

## Annex 6: Cadmium Calculations Summary

Cadmium per unit Calculations;

Large display

1200ppm Cadmium is determined by direct elemental analysis (ICP-MS) of prototype products after dissolution in HF. 1.5mg total Cadmium per unit is based on an average of direct analysis of prototypes, weighted averaged over unit sizes from 32" - 60"+ diagonal.

Medium display

Medium size displays will have 2x the Cadmium concentration per homogeneous material (2000ppm), based on knowledge of the components being half the optical path-length. We estimate one tenth the total Cadmium per unit based upon one third (1/3) the total component length and one third (1/3) the light guide thickness, or 0.2mg per display.

Small display

Extending the above arguments, we expect small displays to be of a proportionately higher concentration (3000 ppm), while having significantly less total Cadmium (10ug/unit).

Lighting

Lighting products may have the widest range of values, given the wide range light outputs in the market. We would expect the concentration to be in the range of several thousand ppm, and conservatively to have 20ug of Cadmium per bulb or fixture.

**Request for a renewal of exemption 39 under Directive 2011/65/EU (RoHS II)**  
**Cadmium in II-VI LED Downconversion**

Total market sizes at 100% penetration:

European TV sales are forecast at 50M units annually, [[http://www.displayforum.de/market\\_raikes.htm](http://www.displayforum.de/market_raikes.htm)] so we take 1.5mg by 50M units, for a total potential for 75kg.

Mid-size monitors, laptops, tablets combine for twice the number of annual units [<http://www.engadget.com/2012/10/10/gartner-and-idc-pc-shipments-tumbled-over-8-percent-in-q3/>], but at 1/10 the Cd per unit, or 20kg annually.

Small displays are forecast to contribute 200M units [<http://www.asymco.com/2011/08/22/nokia-vs-android/>] or [<http://www.eetimes.com/electronics-news/4376108/MediaTek-to-bring-premier-smartphone-features-to--150---200-handsets>] but at 10ug per unit total less than 5kg of potential Cadmium on the market.

Estimates of LED lighting in the EU are very hard to find, but at 20ug per bulb or fixture, a very conservatively high estimate of 1 billion warm white units results in a maximum penetration of 20kg of Cadmium in this segment.

In summary:

Max Cadmium per segment

Large display	75	kg
medium display	20	kg
Small display	5	kg
Lighting	<u>20</u>	kg
Total	120	kg

**Request for a renewal of exemption 39 under Directive 2011/65/EU (RoHS II)**  
**Cadmium in II-VI LED Downconversion**

However, this is the total addressable European market size. II-VI downconversion materials are not in the market in 2012, and so to get a sense of realistic Cadmium entering the market, we must make some penetration assumptions by year.

2H 2014	2015	2016	2017	2018	1H 2019	Total	Average
2	5	8	10	12	7	44	8.8