

Project Management and Working Groups

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Doç. Dr. Hatice D. Yıldız (Ankara Univ.)

1. TAC IR-SEL & Bremstrahlung Facility

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2. TAC Facilities Design Projects

A. Particle Factory (PF):

Co-coordinators: Orhan Çakır (Ankara Univ.), Serkant A. Çetin (Doğuş Univ.)

B. Synchrotron Radiation (SR):

Co-coordinators: Ozgül Kurtulus (Dogus Univ.),
Hüsnü Aksakal (Niğde Univ.),
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C. Free Electron Laser (SASE FEL):

Co-coordinators: Hatice D. Yıldız (Ankara Univ.)
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D. Proton Accelerator (PA):

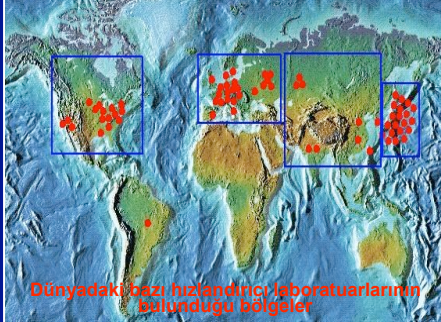
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Accelerator Technologies Around the World

Developing in the 1930s, today in the 21st century, accelerator technologies play important role in almost all fields of science & technology as one of the most important strategic (generic) technologies.



Recently, particle accelerators are highlighted in almost 400 different sub-areas such as particle & nuclear physics, solid-state physics, medicine, chemistry, biology, material science, nanotechnology, electronics and etc. Therefore particle accelerators are major milestones in the plannings of developed and developing countries for a sustainable future with science & technology priorities.

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Recent Status of Turkey

Although medical linacs and small-scaled cyclotrons are available in Turkey, an R&D based particle accelerator facility has not established yet. With the support of **Development Ministry of Turkey** and coordinator **Ankara University** within the scope of "Turkish Accelerator Center" (TAC) Project, first accelerator facility and other related facility substructures are proposed. One of these, **TARLA** in which IR FEL will be produced, will make it possible to develop research and projects based on the areas of material science, nanotechnology, medicine, chemistry, biology, agriculture and communications. An example to these facilities a proton accelerator facility has been built by **Turkish Atomic Energy Authority (TAEK)** in Ankara. Institute of Accelerator Technologies (HTE) which is built by the project will educate trained experts and provide substructure for detector technologies. It's planned to complete the project until 2025 with all the goals aimed.

International Collaborations

Ankara University as the main coordinator of the project has signed scientific cooperation agreements with the leading centers:

1. **CERN (Switzerland)**
2. **Deutsches Elektronen-Synchrotron (DESY, Germany)**
3. **ELBE Accelerator Institute (HZDR, Germany)**
4. **HZB-BESSY II Synchrotron Center (Berlin, Germany)**
5. **Cockcroft Accelerator Institute (Daresbury, UK)**
6. **Beijing High Energy Physics Institute (IHEP, China)**
7. **Euro XFEL GmbH (Hamburg, Germany)**



Ministry of Development of Turkey

TURKISH ACCELERATOR CENTER (TAC) PROJECT

<http://thm.ankara.edu.tr>

TÜRK HIZLANDIRICI MERKEZİ



Turkish Accelerator Project is coordinated by Ankara University and participated with almost 155 scientists from 12 universities around Turkey and officially supporting by the Ministry of Development of Turkey.



Ankara Üniversitesi (Koodinatör)



Gazi Üniversitesi



İstanbul Üniversitesi



Boğaziçi Üniversitesi



Dumlupınar Üniversitesi



Uludağ Üniversitesi



Süleyman Demirel Üniversitesi



Niğde Üniversitesi



Erciyes Üniversitesi



Doğuş Üniversitesi



Osmangazi Üniversitesi

Gebze Yüksek Teknoloji Enstitüsü

Turkish Accelerator Center (TAC)

In order to level up R&D structure of Turkey and develop accelerator technologies via Turkish Accelerator Center Project, first step in accelerator technologies was taken by a feasibility report which was proposed to State Planning Organization of Turkey (SPO) (1997)

Main task of the TAC Project is to introduce our country with accelerator technologies and to be able to coordinate R&D activities based on this technology. Energetic particle and radiation beams with detector technologies make it possible to research micro and macro worlds. These researches can bring a fresh breath to natural and applied science studies in Turkey. First stage will be completed with the first facility of TAC project in 2014. Meanwhile Accelerator Technologies Institute was built at the same place in 2011.



Institute of Accelerator Technologies (Golbasi Campus)

Feasibility phase was completed in 2001 and CDR phase was held until 2005. In the third phase which is still going on (2006-2014), 5 main tasks have been pointed out:

1. to establish Accelerator Technologies Institute
2. to establish Electron Accelerator and Laser Facility (TARLA)
3. to write of CDR/TDR of proposed TAC facilities
4. to collaborate with leading accelerator centers around the world
5. to educate trained experts in accelerator sciences.

It's planned that TAC facilities will be fully operational between 2015-2025.

First Facility of TAC: Infrared Free Electron Laser (IR FEL)

Accelerated electron beam lose a part of its energy during an electromagnetic radiation while it is passing through a sinusoidal magnetic field called an undulator in the linear accelerator. This radiation named as "Free Electron Laser (FEL)". It is taken out from the hole of one of the mirrors which is confined between two mirrors when it reaches certain saturation. Such as a FEL mechanism regarded as "Oscillator mode Free Electron Laser". This radiation is same-phase, single color and adjustable wavelength form.



THM IR-SEL (TARLA*) Facility

IR FEL & Brems. facility will have an Sc electron with 15 - 40 MeV energy range, two undulators and two optical mirror systems. It is planned to produce FEL between wavelength range 2.5 - 250 microns in the IR FEL Laboratory.

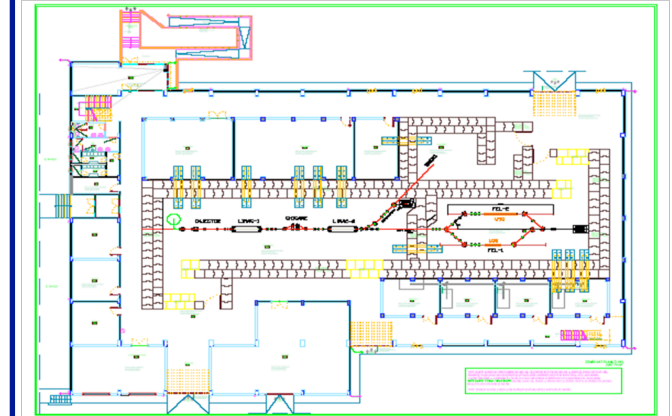
THM IR SEL (TARLA*) Parameters

Parameters of Electron Beam		
Beam Energy [MeV]	15-40	
Bunch Charge [pC]	80	
Bunch Lengths [ps]	1-10	
Repetition Frequency [MHz]	13-26	
Average Current [mA]	1.6	
Parameters of Undulator Magnets		
	Salıncırcı-1	Salıncırcı-2
Undulator Period [cm]	2,5	9
Peak Magnetic Field [T]	0,1-0,35	0,1-0,42
Strength Parameter (K)	0,3 - 1	0,8 - 2,3
Number of Periods	60	40
Parameters of IR FEL		
	SEL-1	SEL-2
FEL Wavelength [μm]	2,5- 30	18 - 250
Pulse Energy [μJ]	~10	~8
Maximum Peak Power [MW]	~5	~2,5
Pulse Legnth [ps]	1-10	1-10

T.A.R.L.A.: Turkish Accelerator and Radiation Laboratory at Ankara

IR FEL Facility Research Potential

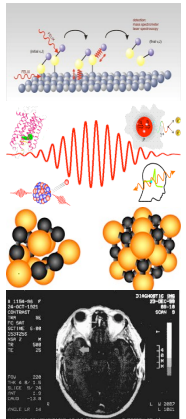
7 experimental stations will take place in the TAC IR FEL facility including a photon diagnostics laboratory. These stations will equipped with fully modern instruments and use IR FEL for special spectroscopic and microscopic methods.



Ground Floor Plan of TARLA Facility

Experimental stations will be structured to be able to develop modern R&D studies taking account of the user potentials and highest priorities of our country in the following titles:

- ⇒ **Material and Surface Physics**
- ⇒ **Nanotechnology**
- ⇒ **Biotechnology**
- ⇒ **Photochemistry**
- ⇒ **Atom ve Molecule Physics**
- ⇒ **Medical Physics**
- ⇒ **Optics & Laser Physics**



Approximately 70 third generation radiation laboratories and 30 fourth generation radiation laboratories take place around the world in various countries.

http://sbfel3.ucsb.edu/www/vl_fel.html