

DTE Power via MDI Task Force P802.3af

AC Disconnect Detection Ad Hoc

Audio Interference (and other) Test Results
A.1.3.1

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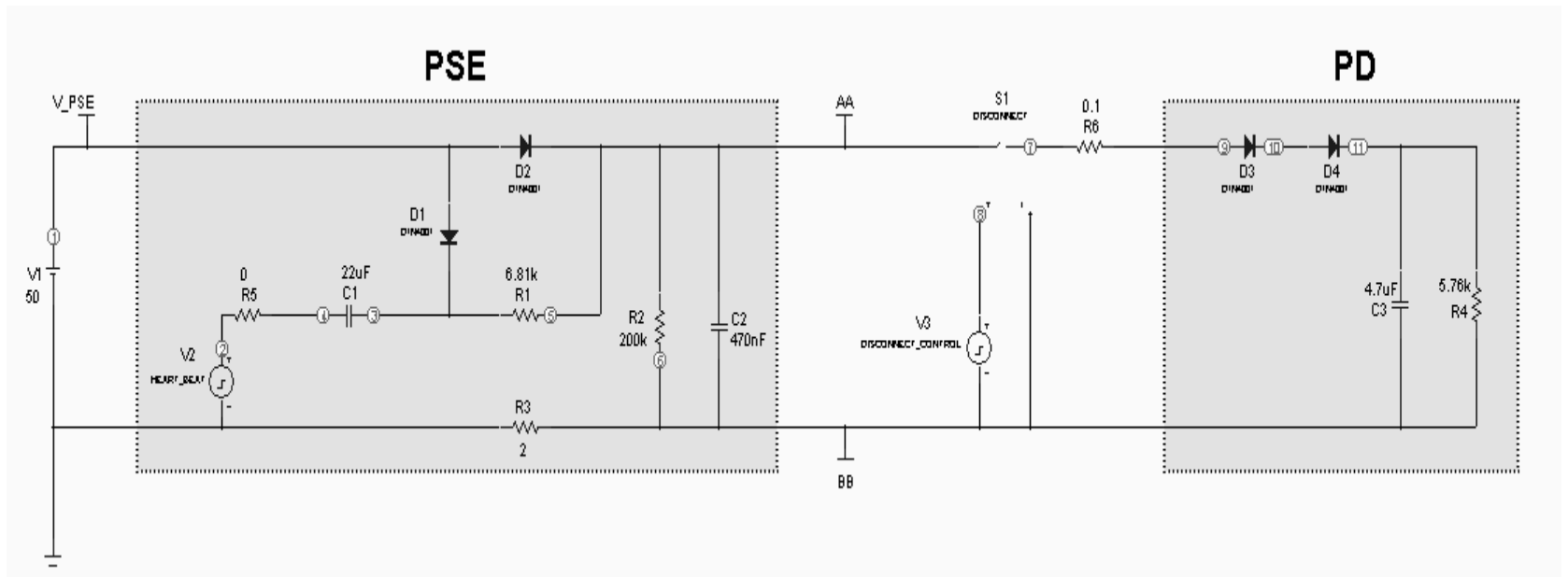
Objectives

- To investigate relationship between AC disconnect signal parameters (amplitude, frequency) with and without PD present
- To quantify IP Phone power supply rejection seen by AC disconnect signal
- To determine the impact of the AC disconnect signal on the acoustic performance of an IP Phone.



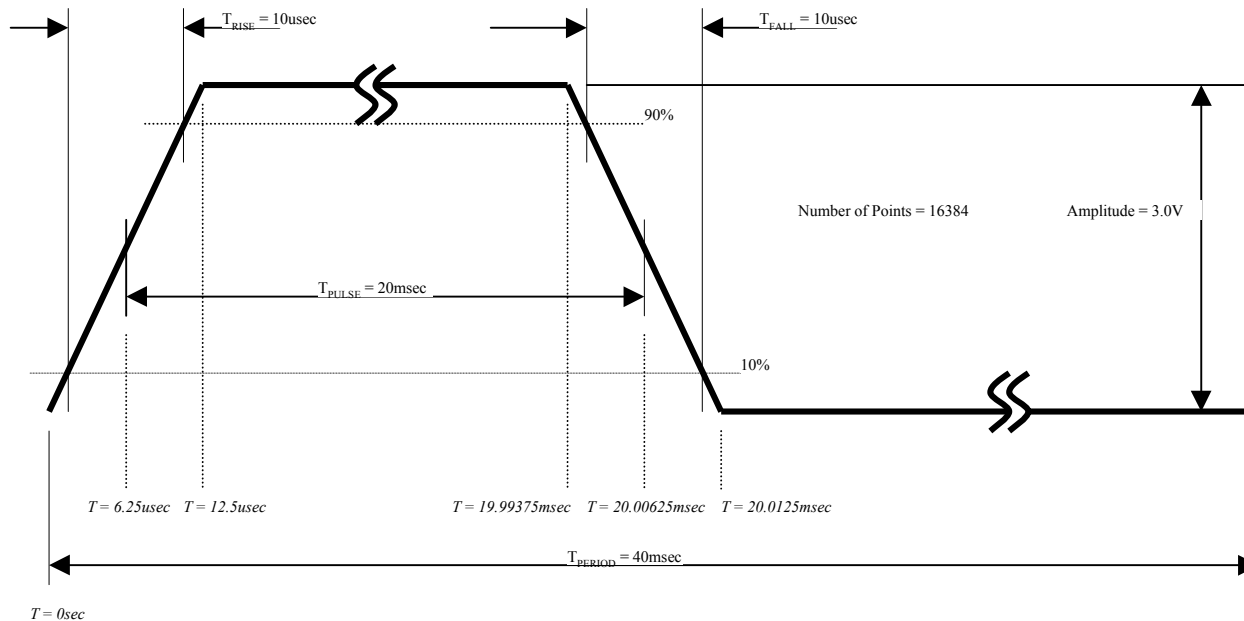
Circuit

- Simulated and essentially constructed as shown



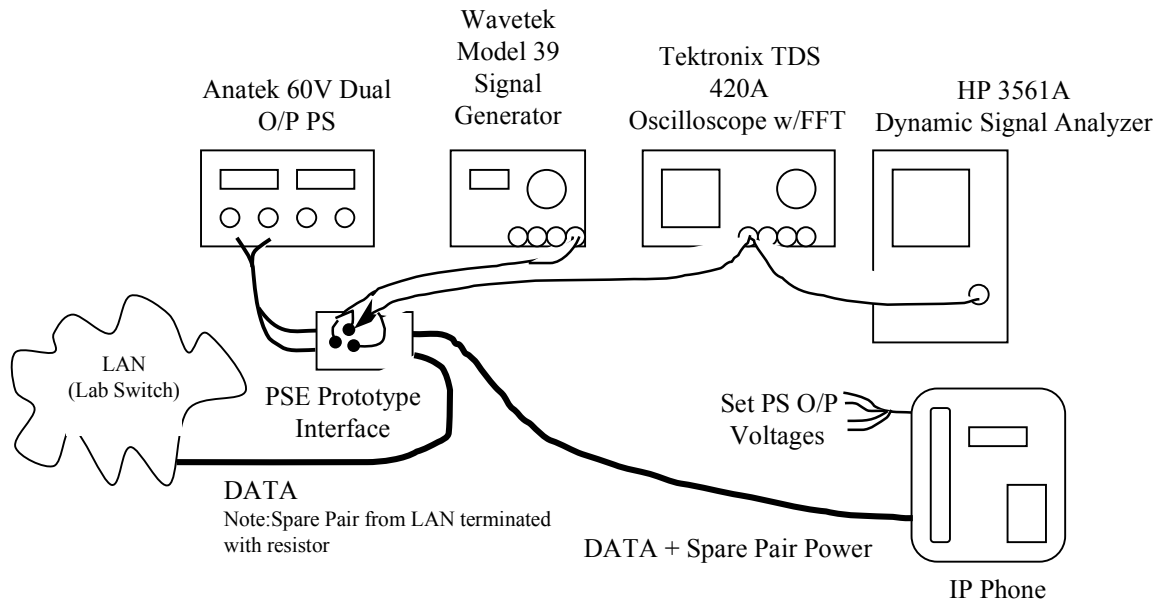
V2 Waveform

- Source is arbitrary waveform generator
- slew rate 10us or higher (worst case); 50% duty cycle
- amplitude adjusted as necessary to obtain req'd PSE o/p level



Test Setup

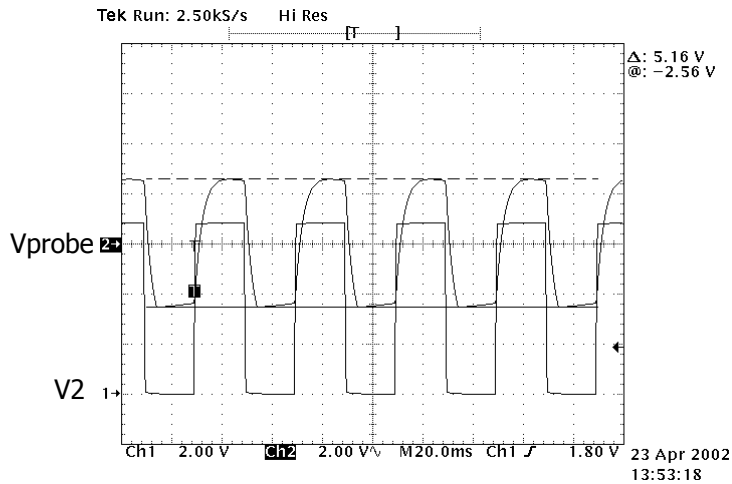
- Used to characterize AC signal parameter effects and IP Phone power supply rejection ratio



AC Signal Parameter Effects

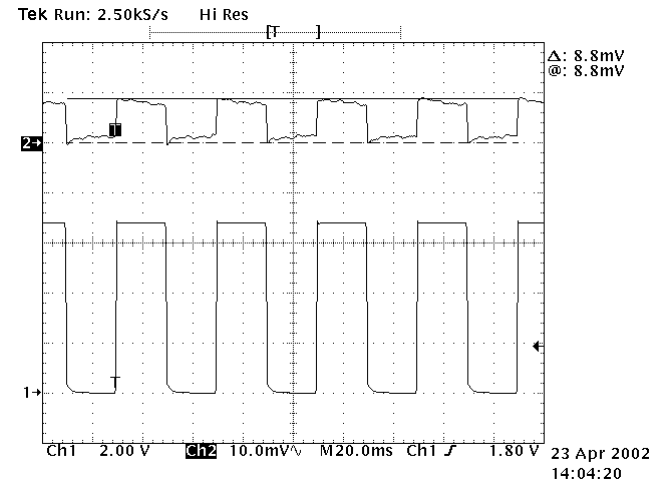
PD Impact on AC Signal

- Plots show V2 and Vprobe (VAA to REFGND) AC signals with and without PD connected at various frequencies and DC voltages



PD Disconnected

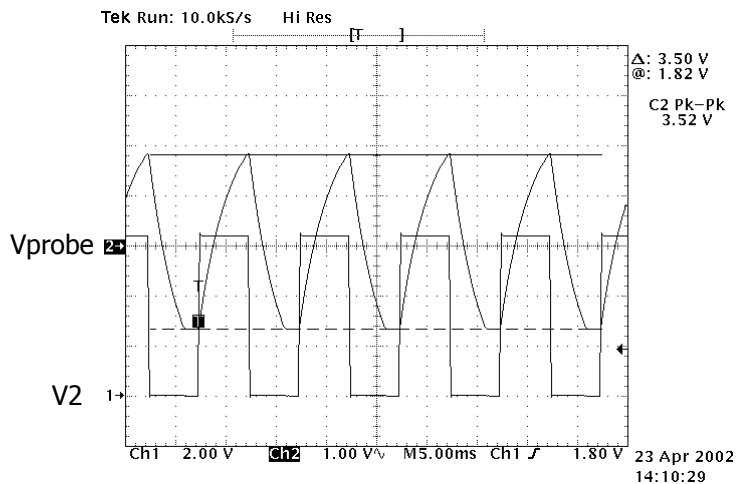
Vpse = 40VDC
V2freq = 25Hz
V2 = 6.82Vpp



PD Connected

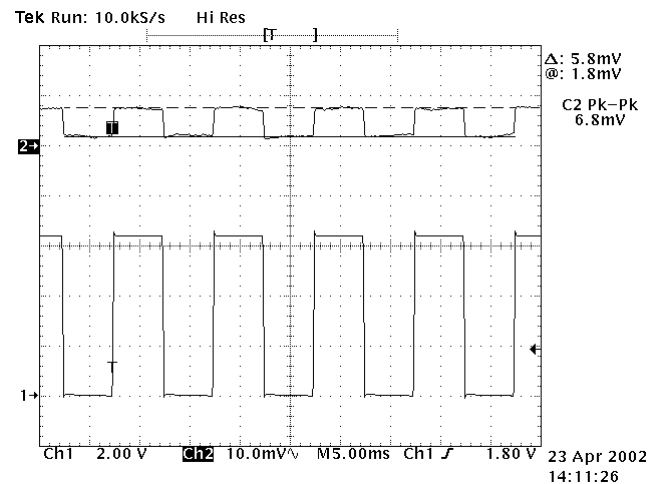


PD Impact On AC Signal (cont'd)



PD Disconnected

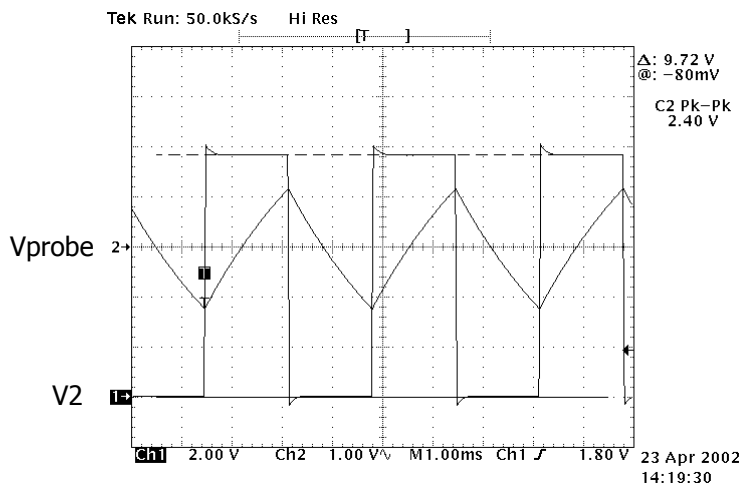
Vpse = 50VDC
V2freq = 100Hz
V2 = 6.44Vpp



PD Connected

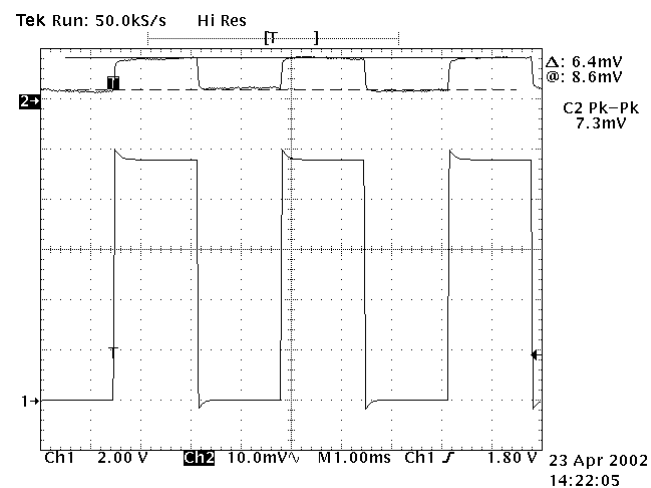


PD Impact On AC Signal (cont'd)



PD Disconnected

$V_{pse} = 60\text{VDC}$
 $V_2\text{freq} = 300\text{Hz}$
 $V_2 = 9.72\text{Vpp}$



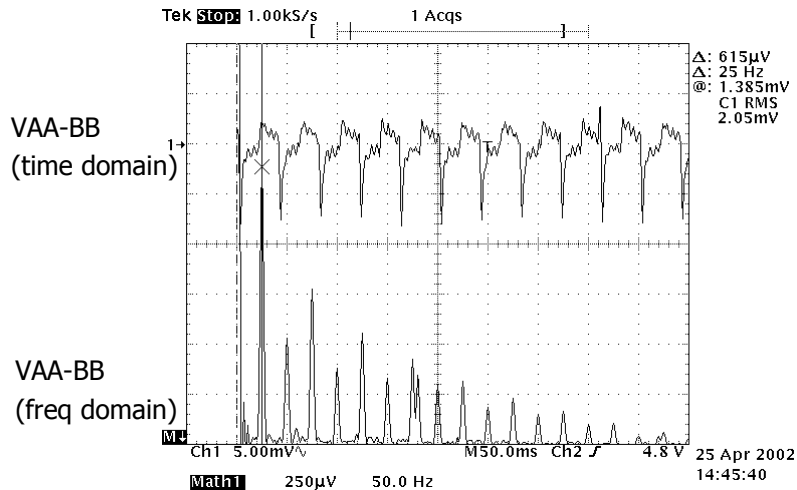
PD Connected

Power Supply Rejection



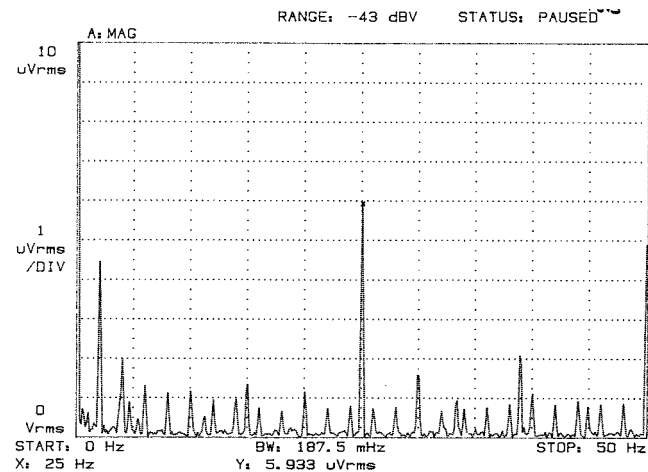
Rejection Characterization

- PD is Mitel production IP Phone (~2W load)
- Plots show VAA-BB (at IP Phone input) and V3V3 (at IP Phone power supply output) at various frequencies



VAA-BB

Vpse = 40VDC
V2freq = 25Hz
 V2 = 20Vpp

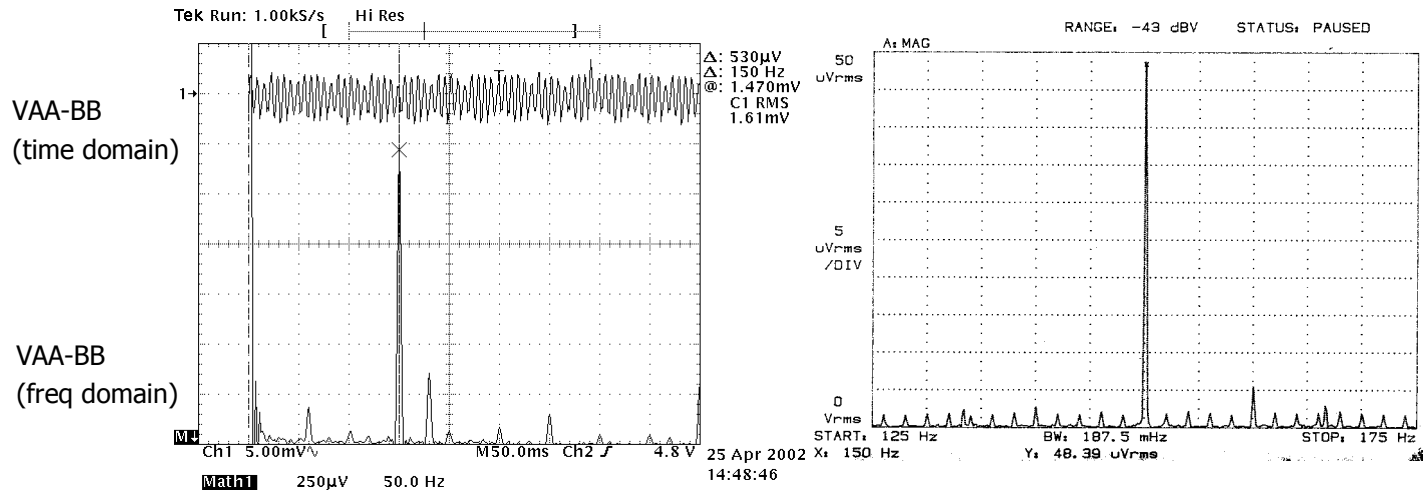


V3V3
 (freq domain)

PSRR
 = $20\text{Log}(1.385\text{mV}/5.933\text{uV})$
 = **47.4dB**



Rejection Characterization (cont'd)



VAA-BB

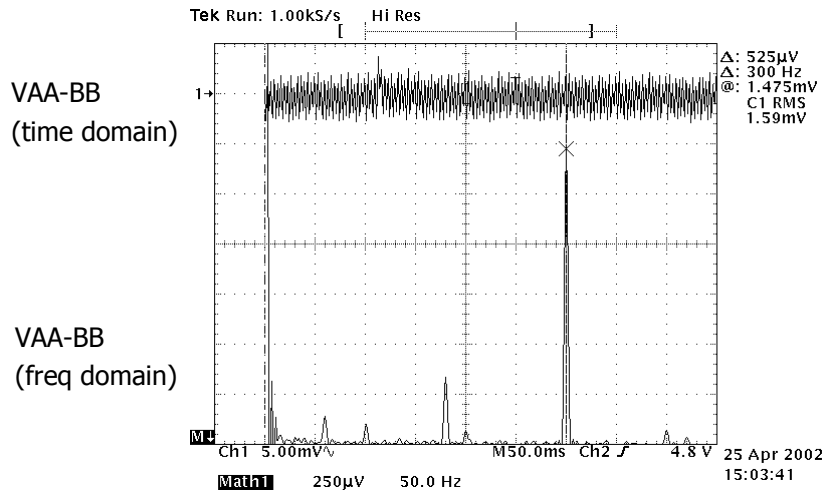
$V_{pse} = 40\text{VDC}$
 $V_2\text{freq} = 150\text{Hz}$
 $V_2 = 20\text{Vpp}$

V3V3
(freq domain)

PSRR
 $= 20\text{Log}(1.470\text{mV}/48.39\mu\text{V})$
 $= 29.7\text{dB}$

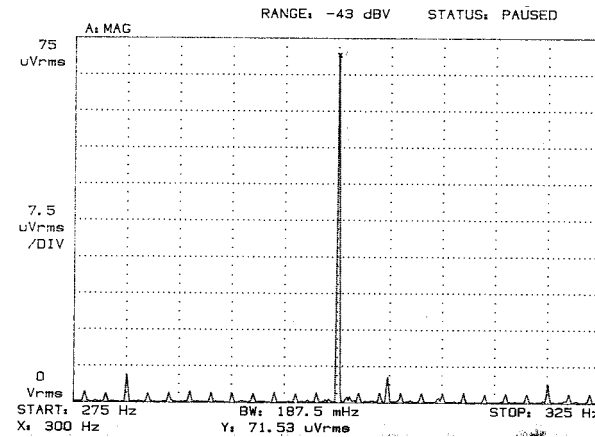


Rejection Characterization (cont'd)



VAA-BB

$V_{pse} = 40\text{VDC}$
 $V2_{freq} = 300\text{Hz}$
 $V2 = 20\text{Vpp}$



V3V3
(freq domain)

PSRR
 $= 20\text{Log}(1.475\text{mV}/71.53\mu\text{V})$
 $= 26.3\text{dB}$



IP Phone Acoustic Impact



Acoustic Test Setup

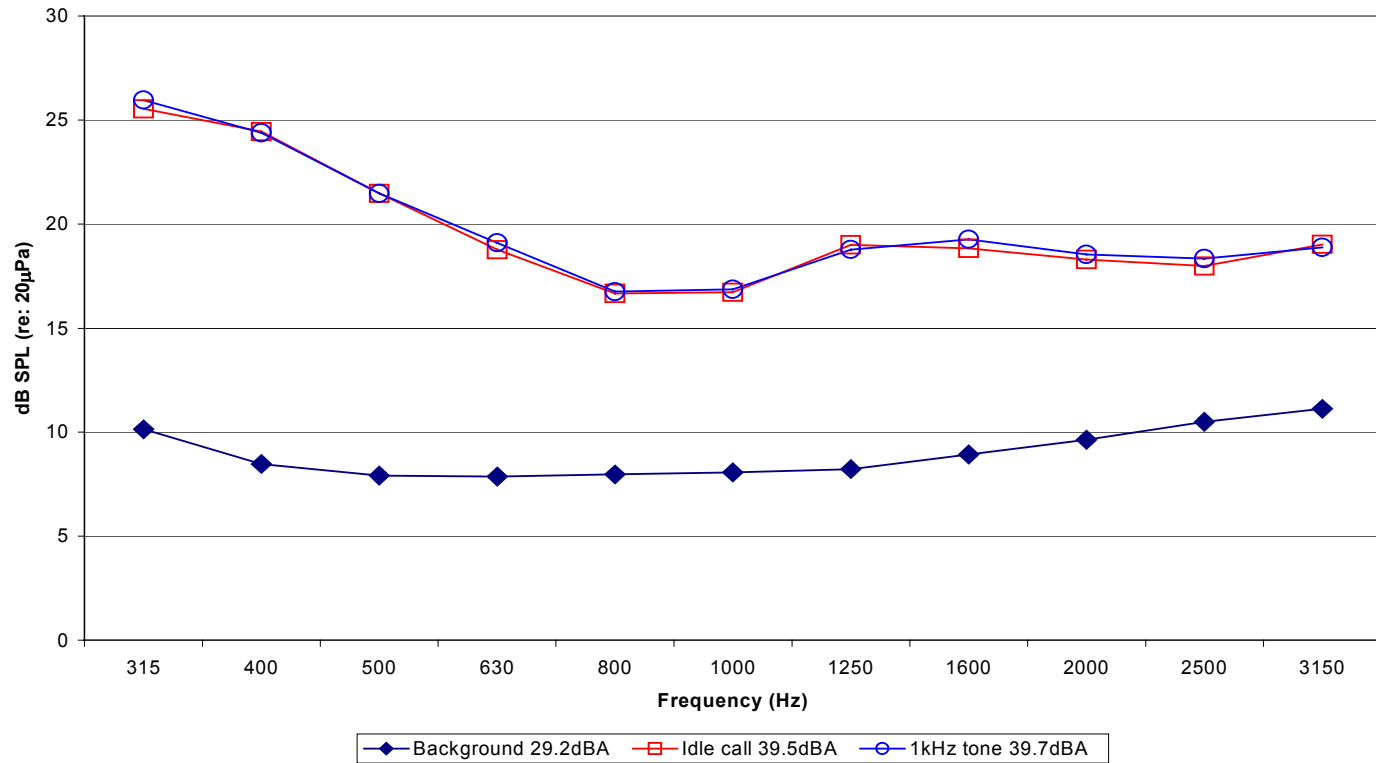
- PD is Mitel production IP Phone
- Tests conducted with PSE V2 voltage adjusted to yield **1.5Vpp** AC signal at input to PD (compared to actual level of $\sim 10\text{mVpp}$ with PD connected)
- to maximize any potential affects on Phone used AC signal frequency of 1kHz (worst case in acoustic pass band)
- slew rate of 1.5V/10us
- receive levels measured at maximum volume (+15dB)
- handset noise measured at idle (quiet code) and with 1kHz signal present using B&K 8206 head with Type 1 artificial ear



Band Analysis of Handset Noise

- No change to noise due to 1.5Vpp 1kHz signal

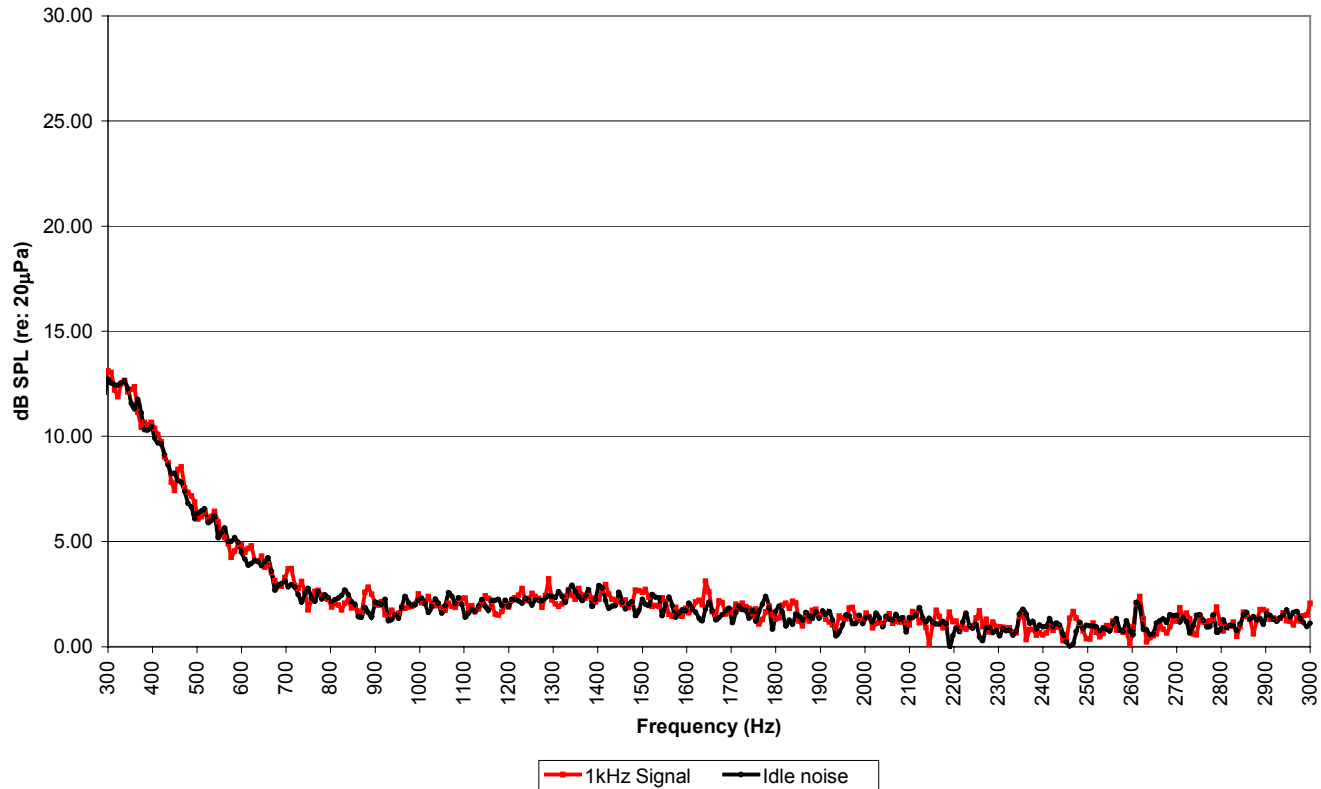
Power supply noise on Handset receive
1/3 octave Band measurement



Harmonic Analysis of Handset Noise

- No change to noise due to 1.5Vpp 1kHz signal

Power supply noise on Handset receive
Narrow band (Hanning FFT 7.5Hz BW)



Conclusions

- AC disconnect detection scheme has no acoustic impact on a typical IP Phone, even at 150x intended PD signal level
- AC signal frequency value \leq 1KHz not critical to minimization of acoustic effects
- typical IP Phone power supply rejection ratio $>$ 25dB at \leq 300Hz
- AC detect signal response as expected with worst case PD (4.7uF/5.7kohm) connected/disconnected

