Test Specification Report - Path Following

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1. Path_Following_test

Test Details

Description	These tests are aimed to evaluate the performance of a path follower in different scenarios

1.1. Hyundai Azera

Setup Callback

```
param = loadParameters(1);
```

1.1.1. Puglia

Test Details

Description	This scenario is taken from an Highway and it is a road that is straigth for the most with some smooth corners. In this test we try to follow the path with a speed of 40 km/h.

PreLoad Callback

```
%% Set Speed
V = 40/3.6;
%% Scenario Loading
map = ScenarioLoading('puglia.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
```

```
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.2. Switzerland

Test Details

Description	This is the slowest scenario considered, with lots of corners one after another. We try to follow this scenario with 15 km/h speed.

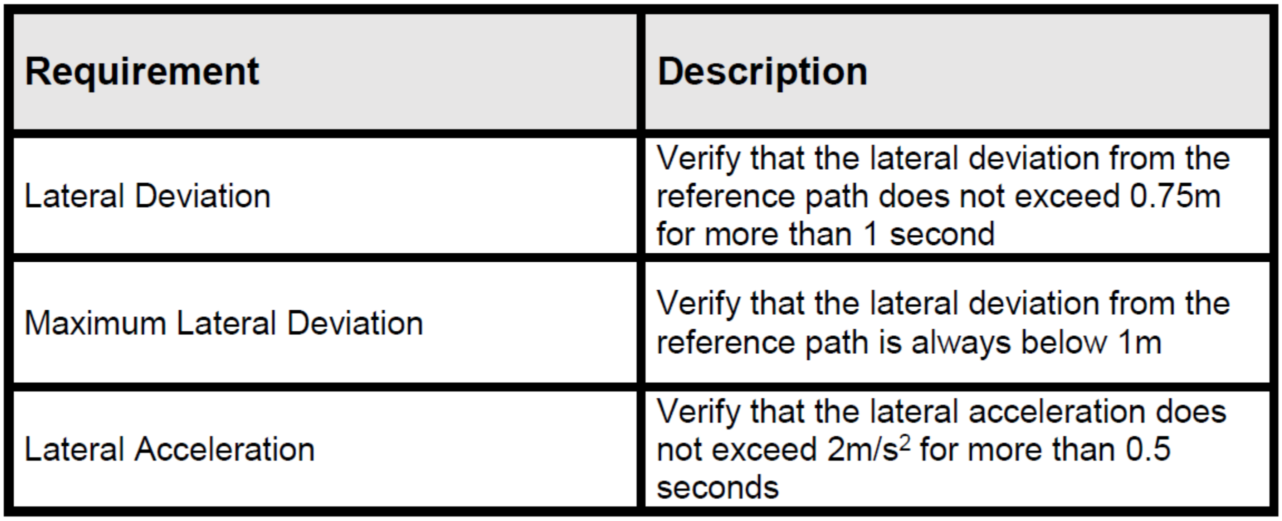
PreLoad Callback

```
%% Set Speed
V = 15/3.6;
```

```
%% Scenario Loading
map = ScenarioLoading('switzerland.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.3. Straight_Slow

Test Details

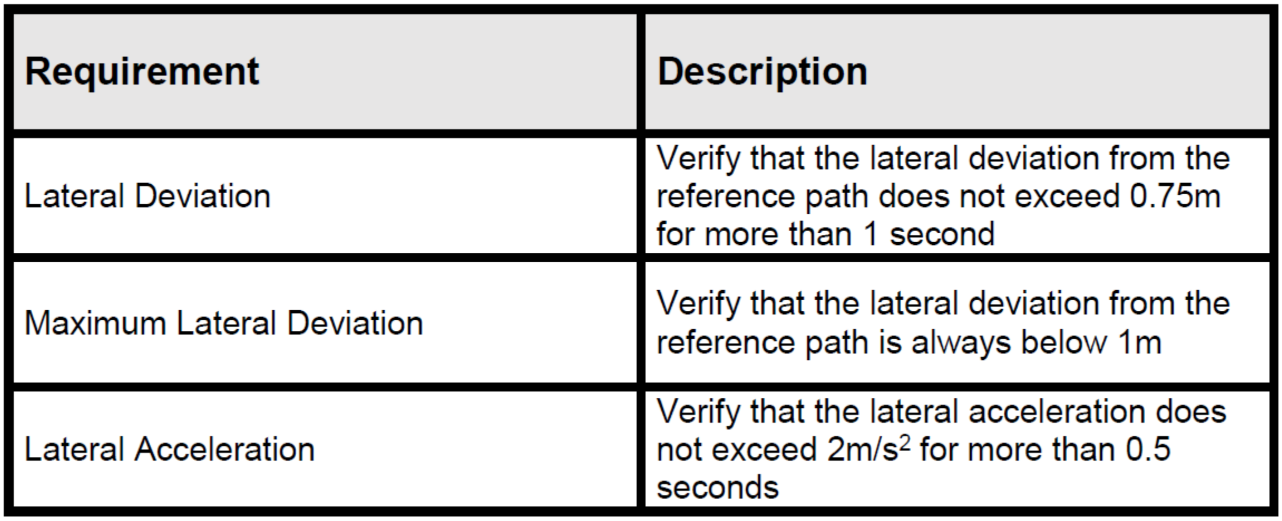
Description	Sample scenario consisting in a straight line. Speed 10 km/h.

PreLoad Callback

```
%% Set Speed
V = 10/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.4. TiltedStraight_Slow

Test Details

Description	Sample scenario consisting in a straight line with a direction of 45 degrees in the X-Y plane. Speed 10 km/h.

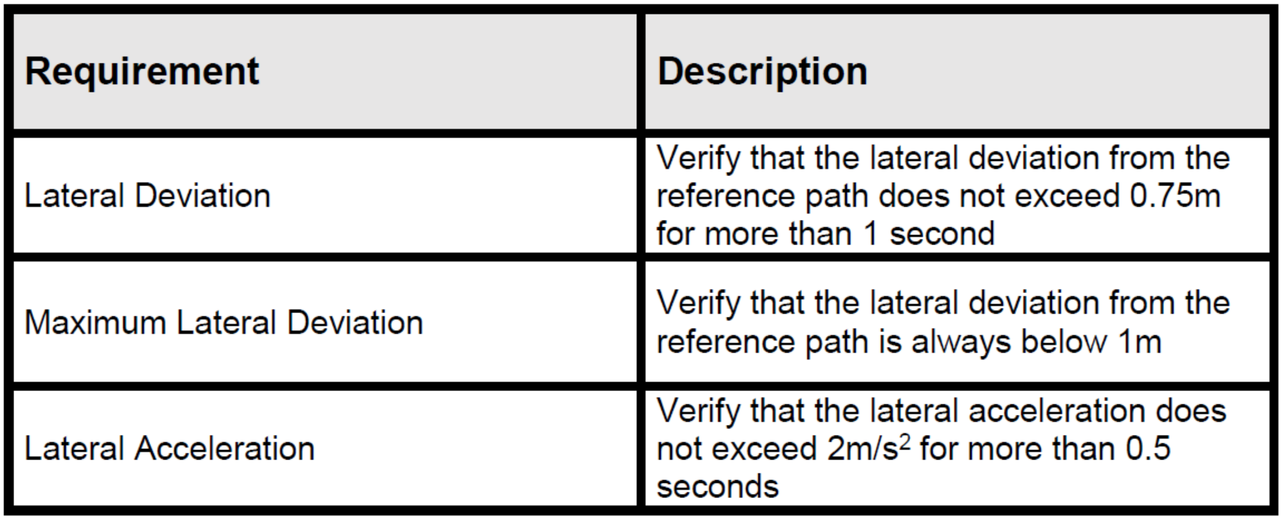
PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
map = [0 0; 1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.5. Campania

Test Details

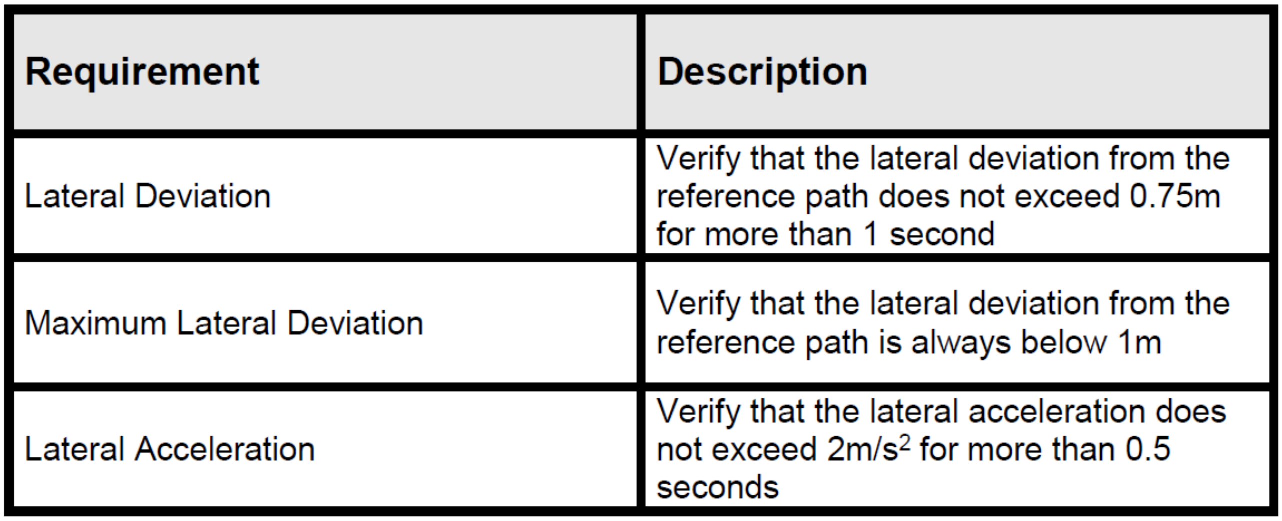
Description	This scenario is made up by a sequence of smooth corners. We try to follow this path with 30 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 30/3.6;
%% Scenario Loading
map = ScenarioLoading('campania.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.6. Straight_Fast

Test Details

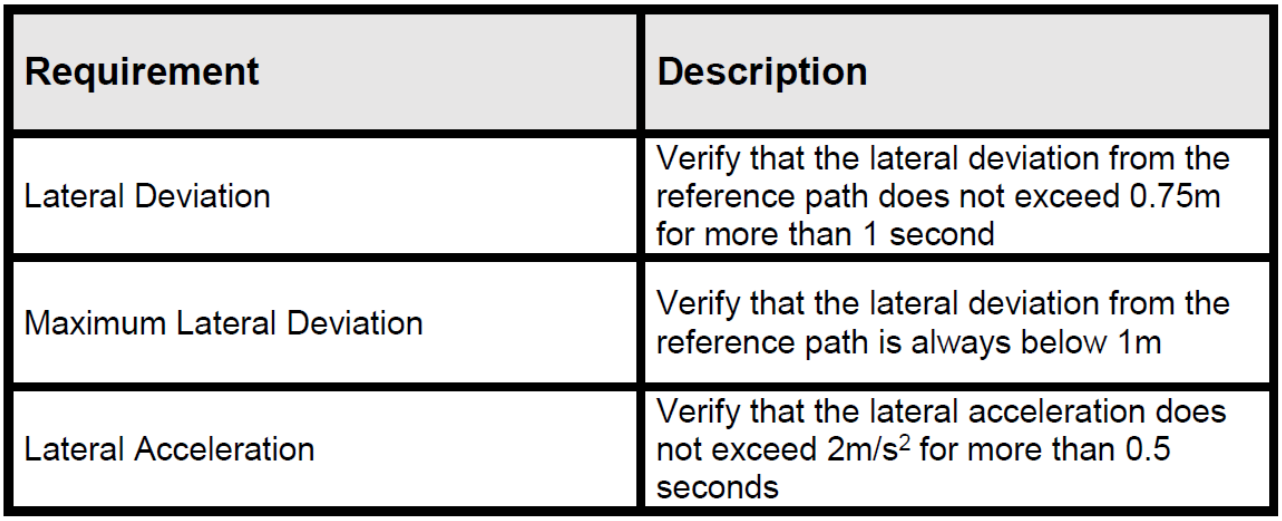
Description	Sample scenario consisiting in a straight line. Speed: 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.7. TiltedStraight_Fast

Test Details

Description	Sample scenario consisting in a straight line tilted by 135 degrees in the X-Y plane. Speed: 100 km/h.

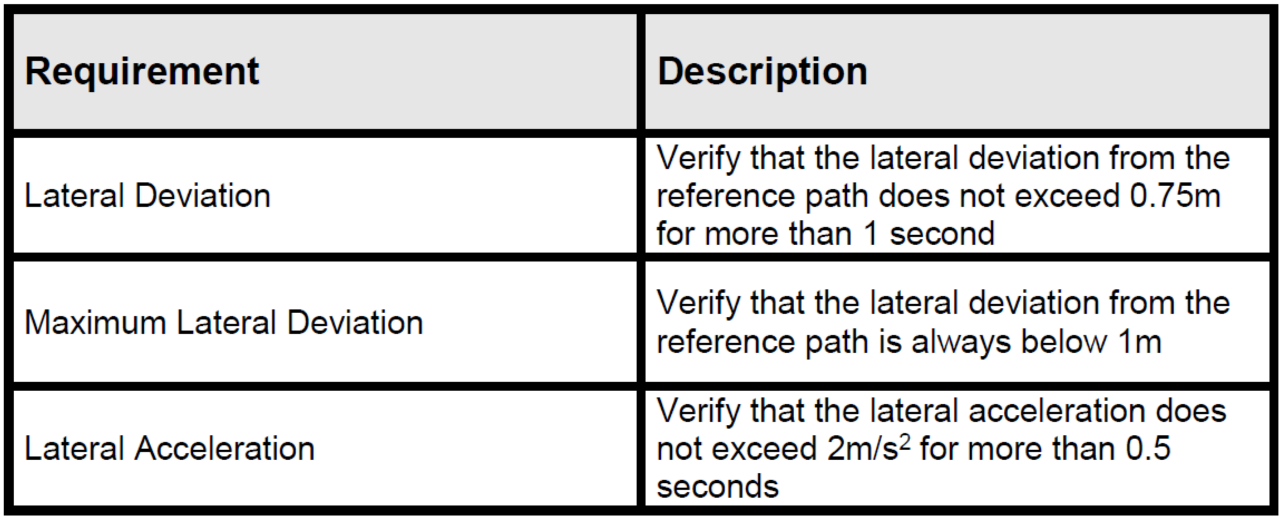
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
map = [0 0; -1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.8. 1000mCurve_Slow

Test Details

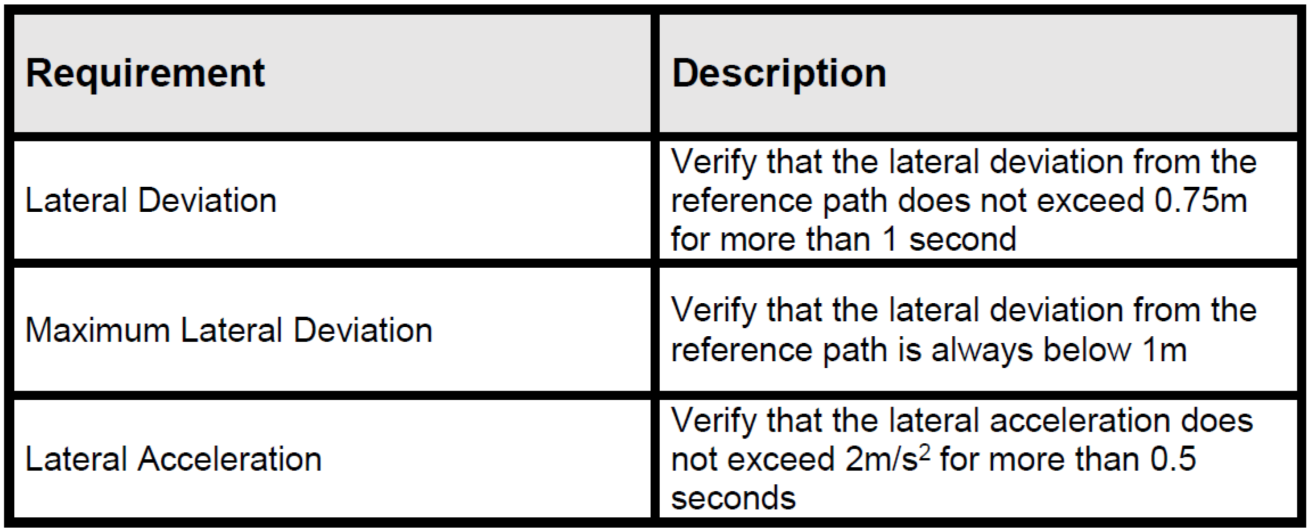
Description	Sample scenario consisting in a constant curve with radius 1000m. Speed set to 20 km/h.

PreLoad Callback

```
%% Set Speed
V = 20/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.9. 100mCurve_Slow

Test Details

Description	Sample scenario consisting in a constant curve with radius 100m. Speed: 10 km/h.

PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second

Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.10. 1000mCurve_Fast

Test Details

Description	Sample scenario consisting in a constant curve with 1000m radius. Speed: 100 km/h.

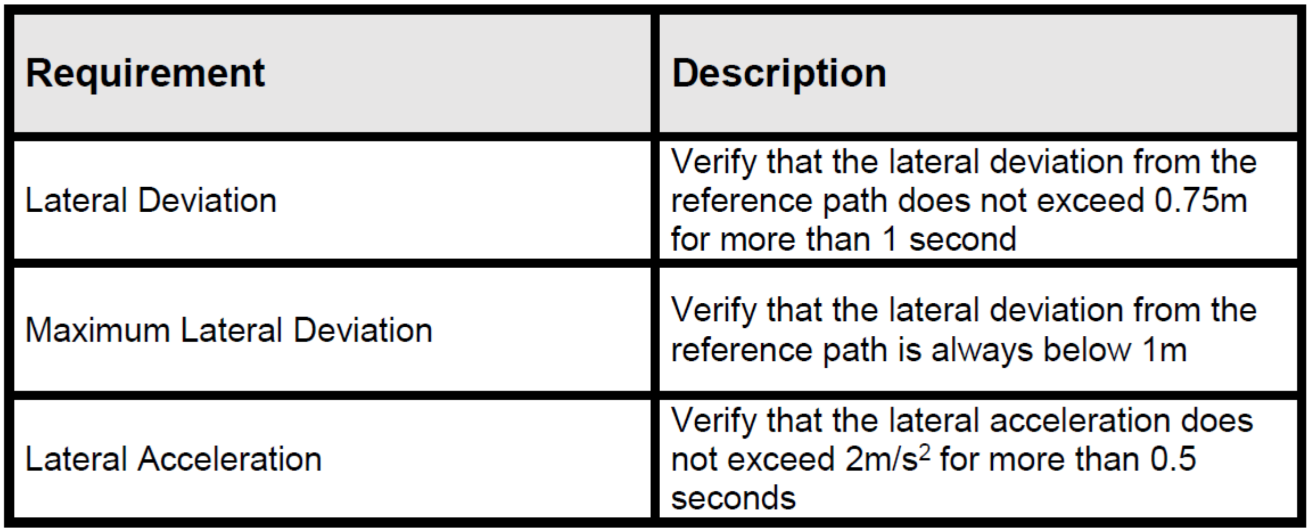
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
```

```
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.11. 100mCurve_Fast

Test Details

Description	Sample scenario consisting of a constant curve with radius 100m. Speed: 100 km/h.

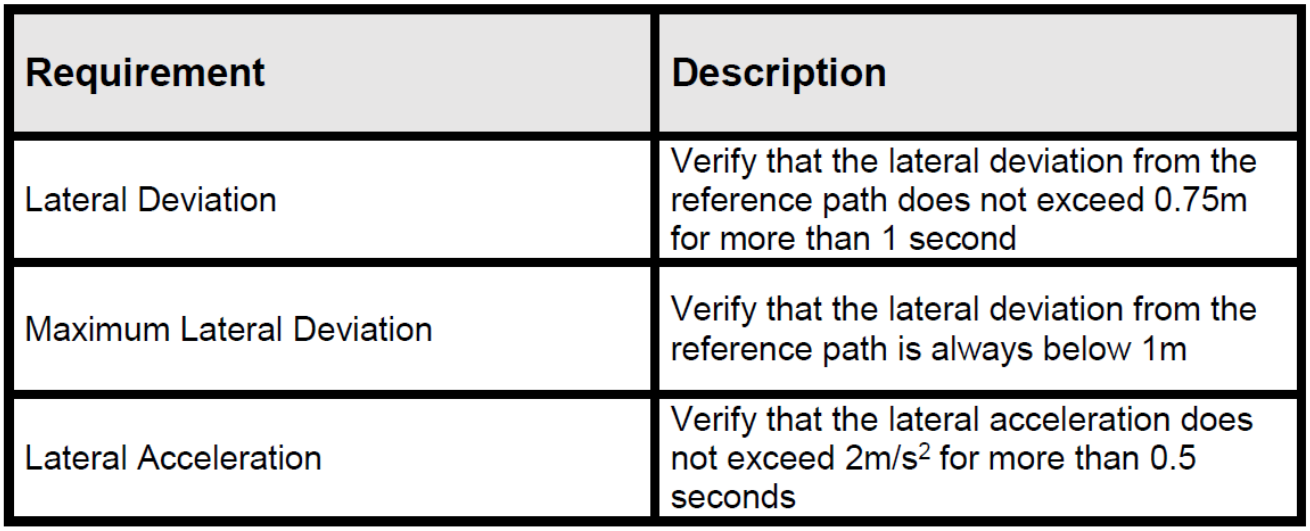
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
```

```
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.12. Adriatic Highway A 14

Test Details

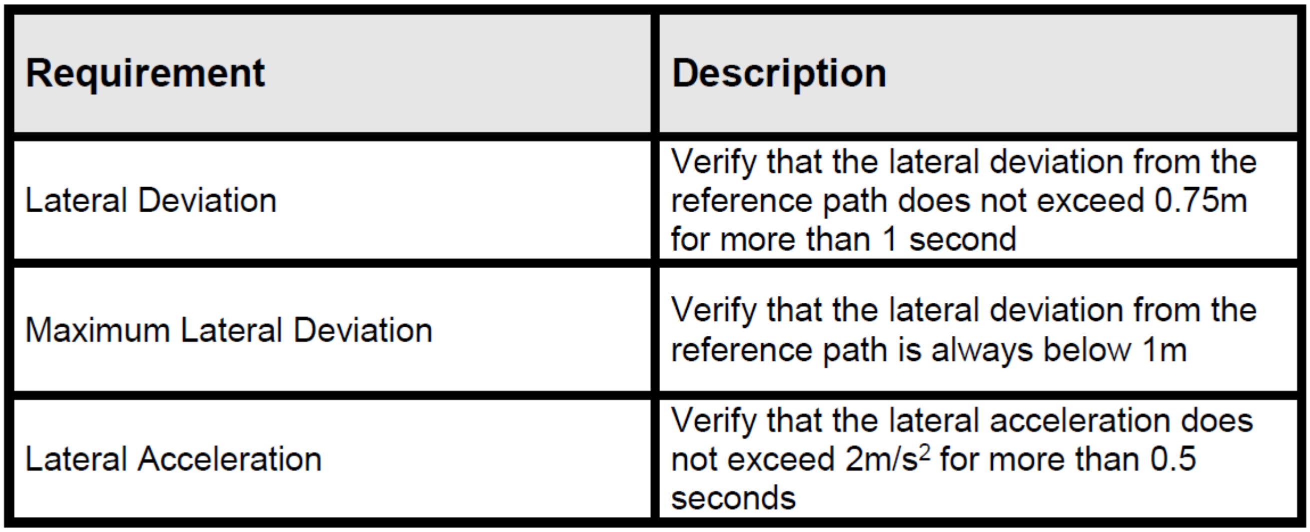
Description	This scenario is taken from the A14 Highway which is a straight road for the most of it, with some high-speed corners. We simulate this scenario at 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('A_14.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.1.13. Indianapolis Speedway

Test Details

Description	This scenario is taken from the Indianapolis Speedway. We simulate it at 100 km/h.

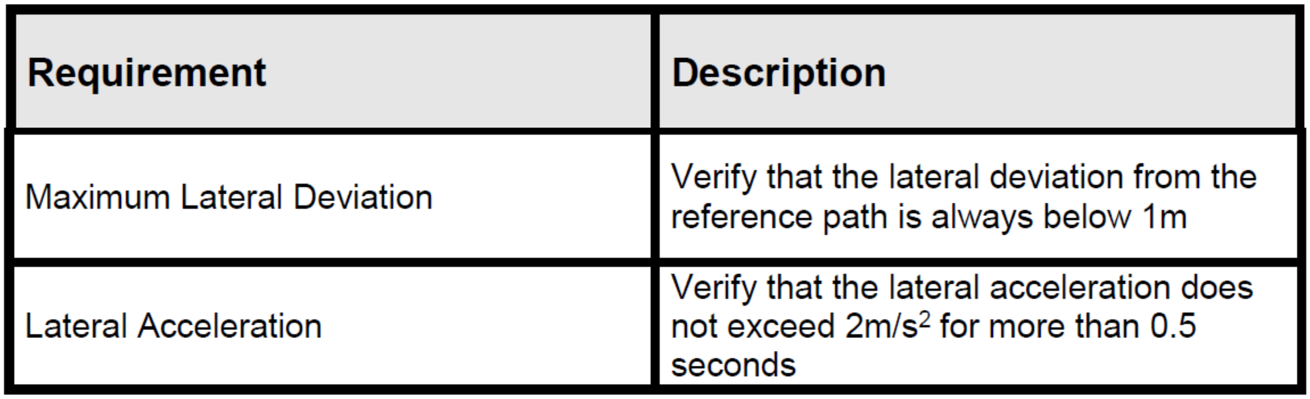
PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('indianapolis.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2. BMW 325i

Setup Callback

```
param = loadParameters(2);
```

1.2.1. Puglia

Test Details

Description	This scenario is taken from an Highway and it is a road that is straigth for the most with some smooth corners. In this test we try to follow the path with a speed of 40 km/h.

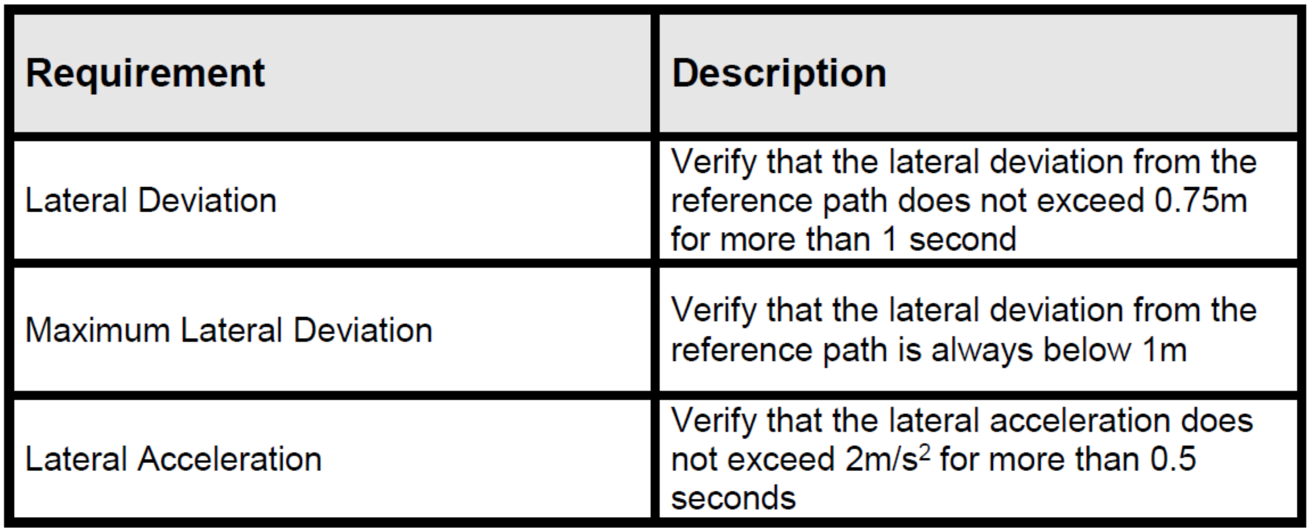
PreLoad Callback

```
%% Set Speed
V = 40/3.6;
%% Scenario Loading
map = ScenarioLoading('puglia.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.2. Switzerland

Test Details

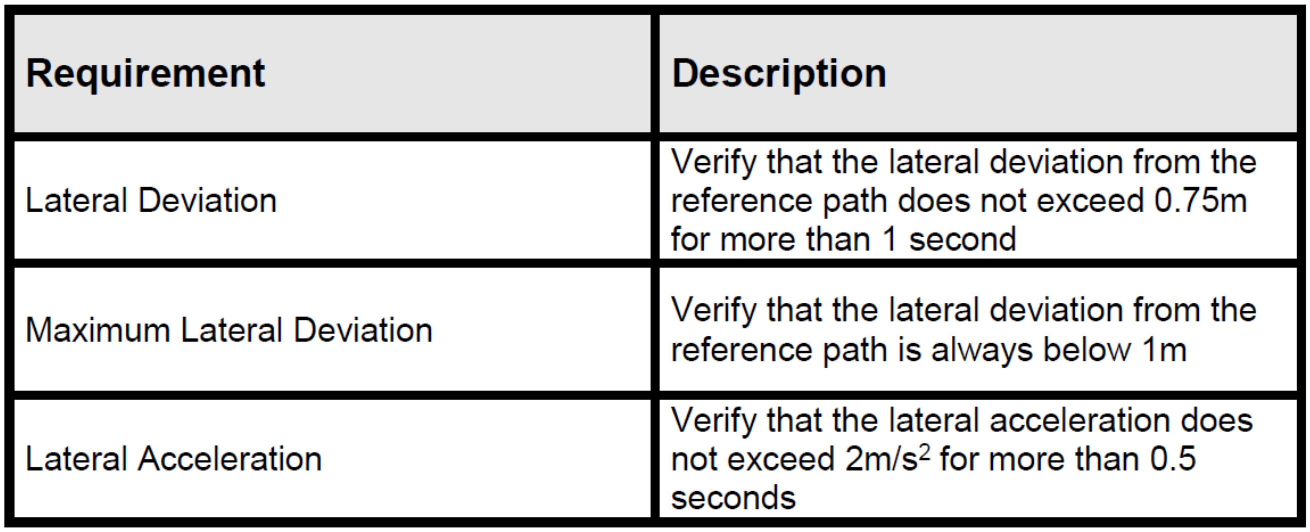
Description	This is the slowest scenario considered, with lots of corners one after another. We try to follow this scenario with 15 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 15/3.6;
%% Scenario Loading
map = ScenarioLoading('switzerland.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.3. Straight_Slow

Test Details

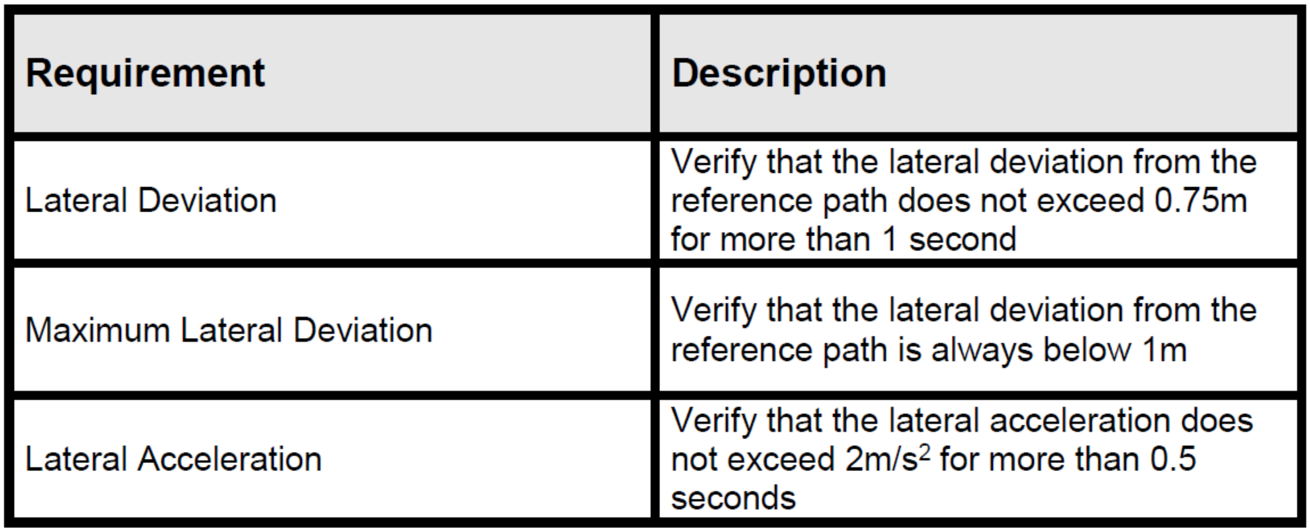
Description	Sample scenario consisting in a straight line. Speed 10 km/h.

PreLoad Callback

```
%% Set Speed
V = 10/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.4. TiltedStraight_Slow

Test Details

Description	Sample scenario consisting in a straight line with a direction of 45 degrees in the X-Y plane. Speed 10 km/h.

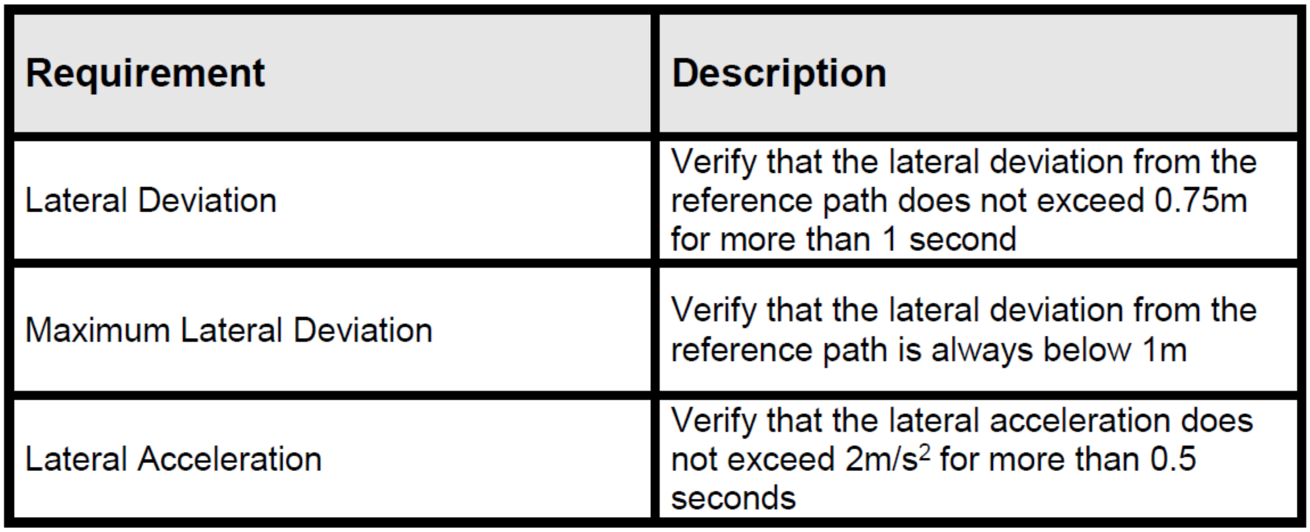
PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
map = [0 0; 1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.5. Campania

Test Details

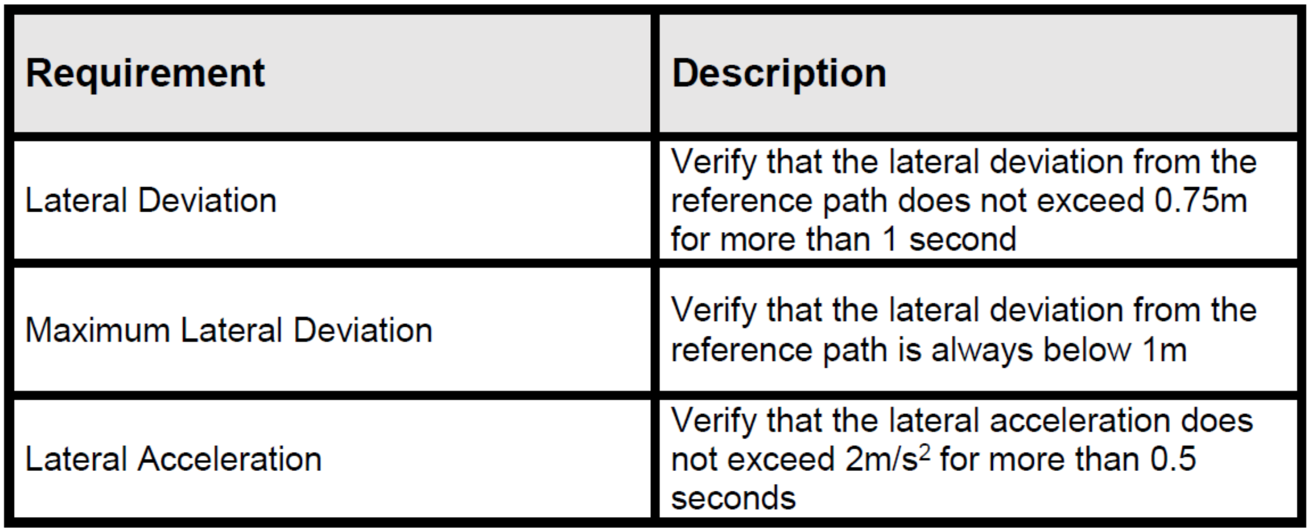
Description	This scenario is made up by a sequence of smooth corners. We try to follow this path with 30 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 30/3.6;
%% Scenario Loading
map = ScenarioLoading('campania.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.6. Straight_Fast

Test Details

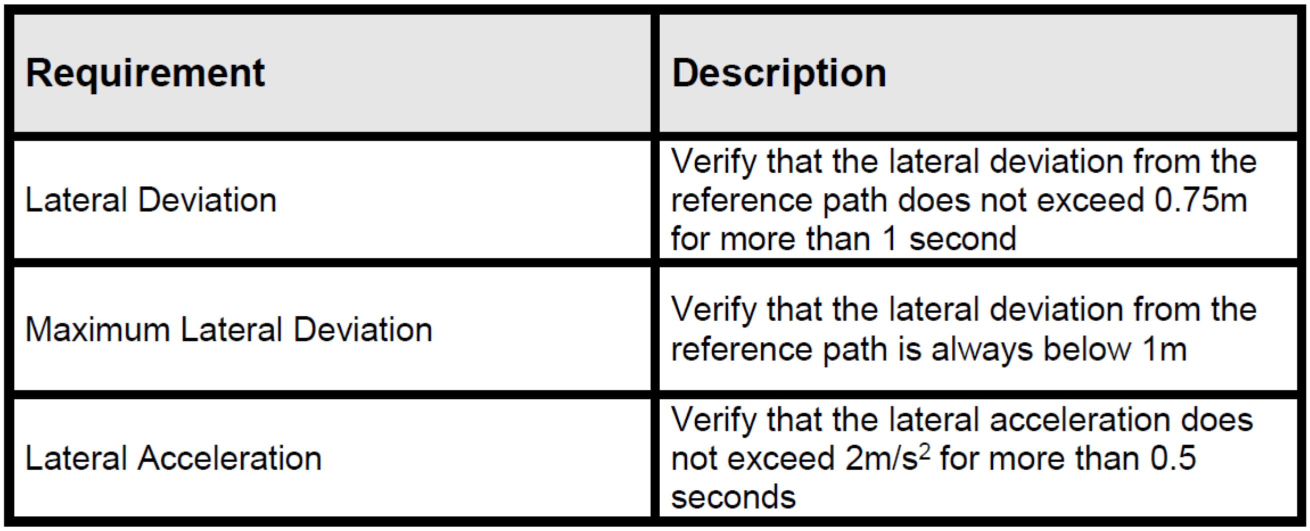
Description	Sample scenario consisiting in a straight line. Speed: 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.7. TiltedStraight_Fast

Test Details

Description	Sample scenario consisting in a straight line tilted by 135 degrees in the X-Y plane. Speed: 100 km/h.

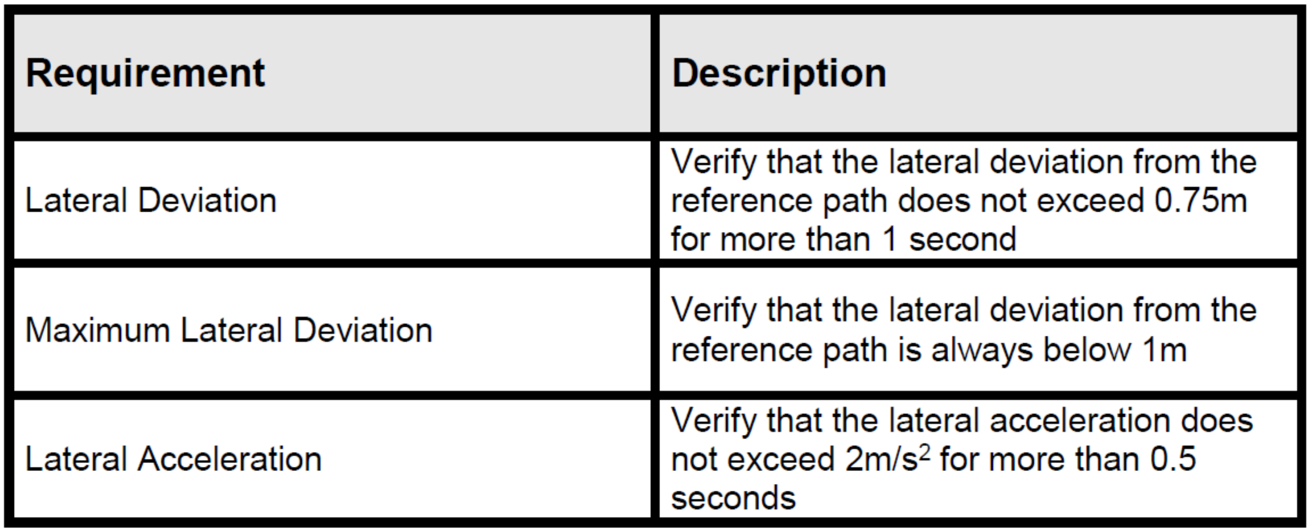
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
map = [0 0; -1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.8. 1000mCurve_Slow

Test Details

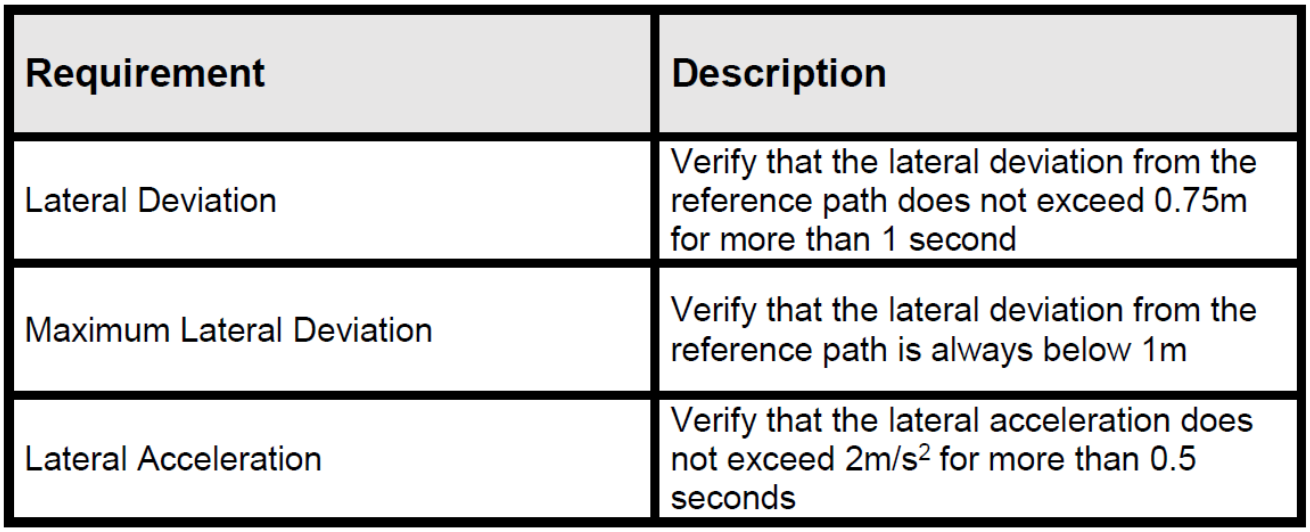
Description	Sample scenario consisting in a constant curve with radius 1000m. Speed set to 20 km/h.

PreLoad Callback

```
%% Set Speed
V = 20/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.9. 100mCurve_Slow

Test Details

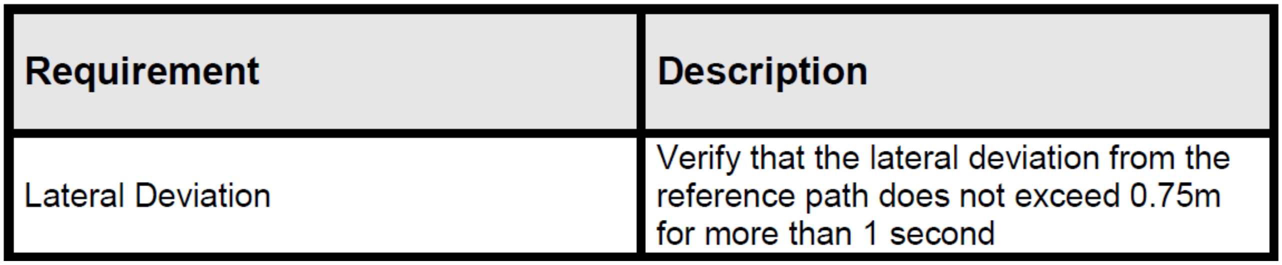
Description	Sample scenario consisting in a constant curve with radius 100m. Speed: 10 km/h.

PreLoad Callback

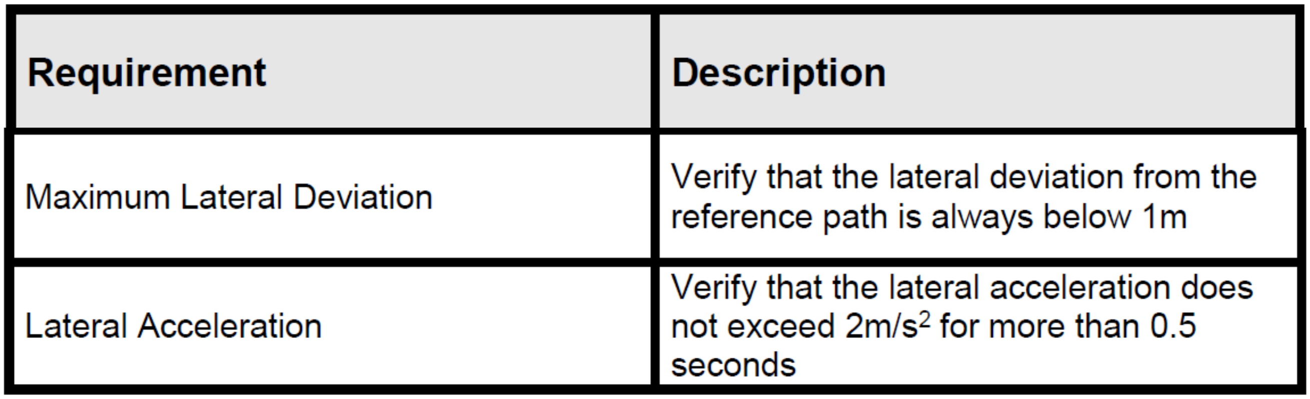
```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.10. 1000mCurve_Fast

Test Details

Description	Sample scenario consisting in a constant curve with 1000m radius. Speed: 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
```

```
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed $2m/s^2$ for more than 0.5 seconds

1.2.11. 100mCurve_Fast

Test Details

Description	Sample scenario consisting of a constant curve with radius 100m. Speed: 100 km/h.

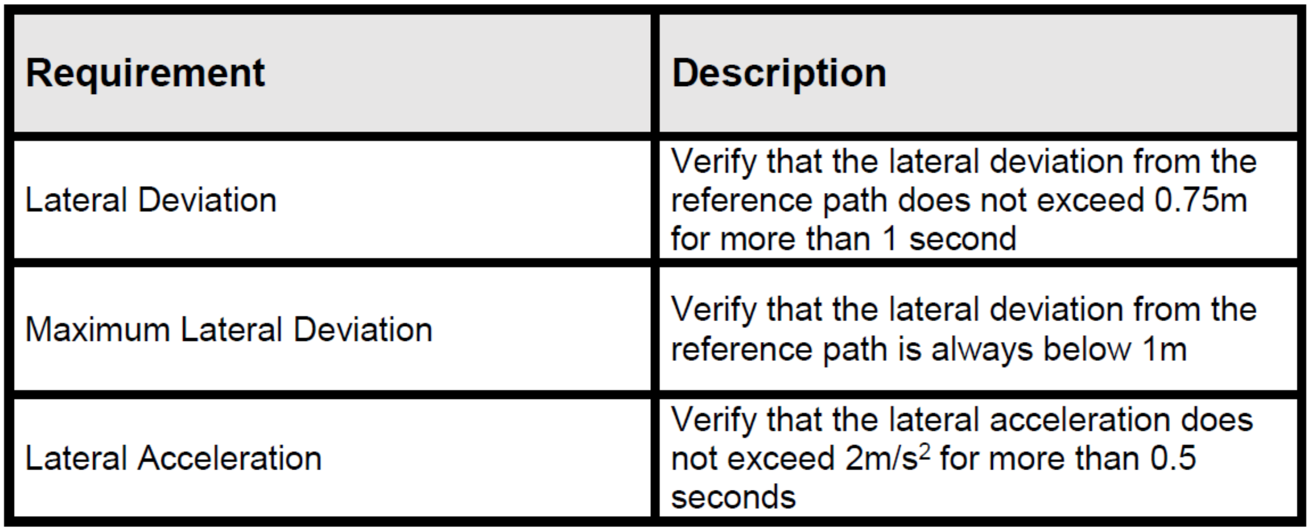
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
```

```
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.12. Adriatic Highway A 14

Test Details

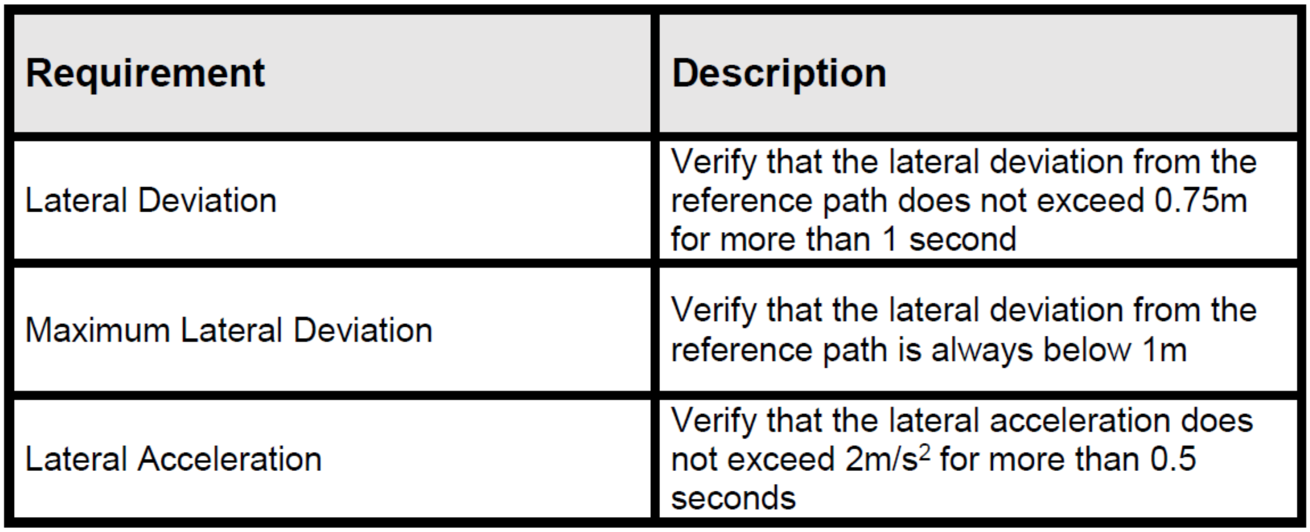
Description	This scenario is taken from the A14 Highway which is a straight road for the most of it, with some high-speed corners. We simulate this scenario at 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('A_14.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.2.13. Indianapolis Speedway

Test Details

Description	This scenario is taken from the Indianapolis Speedway. We simulate it at 100 km/h.

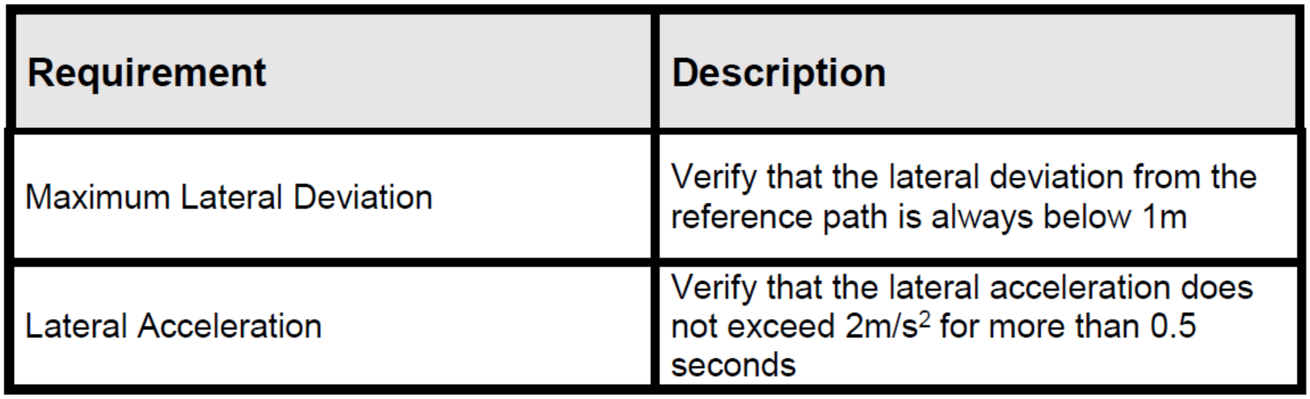
PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('indianapolis.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3. Ford E150

Setup Callback

```
param = loadParameters(3);
```

1.3.1. Puglia

Test Details

Description	This scenario is taken from an Highway and it is a road that is straigth for the most with some smooth corners. In this test we try to follow the path with a speed of 40 km/h.

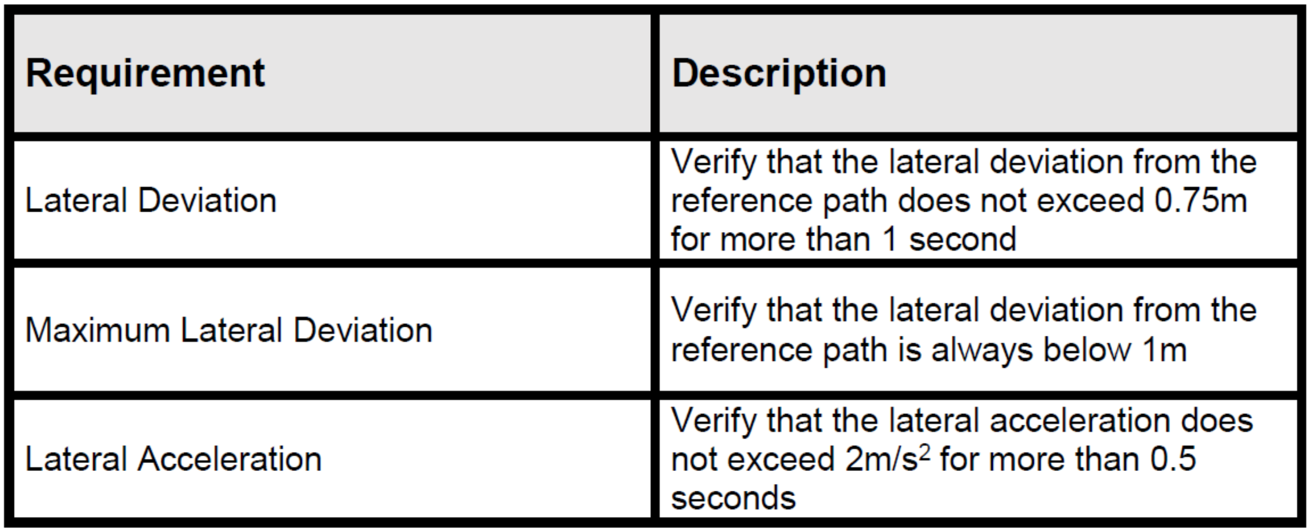
PreLoad Callback

```
%% Set Speed
V = 40/3.6;
%% Scenario Loading
map = ScenarioLoading('puglia.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	**Description**
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.2. Switzerland

Test Details

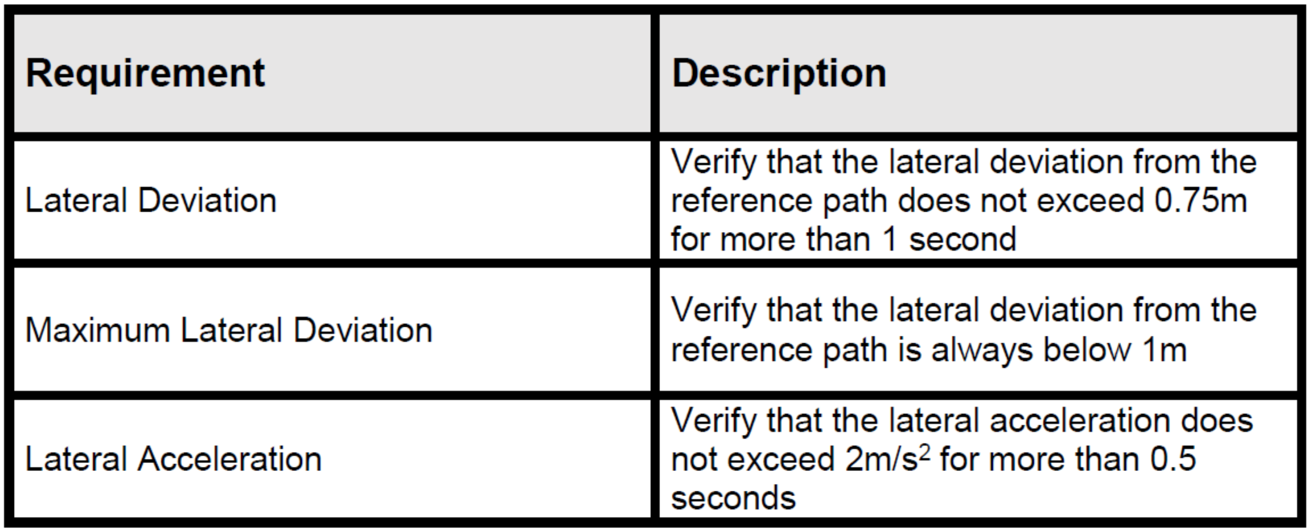
Description	This is the slowest scenario considered, with lots of corners one after another. We try to follow this scenario with 15 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 15/3.6;
%% Scenario Loading
map = ScenarioLoading('switzerland.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	**Description**
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.3. Straight_Slow

Test Details

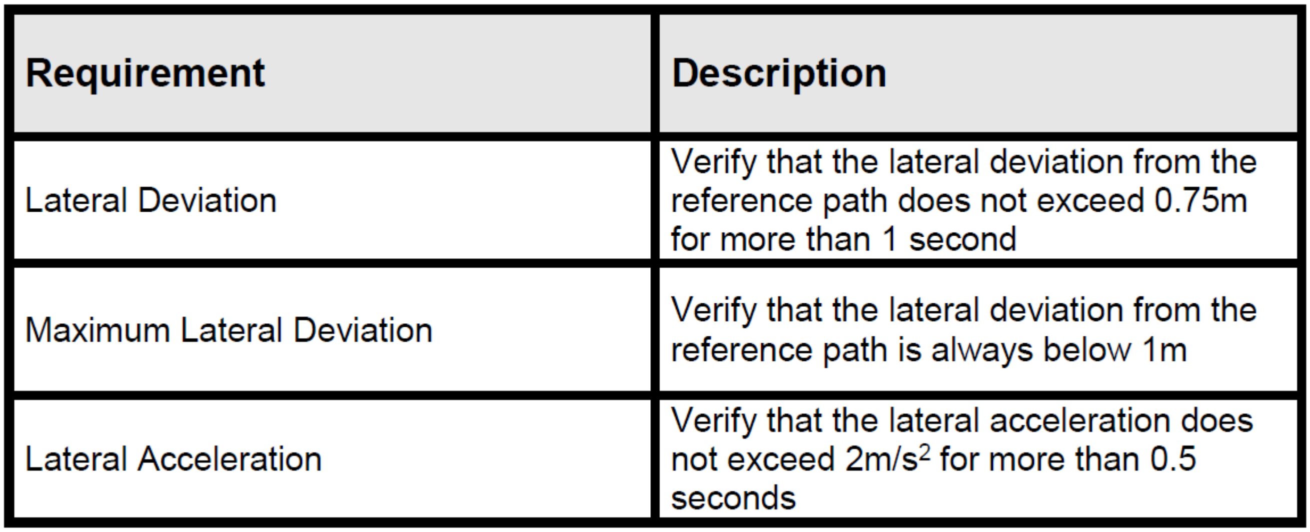
Description	Sample scenario consisting in a straight line. Speed 10 km/h.

PreLoad Callback

```
%% Set Speed
V = 10/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.4. TiltedStraight_Slow

Test Details

Description	Sample scenario consisting in a straight line with a direction of 45 degrees in the X-Y plane. Speed 10 km/h.

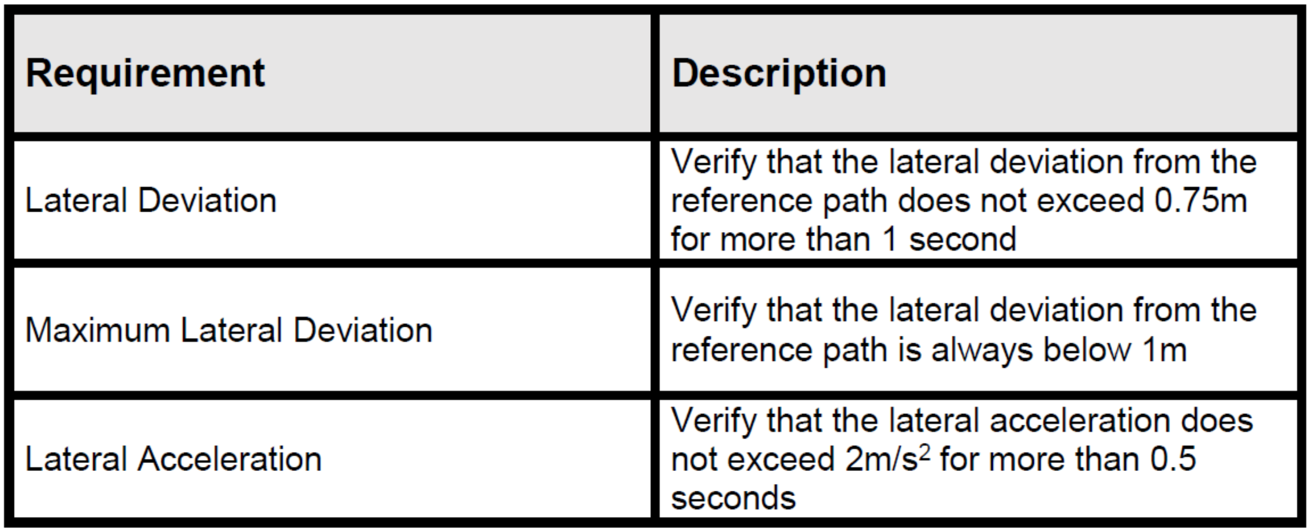
PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
map = [0 0; 1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.5. Campania

Test Details

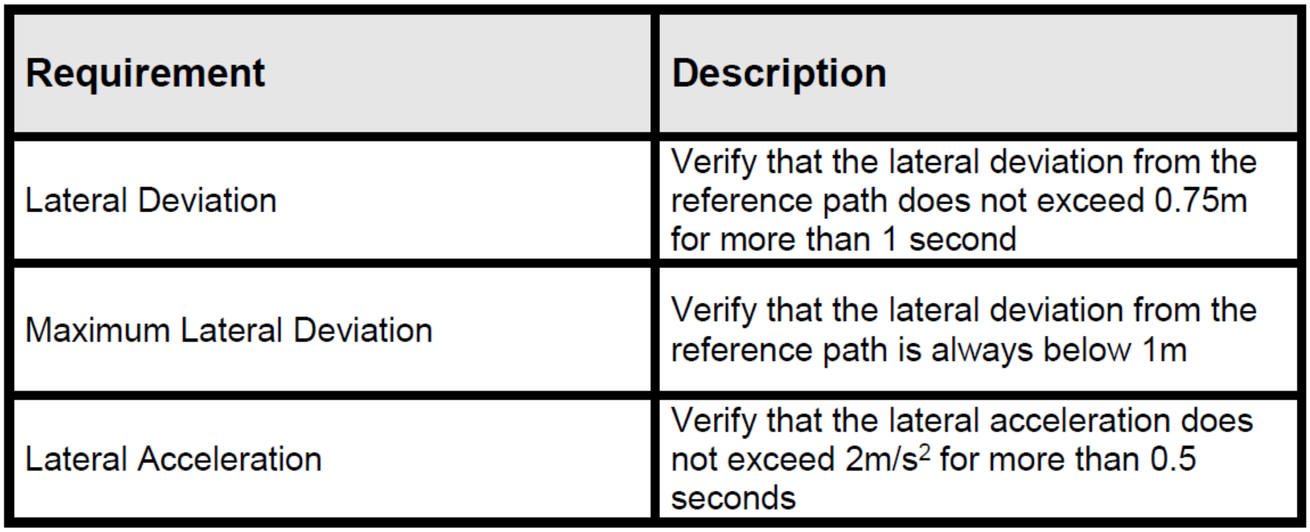
Description	This scenario is made up by a sequence of smooth corners. We try to follow this path with 30 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 30/3.6;
%% Scenario Loading
map = ScenarioLoading('campania.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.6. Straight_Fast

Test Details

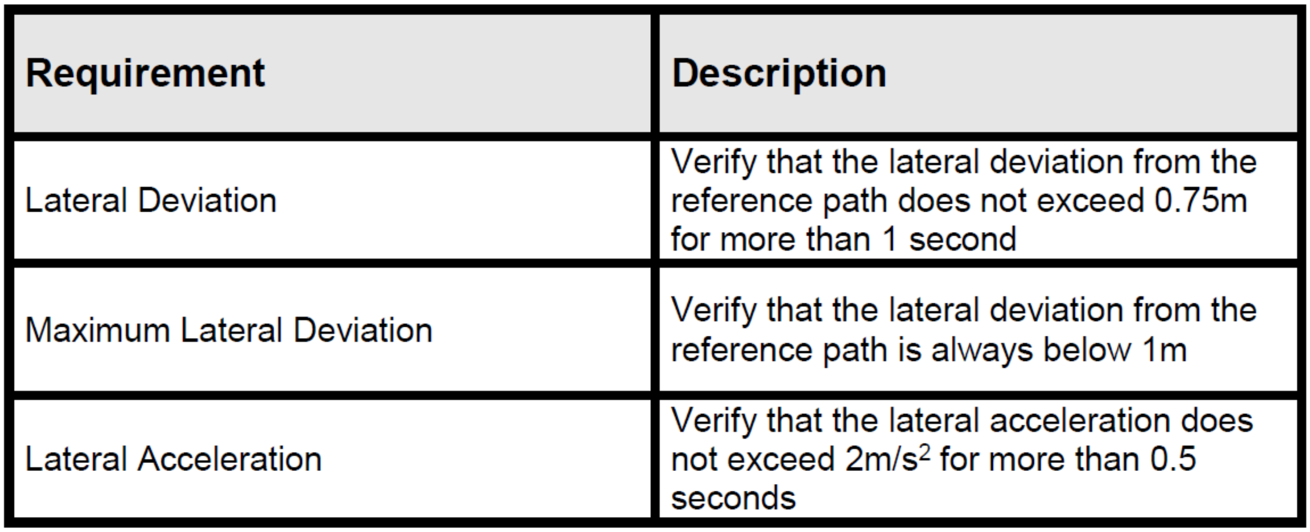
Description	Sample scenario consisiting in a straight line. Speed: 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.7. TiltedStraight_Fast

Test Details

Description	Sample scenario consisting in a straight line tilted by 135 degrees in the X-Y plane. Speed: 100 km/h.

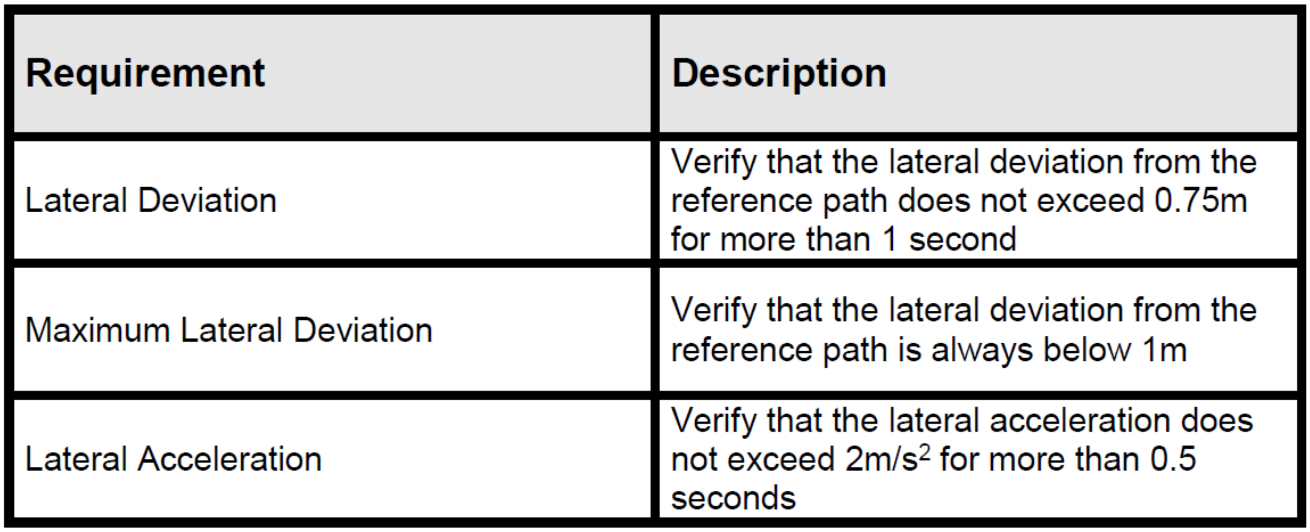
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
map = [0 0; -1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.8. 1000mCurve_Slow

Test Details

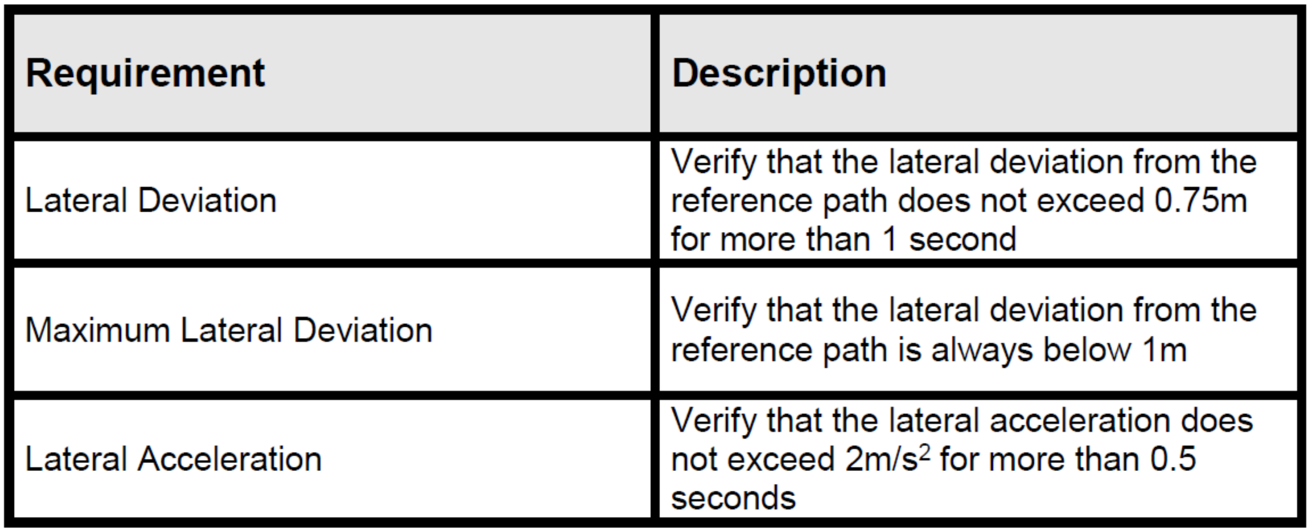
Description	Sample scenario consisting in a constant curve with radius 1000m. Speed set to 20 km/h.

PreLoad Callback

```
%% Set Speed
V = 20/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.9. 100mCurve_Slow

Test Details

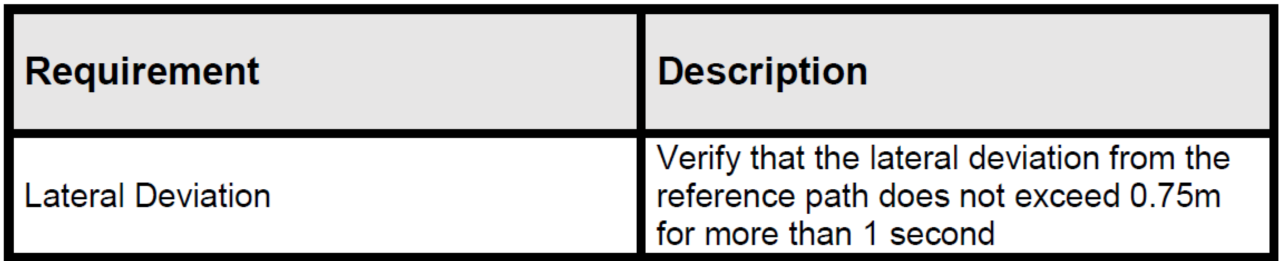
Description	Sample scenario consisting in a constant curve with radius 100m. Speed: 10 km/h.

PreLoad Callback

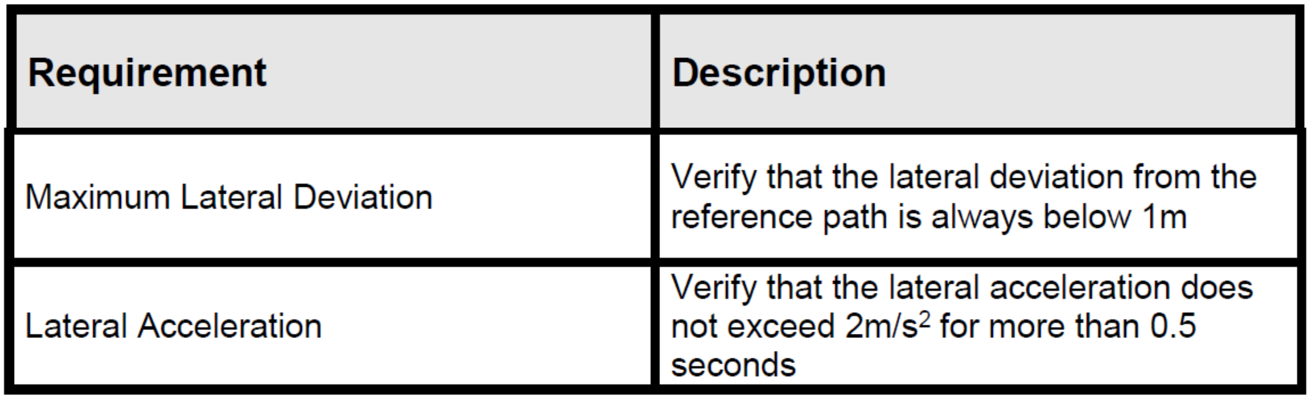
```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.10. 1000mCurve_Fast

Test Details

Description	Sample scenario consisting in a constant curve with 1000m radius. Speed: 100 km/h.

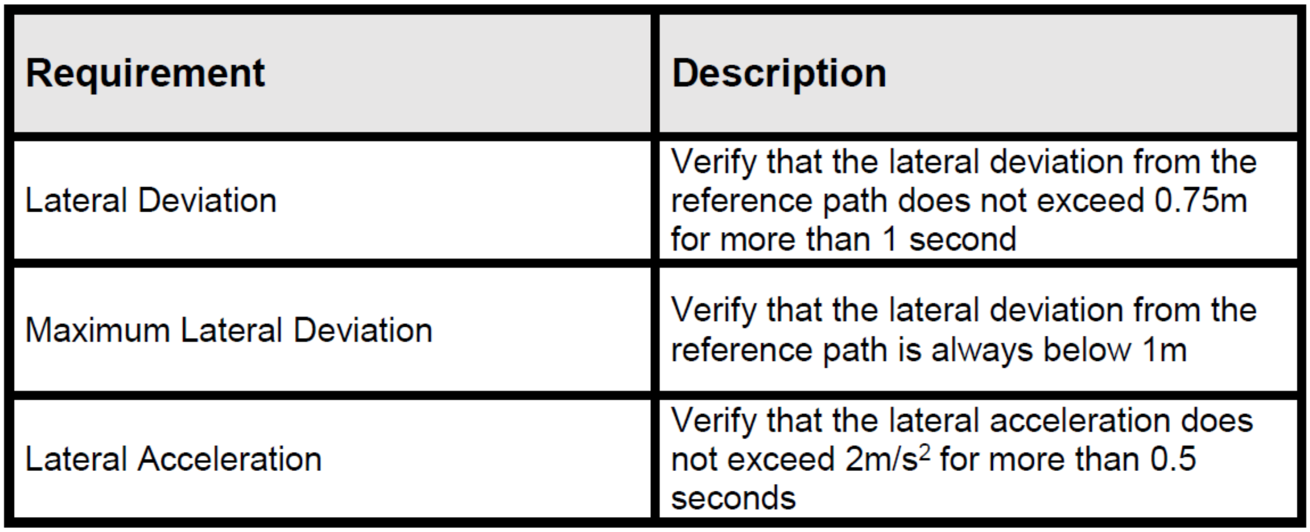
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
```

```
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.11. 100mCurve_Fast

Test Details

Description	Sample scenario consisting of a constant curve with radius 100m. Speed: 100 km/h.

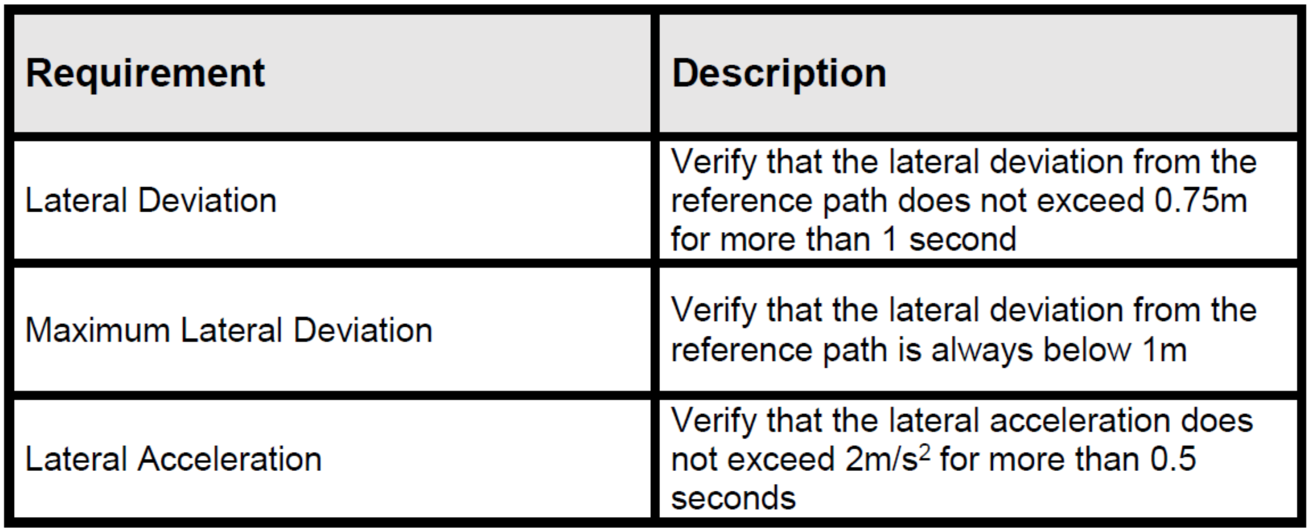
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
```

```
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	**Description**
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.12. Adriatic Highway A 14

Test Details

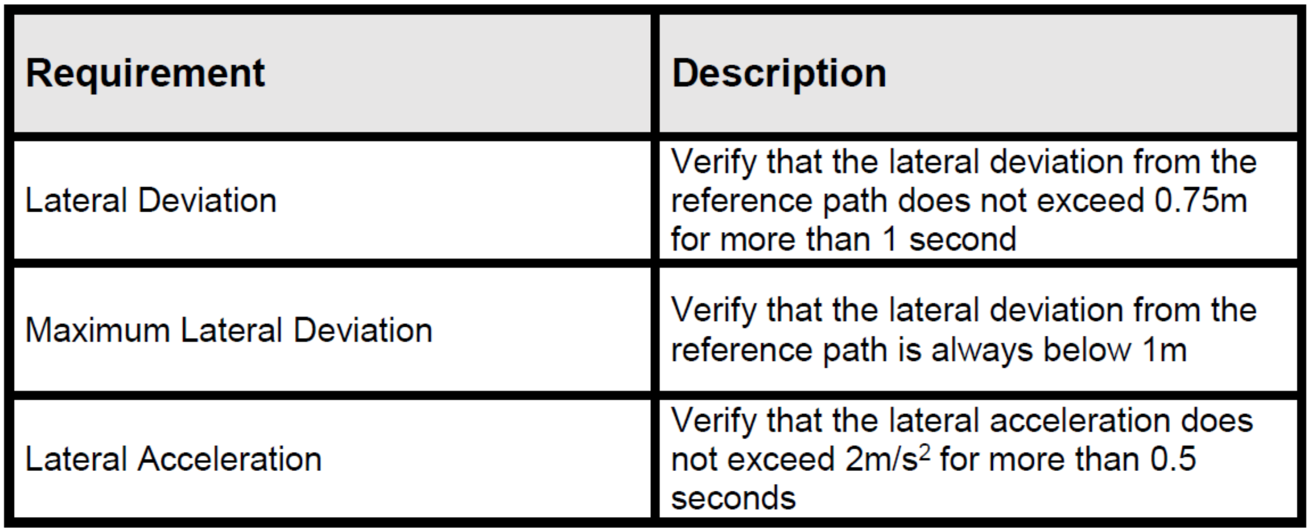
Description	This scenario is taken from the A14 Highway which is a straight road for the most of it, with some high-speed corners. We simulate this scenario at 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('A_14.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	**Description**
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.3.13. Indianapolis Speedway

Test Details

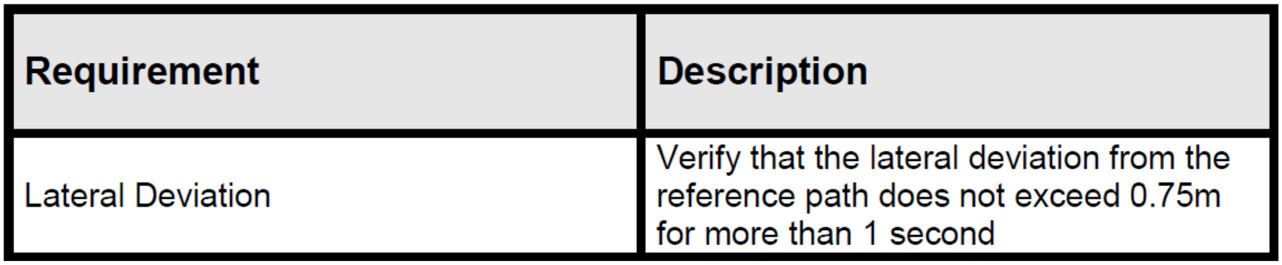
Description	This scenario is taken from the Indianapolis Speedway. We simulate it at 100 km/h.

PreLoad Callback

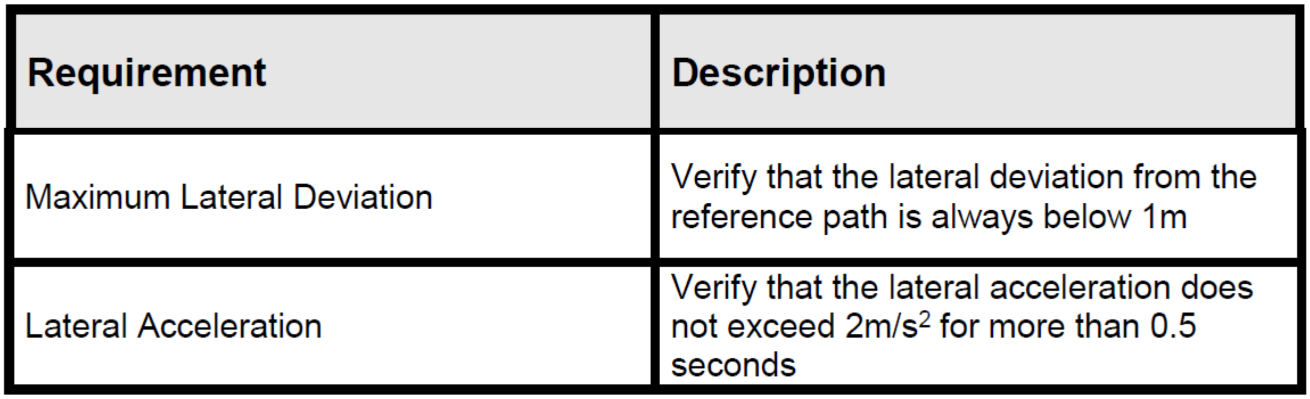
```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('indianapolis.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	**Description**
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4. Suzuki Samurai

Setup Callback

```
param = loadParameters(4);
```

1.4.1. Puglia

Test Details

Description	This scenario is taken from an Highway and it is a road that is straigth for the most with some smooth corners. In this test we try to follow the path with a speed of 40 km/h.

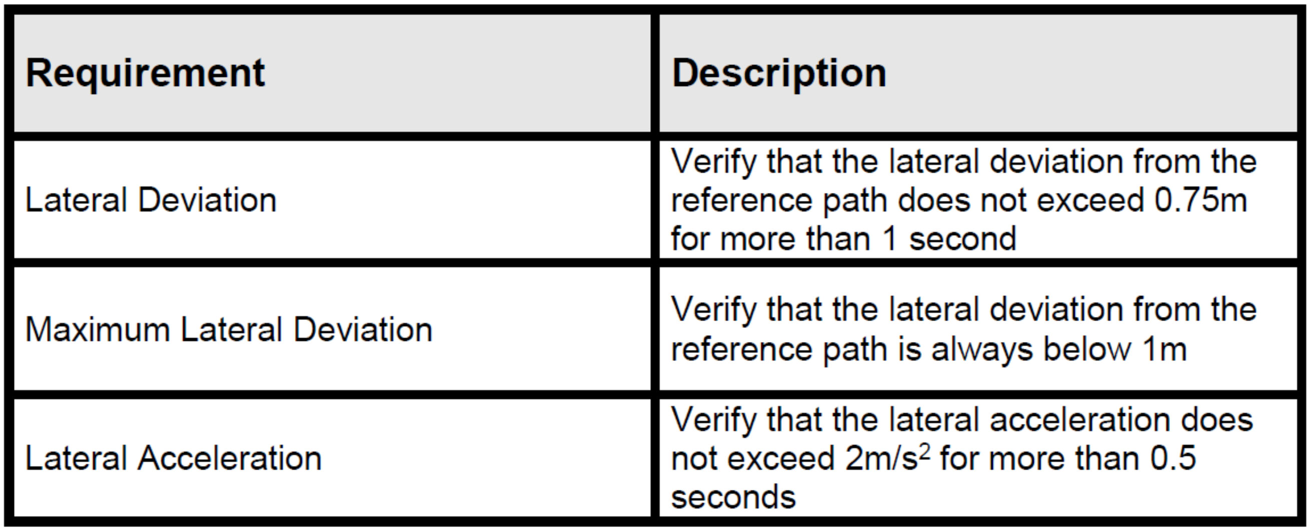
PreLoad Callback

```
%% Set Speed
V = 40/3.6;
%% Scenario Loading
map = ScenarioLoading('puglia.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.2. Switzerland

Test Details

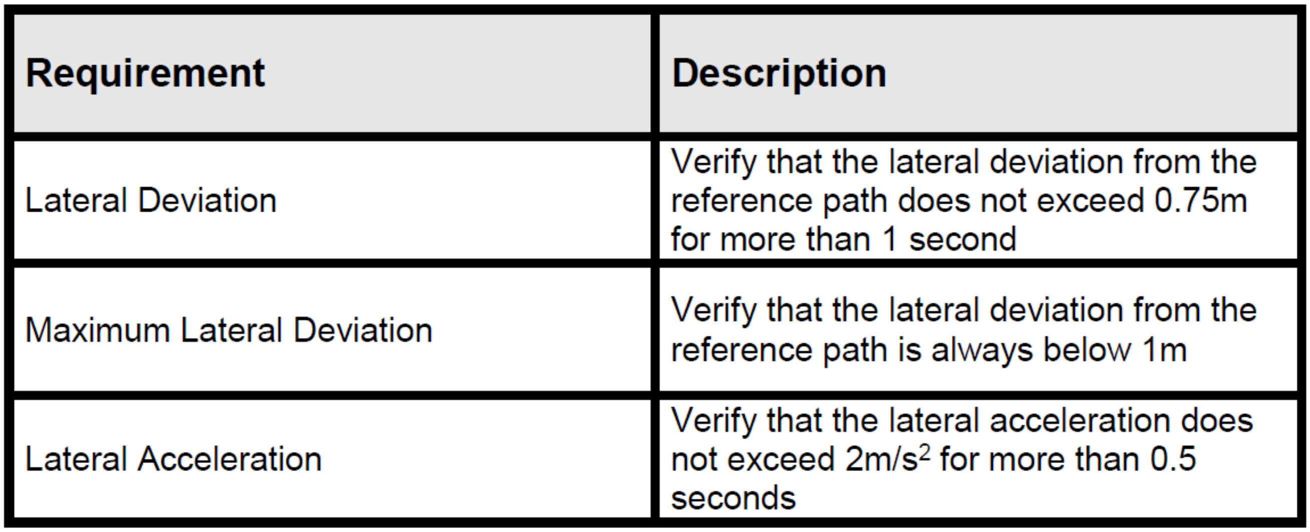
Description	This is the slowest scenario considered, with lots of corners one after another. We try to follow this scenario with 15 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 15/3.6;
%% Scenario Loading
map = ScenarioLoading('switzerland.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.3. Straight_Slow

Test Details

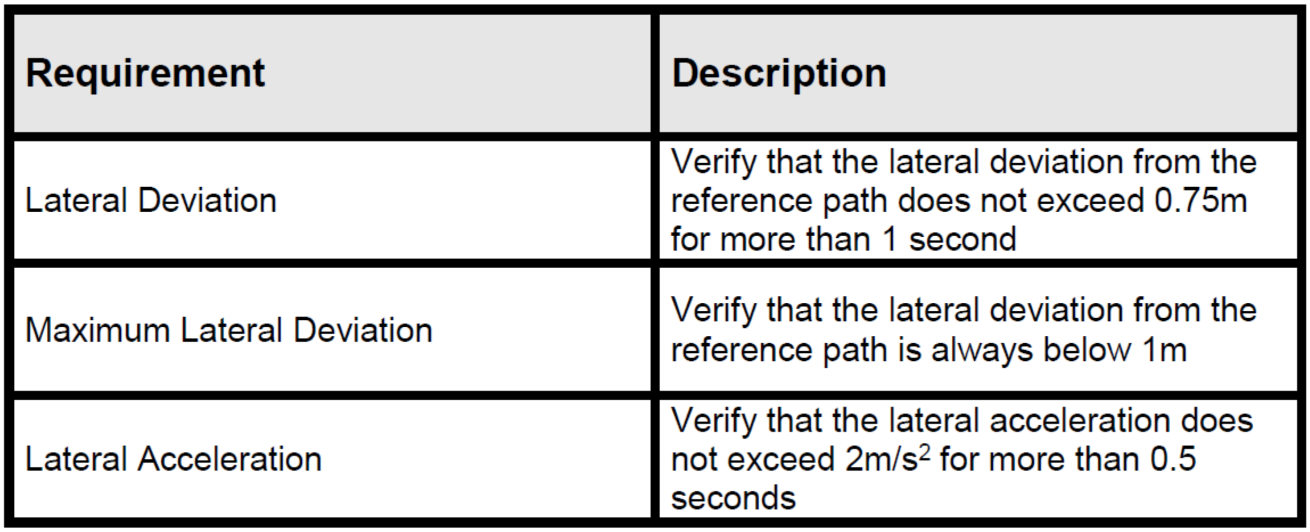
Description	Sample scenario consisting in a straight line. Speed 10 km/h.

PreLoad Callback

```
%% Set Speed
V = 10/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.4. TiltedStraight_Slow

Test Details

Description	Sample scenario consisting in a straight line with a direction of 45 degrees in the X-Y plane. Speed 10 km/h.

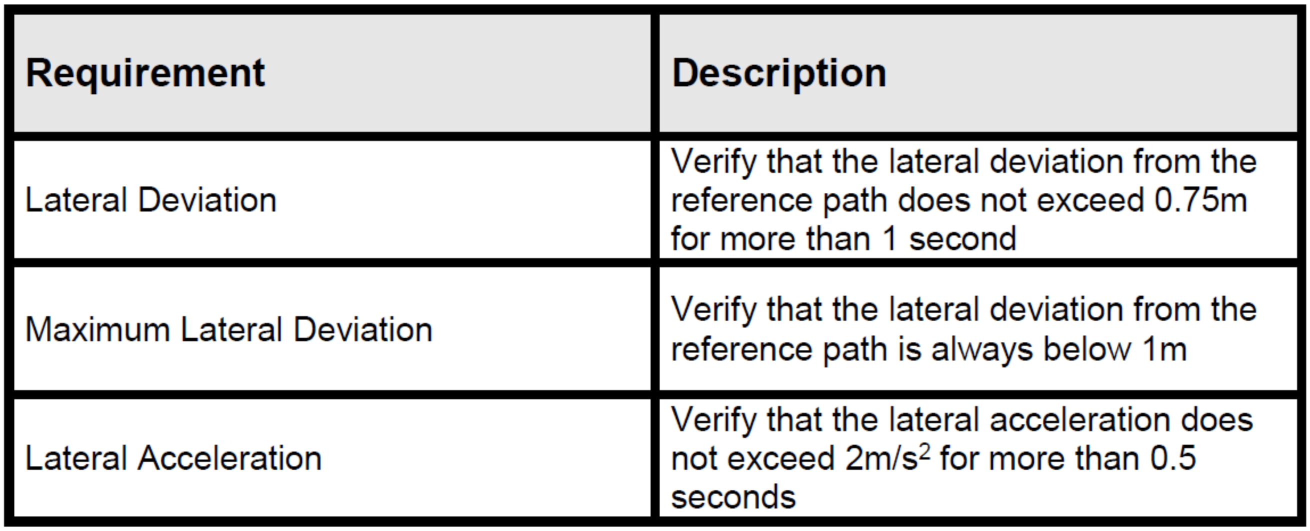
PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
map = [0 0; 1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.5. Campania

Test Details

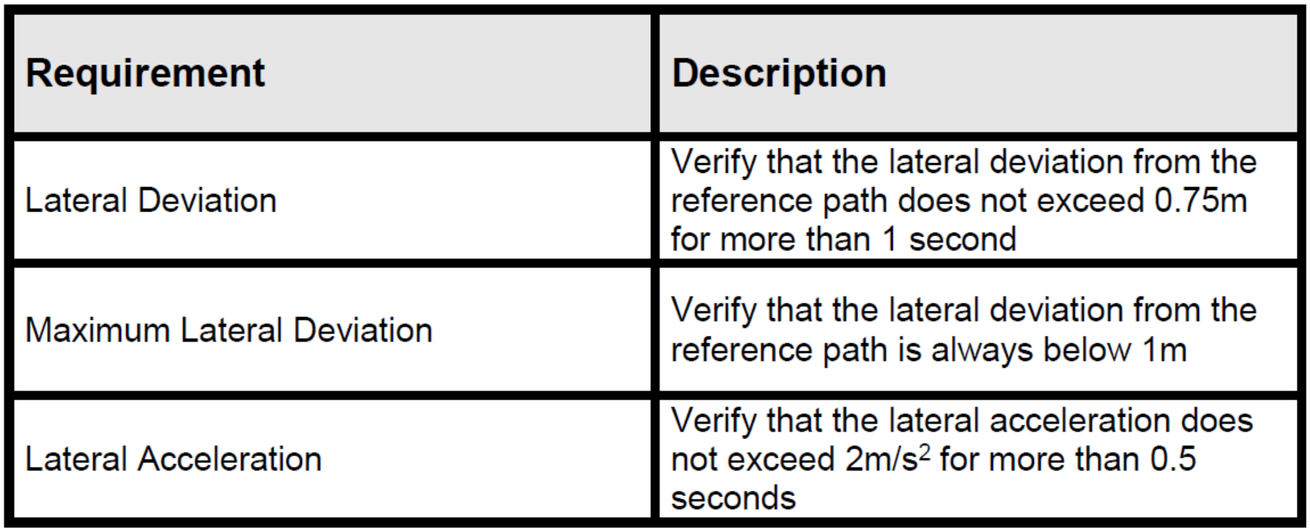
Description	This scenario is made up by a sequence of smooth corners. We try to follow this path with 30 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 30/3.6;
%% Scenario Loading
map = ScenarioLoading('campania.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.6. Straight_Fast

Test Details

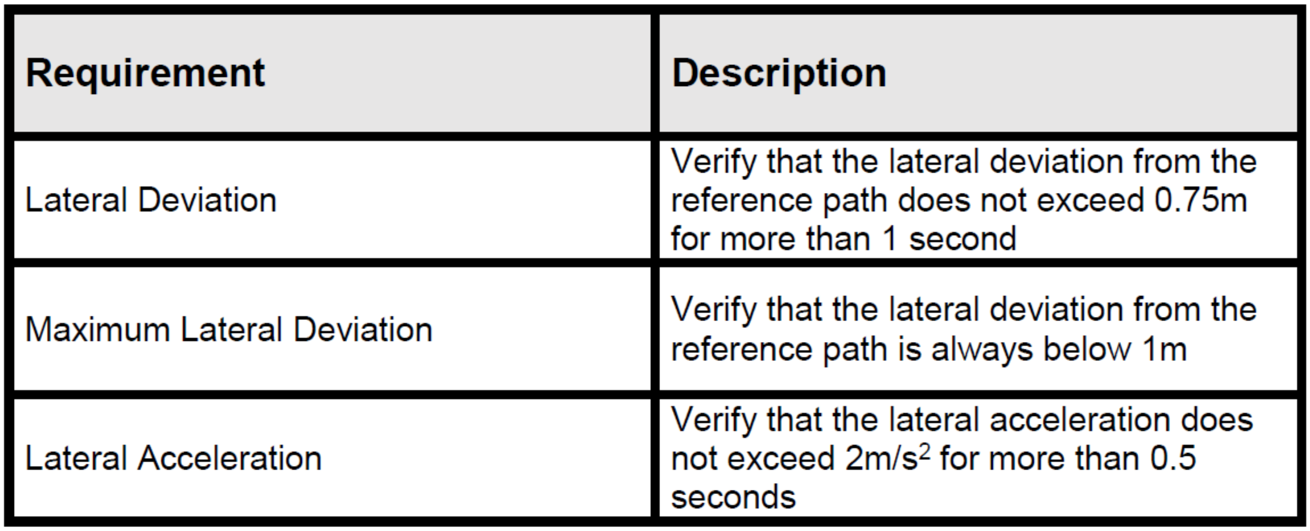
Description	Sample scenario consisiting in a straight line. Speed: 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.7. TiltedStraight_Fast

Test Details

Description	Sample scenario consisting in a straight line tilted by 135 degrees in the X-Y plane. Speed: 100 km/h.

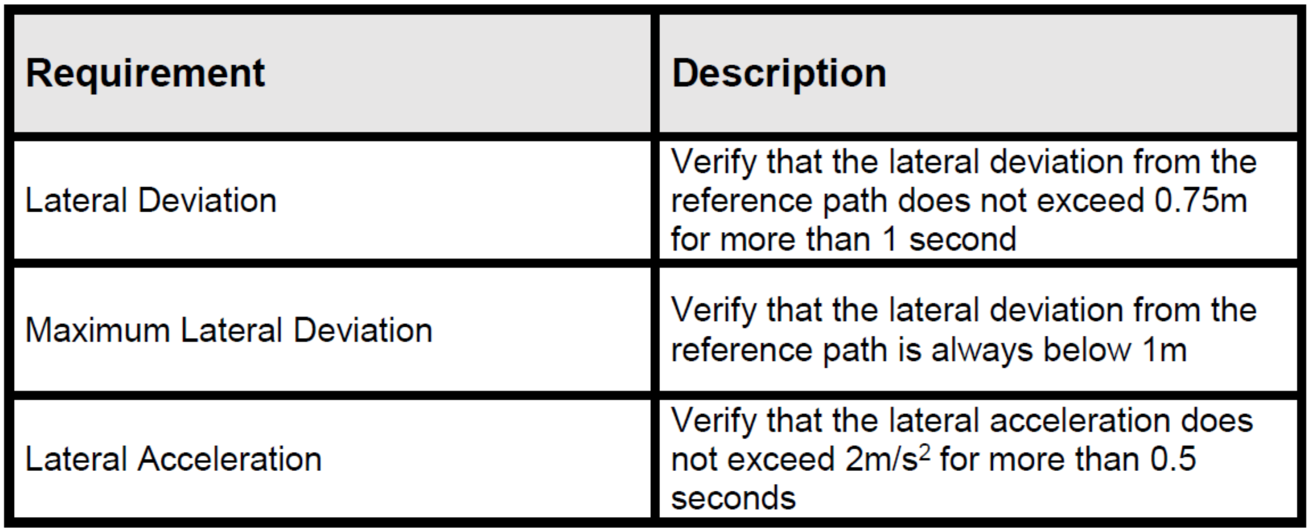
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
map = [0 0; -1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.8. 1000mCurve_Slow

Test Details

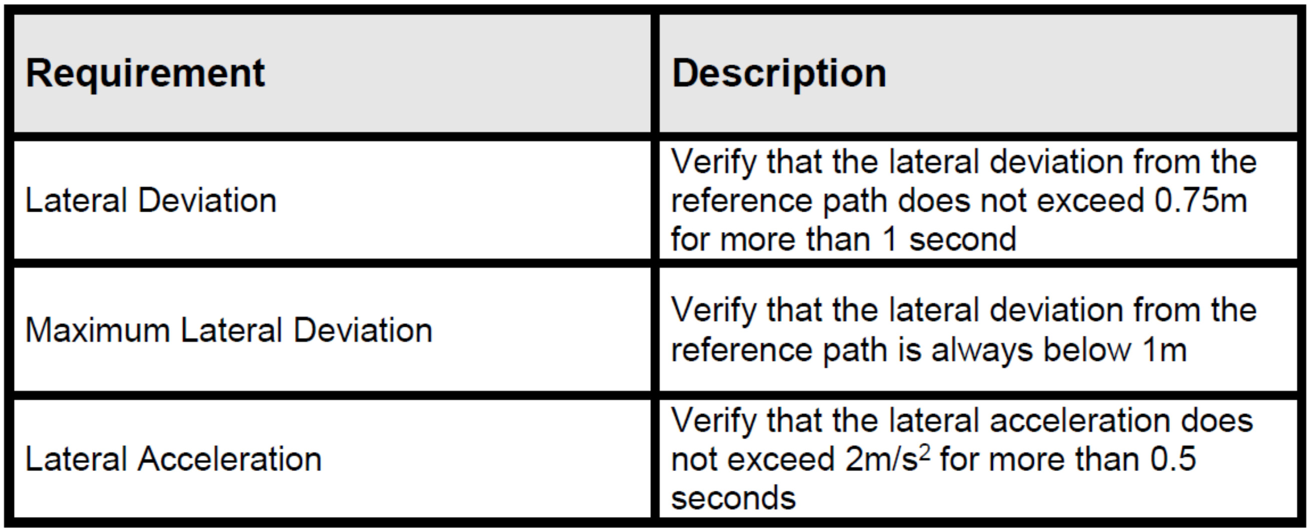
Description	Sample scenario consisting in a constant curve with radius 1000m. Speed set to 20 km/h.

PreLoad Callback

```
%% Set Speed
V = 20/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.9. 100mCurve_Slow

Test Details

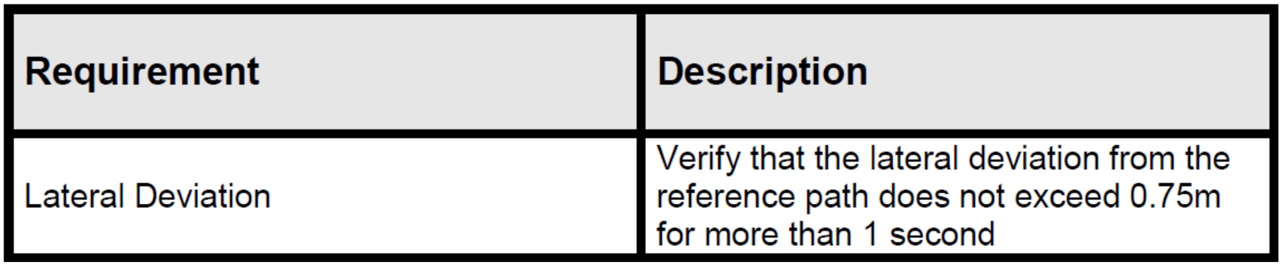
Description	Sample scenario consisting in a constant curve with radius 100m. Speed: 10 km/h.

PreLoad Callback

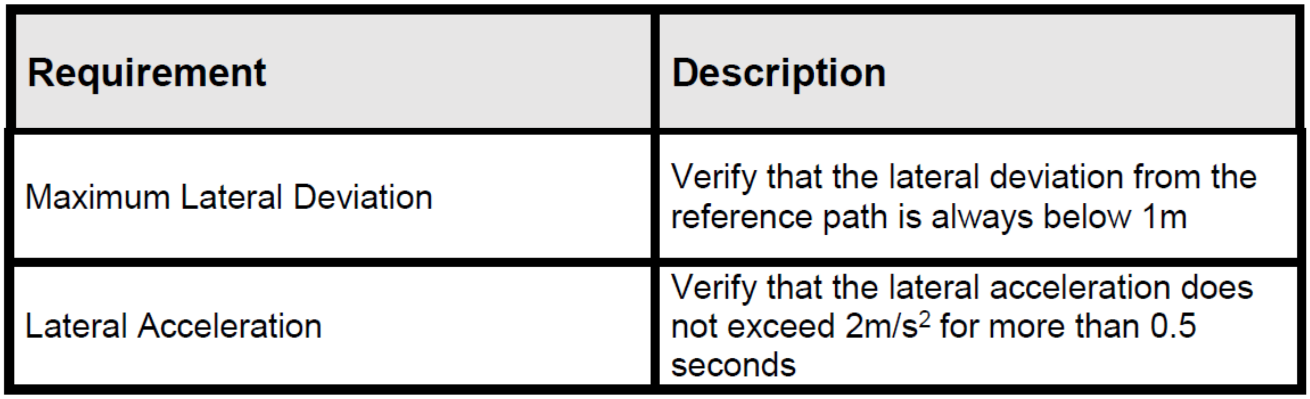
```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.10. 1000mCurve_Fast

Test Details

Description	Sample scenario consisting in a constant curve with 1000m radius. Speed: 100 km/h.

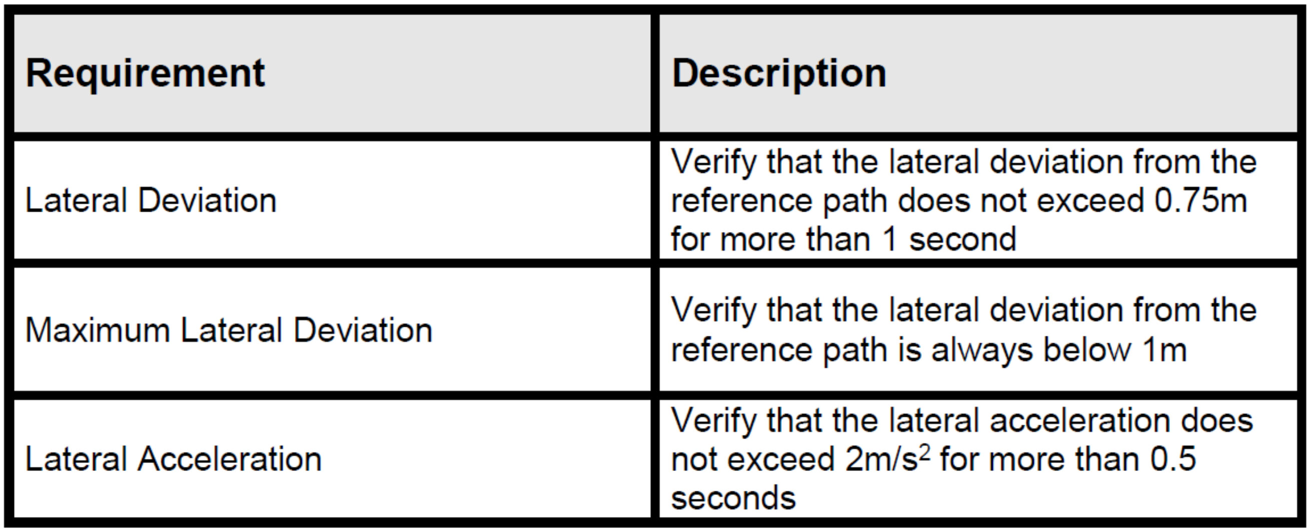
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
```

```
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.11. 100mCurve_Fast

Test Details

Description	Sample scenario consisting of a constant curve with radius 100m. Speed: 100 km/h.

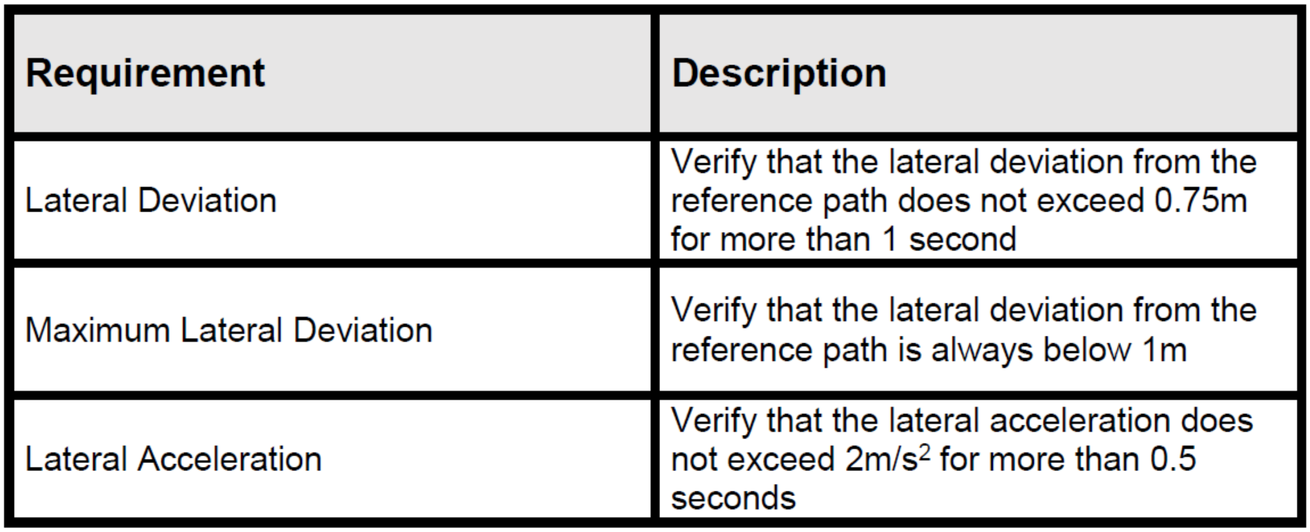
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
```

```
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed $2m/s^2$ for more than 0.5 seconds

1.4.12. Adriatic Highway A 14

Test Details

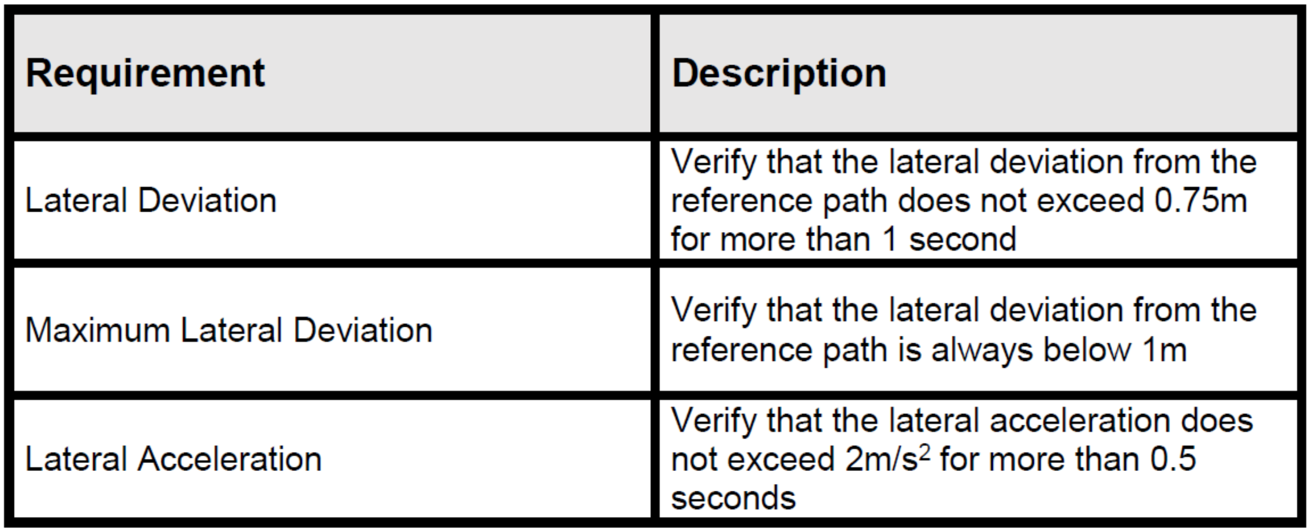
Description	This scenario is taken from the A14 Highway which is a straight road for the most of it, with some high-speed corners. We simulate this scenario at 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('A_14.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.4.13. Indianapolis Speedway

Test Details

Description	This scenario is taken from the Indianapolis Speedway. We simulate it at 100 km/h.

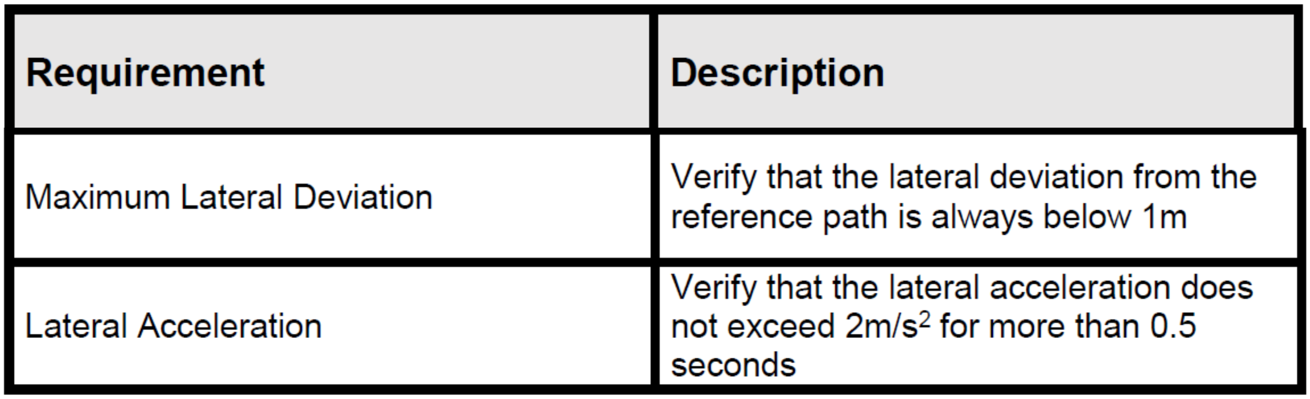
PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('indianapolis.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5. Volkswagen Beetle

Setup Callback

```
param = loadParameters(5);
```

1.5.1. Puglia

Test Details

Description	This scenario is taken from an Highway and it is a road that is straigth for the most with some smooth corners. In this test we try to follow the path with a speed of 40 km/h.

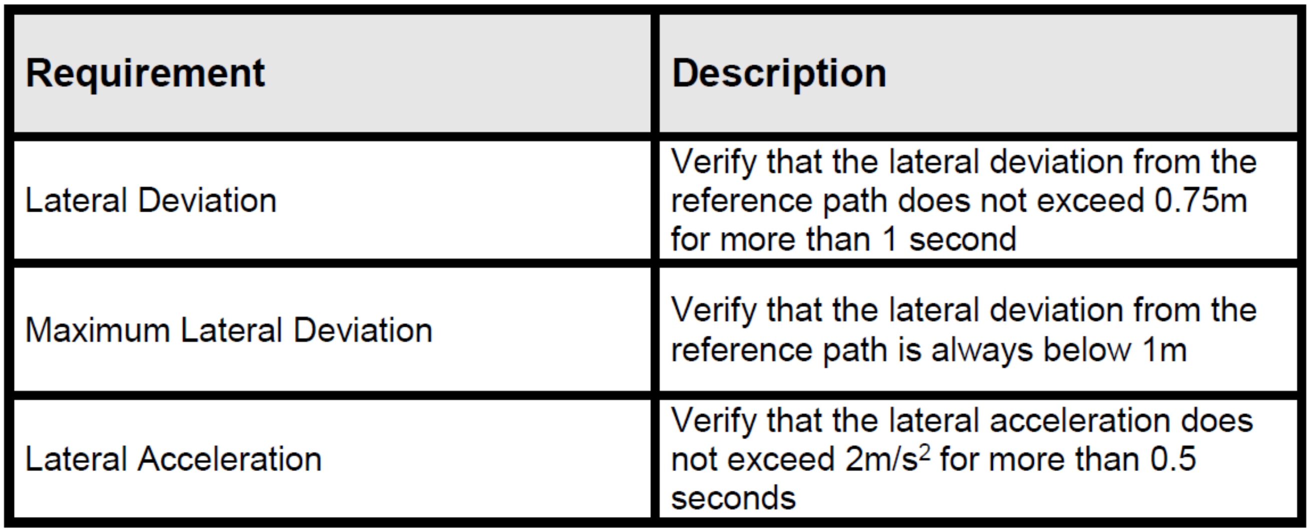
PreLoad Callback

```
%% Set Speed
V = 40/3.6;
%% Scenario Loading
map = ScenarioLoading('puglia.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.2. Switzerland

Test Details

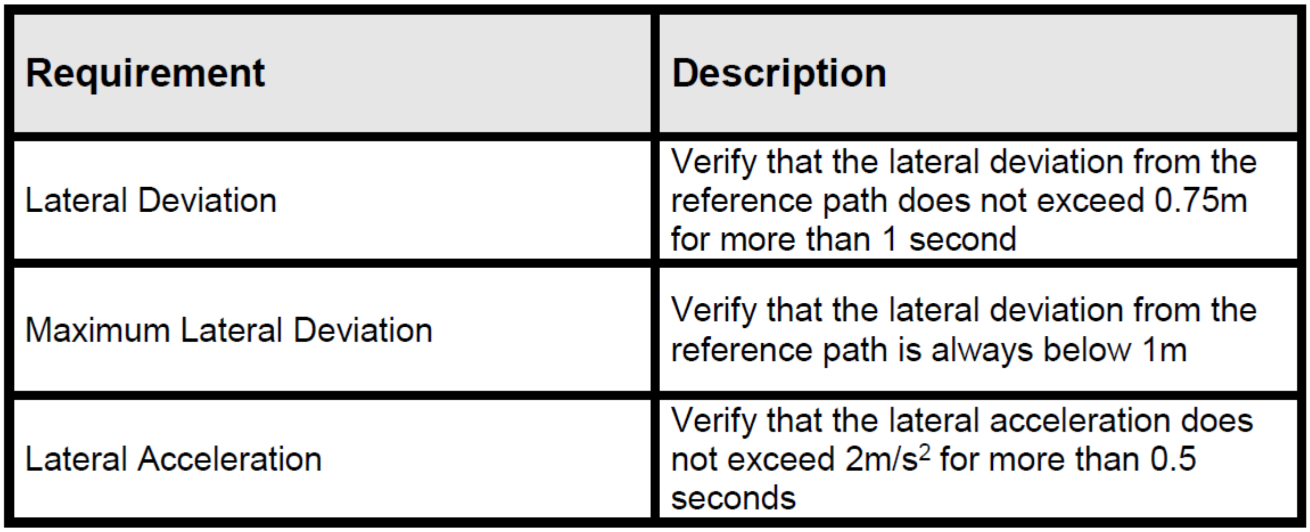
Description	This is the slowest scenario considered, with lots of corners one after another. We try to follow this scenario with 15 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 15/3.6;
%% Scenario Loading
map = ScenarioLoading('switzerland.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.3. Straight_Slow

Test Details

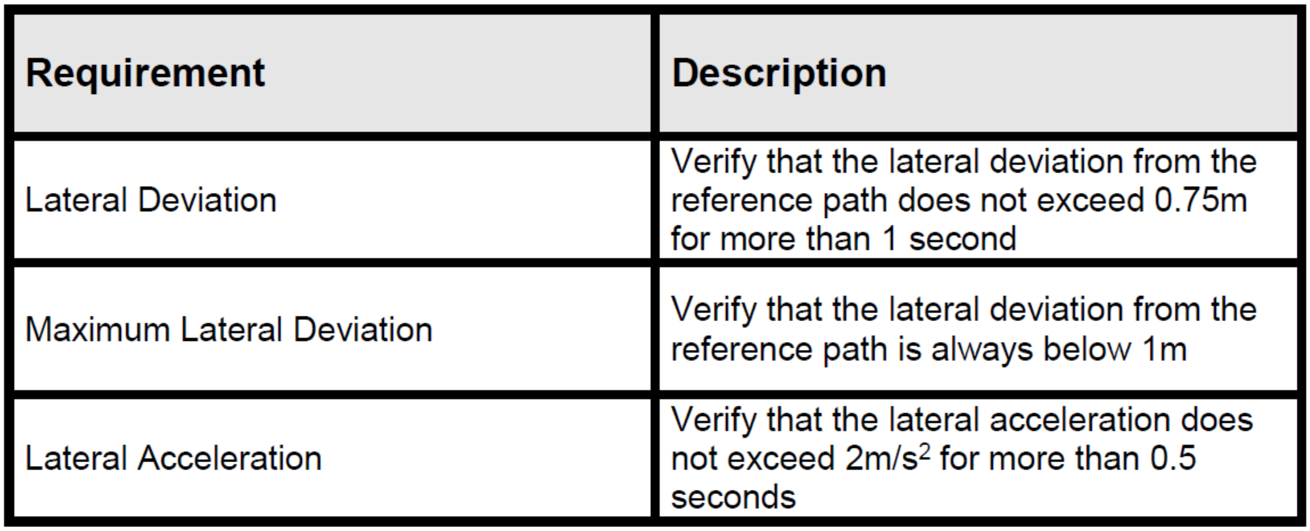
Description	Sample scenario consisting in a straight line. Speed 10 km/h.

PreLoad Callback

```
%% Set Speed
V = 10/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.4. TiltedStraight_Slow

Test Details

Description	Sample scenario consisting in a straight line with a direction of 45 degrees in the X-Y plane. Speed 10 km/h.

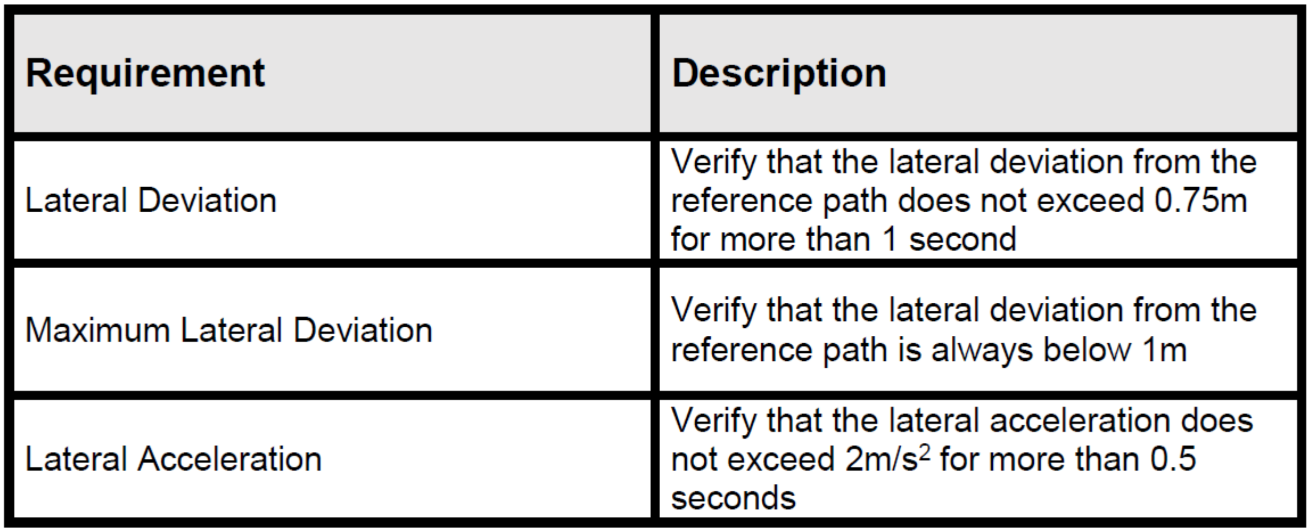
PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
map = [0 0; 1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.5. Campania

Test Details

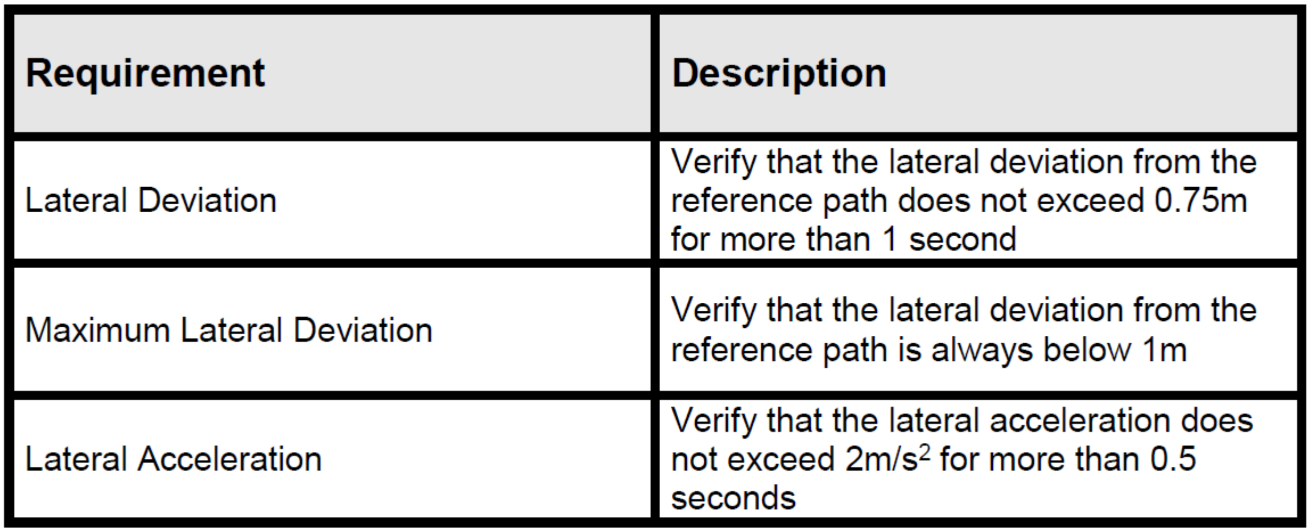
Description	This scenario is made up by a sequence of smooth corners. We try to follow this path with 30 km/h speed.

PreLoad Callback

```
%% Set Speed
V = 30/3.6;
%% Scenario Loading
map = ScenarioLoading('campania.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.6. Straight_Fast

Test Details

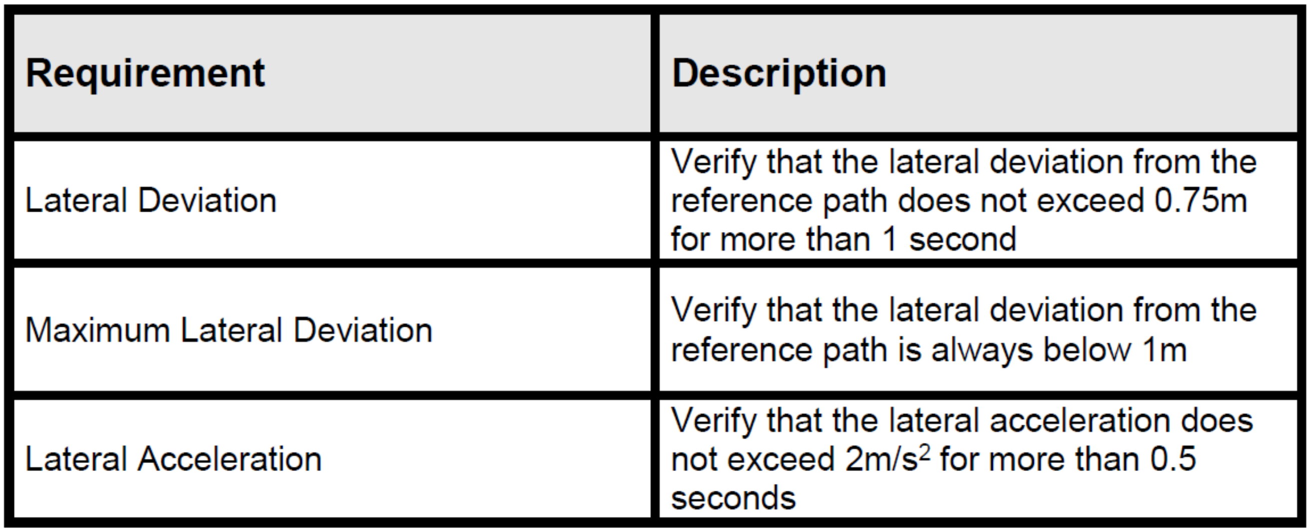
Description	Sample scenario consisiting in a straight line. Speed: 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = [0 0; 1000 0];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.7. TiltedStraight_Fast

Test Details

Description	Sample scenario consisting in a straight line tilted by 135 degrees in the X-Y plane. Speed: 100 km/h.

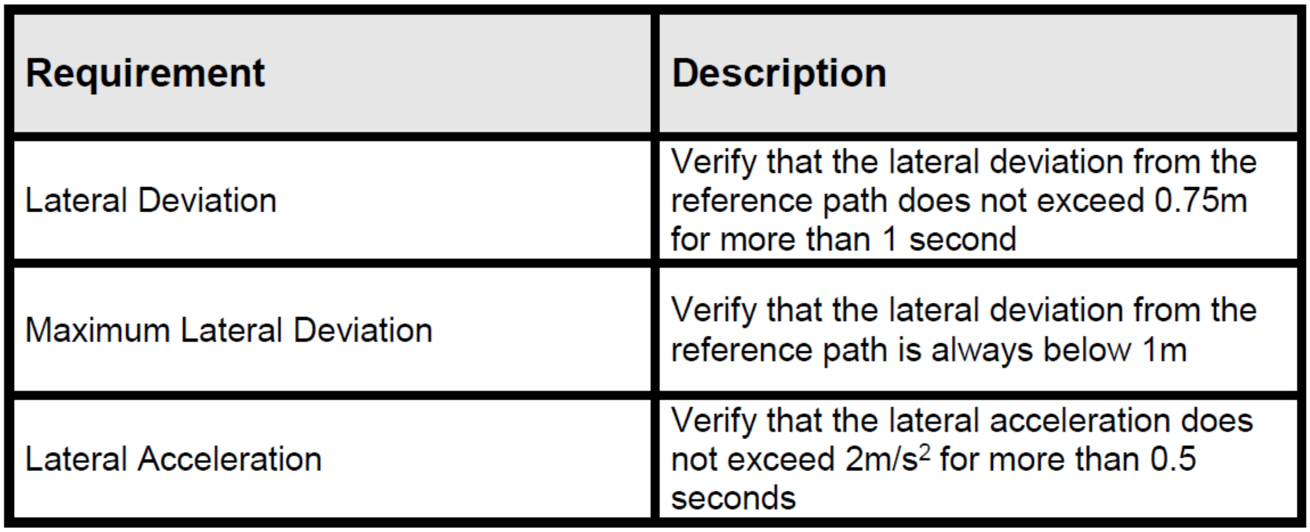
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
map = [0 0; -1000 1000];

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
```

```
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.8. 1000mCurve_Slow

Test Details

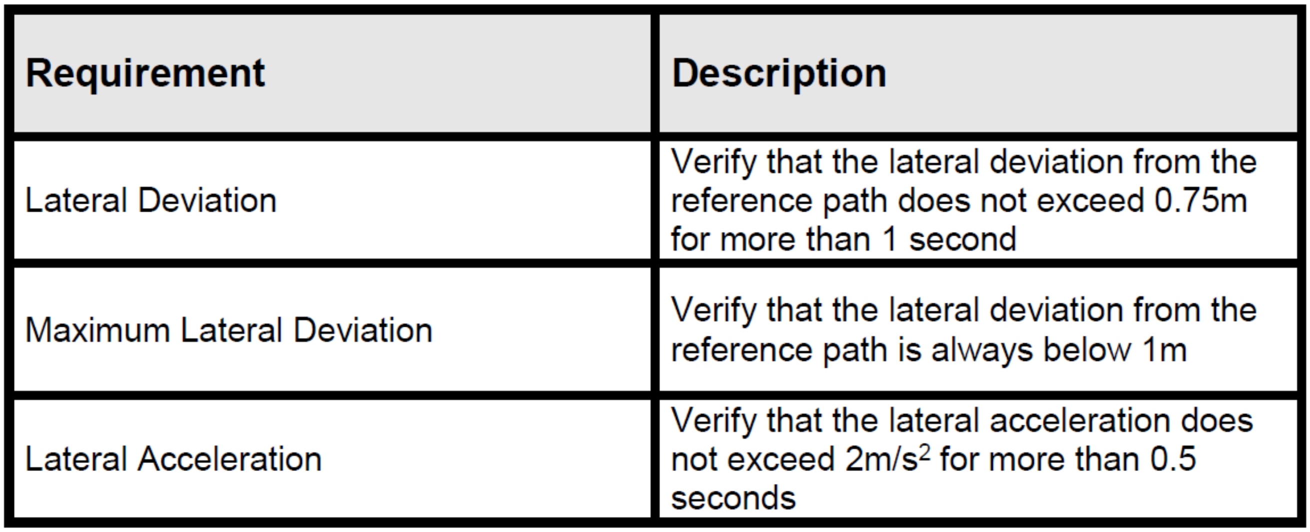
Description	Sample scenario consisting in a constant curve with radius 1000m. Speed set to 20 km/h.

PreLoad Callback

```
%% Set Speed
V = 20/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.9. 100mCurve_Slow

Test Details

Description	Sample scenario consisting in a constant curve with radius 100m. Speed: 10 km/h.

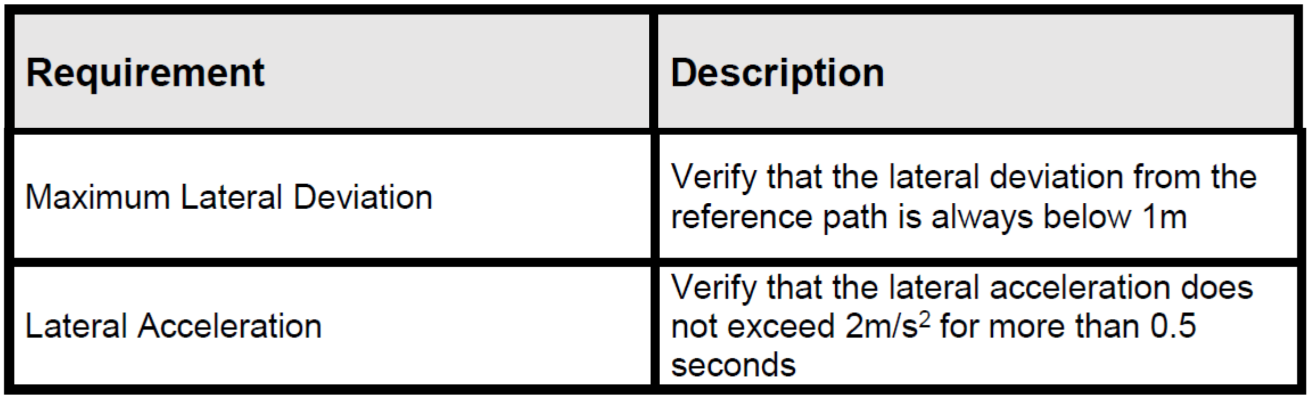
PreLoad Callback

```
%% Set Speed
V = 10/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols

Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.10. 1000mCurve_Fast

Test Details

Description	Sample scenario consisting in a constant curve with 1000m radius. Speed: 100 km/h.

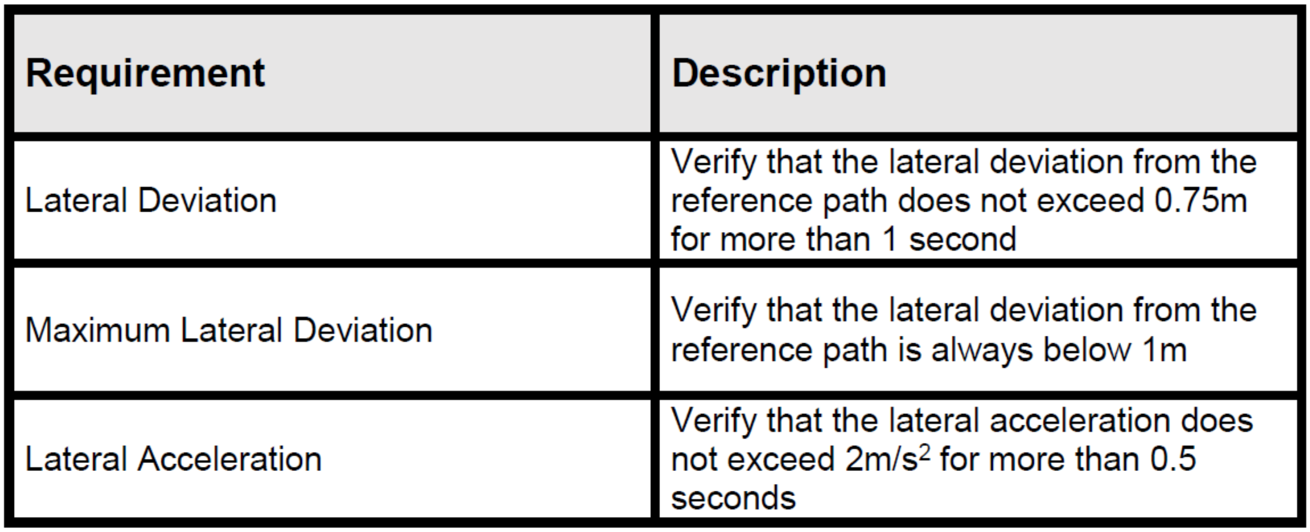
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(1000,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
```

```
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.11. 100mCurve_Fast

Test Details

Description	Sample scenario consisting of a constant curve with radius 100m. Speed: 100 km/h.

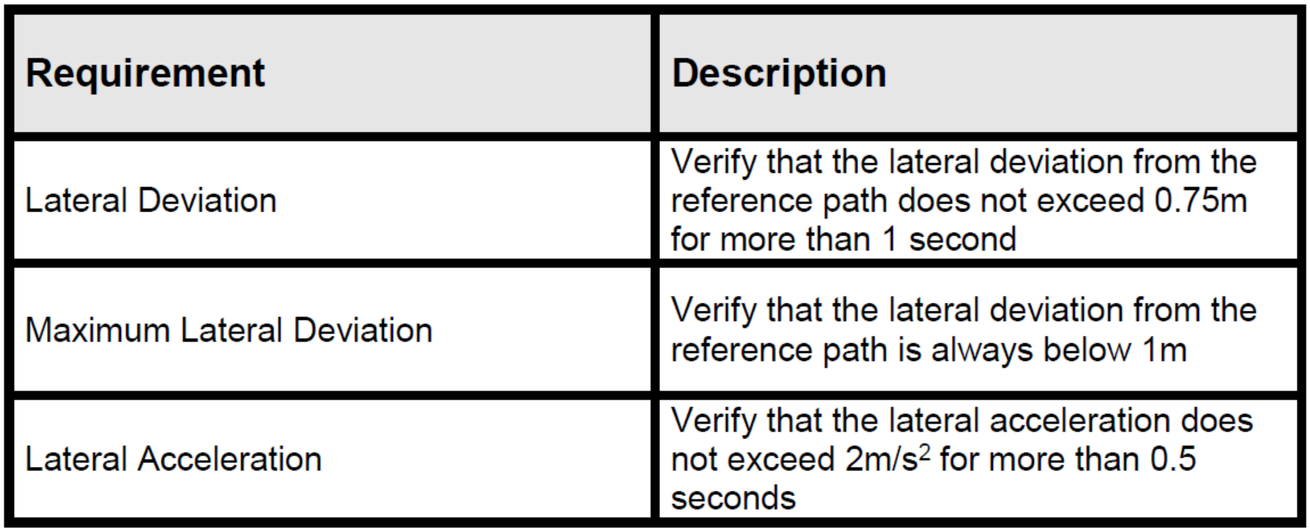
PreLoad Callback

```
%% Set Speed
V = 100/3.6;

%% Scenario Loading
[X_rec, Y_rec, Theta_rec] = curve_generator(100,V,Ts);
map = [X_rec Y_rec];
distance = odometer(map);
% Extend the reference signal to avoid index over limits
```

```
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.12. Adriatic Highway A 14

Test Details

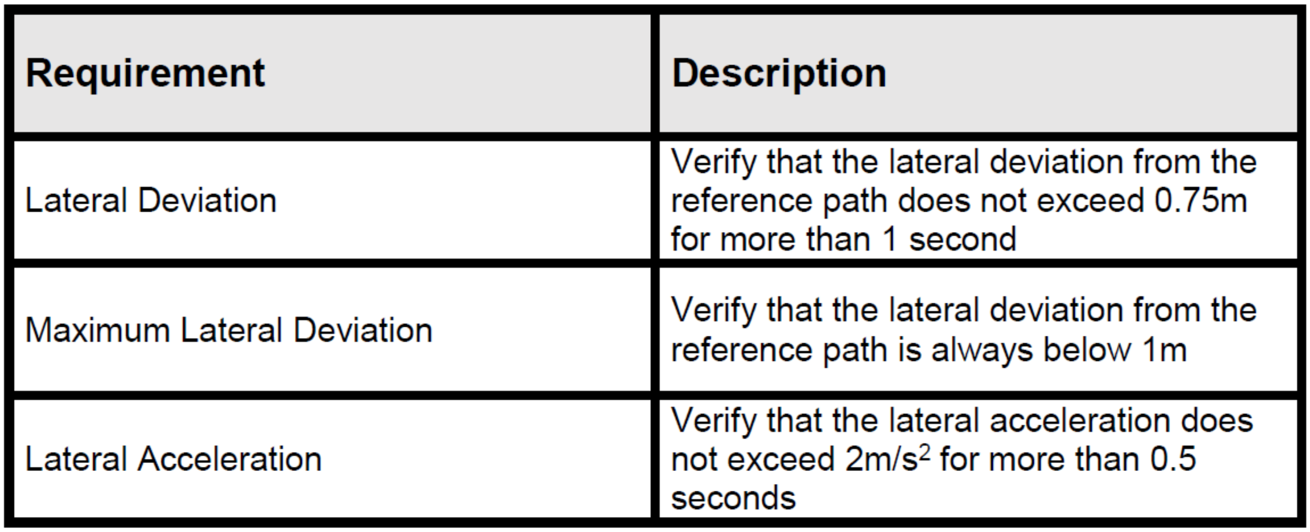
Description	This scenario is taken from the A14 Highway which is a straight road for the most of it, with some high-speed corners. We simulate this scenario at 100 km/h.

PreLoad Callback

```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('A_14.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds

1.5.13. Indianapolis Speedway

Test Details

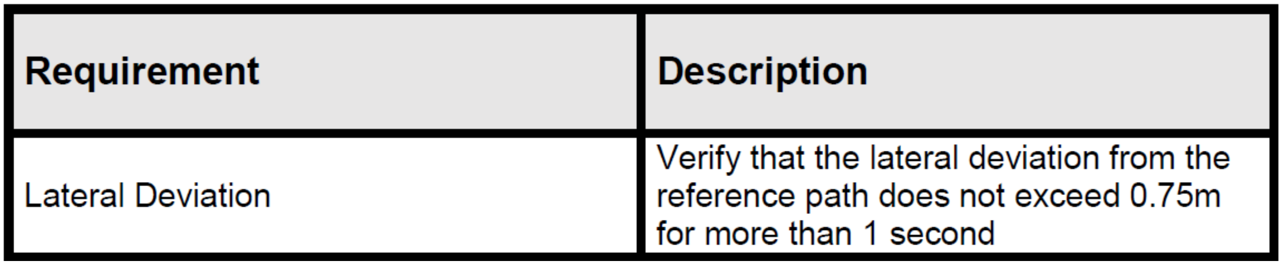
Description	This scenario is taken from the Indianapolis Speedway. We simulate it at 100 km/h.

PreLoad Callback

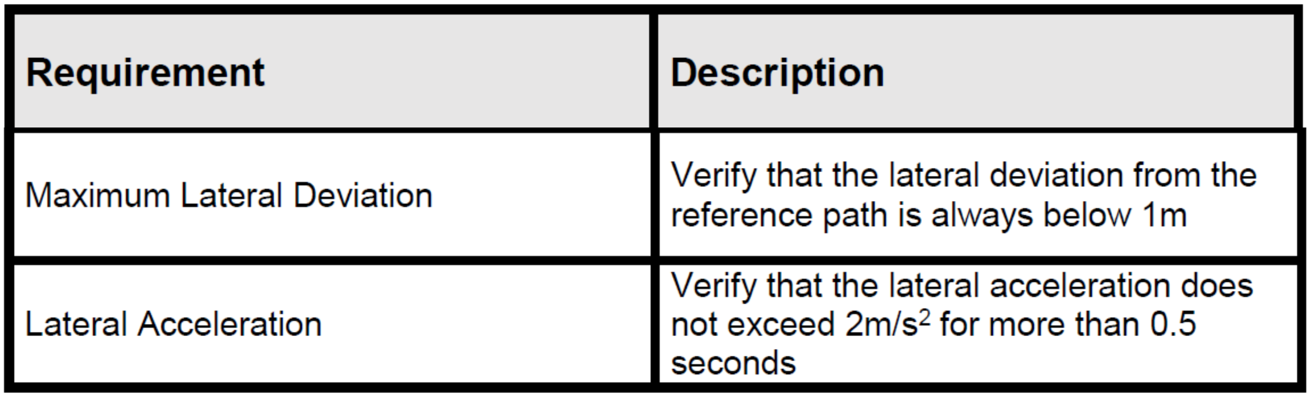
```
%% Set Speed
V = 100/3.6;
%% Scenario Loading
map = ScenarioLoading('indianapolis.mat');

% Evaluate total distance covered by the route on the map
distance = odometer(map);
%% Reference signal
% Upsample map based on speed and timestep
[X_rec, Y_rec, Theta_rec] = reference_generator(map,V,Ts);
% Extend the reference signal to avoid index over limits
X_rec(end+1:end+p+20) = X_rec(end);
Y_rec(end+1:end+p+20) = Y_rec(end);
Theta_rec(end+1:end+p+20) = Theta_rec(end);
% Define initial condition based on map
x0_kin = [X_rec(1) Y_rec(1) Theta_rec(1) V]';
x0_dyn = [X_rec(1) Y_rec(1) Theta_rec(1) V 0 0]';
extended_map = [X_rec Y_rec Theta_rec repmat(V,length(X_rec),1)];
egoStates.Plant = x0_kin';
egoStates.Covariance = eye(6)*1000;
```

Logical and Temporal Assessments

Symbols



Requirement	Description
Lateral Deviation	Verify that the lateral deviation from the reference path does not exceed 0.75m for more than 1 second



Requirement	Description
Maximum Lateral Deviation	Verify that the lateral deviation from the reference path is always below 1m
Lateral Acceleration	Verify that the lateral acceleration does not exceed 2m/s^2 for more than 0.5 seconds