

Todays topics

- What is EMC?
- Some basic concepts
- Rules, regulations & standards
- Practical examples

























































Example



- Navigation lights were compliant
- Disturbances stop when lights are switched off
- Aerials are placed at 10 to 50 cm from navigation lights;

Reported by IMO [3]







EMC directive



- 89/336/EEC: No reference to risk
- 2004/108/EC: No reference to risk
- 2014/30/EU: 17 references to risk
 - The manufacturer shall establish the technical documentation. The documentation shall make it possible to assess the apparatus conformity to the relevant requirements, and shall include an adequate analysis and assessment of the risk(s)
- 2014/53/EU: Radio equipment directive
 - Replaces the EMC directive for all electrical or electronic product, which intentionally emits and/or receives radio waves for the purpose of radio communication and/or radiodetermination,













Reduction of harmonics ≠ n*3																	
Rectifier	Generated harmonics	5	7	11	13	17	19	23	25	29	31	35	37	41	43	47	49
6 pulse	6*n ± 1:	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х
12 pulse	12*n ± 1			Х	Х			Х	Х			Х	Х			Х	Х
18 pulse	18*n ± 1					Х	Х					Х	Х				
24 pulse	24*n ± 1							Х	Х							Х	Х
48 pulse	48*n ± 1															Х	Х



























Screened cable isolated from EMC gland, earthed with long pigtail / short pigtail

















Who is to blame? Supplier drives? Rules? Too much emission EMC standards Separate supply grid kHz Electrical contractor? No cable separation Client? No screened cables No separation between supply grids Supplier hydraulic platform? No instructions for electrical contractor No shielded cables

No twisted pair data cables





Thank you for your attention

Questions?



- Discrepancy between IEC 61800-3 & other
- No proper requirements between 2 and 150
- No system integration