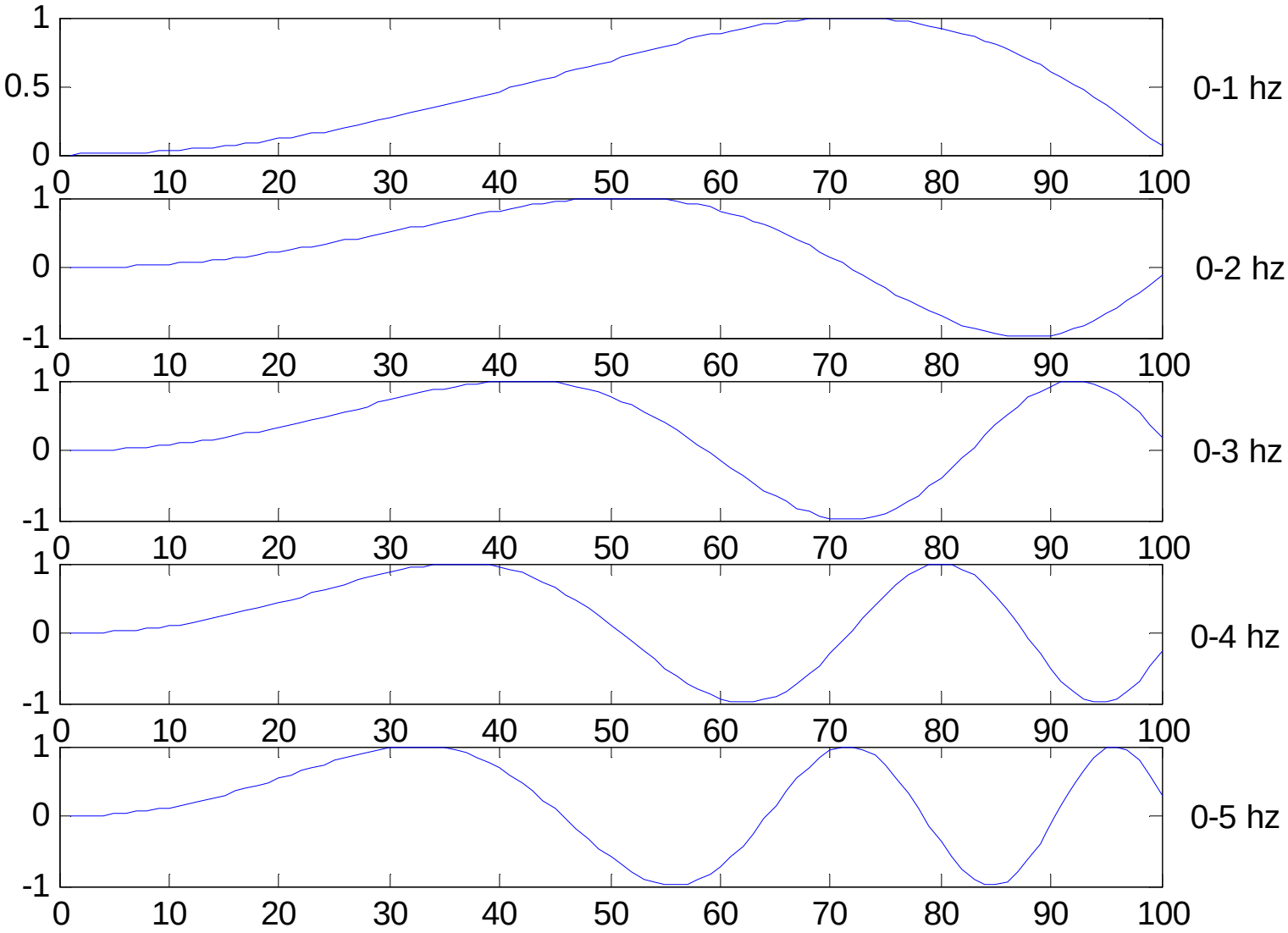
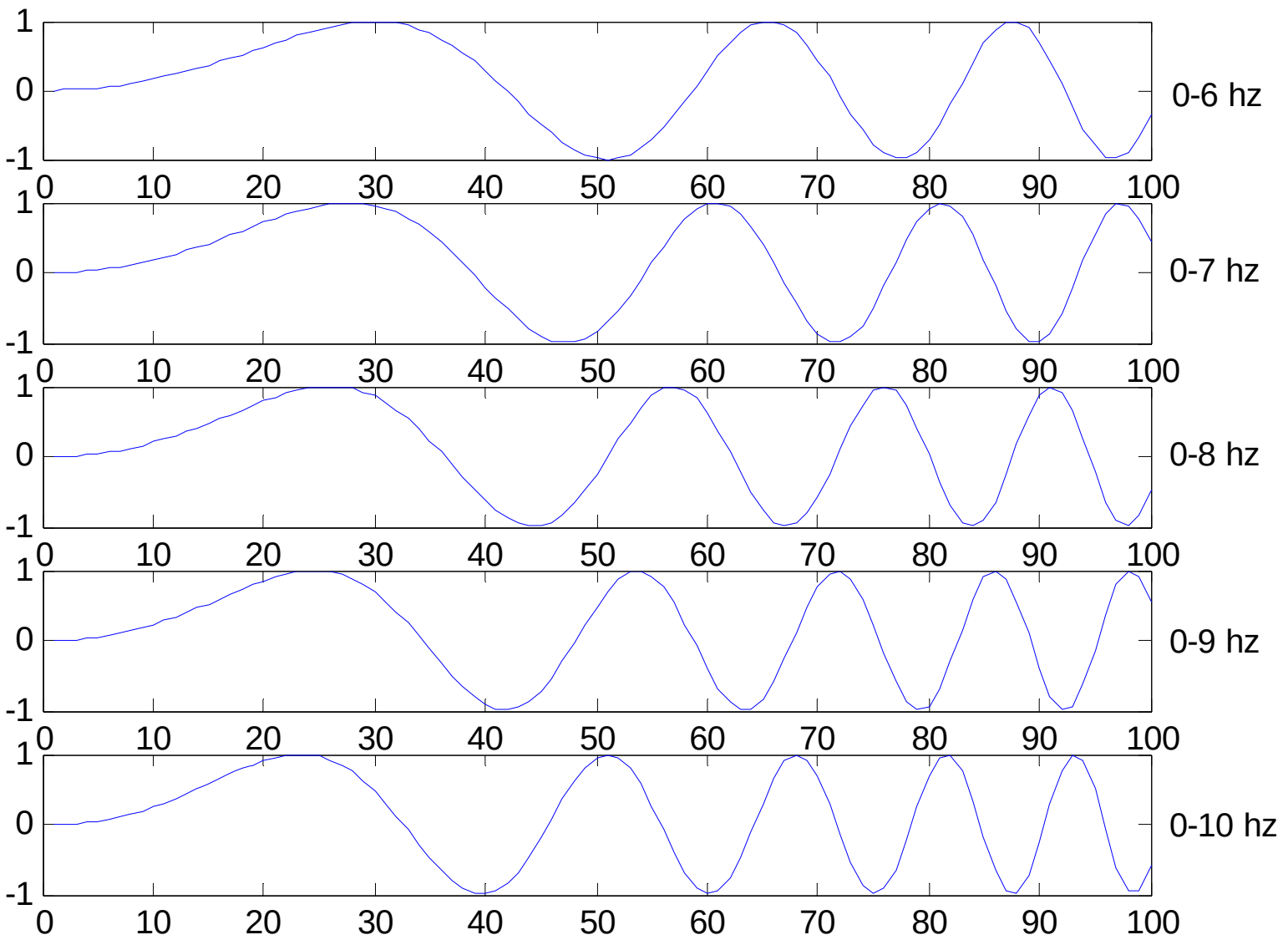
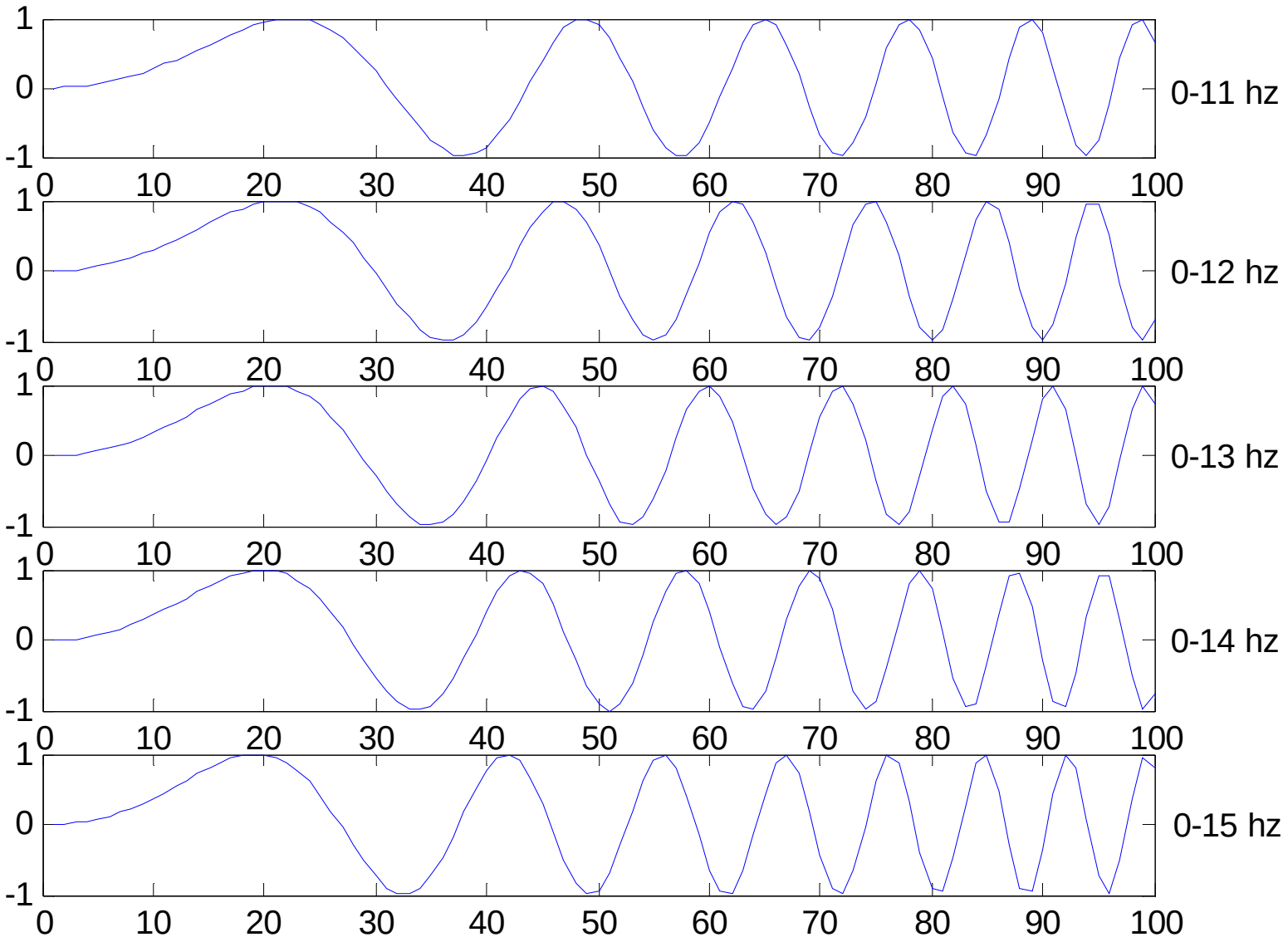
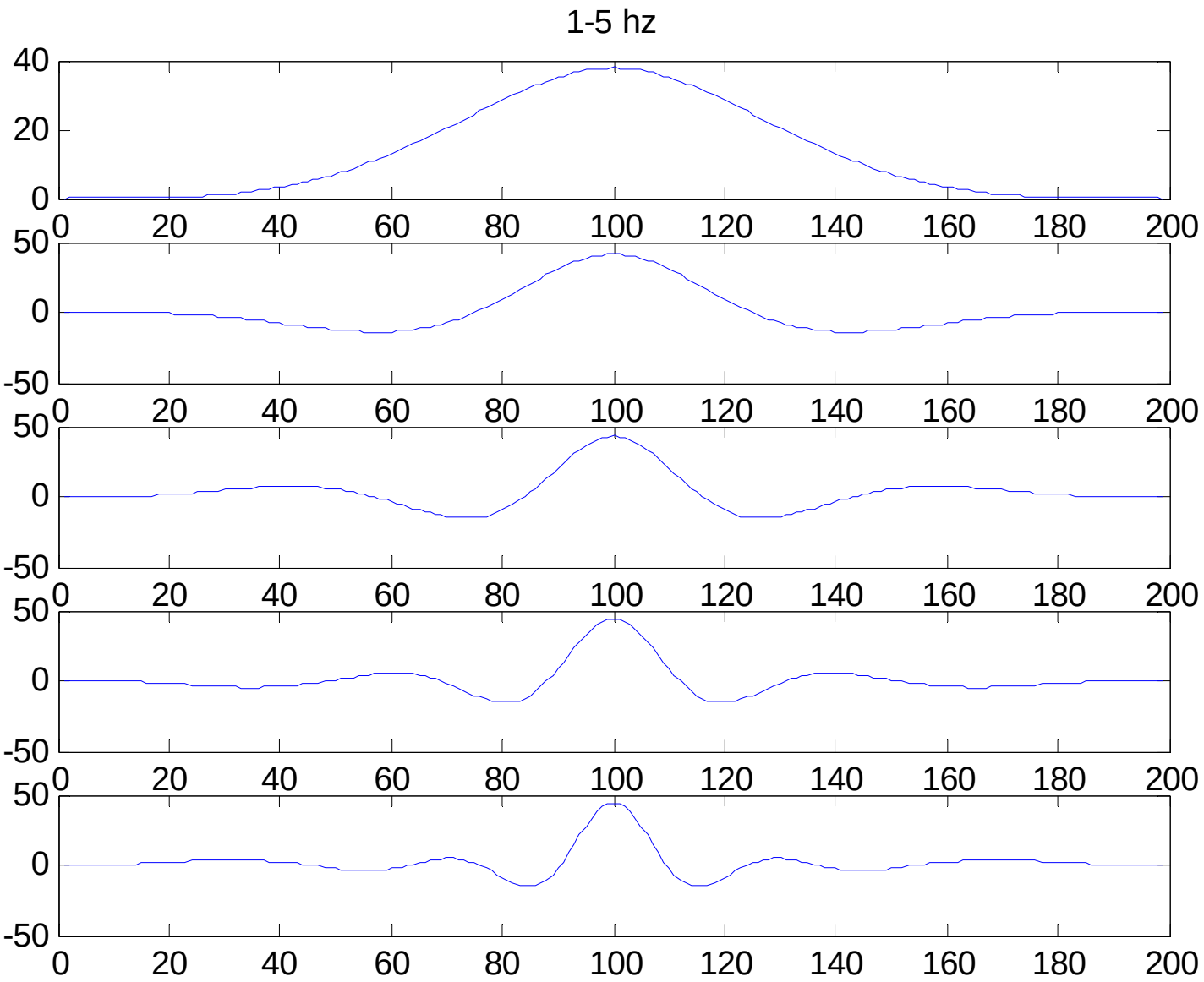
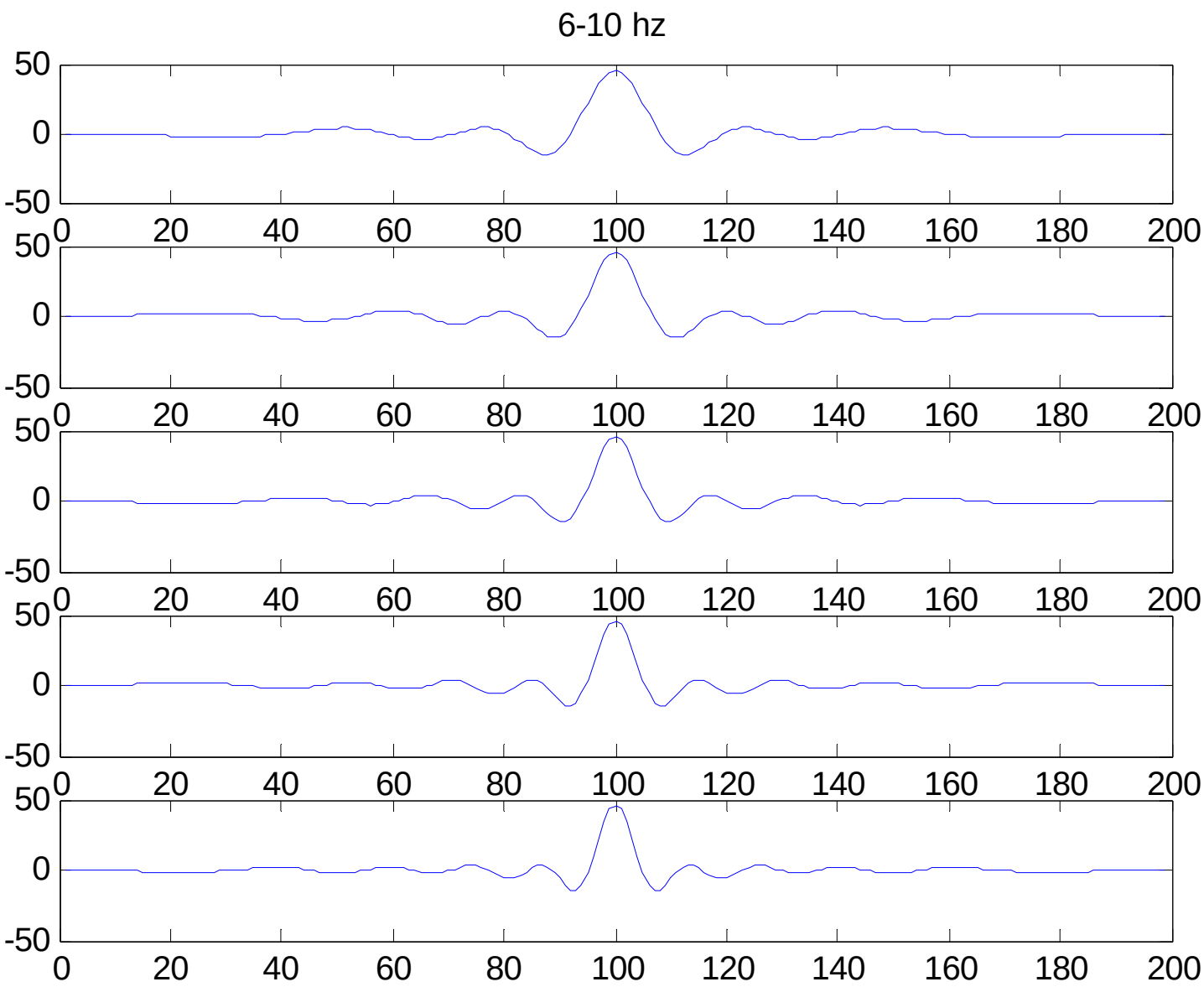
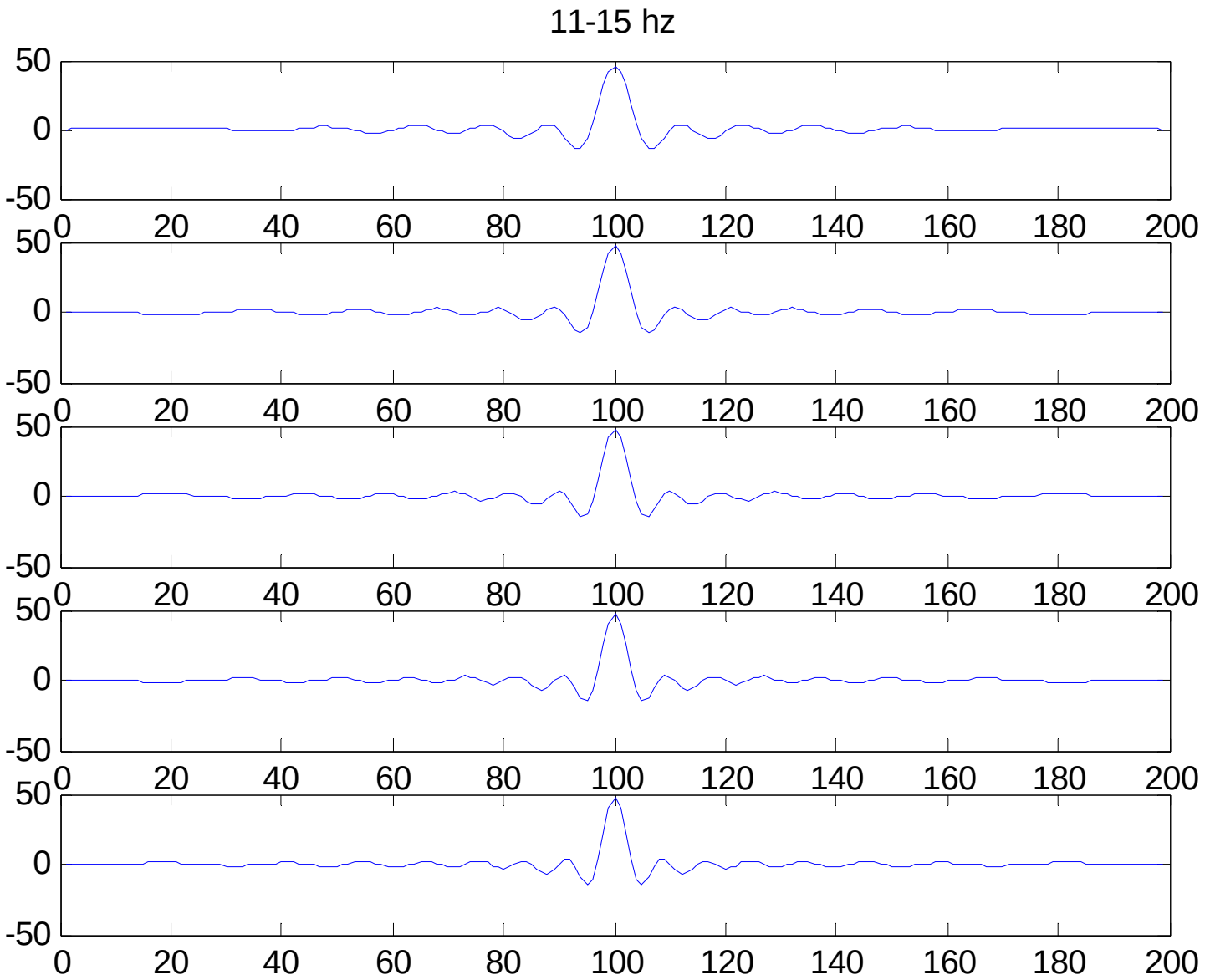

1
0.5
0
0-1 hz
0 10 20 30 40 50 60 70 80 90 100
1
0
-1
0-2 hz
0 10 20 30 40 50 60 70 80 90 100
1
0
-1
0-3 hz
0 10 20 30 40 50 60 70 80 90 100
1
0
-1
0-4 hz
0 10 20 30 40 50 60 70 80 90 100
1
0
-1
0-5 hz
0 10 20 30 40 50 60 70 80 90 100


1
0
-1
0 10 20 30 40 50 60 70 80 90 100
0-6 hz
0-7 hz
0-8 hz
0-9 hz
0-10 hz

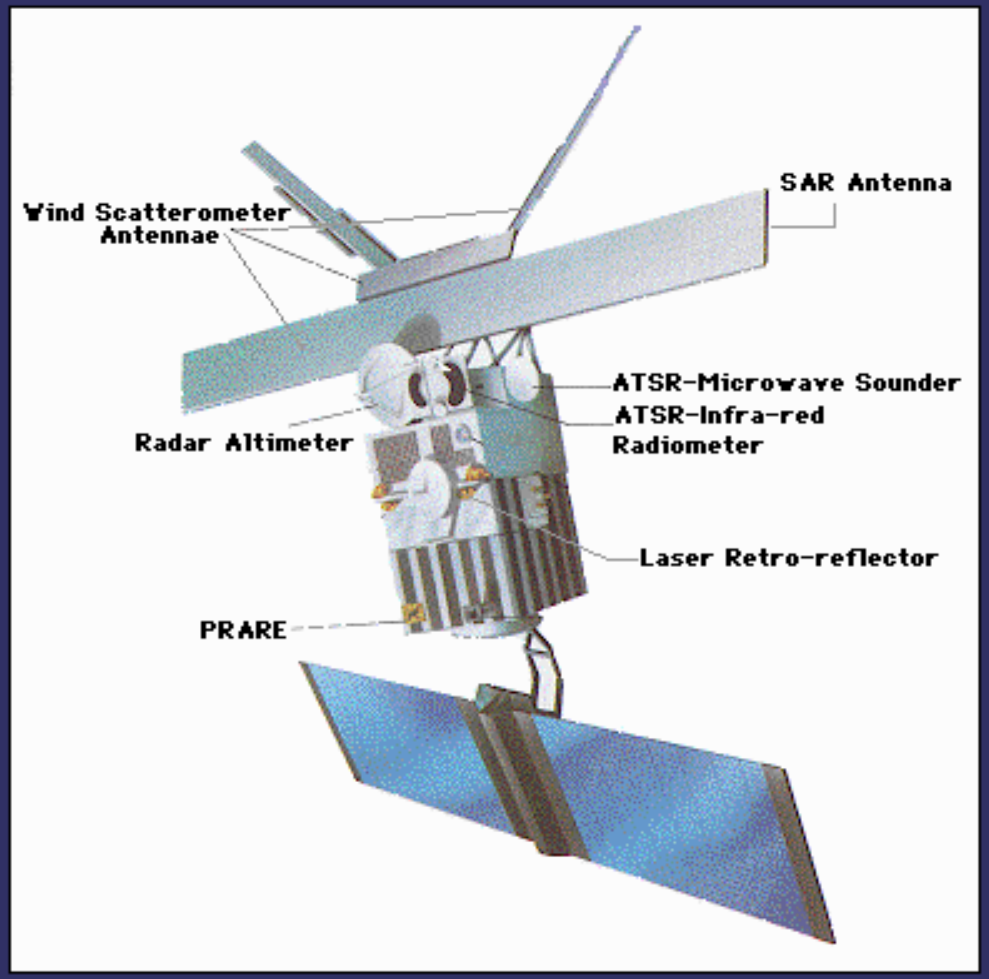

1
0
-1
0 10 20 30 40 50 60 70 80 90 100
0-11 hz
0-12 hz
0-13 hz
0-14 hz
0-15 hz


1-5 hz
40
20
0
0 20 40 60 80 100 120 140 160 180 200
50
0
-50
0 20 40 60 80 100 120 140 160 180 200
50
0
-50
0 20 40 60 80 100 120 140 160 180 200
50
0
-50
0 20 40 60 80 100 120 140 160 180 200
50
0
-50
0 20 40 60 80 100 120 140 160 180 200

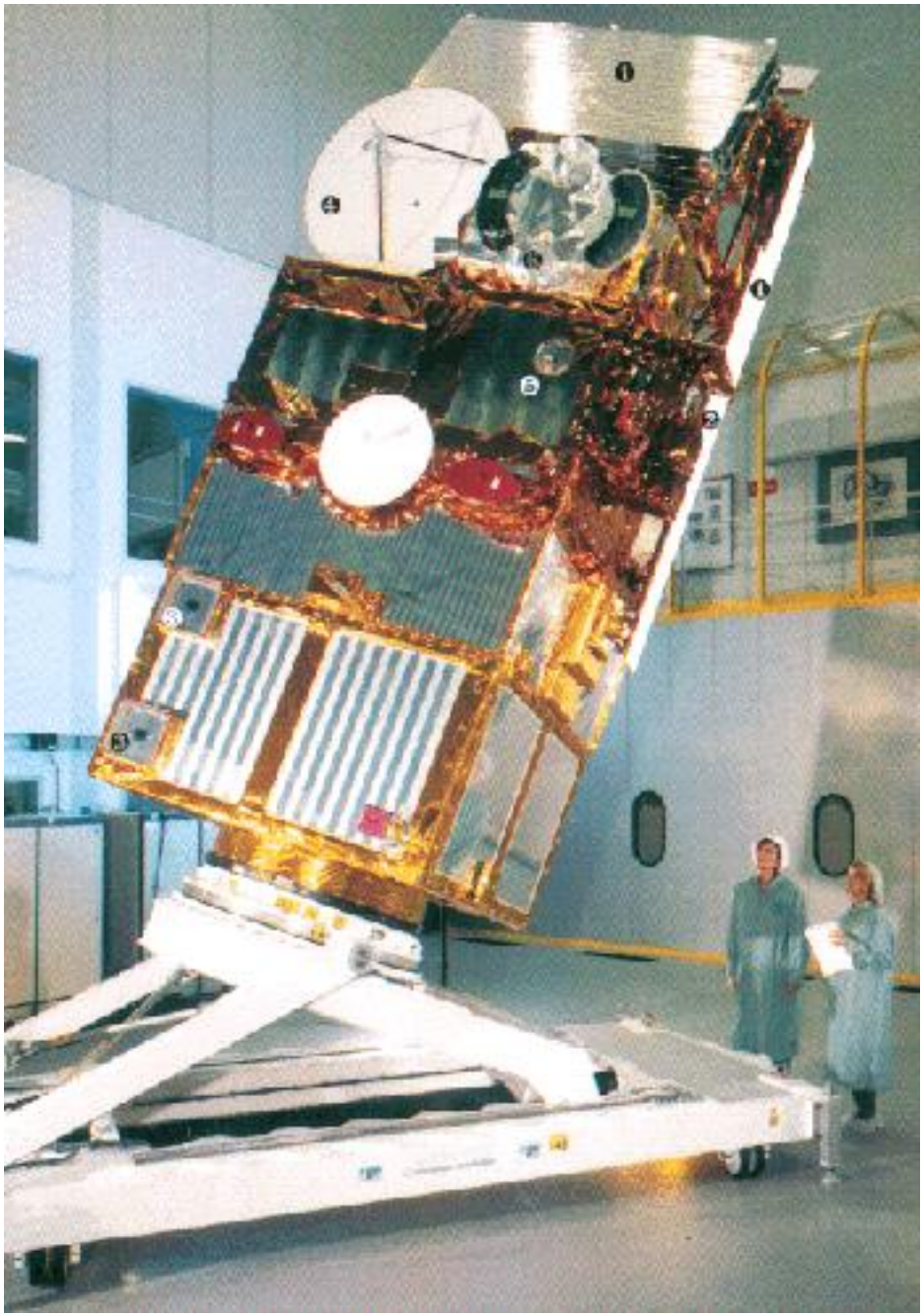

6-10 hz
50
0
-50
0
20
40
60
80
100
120
140
160
180
200

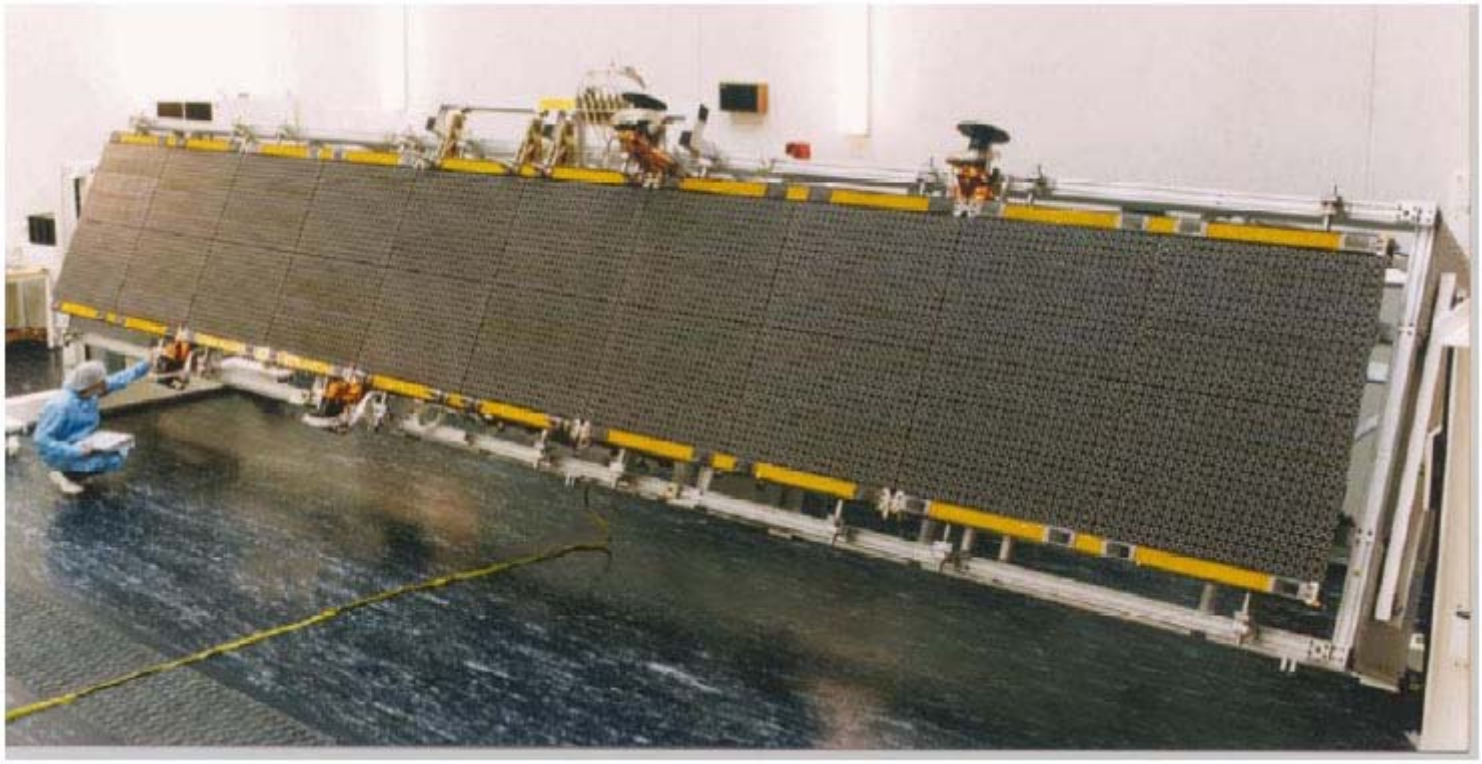

11-15 hz
50
0
-50
0
20
40
60
80
100
120
140
160
180
200

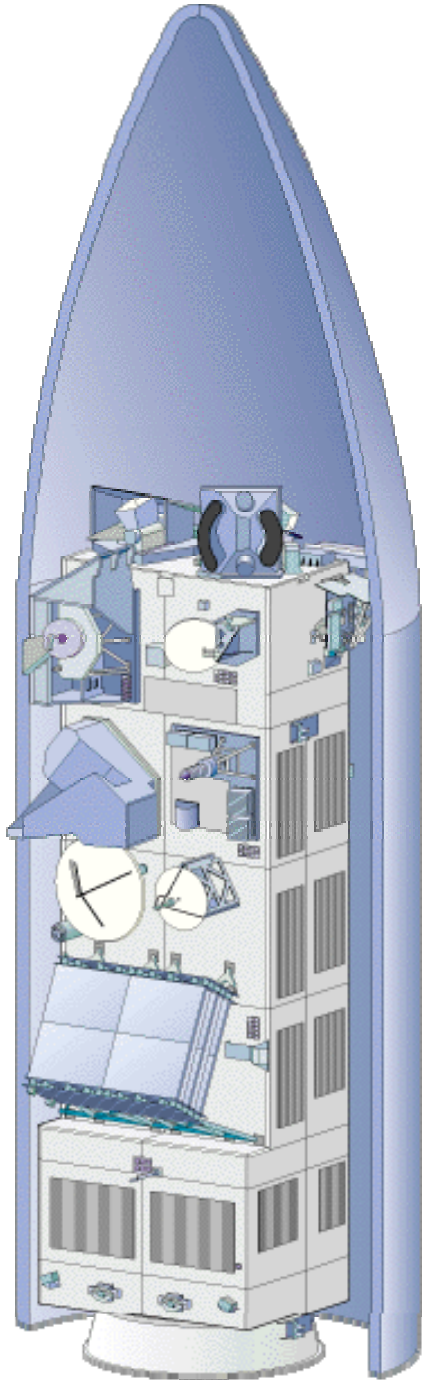
ERS-1

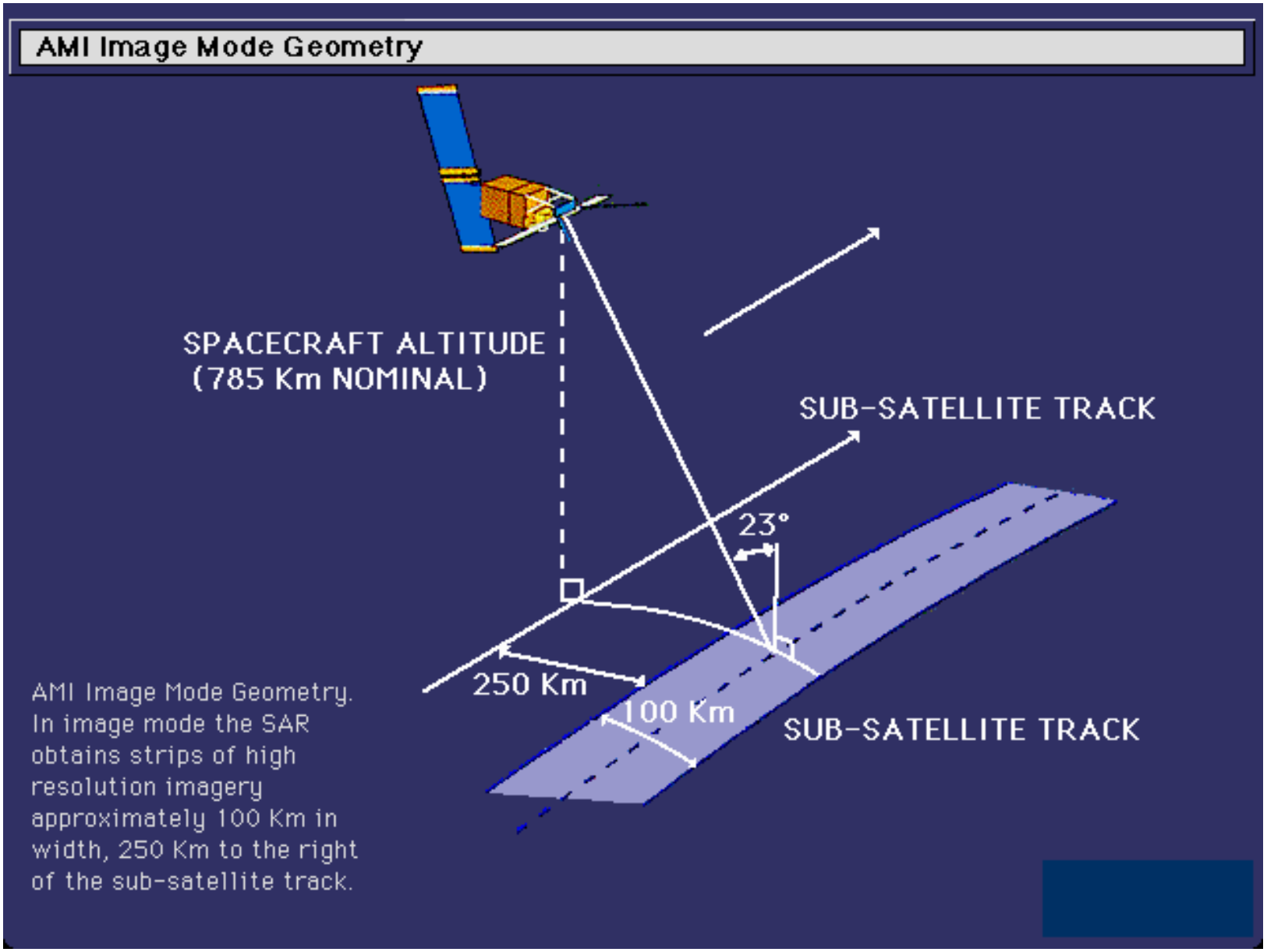


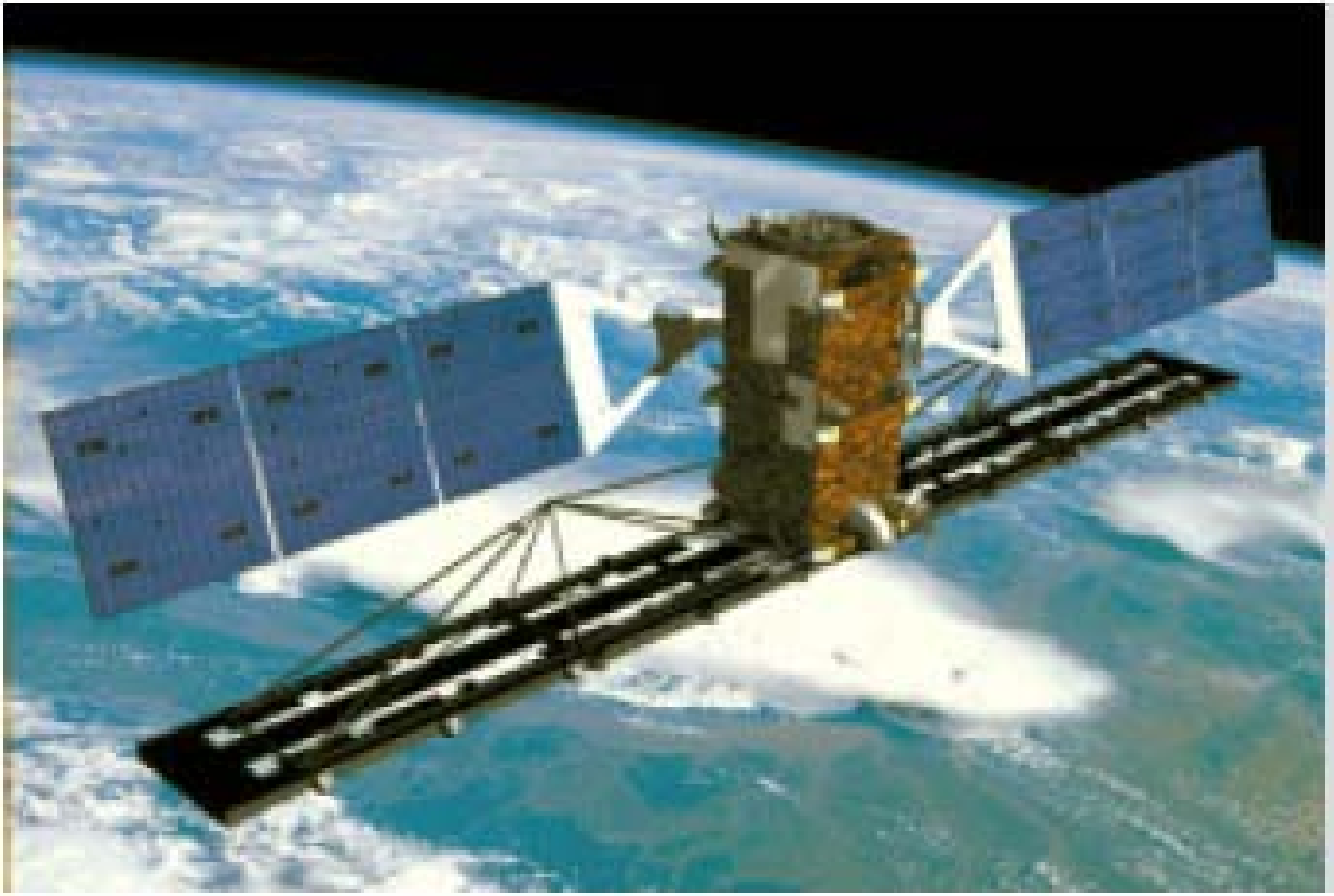
ERS-1 Payload

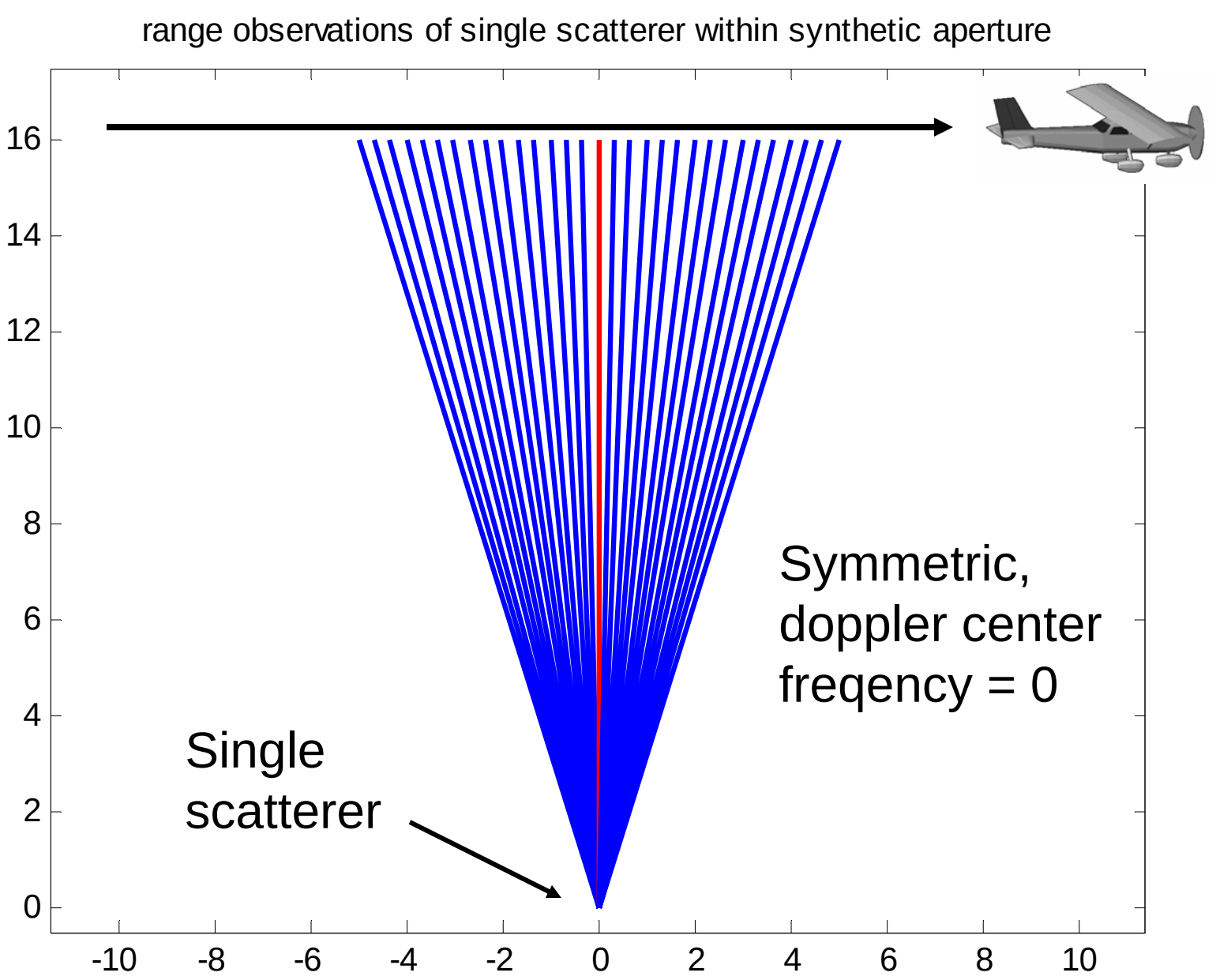


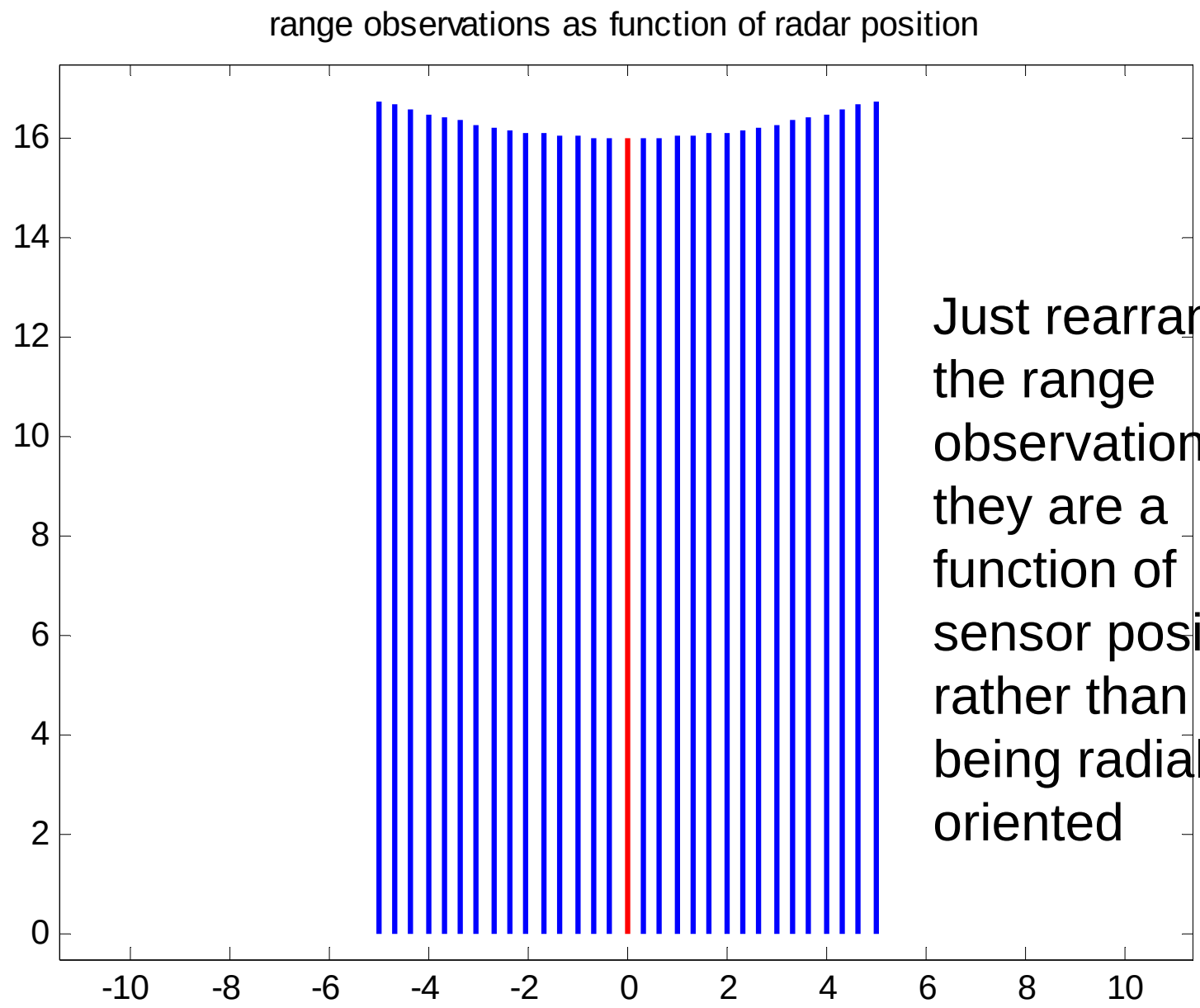




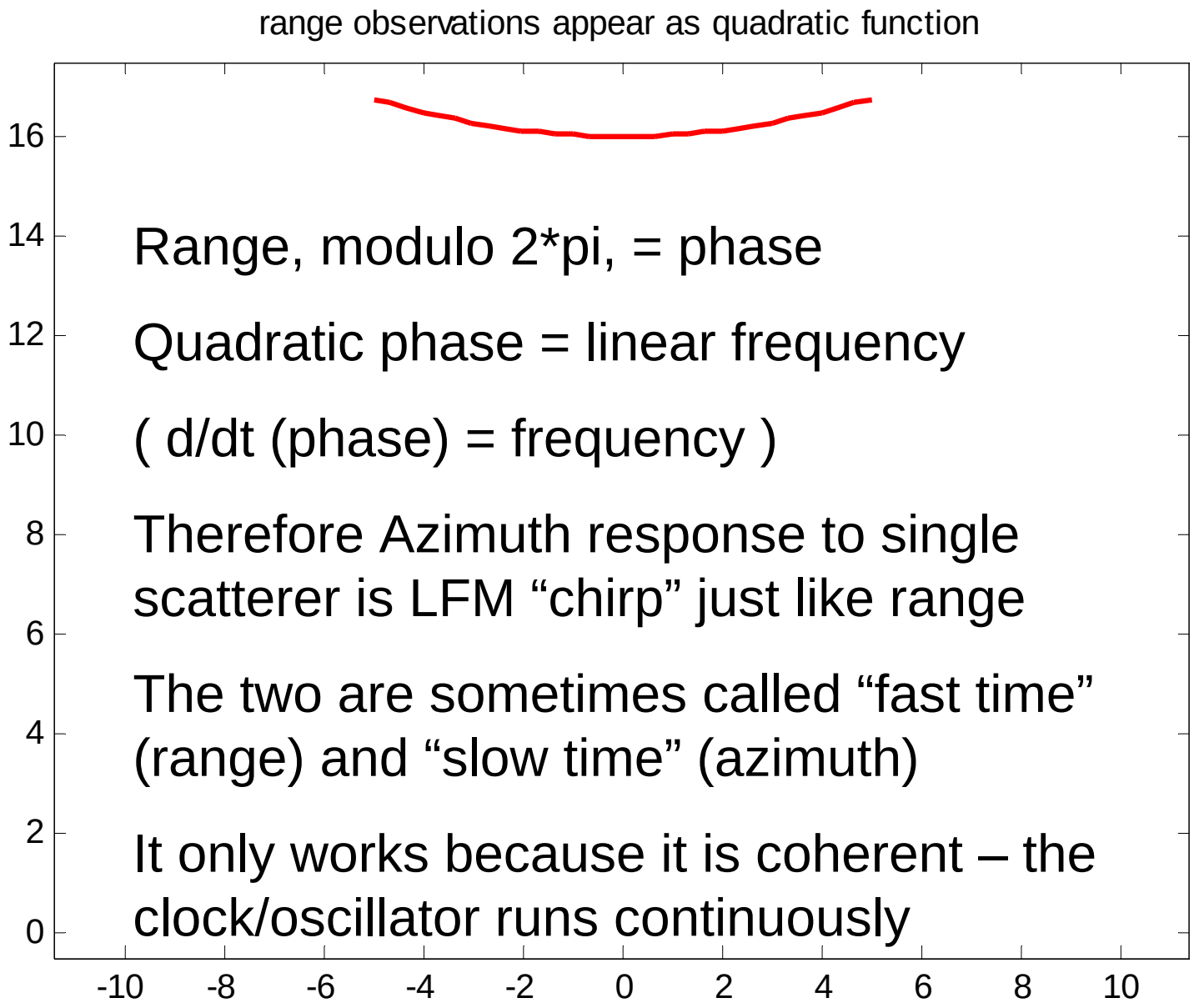

AMI Image Mode Geometry
SPACECRAFT ALTITUDE
(785 Km NOMINAL)
SUB-SATELLITE TRACK
23°
250 Km
100 Km
SUB-SATELLITE TRACK
AMI Image Mode Geometry.
In image mode the SAR
obtains strips of high
resolution imagery
approximately 100 Km in
width, 250 Km to the right
of the sub-satellite track.

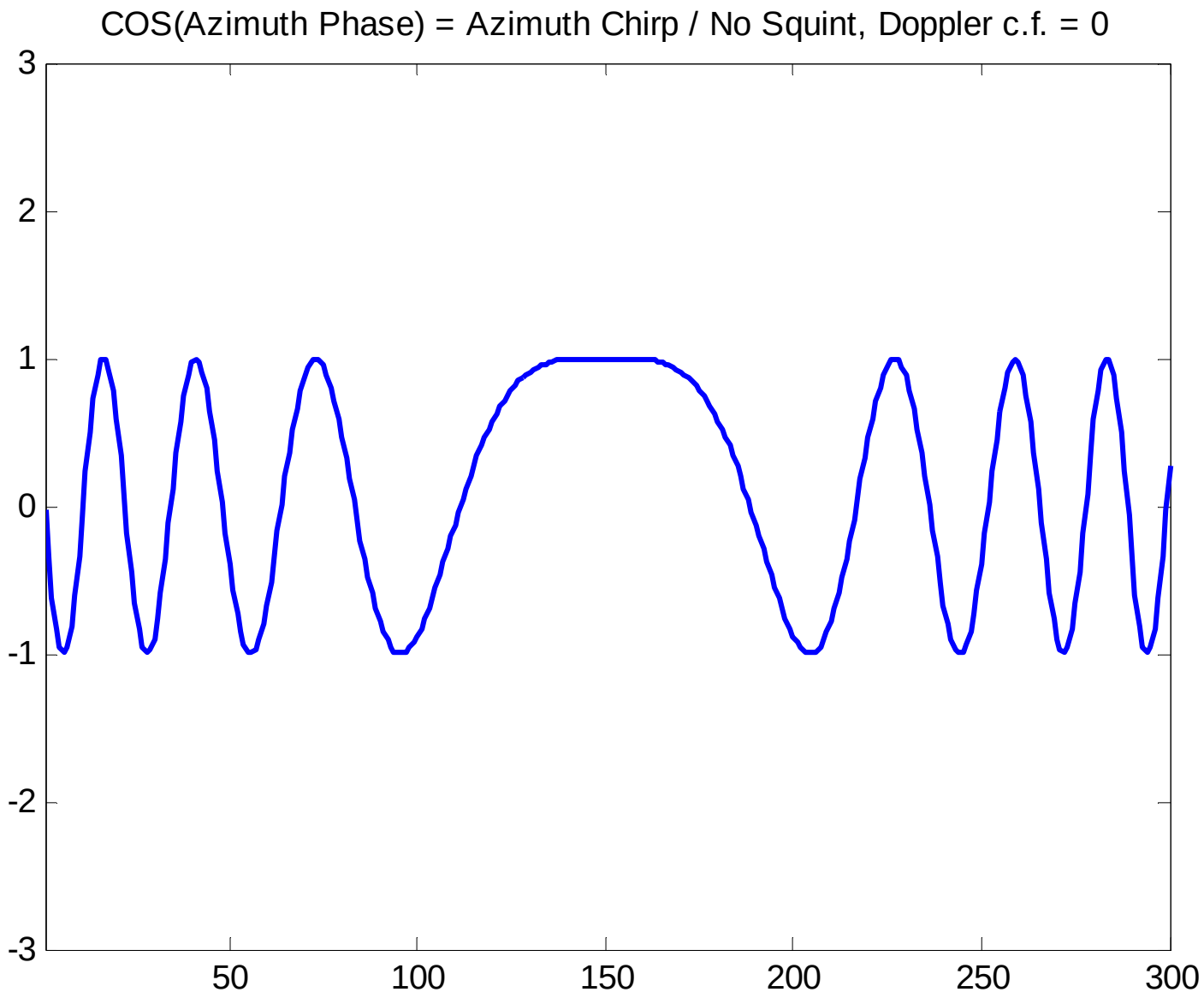


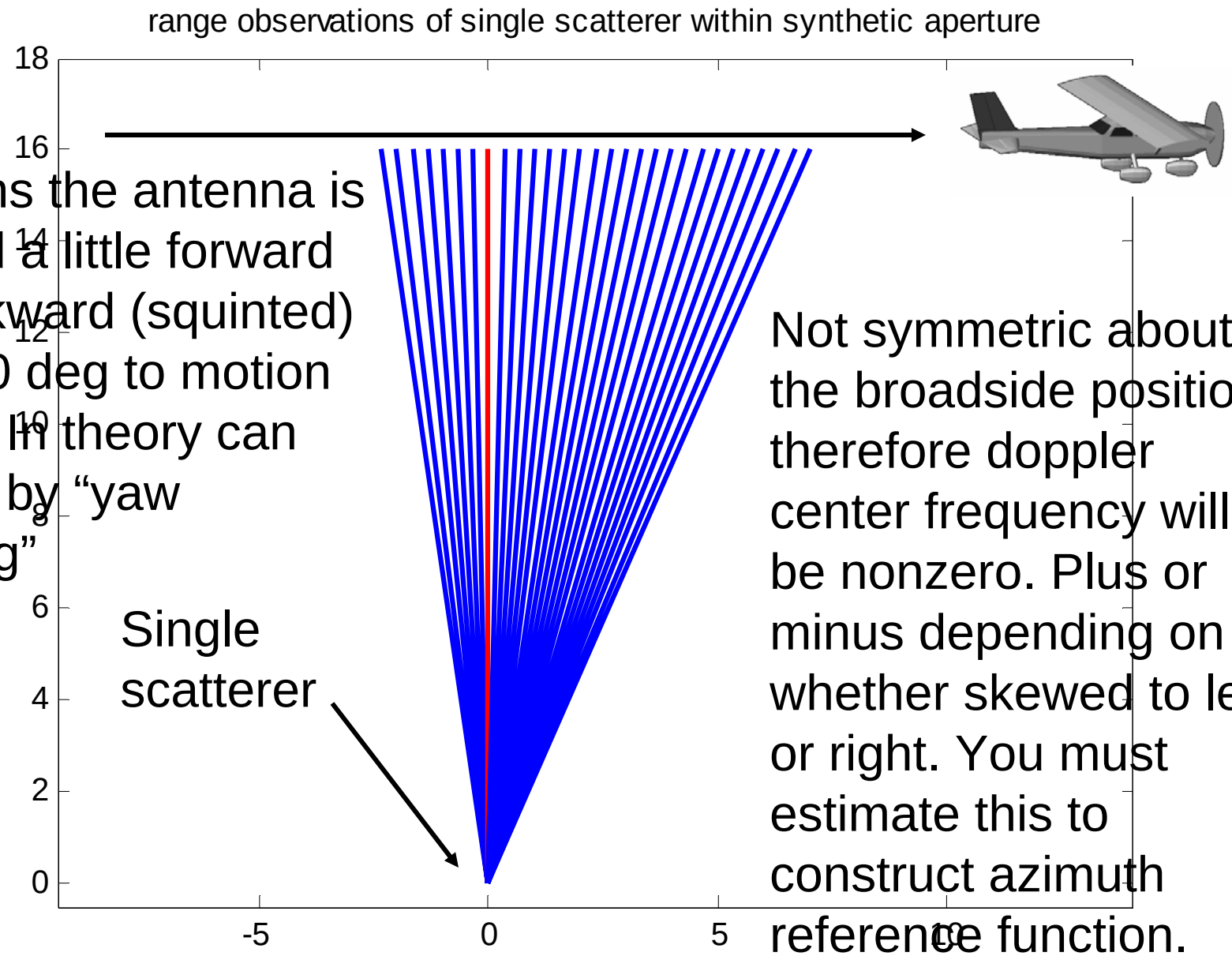

range observations of single scatterer within synthetic aperture
16
14
12
10
8
6
4
2
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
Symmetric,
doppler center
freqency = 0
Single
scatterer



Just rearrange the range observations so they are a function of sensor position rather than being radially oriented

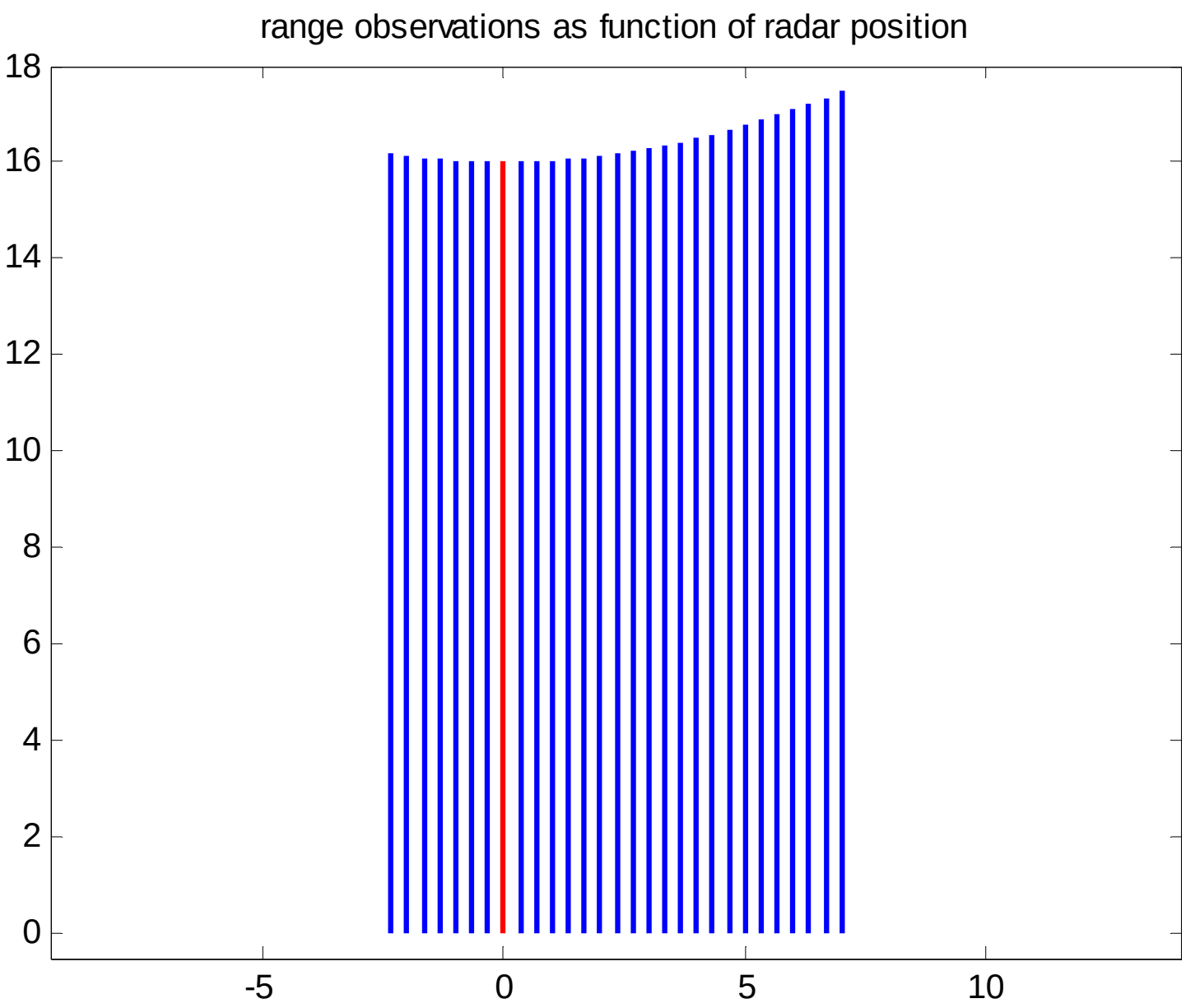

range observations appear as quadratic function
16
14
12
10
8
6
4
2
0
-10
-8
-6
-4
-2
0
2
4
6
8
10
Range, modulo 2*pi, = phase
Quadratic phase = linear frequency
(d/dt (phase) = frequency)
Therefore Azimuth response to single scatterer is LFM “chirp” just like range
The two are sometimes called “fast time” (range) and “slow time” (azimuth)
It only works because it is coherent – the clock/oscillator runs continuously

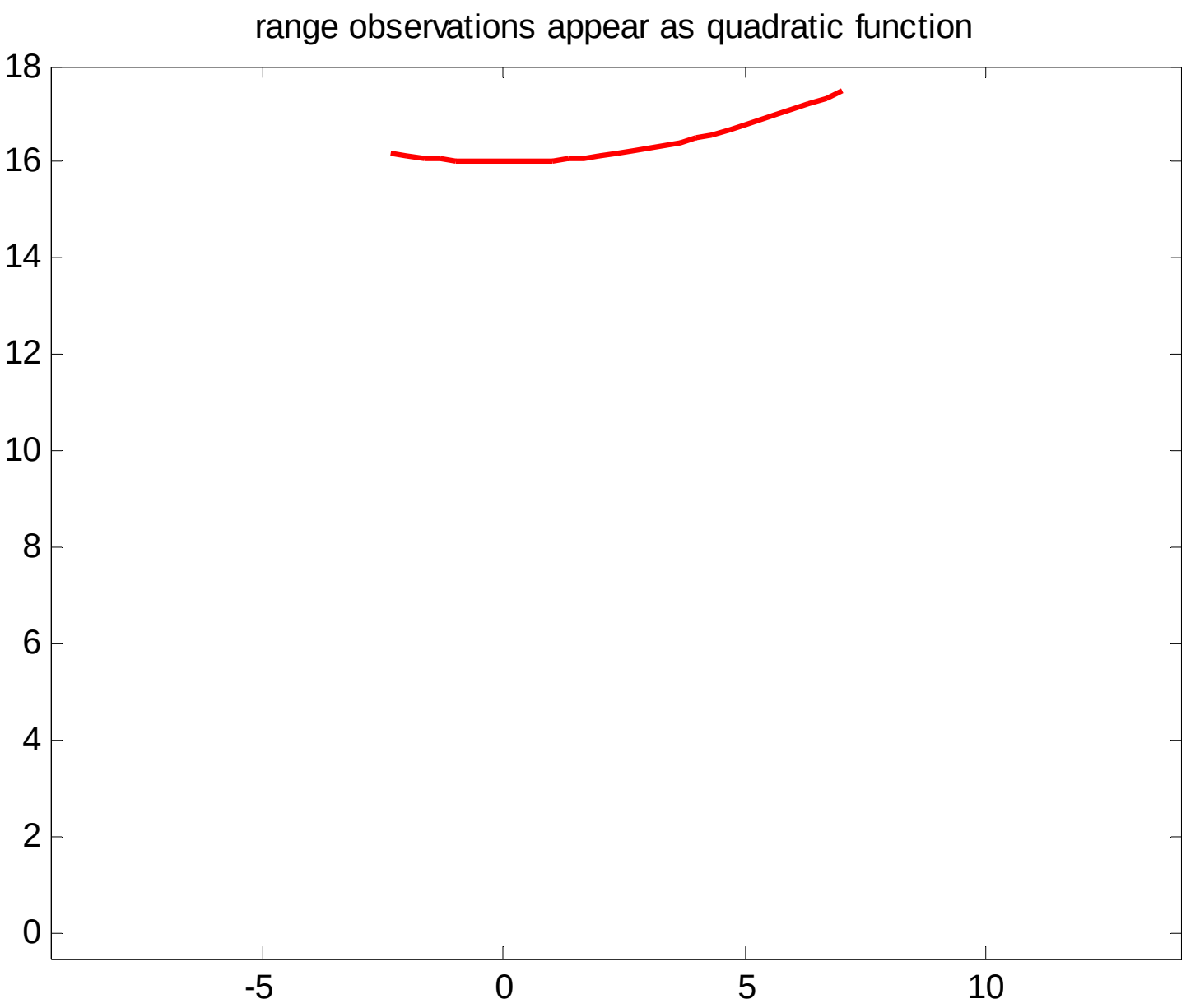

COS(Azimuth Phase) = Azimuth Chirp / No Squint, Doppler c.f. = 0
3
2
1
0
-1
-2
-3
50
100
150
200
250
300

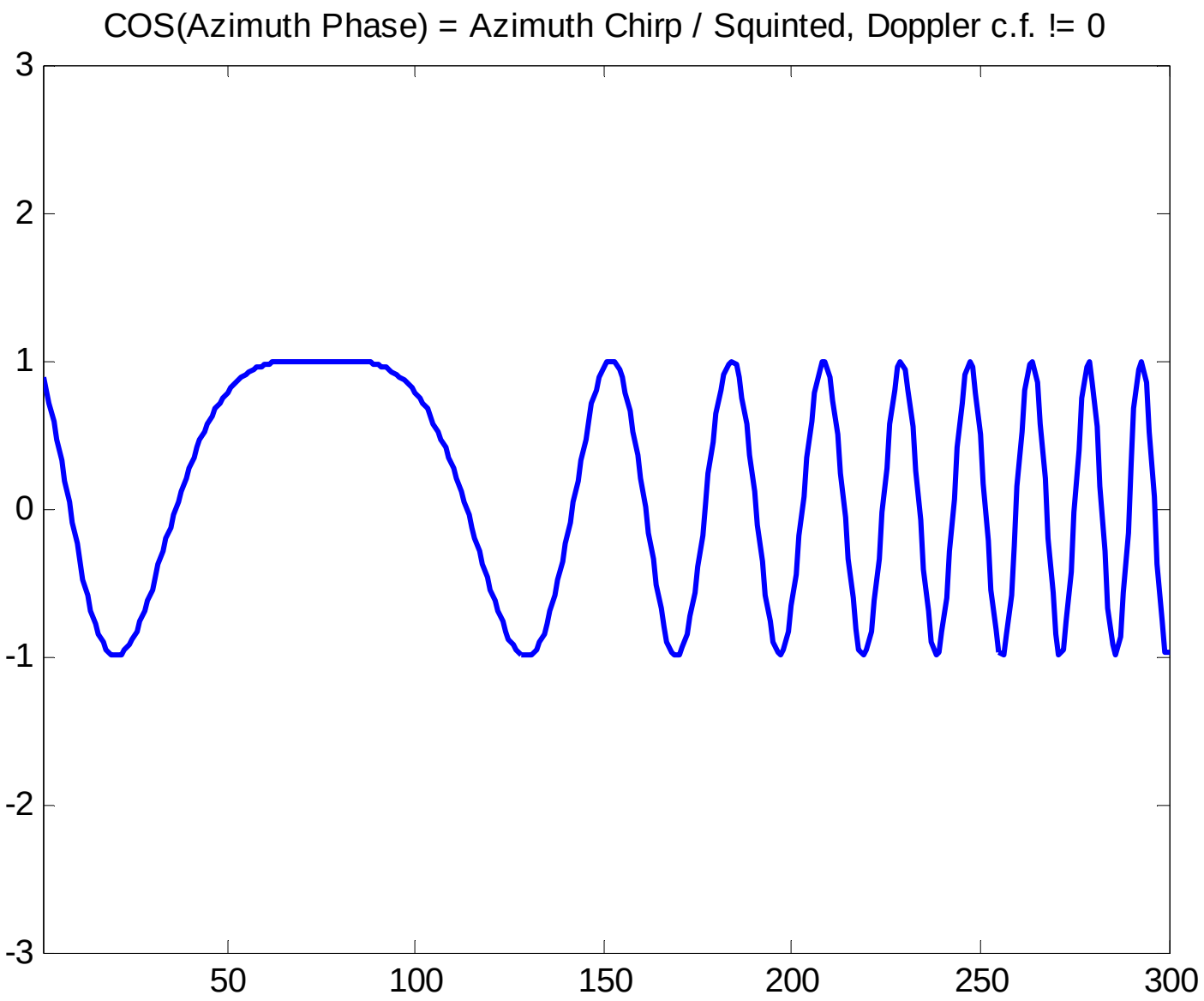


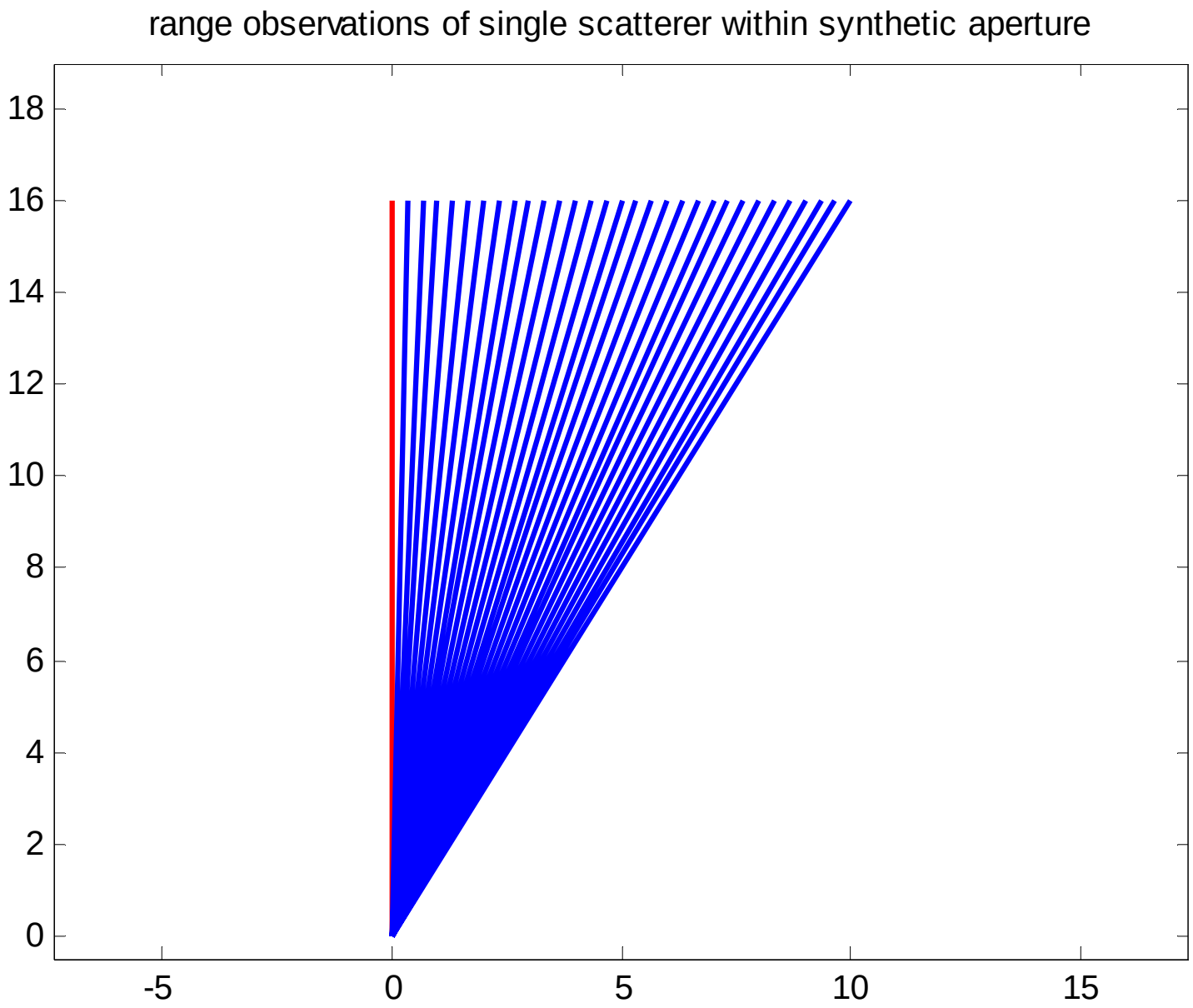
It means the antenna is pointed a little forward or backward (squinted) from 90 deg to motion vector. In theory can control by “yaw steering”

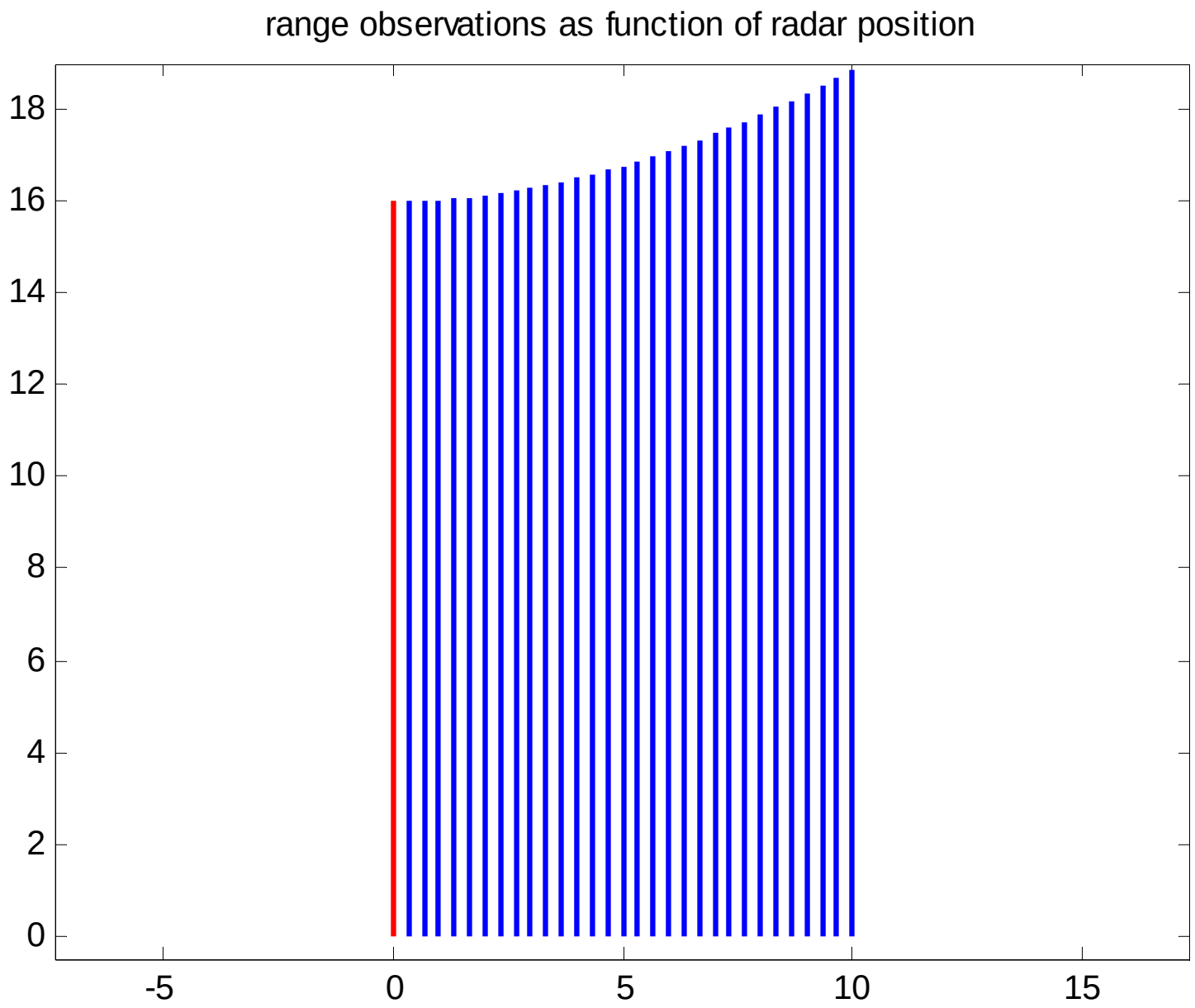
Not symmetric about the broadside position, therefore doppler center frequency will be nonzero. Plus or minus depending on whether skewed to left or right. You must estimate this to construct azimuth reference function.

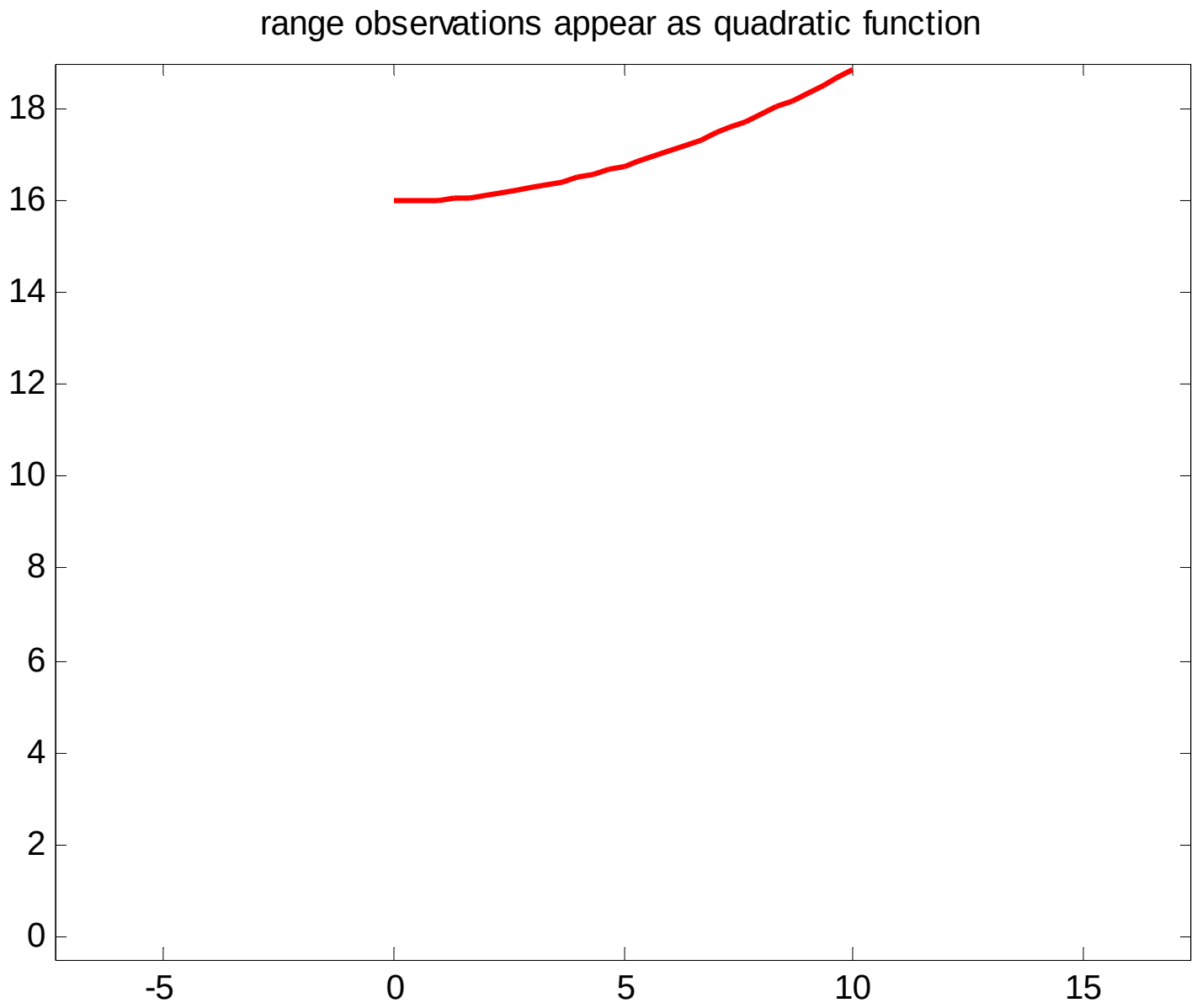

range observations as function of radar position
18
16
14
12
10
8
6
4
2
0
-5
0
5
10

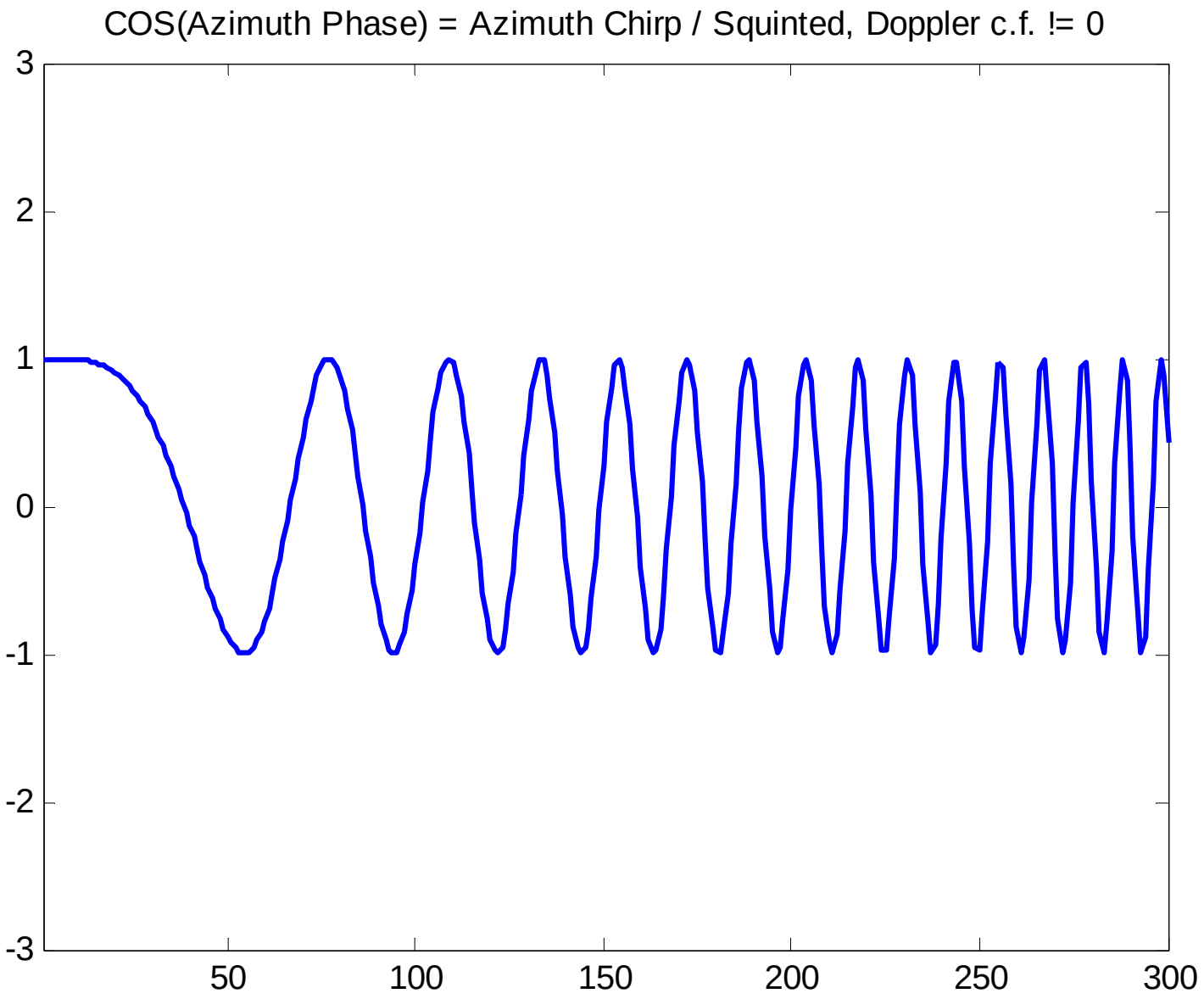

range observations appear as quadratic function
18
16
14
12
10
8
6
4
2
0
-5
0
5
10

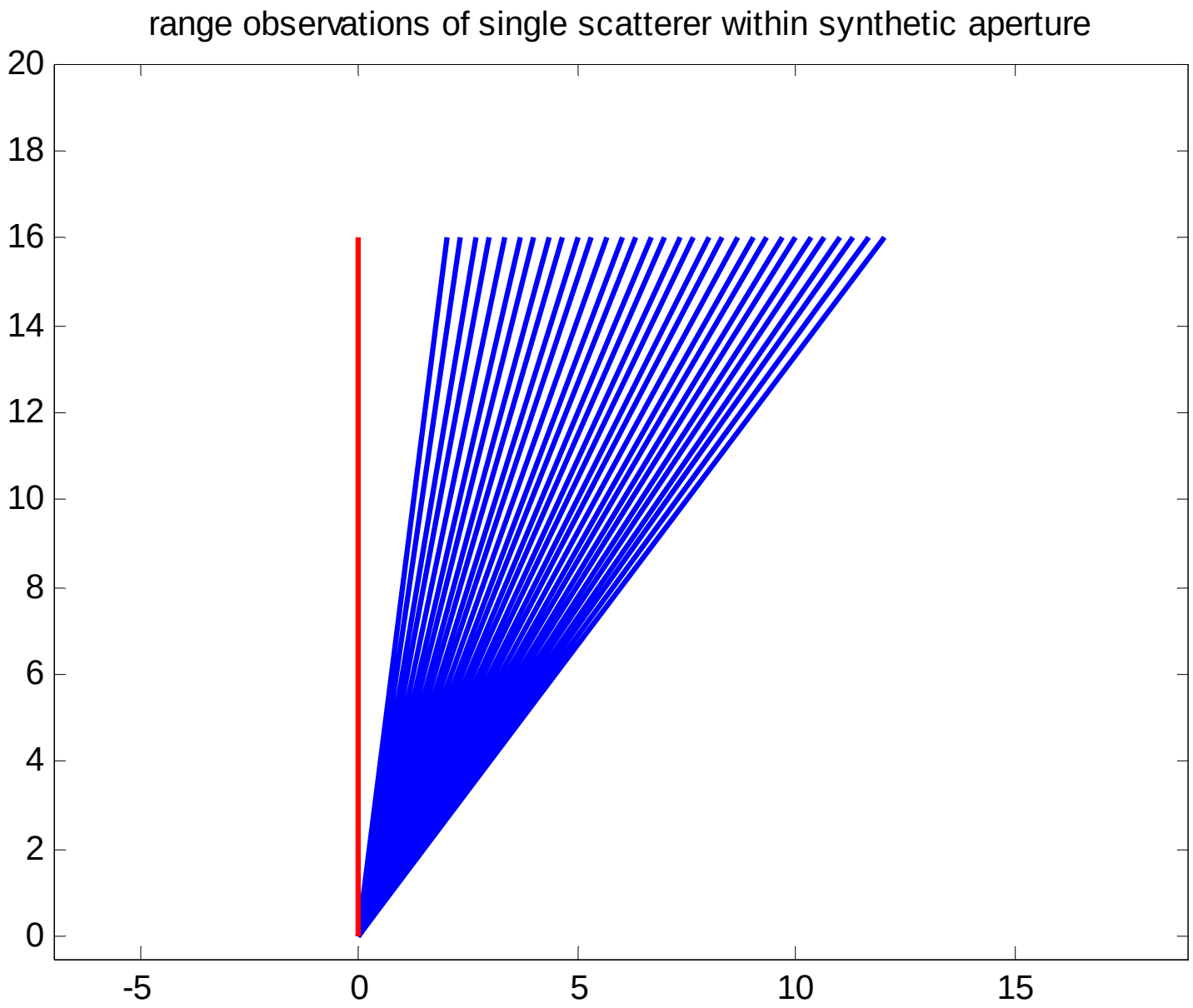

COS(Azimuth Phase) = Azimuth Chirp / Squinted, Doppler c.f. != 0
3
2
1
0
-1
-2
-3
50
100
150
200
250
300

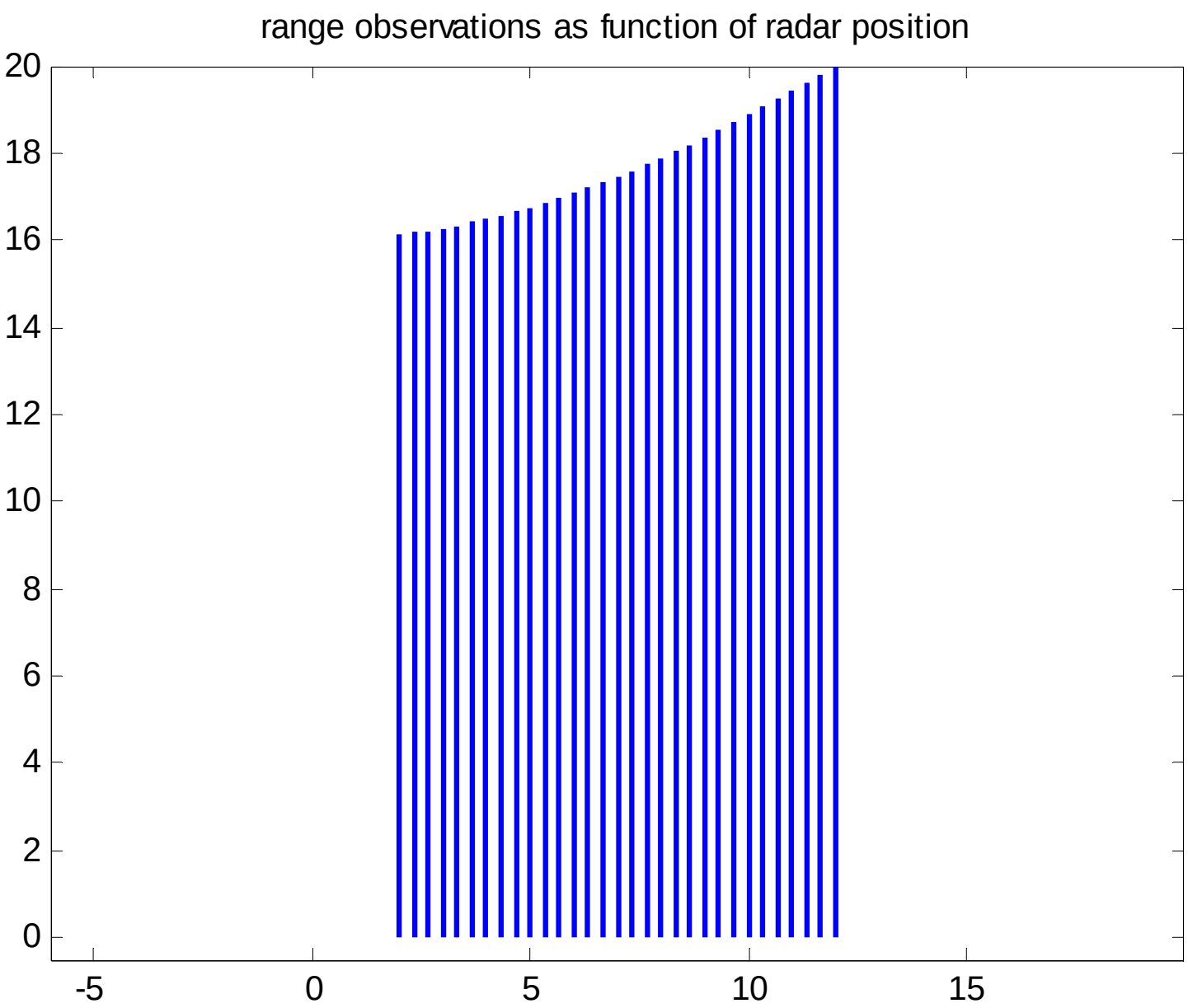

range observations of single scatterer within synthetic aperture
18
16
14
12
10
8
6
4
2
0
-5
0
5
10
15

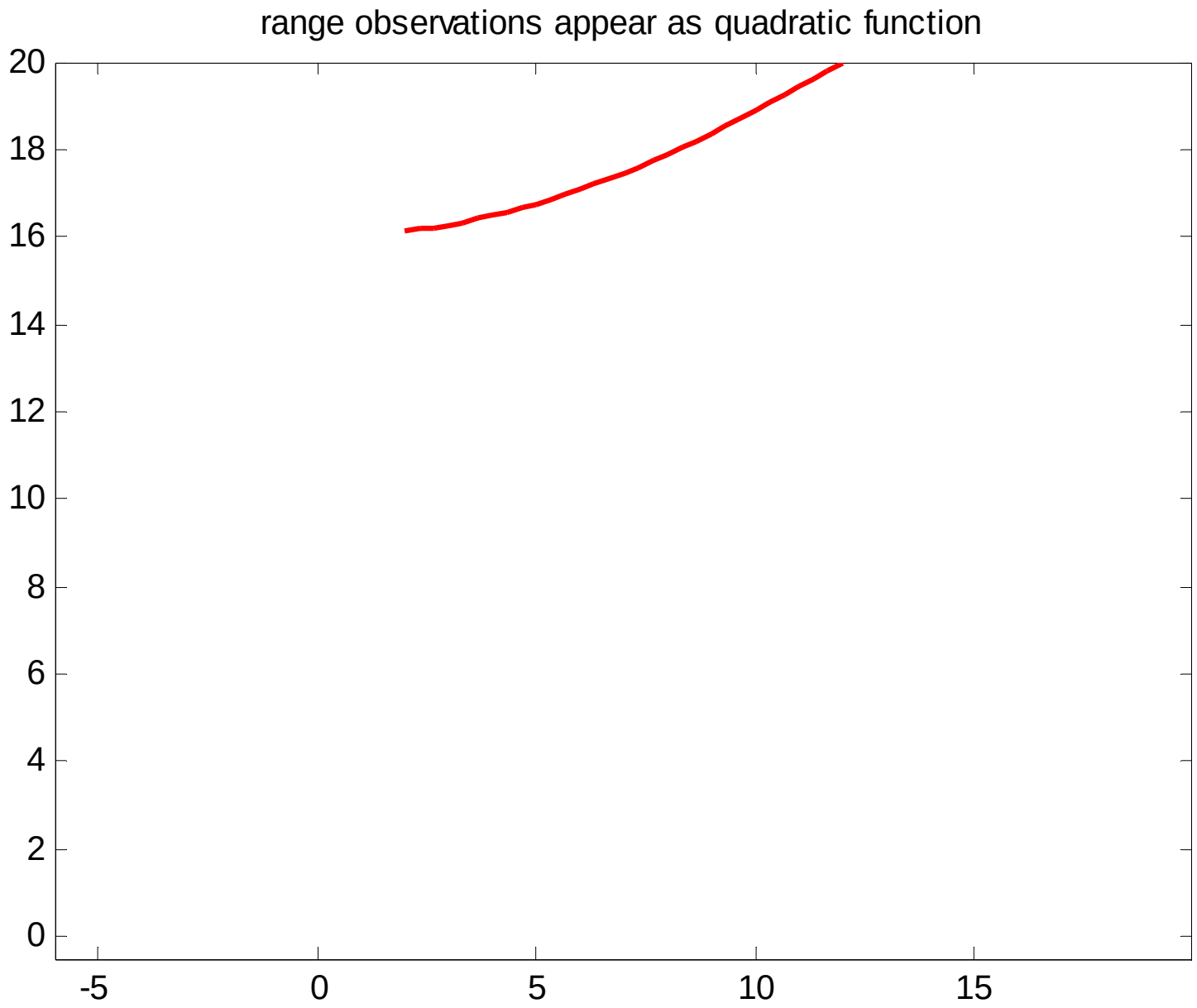

range observations as function of radar position
18
16
14
12
10
8
6
4
2
0
-5
0
5
10
15

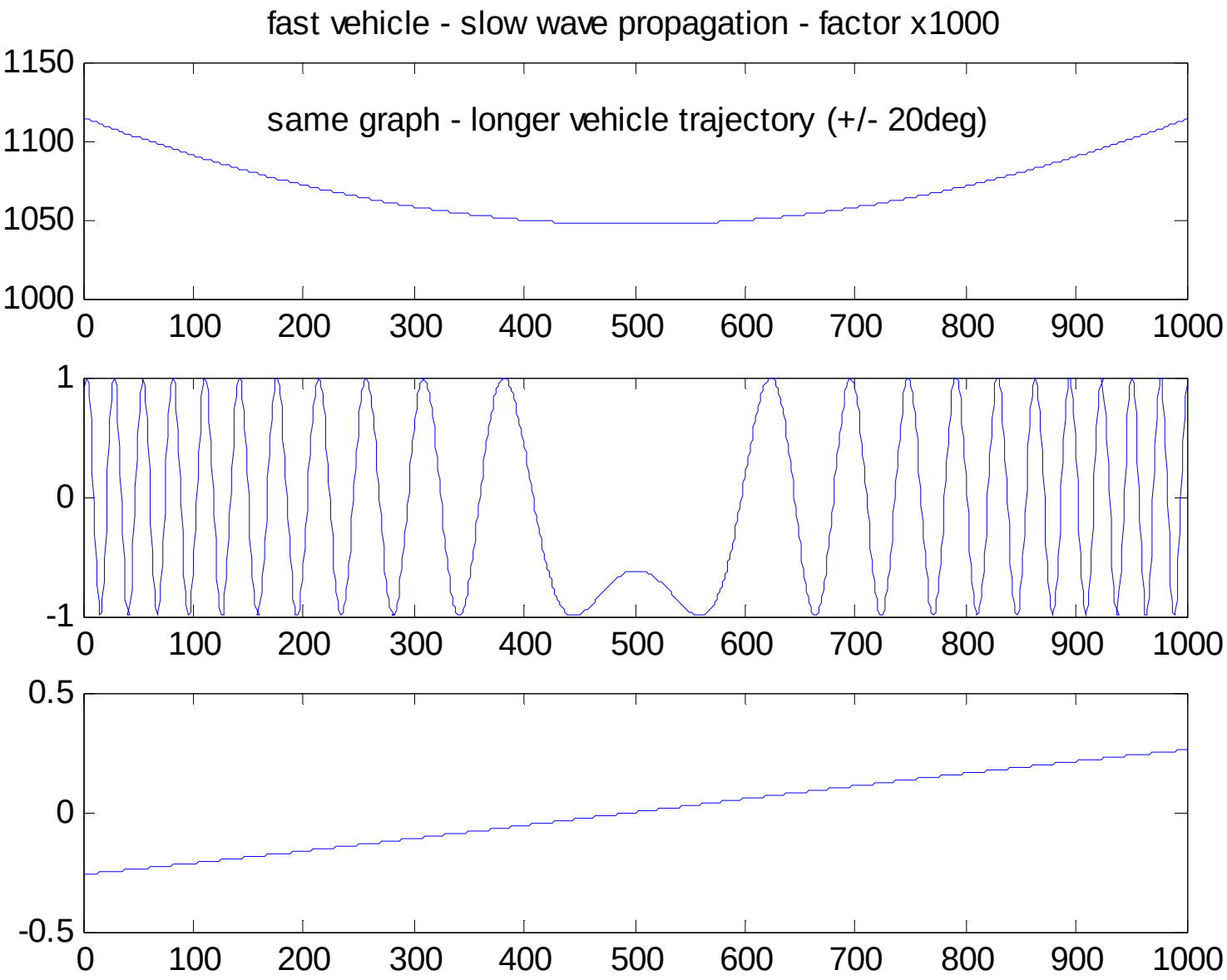

range observations appear as quadratic function
18
16
14
12
10
8
6
4
2
0
-5
0
5
10
15

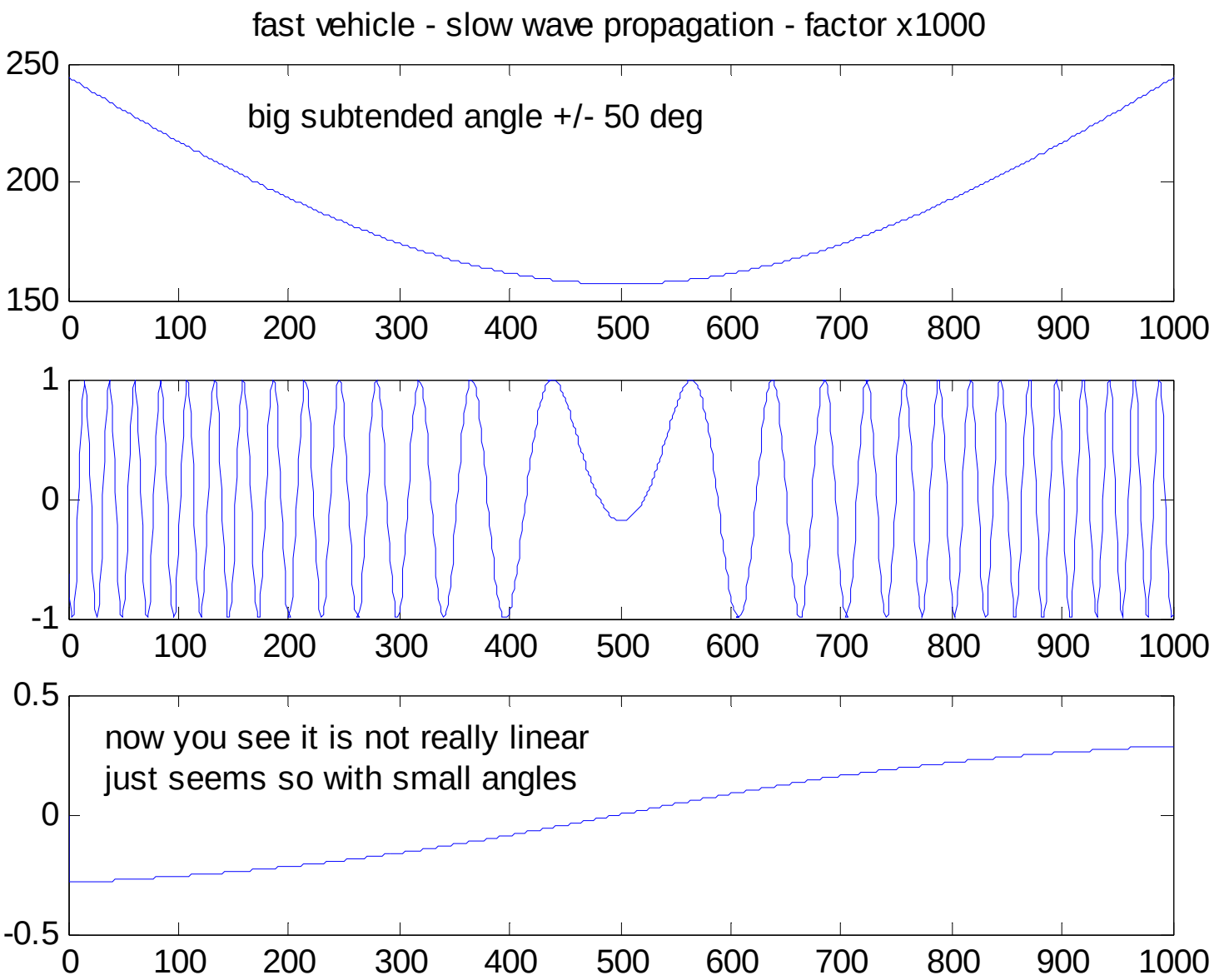

COS(Azimuth Phase) = Azimuth Chirp / Squinted, Doppler c.f. != 0
3
2
1
0
-1
-2
-3
50
100
150
200
250
300


range observations of single scatterer within synthetic aperture
20
18
16
14
12
10
8
6
4
2
0
-5
0
5
10
15


range observations as function of radar position
20
18
16
14
12
10
8
6
4
2
0
-5
0
5
10
15


range observations appear as quadratic function
20
18
16
14
12
10
8
6
4
2
0
-5
0
5
10
15


fast vehicle - slow wave propagation - factor x1000
same graph - longer vehicle trajectory (+/- 20deg)
1150
1100
1050
1000
1
0
-1
0.5
0
-0.5
0
100
200
300
400
500
600
700
800
900
1000


fast vehicle - slow wave propagation - factor x1000
250
200
150
big subtended angle +/- 50 deg
0
100
200
300
400
500
600
700
800
900
1000
1
0
-1
0.5
0
-0.5
now you see it is not really linear
just seems so with small angles