

# P1.3017 Toroidal plasmoid generation via extreme hydrodynamic shear

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See the full abstract here:

<http://ocs.ciemat.es/EPS2019ABS/pdf/P1.3017.pdf>

Saint Elmo's fire and lightning are two known forms of naturally occurring atmospheric pressure plasmas. As a technology, non-thermal plasmas are induced from artificially created electromagnetic or electrostatic fields. Here we report the observation of arguably a new case of a naturally formed such plasma, created in air at room temperature without external electromagnetic action, by impinging a high-speed microjet of de-ionized water on a dielectric solid surface. We demonstrate that tribo-electrification from extreme and focused hydrodynamic shear is the driving mechanism for the generation of energetic free electrons. Air ionization results in a plasma that, unlike the general family, is topologically well-defined in the form of a coherent toroidal structure. Possibly confined through its self-induced electromagnetic field, this plasmoid is shown to emit strong luminescence and discrete-frequency radio waves. Our experimental study suggests the discovery of a novel platform to support new experimentation in low-temperature plasma science.

## References

[1] Gharib M, Mendoza S, Rosenfeld M, Bezai M, Alves Pereira F (2017). Toroidal Plasmoid Generation Via Extreme Hydrodynamic Shear. *Proceedings of the National Academy of Sciences*, 114(48): 12657-12662.

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