



Choose Scandinavian trust

Global Radio Testing: Strategies for bundling tests efficiently

Prepared by,
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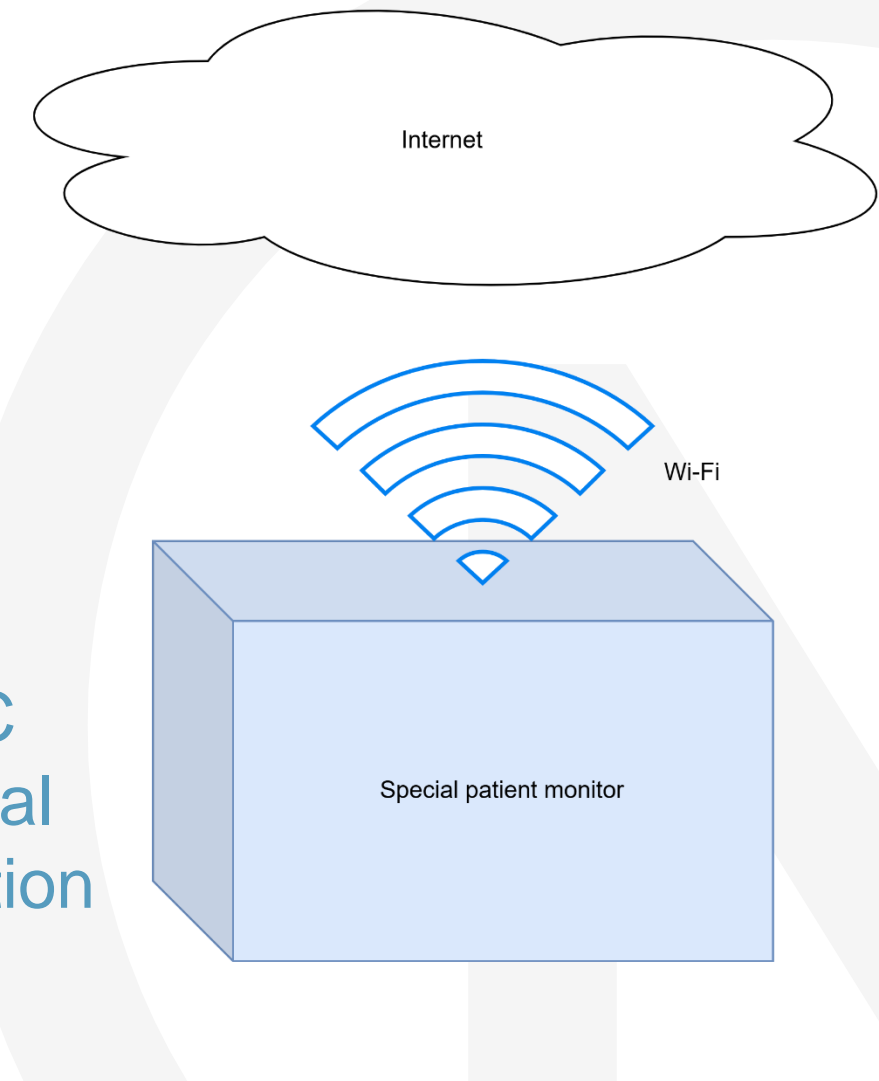
Introduction – Why do we do this regulatory testing?

- Limited Spectrum:
 - The radio frequency spectrum is a finite resource. Without regulation, different transmitters could interfere with each other, leading to communication breakdowns.
- Preventing Interference:
 - Regulation ensures that essential services like emergency communications, aviation, and military operations can function without interference from other signals.
- International Coordination:
 - Radio waves can travel long distances, crossing national borders. International regulations, such as those set by the International Telecommunication Union (ITU), help manage and coordinate the use of frequencies globally.
- Safety and Security:
 - Proper regulation helps prevent unauthorized use of frequencies that could disrupt critical infrastructure or pose security risks.

Case Study

- A manufacturer is developing a medical device that a patient wears to monitor some vital signs
 - Wi-Fi radio to transmit patient data to the cloud
- Intended markets:
 - USA, Canada, Mexico
 - EU
 - Australia, New Zealand
 - Japan, Korea, Taiwan, Indonesia, Vietnam

Just because it's a medical device (and exempt from FCC Part 15B, EU EMC Directive), because it has an intentional radiator, it still must go through wireless test and certification and RF exposure considerations!!



Transmitter details

Technology: Wi-Fi, IEEE 802.11x
Frequency band: 2400 – 2483.5 MHz

Country/Region	Standard/Regulation
USA	FCC Part 15.247
Canada	RSS-247
Mexico	NOM-208
EU	ETSI EN 300 328
Australia / New Zealand	AS/NZS 4268
Japan	Article 2, Paragraph 1-item 19 of certification ordinance
Korea	“Technical standards for wireless equipment for wireless stations that can be operated without reporting”, Article 7- clause 7
Taiwan	LP-0002 Clause 4.10
Indonesia	NOMOR 2 TAHUN 2019
Hong Kong	HKCA 1039
Vietnam	QCVN 54:2020/BTTTT

Standards

So that's a lot of different standards many of which are hard to find and/or not in English for your convenience.

47 CFR § 15.247 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

CFR



Innovation, Science and Economic Development Canada

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HKCA 1039
ISSUE 7
AUGUST 2024

RSS-247
Issue 3
August 2023

PERFORMANCE SPECIFICATION
FOR RADIOCOMMUNICATIONS APPARATUS
OPERATING IN THE 2.4 GHz OR 5 GHz BAND
AND EMPLOYING FREQUENCY HOPPING
OR DIGITAL MODULATION

Low Power 0002 (LP0002)
Date: 6 February 2024

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Telecom Technical Regulations
Test Requirements

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-

BỘ THÔNG TIN VÀ TRUYỀN THÔNG CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

Số: 35 /2020/TT-BTTTT Hà Nội, ngày 06 tháng 11 năm 2020

THÔNG TƯ

Ban hành “Quy chuẩn kỹ thuật quốc gia về thiết bị truyền dữ liệu
băng rộng hoạt động trong băng tần 2,4 GHz”

Căn cứ Luật Tiêu chuẩn và Quy chuẩn kỹ thuật ngày 29 tháng 6 năm 2006;

AS/NZS 4268:2017
(Incorporating Amendment No. 1)



Australian/New Zealand Standard™

Radio equipment and systems — Short
range devices — Limits and methods
of measurement

NORMA Oficial Mexicana NOM-208-SCFI-2016, Productos. Sistemas de radiocomunicación que emplean la técnica de espectro disperso-Equipos de radiocomunicación por salto de frecuencia y por modulación digital a operar en las bandas 902 MHz-928 MHz, 2400 MHz-2483.5 MHz y 5725 MHz-5850 MHz-Especificaciones y métodos de prueba.

Al margen un sello con el Escudo Nacional, que dice: Estados Unidos Mexicanos.- Secretaría de Economía.- Dirección General de Normas.

NORMA OFICIAL MEXICANA NOM-208-SCFI-2016 PRODUCTOS. SISTEMAS DE RADIOCOMUNICACIÓN QUE EMPLEAN LA TÉCNICA DE ESPECTRO DISPERSO - EQUIPOS DE RADIOCOMUNICACIÓN POR SALTO DE FRECUENCIA Y POR MODULACIÓN DIGITAL A OPERAR EN LAS BANDAS 902 MHZ - 928 MHZ, 2400 MHZ - 2483.5 MHZ Y 5725 MHZ -5850 MHZ - ESPECIFICACIONES Y MÉTODOS DE PRUEBA.

ALBERTO ULISES ESTEBAN MARINA, Director General de Normas y Presidente del Comité Consultivo Nacional de Normalización de la Secretaría de Economía (CONNASE), con fundamento en los artículos 34 fracciones II, XIII y XXXIII de la Ley Orgánica de la Administración Pública Federal; 4 de la Ley Federal de Procedimiento Administrativo, 39 fracción V, 40 fracción I, 46 y 47 fracción IV de la Ley Federal sobre Metrología y Normalización, 34 de su Reglamento y 22 fracciones I, IX, XII y XXV del Reglamento Interior de esta Secretaría.

ETSI EN 300 328 V2.2.2 (2019-07)

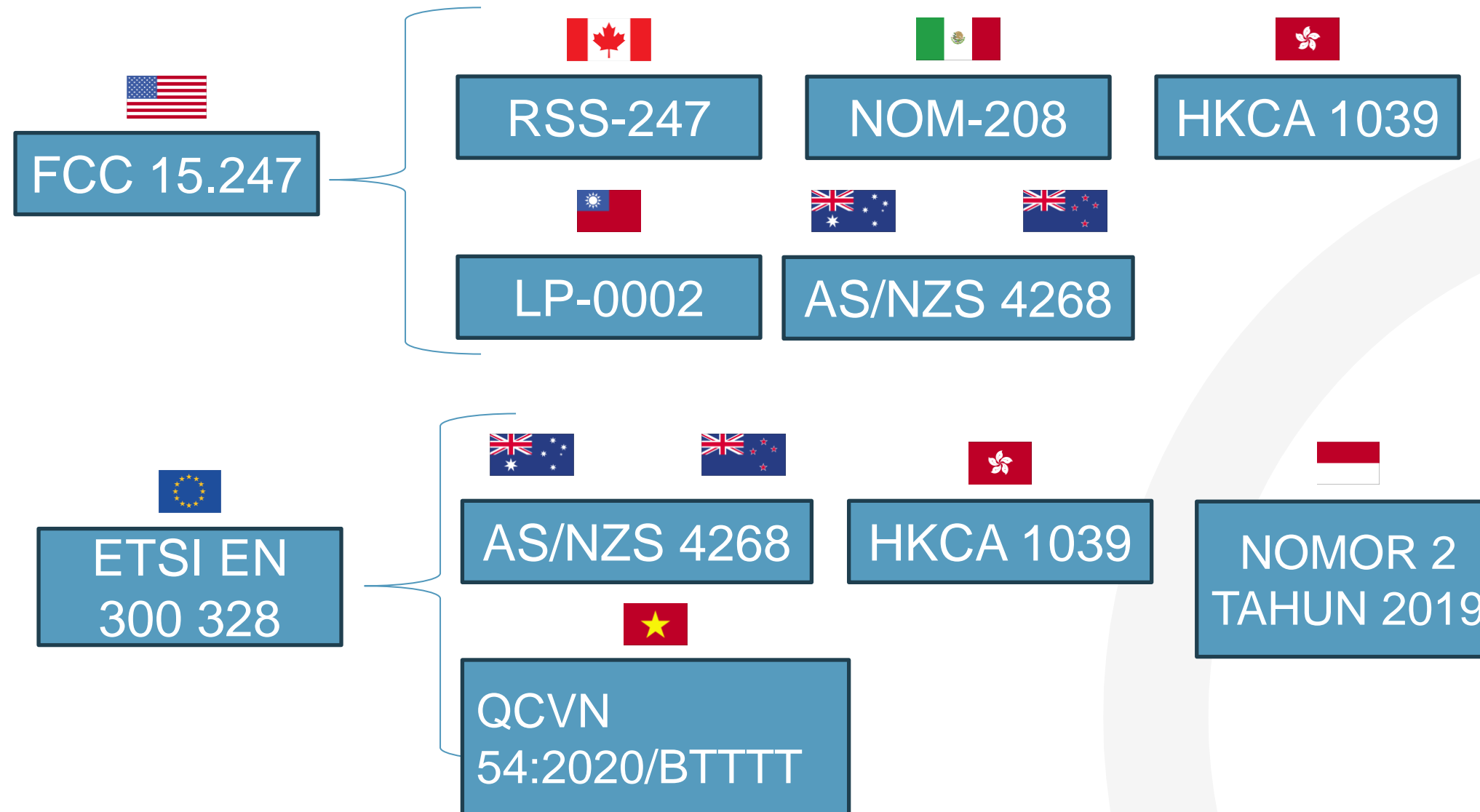


KEMENTERIAN KOMUNIKASI DAN INFORMATIKA
REPUBLIK INDONESIA

PERATURAN DIREKTUR JENDERAL SUMBER DAYA DAN PERANGKAT
POS DAN INFORMATIKA
NOMOR 2 TAHUN 2019
TENTANG
PERSYARATAN TEKNIS ALAT DAN/ATAU PERANGKAT TELEKOMUNIKASI
WIRELESS LOCAL AREA NETWORK

- **제1조(목적)** 이 고시는 「전파법」 제45조 및 「무선설비규칙」 제19조에 따라 신고하지 아니하고 개설했을 수 있는 무선국용 무선설비의 기술기준을 규정함을 목적으로 한다.
- **제2조(적용범위)** 이 고시에서 정하는 기술기준은 「전파법 시행령」 제25조제2호 및 제4호에 따라 신고하지 아니하고 개설했을 수 있는 무선국의 무선설비에 대하여 이를 적용한다. 다만, 이 고시의 무선설비는 다른 무선국에 유해한 혼신을 주지 않아야 하며, 다른 무선국에 의한 혼신으로부터 보호를 주장할 수 없다.
- **제3조(정의)** ① 이 고시에서 사용하는 용어의 정의는 다음과 같다.
1. "인접채널 누설전력"이란 변조된 신호의 전파발사로 인하여 기본파의 상하로 인접해 있는 채널의 필요주파수대역폭 내에 누설되는 전력을 말한다.
2. "유성신호"란 음성 또는 기타 음향을 전송하기 위하여 음성 또는 기타 음향에 따라 발생하는 직접적인 전기적 변화를 말한다.

Standards – Good news!



Standards – What about Korea and Japan



“Technical standards for wireless equipment for wireless stations that can be operated without reporting”, Article 7, Clause 7



Article 2, Paragraph 1-item 19 of certification ordinance

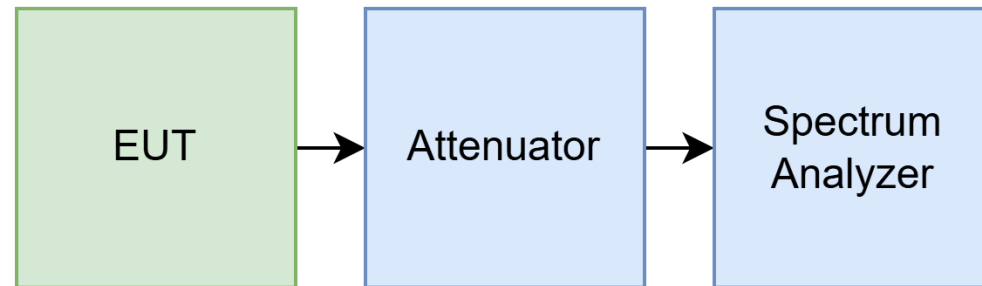
However: Testing is relatively quick – no “radiated” measurements, all measurements via coaxial connection to antenna port

Tests

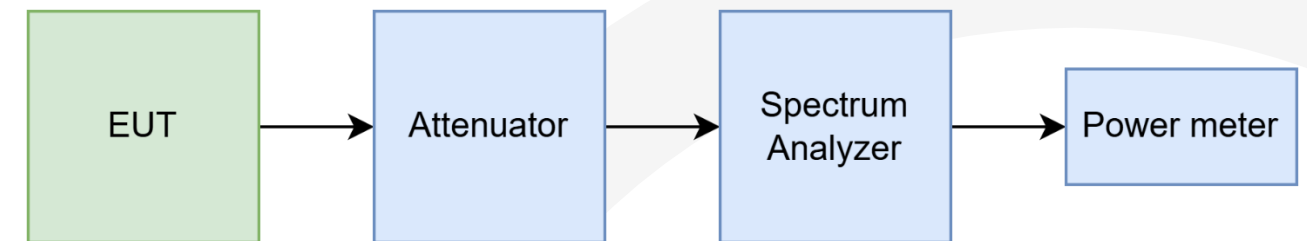
Test	“FCC”	“EU”	Korea	Japan
Output power	Conducted peak (or average) power	EIRP (power meter)	RMS dBm/MHz	mW/MHz, tolerance (*)
Power density	dBm/3kHz	dBm/MHz (*)	X	X
Bandwidth	6 dB	99%	99%	99%
TX spurious emissions	Conducted and radiated	Conducted and radiated	Conducted	Conducted
Adaptivity	X	Usually	X	X
Spectrum mask	“Band edge”	Yes (*)	X	X
RX emissions	X	Conducted and radiated	X	Conducted
RX blocking	X	Yes	X	X
Frequency error	X	X	Yes	Yes
Temperature variation	X	Yes (power)	Yes	X
Voltage variation	X	X	Yes	Yes
Humidity	X	X	Yes	X
Antenna restrictions	Peak gain	X	EIRP limited	EIRP limited

“Output power”

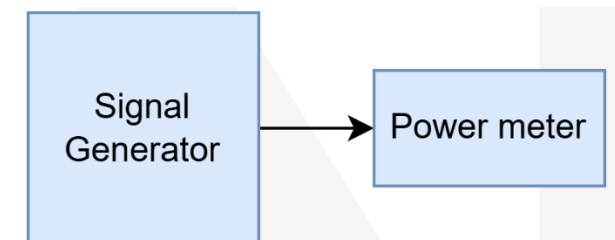
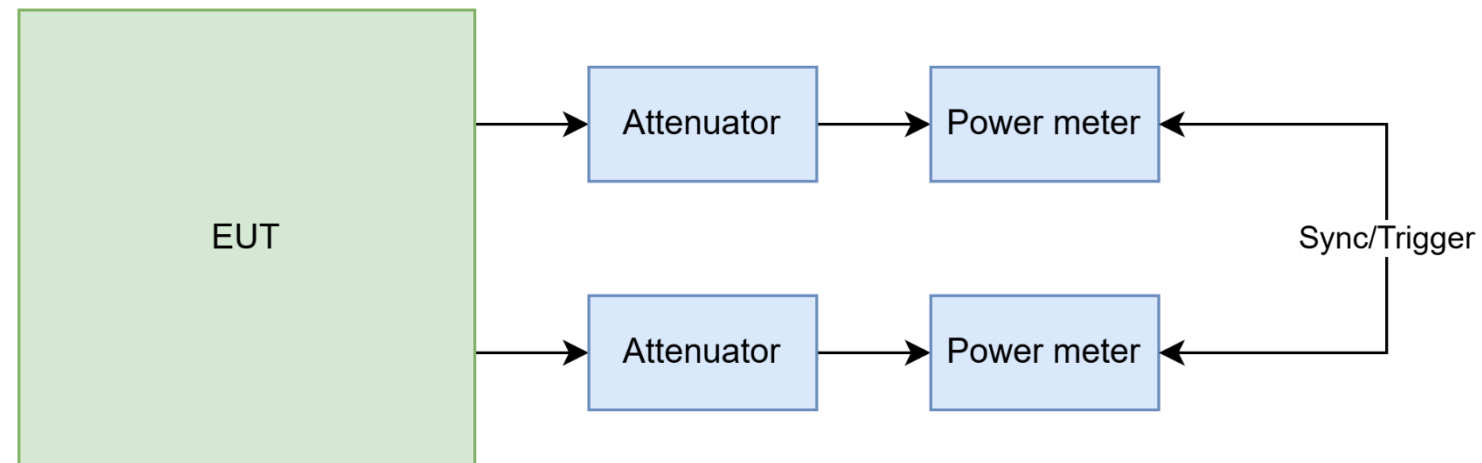
“FCC” and Korea



Japan



“EU”

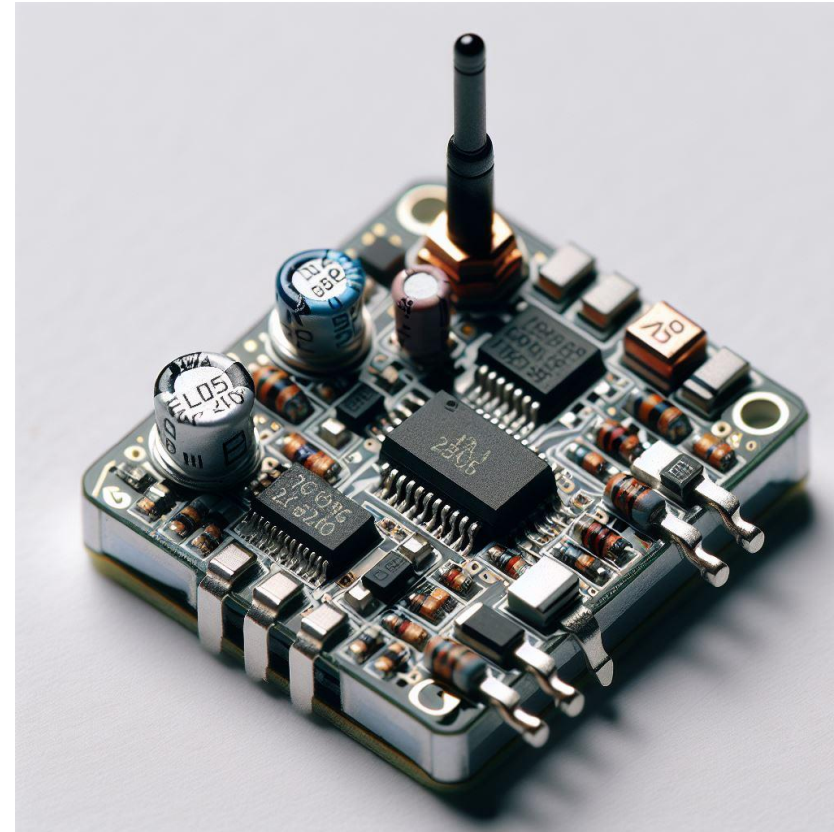


Pitfalls

- Operating voltage
- Frequency bands / permitted channels
 - Wi-Fi in 2.4 GHz for USA: Only Channels 1 (2412 MHz) through 11 (2462 MHz), other regions may permit Channel 12 or 13
 - 902-928 MHz is an open band in North/South America but not elsewhere (915-928 MHz)
 - Cellular bands different around the world
- Permitted transmitter power
 - Wi-Fi in 2.4 GHz for USA: 1 W conducted power, 4 W EIRP, for EU: 100 mW EIRP
- Radio EMC
 - EU RED directive mandates ETSI EN 301 489-x EMC testing
 - Korea has equivalent standards KS X 3124, etc.
 - But: radiated emissions in EN 301 489-x is done with transmitters off, Korean standards mandate radiated emissions with transmitter on!

Modules

But I bought an approved module you say!



Questions:

Is modular approval permitted in your target market? (Mexico for example does not recognize modular radio approvals)

Does that approval apply in your target market? (FCC approval is no good in Japan, etc.)

What does a CE-marked module actually mean? (Check the Declaration of Conformity)

Did you integrate the module per integration instructions? (What if you use a custom antenna?)

Are there multiple co-located transmitters in your product? (FCC mandates and RED recommends co-location testing)

What about SAR?

SAR and RF Exposure is generally regulated around the world.

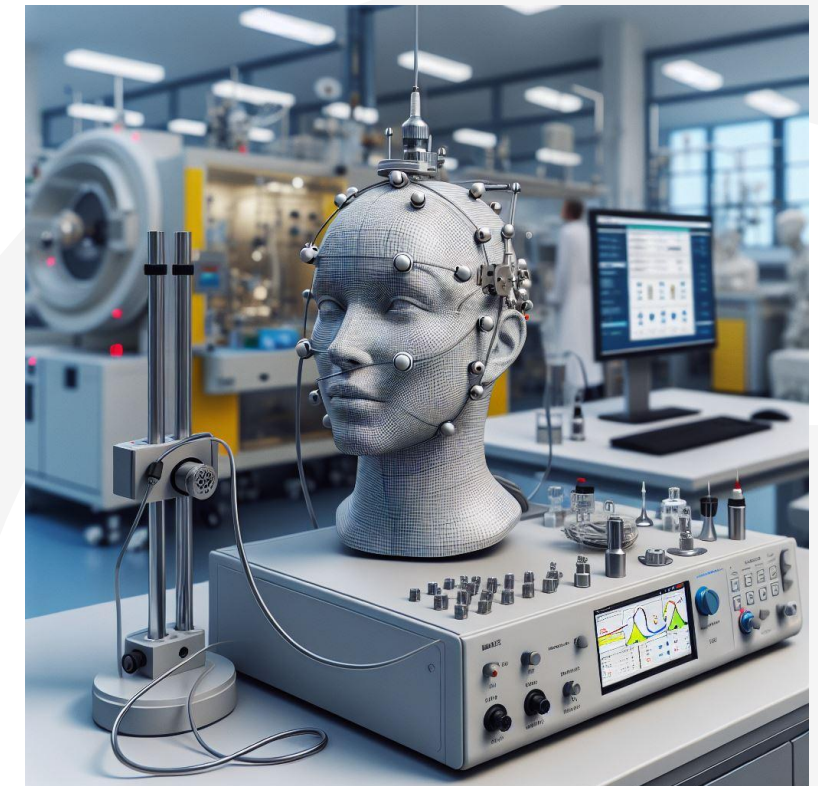
For the most part, unless your transmitters are relatively high power or operate near users (i.e., hand-held or body-worn), SAR testing is not required and compliance with national/regional exposure requirements can be demonstrated via calculation.

If you use an approved module, check the module certification (i.e., the FCC grant) for any restrictions on use with respect to RF Exposure. Many modules are certified for “mobile” use (> 20 cm from users). If your product is intended for “portable” use (< 20 cm from users), you will need to do some work:

CHID: Change of ID paperwork to create an FCC listing for the module in your own name

C2PC: A class 2 permissive change to change the classification of the module from mobile to portable

- this may trigger a requirement to perform SAR testing



Lessons and tips

Rule #1: Plan carefully and understand the different requirements for your target markets

Rule #2: Consider that because of different spectrum allocations, etc., you may need multiple SKU's of your product to address:

- Different frequency bands (i.e., cellular bands, 902-928 MHz or 915-928 MHz, etc.)

- Different permitted operating channels (i.e. Wi-Fi channels 12 and 13)

- Different permitted transmitter powers (i.e., Wi-Fi 1 W for USA/Canada, 100 mW for EU, etc.)

Rule #3: Scope out a test plan covering all target markets leveraging test results where possible

- For example, test data from an FCC 15.247 test regime can be “repurposed” into multiple test reports (RSS-247, LP-0002, NOM-208)

Rule #4: Choose approved modules carefully with a view to your target markets

Rule #5: Try to avoid “we’ll do {XXX market} later” where possible

Thank you!

