

Co-location and Proximity

Within close proximity of existing antennas, on the same building, or in the same tower, co-location is unmistakable. But beware, even separated by kilometers, there is at times an interaction between the users of the electromagnetic spectrum. Indeed, there exists a relative proximity between certain types of sites that must be accounted for during the installation of a new antenna

The co-location and the proximity of some sites require particular precautions to avoid disturbing the nearby operators and to optimally operate our own communication system. A detailed inventory of the services available and of their technical characteristics allows the necessary actions to be taken in order to avoid undesirable interactions.

Co-location

Co-location refers to the sharing of a site between two or more RF users. Depending on the type of site to be shared, the new user can decide to occupy the existing tower, to build a new tower nearby or make use of available space on a building.

Technically, when orchestrating co-location, one must make sure not to disrupt the existing users at the site but also not to be influenced by them in return.

A possible effect of an unwarranted proximity is the desensitization of the receivers by transmitted signals of high intensity. This can be avoided by ensuring sufficient space is left between the projected antenna and the other existing antennas, but also by the use of appropriate filters.

Another potential problem at sites where many frequencies are being used stems from intermodulation. Intermodulation products are generated by the combination of broadcast frequencies at the site or of their harmonics, in non-linear elements such as not properly grounded elements, rusted hardware, or inadequate connections. Proper grounding of the installations and adequate frequency planning can prevent, or at least diminish, future intermodulation problems.

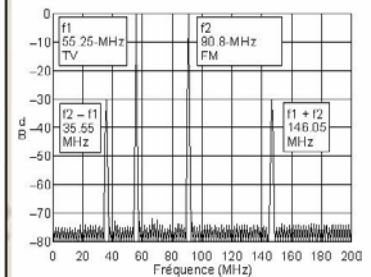
According to the recommendations of the Safety Code 6, the last operator to set up its system will be required to evaluate its own contribution as well as that of other users in order to demonstrate that the total power density does not exceed the prescribed limit. Furthermore, it may be necessary to coordinate the required power cutback or shutdown of transmitters with other users (especially when dealing with broadcasting stations) to guarantee a safe working environment at the time of installation of the new antennas and in subsequent maintenance sessions.



Antenna Spacing

In order to determine the minimum required space between two antennas, one must account for the isolation between them. This isolation is measured in dB, between the signal level injected at the antenna port of one antenna and the level measured at the port of the other antenna.

Intermodulation



Checking intermodulation products consists of identifying the products whose frequency f_{IM} is within the bandwidth of each received frequency studied at the site. When doing a 7th order calculation for a combination of up to three transmitters, we can identify 97% of the potential products. To reduce the calculation time, which increases exponentially at higher orders, we usually limit the calculations to the 5th order while considering a combination of up to three (3) transmitters:

$$f_{IM} = \pm a_1 f_1 \pm a_2 f_2 \pm a_3 f_3$$

where $a_1 + a_2 + a_3 = N =$ Order of intermodulation product

a_1, a_2, a_3 vary from 0 to N

and f_1, f_2, f_3 represent the transmitted frequencies at the site.

YRH

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Within a 1.6 km radius

Inside the perimeter of a broadcast station, at less than 300m from an FM station or less than 1600m from a TV or AM station, the new user must provide an analysis in order to demonstrate that the proposed tower will not disturb the existing services. An echo analysis must be done for the FM stations, a ghosting interference analysis for the TV station, and a secondary radiation study for the AM stations.

The proportions of the telecommunication tower offer a reflective surface to the FM and TV radio waves. The echo and ghosting analysis are performed to verify that the reflected FM and TV radio waves on the proposed tower will not lessen the broadcast quality.

The height of these towers also makes them excellent retransmission elements for the AM radio waves. This phenomenon is called secondary radiation and can reduce the coverage of an AM station by distorting its radiation pattern. Since AM stations have two different radiation patterns, one for day and one for night, the new user must not disturb either one. Certain modifications to the initial project could possibly be required in order to make the proposed tower transparent to the frequency of the AM station.

Up to a 6 km radius

The aeronautical services must not be disturbed for obvious security reasons whenever a proposed site is within the installation perimeter of Transport Canada or NAV Canada, even if located many kilometres away.

At less than 2km from a Transport Canada radar, radionavigation or radiocommunication antenna, specific studies for each antenna must be done in order to demonstrate that the installation will not significantly affect the aeronautical navigation systems.

The limitation criteria of Transport Canada must be respected to ensure that a tower is not an obstacle to aeronautical navigation for distances less than 6 km from an airport. These obstacles, as well as being limited in height can also be marked to enhance their visibility.

Our expertise in co-location and proximity

- Seminars on the impacts related to situations of co-location and proximity (1/2 or 1 day)
- Support to the implementation of shared sites; collection of the site parameters, verification of intermodulation products, antenna location recommendations.
- Performing ghosting interference studies, echo analysis, secondary radiation studies, and evaluations of the impact of putting up towers in proximity to NAV Canada equipment...

Contact us for more information!

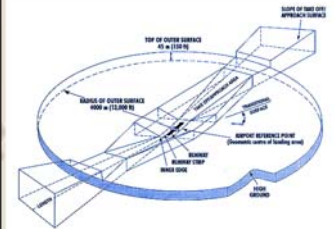
Ghosting interference



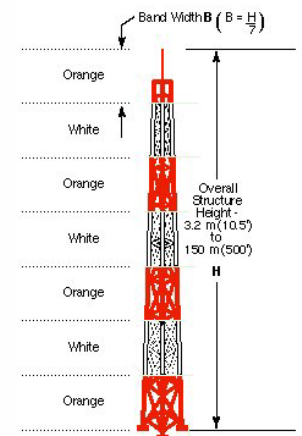
AM Radio



Obstacle limitation zone surrounding an airport



Day Marking



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