

# BESSEL NULL FM DEVIATION MEASUREMENT

The BESSEL NULL FM deviation measurement is an extremely accurate way to obtain a precise deviation setting on any FM modulator operating at any RF frequency. This test requires a Spectrum Analyzer, Sine-Wave Generator, Audio Frequency Counter, and an accurate dBm meter to verify audio levels.

At zero audio input, the Spectrum Analyzer (S.A.) shows only the Carrier Frequency. As the selected audio frequency is slowly increased in amplitude, the original carrier will be seen to decrease in amplitude at the same time that a whole forest of Bessel Function side-bands arise. OBSERVE ONLY THE CARRIER FREQUENCY AMPLITUDE. As the audio frequency amplitude increases, the Carrier Amplitude will go through one null after another. Exactly at the desired Carrier Null Number, the carrier will be deviating at the desired deviation.

Note that the sine-wave audio frequency will be deviating at Average Program Level (APL) and will indicate Zero VU while a complex audio waveform such as Program Audio, while also registering Zero VU on the meter, will actually deviate the modulator at a Peak Program Level (PPL). The PPL can be considered to be 10 dB greater than the APL level. As an example, a low frequency sine-wave at APL would deviate at +/- 75 KHz, the same level of program audio would cause a deviation of +/- 237 KHz, even though the VU meter reading was the same. ( $20 \log 237/75 = 10 \text{ dB}$ ).

Use the table below to set the deviation of any modulator. You must disconnect any Pre-emphasis in the modulator to prevent errors in the setting of the deviation. The input response must be flat for accurate results. Choose the carrier null and audio frequency for the deviation you want that will easily pass through the input audio stage of your modulator.

## CARRIER NULL TABLE:

Carrier Null	DEV Ratio	+/- 25 KHz PPL +/-7.9 KHz APL AUDIO FREQ	+/- 75 KHz PPL +/-23.7 KHz APL AUDIO FREQ	+/-237 KHz PPL +/- 75 KHz APL AUDIO FREQ
1	2.40466	3.28766 KHz	9.86297 KHz	31.1894 KHz
2	5.51998	1.43220 KHz	4.29659 KHz	13.5870 KHz
3	8.65489	.913437 KHz	2.74031 KHz	8.66562 KHz
4	11.791	.670485 KHz	2.01146 KHz	6.36078 KHz
5	14.931	.529482 KHz	1.58845 KHz	5.02311 KHz