Proposal for 802.16t channel models

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A proposal is to utilize or maintain the same propagation delay-spread characteristics for channel models as the radio propagation models defined in TETRA standard, ETSI EN 300 392-2 [1], Section 6.8.3. The channel model information included for reference in tables below. RICE refers to Rician fading distribution with K = 1 and CLASS is Rayleigh fading distribution with classic Jake’s spectrum.

These TETRA models are simplified delay-line models, which do not provide propagation characteristics such as signal attenuation, blocking, time-varying Doppler characteristics, or spatial characteristics of the radio channel. The TETRA models also represent a relatively narrow-band system/channel, which is obvious from the small number of delay taps. In case some of these factors become limitations, a recommended alternative would be to utilize a wider bandwidth spatial 3GPP channel model [2]. This 3GPP model specifies tap delays as normalized relative numbers and introduces a process to scale the models for a particular RMS delay spread. A proposal is to use the same RMS delay spread values with the 3GPP model as the TETRA models represent, in Table 3.

In terms of Doppler, it is important to capture the agreed maximum supported remote radio speed relative to the base station of 250 mph (400 km/h). For rail industry, it is also important to support the typical “restricted” locomotive speed of 25 mph (40 km/h).

Table 1. 2-tap propagation models in ETSI EN 300 392-2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Propagation model | Tap number | Relative delay (us) | Average relative power (dB) | Tap-gain process |
| Rural Area (RAx) | 1 | 0 | 0 | RICE |
| Typical Urban (TUx) | 1 | 0 | 0 | CLASS |
| 2 | 5 | -22.3 | CLASS |
| Bad Urban (BUx) | 1 | 0 | 0 | CLASS |
| 2 | 5 | -3.0 | CLASS |
| Hilly Terrain (HTx) | 1 | 0 | 0 | CLASS |
| 2 | 15 | -8.6 | CLASS |

Table 2. 6-tap propagation models in ETSI EN 300 392-2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Propagation model | Tap number | Relative delay (us) | Average relative power (dB) | Tap-gain process |
| Typical Urban (TUx) | 1 | 0 | -3.0 | CLASS |
| 2 | 0.2 | 0 | CLASS |
| 3 | 0.6 | -2.0 | CLASS |
| 4 | 1.6 | -6.0 | CLASS |
| 5 | 2.4 | -8.0 | CLASS |
| 6 | 5.0 | -10.0 | CLASS |
| Hilly Terrain (HTx) | 1 | 0 | 0.0 | CLASS |
| 2 | 0.2 | -2.0 | CLASS |
| 3 | 0.4 | -4.0 | CLASS |
| 4 | 0.6 | -7.0 | CLASS |
| 5 | 15.0 | -6.0 | CLASS |
| 6 | 17.2 | -12.0 | CLASS |

Table . Delay spread characteristics of the propagation models in ETSI EN 300 392-2

|  |  |  |  |
| --- | --- | --- | --- |
| Propagation model | Number of taps | Mean delay spread [us] | RMS delay spread [us] |
| Rural Area (RAx) | 1 | 0 | 0 |
| Typical Urban (TUx) | 2 | 0.029 | 0.38 |
| 6 | 0.70 | 1.1 |
| Bad Urban (BUx) | 2 | 1.7 | 2.4 |
| Hilly Terrain (HTx) | 2 | 1.8 | 4.9 |
| 6 | 2.1 | 5.0 |

# References

1. Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI), ETSI EN 300 392-2 V3.8.1 (2016-08)
2. 5G; Study on channel model for frequencies from 0.5 to 100 GHz, 3GPP TR 38.901 version 14.3.0 Release 14