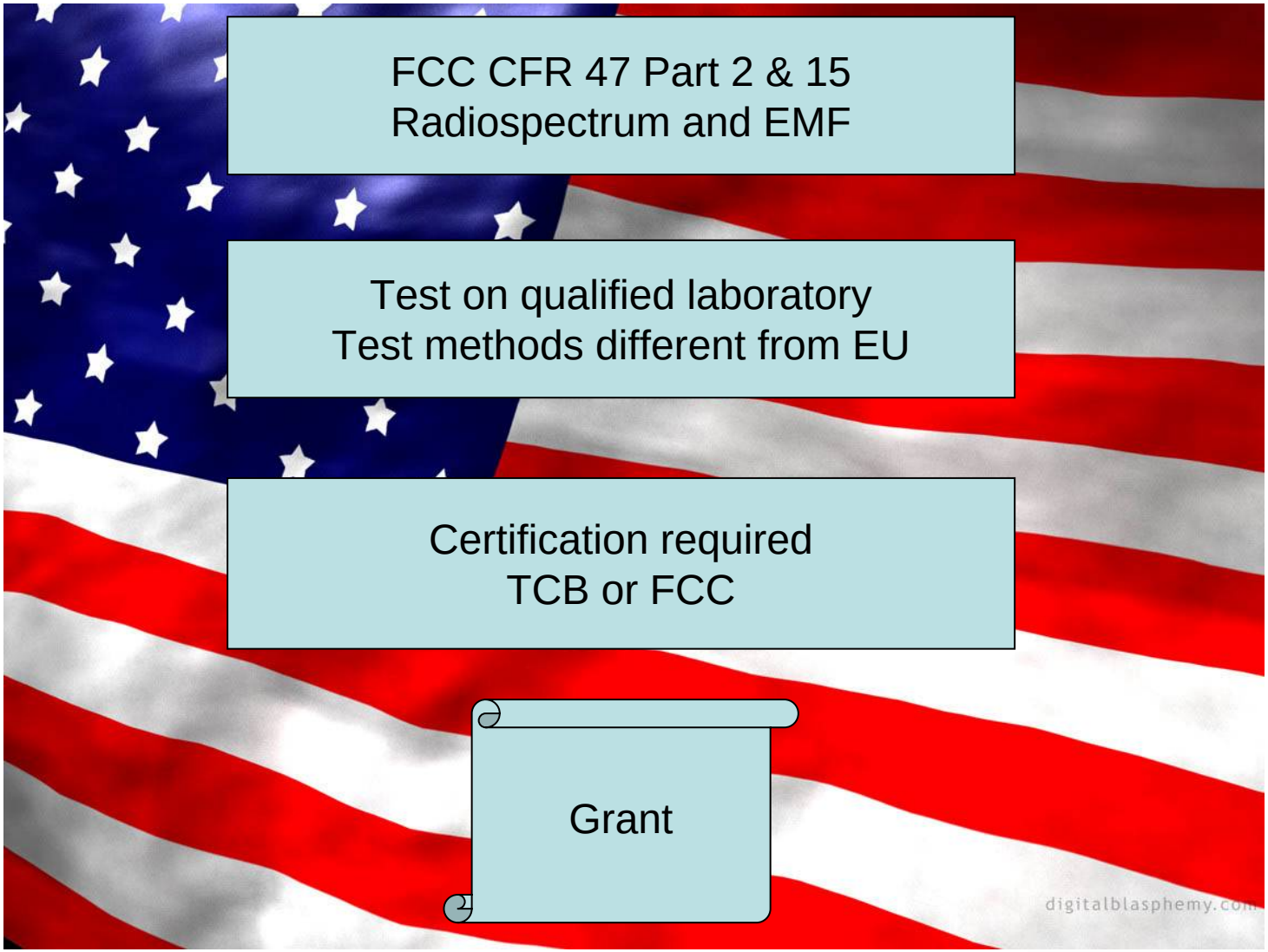
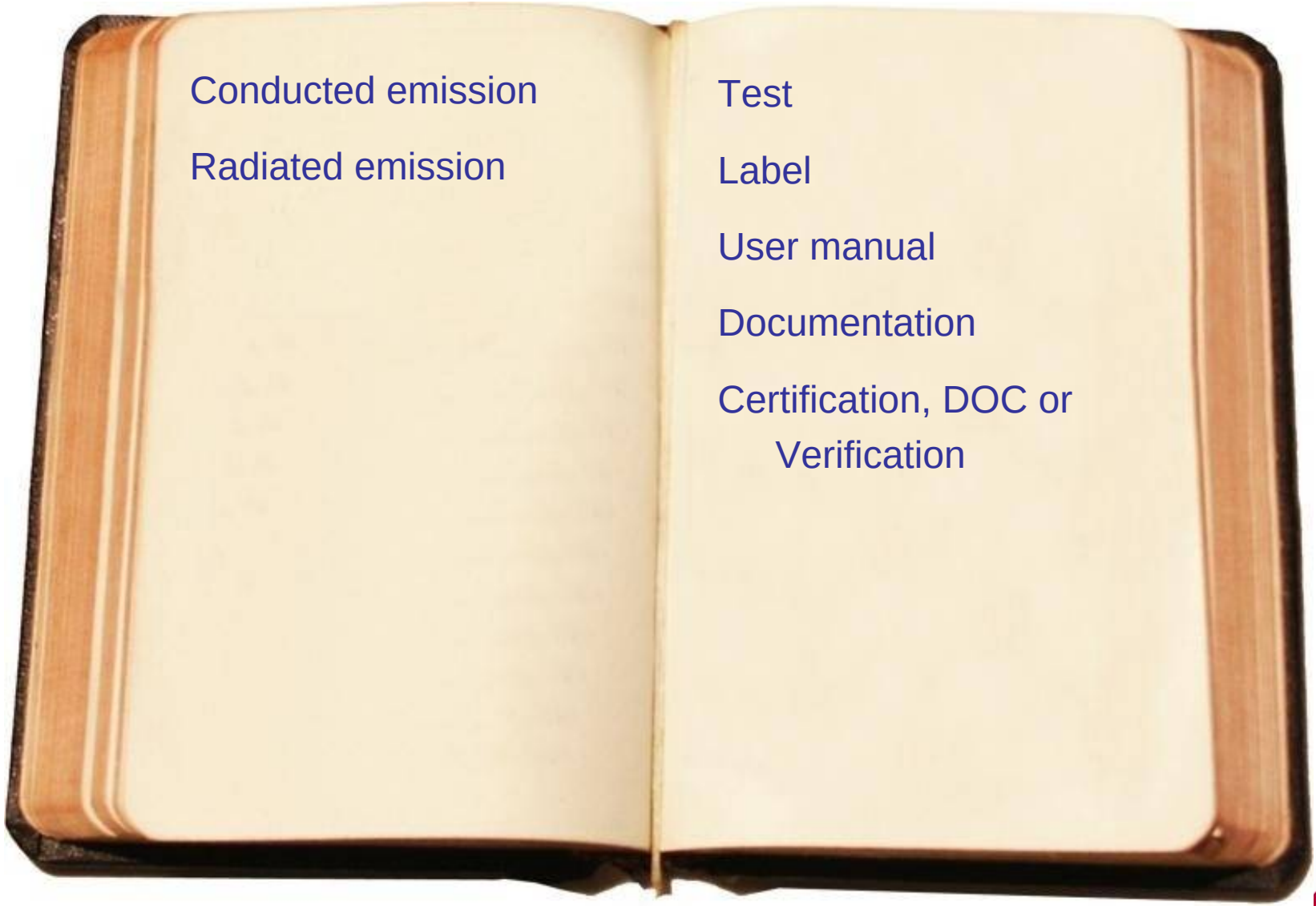
Regulatory requirements - USA



FCC Federal Communications Commission

ANSI

Regulatory EMC requirements



Conducted emission

Radiated emission

Test

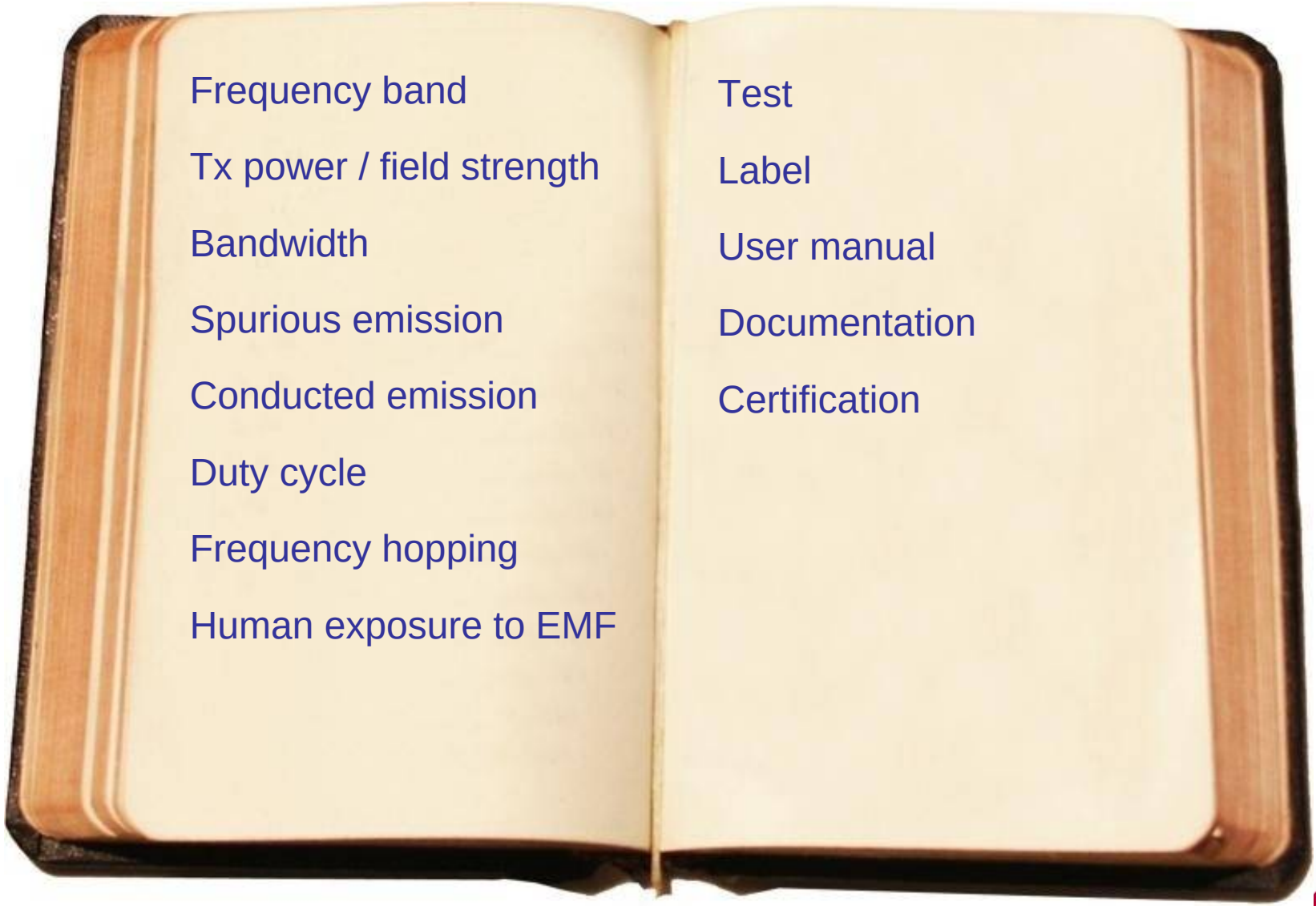
Label

User manual

Documentation

Certification, DOC or Verification

Regulatory radioparameter requirements



Approval procedures

FCC CFR 47 Part 2
Subpart J
General Equipment
Authorization
procedures

FCC CFR 47 Part 15
Subpart A, 15.3
Unlicensed Intentional
radiators and digital
deivices

FCC CFR 47 Part 15
Subpart B 15.101
Unintentional radiators

FCC CFR 47 Part 15
Subpart C 15.201
Intentional radiators

Classification of equipment

Verification
Labelling: 15.19(a)
Unique identifier: 2.954

Certification
Labelling: 15.19(a), 2.926
FCC ID: 2.925

Declaration of Conformity
Labelling: 15.19(b)

User manual: 15.21 + 15.27(a)
Digital device => user manual 15.105

15.101 – Eq. Auth. Of unintentional radiators

Type of device	Eq. Auth.		
TV broadcast receiver	Ver.	Stand-alone cable input selector switch	Ver.
FM broadcast receiver	Ver.	Class B personal computers and peripherals	DoC or Cert. (TCBs only)
CB receiver	DoC or Cert.	CPU boards and internal power supplies used with Class B personal computers	DoC or Cert. (TCBs only)
Superregenerative receiver	DoC or Cert.	Class B personal computers assembled using authorized CPU boards or power supplies	DoC
Scanning receiver	Cert.	Class B external switching power supplies	Ver.
All other receivers subject to part 15	DoC or Cert.	Other Class B digital devices & peripherals	Ver.
TV interface device	DoC or Cert.	Class A digital devices, peripherals & external switching power supplies	Ver.
Cable system terminal device	DoC	All other devices	Ver.

15.201 –Eq. Auth. Of intentional radiators

- In general ’intentional radiators’ must be certified

Exeptions:

- Intentional radiators operated as carrier current systems
- Perimeter protections systems

Verification - Label

$$15.19(a)(3): All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

$$2.954: Unique Identification

- Devices subject only to verification shall be uniquely identified by the person responsible for marketing or importing the equipment within the United States. However, the identification shall not be of a format which could be confused with the FCC Identifier required on certified, notified or type accepted equipment. The importer or manufacturer shall maintain adequate identification records to facilitate positive identification for each verified device.

Certification – Label

$$15.19(a)(3): All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

$$2.925(a)(1): FCC ID:

- FCC Identifier consisting of the two elements in the exact order specified in Sec. 2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example:

FCC ID XXX123

XXX: Grantee Code

123: Equipment Product Code

NB: Test performed at FCC listed lab

Declaration of Conformity – Label

eller

- NB: Test performed at US recognized accredited lab

User Manual

- $$15.21:
  - The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- $$15.27(a):
  - Special accessories specified and sold with equipment
  - Instructions for use on first page of user manual

$$15.105 User Manual for Digital Devices

- Text in prominent location in the text of the manual:
- Class A:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

$$15.105 User Manual for Digital Devices

- Text in prominent location in the text of the manual:
- Class B:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
--Reorient or relocate the receiving antenna.
--Increase the separation between the equipment and receiver.
--Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
--Consult the dealer or an experienced radio/TV technician for help.

Tips for label and usermanual

- Do not change the wording of the texts.
- First page = page 1
- Prominent location = page 2

$$15.33(b) – Frequency Range of Radiated Measurements – Unintentional radiators

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Lowest frequency: the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified (= 30 MHz)

$$15.33(a) – Frequency Range of Radiated Measurements – Intentional radiators

Operating frequency of intentional radiator	Upper frequency of measurement
< 10 GHz	10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower
10 GHz ≤ f < 30 GHz	5th harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower
30 GHz ≤ f	5th harmonic of the highest fundamental frequency or to 200 GHz

Lowest frequency: the lowest radio frequency signal generated or used in the device, without going below 9 kHz.

If the intentional radiator contains a digital devices, the upper frequency is the higher of 15.33(a) or 15.33(b).

$$15.3(h) and (i) – Definition of A and B

Class A digital device. A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Class B digital device. A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

$$15.107 & 109 – Emission limits for Digital devices, Subpart B, Class A

Conducted Emission		
Frequency (MHz)	QP limit (dBµV)	AV limit (dBµV)
0.15-0.5	79	66
0.5-30	73	60

Radiated Emission	
Frequency (MHz)	Limit @ 10 m (µV/m)
30-88	90
88-216	150
216-960	210
Above 960	300

$$15.107 & 109 – Emission limits for Digital devices, Subpart B, Class B

Conducted Emission		
Frequency (MHz)	QP limit (dBµV)	AV limit (dBµV)
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency		

Radiated Emission	
Frequency (MHz)	Limit @ 3 m (µV/m)
30-88	100
88-216	150
216-960	200
Above 960	500

$$15.202 – Certified operating frequency range

- Master devices must be limited to operation on permissible Part 15 frequencies

$$15.203 – Antenna requirement

- An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
  - Standard antenna connector:
    Any antenna connector found in an electronic parts catalogue is not unique (BNT, TMC, N, SMA, SMX & F)
  - Permanent antenne
  - Unik antenne konnektor
    F.eks.:Left handed thread, reverse polarity
  - Limet med epoxy
- Test skal gøres for hver type antenne, med den antenne med højest gain
- Liste for alle antenner: gain, type, fabrikant / forhandler, output power

$$15.205 – Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

Only spurious emissions are permitted in any of the restricted bands

$15.207 – Conducted limits

- Limit: Class B
- Ikke nødvendigt for batteriforsynede enheder
- Hvis man ikke leverer AC/DC adapter, skal testen udføres med en repræsentativ off-the-shelf adapter

$$15.209 & 15.215(b) – Radiated emission

Frequency (MHz)	Field Strength (µV/m)	Measuring distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Fundamental: below radiated limit & not in restricted bands.
Spurious emissions: below fundamental

$$15.215 – Additional provisions

- $$15.217 – 15.257 provide alternatives to the general radiated emission limits in specified frequency bands
- Unwanted emissions outside the designated frequency band shall be below the radiated emissions of $$15.209
- 20 dB bandwidth (or specified BW) shall be within the designated frequency band

$$15.231 – Periodic operation, 40.7 & >70 MHz

- Frequency band: 40.66-40.70 MHz and above 70 MHz
- Periodic operation: control signal, such as those used with alarm systems, door openers, remote switches, etc
- Continuous transmission not allowed
- Automatic shut off after 5 sec.
- Tx at regular predetermined intervals not allowed
- Max. 2 sec Tx per hour
- Alarm for fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

$$15.231 – Periodic operation, 40.7 & >70 MHz

- Data only transmission prohibited
- Toys prohibited
- Max. 20 dB bandwidth:
  - 70 MHz – 900 MHz: 0.25 % of center frequency
  - > 900 MHz: 0.5 % of center frequency
- 40.6 MHz frequency tolerence: +/- 0.01 %
  - -20 to +50 °C @ rated supply voltage
  - 85 to 115 % supplyvoltage @ 20 °C

$$15.231 – Periodic operation, 40.7 & >70 MHz

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)	Field strength of spurious emissions (µV/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750	125 to 375
174-260	3750	375
260-470	3750 to 12500	375 to 1250
Above 470	12500	1250

Limit @ 3 m distance
Detector: Average or CISPR QP
$$15.205 (restricted bands) applies

$$15.249 – 915, 2450, 5800 & 24100 MHz

Fundamental frequency (MHz)	Field strength of fundamental (mV/m)	Field strength of harmonic emissions (µV/m)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Limit @ 3 m distance

Emissions other than harmonics shall be attenuated 50 dB below fundamental or to the general emission limits ($$15.209)

Detector: Average, Peak limit: AV + 20 dB

$$15.247 – 915, 2450, 5800 & 24100 MHz – DTS

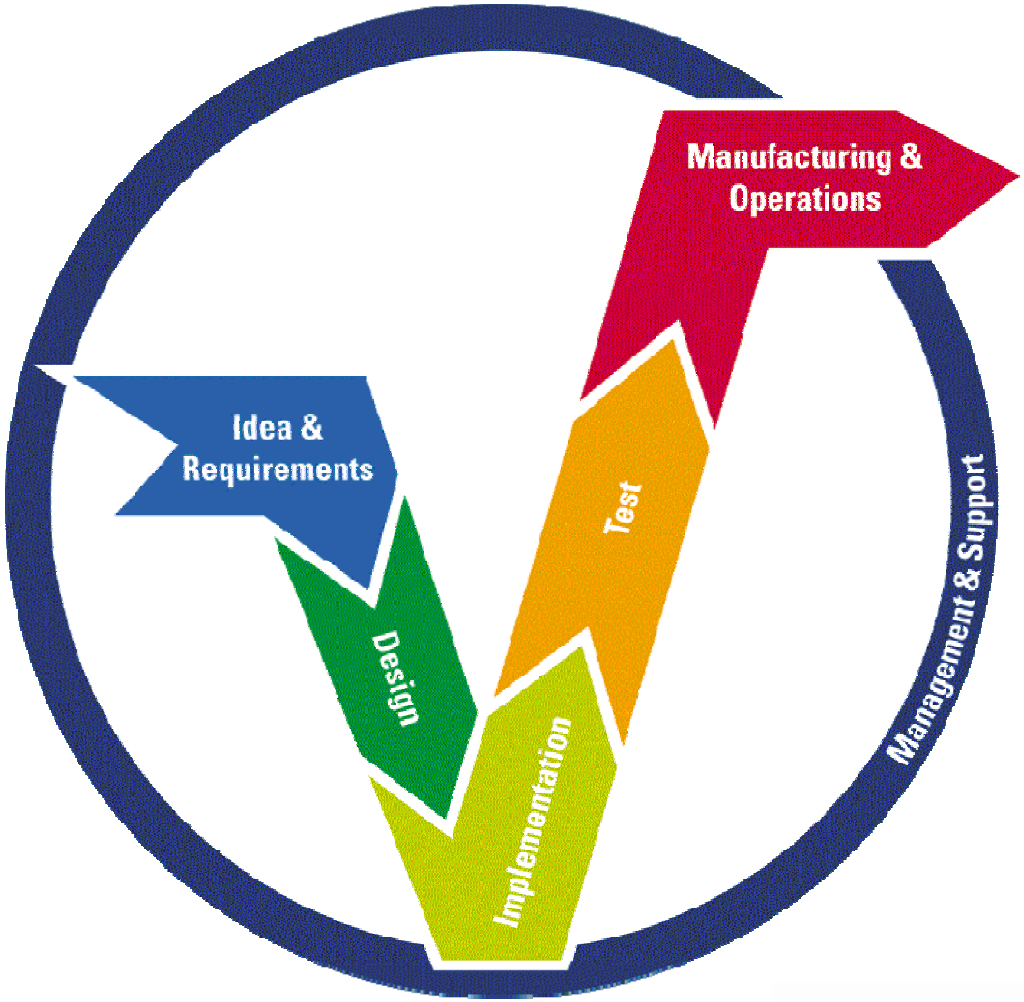
- Digital modulation is required for Digital Transmission Systems (DTS).
- $$15.31(m):

Frequency range over which device operates	Number of frequencies	Location in the range of operation
≤ 1 MHz	1	Middle
1-10 MHz	2	Low & High
> 10 MHz	3	Low, middle & High

$$15.247 – 915, 2450, 5800 & 24100 MHz – DTS

- 6 dB BW > 500 kHz
  (measured with 100 kHz RBW)
- Max. Peak conducted output power: 1 W
- RF Safety:
  Ensure that measurements/calculations in the exhibits showing RF safety compliance are consistent throughout the filing.
- Conducted spurious emission test (10^{th} harmonic) and Radiated spurious emission test (10^{th} harmonic)
- Power spectral density: 8 dBm in 3 kHz

When should identify your requirements?



Why are we doing this?

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