

## CHIMERA STATES IN A NETWORK OF OSCILLATORS UNDER CROSS-GLOBAL COUPLING

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Chimera states was surprisingly emerged in a symmetric network of identical oscillators, when the whole population splits into two subpopulations, one coherent, another noncoherent. It was first noticed [1] in phase oscillators for nonlocal coupling where the coupling has a space variation, later in limit cycle system and chaotic system. Three different characteristic features of chimera states were identified: spatio-temporal chaos [2], spatial chaos [3] and a mixture of both [4] in the noncoherent population while the coherent population may stay in periodic, chaotic state. It was also evidenced in physical experiments [5]. The strict condition of nonlocal coupling in a network was relaxed recently; it was found to emerge for linear or nonlinear global coupling[6, 7]. However, the chimera states has a characteristic spatio-temporal chaos only in the noncoherent population.

We extend [8] the work here and report chimera states in a network of identical oscillators (limit cycle and chaotic) where a linear repulsive cross-global coupling is added to the typical attractive self-global coupling. We present examples of the van der Pol oscillator and the Rössler oscillator as individual nodes of the network. Especially, in a Liénard system, we find both the spatio-temporal chaos and spatial chaos in the noncoherent population.

## References

- [1] Y. Kuramoto and D. Battogtokh, *Nonlin. Phen. in Complex Sys.* **5**, 380 (2002).
- [2] C. Gu, G. St-Yves, J. Davidsen, *Phys. Rev. Lett* **111**, 134101 (2013).
- [3] I. Omelchenko, Y. L. Maistrenko, P. Hövel, E. Schöll, *Phys. Rev. Lett.* **106**, 234102 (2011).
- [4] D. Dudkowski, Y. Maistrenko, T. Kapitaniak, *Phys. Rev. E* **90**, 032920 (2014).
- [5] E . A. Martens., S. Thutupallic., A.Fourrierc, O. Hallatscheka, *Proc. Natl. Acad. Sci.* **110**, 10563 (2013).
- [6] G. C. Sethia and A. Sen, *Phys. Rev. Lett* **112**, 144101 (2014).
- [7] L. Schmidt, K. Krischer, *Phys. Rev. Lett.* , (2014).
- [8] C.R.Hens, A.Mishra, P.K.Roy, A.Sen, S.K.Dana, *Pramana-J.Phys.* (*in Press*); A.Mishra, C.R.Hens, M.Bose, P.K.Roy, S.K.Dana (*in preparation*).