

CURRICULUM
DI
Marco Balato
ASSISTANT PROFESSOR
UNIVERSITÀ DI NAPOLI “*FEDERICO II*”

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Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it
Researchgate profile: https://www.researchgate.net/profile/Marco_Balato
Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

I. NOTIZIE RIASSUNTIVE

Marco Balato è nato [REDACTED] ed è residente in [REDACTED]. Dal 15/04/2019 ricopre il ruolo di Ricercatore (RTDA) nel settore scientifico disciplinare ING-IND/31, presso il Dipartimento di Ingegneria Industriale e delle Tecnologie Informatiche (DIETI) dell'Università di Napoli Federico II.

II. TITOLI DI STUDIO POSSEDUTI

- Ha conseguito la laurea specialistica in Ingegneria Elettronica presso la Seconda Università degli Studi di Napoli "SUN" il 03/02/2011 con la votazione di 110/110, discutendo una tesi dal titolo "*Analisi di una tecnica di MPPT per applicazioni fotovoltaiche*", relatore il Prof. M. Vitelli.
- Ha conseguito il titolo di dottore di ricerca in conversione dell'energia presso la Seconda Università degli Studi di Napoli "SUN" il 23/12/2014 discutendo una tesi dal titolo "*architectures and control techniques for the maximization of the energetic efficiency of photovoltaic systems*", Tutor il Prof. M. Vitelli.

III. ABILITAZIONI POSSEDUTE

- Di possedere il titolo di abilitazione per l'esercizio della professione di Ingegnere (Sez. A).
- Di possedere l'abilitazione triennale a far parte delle commissioni per gli esami di profitto e di laurea (Cultore della materia nel settore disciplinare ING-IND/31 (Elettrotecnica)) dell'Università della Campania "Luigi Vanvitelli" (2015-2018). Verbale N°050 CONSIGLIO DI DIPARTIMENTO DEL 10/12/2015.

IV. ESPERIENZE LAVORATIVE PRESSO LA PUBBLICA AMMINISTRAZIONE

- Di aver fatto parte, per la durata di un anno, dell'ufficio staff dell'assessore all'agricoltura dalla Provincia di Caserta (anno 2010/2011).

V. ESPERIENZE LAVORATIVE IN QUALITÀ' DI CONSULENTE TECNICO D'UFFICIO DEL TRIBUNALE DI NAPOLI NORD

- 1) Di aver svolto, in qualità di CTU, una consulenza in materia di estimo di strumentazione geotecniche per la causa iscritta al Registro generale al N. 2660/2013.
- 2) Di aver svolto, in qualità di CTU, una consulenza in materia di estimo, conformità catastale, e conformità urbanistica nell'ambito della causa iscritta al Registro generale al N. 4792/2014.
- 3) Di aver svolto, in qualità di CTU, una consulenza in materia di stima del danno per ridotta commerciabilità nell'ambito della causa iscritta al Registro generale al N. 7659/2016.

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VI. ESPERIENZE LAVORATIVE IN QUALITA' DI PROFESSIONISTA ISCRITTO ALL'ORDINE PROFESSIONALE

- Di aver svolto una collaborazione professionale di natura tecnica nell'ambito del contratto di consulenza stipulato tra il DIII della Seconda Università di Napoli (SUN) e la società NOVARTIS FARMA spa (responsabile del progetto Prof. Sergio Nardini), consistente in "Scrittura di programmi di calcolo, in ambiente matlab, per la valutazione del rischio da fulminazione della Novartis spa secondo le norme CEI EN 62305.
- Di aver ricevuto un incarico di natura professionale dalla società Mediterranea SPA consistente in: ***Valutazione del rischio da fulminazione della Mediterranea spa secondo le norme CEI EN 62305 1-4.***
- Di essere stato membro della Commissione per il controllo dei pubblici spettacoli della città di Aversa (CE) in qualità di esperto Elettrotecnico.

VII. TITOLI ACCADEMICI

VII.1 ORGANIZZAZIONE O PARTECIPAZIONE COME RELATORE A CONVEGNI DI CARATTERE SCIENTIFICO IN ITALIA O ALL'ESTERO

- Partecipazione come relatore al congresso "8th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2013", per l'articolo: A new strategy for the identification of the optimal operating points in PV applications with Distributed MPPT, tenutosi a Montecarlo, Monaco. Dal 27-03-2013 al 30-03-2013;
- Partecipazione come relatore al congresso "8th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2013", per l'articolo: A hybrid MPPT technique based on the fast estimate of the Maximum Power voltages in PV applications, tenutosi a Montecarlo, Monaco. Dal 27-03-2013 al 30-03-2013;
- Partecipazione come relatore al congresso "9th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2014", per l'articolo: Fast dynamical reconfiguration algorithm of PV arrays, tenutosi a Montecarlo, Monaco. Dal 25-03-2014 al 27-03-2014;
- Partecipazione come relatore al congresso "9th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2014", per l'articolo: An algorithm for the estimation of the Maximum Power Voltages in microconverters based PV applications, tenutosi a Montecarlo, Monaco. Dal 25-03-2014 al 27-03-2014;
- Partecipazione come relatore al congresso "International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2015", per l'articolo: Dual implementation of the MPPT technique TEODI: Uniform and mismatching operating conditions, tenutosi a Taormina, Italia. Dal 16-06-2015 al 18-06-2015;
- Partecipazione come relatore al congresso "10th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2015", per l'articolo: Optimization of both

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the energetic efficiency and the duration of life of PV arrays by means of the dynamical reconfiguration of PV modules connections, tenutosi a Montecarlo, Monaco. Dal 07-10-2015 al 10-10-2015;

- Partecipazione come relatore al congresso “International Conference on Renewable Energy Research and Applications, ICRERA 2015”, per l’articolo: "Identification of the parameters of the equivalent electric circuit of electromagnetic harvesters", tenutosi a Palermo, Italia. Dal 22-11-2015 al 25-11-2015;
- Partecipazione come relatore al congresso “International Conference on Renewable Energy Research and Applications, ICRERA 2015”, per l’articolo: "Multi-objective optimization of PV arrays performances by means of the dynamical reconfiguration of PV modules connections", tenutosi a Palermo, Italia. Dal 22-11-2015 al 25-11-2015
- Partecipazione come relatore al congresso “IEEE International Power Electronics and Motion Control Conference, PEMC 2016”, per l’articolo: Series-parallel PV arrays: A comparison between the performances of two algorithms for strings with an equal or with a different number of PV modules, tenutosi a Varna, Bulgaria. Dal 25-09-2016 al 30-09-2016.

VII.2 DIREZIONE O PARTECIPAZIONE ALLE ATTIVITÀ DI UN GRUPPO DI RICERCA CARATTERIZZATO DA COLLABORAZIONI A LIVELLO NAZIONALE O INTERNAZIONALE

- Partecipazione alle attività di ricerca nell'ambito del progetto di ricerca PRIST 2009 "Generazione distribuita di energia da fonti tradizionali e rinnovabili: aspetti ingegneristici e giuridici-economici-ambientali" (Responsabile del Progetto, Prof. Alfredo Testa), come testimoniato, sia dal conferimento di un incarico di collaborazione coordinata continuativa di natura tecnica per il supporto all'attività di ricerca consistente in "Scrittura di programmi di calcolo per la valutazione numerica dell'efficienza del Distributed Maximum Power Point Tracking in applicazioni fotovoltaiche al variare delle condizioni di mismatching", sia dalla seguente pubblicazione:
 - 1) Balato M, Vitelli M, Femia N, Petrone G, Spagnuolo G: Factors limiting the efficiency of DMPPT in PV applications, (2011) 3rd International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2011, art. no. 6036319, pp. 604-608. Cited 22 times. Dal 22-06-2011 al 22-10-2011
- Partecipazione alle attività di ricerca nell'ambito del progetto "POLIGRID", come testimoniato, sia dall'assegnazione di una Borsa per l'attività di ricerca dal titolo: "Sviluppo di modelli circuitali di dispositivi di Energy harvesting da vibrazioni basati su trasduttori di tipo elettromagnetico, piezoelettrico ed elettrostatico per l'alimentazione di Wireless Sensor Networks", sia dalle seguenti pubblicazioni:
 - 1) Balato, M., Costanzo, L., Vitelli, M: Closed-form analysis of switchless electrostatic vibration energy harvesters, (2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112921, . Cited 5 times.
 - 2) Balato, M., Costanzo, L., Vitelli, M: Optimization of both the energetic efficiency and the duration of life of PV arrays by means of the dynamical reconfiguration of PV modules connections, (2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112922, Cited 1 time.
dal 30-01-2015 al 30-04-2015

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- Partecipazione alle attività di ricerca nell'ambito del progetto PROGETTO PON R&C DD 713/Ric. del 29/10/2010 Titolo 25 III - Creazione di nuovi Distretti e/o nuove Aggregazioni Pubblico-Private. Progetto di ricerca industriale, sviluppo sperimentale e formazione PON03PE_00178_1: Microgrid Ibride in Corrente Continua e Corrente Alternata (MICCA), come evidenziato dalla seguente pubblicazione:
 - 1) Balato, M., Costanzo, L., Marino, P., Rubino, G., Rubino, L., Vitelli, M.: High performance non isolated interleaved switched inductance converter for PV sources, (2015) 5th International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2015, art. no. 7177595, pp. 19-26. dal 15-02-2015 al 18-06-2015
- Partecipazione alle attività di ricerca nell'ambito del progetto di ricerca PON03PE_00159_3 "MODISTA" (Responsabile del Progetto, Prof. Roberto Langella), come testimoniato, sia dall'affidamento di n.1 incarico di prestazione occasionale di natura tecnica consistente in: "Studio di tecniche di tuning elettrico e meccanico per harvester elettromagnetici da vibrazioni per applicazioni ferroviarie", sia dalle seguenti pubblicazioni:
 - 1) Balato, M., Costanzo, L., Vitelli, M.: Resonant electromagnetic vibration harvesters: Determination of the equivalent electric circuit parameters and simplified closed-form analysis for the identification of the optimal diode bridge rectifier DC load, (2017) International Journal of Electrical Power and Energy Systems, 84, pp. 111-123. Cited 5 times.
 - 2) Brignole, O., Cavalletti, C., Lauro, G., Maresca, A., Mazzino, N., Balato, M., Buonomo, A., Costanzo, L., Giorgio, M., Langella, R., Schiavo, A.L., Scaldarella, D., Smoraldi, A., Testa, A., Verde, L., Vitelli, M.: Experimental analysis of mechanical vibrations and wind speed for a rail vehicle WSN fed by energy harvesters, (2015) 2015 AEIT International Annual Conference, AEIT 2015, art. no. 7415261, . Cited 1 time.
 - 3) Brignole, O., Cavalletti, C., Maresca, A., Mazzino, N., Balato, M., Buonomo, A., Costanzo, L., Giorgio, M., Langella, R., Schiavo, A.L., Testa, A., Vitelli, M.: Resonant electromagnetic vibration harvesters feeding sensor nodes for real-time diagnostics and monitoring in railway vehicles for goods transportation: A numerical-experimental analysis, (2016) Proceedings - 2016 IEEE International Power Electronics and Motion Control Conference, PEMC 2016, art. no. 7752040, pp. 456-461. Cited 1 time.
 - 4) Balato, M., Costanzo, L., Vitelli, M.: Closed-form analysis of switchless electrostatic vibration energy harvesters, (2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112921, . Cited 5 times.
 - 5) Balato, M., Costanzo, L., Vitelli, M.: Identification of the parameters of the equivalent electric circuit of electromagnetic harvesters, (2015) 2015 International Conference on Renewable Energy Research and Applications, ICRERA 2015, art. no. 7418684, pp. 1641-1645. Cited 4 times. dal 20-07-2015 al 20-09-2015
- Partecipazione alle attività di ricerca nell'ambito del progetto di ricerca PON03PE_00159_3 "MODISTA" (Responsabile del Progetto, Prof. Roberto Langella), come testimoniato, sia dall'affidamento di n.1 incarico di prestazione occasionale di natura tecnica consistente in: "Supporto tecnico allo sviluppo di un dimostratore da laboratorio "Hardware in the loop" per un sistema fotovoltaico di harvesting per applicazioni ferroviarie", sia dalla seguente pubblicazione:
 - 1) Balato, M., Costanzo, L., Marino, P., Rubino, L., Vitelli, M.
Dual implementation of the MPPT technique TEODI: Uniform and mismatching operating

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Conditions (2015) 5th International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2015, art. no. 7177658, pp. 422-429. Cited 1 time. dal 24-02-2016 al 24-03-2016

- Partecipazione alle attività di ricerca nell'ambito del progetto di ricerca PON03PE_00177_1 "FERGE" (Responsabile del Progetto, Prof. Carmine Landi), come testimoniato dall'assegnazione della Borsa di studio per attività di ricerca avente ad oggetto l'espletamento della seguente attività: "Analisi di tecniche per la riconfigurazione dinamica di impianti fotovoltaici". dal 20-02-2017 al 19-09-2017

VII.3 RESPONSABILITA' DI STUDI E RICERCHE SCIENTIFICHE AFFIDATI DA QUALIFICATE ISTITUZIONI PUBBLICHE O PRIVATE

- Responsabile attività di ricerca "Analisi di una tecnica di MPPT per applicazioni fotovoltaiche" nell'ambito dello svolgimento della tesi di laurea specialistica in Ingegneria Elettronica presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). Da questa attività di ricerca è stata prodotta la seguente pubblicazione: 1) Balato, M., Costanzo, L., Marino, P., Rubino, G., Rubino, L., Vitelli, M., Modified TEODI MPPT Technique: Theoretical Analysis and Experimental Validation in Uniform and Mismatching Conditions, (2017) IEEE Journal of Photovoltaics, 7 (2), art. no. 7786900, pp. 604-613. Cited 1 time. dal 27-06-2010 al 03-02-2011
- Responsabile attività di ricerca "architectures and control techniques for the maximization of the energetic efficiency of photovoltaic systems" nell'ambito dello svolgimento del Dottorato di ricerca in Conversione dell'energia presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). Da questa attività di ricerca sono state prodotte le seguenti pubblicazioni scientifiche:
 - 1) Balato, M., Vitelli, M., An algorithm for the fast estimate of the maximum power voltages in PV applications adopting microconverters, (2015) COMPEL - The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, 34 (1), pp. 110-131.
 - 2) Balato, M., Vitelli, M. A new control strategy for the optimization of Distributed MPPT in PV applications, (2014) International Journal of Electrical Power and Energy Systems, 62, pp. 763-773. Cited 6 times.
 - 3) Balato, M., Vitelli, M., Optimization of distributed maximum power point tracking PV applications: The scan of the Power vs. Voltage input characteristic of the inverter, (2014) International Journal of Electrical Power and Energy Systems, 60, pp. 334-346. Cited 9 times.
 - 4) Aurilio, G., Balato, M., Graditi, G., Landi, C., Luiso, M., Vitelli, M., Fast hybrid MPPT technique for photovoltaic applications: Numerical and experimental validation, (2014) Advances in Power Electronics, 2014, art. no. 125918, . Cited 15 times. dal 03-02-2011 al 22-12-2014
- Responsabile attività di ricerca nell'ambito del progetto di ricerca PRIST 2009 "Generazione distribuita di energia da fonti tradizionali e rinnovabili: aspetti ingegneristici e giuridico-economici-ambientali" (Responsabile del Progetto, Prof. Alfredo Testa), come testimoniato, sia dal conferimento di un incarico di collaborazione coordinata continuativa di natura tecnica per il supporto all'attività di ricerca consistente in "Scrittura di programmi di calcolo per la valutazione numerica dell'efficienza del Distributed Maximum Power Point Tracking in

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applicazioni fotovoltaiche al variare delle condizioni di mismatching", sia dalla seguente pubblicazione:

1) Balato M, Vitelli M, Femia N, Petrone G, Spagnuolo G: Factors limiting the efficiency of DMPPT in PV applications, (2011) 3rd International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2011, art. no. 6036319, pp. 604-608. Cited 22 times. dal 22-06-2011 al 22-10-2011

- Responsabile attività di ricerca "Sviluppo di modelli circuitali di dispositivi di Energy Harvesting da vibrazioni basati su trasduttori di tipo elettromagnetico, piezoelettrico ed elettrostatico per l'alimentazione di Wireless Sensor Networks" nell'ambito dello svolgimento di una Borsa di ricerca (Progetto Poligrad) presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). Da questa attività di ricerca sono state prodotte le seguenti pubblicazioni:

1) Balato, M., Costanzo, L., Vitelli, M: Closed-form analysis of switchless electrostatic vibration energy harvesters, (2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112921, . Cited 5 times.

2) Balato, M., Costanzo, L., Vitelli, M: Optimization of both the energetic efficiency and the duration of life of PV arrays by means of the dynamical reconfiguration of PV modules connections, (2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112922, Cited 1 time. dal 30-01-2015 al 30-04-2015

- Responsabile attività di ricerca "Studio di tecniche di tuning elettrico e meccanico per harvester elettromagnetici da vibrazioni per applicazioni ferroviarie" nell'ambito dello svolgimento di un incarico di prestazione occasionale di natura tecnica (Progetto Modista) presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). Da questa attività di ricerca sono state prodotte le seguenti pubblicazioni:

1) Balato, M., Costanzo, L., Vitelli, M., Resonant electromagnetic vibration harvesters: Determination of the equivalent electric circuit parameters and simplified closed-form analysis for the identification of the optimal diode bridge rectifier DC load, (2017) International Journal of Electrical Power and Energy Systems, 84, pp. 111-123. Cited 5 times.

2) Brignole, O., Cavalletti, C., Lauro, G., Maresca, A., Mazzino, N., Balato, M., Buonomo, A., Costanzo, L., Giorgio, M., Langella, R., Schiavo, A.L., Scaldarella, D., Smoraldi, A., Testa, A., Verde, L., Vitelli, M.: Experimental analysis of mechanical vibrations and wind speed for a rail vehicle WSN fed by energy harvesters, 2015 AEIT International Annual Conference, AEIT 2015, art. no. 7415261, . Cited 1 time.

3) Brignole, O., Cavalletti, C., Maresca, A., Mazzino, N., Balato, M., Buonomo, A., Costanzo, L., Giorgio, M., Langella, R., Schiavo, A.L., Testa, A., Vitelli, M.: Resonant electromagnetic vibration harvesters feeding sensor nodes for real-time diagnostics and monitoring in railway vehicles for goods transportation: A numerical-experimental analysis (2016) Proceedings - 2016 IEEE International Power Electronics and Motion Control Conference, PEMC 2016, art. no. 7752040, pp. 456-461. Cited 1 time.

4) Balato, M., Costanzo, L., Vitelli, M: Closed-form analysis of switchless electrostatic vibration energy harvesters, (2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112921, Cited 5 times.

5) Balato, M., Costanzo, L., Vitelli, M.: Identification of the parameters of the equivalent electric circuit of electromagnetic harvesters, (2015) 2015 International Conference on Renewable

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Energy Research and Applications, ICRERA 2015, art. no. 7418684, pp. 1641-1645. Cited 4 times. dal 20-07-2015 al 20-09-2015

- Responsabile attività di ricerca "Sviluppo ed ottimizzazione di tecniche di riconfigurazione dinamica di array fotovoltaici " nell'ambito dello svolgimento di un assegno di ricerca annuale presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università degli studi di Napoli (SUN). Da questa attività di ricerca sono state prodotte le seguenti pubblicazioni:
 - 1) Balato, M., Costanzo, L., Vitelli, M., Series-parallel PV arrays: A comparison between the performances of two algorithms for strings with an equal or with a different number of PV modules, (2016) Proceedings - 2016 IEEE International Power Electronics and Motion Control Conference, PEMC 2016, art. no. 7752178, pp. 1269-1274.
 - 2) Balato, M., Costanzo, L., Vitelli, M., Multi-objective optimization of PV arrays performances by means of the dynamical reconfiguration of PV modules connections, (2015) 2015 International Conference on Renewable Energy Research and Applications, ICRERA 2015, art. no. 7418685, pp. 1646-1650. Cited 5 times.
 - 3) Balato, M., Costanzo, L., Vitelli, M., Reconfiguration of PV modules: A tool to get the best compromise between maximization of the extracted power and minimization of localized heating phenomena, (2016) Solar Energy, 138, pp. 105-118. Cited 2 times.
 - 4) Manganiello, P., Balato, M., Vitelli, M., A Survey on Mismatching and Aging of PV Modules: The Closed Loop, (2015) IEEE Transactions on Industrial Electronics, 62 (11), art. no. 7076631, pp. 7276-7286. Cited 16 times. dal 01-10-2015 al 01-10-2016
- Responsabile attività di ricerca "Supporto tecnico allo sviluppo di un dimostratore da laboratorio 'Hardware in the loop' per un sistema fotovoltaico di harvesting per applicazioni ferroviarie" nell'ambito dello svolgimento di un incarico di prestazione occasionale di natura tecnica (Progetto Modista) presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). Da questa attività di ricerca è stata prodotta la seguente pubblicazione:
 - 1) Balato, M., Costanzo, L., Marino, P., Rubino, L., Vitelli, M.: Dual implementation of the MPPT technique TEODI: Uniform and mismatching operating conditions, (2015) 5th International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2015, art. no. 7177658, pp. 422-429. Cited 1 time. dal 24-02-2016 al 24-03-2016
- Responsabile attività di ricerca "Analisi di tecniche per la configurazione dinamica di impianti fotovoltaici" nell'ambito dello svolgimento di un incarico di prestazione occasionale di natura tecnica (Progetto Ferge) presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). dal 20-02-2017 al 19-09-2017

VII. 4 DIREZIONE O PARTECIPAZIONE A COMITATI EDITORIALI DI RIVISTE, COLLANE EDITORIALI, ENCICLOPEDI E TRATTATI DI RICONOSCIUTO PRESTIGIO

- Partecipazione all'attività di revisore per la rivista ENERGIES. dal 21-01-2015 al 21-01-2016
- Partecipazione all'attività di revisore per la rivista ENERGIES. dal 21-01-2016 al 17-01-2017
- Partecipazione alla stesura dell'enciclopedia "Wiley Encyclopedia of Electrical and Electronics Engineering", Pubblicata Online: 15 FEB 2016. DOI: 10.1002/047134608X.W8299, in qualità

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it
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Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

di autore del capitolo dal titolo: "Maximum Power Point Tracking Techniques". dal 15-02-2016 a oggi.

- Partecipazione all'attività di revisore per la rivista ENERGIES. dal 17-01-2017 al 18-01-2018
- Partecipazione al trattato "Advances in Renewable Energies and Power Technologies (Elsevier book), Volume 1: Solar and Wind Energies", in qualità di autore del capitolo: Chapter 5 – DMPPT PV System: Modeling and Control Techniques. dal 16-02-2018 a oggi.

VII.5 FORMALE ATTRIBUZIONE DI INCARICHI DI INSEGNAMENTO O DI RICERCA (FELLOWSHIP) PRESSO QUALIFICATI ATENEI E ISTITUTI DI RICERCA ESTERI O SOVRANAZIONALI

- Attività di correlatore di tesi di laurea per studenti iscritti alla laurea magistrale di ingegneria elettronica dell'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). dal 01-01-2011 al 01-01-2018
 - Attività di tutorato specializzato di un soggetto diversamente abile presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). dal 04-04-2011 al 31-12-2011
 - Attività di tutorato per l'insegnamento MAT/05_Analisi Matematica 1, presso l'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). dal 01-01-2012 al 01-01-2013
 - Attività di tutorato e di supporto alla didattica per il corso di ELETTROTECNICA (secondo anno) della laurea triennale in Ingegneria Aerospaziale-Meccanica dell'Università degli studi della Campania "Luigi Vanvitelli" già Seconda Università di Napoli (SUN). dal 01-01-2015 al 01-01-2018
 - Incarico annuale di insegnamento nel settore concorsuale A040 "Scienze e tecnologie elettriche ed elettroniche", presso l'istituto di Istruzione Secondaria Superiore Statale "Emilio Sereni Afragola - Cardito".dal 30-10-2017 al 30-06-2018

VII.6 RISULTATI OTTENUTI NEL TRASFERIMENTO TECNOLOGICO IN TERMINI DI PARTECIPAZIONE ALLA CREAZIONE DI NUOVE IMPRESE (SPIN OFF), SVILUPPO, IMPIEGO E COMMERCIALIZZAZIONE DI BREVETTI

- Brevetto: Depositata domanda di brevetto dal titolo "Nuova formazione di Cemento osseo". Nr. BO2012A000493.
- Brevetto: depositata domanda di brevetto di ateneo che ha ottenuto una valutazione positiva da parte della commissione trasferimento tecnologico dell'Università della Campania (09/06/2016): Domanda di brevetto IT102018000003632: M. Balato, L. Costanzo, A. Lo Schiavo, M. Vitelli: "Harvester di energia vibrazionale ottimizzato mediante la tecnica di tuning meccanico".

VII.7 CONSEGUIMENTO DI PREMI E RICONOSCIMENTI PER L'ATTIVITÀ SCIENTIFICA, INCLUSA L'AFFILIAZIONE AD ACCADEMIE DI RICONOSCIUTO PRESTIGIO NEL SETTORE

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it
Researchgate profile: https://www.researchgate.net/profile/Marco_Balato
Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

- Estensione a rivista di un lavoro presentato alla conferenza internazionale EVER 2013 dal titolo "A new strategy for the identification of the optimal operating points in PV applications with Distributed MPPT". Successivamente il lavoro è stato sottomesso ed accettato in una sessione speciale (special issue: EVER 2013) della rivista: "COMPEL-The International Journal for Computation and Mathematics in Electrical and Electronic Engineering". dal 30-03-2013 a oggi
- La domanda di brevetto di ateneo ha ottenuto una valutazione positiva da parte della commissione trasferimento tecnologico dell'Università della Campania (09/06/2016). Il titolo del brevetto è: Harvester di energia vibrazionale ottimizzato mediante la tecnica di tuning meccanico. dal 09-06-2016 a oggi

VIII. ELENCO DELLE PUBBLICAZIONI DI MARCO BALATO

CONGRESSI INTERNAZIONALI

1) Balato, M., Costanzo, L., Vitelli, M.

Series-parallel PV arrays: A comparison between the performances of two algorithms for strings with an equal or with a different number of PV modules

(2016) Proceedings - 2016 IEEE International Power Electronics and Motion Control Conference, PEMC 2016, art. no. 7752178, pp. 1269-1274.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008259900&doi=10.1109%2fEPEPEMC.2016.7752178&partnerID=40&md5=52aa543948f0137f63f695593b1e7bcc)

[85008259900&doi=10.1109%2fEPEPEMC.2016.7752178&partnerID=40&md5=52aa543948f0137f63f695593b1e7bcc](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008259900&doi=10.1109%2fEPEPEMC.2016.7752178&partnerID=40&md5=52aa543948f0137f63f695593b1e7bcc)

DOI: 10.1109/EPEPEMC.2016.7752178

ABSTRACT: In this paper the comparison between the Fast Dynamical Reconfiguration (FDR) algorithm and the Exhaustive Search Reconfiguration (ESR) algorithm is presented and discussed. Both algorithms are designed with specific reference to the Series-Parallel (SP) architecture. Moreover, in order to identify the optimal configuration, both algorithms need the knowledge of the I-V characteristics of the N PV modules of the SP array. The main difference between such algorithms is represented by the fact that, while the FDR algorithm analyzes both symmetric configurations (equal numbers of PV modules in the strings) and asymmetric configurations (different numbers of PV modules in the strings), instead the ESR algorithm considers symmetric strings only. The results of the numerical analysis puts in evidence the superior performances (at least in terms of execution times) which are exhibited by the FDR algorithm with respect to the ESR algorithm. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

2) Balato, M., Costanzo, L., Vitelli, M.

Resonant electromagnetic vibration energy harvesters: The harvester ideal utilization factor

(2016) Proceedings - 2016 IEEE International Power Electronics and Motion Control Conference, PEMC 2016, art. no. 7752090, pp. 769-774.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008253022&doi=10.1109%2fEPEPEMC.2016.7752090&partnerID=40&md5=dc4800ed5547b116540c4d1c1be1e836)

[85008253022&doi=10.1109%2fEPEPEMC.2016.7752090&partnerID=40&md5=dc4800ed5547b116540c4d1c1be1e836](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008253022&doi=10.1109%2fEPEPEMC.2016.7752090&partnerID=40&md5=dc4800ed5547b116540c4d1c1be1e836)

DOI: 10.1109/EPEPEMC.2016.7752090

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

ABSTRACT: In this paper an important figure of merit is introduced and discussed with reference to electromagnetic vibration energy harvesters which are loaded by diode bridge rectifiers. It is called Harvester Ideal Utilization Factor. It precisely quantifies how close to the optimum the harvester is loaded. Such a figure of merit can be defined not only for electromagnetic but also for piezoelectric harvesters as long as the assumptions which allow the modeling of such vibration harvesters by means of an equivalent linear electric circuit are valid. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

3) Brignole, O., Cavalletti, C., Maresca, A., Mazzino, N., Balato, M., Buonomo, A., Costanzo, L., Giorgio, M., Langella, R., Schiavo, A.L., Testa, A., Vitelli, M.

Resonant electromagnetic vibration harvesters feeding sensor nodes for real-time diagnostics and monitoring in railway vehicles for goods transportation: A numerical-experimental analysis

(2016) Proceedings - 2016 IEEE International Power Electronics and Motion Control Conference, PEMC 2016, art. no. 7752040, pp. 456-461. Cited 1 time.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008251815&doi=10.1109%2fEPEPEMC.2016.7752040&partnerID=40&md5=29a26a09ea86a8d83d8d28a267dbe25a)

[85008251815&doi=10.1109%2fEPEPEMC.2016.7752040&partnerID=40&md5=29a26a09ea86a8d83d8d28a267dbe25a](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85008251815&doi=10.1109%2fEPEPEMC.2016.7752040&partnerID=40&md5=29a26a09ea86a8d83d8d28a267dbe25a)

DOI: 10.1109/EPEPEMC.2016.7752040

ABSTRACT: In this paper, the results of a combined numerical-experimental analysis on a system, part of a wireless sensor network, composed by a resonant electromagnetic energy harvester, a suitable power electronic interface and a sensor node are presented and discussed. Such a system is to be used onboard for real-time diagnostics and monitoring in railway vehicles for goods transportation. © 2016 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

4) Balato, M., Costanzo, L., Vitelli, M.

Closed-form analysis of switchless electrostatic vibration energy harvesters

(2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112921, . Cited 5 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943393620&doi=10.1109%2fEVER.2015.7112921&partnerID=40&md5=e5b25463f02d52457bb0fb9e30bcd4ba)

[84943393620&doi=10.1109%2fEVER.2015.7112921&partnerID=40&md5=e5b25463f02d52457bb0fb9e30bcd4ba](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943393620&doi=10.1109%2fEVER.2015.7112921&partnerID=40&md5=e5b25463f02d52457bb0fb9e30bcd4ba)

DOI: 10.1109/EVER.2015.7112921

ABSTRACT: Batteries drawbacks are represented by the high cost, the limited reliability and the frequent maintenance requirements (recharge or replacement). Energy Harvesting (EH) offers an alternative to batteries replacement or, at least it allows the increase of their lifetime. EH is the conversion of ambient energy, which is present in the environment, into electrical energy. Different energy sources for EH applications have been reported in the literature: light, radio frequency (RF), temperature gradients, solar energy, vibrations. In this paper we will focus on vibration EH. In a Vibration Energy Harvester (VEH) electrical energy is generated by allowing an inertial mass to vibrate with respect to a frame. In this paper a closed-form analysis of the model of a single-degree of freedom Out-of-Plane Switchless Electrostatic Vibration Energy Harvester (SEVEH) will be presented and discussed. We will demonstrate that, under suitable reasonable assumptions, it is possible to study SEVEHs by using models that admit closed form solutions and, at the same time, are enough accurate if the simplifying hypothesis are met. In particular, a circuital model will be developed which describes both the mechanical and the electrical subsystems composing a SEVEH. © 2015 European Union.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

DOCUMENT TYPE: Conference Paper
SOURCE: Scopus

5) Balato, M., Costanzo, L., Vitelli, M.

Identification of the parameters of the equivalent electric circuit of electromagnetic harvesters
(2015) 2015 International Conference on Renewable Energy Research and Applications, ICRERA 2015, art. no. 7418684, pp. 1641-1645. Cited 4 times.
<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84964658329&doi=10.1109%2fICRERA.2015.7418684&partnerID=40&md5=013320c44c341f1fda6c4edb551a8189>

DOI: 10.1109/ICRERA.2015.7418684

ABSTRACT: This paper concerns electromagnetic vibration energy harvesters. The knowledge of the equivalent electric circuit of electromagnetic harvesters is a fundamental need in order to be able to carry out numerical simulations of electromagnetic vibration harvesters. The aim of this paper is the description of a suitable procedure leading to the determination of the parameters of such an equivalent electric circuit. In fact, while in the case of the laboratory harvesters which are presented and discussed in the scientific literature such parameters are usually known, in the case of commercial devices instead such parameters must be extracted from the typical information which can be usually found in the manufacturers data sheet. © 2015 IEEE.

DOCUMENT TYPE: Conference Paper
SOURCE: Scopus

6) Balato, M., Costanzo, L., Vitelli, M.

Multi-objective optimization of PV arrays performances by means of the dynamical reconfiguration of PV modules connections
(2015) 2015 International Conference on Renewable Energy Research and Applications, ICRERA 2015, art. no. 7418685, pp. 1646-1650. Cited 5 times.
<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84964679050&doi=10.1109%2fICRERA.2015.7418685&partnerID=40&md5=c33f3487c9341b9fedf5da9485025e22>

DOI: 10.1109/ICRERA.2015.7418685

ABSTRACT: Mismatching operating conditions (due to clouds, shading, non-uniform aging, manufacturing tolerances, etc.) strongly limit the energetic efficiency and the reliability of PV plants. The dynamical re-configuration of PV modules represents a promising solution in order to mitigate the drawbacks associated to mismatching phenomena. The goal of this paper is just to prove that, by using the dynamical reconfiguration of PV modules, it is possible to find configurations which allow to get a suitable compromise between energetic efficiency and reliability. In particular, in this paper, the expression of a suitable Objective Function whose maximization allows to get the required compromise between energetic efficiency and amplitude of thermal stresses (due to bypass diode conduction and/or reverse biasing of shaded cells) is introduced and discussed. © 2015 IEEE.

DOCUMENT TYPE: Conference Paper
SOURCE: Scopus

7) Balato, M., Costanzo, L., Vitelli, M.

Optimization of both the energetic efficiency and the duration of life of PV arrays by means of the dynamical reconfiguration of PV modules connections

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it
Researchgate profile: https://www.researchgate.net/profile/Marco_Balato
Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

(2015) 2015 10th International Conference on Ecological Vehicles and Renewable Energies, EVER 2015, art. no. 7112922, . Cited 1 time.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943371073&doi=10.1109%2fEVER.2015.7112922&partnerID=40&md5=d46e39e7fc1d55b281da28e4e9fe86ad)

[84943371073&doi=10.1109%2fEVER.2015.7112922&partnerID=40&md5=d46e39e7fc1d55b281da28e4e9fe86ad](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943371073&doi=10.1109%2fEVER.2015.7112922&partnerID=40&md5=d46e39e7fc1d55b281da28e4e9fe86ad)

DOI: 10.1109/EVER.2015.7112922

ABSTRACT: In mismatching operating conditions (due to clouds, shadows, soiling from dust, debris, manufacturing tolerances, non-uniform aging, different orientation of parts of the PV field, etc.) the energetic efficiency and the reliability of the Photovoltaic (PV) systems are strongly compromised. A possible solution adopt to mitigate the negative effects of the occurrence of mismatching conditions is represented by the dynamical reconfiguration of PV modules in the PV field. The goal of this paper is to demonstrate that, by using the dynamical reconfiguration of PV modules, it is possible to find a configuration which represent a suitable compromise between efficiency and reliability. Further work is needed and is in progress in order to design suitable re-configuration algorithms able to identify such compromise configurations. © 2015 European Union.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

8) Balato, M., Costanzo, L., Marino, P., Rubino, L., Vitelli, M.

Dual implementation of the MPPT technique TEODI: Uniform and mismatching operating conditions

(2015) 5th International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2015, art. no. 7177658, pp. 422-429. Cited 1 time.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84946555427&doi=10.1109%2fICCEP.2015.7177658&partnerID=40&md5=51f55f4c8e3476b2f5835ab6172a0a24)

[84946555427&doi=10.1109%2fICCEP.2015.7177658&partnerID=40&md5=51f55f4c8e3476b2f5835ab6172a0a24](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84946555427&doi=10.1109%2fICCEP.2015.7177658&partnerID=40&md5=51f55f4c8e3476b2f5835ab6172a0a24)

DOI: 10.1109/ICCEP.2015.7177658

ABSTRACT: In this paper the dual implementation of the MPPT technique TEODI is presented and discussed. Such a new technique will be called D-TEODI. As well as TEODI, also D-TEODI is suitable for DMPPT PV applications. Its main advantages, as for TEODI, are the simplicity of implementation, the absence of memory and multiplication operations, and the high MPPT efficiency obtainable when the PV modules belonging to the same TEODI Building Block operate in the same atmospheric conditions (absence of mismatching conditions). In order to obtain a technique which is efficient also when mismatching events occur, a proper modification of D-TEODI is necessary. The modified version of D-TEODI will be called MD-TEODI. MD-TEODI is based on the periodic measurement of the short circuit currents of the PV modules. The knowledge of such currents allows not only to determine if mismatching conditions have occurred, but also to identify a suitable correction factor k on which the working of MD-TEODI is based. The results of numerical simulations fully confirm the validity of MD-TEODI. © 2015 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

9) Balato, M., Costanzo, L., Marino, P., Rubino, G., Rubino, L., Vitelli, M.

High performance non isolated interleaved switched inductance converter for PV sources

(2015) 5th International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2015, art. no. 7177595, pp. 19-26.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84946575395&doi=10.1109%2fICCEP.2015.7177595&partnerID=40&md5=fcd11df5a3b56db7c554def3bd0e48be>

DOI: 10.1109/ICCEP.2015.7177595

ABSTRACT: The best way to avoid MPPT drawbacks due to mismatching phenomena is to use a dedicated DC/DC converter, in charge of MPPT, for each PV panel instead of a big central converter for the whole PV array. Dedicated DC/DC converters can be boost-like converters; they must be serially connected each other to obtain an higher voltage as required by the grid inverter. However, when the number of PV panels is relatively low, the sum of the voltages of the boost converters in a string may be insufficient to allow the inverter energy conversion function. In this paper a non isolated interleaved switched inductance converter is proposed and studied. Such a converter is characterized by a high voltage ratio and by a quite simple construction. A mathematical study of static characteristics of the proposed converter in both CCM and DCM conditions is provided together with the analytical estimation of losses. Moreover, the proposed converter has been compared, in terms of losses, with the dual stage synchronous boost converter. © 2015 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

10) Brignole, O., Cavalletti, C., Lauro, G., Maresca, A., Mazzino, N., Balato, M., Buonomo, A., Costanzo, L., Giorgio, M., Langella, R., Schiavo, A.L., Scaldarella, D., Smoraldi, A., Testa, A., Verde, L., Vitelli, M.

Experimental analysis of mechanical vibrations and wind speed for a rail vehicle WSN fed by energy harvesters

(2015) 2015 AEIT International Annual Conference, AEIT 2015, art. no. 7415261, . Cited 1 time.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84964891656&doi=10.1109%2fAEIT.2015.7415261&partnerID=40&md5=c1a326a21940be3b8e2bd092bf4fb724)

[84964891656&doi=10.1109%2fAEIT.2015.7415261&partnerID=40&md5=c1a326a21940be3b8e2bd092bf4fb724](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84964891656&doi=10.1109%2fAEIT.2015.7415261&partnerID=40&md5=c1a326a21940be3b8e2bd092bf4fb724)

DOI: 10.1109/AEIT.2015.7415261

ABSTRACT: Real-time diagnostic and monitoring on railway vehicles for goods transportation is considered. The results of a preliminary experimental activity aimed to model mechanical vibrations and wind speed for autonomous monitoring and diagnostic wireless sensor network fed by means of energy harvesters are reported and commented. © 2015 AEIT.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

11) Balato, M., Vitelli, M.

An algorithm for the estimation of the Maximum Power Voltages in microconverters based PV applications

(2014) 2014 9th International Conference on Ecological Vehicles and Renewable Energies, EVER 2014, art. no. 6844109, . Cited 1 time.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84904490409&doi=10.1109%2fEVER.2014.6844109&partnerID=40&md5=7aff626004e1b34d36afa30a8fa88870)

[84904490409&doi=10.1109%2fEVER.2014.6844109&partnerID=40&md5=7aff626004e1b34d36afa30a8fa88870](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84904490409&doi=10.1109%2fEVER.2014.6844109&partnerID=40&md5=7aff626004e1b34d36afa30a8fa88870)

DOI: 10.1109/EVER.2014.6844109

ABSTRACT: In order to extract the maximum energy from PhotoVoltaic (PV) systems operating under mismatching conditions, the adoption of a Hybrid Maximum Power Point Tracking (HMPPT) technique

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

is necessary. Such a technique is based on the coupled use of two control techniques. The first one is a MPPT technique which is distributed on all the PV modules of the field and which properly regulates the operating voltage of each PV module. It is called Distributed Maximum Power Point Tracking (DMPPT) technique because it is carried out by means of suitable DC/DC converters (microconverters) which are distributed on all the PV modules of the array. The second control technique is called Central Maximum Power Point Tracking (CMPPT) technique because it is carried out by the central inverter which properly regulates the operating voltage of the whole PV array. The adoption of a HMPPT technique is necessary because, in order to extract the maximum available energy from a PV system operating in mismatching conditions, the proper regulation either of the PV modules voltages or of the DC inverter input voltage is necessary. One possible HMPPT technique adopts a Perturb & Observe (P&O) based DMPPT technique and a CMPPT technique which is based on the periodic sweep of the power versus voltage characteristic at the input of the inverter. Such a HMPPT technique is characterised by two major drawbacks: the waste of available energy during the sweep and the relatively low tracking speed. In this paper a new algorithm, called Fast Estimate of the Maximum Power Voltages (FEMPV), which can be profitably used in HMPPT applications in order to overcome the above drawbacks will be discussed. The case of microconverters based on the adoption of the buck, boost and buck-boost topology will be studied in detail. © 2014 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

12) Balato, M., Manganiello, P., Vitelli, M.

Fast dynamical reconfiguration algorithm of PV arrays

(2014) 2014 9th International Conference on Ecological Vehicles and Renewable Energies, EVER 2014, art. no. 6843998, . Cited 4 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84904490784&doi=10.1109%2fEVER.2014.6843998&partnerID=40&md5=da3732657d516f90051a2bb1daff73bf)

[84904490784&doi=10.1109%2fEVER.2014.6843998&partnerID=40&md5=da3732657d516f90051a2bb1daff73bf](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84904490784&doi=10.1109%2fEVER.2014.6843998&partnerID=40&md5=da3732657d516f90051a2bb1daff73bf)

DOI: 10.1109/EVER.2014.6843998

ABSTRACT: In case of mismatch (due to clouds, shadows, dirtiness, manufacturing tolerances, aging, different orientation of parts of the PV field, thermal gradients, etc.), the Power versus Voltage (P-V) characteristic of a PV field may exhibit more than one peak, because of the adoption of bypass diodes, therefore Centralized Maximum Power Point Tracking (CMPPT) algorithms can fail. The consequent power drop can be avoided by using power optimizers, which are module dedicated dc/dc converters, or micro-inverters. The main drawbacks of such devices are the high cost and the reduced plant efficiency during the day hours in which the PV array works under a uniform irradiation level. This usually happens in the middle of the day, just when the PV power reaches the peak. Moreover, both the dc/dc and the dc/ac module dedicated converters introduce further components that may reduce the system lifetime, e.g. large electrolytic capacitances. A recent alternative is represented by the dynamical re-configuration of the PV array by means of active switches: in this way, the efficiency under uniform irradiation conditions is preserved and, in presence of mismatching, the best series/parallel modules configuration is achieved. This solution is cheaper than the one involving power optimizers and, besides the possibility of plant monitoring, offers additional advantages in terms of safety in case of fire. In this paper a novel approach to the PV string dynamical reconfiguration is presented and discussed. © 2014 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

13) Barra, F., Balato, M., Costanzo, L., Gallo, D., Landi, C., Luiso, M., Vitelli, M.

Dynamic and reconfigurable photovoltaic emulator based on FPAA

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

(2014) 20th IMEKO TC4 Symposium on Measurements of Electrical Quantities: Research on Electrical and Electronic Measurement for the Economic Upturn, Together with 18th TC4 International Workshop on ADC and DCA Modeling and Testing, IWADC 2014, pp. 1005-1010. Cited 2 times.
<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84918785036&partnerID=40&md5=ce90cdf5020266e56971af942d8158dc>

ABSTRACT: A photovoltaic (PV) emulator is an electronic device which allows, without using real PV modules, to reproduce the current vs. voltage characteristics of PV sources in the desired operating conditions as concerns the values of the irradiance and of the temperature. This is very useful since it is possible to evaluate the performances of the electronic DC/DC or DC/AC converters adopted in PV systems, under perfectly replicable operating conditions. Moreover, it is possible to fairly compare advantages and drawbacks of different MPPT algorithms under perfectly controlled stationary or dynamic atmospheric conditions. In this paper a dynamic and reconfigurable photovoltaic emulator which allows to reproduce the PV current vs. voltage characteristics both in stationary and dynamic environmental conditions, is presented and discussed. It is based on the implementation of the circuit model of the considered PV module in a Field Programmable Analog Array. The field Programmable Analog Array provides a suitable time varying reference signal to the control circuitry of a step-down DC-DC converter. The output port of such a DC/DC converter emulates the current versus voltage characteristic which is obtained at the terminals of the considered PV module in the desired atmospheric conditions. The main advantages of the proposed PV emulator are represented by the simplicity of programming of the FPAA and by its low cost. The results of numerical simulations and of experimental activities are reported and discussed.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

**14) Aurilio, G., Balato, M., Gallo, D., Landi, C., Luiso, M., Vitelli, M.
Design and characterization of a HMPPT technique for PV applications**

(2013) 2013 IEEE International Workshop on Applied Measurements for Power Systems, AMPS 2013 - Proceedings, art. no. 6656244, pp. 162-167. Cited 1 time.

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84890293906&partnerID=40&md5=23a1bc899b45bbd99b56e9ca6b1ceff4>

ABSTRACT: In the last years, with the focus on greener sources of power, photovoltaic has become an important source of power for a wide range of applications. Even with higher efficiency and lower cost, the goal remains to maximize the power from the PV system under various lighting and temperature conditions. In PV applications, under mismatching conditions, the Maximum Power Point Tracking technique both to regulate the voltages of the PV modules of the array and the DC input voltage of the inverter is used. In this paper a new hybrid method based on the periodic scan of the Power vs. Voltage characteristic at the input of the inverter is presented to improve the performance of MPPT for solar PV system. Its main advantages are the high MPPT efficiency and the high speed of tracking. Design, simulation and laboratory characterization of the presented technique are discussed. © 2013 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

**15) Balato, M., Gallo, D., Landi, C., Luiso, M., Vitelli, M.
Design and implementation of a hybrid MPPT technique based on the scan of the power vs voltage input characteristic of the inverter**

(2013) 19th IMEKO TC4 Symposium - Measurements of Electrical Quantities 2013 and 17th International Workshop on ADC and DAC Modelling and Testing, pp. 687-693. Cited 4 times.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it
Researchgate profile: https://www.researchgate.net/profile/Marco_Balato
Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84894114834&partnerID=40&md5=1724b521e8b59605e0f709415f1f9876>

ABSTRACT: The adoption of a Hybrid MPPT (HMPPT) technique is mandatory in PV applications operating under mismatching conditions. It is called Hybrid because it is neither only Distributed (on the PV modules) nor only Centralized (on the inverter). In this paper it is shown how to properly optimize an HMPPT technique based on the periodic scan of the Power vs. Voltage characteristic at the input of the inverter in order to locate the optimal operating value, from the energetic efficiency point of view, of the bulk inverter voltage. Therefore, numerical simulations and experimental measurements on a reduced scale laboratory prototype are carried out to confirm the validity of the theoretical predictions.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

16) Balato, M., Gallo, D., Landi, C., Luiso, M., Vitelli, M.

Simulation and laboratory characterization of a hybrid MPPT technique based on the fast estimate of the maximum power voltages in PV applications

(2013) Conference Record - IEEE Instrumentation and Measurement Technology Conference, art. no. 6555412, pp. 218-223. Cited 9 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84882280944&doi=10.1109%2fI2MTC.2013.6555412&partnerID=40&md5=63141cdd0c9dac69ee331730457ea2fc)

[84882280944&doi=10.1109%2fI2MTC.2013.6555412&partnerID=40&md5=63141cdd0c9dac69ee331730457ea2fc](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84882280944&doi=10.1109%2fI2MTC.2013.6555412&partnerID=40&md5=63141cdd0c9dac69ee331730457ea2fc)

DOI: 10.1109/I2MTC.2013.6555412

ABSTRACT: In photovoltaic (PV) applications, under mismatching conditions, the adoption of a Maximum Power Point Tracking (MPPT) technique which is able to regulate not only the voltages of the PV modules of the array, but also the DC input voltage of the inverter is necessary. Such a technique can be considered an Hybrid MPPT (HMPPT) technique which is neither only distributed on the PV modules of the PV array or only centralized at the input of the inverter. In this paper a new HMPPT technique is presented and discussed. Its main advantages are the high MPPT efficiency and the high speed of tracking obtained by means of a fast estimate of the maximum power voltages of the PV modules and of the inverter. The new HMPPT technique is compared with traditional HMPPT techniques. Mathematical formulation, simulation and a test system for laboratory characterization of the presented technique are discussed. © 2013 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

17) Balato, M., Vitelli, M.

A new strategy for the identification of the optimal operating points in PV applications with Distributed MPPT

(2013) 2013 8th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2013, art. no. 6521518, . Cited 8 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84879980783&doi=10.1109%2fEVER.2013.6521518&partnerID=40&md5=7f6364e55257930169b14a0c0729a22d)

[84879980783&doi=10.1109%2fEVER.2013.6521518&partnerID=40&md5=7f6364e55257930169b14a0c0729a22d](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84879980783&doi=10.1109%2fEVER.2013.6521518&partnerID=40&md5=7f6364e55257930169b14a0c0729a22d)

DOI: 10.1109/EVER.2013.6521518

ABSTRACT: In this paper, a new control strategy allowing to optimize the performances of PV systems adopting Distributed Maximum Power Point Tracking (DMPPPT), is presented and discussed. It is based on the estimate of the optimal operating range of the inverter input voltage and of the optimal operating

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

voltages of the PV modules. The main advantage of the proposed technique is represented by the fast identification of a set of operating points for the inverter and for the PV modules, which allows to obtain a marked increase of the speed of tracking both of the inverter and of the DC/DC converters performing the DMPPT function. Moreover, a further advantage is represented by the possibility to avoid that, due to mistakes of the inverter MPPT technique, the operating value of the inverter input voltage remains trapped in the neighborhood of a suboptimal operating point. © 2013 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

18) Balato, M., Vitelli, M.

A hybrid MPPT technique based on the fast estimate of the Maximum Power voltages in PV applications

(2013) 2013 8th International Conference and Exhibition on Ecological Vehicles and Renewable Energies, EVER 2013, art. no. 6521576, . Cited 13 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84879952422&doi=10.1109%2fEVER.2013.6521576&partnerID=40&md5=102df0d66027d10be0f2c5e7dfa5b316)

[84879952422&doi=10.1109%2fEVER.2013.6521576&partnerID=40&md5=102df0d66027d10be0f2c5e7dfa5b316](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84879952422&doi=10.1109%2fEVER.2013.6521576&partnerID=40&md5=102df0d66027d10be0f2c5e7dfa5b316)

DOI: 10.1109/EVER.2013.6521576

ABSTRACT: In PV applications, under mismatching conditions, the adoption of a Maximum Power Point Tracking (MPPT) technique which is able to regulate not only the voltages of the PV modules of the array, but also the DC input voltage of the inverter is necessary in order to inject into the grid the maximum available energy. Such a technique can be considered an Hybrid MPPT (HMPPT) technique which is neither only distributed on the PV modules of the PV array or only centralized at the input of the inverter. In this paper a new HMPPT technique is presented and discussed. Its main advantages are the high MPPT efficiency and the high speed of tracking obtained by means of a fast estimate of the maximum power voltages of the PV modules and of the inverter. The new HMPPT technique is compared with a HMPPT technique based on the coupled adoption of the Perturb & Observe technique, distributed on the PV modules, and of a suitable centralized MPPT technique carried out by the controller of the central inverter and based on the periodic scan of the power versus voltage characteristic at the input of the inverter. © 2013 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

19) Balato, M., Vitelli, M., Femia, N., Petrone, G., Spagnuolo, G.

Factors limiting the efficiency of DMPPT in PV applications

(2011) 3rd International Conference on Clean Electrical Power: Renewable Energy Resources Impact, ICCEP 2011, art. no. 6036319, pp. 604-608. Cited 22 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-80054913678&doi=10.1109%2fICCEP.2011.6036319&partnerID=40&md5=4e983331a5df744e92243e8b8c66c890)

[80054913678&doi=10.1109%2fICCEP.2011.6036319&partnerID=40&md5=4e983331a5df744e92243e8b8c66c890](https://www.scopus.com/inward/record.uri?eid=2-s2.0-80054913678&doi=10.1109%2fICCEP.2011.6036319&partnerID=40&md5=4e983331a5df744e92243e8b8c66c890)

DOI: 10.1109/ICCEP.2011.6036319

ABSTRACT: In this paper, the main factors limiting the efficiency of Distributed Maximum Power Point Tracking (DMPPT) in PV applications are analyzed. It is shown why, in a PV system adopting DMPPT and operating under mismatching conditions, it is not always possible to obtain the working of each PV module in its own MPP. © 2011 IEEE.

DOCUMENT TYPE: Conference Paper

SOURCE: Scopus

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

RIVISTE INTERNAZIONALI

1) Balato, M., Costanzo, L., Lo Schiavo, A., Vitelli, M.

Optimization of both Perturb & Observe and Open Circuit Voltage MPPT Techniques for Resonant Piezoelectric Vibration Harvesters feeding bridge rectifiers

(2018) Sensors and Actuators, A: Physical, 278, pp. 85-97.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85047261312&doi=10.1016%2fj.sna.2018.05.017&partnerID=40&md5=5cd9587dbd89d85a4a20db73f3108105)

[85047261312&doi=10.1016%2fj.sna.2018.05.017&partnerID=40&md5=5cd9587dbd89d85a4a20db73f3108105](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85047261312&doi=10.1016%2fj.sna.2018.05.017&partnerID=40&md5=5cd9587dbd89d85a4a20db73f3108105)

DOI: 10.1016/j.sna.2018.05.017

DOCUMENT TYPE: Article

SOURCE: Scopus

2) Balato, M., Costanzo, L., Vitelli, M.

Maximization of the extracted power in resonant electromagnetic vibration harvesters applications employing bridge rectifiers

(2017) Sensors and Actuators, A: Physical, 263, pp. 63-75.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85020028164&doi=10.1016%2fj.sna.2017.04.002&partnerID=40&md5=d775ef3cb3de3b92b0b6e0f7a55a7715)

[85020028164&doi=10.1016%2fj.sna.2017.04.002&partnerID=40&md5=d775ef3cb3de3b92b0b6e0f7a55a7715](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85020028164&doi=10.1016%2fj.sna.2017.04.002&partnerID=40&md5=d775ef3cb3de3b92b0b6e0f7a55a7715)

DOI: 10.1016/j.sna.2017.04.002

AFFILIATIONS: Department of Industrial and Information Engineering, Università degli Studi della Campania "Luigi Vanvitelli", Aversa, Italy

ABSTRACT: The capability of a resonant electromagnetic vibration harvester to provide power to a load, in given vibration conditions, is usually quantified by considering the power POPT that can be transferred to the harvester optimal impedance. In this paper it is explained that, in presence of a bridge rectifier between the harvester and the DC load, it is instead necessary to consider the power PSUBOPT, that is the power that can be transferred by the harvester to its optimal resistive load. $PSUBOPT \leq POPT$ and represents a more accurate estimate of the upper bound of the average power Ptot that can be actually transferred to the load in case a bridge rectifier is placed between the harvester and the DC load. In particular, in this paper it is shown that a bridge rectifier is able to roughly emulate a resistance and hence $P_{tot} \approx PSUBOPT \leq POPT$. By means of a suitable theoretical analysis, it is also demonstrated why and how the power that can be transferred to the load by the harvester strongly depends on the value of the DC voltage V0 at the output of the bridge rectifier. Moreover, a closed form estimate of the optimal value V0* of V0 is also provided. Experimental results are also reported and discussed in order to validate the theoretical findings. In particular, a resonant electromagnetic vibration harvester prototype has been used. The values of its main parameters are: resonance frequency 16.2 Hz, max output power 0.25 mW (at a vibration amplitude equal to 1 g), optimal DC voltage 1.2 V, coil resistance = 5720.4 Ω , coil inductance = 0.56 H. © 2017 Elsevier B.V.

DOCUMENT TYPE: Article

SOURCE: Scopus

3) Balato, M., Costanzo, L., Vitelli, M.

MPPT in wireless sensor nodes supply systems based on electromagnetic vibration harvesters for freight wagons applications

(2017) IEEE Transactions on Industrial Electronics, 64 (5), art. no. 7797197, pp. 3576-3586.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-85018952586&doi=10.1109%2fTIE.2016.2644605&partnerID=40&md5=a8e75c2c958c51588da30e693b612ffb>

DOI: 10.1109/TIE.2016.2644605

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Caserta, Italy

ABSTRACT: The starting point for the proper design of an efficient wireless sensor node (WSN) supply system that is based on the adoption of a resonant electromagnetic vibration energy harvester (REVEH) is represented by the choice of a REVEH with a proper resonance frequency. But further likewise important design guidelines need to be also taken into account especially if, as in the case of freight wagons applications, vibrations are nonsinusoidal and their characteristics change with time. In this paper, the guidelines leading to the development of a smart power electronics interface between the REVEH and the WSN are provided with reference to freight wagons applications. In particular, for the most widely used double stage ac/dc architecture for REVEH applications, such guidelines not only allow the choice of the proper dc/dc converter topology, but they also allow the development of a suitable maximum power point tracking control strategy that allows to avoid the waste of energy and the consequent necessity to oversize the REVEH. © 1982-2012 IEEE.

DOCUMENT TYPE: Article

SOURCE: Scopus

4) Balato, M., Costanzo, L., Marino, P., Rubino, G., Rubino, L., Vitelli, M.

Modified TEODI MPPT Technique: Theoretical Analysis and Experimental Validation in Uniform and Mismatching Conditions

(2017) IEEE Journal of Photovoltaics, 7 (2), art. no. 7786900, pp. 604-613. Cited 1 time.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85007346187&doi=10.1109%2fJPHOTOV.2016.2634327&partnerID=40&md5=950ff69c8662ceddf7501adf5a40b922)

[85007346187&doi=10.1109%2fJPHOTOV.2016.2634327&partnerID=40&md5=950ff69c8662ceddf7501adf5a40b922](https://www.scopus.com/inward/record.uri?eid=2-s2.0-85007346187&doi=10.1109%2fJPHOTOV.2016.2634327&partnerID=40&md5=950ff69c8662ceddf7501adf5a40b922)

DOI: 10.1109/JPHOTOV.2016.2634327

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Aversa, Italy

ABSTRACT: In this paper, the theoretical analysis and the experimental validation of a modified version of the maximum power point tracking technique, that is known with the acronym TEODI, are presented and discussed. The modified version of TEODI (MTEODI) outperforms TEODI in photovoltaic (PV) applications operating under mismatching conditions. The working principle of MTEODI is based on the periodic measurement of the short-circuit currents of the PV units. The knowledge of such currents allows not only the determination of whether mismatching conditions occur but identification of the values of the suitable correction factors, on which the working of MTEODI is based, as well. © 2011-2012 IEEE.

DOCUMENT TYPE: Article

SOURCE: Scopus

5) Balato, M., Costanzo, L., Vitelli, M.

Resonant electromagnetic vibration harvesters: Determination of the equivalent electric circuit parameters and simplified closed-form analysis for the identification of the optimal diode bridge rectifier DC load

(2017) International Journal of Electrical Power and Energy Systems, 84, pp. 111-123. Cited 5 times.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84971505057&doi=10.1016%2fj.ijepes.2016.05.004&partnerID=40&md5=ad4165ea24aeacc30b34a80947e76353>

DOI: 10.1016/j.ijepes.2016.05.004

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Aversa, Italy

ABSTRACT: In this paper, the guidelines leading to the identification of the values of the parameters of the equivalent electric circuit of vibration electromagnetic harvesters are identified and discussed. A simplified closed form analysis of the non-linear system composed by a vibration electromagnetic harvester which supplies a DC load by means of a diode bridge rectifier is also presented. Such an analysis clearly puts in evidence that the maximum power which can be extracted by a given vibration harvester (when it supplies the optimal load impedance) is higher than the maximum power which can be extracted by such an harvester when it is cascaded with a diode bridge rectifier which supplies the optimal DC load. The term "optimal load" identifies in both cases the load in correspondence of which the electric power which is extracted from vibrations attains its maximum value. © 2016 Elsevier Ltd. All rights reserved.

DOCUMENT TYPE: Article

SOURCE: Scopus

6) Balato, M., Costanzo, L., Vitelli, M.

Reconfiguration of PV modules: A tool to get the best compromise between maximization of the extracted power and minimization of localized heating phenomena

(2016) Solar Energy, 138, pp. 105-118. Cited 2 times.

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84988452853&doi=10.1016%2fj.solener.2016.09.011&partnerID=40&md5=ad368faa1f7f5e43d510c60849e2b2bd>

DOI: 10.1016/j.solener.2016.09.011

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Aversa, Italy

ABSTRACT: Localized heating phenomena due to bypass diodes conduction and/or to hot spots of reverse biased cells unavoidably lead to the damage or to the premature failure of PV modules. Therefore a proper control of the array operating point, with the aim to avoid or to limit the above phenomena, can be beneficial in order to maximize the energy production of the PV array itself during its lifetime. The basic idea which is discussed in this paper is that the maximization of the extracted power, when it is obtained at the price of too severe thermal stresses, is to be avoided. It may be preferable to give up a part of the available energy today in order to gain greater amount of energy tomorrow. In this paper, with specific reference to the Series Parallel PV array architecture, it is shown that, by means of the reconfiguration of the PV modules connections and with the help of a proper objective function, it is possible to identify, in any operating condition, both the optimal array configuration and the associated optimal operating point that are able to lead to the maximization of the extracted energy during the whole PV array lifetime. © 2016 Elsevier Ltd

DOCUMENT TYPE: Article

SOURCE: Scopus

7) Balato, M., Costanzo, L., Gallo, D., Landi, C., Luiso, M., Vitelli, M.

Design and implementation of a dynamic FPAA based photovoltaic emulator

(2016) Solar Energy, 123, pp. 102-115. Cited 5 times.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84949009465&doi=10.1016%2fj.solener.2015.11.006&partnerID=40&md5=ce58f371dc092decee3a35d882fc7c9d>

DOI: 10.1016/j.solener.2015.11.006

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Italy

ABSTRACT: In this paper, a new Photovoltaic (PV) emulator is presented and discussed. Its main feature is represented by the use of a Field Programmable Analog Array (FPAA) on which the desired current vs. voltage (I-V) PV characteristic can be implemented. The FPAA provides a suitable analog time varying reference signal for the output current control of a proper DC/DC converter whose output port emulates the PV I-V curve. The proposed emulator allows to track time varying irradiance values and therefore it allows also to emulate typical scenarios of automotive applications or involving fast time varying weather conditions (e.g. the ones which usually occur in tropical locations). Additional, not less important advantages of the proposed solution are the following ones: (1) no numerical interpolations and no storage of big amount of data in memory are required; (2) the FPAA is characterized by a great ease of reconfiguration and programming with respect to FPGA or DSP based implementations; (3) no DAC or ADC converters are needed; (4) not only uniform but also mismatching operating conditions can be easily emulated; (5) power sources different from PV sources can be easily emulated by using the same architecture. The presented experimental results allow to confirm the validity of the proposed FPAA based architecture. © 2015 Elsevier Ltd.

DOCUMENT TYPE: Article

SOURCE: Scopus

8) Balato, M., Costanzo, L., Vitelli, M.

Series-Parallel PV array re-configuration: Maximization of the extraction of energy and much more

(2015) Applied Energy, 159, pp. 145-160. Cited 13 times.

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-84941278987&doi=10.1016%2fj.apenergy.2015.08.073&partnerID=40&md5=8f8dfbaff923f79e116438b3cf17751a>

DOI: 10.1016/j.apenergy.2015.08.073

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Aversa, Italy

ABSTRACT: In this paper a simple and fast re-configuration algorithm which is suitable for a PV array with Series-Parallel architecture is presented and discussed. The main advantage of such an algorithm is represented by its capability to find a nearly optimal configuration by testing only a very small subset of all the possible configurations. In particular it is shown that, in an actual PV array composed by 24 PV modules which operate under mismatching conditions (which are quite common in urban environments due to chimneys, streets lighting poles, antennas, neighboring buildings, etc.), the proposed algorithm is able to lead to energetic performances which are more or less comparable with those ones which can be obtained by adopting a Monte Carlo based algorithm employing a much higher number of trials. Moreover, by means of a specific example, it is shown that maximization of extracted energy and absence of dangerous operating conditions, possibly leading to the premature aging of the PV field and/or to hot spot phenomena, are contrasting requirements. It is nonetheless possible to find proper configurations able to lead to a suitable compromise between such two contrasting requirements. Further work is needed and is in progress in order to design suitable re-configuration algorithms able to identify such compromise configurations. © 2015 Elsevier Ltd.

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczkAAAAJ&hl=it>

DOCUMENT TYPE: Article
SOURCE: Scopus

9) Manganiello, P., Balato, M., Vitelli, M.

A Survey on Mismatching and Aging of PV Modules: The Closed Loop

(2015) IEEE Transactions on Industrial Electronics, 62 (11), art. no. 7076631, pp. 7276-7286. Cited 16 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943805487&doi=10.1109%2fTIE.2015.2418731&partnerID=40&md5=0208a464b8f3e69311ded4f5c321b157)

[84943805487&doi=10.1109%2fTIE.2015.2418731&partnerID=40&md5=0208a464b8f3e69311ded4f5c321b157](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84943805487&doi=10.1109%2fTIE.2015.2418731&partnerID=40&md5=0208a464b8f3e69311ded4f5c321b157)

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AFFILIATIONS: Dipartimento Di Ingegneria Dell'Informazione, Seconda Università degli Studi di Napoli, Caserta, Italy

ABSTRACT: In this paper, the different aging mechanisms taking place in photovoltaic modules are discussed, and the cause-effect links, which exist among such mechanisms, are evidenced. It is also shown that a closed-loop link exists between aging and mismatching since aging (which is nonuniform by its nature) causes mismatching among cells, whereas mismatching, in turn, mainly due to its thermal effects, leads to nonuniform aging. © 2015 IEEE.

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SOURCE: Scopus

10) Balato, M., Vitelli, M.

An algorithm for the fast estimate of the maximum power voltages in PV applications adopting microconverters

(2015) COMPEL - The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, 34 (1), pp. 110-131.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-84921386089&doi=10.1108%2fCOMPEL-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84921386089&doi=10.1108%2fCOMPEL-11-2013-0378&partnerID=40&md5=3717de932aef1d301d81a6a0c5348a20)
[11-2013-0378&partnerID=40&md5=3717de932aef1d301d81a6a0c5348a20](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84921386089&doi=10.1108%2fCOMPEL-11-2013-0378&partnerID=40&md5=3717de932aef1d301d81a6a0c5348a20)

DOI: 10.1108/COMPEL-11-2013-0378

AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Aversa, Italy

ABSTRACT: Purpose - The purpose of this paper is to discuss the main parameters influencing the performances of Distributed Maximum Power Point Tracking (DMPPT) and to present an algorithm aimed at the maximization of the energetic efficiency of the grid-connected PhotoVoltaic (PV) systems. Such an algorithm is based on the estimate of the optimal operating range of the input inverter voltage and of the optimal operating voltages of the PV modules. Design/methodology/approach - The Fast Estimate of the Maximum Power Voltages algorithm, described in this paper, is based on the idea that the controllers of the DC/DC converters (DMPPT function) and the controller of the inverter (Central MPPT function) must be able to exchange useful data in order to carry out a suitable technique based on the jointed adoption of DMPPT and CMPPT function. Such a technique is essentially based on the knowledge, even if in approximate form, of the Power vs Voltage (P-V) characteristic of a string composed by PV modules and DC/DC converters and on the consequent fast identification of a set of operating points for the inverter and for the PV modules. Findings - The main advantage of the proposed algorithm is represented by the fast identification of a set of operating points for the inverter and for the PV modules, which allows to obtain a marked increase of the speed of tracking both of the inverter and of the DC/DC converters performing the DMPPT function. Originality/value - The simulation results,

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

shown in this paper, confirm the validity of the proposed original approach. © Emerald Group Publishing Limited.

DOCUMENT TYPE: Article

SOURCE: Scopus

11) Balato, M., Vitelli, M.

A new control strategy for the optimization of Distributed MPPT in PV applications

(2014) International Journal of Electrical Power and Energy Systems, 62, pp. 763-773. Cited 6 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84902659075&doi=10.1016%2fj.ijepes.2014.05.032&partnerID=40&md5=e7b636c398ed90e35757607d62d7f155)

[84902659075&doi=10.1016%2fj.ijepes.2014.05.032&partnerID=40&md5=e7b636c398ed90e35757607d62d7f155](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84902659075&doi=10.1016%2fj.ijepes.2014.05.032&partnerID=40&md5=e7b636c398ed90e35757607d62d7f155)

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AFFILIATIONS: Department of Industrial and Information Engineering, Via Roma 29, Aversa 81031, Italy

ABSTRACT: In this paper, a new control strategy allowing to optimize the performances of PV systems adopting Distributed Maximum Power Point Tracking (DMPPT) is presented and discussed. Such a strategy is based on the evaluation of an estimate of the optimal operating range of the inverter input voltage and on the evaluation of an estimate of the optimal operating voltages of the PV modules. The main advantage of the proposed technique is represented by the possibility to evaluate in closed-form the above estimates, provided that the PV modules short circuit currents are known. The closed-form evaluation of the above estimates allows in turn the fast identification of a set of optimal operating points for the inverter and for the PV modules; such a fast identification allows to obtain a marked increase of the speed of tracking of the maximum power point of the whole PV system. Moreover, a further advantage of the proposed technique is represented by the capability to avoid that the operating value of the inverter input voltage remains trapped in the neighborhood of a suboptimal operating point thus lowering the energetic efficiency of the PV system, as it may happen when standard MPPT techniques (such as the Perturb and Observe technique) are adopted. © 2014 Elsevier Ltd. All rights reserved.

DOCUMENT TYPE: Article

SOURCE: Scopus

12) Balato, M., Vitelli, M.

Optimization of distributed maximum power point tracking PV applications: The scan of the Power vs. Voltage input characteristic of the inverter

(2014) International Journal of Electrical Power and Energy Systems, 60, pp. 334-346. Cited 9 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84899006569&doi=10.1016%2fj.ijepes.2014.03.058&partnerID=40&md5=eec6fd66f5c6cd72dba72de7ba8d5ebb)

[84899006569&doi=10.1016%2fj.ijepes.2014.03.058&partnerID=40&md5=eec6fd66f5c6cd72dba72de7ba8d5ebb](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84899006569&doi=10.1016%2fj.ijepes.2014.03.058&partnerID=40&md5=eec6fd66f5c6cd72dba72de7ba8d5ebb)

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AFFILIATIONS: Department of Industrial and Information Engineering, Via Roma 29, Aversa 81031, Italy

ABSTRACT: In order to overcome the drawbacks associated to mismatching operating conditions in PV systems it is possible to adopt one DC/DC converter (microconverter) for each PV module. The aim of microconverters is that of carrying out the Distributed Maximum Power Point Tracking (DMPPT), that is the MPPT of each PV module rather than of the whole PV field. Standard PV systems adopts instead central inverters which carry out the Central Maximum Power Point Tracking (CMPPT), that is the MPPT of the whole PV array. The DMPPT alone is not enough in order to get the actual maximization of the energetic efficiency of the PV system. Instead, it is necessary to couple the DMPPT technique

Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

with a suitable CMPPT technique. In this paper it will be shown how to properly optimize the CMPPT technique. In particular, the considered CMPPT technique is based on the periodic scan of the Power vs. Voltage characteristic seen at the input by the inverter. The aim of such a scan is to locate the optimal operating value of the bulk inverter voltage v_b , that is the value of v_b in correspondence of which the power extracted from the PV source is the maximum one. It will be shown that, despite of the apparent simplicity of such a CMPPT technique, much care is needed in order to avoid errors due to the peculiar shape assumed, under mismatching operating conditions, by the Power vs. Voltage characteristic seen at the input by the inverter. In fact, such a characteristic may exhibit the presence of multiple peaks and/or flat parts and/or nearly vertical portions which may easily lead the CMPPT technique to the error and, consequently, may cause a potentially significant waste of the available energy. The results of numerical simulations fully confirm the validity of the theoretical predictions. © 2014 Elsevier Ltd. All rights reserved.

DOCUMENT TYPE: Article

SOURCE: Scopus

13) Aurilio, G., Balato, M., Graditi, G., Landi, C., Luiso, M., Vitelli, M.

Fast hybrid MPPT technique for photovoltaic applications: Numerical and experimental validation

(2014) *Advances in Power Electronics*, 2014, art. no. 125918, . Cited 15 times.

[https://www.scopus.com/inward/record.uri?eid=2-s2.0-](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84903649777&doi=10.1155%2f2014%2f125918&partnerID=40&md5=aaf8746be3f45f7c4330845457d49a5e)

[84903649777&doi=10.1155%2f2014%2f125918&partnerID=40&md5=aaf8746be3f45f7c4330845457d49a5e](https://www.scopus.com/inward/record.uri?eid=2-s2.0-84903649777&doi=10.1155%2f2014%2f125918&partnerID=40&md5=aaf8746be3f45f7c4330845457d49a5e)

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AFFILIATIONS: Department of Industrial and Information Engineering, Second University of Naples, Via Roma 29, 81031 Aversa, Italy;

ENEA Portici Research Centre, P. E. Fermi 1, Naples, 80055 Portici, Italy

ABSTRACT: In PV applications, under mismatching conditions, it is necessary to adopt a maximum power point tracking (MPPT) technique which is able to regulate not only the voltages of the PV modules of the array but also the DC input voltage of the inverter. Such a technique can be considered a hybrid MPPT (HMPPT) technique since it is neither only distributed on the PV modules of the PV array or only centralized at the input of the inverter. In this paper a new HMPPT technique is presented and discussed. Its main advantages are the high MPPT efficiency and the high speed of tracking which are obtained by means of a fast estimate of the optimal values of PV modules voltages and of the input inverter voltage. The new HMPPT technique is compared with simple HMPPT techniques based on the scan of the power versus voltage inverter input characteristic. The theoretical analysis and the results of numerical simulations are widely discussed. Moreover, a laboratory test system, equipped with PV emulators, has been realized and used in order to experimentally validate the proposed technique. © 2014 Gianluca Aurilio et al.

DOCUMENT TYPE: Article

SOURCE: Scopus

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1) Marco Balato, Luigi Costanzo, Massimo Vitelli, *Maximum Power Point Tracking Techniques*, Wiley Encyclopedia of Electrical and Electronics Engineering, Published Online: 15 FEB 2016. DOI: 10.1002/047134608X.W8299.

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Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it

Researchgate profile: https://www.researchgate.net/profile/Marco_Balato

Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>

1) Marco Balato, Luigi Costanzo, Massimo Vitelli, *DMPPT PV SYSTEMS: Modelling and control techniques*, Elsevier book, Advances in Renewable Energies and Power Technologies Volume 1, Solar and Wind Energies.

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Ing. Marco Balato



Ing. Marco Balato

Mail: marco.balato@unina.it, pec: marco.balato@ordingce.it
Researchgate profile: https://www.researchgate.net/profile/Marco_Balato
Google scholar profile: <https://scholar.google.it/citations?user=9gdczfkAAAAJ&hl=it>