3M Optical Systems Division

3M-commissioned research shows consumers value wide-angle viewing on their LCD TVs

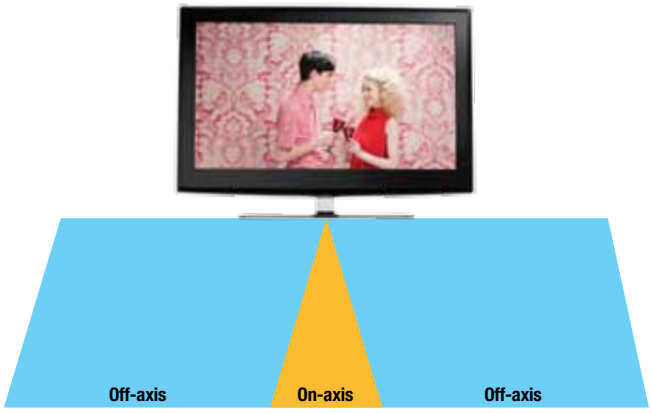
by: Dr. Dave Lamb

The Right Look Matters

A new study commissioned by 3M shows that American consumers want high brightness and quality no matter which angle they view their LCD TVs.

The study was conducted by CBS Vision, the Las Vegas-based research division and facility owned by CBS Corporation. 3M is a leading technology company in high-quality consumer electronics.

The findings show that as TVs become central entertainment hubs for viewing, gaming and web connectivity, consumers are viewing their TVs from many different angles on a regular basis, and expect a consistently bright and crisp screen image. As consumers age, they place an even higher premium on wide-angle viewing, the study shows.



Off-Axis Viewing, Defined
For the purposes of this study, off-axis viewing was defined as any viewing angle that is more than 15° from center.

"We were pleased to team up with 3M to take a closer look at the fundamentals surrounding consumers' LCD television viewing experience," said David Poltrack, chief research officer, CBS Corporation and president, CBS Vision. "We learned that consumers don't always realize that the way they watch their LCD TV impacts the quality of what they see."

"We wanted to understand how important wide-angle luminance—a combination of off-axis viewing and brightness—was to consumers, since this is something 3M technology enhances. This study shows that wide-angle luminance is very important, even if consumers are not initially aware of the measurement," said 3M Physicist Dr. Dave Lamb, the scientific advisor on the study.

Studying nearly 600 consumers in three phases over a four-week period, the study found that 84 percent of respondents view their TVs from a variety of angles. Further, 69 percent of participants said wide-angle picture quality was very or extremely important. And yet, 44 percent initially were unaware of a difference in quality of many LCD screens when viewed from the side. Once they viewed two sets of varying quality side by side, however, 88 percent preferred the screen with better wide-angle luminance—a brighter, crisper screen at a variety of viewing angles.

Additionally, the research shows that 47 percent of consumers reported they are not satisfied with the home-mode settings of most LCD screens, and change these settings, increasing the amount of energy consumed.

The research reinforces previous studies conducted in Japan looking at consumer viewing habits[i] and luminance preferences[ii].

---

[i] 2007 T. Fujine, Y. Kikuchi, M. Sugino, Y. Yoshida, *Japanese Journal of Applied Physics,* Vol. 46, No. 3B, p. 1358-1362 (2007).

[ii] 2011 T. Matsumoto, S. Haga, T. Nakatsue, S. Kubota, Y. Kubota, K. Imabayashi, K. Kishimoto, S. Goshi, S. Imai, Y. Igarashi, SID 18.2 (2011).

Key consumer behavior findings include:

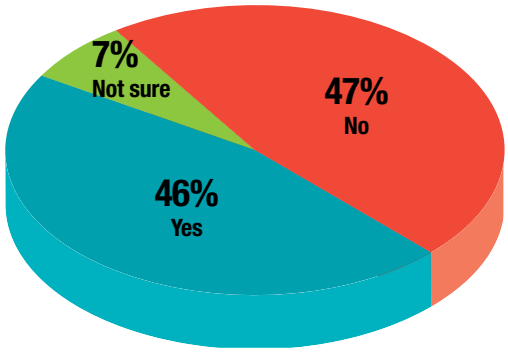
- 86% have a flat screen TV
- 15% definitely will buy a new TV this year; 60% find picture quality extremely important
- 46% typically view their primary TV off axis, defined as any viewing angle that is more than 15% from center, when watching alone; 67% do so when watching with other people
- 52% typically view their secondary TV off axis when watching alone; 65% do so when watching with other people
- 84% at times view their TV off axis when watching alone; 87% reported other people at times viewing their TV off axis

Key consumer preference findings include:

- 47% change the settings on their TVs to make them brighter (reducing the effectiveness of ENERGY STAR ratings)

Changing Picture Settings

To the best of your knowledge, have you or anyone else changed the picture settings on your newest TV since it was purchased?

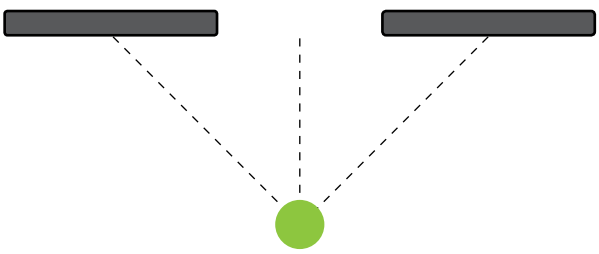


- 44% were initially not aware of a difference in picture quality when viewed off axis
- 88% preferred the set with better wide-angle luminance in a direct comparison

Television Evaluations

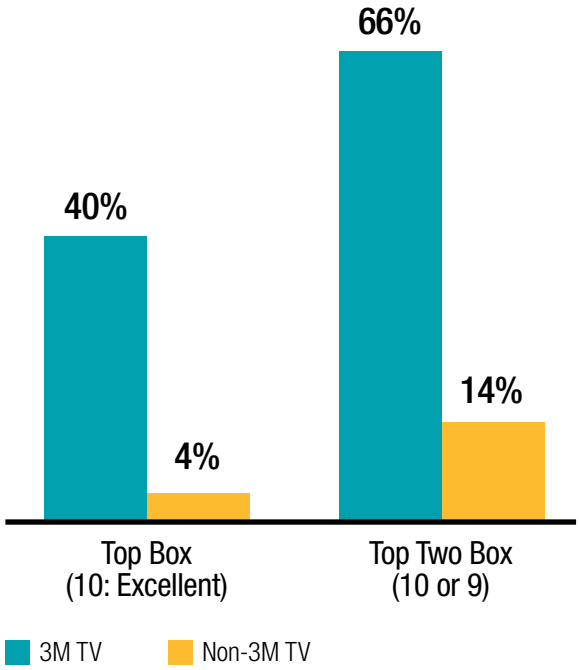
In the course of the current study, respondents viewed two TVs and evaluated them. One of the TVs included 3M technology, and one did not.

Each respondent viewed both TVs at the same time while sitting off-axis to both of them. Specifically, respondents sat facing both TVs, in the middle, at a 45 degree angle from both TVs simultaneously.



Detecting a Difference in Brightness All Respondents

How would you rate the brightness of this TV, overall? Please rate the brightness on a scale of 1 to 10, where 1 = Poor and 10 = Excellent.



- 83% of males 55 years of age and older would pay on average $200 more for the TV with better wide-angle luminance; 64% of females 55 years of age and older would do so, as well

Since 2007, 3M's team of scientists has documented a decline in LCD TV wide-angle luminance – a combination of off-axis viewing and brightness.

3M Physicist Dr. Dave Lamb, an expert in applied optics, and his team at 3M have characterized and disassembled more than 150 commercial LCD TVs of a variety of brands and models to assess technical quality over the past five years. In the process, they have documented a decline in wide-angle luminance – a quality 3M technology enhances.

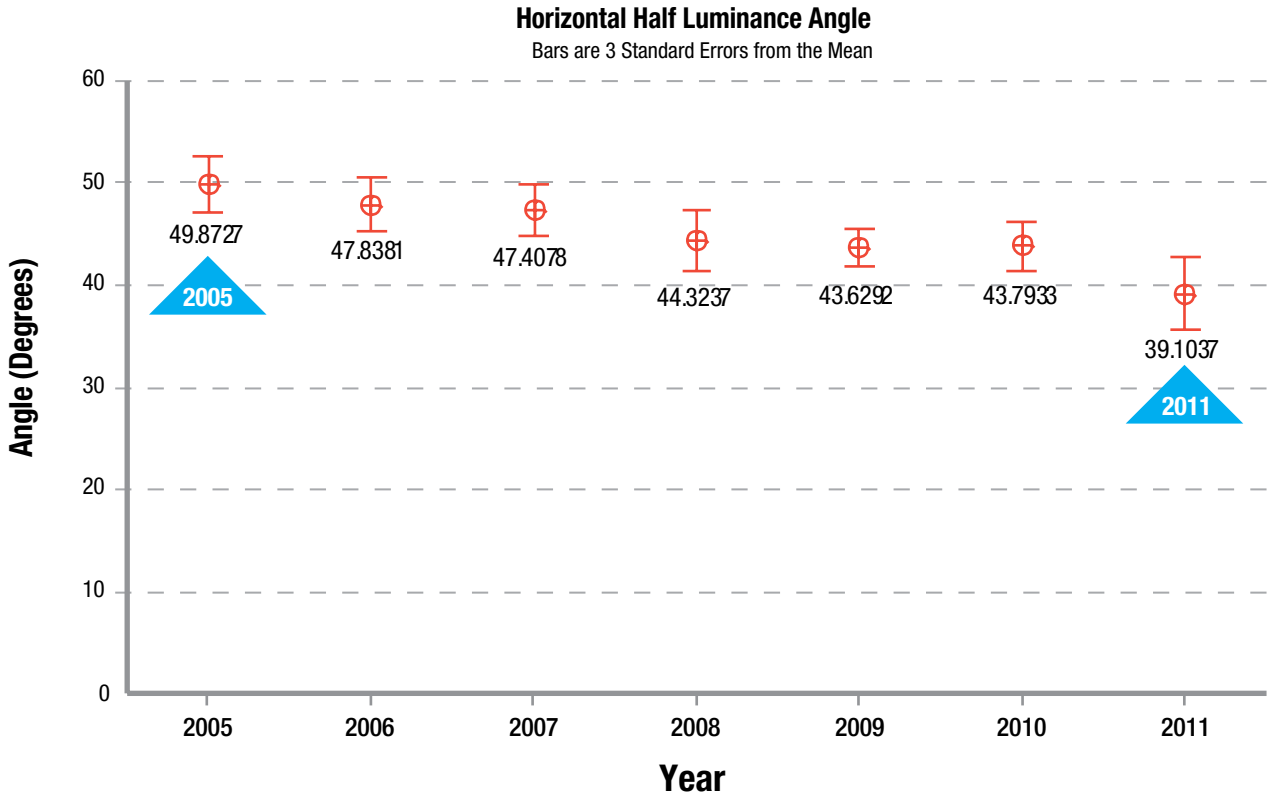
Mean Television Axial Luminance *3M Conoscopic Data Set*

Axial luminance has fallen since full capability was established in 2007 Validated with available third party data since 2010.

	2005	2006	2007	2008	2009	2010	2011
Maximum	329	438	501	470	380	374	302
Default	325	385	414	321	235	247	226

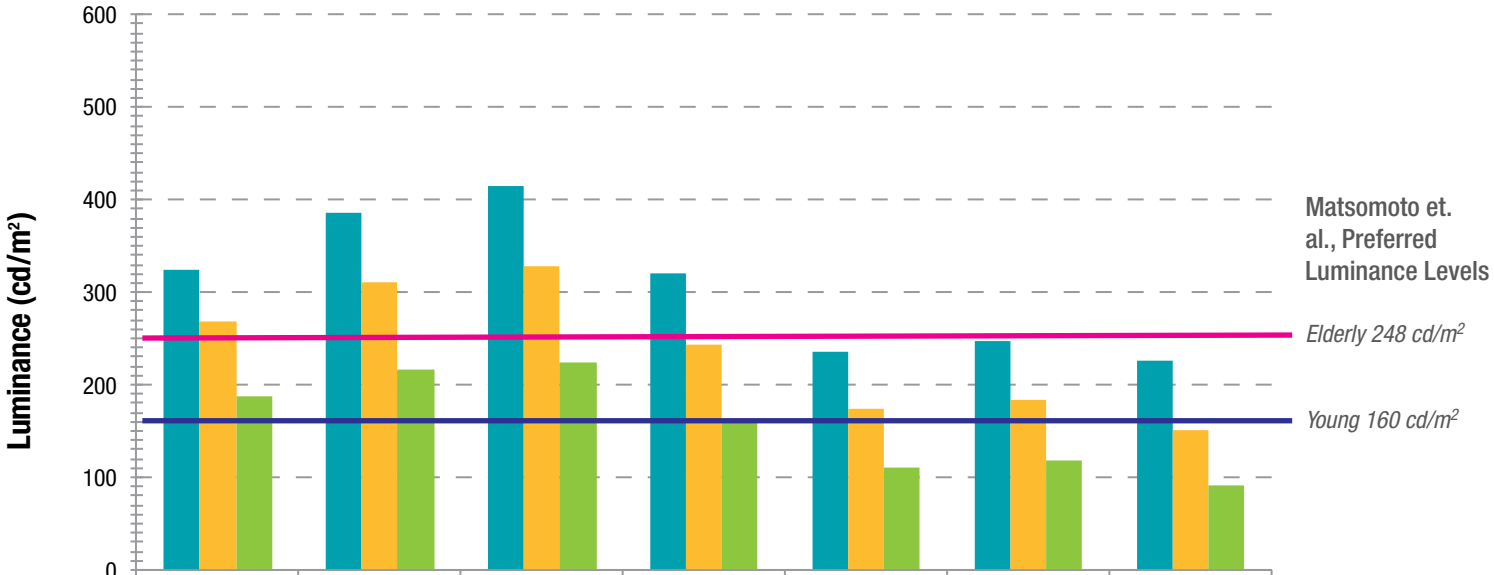
Distribution of TV Horizontal Half Angles *3M Conoscopic Data Set*

Backlights have become more collimated with time.



Mean Default TV Luminance Compared to Preferred Luminance Levels

Industry in danger of not meeting consumer needs. Consumers may change settings if sets are too dim.



	2005	2006	2007	2008	2009	2010	2011
0 Degrees	325	385	414	321	235	247	226
30 Degrees	268	310	328	244	174	184	151
45 Degrees	188	216	224	161	110	119	92

Year

"This decline in wide-angle luminance is a concern, because we believe it results in consumers changing the settings on their TVs in an effort to brighten them," said Lamb.

Since ENERGY STAR ratings for TVs are based on the home-mode settings, consumers may be using more energy than they realize. "When consumers must change the settings to meet their home-viewing needs, it reduces the effectiveness of an efficiency standard," Lamb said.

He says new standards are needed to ensure consumers receive the screen quality they prefer.

"We believe the time is now for a new measurement standard of wide-angle luminance—a combination of brightness and off-axis viewing. The standard must meet consumers' needs while achieving high ENERGY STAR standards," Lamb stated.

Lamb, who also is at work on a next generation 3M LCD technology, says that a minimum industry wide-angle luminance specification of 100 cd/m² (a measure of luminance) at 45 degrees in the home mode for TVs will ensure that consumers have great picture quality from all viewing angles without having to adjust the settings on ENERGY STAR-qualified sets.

"We want to ensure that every seat is the best seat in the house," Lamb said.

Dr. Dave Lamb is a Senior Physics Research Specialist for 3M's Optical Systems Division in St. Paul, Minn. He earned his Ph.D. in physics with an emphasis in applied optics from the University of Alabama in Huntsville, Ala.

3M

3M Optical Systems Division
3M Center, Building 235-1E-54
St. Paul, MN 55144-1000
U.S.A.

dZ **Requester:** Carly Bosanko **Creator:** deZinnia **File Name:** dz13905_SID2012WideAngleWP.indd **Date:** 5/30/12	**Printed Colors – Front:** C M Y K **Printed Colors – Back:** C M Y K **Match Colors:** 3M RED
Scale: 1 Inch	**This artwork has been created as requested by 3M. 3M is responsible for the artwork AS APPROVED and assumes full responsibility for its correctness.**