Assignment 4

Error vs iteration

METHODS USED TO SOLVE ODE :
1. MIDPOINT METHOD
2. 4TH ORDER RUNGE-KUTTA

step size : 1e-16 seconds
alpha : 0.05

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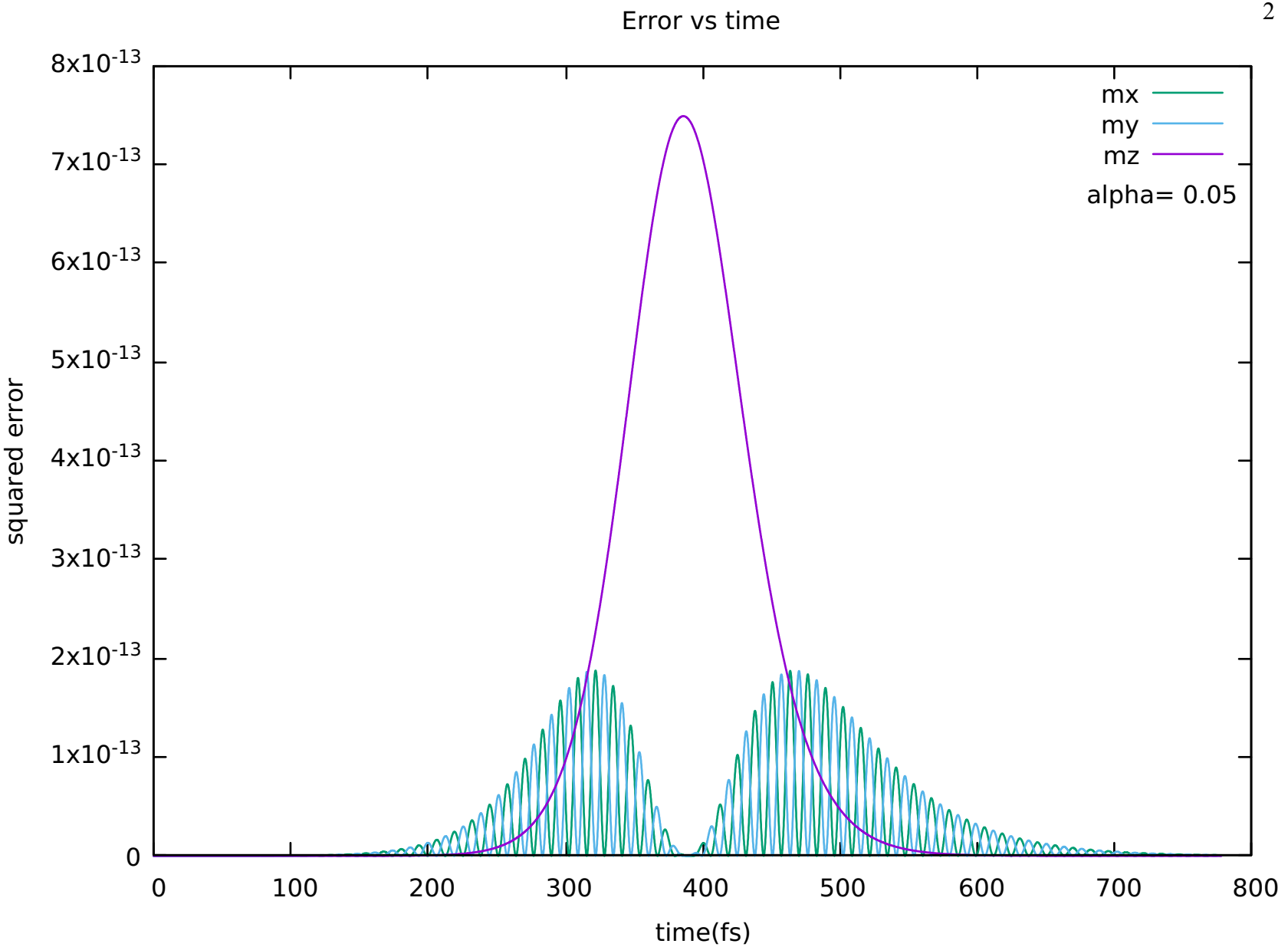
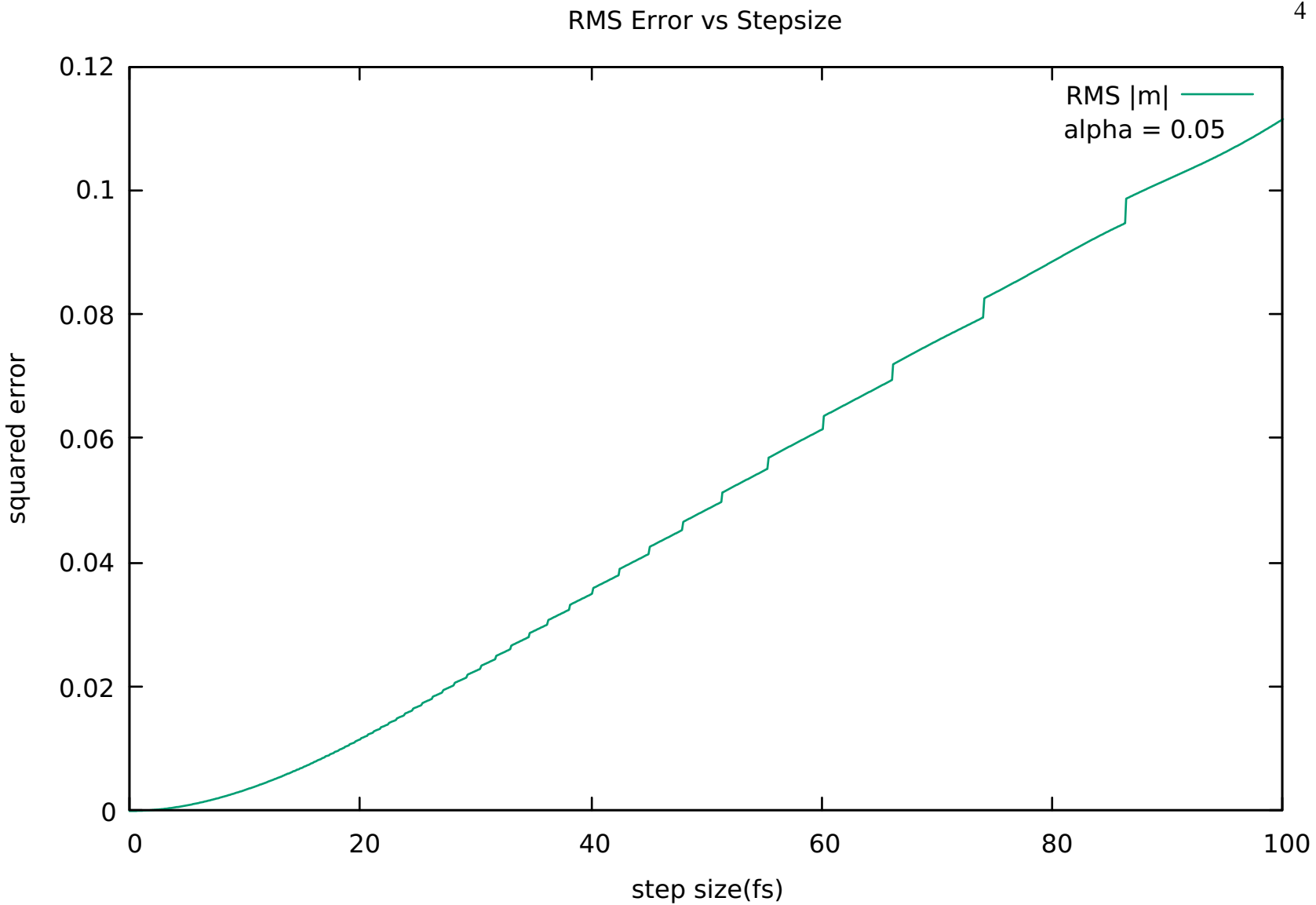

Error vs time
mx
my
mz
alpha= 0.05
squared error
8x10-13
7x10-13
6x10-13
5x10-13
4x10-13
3x10-13
2x10-13
1x10-13
0
0
100
200
300
400
500
600
700
800
time(fs)

RMS Error vs step-size

METHODS USED TO SOLVE ODE :
1. MIDPOINT METHOD
2. 4TH ORDER RUNGE-KUTTA

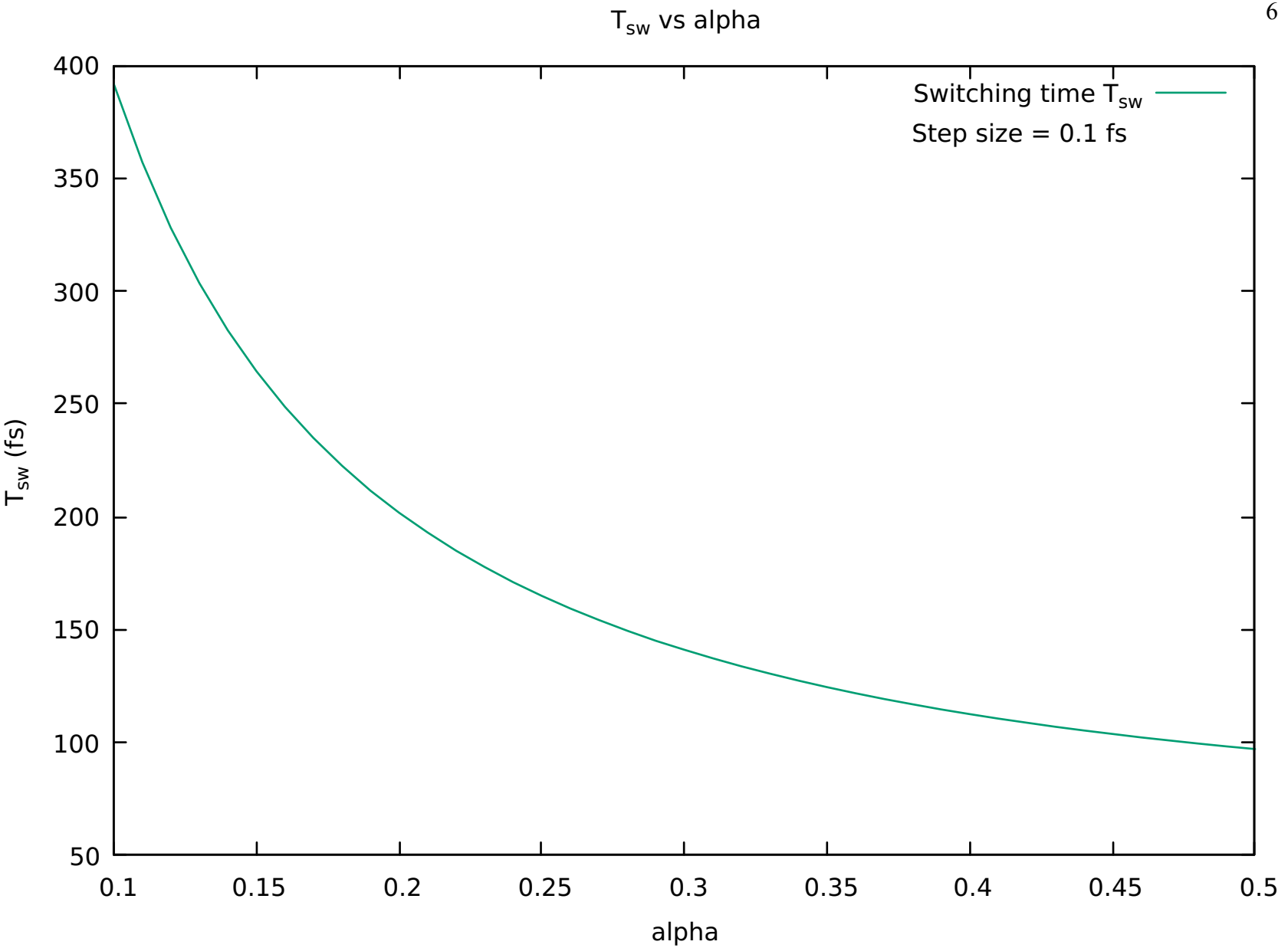
alpha : 0.05


RMS Error vs Stepsize
RMS |m|
alpha = 0.05
squared error
step size(fs)
0.12
0.1
0.08
0.06
0.04
0.02
0
0
20
40
60
80
100

Switching time vs alpha

METHOD USED TO SOLVE ODE :
MIDPOINT METHOD

step size : 1e-19 seconds


T_{sw} vs alpha
Switching time T_{sw}
Step size = 0.1 fs
T_{sw} (fs)
400
350
300
250
200
150
100
50
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
alpha

Normalized vector <m>

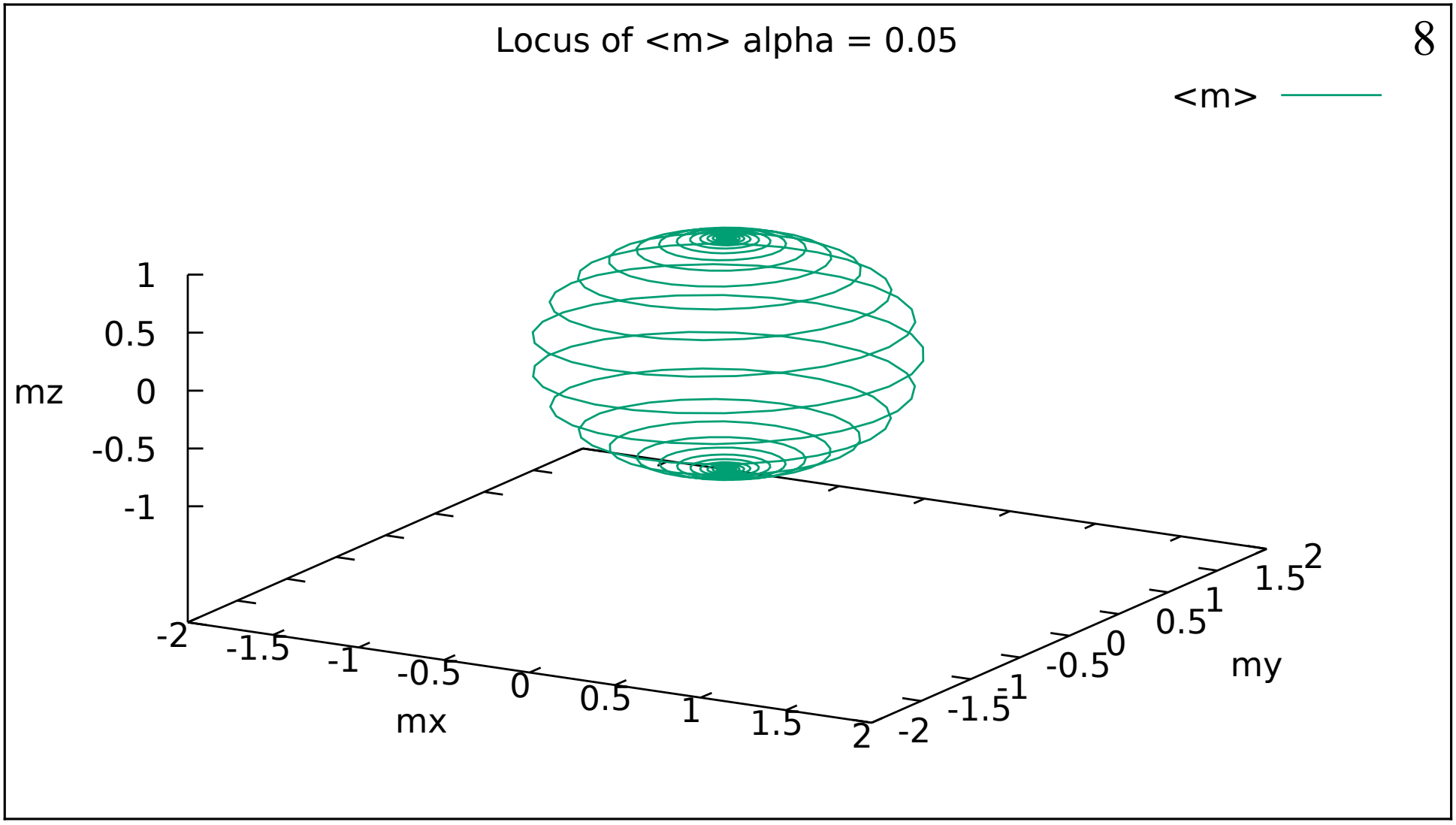
METHOD USED TO SOLVE ODE :
MIDPOINT METHOD

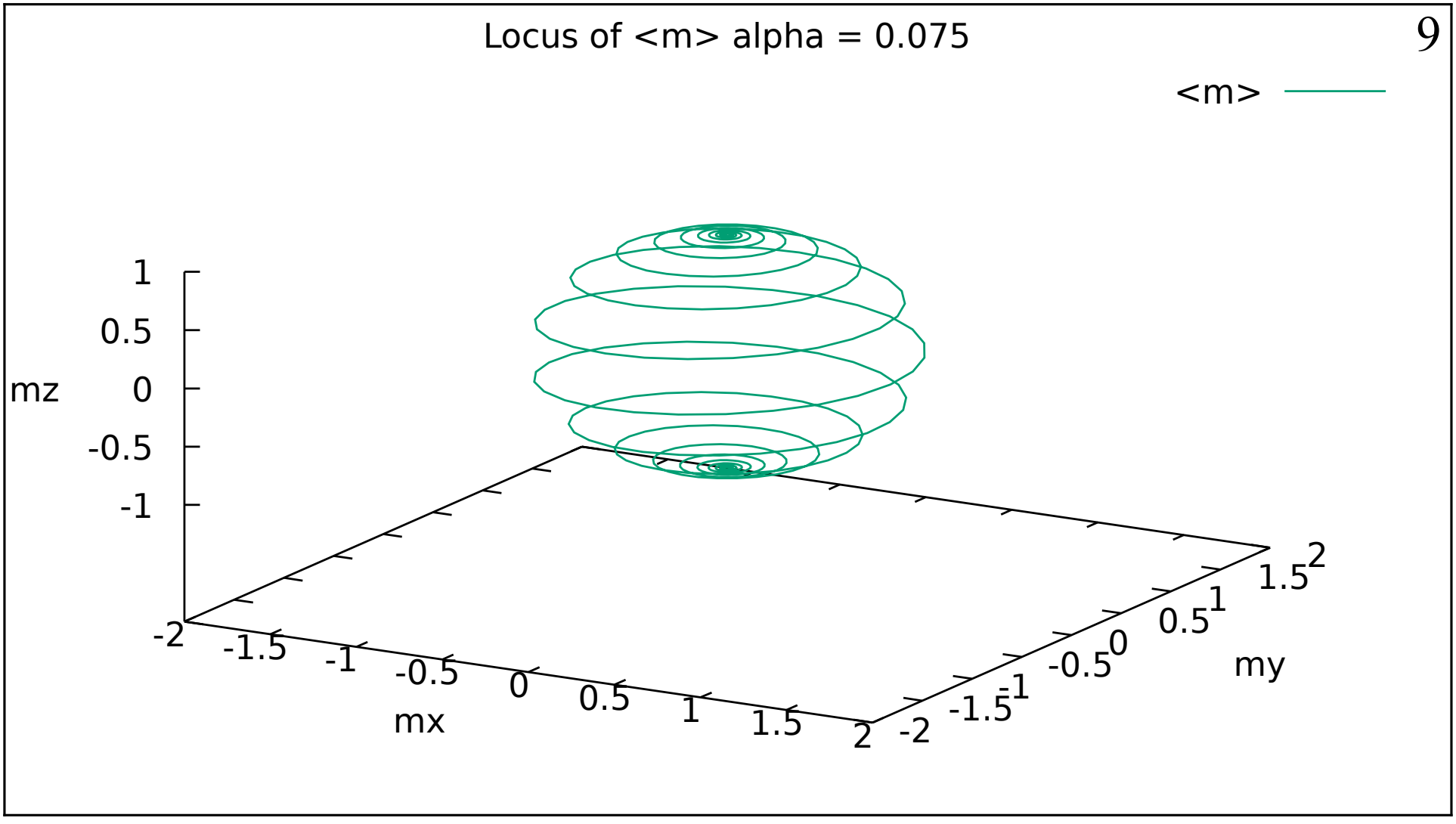
step size : 1e-15 seconds

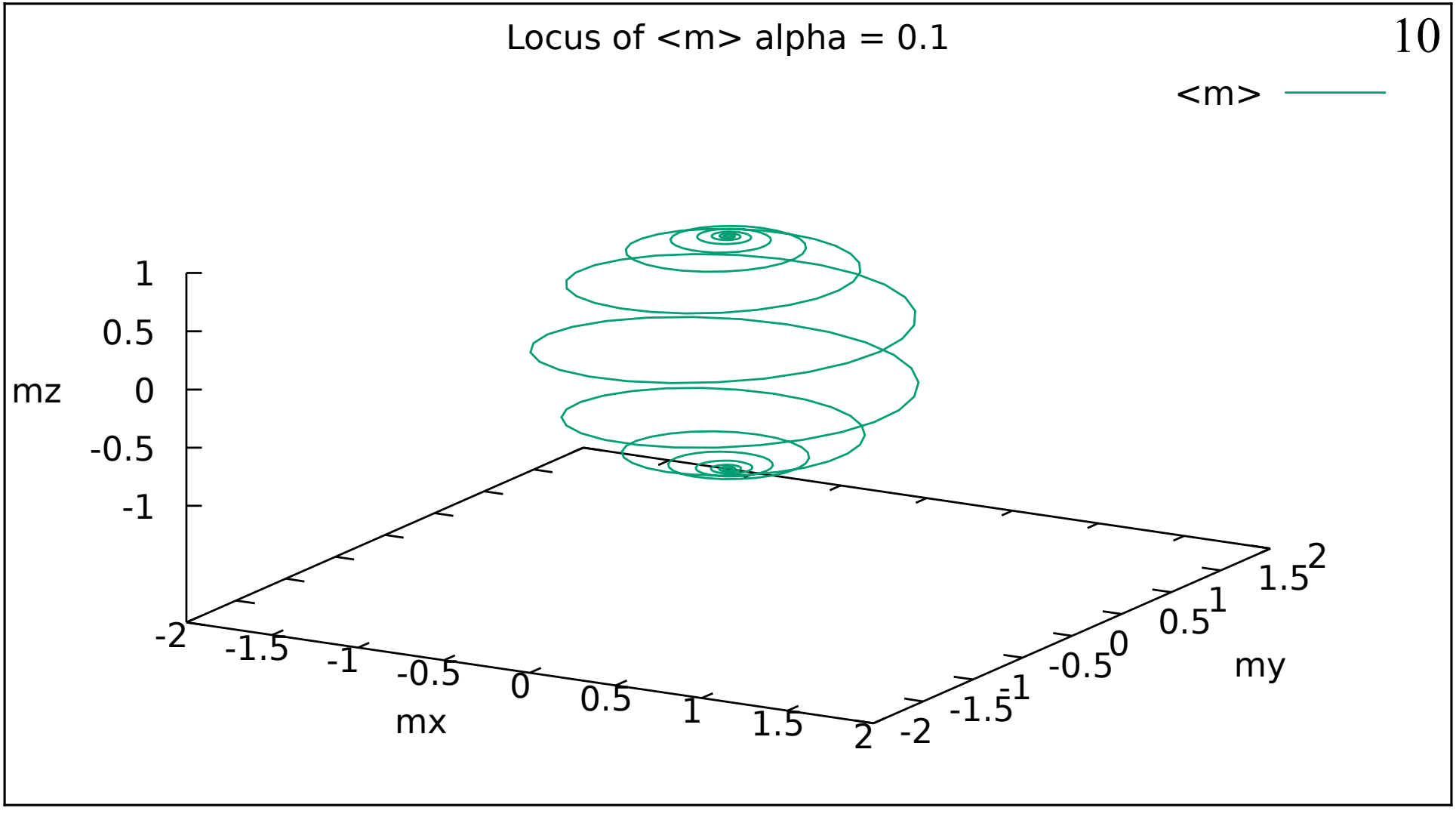
GRAPH PLOTS INCLUDE :

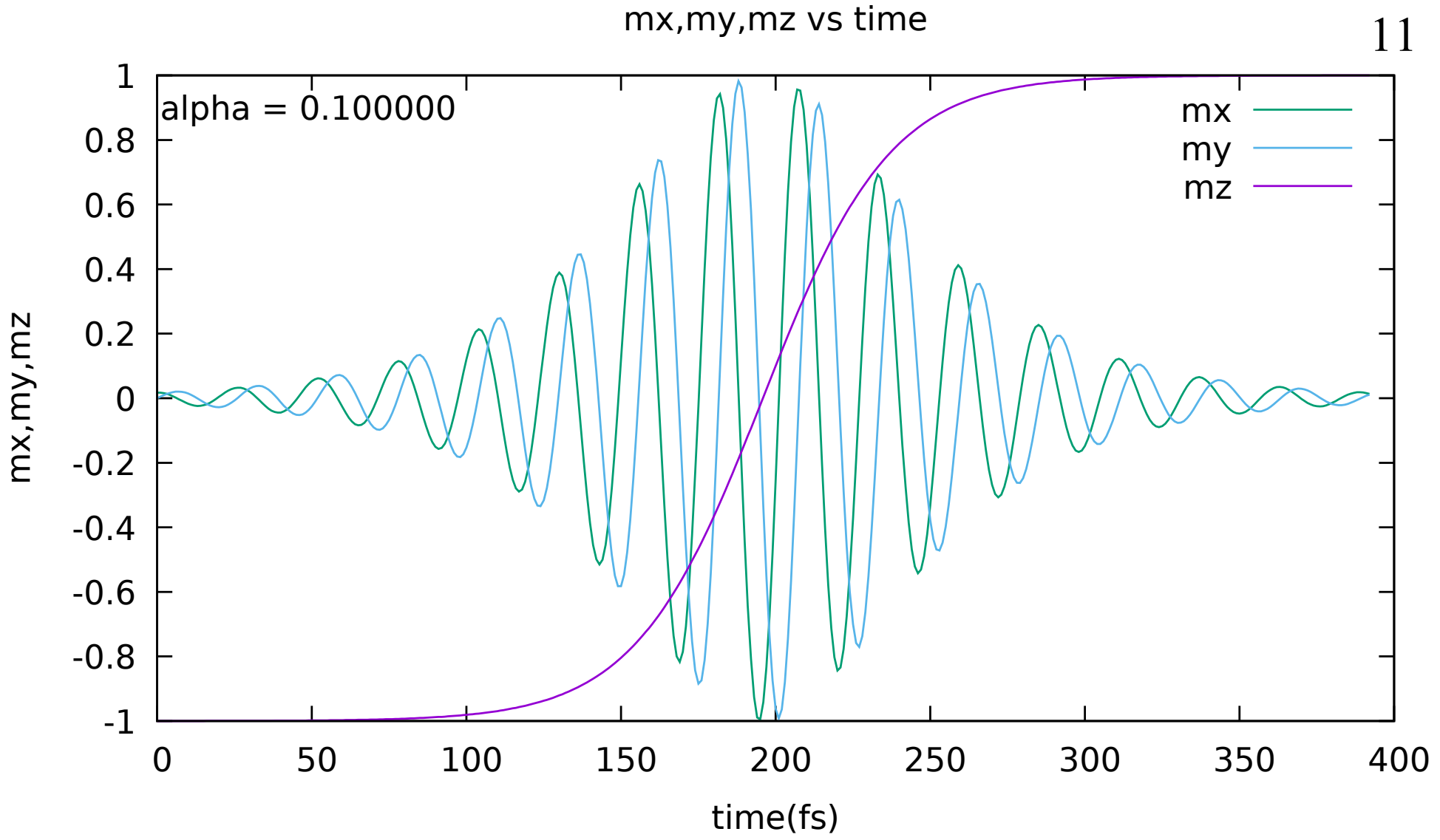
1. PATH OF TIP OF UNIT <M> VECTOR FOR DIFFERENT VALUES OF ALPHA

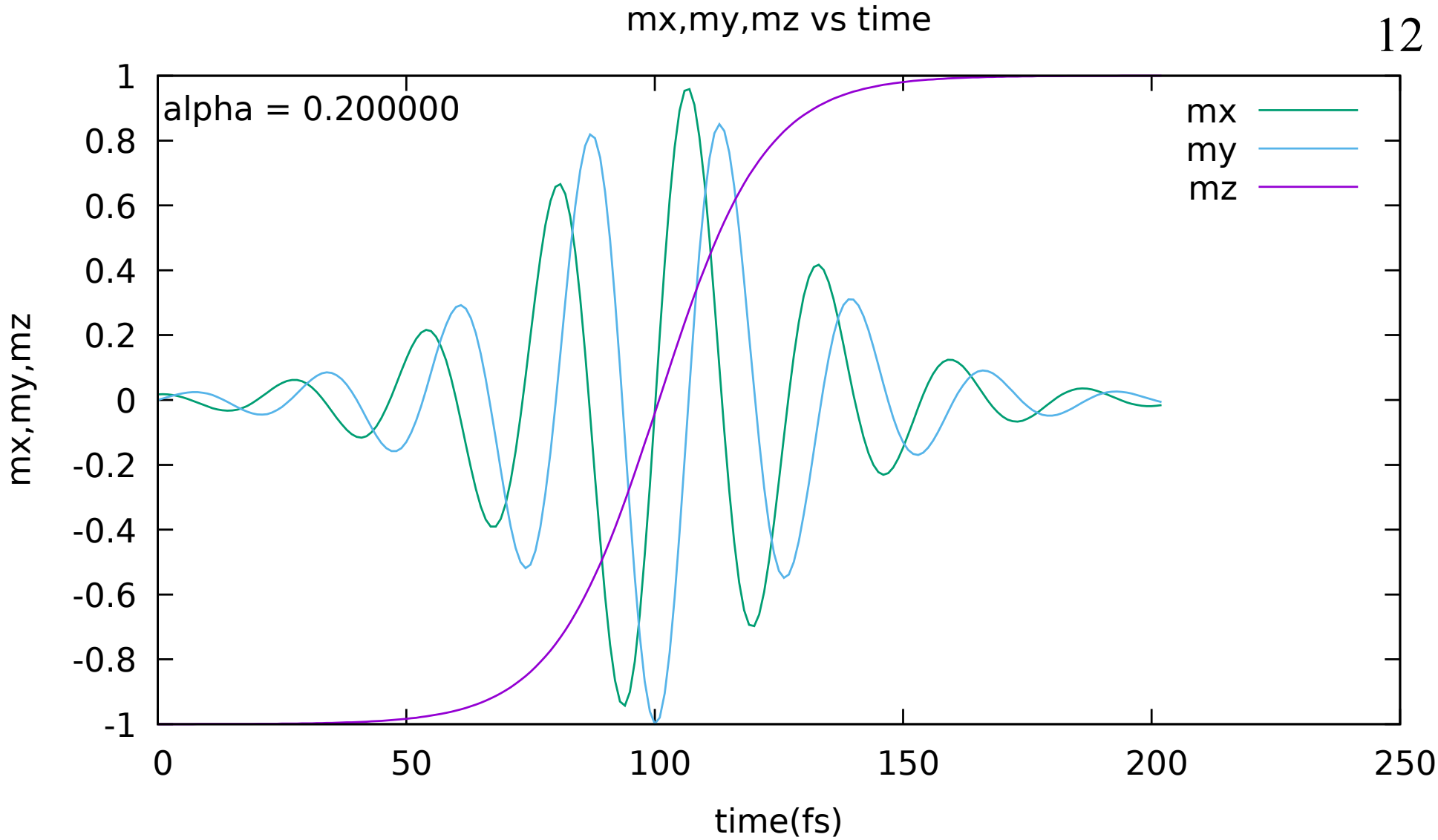
2. COMPONENTS OF UNIT <M> VECTOR FOR DIFFERENT ALPHA

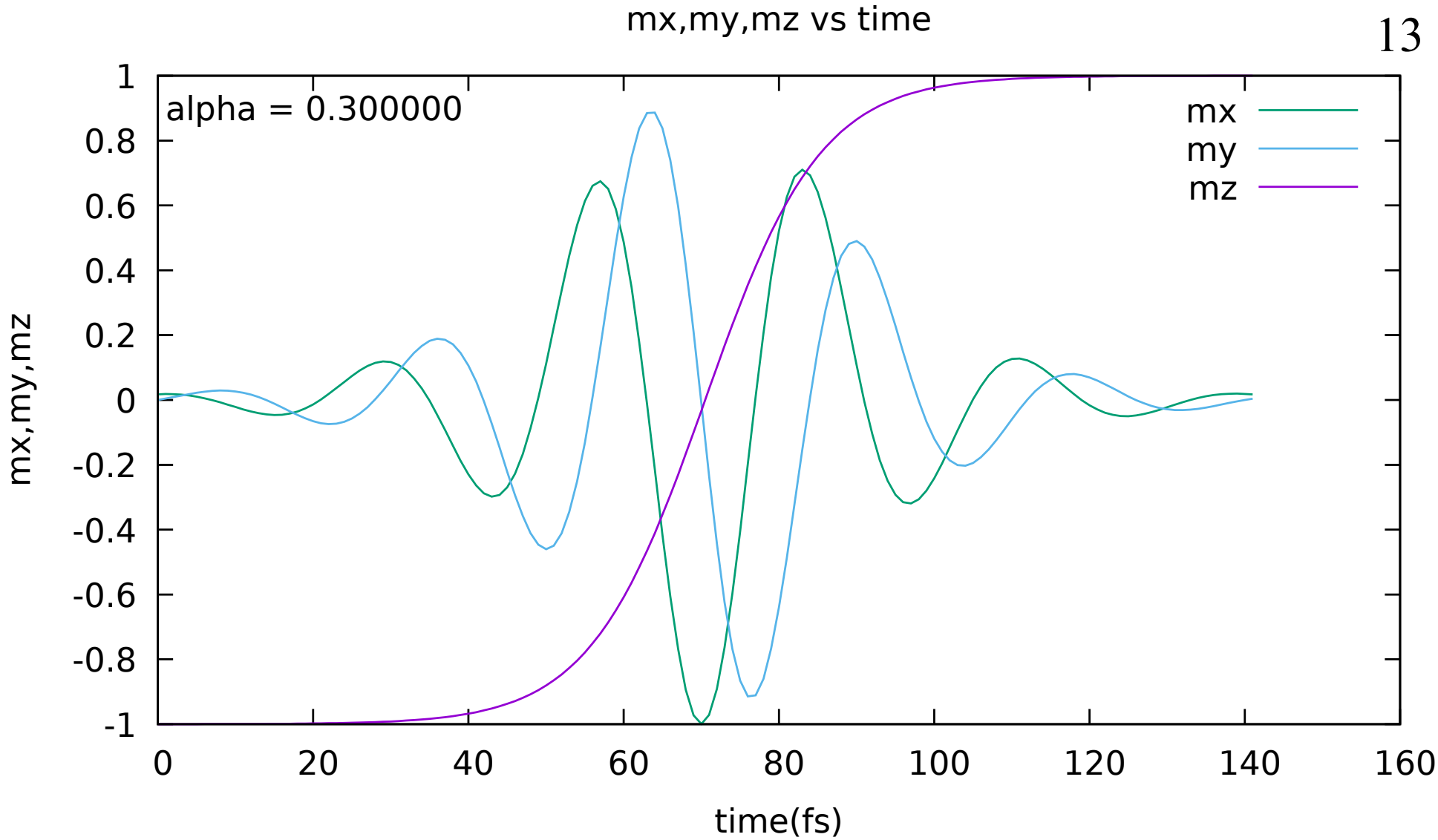

Locus of <m> alpha = 0.05
<m>
mz
1
0.5
0
-0.5
-1
mx
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
my
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2

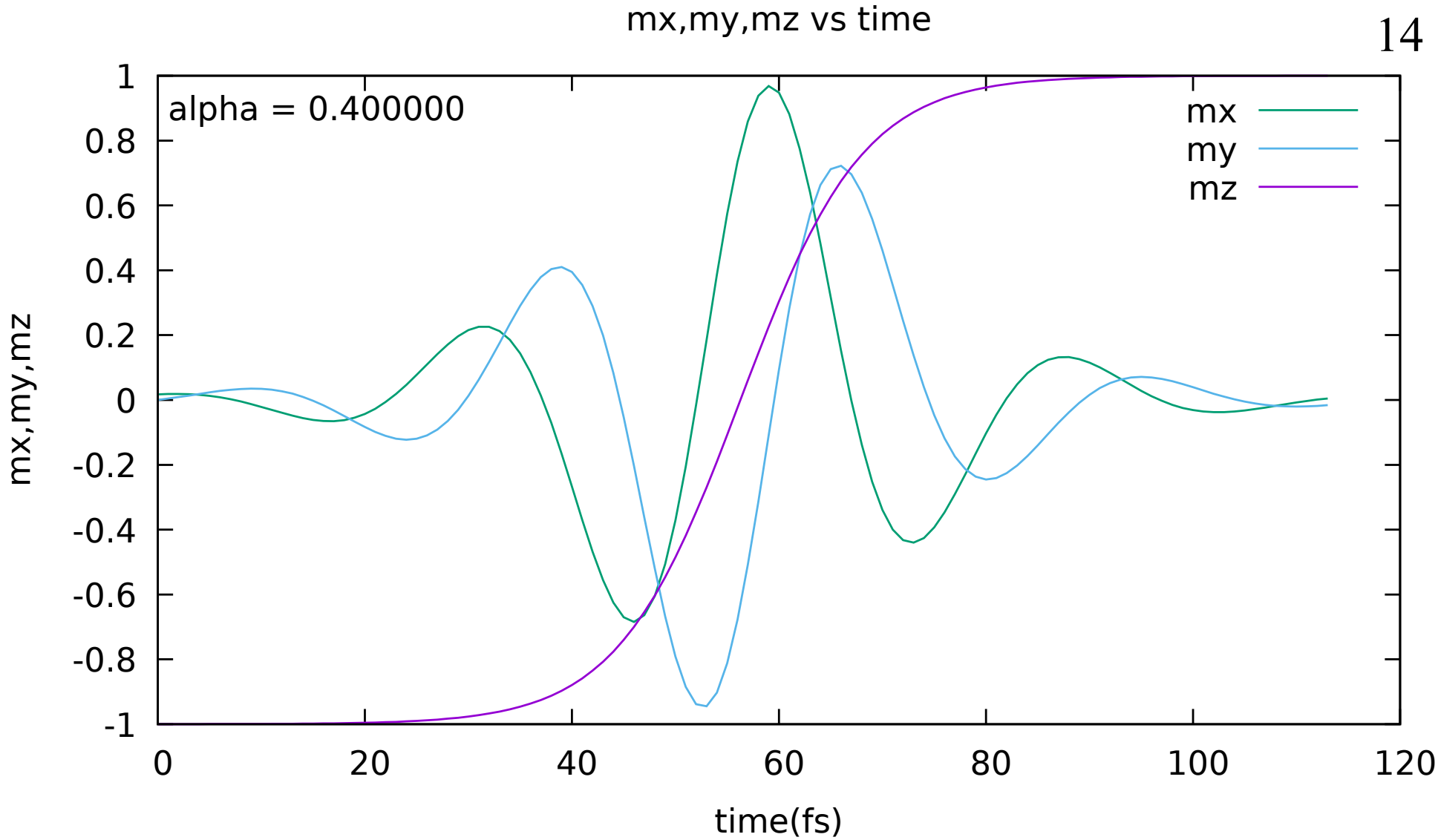

Locus of <m> alpha = 0.075
<m>
mz
1
0.5
0
-0.5
-1
mx
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
my
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2

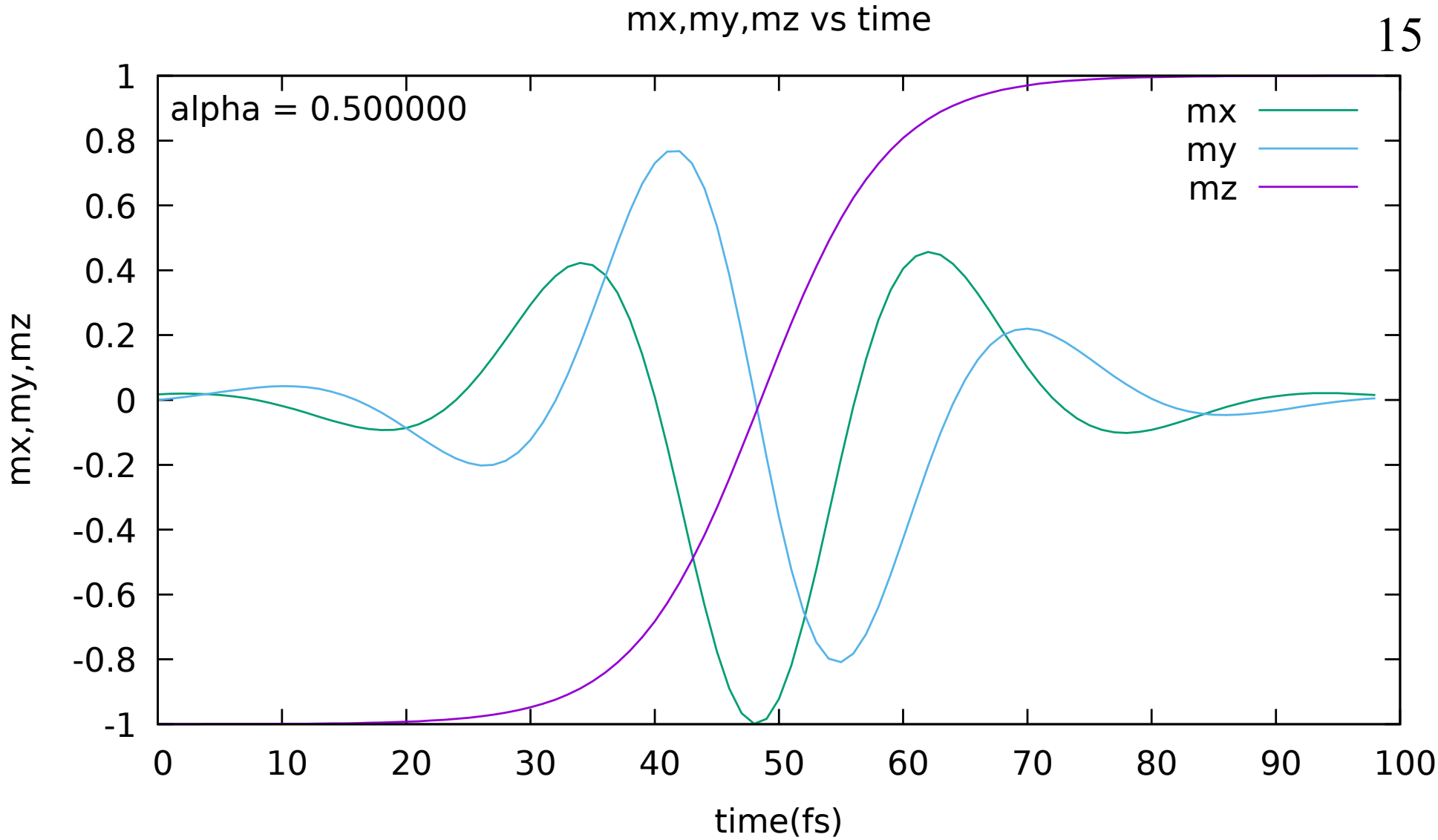

Locus of <m> alpha = 0.1
<m>
mz
1
0.5
0
-0.5
-1
mx
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
my
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2


mx,my,mz vs time
alpha = 0.100000
mx
my
mz
mx,my,mz
time(fs)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
50
100
150
200
250
300
350
400


mx,my,mz vs time
alpha = 0.200000
mx
my
mz
mx,my,mz
time(fs)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
50
100
150
200
250


mx,my,mz vs time
alpha = 0.300000
mx
my
mz
mx,my,mz
time(fs)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
20
40
60
80
100
120
140
160


mx,my,mz vs time
alpha = 0.400000
mx
my
mz
mx,my,mz
time(fs)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
20
40
60
80
100
120


mx,my,mz vs time
alpha = 0.500000
mx
my
mz
mx,my,mz
time(fs)
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
10
20
30
40
50
60
70
80
90
100