Reflections

- Basics
- Side mounted omni antenna
- Directional antenna wall mounted
- Directional antenna roof mounted

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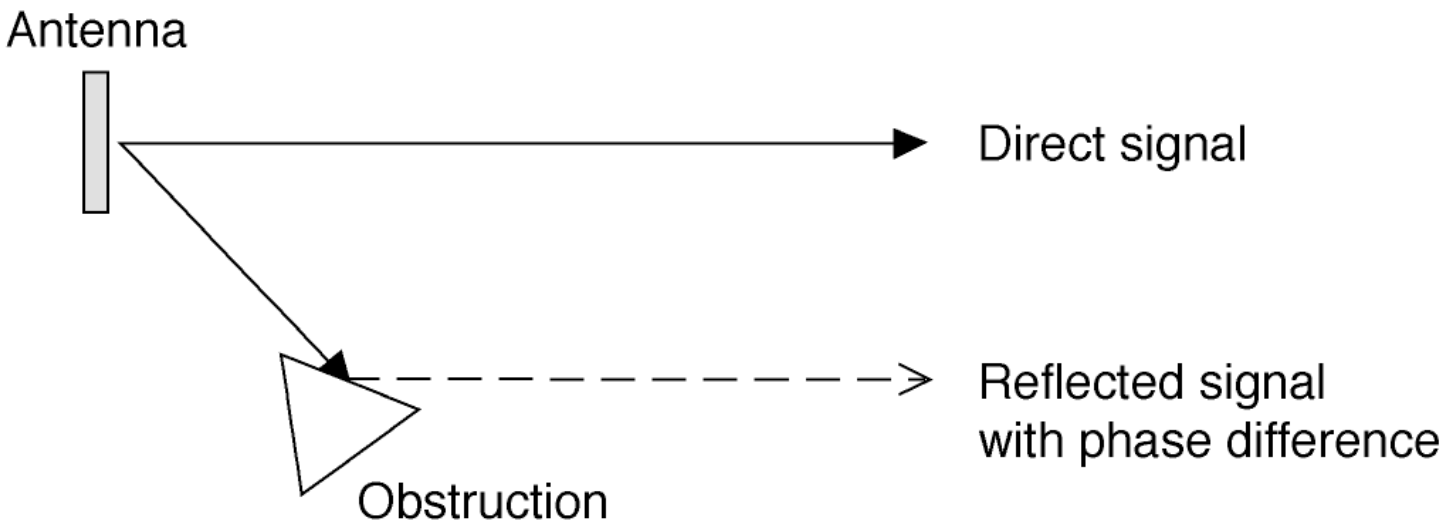
Reflections / Basics

- vertical and horizontal radiation patterns given in data sheets apply only to a reflection-free environment (free-space propagation)
- reflections from obstructions create additional signals with different phases (according to the additional distance)
- the original radiation pattern is deformed



Reflections / Side Mounted Omni

- significant influence of obstructions on omnidirectional patterns
- ideal omni pattern only on top of masts
- tower side mounting of omni antennas results in strong pattern deformation
- patterns on cylindrical masts are very defined and may be useful for network planning
- resulting patterns depends on the mast diameter and the spacing antenna - mast
- patterns on lattice towers are hard to predict

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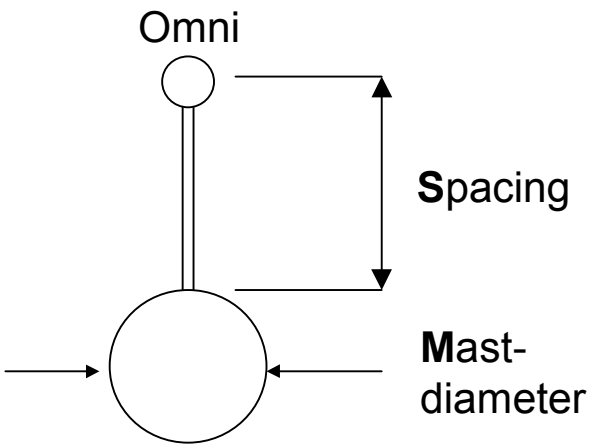
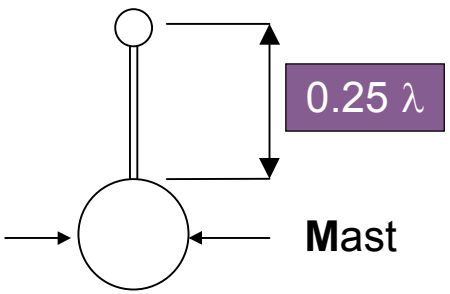


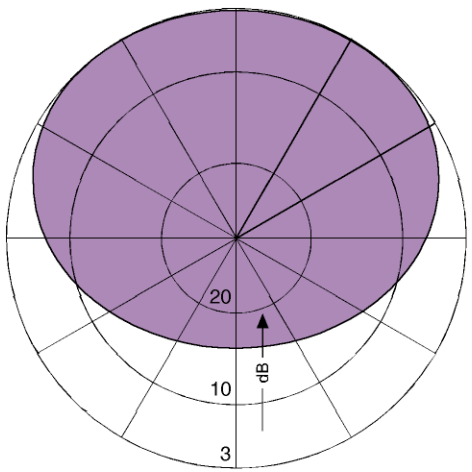
Reflections / Side Mounted Omni

- Spacing 0.25 λ : offset pattern

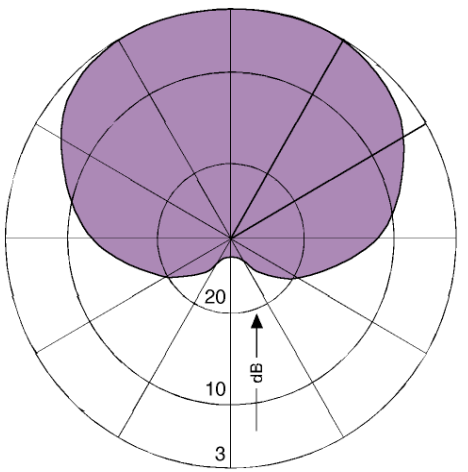
- main radiation in direction of the line mast - antenna
- gain increase by approx. 2 dB
- most used application



M = 0.04 λ



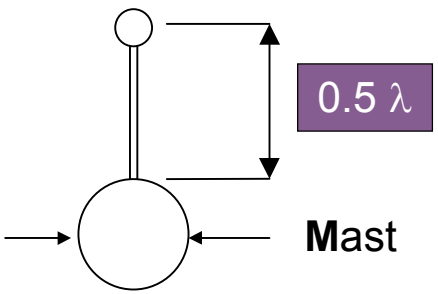
M = 0.6 λ



Reflections / Side Mounted Omni

- Spacing 0.5 λ : bi-directional pattern

- main beams perpendicular to the line mast - antenna
- gain increase by 2-3 dB
- application : coverage of highways or railroad lines



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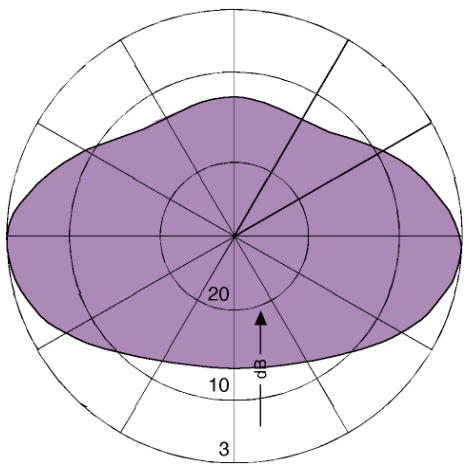

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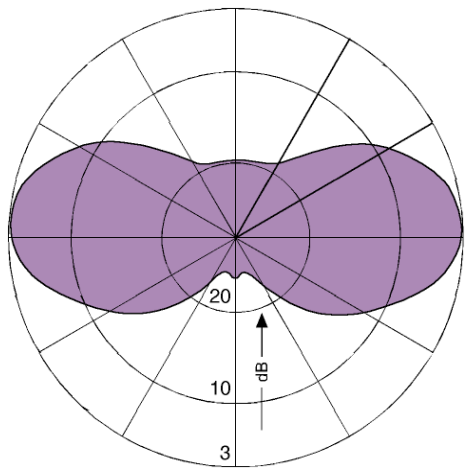

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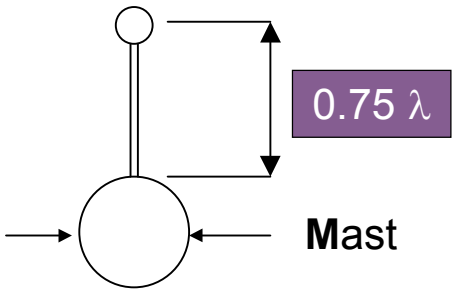
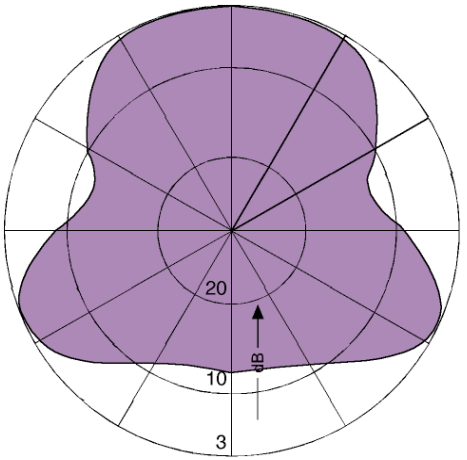
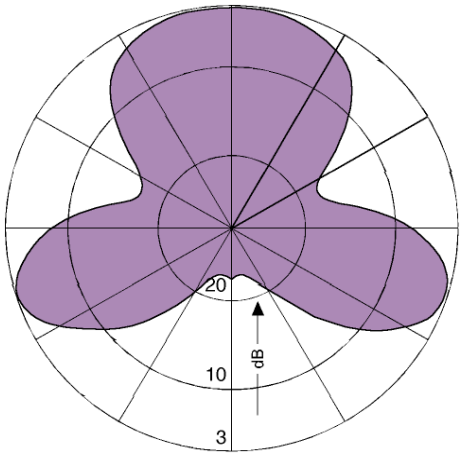
Reflections / Side Mounted Omni

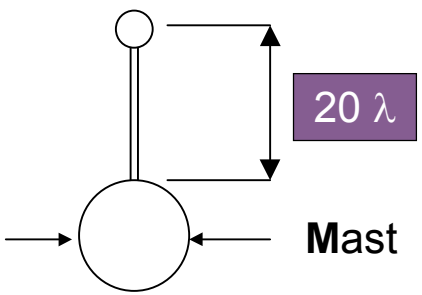


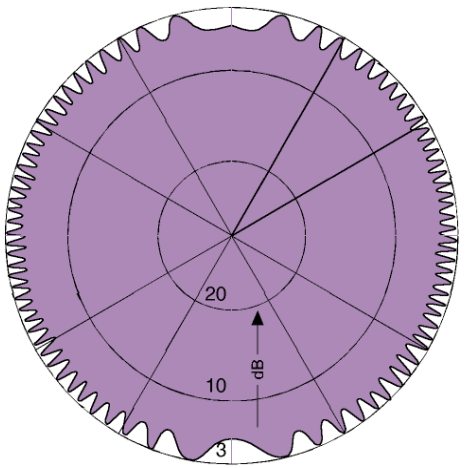


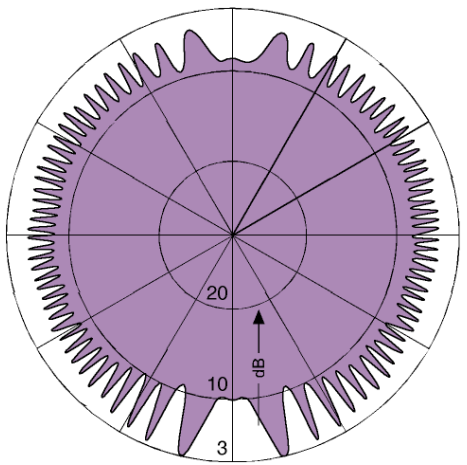
M = 0.04 λ



M = 0.6 λ







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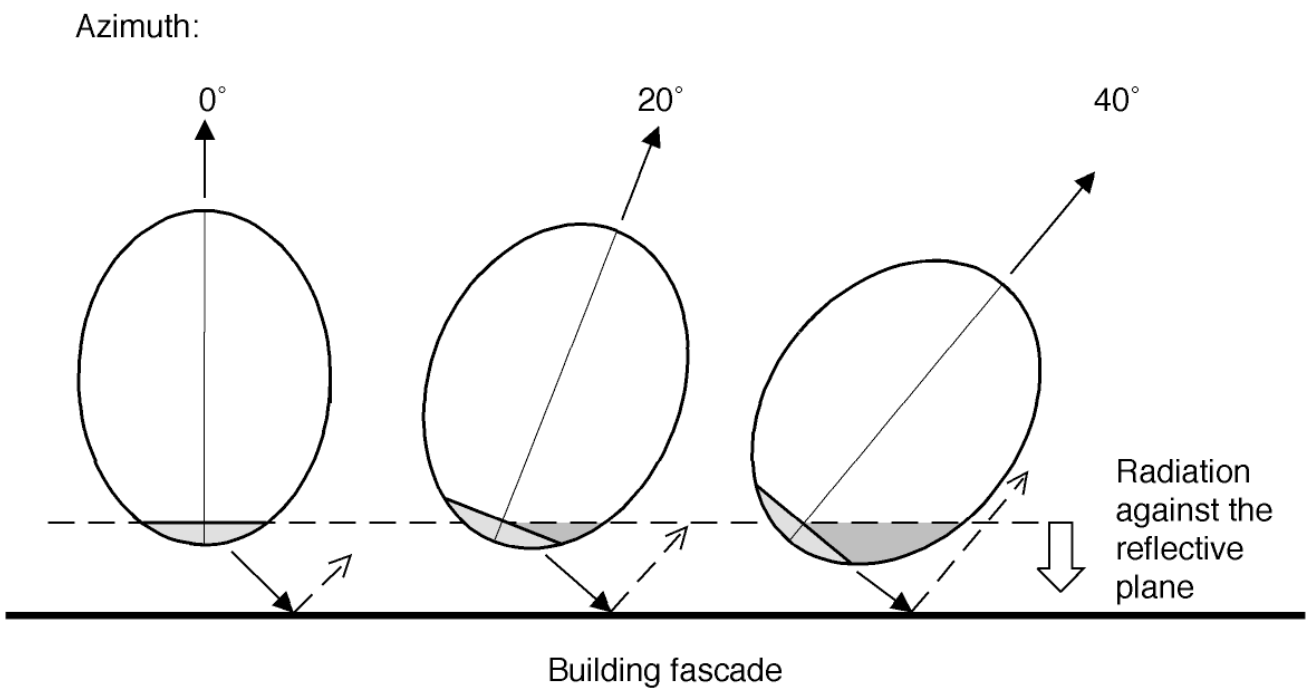
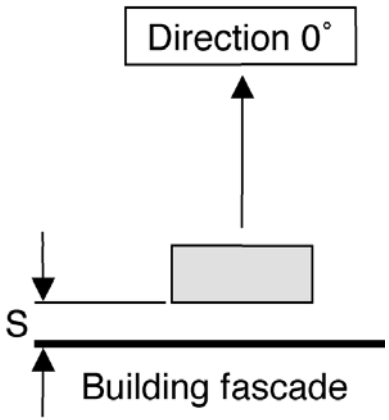
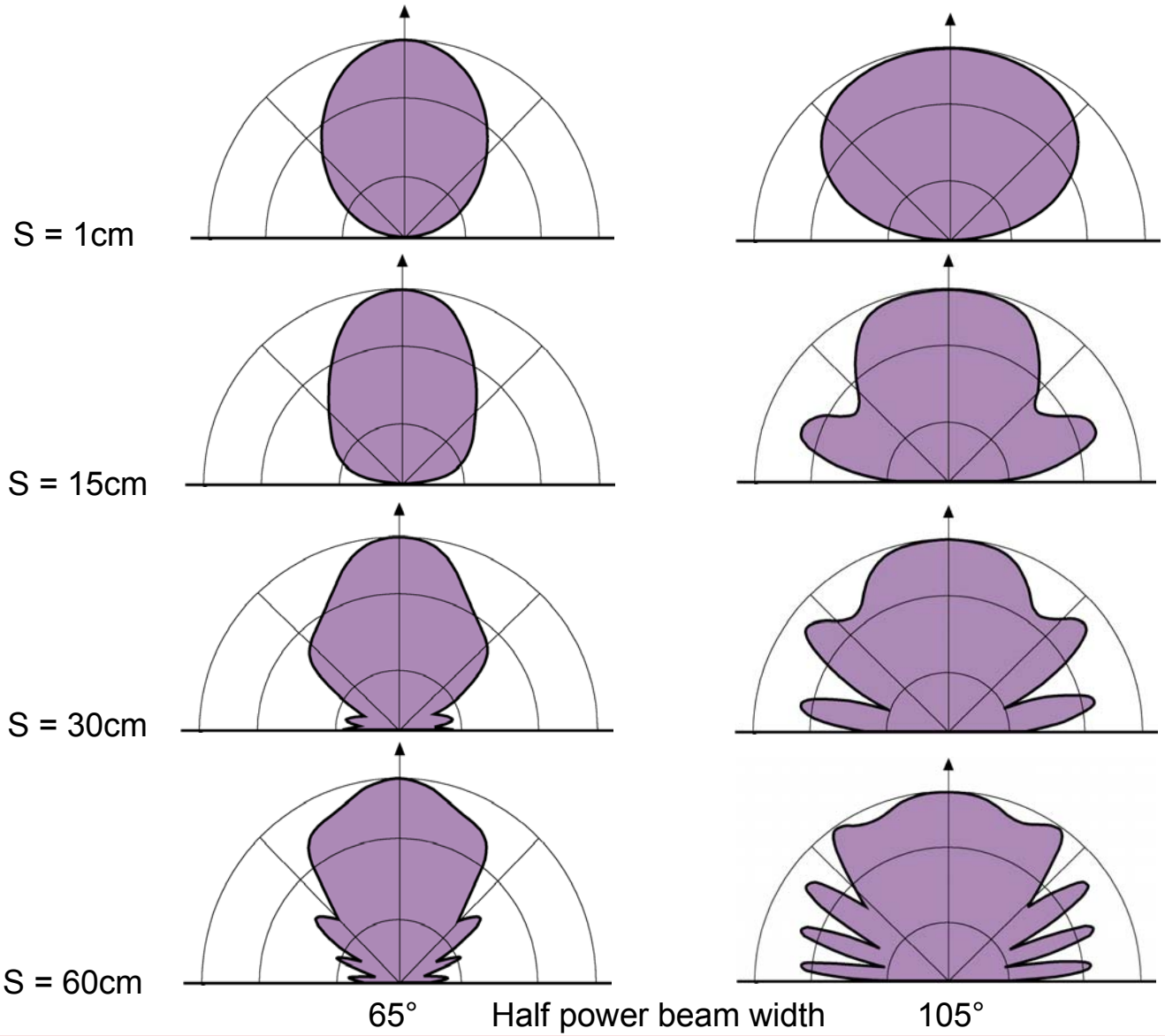
Reflections / Wall Mounted Directionals

- in spite of the relatively high front-to-back-ratio of directional antennas, reflective building facades behind the antenna influence the pattern
- this effect is increased by rotating the antenna due to a higher radiation towards the wall

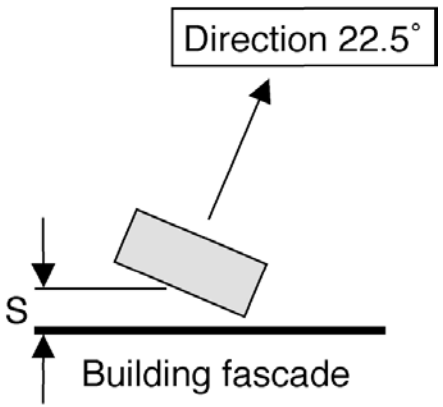


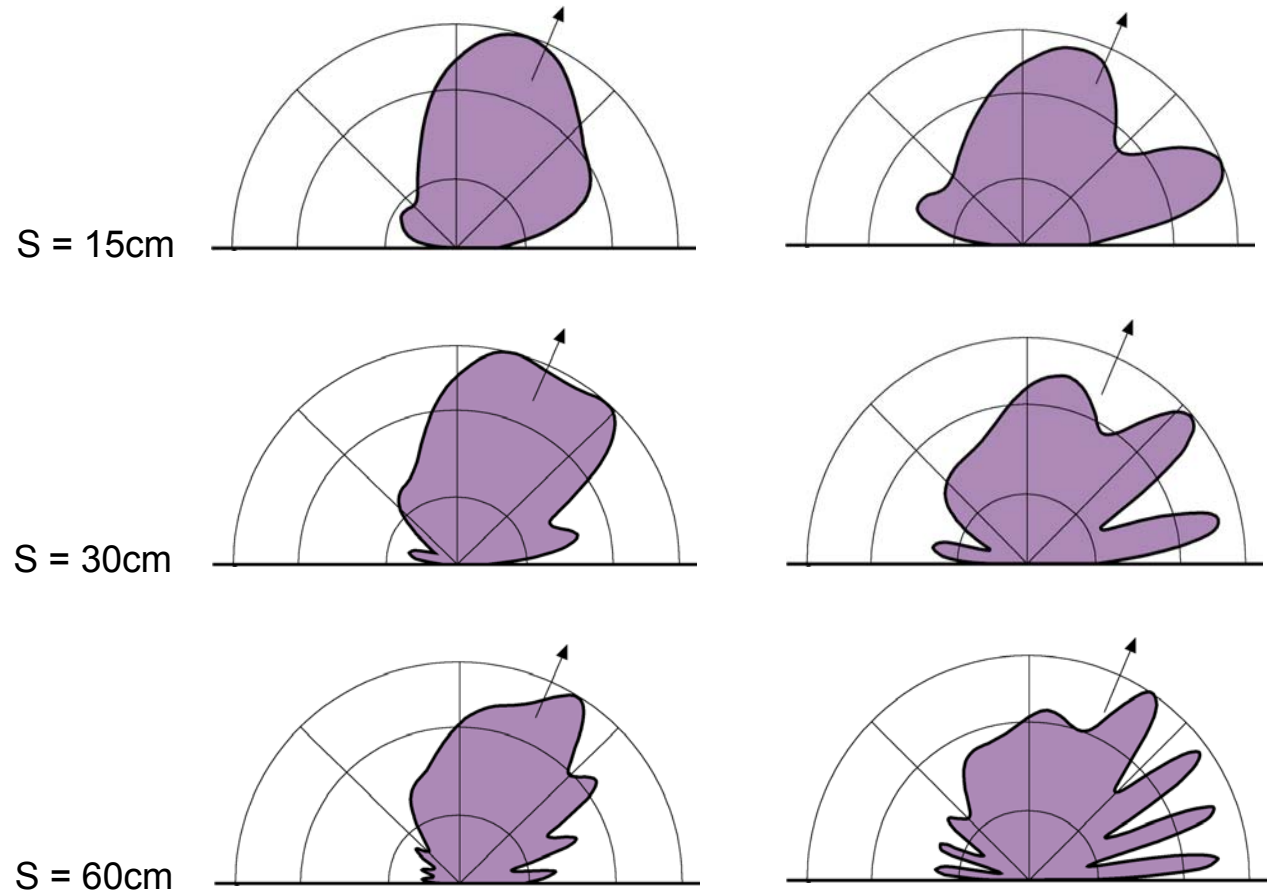
Reflections / Wall Mounted Directionals



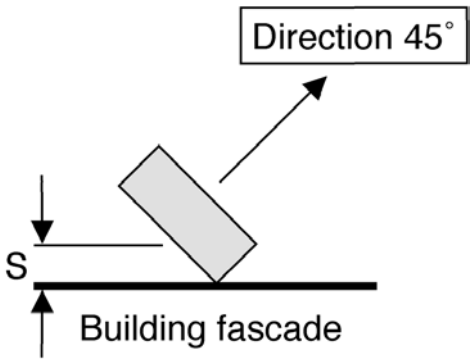


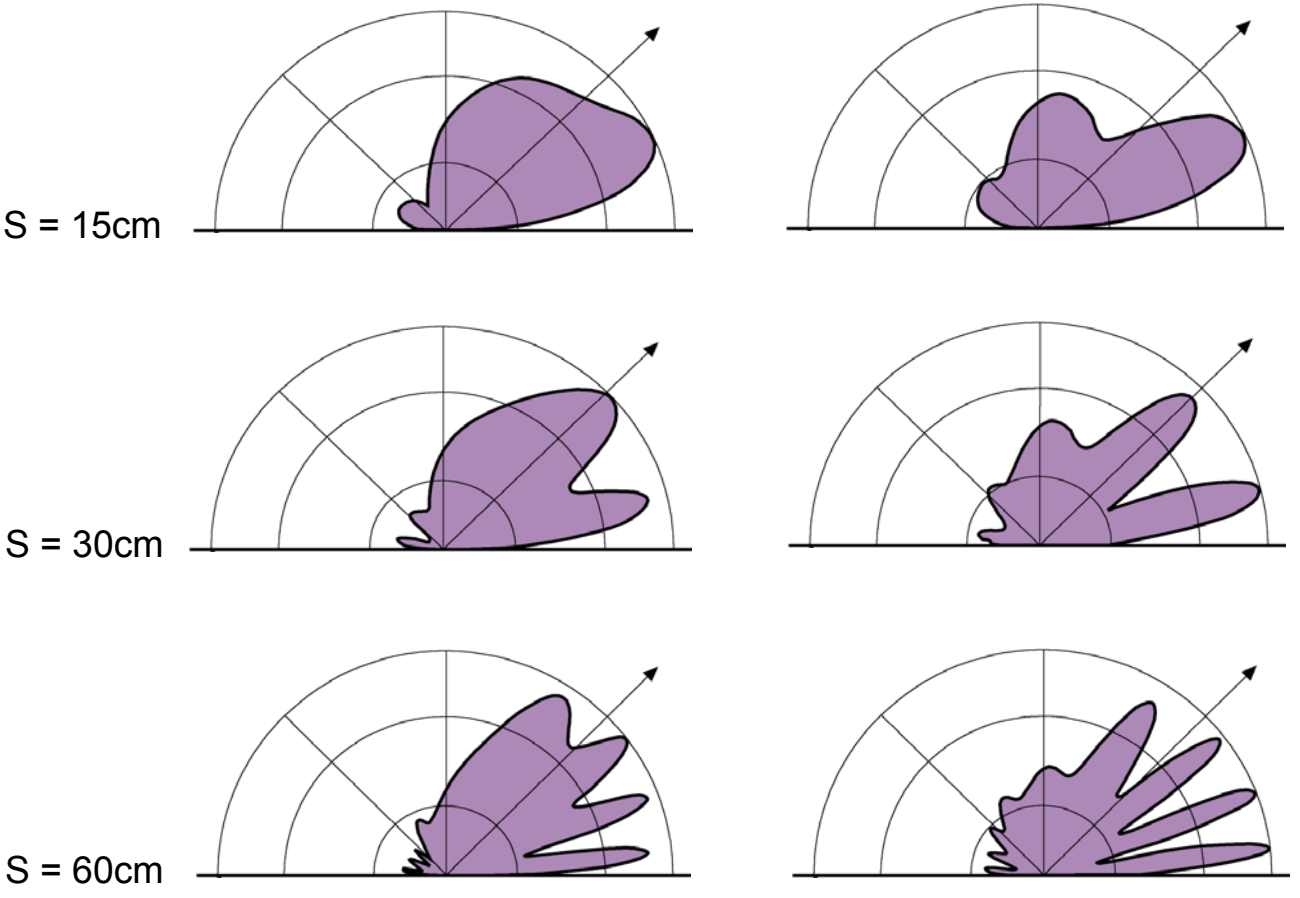
Reflections / Wall Mounted Directionals





Reflections / Wall Mounted Directionals





Reflections / Wall Mounted Directionals

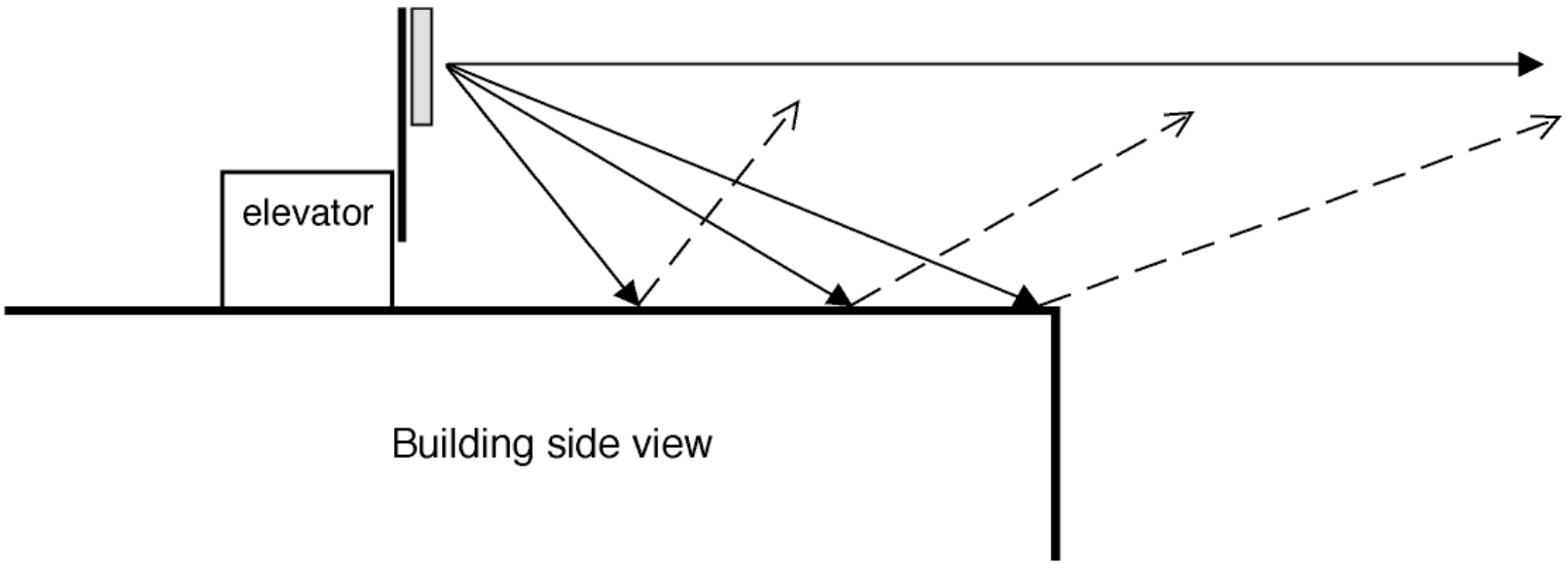
- the calculations considers the wall as ideal reflective; this accords to the real situation for concrete walls and aluminum facades, not for bricks

- Conclusions :

- mounting of the antenna on the wall as close as possible (minimim phase difference between the direct and the reflected signal)
- maximum rotation angle approx. 20° with reference to the wall perpendicular
- maximum horizontal half power beam width 65°

Reflections / Roof Mounted Directionals

- the recommended location for roof top mounted antennas is the roof‘s edge
- if the antenna system is mounted above the roof, reflections may influence the vertical pattern and create an uptilt



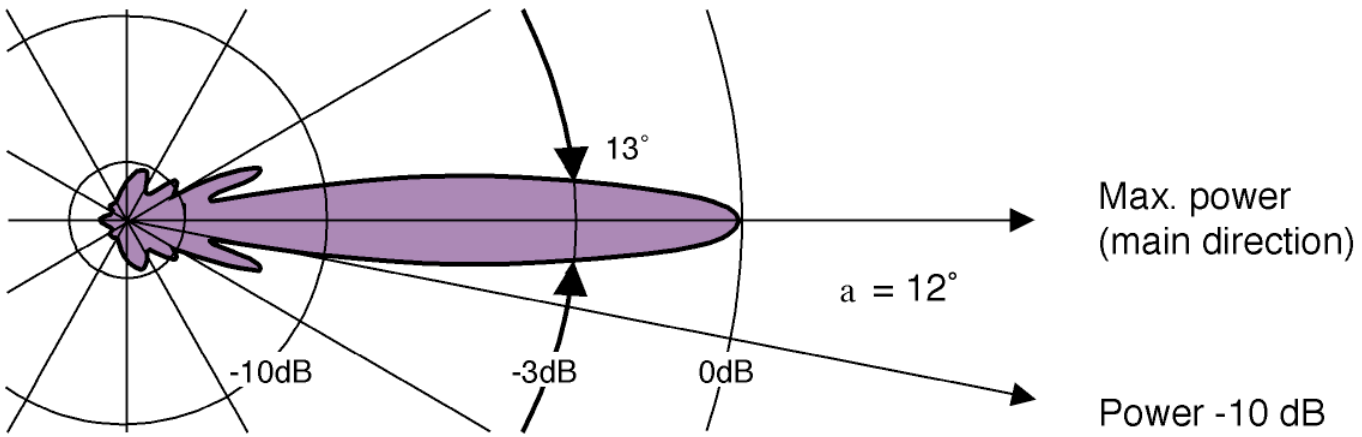
Building side view

Reflections / Roof Mounted Directionals

- Rule of thumb :

> The radiated power towards the roof should be decreased by
> min. 10 dB referred to the main beam

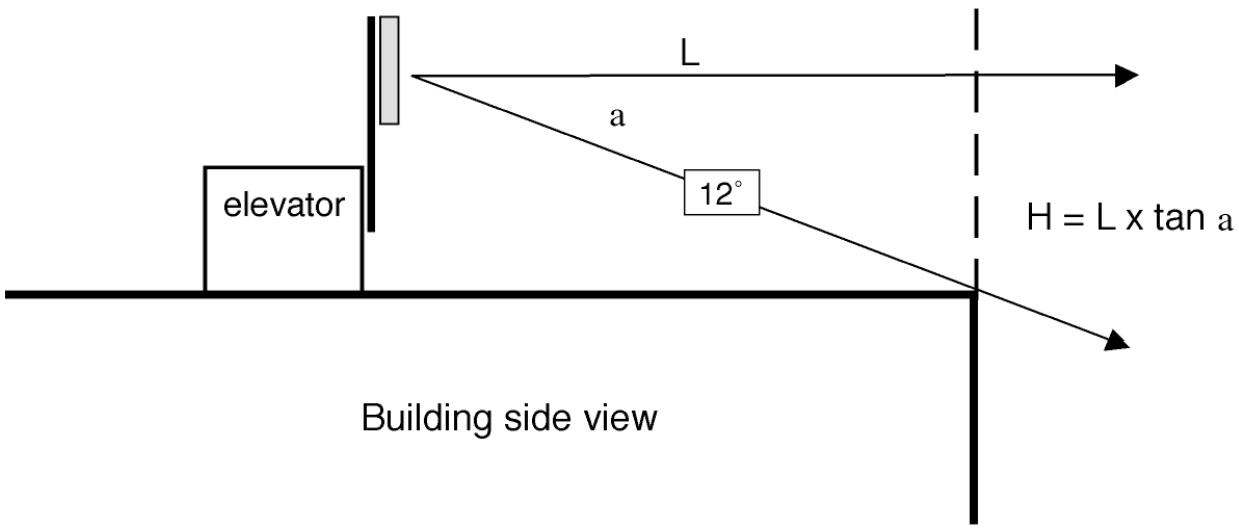
- the required „free“ angle without any reflections is given by the individual vertical pattern



Reflections / Roof Mounted Directionals

- with this angle (e.g. 12 ° for an antenna with 13° half power beam width) the required hight with reference to the length of the roof in front of the antenna can be calculated
- note for downtilted antennas :

  the downtilt angle has to be added for the „free“ angle



Example for the above antenna (730 368) :

L = 14 m

H > 3 m