EMC-1. Convert the following voltages in units of V into units of dBmV and dBμV: (a.) 31 mV (b.) 1 mV (c.) 582 μV (d.) 0.24 μV [Answer: (a.) 29.83 dBmV, 89.83 dBμV (b.) 0 dBmV, 60 dBμV (c.) −4.70 dBmV, 55.30 dBμV (d.) −72.40 dBmV, −12.40 dBμV]

EMC-2. Convert the following voltages in units of dBmV and dBμV into units of V: (a.) −0.76 dBμV (b.) 49.55 dBμV (c.) −18.34 dBmV (d.) 4.27 dBmV [Answer: (a.) 916 nV (b.) 300 μV (c.) 121 μV (d.) 1.63 mV]

EMC-3. Assuming the voltages given in EMC-1 are across a 50 Ω load, determine the power delivered to the load in dBm. [Answer: (a.) −17.16 dBm (b.) −46.99 dBm (c.) −51.69 dBm (d.) −119.39 dBm]

EMC-4. A 100 MHz 50 Ω source is connected to a 50 Ω receiver through 35 m of RG-58U (50 Ω) coaxial cable. The receiver indicates an input power level of −12 dBm at 100 MHz. Determine the source output voltage (dBμV) and output power (dBm) if the cable loss is 4.5 dB/100 ft at 100 MHz. [Answer: 100.16 dBμV, −6.83 dBm]

EMC-5. Given the same system as defined in EMC-4, if the output power of the source is set to 10 dBm at 100 MHz, determine the receiver input voltage (dBμV) and input power (dBm). [Answer: 111.8 dBμV, 4.83 dBm]

EMC-6. Determine the current levels (dBμA) associated with the FCC/CISPR Class B conducted emissions limits over the frequency range of 0.15-30 MHz. [Answer: 0.15-0.5 MHz: 22-12 dBμA, 0.5-5 MHz: 12 dBμA, 0.5-30 MHz: 16 dBμA]

EMC-7. Determine the FCC Class A radiated emission limits for measurements made from 30 MHz to 1 GHz with a separation distance of 25 ft. between the DUT and the measurement antenna. [Answer: 30-88 MHz: 41.5 dBμV/m, 88-216 MHz: 45.9 dBμV/m, 216-960 MHz: 48.8 dBμV/m, 960-1000 MHz: 51.9 dBμV/m]

EMC-8 A DUT radiates an electric field of 36 dBμV/m at 100 MHz when measured at a distance of 30 ft. from the DUT. Determine the emission level in dBμV/m at a distance of 3 m from the DUT. [Answer: 45.7 dBμV/m]

EMC-9. A product is tested for radiated emissions compliance at f = 200 MHz where the distance between the DUT and the measurement antenna is 30 ft. The measurement antenna provides 1.5 V for every V/m in the incident electric field and is connected to the spectrum analyzer by 18 ft. of coaxial cable (attenuation = 8 dB/100 ft at 200 MHz). The spectrum analyzer input voltage is 44 dBμV. Determine (a.) the antenna factor in dB (b.) the electric field magnitude at the measurement antenna (c.) if the product passes or fails FCC Class A compliance and by how much (d.) if the product passes or fails CISPR Class A compliance and by how much. [Answer: (a.) −3.52 dB (b.) 41.9 dBμV/m (c.) passes by 2.4 dB (d.) fails by 1.6 dB]
EMC-10. The voltage measured by a certain antenna is 5V for every V/m of the incident electric field at 100 MHz. What voltage (dBµV) at the antenna terminals corresponds to the FCC Class B limit at 100 MHz? At this antenna voltage, what voltage is measured by a spectrum analyzer when connected to the antenna by 200 ft of coaxial cable with 4.5 dB/100 ft of loss at 100 MHz. [Answer: 57.48 dBµV, 48.48 dBµV]

EMC-11. The radiated emissions from a product at 50 MHz are measured at a distance of 15m. The radiated emissions are measured to be 21 µV/m. Does this product comply with FCC Class B limit? By how much does the product pass or fail? [Answer: No, 0.42 dB]

EMC-12. A pair of wires (length = 2 m, separation = 5 cm) carry 100 MHz currents of 96 mA and 104 mA flowing in opposite directions. Determine (a.) the magnitudes of the differential-mode and common-mode current components (b.) the magnitude of radiated electric field at a distance of 10 m in the direction of maximum radiation. [Answer: (a.) \( |I_d| = 100 \text{ mA}, \ |I_c| = 4 \text{ mA} \)  (b.) 107.32 dBµV/m]

EMC-13. The radiated emissions of the pair of wires (length = 1 m, separation = 10 cm) shown below are measured at 100 MHz. The antenna factor of the measurement antenna is 15 dB at 100 MHz. The measurement antenna is 3m from the cable in the direction of maximum radiation. Determine the voltage (dBµV) at the terminals of the measurement antenna. [Answer: 112.97 dBµV]

\[ I_1 = 100 \text{ mA} \]

\[ I_2 = 10 \text{ mA} \]

EMC-14. The radiated emission of a cable (length= 0.5m) carrying common-mode currents is measured at 100 MHz at a distance of 3 m in the direction of maximum radiation. The measurement antenna has an antenna factor of 16 dB and is connected to a spectrum analyzer by 200 ft of RG-58U coaxial cable (4.5 dB/100 ft loss at 100 MHz). The spectrum analyzer reads a voltage of 32 dBµV. Determine the magnitude of the common-mode current. [Answer: 33.79 µA]