



Dynamic Sciences International, Inc.

Application Note

DSI-600 EMI TEST MEASUREMENT RECEIVER SYSTEM

Subject: Cable Loss

Application Note No. 4.0

DSI Application Note

Cable Loss of the DSI-600-40 Receiver

The sensitivity of the Receiver DSI-600-40 is -130dBm @ 1KHz BW @ 18 GHz and -124 dBm at 40GHz .

With a typical horn antenna having an antenna factor of 44 dB/m @ 18 GHz and 47.7 dB/m at 40 GHz , the system can measure a field of $57\text{dB}\mu\text{V/m}$ @ 18 GHz and $67\text{ dB}\mu\text{V/m}$ @ 40 GHz with a bandwidth of 200 KHz .

This provides a margin of 13 dB below the MIL-STD-461E RE102 test limit for aircraft.

(See below for details of the calculation of universal values)

The cable loss must be less than 7 dB at the frequency of measurement, to meet the requirements of MIL-STD461E.

The selection of cable types and lengths is up to the user of the system

Calculation Details

$P = V^2/R$ Power at the receiver input

$P(\text{dBm}) = V(\text{dBV}) - 20 \lg 50 \text{ Ohms} - V(\text{dBV}) - 17$

$P(\text{dBm}) = V(\text{dBV}) - 17 + 30$

$P(\text{dBm}) = V(\text{dB}\mu\text{V}) - 120 - 17 + 30 = V(\text{dB}\mu\text{V}) - 107$

$E(\text{dB}\mu\text{V/m}) = V(\text{dB}\mu\text{V}) + \text{AF}(\text{dB/m}) = \text{Measured electric field}$

$V = E - \text{AF}$

$P(\text{dBm}) = E(\text{dB}\mu\text{V/m}) - \text{AF}(\text{dB/m}) - 107 - \text{cable loss}(\text{dB}) = \text{power input}$

Measurable Field: $E(\text{dB}\mu\text{V}) = P(\text{dBm}) + \text{AF}(\text{dB/m}) + 107 + \text{cable loss}$

Receiver Sensitivity: $P(\text{dBm}) = -130\text{dBm}$ @ 18GHz @ 1KHz BW = -84dBm @ 200kHz BW

$P(\text{dBm}) = -124\text{dBm}$ @ 40GHz @ 1KHz BW = -88dBm @ 200kHz BW

Antenna Factor: AF (EMCO model 3116) 44.0 dB/m @ 18GHz

47.7 dB/m @ 40GHz

MIL-STD-461E, RE102, Aircraft Radiated Emissions

Spec Limit: $E = +69.9\text{dB}\mu\text{V/m}$ @ 18GHz , Extrapolated

$+79.9\text{dB}\mu\text{V/m}$ @ 40GHz , Extrapolated

Cable Loss of the DSI-600-40 Receiver

Measurable Field E min (dB μ v/m)

$$= -94+44+107=57\text{dB}\mu\text{V/m @ 18GHz}$$

$$= -88+47.7+107=67\text{dB}\mu\text{V/m @ 40GHz}$$

Hence, there is a 13dB Margin between the spec and system sensitivity.