THE NEED TO IDENTIFY OCCUPATIONAL EXPOSURE TO LASER RADIATION IN GREECE

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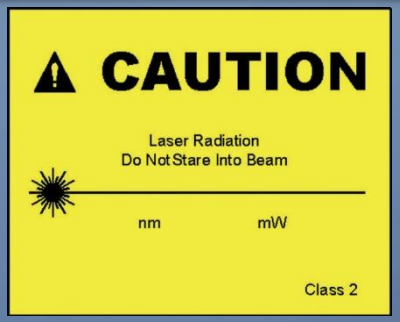

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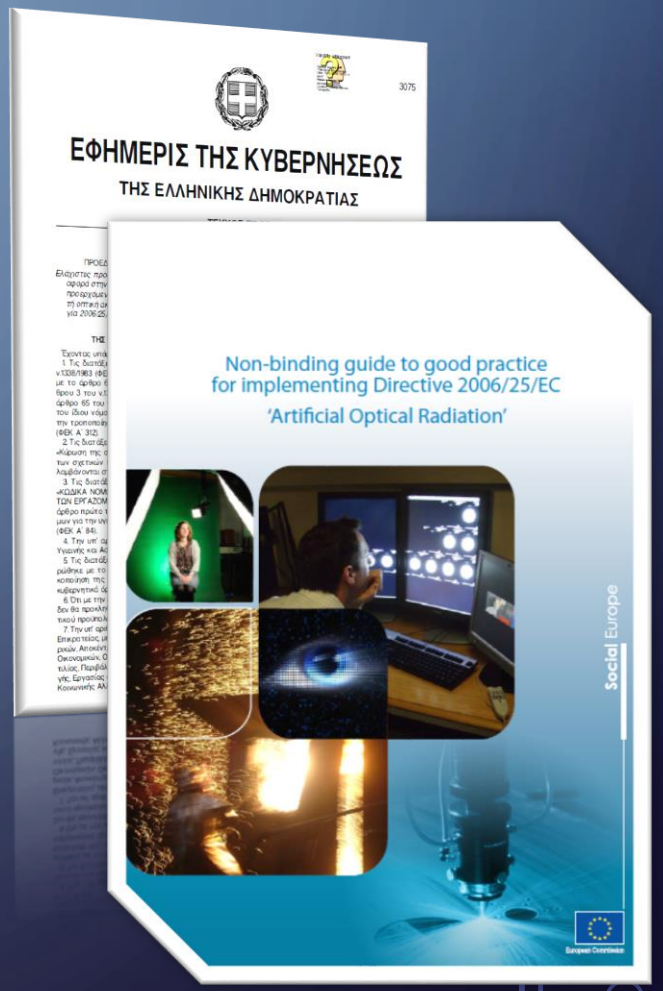
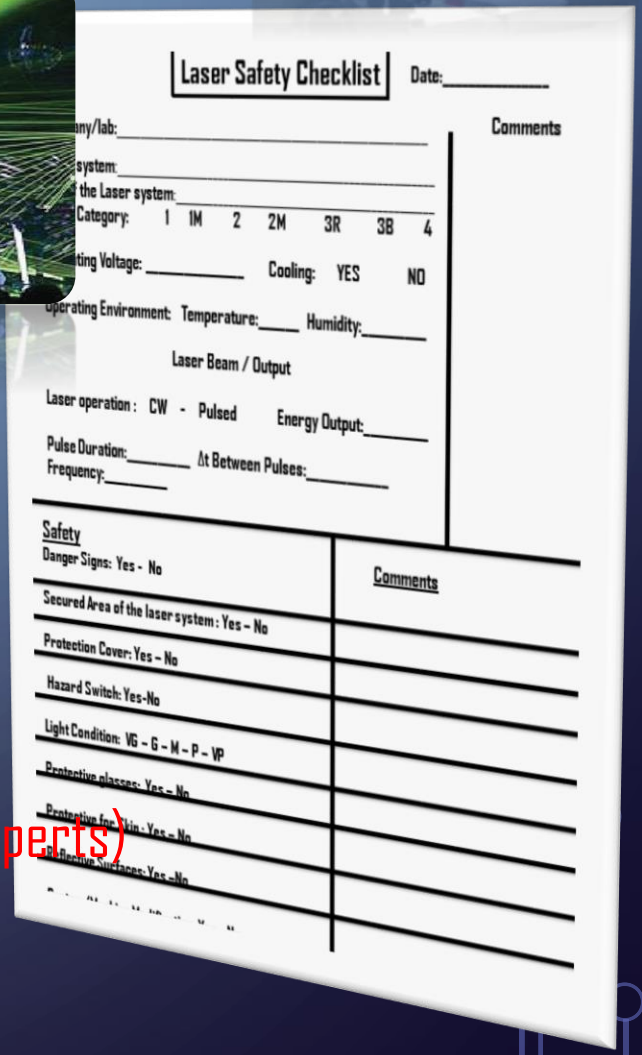
PURPOSE / INTRODUCTION

- **Directive 2006/25/EC** is a specific Occupational Health & Safety (OHS) one for Artificial Optical Radiation (AOR) - **UV, visible and IR**.
  - Employs limits and OHS measures for **laser** and **non-coherent** AOR.
  - Limited actions in Greece 10 years after the release.
- Ministry of Labor, NTUA and GAEC identify the field.



METHODS (1/2)

- Lasers are widespread in:
  - **Hospitals**
  - **Cosmetic** applications
  - **Research**
  - **Entertainment**
  - **Industry**
- Assessment through:
  - Evaluations of OHS regulations (**checklists** – laser experts)
  - **Measurements** of appropriate optical quantities


Laser Safety Checklist Date:

Comments

ny/lab:

system:

the Laser system:

Category: 1 1M 2 2M 3R 3B 4

ting Voltage: Cooling: YES NO

perating Environment: Temperature: Humidity:

Laser Beam / Output

Laser operation : CW - Pulsed Energy Output:

Pulse Duration: Δt Between Pulses:

Frequency:

Safety

Danger Signs: Yes - No

Comments

Secured Area of the laser system : Yes – No

Protection Cover: Yes – No

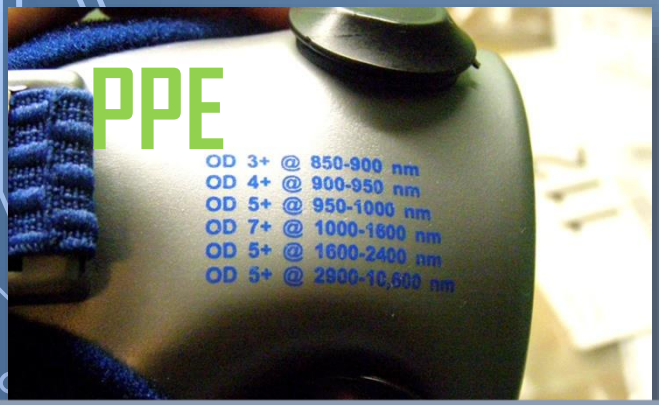
Hazard Switch: Yes-No

Light Condition: VG – G – M – P – VP

Protective glasses: Yes – No

Protective for Skin: Yes – No

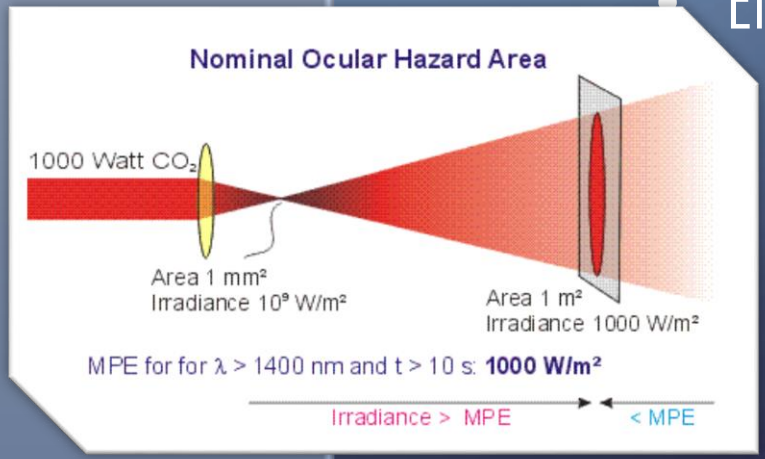
Protective Surfaces: Yes –No



METHODS (2/2)

- Safety issues:
  - Zone identification - signaling
  - Laser expert - instructions
  - NOHA
  - PPE (OD>4)
- Measuring equipment
  - Energy meters
  - Photometer
  - Thermohygrometer

- Measurements
  - Main beam
  - Scattered beam
    - Limit verification (MPE)
  - Environmental conditions

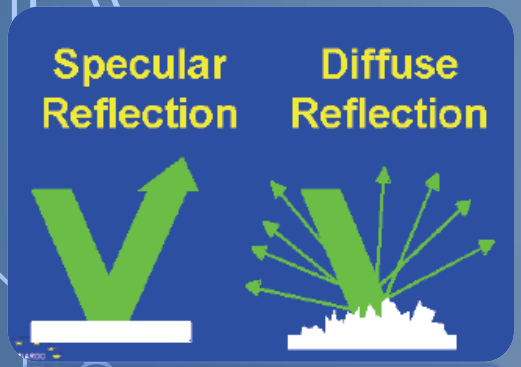


RESULTS - COSMETICS

- **Nd:YAG hair removal system** (1064nm, pilot 650nm)
  - 10W mean power, 10ms pulse, 1Hz repetition rate, 4mm beam diam.
- Nominal output for **primary beam 15J/cm²**
  - Verification: 14.9 J/cm² (ophir novall)
  - 52,000 times over limit for eye per pulse
  - 8.5 times over skin limit per pulse
- **Safety**
  - No signaling, no curtains, reflecting surfaces
  - Glasses, no gloves

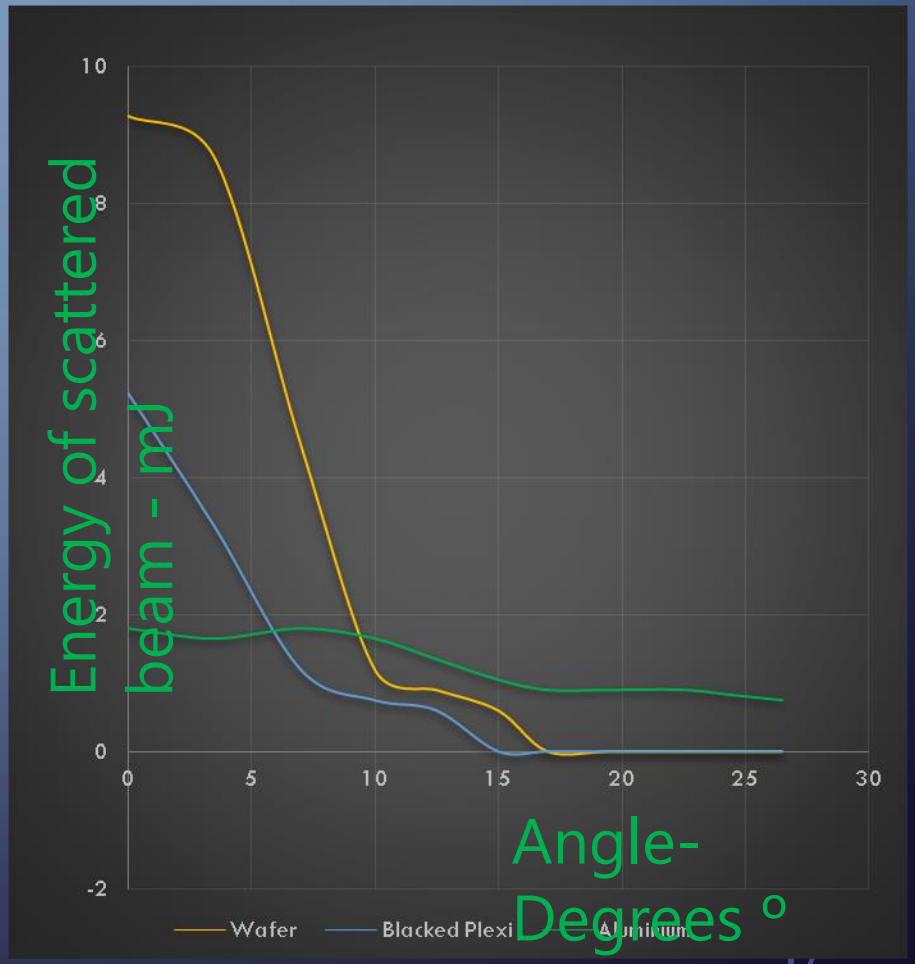
RESULTS – RESEARCH LAB (1/2)

- **Nd:YAG research system**
  - 6ns pulse, 1Hz repetition rate
- **Primary beam** nominal output
  Verification: 120 mJ and 126 mJ
- **Safety**
  - Signaling, no curtains, reflecting surfaces, interlocks.
  - Glasses, no gloves
- Environmental Conditions in Lab: Humidity 55%, Temp. 27° C , 250 Lux .



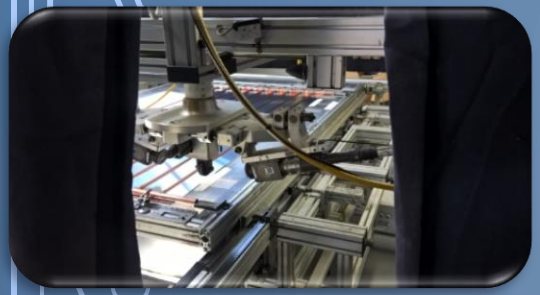
RESULTS – RESEARCH LAB (2/2)

- **Scattered beam** measurements
  - 3 materials
  - Angles from catoptric reflection
  - Safety distance for worst case catoptric reflection (NOHA approach) ≈ **2m**
  - Safety distance for diffuse reflection (NOHA approach) ≈ **0.6m**



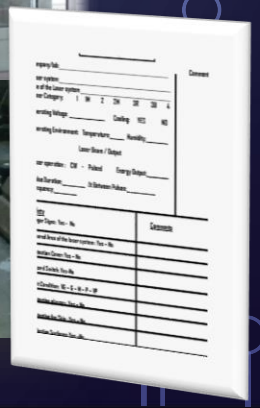
RESULTS - INDUSTRY

- Double head **Nd:YAG**, 1064nm, 500W mean power, 2.4J, 0.3ms pulse, 155Hz repetition rate.
- **Scattered beam**: great fluctuation – worst result: 25 times over eye limit, 0.1% of skin limit.
- **Safety**
  - Signaling, curtain, emergency buttons, no interlocks, PPE (OD>7), reflecting surfaces
- Environmental Conditions: Humidity 38%, Temp. 29° C , 200 Lux



DISCUSSION (1/2)

- Safety **measurements** & application of Directive's limits are possible
- Initial results reveal:
  - Eye hazard is present in installations (even from scattered beam)
  - Safety procedures are not always followed
- Objectives:
  - Creation of sample safety checklists
  - Pilot safety procedures for certain installations
  - Creation of sample risk assessment
  - Laser safety expert activation



DISCUSSION (2/2)

- Objectives (continued):
  - Medical safety and QA protocols
    - Legislative upgrade of laser safety
- Lack of overall data of laser installations
  - Pilot results for sample ones

REFERENCES

- Directive 2006/25/EC: Artificial Optical Radiation, OJ L 2006; 114/38.
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- MEDICAL LASERS: QUALITY CONTROL, SAFETY STANDARDS, AND REGULATIONS, AAPM REPORT NO. 73, 2001.
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