Exposing the Truth by SR Nanobeam:
The huge microscope, SPring-8, sustains a secure and safe society

1. Establishment of the Nano Forensic Science Group at SPring-8

2. Members of the Nano Forensic Science Group

3. Kick-off Meeting with the United Nations Office on Drugs and Crime

3. Newspaper Articles about Nano Forensic Science at SPring-8

Forensic Science:
A discipline of a broad spectrum of sciences to investigate and elucidate evidences relating to criminal or civil law.
1. Establishment of the Nano Forensic Science Group at Spring-8

On December 1, 2011, "Nano Forensic Science Group" (NFS Group) was established in the Research and Utilization Division of Japan Synchrotron Radiation Research Institute (JASRI) to promote forensic science using synchrotron radiation (SR) of SPring-8 and began its activity. "Nano Forensic Science" means the field of forensic science that deals with nano level size forensic materials.

Note: 1 nano means a one-1,000,000,000th. In other words, 1 nanometer is a one-1000th of 1 micron.

Mission of the Group:
Via the cutting edge science and technology using high brilliant X-ray nanobeam emanated from SPring-8, we expose the truth from criminal evidences. To accomplish this, we develop advanced analytical methods for the nano forensic science with proper utilization system. That will lead to deter violent crimes worldwide, not only in Japan, and contribute to the realization of peaceful and secure society. Furthermore, we develop the cutting edge nano-analytical methods using SR.

Targets to Achieve:
(1) Establishment of the research field, Nano Forensic Science
We will develop the research of ultra nanobeam analytical techniques at SPring-8 and promote the utilization to the scientific investigation.

(2) Standardization of precision and reliability criteria for methods and data
We will establish a firm position of SR usage in the scientific criminal investigation by standardizing analytical precision of nanobeam as analytical criteria for forensic science analysis, building a database.

(3) Consolidation of utilization system
We will establish an effective utilization system in a particular filed of application, the scientific criminal investigation.

The analysis of a tiny piece of evidence:
In SPring-8, you are able perform the analysis of a minute exhibit nondestructively.

In 2010, the space craft Hayabusa took home the fine particles from asteroid Itokawa, which include small particles of several microns. It was no doubt the "minute exhibits". These "fine particles" were analyzed with a X-ray CT method at SPring-8 nondestructively, and the kind of mineral ingredients included in "the fine particles" became clear.

In addition, minute criminal evidences such as the small glass pieces can be analyzed at SPring-8 (see right figure, below).

Overview of SPring-8 and SACLA
SPring-8, the world's largest synchrotron radiation facility, has been operated since 1997. The facility is used by universities and research institutes for fundamental research and by private sectors for new material development. Moreover it is also used for elucidating various crimes.

SACLA, the X-ray free-electron laser facility which started to be in use this year. Since 100 million times brighter light than that of SPring-8 is available, it is expected to be useful in the field of basic and applicational study of industrial research, and development are going to open for future.
The Nano Forensic Science Group has set up a new system for nanobeam spectroscopy in the beamline BL05SS on demand for advanced forensic science.

2. Members of the Nano Forensic Science Group

Mr. Kaoru Okada, Senior Advisor  
Former Director-General of Criminal Affairs Bureau, National Police Agency

Dr. Toshio Ninomiya, Group Leader  
Former Director of Forensic Science Laboratory, Hyogo Prefectural Police Headquarters

Dr. Yukio Minami, Coordinator  
Former Director of Forensic Science Laboratory, Osaka Prefectural Police Headquarters

Dr. Yukiko Makino, Coordinator  
Researcher, Faculty of Pharmaceutical Sciences, the University of Tokyo  
Former Chief Technical Officer of Narcotics Control Department, Kanto Shin-etsu Drug Control Division, Ministry of Health, Labour and Welfare

Dr. Kazuhiko Nakano, Postdoctoral Researcher  
Former Senior Researcher, Central Customs Laboratory, Ministry of Finance

Dr. Shinjirou Hayakawa, Visiting Chief Scientist  
Associate Professor of Graduate School of Engineering, Hiroshima University  
Expert of Synchrotron radiation Analysis

**Progress in Analytical Performance at SPring-8**

The nanobeam at SPring-8 will bring "innovation in precision" in the scientific criminal investigation.

It is our mission to cultivate the forensic science and expose the truth through advanced science utilizing SR nanobeam.

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<tbody>
<tr>
<td>X-ray focusing efficiency (x10,000,000)</td>
<td>Ultra flat mirror for ultra-trace analysis (x 1,000,000 – x 10,000,000)</td>
<td>KB mirror focusing optics (x 10,000)</td>
<td>X-ray focusing optics was not used (x 1)</td>
</tr>
<tr>
<td>X-ray photon flux density (x1,000,000)</td>
<td>10^{13} photons/1µm²</td>
<td>10^{10} photons/1µm²</td>
<td>10^{6} photons/1µm²</td>
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<tr>
<td>X-ray beamsize (x100,000)</td>
<td>100 – 300 nm</td>
<td>µm</td>
<td>mm</td>
</tr>
<tr>
<td>Detection Limit (x3,000)</td>
<td>30 thousands atoms</td>
<td>500 thousand atoms</td>
<td>100 millions atoms</td>
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The Nano Forensic Science Group has set up a new system for nanobeam spectroscopy in the beamline BL05SS on demand for advanced forensic science.
3. Kick-off Meeting with the United Nations Office on Drugs and Crime (UNODC)

June 22, 2012 – Representatives from SPring-8 visit Dr. Justice Tettey, the Chief of Laboratory and Scientific Section, United Nations Office on Drugs and Crime (UNODC) with Mr. Yasuhiro Araki, the First Secretary of Permanent Mission of Japan to the International Organization in Vienna.

4. Newspaper Articles about Nano Forensic Science at SPring-8