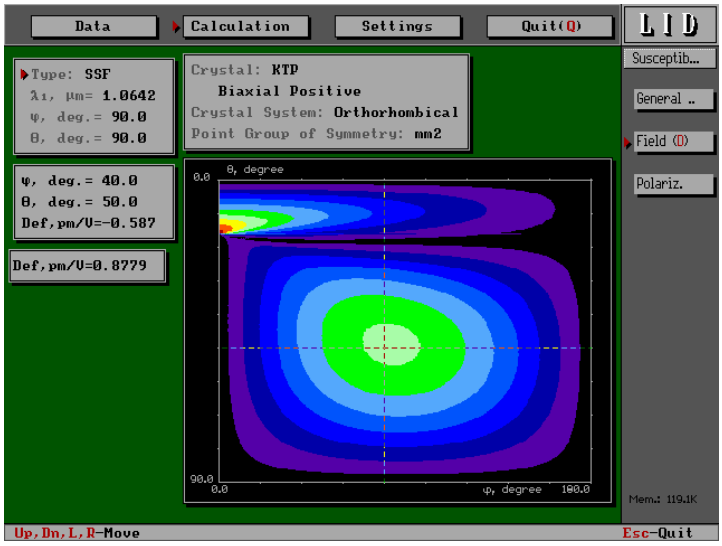
Bauman Moscow State Technical University
Scientific Research Institute of Radioelectronics & Laser Technology

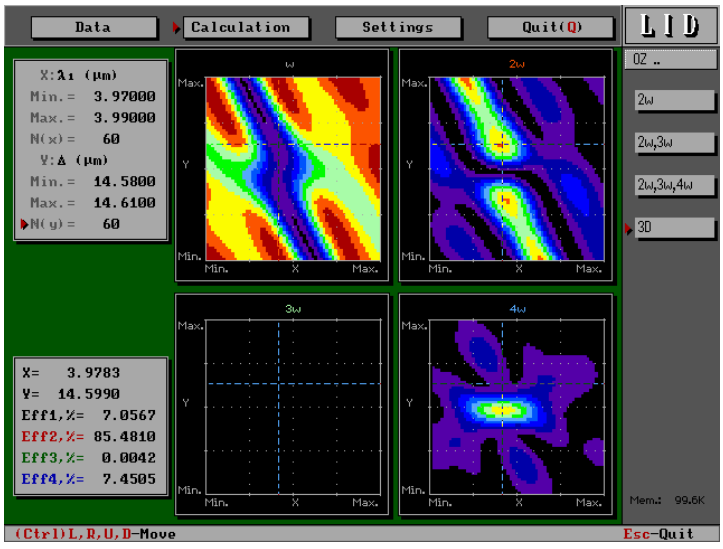
Research & Development Institute “POLYUS”

LID - SHG

Laser Investigator & Designer - Second Harmonic Generation

HandBook - Calculation Applied Program Set for Investigation, Development and Design of Laser Radiation Frequency Converters





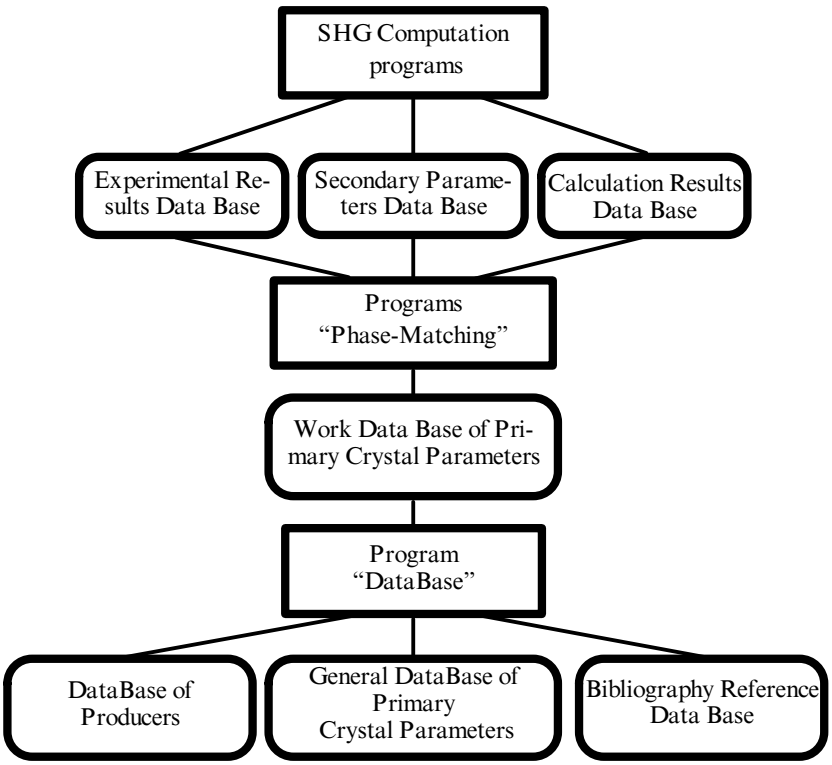
Solution of the professional and education tasks

LID - SHG (Laser Investigator & Designer - Second Harmonic Generation) is the HandBook-Calculation set of the applied programs for solution of the professional (investigation and development) and education tasks.

The program set contains three large groups of the programs:

- DataBase and supporting programs,
- Programs for analysis of Phase-Matching Conditions,
- Programs for analysis of a generation processes.

The structure of the program set.



The subsection "General DataBase of Primary Crystal Parameters" (program "DataBase") allows you to select the crystals from DataBase. There are 18 DataBase on 81 crystals (biaxial/uniaxial, organic/inorganic) in the Primary Parameter DataBase.

Data Base contains the information about the following crystals:

Uniaxial crystals:

1. Mercury Thiogallate
2. FMA
3. $K_3Li_2Nb_5O_{12}$
4. $CdGeAs_2$
5. Urea
6. $ZnGeP_2$
7. ADA
8. DADA
9. ADP
10. DADP
11. KDA
12. DKDA
13. KDP
14. DKDP
15. CDA
16. DCDA
17. RDA
18. DRDA
19. RDP
20. DRDP
21. CLBO
22. $AgGaSe_2$
23. Beryllium Sulfate
24. Silver Thiogallate
25. $LiIO_3$
26. Cadmium Selenide
27. Gallium Selenide
28. Selenium
29. Tellurim
30. Cinnibar
31. Quartz
32. BBO
33. $LiNbO_3$
34. $LiNbO_3$:MgO
35. TAS
36. Proustite
37. Pyrargyrite

Biaxial crystals:

1. MAP
2. MHBA
3. T-17
4. NPLO
5. DAN
6. LAP
7. DLAP
8. PNP
9. NPP
10. Saccharose
11. KM
12. MNA
13. 5-NU
14. BFM
15. L-PCA
16. POM
17. StFM
18. StFMD
19. AO
20. CBO
21. a-Iodic Acid
22. COANP
23. KTP
24. KTA
25. CTA
26. RTA
27. KB5
28. DKB5
29. L-CTT
30. MMONS
31. Sodium Nitrite
32. BAMB
33. "Banana"
34. KCN
35. KLN
36. LBO
37. LFM
38. LGO
39. MDNB
40. Magnesium-Barium Fluoride
41. NPAN
42. Potassium Niobate
43. SFM
44. mNA

DataBase contains the following parameters:

A. “General Parameters” Part:

- Short and Full name of crystal,
- Symmetry and Point Group,
- Chemical Formula,
- Specific Gravity,
- Hardness,
- Solubility,
- Thermal Conductivity,
- Thermic Capacity,
- Thermal Expansion Coefficient.

B. “Optical Parameters” Part:

- Transparency range,
- Refraction indices (9 Sellmeier’s equations),
- Temperature variation of refraction indices,
- Linear Absorption Coefficient (from wavelength),
- Threshold of optical damage (from wavelength and pulse duration).

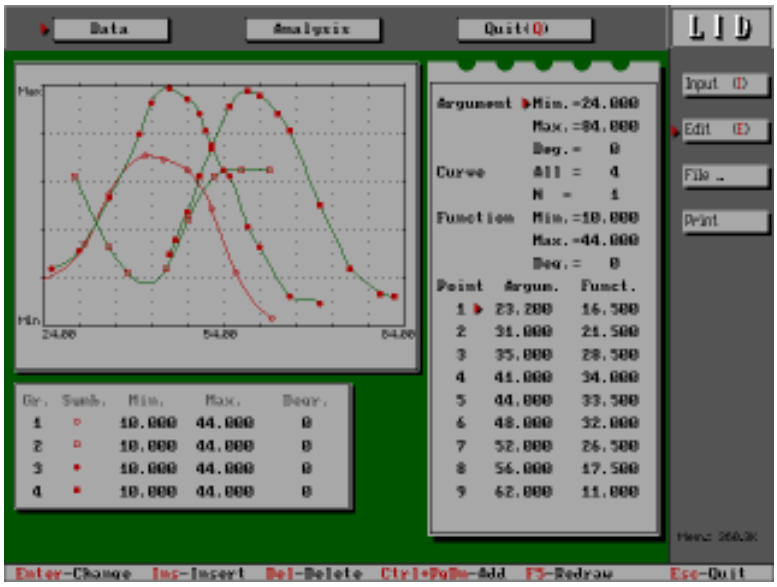
C. “Nonlinear Optical Parameters” Part:

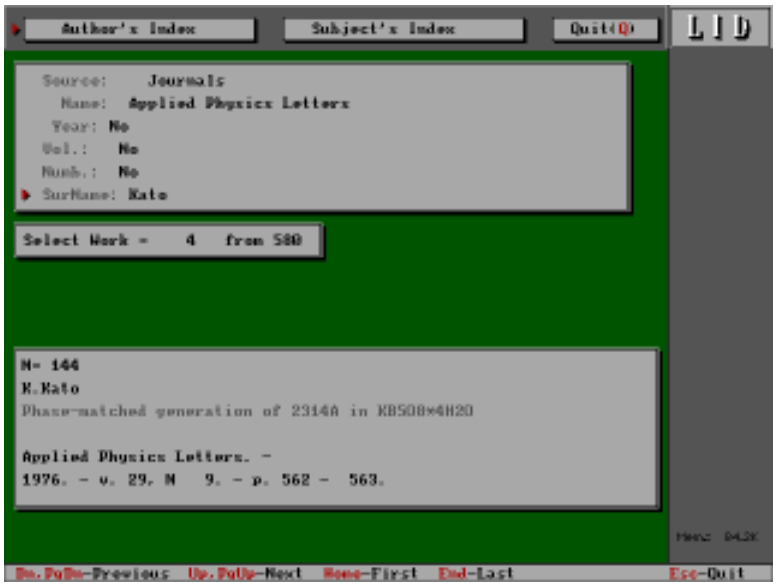
- Nonlinear Susceptibility (nonlinear coefficients),
- TwoPhoton Absorption Coefficient (from wavelength and pulse duration),
- Threshold of Stimulated Raman Scattering (from wavelength and pulse duration).

All parameters can be approximated in the transmission crystal band.

The Bibliography Data-Base supports all parameters.

The section "Experiment" allows you to input the result of the experimental investigation for comparison with the calculation results.





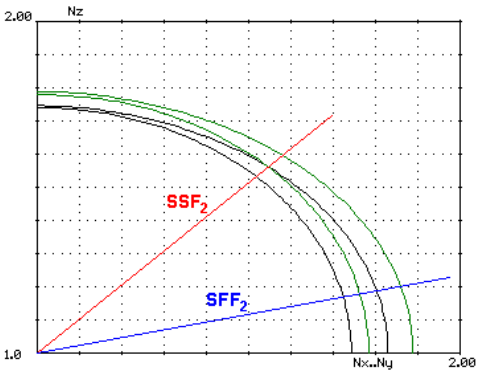
The section "Bibliography" allows you to select the bibliography references (more then 580 articles and books).

The program “Phase-Matching SHG” allows you to select the crystal and to calculate all integral parameters for second harmonic generation:

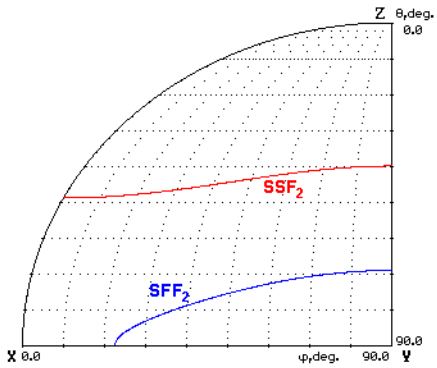
- phase-matching angles - φ and θ,
- phase-matching angular (internal and external), spectral and temperature bandwidths,
- “walk-off” angles,
- effective non-linear coefficients, and etc.

The information about phase-matching properties is represented in the 21 graph dependencies and tables form for all crystals.

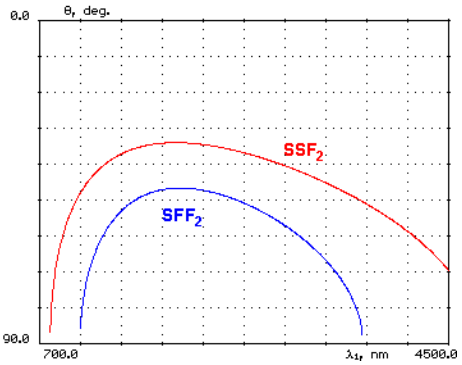
Only one example for widely used crystal KTP:



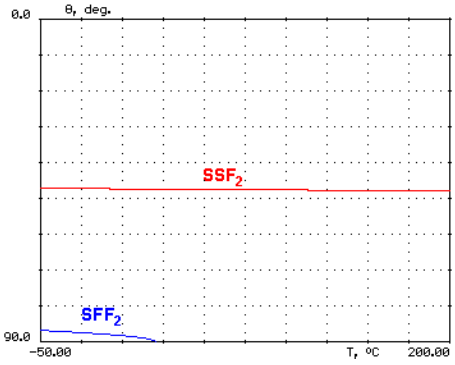
n(θ)



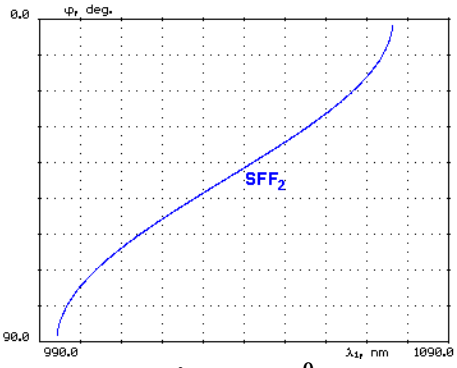
θ(φ)



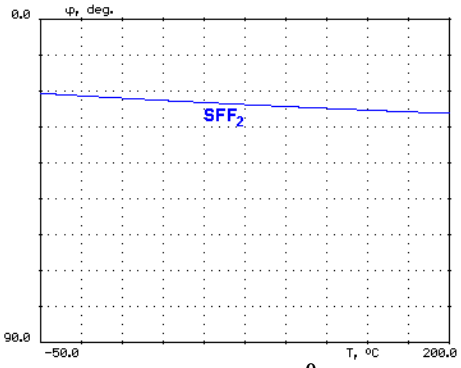
θ(λ)



θ(T)

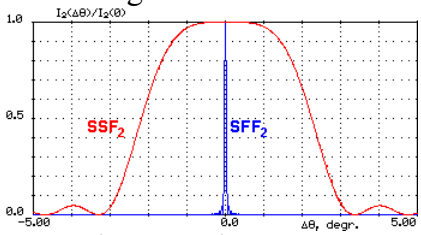


φ(λ), θ=90^0

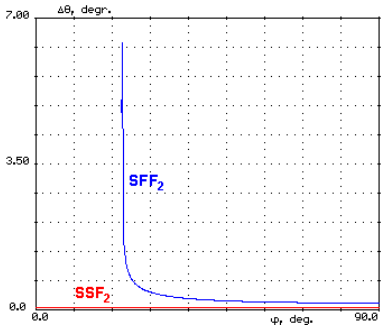


φ(T), θ=90^0

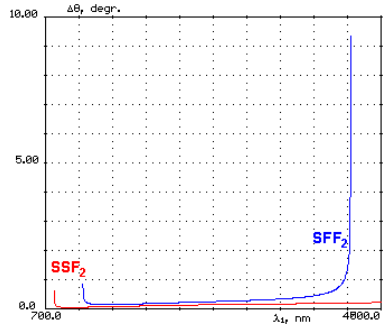
Angular width -Δθ



Phase-Matching Curve

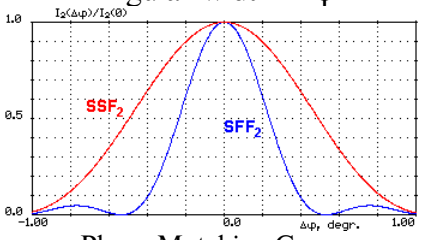


Δθ(φ)

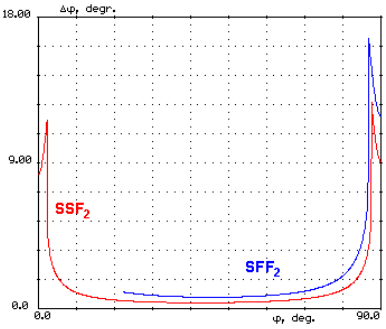


Δθ(λ)

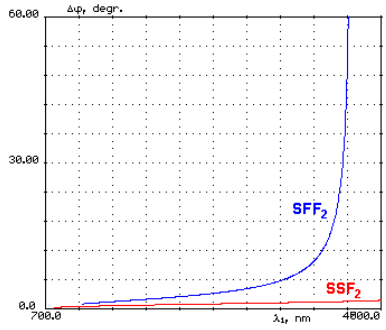
Angular width -Δφ



Phase-Matching Curve

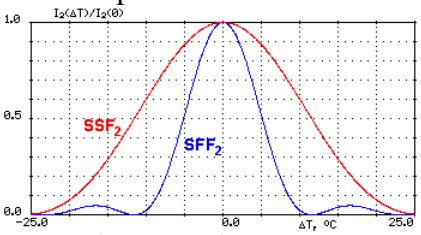


Δφ(φ)

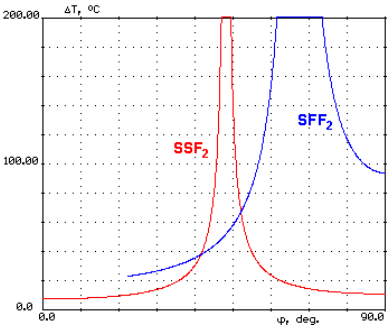


Δφ(λ)

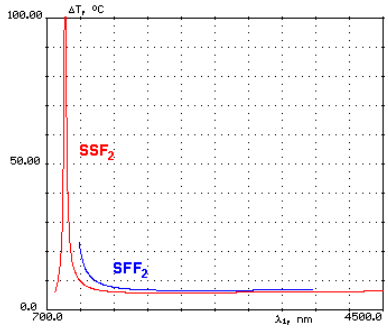
Temperature width -ΔT



Phase-Matching Curve

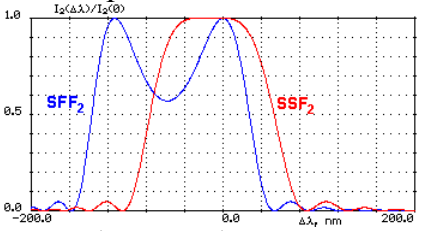


ΔT(φ)

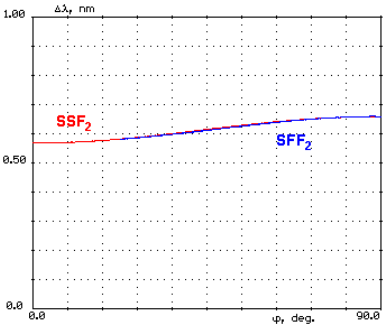


ΔT(λ)

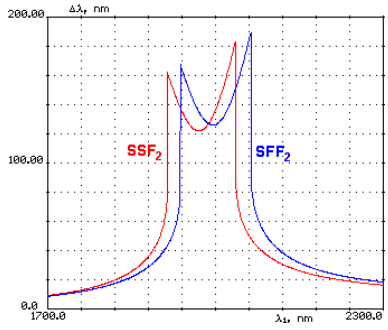
Spectral width -Δλ



Phase-Matching Curve

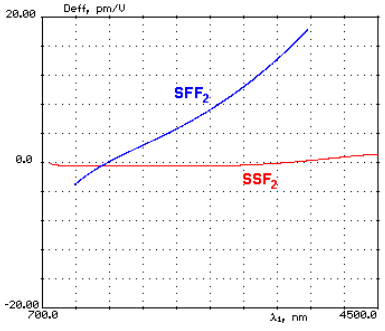


Δλ(φ)



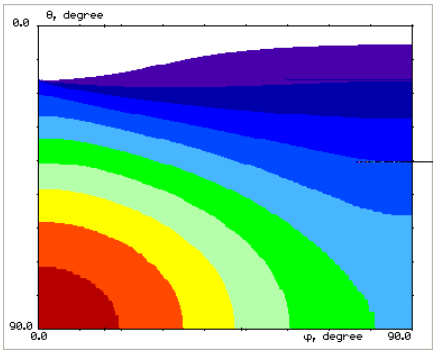
Δλ(λ)

Effective Nonlinearities.

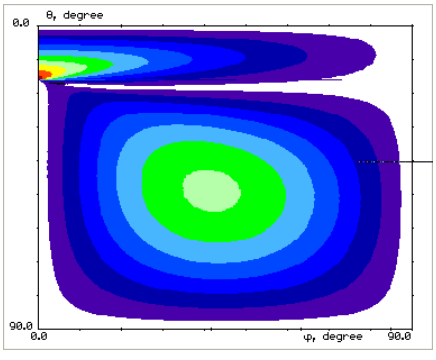


$D_{eff}(\lambda)$

SFF



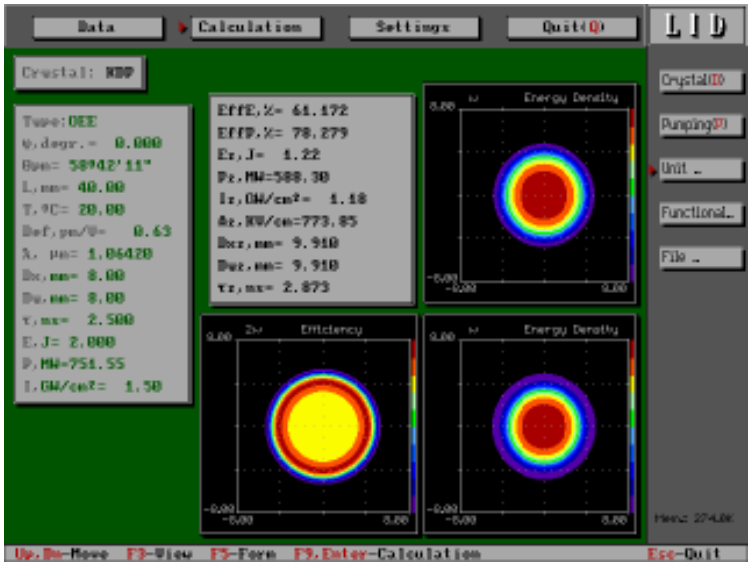
SSF



The program “SHG-MPW” (Second Harmonic Generation - Modulated Plane Waves) allows you to calculate the frequency conversion parameters and distributions for second harmonic laser radiation.

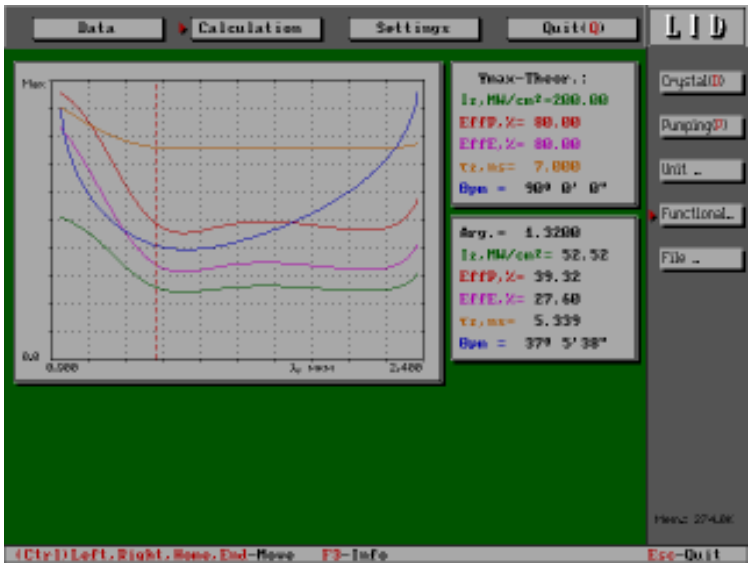
Initial Data:

- Working Data Base of Primary Crystal Parameters with dispersion dependencies for optical (absorption coefficient, threshold damage) and non-linear optical parameters (nonlinear susceptibility tensor coefficients and two-photon absorption).
- Amplitude-modulated laser beams (rectangular and elliptic) and pulses parameters.



Result of computation for efficiency of conversion in KDP crystal with two-photon absorption.

The computations are executing for power and energy density and for efficiency of conversion.

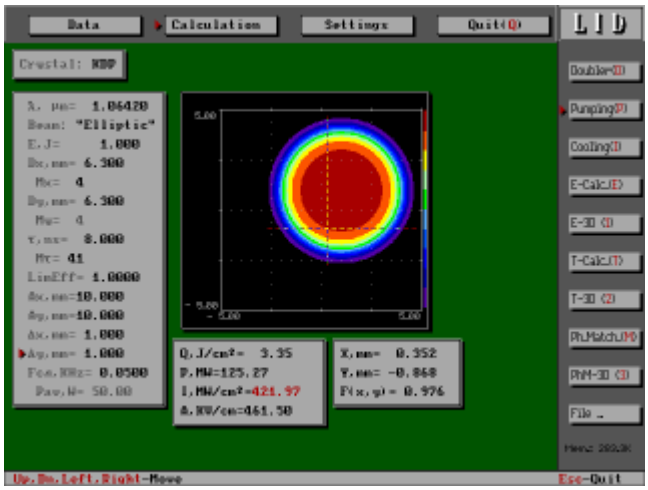


Dispersion dependencies for output parameters of second harmonic. Crystal - POM.

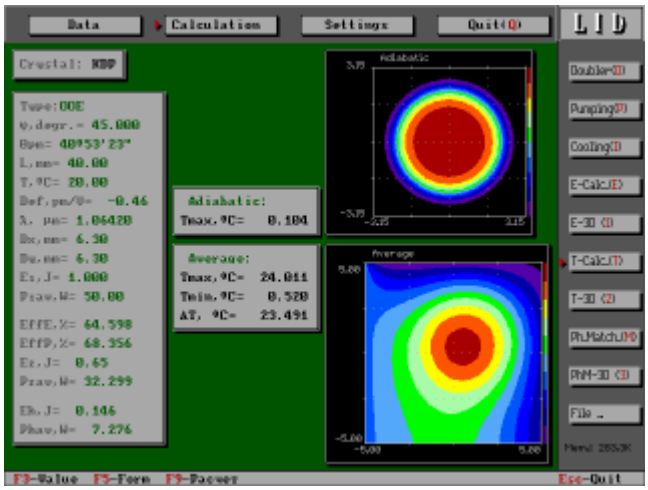
Very important possibility of program is the computation of the functional dependencies vs. all initial data.

The program “SHG-MPW-Heat” (Second Harmonic Generation - Modulated Plane Waves - Heat Processes) allows you to calculate the frequency conversion parameters and distributions for laser radiation with influence of a self-heat of crystal by laser and second harmonic radiation’s and inhomogeneities of a cooling. Program takes into account the linear and two-photon absorption (with dispersion) and different parameters of cooling for 1-st ant 3-rd types of boundary conditions independently on all surfaces. The computation is carrying out for following problems:

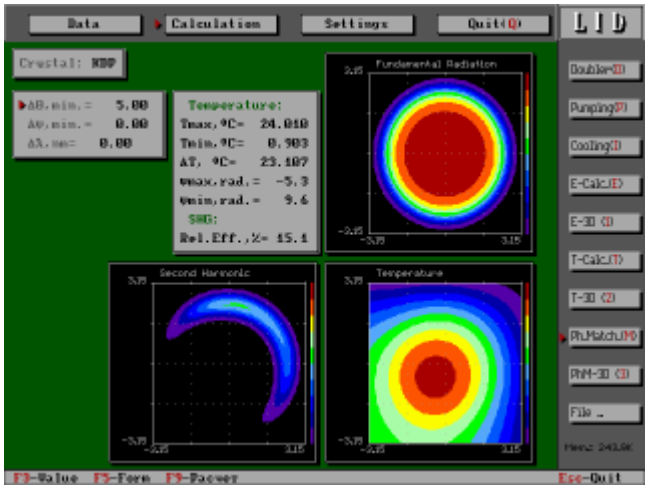
- efficiency of conversion,
- solution of a thermal problem (adiabatic and “average” heat),
- solution of violation of a phase-matching conditions.



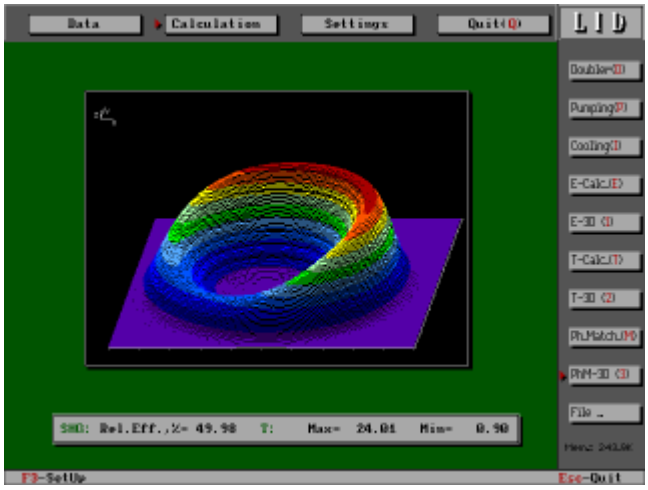
Geometry and pumping initial data.



Adiabatic and “average” heat of crystal.



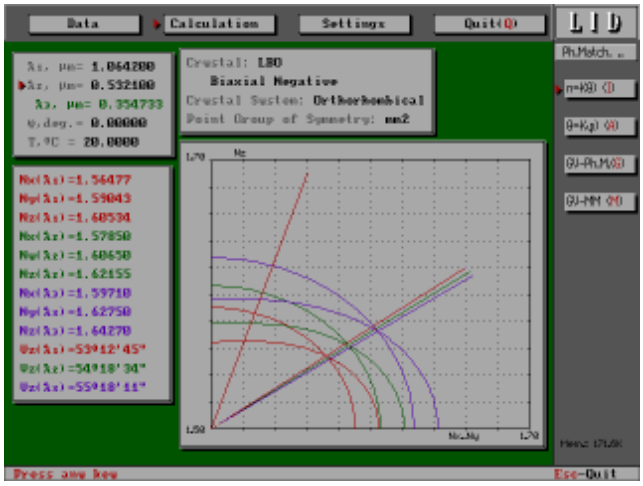
Subsection for computation of the violation of a phase-matching



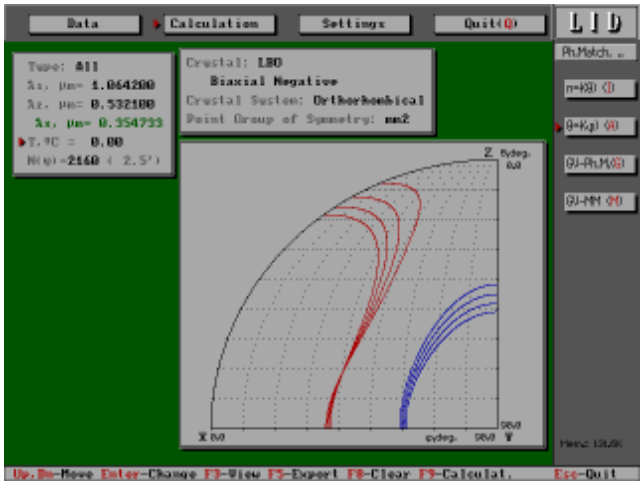
All results as 3D-graph are represented.

The program “LID-3WI - Phase Matching” (Three Waves Interactions - Phase Matching - SFG, SDG, OPO) (project at final stage) allows you to calculate the phase-matching conditions for Sum-Frequency, Difference-Frequency and Optical Paramatric Oscillation. It are the tuning curves vs. pumping wavelength, angles of orientation and temperature of a crystals; phase-matching directions distributions. Also program allows you to calculate the group-velocity phase-matching and group-velocity mismatch for short pulses frequency conversion.

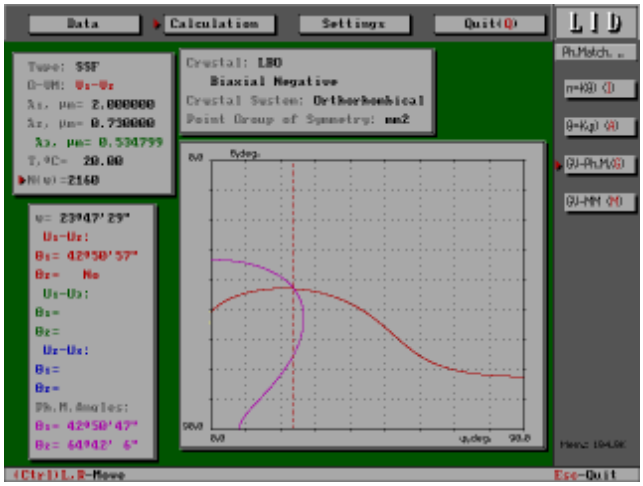
Working Data Base of Primary Crystal Parameters is used as initial data for computations.



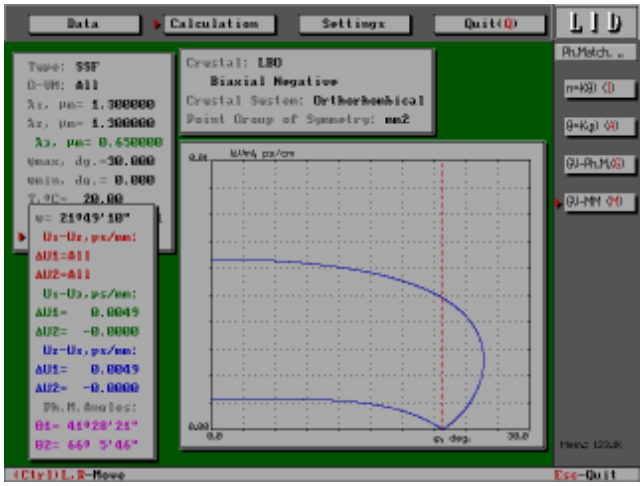
Indices of refraction, optical axis and phase-matching direction.



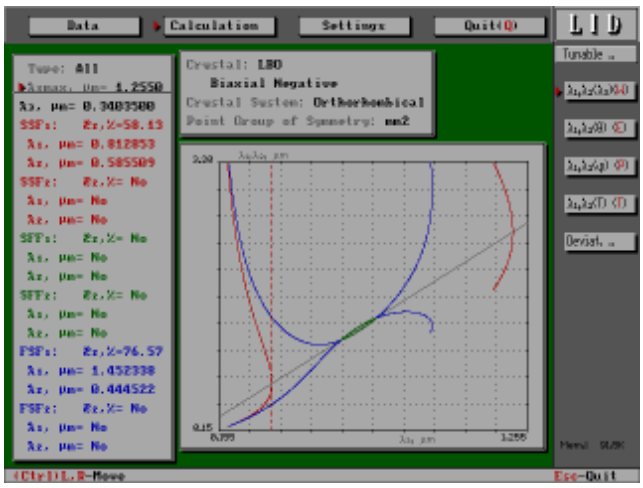
Phase-matching directions for different temperatures.



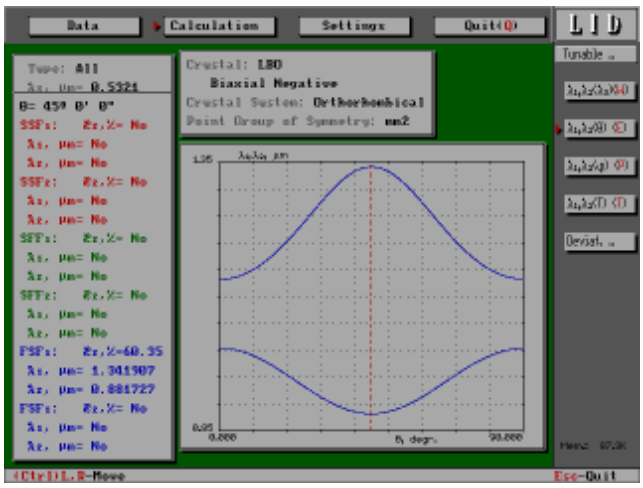
Phase-matching (violet) and group-velocity phase-matching (red) directions.



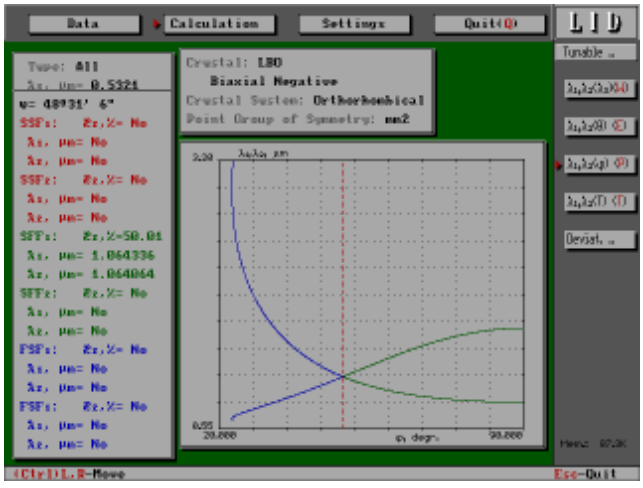
Group-velocity mismatch along phase-matching direction.



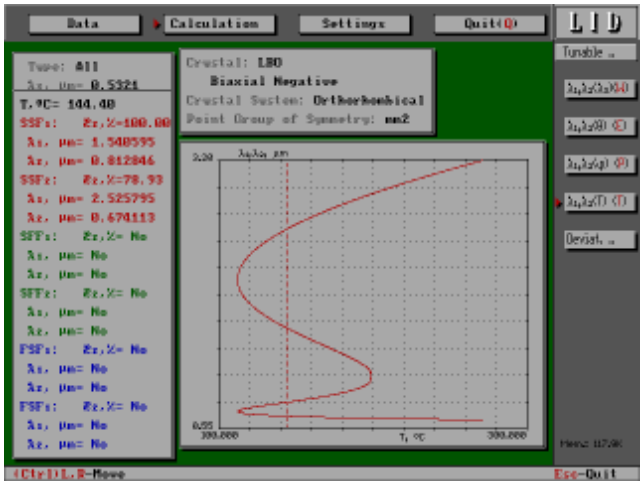
Tuning curves vs. pumping wavelength.



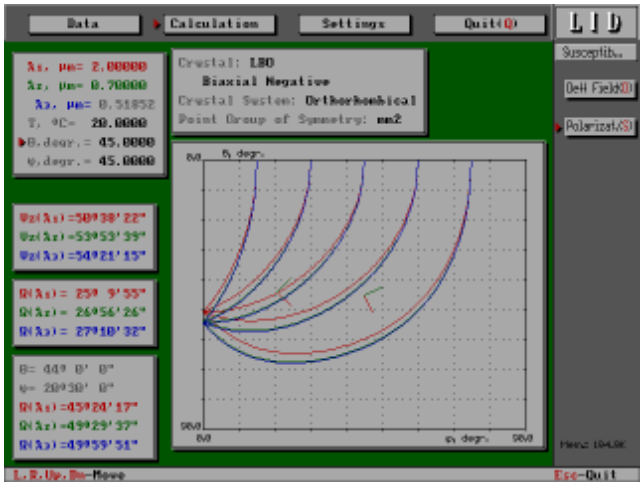
Tuning curves vs. angle θ.



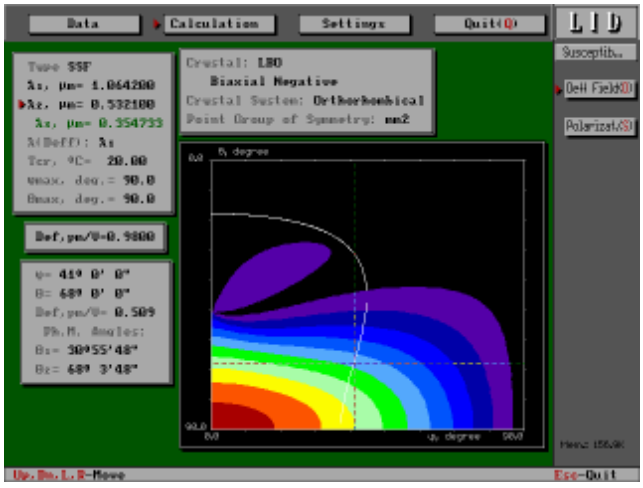
Tuning curves vs. angle φ.



Tuning curves vs. temperature.

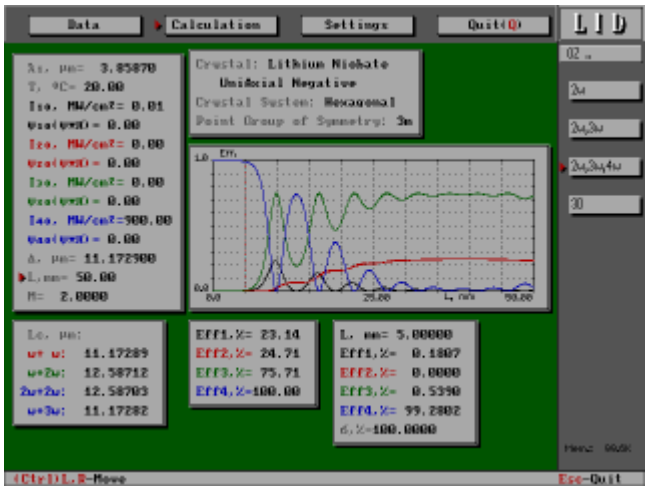


Orientations of self-polarisation.

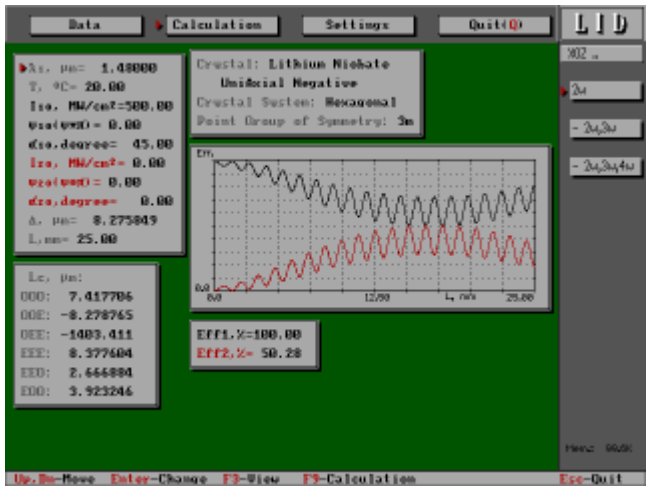


"Field" of effective non-linearity and phase-matching directions.

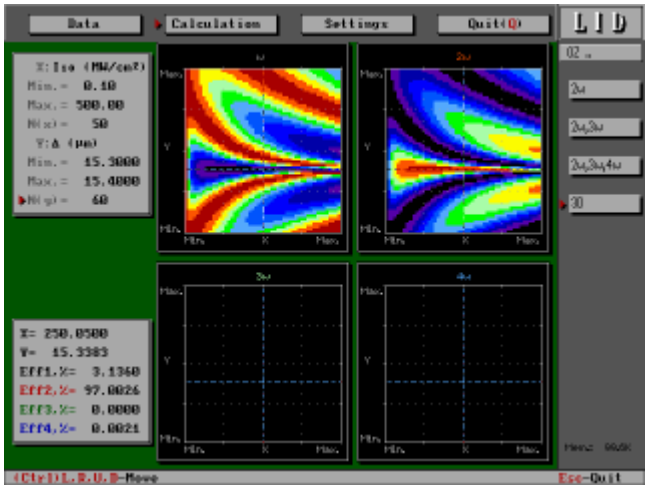
Frequency conversion in crystals with domain structure (periodically poled crystals). (Project)



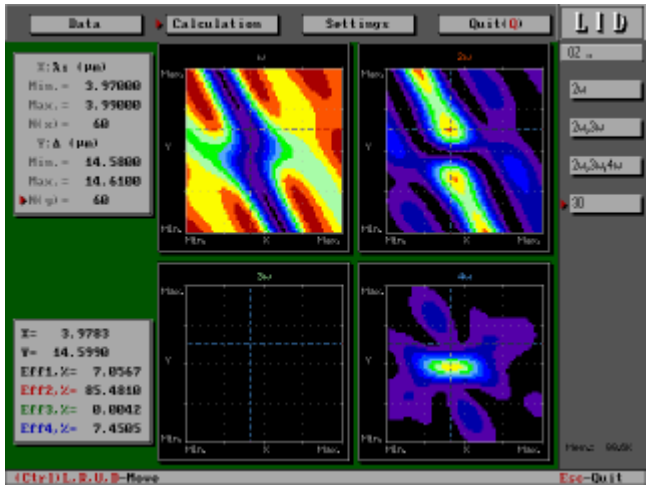
OPO with multiple frequencies.



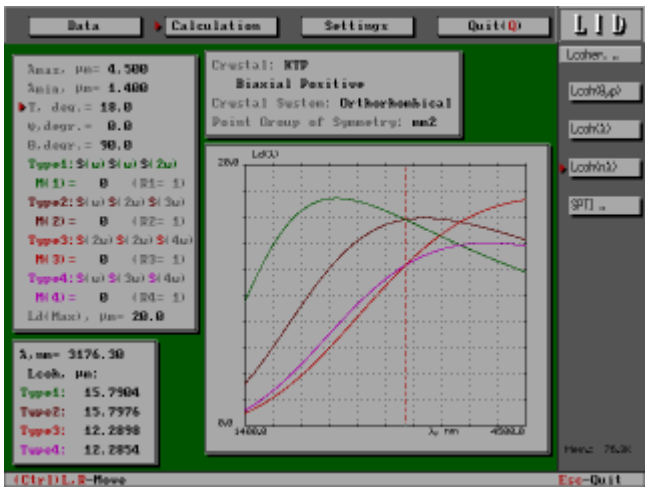
Result of concurrent processes for SHG.



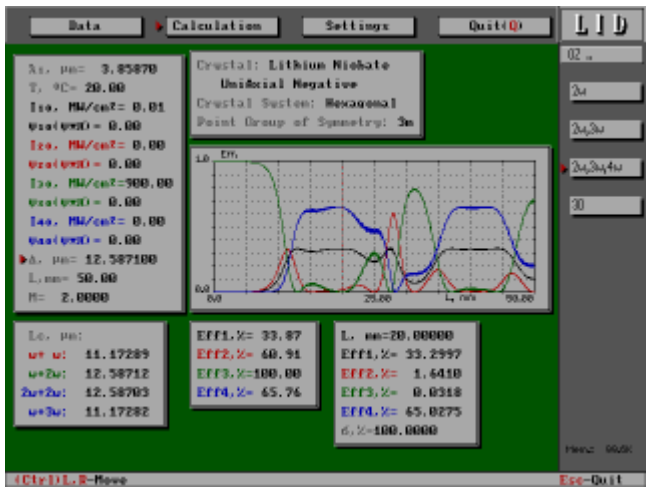
"Field" of efficiency of second harmonic generation versus power density of fundamental radiation and domain length.



Joint second and fourth harmonics generation. "Field" of efficiency versus fundamental radiation wavelength and domain length.



Domain length for quasi-phase-matching versus wavelength for different types of interaction.



Irregularity of solution for multi-frequency generation.

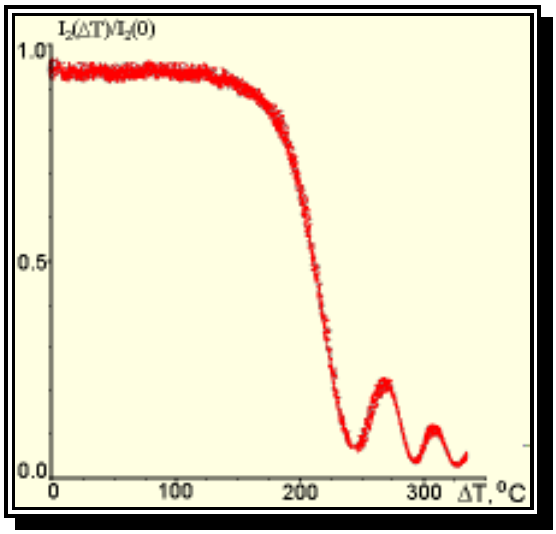
Only the program set LID-SHG allows you to carry out the complete analysis of a noncritical phase-matching for all parameters (angles, wavelength, temperature). With application of LID-SHG were obtained results for anomalously temperature-noncritical phase-matching in widely used crystal KTP (SFF-type of interaction) at wavelength 1064,2 nm.

S.G.Grechin, V.G.Dmitriev, V.A.D'yakov, V.I.Pryalkin. Quantum Electronics, 1998, v.28, №11, pp.937-938 "Anomalously temperature-noncritical phase matching in frequency conversion in nonlinear crystals".

S.G.Grechin, V.G.Dmitriev, V.A.D'yakov, V.I.Pryalkin. Quantum Electronics, 1999, v.29, №1, pp.77-81 "Temperature-independent phase matching for second harmonic generation in a KTP crystal".

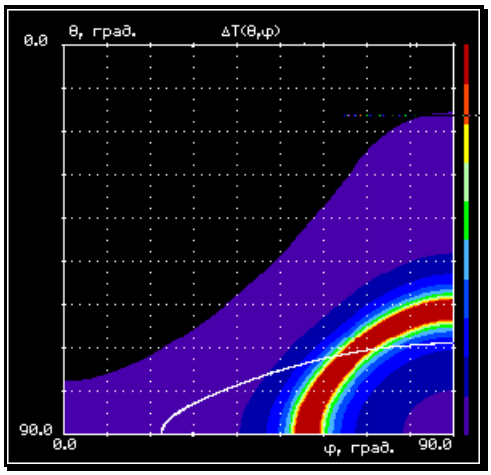
Copies of article you can take at http://www.bmstu.ru/~lid (Resent Publications).

This regime can be obtained for SFG, DFG, OPA, OPO and etc. in homogeneous media and in crystals with regular domain structure (periodically poled crystals).



Experimentally measured temperature bandwidth is equal 210 ^{0}C (for KTP crystal length 7,7 mm).

Temperature-noncritical (red) and phase-matching (white) directions for KTP crystal at 1064,2 nm (SFF-type). It is possible to obtain jointly the temperature-noncritical and angular-noncritical types of phase-matching.

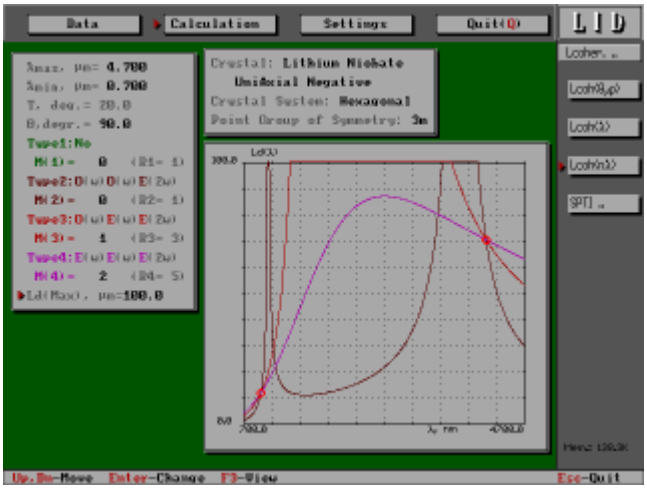


Only “LID-SHG-RDS” allows you to carry out an analysis for all possible combinations of types of interaction for simultaneous generation 2-nd, 3-d and 4-th harmonics of laser radiation: ooe, oee, eee and eeo, eoo, ooo for uniaxial crystals; ssf, sff, fff and ffs, fss, sss for biaxial crystals.

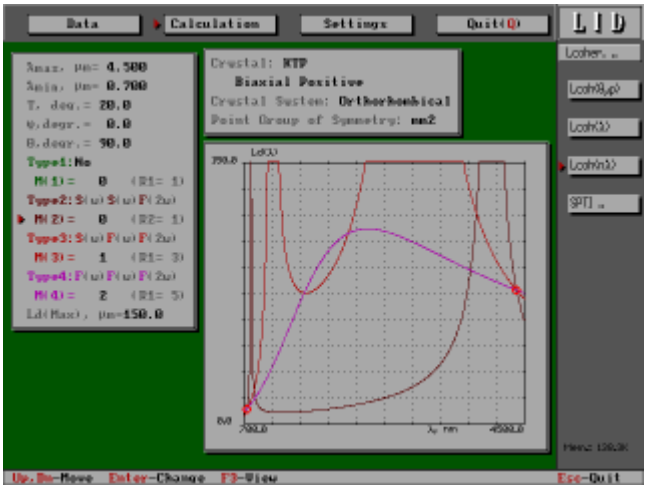
At the first time these results were published in:

S.G.Grechin, V.G.Dmitriev. Quantum Electronics, 1998, v.29, №2, pp.151-154 “Simultaneous generation of a second harmonic of laser radiation by three types of interaction in nonlinear crystals with a regular domain structure”.

Copy of article you can take at http://www.bmstu.ru/~lid (Resent Publications).



Dispersion dependencies for required domain length for $LiNbO_3$ crystal.
Red circles show the simultaneous generation.



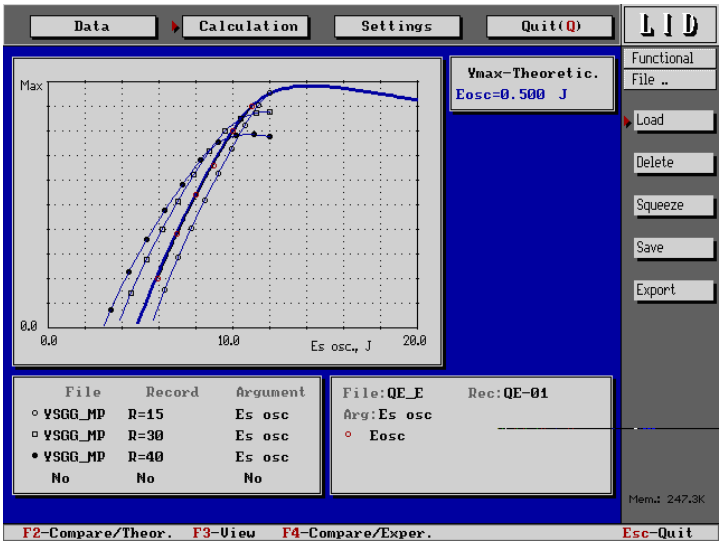
Dispersion dependencies for required domain length for KTP crystal.
Red circles show the simultaneous generation.

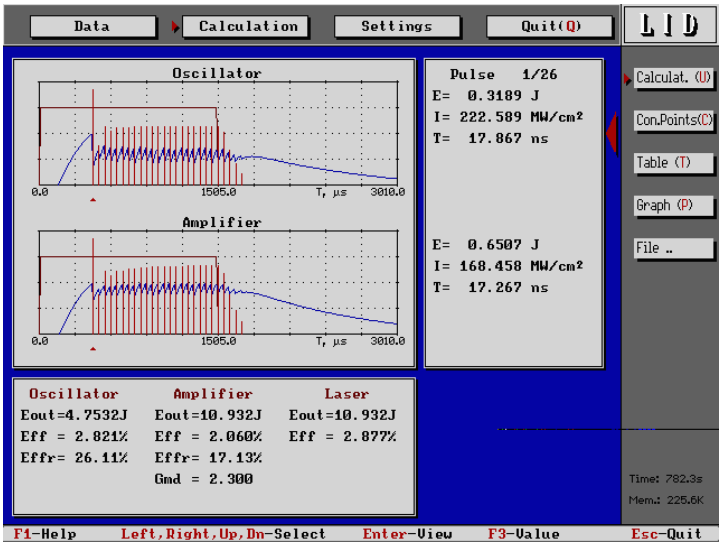
Bauman Moscow State Technical University
Scientific Research Institute of Radioelectronics & Laser Technology

LID - PSSL

Laser Investigator & Designer - Pulsed Solid State Lasers

Calculation Applied Program Set for the Investigation, Development and Design of Pulsed Solid-State Lasers





Solution of the professional and education tasks

LID - PSSL (Laser Investigator & Designer - Pulse Solid-State Lasers) is the Handbook-Calculation Program Set of the applied programs for the specialists training and professional calculations.

This program set allows you to make calculations for different laser elements, lasers and laser systems. The use of various mathematical models allows both quick and rigorous calculations with the account of fine laser physical phenomena.

This software package has been intended for the investigation and development of pulse solid-state lasers. It consist of five individual sections:

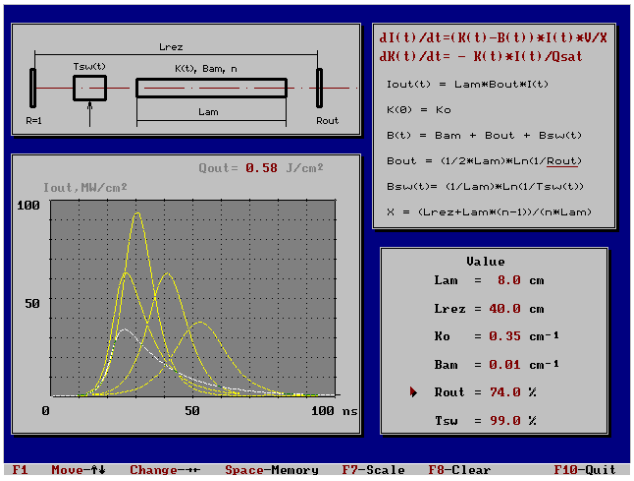
- "Student"
- "Expert"
- "Experiment"
- "Engineer"
- "Micro-Chip"

Program "Student".

Section "Student" has the simplest model and describes the most common generation approaches. You can change all of general laser parameters and the operation mode.

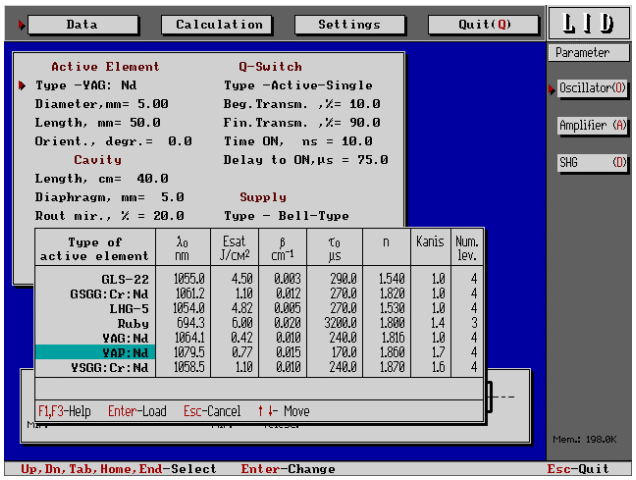
Time solution for differential equations is no more than 50 milliseconds. You can display the results as it is on the oscillograph screen.

There is a possibility to present a set of calculation results at different initial conditions, e.g, at the gain medium change or output mirror reflection.



Program "Engineer".

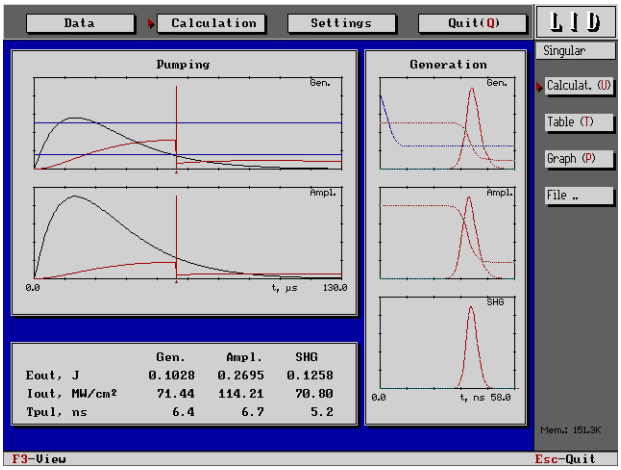
Section "Engineer" of the program allows you to make the calculation of the laser due to the scheme: master-oscillator - amplifier - frequency doubler with different elements. The calculation is based on averaged kinetic equations. This part is used for the education process (lectures, seminars, diploma works, etc.) and for the engineering works.



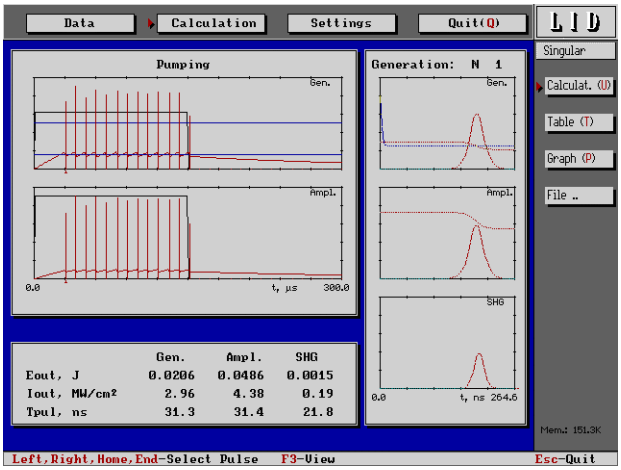
Active Elements Data Base in the section “Oscillator”

All initial data are technically measured parameters. Special Data Base contains active elements parameters.

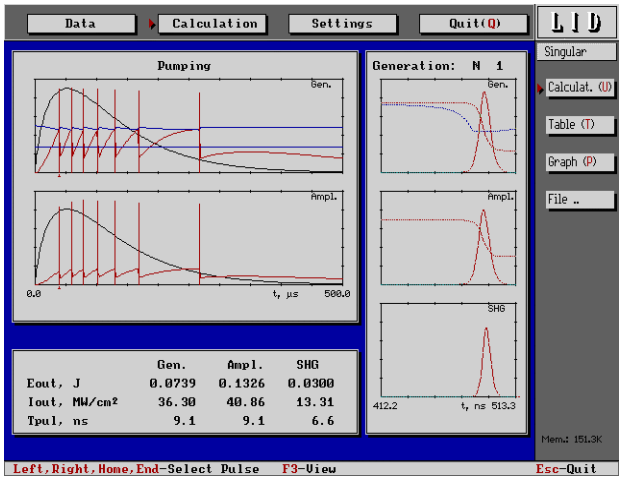
The program allows you to calculate temporal dependencies for generation parameters with single and periodical active Q-switch.



Temporal distributions for the active Q-switch YAG:Nd^{3+} laser (monopulse regime).



Temporal distributions for the active Q-switch YAG:Nd^{3+} laser (serial pulse regime).

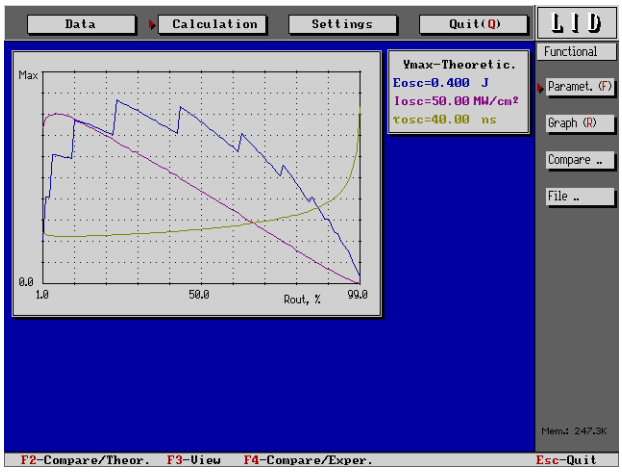


Temporal distributions for the passive Q-switch YAG:Nd^{3+} laser.

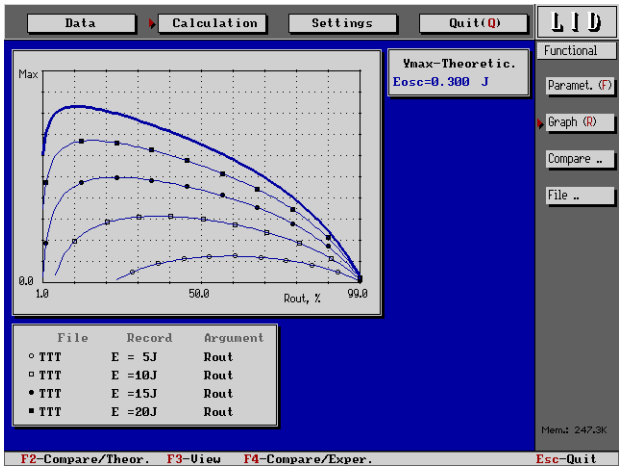
Also for the passive Q-switch laser output parameters can be calculated.

Section “Engineer” allows you to calculate also the functional dependencies. You can change the following laser’s parameters for functional calculations:

- Supply Energy and Duration for Oscillator and Amplifier,
- Time delay of the Pump pulse for Oscillator or Amplifier,
- Length of Active Medium for Oscillator and Amplifier,
- Output Mirror Reflection,
- Length of the non-linear crystal for Second Harmonic Generation,
- Initial and Finishing Transmittance of passive Q-Switch,
- Length of Cavity,
- Q-Switch’s Time On,
- Delay to Q-Switch On,
- Non-axial Losses, etc.



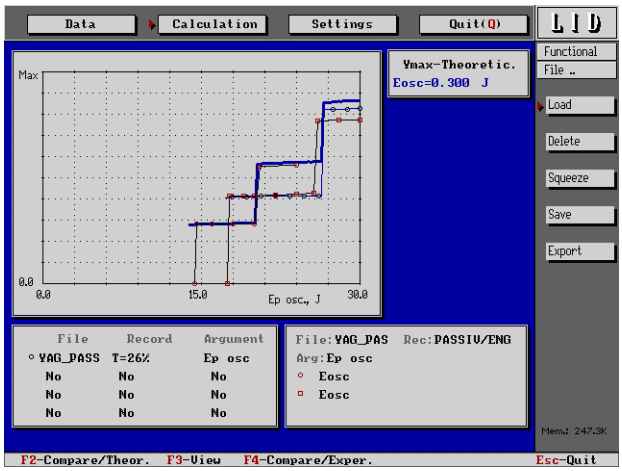
Functional dependencies for the passive Q-switch YAG:Nd^{3+} laser from the output mirror reflection.



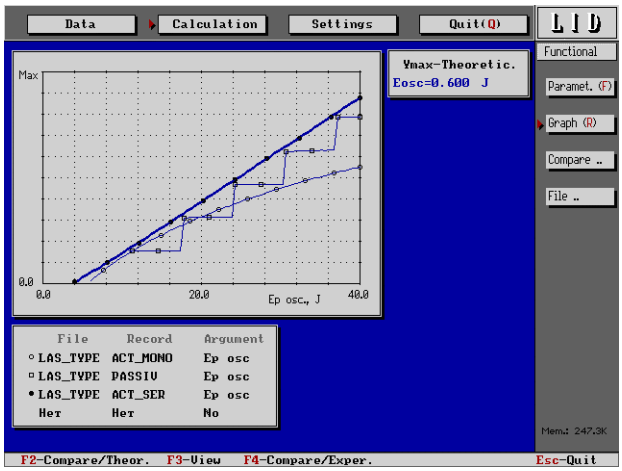
Output energy versus of the output mirror reflection.

Program “Engineer” has the regime “Comparison” for modelling lasers on the experimental data.

Results of modelling allow you to carry out the faithful development and design of the lasers



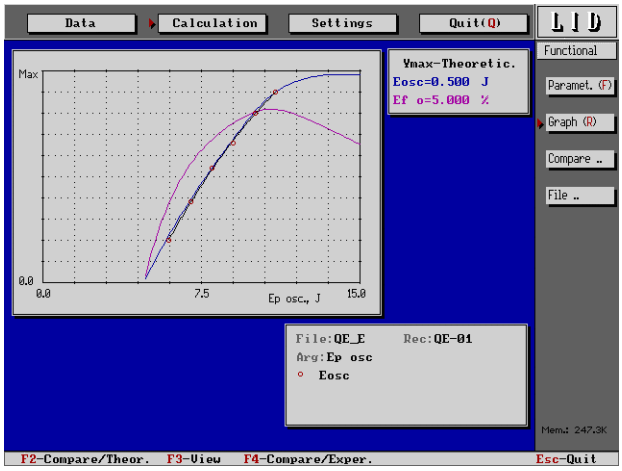
Result of modelling the passive Q-switch YAG:Nd^{3+} laser on the experimental data.



Comparison results for the lasers with various types of Q-switch.

Program “Engineer” allows You to compare various regimes for the lasers.

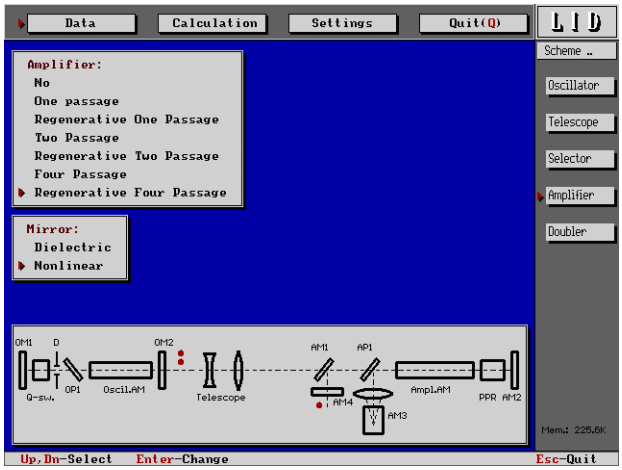
You can carry out the comparison of various types of lasers.



Result of modelling the active Q-switch YSGG:Nd^{3+}:Cr^{3+} laser on the experimental data.

Program “Expert”.

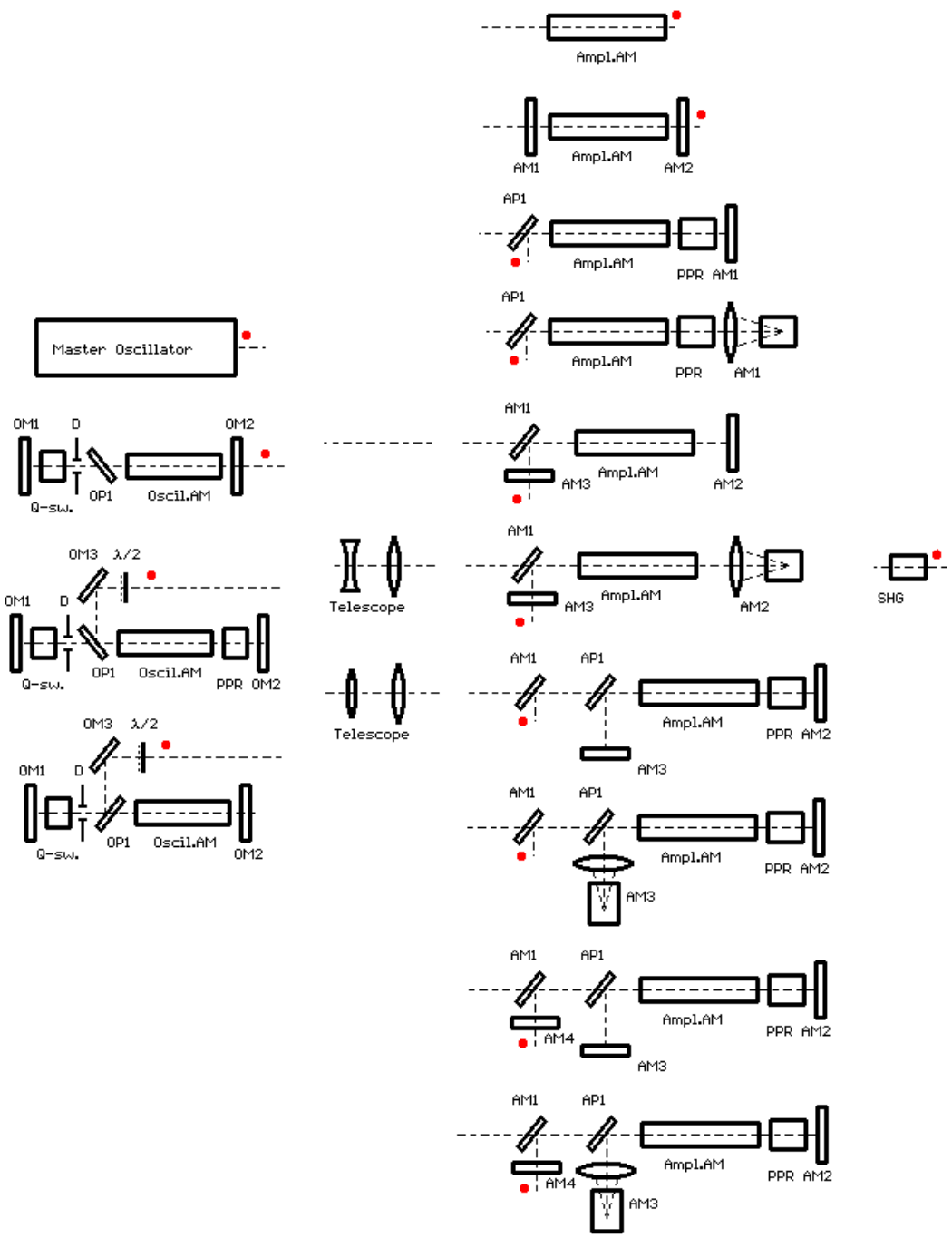
This section of the program set is based on a strict mathematical models taking account of optical element quality, encountering interaction of radiation fluxes with various polarisation, and mutual influence of cascades, and etc.



Section “Selection optical scheme configuration”.

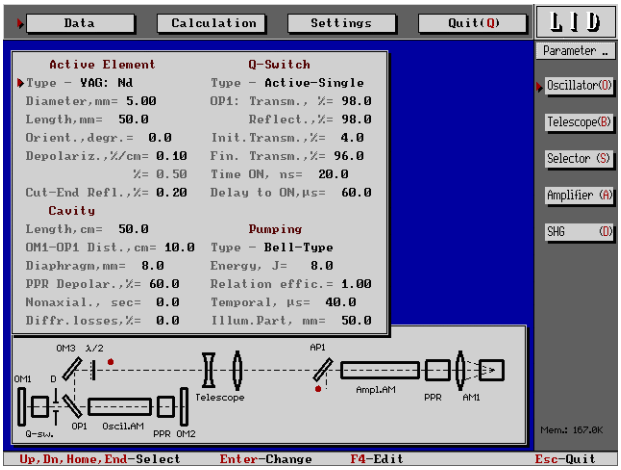
A number of optical schemes - about 200 (4 master-oscillators, 10 amplifiers, telescopes, doubler, and etc.).

Optical Schemes.



Master-Oscillator Telescope Amplifier Doubler

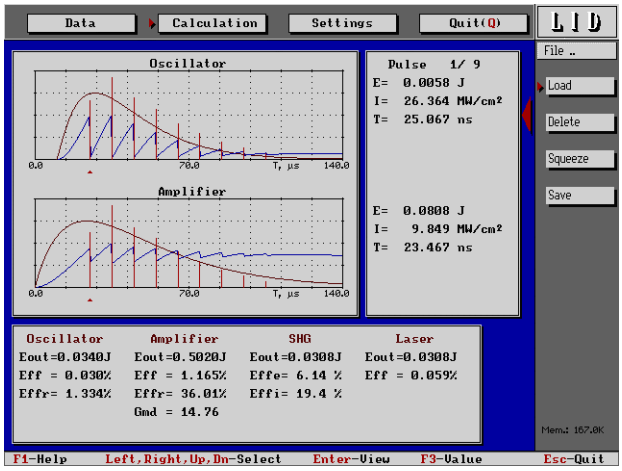
Program “Expert” supports two type of mirrors (into the amplifier) - the dielectric (thin-film) and non-linear (Stimulated Brillouin Scattering) mirrors. There are beyond ten basic types of active medium contained in the program.



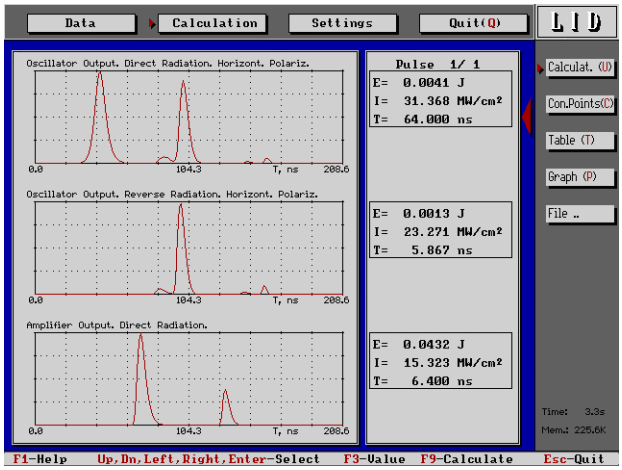
Subsection “Master-Oscillator“ parameters.

Calculating results are in good agreement with the experimental results.

The calculations are made for arbitrary points of optical schemes and are presented as graphs or tables.



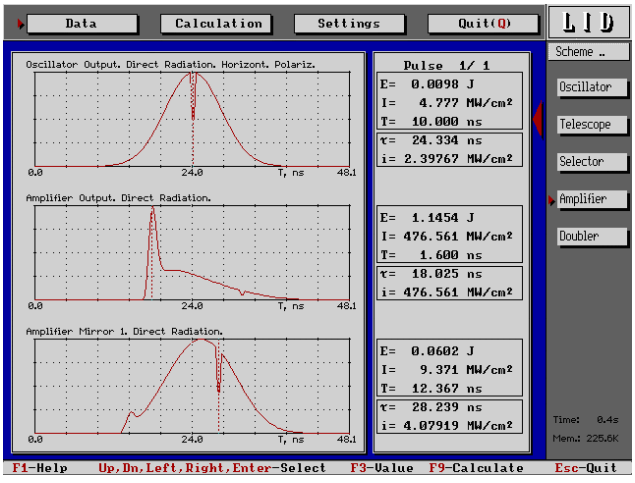
Serial pulse generation mode in the pumping scale.



Example of the mutual influence between the cascades (oscillator and 2-pass amplifier).

The pictures illustrates the example of the temporal calculations for the various laser systems.

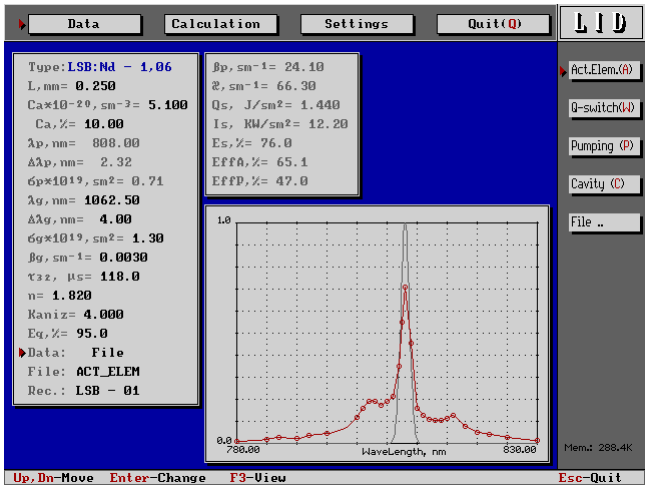
Program allows you to carry out the precision investigation of the output parameters forming.



“Super-light” propagation of the amplification pulse.

Program " Micro-Chip" .

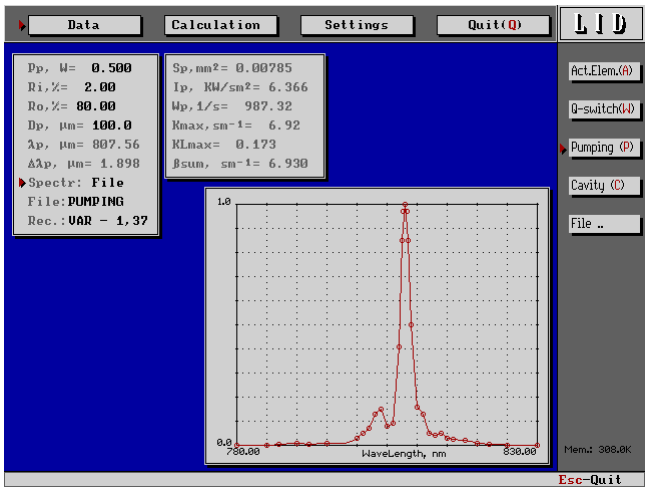
Program " Micro-Chip" is intended for analysis of diode end-pumping solid-state lasers in quasi-CW mode (with passive Q-switch).



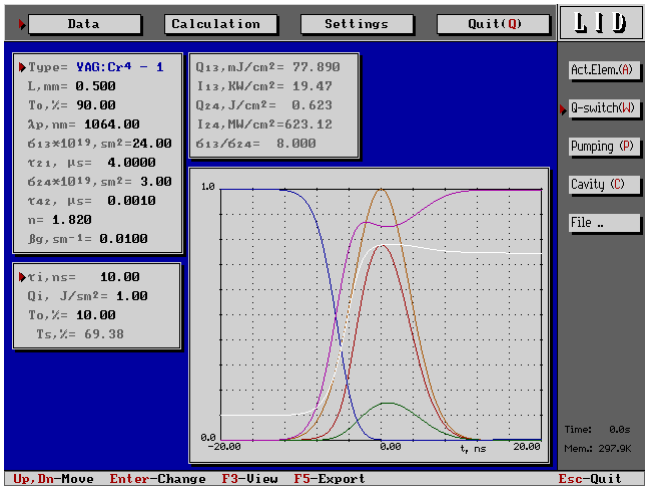
Section “Active Element“ parameters.

You can edit all parameters of an active element. For active element absorption you may take model distribution or load experimental results from the file.

Program takes into account spectral width of absorption of an active element, spectral width of pumping radiation and spectral mismatch between ones.

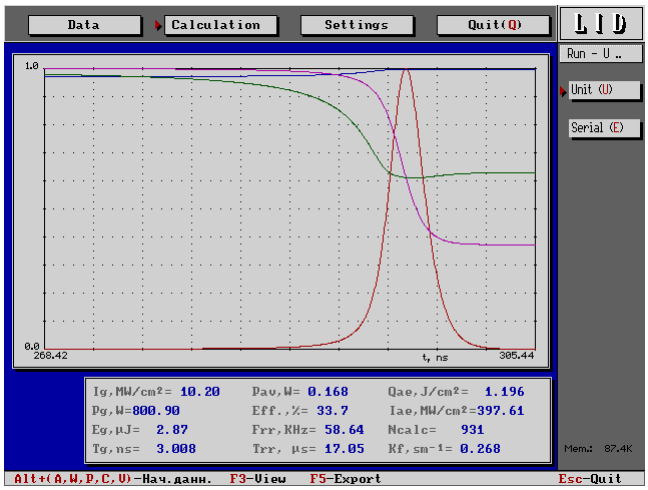


Section “Pumping“ parameters.



Section “Q-switch“ parameters.

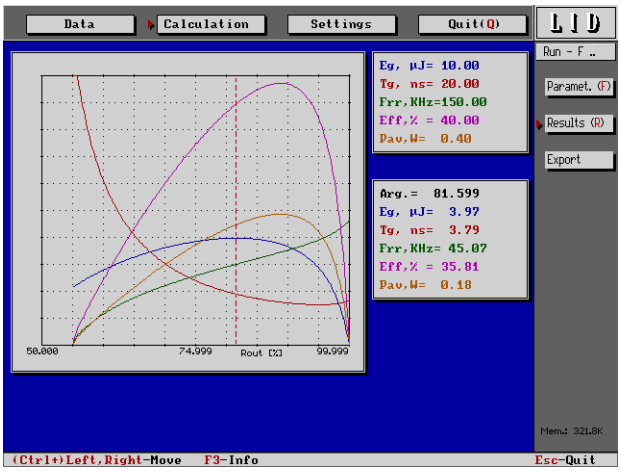
Four levels model for Q-switch is used in program. You can edit all parameters and calculate energy and temporal dependencies for Q-switch.



Section “Temporal“ computations.

You may execute temporal computations and obtain results for all integral parameters of output radiation - energy, peak power, pulse-width, average output power, frequency and period of repetition rate, efficiency and etc.

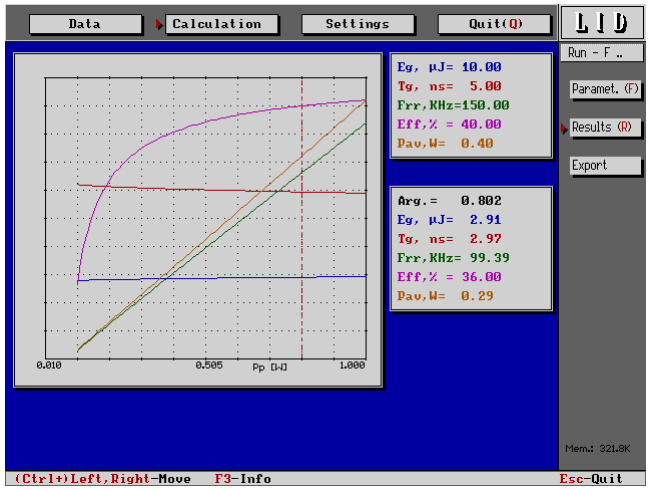
Very useful part of program is the section “Functional computations”. In this section you can execute computations for output parameters of laser radiation versus parameters of initial data.



Output parameters vs. output mirror reflection.

Output parameters vs. Q-switch initial transmi s-sion.

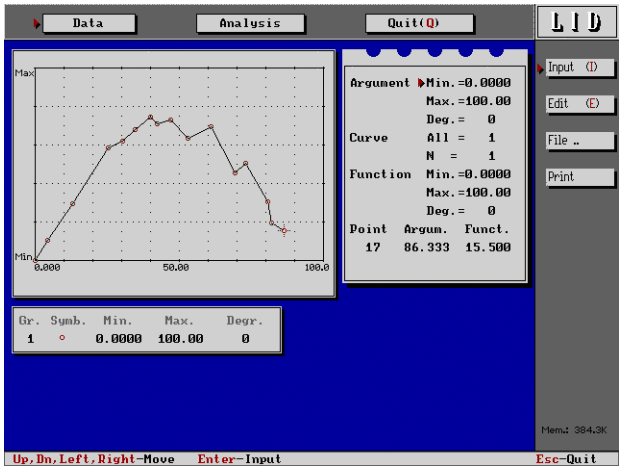
Functional computation results allow you to carry out the complete optimisation of a laser for different applications.



Output parameters vs. pumping power.

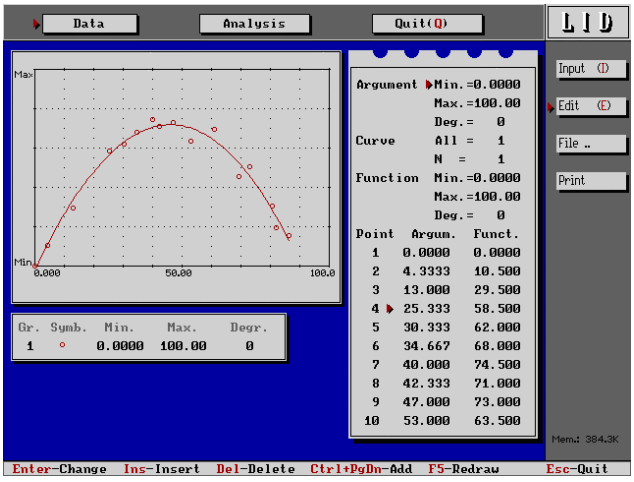
Program "Experiment".

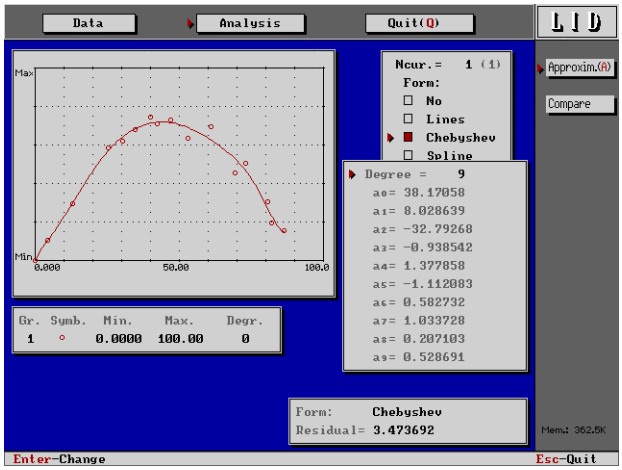
Section "Experiment" is the program for analysis and data process, for example, experimental and calculating data results from various publications.



All the results are stored with the necessary comments, they can be used by other LID-programs as initial data for computations or as experimental data for comparison with computation results.

The data can be input in the graphic or table modes.





The results can be approximated in different ways.

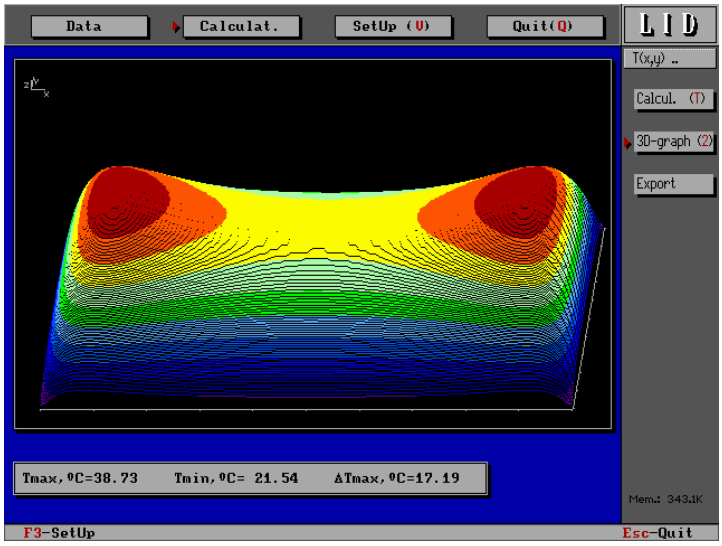
Bauman Moscow State Technical University
Scientific Research Institute of Radioelectronics & Laser Technology

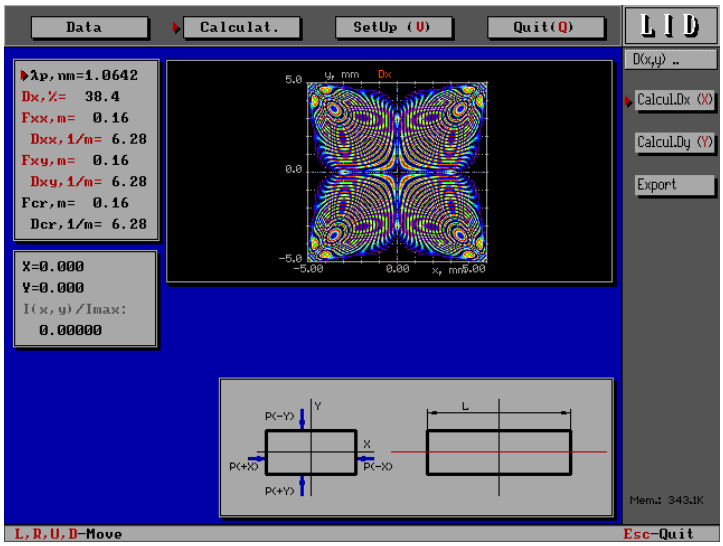
General Physics Institute of Russian Academy of Sciences

LID - DPSSAE

Laser Investigator & Designer - Diode Pumped Solid-State Active Elements

Applied Program Set for Investigation, Development and Design of Solid-State Lasers.





Solution of the professional and education tasks

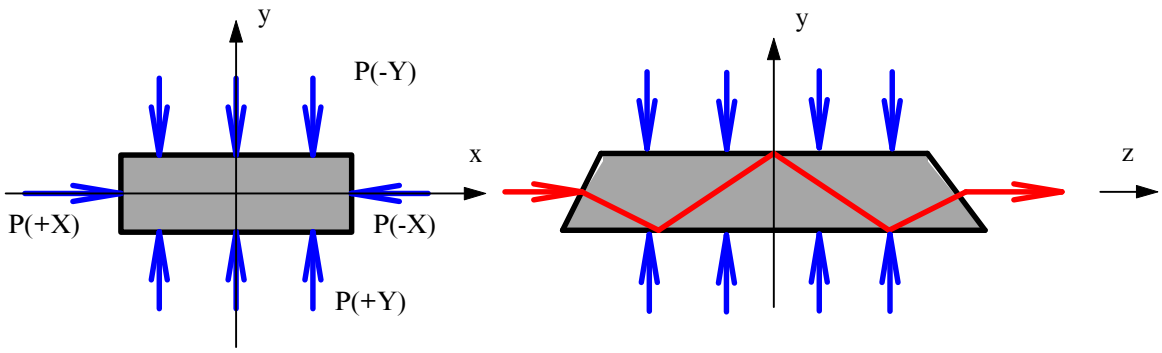
LID - DPSSAE (Laser Investigator & Designer - Diode Pumped Solid-State Active Elements) is the applied program set for solution of the professional (investigation and development) and education tasks.

LID-DPSSAE-R program allows to carry out the computations of pumping processes for rectangular form of solid-state active elements.

Computation Subsections:

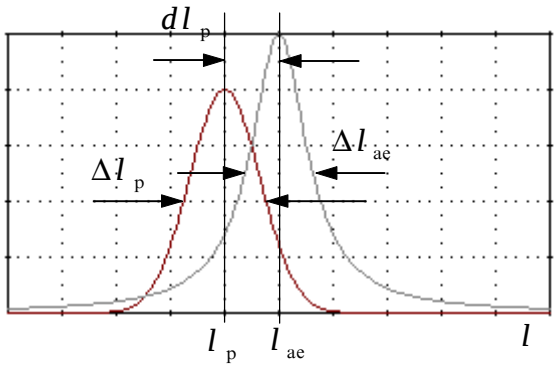
- Volumetric power heat-release in the active element,
- Temperature distribution on the active element cross-section,
- Distributions of thermoelastic stresses on the active element cross-section (σ_x, σ_y and σ_{xy}),
- Active element optical length increasing for the laser radiation,
- Depolarisation for the probe laser radiation passed through the active element (conoscope picture) - direct and zig-zag propagation,
- Values of the focal length.

The optical scheme.

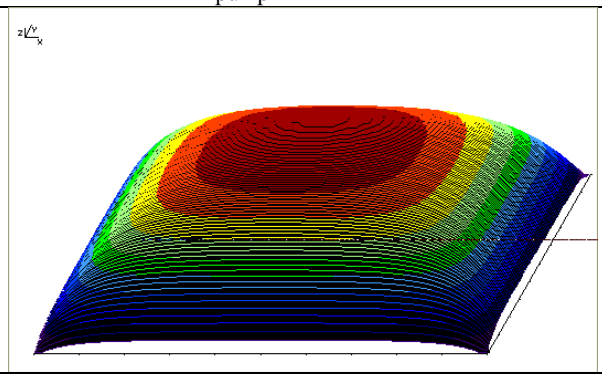
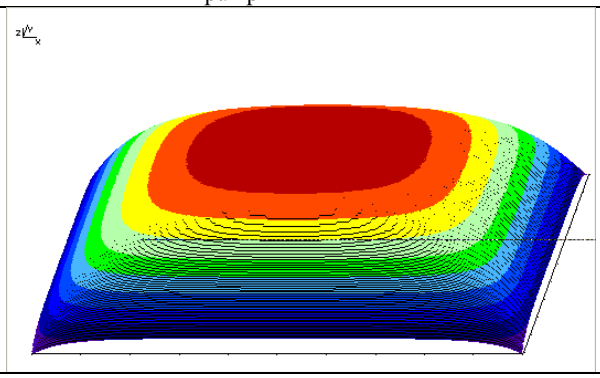
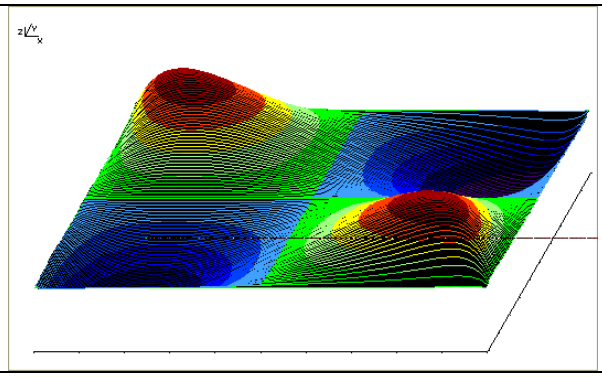
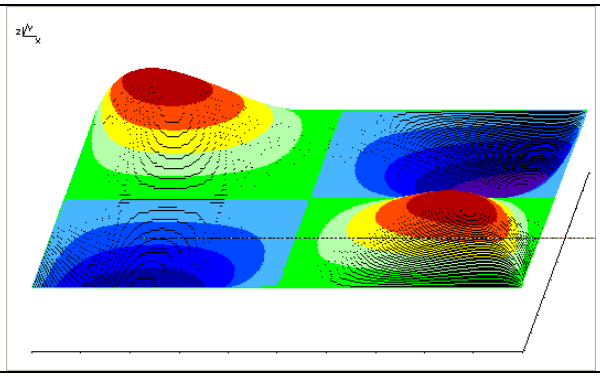
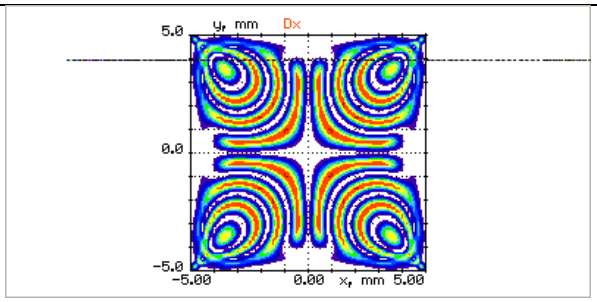
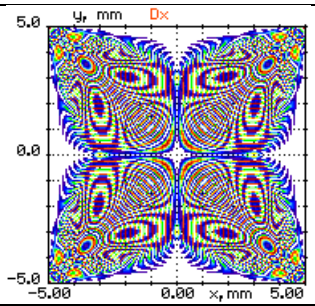


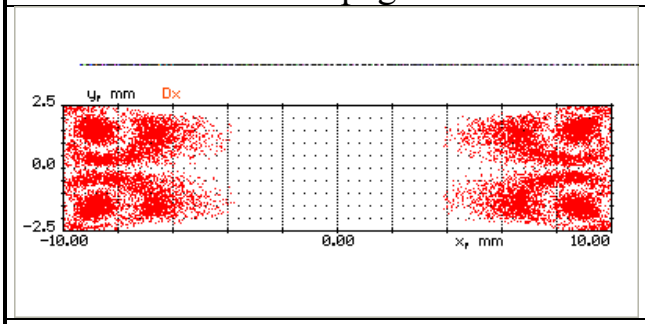
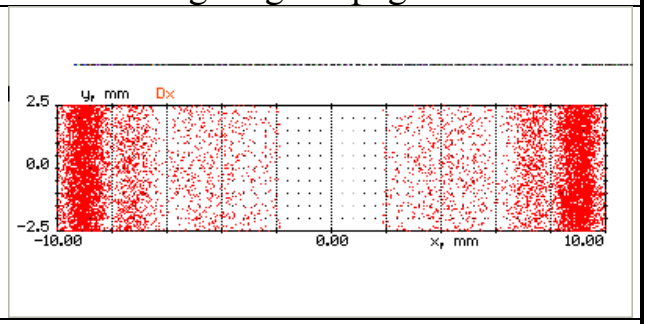
The models take into account the following:

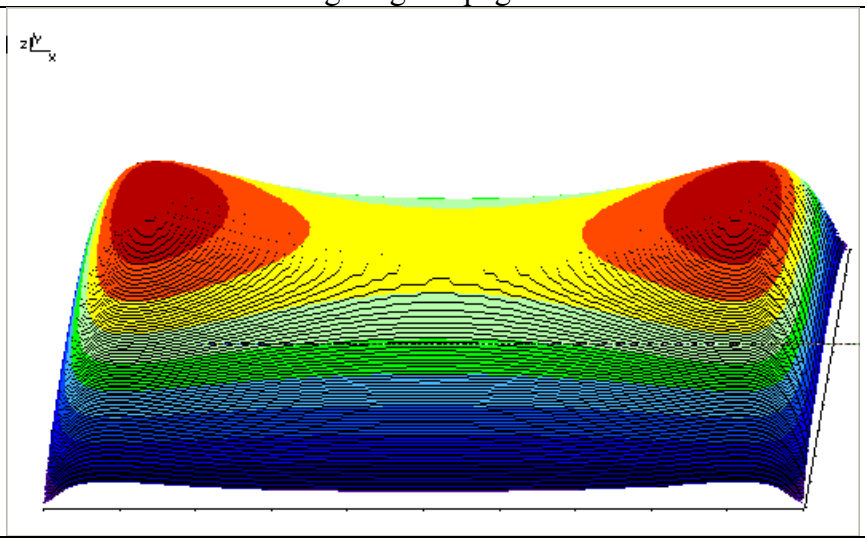
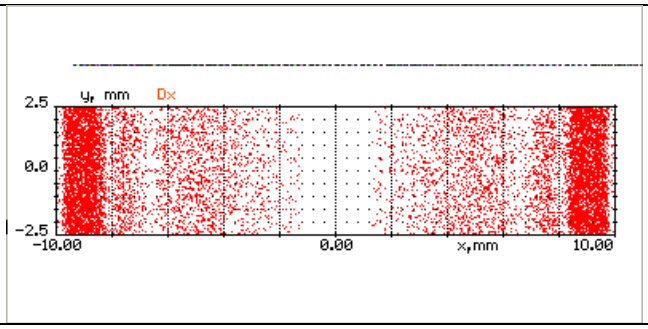
- Finite quality of the pumping surfaces.
- First and third type of boundary conditions for temperature task.
- Possibility to calculate one- and two-passage pumping in cross-section of the active element.
- Finite spectral width for the pumping power Δl_p and absorption of the active element Δl_{ae},
- Spectral mismatch between central wavelengths of the pumping power and absorption of the active element dl_p,
- Different power for four pumping flows,
- Variation for active element concentration and pumping cross-section transient.
- Direct and zig-zag propagation of laser radiation.



The spectral distributions for an active element absorption and radiation of pumping.

Square Cross-Section Active Element (10x10x100 mm) YAG:Nd $^{3+}$ [001] Direct Propagation of Laser Radiation	
P_{pump}=4000 W	P_{pump}=20000 W
	
T_{max}=49,5 ^{0}C, ΔT=27,4 ^{0}C	T_{max}=168 ^{0}C, ΔT=139 ^{0}C
	
σ_{xy}=104,7 kg/cm^2	σ_{xy}=523 kg/cm^2
	
D=36,9%, F_x=F_y=0,78 m	D=38,4%, F_x=F_y=0,16 m

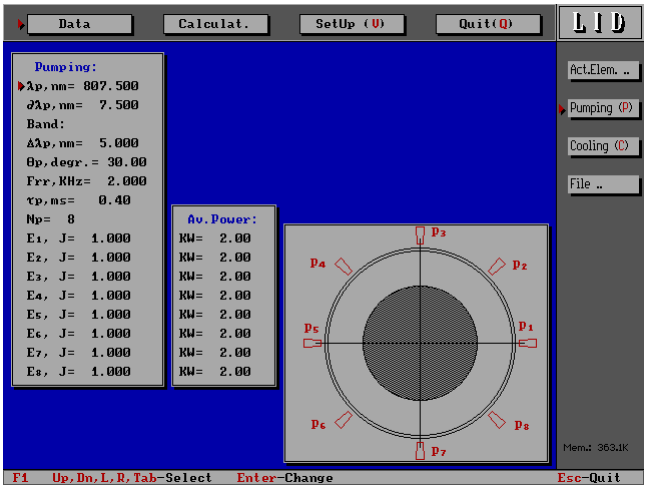
Rectangular Cross-Section Active Element (5x20x100 mm) YAG:Nd $^{3+}$ [001]	
P_{pump}=4000 W Direct Propagation	P_{pump}=4000 W Zig-Zag Propagation
	
T_{max}=40,3 ^{0}C, ΔT=20,3 ^{0}C	
D=15,9%, F_x=4,15 m, F_y=0,78 m, Fcr=10,3 m	D=11,2%, F_x=4,8 m, F_y=2685 m, Fcr=4,44 m

Rectangular Cross-Section Active Element (5x20x100 mm) YAG:Nd $^{3+}$ [001]
P_{pump}=4000 W [P(y)=P(-y)=1352 W, P(x)=P(-x)=648 W] Zig-Zag Propagation

T_{max}=38,7 ^{0}C, ΔT=17,2 ^{0}C

D=12,8%, F_x=4453 m !!!, F_y=-13988 m !!!, Fcr=58,4 m

LID-DPSSAE-C (project) program allows you to carry out the computations of pumping processes for cylindrical form of solid-state active elements inside the pumping cavity.

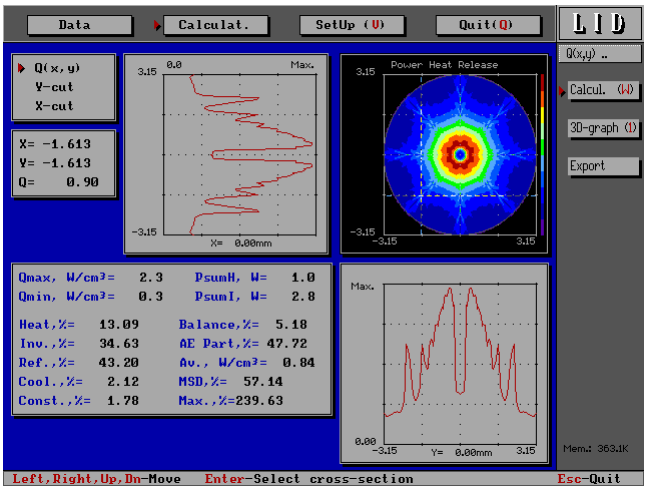
Computation Subsections:

- Volumetric power heat-release in the active element,
- Temperature distribution on the active element cross-section,
- Distributions of thermoelastic stresses on the active element cross-section (σ_x, σ_y and σ_{xy}),
- Active element optical length increasing for the laser radiation,
- Depolarisation for the probe laser radiation passed through the active element (conoscope picture),
- Values of the focal length.



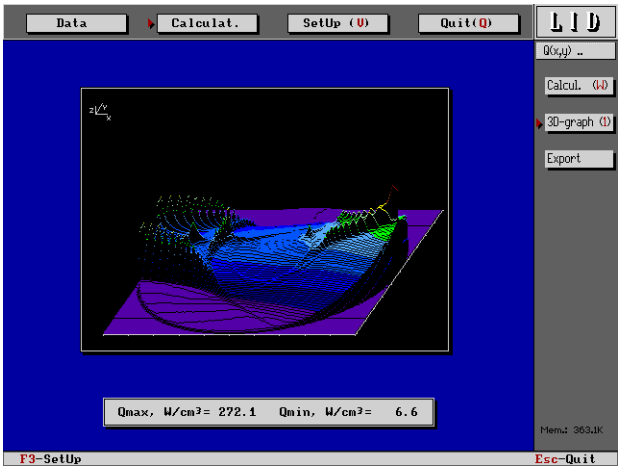
Initial Data for Pumping.

The computations are carrying out for cw- and pulsed pumping mode with different powers of sources.

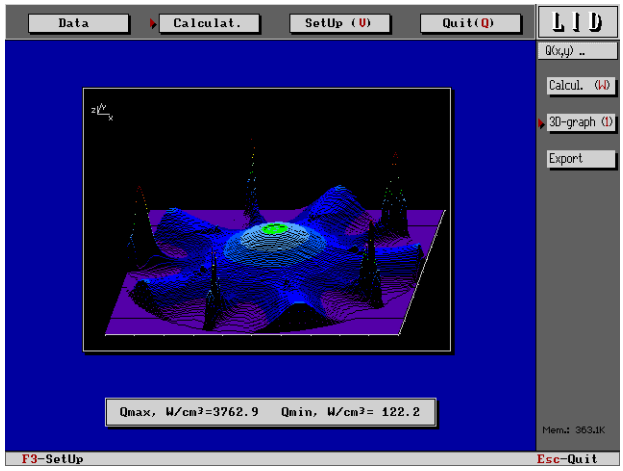


Pumping with large divergence of a sources.

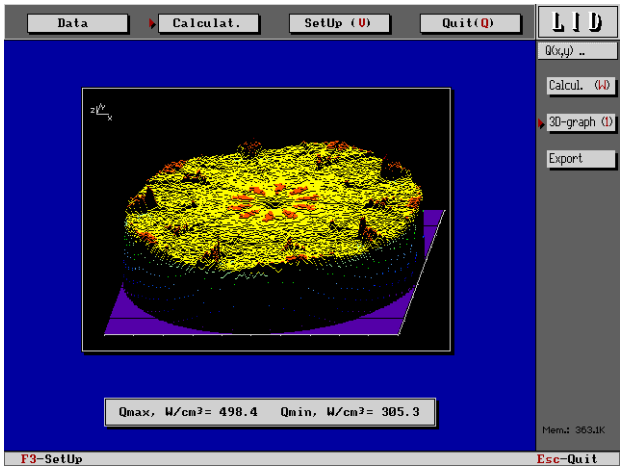
All results can be presented as 2D- and 3D-graphs. Complete information about energy balance is represented.



One-beam pumping.



Five-beam pumping.

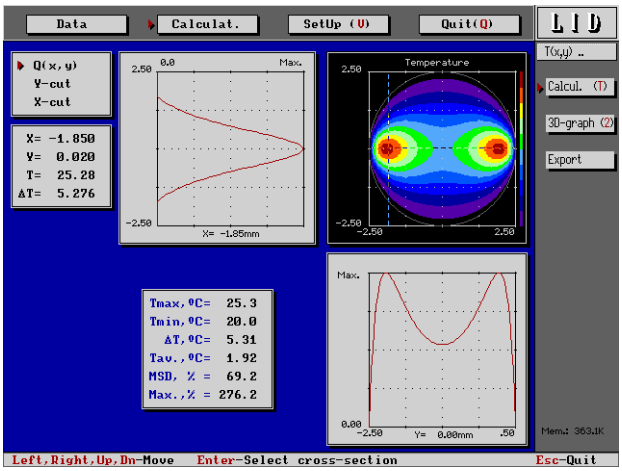


Result of optimisation on inversion population and heat-release homogeneity.

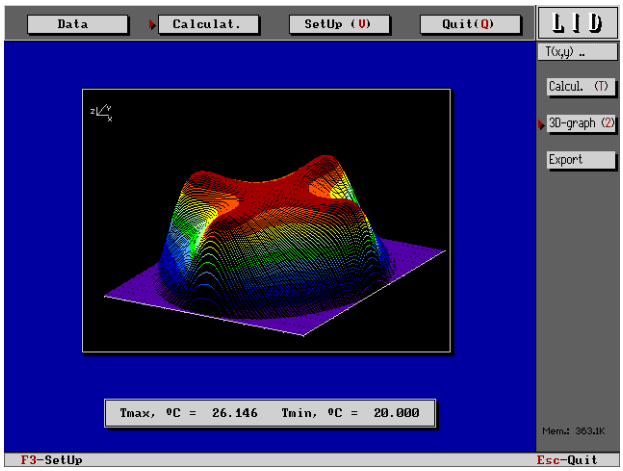
Program allows to carry out investigations of processes for different relations of pumping powers of sources.

You can make complex optimisation for obtaining homogeneity of an inversion population.

Temperature field's computations are carried out for different boundary conditions, for different relations of pumping power and geometry, pumping reflector and immersion medium parameters.

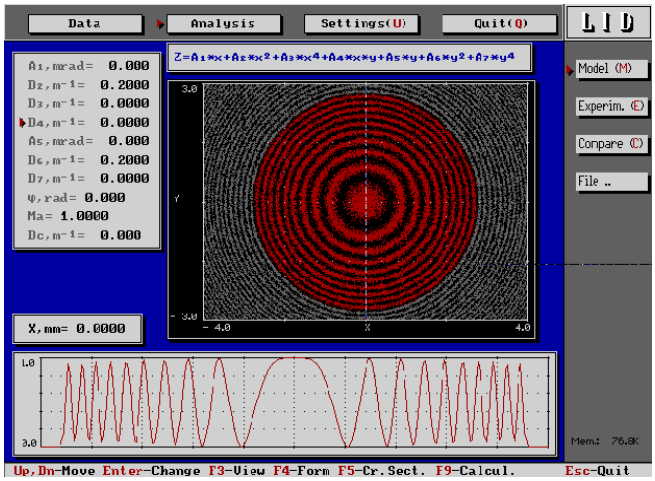


Temperature "field" for two-beam pumping.



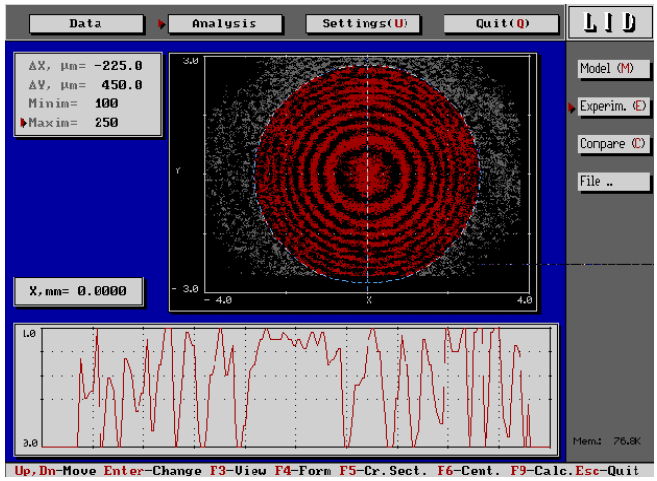
Temperature "field" for four-beam pumping.

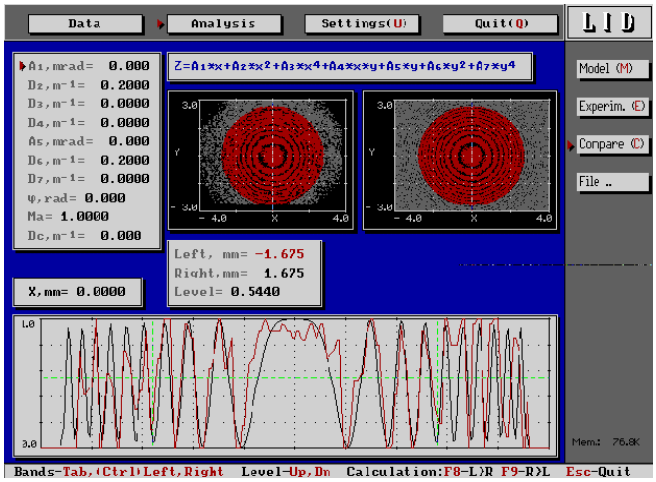
LID-DPSSAE-Inter program allows you to carry out the comparison analysis of a computation and experimental interferogram.



You can modelling an required interferogram.

You can load experimental result (as bitmap file) and execute the pre-analysis of a distribution.





Independent subsection allows you to carry out the comparison analysis and to obtain the numerical result of comparison in different units (number of N, microns and other).

Requirements:

- IBM PC/AT 386 or higher (best result Pentium III),
- 580 KB RAM or higher,
- 3..15 MB space on Hard Disk,
- A co-processor is required,
- DOS 3.1 or higher, Windows 3.x, Windows 95, Windows 2000, Windows NT, OS/2 and MacOS, FreeBSD, Linux (in MS DOS emulation mode).
- VGA or SVGA monitor.

Authors:

- Dmitriev V.G. - Professor, Doctor of Sciences, Corresponding Member of Engineering Academy of Russia, Academican of International Informatization Academy, Member of SPIE
- Grechin S.G. - Associate Professor, Ph.D., Member of SPIE
- Sharandin E.A. - Assistant Professor, Senior Researcher.
- Kijko V.V. - Senior Researcher, Ph.D.

Write, Phone or Fax Us for Further Information:

5, 2-nd Baumanskaya str., Moscow, 107005, Russia
Bauman MSTU, SRI R&L, S.Grechin
E-mail: gera@mx.bmstu.ru
shar@mx.bmstu.ru
Fax: (095) 333-91-66 (R&DI "POLYUS")
Tel.: (095) 731-43-12

Home-page http://www.bmstu.ru/~lid

Geography of our users:

Germany, France, Turkey, Israel, Korea, China, Japan and Russia also.

LID SoftTools is the key to success.

LID SoftTools Group

Printed in Russia, 2000