



May 19, 2006

The NEMA Lamp Section submits the following written comments in response to the Department of Energy's Energy Star Program request for stakeholder input on the third draft of proposed revisions to the CFL Energy Star specification dated April 19, 2006. Save for the first item on requalification, the comments follow the order of the document:

Requalification/Resubmission Requirement and Effective Date (p. 22)

Due to the importance of the issue and the fact that the current draft does not reflect our earlier comments, at the outset we strongly urge you take action to bring the proposed requalification/resubmission requirement in line with industry realities and the voluntary nature of the Energy Star program. If we are to be Energy Star Partners, we need a transition to the new specification that reflects the costly business we are in, and that lets us recover our investments in development, manufacturing, and marketing of new energy-saving products. Companies who have invested in good faith to meet the current criteria should not be penalized.

Although the interpretation of Requalification in section 14 is a little ambiguous, section 16 makes it clear that products qualified and submitted under Version 3.0 in 2006 would have to be requalified by January 1, 2007.

This is unacceptable to industry. New 2006 products were under development even before the first draft Version 4.0 criteria were made public. This could mean that products just now qualified and launched under Version 3.0 have to meet Version 4.0 within 6 months or be pulled from the market. Such products will typically require additional effort and resources by the manufacturers to modify or redesign these products, or at least do additional testing and reporting to comply with the new requirements, long before the investment in their initial design and manufacture has been recovered. This is not a product quality issue. We consider lamps made under the current Version 3.0 and the earlier Version 2.0 – the current Federal standard per EPCACT 2005 – to be quality products. The approach DOE is taking can drive lamps – lamps that consumers want, are using and are happy with – out of the program and out of the market.

We propose the following:

The transition from Version 3.0 to Version 4.0 should be managed similarly to the way conversion from Version 2.0 to Version 3.0 was handled, with a cut-off date for product submissions before the effective date of the new criteria and with substantial allowances for previously-qualified products. We propose that the cut-off date be 30 days prior to the effective date of version 4.0, keeping in mind that the effective date of version 4.0 must be at least 270 days after version 4.0 is finalized, per EPCACT 2005.

Lamps that are currently qualified, no matter what the date of qualification, and lamps that are qualified by the cut-off date, should not have to be requalified for 36 months from the effective date of Version 4.0, just as if the lamp had qualified under Version 4.0. Many of the Version 3.0 lamps have been subject to PEARL testing and are continuously tested by the manufacturers.

Products currently qualified or qualified by the cut-off date, must be shown to comply with the version 4.0 specification by the effective date of the Version 4.0 specification + 36 months.

Additionally, if a model is tested during a cycle of the Third Party Testing and Verification system under 4.0, and passes 40% of life testing, the manufacturer should be given the option to continue the test to full life and use this test as a re-qualification test. Then this lamp would not have to re-qualify again for 36 months from the time it successfully passed the third party testing to full life. In addition, if a lamp model is subjected to third party testing, the manufacturer should be allowed to count that data toward the requalification testing requirements for the model.

We welcome additional dialogue on this subject. It is of great importance to us. If DOE will not move on this point, then we ask Energy Star to tell us now what the Version 5.0 criteria will be so that our companies can start designing products now to meet them so we do not face this problem again.

Inclusion of CFLs with GU24 Bases (p. 3)

We suggest that language be added to the requirements to reflect that the GU24 base referred to in the document is defined by an ANSI specification or draft that is in process.

In addition, we note that the Energy Star Residential Fixture Program, administered by the U.S. Environmental Protection Agency (EPA), has also raised the prospect of including self-ballasted GU24 base lamps within its requirements later this year. We strongly urge DOE and EPA to coordinate their inclusion of these products within their respective programs so that uncertainty for manufacturers is minimized and marketplace confusion is prevented. Especially, we urge that all integrated CFLs be in one place since many of their design parameters (e.g., the ballasts and the fluorescent tubes) are the same.

Definition of “Specialty lamp” (p. 5)

We respectfully suggest that a clarification is necessary on this topic, as the term “specialty” lamp is not defined in Draft #3. For example, does “specialty” include only dimming and 3-way lamps, or would it also include “off-white” lamps that might still be considered white, but clearly off the black-body line (much like the Reveal, Daylight, or Natural Light incandescent lamps), or “bug lamps”? If the concept does not include the latter products, then in section 4A the terms “Non-specialty, Bare lamp” and “Specialty, Bare Lamp” should be removed and replaced with “Bare lamp–(Fixed light output), and “Bare lamp (Dimmable/3-way)”, respectively.

Covered dimmable and 3-way lamps

The most recent version allows for bare dimmable and 3-way lamps, with an efficacy target 5 LPW below the other bare types. We would like to see the same 5 LPW difference applied to covered lamps (dimmable, 3-way).

Definition of “Outdoor reflector” (p. 4)

We welcome your addition of a definition of this product as we suggested. However, we noted the addition of the word “only” to our proposed language. Accordingly, we are concerned how this requirement would be enforced. For example, would it be acceptable for a manufacturer to say “Outdoor” on the packaging or would the interpretation later be enforced to something like “Outdoor use only”? We suggest a clearer definition: “A reflector CFL that is primarily marketed for use in outdoor applications and is UL listed for wet locations.”

Use of Decimal Place for Minimum Efficacy Requirements, Lumen Maintenance and CRI (p. 5)

We would like to see the minimum efficacy targets expressed to the nearest LPW, not the nearest tenth of an LPW. For example, “60 instead of 60.0”. This would allow rounding up of 59.7 LPW, for example.

Similarly, the decimal place used in the percentage thresholds for Lumen Maintenance (90.0% and 80.0%) and CRI (80.0 and 77.0) should also be removed.

Bare, Covered, [Globe,] and Reflector CFLs (p. 5)

The word “Globe” should be added to the title of this category for minimum efficacy requirements. This would seem to be consistent with the categories listed at the bottom of page 1 and top of page 2.

Correlated Color Temperature (p. 5)

Do the proposed CCT limits hold for all settings of dimmable and 3-way lamps, or only for the highest setting? Footnote 2 on page 5 specifies that the efficacy measurements on dimmable or three-way lamps must be made at the highest wattage setting listed for the model. We suggest that a similar footnote should be created for the CCT measurement.

The proposed specification provides that manufacturers must identify one of a set of only six CCTs for marketing their products. We are concerned that these “Kelvin” designations are too few in number and will mean little or nothing to the consumer.

Furthermore, many consumers are currently purchasing lamps in colors other than the six specified. These include 2600K, 2800K, 3100K, 5800K and 6000K. Millions of lamps have been sold and are being sold today that have colors outside of the six specific Kelvin

temperatures listed. There appears to be consumer need and demand for CCTs other than what has been suggested for Version 4.0.

Under the current proposal, consumers who want to purchase lamps to replace spent Version 3.0-qualified CFLs may not be able to find their color match in an Energy Star-qualified 4.0 CFLs. They will be forced to purchase non-Energy Star product, or Energy Star products that do not color-match what their current installation currently use. Will this lead to CFL dissatisfaction?

We believe that additional color temperatures should be added to the list of acceptable CCTs. As under Version 3.0, if a manufacturer wants to qualify with one of these additional CCTs, the manufacturer should be required to put the CCT on the product packaging and the lamp should meet the MacAdam ellipse of the color claimed, centered at the black-body locus.

Individual Lamp Deviations from Lumen Maintenance and CRI Values (p. 5)

We note that Draft 3 makes no change from Draft 2 in this area, despite our previous comments. We continue to believe that the inclusion of these “individual lamp deviations” for lumen maintenance performance cannot be statistically justified. Placing a limit on the number of outlying data points on the low side of the distribution requires a corresponding offset on the high side if the data are normally distributed. Such a wide range is unlikely to occur in practice. In other words, variation on only the low side is likely the result of special cause variation. The Quality Assurance requirements in Section 11 of the criteria should minimize this variation and the need to limit outlying data points. We feel in principle that manufacturers should be encouraged to emphasize high quality rather than lower, but more uniform quality.

The NEMA partners, based on their design and manufacturing experience, do not recognize a technically sound basis for the added criteria. In fact, these proposed criteria demonstrate a lack of technical understanding and it is strongly recommended that they not be included.

We have the same opinion about the parallel criterion for CRI. We do not believe there is a CRI problem, and the September 2005 stakeholders meeting indicated that the proposed criterion is not based on any field complaints. In any case, if 2 or more lamps have exceptionally low CRI, we think it very unlikely that this can be compensated for by lamps with exceptionally high CRI, assuming the same phosphor blends are used. If the lamps are made to the same specification (i.e., the same phosphor formulation), it is very unlikely that they can meet both the average CRI and also this “2 less than 77” criterion. It does not reflect well on the Energy Star program to have such unreasonably coupled criteria.

However, if individual lamp deviation threshold values will be retained in the final criteria, we suggest that the values for both Lumen Maintenance and CRI should be 3.

To be clear, we favor dropping all of the proposed language designed to tighten the uniformity of lumen maintenance and CRI performance beyond the average values specified.

Reflector CFLs for Indoor Use: Photometric Testing Requirements (pp. 9-13)

As you know, a task force of NEMA companies continues to develop an alternative testing protocol that will be more accurate and less burdensome for manufacturers. The task group shared revised proposals with you in mid-April and we understand that you responded in a May 3rd letter. Based on a report from the task group, we are extremely concerned that our proposal to reduce the required life of a reflector CFL to 4,000 hours has been rejected. In particular, we believe the proposal to set rated life for Energy Star qualified reflector CFLs at 6,000 hours, combined with the increased maximum ambient temperature rating of 55 degrees C, based on only a handful of NEMA company products that currently met that criterion, will negatively impact market availability and penetration of Energy Star labeled products.

The task group is preparing a response to your May 3 letter and we look forward to a fruitful dialogue. As noted previously by the task group, based on current progress, NEMA is on track to deliver a full proposal to DOE by the end of June.

Qualification (p. 13)

The first sentence of Section 7 should be corrected by inserting “or outdoor reflector” after “covered”.

Quality Assurance: Manufacturing Quality Control Documentation (p. 16)

The first sentence of Section 11A should be corrected by inserting “any of” between “will accept” and “the following”. The next to last sentence of the Section

Quality Assurance: Color Consistency (p. 16)

It is not clear if next to last sentence fragment (“Records to substantiate...”) is meant to be a sub-point d under point 11.B.3.

We note that an important addition to the document needs to be made to ensure that the desired improved color consistency envisioned is obtained under this revision.

The color consistency provisions of this draft for CFLs are meant to be the same color consistency provisions that were previously adopted for Energy Star RLF 4.0.

In both cases color consistency is obtained by establishing a 7 step MacAdam ellipse around a reference x,y point that is the ANSI standard x,y point for the 2700K, 3000K, 3500K, 4100K, 5000K, and 6500K designated correlated colors. These x,y color points were provided by NEMA to EPA when EPA revised the RLF requirements. However, language was not subsequently included in RLF 4.0 to make it sufficiently clear that while the manufacturer has the option to choose the designated ‘color’ from the allowable options, in all cases the 7 step MacAdam ellipse that defines the boundary for that chosen designated color and subsequent color consistency substantiation (test and data retention requirements) is derived from the ANSI standardized x,y point for each color. Thus, while the manufacturer has some latitude to allow

for color variation that will naturally occur across different physical CFL configurations and with different wattages, in all cases lamps designated with the same ‘color’ are expected to have approximately 90% of ongoing production fall within the specifically defined ellipse for each ‘color’.

This led to some initial confusion when RLF 4.0 was implemented since some manufacturers thought they were allowed a 7 step variation around their own internal x,y point. This would not be acceptable since it would potentially allow more than a 7 step variation for the same designated ‘color’.

To eliminate this potential confusion EPA issued a special instruction (see Attachments A and B) to clarify this aspect and to further graphically specify the 7 step MacAdam ellipses for each of the allowable colors that a manufacturer may choose to designate..

To ensure that there is no initial confusion regarding the same issue, we strongly recommend the following:

- 1) Create a Supplemental Color Annex that would be referenced under Section 11.B. to ensure that manufacturers understand 11.B.1 means that once a manufacturer has designated a lamp to be either 2700K, 3000K, 3500K, 4100K, 5000K, or 6500K, that the lamps produced should fall within the associated specified 7 step ellipses as defined (see attached).
- 2) Include in the Supplemental Color Annex
 - a. The explanation EPA provided [under 1) Required Documentation for Correlated Color Temperature (CCT)’ from the attached EPA letter, (Attachment A)]
 - b. The same 7 step ellipse sheets provided by EPA (Attachment B)

Third Party Testing and Verification Program (p. 17)

Product selection committee

We would like to see the memberships of the two committees framed so that the NEMA Lamp Section companies are represented on each committee.

The term “lighting stakeholder group” should be defined in practical terms. Does this term mean any environmental advocacy group, for example?

The committee will comprise five representatives – for industry that includes CFL manufacturers and distributors. Does the category of “distributors” include distributors and retailers? We believe it should. If so, the eligible retailers should be Energy Star Retail Partners.

Organizational details still to be determined also include: Who can actually nominate someone? May a company nominate someone from their own company? Who in the company has the initial right of nomination? The draft refers to 'peers'; does this mean the nomination must be by more than one person with nominating authority? Also what are the qualifications for being

accepted as a “peer”? Is the Committee Chair selected from the members? If so, as initially there are no members, who is the Committee Chair? If there is none, then how does the Committee Chair participate in the approval of members?

Also, DOE has not yet addressed the question about how much time must pass before committee members can serve again. Will there be a “rest period” or can a member continue to serve two-year terms indefinitely?

TPT Product Nominations and Selection (pp. 18-19)

The term “random generator” is never fully explained. Please clarify.

The description of the product selection process also needs clarifying. It seems clear that a random selection process will be used for half of the samples, but there is some confusion about the other half. Does the Product Selection Committee choose the other half, using input from those Product Nominations received (12.F.5 and 12.F.6) as suggestions, or must the Product Selection Committee choose products from the list of those nominated? How much freedom does the Product Selection Committee have in accepting / rejecting nominated products. What if more products are nominated than can be accommodated? Does the Product Selection Committee decide?

The first sentence of Item F 2 should be corrected in two ways to read, “The product testing pool will comprise all distinct CFL models (technical designs).” This will lessen the chance that a model with many SKU designations will be selected for testing much more than the term “random” would suggest. The chance of being tested should not depend on the number of SKUs of the model there are, which relates only to how manufacturers have chosen to market their items. To make it fair to all manufacturers you must only use the unique model numbers for each manufacturer. With this change, the other sentences in the paragraph can be omitted.

Item 12.F.5 states those products that are not readily available in the marketplace will be removed from the nomination group. The products that are not readily available in the marketplace should automatically enter the delisting process.

Also, the text seems to read that any interested party (12.F.5) can nominate a product for testing without giving any reason, while a Partner (12.F.6) has to follow additional restrictions. On the surface, this doesn’t make sense. What is the rationale for this? We recommend that all nominators be limited by the same two constraints that apply to Partners (12.F.6, p. 19): (1) no more than two models per cycle; and (2) some supporting evidence of non-conformity must accompany the nomination.

Section 12 H 1 should be rewritten to read “...to release the data ONLY to the Third Party Program Administrator and to the manufacturer.” This corrects this awkward phrasing in the draft.

Also, it is assumed that 20 percent of the fees for testing will cover the cover the costs of the administrative work by the Third Party Testing Program Administrator. We respectfully suggest

that the TPTA submit to each of the manufacturers a report outlining their costs each cycle so that that the 20% figure is accurate – neither too high or too low.

Effective Date (p. 23)

The effective date of Version 4.0 must be at least 270 days after finalization of the revised specification, per EPACT 2005.

We have raised a number of specific issues of concern and would be happy to discuss them with you in person.

END MAIN TEXT OF COMMENTS

ATTACHMENTS A AND B FOLLOW

Attachment A – Energy Star RLF Clarification on Color Consistency

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460



OFFICE OF AIR AND RADIATION

July 1, 2005

Dear ENERGY STAR Partner,

Since the release of the Version 4.0 ENERGY STAR Residential Light Fixture specification, Partners have asked EPA a number of clarifying questions. This letter summarizes the issues and EPA's response to ensure that the specification is applied consistently among all Partners. It serves only to supplement and clarify the language of the specification and presumes that Partners are already familiar with version 4.0 of the specification.

1) Required documentation for Correlated Color Temperature (CCT):

For lamps shipped with fixtures, the lamps must have one of the following designated CCT values: 2700K, 3000K, 3500K, 4100K, 5000K, or 6500K. Supplemental documentation is required to demonstrate that at least 90% of the lamps tested fall within a 7-step ANSI Mac Adam ellipse. A Mac Adam ellipse is a **standardized** elliptical region on the CIE chromaticity diagram that bounds acceptable levels of chromaticity variance. In the attached spreadsheet, please find the standardized 7-step Mac Adam ellipse for each of the nominal CCT's that will be accepted under version 4.0 of the specification. Partners may meet the supplemental documentation requirements for CCT in the following manner:

- a. Select the spreadsheet for the nominal CCT of the tested lamp.
- b. Enter the lamp manufacturer and model number into the spreadsheet.
- c. Enter the lamp chromaticities tested in compliance with the specification (e.g., minimum sample size of 10 lamps) in the green input cells on the selected spreadsheet.

The graph should automatically plot these data points. The CCT requirement will be met if at least 90% of the data points fall within the 7-step ANSI Mac Adam ellipse for the nominal lamp CCT. Partners may also incorporate the Mac Adam ellipses into a separate document, as long as they are constructed to be identical to the ones contained in this spreadsheet.

2) Test requirements for lamp models that are identical except for CCT:

For lamp models that are identical except for CCT (i.e., same wattage and same lamp shape), the efficacy, color rendering index, and lamp life testing completed for one lamp model will also be accepted for the other lamp models. However, lumen maintenance and CCT testing must be completed on all lamp models.

Note that these requirements also apply to alternate lamps that may ship with a qualified fixture. If alternate lamps are of the same type as the primary lamp (i.e., same wattage, lamp shape, **and same CCT**) additional test documentation is not required. However, if the alternate lamps vary in wattage, lamp shape, and/or CCT, additional test documentation is required. If only CCT varies, lumen maintenance and CCT testing must be completed on the alternate lamp.

3) Requirements for replacement lamps:

EPA recognizes that fixture Partners cannot control which lamp model a consumer might select to replace a lamp that has reached its end of life. Therefore, while the specification requires that lamps shipped with fixtures meet specific performance characteristics, and that fixtures shipped without lamps provide guidance to the consumer, it does not have requirements for replacement lamps.

4) Reference to IEC 60091 under “Table 3 – Lamp Life Method and Measurement Reference Standards“

Table 3, page 17, Lamp Life section, the reference to IEC 60091 should be changed to IEC 60081.

5) Application of Line Voltage Socket standard:

As stated on page four of the specification, fixtures that use a self-ballasted pin based lamp are eligible for ENERGY STAR qualification. Manufacturers should note that this allowance **only** applies to compact fluorescent lamps. Fixtures that use self-ballasted pin based linear fluorescent lamps, (i.e., double ended fluorescent lamp with a plug-in lamp base, including straight shaped or U-bent types) are not eligible for qualification.

6) Temporary Conditional Approval for Lumen Maintenance and Life Testing:

EPA understands that due to the calendar time needed to test lamps for lumen maintenance and life testing, several lamp/ballast platforms will not be ready by October 1, 2005. EPA will grant a temporary conditional ENERGY STAR qualification to any fixtures that meet all the following requirements:

- 1) EPA receives a completed QPI form and all required supplemental documentation demonstrating that the fixture meets ENERGY STAR performance characteristics (except lamp life and lumen maintenance).
- 2) EPA receives laboratory report stating:
 - a. the lamp manufacturer and model number,
 - b. the number of lamps being tested,
 - c. the date that testing began,
 - d. 1,000 hour testing results for lumen maintenance and life, and,
 - e. the anticipated completion date for testing to 40% of rated life (4,000 hours minimum).

Note that the ENERGY STAR specification only requires lumen maintenance testing to 40% of rated life and will grant conditional qualification when testing has been completed for at least 40% of rated life. See the ENERGY STAR specification for more details.

This temporary conditional approval is only good until February 15, 2006. By this time, EPA must receive the 40% life test documentation for lumen maintenance and life testing. If this information is not received by EPA on February 15, 2006 the fixtures will be automatically delisted from the ENERGY STAR Qualified Product List, and utility and retail partners will be immediately notified of this delisting.

I hope this helps to clarify the requirements of the version 4.0 specification. Please contact Nick Germana, ICF Consulting, (ngermana@icfconsulting.com) if you have further questions about meeting these requirements.

Sincerely,



David Shiller, Product Manager
ENERGY STAR for Residential Light Fixtures

Attachment B – 7 Step MacAdam Ellipses for Allowable Colors

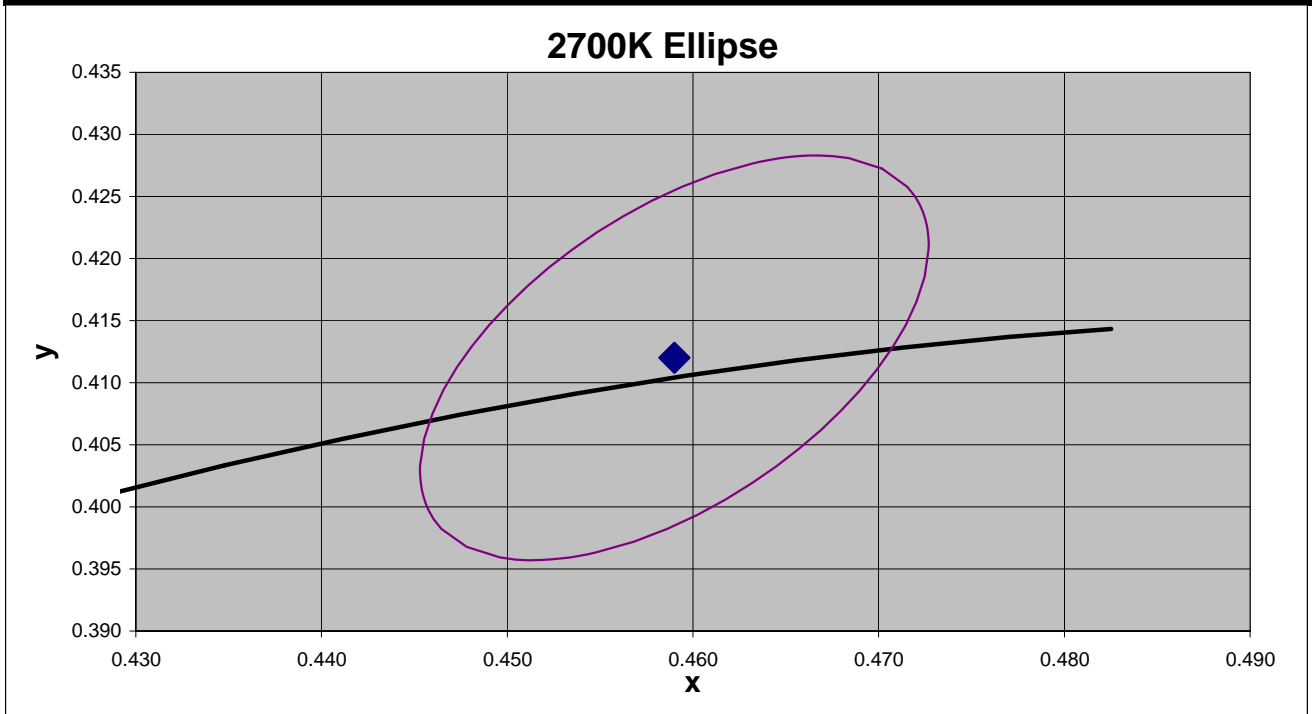
MacAdam Steps: 7

ANSI 2700K	Ellipse Center							
Ellipse Parameters	x	y	g11	2g12	g22	theta	a	b
	0.459	0.412	4.00E+05	-3.90E+05	2.80E+05	53.70	0.00270	0.00140

Enter lamp model and chromaticity coordinates from tested lamps samples below.

Lamp Manufacturer:

Lamp Model:



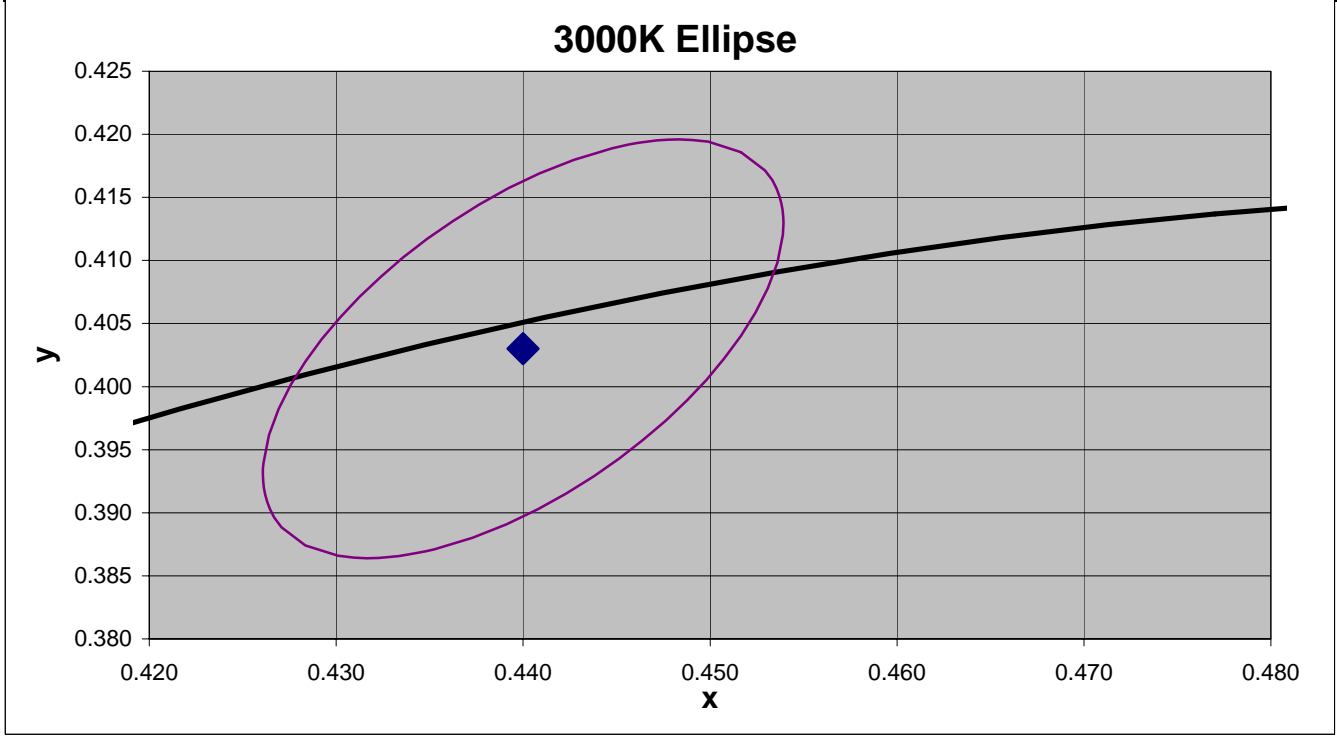
Chromaticity Samples

Sample	x	y
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2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
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6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>

MacAdam Steps: 7

ANSI 3000K	Ellipse Center							
Ellipse Parameters	x	y	g11	2g12	g22	theta	a	b
	0.440	0.403	3.90E+05	-3.90E+05	2.75E+05	53.22	0.00278	0.00136

Enter lamp model and chromaticity coordinates from tested lamps samples below.



Lamp Manufacturer:
Lamp Model:

Chromaticity Samples

Sample	x	y
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>

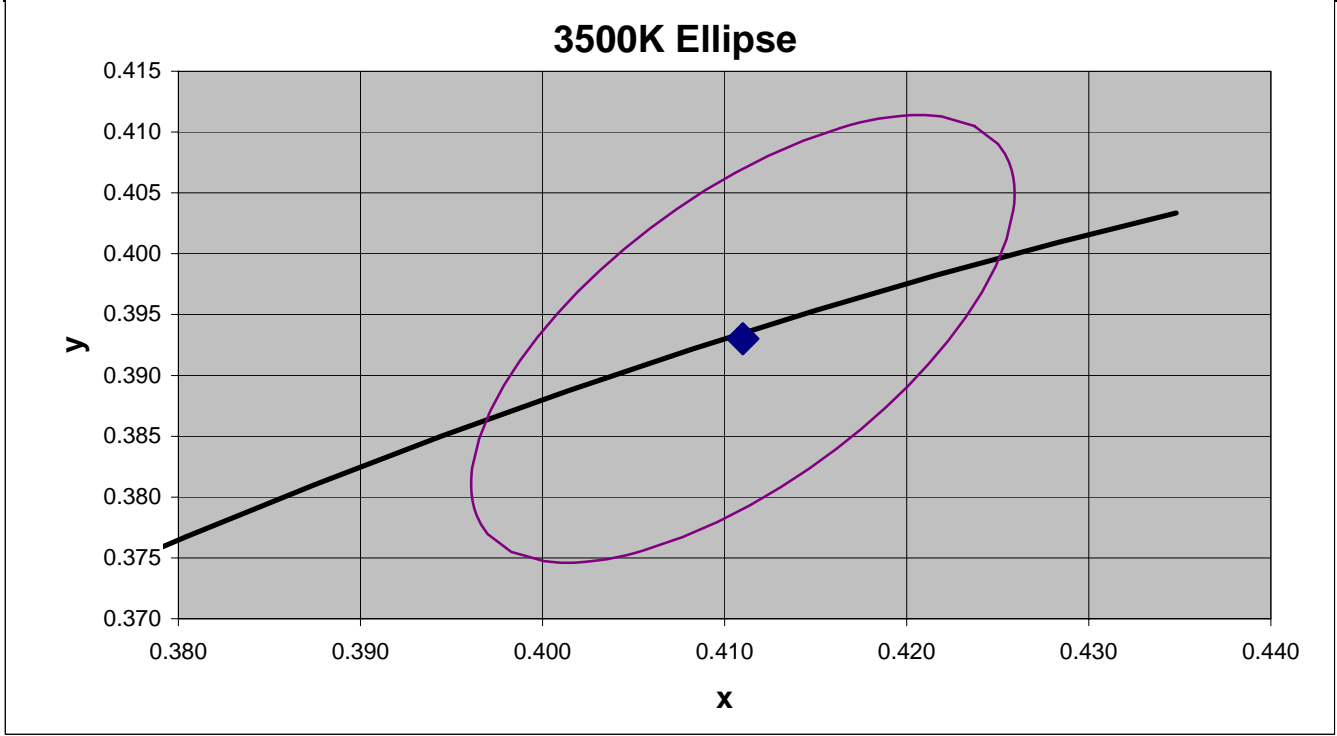
MacAdam Steps: 7

ANSI 3500K	Ellipse Center							
Ellipse Parameters	x	y	g11	2g12	g22	theta	a	b
	0.411	0.393	3.80E+05	-4.00E+05	2.50E+05	54.00	0.00309	0.00138

Enter lamp model and chromaticity coordinates from tested lamps samples below.

Lamp Manufacturer:

Lamp Model:



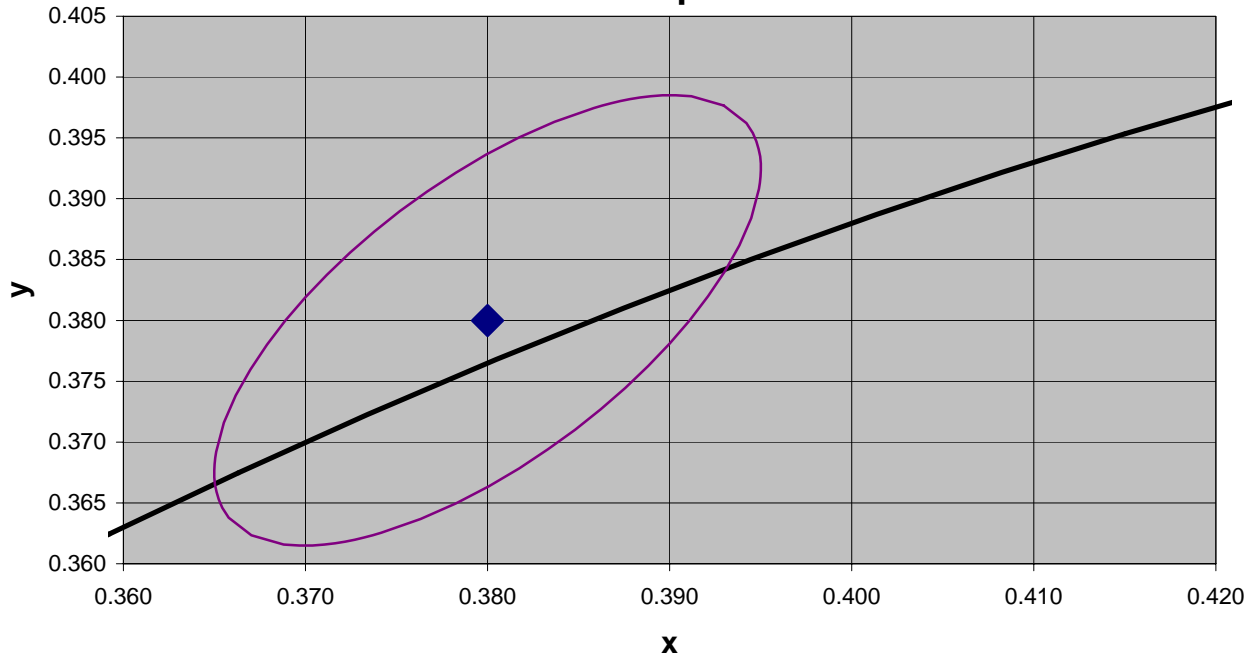
Chromaticity Samples

Sample	x	y
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2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>

MacAdam Steps: 7

ANSI 4100K	Ellipse Center							
Ellipse Parameters	x	y	g11	2g12	g22	theta	a	b
	0.380	0.380	3.95E+05	-4.30E+05	2.60E+05	53.72	0.00313	0.00134

4100K Ellipse



Enter lamp model and chromaticity coordinates from tested lamps samples below.

Lamp Manufacturer:

Lamp Model:

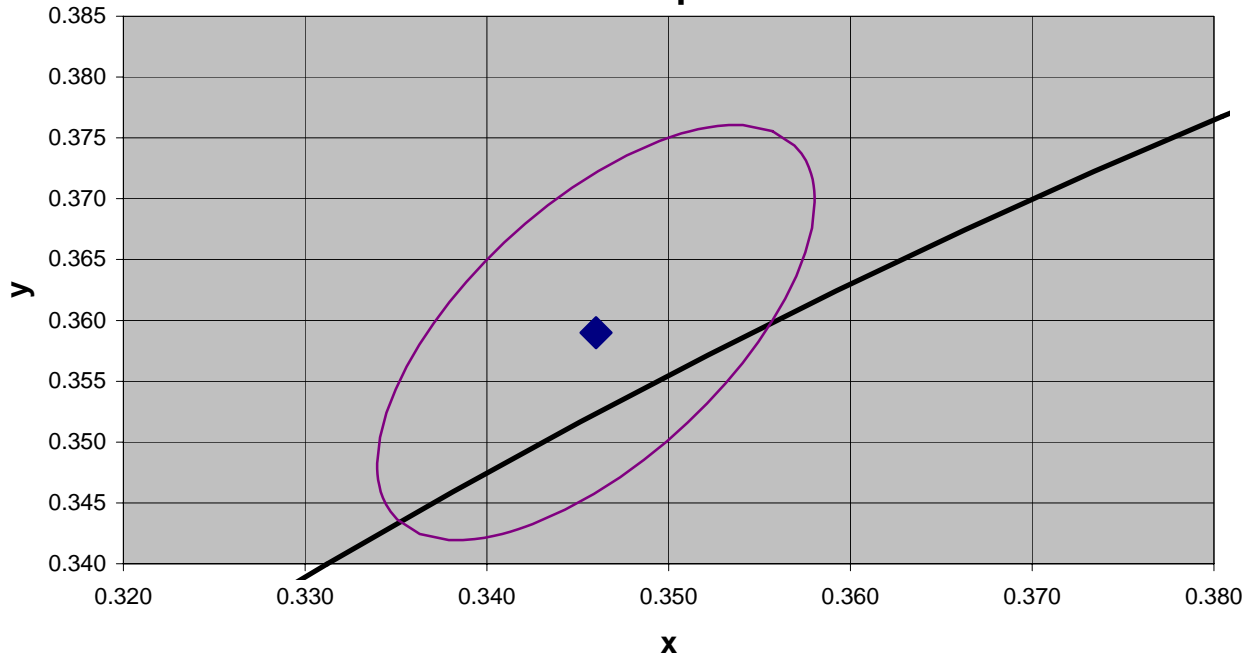
Chromaticity Samples

Sample	x	y
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2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>

MacAdam Steps: 7

ANSI 5000K	Ellipse Center							
Ellipse Parameters	x	y	g11	2g12	g22	theta	a	b
	0.346	0.359	5.60E+05	-5.00E+05	2.80E+05	59.62	0.00274	0.00118

5000K Ellipse



Enter lamp model and chromaticity coordinates from tested lamps samples below.

Lamp Manufacturer:

Lamp Model:

Chromaticity Samples

Sample	x	y
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>
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9	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>

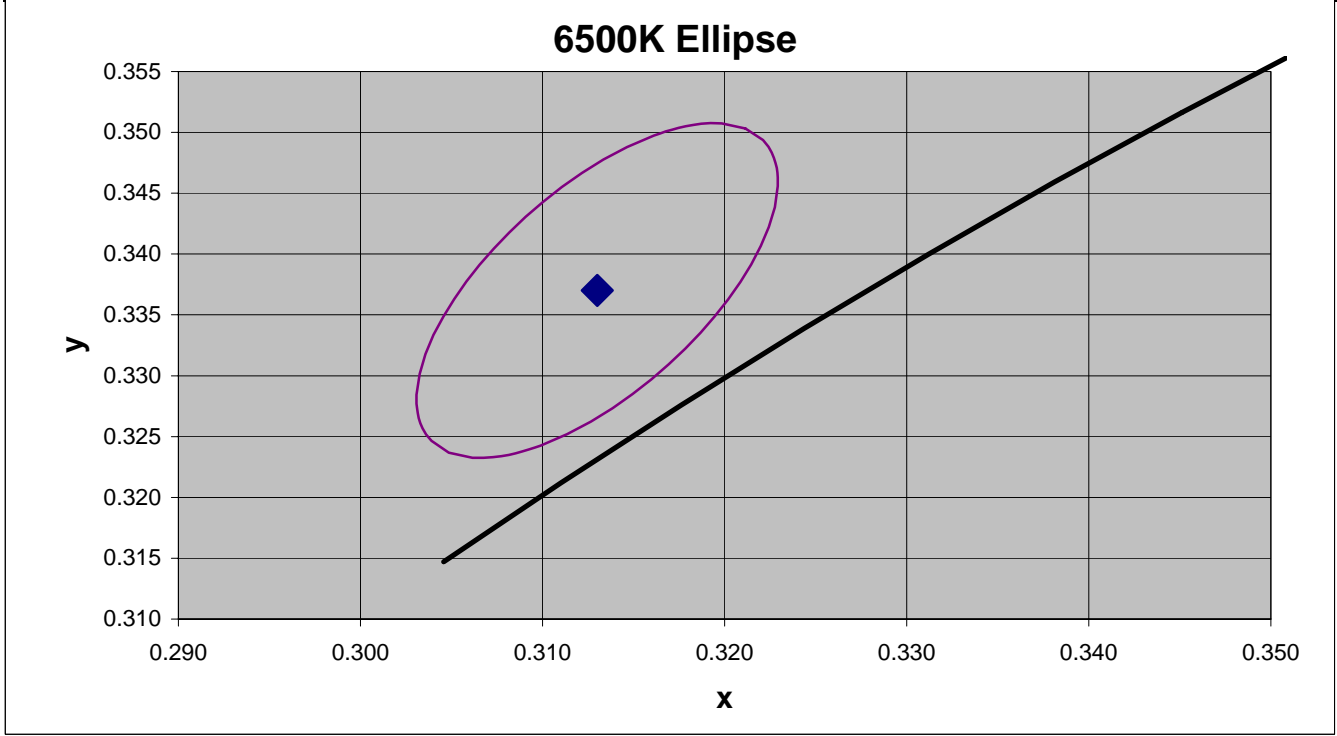
MacAdam Steps: 7

ANSI 6500K	Ellipse Center							
Ellipse Parameters	x	y	g11	2g12	g22	theta	a	b
	0.313	0.337	8.60E+05	-8.00E+05	4.50E+05	58.57	0.00223	0.00095

Enter lamp model and chromaticity coordinates from tested lamps samples below.

Lamp Manufacturer:

Lamp Model:



Chromaticity Samples

Sample	x	y
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>
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8	<input type="text"/>	<input type="text"/>
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