

CLRC 2013

17th Coherent Laser Radar Conference
Barcelona, 17-20 June, 2013



Organised by:



BARCELONATECH

Greetings!

As Chair of the 17th Coherent Laser Radar Conference CLRC 2013, I join Co-Chair Philip Gatt and all the members of the Advisory Committee in welcoming each of you to this exciting event.

Every two years, this conference brings together researchers and practitioners to discuss information on recent measurement campaigns, current system status, and future directions of coherent lidar technology and applications. The conference provides a valuable opportunity to present and exchange findings and new ideas from the most recent and rigorous research in the field.

This year's conference promises to have something for everyone. I hope you will have a nice time during the next four days and will take advantage of the sessions and social events that have been planned for you. In addition, you have the benefit of many wonderful cultural opportunities available for you to discover and enjoy in Barcelona.

I want to express my sincere appreciation to those who have given their time and talent to ensure a successful conference. Be sure to spend time with our sponsors, whose support has helped to make this conference possible.

Welcome to Barcelona and the 17th Coherent Laser Radar Conference!

Aniceto Belmonte

CLRC 2013 Chair

Chair

Aniceto Belmonte, *UPC BarcelonaTech, Spain*

Co-Chair

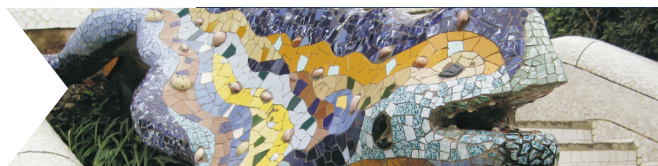
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Day 1

Monday, June 17

08.30-09.30 RECEPTION
®ISTRATION

09.30-09.45 OPENING REMARKS

09.45 -10.30 PLENARY PRESENTATION
Session Chair: Aniceto Belmonte, *UPC BarcelonaTech (Spain)*

09.45-10.30 Perspectives on the Future of Coherent Laser Radar
Paul McManamon, *Exciting Technology (USA)*

10.30-11.00 COFFEE BREAK

11.00-12.30 **Session 1**
COHERENT LIDAR DEVELOPMENTS
Session Chair: Philip Gatt, *Lockheed Martin Coherent Technologies (USA)*

11.00-11.30 **Invited Paper**
New fiber laser and coherent lidar developments at ONERA
Agnes Dolfi-Bouteyre, Beatrice Augere, Guillaume Canat, Nicolas Cezard, Alexandre Dobroc, Mathieu Duhant, Anne Durecu, Didier Fleury, Julien Le Gouet, Didier Goular, Laurent Lombard, Christophe Planchat, William Renard, Matthieu Valla and Claudine Besson, *ONERA (France)*

11.30-12.00. Invited Paper
Development of wind sensing coherent Doppler LIDAR at Mitsubishi Electric Corporation ~from late 1990s to 2013

Shumpei Kameyama, Takayuki Yanagisawa, Toshiyuki Ando, Takeshi Sakimura, Hisamichi Tanaka, Masashi Furuta and Yoshihito Hirano, *Mitsubishi Electric Corporation (Japan)*

12.00-12.30 **Invited Paper**
Assessing the metrological capabilities of Wind Doppler Lidars

Jean-Pierre Cariou, Ludovic Thobois, Rémy Parmentier, Matthieu Boquet and Sophie Loaec, *LEOSPHERE (France)*

12.30-14.00 LUNCH

14.00-15.30 **Session 2**
COHERENT DOPPLER SYSTEMS
Session Chair: Agnès Dolfi-Bouteyre, *ONERA (France)*

14.00-14.30 **Invited Paper**
Frequency diversity in LIDAR/LADAR links operating in NIR/SWIR bands
Stojan Radic, *UC San Diego (USA)*

14.30-14.50 Mobile Coherent Doppler LIDAR system for wind sensing
Toshiyuki Ando and Eisuke Haraguchi, *Mitsubishi Electric Corporation (Japan)*

14.50-15.10 Coherent Wind LIDAR Based on a Coherently-Beam-Combined Pulsed Laser Source
Matthieu Valla, Laurent Lombard, Christophe Planchat, Didier Goular, Béatrice Augère, Pierre Bourdon and Guillaume Canat, *ONERA (France)*

15.10-15.30 Coherent Beam Combination of Multiple phase modulated optical signals for a coherent Doppler LIDAR
Eisuke Haraguchi, Toshiyuki Ando, Jiro Suzuki and Yoshihito Hirano, *Mitsubishi Electric Corporation (Japan)*

15.30-16.00 COFFEE BREAK

16.00 -17.50 **Session 3**
COHERENT LIDAR TECHNOLOGY
Session Chair: Stojan Radic, *University of California, San Diego (USA)*

16.00-16.30 **Invited Paper**
Advanced 2- μ m Ho: YLF transmitter and coherent DIAL for atmospheric CO₂ profiling in the boundary layer

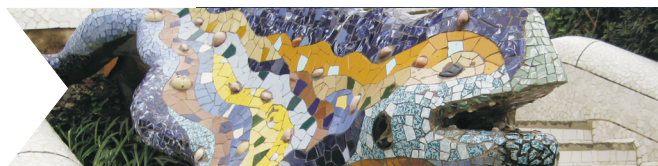
Fabien Gibert, Dimitri Edouart, Claire Cénac, Florian Le Mounier and Pierre Flamant, *LMD/CNRS (France)*

16.30-16.50 MO Frequency Stability Requirements for Coherent Ladar
Maurice Halmos, *Raytheon Space & Airborne Systems (USA)*

16.50-17.10 3.2-mJ, 1.5- μ m laser power amplifier using an Er,Yb: glass planar waveguide for coherent Doppler LIDAR
Takeshi Sakimura, Yojiro Watanabe, Toshiyuki Ando, Shumpei Kameyama, Kimio Asaka, Hisamichi Tanaka, Takayuki Yanagisawa, Yoshihito Hirano, *Mitsubishi Electric Corporation (Japan)*; and Hamaki Inokuchi, *Japan Aerospace Exploration Agency (Japan)*

17.10-17.30 Near IR APD detectors. Application to high sensitivity direct detection DIAL
Johan Rothman, Kevin Foubert, *CEA/LETI (France)*; Florian Le Mounier, Dimitri Edouart, *LMD/CNRS (France)*; Claire Cénac, *CNRS (France)*; and Fabien Gibert, *LMD/CNRS (France)*

17.30-17.50 Adaptive compensation on free-space optical coherent systems
Esdras Anzuola and Aniceto Belmonte, *UPC BarcelonaTech (Spain)*



Day 2

Tuesday, June 18

08.00-09.00 RECEPTION
®ISTRATION

09.00-10.30 **Session 4**
DIRECT-DETECTION
DOPPLER LIDARS
Session Chair: Adolfo Comerón,
UPC BarcelonaTech (Spain)

09.00-09.30 **Invited Paper**
The Aeolus Wind LIDAR
Mission and its Aladin
instrument: Technical status
and latest results
Anders Elfving, Alain Culoma,
Denny Wernham, *ESA/ESTEC*
(The Netherlands)

09.30-10.00 **Invited Paper**
Review of key
characteristics of coherent
and direct detection lidar
receivers and relevance to
wind measurement lidar
system trades
Sammy Henderson, *Beyond
Photonics (USA)*

10.00-10.30 **Invited Paper**
Comparing and Contrasting
the Optical Autocovariance
Wind Lidar (OAWL) and
Coherent Detection Wind
Lidar
Sara Tucker and Carl Weimer,
*Ball Aerospace &Technologis
Corporation (USA)*

10.30-11.00 COFFEE BREAK

11.00-12.30 **Session 5**
SHIPBORNE, AIRBORNE
AND AIRPORT LIDAR
MEASUREMENTS
Session Chair: Jean-Pierre
Cariou, *LEOSPHERE (France)*

11.00-11.30 **Invited Paper**
Offshore wind flow variability
from ship-borne lidar
measurements
Yelena Pichugina, *CIRES/
NOAA (USA)*; Robert Banta,
Alan Brewer and Mike Hardesty,
NOAA (USA)

11.30-11.50 All-weather sensors (lidar
+ radar) for Wake-Vortex
hazards mitigation on
Airport
Agnes Dolfi-Bouteyre, Didier
Goular, Christophe Planchat,
ONERA (France); Sophie Loaec,
Ludovic Thobois, Jean-Pierre
Cariou, *LEOSPHERE (France)*;
Frederic Barbaresco, Philippe
Juge, Fabrice Orlandi, Yves Ricci
and Mathieu Klein, *Thales Air
Systems (France)*

11.50-12.10 Direct Measurement of Initial
Wake Separation (bo) Using
Pulsed Lidars
Hadi Wassaf, *Volpe Center / DOT
(USA)*; David Burnham, *Scientific
& Engineering Solutions Inc.
(USA)*; and Frank Wang, *Volpe
Center / DOT (USA)*

12.10-12.30 Airborne DWL/WRF
model investigation of
flow over complex terrain
(MATERHORN 2012)
G. D. Emmitt, S. Greco, K.
Godwin and S. de Wekker,
*Simpson Weather Associates
(USA)*

12.30-14.00 LUNCH

14.00-15.30 **Session 6**
DOPPLER MEASUREMENT
TECHNIQUES
Session Chair: Alain Dabas,
Météo-France (France)

14.00-14.30 **Invited Paper**
Light with a twist:
opportunities and
challenges
Juan P. Torres, *ICFO/UPC
BarcelonaTech (Spain)*

14.30-14.50 Comparison of Single- and
Dual-Doppler Lidar Wind
Vector Retrievals with
In-Situ and Vertical Lidar
Measurements as They
Apply to Wind Resource
Assessment
Keith S. Barr, *Lockheed Martin
Commercial Ventures (USA)*;
Justin Sharp, *Sharply Focused
(USA)*; and Dan E. Wolfe, *NOAA
(USA)*

14.50-15.10 Transverse Doppler Effect
using engineered optical
beams
Carmelo Rosales, Nathaniel
Hermosa, *ICFO (Spain)*; Aniceto

Belmonte, *UPC BarcelonaTech
(Spain)*; and Juan P. Torres,
ICFO/UPC BarcelonaTech (Spain)

15.10-15.30 Wave Optic Analysis of
Fizeau Fringes with Plate
Defects
Michael Vaughan and Kevin
Ridley, *Optical & Lidar Associates
(UK)*

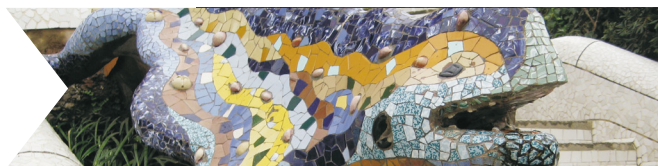
15.30-16.00 Coffee Break

16.00 -17.50 **Session 7**
LIDAR MEASUREMENTS
Session Chair: Sammy
Henderson, *Beyond Photonics
(USA)*

16.00-16.30 **Invited Paper**
Recent and ongoing
coherent Doppler lidar
measurements at DLR
Stephan Rahm, *DLR (Germany)*

16.30-17.00 **Invited Paper**
Air/sea energy exchange
using TODWL and a towed
platform (Unified Physical
Parameterization Project)
G. D. Emmitt, K. Godwin and
R. Foster, *Simpson Weather
Associates (USA)*

17.00-17.30 **Invited Paper**
Lidars for operational
meteorology
Alain Dabas, *Météo-France
(France)*



17.30-17.50 Non-mechanical conformal beam steering system with an 80° x 80° field of regard
Joseph Buck, Steve Serati, *Boulder Nonlinear Systems Inc. (USA)*; Jihwan Kim, Michael Escuti, *North Carolina State University (USA)*; and Rob Morrison, *Coherent Investments, LLC (USA)*

Day 3

Wednesday, June 19

08.00-09.00 RECEPTION & REGISTRATION

09.00-10.30 **Session 8**
LIDAR OBSERVATIONS AND MONITORING
Session Chair: Stephan Rahm, *DLR (Germany)*

09.00-09.30 **Invited Paper**
Europe on Earth Observation Lidar
Pierre Flamant, *LMD/CNRS (France)*

09.30-10.00 **Invited Paper**
The French-German Climate Mission MERLIN
Gerhard Ehret, *DLR Institute for Atmospheric Physics (Germany)*; Pierre Flamant, *LMD/CNRS (France)*; Bruno Millet, *CNES (France)*; Matthias Alpers, *DLR Space Administration (Germany)*; Philippe Crebassol, *CNES (France)*; and Christian Stephan, *DLR Space Administration (Germany)*

10.00-10.30 **Invited Paper**
ACTRIS: European aerosols, clouds, and trace gases research infraestructura network
Gelsomina Pappalardo, *IMAA-CNR (Italy)*; Adolfo Comerón, *UPC BarcelonaTech (Spain)*

10.30-11.00 COFFEE BREAK

11.00-12.30 COHERENT DIAL SYSTEMS
Session Chair: Shumpei Kameyama, *Mitsubishi Electric Corporation (Japan)*

11.00-11.30 **Invited Paper**
Methods for retrievals of CO₂ mixing ratios from JPL Laser Absorption Spectrometer flights during a summer 2011 campaign
Robert Menzies, Gary Splers and Joseph Jacob, *NASA JPL (USA)*

11.30-11.50 2-micron laser development for wind and CO₂ sensing
Kohei Mizutani, Toshikazu Itabe, Shoken Ishii, Hironori Iwai, Motoaki Yasui, *NICT (Japan)*; Kazuhiro Asai, Atsushi Sato, *Tohoku Institute of Technology (Japan)*; Hirotake Fukuoka, *Hamamatsu Photonics K.K. (Japan)*; Takayoshi Ishikawa, *Nippon Aleph Co. (Japan)*; and Teiji Kase, *NEC Co. (Japan)*

11.50-12.10 Development of airborne 2-μm coherent lidar for CO₂ and wind measurements

Shoken Ishii, Kohei Mizutani, Philippe Baron, Hironori Iwai, *NICT (Japan)*; Yoshihiro Asawaka, Teiji Kase, Tsutomu Murayama, *NEC Co. (Japan)*; Tetsuo Shiina, Takashi Imaoku, *NEC Engineering Ltd. (Japan)*; Takahiro Ishikawa, *Nippon Aleph Co. (Japan)*; Toshikazu Itabe, *NIC (Japan)*; Kazuhiro Asai, Atsushi Sato, *Tohoku Institute of Technology (Japan)*; Motoaki Yasui, *NICT (Japan)*; and Kenichi Kurata, *NECE (Japan)*

12.10-12.30 Coherent Doppler Lidar Backscattered Signal Power Validation Against Direct Detection
Sameh Abdelazim, David Santoro, Mark Arend, Fred Moshary and Sam Ahmed, *The City College of New York (USA)*

12.30-14.00 LUNCH

14.00-15.30 **Session 10**
COHERENT IMAGING AND VIBROMETRY
Chair: Maurice Halmos, *Raytheon (USA)*

14.00-14.30 **Invited Paper**
The Autodyne Laser Vibrometer
Thomas Karr, *DARPA/STO (USA)*

14.30-14.50 Applications of Digital Holographic Imaging at Lockheed Martin Coherent Technologies
Philip Gatt and Samuel T. Thurman, *Lockheed Martin*

14.50-15.10 *Coherent Technologies (USA)*
Phase noise of two wavelength coherent imaging system as function of spatial frequency content
Benjamin Daport, *Ladar & Optical Communications Institute (USA)*; David Rabb, *AFRL/RMMM*; and Joseph Haus, *Ladar & Optical Communications Institute (USA)*

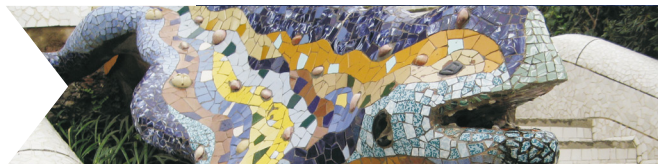
15.10-15.30 Multiple-Path LIDAR Vibrometer for Remote Modal Study of Reinforced Concrete Buildings
Matthieu Valla, *ONERA (France)*; Julien Totems, *LSCE (France)*; Béatrice Augère, Didier Goulard, Didier Fleury, *ONERA (France)*; Philippe Guéguen, Matthieu Perrault, *ISTerre (France)*; and Christophe Planchat, *ONERA (France)*

15.30-16.00 COFFEE BREAK

16.00 -17.20 **Session 11**
ATMOSPHERIC ANALYSIS AND ESTIMATION
Session Chair: Gerart Heret, *DLR (Germany)*

16.00-16.20 Short-range measurement of extinction in fog with heterodyne lidar
Céline Klein and Alain Dabas, *Météo-France (France)*

16.20-16.40 Estimation of the turbulence energy dissipation rate
Viktor Banakh, Igor Smalikho, *Institute of Atmospheric Optics (Russia)*; Yelena Pichugina and Alan Brewer, *NOAA (USA)*



16.40-17.00 Numerical model of radial wind velocity in case of Gaussian approximation of range weighting function
Evgeniya Shelekhova and Alexander Shelekhov, *IMCES SB RAS (Russia)*

17.00-17.20 Concept of wind LIDAR system with the adaptive parameter tuning to atmospheric condition
Nobuki Kotake, Masaharu Imaki and Shumpei Kameyama, *Mitsubishi Electric Corporation (Japan)*

17.20 -17.30 CONCLUSION & ADJOURN

20.30-22.00 CONFERENCE DINNER
Restaurant Maritim
(Moll d'Espanya s/n)

Day 4

Thursday, June 20

09.00 -13.00 WALKING GUIDED TOUR
Barcelona Modernism

TECHNICAL SECRETARIAT

ACTIVA Congressos

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VENUE

UPC BarcelonaTech

Campus Diagonal Nord
Aula Master. Building A3
Jordi Girona, 1-3
08034 Barcelona, Spain

Getting there

Metro: L3 (Palau Reial station)
Trambaix: T1, T2, T3
(Palau Reial station)
Bus: 7, 33, 54, 60, 67, 68, H6, 75, N12
Car: There is a payment car park on Jordi Girona street.

INSURANCES

The organizers do not accept responsibility for individual medical, travel or personal insurance. Participants are strongly advised to take out their own insurance policies.

CURRENCY AND BANKING FACILITIES

The Euro (€) is the currency of the European Union. You can change money at the city's banks as well as at the exchange booths located in the city centre and at tourist sites.

Cash machines, which accept most bankcards, are located at the airport and throughout the city of Barcelona. Banks open from Monday to Friday, 08h30 to 14h00.

SHOPPING & RESTAURANT HOURS

Shops in Barcelona open their doors between 09h00 and 10h00, and generally close for lunch at 13h30 or 14h00. They open again in the afternoon between 16h00 and 17h00 and remain open until 20h00 or 20h30 in the evening.

Restaurants normally open for lunch from 13h00 to 15h00 and for dinner from 20h30 to 23h00. In the city centre some restaurants work non-stop.

EMERGENCIES

The phone 112 centralizes all emergency calls. It is unique in the European context and provides immediate response 24 hours a day. Used to allow citizens to request public emergency health services, firefighting and rescue, public safety and civil protection when in an emergency situation.

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