Shin-en2 Telemetry Signal Power at 5000-Mm Distance

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(1) Calculation Parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Item | Unit | UHF-Down | Comment |
| WSJT |
| （1） | Transmission frequency | MHｚ | 437 | 　 |
| （2） | Transmission power | ｄBm | 29.0 | 0.8W |
| （3） | Transmitter feeder loss | ｄB | 0.5 | 　 |
| （4） | Transmitter antenna gain | ｄBi | 0.0 | 　 |
| （5） | EIRP | ｄBm | 28.5 | =(2)-(3)+(4) |
| （6） | Polarization loss | ｄB | 3.0 | 　 |
| （7） | Communication distance | km | 5,500,000 | 　 |
| （9） | Transmission loss in free space | dB | 220.0 | =32.4+20log(f[MHz]) +20log(d[km]) |
| (10) | Ionospheric absorption loss | dB | 0.5 | 　 |
| （11） | Rainfall loss | dB | 1.0 | 　 |
| （12） | Antenna pointing loss | dB | 0.2 | 　 |
| （13） | Receiver antenna gain | dBi | 35.0 | 　 |
| （14） | Receiver feeder loss | dB | 1.0 | 　 |
| （15） | Receiver input signal power | ｄBm | -161.7 | =(5)-(6)-(9)-(10)-(11)-(12)+(13)-(14) |
| (16) | Receiver noise power density | dBm/Hz | -164.8 | -123 dBm(Typ)@3kHz |

(2) Distance [km] vs. Receiver Input Signal Power [dBm]

Receiver Antenna gain = 35 dBm

|  |  |  |
| --- | --- | --- |
| Commun. Distance | Trans. loss in free space | Receiver Input Power |
| km | dB | dBm |
| 1,000,000 | 205.2 | -147 |
| 2,000,000 | 211.2 | -153 |
| 3,000,000 | 214.8 | -157 |
| 4,000,000 | 217.3 | -159 |
| 5,000,000 | 219.2 | -161 |
| 6,000,000 | 220.8 | -163 |
| 7,000,000 | 222.1 | -164 |
| 8,000,000 | 223.3 | -165 |
| 9,000,000 | 224.3 | -166 |
| 10,000,000 | 225.2 | -167 |

Receiver Antenna gain = 40 dBm

|  |  |  |
| --- | --- | --- |
| Commun. Distance | Trans. loss in free space | Receiver Input Power |
| km | dB | dBm |
| 1,000,000 | 205.2 | -142 |
| 2,000,000 | 211.2 | -148 |
| 3,000,000 | 214.8 | -152 |
| 4,000,000 | 217.3 | -154 |
| 5,000,000 | 219.2 | -156 |
| 6,000,000 | 220.8 | -158 |
| 7,000,000 | 222.1 | -159 |
| 8,000,000 | 223.3 | -160 |
| 9,000,000 | 224.3 | -161 |
| 10,000,000 | 225.2 | -162 |

（３）Distance [km] vs. Flux Density [dBm/m2]

|  |  |  |
| --- | --- | --- |
| Distance | Flux | Flux |
| km | W/m^2 | dBm/m^2 |
| 1,000,000  | 5.63E-20 | -162 |
| 2,000,000  | 1.41E-20 | -169 |
| 3,000,000  | 6.26E-21 | -172 |
| 4,000,000  | 3.52E-21 | -175 |
| 5,000,000  | 2.25E-21 | -176 |
| 6,000,000  | 1.56E-21 | -178 |
| 7,000,000  | 1.15E-21 | -179 |
| 8,000,000  | 8.80E-22 | -181 |
| 9,000,000  | 6.96E-22 | -182 |
| 10,000,000  | 5.63E-22 | -182 |