

# EEDAL'06

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DOMESTIC APPLIANCES & LIGHTING CONFERENCE '06

Power Consumption Characteristics of Display Technologies

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## Topics to cover

- Background and Data Collection Methodology
- LCD, Plasma and CRT Power consumption characteristics
- Characteristics of sampled Average Picture Levels (APLs)
- Results of modelled power consumption for several TVs

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# Background and Data collection method 1

- Deficiencies in TV power measurement standards have been evident for some years.
- Until recently TV were a single technology device (CRTs)
  - The test method did produce a comparative measurement and
  - Could not favour one technology over another.
- With the advent of Plasma and LCD technology it has become evident that a new method is needed that will provide realistic measurements of actual use power.

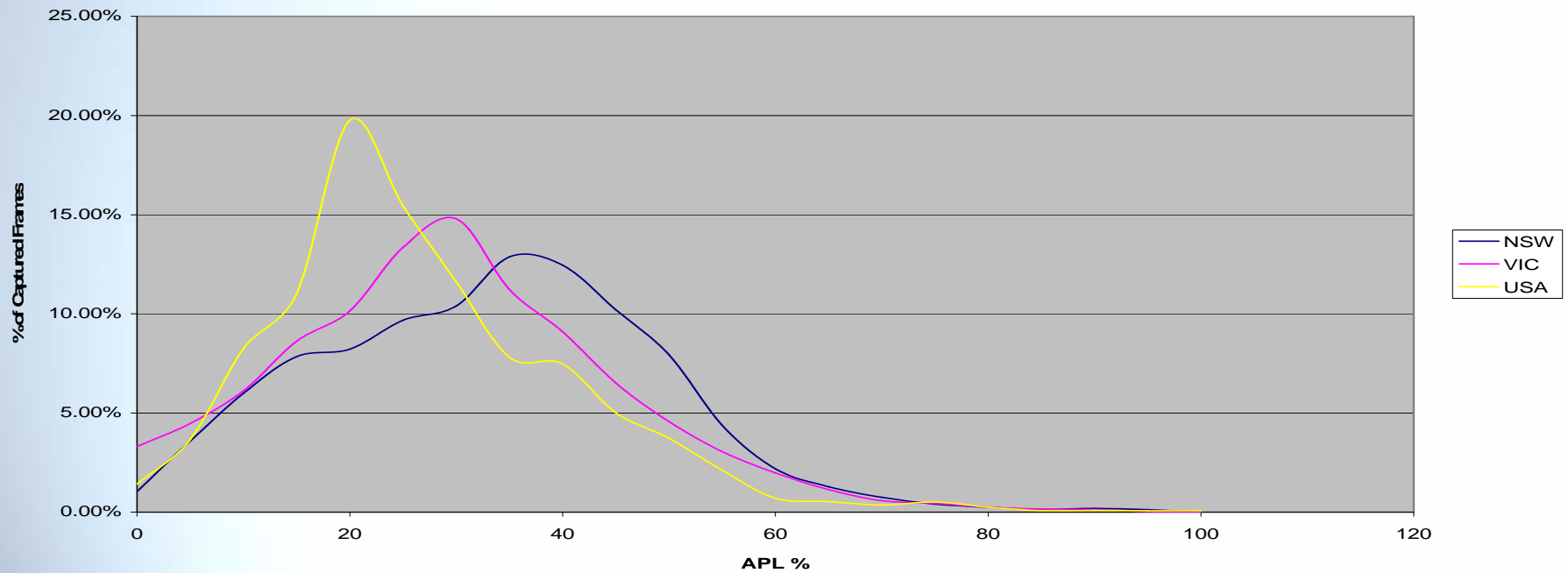
## Background and Data collection method 2

- To assist in the development of such a method it was clear that two issues needed to be understood.
  - What was the APLs of the signals that were broadcast to TVs
  - How did these APL levels affect power consumption of the different technology TVs
- Data collection of APLs had to provide information on regional and platform differences. In order to do this arrangements were made to collect data in Australia, USA and UK and to ensure samples were taken from Terrestrial, Cable and Satellite platforms.
- It was also important to sample as many different programme contents as possible

# APL Sampling Results Slide 2

- Number of Samples taken 115

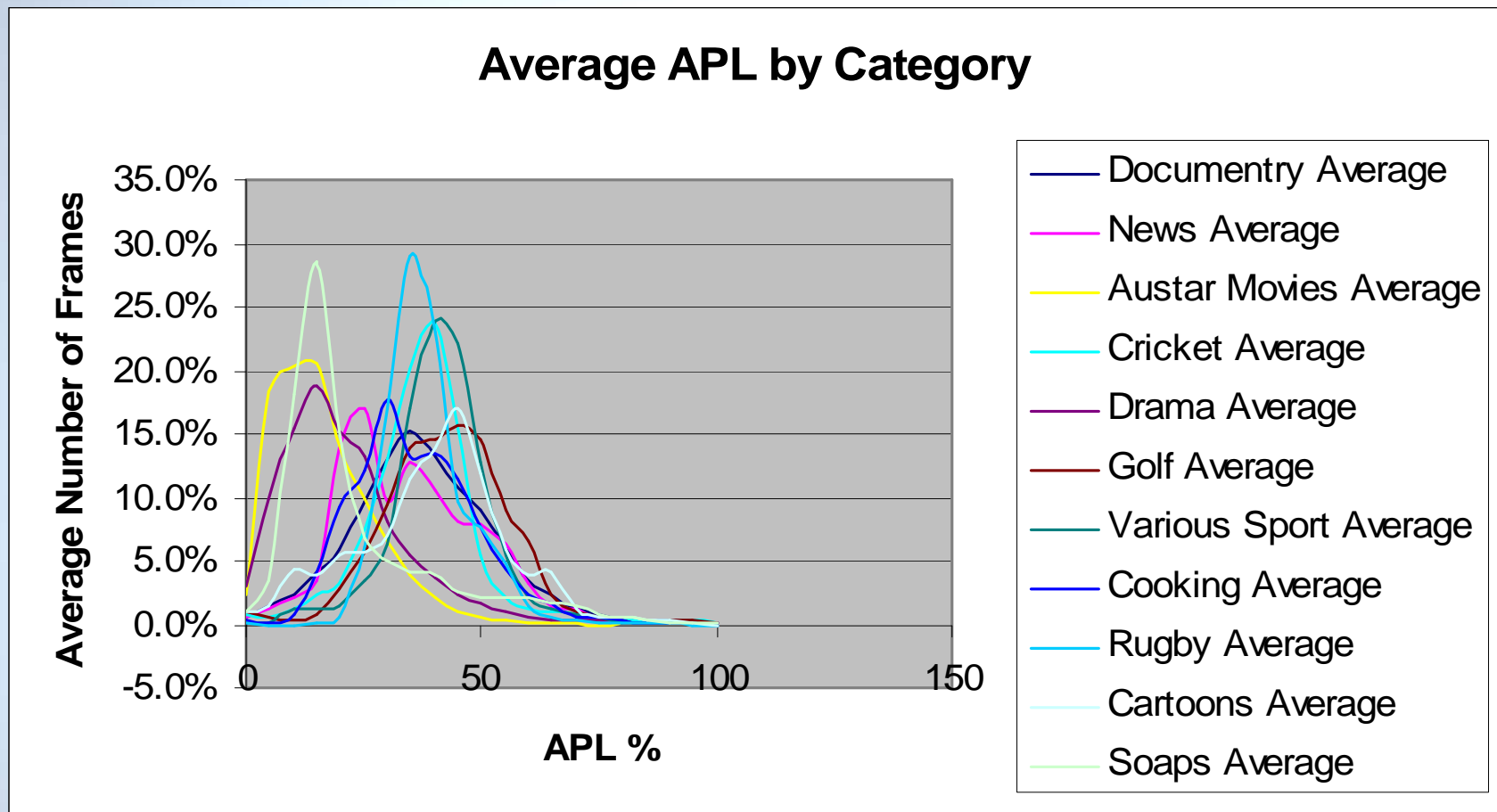
APL Sample Set Comparison



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# APL Sampling Results Slide 3



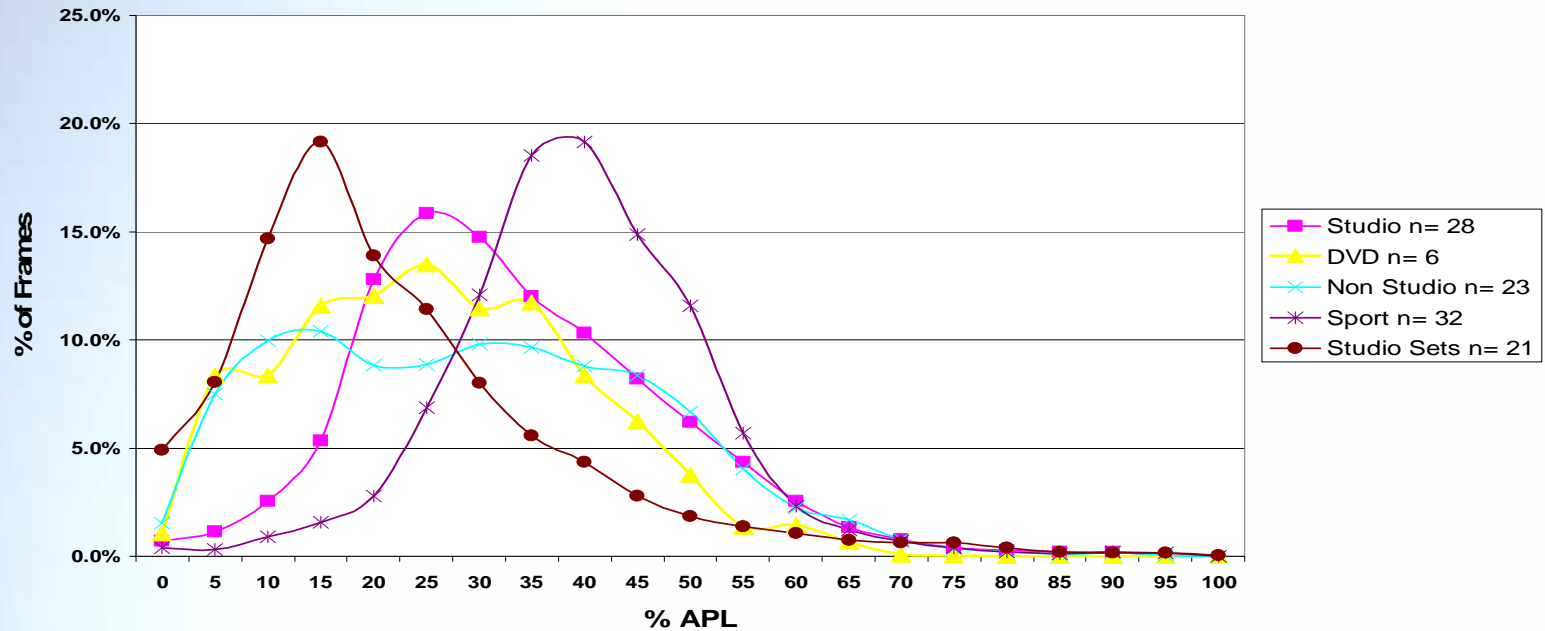
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# APL Sampling Results Slide 4

Unit %

Average Broadcast APL



Category	Sample	<20%	20 to 50%	>50%
Studio	28	9.7%	73.9%	16.3%
DVD	6	29.3%	63.3%	7.4%
Non Studio	23	29.4%	54.3%	16.3%
Sport	32	3.2%	74.3%	22.5%
Studio Sets	21	46.8%	46.0%	7.2%

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## Summary Of APL Characteristics

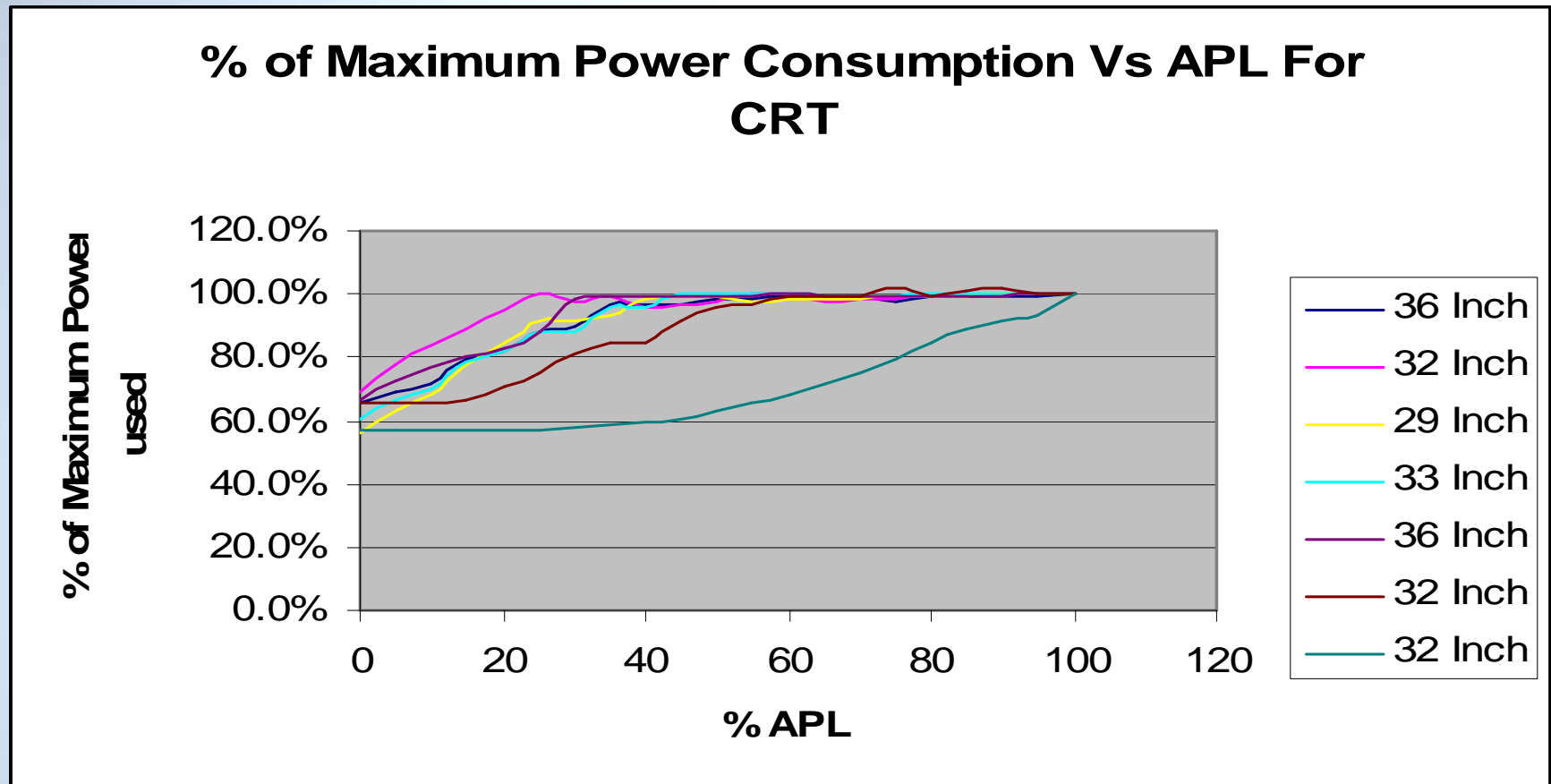
- APLs are concentrated below the 50% level.
- APLs vary according to programme type with Movies, Drama and Soaps at the lower levels and Sport at the higher levels.
- Analysis of the APLs collected show that less than 10% of sampled APLs are above 55% levels.
- It is reasonable to postulate that for Plasma, CRT and Backlight Modulated LCD technologies that the sampled APLs will affect the power consumption of TVs using that technology.



# Display Type Power Consumption Characteristics

- The common technologies used for TV displays are:
  - **CRT**
  - **Plasma**
  - **LCD Panels**
  - **LCD Rear Projection**
  - **DLP Rear Projection**
  - **CRT Rear Projection**
- CRT, Plasma and CRT Rear Projection use Automatic Brightness Limiting (ABL). This acts to limit maximum Power and therefore power consumption.
- A growing number of LCD panels have modulated backlights that dynamically reduce the backlight level in darker scenes. This also reduces power consumption
- Non Backlighted LCD, LCD and DLP rear projection have power consumptions independent of APL

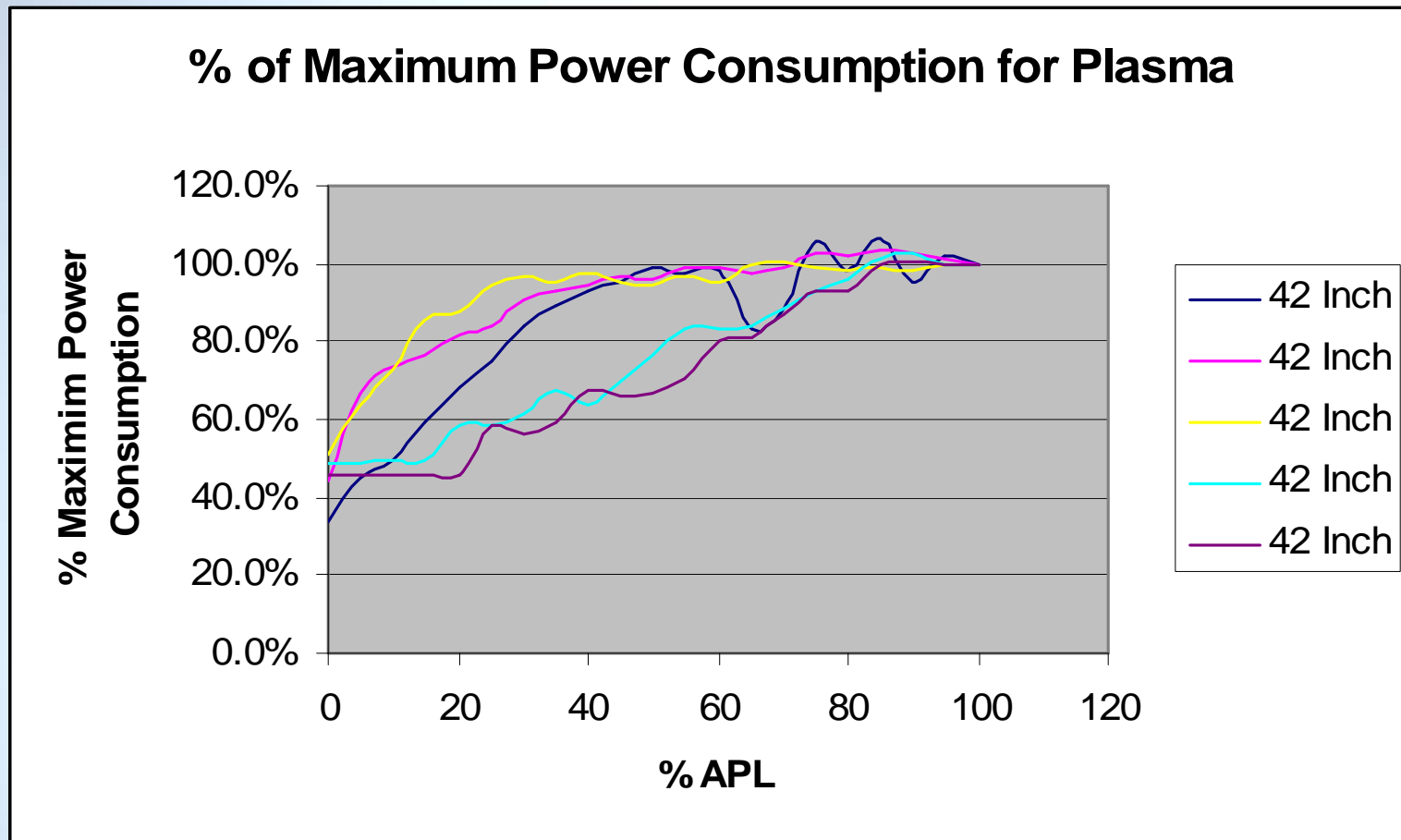
# Measured CRT Power Consumption Characteristics



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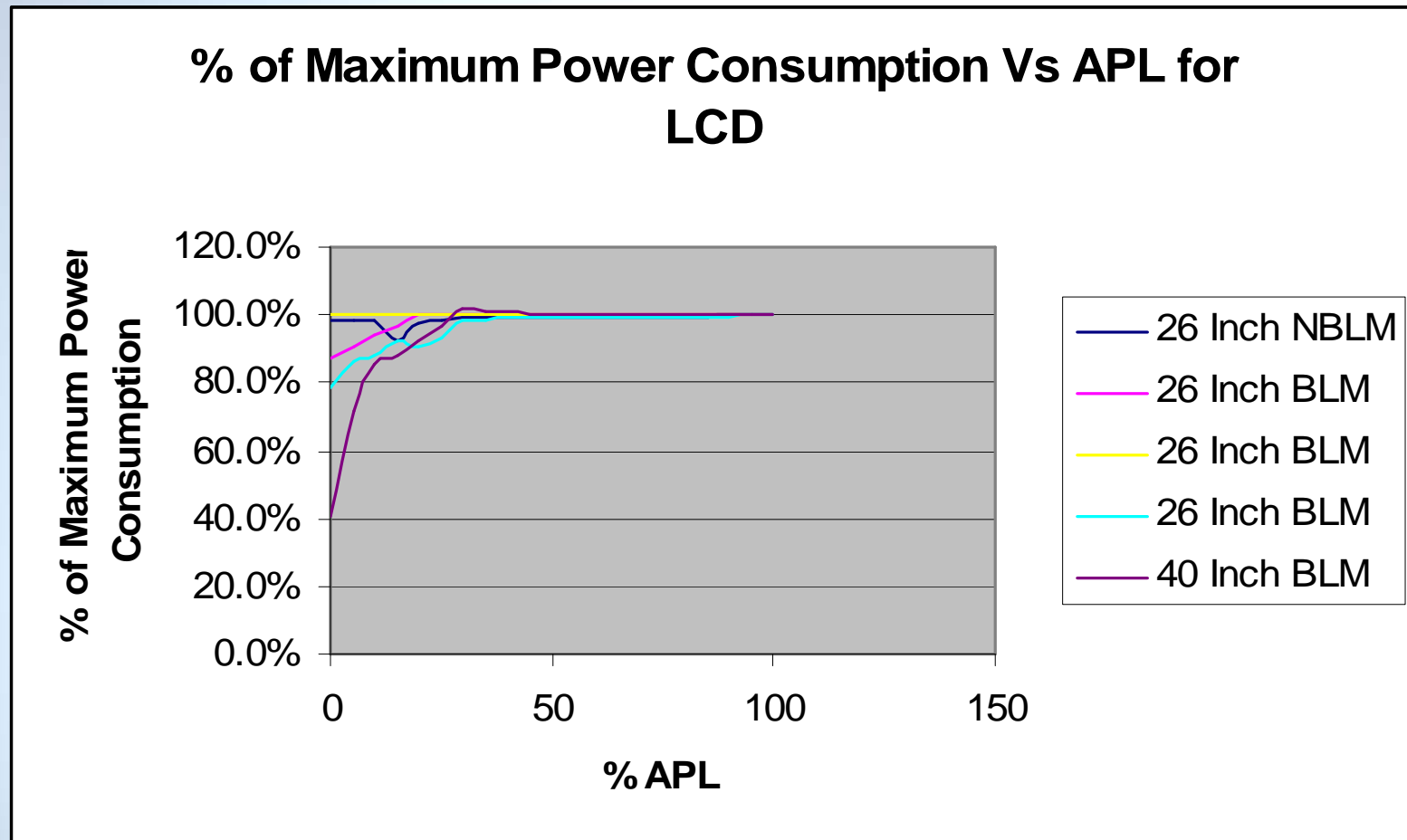
# Measured Plasma Power Consumption Characteristics



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# Measured LCD Power Consumption Characteristics

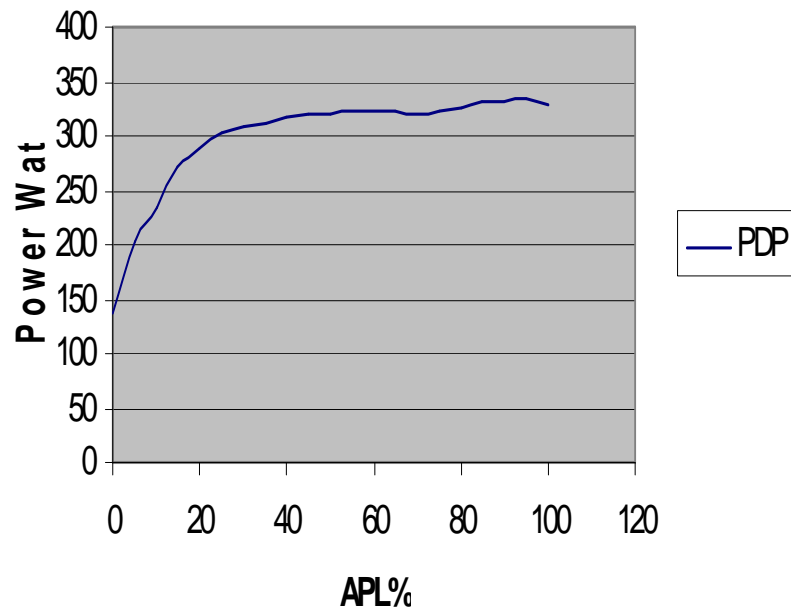


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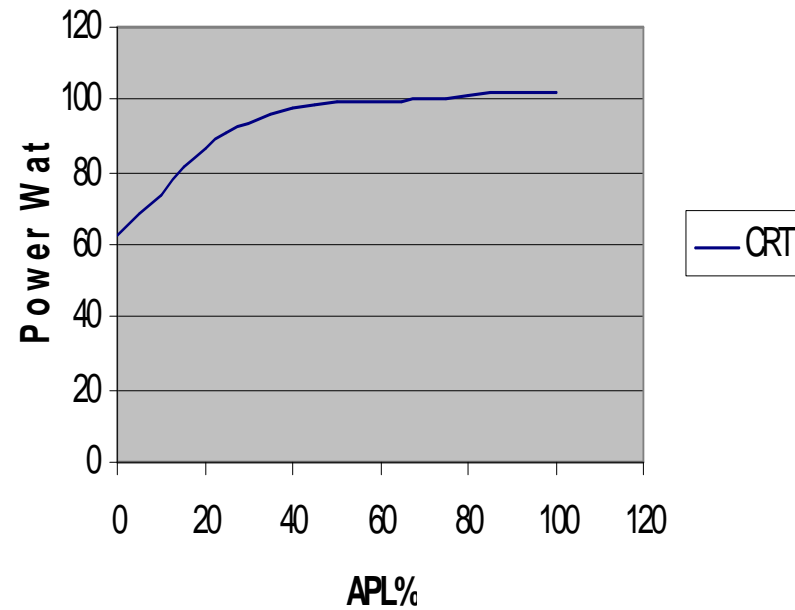
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# Plasma and CRT Power Consumption Characteristics

### PDP Power vs APL



### CRT Power vs APL



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# APL and Power Consumption by Programme Category

## Comparison Using Modeled Power Consumption

	Documentary	News	Movie	Sports	Lifestyle	Cartoon	Soaps	Drama	Max Variation
42 Inch Plasma	221	216	178	224	217	224	191	187	-46
42 Inch Plasma	291	283	208	302	290	293	231	227	-94
42 Inch Plasma	328	325	282	331	329	325	300	295	-48
42 Inch Plasma	313	308	265	318	312	314	281	275	-53
40 Inch LCD	187	185	165	189	188	186	174	171	-24
26 Inch LCD	117	117	113	118	118	117	115	115	-4
26 Inch LCD	107	106	100	108	107	107	102	102	-8
32 Inch CRT	114	112	95	116	113	116	100	99	-21
32 Inch CRT	69	68	65	69	68	70	67	66	-4
32 Inch CRT	131	131	120	131	131	130	124	123	-12
36 Inch CRT	172	169	146	175	171	172	154	152	-29
36 Inch CRT	262	257	225	266	262	262	235	233	-41
33 Inch CRT	156	154	131	159	156	157	139	137	-28
29 Inch CRT	112	110	93	114	112	112	99	98	-21

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# APL Power Consumption by Percent

Comparison Expressed by Percent

	Documentary	News	Movie	Sports	Lifestyle	Cartoon	Soaps	Drama	Max Variation
42 Inch Plasma	99%	97%	79%	100%	97%	100%	85%	84%	21%
42 Inch Plasma	97%	94%	69%	100%	96%	97%	77%	75%	31%
42 Inch Plasma	99%	98%	85%	100%	100%	98%	91%	89%	15%
42 Inch Plasma	98%	97%	83%	100%	98%	99%	88%	87%	17%
40 Inch LCD	99%	98%	88%	100%	99%	99%	92%	90%	12%
26 Inch LCD	100%	100%	96%	100%	100%	100%	98%	97%	4%
26 Inch LCD	99%	98%	93%	100%	99%	99%	95%	94%	7%
32 Inch CRT	98%	96%	82%	100%	97%	100%	86%	85%	18%
32 Inch CRT	100%	99%	95%	100%	99%	101%	97%	96%	5%
32 Inch CRT	100%	100%	91%	100%	100%	99%	94%	94%	9%
36 Inch CRT	98%	97%	84%	100%	98%	99%	88%	87%	16%
36 Inch CRT	98%	97%	84%	100%	98%	98%	88%	87%	16%
33 Inch CRT	98%	97%	82%	100%	98%	99%	87%	86%	18%
29 Inch CRT	98%	97%	82%	100%	98%	98%	87%	86%	18%

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## Conclusions

- To achieve proper measurements of TV power the test signal must be characteristic of APLs actually applied to TVs
- Existing test methods based on static patterns that fail to replicated the actual viewed APLs of pictures under 50% are inadequate as a valid Test.
- Further work needs to be done to validate the modelled approach in this presentation to by validation with actual power measurments