Contribution ID: **101** Type: **Poster**

How to use geodetic VLBI to measure relativistic light deflection from extragalactic objects

Thursday 17 December 2015 17:44 (3 minutes)

The Sun's gravitational field deflects the apparent positions of close objects in accordance with the formulae of general relativity. Optical astrometry is used to test the prediction, but only with the stars close to the Sun and only during total Solar eclipses. Nowadays, more advanced technique, geodetic Very Long Baseline Interferometry (VLBI) is applied for testing of general relativity with precision about 0.01 percent. The geodetic VLBI is capable of measuring the gravitational delay based on the differential Shapiro's delay. By reason, the gravitational delay is equivalent to the deflection of the light from distant radio sources and could be measured at anytime and across the whole sky. In accordance with the theory, all celestial objects display annual circular motion with the magnitude proportional to their ecliptic latitude due to the Earth orbital motion. In particular, the objects near the ecliptic pole draw an annual circle with magnitude of 4 millisecond of arc.

In contrast to the optical facilities, a single ground-based VLBI interferometer is made of two radio telescopes separated by several thousand kilometers. This provides an additional advantage to detect a secondary light deflection angle caused by the parallactic shift of the Sun as observed from both ends of the interferometer. This effect is proportional to the baseline length and is about 0".01 for grazing light at baseline of 8000 km. It could be used in future space interplanetary VLBI missions with baseline length of one billion kilometers (comparable to the Jupiter orbit size) for direct detection of invisible mass from extragalactic objects.

Primary author: TITOV, Oleg

Co-author: Mrs GIRDIUK, Anastasiia (Technical University of Vienna)

Presenter: TITOV, Oleg

Session Classification: 12 - Gravitational lensing