Relativistic Acceleration MFD

An Orbiter add-on to add the relativistic acceleration
to all the active vessels present in the simulation

1. Description

RelAccMFD adds a first order relativistic acceleration exerted by the celestial bodies on each active (non-landed) vessel present in the simulation. Additionally, for the focused vessel (even if the vessel is inactive), the MFD shows:

- the total acceleration calculated by Orbiter (including the relativistic acceleration calculated by this add-on*)*;
- the name of the main perturbing bodies;
- the Newtonian and the relativistic accelerations.

The values are shown using a compact syntax: "123f45" means 123.45 fm/s^2 ("f" is the prefix for "femto", 10^{-15}). The value zero is shown as "0a00" ("a" means "atto", 10^{-18} and it's the smallest prefix used by this add-on).

After this add-on has been enabled in the Orbiter Launchpad (see section 3), the relativistic acceleration is enabled by default, there is no need to open the MFD to enable it.

When the MFD is not shown, this add-on works in the background; in other words, the relativistic acceleration is active even when this MFD is not shown. The relativistic acceleration can be disabled at any time by clicking the "E/D" button in the MFD.

Extensive testing showed no frame rate penalty with 212 celestial bodies and 82 vessels.

2. Magnitude of the relativistic acceleration

The magnitude of the relativistic acceleration is very small when compared to the Newtonian component and it depends also on the vessel's velocity.

Unlike the Newtonian acceleration (which is purely radial), the first order relativistic acceleration added by *RelAccMFD* include also a (small) tangential component.

In order to have an idea about the effect of the relativistic acceleration in the Solar System, we can consider a vessel that orbits the Sun at the distance of Mercury (but outside the Mercury's gravity well). A numerical integration of the state of that vessel over a period of 1000 days shows a difference of about 1000 km when the relativistic acceleration is taken into account.

The same relativistic acceleration (in magnitude) is experienced when orbiting Jupiter at the distance of Europa or Saturn at the distance of Tethys.

3. Installation

Unzip the archive to the Orbiter root folder maintaining the folder structure. The file "RelAccMFD.dll" will be unpacked in "<Orbiter_root>\Modules\Plugin" folder.

Activate the add-on via the Launchpad dialog → Modules and then click on the checkbox "RelAccMFD".

This add-on needs the files msvcp110.dll and msvcr110.dll; you may already have them installed. In this case, the files included in this add-on can be deleted. You can also download and install the "Visual C++ Redistributable Packages for Visual Studio 2012" from this link: http://www.microsoft.com/en-us/download/details.aspx?id=30679.