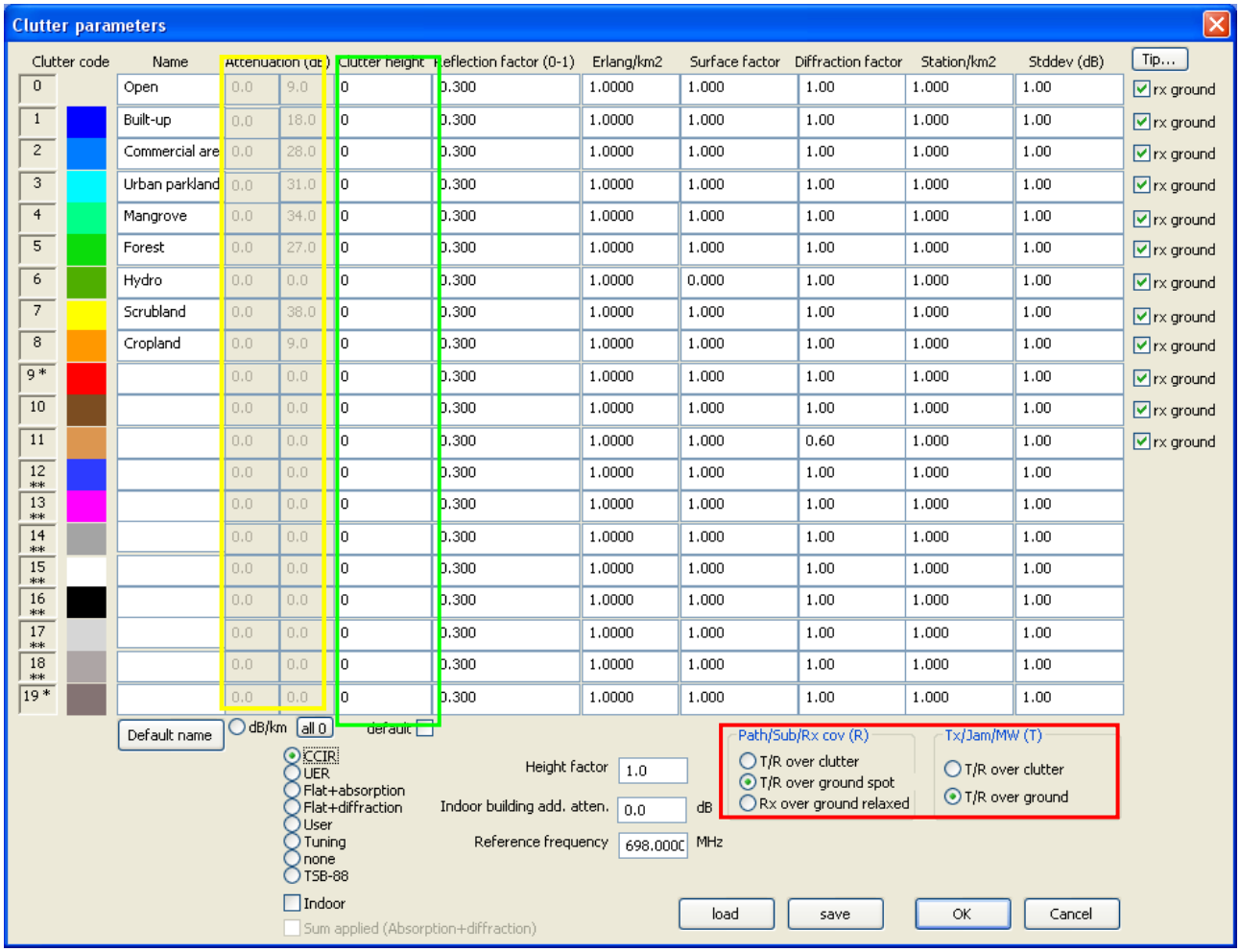
Clutter attenuations in ICS TELECOM

INDEX

Introduction

This document describes the different possibilities to take into account the attenuations due to the penetration of the signal inside the clutter layer.



In ICS Telecom, it is possible to define the position of the receiver according to the clutter. Three positions are available:
- Rx over clutter, in this case, the value set for the receiver's height is defined over the clutter's height.
- Rx over ground spot, the value set for the receiver's height is defined over the ground.
- Rx over ground relaxed, the value set for the receiver's height is defined over the ground, and when the receiver is located inside a clutter, the clutter is cut around the receiver (the receiver is encircled by the clutter, but not inside).
The same is defined for the transmitter.

For each clutter code (type of terrain), the user has to set a specific clutter height.

Two columns are available to define the attenuation on each clutter code. The linear attenuation (first column) corresponds to the dB/Km attenuation and the flat attenuation (2nd column) corresponds to a fixed attenuation added in different ways according to the mode selected.
For each field strength calculation performed, two kinds of attenuations are calculated: The diffraction and the absorption. Diffraction is a fixed value calculated according to the propagation model. Absorption corresponds to the clutter attenuation and depends on the selected mode.

Remark about the clutter code #9: This clutter code has a specific role, it is used as the "building layer", and its properties are different from the other clutter codes. That is why in the document this clutter code is handled differently.

A – Rx over clutter mode

In this mode, the receiver's antenna height (elevation) is always greater than the clutter height. The receiver's antenna height is defined above the clutter level.

1 - The "dB/km" mode

1.1 – All clutter codes except #9 (not BLG)

1.1.1 – Without the "sum applied" button checked

Flat attenuation is ignored.
Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.2 – With the "sum applied" button checked

Flat attenuation is ignored.
The power received is the summation of the diffraction and the absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.2 – Clutter code #9 (BLG)

1.2.1 – Without the "sum applied" button checked

Flat attenuation is ignored.
Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.1 – With the "sum applied" button checked

Flat attenuation is ignored.
The power received is the summation of the diffraction and the absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

2 - The “CCIR” mode

CCIR mode is based on a specific clutter layer. That is why in this mode, there is no differentiation between the clutter codes.

In this mode, the flat attenuation is added to the calculated diffraction.

3 - The “UER” mode

UER mode is based on a specific clutter layer. That is why in this mode, there is no differentiation between the clutter codes.

In this mode, the flat attenuation is added to the calculated diffraction.

4 - The “Flat + absorption” mode

4.1 – All clutter codes except #9 (not BLG)

1.1.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

1.1.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2 – Clutter code #9 (BLG)

1.1.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

1.1.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

5 - The “Flat + diffraction” mode

5.1 – All clutter codes except #9 (not BLG)

Only diffraction is taking into account, the flat values as no effect on the calculation (because the receiver is located over the clutter).

5.2 – Clutter code #9 (BLG)

Only diffraction is taking into account, the flat values as no effect on the calculation (because the receiver is located over the clutter).

6 - The “User” mode

6.1 – All clutter codes except #9 (not BLG)

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.2 – Clutter code #9 (BLG)

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

7 - The “Tuning” mode

7.1 – All clutter codes except #9 (not BLG)

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

7.2 – Clutter code #9 (BLG)

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

8 - The "TSB-88" mode

This mode applies automatically default attenuation values.

8.1 – All clutter codes except #9 (not BLG)

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

8.2 – Clutter code #9 (BLG)

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

9 - The “none” mode

9.1 – All clutter codes except #9 (not BLG)

The attenuation is the diffraction due to the last obstacle.

9.2 – Clutter code #9 (BLG)

The attenuation is the diffraction due to the last obstacle.

10 - The "Indoor" option

The indoor option is only available for the indoor clutter code (from 12 to 18).
The attenuation calculated is the summation of the diffraction and the absorption.
The absorption depends on the selected mode.

B – Rx over ground spot mode

1 - The “dB/km” mode

1.1 – All clutter codes except #9 (not BLG)

1.1.1 – Rx height > Clutter height

1.1.1.1 – Without the “sum applied” button checked

Flat attenuation is ignored.
Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.1.2 – With the “sum applied” button checked

Flat attenuation is ignored.
The power received is the summation of the diffraction and the absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.2 – Rx height < Clutter height

1.1.2.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the flat attenuation on the last obstacle added to the summation the linear attenuation of the crossed obstacles.

1.1.2.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is equal to the flat attenuation on the last obstacle added to the summation the linear attenuation of the crossed obstacles.

1.2 – Clutter code #9 (BLG)

1.2.1 – Rx height > Clutter height

1.1.1.1 – Without the “sum applied” button checked

Flat attenuation is ignored.
Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.1.2 – With the “sum applied” button checked

Flat attenuation is ignored.
The power received is the summation of the diffraction and the absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.2.2 – Rx height < Clutter height

1.1.1.1 – Without the “sum applied” button checked

The attenuation is only the absorption, diffraction is ignored.
Absorption is equal to the flat attenuation on the last obstacle added to the summation the linear attenuation of the crossed obstacles.

1.1.1.2 – With the “sum applied” button checked

Not available (value 255).

2 - The “CCIR” mode

CCIR mode is based on a specific clutter layer. That is why in this mode, there is no differentiation between the clutter codes.

2.1 – Rx height > Clutter height

Flat attenuation is added to the calculated diffraction.

2.2 – Rx height < Clutter height

Flat attenuation calculated on the last obstacle is added to the calculated diffraction.

3 - The “UER” mode

UER mode is based on a specific clutter layer. That is why in this mode, there is no differentiation between the clutter codes.

3.1 – Rx height > Clutter height

Flat attenuation is added to the calculated diffraction.

3.2 – Rx height < Clutter height

Flat attenuation calculated on the last obstacle is added to the calculated diffraction.

4 - The “Flat + absorption” mode

4.1 – All clutter codes except #9 (not BLG)

4.1.1 – Rx height > Clutter height

4.1.1.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.1.1.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.1.2 – Rx height < Clutter height

4.1.2.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.1.2.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2 – Clutter code #9 (BLG)

4.2.1 – Rx height > Clutter height

4.2.1.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2.1.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2.2 – Rx height < Clutter height

4.2.2.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2.2.2 – With the “sum applied” button checked

No diffraction is calculated, no summation is applied.

5 - The “Flat + diffraction” mode

5.1 – All clutter codes except #9 (not BLG)

5.1.1 – Rx height > Clutter height

Only diffraction is taking into account, the flat values as no effect on the calculation (because the receiver is located over the clutter).

5.1.2 – Rx height < Clutter height

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the diffraction before the last obstacle and the flat attenuation on the last obstacle.

5.2 – Clutter code #9 (BLG)

5.2.1 – Rx height > Clutter height

Only diffraction is taking into account, the flat values as no effect on the calculation (because the receiver is located over the clutter).

5.2.2 – Rx height < Clutter height

No diffraction on the last obstacle.
Absorption is the summation of the diffraction before the last obstacle and the flat attenuation on the last obstacle.

6 - The “User” mode

6.1 – All clutter codes except #9 (not BLG)

6.1.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.1.2 – Rx height < Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.2 – Clutter code #9 (BLG)

6.2.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.2.2 – Rx height < Clutter height

Not applicable.

7 - The “Tuning” mode

7.1 – All clutter codes except #9 (not BLG)

7.1.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

7.1.2 – Rx height < Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

7.2 – Clutter code #9 (BLG)

7.2.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

7.2.2 – Rx height < Clutter height

Not applicable.

8 - The "TSB-88" mode

This mode applies automatically default attenuation values.

8.1 – All clutter codes except #9 (not BLG)

8.1.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

8.1.2 – Rx height < Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

8.2 – Clutter code #9 (BLG)

8.2.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

8.2.2 – Rx height < Clutter height

Not applicable.

9 - The “none” mode

9.1 – All clutter codes except #9 (not BLG)

9.1.1 – Rx height > Clutter height

The attenuation is the diffraction due to the last obstacle.

9.1.2 – Rx height < Clutter height

The attenuation is the diffraction due to the last obstacle.

9.2 – Clutter code #9 (BLG)

9.2.1 – Rx height > Clutter height

The attenuation is the diffraction due to the last obstacle.

9.2.2 – Rx height < Clutter height

Not applicable.

10 - The "Indoor" option

The indoor option is only available for the indoor clutter code (from 12 to 18).
The attenuation calculated is the summation of the diffraction and the absorption.
The absorption depends on the selected mode.

C - Rx over ground “relaxed” mode

1 - The “dB/km” mode

1.1 – All clutter codes except #9 (not BLG)

1.1.1 – Rx height > Clutter height

1.1.1.1 – Without the “sum applied” button checked

Flat attenuation is ignored.
Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.1.2 – With the “sum applied” button checked

Flat attenuation is ignored.
The power received is the summation of the diffraction and the absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.1.2 – Rx height < Clutter height

1.1.2.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the flat attenuation on the last obstacle added to the summation the linear attenuation of the crossed obstacles.

1.1.2.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is equal to the flat attenuation on the last obstacle added to the summation the linear attenuation of the crossed obstacles.

1.2 – Clutter code #9 (BLG)

1.2.1 – Rx height > Clutter height

1.2.1.1 – Without the “sum applied” button checked

Flat attenuation is ignored.
Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.2.1.2 – With the “sum applied” button checked

Flat attenuation is ignored.
The power received is the summation of the diffraction and the absorption.
Absorption is equal to the summation the linear attenuation of the crossed obstacles.

1.2.2 – Rx height < Clutter height

1.2.2.1 – Without the “sum applied” button checked

Attenuation is only the absorption.
Absorption is equal to the flat attenuation on the last obstacle added to the summation the linear attenuation of the crossed obstacles.

1.2.2.2 – With the “sum applied” button checked

Not applicable.

2 - The “CCIR” mode

CCIR mode is based on a specific clutter layer. That is why in this mode, there is no differentiation between the clutter codes.

2.1 – Rx height > Clutter height

Flat attenuation is added to the calculated diffraction.

2.2 – Rx height < Clutter height

Flat attenuation calculated on the last obstacle is added to the calculated diffraction.

3 - The “UER” mode

UER mode is based on a specific clutter layer. That is why in this mode, there is no differentiation between the clutter codes.

3.1 – Rx height > Clutter height

Flat attenuation is added to the calculated diffraction.

3.2 – Rx height < Clutter height

Flat attenuation calculated on the last obstacle is added to the calculated diffraction.

4 - The “Flat + absorption” mode

4.1 – All clutter codes except #9 (not BLG)

4.1.1 – Rx height > Clutter height

4.1.1.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.1.1.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.1.2 – Rx height < Clutter height

4.1.2.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.1.2.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2 – Clutter code #9 (BLG)

4.2.1 – Rx height > Clutter height

4.2.1.1 – Without the “sum applied” button checked

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2.1.2 – With the “sum applied” button checked

The power received is the summation of the diffraction and the absorption.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2.2 – Rx height < Clutter height

4.2.2.1 – Without the “sum applied” button checked

No diffraction is calculated.
Absorption is the summation of the flat attenuation due to the crossed obstacles.

4.2.2.2 – With the “sum applied” button checked

No diffraction is calculated, no summation is applied.

5 - The “Flat + diffraction” mode

5.1 – All clutter codes except #9 (not BLG)

5.1.1 – Rx height > Clutter height

Only diffraction is taking into account, the flat values as no effect on the calculation (because the receiver is located over the clutter).

5.1.2 – Rx height < Clutter height

Attenuation is equal to the minimum value between diffraction and absorption.
Absorption is the summation of the diffraction before the last obstacle and the flat attenuation on the last obstacle.

5.2 – Clutter code #9 (BLG)

5.2.1 – Rx height > Clutter height

Only diffraction is taking into account, the flat values as no effect on the calculation (because the receiver is located over the clutter).

5.2.2 – Rx height < Clutter height

No diffraction on the last obstacle.
Absorption is the summation of the diffraction before the last obstacle and the flat attenuation on the last obstacle.

6 - The “User” mode

6.1 – All clutter codes except #9 (not BLG)

6.1.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.1.2 – Rx height < Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.2 – Clutter code #9 (BLG)

6.2.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption.
Absorption is the flat attenuation calculated on the last obstacle only.

6.2.2 – Rx height < Clutter height

Not applicable.

7 - The “Tuning” mode

7.1 – All clutter codes except #9 (not BLG)

7.1.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

7.1.2 – Rx height < Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

7.2 – Clutter code #9 (BLG)

7.2.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

7.2.2 – Rx height < Clutter height

Not applicable.

8 - The "TSB-88" mode

This mode applies automatically default attenuation values.

8.1 – All clutter codes except #9 (not BLG)

8.1.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

8.1.2 – Rx height < Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

8.2 – Clutter code #9 (BLG)

8.2.1 – Rx height > Clutter height

The attenuation calculated is the summation of the diffraction and the absorption. Absorption is the flat attenuation calculated on the last obstacle only.

8.2.2 – Rx height < Clutter height

Not applicable.

9 - The “none” mode

9.1 – All clutter codes except #9 (not BLG)

9.1.1 – Rx height > Clutter height

The attenuation is the diffraction due to the last obstacle.

9.1.2 – Rx height < Clutter height

The attenuation is the diffraction due to the last obstacle.

9.2 – Clutter code #9 (BLG)

9.2.1 – Rx height > Clutter height

The attenuation is the diffraction due to the last obstacle.

9.2.2 – Rx height < Clutter height

Not applicable.

10 - The "Indoor" option

The indoor option is only available for the indoor clutter code (from 12 to 18).
The attenuation calculated is the summation of the diffraction and the absorption.
The absorption depends on the selected mode.