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A new recipe to shape magnetisation that could open new doors to storing quantum information

CHENNAI – 21 Nov, 2026 Scientists have cracked a way to tune an exotic form of quantum magnetism in a network by changing the connectivity of the network. This may have applications in quantum devices, for example, in storing quantum information.

Many systems are composed of interacting objects, and that can range from gas in the room to social networks. The hub-and-spoke diagrams showing flight routes in aeroplane magazines illustrate how connectivity allows people to move across cities. Another relatable example is that of superspreaders during COVID, who acted as hubs in spreading the disease.

These are familiar instances that show how different patterns of connections can determine collective behaviour. But these are all classical systems.

A team from the Raman Research Institute (RRI), an Autonomous Institute of the Department of Science and Technology (DST), explored what happens when many quantum objects interact with each other, what sets the collective ordering and how the quantum units organise themselves.

To understand the system, Revathy B. S., the lead author of the new study and a postdoctoral fellow at RRI, and Shovan Dutta, co-author and assistant professor in the Theoretical Physics group at RRI, pictured a square lattice with one vacant site (hole) and all other sites occupied by one electron.

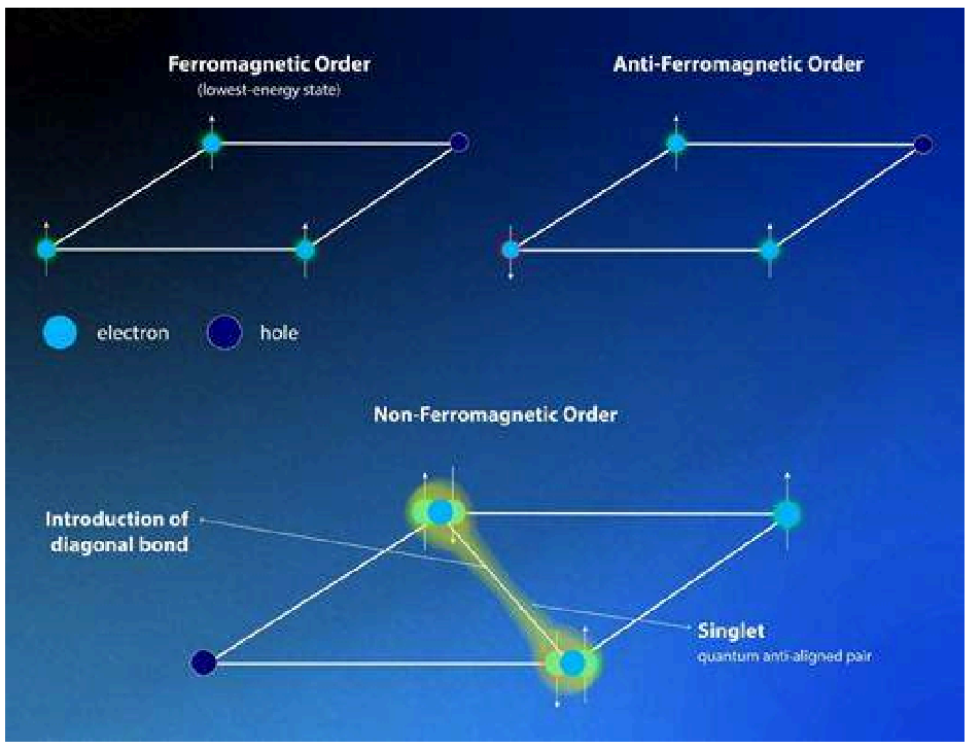


Fig 1: The top row shows the possible magnetic ordering of a many-body quantum system within a single square lattice. The bottom shows that the introduction of a diagonal in the square lattice yield

The electrons have an intrinsic property called spin, which can point up or down. The hole can hop from one site to another, and this motion of the hole can influence how the electron spins arrange themselves, giving rise to what scientists' call "kinetic magnetism". Unlike conventional magnetism which arises from direct interactions between the spins, kinetic magnetism arises from the quantum motion (kinetic energy) of particles. Kinetic magnetism is a true quantum-mechanical effect with no classical counterpart.

If all the spins point along the same direction, it is called ferromagnetic order, and if adjacent spins have opposite directions, it is called antiferromagnetic ordering. For a square lattice with one hole, it has been shown before that the lowest-energy state is ferromagnetic.