INTELLIGENT MOTION Tuesday, June 19, 2001

Room Paris

9:00 – 9:20 Official Opening of the PCIM 2001 Conference for all PCIM participants

9:20 – 10:05 **Key-Note Paper for all PCIM participants**

POWER ELECTRONICS SOLUTIONS FOR DISTRIBUTED POWER GENERATION

R. W. Zehringer, P. Joerg, M. Suter, ABB Corp. Research Ltd. SWITZERLAND

Recently there has been a lot of attention in the media and in the industrial circles on the issue of deregulation of power distribution markets. At the same time power shortages often caused by the insufficient transmission capacity together with increasing power quality problems prompted the search for a solution in the form of distributed power generation.

There are several competing technologies in the distributed power generation arena that are believed to offer a solution for many of the today's power quality problems and that fit well in the vision of the deregulated power distribution markets. Some of the most promising technologies in this arena are microturbines, fuel cells, wind power systems and photovoltaic plants. However, in order to utilize the full potential of these technologies a power electronic solution in the form of power conditioning system (PCS) is required almost without an exception.

Therefore, this paper will make a survey for power electronics solutions that quite naturally serve a combined function of an interface to power utility grid, fault protection function and can be configured to serve various power quality functions. In addition, power electronics based PCS systems can be remotely controlled and monitored to allow a real time optimization of power generation and can allow aggregation of distributed power generation resources into a so called "Virtual Utility". Finally, this paper will emphasis new opportunities in application of power electronics solutions that arise from the natural synergy of power electronics systems with the information technologies.

10:05 – 10:25 Coffee Break and moving of conference participants to different sessions

10:25 Starting oral sessions IM1 and IM2 running parallel in different rooms

Room London **Session IM 1**

VARIABLE SPEED AND NEW DRIVE SCHEMES

Chairman: T. Hopper, MACCON, GERMANY

10:25 – 10:55 **LOW COST MACHINE WITH TWO INDEPENDENTLY CONTROLLABLE SHAFTS BASED ON THE DUOMOTOR PRINCIPLE**
M. Schrödl, S. Ojak, W. Zukrigl, Vienna University of Technology, AUSTRIA

10:55 – 11:25 **COMPACT DRIVE MODULES WITH INTEGRATED DOUBLE COMB-TYPE LINEAR MOTOR UNITS IN USE WITH PARALLEL KINEMATIC MACHINES**
F. Götz, H.-J. Wehner, Baumüller GmbH, GERMANY

11:25 - 11:55 **HIGH-DYNAMIC AND ACCURATE POSITIONING LINEAR AND REVOLVING DRIVES**
P.-K. Budig, EAAT GmbH, GERMANY

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11:55 - 12:25 **HARMONIC DISTORTION AND REDUCTION TECHNIQUES OF PWM ADJUSTABLE SPEED DRIVES - A COST-BENEFIT ANALYSIS**
S. Hansen, P. Nielsen, P. Thorgersen, Danfoss Drives, DENMARK

Room Zurich **Session IM 2**

INDUSTRIAL NETWORKS, INTERNET APPLICATIONS IN DRIVE SYSTEMS

Chairman: J. M. Pacas, University - GH Siegen, GERMANY

10:25 – 10:55 **HIGH PERFORMANCE SERVO'S ON A FIELDBUS**
E. Smeets, Nyquist, NETHERLANDS

10:55 - 11:25 **THE USE OF CAN & LIN-BASED COMMUNICATIONS NETWORKS IN INDUSTRIAL MOTOR CONTROL APPLICATIONS**
H. Kreidl, V. Vendeirinho, Motorola, GERMANY

11:25 - 11:55 **BRINGING THE INTERNET TO THE MOTOR**
G. Kupris, Motorola, GERMANY

11:25 – 11:55 **LIFE CYCLE MONITORING OF ELECTRICAL DRIVE SYSTEMS**
U. Koch, Lust Antriebstechnik, A. Middendorf, TU Berlin, H. Griese, Fraunhofer IZM, GERMANY

11:55 - 1:00 Lunch, Restaurant CCN West first floor

1:00 – 2:30 **Poster/Dialogue Presentations, CCN West second floor**

Chairman: H. Knöll, University of Applied Sciences Wuerzburg-Schweinfurt, GERMANY

VARIABLE SPEED AND NEW DRIVE SCHEMES

IM-D1 **ANALYSIS OF DYNAMIC STATES IN SATURATED INDUCTION MACHINES WHEN USING i_m,$\underline{\Psi}_s$ AS STATE VARIABLES**
A. Campeanu, S. Enache, I. Vlad, University of Craiova, ROMANIA

IM-D2 **LOW-COST INDUCTION DRIVES EMPLOYING STRUCTURAL HARMONIC ELIMINATION METHODS**
P. Bolognesi, L. Taponecco, University of Pisa, ITALY

IM-D3 **TANDEM CONVERTER FED INDUCTION MOTOR DRIVE CONTROLLED WITH RE-CONFIGURABLE VECTOR CONTROL SYSTEM**
M. Imecs, I. Incze, J. Vásárhelyi, Technical University of Cluj-Napoca, ROMANIA

IM-D4 **THE DETERMINATION OF THE LONGITUDINAL TRANSIENT REACTANCE, X_{ed}, AT THE CYLINCRICAL ROTOR SYNCHRONOUS MACHINE**
D. Ovidiu Gh. Draganescu, University of Craiova, ROMANIA

IM-D5 **MAGNETIC BEARING-DESIGN AND APPLICATION**
P.-K. Budig, EAAT GmbH, GERMANY

SENSORLESS DRIVES – IDENTIFICATION, ESTIMATION AND CONTROL

IM-D6 **DESIGN , DEVELOPMENT AND DSP IMPLEMENTATION OF RECURSIVE NEURO-FUZZY SPEED ESTIMATOR FOR ELECTROMECHANICAL DRIVES**
A.F.Stronach, P. Vas, N.N. Gerard, P.F.A. MacConnell, University of Aberdeen, UK

IM-D7 **INVESTIGATIONS TO THE PARAMETER ACCURACY FOR PARAMETER IDENTIFICATIONS IN INDUCTION MOTORS**
W. Michalik, Dresden University of Technology, GERMANY

IM-D8 **FREQUENCY AUTOTUNE FOR DIGITAL DRIVES**
O. Kidron, I. Cohen. E. Zilker, Kollmorgen-Servotronix, ISRAEL

IM-D9 **EXPERT PHASE ANGLE CONTROL IN A VARIABLE RL LOAD CIRCUIT**
C. Suciu, L. Dafinca, R. Cámpeanu, Transilvania University, ROMANIA

IM-D10 **ACCURACY OF INDUCTANCE AND FLUX MEASUREMENTS IN SENSORLESS PM-MOTORS WITH SATURATED SALIENCES**
E. Kokornaczyk, KSiPPO, SGGW, POLAND

IM-D11 **NEURAL NETWORK BASED OPTIMUM EFFICIENCY CONTROL OF VSI FED SPEED-SENSORLESS IM DRIVE**
I. Kádár, R. Kacsó, S. Halász, Budapest University of Technology and Economics, HUNGARY

2:30 Starting oral sessions IM 3

Room London **Session IM 3**

SENSORLESS DRIVES – IDENTIFICATION, ESTIMATION AND CONTROL

Chairman: M. Schroedl, Technical University Vienna, AUSTRIA

2:30 - 3:10 **KEY-NOTE PAPER**
SENSORLESS DRIVES – FROM THE STATE-OF-THE-ART TO FUTURE TRENDS
P. Vas, M. Rashed, A.F. Stronach, A.K.M. Abdulkader, C. Ng, Universtiy of Aberdeen, UK, J.Duits, SKF Industrial Division, E.G.M. Holweg, SKF Engineering and Research Center, THE NETHERLANDS

3:10 - 3:35 **RESISTOR ONLINE ADAPTATION OF SENSORLESS CONTROLLED INDUCTION MOTORS USING A THERMAL OBSERVER**
U. Schümann, C. Rudolph, B. Orlik, IALB Universität Bremen, GERMANY

3:35 - 4:00 **IMPLEMENTATION OF SENSORLESS INDUCTION AND PERMANENT MAGNET SYNCHRONOUS MOTOR DRIVES USING NATURAL FIELD ORIENTATION**
P. Vas, M. Rashed, A.K.M. Abdulkader, C. Ng, Universtiy of Aberdeen, UK, R. Jonsson, NFO Drives, SWEDEN

4:00 – 4:20 Coffee Break

4:20 - 4:45 **SENSORLESS CONTROL SYSTEM OF THE INDUCTION MOTOR**
J. Guzinski, Technical University of Gdansk, POLAND

4:45 – 5:10 **EFFECTIVE SENSORLESS CONTROL FOR GENERAL PURPOSE APPLICATION**
A. Vagati, M. Pastorelli, P. Guglielmi, Politecnico di Torino, ITALY

5:10 – 5:35 **SENSORLESS CONTROL OF BRUSHLESS DC MOTORS USING AN EXTENDED KALMAN ESTIMATOR AND A BACK EMF INTEGRATION ALGORITHM: A COMPARISON**
P. Minciunescu, T. Flint, F. Moynihan, P. Kettle, Analog Devices, USA

5:35 – 6:00 **INDUCTION MOTOR SENSORLESS VECTOR CONTROL ALGORITHMS COMPARISON**
A. Dumitrescu, R&D Institute of Electrotechnics, ROMANIA, R. Giuclea, I. Stefan, L. Kreindler, C. Bogus, Politehnica University of Bucharest, ROMANIA, V. Burtea, Delphax A. Xerox Company, CANADA

The PCIM Exhibition runs the whole day from 9:00 – 5:00, ground floor, Hall 12.

Make your personal time schedule for the day and reserve time for visiting this worldwide leading PCIM and POWER QUALITY Exhibition.

INTELLIGENT MOTION Wednesday, June 20, 2001

Room Paris

8:30 – 9:15 **Key-Note Paper for all PCIM participants**

CONTROL SYSTEM PROTOTYPING, PRODUCTIONIZING AND TESTING WITH MODERN TOOLS

H. Hanselmann, F. Schütte, dSpace, GERMANY

Tools for the rapid development of control systems have found strong acceptance in certain industries, especially in the automotive industry. Penetration of tool usage seems to be much weaker in the areas of drives, motion control systems and power electronics. There may be reasons for sticking to more traditional development processes, but one reason should not be the cause - lack of awareness.

This presentation shows what modern tools can do today in the development process, why the automotive industry is so keen on using them and driving their further development, and how early adopters of such new tools and methodologies in the drives, motion control and power electronics industry successfully apply them.

The areas covered are simulation and rapid control prototyping, automatic production code generation and hardware-in-the-loop testing. Automatic production code generation is considered of high potential for complex developments and will receive particular attention.

9:15 – 9:30 Coffee Break and moving of conference participants to different sessions

9:30 Starting oral sessions IM4 and IM5 running parallel in different rooms

Room London **Session IM 4**

SERVO AND STEP POSITIONING SYSTEMS – DESIGN AND APPLICATIONS

Chairman: W. Papiernik, Siemens AG, GERMANY

9:30 - 10:00 **CONTROL OF SYNCHRONOUS RELUCTANCE MACHINES INCLUDING CROSS SATURATION**
A. Kilthau, J.M. Pacas, University-GH Siegen, GERMANY

10:00 -10:30 **HIGH PERFORMANCE SERVO DRIVE DESIGN FOR DISTRIBUTED MOTION CONTROL**
D. Jouve, D. Bui, Infranor, FRANCE

10 :30 – 11 :00 Coffee Break

11:00 - 11:30 **HIGH PERFORMANCE CURRENT CONTROL OF THREE-PHASE BRUSHLESS DC DRIVES WITH DC-LINK CURRENT MEASUREMENT**
J. Zhang, M. Schroff, Maxon Motor, SWITZERLAND

11:30 - 12:00 **COGGING TORQUE COMPARISON BETWEEN 2 AND 3 PHASE HB TYPE STEPPING MOTORS**
M. Sakamoto, Japan Servo, JAPAN

INTELLIGENT MOTION Wednesday, June 20, 2001

Room Zurich **Session IM 5**

LOW POWER MOTORS, ACTUATORS AND DRIVES, CONSUMER APPLICATIONS

Chairman: A. Vagati, University of Turin, ITALY

9:30 - 10:00 **COST OPTIMIZE CONTROL SOLUTION FOR CONSUMER DRIVE**
A. Denais, A. Jansen, L. Lorenz, Infineon Technologies, GERMANY

10:00 – 10:30 **LOW-NOISE, SENSORLESS COMMUTATION OF BRUSHLESS DC MOTORS**
J. Krotsch, A. Lelkes, T. Zoller, ebm Werke GmbH, GERMANY

10 :30 – 11 :00 Coffee Break

11:00 - 11:30 **NOVEL BRAKE CONCEPT OF VSI-FED SENSORLESS PERMANENT MAGNET SYNCHRONOUS DRIVES**
E. Robeischl, M. Schrödl, U.H. Rieder, Vienna University of Technology, AUSTRIA

11:30 - 12:00 **LOW COST LINEAR VOICE COIL ACTUATOR AS A BI-DIRECTIONAL LONG STROKE PROPORTIONAL SOLENOID**
M. Godkin, BEI Technologies, USA

12:00 – 1:00 Lunch, Restaurant CCN West first floor

1:00 – 2:30 **Poster/Dialogue Presentations, CCN West second floor**

Chairman: S. Colombi, IMV Invertomatic Technology, SWITZERLAND

SERVO AND STEP POSITIONING SYSTEMS – DESIGN AND APPLICATION

IM-D12 **TORQUE CONTROLLER MODEL FOR INDUSTRIAL ROBOT**
P. Ph. Robet, I.U.T. de Nantes, M. Gautier, Institut de Recherche en Cybernétique de Nantes, FRANCE

IM-D13 **SPEED CONTROL BASED ON A POSITION REGULATOR AND AN INCREMENTAL ENCODER**
J. Zhang, M. Schroff, Maxon Motor, SWITZERLAND

IM-D14 **ESTIMATION OF THE MECHANICAL PARAMETERS OF A STIFF THREE-INERTIA-DRIVE**
I. Müller, Technical University Darmstadt, GERMANY

LOW POWER MOTORS, ACTUATORS AND DRIVES, CONSUMER APPLICATIONS

IM-D15 **ANALYSIS OF TORQUE RIPPLE IN BRUSHLESS DC MOTOR**
H. Zeroug, University of Sciences and Technology, ALGERIA

IM-D16 **EMC VALIDATION OF THE SAFETY OF SMALL SERVODRIVES**
T. Missala, Industrial Research Institute for Automation and Measurement, Warszawa, POLAND

IM-D17 **AN IMPROVED PERFORMANCE ANALYSIS OF SHADED POLE MOTOR**
V. Sarac, L. Petkovska, M. Cundev, Sts. Cyril & Methodius University, MACEDONIA

SOFTWARE TOOLS AND CONTROL HARDWARE

IM-D18 **ICS FOR REAL TIME MOTION CONTROL: A DESIGN METHODOLOGY FOR RAPID PROTOTYPING**
P. Poure, F. Aubépart, F. Braun, Laboratoire LEPSI, FRANCE

IM-D19 **ON THE USE OF A DOMAIN DECOMPOSITION ALGORITHM IN THE FINITE ELEMENT ANALYSIS OF ELECTRICAL MACHINES**
E. Schmidt, Vienna University of Technology, AUSTRIA

IM-D20 **AN INTEGRATED C.A.D. ENVIRONMENT FOR DESIGNING AND SIMULATING DOUBLE SALIENT PERMANENT MAGNET LINEAR MOTORS**
L. Szabó, I.-A. Viorel, Technical University of Cluj, ROMANIA

2:30 Starting oral sessions IM6 and IM7 running parallel in different rooms

Room London **Session IM 6**

MECHATRONIC SYSTEMS

Chairman: G. Pfaff, University of Erlangen-Nuremberg, GERMANY

2:30 – 3:15 **KEY-NOTE PAPER**
MECHATRONIC SYSTEMS – FROM THE STATE OF THE ART TO FUTURE TRENDS
D. Schröder, Technical University of Munich, GERMANY

3:15 - 3:40 **LINEAR H_∞ CONTROL OF A NONLINEAR TWO-MASS SYSTEM**
K. Peter, I. Schöling, B. Orlik, IALB Universität Bremen, GERMANY

3:40 –4:00 Coffee Break

4:00 – 4:25 **ANALYSIS AND CURES FOR MECHANICAL RESONANCE IN INDUSTRIAL SERVO SYSTEMS**
G. Ellis, Kollmorgen, Z. Gao, Cleveland State University, USA

4:25 – 4:50 **CLOSED-LOOP CONTROL OF A ROTARY MAGNETIC ACTUATOR WITH AN INTEGRATED POSITION SENSOR**
S. Biwersi, T. Dorge, R. Gie, Moving Magnet Technologies, FRANCE

4:50 – 5:15 **ADVANCED INTEGRATION FOR MECHATRONIC DRIVE SYSTEMS**
S. Raith, T. Franke, Siemens AG, GERMANY

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5:15 – 5:40 **DESIGN OF THE MECHATRONIC SYSTEM WITH LINEAR MOTOR**
E.A. Lomonova, Joint-Stock Company SpecRemont, RUSSIA, M.J. Ruminchev, S.I. Volsky, Delft University of Technology, NETHERLANDS

Room Zurich **Session IM 7**

SOFTWARE TOOLS AND CONTROL HARDWARE

Chairman: P. Vas, University of Aberdeen, UK

2:30 - 2:55 **CONTRIBUTION TO SYSTEM-ON-CHIP IN MOTION CONTROL: VLSI DESIGN OF A DIGITAL CONTROLLER FOR AN INDUCTION MACHINE**
F. Aubépart, IMT Technopole, P. Poure, F. Braun, Laboratoire LEPSI, FRANCE

2:55 - 3:20 **A NOVEL APPROACH OF MODELING SR MOTOR SYSTEMS**
U. Bock, Simec, GERMANY

3:20 – 3:45 Coffee Break

3:45 - 4:10 **DEVELOPING A CONTROL ASIC FOR HIGHER VOLUME FIVE PHASE HYBRID STEP MOTOR-DRIVE SYSTEMS**
K. Takahashi, Sanken Electric, JAPAN, K. Moritake, Oriental Motor, JAPAN, D. Jones, Incremotion Associates, USA

4:10 – 4:35 **ASIC FOR INDIRECT VECTOR CONTROL OF INDUCTION MOTORS WITH FUZZY LOGIC BASED SPEED REGULATION**
J.L. Mora, F. Barrero, E. Galván, F. Colodro, J.N. Tombs, A. Torralba, L.G. Franquelo, Escuela Superior de Ingenieros, SPAIN, M. Barranco, Dept. I & D Mecanismos y Accesorios

4:35 – 5:00 **VIRTUAL SYSTEM LAB – A MONITOR CONTROL SIMULATION ENVIRONMENT AVAILABLE THROUGH WWW**
Vecera, Motorola Czech Systems Lab, CZECH REPUBLIK, M. Brejl, A. Lara, Motorola SPS, POLAND

5:00 - 5:25 **MATCHING WINDING PATTERNS TO MAGNET SHAPES IN SMALLER BRUSHLESS PM SERVO MOTORS**
D. Jones, Incremotion Associates, USA

5:25 - 5:50 **COMPARISON OF ANALYTICAL AND FEM CALCULATION SOFTWARE AS A TOOL FOR DESIGNING A HIGH EFFICIENT INDUCTION MACHINE**
P. Pichler, P. Ebner, H. Weiss, University of Leoben, AUSTRIA

6:00 **Get Together Party**

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Make your personal time schedule for the day and reserve time for visiting this worldwide leading PCIM and POWER QUALITY Exhibition.

INTELLIGENT MOTION Thursday, June 21, 2001

Room Paris

8:30 – 9:15 **Key-Note Paper for all PCIM participants**

KEY DEVELOPMENTS FOR SUPERCAPACITIVE ENERGY STORAGE: POWER ELECTRONIC CONVERTERS, SYSTEMS AND CONTROL

A. Rufer, Laboratoire d'Electronique Industrielle LEI, EPFL, SWITZERLAND

Supercapacitors represent one of the newest innovations in the field of electrical energy storage, and will find their place in many applications where energy storage is needed, and can help to the smoothing of strong and short time power solicitations of a distribution network. Other system developments are going on, opening new fields in engineering sciences, based on new possibilities in the field of electrical energy storage.

In comparison with classical capacitors, these new components allow a much more higher energy density, together with a high power density. Even if the energy density is not comparable with that one of electrochemical accumulators, the possible energy amount and storage time is compatible with many industrial requirements. In transportation systems, as a first example, the energy needed to relay two bus-stations can easily be transferred from a fixed supercapacitive storage device to another mobile one placed on the bus during passenger transfer time, allowing so the use of electrical propulsion without trolleys. Many other systems for better share of energy and instantaneous power amounts will soon appear as industrial products.

This contribution shows some actual research and development projects, running at university level, but in connection with specialists from the corresponding application field. Innovative and promising solutions and technologies are investigated, which need of course clarification of their actual industrial and economical compatibility, they can also be seen as future solutions for next decades, in relation with the tendency of getting weaker distribution of electrical energy.

9:15 – 9:30	Coffee Break and moving of conference participants to different sessions

9:30	Starting oral sessions IM8 and IM9 running parallel in different rooms

Room London **Session IM 8**

TRACTION AND ELECTRIC VEHICLES

Chairman: S. Chiama, Consultant ABB, ITALY

9:30 – 9:55 **ASYNCHRONOUS LINEAR MACHINE WITH MASSIVE IRON AS SECONDARY**
Th. Werle, M. Hofmann, A. Binder, Darmstadt University of Technology, GERMANY

9:55 - 10:20 **ENERGY SAVING WITH HIGH SPEED TRAINS PROPELLED BY DIRECT PERMANENT MAGNET SYNCHRONOUS DRIVE**
Th. Koch, A. Binder, Darmstadt University of Technology, GERMANY

10:20 – 10:50	Coffee Break

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10:50 – 11:15 **NOVEL BRUSHLESS ELECTRIC MOTOR DRIVES IN VEHICLE APPLICATION**
T. Mezo, S. Peresztegi, P. Korondi, L. Nagy, HUNGARY

11:15 - 11:40 **COMMERCIAL ELECTRONIC DEVICES FOR OPERATION IN HIGH-PRESSURE; DEEP-SEA DRIVE SYSTEM**
P. Snary, C.M. Bingham, D. A. Stone, University of Sheffield, UK

11:40 – 12:05 **CRITERIA FOR INDIVIDUATING THE TRACTION SPECIFICATIONS AND DESIGNING THE MOTOR OF AN ELECTRICAL SCOOTER**
N. Bianchi, S. Bolognani, F. Luise, University of Padova, ITALY

12:05 – 12:30 **ENERGY-FLOW-CONTROL OF A HYBRID-CAR**
P.-K. Budig, EAAT GmbH, GERMANY

Room Zurich **Session IM 9**

IMPROVEMENTS IN MODULATION AND DIRECT TORQUE CONTROL

Chairman: G. Ellis, Kollmorgen, USA

9:30 – 9:55 **IMPROVED SINGLE CURRENT SENSING METHOD AND ITS REALISATION BASED ON ADMCF341 DSP CONTROLLER**
B. Huo, T. Flint, F. Moynihan, Analog Devices, USA

9:55 – 10:20 **STEADY-STATE ANALYSIS OF AN ORIGINAL SVM-DTC STRATEGY FOR INDUCTION MOTOR DRIVES**
E. Monmasson, A. A. Naassani, Université de Cergy-Pontoise, J. P. Louis, ENS Cachan, FRANCE

10:20 – 10:50 Coffee Break

10:50 - 11:15 **IMPROVEMENTS IN FLUX AND TORQUE CONTROL IN DTC INDUCTION MOTOR DRIVES**
W. S. H. Wong, D. Holliday, University of Bristol, UK

11:15 – 11:40 **TORQUE AND SPEED CONTROL OF INVERTER-FED INDUCTION MACHINE USING SLIDING MODE**
F. Moldoveanu, V. Comnac, M. Cernat, Transilvania University of Brasov, ROMANIA

11:40 - 1:30 Lunch, Restaurant CCN West first floor

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1:30	Starting oral session IM10

Room London **Session IM 10**

MOTION COMPONENTS – SENSORS AND ACTUATORS

Chairman: D. Jones, Incremotion, USA

1:30 – 1:55 **SUPPRESSION OF SYSTEMATIC ERRORS IN RESOLVER SIGNALS FOR HIGH PERFORMANCE SERVO DRIVES**
A. Bünte, S. Beineke, Lust Antriebstechnik, GERMANY

1:55 – 2:20 **USE OF OBSERVERS TO PROCESS RESOLVER SIGNALS IN INDUSTRIAL SERVO SYSTEMS**
G. Ellis, J. Krah, Kollmorgen, USA

2:20 – 2:40	Coffee Break

2:40 - 3:05 **DESIGN AND SIMULATION OF A LINEAR ACTUATOR FOR DIRECT DRIVE**
E. Macua, Ch. Ripoll, Renault, J.-C. Vannier, Ecole Superieure d'Electricitié, FRANCE

3:05 – 3:30 **X-Y CONTACTLESS POSITION SENSING USING MOVING MAGNETS**
S. Biwersi, D. Angleviel, D. Frachon, Moving Magnet Technologies, FRANCE

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