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BPIP-1


Power electronic converters for Grid
Interface of solar power generation
Dr. BHIM SINGH
Prof. & Head
FNAE, FNA, FNASc, FASc, FTWAS, FIEEE, FIET, FIETE, FIE (I), C. ENGR
Department of Electrical Engineering
Indian Institute of Technology Delhi
New Delhi-110016-India


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
(for Research Scholars)
Date: 29-30 December 2015
Venue : IC & SR Auditorium
Chief Guest
Prof. Bhaskar Ramamurthi
(Director, IIT Madras)
&
Plenary Talk on
"Enabling India with Electricity"
by
Prof. Ashok JhunJhunwala
Department of Electrical Engineering,
IIT Madras
A Generalized Framework to Diagnose Displacements in Transformer Winding
Prof. L. Satish
HV Lab, Dept. of Electrical Engineering
Indian Institute of Science, Bangalore
homepage:hve.iisc.ernet.in/~satish
Credits: Mr. Pritam Mukherjee, Ph.D. scholar
National Power Engineering Research Scholars' Meet, IIT-M, 29-30 Dec, 2015


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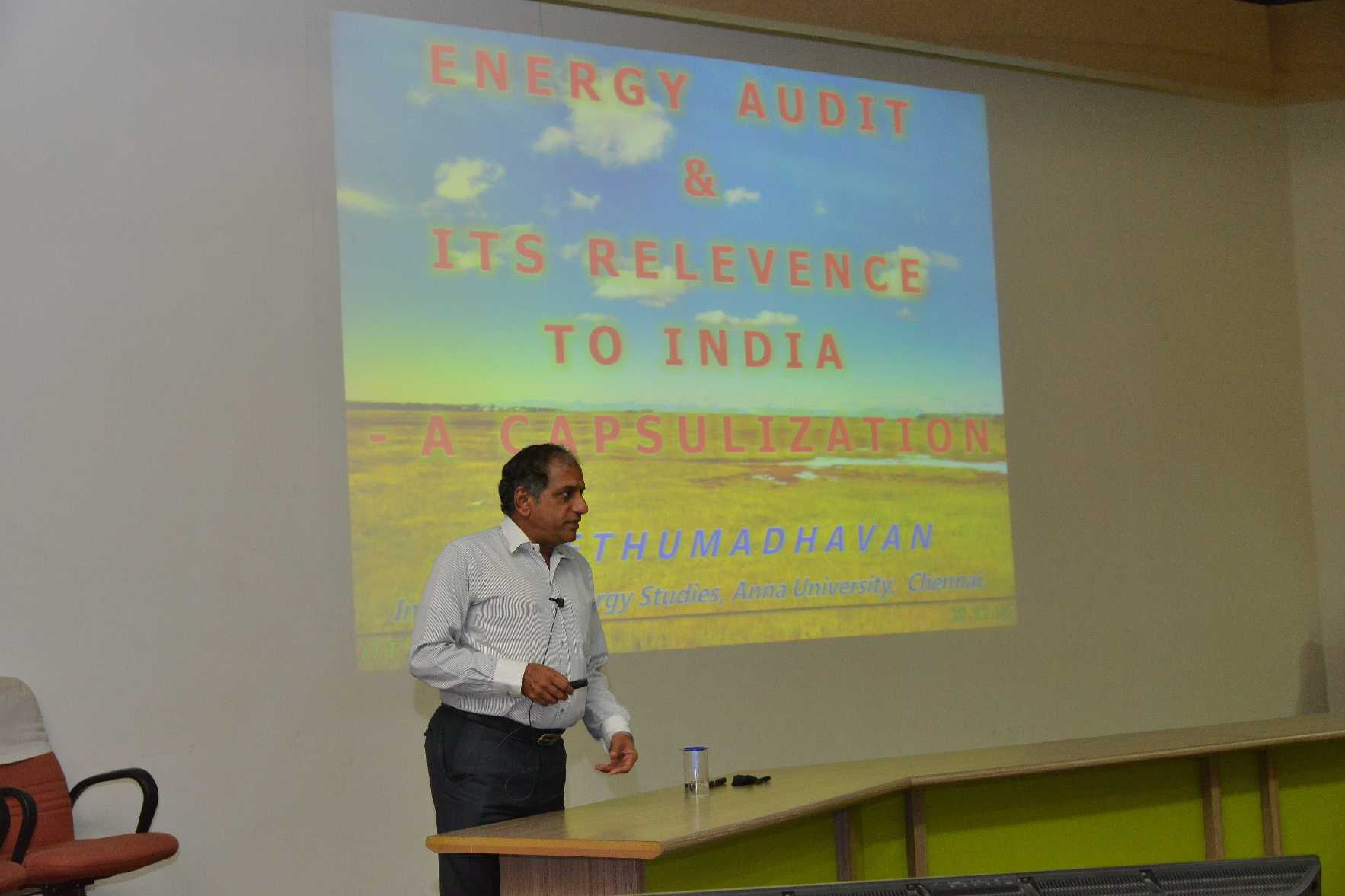
Department of Electrical Engine
IIT Madras
ABB and Solar Impulse
An innovation and technology alliance for a better world


Venue : IC & SR Auditorium
Chief
Prof.


Chief Guest
Bhaskar Ram
ector, IIT
&


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
(for Research Scholars)
Date: 29-30 December 2015
Venue : IC & SR Auditorium
Chief Guest
Prof. Bhaskar Ramamurthi
(Director, IIT Madras)
Multilevel inverters with reduced DC link power supplies for IM drives
K. Gopakumar
Professor , DESE (formerly CEDT)
Department of Electronic systems Engineering
Indian Institute of Science
Bangalore


SR Auditorium
Prof.
on


ENERGY AUDIT
&
ITS RELEVENCE
TO INDIA
- A CAPSULIZATION
ETHUMADHAVAN
rgy Studies, Anna University, Chennai


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
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Date: 29-30 December 2015
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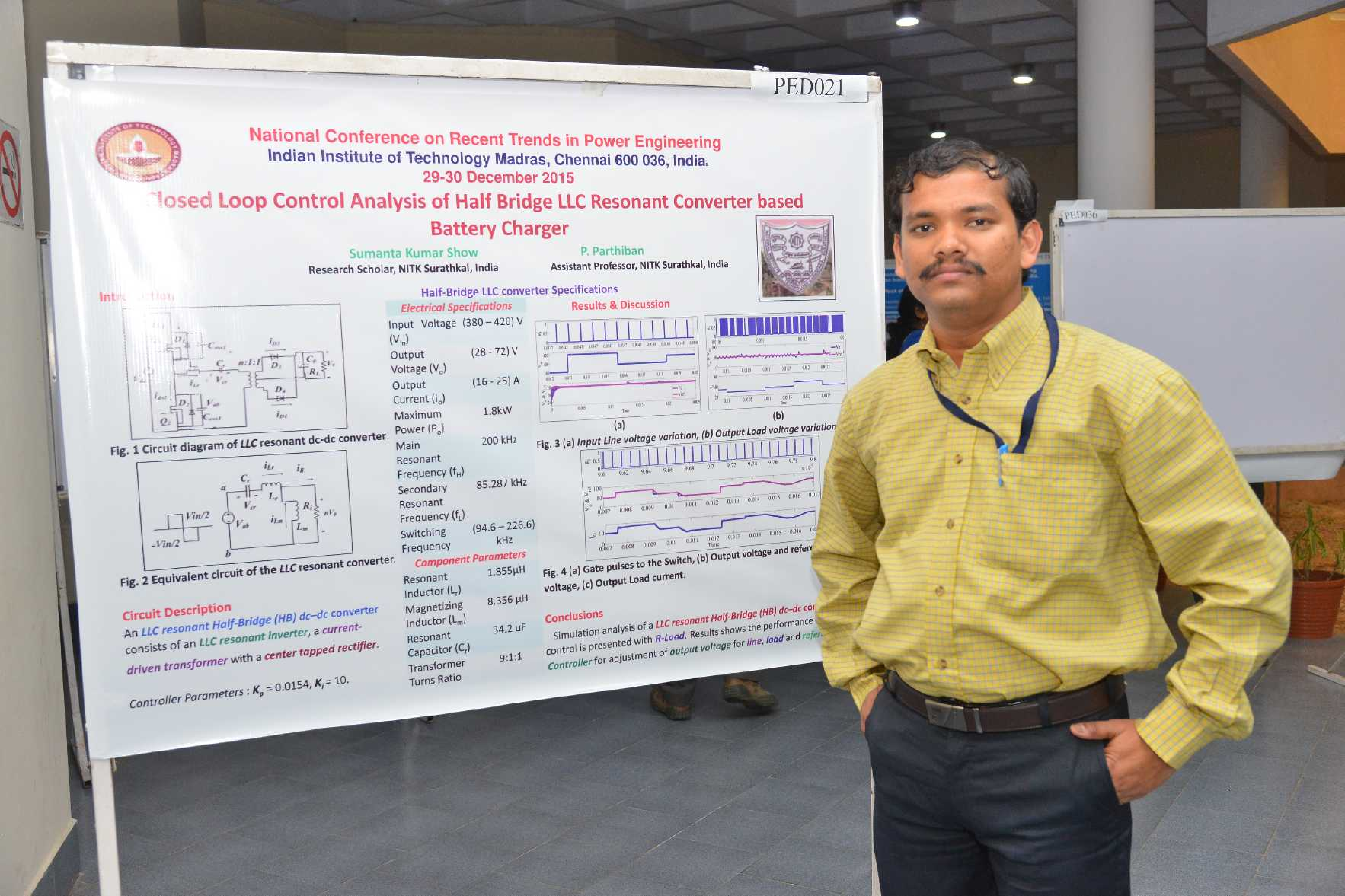
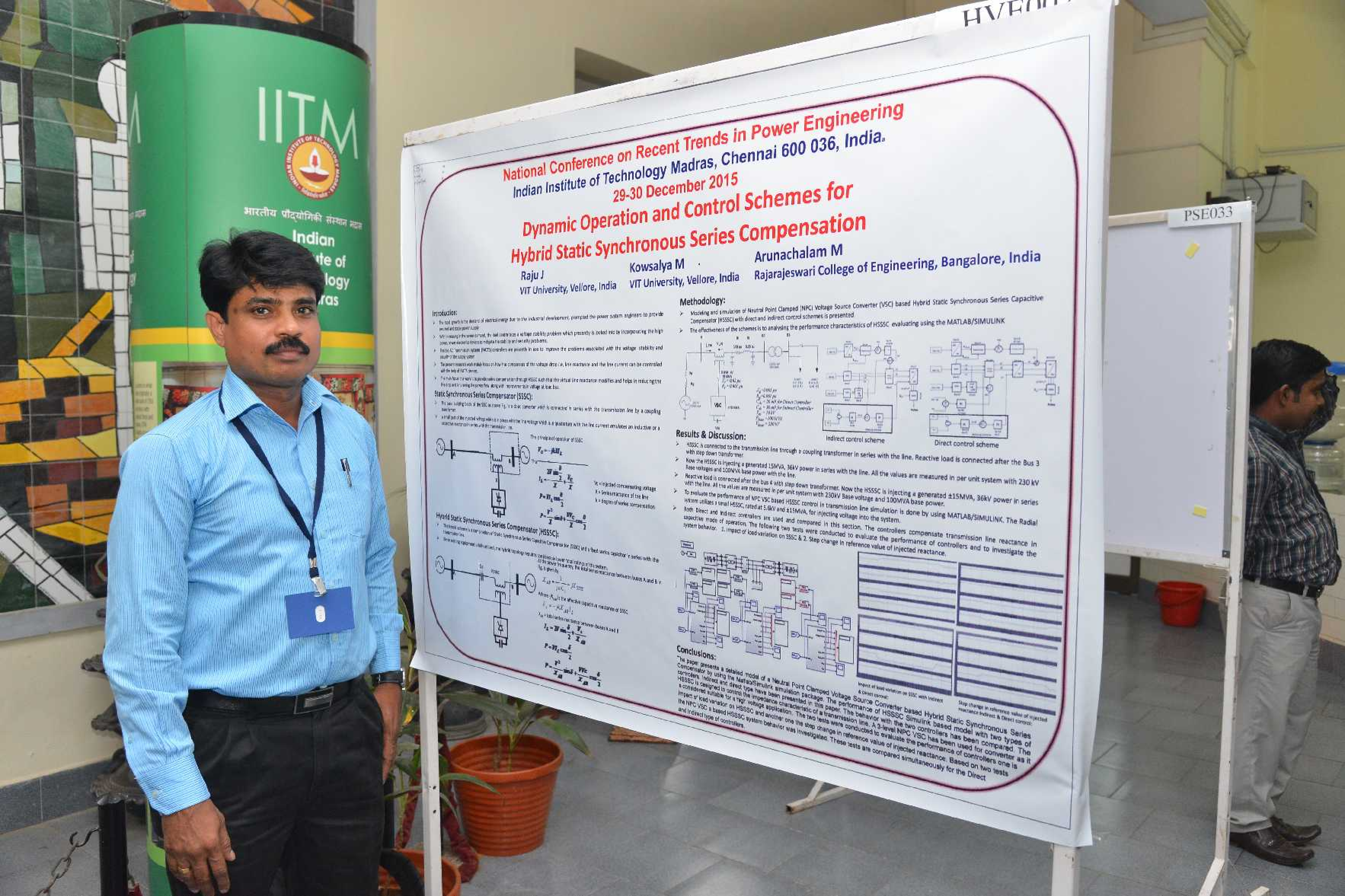
Chief Gu
Prof. Bhaskar
amurthi
An Overview
What is Green Energy?
-Energy that can be extracted, generated, and/or consumed without any significant negative impact to the environment.
- lower waste output relative to energy sources.
- eg. solar, wind, geothermal and hydro energy.
Why use Green Energy in Data Communication?
- rapid surge in both subscribers and digital data content.
- produce a lot of stress in wireless infrastructures.
- use of more power due to Power Amplifiers (PA's) in Radio Base Stations (RBS's).
- account for large emission of Green House Gases (GHG's).
Present talk deals with use of alternative green energy sources for powering a Telecom tower for future Data Communication as well as to reduce the GHG's emission.
OVERVIEW
2

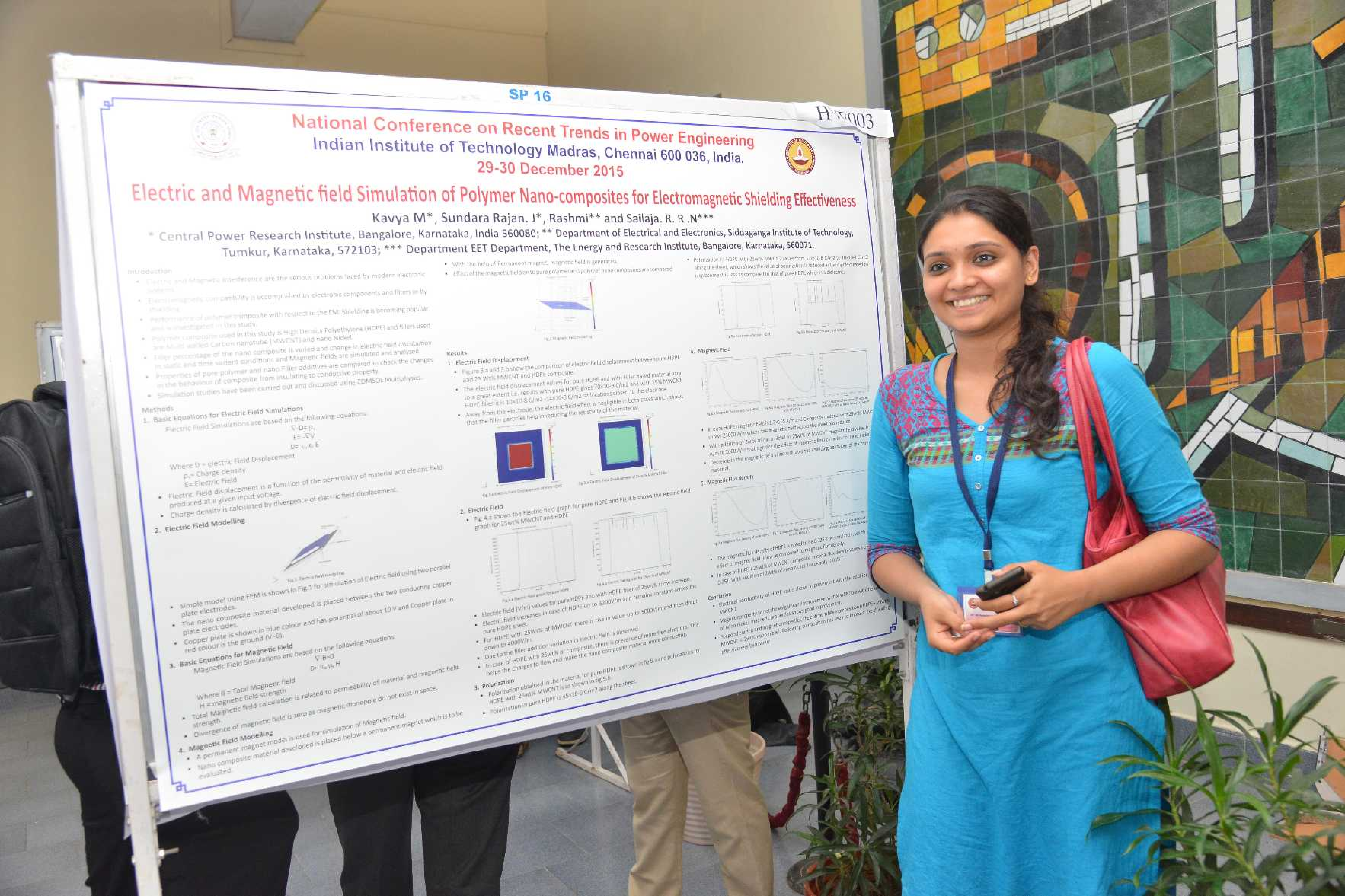


PED021
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Closed Loop Control Analysis of Half Bridge LLC Resonant Converter based Battery Charger
Sumanta Kumar Show
Research Scholar, NITK Surathkal, India
P. Parthiban
Assistant Professor, NITK Surathkal, India
Half-Bridge LLC converter Specifications
Electrical Specifications
Input Voltage (Vin) (380 – 420) V
Output Voltage (Vo) (28 - 72) V
Output Current (Io) (16 - 25) A
Maximum Power (Po) 1.8kW
Main Resonant Frequency (fH) 200 kHz
Secondary Resonant Frequency (fL) 85.287 kHz
Switching Frequency (94.6 – 226.6) kHz
Component Parameters
Resonant Inductor (Lr) 1.855µH
Magnetizing Inductor (Lm) 8.356 µH
Resonant Capacitor (Cr) 34.2 uF
Transformer Turns Ratio 9:1:1
Fig. 1 Circuit diagram of LLC resonant dc-dc converter.
Fig. 2 Equivalent circuit of the LLC resonant converter.
Circuit Description
An LLC resonant Half-Bridge (HB) dc–dc converter consists of an LLC resonant inverter, a current-driven transformer with a center tapped rectifier.
Controller Parameters : Kp = 0.0154, Ki = 10.
Results & Discussion
(a)
(b)
Fig. 3 (a) Input Line voltage variation, (b) Output Load voltage variation
Fig. 4 (a) Gate pulses to the Switch, (b) Output voltage and refer
voltage, (c) Output Load current.
Conclusions
Simulation analysis of a LLC resonant Half-Bridge (HB) dc–dc co
control is presented with R-Load. Results shows the performance
Controller for adjustment of output voltage for line, load and refe
PED036


HVE018
Calculation of Corona Generated Ionic Currents of Unipolar HVDC Transmission Lines Using New Computational Method
M. Raja Nayak, Pradeep M. Nirgude, K. A. Aravind
UHVRL, Central Power Research Institute, Hyderabad
mrajanayak@yahoo.com
INTRODUCTION
Electric Field Environment Of Unipolar Hvdc Lines
METHOD OF CALCULATION:
CORONA CONDUCTOR
Ionization region formation around the HVDC line conductor
RESULTS
CONCLUSIONS
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Electric and Magnetic Field Simulation of Polymer Nano-composites for Electromagnetic Shielding

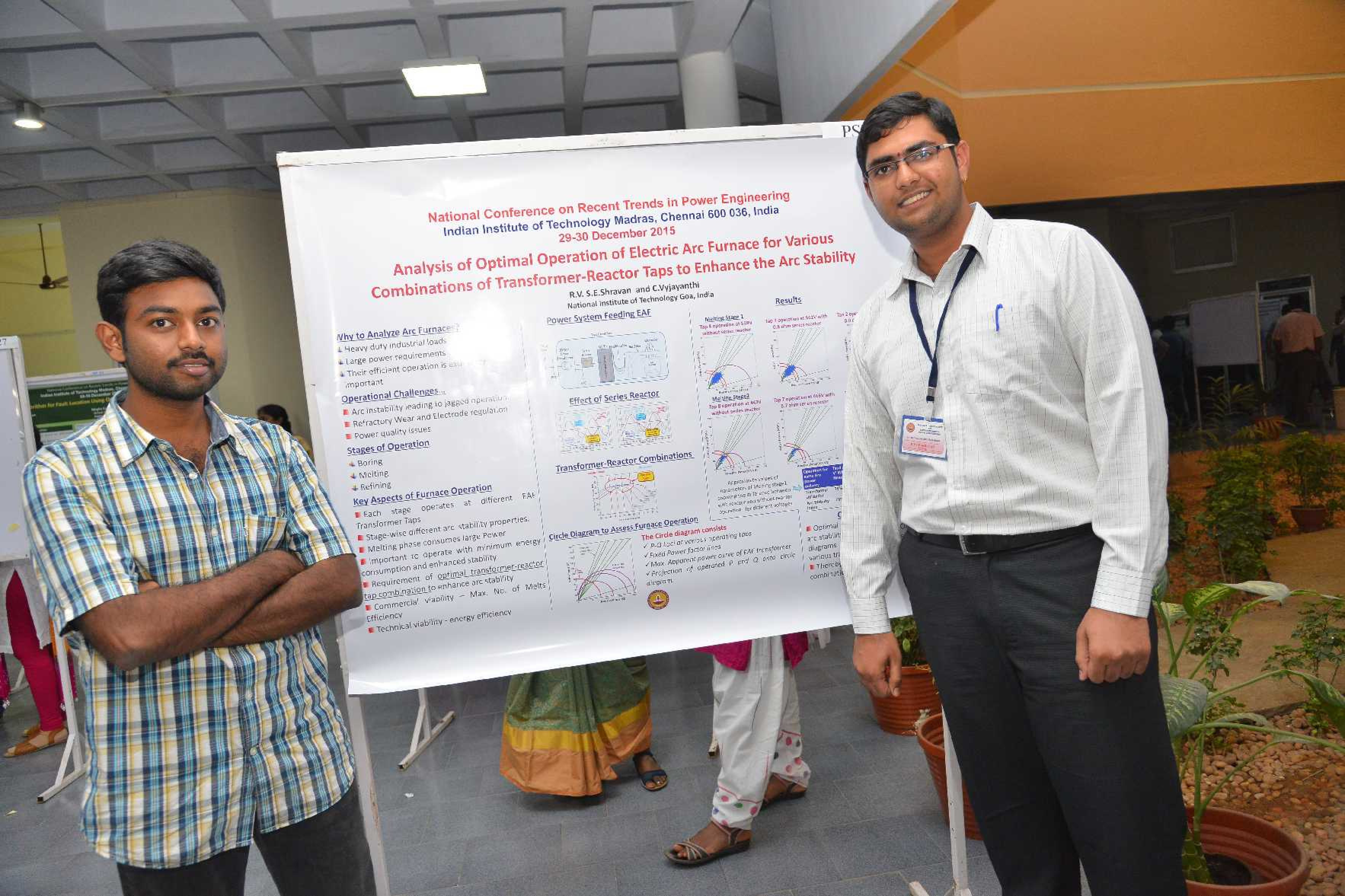


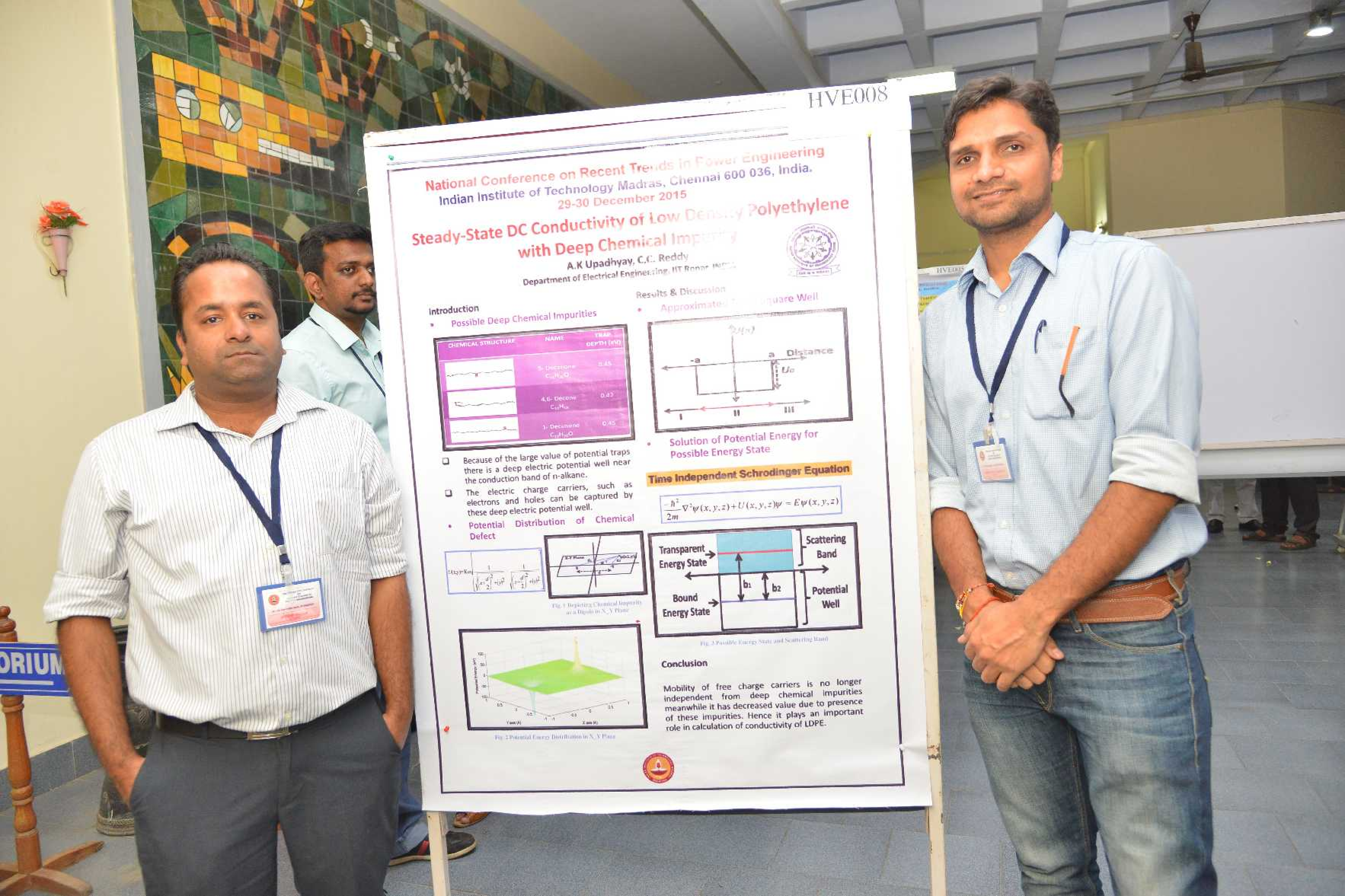
IITM
भारतीय प्रौद्योगिकी संस्थान मद्रास
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Dynamic Operation and Control Schemes for
Hybrid Static Synchronous Series Compensation
Raju J
VIT University, Vellore, India
Kowsalya M
VIT University, Vellore, India
Arunachalam M
Rajarajeswari College of Engineering, Bangalore, India
Introduction:
Static Synchronous Series Compensator (SSSC):
Hybrid Static Synchronous Series Compensator (HSSSC):
Methodology:
The effectiveness of the schemes is to analysing the performance characteristics of HSSSC evaluating using the MATLAB/SIMULINK
Indirect control scheme
Direct control scheme
Results & Discussion:
HSSSC is connected to the transmission line through a coupling transformer in series with the line. Reactive load is connected after the Bus 3 with step down transformer.
Conclusions:
PSE033

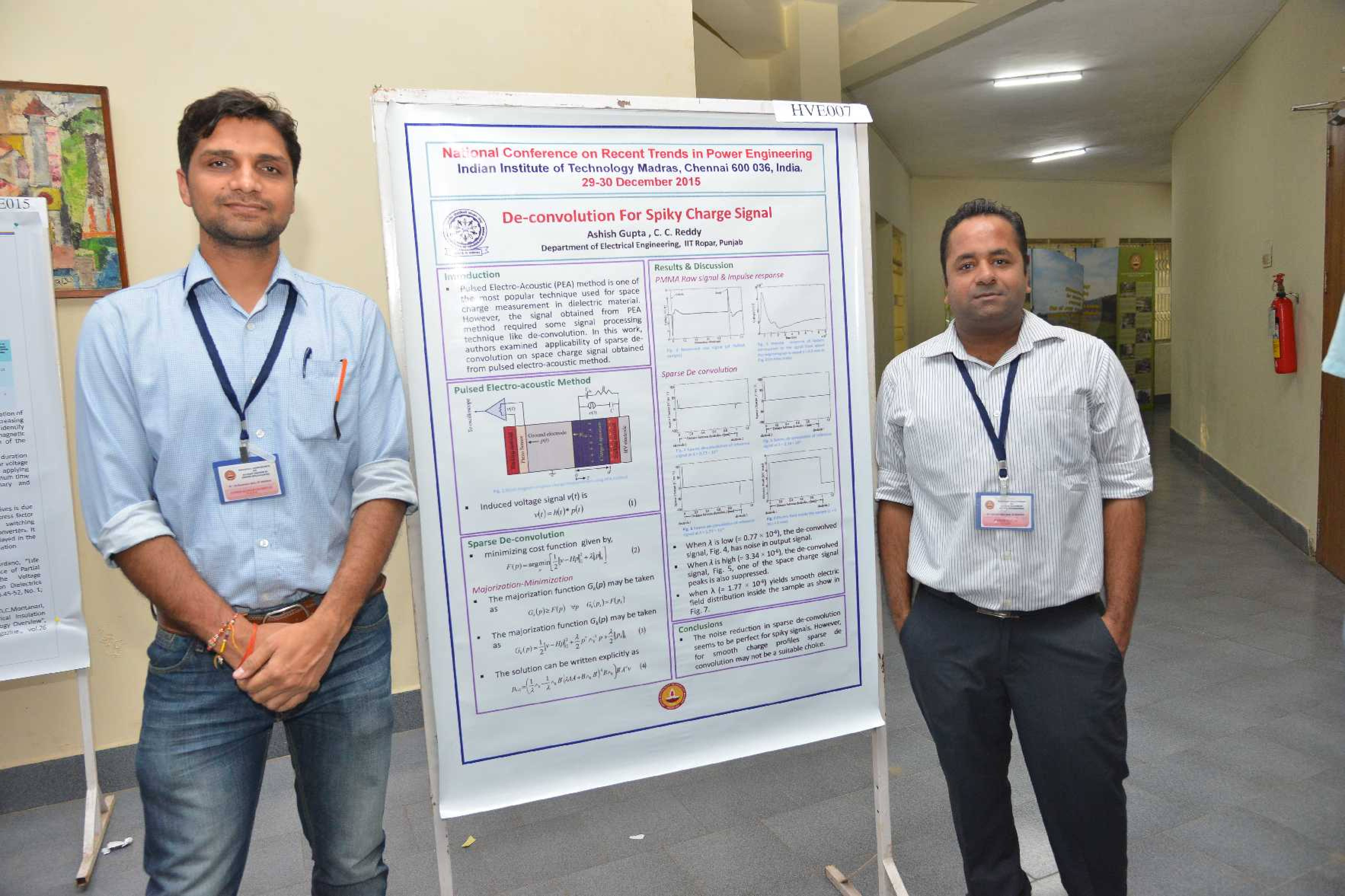

SP 16
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Electric and Magnetic field Simulation of Polymer Nano-composites for Electromagnetic Shielding Effectiveness
Kavya M*, Sundara Rajan. J*, Rashmi** and Sailaja. R. R .N***
* Central Power Research Institute, Bangalore, Karnataka, India 560080; ** Department of Electrical and Electronics, Siddaganga Institute of Technology, Tumkur, Karnataka, 572103; *** Department EET Department, The Energy and Research Institute, Bangalore, Karnataka, 560071.
Methods
1. Basic Equations for Electric Field Simulations
2. Electric Field Modelling
3. Basic Equations for Magnetic Field
4. Magnetic Field Modelling
Results
1. Electric Field Displacement
2. Electric Field
3. Polarization
4. Magnetic Field
5. Magnetic Flux density
Conclusion


HVE017
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
Evaluation of High Voltage Rotating Machine Stator Insulation System Using Diagnostic Tests
Ramesh P Nair*
B V Sumangala**
K Mallikarjunappa***
*Senior Research Fellow, Diagnostic Cables & Capacitors Division, Central Power Research Institute, Bangalore.
**Professor and Head of EEE Department, Dr. Ambedkar Institute of Technology, Bangalore.
***Joint Director and HOD, Diagnostic Cables & Capacitors Division, Central Power Research Institute, Bangalore.
Introduction
Diagnostic Tests
Diagnostic Tests continued
Results & Discussion
Conclusions
HVE002
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Dynamic Operation and Control Schemes for
Hybrid Static Synchronous Series Compensation

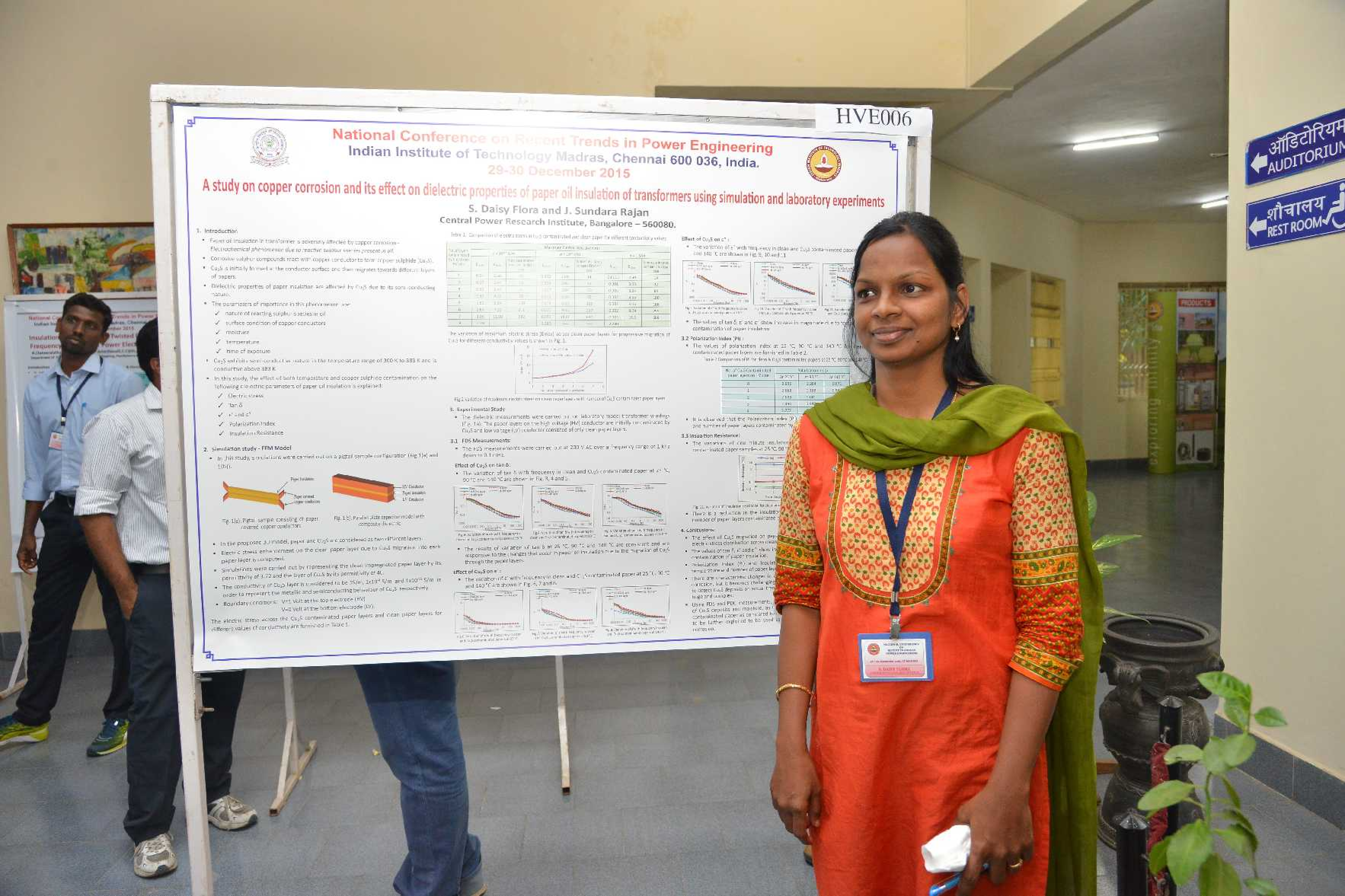

PSE012
SP 15
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Unscheduled Interchange Price Based Load Frequency Control suitable for a two area Competitive Electricity Market
Bhavani M
Assistant professor
Anna University Regional Campus, Madurai
TN, India
Selvi K
Associate Professor
Thiagarajar College of Engineering, Madurai
TN, India
Durga R
PG scholar- Power System Engineering
Thiagarajar college of Engineering, Madurai
TN, India
Introduction
Implementation of proposed work
Results & Discussion
Bilateral Contract
Conclusions of our research

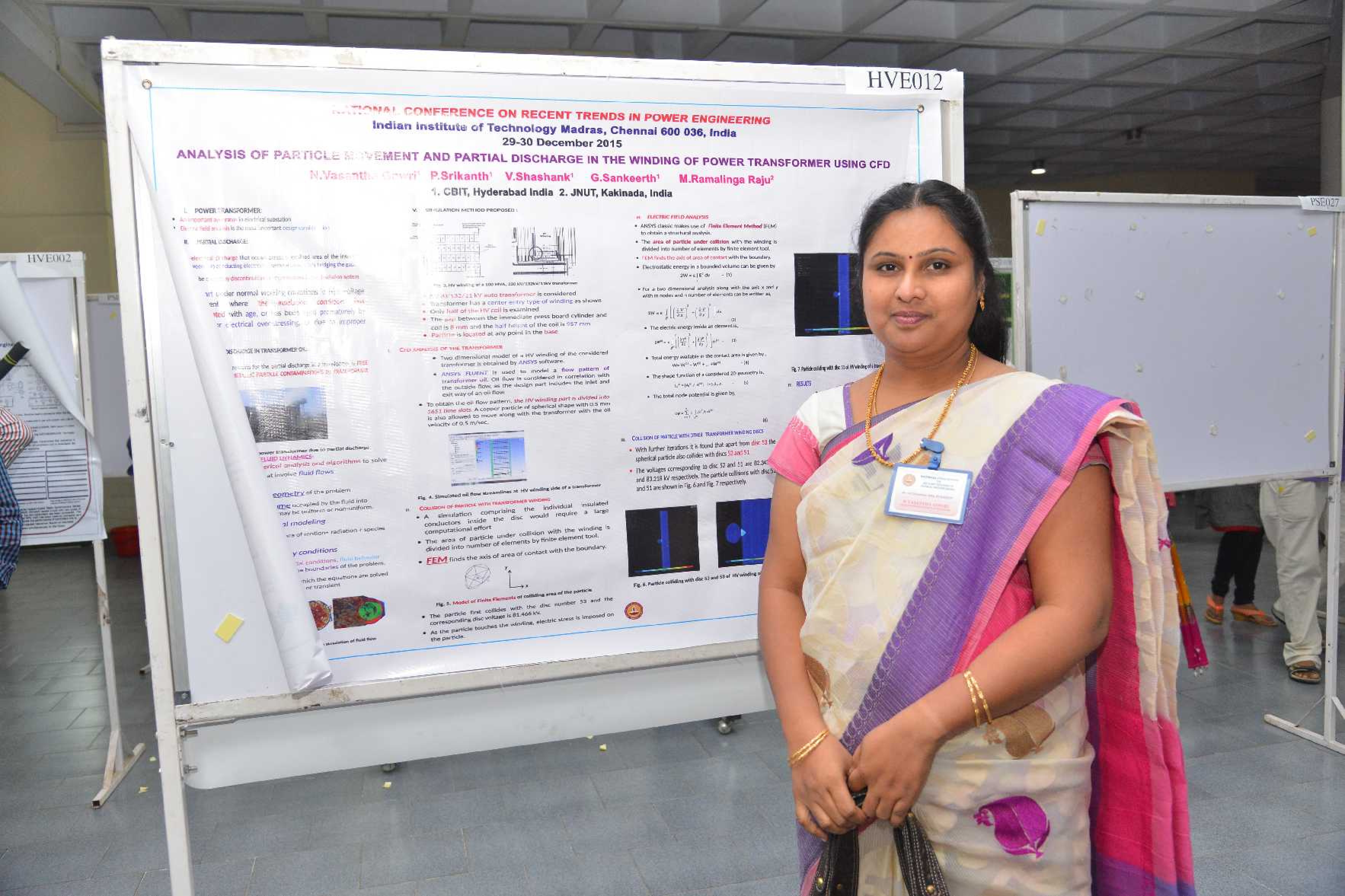

National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
Analysis of Optimal Operation of Electric Arc Furnace for Various Combinations of Transformer-Reactor Taps to Enhance the Arc Stability
R.V. S.E.Shravan and C.Vyjayanthi
National Institute of Technology Goa, India
Power System Feeding EAF
Results
Operational Challenges
Arc instability leading to jagged operation
Refractory Wear and Electrode regulation
Power quality issues
Stages of Operation
Boring
Melting
Refining
Key Aspects of Furnace Operation
Each stage operates at different EAF Transformer Taps
Stage-wise different arc stability properties.
Melting phase consumes large Power
Important to operate with minimum energy consumption and enhanced stability
Requirement of optimal transformer-reactor tap combination to enhance arc stability
Commercial viability – Max. No. of Melts Efficiency
Technical viability - energy efficiency
Effect of Series Reactor
Transformer-Reactor Combinations
Circle Diagram to Assess Furnace Operation
The Circle diagram consists
Fixed Power factor lines
Projection of operated P and Q onto circle diagram.

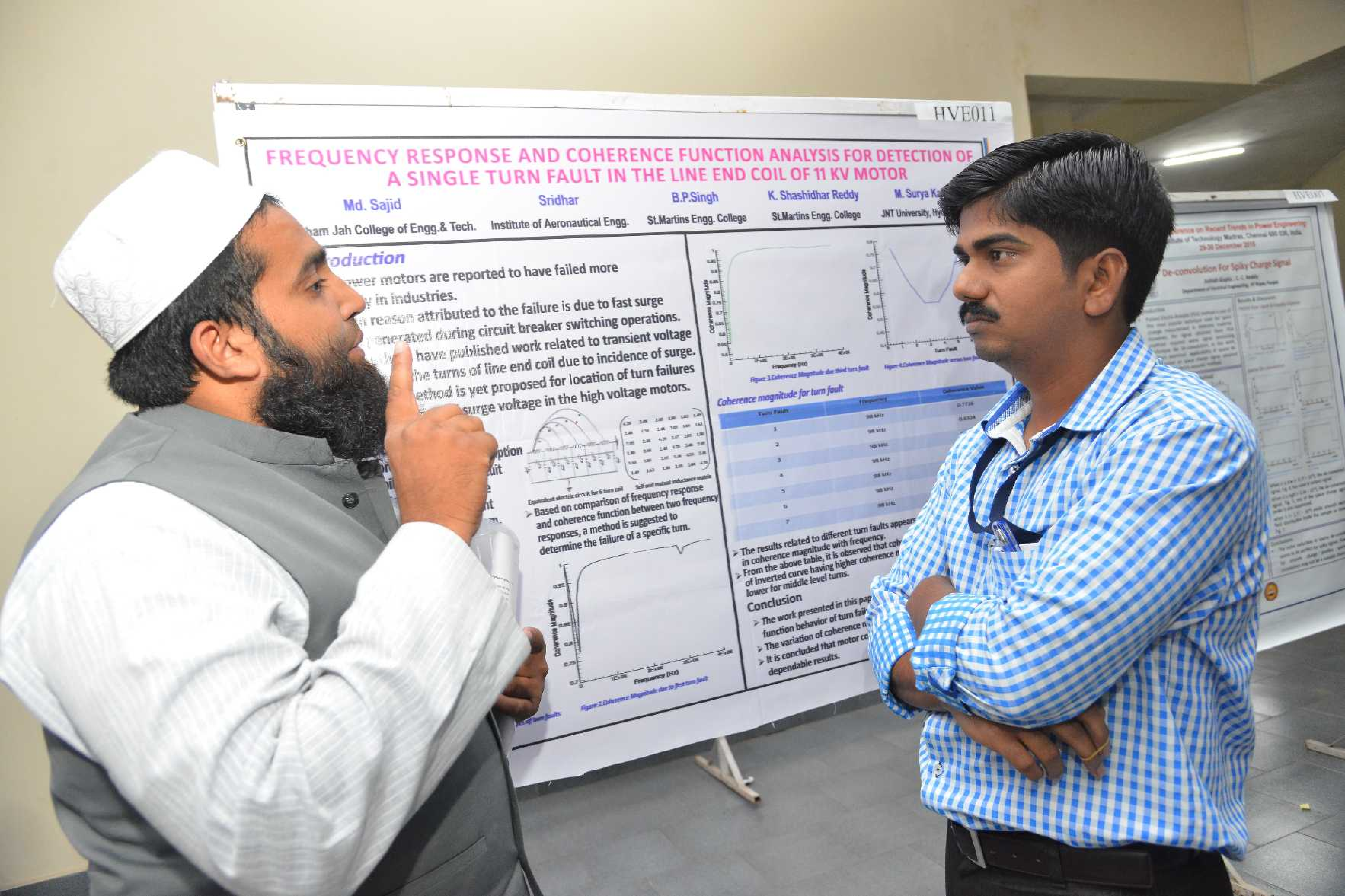

HVE008
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Steady-State DC Conductivity of Low
Polyethylene
with Deep Chemical
A.K Upadhyay, C.C. Reddy
Introduction
Possible Deep Chemical Impurities
CHEMICAL STRUCTURE
NAME
Because of the large value of potential traps there is a deep electric potential well near the conduction band of n-alkane.
The electric charge carriers, such as electrons and holes can be captured by these deep electric potential well.
Potential Distribution of Chemical Defect
Results & Discussion
Distance
Solution of Potential Energy for Possible Energy State
Time Independent Schrodinger Equation
$-\frac{\hbar^2}{2m}\nabla^2\psi(x,y,z)+U(x,y,z)\psi=E\psi(x,y,z)$
Transparent Energy State
Scattering Band
Potential Well
Bound Energy State
Conclusion
Mobility of free charge carriers is no longer independent from deep chemical impurities meanwhile it has decreased value due to presence of these impurities. Hence it plays an important role in calculation of conductivity of LDPE.


HVE007
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
De-convolution For Spiky Charge Signal
Ashish Gupta , C. C. Reddy
Department of Electrical Engineering, IIT Ropar, Punjab
Introduction
Pulsed Electro-Acoustic (PEA) method is one of the most popular technique used for space charge measurement in dielectric material. However, the signal obtained from PEA method required some signal processing technique like de-convolution. In this work, authors examined applicability of sparse de-convolution on space charge signal obtained from pulsed electro-acoustic method.
Pulsed Electro-acoustic Method
Induced voltage signal v(t) is
Sparse De-convolution
minimizing cost function given by,
Majorization-Minimization
The majorization function G_k(p) may be taken as
The majorization function G_k(p) may be taken as
The solution can be written explicitly as
Results & Discussion
PMMA Raw signal & Impulse response
Sparse De convolution
When λ is low (= 0.77 × 10⁻⁶), the de-convolved signal, Fig. 4, has noise in output signal.
When λ is high (= 3.34 × 10⁻⁶), the de-convolved signal, Fig. 5, one of the space charge signal peaks is also suppressed.
when λ (= 1.77 × 10⁻⁶) yields smooth electric field distribution inside the sample as show in Fig. 7.
Conclusions
The noise reduction in sparse de-convolution seems to be perfect for spiky signals. However, for smooth charge profiles sparse de convolution may not be a suitable choice.

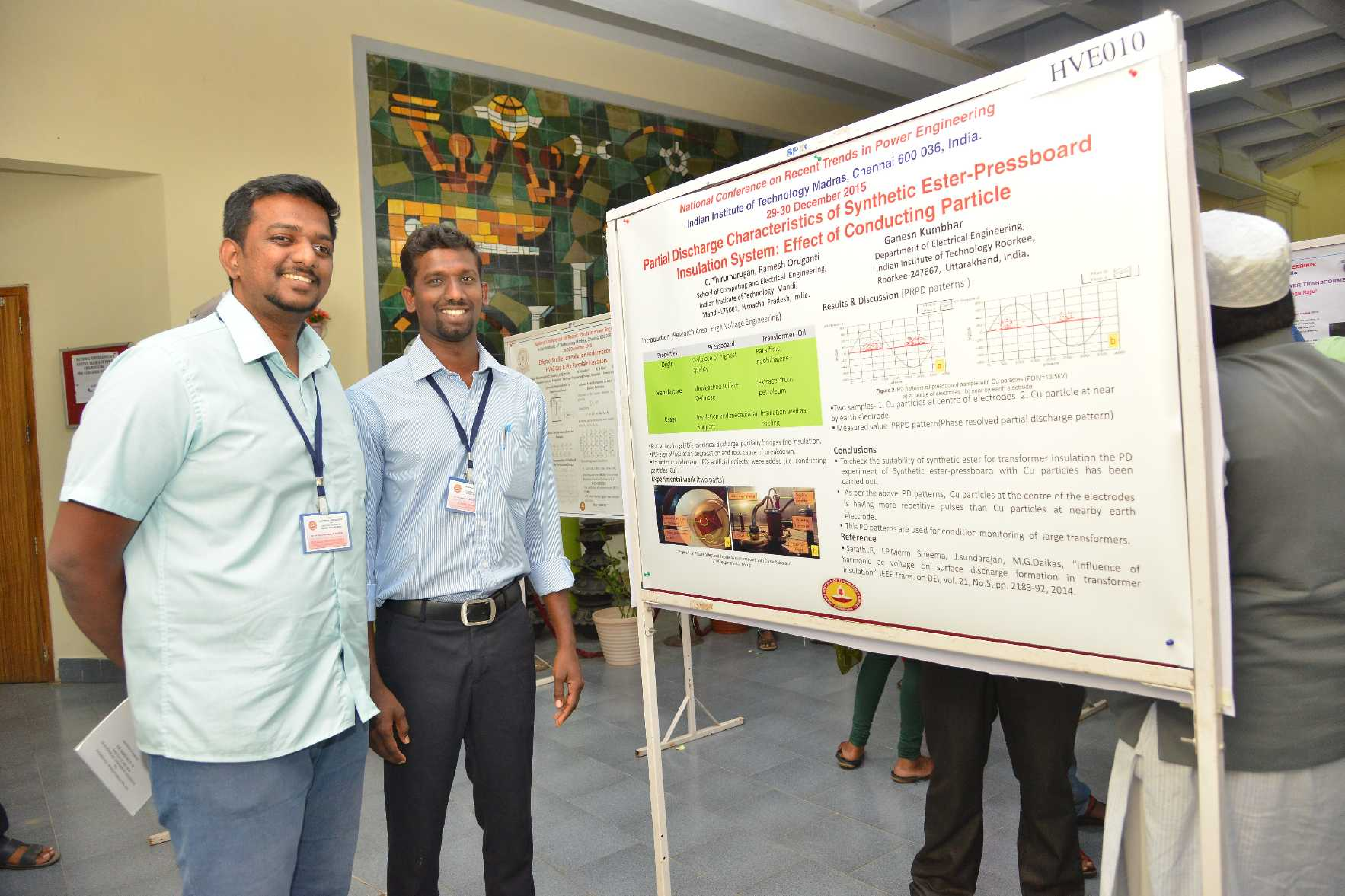

HVE009
SP 6
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Effect of Profiles on Pollution Performance of
HVAC Cap & Pin Porcelain Insulators
Sudalai Shunmugam S[1] (sudalai_srf@cpri.in) N Vasudev[1] K N Ravi[2] K A Venkatesh[3]
[1] Central Power Research Institute, Bangalore [2] Sapthagiri Engineering College, Bangalore [3] Presidency University, Bangalore
Introduction
Schematic Representation of Experimental Setup
Insulator Samples Considered for Analysis
MWS Characteristics Vs Profile of Cap & Pin Insulator Strings
Calculus Based Derivation for Least Squares Formulas
The sum of the squared residuals is given by
Substituting
Multiple Regression Equation is
Mean Square Error (MSE) of the arrived Regression Equation (Samples 1-11) is
MSE = 0.005185
The coefficient of determination (R2) is 0.9839
MSE = 0.005767
Prediction of Maximum Withstand Salinity Characteristics of Insulators
Conclusions
1. A critical study has been carried out to evaluate the pollution performance of different profiles of insulators with respect to maximum withstand salinity characteristics.
2. Statistical model has been developed to determine the maximum withstand salinity of the insulators in terms of its profile parameters.
3. The co-efficient of determination (R2) and Mean Square Error (MSE) of the predicted MWS value comes in good agreement with the experimental investigations
4. For the first time, validity of the model has been verified by checking against the new profiles.
HVE005


HVE006
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
A study on copper corrosion and its effect on dielectric properties of paper oil insulation of transformers using simulation and laboratory experiments
S. Daisy Flora and J. Sundara Rajan
Central Power Research Institute, Bangalore – 560080.
शौचालय
REST ROOM


HVE012
CONFERENCE ON RECENT TRENDS IN POWER ENGINEERING
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
ANALYSIS OF PARTICLE
VEMENT AND PARTIAL DISCHARGE IN THE WINDING OF POWER TRANSFORMER USING CFD
P.Srikanth
V.Shashank
G.Sankeerth
M.Ramalinga Raju
1. CBIT, Hyderabad India 2. JNUT, Kakinada, India
HVE002
PSE027


HVE011
FREQUENCY RESPONSE AND COHERENCE FUNCTION ANALYSIS FOR DETECTION OF A SINGLE TURN FAULT IN THE LINE END COIL OF 11 KV MOTOR
Md. Sajid
Sridhar
B.P.Singh
K. Shashidhar Reddy
Institute of Aeronautical Engg.
St.Martins Engg. College
St.Martins Engg. College
Based on comparison of frequency response and coherence function between two frequency responses, a method is suggested to determine the failure of a specific turn.
Coherence magnitude for turn fault
Conclusion
De-convolution For Spiky Charge Signal


PED025
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
Study, Design and Performance Analysis of 2,3 & 4 Phase Interleaved Boost Converters in Renewable Energy Source Application
ABISHRI.P
Research Scholar, School of Electrical Engineering, VIT University, Vellore, Tamil Nadu, India.
INTRODUCTION :
A suitable power conditioner is very much needed for the Renewable Energy Sources (RES), such as Solar Photovoltaic(SPV) panel, Wind Turbine Generator(WTG) and fuel cell to connect it to the load because of its non-linear current Vs voltage (I-V) characteristics, due to lower output voltage of the sources and its dependency on the sporadically varying natural phenomena. The DC-DC converter along with suitable controllers is generally used in the renewable energy sources, to maintain a constant voltage at the input of the inverter for a stable output (load) voltage, and to handle power flow control based on load requirement. The larger ripples in RES sources such as SPV panel, fuel cell etc., A detailed investigation on 2 phase, 3 phase and 4 phase interleaved boost converter is carried out with SPV , wind turbine generator , Fuel cell and battery and parameters like input current ripple, output voltage ripple and the power handling capability is analyzed. It is observed that the output voltage ripple is minimized at the points where the input current ripple is minimized. It is observed that the 4 phase IBC offers better input current and output voltage ripple reduction than the 2 and 3-phase IBC.
METHODOLOGY:
BOOST CONVERTER:
A boost converter is a DC-to-DC power converter with an output voltage greater than its input voltage. It is a class of SMPS containing at least two semiconductors and at least one energy storage element. Filters made of capacitors are reduce output voltage ripple
SPV Panel
or
WTG
or
Fuel Cell
varies continuously
Boost Converter
Controller
continuously varied to modulate the power
Inverter
Battery
Load
Constant or varies continuously
Figure 1 : Conventional Renewable Energy Based Power Generation Systems
PROBLEMS WITH BOOST CONVERTER:
The power level of a power electronic converter is limited due to several factors.
An increase in current causes an increase in stresses on switching devices and The boost inductor should be increased to avoid saturation and overheating problems.
INTERLEAVED BOOST CONVERTER(IBC):
Hence, for an efficient power generation and to protect the life time of the RE resources, a power conditioner that simultaneously applies voltage and power flow control along with negligible voltage and current ripple is very much necessary.
To develop an efficient multi-phase DC-DC converters as the basic converter unit of the RES based power generation systems to increase the power processing capability with reduced ripple content and to improve the reliability.
Figure 2. Structure of Boost Converter (IBC)
ADVANTAGES OF IBC:
Increase the power processing capability
Reduced electromagnetic emission
Fault tolerance
Reduced conduction losses (I²R)
Improve the reliability of the power electronic system
Ripple cancellation in both the input and output waveforms
RESULT:
Analysis of 2, 3 & 4 Phase are tabulated below:
Source
2 Phase
3 Phase
4 Phase
Input Current (I)
Output Voltage (V)
As Seen in the both Cases the 4 Phase IBC offers better Input Current and Output Voltage Ripple Reduction then the 2 Phase and 3 Phase Interleaved Boost Converter (IBC) Hence 4 Phase Interleaved Boost Converter (IBC) is Proposed as the Basic Converter Unit of High Power Supply.


HVE010
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Partial Discharge Characteristics of Synthetic Ester-Pressboard Insulation System: Effect of Conducting Particle
C. Thirumurugan, Ramesh Oruganti
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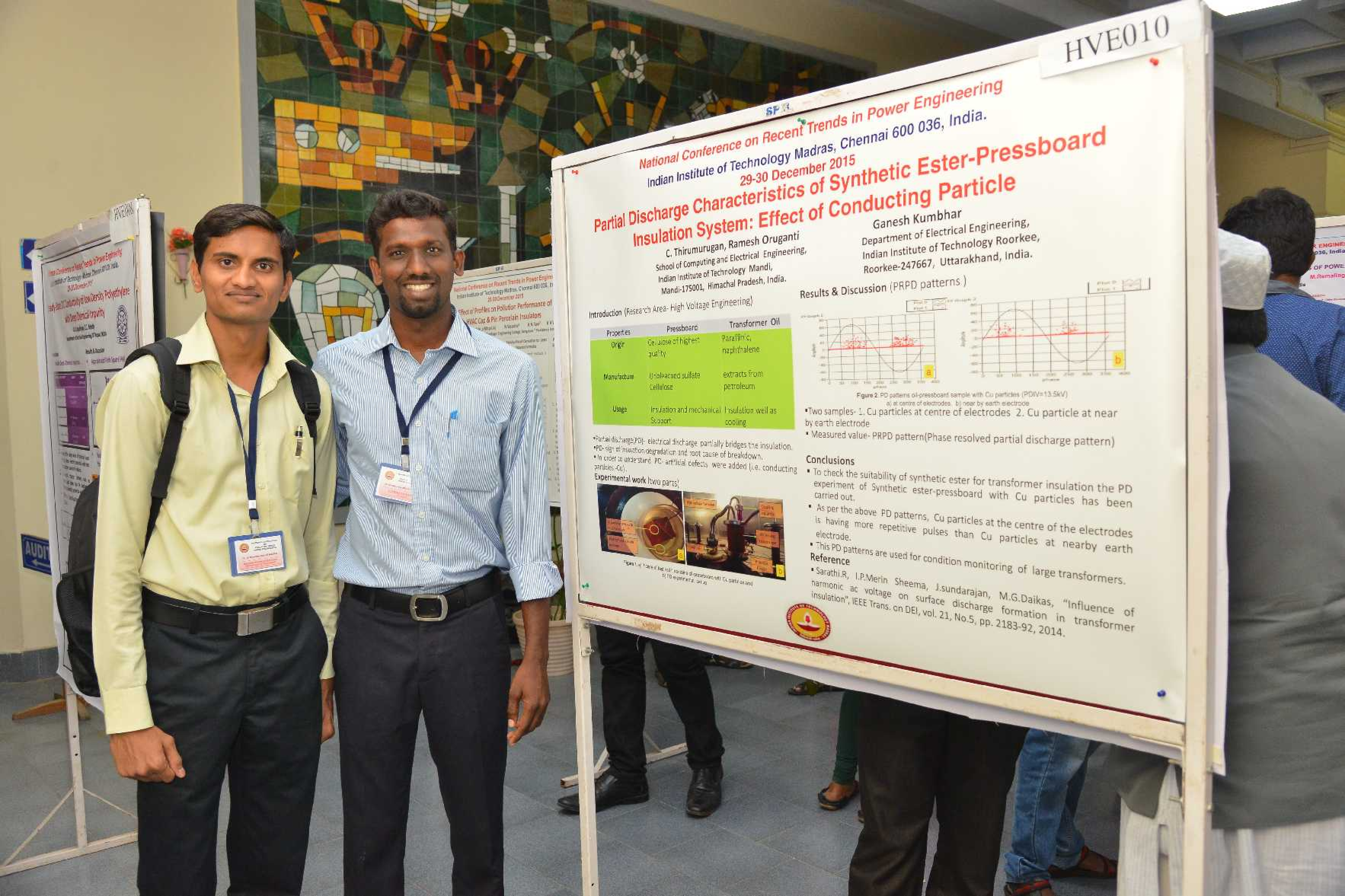
Indian Institute of Technology Mandi,
Mandi-175001, Himachal Pradesh, India.
Ganesh Kumbhar
Department of Electrical Engineering,
Indian Institute of Technology Roorkee,
Roorkee-247667, Uttarakhand, India.
Introduction (Research Area- High Voltage Engineering)
Properties
Pressboard
Transformer Oil
Experimental work (two parts)
Results & Discussion (PRPD patterns)
Two samples- 1. Cu particles at centre of electrodes 2. Cu particle at near by earth electrode
Measured value PRPD pattern(Phase resolved partial discharge pattern)
Conclusions
To check the suitability of synthetic ester for transformer insulation the PD experiment of Synthetic ester-pressboard with Cu particles has been carried out.
As per the above PD patterns, Cu particles at the centre of the electrodes is having more repetitive pulses than Cu particles at nearby earth electrode.
This PD patterns are used for condition monitoring of large transformers.
Reference
Sarath..R, I.P.Merin Sheema, J.sundarajan, M.G.Daikas, "Influence of harmonic ac voltage on surface discharge formation in transformer insulation", IEEE Trans. on DEI, vol. 21, No.5, pp. 2183-92, 2014.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National Conference on Recent Trends in Power Engineering
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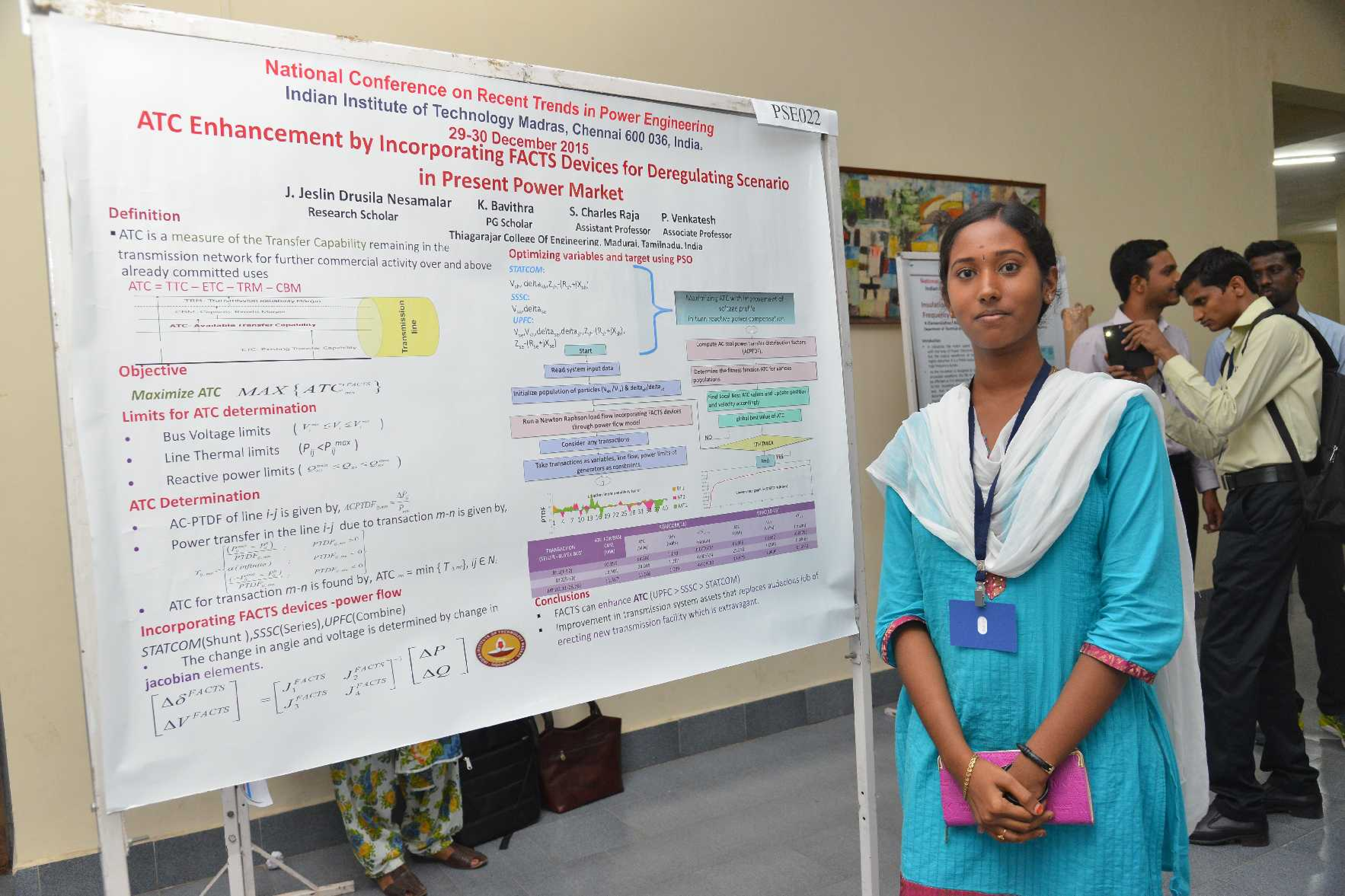
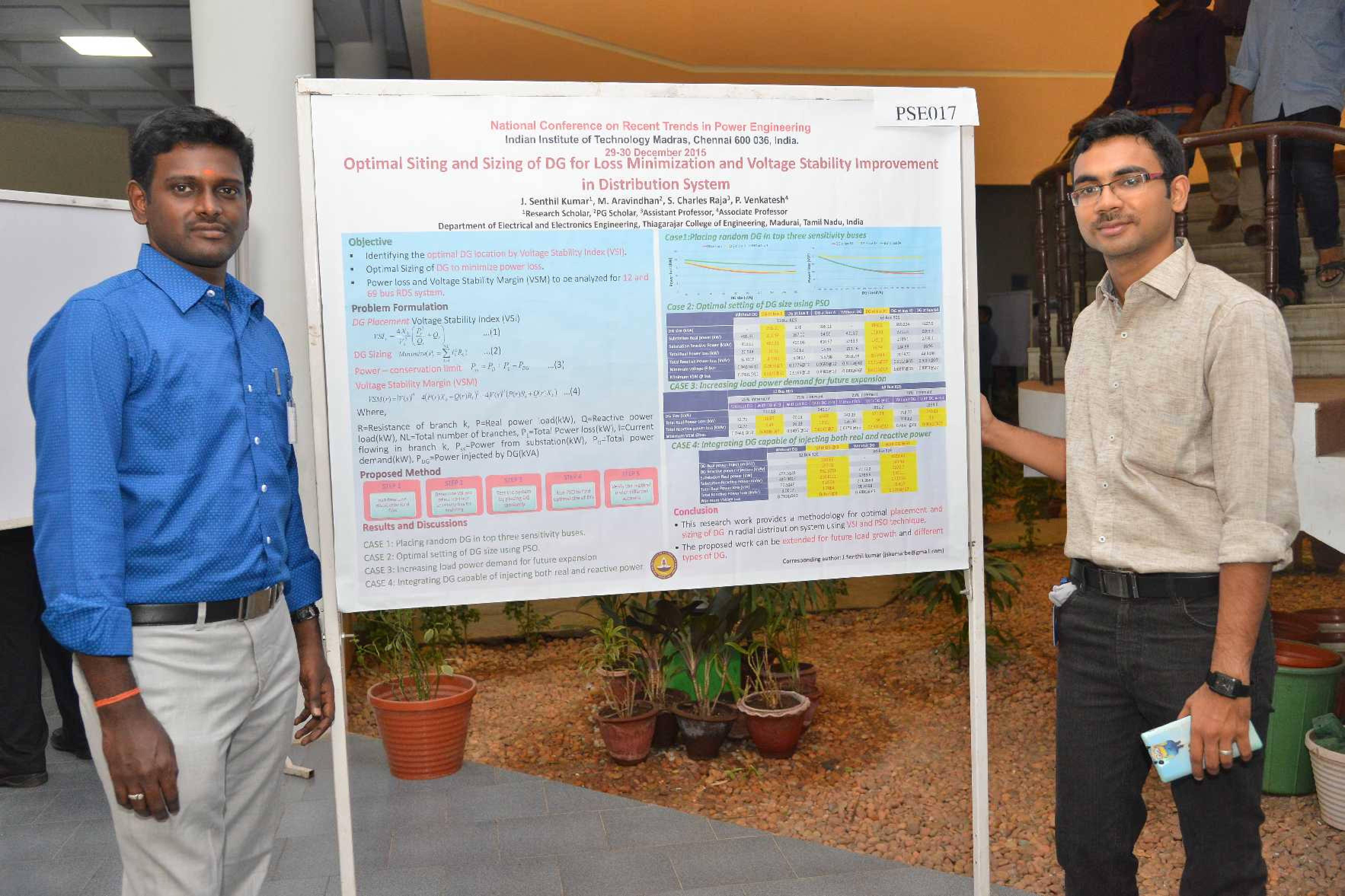
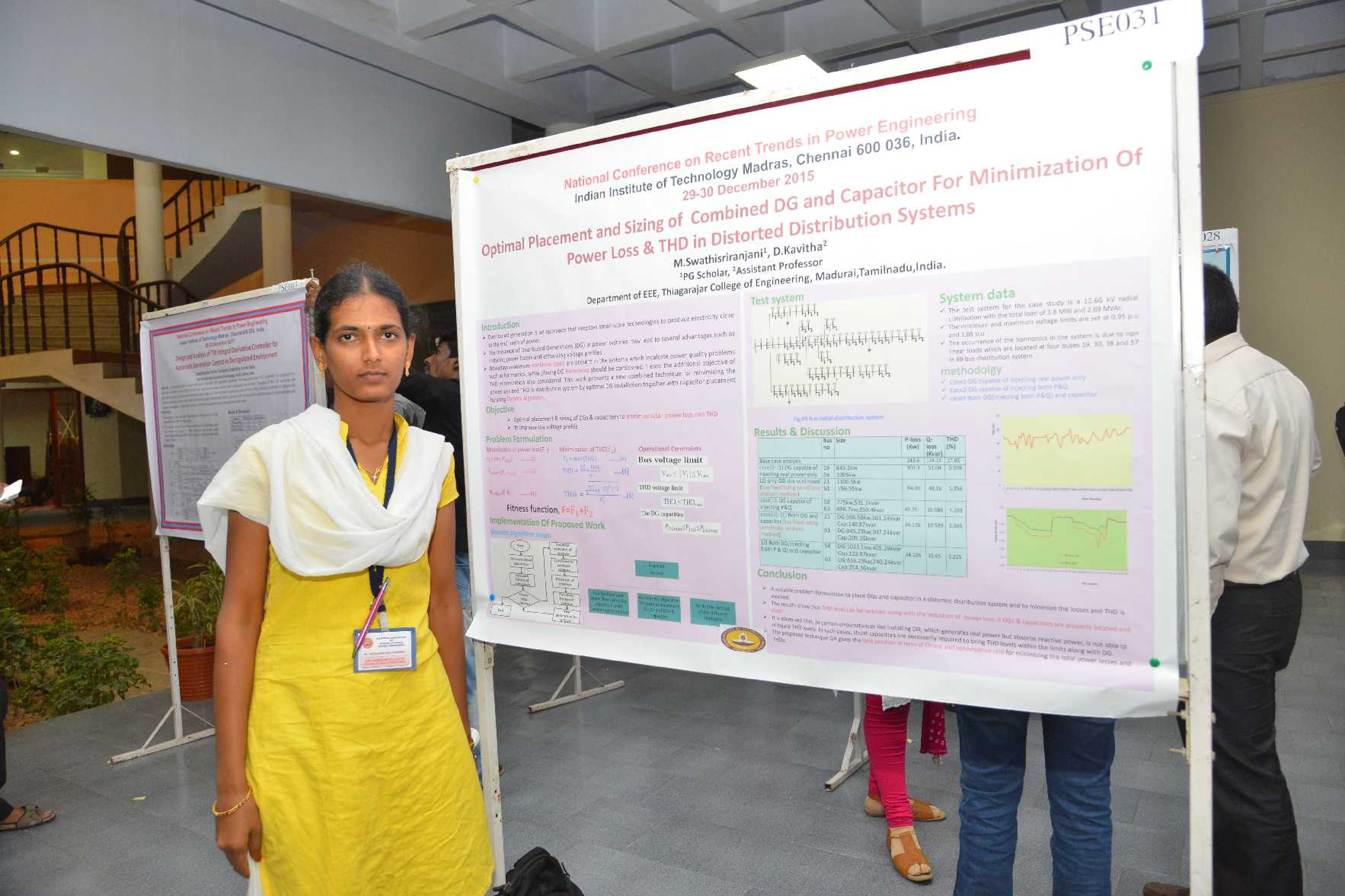
Partial Discharge Characteristics of Synthetic Ester-Pressboard Insulation System: Effect of Conducting Particle
C. Thirumurugan, Ramesh Oruganti
School of Computing and Electrical Engineering,
Indian Institute of Technology Mandi,
Mandi-175001, Himachal Pradesh, India.
Ganesh Kumbhar
Department of Electrical Engineering,
Indian Institute of Technology Roorkee,
Roorkee-247667, Uttarakhand, India.
Introduction (Research Area- High Voltage Engineering)
Properties
Pressboard
Transformer Oil
Origin
Cellulose of highest quality
Paraffinic, naphthalene
Manufacture
Unbleached sulfate Cellulose
extracts from petroleum
Usage
Insulation and mechanical Support
Insulation as well as cooling
•Partial discharge(PD)- electrical discharge partially bridges the insulation.
•PD- sign of insulation degradation and root cause of breakdown.
Experimental work (two parts)
Results & Discussion (PRPD patterns)
Figure 2. PD patterns oil-pressboard sample with Cu particles (PDIV=13.5kV)
a) at centre of electrodes. b) near by earth electrode
•Two samples- 1. Cu particles at centre of electrodes 2. Cu particle at near by earth electrode
• Measured value- PRPD pattern(Phase resolved partial discharge pattern)
Conclusions
• To check the suitability of synthetic ester for transformer insulation the PD experiment of Synthetic ester-pressboard with Cu particles has been carried out.
• As per the above PD patterns, Cu particles at the centre of the electrodes is having more repetitive pulses than Cu particles at nearby earth electrode.
• This PD patterns are used for condition monitoring of large transformers.
Reference
• Sarathi.R, I.P.Merin Sheema, J.sundarajan, M.G.Daikas, "Influence of harmonic ac voltage on surface discharge formation in transformer insulation", IEEE Trans. on DEI, vol. 21, No.5, pp. 2183-92, 2014.
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Effect of Profiles on Pollution Performance of HVAC Cap & Pin Porcelain Insulators
AUDIT

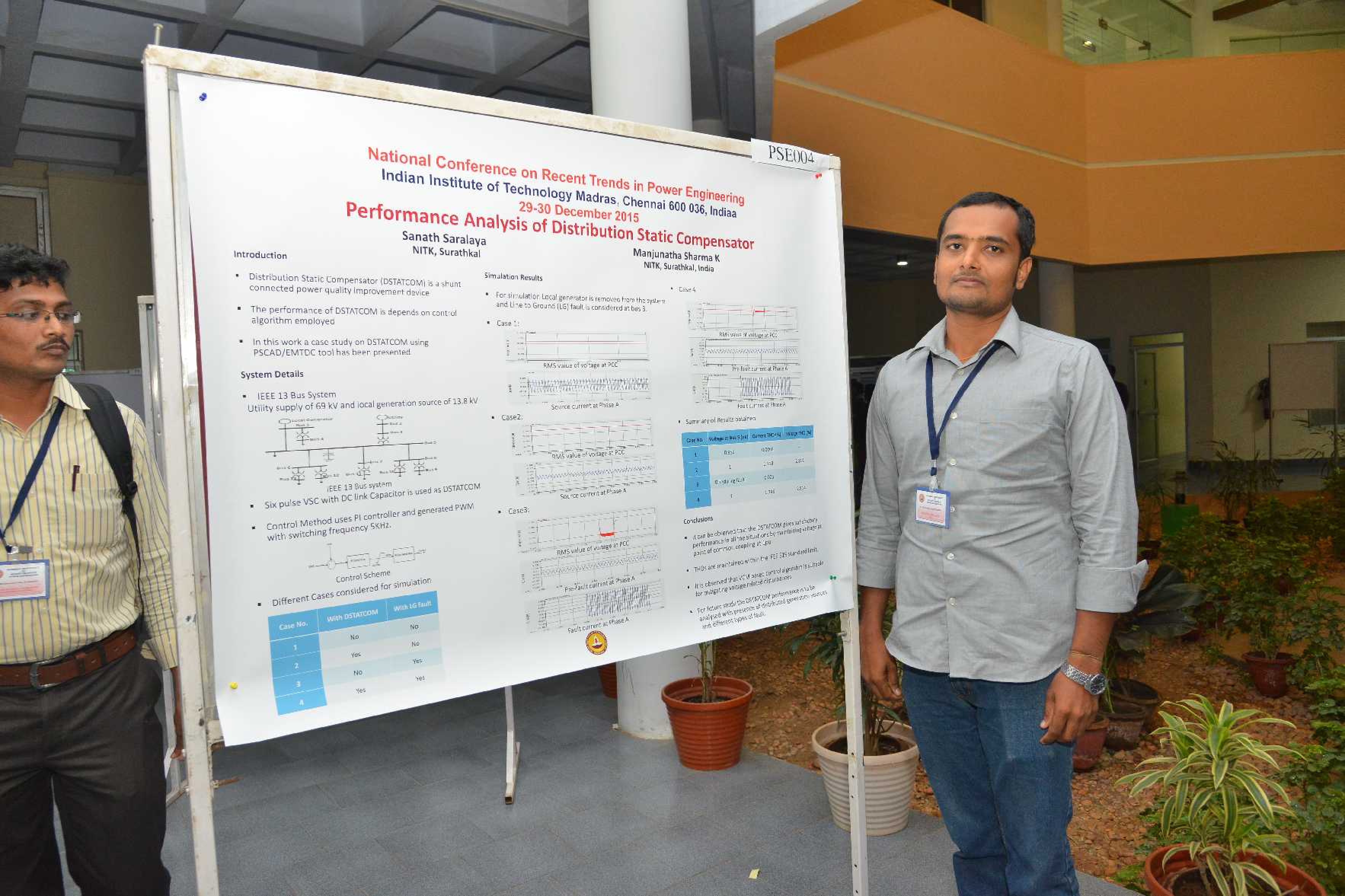

National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
PSE017
Optimal Siting and Sizing of DG for Loss Minimization and Voltage Stability Improvement in Distribution System
J. Senthil Kumar1, M. Aravindhan2, S. Charles Raja3, P. Venkatesh4
1Research Scholar, 2PG Scholar, 3Assistant Professor, 4Associate Professor
Department of Electrical and Electronics Engineering, Thiagarajar College of Engineering, Madurai, Tamil Nadu, India
Objective
Identifying the optimal DG location by Voltage Stability Index (VSI).
Optimal Sizing of DG to minimize power loss.
Power loss and Voltage Stability Margin (VSM) to be analyzed for 12 and 69 bus RDS system.
Problem Formulation
DG Placement Voltage Stability Index (VSI)
DG Sizing
Power – conservation limit
Voltage Stability Margin (VSM)
Where,
R=Resistance of branch k, P=Real power load(kW), Q=Reactive power load(kW), NL=Total number of branches, PL=Total Power loss(kW), I=Current flowing in branch k, PSS=Power from substation(kW), PD=Total power demand(kW), PDG=Power injected by DG(kVA)
Proposed Method
Results and Discussions
CASE 1: Placing random DG in top three sensitivity buses.
CASE 2: Optimal setting of DG size using PSO.
CASE 3: Increasing load power demand for future expansion
CASE 4: Integrating DG capable of injecting both real and reactive power
Case1:Placing random DG in top three sensitivity buses
Case 2: Optimal setting of DG size using PSO
CASE 3: Increasing load power demand for future expansion
CASE 4: Integrating DG capable of injecting both real and reactive
Conclusion
This research work provides a methodology for optimal
sizing of DG in radial distribution system using VSI and PSO
The proposed work can be extended for future load growth
types of DG.
Corresponding author: J Senthil Kumar

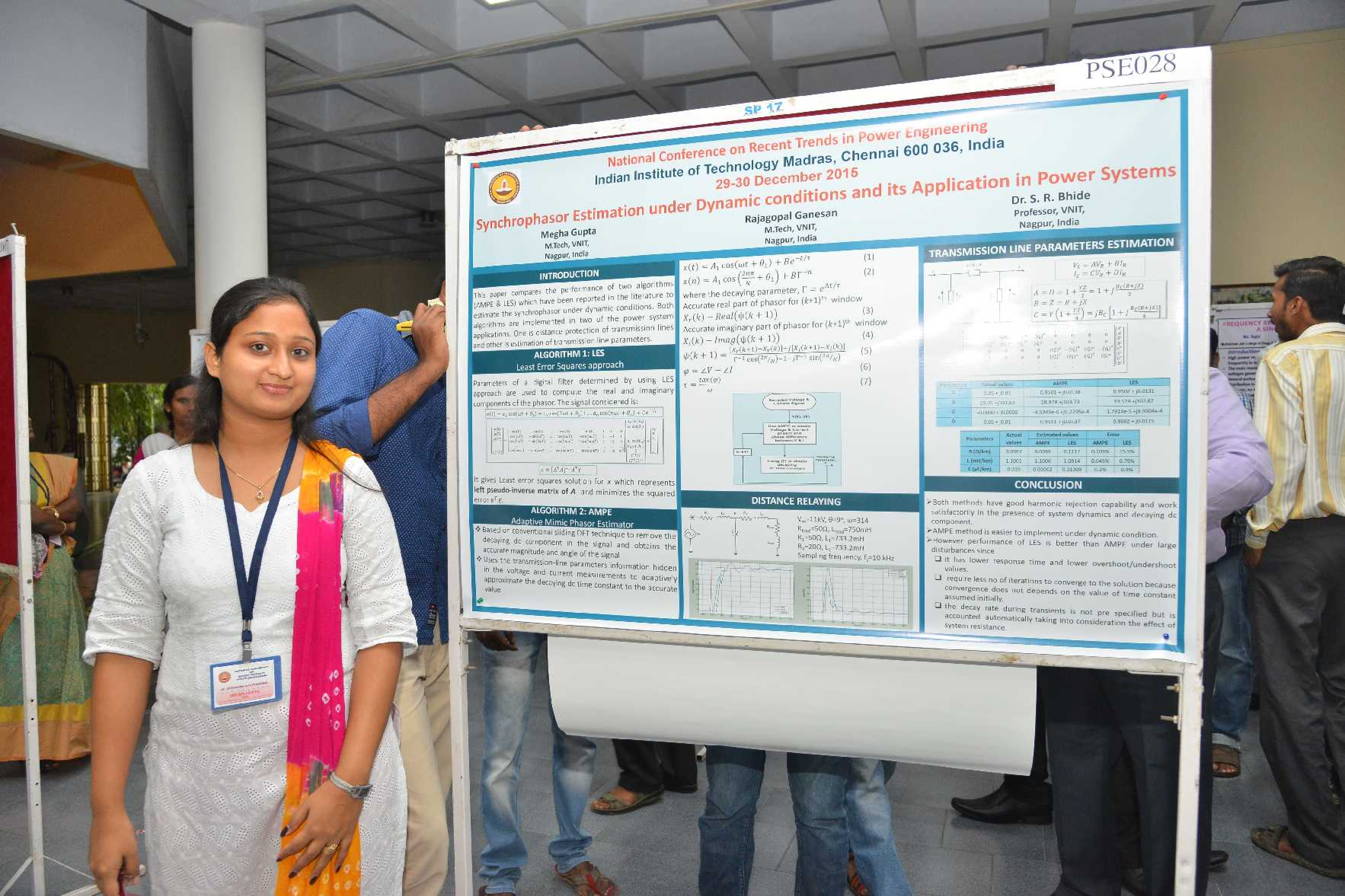

National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
PSE022
ATC Enhancement by Incorporating FACTS Devices for Deregulating Scenario in Present Power Market
J. Jeslin Drusila Nesamalar
Research Scholar
K. Bavithra
PG Scholar
S. Charles Raja
Assistant Professor
P. Venkatesh
Associate Professor
Thiagarajar College Of Engineering, Madurai, Tamilnadu, India
Definition
ATC is a measure of the Transfer Capability remaining in the transmission network for further commercial activity over and above already committed uses
ATC = TTC – ETC – TRM – CBM
Transmission line
Objective
Maximize ATC
Limits for ATC determination
Bus Voltage limits
Line Thermal limits
Reactive power limits
ATC Determination
AC-PTDF of line i-j is given by,
Power transfer in the line i-j due to transaction m-n is given by,
ATC for transaction m-n is found by,
Incorporating FACTS devices -power flow
STATCOM(Shunt),SSSC(Series),UPFC(Combine)
The change in angle and voltage is determined by change in jacobian elements.
Optimizing variables and target using PSO
STATCOM:
SSSC:
UPFC:
Start
Read system input data
Consider any transactions
Conclusions
FACTS can enhance ATC (UPFC > SSSC > STATCOM)
Improvement in transmission system assets that replaces audacious job of erecting new transmission facility which is extravagant.


PSE017
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Optimal Siting and Sizing of DG for Loss Minimization and Voltage Stability Improvement in Distribution System
J. Senthil Kumar1, M. Aravindhan2, S. Charles Raja3, P. Venkatesh4
1Research Scholar, 2PG Scholar, 3Assistant Professor, 4Associate Professor
Department of Electrical and Electronics Engineering, Thiagarajar College of Engineering, Madurai, Tamil Nadu, India
Objective
Identifying the optimal DG location by Voltage Stability Index (VSI).
Optimal Sizing of DG to minimize power loss.
Power loss and Voltage Stability Margin (VSM) to be analyzed for 12 and 69 bus RDS system.
Problem Formulation
DG Placement Voltage Stability Index (VSI)
DG Sizing
Power – conservation limit
Voltage Stability Margin (VSM)
Where,
R=Resistance of branch k, P=Real power load(kW), Q=Reactive power load(kW), NL=Total number of branches, PL=Total Power loss(kW), I=Current flowing in branch k, PSS=Power from substation(kW), PD=Total power demand(kW), PDG=Power injected by DG(kVA)
Proposed Method
STEP 1
STEP 2
STEP 3
STEP 4
STEP 5
Results and Discussions
CASE 1: Placing random DG in top three sensitivity buses.
CASE 2: Optimal setting of DG size using PSO.
CASE 3: Increasing load power demand for future expansion
CASE 4: Integrating DG capable of injecting both real and reactive power
Case1:Placing random DG in top three sensitivity buses
Case 2: Optimal setting of DG size using PSO
CASE 3: Increasing load power demand for future expansion
CASE 4: Integrating DG capable of injecting both real and reactive power
Conclusion
This research work provides a methodology for optimal placement and sizing of DG in radial distribution system using VSI and PSO technique.
The proposed work can be extended for future load growth and different types of DG.

PSE003
PP 6
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Design and Analysis of Tilt Integral Derivative Controller for Automatic Generation Control in Deregulated Environment
Tulasichandra Sekhar Gorripotu, Rabindra Kumar Sahu
Veer Surendra Sai University of Technology, Burla, Odisha, India
Abstract: In this present work, a novel Differential Evolution (DE) algorithm optimized Tilt-integral-Derivative (TID) controller is
Automatic Generation Control (AGC) of multi area multi source power system under deregulated environment. The gains of the TID
optimized employing DE optimization technique using Integral of Time multiplied by Absolute value of Error (ITAE) criterion. Further, to
dynamic performance of the system Static Synchronous Series Compensator (SSSC) is placed in the tie-line and the performance of proposed
has been investigated in all possible of power transactions taking place under deregulated environment.
Introduction
The changes in the load affect the deviation of frequencies of all the areas and also in the tie-line powers.
The problem of controlling the real power output of generating units in response to changes in system frequency and tie-line power interchange within specified limits is known as Automatic Generation Control (AGC).
Methodology
Results & Discussion
Scenario
SLP in area-1
SLP in area-2
From the above Figs. It is observed that, the dynamic responses of the SSSC incorporated system are better in terms of settling time, peak over shoots and ITAE objective function.
Conclusions
A new TID controller for AGC problem under deregulation is designed and implemented.
Important physical constraints such as boiler dynamics, governor dead band, generation rate constraints and time delay are included in the system model.
The dynamic performance improvement with SSSC is performed.


PSE031
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Optimal Placement and Sizing of Combined DG and Capacitor For Minimization Of Power Loss & THD in Distorted Distribution Systems
M.Swathisriranjani[1], D.Kavitha[2]
[1]PG Scholar, [2]Assistant Professor
Department of EEE, Thiagarajar College of Engineering, Madurai,Tamilnadu,India.
Introduction
Objective
Problem Formulation
Implementation Of Proposed Work
Test system
System data
methodology
Results & Discussion
Conclusion


PSE004
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, Indiaa
29-30 December 2015
Performance Analysis of Distribution Static Compensator
Sanath Saralaya
NITK, Surathkal
Manjunatha Sharma K
NITK, Surathkal, India
Introduction
Distribution Static Compensator (DSTATCOM) is a shunt connected power quality improvement device
The performance of DSTATCOM is depends on control algorithm employed
In this work a case study on DSTATCOM using PSCAD/EMTDC tool has been presented
System Details
IEEE 13 Bus System
Utility supply of 69 kV and local generation source of 13.8 kV
IEEE 13 Bus system
Six pulse VSC with DC link Capacitor is used as DSTATCOM
Control Method uses PI controller and generated PWM with switching frequency 5KHz.
Control Scheme
Different Cases considered for simulation
Case No.
With DSTATCOM
With LG fault
1
No
No
2
Yes
No
3
No
Yes
4
Yes
Yes
Simulation Results
Case 1:
RMS value of voltage at PCC
Source current at Phase A
Case2:
RMS value of voltage at PCC
Source current at Phase A
Case3:
RMS value of voltage at PCC
Pre-fault current at Phase A
Fault current at Phase A
Case 4
Conclusions


PSE028
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
Synchrophasor Estimation under Dynamic conditions and its Application in Power Systems
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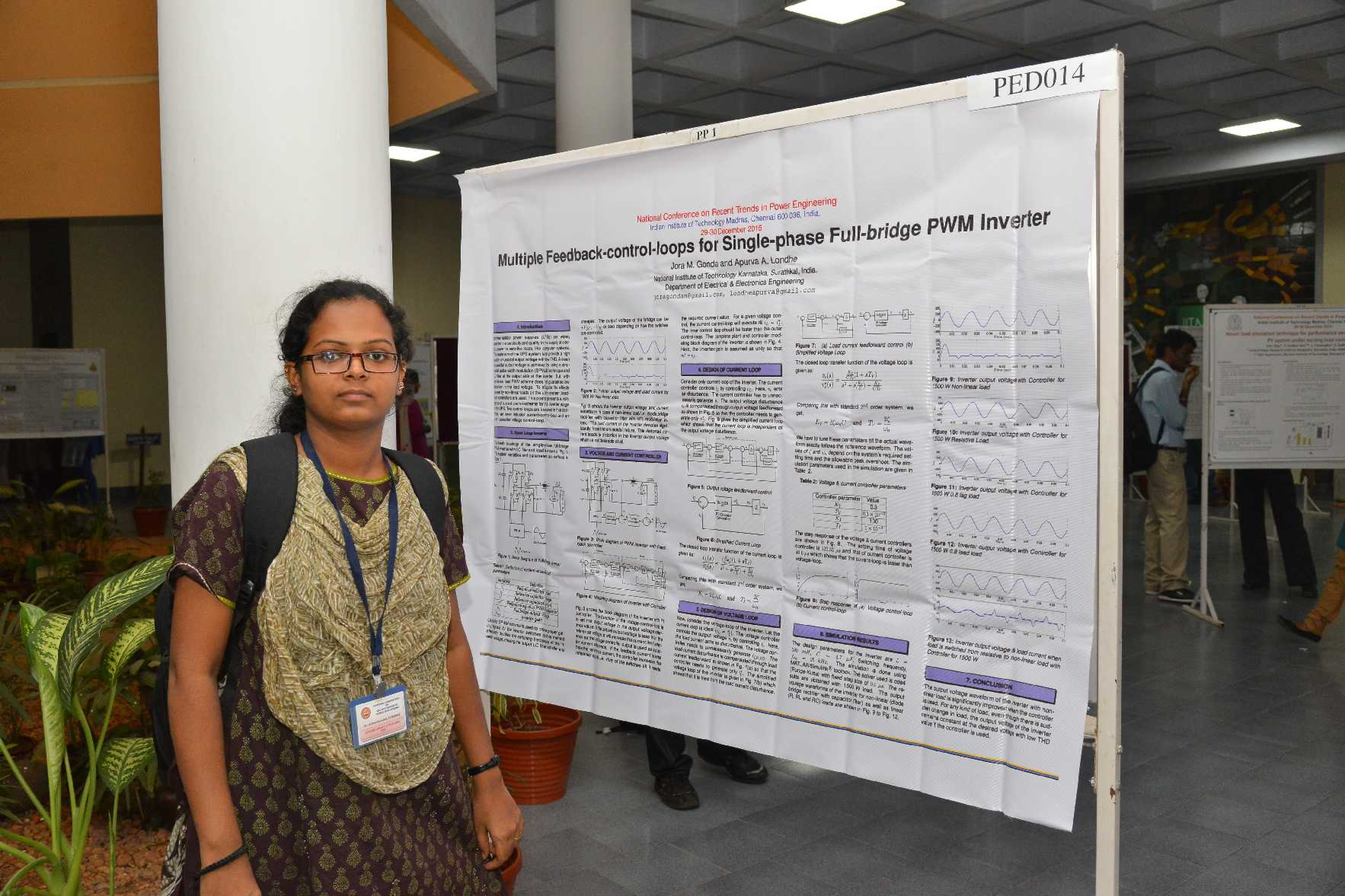
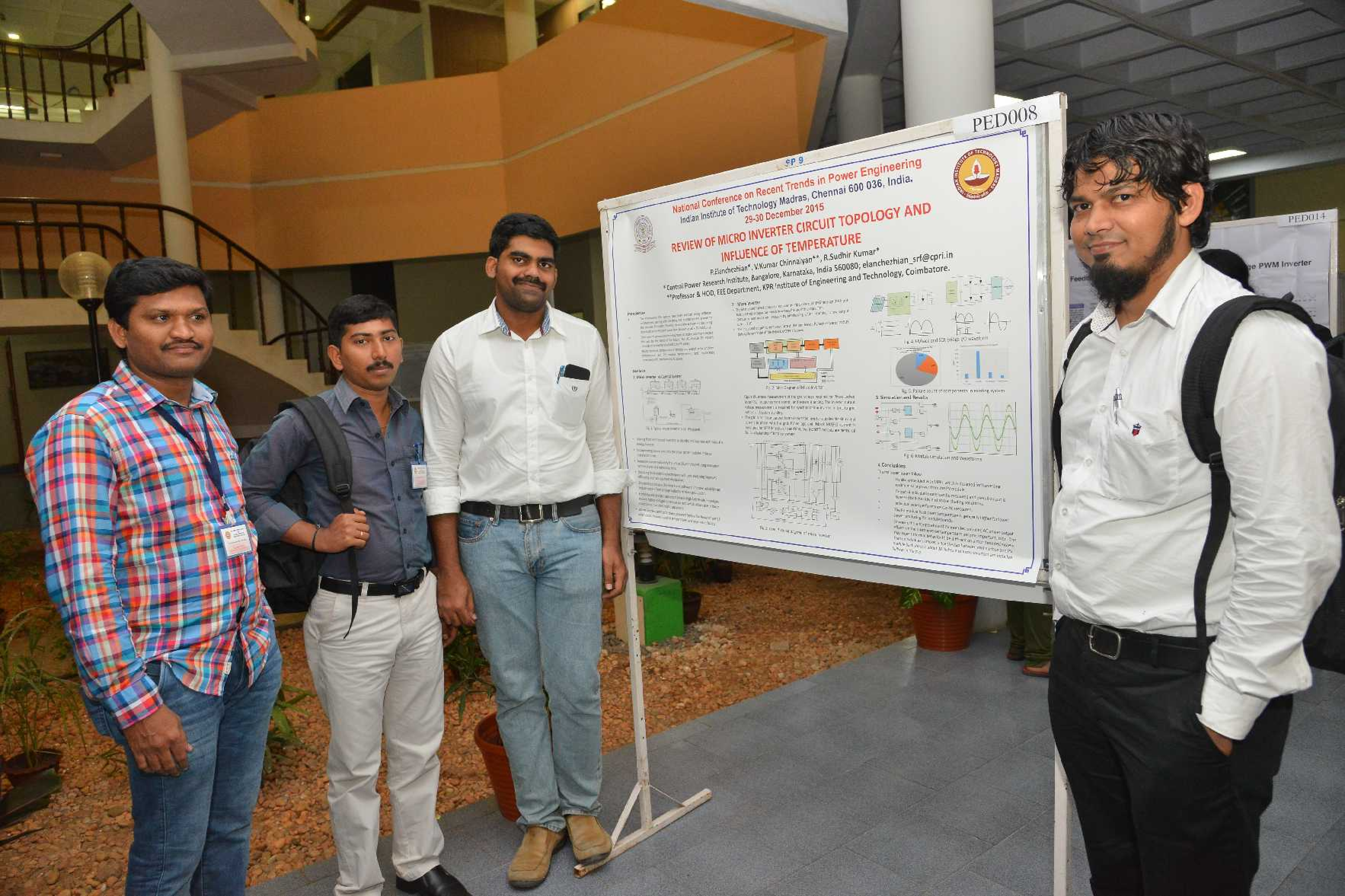
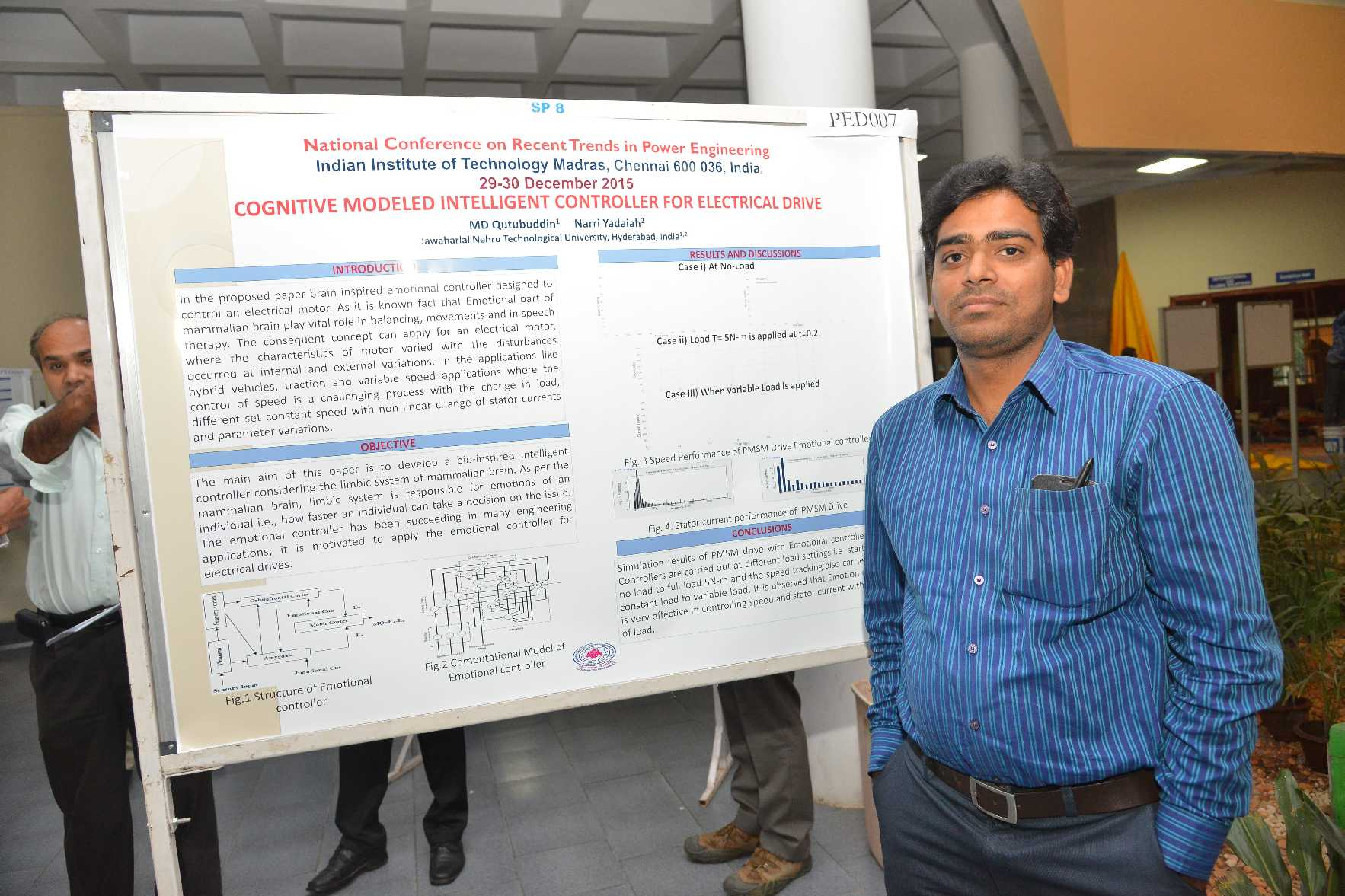
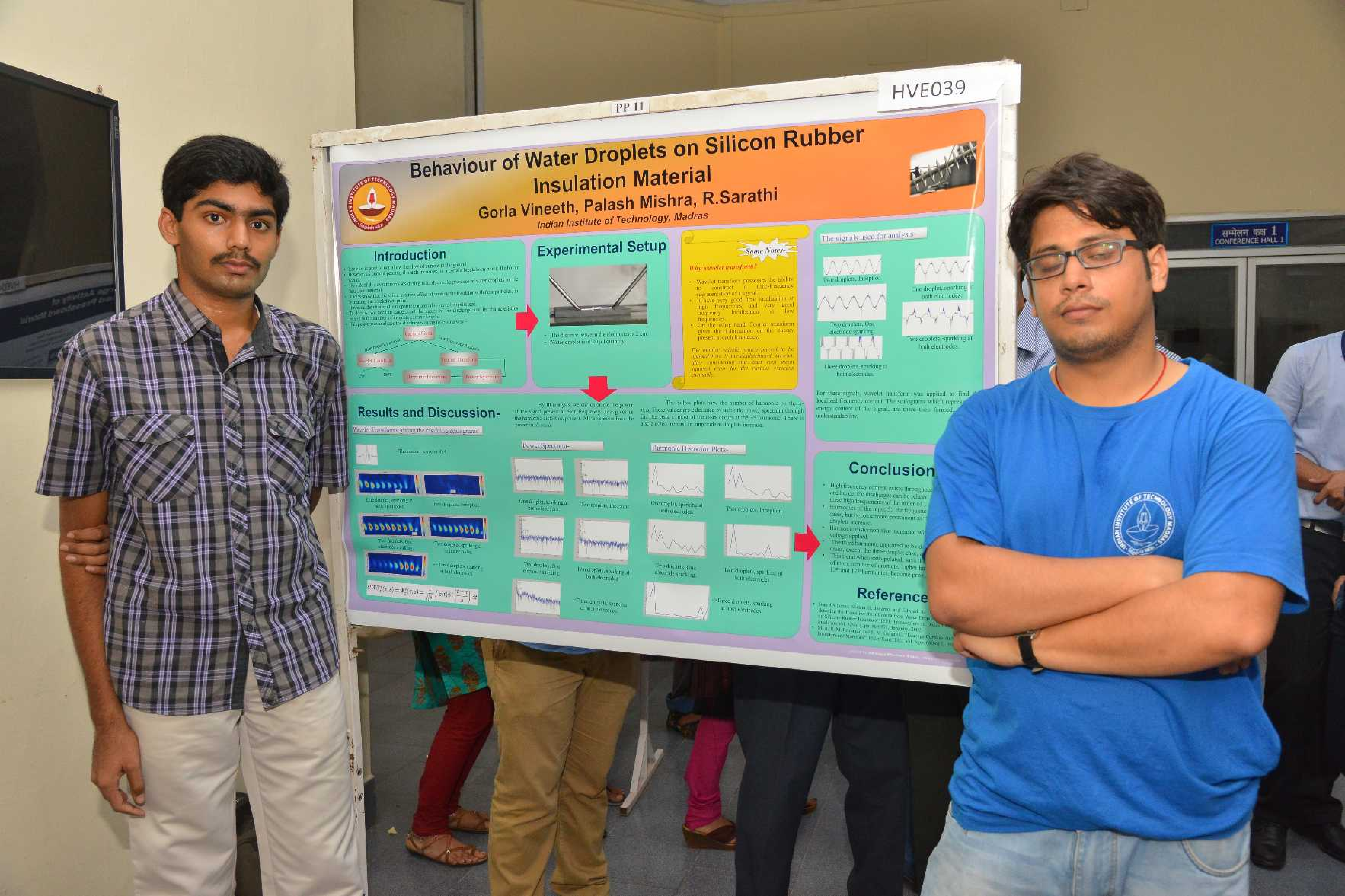
M.Tech, VNIT,
Nagpur, India
Rajagopal Ganesan
M.Tech, VNIT,
Nagpur, India
Dr. S. R. Bhide
Professor, VNIT,
Nagpur, India
INTRODUCTION
This paper compares the performance of two algorithms (AMPE & LES) which have been reported in the literature to estimate the synchrophasor under dynamic conditions. Both algorithms are implemented in two of the power system applications. One is distance protection of transmission lines and other is estimation of transmission line parameters.
ALGORITHM 1: LES
Least Error Squares approach
Parameters of a digital filter determined by using LES approach are used to compute the real and imaginary components of the phasor. The signal considered is:
It gives Least error squares solution for x which represents left pseudo-inverse matrix of A and minimizes the squared error.
ALGORITHM 2: AMPE
Adaptive Mimic Phasor Estimator
Based on conventional sliding DFT technique to remove the decaying dc component in the signal and obtains the accurate magnitude and angle of the signal
Uses the transmission-line parameters information hidden in the voltage and current measurements to adaptively approximate the decaying dc time constant to the accurate value
where the decaying parameter
Accurate real part of phasor for (k+1)th window
Accurate imaginary part of phasor for (k+1)th window
DISTANCE RELAYING
Sampling frequency, fs=10 kHz
TRANSMISSION LINE PARAMETERS ESTIMATION
CONCLUSION
Both methods have good harmonic rejection capability and work satisfactorily in the presence of system dynamics and decaying dc component.
AMPE method is easier to implement under dynamic condition.
However performance of LES is better than AMPE under large disturbances since
it has lower response time and lower overshoot/undershoot values.
require less no of iterations to converge to the solution because convergence does not depends on the value of time constant assumed initially.
the decay rate during transients is not pre specified but is accounted automatically taking into consideration the effect of system resistance.


PSE081
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Power Quality Issues in Steel Re-Rolling Mills in India
Deepak S. Jain[1]
M. Tech Student
Mohan V. Aware[1]
Professor
[1]Electrical Engineering Department, Visvesvaraya National Institute of Technology, Nagpur, Maharashtra, India
1. MOTIVATION
Power Quality (PQ) issues are still largely underestimated, mainly because the losses are often hidden or not known.
Steel re-rolling mill (SRRM) sector are prone to poor power quality and could have serious problems if not addressed in proper way.
2. OBJECTIVES
To identify, the sources of the poor PQ areas and PQ issues plaguing the sector, through power quality audit and analyse the collected data in view of its compliance with the standards available [1].
To make the SRRMs aware about the effects of poor PQ.
3. BLOCK DIAGRAMS
Process flow of SRRM
Electrical Supply
If required
Electrical Supply
Raw Material (Ingot/billet)
Furnace (IF/ EAF/CF)
Rolling Mill
Finished Product
Project Focus
Generation of PQ Impediments [2]
Unnecessarily Applying Over Voltage
Results
Voltage Swell
Causes
Motor Saturation
Generates
Power Quality Impediments
6. OVERVIEW OF TOTAL ANALYSIS
SRRM's Type
RMS
Va (V)
Variation
THD
Va %
Ia %
Ia Harmonics
5th %
7th %
Micro 217-250 33 1-9 4-55 13-52 8-45
Small 235-264 29 1-6 3-54 8-50 5-27
Medium 234-249 15 1-16 1-70 2-30 2-11
4. FIELD MEASUREMENTS
PQ measurements of 15 SRRMs have been carried out in two cities (Nagpur and Raipur) of Central India by using Megger make PA9 PLUS V604 Portable PQ Analyzer.
15 SRRMs have been divided into three categories i.e. Micro, Small and Medium SRRMs. Out of 15 SRRMs, graphs and results of a plant, under Medium SRRM group, are presented.
5. IDENTIFICATION & EFFECTS OF PQ PROBLEMS
Electrical Distribution N/W of Plant
M
M
Major Power Quality impediments are voltage sag & swell and harmonics.
More pronounced PQ effects are increase in Voltage Drop (VD), transformer k-factor, & I²R loss, skin effect in cables, capacitor failure, decrease in motor lifespan & power factor.
7. ACTUAL & SIMULATION RESU
RMS Va & Ia Variations
Va & Ia THD
Actual (Ia THD = 29.93 %)
Simulation
8. CONCLUSIONS
PQ analysis reveals all the PQ problems related to SRRMs.
Real time field measurement and simulation modelling results are compared and found to be nearly same.
This paper presents the effects of poor PQ, in SRRMs, generated due to saturation mode of motor operation
This paper encourages the organizations, who deal with the international standards, to make some PQ standards for controlling the PQ problems generated by the saturable devices.
Proper design of Electrical Configuration N/Ws are also discussed to avoid the PQ issues.
9. REFERENCES
[1] IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems, IEEE Std. 519-1992, 1992.
[2] R C. Dugan, M F. Mc Granaghan, S Santoso, H W. Beauty, "Electrical Power Systems Quality", McGrow-Hill Companies, New York, 2004.
[3] Ö. Salor, B. Gültekin, S. Buhan, B. Boyrazo˘glu, T. ˙Inan, T. Atalik, A. Açik, A. Terciyanli, Ö. Ünsar, E. Altinto¸s, Y. Akkaya, E. Özdemirci, I. Çadirci, and M. Ermi¸s, "Electrical Power Quality of Iron and Steel Industry in Turkey," in IEEE Transactions on Industry Applications, Vol. 46, No. 1, January/February 2010.

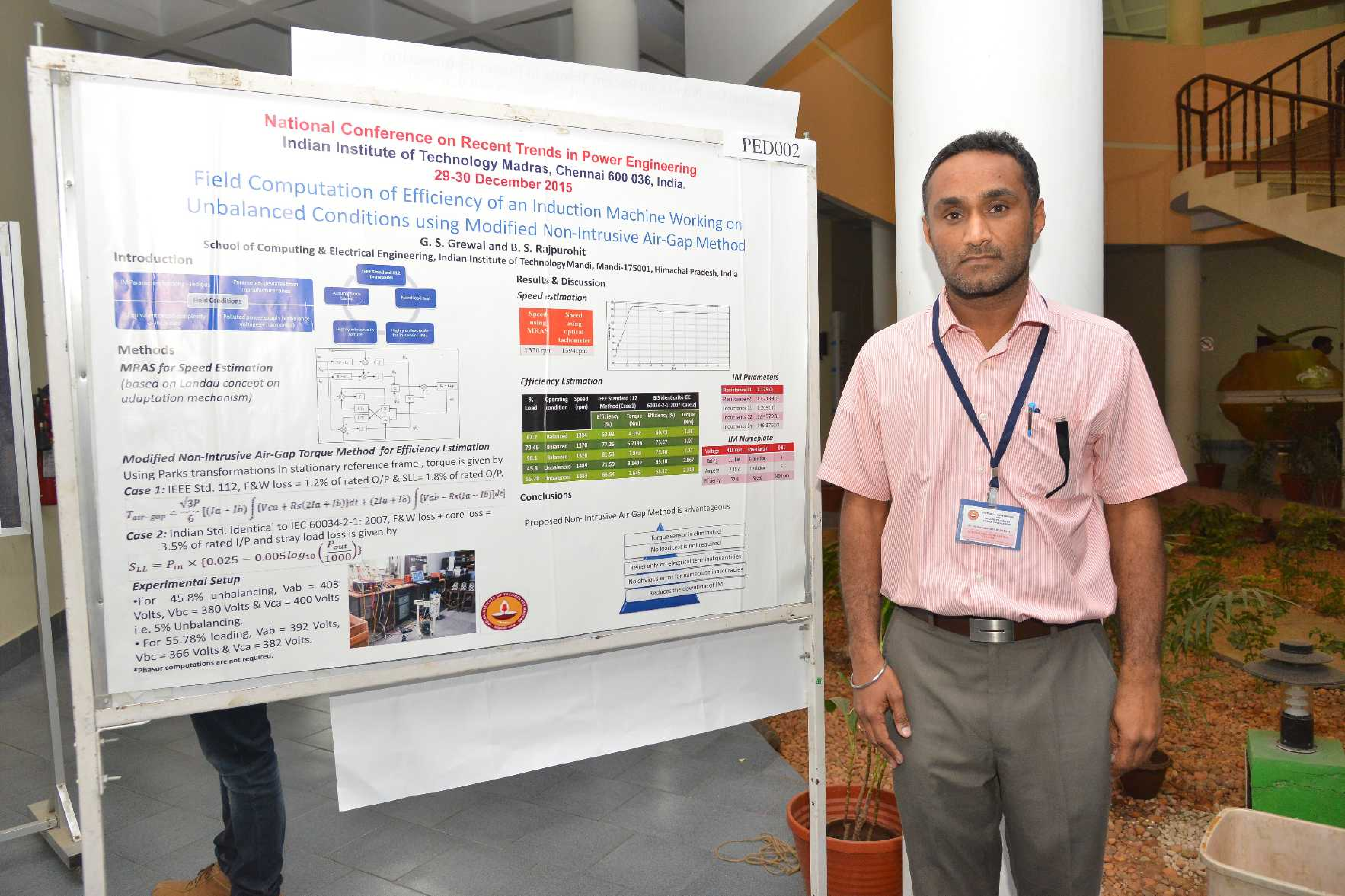

PED014
PP 1
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Multiple Feedback-control-loops for Single-phase Full-bridge PWM Inverter
Jora M. Gonda and Apurva A. Londhe
National Institute of Technology Karnataka, Surathkal, India.
Department of Electrical & Electronics Engineering
joragondam@gmail.com, londheapurva@gmail.com
1. Introduction
3. VOLTAGE AND CURRENT CONTROLLER
4. DESIGN OF CURRENT LOOP
5. DESIGN OF VOLTAGE LOOP
6. SIMULATION RESULTS
7. CONCLUSION


PED008
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
REVIEW OF MICRO INVERTER CIRCUIT TOPOLOGY AND INFLUENCE OF TEMPERATURE
P.Elanchezhian*, V.Kumar Chinnaiyan**, R.Sudhir Kumar*
* Central Power Research Institute, Bangalore, Karnataka, India 560080; elanchezhian_srf@cpri.in
**Professor & HOD, EEE Department, KPR Institute of Engineering and Technology, Coimbatore.
PED014
PWM Inverter

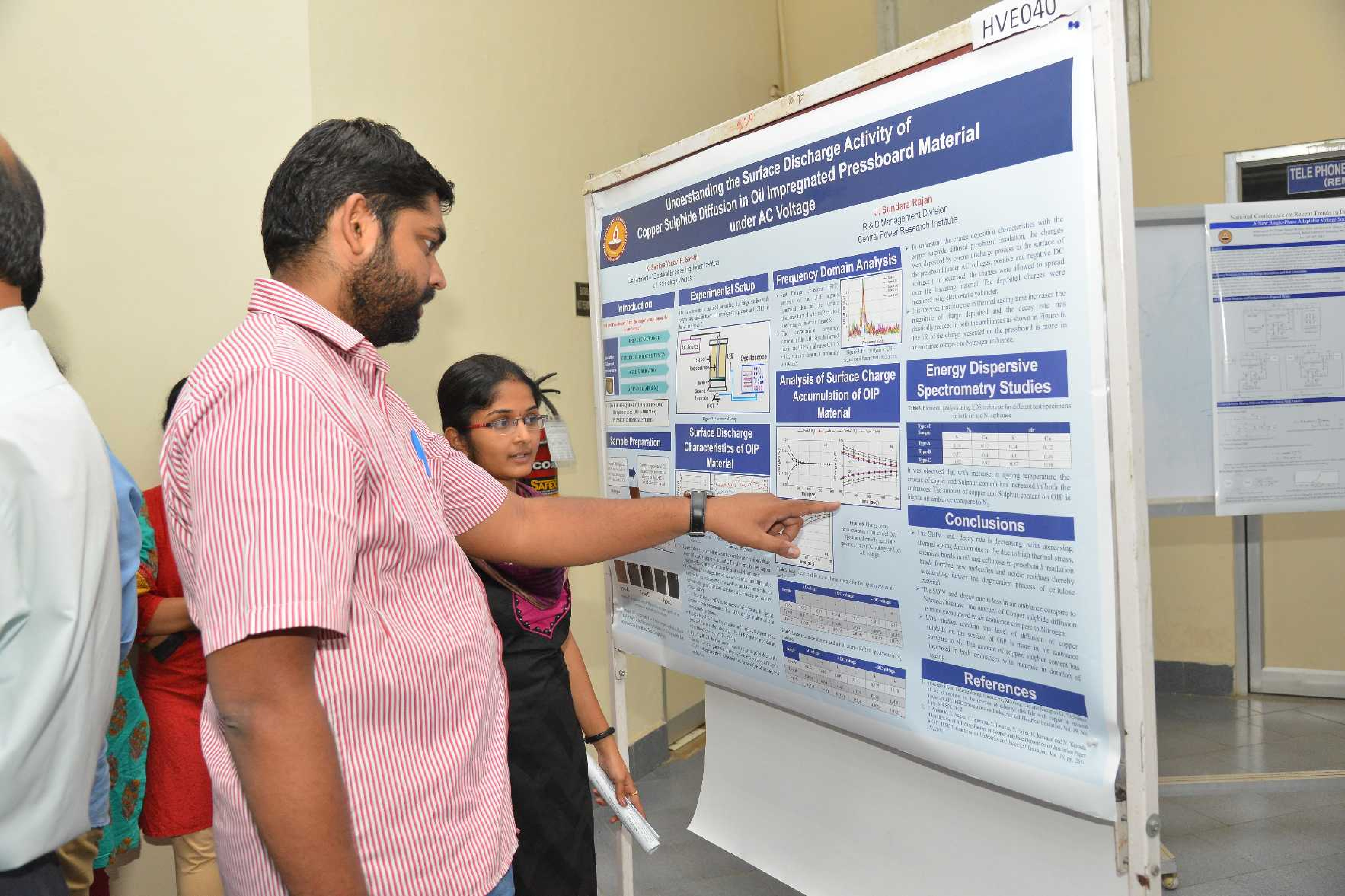

SP 8
PED007
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
COGNITIVE MODELED INTELLIGENT CONTROLLER FOR ELECTRICAL DRIVE
MD Qutubuddin[1] Narri Yadaiah[2]
Jawaharlal Nehru Technological University, Hyderabad, India[1,2]
In the proposed paper brain inspired emotional controller designed to control an electrical motor. As it is known fact that Emotional part of mammalian brain play vital role in balancing, movements and in speech therapy. The consequent concept can apply for an electrical motor, where the characteristics of motor varied with the disturbances occurred at internal and external variations. In the applications like hybrid vehicles, traction and variable speed applications where the control of speed is a challenging process with the change in load, different set constant speed with non linear change of stator currents and parameter variations.
OBJECTIVE
The main aim of this paper is to develop a bio-inspired intelligent controller considering the limbic system of mammalian brain. As per the mammalian brain, limbic system is responsible for emotions of an individual i.e., how faster an individual can take a decision on the issue. The emotional controller has been succeeding in many engineering applications; it is motivated to apply the emotional controller for electrical drives.
Orbitofrontal Cortex
Emotional Cue
Motor Cortex
Amygdala
Thalamus
Sensory Input
Fig.1 Structure of Emotional controller
Fig.2 Computational Model of Emotional controller
RESULTS AND DISCUSSIONS
Case i) At No-Load
Case ii) Load T= 5N-m is applied at t=0.2
Case iii) When variable Load is applied
Fig. 3 Speed Performance of PMSM Drive Emotional controller
Fig. 4. Stator current performance of PMSM Drive
CONCLUSIONS
Simulation results of PMSM drive with Emotional controller
Controllers are carried out at different load settings i.e. start
no load to full load 5N-m and the speed tracking also carried
constant load to variable load. It is observed that Emotion
is very effective in controlling speed and stator current with
of load.

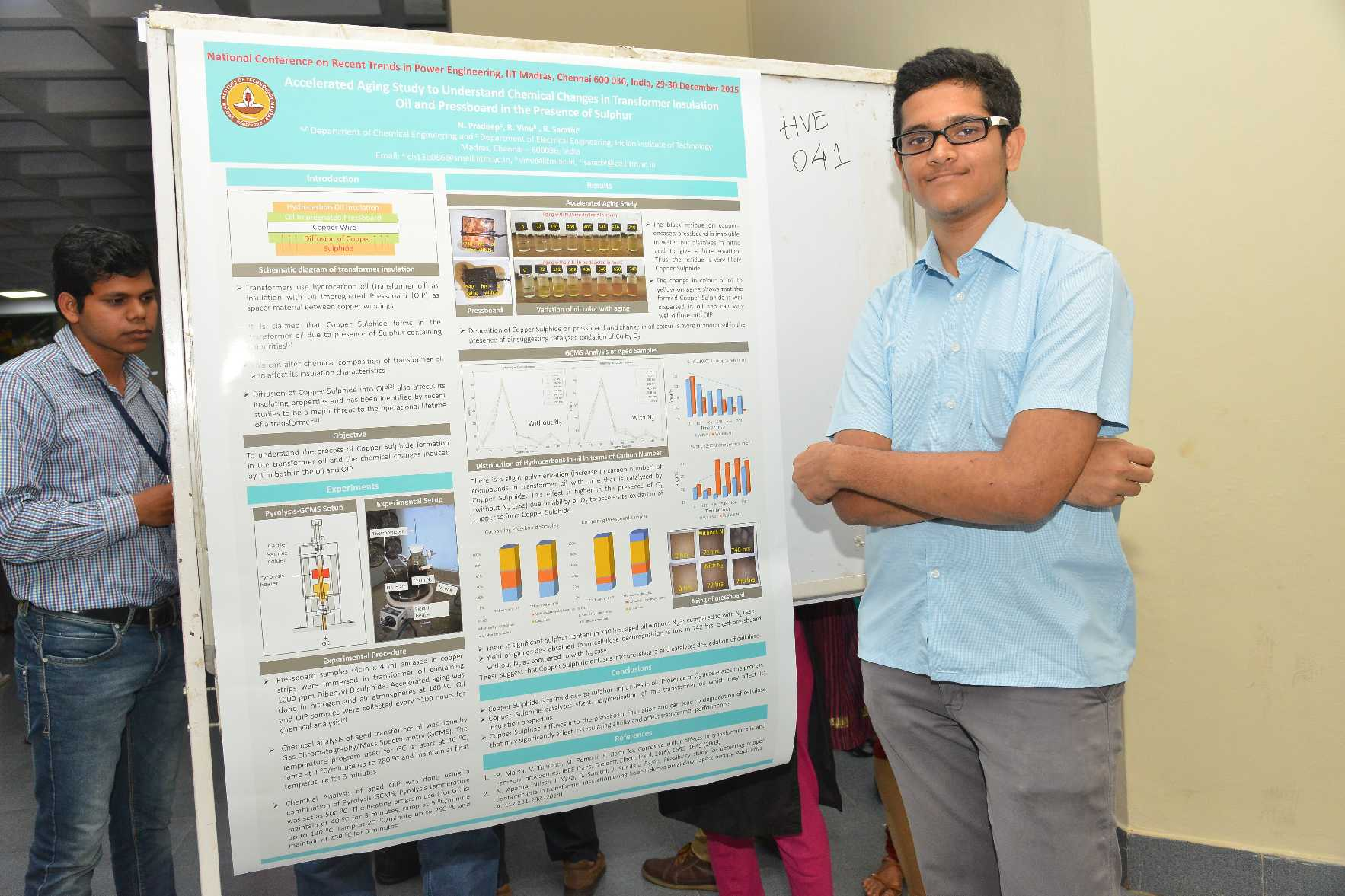


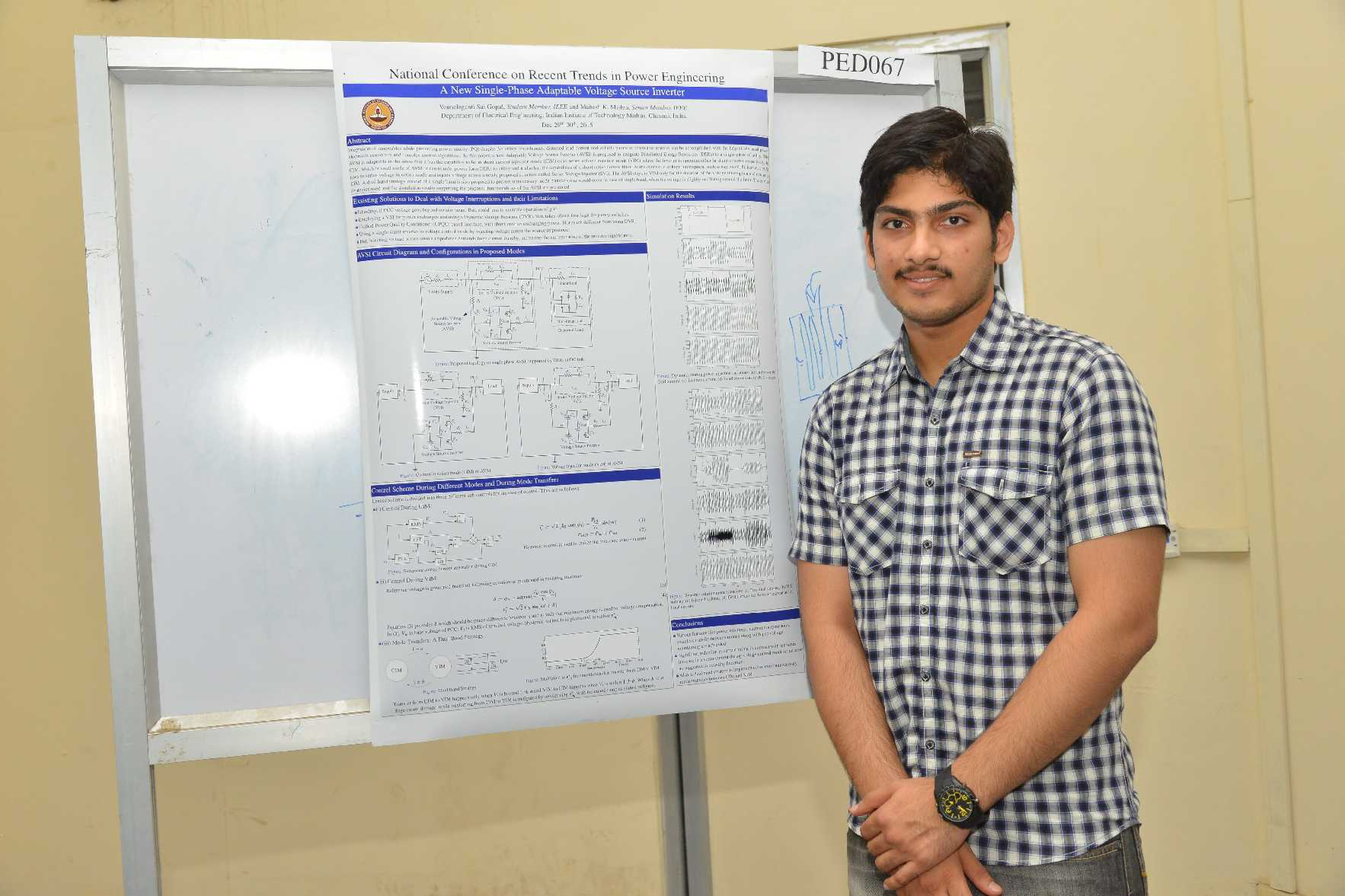
HVE039
PP 11
Behaviour of Water Droplets on Silicon Rubber Insulation Material
Gorla Vineeth, Palash Mishra, R.Sarathi
Indian Institute of Technology, Madras
Introduction
Experimental Setup
Some Notes-
Why wavelet transform?
The signals used for analysis
Results and Discussion-
Power Spectrum-
Harmonic Distortion Plots-
Conclusion
Reference
सम्मेलन कक्ष 1
CONFERENCE HALL 1

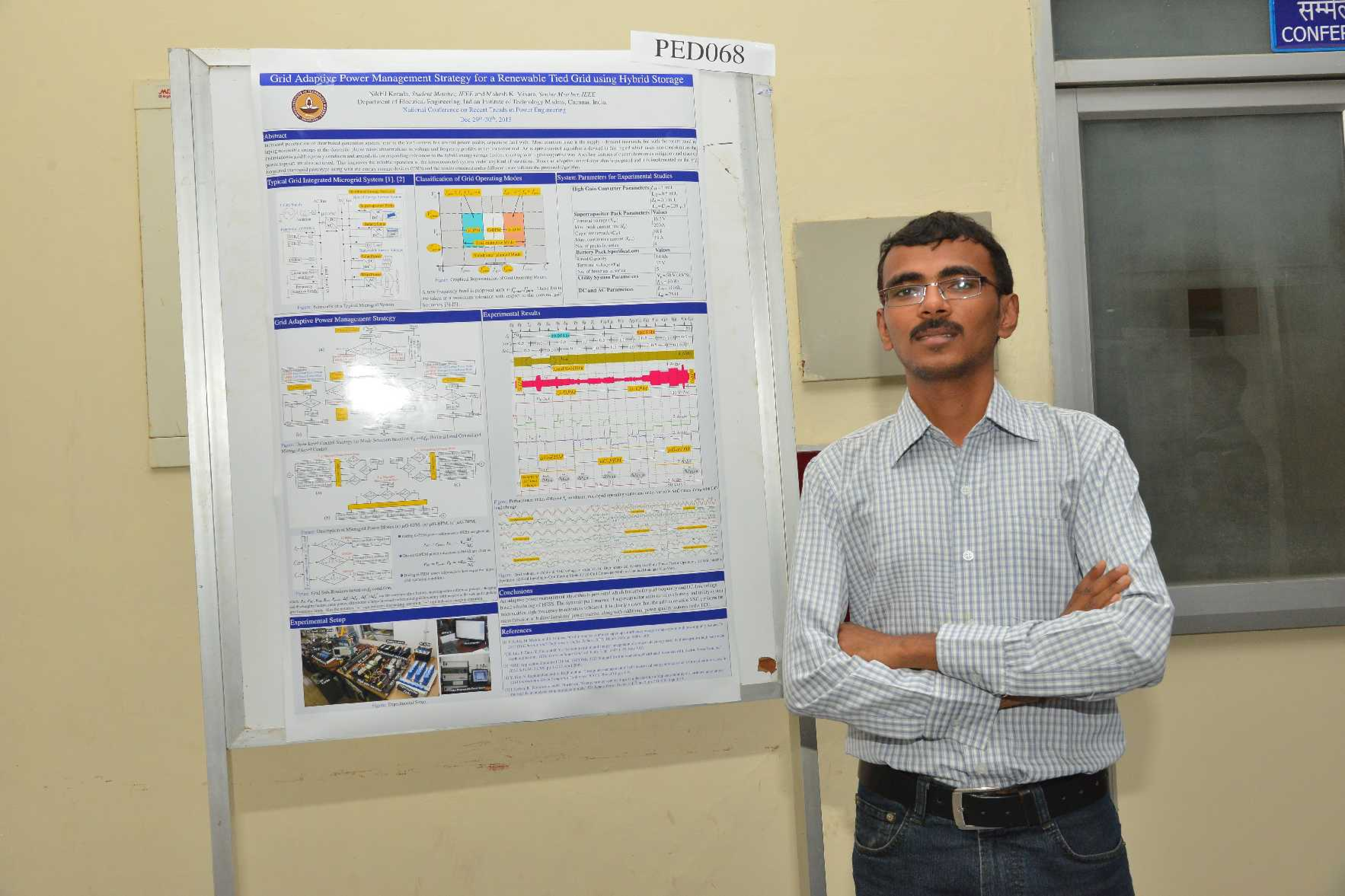


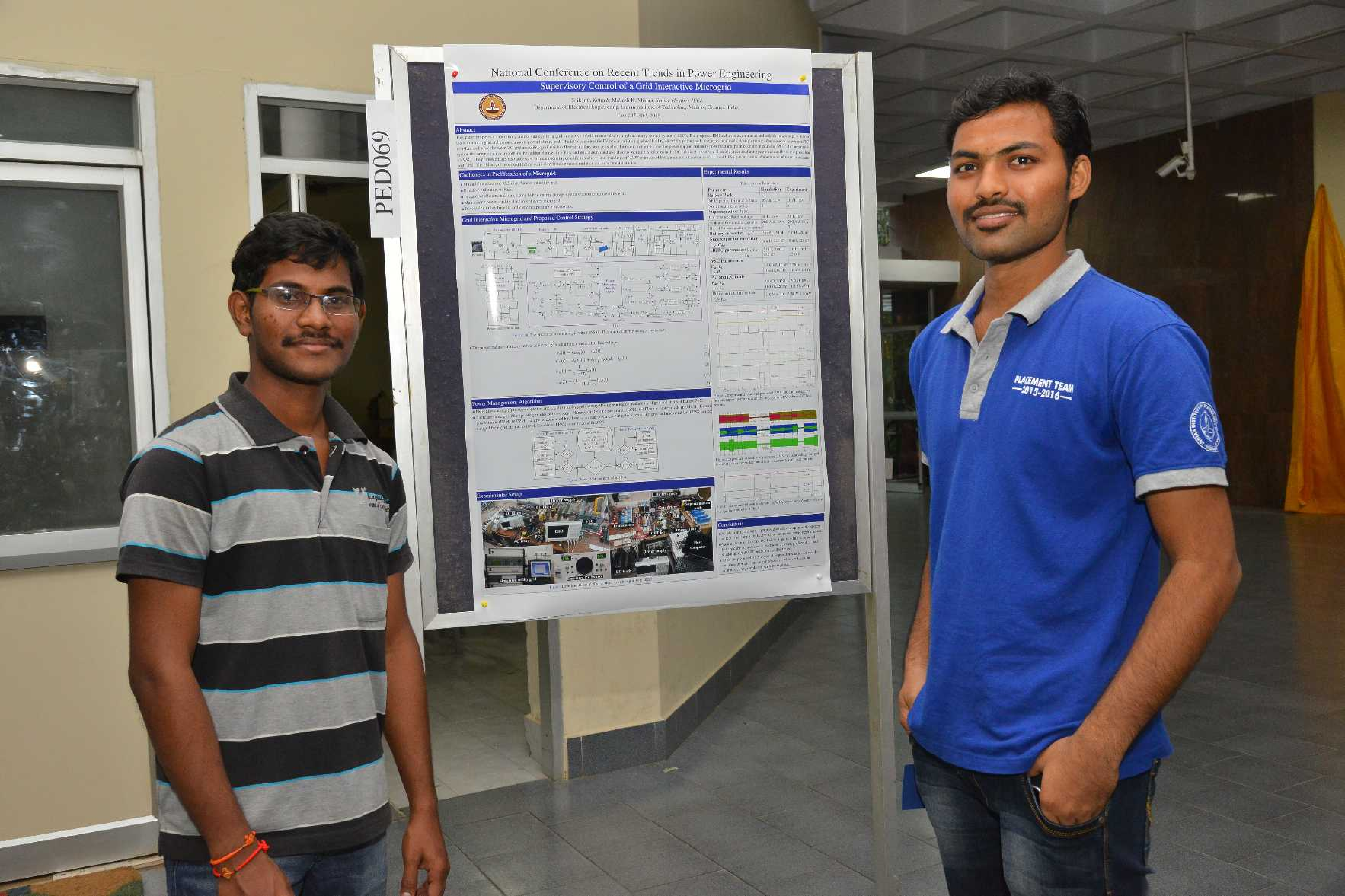
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
PED002
Field Computation of Efficiency of an Induction Machine Working on Unbalanced Conditions using Modified Non-Intrusive Air-Gap Method
G. S. Grewal and B. S. Rajpurohit
School of Computing & Electrical Engineering, Indian Institute of TechnologyMandi, Mandi-175001, Himachal Pradesh, India
Introduction
Field Conditions
Methods
MRAS for Speed Estimation
(based on Landau concept on adaptation mechanism)
Modified Non-Intrusive Air-Gap Torque Method for Efficiency Estimation
Using Parks transformations in stationary reference frame, torque is given by
Case 1: IEEE Std. 112, F&W loss = 1.2% of rated O/P & SLL= 1.8% of rated O/P.
Case 2: Indian Std. identical to IEC 60034-2-1: 2007, F&W loss + core loss = 3.5% of rated I/P and stray load loss is given by
Experimental Setup
•For 45.8% unbalancing, Vab = 408 Volts, Vbc = 380 Volts & Vca = 400 Volts i.e. 5% Unbalancing.
• For 55.78% loading, Vab = 392 Volts, Vbc = 366 Volts & Vca = 382 Volts.
*Phasor computations are not required.
Results & Discussion
Speed estimation
Speed using MRAS
Speed using optical tachometer
1394rpm
Efficiency Estimation
% Load
Operating condition
Speed (rpm)
IEEE Standard 112 Method (Case 1)
Efficiency (%)
Torque (Nm)
Efficiency (%)
Torque (Nm)
79.45 Balanced 1370 77.25 5.2196 73.67
45.8 Unbalanced 1489 71.59 3.1402 65.10 2.067
IM Parameters
IM Nameplate
Conclusions
Proposed Non- Intrusive Air-Gap Method is advantageous
Torque sensor is eliminated
No load test is not required
Relies only on electrical terminal quantities
No obvious error for nameplate inaccuracies
Reduces the downtime of IM


HVE040
Understanding the Surface Discharge Activity of Copper Sulphide Diffusion in Oil Impregnated Pressboard Material under AC Voltage
J. Sundara Rajan
R & D Management Division
Central Power Research Institute
Introduction
Experimental Setup
Frequency Domain Analysis
Sample Preparation
Surface Discharge Characteristics of OIP Material
Analysis of Surface Charge Accumulation of OIP Material
Energy Dispersive Spectrometry Studies
Conclusions
References
TELE PHONE
SAFEX

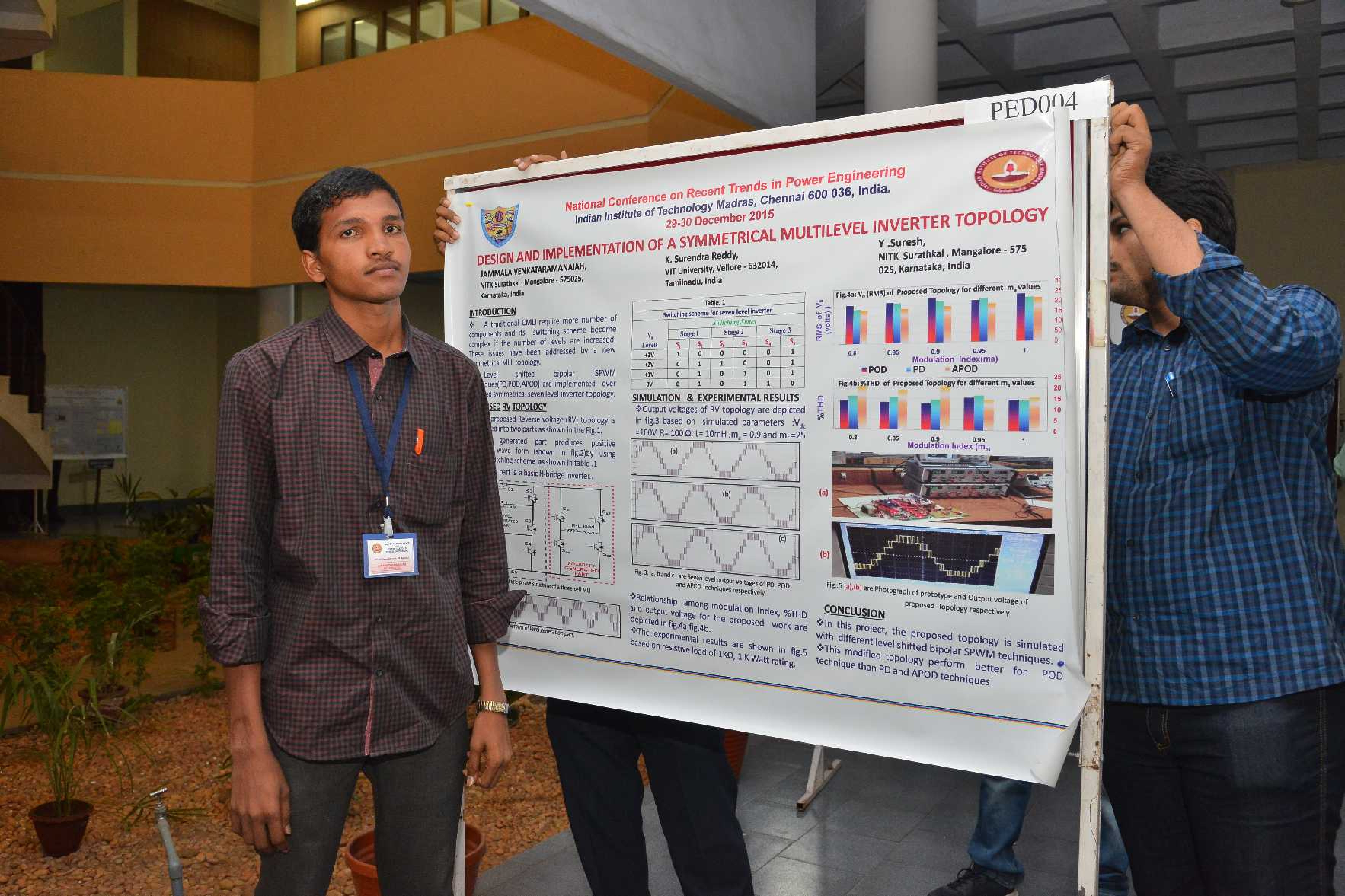

National Conference on Recent Trends in Power Engineering, IIT Madras, Chennai 600 036, India, 29-30 December 2015
Accelerated Aging Study to Understand Chemical Changes in Transformer Insulation Oil and Pressboard in the Presence of Sulphur
Introduction
Hydrocarbon Oil Insulation
Oil Impregnated Pressboard
Copper Wire
Diffusion of Copper Sulphide
Schematic diagram of transformer insulation
Transformers use hydrocarbon oil (transformer oil) as insulation with Oil Impregnated Pressboard (OIP) as spacer material between copper windings
Objective
To understand the process of Copper Sulphide formation in the transformer oil and the chemical changes induced by it in both the oil and OIP
Experiments
Pyrolysis-GCMS Setup
Experimental Setup
Experimental Procedure
Results
Accelerated Aging Study
Pressboard
Variation of oil color with aging
GCMS Analysis of Aged Samples
Distribution of Hydrocarbons in oil in terms of Carbon Number
Aging of pressboard
Conclusions
References
HVE
041

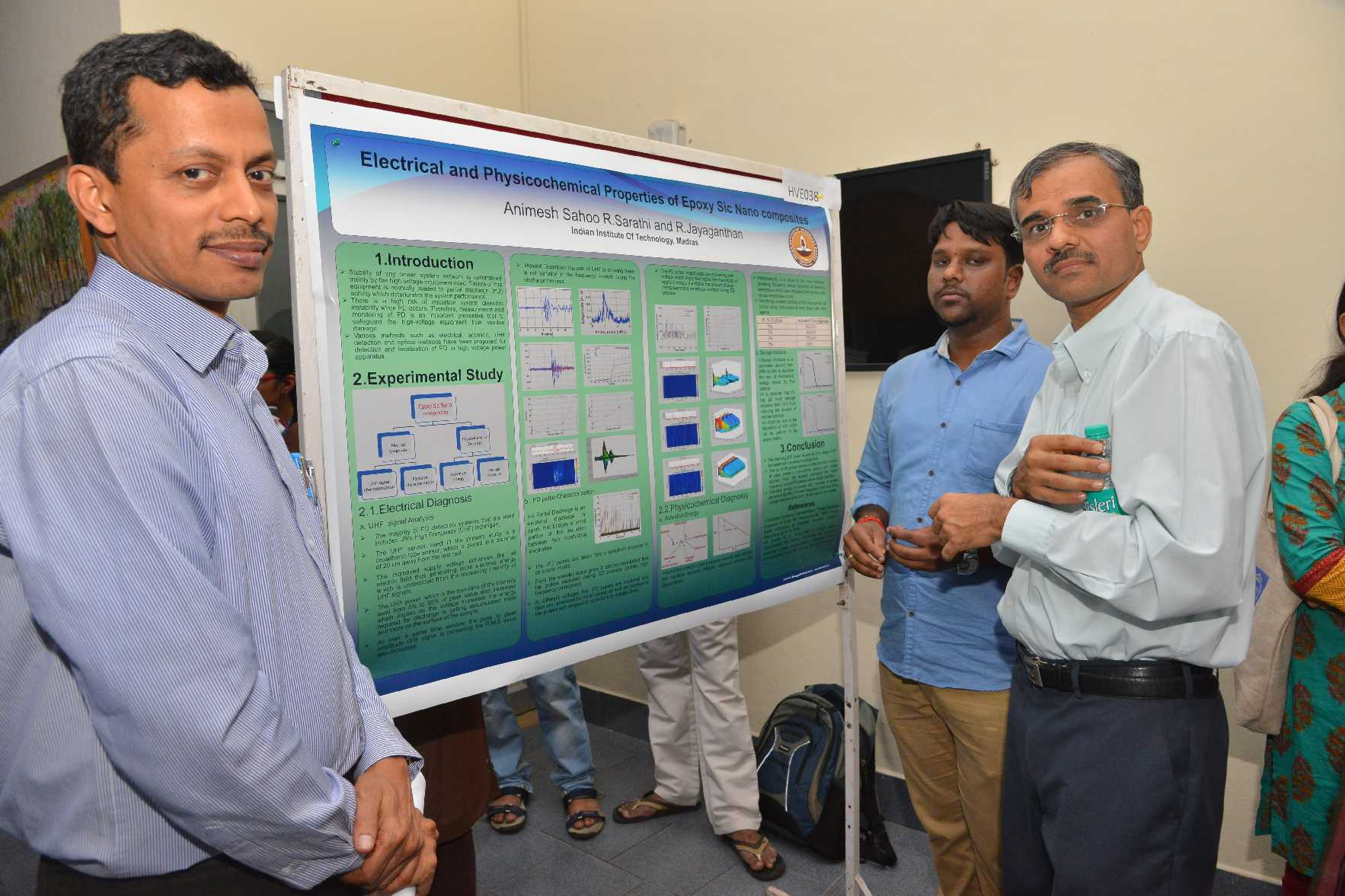

PED067
National Conference on Recent Trends in Power Engineering
A New Single-Phase Adaptable Voltage Source Inverter
Abstract
Simulation Results
AVSI Circuit Diagram and Configurations in Proposed Modes
Control Scheme During Different Modes and During Mode Transfers
Conclusions


PED068
Grid Adaptive Power Management Strategy for a Renewable Tied Grid using Hybrid Storage
National Conference on Recent Trends in Power Engineering
Abstract
Typical Grid Integrated Microgrid System [1], [2]
Classification of Grid Operating Modes
System Parameters for Experimental Studies
Grid Adaptive Power Management Strategy
Experimental Results
Conclusions
References
Experimental Setup
CONFER

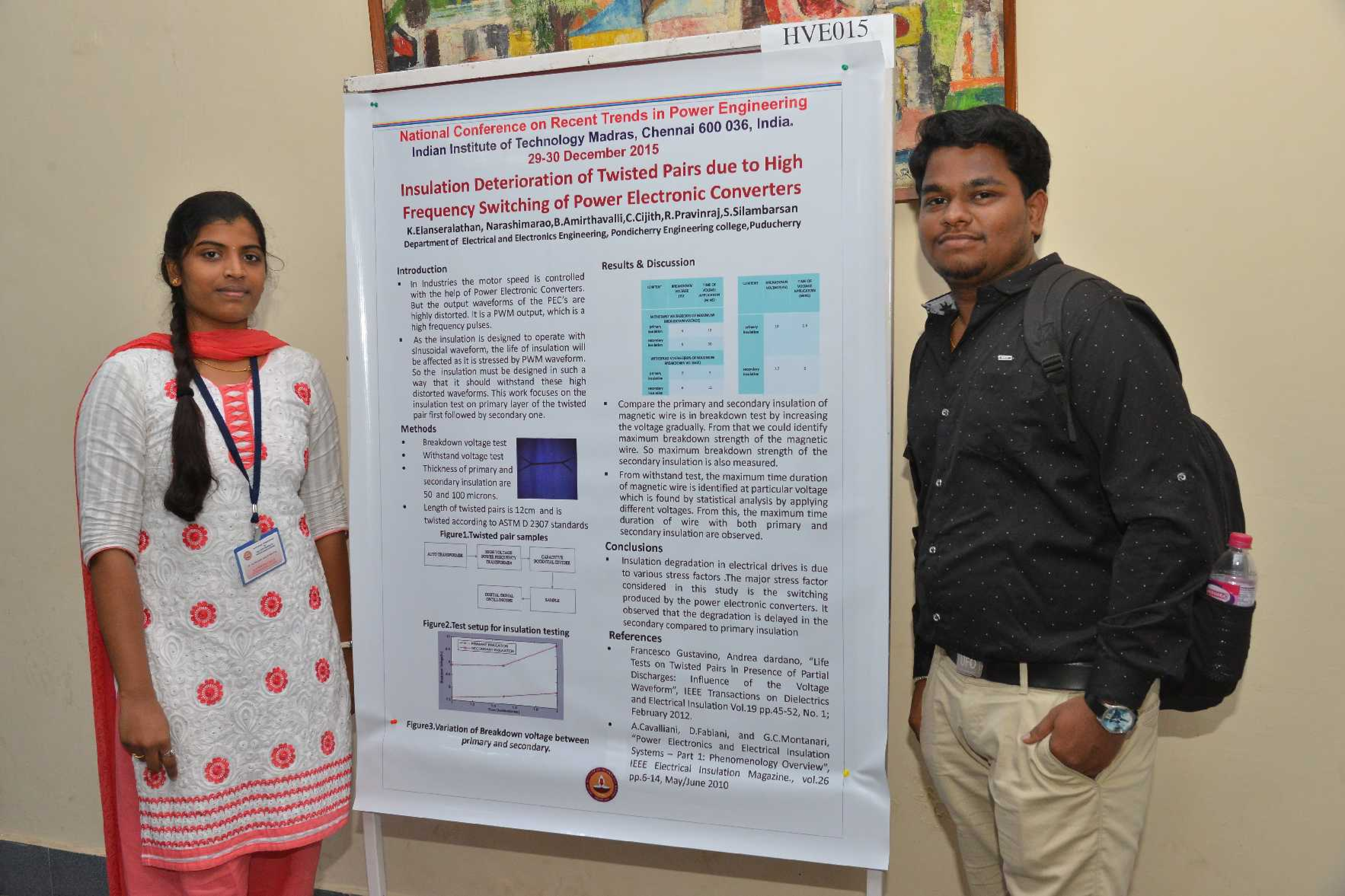


PED069
National Conference on Recent Trends in Power Engineering
Supervisory Control of a Grid Interactive Microgrid
Abstract
Challenges in Proliferation of a Microgrid
Grid Interactive Microgrid and Proposed Control Strategy
Experimental Results
Power Management Algorithm
Experimental Setup
Conclusions
PLACEMENT TEAM
2015-2016

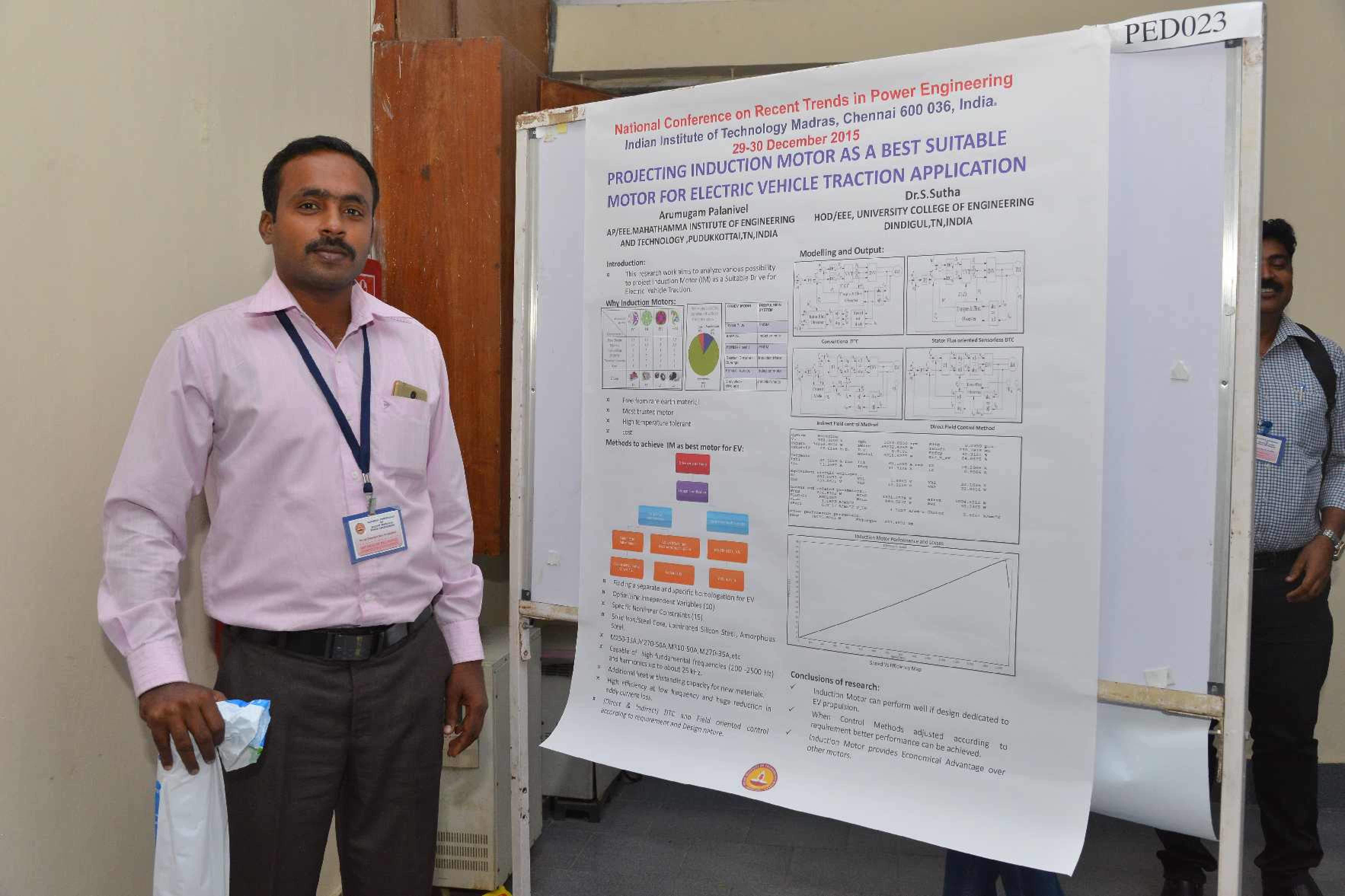

PED004
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
DESIGN AND IMPLEMENTATION OF A SYMMETRICAL MULTILEVEL INVERTER TOPOLOGY
JAMMALA VENKATARAMANAIAH,
NITK Surathkal , Mangalore - 575025,
Karnataka, India
K. Surendra Reddy,
VIT University, Vellore - 632014,
Tamilnadu, India
Y .Suresh,
NITK Surathkal , Mangalore - 575
025, Karnataka, India
INTRODUCTION
A traditional CMLI require more number of components and its switching scheme become complex if the number of levels are increased.
Table. 1
Switching scheme for seven level inverter
SIMULATION & EXPERIMENTAL RESULTS
Output voltages of RV topology are depicted in fig.3 based on simulated parameters
Fig. 3: a, b and c are Seven level output voltages of PD, POD and APOD Techniques respectively
Relationship among modulation index, %THD and output voltage for the proposed work are depicted in fig.4a,fig.4b.
The experimental results are shown in fig.5 based on resistive load of 1KΩ, 1 K Watt rating.
Fig.4a: V0 (RMS) of Proposed Topology for different ma values
Modulation Index(ma)
POD
PD
APOD
Fig.4b: %THD of Proposed Topology for different ma values
%THD
Modulation Index (ma)
Fig..5:(a),(b) are Photograph of prototype and Output voltage of proposed Topology respectively
CONCLUSION
In this project, the proposed topology is simulated with different level shifted bipolar SPWM techniques.
This modified topology perform better for POD technique than PD and APOD techniques

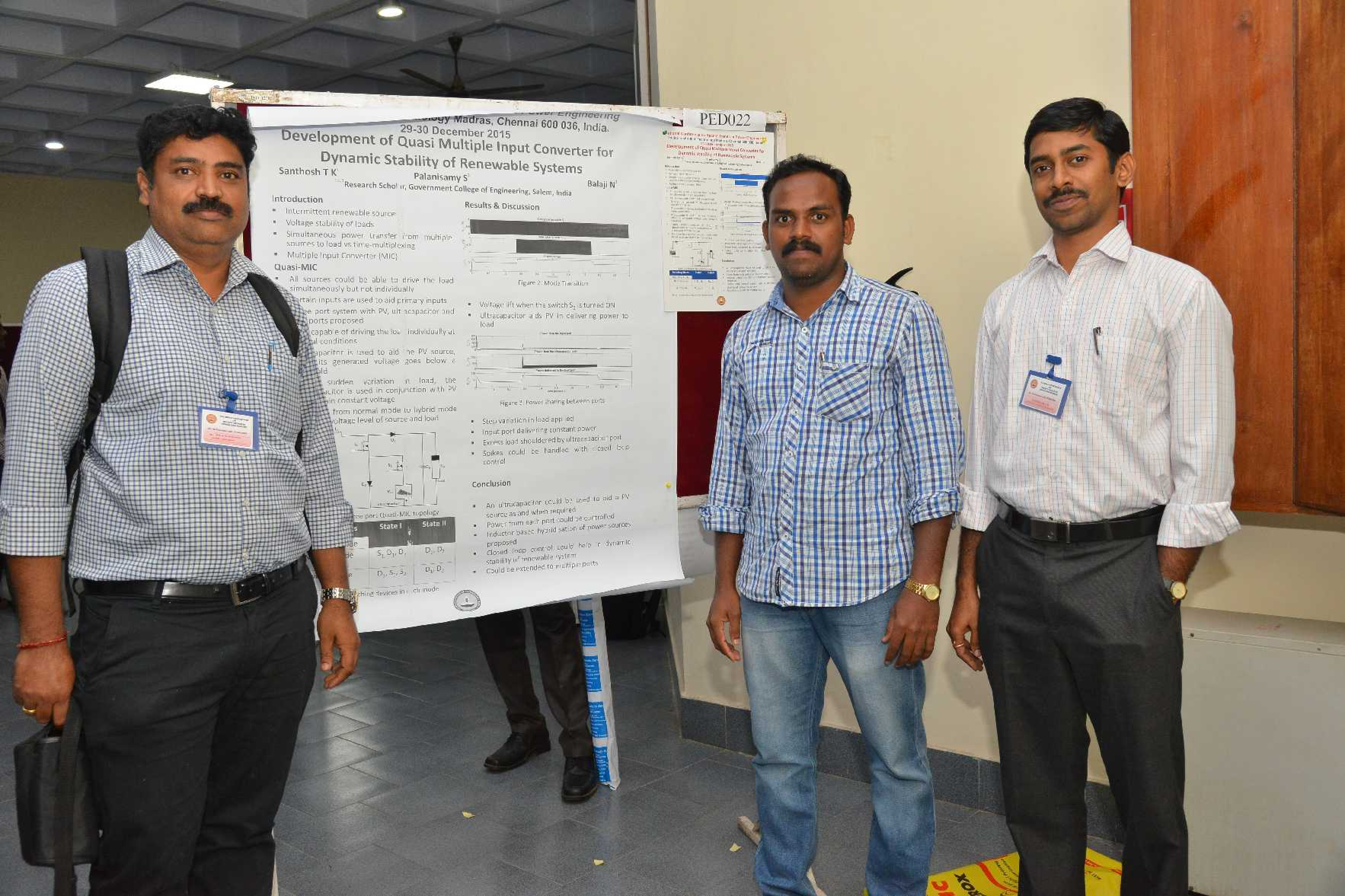

HVE038
Electrical and Physicochemical Properties of Epoxy Sic Nano composites
Animesh Sahoo R.Sarathi and R.Jayaganthan
Indian Institute Of Technology, Madras
1.Introduction
2.Experimental Study
2.1.Electrical Diagnosis
a. UHF signal Analysis
b. PD pulse Characterization
2.2 Physicochemical Diagnosis
3.Conclusion
References
bisleri


CONFERENCE HALL 2
EATABLES AND DRINKS
NOT PERMITTED INSIDE THE HALL
Behaviour of Water Droplets on Silicon Rubber
Insulation Material
Gorle Vineeth, Palash Mishra, R.Sarathi
Experimental Setup
Conclusions
References

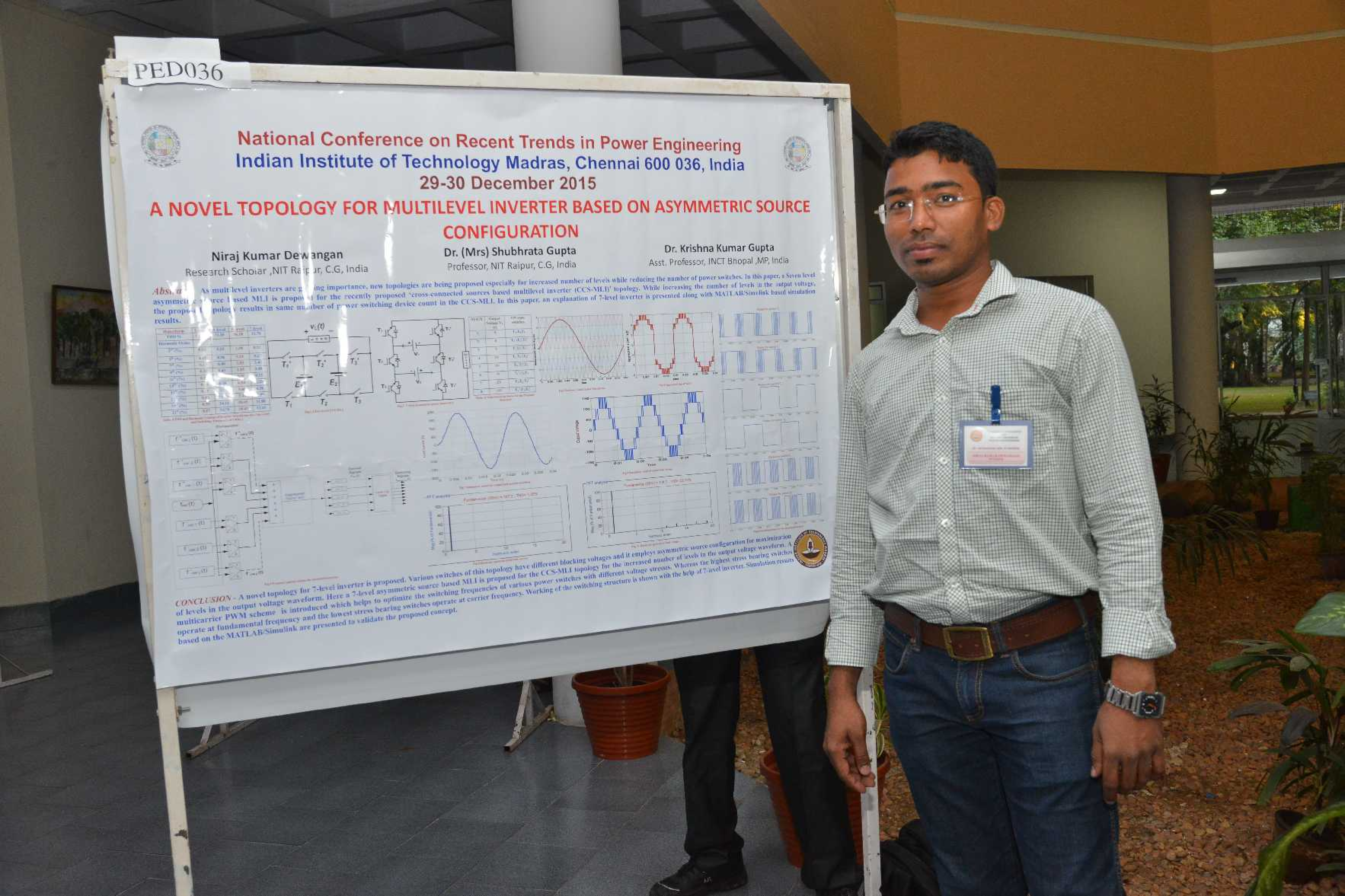

HVE015
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Insulation Deterioration of Twisted Pairs due to High Frequency Switching of Power Electronic Converters
K.Elanseralathan, Narashimarao,B.Amirthavalli,C.Cijith,R.Pravinraj,S.Silambarsan
Department of Electrical and Electronics Engineering, Pondicherry Engineering college,Puducherry
Introduction
In Industries the motor speed is controlled with the help of Power Electronic Converters. But the output waveforms of the PEC's are highly distorted. It is a PWM output, which is a high frequency pulses.
As the insulation is designed to operate with sinusoidal waveform, the life of insulation will be affected as it is stressed by PWM waveform. So the insulation must be designed in such a way that it should withstand these high distorted waveforms. This work focuses on the insulation test on primary layer of the twisted pair first followed by secondary one.
Methods
Breakdown voltage test
Withstand voltage test
Thickness of primary and secondary insulation are 50 and 100 microns.
Length of twisted pairs is 12cm and is twisted according to ASTM D 2307 standards
Figure1.Twisted pair samples
Figure2.Test setup for insulation testing
Figure3.Variation of Breakdown voltage between primary and secondary.
Results & Discussion
Compare the primary and secondary insulation of magnetic wire is in breakdown test by increasing the voltage gradually. From that we could identify maximum breakdown strength of the magnetic wire. So maximum breakdown strength of the secondary insulation is also measured.
From withstand test, the maximum time duration of magnetic wire is identified at particular voltage which is found by statistical analysis by applying different voltages. From this, the maximum time duration of wire with both primary and secondary insulation are observed.
Conclusions
Insulation degradation in electrical drives is due to various stress factors .The major stress factor considered in this study is the switching produced by the power electronic converters. It observed that the degradation is delayed in the secondary compared to primary insulation
References
Francesco Gustavino, Andrea dardano, "Life Tests on Twisted Pairs in Presence of Partial Discharges: Influence of the Voltage Waveform", IEEE Transactions on Dielectrics and Electrical Insulation Vol.19 pp.45-52, No. 1; February 2012.
A.Cavalliani, D.Fabiani, and G.C.Montanari, "Power Electronics and Electrical Insulation Systems – Part 1: Phenomenology Overview", IEEE Electrical Insulation Magazine., vol.26 pp.6-14, May/June 2010

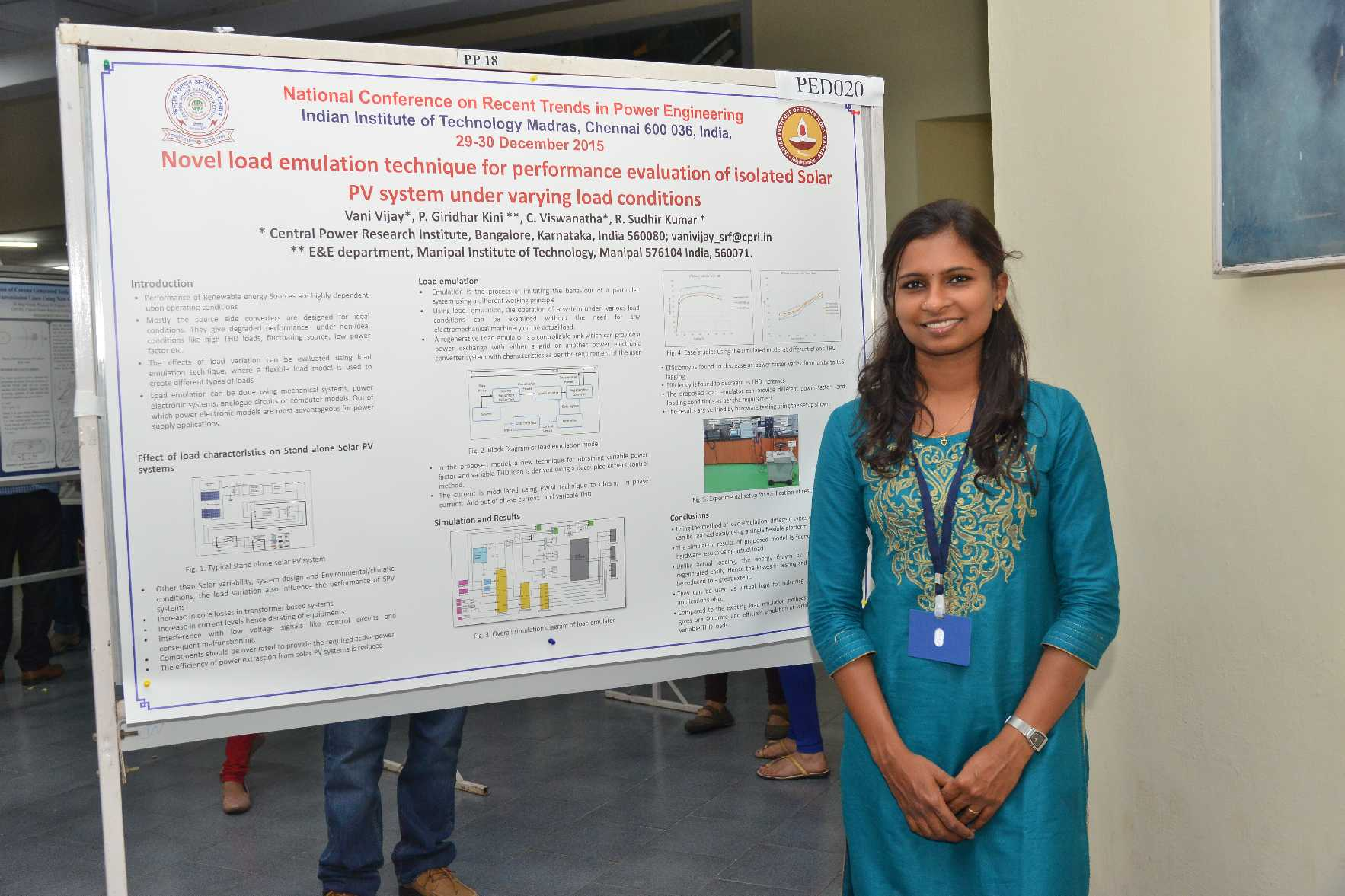

HVE010
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Partial Discharge Characteristics of Synthetic Ester-Pressboard Insulation System: Effect of Conducting Particle
C. Thirumurugan, Ramesh Oruganti
School of Computing and Electrical Engineering,
Indian Institute of Technology Mandi,
Mandi-175001, Himachal Pradesh, India.
Ganesh Kumbhar
Department of Electrical Engineering,
Indian Institute of Technology Roorkee,
Roorkee-247667, Uttarakhand, India.
Introduction (Research Area- High Voltage Engineering)
Properties
Pressboard
Transformer Oil
Origin
Cellulose of highest quality
Paraffinic, naphthalene
Manufacture
Unbleached sulfate Cellulose
extracts from petroleum
Usage
insulation and mechanical Support
insulation well as cooling
•Partial discharge(PD)- electrical discharge partially bridges the insulation.
•PD- sign of insulation degradation and root cause of breakdown.
•In order to understand PD- artificial defects were added (i.e. conducting particles -Cu).
Experimental work (two parts)
Results & Discussion (PRPD patterns)
•Two samples- 1. Cu particles at centre of electrodes 2. Cu particle at near by earth electrode
• Measured value- PRPD pattern(Phase resolved partial discharge pattern)
Conclusions
• To check the suitability of synthetic ester for transformer insulation the PD experiment of Synthetic ester-pressboard with Cu particles has been carried out.
• As per the above PD patterns, Cu particles at the centre of the electrodes is having more repetitive pulses than Cu particles at nearby earth electrode.
• This PD patterns are used for condition monitoring of large transformers.
Reference
• Sarathi.R, I.P.Merin Sheema, J.sundarajan, M.G.Daikas, "Influence of harmonic ac voltage on surface discharge formation in transformer insulation", IEEE Trans. on DEI, vol. 21, No.5, pp. 2183-92, 2014.


PED023
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
PROJECTING INDUCTION MOTOR AS A BEST SUITABLE MOTOR FOR ELECTRIC VEHICLE TRACTION APPLICATION
Arumugam Palanivel
AP/EEE,MAHATHAMMA INSTITUTE OF ENGINEERING AND TECHNOLOGY ,PUDUKKOTTAI,TN,INDIA
Dr.S.Sutha
HOD/EEE, UNIVERSITY COLLEGE OF ENGINEERING DINDIGUL,TN,INDIA
Introduction:
This research work aims to analyze various possibility to project Induction Motor (IM) as a Suitable Drive for Electric Vehicle Traction.
Why Induction Motors:
Free from rare earth material
Most trusted motor
High temperature tolerant
cost
Methods to achieve IM as best motor for EV:
Finding a separate and specific homologation for EV
Optimizing Independent Variables (10)
Specific Nonlinear Constraints (15)
Solid Iron/Steel Core, Laminated Silicon Steel, Amorphous Steel
M250-35A,M270-50A,M310-50A,M270-35A,etc
Capable of high fundamental frequencies (200 -2500 Hz) and harmonics up to about 25 kHz.
Additional heat withstanding capacity for new materials.
High efficiency at low frequency and huge reduction in eddy current loss.
(Direct & Indirect) DTC and Field oriented control according to requirement and Design nature.
Modelling and Output:
Conventional DTC
Stator Flux oriented Sensorless DTC
Indirect Field control Method
Direct Field Control Method
Induction Motor Performance and Losses
Speed Vs Efficiency Map
Conclusions of research:
Induction Motor can perform well if design dedicated to EV propulsion.
When Control Methods adjusted according to requirement better performance can be achieved.
Induction Motor provides Economical Advantage over other motors.



29-30 December 2015
Development of Quasi Multiple Input Converter for Dynamic Stability of Renewable Systems
Santhosh T K
Palanisamy S
Balaji N
Introduction
Intermittent renewable source
Voltage stability of loads
Simultaneous power transfer from multiple sources to load vs time-multiplexing
Multiple Input Converter (MIC)
Quasi-MIC
All sources could be able to drive the load simultaneously but not individually
Results & Discussion
Figure 2: Mode Transition
Ultracapacitor aids PV in delivering power to load
Figure 3: Power sharing between ports
Step variation in load applied
Input port delivering constant power
Excess load shouldered by ultracapacitor port
Spikes could be handled with closed loop control
Conclusion
An ultracapacitor could be used to aid a PV source as and when required
Power from each port could be controlled
State I
State II
PED022


PED036
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
A NOVEL TOPOLOGY FOR MULTILEVEL INVERTER BASED ON ASYMMETRIC SOURCE CONFIGURATION
Niraj Kumar Dewangan
Research Scholar ,NIT Raipur, C.G, India
Dr. (Mrs) Shubhrata Gupta
Professor, NIT Raipur, C.G, India
Dr. Krishna Kumar Gupta
Asst. Professor, INCT Bhopal ,MP, India


National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India,
29-30 December 2015
Novel load emulation technique for performance evaluation of isolated Solar PV system under varying load conditions
Vani Vijay*, P. Giridhar Kini **, C. Viswanatha*, R. Sudhir Kumar *
* Central Power Research Institute, Bangalore, Karnataka, India 560080; vanivijay_srf@cpri.in
** E&E department, Manipal Institute of Technology, Manipal 576104 India, 560071.
Introduction
Load emulation
Effect of load characteristics on Stand alone Solar PV systems
Fig. 1. Typical stand alone solar PV system
Fig. 2 Block Diagram of load emulation model
Simulation and Results
Fig. 3. Overall simulation diagram of load emulator
Conclusions

PED041
Synchrophasor Estimation under Dynamic conditions and its Application in Power
PSE031
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Optimal Placement and Sizing of Combined DG and Capacitor For Minimization Of Power Loss & THD in Distorted Distribution Systems
PP 18
National Conference on Recent
Indian Institute of Technology M
29-30 Dece
Novel load emulation technique for pe
PV system under var
Vani Vijay*, P. Giridhar Kini **, C.
* Central Power Research Institute, Bangalore,
** E&E department, Manipal Institute of T
Introduction
Load emulation
Effect of load characteristics on Stand alone Solar PV systems
Simulation and Results


HVE040
LE PHONE EXCHANGE IIT-M
(REMOTE-14)
Surface Discharge Activity of
Oil Impregnated Pressboard Material
r AC Voltage
Coppe
Frequency Domain Analysis
Introduction
Energy Dispersive
Spectrometry Studies
Conclusions
References
THE HALL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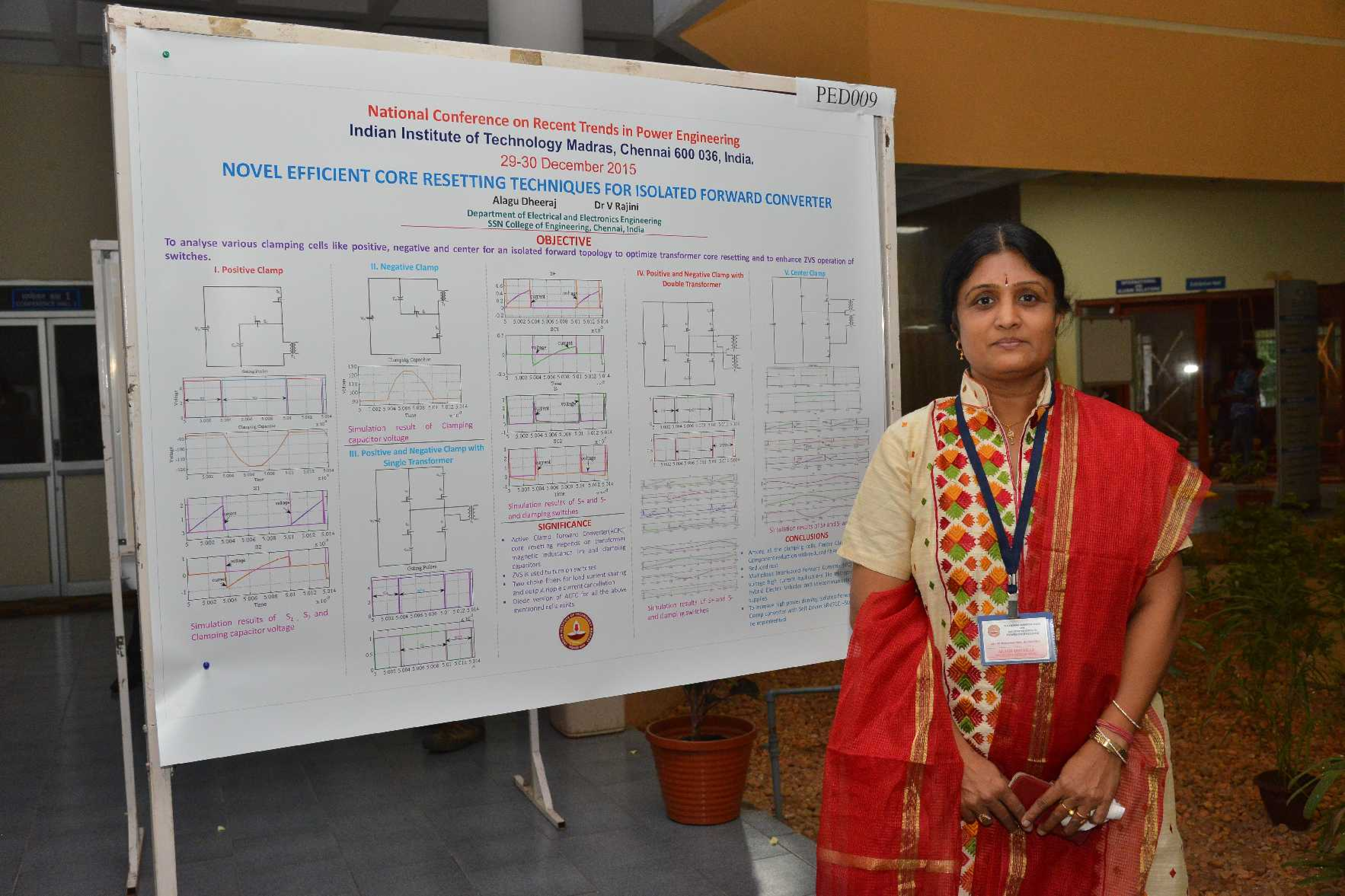
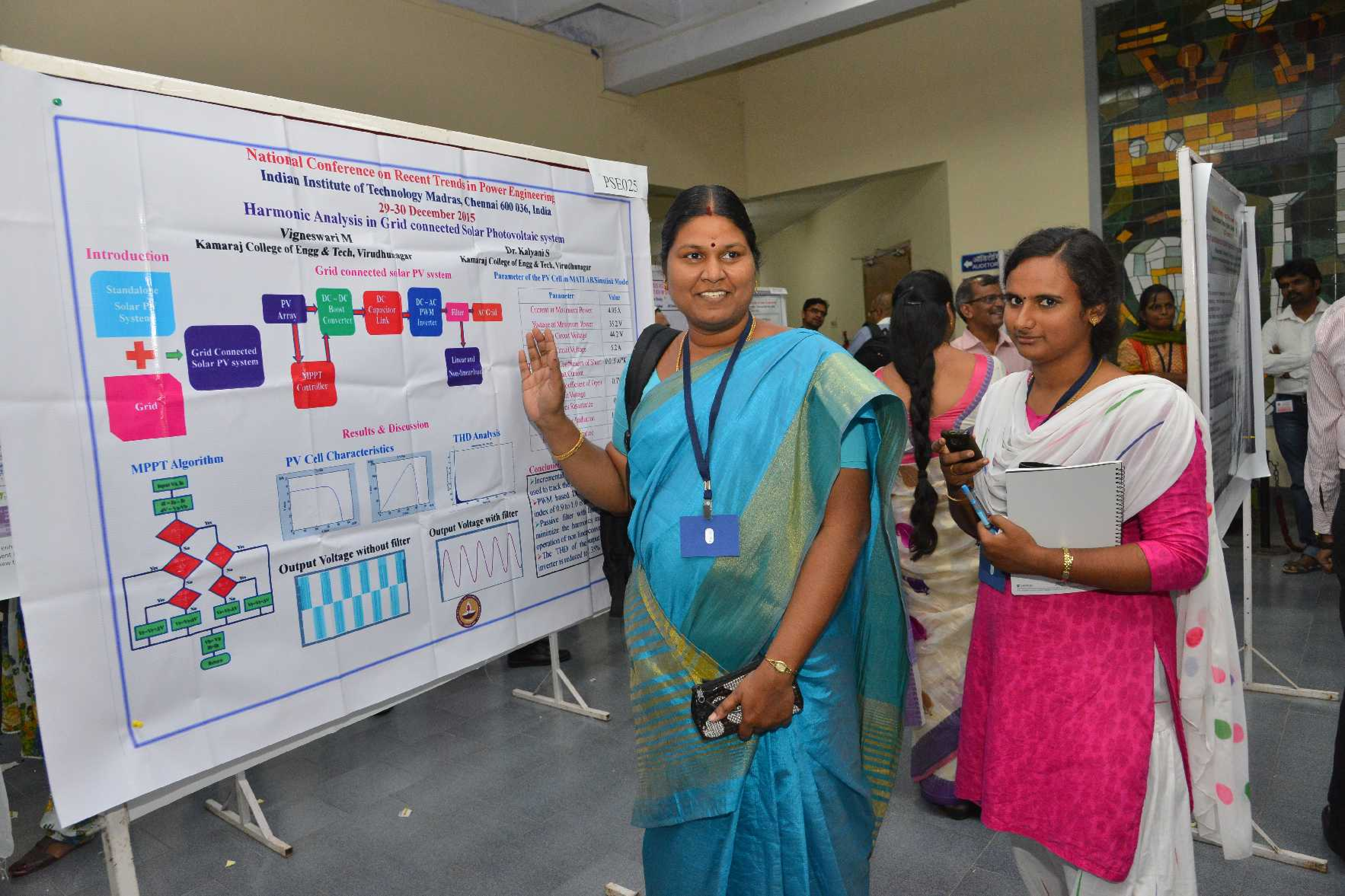
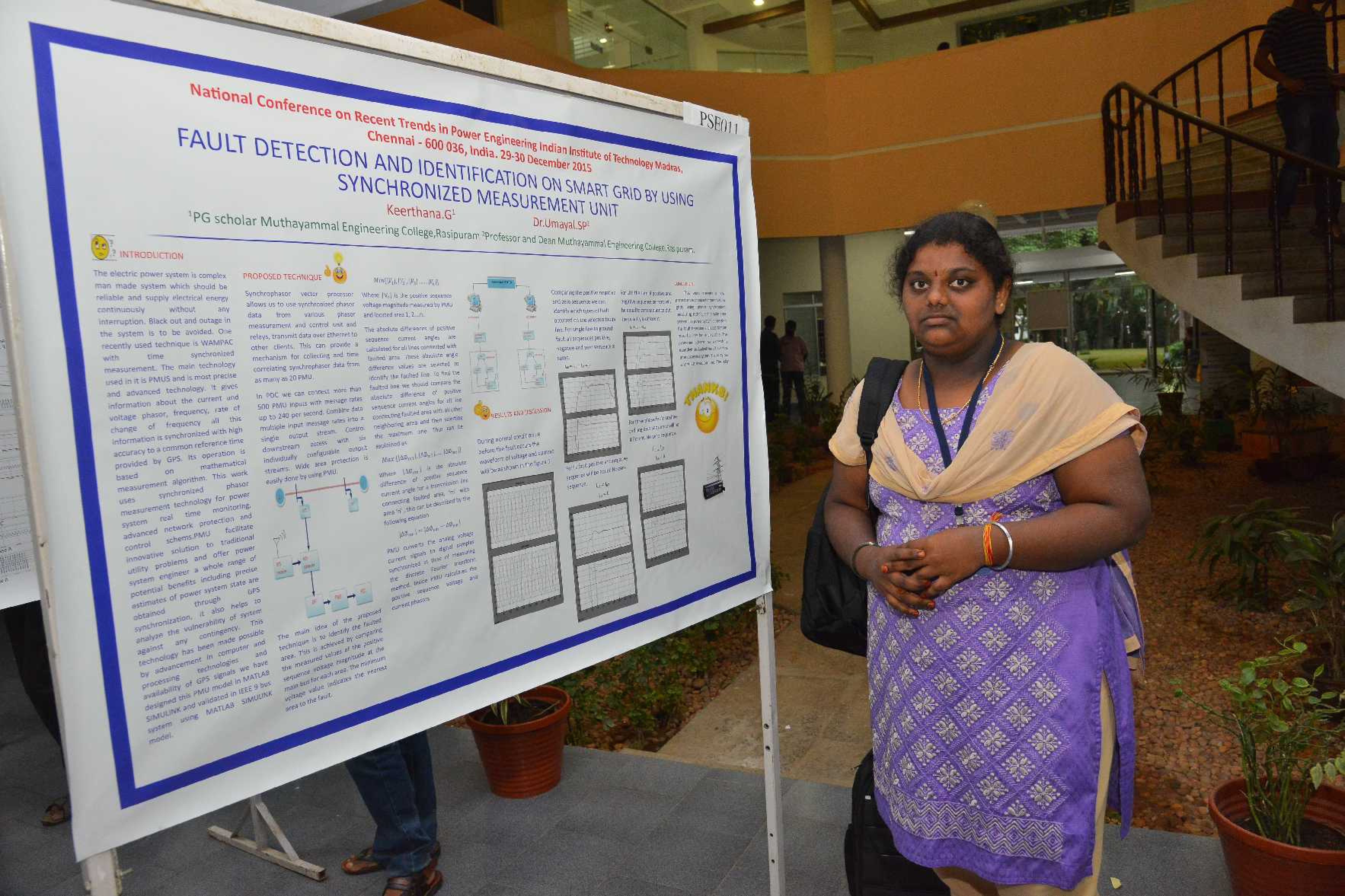
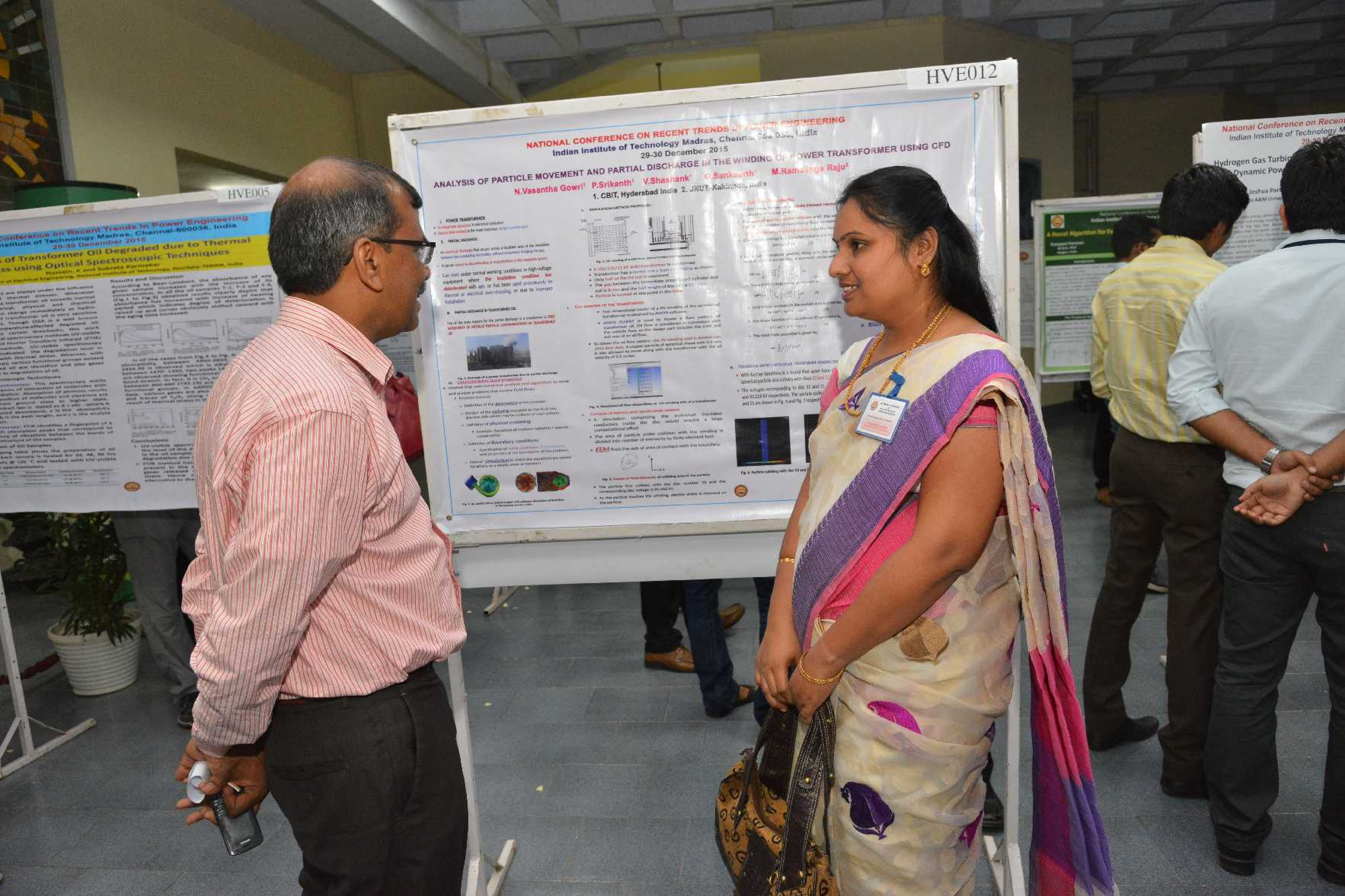
CONFERENCE HALL 2


PED009
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
NOVEL EFFICIENT CORE RESETTING TECHNIQUES FOR ISOLATED FORWARD CONVERTER
Alagu Dheeraj
Dr V Rajini
Department of Electrical and Electronics Engineering
SSN College of Engineering, Chennai, India
OBJECTIVE
To analyse various clamping cells like positive, negative and center for an isolated forward topology to optimize transformer core resetting and to enhance ZVS operation of switches.
I. Positive Clamp
II. Negative Clamp
Simulation result of Clamping capacitor voltage
III. Positive and Negative Clamp with Single Transformer
IV. Positive and Negative Clamp with Double Transformer
V. Center Clamp
Simulation results of S+ and S- and clamping switches
SIGNIFICANCE
CONCLUSIONS
Simulation results of S_1, S_2 and Clamping capacitor voltage

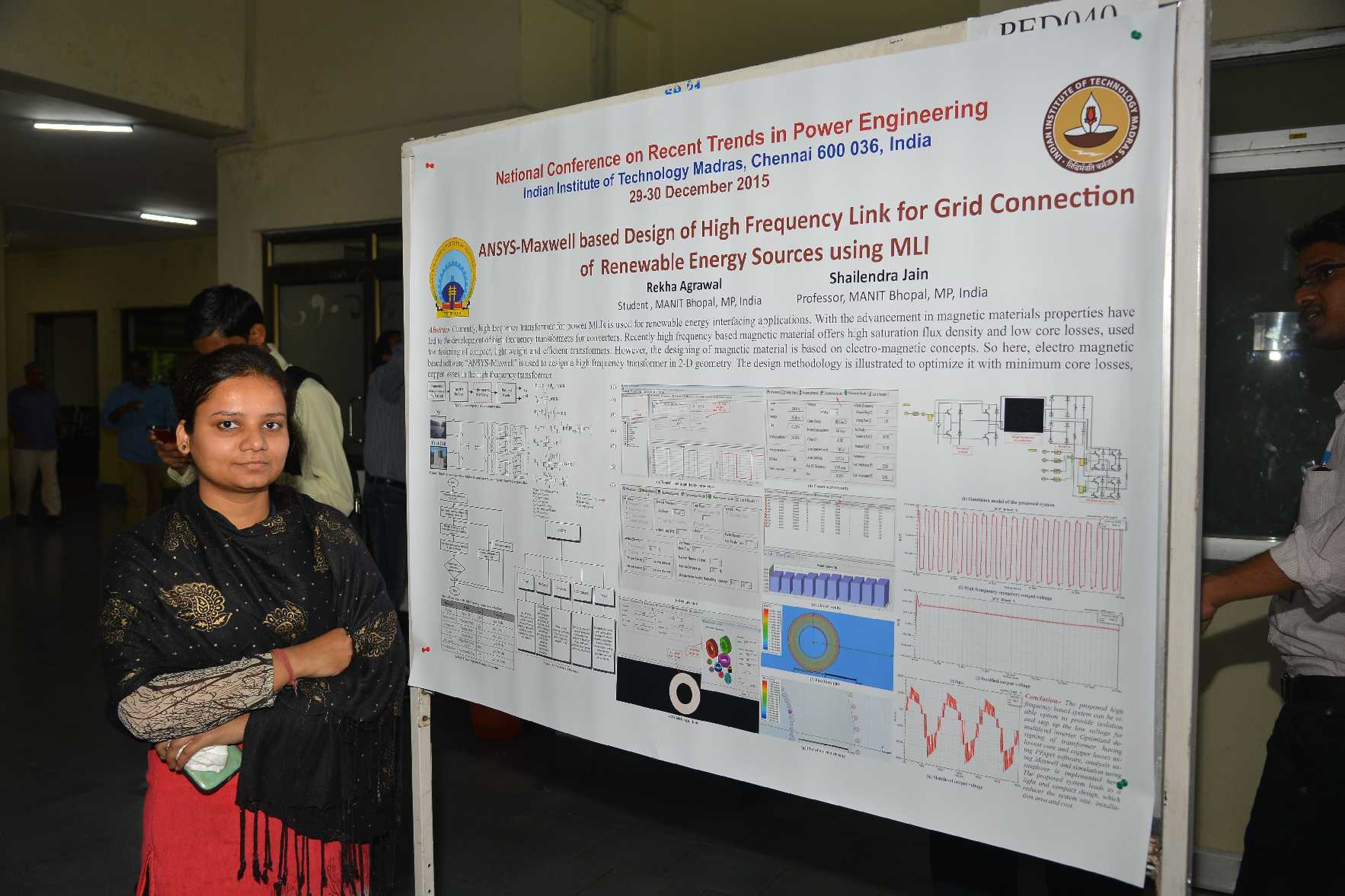

National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
PSE025
Harmonic Analysis in Grid connected Solar Photovoltaic system
Vigneswari M
Kamaraj College of Engg & Tech, Virudhunagar
Dr. Kalyani S
Kamaraj College of Engg & Tech, Virudhunagar
Introduction
Grid connected solar PV system
Grid Connected Solar PV system
Grid
PV Array
DC – DC Boost Converter
DC Capacitor Link
DC – AC PWM Inverter
Filter
AC Grid
MPPT Controller
Results & Discussion
THD Analysis
PV Cell Characteristics
MPPT Algorithm
Output Voltage with filter
Output Voltage without filter


National Conference on Recent Trends in Power Engineering Indian Institute of Technology Madras,
Chennai - 600 036, India. 29-30 December 2015
PSE011
FAULT DETECTION AND IDENTIFICATION ON SMART GRID BY USING
SYNCHRONIZED MEASUREMENT UNIT
Keerthana.G1
Dr.Umayal.SP2
1PG scholar Muthayammal Engineering College,Rasipuram 2Professor and Dean Muthayammal Engineering College,Rasipuram
INTRODUCTION
The electric power system is complex man made system which should be reliable and supply electrical energy continuously without any interruption. Black out and outage in the system is to be avoided. One recently used technique is WAMPAC with time synchronized measurement. The main technology used in it is PMUS and is most precise and advanced technology. It gives information about the current and voltage phasor, frequency, rate of change of frequency all this information is synchronized with high accuracy to a common reference time provided by GPS. Its operation is based on mathematical measurement algorithm. This work uses synchronized phasor measurement technology for power system real time monitoring, advanced network protection and control schems.PMU facilitate innovative solution to traditional utility problems and offer power system engineer a whole range of potential benefits including precise estimates of power system state are obtained through GPS synchronization, it also helps to analyze the vulnerability of system against any contingency. This technology has been made possible by advancement in computer and processing technologies and availability of GPS signals we have designed this PMU model in MATLAB SIMULINK and validated in IEEE 9 bus system using MATLAB SIMULINK model.
PROPOSED TECHNIQUE
Synchrophasor vector processor allows us to use synchronized phasor data from various phasor measurement and control unit and relays, transmit data over Ethernet to other clients. This can provide a mechanism for collecting and time correlating synchrophasor data from as many as 20 PMU.
In PDC we can connect more than 500 PMU inputs with message rates up to 240 per second. Combine data multiple input message rates into a single output stream. Control downstream access with six individually configurable output streams. Wide area protection is easily done by using PMU.
The main idea of the proposed technique is to identify the faulted area. This is achieved by comparing the measured values of the positive sequence voltage magnitude at the main bus for each area. The minimum voltage value indicates the nearest area to the fault.
RESULTS AND DISCUSSION
THANKS!


HVE012
NATIONAL CONFERENCE ON RECENT TRENDS IN POWER ENGINEERING
29-30 December 2015
ANALYSIS OF PARTICLE MOVEMENT AND PARTIAL DISCHARGE IN THE WINDING OF POWER TRANSFORMER USING CFD
N.Vasantha Gowri P.Srikanth V.Shashank G.Sankeerth M.Ramalinga Raju
1. CBIT, Hyderabad India
HVE005
29-30 December 2015


National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
A UNIFIED INHERENT COMPENSATION TECHNIQUE FOR VOLTAGE AND PHASE UNBALANCE WITHOUT USING SEPARATE DC SOURCE
M.K. Ilampooman,
M. Vikash,
Aksheyaa College of Engineering, Kancheepuram
Introduction
The output to input voltage ratio of AC-AC Chopper is given by,
Simulation Results
Conclusions
The simulation of proposed topology was done in MATLAB and the results were found satisfactory. Experimental setup can be modeled for validating the simulation results.

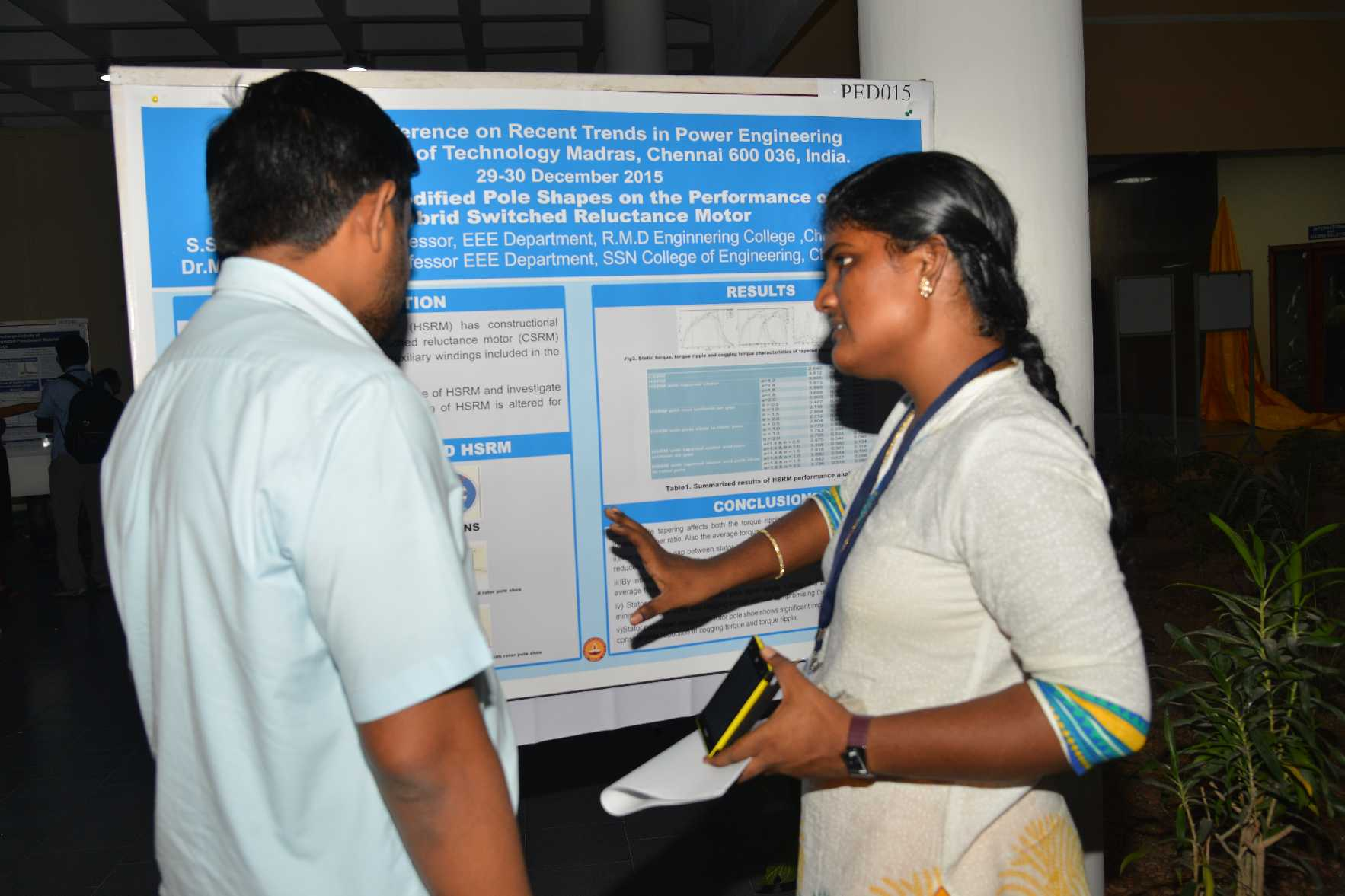

National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
Feasibility of V2G Ideology in Developing Economy : Impact, Analysis and Operation
Md. Samar Ahmad and S. Sivasubramani
Indian Institute of Technology Patna, India
Case 2: V2G Ideological Operation
Conclusion
Forthcoming Research

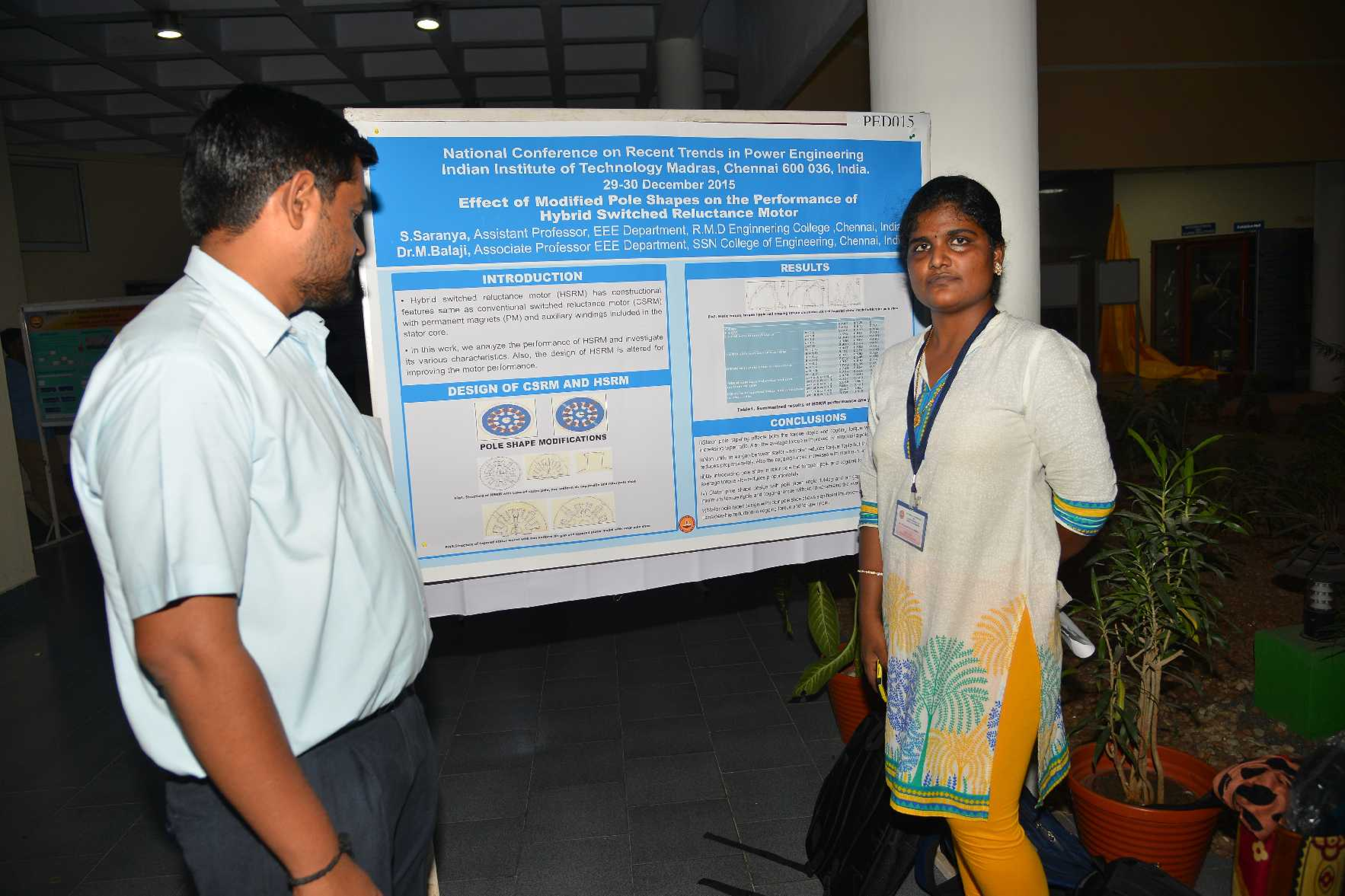


National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
ANSYS-Maxwell based Design of High Frequency Link for Grid Connection of Renewable Energy Sources using MLI
Rekha Agrawal
Student , MANIT Bhopal, MP, India
Shailendra Jain
Professor, MANIT Bhopal, MP, India
Abstract- Currently, high frequency transformer for power MLIs is used for renewable energy interfacing applications. With the advancement in magnetic materials properties have led to the development of high frequency transformers for converters. Recently high frequency based magnetic material offers high saturation flux density and low core losses, used for designing of compact, light weight and efficient transformers. However, the designing of magnetic material is based on electro-magnetic concepts. So here, electro magnetic based software "ANSYS-Maxwell" is used to design a high frequency transformer in 2-D geometry. The design methodology is illustrated to optimize it with minimum core losses, copper losses in the high frequency transformer.
INDIAN INSTITUTE OF TECHNOLOGY MADRAS


GENTS


PSE021
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India
29-30 December 2015
A Systematic Approach towards Developing Proto- type AMI based DSM Model for Load Management
MANJU GUPTA1, SUSHMA GUPTA2, TRIPTA THAKUR3
Maulana Azad National Institute of Technology, Bhopal (M.P.) India
ABSTRACT / INTRODUCTION
CONFIGURATION OF ADVANCED METERING SYSTEM FOR DSM MODEL
PROPOSED METHODOLOGY
SYSTEM DISCRIPTION
1. Smart energy meter
2. Meter Communicatation Module
3. Data Concentrator Unit
DESIGN PARAMETERS OF DSM-AMI MODULE
Algorithm is based on K factor for selection of source:
CONCLUSION / RESULT
The Proposed design of proto type of AMI based DSM model will manage load and improve the efficiency of PV and utility. The system simulation will be done on Lab VIEW.
ACKNOWLEDGEMET
LOAD CONTROL STRATEGIES
Fig 5 Single Line diagram
Fig 6 Topology for load management
BASED ON CONSUMER PRIORITY
1 Highest priority load (Active / Critical)
2 Medium priority load (Essential)
3.Lowest priority load (Non-essentials
HVE010
Ganesh Kumbhar


PED015
erence on Recent Trends in Power Engineering
of Technology Madras, Chennai 600 036, India.
29-30 December 2015
dified Pole Shapes on the Performance o
brid Switched Reluctance Motor
essor, EEE Department, R.M.D Enginnering College ,Ch
fessor EEE Department, SSN College of Engineering, C
TION
(HSRM) has constructional
ed reluctance motor (CSRM)
xiliary windings included in the
e of HSRM and investigate
n of HSRM is altered for
D HSRM
NS
RESULTS
Table1. Summarized results of HSRM performance ana
CONCLUSION


PED015
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Effect of Modified Pole Shapes on the Performance of
Hybrid Switched Reluctance Motor
S.Saranya, Assistant Professor, EEE Department, R.M.D Enginnering College ,Chennai, India
Dr.M.Balaji, Associate Professor EEE Department, SSN College of Engineering, Chennai, India
INTRODUCTION
• Hybrid switched reluctance motor (HSRM) has constructional features same as conventional switched reluctance motor (CSRM) with permanent magnets (PM) and auxiliary windings included in the stator core.
• In this work, we analyze the performance of HSRM and investigate its various characteristics. Also, the design of HSRM is altered for improving the motor performance.
DESIGN OF CSRM AND HSRM
POLE SHAPE MODIFICATIONS
RESULTS
CONCLUSIONS


Venue : IC & SR Auditorium
Chief Guest
Prof. Bhaskar Ramamurthi
(Director, IIT Madras)
&
Plenary Talk on
"Enabling India with Electricity"
by
Department of Electrical Engineering,


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
(for Research Scholars)
Date: 29-30 December 2015
Venue : IC & SR Auditorium
Chief Guest
Prof. Bhaskar Ramamurthi
(Director, IIT Madras)
Research and Development
- Where, When and How?
An engineers odyssey
Dr. V. Jagadeesh Kumar
Professor and HeadCEC
Department of Electrical Engineering
IIT Madras Chennai 600036 India


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
(for Research Scholars)
Date: 29-30 December 2015
Venue : IC & SR Auditorium
Chief Guest
Prof. Bhaskar Ramamurthi
(Director, IIT Madras)
&
Plenary Talk on
"Enabling India with Electricity"
Research and Development
- Where, When and How?
An engineers odyssey
Dr. V. Jagadeesh Kumar
Professor and HeadCEC
Department of Electrical Engineering
IIT Madras Chennai 600036 India


DESTINATIONS
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Power Quality Laboratory
Department of Electrical Engineering, IIT Madras, Chennai - 36
iitmadras
Power Quality Aspects in Renewables Integration and AC-DC Microgrid System
Dr. Mahesh Kumar
Professor
Power Quality Laboratory
Electrical Engg. Dept. I.I.T. Madras


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
(for Research Scholars)
Date: 29-30 December 2015
Venue : IC & SR Auditorium
Chief Guest
Prof Bhaskar Ramamurthi
(Director, IIT Madras)
&
Power Electronics and Drives
4K
BRAVIA
Driven by: Need for DC Transformers,
Need for AC Batteries


IC & SR Auditorium
J. Sundara Rajan
Joint Director
Bangalore 560 080


NATIONAL CONFERENCE ON
RECENT TRENDS IN POWER ENGINEERING
(for Research Scholars)
Date: 29-30 December 2015
Venue : IC & SR Auditorium
Research interests of UK
– Lightning modelling: Modelling of the return stroke evolution; Role of tall objects on ground; Upward connected leaders; ...
– Lightning protection: Definition of stress; Efficacy of different protection schemes; Strike to high voltage lines; Cables on towers and in soil; ...
– Electromagnetics for power engineering: Static fields; RC transient fields; Fields in DC insulation; Eddy current and moving conductor problems; Wave propagation in lightning, transmission lines and windings; ...
– High voltage engineering: Corona; Leader-streamer breakdown; Insulation aspects; Pollution performance of outdoor insulation; Grounding – power system and high voltage; ...


Thank You...


Chief Guest
Prof. Bhaskar Rama
(Director, IIT Madras
&
Plenary Talk or
"Enabling India with Elec
by
Prof. Ashok JhunJh
Department of Electrical Engine
IIT Madras


GROUND FLOOR
SECOND FLOOR
THIRD FLOOR


SP 6
PSE-04
al Conference on Recent Trends in Power Engineering
n Institute of Technology Madras, Chennai 600 036, India
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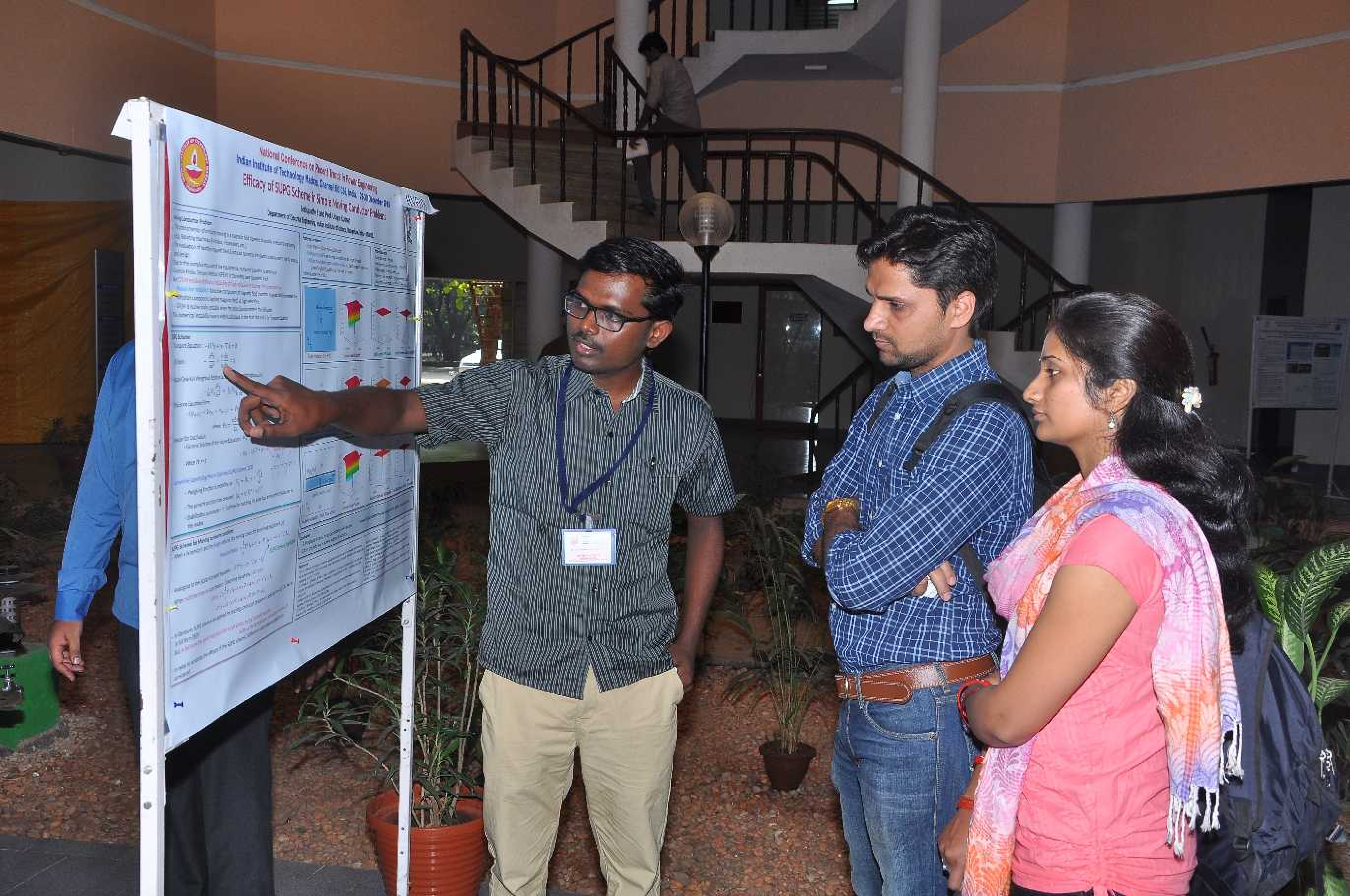
Photovoltaic System

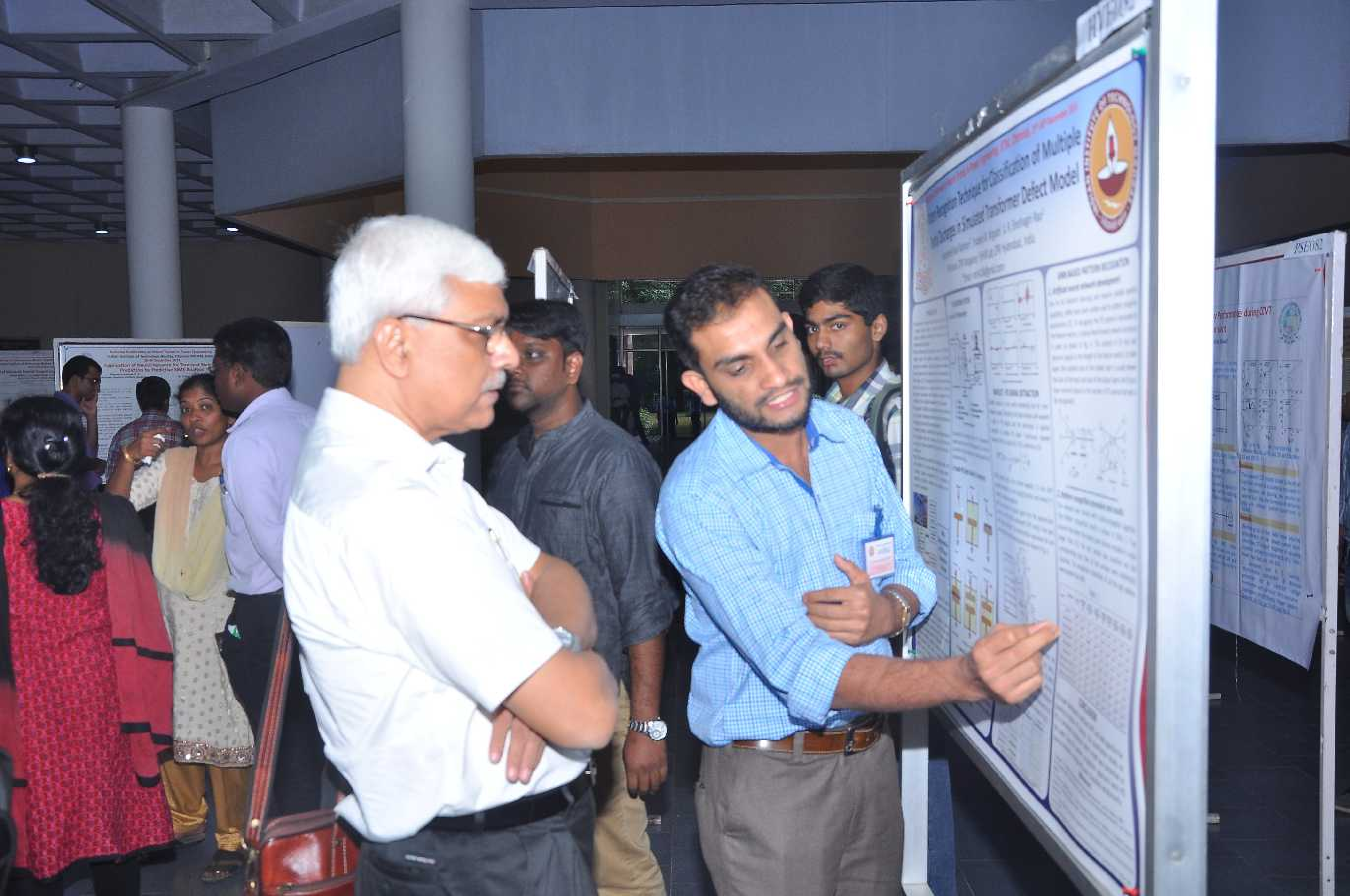



PSE049
Introduction:
Case Study:


PSE065
Recent Trends in Power Engineering
Chennai 600 036, India.
December 2015
Development of Android Application
Design of Solar PV System

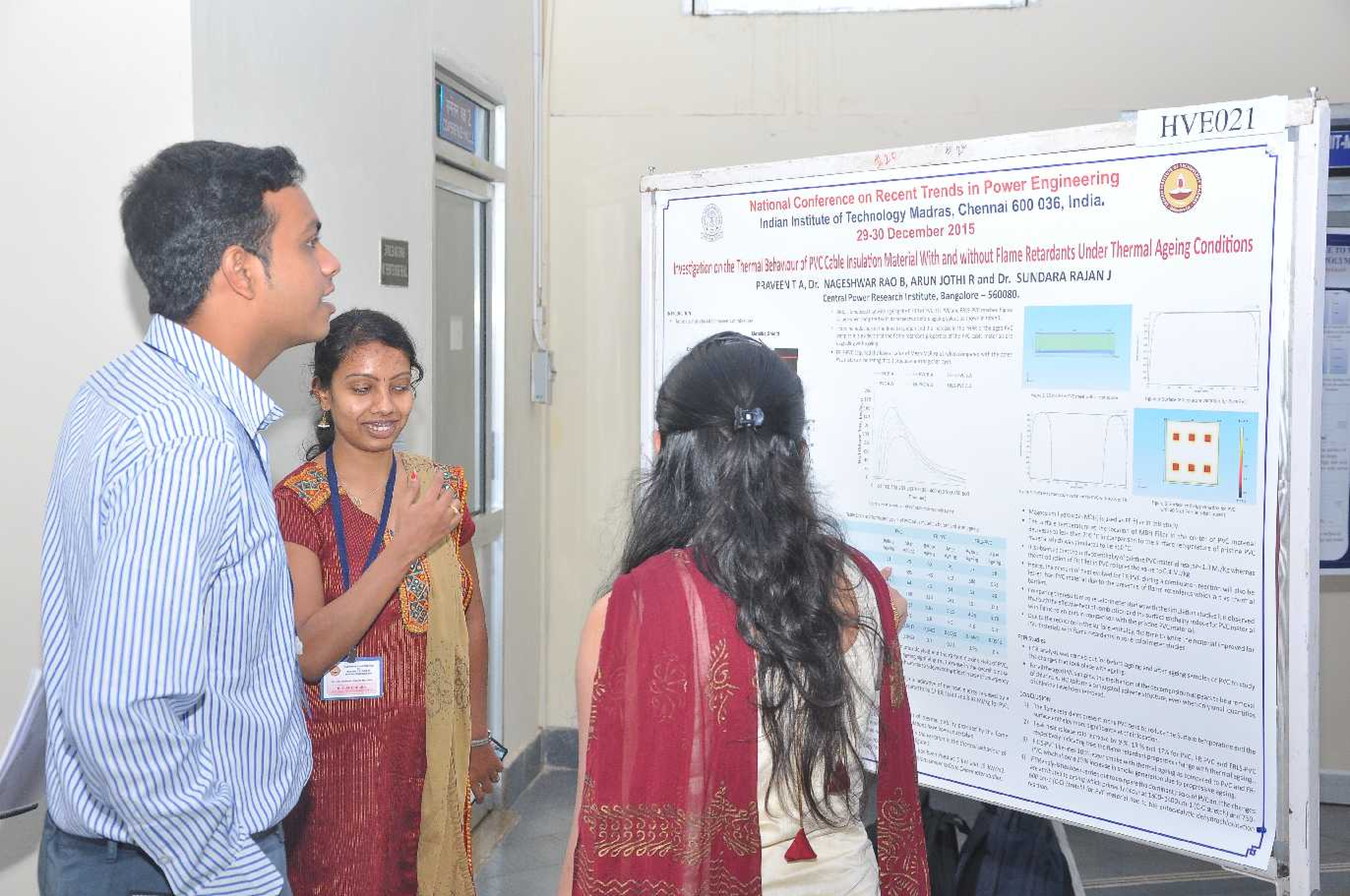

PSE085
PSE053


IITM
Indian Institute of Technology Madras
Indian Institute of Technology Madras, Chennai 600 036, India.
Sukesh A and Udaya Kumar
Computations


Classification of Multiple
Transformer Defect Model
PSE082

Auditorium
Chief Guest
Bhaskar Ramamurthi
(Director, IIT Madras)
&
Plenary Talk on


Chief Guest
Bhaskar
(Director, IIT Madras)
&
Plenary Talk


HVE021
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Investigation on the Thermal Behaviour of PVC Cable Insulation Material With and without Flame Retardants Under Thermal Ageing Conditions
PRAVEEN T A, Dr. NAGESHWAR RAO B, ARUN JOTHI R and Dr. SUNDARA RAJAN J
Central Power Research Institute, Bangalore – 560080.


Design of a Self Excited Induction Generator based Stand Alone W
Energy Conversion System
OBJECTIVES
PSE037
ence on Recent Trends in Power Engineering
Technology Madras, Chennai 600 036, India
December 2015
ewable Energy Sources to the Distribution Grid
S.Charles Raja
P.Venkatesh
Assistant Professor
Associate Professor
Trends in Power Engineering
y using New Fault Location Sys


PED063
SP 18
Recent Trends in Power Engineering
DESIGN AND IMPLEMENTATION OF MULTI-INPUT CONTROLLER FOR ENHANCING POWER SYSTEM DYNAMIC STABILITY


SP 17
CCVT Modelling and Distance Relay Performance during CCV
Subsidence Transient
Sandeep Biswal, Dr. Monalisa Biswal
NIT Raipur, India
Introduction
Motivation
Objective
Modelling of CCVT in PSCAD which is same response with the practical CCVT.
Distance relay performance under different conditions like SIR and burden.
Distance relay algorithm will be applied to solve overreach problem without applying time delay and zone reduction approach.
Results & Discussion
Conclusions
References


HVE029
National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras, Chennai 600 036, India.
29-30 December 2015
Comparison of Conventional and Phase Shift Methods for
Condition Monitoring of Metal Oxide Surge Arrester
Likitha S1 (likitha_jrf@cpri.in) Jithin Pauly P1 M kanyakumari1 R S Shivakumara Aradhya2
1 Central Power Research Institute, Bangalore 2 Acharya Institute of Technology, Bangalore
INTRODUCTION
METHODOLOGY
EXPERIMENTAL RESULTS
CONCLUSIONS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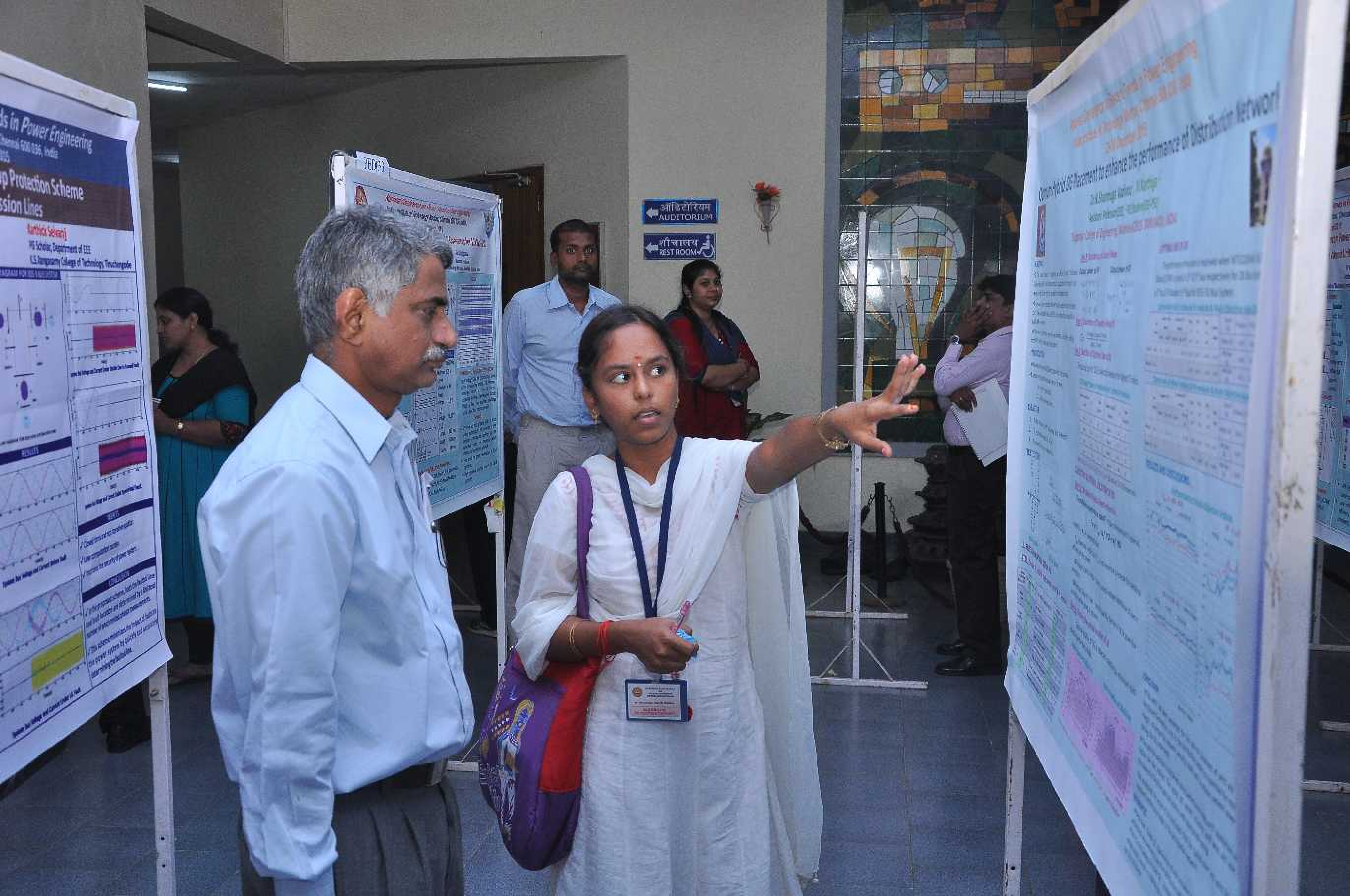

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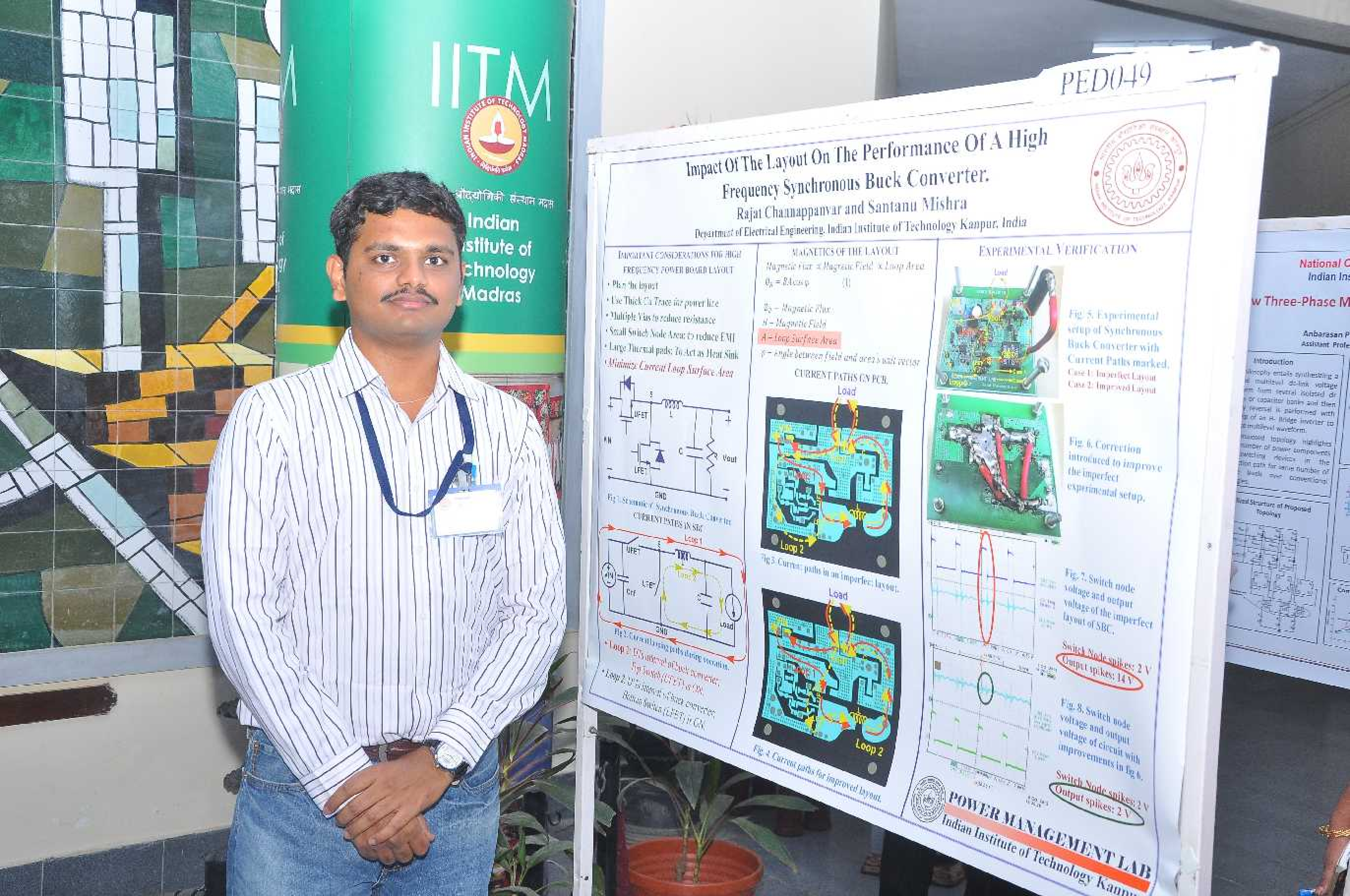
शौचालय
REST ROOM
Power Engineering
Protection Scheme
Karthick Selvaraj
PG Scholar, Department of EEE
K.S. Rangasamy College of Technology, Tiruchengode
RESULTS


alysis and Design of a Self Excited Induction Generator
Energy Conversion System



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Indian Institute of Technology Madras
PED049
Impact Of The Layout On The Performance Of A High Frequency Synchronous Buck Converter.
Rajat Channappanvar and Santanu Mishra
Department of Electrical Engineering, Indian Institute of Technology Kanpur, India
IMPORTANT CONSIDERATIONS FOR HIGH FREQUENCY POWER BOARD LAYOUT
Plan the layout
Use Thick Cu Trace for power line
Multiple Vias to reduce resistance
Small Switch Node Area: to reduce EMI
Large Thermal pads: To Act as Heat Sink
Minimize Current Loop Surface Area
MAGNETICS OF THE LAYOUT
CURRENT PATHS ON PCB.
Fig 3. Current paths in an imperfect layout.
Fig. 4. Current paths for improved layout.
Load
Loop 2
EXPERIMENTAL VERIFICATION
Fig. 5. Experimental setup of Synchronous Buck Converter with Current Paths marked.
Case 1: Imperfect Layout
Case 2: Improved Layout
Fig. 6. Correction introduced to improve the imperfect experimental setup.
Fig. 7. Switch node voltage and output voltage of the imperfect layout of SBC.
Switch Node spikes: 2 V
Output spikes: 14 V
Fig. 8. Switch node voltage and output voltage of circuit with improvements in fig 6.
Switch Node spikes: 2 V
Output spikes: 2 V
CURRENT PATHS IN SBC
Loop 1
Loop 2
GND
Load
Vout
POWER MANAGEMENT LAB
Indian Institute of Technology Kanpur
National C
Indian Ins
w Three-Phase M
Introduction


National Conference on Recent Trends in Power Engineering
Indian Institute of Technology Madras
December 2015
Reduction in Intersymbol Interference (ISI) in Power Line Communication
Introduction
Methods


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(For Research Scholars)
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