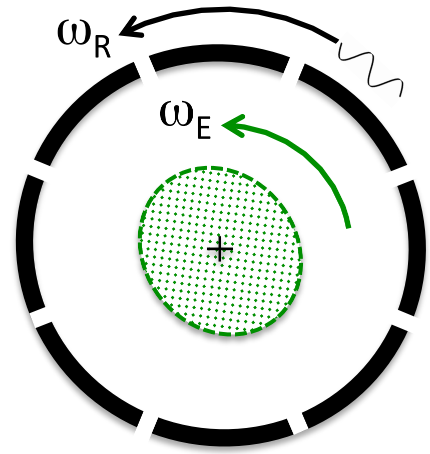
Rotating Wall: Plasmas In Stasis

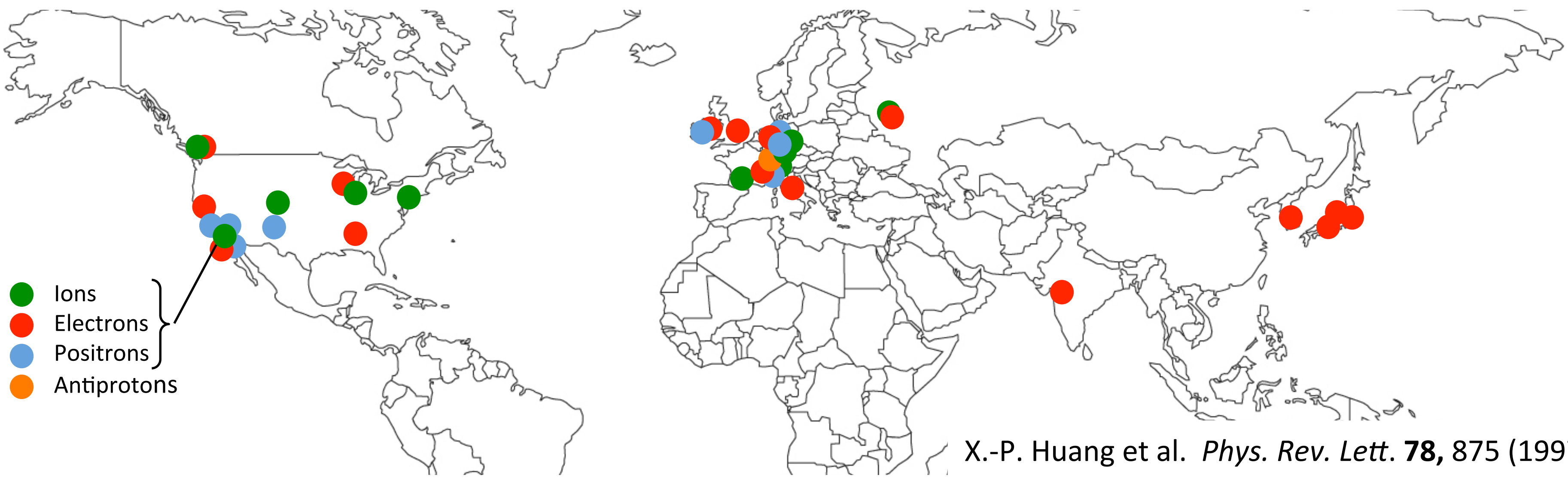
Driscoll, Dubin, O'Neil UCSD



The Rotating Wall technique allows non-neutral plasmas to be compressed to high densities, and to be confined for arbitrarily long times (weeks). In essence, a weak wall voltage rotating at ω_R "spins up" the plasma (drift) rotation ω_E, overcoming unavoidable drags due to trap asymmetries. The confined plasmas can then be in global thermal equilibrium in the rotating frame, including the correlated liquid and crystal states at low temperatures.

The RW technique was developed at UCSD for pure Mg+ ion plasmas and pure electron plasmas, to enable precision tests of plasma transport processes. The technique was immediately "post-doc transferred" to NIST Boulder, where it enabled phase-locked images of rotating Be+ crystals. Applications to anti-matter particles followed immediately, both for positrons (commercialized by First Point Scientific), and for anti-protons at CERN to create anti-hydrogen.

The RW technique is now used at 27 institutions world-wide, for studies of plasma physics, atomic physics, fundamental constants, quantum computing, and accelerator physics.



X.-P. Huang et al. *Phys. Rev. Lett*. **78,** 875 (1997)

Rotating Wall References (out of 370 total)

	Species	Location	PI	Ref.
1.	Mg^+	UCSD	Driscoll	X.-P.Huang, *Phys Rev Lett* 78, 875 (1997)
2.	e^-	UCSD		F.Anderegg, *Phys Rev Lett* 81, 4875 (1998)
3.	e^- Mg^+	UCSD		E.Hollman, *Phys Plasmas* 7, 2776 (2000)
4.	Mg^+ Γ>>1	UCSD		F.Anderegg, *Phys Rev Lett* 102, 185001 (2010)
5.	Be^+	NIST Boulder	Bollinger	X.-P.Huang, *Phys Rev Lett* 80, 73 (1998)
6.	e^+	Los Angeles UCSD UCR	Greaves Surko Mills	R.Greaves, *Phys Rev Lett* 85, 1883 (2000) D.Cassidy, *Phys Rev Lett* 104, 173401 (2010)
7.	e^+	CERN / ATHENA Berkeley Swansea, UK	 Fajans Charlton	D.P.van der Werf, *NNP V*, AIP Conf Proc 692, 172 (2003)
8.	e^-	Milan IT	Pozzoli	B.Paroli, *Phys Plasmas* 21, 122102 (2014)
9.	e^-	Busan Korea		Seung Il Chun, IEEE Trans. Plas. Sci. 2496-7 (2011)
10.	e^- Toroid	Appleton WI	Stoneking	R.Stoneking, *NNP VIII*, AIP Conf 1521, 82 (2013)
11.	Dust	Garching DE	Morfil	V.Nosenko, *Phys Plasmas* 16, 083708 (2009)
12.	Rad^+	CERN / REX-ISOLDE		O.Kester, *Nuc Inst & Meth*, 204, 20 (2003)
13.	Rad^+	CERN / WITCH		A.Lindroth, *Nuc Inst & Meth*, 534, 551 (2004)
14.	Rad^+	SPIRAL2 / PIPERADE Caen,FR Heidelberg DE		P.Ascher, *EPJ Conf* 66, 11002 (2014)
15.	Ca^+	GSI SPECTRAP / HITRAPP Darmstadt London		S.Bharadia, Appl Phys B, 107, 1105 (2012)
16.	Z^{+n}	TRIUMF / EBIS / TITAN		U.Chowdhury, AIP Conf Proc 1640, 120 (2015)
17.	pBar	Tokyo /ASACUSA	Yamazaki	Y. Yamazaki, NNP III, AIP Conf Proc 498, 48 (1999)
18.	pBar	CERN / MRT		N.Kuroda , Phys Rev Lett 100, 203402 (2008)
19.	pBar	CERN / ALPHA		G.B. Andresen, Phys Rev Lett 100, 203401 (2008)
20.	pbar	CERN / ATRAP Boston	Gabrielse	G. Gabrielse, Phys Rev Lett 106, 073002 (2011)
21.	e^+/e^-	FRM-II / APEX Garching DR	Pedersen Saitoh	H.Saitoh, NNP VII, AIP Conf Proc 1114, 163 (2009)
22.	e^+/e^-	LEPTA Moscow Arkhangelsk Swansea UK		M.K.Eseev, Plasma Phys Repts 39, 787 (2013)

Rad^+ = Short lived radioactive ions