Welcome to the ninth issue of *Laser Safety Matters*. This issue includes a review of the 2014 Laser Safety Forum as well as extended articles from some of the invited presenters of the Forum. A section in this latest newsletter revolves around laser pointer awareness and the current situation; also given are details of new and updated CIE publications and HSE guideline documents.

I would like to say a big thank you to everyone who has contributed articles to this issue. Please feel free to contact me if you would like to contribute an article for the next issue, or have suggestions for topics you would like covered.

### 19th Laser Safety Forum review, 2014

September 2014 saw the 19th annual Laser Safety Forum held in Loughborough, UK. The now traditional dinner on the Monday night before the Forum was well attended, with around 35 delegates enjoying lively conversation and the usual Burleigh Court dinner.

The Forum was attended by 77 delegates, breaking the record for the past 10 years; however, with a number of people missing the deadline for booking, the capacity would have been reached. *Book now for the 20th Laser Safety Forum coming later*

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*The views and opinions expressed by the contributors to Laser Safety Matters do not necessarily reflect those of the Board of Public Health England or of the editor.*
this year (September 2015) to avoid disappointment. We were pleased to welcome those who were attending for the first time as well as the many who were making return visits to catch up with acquaintances new and old. For some, this was the first opportunity to see the recently refurbished restaurant and bar area at Burleigh Court.

Ten presentations at the Forum covered the majority of areas where successful laser safety management is critical, not only putting it into practice in the workplace, but also detailing the approaches for emerging technologies, quantifying laser safety and incident reporting.

The morning session kicked off with Bob Ferguson, retired DSTL Laser Safety Advisor, with a presentation entitled “Star Wars’ LASER and open space’. Bob spoke about his experiences, challenges faced by DSTL and managing MOD research with laser equipment on an outdoor range at Porton Down, Salisbury. He discussed the issues and potential risks when operating lasers on the range as well as alignment procedures implemented when firing lasers. Issues that must be taken into consideration on the range include the weather, the landscape, the sheer size of the site and other range users. A further complication is the public highway within 1 km of the range on one side, a railway line on the other and helicopters from an army flying training school within a few kilometres of the range. Bob provided an interesting insight into how such issues are managed in order to deliver safe laser experiments without incident on the challenging range at this MOD facility. The second presentation, entitled “Improving laser safety”, was given by Stef Hoyle from Imperial College London. He covered the issues faced at Imperial College with improving laser safety for the Faculty of Natural Sciences over the last 5 years. Stef kindly agreed to write a more detailed overview of his presentation and this can be found on page 17.

The final presentation in the first session was given by Andrey Lyachev, PHE. Andrey provided an overview of a laser-driven light source (LDLS™) made by Energetiq and currently used within PHE. He described the principle of operation of this device which generates an emission with a near-flat spectral distribution from 170 to 850 nm and compared this new technology to conventional light sources. Andrey considered the safety features of the LDLS™ and how it is classified under BS EN 60825-1:2007 as a class 1 laser product and whether it should be classified under BS EN 62471:2008 “Photobiological safety of lamps and lamp systems”. He finished by highlighting how the same technology is now being developed for use in everyday life, from lighting and laser-driven headlights to laser-based projectors.

The mid-morning session of the Forum focused on quantifying problems and reporting of laser incidents. John Tyrer, Loughborough University, gave a talk on “Quantifying laser safety” based on a method for quantifying risks. A detailed overview of his presentation will be available in the next issue of Laser Safety Matters.

Stan Batchelor, from Guy’s & St Thomas’ NHS Foundation Trust, presented “Problems with medical laser safety eyewear”, on behalf of Delphine Darios. The
presentation provided an overview of Delphine’s work on reviewing and revising the advice given to users of the Trust’s lasers. Investigations were undertaken into the eye protection available for all of the Trust’s lasers and assessing compliance of the eyewear against BS EN 207:1999 and BS EN 207:2009. For the 30 lasers within the Trust, a reduction in compliance was found: 60% for BS EN 207:1999 and 30% for BS EN 207:2009, with 33% of laser eyewear compliant with neither standard. For 12 laser systems revised calculations were undertaken using the maximum clinical settings (rather than the maximum available settings). However, 92% complied with neither British Standard. There were a number of reasons why compliance was not met, most notably the protection level required was too high and so eyewear was not available on the market. From the findings, advice was provided to purchase the highest available protection level eyewear, review risk assessments, ensure training of staff is appropriate and, if possible, resolve safety issues by engineering controls.

The final presentation before lunch was “Role of MHRA and incident reporting”, given by Mel King, Medicines and Healthcare Products Regulatory Agency (MHRA). She gave an overview of the role and work streams of the MHRA in the UK, followed by the reporting and communication procedures for incidents involving medical devices. Mel kindly agreed to write a more detailed overview of her presentation: see page 16.

After lunch, Fahd Quhill, a consultant ophthalmologist from Royal Hallamshire Hospital, Sheffield, presented data on the increasing number of “Toy' laser macular burns in children”, which has resulted in long-term vision damage from laser pointers. Fahd kindly agreed to write an overview of his presentation, which can be found on page 10. Following Fahd’s presentation, an open discussion was initiated on the availability of laser pointers on the consumer market in the UK. The consensus was that solving such a complex issue requires the co-operation of many parties and increasing the awareness without undesired promotion of copycat incidents.

John O’Hagan, PHE, provided a presentation covering the new edition of BS EN 60825-1:2014. He discussed the role of the revised International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines and how these play their part in legislation and the filtration through to national standards on the safety of laser products. John spoke about the changes made by ICNIRP, their implications for revised accessible emission limits (AELs) and maximum permissible exposures (MPEs), time-dependent maximum angular subtense (αmax), the 3-step approach for assessing multiple pulses including pulse grouping, the new class 1C, the new optional pictorial labels and the revised structure of the document. More on the new changes to BS EN 60825-1 can be found in the next issue of Laser Safety Matters.

The final session of the day started with an “Update on laser safety standards and guidance” provided by John O’Hagan, while Gus Zabierek from the University of Birmingham gave an update specifically on IEC 60825-2, “Safety of laser products –
Part 2: Safety of optical fibre communication systems (OFCS)“. In addition to an update of the standards, John discussed a new joint IEC/ISO working group on eye and face protection against laser radiation and announced the appointment of Tom Lieb from the US as the new chairman of IEC TC 76. John spoke about the draft mandate to CENELEC/CEN regarding a change to EN 60825-1 and/or a new standard for consumer laser products and the recent (February 2014) European decision on consumer laser products, including “child appealing consumer laser products”. Another important development included the Professional Lighting and Sound Association (PLASA) taking ownership of the HSE guidance document HS(G)95, “The radiation safety of lasers used for display purposes”, on behalf of the industry. The HSE felt that after review “the document offers guidance on matters of procedure that is well respected and well used by industry but which goes beyond what is required to comply with health and safety law. A revision by HSE would remove some of this useful procedural guidance”. PLASA also aims to update the guidance by industry consensus through fair representation.

An open forum closed the day’s proceedings. Discussions included suggestions for the 20th Laser Safety Forum in September 2015, events upcoming in 2015 of particular interest such as the International Laser Safety Committee in Albuquerque, International Commission on Illumination (CIE) conference in Manchester (June/July 2015) and the International Year of Light 2015. An interesting point was raised on laser product labelling. Should it remain yellow and black, or as often observed on hand-held laser products match the colour of the laser beam? The majority of laser pointers are purchased online, and usually the label is of the colour of the laser beam. Displaying the wording in the colour of the laser beam, at least, indicates the colour to expect, as many customers are unaware what wavelength represents a particular colour, eg 532 nm is green. However, the label displaying a caution is particularly relevant for many of the hand-held lasers.

In conclusion, this was an interesting day covering a wide range of laser safety issues, with opportunities to catch up with fellow, like-minded professionals, providing valuable feedback and sharing solutions to their own experiences.

20th Laser Safety Forum event details, 2015

The 20th annual Laser Safety Forum will be held on Tuesday 15th September 2015 at the Imago at Burleigh Court Conference Centre, Loughborough, UK. A pre-forum dinner will be available at 7:00 pm on Monday 14 September 2015, the fee being £27.

To celebrate the Forum’s 20th anniversary as well as the “International Year of Light”, a number of special events are planned this year. Our keynote speaker will be John Marshall, currently Frost Professor of Ophthalmology at the Institute of Ophthalmology in association with Moorfield's Eye Hospital, UCL, with the talk “It isn’t just the laser beam!”, reminiscences from a life in laser safety.
The other topics include:

- product classification of bespoke products
- the importance of standards
- how laser safety is implemented in the Dutch army

The presentations will be followed by the open forum session, providing an opportunity to raise any laser safety issues that attendees would like to discuss.

If you would like to attend the Forum, please complete the online booking form at www.phe-protectionservices.org.uk/nir/courses, including all additional extras. Bookings need to be completed by 14 August 2015 and delegate numbers are limited to 85.

Attendance fees

- standard rate: £200
- discount rate: £150 (former course participants)
- presenters: no fee

2015 International Year of Light and upcoming events

International Year of Light

2015 sees a number of laser-related events happening around the world celebrating “The International Year of Light”. On 20 December 2013, the United Nations (UN) General Assembly’s 68th Session proclaimed 2015 as the International Year of Light and Light-based Technologies (IYOL 2015). In proclaiming an international year focusing on the topic of light science and its applications, the UN has recognised the importance of raising global awareness about how light-based technologies promote sustainable development and provide solutions to global challenges in energy, education, agriculture and health. Light plays a vital role in our daily lives and is an imperative cross-cutting discipline of science in the 21st century. It has revolutionised medicine, opened up international communication by the internet, and continues to be central to linking cultural, economic and political aspects of the global society.

Events are happening throughout the year all over the world including in the UK. Visit www.light2015.org and view the event programme for all things associated with the year of light.

CIE 2015

The International Commission on Illumination (CIE) has recently celebrated its 100th anniversary as the core international organisation for co-operation and exchange of information on all aspects of light and lighting. 2015 has seen the 28th Session of the CIE, which was held from 29 June to 3 July 2015 at the University of Manchester, UK.
Those unfamiliar with CIE may wonder what is meant by a “session”. It is both a scientific meeting and a turning point in the lifecycle of the CIE where the outgoing board hands over to a new board as well as the meeting of the CIE General Assembly which is attended by representatives of all the national committees.

The session meetings provide an opportunity for everyone who has an interest in light and lighting to come together and discuss their interests, with the central part of the session revolving around the conference. CIE divisions and technical committees also meet, which provides anyone new to CIE a chance to discover more about the different aspects of CIE work, and to explore in more detail the issues that are being embarked upon through its technical committees.

With the CIE sessions being held only every 4 years and this year coinciding with the International Year of Light, it was excellent for the UK to have hosted the session, the first time in 40 years. For further information, please visit the conference website, either through the CIE homepage at www.cie.co.at or directly at session2015.cie.co.at.

**Laser pointer awareness**

Laser pointers have been used as presentational aids by professional trainers for many years, with no reported incidents in the UK. They are usually portable, low power, battery operated, hand-held devices. Laser pointers sold in the UK should be classified in accordance with the current British Standard, BS EN 60825-1:2014.

Many laser pointers available to the general public have been assessed and it was found that a significant proportion of these products are incorrectly classified and often dangerous. The natural aversion responses are unlikely to provide adequate protection from an eye injury to such laser pointers. A number of eye injuries have occurred from the use of class 3B and class 4 laser pointers. With the increasing risk of potentially dangerous laser pointers being available to the general public, awareness of these products is essential.

**Working group meeting**

In June 2014, PHE invited UK stakeholders who have particular interest in the increasing risks of laser pointers to attend a workshop at Chilton. The aim of the meeting was to bring all stakeholders together and to find a common approach to deal with the issues associated with uncontrolled use of laser pointers.

The day consisted of open floor discussions on controlling the supply and use of laser products, as well as presentations covering safety issues and injuries from laser pointers.
To begin the day, John O’Hagan provided a historical review of laser pointers including the current European decision. The first concerns were raised in the mid-1990s and it was not long before there were media reports of suspected laser eye injuries. In a 6-month period from late October 1997, a number of events took place. There was advice/recommendation to restrict to class 2 the availability of laser pointers to the general public; the Home Office considered, and then rejected, a proposal to treat laser pointers as firearms or offensive weapons. There had also been questions raised about restricting sales for those under 18 years old. By early 1998 the then NRPB had published an information sheet that was used throughout the world. The Crown Prosecution Service, however, decided that laser pointers were not a problem; ACPO (Association of Chief Police Officers) ruled against a call for legislation as there had been no serious injuries reported and the then Department of Trade and Industry (DTI) felt the problems were now largely behind us.

By early 2000, many of the laser pointers on the market were low power (up to 5 mW), equivalent to class 3R, and mostly emitted red beams, with only a few seen to be class 3B with an output up to 15 mW. This remained the case for almost 10 years, but with technology moving on significantly, the ability to make small, powerful (more than 1 W) laser pointers in a range of colours (the most common being violet, blue, green and red), readily available and cheap, has led to devices flooding the market and being purchased by all ages.

However, many of the products on the market are of poor quality, missing infrared filters, with large batch variation of output power and incorrectly classified and have the potential to do harm.

With the increase of laser pointers on the market around the world, their misuse has also increased, most notably the targeting of moving vehicles, specifically aircraft. This led to the Civil Aviation Authority (supported by the Air Navigation Order 2009) to make the statement “A person must not in the United Kingdom direct or shine any light at any aircraft in flight so as to dazzle or distract the pilot of the aircraft”. So in 10 years from the statement by ACPO, technological development has led to the increase of misuse and risk of eye injuries, particularly in children.

John finished by discussing the European decision published in February 2014 on “The safety requirements to be met by European standards for consumer laser products”.

Fahd Quhill then spoke about the increasing cases of injury to children from laser pointers given as toys, further details can be found in his article on page 10.

The next presentation was given by Inspector Mark Callagham and PC Scott Gibbons who both belong to the UK Airport Police Commanders. They discussed the current prevention methods, officer education and the implementation of new national guidance published on 1 October 2014 and called “A guide to laser interference with aircraft for the police service in United Kingdom”. Both Mark and
Scott felt more could be done with intervention by the police including educating patrolling officers, pilots, the general public and school children, as well as amendments to the offensive weapons legislation – “lawful authority of reasonable excuse to possess a laser pointer”.

Dai Whittingham, Chief Executive of the UK Flight Safety Committee, provided the final talk of the day, which was on flight safety, with examples of laser pointers targeting aircrafts. He also expanded a discussion on the increasing use of laser pointers targeting the railways, the roads and “others” including at sporting events.

The open floor discussions in the day were entitled “Controlling the supply (or ownership) of laser products” and “Controlling the inappropriate use of laser products”. The discussions included proposals, suggestions, thoughts, questions and responses on dealing with these issues.

The key conclusions of the discussions follow.

**Importing – Border Force, Trading Standards**

a struggle to prevent or, at least, control the laser products coming into the UK. There are a number of factors: staff shortage, lack of staff expertise, no entries on the cargo register, ie lasers are hidden in the shipment and only found if stumbled across during routine checks

b there should be very strict controls on traders importing products such as toys containing lasers, but the majority of the time products are not checked due to staffing levels and lack of expertise

c personal import is said to account for around 95% of the laser pointers brought into the UK. Trading Standards have no power over personal import, so only the Border Force could prevent them entering the UK, but this is very rarely done for the reasons given in point a above

For example, after a purchase of laser pointers has been made on the internet, it is very difficult to stop the pointers being imported, so it may be best for the purchase to be prevented at source, eg to stop members of the public buying pointers on the internet. Some time ago, John Tyrer and John O’Hagan agreed with the major online retailers, Amazon, eBay etc, to restrict sales of pointers to less than 1 mW. This agreement appeared to have worked for a number of years; however, that is no longer the case. Furthermore, false or incorrect information provided by sellers presents a challenge as the power of many “<1 mW” laser pointers sold is significantly higher. It was asked if the agreement could be applied again. Unfortunately, representatives of online retailers were unable to attend the meeting. The consensus of the room felt this might be a good starting point again. But will it change what is happening currently? Can we trust the sellers and do they really know the output power? A better scenario would be a blanket ban on sales. Bigger online retailers may accept this, but individual independent websites are unlikely to
follow. A drop in sales may be observed if customers buy pointers from independent suppliers without the support of a bigger retailer: would people still buy them? – it is hard to say.

**Police**

a regulating laser pointers was raised, similarly to firearms, eg to be considered as an offensive weapon

b current law enforcement requires catching offenders in the criminal act which is very difficult

The police have approached different government departments for support; unfortunately, none appeared willing to take the lead.

c the FBI has pushed a huge campaign in the US mass media to raise awareness; this has led to an incident reduction of 20%

**Education**

a maybe the ideal route forward would be education, eg laser safety awareness education for the police or children

b for the consumer, non-professional market, laser classification needs to be simpler as it could be said to have too many classes. John O’Hagan commented that the US military and the UK support a simpler 3-class system

**“All Party Parliamentary Group” (APPG) on laser products or pointers**

a there is an APPG on blindness, which might be a starting place to raise the issue and get support

b a new APPG may be a good way to influence the government on wider issues. Getting an APPG started can be straightforward; it would require an MP to champion the case and a clear idea of what needs to be achieved

It was felt that splitting the issues into strands might be the best option, eg control of import, consumer awareness, education and legislation. Support from the government would be essential for many of the routes to resolve laser pointer safety issues.

A second meeting has been suggested to provide an update and to develop a further co-ordinated approach in tackling this increasing problem in the UK and the rest of the world.

PHE is currently producing a public laser pointer awareness video which will be made available in the near future. It outlines the problem of laser products coming into the UK, the range of devices and the potential injuries. Another such video that has been produced in Australia for ABC News with the involvement of Trevor Wheatley (University of New South Wales) to raise the awareness of laser pointers can be found at [www.abc.net.au/catalyst/stories/4122619.htm](http://www.abc.net.au/catalyst/stories/4122619.htm).
Following on from the popular “Dumb Ways to …” videos published on YouTube, “Dumb Ways to Blind (cute laser safety video)” has been produced, showcasing the many different ways to misuse a laser. This can be found at www.youtube.com/watch?v=n6ejwtuOf-0.

If you would like to be involved please contact us at laser@phe.gov.uk.

**Injuries in children**

*Burning vision: vision loss from misuse of “toy” laser pens in children*

**Fahd Quhill, consultant ophthalmologist, Royal Hallamshire Hospital, Sheffield**

A case study of 5 children with macular burns due to the misuse of novelty laser products, purchased online or abroad, was undertaken at the Royal Hallamshire Hospital and The Children’s Hospital, Sheffield*. All patients were from the Sheffield area, between 8 and 15 years old, and attended over an 18-month period.

Laser devices of uncertain safety classification and which resemble low power laser pointers can be purchased online or abroad from outside the European Union. Unlike their low power counterparts, which serve a useful educational and commercial purpose, these unclassified lasers have a far greater potential for retinal damage. PHE advises that laser products sold to the general public for use as laser pointers should generally be restricted to class 2 devices (laser power less than 1 mW) and be accompanied by sufficient information on their safe operation. Importantly as laser technology continues to develop, more powerful portable (hand-held) lasers are being produced at lower cost. The 5 local children in this study with maculopathy were exposed to laser devices purchased online or abroad from outside the EU.

Clinically, 3 out of 5 children had laser burns beneath the fovea, with consequent reduced vision (Figures 1 and 2). A choroidal neovascular membrane, a dense scar resulting in permanent vision loss, complicated 1 case.

**Christmas gift**

One of the cases, a 9-year-old boy with a history of lazy right eye, presented on Boxing Day with a 24-hour history of painless vision loss in his better eye. He had routinely attended a community optometrist 3 days previously, with a documented visual acuity of 6/5 in his left eye at presentation; his left vision had reduced by 60% with a fresh laser burn evident at the left macula, this is the central part of the retina responsible for high acuity vision, with a normal right macula.

The family mentioned that the child had been given a laser “toy” pointer, purchased on the internet, and had been playing with it on Christmas Day. The child denied looking directly into the laser beam. He was commenced on a short course of oral steroids. Three days later, the laser scars were clearly visible at the left macula.

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Figure 1. Colour fundus photograph of the right eye showing laser scar at the fovea post laser injury

Examination of the “toy” laser pointers bought by the family revealed three separate laser devices made in China (Figure 3), blue (405 nm), green (532 nm), and red (650 nm) with laser outputs of 57 mW (blue), 42 mW (green) and 72 mW (red). The British Standard states class 3R lasers should be less than 5 mW.

Figure 2. Spectral domain OCT of patient in Figure 1 showing permanent loss of central photoreceptors, following laser injury, with associated visual loss

Figure 3. Laser novelty devices purchased on the internet with an example of a diffraction pattern projected by the laser toys
Public safety concern

Assessment of alleged laser eye injury requires accurate history and examination – in our experience, after careful and sensitive history-taking, 4 out of the 5 children admitted directly looking into the devices. Treatment for such laser retinal injuries is uncertain; oral corticosteroids are sometimes administered.

Our paper raises concerns that some classes of laser novelty products, that fail to meet relevant safety standards, can cause significant damage to vision if used incorrectly, resulting in mild to severe long-term vision damage.

This case study highlights the ocular hazards posed by some laser devices, marketed online as “toys”. With the expansion of online consumer purchasing, the regulation and classification of such laser devices is critical. Such labels may not meet safety standards. It is important to raise awareness of this matter as in our experience children are often reluctant to admit to such mechanisms of injury.

Hence we believe retinal injury in children following exposure to a laser is a potential public safety concern.

Read the full paper at www.nature.com/eye/journal/vaop/ncurrent/full/eye2013315a.html.

Aircraft incidents

Michael Higlett, PHE, and Inspector Mark Callaghan, Sussex Police

With the technological developments in laser pointers over the past 10 years, the number of high power laser pointers in the hands of the public has increased. Finding ways to use laser pointers other than just waving them around is more of a challenge, but the novelty usually wears off quickly. With an increase in the power of laser pointers, the range of the beam can be substantial, leading to illumination of a “perfect” target, which is something moving, and far away objects. Targeting of aircraft has become common practice. The majority of people who own a laser pointer would not consider targeting an aircraft as they understand the safety risks, read about the prosecutions or would have to travel a reasonable distance to achieve the goal. But a small proportion of laser pointer owners live in areas close to or on a flight path where they can see aircraft. Targeting may become a temptation, especially on landing and taking off, which can lead to dazzle, glare or flash blindness to the pilot. What appears to the operator to be a small spot when a few metres away, at 300 m becomes large enough to illuminate an entire cockpit. In 2004 the US was the first country to raise awareness of this issue as there was a spate of aircraft laser strikes. In 2004 the FAA reported 46 strikes, rising to 283 (600% rise) the following year, while both 2013 and 2014 have around 4000 reported strikes.

So within 10 years a 10,000% rise has been seen, as given in the figure. This equates to a rise from roughly 1 strike every 8 days in 2004 to 11 per day in 2013 and 2014.
In the UK, a similar trend has been observed as shown in the figure; however, starting 3 years later than in the US. Although there have been more laser incidents in the US, which is not unexpected based on the size of the country compared to the UK, the number reported in the UK is high when considering its size. However, it is notable that for the past 3 years the number of incidents has dropped away, in contrast to the US.

Looking at the UK airports for individual reports, a top 20 list contains the biggest airports in the UK, as would be expected, but not in the order of the busiest, as shown in the table. It is notable that the airports which dominate the laser incidents are all in built-up areas or have their flight path over a built-up area. Airports such as Gatwick and Stansted, which are two of the busiest airports, have a low incident rate due to their locations, the opposite being the case for Glasgow and London City.

How to deal with laser incidents presents a challenge. Catching an offender in the act is even more difficult. Making the public aware of the severity of this act, in such a way that it does not attract more interest in targeting aircraft and so cause a spike in incidents, is a further challenge.

**What can be done?**

In the US the federal government has tried a number of ways to reduce and stop aircraft targeting incidents. In 2012, the US Congress passed a federal law designed to make criminal prosecution easier. Convictions have been successful and resulted in imprisonment for the individual. It now states that “anyone caught flashing a plane with a laser can be fined up to $11,000 and spend up to 5 years in prison. That's in addition to an existing law that allows fines of up to $250,000 and prison terms of up to 20 years for interfering with the operation of an aircraft".
Top 20 reported laser incidents at UK airports

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<td>Belfast City (17)</td>
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<td>2.5</td>
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<td>Aberdeen (14)</td>
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<tr>
<td>Inverness (28)</td>
<td>7</td>
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<tr>
<td>Cardiff (21)</td>
<td>7</td>
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In February 2014, the FBI launched a 60-day programme in 12 cities called “Protecting aircraft from lasers” with the aim to reduce the number of laser incidents in order to prevent a major incident from occurring as laser incidents are now seen as a major threat to aviation security. A key part of the programme was the inclusion of a reward, with the FBI offering up to $10,000 for information leading to the arrest of any individual who intentionally aimed a laser beam at an aircraft. In June 2014 the programme was extended by 3 further months and made nationwide.

The efforts appear to have led to some success, with the number of laser strikes in recent months dropping to about 9 a day from about 11 in 2013, according to an FBI spokeswoman. She also said that “this crime was the first for which the FBI has offered a reward that didn’t involve a fugitive or missing person”. However, as shown in the figure, the overall total has not changed from the previous year.

So what is happening in the UK? Incidents that are reported are investigated by the UK Airport Police Commanders. In October 2014 the police national guidance was...
published: “A guide to laser interference with aircraft for the police service in the United Kingdom” which sets out the common guidelines to be followed when dealing with laser incidents with aircraft. Before these guidelines were introduced a common procedure was not usually followed.

Following from this representatives of the FBI visited the UK Airport Police Commanders and had discussions with Deputy Commissioner Mackay of the Metropolitan Police, Assistant Chief Constable Barry of Surrey and Sussex, and the CAA. This has highlighted the issue with senior police officers.

The UK Airport Police Commanders have begun working with the National Police Air Service on a joint education and media strategy that is aimed to be in place prior to the summer. The biggest problem the police have is that without catching the offender using the laser pointer, they have very few powers. Often any prosecutions are not due to the laser incident, but other prosecutable offences, eg possession of a firearm or drugs. In contrast to the US, the UK has not passed any specific laws (currently) in helping to deal with the issue and this seems unlikely to change in the near future.

Laser attacks on aircraft continue to be a major concern to pilots across the globe. The UK Airport Police Commanders feel the issue of laser pointer strikes is not going away and, with powerful lasers becoming cheaper and more accessible, the likelihood of a disaster resulting from a laser strike is increasing.

Role of the Medicines and Healthcare Products Regulatory Agency (MHRA) Medical Devices Division

Adverse event management and promotion of safety

Mel King, Medicines and Healthcare Products Regulatory Agency

The MHRA is an executive agency of the Department of Health and its primary role is to protect and promote public health and patient safety by ensuring that medicines, healthcare products and medical equipment meet appropriate standards of safety, quality, performance and effectiveness, and are used safely. The MHRA also ensures that medical devices used by the NHS and private healthcare sector are correctly CE marked and fulfil the regulatory criteria detailed in the European Medical Device Directive (93/42/EEC).

Problems can occur with medical devices, and the MHRA is responsible for investigating all UK medical device adverse event reports. A medical device adverse event is an equipment based incident that causes, or where there is the potential to cause, an unanticipated or unwanted situation involving patient safety, the equipment user or others. The adverse event may be a result of a number of situations, including the device design, operating instructions, training or working practice, equipment storage and maintenance. The MHRA receives adverse event reports
from a range of stakeholders, including equipment manufacturers, healthcare professionals and members of the public, patient groups, other government departments and regulatory bodies.

Though the MHRA received over 13,700 medical device event reports (for the year 2013/14), less than 1% of the incidents related to lasers, IPLs and LED systems. There is a need for healthcare professionals to report problems to the MHRA. The types of laser, IPL or LED adverse event reports received include software problems; mechanical equipment issues; incompatibility of laser/IPL with accessories; injury of a patient or healthcare professional. The type of injury effects include eye injury or tissue burns; tissue damage outside intended surgical area; adverse skin reaction post treatment; ignition of surrounding materials (patient fires).

When an adverse event does occur, it is important that the incident is reported immediately to the MHRA, and any other applicable regulatory authority. All adverse incidents, however insignificant they may appear, including user error, should be reported. What may appear to be a minor incident to an individual user may have greater significance, especially if the agency has received similar reports from other medical establishments. The MHRA wishes to encourage all healthcare professionals to be proactive in reporting medical device problems.

The MHRA uses a number of approaches to communicate safety information to healthcare professionals, members of the public and others. The type of safety communication used will be dependent upon the message being conveyed; from press releases and medical device alerts which are generally aimed at a wide target audience; or targeted letters to specific individuals or hospital departments; or “One-Liners” which are aimed at healthcare professionals and briefly detail problems and lessons learnt. The MHRA has also published the “Laser, IPL and LED Device Bulletin” [2008 (03)], which is aimed at equipment users, eg clinical scientists and engineers, healthcare and cosmetic professionals. The Device Bulletin provides guidance on equipment management, optical radiation safety and mechanisms for controlling hazards, and recommended user competencies for various staff groups, including details of the core of knowledge syllabus. The Device Bulletin content is currently under review, and it is expected that the revision will be published later in 2015.

**Improving laser safety in the Faculty of Natural Sciences, Imperial College London**

**Stef Hoyle, Imperial College London**

Laser safety management in the Faculty of Natural Sciences at Imperial College London is an important consideration due to the volume of research using lasers.

Currently the Departments of Physics, Chemistry and Life Sciences in the Faculty have 579 class 3B and 4 lasers registered and 375 users. At the same time we are
seeing increased laser use in departments, as the ease of use and potential applications of lasers increase.

To further reduce the risks of using lasers the dean of the Faculty, heads of departments, and the Faculty safety team, in co-ordination with the Imperial College laser safety adviser, agreed a plan to improve laser safety management across the Faculty in 2011. Below is a brief summary of the improvements made to the management system.

**Engage with key academic laser users**

A Faculty laser user group of key academic laser users from each department, safety staff and department laser safety officers was set up. The group meets once each term and co-ordinates, standardises and facilitates implementation of laser safety procedures across departments.

**Produce Faculty-wide laser safety documents**

Departmental laser management documents were revised into Faculty-wide documents that all departments, can use.

**Ensure safety by design**

A major refurbishment of laboratories resulted in a custom laser interlock system being designed and installed. The key design principles were guided by the laboratory users directly to the company producing the system. The custom design is now the Faculty standard for future laser laboratory refurbishments or design.

**Improve registration mechanisms**

Registration of lasers and laser users has been revised. The systems are now electronic through online forms. This reduces administration tasks and ensures a database of all lasers and laser users is available for all departments.

**Improve inspection processes**

An electronic system for carrying out annual laboratory inspections is in use. A section on “high powered lasers” is included. It is a requirement for the inspection to be carried out with the principal investigator responsible for the laboratory. This system is efficient and automatically populates a database of hazards identified through the inspection process in all departments.

**Improve training**

The Faculty is developing a practical laser techniques training course, aimed at staff and students using high powered lasers. The learning objectives encourage best practice with practical techniques and consider containment and risk reduction measures during experimental design.
The essential management component in all the above has been engagement with the laser user to improve processes and safety, to ensure the needs of research are met, while ensuring risk is managed in a practical manner in a complex environment.

I would like to acknowledge the following for their input into the improvements, Ms Jan de Abela-Borg, Ms Julia Easton, Mr Ian Gillett, and Ms Lucy Stagg (all from Imperial College London).

**New CIE publications**

The International Commission on Illumination, more commonly known as the CIE (from its French title, the Commission Internationale de l’Eclairage), publishes a number of documents, from technical reports and guides to international standards on all aspects of the science and the art of light and lighting, colour and vision, photobiology and image technology. The documents are prepared by the technical committees that form CIE. There are also joint publications with the IEC (International Electrotechnical Committee) and the ISO (International Organization for Standardization). More than 200 publications have been issued over the years, the table on page 19 gives the most recent documents.

All documents are available for purchase at the CIE web shop (www.techstreet.com/cie). Members of CIE-UK (the UK committee of CIE) can obtain publications at 33% of the list price. Contact John O’Hagan if you (or your organisation) wish to join CIE-UK (or your equivalent national committee).

**New and updated HSE guideline documents**

On 1 August 2013 the HSE published “Managing for health and safety”, a revised version of HSG65 which was previously known as “Successful health and safety management”.

The revised edition has advice on:

- core elements of managing for health and safety
- deciding if you are doing what you need to do
- delivering effective arrangements
- useful resources

The HSE has moved away from using the POPMAR (Policy, Organising, Planning, Measuring performance, Auditing and Review) model of managing health and safety to a “Plan, Do, Check, Act” version. HSE feels that the latter model achieves a better balance between the systems and behavioural aspects of management. The main changes from the previous version is the emphasis on behavioural aspects rather than a system and process orientated methodology It also treats health and safety
Recent CIE publications

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<tr>
<th>Standards</th>
<th>Joint ISO/CIE Standard: Characterization of the Performance of Illuminance Meters and Luminance Meters</th>
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<td>214:2014 Effect of Instrumental Bandpass Function and Measurement Interval on Spectral Quantities</td>
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<td>212:2014 Guidance towards Best Practice in Psychophysical Procedures Used when Measuring Relative Spatial Brightness</td>
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<td>211:2014 Colour Appearance in Peripheral Vision</td>
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<td>205:2013 Review of Lighting Quality Measures for Interior Lighting with LED Lighting Systems</td>
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<td>204:2013 Methods for Re-defining CIE D Illuminants</td>
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<td>203:2012 A Computerized Approach to Transmission and Absorption Characteristics of the Human Eye</td>
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<td>173:2012 Tubular Daylight Guidance Systems</td>
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<td>210:2014 Photometry Using V(λ)-Corrected Detectors as Reference and Transfer Standards</td>
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<td>209:2014 Rationalizing Nomenclature for UV Doses and Effects on Humans</td>
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<td>208:2014 Effect of Stimulus Size on Colour Appearance</td>
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<td>207:2014 Sensitivity of Human Skin to Ultraviolet Radiation, Expressed as Minimal Erythema Dose (MED)</td>
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management as an integral part of good management generally, rather than as a stand-alone system.

The HSE also released an updated leaflet supporting HSG65, called “Plan, Do, Check, Act, An introduction to managing for health and safety”. This leaflet has been designed to help those who need to put in place or oversee their organisation’s
health and safety arrangements. It provides signposts to further sources of support and summarises some of the more detailed guidance in HSG65.

Following the updated HSG65, last year HSE produced a booklet called “The health and safety toolbox – How to control risks at work”. The aim of the booklet is to cover the most common workplace hazards with concise advice that is simple and straightforward to follow to help small to medium-sized businesses to comply with the law and prevent workplace accidents and ill health. It is aimed at those starting up or running a small business, or those who have been appointed as a safety representative in a larger organisation, or those who want additional advice on how to control workplace hazards.

Two further leaflets were published in August 2014, these were “Risk assessment – A brief guide to controlling risks in the workplace” (INDG163 rev4) and “Health and safety made simple – The basics for your business” (INDG449 rev1).

The risk assessment leaflet (INDG163 rev4) has been revised and helps to identify, assess and control health and safety risks associated with workplace hazards. This guidance replaces the previously used “Five steps to risk assessment”. It is important to know that if you use the “Five steps” to carry out your risk assessment, then there is no need to repeat it, unless you feel it is no longer valid or there have been significant changes.

The health and safety made simple leaflet (INDG449 rev1) provides the basic information on what is required for your business to comply with health and safety law. The aim of this leaflet is to help you decide who is responsible for health and safety, write a health and safety policy, control the risks, consult employees, provide training and information, provide the right workplace facilities, make first-aid arrangements and report accidents, display the law poster and get insurance for the business. This revision has brought the advice up to date and clarified some of the key messages; however, guidance on complying with the law has not been fundamentally changed.

All booklets and leaflets are downloadable for free from the HSE publications page of its website: [www.hse.gov.uk/pubns/index.htm](http://www.hse.gov.uk/pubns/index.htm).

HSE has also developed microsites which provide an overview and further links to help in managing health and safety in the workplace, see, for example, [www.hse.gov.uk/toolbox/index.htm](http://www.hse.gov.uk/toolbox/index.htm).
PHE training courses

2015 laser safety training courses

At Burleigh Court

**Laser Safety Management Course**
5 day course, Monday – Friday (arrive Sunday evening for dinner):
12 – 16 October 2015

**Laser Safety Course**
2 day course, Tuesday – Wednesday (arrive Monday evening for dinner):
24 – 25 November 2015

**Laser Safety Forum**
Tuesday 15 September 2015

**Laser Safety Refresher Course**
Wednesday 16 September 2015

**Customised courses**
Alternatively, training courses can be created individually and delivered to meet your schedule. This approach is particularly effective for a large number of students or where discussion on company-specific issues is the focus of the training. Customised courses can be delivered onsite to minimise service disruption through staff downtime and where training completion is business critical. This combination of factors means that customised courses are highly cost effective. For further information visit [www.phe-protectionservices.org.uk/nir/courses/private](http://www.phe-protectionservices.org.uk/nir/courses/private).

**Bookings**
If you are interested in attending any of these courses, booking is now possible through the PHE protection services website, where information on all courses relating to non-ionising radiation can be found: [www.phe-protectionservices.org.uk/nir/courses/](http://www.phe-protectionservices.org.uk/nir/courses/).

Or contact us directly:
Training Centre
Public Health England
Chilton
Didcot
Oxfordshire
OX11 0RQ, UK
+44 (0)1235 825313
chilton.training@phe.gov.uk
Laser Safety Forum

The Laser Safety Forum is open to anyone with an interest in laser safety. Membership is currently free. You can join by sending your postal address to laser@phe.gov.uk.

Future laser safety training course bookings

If you are interested in attending any of these courses in the future, information and bookings will be possible through Loughborough University website.

Updated PHE documents

For many years the “Lasers at Work” information poster has been given free to participants on our courses and more recently has also been available on our website. In 2015, the information poster has undergone a major revision including a name change to “Ubiquitous Lasers” and has moved from being a poster to a booklet. The booklet will be available to download from our website as well as being provided on any PHE laser safety course in the near future.

To coincide with the updated information booklet, PHE has developed a quick reference wallet card that includes laser classification, limiting apertures, MPE, AEL and NOHD definitions as well as common units and spectral regions. The quick reference card will be available on any PHE course on laser safety.