

For the improvement of the parameters of ferrite films and their time stability the method of the temperature treatment of the ferrite films in the stream of dry oxygen has been worked out.

We worked out and made the diminutive variable filter on the monocrystalline  $Y_3Fe_5O_{12}$  film with 20  $\mu\text{m}$  of thickness. The filter is designed for narrow-band filtration of low power radio signal frequencies of decimetre range. Signal is carried out at resonance frequencies of magnetostatic waves excited in magnetised epitaxial film of yttrium iron garnet. Filtration frequency varies upon changing the value of the applied magnetic field. The magnetic field is formed by a portable screened magnetic system, which has a mechanical and electrical adjustment of field value and, hence, filter frequency. Mechanical variation range of filter frequency is (0.4-4) GHz, electronic variation range of filter frequency is 1 GHz, signal attenuation at central filtration frequency not exceeding 4 dB, filtration bandwidth at 3 dB level not exceeding 8 MHz. The filter can be used in metering instruments, systems of analog processing of microwave signals as well as in input microwave sections of radio and television tuners.

## REFERENCES

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## ASPECTS OF EMC- EVALUATION OF LIN TRANSCEIVERS

*With this paper a proposal for EMC- Evaluation of LIN (Line Integrated Network)- Transceiver is presented. It is based on EMC- standards for semiconductors and automotive applications and can be applied to Stand Alone LIN Transceiver and Embedded Systems with an on chip LIN Transceiver (Automotive System Basis Chips). At this time there are positive experiences by using this evaluation proposal on LIN Transceivers from different manufactures and samples in the last two years. It can be shown, that the results of the measurements have a very good reproducibility.*

*The proposal for EMC- Evaluation of LIN- Transceivers is based on the same procedure as EMC- Evaluation of CAN – Transceivers, witch is successful implemented in Transceiver evaluation for automotive applications and has a correlation to vehicle measurements.*

### 1. GENERAL EMC- REQUIREMENTS ON SEMICONDUCTORS IN VEHICLES

To guarantee the EMC of semiconductors in automotive applications different tests on vehicle and component level were done up to now. On account of short development cycles it isn't valid to solve the EMC- problems of a semiconductor device in the last period of development of

the electronic equipment or of the vehicle itself. Therefore in this time EMC- optimized semiconductors are needed for automotive application. To do this, some standards for emission of RF disturbances of semiconductors are developed in the last time. The work on standards for immunity is still going on.

## **2. EMC - STANDARDS FOR SEMICONDUCTORS**

### **2.1. Emission**

In the last 10 years the standard IC IEC 61967 "Integrated circuits- Measurement of Electromagnetic Emissions" was developed for investigation the emissions of an IC in the frequency domain [2]. This standard consists of 6 parts, which describe general definitions and 5 measuring methods:

- Part 1 General and Definitions
- Part 2 "TEM-cell method"
- Part 3 "Loop probe method"
- Part 4 "1  $\Omega$ / 150  $\Omega$ - direct coupling method"
- Part 5 "Workbench Faraday cage method"
- Part 6 "Magnetic probe method"

The selection of the best measuring method for a specific IC must be done by the user with a scope of the its EMC- relevant properties.

### **2.2 Immunity**

The work on a equivalent standard for the immunity against radiated narrow band disturbances was started in the last 3 years. The standard IEC 62132 (CD) – "Integrated circuits- Measurement of Electromagnetic Immunity, 150 kHz to 1 GHz [1]" consists also of an general part and different measurement methods:

- Part 1 "General and Definitions"
- Part 2 "TEM-cell method" (planed)
- Part 3 "BCI method"
- Part 4 "DPI method"
- Part 5 "Workbench Faraday cage method"

## **3. ASPECTS OF SELECTION OF MEASUREMENT METHODS FOR LIN- TRANSCEIVER**

A LIN- Transceiver (first stand alone type) is a small semiconductor device and the conducted emission via its pins is dominate compared to the radiated emission via the surface of the device. In case of immunity of the semiconductor it is the physical effect.

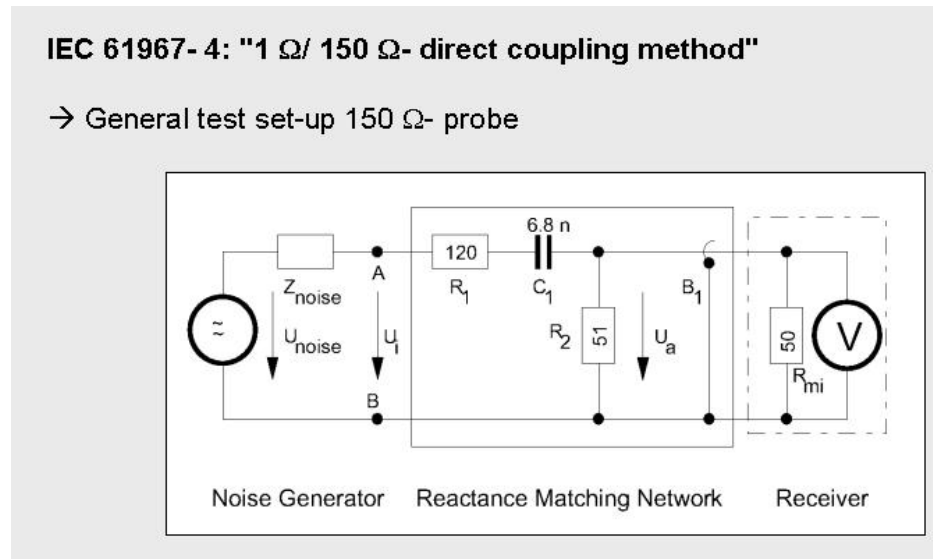


Fig. 1. General test set-up 150  $\Omega$ - probe

In order to do a practice EMV- evaluation of LIN- Transceivers with requirements of automotive applications for RF- Disturbances the conducted measuring methods "1  $\Omega$  / 150  $\Omega$  method" (Figure 1) for emission and the "DPI method" (Figure 2) for immunity should be used.

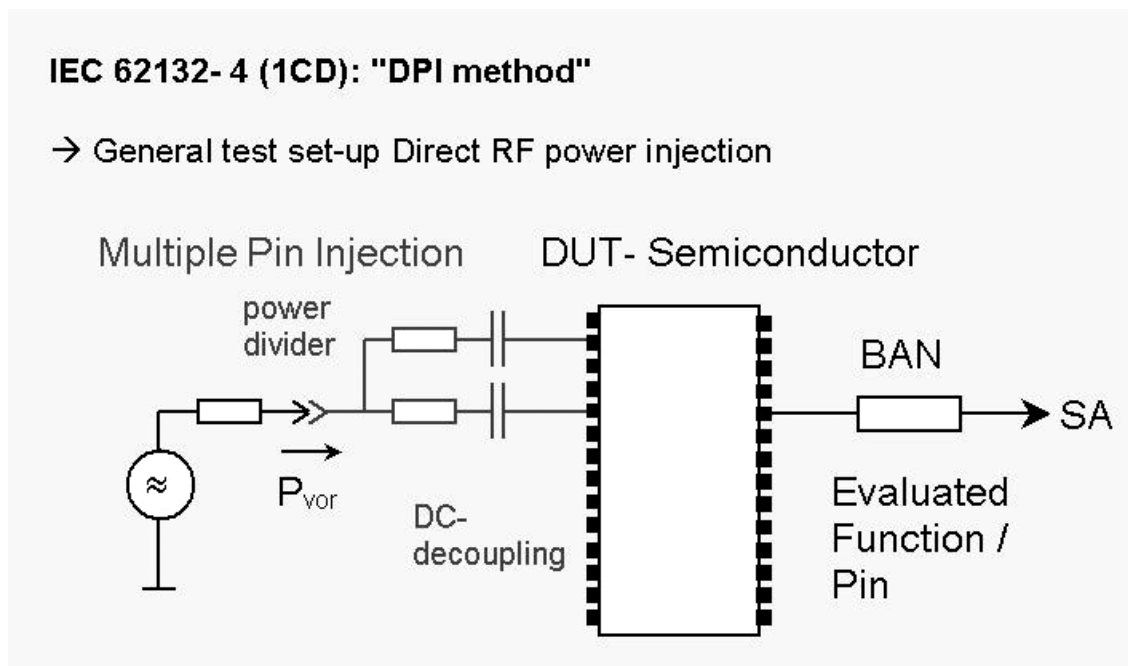


Fig. 2. General test set-up Direct RF power injection

A direct capacitive coupling of transients, which are described in ISO 7637, is valid for verification of the impulse immunity as an additional test. The ESD- immunity of the transceiver must be shown on the component level with the so-called "Packaging and Handling Test". Therefore an IC-Test under the basic requirements of EN 61000-4-2 (discharge circuit 150 pF and 300  $\Omega$ ) is reasonable [3].

#### 4. PROPOSAL FOR EMC – EVALUATION OF LIN- TRANSCEIVERS

This proposal for a test standard shall be used as a standardized common scale for EMC evaluation of LIN- Transceivers in automotive applications. For this reason, this instruction does not include any limits, but only test procedures, failure criteria, test set-ups, and test signals concerning:

- The immunity against radiated disturbances on the signal line,
- The emissions in the frequency domain caused by the slew rates of the bus signal,
- The immunity against transients (malfunction and damage),
- The immunity against electrostatic discharges (damage).

Figure 3 gives an overview about this procedure.

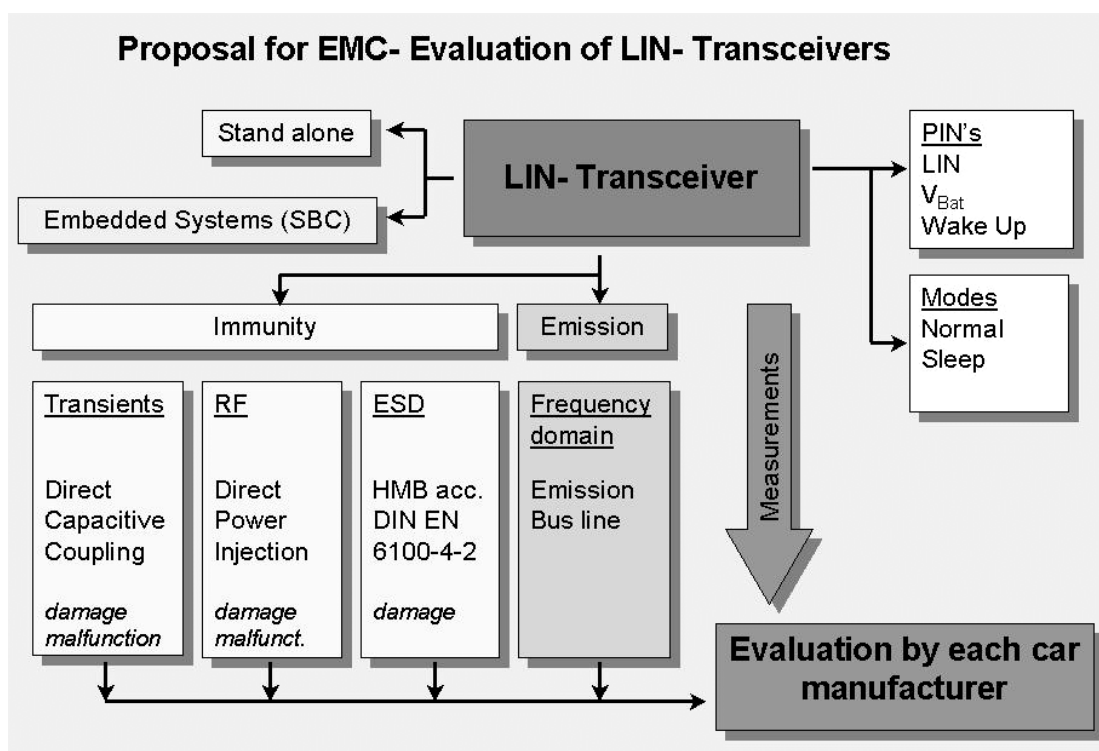


Fig. 3. Proposal for EMC- Evaluation of LIN- Transceivers

The final judgment of the tested device, whether if it can be released or not, is still to be decided by each car manufacturer.

#### 5. CONCLUSIONS

In case of ASIC's or SBC's with an integrated LIN-Transceiver, the test condition cannot be fixed in this stage for any type of IC. Therefore, if it is possible, apply the test conditions of standard stand alone LIN-Transceiver. The configuration of the physical layer of the LIN- Bus is fixed in any case. To connect the LIN- Transceiver to transmit and receive data, mode control (SPI) or inhibit (reset or interrupt outputs) use an adaptation according the application circuit of the semiconductor manufacture.

#### REFERENCES

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