IEEE The 2015 International Future Energy Challenge

IFEC'15 Topic A
July 13-15, 2015
Institute for Advanced Vehicle Systems (IAVS) Building
University of Michigan-Dearborn
4901 Evergreen Road
Dearborn, MI 48128, U.S.A.

Final Program

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General Information

■ Final Information

The IFEC'15 final competition for Topic A "High-efficiency Wireless Charging Systems for Electric Vehicles and Other Applications" will be held in University of Michigan-Dearborn, Dearborn, USA. The competition time is **Monday-Wednesday, July 13~15, 2015**.

■ About IFEC

IFEC is an international student competition for innovation, conservation, and effective use of electrical energy, which is open to college and university student teams from recognized engineering programs in any location.

The competition is sponsored by the Institute of Electrical and Electronics Engineers (IEEE) Power Electronics Society (PELS), Power & Energy Society (PES), Industry Application Society (IAS), Industrial Electronics Society (IES), Vehicular Technology Society (VTS) and Power Sources Manufacturers Association (PSMA).

■ Topic A Chairs:

Prof. Kevin Bai
Kettering University, USA
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Prof. Wencong Su
University of Michigan-Dearborn, USA
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Committees

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Chandan Chakraborty, *IIT Kharagpur, India*

Burak Ozpineci, *ORNL, USA*

Faete Jacques Teixeira Filho, *Eaton Corp. USA*

Ira J. Pitel, *Magna-Power Electronics, USA*

Marcelo G. Simões, *Colorado School of Mines, USA*

Agenda

1. Monday Session

Place: IAVS, Room # TBD

Chairs: Prof. Kevin Bai, Prof. Wencong Su

7:00am~8:30am	Breakfast in IAVS
8:00am~8:30am	Judge and Committee meeting
8:30am~9:00am	Announcement, team draw, Q&A
9:00am~10:00am	Safety Training to all teams
10:00am~10:30am	Team #1 presentation
10:30am~11:00am	Team #2 presentation
11:00am~11:30am	Team #3 presentation
11:30am~12:00pm	Team #4 presentation
12pm~1:30pm	Lunch
1:30pm~3:00pm	Team #1 + Team #2 testing
3:00pm~4:30pm	Team #3 + Team #4 testing
4:30pm~5:30pm	Judge and Committee meeting
5:30pm~7:00pm	Dinner

2. Tuesday Session

Place: IAVS, Room # TBD

Chairs: Prof. Kevin Bai, Prof. Wencong Su

7:00am~8:00am	Breakfast in IAVS
8:00am~8:30am	Team #5 presentation
8:30am~9:00am	Team #6 presentation
9:00am~9:30am	Team #7 presentation
9:30am~10:00am	Team #8 presentation
10:00am~10:30am	Team #9 presentation
10:30am~12pm	Team #5 testing
12pm~1:30pm	Lunch
1:30pm~3:00pm	Team #6 + Team #7 testing
3:00pm~4:30pm	Team #8 + Team #9 testing
4:30pm~5:30pm	Judge and Committee meeting; Final Score and Ranking.
5:30pm~7:00pm	Dinner

3. Wednesday Session

Place: IAVS, Room # TBD

Chairs: Prof. Kevin Bai, Prof. Wencong Su

7:00am~8:00am	Breakfast in IAVS
8:00am~12pm	ANSYS Workshop
12pm~1pm	Lunch and IFEC'15 Award Announcement
1pm~5pm	ANSYS Workshop

Presentation Requirement

Each team has 20 mins to present the project progress and 10 mins to answer questions. The team presentation will be one of the elements to affect the final score. Although IFEC does not provide the detailed format of the presentation, it is highly recommended for the team to incorporate the following elements when preparing the presentation:

1. 500W test, airgap >15cm, no sliding;
2. 400W test, airgap >15cm, sliding distance >10cm;
3. Compatibility to the universal input;
4. System dimension, weight and power density;
5. Component selection and cost breakdown (@5,000 units);
6. Protections;

Test Procedure

Step 1. Each team will connect their prototype with the resistor load and DC power supply. Multi-meter will be provided.

This step will be used to verify that no problems happen during the transportation. No data will be recorded. If the team feels confident on the system design, they could skip this step and move to Step 2.

Step 2. Each team will connect their prototype with the DC electronics load and AC grid. Power analyzer will be equipped by IFEC staffs before the test.

1) DC electronics load will be set as voltage mode (48VDC). The distance between the power transceiver and receiver will be measured by staff and is required to be >15cm. Team needs gradually increase the power to 500W. The provided power analyzer will display the in-take power and output power thereby calculate the system efficiency;

2) DC electronics load will be set as voltage mode (48VDC). The distance between the power transceiver and receiver will be measured by staff and is required to be >15cm. The misalignment between two coils need be >10cm. Team needs gradually increase the power to 400W. The provided power analyzer will display the in-take power and output power thereby calculates the system efficiency.

   The measured two efficiency numbers and power readings in this step will be recorded by IFEC staffs. These numbers will be the important references by IFEC committees and judges.

Step 3. If time allows, or team decides to try battery directly, each team will connect their prototype with the battery pack and AC grid provided by IFEC.

1) Team needs gradually increase the power to 500W. The distance between the power transceiver and receiver will be measured by staff and is required to be >15cm;

2) Team needs gradually increase the power to 400W. The distance between the power transceiver and receiver will be measured by staff and is required to be >15cm. The misalignment between two coils need be >10cm.

Step 4. Disconnect the system from the test bench. Team needs provide the prototype to IFEC committees and judges, who will evaluate other performance of the system, e.g., power density, weight. This step will not occupy the test time.

Attention:

1) A soldering room will be provided to teams for replacing the failed components during the test. However, all the tests need be finished within the assigned time length. Since soldering components will shorten the effective test time, all teams are recommended to do repetitive and complete tests before the prototype shipment;

2) Efficiency and power numbers are the MUST. Team need provide these numbers through either Step 2 or Step 3;

3) Step 3 is not the MUST. When two and above teams have similar performance, the team able to charge the actual battery pack through Step 3 will get bonus;

4) Teams might encounter the problem with Step 2 when connected to the electronics load due to the EMI issue. If team ultimately could finish the Step 3 with successfully collecting the power and efficiency data, the final score will not be affected by failure of Step 2.

Teams and Members

■ Topic A

Cologne University of Applied Sciences

Members:

*Andreas Krause, *David Wiegand, *Pascal Cizmowski, Evgenios Mentventev, Sebastian Wittkopp, Talha Sahin, Anil Bayzat, Tobias Hirche, Lukas Hilger, Danny Abbing, Johannes Cordes, Henrik Dörmann, Matthias Vogelei, Fabian Fröhlingsdorf, Julian Roskosch, Eckhardt Frasch

Federal University of Mato Grosso do Sul

Members:

Alison França Queiroz da Costa, André Acosta Amaral, Bruno da Silva Oliveira, Caio Guilherme da Silva Moraes, *Emílio Tanowe Maddalena, Filipe de Castro e Silva, Gabriel de Figueiredo Gentil, *Glauber de Freitas Lima, Guilherme Maschio, Hugo Gonçalves Bertolassi, Isabela Fenner Rondon, Janaina Luiz Ramires, José de Arimatéia Olimpio Filho, Kássio Rezende Electrical, Larissa Rodrigues Souza, Lucas Pelicano Rosso, Luiz Fernando Ferrari, Renata Rezende da Costa Reis, Rodrigo Alves Ribeiro Calunga

Kunming University of Science and Technology

Members:

Desong Li, Shiyi Chen, Yingkai Deng, *Wenbin Shu, Yuanmi Wu, Yao Shi, Liyan Zhu

National Taiwan University of Science and Technology

Members:

Xin Han Lin, *Yong-Long Syu, Yu Chen Li, Li-Chung Chen, Kai De Chen, Ding-Min Wang, *Wan-Ju Lin, *Hsin-Che Hsieh, Kun-Che He, *MING-CHENG CHEN

Osaka Institute of Technology

Members:

*Takuya Kitamoto, *Shinya Ohara, *Tomoki Onishi, *Tomoya Arata, Naoki Mukaiyama, Kohei Sihara, Keiichi Kaneko, Minoru Inoue

University of Michigan-Dearborn

Members:

Ahmad Hamdoun, Ali Bazzi, Bowen Zhang, Chang Liu, Fanning Jin, FadiMatti, HaihanZou, *Hang Dai, Jiaxing Wang, Jiyuan Fu, Maoxu Liu, Mena Abdel-Maguid, Wei Li, YifeiRen, Zhi Huang

University of Texas at Dallas

Members:

*Mark Ditsworth, Adrian Green, *Luke Szymanski, Pratik Parekh, Benjamin Cruz

Ulsan National Institute of Science and Technology

Members:

Sangyeong Jeong, *Mina Kim, Zhanibek Bizak, Hyeuntae Cho

Zhejiang University

Members:

Boping Yang, Chenkai zhao, Houjian Xu, Ti Ma, *Hongzhi Cui, Ziheng Wu

Accommodation

We are not affiliated with any specific hotels for accommodation. However, the closest hotels to the University of Michigan-Dearborn include:

THE ADOBA HOTEL (formerly the Hyatt Regency)
600 Town Center Dr., Dearborn, MI 48126
UM EMPLOYEES AND GUESTS of the University and Employees: **$107** for a regular guest room, or **$179** for a VIP suite with breakfast.
Reservations: 313-592-3622
Web: www.adobadearborn.com
Enter **UOMD** for the Preferred Code

THE HENRY
300 Town Center Drive, Dearborn, MI 48126
UM EMPLOYEES AND GUESTS of the University and Employees: **$141**
Reservations: 1-888-709-8081, ask for the University of Michigan Rate
Web: www.behenry.com
Enter **UMI** for the corporate/promotional code.

Transportation

Address:

Institute for Advanced Vehicle Systems (IAVS) Building

4901 Evergreen Road

Dearborn, MI 48128, USA

Airport:

The closest airport in Michigan to the University of Michigan-Dearborn is Detroit Metropolitan Airport (DTW) (approximately 20 miles west).

Campus Maps & Directions

http://umdearborn.edu/maps_directions/

Things to Do in Dearborn

The Henry Ford (also known as **the Henry Ford Museum and Greenfield Village**, and more formally as **the Edison Institute)**

Address: 20900 Oakwood Blvd., Dearborn, MI 48124

Web: http://www.thehenryford.org/

Activities: Group tours/walking tour, Leisure education

Description: It is a large indoor and outdoor history museum complex and a National Historic Landmark in the Metro Detroit suburb of Dearborn, Michigan, USA. Named for its founder, the noted automobile industrialist Henry Ford, and based on his desire to preserve items of historical significance and portray the Industrial Revolution, the property houses a vast array of famous homes, machinery, exhibits, and Americana. The collection contains many rare exhibits including John F. Kennedy's presidential limousine, Abraham Lincoln's chair from Ford's Theatre, Thomas Edison's laboratory, the Wright Brothers' bicycle shop, and the Rosa Parks bus.

Henry Ford Museum began as Henry Ford's personal collection of historic objects, which he began collecting as far back as 1906. Today, the 12 acre (49,000 m^2) site is primarily a collection of antique machinery, pop culture items, automobiles, locomotives, aircraft, and other items.

Greenfield Village: The Henry Ford is the largest indoor-outdoor museum complex in America. Patrons enter at the gate, passing by the Josephine Ford Memorial Fountain and Benson Ford Research Center. Nearly one hundred historical buildings were moved to the property from their original locations and arranged in a "village" setting. The museum's intent is to show how Americans lived and worked since the founding of the country. The Village includes buildings from the 17th century to the

present, many of which are staffed by costumed interpreters who conduct period tasks like farming, sewing and cooking. A collection of craft buildings such as pottery, glass-blowing, and tin shops provide demonstrations while producing materials used in the Village and for sale. Greenfield Village has 240 acres (970,000 m²) of land of which only 90 acres (360,000 m²) are used for the attraction, the rest being forest, river and extra pasture for the sheep and horses.

Ford Rouge Factory Tour is a first-hand journey behind the scenes of a modern, working automobile factory. Boarding buses at the Henry Ford Museum, visitors are taken to the River Rouge Plant and Dearborn Truck Plant – an industrial complex where Ford has built cars since the Model A and which once employed 100,000 people

Automotive Hall of Fame

Address: 21400 Oakwood Blvd., Dearborn, MI 48124

Web: http://www.automotivehalloffame.org/

Description: It is an American museum dedicated to preserving and celebrating outstanding automotive achievement. Since its founding in 1939, the Automotive Hall of Fame has honored nearly 800 automotive industry greats from around the world. This museum gives the nod to those who distinguished themselves in the auto industry by innovation, determination and inspiration.

Henry Ford Estate

Address: Henry Ford Estate, University Of Michigan - Dearborn, MI 48128

Web: http://www.henryfordestate.org/

Description: Fair Lane was the name of the estate of Ford Motor Company founder Henry Ford and his wife Clara Ford in Dearborn, Michigan, in the United States. The 1,300-acre (530 ha) estate along the River Rouge included

a large limestone house, an electrical power plant on the dammed river, a greenhouse, a boathouse, riding stables, a children's playhouse, a treehouse and extensive landmark gardens designed by Chicago landscape architect Jens Jensen. The residence and part of the estate grounds are open to the public as a historical landscape and house museum and preserved as a National Historic Landmark.