Contribution ID: **77** Type: **Talk**

A crucial test of the fermion dark matter constituency of our Galactic core from the geodesic motion of S2 and G2

Friday 11 September 2020 08:30 (30 minutes)

The motion of the S stars around the Galactic center implies the existence of a central gravitational potential dominated by a compact source, Sagittarius A*(Sgr A)*, with a mass of four million solar masses. Traditionally, it has been assumed that such a gravitational potential is produced by a supermassive black hole (SMBH) sitting at the center of our Galaxy. It is particularly important for this hypothesis, and for any alternative model, the explanation of the multiyear, accurate astrometric data of S2. With an orbital period of nearly 16 years, it is one of the closest stars to Sgr A*. The accuracy of the S2 data has allowed the GRAVITY Collaboration to recently verify the gravitational redshift of light predicted by general relativity Another important object is G2 whose most recent data challenges the SMBH scenario its post pericenter radial velocity is lower than the expectation from a Keplerian orbit around the putative SMBH. This scenario has been reconciled by introducing a drag force on G2 by an accretion flow. Alternatively, I discuss here the consistency of the "dense core diluted halo" fermionic dark matter (DM) profile, obtained from the general relativistic treatment of the Ruffini-Argüelles-Rueda (RAR) model, with the data of S2 and G2. It has been already shown that for a fermion mass in the range 48-345 keV, the RAR DM profile accurately fits the rotation curves of the Milky Way halo. It is here shown that, without invoking a central SMBH, the solely gravitational potential of such DM profile explains: 1) all the available data of the orbit and radial velocity of S2; 2) the general relativistic redshift measured in S2; 3) the currently available data on the orbit and radial velocity of G2 and 4) its deceleration after its pericenter passage, without introducing a drag force, hence a purely geodesic motion. All this for the same fermion mass of 56 keV. A DM core made of these fermions is expected to collapse into a BH if it gets a mass of about million solar masses, thereby providing formation scenario for the observed central SMBH in active galaxies such as M87.

Author: RUEDA, Jorge (ICRANet)

Presenter: RUEDA, Jorge (ICRANet)

Session Classification: DM, DE, GWs, BHs, GRAVITATION, GALAXIES, EROSITA