Nicola Vianello
Consorzio RFX-CNR
C.so Stati Unit 4, I-35127, Padova
+39 0498295991 · nicola.vianello@igi.cnr.it

Personal information

Name	Nicola Vianello
Date and Place of birth	14 August 1975, Venice, Italy
Work Address	ISTP-CNR and Consorzio RFX C.so Stati Uniti 4, 35127 Padova, Italy
ORCID ID	0000-003-4401-5346
ResearcherID	B-6323-2008
Google Scholar	Google scholar
Plubons	Plubons profile

Education

1999	**M. Sci. Physics**, *Universitá degli Studi di Padova*. Grade: **110/110 cum Laude**
2002	**PhD in Energetics**, *Universitá degli Studi di Padova*

Employment

2003–2015	*Consiglio Nazionale delle Ricerche and Consorzio RFX*, Researcher
2015-2016	*Swiss Plasma Center, Ecole Polytechnique Federale de Lausanne*, Researcher
2016-2022	*Institute of Plasma Science and Technology, National Research Council (CNR) and Consorzio RFX*, Researcher permanent staff
2023-Present	*Institute of Plasma Science and Technology, National Research Council (CNR) and Consorzio RFX*, Senior Researcher

Duties and Responsibilities

2007–2015	Responsible Scientist for edge manipulators in RFX-mod device
2015-2016	Responsible Scientist Soft X ray diagnostic in the TCV tokamak. Deputy Responsible Scientist for the Neutral Beam Heating system in the TCV tokamak.
2009	Task force leader in RFX-mod experiment for task force *Particle, Momentum and energy transport*
2010	Task force leader in RFX-mod experiment for task force *Physics integration for high performance RFP*
2011	Coordinator of the EFDA working group *3D field effects in edge and SOL and diagnostic development* under EFDA Transport Topical Group.
2012	Member of the Program committee of the 17th Joint EU-US Transport Task Force Meeting in combination with the 4th EFDA Transport Topical Group meeting, 3-6 September 2012, Padova, Italy
2013	Scientific Coordinator of experiment *B13-19 Investigation of M-Mode* on JET Tokamak campaigns C31-C34
2014	Scientific Coordinator of experiment *AUG14-2.2-3, SOL filamentary transport at high density*, under the MST1 Eurofusion Work-Packages.
2015-2016	Scientific Coordinator of experiment *TCV15-2.2-3: Filamentary Transport in the SOL* under MST1 Eurofusion Work-Package.
2015-2016	Scientific Coordinator of experiment *TCV15-1.5-1, Mitigation of high Z impurity accumulation through combined central ECRH and tailoring of MHD activity in high performance H-modes* under MST1 Eurofusion Work-Package.

2017-2018	Scientific Coordinator of Topic 21 *Filamentary transport in high-power H-mode conditions and in no/small-ELM regimes to predict heat and particle loads on PFCs for future devices* under MST1 Eurofusion Work-Package.
2018-19	Scientific Coordinator of JET Task T18-02 *Scrape-off layer and SOL- pedestal interaction* under JET1 Eurofusion Work-Package.
2019-20	Scientific Coordinator of JET Experiment M18-41 *Divertor geometry effect on detachment and SOL* under JET1 Eurofusion Work-Package.
2019-20	Scientific Coordinator of Topic 16 *Effect of filamentary transport on heat and particle loads* under MST1 Eurofusion Work-Package.
2019-Present	European representative at the *Pedestal and Edge Physics* ITPA Topical Group
2020-Present	Responsible of ITPA Div-SOL task D34 on *Far SOL fluxes and link to detachment*
2020-Present	Deputy task force leader of EUROfusion Package *Tokamak Exploitation*
2020-Present	Member of the *Allocation Commitee* of EUROfusion Marconi HPC resources
2022-Present	Member of the Expert Group on SOL and Divertor Physics for the definition of the DTT Experiment Research Plan

Teaching activity

Supervision of 2 Bachelor students, 4 Master students, 5 PhD students. Since 2008 I've acted as assistant for the courses of *Fluid and Plasma Physics*, *Foundamental of Plasma Physics* at the Department of Physics of the University of Padova. I've also teached at the Joint Research Doctorate and European Interuniversity Doctoral Network on Fusion science and Engineering. I've been invited in the PhD Commitee for several Universities including the Technical University of Denmark, the Ecole Polythecnique Federale de Lausanne, the University of York, the Aix-Marseille Universite.

Research

I've been involved in fusion plasma science since my M.Sci. thesis in Physics in 1999. During these 25 years I've tried to expand as much as possible my personal research skills focusing in particular on collection, analysis, interpretation and modeling of experimental data collected in fusion oriented experiments (Reversed Field Pinches, Tokamaks and Stellarators), with particular emphasis on the comparison with theoretical and numerical results. Main research subjects may be summarized as follow:

(a) Electromagnetic turbulence induced transport: with emphasis on anomalous transport studies induced by different source of turbulence: electrostatic as Drift-induced or interchange induced transport, or electromagnetic including the role of magnetic flutter fluxes in the mechanism of particle and energy losses

(b) Statistical analysis of plasma turbulence: the topic allowed me to get confident with advanced statistical tool (as Wavelet Transforms, Local Intermittency Measurements, Waiting Time distribution) and with dynamical system model as Self-Organized Criticality (SOC) systems, shell-models

(c) Blobs and ELM filaments: non linear coherent structures arising as a non-linear evolution of plasma instabilities have been experimentally investigated. The research includes studies on the generation and evolution of these structures including their parallel dynamics with emphasis on turbulent *blobs* and ELM *filaments*

(d) Sheared flow generation: Non linear interaction between turbulence and sheared flows including experimental investigation of the role of Maxwell and Reynolds stress in the momentum generation of edge flow

(e) Magnetic topology and its relation with plasma flow: with emphasis on the effect of non-axysimmetric magnetic field perturbation on kinetic properties of the plasma, as plasma flow, ambipolar electric field and Plasma Wall Interaction

(f) Divertor and SOL physics with emphasis on the impact on pedestal transport

(g) No ELM regimes: with emphasis on the modification of far SOL particle and heat load in no-ELM regimes

(h) Separatrix turbulence: with emphasis on the role played by local separatrix plasma parameter in setting near and far SOL transport

Among the results the following should be highlighted:

- **i** First experimental proof of non applicability of *Self Organized Criticality* paradigm to edge plasma turbulence [15, 14]
- **ii** First experimental evidence of non-linear generation of edge flow in Reversed Field Pinches through Reynolds stress mechanism [13, 12]

iii First experimental measurements of parallel current associated to coherent structures in a fusion relevant plasma [11]

iv First experimental evidence of the existence of a particular class of coherent structure, named *Drift-Kinetic Alfvén vortices*, arising because of the non linear coupling of Drift and Kinetic Alfvén waves in a laboratory plasma [9]. This type of structure has been previously detected in the magnetosphere

v First experimental estimate of parallel current associated to Edge Localized Modes filament [8]

vi First experimental measurements of 2D current distribution associated to plasma blobs [7]

vii Experimental evidence of transition towards helical states in high current Reversed Field Pinch operation [10] and its consequence on edge ambipolarity [6]

viii Experimental investigation on the role of *blobs* in the formation of the so-called *shoulder* in density gradient in high density regime [5, 4, 3, 2, 1]

In all my carrier I've always tried to conjugate a strong experimental insight on the data collection, participating in all the experimental activities mandatory in order to obtain useful experimental results, and a rigorous theoretical approach in the data analysis and interpretation, using theories and numerical tools as a framework to understand real plasma signals. This approach helped me to build a bridge between theories and experiments, a necessary effort in order to understand complex plasma dynamics.
I've authored a total number of **158 Articles** in peer reviewed journal, more than **100 Conference proceedings**. The complete list of publications is available on request.
h-index factor: 35 according to ISI Web of Knowledge (last update April 19, 2024) and 48 according to Google Scholar (last update April 19, 2024) (last update April 19, 2024).

Relevant publications

[1] Stagni, A., **Vianello, N.**, Agostini, M., Colandrea, C., Gorno, S., Labit, B., Sheikh, U. A., Simons, L., Sun, G.-Y., Tsui, C. K.-W., Ugoletti, M., Wang, Y., Wüthrich, C. T., Boedo, J. A., Reimerdes, H., and Theiler, C. (2024) *Nuclear Fusion*.

[2] Redl, A., Eich, T., **Vianello, N.**, David, P., Team, t. A. U., and Team, t. E. M. (2023) *Nuclear Materials and Energy* **34**, 101319.

[3] Stagni, A., **Vianello, N.**, Tsui, C., Colandrea, C., Gorno, S., Bernert, M., Boedo, J., Brida, D., Falchetto, G., Hakola, A., Harrer, G., Reimerdes, H., Theiler, C., Tsitrone, E., Walkden, N., Team, t. T., and Team, t. E. M. (2022) *Nuclear Fusion* **62**, 096031.

[4] **Vianello, N.**, Carralero, D., Tsui, C. K., Naulin, V., Agostini, M., Cziegler, I., Labit, B., Theiler, C., Wolfrum, E., Aguiam, D., Allan, S., Bernert, M., Boedo, J., Costea, S., Oliveira, H. D., Fevrier, O., Galdon-Quiroga, J., Grenfell, G., Hakola, A., Ionita, C., Isliker, H., Karpushov, A., Kovacic, J., Lipschultz, B., Maurizio, R., McClements, K., Militello, F., Nielsen, A. H., Olsen, J., Rasmussen, J. J., Ravensbergen, T., Reimerdes, H., Schneider, B., Schrittwieser, R., Seliunin, E., Spolaore, M., Verhaegh, K., Vicente, J., Walkden, N., and Zhang, W. (2020) *Nuclear Fusion* **60**, 016001.

[5] **Vianello, N.**, Tsui, C. K.-W. K.-W., Theiler, C., Allan, S., Boedo, J. A., Labit, B., Reimerdes, H., Verhaegh, K., Vijvers, W. A. J., Walkden, N., Costea, S., Kovačič, J., Ionita, C., Naulin, V., Nielsen, A., Rasmussen, J. J., Schneider, B. S., Schrittwieser, R., Spolaore, M., Carralero, D., Madsen, J., Lipschultz, B., and Militello, F. (Nov. 2017) *Nuclear Fusion* **57**, 116014.

[6] Spizzo, G., **Vianello, N.**, White, R. B., Abdullaev, S. S., Agostini, M., Cavazzana, R., Ciaccio, G., Puiatti, M. E., Scarin, P., Schmitz, O., Spolaore, M., Terranova, D., RFX, and Teams, T. (Apr. 2014) *Physics of Plasmas* **21**, 056102.

[7] Furno, I., Spolaore, M., Theiler, C., **Vianello, N.**, Cavazzana, R., and Fasoli, A. (June 2011) *Physical Review Letters* **106**, 245001.

[8] **Vianello, N.**, Naulin, V., Schrittwieser, R., M uller, H. W., Zuin, M., Ionita, C., Rasmussen, J. J., Mehlmann, F., Rohde, V., Cavazzana, R., and Maraschek, M. (2011) *Physical Review Letters* **106**, 125002.

[9] **Vianello, N.**, Spolaore, M., Martines, E., Cavazzana, R., Serianni, G., Zuin, M., Spada, E., and Antoni, V. (2010) *Nuclear Fusion* **50**, 042002.

[10] Lorenzini, R., Martines, E., Piovesan, P., Terranova, D., Zanca, P., Zuin, M., Alfier, A., Bonfiglio, D., Bonomo, F., Canton, A., Cappello, S., Carraro, L., Cavazzana, R., Escande, D., Fassina, A., Franz, P., Gobbin, M., Innocente, P., Marrelli, L., Pasqualotto, R., Puiatti, M., Spolaore, M., Valisa, M., **Vianello, N.**, and Martin, P. (2009) *Nature Physics* **5**, 570–754.

[11] Spolaore, M., **Vianello, N.**, Agostini, M., Cavazzana, R., Martines, E., Scarin, P., Serianni, G., Spada, E., Zuin, M., and Antoni, V. (2009) *Physical Review Letters* **102**, 165001.

[12] **Vianello, N.**, Antoni, V., Spada, E., Spolaore, M., Serianni, G., Cavazzana, R., Bergsåker, H., Cecconello, M., and Drake, J. (2005) *Nucl. Fusion* **45**, 761–766.

[13] **Vianello, N.**, Spada, E., Antoni, V., Spolaore, M., Serianni, G., Regnoli, G., Cavazzana, R., Bergsåker, H., and Drake, J. R. (2005) *Physical Review Letters* **94**, 135001.

[14] Antoni, V., Carbone, V., Cavazzana, R., Regnoli, G., **Vianello, N.**, Spada, E., Fattorini, L., Martines, E., Serianni, G., Spolaore, M., Tramontin, L., and Veltri, P. (2001) *Physical Review Letters* **87**, 045001.

[15] Spada, E., Carbone, V., Cavazzana, R., Fattorini, L., Regnoli, G., **Vianello, N.**, Antoni, V., Martines, E., Serianni, G., Spolaore, M., and Tramontin, L. (2001) *Physical Review Letters* **86**, 3032–3035.