Contents

Chapter 1

GaAs spacer thickness

Simulations with varying GaAs spacer thickness are shown in figures 1.1–1.21. The figures are arranged by increasing thickness, from 60 nm to 80 nm.
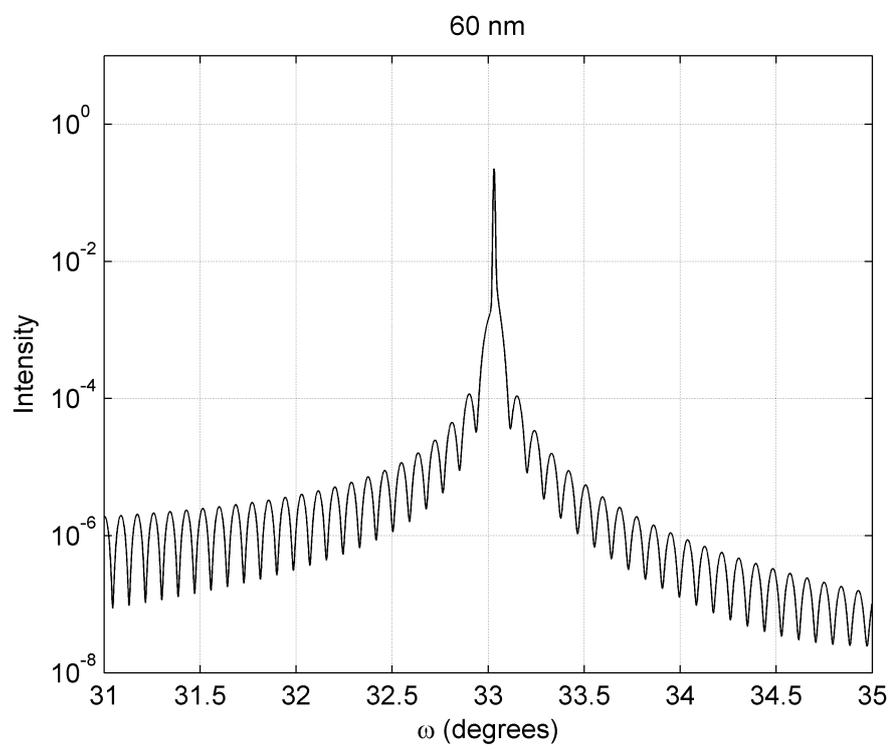
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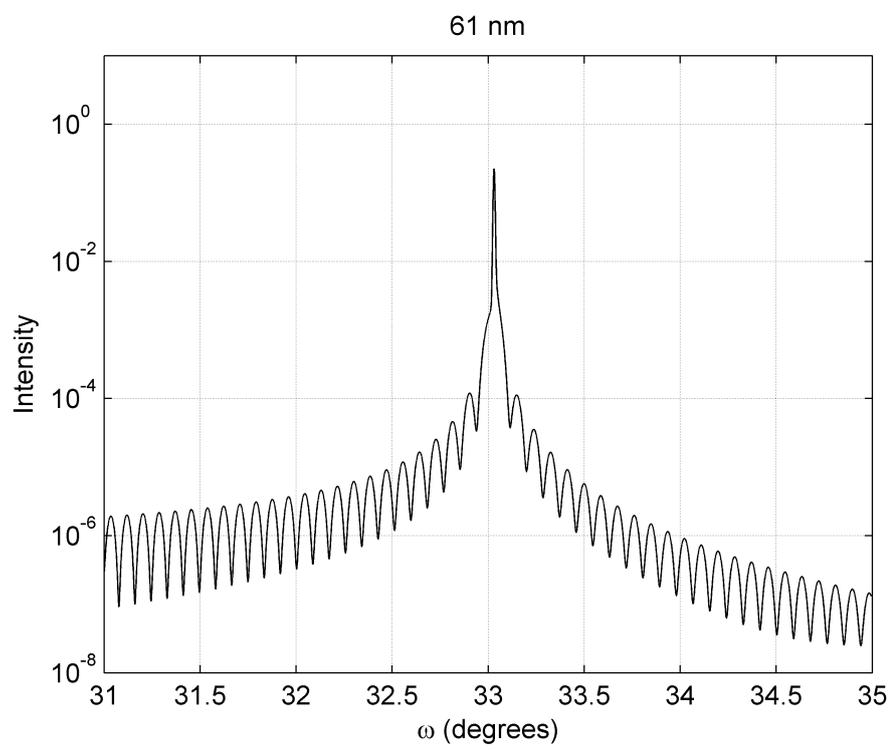
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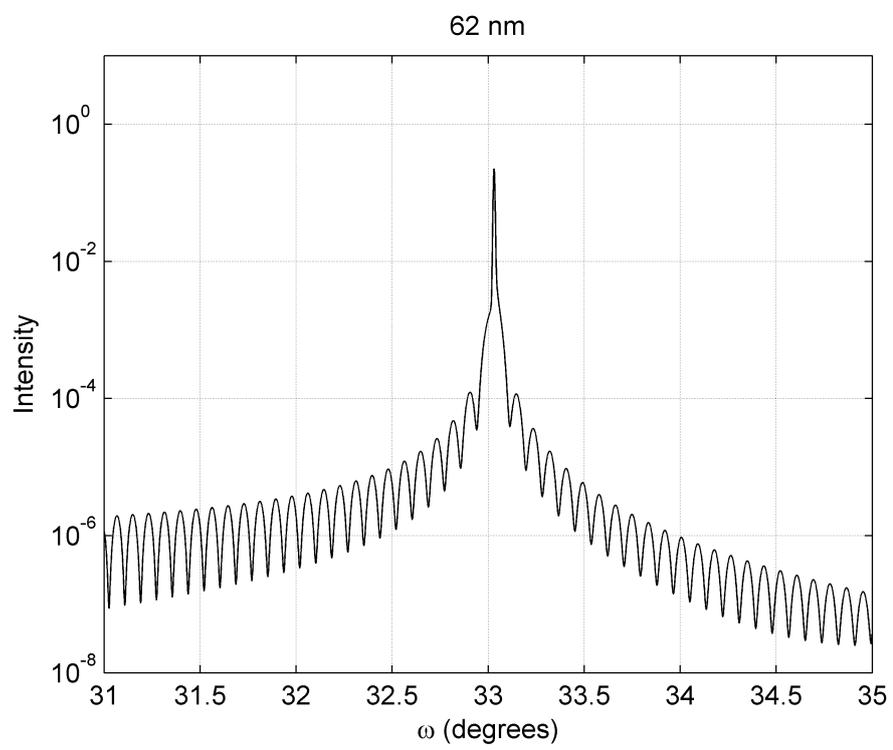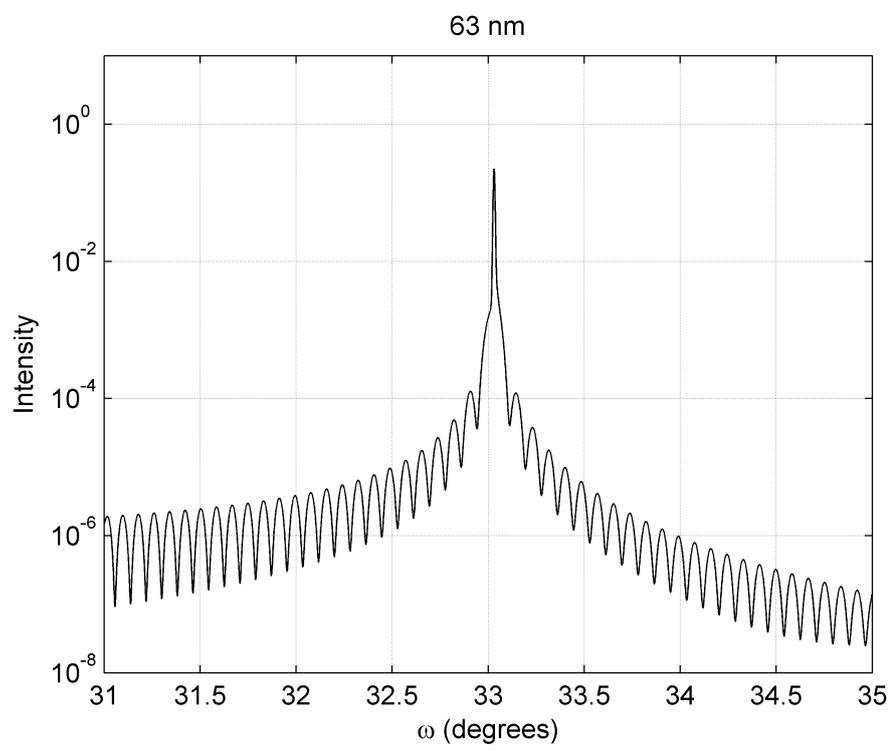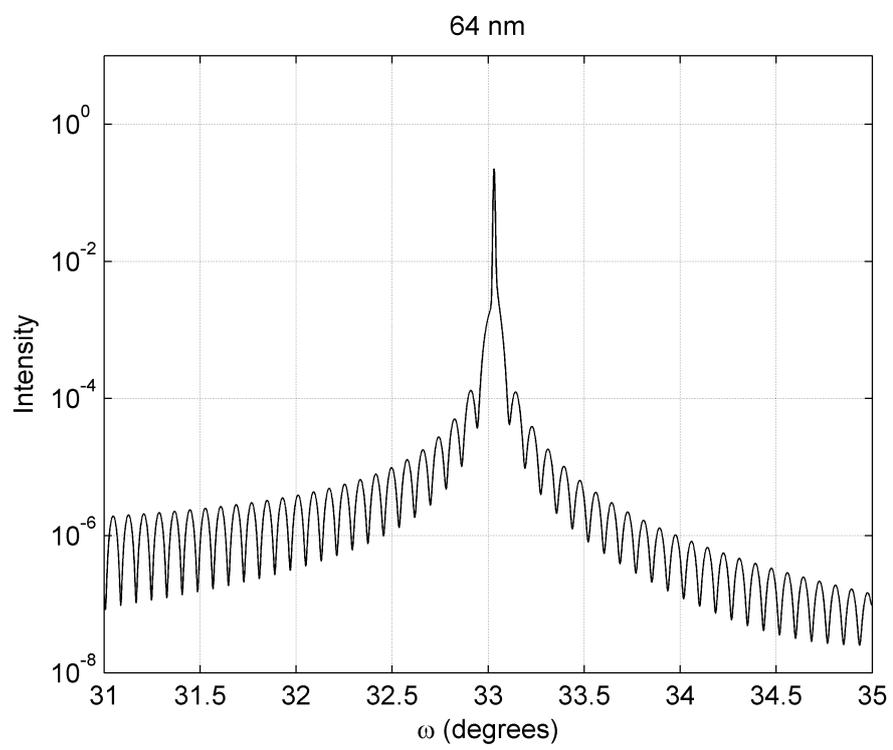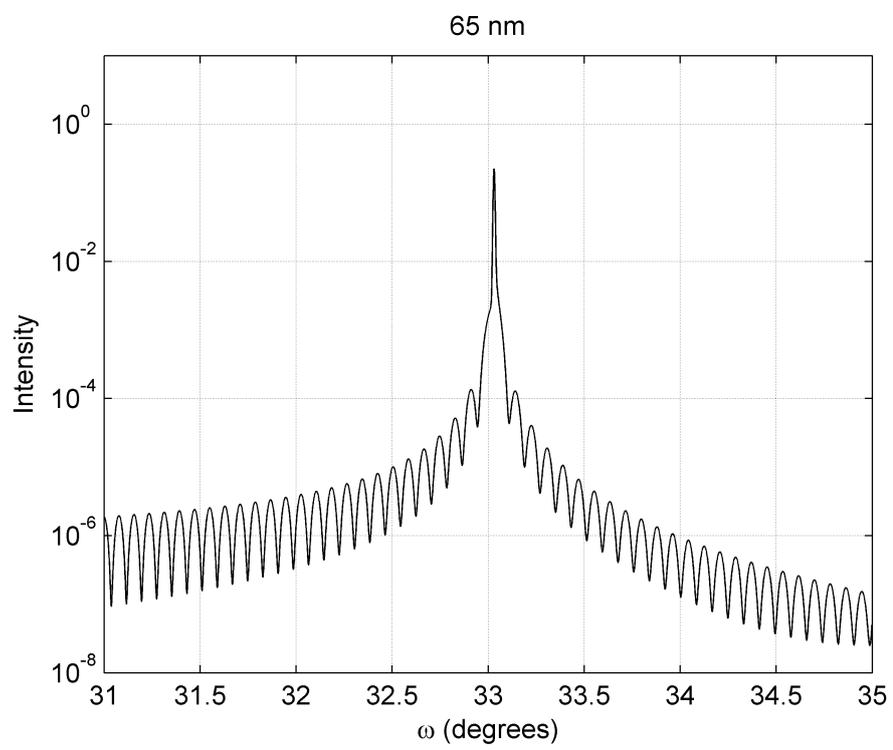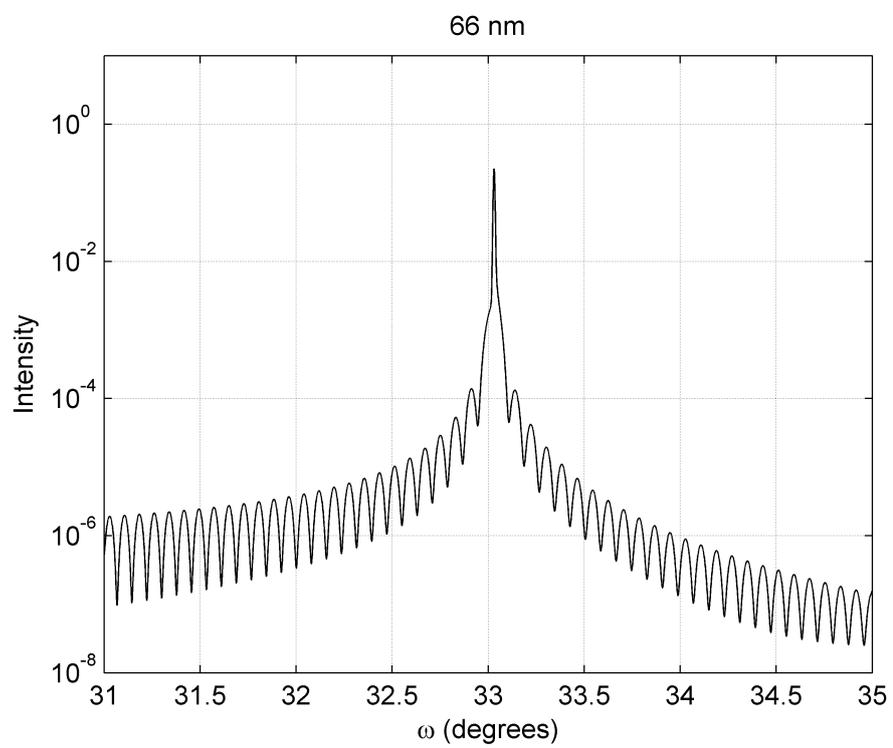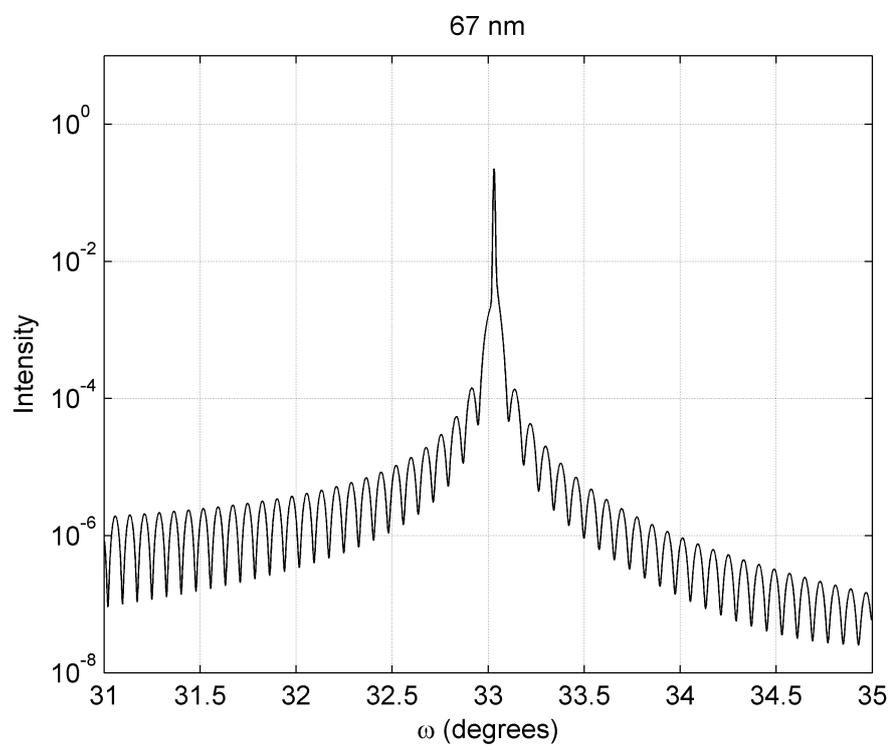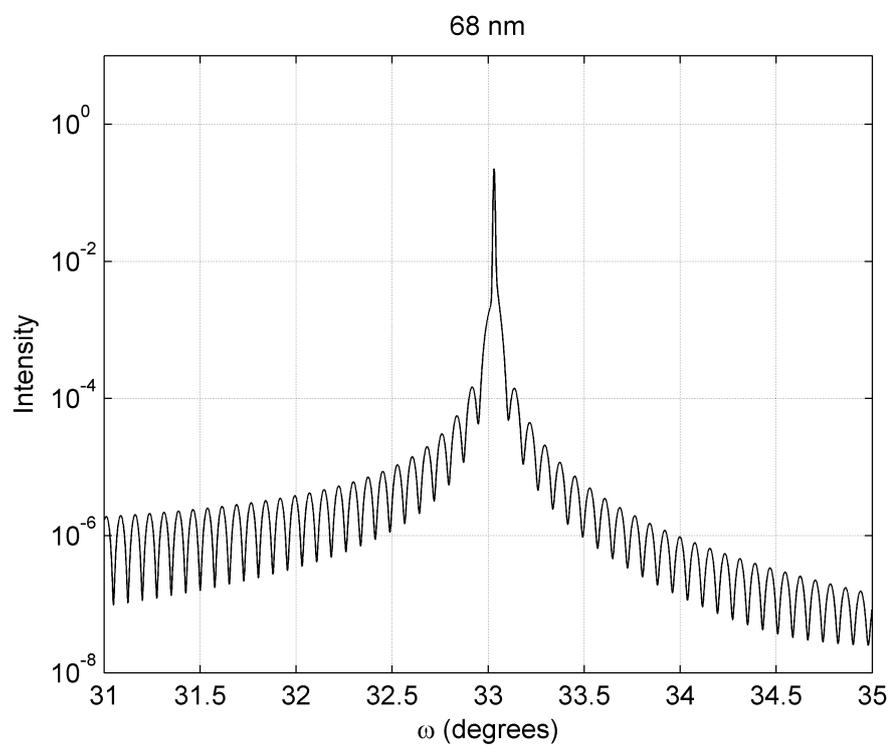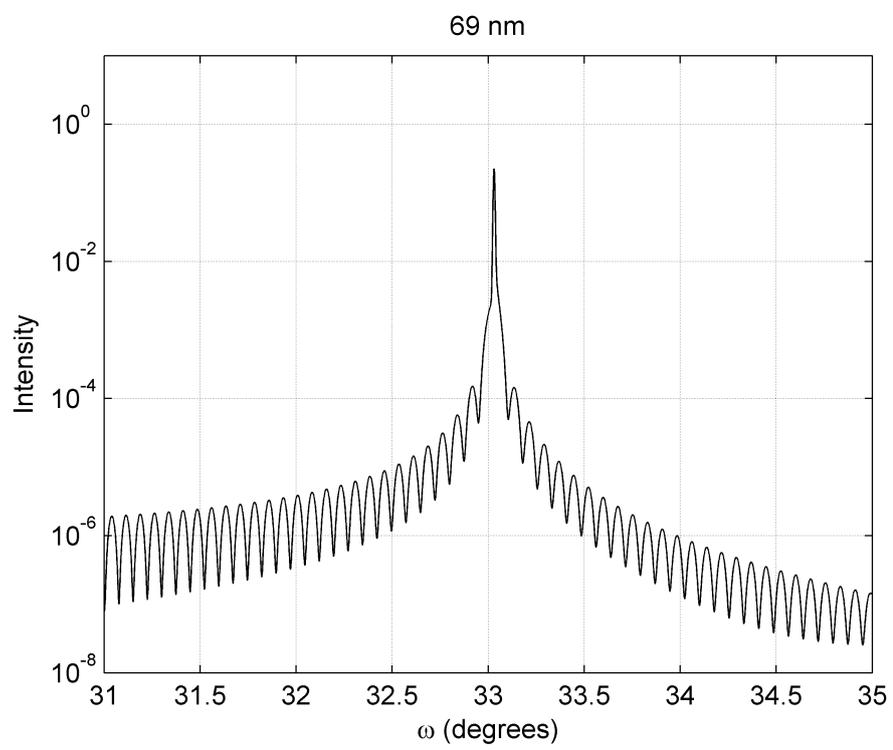
62 nm

Intensity

ω (degrees)

Figure 1.3

Figure 1.4

64 nm

Figure 1.5

65 nm

Intensity

ω (degrees)

Figure 1.6

66 nm

Intensity

ω (degrees)

Figure 1.7

67 nm

Intensity

ω (degrees)

Figure 1.8

68 nm

Intensity

ω (degrees)

Figure 1.9

69 nm

Figure 1.10

70 nm

Figure 1.11

Figure 1.12

72 nm

Figure 1.13

73 nm

Figure 1.14

16

74 nm

Intensity

ω (degrees)

Figure 1.15

75 nm

Intensity

ω (degrees)

Figure 1.16

76 nm

Figure 1.17

Figure 1.18

78 nm

Intensity

ω (degrees)
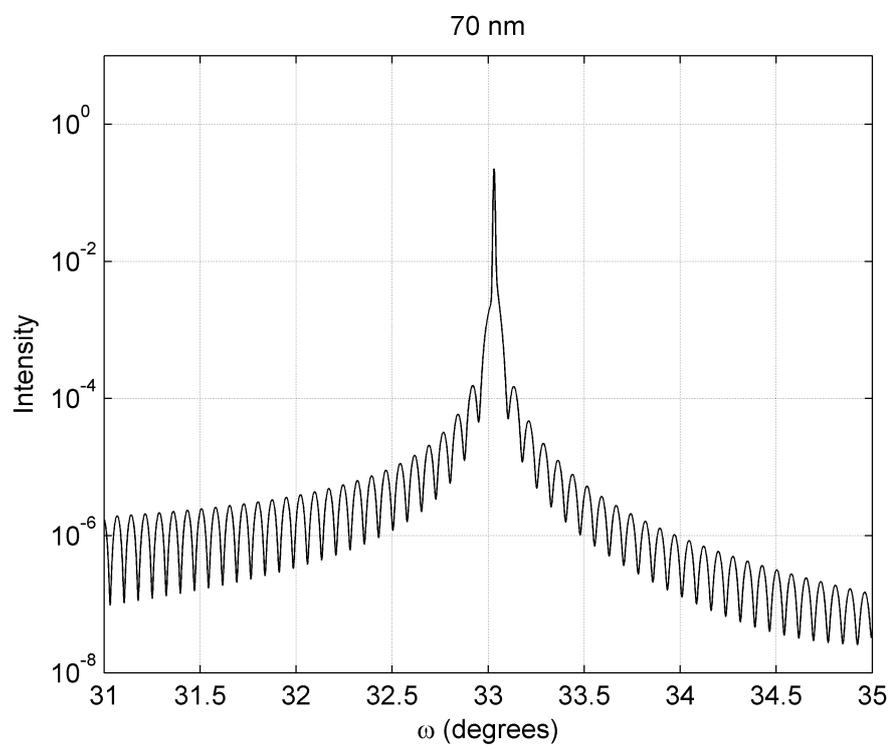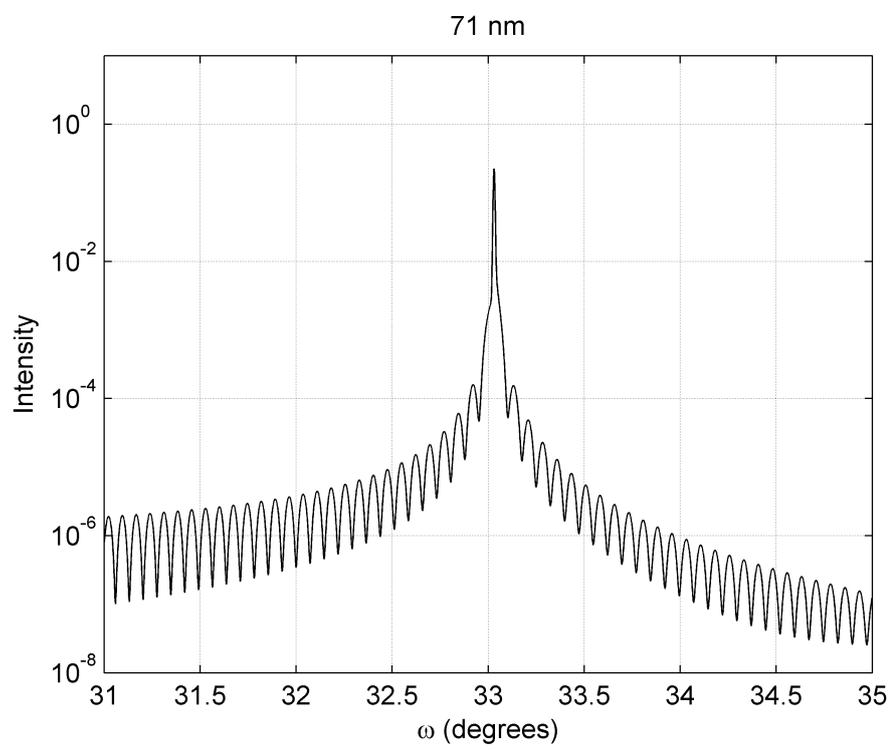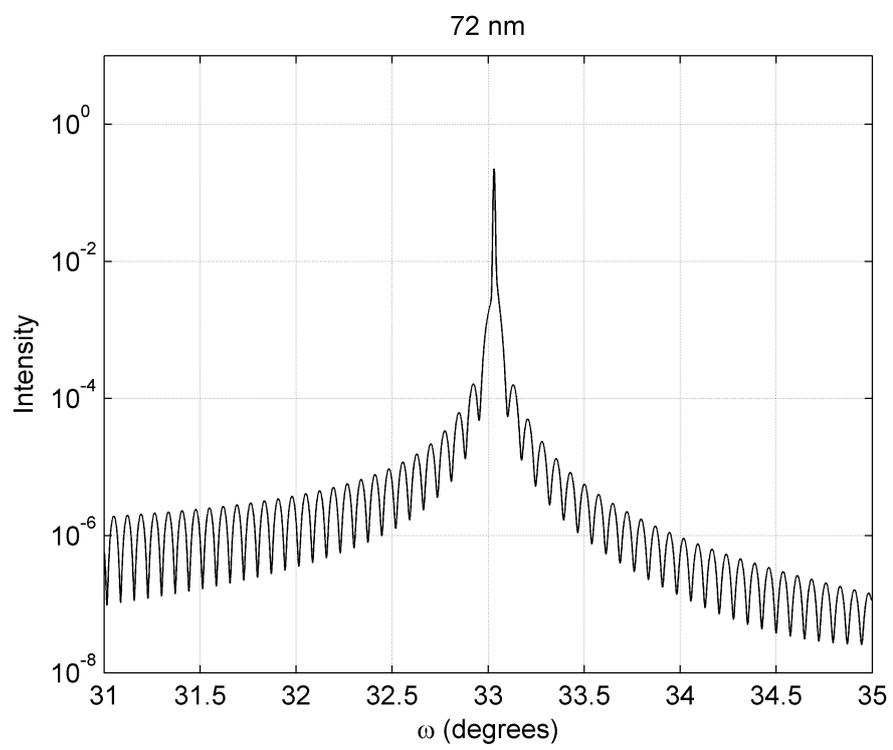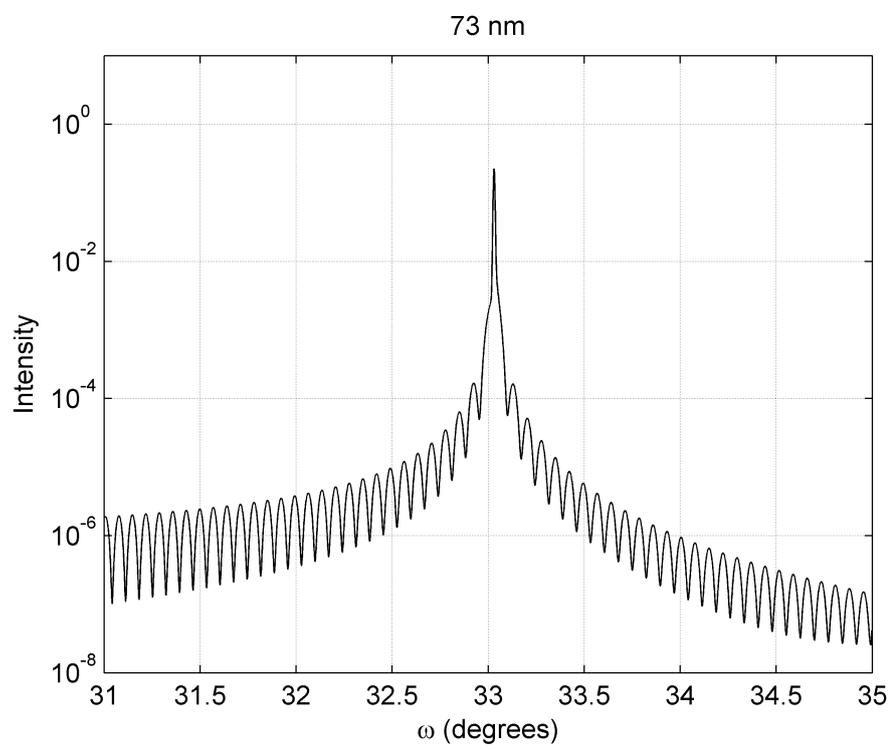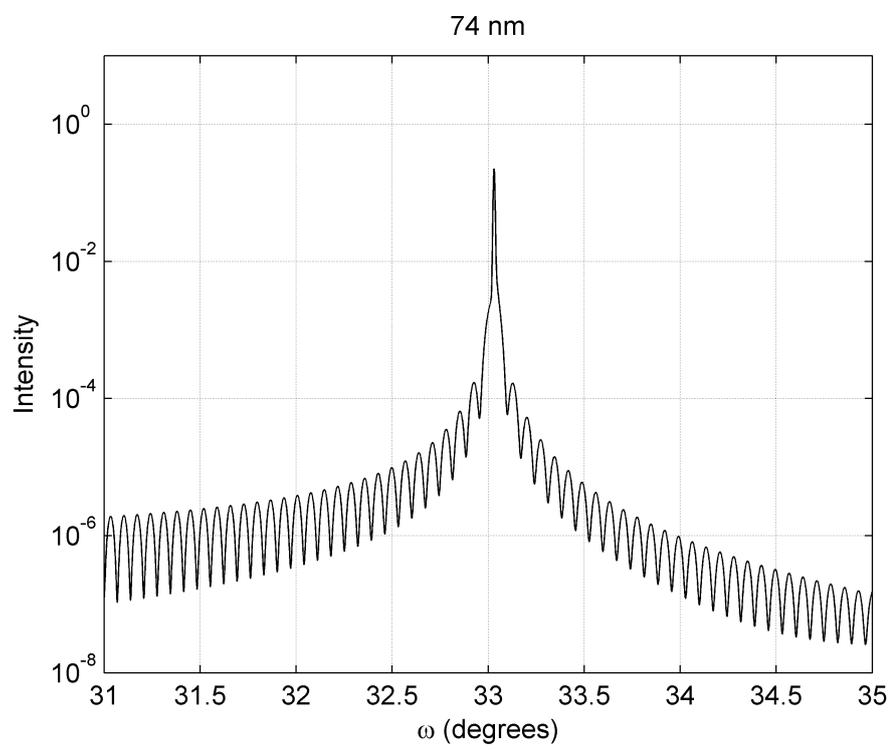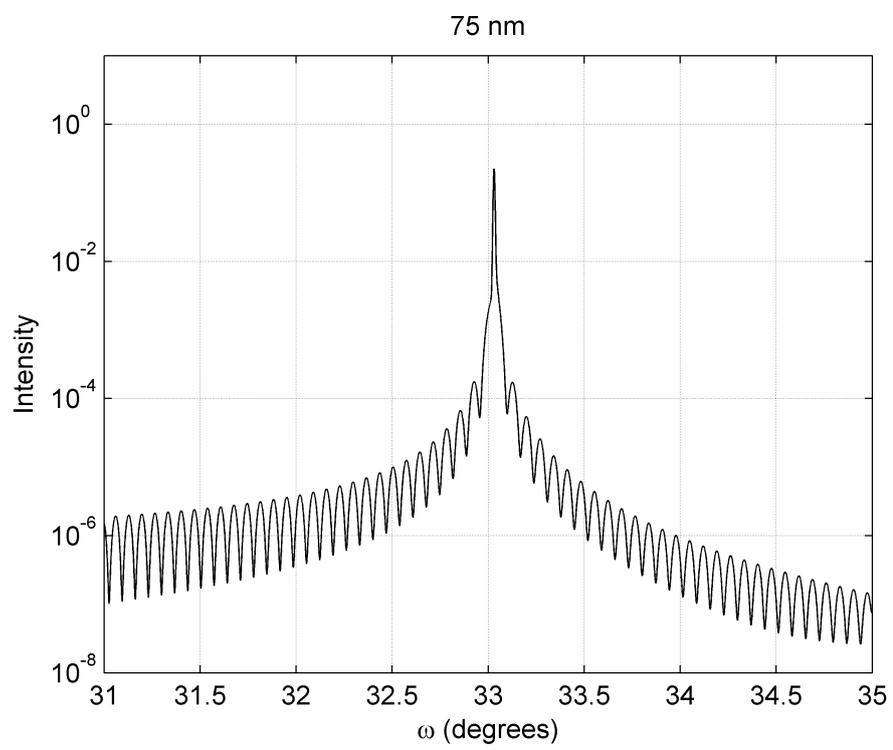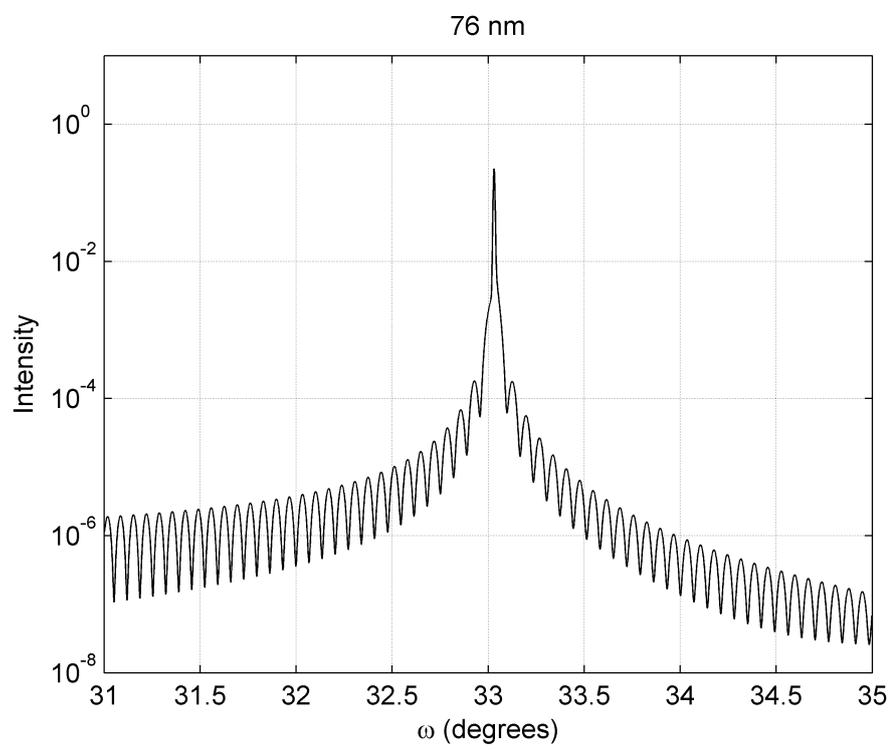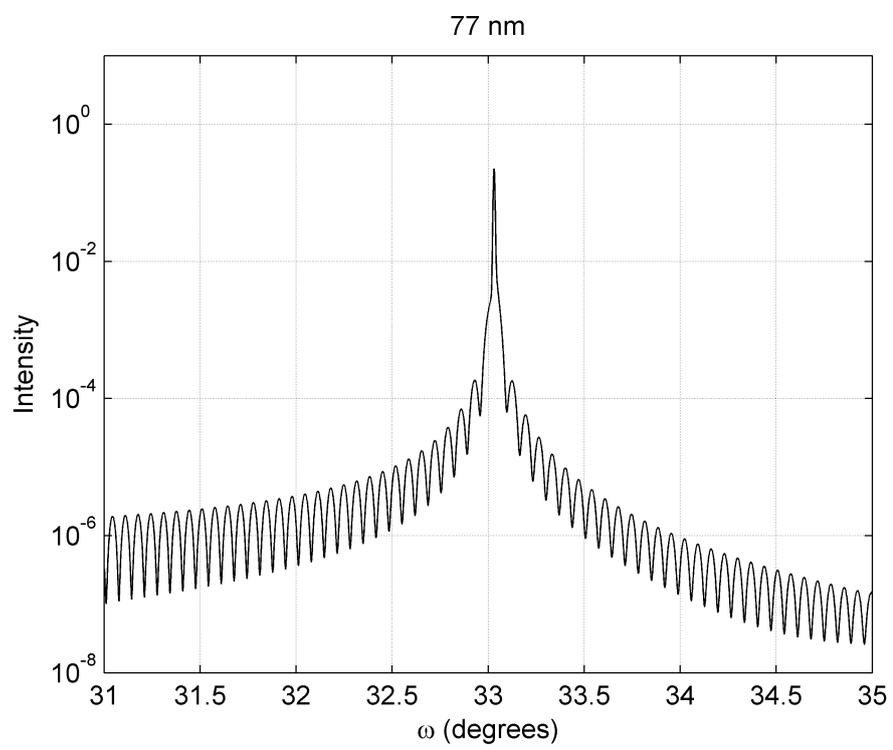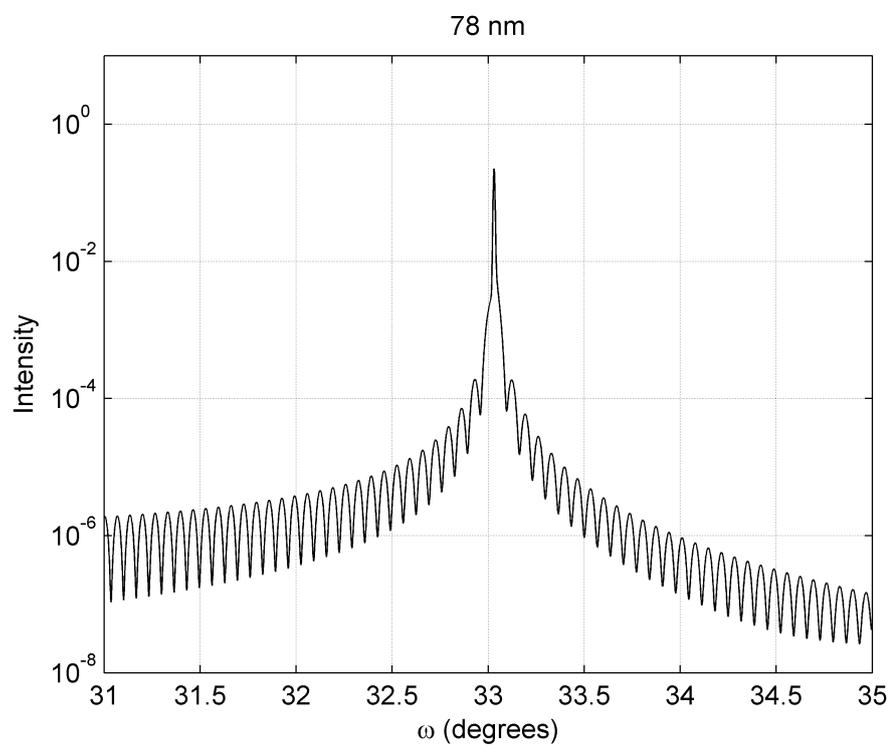
**Figure 1.19**

Figure 1.20

80 nm
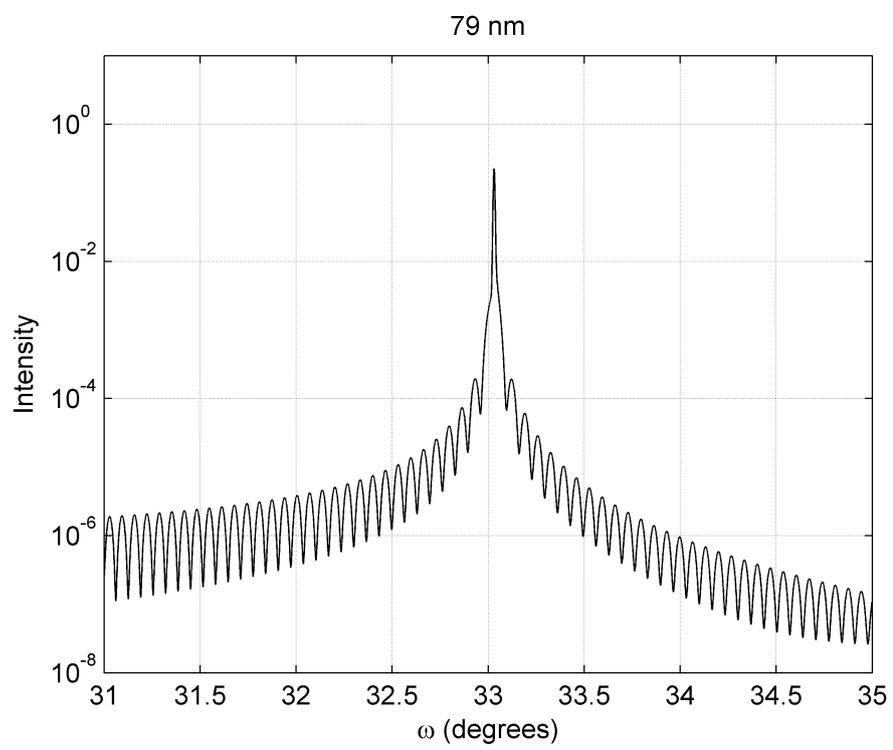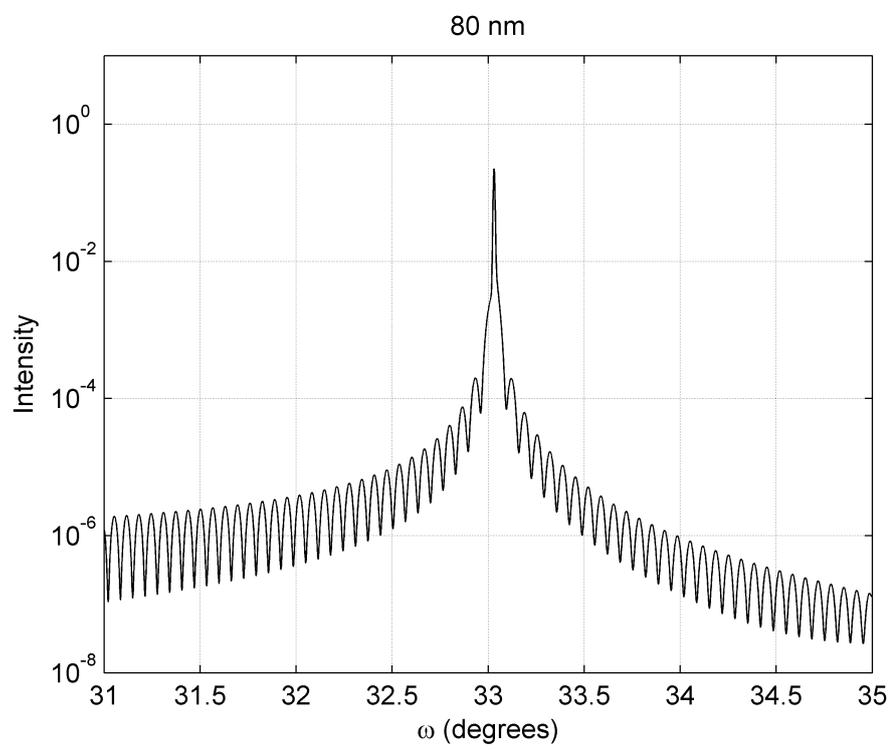
Figure 1.21

Chapter 2

InAs layer thicknesses

2.1   Bottom InAs layer

Simulations with varying InAs bottom layer thickness and a constant top layer thickness of 2 monolayers are shown in figures 2.1–2.41. They are arranged by increasing bottom layer thickness from 0 to 4 monolayers.

0.0 ML

Figure 2.1

0.1 ML

Intensity

ω (degrees)

Figure 2.2

0.2 ML

Figure 2.3

0.3 ML

Intensity vs ω (degrees)

Figure 2.4

0.4 ML

Figure 2.5

0.5 ML

Figure 2.6

0.6 ML

Figure 2.7

0.7 ML
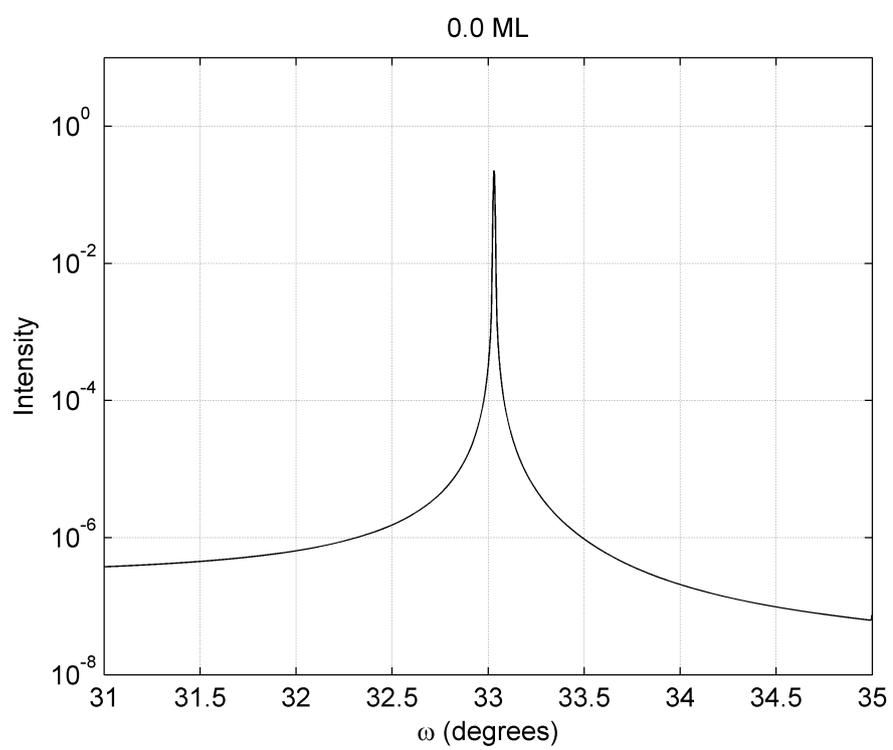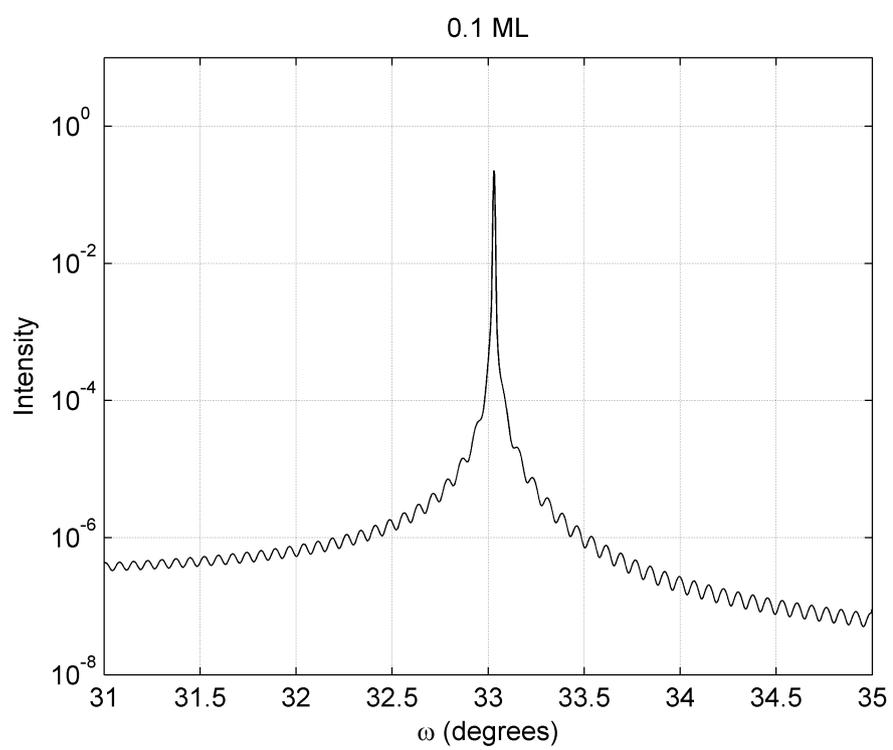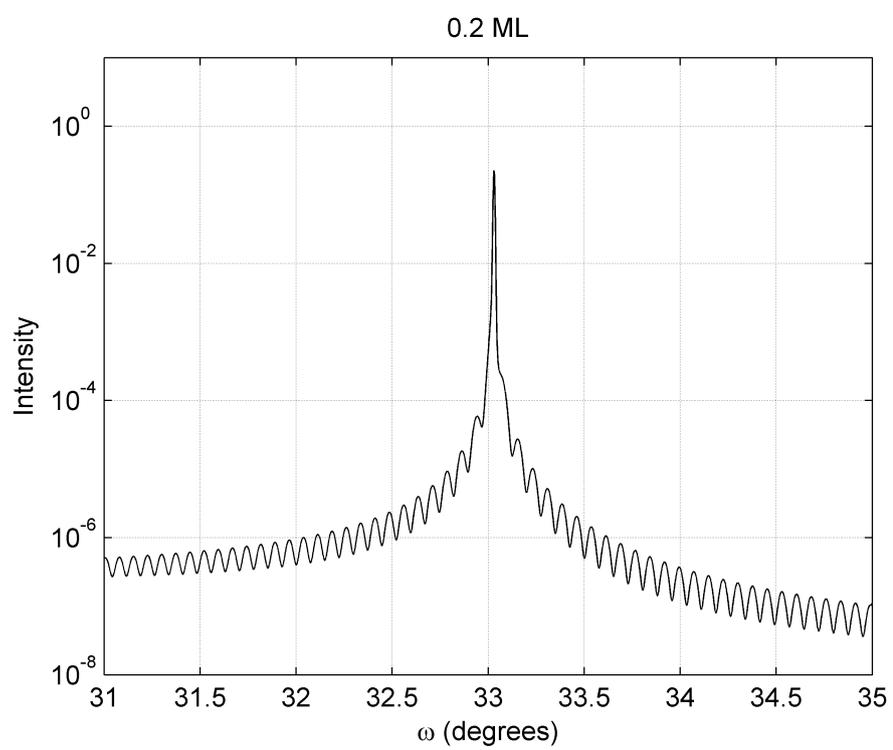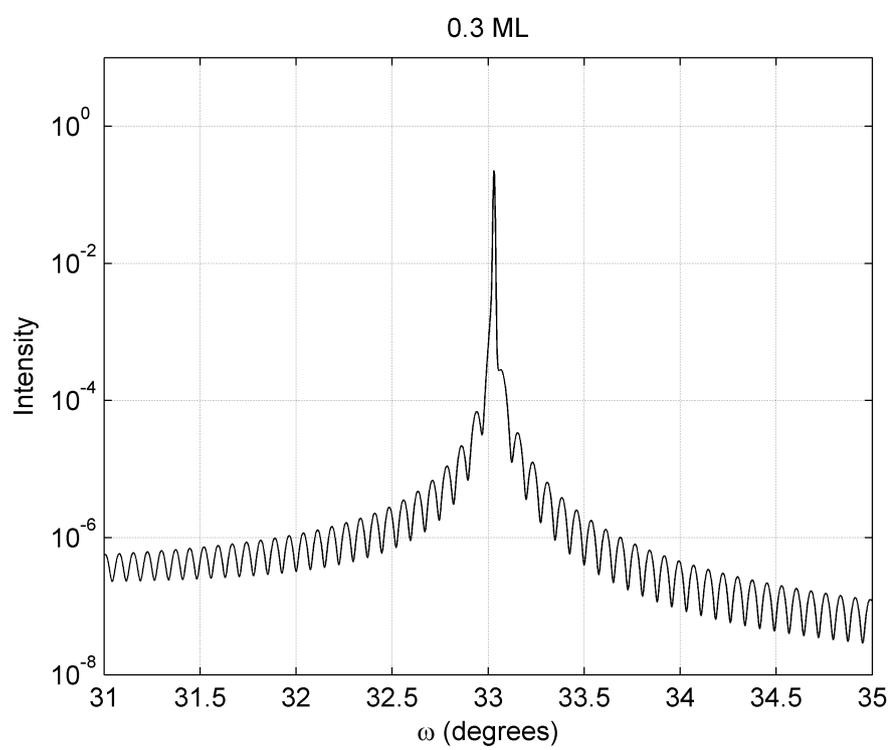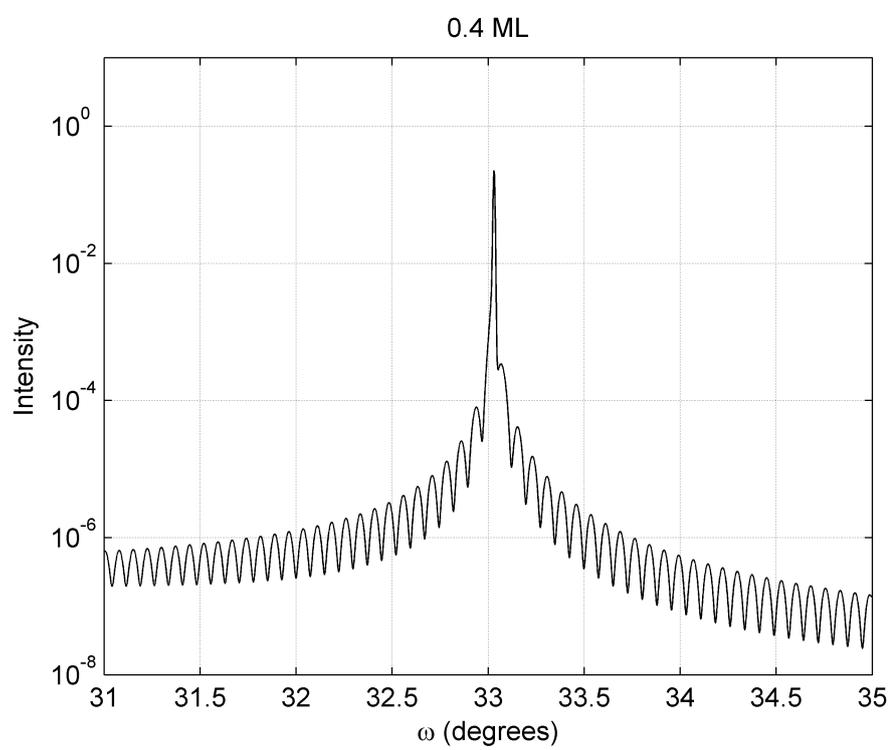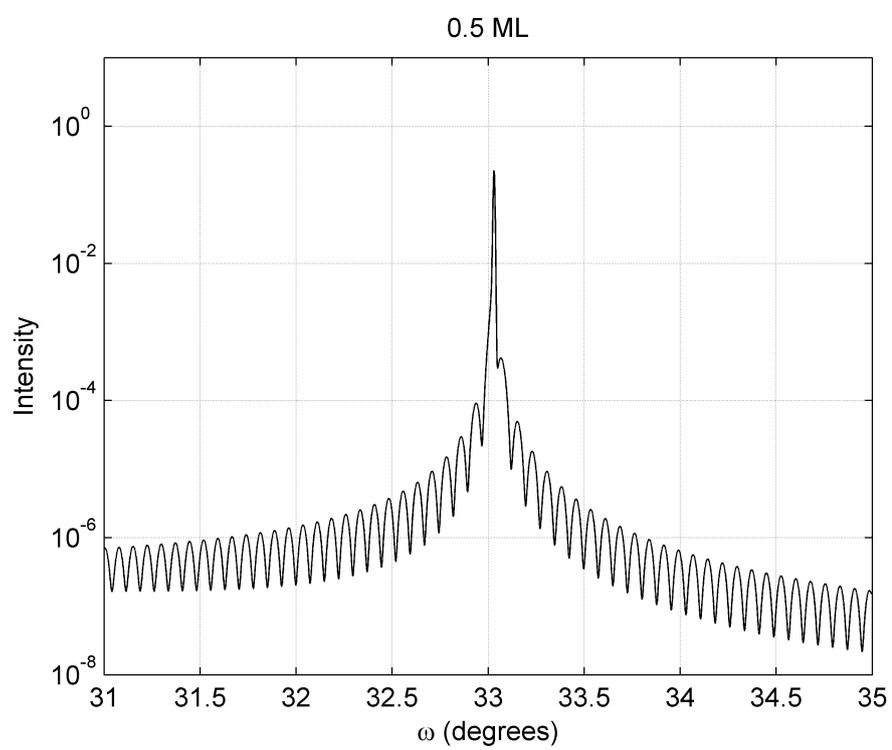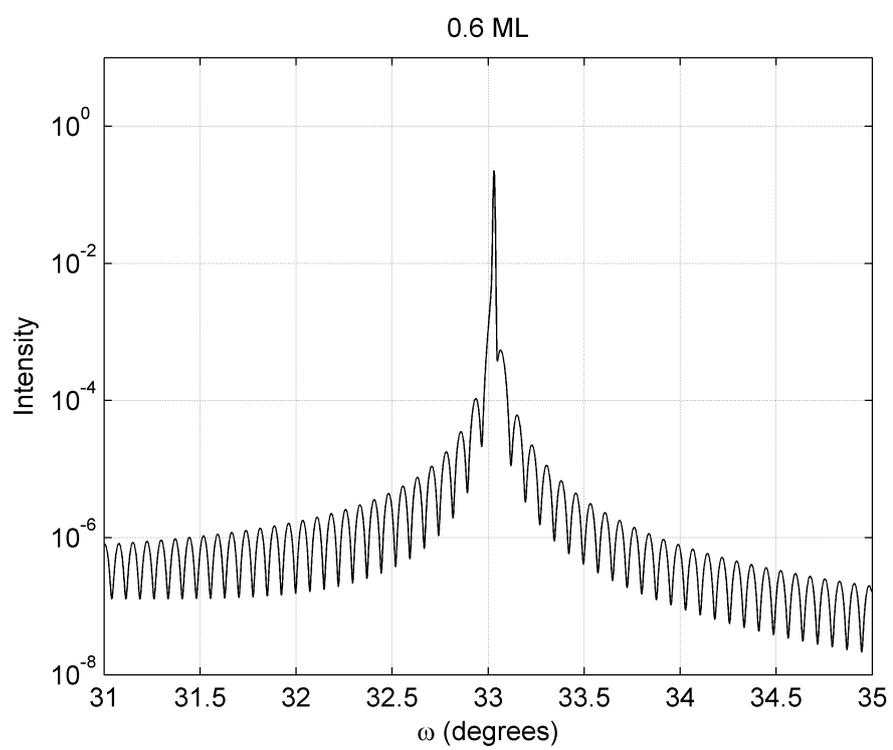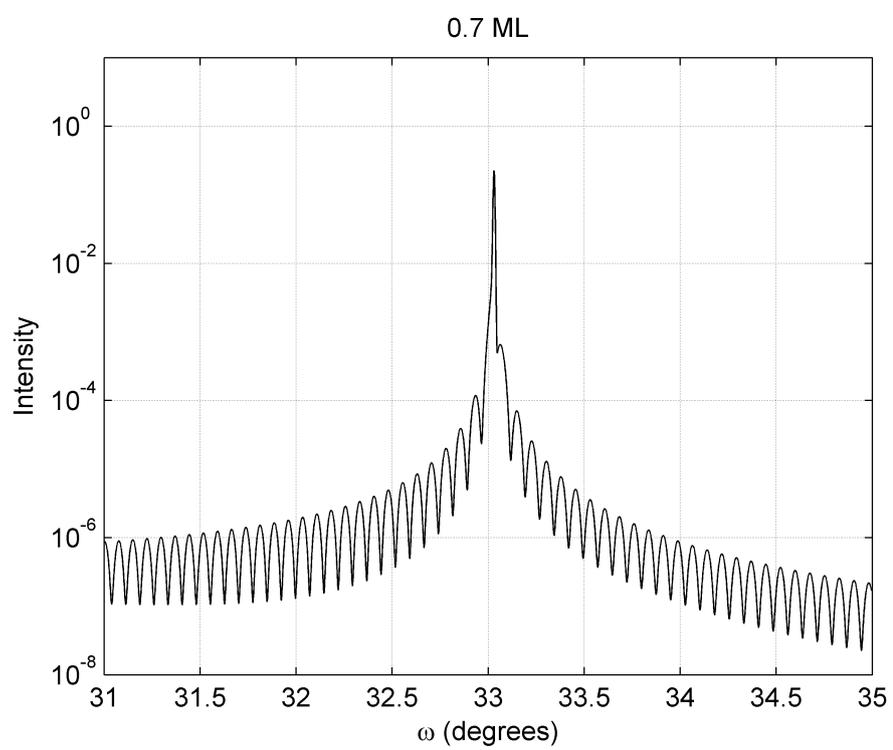
Figure 2.8

Figure 2.9

0.9 ML

Figure 2.10

1.0 ML
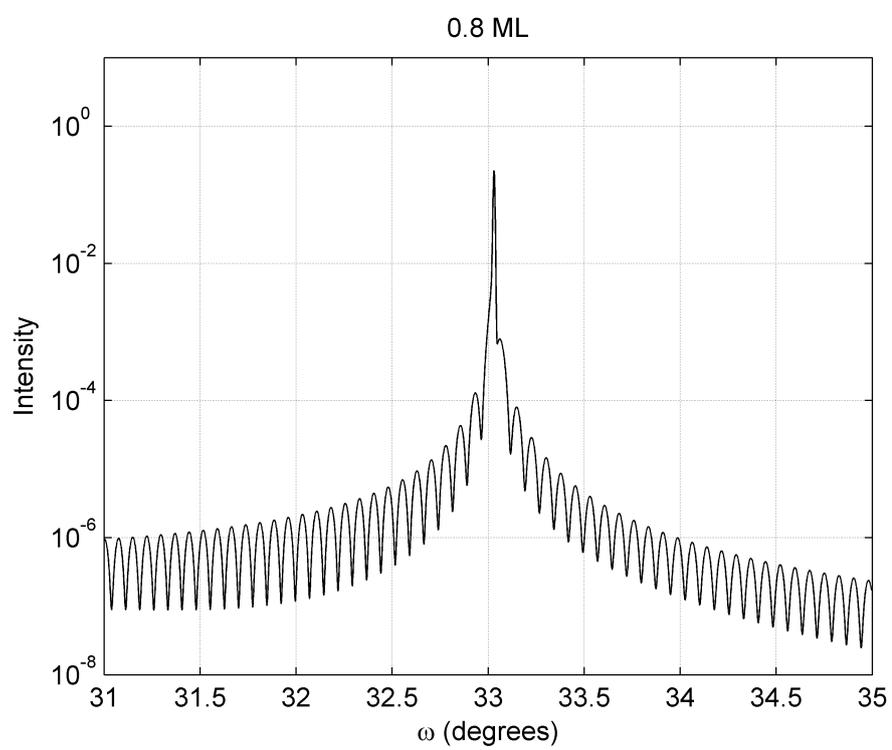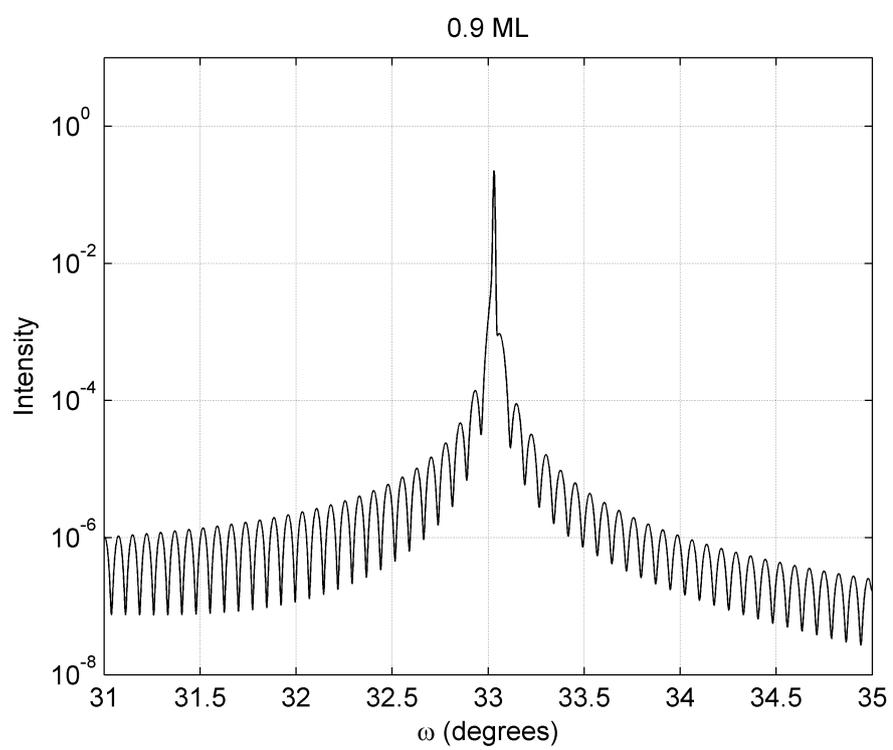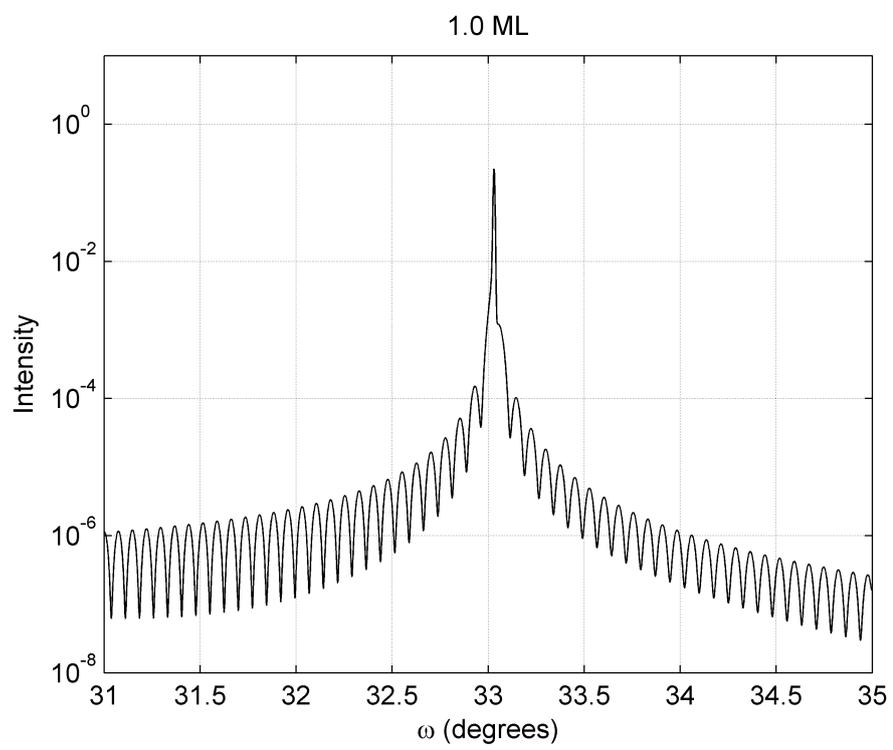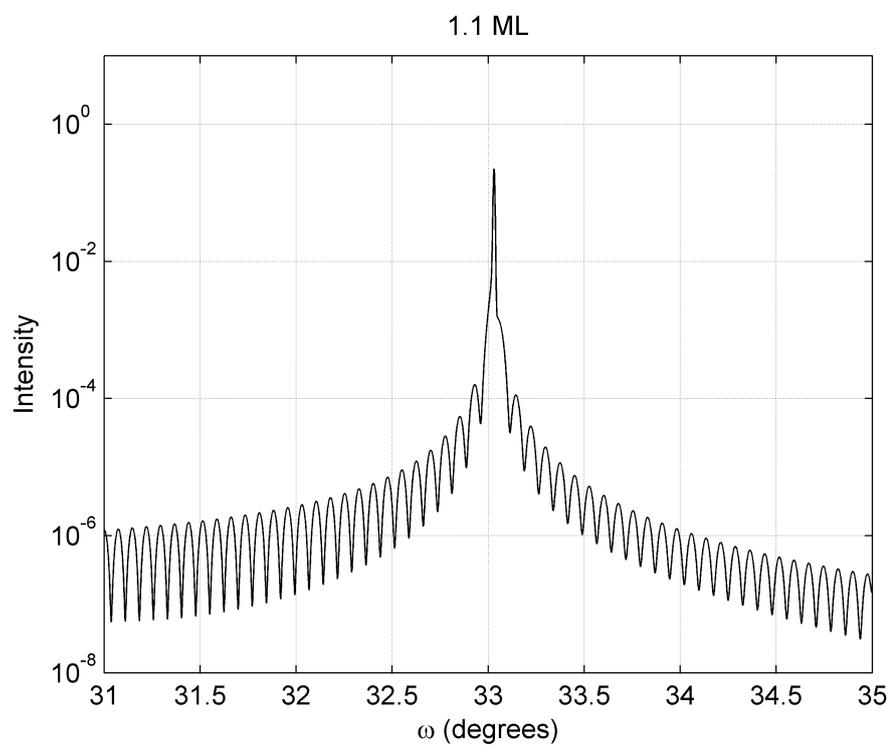
Figure 2.11

Figure 2.12

Figure 2.13

Figure 2.14

1.4 ML

Figure 2.15

1.5 ML

Intensity

ω (degrees)

Figure 2.16

1.6 ML

Figure 2.17

1.7 ML

Intensity

ω (degrees)
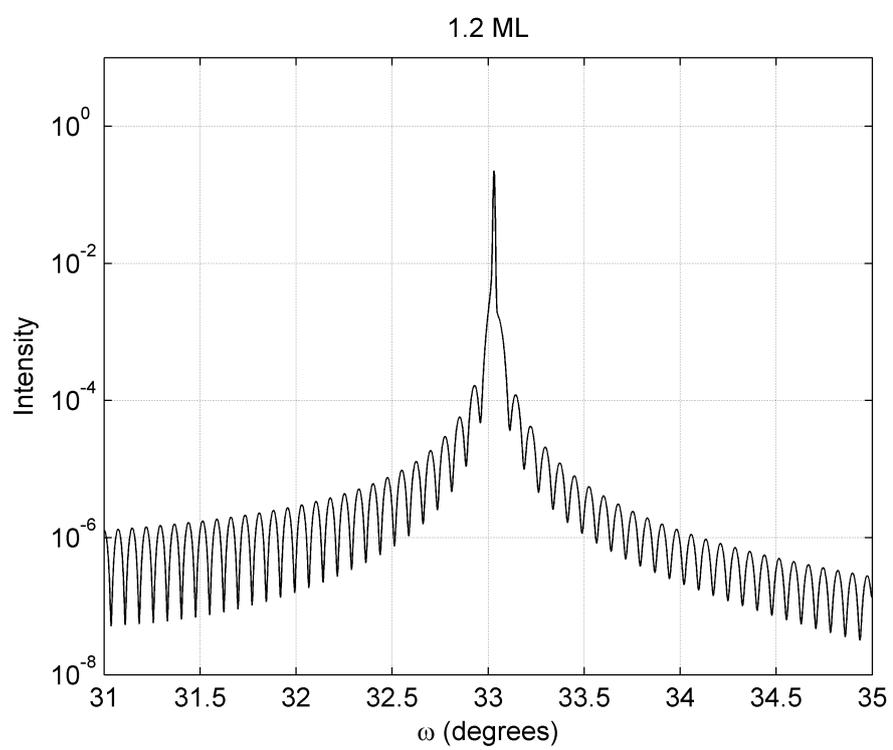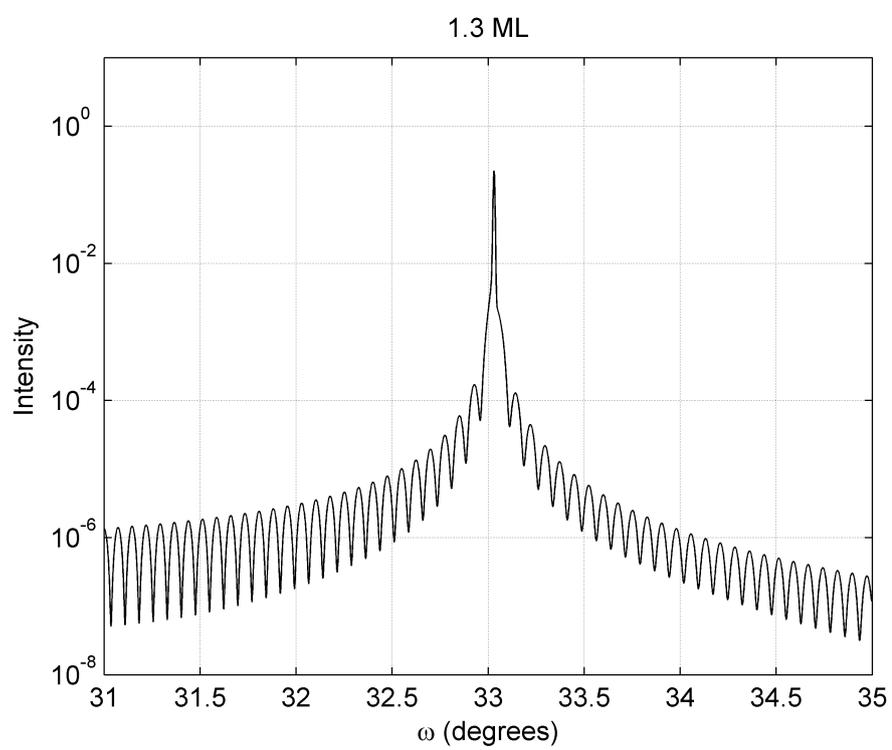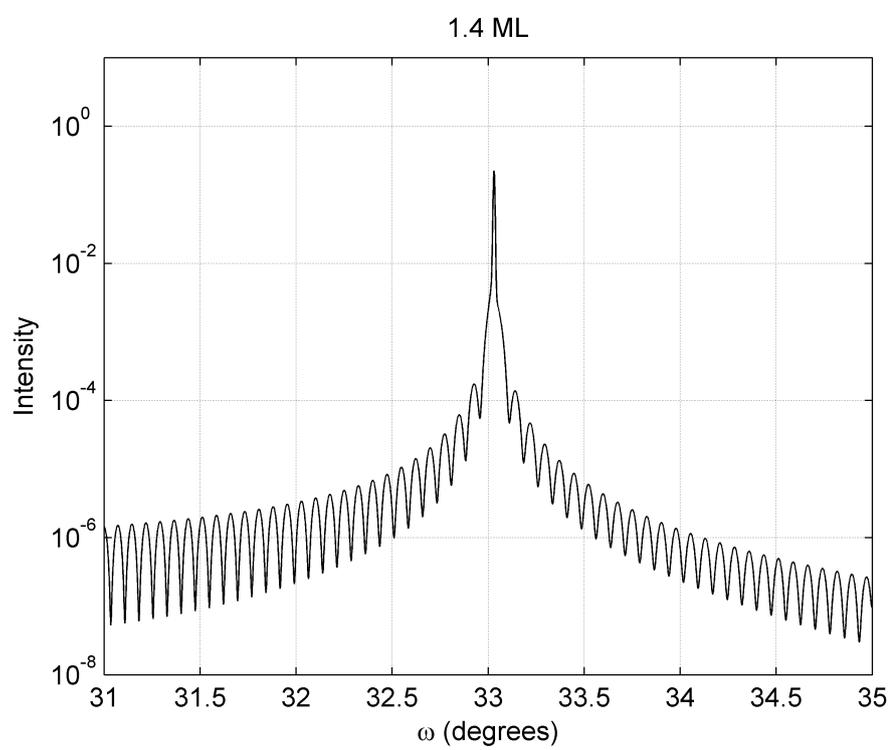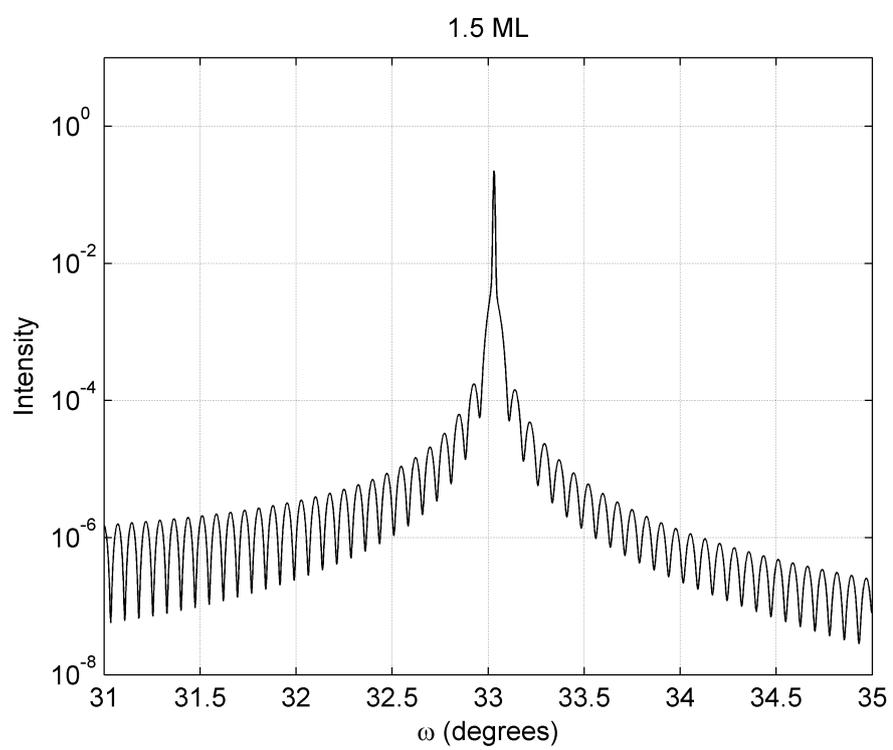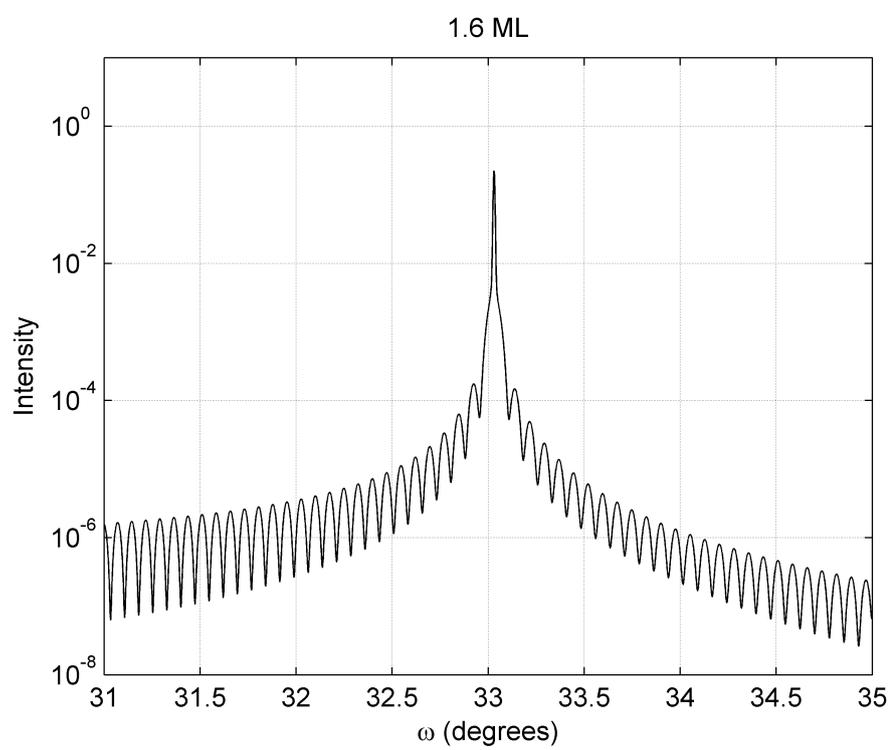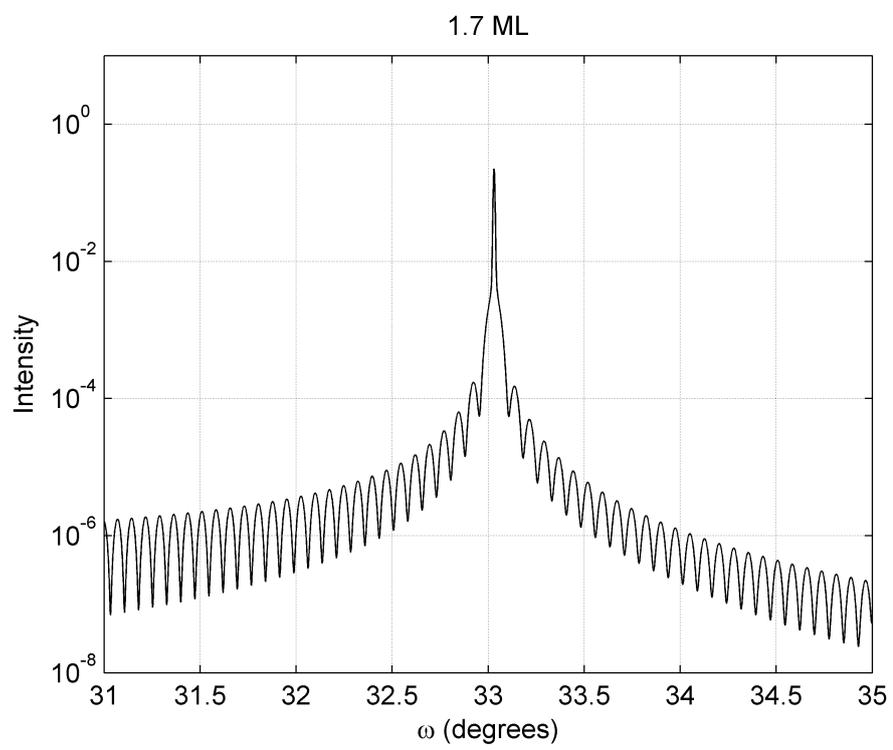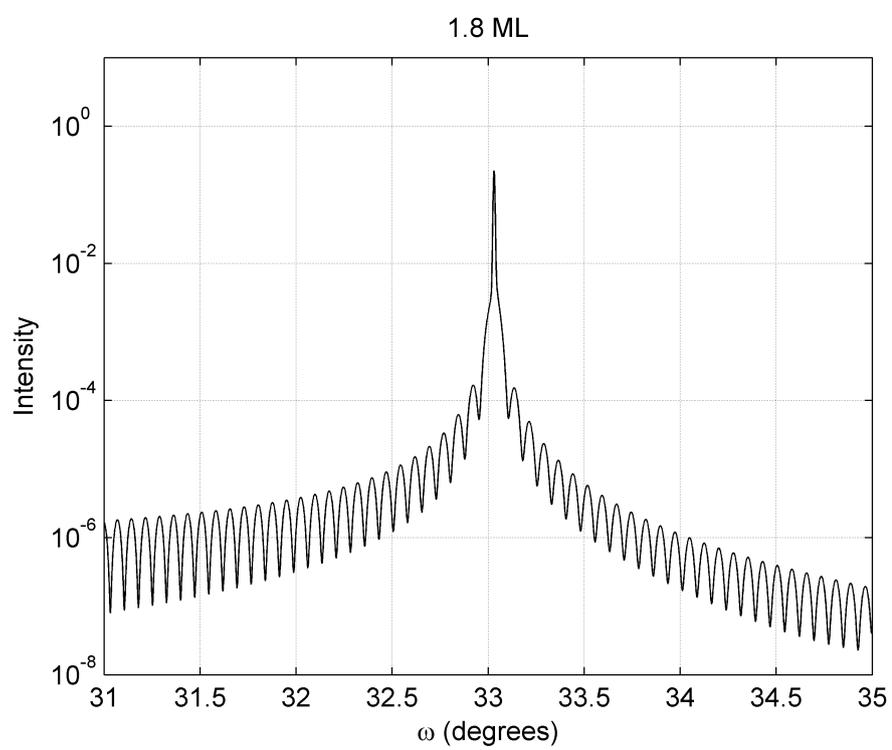
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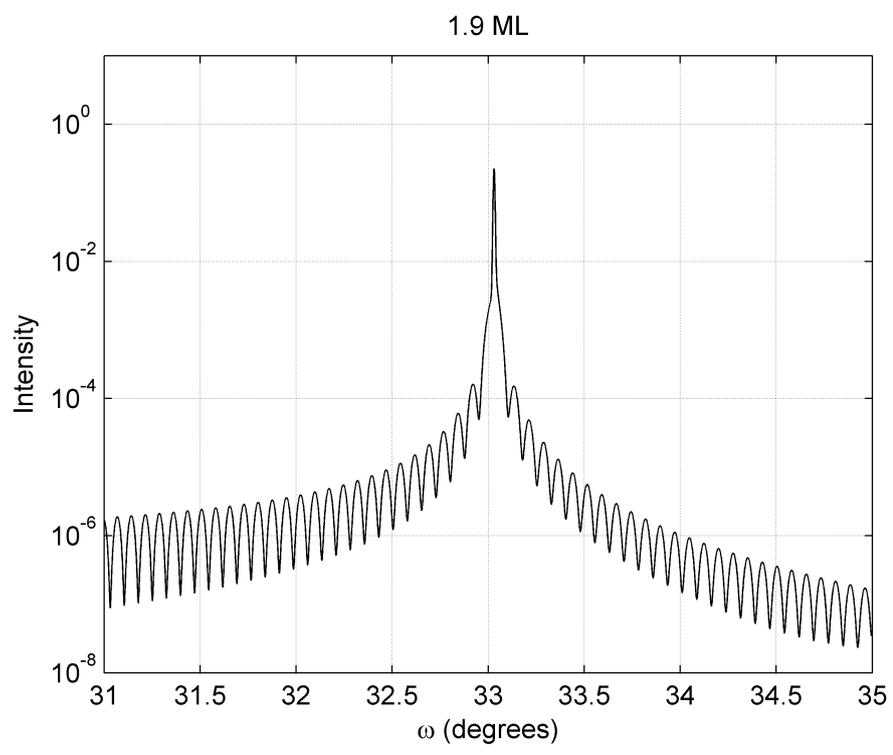
Figure 2.19

Figure 2.20

Figure 2.21

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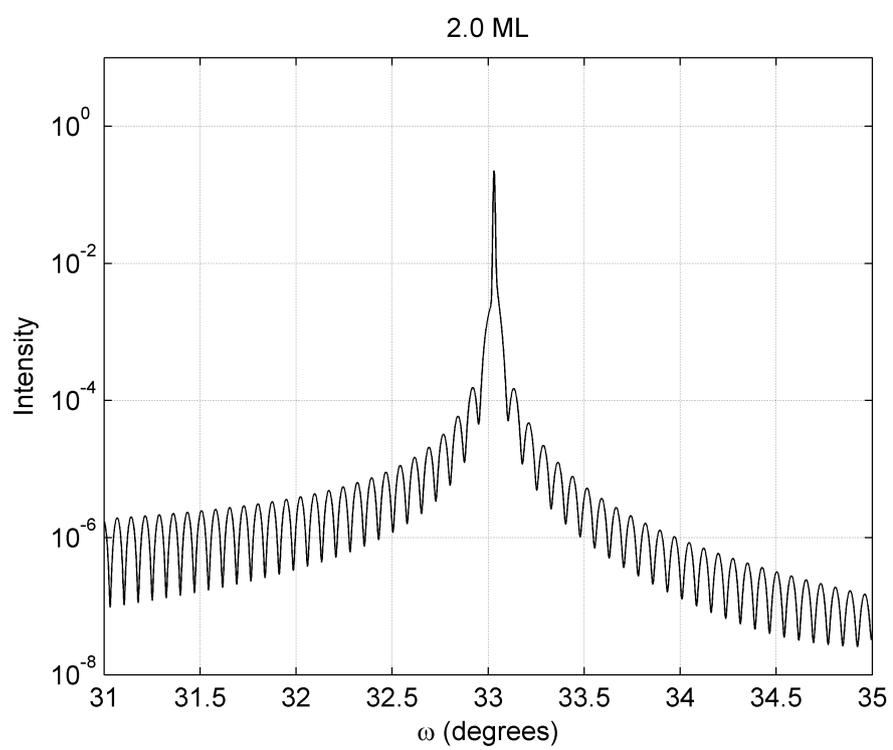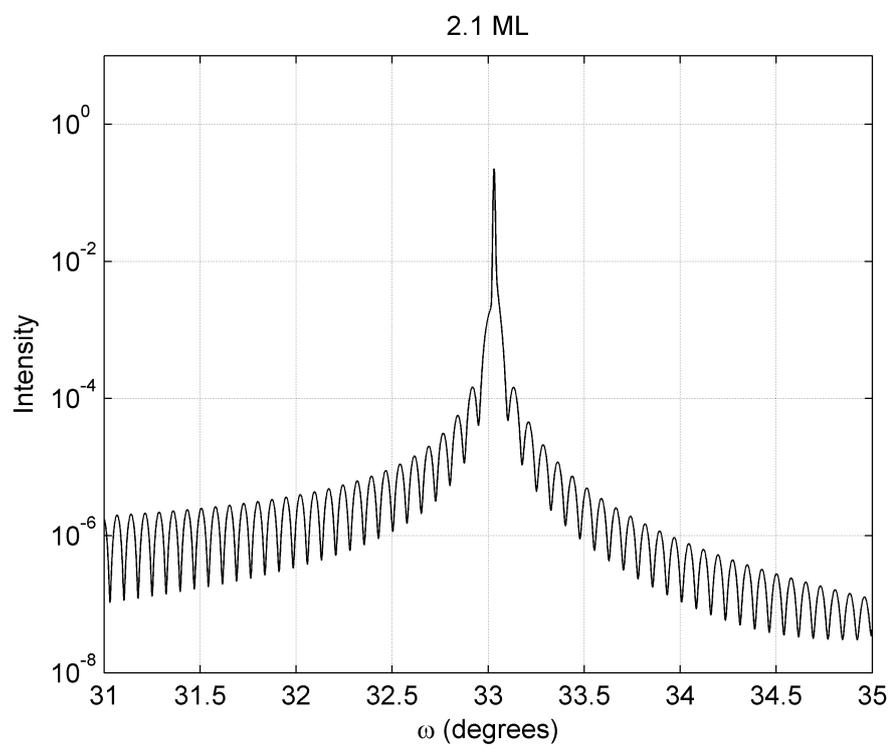
Figure 2.22

Figure 2.23

2.3 ML

Figure 2.24

48
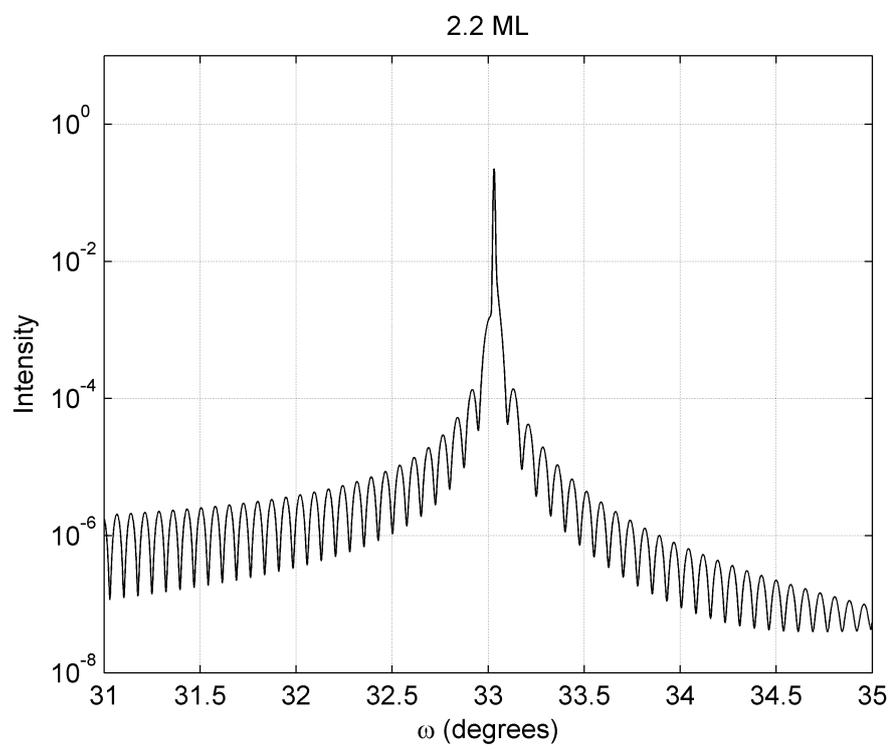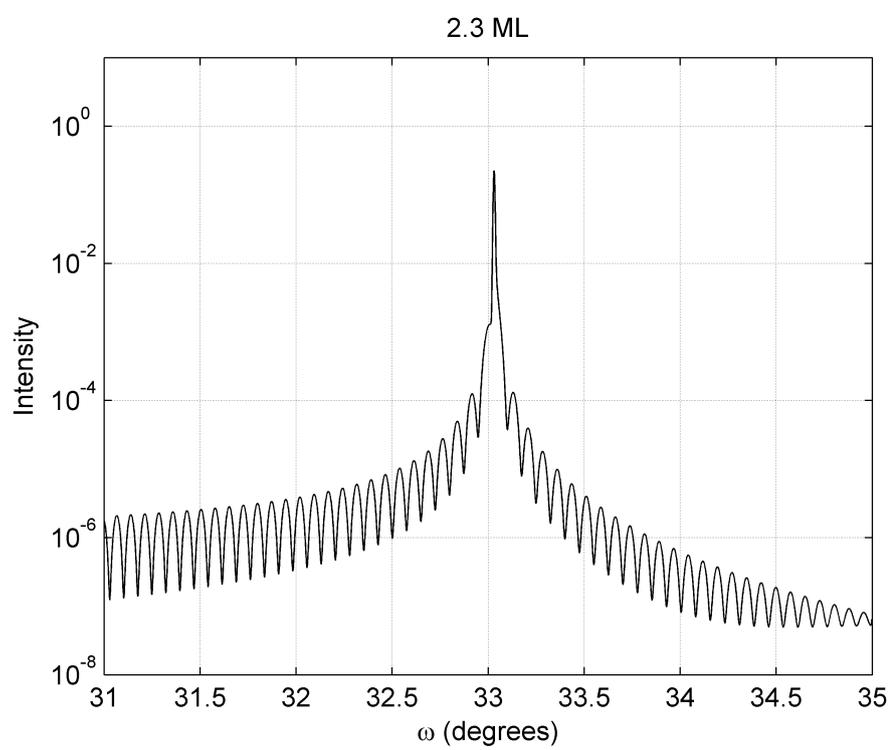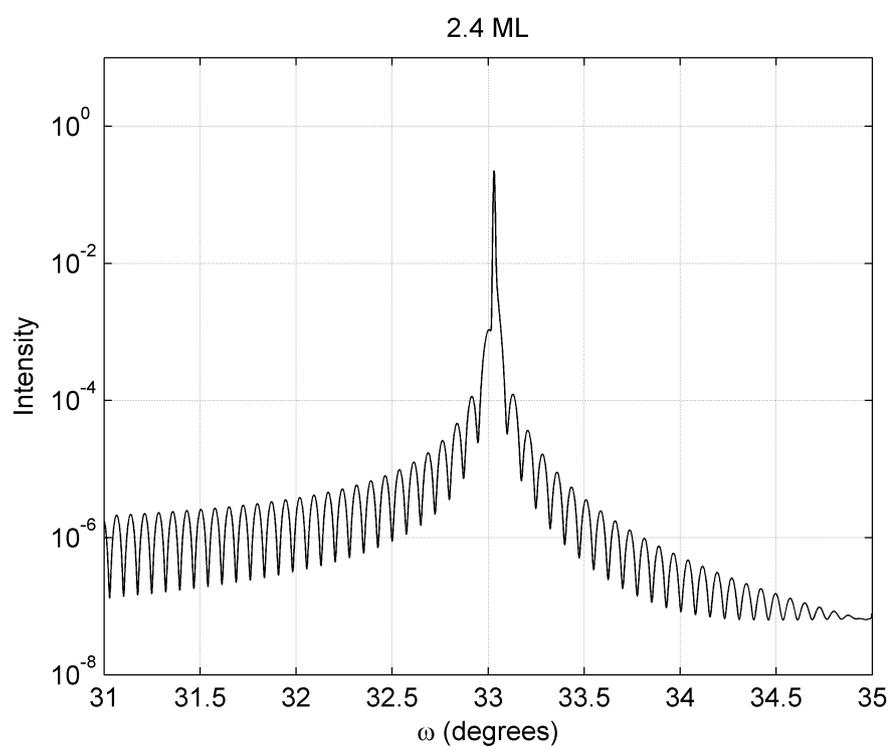
Figure 2.25

Figure 2.26

2.6 ML
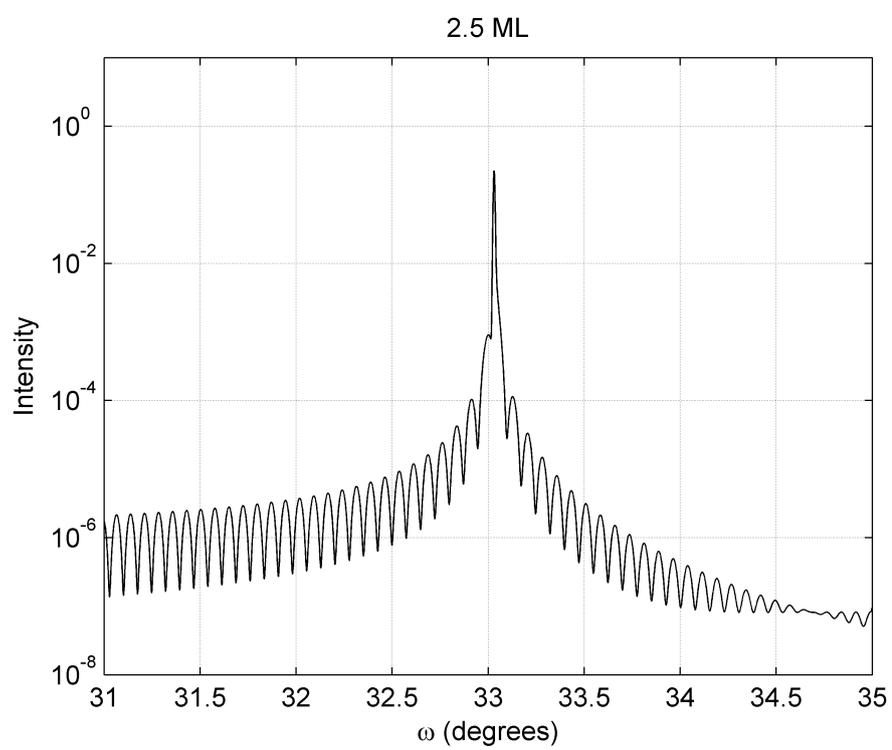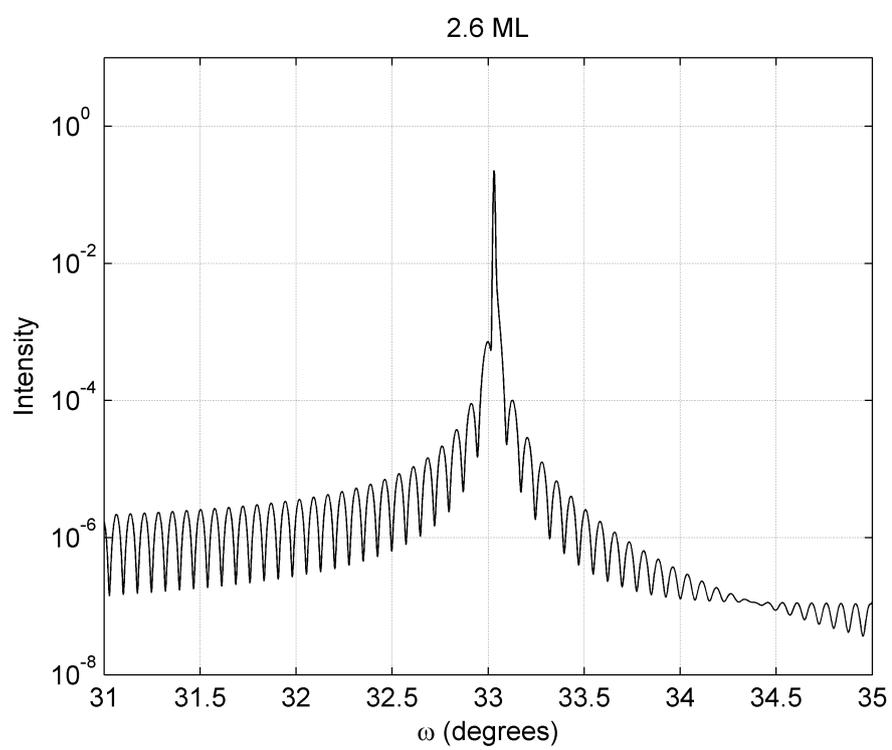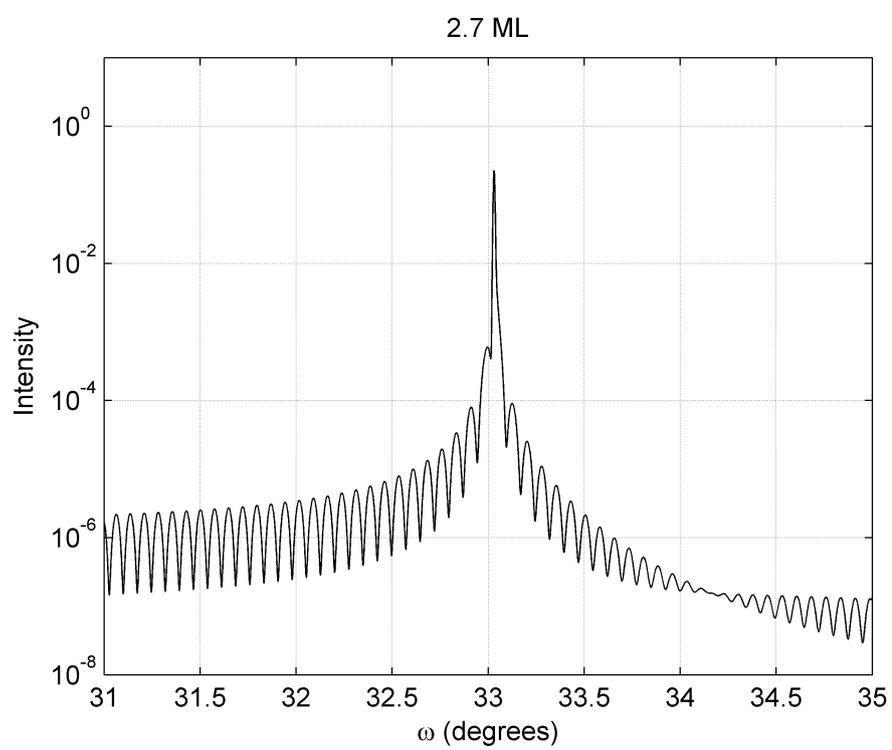
Figure 2.27

Figure 2.28
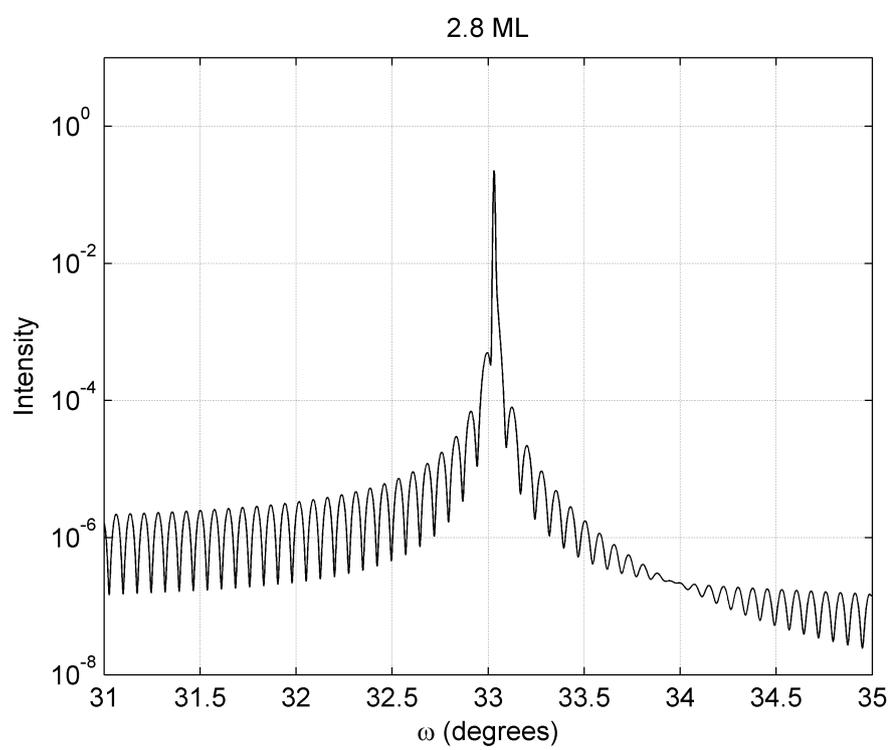
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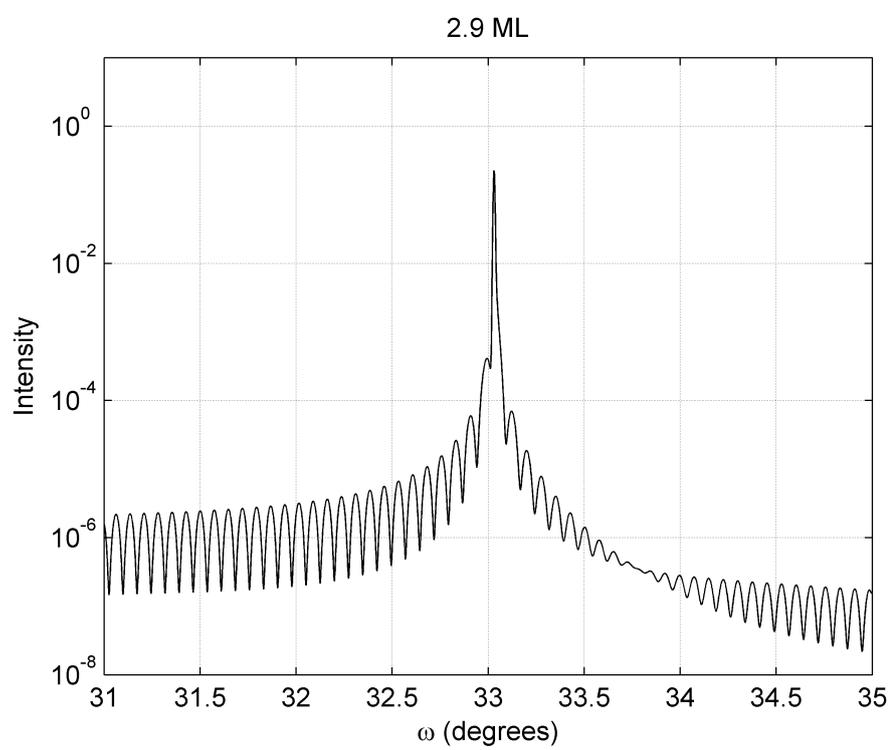
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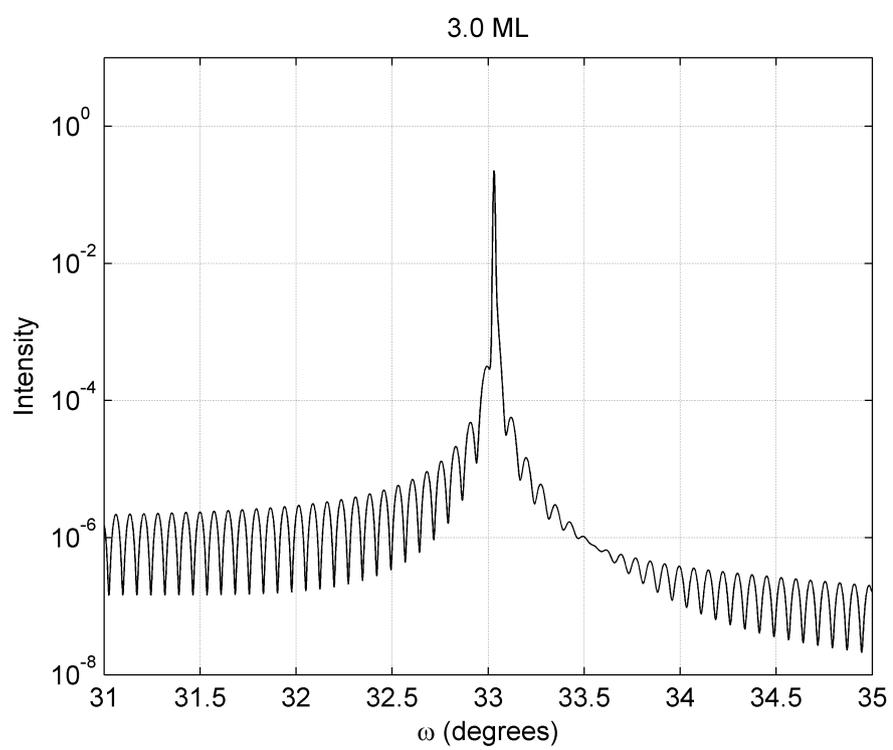
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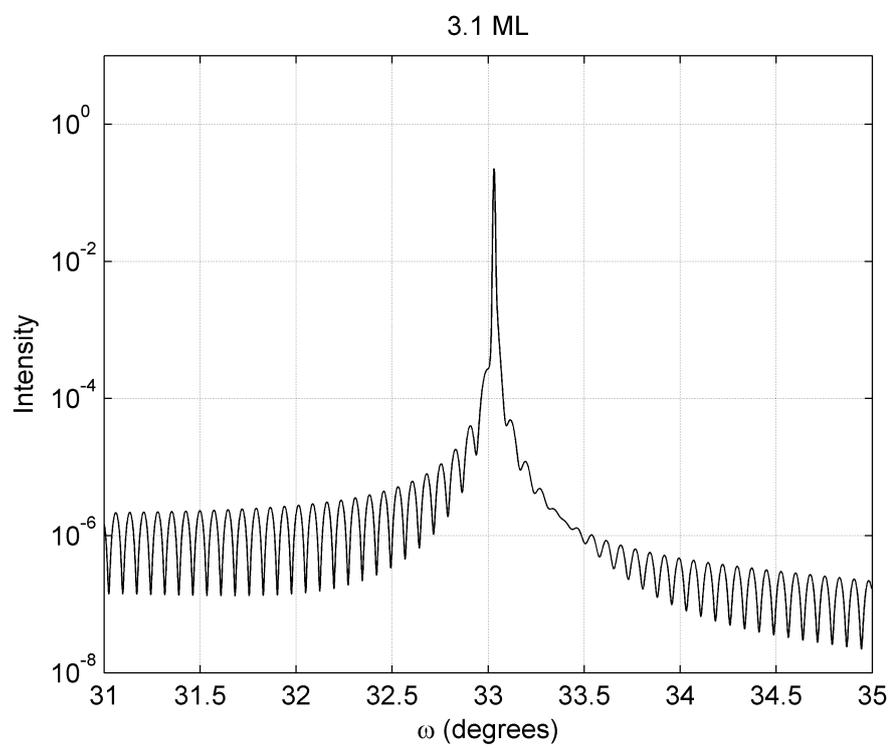
Figure 2.32

Figure 2.33

Figure 2.34

3.4 ML

Figure 2.35

3.5 ML

Intensity

10^0

10^{-2}

10^{-4}

10^{-6}

10^{-8}

31   31.5   32   32.5   33   33.5   34   34.5   35

ω (degrees)

Figure 2.36

3.6 ML

Figure 2.37

3.7 ML
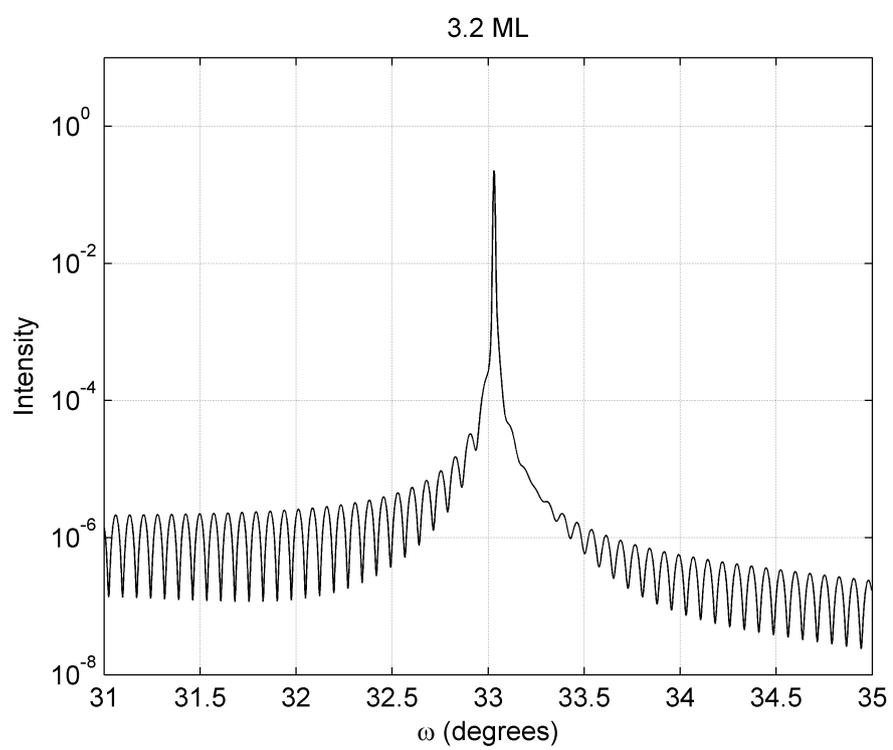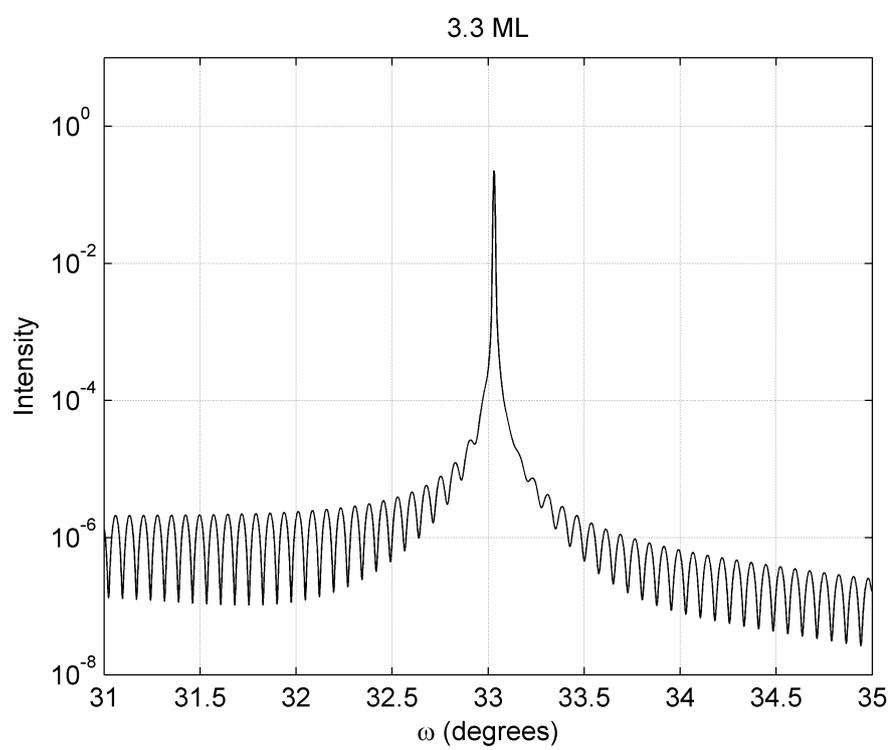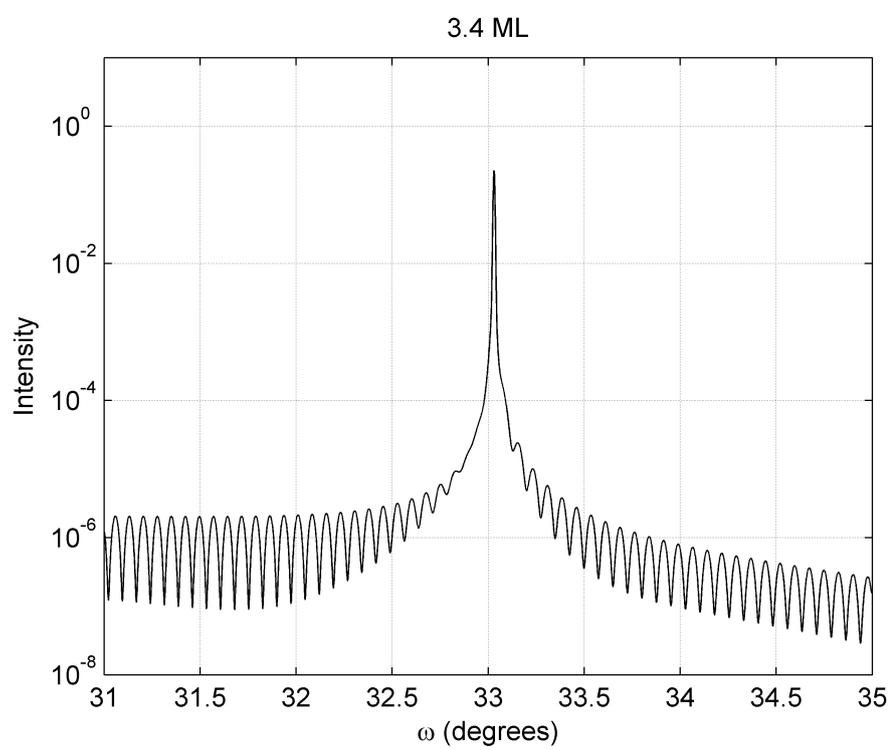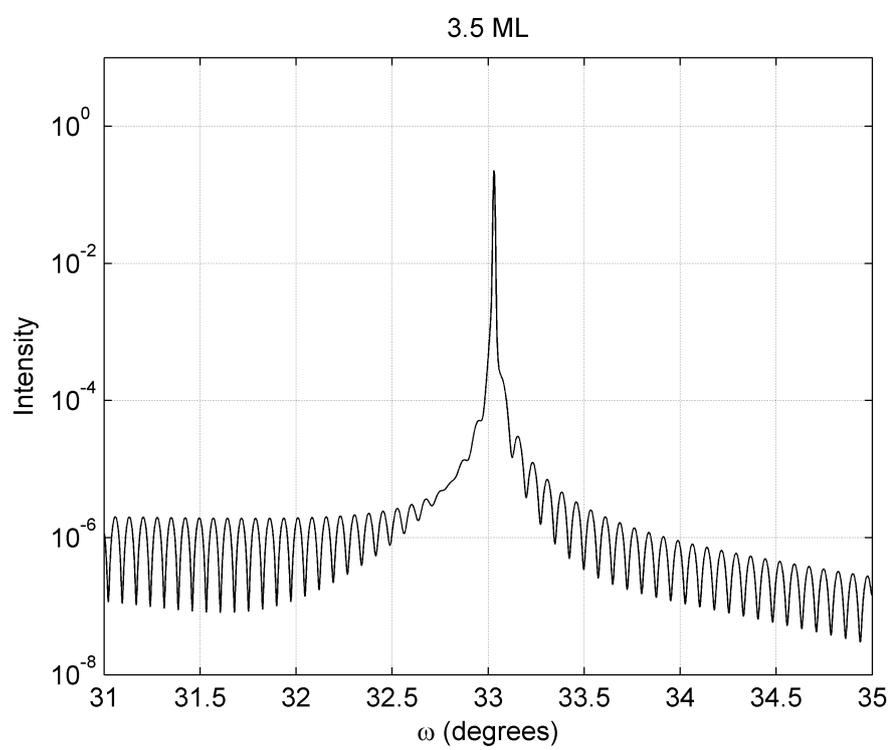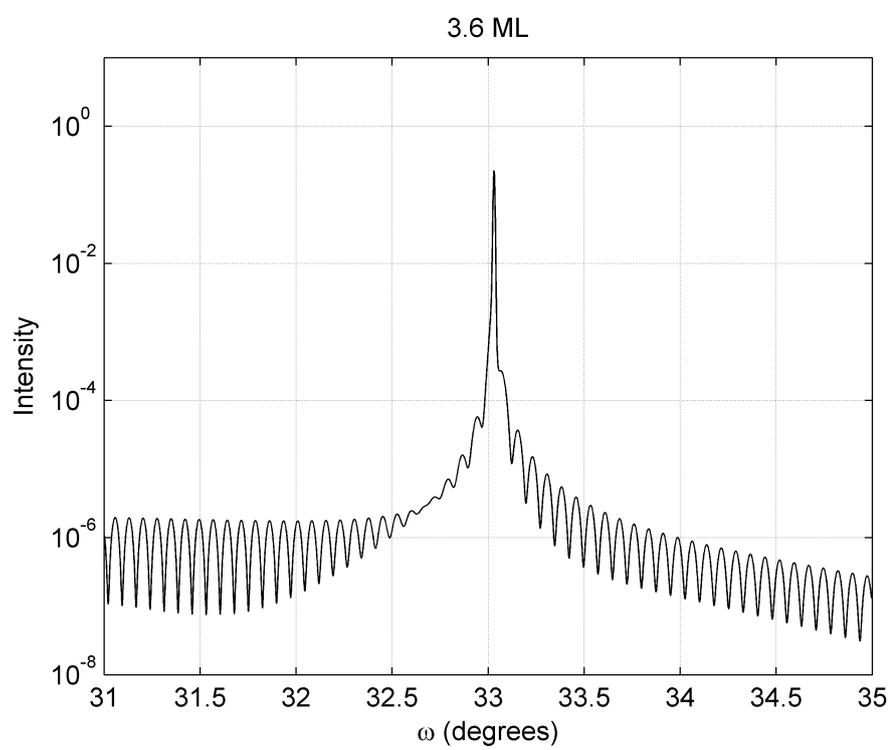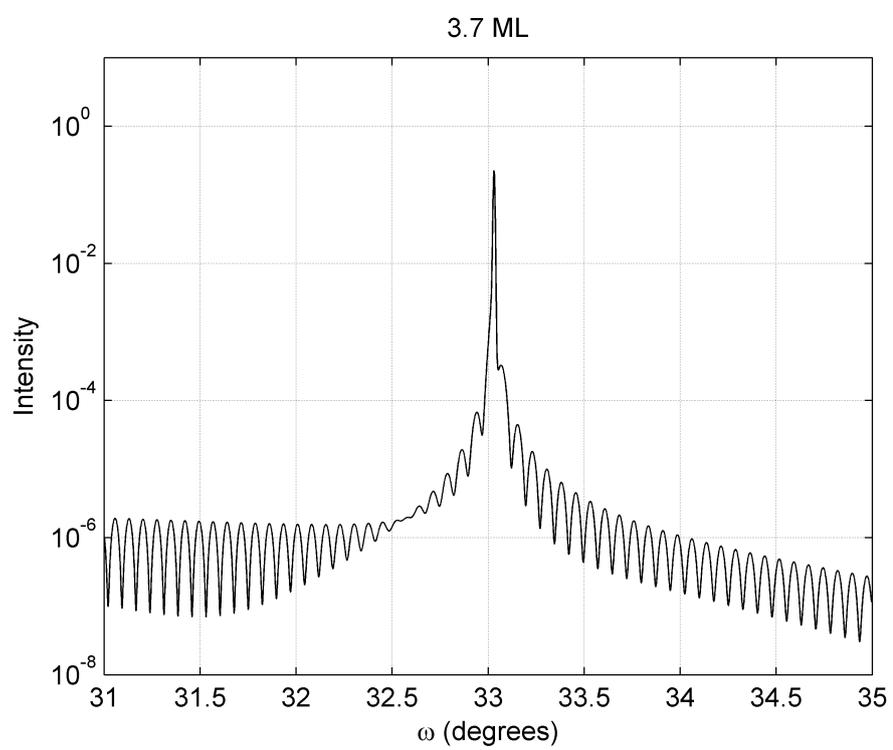
Figure 2.38

Figure 2.39

3.9 ML
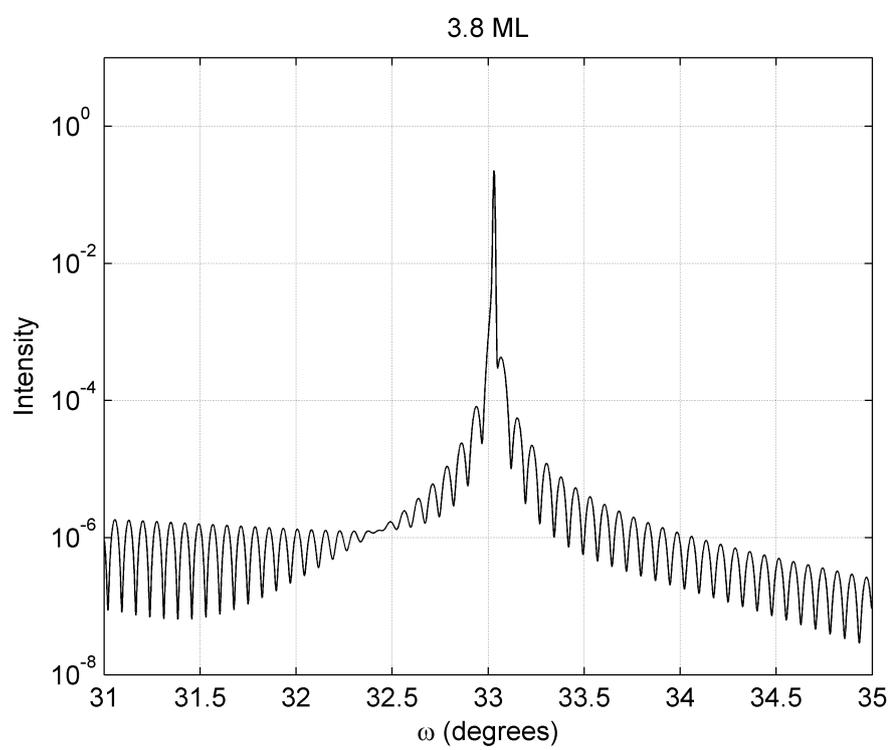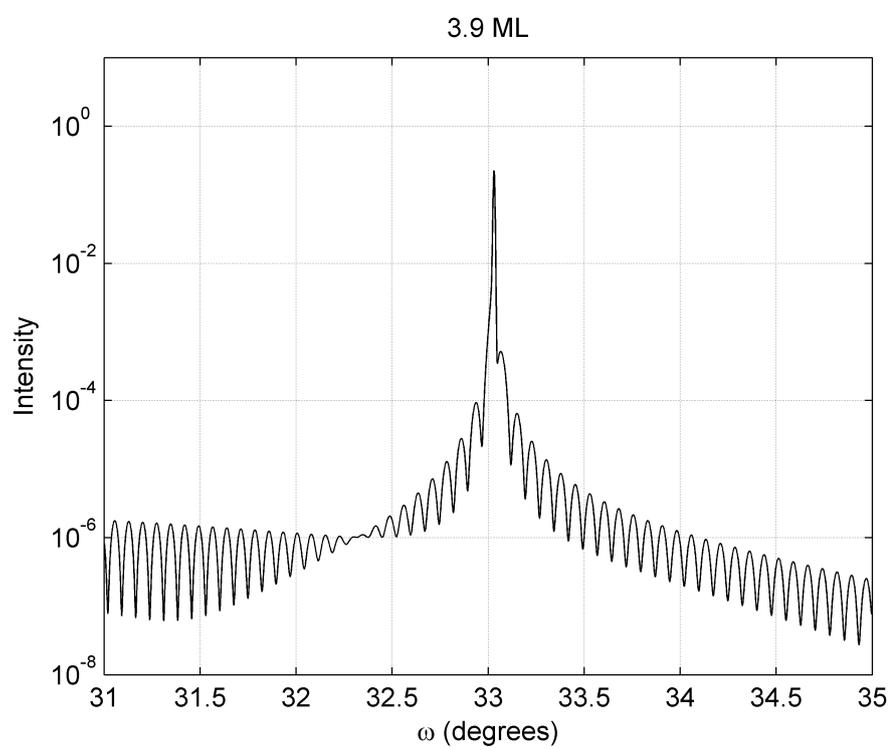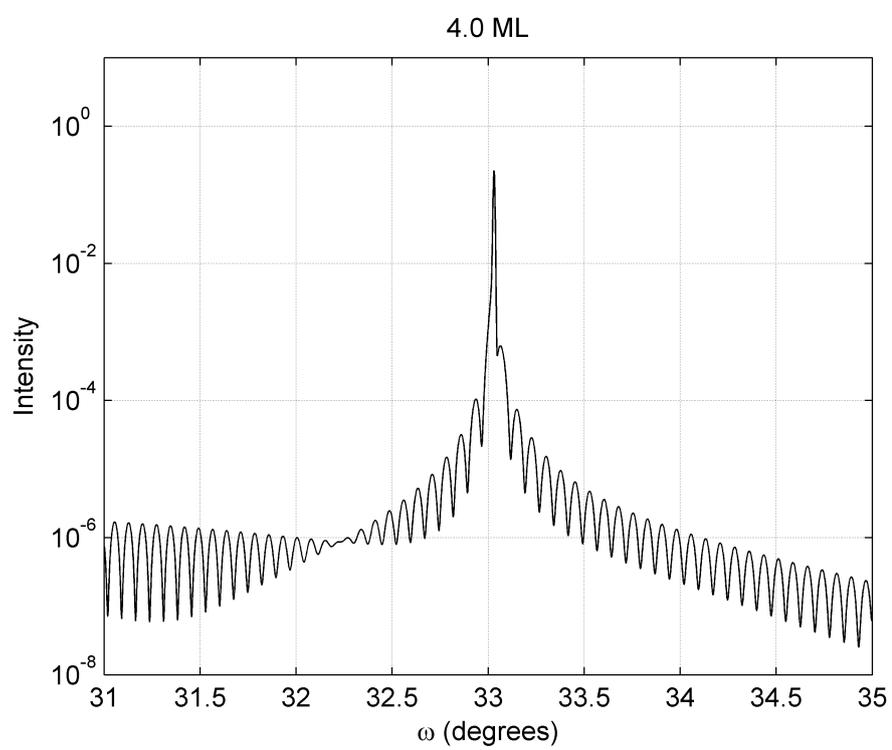
Figure 2.40

Figure 2.41

2.2 Top InAs layer

Simulations with varying InAs top layer thickness and a constant bottom layer thickness of 2 monolayers are shown in figures 2.42–2.82. They are arranged by increasing top layer thickness from 0 to 4 monolayers.

0.0 ML

Figure 2.42

0.1 ML

Figure 2.43

0.2 ML

Figure 2.44

0.3 ML

Intensity

ω (degrees)

Figure 2.45

0.4 ML

Figure 2.46

0.5 ML

Figure 2.47

0.6 ML
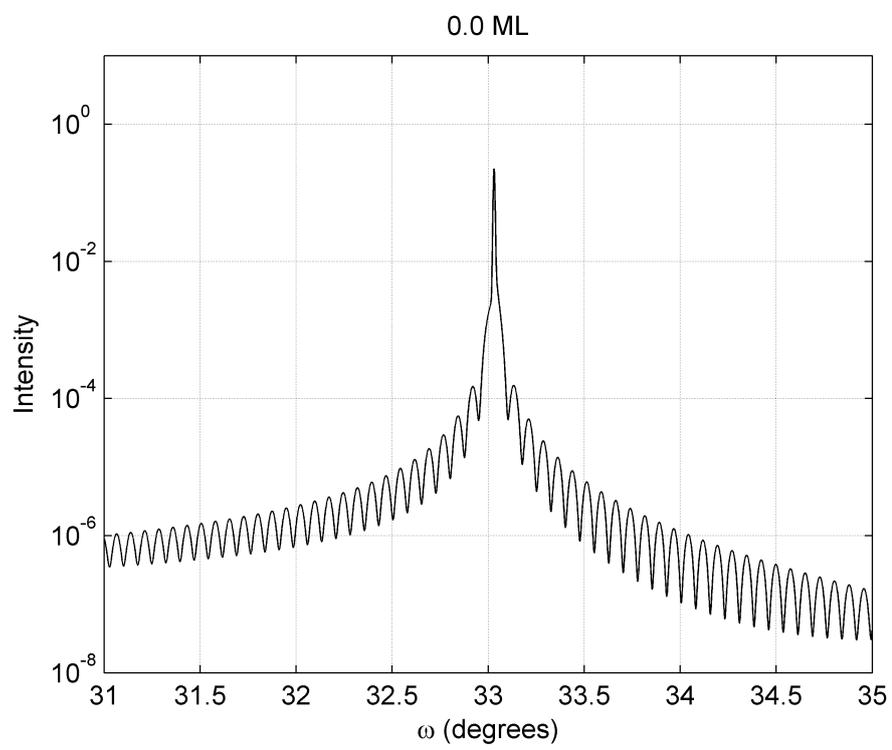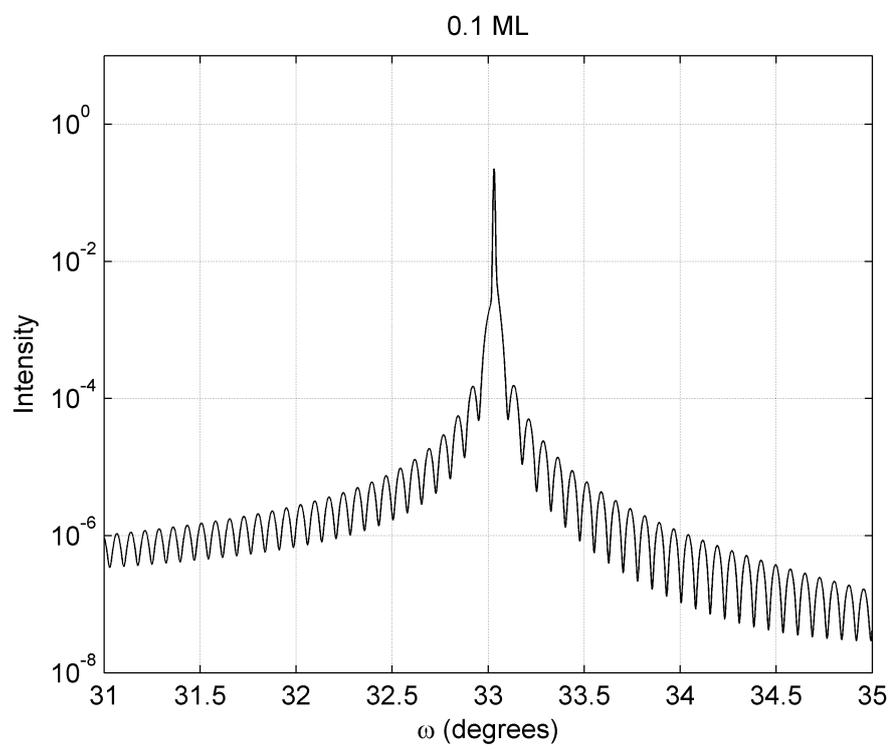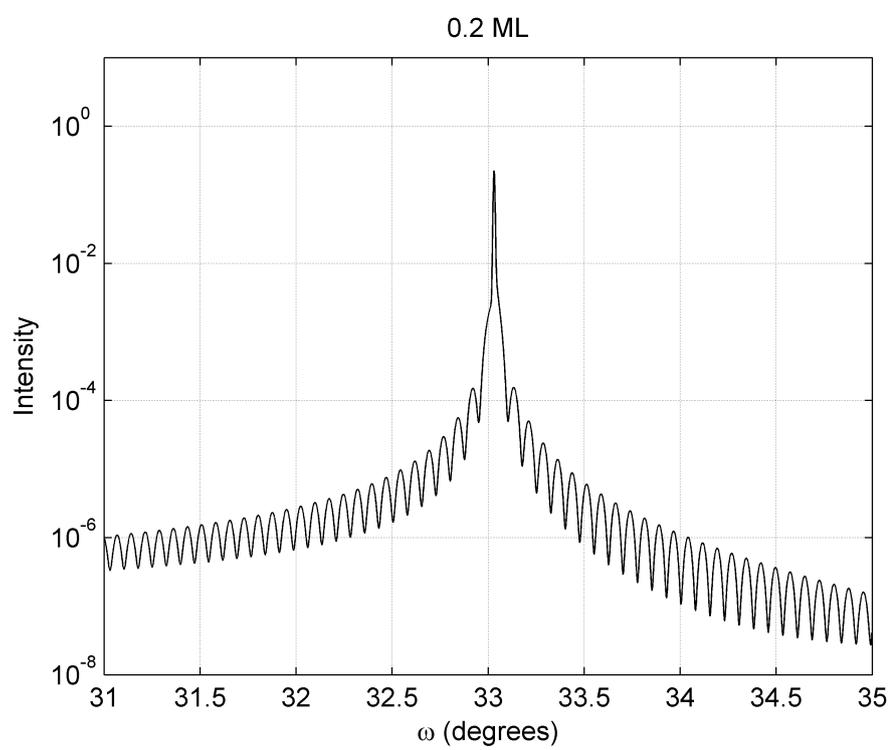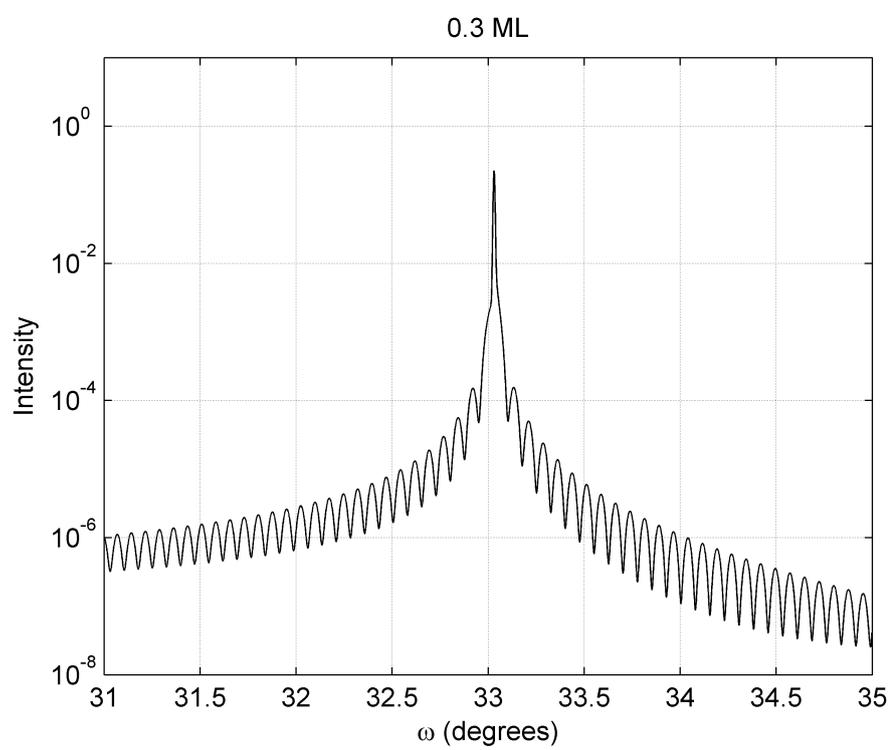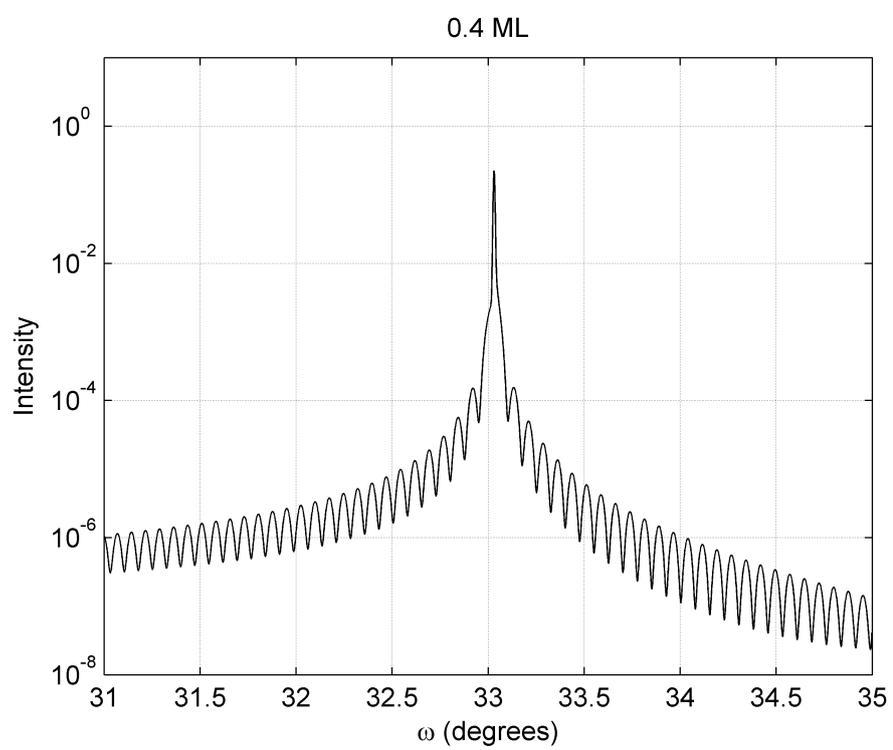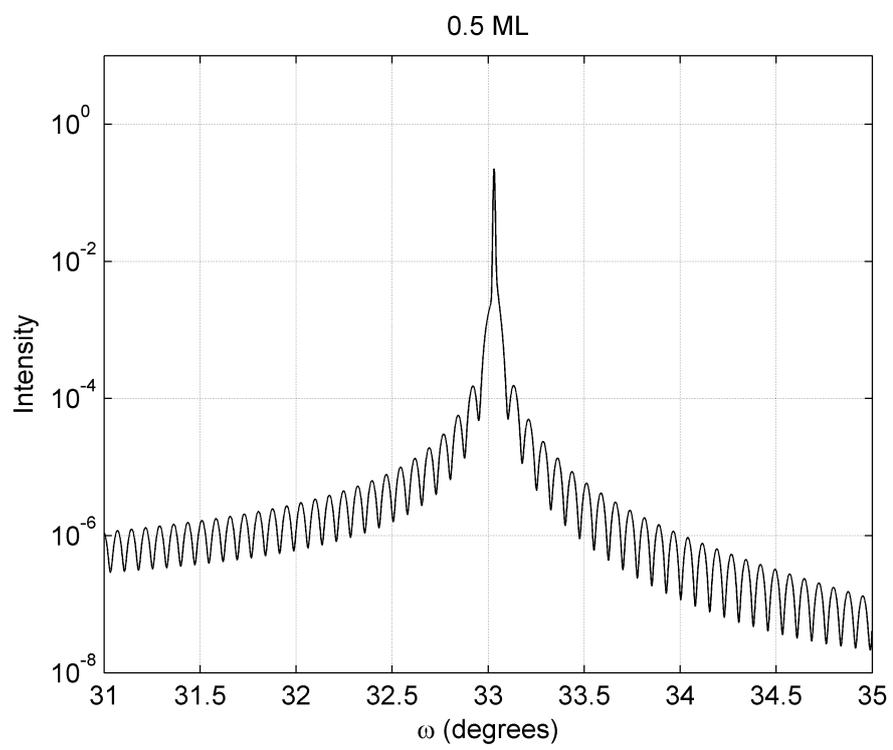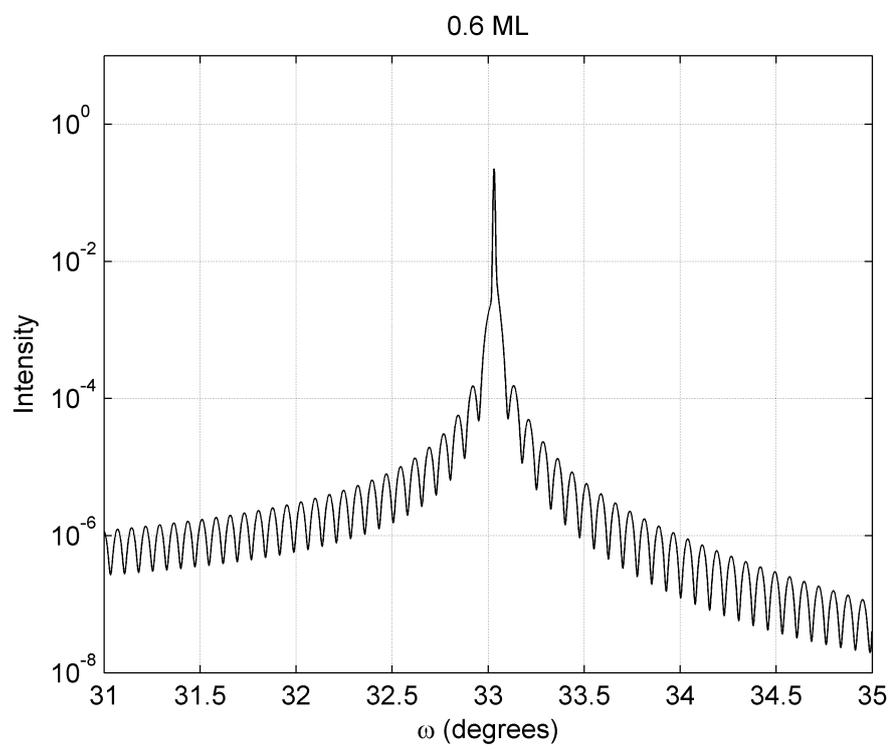
Figure 2.48

Figure 2.49

Figure 2.50

0.9 ML

Figure 2.51

1.0 ML

Intensity

ω (degrees)
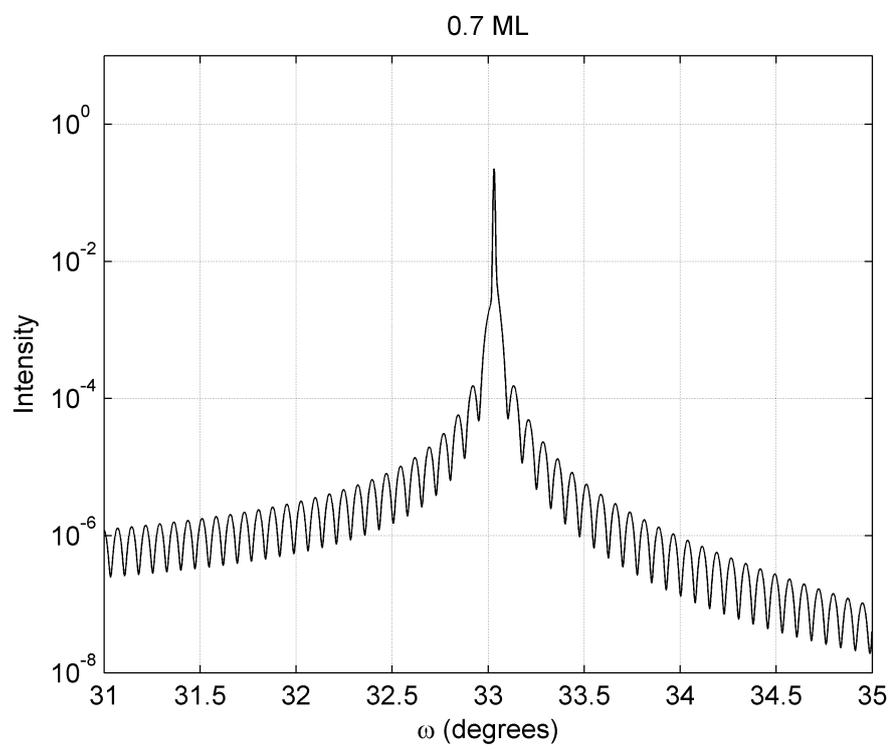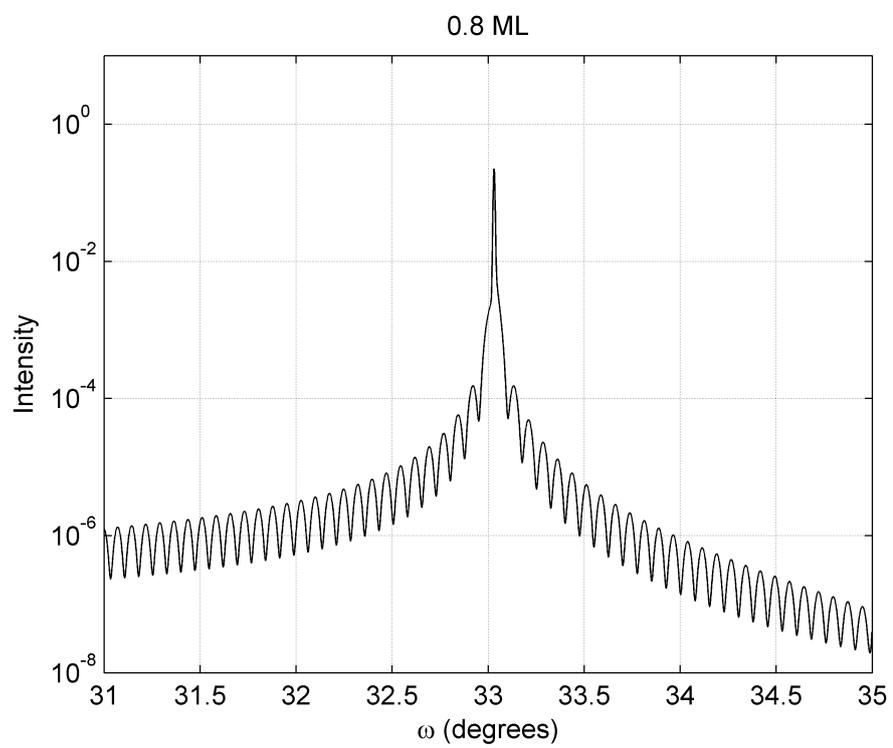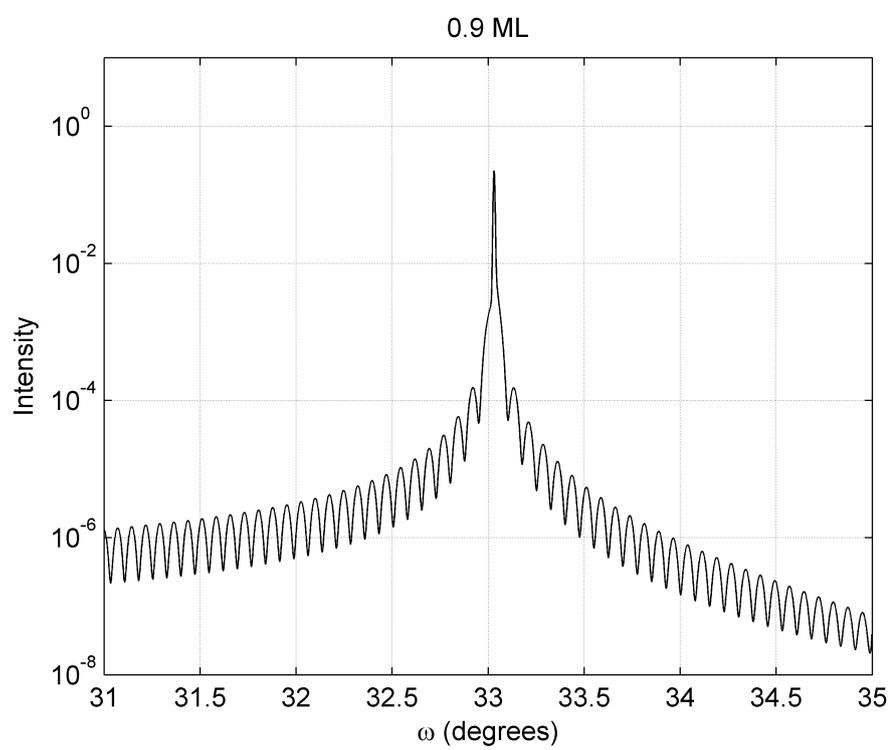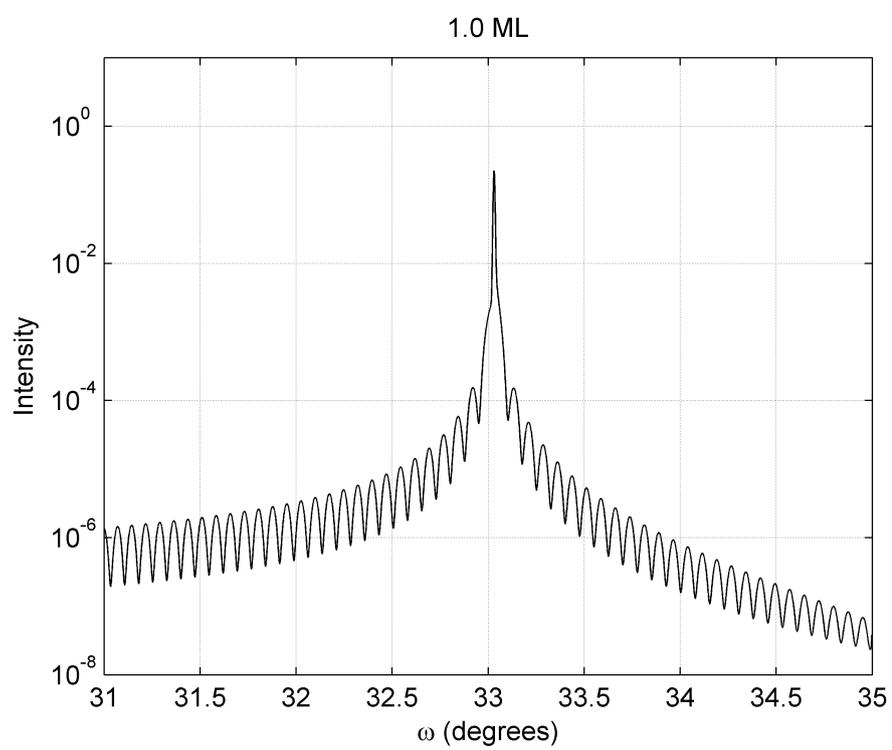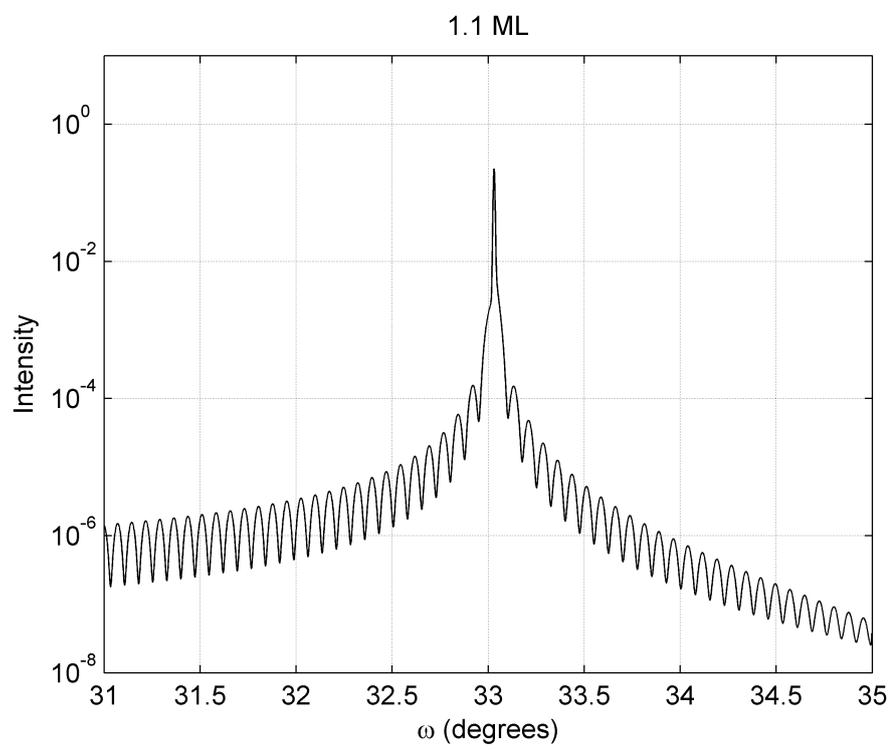
Figure 2.52

Figure 2.53

Figure 2.54

1.3 ML
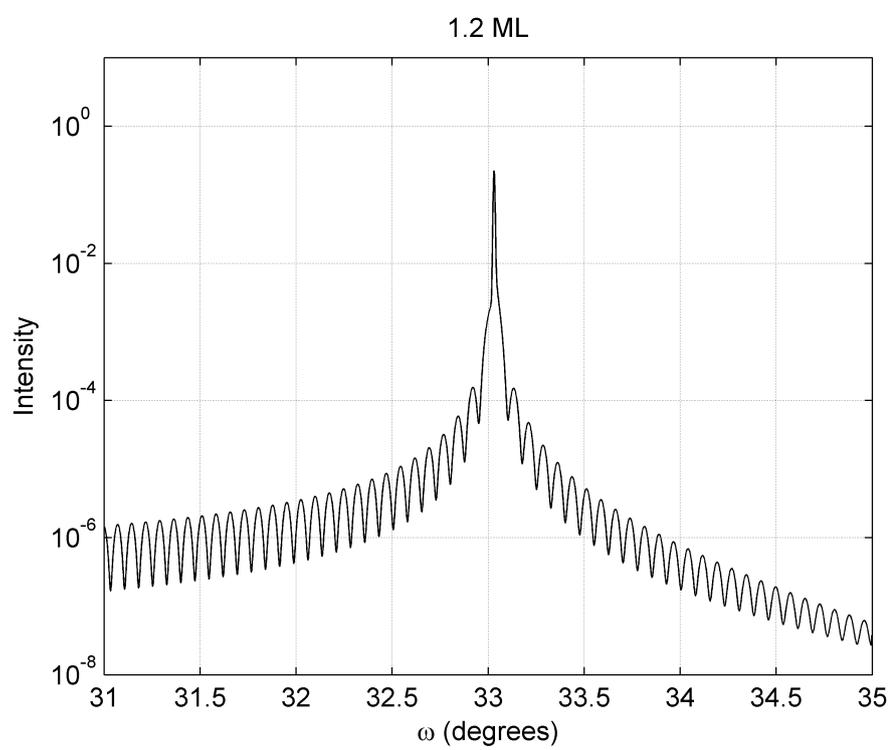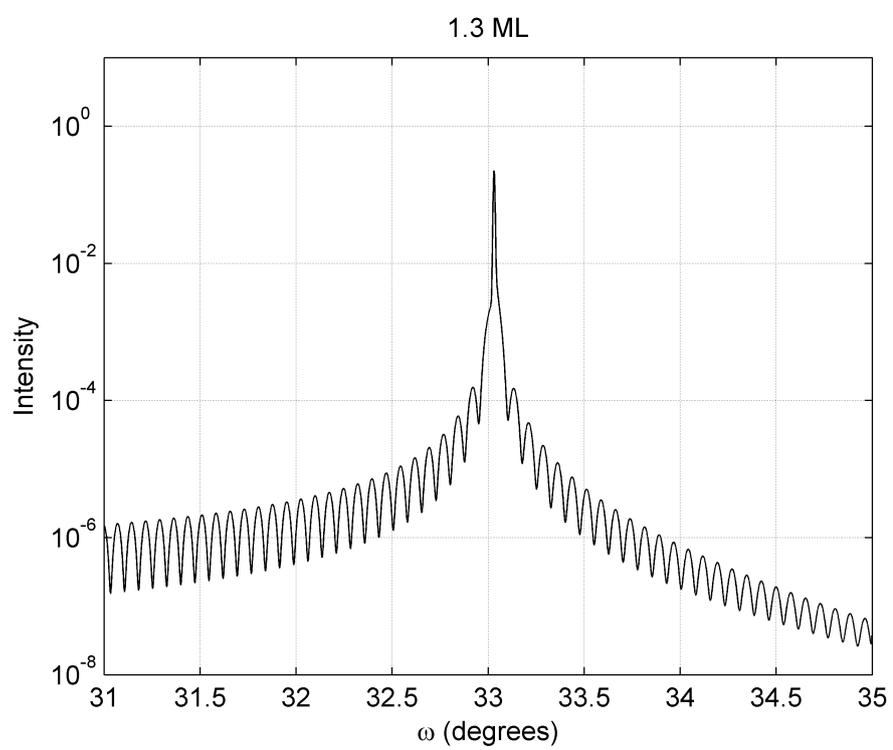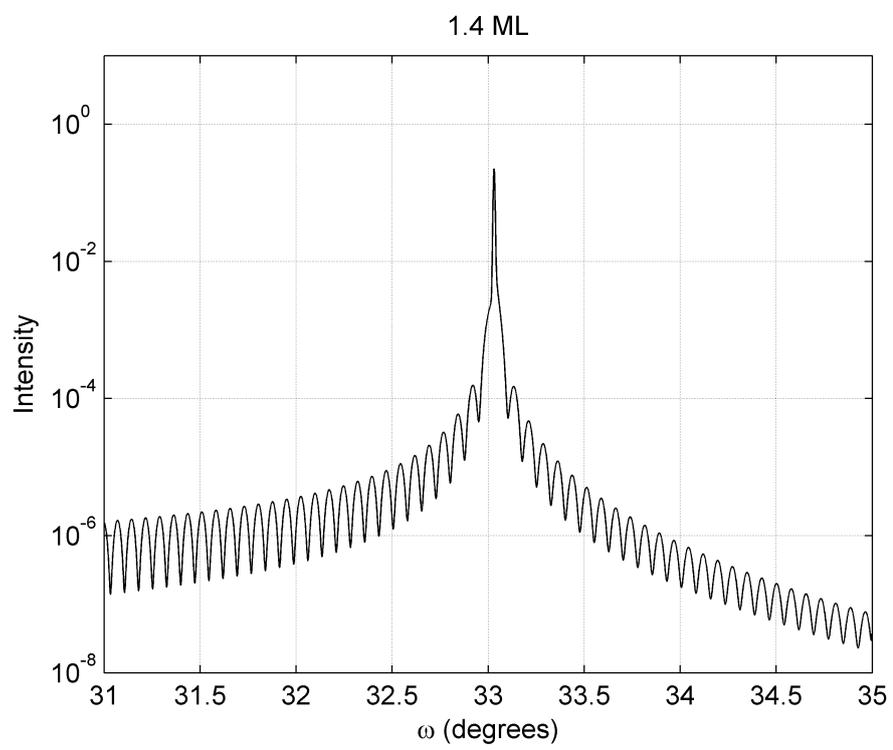
Figure 2.55

Figure 2.56
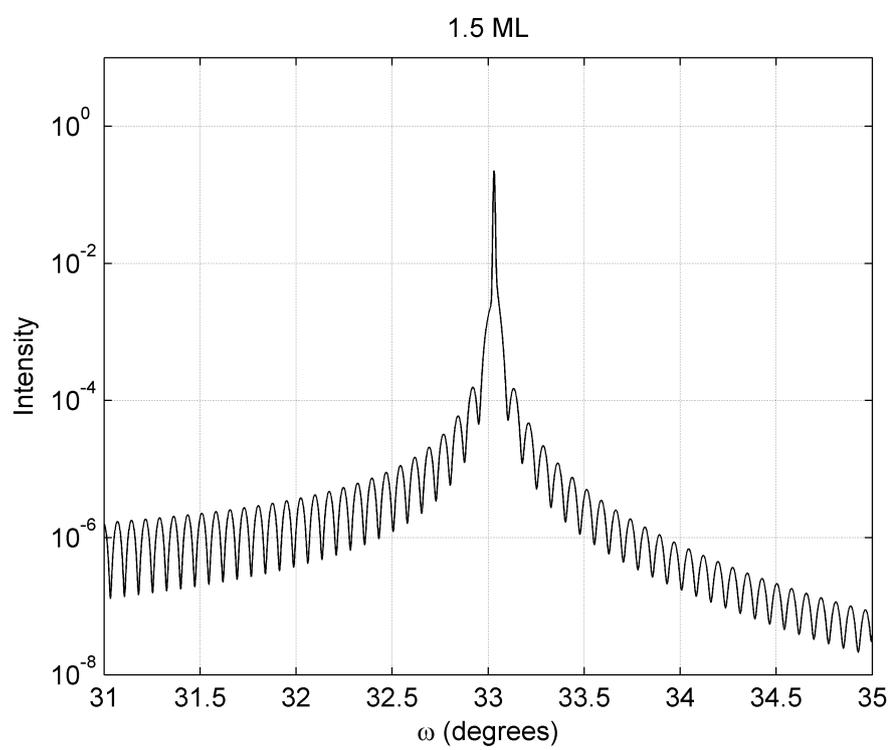
Figure 2.57

Figure 2.58

1.7 ML
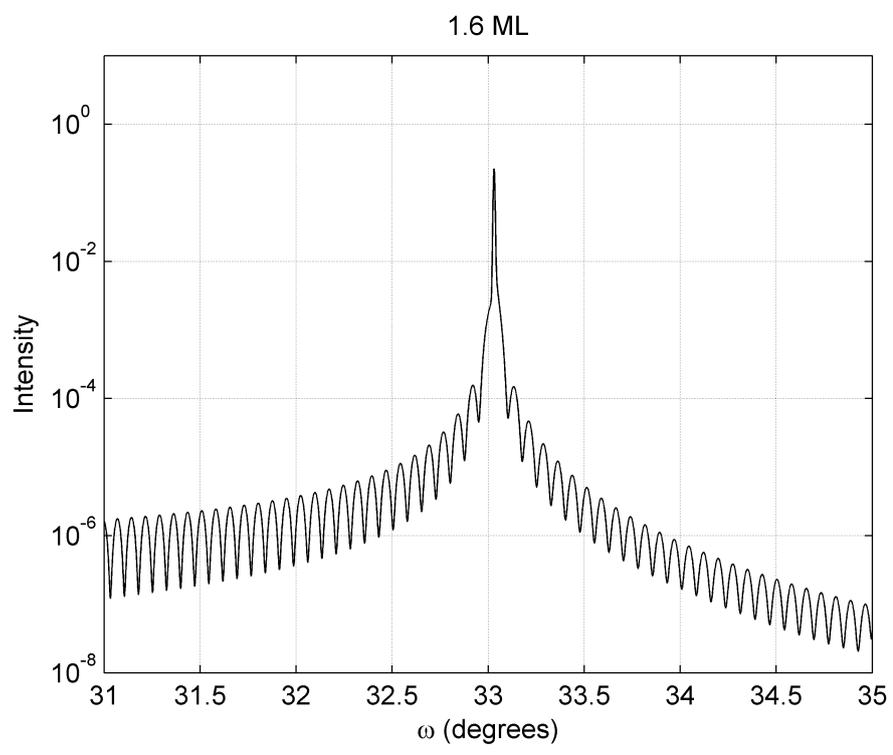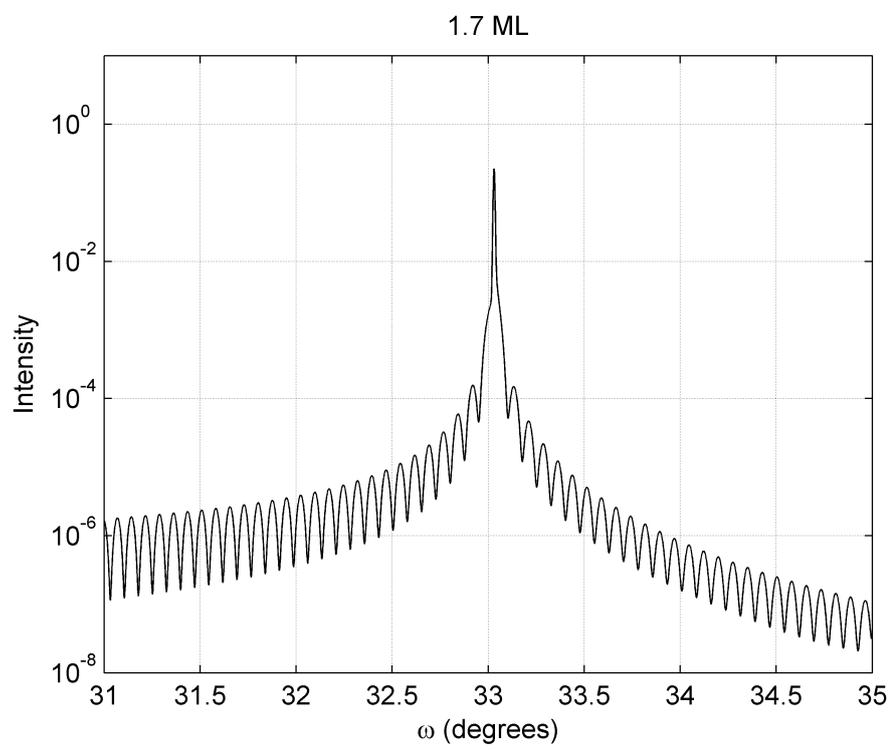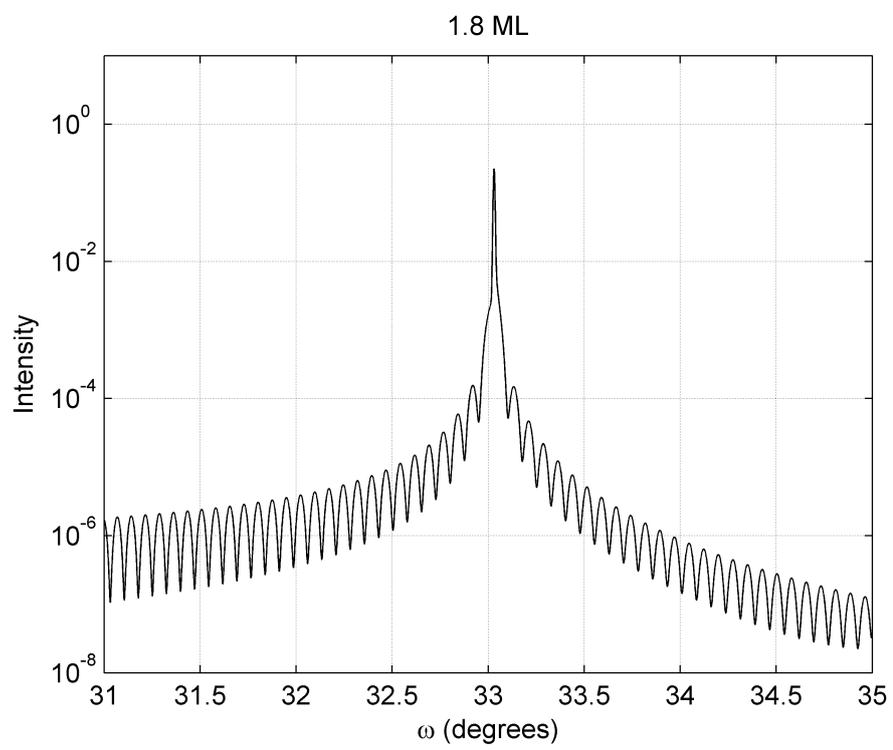
Figure 2.59

Figure 2.60
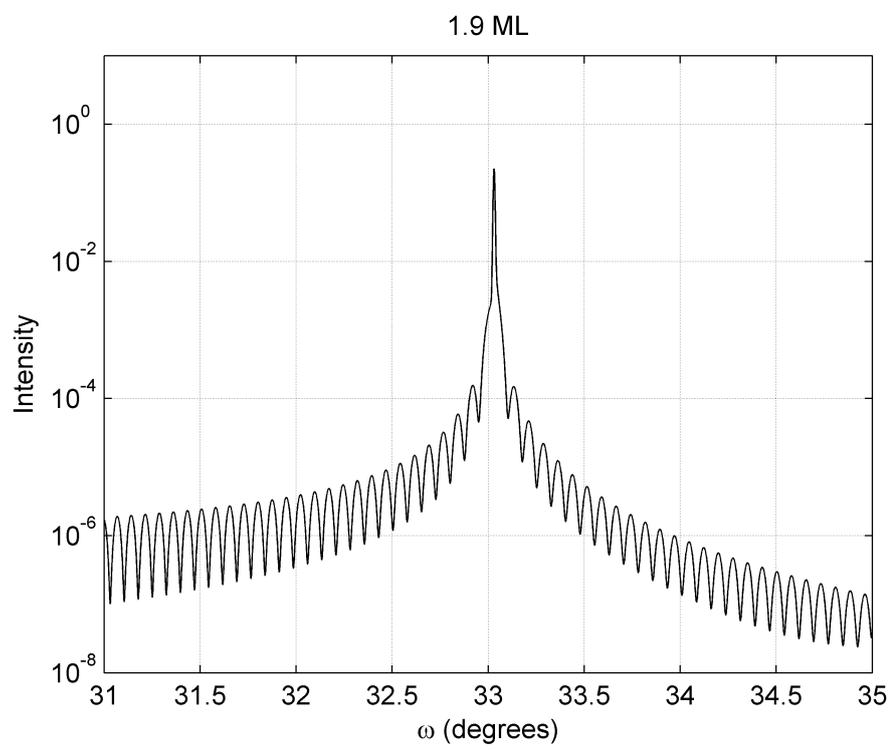
Figure 2.61
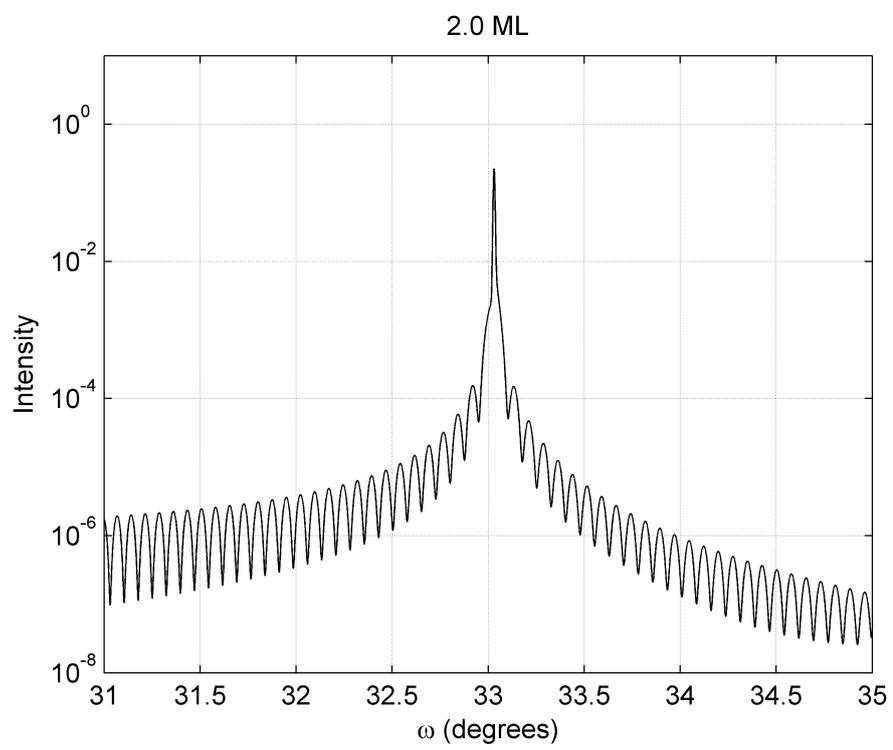
Figure 2.62

Figure 2.63

2.2 ML

Figure 2.64

2.3 ML
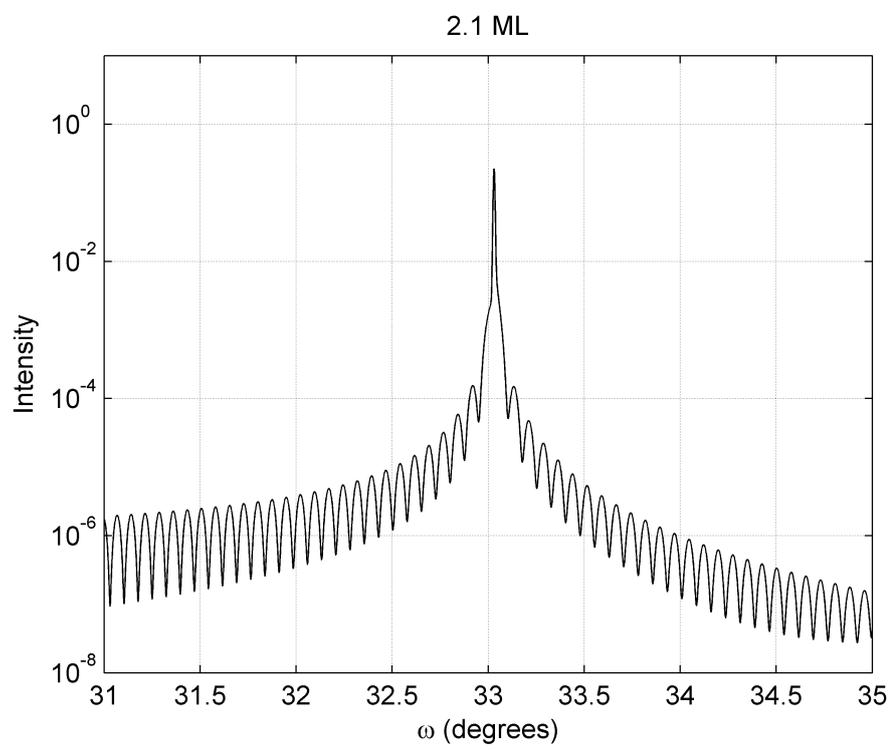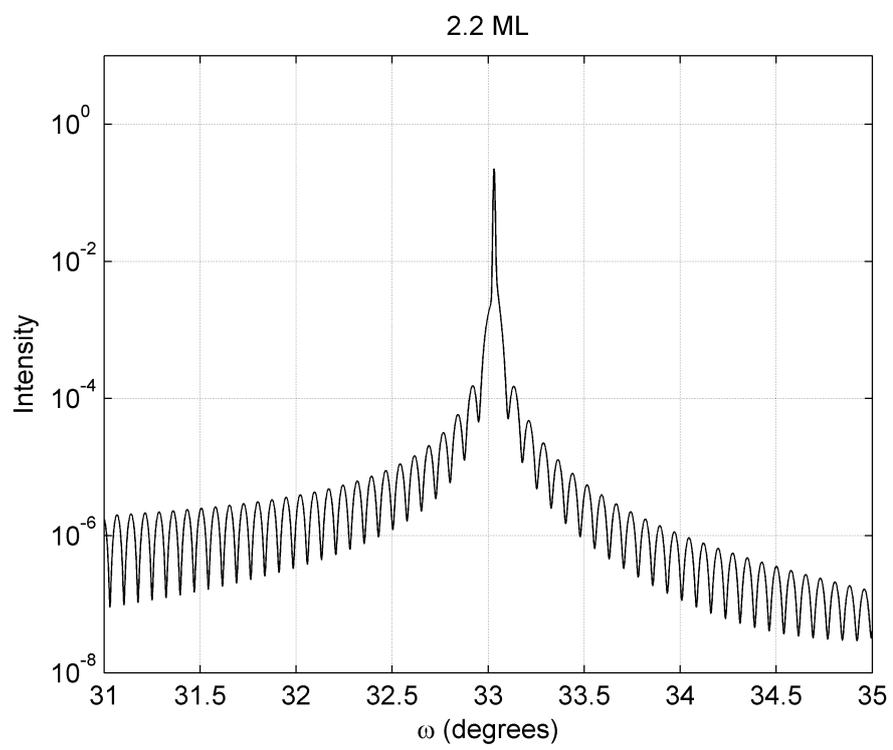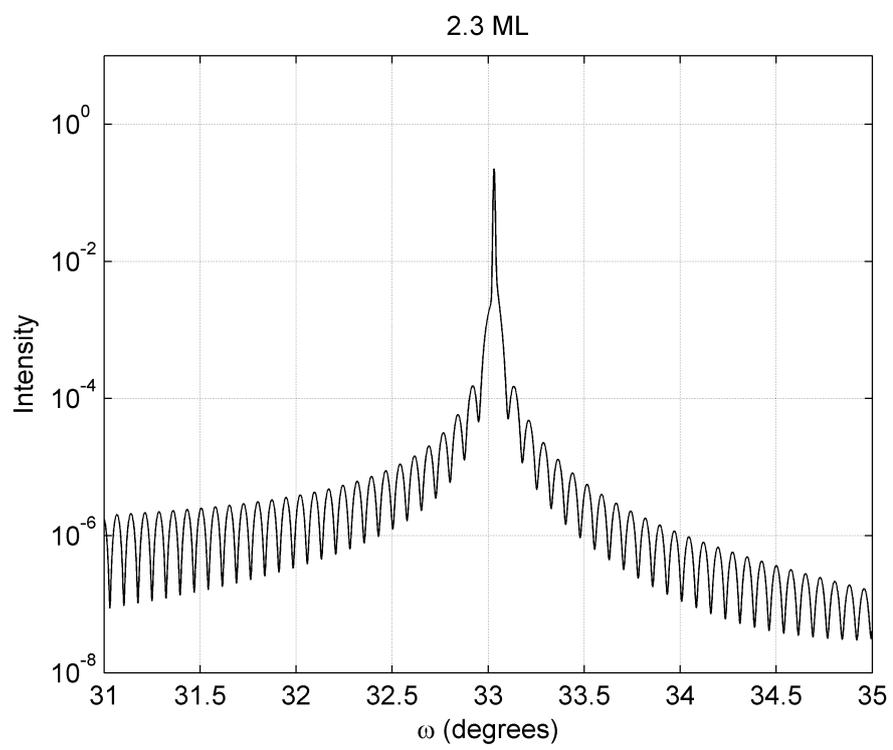
Figure 2.65

Figure 2.66
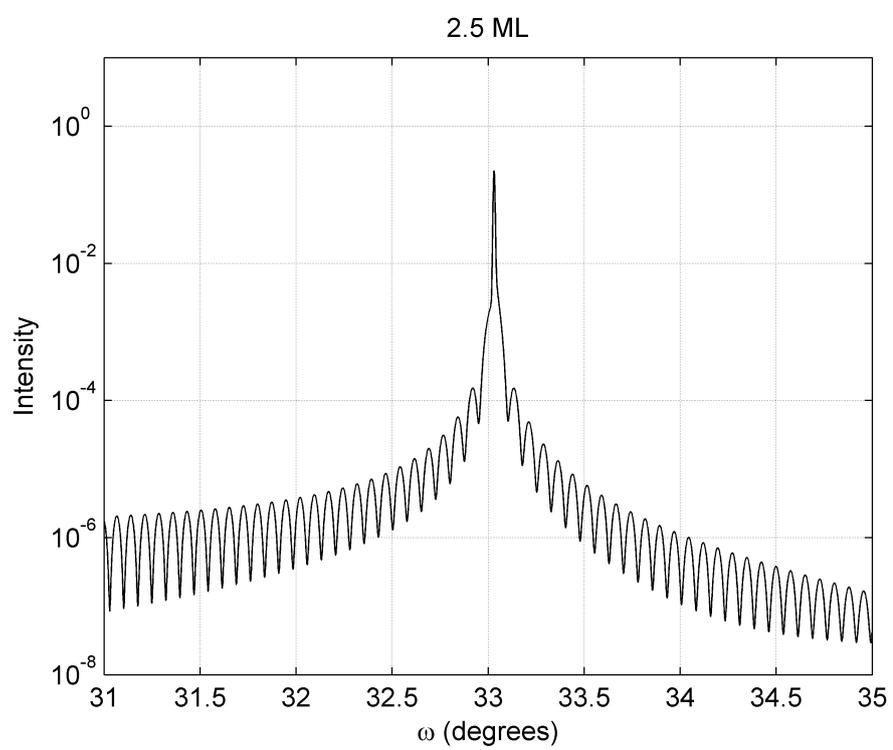
Figure 2.67
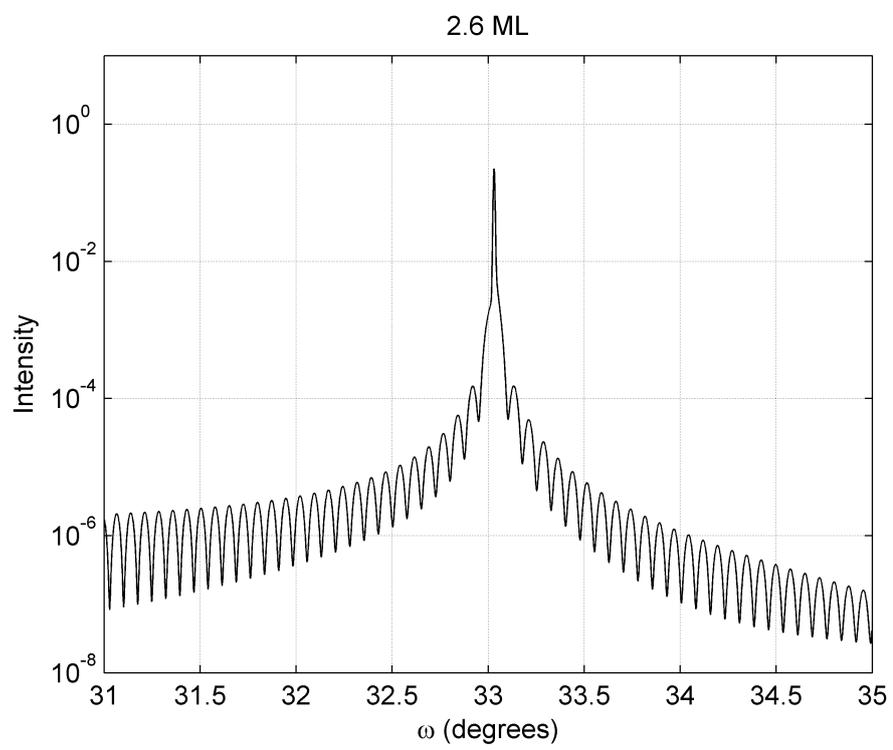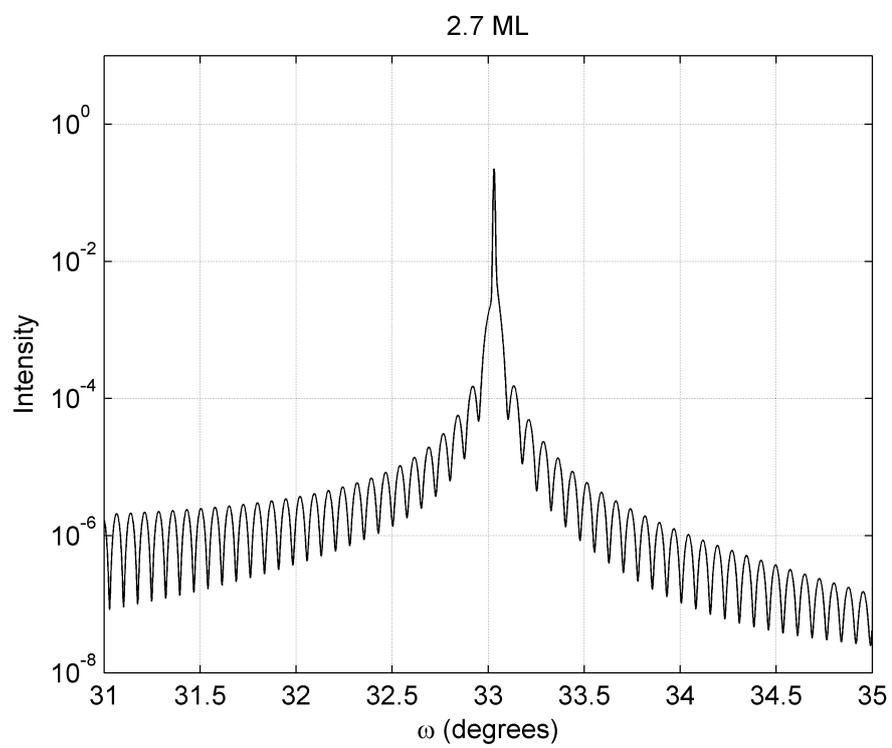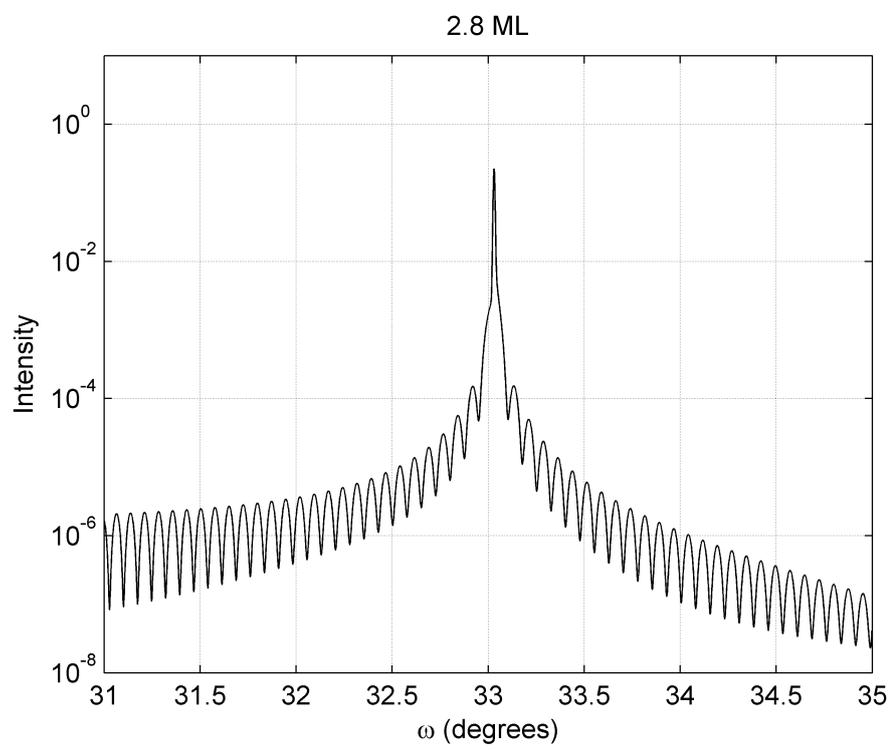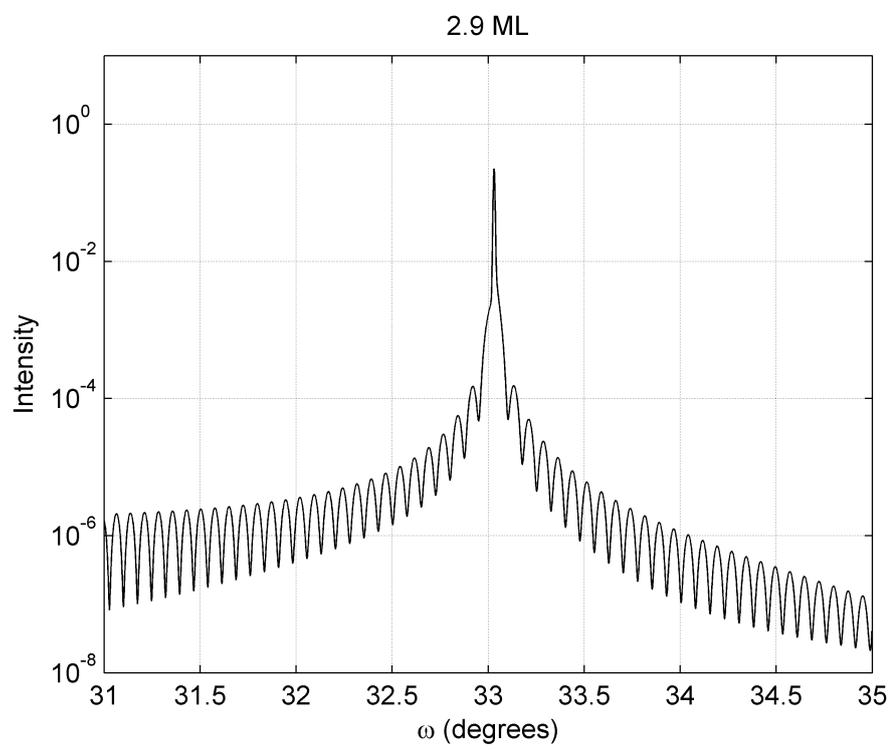
2.6 ML

Intensity

ω (degrees)

Figure 2.68

2.7 ML

Intensity

ω (degrees)

Figure 2.69

Figure 2.70

2.9 ML

Intensity

ω (degrees)

Figure 2.71

Figure 2.72

3.1 ML

Figure 2.73

3.2 ML

Figure 2.74

3.3 ML

Intensity

ω (degrees)

Figure 2.75

3.4 ML

Figure 2.76

3.5 ML

Figure 2.77

3.6 ML
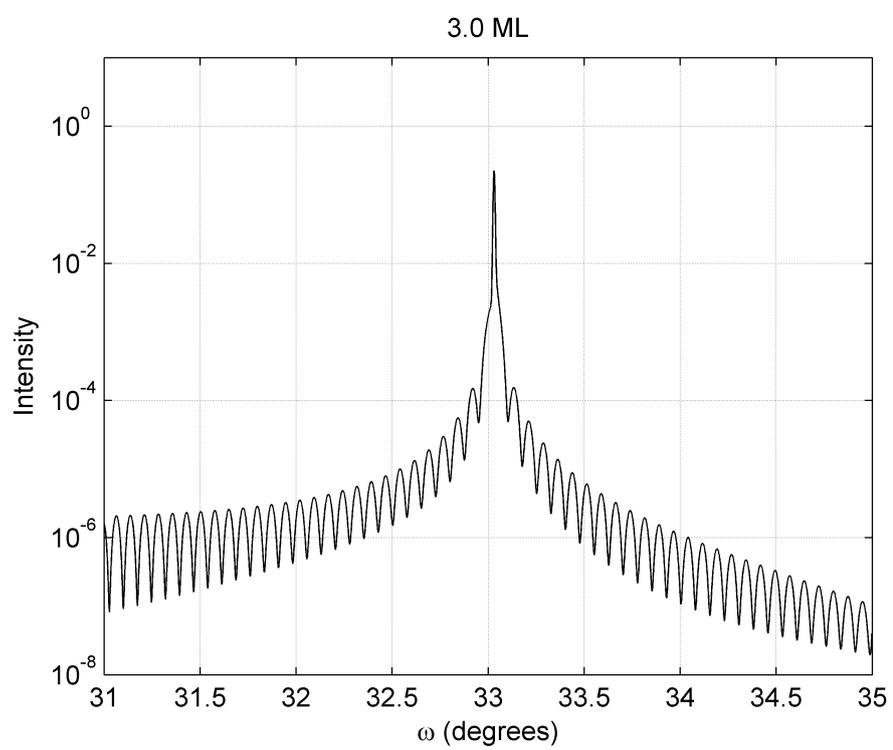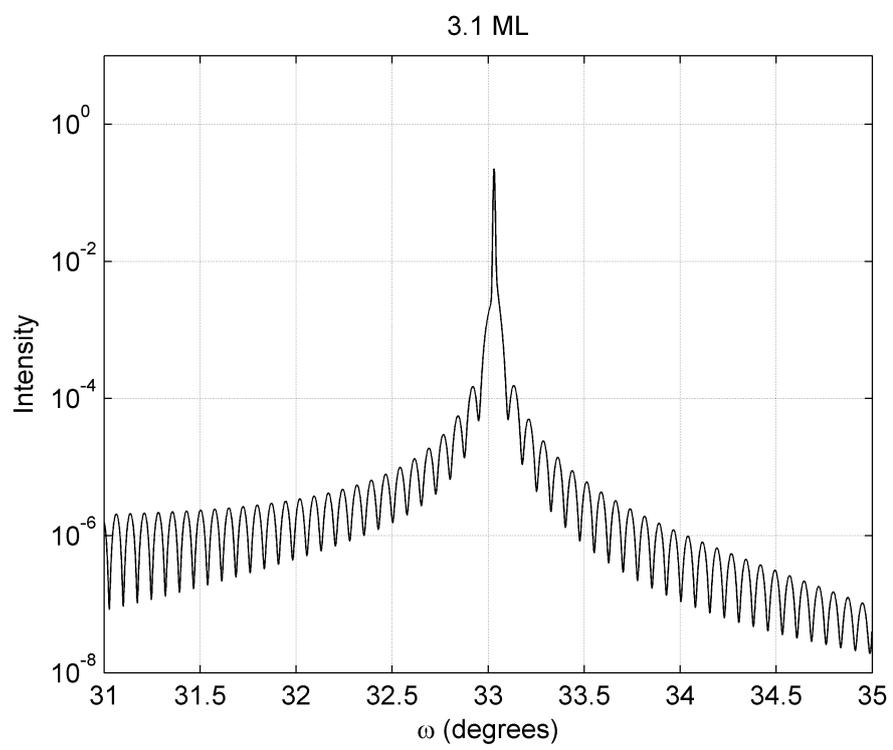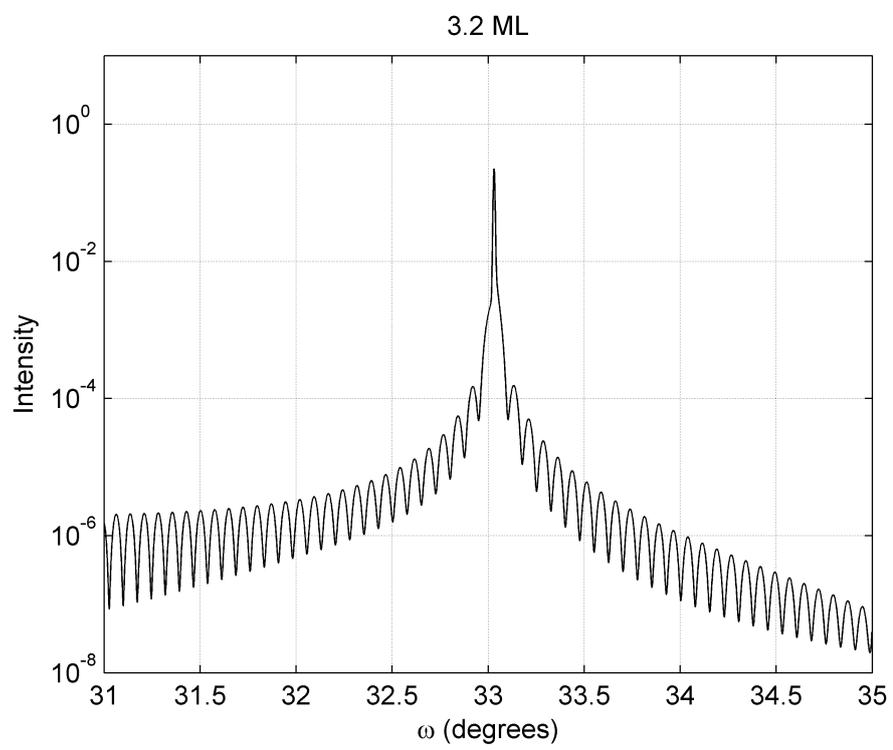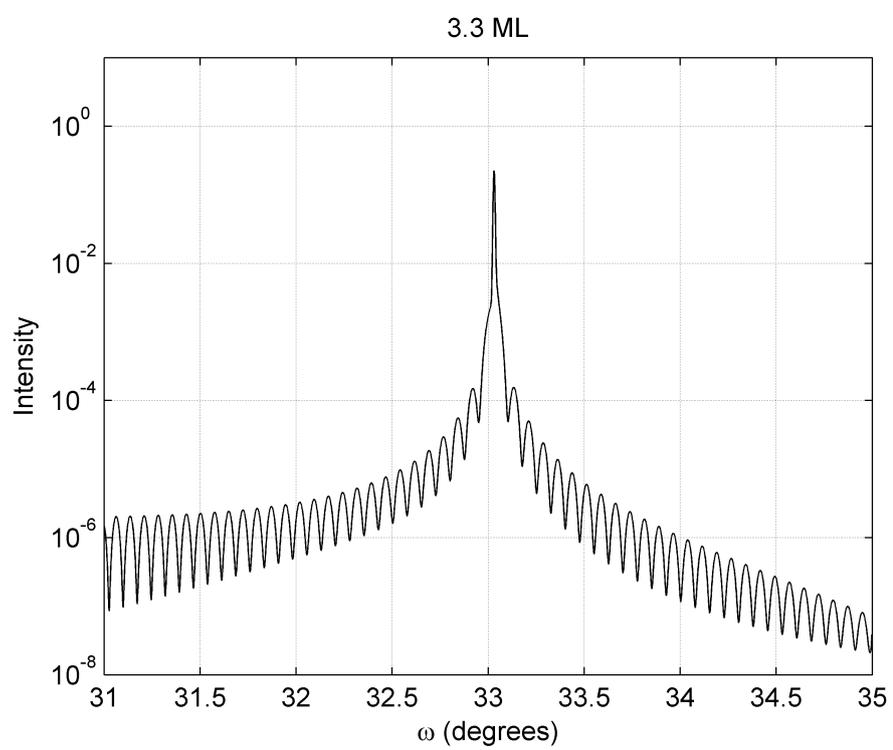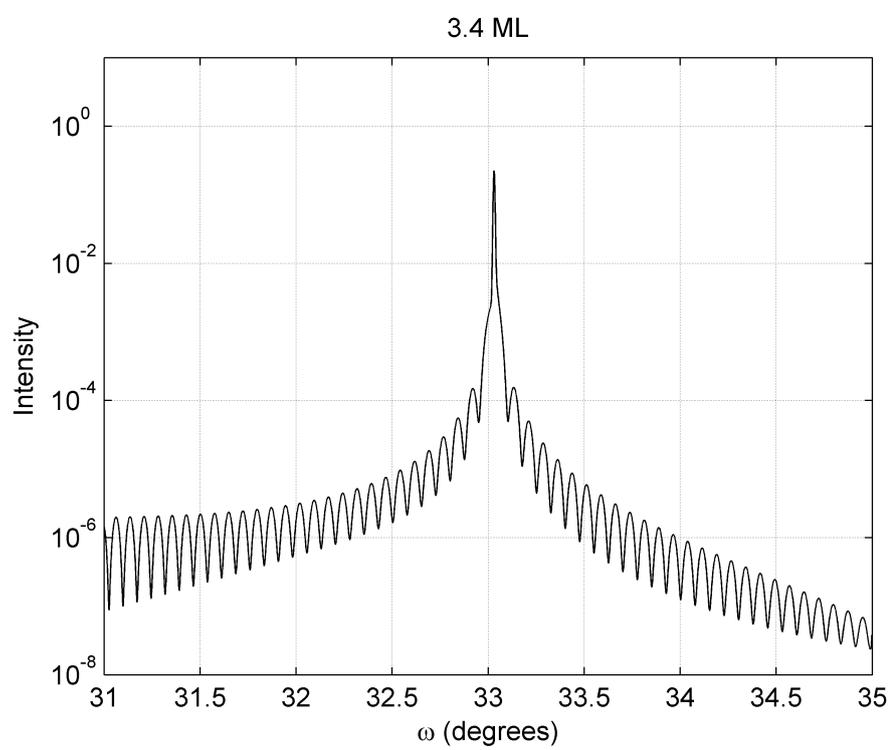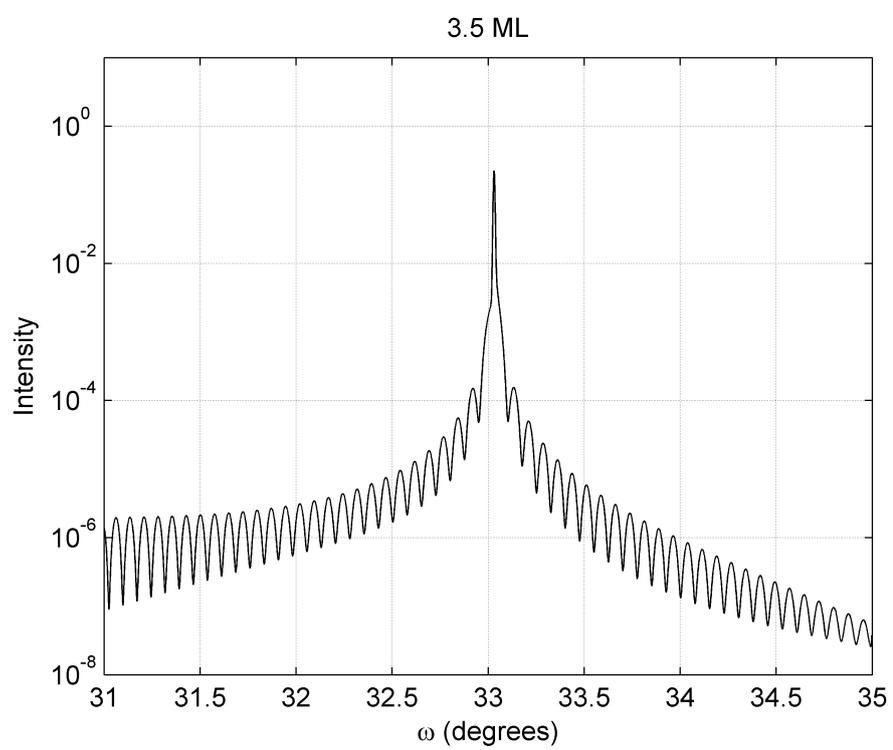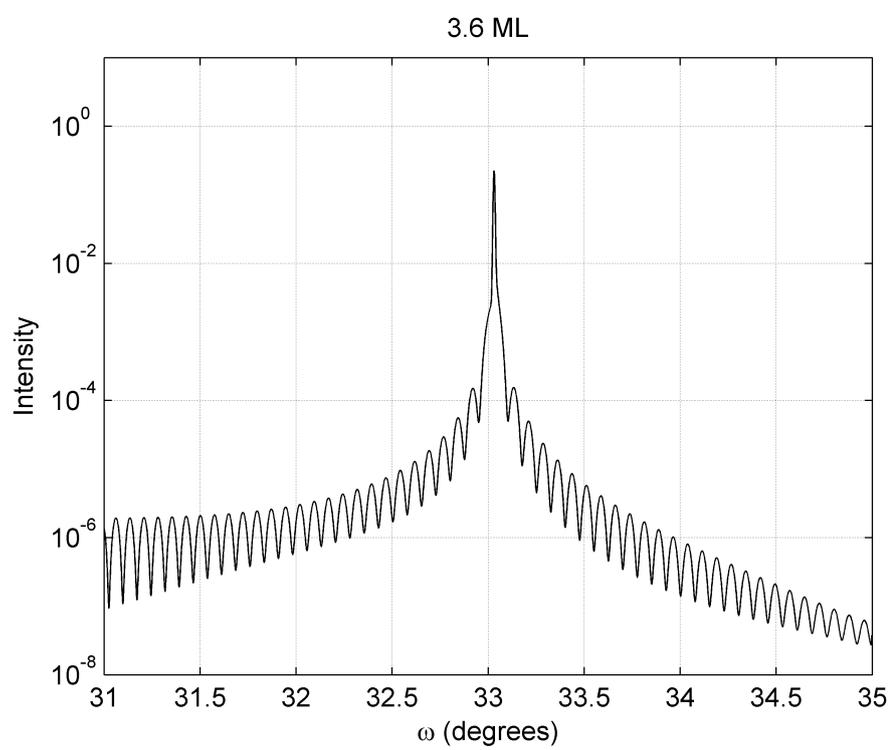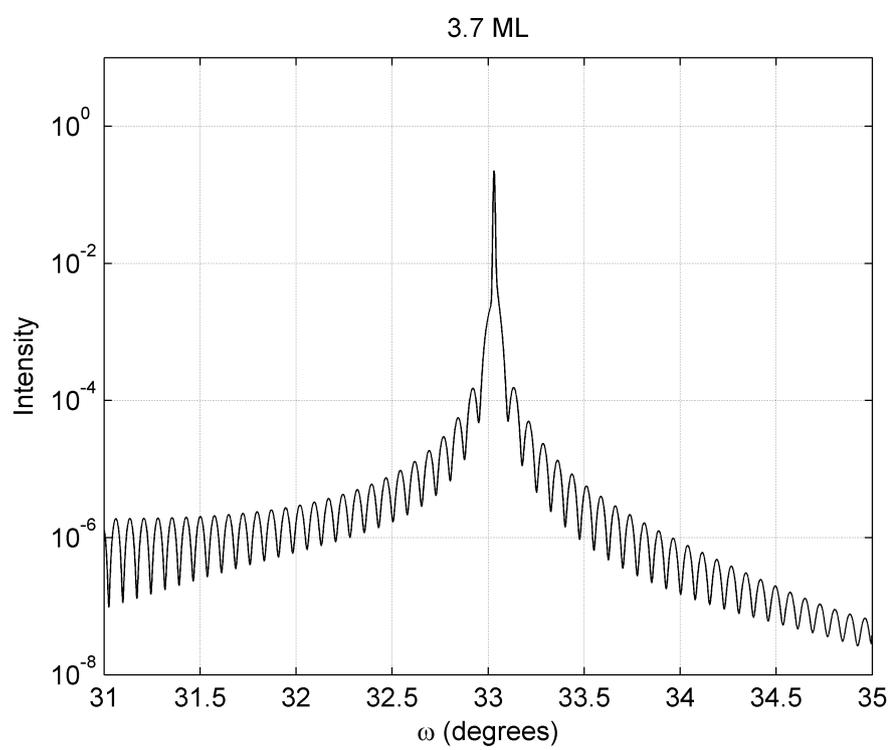
Figure 2.78
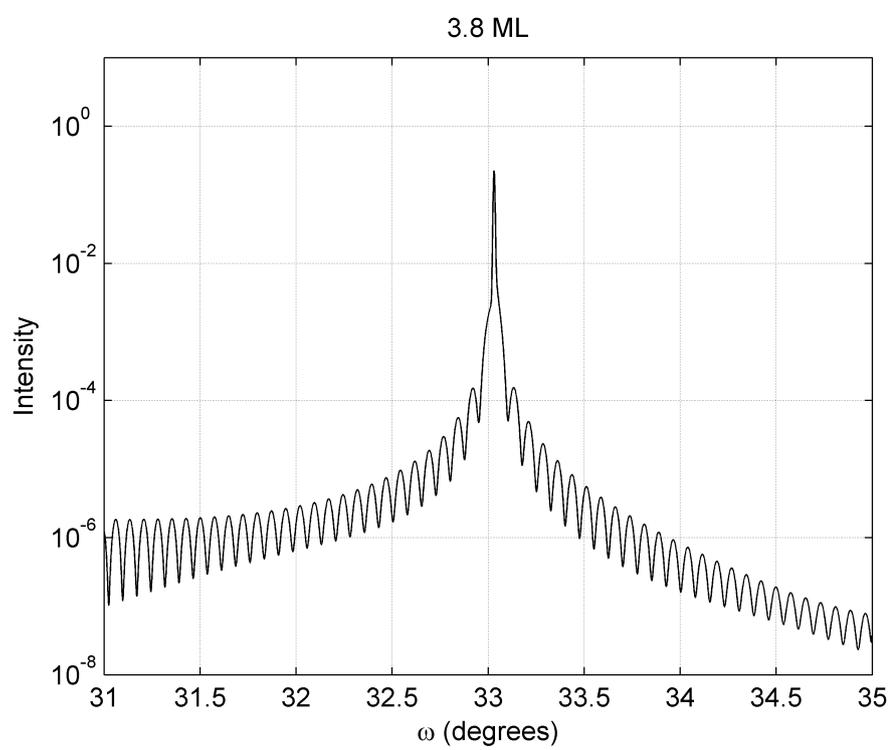
Figure 2.79

Figure 2.80
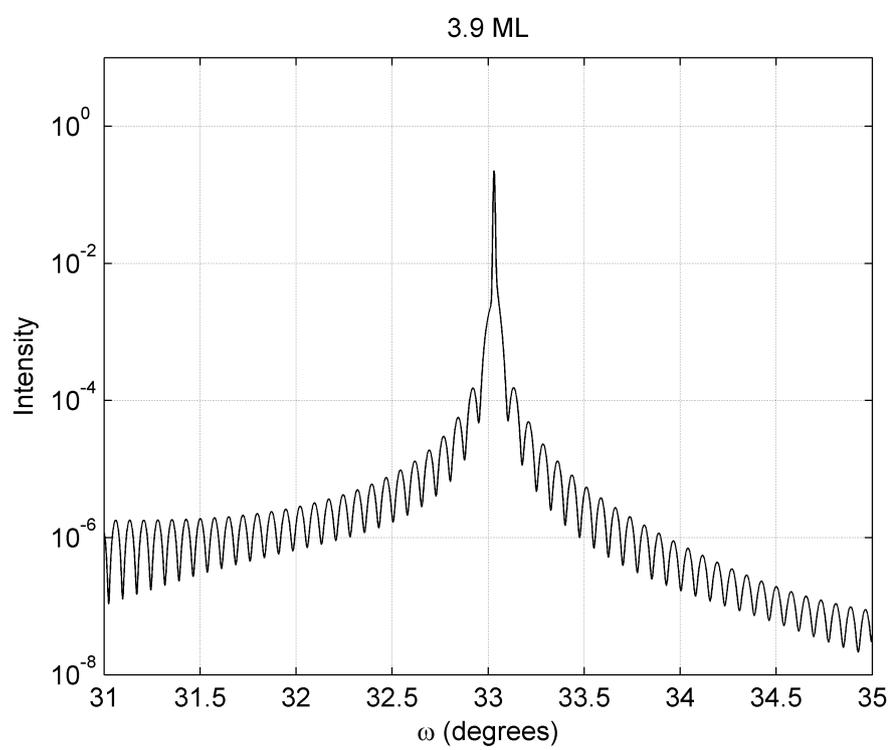
Figure 2.81
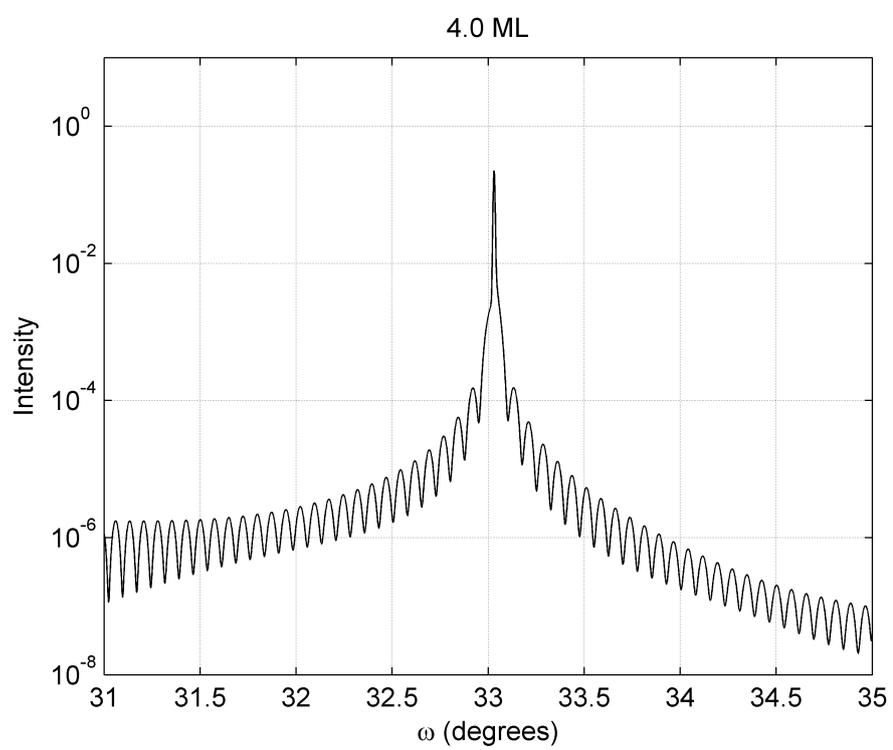
Figure 2.82

2.3   No top InAs layer

Simulations with varying InAs bottom layer thickness and no InAs top layer are shown in figures 2.83–2.123. They are arranged by increasing bottom layer thickness from 0 to 4 monolayers.
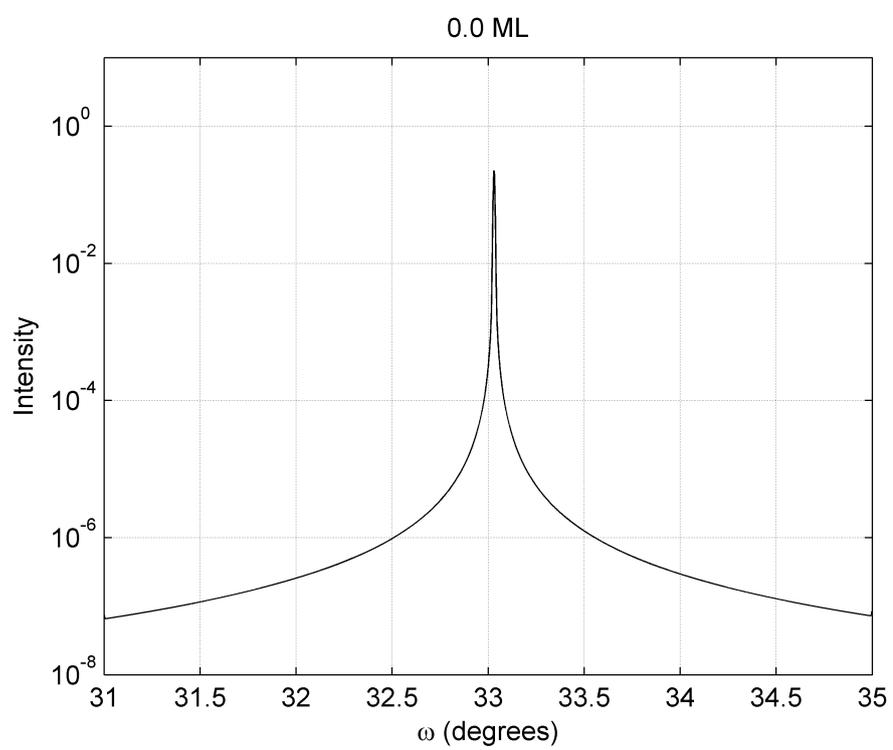
Figure 2.83

Figure 2.84

0.2 ML
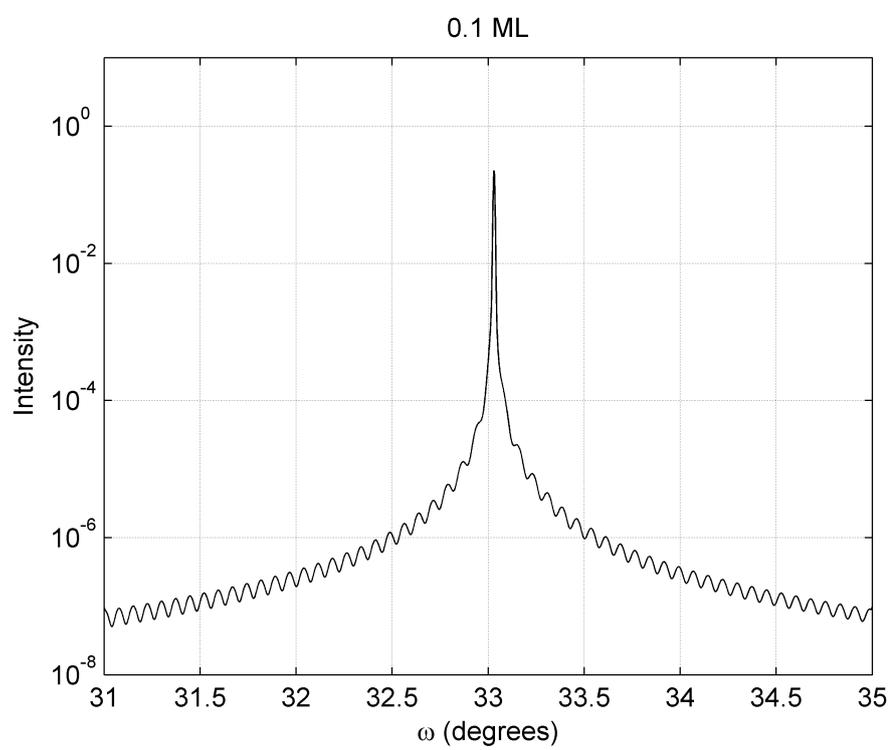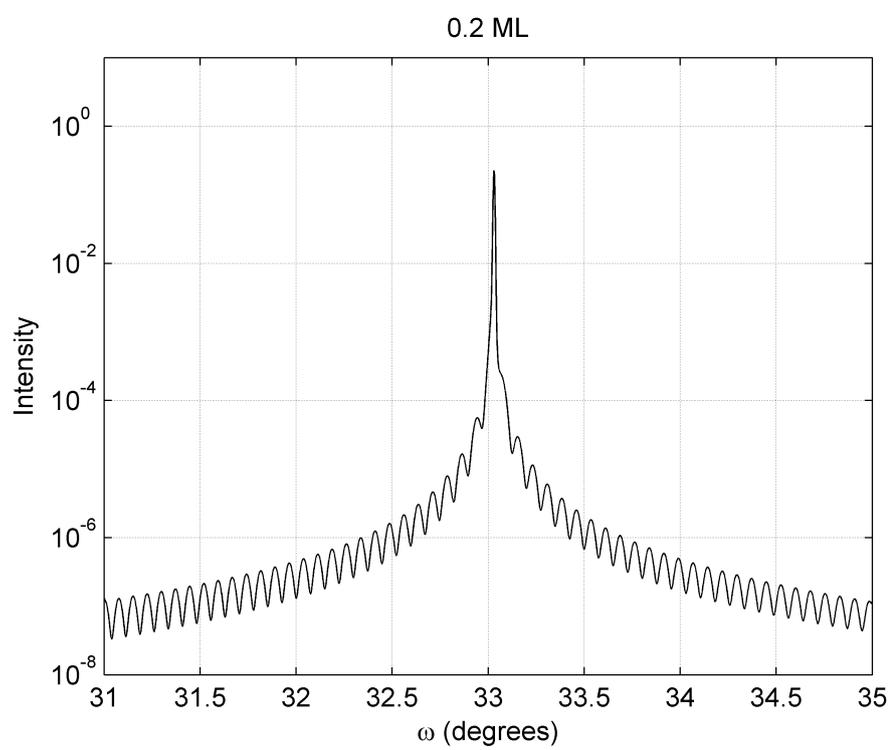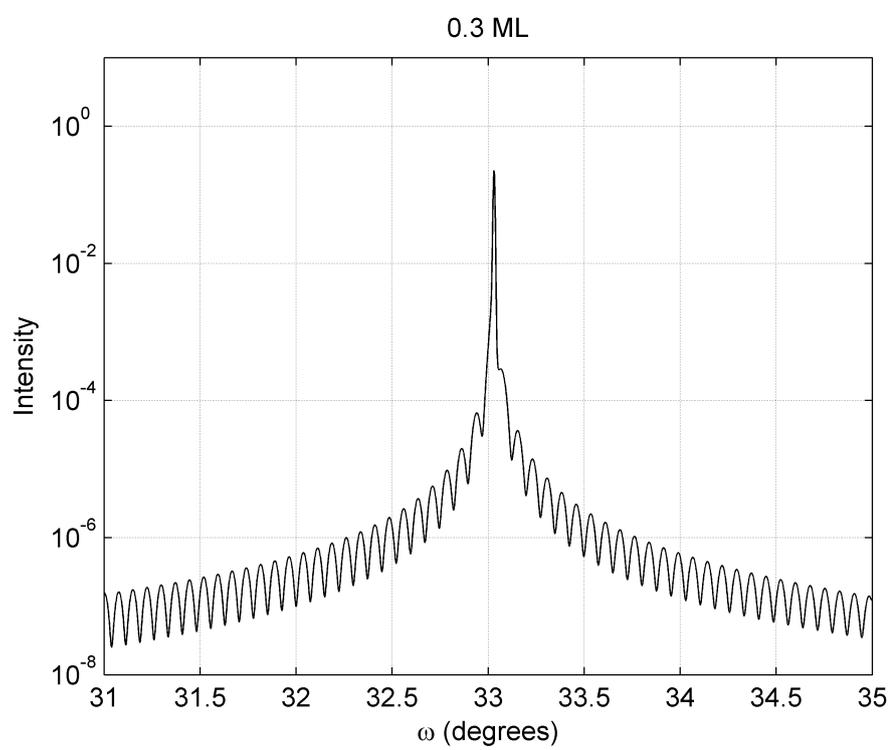
Figure 2.85

Figure 2.86
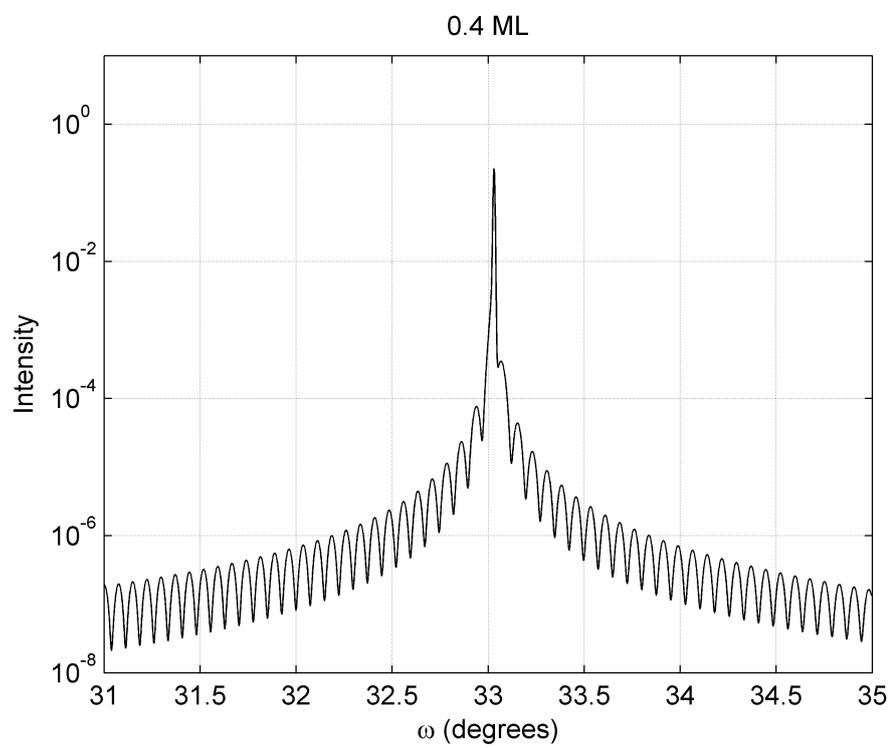
Figure 2.87
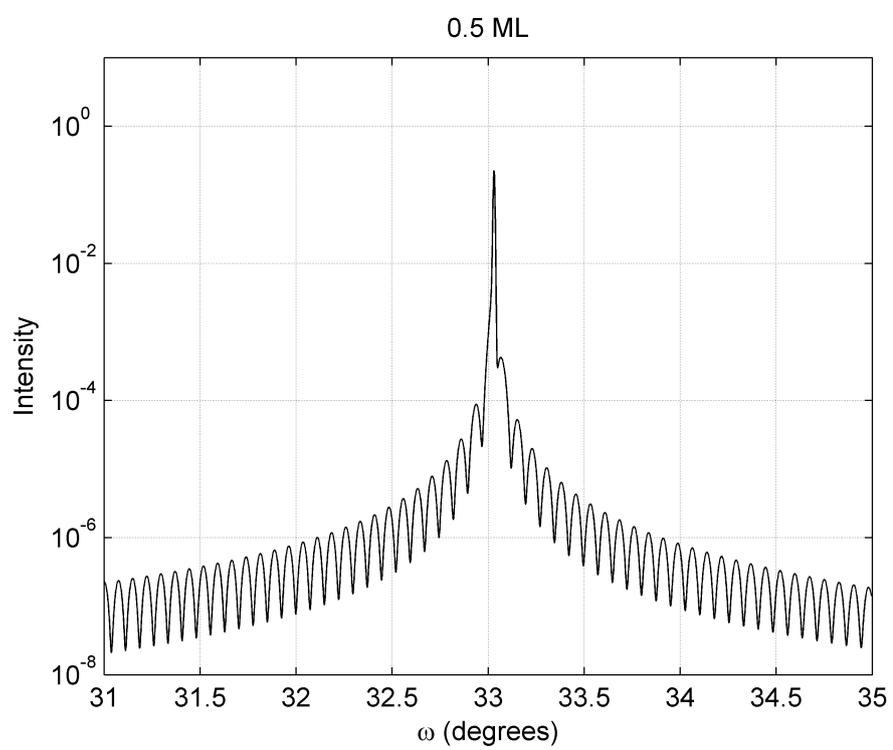
Figure 2.88
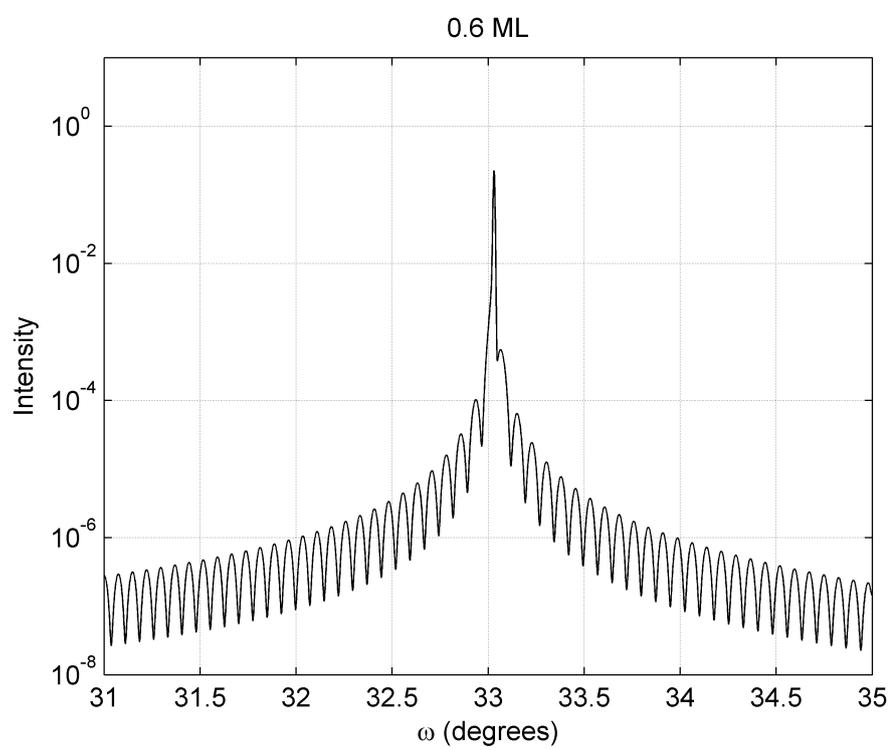
Figure 2.89
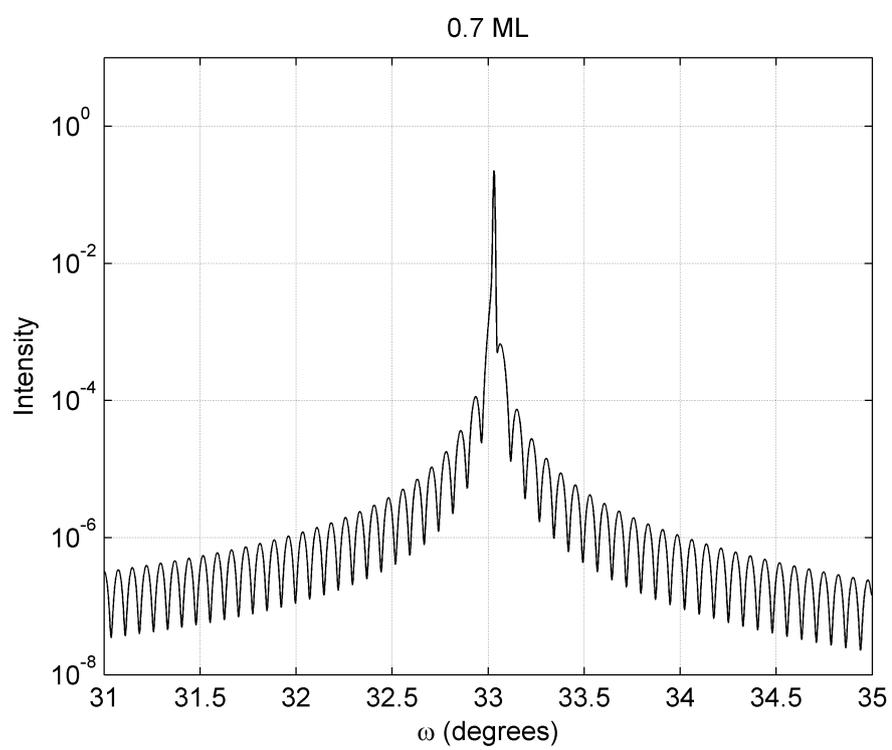
Figure 2.90
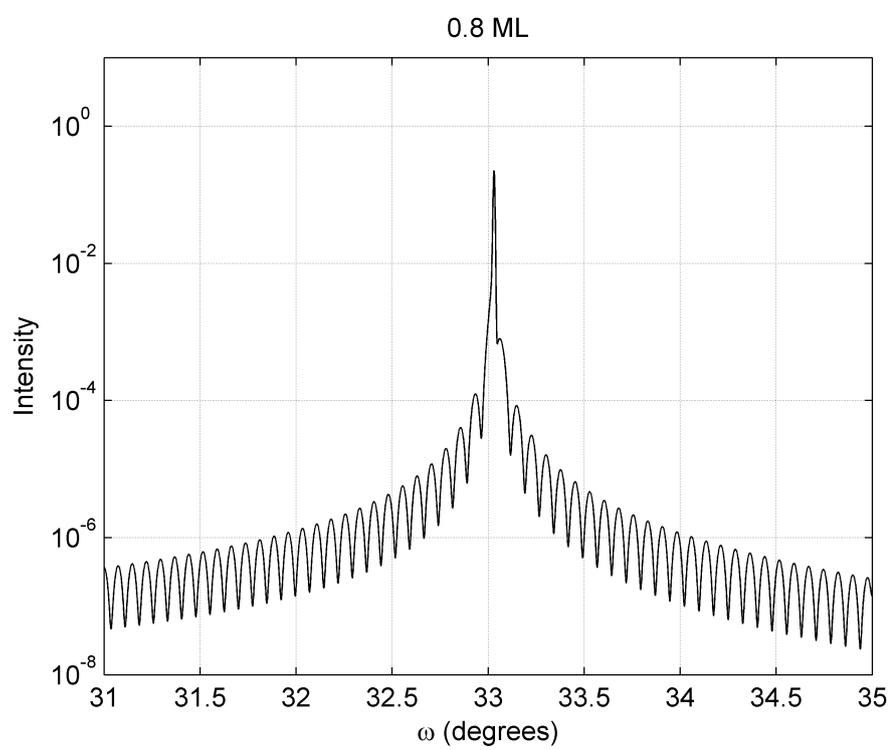
Figure 2.91

Figure 2.92

Figure 2.93

1.1 ML

Intensity

ω (degrees)

Figure 2.94

1.2 ML

Figure 2.95

1.3 ML

Figure 2.96

1.4 ML
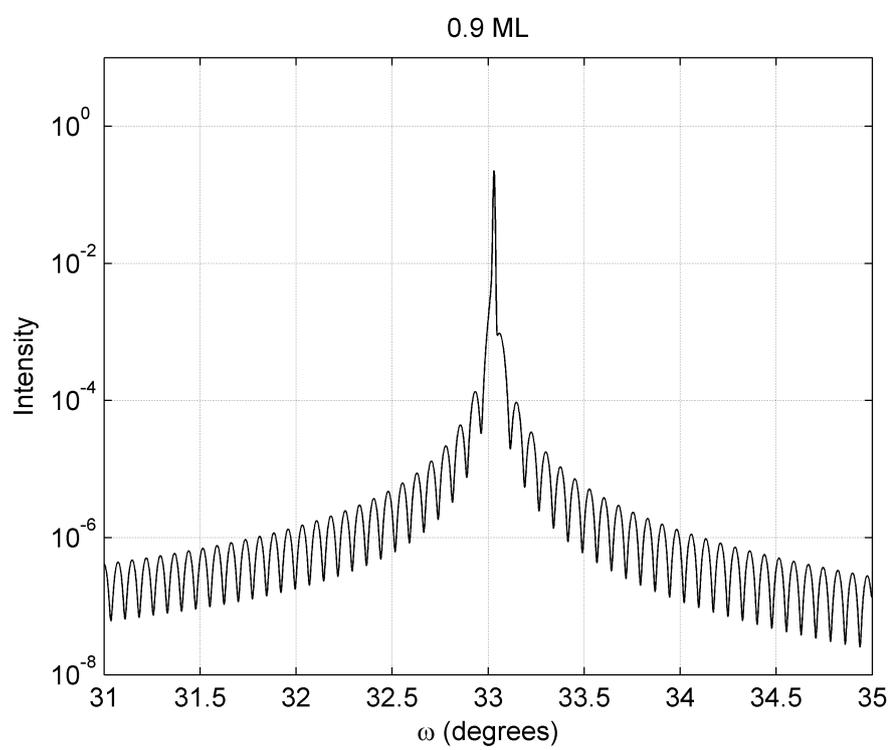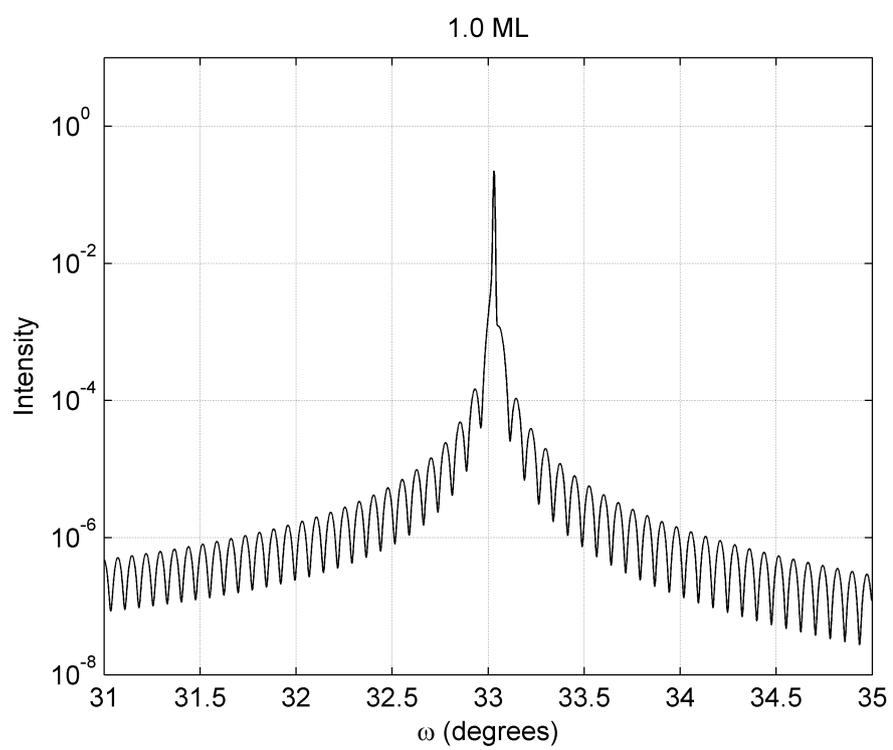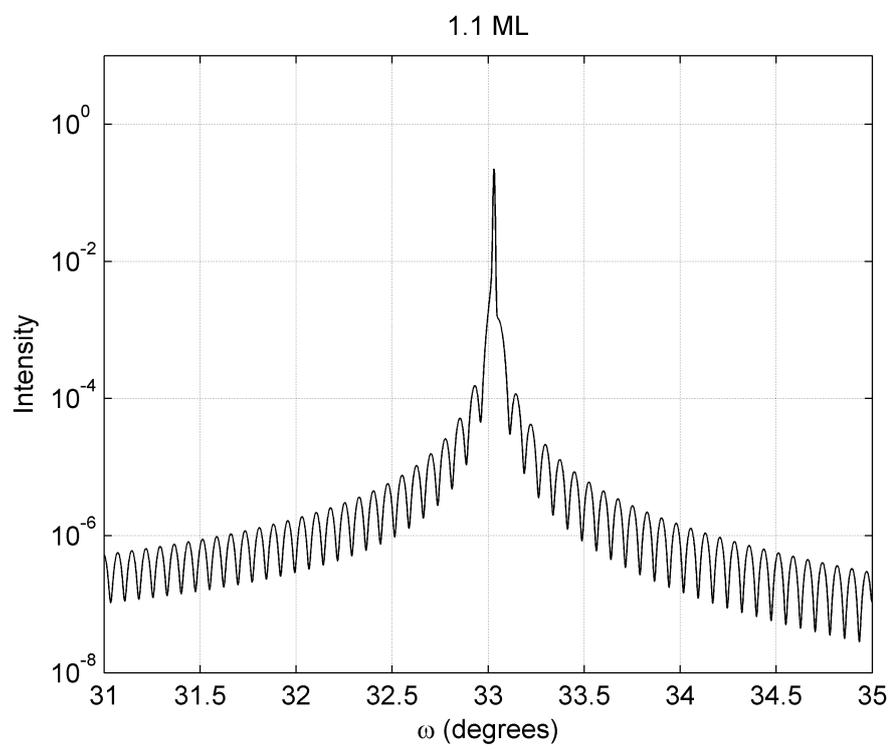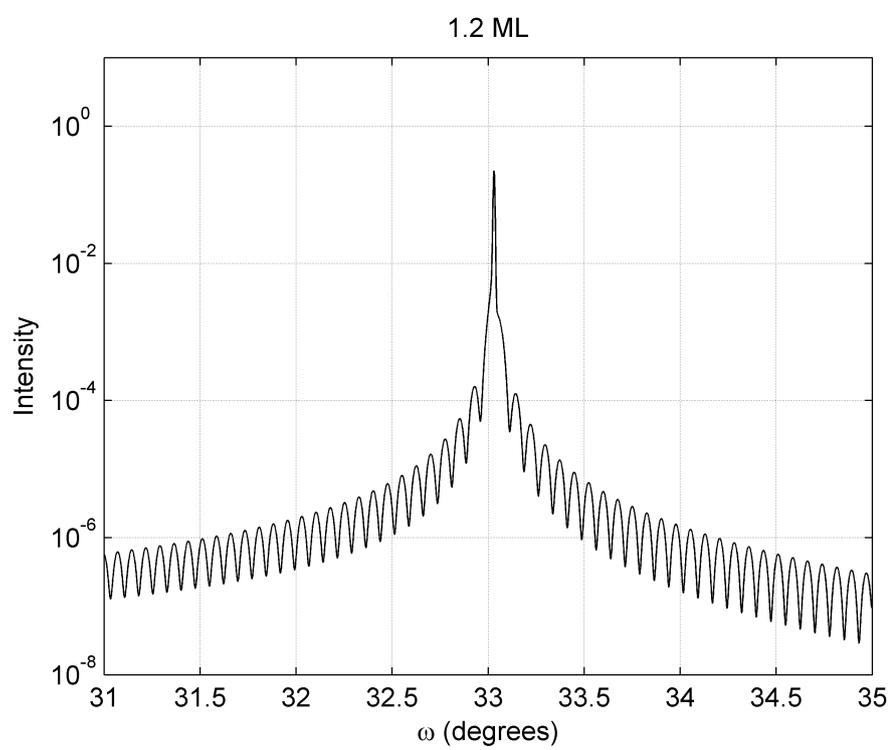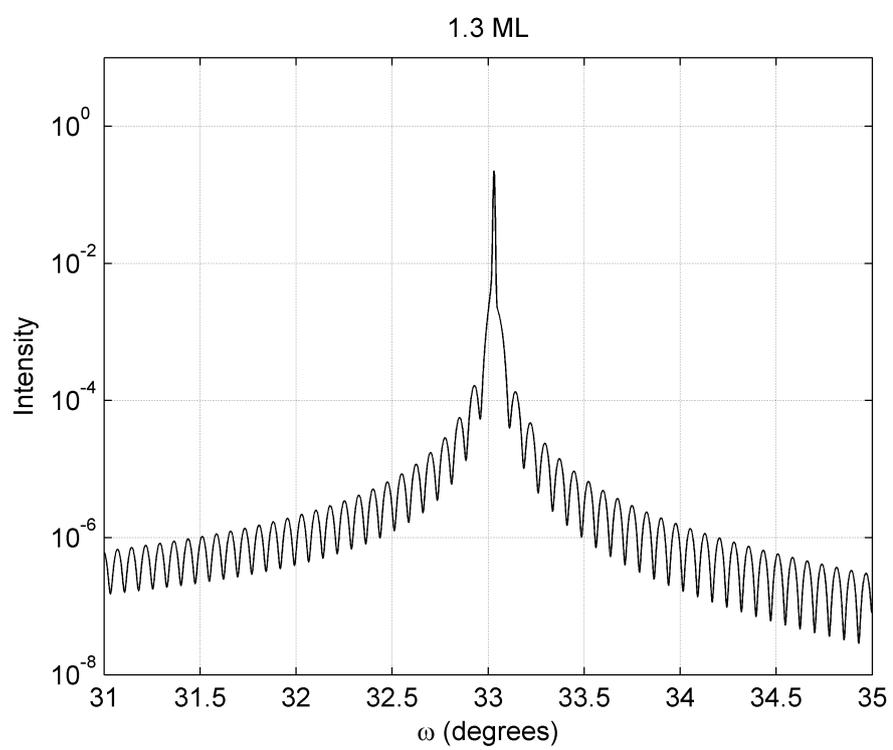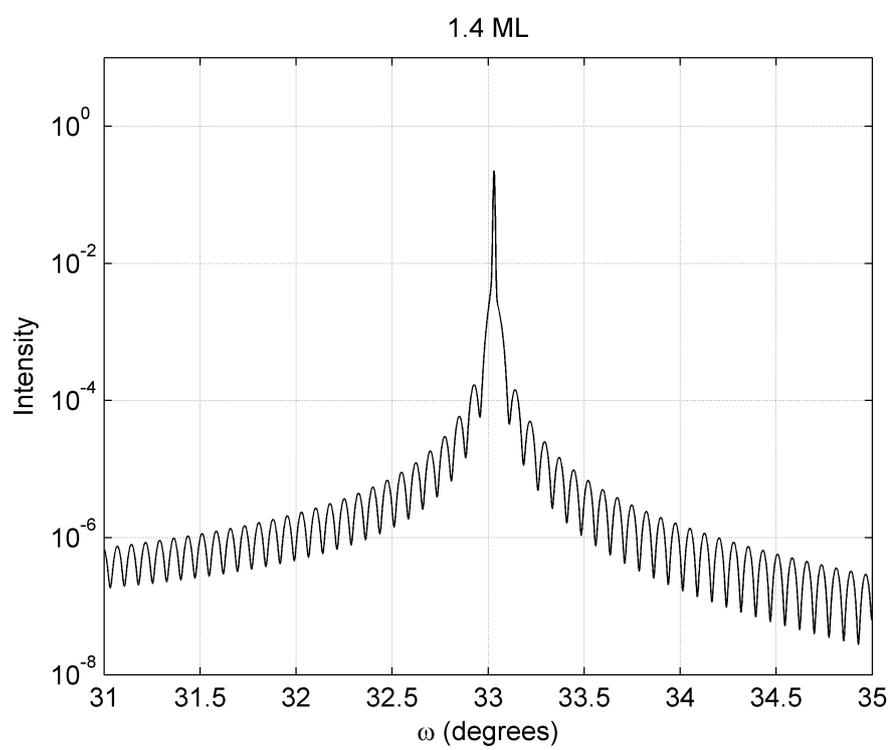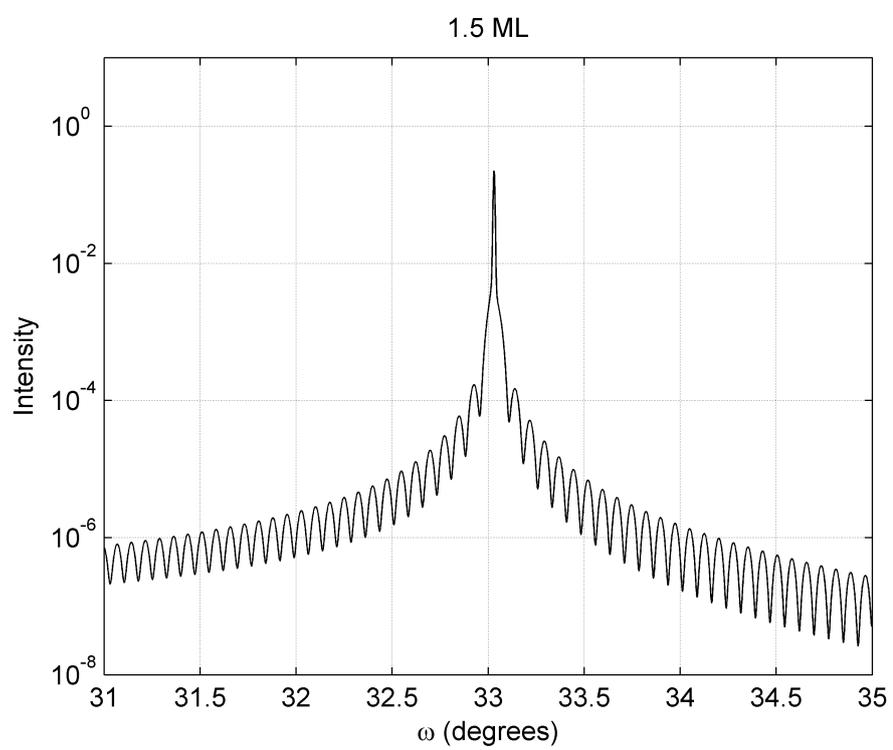
**Figure 2.97**
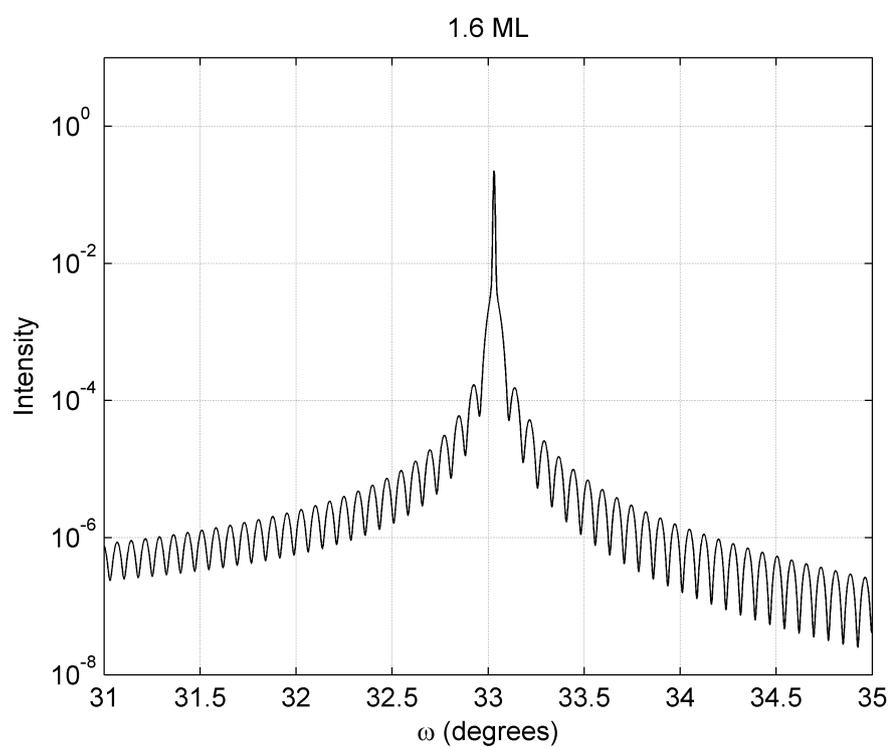
Figure 2.98

Figure 2.99
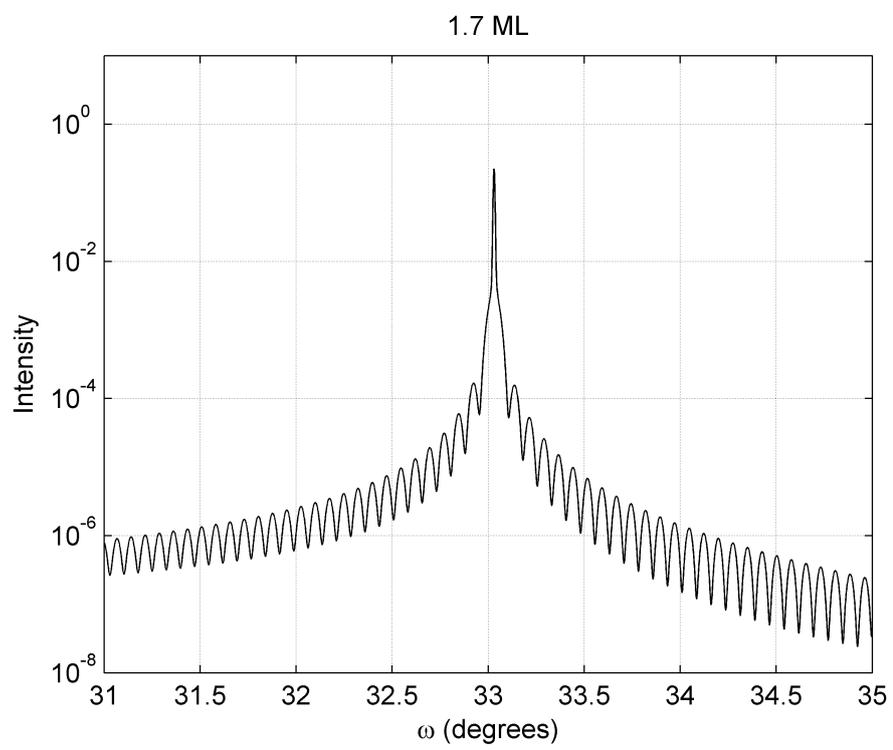
Figure 2.100
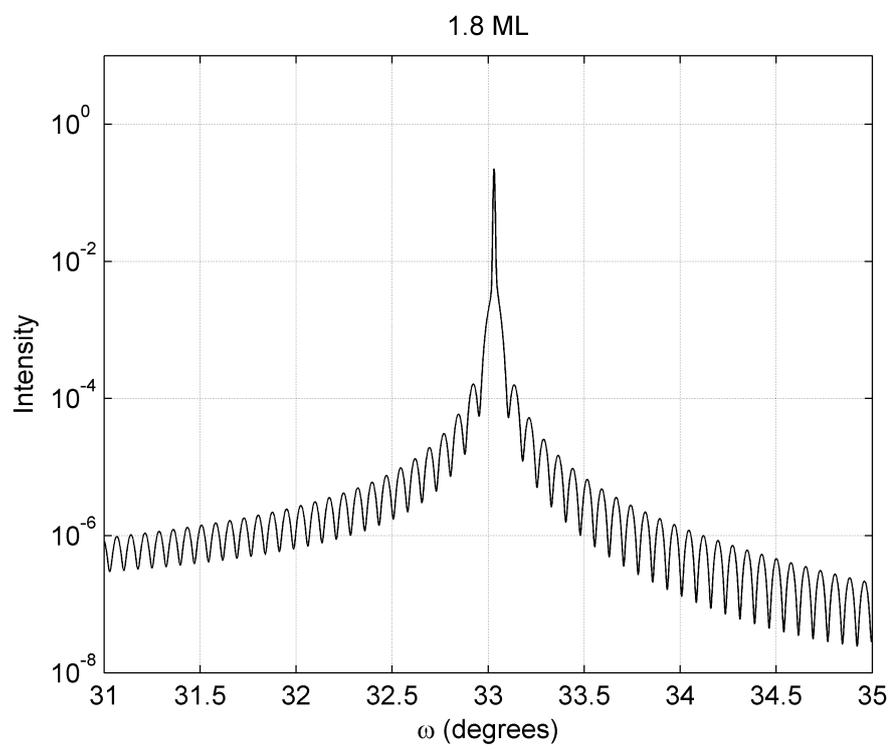
Figure 2.101
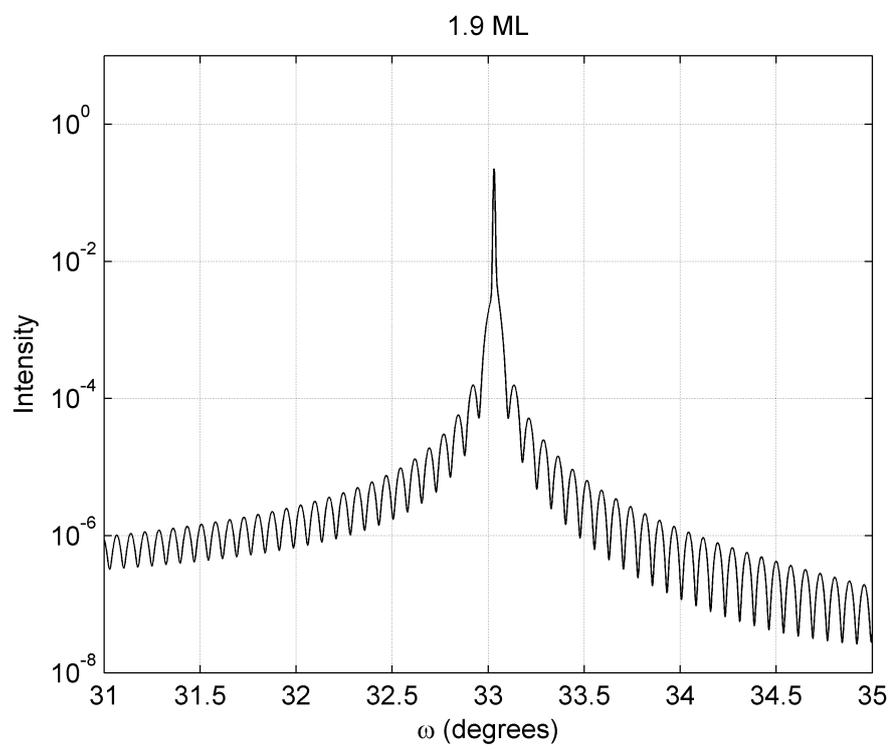
Figure 2.102

Figure 2.103

2.1 ML

Figure 2.104

2.2 ML
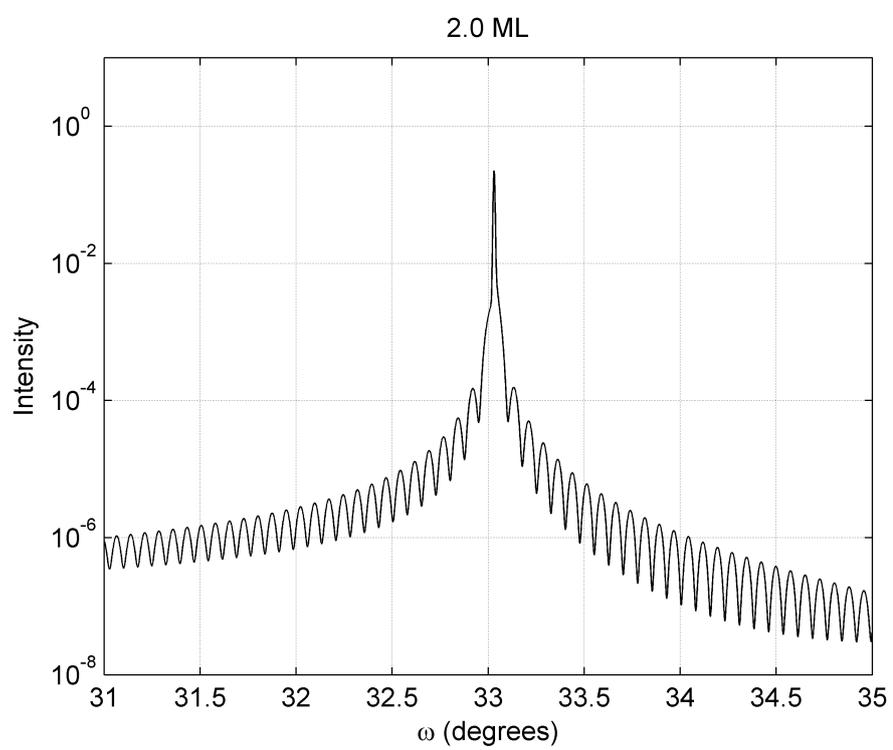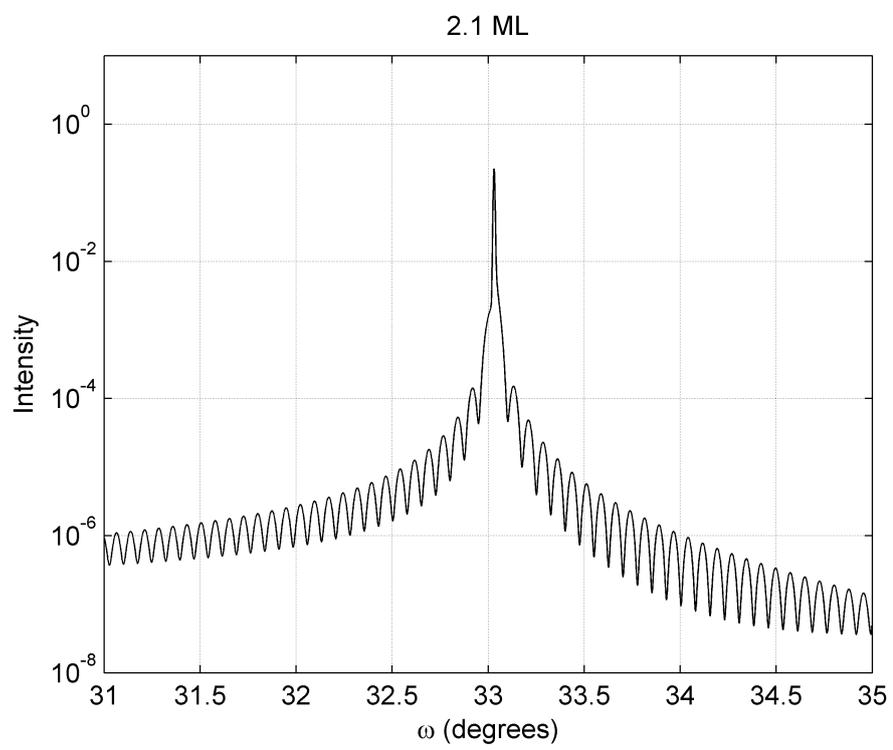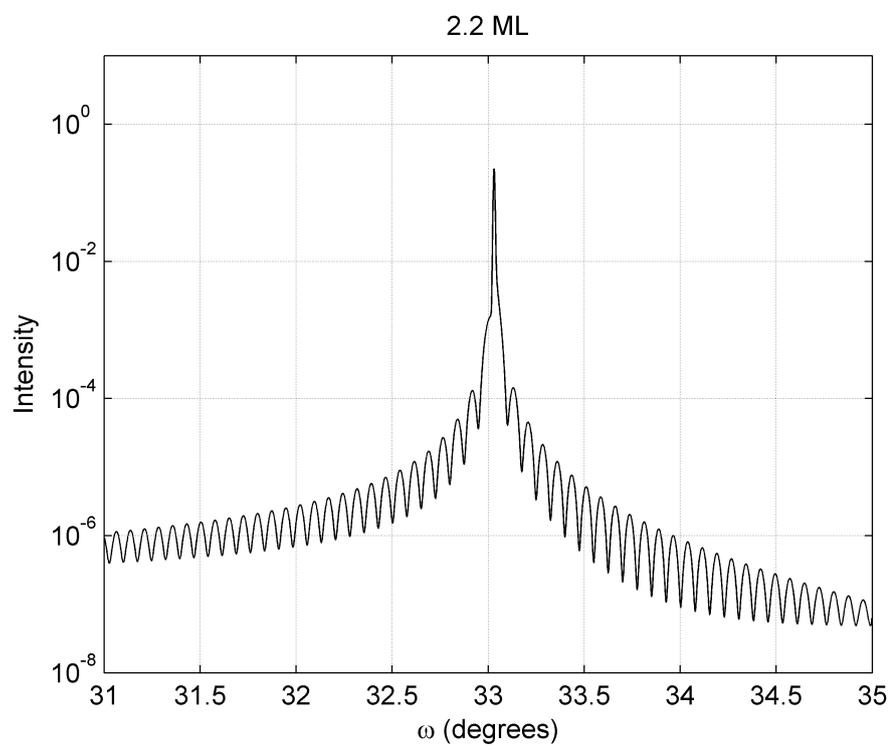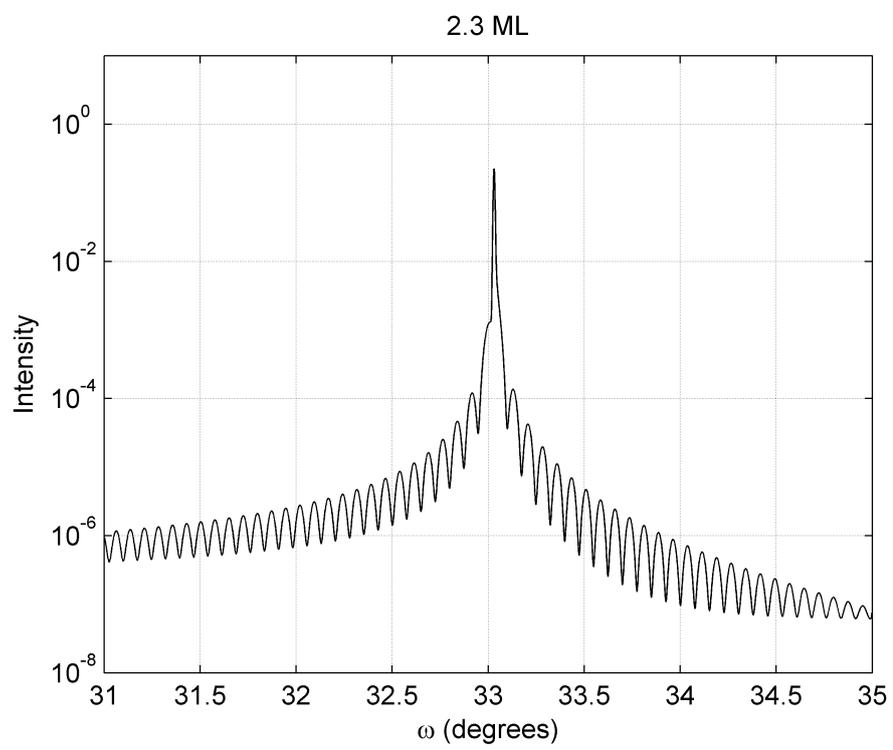
Figure 2.105

Figure 2.106

Figure 2.107

Figure 2.108

2.6 ML

Intensity

ω (degrees)

Figure 2.109

2.7 ML
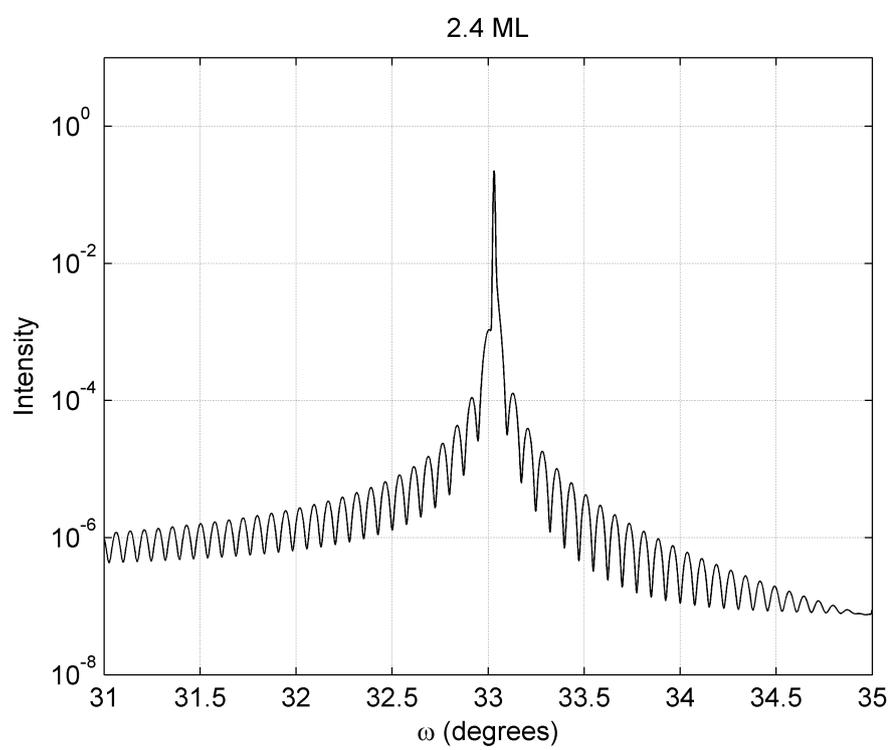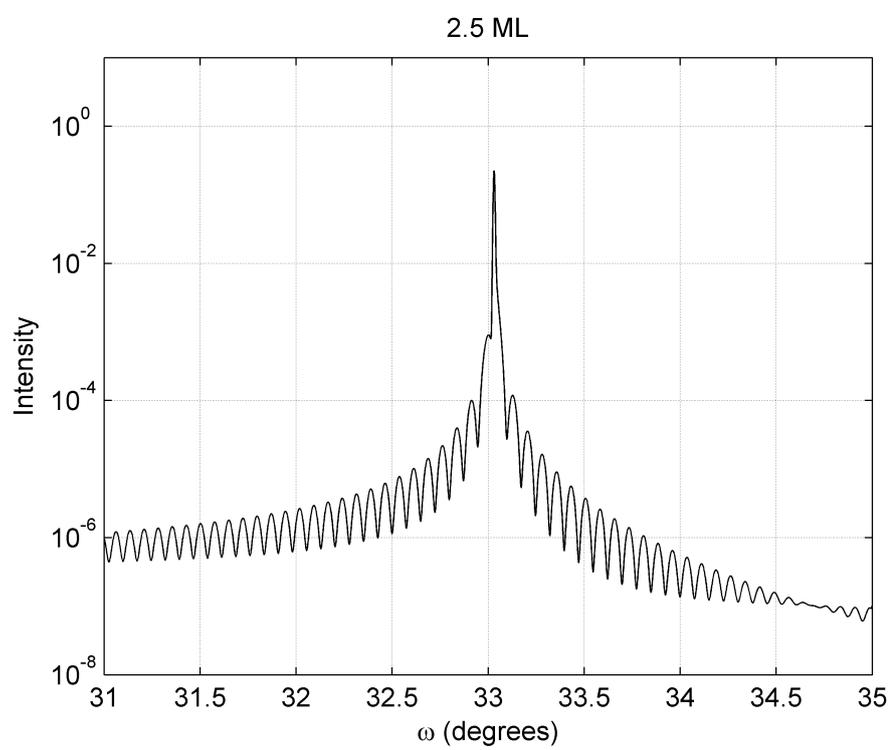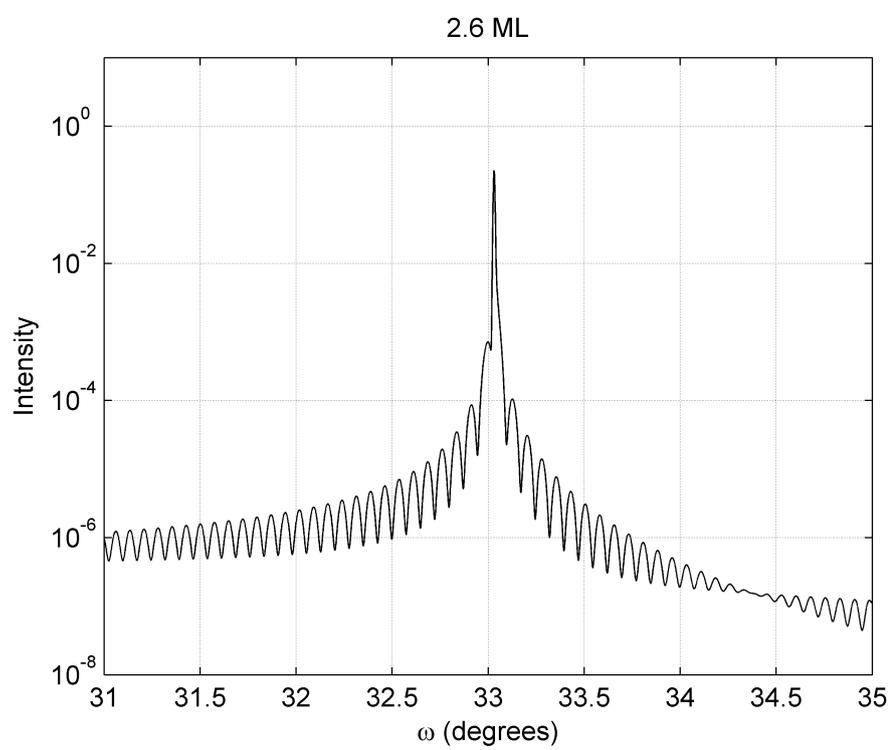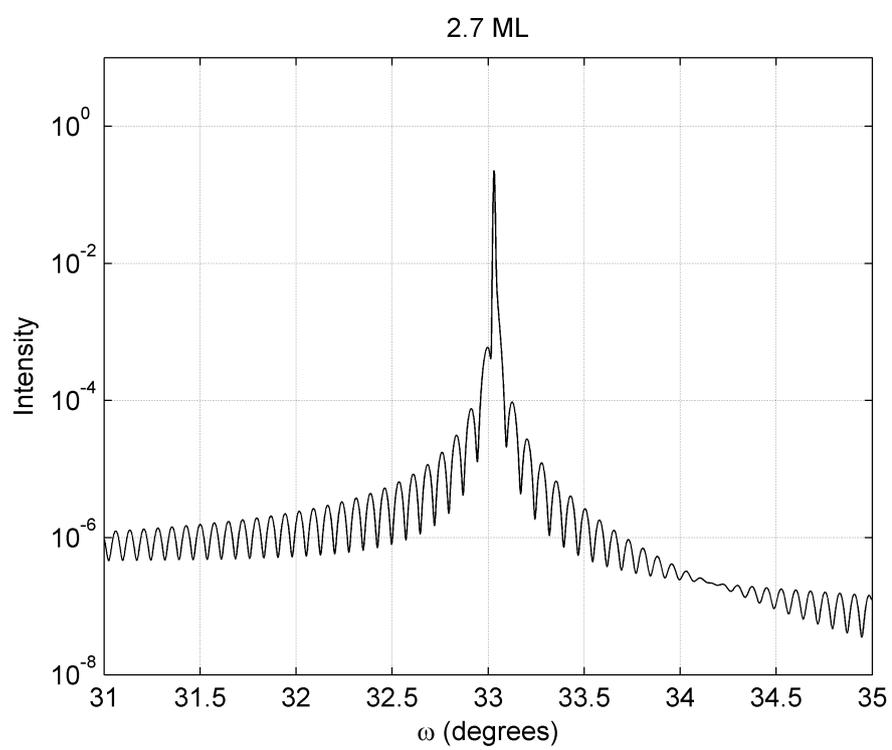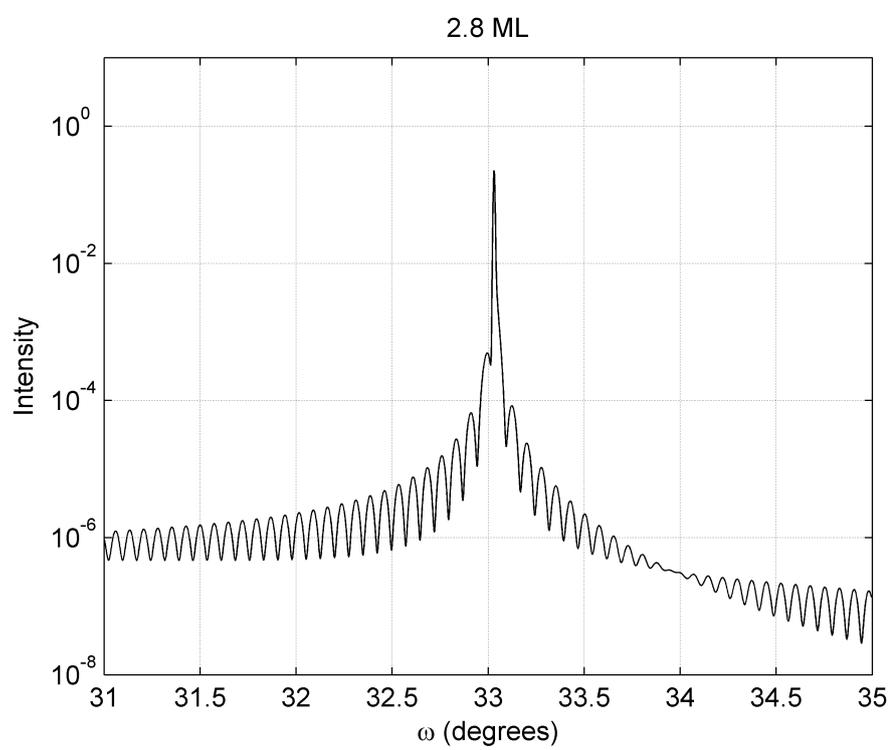
Figure 2.110

Figure 2.111

Figure 2.112

3.0 ML
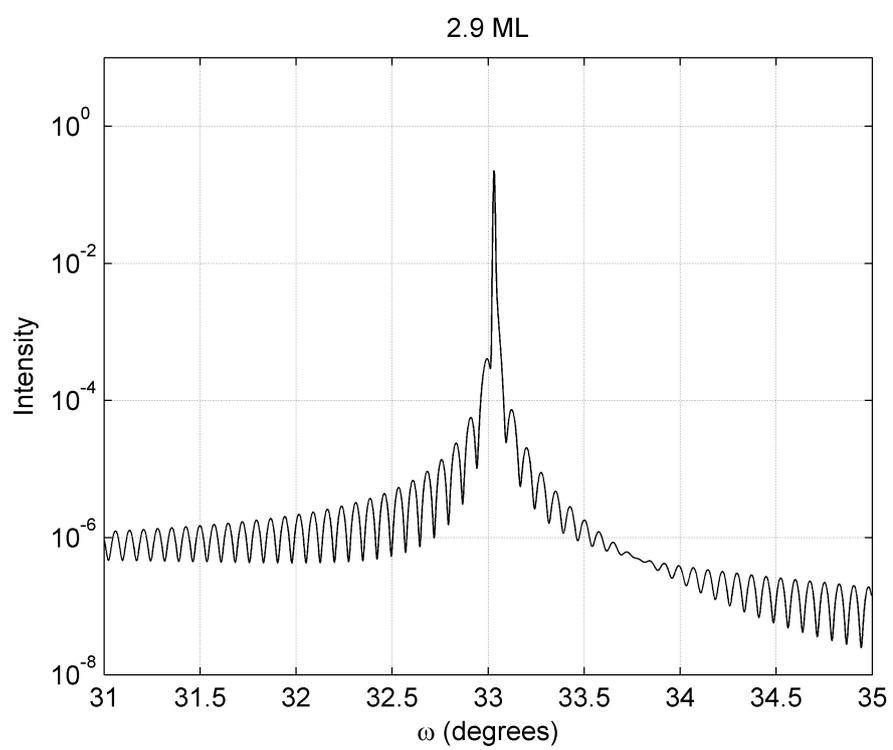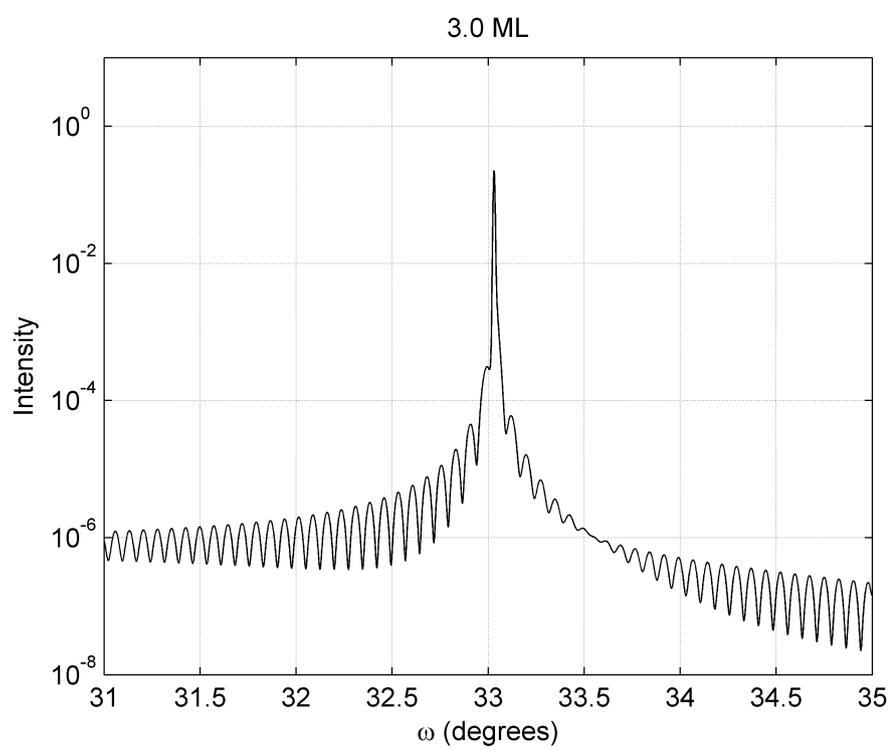
Figure 2.113

Figure 2.114

Figure 2.115

3.3 ML

Intensity

ω (degrees)
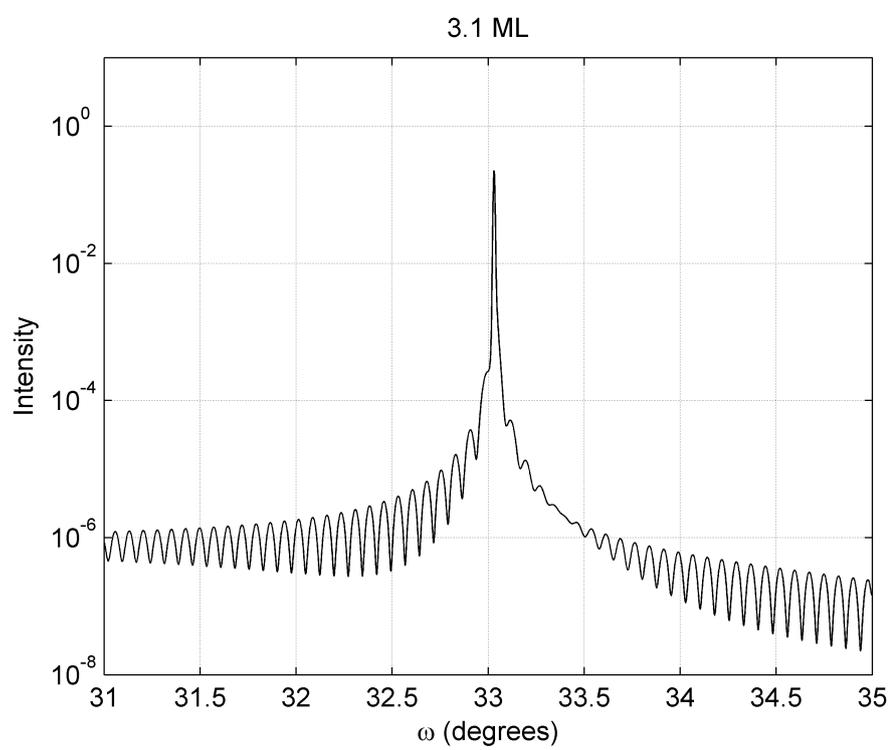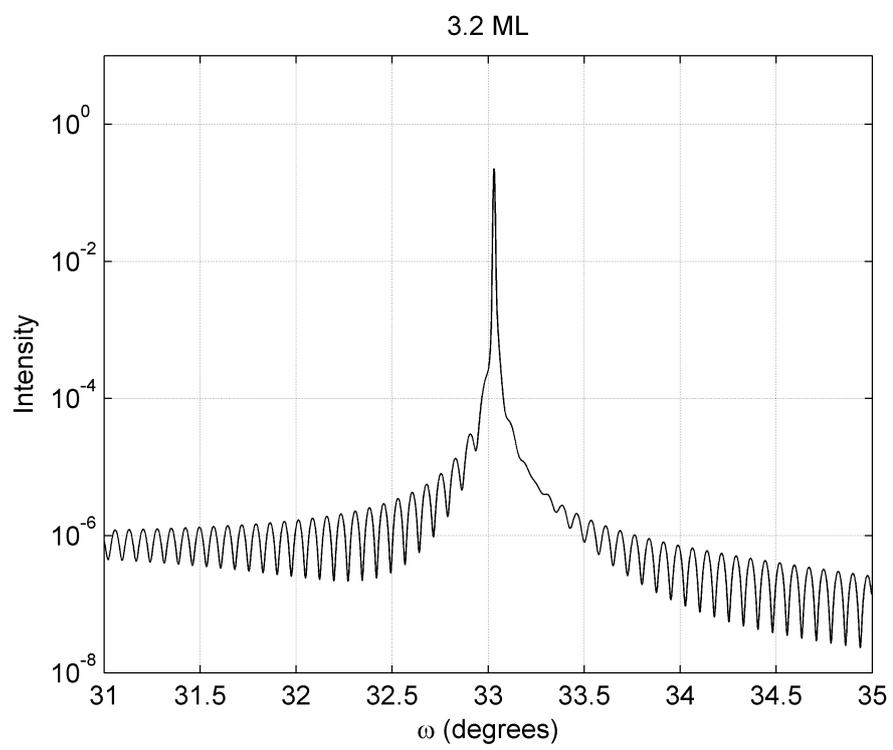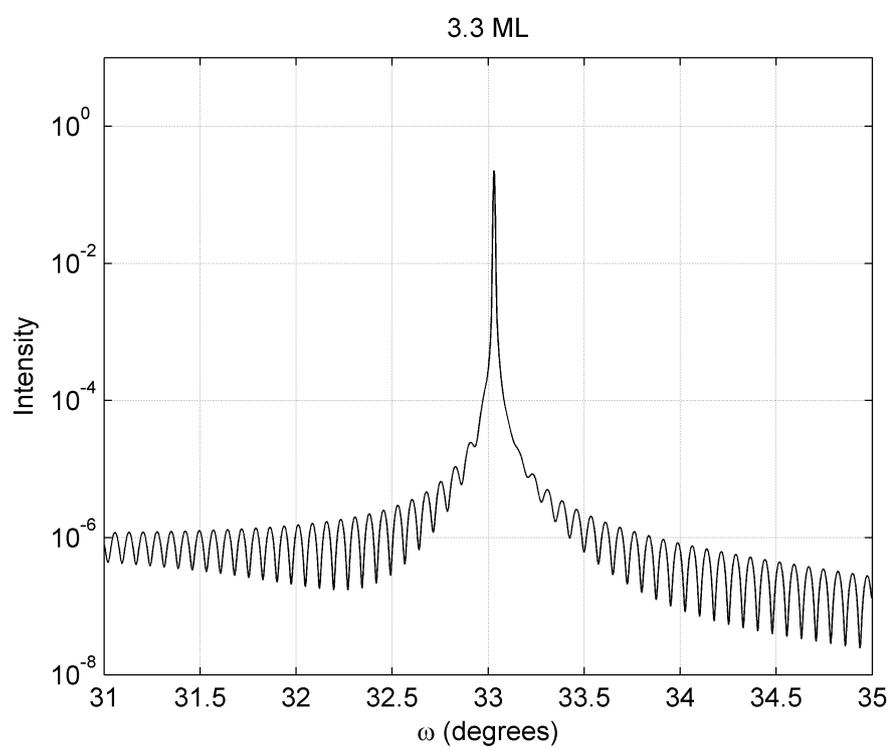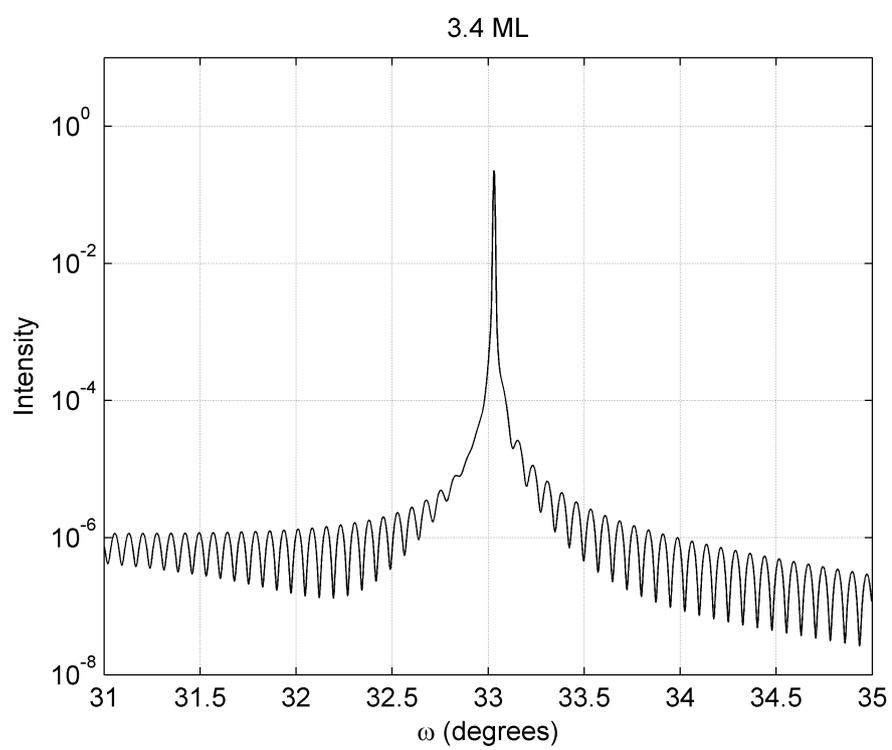
Figure 2.116
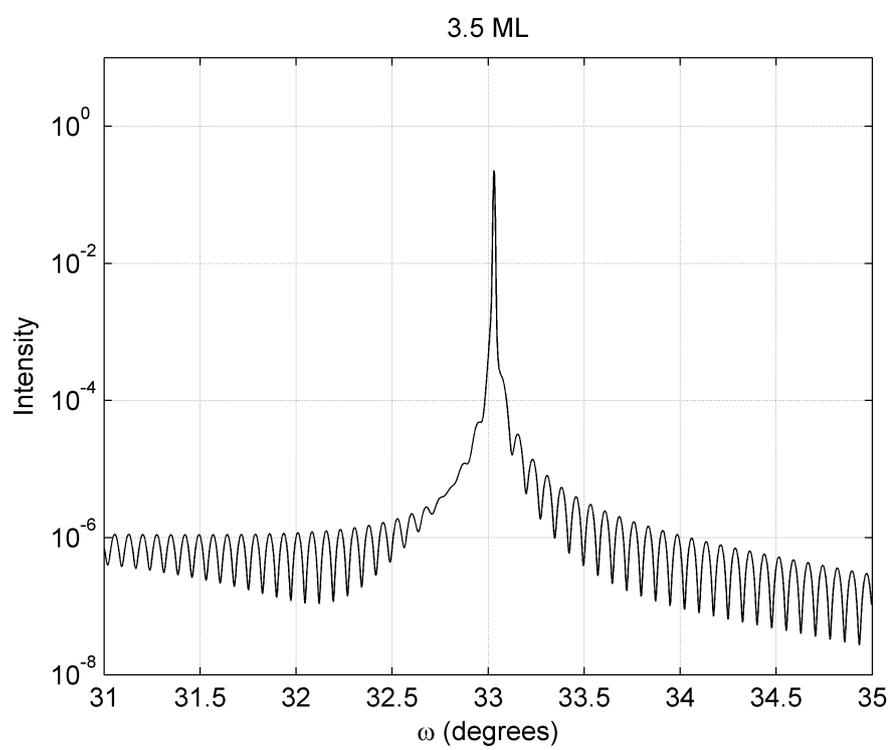
Figure 2.117

Figure 2.118
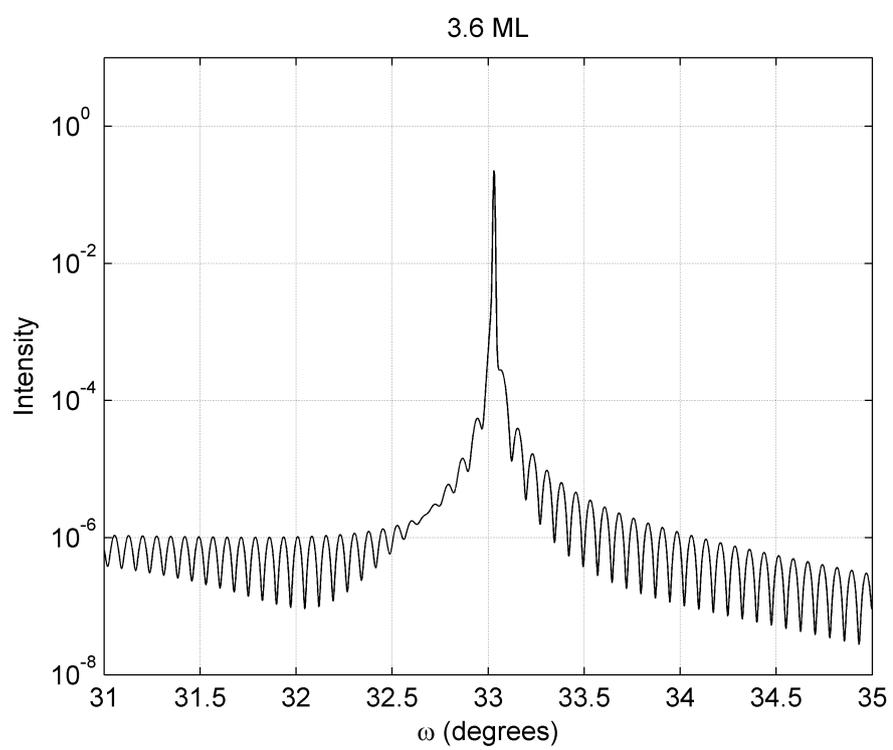
Figure 2.119
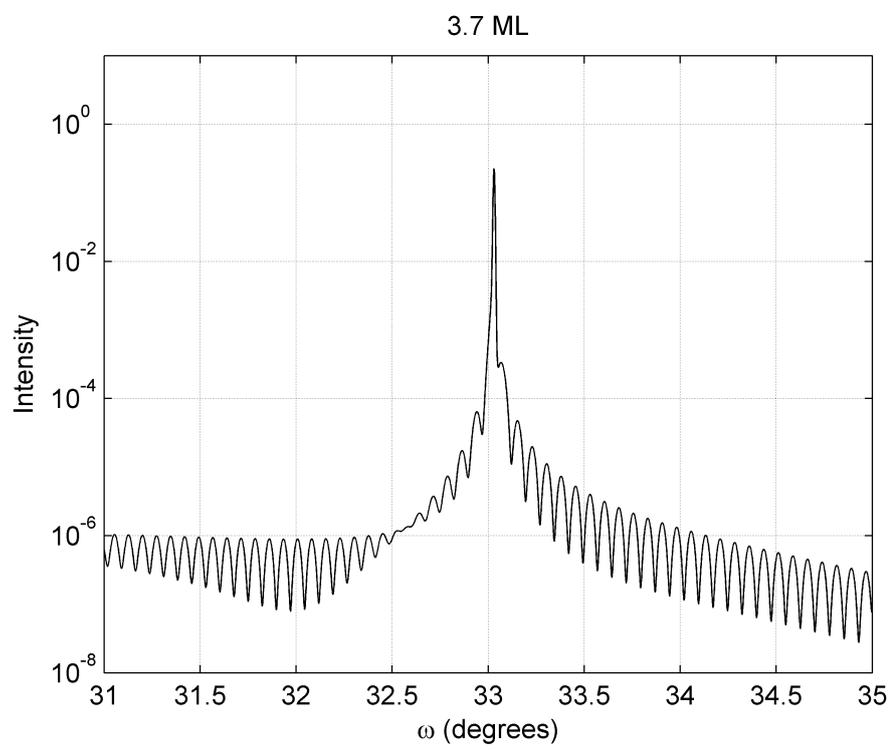
Figure 2.120

**Figure 2.121**

3.9 ML

Figure 2.122

4.0 ML
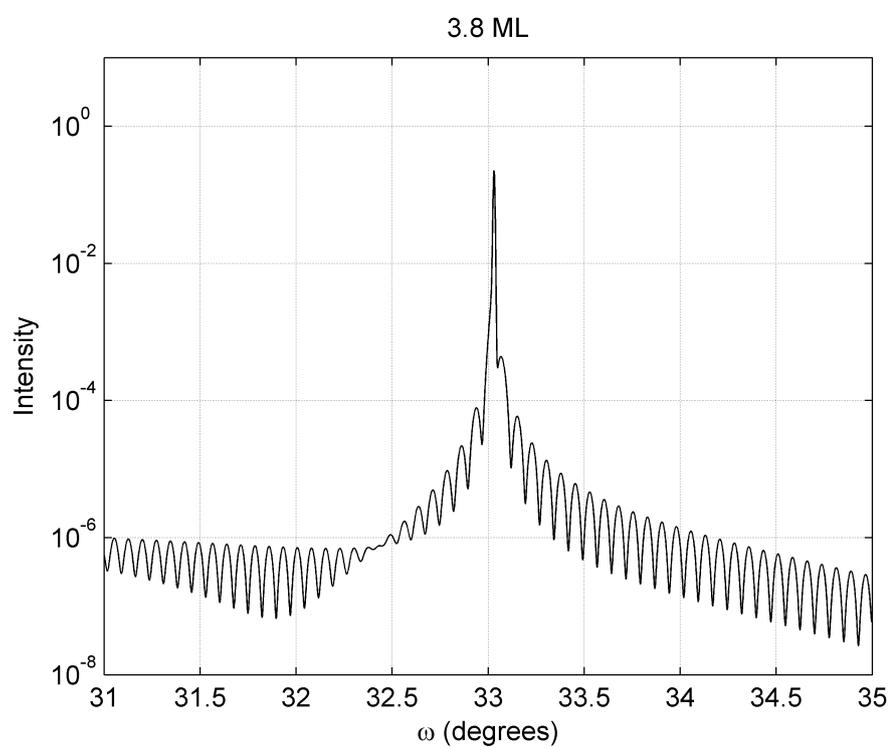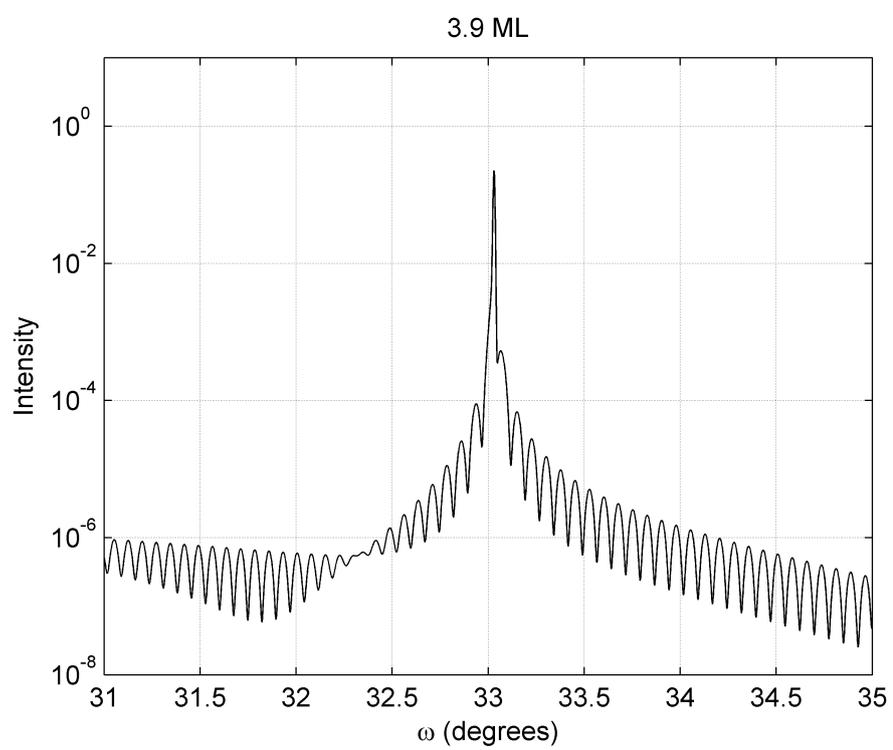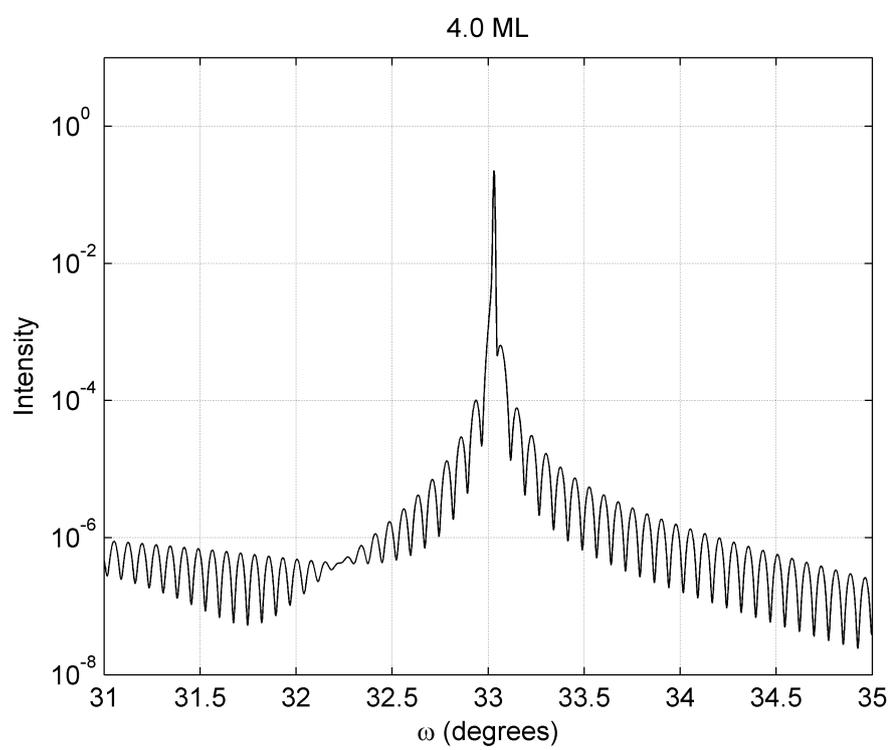
Figure 2.123

2.4   Both top and bottom InAs layer

Simulations with varying InAs bottom and top layer thicknesses are shown in figures 2.124–2.164. They are arranged by increasing layer thicknesses from 0 to 4 monolayers.

Figure 2.124

0.1 ML

Figure 2.125

0.2 ML

Figure 2.126

0.3 ML

Figure 2.127

0.4 ML
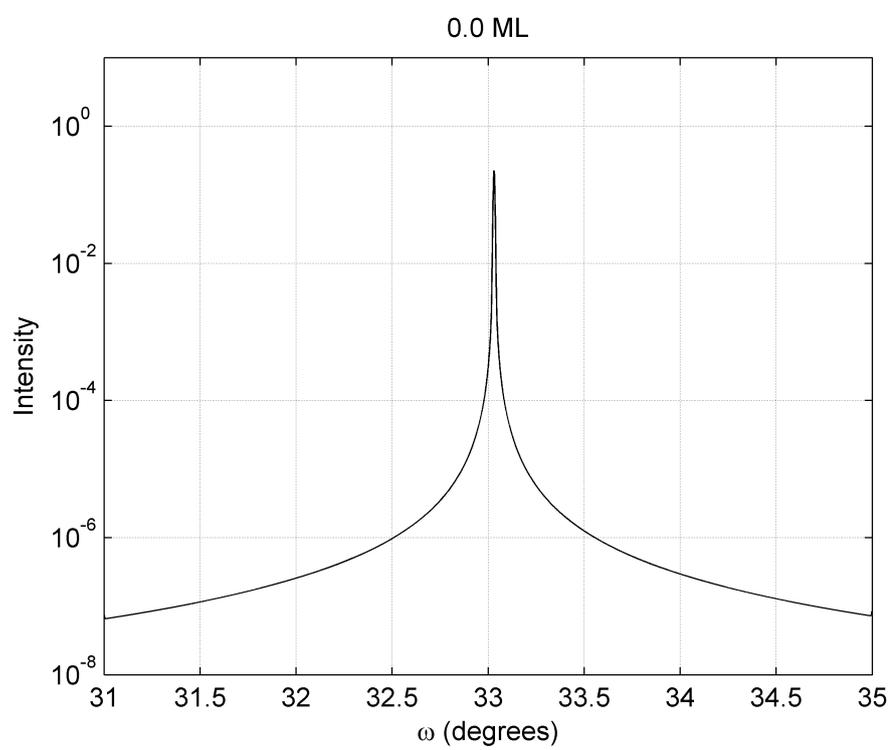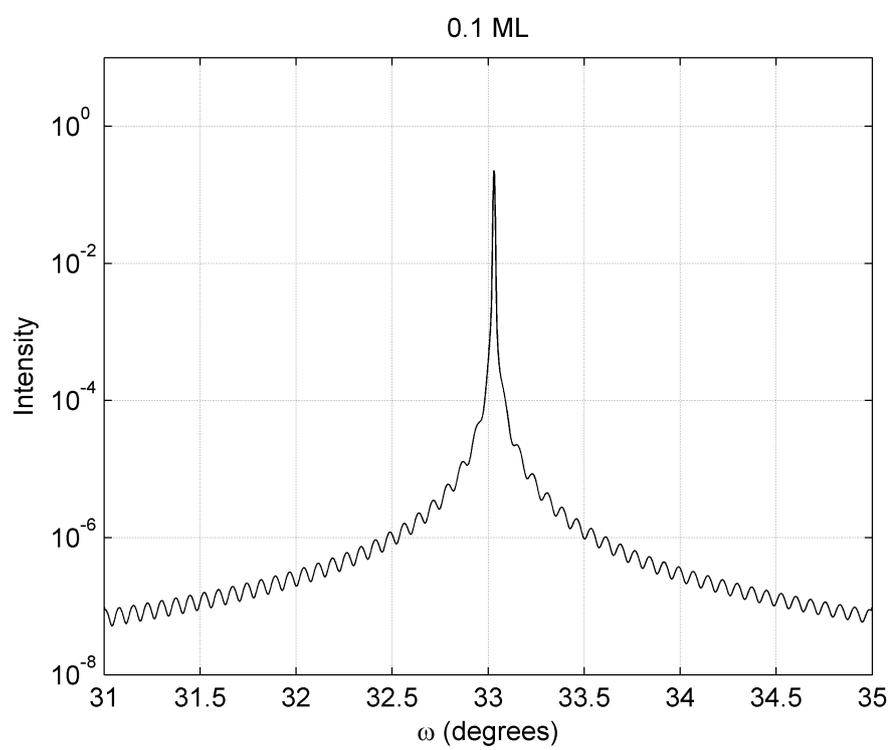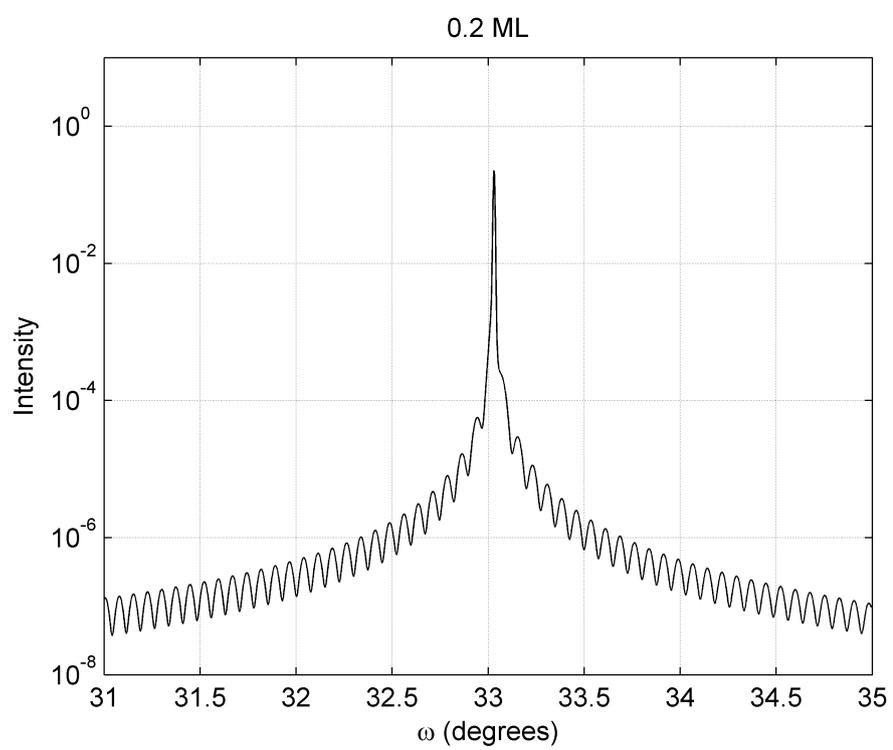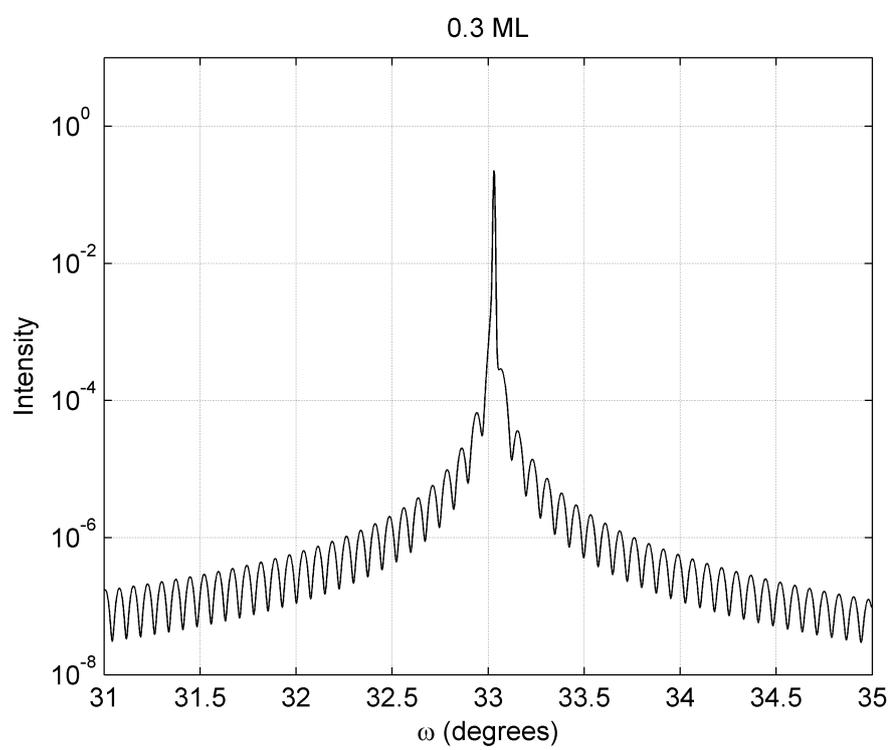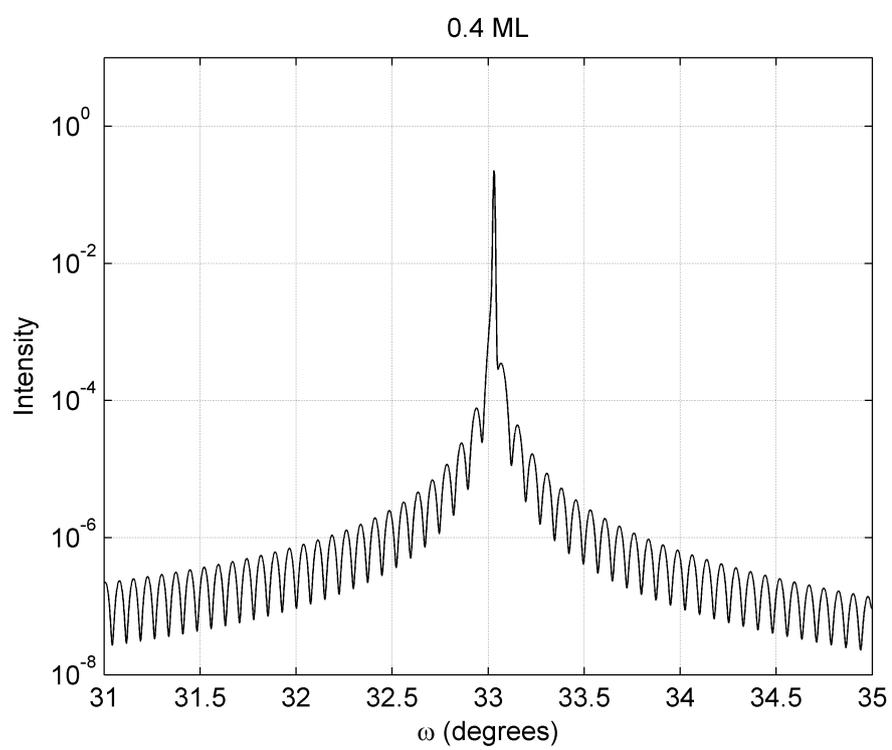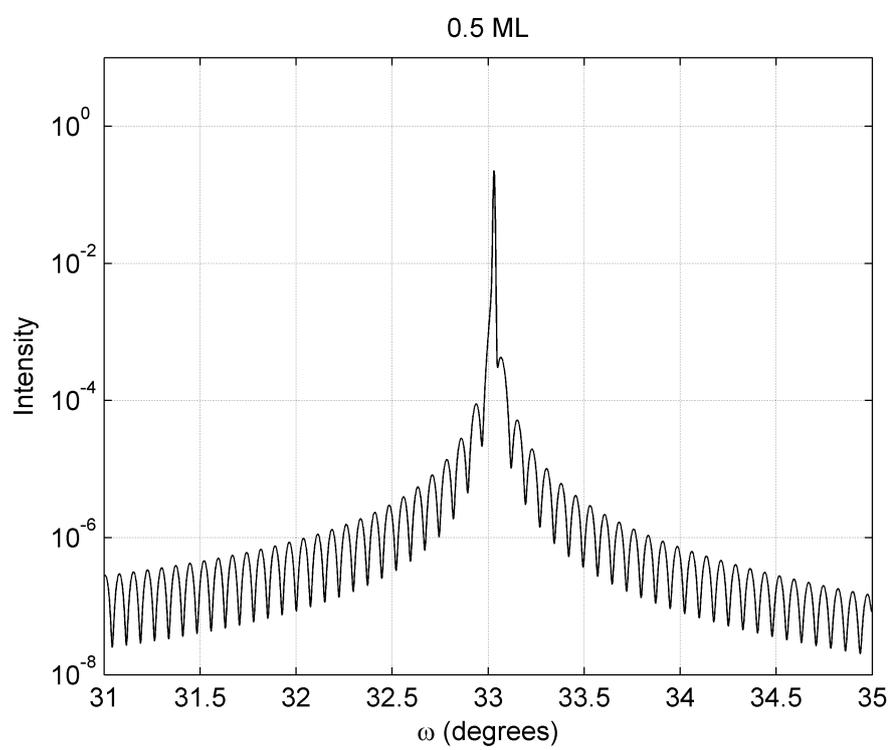
Figure 2.128

Figure 2.129

Figure 2.130

0.7 ML
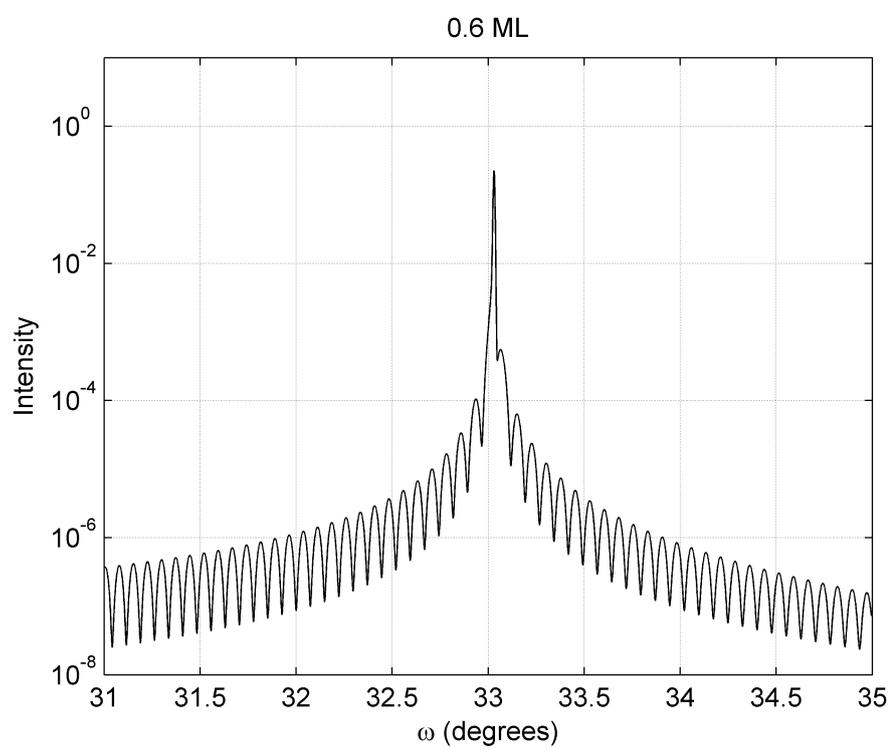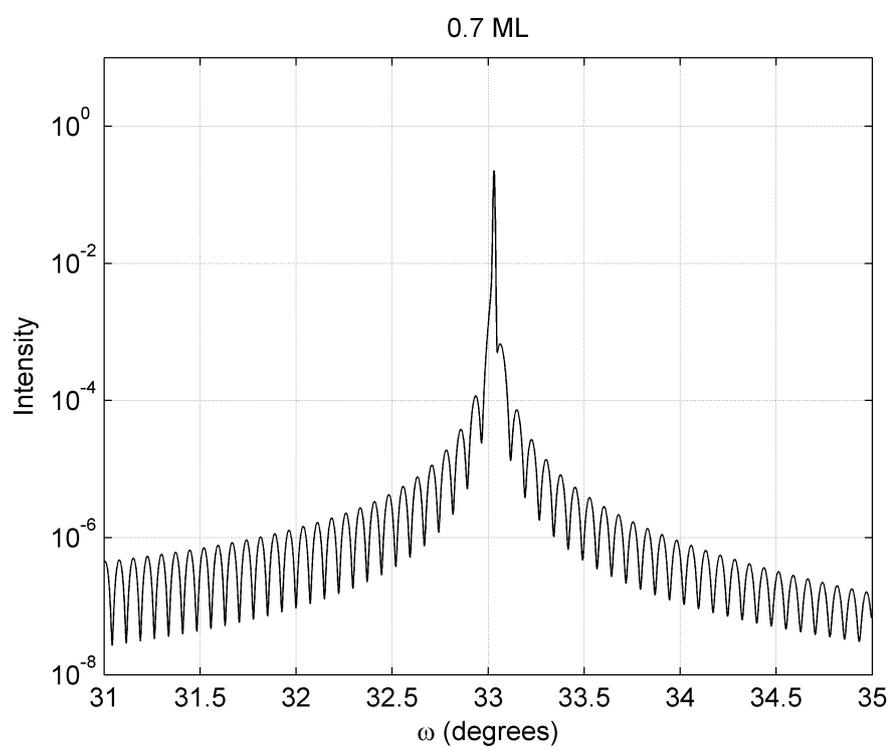
Figure 2.131

Figure 2.132

Figure 2.133

1.0 ML

Figure 2.134

1.1 ML

Intensity

ω (degrees)
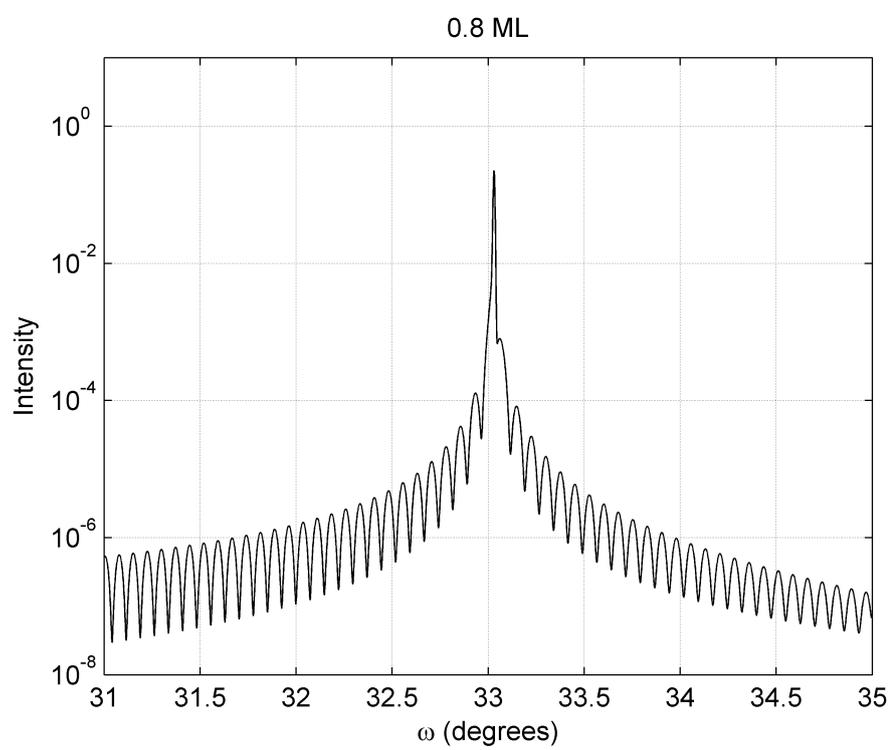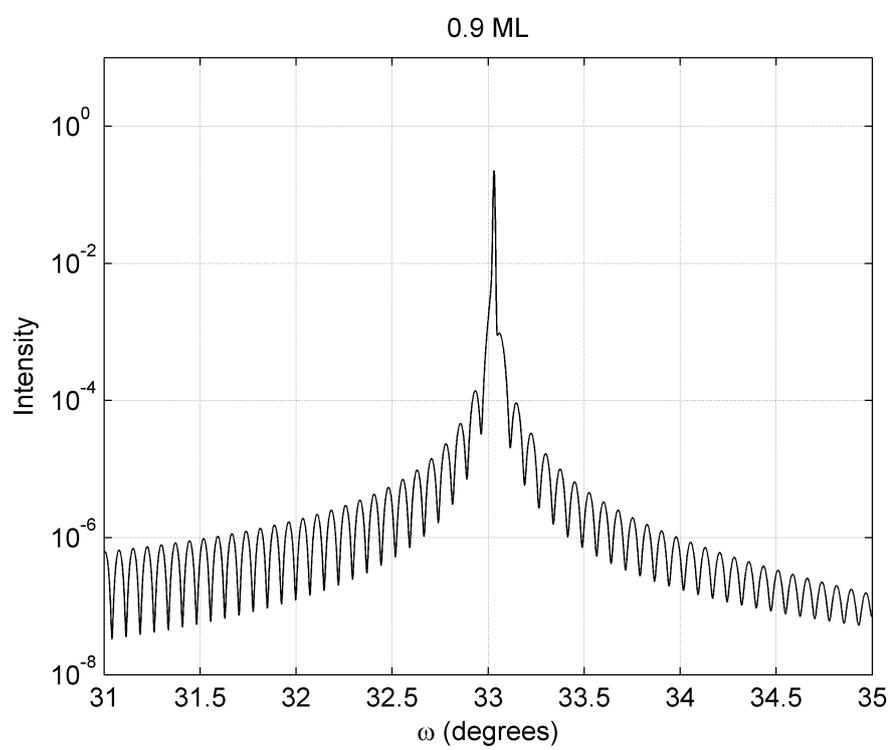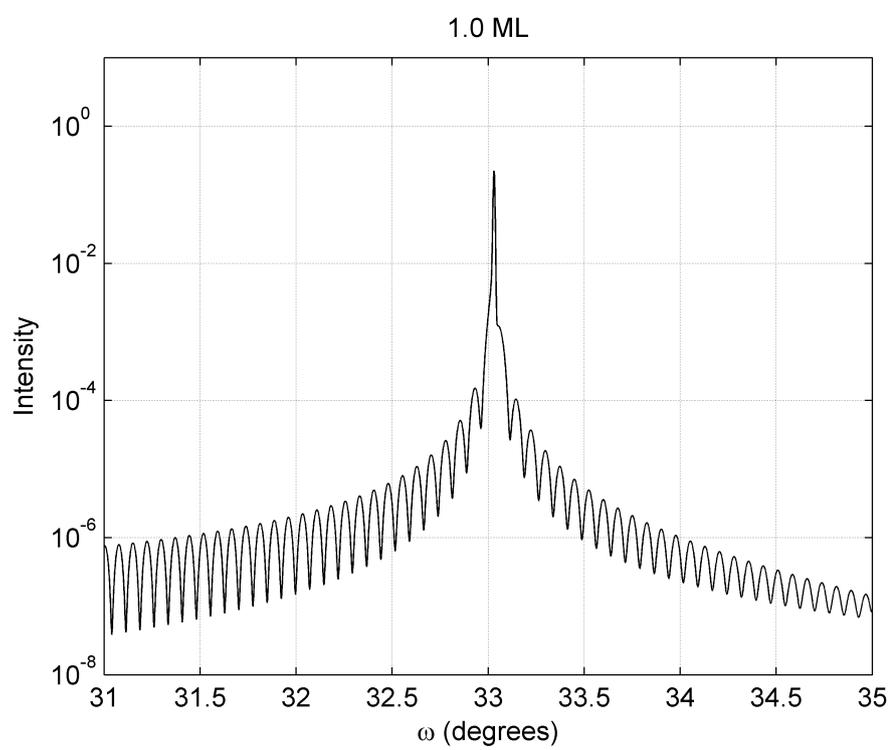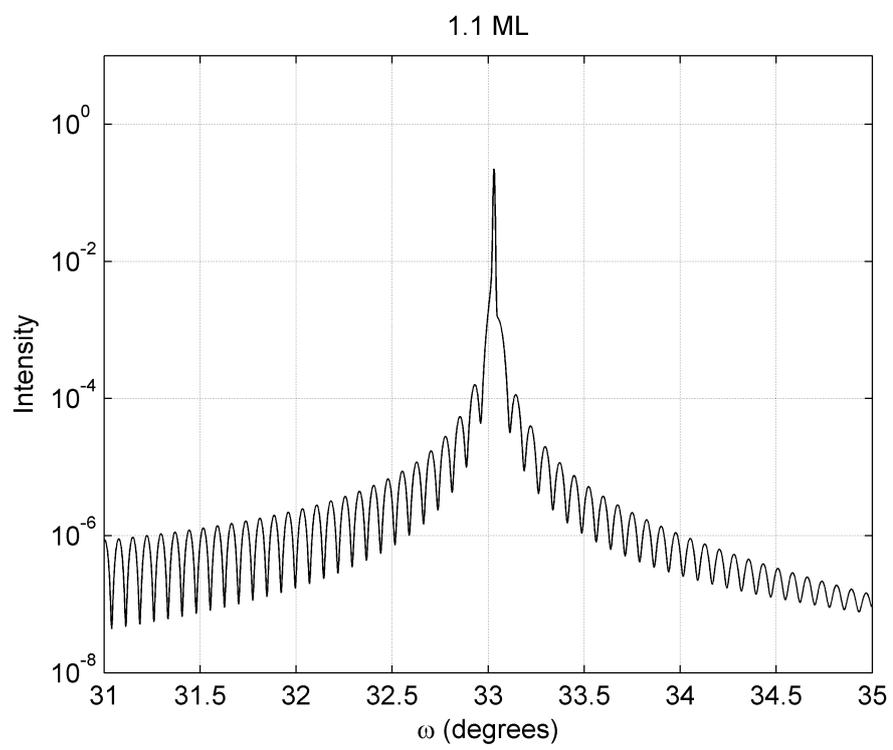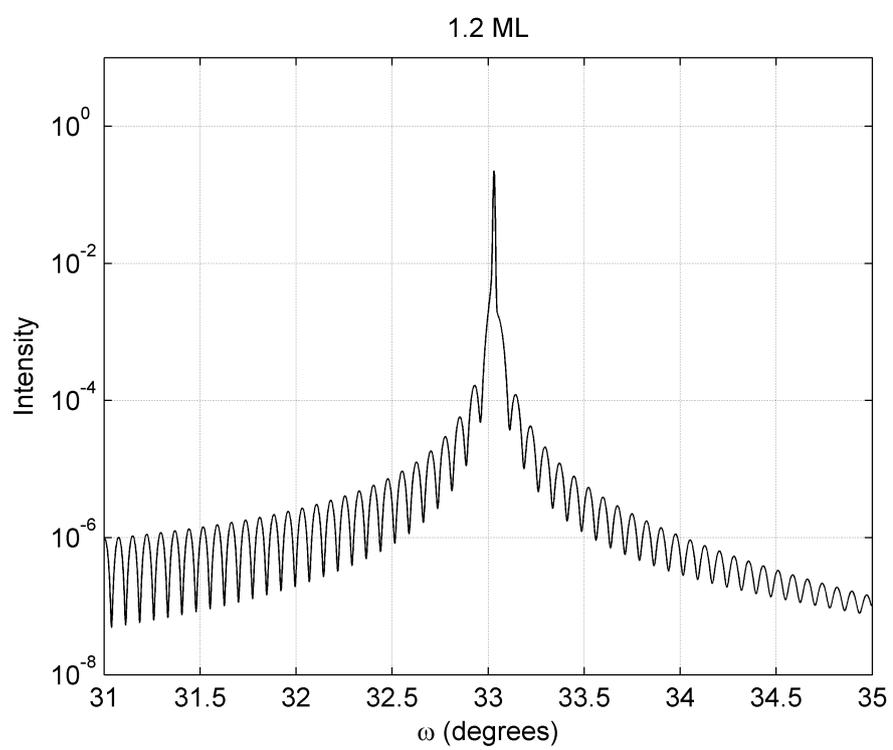
Figure 2.135
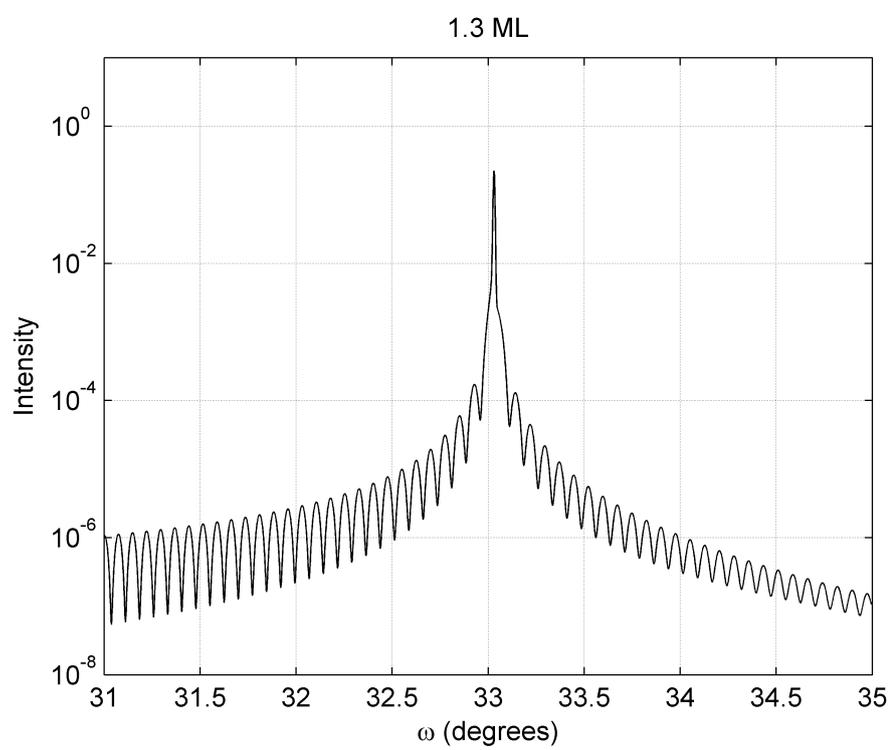
Figure 2.136

Figure 2.137

Figure 2.138

1.5 ML

Figure 2.139

166
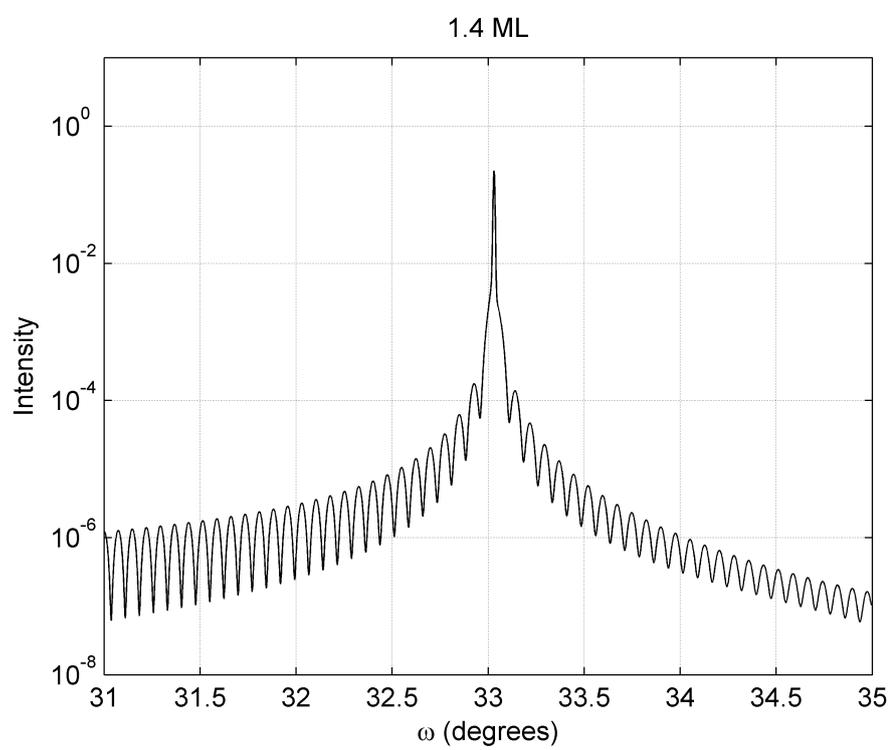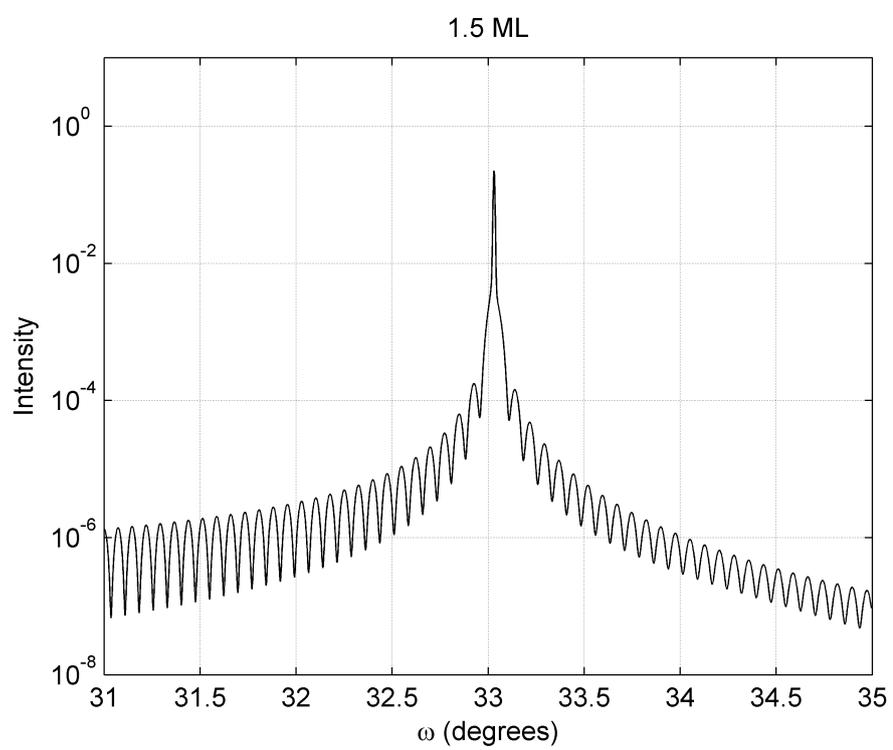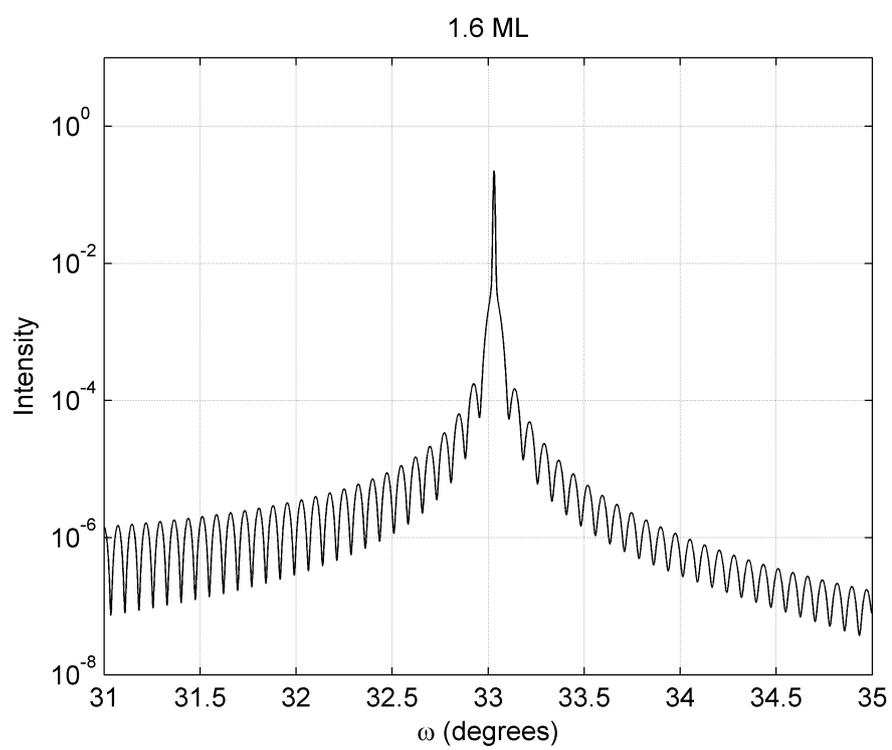
Figure 2.140

Figure 2.141

1.8 ML

Figure 2.142

Figure 2.143

2.0 ML

Figure 2.144

171

Figure 2.145

2.2 ML

Intensity

ω (degrees)

Figure 2.146

2.3 ML

Figure 2.147

2.4 ML
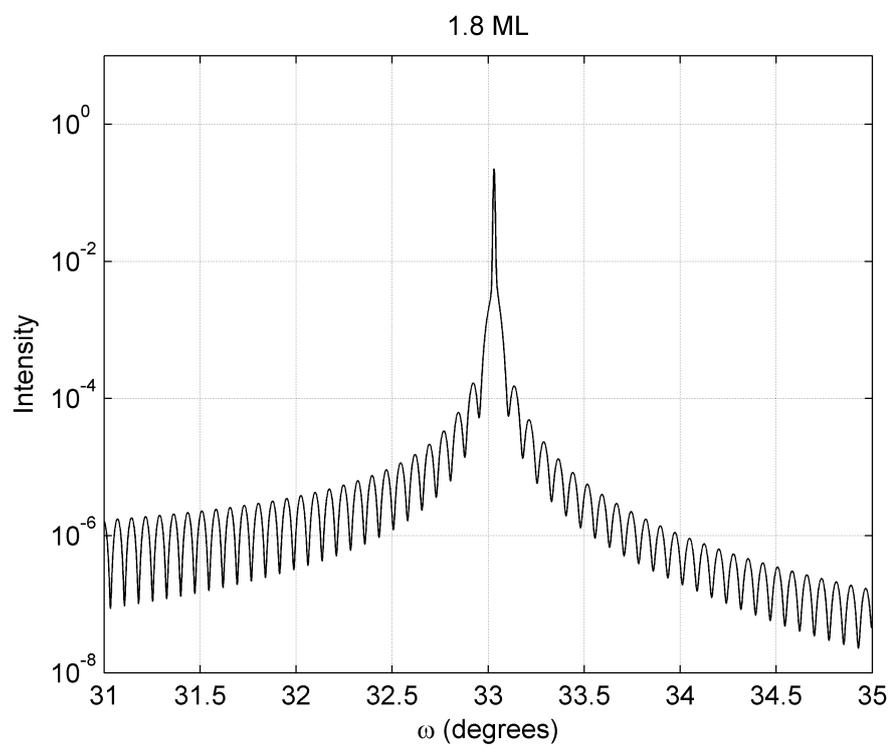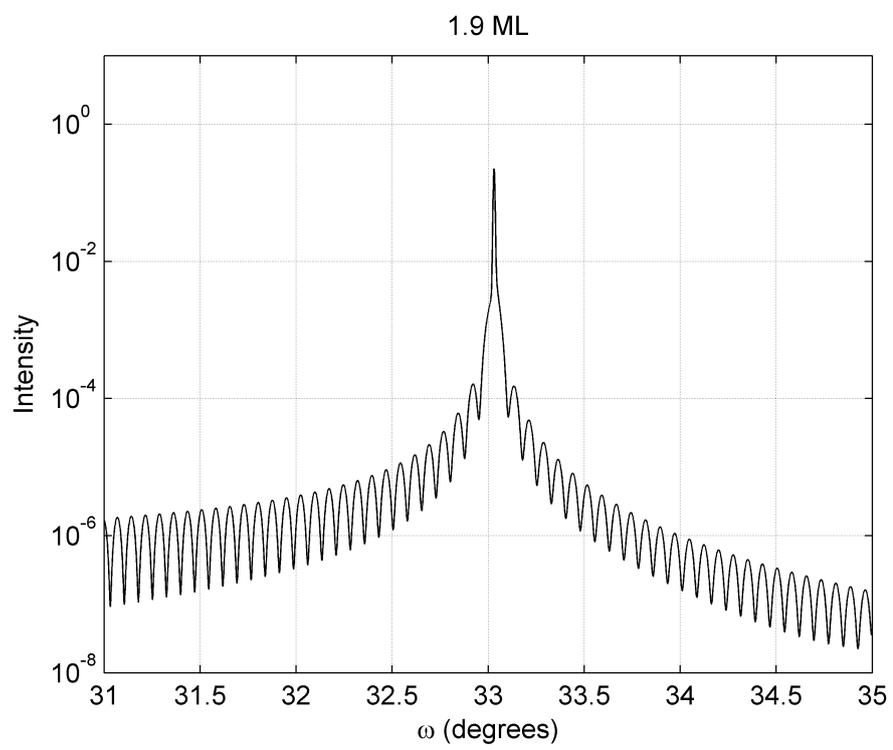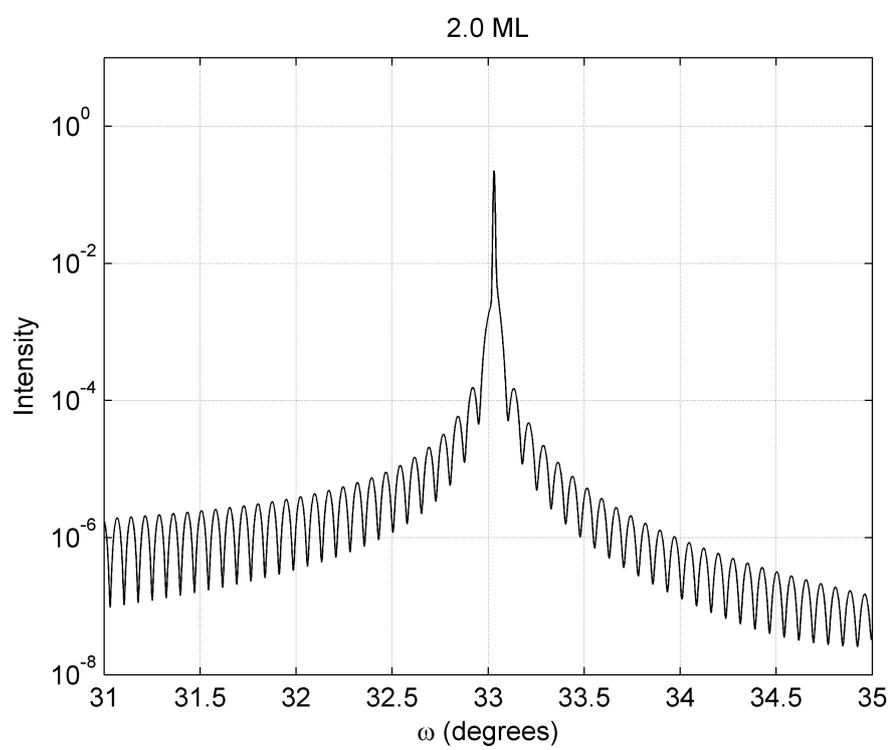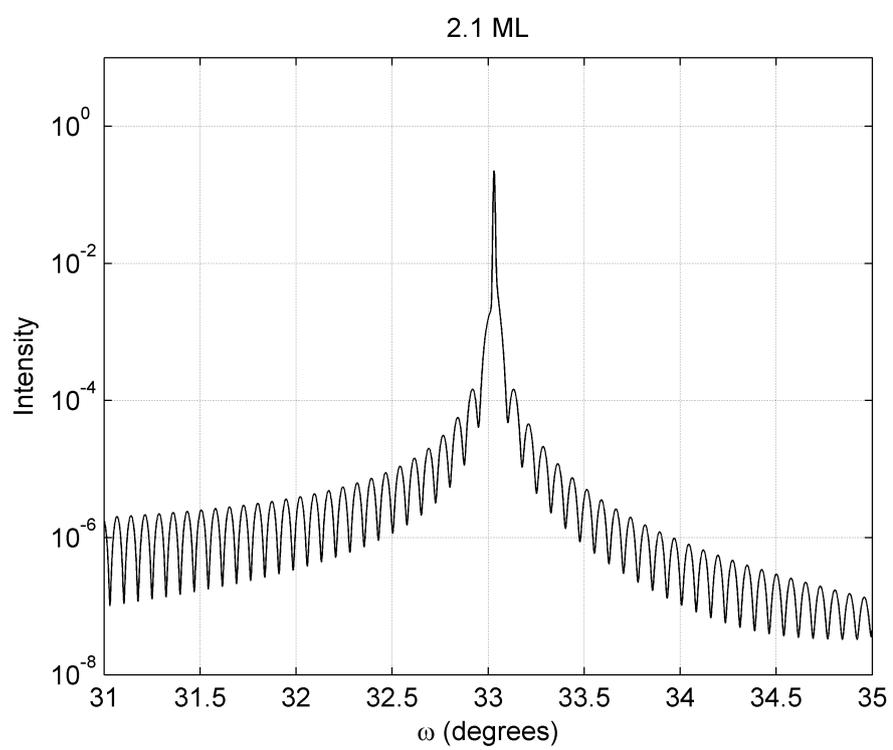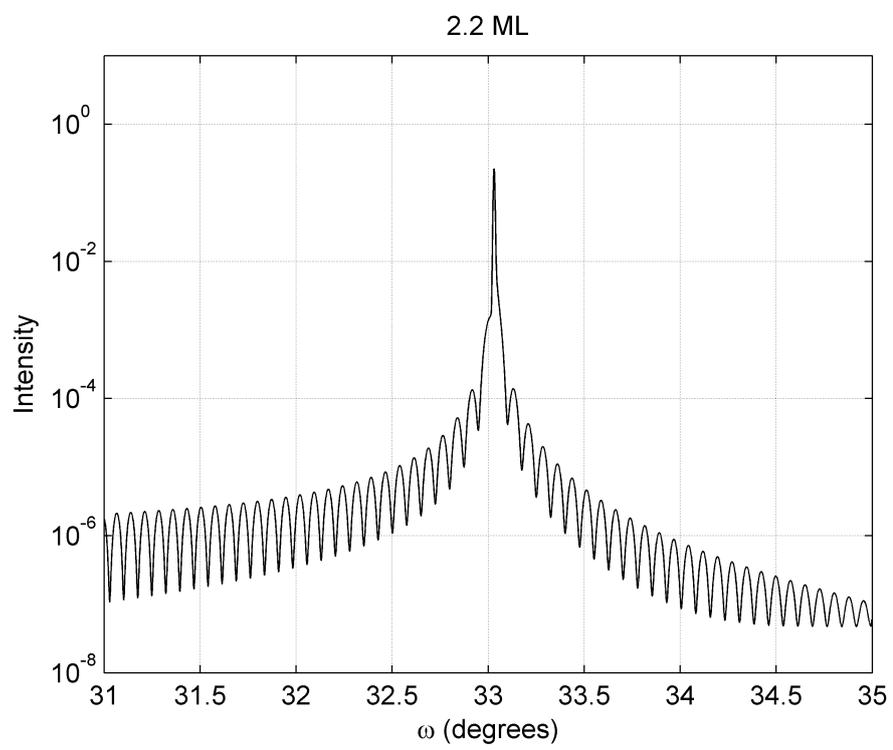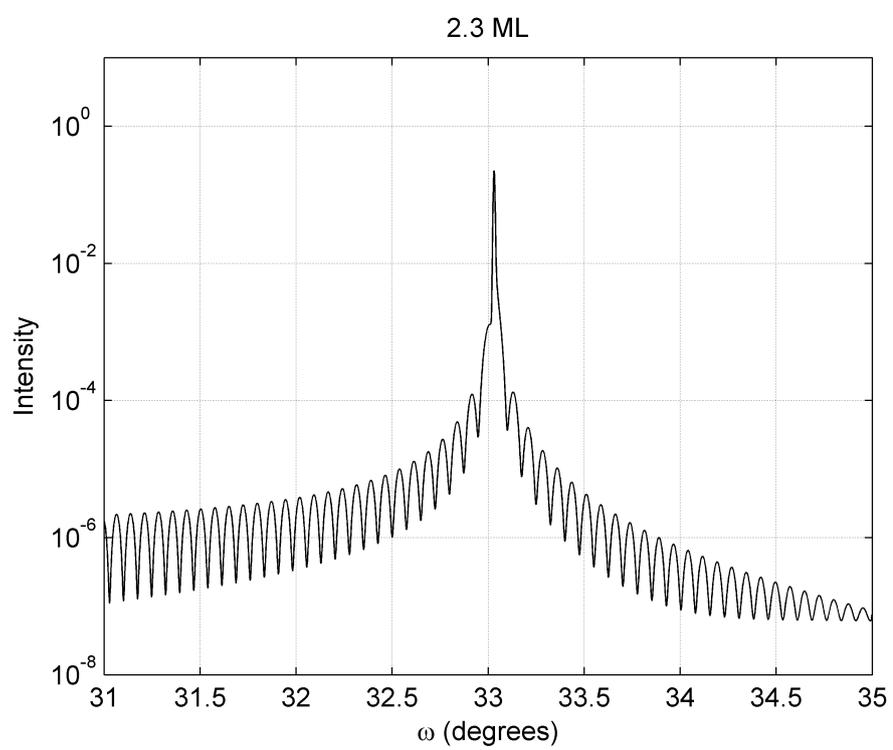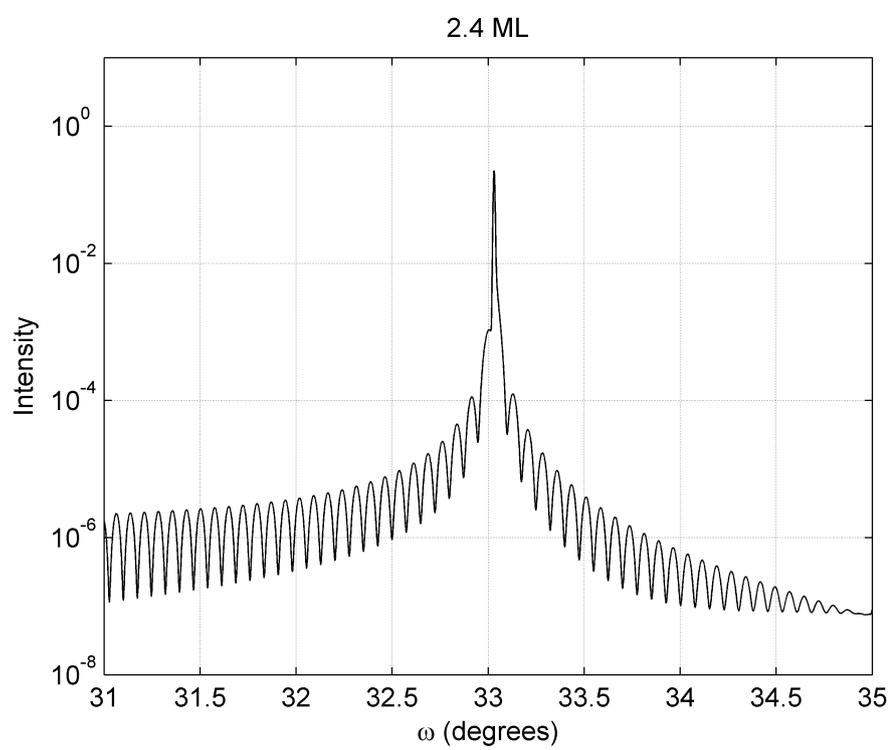
Figure 2.148

Figure 2.149

2.6 ML
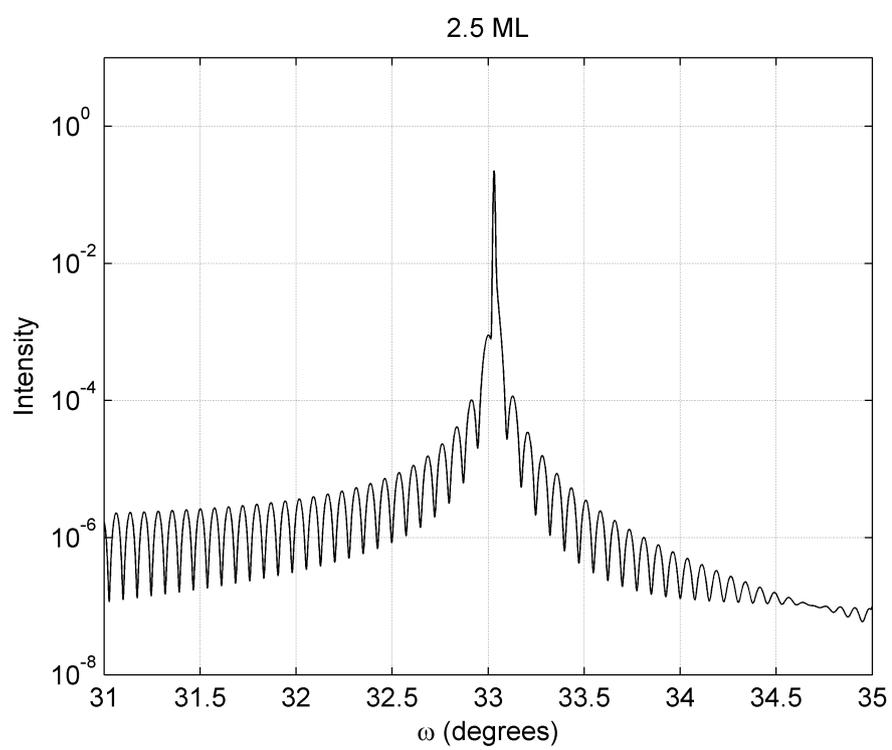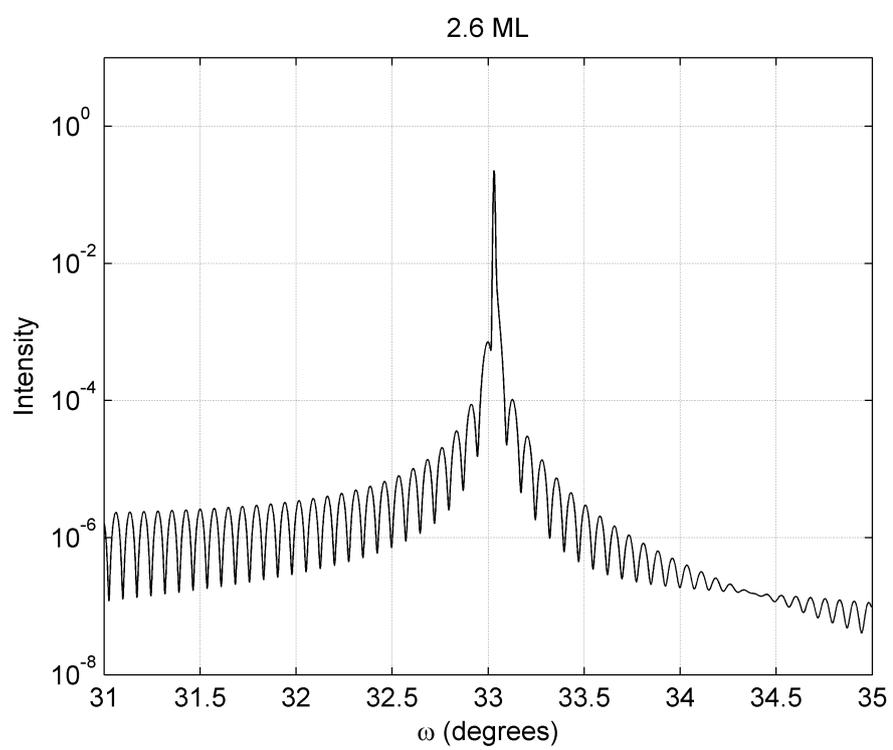
Figure 2.150

Figure 2.151

2.8 ML
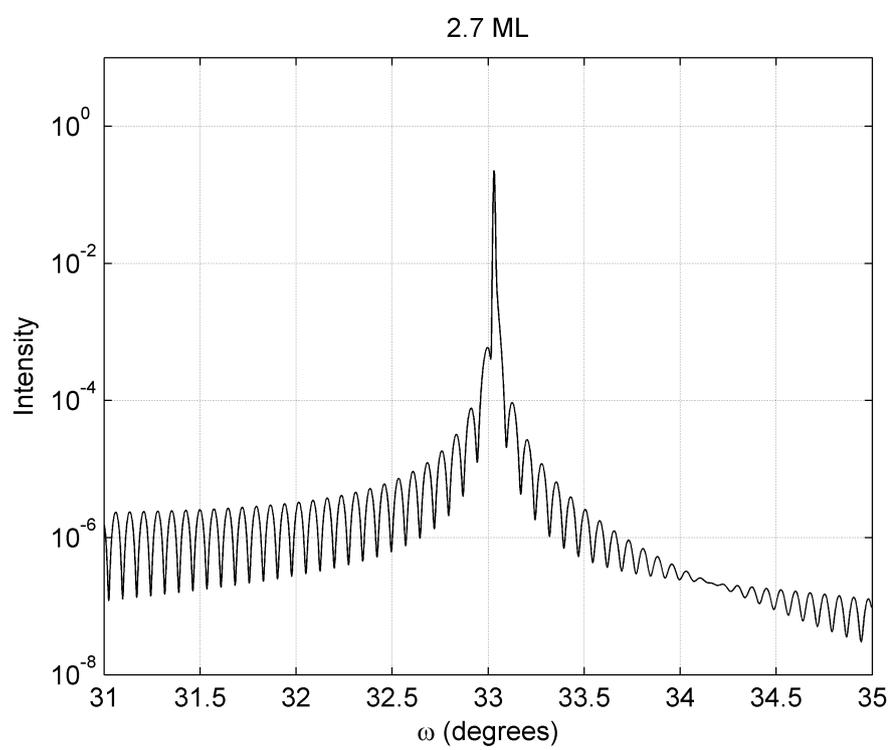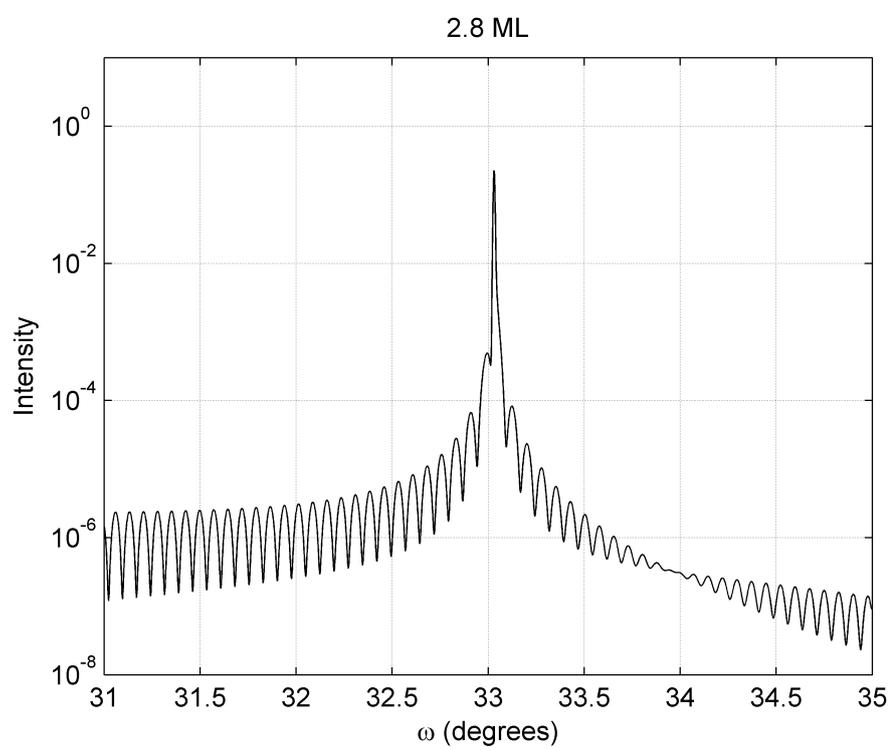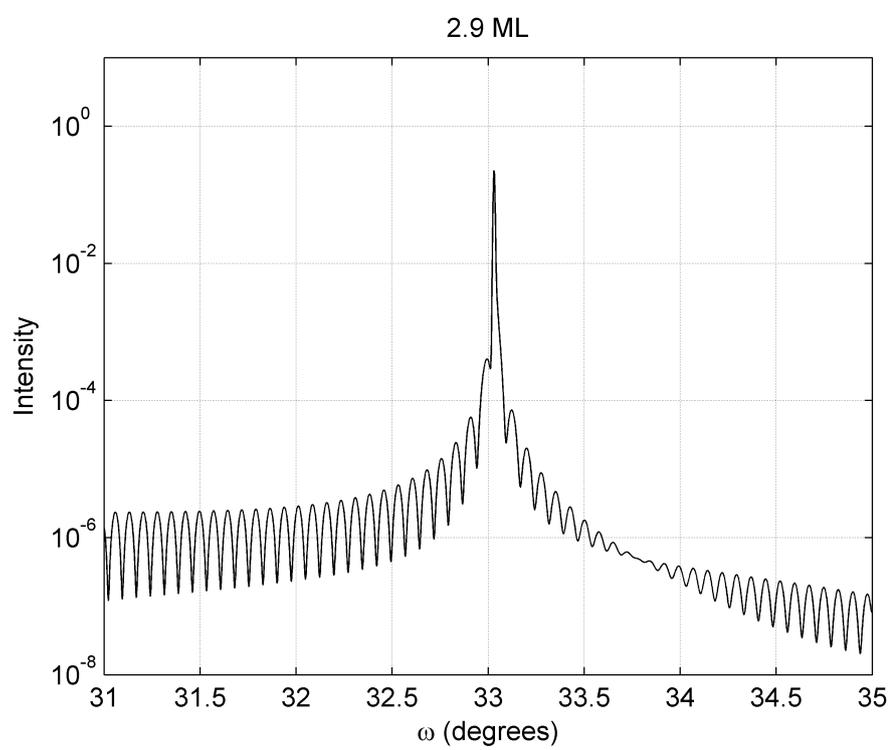
Figure 2.152

Figure 2.153

Figure 2.154

3.1 ML
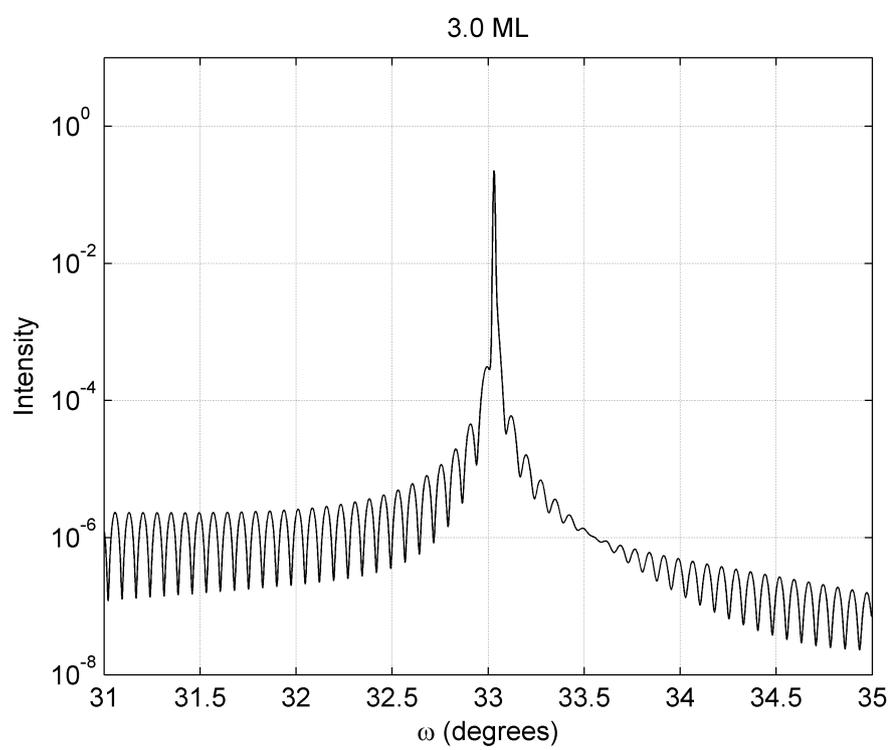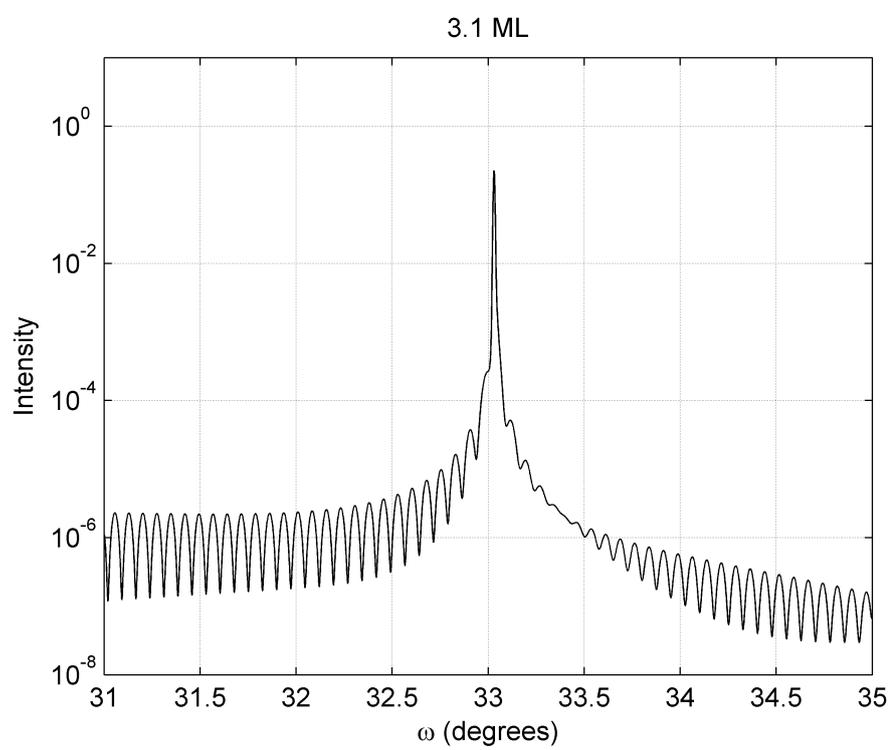
Figure 2.155

Figure 2.156

Figure 2.157

3.4 ML

Intensity

ω (degrees)

Figure 2.158

3.5 ML

Intensity

ω (degrees)
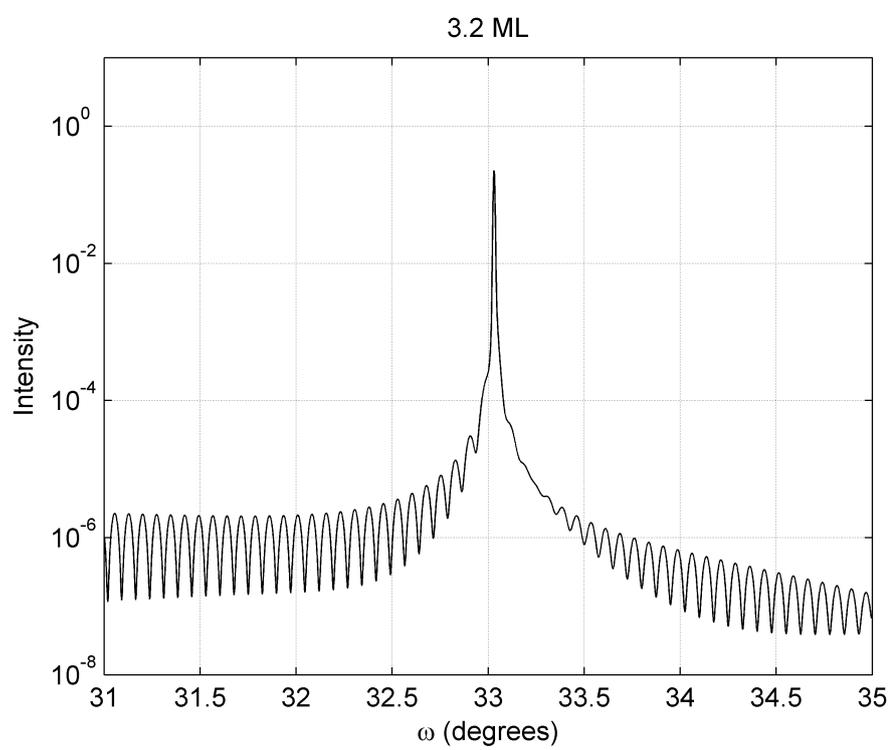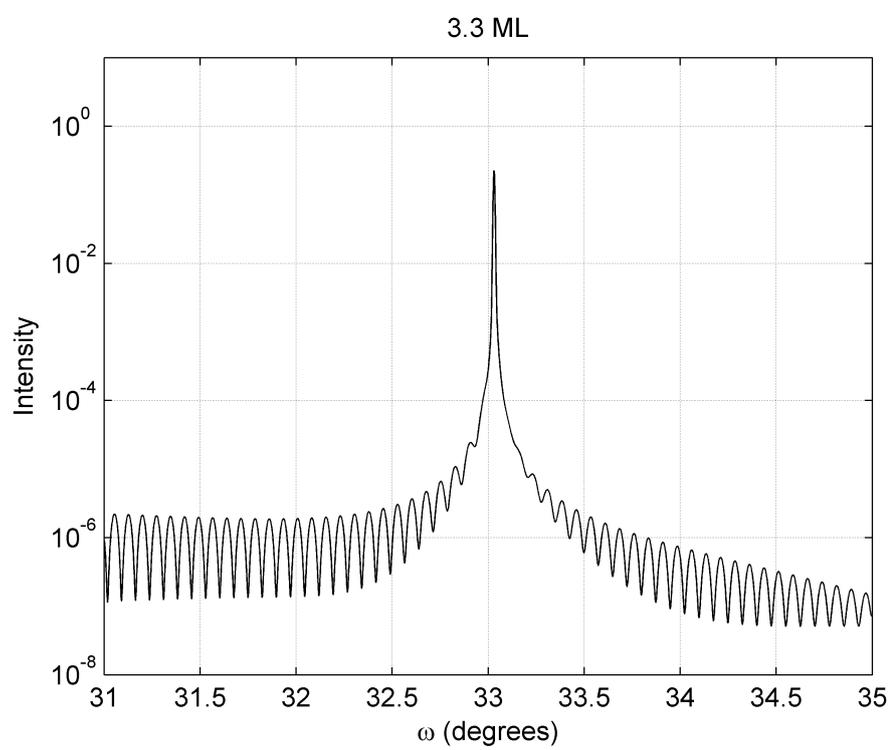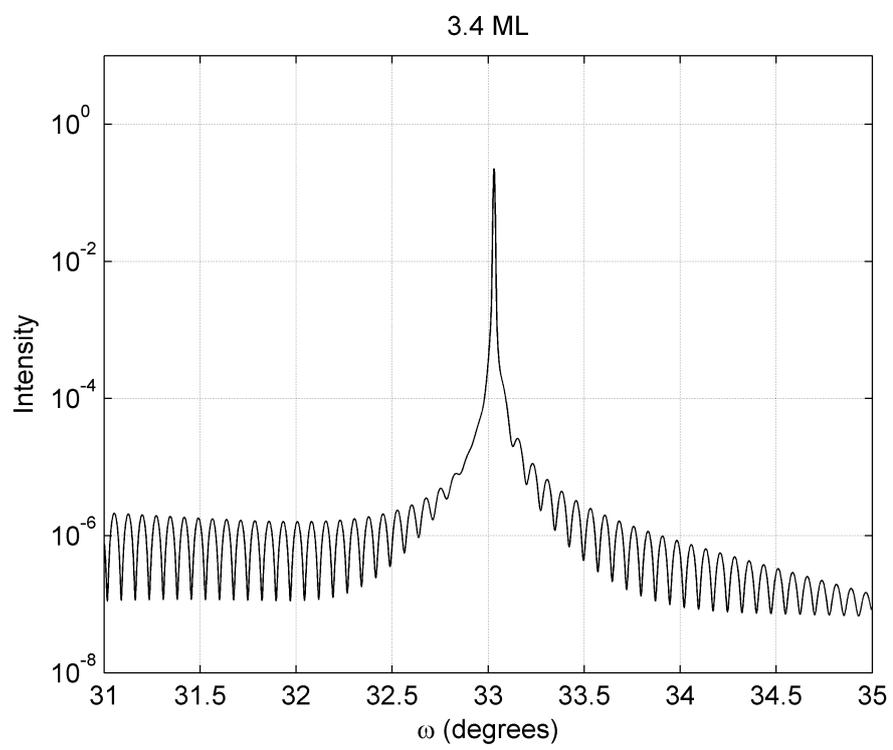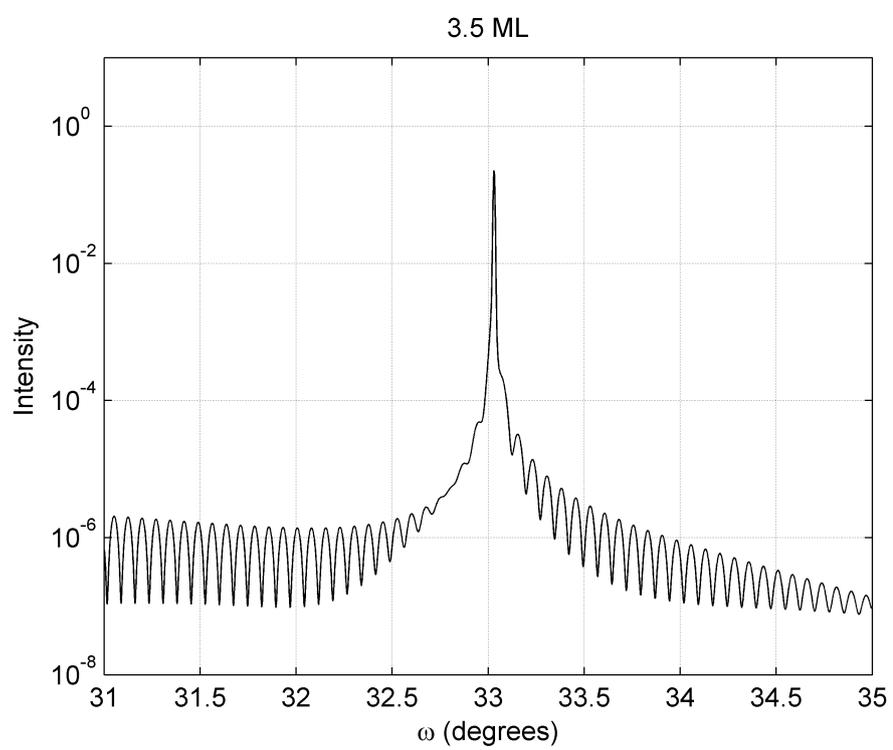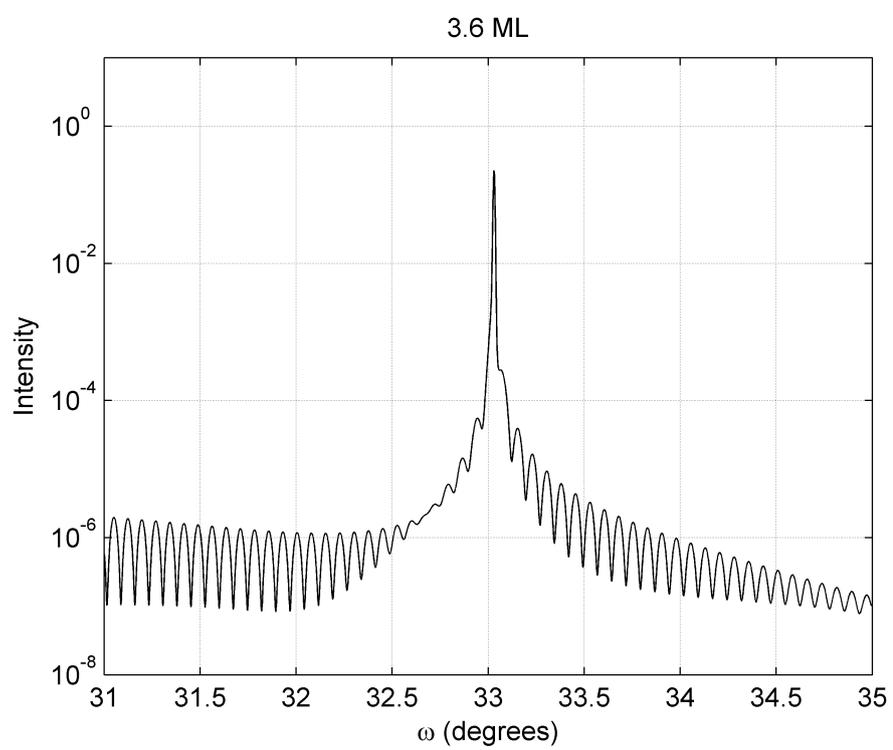
Figure 2.159

Figure 2.160

Figure 2.161

Figure 2.162

3.9 ML

Intensity

ω (degrees)

Figure 2.163

4.0 ML

Figure 2.164

191
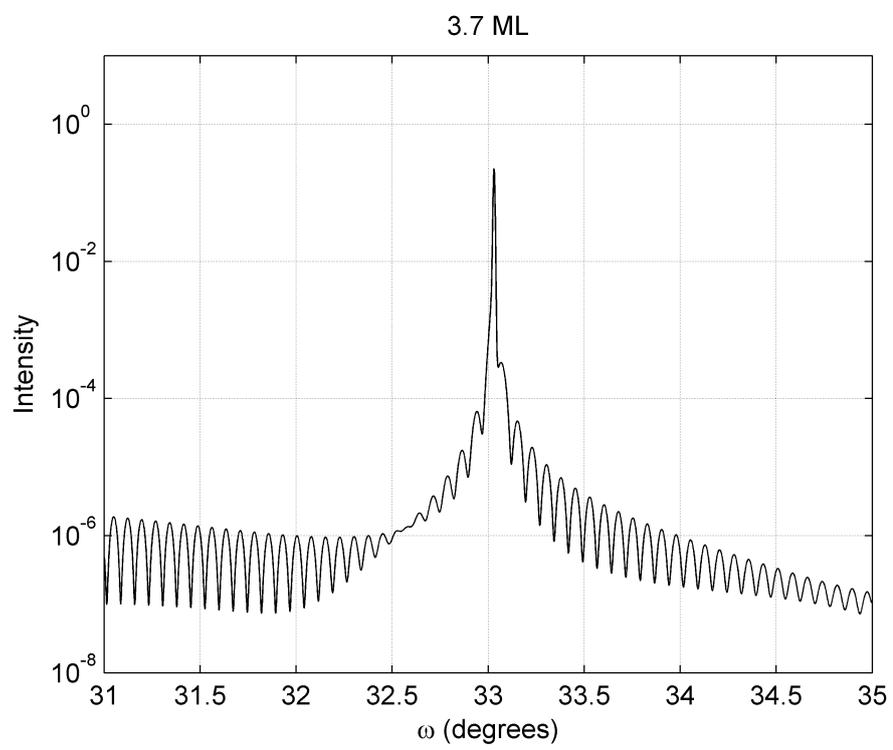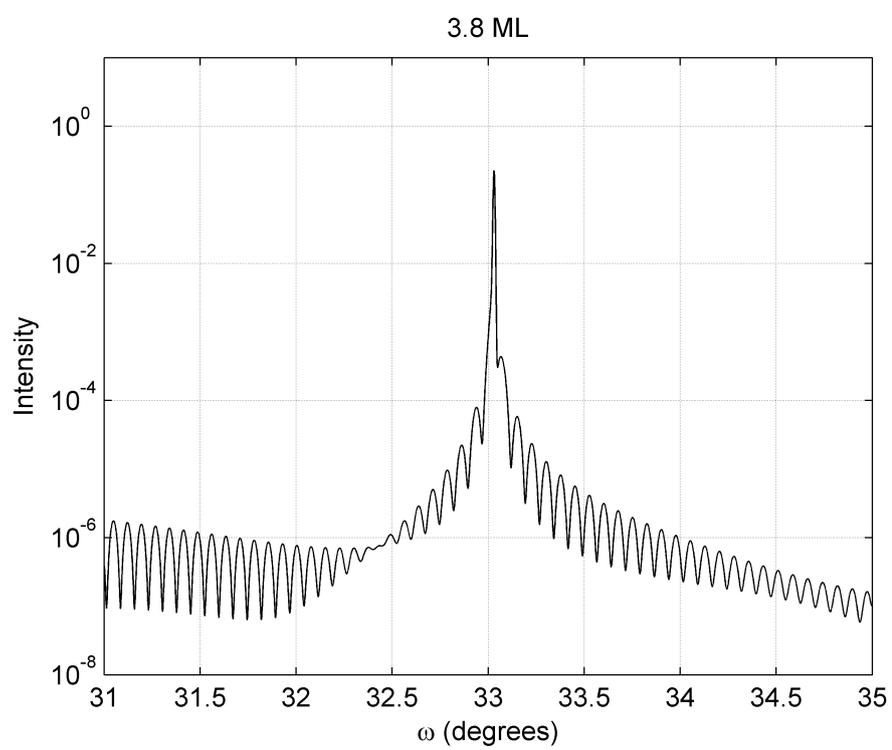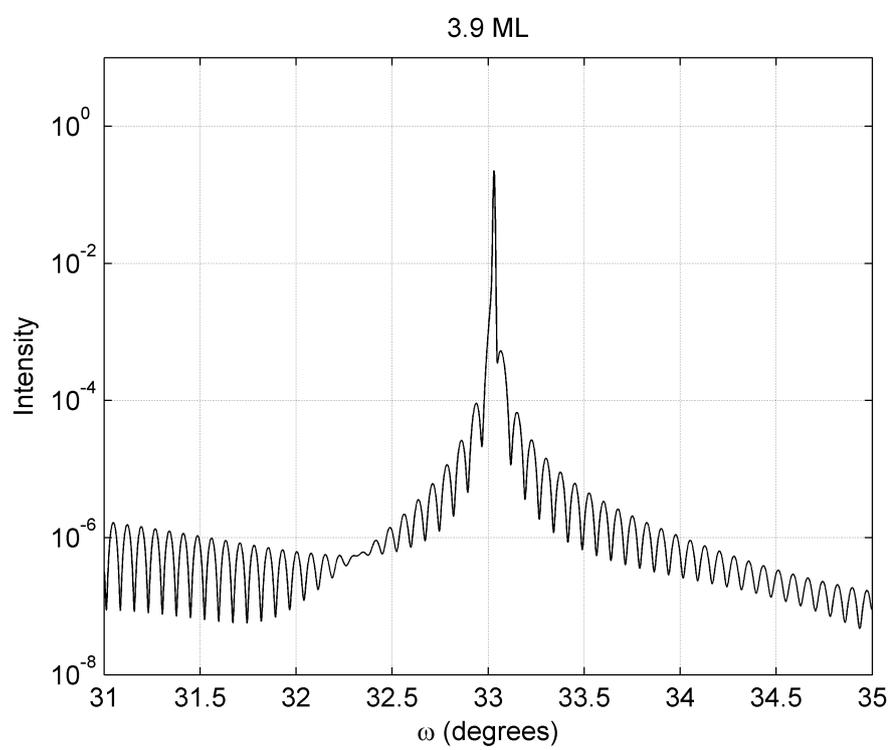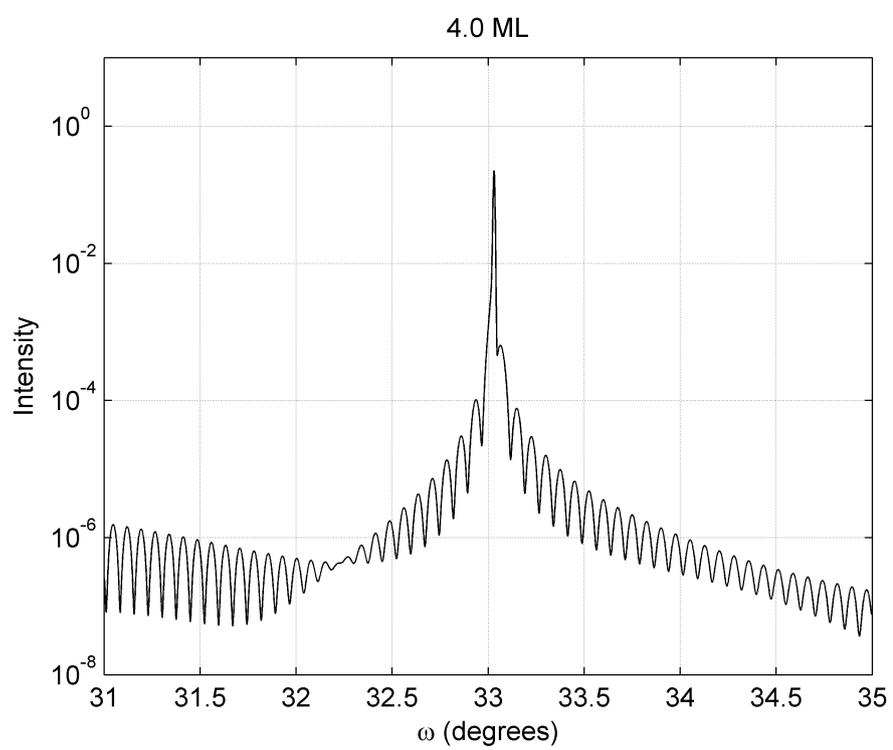
Chapter 3

Segregation

3.1 Case 1

3.1.1 Layers of segregation

Simulations of segregation with up to 9 layers are shown in figures 3.1–3.9.
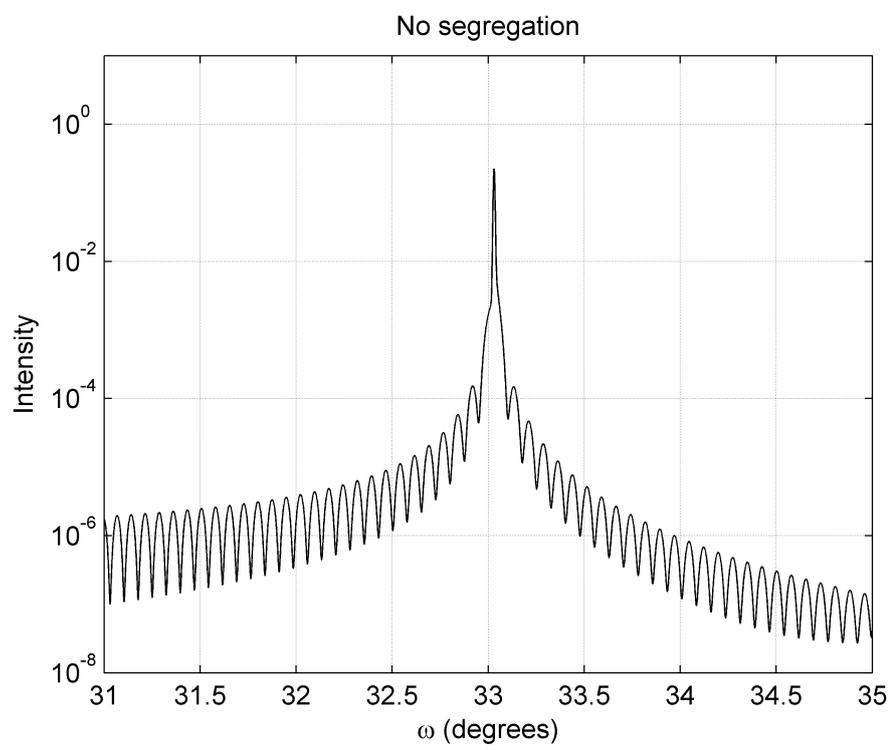
Figure 3.1
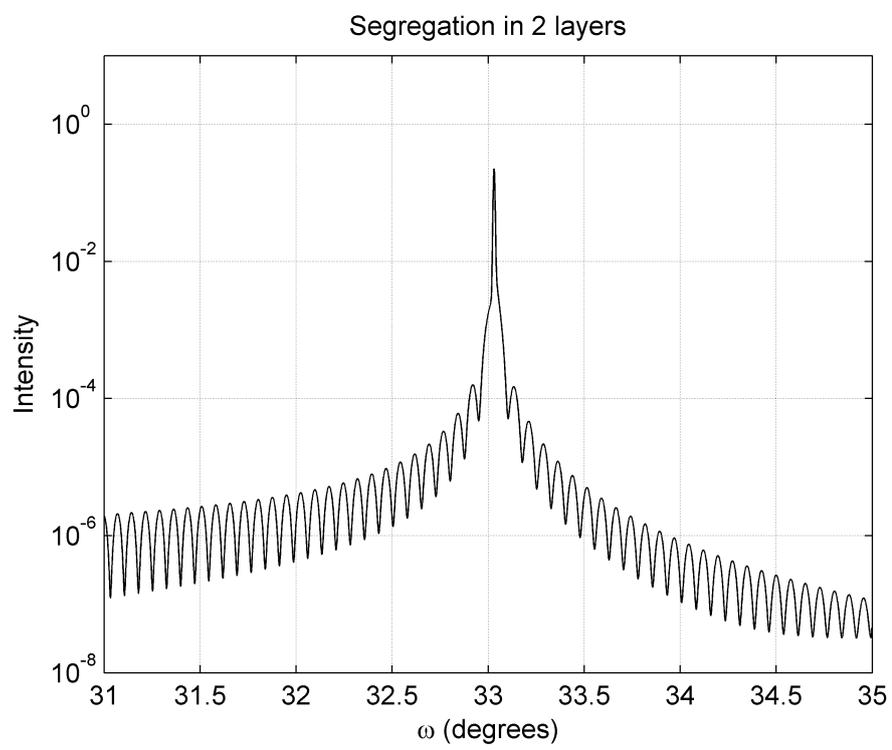
Figure 3.2
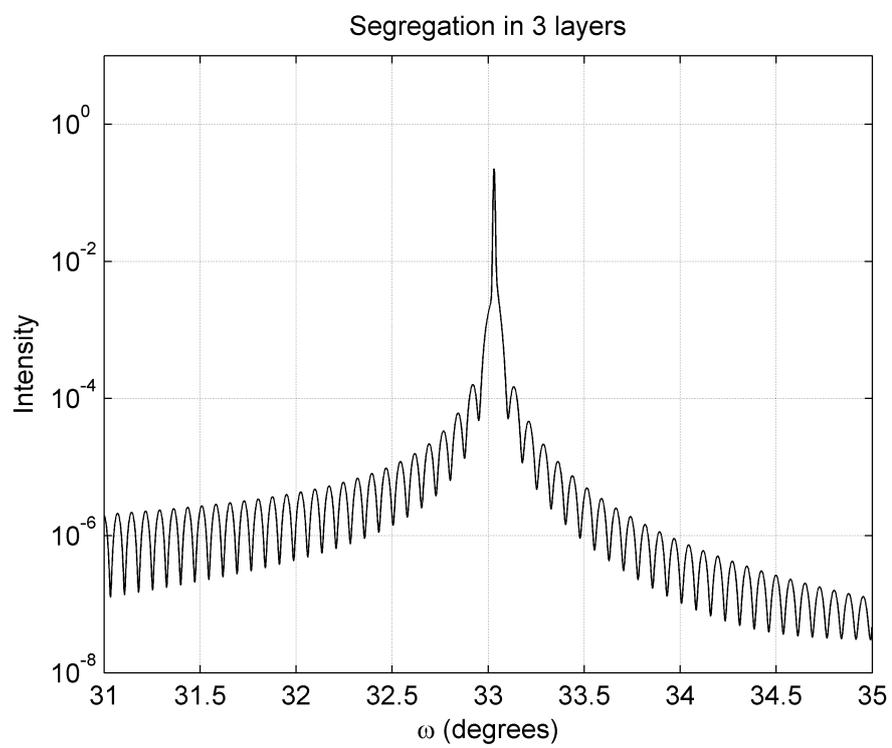
Figure 3.3
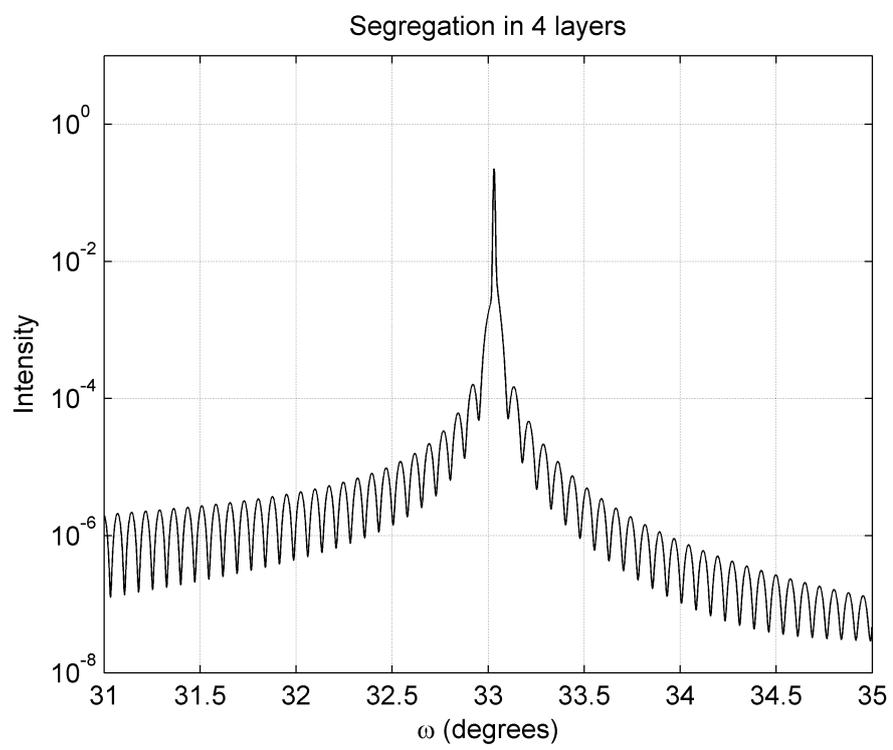
Figure 3.4

Figure 3.5

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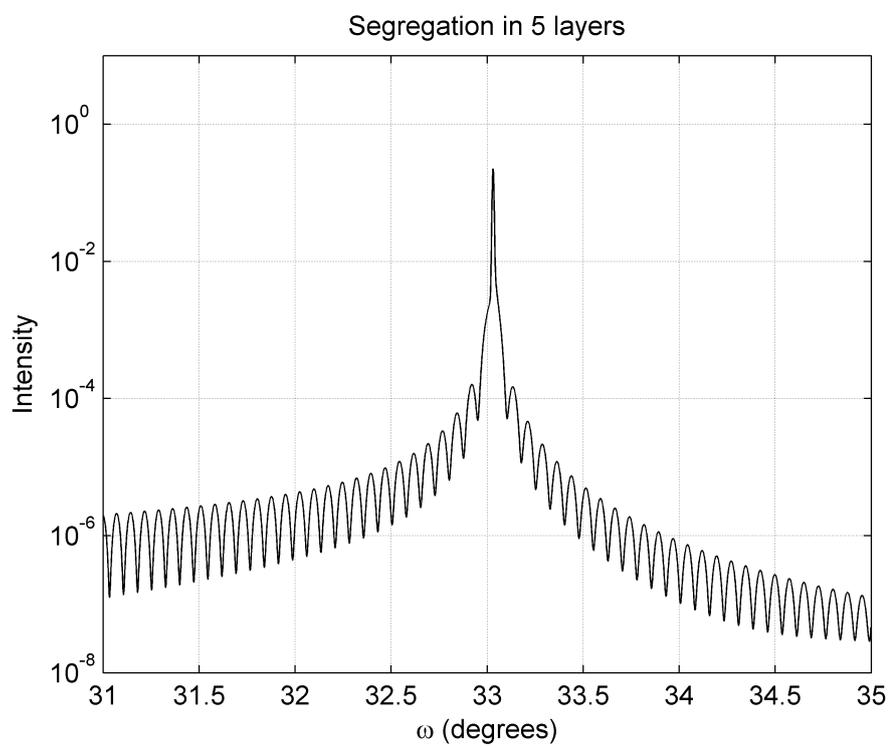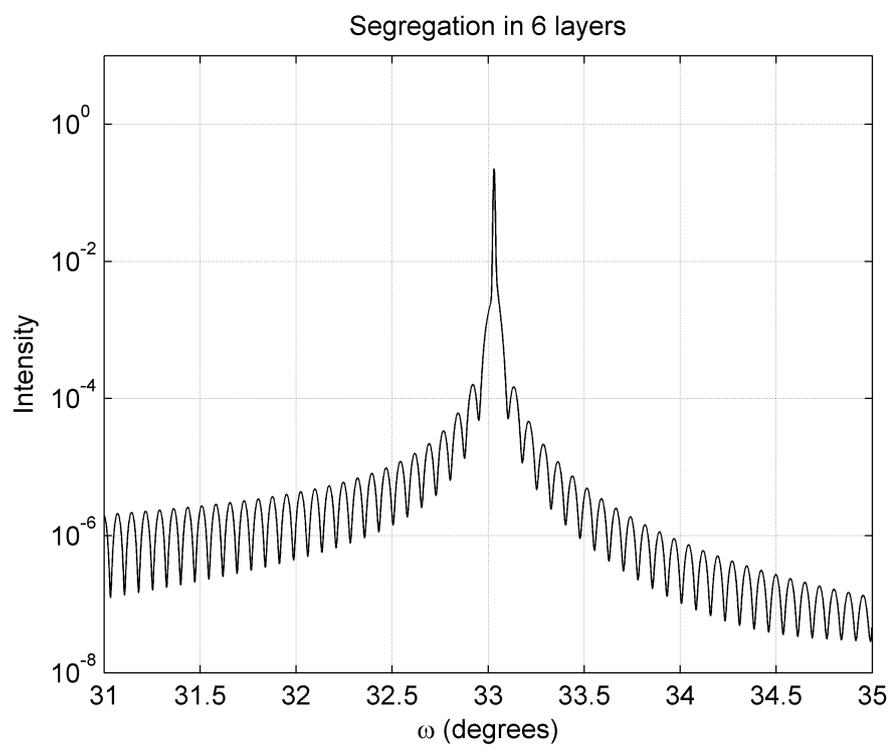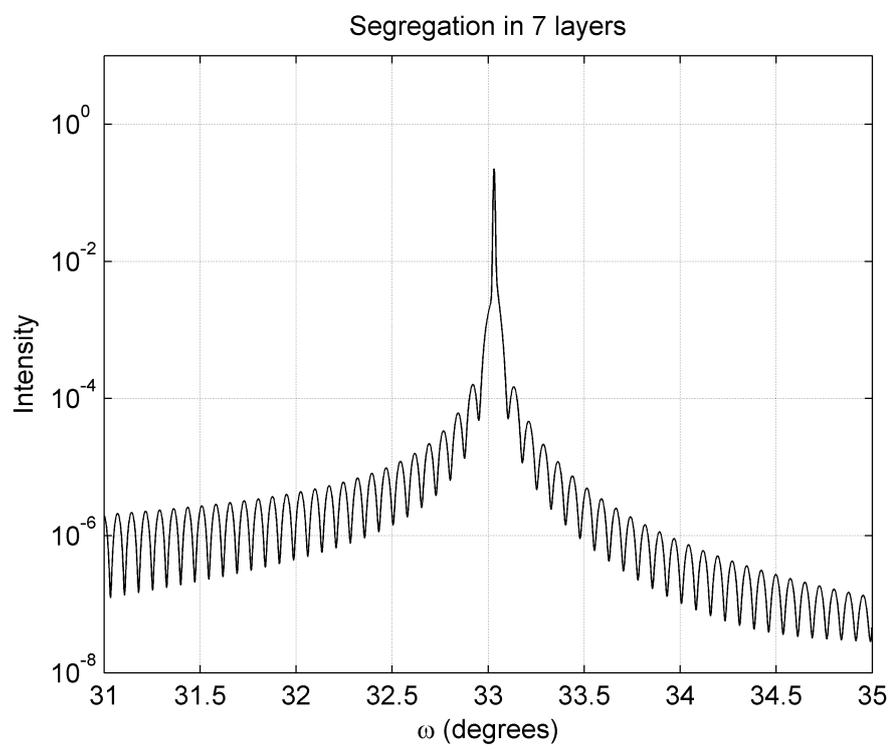
Figure 3.6

Figure 3.7
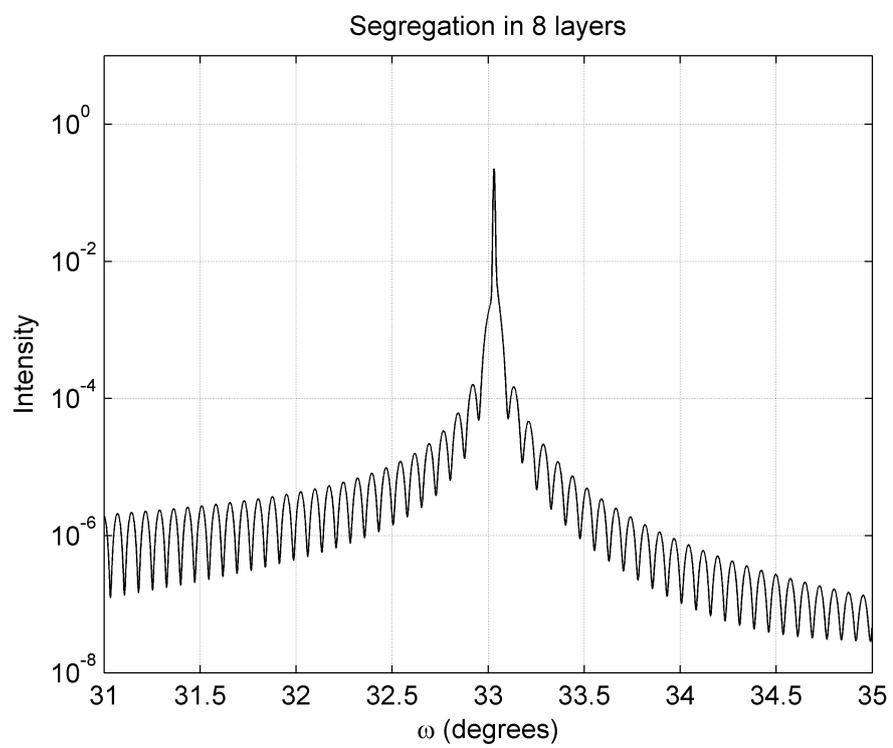
Figure 3.8
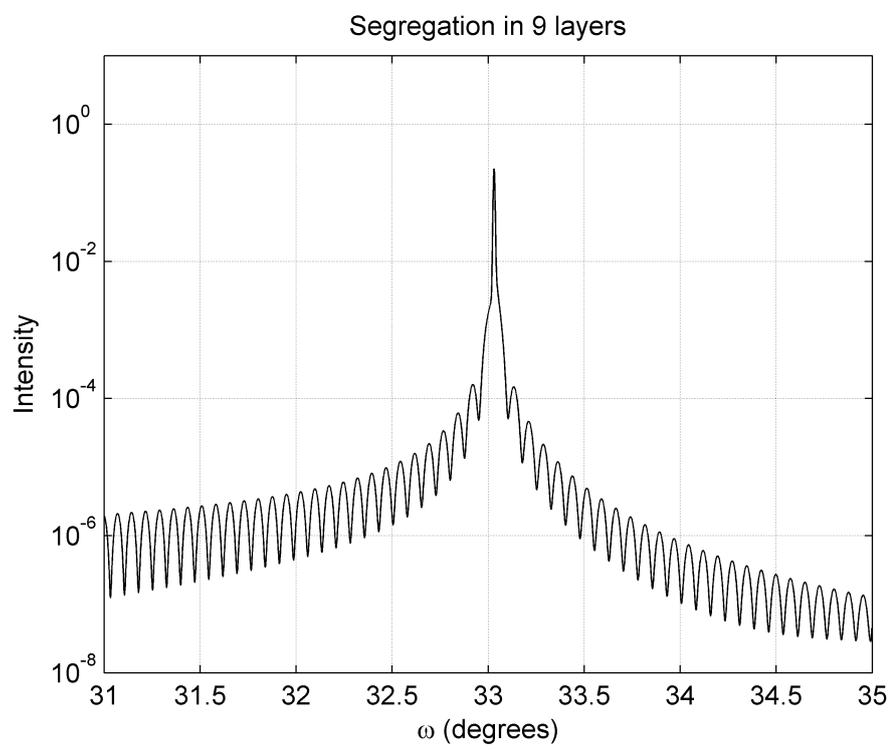
Figure 3.9

3.1.2 Segregation rate

Simulations with first no segregation, then an increasing segregation rate from 5% to 50% are shown are shown in figures 3.10–3.20.

Figure 3.10

Figure 3.11

10% segregation rate

Figure 3.12

15% segregation rate
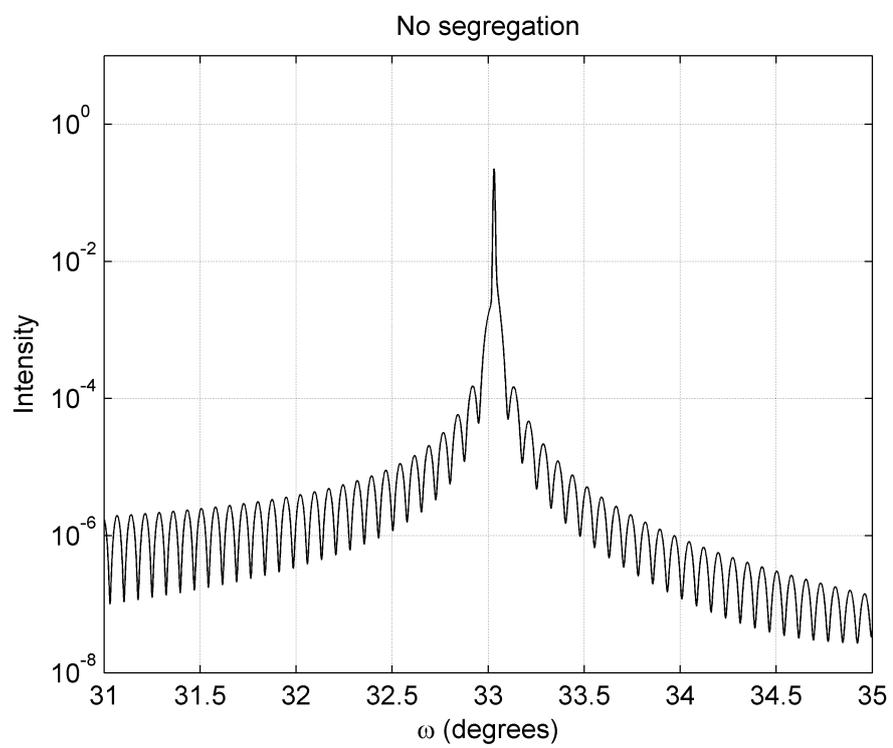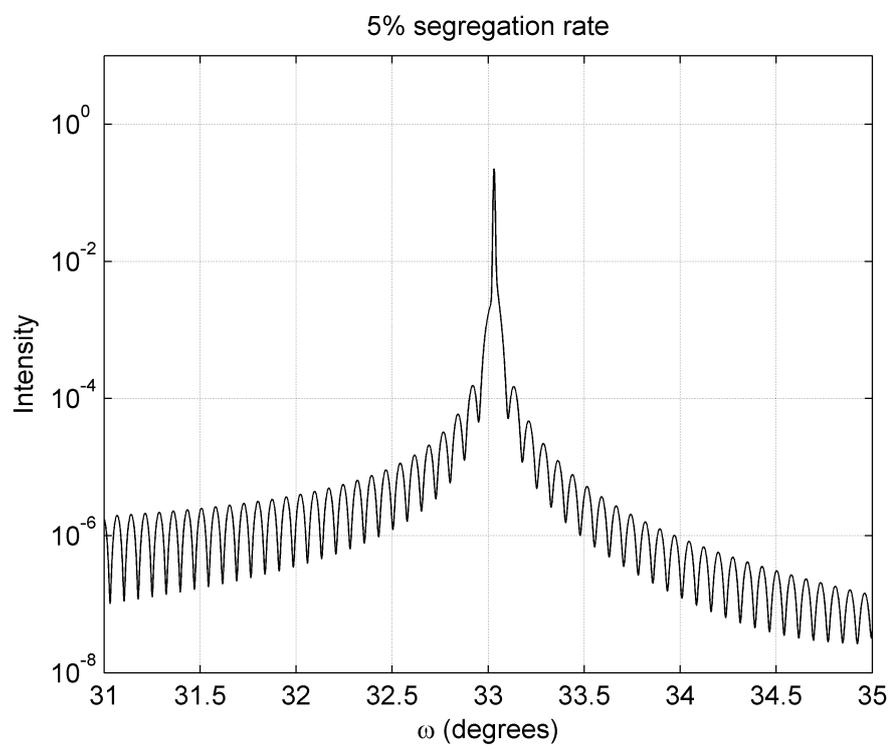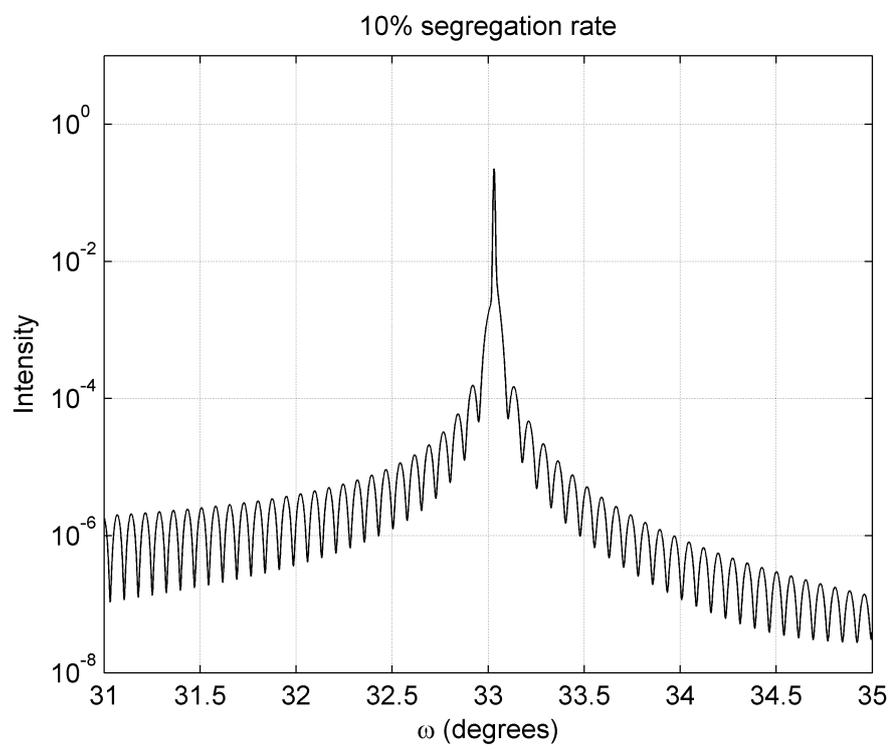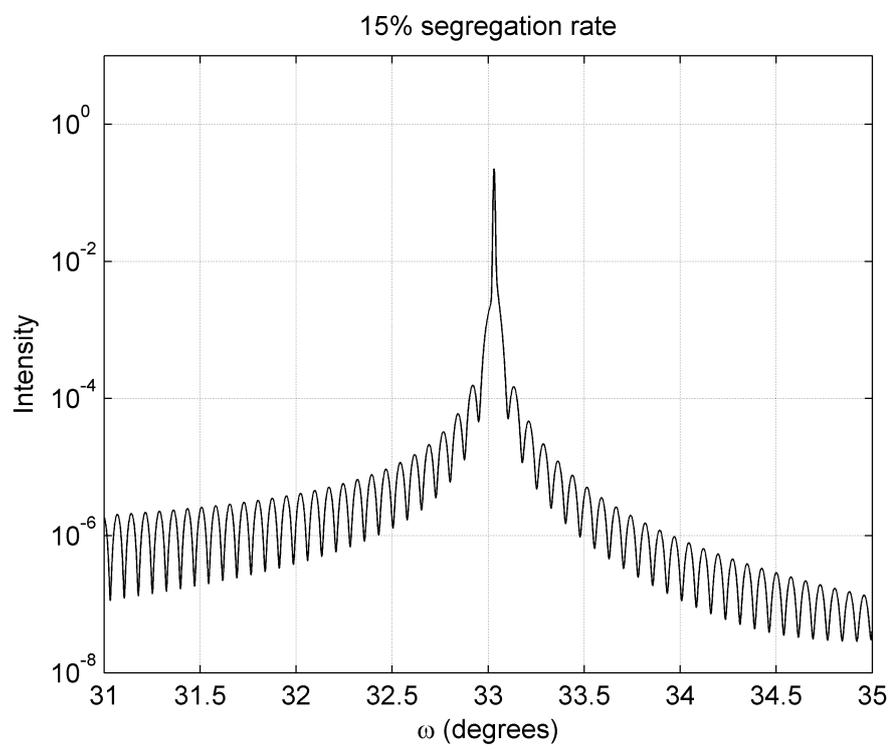
Figure 3.13

Figure 3.14

Figure 3.15

30% segregation rate

Figure 3.16

209

35% segregation rate

Figure 3.17

40% segregation rate
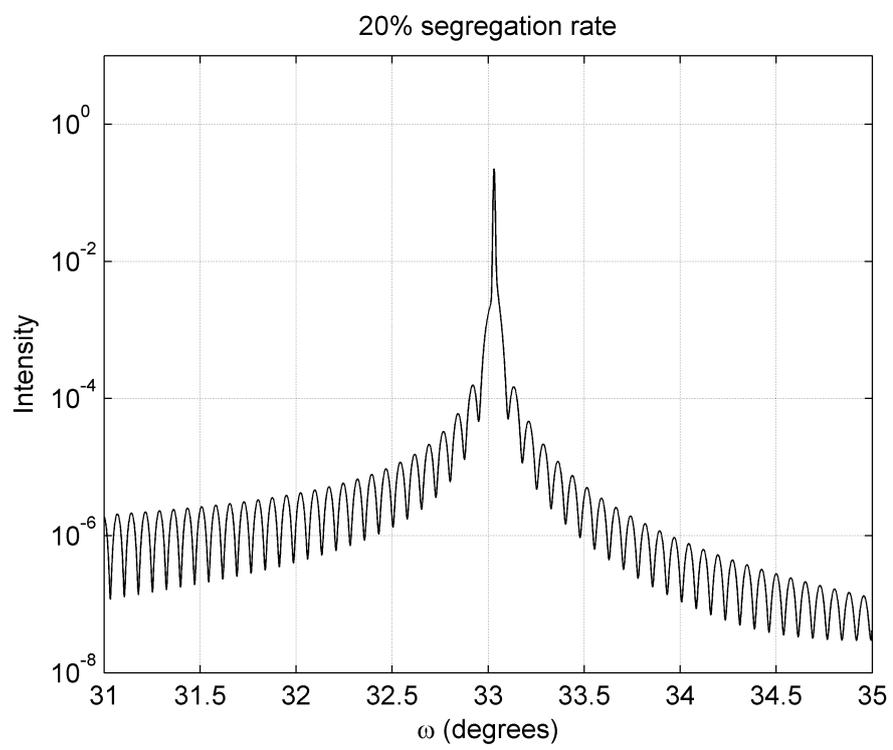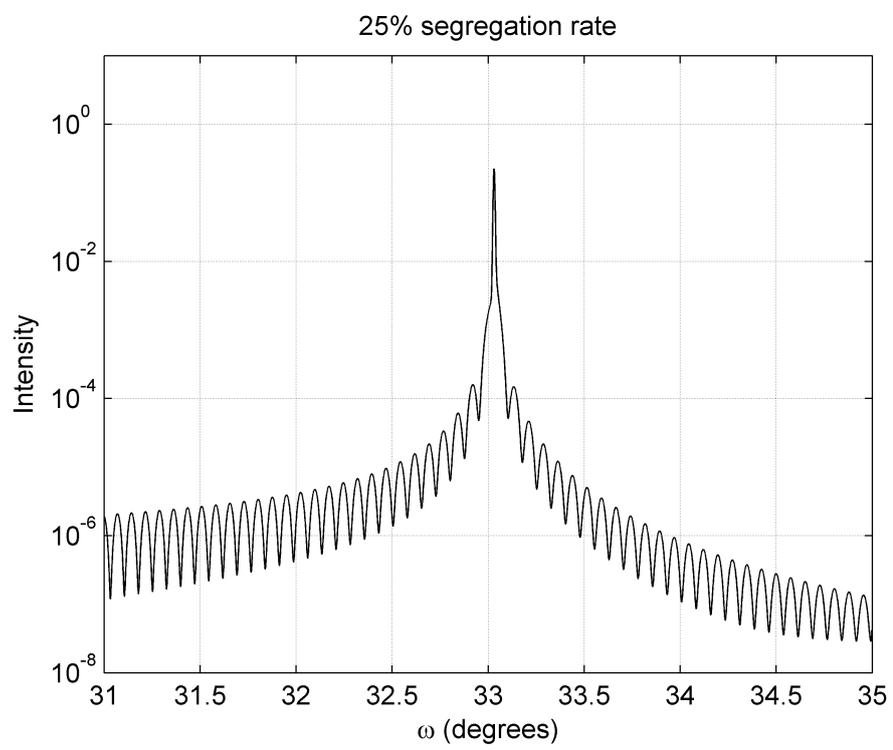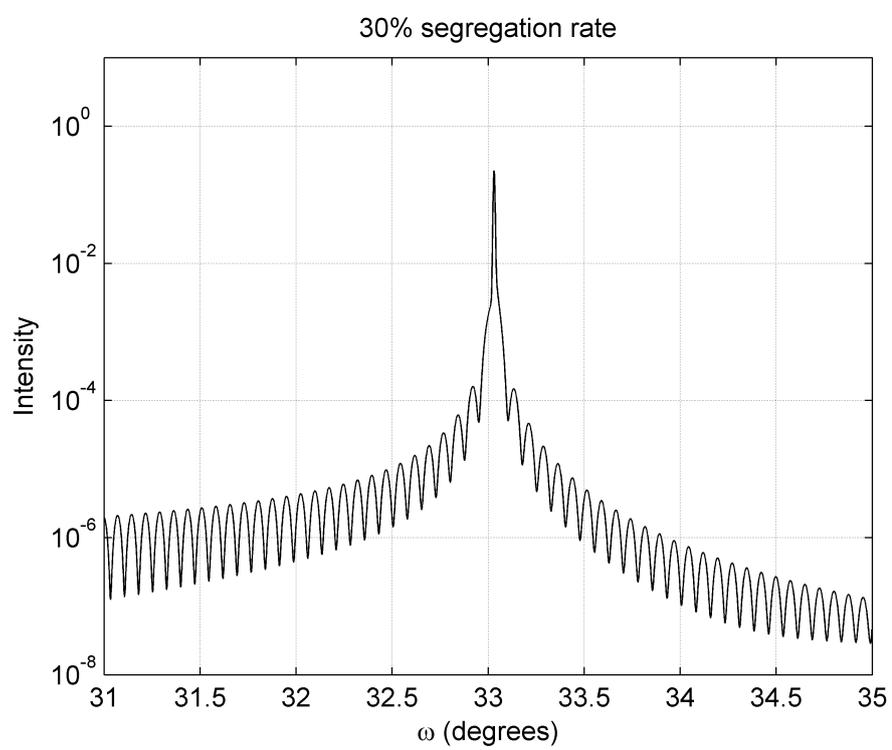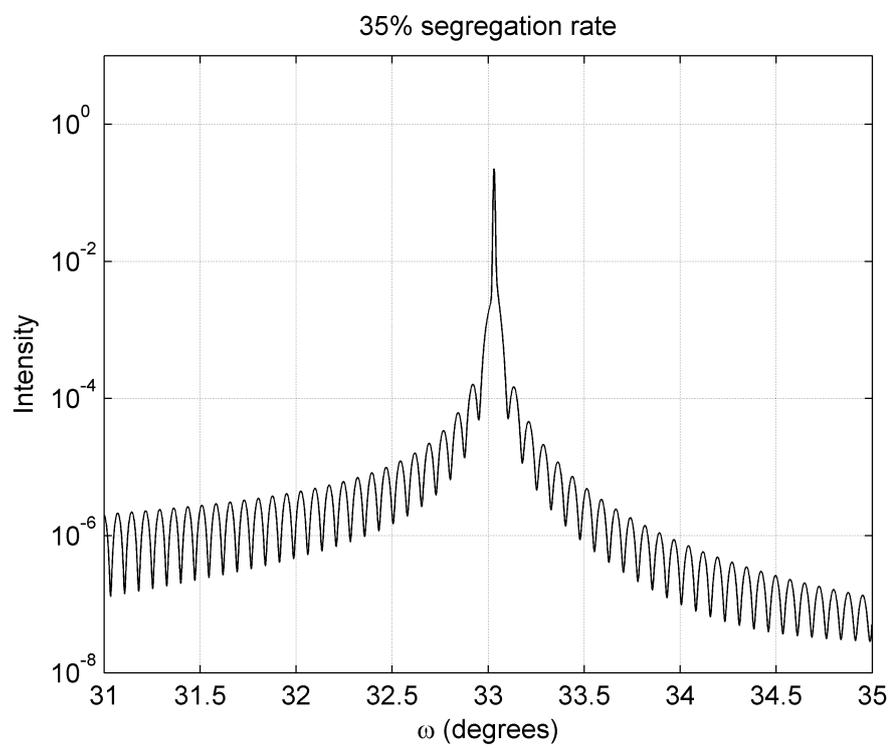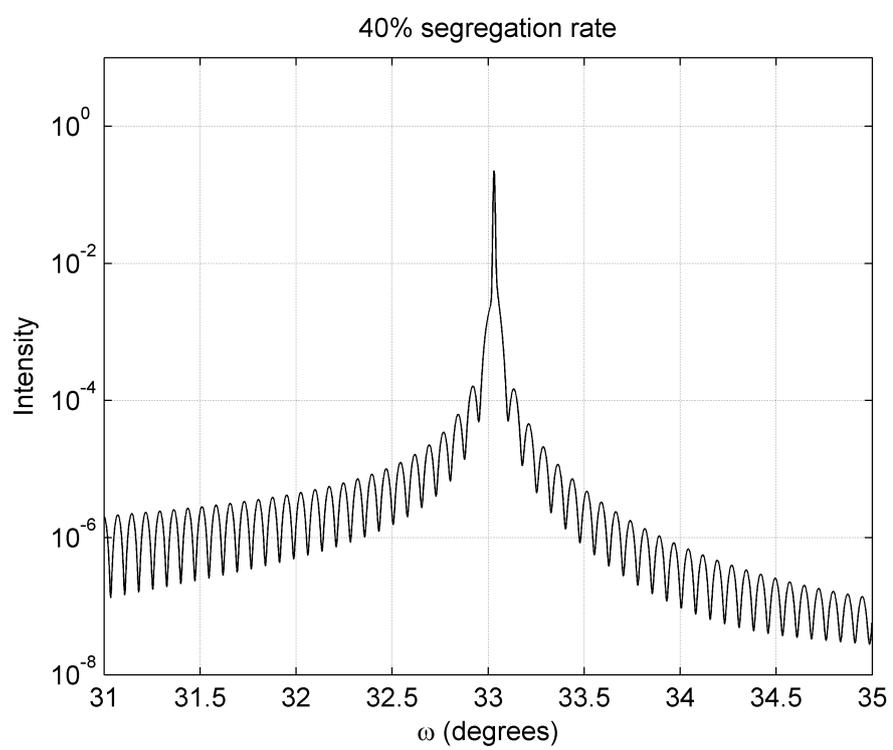
Figure 3.18

Figure 3.19

50% segregation rate

Figure 3.20

213
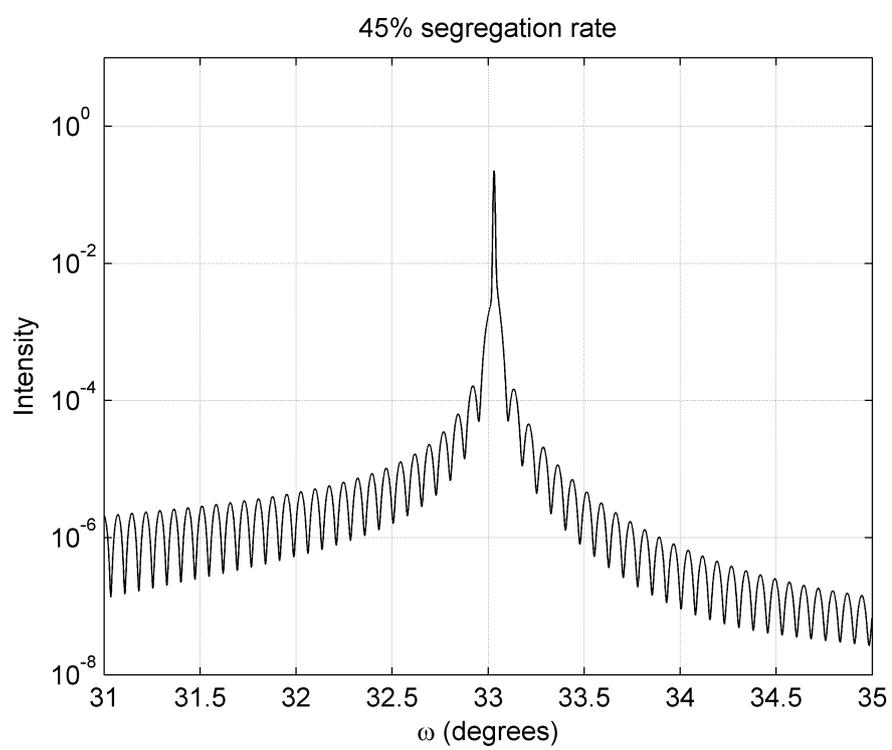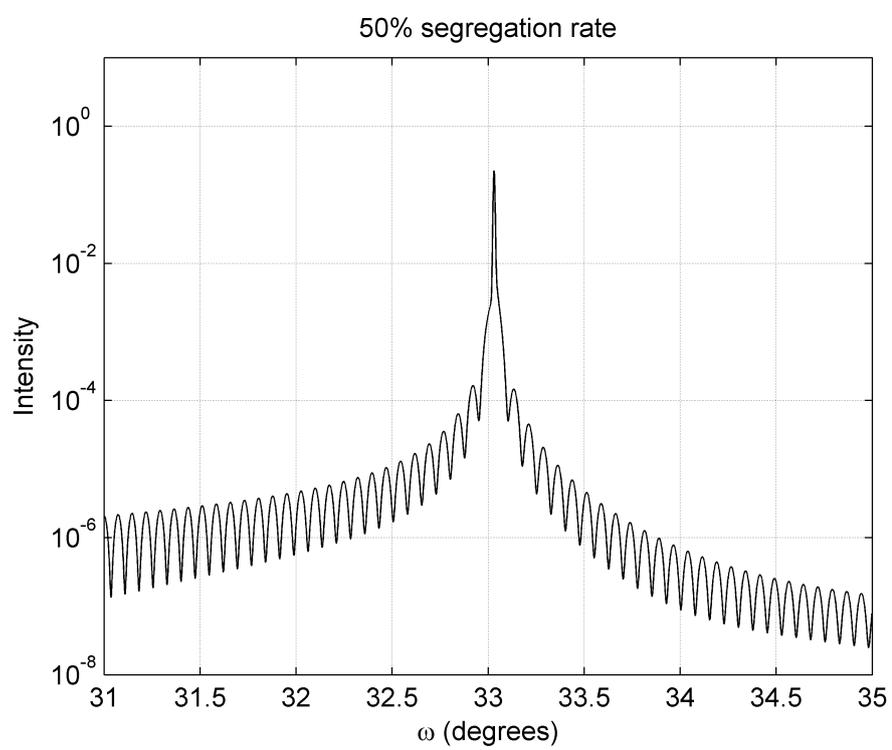
3.2   Case 2

Simulations with varying degrees of segregation are shown in figures 3.21–3.31

100% InAs

Figure 3.21

95% InAs

Figure 3.22

Figure 3.23

85% InAs

Intensity

ω (degrees)

Figure 3.24

80% InAs

Intensity

ω (degrees)
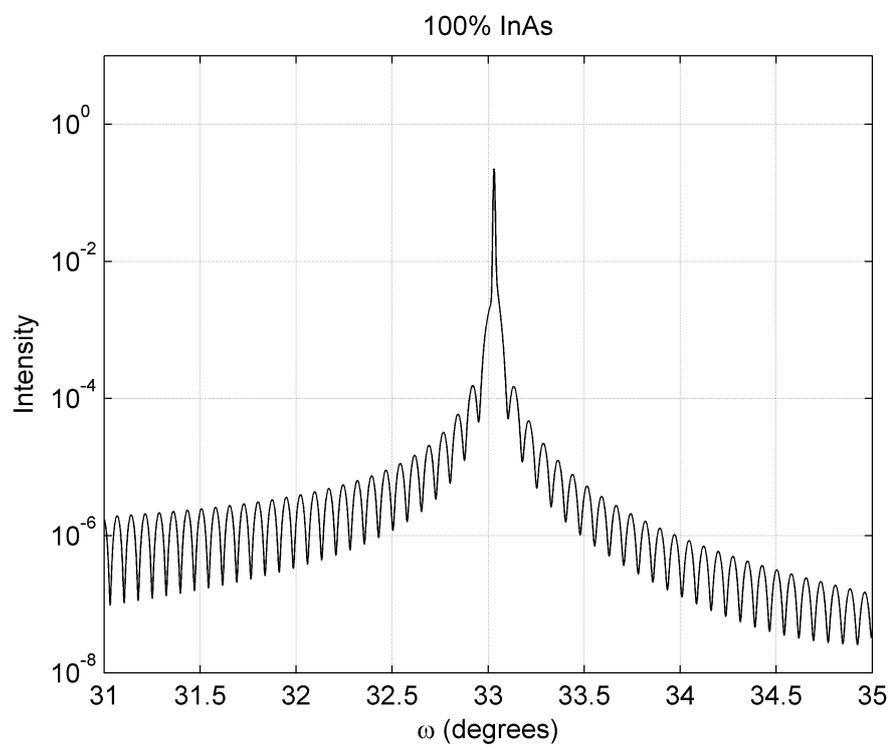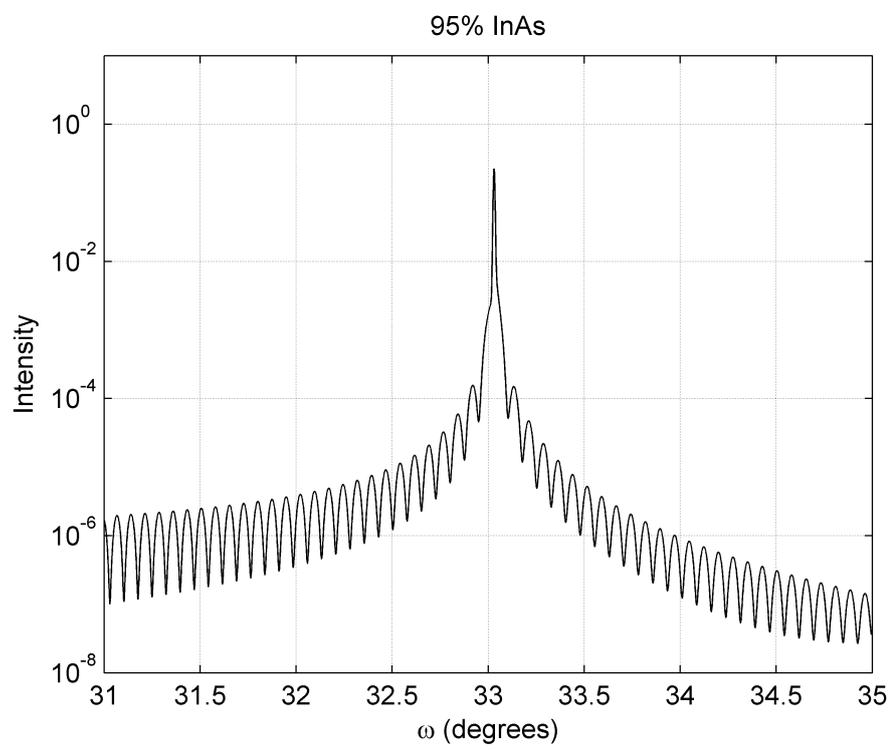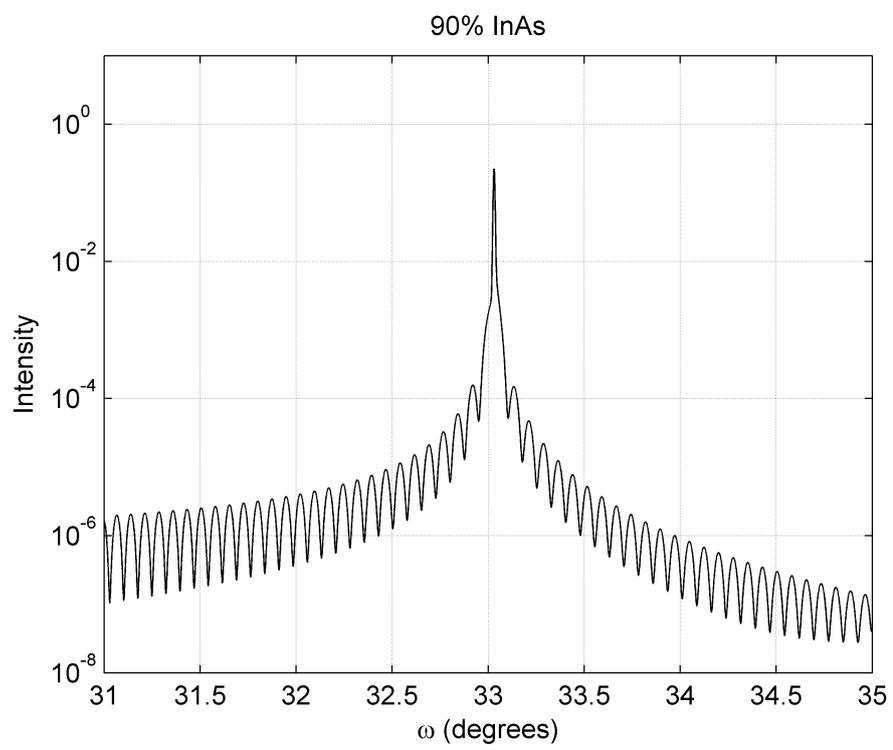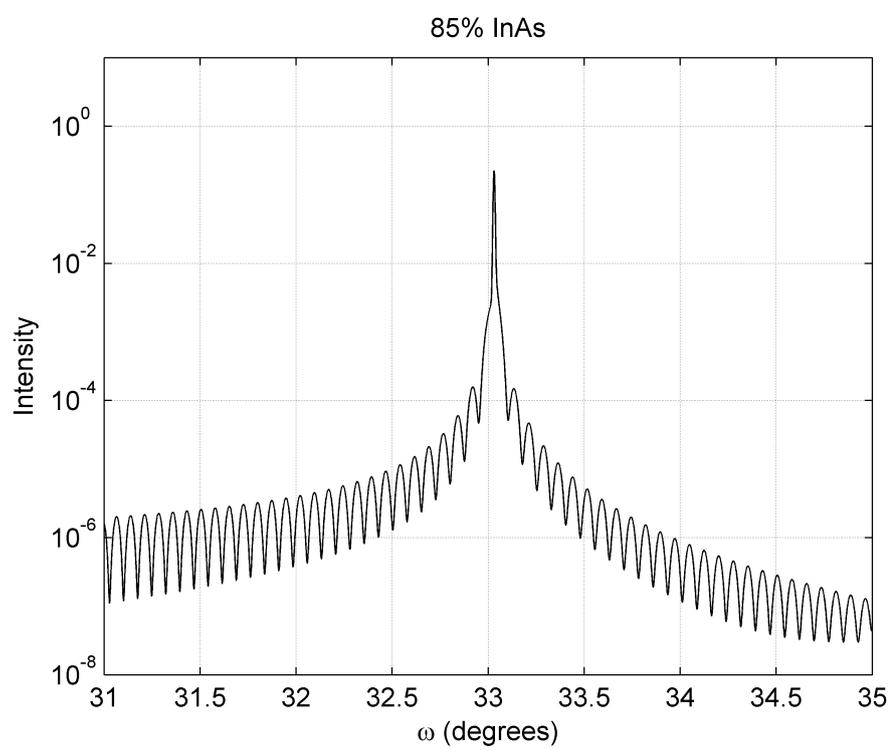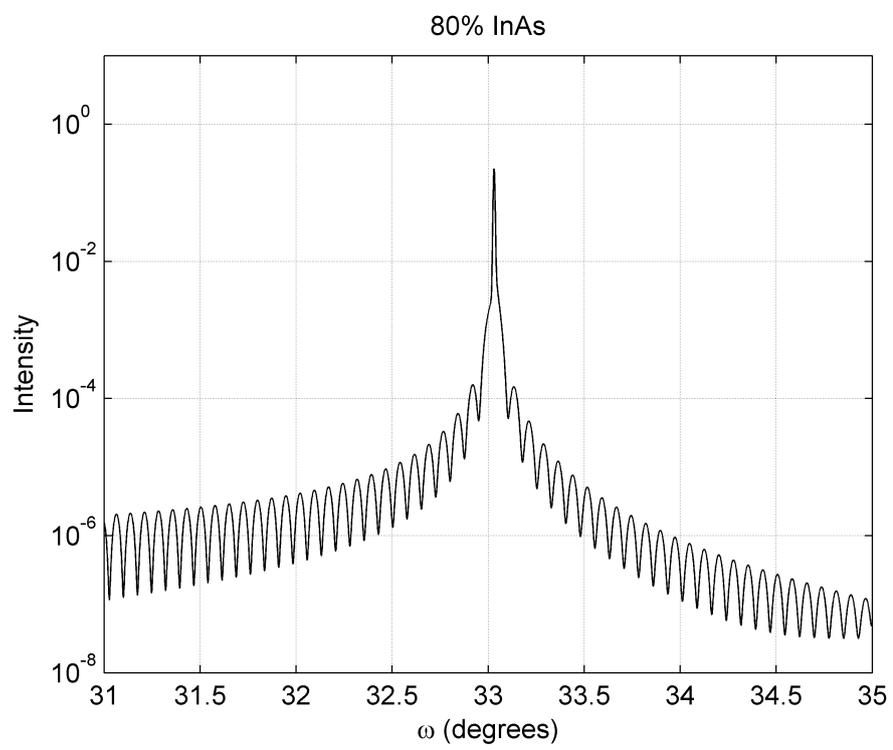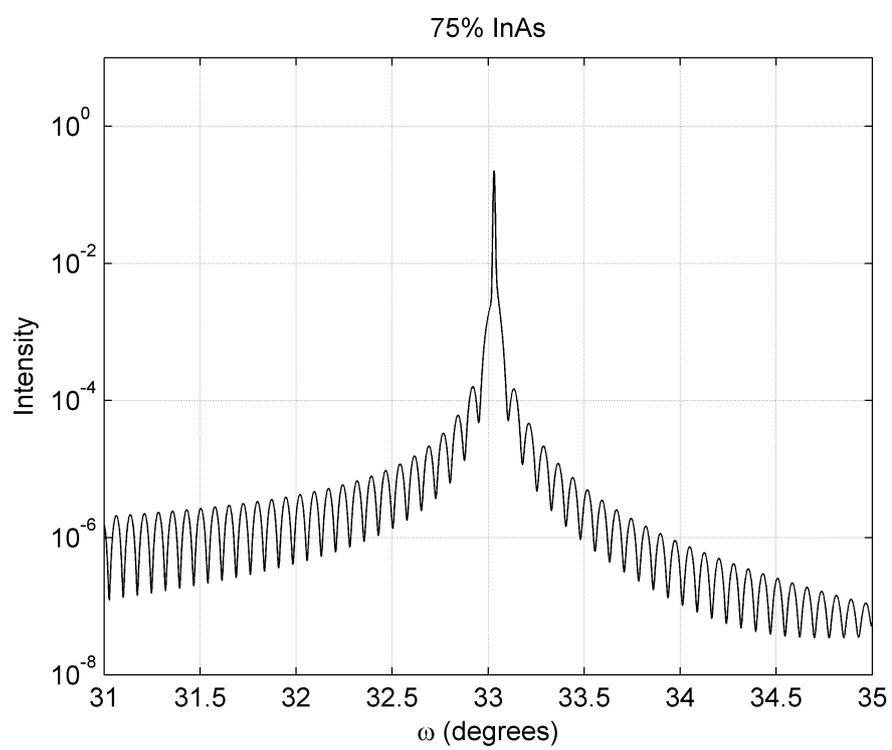
Figure 3.25

Figure 3.26

Figure 3.27

65% InAs
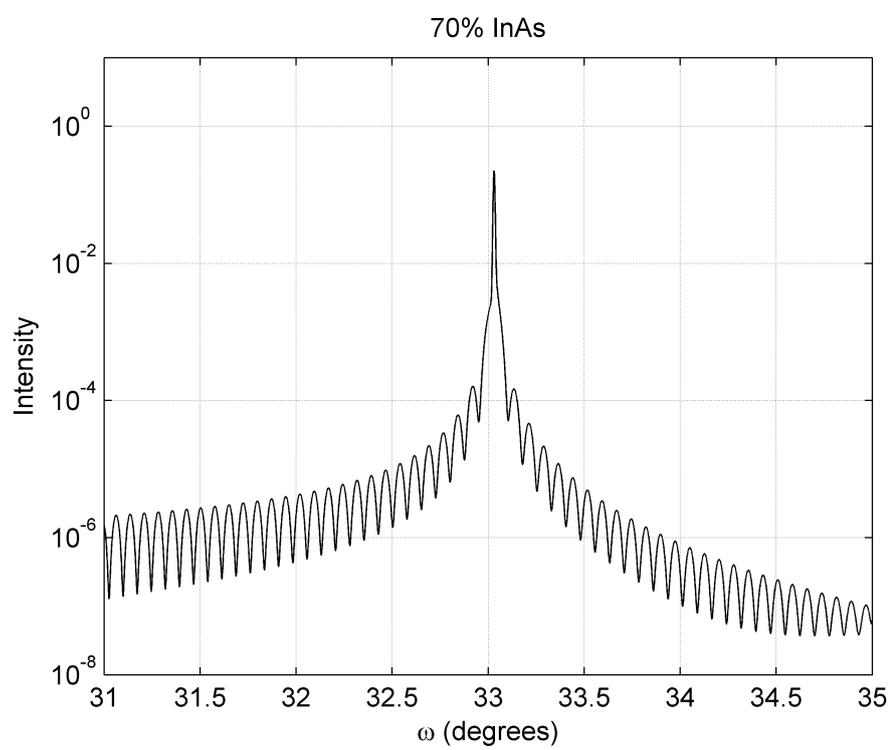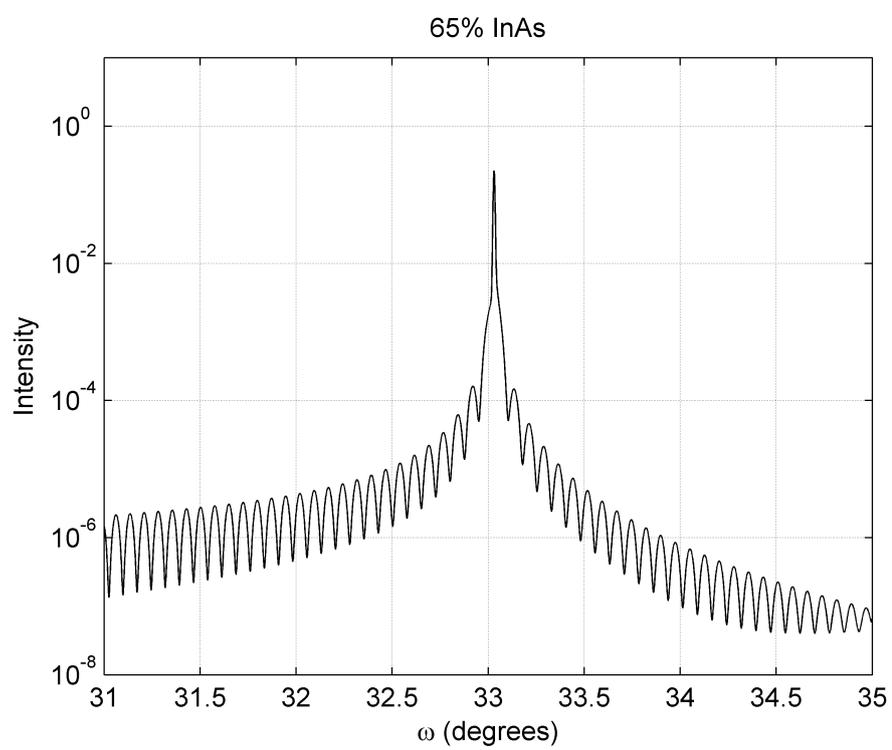
Figure 3.28

Figure 3.29

55% InAs

Figure 3.30

50% InAs
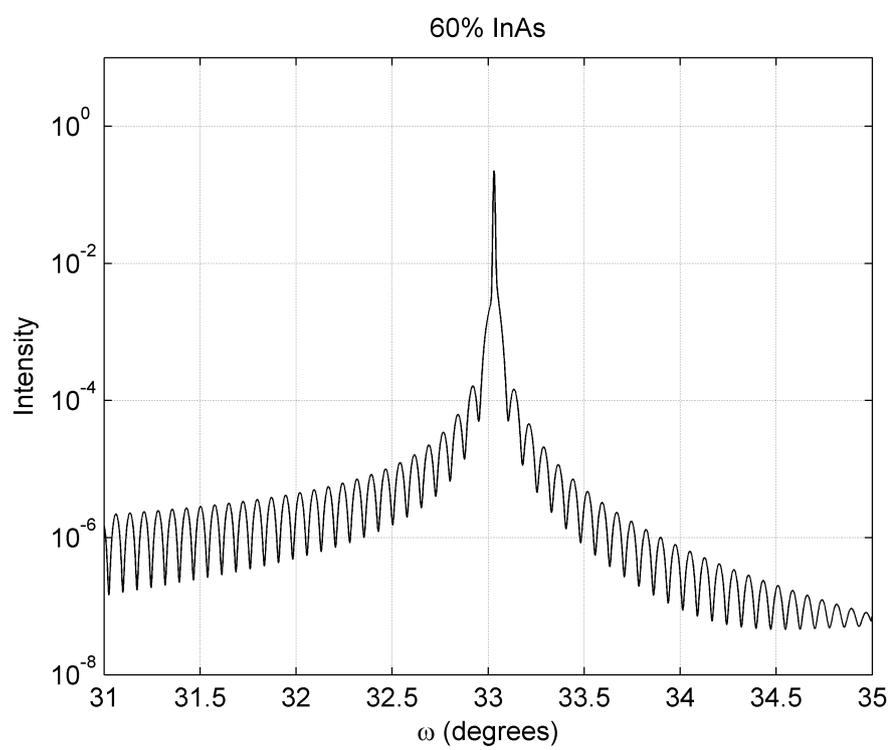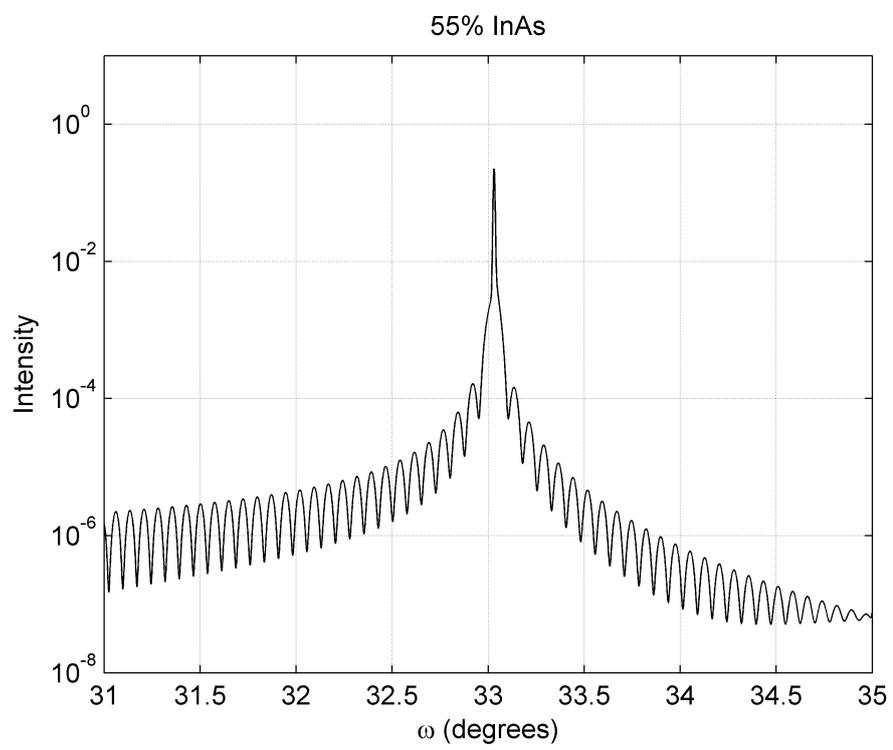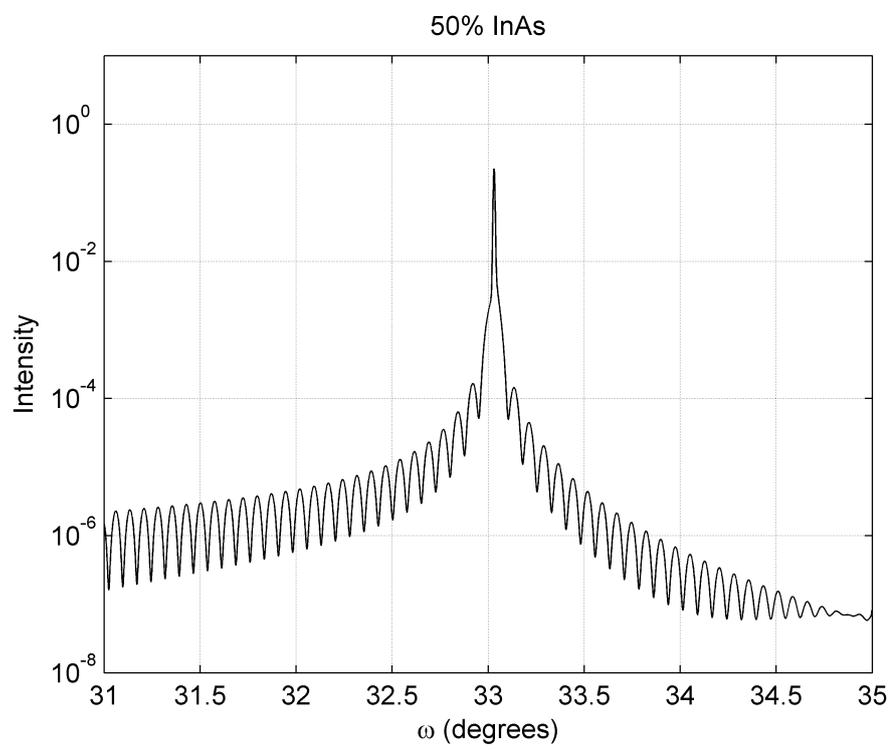
**Figure 3.31**

3.3 Case 3

Simulations with various InAs/GaAs distributions are shown in figures 3.32–3.35.
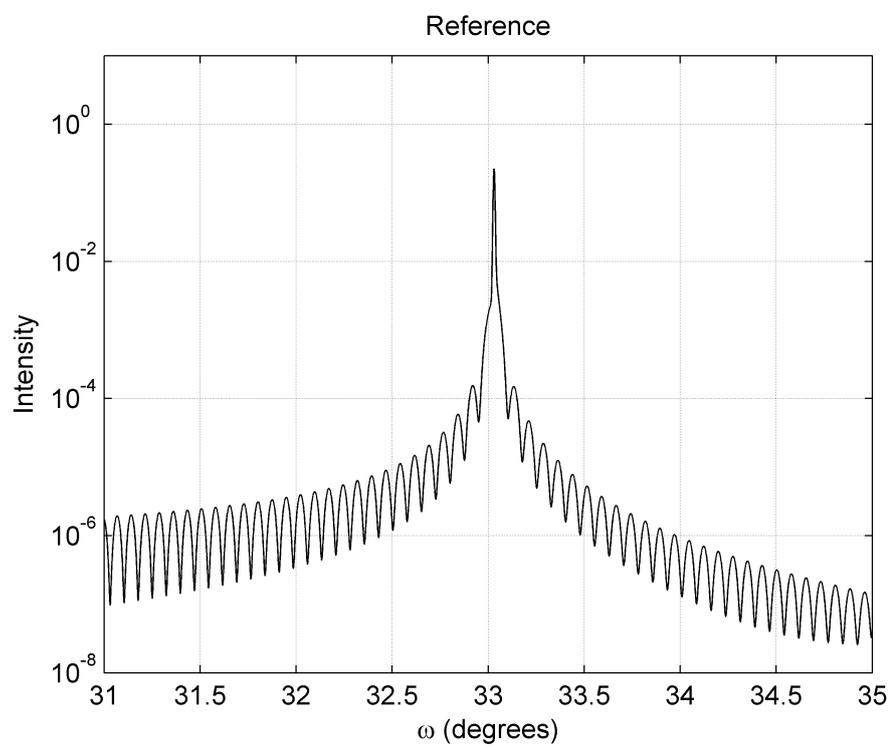
Figure 3.32
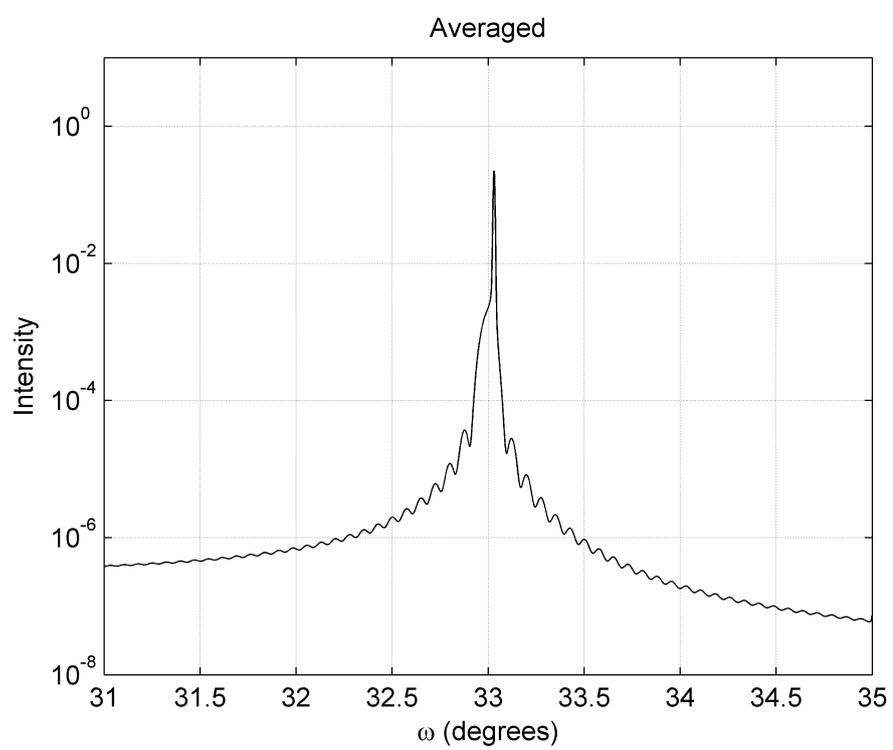
Figure 3.33

Figure 3.34

Broad triangular
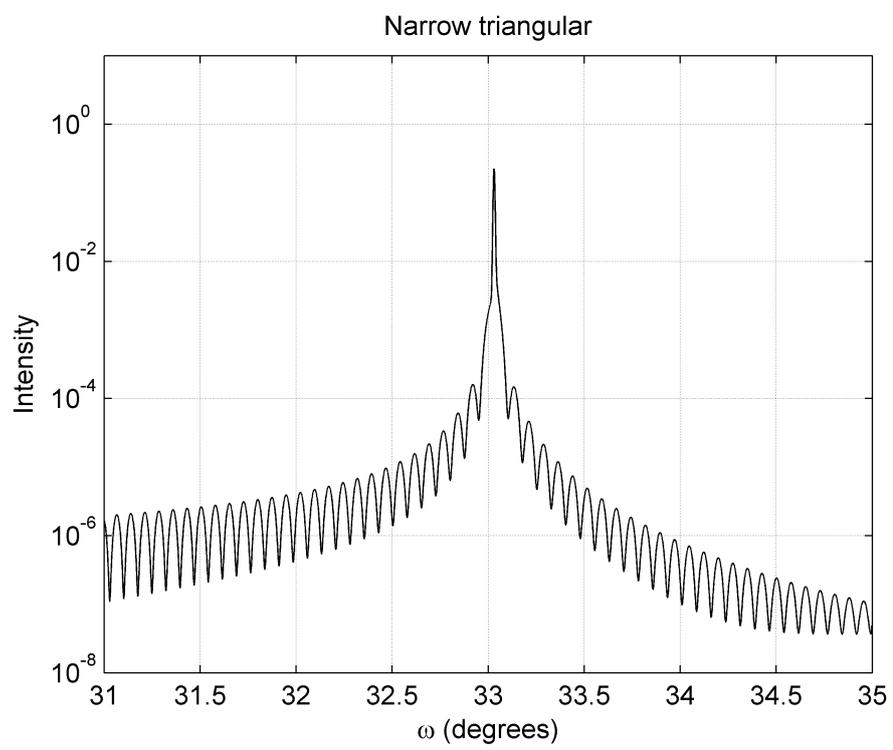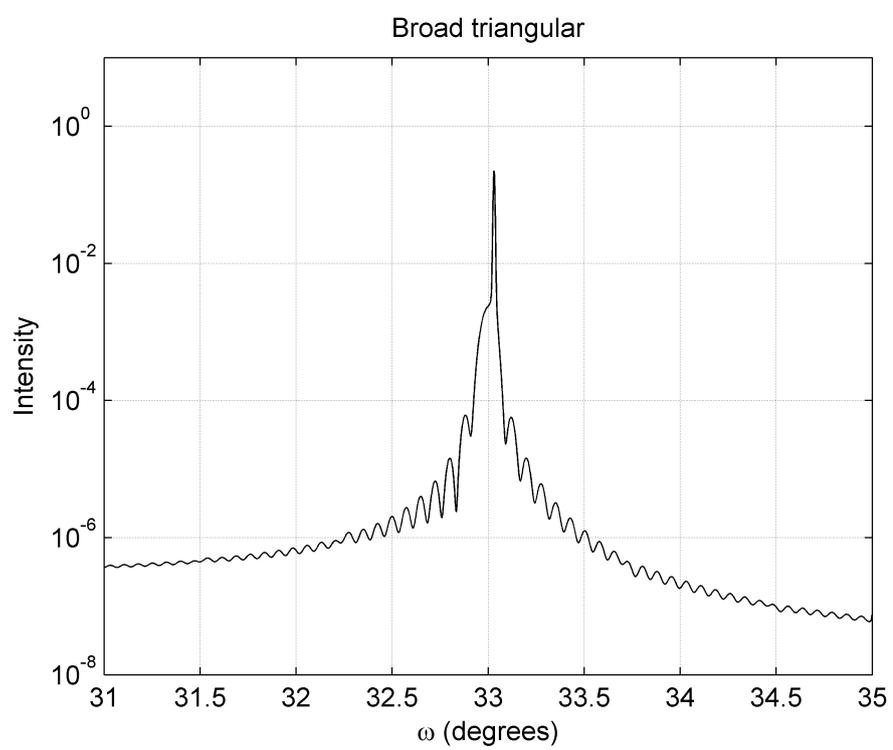
Figure 3.35

Chapter 4

Intermixing and segregation

Simulations with different cases of intermixing and segregation are shown in figures 4.1–4.11.

Figure 4.1

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Simulation 2a
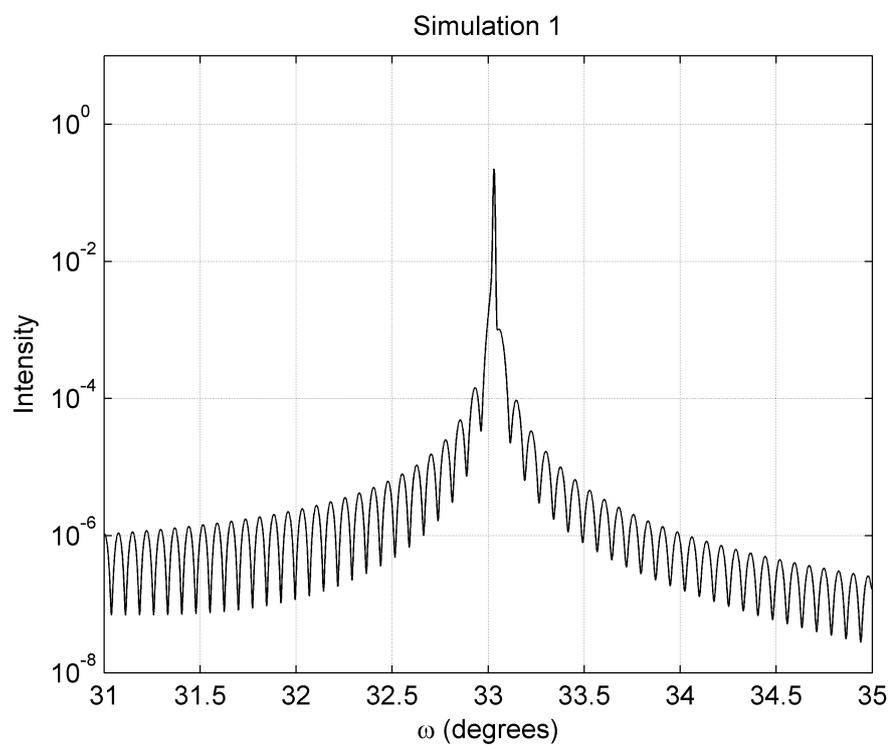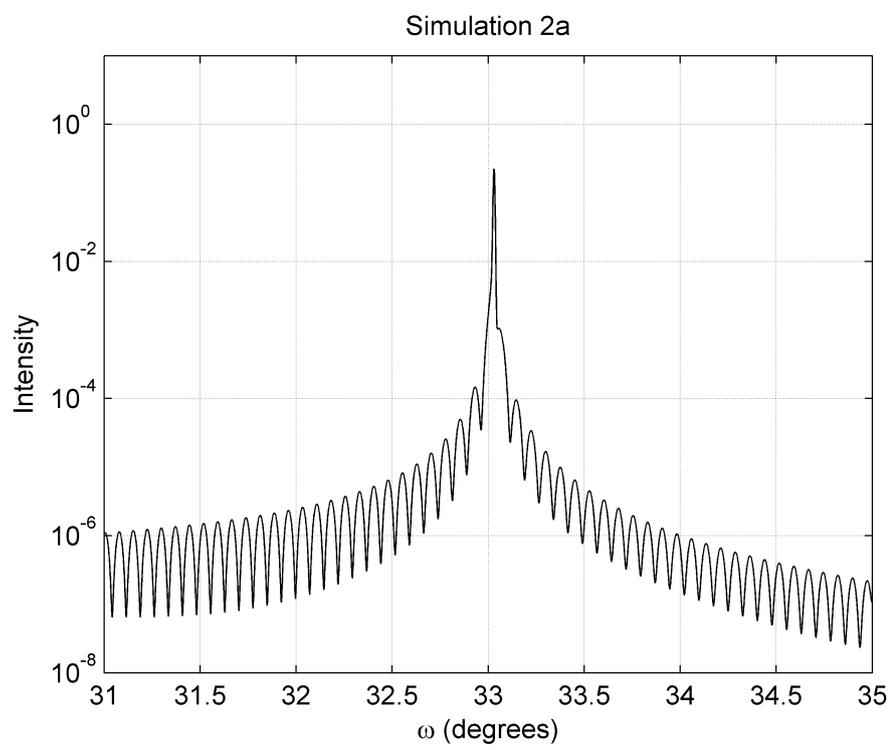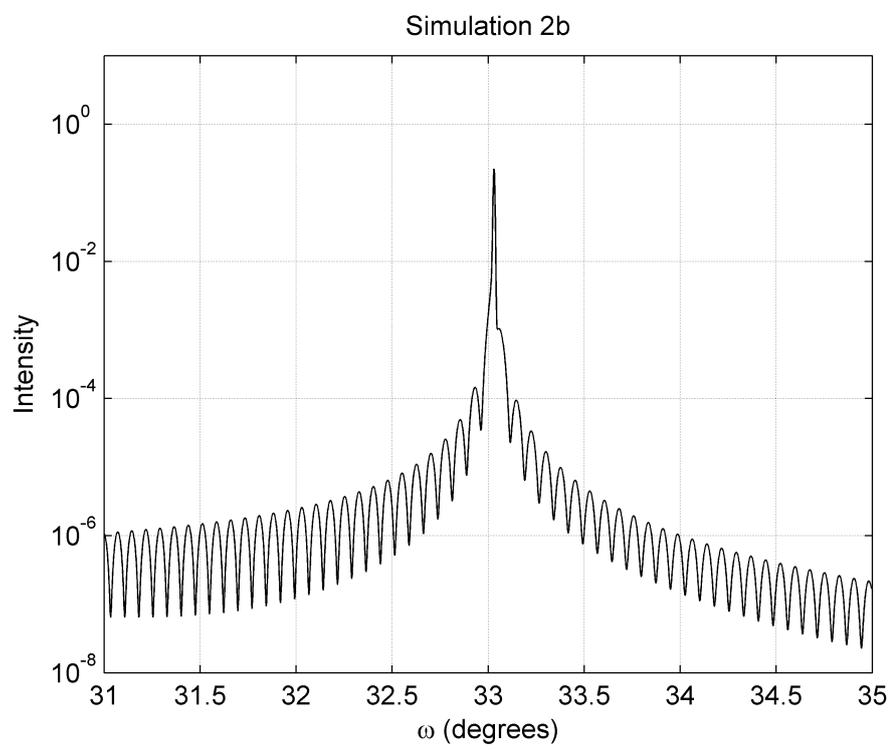
**Figure 4.2**

Figure 4.3
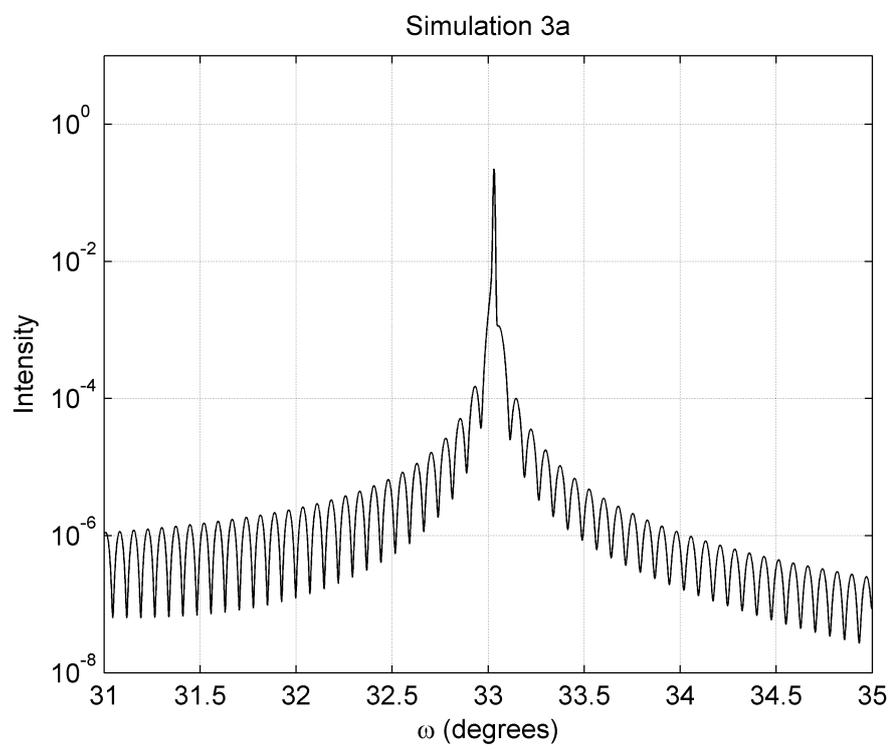
Figure 4.4
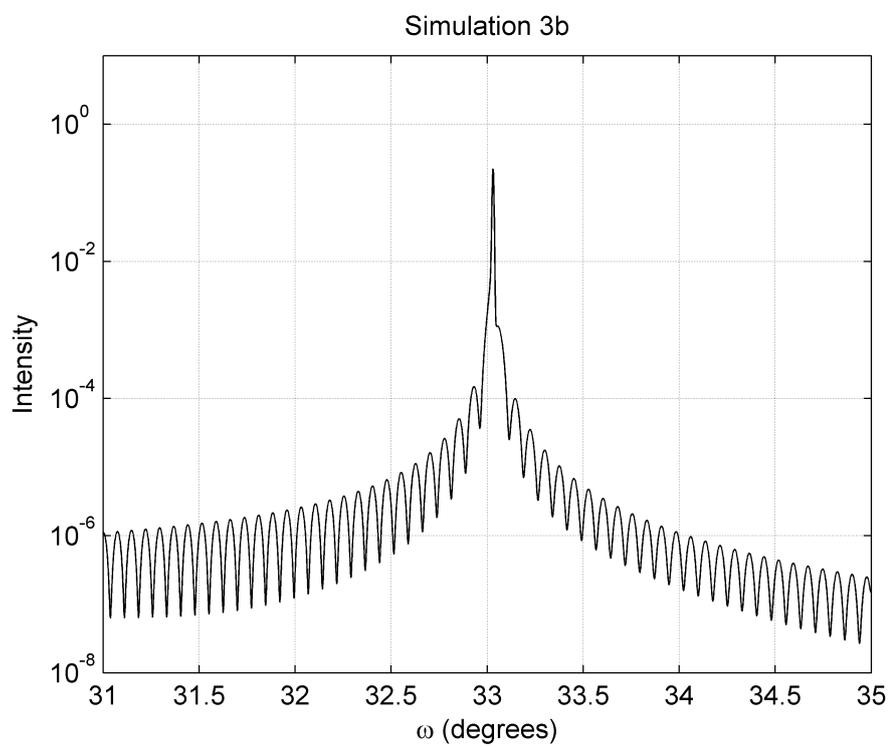
Figure 4.5
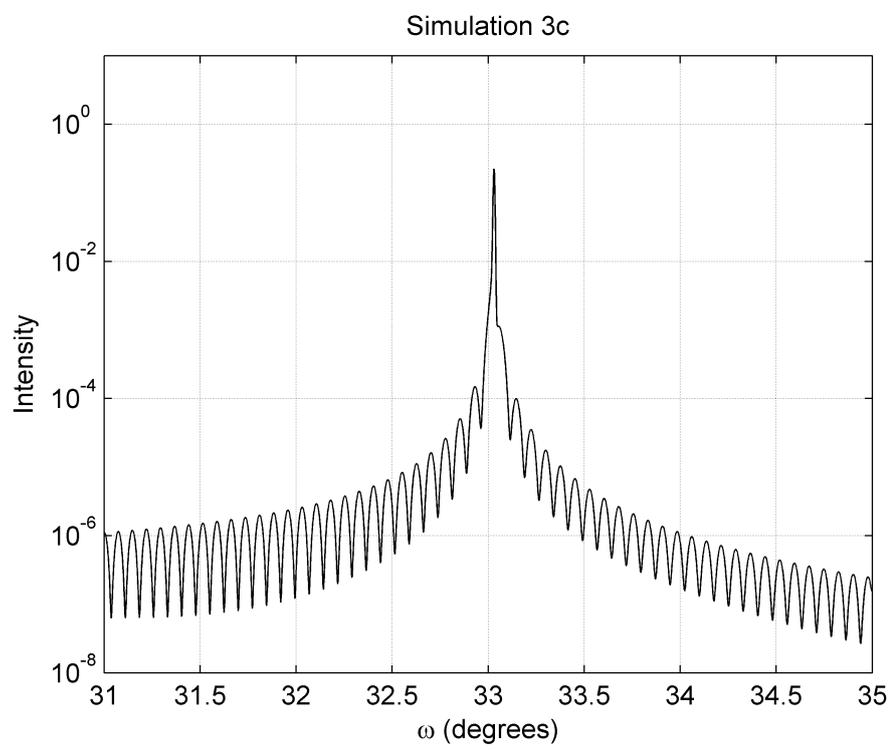
Figure 4.6
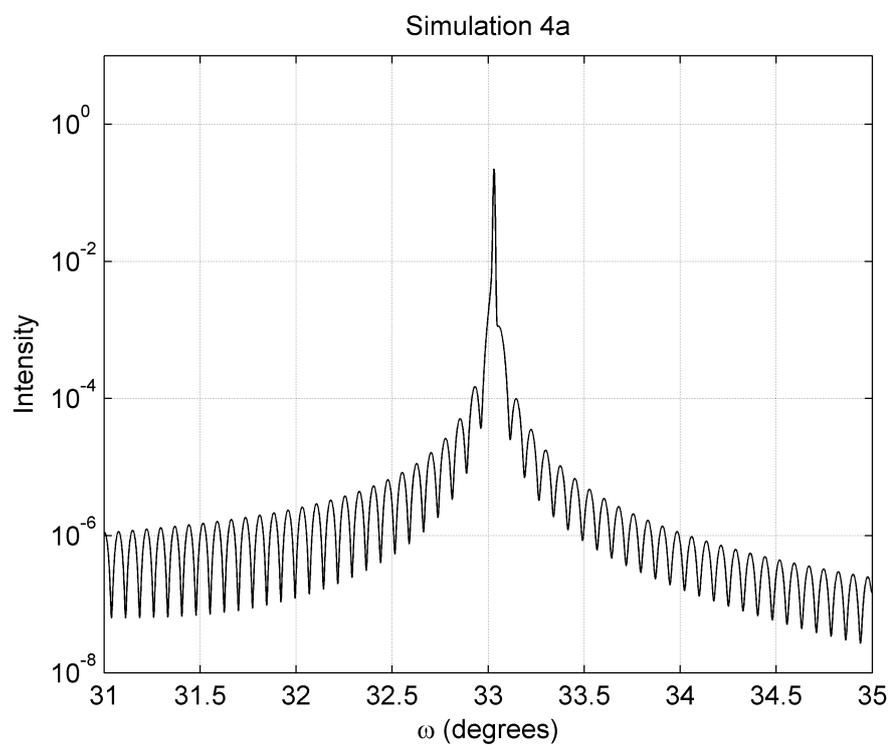
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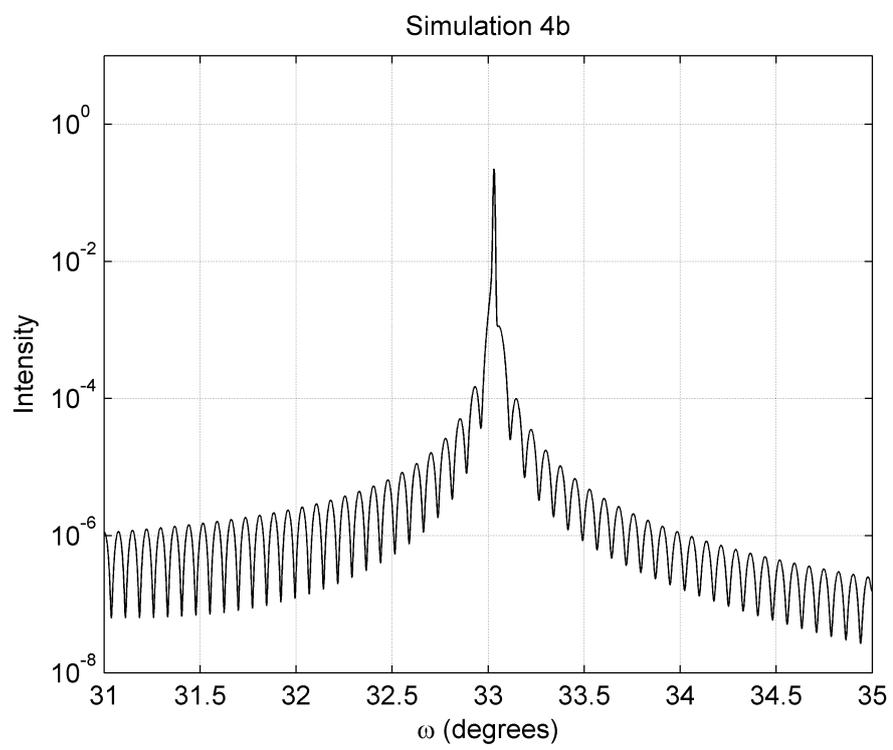
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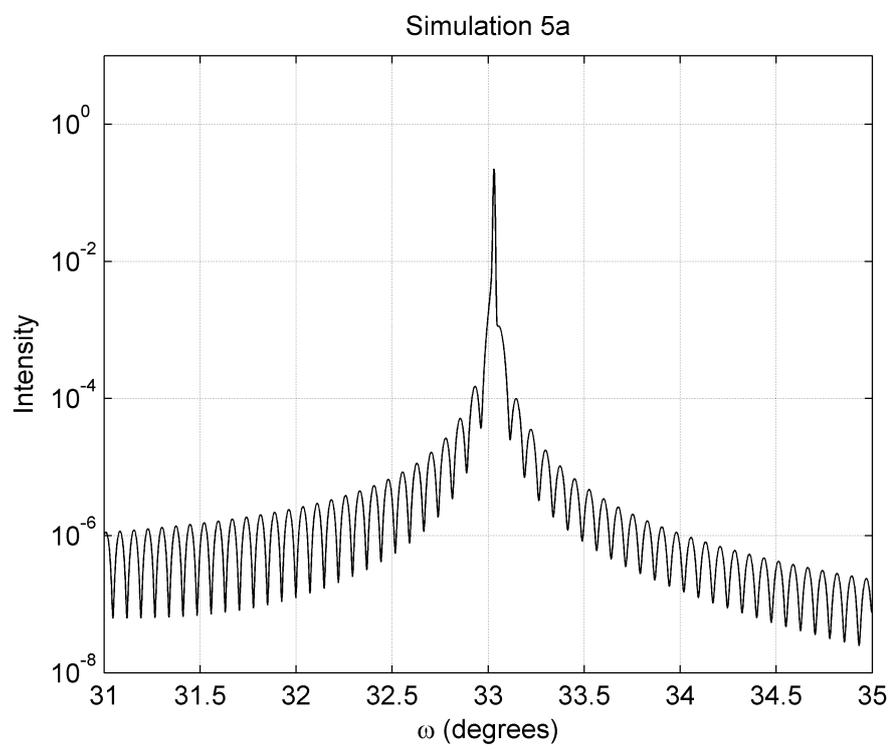
Figure 4.9

Figure 4.10

Figure 4.11