

New R&D in Vlatacom Institute

N. Stanojević, T. Pavličević, L. Kašca, M. Marković, Đ. Nešković

VLATACOM Institute of High Technologies
5 Milutina Milankovića St, 11070 Belgrade, Serbia
Tel: +381 11 377 11 00
Fax: +381 11 377 11 99
info@vlatacom.com

Agenda

- Intro
- Laser systems – CW lasers and directed energy
- Laser systems – pulse lasers and their application
- Surveillance by underwater acoustic
- Crypto devices – network protection (L3 encryption)
- Call for young researchers

Intro

- Vlatacom Institute is Serbian company oriented to technology with main activities in the fields of **electro-optics**, **crypto**, **maritime security**, **military** and **system integration**
- 2023 We have 170 employees among which
 - 30 PhD
 - **38 at PhD studies**
 - More than 100 MSc and dipl. ing.
- The goal of this presentation is that young PhD students present their work



Electro-optics



Maritime security



System integration



Crypto



Military

Vlatacom Institute Laser Program

a. CW lasers and directed energy

Pan Tilt Positioner Integration of Fiber Laser for direct energy application - laser obstacle removal

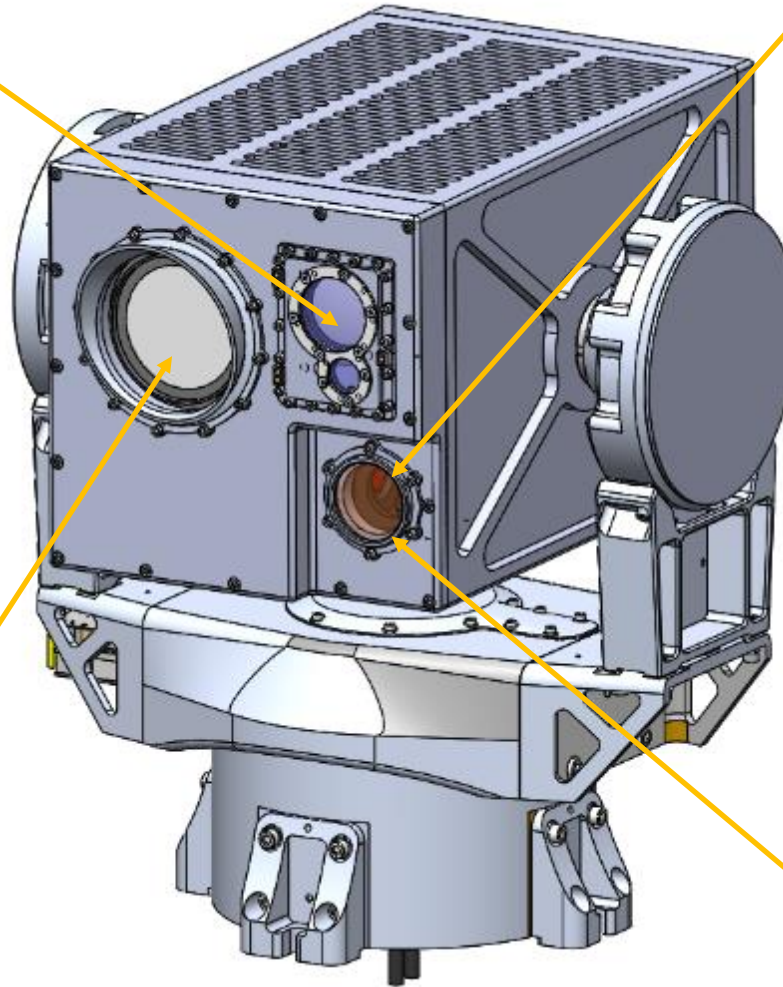
Laser Range Finder – LR3000



Sony Block FCB-EV7520A Full HD Camera



Thermal or SWIR camera

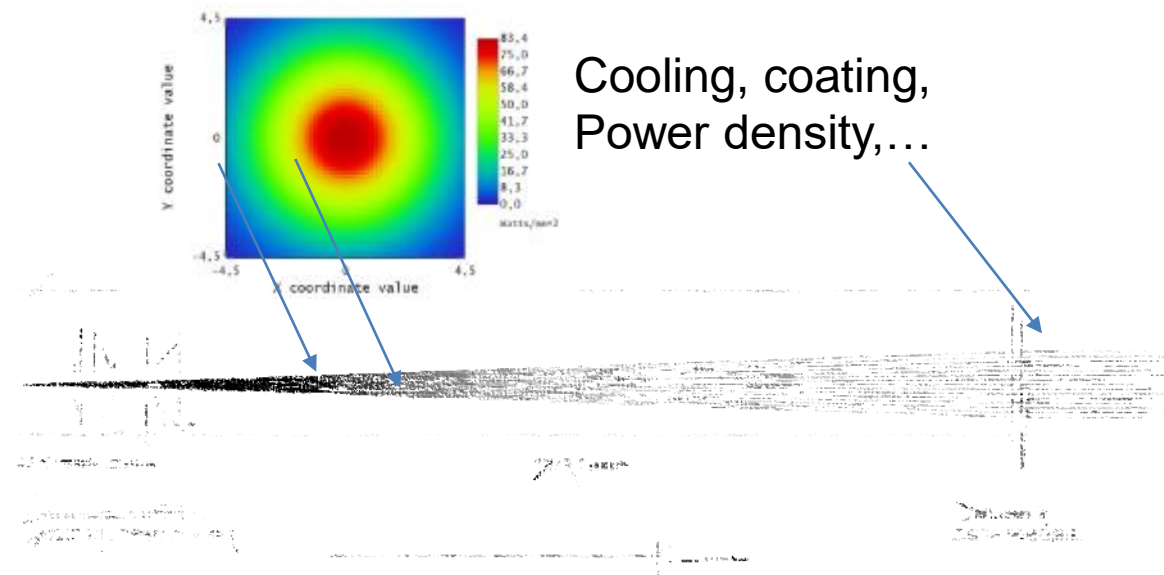
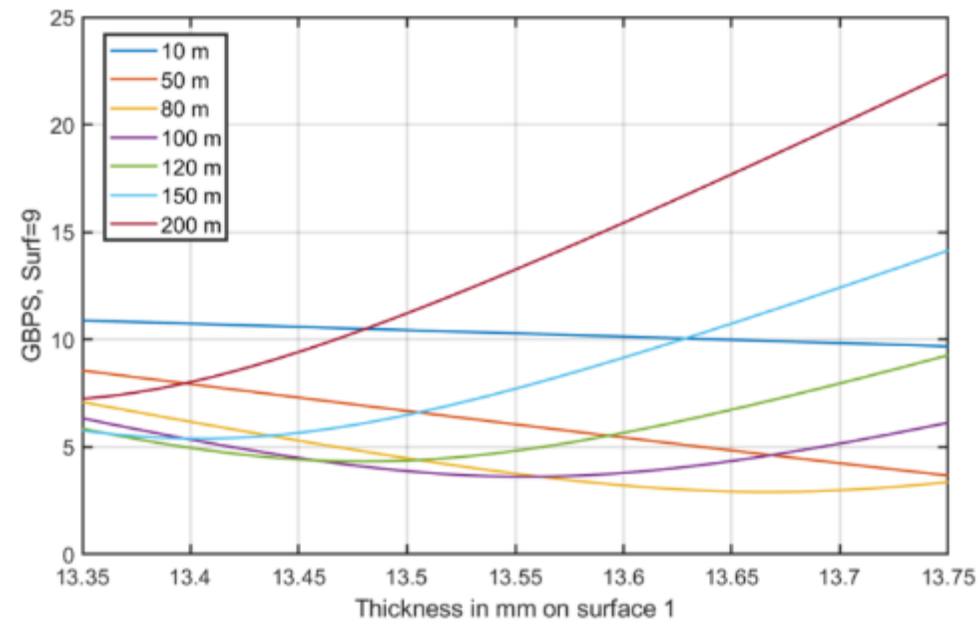


High Power Fiber Laser Collimator

Coupled with

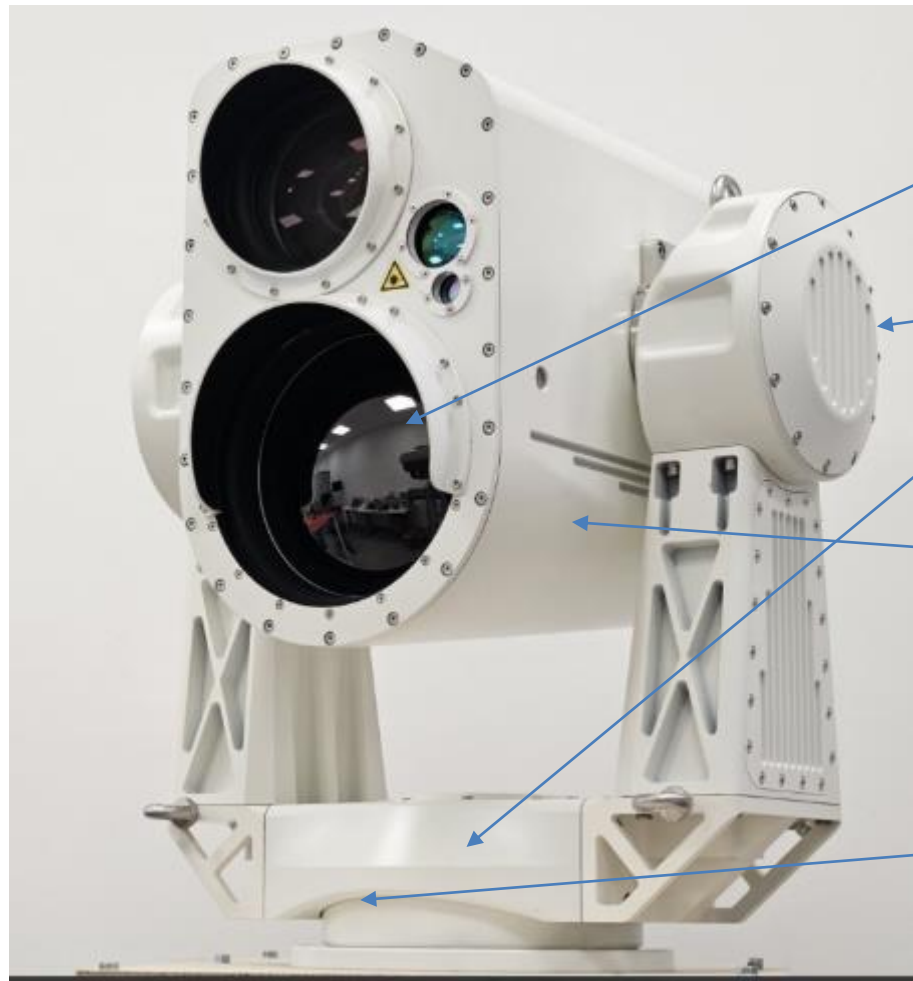
Vlatacom Colimator Design

- Targeting and target tracking is crucial
- CW laser illumination require **serious cooling subsystem**
- In the first steps we focus on **adaptive “collimator” only**, while laser is separate component
- Simulations show that knowing distance to target is important



New Pan-Tilt Positioner – designed by Vlatacom Institute

Today electro-optics surveillance, tomorrow directed energy



Protection windows VIS/SWIR/MWIR/LWIR

Motors are designed in Serbia / made in Serbia

Encapsulation

- Current – processed aluminum alloys
- Option a) very lightweight with EMC shielding
- Option b) bullet proof

Slip ring for high power CW laser signal + PSU + control
In order to have Nx360 deg as EO system

AI application for safety features

- Safety first
- Drone targets are usually on sky
- Shooting objects on Earth could be very dangerous
- AI assistance for real time response (block laser beam) is very important



Intensive AI application for
Safety features

*AI determined boundary between
Sky and objects on Earth
© Vlatacom Institute 2024*

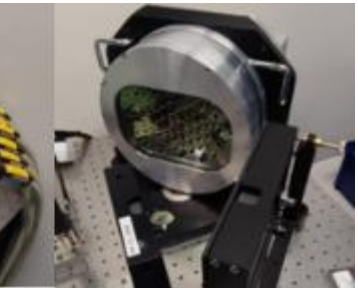
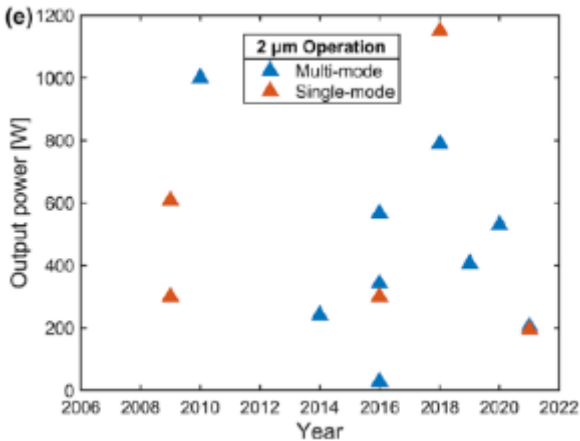
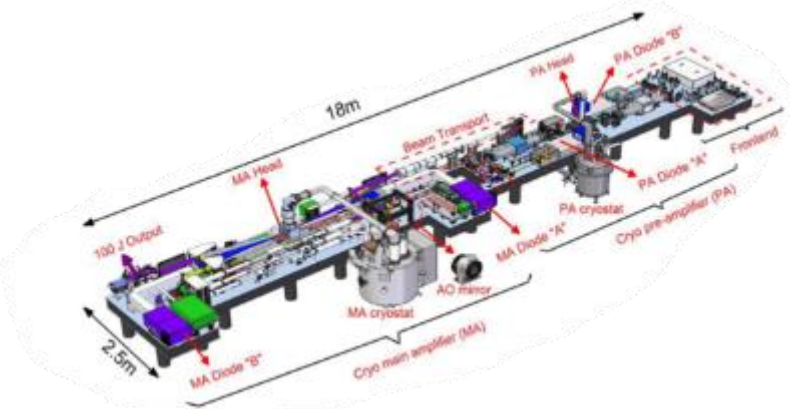
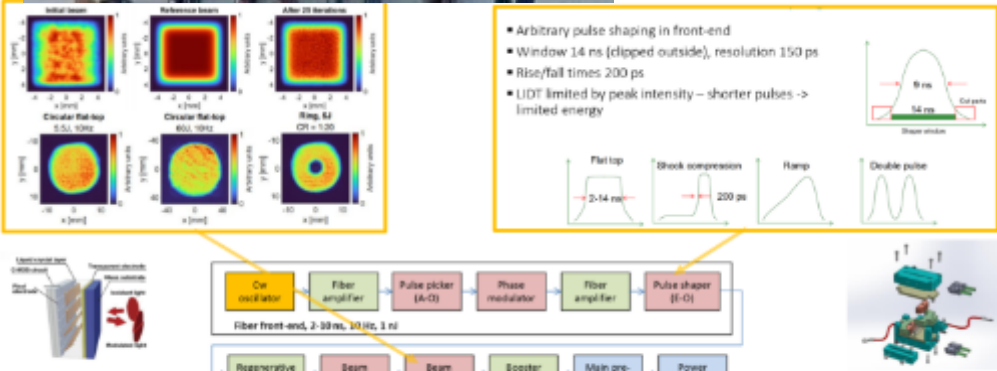


Vlatacom Institute Laser Program –Pulsed Lasers

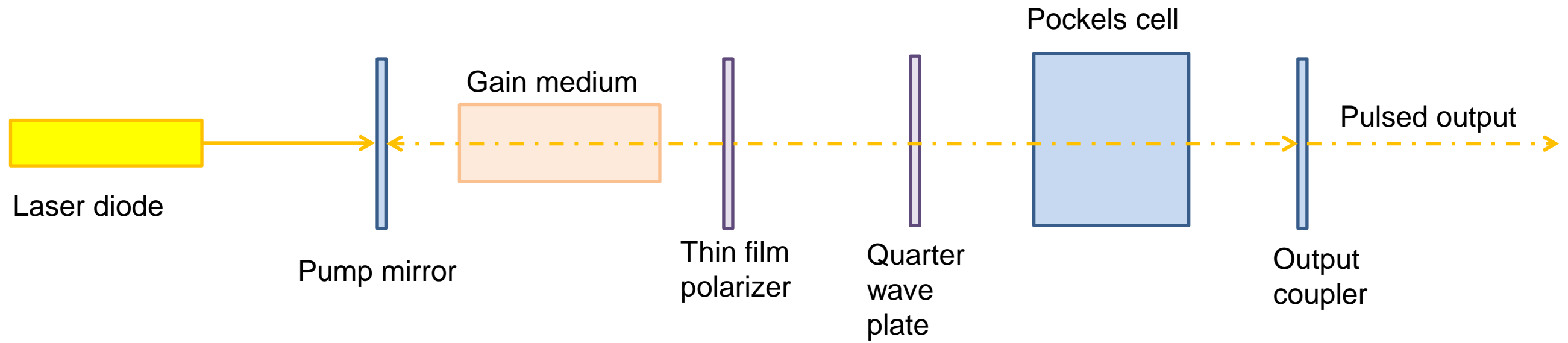
Finding partners



Laser	Bivoj	PERLA A	PERLA B	PERLA C	DG regen	Pharos	Pharos
Parameters							
Wavelength (nm)	1030, 515, 343	NA	1030, 515	1030, 515, 257, 206	1030	1030	515, 343, 257
Max. pulse energy	80 J, 60 J, 30 J*	NA	10 (1) mJ 2 (0.2) mJ	5 mJ, 1 mJ, 0.1 mJ, 0.01 mJ	100 mJ	1.4 mJ	0.5 mJ, 0.25 mJ, 0.1 mJ
Pulse duration	2-14 ns	NA	1 - 2 ps	0.3 - 2 ps	2 ps or 0.5 ns	250 fs - 10 ps	270 fs
Max. rep. rate	10 Hz	NA	1 (10) kHz	100 kHz	1 kHz	200 kHz	2 kHz

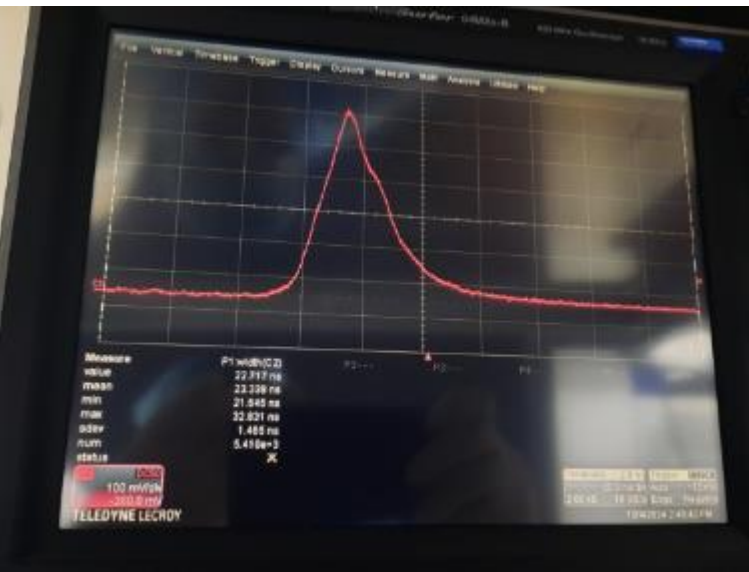
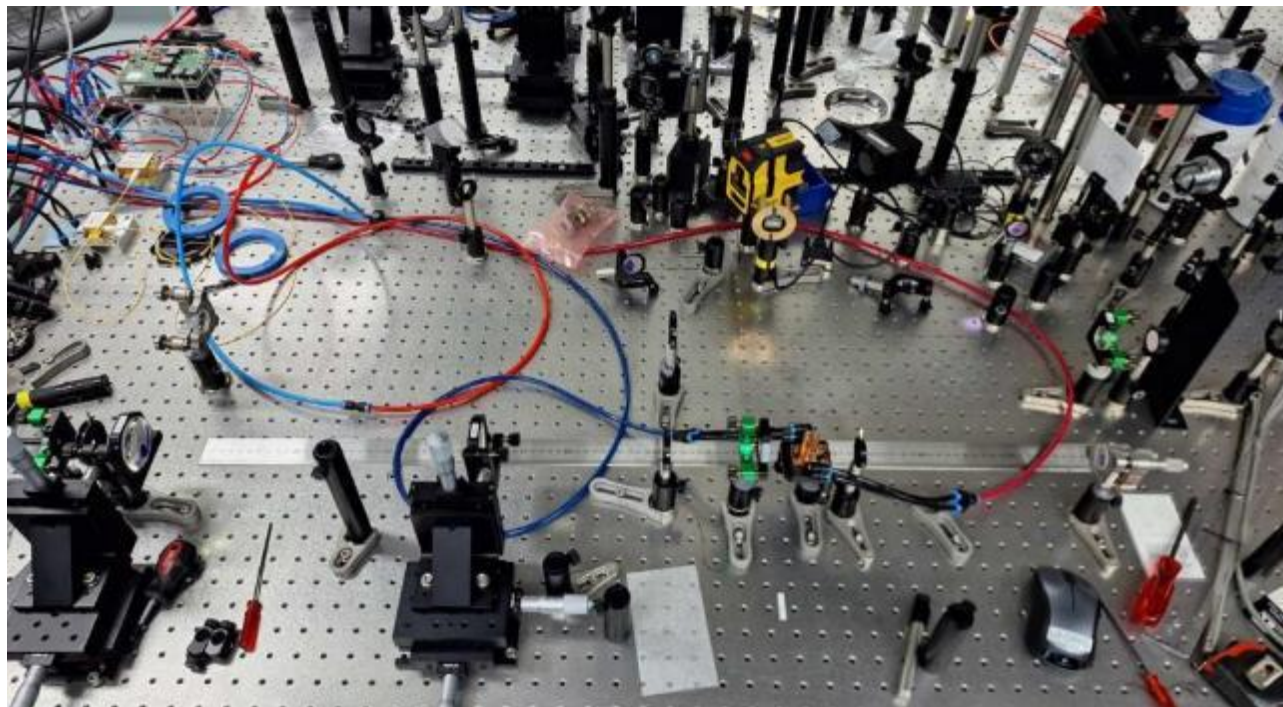


Pulse laser block diagram



- Pulsed output can be obtained from CW laser using Q-switching technique
- When voltage is applied periodically to the Pockels cell pulsed output is achieved

First results September/October 2024



The Challenge: produce YAG and other crystals in Serbia
Call for cooperation

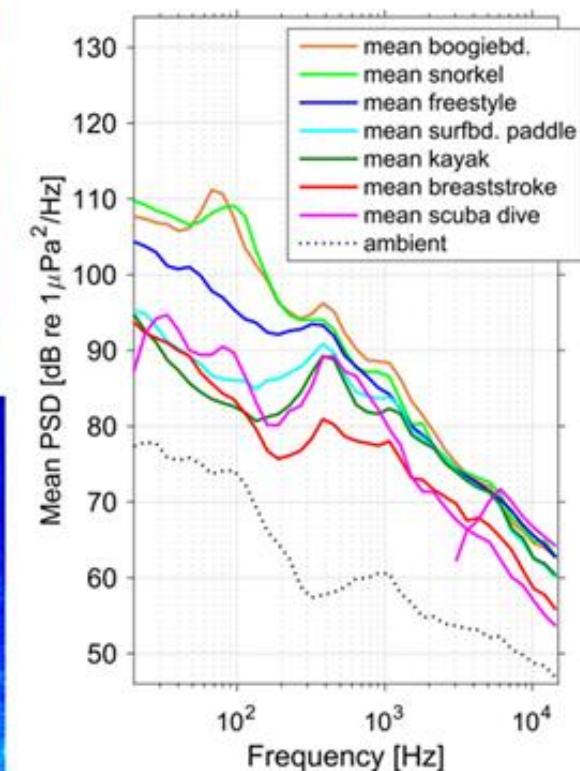
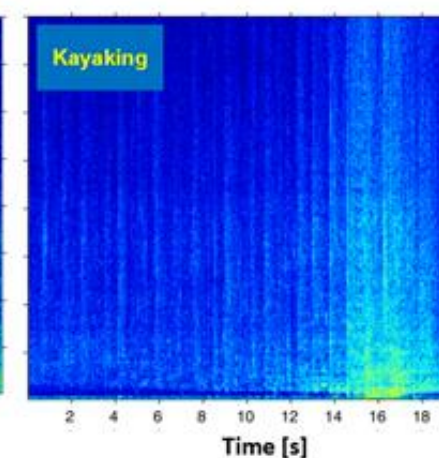
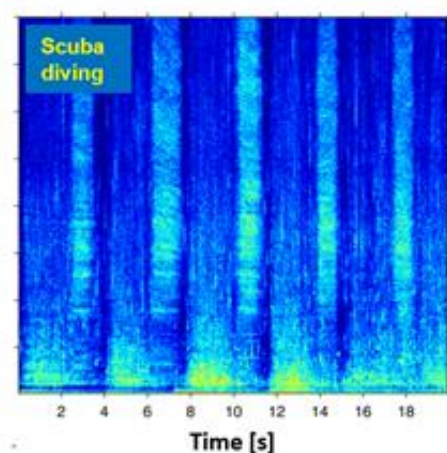
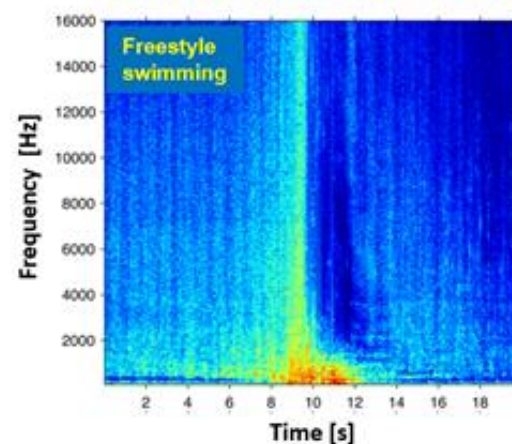
Acknowledgement: Special thanks to HiLase, CZ for teaching us and borrowing the laboratory

Naval Surveillance by Under Water Acoustics – SUWA project proposal

Targets and their acoustic signatures, part b



Bigger vessels acoustic power



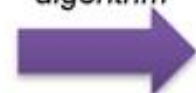
Human targets vs activity, acoustic power and their signatures in both frequency and time domain (Erbe et al, 2016)

The cooperation with School of Electrical Engineering, Belgrade University (ETF) and their alumni

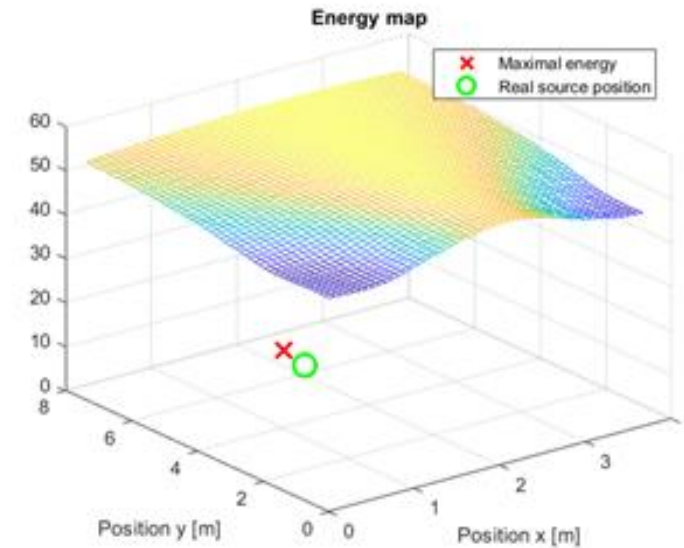


Transmitter
(individual frequencies on an omnidirectional source)

Basic Delay
and Sum
algorithm

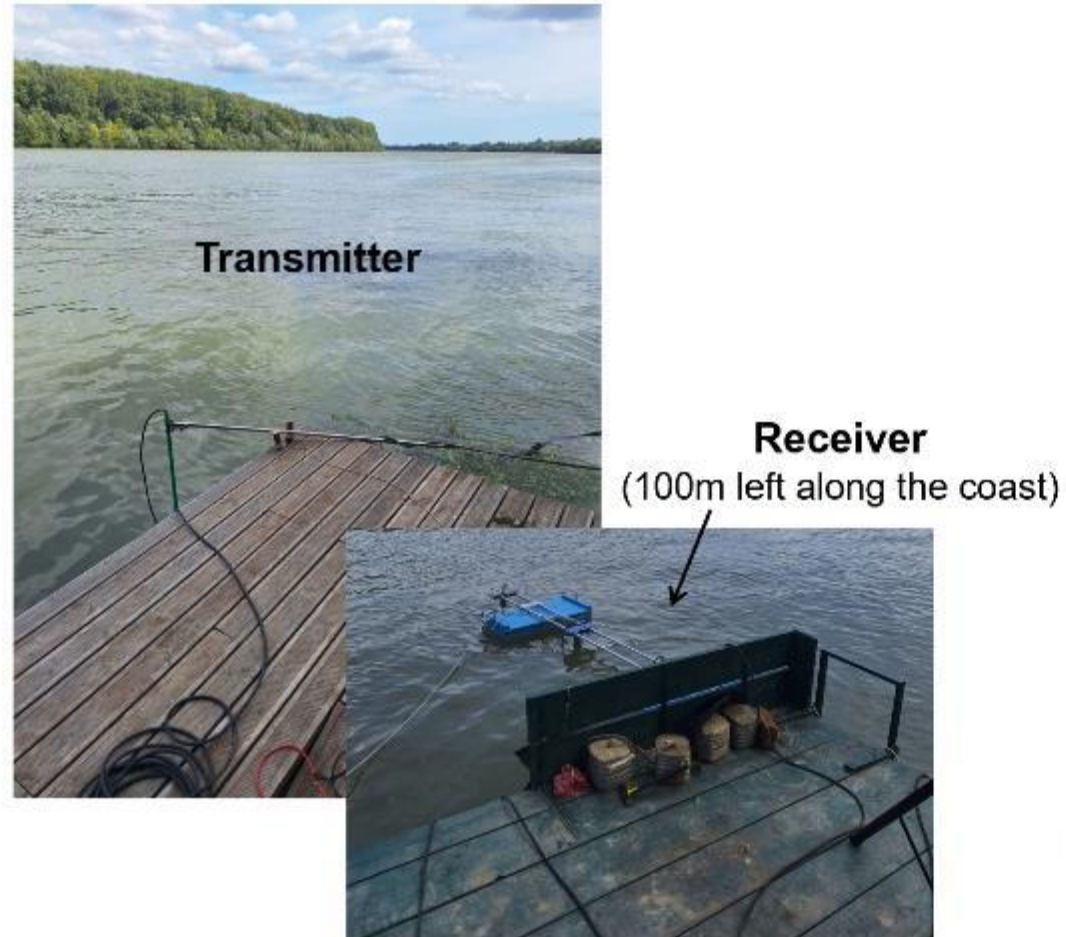


Suitable for
many
improvements



- Four hydrophones experiment conducted by ETF and Vlatacom Institute's PhD students

The cooperation with **School of Electrical Engineering, Belgrade University (ETF)** and their alumni

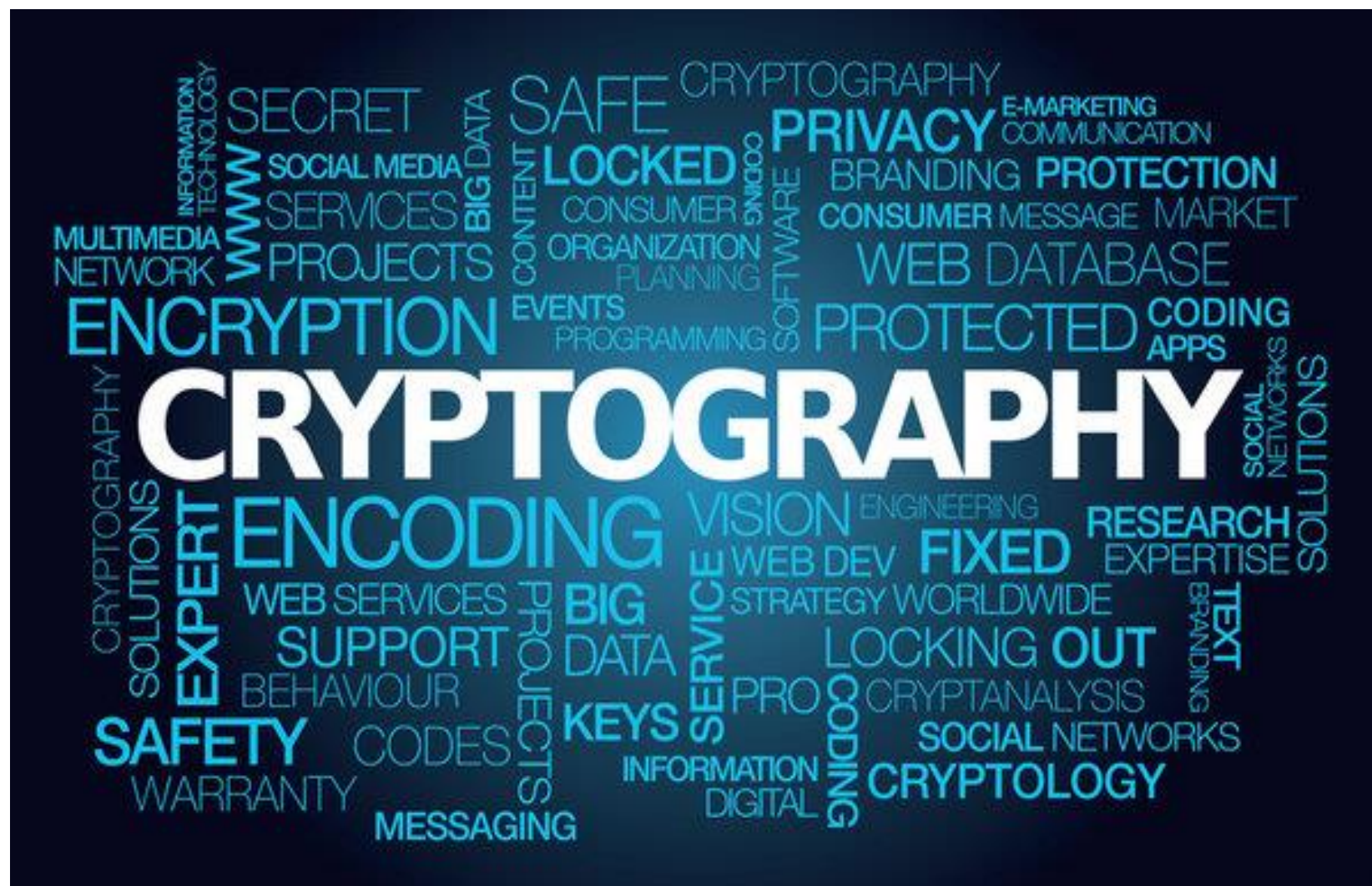


- Trial test bed on river Sava, near Belgrade proved range of several km for small boats in such river conditions (different from the Gulf due to noise caused by constant water moving)

Vlatacom crypto solutions – Network protection (L3)

Vlatacom crypto solutions:

- **Attack** analysis,
- **Encryption algorithm** design,
- **Keys** production and distribution,
- **Encryption devices** design, production and customization
- Building special facilities of **National crypto center**.



Vlatacom Encryption Devices (basic set)

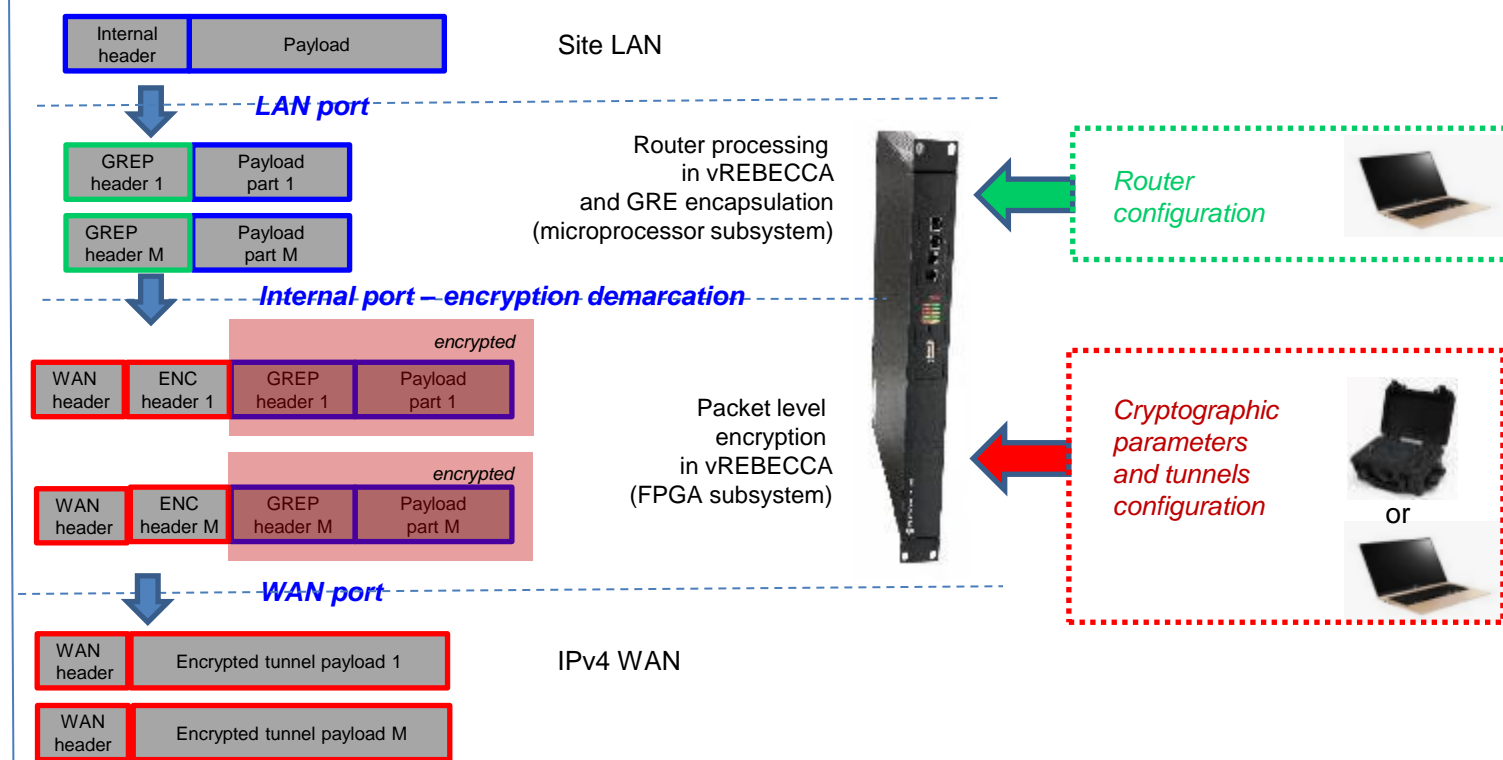
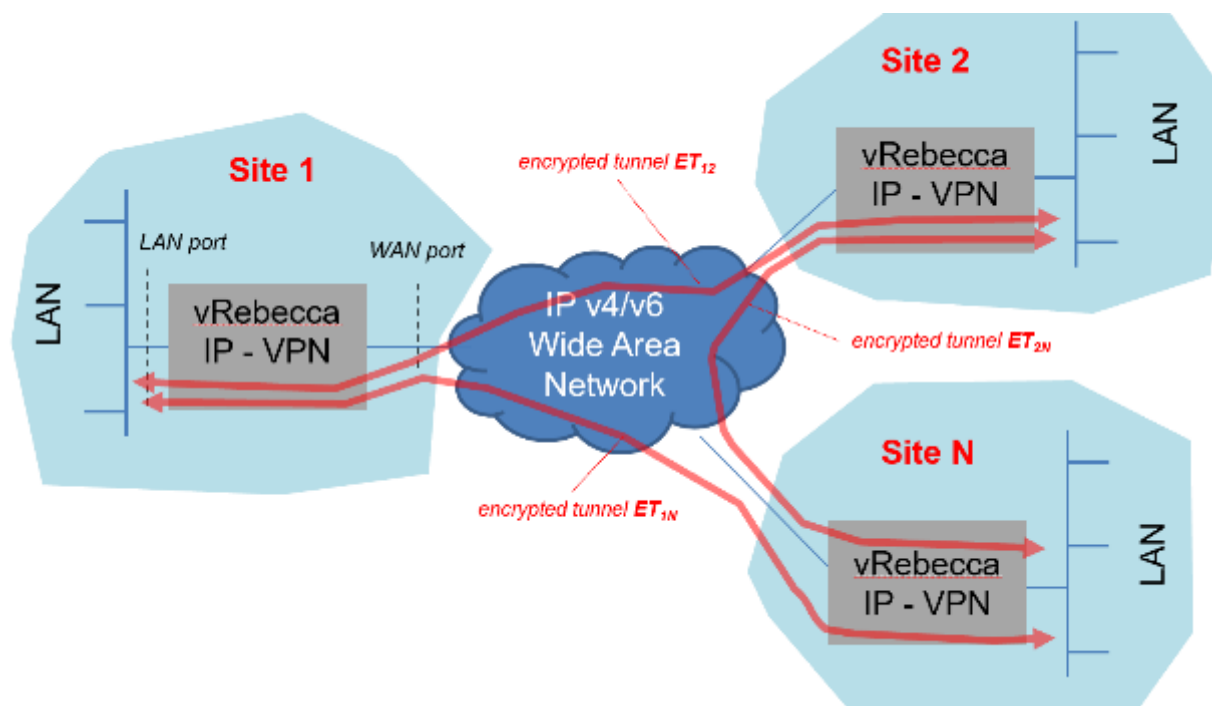
vREBECCA

Fully customizable high capacity (up to 10 Gbps), low latency encryption system



Communication Encryption Device (vREBECCA) and
Key Distribution System (vKDD)

vRebecca: IP-VPN mode



Note: packet segmentation is optional, depending on predefined max MTU size

Call for young researchers

Science in Vlatacom Institute

Scientific result	Quantity
Monographs	7
International journal papers	34
National journal papers	20
International conferences	129
Technical solutions	36
Doctoral dissertations	8
Total	234

Title	Number
University professors	14*
Senior research associate	6
Research associate	7
Research assistant	7
Junior research assistant	14
Principal technical associate	8
Senior technical associate	21
Technical associate	13


*Note: some researchers have both University and Institute title

- The **mission of the Scientific council is to lead research politics of the Vlatacom Institute**
- Total 234 scientific result achieved in previous five years (2019 – 2024)
- According to Serbian Ministry of Education, Science and Technological development 76 employees have Institute title (scientific or technical)
- Additionally there are more than 120 intellectual property items: new algorithms, application software, hardware solutions, new measurement methodologies, original work flow procedures, etc.



Internship program

- Each year about 50 students of BSc and MSc studies pass through internship program
- This year the program was international so we had additional five students from Khalifa University, Abu Dhabi on summer internship


**INSTITUTE
VLATACOM**

website: www.vlatacom.com
 email: office@vlatacom.com

Informativni plan profesionalne prakse

Datum kreiranja: 04-Nov-2017

Datum poslednje promene: 13-Nov-2017

Polazneve kompetence i ciljeve,

U kompaniji Vlatacom Institut Viskih Tehnologija profesionalnu praksu obavljamo u posebno opremljenoj na adekvatan način da se pokriva predložene teme. Osim toga, pruža radu sa:

Oblast prakse traje do 30 kalendarskih dana (tj. radnih sati) je fleksibilan i u skladu je sa konkretnim potrebama i ciljevima, niti postoje fiksno vreme. **Najduže** sta mjesec da radite na o praksi je od 10 do 14h zbog pridržavanja kompanijskog standarda ISO20000. Minimalna grupa broj tri studenta, a maksimalna osam (mislila smo brojem radnih mesta). Podatak prakse može biti poznatog u mesecu.

Svaki student se dođe uje mentor koji će voditi praksu i po potrebi demonstrator, i po prvi, je naučni radnik, sa titulom doktora nauka iz oblasti elektronike i računarstva.

Prilikom prijave na praksu polaznik je po polo:

1. CV (važno pobeje sa fotografijom)
2. Spisak do sada položenih predmeta sa ocenama (ne mora završiti)
3. Listu kojom celisa da se budete (spisak slobodnih tema je u prilogu). Listu najveći parim ne samo radnim brojem)

Najboljim studentima, koji završe obilnu praksu, nudimo plaćenu praksu, koja se plaća po satu preko studentstva zadrage. Otkazano mesečno angažovanje studenta na obilnoj praksi je od 80 sati do punog radnog vremena. Trajanje plaćene prakse je do tri meseca. **Smatramo da je našu naftu angažovanje isključivo pogodan za studentima master studijama. Pošto angažovanje perioda, ako se se dođe polaznik, studenti mogu da se zapreke na određene vreme ili 22 meseci u zavisnosti od rezultata rada i kvanit na narednjem.**

Potrebni rezultati prakse:

1. Zapošljavanje u Vlatacomu
2. Opozivljanje rada na konferenciji (Telnet, INTRANET) u skladu sa komentarnom (komenzitarni) iz Instituta Vlatacom
3. Ustavu u uli infor na buduć kontakt na zaprejenje

Valite: Smatramo da je Beja sa radom na datoj tematici, moćnije od onima, pružila trajanje studiranja.

Odgovorna lice za organizaciju prakse:

dr Miroslav Perić, tehnički direktor (CTO)




Prijava za profesionalnu praksu moćno poslaticu u mail:

mladica.petic@vlatacom.com

VLATACOM INSTITUTE OF HIGH TECHNOLOGIES LTD BELGRADE

VLATACOM INSTITUTE LTD BELGRADE
 Address: Zvezdara Miroslava St. 11-073 Beograd, Serbia
 T: +381 11-2771130, F: +381 11-2771169

Registered address: 11 Andrija Kralja St. 11-032 Beograd
 Company ID number: 1747121, VAT: 121032612
 Professional company activity: 7213

Trenutno določene teme za prakso so:

Rb.	Naziv teme	Broj studenata**	Pojedini smerovi sa ET-a*
Iskustvo izrade i realizacija			
1.	Uvod u Affinity Designer. Projektovanje elektroničkih dijagrama uEagle softu. (u skladu sa 2024/25)	1-4	Elektronika
2.	Uvod u embedded systeme. Implementacija Jednostavnih kontroliranih Sistema.		Elektronika, RTI, signal i sistem, telekomunikacije
3.	Uvod u primenu FPGA.		Elektronika, RTI, signal i sistem, telekomunikacije
Uvod u izradu i ET sistema i implementaciju			
4.	Instalacija i konfigurisanje periferijarnih opreme sa strane desktop platformi na VME, cuvene, rutere, napajalace, karte i sl. (Pozivimo saradnike posredstvom operativnog sistema Linux)	1-3	Telekomunikacije, RTI
5.	Uvod u izradu i implementaciju izobrazno poznavanje Linux operativnog sistema	1-3	Telekomunikacije, elektronika, RTI
RVO, RF i mikrotelneke sisteme			
6.	Sistemi za mikrotelneke i mikrokontrolere (u skladu sa 2024/25)	nema odgovarajućeg	Telekomunikacije, RTI, elektronika, signal i sistem
7.	Pracenje rada i stabilizacija posredstvom platformi	1-3	elektronika, signal i sistem, RTI, SI
8.	Primenjena izrada i implementacija i telekomunikacionih sistema	1-3	elektronika, elektronika, sistem
9.	Detaljnija izrada i implementacija i telekomunikacionih sistema (u skladu sa 2024/25)	1-3	Telekomunikacije, elektronika, sistem
Obrada signala			
10.	Obrada signala u radnom i telekomunikacionom sredstvu	nema odgovarajućeg	Telekomunikacije, signal i sistem, elektronika
11.	Merjenje i obrada signala u elektr. optičkim sistemima. Služi za merenje core karmalno karmalno. (u skladu sa 2024/25)	nema odgovarajućeg	signal i sistem, elektronika
12.	Izrada i obrada, izrada i obrada (u skladu sa 2024/25)	1-3	Elektronika, signal i sistem, RTI
13.	Merjenje i obrada i primena u elektroničkim i radnim sistemima	nema odgovarajućeg	Signal i sistem, elektronika, telekomunikacije
Projevanje			
14.	Primena i implementacija	nema odgovarajućeg	RTI, SI, telekomunikacije
15.	Komandno-kontrolni sistem	nema odgovarajućeg	RTI, SI

[illegible]

*Broj studenata koji se može baviti istom u okviru jedne grupe je ograničen brojem razvijene platforme i brojem razvijene platforme.

Napomena: Za teme obelodane kao ***fu fo hua rina 169/172*** postoji mogućnost predavanja stepenice neploče prikolice za studenat koji imaju pristup preko 9.00 na definiranom intervalima ***1. polovine semestra***

Thank you for your attention!

Any questions?



info@vlatacom.com