

# Wired or Chassis Ground: The Best Solution for Automotive Emissions

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## Synopsis

Investigations into the level of radiated and conducted emissions from an automotive electronic sub-assembly (ESA) given either a chassis grounded case or a wired ground return have been examined using standard cables and a comparison noise emitter as a simulated ESA. The cable harnesses used have been the standard 1.5m length required for 95/54/EC and CISPR-25 for radiated emissions and 0.2m for CISPR-25 conducted emission tests.

The results have been previously released as comparison of cable length variations using different harness lengths to those prescribed by the test standards<sup>1,2</sup>. Here the results have been examined specifically to determine if using a wired ground return or a chassis ground return offers any benefit with respect to emissions performance.

## Results

Conducted emissions demonstrate a benefit for chassis grounded systems in the onset of resonance occurring at a later stage, undoubtedly due to a lower overall inductive path for a chassis return current. Wired system emissions show clear onset of resonance in the harness within the measurement bands of CISPR-25 (below 108MHz) even with relatively short (0.2m) harnesses, for real in-vehicle harnesses the results are predicted to be more significant.

Radiated emissions are less clear-cut, although there is still the presence of fewer harmonics in the chassis grounding scheme, the overall emissions levels are slightly lower for a wired ground return. The cause of the lower emissions for the wired scheme is believed to be the result of the smaller ground loop of the wired ground scheme, being in the same harness bunch as the signal/supply line.

## Conclusion

Overall it would appear that there are some benefits to using a chassis grounded scheme for automotive ESA's. However, the reduced resonances have to be weighed against lower overall emission levels for a wired ground scheme and the potential easier installation of wired compared to chassis grounding schemes. Ultimately, as with most automotive ESA, cost will be the dominating factor, if a product is already in a metalised and grounded case chassis grounding will be the preferred return current scheme, if an insulated case is used then wired grounding can be implemented and additional effort may be required to reduce conducted emissions.

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<sup>1</sup> *Automotive EMC Test Harnesses: Standard Lengths and their Effect on Conducted Emissions*, M. O'Hara and J. Colebrooke, 2003 IEEE International Symposium on Electromagnetic Compatibility (EMC), Istanbul, 11-16 May 2003.

<sup>2</sup> *Automotive EMC Test Harnesses: Standard Lengths and their Effect on Radiated Emissions*, M. O'Hara and J. Colebrooke, York EMC 2003, York, 1 July 2003.