Conference Program

17th Annual Applied Power Electronics Conference And Exposition

March 10–14, 2002
Adam's Mark Hotel
Dallas, Texas

www.apec-conf.org

APEC®2002

CoSponsored By
IEEE Power Electronics Society
IEEE Industry Applications Society
Power Sources Manufacturer's Association (PSMA)

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IEEE Industry Application Society

Dallas, Texas will be the site for APEC 2002, the seventeenth in a series of highly successful technical conferences and Exhibitions dedicated to serving the needs of power-electronics professionals. The conference will be returning to the Adam's Mark Hotel, located in downtown Dallas near popular attractions and close to a Dallas Area Rapid Transit light rail stop. APEC 2002 is planned to be in the same style as previous conferences with the popular series of Professional Education Seminars on Sunday and Monday morning, Technical Sessions on Monday afternoon through Thursday, and the Exhibition on Monday through Wednesday. The MicroMouse contest will be on Monday evening and the Vendor Seminars followed by the Rap Sessions on Tuesday. On Wednesday, we are planning for a grand evening of good food and entertainment.

APEC has become a very useful and lively conference for promoting new ideas, meeting old friends and making new ones, exchanging news and learning about the power electronics industry. This year's Conference Committee, comprised of volunteers from industry and academia and the professional conference management firm Courtesy Associates, is working diligently to provide you an enjoyable and useful conference experience. On behalf of the APEC 2002 Conference Committee and the Conference Sponsors, I invite you to participate in every possible way to make APEC 2002 a memorable event.

V. Joseph Thottuvelil
General Chair

APEC Web Site

For the latest information on APEC, please consult the APEC web site at **www.apec-conf.org**. The web site has the latest news and information, access to on-line registration and downloadable registration forms.

For More Information

If the information you need is not in this program or on the APEC web site, inquires can also be directed to:

APEC 2002
2000 L Street, NW Suite 710
Washington DC 20036 USA
Telephone: +1-202-973-8664
Facsimile: +1-202-331-0111
Email: APEC@courtesyassoc.com

APEC HIGHLIGHTS

TECHNICAL SESSIONS

APEC will offer a total of 26 Technical Sessions with 181 papers on a wide range of topics including AC-DC power supplies, DC-DC converters, motor drives, inverters, lamp ballasts and magnetics. The Plenary Session on Monday afternoon features a combination of papers on special topics from noted industry experts as well as a selection of papers from those submitted for general review.

PROFESSIONAL EDUCATION SEMINARS

APEC's Professional Education Seminars give you a unique opportunity to hear some of the world's foremost authorities in power electronics for a fraction of the price that other conferences charge. This year, APEC received almost 30 proposals, each of them excellent, for the 15 available seminar sessions. Choosing was not easy but APEC 2002 will have another superb seminar program.

EXHIBITION

The APEC 2002 Exhibition is the biggest ever with 155 booths featuring all the latest and greatest products and services from the leading companies in the power electronics industry.

The Exhibition Hall is also the social center of APEC. Whether it is during one of the conference receptions or during the luncheons, the Exhibition Hall is the place to be. APEC's Exhibitors are also offering a series of seminars on Tuesday afternoon so that you can get an in-depth look at the latest solutions to your power electronics challenges.

MICROMOUSE CONTEST

According to one spectator, "Just too much fun." APEC will once again host the premier Micromouse contest in North America, drawing contestants from all over the world. Come by the Dallas Ballroom C at 8:00 PM on Monday to cheer your favorite mouse to victory.

If you are interested in entering a MicroMouse in the contest, please see the APEC web page for information and instructions. Information is also available from the APEC 2002 offices.

RAP SESSIONS

Hot, current, controversial and even emotional topics are traditionally explored at APEC's Rap Sessions and this year is no different. APEC is pleased that three of the industry's most well known contributors are leading discussions on topics that will affect everyone at the conference. Don't miss your chance to hear the industry pundits on both sides of these issues and to let your opinion be heard.

CONFERENCE BANQUET

APEC 2002 will spend the evening of Wednesday, March 14th, at the Dallas World Aquarium in the Orinoco Rainforest. APEC attendees will follow a bamboo-planked path into the Orinoco Rainforest where they will view rare and exotic plants, squirrel monkeys and soft-billed toucans. The path continues underwater for a look at the world's largest freshwater aquarium filled with catfish, schooling cichlids and huge turtles. Food and drink will be served at stations throughout the Aquarium exhibit.

SPOUSE AND GUEST PROGRAM

APEC welcomes the spouses and guests of the APEC conference participants. A welcoming breakfast will be held on Monday, March 11. Afterwards, the *Dallas Blooms* tour is available. This tour starts with a visit to the Dallas Arboretum and Botanical Garden. From there the tours visits many of Dallas' historical and cultural landmarks. On Tuesday, March 12, a tour of Fort Worth, highlighting its fascinating history and cultural attractions is offered. Spouses and guests are also welcome at conference activities like the Exhibit Hall receptions and the MicroMouse Contest.

DALLAS, "THE BIG D"

Dallas is a diverse and vibrant city offering world class culture and dining, top-notch sports teams, a moderate climate, low cost of living, and the lowest population density of any major city in the United States.

Dallas is also a major high technology center with the nation's third-largest concentration of high technology companies. It has long been called "Silicon Prairie" and is the home of the integrated circuit, invented in 1958 at Texas Instruments. In recent years, an explosion in communications companies along the Central Expressway northeast of the city has created "Telecom Corridor."

This combination of technology, culture and entertainment make Dallas an ideal location for APEC.

DALLAS WEATHER IN MARCH

March is early spring in the Dallas area. The average daily high temperature is 20 °C (68 °F) and the average daily low temperature is 8 °C (47 °F). The monthly average rainfall is 81 mm (3.2 in.), so be prepared for the occasional spring rain shower.

GETTING AROUND IN DALLAS

Yes, there is public transit, but to go to most places will require a car.

The Dallas light rail train has a stop right outside the Adam's Mark Hotel. The light rail can take you to the North Park Shopping Center, the West End and out to the Dallas Zoo.

To take the light rail, proceed from the hotel lobby out the north end of the hotel onto Bryan Street. The train station will be to your right. Tickets are purchased from machines at each station.

There is also a Transit Center across the street from the south entrance of the hotel. At the Transit Center, you will find buses to most parts of the city.

NIGHTLIFE AND ENTERTAINMENT

Dallas has a vibrant nightlife with clubs, music and dining for any taste and budget. The Dallas area offers more live music every night than Nashville - from Country and Western music to blues, rock, symphony and much more. There are over 100 live performances each night.

The West End, close to the Adam's Mark, features many restaurants and clubs. In "Deep Ellum", you will find an eclectic mix of music and dining. On the streets of Deep Ellum you will see people dressed in everything from grunge to western hats and boots to tuxedos. The Lower Greenville area is a popular dining, shopping and clubbing area for those with a more bohemian outlook.

CULTURAL AND HISTORICAL ATTRACTIONS

Dallas has more than 160 museums, galleries and artistic attractions. The Dallas Cultural District is the largest urban arts district in the United States. It includes the Dallas Museum of Art and the world famous Meyerson Symphony Center and is within walking distance of the Adam's Mark Hotel.

Throughout the city, you will find more than 115 works of public art. Don't miss Pioneer Plaza, the world's largest bronze monument, standing at the Dallas Convention Center, with more than 40 larger-than-life longhorn steers, horses and cowboys in a Texas cattle drive.

Dealey Plaza, the site of the assassination of President John F. Kennedy is a short walk from the West End. The nearby Sixth Floor Museum offers a fascinating record of that history changing event. Also near the West End are the Kennedy Memorial cenotaph, a re-creation of the cabin of the first settlers of Dallas, the Bryan family, and the old county courthouse, a magnificent building of red and grey stone.

The Meadows Museum at Southern Methodist University has the most significant collection of Spanish art outside of Spain, featuring art from the ninth through the 20th centuries. The African American Museum in Dallas has one of the largest collections of African-American folk art in the nation and is one of the top five African-American art museums in the world.

Old City Park has a re-creation of a turn of the century Texas town made with buildings gathered from around the state. At the State Fairgrounds, the Science Museum and Planetarium is just one of the eight museums you will find there. And the Dallas World Aquarium has the world's largest freshwater aquarium tank - 200,000 gallons.

The Dallas Public Library in Downtown Dallas has on permanent display one of the original copies of the Declaration of Independence, printed on July 4, 1776. It also has on permanent display the

First Folio of William Shakespeare's Comedies, Histories and Tragedies. This important book marks the first printing of Shakespeare's plays.

SHOPPING

With more shopping centers per capita than any other major U.S. city, Dallas is truly a shopper's paradise.

Nearest to the Adam's Mark Hotel is the West End district with the West End Marketplace. The Marketplace is a renovated warehouse filled with shops and galleries - everything from the latest Western wear to jewelry to fine art.

In the north part of the city, the Galleria has a number of world class anchor stores and encloses a year-round skating rink. A sea of shopping, including the Valley View shopping center, flanks the Galleria. Preston Avenue, running from the downtown to North Dallas is lined with an endless array of stores and boutiques. To the east, the Town East Mall and shopping district offers several square miles of value-oriented shopping. The North Park Mall, accessible from the Adam's Mark by the light rail train, is another upscale and popular shopping center.

There are also a number of large outlet centers near Dallas, like the Grapevine Mills and Hillsboro outlet centers. These do require a drive of 60-90 minutes.

OTHER DALLAS ATTRACTIONS

McKinney Street offers an eclectic variety of shops and restaurants as an alternative to the more tourist oriented West End. The Dallas Arboretum, on the banks of White Rock Lake, should just be starting to fill with blooms at APEC-time.

FORTH WORTH ATTRACTIONS

Fort Worth is about 40 miles west of Dallas and easily reached via Interstate 30. The Kimbell Art Museum is world class and always has wonderful exhibits. The Forth Worth Stockyards and Sundance Square areas offer a wide range of dining, music and nightlife activities. Billy Bob's Texas, located in the Stockyards, is billed as the world's largest honky-tonk. The Fort Worth Zoo is a great place to take children for a day's outing.

In between Dallas and Fort Worth is Six Flags over Texas, a popular amusement park larger than Disneyland.

FOR MORE INFORMATION

For more information on Dallas events and activities, check out the GuideLive and Dallas Convention and Visitor's Bureau websites (www.guidelive.com, www.dallascvb.com).

CONFERENCE REGISTRATION

In order to participate in APEC 2002 activities, one must register with the conference. Registration for the Professional Education Seminars and Technical Sessions requires payment of the appropriate registration fees. We recommend that you register in advance if at all possible.

Admission to the Exhibition Hall is complimentary, but one must register at the Conference Registration Center and receive a badge that allows entrance. *Exhibition Only* registrations are only done at the conference and cannot be done in advance.

A complimentary registration is available to spouses and guests who wish to participate in APEC's Spouse and Guest Hospitality Program.

REGISTRATION FEES

Membership

Member registration rates are available to all current IEEE members and employees of companies that are current members of the Power Sources Manufacturer's Association (PSMA).

To make sure there is no delay in processing your registration or checking in at the Conference, please indicate on the registration form how you qualify for the Member rates by providing either your IEEE membership number or the name of your employer in the space provided.

Advance Registration

To be eligible for the Advance Registration rates, registrations must be received at the APEC registration offices or through the on-line registration system no later than the close of business on Monday, February 11, 2002.

Professional Education Seminars

Member $250.00
Non-Member $300.00

Technical Sessions

Member $350.00
Non-Member $425.00

Late Or On-Site Registration

Professional Education Seminars

Member $300.00
Non-Member $350.00

Technical Sessions

Member $425.00
Non-Member $500.00

IEEE Life Members And Students

Professional Education Seminars $50.00
Technical Sessions $100.00

When registering at the conference, you will be required to show identification to receive the Life Member and Student rates. Student rates require full time registration at an accredited institution.

WHAT'S INCLUDED

Professional Education Seminars

Registration for the Professional Education Seminars includes one copy of the Seminar Workbook in hard copy and admission to any or all of the Professional Education Seminars. Unlike some conferences that require a separate registration fee for each seminar, APEC gives you your choice of as many seminars as you can attend for one low registration fee.

Also included in the registration fee for the Professional Education Seminars is admission to the:

- Exhibition Hall,
- Exhibition Hall receptions,
- Exhibitor's Seminars,
- MicroMouse Contest and
- Rap Sessions.

Technical Sessions

Registration for the Technical Sessions includes one copy of the Proceedings in hard copy, one copy on CD-ROM and admission to any or all of the Technical Sessions.

Also included in the registration fee for the Technical Session is admission to the:

- Conference Banquet,
- Exhibition Hall,
- Exhibition Hall receptions,
- Exhibitor's Seminars,
- MicroMouse Contest and
- Rap Sessions.

Exhibition Only

Included in the no-charge *Exhibition Only* registration is admission to the:

- Exhibition Hall,
- Exhibition Hall receptions,
- Exhibitor's Seminars,
- MicroMouse Contest and
- Rap Sessions.

Exhibition Only registrations must be done at the conference; they cannot be done in advance.

Spouse And Guest Registration

Spouses and guests accompanying APEC attendees are encouraged to register with the conference. Spouses and Guests who register with the conference will receive a badge allowing admission to the:

- APEC Spouse And Guest Hospitality Room,
- Spouse And Guest Welcoming Breakfast,
- Exhibition Hall,
- Exhibition Hall receptions,
- Exhibition Hall luncheons (with separately purchased ticket),
- Conference Banquet (with separately purchased ticket),
- MicroMouse Contest and
- Rap Sessions.

HOW TO REGISTER

On-Line Registration

On-line registration is available through the APEC website, **www.apec-conf.org**. A Master Card, Visa or American Express card will be required.

Registering By Mail Or Fax

A conference registration form is included in this Conference Program or one in Adobe® Acrobat® format can be downloaded from the APEC website, **www.apec-conf.org**.

Complete this form and send it by mail or fax to the APEC Registration Center:

APEC 2002/RHS
6901 K Avenue, Suite 106
Plano, Texas 75074 USA
Facsimile: +1-972-881-1747

Registrations sent by mail must include payment by credit card, check or money order. Checks may be personal, business or certified. All checks and money orders must be payable in United States dollars and drawn on a United States bank. If you wish to pay with a credit card, APEC accepts Master Card, Visa and American Express. Be sure to include your credit card number and expiration date where indicated on the registration form. Please do not send cash.

Registrations sent by fax must include payment by credit card. Be sure to include your credit card number and expiration date where indicated on the registration form.

Checks and money orders returned unpaid or credit card payments for which payment was refused will be assessed an additional handling charge of $25.00.

Registering At The Conference

You may also register at the conference at the Conference Registration Center. For payments at the conference, APEC can accept credit cards (Master Card, Visa or American Express) or checks or money orders (payable in U.S dollars and drawn on an U.S. bank).

CONFERENCE REGISTRATION CENTER

When you arrive at the conference, please go the Conference Registration Center, located in the pre-convene area of the Lone Star Ballroom, to register and pick up your conference materials.

The Conference Registration Center will be open:

Saturday, March 9.....3:00 PM - 6:00 PM

Sunday, March 10.....8:00 AM - 5:00 PM

Monday, March 11 ..... 8:00 AM - 3:00 PM

Tuesday, March 12 ..... 8:00 AM - 3:00 PM

Wednesday, March 13 ..... 8:00 AM - 3:00 PM

Thursday, March 14 ..... 8:00 AM - 12:00 Noon

CONFIRMATION OF REGISTRATION

All Advance Registrants will be sent a post card confirming that their registration has been received. The post card will include your name and address, events for which you registered, any extra items purchased and amounts paid. However, to protect your privacy, it will not contain any information about the method of payment.

Registrations received after the Advance Registration Deadline do not allow time for a confirmation to be sent by mail.

CANCELLATION & REFUND POLICY

All requests for cancellation and refund of registration fees must be received in writing at the APEC offices no later than the close of business **Monday, February 11, 2002**. All refunds will be processed after the conclusion of the conference and will be subject to a $25.00 processing fee.

For those who register and are unable to attend the conference, any Proceedings, Seminar Workbooks or other printed materials to which you are entitled will be shipped to you within 30 days of the conclusion of the conference.

TRAVEL AND ACCOMMODATIONS

CONFERENCE HOTEL

The Adam's Mark Hotel in Dallas, Texas will be the center of activity for APEC 2002. Your conference experience will be enhanced if you stay in the conference hotel. The Adam's Mark Hotel is located at 400 North Alive Street, a short walk from Dallas' Cultural District featuring the Meyerson Symphony and Dallas Museum of Art. Also, the Dallas light rail transit system stops right outside the hotel giving easy access to the West End, the Dallas Zoo and the North Park Shopping Center.

Hotel Room Rates

A block of rooms has been reserved for the APEC 2002 participants at the Adam's Mark Hotel at

special conference rates. Be sure to mention that you are with the "IEEE APEC" when making a reservation to qualify for these rates:

Single.....$167.00

Double $191.00

Current city and state taxes are additional.

It is imperative that you make your reservation before Monday, February 11, 2002. After February 11, 2002, reservations will be confirmed only on a space available basis.

Reservations

To make a reservation, please call the hotel directly and reference "IEEE APEC". You may also complete the hotel reservation form and mail or fax it with *one night's payment* (check or major credit card) to:

The Adam's Mark Hotel
Reservations
400 North Olive Street
Dallas, TX 75201

A hotel registration form is included in this Conference Program or one in Adobe® Acrobat® format can be downloaded from the APEC website, **www.apec-conf.org**.

Contacting The Dallas Adam's Mark Hotel

To reach the Adam's Mark Hotel by phone or fax:

Reservations Only

Phone: 1-800-444-ADAM (1-800-444-2326)
1-214-922-8000
Fax: 1-214-777-6532

All Other Inquiries

Phone: 1-214-922-8000
Fax: 1-214-969-7650

AIRLINE DISCOUNT PROGRAM

American Airlines will be the official airline for APEC 2002. They are offering a number of discount fares for APEC attendees traveling to Dallas. To take advantage of these low fares, give the APEC 2002 conference identifier number, A6832AE, to your travel agent or call American Airlines at their special Meeting Services Desk Toll Free Number: 1-800-433-1790.

GROUND TRANSPORTATION

The Adam's Mark Hotel, in downtown Dallas, is served by all the cab and shuttle services operating at the Dallas-Fort Worth (DFW) airport.

Taxi Service

Taxicab service is available at designated areas along upper-level curbside exits. Fares to downtown Dallas are approximately $41.00 for one person. The charge for each additional person is $2.00.

Shared Ride Services

Ground transportation between the DFW Airport and the Adam's Mark is provided by several shared ride companies. Shared ride services at DFW Airport operate from the lower level of the terminal. After claiming your baggage, follow the signs for ground transportation to an escalator that will take you to the lower level. Reservations are not needed for transportation from the airport to the hotel.

Companies currently serving the DFW Airport are:

Big Tex Shuttle.....214-352-9700

Classic Shuttle 214-841-1900

Discount Shuttle & Tours 817-267-5150

Super Shuttle D/FW Inc 817-329-2001

As an example of the shared ride fares, the SuperShuttle service charges $14.00 per person one-way from the airport to the Adam's Mark Hotel.

Car Rental

AVIS will offer attendees a special conference rate from March 3—March 21, 2002. To take advantage of this special rate, call the AVIS Meeting Reservation and Information Desk at 1-800-331-1600 or contact them online at www.avis.com. Identify yourself as eligible for the APEC rate by the giving the AWD discount number, A606092.

Parking At The Adam's Mark Hotel

The Adam's Mark offers self-parking in a garage across the street from the hotel. The rates are $1.50 per hour with a maximum of $10.00 per day. Hotel guests can get a pass that allows unlimited in and out privileges. Valet parking is

available at the front of the hotel for $17.00 per day.

SPOUSE & GUEST PROGRAM

Spouses and guests are encouraged and invited to attend the APEC 2002 Conference. Aside from the APEC activities, the Dallas-Fort Worth area offers an enormous range of cultural, sightseeing and shopping activities.

In addition to the Spouse and Guest specific activities, spouses and guests are welcome at all APEC social and dining events. Please be sure to register for a badge in order to participate.

In particular, spouses and guests are welcome at the Exhibitor Receptions (badge required), Exhibition Hall Luncheons (ticket required), the Conference Banquet (ticket required), Rap Sessions (badge required) and the MicroMouse Contest.

SPOUSE & GUEST HOSPITALITY ROOM

So that the spouses and guests of APEC attendees can have a place to meet friends old and new, chat over a cup of coffee, plan the next expedition into the city or just hang out, APEC will have a Spouse And Guest Hospitality room available.

The room will be open as follows:

Sunday, March 10..... 12:00 Noon - 5:00 PM

Monday, March 11 .....8:30 AM - 5:00 PM

Tuesday, March 12 .....8:30 AM - 5:00 PM

Wednesday, March 13.....8:30 AM - 5:00 PM

Thursday, March 14.....8:30 AM - 12:00 Noon

Coffee will be served Tuesday through Thursday from 8:30 AM to 9:30 AM.

Please check at the Registration Desk for the name and location of this room.

TOURS AND EVENTS

Monday, March 11, 8:30 – 9:30 AM
Welcoming Breakfast
Spouse And Guest Hospitality Room

To help you start off what will be an exciting week, APEC is serving a continental breakfast for spouses and guests on Monday morning. This is a great time to meet old friends and make new ones. There will be an information person available to answer questions about things to do and see in Dallas.

This event is complimentary to registered spouses and guests but you must have your name badge to be admitted.

Monday, March 11, 9:30 AM – 3:30 PM
Dallas Blooms Tour

This program looks at Dallas' strong dedication to beauty and heritage beginning with a stop at the Dallas Arboretum and Botanical Garden, an impressive 66-acre garden located on the southeast corner of White Rock lake that features spectacular spring and fall floral displays. The focal point of the garden is the 44-acre former estate of petroleum geologist and oilman Everett Lee DeGolyer. Patterned after a 1930s Mexican hacienda, the house is both a museum and a memorial to DeGolyer and his accomplishments. There is also a dedicated Women's Garden at the Arboretum. After strolling through the beautiful gardens, guests may enjoy a delightful lunch at the Arboretum overlooking all of the lovely blooms and gardens.

After touring the Arboretum, guests will then be driven by the Kennedy Memorial and assassination site as well as City Hall, Farmer's Market, and the Arts District while the guides interpret the wealth of information, civic pride and historical significance that is necessary to fully understand the Dallas spirit. The tour will take guests by the new Pioneer Plaza at the renovated Dallas Convention Center. The 4.2-acre plaza features the world's largest bronze monument, *Cattle Drive*, which consists of 70 longhorn steers being driven by three cowboys on horseback.

Guests will stroll through two of Dallas' most distinctive sites: Thanksgiving Square and the Hall of State at Fair Park. Located in the heart of downtown Dallas, Thanksgiving Square is a tranquil park complete with a water garden bell tower and a beautiful spiral chapel, offering Dallasites their own mini Central Park. The Hall of State at Fair Park, built to commemorate Texas' centennial in 1936, is truly one of the most fascinating sites in the Lone Star State. The

elegant Art Deco architecture, the intricate mosaics and stonework, the grand murals depicting Texas' history make sure a profound statement that guests will want to explore the unique museum on their own, taking in every interesting detail.

The cost is $62.00 per person and includes lunch and all admissions fees.

Tuesday, March 12, 10:00 AM – 3:00 PM
Fascinating Cultural Fort Worth

Fort Worth got a rough-and-rowdy reputation early when it was settled in 1849 as an Army outpost on the fork of the Trinity River—one of eight different posts in Texas assigned to protect settlers from Indian attacks. As this thriving town became the last major stop on the legendary Chisholm Trail, it also became home to settlers and soldiers, cattle drivers and outlaws who lived it up in the legendary Hell's Half Acre. In the latter half of the 1800's, the arrival of the railroad transformed Fort Worth into a major shipping center for livestock. Now, unlike any other, Fort Worth is a city where the Old West continues to live side by side with high-tech industry, performing and fine arts, medical centers and international business operations.

Guests will travel by bus to the historic North Side and Stockyards area, once a favorite for notorious outlaws and now the home of charming shops and galleries. It once was the biggest, busiest hog and sheep-marketing center in the Southwest. Today, without destroying the architectural integrity of the original structure, Stockyards Station offers visitors an exciting opportunity to experience the old West in an authentic but modern setting. Guests will be able to experience firsthand the true tease of Fort Worth as they observe the world's only daily cattle drive.

A delicious lunch will be served at world famous Joe T. Garcia's. Since 1935, Joe T's has been a mainstay in the Fort Worth area featuring authentic Tex-Mex dishes and more than fifty years of tradition at the family owned and operated restaurant.

Next, guests will visit the Kimbell Art Museum. Since its opening in 1972, the Kimbell Art Museum has won acclaim for its classic modern building designed by the great American architect Louis I. Kahn. Kahn's innovative use of natural light and subtle articulation of space and materials enhance the experience of the art. The building's gracious proportions, fine craftsmanship, and beautiful landscaping lend a further sense of serenity and restraint. The Kimbell Art Museum is widely regarded as one of the most outstanding modern public art gallery facilities in the world.

The cost is $40.00 per person and includes lunch and museum entrance fee.

Wednesday, March 13, 9:30 AM til ???
Group Shopping Expedition

Those interested in a joining with others to take advantage of the abundant shopping available in Dallas should meet in the Spouse and Guest Hospitality Room at 9:30 AM. Based on the interests of those that assemble, groups will be organized to visit various shopping and outlet centers in the Dallas area. Brave volunteers from the ranks of the APEC Spouses and Guests will lead the groups.

Wear comfortable walking shoes and clothing appropriate to the weather. Lunch will be no-host and at the discretion and choice of each group.

OTHER TOURS

Dallas has such a variety of places of interest that we were unable to choose tours or attractions that would appeal to all. APEC and the hotel concierge will have available information on a number of different tours, sightseeing expeditions and attractions so that you can choose the ones that best suit your needs and interests. These tours are offered through regular tour companies. The cost varies depending on the tour but typically cost from $15 to $35 each. There are too many to list here, but a sampling of the tours that are available includes:

- Dallas history and landmarks,
- The Sixth Floor Museum,
- Southfork Ranch,
- The Studios At Los Colinas and the
- Wilson Block Historical District and Upper Swiss Avenue Historical District.

APEC encourages the Spouses, Guests and Attendees to be creative and adventurous in

exploring Dallas. Whether it is touring an art or history museum, shopping, walking among the flowers in the Arboretum, enjoying one of Dallas' fabulous restaurants or soaking up the sounds of a live band, the opportunities to relax and enjoy are limited only by your imagination.

CONFERENCE BANQUET

Wednesday, March 14, 2002,
6:00 – 10:00 PM

After four days of intense reading, listening and discussing our trade, this will be a time to slow down, relax a bit and enjoy food, drink and conversation with our friends and colleagues.

This year's APEC Conference Banquet will be held at the Dallas World Aquarium in the Orinoco Rainforest Exhibit. We start out by following a bamboo-planked path into the Orinoco Rainforest where we will see rare and exotic plants, squirrel monkeys and soft-billed toucans.

The path continues underwater for a look at the world's largest freshwater aquarium filled with catfish, schooling cichlids and huge turtles.

Food and drink will be served throughout the Aquarium exhibit. We will be able to eat, drink and wander through the exhibit while enjoying the company of our friends and colleagues. This kind of "walk and talk" event is like the ones held at the San Jose Children's Museum and the Boston Science Museum and have been very popular with APEC attendees. You won't want to miss this special evening.

The buses will start loading from the hotel lobby entrance at 6:00 PM. The last bus will leave the Adam's Mark for the Aquarium at 6:30 PM. You will be required to have a banquet ticket in order to board the bus.

To provide the most convenience, the first bus to return to the hotel will be available for boarding at 8:30 PM. The last bus will leave the Aquarium for the Adam's Mark Hotel at 10:00 PM. You may also walk back to the hotel if you wish.

The Banquet is included in registration fee for the Technical Sessions. Additional tickets can be purchased for $60.00.

DINING AT APEC

Dallas is a world class city with a broad range of restaurants to fit any taste and budget. There are over 7,000 restaurants (four times as many per person as New York City!). While the best steak, barbeque and Tex-Mex in the world are just around any corner, Dallas also features an excellent array of cuisine from all around the world. APEC suggests you talk with the hotel concierge if you have a particular request.

DINING IN THE HOTEL

The dining rooms at the Adam's Mark Dallas are numbered among the city's best, with settings, selections, and service for every individual taste. The Chaparral Club returns a historic name to Dallas. It is a warm, elegant restaurant that brings fine dining to the hotel's top floor. Guests enjoy a creative menu of New World specialties set against a magical, panoramic view of the Dallas Skyline.

For lighter fare, Bagels on Bryan offers a large selection of fresh, flavorful bagels, spreads, sandwiches, pastries, specialty coffees and juices for takeout.

Pearl Street Café, located off the lobby, offers traditional and contemporary cuisine with three meals served daily in a cozy setting. Silhouettes serves breakfast and lunch buffets, turning into a night club in the evening.

For sports action, refreshments and snacks, check out Players Sports Bar. The Tiffany Rose lounge is located off the lobby and serves appetizers along with drinks.

DINING AROUND THE ADAM'S MARK HOTEL

If wish a change of pace and want to have breakfast and lunch outside of the hotel, there are several alternatives nearby.

If you walk out the north end of the hotel onto Bryan Street and turn left, there are several neighborhood style restaurants within a few blocks.

Just a short walk from the hotel is a wide range of restaurants and eateries in the Plaza of the Americas. Go to the north end of the hotel on the

first floor and take the escalator to the second level. Follow the pedestrian bridge over Bryan Street and turn right. This will take you into the Plaza. There are about twenty restaurants in the Plaza, ranging from nice sit down to sandwich shops to fast food to coffee shops. Some of the restaurants to be found there include:

- Le Meridien
- Alonti Deli
- Au Bon Fruit
- Ziggy's Bar-B-Q
- Broadway Pizza
- Chez Max
- China Dragon
- J. Pepe's
- Treebeards

There are also several well known fast food outlets such as MacDonalds, KFC Express, Taco Bell and Blimpie's.

DINING IN THE WEST END

The West End of Dallas is a renovated warehouse district filled with restaurants, shopping and clubs. The West End is only a few blocks from the Adam's Mark hotel and is easily reached by the light rail train that stops right outside the hotel. Here are some of the fine restaurants you will find in the West End:

- Sonny Bryan's (Unbeatable Texas barbeque!)
- Landry's (Seafood)
- Lombardi's (Wonderful Italian)
- El Fenix (Tex-Mex)
- The Palm (World class steakhouse)
- On The Border (Tex-Mex)
- The Butcher Block (Cook your own steaks)

LUNCH WITH THE EXHIBITORS

Lunch will be served in the Exhibition Hall on Tuesday and Wednesday. Advance purchase of a ticket is required. For details, please see *Exhibition Hall Luncheons* on page 21.

ADDITIONAL INFORMATION

PURCHASING ADDITIONAL CONFERENCE PROCEEDINGS AND SEMINAR WORKBOOKS

Through Advance Registration

Conference registrants can purchase extra copies of the Conference Proceedings and Seminar Workbooks through Advance Registration. Those wishing extra copies are strongly encouraged to purchase them through the Advance Registration.

APEC reserves the right to limit quantities of APEC Proceedings or Seminar Workbooks sold to any one person or institution.

Advance purchase prices with registration for the conference:

Conference Proceedings..... $70.00
(Includes both Hardcopy and CD-ROM)

Seminar Workbook..... $65.00
(Hardcopy only)

Both Proceedings And Seminar Workbook
..... $120.00

These prices are only available when your order is received with your paid conference registration by February 11, 2002. Publications purchased with advance registration will be available for pick-up when you register for the conference.

Advance Purchase Without Conference Registration

You may order copies of the APEC publications in advance of the conference without registering for the conference. Please use the *APEC 2002 Pre-Conference Publications Order Form*, included in this program and available for download from the APEC website. Your order with payment must be received at the APEC 2002 offices by February 11, 2002.

Conference Proceedings..... $70.00
(Includes both Hardcopy and CD-ROM)

Seminar Workbook..... $65.00
(Hardcopy only)

Both Proceedings And Seminar Workbook
..... $120.00

The books will be shipped after the conference and requires payment of a shipping and handling charge. Shipping to locations in the United States and Canada is $25.00 per order. Shipping to locations other than the United States or Canada is $80.00 per order.

APEC reserves the right to limit quantities of APEC Proceedings or Seminar Workbooks sold to any one person or institution.

At The Conference

A LIMITED NUMBER of copies of the Conference Proceedings and Seminar Workbooks **MAY** be available for sale at the Conference Registration Center, starting at noon on Wednesday, March 13. If there are any extra copies available, the prices will be:

Conference Proceedings $100.00
(Includes both Hardcopy and CD-ROM)

Seminar Workbook $100.00
(Hardcopy only)

Both Proceedings And Seminar Workbook
.....$175.00

Through The IEEE

After the conference, the APEC Proceedings may be purchased through the IEEE. Contact:

IEEE Single Copy Sales
445 Hoes Lane
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Telephone: +1-800-678-4333
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Website: www.ieee.org/products/

Special Note On Seminar Workbooks

The APEC Professional Seminar Education Workbook will not be available through the IEEE or any other source after the conference. If you want extra copies of the Seminar Workbook, you are strongly encouraged to buy them through Advance Registration.

SPONSOR MEMBERSHIP DESK

Each of the organizations sponsoring APEC will have membership desks. Individuals can inquire about membership in the **IEEE** and the two societies that sponsor APEC, the **Power Electronics Society** and **Industry Applications Society**. **The Power Sources Manufacturers Association (PSMA)** will also have a membership desk where organizations interested in joining can obtain information.

MESSAGE CENTER

A bulletin board for messages will be placed near the main conference registration area. Messages can be received and posted whenever the Conference Registration Center is open. Please advise any callers who may wish to reach you to call the main number of the Adam's Mark Hotel (+1-214-922-8000) and ask for the IEEE APEC 2002 Message Center. APEC participants are encouraged to regularly check the message board.

SACK SITTERS

Sack Sitters will be on site from Monday, March 11 through Thursday, March 14. Sack Sitters offers packaging and shipping of APEC Proceedings, Seminar Workbooks and conference materials to any destination. The Sack Sitters desk will be near the main registration area. Please check at the conference for Sack Sitters' operating hours.

IMPORTANT NOTICES

BADGES

Badges are required for admission to all Professional Education Seminars, Technical Sessions, Rap Sessions and the Exhibition Hall. Please wear your badge at all times so that you will not be delayed at the entrance to an event.

RECRUITING

IEEE Policy #10.1.24 prohibits recruiting at IEEE sponsored conferences. Consequently, recruiters and recruiting advertisements will not be permitted in the APEC 2002 hotel space, meeting facilities or Exhibition Hall.

DISTRIBUTION OF COMMERCIAL MATERIAL

Distribution of commercial material by organizations not participating in the Exhibition is

prohibited in the APEC 2002 hotel space, meeting space and Exhibition Hall.

PROFESSIONAL EDUCATION SEMINARS

APEC 2002 features 15 professional education seminars with a broad range of topics. The conference committee has worked hard to make sure there is something of interest to all APEC attendees during each of the seminar time periods. As always, APEC seminars offer a practical mix of theory and application for the professional working in power electronics. Unlike other conferences that charge by the seminar, at APEC one low fee gains you access to any and all of the seminars, along with the notes for every seminar. Whether you want to review an important topic area, broaden your understanding of a neighboring discipline, or take advantage of the practical experiences of experts in the field, the APEC 2002 seminars are a must for every conference attendee.

Please note that the room assignments are tentative and subject to change. Please check with the registration desk at the conference for the latest information.

PROFESSIONAL EDUCATION SEMINARS SESSION I

Sunday, March 10, 9:30 AM – 1:00 PM

S.1 Brushless DC And Switched-Reluctance Motor Drives

James M. Kokernak, Advanced Energy Conversion & David A. Torrey, Rensselaer Polytechnic Institute

San Antonio Ballroom A

This course is intended for those who work with either brushless dc or switched-reluctance motor drives and desire a better understanding of how they can be controlled. The presentation will be broken up into six parts that address the operation of these machines, and how they may be controlled. Part 1 provides an overview of the basic principles of how brushless dc motors operate. Part 2 discusses the converters used to operate brushless dc motors at variable speed. Switch specification, snubber circuits and clamps, thermal issues and costs are addressed. With a basic understanding of motor operation providing the motivation, Part 3 revisits the control of brushless dc motors, discussing issues such as system modeling, control loop design, and enhancements that can improve or extend performance of the drive. Part 4 provides an overview of the basic principles of how switched-reluctance motors operate. Part 5 discusses the converters used to operate switched-reluctance motors at variable speed. Again, switch specification, snubber circuits and clamps, thermal issues and costs are addressed. Part 6 revisits control of the switched-reluctance motors, also addressing modeling, control design and enhancements.

S.2 Practical Methods For Optimizing Power Transistor And Diode Selection

Eric Persson, International Rectifier

Houston Ballroom A

Selecting the proper size power transistor (FET or IGBT) and diode for any particular power electronics application should be a straightforward task-but often is not. The objective is to use the smallest silicon size that can handle the current, yet keep the die temperature to a safe limit. For DC applications, this is simple- but for the complex waveforms often found in power electronic circuits, many questions arise: When should you use average current ratings instead of peak or rms value? How do you determine the effective value of current for complex waveforms like those found in PFC circuits or motor drives where there is a high frequency sawtooth waveform modulated by another low frequency waveform? How is transient thermal impedance used to determine maximum die temperature for these complex waveforms?

Almost every power electronic application involves tradeoffs between worst-case values of current, voltage, and temperature against the need to reduce cost to the absolute minimum. How do you know if you are on the edge, or have plenty of margin in

SEMINARS AT A GLANCE

	SESSION I SUNDAY 9:30am-1:00pm	SESSION II SUNDAY 2:30pm-6:00pm	SESSION III MONDAY 8:30am-12:00noon
San Antionio Ballroom A	**S.1 Brushless DC And Switched-Reluctance Motor Drives** James M. Kokernak, Advanced Energy Conversion & David A. Torrey, Rensselaer Polytechnic Institute	**S.6 Automotive Integrated Starter-Generator Systems** John M. Miller, Ford Corporation; Patrick McCleer, McCleer Power And Raymond B. Sepe, Electrostandards Laboratories	**S.11 Sensorless Control Of Adjustable Speed Motor Drives: State Of The Art And Recent Advances** H. A. Toliyat & B. Fahimi, Texas A&M University
Houston Ballroom A	**S.2 Practical Methods For Optimizing Power Transistor And Diode Selection** Eric Persson, International Rectifier	**S.7 An Overview Of Single-Phase and Three-Phase Power Factor Correction Methods For Switching Converters** Prasad Enjeti, Texas A&M University And Oscar Garcia, Universidad Politécnica de Madrid	**S.12 Solar And Alternative Energy – The Engineering Issues** Dean Patterson, University Of South Carolina
Houston Ballroom B	**S.3 Power Supply Design From The Trenches** Charles E. Mullett, Condor DC Power Supplies	**S.8 Analysis And Design Of Power Electronics Circuits Using PSpice** Thomas Salem, Elizabethtown College	**S.13 Soft-Switching In DC-DC Converters: Principles, Practical Topologies, Simulations And Design Techniques** Raja Ayyanar, University Of Arizona; Ned Mohan, University Of Minnesota And Eric Persson, International Rectifier
Houston Ballroom C	**S.4 Power Systems For Electronic Equipment** Robert V. White, Artesyn Technologies	**S.9 Power Packaging Techniques For Low And High Voltage Systems** Douglas C. Hopkins, State University Of New York At Buffalo	**S.14 Puzzles And Answers In The Thermal Management Of Board-Mounted Power Modules** Frank Liang, Tyco Electronics Power Systems
San Antonio Ballroom B	**S.5 EMI: Theory, Issues And Solutions** Michael J. Schutten, General Electric Corporate Research And Development	**S.10 Overview Of HALT And HASS: Methods That Work** Kirk A. Gray, AcceleRel Engineering	**S.15 Understanding And Controlling Common-Mode Emissions In High-Power Electronics** Henry W. Ott, Henry Ott Consultants

your design? Too close to the edge results in poor reliability, while too much margin means that costs are unnecessarily high. The objective of this course is to help the designer gain a better understanding of how to estimate device temperature for a variety of complex waveforms using simple math.

We will cover FET, IGBT, and diode applications. Conduction and switching loss mechanisms will be clearly explained. The

difference between peak, average, and rms value- and when to use each- will be covered in detail.

This is an intermediate level course intended for power electronics designers and engineers who would like a practical course in sizing power devices.

S.3 Power Supply Design From The Trenches

Charles E. Mullett, Condor DC Power Supplies

Houston Ballroom B

This seminar takes the audience through a real power supply design, from start to finish, with special emphasis on the design of each magnetic component. A power-factor corrected, 100-watt multi-output forward converter is used as the example. Novices will gain much insight into the "total picture" of this exciting process, while the veteran designer will identify with the "war stories" and see some of the challenges in a new light. Non-designers will be fascinated to see just what their engineering colleagues are going through to come up with a new product design.

The focus of this seminar is twofold: First, it provides an overview of the entire power supply, including the operation of each functional block, from the input EMI filter through the rectifier, PFC stage, bulk storage capacitor, to the main power converter, output regulators, feedback control circuits and protection circuits. Second, it provides the design techniques for each of the magnetic components, including choice of core materials, wire, winding structure and test specifications, as well as selection criteria for the semiconductors.

While not meant as a substitute for a two- to four-day intensive course, it provides a valuable perspective of the design process and a solid foundation for further study.

It shows the "big picture" and contains enough detail to be extremely helpful to new designers, field applications engineers in component companies, and sales engineers in the power electronics industry. A comprehensive bibliography is included.

S.4 Power Systems For Electronic Equipment

Robert V. White, Artesyn Technologies

Houston Ballroom C

This seminar gives an overview of designing power systems for electronic equipment. The seminar starts with a problem statement: Convert power from a given source into power that can be used by a given load. The first step is to review the basic types and characteristics of power sources and electronic equipment loads. The next discussion is of the possible power system architectures that can be used to move power from source to load: central, distributed and hybrid. Then the various building blocks, AC-DC power supplies and DC-DC converters are reviewed to understand how to choose the best one for a given application. Reliability and availability are most important in today's equipment and these get an extended review of the fundamentals. Important regulatory and agency standards are briefly reviewed. The discussion progresses to the fundamentals of power system protection and control methods. The emphasis is on understanding what is being protected, why it is being protected and choosing the best technique to achieve the needed performance. Distributed power systems are becoming common and the seminar dedicates a section to distributed power system fundamentals. The seminar concludes with a survey of batteries in power systems and some miscellaneous design topics.

S.5 EMI: Theory, Issues And Solutions

Michael J. Schutten, General Electric Corporate Research And Development

San Antonio Ballroom B

This seminar is intended for entry-level engineers wanting a fundamental understanding of electromagnetic interference (EMI) issues and experienced engineers desiring a thorough

understanding of EMI concerns. The presentation introduces the concept of how energy couples between separate electronic circuits. The fundamentals of EMI are presented including theory, energy coupling mechanisms having the ability to corrupt or damage a circuit, troubleshooting approaches, and EMI fixes. The characteristics and electrical symptoms of the four methods of EMI energy transfer are presented: common impedance coupling, magnetic field coupling, electric field coupling, and radiation coupling. Understanding EMI theory allows simple noise equivalent circuit approximations and low cost, robust fixes at the circuit board or component level. PWB layout and IC decoupling procedures are derived from fundamental EMI concepts. Novel test methods are presented that decouple multiple simultaneous EMI problems allowing a systematic approach for improving and quantifying EMI susceptibility.

PROFESSIONAL EDUCATION SEMINARS SESSION II

Sunday, March 10, 2:30 – 6:00 PM

S.6 Automotive Integrated Starter-Generator Systems

John M. Miller, Ford Corporation; Patrick McCleer, McCleer Power And Raymond B. Sepe, Electrostandards Laboratories

San Antonio Ballroom A

Automotive OEM's have announced plans to improve passenger vehicle fuel economy 25% or more by year 2005. Fuel economy improvement levels beyond current mandates are likely to be legislated during the next five years in North America. In Europe and Asia the mandates for reduced CO2 emissions are already coming into effect. This challenge of higher fuel economy standards is promoting optimized and sometimes novel vehicle power train architectures that combine the traditional heat engine with various forms of electric drives. Today hybridized power trains are commercially available and as 42V next generation automotive electrical power systems are deployed the consumer will see the availability of ISG systems. Vehicle power trains in which electric traction power levels are upwards of 50% of the heat engine peak power are, or will soon be, available as powersplit and through the road hybrids. The industry is now poised to introduce soft hybridization of power trains, enabled by the introduction of 42V PowerNet, and facilitated by advancements on full hybrids. In the case of such soft or mild hybrids the power levels are nominally 10 kW of peak power in a 42V system which is typically 5% to 10% of the heat engine peak power. This seminar will introduce the development of ISG for automotive applications, why a particular type of electric machine technology is selected and how the ISG is controlled for not only optimized performance but also continued operation in the face of single and multiple faults.

S.7 An Overview Of Single-Phase and Three-Phase Power Factor Correction Methods For Switching Converters

Prasad Enjeti, Texas A&M University And Oscar Garcia, Universidad Politécnica de Madrid

Houston Ballroom A

The objective of this seminar is to present an overview of several single phase and three phase advance power factor correction (PFC) approaches for switching power converters. The course will begin with an introduction to national and international harmonic standards. Several active power factor correction approaches to realize sinusoidal input currents in single phase and three phase switching converters will be thoroughly reviewed. Application specific control ICs for PFC will be discussed. Digital control design for PFC with emerging low cost digital signal processors (DSP) will also be examined. Analysis, simulation and design of PFC methods will be dealt in per-unit to facilitate comparison. Throughout the course, numerous design examples with simulation and experimental results will be presented. Power electronic design engineers who deal with single phase and three phase power conversion for power

supplies, switch mode converters, UPS, Battery chargers, rectifiers etc. You will find this course informative and the knowledge gained in this seminar can be immediately applied.

S.8 Analysis And Design Of Power Electronics Circuits Using PSpice

Thomas Salem, Elizabethtown College

Houston Ballroom B

This seminar will discuss using PSpice to analyze and design power electronic circuits. The presentation will address a variety of circuit topologies for both AC and DC converters. Emphasis will be placed upon using the circuit simulation as an engineering tool first to understand the topology, and then to develop and improve circuit design. Throughout the discussion, a variety of implementation tips and tricks for working with PSpice will be demonstrated. Details will be provided on recognizing and troubleshooting simulation difficulties and problems, using vendor supplied device models, understanding limitations on circuit simulations, and references for further information and assistance.

For the computer savvy entry-level engineer with a minimal background in power electronics, this course will provide a survey of power electronic converter simulation. For the intermediate-level engineer with a knowledgeable background in power electronics, this course will provide a detailed examination of developing PSpice circuit simulations. The overall focus of the course will be to promote self-learning and discovery of using PSpice as an engineering analysis and design tool.

S.9 Power Packaging Techniques For Low And High Voltage Systems

Douglas C. Hopkins, State University Of New York At Buffalo

Houston Ballroom C

This seminar provides the power electronics designer with an in-depth description of leading and next-generation power packaging techniques used in supplies and drives. Emphasis is placed on transitioning FR-4 systems to other packaging approaches to improve performance and reduce cost. The designer will gain familiarity with nomenclature, electrical and material characteristics, and guidelines for use of several packaging processes. In particular, the designer will gain an understanding of packaging characteristics that limit current and voltage, with emphasis on higher voltage systems (>1200V). Included will be a review of the latest in integrated thermal augmentations. A case study of a commercial power module will demonstrate an electrical/physical circuit design and be used to identify the critical packaging issues. This is an essential course for the designer who must look at other packaging design approaches to further shrink their electronics.

S.10 Overview Of HALT And HASS: Methods That Work

Kirk A. Gray, AcceleRel Engineering

San Antonio Ballroom B

Over the last decade, Accelerated Stress Testing (AST) has been embraced by an ever widening array of worldwide electronics design and manufacturing companies seeking to reconcile the need for the highest quality product with the necessary push for early time to market.

This AST Seminar is designed as an overview of these methods for product development, reliability, quality, and design validation engineers that want the basics on how to apply AST methods (also known as Highly Accelerated Life Test, or HALT, and Highly Accelerated Stress Screens, or HASS). Those that attend will learn the reasons why leading companies are using the new orientation of testing to limits. Information will be presented on why basing screening on the capabilities of the material and physics of failure is so cost effective and time efficient. Attendees will learn in general the steps on how to implement an AST development and manufacturing screening process at their own facilities. The seminar will also present a case history of how a power supply manufacturer reduced

warranty returns 5% to 0.5% at the same time they reduced testing time from 4 days to 1 hour.

PROFESSIONAL EDUCATION SEMINARS SESSION III

Monday, March 11, 8:30 AM – 12:00 Noon

S.11 Sensorless Control Of Adjustable Speed Motor Drives: State Of The Art And Recent Advances

H. A. Toliyat & B. Fahimi, Texas A&M University

San Antonio Ballroom A

Detection of rotor position forms an integral part of control in adjustable speed motor drives. In fact, proper synchronization of the excitation with respect to spatial distribution of magnetic field is an essential step in optimal control of motor drives. Since rotor position portraits a one to one correspondence with magnetic status of the machine, it has been traditionally used for control purposes. External position sensors, such as optical encoders, Hall effect sensors, etc. are traditionally used for detection of rotor position. These sensors, however, contribute to unreliability, additional cost and size in most cases. This, in turn, has motivated substantial research on development of position sensorless control techniques all around the globe.

The main idea behind all these techniques stems from the fact that mechanical time constants of the motor drive systems are significantly larger than their electrical time constants. Given the impressive speed of computation in the state-of-the-art controllers, one can use the existing separation between system time constants to extract embedded position information from electromagnetic quantities of the machine. In fact, one might directly process the magnetic data to monitor the spatial distribution of the magnetic field thereby eliminating the need for position information in control.

The proposed seminar is intended to offer a systematic review of the position sensorless techniques in induction, BLDC and SRM motor drives. This will cover an entire range of topics related to these emerging technologies such as resolution versus speed range, four-quadrant operation, hardware intensive versus software intensive methods, etc. While presenting fundamentals of classified sensorless methods, we will also provide design examples to clarify important engineering issues. This will provide practicing engineers and graduate students with an insightful description of sensorless techniques.

S.12 Solar And Alternative Energy – The Engineering Issues

Dean Patterson, University Of South Carolina

Houston Ballroom A

The subject of "alternative" or "renewable" energy is one that typically evokes emotive and political responses, which often have higher visibility than the engineering issues.

This tutorial is a very broad introductory overview of the field. It aims to provide you with the information, in terms of facts, figures, analytical tools, design procedures and costings to make engineering judgements about the viability of alternative energy sources for given situations, and to highlight the range of applications where they should be seriously considered.

The tutorial begins with an overview of the two-sided issue of energy provision and use, and then concentrates firstly on the use of solar energy via photovoltaics and secondly on the use of wind energy. The state of the art of technology for both of these will be examined in some detail.

The tutorial will include a survey of storage technologies. This will lead to the presentation of procedures for stand alone system design. The complementary issue of efficiency of energy use will also be addressed.

S.13 Soft-Switching In DC-DC Converters: Principles, Practical Topologies, Simulations And Design Techniques

Raja Ayyanar, University Of Arizona; Ned Mohan, University Of Minnesota And Eric Persson, International Rectifier

Houston Ballroom B

Soft-switching in dc-dc converters can result in improved energy efficiency, power density, reliability and lower EMI. The main objectives of this tutorial are as follows.

To explain the basic principles of soft-switching, both zero-current switching (ZCS) and zero-voltage switching (ZCS). Brief survey of important topologies classified as resonant transition, quasi-resonant and resonant load topologies. Detailed discussion including the principles of operation, simulations and design techniques for a few popular topologies like the phase-shift controlled full-bridge converter, active reset ZVT forward converter etc. The effectiveness of the proposed design procedures will be clearly demonstrated using PSPICE simulations. The trade-offs involved in the design in terms of increased conduction losses, need for extra components and the additional complexity etc. will be discussed.

Discussion on the latest developments like the family of full-load-range hybrid full-bridge converters, soft-switching in power factor correction circuits, analysis of failure mode in phase-shifted full bridge converters due to poor reverse recovery characteristic of the body diode.

This tutorial is designed to benefit both entry level as well as experienced power supply designers, designers of switch mode converters, power factor correction circuits, technical managers, application engineers and professors teaching Power Electronics.

S.14 Puzzles And Answers In The Thermal Management Of Board-Mounted Power Modules

Frank Liang, Tyco Electronics Power Systems

Houston Ballroom C

The objective of this seminar is to clarify the misconceptions and identify the common mistakes in the thermal management of power modules through theoretical analysis, experiments and computer-based CFD simulations. Following a practical review of the fundamentals of heat transfer and fluid dynamics in a manner geared towards practicing power electronics professionals, the issues involved in thermal characterization testing of power modules are first discussed, followed by the "tricks" in power derating. Next covered are heat-sinking problems and other system and application issues, along with the common mistakes in thermal (CFD) modeling.

This seminar is designed as an intermediate-level broad tutorial, and is intended for general audience with common interest in thermal issues.

S.15 Understanding And Controlling Common-Mode Emissions In High-Power Electronics

Henry W. Ott, Henry Ott Consultants

San Antonio Ballroom B

Most people try to fix their common-mode emission problem without first understanding the basic cause of the problem. This at best leads to a trial and error approach to the solution. Therefore, this seminar starts out with a discussion of what causes common-mode emission problems and how common-mode currents are generated. This requires an understanding of what I like to call "the invisible schematic," as well as some basic principles of EMC. Once the source of the problem is understood, the control techniques become fairly straightforward and obvious. They are not "black magic."

A discussion of the applicable FCC and European Union EMC regulations, and the difference between them, is also included.

Knowledge of these regulations is important since they determine the allowable magnitude of the common-mode emission -- and hence the degree of mitigation required.

This seminar then goes on to describe basic control techniques, which include filtering, grounding, and shielding. This is followed by examples of these techniques applied to a switching power supply, and a high power IGBT motor drive circuit. The presentation concludes with a discussion of some simple techniques for measuring the common-mode emission-- since only by measuring the emissions, can you determine the effectiveness of your solution.

This is an in-depth presentation on the subject of common-mode emissions and is intended for an intermediate level audience.

RAP SESSIONS

Tuesday, March 11, 6:30 – 8:00 PM

Rap Session #1 Houston Ballroom A

Contract Manufacturing: Cost Or Benefit?

Moderator: Craig Johnston, Roundtable Innovations

There is more and more pressure to reduce costs and increase profits while prices fall. One possible answer to this challenge is the shift to outsourced manufacturing, contract manufacturing! Is this the right answer? Will it ultimately save cost or create increased total supply chain cost, as we now need to manage the contract manufacturer (CM) for all phases of our product cycles? What about New Product Introduction (NPI) issues? Component shortages? Back end test and quality assurance? We will address the pros and cons of outsourcing to CMs. Please join us for a discussion on whether this trend is or is not the best solution. What has your experience been? What pitfalls can others avoid?

Rap Session #2 Houston Ballroom B

Acquiring an ASIC: Technical Triumph Or Never-Ending Nightmare?

Moderator: Arnold Alderman, Anagenesis, Inc.

This session will focus on the experiences that everyone has had in the journey to acquiring an Application Specific or customer specific IC. Come share yours. Was yours a success story, or was it a tormenting experience? We can learn from each other the do's and don't of taking the ASIC path.

Rap Session #3 Houston Ballroom C

Does 42 V Really Have What it Takes for Future Automotive Electrical Systems?

Moderator: Tom Jahns, University Of Wisconsin, Madison

There is a lot of excitement in the automotive world about the impending transition from 14 V to 42 V electrical systems in future road vehicles. Since the 14 V system reigned supreme for nearly 50 years, many see this as a once-in-a-professional-lifetime leap in technology. However, others aren't nearly as enthused about this change. They see wide swings in the bus voltage that stretch the limits of the proposed 42 V PowerNet standard, making the system considerably more expensive to implement. Others see higher future electrical loads that exceed the practical capacity limits of a 42 V bus. Will 42 V become an enduring standard or a temporary stop on the way to something else? Please join us for a lively discussion of the strengths and shortcomings of 42 V in future automotive electrical systems.

EXHIBITION

EXHIBITION HOURS

The Exhibition, located in the **Grand Hall** on the First Floor of the Adam's Mark Conference Center, will be open as follows:

Monday, March 11 ..... 5:30 PM - 8:00 PM

Tuesday, March 12 ..... 12:00 Noon - 6:30 PM

Wednesday, March 13 ..... 12:00 Noon - 2:00 PM

EXHIBITION DIRECTORY

The Exhibition Directory, which will be available at the conference, will give a complete listing of the Exhibitors, a map of the Exhibition Hall, details of the Exhibitor Seminars and other events in the Exhibition Hall.

EXHIBITOR SEMINARS

On the afternoon of Tuesday, March 12, from 2:00 PM until 5:30 PM, several of the companies participating in the Exhibition will offer technical seminars. Descriptions of the seminars will be listed in the Exhibition Directory, available at the conference.

EXHIBITOR'S RECEPTIONS

A **Welcoming Reception** will be held in the Exhibition Hall on Monday, March 11, from 5:30 PM until 8:00 PM. Join us for hors d'ouevres while visiting with the Exhibitors and other conference participants.

On Tuesday, light refreshments will be served during an **Exhibitors' Reception** from 5:00 PM until 6:30 PM.

Registered spouses and guests are welcome at these receptions.

EXHIBITION SURVEY & GIVEAWAY

To help the exhibitors and us continually improve the APEC Exposition, a survey is taken each year. Those who complete the survey form and return it no later than early on Tuesday afternoon are entered in a drawing for one of five fabulous prizes. The first name will get their choice of one of the five prizes, the second name drawn will get their choice of one of the remaining four prizes and so forth. The currently planned prizes for APEC 2002 are:

- Portable DVD player
- Digital Camcorder
- Digital Still Camera
- Pocket Computer
- Digital Music Recorder/Player

The drawing will take place in the Exhibition Hall about 6:15 PM on Tuesday, March 12 (right before the Rap Sessions) and you *must* be present to win!

EXHIBITION HALL LUNCHEONS

On Tuesday, March 12 and Wednesday, March 13, enjoy your lunch in the Exhibition Hall. Tickets are $8.00 each and are available through Advance Registration. Tickets may also be purchased at the Conference Registration Desk at least 24 hours in advance. The number of tickets is limited and may sell out. It is recommended that if you are interested in lunch in the Exhibition Hall that you buy them with your Advance Registration. Tickets will not be available at the luncheons.

Registered spouses and guests are welcome at the Exhibit Hall luncheons – ticket required, of course.

APEC 2002 Exhibitors

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Microsemi Corporation
MMG
NetPower Technologies
New England Electric Wire
NH Research
Nissei Arcotronics
Ohmite
Opal-RT Technologies, Inc.
Paratronix Inc.
Payton America
PFC Flexible Circuits
Philips Semiconductor
Positronic Industries
Power Electronics Technology Magazine
Power Integrations
Power One
Powerex
Primarion
RAF Technologies, Inc.
Ridley Engineering
Silicon Power Corporation
SMP, Sintered Magnetics Prometheus
Spectrum Control, Inc.
STMicroelectronics
Sumida
Supertex
Taiwan Semiconductor Manufacturing Corp.
Texas Instruments
Thermacore
Thermagon, Inc.
Tocos America
Top Magnetics
TSC Ferrite International
Transim
Tyco Electronics Power Systems
United Chemicon
VAC Corporation
Venable Industries
Vishay Intertechnology
Vogt Electronic
Voltage Multipliers
Westcode

The exhibitors listed above were confirmed at the time of publication. Please check the Exhibition Directory at the conference for the most up-to-date listing of companies participating in the APEC Exhibition.

TECHNICAL SESSIONS

Session 1 **Monday, March 11**
Plenary **Dallas Ballrooms A & B**
1:30 PM – 5:00 PM

Session Chair: Bruce Miller, Dell Computer

1.1 System Approaches to Power Management
Dennis Monticelli, National Semiconductor Corp., Santa Clara, CA

1.2 The Effective Engineer: A Challenge—Define Your Own Excellence!
Charles Mullett, Condor D.C. Power Supplies, Inc., Oxnard, CA

1.3 Design Considerations for VRM Transient Response Based on the Output Impedance
Kaiwei Yao, Yu Meng, Peng Xu and Fred C. Lee, Virginia Polytechnic Institute & State University, Blacksburg, VA

1.4 Flip-Chip Flex-Circuit Packaging Implemented for 42V/16A Integrated Power Electronics Module Applications
Y. Xiao, R. Natarajan, T.P. Chow, E.J. Rymaszewski, R.J. Gutmann, Rensselaer Polytechnic Institute, Troy, NY

1.5 A High-Frequency 1.5 MVA H-Bridge Building Block for Cascaded Multilevel Converters Using Emitter Turn-Off Thyristor
Alex Huang, Siriroj Sirisukprasert, Zhenxue Xu, Bin Zhang, Jason Lai, Virginia Polytechnic Institute and State University, Blacksburg, VA

1.6 A Novel Direct Back EMF Detection for Sensorless Brushless DC (BLDC) Motor Drives
Jianwen Shao, Dennis Nolan, Thomas Hopkins, STMicroelectronics, Schaumburg, IL

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Session 2 **Tuesday, March 12**
Motor Drive Control **San Antonio Ballroom A**
8:30 AM – 12:00 Noon

Session Chairs: Babak Fahimi, Electro Standards Laboratories & Francesco Profumo, Politecnico di Torino

2.1 Four Quadrant Control of a Switched Reluctance Motor for a Highly Dynamic Actuator Load
Iqbal Husain, Syed Hossain, The University of Akron, Akron, OH; Harald Klode, Dayton Technical Center, Dayton, OH; Bruno Lequesne, Avoki Omekanda, Delphi Automotive Systems, Shelby Twp., MI

2.2 Automatic Control of Excitation Parameters for Switched-Reluctance Motor Drives
Yilmaz Sozer, David A. Torrey, Erkan Mese, Advanced Energy Conversion, LLC, Ballston Spa, NY

2.3 Vector Control of Five-Phase Synchronous Reluctance Motor with Space Vector Pulse Width Modulation (SVPWM) for Minimum Switching Losses
Hamid A. Toliyat, Ruhe Shi, Texas A&M University, College Station, TX

2.4 Resilient Current Control of Five-Phase Induction Motor under Asymmetrical Fault Conditions
Hamid Toliyat, Huangsheng Xu, Texas A&M University, College Station, TX

2.5 A Simple Space-Vector PWM Algorithm For VSI-FED AC Motor Drives
Razvan C. Panaitescu, Ned Mohan, University of Minnesota, Minneapolis, MN

2.6 Direct Synchronized PWM Techniques with Linear Control Functions for Adjustable Speed Drives
V. Oleschuk, F. Blaabjerg, Aalborg University, Aalborg East, DENMARK

2.7 A Sensorless, Stable V/F Control Method for Permanent Magnet Synchronous Motor Drives
P.D. Chandana Perera, Frede Blaabjerg, John K. Pedersen, Paul Thogersen, Aalborg University, Aalborg East, DENMARK

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Session 3A
EMI & Packaging

Tuesday, March 12
San Antonio Ballroom B
8:30 AM – 10:15 AM

Session Chair: Douglas C. Hopkins, State University at Buffalo

3A.1 Effect of Switching Frequency Modulation on EMI Performance of a Converter Using Spread Spectrum Approach
Matti Rahkala, Rovaniemi Polytechnics, Rovaniemi, Finland; T. Suntio and K.Kalliomäki, University of Oulu, Finland

3A.2 Devices for the Separation of the Common and Differential Mode Noise: Design and Realization
F. Profumo, M. Chiado Caponet, Politecnico di Torino, Torino, ITALY

3A.3 Novel Power MOSFET Packaging Technology Doubles Power Density In Synchronous-Buck Converters for Next Generation Microprocessors
Andrew Sawle, International Rectifier, Surrey, UNITED KINGDOM; Carl Blake, Dragan Maric, International Rectifier, El Segundo, CA

3A.4 An Evaluation of Board-Mounted Power Module Packages
Frank Liang, Karl Wolf, V. Joseph Thottuvelil, Tyco Electronics Power Systems, Mesquite, TX

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Session 3B
Manufacturing & Marketing

Tuesday, March 12
San Antonio Ballroom B
10:45 AM – 12:00 Noon

Session Chair: Larry Gilbert, The Powerhouse Inc

3B.1 Environmental Issues In Power Electronics (Lead-Free)
Patrick Le Fevre, Ericsson Microelectronics AB, Kista-Stockholm, SWEDEN

3B.2 The Global Market for Power Supply and Power Management Integrated Circuits
Nathan Andrews, Venture Development Corporation, Natick, MA

3B.3 Standard Products (Brick Converters): Product Development, Marketing, Advertising, Selling And Making A Profit
Mohan Mankikar, Micro-Tech Consultants, Santa Rosa, CA

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Session 4A
Magnetics Modeling

Tuesday, March 12
Houston Ballroom A
8:30 AM – 10:15 AM

Session Chair: Van Niemela, Tyco Electronics Power Systems

4A.1 Dynamic Lossy Inductor Model for Power Converter Simulation
Patrick Chapman, University of Illinois at Urbana-Champaign, Urbana, IL; Scott Sudhoff, Purdue University, West Lafayette, IN

4A.2 New Modeling Strategy for the Fringing Energy in Magnetic Components with Air Gap
L.M. Escribano, R. Prieto, J.A. Oliver, J.A. Cobos, J. Uceda, Universidad Politécnica de Madrid (UPM), Madrid, SPAIN

4A.3 An Improved Two-Dimensional Numerical Modeling Method for E-Core Transformers
Charles R. Sullivan, Anderson F. Hoke, Dartmouth College, Hanover, NH

4A.4 An Accuracy Assessment of 2D vs 3D Finite Element Models for Ferrite Core, Sheet Wound Transformers
J.D. Lavers, E.D. Lavers, University of Toronto, Toronto, Ontario, CANADA

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Session 4B
Power Semiconductor Devices

Tuesday, March 12
Houston Ballroom A
10:45 AM – 12:00 Noon

Session Chair: Alexander Craig, Fairchild Semiconductor

4B.1 The Uniform Turn-on of the Emitter Turn-Off Thyristor
Z. Xu, Y. Bai, B. Zhang, A. Huang, Virginia Polytechnic Institute and State University, Blacksburg, VA

4B.2 A 1700V LPT-CSTBT With Low Loss and High Durability
E. Motto, J. Donlon, T. Nakagawa, Powerex, Inc., Youngwood, PA; Y. Ishimura, K. Satoh, J. Yamada, M. Yamamoto, Mitsubishi Electric Corp., Fukuoka, JAPAN; S. Kusunoki, H. Nakamura, K. Nakamura, Mitsubishi Electric Corp., Kumamoto, JAPAN

4B.3 A Resonant Power MOSFET/IGBT Gate Driver
I. de Vries, Turbo Switchers (Pty) Ltd., Cape Town, SOUTH AFRICA

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Session 5 **Tuesday, March 12**
Voltage Regulator Modules I **Houston Ballroom B**
8:30 AM – 12:00 Noon

Session Chairs: Ionel Dan Jitaru, Ascom Rompower Inc. & Rais Miftakhutdinov, Texas Instruments Inc

5.1 An AC VRM Topology for High Frequency AC Power Distribution Systems
Mei Qiu, Concordia University, Montreal, Quebec, CANADA; Praveen Jain, Queen's University, Kingston, Ontario, CANADA

5.2 Effect of Target Impedance and Control Loop Design on VRM Stability
Shamala Chickamenahalli, Suryakumar Mahadevan, Edward Stanford, Kim Merley, Intel Corporation, Chandler, AZ

5.3 Critical Inductance in Voltage Regulator Modules
Pit-Leong Wong, Linear Technology Corporation, Milpitas, CA; Fred C. Lee, Peng Xu, Kaiwei Yao, Virginia Polytechnic Institute and State University, Blacksburg, VA

5.4 Withdrawn By The Author

5.5 Comparison of Three Topologies for VRM Fast Transient Application
M.H. Pong, Y.Y. Law, J.H. Kong, Joe Liu, N.K. Poon, Hong Kong University, Hong Kong, CHINA

5.6 Novel Transient Cancellation Control Method for Future Generation of Microprocessors
Issa Batarseh, Jaber A. Abu Qahouq, University of Central Florida, Orlando, FL

5.7 Transient Current Compensation for Low-Voltage High-Current Voltage Regulator for Microprocessor
Issa Batarseh, Jia Luo, Xiaofang Gao, Thomas Wu, University of Central Florida, Orlando, FL

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Session 6 **Tuesday, March 12**
Single Stage PFC **Houston Ballroom C**
8:30 AM – 12:00 Noon

Session Chairs: Jun Chen, Texas Instruments Incorporated & Robert Crane, Ascom Energy Systems

6.1 Optimizing the Design of Single-Stage Power Factor Correctors
J.A. Villarejo, Polytechnic University of Cartagena, Cartagena, SPAIN; J. Sebastian, A. Fernandez, M.M. Hernando and P.J. Villegas, University of Oviedo, Gijon, SPAIN

6.2 Universal Line Voltage Single-Stage AC/DC Converter
O. Garcia, C. Fernandez, J.A. Cobos, J. Uceda, Universidad Politécnica de Madrid, Madrid, SPAIN

6.3 Flyback with Active Clamp: A Suitable Topology for Low Power and Very Wide Input Voltage Range Applications
P. Alou, O. Garcia, J.A. Cobos, J. Uceda, Universidad Politécnica de Madrid, Madrid, SPAIN; M. Rascon, ALCATEL, Madrid, SPAIN

6.4 Comparison Between Two Single-Switch Isolated Flyback and Forward High-Quality Rectifiers for Low Power Applications
Giorgio Spiazzi, Simone Buso, University of Padova, Padova, ITALY

6.5 A Bi-Flyback PFC Converter with Low Bulk Capacitor Voltage and Tight Output Voltage Regulation for Universal Input Applications
Weihong Qiu, Wenkai Wu, Wei Gu, Issa Batarseh, University of Central Florida, Orlando, FL

6.6 Parallel-Connected Single-Stage Power Factor Correction Approach for Improved Performance and Efficiency
Sangsun Kim, Prasad N. Enjeti, Texas A&M University, College Station, TX

6.7 Single-Switch Parallel Power Factor Correction AC/DC Converters with Inherent Load Current Feedback
Qun Zhao, Fred C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA; Jinrong Qian, Maxim Integrated Products, Sunnyvale, CA

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Session 7 **Wednesday, March 13**
Sensorless Motor Drives **San Antonio Ballroom A**
8:30 AM – 12:00 Noon

Session Chairs: David A. Torrey, Rensselaer Polytechnic Institute & Miguel Velez, University of Puerto Rico at Mayaguez

7.1 Sensorless Drive of SMPM Motor by High Frequency Signal Injection Method
Seung-Ki Sul, Ji-Hoon Jang, Seoul National University, Seoul, SOUTH KOREA

7.2 Low Cost Sensorless Control of Brushless DC Motors with Improved Speed Range
Gui-Jia Su, John McKeever, Oak Ridge National Laboratory, Knoxville, TN

7.3 Withdrawn By The Author

7.4 Sensorless Control of Switched Reluctance Motors for Constant Torque Applications Based on Back EMF Calculation
M. Ehsani, F.R. Salmasi, H. Gao, Texas A&M University, College Station, TX; B. Fahimi, Electro Standards Laboratory, Cranston, RI

7.5 A Voltage Model Flux Observer Design Requiring No Stator Resistance or Voltage Signal Information
Longya Xu, Habib-ur Rehman, Ohio State University, Columbus, OH

7.6 Implementation of Generic Sensorless Direct Field Oriented Control of AC Motors on Fixed-Point Digital Signal Processor
Mongkol Konghirun, Longya Xu, The Ohio State University, Columbus, OH; David Figoli, Texas Instruments Incorporated, Stafford, TX

7.7 A Modified PWM Scheme in Order to Obtain Spatial Information of AC Machines without Mechanical Sensor
Thomas Wolbank, Juergen Machl, Vienna University of Technology, Vienna, AUSTRIA

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Session 8 — Magnetic & Piezoelectric Devices
Wednesday, March 13 — San Antonio Ballroom B — 8:30 AM – 12:00 Noon

Session Chairs: Ed Bloom, e/j BLOOM associates Inc. & Conor Quinn, Artesyn Technologies

8.1 PCB Integrated Inductor for Low Power DC/DC Converter
Matthias Ludwig, Maeve Duffy, Terence O Donnell, Cian O Mathuna, PEI Technologies, NMRC, Cork, IRELAND

8.2 Experimental Evaluation of the Core Losses in the Magnetic Components used in PFC Converters: Application to Optimize the Flyback Structure Losses
C. Larouci, J.P. Ferrieux, L. Gerbaud, J. Roudet, S.Catellani, Laboratoire d'Electrotechnique de Grenoble, Grenoble, FRANCE

8.3 Improved Loss Determination for Planar Integrated Power Passive Modules
J.T. Strydom, J.D. van Wyk, Virginia Polytechnic and State University, Blacksburg, VA

8.4 Design Issues of a Core-less Transformer for a Contact-less Application
C. Fernandez, O. Garcia, R. Prieto, J.A. Cobos, Universidad Politécnica de Madrid, Madrid, SPAIN; S. Gabriels, G. Van Der Borght, Cochlear Technology Centre Europe, Edegem, Belgium

8.5 Integrated Magnetic for LLC Resonant Converter
Bo Yang, Rengang Chen, Fred C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA

8.6 An Actively Cooled High Power, High Frequency Transformer with High Insulation Capability
Lothar Heinemann, ABB Calor Emag High Voltage Switchgears, Hanau, GERMANY

8.7 Comparison of Different Alternatives to Drive Piezoelectric Transformers
M. Sanz, P. Alou, R. Prieto, J.A. Cobos, J. Uceda, Universidad Politécnica de Madrid, Madrid, SPAIN

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Session 9 — DC-DC Control
Wednesday, March 13 — Houston Ballroom A — 8:30 AM – 12:00 Noon

Session Chairs: José A. Cobos, Universidad Politécnica de Madrid & Jian Sun, Rockwell Collins, Inc.

9.1 A Stability Assessment Tool for DC-DC Converters
Cahit Gezgin, Wayne Bowman, V. Joseph Thottuvelil, Tyco Electronics Power Systems, Mesquite, TX

9.2 High-Frequency Digital Controller IC for DC/DC Converters
Aleksandar Prodic, Ben Patella, Dragan Maksimovic, University of Colorado at Boulder, Boulder, CO

9.3 PID Controller Modifications to Improve Steady-State Performance of Digital Controllers for Buck and Boost Converters
Liping Guo, John Y. Hung, R.M. Nelms, Auburn University, Auburn, AL

9.4 Stability and Dynamic Response Improvement of Flyback DC-DC Converter by a Novel Control Scheme
Tamotsu Ninomiya, Kyushu University, Hakozaki, Fukuoka, JAPAN; Hiroto Terashi, Densei-Lambda KK, Kanoya, Kagoshima, JAPAN; Isacc Cohen, Lambda Electronics Inc., Melville, NY

9.5 Analysis and Small-Signal Modeling of Self-Oscillating Converters with Applied Switching Delay
Teuvo Sunito, University of Oulu, Oulu, Finland; Katja Hynynen, Pertti Silventoinen, Lappeenranta University of Technology, Lappeenranta, Finland

9.6 Soft-Switching Zeta Converter with an Asymmetrical PWM Control
T.-F. Wu, S.-A. Liang, Y.-M. Chen, National Chung Cheng University, Chia-Yi, TAIWAN

9.7 Synergetic Synthesis of DC-DC Boost Converter Controllers: Theory and Experimental Analysis
E. Santi, A. Monti, R. Dougal, F. Ponci, University of South Carolina, Columbia, SC; A. Kolesnikov, G. Veseloc, A. Kolesnikov, Tanganrog State University of Radio-Engineering, Tanganrog, RUSSIA

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10.4 A Novel Method for Inductor Core Loss Estimation and Its Implementation in a Simulation Tool
Jinjun Liu, Fred C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA; Thomas G. Wilson, Jr., Ronald C. Wong, Ron Wunderlich, Transim, Incorporated, Boston, MA

10.5 A Unified Approach to Compact Modeling of Power and Logic Devices in Low Cost nMOS-Based Smart Power Technology
A. Roncaglia, N. Speciale, M. Rudan, University of Bologna, Bologna, ITALY; G.C. Cardinali, Lamel CNR, Bologna, ITALY

10.6 Parameter Extraction for a Power Diode Circuit Simulator Model Including Temperature Dependent Effects
E. Santi, X. Kang, A. Caiafa, J. Hudgins, University of South Carolina, Columbia, SC; P. Palmer, University of Cambridge, Cambridge, UNITED KINGDOM

10.7 Optimization Design of A Single-Stage PFC Converter with Averaging Circuit Model and MathCAD
Issa Batarseh, Weihong Qiu, Chris Iannello, University of Central Florida, Orlando, FL; Shiguo Luo, Tyco Electronics Power Systems, Inc., Mesquite, TX

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Session 10 — Modeling, Simulation & Control

Wednesday, March 13
Houston Ballroom B
8:30 AM – 12:00 Noon

Session Chairs: Cahit Gezgin, Tyco Electronics Power Systems & Chuck Mullett, Condor DC Power Supplies

10.1 Parallel-Connected Converters with Maximum Power Tracking
Kasemsan Siri, Kenneth Conner, The Aerospace Corporation, El Segundo, CA

10.2 Optimum Control Design of PWM-Buck Topologies to Minimize Output Impedance
A. Soto, P. Alou, J.A. Oliver, J.A. Cobos, J. Uceda, Universidad Politécnica de Madrid (UPM), Madrid, SPAIN

10.3 Real-Time, PC-Based Simulator of Electric Systems and Drives
Simon Abourida, Guillaume Murere, Nicolas Lechevin, Christian Dufour, Biao Yu, Jean Belanger, Opal-RT, Montreal, Quebec, CANADA

Session 11 — Control & Circuit Techniques

Wednesday, March 13
Houston Ballroom C
8:30 AM – 12:00 Noon

Session Chairs: Neil J. Barabas, B&R Electronics & Vladimir Muratov, Intersil Corporation

11.1 Concurrent and Simple Digital Controller of an AC/DC Converter with Power Factor Correction
P. Zumel, A. de Castro, O. Garcia, T. Riesgo, J. Uceda, Universidad Politécnica de Madrid (UPM), Madrid, SPAIN

11.2 Digitally Controlled Low-Harmonic Rectifier Having Fast Dynamic Response
Aleksandar Prodic, Jingquan Chen, Robert W. Erickson, Dragan Maksimovic; University of Colorado Boulder, Boulder, CO

11.3 A Modified Control Scheme to Alleviate DC Voltage Stress in Active Clamp PFC AC/DC Converter with Universal Input
Issa Batarseh, Wenkai Wu, Weihong Qiu, Wei Gu, University of Central Florida, Orlando, FL

11.4 Multi-Input Converter with Power Factor Correction and Maximum Power Point Tracking Features
Y.-M. Chen, Y.-C. Liu, F.-Y. Wu, National Chung Cheng University, Chia-Yi, TAIWAN

11.5 Low Loss Modulation of PWM-Rectifiers
C. Attaianese, G. Tomasso, University of Cassino, Cassino, ITALY

11.6 Analysis, Design, and Performance Evaluation of Flying-Capacitor Passive Lossless Snubber Applied to PFC Boost Converter
Brian T. Irving, Milan M. Jovanovic, Delta Products Corporation, Research Triangle Park, NC

11.7 A Boost Converter With Lossless Snubber Under Minimum Voltage Stress
Wei Dong, Qun Zhao, Jinjun Liu, Fred Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA

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Session 12A — Wednesday, March 13
Resonant & Soft-Switching Converters — Houston Ballroom A — 2 PM – 3:45 PM

Session Chair: S. R. Doradla, Indian Institute of Technology

12A.1 Zero Voltage Switching DC Link Single-Phase Pulse-Width Modulated Voltage Source Inverter
R. Gurunathan, Tyco Electronics, Bangalore, INDIA; A.K.S. Bhat, University of Victoria, Victoria, British Columbia, CANADA

12A.2 Zero-Current and Zero-Voltage Soft-Transition Commutation Cell for PWM Inverters
C. M. de O. Stein, H. L. Hey, J. R. Pinheiro, H. Pinheiro and H. A. Gründling, Federal University of Santa Maria, Santa Maria, RS, BRAZIL

12A.3 Half-Bridge Two-Amplitude Actively Clamped Resonant DC-Link Inverter
Jianping Ying, Teng Liu, Dehua Zhang, Zhejiang University, Hangzhou, CHINA

12A.4 Single-Stage Resonant Boost AC-DC-AC Converter
S. Yuvarajan, Shanguang Xu, North Dakota State University, Fargo, ND

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Session 12B — Wednesday, March 13
EMI & PWM Filtering — Houston Ballroom A — 4:15 PM – 5:30 PM

Session Chair: T.A. Lipo, University of Wisconsin, Madison

12B.1 A Novel Active Common-Mode EMI Filter for PWM Inverter
Seung-Ki Sul, Yo-Chan Son, Seoul National University, Seoul, SOUTH KOREA

12B.2 An Inverter Output Filter to Mitigate dv/dt Effects in PWM Drive System
Prasad Enjeti, Loo Palma, Texas A&M University, College Station, TX

12B.3 Adverse Effects in Voltage Source Inverter-Fed Drive Systems
Zdenek Peroutka and Vaclav Kus, University of West Bohemia, Plzen, CZECH REPUBLIC

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Session 13 — Wednesday, March 13
Uninterruptible Power Systems — San Antonio Ballroom A — 2 PM – 5:30 PM

Session Chairs: B. K. Lee, Texas A&M University & Barry Papermaster, Emerson Energy Systems

13.1 Analysis and Design of a New High-Efficiency Bi-Directional ZVT PWM Converter for DC Bus and Battery Bank Interface
Luciano Schuch, Cassiano Rech, Humberto Pinheiro, Hilton A. Gründling, Hélio L. Hey and José R. Pinheiro, Federal University of Santa Maria, Santa Maria, RS, BRAZIL

13.2 Compensation of Cable Voltage Drops and Automatic Identification of Cable Parameters in Ground Power Units
Uffe Borup, Bo Vork Nielsen, AXA Power Aps, Odense, Denmark; Frede Blaabjerg, Aalborg University, Aalborg, Denmark

13.3 DEAD-BEAT Control for Parallel Connected UPS
Alireza Daneshpooy, Silicon Power, Exton, PA

13.4 Dual AC-Input Power System Architectures
Milan Jovanovic and Yungtaek Jang, Delta Products Corporation, Research Triangle Park, NC

13.5 DSP Control Method of Single-Phase Inverters for UPS applications
Liviu Mihalache, Power Conversion Technologies Inc., Harmony, PA

13.6 Uninterruptible Power Supplies: Classification, Operation, Dynamics, and Control
A. Emadi, S.B. Bekiarov, Illinois Institute of Technology, Chicago, IL

13.7 A Fuel Cell Based Domestic Uninterruptible Power Supply
E. Santi, D. Franzoni, A. Monti, D. Patterson, F. Ponci, University of South Carolina, Columbia, SC; N. Barry, Cork Institute of Technology, Cork, IRELAND

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Session 14 **Wednesday, March 13**
DC-DC High Power & Boost Converters **San Antonio Ballroom B**
2:00 PM – 5:30 PM

Session Chairs: Freddy R. Canizales, Alcatel Converters USA & Bharat Modh, Tyco Electronics Power Systems

14.1 Dynamic Analysis of Loss Limited Switching Full Bridge DC-DC Converter with Multimodal Control
Ashish Bendre, Giri Venkataramanan, University of Wisconsin-Madison, Madison, WI; Deepak Divan, Soft Switching Technologies, Middleton, WI

14.2 A Quadratic Boost Converter Using Soft Commutation
Joao Vieira Jr., Luiz Barreto, Ernane Coelho, Valdeir Farias, Luiz de Freitas, Universidade Federal De Uberlandia, Uberlandia, MG, BRAZIL

14.3 A Switched Mode Converter Suitable for Superconductive Magnetic Energy Storage (SMES) Systems
D. Shmilovitz, S. Singer, Tel-Aviv University, Tel-Aviv, ISRAEL

14.4 A Novel ZVS DC/DC Converter for High Power Applications
J.M. Zhang, F. Zhang, X.G. Xie, D.Z. Jiao, Zhaoming Qian, Zhejiang University, Hangzhou, Zhejiang, CHINA

14.5 A Primary-Side-Assisted Zero-Voltage and Zero-Current Switching Three-Level DC-DC Converter with Phase-Shift Control
Seong-Jeub Jeon, Francisco Canales, Peter Barbosa, F. C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA

14.6 Input Series Connection of Modular DC-DC Converters with Active Voltage Sharing for High Voltage Applications
Ned Mohan, Amol Bhinge, University of Minnesota, Minneapolis, MN; Rajapandian Ayyanar, Arizona State University, Tempe, AZ

14.7 A New Two-Inductor Boost Converter with Auxiliary Transformer
Yungtaek Jang, Milan Jovanovic, Delta Products Corporation, Research Triangle Park, NC

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Session 15 **Wednesday, March 13**
Voltage Regulator Modules II **Houston Ballroom B**
2:00 PM – 5:30 PM

Session Chairs: Ed Stanford, Intel Corporation & Toshiyuki Zaitsu, TDK Corporation

15.1 Multiphase Voltage-Mode Hysteretic Controlled VRM with DSP Control and Current Sharing Solution
Issa Batarseh, Jaber A. Abu Qahouq, University of Central Florida, Orlando, FL

15.2 A Multiphase DC/DC Converter with Hysteretic Voltage Control and Current Sharing
Wei Gu, Weihong Qiu, Wenkai Wu, Issa Batarseh, University of Central Florida, Orlando, FL

15.3 Switching Action Delays in Voltage Regulator Modules
Pit-Leong Wong, Linear Technology Corporation, Milpitas, CA; F. C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA

15.4 A High Efficiency Topology for 12V VRM - Push Pull Buck and Its Integrated Magnetics Implementations
Jia Wei, Peng Xu, F. C. Lee, Virginia Polytechnic Institute & State University, Blacksburg, VA

15.5 Investigation of Candidate Topologies for 12V VRM
Peng Xu, Wei Jia, Kaiwei Yao, Yu Meng, F. C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA

15.6 Tapped-Inductor Buck Converter with a Lossless Clamp Circuit
Kaiwei Yao, F. C. Lee, Yu Meng, Jia Wei, Virginia Polytechnic Institute & State University, Blacksburg, VA

15.7 Investigation of Topology Candidates for 48V VRM
Mao Ye, Peng Xu, Bo Yang, F. C. Lee, Virginia Polytechnic Institute & State University, Blacksburg, VA

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Session 16A — **Wednesday, March 13**
Rectifier Circuits — **Houston Ballroom C**
2:00 PM – 3:45 PM

Session Chair: Tim A. Haskew, University of Alabama

16A.1 A High Power-Quality, Three-Phase Utility Interface
Bunyamin Tamyurek, David A. Torrey, Rensselaer Polytechnic Institute, Troy, NY

16A.2 A Novel Control Concept for Operating a Two-Stage Delta-Rectifier-Based Telecommunication Power Supply Module under Heavily Unbalanced Mains Voltage Conditions
Roland Greul, Johann Kolar, Swiss Federal Institute of Technology Zurich, Zurich, SWITZERLAND

16A.3 Control of a Flyback Converter in Power Factor Correction Mode: Compromise Between the Current Constraints and the Transformer Volume
C. Larouci, J.P. Ferrieux, L. Gerbaud, J. Roudet, J.Barbaroux, Laboratoire d'Electrotechnique de Grenoble, Grenoble, FRANCE

16A.4 Design of 80W Two-Stage Adapter with High Efficiency and Low No Load Input Power
Shixiang Zhou, Boshi Liu, China Institute of Metrology, Hangzhou, CHINA

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Session 16B — **Wednesday, March 13**
Power Electronics Chili — **Houston Ballroom C**
4:15 PM – 5:30 PM

Session Chair: Gautam (Tom) Nath, Intel Corporation

16B.1 Ultra High Efficiency of 95% for DC/DC Converter - Considering Theoretical Limitation of Efficiency
Masakazu Takagi, Katsuhiko Shimizu, TDK Corporation, Chiba, JAPAN

16B.2 Improving the Dynamic Response of Active Power Filters Based on the Synchronous Reference Frame Method
Levy E.L. de Oliveira, L.E. Borges da Silva, V.F. da Silva, G.L. Torres, J.O. Pinto, Escola Federal de Engenharia de Itajuba, Itajuba, MG, BRAZIL

16B.3 Survey of Modern Approaches of Education in Power Electronics
Uwe Drofenik, Johann Kolar, Swiss Federal Institute of Technology Zurich, Zurich, SWITZERLAND

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Session 17A — **Thursday, March 14**
Induction Motor Drives & Control — **San Antonio Ballroom A**
8:30 AM – 10:15 AM

Session Chair: Fabio Crescimbini, University Roma TRE

17A.1 A Low Cost, Simple Torque Ripple Reduction Technique For Three Phase Inductor Motors
Jim Spangler, ON Semiconductor, Schaumburg, IL

17A.2 Induction Machines Performance Evaluator 'Torque Speed Estimation and Rotor Fault Diagnostic'
Hamid A. Toliyat, Shehab Ahmed, Masoud Haji, Texas A&M University, College Station, TX

17A.3 Adjustable-Speed Single-Phase Induction Motor Drive
C.B. Jacobina, A.M.N. Lima, E.R.C. da Silva, CCT UFPB, Campina Grande, PB, BRAZIL; M.B. de R. Correa, CEFET-AL UNED, Palmeira dos Indios, AL, BRAZIL

17A.4 The Sparse Matrix Converter - A Novel Three-Phase Fully Matrix-Equivalent AC-DC-AC Converter Employing Only 15 Unipolar Turn-Off Power Semiconductors and 18 Diodes and No DC Link Energy Storage Components
Johann W. Kolar, and Frank Schafmeister, Swiss Federal Institute of Technology, Zurich, SWITZERLAND; Hans Ertl, Vienna University of Technology, Vienna, AUSTRIA

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Session 17B **Thursday, March 14**
Unique Drive Topologies **San Antonio Ballroom A**
10:45 AM – 12:00 Noon

Session Chair: Eric Persson, International Rectifier

17B.1 Withdrawn By The Author

17B.2 An Advanced Low-Cost Sensorless Induction Motor Drive
Jaroslaw Guzinski, Technical University of Gdansk, Gdansk, POLAND; Haithem Abu-Rub, Hamid Toliyat, Texas A&M University, College Station, TX

17B.3 Indirect Field Orientation for Induction Motors without Speed Sensor
C.B. Jacobina, C.C. de Azevedo, A.M.N. Lima, A.C. Oliveira, UFPB/CCT/DEE/LEIAM, Campina Grande, PB, BRAZIL; L.A.S. Ribeiro, CEFET-MA, Sao Luis, MA, BRAZIL

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Session 18 **Thursday, March 14**
DC-DC Magnetics & Topologies **Houston Ballroom A**
8:30 AM – 12:00 Noon

Session Chairs: Khai D. T. Ngo, University of Florida & Roberto Prieto, Universidad Politécnica de Madrid

18.1 Coupled Inductor Design Optimization for Fast-Response Low-Voltage DC-DC Converters
Charles R. Sullivan, Jieli Li, Dartmouth College, Hanover, NH

18.2 Integrated Magnetic Full Wave Converter With Flexible Output Inductor
Liang Yan, Dayu Qu, Brad Lehman, Northeastern University, Boston, MA

18.3 An Improved Current-Doubler Rectifier with Integrated Magnetics
Jian Sun, Kenneth F. Webb, Rockwell Collins, Inc., Cedar Rapids, IA; Vivek Mehrotra, Rockwell Scientific Company, Cedar Rapids, IA

18.4 Bi-Directional Resetting Scheme of the Magamp Post-Regulator
Wei Chen, Jiang Jian, Delta Power Electronics Center, Pudong, Shanghai, CHINA

18.5 Single-Magnetic Push-Pull Forward Converter Featuring Built-in Input Filter and Coupled-Inductor Current Doubler for 48V VRM
Peng Xu, Mao Ye, F. C. Lee, Virginia Polytechnic Institute and State University, Blacksburg, VA

18.6 A Family of Compound Active-Clamping DC-DC Converters
Gang Chen, Dehong Xu, Bo Feng,Yousheng Wang, Zhejiang University, Yuquan, Hangzhou, CHINA

18.7 The Forward Converter: From the Classic to the Contemporary
F. Dong Tan, TRW, Redondo Beach, CA

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Session 19 **Thursday, March 14**
DC-DC Low Power & Low Output Voltage Converters **Houston Ballroom B**
8:30 AM – 12:00 Noon

Session Chairs: Tamotsu Ninomiya, Kyushu University & David Strasser, Texas Instruments, Inc.

19.1 High Efficiency Flyback Converter Using Synchronous Rectification
Ionel Jitaru, Ascom Rompower Inc., Tucson, AZ

19.2 20V MOSFETs For On-Board DC-DC Converters in Desktop Computers
Dragan Maric, Ralph Monteiro, International Rectifier, El Segundo, CA

19.3 Practical Solutions to the Design of Current-Driven Synchronous Rectifier with Energy Recovery from Current Sensing
Joe Liu, Xuefei Xie, N.K. Poon, M.H. Pong, Hong Kong University, Hong Kong, CHINA

19.4 A Single-Stage Converter Topology to Achieve Efficient On-Board Power Distribution for Multi-Points Loads
Youhao Xi, Concordia University, Montreal, Quebec, CANADA; Praveen Jain, Queen's University, Kingston, Ontario, CANADA

19.5 A Novel DC/DC ZVS Converter for Battery Input Application
Jianhong Zeng, Jianping Ying, Qingyou Zhang, Delta Power Electronics Center (DPEC), Pudong, Shanghai, CHINA

19.6 Analysis and Design of Self-Oscillating Flyback Converter
Brian T. Irving, Milan M. Jovanovic, Delta Products Corporation, Research Triangle Park, NC

19.7 An Alternative Approach to Efficiently and Flexibly Generating Reset Waveforms for AC PDP
T.-F. Wu, C.-C. Chen, C.-C. Chen, W.-F. Hsu, National Chung Cheng University, Chia-Yi, Taiwan

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Session 20
Lamp Ballasts & Lighting
Thursday, March 14
San Antonio Ballroom B
8:30 AM – 12:00 Noon

Session Chairs: Jaime Arau, CENIDET & J. C. Johnson, Cooper Lighting

20.1 HF Multiresonant Electronic Ballast for Fluorescent Lamps with Constant Filament Preheat Voltage
Sam Ben-Yaakov, Moshe Shvartsas, Gregory Ivensky, Ben-Gurion University of the Negev, Beer-Sheva, ISRAEL

20.2 Piezoelectric-Transformer Inverter with Maximum-Efficiency Tracking and Dimming Control
Tamotsu Ninomiya, Satoshi Nakashima, Kyushu University, Fukuoka, JAPAN; Hiroshi Ogasawara, Hidenori Kakehashi, Matsushita Electric Works, Ltd., JAPAN

20.3 A High Efficiency HPF-ZCS-PWM SEPIC for Electronic Ballast With Multiple Tubular Fluorescent Lamps
Carlos Canesin, Fabio Wakabayashi, Paulista State University, Ilha Solteira (SP), BRAZIL

20.4 Partitioning a Digitally Programmable Power-Control ASIC for Application to Ballasts
Douglas C. Hopkins, State University at Buffalo, Buffalo, NY; James Moronski, Binghamton University, Binghamton, NY

20.5 Digitally Addressable DALI Dimming Ballast
Cecilia Contenti, International Rectifier, El Segundo, CA

20.6 Series-Parallel Resonant Forward Inverter as a Cold Cathode Fluorescent Lamp (CCFL) Driver
Weiyun (Sophie) Chen, Texas Instruments, Manchester, NH

20.7 A Behavioral SPICE Compatible Model of an Electrodeless Fluorescent Lamp
Sam Ben-Yaakov, Moshe Shvartsas, Ben-Gurion University of the Negev, Beer-Sheva, ISRAEL; Jim Lester, OSRAM SYLVANIA, Beverly, MA

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Session 21
High Power PFC
Thursday, March 14
Houston Ballroom C
8:30 AM – 12:00 Noon

Session Chairs: Michael A. E. Andersen, Technical University of Denmark & Dusan Graovac, Baldor ASR GmbH

21.1 Withdrawn By The Author

21.2 Novel Passive Soft Switching Schemes for High Power Single Phase PFC Rectifiers
Yan Deng, Xiangning HE, Zhejiang University, Hangzhou, Zhejiang, CHINA

21.3 Zero-Current-Switching (ZCS) Power Factor Pre-Regulator (PFP) with Reduced Conduction Losses
Hang-Seok Choi, B.H. Cho, Department of Electrical Engineering, Seoul National University, Seoul, SOUTH KOREA

21.4 A Novel Single Phase Three-level PFC Circuit with Passive Lossless Snubber
Hongyang Wu, Xiangning He, Zhejiang University, Hangzhou, CHINA

21.5 A Simplified Zero-Voltage-Switching PWM Three-Level Converter with Two Clamping Diodes
Xinbo Ruan, Dayu Xu, Linquan Zhou, Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu Provice, CHINA

21.6 Zero-Voltage-switching PWM Three-Level Converter with Current-Double-Rectifier
Xinbo Ruan, Bin Li and Jinzhong Li, Nanjing University of Aeronautics and Astronautics, Nanjing, Jiangsu Provice, CHINA

21.7 Compensation Devices Solve Failure Mode of the Phase Shift ZVS Bridge During Light-Load Operation
G. Deboy, M. Purschel, U. Wahl, A. Willmeroth, Infineon Technologies AG, Munich, GERMANY; J. Hancock, Infineon Technologies North America, San Jose, CA

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Session 22
PWM, Multi-Level & Parallel Converters
Thursday, March 14
San Antonio Ballroom A
2:00 PM – 5:30 PM

Session Chair: Philip Cooke, Analog Devices Inc.

22.1 High Frequency Link Inverter Based on Multiple-Carrier PWM
P.T. Krein, X Geng, R. Balog, University of Illinois, Urbana, IL

22.2 Symmetrical SVPWM Pattern Generators Using Field Programmable Gate Array Implementation
Geza Joos, Su Chen, Concordia University, Montreal, Quebec, CANADA

22.3 A Novel Passive Lossless Snubber for Multilevel Inverters
Hongyang Wu, Xiangning He, Yan Deng, Zhejiang University, Hangzhou, CHINA

22.4 CWDC Strategy for Paralleled Multi-Inverter Systems Achieving a Weighted Output Current Distribution
Y.-K. Chen, Chien Kuo Institute of Technology, Chang-Hua, Taiwan; Y.-E. Wu, T.-F. Wu, C.-P. Ku, National Chung Cheng University, Chia-Yi, Taiwan

22.5 Investigations on a Unified Controller for a Practical Hybrid Multilevel Power Converter
Madhav Manjrekar, ABB Automation Inc., New Berlin, WI; Tilak Gopalarathnam, Texas A&M University, College Station, TX; Peter K. Steimer, ABB Industrie AG, Turgi, SWITZERLAND

22.6 A Novel Approach to the Control of Parallel Three-Phase Boost Converters that Combines Space-Vector Modulation with Variable-Structure Control
Sudip K. Mazumder, Ali H. Nayfeh, Dushan Boroyevich, Virginia Polytechnic Institute and State University, Blacksburg, VA

22.7 Application of Synchronous and Stationary Frame Controllers for Unbalanced and Non-Linear Load Compensation in 4-Leg Inverters
Robert Gannett, Dushan Boroyevich, Virginia Polytechnic Institute and State University, Blacksburg, VA; John Sozio, Northrop Grumman, Sykesville, MD

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Session 23
Utility Interface & High Power Electronics
Thursday, March 14
San Antonio Ballroom B
2:00 PM – 5:30 PM

Session Chairs: Madhav D. Manjrekar, ABB Inc. & Sudip Mazumder, University of Illinois, Chicago

23.1 A New Multiple Loops Linear Control Scheme Applied to a Current-Injection Three-Phase Unity-Power-Factor Rectifier
K. Al-Haddad, H. Kanaan, H.F. Blanchette, Ecole de Technologie Superieure, Montreal, Quebec, CANADA; R. Chaffai, L. Duguay, ASTEC Advanced Power System, St.-Laurent, Quebec, CANADA; F. Fnaiech, ESSTT - University of Tunis, Tunis, Tunisia

23.2 Stationary Frame Harmonic Reference Generation for Active Filter Systems
M.J. Newman, D.N. Zmood, D.G. Holmes, Monash University, Clayton, VIC, Australia

23.3 Design and Implementation of a Series Voltage Sag Compensator Under Practical Utility Conditions
Po-Tai Cheng, Chun-Chiang Pan, Chian-Chung Huang, National Tsing Hua University, Hsin-Chu, TAIWAN

23.4 A Study on DVR Control for Unbalanced Voltage Compensation
Hong-Ju Jung, In-Young Suh, Byung-Seob Kim, Rae-Young Kim, See-Young Choi, Jhong-Hwan Song, Hyosung Corporation, Seoul, SOUTH KOREA

23.5 A DC-DC Converter Adequate for Alternative Supply System Applications
V.J. Farias, V.M. Pacheco, E.A.A. Coelho, J.B. Vieria Jr, L.C. de Frietas, Universidade Federal De Uberlandia, Uberlandia, MG, BRAZIL

23.6 Seamless Transfer of Grid Connected PWM Inverters between Utility Interactive and Stand-Alone Modes
Ned Mohan, Rohit Tirumala, University of Minnesota, Minneapolis, MN; Chris Henze, Analog Power Devices, Inc., Lakeville, MN

23.7 Phase Angle Balance Control for Harmonic Filtering of A Three Phase Shunt Active Filter System
Souvik Chattopadhyay, V. Ramanarayanan, Indian Institute of Science, Bangalore, INDIA

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Session 24
DC-DC Resonant & Bridge Converters
Thursday, March 14
Houston Ballroom A
2:00 PM – 5:30 PM

Session Chairs: Praveen Jain, Queen's University & C. Wesley Tipton, U. S. Army Research Laboratory

24.1 A New ZVCS Resonant Push-Pull DC/DC Converter Topology
Itsda Boonyaroonate, Shinsaku Mori, Nippon Institute of Technology, Minamisaitama-gun, Saitama-ken, JAPAN

24.2 A ZVT PWM Boost Converter Using an Auxiliary Resonant Source
M. L. Martins, H. L. Hey, J. R. Pinheiro, Humberto Pinheiro, H. A. Gründling, Federal University of Santa Maria, Santa Maria, RS, BRAZIL

24.3 LLC Resonant Converter for Front End DC/DC Conversion
Bo Yang, Fred Lee, Virginia Polytechnic Institute & State University, Blacksburg, VA; Alpha Zhang, Guisong Huang, Delta Power Electronics Center, Pudong, Shanghai, CHINA

24.4 An LCLC Resonant DC-DC Converter with PWM Control-Analysis, Simulation and Implementation
S.R. Doradla, Kamal Singh, Rajesh Ghosh, IIT Kanpur, Kanpur, INDIA; Guido Bachmann, Peter Mutschler, TU Darmstadt, Darmstadt, GERMANY

24.5 Large-Signal Modeling of the PRC-LCC Resonant Topology With A Capacitor as Output Filter
J.A. Martin, A.M. Pernia, J. Diaz, F. Nuno, J. Sebastian, Universidad de Oviedo, Gijon, SPAIN

24.6 A Low Loss High-Frequency Half-Bridge Driver with Integrated Power Devices using EZ-HV SOI Technology
Faye Li, Demetri Giannopoulos, Ihor Wacyk, Philips Research, Briarcliff Manor, NY

24.7 Dual-Bridge DC-DC Converter: A New Topology of No Deadtime DC-DC Converters
Wei Song, Brad Lehman, Northeastern University, Boston, MA

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Session 25
Power Electronics Applications
Thursday, March 14
Houston Ballroom B
2:00 PM – 5:30 PM

Session Chairs: Lothar Heinemann, ABB, Calor Emag Switchgear & Pietro Scalia, University of Palermo

25.1 An APWM Resonant Inverter Topology for High Frequency AC Power Distribution Systems
Mei Qiu, Concordia University, Montreal, Quebec, CANADA; Praveen Jain, Queen's University, Kingston, Ontario, CANADA

25.2 A New Hybrid Control Scheme Using Active-Clamped Class-E Inverter with Induction Heating Jar for High Power Applications
Dong-Yun Lee, Doug-Seok Hyun, Hanyang University, Seoul, SOUTH KOREA

25.3 A Digitally-Controlled, Low-Cost Driver for Piezoceramic Flight Control Surfaces in Small Unmanned Aircraft and Munitions
Bill Dillard, R. Mark Nelms, Auburn University, Auburn, AL

25.4 Withdrawn By The Authorv

25.5 Withdrawn By The Author

25.6 Performance Prediction of Distributed Power Systems Based on Small-Scale Prototypes
Peng Li, Brad Lehman, Northeastern University, Boston, MA

25.7 A Comparative Study Of Resonant Inverter Topologies Used In Induction Cookers
S. Llorente, J.M. Burdio, J. Acero, Universidad de Zaragoza, Zaragoza, SPAIN; F. Monterde, Bosch-Siemens Home Appliances Group, Zaragoza, SPAIN

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Session 26
Medium Power PFC
Thursday, March 14
Houston Ballroom C
2:00 PM – 5:30 PM

Session Chairs: Brian T. Irving, Delta Products Corporation & James P. Noon, Texas Instruments

26.1 Design Optimization Using Genetic Algorithms of a Boost Power Factor Correction Converter
S. Busquets-Monge, E. Hertz, C. Crebier, D. Boroyevich, D.K. Lindner, S. Ragon, Z. Gurdel, Virginia Polytechnic Institute and State University, Blacksburg, VA; G. Soremekun, ADOPTECH, Inc., Blacksburg, VA; M. Arpilliere, Schneider Electric, S.A., FRANCE

26.2 Comparison of Different Techniques to Realize PFC Boost Inductor
Vytenis Leonavicius, Maeve Duffy, Cian O Mathuna, PEI Technologies, NMRC, Cork, IRELAND; Ulrich Boeke, Philips Research Laboratories, Aachen, GERMANY

26.3 A PWM AC/DC Full Bridge Soft-Switching Converter as an Unity Power Factor Power Supply Rectifier
Joao Vieira Jr., Ernane Coelho, Valdeir Farias, Luiz de Freitas, Universidade Federal De Uberlandia, Uberlandia, MG, BRAZIL; Joao Correa Pinto, Centro Federal de Edcacao Tecnologica do Para, Belem, PA, BRAZIL

26.4 Two-Stage Power Factor Corrected Power Supplies: The Low Component-Stress Approach
Lars Petersen, Michael Andersen, Technical University of Denmark, Lyngby, DENMARK

26.5 Wide Input Range Module for Rectified AC Power Distribution Demonstrator for Telecommunication System
J. de la Pena, M. Rivas, A. Huertas, M. Perez, M. Rascon, ALCATEL, Madrid, SPAIN

26.6 Simplified Input Current Waveshaping Technique by Using Inductor Voltage Sensing for High Power Factor Isolated SEPIC, Cuk and Flyback Rectifiers
Tanes Tanitteerapan, Shinsaku Mori, Nippon Institute of Technology, Minamisaitama-gun, Saitama-ken, JAPAN

26.7 Design of the Basic Rectifier with LC Filter to Comply with the New Edition of the IEC1000-3-2 Current Harmonic-Limit Specifications (Edition 2.0)
W.M. Lin, Fuzhou University, Fuzhou, Fujian, CHINA; J. Sebastian, A. Fernandez, M.M. Hernando and P.J. Villegas, Universidad de Oviedo, Gijon, SPAIN

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Conference Program Last Updated:
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APEC 2002 — CONFERENCE AT A GLANCE

Saturday, March 9			
Registration Desk Open		3:00 PM – 6:00 PM	Lone Star Ballroom Foyer
Sunday, March 10			
Registration Desk Open		8:00 AM – 5:00 PM	Lone Star Ballroom Foyer
Seminar 1	Brushless DC And Switched-Reluctance Motor Drives	9:30 AM – 1:00 PM	San Antonio Ballroom A
Seminar 2	Practical Methods For Optimizing Power Transistor And Diode Selection	9:30 AM – 1:00 PM	Houston Ballroom A
Seminar 3	Power Supply Design From The Trenches	9:30 AM – 1:00 PM	Houston Ballroom B
Seminar 4	Power Systems For Electronic Equipment	9:30 AM – 1:00 PM	Houston Ballroom C
Seminar 5	EMI: Theory, Issues And Solutions	9:30 AM – 1:00 PM	San Antonio Ballroom B
Seminar 6	Automotive Integrated Starter-Generator Systems	2:30 PM – 6:00 PM	San Antonio Ballroom A
Seminar 7	An Overview Of Single-Phase and Three-Phase Power Factor Correction Methods For Switching Converters	2:30 PM – 6:00 PM	Houston Ballroom A
Seminar 8	Analysis And Design Of Power Electronics Circuits Using PSpice	2:30 PM – 6:00 PM	Houston Ballroom B
Seminar 9	Power Packaging Techniques For Low And High Voltage Systems	2:30 PM – 6:00 PM	Houston Ballroom C
Seminar 10	Overview Of HALT And HASS: Methods That Work	2:30 PM – 6:00 PM	San Antonio Ballroom B
Monday, March 11			
Registration Desk Open		8:00 AM – 3:00 PM	Lone Star Ballroom Foyer
Seminar 11	Sensorless Control Of Adjustable Speed Motor Drives: State Of The Art And Recent Advances	8:30 AM – 12:00 Noon	San Antonio Ballroom A
Seminar 12	Solar And Alternative Energy – The Engineering Issues	8:30 AM – 12:00 Noon	Houston Ballroom A
Seminar 13	Soft-Switching In DC-DC Converters: Principles, Practical Topologies, Simulations And Design Techniques	8:30 AM – 12:00 Noon	Houston Ballroom B
Seminar 14	Puzzles And Answers In The Thermal Management Of Board-Mounted Power Modules	8:30 AM – 12:00 Noon	Houston Ballroom C
Seminar 15	Understanding And Controlling Common-Mode Emissions In High-Power Electronics	8:30 AM – 12:00 Noon	San Antonio Ballroom B
Session 1	Plenary Session	1:30 PM – 5:00 PM	Dallas Ballrooms A & B
Spouse & Guest Welcoming		8:30 AM – 9:30 AM	Room TBA
Spouse & Guest Tour – Dallas Blooms!		9:30 AM – 3:30 PM	
Exposition Hall Open		5:30 PM – 8:00 PM	Grand Ballroom
MicroMouse Contest		8:00 PM – 10:00 PM	Dallas Ballroom C
Tuesday, March 12			
Registration Desk Open		8:00 AM – 3:00 PM	Lone Star Ballroom Foyer
Session 2	Motor Drive Control	8:30 AM – 12:00 Noon	San Antonio Ballroom A
Session 3A	EMI & Packaging	8:30 AM – 10:15 AM	San Antonio Ballroom B
Session 3B	Manufacturing & Marketing	10:45 AM – 12:00 Noon	San Antonio Ballroom B
Session 4A	Magnetics Modeling	8:30 AM – 10:15 AM	Houston Ballroom A
Session 4B	Power Semiconductor Devices	10:45 AM – 12:00 Noon	Houston Ballroom A
Session 5	Voltage Regulator Modules I	8:30 AM – 12:00 Noon	Houston Ballroom B
Session 6	Single Stage PFC	8:30 AM – 12:00 Noon	Houston Ballroom C

APEC 2002 — CONFERENCE AT A GLANCE

Tuesday, March 12 (continued)			
Spouse & Guest Tour – Fascinating, Cultural Forth Worth		10:00 AM – 3:00 PM	
Exposition Hall Open		12:00 Noon – 6:30 PM	Grand Ballroom
Exhibitor Seminars	See Exposition Directory For Seminar Descriptions	2:00 PM – 5:30 PM	See Exposition Directory
Rap Session I	Contract Manufacturing: Cost Or Benefit?	6:30 PM – 8:00 PM	Houston Ballroom A
Rap Session II	Acquiring An ASIC: Technical Triumph Or Never-Ending Nightmare?	6:30 PM – 8:00 PM	Houston Ballroom B
Rap Session III	Does 42 V Really Have What It Takes For Future Automotive Electrical Systems?	6:30 PM – 8:00 PM	Houston Ballroom C
Wednesday, March 13			
Registration Desk Open		8:00 AM – 3:00 PM	Lone Star Ballroom Foyer
Session 7	Sensorless Motor Drives	8:30 AM – 12:00 Noon	San Antonio Ballroom A
Session 8	Magnetic & Piezoelectric Devices	8:30 AM – 12:00 Noon	San Antonio Ballroom B
Session 9	DC-DC Control	8:30 AM – 12:00 Noon	Houston Ballroom A
Session 10	Modeling, Simulation & Control	8:30 AM – 12:00 Noon	Houston Ballroom B
Session 11	Control & Circuit Techniques	8:30 AM – 12:00 Noon	Houston Ballroom C
Session 12A	Resonant & Soft-Switching Converters	2:00 PM – 3:45 PM	Houston Ballroom A
Session 12B	EMI & PWM Filtering	4:15 PM – 5:30 PM	Houston Ballroom A
Session 13	Uninterruptible Power Systems	2:00 PM – 5:30 PM	San Antonio Ballroom A
Session 14	DC-DC High Power & Boost Converters	2:00 PM – 5:30 PM	San Antonio Ballroom B
Session 15	Voltage Regulator Modules II	2:00 PM – 5:30 PM	Houston Ballroom B
Session 16A	Rectifier Circuits	2:00 PM – 3:45 PM	Houston Ballroom C
Session 16B	Power Electronics Chili	4:15 PM – 5:30 PM	Houston Ballroom C
Exposition Hall Open		12:00 Noon – 2:00 PM	Grand Ballroom
Conference Banquet		6:00 PM – 10:00 PM	Dallas World Aquarium
Thursday, March 14			
Registration Desk Open		8:00 AM – 12:00 Noon	Lone Star Ballroom Foyer
Session 17A	Induction Motor Drives & Control	8:30 AM – 10:15 AM	San Antonio Ballroom A
Session 17B	Unique Drive Topologies	10:45 AM – 12:00 Noon	San Antonio Ballroom A
Session 18	DC-DC Magnetics & Topologies	8:30 AM – 12:00 Noon	Houston Ballroom A
Session 19	DC-DC Low Power & Low Output Voltage Converters	8:30 AM – 12:00 Noon	Houston Ballroom B
Session 20	Lamp Ballasts & Lighting	8:30 AM – 12:00 Noon	San Antonio Ballroom B
Session 21	High Power PFC	8:30 AM – 12:00 Noon	Houston Ballroom C
Session 22	PWM, Multi-Level & Parallel Converters	2:00 PM – 5:30 PM	San Antonio Ballroom A
Session 23	Utility Interface & High Power Electronics	2:00 PM – 5:30 PM	San Antonio Ballroom B
Session 24	DC-DC Resonant & Bridge Converters	2:00 PM – 5:30 PM	Houston Ballroom A
Session 25	Power Electronics Applications	2:00 PM – 5:30 PM	Houston Ballroom B
Session 26	Medium Power PFC	2:00 PM – 5:30 PM	Houston Ballroom C

APEC 2002

March 10 – 14, 2002
Adam's Mark Hotel
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EXTRAS AND TOURS

	Tuesday Lunch In The Exhibit Hall	$8	
	Wednesday Lunch In The Exhibit Hall	$8	
	Additional Banquet Ticket	$60	
	Monday Spouse & Guest Tour: Dallas Blooms	$62	
	Tuesday Spouse & Guest Tour: Fascinating Cultural Fort Worth	$40	

ADDITIONAL SEMINAR WORKBOOKS AND CONFERENCE PROCEEDINGS (WITH REGISTRATION)

	Seminar Workbooks	$60	
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Registration cancellations and requests for refunds must be received in writing at the APEC 2002 offices by Monday, February 11, 2002. All refund requests will be charged a $25 handling fee and will be processed after the conference.

APEC 2002

March 10 – 14, 2002
Adam's Mark Hotel
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Name of guest(s) in room _____

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A deposit of one night's room charge is required to hold your reservation. Payment can be by check or credit card. Checks should be made payable to Adams' Mark Hotel. All major credit cards are accepted.

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APEC 2002

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