Infrared Free Electron Laser Research Center (FEL-TUS)

Established : 1st April 2009

Staff		
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Senior staff	Dept. of Physics, Faculty of Science	Prof. E. Tokunaga
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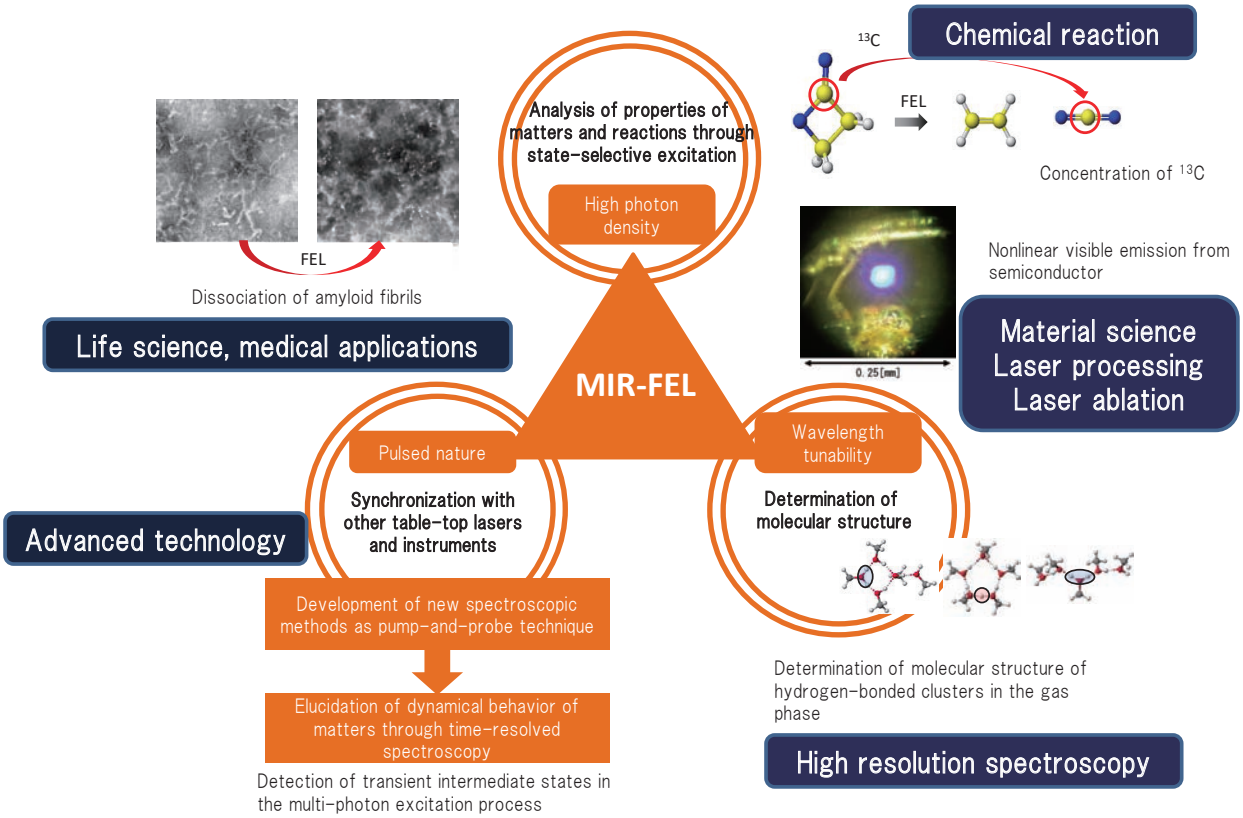
	Dept. of Appl. Physics, Faculty of Science	Prof. T. Nakajima
Junior staff	Dept. of Chemistry, Faculty of Science	Dr. T. Oyama
	RIST	Dr. T. Imai
	RIST	Dr. T. Kawasaki
Visiting professor	KEK	Prof. R. Kato
	University of New Brunswick・Professor	Prof. S. C. Ross
Visiting scientist	Osaka University	Dr. A. Irizawa
	RIST	Dr. M. Toriumi
	Dental Clinic TMP	Dr. J. Fujioka
Secretariat	URA	Dr. H. Taskayanagi

FEL-TUS exploits an intense pulsed mid-infrared free electron laser which is used for basic and applied research both by in-house as well as external users.



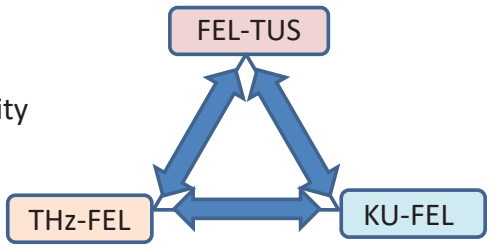
Towards construction of IR-FEL Network

○ Collaboration with THz-FEL at SanKen, Osaka University

Ex. Disruption of amyloid fibrils by THz-FEL

○ Use of KU-FEL at Kyoto University

Ex. Irradiation effect on melanin and melanoma

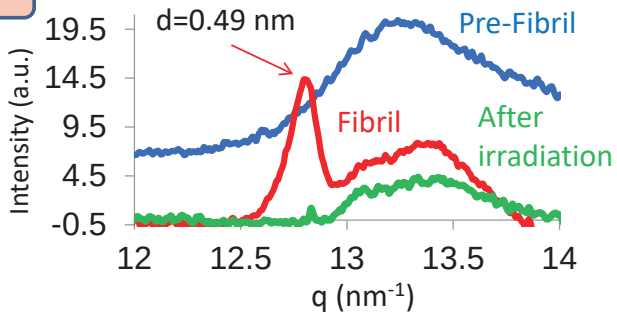


Technical Interaction
Open Seminar

Cooperative Study in Photon-Beam Platform

Use of SAXS at Aichi SR Center

Direct evidence for dissociation of amyloid fibrils by IR-FEL can be obtained by SR-based SAXS analysis.



Cooperative study with CNRS

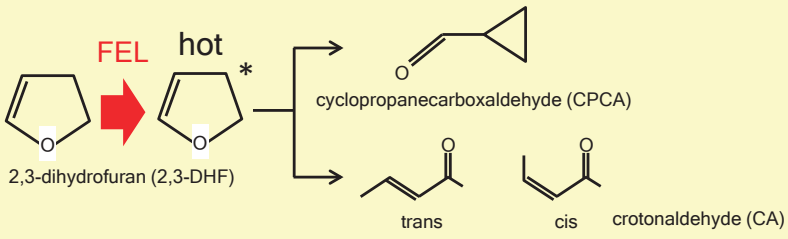
Combination of experiments and molecular simulation study can realize the usefulness of FEL in bio- and material- sciences.

➡ **interdisciplinary studies**

"Breaking down cellulose fibrils with a mid-infrared laser"
Domin, D. et al. *Cellulose* (2018). https://doi.org/10.1007/s10570-018-1973-2

Chemistry/Spectroscopy

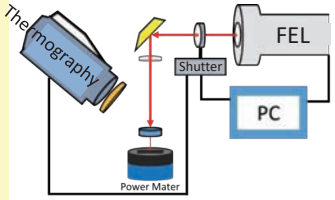
Chemical reactions induced by Infrared Multi-Photon Absorption

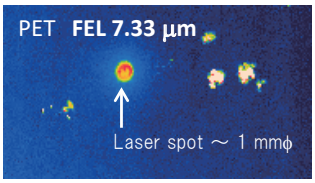


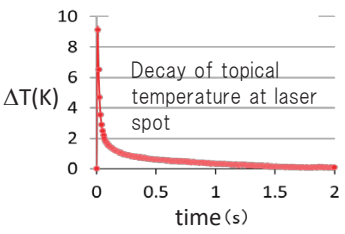
Isomerization and dissociation of 2,3-DHF induced by infrared free electron laser
M. Matsubara, F. Osada, M. Nakajima, T. Imai, K. Nishimura, T. Oyama and K. Tsukiyama
J. Photochem. Photobiol. A, **322**, 53-59(2016)

Advanced technology

Time-resolved real-time imaging of temperature
Analysis of thermo-physical property of materials





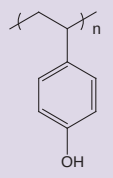


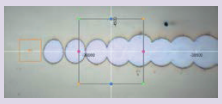
Material Science

Ablations of thin polymer films for semiconductor resist materials

Ablation of poly(hydroxystyrene) (PHOST)

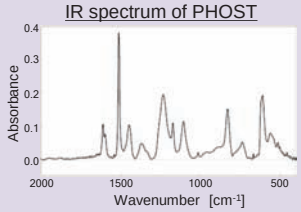
Polymer structure





Ablation of Si substrate

IR spectrum of PHOST



Resist-polymer ablation by mid-infrared free electron laser
M. Troiumi, T. Kawasaki, M. Araki, T. Imai and K. Tsukiyama
Proceedings of SPIE, 1058613-1-8(2018)