

IJS - Designcetner

Strateško srečanje F9

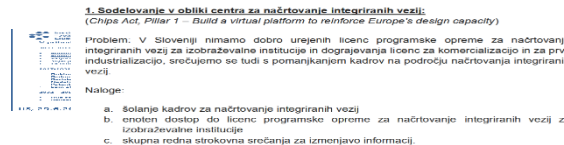
Krvavec

29.9.2026

Outline of today's presentation:

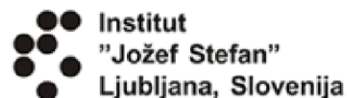
- Context
- Statuts
- Direction

Context - timeline



Temline of activities in Slovenia:

- 2022.08.02. EU announces Chips ACT
- 2022.22.6. IJS organizes a round table on Chip Large reposnse!
- 2023.21.09 Chips ACT In force
- 2023.26.05 Meeting DG connect director in Maribor
- 2023 MoU, based on IJS work is signed by many
- 2024.11.01 National strategy for chips and semiconductors (IJS representative)
- 2025 25.09 **Competence center 4M project, 600k IJS**
- 30.3.2026 Strategy confirmed by the government
- End of 2026 begining of the Design center
- Chips ACT 2.0
- Quantum ACT



V prihodnje:

2022-2027 (5 let - inkubacija):

- **Povečati segment** instrumentacije zaradi vse kompleksnejših projektov na več področjih
- **Povečati sodelovanje pri načrtovanju ASIC-ov** in obseg testiranja na sevalne poškodbe
- **Vključitev v Design center (HUB) v katerem se pri projektih lahko priključijo tudi fakultete in podjetja**
- Širjenje programa na fotoniko in sisteme za uporabo v vesolju
- **Za nove eksotične procese svoj fab in/ali se priključiti obstoječi in bodoči infrastrukturi**

2027-2032 (10 let - internacionalizacija):

- Doktorski kandidati in podoktorski sodelavci
- Redno načrtovanje najmanj 10 ASIC-ov preko MPW letno, preko Open Foundry programa v EU
- Raziskovanje AI implementacij na čipu za zmanjšanje prenosa podatkov v detektorjih pri visoki luminoznosti
- Nadaljevanje programa novih arhitektur, Quantum computing, Photonic chips
- Patentiranje tehnoloških rešitev
- Spin off podjetja, ki tržijo produkte na osnovi proizvedenih čipov

2032 – 2052 (30 let):

- Hub se pozicionira med vodilne centre za načrtovanje nano tehnologij z lastnimi proizvodnimi kapacitetami
- Povdarek na novih tehnologijah in procesih, ki omogočajo čipe za nove aplikacije

IJS, 29.6.2022, Andrej.Seljak@ijs.si

F9 / Experimental Particle Physics Department



Status – Natioinal program



Program razvoja čipov in polprevodniških tehnologij v Sloveniji do leta 2030

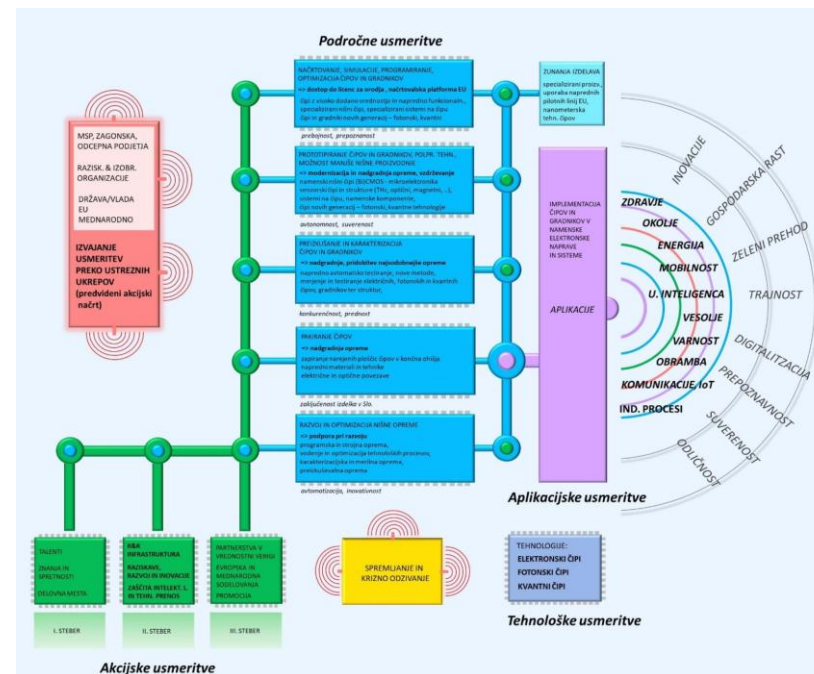


160 Million EURO program

Področne usmeritve

V okviru področnih usmeritev podrobneje navajamo zahtevane aktivnosti in strokovne usmeritve za razvoj čipov in polprevodniških tehnologij v Sloveniji. Te vključujejo:

- **načrtovanje čipov in gradnikov,**
- **prototipiranje čipov in gradnikov z možnostjo manjše nišne proizvodnje,**
- **testiranje in karakterizacijo čipov ter gradnikov,**
- **pakiranje čipov in**



```

1  # Import the necessary libraries
2  import pandas as pd
3  import numpy as np
4  from sklearn.preprocessing import StandardScaler
5  from sklearn.model_selection import train_test_split
6  from sklearn.metrics import mean_squared_error, r2_score
7  from sklearn.linear_model import LinearRegression
8  from sklearn.ensemble import RandomForestRegressor
9  from sklearn.svm import SVR
10 from sklearn.neural_network import MLPRegressor
11
12 # Load the dataset
13 data = pd.read_csv('data.csv')
14
15 # Split the data into features and target variable
16 X = data[['feature1', 'feature2', 'feature3']]
17 y = data['target']
18
19 # Split the data into training and testing sets
20 X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
21
22 # Standardize the features
23 scaler = StandardScaler()
24 X_train = scaler.fit_transform(X_train)
25 X_test = scaler.transform(X_test)
26
27 # Train the Linear Regression model
28 lr = LinearRegression()
29 lr.fit(X_train, y_train)
30
31 # Predict using the Linear Regression model
32 y_pred_lr = lr.predict(X_test)
33
34 # Calculate the Mean Squared Error (MSE) and R-squared (R2) for the Linear Regression model
35 mse_lr = mean_squared_error(y_test, y_pred_lr)
36 r2_lr = r2_score(y_test, y_pred_lr)
37
38 # Train the Random Forest model
39 rf = RandomForestRegressor()
40 rf.fit(X_train, y_train)
41
42 # Predict using the Random Forest model
43 y_pred_rf = rf.predict(X_test)
44
45 # Calculate the Mean Squared Error (MSE) and R-squared (R2) for the Random Forest model
46 mse_rf = mean_squared_error(y_test, y_pred_rf)
47 r2_rf = r2_score(y_test, y_pred_rf)
48
49 # Train the Support Vector Regression (SVR) model
50 svr = SVR()
51 svr.fit(X_train, y_train)
52
53 # Predict using the SVR model
54 y_pred_svr = svr.predict(X_test)
55
56 # Calculate the Mean Squared Error (MSE) and R-squared (R2) for the SVR model
57 mse_svr = mean_squared_error(y_test, y_pred_svr)
58 r2_svr = r2_score(y_test, y_pred_svr)
59
60 # Train the Multi-Layer Perceptron (MLP) model
61 mlp = MLPRegressor()
62 mlp.fit(X_train, y_train)
63
64 # Predict using the MLP model
65 y_pred_mlp = mlp.predict(X_test)
66
67 # Calculate the Mean Squared Error (MSE) and R-squared (R2) for the MLP model
68 mse_mlp = mean_squared_error(y_test, y_pred_mlp)
69 r2_mlp = r2_score(y_test, y_pred_mlp)
70
71 # Print the results
72 print('Linear Regression MSE: ', mse_lr, 'R2: ', r2_lr)
73 print('Random Forest MSE: ', mse_rf, 'R2: ', r2_rf)
74 print('SVR MSE: ', mse_svr, 'R2: ', r2_svr)
75 print('MLP MSE: ', mse_mlp, 'R2: ', r2_mlp)

```

Skupaj:	295939,85
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Re: licenčna programska oprema

 From [Razvojni steber financiranja IJS](#)
To [Andrej Seljak](#)
Date 2024-10-19 10:19

 Summary Headers

Pozdravljeni,
Predlagam, da prijavite.
Lep pozdrav,
RSF Komisija

Licensed software at IJS



Re: Synopsys donation for A47690



From Andrej Seljak
To Catherine Le Lan
Date 2025-11-10 12:58
Summary Headers

SYNOPSYS®

Dear Catherine,

We would like to thank you for the trouble you have taken, and your generous contribution. Most certainly it will have an impact on a long term.

Thank you again.

Are you visiting Efecs in Malta this year perhaps?

Yours, Andrej

On 2025-11-04 15:27, Catherine Le Lan wrote:

Good afternoon

I would like to ask you to waive your fees on the initial cost of 10 licenses of FEV and IMP and ASM for Jozef Stefan Institute in Slovenia

They will be purchasing the maintenance fee, and 10 TCAD Bundle. If you could drive Andrej through the process.

Let me know if temp keys are needed while waiting for the January renewals

Thank you and regards
Catherine

----- Original Message -----

Subject: RE: Slovenian Design Centre

Date: 2024-07-15 15:35

From: Mark Willoughby - STFC UKRI <mark.willoughby@stfc.ac.uk>

To: Andrej Seljak <andrej.seljak@ijs.si>

Cc: Aleksander Sesek <aleksander.sesek@rls.si>, Marijan Leban <marijan.leban@ijs.si>

Dear Andrej,

Sorry, I took some extra time away.

We hope to add the GF 180nm to the Europractice MPW runs. Practically, I think that this is ~18 months away, but it is open source. I hear conflicting reports on the quality of the kit/process.

Following some meetings, I have agreement in principle from both Cadence and Synopsys to donate licenses to each institute to remove the need for a central server.

I am reasonably certain that I can get you all of the FPGA licenses you need (they don't prize them so highly, as licenses are just a route to sell more devices).

The design sharing aspect (for collaborative design) we know we can fix for Cadence and have agreement in principle (still needs lawyer effort) from Synopsys.

cadence®

Take away:

- Synopsys donated 20.000 EUR of software
- Cadence can put in place an agreement to share designs



IJS Design center content:



Retry by making an IJS center

Europractice Full IC Membership fee
Cadence IC
Cadence PCB
Siemens EDA Full Suite
Synopsys Front End and Verification
Synopsys Implementation Tools
Synopsys QuantumATK
Synopsys Advanced TCAD
Xilinx Vivado Maintenance

Andrej Seljak F9

Anton Biasizzo E7

Anže Mráz F5

Program: COMSOL Multiphysics 3x

Microfluidics Module

Plasma Module

Wave Optics Module

Acoustics Module

Ray Optics Module

Acoustics Module

MEMS Module

Semiconductor Module

Chemical Reaction Engineering Module

Plasma Module

RF Module

CFD Module

Particle Tracing Module

Heat Transfer Module

AC/DC Module

Structural Mechanics Module

First year: 72.295,00 EUR

Annual cost 20.820,00 EUR

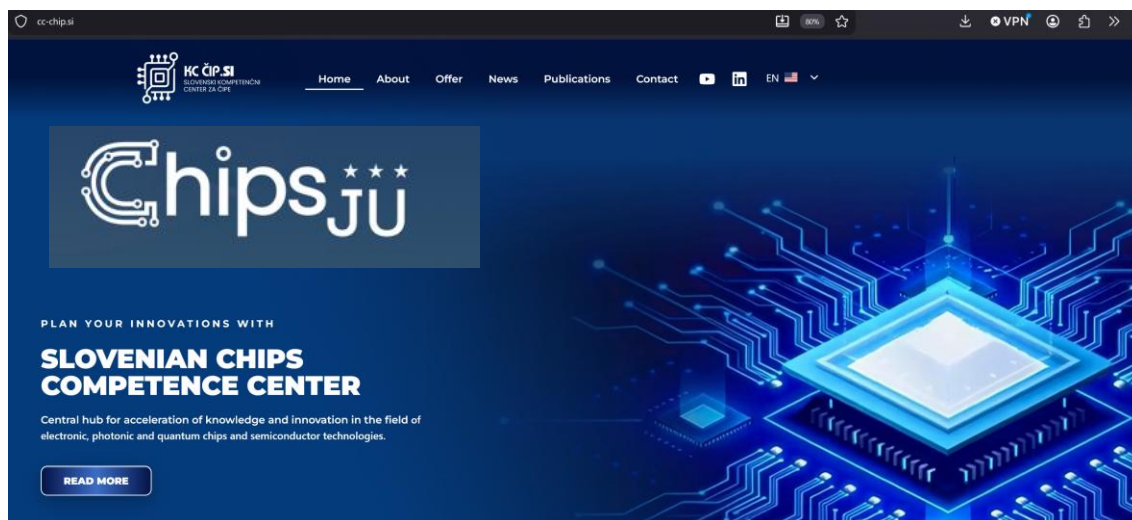
5 year project is 160k, some 35k annually.



Problem: V Sloveniji nimamo dobro urejenih licenc programske opreme za načrtovanje integriranih vezij za izobraževalne institucije in dograjevanja licenc za komercializacijo in za prvo industrializacijo, sročujemo se tudi s pomanjkanjem kadrov na področju načrtovanja integriranih vezij.

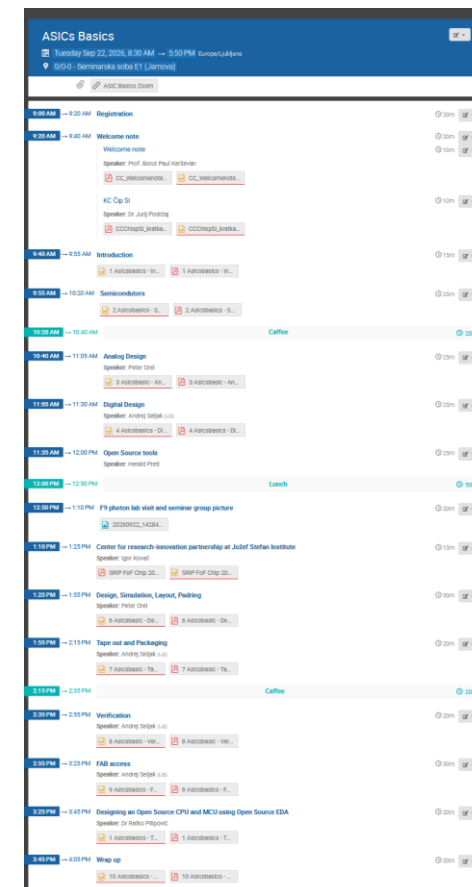
Naloge:

- šolanje kadrov za načrtovanje integriranih vezij
- enoten dostop do licenc programske opreme za načrtovanje integriranih vezij za izobraževalne institucije
- skupna redna strokovna srečanja za izmenjavo informacij



Overall we had so far at IJS:

- 7 three month trainings (IJS department collaboration)
- 1 very large seminar on ASICs
-
- 1 one month training
- 1 three month SME consultancy with business plan
- Financing the reservation system
- Funds for learning, design, production, verification, testing



Status at IJS



Open source tools, IJS Tapeout IHP 130 BiCMOS SiGe process
2 or 3 internships under CHIP-CC and paied tapeout!

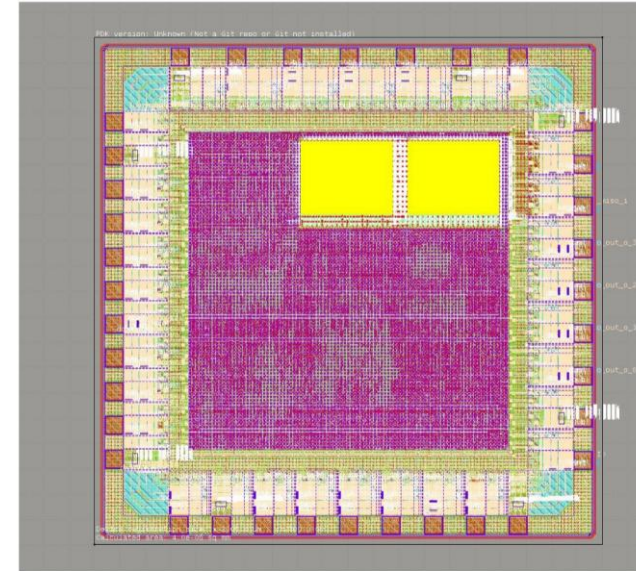
Jure Vreča, Ph.D.

Building A, Floor 1, Room 230

+386 1 477 3075

jure.vreca@ijs.si

<http://cs.ijs.si/vreca/>



Assist. Prof. dr. Ratko Pilipović

Assistant

E: [Send a message](#)

Room: R2.05 - Kabinet

CLASSES

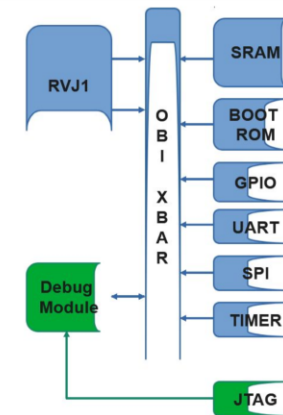
- Digital Design
- Computer Systems
- Digital Logic Design

LABORATORY

- **Laboratory for Adaptive Systems and Parallel Processing**, Laboratory Member

- A simple MCU style SoC
- All digital design with a single clock domain (except JTAG).
- Open Bus Interface (OBI)
- Designed from scratch (except the debug)

github.com/jurevreca12/mcu-soc



Status at IJS



Ekipa:



PI: Mitja Kelemen (F2)



Matevž Skobe (F2)



Žiga Brenčič (F2)



Žiga Gosar (F5)

Production of isolated NV centres in diamond substrates using ion implantation

Type of project: **national programme**
Duration: **2022 - 2024**



Project leader: Dr Žiga Barba
Code: Z1-4390
Coworkers:
Partners: Jožef Stefan Institute

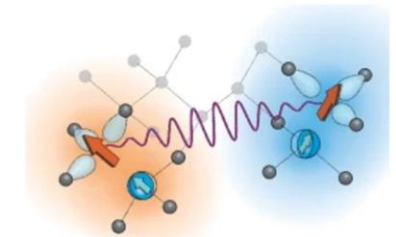


figure: F. Dolde et al, Nature Phys. 9 (139-143), 2013

Sodelavci:



◆ Diamond Quantum Chips Pilot Line (DIREQT)

- **The Technology:** This pilot line specializes in the fabrication and integration of **nitrogen-vacancy (NV) centers** inside single-crystal synthetic diamonds.
- **Significance:** NV centers act as highly stable quantum defects (or "intrinsic quantum chips") capable of room-temperature operations. They are utilized for ultra-precise quantum sensing (like vector magnetometry), quantum communication, and computing hardware.
- **Coordination:** Coordinated primarily by the National Research Council of Italy

(CNR). AMIRES +2



Direction for F9



Possible connection V: Machine learning expertise

We have ML experience in various levels of data processing :

- background estimation (fakes, smoothing)
- generative models (fact MC)
- inference/categorization (PID, S/B separation,...)
- ML on chip

Possible new directions

- ML-assisted detector design (MODE collaboration)
- ML-assisted TRG and data flow (e.g., event cleaning)



Professor Keisuke Yoshihara Launches Open-Source ASIC (Readout Chip) Development Effort for High-Energy Physics

The University of Hawai'i at Mānoa Department of Physics and Astronomy has received supplemental support from the U.S. Department of Energy Office of Science for Professor Keisuke Yoshihara to begin a new research effort on open-source application-specific integrated circuits (ASICs) or "readout chips" for high-energy physics instrumentation and readout.

The project, titled "*Feasibility Study of an Open-Source Mixed-Signal ASIC*," will explore whether modern open-source design tools and foundry access can be used to develop compact, low-power, mixed-signal ASICs for detector front-end readout. Such chips are essential for future particle physics experiments, where detector systems must process fast signals with high precision, low noise, and limited power.

Peter Križan, Ljubljana

IJS and UH have in place a collaboration agreement!

High interest to collaborate,
soon to happen a meeting between:

Andrej Seljak	IJS
Jure Vreča	IJS
Ratko Pilipović	FRI
Boštjan Maček	IJS
Keisuke Yoshihara	UH

Intent to start a new collaboration :

ML accelerators
Detector chips
Advanced architectures

.....



Direction for F9

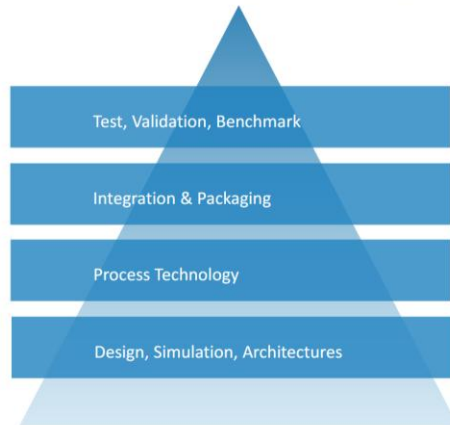
Quantum ACT:

Conslutations with European Commision via EARTO organization

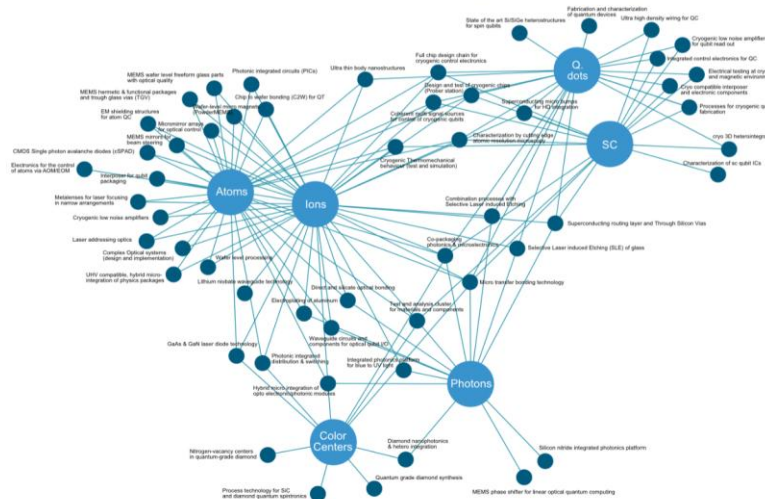
- Main driver for F9 is **Quantum Classical interaces** (Chips, algorithms,..)
- Discussions onginig to enter a consortium**
- More opportunities in Quantum Sensing

Cross-sectional and leveraging several QTs

Process Enabling Technologies



Operations Enabling Technologies



Sprejeta Strategija razvoja kvantnih tehnologij v Sloveniji do leta 2035

16. 10. 2025 Direktorat za znanost in inovacije Ministrstvo za visoko šolstvo, znanost in inovacije

Vlada Republike Slovenije je sprejela Strategijo razvoja kvantnih tehnologij v Sloveniji do leta 2035 kot prvega nacionalnega strateškega dokumenta na tem področju.



Avtor: Depositphotos

Status



Plan:

1. Collect funds for starting the center
2. 2027 formally move financing to infrastructure

Competence center CC chip
Consortium providing means for training

Link Quantum and HEP

Design center:
Long term support for tools
Collaboration enabler

Seek international
Collaborations and projects

Engage in future
multisipartemental activities

