

# TwoDirectionsAttitudeLaw 4.1

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```
public class TwoDirectionsAttitudeLaw {

    public static void main(String[] args) throws PatriusException {

        // Patrius Dataset initialization (needed for example to get the UTC
time
        PatriusDataset.addResourcesFromPatriusDataset() ;

        // Recovery of the UTC time scale using a "factory" (not to duplicate
such unique object)
        final TimeScale TUC = TimeScalesFactory.getUTC();

        // Date of the orbit given in UTC time scale)
        final AbsoluteDate date = new AbsoluteDate("2010-01-01T12:00:00.000",
TUC);

        // Getting the frame with wich will defined the orbit parameters
// As for time scale, we will use also a "factory".
        final Frame GCRF = FramesFactory.getGCRF();

        // Initial orbit
        final double sma = 7200.e+3;
        final double exc = 0.01;
        final double inc = FastMath.toRadians(98.);
        final double pa = FastMath.toRadians(0.);
        final double raan = FastMath.toRadians(0.);
        final double anm = FastMath.toRadians(0.);
        final double MU = Constants.WGS84_EARTH_MU;

        final KeplerianParameters par = new KeplerianParameters(sma, exc,
inc, pa, raan, anm, PositionAngle.MEAN, MU);
        final Orbit iniOrbit = new KeplerianOrbit(par, GCRF, date);

        // Using the Meeus model for the Sun.
        final CelestialBody sun = new MeeusSun();

        // Sun directions
        ToCelestialBodyCenterDirection dirSun = new
ToCelestialBodyCenterDirection(sun);
        CelestialBodyPolesAxisDirection dirPole = new
CelestialBodyPolesAxisDirection(sun);

        // Building an attitude law
        final Vector3D firstAxis = new Vector3D(1., 0., 0.);
```

```

    final Vector3D secondAxis = new Vector3D(0., 1., 0.);
    final AttitudeLaw attitudeLaw = new TwoDirectionsAttitude(dirSun,
dirPole, firstAxis, secondAxis);
    final Attitude att = attitudeLaw.getAttitude(iniOrbit);

    // Printing attitude
    final double psi =
att.getRotation().getAngles(RotationOrder.ZYX)[0];
    final double teta =
att.getRotation().getAngles(RotationOrder.ZYX)[1];

    System.out.println("Psi / GCRF = "+FastMath.toDegrees(psi)+" deg");
    System.out.println("Teta / GCRF = "+FastMath.toDegrees(teta)+" deg");

    // Coordinates of the Sun vs GCRF at the same date
    PVCoordinates pv = sun.getPVCoordinates(date, GCRF);
    final Vector3D sunPos = pv.getPosition();

    // Direction of the Sun from the cdg of the satellite
    final Vector3D satPos = iniOrbit.getPVCoordinates().getPosition();
    final Rotation sunDir = new Rotation(Vector3D.PLUS_I,
sunPos.subtract(satPos));

    final double psiSun = sunDir.getAngles(RotationOrder.ZYX)[0];
    final double tetaSun = sunDir.getAngles(RotationOrder.ZYX)[1];

    System.out.println();
    System.out.println("Psi / GCRF = "+FastMath.toDegrees(psiSun)+"
deg");
    System.out.println("Teta / GCRF = "+FastMath.toDegrees(tetaSun)+"
deg");

    System.out.println();
    System.out.println("Delta Psi = "+FastMath.toDegrees(psiSun-psi)+"
deg");
    System.out.println("Delta Teta = "+FastMath.toDegrees(tetaSun-teta)+"
deg");

    }
}

```

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