



How clean is your home ?

BT's experience in assessing Radio Frequency Interference issues encountered during the development and deployment of broadband ADSL services

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Overview

- Introduction
- What are the REAL issues ?
- What's out there ?
- How bad can it get ?
- How does it affect us ?
- Detection and mitigation
- The future

Introduction

- BT now has in excess of 7 million ADSL lines
 - Worldwide in excess of 100 million ADSL lines
- To date, the focus of regulatory / standards has been on broadband causing interference
- Of the 7 million lines we have had...

Interference
Caused

1

Interference
Suffered

A large number
(and increasing)

Introduction

- Broadband is no longer about just surfing and email
- Customers expect exciting new services
- Broadband delivery will be key to future services :
 - Entertainment
 - Communication
 - Education
- With these, the quality of 'the pipe' becomes important

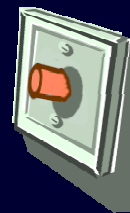
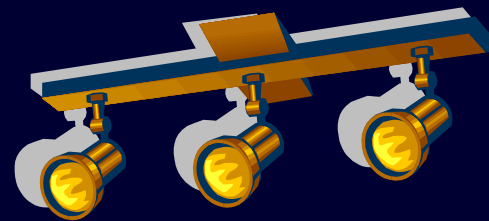
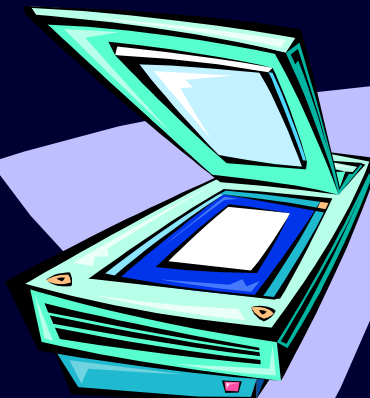
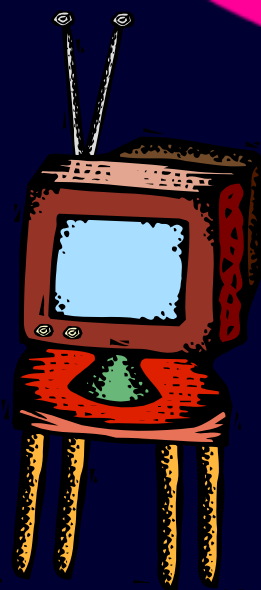
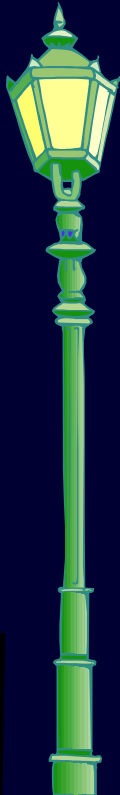
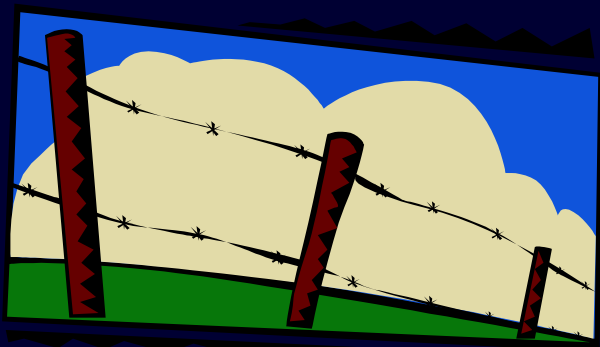
What are the REAL issues ?

- Since ~1997, regulatory focus has been on broadband systems causing interference
- These debates continually claim that the RF environment is generally 'clean'
- In reality, there is a significant amount of equipment within the home that is polluting the radio spectrum
- The noise is broadband in nature and initially mains borne or radiated before coupling into our network

What are the REAL issues ?

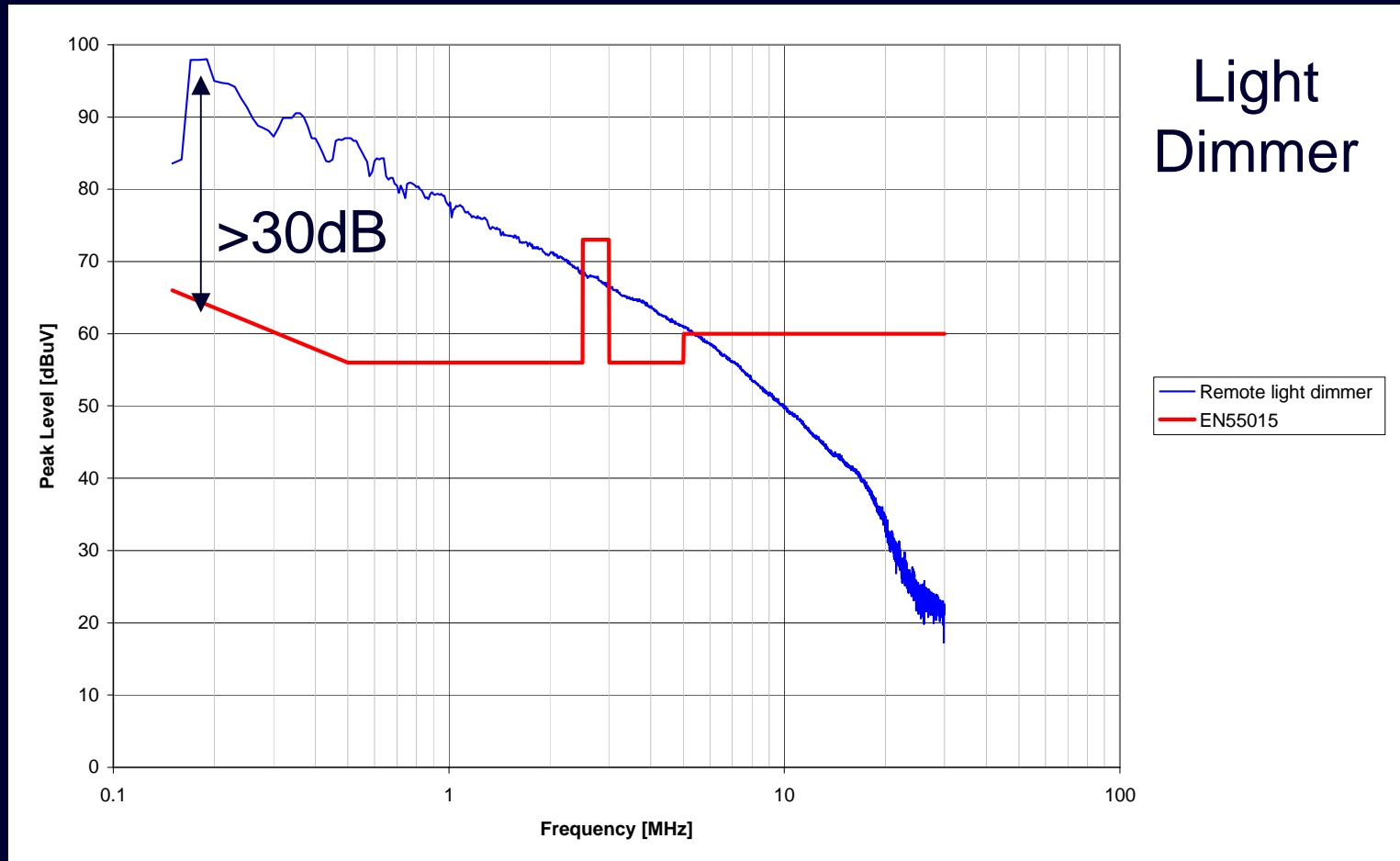
- ADSL engineered to work with equipment compliant with EMC standards. To date all interference caused by equipment that:
 - is found to be non-compliant by design or
 - Is non-compliant due to a fault condition, but still functions normally
 - Is a Class A product used in the home
- Annex III of the EMC Directive lists apparatus that shall not be interfered with, item (j) is *“Telecommunications networks and apparatus”*. This doesn't provide protection due to
 - faulty equipment or
 - mass sales of non-compliant equipment

What's out there ?



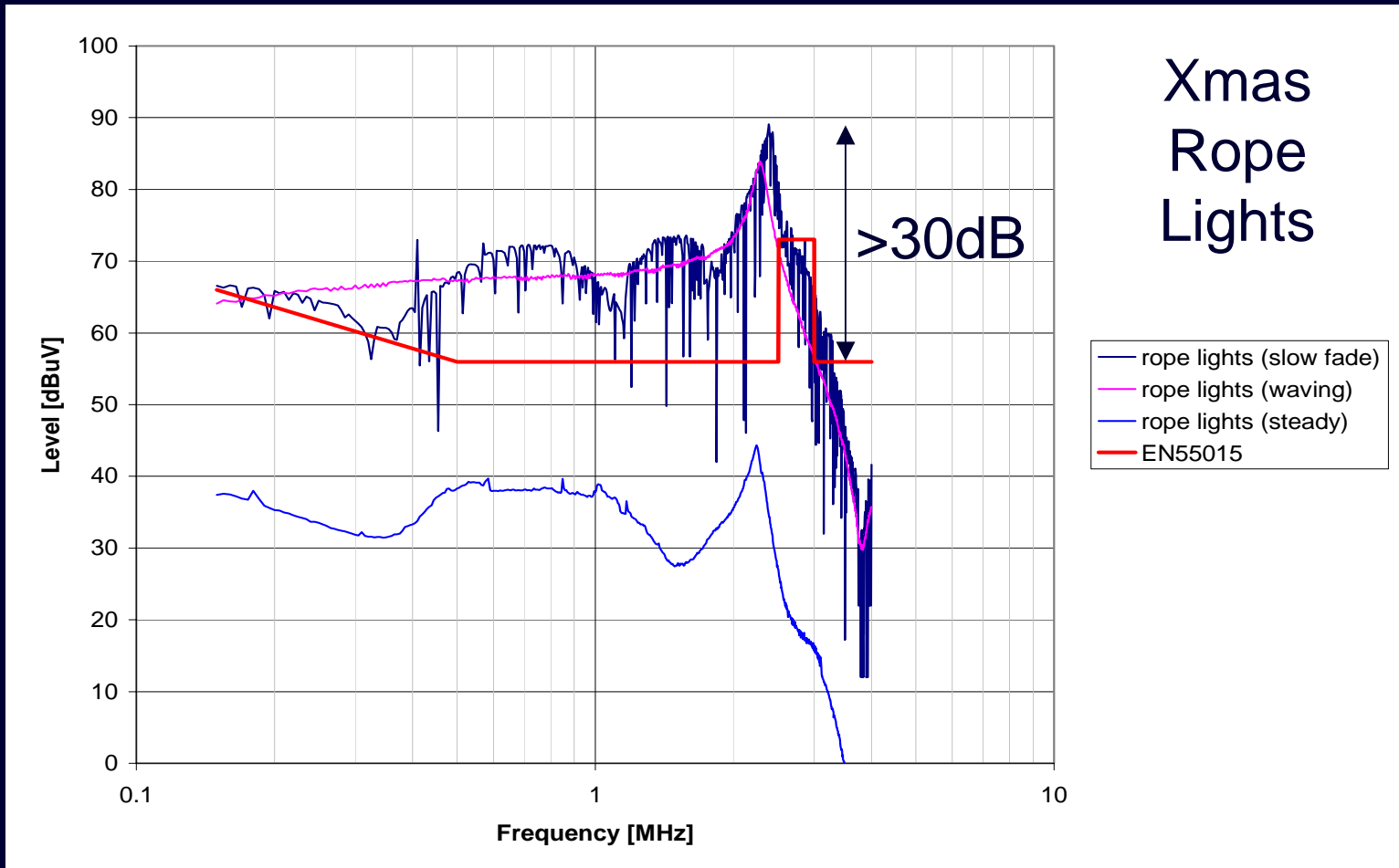
How bad can it get ?...

by design !



How bad can it get ?...

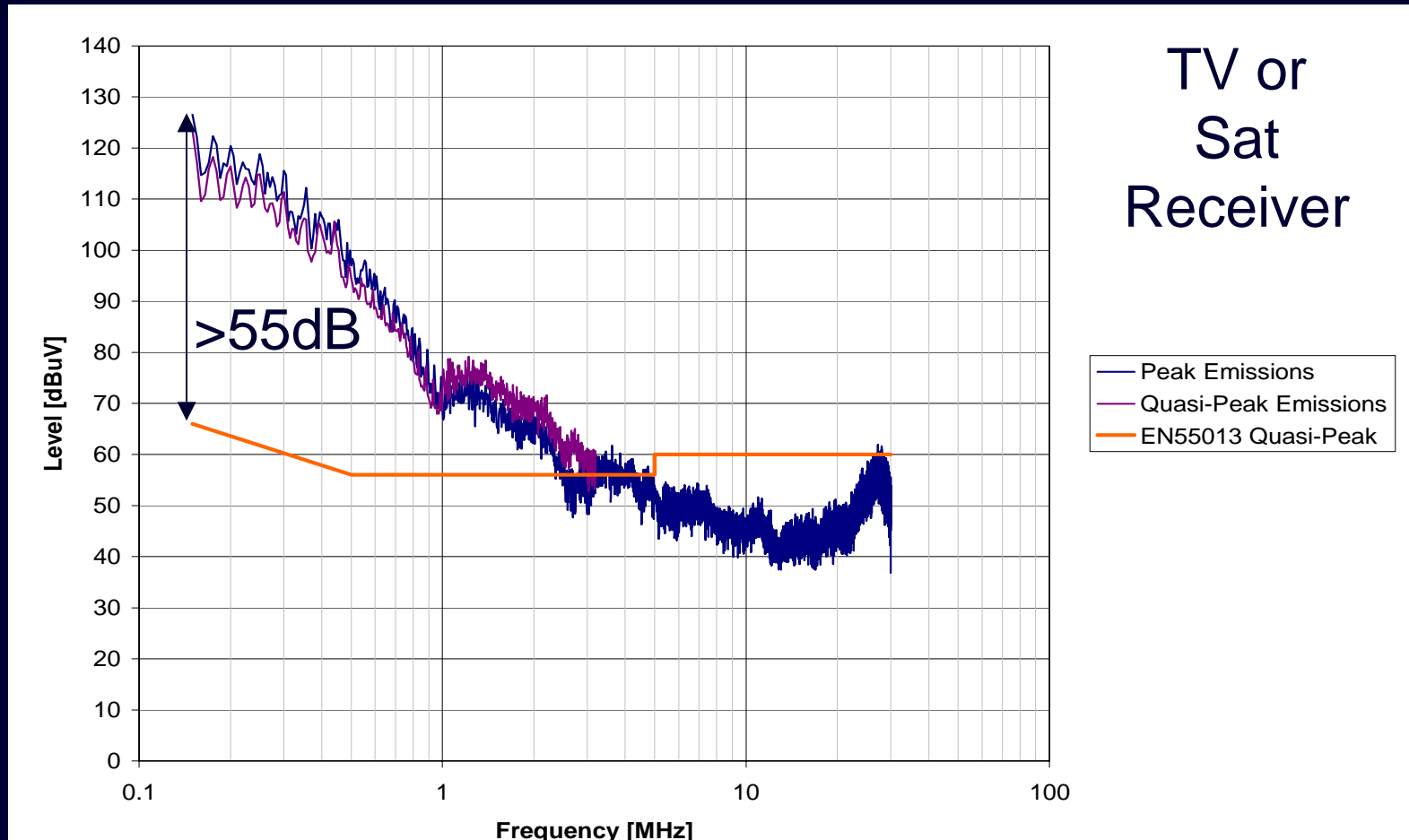
by design and part test !



Note: It is known that in excess of 20,000 of these have been sold !

How bad can it get ?...

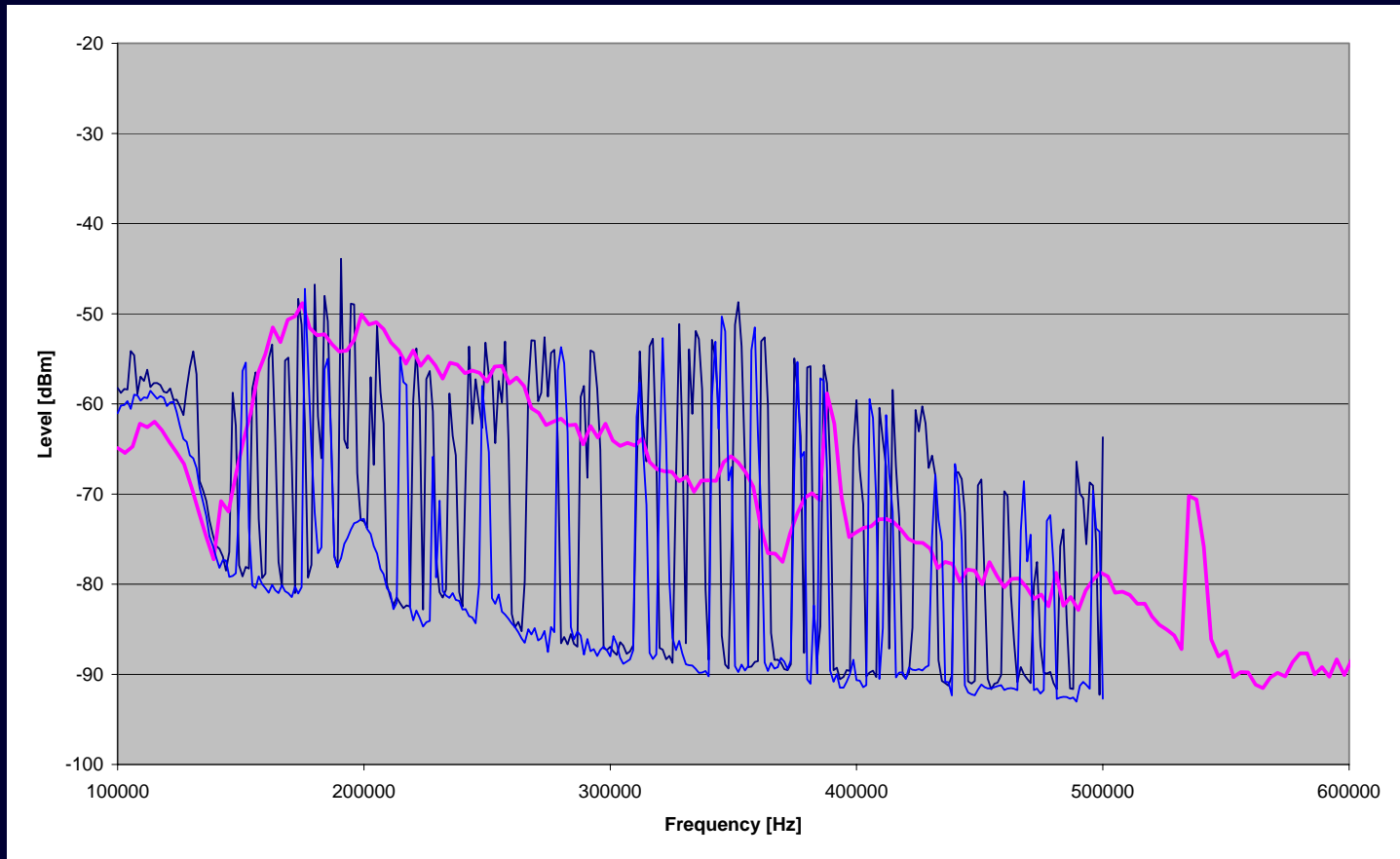
due to a fault condition



Note: To the user the products still work fine !

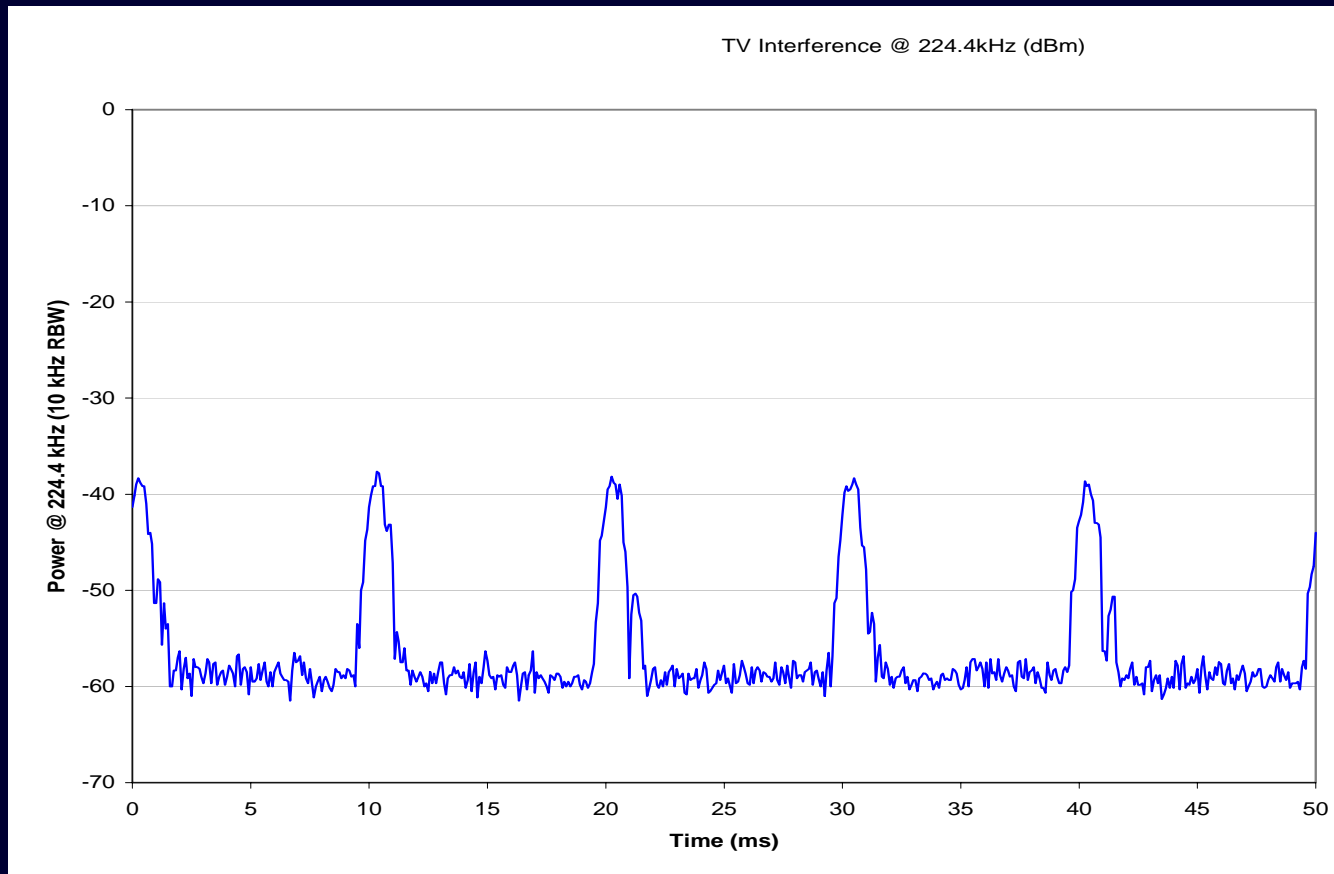
Why should this impact us ?

- Interference is both broadband and 'in band' to ADSL



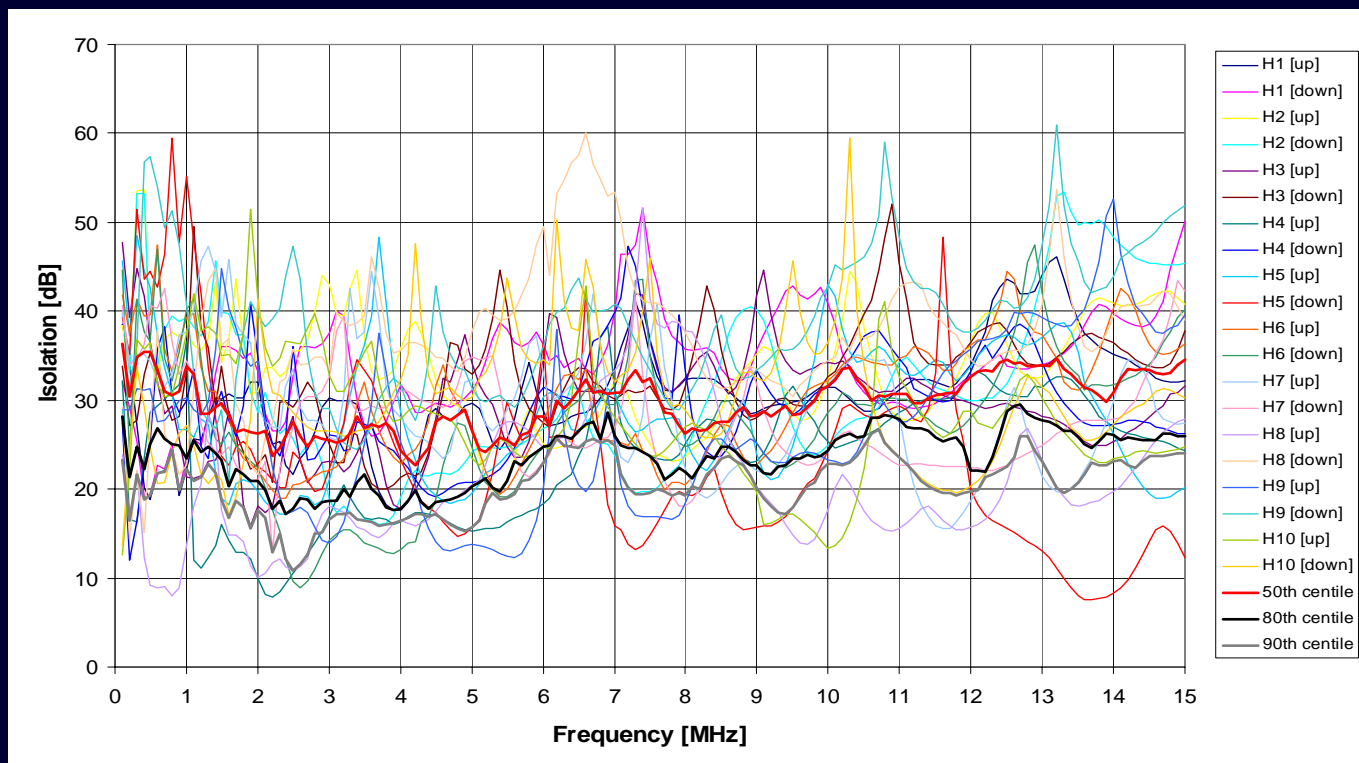
Why should this impact us ?

- Interference is Impulsive and difficult for modems to assess



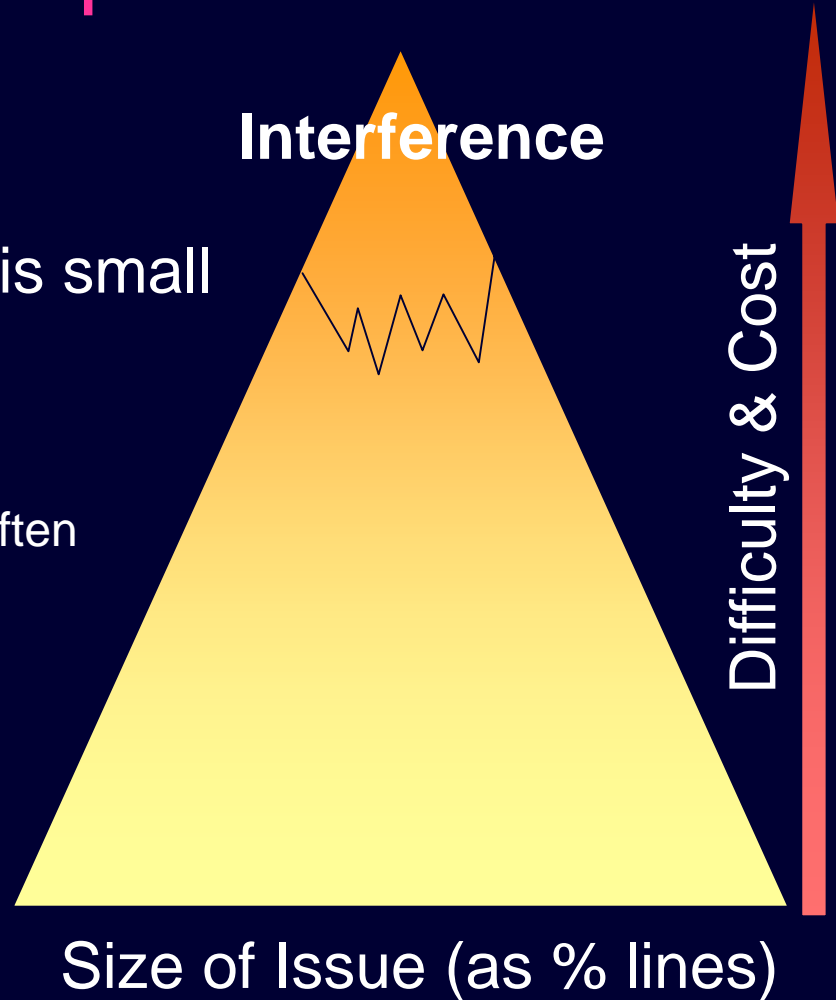
Why should this impact us ?

- In many homes and housing estates, the telecom cables and power cables have little separation
- Our studies have shown the degree of isolation between power and telecom networks to be ~10-40 dB



Why should this impact us ?

- Proportion of problems is small but impact is high...
 - Longer time to identify
 - Increased repair costs
 - Repeat visits to customers often at unsociable hours
 - No guaranteed solution

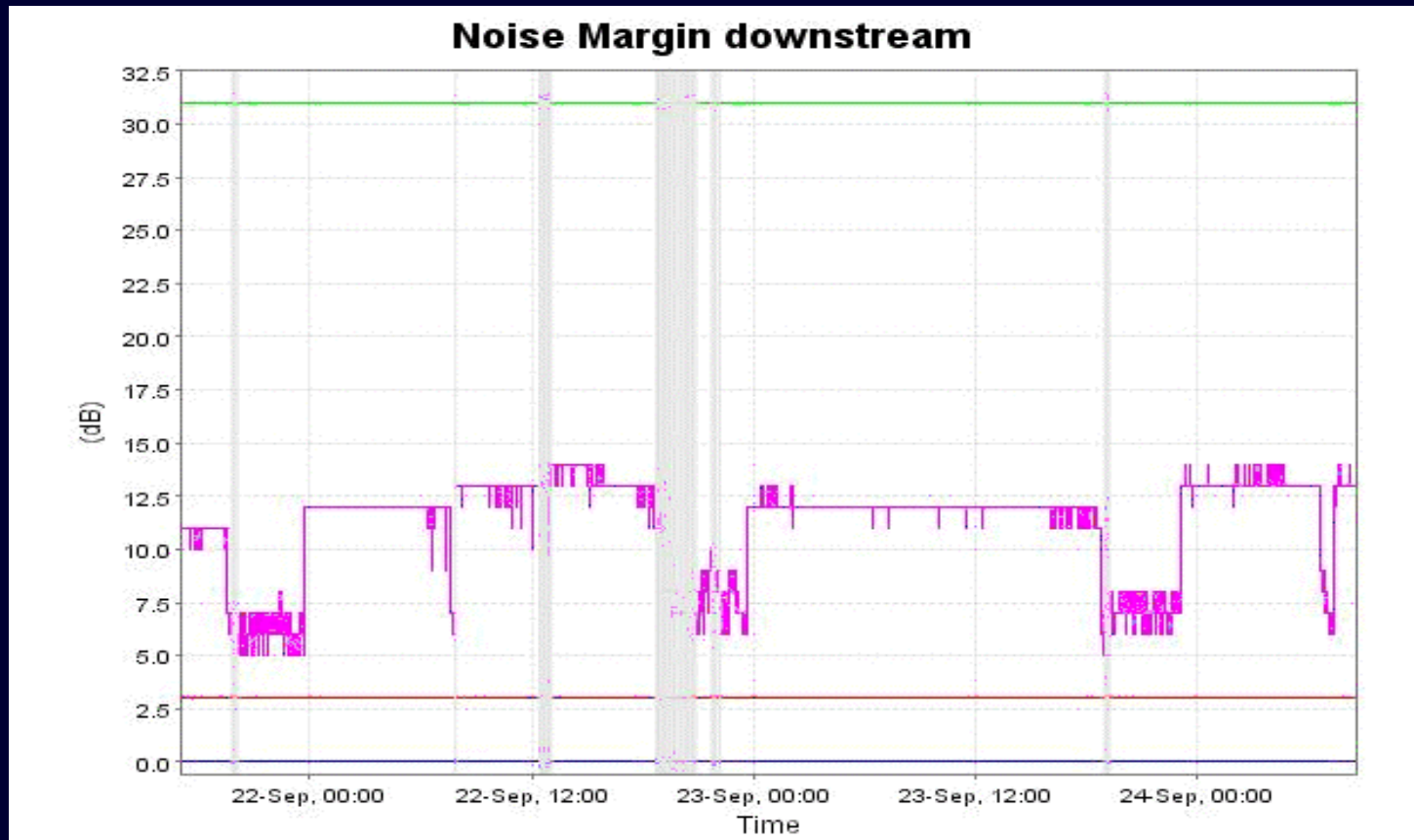


Detection

- Very Difficult
- Requires specialist staff often out of office hours
- Interference spectrum and sound varies with source
- May have a regular occurrence pattern

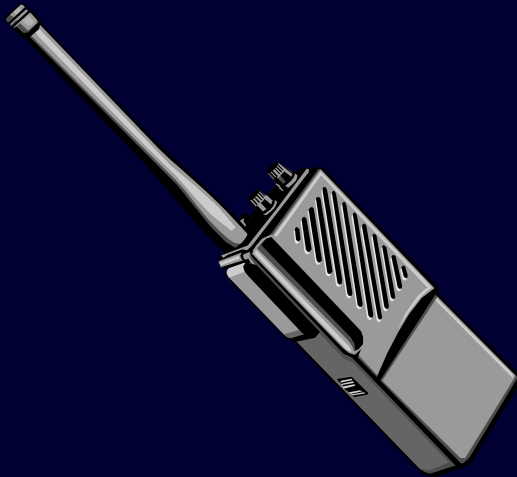
Detection

Trace from monitoring of a real customer line showing extensive periods of service loss



Detection

- Source may be several hundred metres away from the victim(s)
- So how do we find it ?



Mitigation

- Try to fix the symptoms through...
 - Limited improvement to network cabling
 - Improvements to customers own internal cabling
 - Common mode filtering
- Or eliminate the source though...
 - Detection is difficult
 - Even if found then only through helpful co-operation can it hopefully be eliminated
 - Creates potential for “neighbours from hell”
- Tolerate or Cease service

The Future

- Defining new noise models for future standardization of DSL CPE
- Would like to see improvements in the enforcement of the EMC Directive
- Some legal / regulatory protection afforded to Fixed networks when they are interfered with
 - e.g. Wireless networks protected by Wireless Telegraphy Act

To Conclude

- Considerable interference potential lurks in many homes
- Detection and Mitigation is very difficult
- Broadband is a success and we are doing everything to give the best possible service, but interference...
 - Affects customer satisfaction and incurs additional costs
 - There are cases beyond our control
- Limited protection is achieved with the EMC Directive
- Legal / regulatory mechanism needed in order to address real interference issues

‘Prevention is better than cure’



So how clean is your home ? ...

Thank you