

GPIntegrator

De Wiki

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Only available since V2.1 version

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How to call it

For using the [GPIntegrator](#) class, the developer has only to create such an object with these two possibilities:

- With no initialization:

```
GPIntegrator gpInteg = new GPIntegrator();
```

In that case, all the possible integrators will be displayed (i.e. [Runge Kutta 4](#), [Runge Kutta 6](#) and [Dormand Price 853](#))

- Or, if we want to limit the display to some of these integrators (in the example below, only [Runge Kutta 4](#) and [Dormand Price 853](#)) and choose the one initially displays (here the [Dormand Price 853](#) one):

```
final IntegratorTypeEnum[] types = { IntegratorTypeEnum.RK4,  
IntegratorTypeEnum.DOP };  
GPIntegrator gpInteg = new GPIntegrator(types, IntegratorTypeEnum.DOP);
```

- There are also several setter methods to override default values. For example, if we want to display by default 5 seconds for the [Runge Kutta](#) time steps, we will have to call to the specific method as:

```
gpInteg.setRKParameters(5.);
```

Display

For the first cases, the display will be:

Integrator parameters

Type: ☒ Dormand-Prince (8th order) ☐ Runge-Kutta (4th order) ☐ Runge-Kutta (6th order)

Minimum timestep: [s](#)

Maximum timestep: [s](#)

Tolerances definition: ☒ Complete ☐ Reduced ☐ Simplified

Bypass error on min timestep ☒ Templates for tolerances definition

Absolute Tolerance		Relative Tolerance	
X	<input type="text" value="7.0E-6"/> m	Xr	<input type="text" value="0.0E0"/> %
Y	<input type="text" value="7.0E-6"/> m	Yr	<input type="text" value="0.0E0"/> %
Z	<input type="text" value="7.0E-6"/> m	Zr	<input type="text" value="0.0E0"/> %
Vx	<input type="text" value="3.0E-10"/> m/s	Vxr	<input type="text" value="0.0E0"/> %
Vy	<input type="text" value="3.0E-10"/> m/s	Vyr	<input type="text" value="0.0E0"/> %
Vz	<input type="text" value="3.0E-10"/> m/s	Vzr	<input type="text" value="0.0E0"/> %
Mass	<input type="text" value="1.0E-3"/> kg	Massr	<input type="text" value="1.0E-2"/> %

as, for the second one ...

Integrator parameters

Type: ☒ Runge-Kutta (4th order) ☐ Dormand-Prince (8th order)

Timestep (fixed): [s](#)

Note an interesting fonctionnality for the [Dormand Price 853](#) data with a user help for initializing steps and tolerances depending of some kind of orbits.

Integrator parameters

Type: ☒ Dormand-Prince (8th order) ☐ Runge-Kutta (4th order) ☐ Runge-Kutta (6th order)

Minimum timestep: [s](#)

Maximum timestep: * [s](#)

Tolerances definition: ☒ Complete ☐ Reduced ☐ Simplified

Bypass error on min timestep ☒ Templates for tolerances definition

Absolute Tolerance		Relative Tolerance	
X *	<input type="text" value="7.0E-4"/> m	Xr	<input type="text" value="0.0E0"/> %
Y *	<input type="text" value="7.0E-4"/> m	Yr	<input type="text" value="0.0E0"/> %
Z *	<input type="text" value="7.0E-4"/> m	Zr	<input type="text" value="0.0E0"/> %
Vx *	<input type="text" value="3.0E-8"/> m/s	Vxr	<input type="text" value="0.0E0"/> %
Vy *	<input type="text" value="3.0E-8"/> m/s	Vyr	<input type="text" value="0.0E0"/> %
Vz *	<input type="text" value="3.0E-8"/> m/s	Vzr	<input type="text" value="0.0E0"/> %
Mass	<input type="text" value="1.0E-3"/> kg	Massr	<input type="text" value="1.0E-2"/> %

How to use it

To get a [\[PATRIUS\]](#) [FirstOrderIntegrator](#) object, we will just have to call for the [getPatriusObject\(\)](#) method as below:

```
final FirstOrderIntegrator integ = gpInteg.getPatriusObject();
```

Be careful, that this call will not work if the user selected the "Simplified" display for [Dormand Price 853](#) tolerances.

To be sure that it will work every time, we will have to give an orbit as input:

```
gpInteg.setInitialOrbit(initialOrbit);  
final FirstOrderIntegrator integ = gpInteg.getPatriusObject();
```

How it is stored

Here is the XML format for the **Dormand Price 853** integrator data:

```
<String name="Type:">Dormand-Prince (8th order)</String>  
<Real name="Minimum_timestep:_" unit="s">1.0E0</Real>  
<Real name="Maximum_timestep:_" unit="s">3.0E2</Real>  
<String name="Tolerances_definition:_">Complete</String>  
<Boolean name="Bypass_error_on_min_timestep">true</Boolean>  
<String name="Templates_for_tolerances_definition">---</String>  
<Tolerances name="Tolerance1">  
  <Real name="X" unit="m">7.0E-6</Real>  
  <Real name="Xr" unit="%">0.0E0</Real>  
</Tolerances>  
<Tolerances name="Tolerance2">  
  <Real name="Y" unit="m">7.0E-6</Real>  
  <Real name="Yr" unit="%">0.0E0</Real>  
</Tolerances>  
<Tolerances name="Tolerance3">  
  <Real name="Z" unit="m">7.0E-6</Real>  
  <Real name="Zr" unit="%">0.0E0</Real>  
</Tolerances>  
<Tolerances name="Tolerance4">  
  <Real name="Vx" unit="m/s">3.0E-10</Real>  
  <Real name="Vxr" unit="%">0.0E0</Real>  
</Tolerances>  
<Tolerances name="Tolerance5">  
  <Real name="Vy" unit="m/s">3.0E-10</Real>  
  <Real name="Vyr" unit="%">0.0E0</Real>  
</Tolerances>  
<Tolerances name="Tolerance6">  
  <Real name="Vz" unit="m/s">3.0E-10</Real>  
  <Real name="Vzr" unit="%">0.0E0</Real>  
</Tolerances>  
<Real name="Mass" unit="kg">1.0E-3</Real>  
<Real name="Massr" unit="%">1.0E-2</Real>
```

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