

$$CMRR = \frac{|b_{dm}|}{|b_{cm}|} = \frac{(2+\Delta) + j\theta(1+\Delta)}{1 - (1+\Delta)(1+j\theta) = 1 - 1 - \Delta - j\theta - j\theta\Delta = -\Delta + j\theta(-1-\Delta)}$$

$$\frac{\sqrt{(2+\Delta)^2 + \theta^2(1+\Delta)^2}}{\sqrt{(-\Delta)^2 + \theta^2(-1-\Delta)^2}} = \frac{\sqrt{4 + \Delta^2 + \theta^2 + 2\theta\Delta}}{\sqrt{\Delta^2 + \theta^2 + \theta^2\Delta^2}}$$

θ is in rad! $\Rightarrow 10^\circ = \frac{10}{360} \times 2\pi = 0.174 \text{ rad.}$

$$\sqrt{\frac{(2+\Delta)(2+\Delta) + \theta^2(1+\Delta)(1+\Delta)}{\Delta^2 + (-\theta - \theta\Delta)(-\theta - \theta\Delta)}}$$

$$\sqrt{\frac{4 + 2\Delta + 2\Delta + \Delta^2 + \theta^2 + \theta^2\Delta + \theta^2\Delta + \theta^2\Delta}{\Delta^2 + \theta^2 + \theta^2\Delta + \theta^2\Delta + \theta^2\Delta}} \quad \text{small}$$

$$= \sqrt{\frac{4 + \Delta(4 + 2\theta^2) + \theta^2 + \Delta^2}{\Delta(2\theta^2) + \theta^2 + \Delta^2}}$$

$$\approx \sqrt{\frac{4 + 4\Delta + \theta^2 + \Delta^2}{2\Delta + \theta^2 + \Delta^2}}$$

0 dB @ $10^\circ \Rightarrow \Delta = 0 \text{ \& } \theta = \pm 0.174 \Rightarrow CMRR = \sqrt{\frac{4 + 0.174^2}{0.174^2}} = \sqrt{\frac{4.03}{0.03}}$

11.5 = 21.2 dB

0.8 dB @ $0^\circ \Rightarrow \Delta = \pm 0.2 \text{ \& } \theta = 0 \Rightarrow CMRR = \sqrt{\frac{4 + 0.8 + 0.04}{\pm 0.4 + 0.04}} \begin{cases} \sqrt{\frac{4.84}{0.44}} = 11 = 20.8 \text{ dB} \\ \sqrt{\frac{3.24}{0.26}} = 9 = 16.1 \text{ dB} \end{cases}$