

June 12, 2017

Radioactive contamination at Plutonium Fuel Research Facility (PFRF) in Oarai
Research and Development Center (Follow-up 2)

Japan Atomic Energy Agency

Below is the situation after the press release issued on June 9 of the radioactive contamination at Plutonium Fuel Research Facility (PFRF) occurred on June 6 (Tue), 2017. (Added information is underlined.)

1. Main measures taken by JAEA so far

During inspection work of storage container containing nuclear fuel materials, the resin bag filled with the container containing nuclear fuel material in the storage container was broken, and radioactive contamination of 5 workers was confirmed. As a result of body contamination check, 24 Bq (α ray) at a maximum in nasal cavity was confirmed. (June 6 press release)

Because 2.2×10^4 Bq (Pu-239) was confirmed at most by lung monitor measurement of the 5 workers at Nuclear Fuel Cycle Engineering Laboratories, the workers were sent to the National Institute of Radiological Sciences (NIRS), the National Institutes for Quantum and Radiological Science and Technology (QST), re-decontamination of body surface, lung monitor, etc. was carried out.

On the other hand, survey about the contamination situation inside Room No. 108 of PFRF set as an entry restricted area was conducted. (June 6 press release)

JAEA gave a detailed description of the accident at the Secretariat of the Nuclear Regulation Authority. (Attachment 1)

2. Situation of workers exposed to radiation

The 5 workers (one in 50's, two in 40's, one in 30's one in 20's: five in total) arrived at NIRS around 12:00, June 7.

(1) Health condition: No abnormality

(2) Situation of treatments, etc.

Today June 12, JAEA received the result of lung monitoring conducted at NIRS. (Attachment 2)

3. Situation of the spot

(1) Situation of the hood

The storage container with a lid covered is set still in the hood, being monitored continuously by TV camera.

(2) Contamination situation inside Room No. 108, etc.

- On June 7, measurement was conducted at 14 spots, and at a maximum 55 Bq/cm² (α ray) and 3.1 Bq/cm² (β (γ)ray) were measured. (June 6 press release)
- Currently, means to collect dispersed materials, decontaminate the room of the accident and move forward with investigation is being examined.

(3) Radiation Monitors, etc.

- There is no change in the indicated value of Pu dust monitor in Room No. 108, the indication of radioactive material density in the air is staying within the normal range.
- There is no change in indication with low values of the ventilation dust monitor and area monitor compared with before the incident. (Attachment 3)

4. Following action

Situation and measures taken will be reported to the NRA by June 19.

5. JAEA received documents from the following municipalities.

- ① Ibaraki prefecture: “Radioactive contamination and exposure accident of workers at ”Plutonium Fuel Research Facility” in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 8)
- ② Oarai town: “Emergency requests concerning the accidental incident occurred in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 8)
- ③ Mito city: “Emergency requests concerning the accidental incident occurred in Oarai Research and Development Center” (June 8)
- ④ Hokota city: “Emergency requests concerning the radioactive contamination and exposure accident of workers at Plutonium Fuel Research Facility in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)
- ⑤ Ibaraki town: “Emergency requests concerning the accident occurred in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)
- ⑥ Hokota city council: “Requests” (June 9)
- ⑦ Oarai town council: “Emergency requests concerning the radioactive contamination and exposure accident of workers at Plutonium Fuel Research

Facility in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)

- ⑧ Omitama city: “Emergency requests concerning the radioactive contamination and exposure accident of workers at Plutonium Fuel Research Facility in Oarai Research and Development Center, Japan Atomic Energy Agency” (June 9)

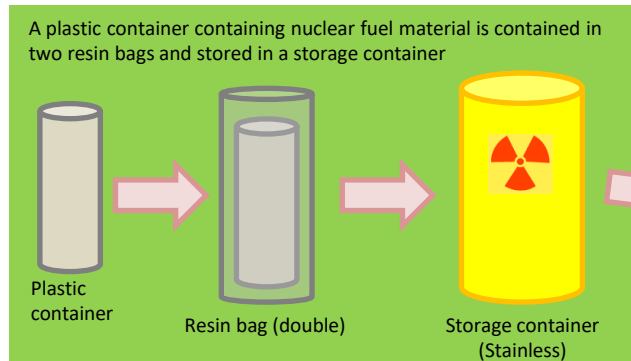
Contamination at Plutonium Fuel Research Facility in Oarai Research and Development Center

June 12, 2017

Japan Atomic Energy Agency

Outline

Around 11:15, June 6 2017 (Tue.), in an analysis room of Plutonium Fuel Research Facility (PFRF) (controlled area) (Room No. 108), resin bags ruptured and contamination occurred during inspecting a storage container containing plutonium and uranium with a hood (H-1).



Events in chronological order

【June 6 (Tue)】

Around 11:15: During inspection work of storage container containing nuclear fuel materials (work with a hood) in Room No. 108 (controlled area) at PFRF, it is confirmed the resin bag in the storage container was broken, and the possibility of radioactive contamination of five worker's bodies was confirmed. The five workers wore half-faced masks. Room No. 108 (controlled area) at PFRF, it is confirmed the resin bag in the storage container was broken, and the possibility of radioactive contamination of five worker's bodies was confirmed. The five workers wore half-faced masks.

Around 11:48: On-site Command Post was set up.

12:00: The Oarai on-site Response Headquarters was set up.

12:27: FAX (the 1st report) was sent. → 12:52 FAX acceptance was confirmed.

12:52: A staff of radiation management and a staff of the facility entered the controlled area. They confirmed no abnormality on the workers' health condition.

13:05: No contamination of walls etc. of the Room No. 108 (outer boundary) was confirmed. Gaps were sealed.

13:15: Construction of a greenhouse at the entrance of the Room No. 108 started.

13:22: FAX (the 2nd report) was sent. → 13:40 FAX acceptance was confirmed.

13:55: Rise in the indicated value of the "Pu dust monitor No.2 (Room No. 108)" was confirmed (circa 5×10^{-8} Bq/cm³ (average density of a week)). The indicated value of "ventilation dust monitor" was confirmed to be within the range of normal.

14:20: The indicated value of the "monitoring post (P-2)" was normal. No impact on environment.

14:29: Construction of the greenhouse at the entrance of the Room No. 108 completed.

14:30~: The workers started to leave the site (inspection of body contamination).

14:44~: Inspection of Worker A's contamination: 100 min⁻¹ at a maximum (α ray, cap), no body contamination after removing radiation protectors;
Result of nasal cavity contamination test: normal

14:53: FAX (the 3rd report) was sent. → 15:15 FAX acceptance was confirmed.

14:59~: Inspection of Worker B's contamination: 3,000 min⁻¹ at a maximum (α ray, overall); Body contamination after removing radiation protectors: body contamination was confirmed; Ears 500 min⁻¹ (α ray); Result of nasal cavity contamination test: normal; Shower done.

Events in chronological order (continued)

【June 6 (Tue) (continued)】

- 14:59~: Inspection of Worker B's contamination: $3,000 \text{ min}^{-1}$ at a maximum (α ray, overall); Body contamination after removing radiation protectors: body contamination was confirmed; Ears 500 min^{-1} (α ray); Result of nasal cavity contamination test: normal; Shower done.
- 15:25~: Inspection of Worker C's contamination: $1,000 \text{ min}^{-1}$ at a maximum (α ray, cap); Result of nasal cavity contamination test: 13 Bq (α ray); Shower done.
- 16:00~: Inspection of Worker D's contamination: $1,800 \text{ min}^{-1}$ at a maximum (α ray, overall); Result of nasal cavity contamination test: 3 Bq (α ray); Shower done.
- 16:07~: Inspection of Worker E's contamination: greater than $> 100,000 \text{ min}^{-1}$ at a maximum (α ray, overall); Result of nasal cavity contamination test: 24 Bq (α ray)
- 16:27: Room No. 108 was designated as the entry restriction area.
- 17:05: FAX (the 4th report) was sent. → 17:40 FAX acceptance was confirmed.
- 18:52: Decontamination of all the five workers completed.
- 18:55: All the five workers left the area.
- 19:05: The five workers left for Nuclear Fuel Cycle Engineering Laboratories.
- 19:40: Dust collection filters of the "Pu dust monitor No.2 (Room No. 108)" were replaced. The indicated value was confirmed to be within the range of normal. Ventilation dust monitor: The indicated value was confirmed to be within the range of normal.
- 19:41: The five workers arrived at the Nuclear Fuel Cycle Engineering Laboratories.
- 19:59: Measurement of Worker E using a lung monitor started.
- 22:05: Injection of chelating agent to the workers started.
- 23:33: Inspection of the five workers using a lung monitor completed. As a result of the measurement, $2.2 \times 10^4 \text{ Bq}$ and $2.2 \times 10^2 \text{ Bq}$ at maximum were confirmed regarding Pu-239 and Am-241 respectively.

【June 7 (Wed)】

- 1:05: Injection of chelating agent to all the workers completed.
- 10:00~: The five workers left Oarai Research and Development Center for the National Institute of Radiological Science (NIRS). At 11:55 they arrived at NIRS. Measurement using lung monitor started after inspection of body contamination and decontamination.
- 12:18: FAX (the 2nd report, the 5th in total) was sent. → 13:01 FAX acceptance was confirmed.
- 13:27: JAEA reported the Nuclear Regulation Authority (NRA) judging it as the one which report is required by laws and regulations.
- 17:05: FAX (the 3rd report, the 6th in total) was sent. → 17:56 FAX acceptance was confirmed.
- 18:55: As a result of contamination survey in Room No. 108, 55 Bq/cm^2 (α ray) at a maximum was confirmed.

【June 8 (Thu)】

- 10:43: FAX (the 4th report, the 7th in total) was sent. → 11:20 FAX acceptance was confirmed.
- 16:40: Clearance and decontamination in the greenhouse was completed.

Following action plan will be studied in the Agency and will be implemented systematically.

Plan for action

○ Grasp the current situation

- Continue continuous monitoring of the inside of the hood (H-1) using TV camera and continuous measurement by Pu dust monitor No.2
- Confirm the detailed contamination situation of Room No. 108
- Contribute to the information gathering to identify the cause of the accident by grasping the situation of the accident site through efforts such as collecting particles having dispersed from the hood (H-1) based on the location information
- Develop the plan for the above effort for grasping the current situation, and carry out it

○ Restoration of the accident site

- Decontaminate Room No. 108. Decontamination materials are stored grouped by area
- Transfer the storage container to an appropriate place from the hood (H-1)
- Decontaminate the hood (H-1). 108. Decontamination materials are stored grouped by area
- Develop the plan for the above effort for grasping the current situation, and carry out it

○ Determine the cause of the accident (identification of the direct cause)

- Grasp the characteristics of the nuclear fuel materials of this accident, investigating the records of the past and use history
- Narrow down the factors for the pressurization of the resin bags through observation of the nuclear fuel materials, analysis, experiment, etc.
- Verify the process of the accident up to the exit from the controlled area of the workers
- Formulate necessary measures based on the identified causes

○ Improve work management (identification of the indirect cause)

- Verify the work plan from planning to implementation, and work out a solution to the identified issues

Plan for action

- Improve accident response
 - Verify the response to the accident and work out a solution to the identified issues

- Make reports required by laws and regulations
 - Report to the NRA on the situation of the accident and measures taken by June 19, 2017

- Evaluate the exposure and care for the exposed workers
 - Provide care to the workers in cooperation with NIRS

- Release information
 - Disclose new facts in a prompt and accurate manner

Measurement with lung monitor

1. Result of the measurement at the National Institute of Radiological Sciences (NIRS), the National Institutes for Quantum and Radiological Science and Technology (QST)

Below are the recognition of JAEA on the result of the measurement with lung monitor conducted at NIRS:

- While peak was not detected regarding ^{239}Pu among all the five workers, there was a worker with whom significant peak was detected regarding ^{241}Am .
- The lower limit values detected with lung monitor are 5~10 kBq and 10 Bq with regard to ^{239}Pu and ^{241}Am respectively.
- With regard to the significant peak of ^{241}Am , possibility of the influence by the slight contamination on the skin needs to be assessed. The lower limit of detected value of the lung monitor is high, and even if the result is lower than the lower limit, it does not mean there is no internal exposure.

2. Difference between the results of lung monitor measurement conducted at JAEA and at NIRS

While ^{239}Pu and ^{241}Am were detected with one person and four people respectively by the measurement conducted on the day of the accident (June 6) at JAEA's Nuclear Fuel Cycle Engineering Laboratories, in the measurement conducted at NIRS on the following days, no ^{239}Pu was detected and the number of people with whom ^{241}Am was significantly detected reduced.

There is a possibility that the lung monitor detected slight ^{239}Pu , etc. remaining in wrinkles of the skin after decontamination of the worker which reduced contamination to the level meeting the standard for exiting the controlled area, and accordingly overestimated the radioactivity. As the lung monitor detects relatively weak penetrability of x-ray (about 17keV), the quantity of ^{239}Pu deposited in the lung is determined by correcting the value taking account the x-ray attenuation due to the thickness of the chest. If ^{239}Pu attaches to the skin, even a small amount can cause overestimation. (In the case of ^{241}Am , as relatively strong penetrability of γ -ray is detected (about 59.5 keV), the tendency toward overestimation due to correction is less compared with ^{239}Pu .)

The purpose of the measurement with lung monitor conducted immediately after the accident is to help the decision on the urgent medical treatment (injection of chelate agent to prompt egestion, etc.), and therefore in accordance with the

precautionary principle, tendency toward overestimation is unavoidable. Underestimation resulting in regarding the person measured as not contaminated has more problems.

3. Environmental impact due to contamination remaining on the skin

As the result of the body contamination test at the time of exiting the controlled area after body decontamination, the levels were sufficiently lower than the standards set for the controlled area (α : 0.4 Bq/cm², β : 4 Bq/cm²), and no significant contamination was detected in the contamination test by NIRS of the car after transporting the workers, and accordingly there was no environmental impact.

Wind direction and speed

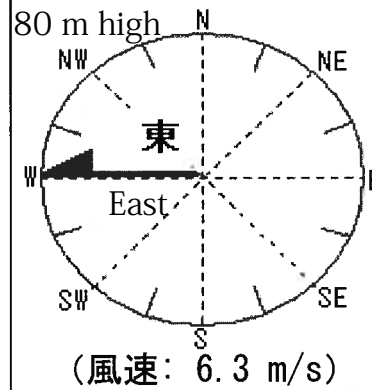
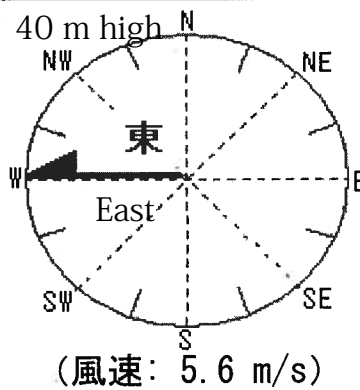
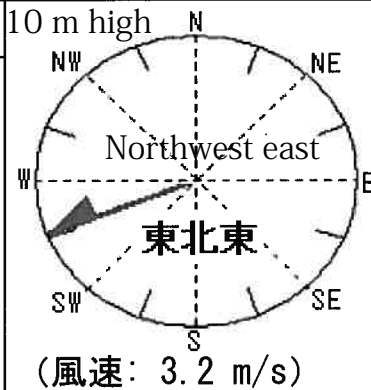
環境監視結果 (2017年06月12日14時00分)

10m高風向・風速

40m高風向・風速

80m高風向・風速

記入者 [Redacted]



大気安定度 A B **C** D E F G 感雨 有 -

Atomospheric stability

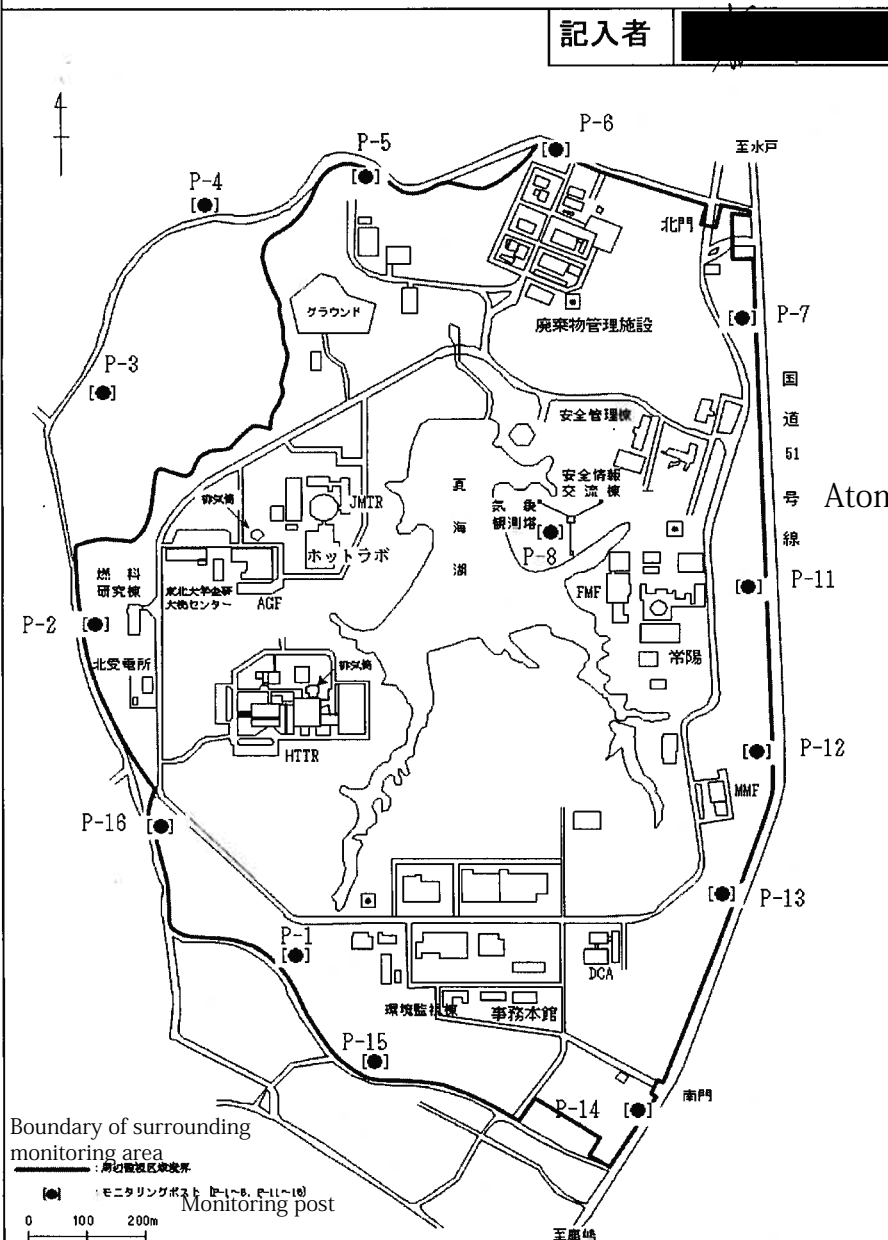
モニタリングポスト測定値 (※)

Rain No

ポストNo.	測定値 (nGy/h)	平常値 (nGy/h)	異常	ポストNo.	測定値 (nGy/h)	平常値 (nGy/h)	異常
P-1	62	55~80	有(無)	P-11	110	91~121	有(無)
P-2	67	58~81	有(無)	P-12	97	81~105	有(無)
P-3	52	46~67	有(無)	P-13	69	58~84	有(無)
P-4	61	52~68	有(無)	P-14	59	50~82	有(無)
P-5	56	51~70	有(無)	P-15	65	56~78	有(無)
P-6	51	49~68	有(無)	P-16	55	45~66	有(無)
P-7	78	69~91	有(無)	特記事項: 平常値の欄の上段の数値はH29年3月の1時間平均値。下段の数値は1分値の最小~最大値を使用。			
P-8	58	51~71	有(無)				

備考欄
H23年3月以降、福島第一原子力発電所事故の影響により事故前に比べ高い線量率で推移している。
(※)緊急事態発生時において実効線量に換算する場合、環境放射線モニタリング指針に基づき換算係数1(Sv/Gy)を適用する。

測定値は通常値と比較して変化はない。



Boundary of surrounding monitoring area
Monitoring post

空間γ線量率測定地点及び気象観測地点

Measuring points of spatial γ ray dose rate and weather

Monitoring post measured values (※)

Post No.	Measured value (nGy/h)	Normal value (nGy/h)	Abnormality	Post No.	Measured value (nGy/h)	Normal value (nGy/h)	Abnormality
P-1	62	63 55-80	No	P-11	110	105 91-121	No
P-2	67	65 58-81	No	P-12	97	92 81-105	No
P-3	52	54 46-67	No	P-13	69	69 58-84	No
P-4	61	59 52-68	No	P-14	59	58 50-82	No
P-5	56	57 51-70	No	P-15	65	65 56-78	No
P-6	51	55 49-68	No	P-16	55	53 45-66	No
P-7	78	78 69-91	No	Notes: Upper values in “Normal value” columns are average values per hour in March, 2017. Lower values are minimum-maximum values in 1 minute.			
P-8	58	58 51-71	No				

Remarks

After March 2011, because of the influence of Fukushima Daiichi nuclear power plant accident, dose rates have been higher than before.

(※)When converting to effective dose at the time of emergency situation occurrence, conversion factor 1 (Sv/Gy) should be adapted based on the environmental radiation monitoring guidelines.

Measured values are no change from the normal values.

PFRF Radiation Monitor Data
(Radiation Protection Report No. 58)

Reporting addresses	General manager of Alpha-Gamma Section, General manager of Radiation Safety Management Section II
Report time	14:15 June 12, 2017

Confirmed time	14:00 June 12, 2017		-
Monitor	Indicated value	Normal indicated value	Judgement
Ventilation dust monitor α (min^{-1})	< 1.0	1.0E+00 ~ 4.1E+00	Within the normal indicated value range
Room dust monitor α (min^{-1})	< 1.0	1.0E+00 ~ 1.7E+00	Within the normal indicated value range
Pu dust monitor No.1 (s^{-1})	< 0.1	~ 1.0E-01	Within the normal indicated value range
Pu dust monitor No.2 (s^{-1})	< 0.1	~ 1.0E-01	Within the normal indicated value range

Monitor		Indicated value ($\mu\text{ Sv/h}$)	Normal indicated value ($\mu\text{ Sv/h}$)	Judgement
Gamma-ray area monitors	Area monitor No.1	80	80 ~ 110	Within the normal indicated value range
	Area monitor No.2	100	90 ~ 120	Within the normal indicated value range
	Area monitor No.3	78	70 ~ 100	Within the normal indicated value range
	Area monitor No.4	110	90 ~ 120	Within the normal indicated value range
	Area monitor No.5	70	70 ~ 100	Within the normal indicated value range

Confirmed result of radiation monitor	No abnormality
Notices	Area monitors contain radiation sources, so the values indicate around 100 $\mu\text{ Sv/h}$ constantly. Pu dust monitor No.2 indicated value is normal, no change from before the incident.
Attachment	2 sheets (Trends)

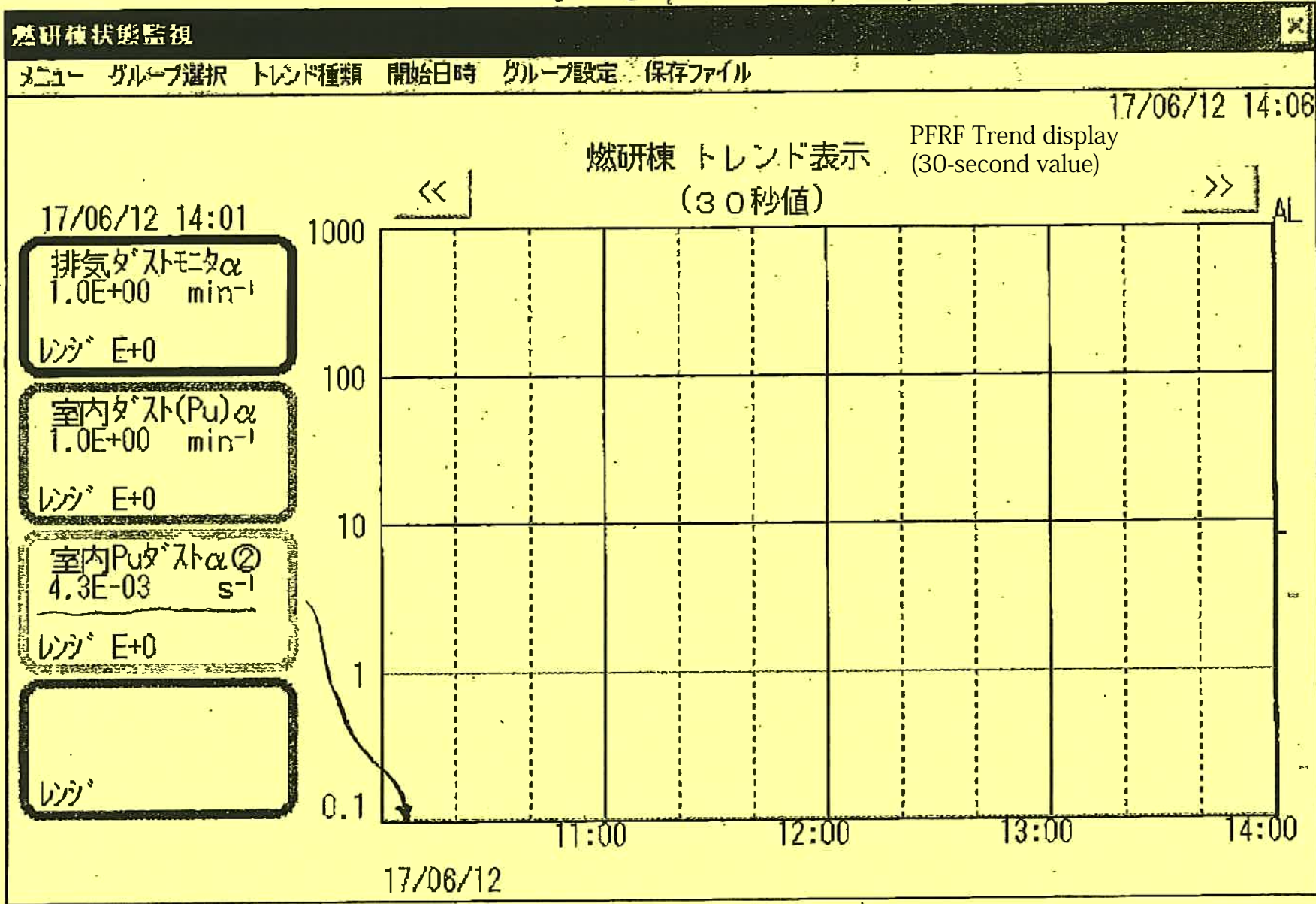
放射58報 別添①

2017年 6月12日 16時12分

原研大洗 燃料研究棟

No. 3629

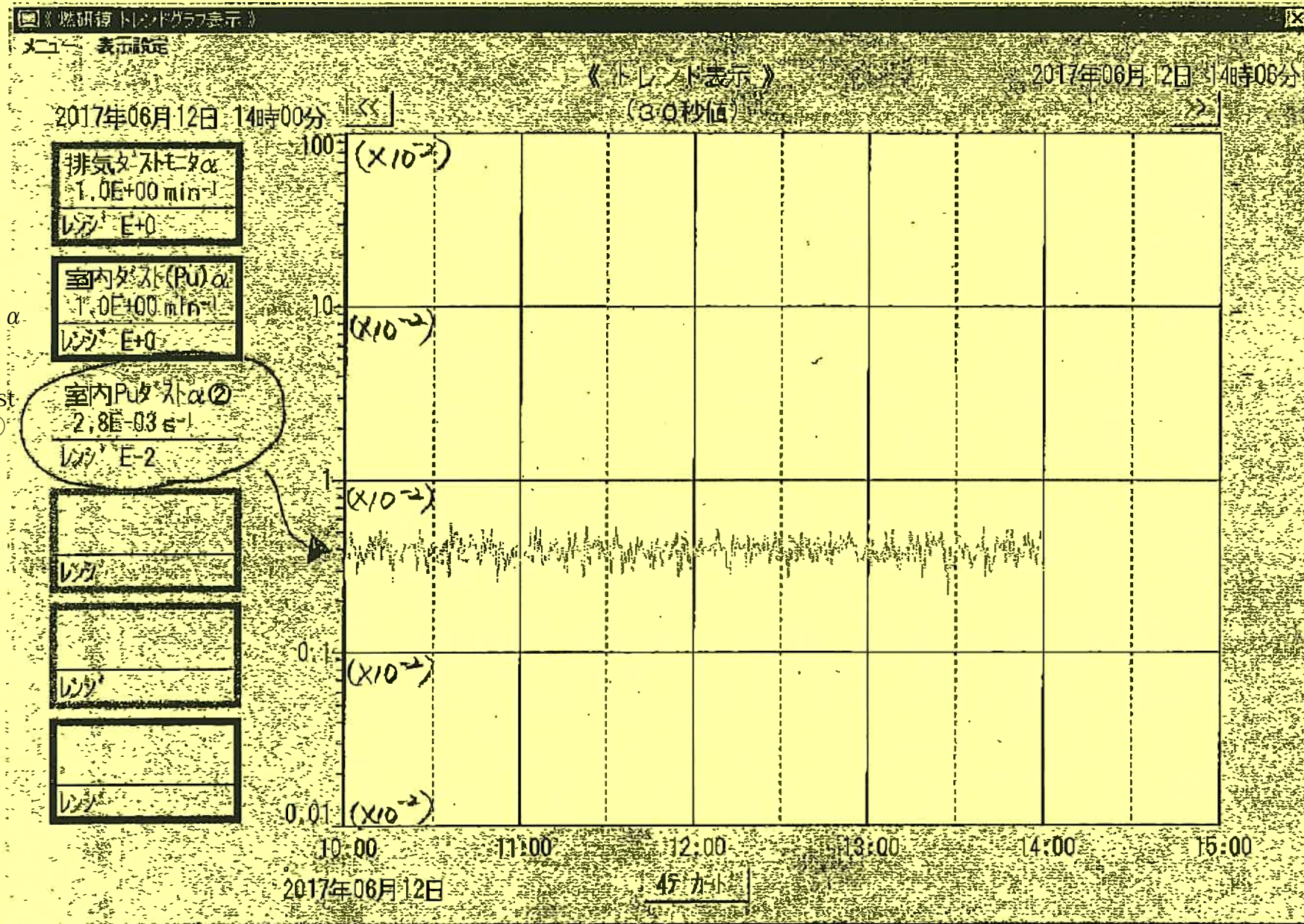
P. 2/3



Room Pu dust α ② Indicated value is within the range of normal (<0.1 s⁻¹)
→ Vertical axis range switched → Attachment ②

室内Puダスト α ② 通常指示範囲内 (<0.1 s⁻¹)
→ 縦軸由レンジを切替え → 別添②

放射 58 報 別添 ②



室内Puダスト α ② 通常指示範囲内 (<0.1 s⁻¹)

Room Pu dust α ② Indicated value is within the range of normal. (<0.1 s⁻¹)