User Requirements

Ivan Hendrikx

Hevrox EMC/Safety Services NV/SA

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Annex 1 : Summary results of questionnaires

1. Introduction

- Safety issues of GSM in neighbourhood of fuel station (Malaysia)
- In general
  - use of GSM not under control
- Little knowledge of coupling paths to cabling
  $\rightarrow$ no system approach
- Important problem (product liability) for the smaller ESA/vehicle manufacturers

2. Number and complexity of electronics in vehicles

- Now up to 15 % of vehicle cost, future 20-25 %
- Examples
  Use of electronics in:
  ABS, motor adjustments, gearbox, consumer (audio, video) information technology (Internet), GPS, “Drive-by-wire”

2. Number and complexity of electronics in vehicles

- Frequency domain up to 80 GHz
  Examples of mobile communication applications:
  GSM : 890-960 MHz
  P from 3,7mW-20W (mostly 2 + 8W in some countries)
  DCS1800 : 1700-1900 MHz
  P from 250mW - 2W
  → Use of the antenna may lead to dangerous coupling to sensitive cabling

3. Cable harness issues in vehicles

In an “average” vehicle :

- ! Total length of all wires : 2.500 m
- Weight : 40 kg
- Number of contacts : 2.300
- ! Ø principal cable loom : 70 mm
- Costs : 1.000 EURO
- Development volume : 4 man-year
- ! Average length of a connection : 2,5 m

4. Current situation: EM coupling on cables

4.1 Theoretical models

1. Simple modelling approval
    - box-to-box model
2. Advanced modelling techniques
    - MoM : Method of Moments
    - FE : Finite Elements
    - FDTD : Finite Difference Time Domain
    - TLM : Transmission Line Method

4. Current situation: EM coupling on cables

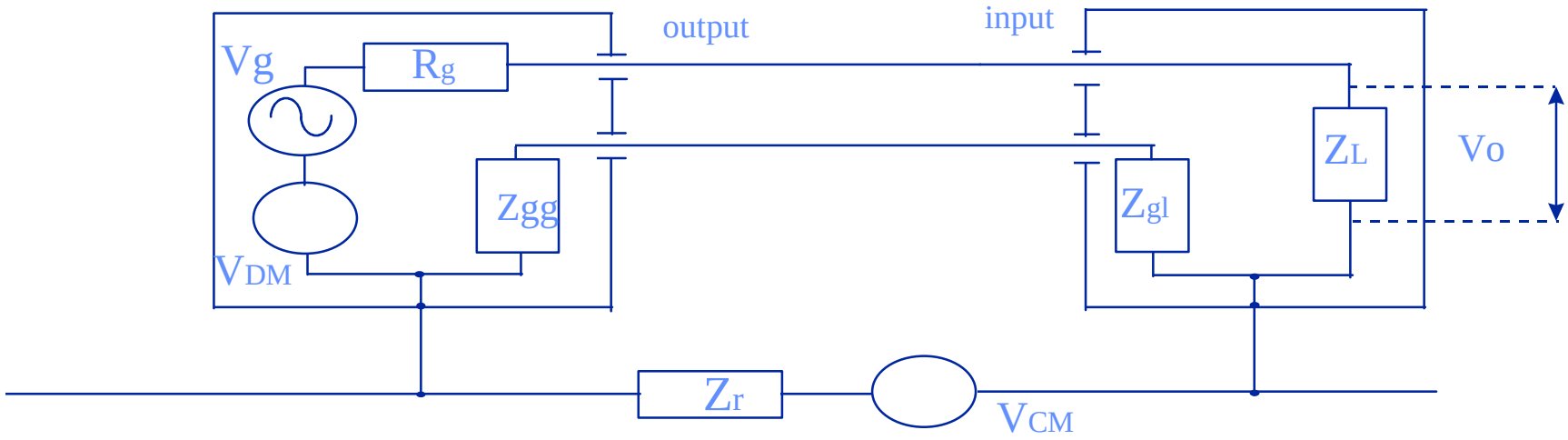
4.1 Theoretical models (Continued)

Conclusion:

- Lack of theoretical models to analyse accurately the cable coupling issues
- Also lack of validation measurements in anechoic chambers and in vehicles

4. Current situation: EM coupling on cables

4.1 Theoretical models (Continued)



Box-to-box model

4. Current situation: EM coupling on cables

4.2 Present ESA test techniques (EMC)

Draft ISO 11452 (1997)

- Part 2 : Absorber lined chamber
- Part 3 : TEM cell
- Part 4 : BCI
- Part 5 : Stripline
- Part 6 : Parallel plate antenna
- Part 7 : Direct RF power injection

No correlation between them

No correlation ESA - vehicle test techniques

5. Cabling issues and the authorities

- Cable harness to define as sort of “ESA”, which should be type approved
- How to classify, to follow up
- Technical issues
  - signal integrity
  - crosstalk
  - impedance control
  - earthing
  - shielding

5. Cabling issues and the authorities

- Who has system responsibility?
  → the ESA-manufacturer and/or the vehicle manufacturer?
  →final system liability: should be with vehicle manufacturer

6. GEMCAR project

GEMCAR stands for:

"Guidelines for ElectroMagnetic Compatibility modelling for Automotive Requirements"

- European EMC research project within FW V of EC
- Consortium members from BE, CH, FR, SE, UK
- EMC modelling guidelines
- Details on http://www.gemcar.org

6. GEMCAR project

6.1 Questionnaires

To know:

- Research items
- Parameters for numerical simulations
- Accuracy of expected results (model detailing)
- Input for consortium

6. GEMCAR project

6.2 Approach for data collection

- 20 face-to-face interview
- Sectors
  - Automotive
  - Aerospace
  - Railway

6. GEMCAR project

6.2 Approach for data collection (Continued)

- Involved parties
  - vehicle manufacturers
  - ESA manufacturers
  - component and material manufacturers
  - testhouses, consulting companies
  - authorities, standardisation bodies

6. GEMCAR project

6.3 Results

- Immunity: most important topic
  → complexity of new products
  → cost of EMC testing
- Intra-EMC knowledge: more needed
  → complexity
  → lack of standardisation

Refer to Annex 1: Summary

7. Conclusions

User requirements interviews reveal:

- Lacking ESA EMC test correlation
- Lacking ESA - vehicle EMC test correlation (i.e. What is tested as ESA, may fail in vehicle EMC test hence large overtest of ESA's)

7. Conclusions (continued)

- Definition of worst case immunity test set-up
  → very important
    → quality issue
    → safety issue
    → cost issue
- Good EMC simulation guidelines required by all parties

Annex 1 : Summary of results questionnaires

Q. N°	Required research items	Importance	Remarks
1	Emissions of parts in vehicle i.e. noisy DC motor	Required	Economical benefits : • good to high • > 30% over 5 years ! • only 1 vehicle needed for qualification
2	Evaluation of system immunity requirements	Required	Economical benefits : • good to high • > 30% over 5 years ! • qualitative advantage
3	Design studies for vehicle antennas	Required	Economical benefits : • fair to good • > 5% reduction in project cost
4	Prediction of intra-system EMC performance	Required	
5	Prediction of system emission (installed systems	Required	
6	Evaluation of worst case model variant in immunity testing	Highly required	Economical benefits : • high • 30% over 5 years ! • only 1 vehicle needed for qualification