EMFWeld

Electromagnetic fields in welding

PRESS KIT

2014 Version I

Flyer / Press Release / Presentations

EMFWeld
Electromagnetic fields in welding

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Introduction to EMFWeld

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Presentation II

EMFWeld
Electromagnetic fields in welding

Tool for risk assessment of a worker's exposure to welding electromagnetic fields will improve the fabrication industry competitiveness, ensuring that the highest levels of safety are met

Research project EMFWELD aims to comply with European Commission's Directive

Some welding and non-destructive testing processes are high emitters of EMF and yet there is a recognised lack of knowledge concerning its sources and its comparison to exposure limit values. The European fabrication industry, among other, regularly utilizes machinery that emits EMF, and is required to ensure that workers exposure is minimised and below the levels set out by the European Commission's EMF Directive (2013/35/EU), published on June 26th 2013. This research project, led by the European Federation of Welding, Joining and Cutting, aims to lower SMEs' cost of compliance by providing an innovative, economic, easily accessible and accurate software tool for EMF exposure risk assessment in welding and non-destructive testing processes.

The fabrication industry EMF challenge

Electromagnetic fields (EMF) are a form of electromagnetic radiation and are defined as non-ionising radiation having both magnetic and electric field components varying with time at frequencies up to 300 GHz. This new Directive, which will be enforced in July 2016, promotes the safety and health of individuals working in environments likely to be subjected to electromagnetic fields. SMEs in the fabrication industry will be put at a competitive disadvantage as they incur a heavy and disproportionate financial cost in order to meet the required standards and ensure a safe working environment for their workers. In many cases a simple measurement may not be sufficient to demonstrate compliance with the forthcoming Directive, so complex numerical modelling will be required to make a full assessment.

The EMFWeld project

This ambitious project – EMFWELD – aims to lower SMEs' cost of compliance to the newly proposed EMF Directive by providing an EMF exposure risk assessment tool. The envisaged web-based software application will however require expertise and extensive research and understanding of welding processes and their associated EMF parameters; EMF exposure health effects, and software development. The SME-AGs of this consortium simply do not have the necessary research capabilities and have therefore engaged leading Research and Technological Development performers (RTDPs) with world class knowledge in welding processes (TWI) and simulation of EMF health effects (CHALMERS) to develop the EMF concept. In addition to providing decisive cost benefit for the SMEs, EMFWELD will also contribute towards the establishment of new EU standards for the assessment of EMF in metal fabrication industries promoting a safe working environment and benefiting Europe as a whole.

The goals of the project are to:

- *improve knowledge of EMF in welding and inspection;*
- *provide tools for the correct assessment of worker's exposure to EMF;*
- *reduce the cost of compliance with the EMF Directive for SMEs.*

The software toolkit will provide a simple yet very effective and actionable information to the organization regarding the risk for its workers by using a certain machine. The software toolkit will inform if there is no risk whatsoever for the user of the specified machine, when the exposure is likely to be below the limit, or if the level of exposure is likely to be above the limit imposed by the directive.

The project is comprised of a transnational consortium, which includes seven partners (*EWF, CEEMET, SWANTEC, INACEINOX, LINK MICROTEK, TWI, and CHALMERS*). The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA-Research Executive Agency http://ec.europa.eu/rea (FP7/2007-2013) under grant agreement no. FP7-SME-2012-2-315382.

www.EMFWELD.com

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EMFWeld

Electromagnetic fields in welding

ATTENTION: Employers in the European Union will be required to ensure that worker's exposure to ***EMF ElectroMagnetic Fields*** is assessed, minimized and below the levels set out in the new ***EMF Directive (2013/35/EU)*** published on 26 June 2013.

EMFWELD is a research project to increase knowledge and understanding of worker's exposure to electromagnetic fields in the fabrication industry.

More information can be found at:

www.emfweld.com

About

EMFWELD Electromagnetic Fields in Welding, a European Union funded research project, is developing an interactive web based software application to calculate and assess workers exposure to electromagnetic fields - EMF in metal fabrication, particularly in welding and non-destructive testing - NDT.



Project Goals

- Improve knowledge of EMF in welding and inspection

- Provide tools for the correct assessment of worker's exposure to EMF

- Reduce the cost of compliance with the EMF Directive for SMEs (2013/35/EU)

More information can be found at:

www.emfweld.com

Consortium Partners:

The EMFWELD project and website is managed by EWF and has received funding from the European Community's Seventh Framework Programme managed by REA-Research Executive Agency (FP7-SME-2012) under grant agreement no. 315382. Information is provided as is and no guarantee or warranty is given that the information is fit for any particular purpose. The user thereof uses the information at its sole risk and liability.

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EMFWELD research project to increase knowledge and understanding of worker's exposure to electromagnetic fields (EMF) in the fabrication industry.

Employers in the European Union will be required to ensure that worker's exposure to EMF is assessed, minimised and below the levels set out in the new EMF Directive (2013/35/EU) published on 26 June 2013.

EMFWELD is a European Union funded research project which will develop an interactive web based software application to calculate and assess workers exposure to electromagnetic fields (EMF) in metal fabrication, particularly welding and non-destructive testing (NDT).

The goals of the project are to:

- improve knowledge of EMF in welding and inspection
- provide tools for the correct assessment of worker's exposure to EMF
- reduce the cost of compliance with the EMF Directive for SMEs

Some welding and NDT processes are believed to be high emitters of EMF, but there is a lack of good information and measurements, on which to base an assessment of welder's exposures and to compare the exposure to limit values. In many cases a simple measurement may not be sufficient to demonstrate compliance with the forthcoming Directive, so complex numerical modelling will be required to make a full assessment.

Without clear guidance and support, European industry and particularly SMEs, will be put at a competitive disadvantage. EMFWELD aims to lower SMEs cost of compliance with the forthcoming EMF Directive by providing an innovative, economic, easily accessible, and accurate EMF exposure risk assessment software toolkit. The expertise of the project partners in welding processes, measurement and numerical modelling of EMF will ensure the successful development of this software application.

The project is comprised of a transnational consortium, which includes seven partners (EWF, CEEMET, SWANTEC, INACEINOX, LINK MICROTEK, TWI, and CHALMERS). The research leading to these results has received funding from the European Union's Seventh Framework Programme managed by REA-Research Executive Agency http://ec.europa.eu/rea (FP7/2007-2013) under grant agreement no. FP7-SME-2012-2-315382.

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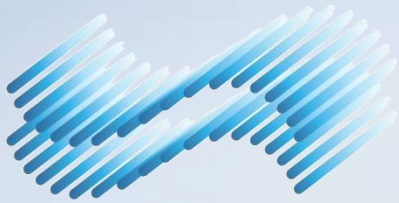


EMFWeld

Electromagnetic fields in welding

EMFWeld – Electromagnetic fields in welding Preparing for the EU Directive 2013/35/EU

Eurico Assunção*, Luisa Coutinho**, Geoff Melton***, Robert Shaw-Edwards***

*EWF / ** TU-Lisbon, EWF / ***TWI

66th IIW Annual Assembly
11-17 September 2013
Essen, Germany

EMFWeld

EMFWELD - Analysis of workers exposure to electromagnetic fields **(EMF)** from **weld**ing and NDT processes, guidelines for risk assessment and development of risk assessment web based application

Introduction

EMFWELD is a European Union funded research project, under the Grant Agreement FP7-SME-2012-2-315382-EMFWELD, which will develop an interactive web based software application to calculate and assess workers exposure to electromagnetic fields (EMF) in metal fabrication, particularly welding and non-destructive testing (NDT).

- EC Framework 7
- Research for SME Associations
- Start date: 1 October 2012
- Duratio: 2 years
- Total Value: 932,000 €

EMFWELD Partners

Background

Electromagnetic fields (EMF) are a form of electromagnetic radiation and are defined as non-ionising radiation having both Magnetic and Electric field components varying with time at frequencies up to 300GHz.

The European Commission Directive aims at promoting the safety and health of individuals working in environments likely to be subjected to electromagnetic fields.

Background

With the new European Commission Directive employers will have to:

- Determine the levels of exposure and assess risk to employees
- Provide mitigation measures to avoid or reduce risks where the exposure limits is exceeded
- Provide worker information and trainning regarding EMF exposure and the risk associated

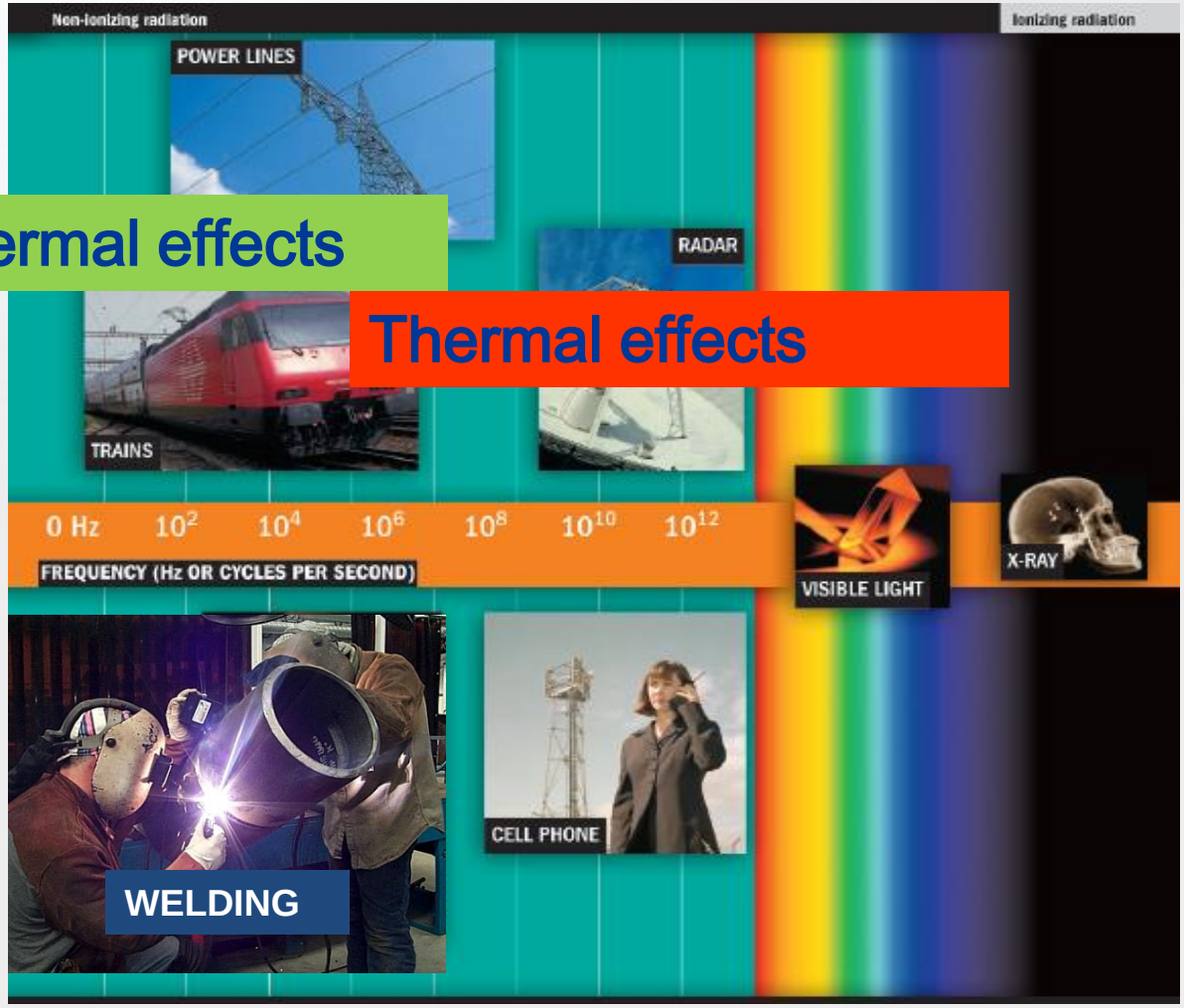
Objectives of EMFWELD

- Improve knowledge of EMF in welding and inspection
- Provide tools for the correct assessment of worker's exposure to EMF
- Reduce the cost of compliance with the EMF Directive for SMEs

EMF Health Effects

Non -Thermal effects

Thermal effects



Why Limit Exposure?

Non –Thermal effects 1Hz to 10MHz

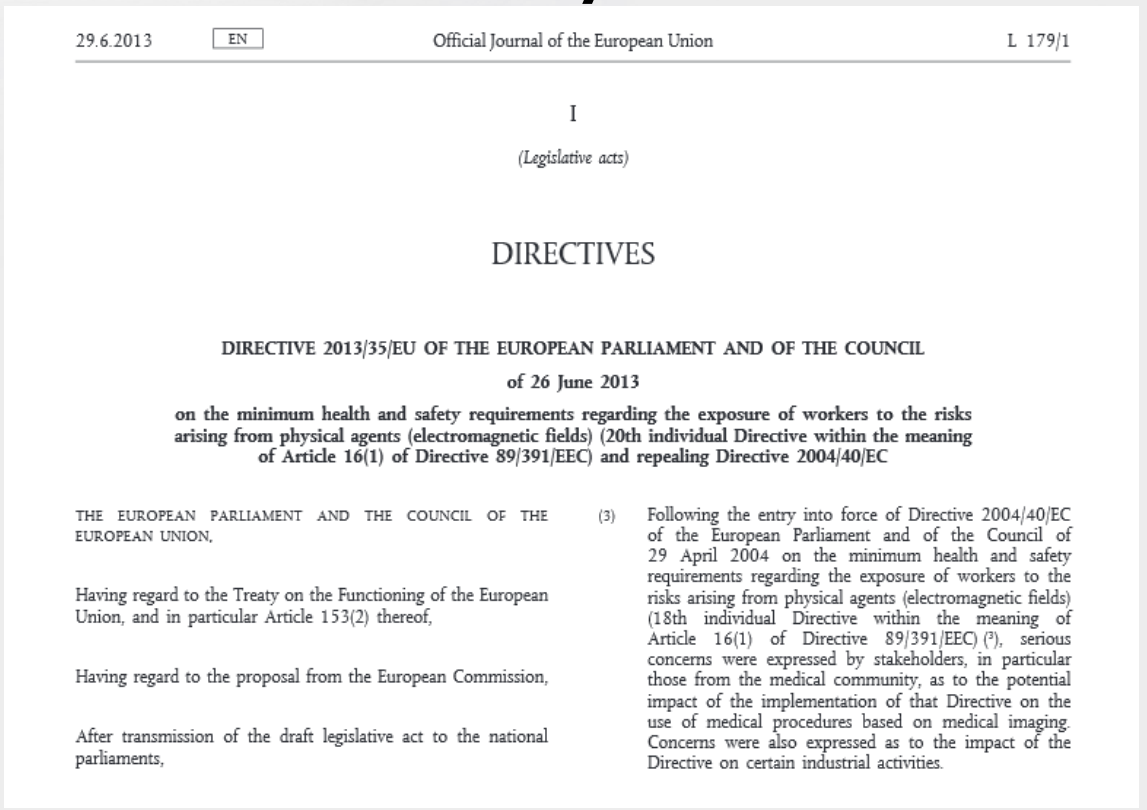
- Stimulation of Muscle, nerves and sensory organs
- Sensory Effects 1 to 400Hz
  - Vertigo
  - Retinal phosphenes
  - Metallic taste
- Interference with AIMDs (Active implanted medical devices)

EMF Directive

On June 29 2013, the new EMF directive **"Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and repealing Directive 2004/40/EC** was published by the Official Journal of the European Union

EMF Directive

The Directive is now official EU law.
Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive
by 1 July 2016



29.6.2013 EN Official Journal of the European Union L 179/1

I

(Legislative acts)

DIRECTIVES

DIRECTIVE 2013/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 26 June 2013

on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and repealing Directive 2004/40/EC

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 153(2) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

(3) Following the entry into force of Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (18th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) [3], serious concerns were expressed by stakeholders, in particular those from the medical community, as to the potential impact of the implementation of that Directive on the use of medical procedures based on medical imaging. Concerns were also expressed as to the impact of the Directive on certain industrial activities.

EMF in Welding

Some welding and non-destrucive testing processes use relatively high currents that generate significan magnetic fields around cables, work pieces and electrodes.

Arc Welding

Resistance Welding

Project Workpackages

WP number	WP Title	Work Package leader
WP 1	Review of regulatory requirements and system specification	EWF
WP 2	Process monitoring and measurement	TWI
WP 3	Modelling and simulation	CHALMERS
WP 4	Development of a software toolkit	DTU
WP 5	Testing and Validation	TWI
WP 6	Demonstration	INACEINOX
WP 7	Dissemination, Exploitation and Training	CEEMET
WP8	Project Management	EWF

Measuring the EMF in welding

Arc Welding

Spot Welding

Stud Welding

Magnetic Particle inspection

Induction Heater

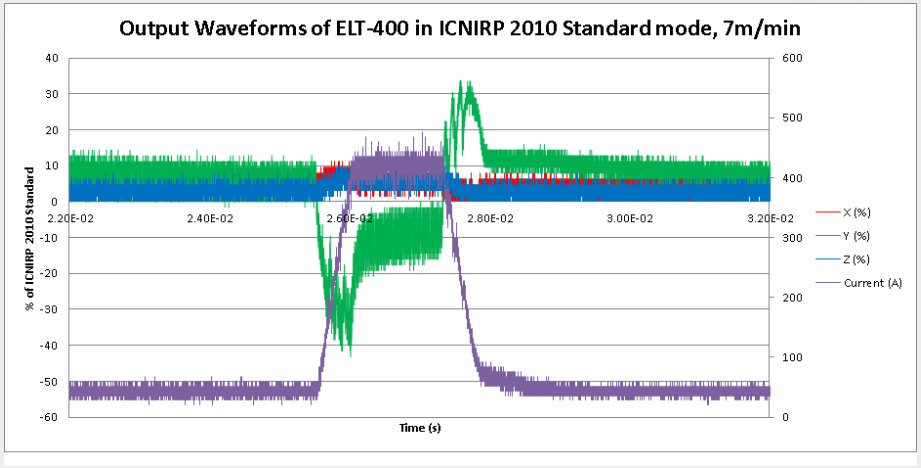
Measuring the EMF in welding

EMF Measuring of pulsed TIG welding

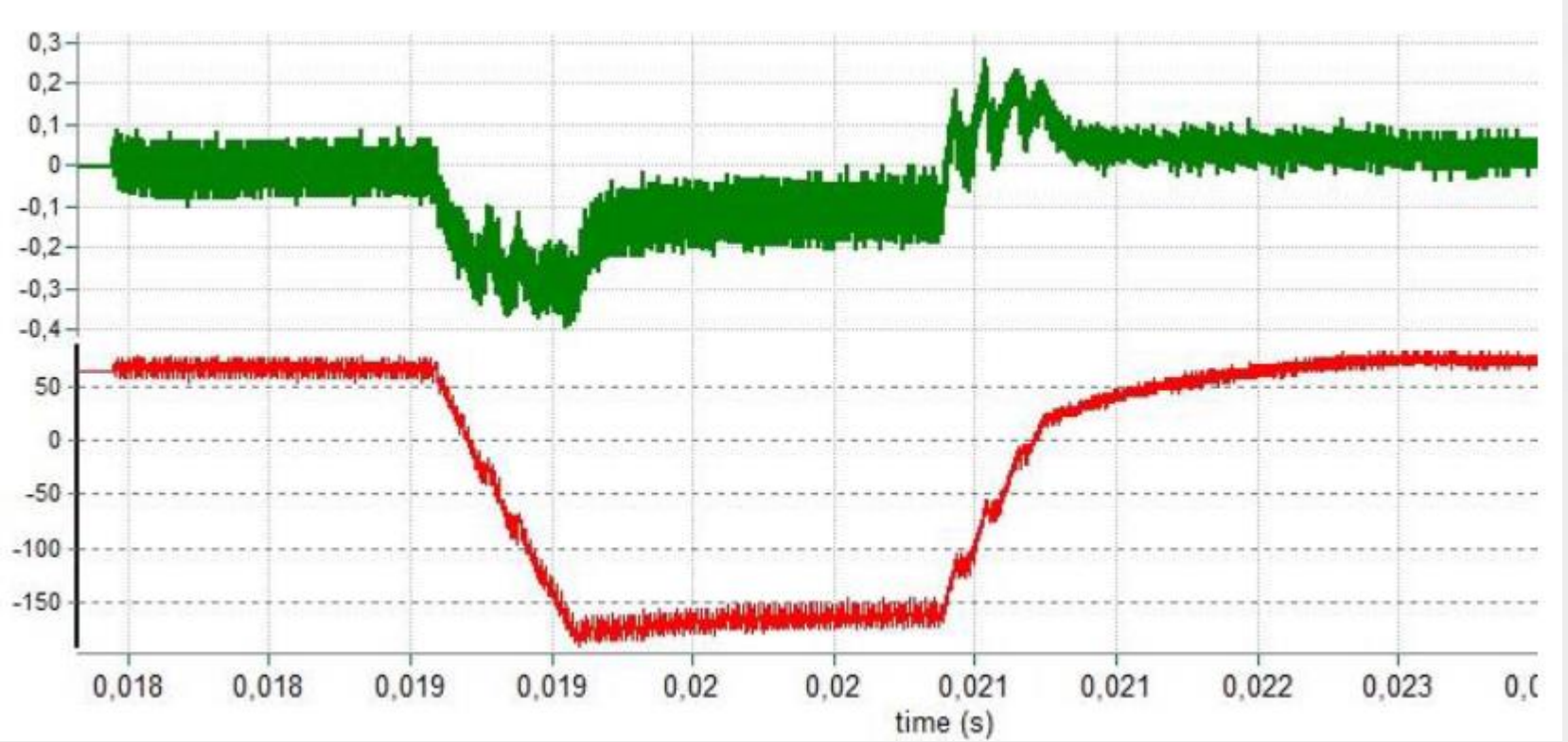
EMF Measuring of resistance welding

Measurement Setup for standardised results

- Measurements taken with ELT-400 at 20cm from a cable (or in the case of resistance, from the electrodes).
- Waveforms collected from probe analogue outputs.



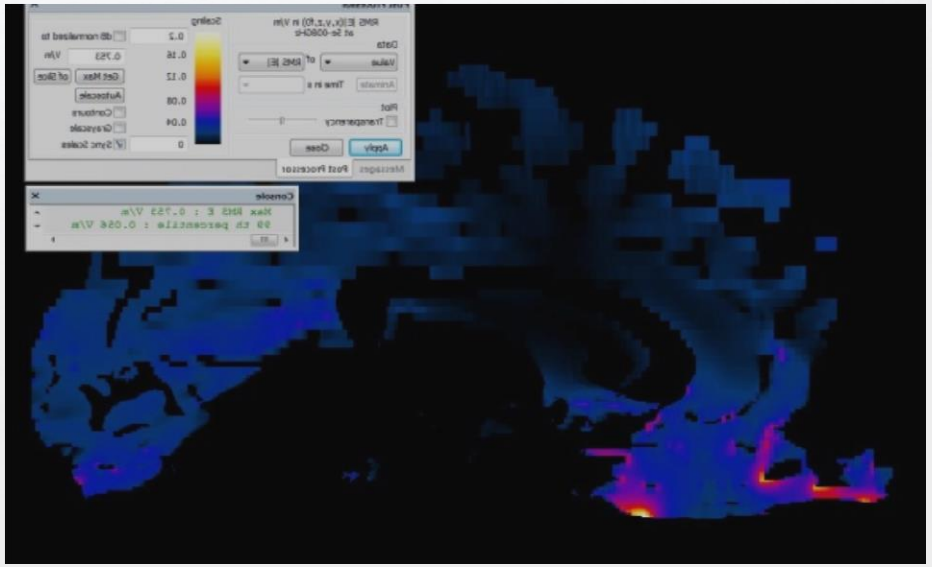
Measuring results

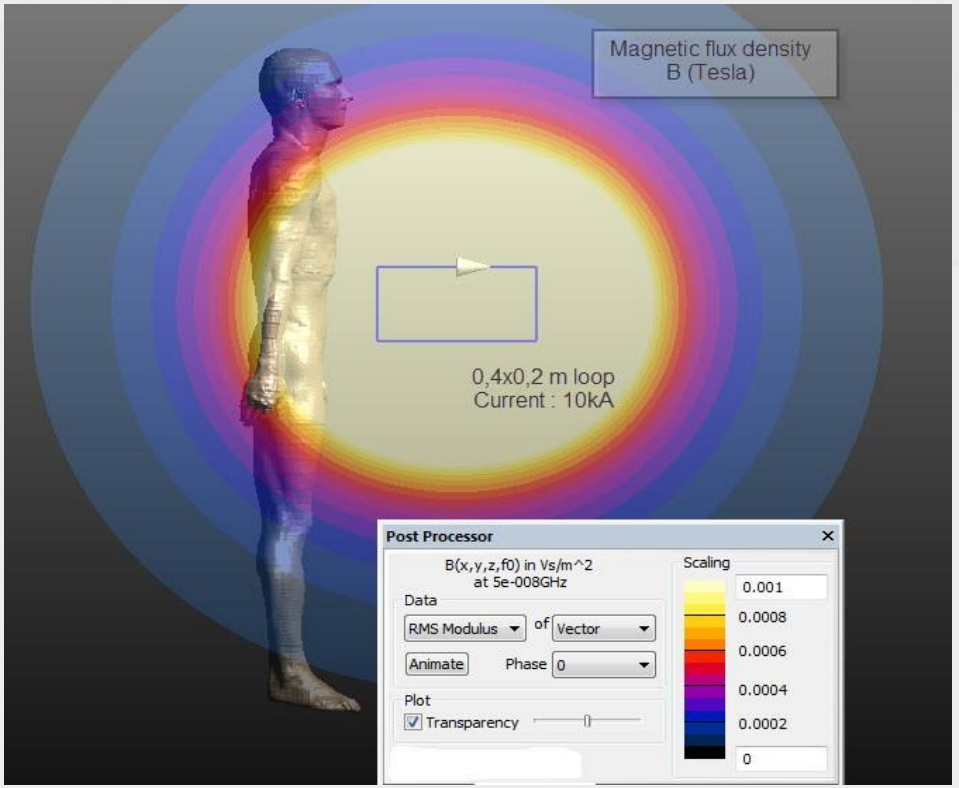


Measured magnetic field waveform (red)
Calculated weighted reference value (green)

Simulations of the magnetic fields from welding

Simulation to determine compliance with the Exposure Limit values

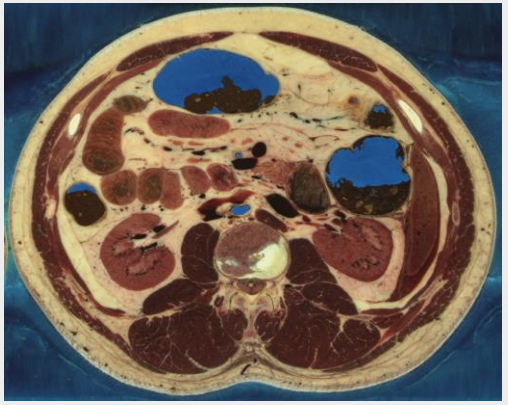




EMFWELD Overview

Measurement

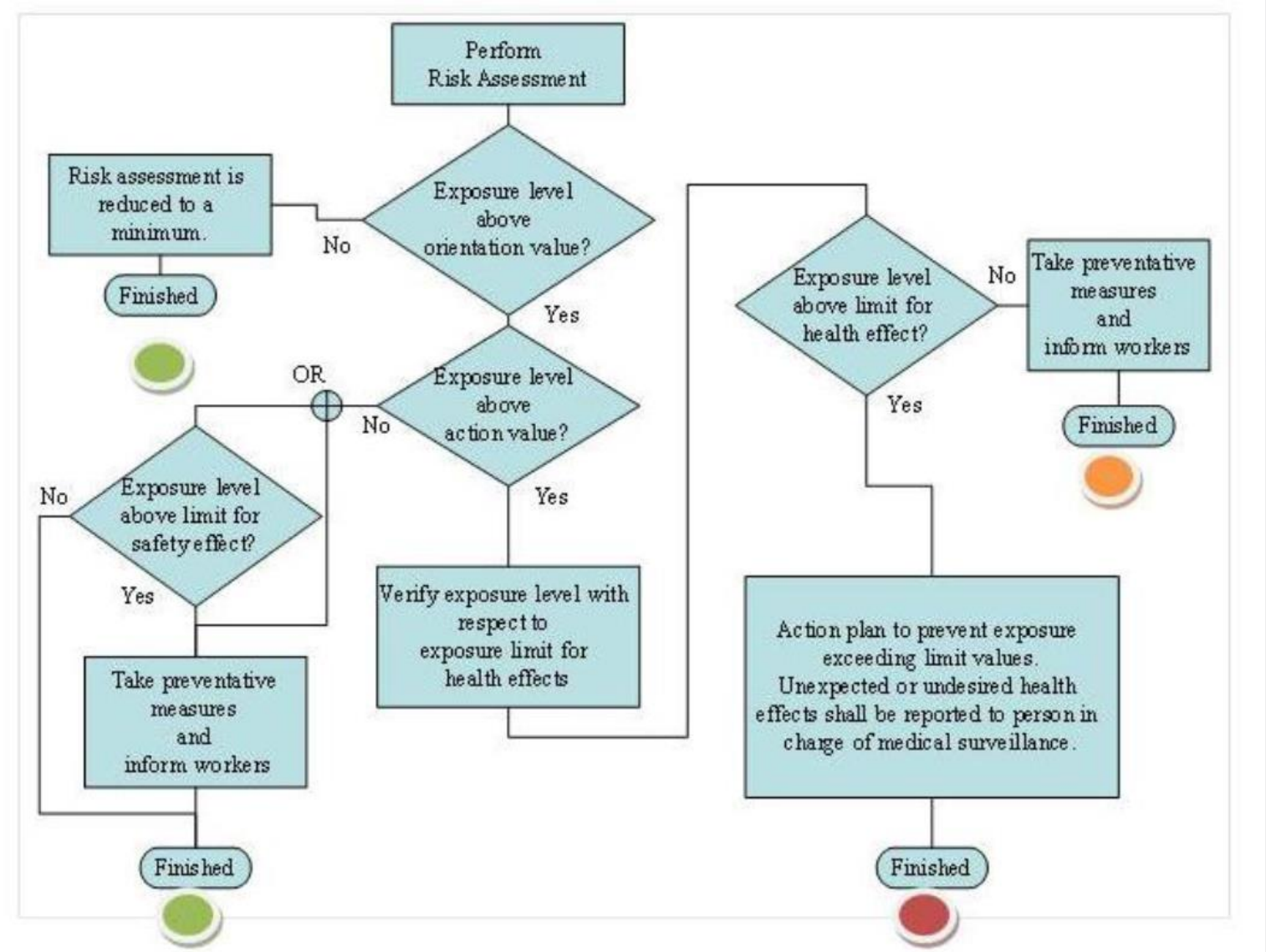
Modelling



Software toolkit

	Green - No risk at all (i.e. exposure below the limit imposed by the directive).
	Amber - System will request additional information from user concerning equipment age, operational environmental parameters etc. Will then return either Green or Red
	Red - Level of exposure likely to be above the limit imposed by the directive. The end user will then be redirected to equipment manufacturers or other possible sources of information.

EMFWELD assessment software



Conclusions

- The main objective of the EMFWELD project, to improve the knowledge in terms of EMF in different welding and inspection processes is showing some progress with initial evaluations already carried out.
- The software that will combine this knowledge with the EC Directive requirements is being developed with the intent of supporting SMEs in the implementation of the Directive

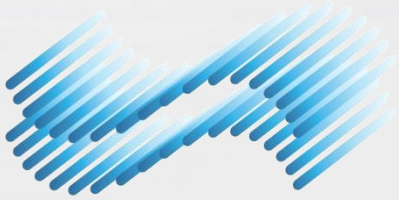
Further work

Next steps

- Finalise the measurement of the EMF for different welding and inspection processes
- Model and simulate the effect of those EMF on the user of the equipment
- Develop the software which will integrate the EMF measurement with the EC Directive
- Carry out trial/tests in industrial conditions

Aknowledgements

The EMFWELD project has received funding from the European Community's Seventh Framework Programme managed by REA-Research Executive Agency (FP7-SME-2012) under grant agreement no. 315382.



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The End

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A world of joining experience

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COMMISSION VIII
HEALTH, SAFETY AND ENVIRONMENT

AN INITIAL ASSESSMENT OF WELDER'S EXPOSURE TO EMF WITH REFERENCE TO THE EU DIRECTIVE (2013/35/EU)

Geoff Melton*, Robert Shaw-Edwards*,
Eurico Assunção**, Luisa Coutinho***

*TWI / **EWF / *** TU-Lisbon, EWF

66th IIW Annual Assembly 11-17 September 2013 Essen, Germany

THE "NEW" EMF DIRECTIVE 2013/35/EU

29.6.2013 EN Official Journal of the European Union L 179/1

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(Legislative acts)

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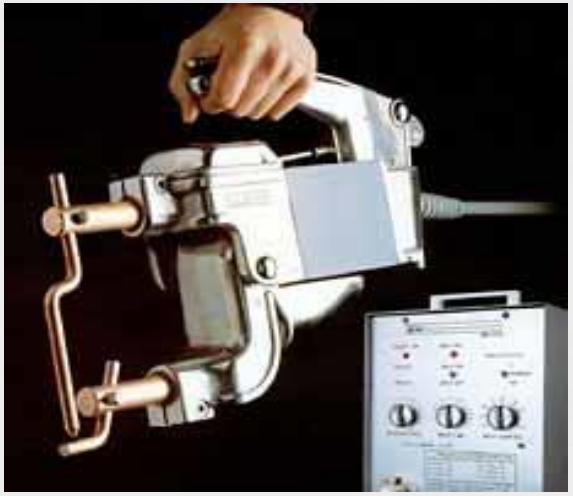
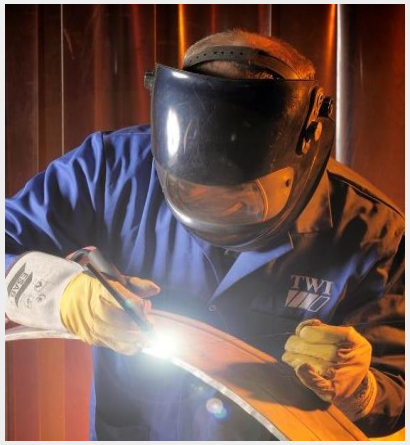
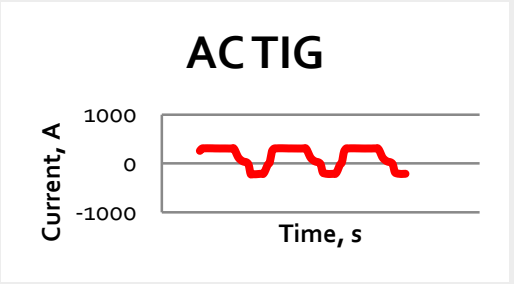
TRANSPOSED INTO LAW BY 1 JULY 2016

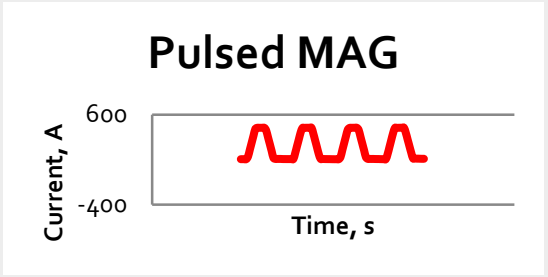
Practical Guide to be published by 1 Jan 2016

Welding processes affected









Why Limit Exposure?

Silvanus P. Thompson attempting to electromagnetically stimulate his brain in 1910

TRANSCRANIAL MAGNETIC STIMULATION

The Times, 24 May 2007

nrpb
National Radiological Protection Board

There is evidence that exposure to magnetic fields may modulate the functions of the opioid and cholinergic systems, and this is supported by the results of studies investigating effects on analgesia and on the acquisition and performance of spatial memory tasks.

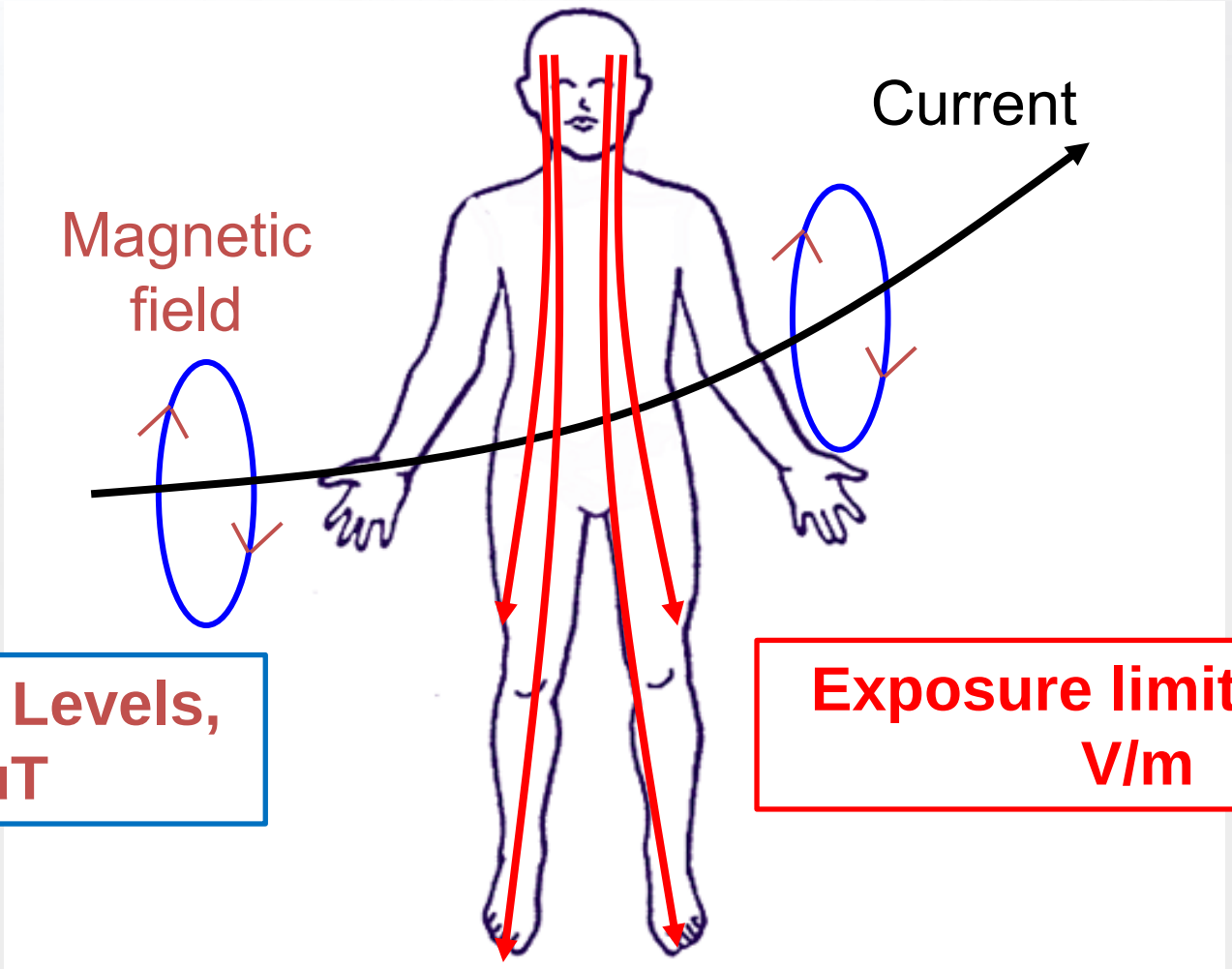
PROTECTION OF WORKERS

- Covers Direct Biophysical effects
  - Thermal effects such as tissue heating
  - Stimulation of muscles, nerves or sensory organs.
    - Detrimental effect on mental and physical health
    - Transient sensory symptoms such as vertigo or retinal phosphenes, may cause a safety risk.
  - Limb currents
- Does not cover suggested long term effects.

EM Spectrum


Non-ionizing radiation
Ionizing radiation
POWER LINES
RADAR
TRAINS
0 Hz
10^2
10^4
10^6
10^8
10^{10}
10^{12}
FREQUENCY (Hz OR CYCLES PER SECOND)
VISIBLE LIGHT
X-RAY
LL PHONE
WELDING

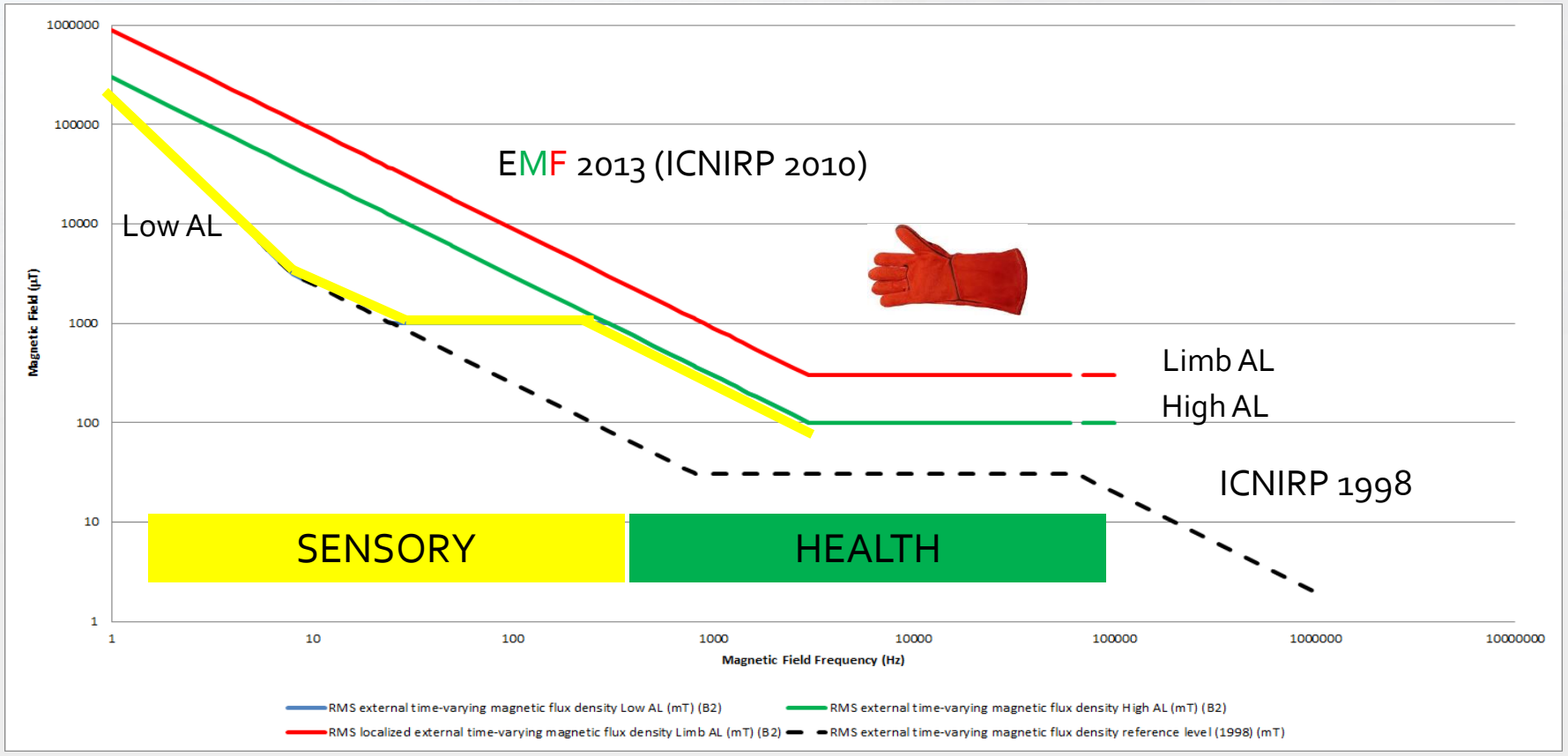
EMF Exposure



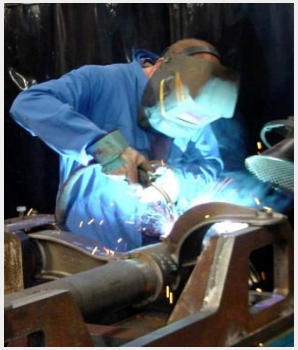
Action Levels, μT

Exposure limit values, V/m

EMF Directive Action Levels

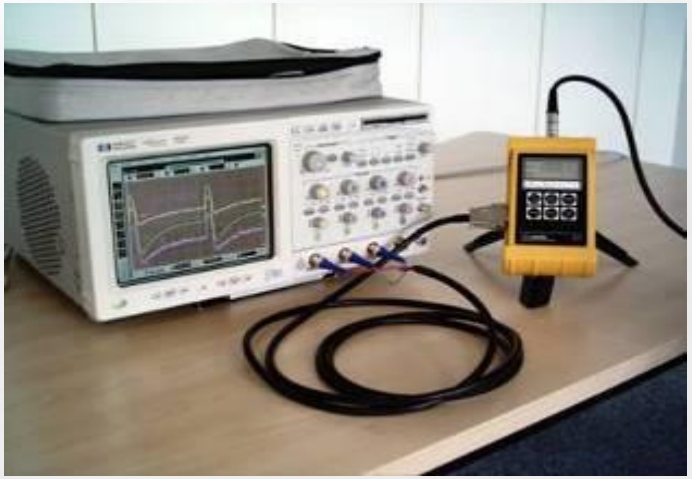


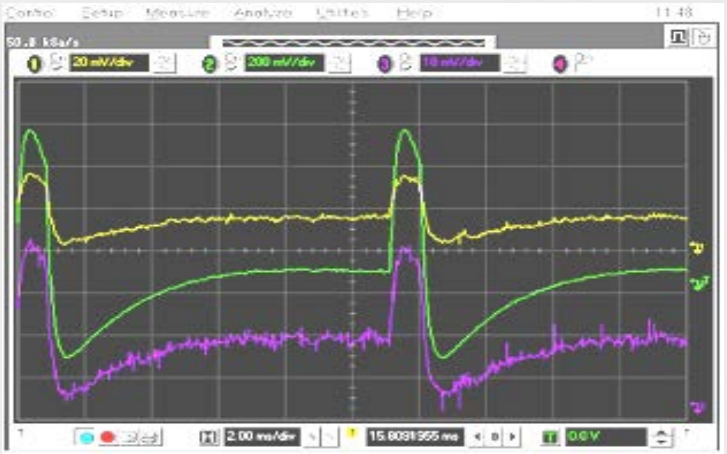
“Temporarily exceed” and Derogations

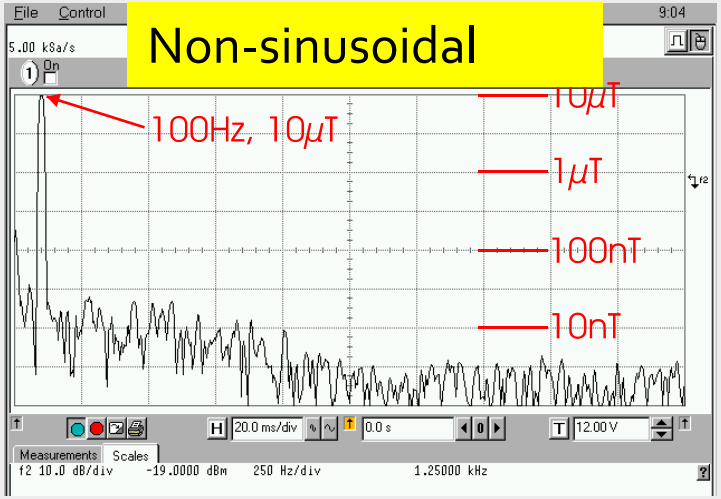


Assessment of exposure

EMF Measurement







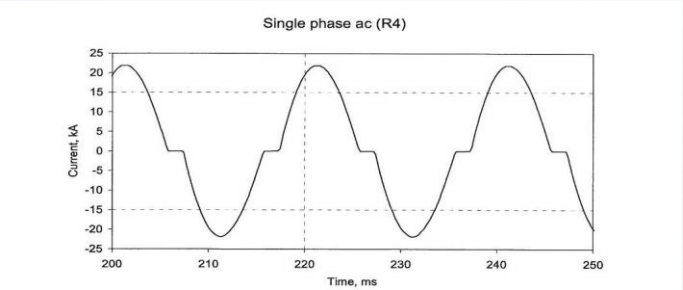
Non-sinusoidal

Low AL

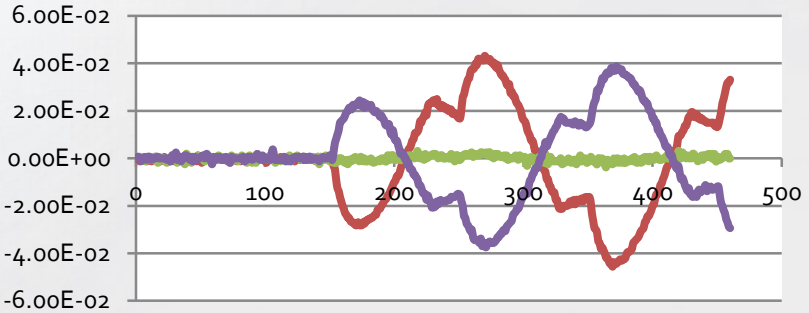
"weighted peak method"

High AL Limb AL

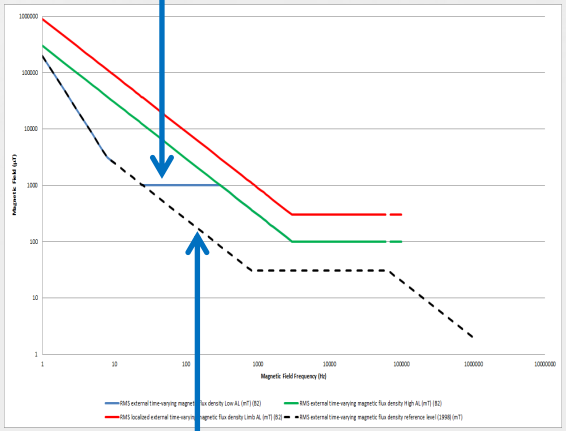
Single phase resistance welder
Old vs new Action Levels



Current



Magnetic field



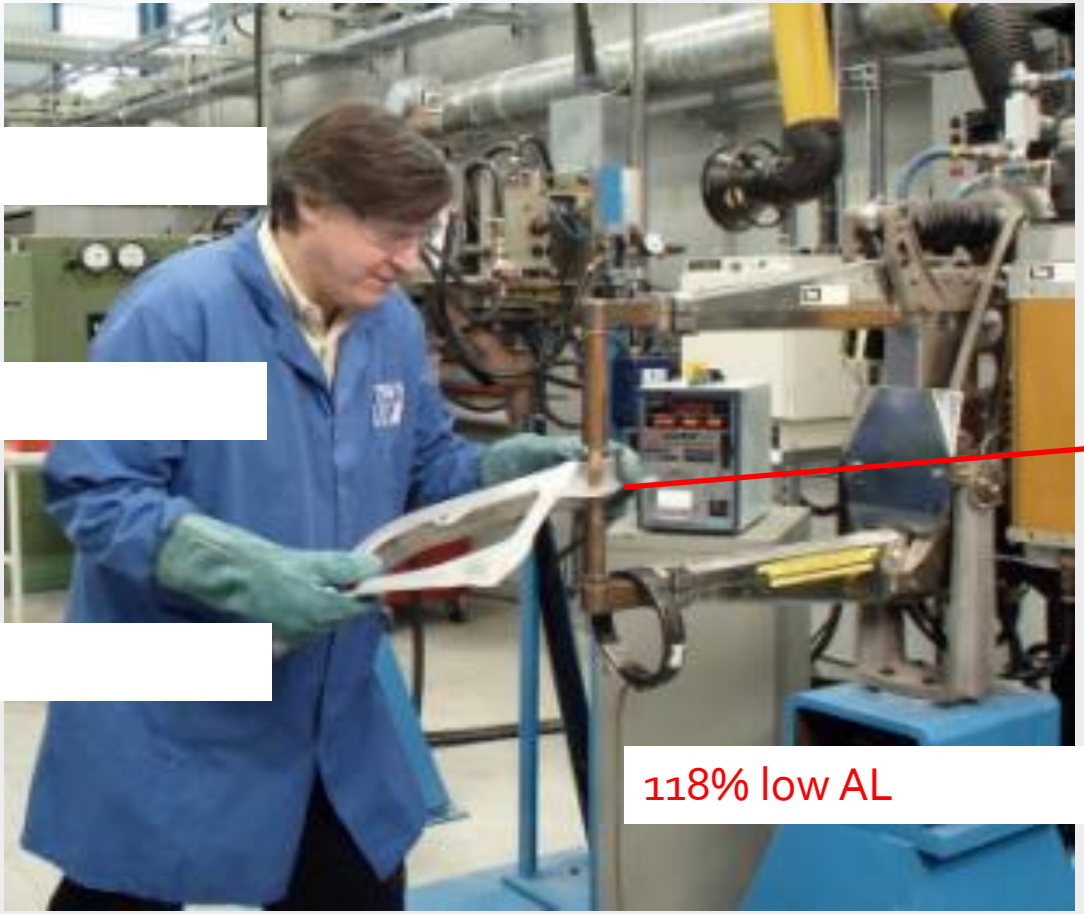
Current, kA	Conduction angle	B field, uT	ICNIRP 1998, %	EMF Low AL, %
4.2	90	594	241	39
5.7	109	751	251	45
7.2	126	890	247	54
8.8	174	1060	189	59

Single phase resistance welder at 10kA

14% low AL

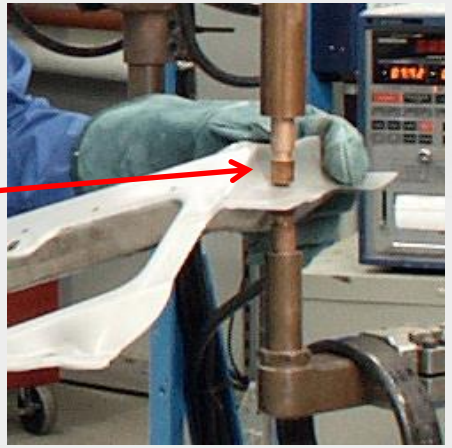
73% low AL

66% low AL



118% low AL

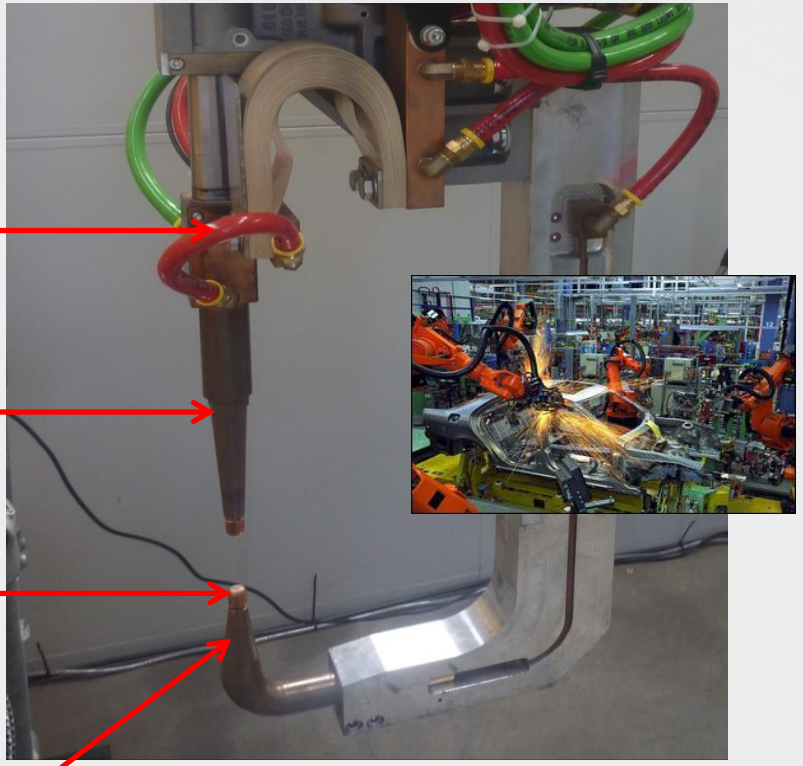
94%
limb AL



Medium frequency resistance welding at 30kA

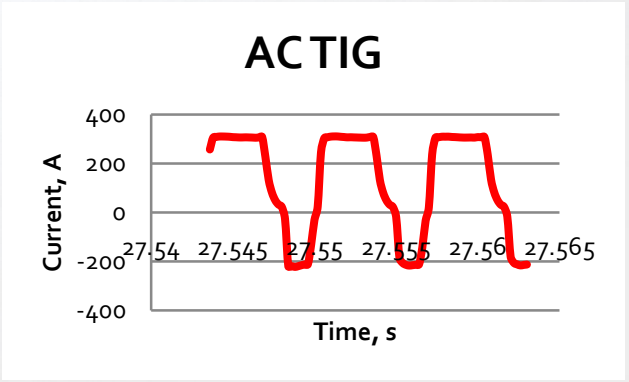
FRONT		SIDE	
20cm	50cm	20cm	50cm
162	32	217	73
170	45	525	128
210	80	426	115

10cm	20cm
200	80



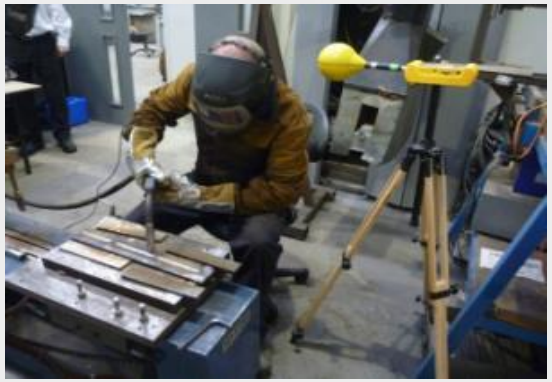
% low AL and % limb AL

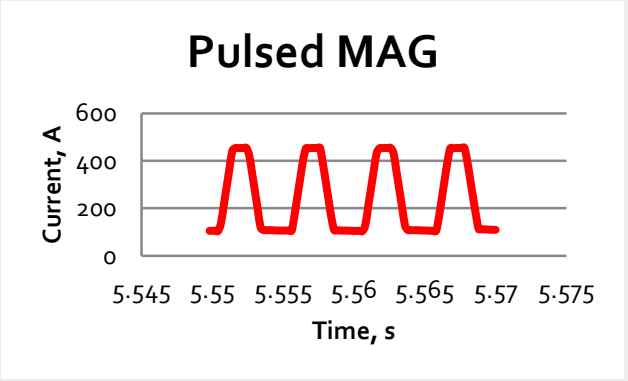
Arc Processes



Best practice
- Head below AL
- Trunk approaches AL
- Hand exceed AL

Cable placement
- Exceed AL for body





Best practice
- Head below AL
- Trunk below AL
- Hand below AL

Cable placement
- Exceed AL for body

Conclusions

- The new Action Levels for head and trunk have eased compliance at power frequencies for resistance welding.
- Medium frequency resistance process may still have difficulty in complying.
- The new Action Levels for limbs (hand exposures) may be exceeded for arc and resistance welding.
- Compliance with Exposure Limit Values needs to be determined.

THANK YOU

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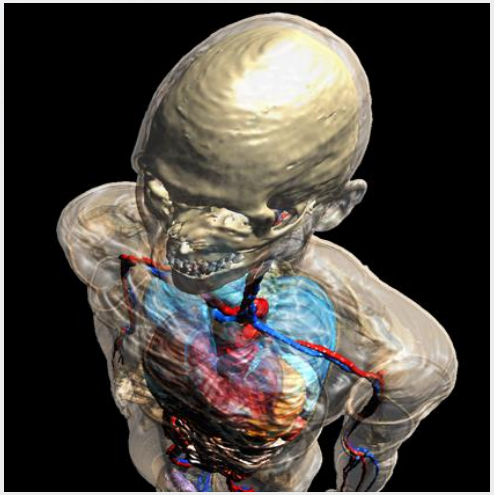

SEVENTH FRAMEWORK PROGRAMME

REA
RESEARCH
EXECUTIVE AGENCY

The EMFWELD project is co-ordinated by EWF and has received funding from the European Community's Seventh Framework Programme managed by REA – Research Executive Agency (FP7-SME-2012) under grant agreement No.315382.

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1.
Introduction to EMFWeld

2.
EMFWeld Promotional Flyer

3.
Press Release

4.
Presentation I

5.
Presentation II

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