

Do home-use hair removal lasers & intense light devices deliver what they promise and are they safe?



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Statement of Disclosure



The following potential conflict of interest relationships are germane to our presentation:

Godfrey Town:

Consultancy & travel grant: CyDen Ltd., UK
Consultancy: UNILEVER, Trumbull, USA

Caerwyn Ash:

Salary and test equipment loan: CyDen Ltd., UK
Travel grant: Swansea University, Wales

Objectives

This study investigates technical performance of a wide range of devices with particular focus on recognized critical parameters for safe and effective use of light-based technology in hair removal. The study also catalogues measured values against stated claims and examines likely suitability.

The technical evaluation of several leading IPL devices expands upon a previously published study cataloging manufacturers' claims, examining safety features and focusing on recognised critical parameters for permanent hair reduction.

They are already out there!



Tria



Salon Laser



Scanning Laser



IPL 8000



iPulse Personal



Silk'n



SensEpil



iLight



Teny Epilflash



Satinlux/Lumea

Home Use Hair Removal Lasers & IPLs Tested

- SpectraGenics TRIA 810 nm
- Dezac Rio X20 Laser 808 nm
- Dezac Rio Scanning Laser 808 nm
- E-Swin E-One IPL
- HomeSkinovations Silk'n / SmartEpil IPL
- Boots Smooth Skin / iPulse Personal IPL
- Teny Epil-Flash IPL
- Philips SatinLux / Lumea IPL
- Remington i-Light / LumaSmooth IPL

Classification & Prices

Name	Wavelength	Price
SpectraGenics TRIA USA	Laser 810 nm	A\$650(?)
Dezac Rio Scanning Laser UK	Laser 808 nm	A\$895-995
Dezac Rio X20 Laser UK	Laser 808 nm	A\$595
E-Swin E-One France	IPL	A\$2890
Boots iPulse Smooth Skin UK	IPL	A\$890
HomeSkinovations Silk'n / SmartEpil Israel	IPL	A\$999.95
Teny Epi-Flash France	IPL	€300
Philips SatinLux / Lumea Netherlands	IPL	€760-845
Remington i-Light /LumaSmooth USA	IPL	A\$799

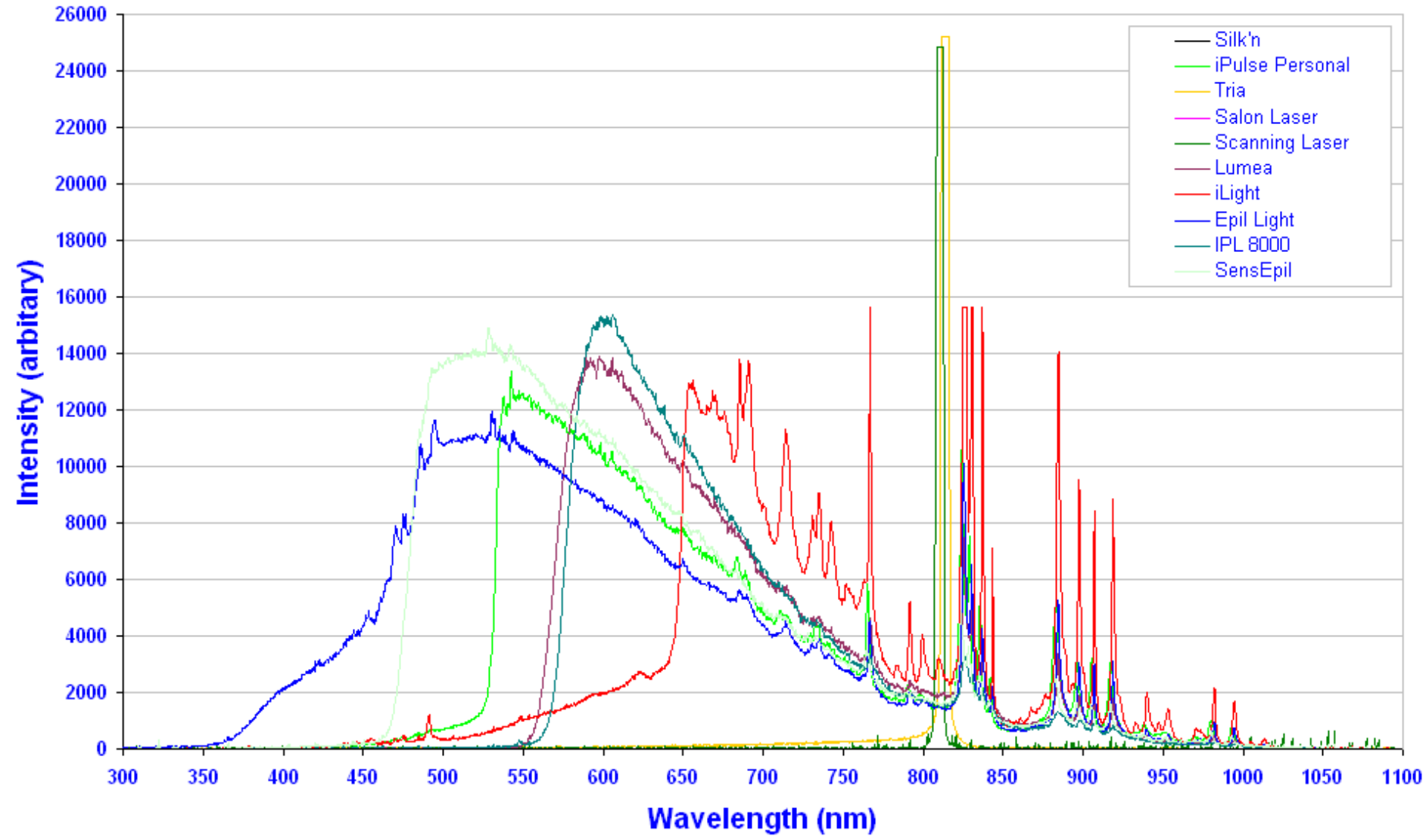
Classification & Prices (Other)

Name	Wavelength	Price
Tända Clear (Acne) <small>Canada</small>	LED Array	A\$495-855
Radiancy No! No! <small>Israel</small>	Hot Wire	A\$299
Applisonix Selectif Pro <small>USA</small>	Ultrasound	?
Verseo ePen <small>USA</small>	Galvanic	A\$189-229
Leimo Re-Growth Laser	LLLT+LED 890 nm + 660 nm	A\$1295
Lexington HairMax LaserComb <small>Australia</small>	LLLT 650 nm	A\$749

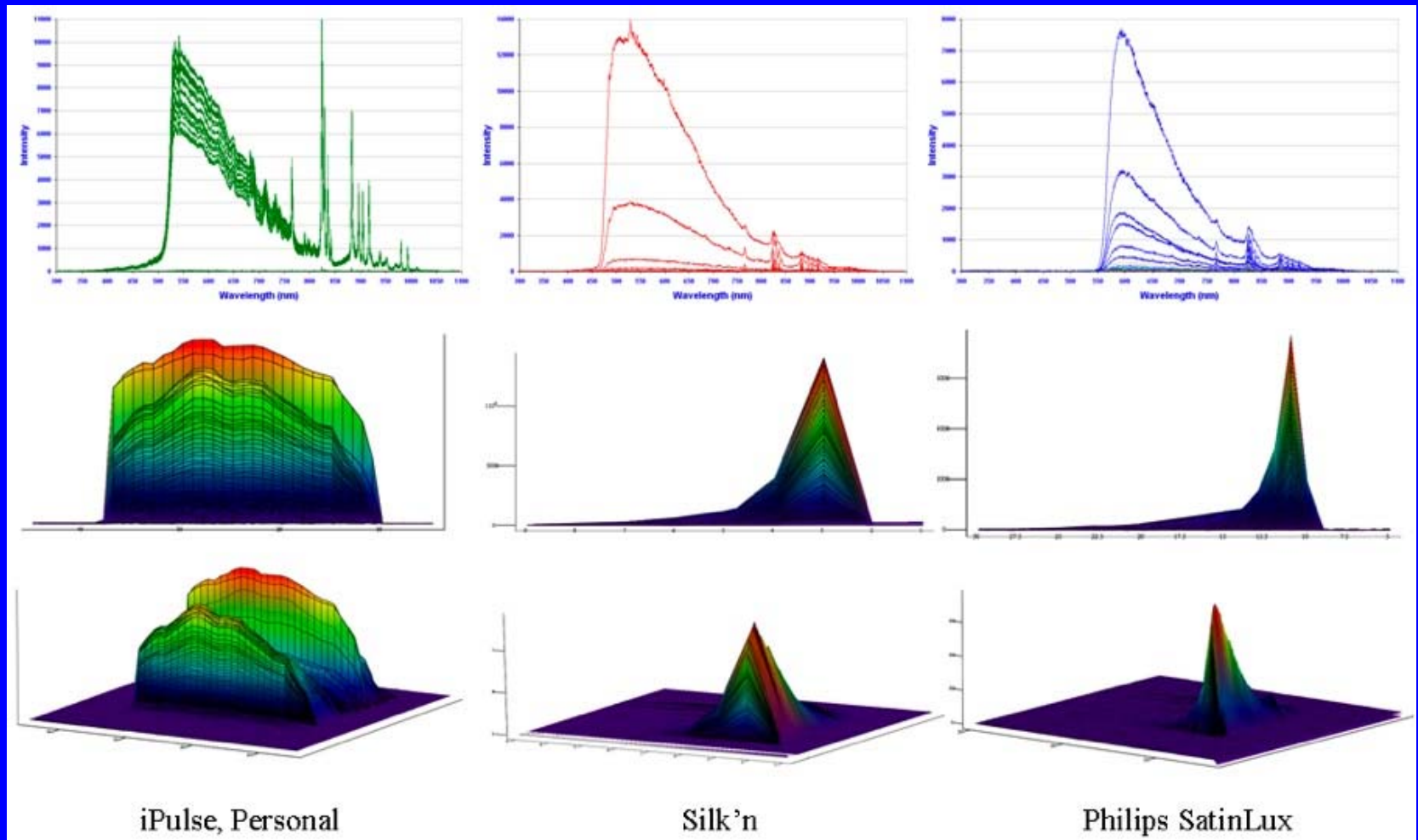
Test Methods Used

- Recorded general claims: device identity, price, spot size, **fluence**, number of shots, **discharge pattern**, **pulse duration**, **spectral emission**, safety features, repetition rate, **spatial profile**, CE-classification and clinical claims.
- Measurements made per Town GA, Ash C, Eadie E, Moseley H. *Measuring key parameters of intense pulsed light (IPL) devices*: J Cosmetic Laser Therapy 2007; 9:3:148-160.
- Spectral measurements made per Ash C, Town G and Bjerring P. *Relevance of the structure of time-resolved spectral output to light-tissue interaction using intense pulsed light (IPL)*. Lasers in Surgery and Medicine 2008; Vol 40:2: 83-92.

Spectral Distribution of Home Use Lasers & IPLs



Time Resolved Spectral Emission of Home Use IPLs



Time-Resolved Spectroscopy

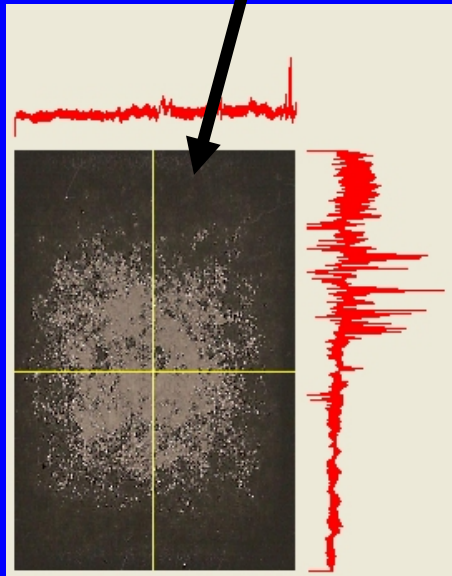
Silk'n



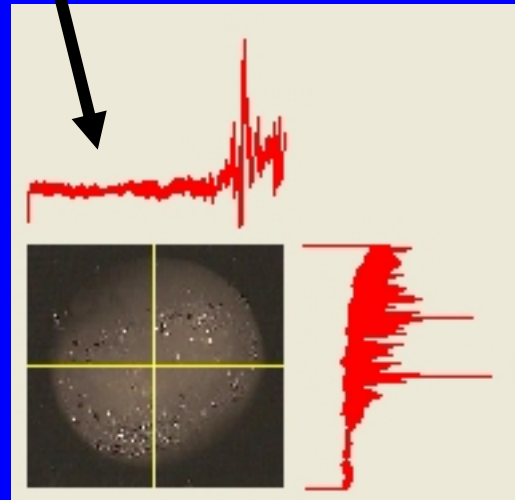
iPulse Personal



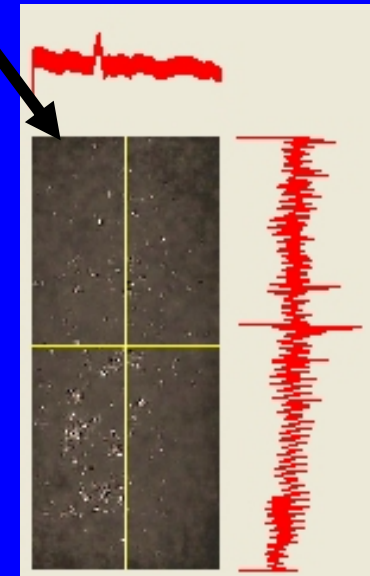
Spatial Profiles of Home-Use Hair Removal Devices



Silk'n



Tria



iPulse

Comparative Data: Lasers

Features	TRIA Laser	Rio X20 Salon Laser	Rio Scanning Laser
Sufficient energy for permanent hair reduction?	YES: 5-19 J/cm ² (claimed 6-24 J/cm ²)	No: <0.1 J/cm ²	No: <0.3 J/cm ²
Safety features?	Yes	Yes	Yes
Wavelengths?	810 nm	808 nm	808 nm
Handpiece size?	Fat grip to hold	Small	Small
Weight?	Heavy for long procedures (645 g)	Light	Light
Clinical data?	R. Wheeland, LSM	None specific quoted	None specific quoted
Spot size?	1 cm diameter = 0.793 cm ²	2 mm x 2mm = 0.04 cm ²	7 mm x 5 mm = 0.35 cm ²
Rep rate?	2.2 secs max (claimed 2 secs)	6.3 secs	9-46 secs max
Stated Pulse Duration	300 ms / 400 ms /600 ms	4 secs max	4 secs max
Measured Pulse Duration	130 ms / 210 ms /345 ms	3.45-4.0 secs max	9-46 secs
Time per cm ²	2.52 secs	>87.5 secs	29-143 secs

Comparative Data: IPLs

Features	Philips SatinLux / Lumea	Silk'n / SensEpil K072906	Boots iPulse Smooth Skin
Sufficient energy for permanent hair reduction?	Too Low: 2.5-6.8 J/cm ² (claimed 2-6.5 J/cm ²)	Too Low: 2.8-4.2 J/cm ² (claimed < 5 J/cm ²)	Yes: 10 J/cm ² (as claimed)
Safety features?	Yes Pressure, 4 microswitches	Yes Pressure Switch	Yes 4 electrical sensors
Wavelengths?	575-1100 nm (as claimed)	475-1100 nm (as claimed)	530-1100 nm (as claimed)
Handpiece size?	Bulky	Moderately light	Small and light
Pulse duration?	2.5-7 ms	ca. 5 ms	25-60 ms
Clinical data?	Nuijs et al Laser Surg Med 2008	Alster & Tanzi Dermatol Surg 2009	Emerson & Town J. Cos Las Ther 2009
No shots?	160-520 (3 hr charging)	750	10,000
Spot size?	3.0 cm ² (30 mm x 10 mm)	6 cm ² (30 mm x 20 mm)	3 cm ² (12 mm x 25 mm)
Measured Rep rate?	4.5 secs	4.1 secs	<6 secs
Time per cm ²	1.5 secs	0.68 secs	<2.0 secs

Comparative Data: IPLs

Features	TENY Epil-Flash	E-Swin E-One	Remington i-Light / LumaSmooth
Sufficient energy for permanent hair reduction?	No: 0.18 J/cm ² (claimed 20 J/cm ²)	Yes: 9.5-12 J/cm ² (measured)	Yes: 7.4-7.9 J/cm ² (measured)
Safety features?	Yes Pressure, electrical, security code	Yes Pressure Switch	Yes Pressure Switch (x2)
Wavelengths?	ca. 450-1100 nm (claimed 600-950 nm)	575-1100 nm (measured)	650-1100 nm (measured)
Handpiece size?	Bulky but light	Fat grip to hold	Small and light
Pulse duration?	~ 20 ms	~ 30 ms	~ 27.5 ms
Clinical data?	None	None published	None published
No shots?	20,000	3,000	1,500
Spot size?	2.64 cm ² (8 mm x 33 mm)	6 cm ² (20 mm x 30 mm)	2 cm ² (20 mm x 10 mm)
Measured Rep rate?	6.9 / 8.3 secs (2 passes reqd)	6-6.5 secs	2.1 secs
Time per cm ²	6 secs	1.08 secs	1.05 secs

The trouble with claims

Q: Is LUMASMOOTH the same as laser hair removal

A: LumaSmooth delivers more energy over a larger area than laser and goes deeper into the skin to impact the hair follicle. (Remington web site claim)

FACT:

TRIA claims fluence of max 24 J/cm² spot size 0.793 cm²
(we measured max 19 J/cm²) Pulse energy = 19.03J
(15.07J)

LumaSmooth doesn't state fluence (or pulse energy) but we measured it at 7.9 J/cm² over a 2 cm² spot size Pulse energy = 15.8J

Safety?

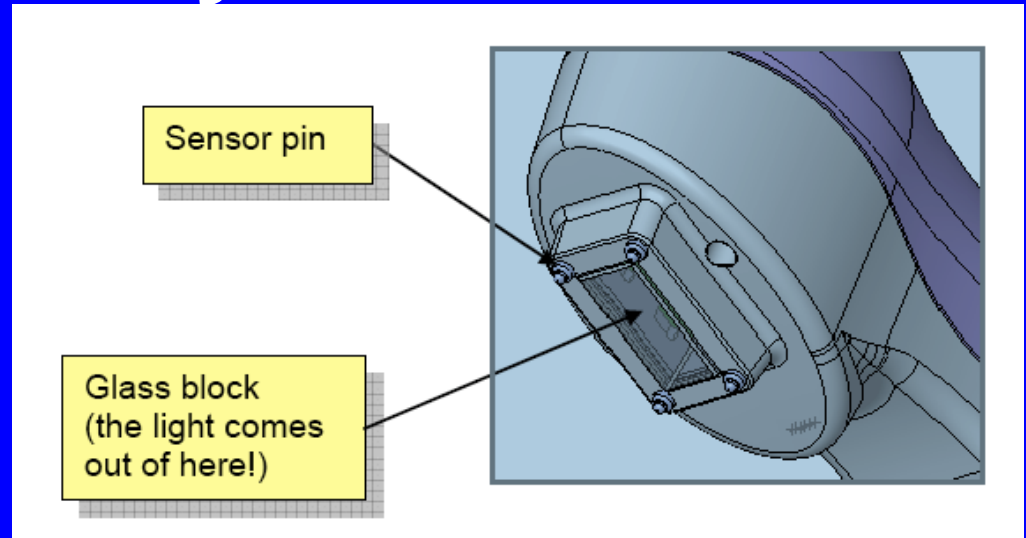


Combinations of: conductance, pressure and electrical contact sensors, security codes, low energy, visual LED and audible warnings, filtered safety glasses.

Safety?



Epil-Flash electrical
conductive sensing pins



Boots Smooth Skin iPulse IPL
conductance sensing pins



SpectraGenics TRIA Laser



Remington LumaSmooth recessed aperture

Safety?



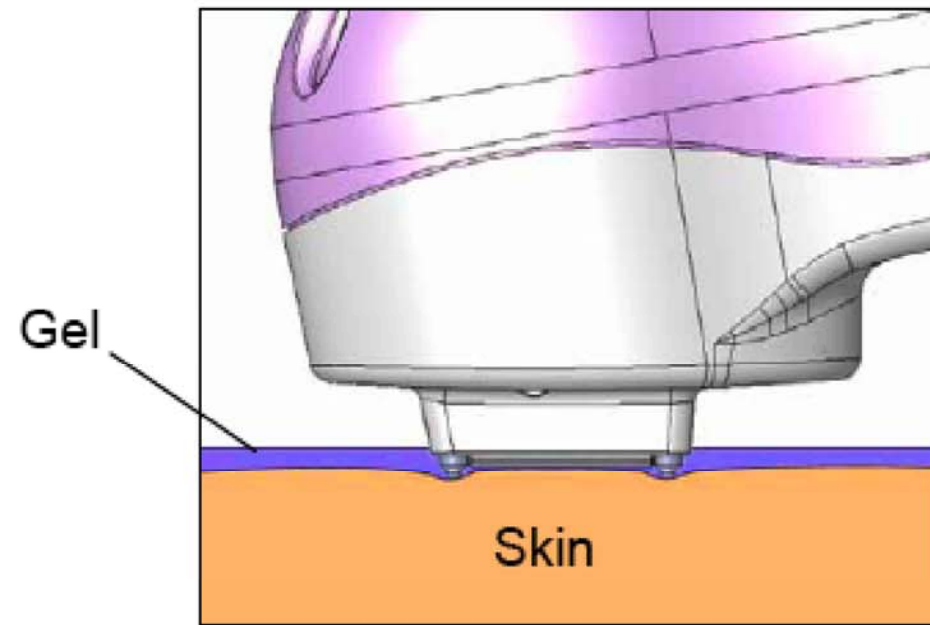
iPulse Personal

Silk'n/SensEpil

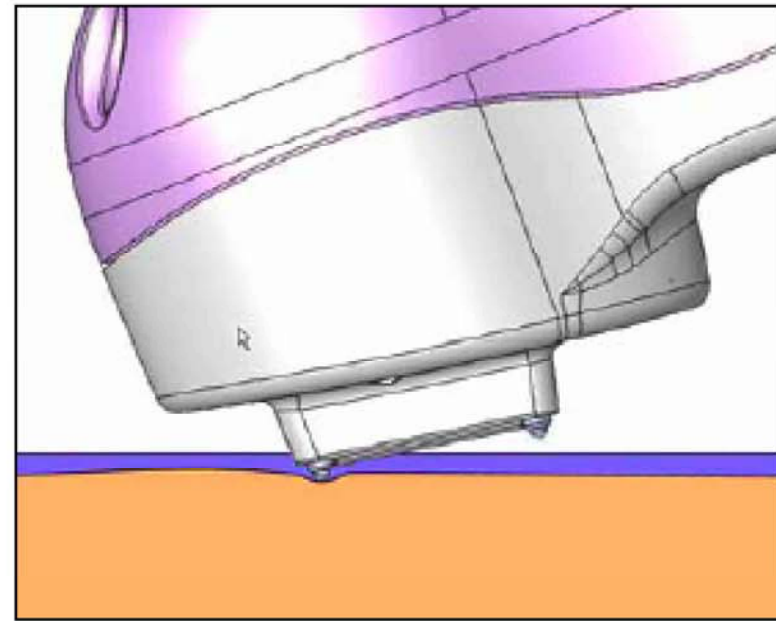
Lumea

Combinations of: conductance, pressure and electrical contact sensors, security codes, low energy, visual LED and audible warnings, filtered safety glasses.

Skin Positioning



Correct



Incorrect

Without full skin contact of the safety sensors, the home-use IPLs should not fire

Eye Hazard?

The test methods described in the latest draft of the international safety standard ‘Optical radiation safety and laser equipment’ (IEC 60601-2-57/Ed.1) include classification of LE devices by ranking of the Risk Groups (measured by the method specified in IEC 62471-1) and is based upon calculating excessive exposure during normal operation of equipment and foreseeable accidental exposure due to equipment malfunction or human error.

Boots Smooth Skin IPL outputs fall into the “Exempt Risk Group” in all of the applicable photo-biological hazard spectral regions for all device settings (Fair, Medium and Dark).

This classification is achieved irrespective of safety devices designed to ensure triggering only in skin contact. Therefore, no safety eyewear is required to protect against potential retinal thermal hazard injury.

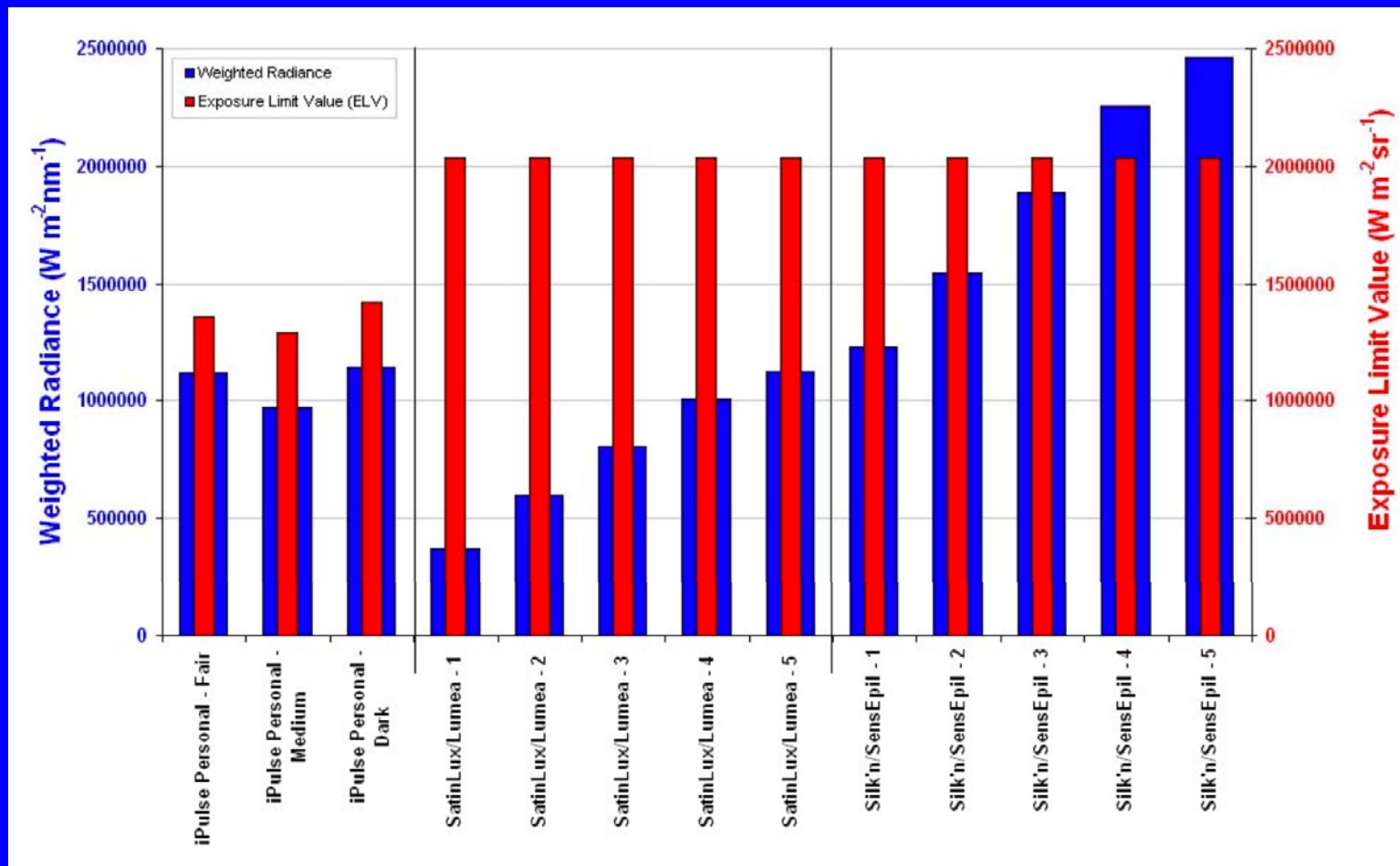
Suitability / Safety

Home-Use Device	Eye Safe? (if primary safety feature defeated)	Use on Face & Neck?
Tria (Class 1 diode laser) - diffusing lens	Yes	Yes
RioScanning Laser (Class 1 diode laser)	No	Yes
SatinLux / Lumea IPL	Yes ¹	No
Silk'n / SensEpil IPL (NO safety glasses provided)	No	Yes ²
iPulse Personal IPL (No glasses req'd)	Yes ¹	Yes
Epil-Flash IPL (safety glasses provided)	Yes/No	Yes (?)
E-One IPL (safety glasses provided)	No	Yes
i-Light / LumaSmooth IPL	Yes ¹	No

¹ Weighted Radiance Values less than the Exposure Limit Values in IEC 62471-1

² Now released as SensEpil for treatments below moustache

Exposure Limit Values



Retinal Exposure Limit Values vs. Measured Limit Values for 3 IPL devices according to IEC TR 60825-9 and the International Committee on Non-Ionizing Radiation Protection (ICNIRP) Guidelines on Limits of Exposure to Broad-band Incoherent Optical Radiation

Clinical Studies

Published Study	Mean hair reduction all areas at 6 months post 3 Tx
Wheeland, Lasers Surg Med 2007 (diode laser) (Tria diode laser)	41%
Alster and Tanzi, J. Dermatol Surg 2009 (IPL) (Silk'n IPL)	43%
Emerson and Town, J. Cos Laser Ther 2009 (IPL) (iPulse IPL)	41%

CONCLUSIONS

- As in the evaluation of professional IPL systems, some home use devices did not do what the manufacturers claimed.
- Acceptability of home use laser safety systems under current medical laser safety standards is unclear.
- Manufacturers should adhere to the new draft IEC intense light standard (IEC 60601-2-57/Ed.1) which includes cosmetic / home use devices and specifies risk categories to ensure that they remain below the prescribed limits set out in IEC 62471-1.
- There are few clinical papers evidencing efficacy.
- Manufacturers should consider “glare” discomfort with extended use of such domestic devices.

Will professional treatments be adversely affected?

- The introduction of a “trusted” brand in the consumer market will increase public awareness of laser and IPL treatments.
- Effective home use devices may be promoted by professionals (as in US) to provide “maintenance” care.
- Home use waxing and electrolysis kits and tooth whitening have never dented the demand for professional treatments.

Thank you !

