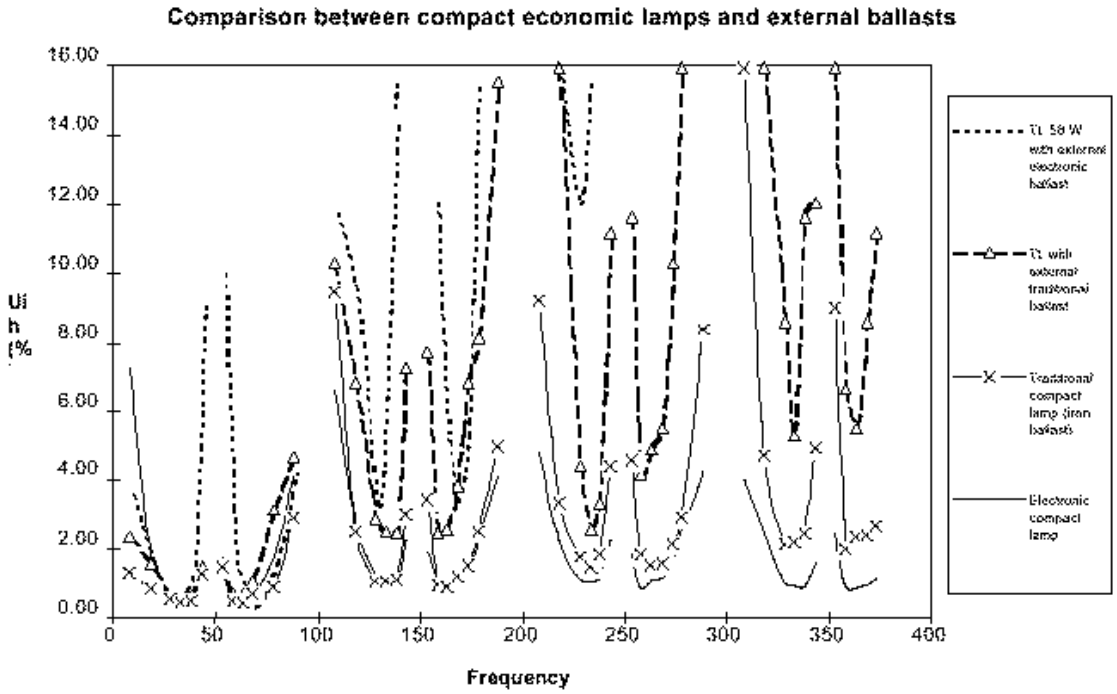
Interharmonic Voltage Limit Rationale

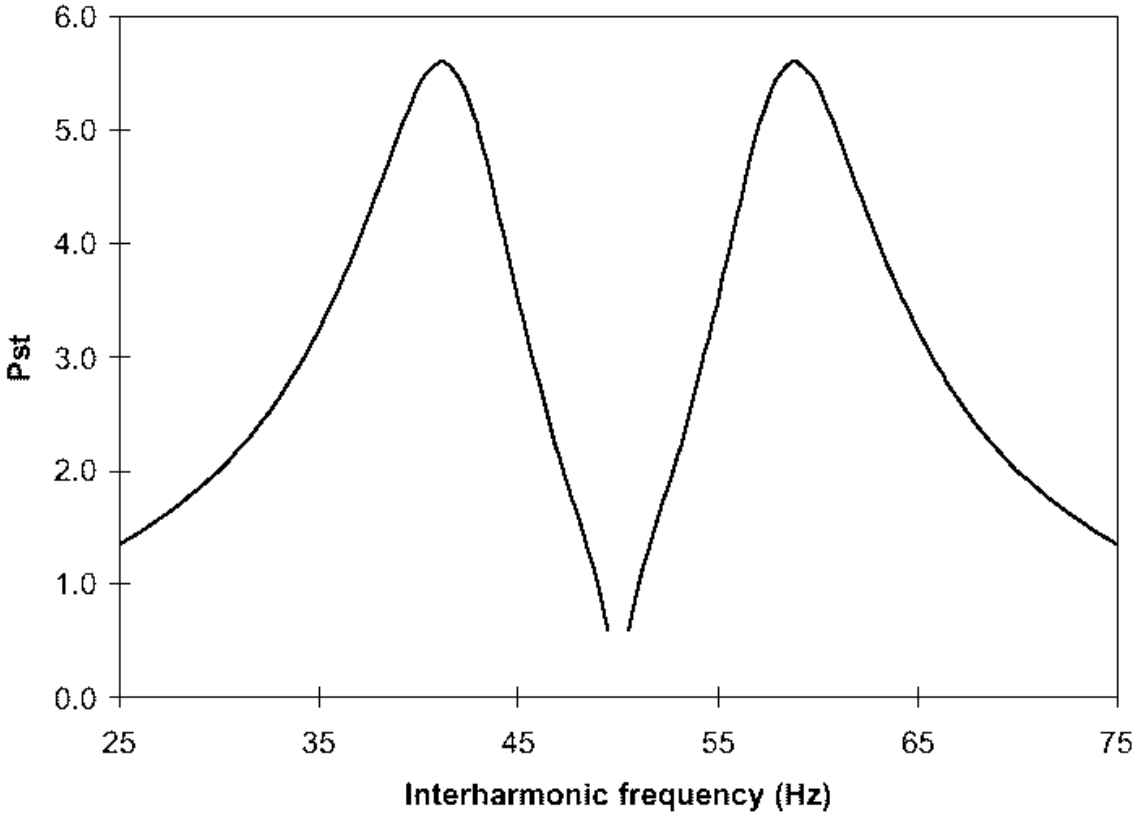
Facts:

- Interharmonic voltages cause lamp flicker for electronic ballasts when the frequency is near a multiple of the fundamental.
- Interharmonic voltages cause lamp flicker in incandescent lamps primarily when the frequency is near the fundamental or second harmonic. The sensitivity drops off quickly at higher frequencies.
- 1% IH near the fundamental frequency can result in a measured Pst of 5.
- Interharmonics can interfere with low frequency power line carrier (PLC) signals.
- Low frequency PLC can cause flicker but occurs infrequently. These signals have magnitudes around 1-5 % and are generally at frequencies in a range between the 3^{rd} and 7^{th} harmonic.
- Interharmonic currents cause interharmonic voltage distortion according to the network impedance in the same manner as harmonic currents.
- Interharmonics currents have the same thermal effects as harmonic currents in the same frequency range.
- Series tuned filters commonly applied on power systems to limit 5^{th} through 13^{th} harmonic voltage distortion and comply with the existing 519 cause parallel resonance (high impedance) at interharmonic frequencies (e.g. 250 Hz for a 5^{th} harmonic filter). Filter designers expect this bandwidth to be clear of intentional signals. Interharmonic currents/voltages at these frequencies can be magnified. Filter failure and/or loss of life can result.
- IEC presently has a limit recommendation of 0.2% voltage distortion from 0 – 2 kHz.

Recommendations:

- Adopt the IEC limit of 0.2% for frequencies less than 140 Hz to address flicker of incandescent lamps and fluorescent lamps with reasonable gain factors.
- Limit individual interharmonic component voltage distortion to less than 1% above 140 Hz up to some frequency yet to be determined (e.g. 800 Hz) to protect low frequency PLC and account for resonances created by harmonic filters.
- For higher frequencies, limit interharmonic voltage component and total distortion to some percentage related to the existing harmonic limits (say 1/5) to protect higher frequency PLC and filter resonances.


Comparison between compact economic lamps and external ballasts
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
50
100
150
200
250
300
350
400
Frequency
TL 58 W with external electronic ballast
TL with external traditional ballast
Traditional compact lamp (iron ballast)
Electronic compact lamp


6.0
5.0
4.0
3.0
2.0
1.0
0.0
Pst
25
35
45
55
65
75
Interharmonic frequency (Hz)