



Excellence in Compliance Solutions

2.4 GHz Wireless Devices in Europe Big changes to ETSI EN 300 328 Coming in 2015




Presenter: Sam Wismer
Title: VP, Technology



Presenter: Kirby Munroe
Title: Director, Wireless Certifications






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Outline

- R&TTE Directive – An overview
- ETSI EN 300 328 – History and Future
- Technical Changes to v1.8.1
- Challenges of the New Standard
- How to prepare for the test lab visit
- What's coming with ETSI EN 300 328 beyond v1.8.1





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The R&TTE Directive


Essential Requirements

The Directive requires equipment to meet certain essential requirements before it is placed on the market in the European Union (EU). Equipment compliant with these essential requirements may be freely marketed anywhere in the EU*. The essential requirements are described in qualitative terms, which are:

- Protection of health and safety of the user and any other person, based on the protection requirements of the Low Voltage Directive 73/23/EEC (article 3.1a of the Directive)
- The essential requirements of the Electromagnetic Compatibility Directive (article 3.1b)
- Effective use of the radio spectrum/orbital resource so as to avoid harmful interference (article 3.2).

*There may be restrictions on the use of radio frequencies in individual countries.






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The R&TTE Directive

Essential Requirements

In order to meet the essential requirements, the R&TTE Directive relies on harmonized standards developed by the recognized European Standards Organizations. It is these Harmonized Standards which define technical characteristics needed to comply with the essential requirements.

ETSI EN 300 328 is a harmonized European standard under the R&TTE Directive.







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ETSI EN 300 328

Description and Scope

Description	Scope
<ul style="list-style-type: none"> • Harmonized standard which satisfies the essential requirement for effective use of the radio spectrum for wideband transmission systems • Specifically data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques 	<ul style="list-style-type: none"> • IEEE 802.11 (WIFI), Bluetooth, Zigbee™, etc. • Other equipment and technologies that use the 2.4 GHz ISM band such as proprietary wideband transmission systems and FHSS devices.






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ETSI EN 300 328


History of the Harmonized Standard

History	
<ul style="list-style-type: none"> • First published in 1994 • v1.6.1 was issued in 2004 and was very basic with respect to the technical requirements needed for compliance. It did not include requirements for spectrum sharing and relied on simple measurement techniques for determining compliance with other technical parameters. 	<ul style="list-style-type: none"> • v1.7.1 was released in 2006. This standard introduced improved, although still simple, measurement techniques for existing technical requirements and included additional technical requirements for frequency hopping equipment that had not been seen in previous versions. But the most notable inclusion was the requirement for medium access protocol. Medium access protocol is a mechanism designed to facilitate spectrum sharing with other devices in a wireless network.



ETSI EN 300 328


Problems with V1.7.1



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ETSI EN 300 328 v1.7.1 limitations:

- Did not provide test procedures for new technical requirements - No test related to the corresponding requirement;
- Requirements had to be complied with as a necessary condition for presumption of conformity;
- Not an issue for the new frequency hopping requirements as these could easily be declared based on the equipment technology.
- Conformance with these requirements could be claimed by an equivalent test or by manufacturer's declaration.
- Medium access protocol was not trivial.
 - Some manufacturers simply didn't understand what was necessary to meet this requirement
 - Others assumed it would be addressed in the transmission protocol.
 - Several notes were included in the Official Journal over the last few years indicating the mandatory status for compliance, medium access protocol was still being ignored.




ETSI EN 300 328

Transition to ETSI EN 300 328 v1.8.1




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v1.7.1 Deemed insufficient	v1.8.1 Overhaul
<ul style="list-style-type: none"> • Could not guarantee presumption of conformity with respect to spectrum sharing; • Could not fill the need for new, better defined and more precise test methods and requirements; 	<ul style="list-style-type: none"> • Complete overhaul from its predecessor; • Well defined spectrum sharing and usage requirements introduced with test methods; • Previously undefined test procedures for frequency hopping equipment were added as well as drastically revised, more complex test procedures for existing requirements.




Technical Changes in V1.8.1

Changes in Requirements and Test Methods




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RF Output Power	Duty Cycle, Tx-sequence, Tx-gap
<ul style="list-style-type: none"> • Revised more complex test procedure (No longer simple PM measurement) • Requires $\geq 1\text{MS/s}$ • Requires complex data processing for final results 	<ul style="list-style-type: none"> • New requirement • Not applicable to equipment with e.i.r.p < 10 mW or adaptive equipment • Requires complex data processing for final results




Technical Changes in V1.8.1

Changes in Requirements and Test Methods




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Power Spectral Density	Frequency hopping characteristics
<ul style="list-style-type: none"> • Revised more complex test procedure (No longer simple SA measurement) • Applies only to non-FHSS equipment • Requires complex data processing for final results 	<ul style="list-style-type: none"> • New test procedures and better defined limits • Dwell time, Minimum Frequency Occupation, Hopping Sequence and Hopping Frequency Separation




Technical Changes in V1.8.1

Changes in Requirements and Test Methods




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Medium Utilization (MU) factor	Adaptivity
<ul style="list-style-type: none"> • Measure to quantify the amount of resources (Power and Time) used by non-adaptive equipment; • Previously Medium Access Protocol; • Not applicable to equipment with e.i.r.p < 10 mW or adaptive equipment; • Includes Duty Cycle measurement in combination RF Output Power. 	<ul style="list-style-type: none"> • Mechanism by which equipment can adapt to its environment by identifying other transmissions present in the band; • Previously Medium Access Protocol; • Applies to equipment with e.i.r.p $\geq 10\text{ mW}$; • Covers FHSS and other types of Wide Band modulation (LBT / non-LBT Based). <ul style="list-style-type: none"> • Adaptive Frequency Hopping equipment using DAA; • Adaptive equipment using modulations other than FHSS.




Technical Changes in V1.8.1

Changes in Requirements and Test Methods



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Occupied Channel Bandwidth / Transmitter unwanted emissions in the out-of-band domain	Transmitter unwanted emissions in the spurious domain / Receiver spurious emissions
<ul style="list-style-type: none"> • Previously Frequency Range • Revised more complex test procedure • Combination of both required to show compliance 	<ul style="list-style-type: none"> • Revised test procedure (RBW/VBW/Etc.) • Limits for transmitters new




Technical Changes in V1.8.1

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Use of Test Modes

ETSI EN 300 328 v1.8.1 does not allow for the use of traditional test modes that were once so commonly relied upon.

- Measurements must be made in a realistic mode of operation;
- Typically can only be realized under normal operating conditions;
- Must still be able to provide some control to force the device into these "normal" modes;
- Normal modes of operation allow market surveillance authorities to perform testing without contacting the manufacturer to ask for special tools/software.




Technical Changes in V1.8.1

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Timeline

With new and revised test procedures, new test requirements and host of other changes it's easy to see why the transition from v1.7.1 to v1.8.1 is causing such a stir with manufacturers, integrators and test labs.

- Currently manufacturers can apply either EN 300 328 v1.7.1 or EN 300 328 v1.8.1;
- As of Jan. 1st 2015 v1.7.1 will no longer provide a presumption of conformity and v1.8.1 will be the sole harmonized standard;
- All products imported or offered for sale into the EU after this date must comply with v1.8.1.




Challenges of the New Standard

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For the Manufacturer

- Manufacturer's responsibility to ensure their products are capable of complying with the technical requirements;
- Can be properly configured for testing.
- Imperative that manufacturers become extremely familiar with ETSI EN 300 328 v1.8.1;
- Should source the appropriate and proven components;
- Must understand how to configure equipment for test since test modes are no longer allowed;
- Must provide instructions or accessory equipment for operation under worst case scenarios.




Challenges of the New Standard

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For the Test Lab

- Complete departure from v1.7.1;
- Must re-tool to acquire or develop specialized test systems which are capable of collecting, processing and analyzing data from several of the new complex test procedures;
- Test personnel must be intimately familiar with every aspect of the standard;
- Must also be intimately familiar with the various technologies in covered by the scope of the standard;
- Manufacturers in many cases do not fully understand even their own equipment's capabilities and rely on the test lab.




Preparing for the test lab visit

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More than ever before, being prepared for your lab visit will help ensure a smooth and trouble free experience

- Test sample should be capable of producing all available modes, modulations and data rates without the use of any traditional test modes;
- For example:
 - 802.11 - all data rates and bandwidths;
 - Bluetooth - all modes and packet types.
 - This includes classic BT, EDR, AFH, and low energy modes.
- Modes are sometimes not available to the user and may require a unique configuration or firmware to achieve;
- May be necessary to place your device in a network configuration.




Preparing for the test lab visit

Excellence in Compliance Solutions

More than ever before, being prepared for your lab visit will help ensure a smooth and trouble free experience

- Documentation must be provided to the test labs to understand the full functionality of the device;
- Often required as input variables to individual test suites;
- EN 300 328 v1.8.1 includes a checklist of necessary information to be supplied to test labs.;
- Checklist must be accurate and is included in the test report;
- Equipment submitted for test should be supplied with accessory equipment including cables, connectors and support equipment;
- Anything less can create delays in testing or produce non-representative results.



What's coming with EN 300 328 beyond v1.8.1

ETSI EN 300 328 v1.8.2



- Work has already begun on the next revision to EN 300 328;
- Draft version v1.8.2 released in April 2014;
- Final harmonized standard expected to be published in 2015 v1.9.1;
- Will provide some clarification of v1.8.1;
- Overall scope and essential requirements of the standard remain the same;
- Changes include new and revised definitions, modifications to limits and simplification or clarification of measurement methods;
- For frequency hopping equipment the definition for dwell time has been clarified and the test requirement renamed to accumulated transmit time.



What's coming with EN 300 328 beyond V1.8.1

ETSI EN 300 328 v1.8.2



- Minimum frequency occupation renamed as frequency occupation;
- Occupation probability is one of two options for compliance;
- Conformance with both accumulated transmit time and frequency occupation can be confirmed using statistical analysis by the manufacturer;
- Only applies in certain circumstances.



What's coming with EN 300 328 beyond V1.8.1

ETSI EN 300 328 v1.8.2



- Adaptivity conformance requirement for non-frequency hopping devices using LBT modified;
- Removed random variables 'R' and 'q' and the corresponding equations for calculating extended CCA time and channel occupancy time;
- Variables are very confusing;
- Replaced with fixed values or a range of fixed values to simplify the test methods.



What's coming with EN 300 328 beyond V1.8.1

ETSI EN 300 328 v1.8.2



- Revised transmitter unwanted emissions in the spurious domain and receiver spurious emissions requirements;
- V1.8.2 Clarifies the requirement for both conducted and radiated measurements;
- Test methods were modified and better defined:
 - Increased number of sweep points;
 - Use of a 3 dB (Gaussian) filter ;
 - Zero span video triggered measurement for time domain power.



What's coming with EN 300 328 beyond V1.8.1

ETSI EN 300 328 v1.8.2



- There are other changes, too numerous to detail;
- Put into place to help clarify the conformance requirements and test methods;
- Eliminates some of the questions and confusion already seen in v1.8.1.




What's coming with EN 300 328 beyond V1.8.1

ETSI EN 300 328 v1.10.1





- EN 300 328 v1.10.1 is already on the horizon;
- Not much is known about the content of v1.10.1;
- Assumed that it will provide further clarification and potentially new test methods.





Questions?






Speaker Biographies

Sam Wismer:

Sam understands the intense pressure manufacturers face and the obstacles they must surmount to bring their products to market; he's felt it himself. Sam joined ACS in 2001 as its first employee. He has 20 years experience in the industry to include both lab and manufacture experience. Sam plays an integral role in ACS's mission to remove barriers to compliance and ensure customers meet their objectives. In 1994, while earning his degree in Electronics Engineering at DeVry University, Sam started working for a small test lab where he gained an in-depth introduction to the EMC and compliance testing industry. Four years later, Sam moved to the manufacturing side. He joined LXE, which designs wireless computers and data collection solutions. Sam's responsibilities grew from testing for EMC and wireless compliance to securing necessary certifications for products in countries around the world. As Senior Regulatory Engineer, Sam led a staff of professionals dedicated to expediting the approval process and reducing the time to market.

swismer@acstestlab.com
www.acstestlab.com






Speaker Biographies

Kirby Munroe:

Nobody understands wireless technology like Kirby does. His fascination with the electromagnetic industry began at Florida Atlantic University, where he specialized in EMC, which quickly landed him a position as a compliance engineer at Motorola. Here Kirby was able to really sink his teeth into developing EMC and EMI testing at the ground level, and he advanced to senior compliance engineer, becoming a major figure in their EMC lab. In 2004, Kirby found ACS. With his help, ACS quickly became a TCB and developed its own Wireless Certification Department. With his knowledge and hands-on experience, Kirby manages ACS's radio device testing and deals with regulatory bodies worldwide, as one of ACS's most valuable experts in the field.

kmunroe@acstestlab.com
www.acstestlab.com

Company Information


ACS was founded in 2001 and now includes 5 locations. ACS is a fully accredited to ISO/IEC 17025 as a testing laboratory and ISO/IEC 17065 as a certification body.

ACS is:

- EMC (Commercial, Mil-Std and Aerospace), Product Safety, Wireless, ENERGY STAR® Testing Lab
- Designated FCC TCB and an Industry Canada CAB
- UL Recognized TPTDP
- TUV SUD CARAT
- IEC/IEEE Recognized ACTL for the CB Scheme
- ENERGY STAR® Certification Body

Atlanta, GA (HQ) 5015 B.U. Bowman Drive Buford, GA 30518 Phone: (770) 831-8048	Melbourne, FL 284 West Drive Suite B Melbourne, FL 32904 Phone: (321) 951-1710	Boca Raton 3998 N.W. 8th Avenue Suite #310 Boca Raton, FL 33431-0991 Phone: (561) 961-5585	Raleigh, NC 2220 Presidential Dr Suite #101 Durham, NC 27703 Phone: (404) 915-8445	Marietta, GA 1220 Kennestone Circle Suite #110 Marietta, GA 30066 Phone: (770) 570-0113
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