Missions with firefly in gazebo Mission with firefly in gazebo: chosen mission. This mission depends on:

- mission: mission

Parameters:

- thrust_gain: 1.0
- mission=TrajectoryTracking:

  Track a desired trajectory. This mission depends on:

  - controller: a trajectory tracking controller
  - reference: a reference position trajectory to be tracked
  - yaw_controller: a yaw controller
  - yaw_reference: a yaw reference

  Track a desired trajectory. This mission depends on:

  - controller: a trajectory tracking controller
  - reference: a reference position trajectory to be tracked
  - yaw_controller: a yaw controller
  - yaw_reference: a yaw reference

  - controller=SimplePIDController:

    PID Controller, with saturation on integral part

    PID Controller, with saturation on integral part

    force(Δt, p,pd) = 1.442*($pd^{(2)}$ + u($p^{(0)}$ - $pd^{(0)}$,$p^{(1)}$ - $pd^{(1)}$) + g e_3 - d^{est}), where

    - u_{xy}(p,v) = -6.0*p-7.83836717691*v
    - u_z(p,v) = -1.0*p-1.41421356237*v
    - $d_{xy}^{est(1)}$ = 0.0*(kp/2*ep + ev)
    - $|d_{xy}^{est(0)}| \leq$ 0.0
    - $d_z^{est(1)}$ = 0.0*(kp/2*ep + ev)
    - $|d_z^{est(0)}| \leq$ 0.0

  - reference=FixedPointTrajectory:

    Stay at rest at speficied point

    Trajectory with:

    - **offset = [0. 0. 1.]** in (m),
    - **rotation = [0. 0. 0.]** in (degrees).

  - yaw_controller=SimpleTrackingYawController:

    Simple yaw tracking controller, based on **feedback linearization of yaw rate equation**

    Controller for yaw motion.

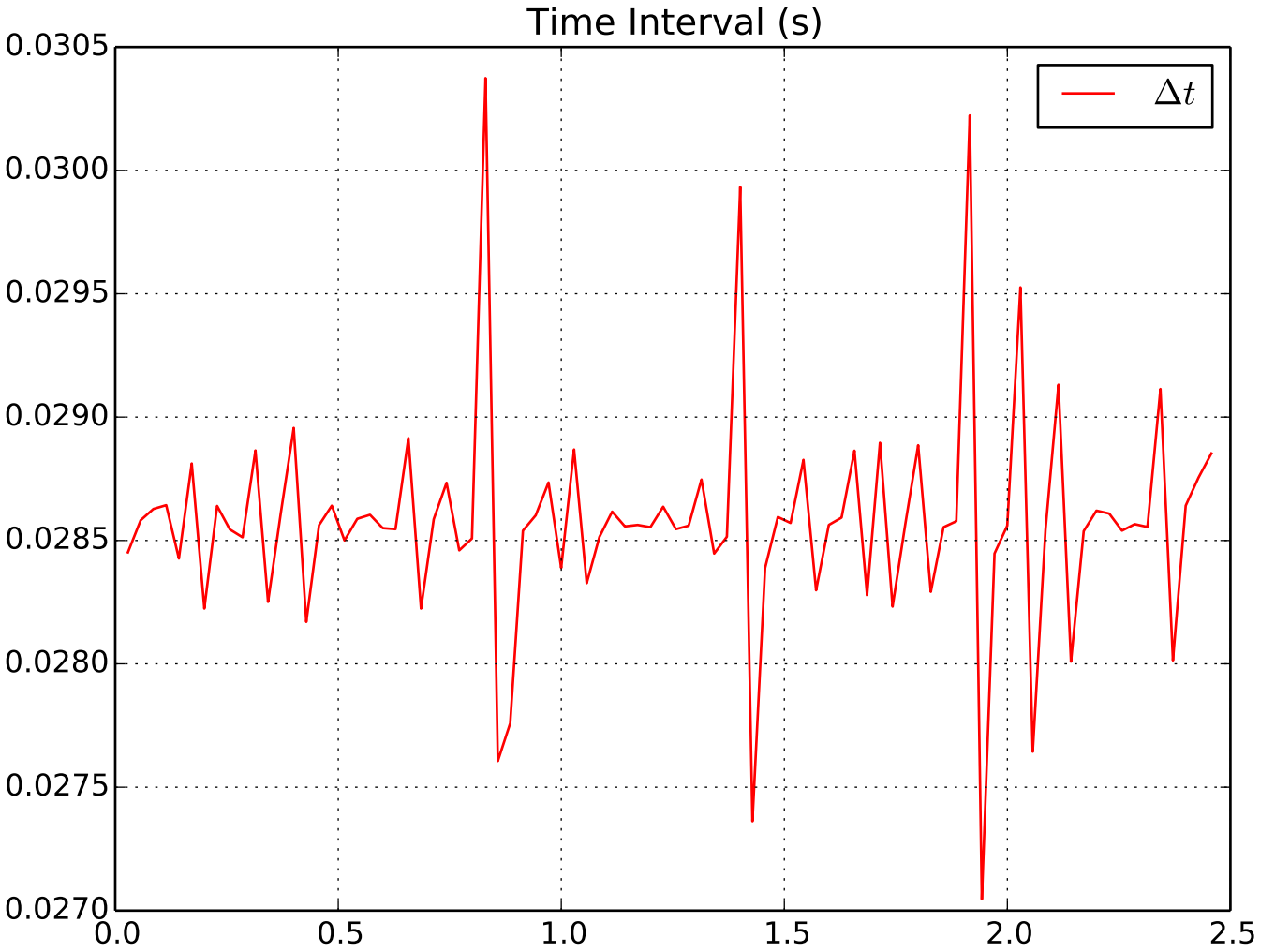
  - $\psi^{(1)} = \psi^{*(1)}$ - gain*sin(ψ - ψ^*)
  - yaw rate = cos(φ)(cos(θ)*$\psi^{(1)}$ - sin(φ)*$\theta^{(1)}$)
    Parameters:
    - gain: 4.0

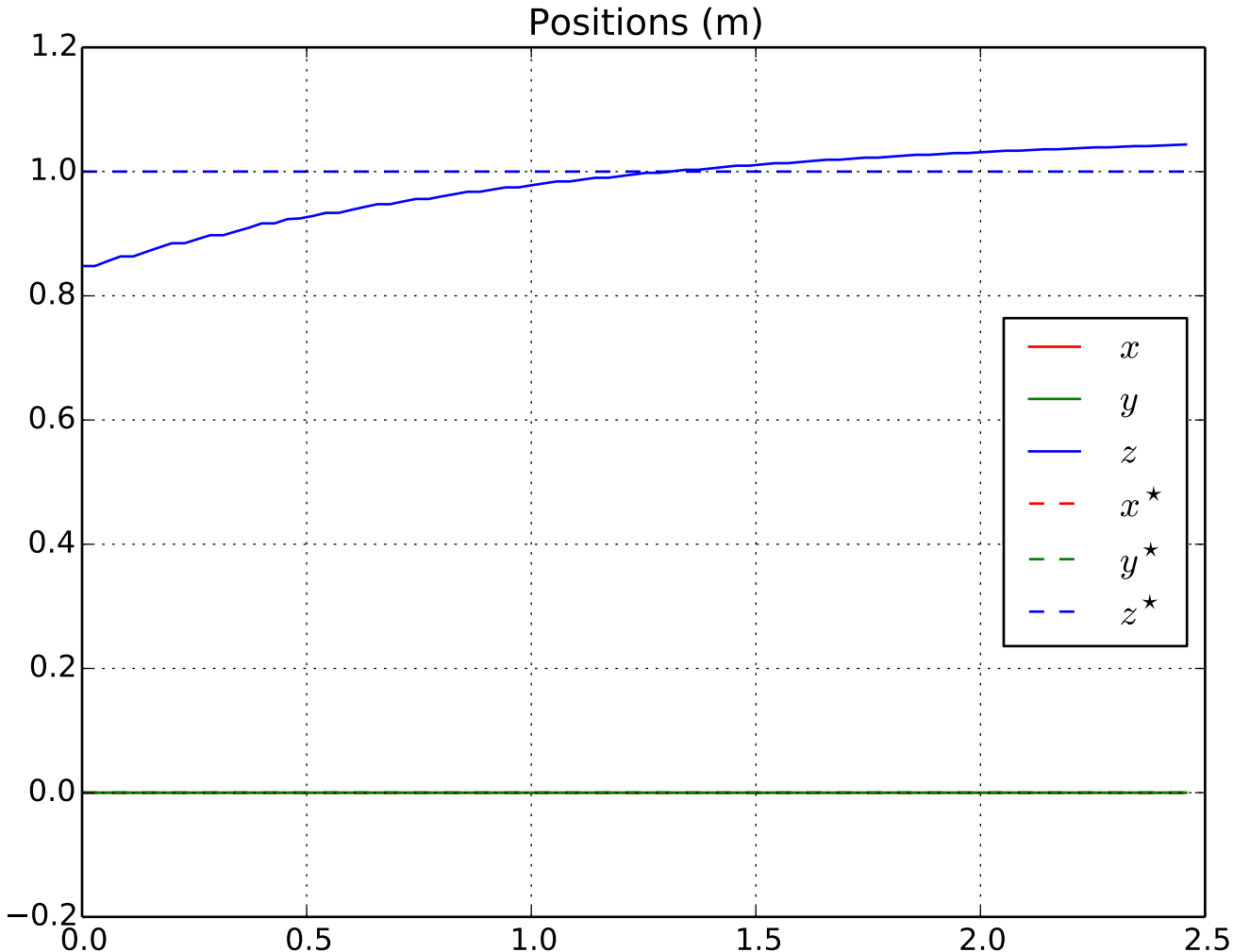
  - yaw_reference=FixedYawTrajectory:

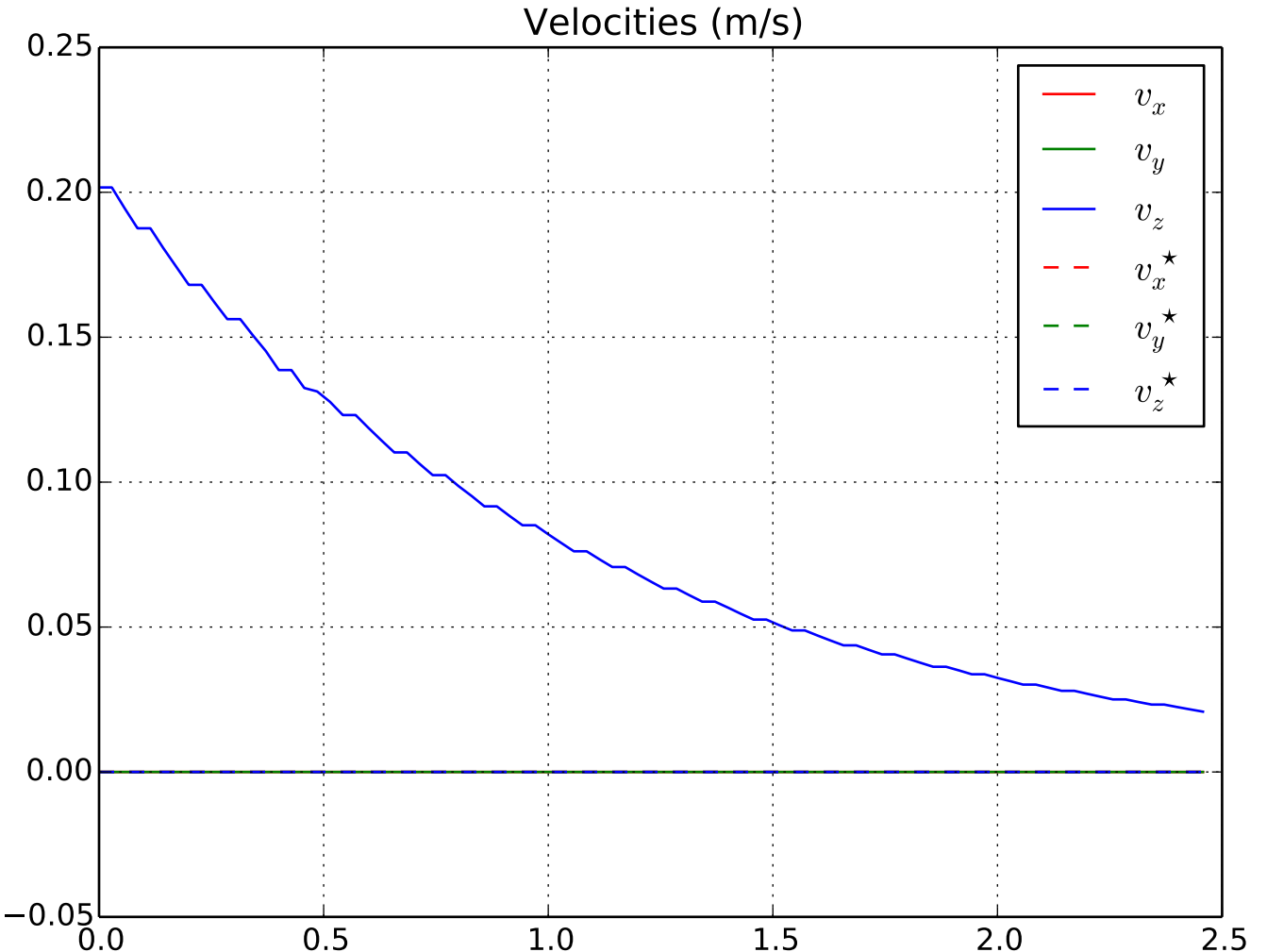
    Yaw angle to be constant

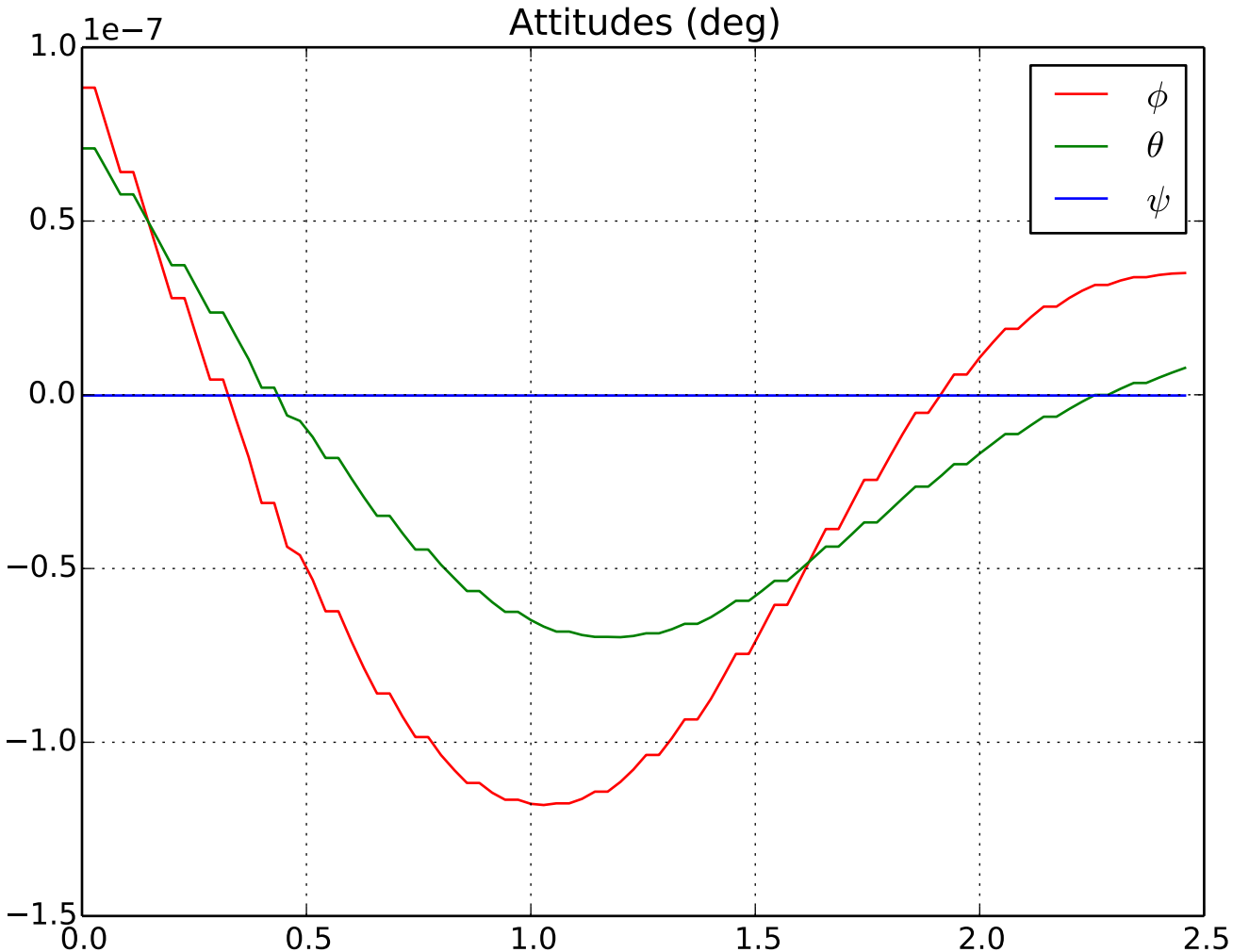
    Fixed yaw reference.

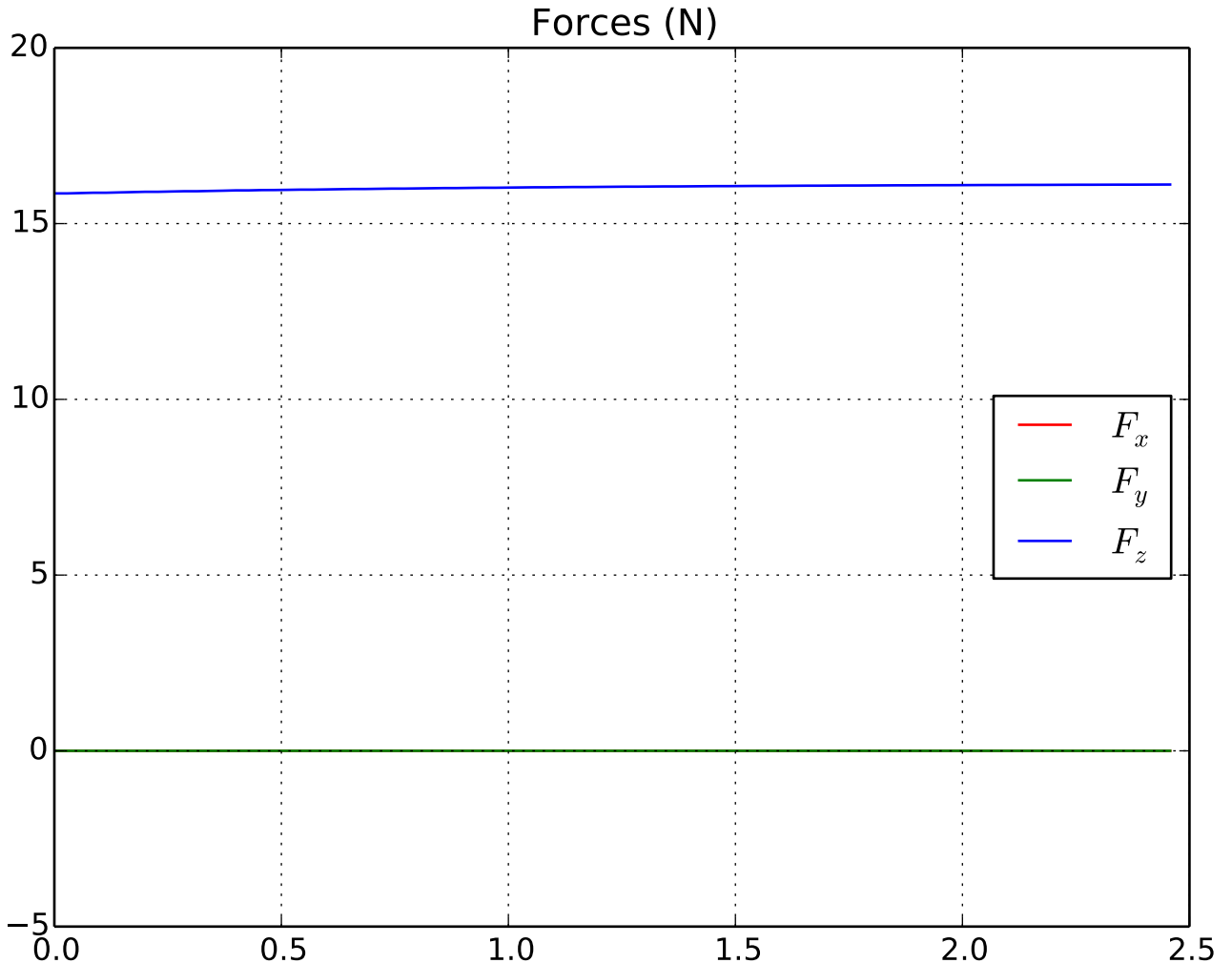
  - ψ^* = 0.0

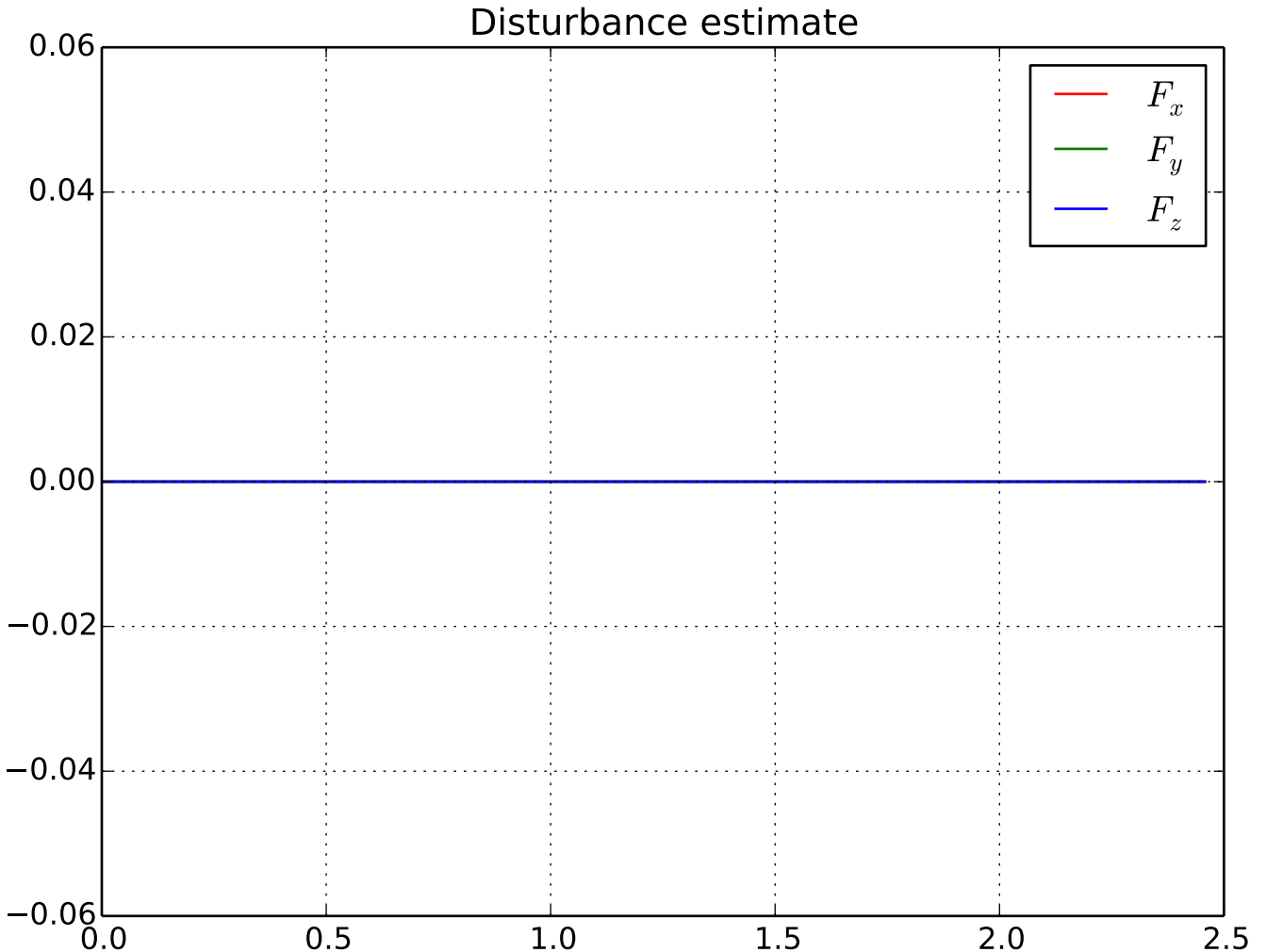

Time Interval (s)
0.0305
0.0300
0.0295
0.0290
0.0285
0.0280
0.0275
0.0270
0.0
0.5
1.0
1.5
2.0
2.5
Δt


Positions (m)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0.0
0.5
1.0
1.5
2.0
2.5
x
y
z
$x^\star$
$y^\star$
$z^\star$


Velocities (m/s)
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
0.0
0.5
1.0
1.5
2.0
2.5
v_x
v_y
v_z
$v_x^\star$
$v_y^\star$
$v_z^\star$


Attitudes (deg)
1e−7
1.0
0.5
0.0
−0.5
−1.0
−1.5
0.0
0.5
1.0
1.5
2.0
2.5
ϕ
θ
ψ


Forces (N)
20
15
10
5
0
−5
0.0
0.5
1.0
1.5
2.0
2.5
F_x
F_y
F_z


Disturbance estimate
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
0.0
0.5
1.0
1.5
2.0
2.5
F_x
F_y
F_z

Missions with firefly in gazebo Mission with firefly in gazebo: chosen mission. This mission depends on:

- mission: mission

Parameters:

- thrust_gain: 1.0
- mission=LoadLifting:

  Load attached to uav to track a desired trajectory. This mission depends on:

  - controller: a trajectory tracking controller for system "load+uav"
  - reference: a reference position trajectory to be tracked by load
  - yaw_controller: a yaw controller
  - yaw_reference: a yaw reference

  No parameters

  - controller=LinearController:

    Linear controller for a **single aerial vehicle transporating load** attached by cable. Decompose control problems in two parts:

    - Control z component ...
    - Control x and y ....

    Parameters:

    - load_mass: 0.1
    - quad_mass: 1.56779
    - cable_length: 0.6

    - z_double_integrator_ctr=OneDimensionalBoundedDIC:

      One dimenisonal Double-integrator (bounded actuation)

      Parameters:

      - natural_frequency: 1.5
      - damping: 0.707106781187
      - position_saturation: 0.5
      - velocity_saturation: 0.5

  - reference=FixedPointTrajectory:

    Stay at rest at speficied point

    Trajectory with:

    - **offset = [0. 0. 1.]** in (m),
    - **rotation = [0. 0. 0.]** in (degrees).

  - yaw_controller=SimpleTrackingYawController:

    Simple yaw tracking controller, based on **feedback linearization of yaw rate equation**

    Controller for yaw motion.

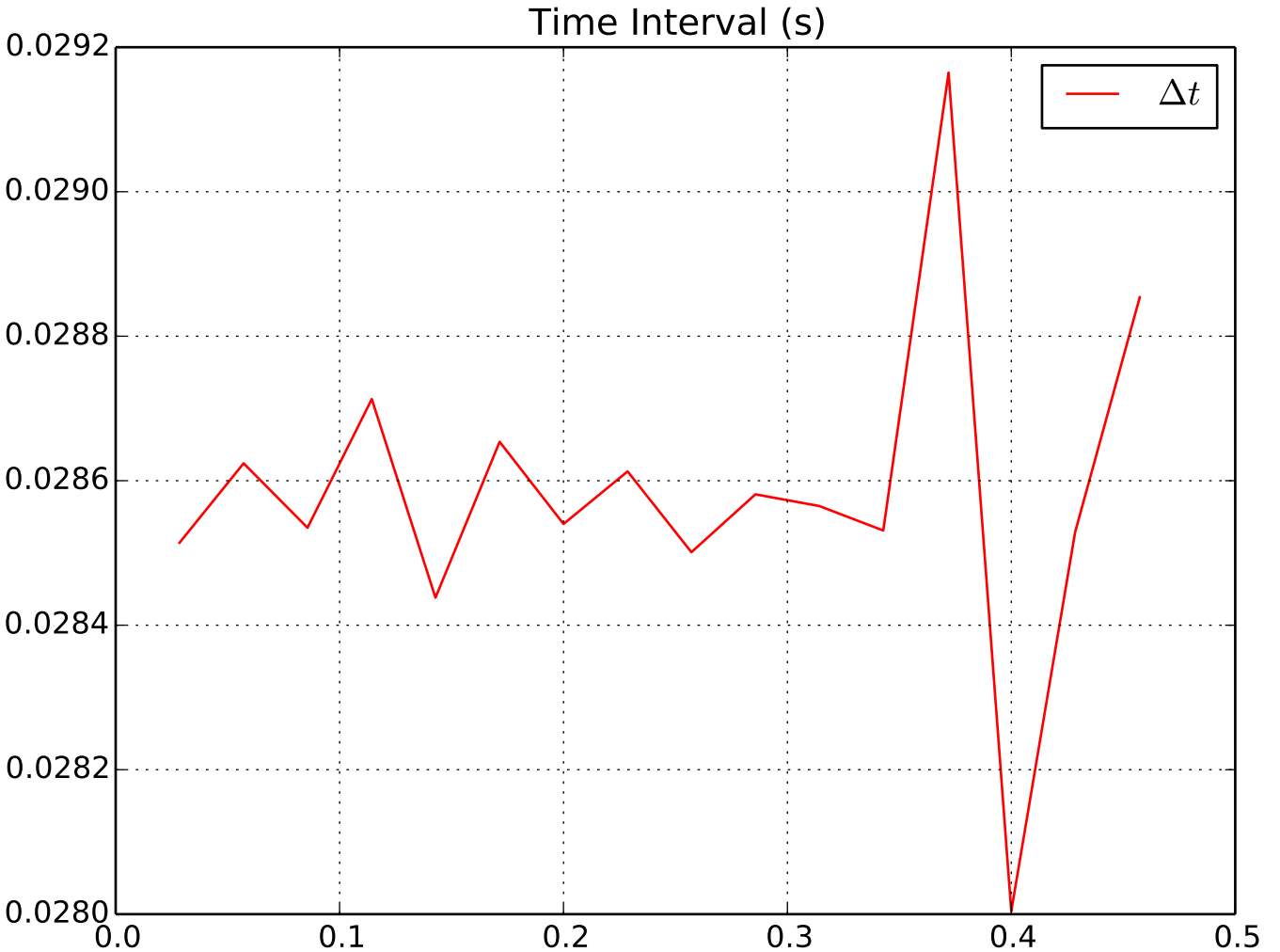
  - $\psi^{(1)} = \psi^{*(1)}$ - gain*sin(ψ - ψ^{*})
  - yaw rate = cos(φ)(cos(θ)*$\psi^{(1)}$ - sin(φ)*$\theta^{(1)}$)
    Parameters:
    - gain: 4.0

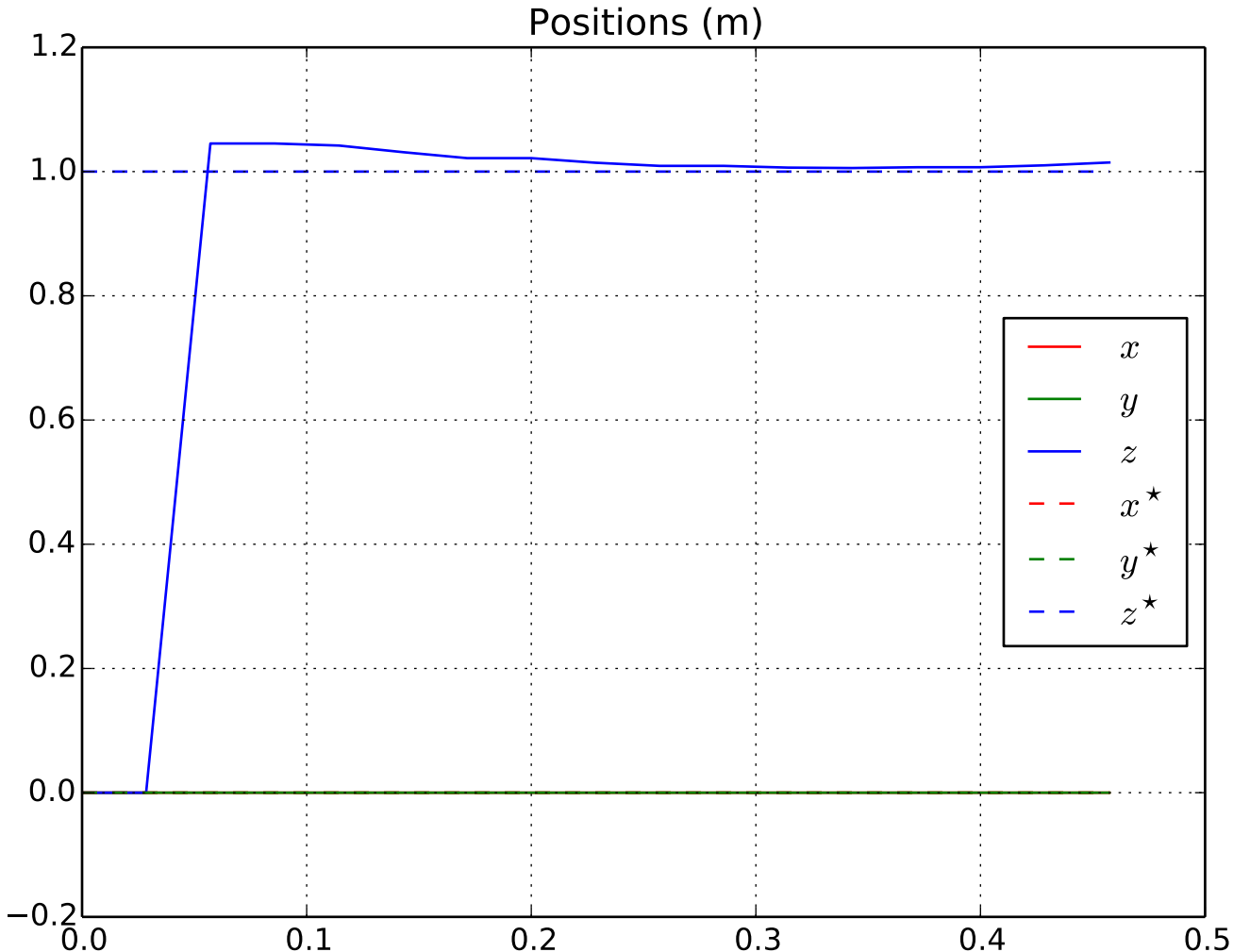
  - yaw_reference=FixedYawTrajectory:

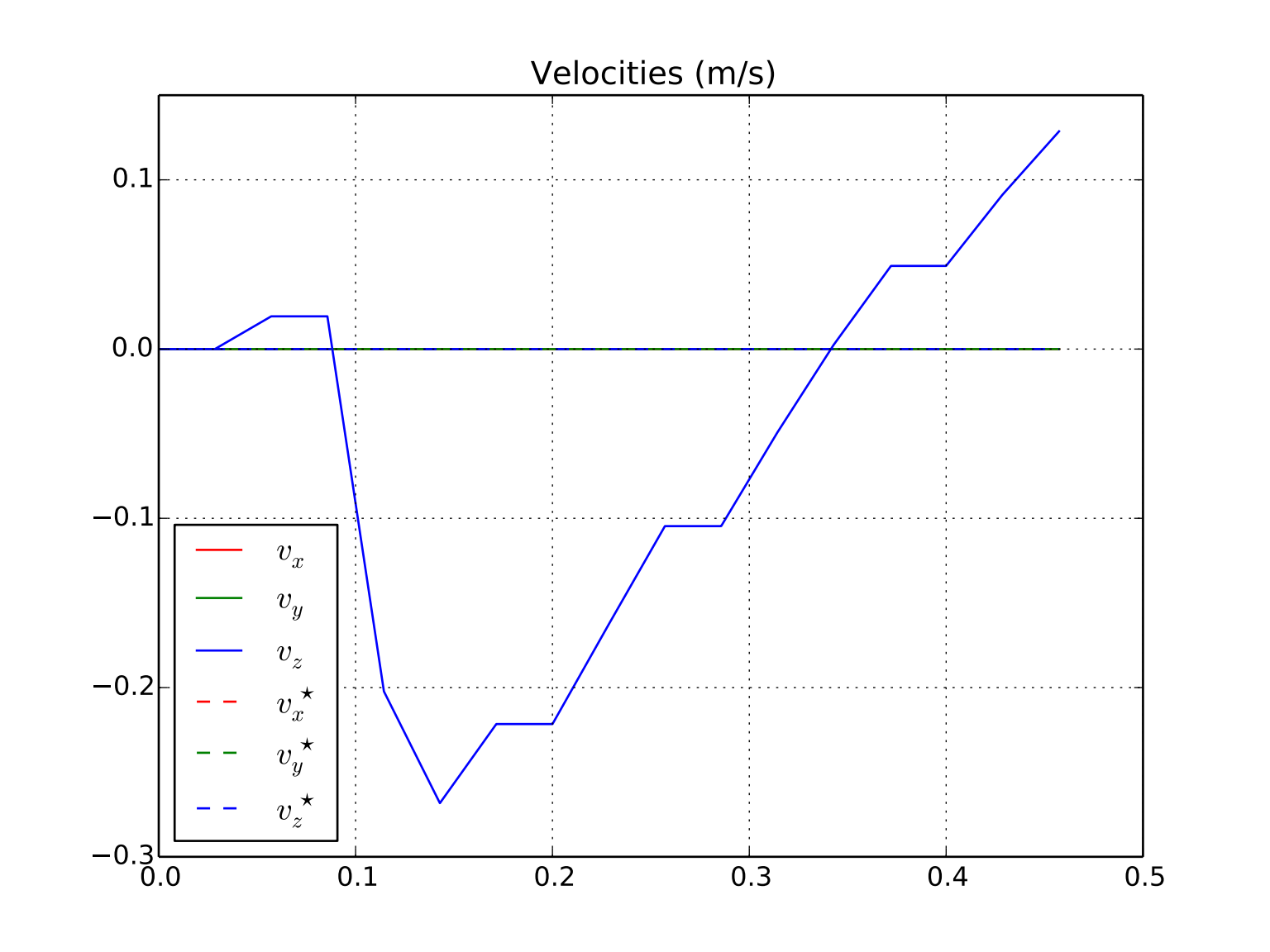
    Yaw angle to be constant

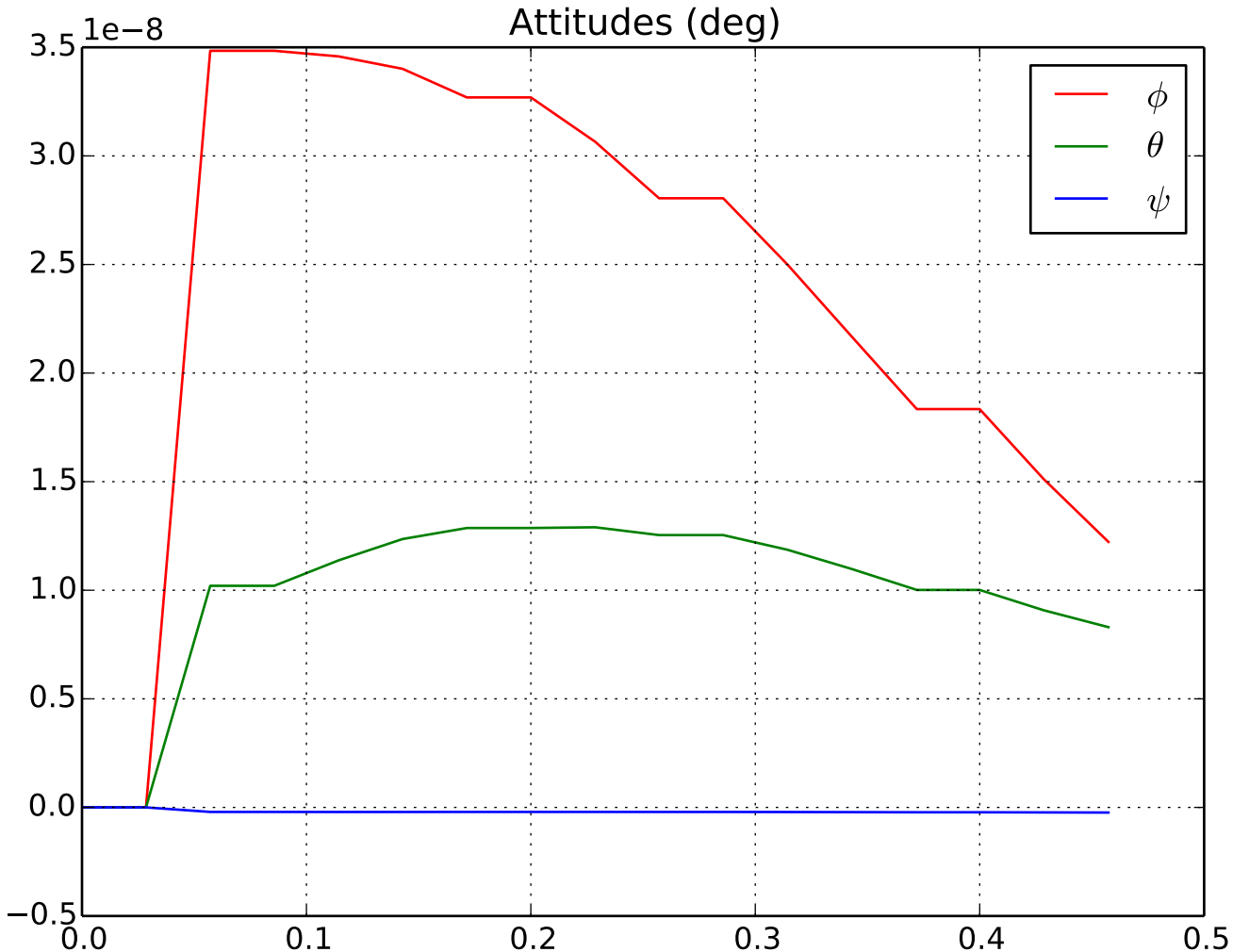
    Fixed yaw reference.

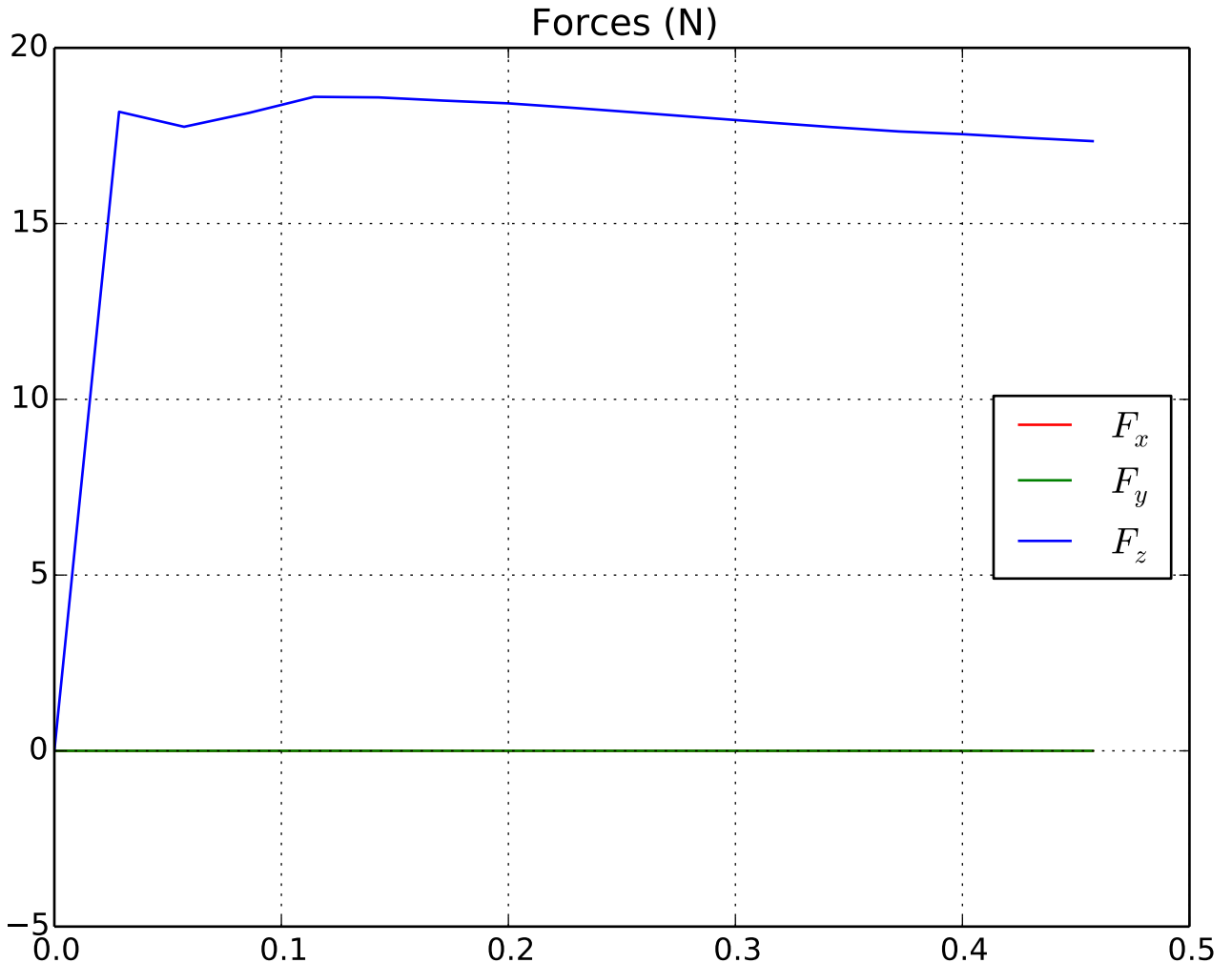
  - ψ^{*} = 0.0

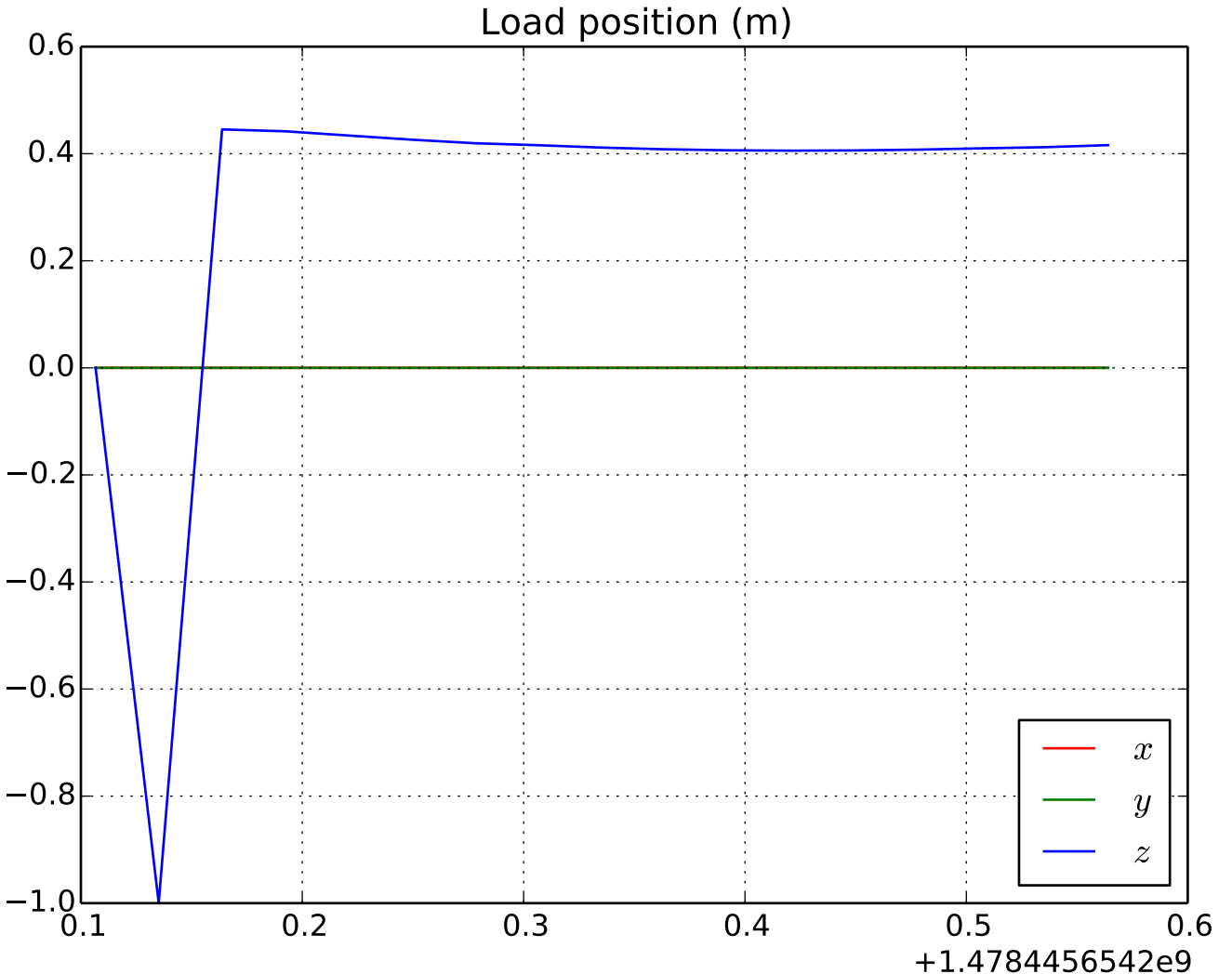

Time Interval (s)
0.0292
0.0290
0.0288
0.0286
0.0284
0.0282
0.0280
0.0
0.1
0.2
0.3
0.4
0.5
Δt

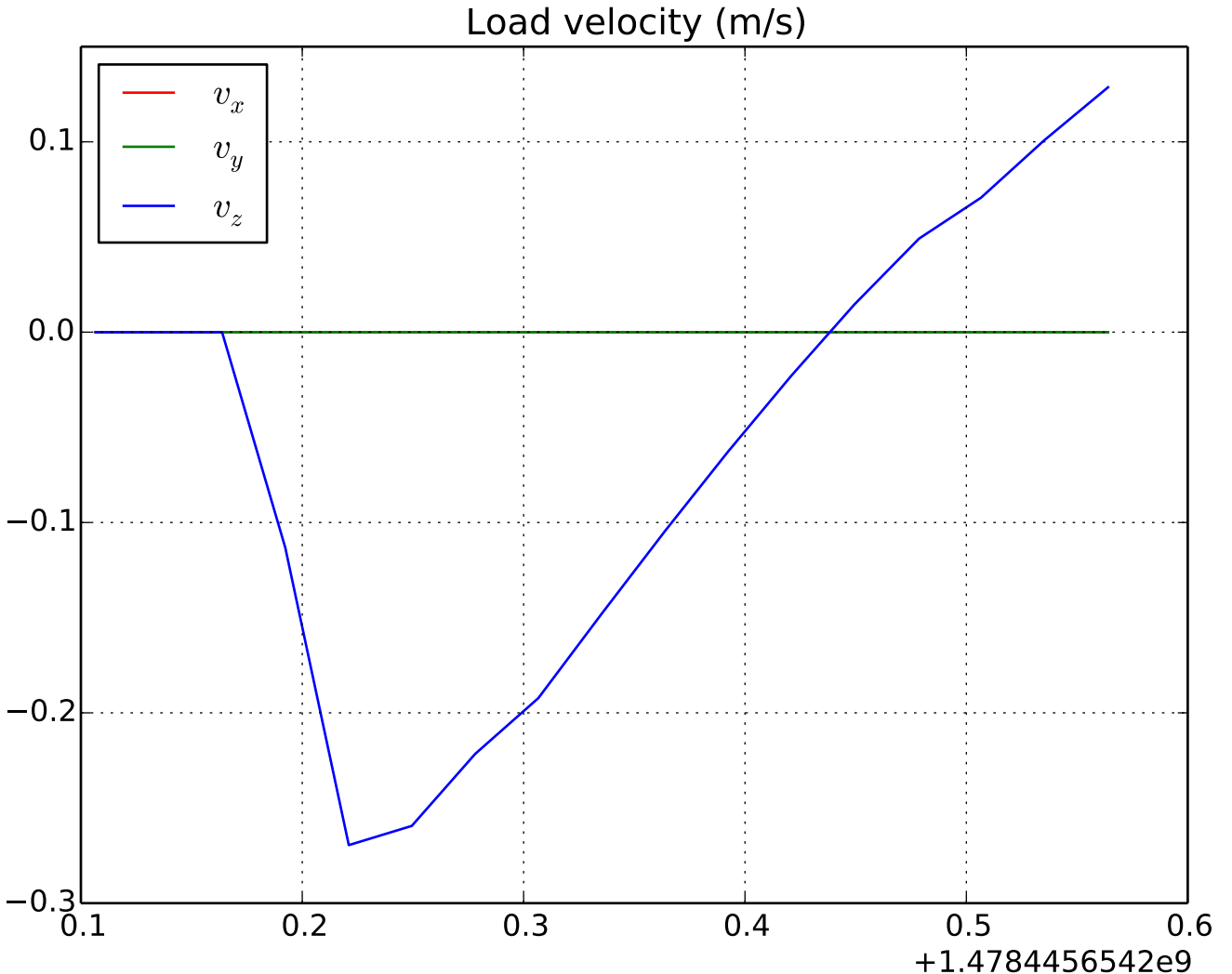

Positions (m)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0.0
0.1
0.2
0.3
0.4
0.5
x
y
z
$x^\star$
$y^\star$
$z^\star$

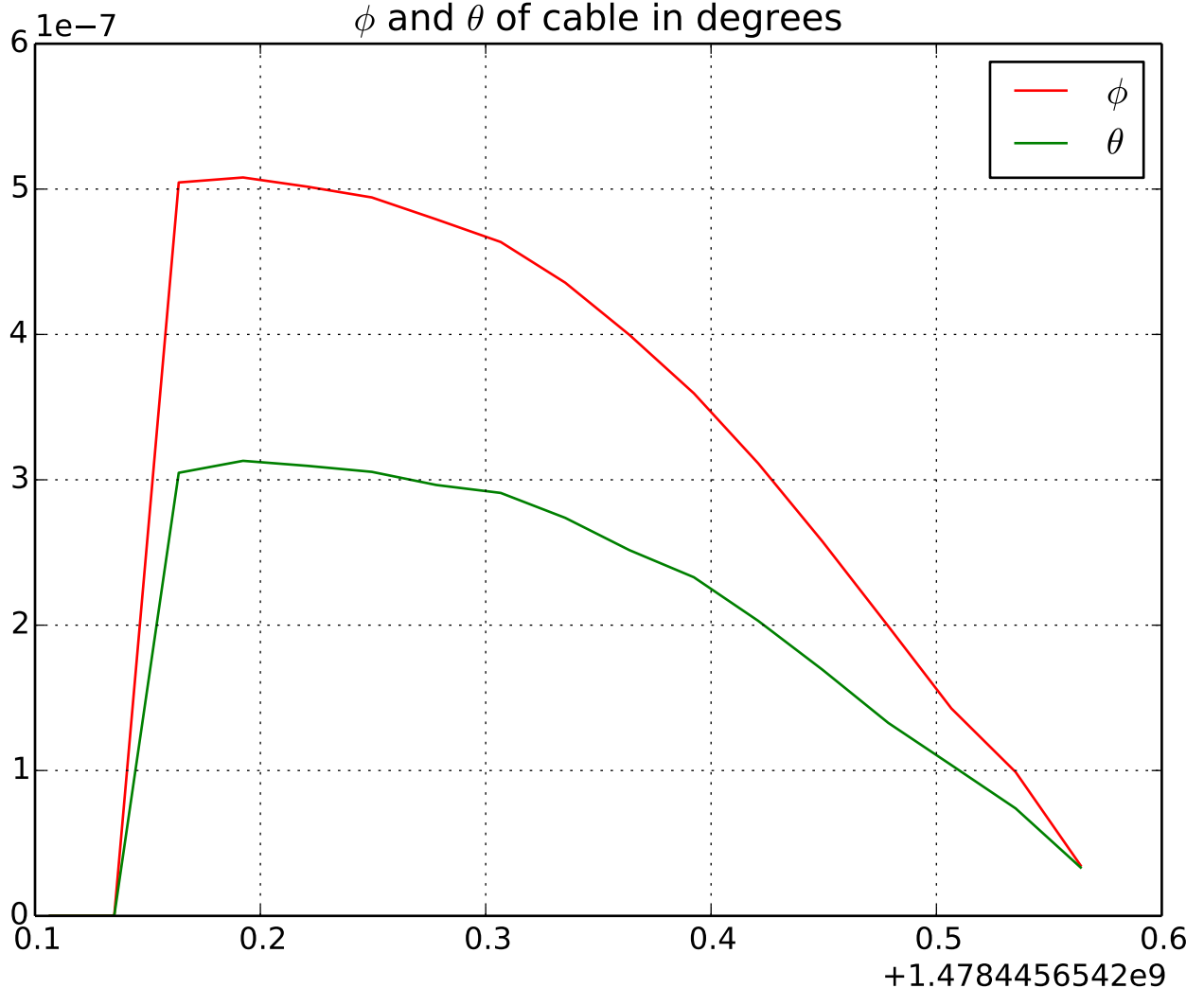

Velocities (m/s)
0.1
0.0
−0.1
−0.2
−0.3
0.0
0.1
0.2
0.3
0.4
0.5
v_x
v_y
v_z
$v_x^\star$
$v_y^\star$
$v_z^\star$

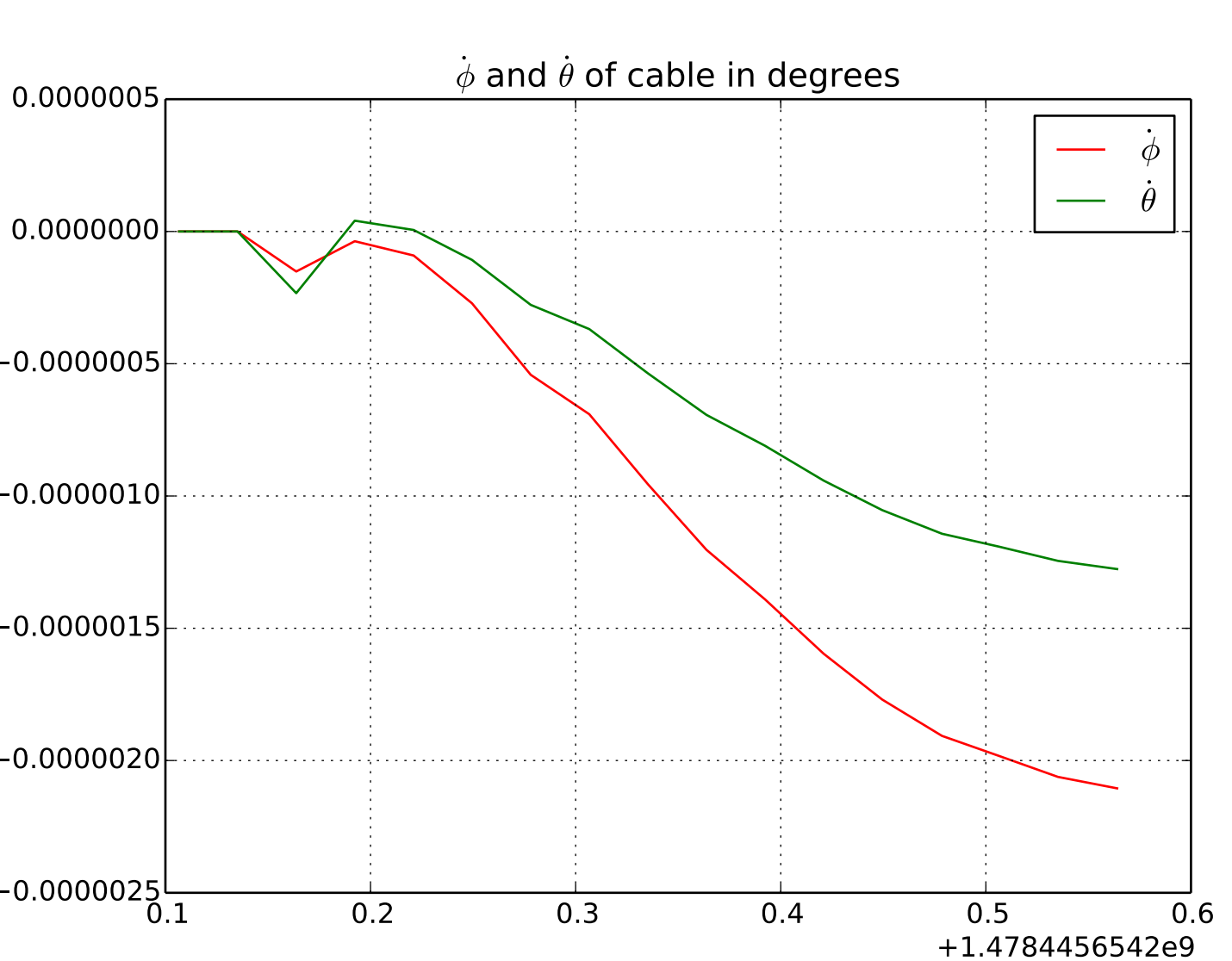

Attitudes (deg)
1e−8
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
−0.5
0.0
0.1
0.2
0.3
0.4
0.5
ϕ
θ
ψ

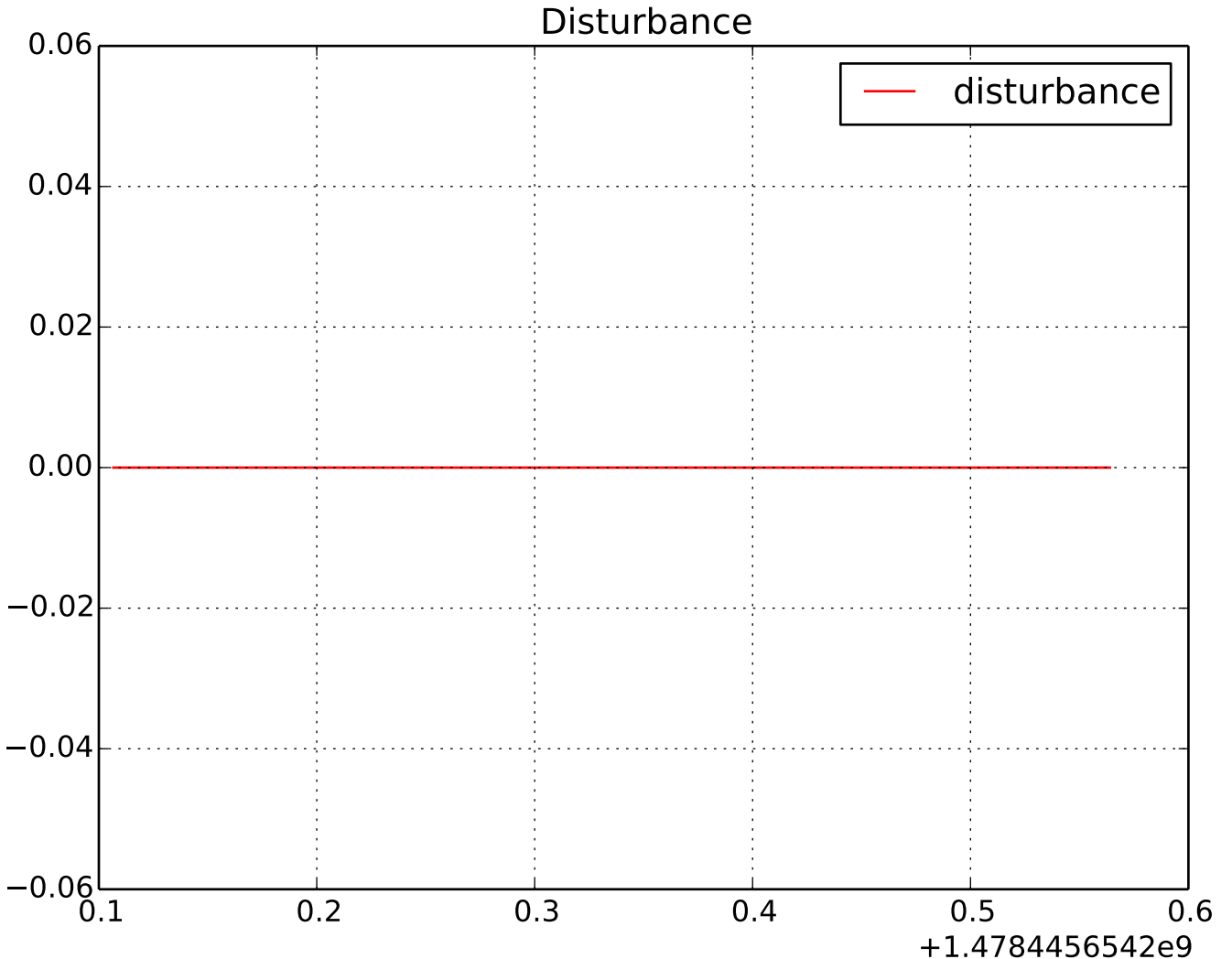

Forces (N)
20
15
10
5
0
−5
0.0
0.1
0.2
0.3
0.4
0.5
F_x
F_y
F_z


Load position (m)
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
0.1
0.2
0.3
0.4
0.5
0.6
+1.4784456542e9
x
y
z


Load velocity (m/s)
v_x
v_y
v_z
0.1
0.0
−0.1
−0.2
−0.3
0.1
0.2
0.3
0.4
0.5
0.6
+1.4784456542e9


ϕ and θ of cable in degrees
1e−7
6
5
4
3
2
1
0
0.1
0.2
0.3
0.4
0.5
0.6
+1.4784456542e9
ϕ
θ


$\dot{\phi}$ and $\dot{\theta}$ of cable in degrees
0.0000005
0.0000000
−0.0000005
−0.0000010
−0.0000015
−0.0000020
−0.0000025
0.1
0.2
0.3
0.4
0.5
0.6
+1.4784456542e9
$\dot{\phi}$
$\dot{\theta}$


Disturbance
disturbance
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
0.1
0.2
0.3
0.4
0.5
0.6
+1.4784456542e9

Missions with firefly in gazebo Mission with firefly in gazebo: chosen mission. This mission depends on:

- mission: mission

Parameters:

- thrust_gain: 1.0
- mission=LoadLifting:

  Load attached to uav to track a desired trajectory. This mission depends on:

  - controller: a trajectory tracking controller for system "load+uav"
  - reference: a reference position trajectory to be tracked by load
  - yaw_controller: a yaw controller
  - yaw_reference: a yaw reference

  No parameters

  - controller=LinearController:

    Linear controller for a **single aerial vehicle transporating load** attached by cable. Decompose control problems in two parts:

    - Control z component ...
    - Control x and y ....

    Parameters:

    - load_mass: 0.1
    - quad_mass: 1.56779
    - cable_length: 0.6

    - z_double_integrator_ctr=OneDimensionalBoundedDIC:

      One dimenisonal Double-integrator (bounded actuation)

      Parameters:

      - natural_frequency: 1.5
      - damping: 0.707106781187
      - position_saturation: 0.5
      - velocity_saturation: 0.5

  - reference=FixedPointTrajectory:

    Stay at rest at speficied point

    Trajectory with:

    - **offset = [0. 0. 1.]** in (m),
    - **rotation = [0. 0. 0.]** in (degrees).

  - yaw_controller=SimpleTrackingYawController:

    Simple yaw tracking controller, based on **feedback linearization of yaw rate equation**

    Controller for yaw motion.

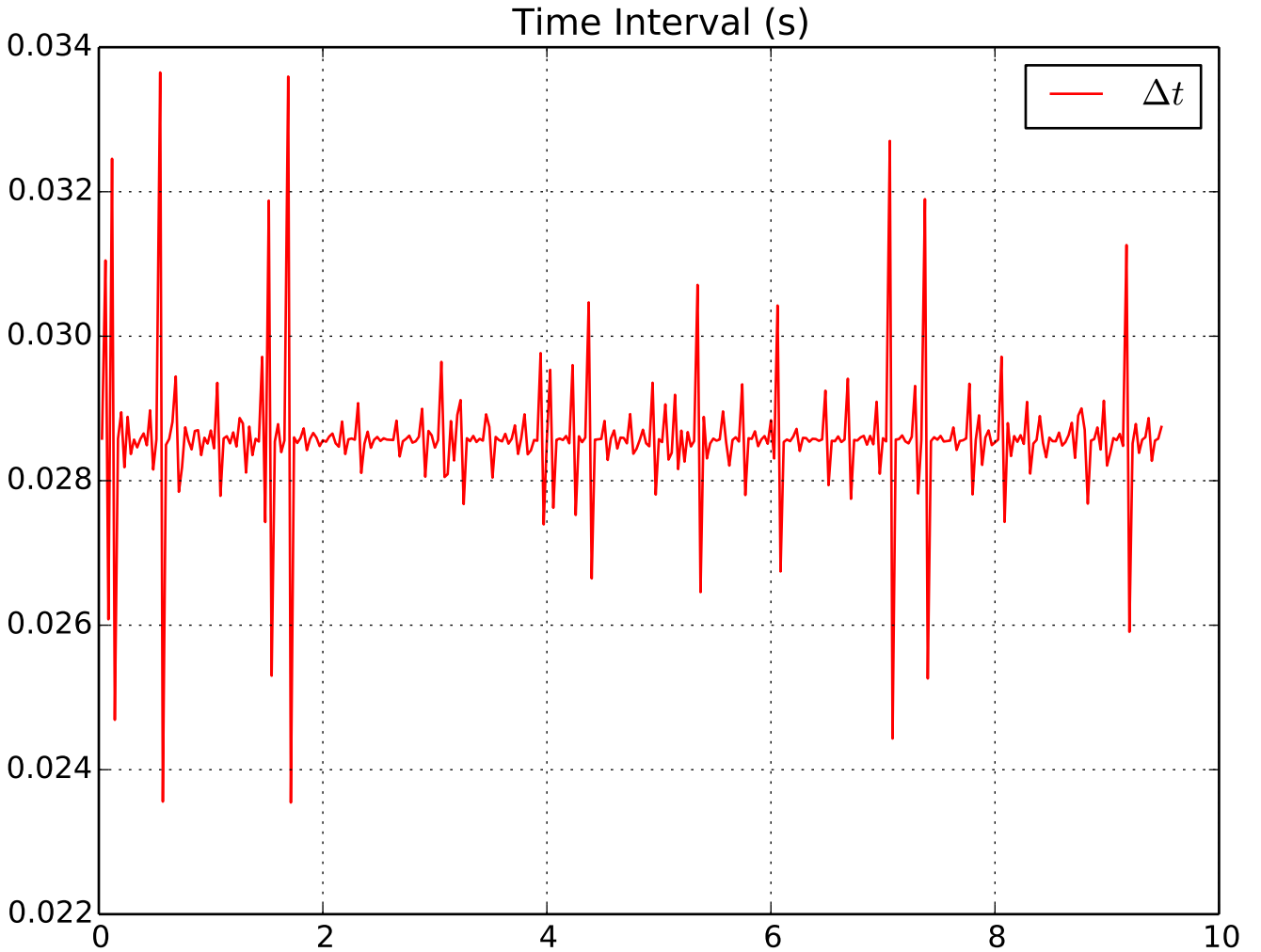
  - $\psi^{(1)} = \psi^{*(1)}$ - gain*sin(ψ - ψ^{*})
  - yaw rate = cos(φ)(cos(θ)*$\psi^{(1)}$ - sin(φ)*$\theta^{(1)}$)
    Parameters:
    - gain: 4.0

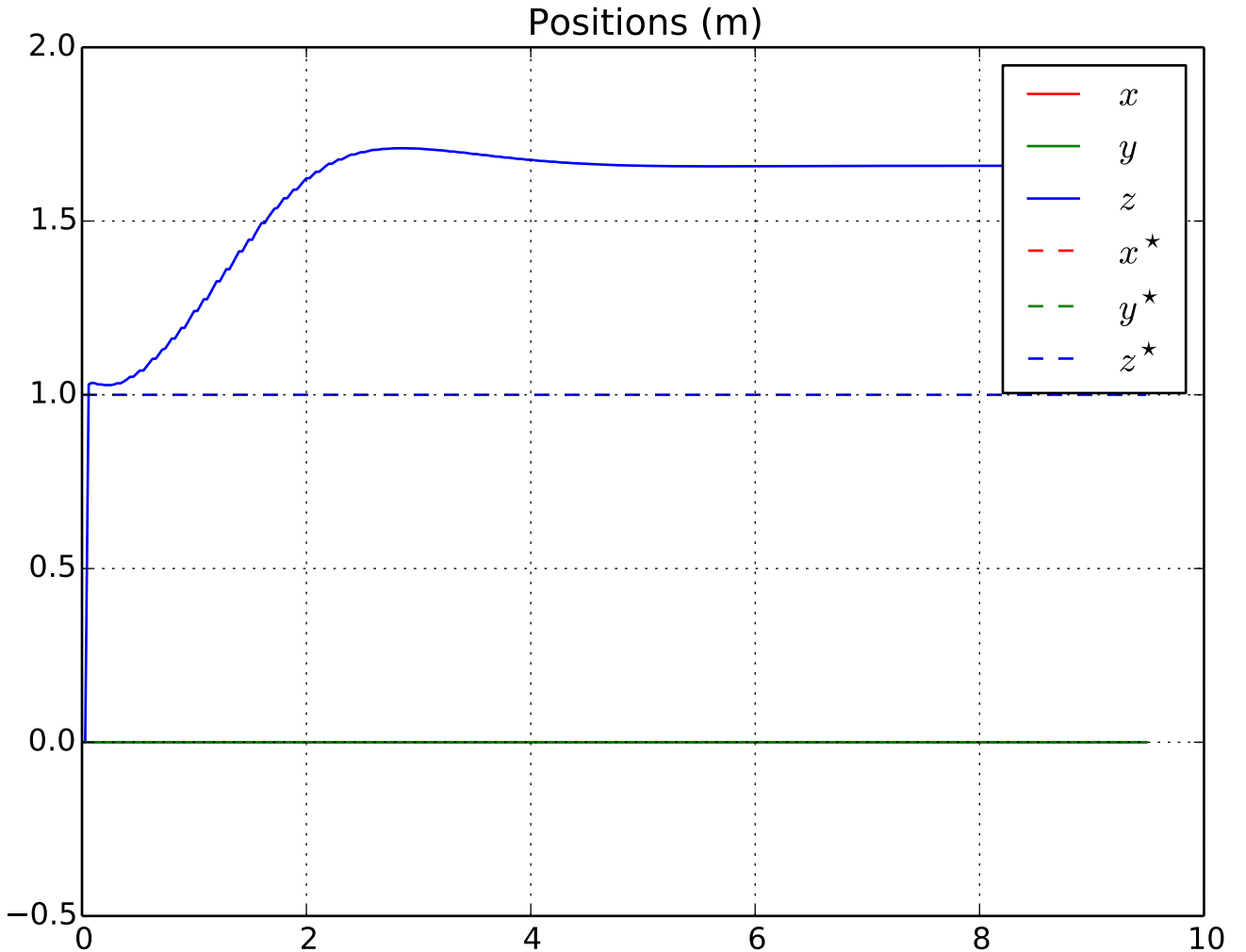
  - yaw_reference=FixedYawTrajectory:

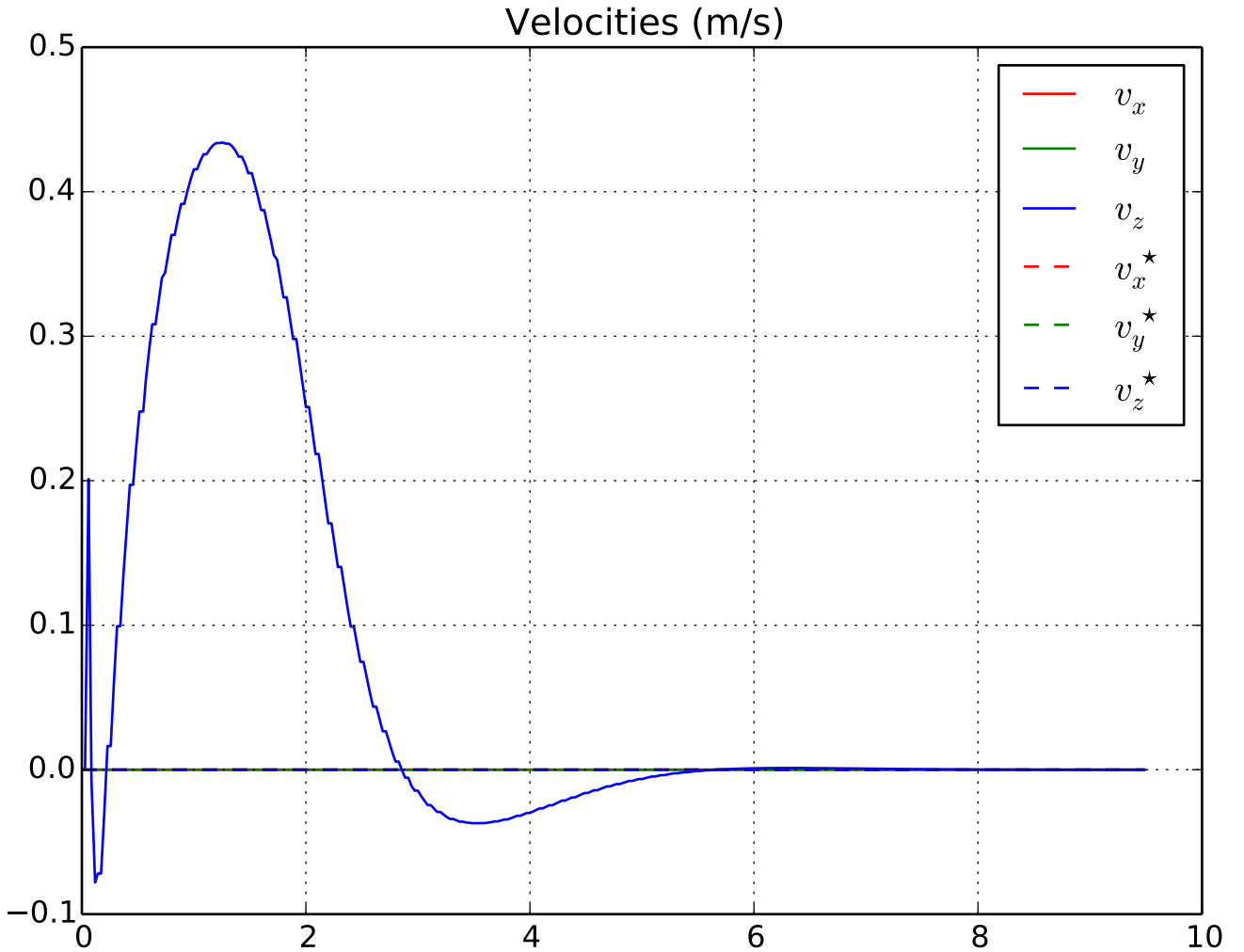
    Yaw angle to be constant

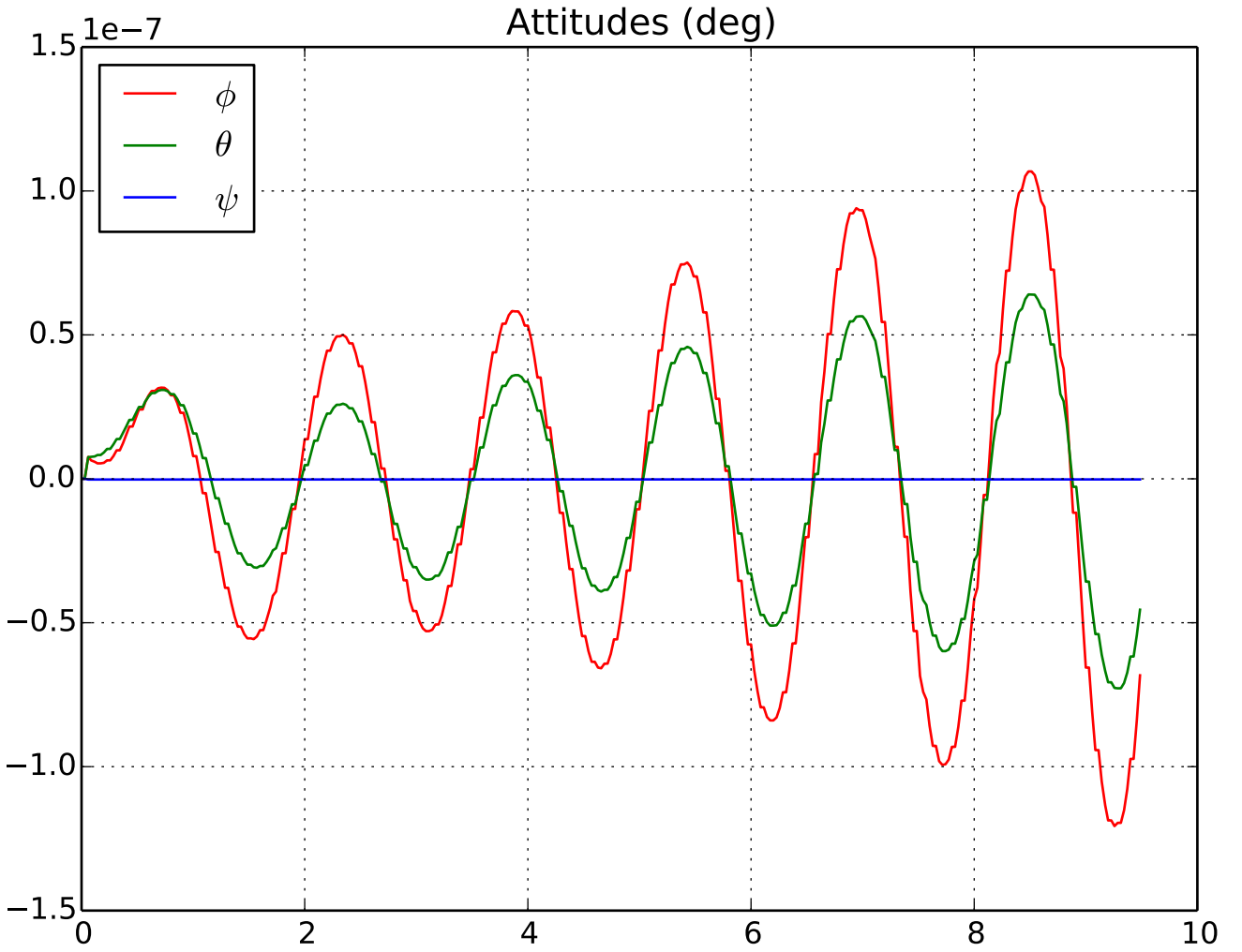
    Fixed yaw reference.

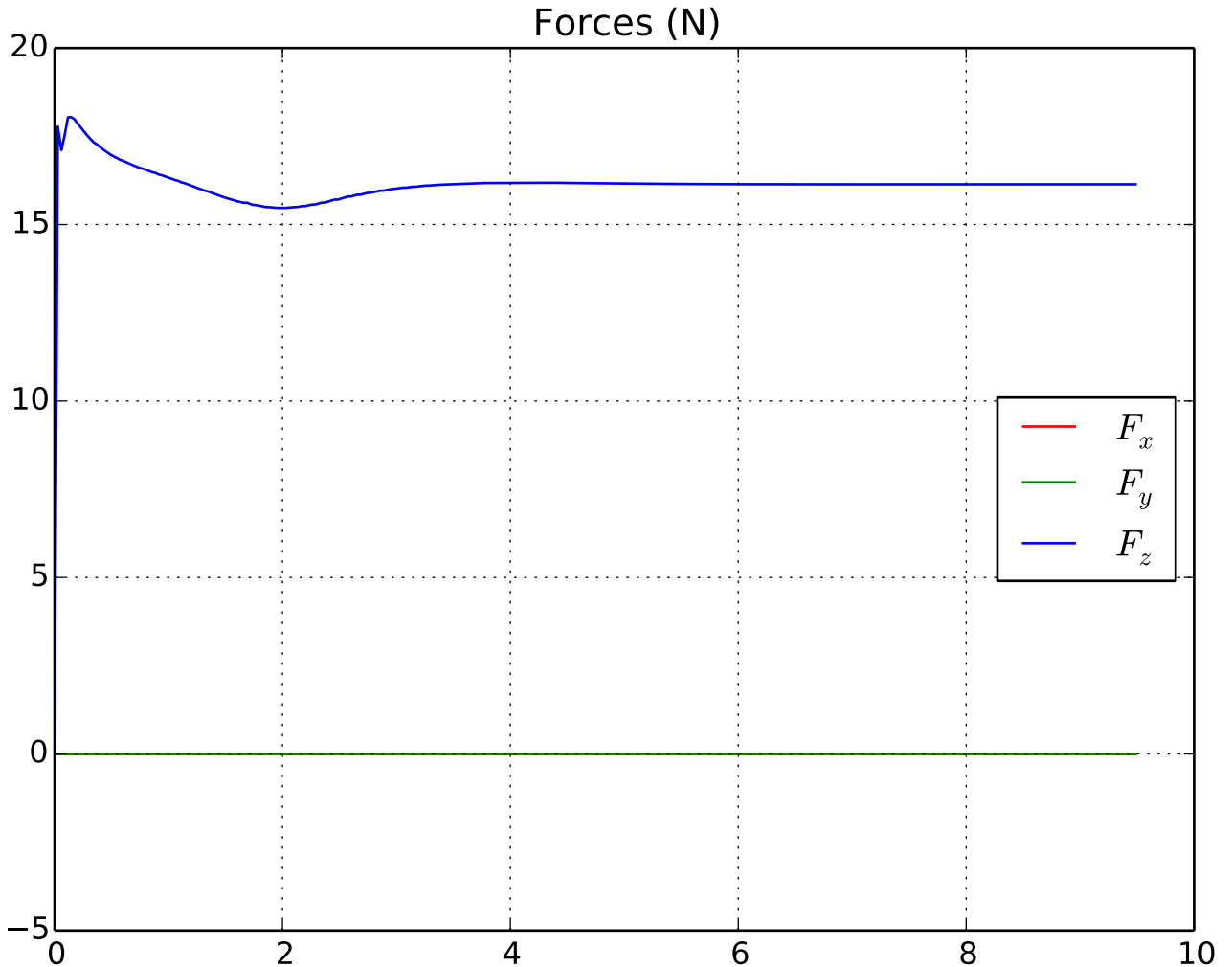
  - ψ^{*} = 0.0

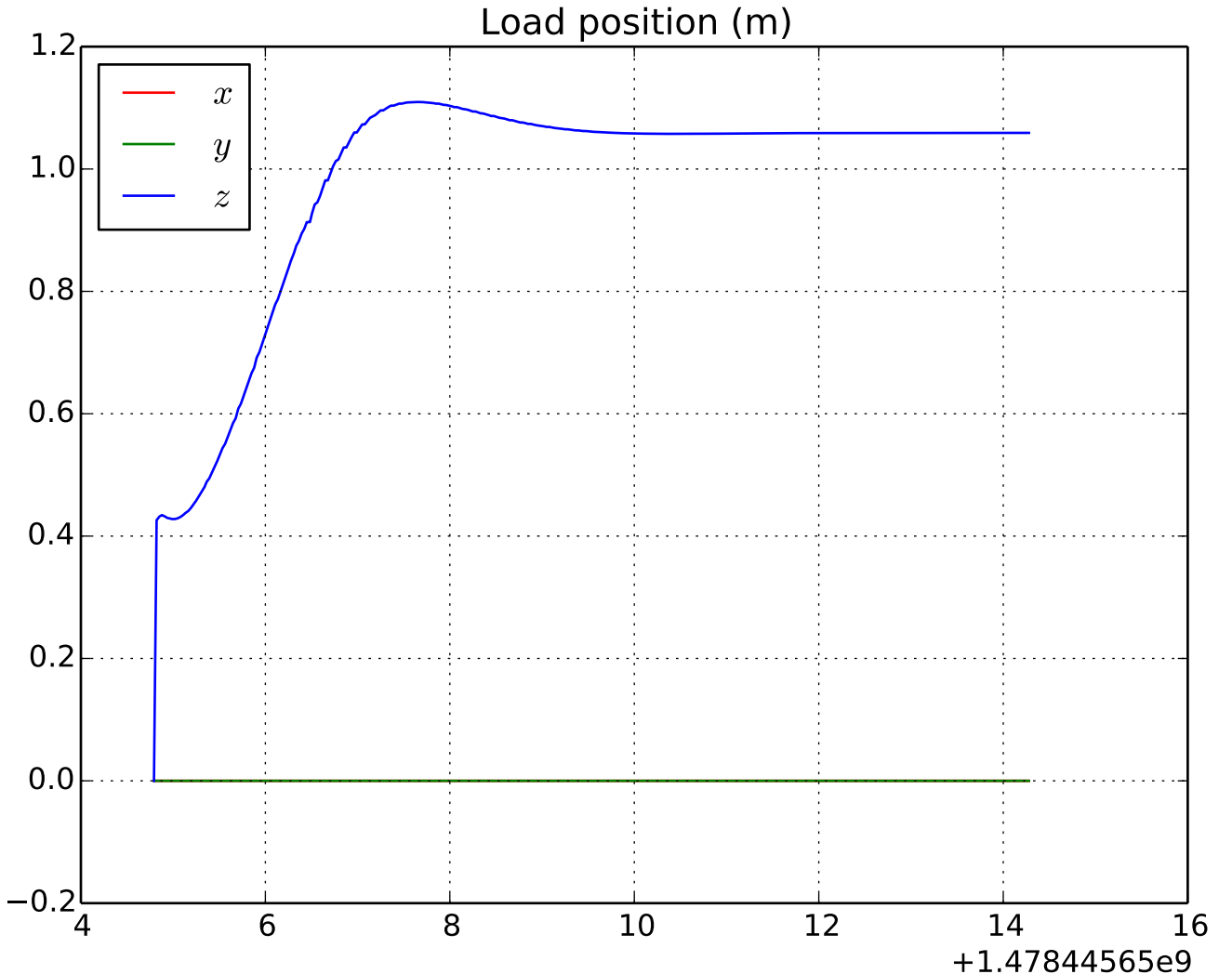

Time Interval (s)
0.034
0.032
0.030
0.028
0.026
0.024
0.022
0
2
4
6
8
10
Δt

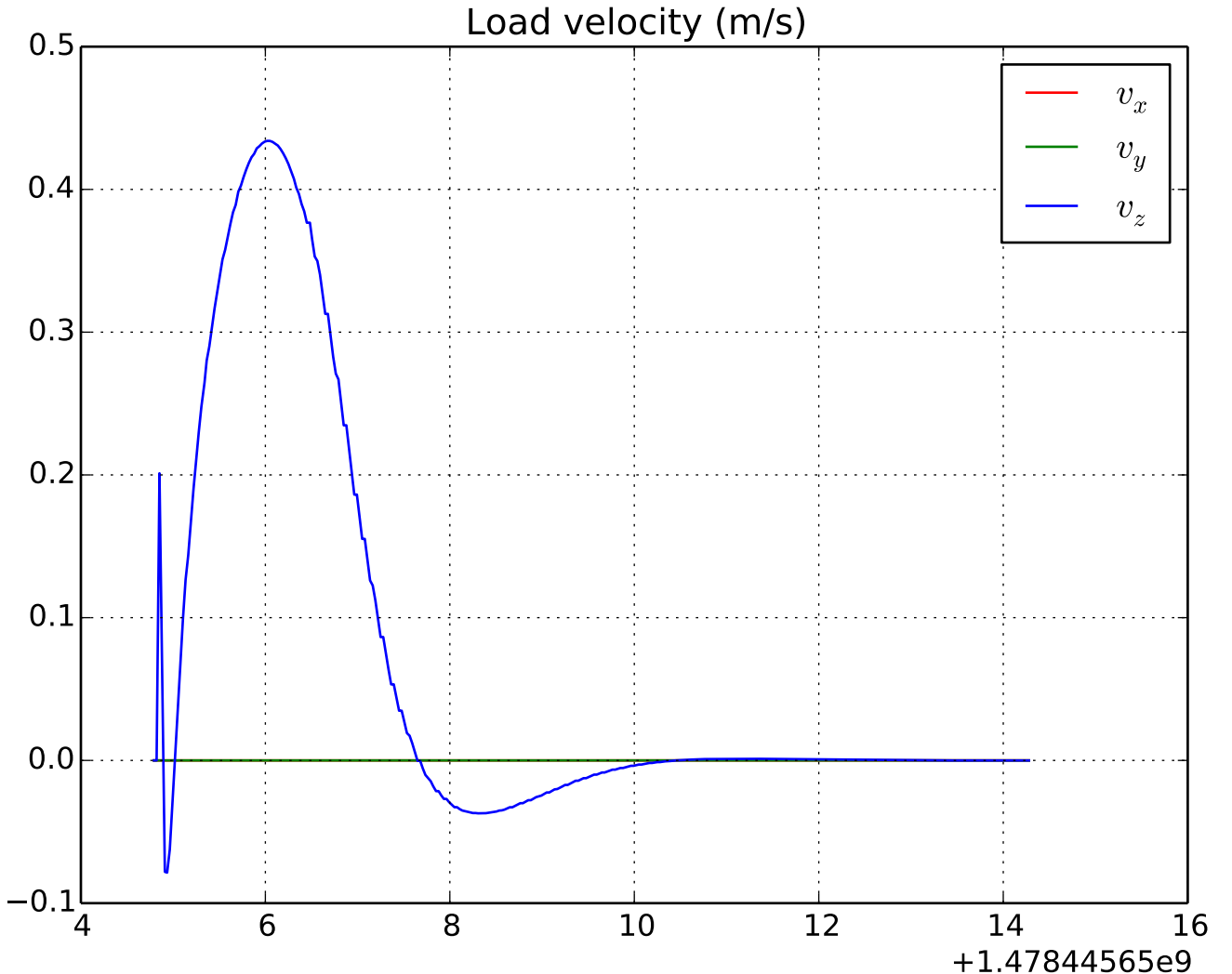

Positions (m)
2.0
1.5
1.0
0.5
0.0
−0.5
0
2
4
6
8
10
x
y
z
$x^\star$
$y^\star$
$z^\star$

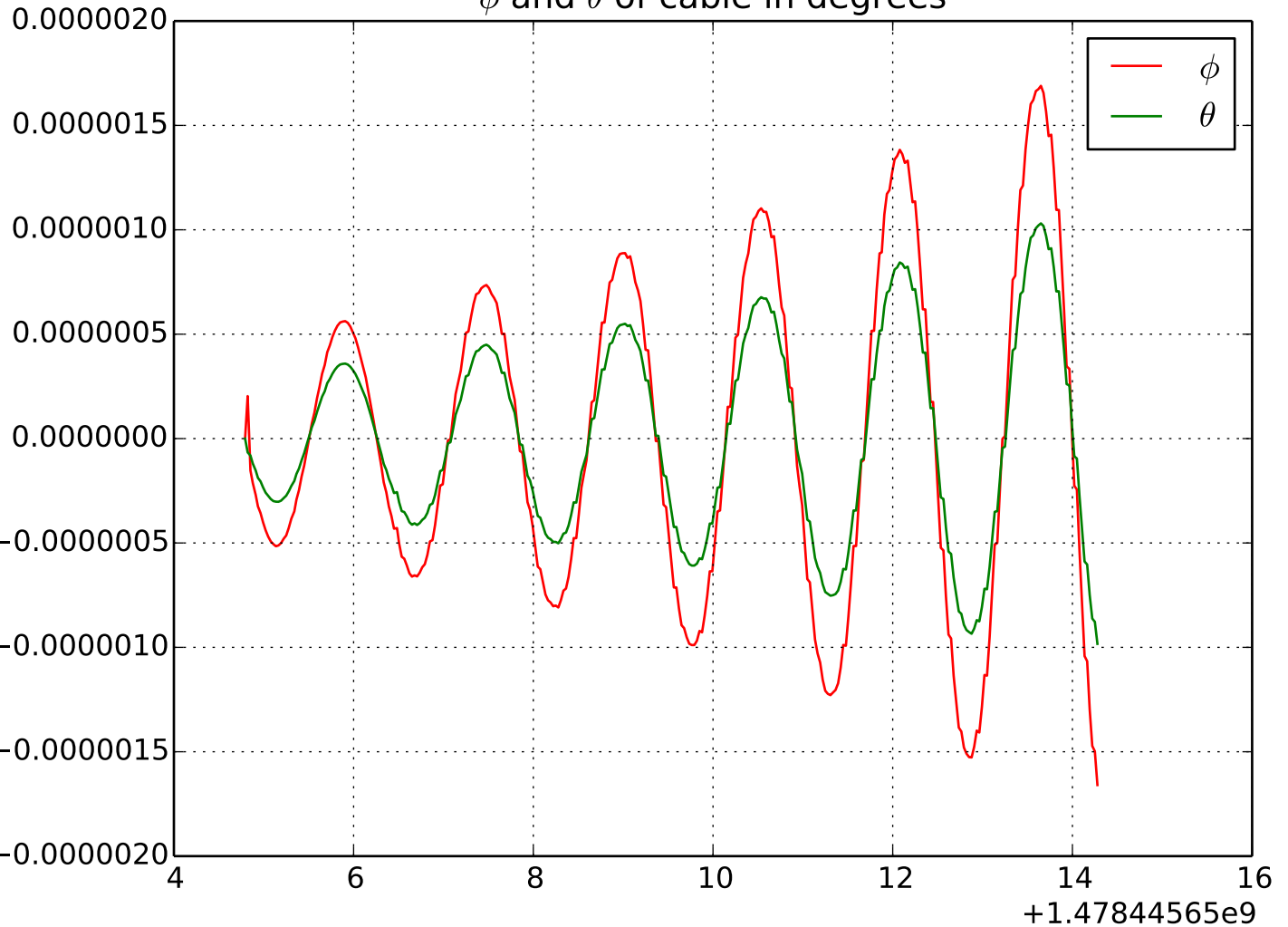

Velocities (m/s)
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
0
2
4
6
8
10
v_x
v_y
v_z
$v_x^\star$
$v_y^\star$
$v_z^\star$

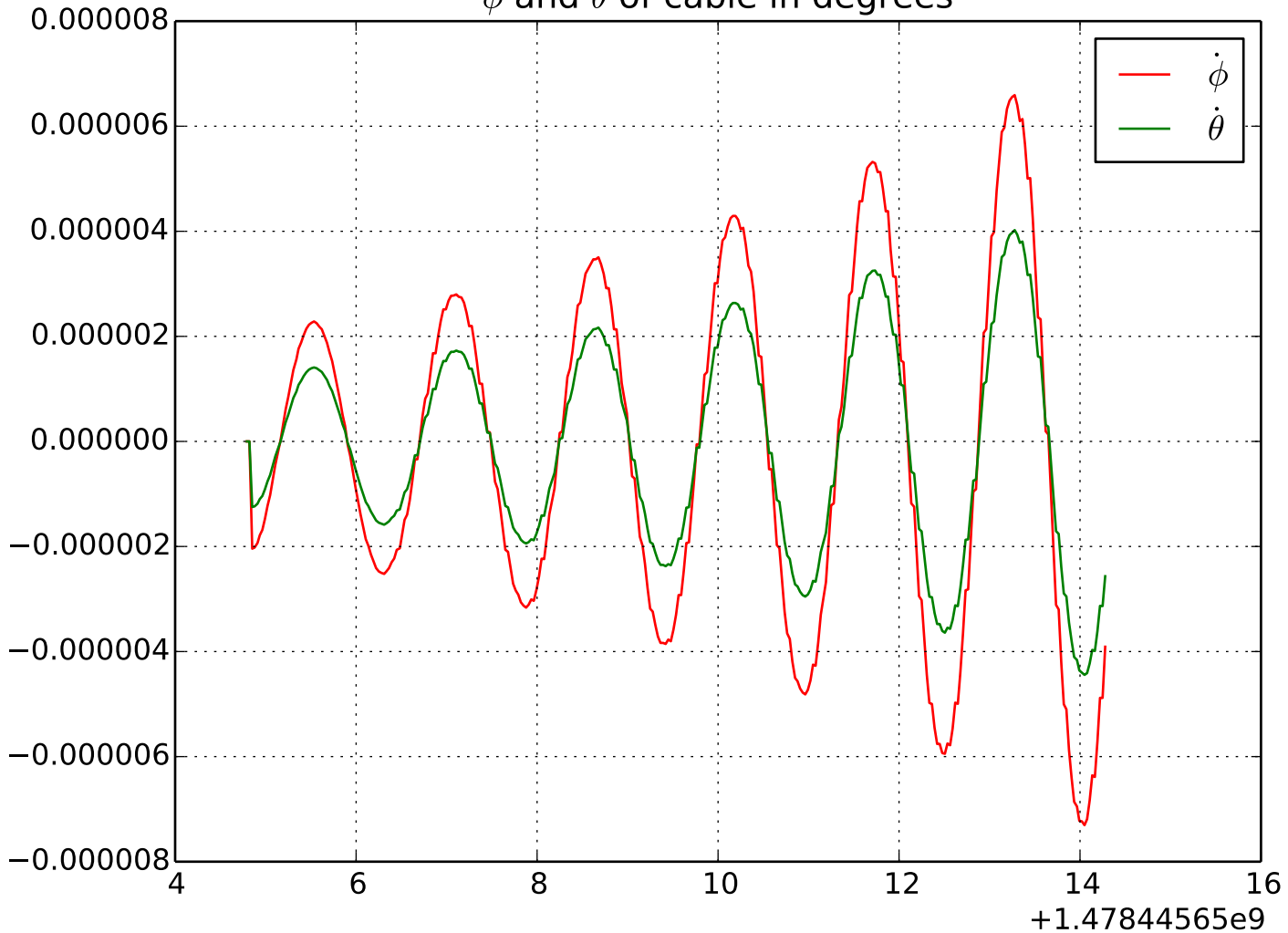

Attitudes (deg)
1e−7
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
0
2
4
6
8
10
ϕ
θ
ψ

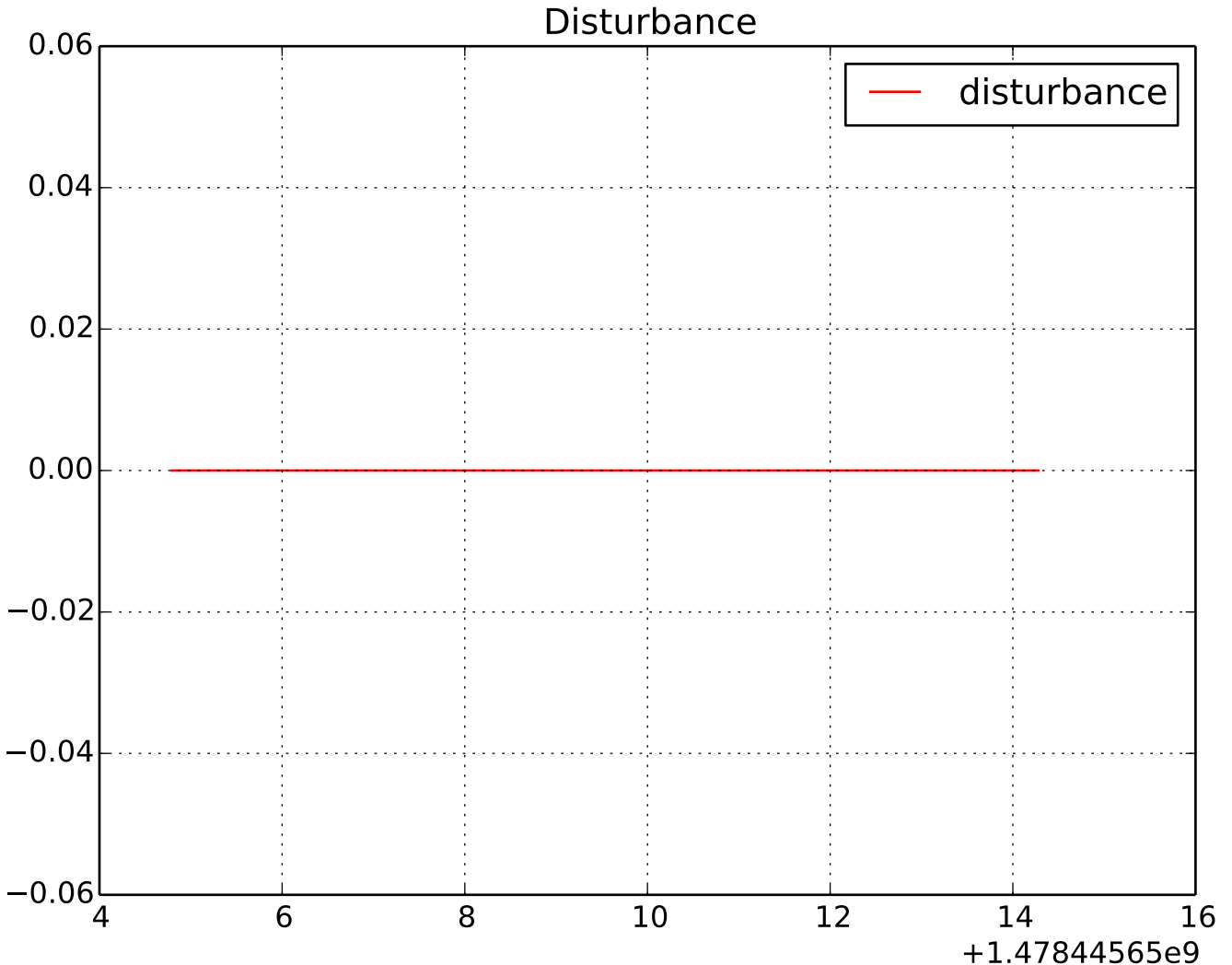

Forces (N)
20
15
10
5
0
−5
0
2
4
6
8
10
F_x
F_y
F_z


Load position (m)
x
y
z
1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
4
6
8
10
12
14
16
+1.47844565e9


Load velocity (m/s)
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
4
6
8
10
12
14
16
+1.47844565e9
v_x
v_y
v_z


ϕ and θ of cable in degrees
0.0000020
0.0000015
0.0000010
0.0000005
0.0000000
-0.0000005
-0.0000010
-0.0000015
-0.0000020
4
6
8
10
12
14
16
+1.47844565e9
ϕ
θ


$\dot{\phi}$ and $\dot{\theta}$ of cable in degrees
0.000008
0.000006
0.000004
0.000002
0.000000
−0.000002
−0.000004
−0.000006
−0.000008
4
6
8
10
12
14
16
+1.47844565e9
$\dot{\phi}$
$\dot{\theta}$


Disturbance
disturbance
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
4
6
8
10
12
14
16
+1.47844565e9

Missions with firefly in gazebo Mission with firefly in gazebo: chosen mission. This mission depends on:

- mission: mission

Parameters:

- thrust_gain: 1.0
- mission=LoadLifting:

  Load attached to uav to track a desired trajectory. This mission depends on:

  - controller: a trajectory tracking controller for system "load+uav"
  - reference: a reference position trajectory to be tracked by load
  - yaw_controller: a yaw controller
  - yaw_reference: a yaw reference

  No parameters

  - controller=LinearController:

    Linear controller for a **single aerial vehicle transporating load** attached by cable. Decompose control problems in two parts:

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    - Control x and y ....

    Parameters:

    - load_mass: 0.1
    - quad_mass: 1.56779
    - cable_length: 0.6

    - z_double_integrator_ctr=OneDimensionalBoundedDIC:

      One dimenisonal Double-integrator (bounded actuation)

      Parameters:

      - natural_frequency: 1.5
      - damping: 0.707106781187
      - position_saturation: 0.5
      - velocity_saturation: 0.5

  - reference=FixedPointTrajectory:

    Stay at rest at speficied point

    Trajectory with:

    - **offset = [1. 1. 1.]** in (m),
    - **rotation = [0. 0. 0.]** in (degrees).

  - yaw_controller=SimpleTrackingYawController:

    Simple yaw tracking controller, based on **feedback linearization of yaw rate equation**

    Controller for yaw motion.

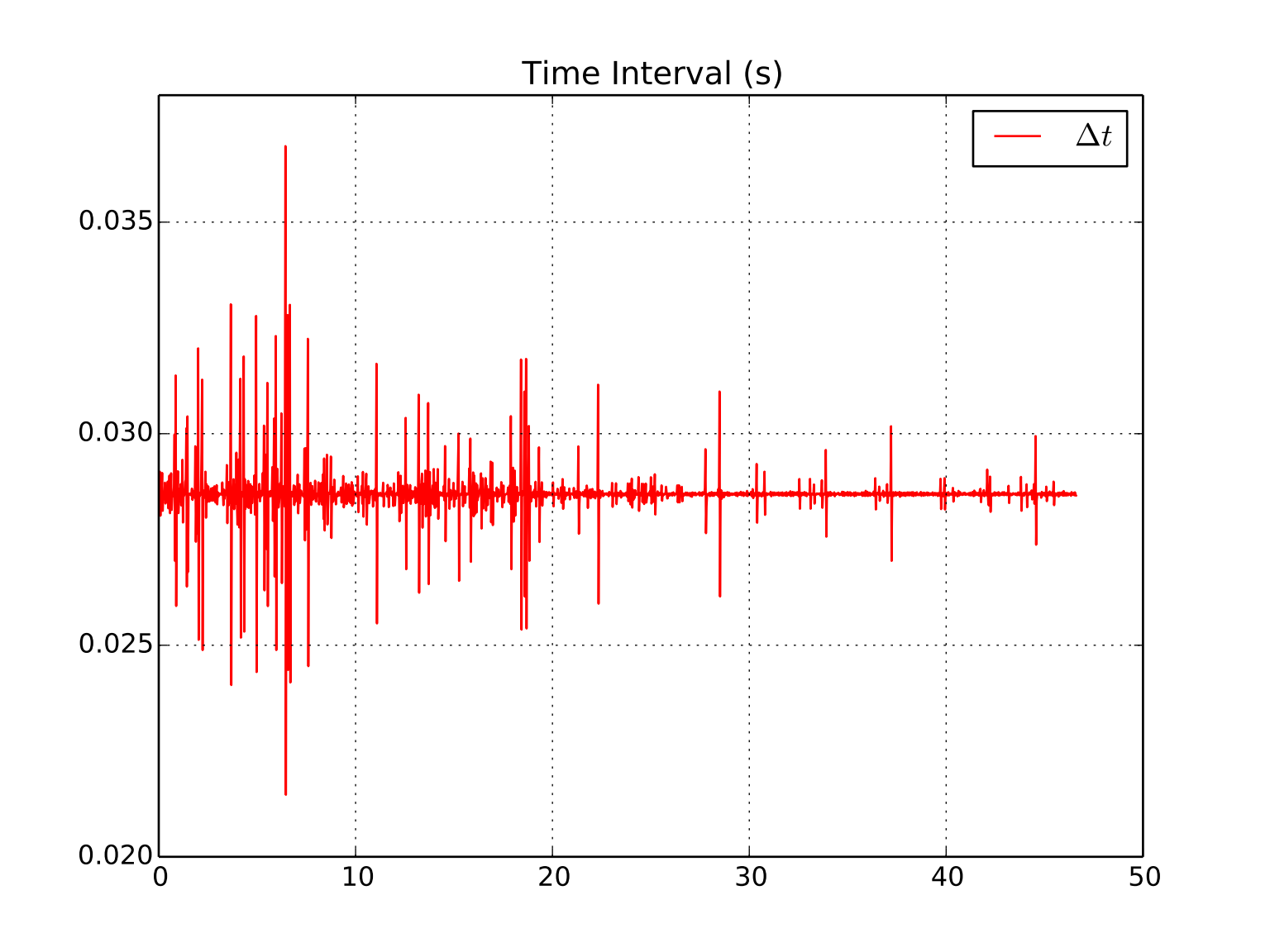
  - $\psi^{(1)} = \psi^{*(1)}$ - gain*sin(ψ - ψ^{*})
  - yaw rate = cos(φ)(cos(θ)*$\psi^{(1)}$ - sin(φ)*$\theta^{(1)}$)
    Parameters:
    - gain: 4.0

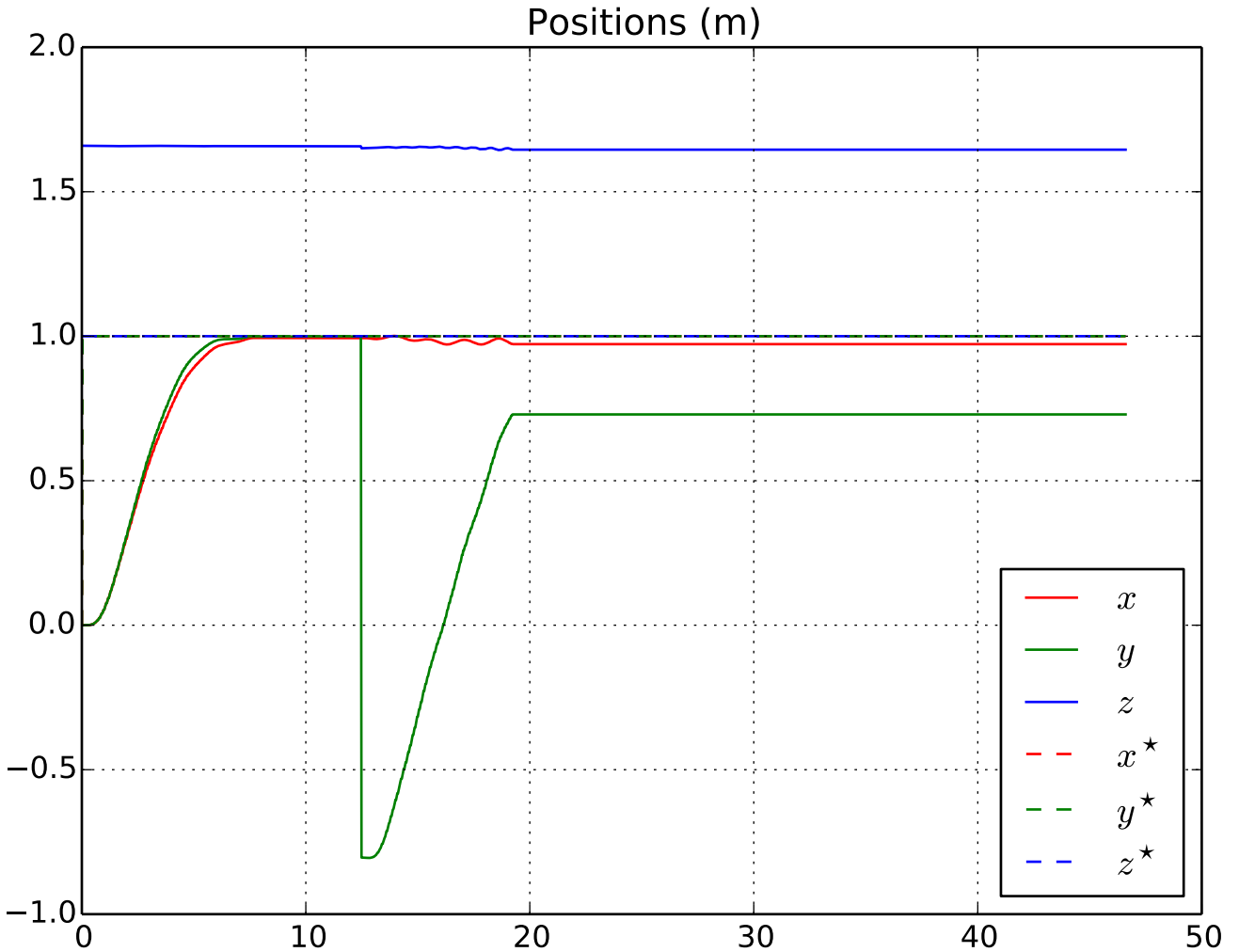
  - yaw_reference=FixedYawTrajectory:

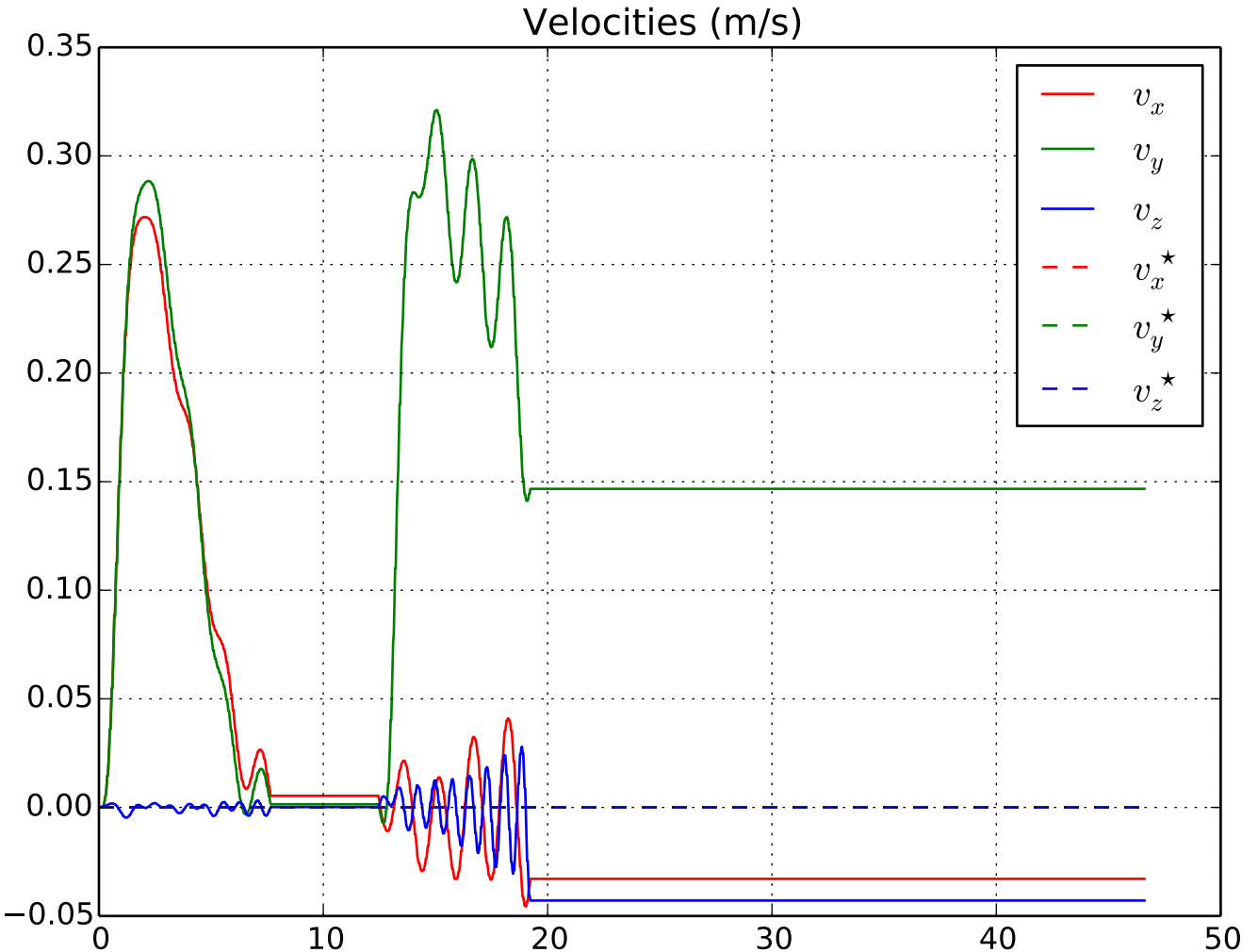
    Yaw angle to be constant

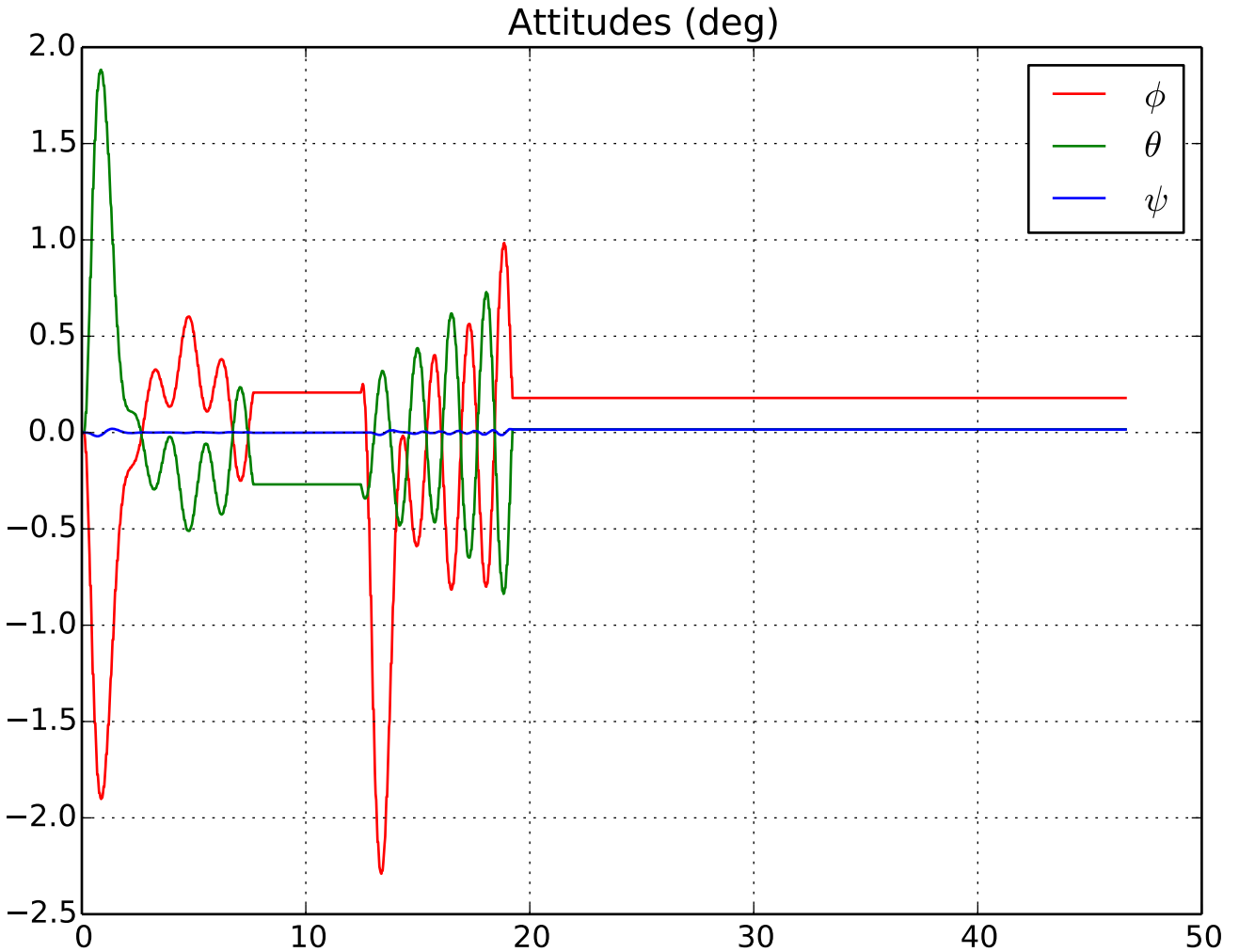
    Fixed yaw reference.

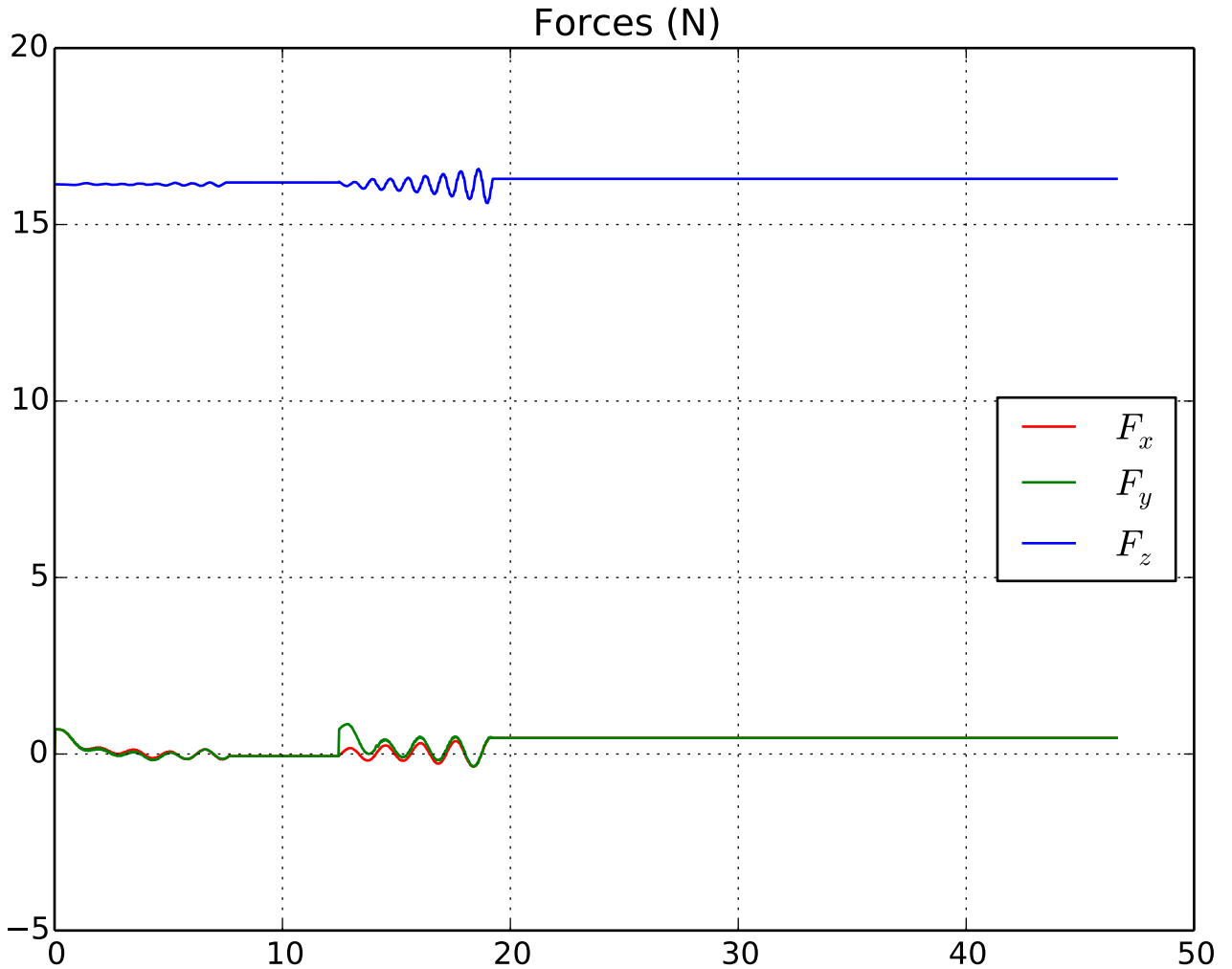
  - ψ^{*} = 0.0

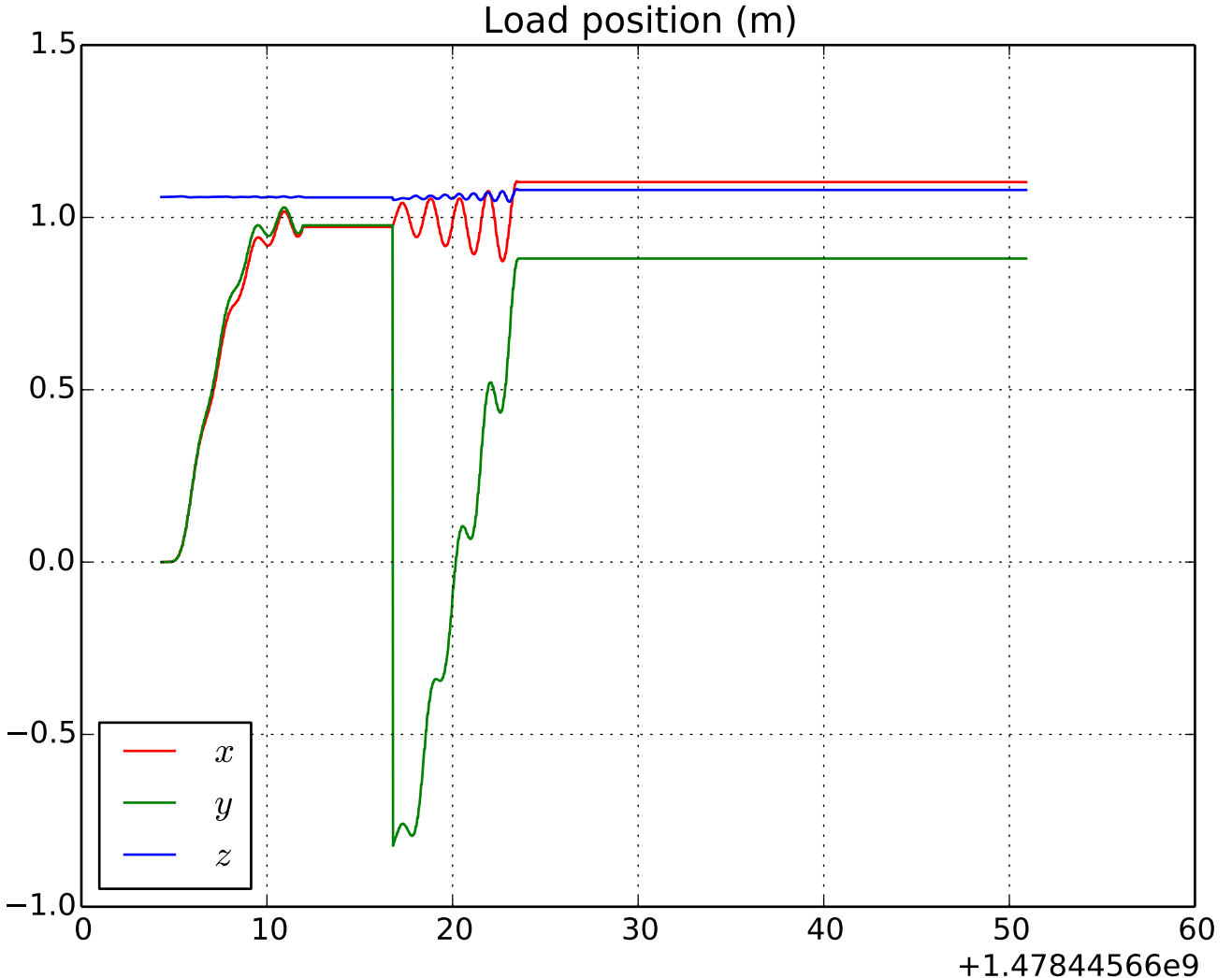

Time Interval (s)
Δt
0.035
0.030
0.025
0.020
0
10
20
30
40
50

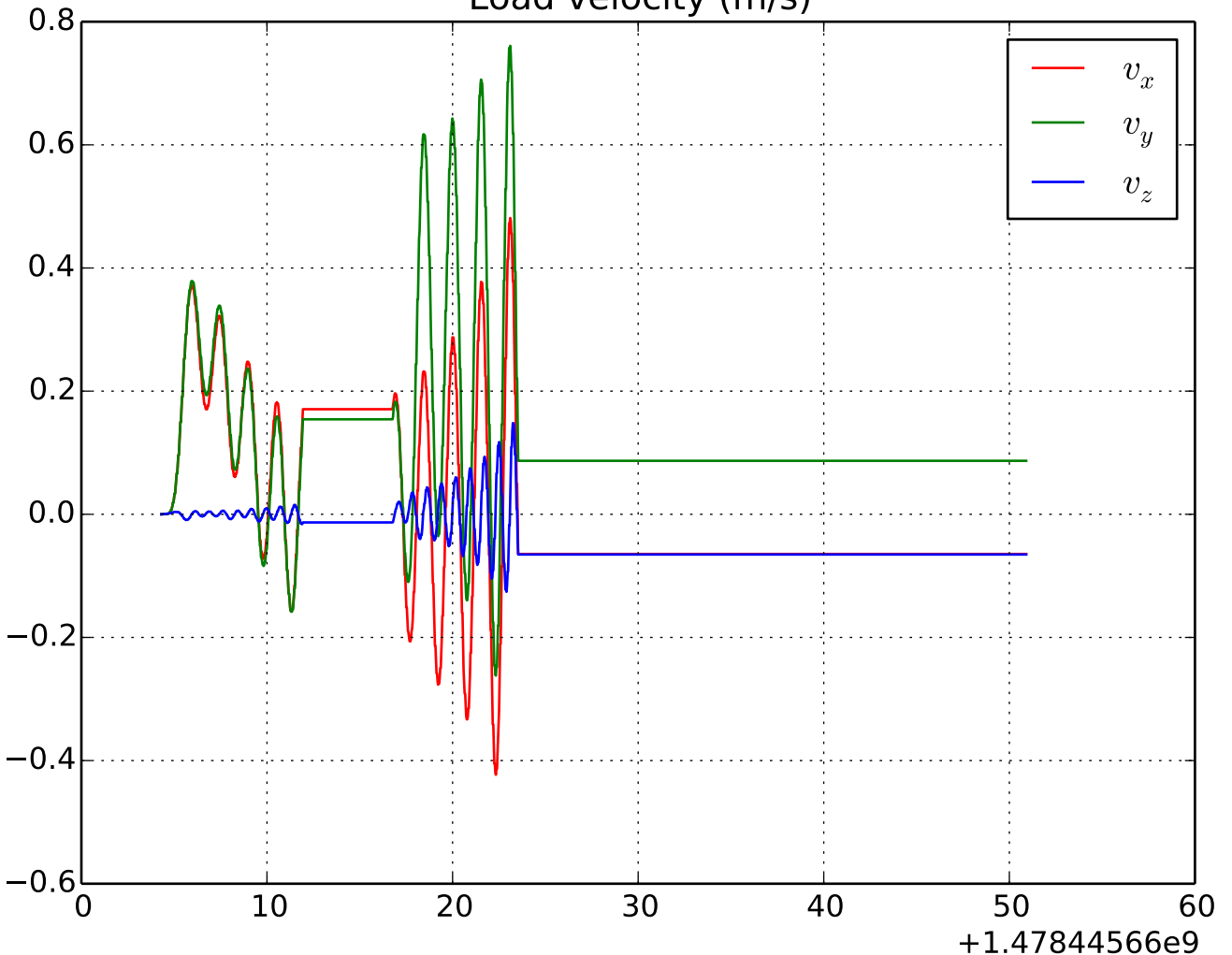

Positions (m)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
0
10
20
30
40
50
x
y
z
$x^\star$
$y^\star$
$z^\star$

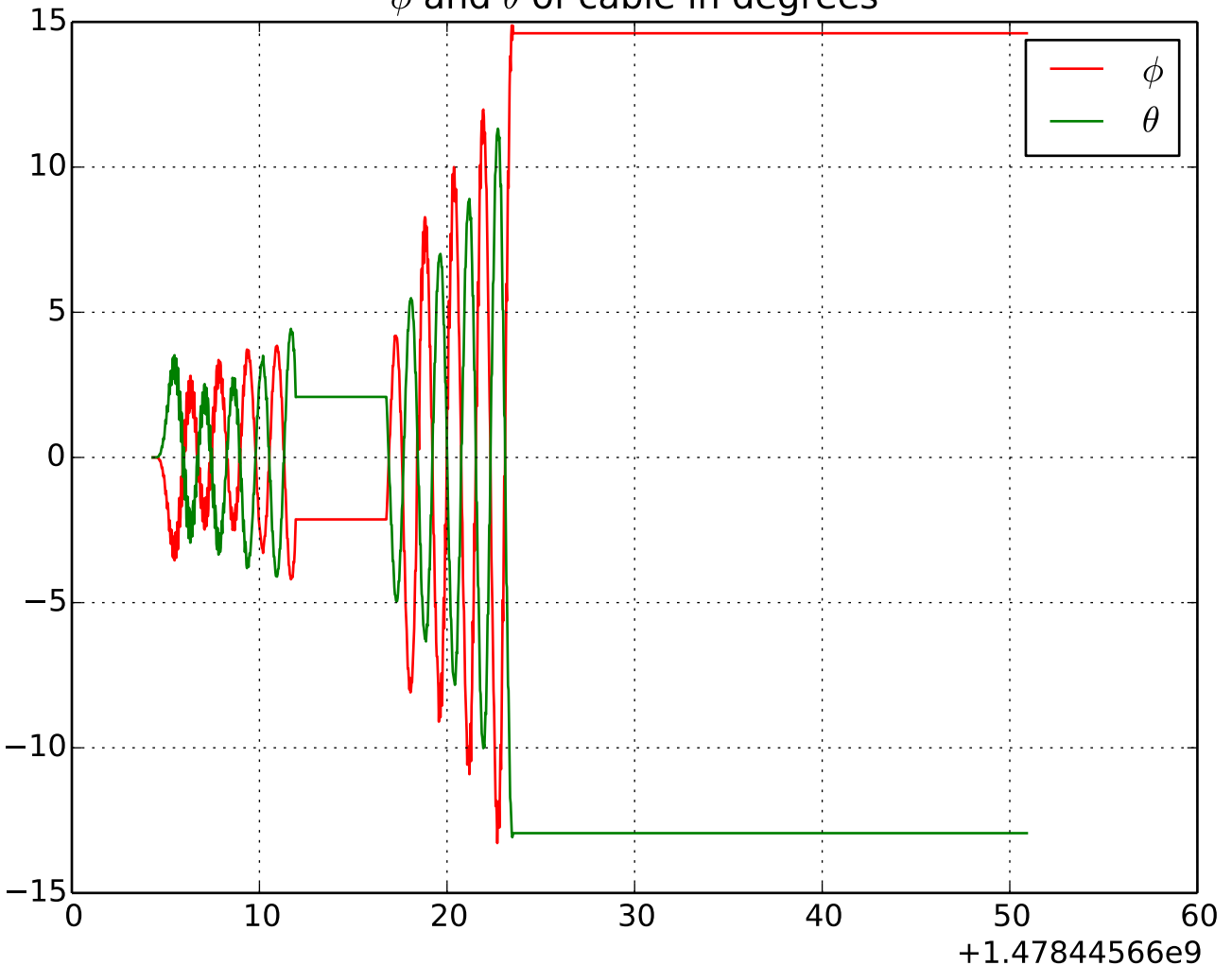

Velocities (m/s)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
0
10
20
30
40
50
v_x
v_y
v_z
$v_x^\star$
$v_y^\star$
$v_z^\star$

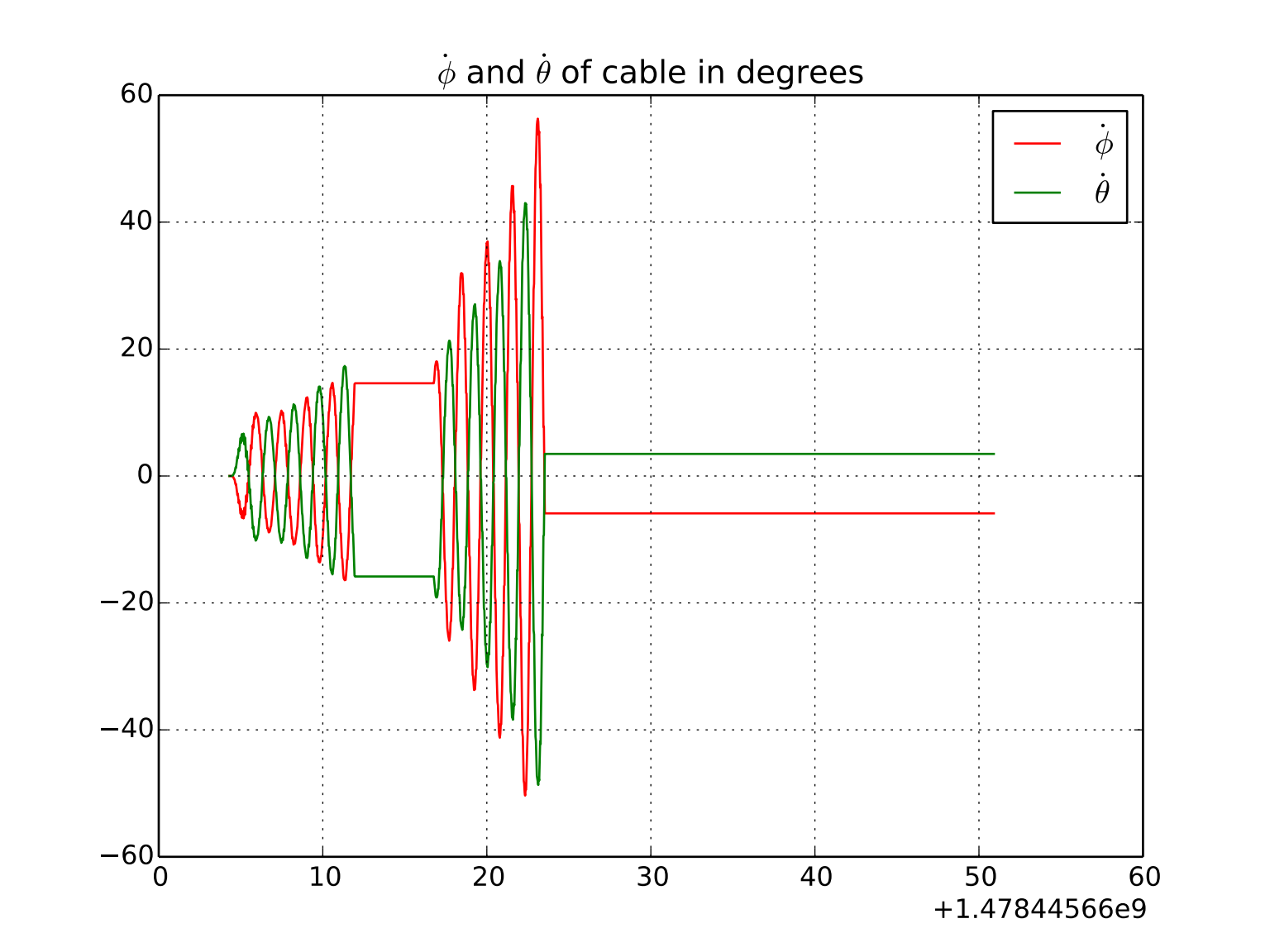

Attitudes (deg)
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
0
10
20
30
40
50
ϕ
θ
ψ

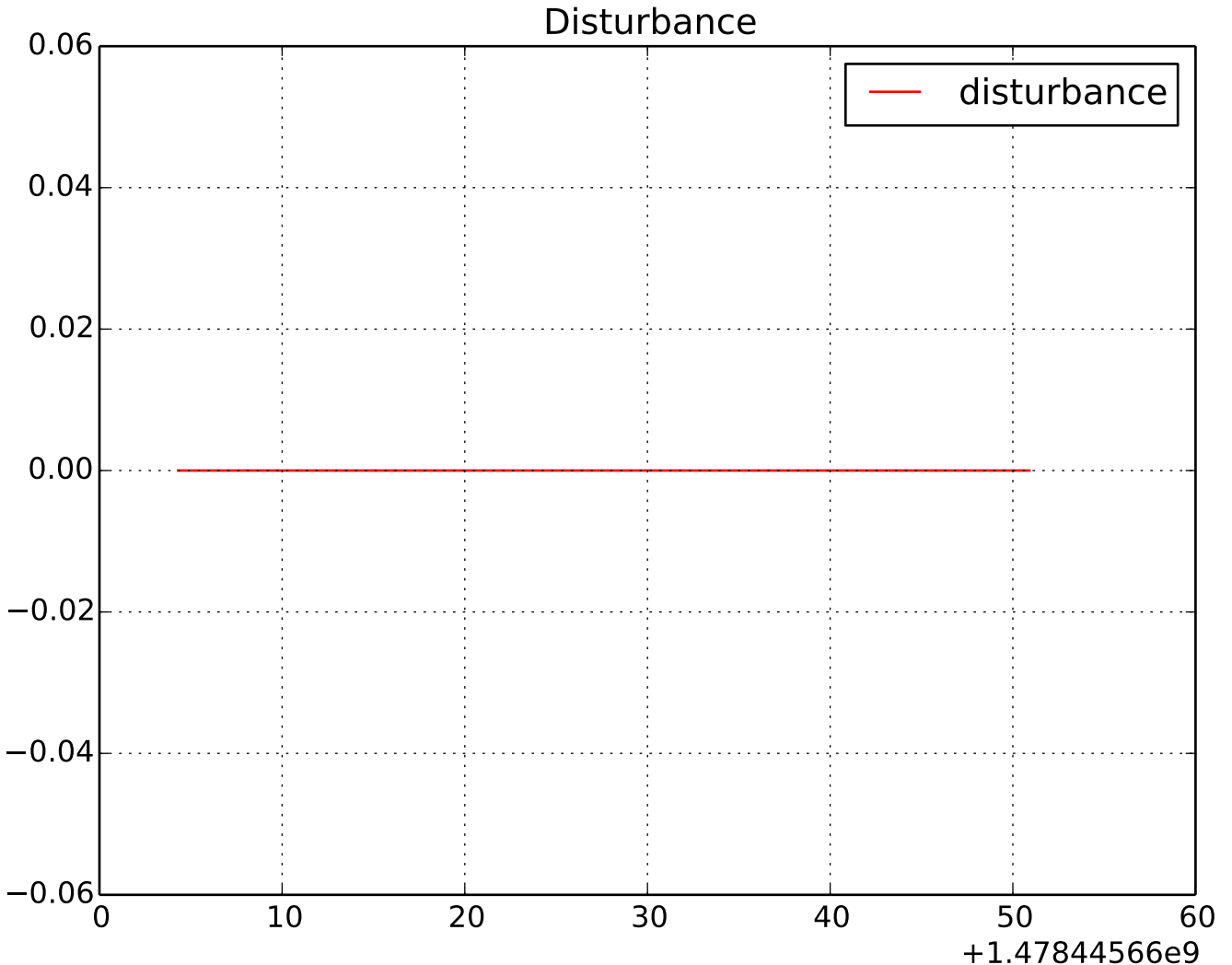

Forces (N)
20
15
10
5
0
−5
0
10
20
30
40
50
F_x
F_y
F_z


Load position (m)
1.5
1.0
0.5
0.0
−0.5
−1.0
0
10
20
30
40
50
60
+1.47844566e9
x
y
z


Load velocity (m/s)
0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
0
10
20
30
40
50
60
+1.47844566e9
v_x
v_y
v_z


ϕ and θ of cable in degrees
15
10
5
0
−5
−10
−15
0
10
20
30
40
50
60
+1.47844566e9
ϕ
θ


$\dot{\phi}$ and $\dot{\theta}$ of cable in degrees
60
40
20
0
−20
−40
−60
0
10
20
30
40
50
60
+1.47844566e9
$\dot{\phi}$
$\dot{\theta}$


Disturbance
disturbance
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
0
10
20
30
40
50
60
+1.47844566e9