NEWSLETTER

of the International Consortium "Development of High-Power Terahertz Science & Technology"

February 2017 № 5

CONTENT

EDITORIAL: HOW TO CONTRIBUTE TO THE NEWSLETTER

Dear Reader,

We are inviting contributions to the following rubrics:

- Research highlights (annotations) presenting the projects pursued by the members of the Consortium.
- Short regular papers.
- Proposals for collaborative research work.
- News from the participating institutions.
- Information about conferences, symposia, workshops, seminars.
- Programs and frameworks for an exchange of visits and mobility of researchers. Job opportunities (especially for young researchers, e.g. postdoctoral positions, specializations, internships).
- Annotations of books, conference proceedings, software and internet resources. Additions to the list of the recent scientific publications and conference reports at the website of the Consortium (http://fir.u-fukui.ac.jp/Website_Consortium/publist.html).
- Information and announcements about awards and nominations.
- Short presentations of laboratories and research groups belonging to the participating institutions.

Please submit your contributions to the Newsletter as well as requests for information to:

Professor Toshitaka Idehara
Supervisor of International Cooperation and Facilitator of the International Consortium
FIR UF
idehara@fir.u-fukui.ac.jp

Dr. Svilen Sabchevski
Editor of the website and the Newsletter
Institute of Electronics of the Bulgarian Academy of Sciences (IE-BAS)
sabch@ie.bas.bg

NEWS FROM THE MEMBERS OF THE CONSORTIUM

NEW INTERNATIONAL RESEARCH GROUP AT FIR UF

Recently, a new International Research Group has been established at the Faculty of Advanced Researches and the Research Center for Development of Far-Infrared Region, University of Fukui (FIR UF Center). In the beginning of December 2016, Professor Svilen Petrov Sabchevski, a Head of the Laboratory Plasma Physics and Engineering at the Institute of Electronics of the Bulgarian Academy of Sciences (IE-BAS) joined the group as a Specially Appointed Professor. This group includes the following researchers (pictured):

- Professor Toshitaka Idehara – Supervisor of the international collaboration and facilitator of the International Consortium
- Professor Svilen Petrov Sabchevski – Specially Appointed Professor
- Visiting Professors at FIR UF:
- Professor Olgierd Dumbrajs, University of Latvia (October – December 2016)
- Professor Michail Glyavin, Institute of Applied Physics, Russian Academy of Sciences (January 2017)
- Professor Alexei Kuleshov, O. Ya. Usikov Institute for Radiophysics and Electronics, National Academy of Sciences of Ukraine (February-March 2017)
- Dr. Eduard Khutorian, O. Ya. Usikov Institute for Radiophysics and Electronics, National Academy of Sciences of Ukraine (until December 2017)
- Dr. Ali Khumaeni.


T. Idehara


S. Sabchevski


O. Dumbrajs


M. Glyavin


A. Kuleshov


E. Khutorian


A. Khumaeni

MISSION

- Promote a broad and active international collaboration
- Strengthen the leading position of FIR UF as a managing organization and a facilitator of the International Consortium for Development of High-Power THz Science and Technology as well as in other current and prospective collaborations.

GOALS AND OBJECTIVES

- Development of novel advanced concepts and devices for high power science and technology.
- Accelerate the research leading to the development of novel high-performance radiation sources (sub-THz and THz gyrotrons) for novel applications.

MEANS

- Theoretical, experimental and numerical studies of sub-THz and THz gyrotrons
- Computer Aided Design (CAD) of radiation sources and quasi-optical systems
- Application of the developed gyrotrons to novel fields of the fundamental research and the technologies

SHORT PAPER

Generalized Self-Consistent Non-Stationary Theory of the Gyrotron

Olgierd Dumbrajs

Institute of Solid State Physics, University of Latvia

For a long time, the gyrotron theory was developed assuming that the transit time of electrons through the interaction space $T_{tr} = L/v_z$ is much shorter than the cavity fill time τ_d. Correspondingly, it was assumed that during this transit time the amplitude of microwave oscillations remains constant. In such a case the standard self-consistent nonstationary theory of the gyrotron can be used [1]

$$\frac{dp}{d\varsigma} + i\left(\Delta + |p|^2 - 1\right)p = if\left(\varsigma, \tau\right) \qquad (1)$$

$$\frac{\partial^2 f}{\partial \varsigma^2} - i\frac{\partial f}{\partial \tau} + \delta f = I \cdot \frac{1}{2\pi}\int_0^{2\pi} p d\vartheta \,. \qquad (2)$$

First, for the given initial high frequency field distribution $f(\zeta,0)$ Eq. (1) is solved and the electron transverse momentum $p(\zeta,0)$ is calculated. Next, Eq. (2) is solved and $f(\zeta,h\tau)$ is found, which is then inserted into Eq. (1). This process is repeated until the solution no longer depends on time.

If the condition $T_{tr} << \tau_d$ does not hold, Eq. (1) should be modified and the generalized self-consistent non-stationary theory of the gyrotron should be used [2]

$$\frac{\alpha^2}{4} \cdot \frac{\partial p}{\partial \tau} + \frac{\partial p}{\partial \varsigma} + i\left(\Delta + |p|^2 - 1\right)p = if\left(\varsigma, \tau\right) \qquad (3)$$

$$\frac{\partial^2 f}{\partial \varsigma^2} - i\frac{\partial f}{\partial \tau} + \delta f = \frac{I}{2\pi}\int_0^{2\pi} p d\vartheta \,. \qquad (4)$$

Numerical implementation of solving the system (3) and (4) is significantly more complicated than solving the system (1) and (2) [3].

It has been found that the theory free from the assumption about the frozen wave amplitude during the electron transit time predicts some widening of the region of automodulation [4].

The topology of various regions (oscillations with constant amplitude, regular automodulation and chaos) shown in Fig. 1 is very similar to that presented in [5]. This could be expected because in the case of stationary oscillations with constant amplitude the addition term with the partial time derivative in Eq. (3) does not play any role. However, it plays a role in defining the boundary between the region of stationary oscillations and the region of automodulation.

The boundaries between the regions of oscillations with constant amplitude and automodulation determined with and without this additional term in Eq. (3) are shown in Fig. 2. Here, black, green and red lines show this boundary for the cases α=0, α=1.0 and α=1.5, respectively. As the beam alpha increases, so does the region of automodulation, mostly, in the region of large values of negative detunings.

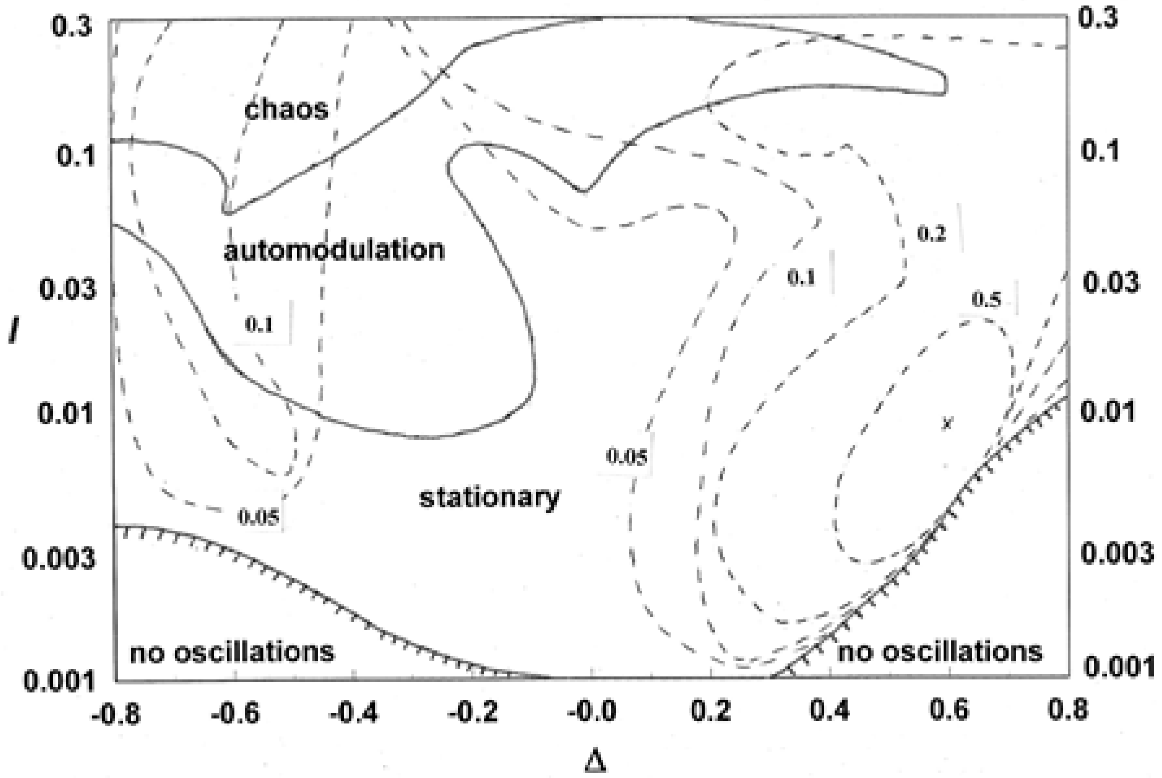

Fig. 1. Zones of different kinds of oscillations are separated by solid lines. The normalized interaction length μ=15 allows realizing the maximum orbital efficiency. The contours of constant orbital efficiencies are shown by dashed lines. The point of the maximum orbital efficiency 0.7 is marked by the cross.

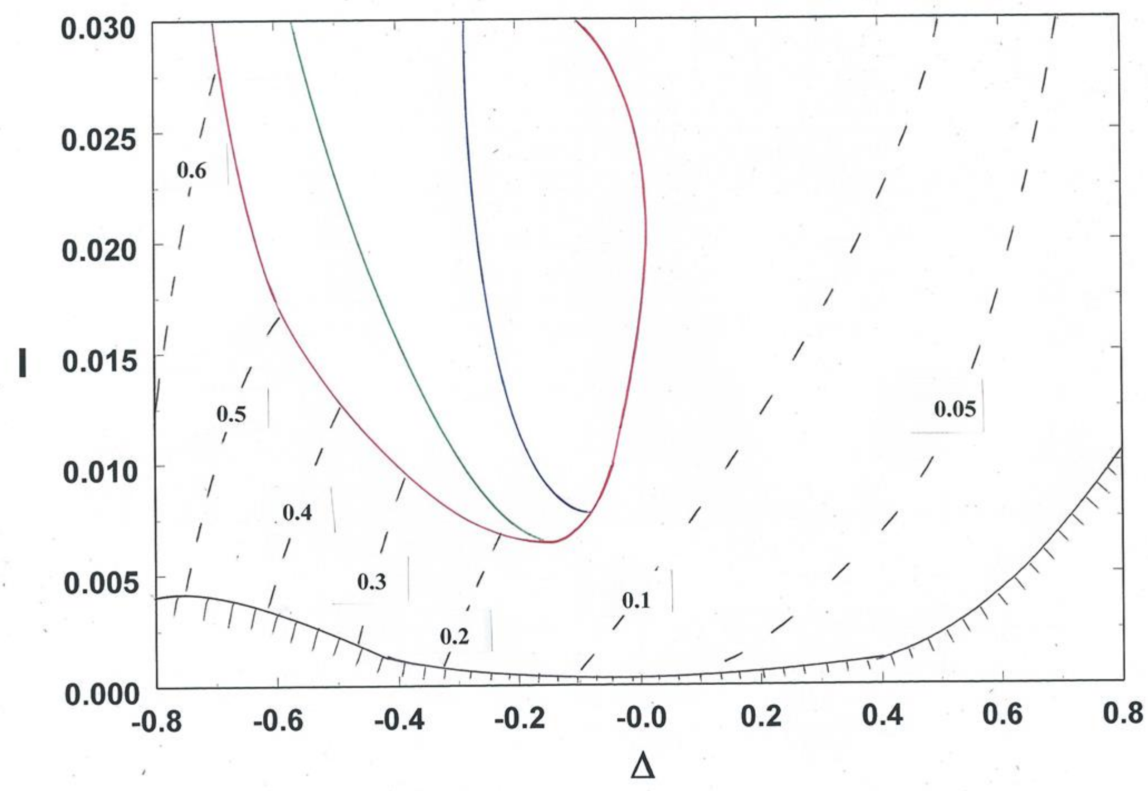

Fig. 2. Boundary between the regions of oscillations with constant amplitude and automodulation for three values of the beam alpha: α=0 (black curve), α=1.0 (green curve), and α=1.5 (red curve). The first case (α=0) represents results of the old theory in which the additional term in the equation for electron motion was neglected. Dashed lines show the frequency shift of oscillations with respect to the cutoff frequency, i.e. the frequency pulling.

The additional term in Eq. (3) may be important for the gyrotron development program at FIR UF Center (University of Fukui, Japan). Let us mention three examples.

1) ***Competition between fundamental and higher harmonics***.
The electron transit time through the resonator is the same for all harmonics, but the cavity decay time is different. The condition $T_{tr} << \tau_d$ holds better for higher harmonics than for the fundamental. To analyze properly the mode competition one should use the system of equations (3) and (4) generalized to multimode case.

2) ***Higher axial indices***.
The condition $T_{tr} << \tau_d$ holds better for lower axial indices. To analyze properly frequency tunability based on excitation of modes with different axial indices one should use the system of equations (3) and (4).

3) ***Low-voltage gyrotrons (gyrotrino).***
In the case of low-voltage gyrotrons the electron transit time through the resonator is long and the condition $T_{tr} << \tau_d$ may not hold.

References

[1] N.A. Zavolsky, G.S. Nusinovich, and A.B. Pavelev, In: Gyrotrons (Academy of Sciences of USSR, Gorky, 1989), p. 84 (in Russian).

[2] N.S. Ginzburg, A.S. Sergeev, I.V. Zotova, Phys. Plasmas, **22** (2015) 033101.

[3] O. Dumbrajs, H. Kalis, Phys. Plasmas, **22** (2015) 053113.

[4] O. Dumbrajs, G.S. Nusinovich, Phys. Plasmas **23** (2016) 083125.

[5] M.I. Airila, O. Dumbrajs, A. Reinfelds, U. Strautins, Phys. Plasmas, **8** (2001) 4608.

The author of this short paper, Professor Olgierd Dumbrajs was a Visiting Professor at the University of Fukui and a member of the International Research Group at the Research Center for Development of Far-Infrared Region (FIR UF) from October to December 2016. On 13 December 2016 he delivered a talk “Generalized self-consistent non-stationary theory of the gyrotron” at the FIR UF seminar. The paper summarizes the main results presented and discussed there.

SPOTLIGHT ON THE INSTITUTE OF SOLID STATE PHYSICS, UNIVERSITY OF LATVIA

LATVIJAS UNIVERSITATE ANNO 1919 UNIVERSITY OF LATVIA

Institute of Solid State Physics, University of Latvia

The University of Latvia's Institute of Solid State Physics (ISSP) is a member of the **International Consortium for Development of High-Power Terahertz Science and Technology** and has active collaborations with many research partners worldwide. The main research topics of the Institute are:

Functional materials for electronics and photonics.

The R&D activities are focused on new materials for light emitters, sensors, materials for photonic applications in information and communications technologies, technology development for synthesis and growth of large single crystals. Special attention will be given to prototyping of photonic and microelectronic devices based on the developed materials in close cooperation with Latvian SMEs.

Nanotechnology, nanocomposites and ceramics.

This broad research field covers novel nanomaterials and nanostructures, nanoceramics and polymer nanocomposites, lead-free ferroelectric ceramic materials, materials for batteries, hydrogen production and storage, as well as for thermoelectric devices. In particular, the research includes investigations of different nanowire based applications, studies of glass ceramics for numerous photonic applications, development of lead-free multiferroic materials, new sodium ion batteries and new materials and innovative technologies for hydrogen energetics.

Thin films and coating technologies.

The main activities are directed towards R&D of the so-called Green Thin Film Nanotechnologies based on such vacuum technologies as physical and chemical vapour deposition (PVD & CVD) and pulsed laser deposition (PLD) as well as organic and inorganic spray wet technologies. Development of infrastructure, technological processes and a search for new applications in the field are also of high economical priority for Latvia, which has one of the largest vacuum technology industries among the Baltic countries.

Theoretical and experimental studies of materials structure and properties.

Development of existing and novel theoretical and experimental tools are of crucial importance for characterisation, testing and studying of (nano-)materials structural, electronic, magnetic and optical properties. These tools include high performance computing, x-ray absorption and optical spectroscopies, scanning/electron/optical microscopy and methods for characterisation of structure.

The Institute of Solid State Physics (ISSP) is the EUROfusion partner representing **Latvia's fusion research initiatives**. The Latvian contribution to the European fusion programme began in 2000 in the form of cost-sharing actions and the Association EURATOM-University of Latvia was established in 2001. The ISSP is a member of the **European Gyrotron Consortium (EGYC)** (which consists of several European Fusion Laboratories, namely KIT - Germany, CRPP - Switzerland, HELLAS - Greece, CNR - Italy, and USTUTT- Germany), and and Thales Electron Devices (TED), France.

For more detail about Latvian R&D contribution to gyrotron development please visit:
http://www.cfi.lu.lv/projekti/eurofusion/

IW - FIRT 2017

The 6th International Workshop on Far-Infrared Technologies (IW-FIRT 2017) and The 2nd International Symposium on Development of High Power Terahertz Science and Technology (DHP-TST 2017)

(7-9 March 2017, University of Fukui, Fukui, Japan)

The International Workshops on Far-Infrared Technologies (IW-FIRT) has been held five times in the past: 1999, 2002, 2010, 2012 and 2014. In these workshops, it was aimed to discuss the recent development and future directions of far-infrared and terahertz science and technologies with a special emphasis on high power radiation sources in this frequency region and their applications. On the other hand, the first International Symposium on Development of High Power Terahertz Science and Technology (DHP-TST 2013) was held in 2013 for discussion of the development of gyrotrons in sub-THz to THz band and their applications. This symposium was associated with the International Consortium "Promoting International Collaboration for Development and Application of Submillimeter Wave Gyrotrons," which consisted of six overseas institutions and three domestic institutions including FIR UF as the moderator institute. This International Consortium was reorganized and expanded in 2015 to the new International Consortium for "Development of High-Power Terahertz Science and Technology" (Visit: http://fir.u-fukui.ac.jp/Website_Consortium/), which consists of thirteen institutions from the world including FIR UF as the facilitator institute. We feel that it is the time to organize IW-FIRT and DHP-TST as a joint meeting to update our knowledge and understanding in this rapidly developing field. Therefore, we organize the Sixth International Workshop on Far-Infrared Technologies (IW-FIRT 2017) and The 2nd International Symposium on Development of High Power Terahertz Science and Technology (DHP-TST 2017) jointly, rather than organize them separately. An important aspect of this joint meeting is to discuss the present status and future prospect of application of high power terahertz technologies.

The joint workshop and symposium consist of invited talks, oral presentations, a panel discussion and a poster session with the following scope of topics:

1) Development of high power radiation sources in the far-infrared region,
2) Application of high power terahertz technologies especially to the following topics:
    2-1) Terahertz spectroscopy;
    2-2) Magnetic resonance phenomena in the far-infrared region;
    2-3) Material development with high-power FIR sources.
3) Other subjects related to the far-infrared region.

For information about the past workshops of IW-FIRT and DHP-TS please follow the links:

5th IW-FIRT 2014, 4th IW-FIRT 2012, 3rd IW-FIRT 2010, and DHP-TST 2013

For more details please visit the official site of IW-FIRT 2017:
http://fir.u-fukui.ac.jp/IWFIRT/IWFIRT2017/index.html

The Program At-A-Glance (tentative)

7(Tue) -9(Thu) March, 2017, at Conference Room on 13th floor of Science Tower I

7 Mar. (Tue)

Start time	*Session*	*No.*	*Time*	*Name (Affiliation)*	*Title*	*Chairperson*
9:15	Opening remark		0:10	(Vice President for Research, Univ. of Fukui)		
9:25	Development and applications of gyrotrons	7a-1	0:30	Masahiko Tani (FIR UF)	Research activities on far-infrared technologies of FIR UF	T. Saito
9:55		7a-2	0:30	Mikhail Yu. Glyavin (Inst. of Appl. Phys., RAS, Russia)	High frequency gyrotrons development and application at IAP RAS: Trends and results	
10:25	Break		0:25			
10:50	Development and applications of gyrotrons	7a-3	0:30	Gregory S. Nusinovich (Univ. of Maryland, USA)	Frequency tuning and pulling in gyrotrons	K. Sakamoto
11:20		7a-4	0:30	Walter Kasparek (Univ. of Sututtgart, Germany)	Diplexers for high-power applications in millimeter and THz waves – an overview	
11:50	Lunch		1:40			
13:30	Development and applications of gyrotrons	7p-1	0:30	Yuusuke Yamaguchi (FIR UF)	Development of 303-GHz high power pulsed gyrotron	Y.Tatematsu
14:00		7p-2	0:30	Keishi Sakamoto (National Inst. for Quantum and Radiological Sci. and Tech.)	Development of sub-terahertz gyrotron for DEMO	
14:30		7p-3	0:30	John Jelonnek (Karlsruhe Inst. of Tech., Germany)	Towards 240 GHz high power fusion gyrotrons - KIT research status	
15:00		7p-4	0:20	#,‡ Sebastian Ruess (Karlsruhe Inst. of Tech., Germany)	Key components development for the KIT 2-MW 170-GHz coaxial-cavity longer-pulse modular prototype gyrotron	
15:20	Break		0:25			
15:45	Development and applications of gyrotrons	7p-5	0:30	Michael A. Shapiro (Massachusetts Inst. of Tech., USA)	Recent results on sub-THz gyrotron devices for DNP NMR at MIT	S. Sabchevski
16:15		7p-6	0:30	Monica Blank (Communications and Power Industries, USA)	Design and development of high-frequency CW gyrotrons for NMR/DNP applications	
16:45		7p-7	0:30	Yoh Matsuki (Osaka Univ.)	Advanced instrumentations for DNP-enhanced solid-state NMR	
17:15		7p-8	0:20	# A. Kuleshov (Visiting prof. of FIR UF & O. Ya. Usikov Inst. for Radiophys. and Electronics of NAS, Ukraine)	High-stable operation of CW clinotrons and CW gyrotrons in THz range for DNP NMR spectroscopy and other applications	
17:35	Break		0:25			
18:00	Banquet		2:00		*at Academy Hall*	

20:00 end

☞**Note**

All invited talks are 30 minutes talks including the time for discussions (~5 min). Talks of contributed papers indicated by "#" are 20 minutes talks. "‡" indicates awardee of the financial support for young researchers for IW-FIRT2017/DHP-TST2017.

For oral presentations, you can connect your own PC to LCD projector via standard RGB cable (mini D-sub 15 pin connector). If you will bring your presentation file without your own PC, please let us know in advance.

or poster presentations, refer to the note in the list of poster presentations.

8 Mar. (Wed)

Start time	*Session*	*No.*	*Time*	*Name (Affiliation)*	*Title*	*Chairperson*
9:00	Pulsed and CW ESR	8a-1	0:30	Masayuki Hagiwara (Osaka Univ.)	Terahertz ESR in quantum and frustrated spin systems	H. Ohta
9:30		8a-2	0:30	Mark Sherwin (Univ. of California, Santa Barbara, USA)	Pulsed electron paramagnetic resonance experiments with a quasi-cw free-electron laser	
10:00		8a-3	0:20	#,‡ Daichi Yoshizawa (Osaka Univ.)	Multi-frequency ESR studies on quantum frustrated magnets with exotic anisotropy in pulsed high magnetic fields	
10:20	Break		0:25			
10:45	THz spectroscopy and techniques	8a-4	0:30	Michael I. Bakunov (Univ. of Nizhny Novgorod, Russia)	Narrowband terahertz generation by an ultrashort laser pulse in bulk $LiNbO_3$	C.-L. Pan
11:15		8a-5	0:30	Koichiro Tanaka (Kyoto Univ.)	Nonlinear properties of semiconductors under high intensity THz radiation	
11:45	Group photo		0:15	*We shall take a photo with all participants just after the morning session.*		
12:00	Lunch		1:30			
13:30	Generation, application and simulation of electromagnetic wave	8p-1	0:30	Kimiya Komurasaki (The Univ. of Tokyo)	Rocket propulsion powered by a gyrotron	S. Mitsudo
14:00		8p-2	0:30	Keiichiro Kashimura (Chubu Univ.)	Iron making by electromagnetic heating at the frequency of 2.45 GHz	
14:30		8p-3	0:20	# Stefan Illy (Karlsruhe Inst. of Tech., Germany)	An overview of the simulation tools for design and optimization of high power / high frequency gyrotron oscillators at KIT	
14:50		8p-4	0:20	#,‡ Alexander Marek (Karlsruhe Inst. of Tech., Germany)	Development of a new vector analysis code for the simulation of electromagnetic fields in the quasi-optical system of gyrotrons	
15:10		8p-5	0:20	# Kazuo Ogura (Niigata Univ.)	Terahertz wave generation based on surface wave resonator	
15:30	Break		0:20			
15:50	Poster session		1:40		*See List of Poster Presentations.*	

17:30end

9 Mar. (Thu)

Start time	*Session*	*No.*	*Time*	*Name (Affiliation)*	*Title*	*Chairperson*
9:00	THz spectroscopy and techniques	9a-1	0:30	Joo-Hiuk Son (Univ. of Seoul, Korea)	Terahertz molecular fingerprints of cancer DNA	D. S. Bulgarevich
9:30		9a-2	0:30	Masaya Nagai (Osaka Univ.)	Desorption of the organic solids by the intense picosecond THz-FEL pulses	
10:00		9a-3	0:20	# Hitoshi Ohta (Kobe Univ.)	Recent developments of multi-extreme THz ESR in Kobe	
10:20	Break		0:25			
10:45	THz spectroscopy and techniques	9a-4	0:30	Ci-Ling Pan (National Tsing Hua Univ., Taiwan)	Dielectric properties of advanced PCBs in the MMW and sub-MMW frequency range	K. Tominaga
11:15		9a-5	0:30	Go Yumoto (The Univ. of Tokyo)	Nonlinear optical responses of non-equidistant Landau levels in graphene in terahertz frequency range	
11:45		9a-6	0:20	# Masahiko Tani (FIR UF)	Terahertz coherent Raman spectroscopy by using frequency-chirped picosecond optical pulses	
12:05	Lunch		1:35			
13:40	DHP-TST special session	9p-1		Toshitaka Idehara (FIR UF)	Establishment of the international consortium and its renewal	M.Yu. Glyavin
		9p-2		Svilen Sabchevski (FIR UF & Institute of Electronics of BAS, Bulgaria)	Accelerating the collaboration between the members of the International Consortium for Development of High-Power Terahertz Science and Technology	
		9p-3			Panel discussion	
14:50	Closing		0:10	Masahiko Tani (FIR UF)		

15:00 end

Poster Presentations (tentative)

Poster session: 15:50~17:30, 8th March

at Conference Room on 13th floor of Science Tower I

No.	*Name of the first author (Affiliation)*	*Title*
P-1	Keisuke Tominaga (Kobe Univ.)	Development of Sub-Terahertz Time-Domain Spectroscopy and its Application to Molecular Science
P-2	Fumiyoshi Kuwashima (Fukui Univ. of Tech.)	High Efficient THz-TDS System Using Laser Chaos and Super Focusing with Metal V-grooved Wave Guides
P-3	Kosaku Kato (Osaka Univ.)	Yellow luminescence of ZnO with the irradiation of sub-terahertz waves from a gyrotron
P-4	Hikomitsu Kikuchi (Univ. of Fukui)	ESR study on quantum frustrated magnet $KCu_3OCl(SO_4)_2$
P-5	Mary Clare Escano (Univ. of Fukui)	Characteristics of band splitting in GaAs due to spin-orbit interaction from first-principles methods
P-6	Dmitry S. Bulgarevich (National Inst. for Materials Sci.)	GHz-TDS Imaging for Materials NDT
P-7	Kunizo Ohkubo (Visiting prof. of FIR UF)	Attenuation of Hybrid Modes in Corrugated Waveguides at Frequencies above the Bragg Frequency
P-8	Osamu Morikawa (Japan Coast Guard Academy)	Characterization of Focusing of Sub-THz Radiation Using Insulator Aperture
P-9	Takahiro Sakurai (Kobe Univ.)	Development of Ceramics for the Inner Parts of the Pressure Cell by Electromagnetic Wave Heating
P-10	Akira Fukuda (Hyogo Coll. of Med.)	ESR Experiments of P Impurities in Si and Dynamic Nuclear Polarization Aimed at the Application for Qubits
P-11	Takayasu Kawasaki (Tokyo Univ. of Sci.)	Analysis of dissociation mechanism of amyloid fibrils by using terahertz-time domain spectroscopy
P-12	Takayuki Yamazaki (The Univ. of Tokyo)	Search for Hidden Photon Dark Matter in the Millimeter Wave Region with a Dish Antenna
P-13	Shin Kubo (National Inst. for Fusion Sci.)	Demonstration of the Vortex Feature of Cyclotron Radiation from Electrons Accelerated by High Power Right-Hand Circularly Polarized Millimeter Wave
P-14	V. N. Manuilov (Inst. of Appl. Phys., RAS, Russia)	Level of the ion compensation of the space charge in the gyrotron electron beams and its influence on the output tube parameters
P-15	Moe Iizawa (FIR UF)	Frequency tunability in multi cavity modes in Gyrotron FU CW XA
P-16	M. Fukunari (FIR UF)	Millimeter Wave Discharge and Its Application to the Rocket Propulsion
P-17	Takumi Hirobe (FIR UF)	Transmission Test of the 303-GHz Gyrotron Power by Corrugated Waveguides
P-18	Ryosuke Ikeda (National Inst. for Quantum and Radiological Sci. and Tech.)	Development of ITER Gyrotron in QST
P-19	Tokihiko Tokuzawa (National Inst. for Fusion Sci.)	Study of THz pulse wave application for the plasma diagnostics
P-20	Dazhi Li (Osaka Univ.)	Terahertz radiation from a grating structure with graphene
P-21	M. Fujita (Univ. of Toyama)	Frequency measurement of rotational transitions of 15NH3 using Evenson-type tunable far-infrared spectrometer
P-22	Ali Khumaeni (FIR UF)	Effect of pump pulse width in generating highly-intense terahertz pulses using tilted-pump-pulse-front (TPPF) scheme at 800 nm
P-23	Dhonny Bacuyag (FIR UF)	Discriminating Surface Defects in GaAs(001)-β2(2x4) by First-Principles Method
P-24	Hideaki Kitahara (FIR UF)	Electromagnetic-Wave Analysis of Tapered Parallel-Plate Wave-Guide by Finite-Difference Time-Domain Method
P-25	Shun Nakae (FIR UF)	Terahertz Coherent Raman Spectroscopy Using Terahertz Radiation by Zinc Telluride Crystal
P-26	Heishun Zen (Kyoto Univ.)	Development of Quasi-monochromatic THz Coherent Undulator Radiation Source at Institute of Advanced Energy, Kyoto University
P-27	Kiwamu Kusama (Univ. of Fukui)	Characteristics of THz plasmonic superfocusing in metallic V-groove tapered waveguides
P-28	Yutaka Fujii (FIR UF)	Considerations on the Overhauser Effect from the Viewpoint of the Non-Equilibrium Phase Transition
P-29	Susumu Okubo (Kobe Univ.)	Far-Infrared ESR Measurements of S=1/2 frustrated J_1-J_2 chain system $NaCuMoO_4(OH)$
P-30	Yuya Ishikawa (Univ. of Fukui)	Development of millimeter-wave band Fabry-Pérot type resonator for ESR/NMR double magnetic resonance measurements
P-31	Yoshiaki Tsunawaki (Visiting prof. of FIR UF & Osaka Sangyo Univ.)	Formation of Octacalcium Phosphate under the Microwave Irradiation

☞Note

A presenter should be in front of each poster board during the following time: Odd number: 15:50~16:40; even number: 16:40~17:30 on 8th March. Poster presentations are encouraged to be put up from 12:30 on 7th March until 17:30 on 8th March. (The boards for posters are available in the conference room from 9:00 on 7th March until 17:30 on 8 March.) The poster board size is 90 cm in width and 180 cm in height. Use detachable stick tape to put up your posters on the poster boards. DO NOT use pushpins. The detachable stick tape is available in the poster session room

Molecular Photoscience Research Center
International Symposium
“Recent Advances in Terahertz Molecular Science”
March 10, 2017 Takigawa Memorial Hall, Kobe University

Scope:

This one-day symposium, a post-conference of IW-FIRT 2017/DHP-TST 2017 in the University of Fukui, will be held on March 10, 2017, at Kobe University to discuss the recent progresses of the spectroscopic applications of the THz region in molecular science. The THz region is an important frequency region to explore structures, interactions, and dynamics of various molecular systems in the fields of chemistry, biology, physics, and material science. The symposium provides an international forum for discussing advances at the forefront of THz research in informal atmosphere.

Discussion topics:

- **THz ESR under strong magnetic field**
- **Applications of THz spectroscopy to various molecular systems such as polymers and biological systems**
- **Bioscience in magnetic resonance**

Venue:

Takigawa Memorial Hall, Rokkodai 2nd campus, Kobe University

Invited speakers and tentative titles:

Mark Sherwin (UC Santa Barbara)
Joo-Hiuk Son (University of Seoul)
"Terahertz molecular spectroscopy and its applications in cancer diagnosis"
Masayuki Hagiwara (Osaka University)
Kohji Yamamoto (University of Fukui)
"Application of a metal parallel-plate waveguide to terahertz spectroscopy"
Keiichiro Shiraga (Kyoto University)
"Characterization of hydration state and hydrogen-bond network in the biomolecular solutions and the epithelial cells"
Yoshihiko Kanemitsu (Kyoto University)
"THz spectroscopy as a new characterization tool for solar-cell materials and devices"
Eiji Ohmichi (Kobe University)
"Development of mechanically detected terahertz electron spin resonance technique"
Toshiro Kohmoto (Kobe University)
"Observation of ultrafast spin dynamics in antiferromagnetic transition metal oxides by pump-probe and terahertz spectroscopies"
Harumi Sato (Kobe University)
"Higher-Order Structure of Biodegradable Polyesters Studied by Terahertz Spectroscopy"
Yasuhiro Kobori (Kobe University)
"Electron Spin Polarization Imaging of Photoinduced Charge-Separated States in Photosynthetic Proteins"

For more details, please visit: http://www.research.kobe-u.ac.jp/mprc/seminar/conference/RATHzMS/

10th International Workshop "Strong Microwaves and Terahertz Waves: Sources and Applications"

Nizhny Novgorod, Russia, July 17–22, 2017

This Workshop, organized by the Institute of Applied Physics of the Russian Academy in Sciences in Nizhny Novgorod, Russia, will be held from July 17 to July 22, 2017 on board of a river boat starting from Nizhny Novgorod, Russia.

The Workshop will consist of four strongly interrelated topical symposia:

Symposium S: High power microwave sources;
Symposium H: Current drive and plasma heating by microwaves in nuclear fusion devices;
Symposium T: Extreme and nonlinear terahertz science (metamaterials for strong THz generation and frequency conversion, nonlinear effects in THz frequencies, high power THz sources);
Symposium A: High power microwave and terahertz applications (including accelerators, radars, gas discharges, materials processing, biomedical applications etc.)

This workshop is a continuation of the "Strong Microwaves in Plasmas" workshops held every three years since 1990. The adjusted title reflects gradual changes in the workshop contents towards a broader range of frequencies and applications. The scope of the workshop covers a wide circle of research activities of both fundamental and applied importance. The workshop is highly interdisciplinary in nature; it opens ample opportunities for the interaction between the researchers working in high-power microwave electronics and plasma physics, with strong emphasis on the development of diverse applications. A three-year cycle chosen for the workshop provides the participants with the possibility of accumulating significant results of their research.

For more detail visit the official website of the Workshop:
http://www.smp.sci-nnov.ru/
Please address all correspondence to the Scientific Secretary of the Workshop,
Dr. Sergey Mishakin
Institute of Applied Physics, RAS
46 Ulyanov St.,
Nizhny Novgorod 603950 Russia
Tel. +7 831 416 4621; Fax +7 831 416 0616
E-mail: smp@ipfran.ru

1st PHILIPPINE-JAPAN
TERAHERTZ RESEARCH
WORKSHOP

February 20-24, 2017
Science and Technology Complex
De La Salle University

Overview

Terahertz (THz) science and technologies have rapidly advanced in recent years, attracting attention owing to its wide array of applications in THz spectroscopy of materials, THz sensing, and non-destructive evaluation of industrial products. The Molecular Photoscience Research Center, Kobe University and Research Center for Development of Far-Infrared Region, University of Fukui, have both dedicated to the development of THz science and technology for more than ten years as Centers of Excellence in this field. In the Philippine setting, pioneering THz-related research activities have commenced in the University of the Philippines (Diliman and Los Banos), mainly in collaboration with these Japanese institutes. These local THz research works have steadily grown and has expanded to active research work at the De La Salle University.

As such, it is high time to formally announce and showcase this active collaborative link between the two countries by holding the 1st Philippines-Japan THz Workshop (PJTW 2017) Structure of the workshop. This workshop aims to promote THz science and technology as a viable research area and to encourage young researchers and students to participate and present their works. The organizers hope that this small workshop will further strengthen the ties between the THz research communities of Japan and the Philippines.

Philippines-Japan THz Workshop 2017

De La Salle University Science and Technology Complex
Laguna Boulevard, LTI Spine Road, Barangays Biñan and Malamig, Biñan City, Laguna

Theme

- THz spectroscopy and sensing
- THz components (emitter, detector, waveguide, etc)
- THz material science (molecules, solid state materials, liquid meta-materials, nonlinear THz response, etc.)
- Theory and Modeling associated with THz science and technology
- Others, associated with THz science and technology

For more details please visit: http://www.dlsu.edu.ph/conferences/terahertz/2016/

INSTITUTE OF PLASMA PHYSICS OF THE CZECH ACADEMY OF SCIENCES

LAPD18 Symposium is organized by Institute of Plasma Physics of the Czech Academy of Sciences. It will take place in Hotel DUO in Prague, Czech Republic from Sunday, 24 September 2017 (evening) to Thursday, 28 September 2017. The LAPD18 Symposium is the continuation of a biennial series that began at Kyushu University in 1983. It brings together physicists and chemists in diverse areas of laser-based plasma diagnostics including the physics of nuclear fusion, laser physics and low-temperature plasma chemistry and physics. The symposium aims to promote cross-pollination of these fields via fruitful discussion, and covers all diagnostics using electromagnetic waves (lasers and microwaves) applied to fusion plasmas, industrial process plasmas, environmental plasmas, plasmas for medical applications, atmospheric plasmas, plasmas in liquids and other plasma applications. Topics on hardware developments related to laser-aided plasma diagnostics are also welcome. Instrumentation developments related to laser-aided plasma diagnostics also received emphasis in the program.

For more information visit: http://indico.ipp.cas.cz/event/5/

OTHER UPCOMING CONFERENCES

42st International Conference on Infrared, Millimeter and Terahertz Waves, will be held from August 27-Sept. 1st in Cancun, Mexico.
http://www.irmmw-thz2017.org/

German THz Conference 2017
At the Ruhr University Bochum, Bochum, Germany from March 29 to 31, 2017.
http://www.thz2017.rub.de/

IEEE MTT-S International Conference on Numerical Electromagnetic and Multiphysics Modeling and Optimization for RF, Microwave, and Terahertz Applications, May 17-19, 2017 Pabellon de Mexico, Sevilia, Spain.
http://www.nemo-ieee.org/

IEEE MTT-S International Microwave Bio Conference, May 15-17, 2017, Lindholmen Conference Centre, Goteborg, Sweden.
http://www.imbioc-ieee.org/

International Conference on Microwaves for Intelligent Mobility (ICMIM 2017), 19-21 March, Nagoya, Aichi, Japan.
http://www.icmim-ieee.org/

Second International Conference on Terahertz Emission, Metamaterials and Nanophotonics (TeraMetaNano-2), May 28 – June 2, 2017, Palazzo Carnoldi, Venice, Italy
http://www.mifp.eu/SCHOOLS/TERAMETANANO-2/index.html

IEEE Wireless Power Transfer Conference (WPTC), Taipei, Taiwan, 10-12 May, 2017.
http://www.wptc2017.org/

ICMTT 2017: 19th International Conference on Microwave and Terahertz Technology, Bangkok, Thailand August 30 - 31, 2017.
https://www.waset.org/conference/2017/08/bangkok/ICMTT

ICMTT 2018 : 20th International Conference on Microwave and Terahertz Technology, New York, USA June 4 - 5, 2017.
https://www.waset.org/conference/2018/06/new-york/ICMTT

ICMST 2017 : 19th International Conference on Microwave Science and Technology, London, United Kingdom, July 25 - 26, 2017
https://www.waset.org/conference/2017/07/london/ICMST

27th International Conference "Microwave and Communication Technology", 10-17 Sept 2017, Ekaterinburg, Russia
http://agora.guru.ru/display.php?conf=CriMiCo_2016&page=conference&PHPSESSID=bdq7g5ikucaegokhc5lvghuu6

Spring PIERS 2017 22-25 May 2017, St Petersburg, Russia.
http://www.piers.org/piers2017StPetersburg/files/callforpapers.pdf

Fall PIERS 2017(Progress in Electromagnetics Research Symposium), 19-22 November 2017, Singapore.
http://www.piers.org/piers2017Singapore/files/callforpapers.pdf

Eighteenth International Vacuum Electronics Conference, IVEC 2017, 24-26 Apr 2017, London, United Kingdom
http://www.ivec2017.org/

44th IEEE International Conference on Plasma Science (ICOPS 2017), 21-25 May, 2017, Atlantic City, New Jersey, United States of America (USA).
http://www.shu.edu/international-conference-plasma-science/index.cfm

SMOT 2017 (International Symposium on Microwave and Optical Technology) 26-28 Jun, 2017, Seoul, Korea.
http://ismot2017.org/

16th International Conference on Microwave and High Frequency Heating 18-21 September 2017, Delft, The Netherlands.
http://www.ampere2017.nl/

Terahertz, RF, Millimeter, and Submillimeter-Wave Technology and Applications IX, 30 Jan - 2 Feb 2016, San Francisco, California, USA.
http://spie.org/PWO/conferencedetails/thz-rf-mm-submm-wave-technology

20th International Summer School on Vacuum, Electron and Ion Technologies (VEIT 2017), 25-29 Sep 2017, Sozopol, Bulgaria.
http://www.veit.dir.bg/sozopol.htm

The 2017 IEEE International Conference on Antennas and Applications (IEEE CAMA 2017), 4-6 Dec 2017, Tsukuba, Ibaraki, Japan.
http://ewh.ieee.org/r10/tokyo/aps/CAMA2017/

LIST OF SELECTED RECENT PUBLICATIONS

Bibliography and links to selected recent publications on topics related to the research field of the International Consortium

This is a cumulative list of selected publications in a chronological order as collected from various bibliographical and alert services and published after October 2016, i.e. after issuing the previous Newsletter #4

A. Publications by authors from the institutions participating in the International Consortium

Idehara T., Hiromoto N., Sakai K., Tani M., Tominaga K., “Preface: Special Issue”Frontiers in THz Technology II,” Journal of Infrared, Millimeter, and Terahertz Waves, vol. 37, n. 12 (2016) 1157–1157. DOI:10.1007/s10762-016-0319-0.
http://link.springer.com/article/10.1007%2Fs10762-016-0319-0

Skalyga V.A., Izotov I.V., Mironov E.A., Voitovich A.V., Palashov O.V., “Design of permanent magnet trap for high current gas dynamic ECR ion sources with plasma heating by gyrotron radiation with frequency up to 45 GHz,” AIP Conference Proceedings, vol. 1771 (2016) 070014. DOI:10.1063/1.4964238.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964238

Viktorov M.E., Shalashov A.G., Golubev S.V., Gospodchikov E.D., Mansfeld D.A., Vodopyanov A.V., Zaitsev V.V., “Kinetic instabilities in a mirror-confined plasma sustained by high-power microwave radiation,” AIP Conference Proceedings, vol. 1771 (2016) 030005. DOI:10.1063/1.4964161.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964161

Koshelev M.A., Tsvetkov A.I., Morozkin M.V., Glyavin M.Yu., Tretyakov M.Yu., “Molecular Gas Spectroscopy Using Radioacoustic Detection and High-Power Coherent Subterahertz Radiation Sources,” Journal of Molecular Spectroscopy, vol. 331 (2016) 9-16. DOI:10.1016/j.jms.2016.10.014.
http://www.sciencedirect.com/science/article/pii/S0022285216302892

Ginzburg N.S., Rozental R.M., Sergeev A.S., Zotova I.V., Tarakanov V.P., “Chaotic millimeter wave generation in a helical-waveguide gyro-TWT with delayed feedback,” Physics of Plasmas, vol. 23, n.10 (2016) 103106. DOI:10.1063/1.4964918.
http://scitation.aip.org/content/aip/journal/pop/23/10/10.1063/1.4964918

Vlasov S.N., Koposova E.V., "Diffraction Theory of Two-Mirror Echelette Resonators," Radiophysics and Quantum Electronics, vol. 59, n.4, (2016) 310–316. pp. DOI: 10.1007/s11141-016-9699-1.
http://link.springer.com/article/10.1007/s11141-016-9699-1

Fukunari M., Wongsuryrat N., Yamaguchi T., Komurasaki K., Koizumi H., “Design of a Millimeter-Wave Concentrator for Beam Reception in High-Power Wireless Power Transfer", Journal of Infrared, Millimeter, and Terahertz Waves", vol. 38, n. 2 (2016) 176–190. DOI: 10.1007/s10762-016-0327-0.
http://link.springer.com/article/10.1007/s10762-016-0327-0

Santos R.D., Ozawa S., Mag-usara V., Azuma S., Tuico A., Copa V., Salvador A., Yamamoto K., Somintac A., Kurihara K., Kitahara H., Tani M., Estacio E., "Cherenkov-phase-matched nonlinear optical detection and generation of terahertz radiation via GaAs with metal-coating," Opt. Express, vol. 24 (2016) 24980-24988. DOI: 10.1364/OE.24.024980.
https://www.osapublishing.org/oe/abstract.cfm?uri=oe-24-22-24980

Li H., Wu Z., Zeng J., Kasparek W., Luo Y., Li T., "Design of a Broadband Quasi-Optical Mode Converter for W-Band Gyro-TWTs," IEEE Trans. on Microwave Theory and Techniques, (2016) 8 pp. DOI:10.1109/TMTT.2016.2615610.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7676318&isnumber=4359079

Wagner D., Leuterer F., Kasparek W. et al., “Minimization of the Ohmic Loss of Grooved Polarizer Mirrors in High-Power ECRH Systems,” Journal of Infrared Millimeter and Terahertz Waves, vol. 38, n. 2 (2016) 191–205. DOI:10.1007/s10762-016-0329-y.
http://link.springer.com/article/10.1007/s10762-016-0329-y

Kalynov Y.K., Osharin I.V., Savilov A.V., Zavolsky N.A., "Relativistic Second-Harmonic Gyrotron with a Selective Quasi-Regular Cavity," IEEE Trans. on Electron Devices, vol. 63, n. 12 (2016) 4968-4974. DOI:10.1109/TED.2016.2618999.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7726023&isnumber=4358746

Arzhannikov A.V., Annenkov V.V., Burdakov A.V., Burmasov V.S., Ivanov I.A., Kasatov A.A., Kuznetsov S.A., Makarov M.A., Mekler K.I., Polosatkin S.V., Postupaev V.V., Rovenskikh A.F., Sinitsky S.L., Sklyarov V.F., Stepanov V.D., Timofeev I.V., Thumm M.K.A., “Beam-plasma system as a source of powerful submillimeter and terahertz radiation (experimental and theoretical studies,” AIP Conference Proceedings, vol. 1771 (2016) 070004. DOI:10.1063/1.4964228.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964228

Chernov V.V., Gorbachev A.M., Vikharev A.L., Radishev D.B., Kozlov A.V., “A continuous microwave discharge maintained by two crossing millimeter-wave beams in hydrogen and argon: numerical simulation and experiment,” Plasma Sources Science and Technology, vol. 25, n. 6 (2016) 065022. DOI: 10.1088/0963-0252/25/6/065022.
http://iopscience.iop.org/article/10.1088/0963-0252/25/6/065022/meta

Ginzburg N.S., Malkin A.M., Zheleznov I.V., Sergeev A.S., Kocharovskaya E.R., “Quasi-optical theory of amplification of surface waves propagating above corrugated structures by a relativistic electron beam (impedance approximation),” Technical Physics, vol. 61, n. 11 (2016) 1609-1618. DOI: 10.1134/ S1063784216110104.
http://link.springer.com/article/10.1134/S1063784216110104

Skalyga V., Izotov I., Golubev S., Razin S., Sidorov A., “H+ and D+ high current ion beams formation from ECR discharge sustained by 75 GHz gyrotron radiation,” AIP Conference Proceedings, 1771 (2016) 070012. DOI:10.1063/1.4964236.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964236

Oda Y., Ikeda R., Fukunari M., Ikeyama T., Takahashi K., Kajiwara K., Kobayashi T., Moriyama S., Sakamoto K., Shapiro M.A., Temkin R.J., "Controllability Study of Propagating Mode Content by an Angle-Adjustable Mirror of a Miter-Bend in EC H&CD Transmission Line," IEEE Trans. on Plasma Science, vol. 44, n. 12 (2016) 3392 - 3397. DOI: 10.1109/TPS.2016.2627138.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7750606&isnumber=4360151

Kakinuma K., Fukunari M., Yamaguchi T., Nakamura Y., Koizumi H., Komurasaki K., Parkin K., “Two-Stage-to-Orbit Transporting System Combining Microwave Rocket and Microwave Thermal Rocket for Small Satellite Launch,” Trans. of the Japan Soc. For Aeronautical and Space Sciences, Aerospace Technology Japan, vol. 14, n. 30 (2016) 99-103. DOI:10.2322/tastj.14.Pb_99.
https://www.jstage.jst.go.jp/article/tastj/14/ists30/14_Pb_99/_article

Bandurkin I.V., Kalynov Y.K., Makhalov P.B., Osharin I.V., Savilov A.V., Zheleznov I.V., "Simulations of Sectioned Cavity for High-Harmonic Gyrotron," IEEE Trans. on Electron Devices, vol. 64, no. 1 (2017) 300-305. DOI:10.1109/TED.2016.2629029.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7756671&isnumber=7792766

Kuftin A.N., Manuilov V.N., “The Electron-Optical System of a Gyrotron with an Operating Frequency of 263 GHz for Spectroscopic Research," Radiophysics and Quantum Electronics, vol. 59, n. 2 (2016) 30-136. DOI:1007/s11141-016-9682-x.
http://link.springer.com/article/10.1007%2Fs11141-016-9682-x

Jin J., Thumm M., Gantenbein G., Jelonnek J., "A Numerical Synthesis Method for Hybrid-Type High-Power Gyrotron Launchers," IEEE Trans. on Microwave Theory and Techniques, (2016) 8pp. DOI:10.1109/TMTT.2016.2630060.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7782340&isnumber=4359079

Kalaria P.C., Avramidis K.A., Franck J., Gantenbein G., Illy S., Jin J., Gr. Pagonakis I., Thumm M., Jelonnek J., “RF Behavior and Launcher Design for a Fast Frequency Step-tunable 236 GHz Gyrotron for DEMO,” Frequenz Journal of RF-Engineering and Telecommunications, (2016). DOI: 10.1515/freq-2016-0212**.**
https://www.degruyter.com/view/j/freq.ahead-of-print/freq-2016-0212/freq-2016-0212.xml

Jelonnek J., et al., “Design Considerations for Future DEMO Gyrotrons: A Review on Related Gyrotron Activities within EUROfusion,” EUROFUSION WPHCD-CP(16) 1651. Preprint of Paper to be submitted for publication in Proceedings of 29th Symposium on Fusion Technology (SOFT 2016)
http://www.euro-fusionscipub.org/wp-content/uploads/WPHCDCP16_16517_submitted.pdf

Ginzburg N.S., Glyavin M.Yu., Malkin A. M., Manuilov V.N., Rozental R.M., Sedov A.S., Sergeev A.S., Zaslavsky V.Yu., Zotova I.V., Idehara T., "Improvement of Stability of High Cyclotron Harmonic Operation in the Double-Beam THz Gyrotrons," IEEE Transactions on Plasma Science, vol. 44, n. 8 (2016) 1303-1309. DOI:10.1109/TPS.2016.2585307.
URL:http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7508412&isnumber=7533555

Ginzburg N.S., Glyavin M.Yu., Zotova I.V., Zheleznov I.V., “Optimization of the self-excitation conditions of terahertz gyrotrons based on an increased lifetime of the cyclotron oscillators in the working space with a lowered voltage,” Journal of Technical Physics Letters, vol. 43, n. 2 (2017) 52-59 (In Russian). ISSN: 0320-0116, DOI: 10.21883/PJTF.2017.02.44187.16273.
http://journals.ioffe.ru/articles/44187

Jin J., Thumm M., Gantenbein G., Jelonnek J., "A Numerical Synthesis Method for Hybrid-Type High-Power Gyrotron Launchers," IEEE Trans. on Microwave Theory and Techniques, (2016) 8 pp. DOI: 10.1109/TMTT.2016.2630060.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7782340&isnumber=4359079

Peskov N.Yu., Bandurkin I.V., Donetc D.E., Kaminsky A.K., Perelstein E.A., Sedykh S.N., Zaslavsky V.Yu., “High-power broadband 30-GHz FEM amplifier operated in the grazing incident regime,” Appl. Phys. Lett., vol. 110 (2017) 013501. DOI:10.1063/1.4973465.
http://aip.scitation.org/doi/pdf/10.1063/1.4973465

Idehara T., Khutoryan E.M., Ogawa I., Matsuki Y., Fujiwara T., “(Invited Review Paper) Modulation and Stabilization of the Output Power and Frequency of FU Series Gyrotrons,**”** Terahertz Science and Technology, vol. 9, n. 4 (2016) 117-130. DOI: 10.11906/TST.117-130.2016.12.12.
http://www.tstnetwork.org/December2016/tst-v9n4-117Modulation.pdf

Schaub S.C., Hummelt J.S., Guss W.C., Shapiro M.A., Temkin R.J., “Electron density and gas density measurements in a millimeter-wave discharge,” Physics of Plasmas, vol. 23, n. 8 (2016) 083512. DOI:10.1063/1.4959171.
http://aip.scitation.org/doi/10.1063/1.4959171

Sudiana I.N., Mitsudo S., Firihu M.Z., Aba L., Ngkoimani L.O., Arsana M.W., Aripin H., Tahir D., Halide H., Surungan T., Hasanah N., “Investigation of silica from rice husk ash wastes as an alternative material for microwave absorbers,” AIP Conference Proceedings, vol. 1801 (2017) 040003. DOI: 10.1063/1.4973092.
http://aip.scitation.org/doi/abs/10.1063/1.4973092

Agusu La, Mitsudo S., Ahmad L.O., Herdianto, Fujii Y., Ishikawa Y., Furuya T., Ramadhan L.A.N, “Transmission characteristic of graphene/TiO2 paper measured at Ka-band,” AIP Conf. Proc., 1801 (2017) 050006. DOI:10.1063/1.49731
http://aip.scitation.org/doi/pdf/10.1063/1.4973104

Girka I.O., Thumm M., “Excitation of azimuthal surface waves in the electron cyclotron frequency range by a rotating electron beam in presence of dissipation,” Physics of Plasmas, vol. 23, n. 12 (2016) 1070-664X. DOI:10.1063/1.4972820.
http://aip.scitation.org/doi/10.1063/1.4972820

Reyes A.D.L., Prieto E.A., Omambac K., Porquez J., Lopez L. Jr., Gonzales K.C., Vasquez J.D., Tumanguil M.A., Muldera J., Yamamoto K., Tani M., Somintac A., Estacio E., Salvador A., “Terahertz emission characteristics of GaMnAs dilute magnetic semiconductor under 650 mT external magnetic field,” Current Applied Physics, (2017). DOI:0.1016/j.cap.2017.01.021.
www.sciencedirect.com/science/article/pii/S1567173917300275

B. Publications by other authors worldwide

Shu G., He W., Zhang L., Yin H., Zhao J., Cross A.W., Phelps A.D.R., "Study of a 0.2-THz Extended Interaction Oscillator Driven by a Pseudospark-Sourced Sheet Electron Beam," IEEE Trans. on Electron Devices, vol. 63, n. 12 (2016) 4955-4960. DOI:10.1109/TED.2016.2615314.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7590094&isnumber=4358746

Chao-Hai Du, Xiang-Bo Qi, Pu-Kun Liu, “Theoretical Study of a Broadband Quasi-Optical Mode Converter for Pulse Gyrotron Devices,” IEEE Trans. Plasma Sci., vol. 44, n. 10 (2016) 2348-2355. DOI: 10.1109/TPS.2016.2606497.
http://ieeexplore.ieee.org/document/7572128/

Li Weiwei, He Zhigang, Lu Yalin, Huang Ruixuan, Liu Weihao, Jia Qika, Wang Lin, “Tunable THz radiation source from dielectric loaded waveguide excited by nonrelativistic electron bunch trains,” Phys. Rev. Accel. Beams, vol. 19, n. 10 (2016) 104701. DOI:10.1103/PhysRevAccelBeams.19.104701.
http://link.aps.org/doi/10.1103/PhysRevAccelBeams.19.104701

Kumar A., Kumar P., “Electron beam induced THz emissions from nanotube array,” Physics of Plasmas, vol. 23 (2016) 103302. DOI:10.1063/1.4964767.
http://scitation.aip.org/content/aip/journal/pop/23/10/10.1063/1.4964767

Wei Fan, Tianying Chang, Lingyu Liu, Hong-Liang Cui, “Dielectric properties of coal in the terahertz frequency region of 100–500 GHz,” Fuel, vol. 188 (2017) 246-253. DOI:10.1016/j.fuel.2016.10.046.
http://www.sciencedirect.com/science/article/pii/S0016236116309942

Kariya T., Imai T, Minami R., Tsumura K., Ebashi, Y., Idei H., Hanada K., Ono M., Komurasaki K., Numakura T., Endo Y., Nakashima Y., “Development of 28/35 GHz dual-frequency gyrotron for ECH study,” AIP Conference Proceedings, vol. 1771 (2016) 030020. DOI:10.1063/1.4964176.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964176

Numakura T., Imai T., Kariya T, Minami R., Tsumura K., Ebashi Y., Kajino S., “Code development for the calculations of time-dependent multimode oscillations in the cavity of the future high-power gyrotrons,” AIP Conference Proceedings, vol. 1771 (2016) 030023. DOI:10.1063/1.4964179.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964179

Nakashima Y., Imai T., Sakamoto M., Katanuma I., et.al. “Overview of recent progress and future in GAMMA 10/PDX project,” AIP Conference Proceedings, vol. 1771 (2016) 020002. DOI:10.1063/1.4964155.
http://scitation.aip.org/content/aip/proceeding/aipcp/10.1063/1.4964155

Nakajima M., Kurihara T., Tadokoro Y.,Kang B., Takano K., Yamaguchi K., Watanabe H., Oto K., Suemoto T., Hangyo M., "Application of Terahertz Field Enhancement Effect in Metal Microstructures", Journal of Infrared, Millimeter, and Terahertz Waves", vol. 37, n. 12 (2016) 1199–1212. DOI: 0.1007/s10762-016-0323-4.
http://link.springer.com/article/10.1007/s10762-016-0323-4

Yang J.-W., et al., "Electric field measurement with Electro-Optic sensor of high power W-band gyrotron," 2016 URSI Asia-Pacific Radio Science Conference (URSI AP-RASC), Seoul, South Korea, 2016, pp. 1919-1920. DOI: 10.1109/URSIAP-RASC.2016.7601217.
http://ieeexplore.ieee.org/abstract/document/7601217/?reload=true

Mirando D.A., Higgins M.D., Wang F., Petkie D.T., "Millimeter-wave/THz FMCW radar techniques for sensing applications", Proc. SPIE 9993, Millimetre Wave and Terahertz Sensors and Technology IX, 99930A (October 21, 2016). DOI:10.1117/12.2242144.
http://proceedings.spiedigitallibrary.org/proceeding.aspx?articleid=2575645

Liu D., "Investigations on a Dual-Frequency Operation Terahertz Gyrotron," in The 8th International Symposium on Ultrafast Phenomena and Terahertz Waves, OSA Technical Digest (online) (Optical Society of America, 2016), paper IW2A.4. DOI: 10.1364/ISUPTW.2016.IW2A.4.
https://www.osapublishing.org/abstract.cfm?URI=isuptw-2016-IW2A.4

Castro P.J, Barroso J.J., et al., “Study of Transmission and Reflection Characteristics of a Gradient Array of Metamaterial Split-Ring Resonators,” Journal of Microwaves, Optoelectronics and Electromagnetic Applications, vol. 15, no. 4, (2016) 380-390. DOI:10.1590/2179-10742016v15i4658380.
https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.1590%2F2179-10742016v15i4658

Raj P., Prasad U., Khristi Y., Ghate M., Panchal A., Bhavsar D., Banaudha M., Kanabar D., Parghi B., Pradhan S., "Long Duration Operational Characteristics of the First Indian 42 GHz, 200 kW Gyrotron," IEEE Trans. on Applied Superconductivity, vol. 26, n.8 (2016) 4902607. DOI:10.1109/TASC.2016.2622658.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7723878&isnumber=6353170

Zhao X., Yuan C., Liu L., Peng S., Zhou H., Cai D., "Solution to GW TEM-Circular Polarized TE_{11} Mode Converter Design for High Frequency Bands," IEEE Trans. on Microwave Theory and Techniques, (2016) 6 pp.DOI:10.1109/TMTT.2016.2616880.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7707467&isnumber=4359079

Chusseau L., Payet P., Raoult J., "Optimization of Near-Field Image Capture With Millimeter-Wave Bow-Tie Probes," IEEE Trans. on Instrumentation and Measurement, vol. 66, n. 1 (2016) 61-68. DOI: 10.1109/TIM.2016.2618960.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7736083&isnumber=4407674

Singh R.K., Thottappan M., "Particle-in-cell (PIC) simulation of a 250GHz gyrotron," 2016 Progress in Electromagnetic Research Symposium (PIERS), Shanghai, China, 2016, pp. 4423-4423. DOI: 10.1109/PIERS.2016.7735641
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7735641&isnumber=7734201

Singh R.K., Thottappan M., "Design and simulation studies of a metal PBG cavity for millimetre wave gyrotrons," 2016 Progress in Electromagnetic Research Symposium (PIERS), Shanghai, China, 2016, pp. 4582-4582. DOI:10.1109/PIERS.2016.7735692.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7735692&isnumber=7734201

Fu T., An Y.B., Ouyang Z.B., "A novel Cherenkov oscillator based on microcavity in photonic crystal waveguide," 2016 Progress in Electromagnetic Research Symposium (PIERS), Shanghai, China, 2016, pp. 1225-1228. DOI:10.1109/PIERS.2016.7734624.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7734624&isnumber=7734201

Singh A.S., Thottappan M., "Design and PIC simulation a stagger tuned gyro-twystron," 2016 Progress in Electromagnetic Research Symposium (PIERS), Shanghai, China, 2016, pp. 4810-4813. DOI:10.1109/PIERS.2016.7735756.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7735756&isnumber=7734201

Pikin A., Alessi J.G., Beebe E.N., Raparia D., Ritter J., "Analysis of magnetically immersed electron guns with non-adiabatic fields," Review of Scientific Instruments, vol. 87 (2016) 113303. DOI:10.1063/1.4966681.
http://scitation.aip.org/content/aip/journal/rsi/87/11/10.1063/1.4966681

Chigryai E.E., Garin B.M., Denisyuk R.N., Kalenov D.S., Nikitin I.P., "Ultralow Absorption in Silicon Carbide in the Millimeter-Wave Range," Journal of Radio Electronics, no. 11 (2016) 12 pp.
http://jre.cplire.ru/jre/nov16/6/text.pdf

Beaudoin B.L., et al., "Novel high-power Radio-Frequency sources for Ionospheric Heating," 2016 IEEE International Vacuum Electronics Conference (IVEC), Monterey, CA, 2016, pp. 1-2. DOI:10.1109/IVEC.2016.7561769.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7561769&isnumber=7561752

Karakkad J.A., Beaudoin B.L., Rodgers J.C., Nusinovich G.S., Goyal N., Antonsen T.M., "Designing an electron gun for an efficient Mobile Ionospheric Heating Source," 2016 IEEE International Vacuum Electronics Conference (IVEC), Monterey, CA, 2016, pp. 1-2. DOI: 10.1109/IVEC.2016.7561770
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7561770&isnumber=7561752

Nusinovich G.S., Thomson C., Beaudoin B.L., Antonsen T.M., "Limiting current of intense electron beams in a decelerating gap," 2016 IEEE International Vacuum Electronics Conference (IVEC), Monterey, CA, 2016, pp. 1-2. DOI:10.1109/IVEC.2016.7561787.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7561787&isnumber=7561752

Chaudhari M.K., Chaudhari S., "Tuning photonic bands in plasma metallic photonic crystals," Physics of Plasmas, vol. 23 (2016) 112118. DOI:10.1063/1.4967867.
http://scitation.aip.org/content/aip/journal/pop/23/11/10.1063/1.4967867

Hummelt J. S., Lu X., Xu H.,Mastovsky I. ,Shapiro M. A., Temkin R. J., “Coherent Cherenkov-Cyclotron Radiation Excited by an Electron Beam in a Metamaterial Waveguide,” Phys. Rev. Lett., vol. 117, n. 23 (2016) 237701. DOI: 10.1103/PhysRevLett.117.237701.
http://link.aps.org/doi/10.1103/PhysRevLett.117.237701

Gamayunov Yu.G., Patrusheva E.V., Rozhnev A.G., "Following-wave amplification mode of a clinotron," Journal of Communications Technology and Electronics, vol. 60, n. 11 (2016) 1280-1287. DOI:10.1134/S1064226916110048.
http://link.springer.com/article/10.1134%2FS1064226916110048

Ikeda R., Oda Y., Kobayashi T., Kajiwara K., Terakado M., Takahashi K., Moriyama S., Sakamoto K., "Multi-Frequency, MW-Power Triode Gyrotron Having a Uniform Directional Beam," Journal of Infrared, Millimeter, and Terahertz Waves, (2016) 7 pp. DOI:10.1007/s10762-016-0348-8.
http://link.springer.com/article/10.1007%2Fs10762-016-0348-8

Nielsen S.K., Michelsen P.K., Hansen S.K., Korsholm S.B., Leipold F., Rasmussen J., Salewski M., Schubert M., Stejner M., Stober J., Wagner D., and the ASDEX Upgrade Team 2, “Recent development of collective Thomson scattering for magnetically confined fusion plasmas,” Physica Scripta, vol. 92, n. 2 (2016) 024001. DOI: 10.1088/1402-4896/92/2/024001.
http://iopscience.iop.org/article/10.1088/1402-4896/92/2/024001/meta

Shcherbinin V.I., Zaginaylov G.I, Tkachenko V.I., “Cavity with distributed dielectric coating for sub-terahertz second harmonic gyrotron,” Problems of Atomic Science and Technology (Series: Plasma Physics), n. 6 (2016) 255-258.
http://vant.kipt.kharkov.ua/ARTICLE/VANT_2016_6/article_2016_6_255.pdf

Shakir Ullah, M. Ayub, N. Aftab, A. Qayyum, “Design and Simulations of Low Loss Single Disk RF Window,” The Nucleus, vol. 53, n. 4 (2016) 221-224.
http://www.thenucleuspak.org.pk/Fulltext/MS-1212.pdf

Sawant A., Yu D., Kim D., Choe M.S., Choi E., "Generation and Validation of Topological Charges of High-Power Gyrotron Orbital Angular Momentum Beams From Phase Retrieval Algorithm," IEEE Trans.on Terahertz Science and Technology, (2016) 8 pp. DOI: 10.1109/TTHZ.2016.2637868.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7802640&isnumber=5741778

Qi X.B., Du C.H., Pan S., Ji X., Huang B., Liu P.K., "Terahertz Broadband-Tunable Minigyrotron With a Pulse Magnet," IEEE Trans. on Electron Devices, (2016) 9 pp. DOI:10.1109/TED.2016.2635201.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7790797&isnumber=4358746

Tang Y., Luo J., Xue Q., Fan Y., Wang X., Peng S., Li S., "Multimode Steady-State Analysis for a Gyrotron Traveling Wave Amplifier Based on a Distributed Loss-Loaded Metal Cylindrical Waveguide," IEEE Trans. on Electron Devices, (2016) 7 pp. DOI10.1109/TED.2016.2639518.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7802565&isnumber=4358746

Bentian Liu, JinjunFeng, Zhiliang Li, Yang Zhang, Efeng Wang, BoyangTian “(Invited paper) Design and experimental study of a high power 140 GHz, $TE_{22.6}$ mode gyrotron for EAST,” Terahertz Science and Technology, vol. 9, n. 4 (2016) 131-140. DOI: 10.11906/TST.131-140.2016.12.13.
http://www.tstnetwork.org/December2016/tst-v9n4-131Design.pdf

Xu Zeng, Efeng Wang, Jinjun Feng, “(Invited paper) A Study of W-band TE_{02} mode gyro-TWT,” Terahertz Science and Technology, vol. 9, n. 4 (2016) 141-148. DOI: 10.11906/TST.141-148.2016.12.14.
http://www.tstnetwork.org/December2016/tst-v9n4-141Study.pdf

Sheng Yu, Qixiang Zhao, Tianzhong Zhang, Youwei Yang, Yanyan Zhang, Zhipeng Wang, "(Invited paper) The theoretical investigation and design on 0.42 THz gyrotron with complex cavity," Terahertz Science and Technology**, v**ol. 9, n. 4 (2016) 149-165. DOI: 10.11906/TST.149-165.2016.12.15.
http://www.tstnetwork.org/December2016/tst-v9n4-149Theoretical.pdf

Xiaotong Guan, Wenjie Fu, Yang Yan "(Invited paper) Continuously frequency-tunable 0.22 THz gyrotron oscillator with quasi-optical resonator," Terahertz Science and Technology**, v**ol. 9, n. 4 (2016) 166-176. DOI: 10.11906/TST.166-176.2016.12.16.
http://www.tstnetwork.org/December2016/tst-v9n4-166Continuously.pdf

Blank M., Borchard P., Cauffman S., Felch K., Rosay M., Tometich L., "(Invited paper) Development of high-frequency cw gyrotrons for DNP/NMR applications," Terahertz Science and Technology, **v**ol. vol. 9, n. 4 (2016) 177-186. DOI: 10.11906/TST.177-186.2016.12.17.
http://www.tstnetwork.org/December2016/tst-v9n4-177Development.pdf

Di Palma E., Sabia E., Dattoli G., Licciardi S., Spassovsky I. "Cyclotron auto resonance maser and free electron laser devices: a unified point of view," Journal of Plasma Physics, vol. 83, n. 1 (2017). DOI:10.1017/S0022377816001239.
http://tinyurl.com/zdjp89r

Li Z.D., Du C.H., Luo L., Qi X.B., Liu P.K., "Terahertz Gyrotron Broadband Tuning Based on Local Field Shaping in a Low-Q Cavity," IEEE Trans. on Electron Devices, vol. 63, n. 10 (2016) 4081-4087. DOI:10.1109/TED.2016.2596303
http://ieeexplore.ieee.org/document/7544531/

Chernomyrdin N.V., Frolov M.E., Lebedev S.P., Reshetov I.V., et al., "Wide-aperture aspherical lens for high-resolution terahertz imaging," Review of Scientific Instruments, vol. 88, n. 1 (2017) 014703. DOI:10.1063/1.4973764.
http://aip.scitation.org/doi/full/10.1063/1.4973764

Yeh Y.S., Kao W.J., Li L.J., Guo Y.W., "Comparative analysis of fourth-harmonic multiplying gyrotron traveling-wave amplifiers operating at different frequency multiplications," Physics of Plasmas, vol. 24, n. 1 (2017) 1070-664X. DOI: 10.1063/1.4974270.
http://aip.scitation.org/doi/10.1063/1.4974270

Alaria M.K., Choyal Y., Sinha A.K., "Design and Development of Cavity for High Power Gyrotron," International Journal of Engineering Science and Innovative Technology, vol. 5, n. 6 (2016) 27-33.
http://www.ijesit.com/Volume%205/Issue%206/IJESIT201606_04.pdf

Dubray J., Alberti S., Couturier S., Cuanillon P., Fasel D., Hogge J.-Ph., Isoz P.-F., Perez A., Silva M.,, Siravo U., "Embedded control systems for gyrotrons applications based on NI solutions, Fusion Engineering and Design," (2017) Available online 17 January 2017. DOI:10.1016/j.fusengdes.2017.01.007.
http://www.sciencedirect.com/science/article/pii/S0920379617300182

Arora A., Thottappan M., Jain P.K., "PIC Simulation of a Millimeter Wave Gyrotron Traveling Wave Amplifier," Int. J. of Microwave and Optical Technology, (2016) 8 pp.
http://ijmot.com/files/1980621123.pdf

Gamzina D., Luhmann N.C., Ravani B., "Thermo-Mechanical Stress in High-Frequency Vacuum Electron Devices," Journal of Infrared, Millimeter, and Terahertz Waves, vol. 38, n. 1 (2017) 47-61. DOI:10.1007/s10762-016-0312-7.
http://link.springer.com/article/10.1007/s10762-016-0312-7

Smith D.R., Gowda V.R., Yurduseven O., Larouche S., Lipworth G., Urzhumov Y., Reynolds M., “An analysis of beamed wireless power transfer in the Fresnel zone using a dynamic, metasurface aperture,” Journal of Applied Physics, vol. 121, n. 1 (2017) 014901. DOI:10.1063/1.4973345.
http://aip.scitation.org/doi/abs/10.1063/1.4973345

Garner J.R., Zhang L., Donaldson C.R., Cross A.W., He W., “Design study of a 372 GHz higher order mode input coupler,”. IEEE Trans. on Electron Devices, vol. 63, n. 8 (2016) 3284-3290. DOI:10. 1109/TED.2016.2581314.
http://strathprints.strath.ac.uk/56705/1/.pdf

Chernyavskiy I.A., Antonsen T.M., Rodgers J.C., Vlasov A.N., Chernin D.,Levush B., "Modeling Vacuum Electronic Devices Using Generalized Impedance Matrices," IEEE Trans. on Electron Devices, vol. 64, no. 2 (2017) 536-542. DOI:10.1109/TED.2016.2640205.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7807275&isnumber=7828063

Yeh Y.S., Kao W.J., Li L.J., Guo Y.W., “Comparative analysis of fourth-harmonic multiplying gyrotron traveling-wave amplifiers operating at different frequency multiplications,” Phys. Plasmas, vol. 24 (2017) 013115. DOI:10.1063/1.4974270.
http://aip.scitation.org/doi/pdf/10.1063/1.4974270

Lepeshov S., Krasnok A., Krasnok A., Rafailov E., Belov P., “Enhancement of terahertz photoconductive antenna operation by optical nanoantennas,” Laser & Photonics Reviews (2017) 1600199. DOI: 10.1002/lpor.201600199.
http://onlinelibrary.wiley.com/doi/10.1002/lpor.201600199/epdf

Si-Jia Liu, Yu-Fei Zhang, Kang Wang, Yong-Ming Li, Jian Jing, “Efficiency enhancement of slow-wave electron-cyclotron maser by a second-order shaping of the magnetic field in the low-gain limit,” Annals of Physics, (2017). DOI: 10.1016/j.aop.2017.01.019.
http://www.sciencedirect.com/science/article/pii/S0003491617300362

Shcherbinin V.I., Zaginaylov G.I., Tkachenko V.I., “Analogy between Circular Core-Cladding and Impedance Waveguides and Their Membrane Functions,” Progress In Electromagnetics Research M, vol. 53 (2017) 111–120.
http://www.jpier.org/PIERM/pierm53/11.16110902.pdf

Zhang Yaxin, Zhou Yucong, Gang Yin, Jiang, Guili, Yang, Ziqiang, “Coherent Terahertz Radiation from Multiple Electron Beams Excitation within a Plasmonic Crystal-like structure,” Scientific Reports, vol. 7 (2017) 41116. DOI:10.1038/srep41116.
http://www.nature.com/articles/srep41116

A. Qixiang Zhao, B. Sheng Yu, "The Nonlinear Designs and Experiments on a 0.42-THz Second Harmonic Gyrotron With Complex Cavity," IEEE Trans. on Electron Devices, vol. 64, n. 2 (2017) 564-570. DOI:10.1109/TED.2016.2642984.
http://ieeexplore.ieee.org/document/7809048/

Kolmakova N.G., Louksha O.I., Sominskii G.G., Trofimov P.A., “Development of the Method for Determining the Electron Velocity in a Gyrotron,” Technical Physics, vol. 62, n. 1 (2017) 145-151. DOI: 10.1134/S1063784216120215.
https://www.researchgate.net/publication/313161100

Wang J., Tian Q., Li X., Shu G., Xu Y., Luo Y., "Theory and Experiment Investigate of a 400-kW Ku-Band Gyro-TWT With Mode Selective Loss Loading Structure," IEEE Trans. on Electron Devices, vol. 64, n. 2 (2017) 550-555. DOI:10.1109/TED.2016.2641159.
http://ieeexplore.ieee.org/abstract/document/7828162

Bin W., Bruschi A., Takahashi K., Ikeda R., Oda Y., Aoki T., Dell'Era F., Hayashibara M., Minelli D., Nardone A., Sakamoto K., Simonetto A., Spinicchia N., Terakado M., Tsubota N., "Validation Experiments on the 2-MW CW 170-GHz Load for the European ITER Gyrotron," IEEE Trans. on Plasma Science, (2017) 11 pp. DOI: 10.1109/TPS.2017.2658184.
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7847447&isnumber=4360151

Liang L., Liu W., Jia Q., Wang L., Lu Y., "High-harmonic terahertz Smith-Purcell free-electron-laser with two tandem cylindrical-gratings," Opt. Express, vol. 25 (2017) 2960-2968. DOI:10.1364/OE.25.002960.
https://www.osapublishing.org/oe/abstract.cfm?uri=oe-25-3-2960

C. PATENTS

Method and apparatus for exchanging communication signals

US 9461706 B1
Inventors: Robert Bennett, Paul Shala Henry, Farhad Barzegar, Irwin Gerszberg, Donald J Barnickel, Thomas M. Willis
Publication date: Oct 4, 2016
https://www.google.com/patents/US9461706

Electron beam gun with kinematic coupling for high power RF vacuum devices

US 9502203 B1
Inventors: Philipp Borchard
Publication date: Nov 22, 2016
http://www.google.com/patents/US9502203

Large-Scale Space-Based Solar Power Station: Power Transmission Using Steerable Beams

United States Patent Application 20160380486
Inventors: Hajimiri S.A, Atwater H.A., Pellegrino S., Abiri B., Bohn F.
Publication date: Dec 29, 2016.
http://www.freepatentsonline.com/y2016/0380486.html

High power terahertz photoconductive antenna array

US 20160377803 A1
Inventors: Dong Ho Wu, Benjamin Graber
Publication date: Dec 29 2016
http://www.freepatentsonline.com/y2016/0377803.html

Method for the Chemical Strengthening of Glass

US 9505654
Inventors: Vladislav Sklyarevich, Mykhaylo Shevelev
Publication date: Nov 29, 2016
https://www.google.com/patents/US9505654

NEWS FROM THE NET (OUR BROADER HORIZONTS)

NEWS FROM MIT

NOVEL SOURCES OF COHERENT RADIATION USING METAMATERIALS AND INTENSE ELECTRON BEAMS

Recently, Professor Richard Temkin and his colleagues at MIT have presented experimental results [1] that demonstrate the generation of reversed Cherenkov radiation when an intense electron beam is passing through a waveguide loaded by a metamaterial. They have observed power levels up to 5 MW at a frequency of 2.40 GHz using a one microsecond electron beam of 490 keV in a magnetic field with an intensity of 400 G. The authors comment that contrary to the expectations the output power is not generated in the Cherenkov mode but is due to a Cherenkov-cyclotron (or anomalous Doppler) instability induced by the presence of the magnetic field, which is used for guiding the electron beam trough, the structure. The resonance frequency is equal to the Cherenkov frequency minus the cyclotron frequency. The potential applications of this first experimental demonstration of coherent microwave generation from a continuous electron beam interacting with a metamaterial structure are discussed in [2]. This work is a continuation of the research of novel sources of coherent radiation that utilize metamateial structures and intense electron beams [3-4].

[1] J.S. Hummelt, X. Lu, H. Xu, I. Mastovsky, M.A. Shapiro, and R. J. Temkin, “Coherent Cherenkov-Cyclotron Radiation Excited by an Electron Beam in a Metamaterial Waveguide,” Phys. Rev. Lett., 117 (2016) 237701. DOI: 10.1103/PhysRevLett.117.237701.

[2] M. Buchanan, “Focus: Better Microwaves from a Metamaterial”, *Physics* 9, 141 (December 2, 2016). Visit: https://physics.aps.org/articles/v9/141

[3] J.S. Hummelt, S.M. Lewis, M.A. Shapiro and R.J. Temkin, "Design of a Metamaterial-Based Backward-Wave Oscillator," *IEEE Trans. on Plasma Science*, vol. 42, no. 4 (2014) 930-936. DOI:10.1109/TPS.2014.2309597.

[4] J. Hummelt, Xueying Lu, Haoran Xu, M. Shapiro and R. Temkin, "High power microwave generation from a metamaterial waveguide," *2016 IEEE International Vacuum Electronics Conference (IVEC)*, Monterey, CA, 2016, pp. 1-3. DOI: 10.1109/IVEC.2016.7561790.

The 2017 terahertz science and technology roadmap

Recently a large panel of researchers (from 32 institutions worldwide) has published a roadmap for a further development of the terahertz science and technology (see the link below). Its aim is to present the current State-of-the-Art in this broad field of research and to provide an opinion on the challenges and opportunities that the future holds. This topical review consists of 18 sections that cover most of the key areas of THz science and technology. This paper and the references therein is a useful resource that provides a wide-ranging introduction to the capabilities of THz radiation and surveys the most important well established as well as novel and prospective applications.

S.S. Dhillon et al., “The 2017 terahertz science and technology roadmap,” J. Phys. D: Appl. Phys. **50** (2017) 043001 (49pp). DOI:10.1088/1361-6463/50/4/043001.
Open Access:
http://iopscience.iop.org/article/10.1088/1361-6463/50/4/043001/pdf

The resonant heating of heavy water solutions under the terahertz pulse irradiation

In a recent paper by Yang, et al. significant differences between the properties of heavy and usual water irradiated by terahertz pulses have been observed. The main highlights of this study are: (i) A resonant heating of heavy water solution under terahertz pulse irradiation is observed; (ii) The resonant frequencies exhibit a large difference between heavy water and normal water; (iii) Several rotational collective modes are addressed as the mechanisms of the resonant phenomena; (iv) The specific location of the resonant peak is dependent on the intensity of the terahertz pulse; (v) The shifting of peak location stems from different efficiency of each resonant mode under different pulse intensities.
For more detail see the paper:
Yang Rong-Yao, et al. "The resonant heating of heavy water solutions under the terahertz pulse irradiation," Journal of Molecular Liquids, vol. 229 (2017) 148–152. DOI: 10.1016/j.molliq.2016.12.064.
http://www.sciencedirect.com/science/article/pii/S0167732216325065

Record 34Gbit/second Wi-Fi data transmission at a 500 GHz range

Japanese researchers from Tokyo Institute of Technology have succeeded to boost the speed of Wi-Fi data transmissions to 34 Gbps (Gigabits per second) by harnessing the 500 GHz frequency band of the electromagnetic spectrum, which falls within the Terahertz range. Such high frequencies are attractive because they have ultra-wide bandwidth (several tens of GHz) and offer short-range speeds of more than 100 Gbps. For more detail, please visit:
http://www.ispreview.co.uk/index.php/2016/12/terahertz-wifi-moves-closer-scientists-achieve-speeds-34gbps.html
and the original paper:
Oshima N., Hashimoto K., Suzuki S., Asada M., "Wireless data transmission of 34 Gbit/s at a 500-GHz range using resonant-tunnelling-diode terahertz oscillator," Electronics Letters, vol. 52, n. 22 (2016) 1897-1898. DOI: 10.1049/el.2016.3120.
http://digital-library.theiet.org/content/journals/10.1049/el.2016.3120

First metal-free metamaterial that can absorb electromagnetic energy without heating

Electrical engineers at Duke University have created an electromagnetic metamaterial made without metal. It has the ability of to absorb electromagnetic energy without heating. Such material could find numerous applications in imaging, sensing, lighting and other advanced technologies. The concept of an all-dielectric metasurface absorber offers a new route for control of the emission and absorption of electromagnetic radiation from surfaces with potential applications in energy harvesting, imaging, and sensing..
https://pratt.duke.edu/about/news/dielectric-metamaterial
See the original paper at:
Xinyu Liu, Kebin Fan, Ilya V. Shadrivov, and Willie J. Padilla, "Experimental realization of a terahertz all-dielectric metasurface absorber," Opt. Express **25**, 191-201 (2017). DOI: 10.1364/OE.25.000191.
https://www.osapublishing.org/oe/abstract.cfm?uri=oe-25-1-191&origin=search

Terahertz radiation could speed up computer memory by 1000 times!

A team of Russian scientists from the Moscow Institute of Physics and Technology in a collaboration with their colleagues from the Netherlands and Germany have developed a method for speeding up the computer memory using terahertz waves. For more detail, please see the original paper:

S. Bairel, et al., "Nonlinear spin control by terahertz-driven anisotropy fields," Nature Photonics, 10, (2016) 715–718. DOI:10.1038/nphoton.2016.181.
http://www.nature.com/nphoton/journal/v10/n11/full/nphoton.2016.183.html