
**IEEE P802.11
Wireless LANs**

Interpretation Response 2-09/03

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Interpretation Number: 2-09/03 (Maximum transmit power level in Country information element)

Topic: Maximum transmit power level in Country information element

Relevant Clauses: 7.3.2.9

Classification: unambiguous

Interpretation Request (part 1)

The phrase "...maximum power...allowed to be transmitted" is ambiguous.
The most likely interpretations include:

- 1 TPO (Transmitter Power Output)
- 2 EIRP (Effective Isotropically Radiated Power)

Unfortunately, different administrations have regulations that are based on either TPO (e.g. FCC) or EIRP (e.g. ETSI), and in such a way that they cannot always be converted into one another. E.g. the FCC specifies a maximum TPO and allows up to 6dBi antenna gain. Above 6dBi the TPO should be reduced dB for dB, except for point-to-point links, where a higher antenna gain is allowed and less reduction is to be applied. This cannot be converted to an equivalent EIRP limit. ETSI specifies a plain EIRP limit. What is the interpretation of the Maximum Transmit Power Level field?

Interpretation for IEEE STD 802.11-1999 (reaffirmed 2003) (part 1)

The interpretation of a value in the Maximum Transmit Power Level field of a Country information element does not need be expressed as TPO, EIRP, or any other particular means of measurement. The interpretation is defined by the regulations of the country identified in the Country String of the same information element. Assuming the examples provided by the requester are correct, this would mean that a value in the Maximum Transmit Power Level field of a Country information element with a Country String value of "US" would be interpreted as a measure of the TPO of the device, whereas a value in an information element where the value of the Country String is "NL" would be interpreted as a measure of the EIRP of the device.

Interpretation Request (part 2)

Apart from a limit on radiated power, the regulations usually contain a PSD (Power Spectral Density) limit. In some domains, the PSD limit is more strict than the TPO/EIRP limit and thus further limits the transmitted power.

Example: The EIRP limit under ETSI regulations in the 5150-5350 MHz band is 200mW, but the PSD limit is 10mW/MHz EIRP. Since an OFDM signal has a bandwidth of 16MHz, the EIRP is further limited to approximately 160mW.

Should, in this case, the Maximum Transmit Power Level field be set to 200mW or 160mW?

If the interpretation is plain EIRP, the station will exceed PSD limits for certain countries, since the PSD limit is not part of the country information elements. How should in that case the PSD limit be derived?

If the interpretation is to take the PSD limit into account in the Maximum Transmit Power Level, we have to integrate the PSD over the signal bandwidth to convert to total power. However, there is a problem in the 2.4GHz band, since the spectral shape for DSSS/CCK is not accurately defined, so that the conversion factor may depend on the transmitter filter implementation (and thus may vary for each client STA). What conversion factor should be used in that case?

Interpretation for IEEE STD 802.11-1999 (reaffirmed 2003) (part 2)

The information in the Country information element provides an indication of the regulatory domain and the requirements of that domain. It is not expected that the information in the information element is sufficient to configure all of the parameters of a device to comply with the regulations in effect in the regulatory domain. The value of the Maximum Transmit Power Level is to contain the value specified in the regulations of the particular regulatory domain identified by the value of the Country String. It is up to each manufacturer to use the information in the Country information element, along with local configuration information, such as a power backoff value, to configure a device for operation that is compliant with the local regulations where the device is operating.

Interpretation Request (part 3)

The Country Information Element does not indicate whether a particular subband has indoor/outdoor restrictions. How should this information be derived?

Interpretation for IEEE STD 802.11-1999 (reaffirmed 2003) (part 3)

The Country information element provides, as part of the Country String, an indication as to whether the bands described in the information element are utilizing regulations that are differentiated for indoor and outdoor operation. While an access point or station may be sending a Beacon or Probe Response containing a Country information element

that does not match the location of the receiver, i.e., an access point that is indoors might be received outdoors, it is expected that the receiver will utilize the information in the Country String and determine its local configuration based on that information. There is no mechanism specified in the standard to convey both indoor and outdoor information for a single band or to describe one or more subbands for indoor operation and one or more other subbands for outdoor operation.