

A black silhouette of a man in a suit and red tie, standing with his right arm resting on the top edge of the text box.

**Electromagnetic interference (EMI)  
sources, problems and how you can  
prevent it**

**-  
Antenna installation guide**

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**1**

## Antenna gain VHF, AM/FM, AIS, Cellular

- Measures the ability to focus existing RF energy (spot light vs. flood light)
- Measure is in dB, a ratio of
  - Maximum radiated power to the radiated power of an isotropic source (dBi)
  - Maximum radiated power to the radiated power of a  $\frac{1}{2}$  wavelength dipole (dBd)

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## 2

## Antenna installation guide electromagnetic interference

Electromagnetic interference (EMI) is a problem which is getting worse as you install more electronics on your vessel.

The following part show you how you can find EMI sources and how you can prevent an electromagnetic interference.

You can find EMI sources everywhere.  
Here some examples for you:

- Electronic compasses
- Audio and Video systems
- Fridge
- Multifunction displays
- *Just about any electronic device*

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## Identifying EMI sources

- Trial-and-error process of elimination
  - Turn off all equipment except for affected devices
  - Turn on a device and check for symptoms
  - Repeat until interference symptoms return
- Additional testing maybe required to determine if interference is radiated or conduced
- Interference may be radiated from cables connected to interference source

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## Mitigation for unintended signals

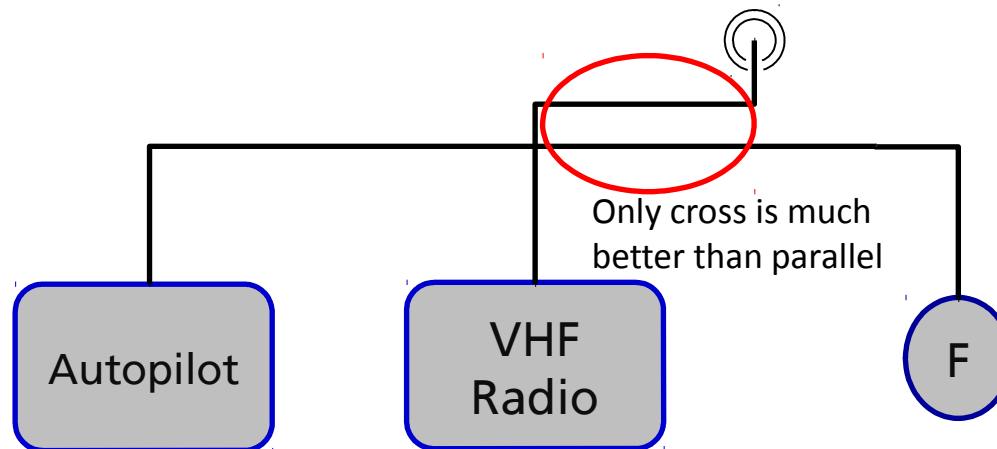
- Objective: Block the signal
  - Prevent signal transmission on cables
  - Prevent signal transmission through enclosure
- Shielded enclosure with attached ground
- Input and output cables
  - Active filters- usually band pass or notch
  - Ferrites

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## Avoiding EMI problems

- Layout and space planning
  - Identify potential EMI radiation sources
  - Identify potential EMI conducted sources
  - Avoid potential hot spots



### Objectives:

- Preserve antenna aperture
- Avoid co- and cross channel interferences
- Make sure that the antenna is placed on the highest position
- Some antennas need a high frequency counterweight (install on a metal pipe)




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**Antenna spacing guidelines (meter)**

	<b>VHF</b>	<b>GPS</b>	<b>SSB*</b>	<b>Radar</b>	<b>Cell</b>	<b>Sat TV</b>
<b>VHF</b>	1,2	0,9	0,9	0,6	0,6	0,9
<b>GPS</b>	0,9	0,65	1,2	(b)	5	0,9
<b>SSB*</b>	0,9	1,2	0,6	1,2	0,6	1,2
<b>Radar</b>	0,6	(b)	0,6	(a)	0,3	1,2(b)
<b>Cell</b>	0,6	5	0,6	0,3	0,3	1,2
<b>Sat TV</b>	0,9	0,9	1,2	1,2(b)	1,2	6

a) 2 radars require minimum 18" vertical separation

b) Must be outside of radar beam

- Install GPS, satellite & cell antennas behind of radar beam
- Install GPS antennas below SATCOM antenna beam
- Install several radar antennas on different high

In summary we recommend:

- Install the VHF antenna on the highest position
- Keep the AIS receiver and VHF radio away from EMI sources
- Connect shielded enclosure with ground
- Avoid co- and cross channel interferences
- Avoid parallel cable routing