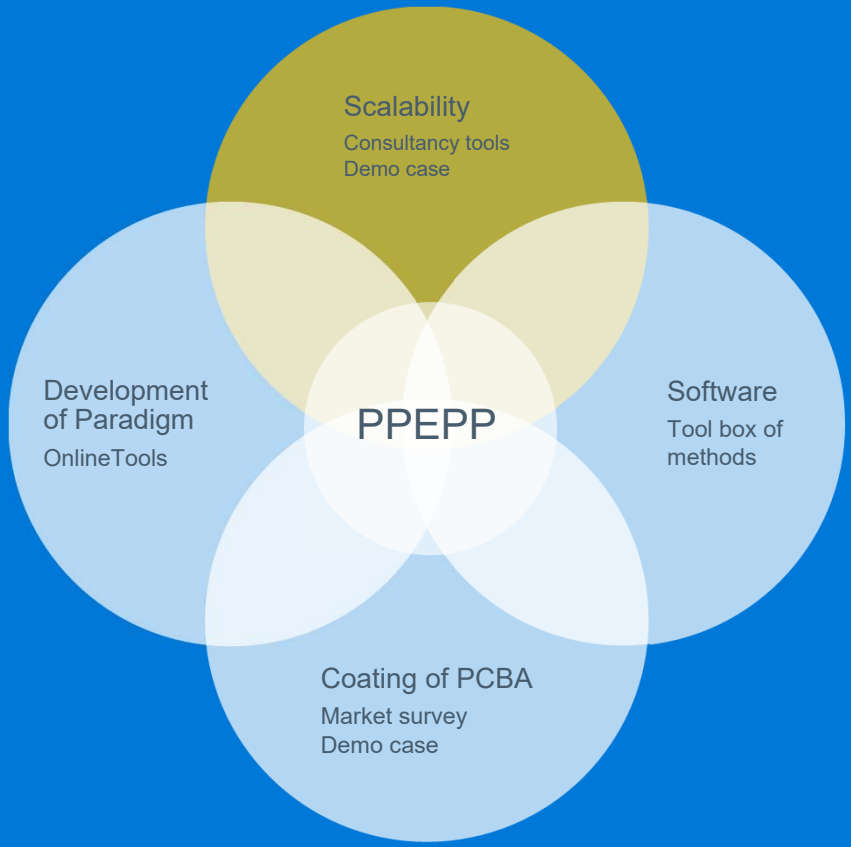
EMC Guidelines

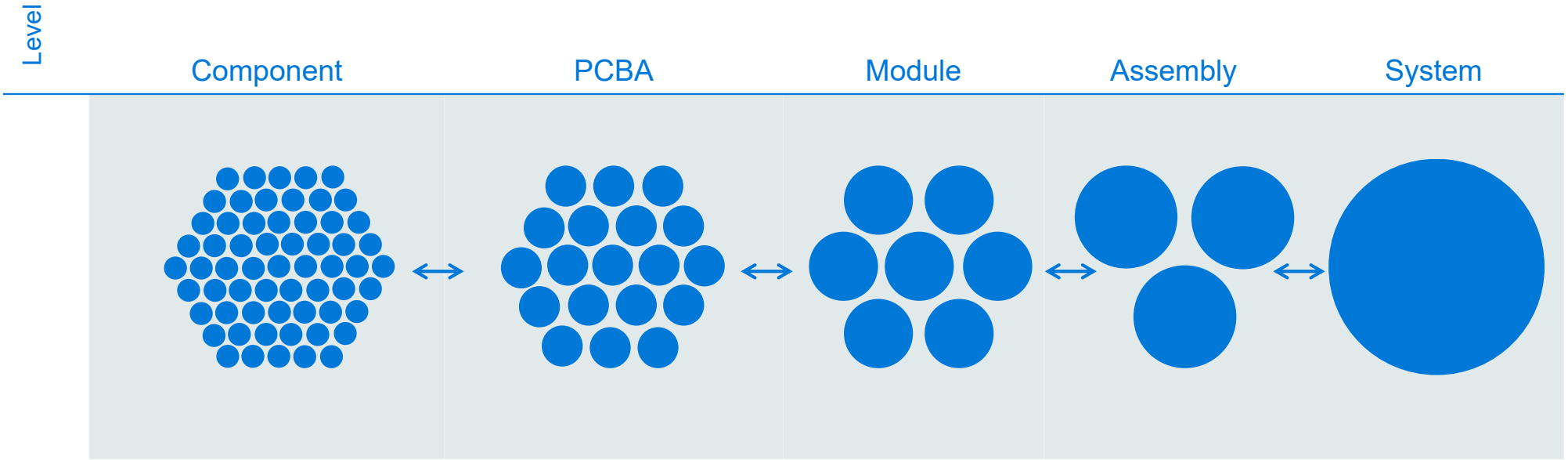
Per Thåstrup Jensen, FORCE Technology – ptj@force.dk

June 2019

PPEPP – Tool overview



EMC design details – Level dependent.

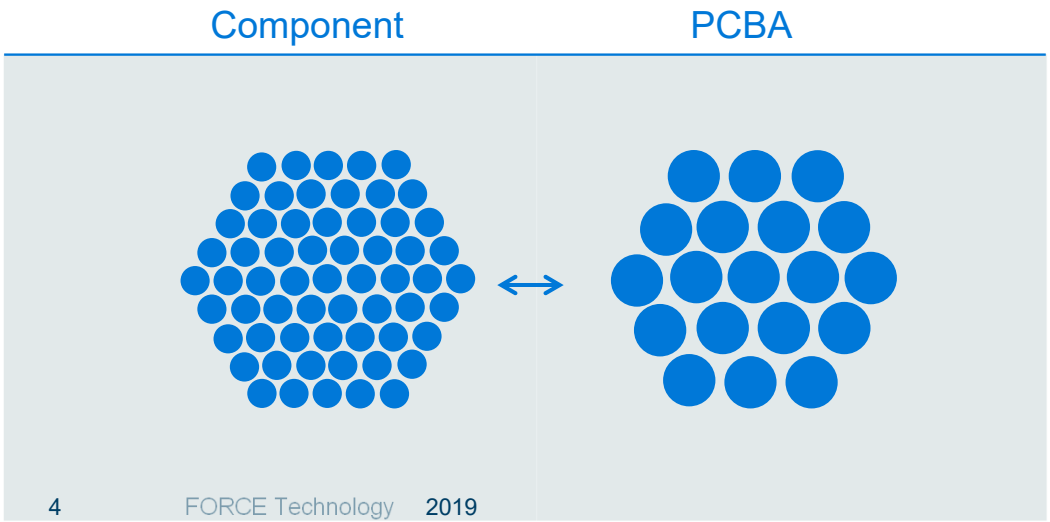


EMC design details. Component – PCBA.

BACK

Interface:

- Use decoupling capacitors between power pins and GND pins.
- Use decoupling / bandwidth limiting on sensitive or noisy pins of active components.
- Use short and directly routed PCB traces.



Component:

- No specific recommendations, but keep impedance level low when possible.

PCBA:

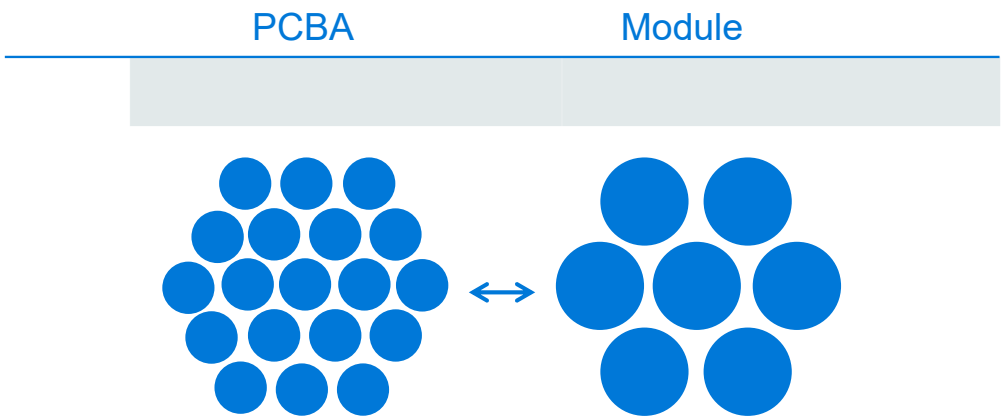
- Use two or more layers, where at least one is a ground plane.
- If more layers, use power planes, and consult litterature on layer distribution.
- Place connectors along one edge only to keep ”single point entry”.
- Use short and directly routed PCB traces.
- Consider filter circuits near all connectors / cable connections.
- If chassis connections from GND plane are used, allow for two or more screw connections (low inductance).

EMC design details. PCBA – Module.

BACK

Interface:

- Arrange/separate cabling from each PCBA to avoid capacitive cross-coupling.
- Use shielded cables and connectors on critical or high-speed connections.
- Use filters or lossy ferrite beads on critical or high-speed connections.



PCBA:

- Use two or more layers, where at least one is a ground plane.
- If more layers, use power planes and consult litterature on layer distribution.
- Place connectors along one edge only to keep ”single point entry”.
- Use short and directly routed PCB traces.
- Consider filter circuits near all connectors / cable connections.
- If chassis connections from GND plane are used, allow for two or more screw connections (low inductance).

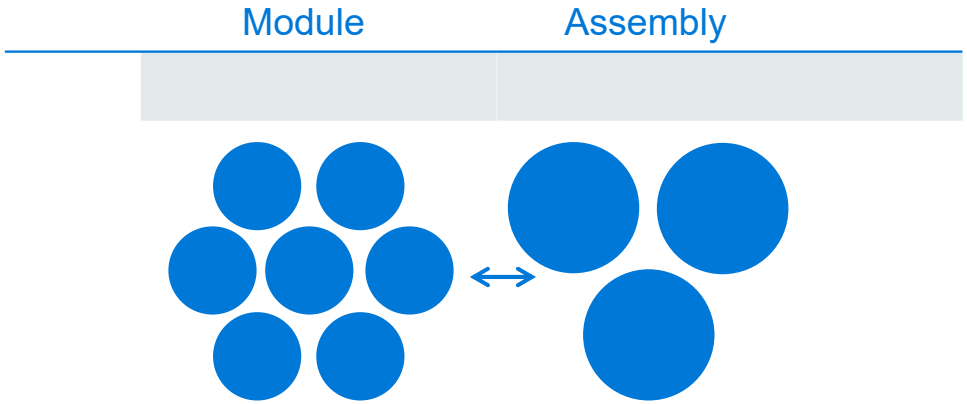
Module:

- Consider shielding using metal encapsulation, if possible.
- Use power filter.

EMC design details. Module – Assembly.

Interface:

- Arrange / separate cabling from each Module to avoid capacitive cross-coupling.
- Use shielded cables and connectors on critical or high-speed connections.
- Use filters or lossy ferrite beads on critical or high-speed connections.



Module:

- Specify installation requirements.
- Consider shielding using metal encapsulation, if possible.
- Place connectors at one face of Module only to keep ”single point entry”.
- Use power filter.
- Consider placement of Assembly and cables to avoid capacitive cross-coupling.
- If feasible, perform pre-tests or EMC HALT analysis.

Assembly:

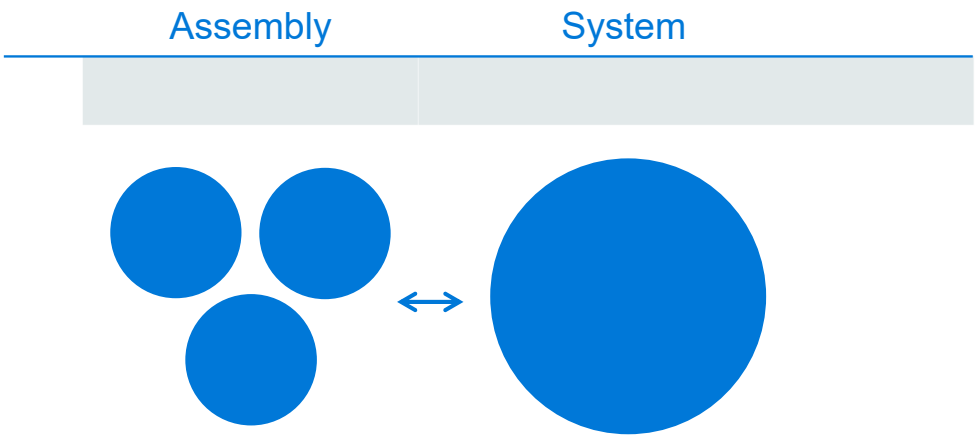
- Basically same considerations as for Module.
- If feasible, perform pre-tests or EMC HALT analysis.

EMC design details. Assembly – System.

BACK

Interface:

- Follow the installation requirements.
- Arrange/separate cabling from each Assembly to avoid capacitive cross-coupling.
- Use shielded cables and connectors on critical or high-speed connections.



Assembly:

- Specify installation requirements.
- Consider shielding using metal cabinet, if possible.
- Use power filter.

System:

- Acquire the Mission Profile for intended use and severe use of the system, and cross-check with the system specifications.
- Specify and follow installation requirements, so EMC design mitigations have a chance of fulfilling their purposes.
- If feasible, perform EMC HALT analysis.
- Perform qualification tests.