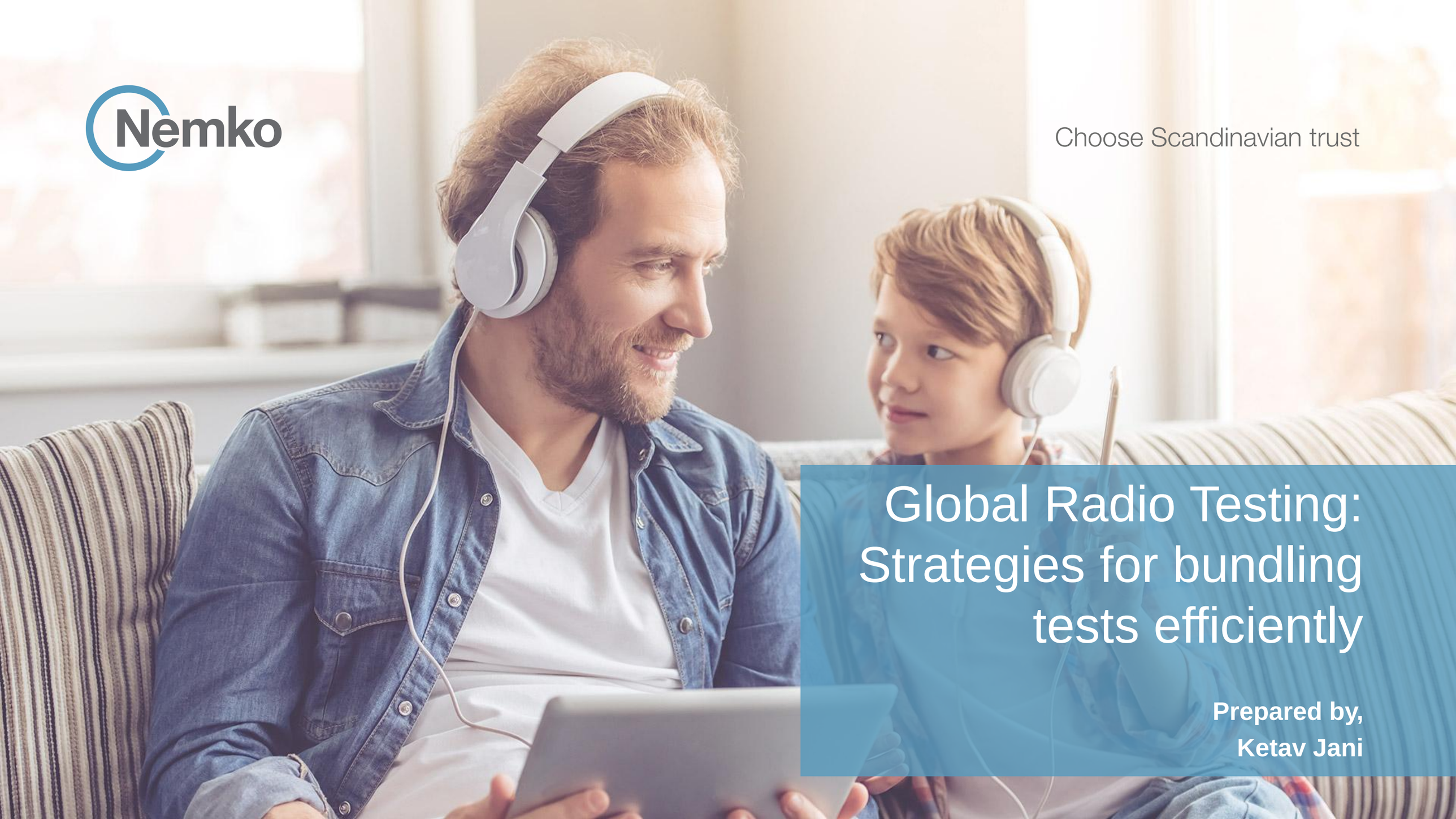


Nemko

Choose Scandinavian trust

Global Radio Testing: Strategies for bundling tests efficiently

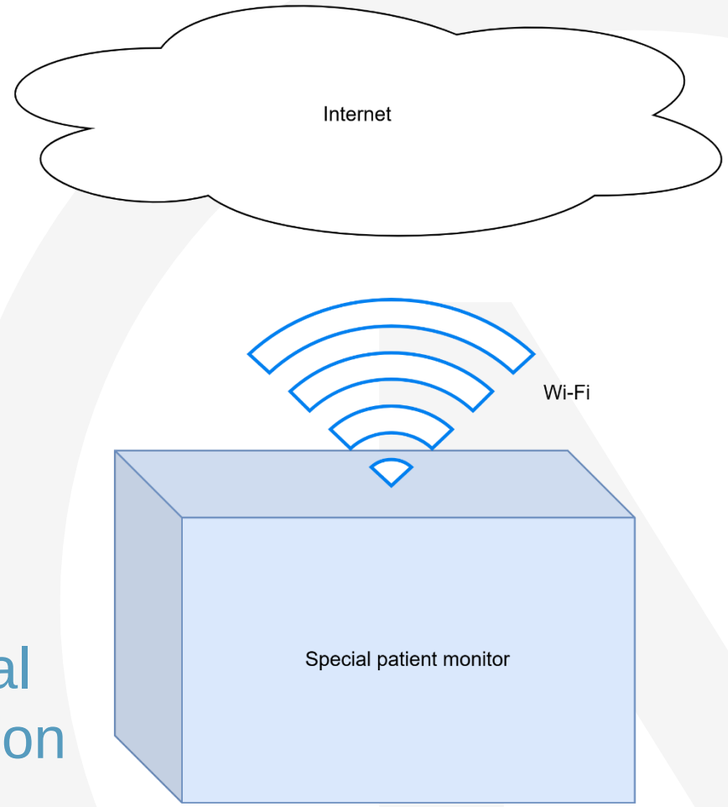
Prepared by,
Ketav Jani

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!!

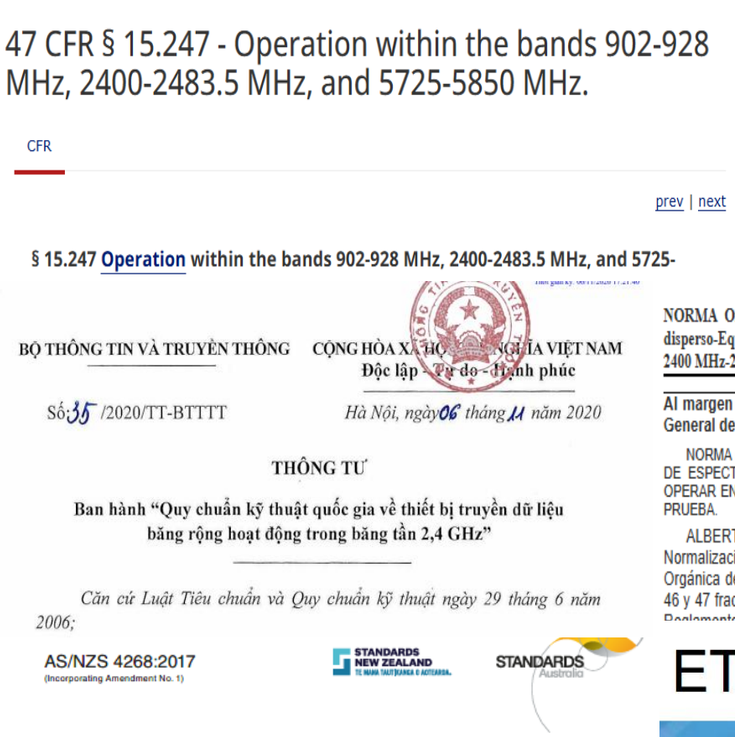
Transmitter details

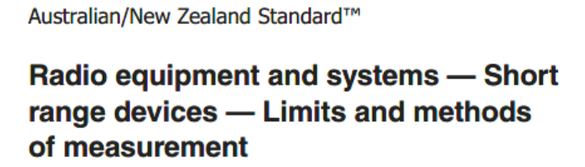
Technology: Wi-Fi, IEEE 802.11x
Frequency band: 2400 – 2483.5 MHz

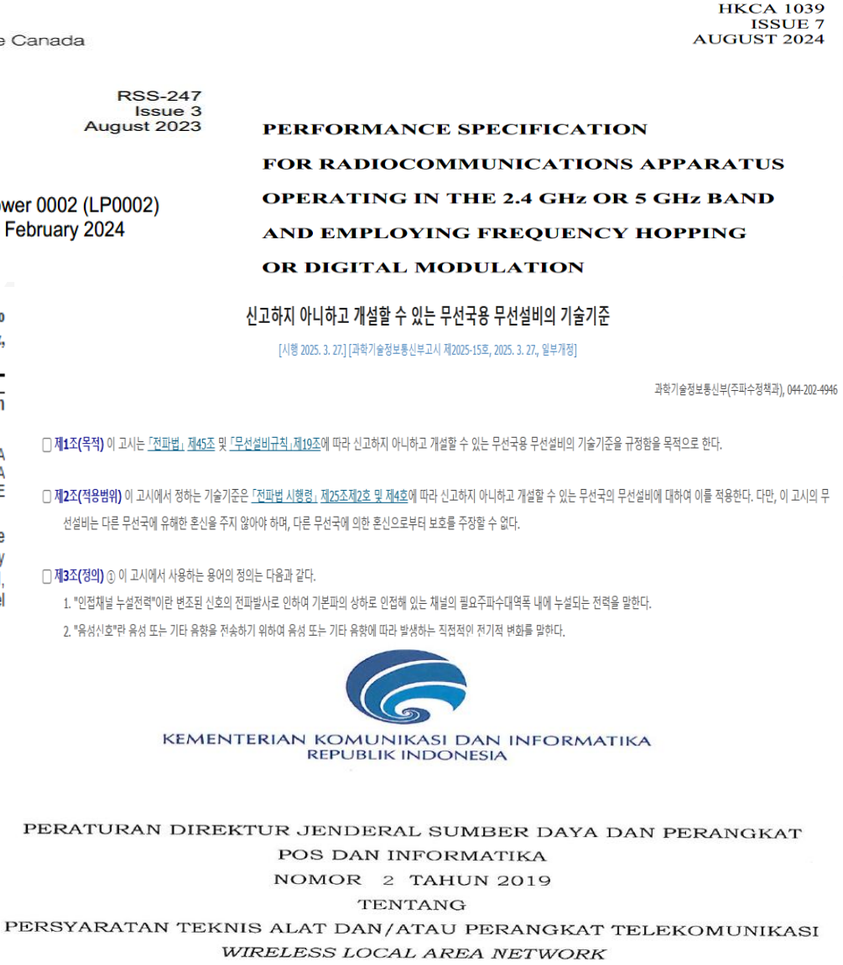
Country/Region	Standard/Regulation
USA	FCC Part 15.247
Canada	RSS-247
Mexico	NOM-208
EU	ETSI EN 300 328
Australia / New Zealand	AS/NZS 4268
Japan	Article 2, Paragraph 1-item 19 of certification ordinance
Korea	“Technical standards for wireless equipment for wireless stations that can be operated without 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

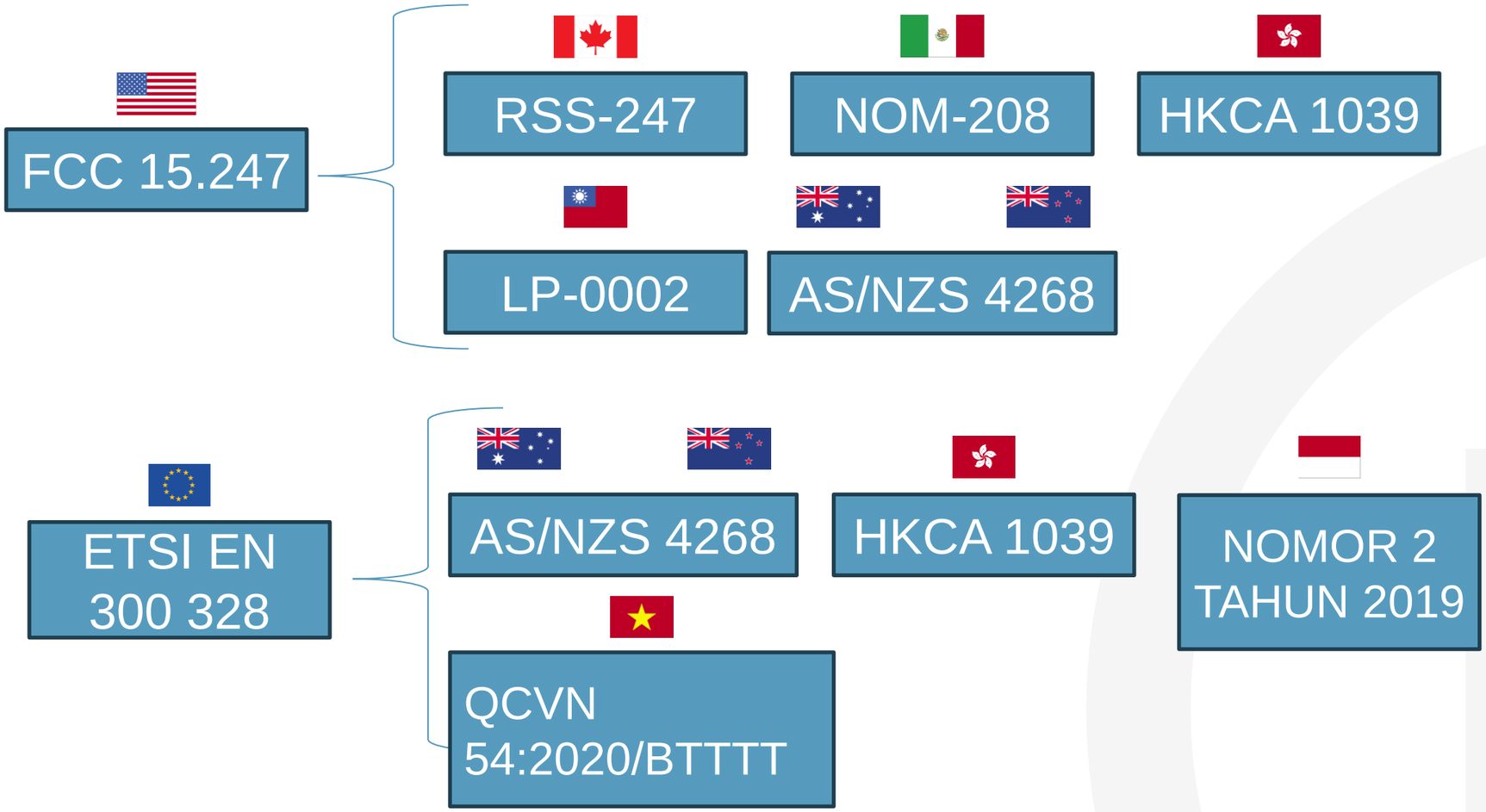
So that’s a lot of different standards many of which are hard to find and/or not in English for your convenience.



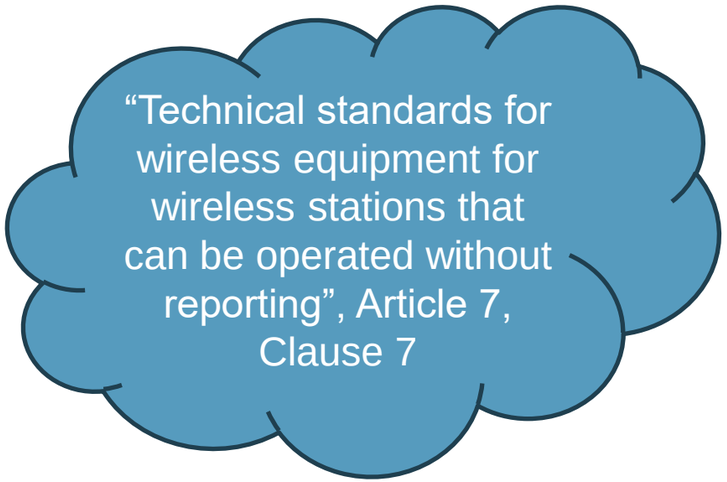


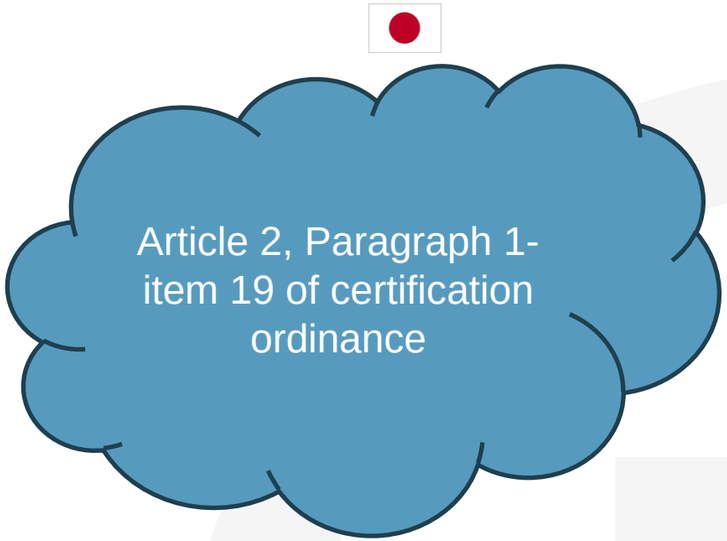


Standards – Good news!



Standards – What about Korea and Japan





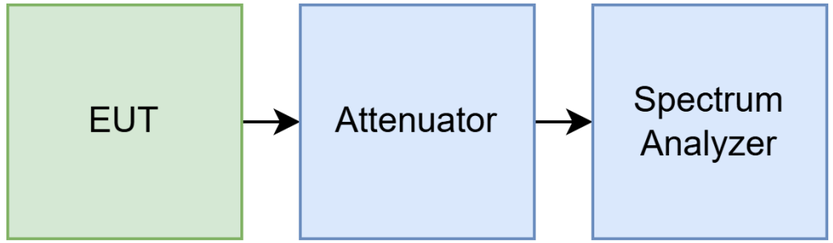
However: Testing is relatively quick – no “radiated” measurements, all measurements via coaxial connection to antenna port

Tests

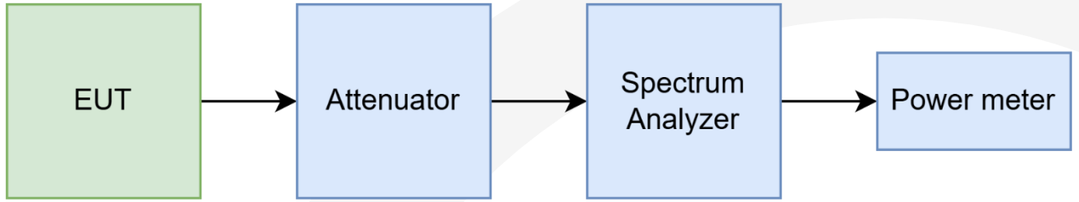
Test	“FCC”	“EU”	Korea	Japan
Output power	Conducted peak (or average) power	EIRP (power meter)	RMS dBm/MHz	mW/MHz, tolerance (*)
Power density	dBm/3kHz	dBm/MHz (*)	X	X
Bandwidth	6 dB	99%	99%	99%
TX spurious emissions	Conducted and radiated	Conducted and radiated	Conducted	Conducted
Adaptivity	X	Usually	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”

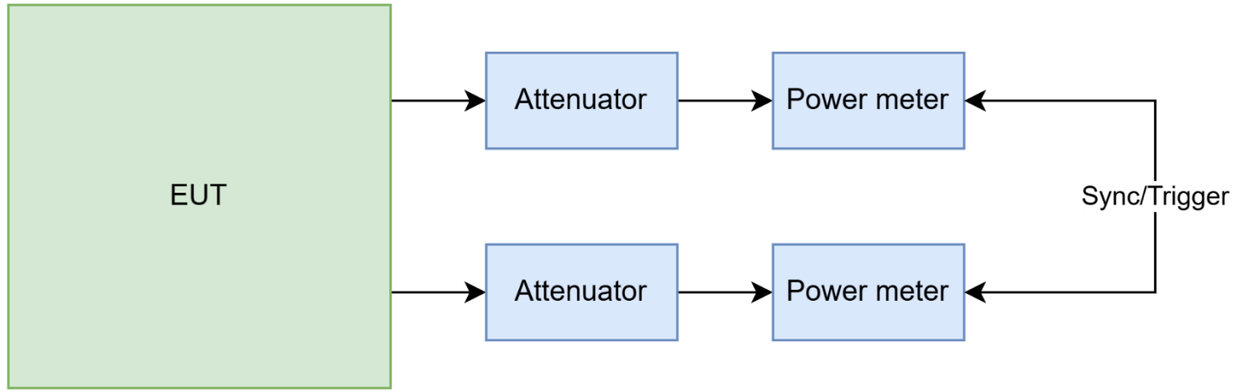
“FCC” and Korea

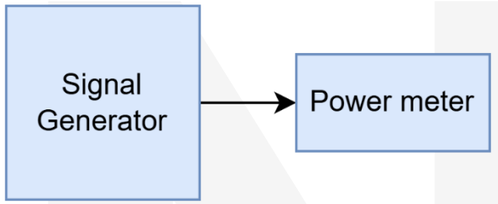


Japan



“EU”



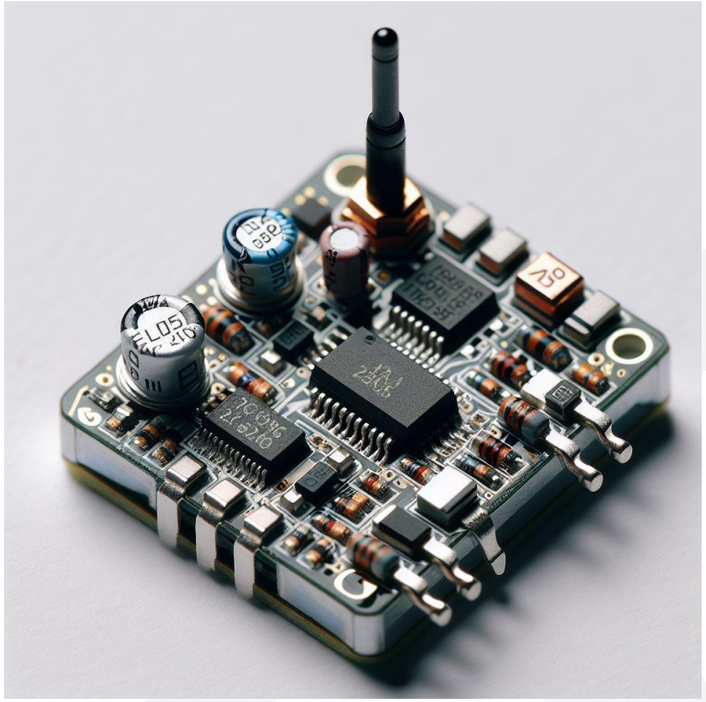


Pitfalls

- 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.

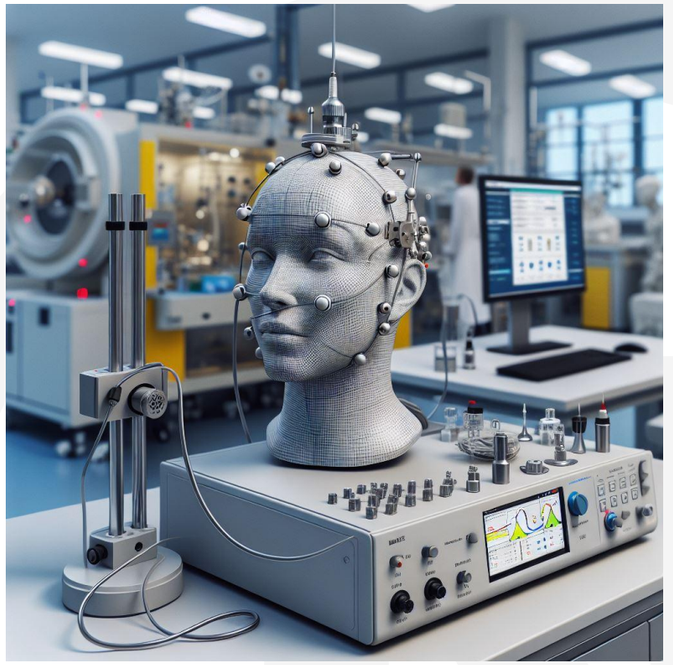
For the most part, unless your transmitters are relatively high power or operate near users (i.e., hand-held or body-worn), SAR testing is not required and compliance with national/regional exposure requirements can be demonstrated via calculation.

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!