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Öko-Institut e.V.

Dipl.-Ing. Carl-Otto Gensch

Dipl.-Ing. Stéphanie Zangl

Fraunhofer Institut IZM

Dipl.-Ing. Otmar Deubzer

Öko-Institut e.V.

Freiburg Head Office

P.O. Box 50 02 40

D-79028 Freiburg

Tel. +49 (0) 7 61 – 45 295-0

Fax +49 (0) 7 61 – 4 52 95 88

Street Address

Merzhauser Str. 173

D-79100 Freiburg

Darmstadt Office

Rheinstraße 95

D-64295 Darmstadt

Tel. +49 (0) 6151 – 81 91 - 0

Fax +49 (0) 6151 – 81 91 33

Berlin Office

Novalisstraße 10

D-10115 Berlin

Tel. +49 (0) 30 – 28 04 86-80

Fax +49 (0) 30 – 28 04 86-88

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1 Background and Objectives

Article 4 (1) of Directive 2002/95/EC on the restriction of the use of certain hazardous sub-stances in electrical and electronic equipment provides “that from 1 July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, PBB or PBDE.” The annex to the Directive lists a limited number of applications of lead, mercury, cadmium and hexavalent chromium, which are exempted from the requirements of Article 4 (1).

Article 5 (1) (b) of the Directive provides that materials and components can be exempted from the substance restrictions contained in Article 4 (1) if their elimination or substitution via design changes or materials and components which do not require any of the materials or substances referred to therein is technically or scientifically impracticable, or where the negative environmental, health and/or consumer safety impacts caused by substitution outweigh the environmental, health and/or consumer safety benefits thereof.

On the basis of this provision the Commission has received (and is still receiving) additional requests for applications to be exempted from the requirements of the Directive from industry. These requests need to be evaluated in order to assess whether they fulfil the above mentioned requirements of Article 5 (1) (b). Where the requirements are fulfilled the Commission proposes a draft decision amending the RoHS Directive.

Against this background Öko-Institut e.V. and Fraunhofer Institute for Reliability and Microintegration IZM have been commissioned by the European Commission with technical assistance for the evaluation of requests for exemptions submitted according to Article 5 (1) (b). The main objective of this technical assistance contract consists in a clear assessment of whether the requests for exemptions are justified in line with the requirements listed in Article 5 (1) (b) and in a subsequent recommendation on whether or not to grant the exemption – including a precise wording. These recommendations as well as the description of the proceeding will be included in monthly reports between October 2006 and October 2007.

2 General Procedure

For details on the general procedure please refer to monthly report 1.

3 Scope

On 10 November 2006 the sixth stakeholder consultation round was launched by the Commission and closed on 10 January 2007. The requests open for comments of this sixth consultation round represent the scope of this sixth monthly report and of the current and forthcoming evaluation. Some stakeholder comments have been posted on the consultation website concerning requests 1, 7, 15, 18, 22 and 23 as well as one general comment.

Table 1 below gives an overview over the corresponding set 6 of requests for exemption and their current status.

Table 1: Overview status of requests set 6

No.	Title	Applicant	Status
1a	Lead used for shielding of x-radiation emissions for CRT	VDC Display Systems	WITHDRAWAL 11/12/06
1b	Hazardous materials and lead in solders in components and assemblies used in non-consumer products	VDC Display Systems	WITHDRAWAL 11/12/06
1c	Electronic equipment where reliability, durability and longevity of the equipment is paramount	VDC Display Systems	WITHDRAWAL 11/12/06
2	Lead as soldering alloy in high performance communication electronic board and hexavalent chromium (Cr-VI)	Clarity SAS	WITHDRAWAL 18/12/06
3	GemCore 410 EMV	Gemplus	Draft recommendation possible (see section 5.1)
4	SAVBIT solder	Roband Electronics PLC	Clarification with applicant in progress.
5	Sn-Pb soldering used in Ground-based Aeronautical Communication Equipment Manufacturing	Telerad	Withdrawal probable. Final clarification with applicant in progress.
6	Transducers used in professional loudspeaker systems, using tin-lead solder	Gemini Sound products Corp.	Recommendation given in monthly report 5.
7	Tin-lead solder in the manufacture of professional audio equipment	Gemini Sound products Corp.	Recommendation given in monthly report 5.
8	Inventory of special ICS having tin-lead solder on/in leads/balls, used in specialist/professional equipment	Gemini Sound products Corp.	WITHDRAWAL 02/01/07
9	Crystal Stones within the battery operated watch	Zeon Ltd.	WITHDRAWAL 10/01/07

No.	Title	Applicant	Status
10	EEE used for the broadcast and homeland security sector	Tieline Technology	WITHDRAWAL 26/2/07
11a	AM186ES-V40 containing lead in used in the leads over plating and AM79C961AKC containing lead in used in the leads over plating	Digigram	Draft recommendation possible (see section 5.2)
11b	Audio board manufacturing process	Digigram	Withdrawal probable. Final clarification with applicant in progress.
12	Cadmium sulphide or cadmium selenide in polymer based thin film transistor	Silk Displays Inc.	Clarification on scope issue in progress with Commission.
13	Lead used in the soldering for surface finishing at the electric pole terminal on the electronic parts	ICOM Incorporated	Answers received 26/04/2007. Recommendation in progress.
14	Cadmium contained in the cadmium oxide of a thick film ceramic substrate	ICOM Incorporated	Questions sent out 7/5/2007. Answers expected until 21/05/2007.
15	All electronics assemblies using lead in solder	RoHSUSA Inc	Final recommendation given in monthly report 5.
16	Lead in electric overblankets for Hot Spot detection	Beurer / Especialidades Eléctricas Daga S.A.	Final recommendation given in monthly report 5.
17	MPC10 used in automatic vending machines to achieve the payment by card	Sagem monetel	Recommendation in progress.
18	Hexavalent Chrome Cr-VI when used as a passivate	Amphenol Limited	Recommendation in process.
19	Lead contained in circuit boards, obsolete and non-compliant Intel 80c188/86 EA\XL microprocessors, Analog Devices ADMC300 DSP, and NEC uPD7101 DART and hexavalent chromium	NBS Technologies Inc.	Clarification on inclusion into RoHS scope still in process with applicant.
20	Component used in the manufacture of electric blankets and heating pads	Thermocable (Flexible Elements) Limited	Final recommendation given in monthly report 5.

No.	Title	Applicant	Status
21	Request to delete exemption for "Lead as impurity in RIG (rare earth iron garnet) Faraday rotators used for fibre optic communications systems	Integrated Photonics	Draft recommendation possible (cf. section 5.3).
22	Lead in Trimmer Potentiometer elements	Tokyo Denshi Ltd.	Questions sent out 7/5/2007. Answers expected until 21/05/2007.
23	Cadmium in opto-electronic components	Marshall Amplification plc	Questions sent out 7/5/2007. Answers expected until 21/05/2007.

4 Results

Questions have been sent out to all applicants. Some answers are still pending (6). This is in some cases due to applicants not replying to questions sent out by Öko-Institut even upon several reminders. Since in cases of possible withdrawals the Öko-Institut insists on a formal withdrawal by the applicant it is sometimes a lengthy procedure until the applicant does follow that request.

Most of the evaluation work has up till now consisted in asking the applicants the relevant questions in order to clarify whether (i) the application for which an exemption is requested falls under the scope of the RoHS Directive, (ii) an existing exemption would cover the application concerned and (iii) the use of the substance in an application can be described in more detail. This process sometimes takes up quite extensive e-mail exchanges and telephone calls. The fact that this is nevertheless an important part in the evaluation before beginning with drafting a recommendation is reflected in the many withdrawals (7) that are brought forward by applicants when they subsequently realise that the exemption request is not valid within the context of the RoHS Directive and its exemptions in force.

5 Recommendations

5.1 GemCore 410 EMV – Gemplus (set 6 request no. 3)

5.1.1 Description of the requested exemption

Gemplus S.A. requests an exemption for “GemCore 410 EMV” from the requirements of the RoHS Directive. “GemCore 410 EMV” stands for a smart card reader coupler designed for professional applications. The device includes a printed circuit board assembled with electric and mechanical components, among specialised chip-set component, multi-purpose components and specialised connectors.

According to the applicant a central component of the device will not be converted to lead-free solder by the manufactures since the current not RoHS compliant version is now not produced any more und has been stockpiled in a Last Time Buy by the applicant. While all other components of the device are presently converted to assembly using a lead-free process the remaining non-conforming component would represent a very small part of the overall system.

Therefore the applicant estimates the corresponding weight of lead being less than 1 mg for the complete product, the total quantity of lead involved being below 2 g per year respectively.

No precise wording was provided by the applicant – even upon further request by the consultants.

5.1.2 Summary of justification for exemption

The applicant justifies his request taking technical and environmental arguments into consideration:

- The applicant argues that the central component of the application has been phased out by the supplier due to the low volume of business. Therefore the supplier had decided not to redesign this component.
- No other similar component would be existing delivering the same functionalities as the current not RoHS compliant component.
- The amount of lead would be low and limited to professional equipment. Not using the stockpiled components and assemblies would mean to scrap them leading to a negative environmental impact.

In order to ensure a proper and well-balanced evaluation of the request, Öko-Institut asked the applicant to provide further information covering the following aspects:

- Technical functionality of the component in question
- Amount of stockpiled components
- Time necessary to develop RoHS compliant components or assemblies respectively.
- Documentation of efforts undertaken to redesign components or the total assemblies respectively.
- Confirmation of suppliers that the component is not available in a RoHS compliant form respectively was not available in a RoHS compliant form at time of the last time buy.

Unfortunately, the applicant did not provide this information. The only document being brought forward was a conformation of a supplier explaining that “the component T83C5101XXX has been phased out and is therefore not available in Green or RoHS”.

Therefore, the exemption request is poorly justified: it is neither understandable why no substitute is available and why substitution is technically not feasible nor is it clear what efforts have been made to replace the component in question. Furthermore, the applicant does not justify why a redesign of the application is not feasible.

5.1.3 Draft final recommendation

Considering the above-mentioned arguments and the evaluation results, the recommendation would be not to grant an exemption since a redesign is feasible and the applicant could not prove why redesign could not be in place by 1 July 2006.

Nevertheless, the attention is drawn to the fact that this exemption request belongs to the lot of the so-called LTB requests and that an evaluation sticking closely to Article 5 (1) (b) does not seem to be adequate: In this particular case the relatively small amounts of lead involved and the need to scrap remaining components in case an exemption is not granted lead to the conclusion that – from a general environmental point of view – an exemption seems to be recommendable; though this argumentation is not in line with Article 5 (1) (b). Furthermore, in this case, it has to be taken into account that it is a small company that would have to support severe economic consequences in case an exemption is not granted – although here again this argumentation is not in line with Article 5 (1) (b).

5.2 AM186ES-V40 containing lead in used in the leads over plating and AM79C961AKC containing lead in used in the leads over plating – Digigram (set 6 request no. 11a)

5.2.1 Description of the requested exemption

Digigram requests an exemption for two devices AM186ES-V40 and AM79C961AKC, both containing lead used in the leads over plating. On request the applicant could provide further information about the area of application of these devices:

- Both of the devices are used for the so called NCX product range, whereas for each of this kind of product one piece of them is used.
- Functionality: AM79C961AKC manages the Ethernet data for AM186ES-V40, whereas AM186ES-V40 codes the Ethernet data for the digital signal processor for the NCX product.
- The NCX product in total serves as a terminal in a network satisfying the demands of various applications used for multi zone audio distribution (retailer, hospitality, theme parks, factories, railway stations, airports etc.). Background and foreground music and live announcements can easily be managed in multiple audio zones.

According to the applicant the AM186ES-V40 and AM79C961AKC devices contain together less than 2 g of lead. Lead is used as part of the solder alloy providing termination solderability. In the beginning of 2007 the applicant had 150 pieces of each reference on stock. The total annual quantity of lead is estimated by the applicant being 200 g per year.

The applicant did not provide a precise wording for the exemption request.

5.2.2 Summary of justification for exemption

The applicant justifies his request taking technical arguments into consideration:

- The manufacturer (AMD) decided not to produce these devices (AM186ES-V40 and AM79C961AKC) lead free.
- Due to the end of life status for this product a new generation is developed in order to replace these products. Due to the low volume of production the restart of the development would require engineering, tooling and lead to viable production costs.
- Currently no direct equivalent would exist and no direct substitutes would be planned.

In order to ensure a proper and well-balanced evaluation of the request Öko-Institut asked the applicant to provide further information covering typical aspects relevant for Last Time Buy. Although the applicant could provide some more information especially relating to the functionality of the devices and describing the application of the final product containing the devices, the main question about efforts being undertaken to redesign components or the total assemblies respectively remained not being answered.

Therefore, the exemption request is too poorly justified: it is neither clear what efforts have been made to replace the two devices in question nor justified why a early redesign of the application was not be feasible.

5.2.3 Draft final recommendation

Considering the above-mentioned arguments and the evaluation results, the recommendation would be not to grant an exemption since a redesign is feasible and the applicant could not prove why redesign could not be in place by 1 July 2006.

Nevertheless, the question remains whether due to the kind of application an exemption is necessary at all, since it is probably that the application can be categorised as a “fixed installation”. Furthermore, the attention is drawn to the fact that this exemption request belongs to the lot of the so-called LTB requests and that an evaluation sticking closely to Article 5 (1) (b) does not seem to be adequate: In this particular case the relatively small amounts of lead involved and the need to scrap remaining components in case an exemption is not granted lead to the conclusion that – from a general environmental point of view – an exemption seems to be recommendable; though this argumentation is not in line with Article 5 (1) (b).

5.3 Request to delete exemption for "Lead as impurity in RIG (rare earth iron garnet) Faraday rotators used for fibre optic communications systems" – Integrated Photonics (set 6 request no. 21)

5.3.1 Description of the request to revoke and existing exemption

As part of the Commission decision of 12 October 2006 the Annex to the RoHS Directive was amended for “Lead as impurity in RIG (rare earth iron garnet) Faraday rotators used for fibre optic communication systems.” The amendment was based on a request for exemption brought forward by JEITA (Japan Electronics & Information Technology Industries Association) on behalf of NEC Corporation and Murata Manufacturing Co., Ltd and SUMITOMO METAL MINING CO., LTD. (see monthly report 3 section 5.15 and update of 21 June 2006).

The function of optical isolators consists in the reduction of reflection noise in several optic communication systems (transceiver, transmitter and receiver, optical amplifier). For this purpose rare earth iron garnet (RIG) are used because of their magneto-optical effect.

The garnet crystal is grown by the so called LPE (liquid phase epitaxial) method which uses lead oxide as flux material. In doing so lead is slightly included in the crystal as an impurity.

The total annual quantity of RIG used for optical isolators in the EU is specified to be 6.000 g. Starting from a typical Pb content of 0,3 to 1,0 % the total amount of Pb in this application accounts for less then 100 g per year. According to JEITA in a dissolution test using Dutch

serial batch test Pb has not been detected. It is thus not expected that there are traceable impacts on the environment when entering the waste stream.

In November 2005 Öko-Institut received first references of garnet Faraday rotators equivalent to those described in the request for exemption. According to the manufacturer of these products (Integrated Photonics, Inc.) all of the bismuth rare-earth iron garnet Faraday rotator products have been third party certified to be compliant to all RoHS requirements and, in particular, all have less than 1000 wt. ppm of lead.

In the context of the last stakeholder consultation which closed in January 2007, Integrated Photonics, Inc. (IPI) now requests to revoke the existing exemption.

5.3.2 Summary of justification for revoking an existing exemption

IPI provides detailed data and information in order to support the requested revoke of the exemption. Data and information span the following considerations:

- Background and cause for developing RoHS compliant RIG Faraday rotators
- Technical and scientific feasibility
- Production capacity
- Qualification time
- Testing method accuracy
- Environmental burden
- Impact of the existing exemption on innovation

The applicant argues substantially that he had been able for five years producing and delivering Faraday rotators that meet the RoHS Maximum Concentration Limits. An independent testing laboratory confirms both, the accuracy of the testing method as well as the results of the tests. Furthermore, an extensive programme of methods development, methods comparison, methods calibration and methods validation had been undertaken in order to assure that lead levels can be accurately determined.

The applicant claims to be well capable of addressing the EU and worldwide market need for RoHS compliant Faraday rotators without any exemption. IPI were already a qualified vendor of Faraday rotators to numerous isolator suppliers.

IPI's Faraday rotator garnets were essentially identical in form, fit, function, chemical, mechanical and structural properties to non-compliant Faraday rotators being replaced. Against this background the applicant argues that a change of such a nearly identical component typically only requires qualification at the first level of device manufacture.

In the stakeholder consultation some comments were received in order to support the existing exemption¹. The main arguments are as follows:

- System vendors are dependent on a supply chain to provide optical modules. Typically this supply chain consists of (1) Vendors of lead free garnets, (2) Vendors of isolators (with or without fiber), (3) vendors of laser diodes, (4) vendors of optical subsystems, (5) system vendors putting telecommunication network equipment systems on the market. Against this background exchanging the subsystem of one vendor by that of another would generally require time consuming design changes and testing regimes. The system vendors would be dependent on their supply chain to provide optical modules using alternate garnet technologies which are fully tested to meet all functional, quality and long term reliability requirements of fiber optic communication systems. The specific structure of the supply chain would require “a long time due to ordering and testing / qualification of engineering samples which has to take place on each level of integration starting on the garnet level and subsequently processing to the system vendor level.” System vendors would not be in a position to assess the feasibility of substitutes further up in the supply chain and currently there were no feasible substitutes on the optical module-level containing RIG faraday rotators with less than 1000 ppm Pb available. The time-span necessary to qualify low-Pb substitutes would require 27 to 36 months.
- Another stakeholder requests further analysis of the request on revoking the current exemption with respect to aspects of competitiveness, referring to extended evaluation done within impact assessments of EU legislation. However, such an extended analysis goes far beyond the framework of this service contract.

Taking into account both, the application to revoke the existing exemption as well as the stakeholder comments mentioned above, the following conclusions can be drawn:

- As pointed out already in the final report “This exemption request does not represent an application which has a significant environmental impact. The lead content in the RIG Faraday rotator is very low and the probability that it will enter the environment is very low too. Thus, this exemption requests rather relates to the question of the rapidity of technological innovation in a very complex supply chain.”
- However, evaluation should stick closely to criteria of Article 5 (1) (b) in order not to undermine the original intention of the Directive with regard to technological innovation.
- It is not clear to Öko-Institut why the corresponding tests in the supply chain could not be done in parallel in order to gain time and to ensure deliverability along the chain.

¹ NEC Europe on behalf of 9 system vendors putting telecommunication network equipment systems on the EU market and direct suppliers to system vendors; Intel Optical Platform Division

- Furthermore, the applicant's argument is comprehensible that a change of such a nearly identical component typically only requires qualification at the first level of device manufacture.

5.3.3 Draft final recommendation

Against the above mentioned background and with regard to the criteria given in Article 5 (1) (b) the existing exemption for "Lead as impurity in RIG (rare earth iron garnet) Faraday rotators used for fibre optic communications systems" should be revoked. Also taking into account that the environmental impact of granting or not granting the exemption request is negligible the existing exemption should be revoked in order to support innovation and to promote early efforts for substitution.

5.4 Explanation concerning set 1 request no. 16, set 2 request no. 9 and set 4 request no. 15 (former contract)

During the last contract with the Commission on the revision of RoHS exemption requests, the Öko-Institut has reviewed three requests referring to the same area of application (i.e. the use of lead in certain lamps):

1. Mercury free flat panel lamps – Osram (set 1 request no. 16)
2. PbO (Lead in Seal Frit) used for making BLU (Back Light Unit Lamp) for LCD televisions – Samsung (set 2 request no. 9)
3. Mercury free flat panel lamps – Osram (set 4 request no. 15)

In a first step a recommendation was given in monthly report 4 with regard to the first two requests on granting an exemption with the following wording: "Lead oxide in glass used for bonding front and rear glass substrates of flat fluorescent lamps used for Liquid Crystal Displays (LCD)."

This wording was adopted in the further process and incorporated into the RoHS Annex as entry no. 20.

Since Osram had initially intended to get an exemption for any kind of application for its mercury free flat panel lamps, it put forward the third request mentioned above. The Öko-Institut reviewed the request and gave the recommendation to grant the exemption with the following wording: "Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting)".

The Commission has now informally consulted Member States on taking over this proposed wording for a replacement of exemption no. 20 of the RoHS Annex. This was not the intention of Öko-Institut when giving its recommendation with regard to set 4 request no. 15. The intention had been to add a new exemption to the Annex explicitly referring to mercury free flat fluorescent lamps in diverse applications (not only LCDs).

In order to clarify this issue Commission and Öko-Institut exchanged their views which included the following points:

- Öko-Institut's recommendation given in the Final Report to the last service contract (p. 119) does not include a replacement of point 20 of Commission Decision 2006/310/EC. What it intended with the recommendation was to include a new entry into the Annex to the RoHS Directive explicitly referring to the use of lead in mercury free flat fluorescent lamps (whereas entry 20 of the Annex does not mention whether the lamps contain mercury or not).
- The background to this is that Öko-Institut considers the use of lead in (not mercury free) flat fluorescent lamps restricted to the use in LCD displays as different to the use of lead in (explicitly mercury free) flat fluorescent lamps in diverse applications.
- According to Öko-Institut's understanding, the use of mercury in LCD backlights and in other lamps is exempted from the restriction of use due to entries 3 and 4 of the Annex thus meaning that the exemption request did only refer to the use of lead in the applications independently of the use of mercury:
- Explanation on entry 3 of the Annex² ("Mercury in straight fluorescent lamps for special purposes") by UK RoHS Guidance from June 2006: "Examples of such lamps are LCD back light lamps, disinfection lamps, medical/therapy lamps, pet care lamps (e.g. aquaria lamps), lamps with special components (e.g. integrated reflectors or external protection sleeves), lamps with special ignition features (e.g. designed for low temperatures), long length lamps (length > 1800mm) and amalgam lamps. In this context, there is no restriction on the quantity of mercury in these lamps."
- According to Osram / ELCF "Typically, so-called cold cathode straight fluorescent lamps with very small diameter are used as LCD backlight lamps. These lamps should be seen as straight fluorescent lamps for special purposes".
- Furthermore, there are two different interpretations of entry 4 of the RoHS Annex ("Mercury in other lamps not specifically mentioned in this Annex"):
 1. "if a mercury lamp is not within the scope of items 1 - 3 of the Annex, it will be covered by item 4" (statement ERA Technology in their exemption review study from 2004).
 2. "Examples of "other lamps" containing mercury are high intensity discharge (HID) lamps (e.g. sodium lamps and metal halide lamps), circular fluorescent lamps and U-shaped fluorescent lamps." (Extract from UK DTI RoHS Regulations - Government Guidance Notes from June 2006). This statement would be interpreted as restricting the scope of entry 4 of the Annex to those examples.

² "Technical adaptation under Directive 2002/95/EC (RoHS) - Investigation of exemptions", ERA Technology, December 2004.

- Öko-Institut as well as Osram / ELCF work with possibility 1 as working hypothesis. ELCF statement: "The flat fluorescent backlight lamp should be seen with regard to entry No 4 of the RoHS Annex".

Concluding on the above mentioned points, Öko-Institut would like to state the following:

- No common valid interpretation of entry 4 of the RoHS Annex exists. Industry is interpreting the entry as exempting the use of mercury in "other lamps" not specifically mentioned in the Annex. This also includes flat fluorescent lamps used in LCDs.
- Thus, Samsung's request covered the use of lead in mercury-containing flat fluorescent lamps used in LCDs.
- Osram's requests covered the use of lead in mercury-free flat fluorescent lamps in diverse applications.
- Öko-Institut – also assuming that the use of mercury in lamps is exempted from the RoHS Directive - thus recommends two different wordings since the use of lead in flat fluorescent lamps containing mercury should be explicitly limited to LCDs while the use of lead in mercury free flat fluorescent lamps can also be exempted for other applications.
- However, legally binding decisions with regard to legislation in force – including the RoHS Annex – can only be done by the European Court of Justice. Öko-Institut's recommendation is therefore only based on assumptions and common understanding of technical and scientific aspects.

6 Further proceeding

The next step will be to finalise to finally clarify open issues concerning withdrawals, scope issues and necessary technical clarifications with applicants. Furthermore, recommendations for remaining requests will be finalised.

The next monthly report is scheduled for 24 May 2007.