Final report ONRG grant number N62909-16-1-2229

Dear Sir or Madam,

For final processing of the ONRG grant with the above mentioned number obtained by the principal investigator Prof. Dr. Wendisch for the symposium entitled “CSP – Hyperspectral Imaging and Sounding of the Environment Meeting Scholarship Fund” you will find hereby the Federal Financial Report SF425 and the Final Technical Report with cover form SF298.

Please, do not hesitate to contact me if you have any questions.

Sincerely,

Dr. Barbara Weiner

Attachments
### FEDERAL FINANCIAL REPORT

**1. Federal Agency and Organizational Element to Which Report Is Submitted**
- Office of Naval Research Global S&T Programs Administrator

**2. Federal Grant or Other Identifying Number Assigned by Federal Agency**
- N62909 - 16 - A - 2229

**3. Recipient Organization (Name and complete address including Zip Code)**
- Leipzig University, Ritterstr. 26, D-04109 Leipzig, Germany

**4a. DUNS Number**
- 330487378

**4b. EIN**
- 44-444444

**5. Recipient Account Number or Identifying Number (To report multiple accounts, use FFR Attachment)**
- 232101142

**6. Report Type**
- Quarterly

**7. Basis of Accounting**
- Planned or Actual

**8. Project/Grant Period**
- From: (Month, Day, Year) 09/30/2016
- To: (Month, Day, Year) 12/31/2016

**9. Reporting Period End Date**
- (Month, Day, Year) 12/31/2016

### Transactions

**Federal Cash (To report multiple grants, also use FFR Attachment):**
- a. Cash Receipts: 18,202.00
- b. Cash Disbursements: 18,180.58
- c. Cash on Hand (line a minus b): 0

**Federal Expenditures and Unobligated Balance:**
- d. Total Federal funds authorized: 18,202.00
- e. Total Federal funds spent: 18,180.58
- f. Unobligated balance of Federal funds: 0

**Recipient Share:**
- g. Total recipient share required: 0
- h. Recipient share of expenditure: 0
- i. Remaining recipient share to be provided (line g minus h): 0

**Program Income:**
- j. Program income earned: 0
- k. Program income expended in accordance with the addition alternative: 0
- l. Unobligated program income: 0

**Indirect Expense:**
- m. Federal share: 0

**11. Indirect Expense:**
- Period From: (Month, Day, Year)
- Period To: (Month, Day, Year)
- d. Base
- e. Amount Charged
- f. Federal Share

**12. Remarks:**
- Breakdown of costs is attached; costs for HISE2016 meetings were approved by ONR.

**13. Certification:**
- By signing this report, I certify that it is true, complete, and accurate to the best of my knowledge. I am aware that any false, fictitious, or fraudulent information may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

**14. Agency Use Only:**
- a. Date Report Submitted: (Month, Day, Year) 05/31/2017

---

**Paperwork Burden Statement**

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB Control Number. The valid OMB control number for this information collection is 0348-0051. Public reporting burden for this collection of information is estimated to average 1.5 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0051), Washington, DC 20503.
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Amount posted [USD]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section A Senior/Key Person</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Section B Other Personnel</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Section C Equipment Description</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Section D Travel</td>
<td>Foreign Travel Costs</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total travel costs</td>
<td>8063.58</td>
</tr>
<tr>
<td>Section E Participant/Trainee Support Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel*</td>
<td>650.00</td>
</tr>
<tr>
<td></td>
<td>Subsistence*</td>
<td>8667.00</td>
</tr>
<tr>
<td></td>
<td>Total Participant/Trainee Support Costs</td>
<td>9317.00</td>
</tr>
<tr>
<td>Section F, Other Direct Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Materials and Supplies*</td>
<td>900.00</td>
</tr>
<tr>
<td></td>
<td>Publication Costs*</td>
<td>438.00</td>
</tr>
<tr>
<td></td>
<td>Equipment or Facility Rental/User Fees*</td>
<td>1200.00</td>
</tr>
<tr>
<td></td>
<td>Total Other Direct Costs</td>
<td>2538.00</td>
</tr>
<tr>
<td>H Indirect Costs</td>
<td>total indirect costs</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total direct Costs</td>
<td>19918.58</td>
</tr>
<tr>
<td></td>
<td>Total direct and indirect costs</td>
<td>19918.58</td>
</tr>
</tbody>
</table>

*costs approved by ONRG: Optical Society of America, Washington, for HISE congress 2018
breakdown of the costs associated to the specific topic (= 1/6 of the total cost except for the HISE specific keynote speaker)
### Abstract

The Hyperspectral Imaging and Sounding of the Environment (HISE) meeting was held on 14-17 November 2016 in Leipzig, Germany. The HISE meeting promoted international collaboration between innovative researchers in hyperspectral instrumentation and data analysis methods, to study geophysical and atmospheric phenomena, and to advance capabilities for anomaly- and signature-based detection. The scope of HISE continues to expand as hyperspectral measurement and detection systems proliferate. These provide unprecedented opportunities to monitor and understand our planetary system.

### Subject Terms

Hyperspectral imaging, clouds, remote sensing
The Hyperspectral Imaging and Sounding of the Environment (HISE) meeting was held in Leipzig, Germany, on 14-17 November 2016. This HISE meeting has promoted international collaboration between innovative researchers in hyperspectral instrumentation and data analysis methods, to study geophysical and atmospheric phenomena, and to advance capabilities for anomaly- and signature-based detection.

The scope of HISE continues to expand as hyperspectral measurement and detection systems proliferate. These provide unprecedented opportunities to monitor and understand our planetary system. Fusing hyperspectral observations with other sensing modalities shows great scientific potential and promises enhanced discrimination capabilities. Of interest is hyperspectral remote sensing over scales ranging from regional to global, and object/event-oriented to climatological.

All relevant passive, active, imaging, and sounding hyperspectral and related remote sensing programs, technologies, missions, field campaigns, signal processing, applications, validation approaches, basic research have presented their most recent research results during the conference. Additionally, research has been solicited that addresses the use of current and future measurements for providing products useful for rapid response efforts to phenomena such as downed aircraft, volcanoes, floods, changes in land cover, snow/ice cover, and treaty violations; also atmospheric events such as biomass burning, tropical storms, trace gases, and heavy aerosol events.

The topics for the conference included the following major areas:

- Atmospheric measurements, modeling, and compensation
- Advanced detection, image segmentation and pattern recognition
- New spectrometer design and sensor characterization
- Planned and deployed operational systems
- Multimodal fusion and visualization algorithms
- Dimension reduction and information content analysis
- Measurement of trace species in the atmosphere
- Fusion with active or passive sensors
- Thermal hyperspectral imaging
- Snapshot/Video rate hyperspectral imaging
- Inverse methods, optimal estimation, spectral fingerprinting
- Remote hyperspectral mining and agricultural products
- Material identification and quantification
- Land and sea environmental applications
- Atmospheric correction
- Weather prediction
This technical program has contributed to the US Naval Science & Technology plan by giving a forum for breakthrough scientific research and innovative technology as it relates to hyperspectral sensing of the environment. This contributes directly to the focus area of Assuring Access to the Maritime Battlespace by holding sessions on new sensor design and calibration techniques, atmospheric modeling, and advanced detection and pattern recognition, which will further technology development in improving mobile autonomous environmental sensing, matching environmental predictive capabilities to tactical planning requirements, and maximizing systems performance via adaptation to the environment. The meeting has also contributed to the focus area of Electromagnetic Maneuver Warfare through disseminating the latest information about advanced sensing techniques and understanding the electromagnetic environment through sensing. Additional sessions on material identification and quantification, thermal hyperspectral sensing and video rate hyperspectral imaging have contributed to the area of Expeditionary and Irregular Warfare by presenting the latest results related to increasing the capability for battlespace awareness and signatures management across the electromagnetic spectrum.

The attendees at this event from the Naval Research Enterprise were Dr. Michael Yetzbacher, as a Program Co-Chair and Dr. Alan Schaum, as an invited speaker. Several other naval researchers have contributed to papers presented at the conference. Notable on the program committee is Prof. Ulrich Platt, the inventor of the Differential Optical Absorption Spectroscopy technique. The keynote speaker, Dr. Stephen Tjemkes, is an internationally renowned expert in satellite remote sensing with the European Organization for the Exploitation of Meteorological Satellites.

This scholarship fund has covered the travel costs and registration of selected applicants for the HISE meeting.