

## 10 Most important publications in the research field of CENTERA-IRA on Terahertz plamomics

### [1a] Resonant detection of subterahertz radiation by plasma waves in a submicron field-effect transistor

**Knap, W.**; Deng, Y.; Rumyantsev, S.; Lü, J. Q.; Shur, M. S.; Saylor, C. A.; Brunel, L. C.,  
[Applied Physics Letters 2002,80 \(18\), 3433-3435.](#)

CITATIONS:193

DOI: 10.1063/1.1473685

<https://aip.scitation.org/doi/10.1063/1.1473685>

Resonant detection of subterahertz radiation by plasma waves in a submicron field-effect transistor

By: **Knap, W (Knap, W)**; Deng, Y (Deng, Y); Rumyantsev, S (Rumyantsev, S); Lu, JQ (Lu, JQ); Shur, MS (Shur, MS); Saylor, CA (Saylor, CA); Brunel, LC (Brunel, LC)

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#### APPLIED PHYSICS LETTERS

Volume: 80 Issue: 18 Page: 3433-3435

DOI: 10.1063/1.1473685

Published: MAY 6 2002

Indexed: 2002-05-06

Document Type: Article

Abstract

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### [1b] Resonant detection of subterahertz and terahertz radiation by plasma waves in submicron field-effect transistors

**Knap, W.**; Deng, Y.; Rumyantsev, S.; Shur, M. S.,  
[Applied Physics Letters 2002,81 \(24\), 4637-4639.](#)

CITATIONS: 255

DOI: 10.1063/1.1525851

<https://aip.scitation.org/doi/10.1063/1.1525851>

Resonant detection of subterahertz and terahertz radiation by plasma waves in submicron field-effect transistors

By: **Knap, W (Knap, W)**; Deng, Y (Deng, Y); Rumyantsev, S (Rumyantsev, S); Shur, MS (Shur, MS)

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#### APPLIED PHYSICS LETTERS

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DOI: 10.1063/1.1525851

Published: DEC 9 2002

Indexed: 2002-12-09

Document Type: Article

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*First experimental work showing that submicron field-effect transistor ( GaAs – HEMT) can operate as plasma wave detector at sub-THz and THz radiation – this means operate as detectors at frequencies. This is first experimental proof of predictions of Dyakonov and Shur plasma wave theory.*

*First experimental work showing that submicron field-effect transistor ( GaAs – HEMT) can operate as plasma wave detector of sub-THz radiation – this means operate as detectors at frequencies much higher than their electrical cut-off frequencies. For the first time theoretical predictions of Dyakonov and Shur – has been confirmed. This work opened the future for THz imaging systems based on arrays of nano-transistors.*

## [2] Nonresonant detection of terahertz radiation in field effect transistors

**Knap, W.**; Kachorovskii, V.; Deng, Y.; Romyantsev, S.; Lü, J. Q.; Gaska, R.; Shur, M. S.; Simin, G.; Hu, X.; Khan, M. A.; Saylor, C. A.; Brunel, L. C.

*Journal of Applied Physics* **2002**,91 (11), 9346-9353.

CITATIONS: 341

DOI: 10.1063/1.1468257

<https://aip.scitation.org/doi/10.1063/1.1468257>

### Nonresonant detection of terahertz radiation in field effect transistors

By: **Knap, W** (Knap, W); Kachorovskii, V (Kachorovskii, V); Deng, Y (Deng, Y); Romyantsev, S (Romyantsev, S); Lu, JQ (Lu, JQ); Gaska, R (Gaska, R); Shur, MS (Shur, MS); Simin, G (Simin, G); Hu, X (Hu, X); Khan, MA (Khan, MA); Saylor, CA (Saylor, CA); Brunel, LC (Brunel, LC)  
...Less

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#### JOURNAL OF APPLIED PHYSICS

Volume: 91 Issue: 11 Page: 9346-9353

DOI: 10.1063/1.1468257

Published: JUN 1 2002

Indexed: 2002-06-01

Document Type: Article

CITATIONS: 341

DOI: 10.1063/1.1468257

<https://aip.scitation.org/doi/10.1063/1.1468257>

*This work presents for the first time complete experimental and theoretical description of plasma wave detection of THz radiation. The work is the basis of the understanding of physical limits of plasma wave rectification in nanostructures. It opens the possibility to interpret results of THz detection experiments on all types of THz plasma wave detectors.*

## [3] Terahertz emission by plasma waves in 60 nm gate high electron mobility transistors

**Knap, W.**; Lusakowski, J.; Parenty, T.; Bollaert, S.; Cappy, A.; Popov, V. V.; Shur, M. S.,

*Applied Physics Letters* **2004**,84 (13), 2331-2333.

CITATIONS: 284

DOI: 10.1063/1.1689401

<https://aip.scitation.org/doi/10.1063/1.1689401>

*This work presents first experimental proof showing that plasma wave oscillations in nano-transistors may lead to THz emission. Work is done in close collaboration with researchers from University of Warsaw*

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Terahertz emission by plasma waves in 60 nm gate high electron mobility transistors

By: [Knap, W \(Knap, W\)](#); [Lusakowski, J \(Lusakowski, J\)](#); [Parenty, T \(Parenty, T\)](#); [Bollaert, S \(Bollaert, S\)](#); [Cappy, A \(Cappy, A\)](#); [Popov, V \(Popov, V\)](#); [Shur, MS \(Shur, MS\)](#)

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APPLIED PHYSICS LETTERS

Volume: 84 Issue: 13 Page: 2331-2333

DOI: 10.1063/1.1689401

Published: MAR 29 2004

Indexed: 2004-03-29

Document Type: Article

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**[4] Plasma wave detection of sub-terahertz and terahertz radiation by silicon field-effect transistors**

**[W. Knap](#)**, F. Teppe, Y. Meziani, N. Dyakonova, J. Lusakowski, F. Boeuf, T. Skotnicki, D. Maude, S. Romyantsev, M.S. Shur,

[Appl. Phys. Lett.](#) **85**, 675 (2004)

CITATIONS: 262

DOI: 10.1063/1.1775034

<https://aip.scitation.org/doi/10.1063/1.1775034>

Plasma wave detection of sub-terahertz and terahertz radiation by silicon field-effect transistors

By: [Knap, W \(Knap, W\)](#); [Teppe, F \(Teppe, F\)](#); [Meziani, Y \(Meziani, Y\)](#); [Dyakonova, N \(Dyakonova, N\)](#); [Lusakowski, J \(Lusakowski, J\)](#); [Boeuf, F \(Boeuf, F\)](#); [Skotnicki, T \(Skotnicki, T\)](#); [Maude, D \(Maude, D\)](#); [Romyantsev, S \(Romyantsev, S\)](#); [Shur, MS \(Shur, MS\)](#)

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APPLIED PHYSICS LETTERS

Volume: 85 Issue: 4 Page: 675-677

DOI: 10.1063/1.1775034

Published: JUL 26 2004

Indexed: 2004-07-26

Document Type: Article

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*First demonstration that Silicon transistors can detect THz radiation – even if the carrier mobility is one order smaller than in GaAs HEMTs*

[5] Schuster, F.; Coquillat, D.; Videlier, H.; Sakowicz, M.; Teppe, F.; Dussopt, L.; Giffard, B.; Skotnicki, T.; **[Knap, W.](#)**, Broadband terahertz imaging with highly sensitive silicon CMOS detectors. *Optics Express* **2011**,*19* (8), 7827-7832.

### Broadband terahertz imaging with highly sensitive silicon CMOS detectors

By: Schuster, F (Schuster, Franz) [1], [2], [3]; Coquillat, D (Coquillat, Dominique) [2], [3]; Videlier, H (Videlier, Hadley) [2], [3]; Sakowicz, M (Sakowicz, Maciej) [2], [3]; Teppe, F (Teppe, Frederic) [2], [3]; Dussopt, L (Dussopt, Laurent) [1]; Giffard, B (Giffard, Benoit) [1]; Skotnicki, T (Skotnicki, Thomas) [4]; **Knap, W** (Knap, Wojciech) [2], [3]

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#### OPTICS EXPRESS

Volume: 19 Issue: 8 Page: 7827-7832  
DOI: 10.1364/OE.19.007827  
Published: APR 11 2011  
Indexed: 2011-04-11  
Document Type: Article

CITATIONS: 278

DOI: 10.1364/OE.19.007827

<https://opg.optica.org/oe/fulltext.cfm?uri=oe-19-8-7827&id=211658>

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*This work is the first demonstration of use of Plasma Wave Detectors Based on standard Silicon technology for THz Imaging.*

*It opens the way for Silicon technology based THz sensors arrays*

[6] Klimenko, O. A.; Mityagin, Y. A.; Videlier, H.; Teppe, F.; Dyakonova, N. V.; Consejo, C.; Bollaert, S.; Murzin, V. N.; **Knap, W.**, Terahertz response of InGaAs field effect transistors in quantizing magnetic fields. *Applied Physics Letters* **2010**,97 (2), 22111-22111.

CITATIONS: 10

DOI: 10.1063/1.3462072

<https://aip.scitation.org/doi/10.1063/1.3462072>

### Terahertz response of InGaAs field effect transistors in quantizing magnetic fields

By: Klimenko, OA (Klimenko, O. A.) [1], [2]; Mityagin, YA (Mityagin, Yu. A.) [1]; Videlier, H (Videlier, H.) [2]; Teppe, F (Teppe, F.) [2]; Dyakonova, NV (Dyakonova, N. V.) [2]; Consejo, C (Consejo, C.) [2]; Bollaert, S (Bollaert, S.) [3]; Murzin, VN (Murzin, V. N.) [1]; **Knap, W** (Knap, W.) [2]

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#### APPLIED PHYSICS LETTERS

Volume: 97 Issue: 2  
Article Number: 022111  
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Published: JUL 12 2010  
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Document Type: Article

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**[7] Terahertz radiation detection by field effect transistor in magnetic field,**

S. Boubanga-Tombet, M. Sakowicz, D. Coquillat, F. Teppe,; W. Knap, M.I. Dyakonov, K. Karpierz, J. Łusakowski, M. Grynberg,

[Appl. Phys. Lett. 95, 072106 \(2009\)](#)

CITATIONS: 31

DOI: 10.1063/1.3207886

<https://aip.scitation.org/doi/10.1063/1.3207886>

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**Terahertz radiation detection by field effect transistor in magnetic field**

By: Boubanga-Tombet, S (Boubanga-Tombet, S.) [1]; Sakowicz, M (Sakowicz, M.) [1], [2]; Coquillat, D (Coquillat, D.) [1]; Teppe, F (Teppe, F.) [1]; **Knap, W (Knap, W.)** [1], [2]; Dyakonov, MI (Dyakonov, M. I.) [3]; Karpierz, K (Karpierz, K.) [2]; Lusakowski, J (Lusakowski, J.) [2]; Grynberg, M (Grynberg, M.) [2]

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**APPLIED PHYSICS LETTERS**

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 Article Number: 072106  
 DOI: 10.1063/1.3207886  
 Published: AUG 17 2009  
 Indexed: 2009-08-17  
 Document Type: Article

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*These works [6, 7] show final – definitive proof that plasma oscillations are responsible for THz radiation rectification in field effect transistors*

[8] Sakowicz, M.; Lifshits, M. B.; Klimenko, O. A.; Schuster, F.; Coquillat, D.; Teppe, F.; **Knap, W.**, Terahertz responsivity of field effect transistors versus their static channel conductivity and loading effects. *Journal of Applied Physics* **2011**, *110* (5), 054512.

CITATIONS: 147

DOI: 10.1063/1.3632058

<https://aip.scitation.org/doi/10.1063/1.3632058>

Terahertz responsivity of field effect transistors versus their static channel conductivity and loading effects

By: Sakowicz, M (Sakowicz, M.) [1], [2], [3]; Lifshits, MB (Lifshits, M. B.) [1], [2], [3], [4]; Klimenko, OA (Klimenko, O. A.) [1], [2], [3], [5]; Schuster, F (Schuster, F.) [1], [2], [3], [6]; Coquillat, D (Coquillat, D.) [1], [2], [3]; Teppe, F (Teppe, F.) [1], [2], [3]; **Knap, W (Knap, W.)** [1], [2], [3]

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**JOURNAL OF APPLIED PHYSICS**

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 Article Number: 054512  
 DOI: 10.1063/1.3632058  
 Published: SEP 1 2011  
 Indexed: 2011-10-05  
 Document Type: Article

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*In this work for the first time the relation between static (DC) characteristics of nanotransistors and their high frequency (THz) plasma wave response is established. Both theoretical and experimental research presented in this work establish the basis of data interpretation for all researchers studying THz rectification by plasma wave nonlinearity mechanisms.*

[9] But, D. B.; Drexler, C.; Sakhno, M. V.; Dyakonova, N.; Drachenko, O.; Sizov, F. F.; Gutin, A.; Ganichev, S. D.; **Knap, W.**, Nonlinear photoresponse of field effect transistors terahertz detectors at high irradiation intensities. *Journal of Applied Physics* **2014,115** (16), 164514.

Nonlinear photoresponse of field effect transistors terahertz detectors at high irradiation intensities

By: But, DB (But, D. B.) [1], [2]; Drexler, C (Drexler, C.) [3]; Sakhno, MV (Sakhno, M. V.) [2]; Dyakonova, N (Dyakonova, N.) [1]; Drachenko, O (Drachenko, O.) [4]; Sizov, FF (Sizov, F. F.) [2]; Gutin, A (Gutin, A.) [5]; Ganichev, SD (Ganichev, S. D.) [3]; **Knap, W (Knap, W.)** [1], [6]

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JOURNAL OF APPLIED PHYSICS

Volume: 115 Issue: 16

Article Number: 164514

DOI: 10.1063/1.4872031

Published: APR 28 2014

Indexed: 2014-05-28

Document Type: Article

CITATIONS: 33

DOI: 10.1063/1.4872031

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*This work presents first experimental studies of the speed and dynamic range of plasma wave THz transistors. It shows high dynamic range and response time below 1ns qualifying these transistors as the best detectors for THz arrays – for THz vision and imaging*

### [10] Room-Temperature Amplification of Terahertz Radiation by Grating-Gate Graphene Structures,

S. Boubanga-Tombet, **W. Knap**, D. Yadav, A. Satou, D.B. But, V.V. Popov, I.V. Gorbenko, V. Kachorovskii, T. Otsuji,  
[Phys. Rev. X \*\*10\*\*, 031004 \(2020\)](#)

CITATIONS: 25

DOI: 10.1103/PhysRevX.10.031004

<https://journals.aps.org/prx/abstract/10.1103/PhysRevX.10.031004>

*This work is the first demonstration of room temperature THz amplification by plasma waves in grating gate graphene transistors. This result is the basis for the ERC project TERAPLASM currently (2023-2028) realized in the CENTERA LABORATORY – International Research Agenda founded in 2019 by Prof.W.Knap (Institute of High Pressure Physics – Polish Academy of Sciences)*



### Room-Temperature Amplification of Terahertz Radiation by Grating-Gate Graphene Structures

By: Boubanga-Tombet, S (Boubanga-Tombet, Stephane) [1]; Knap, W (Knap, Wojciech) [1], [2], [3], [4]; Yadav, D (Yadav, Deepika) [1]; Satou, A (Satou, Akira) [1]; But, DB (But, Dmytro B.) [2], [5]; Popov, VV (Popov, Vyacheslav V.) [6]; Gorbenko, IV (Gorbenko, Ilya V.) [7]; Kachorovskii, V (Kachorovskii, Valentin) [2], [7]; Otsuji, T (Otsuji, Taiichi) [1]

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#### PHYSICAL REVIEW X

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DOI: 10.1103/PhysRevX.10.031004  
Published: JUL 6 2020  
Indexed: 2020-07-16  
Document Type: Article

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[10] Schuster, F.; Coquillat, D.; Videlier, H.; Sakowicz, M.; Teppe, F.; Dussot, L.; Giffard, B.; Skotnicki, T.; **Knap, W.**, Broadband terahertz imaging with highly sensitive silicon CMOS detectors. *Optics Express* **2011**,*19* (8), 7827-7832.

Broadband terahertz imaging with highly sensitive silicon CMOS detectors

By: Schuster, F (Schuster, Franz) [1], [2], [3]; Coquillat, D (Coquillat, Dominique) [2], [3]; Videlier, H (Videlier, Hadley) [2], [3]; Sakowicz, M (Sakowicz, Maciej) [2], [3]; Teppe, F (Teppe, Frederic) [2], [3]; Dussot, L (Dussot, Laurent) [1]; Giffard, B (Giffard, Benoit) [1]; Skotnicki, T (Skotnicki, Thomas) [4]; Knap, W (Knap, Wojciech) [2], [3]

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#### OPTICS EXPRESS

Volume: 19 Issue: 8 Page: 7827-7832  
DOI: 10.1364/OE.19.007827  
Published: APR 11 2011  
Indexed: 2011-04-11  
Document Type: Article

CITATIONS: 278

DOI: 10.1364/OE.19.007827

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*This work is the first demonstration of use of Plasma Wave Detectors Based on standard Silicon technology for THz Imaging.*

*It opens the way for Silicon technology based THz sensors arrays*