machines (PMA-SynRM),
12. Invited lecture, IEEE PES General Meeting, July 27-31, 2014, National Harbor, MD, "Permanent Magnet Assisted Synchronous Reluctance Machine (PMA-SynRM) Design and Performance Analysis For Fan and Pump Applications'.
13. Invited seminar, SMMA'14, April. 22-24, Fort Myers, FL, "Design of Ferrite Assisted Synchronous Reluctance Motor (Fa-SynRM) with Aluminum Conductors in Stator".
14. Invited seminar, Prairie View A&M University, Feb. 10, 2014, Prairie View, TX, "Recent Advances in Electric Machines and Power Electronics for Renewable Energy - Offshore Electric Power Grid".
15. Invited short course presented at the IEEE-APEC'13, March 17-21, 2013, Long Beach, CA, "ac-Link Universal Converters for Renewable energy and Transportation".
16. Invited seminar, University of Southern California, Los Angeles, CA, Jan. 11, 2013, "Recent Advances in Electric Machines and Power Electronics for Renewable Energy - Offshore Electric Power Grid".
17. Keynote Speaker, JMAG User Conference, Detroit, Oct. 16, 2012, "Magnetic Gears".
18. Invited seminar, University of Texas – San Antonio, Oct. 28, 2011, "Soft Switched High-Frequency Link dc/ac Converters for Subsea Applications".
19. Invited seminar, POSCO, Seoul, Korea, Aug. 19, 2011, "New Power Converters for Battery Energy Storage".
20. Invited seminar, Samsung Advanced Research Institute of Technology (SAIT), Seoul, Korea, Aug. 18, 2011, "Recent Advances in Electric Machines and Power Electronics at EMPE Lab".
21. Invited seminar, Korea Railroad Research Center (KRRI), Seoul, Korea, Aug. 18, 2011, "Recent Advances in Electric Machines and Power Electronics at EMPE Lab".
22. Invited seminar, LGC R&D Center, Seoul, Korea, Aug. 17, 2011, "Electric Motors for Electric and Hybrid Electric Vehicles".
23. Invited seminar, LG Electronics, Seoul, Korea, Aug. 17, 2011, "Electric Motors and Power Converters for Electric Vehicles".
24. Invited seminar, Hanyang University, Seoul, Korea, Aug. 16, 2011, "Recent Advances in Electric Machines and Power Electronics at EMPE Lab".
25. Invited seminar, Hyundai Motor Co., Seoul, Korea, Aug. 16, 2011, "Recent Advances in Electric Machines and Power Electronics at EMPE Lab".

26. Invited seminar, Rensselaer Polytechnic Institute, Troy, NY, Sep. 23, 2010, "Condition Monitoring and Fault Diagnosis of Electric Machines".
27. Invited seminar, GE Global Research Center, Niskayuna, NY, Sep 24, 2010, "High Frequency Power Converters".
28. Invited Tutorial, IEEE 2010 Energy Conversion Conference and Exposition (ECCE'10), Atlanta, GA, Sep. 12, 2010, "Design and Control of Permanent Magnet Machines for Geared and Gearless Applications".
29. Invited seminar, Solar Turbines, San Diego, CA, Aug. 20, 2010, "Electric Machines and Power Electronics Review".
30. Distinguished speaker, University of Texas – Arlington, March. 31, 2010, "Condition Monitoring and Fault Diagnosis of Electric Machines".
31. Invited seminar, General Electric Technology Center, Bangalore, India, March 8, 2010, "Recent Advances in Electric Machines Technologies".
32. Invited seminar, National Cheng Kung University, Tainan, Taiwan, Feb. 5, 2010, "A Novel Soft-Switched AC Link Converter".
33. Invited seminar, National Tshing Hua University, Hsinchu, Taiwan, Feb. 4, 2010, "Permanent Magnet Synchronous Reluctance Machines".
34. Invited seminar, National Central University, Taoyuan, Taiwan, Feb. 3, 2010, "Fault Diagnosis and Condition Monitoring of Electric Machines".
35. Invited seminar, PSERC, "Recent Advances in Electric Energy Conversion and Storage," Sep. 1, 2009.
36. Invited seminar, Northeastern University, Boston, MA, May 26, 2009, "Energy Conversions, Transmissions, and Storage".
37. Panelist, IEEE-IECON'08, Nov. 10-13, 2008, Orlando, FL, "Recent Advances and Applications of Power Electronics and Motor Drives".
38. Keynote speaker, International Conference in Electric Machines and Systems (ICEMS'08), Oct. 17-19, 2008, Wuhan, China.
39. Invited seminar, Tsinghua University, Beijing, China, Oct. 15, 2008, "Advanced Electric Machines and Power Electronics Lab at TAMU".
40. Invited seminar, Ferdowsi University, Mashhad, Iran, June 1, 2008, "Advances in Power Electronics and Electric Machines".
41. Invited seminar, San Diego State University, San Diego, CA, April 15, 2008, "Recent Advances in Electric Machines and Power Electronics".
42. Invited seminar, General Atomics, San Diego, CA, April 14, 2008, "Recent Advances in Electric Machines and Power Electronics".
43. Invited seminar, University of Denver, Denver, CO, April 7-8, 2008, "Recent Advances in Electric Machines and Power Electronics".
44. Invited seminar, North Carolina University, Raleigh, NC, March 27, 2008, "Recent Advances in Electric Machines and Power Electronics".
45. Invited seminar, Northeastern University, Boston, MA, March 19, 2008, "Recent Advances in Electric Machines and Power Electronics".

46. Invited seminar at RDECOM Power & Energy IPT, Tactical Electronics and Rotating Machinery Workshop, 23-24 January 2008, "Feasibility Study of Novel Permanent Magnet Assisted Synchronous Reluctance Generators (PMA-SynRG)".
47. Invited seminar at TECO-Westinghouse, Round Rock, TX, November 20, 2007, "Research Activities at EMPE Lab".
48. Invited seminar at European Airspace and Defense Systems (EADS), Munich, Germany, May 25, 2007, "Fault Tolerant Motor Drives", Munich, Germany.
49. Invited tutorial at PCIM'07, Nuremberg, Germany, May 21, 2007, "Condition Monitoring, Fault Diagnosis, and Fault Tolerant Electric Motor Drives".
50. Invited seminar at Black & Decker Company, Baltimore, MD, May 14, 2007, "Design and Performance Improvement of Electromechanical Devices".
51. Invited seminar at United Technology Research Center (UTRC), Hartford, Connecticut, March 14, 2007, "Recent Advances in Modern Electric Machines and Power Electronics Converters".
52. Invited short course presented at the Army Research Lab (TARDEC), Jan. 10, 2007, Detroit, MI, "Vehicle Electric Power Generation and Distribution".
53. Invited seminar, King Mongkut Institute of Technology at Ladkrabang, Bangkok, Thailand, Dec. 15, 2006, "Recent Advances in Modern Electric Machines and Power Electronics Converters".
54. Invited seminar, Chiang Mai University, Chiang Mai, Thailand, Dec. 13, 2006, "Research Activities at Advanced Electric Machines & Power Electronics Laboratory of Texas A&M University".
55. Keynote Speaker, Ansoft Leading Insight – Application Workshops for High-Performance Design, Detroit, Oct. 24, 2006.
56. Invited seminar, Air Force Research Lab, Albuquerque, NM, July 25, 2006, "Flywheel Energy Storage Systems, Condition Monitoring, Fault Diagnosis, and Fault Tolerant Electric Drives".
57. Invited seminar, Drexel University, Philadelphia, PA, April 13, 2006, "Recent Advances in Power Electronics and Motor Drives".
58. Invited seminar, Federal University of Rio de Janeiro, Rio de Janeiro, Brazil, April 1, 2006, "Flywheel Energy Storage Systems".
59. Invited seminar, Federal University of Santa Catarina, Florianopolis, Brazil, March 30, 2006, "Flywheel Energy Storage Systems".
60. Invited short course, WEG Industries, Jaragua del Sol, Brazil, March 28, 2006, "Permanent Magnet Assisted Synchronous Reluctance Motors for Low Cost Applications".
61. Invited seminar, WEG Industries, Jaragua del Sol, Brazil, March 27, 2006, "Flywheel Energy Storage Systems, for Land/Sea/Space Applications".
62. Invited seminar, Oregon State University, Corvallis, OR, March 17, 2006, "Flywheel Energy Storage Systems".
63. Invited short course presented at the Army Research Lab (TARDEC), Jan. 9, 2006, Detroit, MI, "Flywheel Energy Storage Systems, for Land/Sea/Space Applications".
64. Invited seminar, Universidad de Concepcion, Concepcion, Chile, Nov. 24-25, 2005, "Permanent Magnet Assisted Synchronous reluctance Motor Design and Performance Improvement" and "Design and Analysis of Three-Phase AC/AC Power Converters for AC Drives and Utility Interface".

65. Invited seminar, Universidad Tecnica Federico Santa Maria, Valparaiso, Chile, Nov. 28, 2005, "Recent Advances in Electric Machines & Power Converters in Advanced Electric Machines & Power Electronics Laboratory".
66. Invited seminar, University of Tehran, Tehran, Iran, Dec. 7, 2004, "Fault Tolerant Motor Drives for Hybrid Electric Vehicle Applications".
67. Invited seminar, Power System Conference (PSC'04), Tehran, Iran, Nov. 22-24, 2004, "Recent Advances in Wind Power Generations".
68. Invited lecture, LG Electronics, Home Appliance Research Laboratory, Seoul, Korea. Oct. 22, 2004, "Wind Power Generators and Converters".
69. Invited lecture, Korea University, Seoul, Korea, Oct. 22, 2004, "Fault Diagnosis of Electric Machines".
70. Invited lecture, Chungbuk University, Cheongju, Korea, Oct. 21, 2004, "Fault Diagnosis of Electric Machines".
71. Invited lecture, Pohang Technical University, Pohang, Korea, Oct. 19, 2004, "Fault Diagnosis and Fault Tolerant Electric Motor Drives".
72. Invited lecture, Pusan National University, Busan, Korea, Oct. 19, 2004, "Fault Diagnosis of Electric Machines".
73. Invited short course presented at 2004 International Conference on Power Electronics (ICPE'04), Oct. 18-22, Busan, Korea, "Fault Diagnosis and Fault Tolerant Electric Motor Drives".
74. Invited lecture, Illinois Institute of Technology, April 30, 2004, Chicago, IL, "A Novel Integrated Alternator/Active Filter for Wind Power Applications".
75. Invited lecture, University of Missouri-Rolla, April 28, 2004, Rolla, MO, "Fault Tolerant Matrix Converters".
76. Invited short course presented at the Army Research Lab (TARDEC), Jan. 14, 2004, Detroit, MI, "Reconfigurable Motor Drives and Power Electronics Based Architectures for Military Vehicles".
77. Invited short course presented at the IEEE-IECON'03, November 2-6, 2003, Roanoke, VA, "Applications of Power Electronics in Automotive Industry: State of the Art and Future Possibilities".
78. Invited lecture, Hyundai Motor Company, Advanced Technology Center, Seoul, Korea, July 16, 2003.
79. Invited lecture, LG Electronics, Home Appliance Research Laboratory, Seoul Korea. July 15, 2003.
80. Invited lecture, Samsung Electronics, Digital Appliance Research Laboratory, Seoul, Korea, July 16, 2003.
81. Invited short course, Korean Agency for Technology and Standards (ATS), Seoul, Korea, July 14, 2003.
82. Invited lecture, Korea Electronics Technology Institute (KETI), Seoul, Korea, July 14, 2003.
83. Invited lecture, Korea Electric Research Institute (KERI), Seoul, Korea, July 18, 2003.
84. Invited short course presented at the IEEE-APEC'03, February 9-13, 2003, Miami Beach, FL, "Synthesis of Advanced Control Methodologies for High Grade Adjustable Speed Motor Drives: Theory and Applications".

85. Invited short course presented at the Army Research Lab (TARDEC), Dec. 5, 2002, Detroit, MI, "Condition Monitoring and Fault Diagnosis of Electric Machines and Fault Tolerant Electric Machinery".
86. Invited short course presented at the IEEE-IECON'02, November 5-8, 2002, Seville, Spain, "Integration of Advanced Motion Control Devices in automotive Products: Design in the Context of the Application.
87. Invited short course presented at the IEEE-IAS, October 13-17, 2002, Pittsburgh, PA, "Selection, Design, and Control of Adjustable Speed Motor Drives for Stressful & Fault Tolerant Applications".
88. Invited short course presented at the IEEE Applied Power Electronics Conference and Exposition, March 10-14, 2002, Dallas, TX, "Sensorless Control of Adjustable Speed Motor Drives: State of the Art and Recent Advances"
89. Invited short course at Copeland Corporation, Sidney, OH, November 2, 2001, "Fault Diagnosis of Electric Machines".
90. Invited short course presented at the IEEE Applied Power Electronics Conference and Exposition, March 4-8, 2001, Anaheim, CA, "Current Intensive Motor Drives: A New Challenge in Automotive Applications"
91. Invited Tutorial at 2nd International Conference on Power Electronics Drives and Energy Systems for Industrial Growth, IEEE-PEDES'98, Perth, Australia, 1-3 Dec., "Condition Monitoring and Fault Diagnosis of Electric Machines & Transformers".
92. Invited Seminar at Small Motors & Motion Association, Nashville, TN, Nov. 12, 1998, "Adjustable Speed AC Motor Drives: Application Problems and Solutions".
93. Invited short course at Reliance Electric, Cleveland, OH, March 27, 1997, "Fault Diagnosis of Electric Machines".
94. Invited short course at Whirlpool Co, Benton Harbor, MI, Dec. 5-6, 1996, "Permanent Magnet Motors".
95. Invited short course at Texas Instruments INC., Dallas, TX, Jan. 26, 1996, "Switched Reluctance Motor Drives".
96. Invited short course at LeTourneau Inc., Longview, TX, Jan. 12, 1996, "Design and Control of Switched Reluctance Motors".
97. Invited short course at General Motors Mesa Desert Proving Ground, Phoenix, AZ, Oct. 27, 1995, "Electric Drives for Electric and Hybrid Vehicles".
98. Invited short course at General Motors Milford Proving Ground, Detroit, MI, Sep. 8, 1995, "Electric Drives for Electric and Hybrid Vehicles".
99. Invited short course at IEEE Applied Power Electronics Conference and Exposition, March 4, 1995, Dallas, "Electric Drives for Electric and Hybrid Vehicles".
100. Invited Speaker at IEEE Industry Applications Society, Dallas Section, "Power electronics and Electric Machines-A Technology Review, Feb. 21, 1995.

Journal Papers:

1. S.M. Seyedi, D. Talebi, A. Deshpande, S. Kholesidoost, SV. Sankarraman, M.C. Gardner, P.N. Enjeti., and H.A. Toliyat, "Parameter Estimation and Control of Axial Flux Permanent Magnet Motors for Electric Aircraft: Evaluating Axial Force Implications in Field-Oriented Control

- Methods,” To appear in IEEE Journal of Emerging and Selected Topics in Power Electronics (JESTPE).
2. D. Talebi, M.C. Gardner, and H.A. Toliyat, “An Asynchronously Excited Brushless Wound Field Synchronous Machine,” To appear in IEEE Journal of Emerging and Selected Topics.
 3. D. Mustafa, H. Hussain, and H.A. Toliyat, “Design and Analysis of Discrete Halbach Magnetic Lead Screws using Non-Skewed PMs,” IEEE Transactions on Transportation Electrification, Oct. 2024.
 4. S.M. Seyedi, D. Talebi, and H.A. Toliyat, “A PM-free Brushless Synchronous Machine with A Novel Compensated Wound-Field Excited by Modulated Rotating Magnetic Flux,” IEEE Transactions on Energy Conversion, Vol. 39, No. 3, Sep. 2024, pp. 2068-2080.
 5. A. Darwish, S.S. Refaat, H. Abu-Rub, H.A. Toliyat, C.F. Kumru, F. Mustafa, A.H. El-Hag, G. Coapes, and S.M. Kameli, “Novel Antenna for Partial Discharge Detection and Classification: A Convolutional Neural Network-Based Deep Learning Approach,” IEEE Transactions on Dielectrics and Electrical Insulation, Vol. 31, No. 4, Aug. 2024, pp. 1711-1720.
 6. G. Tao, B. Praslicka, S. Hasanpour, T. Simms, Z. Wibisono, M.C. Gardner, M. Johnson, E. Hankins, M. McCall, A. Roussie, S. Ortiz, W. Thiele, H.A. Toliyat, “Experimental Comparison of Acoustic Characteristics for a High-Efficiency Magnetic Gearbox and a Mechanical Planetary Gearbox for Industrial HVAC Applications,” IEEE Transactions on Energy Conversion, Vol. 39, No. 1, Mar. 2024, pp. 182-190.
 7. B. Praslicka, and H.A. Toliyat, “Design and Analysis of a Novel, Low Cost, High-Speed Cycloidal Magnetic Gear for Aerospace Servo Actuator Applications,” IEEE Transactions on Mechatronics, Vol. 28, No. 6, Dec. 2023, pp. 3352-3363.
 8. S.M. Seyedi, M. Gardner, M. Johnson, S. Hasanpour, B. Praslicka, and H.A. Toliyat, “A Cycloidal Magnetic Gear with a Novel Flux Shield (“Moon”) Achieving Higher Torque Density and Lower Unbalanced Electromagnetic Forces,” Journal of Magnetism and Magnetic Materials, Elsevier, Vol. 571, Apr. 2023.
 9. A. Morya, and H.A. Toliyat, “Quantitative Reliability Evaluation of Silicon Carbide Based Inverters for Multiphase Electric Drives for Electric Vehicles,” Power Electronics and Drives, Vol. 1, No. 7, 2022, pp. 29-42.
 10. D. Talebi, M. Gardner, S. Sankarraman, A. Daniar, H.A. Toliyat, “Electromagnetic Design Characterization of a Dual Rotor Axial Flux Motor for Electric Aircraft,” IEEE Transactions on Industry Applications Society, Vol. 58, No. 6, pp. 7088-7098, Nov./Dec. 2022.
 11. M. Albader, Y. Chen, and H.A. Toliyat, “A Power Cable Reference Frame dqn Model for Fundamental Frequency Analysis,” IEEE Access, Vol. 10, Print ISSN: 2169-3536, Online ISSN: 2169-3536, Digital Object Identifier: 10.1109/ACCESS.2022.3222806, pp. 121021-121031, 2022.
 12. S. Hasanpour, M. Johnson, M. Gardner, and H.A. Toliyat, “Cycloidal Reluctance Magnetic Gears for High Gear Ratio Applications,” IEEE Transactions on Magnetics, Vol. 58, No. 6, pp. 1-10, June 2022.
 13. B. Praslicka, M.C. Gardner, M. Johnson, and H.A. Toliyat, “Review and Analysis of Coaxial Magnetic Gear Pole Pair Count Selection Effects,” IEEE Journal of Emerging and Selected Topics in Power Electronics, Vol. 10, No. 2, pp. 1813-1822, Apr. 2022.
 14. O.C. Kivanc, S.B. Ozturk, and H.A. Toliyat, “On-line Dead Time Compensator for PMSM Drive Based on Current Observer,” Elsevier, Engineering Science and Technology, An International Journal - JESTECH, Vol. 25, January 2022.

15. M. Johnson, M. Gardner, H.A. Toliyat, "A Parameterized Linear 3D Magnetic Equivalent Circuit for Analysis and Design of Radial Flux Magnetic Gears–Part II: Implementation," *IEEE Transactions on Energy Conversion*, Vol. 36, No. 4, pp. 2903-2911, Dec. 2021.
16. M. Johnson, M. Gardner, H.A. Toliyat, "A Parameterized Linear 3D Magnetic Equivalent Circuit for Analysis and Design of Radial Flux Magnetic Gears–Part I: Implementation," *IEEE Transactions on Energy Conversion*, Vol. 36, No. 4, pp. 2894-2902, Dec. 2021.
17. A. Darwish, G. Coapes, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "PD Signal Attenuation in 550 kV GIS: Impact of Different Barriers on the Propagation of Electromagnetic Waves" To appear in *IEEE Transactions on Instrumentation & Measurement*, Vol. 70, Nov. 2021.
18. M. Gardner, M. Johnson, B. Praslicka, H.A. Toliyat, "Optimization of Coaxial Magnetic Gear Design and Magnet Material Grade at Different Temperatures and Gear Ratios," *IEEE Transactions on Energy Conversion*, Vol. 36, No. 3, Sep. 2021, pp. 2493-2501.
19. A.G. Yepes, J. Duval-Gandoy, and H.A. Toliyat, "Strategy with Smooth Transitions and Improved Torque-Speed Region and Stator Copper Loss for Two-Level Asymmetrical Six-Phase Induction Motor Drives under Switch Faults," *IEEE Transactions on Power Electronics*, Vol. 36, No. 2, Feb. 2021, pp. 1954-1969.
20. A.G. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Improvement in DC-Link Utilization with Reduced Current and Torque Deterioration for Five-Phase Machines with Circulating-Current Filters," *IEEE Transactions on Industrial Electronics*, Vol. 68, No. 2, Feb. 2021, pp. 960-971.
21. K. Al Jaafari, and H.A. Toliyat, "Performance Analysis of Synchronous Generators under Stator Windings Ground Faults near the Star Point - Experimental Verification," *IEEE Transactions on Energy Conversion*, Vol. 35, No. 3, Sep. 2020, pp. 1402-1410.
22. Q. Khan, S.S. Refaat, H. Abu-Rub, H.A. Toliyat, and M. Olesz, and A. Darwish, "Characterization of Defects Inside the Cable Dielectric with Partial Discharge Modeling," *IEEE Transactions on Instrumentation and Measurement*, Vol. 70, Sep. 2020.
23. A. Darwish, S.S. Refaat, H. Abu-Rub, H.A. Toliyat, "PD Signal Propagation in GIS: Ultra-High Frequency Detection Based Modeling," *IEEE Sensors Journal*, Vol. 20, No. 16, Aug. 2020, pp. 9417-9426.
24. M. Moosavi, F. Naghavi, and H.A. Toliyat, "A Scalable Soft-Switching Photovoltaic Inverter with Full-Range ZVS and Galvanic Isolation," *IEEE Transactions on Industry Applications*, Vol. 56, No. 4, Jul/Aug 2020, pp. 3919-3931.
25. A.G. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Comparison of Stator Winding Connection in Multiphase Drives under Healthy Operation and With One Open Converter Leg," *IET journal on Electric Power*, doi.org/10.1049/iet-epa.2019.0467, Feb. 20, 2020.
26. A. Darwish, S.S. Refaat, H.A. Toliyat, and H. Abu-Rub, "On the Electromagnetic Wave Behavior Due to Partial Discharge in Gas Insulated Switchgears: State-of-Art Review", *IEEE Access*, June 5, Vol. 7, 2019, pp. 75822-75836, Digital Object Identifier 10.1109/ACCESS.2019.2921089.
27. A. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Multifrequency Current Control for n-phase Machines Including Antiwindup and Distortion-Free Saturation with Full DC-Bus Utilization," *IEEE Transactions on Power Electronics*, Vol. 34, No. 10, Oct. 2019, pp. 9891-9905.
28. M.C. Gardner, M. Johnson, and H.A. Toliyat, "Analysis of High Gear Ratio Capabilities for Single-Stage, Series Multistage, and Compound Differential Coaxial Magnetic Gears," *IEEE Transactions on Energy Conversion*, Vol. 34, No. 2, June 2019, pp. 665-672.

29. Q. Khan, S.S. Refaat, H. Abu-Rub, H.A. Toliyat, "Partial Discharge Detection and Diagnosis in Gas Insulated Switchgear: State of the art," IEEE Electrical Insulation Magazine, Vol. 35, No. 4, July/Aug. 2019, pp. 16-33.
30. M. Moosavi, and H.A. Toliyat, "A Multi-Cell Cascaded High Frequency Link Inverter with Soft-Switching and Isolation," IEEE Transactions on Industrial Electronics, Vol. 66, No. 4, Apr. 2019, pp. 2518-2528.
31. A. Morya, M.C. Gardner, B. Anvari, L. Liu, A.G. Yepes, J. Doval-Gandoy, H.A. Toliyat, "Wide Bandgap Devices in AC Electric drives: Opportunities and Challenges," IEEE Transactions on Transportation Electrifications, Vol. 5, No. 1, Mar. 2019, pp. 3-20.
32. A. Negahdari, A.G. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Efficiency Enhancement of Multiphase Electric Drives at Light-Load Operation Considering Both Converter and Stator Copper Losses," IEEE Transactions on Power Electronics, Vol. 34, No. 2, Feb. 2019, pp. 1518-1525.
33. A.G. Yepes, J. Doval-Gandoy, F. Baneira, and H.A. Toliyat, "Control Strategy for Dual Three-Phase Machines with Two Open Phases Providing Minimum Loss in the Full Torque Operation Range," IEEE Transactions on Power Electronics, Vol. 33, No. 12, Dec. 2018, pp. 1004-10050.
34. M.C. Gardner, M. Johnson, and H.A. Toliyat, "Comparison of Surface Permanent Magnet Axial and Radial Flux Coaxial Magnetic Gears," IEEE Transactions on Energy Conversion, Vol. 33, No. 4, Dec. 2018, pp. 2250-2259.
35. X. Li, B. Anvari, A. Palazzolo, and H.A. Toliyat, "A Utility Scale Flywheel Energy Storage System with a Shaft-less, Hub-less, high strength steel rotor," IEEE Transactions on Industrial Electronics, Vol. 65, No. 8, Aug. 2018, pp. 6667-6675.
36. M. Johnson, M. Gardner, H. A. Toliyat, S. Englebreton, W. Ouyang and C. Tschida, "Design, Construction, and Analysis of a Large Scale Inner Stator Radial Flux Magnetically Geared Generator for Wave Energy Conversion," IEEE Transactions on Industry Applications, Vol. 54, No. 4, July/Aug. 2018, pp. 3305-3314.
37. B. Anvari, H.A. Toliyat, and B. Fahimi, "Simultaneous Optimization of Geometry and Firing Angles for In-Wheel Switched Reluctance Motor Drive," IEEE Transactions on Electrifications, Vol. 4, No. 1, March 2018, pp. 322-329.
38. S. Choi, M. Shahidul Haque, Md. Tawhid Bin Tarek, V. Mulpuri, Y. Duan, S. Das, V. Garg, D. Ionel, M. Abul Masrur, B. Mirafzal, and H.A. Toliyat "Fault Diagnosis Techniques for Permanent Magnet AC Machine and Drives," IEEE Transactions on Transportation Electrifications, Vol. 4, No. 2, June. 2018, pp 444-463.
39. N. Safari-Shad, R. Franklin, A. Negahdari, and H.A. Toliyat, "Adaptive 100% Injection-Based Generator Stator Ground Fault Protection with Real-Time Fault Location Capability," IEEE Transactions on Power Delivery, Vol. 33, No. 5, Oct. 2018, pp. 2364-2372.
40. A.G. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Multifrequency Current Control Including Distortion-Free Saturation and Antiwindup with Enhanced Dynamics," IEEE Transactions on Power Electronics, Vol. 33, No. 9, Sep. 2018, pp. 7309-7313.
41. B. Anvari, X. Li, H.A. Toliyat, and A. Palazzolo, "A Coreless Permanent-Magnet Machine for a Magnetically Levitated Shaft-less Flywheel," IEEE Transactions on Industry Applications, Vol. 54, No. 5, Sep/Oct. 2018, pp. 4288-4296.
42. A. Yepes, J. Doval-Gandoy, F. Baneira, and H.A. Toliyat, "Speed Estimation Based on Rotor Slot Harmonics in Multiphase Induction Machines under Open-Phase Fault, IEEE Transactions on Power Electronics, Vol. 33, No. 9, Sep. 2018, pp. 7980-7993.

43. M.C. Gardner, B.E. Jack, M. Johnson, and H.A. Toliyat, "Comparison of Surface Mounted Permanent Magnet Coaxial Radial Flux Magnetic Gears Independently Optimized for Volume, Cost, and Mass," *IEEE Transactions on Industry Applications*, Vol. 54, No. 3, May/June 2018, pp. 2237-2345.
44. M. Johnson, M. Gardner, and H.A. Toliyat, "A Parameterized Linear Magnetic Equivalent Circuit for Analysis and Design of Radial Flux Magnetic Gears–Part II: Evaluation," *IEEE Transactions on Energy Conversion*, Vol. 33, No. 2, June 2018, pp. 792-800.
45. M. Johnson, M. Gardner, and H.A. Toliyat, "A Parameterized Linear Magnetic Equivalent Circuit for Analysis and Design of Radial Flux Magnetic Gears–Part I: Implementation," *IEEE Transactions on Energy Conversion*, Vol. 33, No. 2, June 2018, pp. 784-791.
46. M. Johnson, M. Gardner, and H.A. Toliyat, "Design Comparison of NdFeB and Ferrite Radial Flux Magnetic Gears," *IEEE Transactions on Industry Applications*, Vol. 54, No. 2, March/April 2018, pp. 1254-1263.
47. K. Al Jaafari, A. Negahdari, H.A. Toliyat, N. Safari-Shad, R. Franklin, "Experimental Verification of a Novel Adaptive Stator Ground Fault Protection for Synchronous Generators," *IEEE Transactions on Industry Applications*, Vol. 53, No. 4, July/August 2017, pp. 3379-3386.
48. S. Choi, M. Haque, A.K.M. Arafat, and H.A. Toliyat, "Detection and Estimation of Extremely Small Fault Signature by Utilizing Multiple Current Sensor Signals in Multiphase Electric Machines," *IEEE Transactions on Industry Applications*, Vol. 53, No. 3, May/June 2017, pp. 2805-2816.
49. M. Johnson, M. Gardner, and H.A. Toliyat, "Design and Analysis of an Axial Flux Magnetically Geared Generator," *IEEE Transactions on Industry Applications*, Vol. 53, No. 1, Jan./Feb. 2017, pp. 97-105.
50. S. Pakdelian, H. Hussain, M. Mousavi, H.A. Toliyat, "Control of an Electric Machine Integrated with the Trans-Rotary Magnetic Gear in a Motor Drive Train," *IEEE Transactions on Industry Applications*, Vol. 53, No. 1, Jan./Feb. 2017, pp. 106-114.
51. B. Farhangi, and H.A. Toliyat, "Piecewise Linear Modeling of Snubberless Dual Active Bridge Commutation," *IEEE Transactions on Industry Applications*, Vol. 51, No. 5, Sep./Oct. 2015, pp. 4072-4078.
52. S. Pakdelian, Y. Deshpande, and H.A. Toliyat, "Design of an Electric Machine Integrated with the Trans-Rotary Magnetic Gear," *IEEE Transactions on Energy Conversions*, Vol. 30, No. 3, Sep. 2015, pp. 1180-1191.
53. M. Amirabadi, J. Baek, and H.A. Toliyat, "Bidirectional Soft Switching Series AC-Link Inverter," *IEEE Transactions on Industry Applications*, Vol. 51, No. 3, May/June 2015, pp. 2312-2320.
54. Y. Deshpande, H.A. Toliyat, S. Nair, S.J. Dhinagar, S. Immadisetty, S. Nalakath, "Design Aspects of High Torque Density Permanent Magnet Motor for Electric Two Wheelers Applications," *IEEE Transactions on Industry Applications*, Vol. 51, No. 3, May/June 2015, pp. 2123-2135.
55. B. Farhangi, and H.A. Toliyat, "Modeling and Analyzing Multi-port Isolation transformer Capacitive Components for Onboard Vehicular Power Conditioners," *IEEE Transactions on Industrial Electronics*, Vol. 62, No. 5, May 2015, pp. 3134-3142.
56. S. Pakdelian, N.W. Frank, and H.A. Toliyat, "Magnetic Design Aspects of the Trans-Rotary Magnetic Gear," *IEEE Transactions on Energy Conversion*, Vol. 30, No. 1, March 2015, pp. 41-50.
57. M. Amirabadi, J. Baek, and H.A. Toliyat, "Ultra-Sparse AC-Link Converters," *IEEE Transactions on Industry Applications*, Vol. 51, No. 1, Jan./Feb. 2015, pp. 448-458.

58. M. Amirabadi, J. Baek, H.A. Toliyat, and W. Alexander, "Soft-Switching ac-Link Three-Phase ac-ac Buck-Boost Converter,' IEEE Transactions on Industrial Electronics, Vol. 62, No. 1, Jan. 2015, pp.3-14.
59. H. Keyhani, and H.A. Toliyat, "Single-Stage Multi-String PV Inverter with an Isolated High-Frequency Link and Soft-Switching Operation", IEEE Transactions on Power Electronics, Vol. 29, No.8, Aug. 2014, pp. 3919-3929.
60. H. Keyhani, H.A. Toliyat, M. Harfman-Todorovic, R. Lai, and R. Datta, "An Isolated Resonant AC-Link Three-Phase AC-AC Converter using a Single HF Transformer," IEEE Transactions on Industrial Electronics, IEEE Transactions on Industrial Electronics, Vol. 61, No. 10, Oct. 2014, pp. 5174-5183.
61. S. Choi, B. Akin, S. Kwak, and H.A. Toliyat, "A Compact Error Management Algorithm to Minimize False-Alarm Rate of Motor/Generator Faults in (Hybrid) Electric Vehicles, IEEE Journal of Emerging and Selected Topics in Power Electronics, Vol. 2, No. 3, Sep. 2014, pp. 618-626.
62. H. Keyhani, and H.A. Toliyat, "A Soft Switched Three-Phase AC-AC Converter with a High-Frequency AC Link," IEEE Transactions on Industry Applications, Vol. 50, No. 4, July/Aug. 2014, pp. 2637-2647.
63. H. Keyhani, and H.A. Toliyat, "Partial Resonant Buck-Boost and Flyback DC-DC Converters," IEEE Transactions on Power Electronics, Vol. 29, No. 8, Aug. 2014, pp. 4357-4365.
64. H. Keyhani, and H.A. Toliyat, "Isolated ZVS High-Frequency-Link AC-AC Converter with a Reduced Switch Count," IEEE Transactions on Power Electronics, Vol. 29, No. 8, Aug. 2014, pp. 4156-4166.
65. H. Keyhani, H.A. Toliyat, M. Harfman Todorovic, R. Lai, and R. Datta, "Step-Up/Down Three-Phase Resonant High-Frequency AC-Link Inverters, IET Power Electronics, 2014, Vol 5, Iss. 5, pp. 1246-1255.
66. M. Amirabadi, J. Baek, and H.A. Toliyat, "Sparse ac-Link Buck-Boost Inverter,' IEEE Transactions on Power Electronics, Vol. 29, No. 8, Aug. 2014, pp. 3942-3953.
67. M. Amirabadi, H.A. Toliyat, and W. Alexander, "High-Frequency AC-Link PV Inverter, IEEE Transactions on Industrial Electronics, Vol. 61, No. 1, Jan. 2014, pp. 281-291.
68. M. Amirabadi, H.A. Toliyat, and W. Alexander, "A Multi-Port ac Link PV Inverter with Reduced Size and Weight," IEEE Transactions on Industry Applications Society, Vol. 49, No. 5, Sep./Oct. 2013, pp. 2217-2228.
69. D.M. Lee, and H.A. Toliyat, "A Simple Current Ripple Reduction Method for B4 Inverters," Journal of Electrical Engineering and Technology, Vol. 8, No. 5, 2013, pp. 1062-1069.
70. S. Pakdelian, N.W. Frank, and H.A. Toliyat, "Principles of the Trans-Rotary Magnetic Gear," IEEE Transactions on Magnetics, Vol. 49, No. 2, Feb. 2013, pp. 883-889.
71. S. Sadeghi, L. Guo, L. Parsa, and H.A. Toliyat, "Wide Operational Speed Range of Five-Phase Permanent Magnet Machines by using Different Stator Winding Configurations," IEEE Transactions on Industrial Electronics, Vol. 59, No. 6, June 2012, pp. 2621-2631.
72. B. Akin, S. Choi, and H.A. Toliyat, "DSP Applications in Electric and Hybrid Electric Vehicles," IEEE Signal Processing Magazine, Vol. 29, No. 3, May 2012, pp. 133-136.
73. S. Choi, B. Akin, M.M. Rahimian, and H.A. Toliyat, "Performance-Oriented Electric Motors Diagnostics in Modern Energy Conversion Systems," IEEE Transactions on Industrial Electronics, Vol. 59, No. 2, Feb. 2012, pp. 1266-1277.

74. N.W. Frank, and H.A. Toliyat, "Passive Suppression of Transient Oscillations in the Concentric Planetary Gear," IEEE Transactions on Energy Conversion, Vol. 26, No. 3, Sep. 2011, pp. 933-939.
75. N.W. Frank, and H.A. Toliyat, "Analysis of the Concentric Planetary Magnetic Gear with Strengthened Stator and Interior Permanent Magnet Inner Rotor," IEEE Transactions on Industry Applications, Vol. 47, No.4, July/August 2011, pp. 1652-1660.
76. P.S. Moses, M.A.S. Masoum, and H.A. Toliyat, "Impacts of Hysteresis and Magnetic Couplings on the Stability Domain of Ferroresonance in Asymmetric Three-Phase Three-Leg Transformers," IEEE Transactions on Energy Conversions, Vol. 26, No. 2, June 2011, pp. 581-592.
77. S.B. Ozturk, and H.A. Toliyat, "Direct Torque and Indirect Flux Control of Brushless DC Motor," IEEE Transactions on Mechatronics, Vol. 16, No. 2, April 2011, pp. 351-360.
78. B. Akin, S.B. Ozturk, and H.A. Toliyat, "A Simple Real-Time Fault Signature Monitoring Tool for motor Drive Embedded Fault Diagnosis Systems," IEEE Transactions on Industrial Electronics, Vol. 58, No. 5, May 2011, pp. 1990-2001.
79. S. Choi, B. Akin, M.M. Rahimian, and H.A. Toliyat, "Implementation of a Fault Diagnosis Algorithm for Induction Machines Based on Advanced Digital Signal Processing Techniques," IEEE Transactions on Industrial Electronics, Vol. 58, No. 3, March 2011, pp. 937-948.
80. P.S. Moses, M.A.S. Masoum, and H.A. Toliyat, "Dynamic Modeling of Three-Phase Asymmetric Power Transformers with Magnetic Hysteresis: No-Load and Inrush Conditions," IEEE Transactions on Energy Conversions, Vol. 25, No. 4, Dec. 2010, pp. 1040-1047.
81. J. Faiz, B.M. Ebrahimi, H.A. Toliyat, W.S. Abu-Elhaija, "Mixed-Fault Diagnosis in Induction Motors Considering Varying Load and Broken Bars Location," Journal of Energy Conversion and Management, Elsevier, Vol. 51, Issue 7, July 2010.
82. S.B. Ozturk, W.C. Alexander, and H.A. Toliyat, "Direct Torque Control of Four-Switch Brushless DC Motor with Non-sinusoidal Back-EMF," IEEE Transactions on Power Electronics, Vol. 25, No. 2, Feb. 2010, pp. 263-271.
83. J. Faiz, B.M. Ebrahimi, B. Akin, and H.A. Toliyat, "Dynamic analysis of mixed eccentricity signatures at various operating points and scrutiny of related indices for induction motors," IET Electric Power Applications, Vol. 4, Issue 1, 2010, pp. 1-16.
84. E.C. dos Santos Jr., C.B. Jacobina, H.A. Toliyat, and E.R.C. da Silva, "Monolithic Systems using Standard Three-leg Inverter Supplying Independently Two Motors, IEEE Transactions on Industry Applications, Vol. 45, No. 5, Sep./Oct. 2009, pp. 1660-1669.
85. J. Faiz, B.M. Ebrahimi, and H.A. Toliyat, "Effect of Magnetic Saturation on Static and Mixed Eccentricity Faults Diagnosis in Induction Motor," IEEE Transactions on Magnetics, Vol. 45, No. 8, Aug. 2009, pp. 3137-3144.
86. B. Akin, S.B. Ozturk, H.A. Toliyat, and M. Rayner, "DSP-Based Sensorless Electric Motor Fault Diagnosis Tools for Electric and Hybrid Electric Vehicle Powertrain Applications, IEEE Transactions on Vehicular Technology, Vol. 58, No. 5, June 2009, pp. 2150-2159.
87. J. Faiz, B.M. Ebrahimi, B. Akin, and H.A. Toliyat, "Comprehensive Eccentricity Fault Diagnosis in Induction Motors using Finite Element," IEEE Transactions on Magnetics, Vol. 45, No. 3, March 2009, pp. 1764-1767.
88. J. Faiz, B.M. Ebrahimi, M. Malavi, and H.A. Toliyat, "Mixed Eccentricity Fault Diagnosis on Salient-Pole Synchronous Generator using Modified Winding Function Method," Progress in Electromagnetics Research B, Vol. 11, 2009, pp. 155-172.

89. E. Levi, M. Jones, S.N. Vukosavic, and H.A. Toliyat, "Steady-State Modeling of Series-Connected Five-Phase and Six-Phase Two-Motor Drives," IEEE Transactions on Industry Applications, Vol. 44, No. 5, Sep./Oct. 2008, pp. 1559-1568.
90. B. Akin, H.A. Toliyat, U. Orguner, and M. Rayner, "Phase Sensitive Detection of Motor Fault Signatures in the Presence of Noise," IEEE Transactions on Industrial Electronics, Vol. 55, No. 6, June 2008, pp. 2539-2550.
91. M.T. Abolhassani, P. Enjeti, and H.A. Toliyat, "Integrated Doubly Fed Electric Alternator/Active Filter (IDEA), a Viable Power Quality Solution, for Wind Energy Conversion System," IEEE Transactions on Energy Conversion, Vol. 23, No. 2, June 2008, pp. 642-650.
92. Y. Kumsuwan, S. Premrudeepreechacharn, and H.A. Toliyat, "Modified Direct Torque Control Method for Induction Motor Drives based on Amplitude and Angle Control of Stator Flux," Electric Power Systems Research, Vol. 78, No. 10, Oct. 2008, pp. 1712-1718.
93. M. Wlas, Z. Krzeminski, and H.A. Toliyat, "Neural Network-Based Parameters Estimations of Induction Motors," IEEE Transactions on Industrial Electronics, Vol. 55, No. 4, April 2008, pp. 1783-1794.
94. B. Akin, H.A. Toliyat, Y. Durrani, and M. Rayner, "Low Order PWM Inverter Harmonics Contributions to the Inverter-Fed Induction Machine Fault Diagnosis, IEEE Transactions on Industrial Electronics, Vol. 55, No. 2, Feb. 2008, pp. 610-619.
95. J. Faiz, B.M. Ebrahimi, B. Akin, and H.A. Toliyat, "Finite-Element Transient Analysis of Induction Motors under Mixed Eccentricity Fault," IEEE Transactions on Magnetics, Vol. 44, No. 1, Jan. 2008, pp. 66-74.
96. S. Kwak, and H.A. Toliyat, "An Approach to Fault-Tolerant Three-Phase Matrix Converter," IEEE Transactions on Energy Conversion, Vol. 22, No. 4, Dec. 2007, pp. 855-863.
97. H. Sahraoui, H. Zeroug, and H.A. Toliyat, "Switched Reluctance Motor Design using Neural-Network Method with Static Finite-Element Simulation," IEEE Transactions on Magnetics, Vol. 43, No. 12, Dec. 2007, pp. 4089-4095.
98. J. Faiz, M.B. Ebrahimi, and H.A. Toliyat, "Signature Analysis of Electrical and Mechanical Signals for Diagnosis of Broken Rotor Bars in Induction Motor, Journal of Electromagnetics, Vol. 27, No. 8, November 2007, pp. 507-526.
99. L. Parsa, and H.A. Toliyat, "Sensorless Direct Torque Control of Five-Phase Interior Permanent Magnet Motor Drives," IEEE Transactions on Industry Applications, Vol. 43, No. 4, July/August 2007, pp. 952-959.
100. L. Parsa, and H.A. Toliyat, "Fault-Tolerant Interior permanent Magnet Machines for Hybrid Electric Vehicle Applications, IEEE Transactions on Vehicular Technology, Vol. 56, No. 4, July 2007, pp. 1546-1552.
101. P. Niazi, and H.A. Toliyat, and A. Goodarzi, "Robust Maximum Torque per Ampere (MTPA) Control of PM-Assisted SynRM for Traction Applications, IEEE Transactions on Vehicular Technology, Vol. 56, No. 4, July 2007, pp. 1538-1545.
102. E. Levi, R. Bojoi, F. Profumo, H.A. Toliyat, and S. Williamson, "Multiphase Induction Motor Drives – A Technology Status Review, Invited Paper, Vol. 1, Issue 4, July 2007, pp. 489-516, IEE Proceedings on Electric Power Applications.
103. E. Levi, M. Jones, A. Iqbal, S.N. Vukosavic, H.A. Toliyat, "Induction Machine/Syn-Rel Two-Motor Five-Phase Series-Connected Drive," IEEE Transactions on Energy Conversion, Vol. 22, No. 2, June 2007, pp. 281-289.

104. S. Kwak, and H.A. Toliyat, "Remedial Switching Function Approach to Improve Reliability for AC/AC Converters," IEEE Transactions on Energy Conversion, Vol. 22, No. 2, 2007, pp. 541-543.
105. E. Levi, M. Jones, S.N. Vukosavic, A. Iqbal, H.A. Toliyat, "Modeling, Control and Experimental Investigation of a Five-Phase Series-Connected Two-Motor Drive with Single Inverter supply," IEEE Transactions on Industrial Electronics, Vol. 54, No. 3, June 2007, pp. 1504-1516.
106. P. Niazi, and H.A. Toliyat, "On-Line Parameter Estimation of Permanent Magnet Assisted Synchronous Reluctance Motor Drives," IEEE Transactions on Industry Applications, Vol. 43, No. 2, March/April 2007, pp. 609-615.
107. P. Niazi, H.A. Toliyat, D-H. Cheong, and J-C. Kim, "A Low-Cost and Efficient Permanent Magnet Assisted Synchronous Reluctance Motor Drive," IEEE Transactions on Industry Applications, Vol. 43, No. 2, March/April 2007, pp. 542-550.
108. L. Parsa, H.A. Toliyat, and A. Goodarzi, "Five-Phase Interior Permanent Magnet Motor with Low Torque Pulsation, IEEE Transactions on Industry Applications, Vol. 43, No. 1, Jan./Feb. 2007, pp. 40-46.
109. S. Kwak, and H.A. Toliyat, "A Current Source Inverter with Advanced External Circuit and Control Method," IEEE Transactions on Industry Applications, Vol. 42, No. 6, Nov./Dec. 2006, pp. 1496-1507.
110. S. Kwak, and H.A. Toliyat, "Multilevel Current Source Inverter Topology Based on Dual Structure Associations for Induction Motor Drives," IEEE Transactions on Industry Applications, Vol. 42, No. 6, Nov./Dec. 2006, pp. 1558-1564.
111. M.R. Rafiei, R. Ghazi, R. Asgharian, H.A. Toliyat, and M. Barakati, "Robust Control Methodologies For dc/dc PWM Converters Under Wide Changes in Operating Conditions," WSEAS Transactions on Systems, No. 11, Vol. 5, Nov. 2006.
112. S. Kwak, and H.A. Toliyat, "Current Source Rectifier Topologies for Sinusoidal Supply Current: Theoretical Studies and Analyses," IEEE Transactions on Industrial Electronics, Vol. 53, No.3, June 2006, pp. 984-987.
113. S. Kwak, and H.A. Toliyat, "Simple Energy Recovery and Commutation Circuit for Six-step Current-fed Inverters," IEEE Transactions on Energy Conversion, Vol. 21, No. 2, June 2006, pp. 616-618.
114. I.M. Panahi, and H.A. Toliyat, "An Efficient Processor-Based Online Generation of Time-Optimal Trajectories, IEEE Transactions on Control Systems Technology, Vol. 14, No. 5, Sep. 2006, pp. 966-973.
115. L. Parsa, and H.A. Toliyat, "A Fault Resilient IPM Motor Drive for Wide Speed Range Operation, Naval Engineers Journal, Vol. 117, No. 4, Fall 2005.
116. S. Nandi, H.A. Toliyat, and X. Li, "Condition Monitoring and Fault Diagnosis of Electrical Machines-A Review," IEEE Transactions on Energy Conversion, Vol. 20, No. 4, Dec. 2005, pp. 719-729. (IEEE Power Engineering Society Prize Paper Award, 2007).
117. S. Kwak, and H.A. Toliyat, "Design and Rating Comparisons of PWM Voltage Source Rectifiers and Active Filters for AC Drives with Unity Power Factor," IEEE Transactions on Power Electronics, Vol. 20, No. 5, Sep. 2005, pp. 1133-1142.
118. M. Wlas, H. Abu-Rub, Z. Krezeminski, J. Guzinski, and H.A. Toliyat, "Artificial Neural Network-Based Sensorless Nonlinear Control of Induction Motors," IEEE Transactions on Energy Conversion, Vol. 20, No. 3, Sep. 2005, pp. 520-528.

119. S. Kwak, and H.A. Toliyat, "A Hybrid Converter System for High Performance Large Induction Motor Drives," IEEE Transactions on Energy Conversion, Vol. 20, No. 3, Sep 2005, pp.504-511.
120. S. Kwak, and H.A. Toliyat, "Development of Modulation Strategy for Two-phase ac-ac Matrix Converter, IEEE Transactions on Energy Conversion, Vol. 20, No. 2, June 2005, pp. 493-494.
121. S.M.A. Cruz, H.A. Toliyat, and A.J.M. Cardoso, "DSP Implementation of the Multiple Reference Frames Theory for the Diagnosis of Stator Faults in a DTC Induction Motor Drive," IEEE Transactions on Energy Conversion, Vol. 20, No. 2, June 2005, pp. 329-335.
122. H.A. Toliyat, P. Niazi, and K. Godbole, "Overcoming Vector Control Challenges," Motion System Design, March 2005, pp. 20-24.
123. S. Kwak, and H.A. Toliyat, "A Hybrid Solution for Load Commutated Inverter-Fed Induction motor Drives," IEEE Transactions on Industry Applications, Vol. 41, No.1, Jan./Feb. 2005, pp. 83-90.
124. L. Parsa, and H.A. Toliyat, "A New Five-Phase Permanent Magnet Motor Drive for Traction Applications," IEEE Transactions on Industry Applications, Vol. 41, No. 1, Jan./Feb. 2005, pp. 30-37, (2006 Third Prize Transactions Paper Award).
125. S. Kwak, and H.A. Toliyat, "Design and Performance Comparisons of Two Multi-drive Systems with Unity Power Factor," IEEE Transactions on Power Delivery, Vol. 20, No. 1, January 2005, pp. 417-426.
126. E. Levi, M. Jones, S. Vukosavic, and H.A. Toliyat, "Operating Principles of a Novel Multi-Phase Multi-Motor Vector Controlled Drive, IEEE Transactions on Energy Conversion, Vol. 19, No. 3, Sep. 2004, pp. 508-517.
127. E. Levi, M. Jones, S. Vukosavic, and H.A. Toliyat, "A Five-Phase Two-Machine Vector Controlled Induction Motor Drive Supplied from a Single Inverter, EPE Journal, Vol. 14, No.3, pp. 38-48, 2004.
128. H. Abu-Rub, J. Guzinski, Z. Krzeminski, and H.A. Toliyat, "Predictive Current Control of Voltage Source Inverters," IEEE Transactions on Industrial Electronics, Vol. 51, No. 3, June 2004, pp. 585-593.
129. R.M. Bharadwaj, A.G. Parlos, and H.A. Toliyat, "Neural Speed Filtering for Sensorless Induction Motor Drives, Journal of Control Engineering Practice, Elsevier, 2004, pp. 687-706.
130. S. Kwak, and H.A. Toliyat, "Optimized Power Distribution to Minimize the Power Ratings of Paralleled Rectifiers, The IEE Electronics Letters, Vol. 40, No. 5, March 2004, pp. 336-338.
131. E. Levi, M. Jones, S. Vukosavic, and H.A. Toliyat, "A Novel Concept of a Multiphase, Multi-motor Vector Controlled Drive System Supplied from a Single Voltage Source Inverter," IEEE Transactions on Power Electronics, Vol. 19, No. 2, March 2004, pp. 320-335.
132. H. Abu-Rub, J. Guzinski, Z. Krzeminski, and H.A. Toliyat, "Advanced Control of Induction Motor Based on Load Angle Estimation," IEEE Transactions on Industrial Electronics, Vol. 51, No. 1, Feb. 2004, pp. 5-14
133. H. Meshgin-Kelk, J. Milimonfared, and H.A. Toliyat, "Interbar Currents and Axial Fluxes in Healthy and Faulty Induction Motors," IEEE Transactions on Industry Applications, Vol. 40, No. 1, Jan/Feb 2004, pp. 128-134.
134. M. Hajiaghajani, H.A. Toliyat, and I.M.S. Panahi, "Advanced Fault Diagnosis of a DC Motors," IEEE Transactions on Energy Conversion, Vol. 19, No.1, March 2004, pp. 60-65.
135. K. Abbaszadeh, J. Milimonfared, and H.A. Toliyat, "A Novel Approach to Broken Bar Detection in Induction Motor via Wavelet Transformation," Iranian Journal of Science and Technology, Transaction B: Engineering, Vol. 27, No. B4, 2003, pp. 763-770.

136. J. Guzinski, H. Abu-Rub, and H.A. Toliyat, "An Advanced Low-Cost Sensorless Induction Motor Drive," IEEE Transactions on Industry Applications, vol. 39, No. 6, November/December 2003, pp. 1757-1764.
137. T. Gopalarathnam, and H.A. Toliyat, "A New Topology for Unipolar Brushless DC Motor Drive with High Power Factor," IEEE Transactions on Power Electronics, Vol. 18, No. 6, November 2003, pp. 1397-1404.
138. H.A. Toliyat, K. Abbaszadeh, M. Rahimian, and L.E. Olson, "Rail Defect Diagnosis using Wavelet Packet Decomposition," IEEE Transactions on Industry Applications, Vol. 39, Sep/Oct. 2003, pp. 1454-1461.
139. H.A. Toliyat, E. Levi, and M. Raina, "A Review of RFO Induction Motor Parameter Estimation Techniques," IEEE Transactions on Energy Conversion, Vol. 18, No. 2, June 2003, pp. 271-283.
140. S. Nandi, S. Ahmed, and H.A. Toliyat, and R.M. Bharadwaj, "Selection Criteria of Induction Machines for Speed-Sensorless Drives Applications," IEEE Transactions on Industry Applications, Vol. 39, No. 3, May/June 2003, pp. 704-712.
141. H. Abu-Rub, J. Guzinski, Z. Krzeminski, and H.A. Toliyat, "Speed Observer System for Advanced Sensorless Control of Induction Motor," IEEE Transactions on Energy Conversion, Vol. 18, No. 2, June 2003, pp. 219-224.
142. H. Meshgin-Kelk, H.A. Toliyat, and J. Milimonfared, "A Comprehensive Method for the Calculation of Inductance Coefficient of Cage Induction Machines," IEEE Transactions on Energy Conversion, Vol. 18, No. 2, June 2003, pp. 187-193.
143. J. Faiz, I. Tabatabaei, and H.A. Toliyat, "An Evaluation of Squirrel-Cage Induction Motor Inductances under Mixed Eccentric Conditions," IEEE Transactions on Energy Conversion, Vol. 18, No.2, June 2003, pp. 252-258.
144. H. Abu-Rub, J. Guzinski, Z. Krzeminski, and H.A. Toliyat, "Problems of Exact Generation of Inverter Output Voltage," Journal of Electric Power Components and Systems, Vol. 30, No. 12, 2002, pp. 1261-1277.
145. H.A. Toliyat, S. Ahmed, W. Choi, and P.N. Enjeti, "Instrument Selection Criteria for Non-sinusoidal Power Measurements," ASHRAE Transactions 2002, Vol. 108, Part 2, pp. 897-903.
146. S. Ahmed, W. Choi, H.A. Toliyat, and P.N. Enjeti, "Characterization of Non-sinusoidal Measurement Station Component Requirements and Errors," ASHRAE Transactions 2002, Vol. 108, Part 2.
147. S. Nandi, R. Bharadwaj, H.A. Toliyat, "Performance Analysis of a Three Phase Induction Motor under Mixed Eccentricity Condition," IEEE Transactions on Energy Conversion, Vol. 17, No. 3, September 2002, pp. 392-399.
148. S.M.R. Rafiei, R. Ghazi, H.A. Toliyat, "IEEE-519-Based Real Time and Optimal Control of Active Filters Under Non-Sinusoidal Line Voltages Using Neural Networks," IEEE Transactions on Power Delivery, Vol. 17, No. 3, July 2002, pp. 815-821.
149. E. Afjei, and H.A. Toliyat, "A Novel Multilayer Switched Reluctance Motor," IEEE Transactions on Energy Conversion, Vol. 17, No. 2, June 2002.
150. H. Xu, H.A. Toliyat, and L.J. Peterson, "Five-Phase Induction Motor Drives with DSP-Based Control Systems," IEEE Transactions on Power Electronics, Vol. 17, No. 4, July 2002, pp. 524-533.
151. R. Ghazi, S.M.R. Rafiei, and H.A. Toliyat, "A Programmable Control Strategy For Optimal and Flexible Active Filtering and Power Factor Correction Under Non Sinusoidal Line Voltages, Iranian Journal of Science & Technology (IJST), Shiraz University, Shiraz, Iran, ISSN 0363-1307, 2002.

152. H.A. Toliyat, L. Hao, D.S. Shet, and T.A. Nondahl, "Position Sensorless Control of Surface Mount Permanent Magnet AC (PMAC) Motors at Low Speeds," IEEE Transactions on Industrial Electronics, Vol. 49, No. 1, February 2002, pp. 157-164.
153. S. Nandi, and H.A. Toliyat, "Novel Frequency-Domain-Based Technique to Detect Stator Interturn Faults in Induction Machines using Stator-Induced Voltages after Switch-off," IEEE Transactions on Industry Applications, Vol. 38, No. 1, Jan/Feb. 2002, pp. 101-109.
154. H.A. Toliyat, H. Xu, and L.J. Peterson, "DSP-Based Direct Torque Control (DTC) for Five-Phase Induction Machines," IEEE Transactions on Industry Applications, Vol. 37, No. 12, Dec. 2001, pp. 1256-1262.
155. M. Haji, and H.A. Toliyat, "Pattern Recognition – A Technique for Induction Machines Rotor Broken Bar Detections," IEEE Transactions on Energy Conversion, Vol. 16, No. 4, Dec. 2001, pp. 312-317.
156. J. Hur, H.A. Toliyat, and J. Hong, "3D Time-Stepping Analysis of Induction Motor by New 3-D Equivalent Magnetic Circuit Network Method," IEEE Transactions on Magnetics, Vol. 37, No. 5, September 2001, pp. 3225-3228.
157. S. Nandi, S. Ahmed, and H.A. Toliyat, "Detection of Rotor Slot and Other Eccentricity Related Harmonics in a Three Phase Induction Motor with Different Rotor Cages," IEEE Transactions on Energy Conversion, Vol. 16, No. 3, September 2001, pp. 253-260.
158. J. Hur, H.A. Toliyat, and J. Hong, "Dynamic Analysis of Linear Induction Motors using 3-D Equivalent Magnetic Circuit Network (EMCN) Method," Journal of Electric Machines and Power Systems, Vol. 29, No. 6, June 2001, pp. 531-541.
159. S.M.R. Rafiei, H.A. Toliyat, R. Ghazi, and T. Gopalarathnam, "An Optimal and Flexible Control Strategy for Active Filtering and Power Factor Correction under Non-Sinusoidal Line Voltage," IEEE Transactions on Power Delivery, Vol. 16, No. 2, Apr. 2001, pp. 297-305.
160. H.A. Toliyat, K.M. Rahman, D.S. Shet, "Sensorless Operation of Surface Mount Permanent Magnet AC (PMAC) Motors," IEEE Transactions on Energy Conversion, Vol. 14, No. 4, Dec. 1999, pp. 1004-1010.
161. H.A. Toliyat, G. Suresh, A. Abur, "Estimation of Voltage Distribution on the Inverter Fed Random Wound Induction Motor Windings Supplied through Feeder Cable", IEEE Transactions on Energy Conversion, Vol. 14, No. 4, Dec. 1999, pp. 976-981.
162. J. Milimonfared, H. Meshgin Kelk, A. Der Minassians, S. Nandi, and H.A. Toliyat, "A Novel Approach for Broken Rotor Bar Detection in Cage Induction Motors," IEEE Transactions on Industry Applications, Vol. 35, No. 5, Sept/Oct. 1999, pp. 1000-1006.
163. H.A. Toliyat, M.S. Arefeen, K.M. Rahman, D. Figoli, "Rotor Time Constant Updating Scheme for a Rotor Flux Oriented Induction Motor Drive," IEEE Transactions on Power Electronics, Vol. 14, No. 5, Sept. 1999, pp. 850-857.
164. H.A. Toliyat, N. Sultana, D. Shet, J.C. Moreira, "Brushless Permanent Magnet Motor Drive System using Load Commutated Inverter, IEEE Transactions on Power Electronics, Vol. 14, No. 5, Sept. 1999, pp. 831-837.
165. H.A. Toliyat, N. Al-Nuaim, "Simulation and Detection of Dynamic Air-Gap Eccentricity in Salient Pole Synchronous Machines," IEEE Transactions on the Industry Applications, Vol. 35, No. 1, Jan./Feb. 1999, pp. 86-93.

166. G. Suresh, H.A. Toliyat, D.A. Rendusara, and P.N. Enjeti, "Predicting the Transient Effects of PWM Voltage Waveform on the Stator Windings of a Random Wound Induction Motors, " IEEE Transactions on Power Electronics, Vol. 14, No.1, Jan.1999, pp. 23-30.
167. H.A. Toliyat, "Analysis and Simulation of Five-Phase Variable Speed Induction Motor Drives Under Asymmetrical Connections," IEEE Transactions on Power Electronics, Vol. 13, No. 4, July 1998, pp. 748-756.
168. H.A. Toliyat, S. Waikar, T.A. Lipo, "Analysis and Simulation of Five Phase Synchronous Reluctance Machines Including Third Harmonic of Air-Gap MMF," IEEE Transactions on the Industry Applications, Vol. 34, No. 2, March/April 1998, pp. 332-339.
169. N.A. Al-Nuaim, and H.A. Toliyat, "A Novel Method for Modeling Dynamic Air-Gap Eccentricity in Synchronous Machines Based on Modified Winding Function Theory," IEEE Transactions on Energy Conversion, Vol. 13, No. 2, June 1998, pp. 156-162.
170. H.A. Toliyat, and N. Sargolzaei, "A Comprehensive Method for Transient Modeling of Single Phase Induction Motors Including the Space Harmonics" Journal of Electric Machines and Power Systems, Volume 26, No. 3, 1998, pp. 221-234.
171. M. Ehsani, K.M. Rahman, H.A. Toliyat, "Propulsion System Design of Electric and Hybrid Vehicles," IEEE Transactions on Industrial Electronics, Special Section on Electric Vehicles Technology, Vol. 44, No. 1, Feb. 1997, pp. 19-27.
172. H.A. Toliyat, M.S. Arefeen, A.G. Parlos, "A Method for Dynamic Simulation and Detection of Air-Gap Eccentricity in Induction Machines," IEEE Transactions on Industry Applications, Vol. 32, No. 4, July/August 1996, pp. 910-918.
173. H.A. Toliyat, J. Sadeh, and R. Ghazi, "Design of Augmented Fuzzy Logic Power System Stabilizers to Enhance Power System Stability," IEEE Transactions on Energy Conversion, Vol. 11, No. 1, March 1996, pp. 97-103.
174. H.A. Toliyat, and T.A. Lipo, "Transient Analysis of Cage Induction Machines Under Stator, Rotor Bar and End Ring Faults," IEEE Transactions on Energy Conversion, Vol. 10, No. 2, June 1995, pp. 241-247.
175. X. Luo, Y. Liao, H.A. Toliyat, A. El-Antably, and T.A. Lipo, "Multiple Coupled Circuit Modeling of Induction Machines," IEEE Transactions on Industry Applications, Vol. 31, No. 2, March/April 1995, pp.311-318.
176. H.A. Toliyat, and T.A. Lipo, "Analysis of Concentrated Winding Induction Machines for Adjustable Speed Drive Applications-Experimental Results," IEEE Transactions on Energy Conversion, Vol. 9, No. 4, Dec. 1994, pp. 695-700. (Best Transactions Prize Paper Award)
177. H.A. Toliyat, L. Xue, and T.A. Lipo, "A Five Phase Reluctance Motor with High Specific Torque," IEEE Transaction on Industry Applications, vol. 28, No. 3, May/June 1992, pp. 659-667.
178. H.A. Toliyat, T.A. Lipo, and J.C. White, "Analysis of a Concentrated Winding Induction Machine for Adjustable Speed Drive Applications- part I (Motor Analysis)," IEEE Transaction on Energy Conversion, vol. 6, No. 4, Dec. 1991, pp. 679-692.
179. H.A. Toliyat, T.A. Lipo, and J.C. White, "Analysis of a Concentrated Winding Induction Machine for Adjustable Speed Drive Applications- part II (Motor Design and Performance)," IEEE Transaction on Energy Conversion, vol. 6, No. 4, Dec. 1991, pp. 685-692.

Journal Papers under Review:

1. Y. Chen, and H.A. Toliyat, "Design of a Reconfigurable LCC Compensation Topology for Three-phase Wireless Charging," submitted to IEEE Transactions on Industry Applications, Oct. 2023.
2. S. Seyedi, and H.A. Toliyat, "A Novel Brushless Synchronous Machine with Compensated Wound-Field Winding Excited by Ultra Low Third-Harmonic Current," submitted to IEEE Transactions on Energy Conversion, Oct. 2022.
3. M. Albader, and H.A. Toliyat, "Wavelet Based Demodulation: A Diagnostic Method for Reliable Rotor Fault Index," submitted to Algorithms, October 2022.
4. A. Darwish, A.H. El-Hag, S.S. Refaat, H. Abu-Rub, G. Coapes, and H.A. Toliyat, "A Size Reduction Methodology for Structurally Symmetrical PD-Based Wideband UHF Antennas," submitted to IEEE Sensors Journal, Mar. 2022.
5. S. Hasanpour, M. Johnson, M. Gardner, B. Praslicka, A. Goodarzi, and H.A. Toliyat, "Design, Analysis, and Construction of Radial Flux Cycloidal Magnetic Gears with Reduced Permanent Magnet Piece Count Using Consequent Poles for High-Speed Applications," submitted to IEEE Transactions on Industry Applications, Nov. 2021.
6. D. Talebi, M. Gardner, M. Seyedi, and H.A. Toliyat, "An Asynchronously Excited Brushless Wound Field Synchronous Machine," submitted to IEEE Transactions on Energy Conversions, Feb. 2022.
7. A. Darwish, A.H. El-Hag, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "Impact of RFE and PCA Dimensionality Reduction Techniques on the Classification of Ceramic Insulators PD Defects," submitted to IEEE Sensors Letters, Nov. 2020.
8. A. Darwish, A.H. El-Hag, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "Detection of Damages in Ceramic Insulators using Time-Efficient Machine Learning based UHF Measurement System," submitted to IEEE Transactions on Instrumentation & Measurement, June 2020.
9. Q. Khan, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "Partial Discharge Modeling with Dissimilar Defect Inside the Cable Dielectric," submitted to IEEE Transactions on Power Delivery, Apr. 2020.

Conference Papers:

1. S.M. Seyedi, D. Talebi, and H.A. Toliyat, "Comparison between Pole-Phase Modulation (PPM) Technique and Modulated Rotational Harmonic (MRH) Excitation in Nine-Phase Brushless Wound-Field Synchronous Machine," To be presented at the IEEE-IEMDC 2025, Houston, TX.
2. S.M. Seydi, and H.A. Toliyat, "Performance Analysis and Control of Nine-Phase Electronic Pole-Changing Induction Motor (ePCIM) Operating at Different Modulated Magnetic Flux," To be presented at the IEEE-IEMDC 2025, Houston, TX.
3. F. Naghavi, G. Tao, and H.A. Toliyat, PRACL Converters for Motor Drive Applications, To be presented at ECCE 2024, Phoenix, AZ, Oct. 20-24, 2024.
4. S. Sheshaprasad, M. Johnson, and H.A. Toliyat, "Design and Analysis of Double-Sided Axial Flux Coaxial Magnetic Gears," To be presented at ECCE 2024, Phoenix, AZ, Oct. 20-24, 2024.
5. Y. Chen, M. Seyedi, and H.A. Toliyat, "Coil Design of Integrated LCC-S Compensation Topology for Wireless Charging," Proceedings of 2024 IEEE Transportation Electrification Conference & Expo, Rosemont, IL, June 19-21, 2024.
6. S.M. Seyedi, Y. Chen, and H.A. Toliyat, "Electromagnetic Characterization of Multiphase Electronic Pole-Changing Induction Machine (e-PCIM) with Modulated Rotating Magnetic Flux Produced by Transposed Current Excitation," Proceedings of 2024 IEEE Transportation Electrification Conference & Expo, Rosemont, IL, June 19-21, 2024.

7. Y. Chen, and H.A. Toliyat, "Design of a Rotational Misalignment Resistant Three-Phase Wireless Power Transfer Coil for AUVs, Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC 2024), Long Beach, CA, Feb. 25 -29, 2024.
8. D. Talebi, M. Gardner, S. Sankarraman, A. Daniar, H.A. Toliyat, "Electromagnetic Design Characterization of a Dual Rotor Axial Flux YASA Motor for Electric Aircraft," Proceedings of ECCE 2023, Nashville, TN, Oct. 29 – Nov. 2, 2023.
9. D. Talebi, S. Sri Vignesh, G. C. Matthew, H.A. Toliyat, "Stator Teeth Design for Axial Flux Permanent Magnet Dual Rotor Motors," Proceedings of ECCE 2023, Nashville, TN, Oct. 29 – Nov. 2, 2023.
10. S. Sheshaprasad, M. Johnson, and H.A. Toliyat, "Design Optimization of Radial Flux-Focusing Magnetic Gears," Proceedings of ECCE 2023, Nashville, TN, Oct. 29 – Nov. 2, 2023.
11. S. Hasanpour, M. Gardner, M. Johnson, H.A. Toliyat, "Optimization and Comparison of Permanent Magnet Synchronous Motors with Mechanically and Magnetically Coupled Magnetic Gears at Different Gear Ratios," Proceedings of ECCE 2023, Nashville, TN, Oct. 29 – Nov. 2, 2023.
12. S. Zhang, S. Chakravarty, D. Park, N. Malone, Y. Wang, E.T. Iverson, S.V. Sankarraman, D. Talebi, M. Seyedi, H. Toliyat, M.C. Gardner, J. Grunlan, J. Felts, B. Rasmussen, P. Shamberger, D. Antao, "A Hybrid Single/two Phase Cooling Approach Enabling Power Dense Electric Motors for Next Generation All-Electric Aircraft," Proceedings of the ASME 2023 Heat Transfer Summer Conference (SHTC2023), Washington DC, July 10-12, 2023.
13. Y. Chen, and H.A. Toliyat, "Design of a Three-Phase Inductive Power Transfer Coil with Interphase Mutual Inductance Reduction, Proceedings of IEEE-TPEC 2023, College Station, TX, Feb. 13-14, 2023.
14. Y. Chen, and H.A. Toliyat, "A Reconfigurable LCC-P/S Compensated Three-Phase Wireless Charging Topology with Constant Current and Constant Voltage Output," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC 2023), Orlando, FL, Mar. 19-23, 2023.
15. D. Talebi, M.C. Gardner, S.M. Seyedi, and H.A. Toliyat, "An Asynchronously Excited Brushless Wound Field Synchronous Machine," Proceedings of 2022 International Conference on Electrical Machines (ICEM), Valencia, Spain, Sept 5-8, 2022.
16. S. Rahman, S. Hasanpour, I. Khan, and H.A. Toliyat, and H. Hussain, "Power Dense High-Speed Motor-Generator System for Powering Futuristic Unmanned Aircraft System (UAS)," Proceedings of IEEE Industrial Electronics Society (IECON'22), Brussels, Belgium, Oct. 17-22, 2022.
17. D. Mustafa, H.A. Hussain, and H.A. Toliyat, "Design and Fault Analysis of Discrete Halbach Magnetic Screws," Proceedings of IEEE Industrial Electronics Society (IECON'22), Brussels, Belgium, Oct. 17-22, 2022.
18. S. Sheshaprasad, M.C. Gardner, M. Albader, H. Kang, and H.A. Toliyat, "Optimal Electric Power Take-off Strategy for Surface Riding Wave Energy Converter," Proceedings of ECCE 2022, Detroit, MI, Oct. 9-13, 2022.
19. D. Talebi, S. Sheshaprasad, M. Gardner, A. Crapo, P. Knauer, and H.A. Toliyat, "Design of an Extremely Efficient, Rare-Earth Free, 5 kW Motor in a NEMA 210 Frame," Proceedings of ECCE 2022, Detroit, MI, Oct. 9-13, 2022.
20. B. Praslicka, D. Knight, N. Palmer, A. White, L. Smith, and H.A. Toliyat, "Design and Analysis of an Axial Flux Coaxial Magnetic Gear with Balanced Axial Forces for Precision Aerospace Actuation Applications," Proceedings of ECCE 2022, Detroit, MI, Oct. 9-13, 2022.

21. S.M. Seyedi, D. Talebi, M. Albader, and H.A. Toliyat, "Design Characteristics of Unequal-Turn Sinusoidal Wound Rotor Winding in Brushless Doubly-Fed Induction Generator," Proceedings of 2022 IEEE/AIAA Transportation Electrification Conference and Electric Aircraft Technologies Symposium, Anaheim, CA, June 15-17, 2022.
22. B. Praslicka, L. Smith, H.A. Toliyat, A. White, N. Palmer, D. Knight, J. Park, M. Elyian, and J. Jones, "A Multi-Objective System Optimization for Sizing and Design of a Novel Multi-Stage Magnetically-Geared Servo Motor for Aerospace Applications," Proceedings of 2022 IEEE/AIAA Transportation Electrification Conference and Electric Aircraft Technologies Symposium, Anaheim, CA, June 15-17, 2022.
23. F. Naghavi, and H.A. Toliyat, "A Single-Stage Bidirectional Soft-Switching AC-DC Converter," Proceedings of 2022 IEEE/AIAA Transportation Electrification Conference and Electric Aircraft Technologies Symposium, Anaheim, CA, June 15-17, 2022.
24. F. Naghavi, and H.A. Toliyat, "Grid-connected Soft Switching Partial Resonance Inverter for Distributed Generation", Proceedings of the IEEE-ISIE'2022, Anchorage, Alaska, June 1-3, 2022.
25. F. Naghavi, and H.A. Toliyat, "A Soft-Switching Single-Stage AC-DC Converter," Proceedings of IEEE-TPEC 2022, College Station, TX, Feb. 28 – Mar. 1, 2022.
26. Q. Khan, S.S. Refaat, H. Abu-Rub, H.A. Toliyat, and M. Olesz, "Modeling and Evaluation of Electric Treeing Phenomena in Polymeric Cable Insulation," Proceedings of IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), Vancouver, BC, Canada, Dec. 12-15, 2021.
27. A. Darwish, A.H. El-Hag, S.S. Refaat, H. Abu-Rub, H.A. Toliyat, "Impact of Dimensionality Reduction Techniques on the Classification of Ceramic Insulators Defects," Proceedings of IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), Vancouver, BC, Canada, Dec. 12-15, 2021.
28. Q. Khan, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "A Computational Model for Aging Dependability in Polymeric Cable Insulation," IEEE Industrial Electronics Society (IECON'21), Toronto, ON, Canada, Oct. 13-16, 2021.
29. M. Johnson, S. Hasanpour, M.C. Gardner, and H.A. Toliyat, "Analysis and Benchmarking of Radial Flux Cycloidal Magnetic Gears with Reduced Permanent Magnet Piece Count using Consequent Poles," Proceedings of IEEE Energy Conversion Congress and Exposition (ECCE2021), Vancouver, Canada, Oct. 10-14, 2021.
30. F. Naghavi, S. Sheshaprasad, M. Gardner, H-Y. Kang and H.A. Toliyat, "Permanent Magnet Linear Generator Design for Surface Riding Wave Energy Converters," Proceedings of IEEE Energy Conversion Congress and Exposition (ECCE2021), Vancouver, Canada, Oct. 10-14, 2021.
31. M. Albader, and H.A. Toliyat, "Wavelet Based Demodulation: A Diagnostic Method for Reliable Rotor Fault Index," Proceedings of IEEE Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives (SDEMPED'21), Richardson, TX, Aug. 22-25, 2021.
32. S. Hasanpour, S. Sheshaprasad, M. Gardner, M. Johnson, B. Praslicka, H.A. Toliyat, "Design and Control of a Fault Tolerant Permanent Magnet Motor with Independently Optimized Phase and Pole Counts," Proceedings of IEEE Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives (SDEMPED'21), Richardson, TX, Aug. 22-25, 2021.
33. D. Talebi, M. Gardner, S.V. Sankarraman, A. Daniar, and H.A. Toliyat, "Electromagnetic Design Characterization of a Dual Rotor Axial Flux Motor for Electric Aircraft," Proceedings of IEEE International Electric Machines and Drives Conference (IEMDC'21), Mohegan Sun, CT, May 17-20, 2021.

34. B. Praslicka, M. Johnson, D. Zamarron, A. Marshall, S. Hasanpour, A. Nguyen, A. Goodarzi, E. Bauk, and H.A. Toliyat, "Practical Analysis and Design of a 50:1 Cycloidal Magnetic Gear with Balanced Off-Axis Moments and a High Specific Torque for Lunar Robots," Proceedings of IEEE International Electric Machines and Drives Conference (IEMDC'21), Mohegan Sun, CT, May 17-20, 2021.
35. B. Praslicka, M.C. Gardner, and H.A. Toliyat, "Application of High Performance Research Computing to Parametric Design of Magnetic Gears using a Genetic Algorithm, Proceedings of The International Conference Computing, Networking, Storage, and Analysis (SC20), Nov. 17-19, 2020.
36. S. Hasanpour, M. Gardner, and H.A. Toliyat, "Comparison of Reluctance and Surface Permanent Magnet Coaxial Magnetic Gears," Proceedings of the ECCE 2020, Detroit, MI, Oct. 11-15, 2020.
37. B. Praslicka, M.C. Gardner, E. Dangtran, and H.A. Toliyat, "Effects of Misalignment in Axial Flux Magnetic Gears," Proceedings of the ECCE 2020, Detroit, MI, Oct. 11-15, 2020.
38. A. Darwish, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "Partial Discharge Signal Propagation in Three-Phase Gas-Insulated Switchgear: CIGRE Recommendations-Based Analysis," Proceedings of the ECCE 2020, Detroit, MI, Oct. 11-15, 2020.
39. A. Morya, A.G. Yepes, J. Duval-Gandoy, and H.A. Toliyat, "Evaluation of Current Distortion Improvement in as Asymmetrical Six-Phase Drive by Using SiC MOSFETs with Reduced Dead Time," Proceedings of the ECCE 2020, Detroit, MI, Oct. 11-15, 2020.
40. Q. Khan, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "Computational Model of Aging Dependability in Polymeric Cable Insulation," Proceedings of the IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), 2020.
41. Q. Khan, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "Partial Discharge Modelling of Internal Discharge in Electrical Machine Stator Winding," Proceedings of Kansas Power and Energy Conference (KPEC), July 13-14, 2020.
42. A. Darwish, and H.A. Toliyat, "UHF Partial Discharge Localization in Gas-Insulated Switchgears: Gradient Boosting Based Approach," Proceedings of Kansas Power and Energy Conference (KPEC), July 13-14, 2020.
43. M. Albader, and H.A. Toliyat, "Wavelet Scattering Transform Based Induction Motor Current Signature Analysis," Proceedings of the International Conference on Electrical Machines (ICEM'20), Gothenburg, Sweden, Aug. 23-26, 2020.
44. Q. Khan, S.S. Refaat, H.Abu-Rub, H.A. Toliyat, "A Computational Model for Pre-Breakdown in Gas Insulated Switchgear," Proceedings of the IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), Richland, Washington, USA, Oct. 20-23, 2019.
45. A. Darwish, S. Refaat, H.A. Toliyat, H. Abu-Rub, and Q. Khan, "Partial Discharge Signal Propagation in T-Structures GIS," Proceedings of the IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), Oc. 20-23, 2019, Richland, Washington, CEIDP 2019.
46. M.C. Gardner, M. Johnson and H.A. Toliyat, "Performance Impacts of Practical Fabrication Tradeoffs for a Radial Flux Coaxial Magnetic Gear with Halbach Arrays and Air Cores," Proceedings of the IEEE Energy Conversion Congress and Exposition (ECCE'19), Baltimore, MD, Sep. 29 - Oct. 3, 2019.
47. A. Darwish, S.S. Refaat, H. Abu-Rub, and H.A. Toliyat, "PD Signal Propagation Delay in GAS Insulated Switchgear," Proceedings of the 17th International Symposium on Electrets (ISE 2019), Sep. 2-6, 2019, Limerick, Ireland.

48. M.C. Gardner, M. Johnson, and H.A. Toliyat, "A Parameterized Linear Magnetic Equivalent Circuit for Analysis and Design of Radial Flux Magnetic Gears-Part I: Implementation," Proceedings of 2019 IEEE PES General Meeting, Atlanta, GA, Aug. 4-8, 2019.
49. M.C. Gardner, P. Luo, M. Johnson, and H.A. Toliyat, "Streaming Simulation and Data Transfer in a Heterogeneous Environment," Proceedings of Practice and Experience in Advanced Research Computing (PEARC19), Chicago, IL, July 28 – Aug. 1, 2019.
50. M. Gardner, H.A. Toliyat, "Nonlinear Analysis of Magnetic Gear Dynamics using Superposition and Conservation of Energy," Proceedings of IEEE International Electric Machines & Drives Conference (IEMDC), San Diego, CA, May 12-15, 2019.
51. M. Gardner, Y. Zhang, D. Talebi, H.A. Toliyat, A. Crapo, P. Knauer, and H. Willis, "Loss Breakdown of a Dual Conical Rotor Permanent Magnet Motor using Grain Oriented Electrical Steel and Soft Magnetic Composites," Proceedings of the IEEE International Electric Machines & Drives Conference (IEMDC), San Diego, CA, May 12-15, 2019.
52. M. Moosavi, and H.A. Toliyat, "A Scalable Soft-Switching Photovoltaic Inverter with Cascaded H-Bridge Cells and Isolation," Proceedings of the IEEE Applied Power Electronics Conference and Exposition (APEC 2019), Anaheim, CA, March 17-21, 2019.
53. K. Al Jaafari, A. Negahdari, and H.A. Toliyat, "Synchronous Generators Stator Ground Fault Detection using Wavelet Theory," Proceedings of the 44th Annual Conference of the IEEE Industrial Electronics Society, Washington D.C, Oct. 21-23, 2018.
54. A. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Carrier-Based PWM with Enhanced DC-Link Exploitation for Five-Phase Machines with Circulating-Current Filters," Proceedings of the 44th Annual Conference of the IEEE Industrial Electronics Society, Washington D.C, Oct. 21-23, 2018.
55. A. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Disturbance Rejection Enhancement for Three-Phase Converters by Active Inductance," Proceedings of the 44th Annual Conference of the IEEE Industrial Electronics Society, Washington D.C, Oct. 21-23, 2018.
56. A. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Improvement of Postfault Performance of Multiphase Drives in Terms of Operating Region and Stator Copper Loss," Proceedings of the 44th Annual Conference of the IEEE Industrial Electronics Society, Washington D.C, Oct. 21-23, 2018.
57. M. Gardner, M. Johnson, and H.A. Toliyat, "Comparison of Surface Permanent Magnet Coaxial and Cycloidal Radial Flux Magnetic Gears," Proceedings of 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, Sep. 23-27, 2018.
58. M. Gardner, D. Janak, and H.A. Toliyat, "A Parameterized Linear Magnetic Equivalent Circuit for Air Core Radial Flux Coaxial Magnetic Gears with Halback Arrays," Proceedings of 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, Sep. 23-27, 2018.
59. A. Yepes, J. Doval-Gandoy, and H.A. Toliyat, "Multifrequency Current Control for Multiphase Machines with Antiwindup, Distortion-Free Saturation and Full DC-Link Utilization," Proceedings of 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, Sep. 23-27, 2018.
60. A. Yepes, J. Doval-Gandoy, F. Baneira, and H.A. Toliyat, "Control Strategy for Dual Three-Phase Machines with Two Open Phases Providing Minimum Loss in the Full Torque Operation Range," Proceedings of 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, Sep. 23-27, 2018.

61. A. Yepes, J. Doval-Gandoy, F. Baneira, and H.A. Toliyat, "Performance Comparison of Stator Winding Connections in Multiphase Drives under Open Converter Leg," Proceedings of 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, Sep. 23-27, 2018.
62. B. Anvari, M. Kaya, S. Hajimirza, H.A. Toliyat, and S. Englebreton, "Surrogate-Based Optimization of Firing Angles for Switched Reluctance Motor," Proceedings of the 2018 IEEE Transportation Electrification Conference & Expo, Long Beach, CA, June 13-15, 2018.
63. A. Morya, and H.A. Toliyat, "Insulation Design for Wide Bandgap (WBG) Device Based Converter-Fed Motors," Proceedings of 2017 IEEE 5th Workshop on Wide Bandgap Power Devices and Applications, Albuquerque NM, Oct. 30 –Nov. 1, 2017.
64. M. Johnson, M. Gardner, H. A. Toliyat, S. Englebreton, W. Ouyang and C. Tschida, "Design, Construction, and Analysis of a Large Scale Inner Stator Radial Flux Magnetically Geared Generator for Wave Energy Conversion," Proceedings of 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, Oct. 1-5, 2017.
65. H.A. Hussain, and H.A. Toliyat, "A Fault Monitoring System for a Reciprocating Pump Driven by a Linear Motor for Oil Pumping Systems," Proceedings of 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, Oct. 1-5, 2017.
66. H.A. Hussain, and H.A. Toliyat, "Position Sensorless Control of a Permanent Magnet Linear Motor Connected Through a Long Cable", Proceedings of 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, Oct. 1-5, 2017.
67. A. Negahdari, K. Al Jaafari, H.A. Toliyat, N. Safari-Shad, and R. Franklin, "Reliability Analysis of an Adaptive Third-Harmonic Differential Voltage Stator Ground Fault Protection Scheme Using a Lab-Scale Generating Station," Proceedings of 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, Oct. 1-5, 2017.
68. B. Anvari, and H.A. Toliyat, "Simultaneous Optimization of Hub-Mounted Switched Reluctance Motor Geometry and Firing Angles," Proceedings of 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, Oct. 1-5, 2017.
69. A.G. Yepes, J. Doval-Gandoy, F. Baneira, and H.A. Toliyat, "Speed Estimation Based on Rotor Slot Harmonics in Multiphase Induction Machines Under Open-Phase Fault," Proceedings of 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, Oct. 1-5, 2017.
70. N. Torabi, F. Naghavi, and H.A. Toliyat, "Real Time Fault Isolation in Multi-Phase Multi-level NPC Converters Using Active Semi-supervised Fuzzy Clustering Algorithm with Pairwise Constraints," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
71. B. Anvari, y. Li, and H.A. Toliyat, "Real-Time Digital Control of Switched Reluctance Motor for Torque Ripple Minimization," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
72. B. Anvari, X. Li, H.A. Toliyat, A. Palazzolo, Z. Wang, and X. Han, "An Air-Core Permanent Magnet Machine for a Magnetically Levitated Shaft-Less Flywheel," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
73. H.A. Hussain, B. Anvari, and H.A. Toliyat, "A Control Method for Linear Permanent Magnet Electric Submersible Pumps in a Modified Integrated Drive-Motor System," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.

74. M.C. Gardner, B.E. Jack, M. Johnson, and H.A. Toliyat, "Comparison of Coaxial Radial Flux Magnetic Gears Independently Optimized for Volume, Cost, and Mass," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
75. A. Morya, M. Moosavi, M.C. Gardner, and H.A. Toliyat, "Applications of Wide Bandgap (WBG) Devices in AC Electric Drives," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
76. A. Negahdari, and H.A. Toliyat, "Post-Assembly Magnetization of Rare-Earth Permanent Magnet Materials in Permanent Magnet Assisted Synchronous Reluctance Motors," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
77. S.B. Ozturk, O.C. Kivanc, b. Atila, S. Rehman, B. akin, and H.A. Toliyat, "A Simple Least Squares Approach for Low Speed Performance Analysis of Indirect FOC Induction Motor Drive Using Low-Resolution Position Sensor," Proceedings of 2017 IEEE International Electric Machines and Drives Conference (IEMDC), Miami, FL, May 21-24, 2017.
78. M. Moosavi, and H.A. Toliyat, "An Isolated Soft-Switching High Step-up DC-DC Converter with Stacked Output Cells," Proceedings of 2017 IEEE Applied Power Electronics Conference (APEC), Tampa, FL, Mar. 26-30, 2017.
79. N. Torabi, and H.A. Toliyat, "Fault Diagnosis of Multi Phase Drives Using Machine Learning Techniques," Proceedings of 2017 IEEE Applied Power Electronics Conference (APEC), Tampa, FL, Mar. 26-30, 2017.
80. K. Al Jaafari, A. Negahdari, H.A. Toliyat, N. Safari-Shad, R. Franklin, "Experimental Verification of a Novel Adaptive Stator Ground Fault Protection for Synchronous Generators,' Proceedings of ICEM 2016, Lausanne, Switzerland, Sep. 4-7, 2016.
81. M. Johnson, M.C. Gardner and H. A. Toliyat, "Design Comparison of NdFeB and Ferrite Radial Flux Magnetic Gears," Proceedings of IEEE-ECCE 2016, Milwaukee, WI, Sep. 18-22, 2016.
82. A. Negahdari, V. Sundaram, and H.A. Toliyat, "An Analytical Approach for Determining Harmonic Cusps and Torque Dips in Line-Start Synchronous Reluctance Motors (LSSyn-RM)," Proceedings of IEEE-ECCE 2016, Milwaukee, WI, Sep. 18-22, 2016.
83. V. M. Sundaram and H.A. Toliyat, "Stator Inter-Turn Fault Detection and Seamless Fault Tolerant Control of Five-Phase Induction Motors," Proceedings of IEEE-ECCE 2016, Milwaukee, WI, Sep. 18-22, 2016.
84. M. Moosavi and H.A. Toliyat, "Soft Switching Push-Pull Converter with Parallel Resonant Link and Buck-Boost Capability," Proceedings of IEEE-ECCE 2016, Milwaukee, WI, Sep. 18-22, 2016.
85. A. Negahdari, and H.A. Toliyat, "Studying Crawling Effect in Line-Start Synchronous Reluctance Motors (LSSyn-RM), Proceedings of 2016 IEEE Symposium on Industrial Electronics (ISIE'16), Santa Clara, CA, June 8-10, 2016.
86. B. Anvari, Y. Li, and H.A. Toliyat, "Design of Multiphase Exterior Rotor Switched Reluctance Motor for Traction Applications, Proceedings of 2016 IEEE Symposium on Industrial Electronics (ISIE'16), Santa Clara, CA, June 8-10, 2016.
87. H. Hussain, and H.A. Toliyat, "Field Oriented Control of Tubular PM Linear Motor using Linear Hall Effect Sensors," Proceedings of SPEEDAM 2016, Capri, Italy, June 22-24, 2016.
88. M. Johnson, M. Gardner, and H.A. Toliyat, "Analysis and Development of an Axial Flux Magnetically Geared Generator, Proceedings of the ECCE'15, Montreal, Canada, Sept. 20-24, 2015. (Second Prize Paper Award by the IEEE IAS Electric Machines Technical Committee)

89. M. Johnson, M. Gardner, and H.A. Toliyat, "Analysis of axial Field Magnetic Gears with Halbach Arrays," Proceedings of the IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
90. B. Anvari, Y. Li, and H.A. Toliyat, "Comparison of Outer Rotor Permanent Magnet and Magnet-less Generators for Direct Drive Wind Turbine Applications," Proceedings of the IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
91. H. Hussain, H.A. Toliyat, "Back-EMF Based Sensorless Vector Control of Tubular PM Linear Motors," Proceedings of the IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
92. V. Sundaram, and H.A. Toliyat, "A Fractional Slot Concentrated Winding (FSCW) Configuration for Outer Rotor Squirrel Cage Induction Motors," Proceedings of the IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
93. J.B. Park, M. Moosavi, and H.A. Toliyat, "Electromagnetic Thermal Coupled Analysis for Interior PMSM," Proceedings of the IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
94. S. Pakdelian, H. Hussain, M. Mousavi, H.A. Toliyat, "Control of a Machine-Integrated Trans-Rotary Magnetic Gear in a Motoring Drive Train," Proceedings of the IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
95. B. Farhangi, and H.A. Toliyat, "A Novel Vehicular Integrated Power System Realized with Multi-port Series AC Link Converter," Proceedings of the IEEE Applied Power Electronics Conference and Exposition (APEC'2015), Charlotte, NC, March 15-19, 2015.
96. J-B. Park, M. Johnson, and H.A. Toliyat, "Interior PMSM Double Layer Rotor Core Parametric Design study," Proceedings of the 40th Annual Conference of the IEEE Industrial Electronics Society (IECON'14), Dallas, TX, Oct. 28-Nov. 1, 2014.
97. B. Farhangi, and H.A. Toliyat, "Piecewise Linear Modeling of Snubberless Dual Active Bridge Commutation, Proceedings of IEEE Energy Conversion Congress & Expo (ECCE'14), Pittsburgh, PA, Sept. 15-18, 2014.
98. J-B. Park, M. Johnson, and H.A. Toliyat, "A Novel Hysteresis Current Control Switching Method for Torque Ripple Minimization in Multi-Phase Motors," Proceedings of IEEE Energy Conversion Congress & Expo (ECCE'14), Pittsburgh, PA, Sept. 15-18, 2014.
99. S. Pakdelian, and H.A. Toliyat, "Dynamics and Control of the Trans-Rotary Magnetic Gear for the Point-Absorbing Wave Energy Conversion Systems," Proceedings of IEEE Energy Conversion Congress & Expo (ECCE'14), Pittsburgh, PA, Sept. 15-18, 2014.
100. M. Johnson, A. Shapoury, H.A. Toliyat, P. Boghrat, and M. Post, "Analysis and Development of an Axial Flux Magnetic Gear," Proceedings of IEEE Energy Conversion Congress & Expo (ECCE'14), Pittsburgh, PA, Sept. 15-18, 2014.
101. Y. Deshpande, and H.A. Toliyat, "Design of an Outer Rotor Ferrite Assisted Synchronous Reluctance Machine (Fa-SynRM) for Electric Two Wheeler Application," Proceedings of IEEE Energy Conversion Congress & Expo (ECCE'14), Pittsburgh, PA, Sept. 15-18, 2014.
102. M. Johnson, A. Shapoury, H.A. Toliyat, P. Boghrat, and M. Post, "Review of Magnetically Geared Motors and Analysis of their Potential for Naval Propulsion Applications," Proceedings of Electric Machines Technology Symposium (EMTS 2014), Philadelphia, PA, May 28-29, 2014.
103. M. Amirabadi, H.A. Toliyat, and W. Alexander, "Single-phase Soft-switching ac-Link Buck-Boost Inverter," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC'2014), Fort Worth, Texas, March 16-20, 2014.

104. M. Amirabadi, H.A. Toliyat, and W. Alexander, "Single-Stage Soft-Switching ac-Link ac-ac and dc-ac Buck-boost Converters with Unrestricted Load Power Factor," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC'2014), Fort Worth, Texas, March 16-20, 2014.
105. H. Keyhani, M. Johnson, and H.A. Toliyat, "A Soft-Switched Highly Reliable Grid Tied Inverter for PV Applications," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC'2014), Fort Worth, Texas, March 16-20, 2014.
106. Sk.M. Ahmed, M. Amirabadi, H. Abu-Rib, and H.A. Toliyat, "Development of a New Three-to-Five Phase Bi-directional Partial Resonant AC Link Converter," Proceedings of IECON'13, Nov. 10-13, 2013, Vienna, Austria.
107. B. Farhangi, and H.A. Toliyat, "Modeling Isolation Transformer Capacitive Components in a Dual Active Bridge Power Conditioner," Proceedings of the IEEE Energy Conversion Congress & Expo (ECCE'13), Denver, CO, Sep. 15-19, 2013.
108. M. Amirabadi, J. Baek, and H.A. Toliyat, "Ultra-Sparse AC-Link Converters," Proceedings of the IEEE Energy Conversion Congress & Expo (ECCE'13), Denver, CO, Sep. 15-19, 2013.
109. M. Amirabadi, and H.A. Toliyat, "Novel Bi-directional Series Partial Resonant Inverter for Battery-Utility Interface," Proceedings of the IEEE Energy Conversion Congress & Expo (ECCE'13), Denver, CO, Sep. 15-19, 2013.
110. H. Keyhani, and H.A. Toliyat, "A Single-Stage Multi-String Resonant Inverter for Grid-Tied Photovoltaic Systems," Proceedings of the IEEE Energy Conversion Congress & Expo (ECCE'13), Denver, CO, Sep. 15-19, 2013.
111. H. Keyhani, and H.A. Toliyat, "A ZVS Single-Inductor Multi-Input Multi-Output DC-DC Converter with the Step Up/Down Capability," Proceedings of the IEEE Energy Conversion Congress & Expo (ECCE'13), Denver, CO, Sep. 15-19, 2013.
112. R. Vartanian, Y. Deshpande, and H.A. Toliyat, "Performance Analysis of a Rare Earth Magnet Based NEMA Frame Permanent Magnet Assisted Synchronous Reluctance Machine (PMa-SynRM) with Different Magnet Type and Quantity," Proceedings of the IEMDC'13, Chicago, IL.
113. R. Vartanian, Y. Deshpande, and H.A. Toliyat, "Performance Analysis of a Ferrite-Based Fractional Horsepower Permanent Magnet-Assisted Synchronous Reluctance Motor for Fan and Pump Applications," Proceedings of the IEMDC'13, Chicago, IL.
114. J-B. Park, M. Johnson, and H.A. Toliyat, "Integrated Torque Ripple Analysis Method for Multi-Phase Motors," Proceedings of the IEMDC'13, Chicago, IL.
115. B. Farhangi, H.A. Toliyat, and A. Balaster, "High Impedance Grounding for Onboard Plug-in Hybrid Electric Vehicle Chargers," Proceedings of the 4th IEEE International Conference on Power Engineering, Energy and Electrical Drives (POWERENG), Istanbul, Turkey, May 13-17, 2013.
116. H. Keyhani, and H.A. Toliyat, "A New Generation of Buck-Boost Resonant AC-Link DC-DC Converters," Proceedings of the IEEE Applied Power Electronics Conference and Exposition-APEC'13, Long Beach, CA, March. 17-21, 2013.
117. H. Keyhani, and H.A. Toliyat, "A New Three-Phase Resonant High-Frequency AC-Link Inverter," Proceedings of the IEEE Applied Power Electronics Conference and Exposition-APEC'13, Long Beach, CA, March. 17-21, 2013.
118. M. Amirabadi, and H.A. Toliyat, "A Highly Reliable Converter for Wind Power Generation Application," Proceedings of IEEE the Applied Power Electronics Conference and Exposition-APEC'13, Long Beach, CA, March. 17-21, 2013.

119. M. Amirabadi, and H.A. Toliyat, "Sparse Parallel Partial Resonant ac Link Inverter," Proceedings of the IEEE Applied Power Electronics Conference and Exposition-APEC'13, Long Beach, CA, March. 17-21, 2013.
120. S. Pakdelian, and H.A. Toliyat, "Design Aspects of the Trans-Rotary Magnetic Gear," Proceedings of the IEEE-IECON'12, Montreal, Canada, Oct. 25-28, 2012.
121. Y. Deshpande, and H.A. Toliyat, "Standstill Position Estimation of SPMSM – Robustness to Manufacturing Tolerances," Proceedings of the IEEE-IECON'12, Montreal, Canada, Oct. 25-28, 2012.
122. M. Amirabadi, H.A. Toliyat, and W.C. Alexander, "Partial Resonant AC Link Converter: A Highly Reliable Variable Frequency Drive," Proceedings of the IEEE-IECON'12, Montreal, Canada, Oct. 25-28, 2012.
123. H. Keyhani, H.A. Toliyat, M. Harfman Todorovic, R. Lai, and R. Datta, "Isolated Soft-Switching HFAC-Link 3-Phase AC-AC Converter using a Single-Phase HF Transformer," Proceedings of the IEEE-IECON'12, Montreal, Canada, Oct. 25-28, 2012.
124. H. Hussain, and H.A. Toliyat, "Reduction of Shaft Voltages and Bearing Currents in Five-Phase Induction Motors," Proceedings of IEEE Energy Conversion Congress & Exposition (IEEE-ECCE'12), Raleigh, North Carolina, Sep. 15-20, 2012.
125. H. Keyhani, and H.A. Toliyat, "A Soft-Switching Three-Phase AC-AC Converter with a High Frequency AC Link," Proceedings of IEEE Energy Conversion Congress & Exposition (IEEE-ECCE'12), Raleigh, North Carolina, Sep. 15-20, 2012.
126. M. Amirabadi, and H.A. Toliyat, "A New Class of PV Inverters," Proceedings of IEEE Energy Conversion Congress & Exposition (IEEE-ECCE'12), Raleigh, North Carolina, Sep. 15-20, 2012.
127. M. Amirabadi, H. Hussain, and H.A. Toliyat, "Bi-directional Partial Resonant Converters with Reduced Number of Switches," Proceedings of IEEE Energy Conversion Congress & Exposition (IEEE-ECCE'12), Raleigh, North Carolina, Sep. 15-20, 2012.
128. S. Pakdelian, Y. Deshpande, and H.A. Toliyat, "Winding Integrated Trans-Rotary Magnetic Gear," Proceedings of IEEE Energy Conversion Congress & Exposition (IEEE-ECCE'12), Raleigh, North Carolina, Sep. 15-20, 2012.
129. S. Pakdelian, and H.A. Toliyat, "Analysis and Design of a Trans-Rotary Magnetic Gear," Proceedings of IEEE Energy Conversion Congress & Exposition (IEEE-ECCE'12), Raleigh, North Carolina, Sep. 15-20, 2012.
130. Y. Duan, H. A. Toliyat, "A review of condition monitoring and fault diagnosis for permanent magnet machines," Proceedings of IEEE Power Energy Society General Meeting, July 22-27, 2012, San Diego, CA, pp. 1–4.
131. S. Pakdelian, and H.A. Toliyat, "Trans-Rotary Magnetic Gear," Proceedings of IEEE-PES General Meeting, July 22-27, 2012, San Diego, CA.
132. M. Amirabadi, and H.A. Toliyat, "A Multi-input ac Link PV Inverter with Reduced Size and Weight," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC 2012), Orlando, FL, Feb. 5-9, 2012.
133. H. Keyhani, and H.A. Toliyat, "Flying Capacitor Boos Converter," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC 2012), Orlando, FL, Feb. 5-9, 2012.
134. R. Vartanian, and H.A. Toliyat, "Power Factor Improvement of Synchronous Reluctance Motors (SynRM) using Permanent Magnets for Drive Size Reduction," Proceedings of IEEE Applied Power Electronics Conference and Exposition (APEC 2012), Orlando, FL, Feb. 5-9, 2012.

135. N. Frank, S. Pakdelian, and H.A. Toliyat, "Damper Windings for the Magnetic Gear," Proceedings of the 2011 IEEE Energy Conversion Congress and Exposition (IEEE-ECCE'11), Phoenix, AZ, Sep. 17-22, 2011.
136. H. Abu-Rub, S. Moin Ahmed, A. Iqbal, H.A. Toliyat, and M.M. Rahimian, "Incipient Bearing Fault Detection for Three-Phase Brushless DC Motor Drive using ANFIS," Proceedings of the 8th IEEE International Symposium on Diagnostics for Electrical Machines, Power Electronics & Drives, SDEMPED'11, Bologna, Italy, Sep. 5-8, 2011, pp. 620-625.
137. V. Sundaram, and H.A. Toliyat, "Diagnosis and Isolation of Air-gap Eccentricities in Closed-loop Controlled Doubly-Fed Induction Generators," Proceedings of IEMDC'11, May14-19, 2011, Niagara Falls, Canada.
138. N.W. Frank, S. Pakdelian, and H.A. Toliyat, "A Magnetic Gear with Passive Transient Suppression Capability," Proceedings of 2011 IEEE Electric Ship Technology Symposium (ESTS), April 10-14, 2011, Alexandria, VA.
139. V. Sundaram, and H.A. Toliyat, "Air Gap Eccentricity Fault Detection in DFIG-Based Wind Energy Conversion Systems," Proceedings of the 2011 International Conference & Exhibition on Ecological & Renewable Energies (EVER 2011), March 31 – April 3, 2011, Monte-Carlo, Monaco.
140. H. Abu-Rub, Sk. Moin Ahmed, A. Iqbal, H.A. Toliyat, M.M. Rahimian, "Incipient Bearing Fault Diagnosis for Closed-Loop Inverter-Fed PMSM Drive using ANFIS, Proceedings of the Jordanian International Electrical and Electronics Engineering Conference, Amman, Jordan, April 11-14, 2011.
141. N. Frank and H.A. Toliyat, "Analysis of a Concentric Planetary Magnetic Gear with Strengthened Stator and Interior Permanent Magnet (IPM) Inner Rotor," Proceedings of IEEE-ECCE'10, Sep. 11-16, 2010, Atlanta, GA.
142. H. Abu-Rub, S. M. Ahmed, A. Iqbal, M. Rahimian, and H.A. Toliyat, "Incipient Bearing Fault Diagnostics for Inverter Fed Induction Motor Drive using ANFIS," Proceedings of ICEM'10, Rome, Italy, Sep. 6-8, 2010, pp. 1-5.
143. J. Guzinski, H. Abu-Rub, and H.A. Toliyat, "Speed Sensorless AC Drive with Inverter Output Filter and Fault Detection using Load Torque Signal," Proceedings of ISIE 2010, July 4-7, 2010, Bari, Italy.
144. A.K. Chakali, and H.A. Toliyat, and H. Abu-Rub, "Observer-Based Sensorless Speed Control of PM-Assisted SynRM for Direct Drive Applications," Proceedings of IEEE International Symposium on Industrial Electronics (ISIE-2010), Bari, Italy, July 4-7, 2010.
145. Y. Kumsuwan, W. Srirattanawichaikul, S. Premrudeepreechacharn, and H.A. Toliyat, "A Carrier-Based Unbalanced PWM Method for Four-Leg Voltage Source Inverter Fed Asymmetrical Two-Phase Induction Motor, Proceedings of International Power Electronics Conference – ECCE ASIA (IPEC-Sapporo2010), Sapporo, Japan, June 21-24.
146. S.D. Choi, B. Akin, M.M. Rahimian, H.A. Toliyat, "A Robust Sensorless Fault Diagnosis Algorithm for Low Cost Motor Drives," Proceedings of IEEE-APEC'10, Palm Spring, CA, Feb. 21-25, 2010.
147. Y. Kumsuwan, W. Srirattanawichaikul, S. Premrudeepreechacharn, and H.A. Toliyat, "A Four-leg Voltage Source Inverter Fed Asymmetrical Two-Phase Induction Motor Drive," Proceedings of the 5th IET International Conference on Power Electronics, Machines and Drives, April 19-21, 2010, Brighton, UK.
148. J. Baek, M.M. Rahimian, and H.A. Toliyat, "Optimal Design of PM assisted Synchronous Reluctance Generators using Lumped Parameter Model and Differential Evolution Strategy," Proceedings of the ECCE'09, San Jose, CA, Sep. 20-24, 2009.

149. M. Amirabadi, H.A. Toliyat, and W. Alexander, "Battery-Utility Interface using Soft Switched AC Link supporting Low Voltage Ride Through," Proceedings of the ECCE'09, San Jose, CA, Sep. 20-24, 2009.
150. P. Rasmussen, T. Jahns, H.A. Toliyat, H-H. Mortensen, and T. Matzen, "Motor Integrated Permanent Magnet Gear with a Wide Torque-Speed Range," Proceedings of the ECCE'09, San Jose, CA, Sep. 20-24, 2009.
151. S.D. Choi, B. Akin, M.M. Rahimian, H.A. Toliyat, "Condition Monitoring Technique of Induction Machines with Ordered Harmonic and Noise Cancelation," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
152. S.D. Choi, B. Akin, M.M. Rahimian, H.A. Toliyat, M. Azadpour, and M. Rayner, "Condition Monitoring Technique of Multiphase Induction Machine," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
153. J. Baek, and H.A. Toliyat, "Optimal Design and Comparison of Stator Winding Configurations in Permanent Magnet-Assisted Synchronous Reluctance Generators (PMa-SynRG)," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
154. M. Amirabadi, H.A. Toliyat, W.C. Alexander, "Battery-Utility Interface using Soft Switched AC Link Buck-Boost Converter," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
155. N.W. Frank, and H.A. Toliyat, "Gearing Ratios of a Magnetic Gear for Wind Turbines," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
156. H.A. Toliyat, B. Nikbakhtian, S. Talebi, and P. Niazi, "A Mathematical Modeling of an "N" Flux Barrier per Pole Permanent Magnet-Assisted Synchronous Reluctance Motor for Analytical Purposes," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
157. M.T. Abolhassani, and H.A. Toliyat, "Fault Tolerant Permanent Magnet Motor Drives for Electric Vehicles," Proceedings of IEMDC 2009, Miami, FL, May 3-6, 2009.
158. N.W. Frank, and H.A. Toliyat, "Gearing Ratios of a Magnetic Gear for Marine Applications," Proceedings of ESTS 2009, Baltimore, MD, April 20-22, 2009.
159. S. Talebi, B. Nikbakhtan, and H.A. Toliyat, "Analytical Model-Based Analysis of High-Speed Flywheel Energy Storage Systems for Pulsed Power Applications," Proceedings of ESTS 2009, Baltimore, MD, April 20-22, 2009.
160. H.A. Toliyat, and R. Vartanian, "Design and Comparison of an Optimized Permanent Magnet-Assisted Synchronous Reluctance Motor (PMa-SynRM) with an Induction Motor with Identical NEMA Frame Stators," Proceedings of ESTS 2009, Baltimore, MD, April 20-22, 2009.
161. B. Akin, H.A. Toliyat, "DSP Based Implementation of Continuous Multi-Fault Signature Monitoring," Proceedings of the 24th Annual Applied Power Electronics Conference and Exposition (APEC'09), Feb 15-19, Washington, DC, 2009.
162. S. Choi, B. Akin, M.M. Rahimian, and H.A. Toliyat, "Fault Diagnosis Implementation of Induction Machine Based on Advanced Digital Signal Processing Techniques," Proceedings of the 24th Annual Applied Power Electronics Conference and Exposition (APEC'09), Feb 15-19, Washington, DC, 2009.
163. A. Balakrishnan, M. Amirabadi, H.A. Toliyat, and W. Alexander, "Soft Switched AC-Link Wind Power Converter," Proceedings of IEEE International Conference on Sustainable Energy Technologies 2008 Conference (ICSET 2008), November 24-27, 2008, Singapore.

164. M. Amirabadi, A. Balakrishnan, H.A. Toliyat, and W. Alexander, "Soft Switched AC-Link Direct-Connect Photovoltaic Inverter," Proceedings of IEEE International Conference on Sustainable Energy Technologies 2008 Conference (ICSET 2008), November 24-27, 2008, Singapore.
165. S. Talebi, B. Nikbakhtian, and H.A. Toliyat, "Control Design of an Advanced High-Speed Flywheel Energy Storage System for Pulsed Power Applications," Proceedings of the IECON'08, Nov. 10-13, 2008, Orlando, FL.
166. S.B. Ozturk, and H.A. Toliyat, "Sensorless Direct Torque Control and Indirect Flux Control of Brushless DC Motor with Non-Sinusoidal Back-EMF," Proceedings of the IEEE-IECON'08, Nov. 10-13, 2008, Orlando, FL, Best Paper Second Prize by the IES Electrical Machine Technical Committee.
167. A. Awwad, H. Abu-Rub, and H.A. Toliyat, "Nonlinear Autoregressive Moving Average (NARMA-L2) Controller for Advanced AC Motor Control," Proceedings of the IEEE-IECON'08, Nov. 10-13, 2008, Orlando, FL.
168. S. Talebi, B. Nikbakhtian, and H.A. Toliyat, "Modeling, DC and Small-Signal AC Analysis of a High-Speed FESS in Synchronous D-Q Reference Frame," Proceedings of the ICEMS'08, Oct. 17-19, 2008, Wuhan, China.
169. E.C. dos Santos Jr., C.B. Jacobina, H.A. Toliyat, and E.R.C. da Silva, "Monolithic Systems using Standard Three-leg Inverter Supplying Independently Two Motors, Proceedings of the IEEE-IAS'08, Edmonton, Canada.
170. J. Baek, M.M. Rahimian, and H.A. Toliyat, "Maximum Output Power Control of Permanent Magnet-Assisted Synchronous Reluctance Generator," Proceedings of the 18th International Conference on Electrical Machines (ICEM'08), Sep. 6-9, Vilamoura, Portugal.
171. H.A. Toliyat, A. Balakrishnan, and B. Alexander, "Soft Switched AC-Link AC-AC Buck-Boost Converter," Proceedings of the IEEE Power Electronics Specialist Conference (PESC'08), June 15-19, Rhodes, Greece.
172. S.B. Ozturk, W.C. Alexander, and H.A. Toliyat, Invited Paper, "Direct Torque Control of Four-Switch Brushless DC Motor with Non-sinusoidal Back-EMF," Proceedings of the IEEE Power Electronics Specialist Conference (PESC'08), June 15-19, Rhodes, Greece.
173. A. Balakrishnan, H.A. Toliyat, W. Alexander, "Soft Switched AC-Link Buck-Boost Converter," Proceedings of the 2008 Applied Power Electronics and Exposition (APEC), Austin, TX.
174. J. Faiz, B.M. Ebrahimi, B. Azaie, R. Rajabioun, and H.A. Toliyat, "A Criterion Function for Broken Bar Fault Diagnosis in Induction Motor under Load Variation using Wavelet Transform," Proceedings of International Conference on Electrical Machines and Systems, Oct. 8-11, Seoul, Korea, pp. 1249-1254.
175. S.B. Ozturk, O. Yang, and H.A. Toliyat, "Power Factor Correction of Direct Torque Controlled Brushless DC Motor Drive," Proceedings of the IEEE-IAS'07, New Orleans, LA, Sep. 23-27, 2007.
176. S. Talebi, P. Niazi, and H.A. Toliyat, "Design of Permanent Magnet-Assisted Synchronous Reluctance Motors Made Easy," Proceedings of the IEEE-IAS'07, New Orleans, LA, Sep. 23-27, 2007.
177. B. Akin, S.B. Ozturk, and H.A. Toliyat, "On-board Fault Diagnosis of HEV Induction Motor Drive at Start-up and during Idle Mode," Proceedings of the VPPC'07, Arlington, TX, Sep. 9-12, 2007.
178. S. Talebi, and H.A. Toliyat, "A Novel Algorithm for Designing PID Controllers for High-Speed Flywheels," Proceedings of the VPPC'07, Arlington, TX, Sep. 9-12, 2007.

179. I. Freitas, H.A. Toliyat, and C. Jacobina, "A PWM strategy with Reduced Bearing Currents for Five-Phase Motors," Proceedings of the VPPC'07, Arlington, TX, Sep. 9-12, 2007.
180. R.S. Miranda, H.A. Toliyat, C.B. Jacobina, and A.M.N. Lima, "Short-Circuit Fault Mitigation using Multi-Phase Induction Machine Drive," Proceedings of the VPPC'07, Arlington, TX, Sep. 9-12, 2007.
181. S. Ahmed, H. Patibandla, P. Enjeti, and H.A. Toliyat, "A High Density Power Converter for Remotely Operated Loads," Proceedings of the IEEE-PESC'07, Tampa, FL, June 17-21, 2007.
182. S. Ahmed, and H.A. Toliyat, "Coupled Field Analysis Needs in the Design of Submersible Electric Motors," Proceedings of the IEEE-ESTS'07, May 21-23, 2007.
183. B. Akin, and H.A. Toliyat, "Phase Sensitive Detection of Motor Fault Signatures in the Presence of Noise," Invited paper, Proceedings of the IEEE International Electric Machines and Drives Conference (IEMDC'07), Antalya, Turkey, May 3-5, 2007.
184. B. Ozturk, and H.A. Toliyat, "Direct Torque Control of Brushless DC Motor with Non-Sinusoidal Back-EMF," Proceedings of the IEEE-IEMDC'07, Antalya, Turkey, May 3-5, 2007.
185. J. Faiz, B.M. Ebrahimi, B. Akin, and H.A. Toliyat, "Study of Mixed Eccentricity Fault in Three-phase Induction Motors using Time Stepping Finite Element Technique," Proceedings of the IEEE-IEMDC'07, Antalya, Turkey, May 3-5, 2007.
186. E. Afjei, O. Hashemipour, and H.A. Toliyat, "A New Hybrid Reluctance Motor/Field-Assisted Generator," Proceedings of the IEEE-IEMDC'07, Antalya, Turkey, May 3-5, 2007.
187. S. Kwak, and H.A. Toliyat, "Fault-Tolerant Topologies and Switching Function Algorithms for Three-Phase Matrix Converter Based AC Motor Drives Against Open and Short Phase Failures, Proceedings of the IEEE-IEMDC'07, Antalya, Turkey, May 3-5, 2007.
188. S. Ahmed, and H.A. Toliyat, "Application of a Dual Voltage Exterior Rotor PM Actuator in Compact Harsh Environments," Proceedings of the IEEE-IEMDC'07, Antalya, Turkey, May 3-5, 2007.
189. S. Ahmed, and H.A. Toliyat, "A New Consideration on the Design Optimization of Submersible Electric Motors," Invited paper, Proceedings of the International Exhibition & Conference for Power Electronics, Intelligent Motion, Power Quality Power Electronics (PCIM'07), Nuremberg, Germany, May 22-24, 2007.
190. B. Akin, and H.A. Toliyat, "PWM Inverter Harmonics Contributions to the Inverter-Fed IM Bearing Fault Diagnosis, Proceedings of the IEEE Applied Power Electronics Conference and Exhibition (APEC'07), Anaheim, CA, Feb. 25-March 1, 2007.
191. B. Akin, and H.A. Toliyat, "Low-Cost Motor Drive-Embedded Fault Diagnosis – A Simple Harmonic Analyzer, Proceedings of the IEEE Applied Power Electronics Conference and Exhibition (APEC'07), Anaheim, CA, Feb. 25-March 1, 2007.
192. N. Kim, H.A. Toliyat, I. Panahi, and M. Kim, "BLDC Motor Control Algorithm for Low-Cost Industrial Applications," Proceedings of the IEEE Applied Power Electronics Conference and Exhibition (APEC'07), Anaheim, CA, Feb. 25-March 1, 2007.
193. E. Afjei, and H.A. Toliyat, "A Novel Hybrid Brushless DC Motor/Generator for Hybrid Vehicles Applications," Proceedings of the IEEE-PEDES'06, Delhi, India.
194. E. Levi, M. Jones, S.N. Vukosavic, and H.A. Toliyat, "Steady State Modeling of Series-Connected Five-Phase and Six-Phase Two-Motor Drives, Proceedings of the IEEE-IAS Annual Meeting Conference, Oct. 8-12, Tampa, FL, 2006.

195. E. Levi, M. Jones, S.N. Vukosavic, and H.A. Toliyat, "Stator Winding Design for Multi-Phase Two-Motor Drives with Single VSI Supply," Proceedings of the 2006 ICEM, Crete Island, Greece, Sep. 2-5, 2006.
196. B. Akin, B. Ozturk, P. Niazi, H.A. Toliyat, and A. Goodarzi, "Low-Speed Performance Operation of Induction Motors Drives using Low-Resolution Speed Sensor," Proceedings of the IEEE-ISIE'06, Montreal, Canada, July 9-13, 2006.
197. S. Kwak, and H.A. Toliyat, "Hybrid Parallel Inverter Configuration with Load Commutated Inverter-Based High-Power Induction Motor Drives," Proceedings of the IEEE-PESC'06, Ji-Ju Island, Korea.
198. S. Kwak, and H.A. Toliyat, "Direct AC/AC Converters and Control Techniques for Two-Phase System," Proceedings of the IEEE-PESC'06, Ji-Ju Island, Korea.
199. M.R. Rafiei, R. Ghazi, R. Asgharian, H.A. Toliyat, M. Barakati, "Robust Control Methodologies For dc/dc PWM Converters Under Wide Changes in Operating Conditions," To be presented at the 6th WSEAS Int. Conf. on Applied Informatics and Communications (AIC'06) and the 6th WSEAS Int. Conf. on Signal Processing, Computational Geometry & Artificial Vision (ISCGAV'06) 6th WSEAS Int. Conf. on Systems Theory and Scientific Computation (ISTASC'06), Elounda, Agios Nikolaos, Crete Island, Greece, August 18-20, 2006.
200. K. Abbaszadeh, S.A. Gholamian, M. Ardebili, and H.A. Toliyat, "Modeling of B-H Loop for Core Loss Calculations in Power Transformer using Finite Element Method," Proceedings of the 12th Biennial IEEE Conference on Electromagnetic Field Computation (CEFC 2006).
201. K. Abbaszadeh, M. Ardebili, S. Jamali, and H.A. Toliyat, "Winding Arrangement effects on Electromagnetic Forces and Short Circuit Reactance Calculation in Power Transformers via Numerical and Analytical Methods," Proceedings of the 12th Biennial IEEE Conference on Electromagnetic Field Computation (CEFC 2006).
202. M. Mirzaei, M. Joorabian, and H.A. Toliyat, "A Combined Method for Analysis of High Speed Linear Induction Machines," Proceedings of the 12th Biennial IEEE Conference on Electromagnetic Field Computation (CEFC 2006).
203. P. Niazi, and H.A. Toliyat, "Robust Maximum Torque per Amp (MTPA) Control of PM-Assisted Synchronous Reluctance Motor Drives," Proceedings of the IEEE Applied Power Electronics Conference and Exposition, Dallas, TX, Feb. 19-23, 2006.
204. B.S. Ozturk, H.A. Toliyat, and F. Ashrafzadeh, "Low-Cost Direct Torque Control of Permanent Magnet Synchronous Motors using Hall-Effect Sensors," Proceedings of the IEEE Applied Power Electronics Conference and Exposition, Dallas, TX, Feb. 19-23, 2006.
205. B. Akin, and H.A. Toliyat, "TMS320F28xx-based FOC of AC Drives at Very Low Speed Range using Improved Low-Speed measurement Technique for Low-Count Encoders," Proceedings of the TI Developer Conference 2006.
206. Y. Kumsuwan, K. Oranpiroj, S. Premrudeepreechacharn, H.A. Toliyat, "A Direct Torque Control of Induction Motor Using V/F PWM Technique, Proceedings of the Sixth International Conference on Power Electronics and Drives Systems, Kuala Lumpur, Malaysia, Nov. 28-Dec. 1, 2005.
207. P. Niazi, and H.A. Toliyat, "Design of a Low-Cost Concentric Winding Permanent Magnet-Assisted Synchronous Reluctance Motor, Proceedings of the IEEE-IAS Annual Meeting Conference, Hong-Kong, October 2-6, 2005.
208. H. Meshgin-Kelk, A. Eghbali, and H.A. Toliyat, "Modeling and Analysis of Cage Induction Motors under Rotor Misalignment and Air Gap Eccentricity," Proceedings of the IEEE-IAS Annual Meeting Conference, Hong-Kong, October 2-6, 2005.

209. L. Parsa, and H.A. Toliyat, "Five-Phase Interior Permanent Magnet Motors with Low Torque Pulsations," Proceedings of the IEEE-IAS Annual Meeting Conference, Hong-Kong, October 2-6, 2005.
210. A. Iqbal, S. Vukosavic, E. Levi, M. Jones, H.A. Toliyat, "Dynamics of a Series-Connected Two-Motor Five-Phase Drive System with a Single-Inverter Supply," Proceedings of the IEEE-IAS Annual Meeting Conference, Hong-Kong, October 2-6, 2005.
211. P. Niazi, H.A. Toliyat, and A. Goodarzi, "Robust Maximum Torque per Amp (MTPA) Control of PM-Assisted SynRM for Traction Applications," Proceedings of the 2005 IEEE Vehicle Power and Propulsion (VPP) Conference, Chicago, IL, Sep. 7-9, 2005, pp. 658-664.
212. L. Parsa, A. Goodarzi, and H.A. Toliyat, "Five-Phase Interior Permanent Magnet Motor for Hybrid Electric Vehicle Application," Proceedings of the 2005 IEEE Vehicle Power and Propulsion (VPP) Conference, Chicago, IL, Sep. 7-9, 2005, pp. 294-300.
213. H. Meshgin-Kelk, and H.A. Toliyat, "A New Open Terminal Test Approach for Broken Rotor Bar Detection in Cage Induction Motors," Proceedings of the 5th IEEE International Symposium on Diagnostics, Electric Machines, Power Electronics and Drives, Vienna, Austria, Sep. 7-9, 2005.
214. S. Talebi, H.A. Toliyat, P. McMullen, C. Huynh, and A. Filatov, "The Impacts of Power Factor and Armature Reaction on the Operation of Surface Mount PMSM Based Flywheel Energy Storage Systems for Pulsed Power Applications," Proceedings of the IEEE Electric Ship Technologies Symposium (ESTS), Philadelphia, PA, July 25-27, 2005, pp. 379-386.
215. L. Parsa, and H.A. Toliyat, "Five-Phase Permanent Magnet Motor Drives for Ship Propulsion Applications," Proceedings of the IEEE Electric Ship Technologies Symposium (ESTS), Philadelphia, PA, July 25-27, 2005, pp. 371-378.
216. L. Parsa, N. Kim, and H.A. Toliyat, "Field Weakening Operation of High Torque Density Five-Phase Permanent Magnet Motor Drives," Proceedings of the IEEE-IEMDC'05, San Antonio, TX, May 15-18, 2005, pp. 1507-1512.
217. P. Niazi, H.A. Toliyat, D-H. Cheong, and J-C. Kim, "A Low-Cost and Efficient Permanent Magnet Assisted Synchronous Reluctance Motor Drive," Proceedings of the IEEE-IEMDC'05, San Antonio, TX, May 15-18, 2005, pp. 659-666.
218. P. Niazi, and H.A. Toliyat, "On-Line Parameter Estimation of Permanent Magnet Assisted Synchronous Reluctance Motor Drives," Proceedings of the IEEE-IEMDC'05, San Antonio, TX, May 15-18, 2005, pp. 1031-1036.
219. S. Kwak, and H.A. Toliyat, "A Current Source Inverter with Advanced External Circuit and Control Method," Proceedings of the IEEE-IEMDC'05, San Antonio, TX, May 15-18, 2005, pp. 1327-1334.
220. P. Bazzaz, E. Afjei, and H.A. Toliyat, "A New Power Electronic Converter for Switched Reluctance Motor Drives for High Speed Applications," Proceedings of the IEEE-IEMDC'05, San Antonio, TX, May 15-18, 2005, pp. 71-73.
221. M. Abolhassani, H.A. Toliyat, and P.N. Enjeti, "Integrated Doubly-Fed Electric Alternator/Active Filter (IDEA), A Total Energy Crisis and Power Quality Solution for Wind Energy Conversion Systems," Proceedings of the IEEE-IAS'04, Seattle, WA, October 3-7, 2004.
222. L. Parsa, and H.A. Toliyat, "Fault-Tolerant Five-Phase Permanent Magnet Motor Drives for Military Applications," Proceedings of the IEEE-IAS'04, Seattle, WA, October 3-7, 2004.
223. L. Parsa, and H.A. Toliyat, "Sensorless Direct Torque Control of Five-Phase Interior Permanent Magnet Motor Drives," Proceedings of the IEEE-IAS'04, Seattle, WA, October 3-7, 2004.

224. S. Kwak, and H.A. Toliyat, "Multilevel Current Source Inverter Topology Based on Dual Structure Associations for Induction Motor Drives," Proceedings of the IEEE-IAS'04, Seattle, WA, October 3-7, 2004.
225. S. Kwak, and H.A. Toliyat, "Evaluation of Two Methods to Obtain Clean Utility: PWM Rectifiers and Active Power Filters," Proceedings of the IEEE-PESC'04, Aachen, Germany, June 20-25, 2004.
226. S. Kwak, and H.A. Toliyat, "Design and Performance Comparisons of Two Multi-drive Systems with Unity Power Factor," Proceedings of the IEEE-PES General Meeting, Denver, CO., June 6-10, 2004.
227. S. Kwak, and H.A. Toliyat, "A Hybrid Converter System for High Performance Large Induction Motor Drives," Proceedings of the APEC'04, Anaheim, CA, pp. 529-536.
228. S. Kwak, and H.A. Toliyat, "DSP-Based Development of a Novel Induction Motor Drive using a Load Commutated Inverter" Proceedings of the TI Developer Conference, Houston, TX, Feb. 18-20, 2004.
229. L. Parsa, and H.A. Toliyat, "A Low Cost DSP-Based Control System for IPM Motor Drives," Proceedings of the TI Developer Conference, Houston, TX, Feb. 18-20, 2004.
230. P. Niazi, and H.A. Toliyat, "A Self-Tuning Vector Control Induction Motor with a Low-Count Encoder using Fixed-Point TMS320LF2407, Proceedings of the TI Developer Conference, Houston, TX, Feb. 18-20, 2004.
231. L. Parsa, and H.A. Toliyat, "A New Five-Phase Permanent Magnet Motor Drive for Propulsion Applications," Proceedings of the Electric Machines Technology Symposium (EMTS) 2004, Philadelphia, PA, Jan. 27-29, 2004.
232. L. Parsa, and H.A. Toliyat, "A Fault Resilient IPM Motor Drive for Wide Speed Range Operation," Proceedings of the Electric Machines Technology Symposium (EMTS) 2004, Philadelphia, PA, Jan. 27-29, 2004.
233. P. Niazi, and H.A. Toliyat, "A Self-Tuning Vector Control Induction Motor with a Low-Count Encoder for Naval Applications," Proceedings of the Electric Machines Technology Symposium (EMTS) 2004, Philadelphia, PA, Jan. 27-29, 2004.
234. S. Kwak, and H.A. Toliyat, "Hybrid Load Commutated Inverter-Based Induction Motor Drive for Commercial and Military Ship Propulsions," Proceedings of the Electric Machines Technology Symposium (EMTS) 2004, Philadelphia, PA, Jan. 27-29, 2004.
235. S. Kwak, and H.A. Toliyat, "A Strategy for Improving Reliability of Motor Drive Systems with a Matrix Converter," Proceedings of the Electric Machines Technology Symposium (EMTS) 2004, Philadelphia, PA, Jan. 27-29, 2004.
236. L. Parsa, and H.A. Toliyat, "A Self Reconfigurable Electric Motor Controller for Hybrid Electric Vehicle Application," Invited paper, Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003, pp. 919-924.
237. S.M.A. Cruz, A.J.M. Cardoso, and H.A. Toliyat, "New Developments in the Diagnostics of Faults in Line-Connected Motors and DTC Induction Motor Drives," Invited paper Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003, pp. 1361-1368.
238. B. Fahimi, and H.A. Toliyat, "Application of Power Electronics in Automotive Industry: State of the Art and Future Possibilities," Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003.

239. S. Kwak, and H.A. Toliyat, "An Approach for Matrix Converter Based Induction Motor Drive with Unity Power Factor and Minimum Switching Losses," Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003, pp. 2939-2944.
240. S. Kwak, and H.A. Toliyat, "A Comparison and Assessment of Current-Source-Inverter-Fed Induction Motor Drive Systems with Unity Power Factor," Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003, pp. 232-237.
241. E. Levi, A. Iqbal, S.N. Vukosavic, and H.A. Toliyat, "Modeling and Control of a Five-Phase Series Connected Two-Motor Drive," Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003, pp. 208-213.
242. M. Jones, E. Levi, S.N. Vukosavic, and H.A. Toliyat, "A Novel Nine-Phase Four-Motor Drive System with Completely Decoupled Dynamic Control," Proceedings of the IEEE-IECON 2003 Annual Meeting, Roanoke, Virginia, Nov. 2-6, 2003, pp. 637-642.
243. S. Kwak, and H.A. Toliyat, "A Novel Hybrid Solution for Load Commutated Inverter-Fed Induction Motor Drives," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 1608-1614.
244. M.T. Abolhassani, H.A. Toliyat, and P. Enjeti, "A Sensorless Control of Integrated Alternator/Active Filter Doubly—Fed Induction Generator for Variable Speed Wind Energy," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 507-514.
245. L. Parsa, and H.A. Toliyat, "A New Five-Phase Permanent Magnet Motor Drive for Traction Applications," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 401-408.
246. L. Hao, and H.A. Toliyat, "BLDC Motor Full Speed Range Operation Including the Flux-Weakening Region," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 618-624.
247. M. Hajiaghajani, S.M. Madani, L. Hao, and H.A. Toliyat, "A Novel Method for Detection of Eccentricity in PM Machines," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 1833-1838.
248. S.M.A. Cruz, A.J.M. Cardoso, and H.A. Toliyat, "Multiple Reference Frames for the Diagnosis of Stator Faults, Rotor Faults and Eccentricity in Three-Phase Induction Motors," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 1340-1346.
249. A. Bellini, C. Concarri, F. Filippetti, G. Franceschini, E. Lorenzani, C. Tassoni, and H.A. Toliyat, "Induction Motors Diagnosis using Deceleration – A Possible Improvement," Proceedings of the IEEE-IAS 2003 Annual Meeting, Salt Lake City, UT, Oct. 12-16, 2003, pp. 1874-1881.
250. H. Zeroug, H. Sahraoui, and H.A. Toliyat, "Optimal Design of a Switched Reluctance Motor," Proceedings of the 14th Conference on the Computation of Electromagnetic Fields, Saratoga Springs, NY, July 13-17, 2003.
251. H. Zeroug, H.A. Toliyat, and H. Sahraoui, "Torque Ripple Minimization of a Switched Reluctance Motor Drive, 6th International Symposium of Electric and Magnetic Field, Aachen, Germany, Oct. 6-9, 2003.
252. S.M.A. Cruz, H.A. Toliyat, and A.J.M. Cardoso, "DSP Implementation of the Multiple Reference Frame Theory for the Diagnosis of Stator Faults in a DTC Induction Motor Drive," Proceedings of the IEEE SDEMP'03, Atlanta, GA, Aug. 24-26, 2003, pp. 223-228.
253. S.K. Jeong, Z.G. Lee, P. Niazi, and H.A. Toliyat, "Sensorless Control of Induction Motors with Simultaneous on-line Estimation of Rotor Resistance and Speed Based on the Feedforward Torque

- Control Scheme, Proceedings of the International Electric Machines and Drives Conference (IEMDC'03), Madison, WI, June 1-4, 2003, pp. 1837-1842.
254. R. Khopkar, S.M. Madani, M. Haji, and H.A. Toliyat, "A Low-Cost Motor Drive using Buck-Boost Converter for Residential and Commercial Applications, Proceedings of the International Electric Machines and Drives Conference (IEMDC'03), Madison, WI, June 1-4, 2003, pp. 1251-1257.
 255. M.T. Abolhassani, H.A. Toliyat, and P. Enjeti, "Stator field oriented control of an Integrated Doubly Field Induction Generator for Wind Energy application," Proceedings of the International Electric Machines and Drives Conference (IEMDC'03), Madison, WI, June 1-4, 2003, pp.461-467.
 256. M. Jones, E. Levi, S.N. Vukosavic, and H.A. Toliyat, "Independent Vector Control of a Seven-Phase Three-Motor Drive System Supplied from a Single Voltage Source Inverter," Proceedings of the 2003, Power Electronics Specialist Conference (PESC'03), Acapulco, Mexico, June 15-19, 2003, pp. 1865-1870.
 257. E. Levi, M. Jones, S.N. Vukosavic, and H.A. Toliyat, "A Novel Concept of a Multiphase Multi-motor Vector Controlled Drive System Supplied from a Single Voltage Source Inverter," Proceedings of the European Power Electronics (EPE'03) Conference, Toulouse, France, Sept. 2-4, 2003
 258. H.A. Toliyat, and N.H. Qahtany, "The Influence of High Order Phases on Induction Machine Parameters and Performance," Proceedings of the First GCC Industrial Electrical & Electronics Conference, Manama, Bahrain, May 13-14, 2003.
 259. L. Hao, and H.A. Toliyat, "BLDC Full-Speed Operation Using Hybrid Sliding Mode Observer," Proceedings of the IEEE 2003 Applied Power Electronics Conference and Exposition (APEC 2003), February 9-13, 2003, Miami Beach, FL, pp. 286-293.
 260. S.M.R. Rafiei, R. Ghazi, R. Asgharian, M. Barakati, and H.A. Toliyat, "Robust Control of dc/dc PWM Converters: A Comparison of H_∞ , μ , and Fuzzy Logic Based Approaches," Proceedings of the IEEE 2003 Control Applications Conference, June 23-25, 2003, Vol. 1, pp. 603-608.
 261. S.M. Madani, L. Hao, and H.A. Toliyat, "Four-Switch BLDC Motor Drive with Active Power Factor Correction," Proceedings of the IEEE Industrial Electronics Conference (IECON'02), Nov. 5-8, 2002, Seville, Spain, pp. 579-584.
 262. S.M. Madani, H.A. Toliyat, L.E. Olson, "Determining the Electromagnetic Characteristics of a Slow Release Actuator," Proceedings of the IEEE Industrial Electronics Conference (IECON'02), Nov. 5-8, 2002, Seville, Spain, pp. 2768-2772.
 263. S. Kwak, R. Dabbousi, and H.A. Toliyat, "An Instantaneous Compensation Technique for Supply Disturbances in Direct Frequency Converters," Proceedings of the IEEE Industrial Electronics Conference (IECON'02), Nov. 5-8, 2002, Seville, Spain, pp. 956-960.
 264. S. Kwak, and H.A. Toliyat, "A Matrix Converter for Fault-tolerant Strategies and Two-phase Machine Drives," Proceedings of the IEEE Industrial Electronics Conference (IECON'02), Nov. 5-8, 2002, Seville, Spain, pp. 251-256.
 265. L. Parsa, L. Hao, and H.A. Toliyat, "Optimization of Average and Cogging Torque in 3-Phase IPM Motor Drives," Proceedings of the IEEE-IAS 2002 Annual Meeting, Pittsburgh, PA, Oct. 13-18, 2002, pp. 417-424.
 266. T. Gopalarathnam, and H.A. Toliyat, "A High Power Factor Converter Topology for Switched Reluctance Motor Drives," Proceedings of the IEEE-IAS 2002 Annual Meeting, Pittsburgh, PA, Oct. 13-18, 2002.

267. S. Ahmed, M. Haji, and H.A. Toliyat, "A System Level Solution for Power Electronic Measurements," Proceedings of the IEEE-IAS 2002 Annual Meeting, Pittsburgh, PA, Oct. 13-18, 2002, pp. 307-311.
268. K. Abbaszadeh, M. Rahimian, H.A. Toliyat, and L.E. Olson, "Rail Defect Diagnosis using Wavelet Packet Decomposition," Proceedings of the IEEE-IAS 2002 Annual Meeting, Pittsburgh, PA, Oct. 13-18, 2002, pp. 478-484.
269. H. Meshgin-Kelk, J. Milimonfared, and H.A. Toliyat, "Interbar Currents and Axial Fluxes in Healthy and Faulty Induction Motors," Proceedings of the IEEE-IAS 2002 Annual Meeting, Pittsburgh, PA, Oct. 13-18, 2002.
270. S. Nandi, R. Bharadwaj, and H.A. Toliyat, "Mixed Eccentricity in Three Phase Induction Machines: Analysis, Simulation, and Experiments," Proceedings of the IEEE-IAS 2002 Annual Meeting, Pittsburgh, PA, Oct. 13-18, 2002.
271. L. Hao, M. Madani, H.A. Toliyat, A Low-Cost Four-Switch BLDC Motor Drive with Active Power Factor Correction, Proceedings of the TI Developer Conference, Houston, TX, August 6-8, 2002.
272. S. Ahmed, W. Choi, H.A. Toliyat, and P.N. Enjeti, "Characterization of Non-sinusoidal Measurement Station Component Requirements and Errors," Proceedings of the 2002 ASHRAE Annual Meeting, June 22-26, Hawaii.
273. H.A. Toliyat, S. Ahmed, W. Choi, and P.N. Enjeti, "Instrument Selection Criteria for Non-sinusoidal Power Measurements," Proceedings of the 2002 ASHRAE Annual Meeting, June 22-26, Hawaii.
274. N. Qahtani, and H.A. Toliyat, "Finite Element Analysis of a Concentrated Winding Multi-Phase Induction Machine," Proceedings of the 15th International Conference on Electrical Machines, August 25-28, 2002, Bruges, Belgium.
275. L. Parsa, and H.A. Toliyat, "Minimizing the Cogging Torque and Maximizing the Average Torque of Three-Phase IPM Motor Drives," Proceedings of the 15th International Conference on Electrical Machines, August 25-28, 2002, Bruges, Belgium.
276. L. Parsa, and H.A. Toliyat, "A New Five-Phase Brushless Permanent Magnet Motor for Vehicle Application," Proceedings of the 2002 Future Car Congress, June 3-5, 2002, Arlington, VA.
277. M. Haji, S. Ahmed, and H.A. Toliyat, "Induction Machines Performance Evaluator-Torque Speed Estimation and Rotor Fault Diagnosis," Proceedings of the 2002 Applied Power Electronics Conference and Exposition (APEC 2002), March 10-14, 2002, Dallas, TX, pp. 764-769.
278. R. Shi, and H.A. Toliyat, "Vector Control of Five-Phase Synchronous Reluctance Motor with Space Vector Pulse Width Modulation (SVPWM) for Minimum Switching Losses," Proceedings of the 2002 Applied Power Electronics Conference and Exposition (APEC 2002), March 10-14, 2002, Dallas, TX, pp. 57-63.
279. H. Xu, and H.A. Toliyat, "Resilient Current Control of Five-Phase Induction Motor under Asymmetrical Fault Conditions," Proceedings of the 2002 Applied Power Electronics Conference and Exposition (APEC 2002), March 10-14, 2002, Dallas, TX, pp. 64-71.
280. J. Guzinski, H. Abu-Rub, and H.A. Toliyat, "An Advanced Low-Cost Sensorless Induction Motor Drive," Proceedings of the 2002 Applied Power Electronics Conference and Exposition (APEC 2002), March 10-14, 2002, Dallas, TX, 802-808.
281. M. Haji, and H.A. Toliyat, "Pattern Recognition – A Technique for Induction Machines Rotor Broken Bar Detections," IEEE Power Engineering Society Winter Meeting, Jan. 27-31, 2002, New York, NY.

282. S.M.R. Rafiei, R. Ghazi, and H.A. Toliyat, "Application of Neural Networks Based Real Time and Optimal Control of Active Power Filters Under Three-Phase Non-Sinusoidal /Unbalance Voltages," To be presented at the 10th Iranian Conference on Electrical Engineering (ICEE-2002), Tabriz University, Tabriz, Iran, 2002.
283. H. Abu-Rub, S. Ahmed, and H.A. Toliyat, "Sensorless Torque Control of AC Induction Motors," Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec. 2, 2001, pp. 630-634.
284. H. Abu-Rub, J. Guzinski, Z. Krzeminski, and H.A. Toliyat, "Predictive Current Control of Voltage Source Inverters," Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec. 2, 2001, pp. 1195-1200.
285. M. Raina, and H.A. Toliyat, "Parameter Estimation of Induction Motors – A Review and Status Report," Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec. 2, 2001, pp. 1327-1332.
286. M. Haji, and H.A. Toliyat, "Rotor Eccentricity Fault Detection of a DC Motor, Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec. 2, 2001, pp. 591-596.
287. T. Gopalarathnam, and H.A. Toliyat, "Input Current Shaping in BLDC Motor Drives Using a New Converter Topology," Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec.2, 2001, pp. 1441-1444.
288. K. Abbaszadeh, J. Milimonfared, H.A. Toliyat, and M. Haji, "Broken Bar Detection in Induction Motor via Wavelet Transformation," Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec.2, 2001, pp. 95-99.
289. M.T. Abolhassani, P. Enjeti, and H.A. Toliyat, "Harmonic Compensation using Advanced Electric Machines," Proceedings of the IEEE Industrial Electronics Conference, Denver, CO., Nov. 29-Dec.2, 2001, pp. 1388-1393.
290. L. Parsa, and H.A. Toliyat, "A New Five-Phase Brushless Permanent Magnet Motor for High Power Applications," Proceedings of the 2001 North American Power Symposium, College Station, TX, Oct. 15-16, 2001, pp. 125-131.
291. R. Shi, and H.A. Toliyat, "Torque Production of Five-Phase Synchronous Reluctance Motor with Two Flux Barriers per Pole Rotor under 3rd Harmonic Current Injection," Proceedings of the 2001 North American Power Symposium, College Station, TX, Oct. 15-16, 2001, pp. 136-143.
292. S.M. Madani, and H.A. Toliyat, "A Novel Power Factor Correction (PFC) Technique for Six-Switch AC Motor Drive," Proceedings of the 2001 North American Power Symposium, College Station, TX, Oct. 15-16, 2001, pp. 107-111.
293. S. Ahmed, and H.A. Toliyat, "A Novel DSP-Based Speed Sensorless Performance Evaluation Tool for Induction Motors," Proceedings of the IEEE-IAS 2001 Annual Meeting, Chicago, IL, Sept. 30 - Oct. 5, 2001.
294. M. Haji, and H.A. Toliyat, "Pattern Recognition – A Technique for Induction Machines Rotor Fault Detections, Proceedings of the IEEE-IAS 2001 Annual Meeting, Chicago, IL, Sept. 30 - Oct. 5, 2001.
295. J. Hur, J.P. Hong, H.A. Toliyat, and D.S. Hyun, "3D Dynamic Transient Analysis of Induction Machines using New Equivalent Magnetic Circuit Network Method," Proceedings of IEEE-Compumag 2001, Evian, France, July 2001.
296. R. Shi, H.A. Toliyat, and A. El-Antably, "Field Oriented Control of Five-Phase Synchronous Reluctance Motor Drive with Flexible 3rd Harmonic Current Injection for High Specific Torque," Proceedings of the IEEE-IAS 2001 Annual Meeting, Chicago, IL, Sept. 30 - Oct. 5, 2001.

297. S. Nandi, S. Ahmed, and H.A. Toliyat, and R.M. Bharadwaj, " Selection Criteria of Induction Machines for Speed-Sensorless Drives Applications," Proceedings of the IEEE-IAS 2001 Annual Meeting, Chicago, IL, Sept. 30 - Oct. 5, 2001.
298. S. Ahmed, and H.A. Toliyat, "A Novel Speed Sensorless Technique for Obtaining the Speed-Torque Characteristics of Induction Motors for Commissioning," Proceedings of the IEEE-IEMDC'01, Boston, MA, June 17-20, 2001, pp. 905-910.
299. A. Ba-Thunya, R. Khopkar, and H.A. Toliyat, "Single-Phase Induction Motor Drives – A Literature Survey," Proceedings of the IEEE-IEMDC'01, Boston, MA, June 17-20, 2001, pp. 911-916.
300. H. Xu, H.A. Toliyat, and L.J. Peterson, "Five-Phase Induction Motor Drives with DSP-Based Control Systems," Proceedings of the IEEE-IEMDC'01, Boston, MA, June 17-20, 2001, pp. 304-309.
301. M. Abolhassani, H.A. Toliyat, and P. Enjeti, "An Electromechanical Active Harmonic Filter," Proceedings of the IEEE-IEMDC'01, Boston, MA, June 17-20, 2001, pp. 349-355.
302. M. Haji, and H.A. Toliyat, "Pattern Recognition – A Technique for Induction Machines Rotor Fault Detections," Proceedings of the IEEE-IEMDC'01, Boston, MA, June 17-20, 2001, pp. 899-904.
303. S.P. Waikar, H.A. Toliyat, A.S. Ba-Thunya, Z. Zhang, and J.C. Moreira, "Low-cost Solution for Brushless DC Motor Drive System using Load Commutated Inverter," Proceedings of the 52nd Annual International Appliance Technical Conference and Tabletop Exhibition, Columbus, OH, March 26-28, 2001, pp. 245-255.
304. R. Shi, and H.A. Toliyat, and A. El-Antably, "A DSP-Based Direct Torque Control of Five-Phase Synchronous Reluctance Motor Drive, Proceedings of the 2001 Applied Power Electronics Conference and Exposition (APEC 2001), March 4-8, 2001, Anaheim, CA, pp. 1077-1082.
305. S.P. Waikar, H.A. Toliyat, A.S. Ba-Thunya, J.C. Moreira, and Z. Zhang, "A Novel Thyristor-Based Brushless DC Motor Drive for Low Cost Applications, Proceedings of the 2001 Applied Power Electronics Conference and Exposition (APEC 2001), March 4-8, 2001, Anaheim, CA, pp. 434-439
306. H. Xu, H.A. Toliyat, and L.J. Petersen, "Rotor Field Oriented Control of Five-Phase Induction Motor with the Combined Fundamental plus Third Harmonic Currents," Proceedings of the 2001 Applied Power Electronics Conference and Exposition (APEC 2001), March 4-8, 2001, Anaheim, CA, pp. 392-398.
307. H. Xu, and H.A. Toliyat, L.J. Peterson, "Modeling and Control of Five-Phase Induction Motor under Asymmetrical Fault Conditions," Proceedings of the Third Naval Symposium on Electric Machines, Philadelphia, December 4-7, 2000.
308. H.A. Toliyat, R. Shi, and H. Xu, "A DSP-based Vector Control of Five-phase Synchronous Reluctance Motor," Proceedings of the IEEE-IAS 2000 Annual Meeting, Rome, Italy, Oct. 8-12, 2000, pp. 1759-1765.
309. T. Gopalarathnam, H.A. Toliyat, and J.C. Moreira, "Multi-Phase Fault-Tolerant Brushless DC Motor Drives," Proceedings of the IEEE-IAS 2000 Annual Meeting, Rome, Italy, Oct. 8-12, 2000, pp. 1683-1688.
310. S. Nandi, and H.A. Toliyat, "A Novel Frequency Domain Based Technique to Detect Incipient Stator Inter-Turn Faults in Induction Machines," Proceedings of the IEEE-IAS 2000 Annual Meeting, Rome, Italy, Oct. 8-12, 2000, pp. 367-374.
311. H. Xu, and H.A. Toliyat, "Implementing Rotor Field Oriented Control and Direct Torque Control of Five-Phase Induction Motor Using TMS320C32 DSP, Proceedings of the Texas Instrument DSPS Fest'00, Aug. 2-4, 2000, Houston, TX.

312. J. Hur, H.A. Toliyat, and J. Hong, "3D Time-Stepping Analysis of Induction Motor by New 3-D Equivalent Magnetic Circuit Network Method," Proceedings of the IEEE-CEFC'2000 Conference, Milwaukee, WI, June 4-7, 2000, pp. 463.
313. J. Hur, H.A. Toliyat, and J. Hong, "Analysis of Eddy Current in an Asymmetrical Conductor using New 3-D Equivalent Magnetic Circuit Network Method," Proceedings of the IEEE-CEFC'2000 Conference, Milwaukee, WI, June 4-7, 2000, pp. 199.
314. H.A. Toliyat, and H. Xu, "DSP-Based Direct Torque Control (DTC) for Five-Phase Induction Machines," Proceedings of the International Power Electronics Conference (IPEC 2000), Tokyo, Japan, Apr. 3-7, 2000, pp. 1195-1200.
315. H.A. Toliyat, and H. Xu, "A Novel Direct Torque Control (DTC) Method for Five-Phase Induction Machines," Proceedings of the 2000 Applied Power Electronics Conference and Exposition (APEC 2000), Feb. 6-10, 2000, New Orleans, LA, pp. 162-168.
316. S.M.R. Rafiei, R. Ghazi, and H.A. Toliyat, "Real Time and Optimal Control of Programmable Active Power Filters for Harmonic Compensation and Power Factor Optimization in Non-Sinusoidal Line Voltages Using Neural Networks," Proceedings of the 8th Iranian Conference on Electrical Engineering (ICEE-2000), Isfahan University of Technology, Isfahan, Iran, 2000.
317. S.M.R. Rafiei, R. Ghazi, and H.A. Toliyat, "New and Programmable Control Strategy for Active Filters Under Non-Sinusoidal Line Voltages Using Virtual Voltages," Proceedings of the 14th International Conference on Power Systems (PSC-99), Iran Energy Research Center, Tehran, Iran, 1999.
318. S.M.R. Rafiei, R. Ghazi, H.A. Toliyat, "Review of Research Trends in Active Filtering for Harmonic Elimination and Power Quality Improvement," Proceedings of 13th International Conference on Power Systems (PSC-98), Iran Energy Research Center, Tehran, Iran, 1998.
319. A.S. Ba-thunya, and H.A. Toliyat, "A New High Frequency Transformer Assisted ZVS Quasi-Resonant DC-Link PWM Inverter with Minimum Voltage Stress on the Switches," Proceedings of the 25th Annual Conference of the IEEE Industrial Electronics Society (IECON'99), San Jose, CA, Nov. 29-Dec. 3, 1999, pp. 879-884.
320. J. Mahdavi, A. Agah, A.M. Ranjbar, and H.A. Toliyat, "Extension of PWM Space Vector Technique for Multilevel Current-Controlled Voltage Source Inverters," Proceedings of the 25th Annual Conference of the IEEE Industrial Electronics Society (IECON'99), San Jose, CA, Nov. 29-Dec. 3, 1999, pp. 583-588.
321. R.M. Bharadwaj, A.G. Parlos, and H.A. Toliyat, "Adaptive Neural Network-Based State Filter for Induction Motor Speed Estimation," Proceedings of the 25th Annual Conference of the IEEE Industrial Electronics Society (IECON'99), San Jose, CA, Nov. 29-Dec. 3, 1999, pp. 1283-1287.
322. T. Gopalarathnam, S. Waikar, H.A. Toliyat, M.S. Arefeen, J.C. Moreira, "Development of Low Cost Multi-Phase Brushless Permanent Magnet (BPM) Motors with Unipolar Current Excitations," Proceedings of the IEEE-IAS 1999 Annual Meeting, Phoenix, AZ, Oct. 3-7, 1999, pp. 173-179.
323. S. Nandi, H.A. Toliyat, "Condition Monitoring and Fault Diagnosis of Electrical Machines- A Review," Proceedings of the IEEE-IAS 1999 Annual Meeting, Phoenix, AZ, Oct. 3-7, 1999, pp. 197-204.
324. S. Nandi, H.A. Toliyat, "Study of Three Phase Induction Motors with Incipient Rotor Cage Faults under Different Supply Conditions," Proceedings of the IEEE-IAS 1999 Annual Meeting, Phoenix, AZ, Oct. 3-7, 1999, pp. 1922-1928.
325. S. Nandi, R. Bharadwaj, H.A. Toliyat, A.G. Parlos, "Simulation of a Three Phase Induction Motor with Incipient Rotor Cage Faults," Proceedings of the 1999 IEEE International Symposium on

- Diagnostics for Electrical Machines, Power Electronics and Drives (SDEMPED'99), Gijon, Spain, Sept. 1-3, 1999, pp. 389-393.
326. R. Bharadwaj, A.G. Parlos, H.A. Toliyat, S. Nandi, "A Neural Network-Based Speed Filter for Induction Motors: Adapting to Motor Condition Changes," Proceedings of the 1999 IEEE International Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives (SDEMPED'99), Gijon, Spain, Sept. 1-3, 1999, pp. 359-362.
 327. H.A. Toliyat, and D.S. Shet, "Sensorless Operation of Surface Mount Permanent Magnet AC (PMAC) Motors, The 1999 American Control Conference (ACC'99), San Diego, CA, June 2-4, 1999. (Invited Paper)
 328. A.S. Ba-thunya, and H.A. Toliyat, "Analysis and Design for Certain Circuit Topologies of Soft-Switched Quasi-Resonance Boost and Flyback Converters," Proceedings of the 21st International Telecommunications Energy Conference (INTELEC'99), Copenhagen, Denmark, June 6-9, 1999.
 329. A.S. Ba-thunya, and H.A. Toliyat, "High Frequency Transformer Assisted a New Passive Clamp ZVS Quasi-Resonant DC-Link PWM Inverter with Low Voltage Stress Across the Switches," Proceedings of the 1999 Power Electronics Specialists Conference (PESC'99), Charleston, South Carolina, June 27-July 1, 1999, pp. 981-986.
 330. J. Mahdavi, Sh. Kaboli, and H.A. Toliyat, "Conducted Electromagnetic Emissions in Unity Power Factor AC/DC Converters: Comparison Between PWM and RPWM Techniques," Proceedings of the 1999 Power Electronics Specialists Conference (PESC'99), Charleston, South Carolina, June 27-July 1, 1999, pp. 881-885.
 331. R.M. Bharadwaj, A.G. Parlos, H.A. Toliyat, S.K. Menon, "A Neural Network-Based Speed Filter for Induction Motors: Adaption to Motor Load Changes," Proceedings of the 1999 International Joint Conference on Neural Networks (IJCN'99), July 10-16, Washington DC.
 332. S. Nandi, H.A. Toliyat, "Fault Diagnosis of Electrical Machines-A Review," Proceedings of the IEEE-IEMDC'99, Seattle, WA, May 9-12, 1999, pp. 219-221.
 333. D.S. Shet, H.A. Toliyat, T.A. Nondahl, "Position Sensorless Control of Surface Mount Permanent Magnet AC (PMAC) Motors at Low Speeds," Proceedings of the 1999 Applied Power Electronics Conference (APEC'99), Dallas, Texas, March 14-18, pp. 1219-1225.
 334. S. Waikar, H.A. Toliyat, J.C. Moreira, "Evaluation Of Multiphase Brushless DC Permanent Magnet (BPM) Motors Using Finite Element Method and Experiments," Proceedings of the 1999 Applied Power Electronics Conference (APEC'99), Dallas, Texas, March 14-18, pp. 396-402.
 335. S. Waikar, H.A. Toliyat, J.C. Moreira, "A Low Cost Brushless Permanent Magnet (BPM) Motor Drive System Using TMS320F240", Texas Instrument DSPS Fest'99, Aug. 4-6, 1999, Houston, TX.
 336. T. Gopalarathnam, S. Nandi, H.A. Toliyat, "Feasibility Study to Include Fault Diagnosis as a Housekeeping Function for Motor Drives Applications using TMS320F240 DSP, Texas Instrument DSPS Fest'99, Aug. 4-6, 1999, Houston, TX.
 337. S. Nandi, H.A. Toliyat, "Detection of Rotor Slot and Other Eccentricity Related Harmonics in a Three Phase Induction Motor with Different Rotor Cages," 2nd IEEE International Conference on Power Electronics, Drives, and Energy Systems for Industrial Growth, PEDES'98, Perth, Western Australia, Nov. 30-Dec. 3, 1998, 135-140.
 338. S. Nandi, R. Bharadwaj, H.A. Toliyat, A.G. Parlos, "Performance Analysis of a Three Phase Induction Motor under Incipient Mixed Eccentricity Condition," 2nd IEEE International Conference on Power Electronics, Drives, and Energy Systems for Industrial Growth, PEDES'98, Perth, Western Australia, Nov. 30-Dec. 3, 1998, pp. 123-128.

339. J. Milimonfared, H. Meshgin Kelk, A. Der Minassians, S. Nandi, and H.A. Toliyat, "A Novel Approach for Broken Rotor Bar Detection in Cage Induction Motors," Proceedings of the IEEE-IAS 1998 Annual Meeting, St. Louis, MO, Oct. 12-16, 1998, pp. 286-290.
340. D.S. Shet, H.A. Toliyat, N. Kehtarnavaz, I. Panahi, M.S. Arefeen, "Position Sensor-less Control of Surface Mount Permanent Magnet AC (PMAC) Motors using DSP," Texas Instrument DSPS Fest'98, Aug. 6-8, 1998, Houston, TX.
341. N. Sultana, D. Shet, H.A. Toliyat, J.C. Moreira, "Brushless Permanent Magnet Motor Drive System using Load Commutated Inverter, Proceedings of the IEEE-APEC'98, Anaheim, CA, Feb. 15-19, 1998, pp. 69-74.
342. S.M.R. Rafiei, R. Ghazi, H.A. Toliyat, "Modeling and Digital Control of Current Regulated PWM with Reduced Sampling Frequency-Experimental Results," (in Persian), Proceedings of Sixth Iranian Conference on Electrical Engineering (ICEE'98), Khajeh Nasir Toosi University, Tehran, Iran, 1998.
343. S.M.R. Rafiei, R. Ghazi, H.A. Toliyat, "Design and Fabrication of Active Power Filter using Narrow-Band IIR Digital Filter with Modified Phase Characteristics," (in Persian), Proceedings of Sixth Iranian Conference on Electrical Engineering (ICEE'98), Khajeh Nasir Toosi University, Tehran, Iran, 1998.
344. S. Nandi, H.A. Toliyat, "Performance Analysis of a Three Phase Induction Motor under Abnormal Operating Conditions," Proceedings of the IEEE-SDEMPED'97 Conference, Carry-le-Rouet, France, Sep. 1-3, 1997, pp. 54-59.
345. H.A. Toliyat, N. Al-Nuaim, "Simulation and Detection of Dynamic Air-Gap Eccentricity in Salient Pole Synchronous Machines," Proceedings of the IEEE-IAS 1997 Annual Meeting, New Orleans, LA, Oct. 5-9, 1997, pp. 255-262.
346. S. Nandi, H.A. Toliyat, A.G. Parlos, "Performance Analysis of a Single Phase Induction Motor under Eccentric Condition," Proceedings of the IEEE-IAS 1997 Annual Meeting, New Orleans, LA, Oct. 5-9, 1997, pp. 174-181.
347. H.A. Toliyat, G. Suresh, and A. Abur, "Simulation of Voltage Stress on the Inverter Fed Induction Motor Windings Supplied through Feeder Cable," Proceedings of the IEEE-IAS 1997 Annual Meeting, New Orleans, LA, Oct. 5-9, 1997, pp. 143-150.
348. G. Suresh, H.A. Toliyat, and A. Abur, "Analysis of the Effect of Feeder Cable on the Stator Winding Voltage Stress in a PWM Induction Motor Drive," Proceedings of the Electrical Insulation Conference '97, Chicago, IL, Sept. 22-25, 1997, pp. 407-412.
349. J. Mahdavi, A. Emadi, and H.A. Toliyat, "Application of State Space Averaging Method to Sliding Mode Control of PWM DC/DC Converters," Proceedings of the IEEE-IAS 1997 Annual Meeting, New Orleans, LA, Oct. 5-9, 1997, pp. 820-827.
350. D.S. Shet, H.A. Toliyat, "On-Line Speed Estimation of Induction Motors," Texas Instrument DSPS Fest'97, July 31-Aug. 2, 1997, Houston, TX, pp. 98-101.
351. N.A. Al-Nuaim, and H.A. Toliyat, "A Novel Method for Modeling Dynamic Air-Gap Eccentricity in Synchronous Machines Based on Modified Winding Function Theory," Paper # PE-718-EC-0-05-1997, IEEE-PES 1997 Summer Meeting, Berlin, Germany.
352. S.M.R. Rafiei, R. Ghazi, H.A. Toliyat, "Modeling and Digital Control of Current Regulated PWM with Reduced Sampling Frequency-Theory," (in Persian), Proceedings of Fifth Iranian Conference on Electrical Engineering (ICEE'97), Sharif University of Tehran, Tehran, Iran, May 7-9, 1997.
353. N.A. Al-Nuaim, and H.A. Toliyat, "A Method for Dynamic Simulation and Detection of Dynamic Air-Gap Eccentricity in Synchronous Machines," Proceedings of the 1997 IEEE International

- Electric Machines and Drives Conference (IEEE-IEMDC'97), Milwaukee, WI, May 18-21, 1997, pp. MA2-5.1 : MA2-5.3.
354. G. Suresh, H.A. Toliyat, D.A. Rendusara, and P.N. Enjeti, "Predicting the Transient Effects of PWM Voltage Waveform on the Stator Windings of a Random Wound Induction Motors, " Proceedings of the 1997 IEEE 12th Applied Power Electronics Conference (APEC'97), Atlanta, Georgia, Feb. 23-27, pp. 135-141.
 355. K.M. Rahman and H.A. Toliyat, "Sensorless Operation of Permanent Magnet AC Motors (PMAC) with Modified Stator Windings, " Proceedings of the 1996 IEEE Industry Applications Annual Meeting, San Diego, California, Oct. 6-10, pp. 326-333.
 356. J.P. Johnson, A.V. Rajarathnam, H.A. Toliyat, S. Gopalakrishnan, and B. Fahimi, "Torque Optimization for a SRM using Winding Function Theory with a Gap Dividing Surface," Proceedings of the 1996 IEEE Industry Applications Society Annual Meeting, San Diego, California, Oct. 6-10, pp. 753-760.
 357. H.A. Toliyat, "Analysis and Simulation of Multi Phase Variable Speed Induction Motor Drives Under Asymmetrical Connections," Proceedings of the 1996 IEEE 11th Applied Power Electronics Conference (APEC'96), March 3-7, San Jose, California, pp. 586-592.
 358. M. Ehsani, K.M. Rahman, H. A. Toliyat, "Propulsion System Design of Electric Vehicles," Proceedings of the 1996 IEEE IECON, 22nd International Conference on Industrial Electronics, Control, and Instrumentation, Taipei, Taiwan, August 5-9, 1996, pp. 7-13. (Invited Paper).
 359. H.A. Toliyat, M.S. Arefeen, A. G. Parlos, "A Method for Dynamic Simulation and Detection of Air-Gap Eccentricity in Induction Machines," IEEE-IAS Annual Meeting Conference, Orlando, Florida, 1995, pp. 629-636.
 360. H.A. Toliyat, J. Sadeh, and R. Ghazi, "Design of Augmented Fuzzy Logic Power System Stabilizers to Enhance Power System Stability," IEEE-PES Summer Meeting Conference, Portland, Oregon, Paper # 95SM446-5EC, July 23-27, 1995.
 361. H.A. Toliyat, M.S. Arefeen, K.M. Rahman, and M. Ehsani, "Rotor Time Constant Updating Scheme for a Rotor Flux Oriented Induction Motor Drive," Proceedings of the IEEE 1995 Power Electronics Specialist Conference (PESC'95), Atlanta, Georgia, June 18-22, pp. 1302-1306.
 362. R. Ghazi, H. A. Toliyat, S. M. R. Rafiei, "A Fuzzy-Genetic Pulse Width Modulation for Active Power Filters," Proceedings of the IEEE Stockholm Power Tech, Stockholm, Sweden, June 18-22, 1995, pp. 267-272.
 363. L. Gubbala, A. Von Jouanne, P. Enjeti, C. Singh, H.A. Toliyat, "Voltage Distribution in the Windings of an ac Motor Subjected to Pulse Width Modulation (PWM) Input," Proceedings of the IEEE 1995 Power Electronics Specialist Conference, Atlanta, GA, June 18-22, pp. 579-585.
 364. H.A. Toliyat, K.M. Rahman, and M. Ehsani, "Electric Machines in Electric and Hybrid Vehicle Applications," Proceedings of the 1995 International Conference on Power Electronics, Oct. 10-14, Seoul, Korea, pp. 627-635.
 365. M.M. Rahimian, H.A. Toliyat, T.A. Lipo, "A Comprehensive Analysis of a Locomotive Traction System Including Main Alternator, Bridge Rectifiers, Contactor, and DC Traction Motors," Proceedings of the 1995 IEEE 10th Applied Power Electronics Conference (APEC'95), March 5-9, Dallas, Texas, 1995, pp. 118-124.
 366. S.M.R. Rafiei, H.A. Toliyat, R. Ghazi, "A New Method for Harmonic Identification Using Digital Filters," (in Persian), Proceedings of the Third Iranian Conference on Electrical Engineering (ICEE'95), University of Science and Technology, Tehran, Iran, May 15-18, 1995, pp. 331-338.

367. R. Ghazi, H.A. Toliyat, S.M.R. Rafiei, "A Simple Fuzzy Logic Based Modulator for Sinusoidal PWM Inverters," Proceedings of the Third Iranian Conference on Electrical Engineering (ICEE'95), University of Science and Technology, Tehran, Iran, May 15-18, 1995, 29-35.
368. H. A. Toliyat, and T. A. Lipo, "Transient Analysis of Cage Induction Machines Under Stator, Rotor Bar and End Ring Faults," IEEE-PES Summer Meeting Conference, Paper # 94SM361-6EC, July 1994.
369. H.A. Toliyat, and T.A. Lipo, "Analysis of Concentrated Winding Induction Machines for Adjustable Speed Drive Applications-Experimental Results," IEEE-PES Winter Meeting Conference, Paper # 94WM028-1EC, February 1994.
370. H.A. Toliyat, and S.M.R. Rafiei, "Instability and Chaos in Buck Converters - Two Dimensional Mapping," Proceedings of the Second Iranian Conference on Electrical Engineering (ICEE'94), Tarbiat Modaress University, Tehran, Iran, 1995.
371. S.M.R. Rafiei, H.A. Toliyat, and R. Ghazi, "A Fuzzy Pulse Width Modulator for Power Converters," Proceedings of the International Conference on Application of Fuzzy Systems (ICAFS'94), University of Tabriz, Tabriz, Iran, Oct. 14-17, 1994, pp. 101-110.
372. K. Rasul-Zadeh, and H.A. Toliyat, "Design and Fabrication of Induction Generators and Corresponding Static Converters for Wind Power Plants," (in Persian), Proceedings of the 8th International Power System Conference (PSC' 95), Tehran, Iran.
373. H.A. Toliyat, and J. Sadeh, "An Improved Fuzzy Logic Based PSS for Power System Stability Enhancement," Proceedings of the 9th International Power System Conference (PSC'94), St.-Petersburg State Technical University, St. Petersburg, Russia, 1994.
374. X. Luo, Y. Liao, H.A. Toliyat, A. El-Antably, and T.A. Lipo, "Multiple Coupled Circuit Modeling of Induction Machines," IEEE-IAS Annual Meeting Conference, Toronto, Ontario, Canada, Oct. 2-8, 1993, pp. 203-210.
375. H.A. Toliyat, and M.M. Rahimian, "Transient and Steady State Analysis of Induction Machines Under Internal Faults," Research Report (in Persian), Department of Electrical Engineering, Ferdowsi University-Mashhad, Mashhad, Iran, June 1993.
376. H.A. Toliyat, M.M. Rahimian, and T.A. Lipo, "Analysis and Modeling of Five Phase Converters for Adjustable Speed Drive Applications," Proceedings of the 5th European Conference on Power Electronics and Applications (EPE'93), Sept. 13-16, 1993, pp. 194-199.
377. H.A. Toliyat, A. Hosseini, "Parameter Estimation Algorithm Using Spectral Analysis for Vector Controlled Induction Motor Drives," Proceedings of the IEEE International Symposium on Industrial Electronics (ISIE'93), Budapest, Hungary, June 1-3, 1993, pp. 90-95.
378. H.A. Toliyat, and M.M. Rahimian, "Transient Analysis of Induction Machines Under Internal Faults," Proceedings of the First Iranian Conference on Electrical Engineering (ICEE'93), Amir-Kabir University of Technology, Tehran, Iran, May 18-21, 1993.
379. H.A. Toliyat, and M.R. Rafiei, "Analysis and Compensation of Nonlinear Systems in Power Electronics," (in Persian), Proceedings of the First Iranian Conference on Electrical Engineering (ICEE'93), Amir-Kabir University of technology, Tehran, Iran, May 18-21, 1993.
380. H.A. Toliyat, M.M. Rahimian, S. Bhattacharya, and T.A. Lipo, "Transient Analysis of Induction Machines Under Internal Faults Using Winding Functions," Proceedings of the Third International Conference on Electrical Rotating Machines-ELROMA'92, Bombay, India, Jan. 15-16, 1992, Session IA, Paper #8.

381. H.A. Toliyat, M.M. Rahimian, and T.A. Lipo, "dq Modeling of Five Phase Synchronous Reluctance Machines Including Third Harmonic of Air-Gap MMF," Proceedings of the IEEE-IAS Annual Meeting Conference, October 1991, pp. 231-237.
382. H.A. Toliyat, T.A. Lipo, and J.C. White, "Analysis of a Concentrated Winding Induction Machine for Adjustable Speed Drive Applications- part I (Motor Analysis)," IEEE-PES Winter Meeting, 1991.
383. H.A. Toliyat, T.A. Lipo, and J.C. White, "Analysis of a Concentrated Winding Induction Machine for Adjustable Speed Drive Applications- part II (Motor Design and Performance)," IEEE-PES Winter Meeting, 1991.
384. H.A. Toliyat, L.Y. Xue, and T.A. Lipo, "A Five Phase Reluctance Motor with High Specific Torque," IEEE-IAS Annual Meeting Conference, October 1990, pp. 207-213.
385. M.A. Choudhry, and H.A. Toliyat, "Design of Decentralized Modulation Controllers in a Multiterminal AC/DC System using Dynamic Compensators," Proceedings of the North American Power Symposium, Ithaca, New York, Oct. 13-14, 1986, pp. 239-249.

Technical Reports:

1. A Low Cost Inverter with Battery Interface for Photovoltaic Utility System, California Energy Commission, July 2013.
2. A Smart Induction Motor with High Specific Torque, Office of Naval Research, July 2002.
3. Measurements of Electrical Power Inputs to Variable Speed Motors and their Solid State Power Converters, ASHRAE, RP-1095, July 2002.
4. The Technical and Economic Feasibility of a Freight Pipeline System in Texas- Year 2 Report, Texas Transportation Institute, The Texas A&M University System, TTI: 9-1519, September 2001
5. Feasibility Study of a Converter Optimized Induction Motor. Palo Alto, California; Electric Power Research Institute, January 1989, EPRI Final Report 2624-02.

Graduate Students Supervised or under Supervision:

Ph.D. Degrees

1. Logan Smith, Ph.D. student.
2. Guanhua Tao, Ph.D. student.
3. Simon-Peter (Kofi) Frimpong, Ph.D. student
4. Seyed Mehdi Seyedi, Ph.D. student.
5. Shrikesh Sheshaprasad, Ph.D. student.
6. Shima Hasanpour, Magnetically Geared Permanent Magnet Synchronous Motors for High-Torque Applications, Ph.D. Dissertations, Texas A&M University, Dec. 2024.
7. Dorsa Talebi, Axial Flux Dual Rotor Motors Design and Development for High Power Dense Applications, Ph.D. Dissertation, Texas A&M University, TX, Dec. 2024.

8. Yuming Chen, Multi-Coil Wireless Power Transfer Systems Analysis and Design, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2024.
9. Farid Naghavi, Regulated Partial Resonance AC Power Converters, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2023.
10. Bryton Praslicka, Multi-Physics Modeling and Optimization of Advanced Electric Machinery and Magnetic Gear Development, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2023.
11. Mesaad W. Albader, Condition Monitoring and Fault Diagnosis of Electrical Submersible Pumps Motor Drive Including Long Cable, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2023.
12. Qasim Khan, Condition Monitoring of Power Equipment: Partial Discharge Analysis, Ph.D. Dissertation, Texas A&M University, College Station, TX, Co-Chair with Dr. H. Abu-Rub, TAMUQ, May 2021.
13. Ahmad Naif Darwish, Design and Modeling of UHF Partial Discharge Sensors: FE-Based PD Signal Propagation in High Voltage Systems, Ph.D. Dissertation, Texas A&M University, College Station, TX, Co-Chair with Dr. H. Abu-Rub, TAMUQ, August 2021.
14. Matthew Gardner, Numerical and Experimental Analysis of Magnetic Gears, Ph.D. Dissertation, Texas A&M University, College Station, TX, August 2019.
15. Ajay Morya, Wide Bandgap Device Based Multiphase Motor Drive with High Acceleration Capability, Ph.D. Dissertation, Texas A&M University, College Station, TX, Dec. 2018.
16. Amir Negahdari, Efficiency and Reliability Enhancement of Multiphase Drive Schemes for Six-Phase Synchronous Motors, Ph.D. Dissertation, Texas A&M University, College Station, TX, Dec. 2018.
17. Niloofar Torabi, Real-Time Machine Learning Based Open Switch Fault Detection and Isolation for Multilevel Multiphase Drives, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2018.
18. Bahareh Anvari, Design of Out Runner Electric Machines for Green Energy Applications, Ph.D. Dissertation, Texas A&M University, College Station, TX, Dec. 2017.
19. Morteza Moosavi, Soft-Switching High-Frequency Link Converters with Reduced Voltage Stress, Ph.D. Dissertation, Texas A&M University, College Station, TX, Dec. 2017.
20. Hussain A.I.A. Hussain, Linear Permanent Magnet Machines for Oil Pumping System, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2017.
21. Abdulkadir Bostanci, A System-based Modeling and Simulation of a Floating Production Storage and Offloading (FPSO) Electric Power Systems and Core Loss Analysis on a Small Scale Synchronous Generator and Induction Motor, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2017.
22. Matthew C. Johnson, Design and Analysis of axial and Radial Flux Magnetic gears and Magnetically Geared Machines, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2017.
23. Khalid Jaafari, Electromagnetic Analysis of Stator Ground Faults in Synchronous Generators, Ph.D. Dissertation, Texas A&M University, College Station, TX, Aug. 2016.
24. Vivek M. Sundaram, Reliable Multiphase Induction Motor Drives, Ph.D. Dissertation, Texas A&M university, College Station, TX, May 2016.
25. Jae-Bum Park, Multi-Phase fault Tolerant PMSM Drive System, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2015.

26. Yateendra Deshpande, Automated Design Optimization of Synchronous Machines: Development and Application of a Generic Fitness Evaluation Framework, Ph.D. Dissertation, Texas A&M University, College Station, TX, Dec. 2014.
27. Siavash Pakdelian, Trans-Rotary Magnetic Gear for Wave Energy Application, Ph.D. Dissertation, Texas A&M University, College Station, TX, Dec. 2014.
28. Robert Vartanian, Permanent Magnet Assisted Synchronous Reluctance Machine (PMa-SynRM) Design and Performance Analysis for Fan and Pump Applications, Ph.D. Dissertation, Texas A&M University, College Station, TX Aug. 2014.
29. Babak Farhangi, Power Conditioning for Plug-In Hybrid Electric Vehicles, Ph.D. Dissertation, Texas A&M University, College Station, TX Aug. 2014.
30. Hamidreza Keyhani, Fault-Tolerant Partial-Resonant High-Frequency AC-Link Converters and Their Applications, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2014.
31. Mahshid Amirabadi, Soft-Switching High-Frequency AC-Link Universal Power Converters with Galvanic Isolation, Ph.D. Dissertation, Texas A&M University, College Station, TX, August 2013.
32. Paul S. Moses, Ph.D. Thesis, Curtin University, Perth, Australia, Co-chair with Dr. M. Masoum, December 2011.
33. Mohammad B. Ebrahimi, Ph.D. Thesis, University of Tehran, Tehran, Iran, Co-chair with Dr. J. Faiz, 2011.
34. Nicolas Frank, Analysis of the Concentric Planetary Magnetic Gear, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2011.
35. Seungdeog Choi, Robust Condition Monitoring & Fault Diagnosis of Variable Speed Induction Motor Drives, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2010.
36. Jeihoon Baek, Robust Generator System using PM Assisted Synchronous Reluctance Generator with Current-Fed Drive, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2009.
37. Salman Talebi, Advanced High-Speed Flywheel Energy Storage Systems for Pulsed Power Applications, Ph.D. Dissertation, Texas A&M University, College Station. TX, December 2008.
38. Salih Baris Ozturk, Direct Torque Control of Permanent Magnet Synchronous Motors with Non-Sinusoidal Back-EMF, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2008.
39. Bilal Akin, Low Cost Motor Drive Embedded Fault Diagnosis Systems, Ph.D. Dissertation, Texas A&M University, College Station, TX, August 2007.
40. Shehab Ahmed, Compact Harsh Environment Energy Conversion Systems, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2007.
41. Payman Niazi, Permanent Magnet Assisted Synchronous Reluctance Motor Design and Performance Improvement, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2005.
42. Sang-Shin Kwak, Design and Analysis of Modern Three-Phase AC/AC Power Converters for AC Drives and Utility Interface, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2005.
43. Leila Parsa, Performance Improvement of Permanent Magnet AC Motors, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2005.
44. Lei Hao, Permanent Magnet AC Motor High-Speed Operation using Hybrid Observers, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2002.

45. Masoud Hajiaghajani, Fault Diagnosis of Electric Machines, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2002.
46. Tilak Gopalarathnam, New Solutions for Improved Unipolar-Excited Brushless Motor Drive, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2002.
47. Ruhe Shi, Vector Control of Five-Phase Synchronous Reluctance Machine with the Third Harmonic Current Injections for High Specific Torque, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2001.
48. Huangsheng Xu, Enhanced Rotor Field Oriented Control of Five-Phase Induction Motor with the Combined Fundamental and Third Harmonic Currents, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2001.
49. Shailesh Waikar, A Low-Cost Low-Loss Brushless Permanent Magnet Motor Drive, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2001.
50. Karim Abbaszadeh, Ph.D. Thesis, Amir-Kabir University of Technology, Tehran, Iran, Co-chair with Dr. J. Milimonfared.
51. Homayoun Meshgin-Kelk, 3-D Magnetic Equivalent Circuit Modeling of Induction Machines including the Rotor Bar Faults, Ph.D. Dissertation, Amir-Kabir University of Technology, Tehran, Iran, November 2000, Co-chair with Dr. J. Milimonfared.
52. Rajmohan Bharadwaj, Adaptive State Filtering with Neural Network for Sensorless Induction Motor Speed Estimation, Ph.D. Dissertation, Texas A&M University, College Station, TX, December 2000, Co-chair with Dr. A.G. Parlos.
53. Subhasis Nandi, Fault Analysis for Condition Monitoring of Induction Motors, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2000.
54. Khwaja M. Rahman, Design and Control of Switched Reluctance Motor for Electric and Hybrid Electric Vehicle Application, Ph.D. Dissertation, Texas A&M University, College Station, Texas, December 1998, Co-chair with Dr. M. Ehsani.
55. S.M.R Rafiei, An Optimal and Flexible Control Strategy for Active Filtering and Power Factor Correction under Non-Sinusoidal Line Voltage, Ph.D. Dissertation, Ferdowsi University of Mashhad, Mashhad, Iran, May 2000, Co-chair with Dr. R. Ghazi.

M.S. Degrees

1. Nicholas Martin, M.S. student.
2. Stephen Hurt, M.S. student.
3. Shrikesh Sheshaprasad, Optimal Electric Power Take-off Strategy for Surface Riding Wave Energy Converters, M.S. Thesis, Texas A&M University, College Station, TX, May 2022.
4. Shima Hasanpour, Magnetic Gear Design for High-Speed Applications, M.S. Thesis, Texas A&M University, College Station, TX, Dec. 2021.
5. Yichi Zhang, Efficiency Improvements of an Axial Flux Permanent Magnet Motor, M.S. thesis, Texas A&M University, College Station, TX, August 2019.
6. Amir Negahdari, Modeling and Experimental Verification of Adaptive 100% Stator Ground Fault Protection Schemes for Synchronous Generators, M.S. thesis, Texas A&M University, College Station, August 2017.

7. Yongqi Li, Real-Time Torque Ripple Minimization of Outer Rotor Switched Reluctance Motor, M.S. thesis, Texas A&M University, College Station, May 2016.
8. Esra Ozkentli, High Frequency Effects of Variable Frequency Drives (VFD) on Electrical Submersible Pump (ESP) Systems, M.S. thesis, Texas A&M University, College Station, August 2012.
9. Hussain Abdullah Hussain, Reduction of Shaft Voltages and Bearing Currents in Five Phase Induction Motor, M.S. Thesis, Texas A&M University, College Station, May 2012.
10. Vivek M. Sundaram, Diagnosis and Isolation of Air Gap Eccentricities in Closed-Loop Controlled Doubly-Fed Induction Generators, M.S. Thesis, Texas A&M University, College Station, May 2011.
11. Anil Chakali, Sensorless Speed Control of Permanent Magnet-Assisted Synchronous Reluctance Motor (PMA-SynRM), M.S. Thesis, Texas A&M University, College Station, December 2009.
12. Anand Balakrishnan, Soft Switched High Frequency AC-Link Converter, M.S. Thesis, Texas A&M University, College Station, December 2008.
13. Salih b. Ozturk, Modeling, Simulation and Analysis of Low-Cost Direct Torque Control of PMSM using Hall-Effect Sensors, M.S. Thesis, Texas A&M University, College Station, December 2005.
14. Rahul V. Khopkar, DC-DC Converter Current Source Fed Naturally Commutated Brushless DC Motor Drive, M.S. Thesis, Texas A&M University, College Station, August 2003.
15. Nasser Qahtani, Non-linear Analysis of advanced High-Phase Number Induction Machines for Adjustable Speed Drive Applications, M.S. Thesis, Texas A&M University, College Station, May 2002.
16. Rami Dabbousi, A 3-Phase AC to AC Matrix Converter using the Venturini Method, M.S. Thesis, Texas A&M University, College Station, Texas, May 2002.
17. Tahmid Ur Rahman, Parameter estimation of vector controlled induction machine, M.S. Thesis, Texas A&M University, College Station, Texas, December 2001.
18. Shehab Ahmed, Sensorless Performance Evaluation of Induction Motors, M.S. Thesis, Texas A&M University, College Station, Texas, December 2000.
19. Deepak S. Shet, Sensorless Position Estimation in Sinusoidal Permanent Magnet Synchronous Motor, M.S. Thesis, Texas A&M University, College Station, Texas, December 1998.
20. Nadira Sultana, Performance Analysis of Brushless Permanent Magnet Motor (BPM) using Load Commutated Inverter, M.S. Thesis, Texas A&M University, College Station, Texas, December 1997.
21. Nabil A. Al-Nuaim, Performance Analysis of Synchronous Machines under Dynamic Eccentricity, M.S. Thesis, Texas A&M University, College Station, Texas, December 1996.
22. S. Mohammad Reza Rafiei, "Active Power Filters using Fuzzy Controllers," M.S. Thesis, Ferdowsi University of Mashhad, Mashhad, Iran, May 1995, Co-chair with Dr. R. Ghazi.
23. Nader Sargolzaei, "A Detailed Electric Machines Modeling Including Space Harmonics Using Winding Function Method," M.S. Thesis, Ferdowsi University of Mashhad, Mashhad, Iran, January 1995.
24. Javad Sadeh, "Power System Stability Enhancement Using Fuzzy Logic Control," M.S. Thesis, Ferdowsi University of Mashhad, Mashhad, Iran, January 1995.
25. Ali Hosseini, "On-line Parameter Estimation of Vector Controlled Induction Motor Drives," M.S. Thesis, Ferdowsi University of Mashhad, Mashhad, Iran, August 1993.

B.S. Degrees

1. Tristen Smith, Spring 2024
2. Jacinto Shahin, Fall 2023
3. Nick Martin, Spring 2023
4. Joe Reese, Fall 2022
5. Mike Elyian, Summer 2022
6. Samuel Jakob, Spring 2022
7. Janet Park, Spring 2022
8. Zakki Wibisono, Spring 2022
9. Jacob Wirtz, 2021
10. Mike Elyian, 2021
11. Morayo Soetan, 2021
12. Sean Shamgar, 2021
13. Thomas Simms, 2021
14. Zakki Wibisono, 2021
15. Hamzah Seddiqui, 2021,
16. Abd-Allah El-Attar, 2021
17. Marshall Avery, 2020.
18. Pouya Esfahani. 2020.
19. Daniel Zamarron, 2019.
20. Ellen Dangtran, 2019.
21. Jared Haley, 2019.

Visiting Scholars

1. Dr. Dorsa Talebi, Texas A&M University, Dec. 2024 - present.
2. Dr. Farid Naghavi, Texas A&M University Jan. 2024 – present.
3. Dr. Matthew Gardner, University of Texas Dallas, Sep. 2019- July 2020.
4. Jae-Ryung Lee, March 12, 2018 – March 10, 2019, Hyundai Motor Group, Seoul, South Korea.
5. Dr. Alejandro Gomez-Yepes, Aug. 1, 2016 – Aug. 30, 2018, University of Vigo, Vigo, Spain.
6. Dr. Yateendra Deshpande, Jan. 2015 – Aug. 2015, Texas A&M University, College Station, TX.
7. Dr. Poopak Roshanfekar Fard, Jan. 2015 – June 2015, Chalmers University, Gothenburg, Sweden.
8. Prof. Dong-Myung Lee, Feb. 2012-Sep. 2012, Hongik University, Seoul, Korea.
9. Prof. Hasan Moradi, Nov. 2010-August 2011, Shahid Beheshti University, Tehran, Iran.
10. Prof. Peter Omand Rasmussen, May-July 2008, Aalborg University, Denmark.

11. Dr. Yuttana Kumsuwan, Oct. 2007- March 2008, Chiangmai University, Thailand.
12. Dr. Jung-Chul Kim, LG Electronics, 2006-June 2008, Korea.
13. Prof. Oh Yang, School of Electronics and Information Engineering, Cheong Ju University, March 2006-March 2007, Korea.
14. Dr. Nam-Hun Kim, Department of Electrical Engineering, Yeungnam University, Sep. 2004-July 2007, Korea.
15. Dr. Reginaldo Sousa Miranda, Sep. 2006-Dec. 2006, Federal University of Campina Grande, Brazil.
16. Prof. Euzeli Cipriano dos Santos Junior, Sep. 2006- March 2007, Federal University of Campina Grande, Brazil.
17. Dr. Chang-Ho Choi, June 2003-July 2006, POSCON Co., Korea.
18. Dr. Isaac Soares de Freitas, Sep. 2006-Aug. 2007, Federal University of Campina Grande, Brazil.
19. Prof. Chang Seop Koh, February 2003-May 2004, Chungbuk National University, Korea.
20. Prof. Houcine Zeroug, October 1, 2002-February 2004, Department of Electrical Engineering, Faculty of Electrical Engineering, U.S.H.B, Algiers, Algeria, Fulbright Scholar.
21. Prof. Seok-Kwon Jeong, March 2001-February 2003, School of Mechanical Engineering, Pukyong National University, Korea
22. Dr. Syed Mohammad Madani, October 2000-January 2003, Department of Electrical Engineering, Eindhoven University, Netherlands.
23. Prof. Sergio Cruz, September 2002- January 2003, Department of Electrical and Computer Engineering, Coimbra, Portugal.
24. Prof. Karim Abbaszadeh, January 2002-December 2002, Department of Electrical Engineering, Amir-Kabir University of Technology, Tehran, Iran.
25. Prof. Haithem Abu-Rub, January 2001- December 2001, Department of Electrical Engineering, Bir Zeit University, West Bank, Israel, Fulbright Scholar.
26. Prof. Mohab Hallouda, July 2000-September 2000, Department of Electrical Engineering, Cairo University, Egypt.
27. Dr. Ali S. Ba-thunya, Feb. 2000-December 2000, Department of Electrical Engineering, University of Aden, Yemen.
28. Prof. Kexin Wei, July 2000-December 2001, Tianjin Professional College, China.
29. Dr. Jin Hur, July 1999-September 2000, Department of Electrical Engineering, Hanyang University, Seongdong-Gu, Korea.
30. Prof. Homayoun Meshgin-Kelk, January 2000-August 2000, Department of Electrical Engineering, Amir-Kabir University of Technology, Tehran, Iran.

Membership in Professional and Honorary Societies:

1. Member, Technical Committee, 11th International Conference on Power Electronics, Drive Systems, and Technologies (PEDSTC 2020), Tehran, Iran, Feb. 4-6, 2020.

2. Member, Advisory Board in the IES-IEEE 14th International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG2020), Setubal, Portugal, April 1-3, 2020.
3. Member, Technical Program Committee, IEEE International Power Electronics and Application Conference and Exposition-PEAC'2018, Shenzhen, China, Nov. 4-7, 2018.
4. Member, International Advisory Board, IEEE CPE-POWERENG 2018 (12th International Conference on Compatibility, Power Electronics and Power Engineering), Doha, Qatar, April 10-12, 2018.
5. Member, International steering Committee, IEEE International Conference on Power Electronics, Drives and Energy Systems (IEEE PESES 2016, Trivandrum/Kovalam, Kerala, India, Dec. 14-17, 2016.
6. Co-Chair International Steering Committee, IEEE International Future Energy Electronics Conference (IFEEC), Kaohsiung, Taiwan, May 21-24, 2017.
7. Nominating Chair, IEEE Industry Applications Society, Industrial Power Conversion Systems Department (IPCSD).
8. Member of International Steering Committee, IEEE International Future Energy Electronics Conference (IFEEC), Taipei, Taiwan, Nov. 1-4, 2015.
9. Member of the Advisory Committee, IEEE-IEMDC 2015, Coeur d'Alene, ID, May 10-13, 2015.
10. Member of scientific Committee, Joint 1st International Conference on Applied Automation and Industrial Diagnostic (ICAADI 2015) and the 2nd International Conference on Power Electronics and Their Applications (ICPEA 2015), Djelfa, Algeria,
11. Member of Technical Committee, The Fifth Power Electronics, Drive Systems & Technologies Conference (PEDSTC'14), Tehran, Iran, Feb. 5-6, 2014.
12. Guest Co-Editor, IEEE Journal of Emerging and Selected Topics in Power Electronics, Special Issue on Advanced Control of Electric Motor Drives, December 2013.
13. Co-Chair International Steering Committee, IEEE International Future Energy Electronics Conference (IFEEC), Tainan, Taiwan, Nov. 3-6, 2013.
14. Member of the Steering Committee, Innovations in Energy, Power and Electrical Machines Conference (IEPEM-2013), Istanbul, Turkey, September 5-7, 2013.
15. Chair, IEEE-PES EMC Motor Subcommittee Working Group on Condition Monitoring of Electrical Machines, Jan. 2011 – present.
16. Member of the International Scientific Committee, 13th Scientific Conference Electric Power Engineering 2012, Brno, Czech Republic, May 23-25, 2012.
17. Member of Technical Program Committee, 2nd Power Electronic, Drive Systems & Technologies Conference (PEDSTC2012), Feb 16-17, 2012, Tehran, Iran.
18. Session Chair, IEEE-IEMDC 2011, Miami, FL.
19. Member of Program Committee of EPA 2011, Dec. 6-8, 2011, London, England.
20. Member of Technical Program Committee of the 2011 International Conference & Exhibition on Ecological Vehicles & Renewable Energies, March 31-April 3, 2011, Monaco.
21. Member of Technical Program Committee, 2nd Power Electronic, Drive Systems & Technologies Conference (PEDSTC2011), Feb 16-17, 2011, Tehran, Iran.

22. Member of the Technical Program Committee of the 2009 IEEE 6th International Power Electronics and Motion Control Conference (IPEMC 2009), May 17-20, 2009, Wuhan, China.
23. Member of the International Program Committee of the IASTED International Conference on Modern Nonlinear Theory, Nov. 16-18, 2008, Orlando, FL.
24. Member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard, SSPC41, Standard Methods of Measurement.
25. Member of the International Steering Committee of ICEMS'2008, Oct. 17-20, 2008, Wuhan, China.
26. Chair Industrial Power Conversion Systems Department of IEEE Industry Applications Society, 2007-2009.
27. Vice-Chair Industrial Power Conversion Systems Department of IEEE Industry Applications Society, 2006-2007.
28. Chairman, Electric Machines Committee of IEEE Industry Application Society, 2003-2005.
29. Member of the Organizing Committee of the 12th Biennial IEEE Conference on Electromagnetic Field Computation (CEFC 2006)
30. Member of the International Scientific Committee of 20th International Congress and Exhibition on Condition Monitoring and Diagnostic Engineering Management (COMADEM'2007), Faro, Portugal, June 13-15, 2007.
31. Vice-chairman of Electric Machines Committee of the IEEE Industry Applications Society, 2001-2003
32. Member of Technical Committee of the 5th International Power Electronics and Motion Control Conference (IPEMC2006), Shanghai, China, August 2006.
33. Member of Steering Committee of IEEE-IEMDC Conference, 2003-2005.
34. Member of the International Steering Committee, The Eighth International Conference on Electrical Machines and Systems (ICEMS'2005), Sep. 27-29, 2005, Nanjing, China.
35. Member of the Technical Program Committee of the 4th International Power Electronics and Motion Control Conference, August 14-16, 2004, Xi'an, China.
36. Special Session Chair, 4th International Symposium on Diagnostics for Electric Machines, Power Electronics and Drives (SDEMPED'03), Atlanta, GA, August 24-26, 2003.
37. Member of the IEEE-IEMDC'03 Steering Committee, Madison, WI.
38. Member of the Technical Program Committee, IAS'02, Pittsburgh, PA.
39. Member of IEEE-IAS'02 Technical Program Committee
40. Member of IEEE-APEC'02 Program Committee.
41. Member of Industrial Drives Committee of the IEEE Industry Applications Society
42. Member of the IEEE-IEMDC'01 Organizing Committee.
43. Secretary of Induction Machine Subcommittee of Electric Machinery Committee of IEEE Power Engineering Society.
44. Member of IEEE-APEC'01 Program Committee.
45. Chairman of Standard Subcommittee of Electric Machines Committee of the IEEE Industry Application Society.

46. Member of Induction Machinery Subcommittee of Electric Machinery Committee of IEEE Power Engineering Society.
47. Member of IEEE-APEC'00 Program Committee.
48. Member of the Technical Program Committee of the ICPE'98, Seoul, Korea, Oct. 26-31.
49. Member of IEEE-APEC'99 Program Committee.
50. Member of IEEE-APEC'97 Program Committee.
51. Member of the International Steering Committee of the 1997 IEEE International Symposium on Diagnostics for Electrical Machines, Power Electronics and Drives, Carry-le-Rouet, France.
52. Senior Member of IEEE, 1996-2008.
53. Member of Sigma Xi, the Scientific Research Society.
54. Member of Phi Beta Delta Honor Society for International Scholars.
55. Listed in the 2000 Outstanding Scientist of the 20th Century.

University Services:

1. Former Students and External Relations Committee, Member, Department of Electrical and Computer Engineering, Sep. 1, 2024 – Aug. 31, 2025.
2. Staff and Faculty Internal Awards Committee, Member, Department of Electrical and Computer Engineering, Sep. 1, 2024 – Aug. 31, 2025.
3. Faculty Recruitment and Hiring Committee, Member, Department of Electrical and Computer Engineering, Sep. 1, 2023 – Aug. 31, 2024.
4. Former Students and External Relations Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, Sep. 1, 2022- Aug. 31, 2023.
5. Seminar & Distinguished Speaker Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, Sep. 1, 2021- Aug. 31, 2022.
6. Tenure and Promotion Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, Jan. 1, 2020-present.
7. Faculty Host for the Summer 2019 International Research Internship Program, Texas A&M University.
8. Seminar & Distinguished Speaker Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, Sep. 1, 2017- Aug. 31, 2020.
9. Reviewer for U.S. Department of Energy - Office of Technology Transitions, May 2017.
10. Reviewer for the Texas A&M University Office of Graduate and Professional Studies (OGAPS) Diversity Fellowship Program, 2017-2018.
11. Tenure and Promotion Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, Jan. 1, 2016- Dec. 31, 2017.
12. Member of University Honor Program, 2016.
13. Reviewer for the Texas A&M University Office of Graduate and Professional Studies (OGAPS) Diversity Fellowship Program, 2016-2017.

14. Member of TEES Center for Infrastructure Renewal Hiring Committee, Texas A&M University, 2015.
15. Graduate Studies Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, 2013-2014.
16. Undergraduate Studies Committee, Member, Department of Electrical and Computer Engineering, Texas A&M University, Sep. 1, 2014-Aug. 31, 2017.
17. Seminar Committee, Member, Department of Electrical and Computer Engineering, Texas A&M University, Sep. 1, 2015-Aug. 31, 2017.
18. Tenure and Promotion Committee, Member, College of Engineering, Texas A&M University, Sep. 1, 2010 – Aug 30, 2012.
19. Tenure and Promotion Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, Jan. 1, 2009- Dec. 31, 2010.
20. Awards Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, 2008-2009.
21. College of Engineering Honors and Awards Committee, Member, 2006-2009.
22. Faculty Senate, Member, Texas A&M University, 2006 - 2013.
23. Awards Committee, Member, Department of Electrical & Computer Engineering, Texas A&M University, 2005-2006.
24. Undergraduate Summer Research Grant Program, Member, 2001 and 2002.
25. Served on the Texas A&M University Center for Energy Resources Program, Proposal review panel, 1998.
26. Council of Principal Investigators, Member, Texas A&M University.
27. Electric Power and Power Electronics (EPPEI) Member.
28. Texas A&M Metermens School Lecturer.

Services:

1. Reviewer for the US Civilian Research and Development Foundation
2. Reviewer for the National Research Foundation (NRF) of South Africa
3. Reviewer for IEEE Transactions on Industry Applications.
4. Reviewer for IEEE Transactions on Power Electronics.
5. Reviewer for IEEE Transactions on Energy Conversions.
6. Reviewer for Electric Power Systems Research Journal.
7. Reviewer for the Iranian Journal of Electrical and Computer Engineering
8. Reviewer for IEEE-APEC 1996-2002 Conferences.
9. Reviewer for IEEE Industry Applications Society Annual Meetings.
10. Reviewer for IEEE-IEMDC Conferences
11. Reviewer for IEEE-PESC Conferences.

12. Served on the National Science Foundation SBIR Review Panel, 1997.
13. Reviewer for the 5th International Conference on Modeling and Simulation of Electric Machines, Converters and Systems, Saint-Nazaire, France.

Graduate Students Committee Member:

1. Mohammed Junaid Ahmed, Ph.D. student, Advisor: Dr. A. Palazzolo, Department of Mechanical Engineering.
2. Cody Marquardt, Ph.D. student, Dr. H. Kang, Department of Ocean Engineering.
3. Muhammad Ashar Ayaz, Ph.D. student, Dr. Irfan Khan, Department of Electrical and Computer Engineering.
4. Yun-Chen Lee, M.S. student, Advisor: Dr. A. Datta, Department of Electrical and Computer Engineering.
5. Sangyoon Kim, Ph.D. student, Advisor: Dr. P. Enjeti, Department of Electrical and Computer Engineering.
6. Kevin Kim, M.S. student, Advisor: Dr. P. Enjeti, Department of Electrical and Computer Engineering.
7. Laxmi Thela, M.S. student, Advisor: Dr. M. Ehsani, Department of Electrical and Computer Engineering.
8. Zhemin Hu, Ph.D. student, Ph.D. student, Advisor: Dr. M. Ehsani, Department of Electrical and Computer Engineering.
9. Sahil Mishra, M.S. student, Advisor: Dr. A. Palazzolo, Department of Mechanical Engineering.
10. Zeeshan Khavar, M.S. student, Advisor: W. Kim, Department of Mechanical Engineering.
11. Riley S Kilfoyle, M.S. student, Advisor: M. Ehsani, Department of Electrical and Computer Engineering.
12. Aghamarshana Meduri, Ph.D. student, Advisor: H. Kang, Department of Ocean Engineering.
13. Yongseok Lee, Ph.D. student, Advisor: H. Kang, Department of Ocean Engineering.
14. Sunsoo Kim, Ph.D. student, Advisors: S. Bhattacharyya and R. Bhattacharya, Department of Electrical and Computer Engineering.
15. Joseph Heimerl, Aerodynamic Performance of Full-Scale Ultra-Quiet Coaxial Propeller in Hover, M.S. student, Advisor: Dr. M. Benedict, Department of Aerospace Engineering, Aug. 2024.
16. S. Rahman, Ph.D. Dissertation, Electric Vehicle-Induced Grid Impact Analysis and Its Minimization, Advisor: I. Khan, Department of Electrical and Computer Engineering, May 2024.
17. Xu Feng, Experimental Demonstration of Multiport Multifrequency Power Systems, M.S. Thesis, Advisor: M. Ehsani, Department of Electrical and Computer Engineering, May 2024.
18. Farid Saemi, Electric Powertrain Models for Small UAS Conceptual Design, Ph.D. dissertation, Advisor: M. Benedict, Department of Aerospace Engineering, May 2024.
19. Nathan Malone, General Sizing Relationships for Axial Flux Motors, Ph.D. Dissertation, Advisor: J. Felts, Department of Mechanical Engineering, May 2024.

20. Andrew Miller, Leveraging Natural Language Processing Techniques for More Natural Human-Computer Interactions in Extended Reality Environments, Ph.D. dissertation, Advisor: S. Kalafatis, Department of Electrical and Computer Engineering, May 2024.
21. Eric Pool Mazun, Ph.D. Dissertation, Advisor: P. Enjeti, High Frequency Power Conversion Concepts for Transportation Electrification, Department of Electrical and Computer Engineering, Dec. 2023.
22. Farid Saemi, M.S. Thesis, Advisor: M. Benedict, Department of Aerospace Engineering.
23. Michael Autery, M.S. Thesis, Anti-Diver Harbor Defense with AI-Enabled AUV: Design of Autonomous Helical Search Path with Object Detection for Low-Cost ROV, Advisor: H. Kang, Department of Ocean Engineering, Dec. 2022.
24. Simon Staal Nielsen, Ph.D. Dissertation, Advisor: P. Omand Rasmussen, Aalborg University, June 2021.
25. Lucas Perkins, The Prediction and Experimental Measurement of Torsional Vibrations in Variable Frequency Drive Controlled Induction Motor Machinery, M.S. Thesis, Advisor: Dr. A. Palazzolo, Department of Mechanical Engineering, Aug. 2021.
26. Mine Kaya, Characterization and Optimization of Radiation at Nano Scale: Applications in Solar Cell Design, Ph.D. Dissertation, Advisor: Shima Hajimirza, Department of Mechanical Engineering, Dec. 2020.
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28. Anshuman Swain, Development of Transmission Architecture for Range Extension in Electric Vehicles, M.S. thesis, Advisor: S. Gopalswamy, Department of Mechanical Engineering Dec. 2020.
29. Kevin Hodge, A High Frequency Multilevel Boost Power Factor Correction Approach with GaN Semiconductors, M.S. thesis, Advisor: P. Enjeti, Department of Electrical and Computer Engineering, May 2020.
30. Jiayuan Zhang, Ph.D. student, Advisors: Dr. M. Ehsani and Dr. Wei Zhan, Fault Tolerant Control of PMSM with Inter-Turn Short Circuit, Department of Electrical and Computer Engineering, May 2019.
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33. Xiaojun Li, Design and Development of Next generation Energy storage Flywheel, Ph.D. dissertation, Advisor: Dr. Palazzolo, Department of Mechanical Engineering, May 2018.
34. Woolim Hong, Transfemoral Prosthesis Control for Inclined Walking using Impedance Control and Biewer Based Optimization, M.S. thesis, Advisors, S. Bhattacharyya and P. Hur, Department of Electrical and Computer Engineering, Dec. 2017
35. Bahaa Eldeen Hafez, Ph.D. dissertation, Advisors: Drs. P. Enjeti and Dr. S. Ahmed, Department of Electrical and Computer Engineering.
36. Jose J. Sandoval, Analysis and Design of New Three-Phase ac to dc Rectifier Systems with Higher Frequency Isolation, Ph.D. dissertation, Advisor: Dr. P. Enjeti, Department of Electrical and Computer Engineering, May 2017.

37. Gihyeob An, Collision Cone-Based Lane Changing Model for Advantageous Driving, M.S. thesis, Advisor: Dr. S. Bhattacharyya, Department of Electrical and Computer Engineering, Aug. 2017.
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39. Andrew Nelson, Precision Position Control using an RGB Sensor and Linearized Output Variable-Intensity Color Array, M.S. thesis, Advisor: Won-Jong Kim, Department of Mechanical Engineering, Aug. 2017.
40. Young-shin Kwon, Development of Double-Sided Interior Permanent Magnet Flat Linear Brushless Motor and its Control using Linear Optical Potentiometer, Ph.D. dissertation, Advisor: Dr. Won-jong Kim, Department of Mechanical Engineering, Aug. 2016.
41. Weiran Dai, Advanced Active Output Filter for Low Acoustic Noise Adjustable Speed Drive (ASD) System, M.S. thesis, Advisor: P. Enjeti, Department of Electrical and Computer Engineering, Aug. 2016.
42. Ahmed M.S. Morsy, Design Optimization and Control of High Power Density Converters using Wide Band Gap Devices, Ph.D. dissertation, Advisor: Dr. P. Enjeti, August 2016.
43. Vu H. Nguyen, Design and Validation of a Universal Framework for Linear Motors and Multi-axis Stages with Magnetic Levitation, Ph.D. dissertation, Advisor: Dr. Won-Jong Kim, Department of Mechanical Engineering, Dec. 2015.
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45. Harish S. Krishnamoorthy, Power Electronic Topologies with High Density Power Conversion and Galvanic Isolation for Utility Interface, Ph.D. dissertation, Advisor: Dr. P. Enjeti, May 2015.
46. Adrian Israel Colli Menchi, High Efficiency Switching Systems – Class-D Amplifier and Buck Converter, Advisor: Dr. E. Sanchez, May 2015.
47. Xiaohua Zhang, Small Engine Flash Vapor JP-8 Fuel Injector Testing, Simulation and Development, Dr. Alan Palazzolo, Department of Mechanical Engineering, Texas A&M University, Dec. 2014.
48. Ruikang Zhu, Repetitive Control of a Novel Linear Magnetostrictive Actuator, M.S. thesis, Advisor: Dr. Won-jong Kim, Department of Mechanical Engineering, Texas A&M University, Aug. 2014.
49. Mesaad Albader, Advanced Three Phase Power Factor Correction Schemes for Utility Interface of Power Electronics Systems, M.S. thesis, Advisor: Dr. P. Enjeti, Aug. 2014.
50. Jose-Christian Silva-Rivas, Control and Optimization of a Compact 6-Degree-of-Freedom Precision Positioner using Combined Digital Filtering Techniques, M.S. student, Advisor: Dr. Won-jong Kim, Department of Mechanical Engineering, Texas A&M University.
51. Reza Muhammad Abdullah, Instrumentation Amplifiers for Bio-potential Signal Acquisition, M.S. Student, Advisor: Dr. E. Sanchez.
52. Eddy Aeloiza, Analysis and Design of New harmonic Mitigation Approaches, Ph.D. Dissertation, Advisor, Dr. Prasad Enjeti, Department of Electrical and Computer Engineering, Texas A&M University, Dec. 2012.
53. Jose Silva, M.S. student, Advisor: Dr. Won-jong Kim, Department of Mechanical Engineering, Texas A&M University, Dec. 2011.

54. Jason Wardlow, Energy Harvesting for Self-Powered Wireless Sensors, Ph.D. student, Advisor: Dr. Aydin Karsilayan, Dec. 2011.
55. Ang Li, M.E. student, Advisor: Dr. Won-jong Kim, Department of Mechanical Engineering, Texas A&M University, May 2011.
56. Divya Balakrishnan, Capacitor-less VAR Compensator Based on a Matrix Converter, M.S. student, Advisor: Dr. Robert Balog, Department of Electrical and Computer Engineering, Texas A&M University, Dec. 2010.
57. Naveen Kumar Bibinagar, Robustness of a Ethernet-Based Real-Time Networked Control Sysytem with Multi-Level Client/Server Architecture, M.S. student, Advisor: Dr. Won-jong Kim, Department of Mechanical Engineering, Texas A&M University, Aug. 2010.
58. Mohamed El-Nozahi, System and Circuit Design Technologies for Silicon-Based Multi-Band/Multi-Standard Receiver, Ph.D. Dissertation, Advisors: Drs. Kamran Entesari and Edgar Sanchez, Texas A&M University, College Station, Texas, May 2010.
59. Ali Sadighi, Ph.D. Dissertation, Advisor: Dr. Won-jong Kim, May 2010.
60. Ryan S. Hutcheson, Function-Based Design Tools for Analyzing the Behavior and Sensitivity of Complex Systems during Conceptual Design, Ph.D. Dissertation, Department of Mechanical Engineering, Texas A&M University, College Station, Texas, May 2009, Advisor: Dr. Daniel McAdams.
61. Maja Harfman Todorovic, Ph.D. Dissertation, Advisor: Dr. Prasad Enjeti, Dec. 2007.
62. Alex Skorcz, M.S. student, Performance Evaluation of an Active Filter Non-Regenerative ac Drive, Advisor: Dr. M. Ehsani, December 2007.
63. Leonardo Palma, Design Consideration for DC-DC Converters in Fuel Cell Systems, Ph.D. Dissertation, Texas A&M University, College Station, Texas, December 2006, Advisor: Dr. Prasad Enjeti
64. Yamin Qaisar Durrani, "Analysis of Silicon Carbide Based Semiconductor Power Devices and Their Application in Power Factor Correction," Texas A&M University, College Station, TX, May, 2005, M.S. student, Adviser: Dr. Prasad Enjeti
65. Sebastien Gay, Contactless Magnetic Brake for Automotive Applications, Ph.D. Dissertation, Texas A&M University, College Station, TX, May 2005, Adviser: Dr. Mehrdad Ehsani.
66. Tiejun Hu, "Design and Control of a 6-Degree-of-Freedom Levitated Positioner with High Precision," Ph.D. Dissertation, Department of Mechanical Engineering, Texas A&M University, College Station, TX, May 2005, Adviser: Dr. Won-jong Kim.
67. Maja Harfman Todorovic, M.S. student, Texas A&M University, College Station, TX August 2004, Adviser: Dr. Prasad Enjeti.
68. Han-Ju Cha, "Analysis and Design of Matrix Converters for Adjustable Speed Drives and Distributed Power Sources," Ph.D. Dissertation, Texas A&M University, College Station, TX, August 2004, Advisor: Dr. Prasad Enjeti.
69. Woo-Jin Choi, "New Approaches to Improve the Performance of the PEM Based Fuel cell Power Systems," Ph.D. Dissertation, Texas A&M University, College Station, TX, Advisor: Dr. Prasad Enjeti
70. Leonardo Palma, M.S. Thesis, Texas A&M University, College Station, Texas, August 2003, Advisor: Dr. Prasad Enjeti.

71. Charles C. Kidder, M.S. Thesis, Texas A&M University, College Station. Texas, December 2002, Advisor: Dr. Kai Chang.
72. Avinash G. Dharne, "Increasing the Robustness of the Input-Shaping Method using Adaptive Control," M.S. Thesis, Department of Mechanical Engineering, Texas A&M University, College Station. Texas, December 2002, Advisor: Dr. Suhada Jayasuriya.
73. Mohammad A.K. Jaradat, "Line Map Construction Based on Small-Scale Mobile Robot using Single-Sonar Navigation," M.S. Thesis, Department of Mechanical Engineering, Texas A&M University, College Station. Texas, December 2002, Advisor: Dr. Reza Langari.
74. Jae-hong Hahn, "Analysis and Design of Modular Three-Phase Power Factor Correction Schemes for Utility Interface," Ph.D. Dissertation, Texas A&M University, College Station, Texas, August 2002, Advisor: Dr. Prasad Enjeti.
75. Juan Carlos Juarez, "The Application of Fiber Sensors to the Monitoring of Roller Element Bearing Systems, M.S. Thesis, Texas A&M University, College Station, Texas, August 2002, Advisor: Dr. Henry Taylor.
76. Sang-sun Kim, "New Approaches to Mitigate Harmonics: Development of Active Power Filters and Converters Embedded with Harmonic Filtering Functions", Ph.D. Dissertation, Texas A&M University, College Station, Texas, May 2002, Advisor: Dr. Prasad Enjeti.
77. Rajesh Gopinath, M.S. Thesis, Texas A&M University, College Station, Texas, Dec. 2001, Advisor: Dr. Prasad Enjeti.
78. Hang Wang, "Models for Short Circuit and Incipient Internal Faults in Single-phase, Distribution Transformers", Ph.D. Dissertation, Texas A&M University, College Station, Texas, May 2001, Advisor: Dr. Karen Butler-Perry.
79. Kyusung Kim, "Sensorless Fault Diagnosis of Induction Motors," Ph.D. dissertation, Department of Nuclear Engineering, Texas A&M University, College Station, Texas, May 2001, Advisor: Dr. Alex Parlos.
80. Jose Luis Duran-Gomez, "New Approaches to Improve the Performance of Adjustable Speed Drive (ASD) Systems under Power Quality Disturbances", Ph.D. dissertation, Texas A&M University, College Station, Texas, December 2000, Advisor: Dr. Prasad Enjeti.
81. Ekrem Cengelci, "Multilevel Inverters and Modular Adjustable Speed Drive Systems," Ph.D. dissertation, Texas A&M University, College Station, Texas, August 2000, Advisor: Dr. Prasad Enjeti.
82. Maria D. Bellar, "A Low Cost AC Motor Drive with Power Factor Control", Ph.D. Dissertation, Texas A&M University, College Station, Texas, May 2000, Advisor: Dr. Mehrdad Ehsani.
83. Suresh Gopalakrishnan, "Inductance Model Based Sensorless Control of Switched Reluctance Motor Drive for High Performance Applications", Ph.D. Dissertation, Texas A&M University, College Station, Texas, May 2000, Advisor: Dr. Mehrdad Ehsani.
84. David L. Sabbagh, "Estimation of the Error for Small-Sample Optimal Binary Filter Design using Prior Knowledge", M.S. Thesis, Texas A&M University, College Station, Texas, Dec. 1999.
85. Babak Fahimi, "Control of Vibration in Switched Reluctance Motor Drive", Ph.D. Dissertation, Texas A&M University, College Station, Texas, May 1999, Advisor: Dr. Mehrdad Ehsani.
86. James P. Johnson, "Synchronous-Misalignment Detection/Correction Technique of Sensorless BLDC Control", Ph.D. Dissertation, Texas A&M University, College Station, Texas, December 1998, Advisor: Dr. Mehrdad Ehsani.

87. Yilcan Guzelgunler, "Sensorless Synchronous Operation of the BLDC Motor", M.S. Thesis, Texas A&M University, College Station, Texas, January 1998, Advisor: Dr. Mehrdad Ehsani.
88. Arisitide-Marie Tchamdjou, "An Evaluation of a Parallel-Resonant Current Source Converter for an Electrothermal Thruster", M.S. Thesis, Texas A&M University, College Station, Texas, December 1996, Advisor: Dr. Mehrdad Ehsani.
89. Piyush Tandon, "Self-Tuning Control of Switched Reluctance Motor", M.S. Thesis, Texas A&M University, College Station, Texas, May 1996, Advisor: Dr. Mehrdad Ehsani.

Foreign Ph.D. Students Thesis Evaluator:

1. Aryadip Sen, Grid Interactive and Standalone Permanent Magnet Brushless DC Motor Drive for Solar PV Array Fed Water Pumping, Indian Institute of Technology Delhi, India, Feb. 2024, Advisor: B. Singh.
2. Subramanya K., Simulation and Experimental Investigation on DC Current Capability of Power Transformers, Indian Institute of Technology Roorkee, India, Dec. 2023, Advisor: T. Chelliah.
3. Xie Shuangchun, Design, Analysis and Application of Field-Modulated Machines with Direct-Drive Features for Automated Ground Vehicles, Nanyang Technological University, Singapore, 2023, Advisor: C.H.T. Lee.
4. Jitendra Gupta, Design and Development of Light Electric Vehicle Chargers, Indian Institute of Technology Delhi, India, Nov. 2023, Advisor: B. Singh
5. Prashant Surana, Investigation on Generation of Multilevel 24-Sided Polygonal Voltage Space Vector Structures without Vector Averaging for Variable Speed Drives, Indian Institute of Science, India, Dec. 2022, Advisor: K. Gopakumar.
6. Martin Cheerangal Joy, Fault Tolerant Control Strategies of Induction Motor Drive Fed From Voltage Source Converters, Indian Institute of Technology Delhi, India, Dec. 2022, Advisors: A.K. Jain, and A. Das.
7. Naga Surya Prakash M, Improvised Model Predictive Control Methods for Dual Fed Inverter Fed Open End Winding Induction Motor Drive, Indian Institute of Technology Madras, India, June 2022, Advisor: S. Srinivas.
8. Ebin Cherian Mathew, Fault Tolerant Schemes for Exchanging Power with HVDC Transmission Lines, Indian Institute of Technology Delhi, May 2022, Advisor: A. Das.
9. Pavitra Shukl, Design and Development of Renewable Energy Based Microgrids with Grid Synchronization and Their Applications to EV Charging Infrastructure, Indian Institute of Technology Delhi India, Mar. 2022, Advisor: B. Singh.
10. Casper Jeremias Johannes Labuschagne, Design and Critical Evaluation of Permanent Magnet Wind Generator Technology for Small-scale Wind Energy Systems, Stellenbosch University, South Africa, Feb. 2022, Advisor: M.J. Kamper.
11. Anjeet Kumar Verma, Control of Reliable Charging Infrastructure for EVs with Renewable Energy Grid Interface, Indian Institute of Technology Delhi, Feb. 2021, Advisor: B. Singh.
12. Raja R. Semwal, Design and Operational Challenges in Variable Speed Pumped Storage Plant, Indian Institute of Technology Roorkee, Feb. 2021, Advisor: T.R. Chelliah.
13. Karthik D., Thermal Performance Improvement in Multi-Megawatt power Converter Serving to Asynchronous Hydrogenerator, Indian Institute of Technology Roorkee, Feb. 2021, Advisor: T.R. Chelliah.

14. Ramu Nair R., Emulation of Wind Turbine and Sensorless Control of Doubly-Fed Induction Generator for Wind Energy Application, Indian Institute of Science, India, Oct. 2020, Advisor: G. Narayanan.
15. Akhil Vinayak B., Stator Fault Diagnosis of Inverter-Fed Induction Motor by Means of Machine Learning and Frequency Spectrum Approach, National Institute of Technology Calicut, India, Oct. 2020, Advisor: Jagadanand G.
16. Om Prakash Yadav, Stator and Bearing Faults Diagnosis of Induction Motor, National Institute of Technology, India, Dec. 219, Advisor: G.L. Pathuja.
17. R. Kushwaha, Power Quality Improvement in Battery Chargers of Light Electric Vehicles, Indian Institute of Technology Delhi, India, Dec. 2019, Advisor: B. Singh.
18. Piyush Kant, Power Quality Improvement in Multi-Pulse Converter Fed Multilevel Inverter Based Induction Motor Drives, Indian Institute of Technology Delhi, India, Dec. 2019, Advisor: B. Singh.
19. Nguyen Viet Hung, Model-Based Diagnosis and Prognosis of Induction Motors under Stator Winding Fault, Nanyang Technological University, Singapore, Dec. 2017, Advisor: W. Danwei.
20. Hossein Mousavian, MHz Resonant DC-DC Converters with First Cycle Control, Queen's University, Canada, Oct. 2017, Advisors: A. Bakhshai, and P. Jain.
21. Lilian L. Amuhaya, Design and Optimization of Direct-driven PM Variable-Flux Synchronous Generators for Directly Grid-Connected Slip-Synchronous Wind-Turbines, University of Stellenbosch, South Africa, Dec. 2017, Advisor: M.J. Kamper,
22. Anirudh Guha, Dead-Time Induced Oscillations on Voltage Source Inverter-fed Induction Motor Drives, Indian Institute of Science, India, July 2016, Advisor: G. Narayanan.
23. Arun Rahul S, Investigation on Hybrid Multilevel Inverters with a Single DC Supply for Zero and Reduced Common Mode Voltage Operation and extended Linear Modulation Range Operation for Induction Motor Drives, Indian Institute of Science, India, July 2016, Advisor; K. Gopakumar
24. Arun Dominic D., Performance Investigation of Induction Motor Drives under Sensor Faults, Indian Institute of Technology Roorkee, India, July 2016, Advisor: T. Raj Chelliah.
25. Hao Ge, Fractional Slot Concentrated Winding Interior Permanent Magnet Machines with Reluctance Torque: Inductance –Based Methodology for Comprehensive Analysis, Design, and Control, McMaster University, Canada, June 2016, Advisor: A. Emadi.
26. Sumit Kumar Pramanick, Switched Capacitive Filtering Scheme for Harmonic Suppression in Variable Speed AC Drives, Indian Institute of Science, India, June 2016, Advisor; K. Gopakumar.
27. Vijay Kumar Tayal, Robustness Analysis & Control Design of Flexible AC Transmission (FACTS) Based Power Systems, National Institute of Technology, Kurukshetra, India, Aug. 2015, Advisor: J.S. Lather.
28. Mohd. Faisal Khan, Modeling and Control of Multi-Phase Induction Generator for Wind Energy Applications, Aligarh Muslim University, Aligarh, India, 2015, Advisor: Mohd. Rizwan Khan
29. Kazi Ahsanullah, A Concentrated Wound Interior Permanent Magnet Machine for Direct-Drive Wind Turbine Applications,” University of New South Wales, Australia, June 2015, Advisor: M. Rahman.
30. Yatender Kumar Chaturvedi, “Analysis of Self-Excited Induction Generator with Unbalanced Load and Excitation,” National Institute of Technology, Kurukshetra, Oct. 2014, Advisor: K.S. Sandhu.

31. Jaison Mathew, "Investigation on Dodecagonal Multilevel Voltage space Vector Structures by Cascading Flying Capacitor and Floating H-bridge Cells," Indian Institute of Science, Bangalore, India, July 2013, Advisor: Dr. Gopakumar.
32. Suzan Eren, "Control of a Grid-Connected Voltage Source Inverter with LCL Filter," Queens University, Kingston, ON, Canada, Sep. 2013, Advisor: Dr. A. Bakhshai.
33. Sudhir Sharma, "Power Quality Investigations of Induction Generators under Different Operating Conditions," National Institute of Technology, Kurukshetra, India, March, 2012, Advisor: Dr. K.S. Sandhu.
34. Jeevanand S., "Intelligent Condition Monitoring of Induction Machines," Department of Electrical Engineering, Indian Institute of Technology Delhi, March 2013, Advisors: Drs. Bhim Singh, and B.K. Panigrahi.
35. B. Venugopal Reddy, "Investigations on Circuit Topologies and PWM Schemes for a Four-Level Dual Inverter Fed Open-End Winding Induction Motor Drive," National Institute of Technology, Warangal, India, Sep. 2012, Advisor: Dr. V.T. Somasekhhar.
36. Sukhbir Singh, "Dissolved Gas Analysis for Fault Diagnosis of Power Transformers", Ph.D. thesis, National Institute of Technology Kurukshetra, Kurukshetra, India, Feb. 2012, Advisor: Dr. Deera Joshi.
37. Nkosinathi Gule, "Analysis of Direct Flux and Direct Torque Controlled Multi-phase Cage Induction Machine with Nearly Square Air-gap Flux Density", Ph.D. thesis, Department of Electrical and Electronic Engineering, The University of Stellenbosch, South Africa, Dec 2010, Advisor: Dr. Maarten J. Kamper.
38. Rijil Ramchand, "Investigation on Boundary Selection for Switching Frequency Variation Control of Current Error Space Phasor Based Hysteresis Controllers for Inverter FED IM Drives, Ph.D. thesis, Indian Institute of Science, Bangalore, India, Dec. 2010, Advisor:
39. Dipankar De, "High Frequency Link Inverters and Multiresonant Controllers, Ph.D. thesis, Indian Institute of Science, Bangalore, India, Dec. 2010, Advisor:
40. Meharegzi Tewolde Abreham, "A Matrix Converter-fed Synchronous Motor Drive with an Improved Commutation Technique, Ph.D. thesis, Indian Institute of Technology Kanpur, India, July 2009, Advisor: Dr. S.P. Das
41. P. Parthiban, "Performance Investigation of SVM Based CSI FED Induction Motor Drive," Ph.D. thesis, Indian Institute of Technology Roorkee, India, October 2008, Advisor: Dr. S.P. Srivastava.
42. Arfat Siddique, "Some Investigations on Condition Monitoring of Three Phase Induction Motors," Ph.D. thesis, Indian Institute of Technology Delhi, India, July 2008, Advisors: Dr. G.S. Yadava, and D. Bhim Singh.
43. S. Srinivas, "Investigations on Space Vector Modulations Schemes and Placement of Zero-Vector in a Three-Level Dual-Inverter Fed Open-End Winding Induction Motor Drive," Ph.D. thesis, National Institute of Technology, Andhra Pradesh, India, June 2007, Advisor: Dr. V.T. Somasekhhar.
44. Rahmatollah Mirzaei, "Soft Switched Multi-phase Tapped-Boost Converter and its Control," Ph.D. thesis, Indian Institute of Science, Bangalore, India, June 2007, Advisor: Dr. V. Ramanarayanan
45. N. Lakshminarasamma, "A New Family of Soft Transition DC-DC Converters," Ph.D. thesis, Indian Institute of Science, Bangalore, India, June 2007, Advisor: Dr. V. Ramanarayanan
46. Edward Tshitshiri Rakagati, "Torque Performance of Optimally Designed Multi-Phase Reluctance DC Machines," Ph.D. thesis, Department of Electrical and Electronic Engineering, The University of Stellenbosch, South Africa, June 2006, Advisor: Dr. Maarten J. Kamper.

47. Tripathi Anshuman, "Stator Flux Based Modulation and Constant Switching Frequency Direct Torque Control of AC Machines," Ph.D. thesis, National University of Singapore, August 2004, Advisor: Dr. V. Ramanarayanan
48. M.R. Baiju, "Investigations on Multilevel Inverter Topologies and Modulation Schemes for Induction Motor Drives," Ph.D. thesis, Indian Institute of Science, Bangalore, India, May 2004, Advisor: Dr. K. Gopakumar.
49. Krushna Keshaba Mohapatra, "Study on Harmonic Elimination and Suppression Techniques for Variable Speed Operation of Three Phase and Split Phase Open-End Winding Induction Motors," Ph.D. thesis, Indian Institute of Science, Bangalore, India, Sep. 2003, Advisor: Dr. K. Gopakumar.
50. Amar Nath Tiwari, "Investigations on Permanent Magnet Synchronous Motor Drive," Ph.D. thesis, Indian Institute of Technology Roorkee, India, April 2003, Advisors: Dr. S.P. Srivastava, Dr. Pramod Agarwal.
51. Vinod V. Thomas, "Non-Invasive Techniques for Rotor Fault Detection of Three Phase Squirrel Cage Induction Motors," Ph.D. thesis, Indian Institute of Technology Madras, India, June 2002, Advisors: Dr. Krishna Vasudevan, and Dr. Jagadeesh Kumar.
52. Munir Ahmed A.K. Al-Geelani, "Investigations on Cycloconverter Fed Induction Machine System in Generating Mode," Ph.D. thesis, Indian Institute of Technology Roorkee, India, Feb. 2002, Advisor: Dr. S.P. Gupta.
53. Debiprasad Panda, "Control Strategies for Sensorless and Low-Noise Operation of Switched Reluctance Motor," Ph.D. thesis, Indian Institute of Science, Bangalore, India, August 1999, Advisor: Dr. V. Ramanarayanan.
54. L. Venkatesha, "Determination of Flux-Linkage Characteristics and Torque Ripple Minimization with Pre-Computed Currents in Switched Reluctance Motor," Ph.D. thesis, Indian Institute of Science, Bangalore, India, June 1999, Advisor: Dr. V. Ramanarayanan.