Conference Programme

First Day
Monday June 11th, 08:00 – 09:00
Conference Registration

Monday June 11th, 09:00 – 09:30
Conference Opening

- Giovanni Moroni, Conference Chair
- Marco Francesco Bocciolone, Head of Mechanical Engineering Department, Politecnico di Milano
- Tullio Tolio, President of AITeM - Associazione Italiana di Tecnologia Meccanica
- Alessandro Marini, Cluster Manager, AFIL – Associazione Fabbrica Intelligente Lombardia

Monday June 11th, 09:30 – 10:50
Keynotes

- Kn1: Geometrical Variations Management 4.0: towards next Generation Geometry Assurance
  B. Schleich, K. Wärmefjord, R. Söderberg, S. Wartzack
- Kn2: A Brief Analysis of Recent ISO Tolerancing Standards and Their Potential Impact on Digitization of Manufacturing
  E.P. Morse, C.M. Shakarji, V. Srinivasan

Monday June 11th, 10:50 – 11:10
- Coffee Break

Monday June 11th, 11:10 – 12:25
A1: Tolerance Specification
Chair: Denis Teissandier

- Interactive multimedia learning environment for geometrical specification indication & verification rules – Z. Humienny, M. Berta
- A new approach to first tolerance evaluations in the conceptual design stage based on tolerance graphs – S. Goetz, B. Schleich, S. Wartzack
- A graph-based method and a software tool for interactive tolerance specification
  S. Patalano, F. Vitolo, S. Gerbino, A. Lanzotti

B1: Tolerance Verification 1
Chair: Wahyudin P. Syam

- New development and distribution concepts for Education in Coordinate Metrology
  M. Marxer, L. Rocha, N. Anwer, E. Savio
- Toward a Classification of Partitioning Operations for Standardization of Geometrical Product Specifications and Verification – N. Anwer, P.J. Scott, V. Srinivasan
- Reference data simulation for L∞ fitting of aspheres
  Y. Arezki, C. Mehdi-Souzani, N. Anwer, H. Nouir
Monday June 11th, 12:25 – 13:45
- Lunch

Monday June 11th, 13:45 – 14:25

Keynotes
- **Kn3**: Information-rich surface metrology  
  N. Senin, R. Leach

Monday June 11th, 14:25 – 15:40

**A2: Robust Design and Uncertainty 1**  
*Chair: Nabil Anwer*
- Robust-Design-Optimization of mechanisms based on kinematic requirements considering uncertainties – B. Heling, B. Schleich, S. Wartzack
- Tolerance Analysis - Key Characteristics Identification by Sensitivity Methods  
  D. Idriss, P. Beaurepaire, L. Homri, N. Gayton
- Application of a graphical scheme for representing the mode of action of products for identification of key characteristics – K. Bjarklev, T. Eifler, N.H. Mortensen, S. Linnebjerg, M. Ebro

Monday June 11th, 15:40 – 16:00
- Coffee Break

Monday June 11th, 16:00 – 17:40

**A3: Robust Design and Uncertainty 2**  
*Chair: Rikard Söderberg*
- Quality-driven Optimization of Assembly Line Configuration for Multi-Station Assembly Systems with Compliant Non-Ideal Sheet Metal Parts – V.J. Shahi, A. Masoumi, P. Franciosa, D. Ceglarek
- Comparison of different methods for scrap rate estimation in sampling-based tolerance-cost-optimization – M. Hallmann, B. Schleich, B. Heling, A. Aschenbrenner, S. Wartzack
- Function-Oriented Quality Control Strategies for High Precision Products  
  R. Wagner, B. Haefner, G. Lanza
- Study on the Robust Tolerance Design with Multiple Resource Suppliers on Cloud Manufacturing Platform – Z. Wu, K. Yang, L. Ting, Y. Cao, J. Yang, Y. Gan
B3: Tolerance Verification 3
Chair: Edward Morse

- Uncertainty analysis of a six-degree-of-freedom surface encoder for a planar motion stage
- Uncertainty of coordinate measurement of geometrical deviations
  W. Płowucha
- Metrological evaluation of a Coordinate Measuring Machine with 5-axis measurement technology
  A.R. Sousa
- Method for Measurement Uncertainty Evaluation of Cylindricity Error Based on Good Point Set
  L. Ren, T. Liu, Q. Zhao, J. Yang, Y. Cao

Monday June 11th, 17:40 – 20:00
Mechanical Engineering Department Lab Visit and Welcome Aperitif

Second Day
Tuesday June 12th, 09:00 – 10:40
A4: Tolerance Analysis 1
Chair: Wilma Polini

- Taking into account form variations in polyhedral approach in tolerancing analysis
  D. Teissandier, V. Delos, S. Arroyave-Tobon, Y. Ledoux
- Comparative Study of Tolerance Analysis Methods Applied to a Complex Assembly
  S. Ramnath, P. Haghighi, A. Chitale, J.K. Davidson, J.J. Shah
- Generating T-Maps with the kinematic transformation to model manufacturing variations of parts
  with position tolerancing of cylinders – A. Chitale, N.J. Kalish, J.K. Davidson, J.J. Shah
- Statistical Tolerance Analysis with T-Maps for Assemblies
  G. Ameta, J.K. Davidson, J.J. Shah

B4: Additive Manufacturing 1
Chair: Giovanni Moroni

- Tolerancing and Verification of Additive Manufactured Lattice with Supplemental Surfaces
  G. Ameta, J. Fox, P. Witherell
- Shape Transformation Perspective for Geometric Deviation Modeling in Additive Manufacturing
  Z. Zhu, N. Anwer, L. Mathieu
- Prediction and visualization of achievable orientation tolerances for additive manufacturing
  H. Budinoff, S. McMains
- A categorical framework for formalising knowledge in additive manufacturing
  Q. Qi, L. Pagani, P.J. Scott, X. Jiang

Tuesday June 12th, 10:40 – 11:00
- Coffee Break
Tuesday June 12th, 11:00 – 12:40

**A5: Tolerance Analysis 2**  
**Chair:** Sandro Wartzack

- Consideration of Working Conditions in Assembly Tolerance Analysis
  L. Ting, Z. Zuowei, C. Yanlong, N. Anwer, Y. Jiangxin
- Statistical Tolerance Analysis Technique for Over-Constrained Mechanical Systems
  L. Homri, P. Beaurepaire, A Dumas, E. Goka, N. Gayton, J.Y. Dantan
- Computing clearances and deviations in over-constrained mechanisms
  A. Mabire, P. Serré, M. Moinet, J.-F. Rameau, A. Clément
- Tolerance analysis of hyperstatic mechanical systems with deformations
  L. Pierre, O. Rouetbi, B. Anselmetti

**B5: Additive Manufacturing 2**  
**Chair:** Gaurav Ameta

- Typology of geometrical defects in Electron Beam Melting
  T.H. Vo, M. Museau, F. Vignat, F. Villeneuve, Y. Ledoux, A. Ballu
- Data fusion methods for statistical process monitoring and quality characterization in metal additive manufacturing – M. Grasso, F. Gallina, B.M. Colosimo
- In-process measurement of the surface quality for a novel finishing process for polymer additive manufacturing – W.P. Syam, R. Leach, K. Rybalcenko, A. Gaio, J. Crabtree

Tuesday June 12th, 12:40 – 14:00

- Lunch

Tuesday June 12th, 14:00 – 15:40

**A6: Tolerance Analysis 3**  
**Chair:** Alex Ballu

- Tolerance Analysis of Surface-to-Surface Contacts Using Finite Element Analysis
  S. Camuz, R. Söderberg, K. Wärmefjord, M. Lundblad
- Computer Aided Tolerancing of Composite Elevator Assembly Involving Clamping Forces Coordination – H. Wang, S. Zhang, J. Yu
- The Applicability of CAT tools in industry – boundaries and challenges in tolerance engineering practice observed in a medical device company – N. Sigurdarson, T. Eifler, M. Ebro
- Tolerance analysis using a Computer Aided Tolerancing Software: ANATOLE 3D
  L.-M. Frère, M. Royer, J. Fourcade
B6: Additive Manufacturing 3
Chair: Leonardo De Chiffre

- X-ray computed tomography for metal additive manufacturing: challenges and solutions for accuracy enhancement – F. Zanini, E. Sbettega, S. Carmignato
- Surface extraction algorithm influence on the uncertainty assessment and tolerance compliance of computed tomography measurements J.A. Yagüe-Fabra, R. Jiménez, S. Ontiveros, M. Torralba, G. Tosello
- A Discussion on Performance Verification of 3D X-Ray Computed Tomography Systems G. Moroni, S. Petrò
- Industrial needs and available techniques for geometry assurance for metal AM parts with small scale features and rough surfaces – J. Berglund, R. Söderberg, K. Wärmefford

Tuesday June 12th, 15:40 – 16:00
- Coffee Break

Tuesday June 12th, 16:00 – 17:40
A7: Functional Tolerancing
Chair: Kristina Wärmefford

- On the usage of Least Material Requirement for Functional Tolerancing L. Pierre, B. Anselmetti, N. Anwer
- An adaptive tolerancing algorithm for freeform profiles L. Pagani, Q. Qi, J. Wang, X. Jiang, P.J. Scott
- Functional ISO specification of a blade: a tolerancing challenge Y. Fallot, F. Thiébaut, M. Royer
- A tolerance design method for hydrostatic guideways motion accuracy based on error averaging effect – J. Zha, Y. Chen, Z. Wang

B7: Micro-Manufacturing
Chair: Massimiliano Annoni

- Tolerance verification of precision injection moulded Fresnel lenses D. Loaldi, M. Calaon, D. Quagliotti, P. Parenti, M. Annoni, G. Tosello
- Multiscale dimensional tolerance specifications established on shrinkage assessment in ceramic micro injection molding – D. Quagliotti, H.N. Hansen, G. Tosello
- Comparison of micro and conventional injection moulding based on process precision and accuracy F. Baruffi, A. Charalambis, M. Calaon, R. Elsborg, G. Tosello
- Meta-Model Based on Artificial Neural Networks for Tooth Root Stress Analysis of Micro-Gears B. Haefner, M. Biehler, R. Wagner, G. Lanza

Tuesday June 12th, 20:00 – 22:30
Conference Dinner
- Fondazione Stelline, Milano, Corso Magenta n.61
Third Day
Wednesday June 13th, 09:00 – 10:40

A8: Form Deviation in Tolerance Analysis  
Chair: Lihong Qiao

- An Approach to the Sensitivity Analysis in Variation Simulations considering Form Deviations  
  B. Schleich, S. Wartzack
- Shape Error Modelling and Analysis by Conditional Simulations of Gaussian Random Fields for Compliant Non-Ideal Sheet Metal Parts – M. Babu, P. Franciosa, D. Ceglarek
- FEA integration in the tolerance analysis using Skin Model Shapes  
  A. Corrado, W. Polini
- Tolerance analysis of annular surfaces considering form errors and local surface deformations  
  Z. Zhang, J. Liu, X. Ding, N. Shao

B8: Tolerance Verification 4  
Chair: Stefano Petrò

- Reverse Engineering of Turbine Blades Kaplan's type for Small Hydroelectric Power Station  
  S. Zivkovic, L. Cerce, J. Kostic, V. Majstorovic, D. Kramar
- Study of measurement process capability with non-normal data distributions  
  G. Genta, M. Galetto
- Can A Low Cost Sensing System Be Exploited For High Precision Machining?  
  F. Modica, V. Basile, S. Ruggeri, G. Fontana, I. Fassi
- Highly accurate optical μCMM for measurement of micro holes  
  K. Zangl, R. Danzl, F. Helml, M. Prantl

Wednesday June 13th, 10:40 – 11:00

- Coffee Break

Wednesday June 13th, 11:00 – 12:40

A9: Actual Mating Conditions  
Chair: Benjamin Schleich

- The Calculation Method of the Inspection Tolerance Zone When Two Datum Features Apply MMC/LMC – Y. Wu
- Assembly simulation of Skin Model Shapes: a comparison of two methods taking into account external forces – X. Yan, A. Ballu
- Research on computing position and orientation deviations caused by mating two non-ideal planes  
  J. Zhang, L. Qiao
- A study of contact state for non-ideal planar surface assembly  
  Y. Li, L. Qiao
B9: Quality
Chair: Maurizio Galetto

- An Industrial Product-Service System approach for Laser Process Quality Control
  D. Mourtzis, N. Boli, K. Alexopoulos, P. Pittaro, A. Terreno

- Geometrical Variation from Selective Laser Heat Treatment of Boron Steels
  V.R. Sagar, K. Wärmefjord, R. Söderberg

- Evaluating evolutionary algorithms on spot welding sequence optimization with respect to geometrical variation
  – R.S. Tabar, K. Wärmefjord, R. Söderberg

- Evaluation of the spring-in of CFRP thin laminates in dependence on process variation
  A. Corrado, W. Polini, L. Sorrentino, C. Bellini

Wednesday June 13th, 12:40 – 13:00

Conference Closing

Wednesday June 13th, 13:00 – 14:00
- Lunch

Wednesday June 13th, 15:00 – 17:00

Conference Visit: Fine Arts in Milano
- Veneranda Biblioteca Ambrosiana, Milano, Pizza Pio XI n.2
- Highline Galleria