



18 June 2014  
Gaithersburg, Maryland, USA

# Gaël Obein

Department of photometry



le cnam



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a European Joint Research Project devoted to the  
metrology of the appearance of surfaces



# Outline

What is a JRP ?

xD-Reflect in short

The different Work Packages





# What is a JRP ?

It is a Joint Research Project implemented  
in the framework of the EMRP



## EMRP

European Metrology Research Programme

► Programme of EURAMET

The EMRP is jointly funded by the EMRP participating countries  
within EURAMET and the European Union



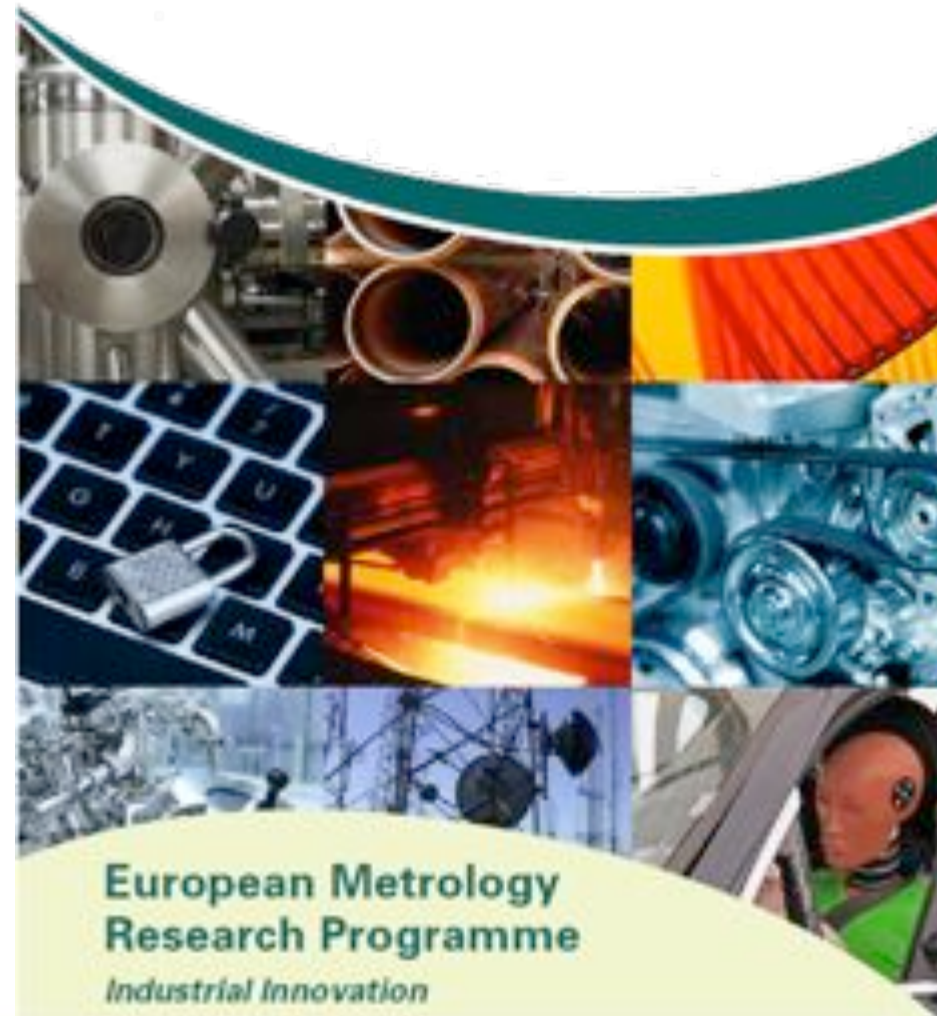


# What is a JRP ?

The EMRP (European Metrology Research Program) is a long-term program for high quality joint R&D amongst the metrology community in Europe.

The EMRP enables European metrology institutes, industrial organizations and academia to collaborate on joint research projects within specified fields.

The EMRP is jointly supported by the European Commission and the participating countries within EURAMET .



# What is a JRP ?

As a minimum 3 European NMIs has to join for a proposal



EMRP has 23 participating countries

Austria	Italy
Belgium	The Netherlands
Bosnia Herzegovina	Norway
Czech Republic	Poland
Denmark	Portugal
Estonia	Romania
European Commission	Slovakia
Finland	Slovenia
France	Spain
Germany	Sweden
Hungary	Switzerland
	Turkey
	United Kingdom

## What is a JRP ?

**EMRP**

European Metrology Research Programme  
► Programme of EURAMET

The EMRP is jointly funded by the EMRP participating countries within EURAMET and the European Union



Annually calls for projects on different subjects :

- Energy
- Environment
- Health
- Industry
- Open excellence

➤ Call 2011 - Industry

PRT and Project « Gonioreflectometry for Industry »

**Ranked 2 / 30**



**Funded**



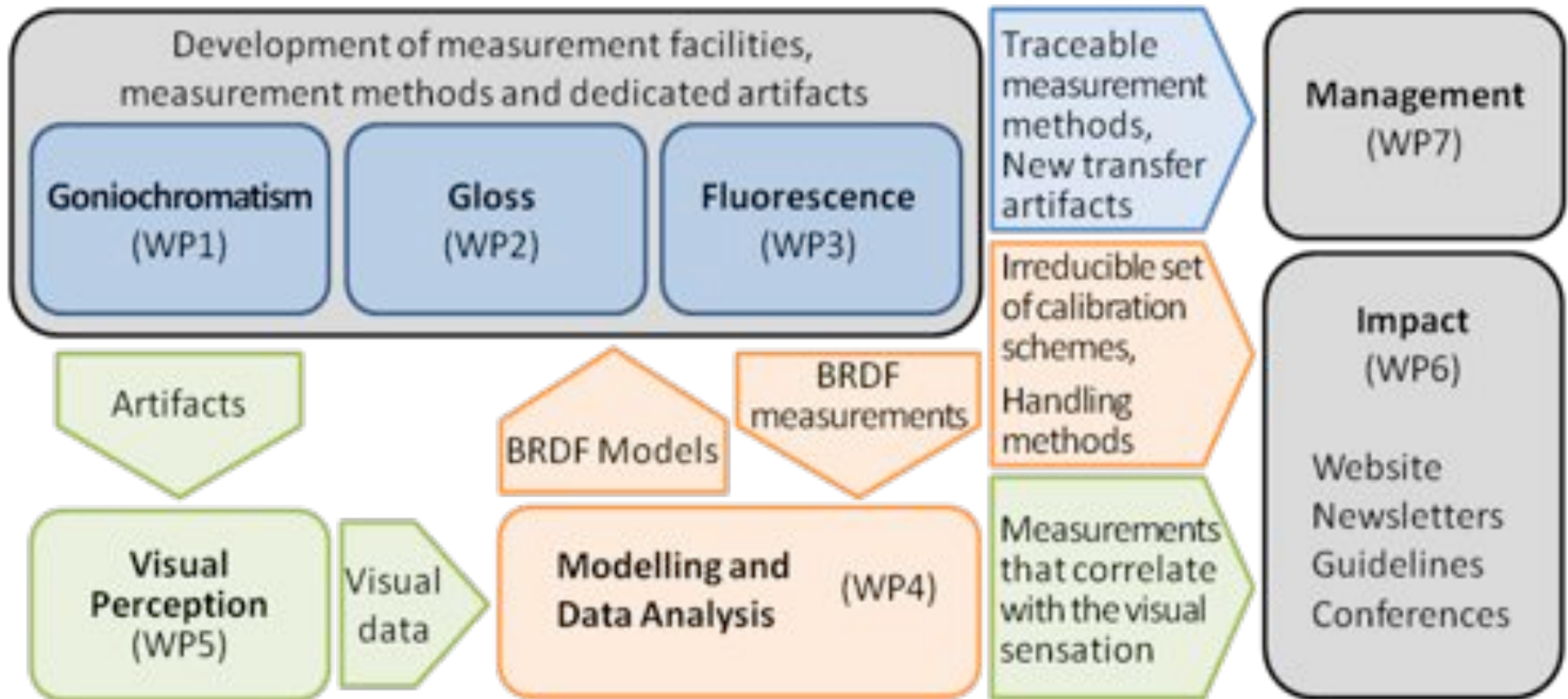
## xDreflect in short : Objectives

- Improvement of metrology and primary measurements capabilities for multidimensionnal reflectometry (BRDF)
- Development of models and data handling for BRDF measurement
- Development standard procedures and transfer artefacts in order to encourage applied metrology for visual appearance attributes (like color, gloss, sparkle and graininess)
- Development of correlation between the visual appearance and the BRDF





# xDreflect in short : Structure



# xDRreflect in short : Consortium

## Funded Partners:



## REG:



## Unfunded Partner:



**= 11 partners**

REG: Research Excellence Grant, financial support for research not located at an NMI



# xDreflect in short : Stakeholders

## Instrumentation



## automotive



## Pigment & coatings



## cosmetics



## Color management



## Materials



## Paper



## Normalization and network





## xDreflect in short : Numbers

Sept 2013  July 2016

**2.87 M€**  
**289 MM**



# Presentation of the workpackages

Goniochromatism  
(WP1)

Gloss  
(WP2)

Fluorescence  
(WP3)

Models and Data analysis  
(WP4)

Visual Perception  
(WP5)

Impact (WP6)



# WP1: Goniochromatism



Leader : Andreas Höpe, PTB ([andreas.hoepe@ptb.de](mailto:andreas.hoepe@ptb.de))



## WP1: Goniochromatism

**PTB, CNAM, CMI, CSIC, INRIM, MIKES, CMI, SP, UA**

Characterisation of a representative set of advanced goniochromatic surfaces regarding their colorimetric properties and visual texture

- Comparison of gonioreflectometers on cooperative samples
- Identify set of configurations for goniochromatism
- Definition of sparkle and graininess
- Data handling recommendation
- Database for impact work package



## WP2: Gloss



Leader : Gaël Obein, LNE-CNAM ([gael.obein@cnam.fr](mailto:gael.obein@cnam.fr))



## WP2: Gloss

**CNAM, CMI, CSIC, INRIM, KUL, PTB, SP**

Development of the measurement technics in and around the specular directions. Progress in the comprehension of the specular pic.

- Comparaison of gonioreflectometer in the specular
- Development of a gloss scale
- Characterisation of the specular peak
- Relation between roughness and specular peak
- Relation between specular peak and glossiness





## WP3: Fluorescence



Leader : Priit Jaanson, MIKES ([priit.jaanson@mikes.fi](mailto:priit.jaanson@mikes.fi))





## WP3: Fluorescence

**MIKES, CSIC, INRIM, UA**

Develop traceable facilities, methods, and reference materials that can be used to improve the uncertainties of gonio-reflectometry of surfaces with fluorescent materials

- New diffuse reflectance standards
- Fluorescence and translucency studies
- Geometrical calibration of goniofluorometer
- Close “gaps” in the colour gamut



## WP4: Mathematics and models



Leader : Gerd Wuebbeler, PTB ([Gerd.Wuebbeler@ptb.de](mailto:Gerd.Wuebbeler@ptb.de))



## WP4: Mathematics and models

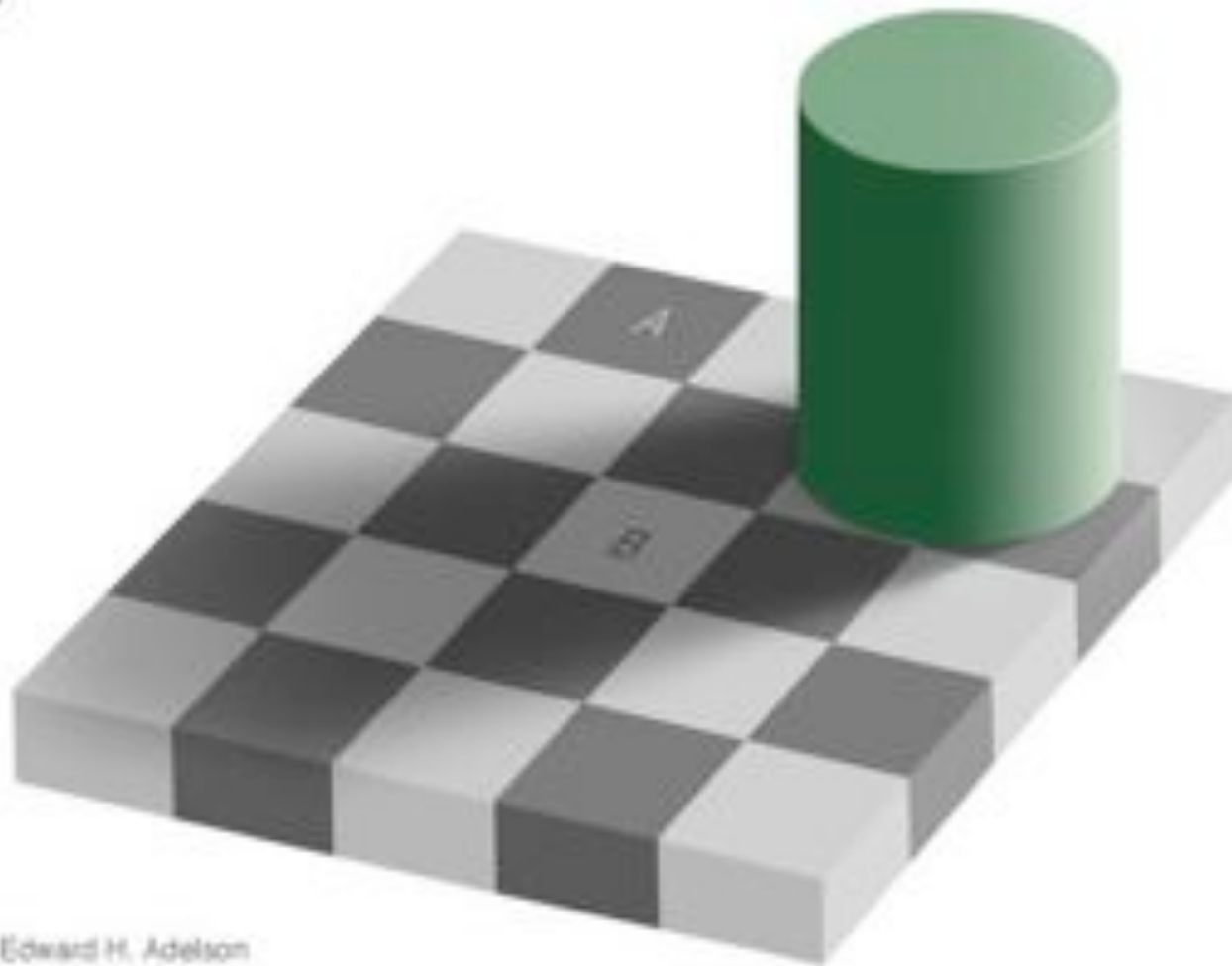
**PTB, CNAM, CSIC, INRIM, KUL, CI, SP, UA**

Modelling and uncertainty evaluation for BRDF measurements and psychophysical measurements - Virtual computer experiments for goniochromatism and gloss measurements

- Identification of dominant uncertainty influences
- Efficient strategies for BRDF measurements
- Reliable prediction schemes for visual perception



## WP5: Visual Perception



Leader : Paola Iacomussi ([p.iacomussi@inrim.it](mailto:p.iacomussi@inrim.it))



## WP5: Visual Perception

**INRIM, CNAM, KUL, UA**

Measurement of visual attributes of materials through psychophysical experiments, in order to provide perceptives scales of the visual attributes and their metrological characterization

- Realization of perception scale of visual attributes (gloss, (colour), sparkle, graininess)
- Influence of the environment attributes on visual perception







## WP6: Impact



Website

IPR

Newsletter

Expert Symposium

Training

Stakeholders

Knowledge Transfer

Publications

Leader : Šmíd Marek, CMI ([msmid@cmi.cz](mailto:msmid@cmi.cz))



# Progress

Start

(Sept 2013)

we are  
here

End

(Jul 2016)

Visit us at

[www.xdreflect.eu](http://www.xdreflect.eu)





# Progress

Start

End

(Sept 2013)

(Jul 2016)

First meeting at CNAM in Paris (Sept 2013)





# Progress

Start

End

(Sept 2013)

(Jul 2016)

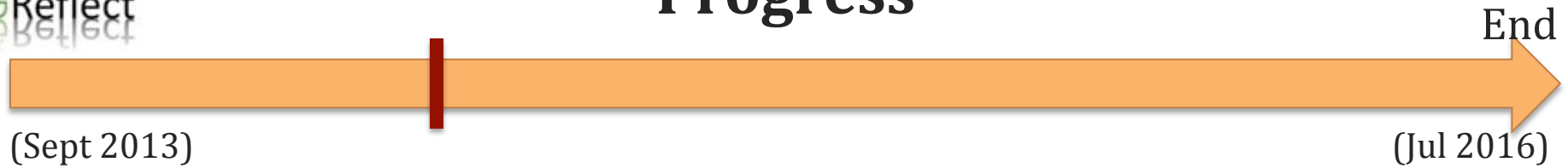
2<sup>nd</sup>e meeting at PTB in Braunschweig (Jan 2014)







# Progress



Samples are ready



The 3 grey-scale and 3 colored standards for the comparison in WP1



Part of the 40 samples of the gloss scale for WP2





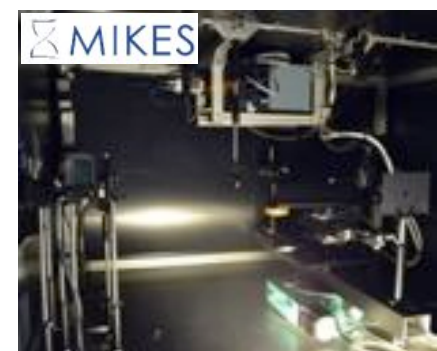
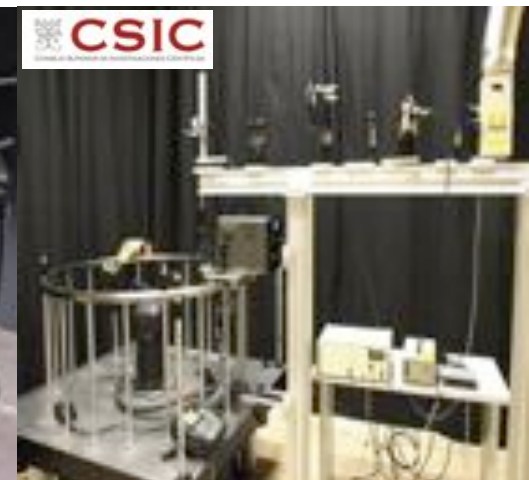
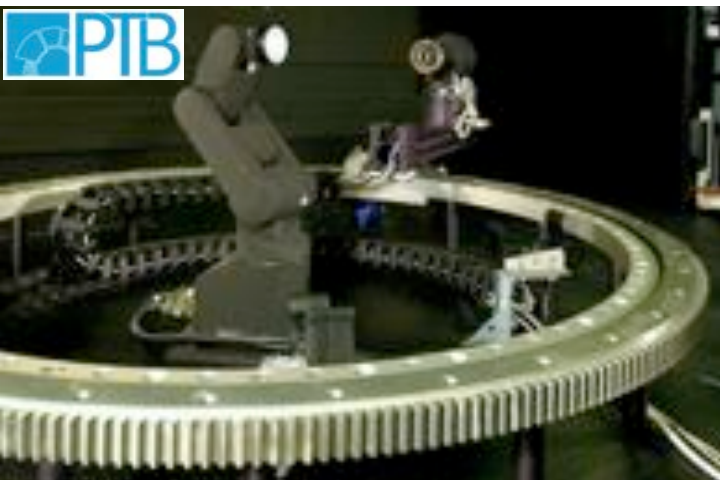
# Progress

End

(Sept 2013)

(Jul 2016)

Gonios are ready





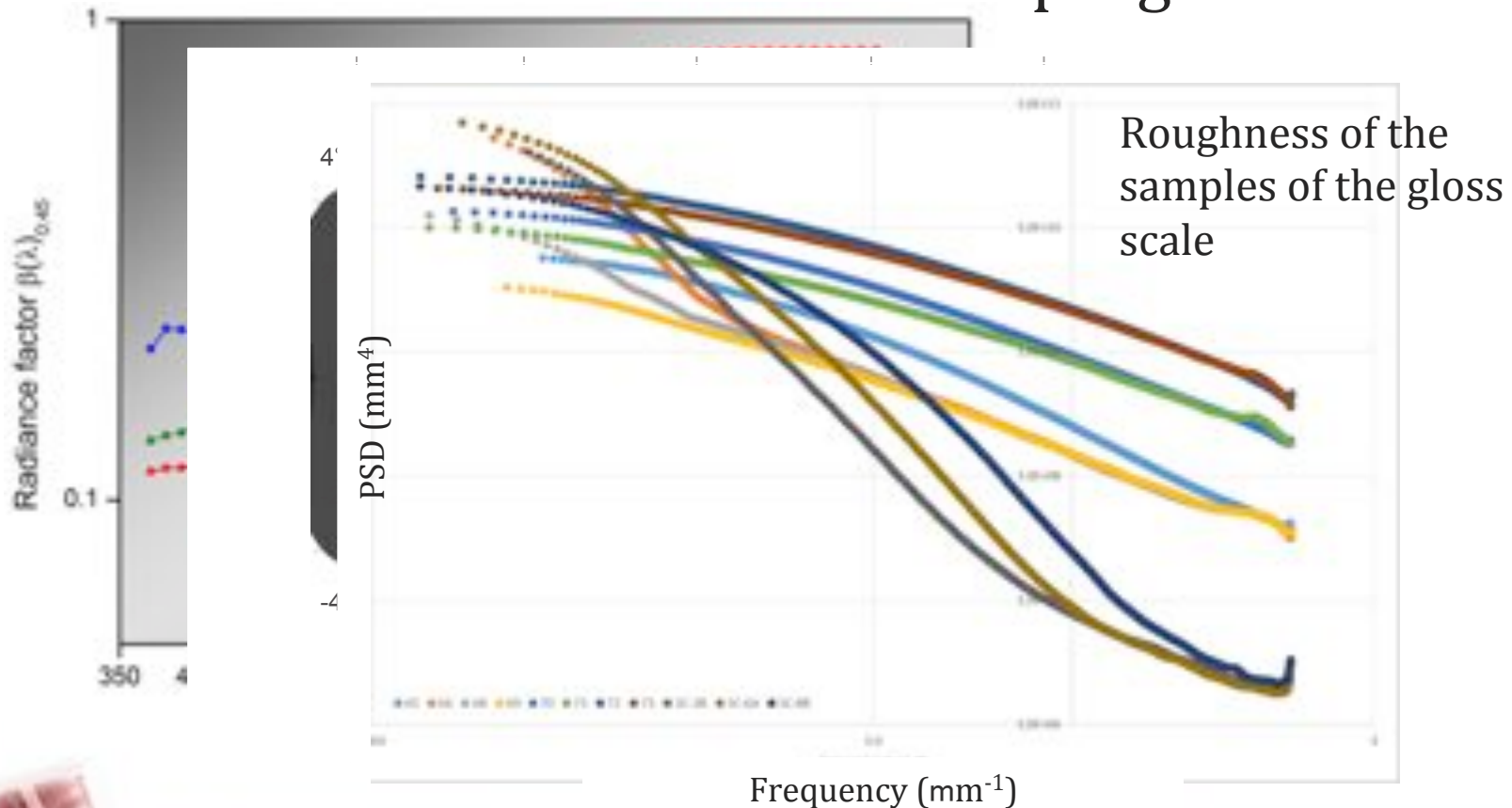
# Progress

(Sept 2013)

End

(Jul 2016)

Measurements are in progress





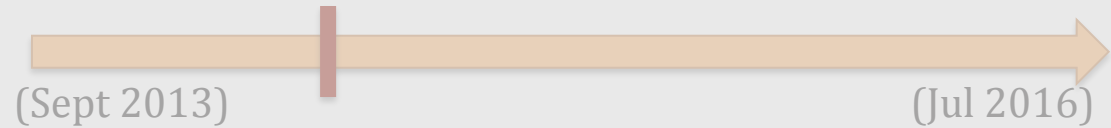
## Future



- Next meeting in Espoo (Finland) on 23<sup>th</sup> June
- Start of the comparisons (WP1, WP2, WP3)
- Start of the visual measurements (Sept 2014)
- Preparation of the expert symposium on „metrology of appearance“ (Spring 2016)



# Summary



- Improvement of metrology and primary capabilities for BRDF measurement
- Understanding of correlation between the visual appearance and the BRDF
- Development of models and data handling for BRDF
- Developing standard procedures and transfer artefacts in order to encourage applied metrology for visual appearance attributes (like color, gloss, sparkle and graininess)

**8 NMI, 3 REG, 2.87 M€, 289 MM, 31 stakeholders**



# Summary



(Sept 2013)

(Jul 2016)

- Improvement of metrology and primary capabilities for BRDF measurement
- Understanding of correlation between the visual appearance and the BRDF
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## WP2: Gloss

