

Tender Document 001-2016

Open tender according to Part I and III of regulations for procurements above EEA Threshold Values

for purchasing of

Hyperspectral imaging system

for delivery to

Forsvarets forskningsinstitutt (FFI)
Norwegian Defence Research Establishment

13th May 2016

Contents

1	GENERAL DESCRIPTION	4
1.1	The customer	4
1.2	Objective of the procurement	4
1.3	Composition of the tender document	4
1.4	Announcement of contract notices/invitation for tenders	4
1.5	Site visits/vendor orientation conferences	4
1.6	Other information	4
1.7	Corrections, supplementary information, or changes to the tender document	4
1.8	Progress schedule	5
2	RULES FOR THE SUBMISSION OF TENDERS	5
2.1	Procurement procedure	5
2.2	Language	5
2.3	Mercell Sourcing Service's Purchasing Tool (KGV)	6
2.4	Qualification requirements	6
2.5	Confidential information	6
2.6	Client Confidentiality	6
2.7	Use of FFI name for marketing purposes	6
2.8	Formulation and submission of the tender	6
2.9	Electronic signature	7
2.10	Security	7
2.11	Exceptions and deviations	7
2.12	Disclosure requirements	8
2.13	Validity of offer	8
2.14	Subcontractor	8
2.15	Alternative offers	8
2.16	Withdrawal of tender and/or changes	8
3	QUALIFICATION REQUIREMENTS	9
3.1	Vendor's organisational and legal position	9
3.2	Mandatory requirements	9
3.3	Vendor's economic and financial position	9
3.4	Vendor's technical and professional qualifications	10
4	SPECIFICATION OF REQUIREMENTS AND ASSIGNMENT CRITERIA.....	11
4.1	Foreseen use	11
4.2	Mandatory ("shall") requirements	11
4.3	Desirable ("should") requirements	12
4.4	Information required in the tender	12
4.5	Prices	13
4.6	Delivery time	13
4.7	General Purchase Conditions	13
4.8	Assignment criteria	14
5	PROCESSING OF SUBMITTED TENDERS	15
5.1	Registration of tenders	15

5.2	Opening of tenders	15
5.3	Rejection of tenderers	15
6	DECISION ON AWARDING OF CONTRACT	16
6.1	Cancellation of the invitation for tenders and rejection of all bids	16
6.2	Information and basis for award of contract	16
7	References	16

1 GENERAL DESCRIPTION

1.1 The customer

Forsvarets forskningsinstitutt (the Norwegian Defence Research Establishment, hereafter named FFI) is a civilian governmental institution belonging to the Norwegian Ministry of Defence. The establishment has 700 employees, of whom 500 are research scientists and engineers engaged in development of technology and expertise to enable Norway to maintain a modern and effective national defence. FFI is a multidisciplinary enterprise covering such fields as mathematics, physics, information technology, chemistry, biology, medicine, psychology, political science and economics. It is located at Kjeller near Lillestrøm, and also has a smaller division at Horten. For more information, please see our internet web pages www.ffi.no.

1.2 Objective of the procurement

FFI seeks delivery of a hyperspectral camera system for the visible to SWIR spectral range, for use as a general research instrument.

More information about the procurement, with technical requirements, are specified in section 4 in this document.

The purchase is subject to budgetary coverage as well as to changes in FFI's needs and other factors. It could be cancelled if such factors change during the bidding process, or if the offered price exceeds the budgeted amount.

1.3 Composition of the tender document

The tender document consists of this template and its associated attachments:

1. General Purchase Conditions, Form 5052 (March 2008) (Annex A)
2. Ethical statement (Annex B)

1.4 Announcement of contract notices/invitation for tenders

Contract notices/invitations to submit tenders will be publicly announced in the Norwegian national tender notification service DOFFIN www.doffin.no.

1.5 Site visits/vendor orientation conferences

There will be no visits to the site or vendor orientation conferences.

1.6 Other information

In the event a supplier feels that the guidelines in the tender document are unclear, or that there are errors in the document, the supplier may submit a written request for more information to the customer through Merzell Sourcing Service's Procurement Tool, KGV (Norwegian, "*Merzell Konkurransgjennomføringsverktøy*").

1.7 Corrections, supplementary information, or changes to the tender document

FFI reserves the right to make corrections, provide supplementary information or make changes to the tender document as long as these adjustments are not of a substantial nature.

Revisions, corrections, supplementary information, or changes to the tender document will be sent to all recipients of the original document immediately. Announcements concerning revisions, corrections, supplementary information or changes to the tender document will be made electronically on DOFFIN through the Merccell Procurement Tool (KGV).

1.8 Progress schedule

The customer has established the following timescale for the process:

Task	Target dates
Announcement of invitation to submit tenders in DOFFIN	13 th May, 2016
Deadline for submission of tenders	23 rd June, 12:00 p.m.
Opening of tenders	23 rd June, 12:00 p.m.
Evaluation of submitted tenders	Week 25 and 26, 2016
Possible meetings for purposes of clarification and negotiations	During the evaluation period
Awarding of contract and notification to other tenderers	July 2016
Disputes – deadline for submission of tenderer complaints	15 days after award
Signing of contract	July 2016

Please note that the target dates following the opening of tenders are only indicative and may be subject to change.

2 RULES FOR THE SUBMISSION OF TENDERS

2.1 Procurement procedure

Procurements are to be made according to the Law of Public Procurement of 16 July 1999 (Norwegian, "*Lov om offentlige anskaffelser av 16. juli 1999*" or LOA), and the Regulations Governing Public Procurements of 7 April 2006, no. 4022 (Norwegian, "*Forskrift om offentlige anskaffelser (FOA) av 7. april 2006 nr. 4022*"). The procurement process will be conducted through the system of open tendering in accordance with Part I and III of Regulations for Procurements above EEA Threshold Values. The type of procurement is "Purchase of goods".

The system of open tendering allows all interested bidders the opportunity to submit tenders in free and open competition. There is no pre-qualification of vendors, and tenderers should submit supporting documentation proving their qualifications with the submission of their bids.

Tenderers are recommended to give their best offer for all the specifications and options described in Annex A within closing date of this competition. FFI reserves the right to negotiate with up to five of the best tenders on price, specifications, options and all other conditions affecting the competition.

Norwegian Ministry of Defence regulations on procurement will be adhered to where the Law of Public Procurement (LOA) or the Regulations Governing Public Procurement (FOA) do not apply.

2.2 Language

All written and oral communication with regards to this competition shall be in Norwegian or English.

2.3 Mercell Sourcing Service's Purchasing Tool (KGV)

The competitive tendering process will be administered through use of Mercell Sourcing Service's Purchasing Tool (KGV). All inquiries concerning the invitation to tender should be made through the Mercell communication module so that they may be documented and registered. Verbal responses and descriptions will not be considered unless they are formally documented in writing.

Please contact Mercell support, e-mail support@mercell.no with questions related to the use of the KGV tool.

2.4 Qualification requirements

The supplier must fulfil the qualification requirements for participation in the competition:

Documentation of the qualification requirements is added under "Kvalifikasjonskrav" in Mercell and answered as described under pkt 3 "Qualification Requirements" in the Tender Document.

To be qualified for participation in the competition all the requirements must be answered with "Ja" (Yes) and valid documentation must be attached.

2.5 Confidential information

According to § 23 in the Law Relating to Public Access to Documents in the Public Administration (Norwegian Freedom of Information Act or in Norwegian, "*Offentleglova*"), information contained in public procurement tenders may be held in confidentiality until the contract has been awarded. After that, barring other extenuating circumstances such as business confidentiality or issues of national security, the information contained in the tenders may be made public. If the tender or parts of it should remain confidential, also after the contract has been awarded, this should be clearly stated in the tender at the time it is submitted.

FFI is willing to enter into a suitable non-disclosure agreement (NDA) if requested by tenderer in order to regulate the use of confidential information.

2.6 Client Confidentiality

FFI and its employees are obliged to maintain confidentiality. Information concerning technical arrangements, procedures, management or business matters will be protected as required for security reasons or commercial reasons cf. FOA § 3-6, jf. forvaltningsloven § 13.

2.7 Use of FFI name for marketing purposes

Vendors must obtain permission from FFI in order to use the business relationship between FFI and the vendor following the award of a contract for advertising/marketing purposes. This restriction applies to any form of advertising, both internal and external, whether in word, speech or image.

2.8 Formulation and submission of the tender

Tenders shall contain all of the areas specified below. In order to facilitate a proper and thorough evaluation of the bids, it is essential that tenderers adhere to the bid outline as below.

Bids shall be submitted through the Mercell Purchasing Tool (KGV).

The following files must be attached to all bids (bid outline):

- all attachments required in section 3
- all technical documentation required in section 4 with a description of how the offered goods/service fulfils each section of the customers specifications and requirements
- price according to the specification of the requirements (ref section 4.5).
- electronic signature by a person who has power to commit the company. For further information, please refer to section 2.9.

Submitted tenders will be considered as an acceptance of all terms applied in the tender document. Any reservations shall be listed in a separate letter with reference to the actual section in the tender document. Reservations quoted in other parts of the tender will not be taken into account.

FFI will not reimburse bidders for expenses incurred in connection with the preparation, submission, or following up of a tender, nor for product demonstrations etc.

Submitted tenders and their accompanying documentation and materials are considered FFI property and will not be returned.

2.9 Electronic signature

An electronic signature will be required for validation of the identity of the supplier. Electronic signature can be provided from www.comfides.com, www.buypass.no or www.bankid.no. Be aware that issuing of an electronic signature may take two weeks or more. Suppliers who download tenders after the tender due date will be rejected.

Mercell Kundesenter, tlf +47 21 01 88 60 will assist suppliers who need technical support regarding the Merzell tool or electronic signature.

2.10 Security

The successful Tenderer will be granted access to FFI as necessary to installation or training. However, all visits by non-Norwegian citizens to FFI must be pre-approved by the Security Officer. FFI reserves for security reasons, cf. Sikkerhetsloven (Law on Security), to deny an employee of the successful Tenderer access to the premises of FFI. The successful Tenderer shall in that case send another employee that can be given access. FFI reserves for security reasons also the right to deny Tenders from companies where it is unlikely that its employees can be granted access to the premises of FFI.

2.11 Exceptions and deviations

If a tenderer wishes to make certain exceptions and stipulations to certain parts of the tender document, this shall be clearly stated in a separate enclosure. These provisos should be clearly specified in the bid, and their implication for performance, price or other relevant factors should be clearly stated.

The same terms apply to deviations. Exceptions and deviations should be formulated precisely and clearly so that the purchaser can assess them without having to contact the supplier. Exceptions and deviations shall refer to the relevant section in the tender document and should be specified and discussed in a separate enclosure (see section 2.8). Exceptions and deviations of a substantial nature will result in rejection of the tender.

2.12 Disclosure requirements

Tenderers will receive written notification from FFI with a short explanation in the event that:

- the tender is refused
- all submitted bids are rejected or if the competition is cancelled.

Suppliers may make a written request for the reasons why the tender was refused or rejected.

FFI must reply within 10 days of having received the tenderer's request.

2.13 Validity of offer

Offers should be valid for a minimum of 60 calendar days after the closing date for submission of tenders.

2.14 Subcontractor

FFI desires to work with a single source vendor who can document the desire and capability of assume responsibility for the entire delivery. If in order to be able to furnish a bid for complete delivery of goods or services, the vendor wishes to include sub vendors, the applying vendor should appear in the tender document as the primary tenderer. FFI reserves the right to disallow the tenderer's choice of sub vendor. The main supplier should be able to enter into a long term cooperative effort with FFI for support of the system described in the invitation for tenders. FFI should be advised of any changes of sub vendors well ahead of time.

2.15 Alternative offers

Alternative offers will be accepted. FFI defines an alternative offer as:

"Offers, that is prepared according to the requirements, functionality and other special requirements in article 4.1 to 4.4, but has an deliberately deviation from the specifications, on one or more sections, that may be considered as positive for the solution and that meets the same functionality as specified".

2.16 Withdrawal of tender and/or changes

Submitted tenders may be withdrawn or changed until the submission deadline. Withdrawal of tenders should go through the Merzell Purchasing Tool (KGV). Changes in the tender will be considered to be a new offer.

3 QUALIFICATION REQUIREMENTS

The separate sections in the qualification requirements in the suppliers start menu in the Merzell web-portal is answered in the following way:

- Choose "Ja" (Yes) from the drawdown menu to the question: Er du kvalifisert? (Are you qualified?)
- Attach necessary documentation to the qualification requirements.

Eventually give your comments to the requirements and answers in the writing area to the left.

3.1 Vendor's organisational and legal position

Requirements - examples	Documentation requirements - examples
The vendor shall be a legally established business enterprise.	<ul style="list-style-type: none"> • Norwegian firms: Company registration certificate. • Foreign enterprises: Official documentation that the company is formally registered in the relevant business directory or formal registry of business enterprises in the country in which it is established.

3.2 Mandatory requirements

Requirement	Required documentation
The vendor should be current and up to date in the payment of income tax and value added tax.	Value added tax certificate issued by the Department of revenue, not more than six months old. Further information is to be found at: www.skatteetaten.no <ul style="list-style-type: none"> • The certificate may be requested from Altinn www.altinn.no and cannot be dated more than six months before the deadline
Ethical statement for suppliers to the royal Norwegian Ministry of Defence	<ul style="list-style-type: none"> • A template for the statement are provided with the tender document. The statement must be printed, signed and scanned.

Foreign vendors should provide certificates of compliance issued by the relevant authorities in their own countries.

3.3 Vendor's economic and financial position

Requirements - examples	Documentation requirements - examples
The vendor shall have the economic capacity to deliver/carry out the contract.	Credit check/rating within the last 6 months based on the last publicly available accounting figures. Credit rating to have been assessed by a publicly approved credit rating institution. The rating should be creditworthy or higher

If there are legitimate reasons that prevent the vendor from providing the requested documentation, the vendor may provide other supporting documentation acceptable to the customer which proves his economic and financial position.

3.4 Vendor's technical and professional qualifications

Requirement	Documentation requirement
The vendor shall be experienced in the relevant line of work	A description of the Tenderer's company history, ownership, size and locations
The vendor should have a functional support and service organization and service policy	A description of the Tenderer's support- and service organization and its support policy.

4 SPECIFICATION OF REQUIREMENTS AND ASSIGNMENT CRITERIA

FFI recognizes that several different camera technologies may satisfy our need for a general-use hyperspectral imaging system. Therefore, requirements are mainly specified in terms of the foreseen uses of the system. Tenderers are invited to propose solutions and provide technical information as outlined below. FFI generally has a good understanding of spectral imaging technology, therefore we request several specific performance parameters, and generally encourage tenderers to supply detailed technical information. (Refer also to section 2.5 regarding "confidential information".)

4.1 Foreseen use

FFI needs a hyperspectral camera system for the VNIR (400 to 1000 nm) and SWIR (1000 to 2500 nm) spectral ranges for use as a generic research tool. The use of the camera system will include testing of application concepts for hyperspectral imaging, as well as characterization of materials and light sources. Representative examples of the foreseen uses are

- 4.1.1 field observation system for daylight-based long distance viewing
- 4.1.2 field characterization of camouflage materials at tens of meters standoff distance
- 4.1.3 characterization of complex surfaces, such as spills on the ground, at close range, preferably with sub-centimeter resolution
- 4.1.4 characterization of light sources with various distances and sizes, such as flames.
- 4.1.5 It may also be of interest to place the camera on an airborne platform, with suitable adaptation, but airborne use will not be driving the requirements.

The most important aspects of the camera system for our use are:

- 4.1.6 imaging performance and spectral data quality
- 4.1.7 flexibility and versatility
- 4.1.8 recording software functionality

Other desirable features are:

- 4.1.9 a moderate degree of ruggedness, for field use
- 4.1.10 size and weight not excessive
- 4.1.11 power consumption not excessive
- 4.1.12 rapid access to technical support.

FFI understands that a system for the visible to SWIR spectral range may consist of two separate camera heads. This is an acceptable solution. However, systems with a common field of view across the entire spectral range may provide a benefit for some of the foreseen uses.

The hyperspectral camera system is understood to consist of the camera itself together with computer, software, power supply, cabling, storage and any other components needed for basic recording of image data. For cameras that must be scanned to cover a two-dimensional scene, notably pushbroom imagers, the required scanning mechanics should be quoted separately.

4.2 Mandatory ("shall") requirements

- 4.2.1 The camera system shall be sensitive in the spectral range 400 to 2500 nm.
- 4.2.2 The spectral sampling interval shall be less than 10 nm.
- 4.2.3 For imaging of scenes at optical infinity, the resolution shall be in the range 0.1 to 1 mrad. (If different options are available for the field of view, they may be quoted separately.)

- 4.2.4 The system shall also be configurable for finite-distance imaging with a resolution of 1 cm or better. (If different options are available, they may be quoted separately.)
- 4.2.5 The system shall be able to resolve at least 256 pixels for SWIR and 1000 pixels for VNIR across the shortest dimension of an image.
- 4.2.6 The system shall be radiometrically calibrated.
- 4.2.7 The system shall have provision for synchronization with external equipment through electrical input and/or output.
- 4.2.8 The system shall have provision for real-time streaming of image data to an external computer.
- 4.2.9 Images shall be displayed for visual check during or immediately after recording.
- 4.2.10 Camera software shall be provided in such a way, and on such conditions, that it can be freely used on different computers for controlling the camera system or, if relevant, working on its data. Copy protection schemes or activation over internet are unacceptable.
- 4.2.11 Software and documentation shall be in English.
- 4.2.12 Image files shall be readable by ENVI.
- 4.2.13 All storage media in the system shall be interchangeable to enable use with classified data when needed. The delivery shall include two sets of storage media.
- 4.2.14 The delivery shall include reusable storage boxes suitable for shipping.
- 4.2.15 The delivery shall include a factory acceptance test report
- 4.2.16 Export licence or similar documents shall be arranged by the supplier if necessary prior to delivery in order to avoid any delays.

4.3 Desirable ("should") requirements

- 4.3.1 The delivery should include a description of the signals between computer and camera head.
- 4.3.2 The delivery should include a complete description of the data file formats used by the system, enabling FFI to read all stored data using own software.
- 4.3.3 Radiometric recalibration by the user should be possible using commonly available equipment such as calibrated light sources.
- 4.3.4 The tender should include a description of the signal path from light to digital data, including any schemes for resampling, dead pixel correction, reconstruction or other manipulation of the raw signal.
- 4.3.5 Tenderer should provide warranty for at least one year against failures (excluding failures resulting from misuse of the instrument).
- 4.3.6 On-site training should be included in the tender, quoted separately.
- 4.3.7 Devices for wireless communication mounted in the camera, computer or other system components should be removable (for example in a way comparable to changing RAM modules in the computer).

4.4 Information required in the tender

The tender shall give complete technical specifications for the system, including

- 4.4.1 optical throughput, for example given by F-number and pixel area (preferably as represented by Ω and A in Ref. 1) together with wavelength-dependent overall quantum efficiency, including optics transmission and pixel fill factor (preferably as represented by η in Ref. 1), as well as any other parameters needed to establish a nominal radiometric signal model for the system
- 4.4.2 spatial resolution (MTF or PSF) and spectral resolution (line spread function or equivalent) across the field of view and spectral range

- 4.4.3 spectral, spatial and spectral-spatial coregistration performance (preferably as represented by average and maximum values of ε_s , ε_λ and $\varepsilon_{\lambda s}$ in Ref. 2).
- 4.4.4 readout noise and full well capacity, as well as any other parameters needed to a first-order model of the noise behaviour and dynamic range of the system
- 4.4.5 available range of integration times and recording speed
- 4.4.6 radiometric accuracy and its stability
- 4.4.7 wavelength accuracy and its stability
- 4.4.8 stray light performance
- 4.4.9 fraction of bad pixels (Company logos or text in any image view are undesirable and must be included in the bad pixel count.)
- 4.4.10 dead time and/or nonsynchronicity in the readout of spectra from a pixel, if relevant
- 4.4.11 type(s) of image sensor used, preferably also its datasheet

The tender shall also include

- 4.4.12 complete user documentation for the system
- 4.4.13 a sample factory acceptance report
- 4.4.14 sample image data showing high-contrast scenes
- 4.4.15 information about software upgrade pricing policy
- 4.4.16 information about foreseen terms of export licence, if applicable.

4.5 Prices

Prices should be given in accordance with requirements in section 3.1, DAP Kjeller, Norway (Incoterms 20.12). The prices shall be fixed for 60 days from the tender due date and is not subject to changes due to later currency amendments in that period.

To the extent that the system is modular, the tender should specify separate prices for the various elements and options. Necessary information must be given in order to make it possible for FFI to choose the final configuration of the system. The final configuration will be decided based on an assessment done by FFI taking into consideration the needs of FFIs researchers, and the budget for this procurement.

Regarding offers in foreign currency

If the price is not stated in NOK, FFI will use the currency exchange rate quoted by Norges Bank on the date of the tenders deadline when comparing the offers.

4.6 Delivery time

The system should be delivered as soon as possible, preferably well before 31. November 2016.

4.7 General Purchase Conditions

General Purchase Conditions, Form 5052 (March 2008), of The Armed Forces of Norway will be applied in this competition.

4.8 Assignment criteria

FFI will award the contract to the Tenderer who submits the most advantageous Tender based on the following criteria set up in the Evaluation weighting base:

Evaluation weighting base	Weight
Overall suitability for the foreseen use	40 %
Technical specifications	40 %
Cost of procurement	20 %

5 PROCESSING OF SUBMITTED TENDERS

5.1 Registration of tenders

All incoming tenders are registered in the Merzell Purchasing Tool (KGV).

FFI reserves the right to request additional information from tenderers that it considers of interest on the basis of the offers presented. FFI also reserves the right to adjust or modify recommended solutions, as well as to accept any offer, in whole or in part, or to reject all of the submitted bids.

Tenderers of rejected bids will receive written notification thereof.

5.2 Opening of tenders

The opening of tenders will not be public.

5.3 Rejection of tenderers

Tenderers who fail to submit income tax statements and workplace health and safety statements by the closing date of the invitation to tender will be rejected, likewise tenderers who do not fulfil the established and announced qualification requirements.

Furthermore, the customer may refuse tenderers for other reasons, cf. FOA § 11-10 (Regulations Governing Public Procurement), or for grounds and procedures that fall under Part I and Part III of the above-mentioned Regulations, such as:

- bankruptcy, if the company is in receivership or in the process of liquidation, suspension of business operations or in the process thereof according to national laws and regulations
- petitioning for bankruptcy, initiation of debt settlement procedures or compulsory dissolution of the enterprise according to national laws and regulations
- the company has, by legally enforceable judgment, been found guilty of unlawful conditions with respect to its professional conduct
- the company has breached professional and ethical norms in its branch of operations
- failure to pay social security insurance in the company's country of establishment or in Norway
- failure to pay taxes and public duties according to the statutes of law in the country in which the company is established or in Norway
- grossly misleading or falsification of information and/or withholding of information mentioned herein; likewise falsification/withholding of information with respect to the customer's stated requirements for suppliers.

A tender will be rejected if:

- a). the tender is not submitted by deadline
- b). the bid is not electronically signed (ref section 2.9).

A bid may be refused if:

- a). the bid does not contain all requested information
- b). the bid does not give a price as assumed in the tender document
- c). the bid seems abnormally low in relation to the service being offered
- b). the tender submitted is not in accordance with the invitation to tender
- c). the tender takes the form of an alternative offer not in keeping with the tender document
- d). the tender contains provisos and exceptions to tender document stipulations on:

- the conditions of contract
- specification of requirements
- partial offers
- time duration of offer's validity
- withdrawal or alteration of offer.

Before an offer is rejected because it seems abnormally low, the customer shall make written request for relevant information about individual components of the bid and check this against the presentation that has been given. The customer may consider factual explanations such as savings in production costs, technical solutions, or unusually favourable conditions made possible by new development.

6 DECISION ON AWARDING OF CONTRACT

6.1 Cancellation of the invitation for tenders and rejection of all bids

The customer may cancel the invitation for tenders or, if there are legitimate grounds, reject all bids.

6.2 Information and basis for award of contract

All tenderers will be notified in writing of the customer's decision on the recipient of the contract and in good time before the contract is formally entered into and signed. The term "contract is entered into", means the point in time that both parties sign the contract.

The final date for lodging a complaint is ten calendar days after notification of the award of the contract. Upon the elapse of this deadline, the intent of the customer is to enter into and sign the contract.

7 References

1. T. Skauli, "*Sensor noise informed representation of hyperspectral data, with benefits for image storage and processing*", *Optics Express* **19**(14), 13031 (2011) ([doi:10.1364/OE.19.013031](https://doi.org/10.1364/OE.19.013031))
2. T. Skauli, "*An upper-bound metric for characterizing spectral and spatial coregistration errors in spectral imaging*", *Optics Express* **20**(2), 918 (2012) ([doi:10.1364/OE.20.000918](https://doi.org/10.1364/OE.20.000918))