

June 9, 2017

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

Japan Atomic Energy Agency

Below is the situation after the press release issued on June 7 of the radioactive contamination at Plutonium Fuel Research Facility (PFRF) occurred on June 6 (Tue), 2017.

1. Main measures taken by JAEA so far

During inspection work of storage container containing nuclear fuel materials (Attachment 2), 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 ( $\alpha$  ray) (Attachment 3) at a maximum in nasal cavity was confirmed.

Because  $2.2 \times 10^4$  Bq (Pu-239) (Attachment 3) was confirmed at most by lung monitor measurement of the 5 workers at Nuclear Fuel Cycle Engineering Laboratories, the workers were sent to National Institute of Radiological Sciences (NIRS), re-decontamination of body surface, lung monitor, etc. is 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.

The president of JAEA directed that this contamination incident should be addressed as a top priority for whole JAEA. (June 8) (Attachment 4)

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, have been treated.

(1) Health condition: No abnormality

(2) Situation of treatments, etc.

Report from NIRS says that re-decontamination of body surface, lung monitor, etc. is carried out. No peak of Pu was detected (in the first check by lung monitor) so far.

### 3. Situation of the spot

#### (1) Situation of the hood

The storage container (Attachment 5) with a lid covered is set still in the hood, being monitored continuously by TV camera. (Attachment 6)

#### (2) Contamination situation inside Room No. 108 is the follows:

55 Bq/cm<sup>2</sup> ( $\alpha$  ray) at a maximum, 3.1 Bq/cm<sup>2</sup> ( $\beta$  ( $\gamma$ )ray) was measured (Attachment 7) from 14 spot measurements. (Attachment 7)

#### (3) Two photographs around the hood were taken with the above measurement work. (Attachment 8)

#### (4) Radiation Monitors, etc. (Attachment 9)

- 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.

#### (5) Others

Decontamination of the greenhouse (Attachment 10) is completed, methods to collect scattered matters are under review.

### 4. External Correspondences, etc.

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: scheduled on June 9

Radiation exposure to workers at Plutonium Fuel Research Facility (PFRF)  
(Chronology)

Tuesday, June 6

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.

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  $5 \times 10^{-8}$  Bq/cm<sup>3</sup> (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<sup>-1</sup> 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<sup>-1</sup> at a maximum (α ray, coverall); Body contamination after removing radiation protectors: body

contamination was confirmed; Ears  $500 \text{ min}^{-1}$  ( $\alpha$  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 ( $\alpha$  ray, cap); Result of nasal cavity contamination test: 13 Bq ( $\alpha$  ray); Shower done.

16:00~: Inspection of Worker D's contamination:  $1,800 \text{ min}^{-1}$  at a maximum ( $\alpha$  ray, coverall); Result of nasal cavity contamination test: 3 Bq ( $\alpha$  ray); Shower done.

16:07~: Inspection of Worker E's contamination: greater than  $>100,000 \text{ min}^{-1}$  at a maximum ( $\alpha$  ray, coverall); Result of nasal cavity contamination test: 24 Bq ( $\alpha$  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,  $2.2 \times 10^4$  Bq and  $2.2 \times 10^2$  Bq at maximum were confirmed regarding Pu-239 and Am-241 respectively.

Wednesday, June 7

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). 11:55 They arrived at NIRS. Inspection of body contamination was done, measurement using lung monitor started after re-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<sup>2</sup> (α ray) at a maximum was confirmed.

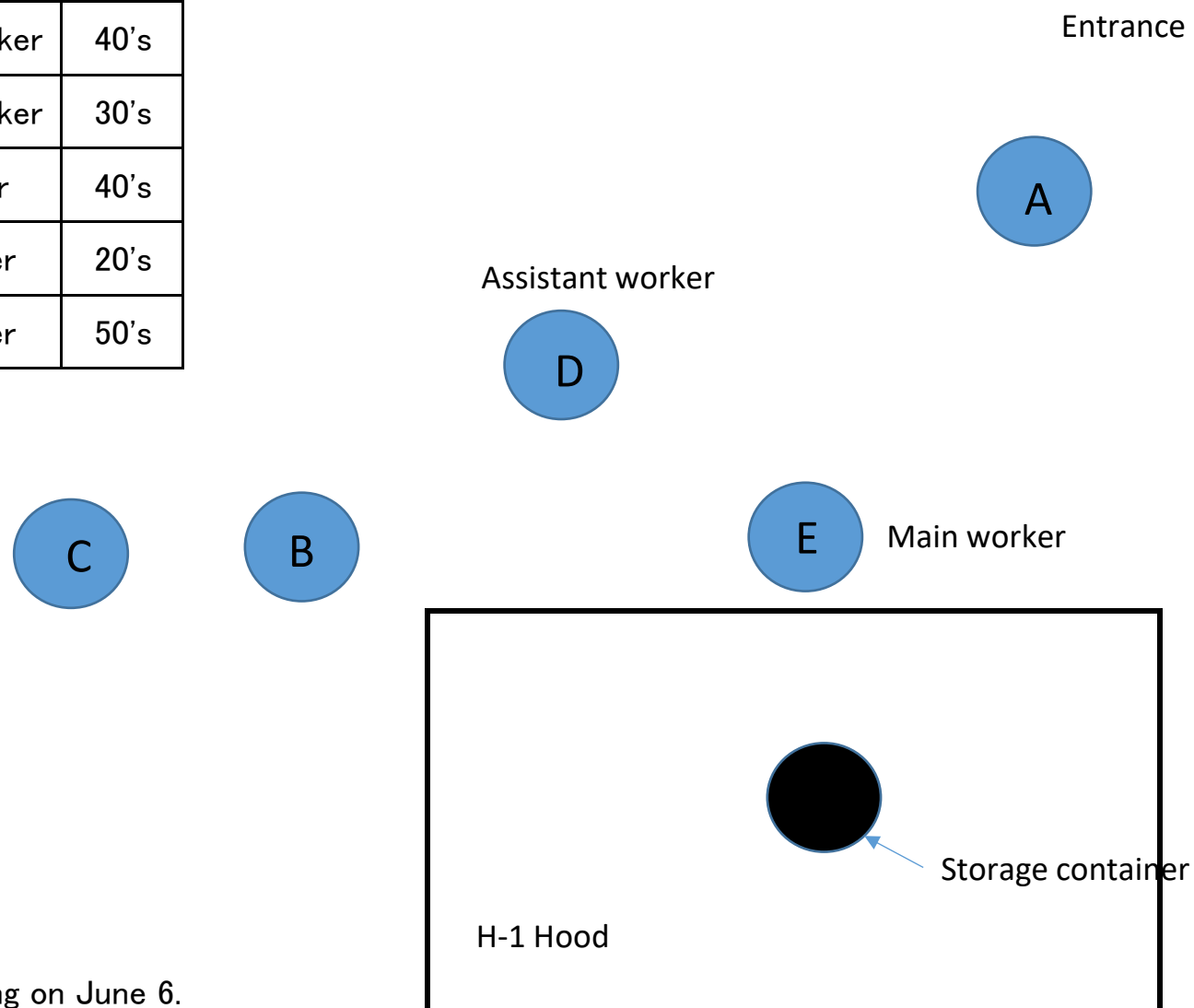
Thursday, June 8

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.

## Location of the workers in Room No. 108

A	Contract-based worker	40's
B	Contract-based worker	30's
C	Temporary-worker	40's
D	JAEA staff member	20's
E	JAEA staff member	50's



Layout based on the hearing on June 6.

Measured Values of Nasal Smear and Lung Monitor  
(Measurement conducted in JAEA)

June 6, 2017

Worker	Nasal Smear measurement (Bq)	Lung monitor measurement (Bq)	
		Pu-239	Am-241
A	-	< 2.2E+03	< 7.1E+00
B	-	< 5.6E+03	8.5E+00
C	13	< 6.0E+03	1.2E+01
D	3	< 1.4E+03	1.3E+02
E	24	2.2E+04	2.2E+02

Note 1: “<” means no detection of radionuclides, that is, the nuclide is below the value.

Note 2: When inhaling Pu-239 of 2.2E+04 Bq, it equivalent to approximately 12 Sv in effective deposit dose.

Note 3: When inhaling Pu-239, the amount of deposit in the lungs is about 6.1 % of inhalation, about 40 % is exhaled, and over 50 % transits to gastrointestinal tract, etc.

That is, if the deposit in the lungs is 2.2E+04 Bq, inhalation amount is 22,000 Bq ÷ 0.061 = 360 kBq.

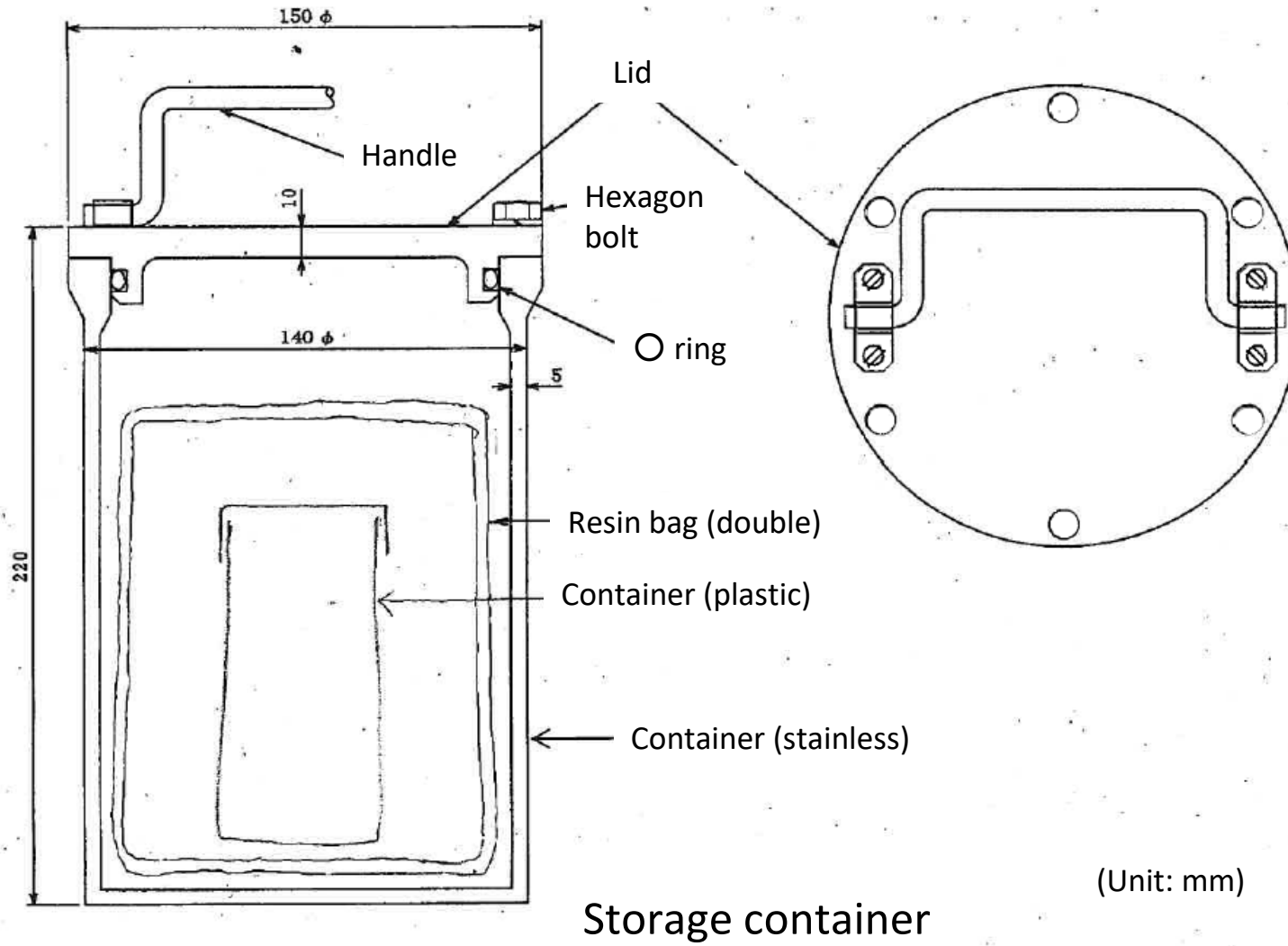
Note 4: The table values are as of June 6, and the values might be changed by future measurements.

Directions from the president of the JAEA

- All the executive directors of the JAEA must let the people they supervise know the points below by today and ensure their compliance.
  - ① Reconfirm the principle of “putting safety first”
    - Check again to make sure safety before handling nuclear fuel materials.
    - To prevent the same kind of accident, suspend similar tasks handling nuclear fuel materials until directions to allow their restart are issued.
  - ② Reaffirm the social responsibility of the JAEA as an expert group in the field of nuclear energy
    - Have an awareness as an expert and reaffirm that your behavior has social responsibility
  - ③ Ensure risk prediction activities
    - Predict potential risks and act in the way to reduce risks
  
- Promptly check again if there is room for improvement in your way of management and if there are issues which the governance does not cover effectively
  
- This accident has a significant meaning that can influence the continuance of the JAEA. With this in mind, place the highest priority on addressing this accident.
  
- Specifically, give directions below to the each of the work-sites
  - Have an awareness and sense of tension regarding handling radioactive materials
  - Check completely the facility/equipment, work environment and work process before starting work
  - Supervisors must not allow starting work until the above requirements are all fulfilled



Attachment 5 ①



## Attachment 5 ②

PFRF inspection result of plutonium and enriched uranium storage container (as of June 7, 2017)

Number of containers inspected Feb - June 2017 (Normal)	Number of containers causing this accident (June 6, 2017)	Number of containers yet to be inspected	
		ROOE*1	Other than ROOE*1
31	1	20	28
Total 80			

R O O E (Material description code for measuring control)

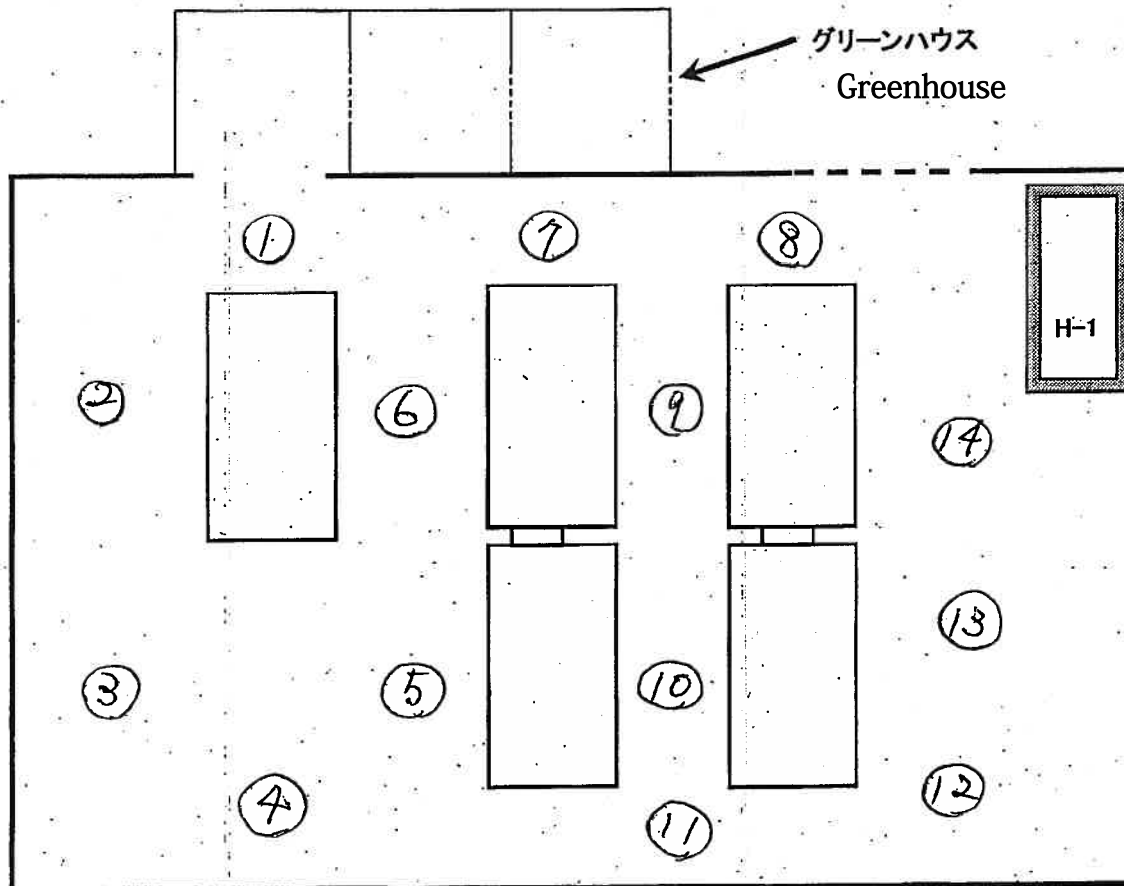
- └─ Non-irradiated non-homogeneous material of mixed composition (dirty scrap)
- └─ Other container
- └─ Miscellaneous items
- └─ Residue/scrap



Continuous monitoring of the storage container by TV camera

## Surface Concentration Measurement Result

## 表面密度測定結果



108号室

Room No. 108

表面密度測定記録	
建家名	燃料研究棟
測定日時	平成29年6月7日 18:26~18:55
測定者	██████████
測定線種	<input checked="" type="checkbox"/> α線 <input checked="" type="checkbox"/> β(γ)線
測定器	放射能計測装置 ( ES-7284 )
測定方法	スマヤ法
単位	Bq/cm <sup>2</sup>
測定条件	拭取効率:10%
備考	①No : 測定点
記事	①~⑭:測定ポイント

Surface Concentration Measurement Records	
Building	Plutonium Fuel Research Facility
Measurement Date and Time	18:36 – 18:55, June 7, 2017
Measurer	
Ray type for measurement	<input checked="" type="checkbox"/> $\alpha$ ray <input checked="" type="checkbox"/> $\beta$ ( $\gamma$ ) ray
Measuring Instrument	Radioactivity Measurement Device (ES-7284)
Measuring Method	Smear
Unit	Bq/cm <sup>2</sup>
Condition of measurement	Wiping effect: 10%
Remarks	⑩ : Measuring Points
Notes	
①～⑭ : Measuring Points	

Surface concentration measurement records ( $\alpha$ )

Facility: Plutonium Fuel Research Facility

Sampling start date and time	16:41 June 7, 2017	Efficiency of instrument (%)	41.6
Sampler	-	Heat source efficiency	0.25
Measurement date and time	18:36 June 7, 2017	Wiping efficiency	0.1
Measurer	-	Wiped area (cm <sup>2</sup> )	200
Ray type for measurement	$\alpha$	Measurement time for natural counts per minute (min)	10
Measuring instrument type	$\alpha \cdot \beta$ scintillation measurement instrument	Measurement time for samples (min)	1
Registration number (Model)	FU-ES-1 (ES-7284)	Natural counts per minute (min <sup>-1</sup> ) (background)	0.05
Measuring method	Smear	Detection lower limit of counts per minute (min <sup>-1</sup> )	4.1
Standard value of control	< 0.04	Detection lower limit of surface concentration (Bq/cm <sup>2</sup> )	3.3E-02

Sampling point	Counts of sample (counts)	Counts per minute of sample (min <sup>-1</sup> )	Net counts per minute (min <sup>-1</sup> )	Surface concentration (Bq/cm <sup>2</sup> )
1	2729	2729	2729	2.2E+01
2	977	977	977	7.8E+00
3	557	557	557	4.5E+00
4	183	183	183	1.5E+00
5	167	167	167	1.3E+00
6	385	385	385	3.1E+00
7	2725	2725	2725	2.2E+01
8	6846	6846	6846	5.5E+01
9	200	200	200	1.6E+00
10	308	308	308	2.5E+00
11	482	482	482	3.9E+00
12	591	591	591	4.7E+00
13	1665	1665	1665	1.3E+01
14	4408	4408	4408	3.5E+01

Surface concentration measurement records ( $\beta(\gamma)$ )

Facility: Plutonium Fuel Research Facility

Sampling start date and time	16:41 June 7, 2017	Efficiency of instrument (%)	64.5
Sampler	-	Heat source efficiency	0.25
Measurement date and time	18:36 June 7, 2017	Wiping efficiency	0.1
Measurer	-	Wiped area (cm <sup>2</sup> )	200
Ray type for measurement	( $\beta(\gamma)$ )	Measurement time for natural counts per minute (min)	10
Measuring instrument type	$\alpha \cdot \beta$ scintillation measurement instrument	Measurement time for samples (min)	1
Registration number (Model)	FU-ES-1 (ES-7284)	Natural counts per minute (min <sup>-1</sup> ) (background)	43.8
Measuring method	Smear	Detection lower limit of counts per minute (min <sup>-1</sup> )	16.0
Standard value of control	< 0.4	Detection lower limit of surface concentration (Bq/cm <sup>2</sup> )	8.3E-02

Sampling point	Counts of sample (counts)	Counts per minute of sample (min <sup>-1</sup> )	Net counts per minute (min <sup>-1</sup> )	Surface concentration (Bq/cm <sup>2</sup> )
1	207	207	163.2	8.4E-01
2	80	80	36.2	1.9E-01
3	71	71	27.2	1.4E-01
4	47	47	< 16.0	< 8.3E-02
5	43	43	< 16.0	< 8.3E-02
6	56	56	< 16.0	< 8.3E-02
7	172	172	128.2	6.6E-01
8	640	640	596.2	3.1E+00
9	68	68	24.2	1.3E-01
10	37	37	< 16.0	< 8.3E-02
11	63	63	19.2	9.9E-02
12	65	65	21.2	1.1E-01
13	119	119	75.2	3.9E-01
14	258	258	214.2	1.1E+00



フード内  
Inside the hood



作業時に用いた布手袋  
Gloves used during the work

フード前床  
Floor in front of the hood

養生を固定するためのテープ  
Tape used to fix the curing sheet

汚染事象発生後のフード（H-1）周辺写真

Photos showing the situation around the hood after the occurrence of the contamination accident



PFRF Radiation Monitor Data  
(Radiation Protection Report No. 52)

Reporting addresses	General manager of Alpha-Gamma Section, General manager of Radiation Safety Management Section II
Report time	10:11 June 9, 2017

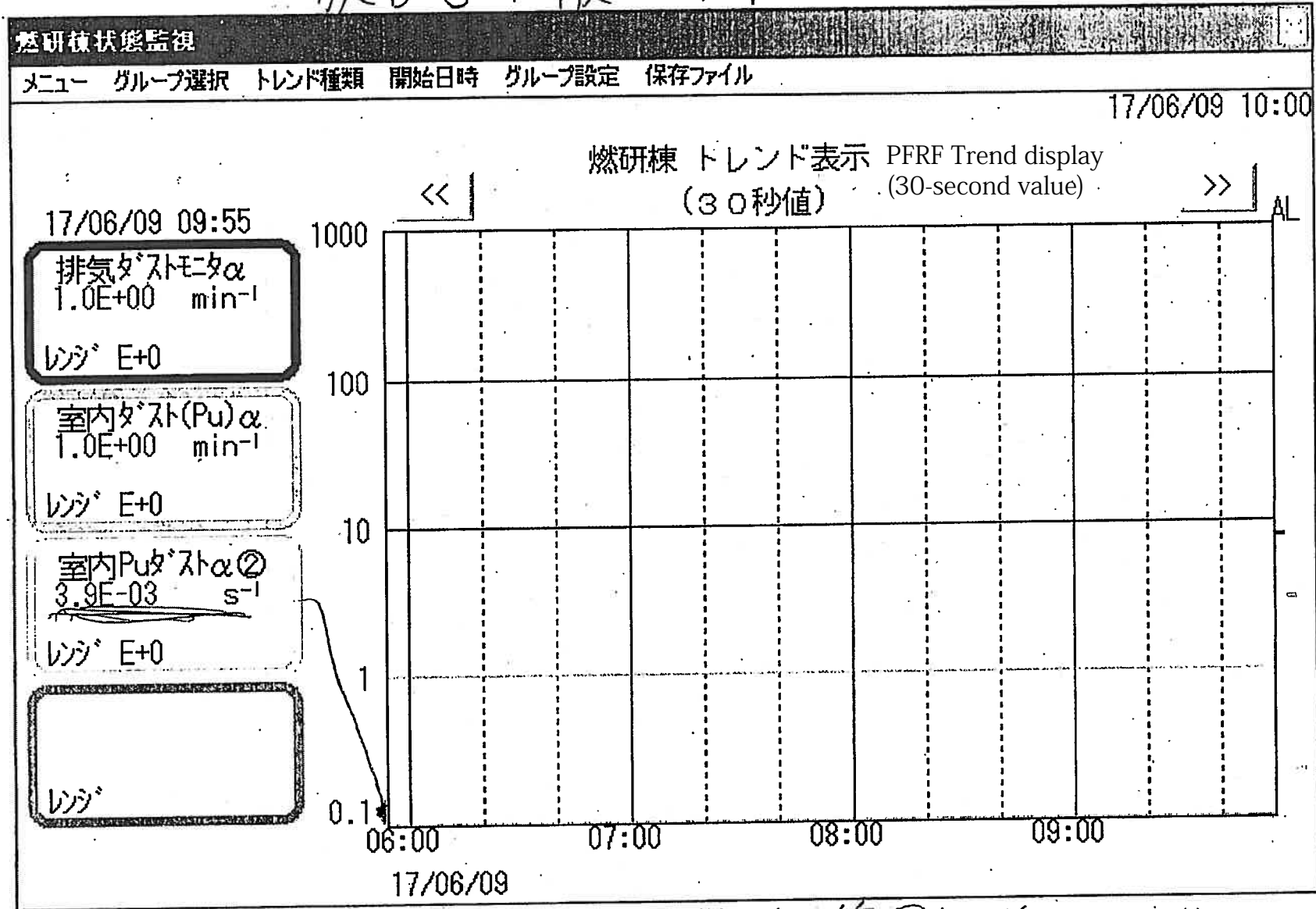
Confirmed time	10:00 June 9, 2017		-
Monitor	Indicated value	Normal indicated value	Judgement
Ventilation dust monitor $\alpha$ ( $\text{min}^{-1}$ )	< 1.0	1.0E+00 ~ 4.1E+00	Within the normal indicated value range
Room dust monitor $\alpha$ ( $\text{min}^{-1}$ )	< 1.0	1.0E+00 ~ 1.7E+00	Within the normal indicated value range
Pu dust monitor No.1 ( $\text{s}^{-1}$ )	< 0.1	~ 1.0E-01	Within the normal indicated value range
Pu dust monitor No.2 ( $\text{s}^{-1}$ )	< 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 contained radiation sources, so the values indicate around 100 $\mu\text{ Sv/h}$ constantly. Pu dust monitor No.2 indicates value within the normal range.
Attachment	2 sheets (Trends)

PFRF Situation Monitor

放射線 52 報 別添 ①



室内Puダスト $\alpha$ ② 通常指示範囲内 (<0.1 s<sup>-1</sup>)

→ 縦軸のレンジを切替へ → 別添②

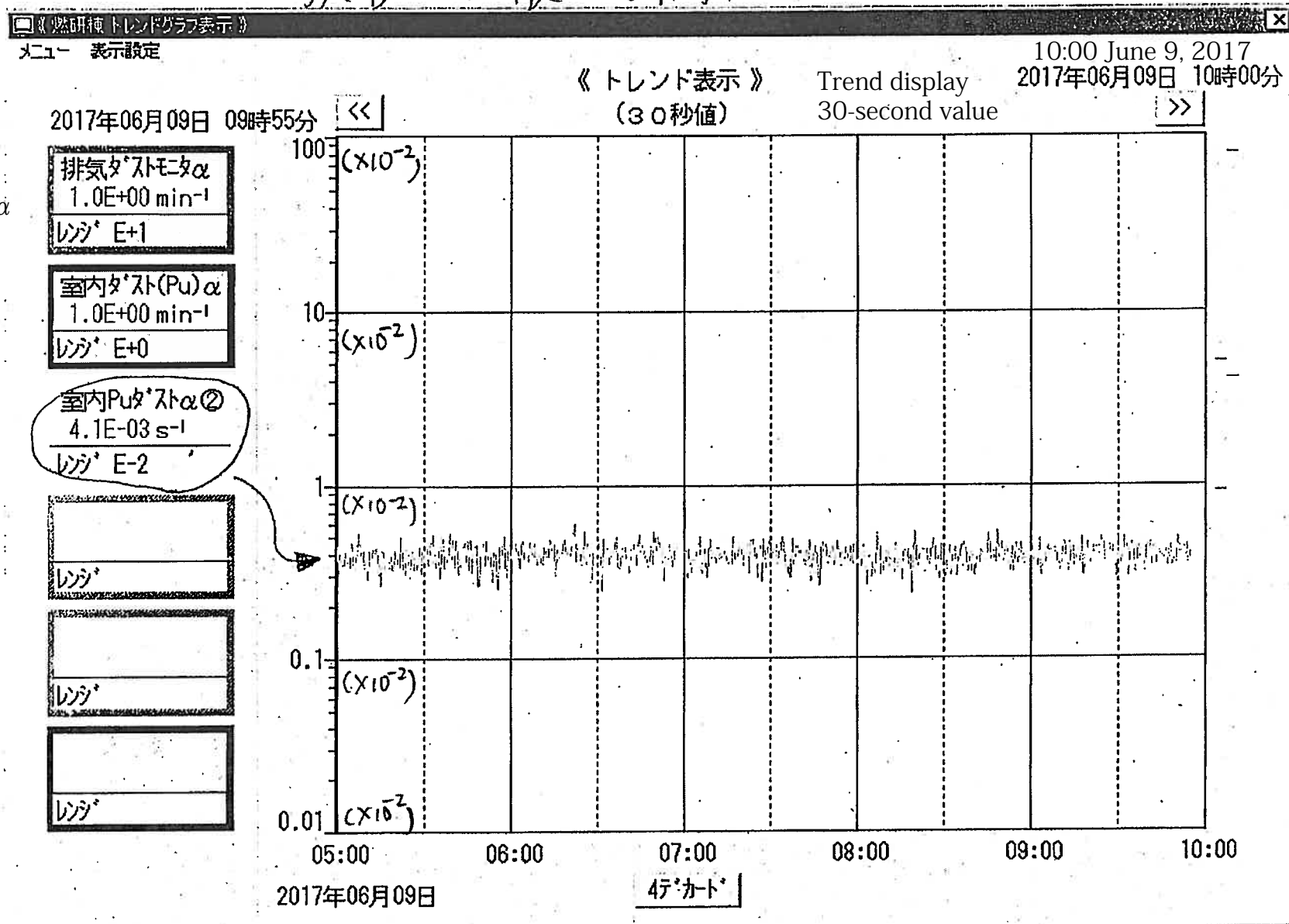
Room Pu dust  $\alpha$  ② Indicated value is within the range of normal. (<0.1 s<sup>-1</sup>)

→ Vertical axis range switched → Attachment ②

添付 9 ②

PFRF Trend Graphic Display

放射52報 別添 ②



Ventilation dust monitor α

Room dust monitor (Pu) α

Room Pu dust monitor α ②

17

室内Puダストα②通常指示範囲内 (<0.1 s<sup>-1</sup>)

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

添付9③



グリーンハウス

Greenhouse