Distance

Imagine a ring of satellites orbiting the Earth. Their relative speed in relation to a non-rotating observer means that the distance between the satellites is predicted to be contracted. Hence the angle subtended at the Earth by two adjacent satellites is similarly reduced - the distance from the Earth to the satellites stays the same. (Circumferential contraction is explained for example in Wikipedia's article on Ehrenfest's paradox.) So the total angle subtended by all the satellites is less than 360 degrees.

When the satellites are photographed against the background of the "fixed stars" the stars should also subtend less than 360 degrees. Yet the fixed stars are not moving in relation to a non-rotating observer so no distance contraction occurs. So how can the distance between the satellites be contracted?

This is akin to particles travelling close to the speed of light in a circular accelerator. When detectors around the accelerator ring detect passing bunches of particles, the distances between the bunches should be contracted. So the total angle subtended at the ring centre by the bunches should be less than 360 degrees, as measured in the frame of the detectors. (Compared with particles at rest the contracted total angle should be less than one degree.) At the same time the detectors still subtend 360 degrees. This difference is impossible. Physicists seem unable to measure any distance contraction, and this paradox illustrates why it would be illogical. Instead they refer, for example, to muons from the upper atmosphere being able to reach the Earth's surface because the atmosphere is greatly contracted. But no such contraction has been measured, it's just a prediction. Muon observations only show they are time dilated.