EMI/EMC vs. Industry 4.0: a legislative and practical approach

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2018
Agenda

- Defining Terms
- Electronics and IOT – Paving the way for Industry 4.0
- The Interference of Things – is EMI/EMC getting enough consideration in South Africa
- Current Legislation
- Implementation of Testing
- Test Methods
- Conclusions
Defining Terms

- Electromagnetic Interference / Compatibility
  - Electromagnetic Compatibility (EMC): The correct operation of different equipment in a common electromagnetic environment.

- Electromagnetic Interference (EMI): Where one electromagnetic field interacts with another causing a distortion in both fields.

Figure 1: Electromagnetic radiation propagation into a circuit causing unwanted effects.
Defining Terms

- Internet of Things: a network of everyday devices with computing embedded, sending and receiving data via an internet connection

Multiple different devices across almost every industry

More than 20 wireless standards, plus proprietary protocols

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Industry 4.0: The fourth industrial revolution involving Industrial Internet of Things (IIoT) devices, cloud computing, and big data analytics

cyber-physical systems all in order to improve manufacturing
Electronics and IoT – Paving the way for Industry 4.0

- According to the IDC, the global cumulative annual growth rate (CAGR) for IoT is 14.40% between 2016 and 2021

- According to Statista, the South African CAGR is 19.95%
  - South Africa is growing faster than the world average when it comes to IoT
The Interference of Things – is EMI/EMC getting enough consideration in South Africa

Sources: Gartner, IDC, Strategy Analytics, Machina research, company filings, BII estimates
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Comparitive Interest (Search Query Hit Comparison - Google Trends)

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The Interference of Things – is EMI/EMC getting enough consideration in South Africa

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*does not include phones, tablets, laptops
MoU signed 30 March 2016 for changes regarding EMI/EMC on equipment entering SA market

CPA ➔ Consumers to receive goods that comply to standards

As a result of this MoU all non-telecommunication electronic equipment that fall under the mandate of ICASA are subjected to robust conformity assessment procedures to ensure that such products meet the quality requirements as stipulated in the South African National Standards (SANS)

SABS Engaged stakeholders regarding
- the costs of compliance
- economic and safety impact on South Africa due to non-compliance;
- the new processes;
- turn-around times to verify participating labs and issuing of CoCs
- penalties for non-compliance;
- declaration of all products currently in the South African market
- EMI/EMC skills in SABS

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As of 01 June 2017, a new program regarding EMC has been implemented. Manufacturers who are compelled to comply can download or request forms. A non-refundable certification fee of R16 000.00 is applicable. The current process will require manual submission of SABS EMC applications submitted directly to SABS. Testing of devices will be achieved through manufacturers' access to various accredited third-party laboratories that are authorized and competent to perform product tests. These laboratories will supply acceptable test results in respect of products that are compliant with the relevant South African National Standards (SANS).
Third party laboratories are verified through a separate SABS Laboratories verification process.

Should a manufacturer require testing services from an independent laboratory that is not SABS verified, the manufacturer can request that they apply for verification.

The certificate of compliance will be valid for a period of three (3) years calculated from the date of issue by the SABS.
Current Legislation

- Under no circumstances will SABS accept test reports from unverified laboratories and where products have not been physically tested (i.e., no conversion of manufactures’ tests reports will be accepted)

- Surveillance of products in the market will be conducted periodically, starting from 1 September 2017, the SABS and ICASA reserve all rights to take the necessary actions against laboratories and manufactures who are noncompliant
Current Legislation

- A manufacturer, being the holder of a certificate of compliance, will be required to pay a non-refundable annual fee to the amount of R 11 000.00

- SABS will ensure continuous assessment of the products that have been issued with the certificate of compliance

- If modifications warrant merit in re-testing the product, the applicable process will have a cost of R5 000.00
Current Legislation

- In the event that the products is manufactured at multiple factory sites, the manufacturer must indicate on the SABS EMC CoC application form the factory sites used for production. This will have a cost of R5 000.00 per factory registration.

- If the model name changes, manufacturers must indicate changes on CoC form, cost is R 5 000.00 cost per change.

- If manufacturer no longer wants to utilise CoC, or ceases to operate, they must inform the SABS by way of written notice, delivered by hand or registered mail to the head office of SABS.

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Current Legislation

- SABS annually publish certification and fees payable by manufacturers on their website, or by means of other public media

- Clarification directed to emc@sabs.co.za
Implementation of Testing

- Fully accredited compliance testing centres
  - Gerotek a division of Armscor
  - iSERT
  - ITC Services
  - 43 centres outside of South Africa

- Alternative options?
  - Pre-compliance
Implementation of Testing

- 60% of electronic designs are wirelessly enabled as of 2016
- Failing EMC late in the process will cause time-to-market delays—No one likes it, but everyone tests
- EMI test equipment is very expensive, most prefer a general purpose tool if it will do the job
- It’s a different discipline from the main job, so it’s unfamiliar to some
- Record keeping can be time consuming
- Troubleshooting is time-consuming, especially when tracking down transients
From a pre-compliance perspective, what we want to do is replace the very expensive EMI receiver with a signal analyzer or a spectrum analyzer.

- Careful!
  - Sub-ranging the span
    - Enough points?
  - Quasi-Peak and Average Detectors
    - Annoyance factor
  - Resolution Bandwidth
    - Narrow
  - Power vs Field Strength
    - System transducers, distance
  - Measurement dwell time
    - Zero-span
  - Pre-selection and overload
    - Software correction
Implementation of Testing

- Conducted Emissions
  - Unwanted signals coupled to AC mains
- Radiated Emissions
  - Unwanted signals broadcast from DUT
- Intentional Radiator (Wireless Device)
  - Spectrum Emission Mask
  - Power Limits
  - Harmonic Content
- Susceptibility/Immunity
  - Unwanted signals received by the DUT
Conducted Measurements

- Measurement receiver per CISPR 16-1-1:2015
  - EMI receiver, Spectrum Analyzer or FFT-based measuring instrument
- Software
- Line Impedance Stabilization Network (LISN)
  - Isolate DUT from mains
- Limiter
  - Front end protection for instrument
Conducted Measurements

- Utilize a metallic surface which can be grounded
- Line Impedance Stabilization Network (LISN)
- Pre-amp (Optional)
- Limiter (Optional)
- Make sure the instrument can accommodate gain/loss corrections
Radiated Measurements

- Measurement receiver per CISPR 16-1-1:2015
  - EMI receiver, Spectrum Analyzer or FFT-based measuring instrument
- EMI software
- RF Isolation
  - Characterized anechoic chamber
  - Open-air test site
- Turntable – 360°
- Antenna’s
Radiated Measurements

- Troubleshooting
  - Know frequencies of failure
  - Reduce amplitudes
  - Relative changes
  - Qualitative Measurements
  - Almost any antenna will work

- Pre-compliance
  - Duplicate test setup for compliance
  - Need actual values for pass / fail analysis
  - Quantitative Measurements
  - Calibrated antenna
Radiated Measurements

- Identify an area with natural RF shielding
  - Basements
  - Parking garages
- Watch out for DAS
  - Used to help cellular coverage
- Non metallic platform for DUT
- We need to look at 360° around DUT
- Tripod/pre-amp optional but recommended
Costs

- First Test: R16 000.00
- Modifications: R 5000.00
- Name Change: R 5 000.00
- New factory: R 5 000.00
- Annual Fee: R 11 000.00

- Spectrum Analyser from ~R 55 0000.00
Automated Scanning

- Aprel

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Conclusions

- EMC/EMI not enough attention
- Not enough labs in SA
- Real benefits too manufacturers in pre-compliance testing
- It’s only going to get busier
- There are many different solutions
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