Department
for Environment
Food & Rural Affairs

Exemption for the use of helium cadmium lasers in Raman spectroscopy

March 2025

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We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.

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Introduction

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (RoHS regulations) restricts the use of 10 hazardous substances in electrical and electronic equipment (EEE), with a view to contributing to the protection of human health and the environment, including the sound recovery and disposal of waste.

Industry can apply for exemptions to allow the supply of products using one or more of the restricted substances above the threshold limits set down in the RoHS regulations where specified criteria are met. Applications for exemptions are made to the Secretary of State under regulation 6 of the Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020 (2020 regulations). Any exemption that is granted can be used across industry, not just by the business that applied for the exemption. Exemptions are granted where it is determined that the necessary criteria have been met following a detailed evaluation conducted in accordance with regulation 5 of the 2020 regulations.

Following the UK's withdrawal from the EU, the function of granting, renewing and revoking exemptions were, in relation to Great Britain, transferred to the Secretary of State by the 2020 regulations, using powers in section 8 of the European Union (Withdrawal) Act 2018 (Withdrawal Act).

Part of the evaluation process is an 8-week consultation to collect contributions from stakeholders.

A request for renewal for an exemption was submitted on 19 January 2023 for the use of helium-cadmium lasers in Raman applications. The requested exemption will be applied in monitoring and control instruments in industry. These lasers are used in Raman spectroscopy which is a widely used analytical method for precise measurement of the chemical structure, phase and polymorphy, crystallinity and molecular interactions. The laser requires the cadmium in order to emit the laser at a certain wavelength, 325 nanometres (nm) for Raman spectroscopy.

The requested duration of the exemption is for 7 years and according to the application it would be expected to lead to the introduction of 200g of cadmium to the Great Britain (England, Scotland and Wales) market annually. The applicant states that elimination or substitution of cadmium maintaining the current technical performance is currently scientifically or technically impracticable.

The exemption covers monitoring and control instruments in industry under category 9 (industrial) of electrical and electronic equipment (EEE), as covered in the 2012 RoHS regulations.

Purpose of this consultation

The purpose of this consultation is to seek views on the request for the renewal of an exemption to the substance restrictions in the RoHS regulations, to collect additional data and information, and to inform stakeholders about the application.

Geographical extent

We are consulting on proposals applicable to England, Wales and Scotland only. The Secretary of State's transferred function only applies in relation to England, Scotland and Wales.

Northern Ireland is out of scope of this consultation. This is because the EU RoHS Directive is covered under the Windsor Framework agreement with the EU. As such, the EU RoHS Directive continues to apply in Northern Ireland and Northern Ireland continues to be bound by exemption decisions made by the EU.

Audience

This is a public consultation, and we welcome all views, particularly views from the electrical and electronic equipment manufacturing and supply industry, and relevant trade bodies, organisations who use the equipment in question, research institutions and universities, non-governmental organisations (NGOs) and public administrations.

Responding to this consultation

You can respond to this consultation online using the Defra Citizen Space consultation hub.

For ease of analysis, responses via the Citizen Space platform would be preferred, but an alternative option is provided below if required.

Email: rohs@defra.gov.GB

Responses must arrive by the closing date of the consultation (4 May 2025) to be counted. Any responses received after this date will not be analysed. To ensure your response is included in the analysis, consider responding online at Citizen Space.

Further exchange with stakeholders will be held after the consultation has ended for those issues where further need for information or (technical) discussion has been identified.

Duration

This consultation will be open for 8 weeks from 10 March 2025 until 4 May 2025.

Confidentiality and data protection information

A summary of responses to this consultation will be published on the government website at www.gov.uk/defra. An annex to the consultation summary will list all organisations that responded, but will not include personal names, addresses or other contact details. Defra may publish the content of your response to this consultation to make it available to the public without your personal name and private contact details (for example, your home address or email address).

If you would like anything in your response to be treated as confidential, please say so clearly in writing when you submit your response to the consultation and explain why you require these details to be kept confidential. The reason for this is that information in response to this consultation may be subject to release to the public or other parties in accordance with access to information laws. These are primarily the Environmental Information Regulations 2004 (EIRs), the Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018 (DPA).

We have obligations, mainly under the EIRs, FOIA and DPA, to disclose information to particular recipients or to the public in certain circumstances. In view of this, your explanation of your reasons for requesting confidentiality for all or part of your response would help us balance these obligations for disclosure against any obligation of confidentiality. If we receive a request for the information that you have provided in your response to this consultation, we will take full account of your reasons for requesting confidentiality of your response, but we cannot guarantee that confidentiality can be maintained in all circumstances.

If you select ‘No’ in response to the question asking if you would like anything in your response to be kept confidential, we will be able to release the content of your response to the public, but we won’t make your personal name and private contact details publicly available.

There may be occasions when Defra will share the information you provide in response to the consultation, including any personal data with external analysts. This is for the purposes of consultation response analysis and provision of a report of the summary of responses only. This consultation is being conducted in line with the Cabinet Office Consultation Principles.

Find our latest privacy notice uploaded as a related document alongside our consultation document.

If you have any comments or complaints about the consultation process, email consultation.coordinator@defra.gov.uk. Use the subject line: Consultation on amendments to the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations – helium cadmum lasers.

After the consultation

A summary of the non-confidential responses to this consultation and the government response will be published and placed on the government website at www.gov.uk/defra

The summary will include a list of respondents and organisations that responded, but not personal names, addresses or other contact details. However, information provided in response to this consultation document, including personal information, will be shared with the devolved administrations and may be subject to publication or release to other parties or to disclosure in accordance with the access to information regimes, for example Freedom of Information Act 2000 (FOIA) and the Data Protection Act 2018.

About you

A wide range of businesses, organisations and individuals are involved with or take an interest in the supply of electrical equipment. The questions below are intended to put your responses in perspective with those of other respondents.

Q1. Would you like your response to be confidential?

Yes or No.

- If you answered ‘Yes’, please provide your reason.

Q2. What is your name?

Q3. What is your email address?

This is optional, but if you enter your email address you will be able to return to edit your consultation response in Citizen Space at any time until you submit it. You will also receive an acknowledgement email when you submit a completed response.

Q4. Which best describes you?

Provide the name of the organisation or business you represent and the approximate size or number of staff (where applicable). (Select one option. If multiple categories apply,

choose the one which best describes the organisation you are representing in your response.)

- Business representative organisation or trade body
- Producer of electrical and electronic equipment
- Business end user of electrical or electronic equipment
- Public end user of electrical or electronic equipment (for example, NHS, educational institution)
- Distributor (including online marketplaces)
- Local government
- Community group
- Non-governmental organisation
- Charity or social enterprise
- Consultancy
- Academic or research
- Individual
- Other
- If you answered ‘Other’, please provide details:

Background

The EU RoHS Directive limits the use of specified hazardous substances in the manufacture of certain electrical and electronic products. The UK played a key role in developing the original European legislation, and the RoHS Regulations transposed the EU RoHS Directive into UK law. The RoHS Regulations limits the use of 10 substances and maximum concentration values tolerated by weight in homogeneous materials as follows:

- lead (0.1%)
- mercury (0.1%)
- cadmium (0.01%)
- hexavalent chromium (0.1%)
- polybrominated biphenyls (0.1%)
- polybrominated diphenyl ethers (0.1%)
- bis(2-ethylhexyl) phthalate (0.1 %)
- butyl benzyl phthalate (0.1%)
- dibutyl phthalate (0.1%)
- diisobutyl phthalate (0.1 %)

The scope of the RoHS Regulations is wide ranging, covering most types of electrical and electronic equipment intended for household or commercial use. A limited list of products is exempt, such as large-scale fixed installations, large-scale industrial tools, military equipment, items designed specifically for research and development, most forms of transport and active implant devices.

Businesses can apply for exemptions that allow the manufacture and supply of products that exceed these threshold limits where it can be proven that alternative less hazardous substances are not available or not reliable or the total environmental, health and safety impacts of the substitution would outweigh the benefits thereof. Following the GB withdrawal from the EU, the Secretary of State now has the power to determine applications for exemptions for products supplied to or in Great Britain. Businesses can apply to the Secretary of State for new exemptions and for the renewal of existing exemptions. A list of existing exemptions can be found in Table 1, Schedule A2, of the Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020.

Under Regulation 5, an exemption may only be granted where the following conditions are satisfied:

1. The exemption does not weaken the environmental or health protection afforded by UK REACH
2. The elimination or substitution of the material or component, via design changes or use of materials or components which do not include any restricted substances, is scientifically or technically impracticable
3. The reliability of substitute materials or components is not ensured
4. The total negative environmental, health and consumer safety impacts caused by substitution of another material or component is likely to outweigh the total environmental, health and consumer safety benefits of that substitution

The exemption request

Entry 69 in Table 1, Schedule A2 of the 2020 regulations is for cadmium in helium-cadmium lasers. The existing exemption for category 9ind (monitoring and control instruments in industry) applications was set to expire on 21 July 2024, although the exemption remains valid until the renewal application is determined. The applicant, Japan Business Council in Europe (JBCE) has requested a renewal for the maximum duration of 7 years.

Granting the renewal of this exemption would lead to the continued introduction of 200g of Cadmium to the GB market annually. The applicant states that no suitable substitutes for use of cadmium to achieve the 325nm wavelength lasers to be used in Raman spectroscopy.

Proposed change to exemption wording

No change to the wording has been proposed by the applicant.

Details on the exemption application

One of the uses of helium cadmium lasers is for Raman spectroscopy, a chemical analysis technique that provides detailed information about molecular compositions, structure and interactions. When a laser is directed at a sample it can be absorbed, transmitted or scattered. When scattered light is of a different frequency to the incoming laser this is known as Raman scattering. Most of the incident light is scattered at the same frequency and only around 0.0000001 % is scattered at a different frequency. The Raman shift is the frequency shift between the incident light from the laser and the Raman scattered light. The frequency shift will depend on the molecules and types of bonds within the sample which allows for this technique to be used to create a chemical fingerprint.

Depending on the material analysed different lasers are used ranging from ultra-violet, visible to near infrared wavelengths. Helium cadmium lasers use a mixture of helium and cadmium gases to produce a laser light at wavelength of 325nm. It is the inclusion of cadmium which generates this specific wavelength. Helium cadmium lasers allow higher sensitivity, selectivity, better analysis of biological structures and less interferences (i.e. fluorescence).

Alternatives and substitutes

According to the applicant, there are no alternatives for the restricted substance (cadmium) in lasers used for Raman spectroscopy at these wavelengths available in the market with the same performance. There are promising technologies such as Diode Pump Solid State lasers (DPSS laser). It is considered an alternative for many of the applications that use helium-cadmium lasers, but the specifications do not match what is required for Raman Spectroscopy. The stability of lasers for Raman spectroscopy is important, a Raman peak is typically 0.01nm wide. Other lasers producing wavelengths of 320nm are available however the wavelength is unstable, shifting from 0.1 to 1nm, impacting the Raman measurement. The applicant states that substitute lasers are being developed but there are none currently available that meet the technical requirements. The applicant estimates that it will take 4-7 years to develop new equipment once alternative lasers are available.

This consultation aims to collect opinions on the current state of play regarding alternatives and substitutes, at a substance and a device level, and to further understand the alternatives and any limitations that the alternatives currently available might have for end users.

Socio-economic and environmental impacts

This consultation is also looking to further understand how the granting or revocation of this exemption request may have an impact on business, from manufacturing through to end user applications, as well as wider society and social impacts (for example, human health impacts). The consultation also aims to understand the effects on the environment of granting or revoking this exemption (for example, additional waste generation caused by enforced equipment changes). We welcome opinions and supporting evidence for any

viewpoints associated with the socio-economic and environmental impacts of this exemption.

Consultation specific questions

Q5. Do you agree or disagree that the exemption under RoHS for cadmium in Helium-Cadmium lasers should be renewed?

Agree

Disagree

Don’t know

Provide evidence to support your answer, explaining why you either support the applicant’s request or object to it. Include detailed technical argumentation or evidence where possible.

Q6. Do you agree or disagree with the proposed length (7 years) of the exemption renewal?

Agree

Disagree

Don’t know

Provide evidence to support your answer, explaining why you either support the applicant’s request or object to it. Include detailed technical argumentation or evidence where possible.

Q7. Do you know of any alternative lasers that can produce a wavelength of 325nm with adequate wavelength stability for use in Raman spectroscopy?

Yes, I do know about other materials that can provide 325nm wavelength lasers for Raman purposes.

No, I do not know about other materials that can provide 325nm wavelength lasers for Raman purposes.

Provide evidence to support your answer, explaining why you either support the applicant’s request or object to it. Include detailed technical argumentation or evidence where possible.

Q8. The applicant has identified Diode Pump Solid State (DPSS) as a possible alternative technology which does not rely on use of restricted substances. In your view does DPSS have the technical capability to replacing He-Cd lasers in all scenarios?

Yes, I do agree that DPSS can replace He-Cd in all scenarios.

Yes, I do agree that DPSS can replace He-Cd in some or most scenarios.

No, I do not agree that DPSS can replace He-Cd in any scenarios.

Provide an explanation to support your answer and if possible, links to supporting information. Include any thoughts on why DPSS is, or is not suitable for use by your organisation.

Q9. Do you consider that there is benefit in continuing to pursue the DPSS technology as an alternative to helium-cadmium lasers? Please include any information you have on the expected timescales and costs associated with this process.

Yes, I do agree that the improvements on the DPSS lasers should be pursued.

No, I consider alternatives to DPSS lasers should be considered (see question 12).

Q10. Are you aware of any research initiatives (past, present or planned) which are looking into possible alternative laser systems for He-Cd other than DPSS?

Yes, I do know of research initiatives which will help in the eventual production of RoHS compliant devices.

No, I do not know of research initiatives which will help in the eventual production of RoHS compliant devices.

Provide evidence to support your answer and, if possible, links to supporting information. If you answered yes, provide an estimate of the time required until the technology will be available for use in the market.

Q11. Can you estimate how many cadmium-containing laser tubes your organisation places on the GB market or purchases per year, or it is planning to place on the GB market or purchase over the next 7 years?

Provide quantitative data to support your view.

Q12. Do you have information on where the laser tubes' suppliers are located? If so, are their installations inside GB, outside or both?

Yes, the suppliers' installations are in GB.

Yes, the suppliers' installations are outside GB.

The suppliers' installations are both within and outside GB.

No, I do know that where the suppliers' installations are.

Q13. When the laser tubes reach their end of life it is assumed that the supplier takes them back for their refurbishment. Do you agree with this statement?

Yes, I do agree that the laser tubes are being collected by the suppliers and refurbished on their installation.

No, I do not agree that the laser tubes are being collected by the suppliers and refurbished on their installation. If no, where do they go?

Provide evidence to support your answer and, if possible, links to supporting information. If you answered no, provide evidence to support your answer (the most common waste management option applied to the laser tubes).

Q14. As part of the evaluation, environmental impacts will be assessed. Please estimate possible amounts of waste to be generated through a forced substitution should the exemption not be granted.

Provide quantitative data to support your view.

Q15. As part of the evaluation, socio-economic impacts will also be assessed. Please estimate possible impacts on employment in total, in Great Britain and outside, should the exemption be granted or not granted. Select the main sectors in which possible impacts are expected:

- manufacturers
- importers, distributors or professional sellers
- end users
- other (provide more information)

Provide any quantitative data available to support your view.

Q16. Estimate additional costs associated with a forced substitution should the exemption not be granted, and how this is divided between various sectors:

- manufacturers
- supply chain (for example, distribution)
- distributors or retailers (selling devices)
- end users
- other (provide more information)

Provide any quantitative data available to support your view.

Q17. Summarise your view on the potential impacts on human health, if this exemption was or was not granted.

Provide quantitative data to support your view.

Q18. Provide any further information and/or data that you think is important to substantiate your views.