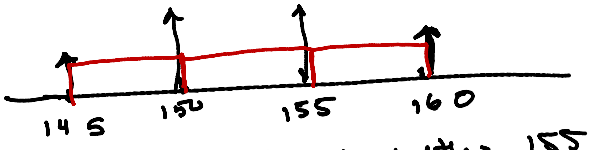
# RF Design - IP3

**Exercise 1**: If the two input frequencies are 150 and 155 MHZ, what are the frequencies of the third-order products? If these two frequencies represent the lower and upper frequencies of a channel, what is the channel bandwidth? Where would the third-order products fall relative to the adjacent channel?

$\omega_1 = 150$
$\omega_2 = 155$

$2\omega_1 - \omega_2 = 2 \cdot 150 - 155 = 300 - 155 = 145$
$2\omega_2 - \omega_1 = 2 \cdot 155 - 150 = 310 - 150 = 160$




channel bandwidth = $155 - 150 = 5\,MHz$

3rd IM products appear at edges of adjacent channels.

**Exercise 2**: An amplifier has an OIP3 of 30dBm. If it is required that the adjacent channel power be 30dB below the in-channel power, what is the maximum output power we should try to get from this amplifier?

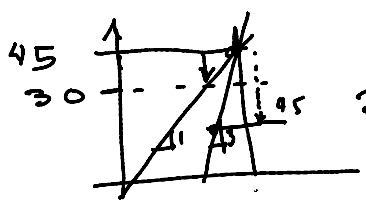
30 dB below in-channel power

→ need to be $\frac{30}{2} = 15$ dB below the OIP3.

if need 30 dBm output from amplifier

OIP3 needs to be 30 + 15 = 45 dBm.

check




3rd order products at 0 dBm.

in-channel power @ 30 dBm.

∴ 30 dB below in-channel power.

if output is 15 dB below OIP3 of 30 dBm then desired output is 30 − 15 = 15 dBm. (actual question above).

check: $30 - 15 = 15$ dBm
$30 - 3 \times 15 = 30 - 45 = -15$ dBm } difference is 30dBm