

## Timeline of incidents, judgements and actions

Serial numbers in red are listed events in the "Chronological Sequence of Events" of the 1st Official Report.

Timeline serial number	Date	Beam	Incident		Who took action:	Who made a judgement on what and why
			Time	Source of information		
	Date					
<b>1</b>	5/23/13		~11:55	zlog HDlog		
<b>2</b>			~12:06	zlog Hearing	Acc. Shift Leader Mag. PS staff	Magnet power-supply staff considered that the PS returned to its normal status.
<b>3</b>			~12:06	zlog Hearing	Magnet power-supply staff	Magnet power-supply staff considered that the PS returned to its normal status.
<b>4</b>			~12:06	zlog Hearing	Acc. Shift Leader	Miss-firing of the fast extraction kicker has been happening once every several months in the past. This knowledge led the Acc. Shift Leader to consider that the beam operation can be resumed by resetting the MPS status.
<b>5</b>			~12:06	zlog HDlog Hearing	HD Shift Leader Manager of Radiation Generator of HD Acc. Shift Leader	HD Shift Leader reset the MPS status considering that the proton beamline is in normal status. He considered that the problem should be with the upstream system (accelerator) as inferred by the observed beam loss distribution.

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6		~12:06	zlog HDlog Hearing	In response to the request by HD Shift Leader, Acc. Shift Leader extracted one (only one) pulse out for the MR for validating the integrity of the beamline components. The data on a proton beam profile monitor indicated that the extracted beam was normally transported to the hadron target. (This is a standard procedure for restarting beam operation upon recovery from MPS beam interruption).	Acc. Shift Leader HD Shift Leader	Acc. Shift Leader and HD Shift Leader determined that the beam operation can be resumed since the beam orbit and the beam loss are in the normal state.
7		~12:08	zlog HDlog	Started continuous beam operation. Started users' experiments.	Acc. Shift Leader HD Shift Leader	Acc. Shift Leader and HD Shift Leader determined that the beam operation can be resumed.
8		~12:15	HDlog	KEK staff A reported to HD Shift Leader that the yield of secondary beam production out of the gold target has been decreased. HD Shift Leader confirmed the yield reduction to 40% of the normal condition, and performed beam tuning with KEK staff A and B. The yield recovered to the normalcy and HD Shift Leader confirmed that the system is in the normal condition including the beamline magnet status, beamline vacuum status, temperature of the gold target and others.	HD Shift Leader KEK staff A,B	HD Shift Leader considered that the reduced yield was due to a shift of the beam orbit relative to the target, and decided to adjust the horizontal position of the beam on the target.
9		~12:30	Hearing	Completed tuning on the targeting. HD Shift Leader informed the experimental groups that the beam tuning was completed.	HD Shift Leader	With the yield recovered by orbit tuning, HD Shift Leader determined that the reduced yield was due to an orbit shift.
10		~12:55	Hearing	K1.8BR group reported to HD Shift Leader that the safety magnet in the K1.8 beamline cannot be excited. This is due to an interlock status created by an excess counting rate on one of the counters to prevent erroneous beam delivery. The safety magnet stayed unexcited from then on.	HD Shift Leader Manager of Radiation Generator of HD	HD Shift Leader, in consultation with Manager of Radiation Generator of HD, who happened to be in Tsukuba, presumed that this interlock status was due to a shift of the beam orbit or an error in the counter system.
11		~13:15	Hearing	While looking into possible reasons for, and actions to take, concerning an increased counting rate of the "counter to prevent erroneous beam delivery" at the K1.8BR container house, HD Shift Leader received report from experimental groups that the scintillation detectors of the K1.8BR group is showing increasingly bigger counting rates since around 12:05. HD Shift Leader felt that the causes of this situation is of beam-origin, returned to the Hadron control building, and began investigation.	HD Shift Leader	HD Shift Leader determined that the situation requires investigation.

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12		~13:30	Hearing	HD Shift Leader, KEK staff C and others observed that the area monitors within HD experimental hall showed maximum 4 microSv/h (10 times larger than normal conditions). HD Shift Leader reported to Manager of Radiation Generator of HD , who happened to be in Tsukuba.	HD Shift Leader Manager of Radiation Generator of HD KEK staffC	HD Shift Leader discussed with Manager of Radiation Generator of HD, who happened to be in Tsukuba, on the needs for retuning of the orbit, the leak of radio-activated air and monitor failures.
13		some time before 14:00	Hearing	HD Shift Leader reported to Manager of the HD Controlled Area on an increased radiation level at the HD experimental hall.	HD Shift Leader Manager of the HD Controlled Area	On-site investigation was considered necessary.
14		some time before 14:00	Hearing	Recognizing the elevated ambient dose rate (10 times higher than normal), KEK staff C and others recommended other persons to voluntarily leave the HD experimental hall.	KEK staffC	
15		~14:26	zlog HDlog Hearing	HD Shift Leader reported to Acc. Shift Leader on the increased radiation rate as seen with area monitors, and asked to stop beam operation. Acc. Shift Leader stopped beam operation.	HD Shift Leader Acc. Shift Leader	HD Shift Leader decided to temporarily stop beam operation to see if the ambient dose rate exhibits correlated changes.
16			Hearing	HD Shift Leader observed that the increase of the gamma-ray monitor values in the HD is subdued and the neutron counting rate was decreased when the beam operation is stopped, and reported on these facts to Manager of Radiation Generator of HD who happened to be in Tsukuba. They discussed that it was necessary to determine if the increase of the dose rate is due to direct radiation, leak of radio-activated air or problems with area monitors.	HD Shift Leader Manager of Radiation Generator of HD	HD Shift Leader and Manager of Radiation Generator of HD considered that if the radiation rate is decreased with ventilation, the increase of the radiation rate was due to radio-activated air, and if not, it would be necessary to check possible problems with the beam orbit or malfunction of area monitors.
17		~15:00	Hearing	Beam extraction system staff member, who happened to be in Tsukuba, found an entry of 11:55 in the zlot concerning the MPS trip due to EQ etc and interruption of beam operation due to high ambient dose rate, and started investigation.	Beam extraction system staff member	
18		~15:15	HDlog Hearing	KEK staff B proposed Manager of Radiation Generator of HD , who happened to be in Tsukuba, to operate the ventilation fans of the HD experimental hall to confirm the operational integrity of the area monitors in the hall. KEK staff B began operation of the ventilation fans.	KEK staffB Manager of Radiation Generator of HD	Manager of Radiation Generator of HD and KEK staff B considered that the effect of ventilation to the environment outside the HD hall would be small enough to be acceptable, although the ambient dose rate within the hall is 10-times bigger than normal as measured with area monitors.
19		~15:15	Hearing	Manager of the HD Controlled Area instructed Contractor (radiation) A to visit HD facility and to start independent measurements of ambient dose rate in the neighborhood of area monitors to confirm their operational integrity.	Contractor (radiation) A Manager of the HD Controlled Area	Manager of the HD Controlled Area determined that it was necessary to confirm the radiation level.

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20		~15:20	HDlog Hearing	The ambient dose rate in the HD experimental hall was decreased in correlation with the operation of ventilation fans.	HD Shift Leader Manager of Radiation Generator of HD	HD Shift Leader and Manager of Radiation Generator of HD , who happened to be in Tsukuba, considered that it is necessary to re-optimize the beam orbit since they thought that radio-activated air due to anomalous beam orbit, is leaking from the primary beam tunnel. (It did not occur to them to re-set-up the Class-1 radiation controlled area.)
21		~15:30	HDlog Hearing	KEK staff B stopped operation of ventilation fans.	KEK staff B HD Shift Leader	HD Shift Leader decided to stop the operation of the fans, since the ambient dose rate was found to be reduced with operation of the fans.
22		~15:32	HDlog Hearing zlog	HD Shift Leader requested to resume beam operation for retuning.	HD Shift Leader Acc. Shift Leader Manager of Radiation Generator of HD	HD Shift Leader and Manager of Radiation Generator of HD consulted and decided to turn off the ventilation fans, and to retune the beam orbit to reduce production of radio-activated air due to the beam.
23			HDlog Hearing	HD Shift Leader and KEK staff A performed beam retuning. HD Shift Leader, after orbit tuning in both horizontal and vertical coordinates, confirmed that the yield stayed unchanged. He also confirmed that the measured values from the area monitor showed no indication of improvement (reduction).	HD Shift Leader KEK staff A	
24		~15:42	Hearing	Beam extraction system staff member, who happened to be in Tsukuba, called HD Shift Leader by phone and asked the status. With the report on the reduced yield after EQ MPS, an increase of the dose rate, and subsequent investigation being conducted with the beam turned off, he started analysis of beam data at the time of MPS.	Beam extraction system staff member	
25		~15:50	Hearing	Manager of the HD Controlled Area and contractor (radiation) looked into data from the area monitors at CCR and found that all the monitors were exhibiting an increase.	Manager of the HD Controlled Area Contractor (radiation)	Manager of the HD Controlled Area determined that the situation was not due to problems with area monitors.
26		~15:59	Hearing	Manager of the HD Controlled Area received a report from the contractor (radiation) in the HD experimental hall who reported that the measurements with area monitors there and the readings of his survey meters were consistent.	Manager of the HD Controlled Area Contractor (radiation)	Manager of the HD Controlled Area considered that the report strongly indicates that the area monitors are operating normally.
27		~16:00	HDlog Hearing	KEK staff D measured the ambient dose rates within the HD experimental hall. He reported to HD Shift Leader that high dose rates of 4~6 microSv/h are measured at locations other than those where the area monitors are installed.	KEK staff D HD Shift Leader	

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28		16:00~17:00	Hearing	Beam extraction system staff member, who happened to be in Tsukuba, began his own investigation on data around the time of EQ-MPS. He started wondering that a sudden current on EQ could cause beam extraction in a short time, resulting in damage on the target. He hypothesized that the rise of the ambient dose rate is due to the excessive beam tuning that caused an increased beam loss at locations downstream of the target. He started putting together related materials.	Beam extraction system staff member	
29		~16:15	zlog HDlog Hearing	Beam operation was stopped.	HD Shift Leader	HD Shift Leader decided to stop the beam operation and switch to investigation, since the beam tuning does not reduce the ambient dose rate and he heard the report from KEK staff D concerning the high dose rate.
30		~17:00	HDlog Hearing	Members on the right re-measured the ambient dose rates in HD experimental hall and elsewhere, and found localized spots with high rates. The air filter in the #2 mechanical facility building is found to show an increased surface dose rate of approximately 3mSv/h while normally it shows approximately 17 microSv/h during operation with 24kW of beam power. This filter is in the loop of closed circulation of the air insulated within the beam tunnel.	HD Shift Leader KEK staffD Manager of the HD Controlled Area Contractor (radiation) B,C	
31		~17:00	Hearing	Manager of the HD Controlled Area gave a status report to Radiation Protection Supervisor, who happened to be in Tsukuba.	Manager of the HD Controlled Area Radiation Protection Supervisor	Radiation Protection Supervisor discussed with HD Control Area Manager over the phone. HD Control Area Manager proposed to operate ventilation fans to reduce the chances of radiation exposure for personnel in the HD experimental hall. Radiation protection supervisor, considering the fact that the ambient dose rate in the hall is below the legal limit, thought that the effect at the boundaries of the controlled area would be absent and agreed to operate the ventilation fans to reduce the ambient dose rate in the hall.
32		~17:18	Hearing	Manager of Radiation Generator of HD, who happened to be in Tsukuba called Beam extraction system staff member, who also happened to be in Tsukuba, and was told that during beam extraction at 11:55 there was a possibility that the target was exposed a large instantaneous beam current and was damaged.	Manager of Radiation Generator of HD Beam extraction system staff member	

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33		~17:20	Hearing	Manager of the HD Controlled Area and Contractors (radiation) B and C took a sample (500mL) of air from HD experimental hall, and began energy spectrum analysis with a Ge detector.	Manager of the HD Controlled Area Contractor (radiation) B & C	Manager of the HD Controlled Area decided that the composition of radioactive nuclei in the air had to be examined.
34		~17:30	HDlog Hearing	Ventilation fans were restarted on the basis of judgement made by Radiation Protection Supervisor, who happened to be in Tsukuba at around 17:00.	HD Shift Leader KEK staffD	
35		~17:30	Hearing	Personnel in the HD hall started evacuation from the hall. They stood by outside the hall awaiting radiation survey and decontamination.	Manager of the HD Controlled Area HD Shift Leader	Manager of the HD Controlled Area, in consultation with HD Shift Leader, decided that it was necessary to evacuate the hall.
36		~17:40	Hearing	Beam extraction system staff member, who happened to be in Tsukuba, reported by phone and via emails on the result of his analysis of beam current of 11:55 to Manager of Radiation Generator of HD, who also happened to be in Tsukuba	Manager of Radiation Generator of HD Beam extraction system staff member	
37		~17:45	Hearing	HD shift change. KEK staff A now became HD Shift Leader. HD Shift Leader up to this point would be called KEK staff E from here on.		
38		~18:20	Hearing	Radiation control officer A checked the results with a Ge detector on the composition of radioactive nuclei, other than radio-activated air, within the air sample collected from HD experimental hall. He reported verbally to Manager of the HD Controlled Area.	Radiation control officer A Manager of the HD Controlled Area	
39			Hearing	At the request of Manager of the HD Controlled Area, Radiation control officer A measured the dose rates on the floor of HD experimental hall and desks etc and confirmed the presence of surface contamination.	Radiation control officer A Manager of the HD Controlled Area	(It did not occur to them to temporarily re-classify the HD experimental hall as the Class-1 radiation control area.)
40		~18:35	Hearing	Manager of the HD Controlled Area reported to Radiation Control Office Head that surface contamination was developing within the controlled area. Radiation Control Office Head reported to Radiation Protection Supervisor, who happened to be in Tsukuba, on the situation.	Manager of the HD Controlled Area Radiation Control Office Head Radiation Protection Supervisor Radiation Protection Proxy Supervisor	Radiation Control Office Head decided to dispatch six staff members for support. Radiation Protection Supervisor decided to go to J-PARC considering that he has to supervise the work there.
41		~19:00	Hearing	The ten members on the right conducted detailed measurements of ambient dose rate and surface contamination under direction of Manager of the HD Controlled Area.	Manager of the HD Controlled Area KEK staffD, E, G 6 Radiation control officers	

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42			Hearing	Radiation control officer started contamination measurements of the personnel. No exit restrictions had been imposed prior to this time. Some individuals had left the controlled area without contamination measurements.	Radiation control officer Manager of the HD Controlled Area	
43		~19:30	Hearing	Manager of Radiation Generator of HD arrived at the HD experimental hall. He received a report from the beam extraction system staff member that a proton beam with bunch population of 2E13 particles was extracted within 5 msec. He examined the proton beam orbit and beam current monitor, and concluded that the gold target is likely to have been damaged at that time. He reported on this matter to the Particle & Nuclear Physics Division Haed.	Manager of Radiation Generator of HD Particle & Nuclear Physics Division head	At this point of time, the Manager of Radiation Generator of HD presumed damage to the gold target.
44		~20:00	Hearing	Detailed radiation survey and smear measurements in the HD experimental hall are completed. Radiation survey outside the HD hall is complete.	Manager of the HD Controlled Area KEK staff D, E, G 6 Radiation control officers	
45		~20:15	Hearing	Radiation Protection Supervisor arrived at J-PARC. He, the Proxy Supervisor, and Radiation Control Office Head discussed on next actions to take upon receiving results of the radiation surveys.	Radiation Control Office Head Radiation Protection Supervisor Radiation Protection Proxy Supervisor	
46		~21:00	Hearing	The Radiation Protection Supervisor received an inquiry from a KEK staff and a radiation control officer concerning the decontamination criteria for personnel who were present in the HD experimental hall.	Radiation Protection Supervisor Radiation control officer	The Radiation Protection Supervisor determined that persons with surface contamination in excess of 4 Bq/cm <sup>2</sup> have to be de-contaminated before leaving the controlled area; otherwise, the persons may leave.
47		~21:41	Hearing	Under the direction of the Radiation Control Office Head, Radiation control officers started energy spectrum measurements of smear samples collected in the HD experimental hall with Ge detectors in the radiation measurement laboratory.	Radiation Control Office Head Radiation control officer	Radiation Control Office Head considered it is necessary to identify the nuclei within radio-active contamination.
48			Hearing	Members on the right received the spectrum analysis result of smear samples from Radiation control officers. In combination with prior data, they noted that the dose rate of surface contamination is below 40Bq/cm <sup>2</sup> (legal limit in the controlled area), and the magnitude of internal radiation exposure is estimated to be a few mSv on the basis of approximately 4Bq/cm <sup>2</sup> of survey measurements on the faces of the personnel and under the assumption that the dominant radio-active nuclei is Na24.	Radiation Control Office Head Radiation Protection Supervisor Radiation Protection Proxy Supervisor Manager of Radiation Generator of HD Manager of the HD Controlled Area	Members on the left learned that numerous radio-active nuclear that can presumed to be derived from proton-gold interactions and considered this to be evidence for "damage on the gold target". Radiation Protection Supervisor considered that even taking a safety factor of x10, the international radiation exposure on personnel is unlikely to exceed a few tens of mSv, and to stay well below the exposure limited as imposed by the Radiation Control Office (male: 500 microSv/day, female: 300 microSv/day).

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49			~23:00	Hearing	Members on the right confirmed the situation.	Radiation Control Office Head Radiation Protection Supervisor Radiation Protection Proxy Supervisor Manager of the HD Controlled Area Manager of Radiation Generator of HD Accelerator Division Head Particle & Nuclear Physics Division head	On the basis of overall review of the contamination measurements and detailed surveys, the Radiation Protection Supervisor determined that radioactive materials have leaked in the HD experimental hall and radioactive contamination is present in the hall. However, he considered that the contamination is limited within the hall, and has not leaked outside the hall. He also considered that the magnitudes of internal radiation exposure are within the limit imposed by the Radiation Control Office. For these reasons, the Radiation Protection Supervisor determined that this incident is not classified as one for escalated reporting. None expressed objection.
50			~23:30	Hearing	Radiation surveys and decontamination of all users and staff members are completed. All personnel left the HD radiation controlled area. Then the HD experimental facility was placed under a "no-entry permitted" state in principle, under the direction by the Radiation Protection Supervisor.	Radiation Protection Supervisor Manager of Radiation Generator of HD	The Radiation Protection Supervisor decided to place the HD experimental facility under a "no-entry permitted" state.
51	5/24/13		~07:00	Hearing	Particle & Nuclear Physics Division head gave a detailed report to Deputy Director of J-PARC Center (KEK) over the phone.	Particle & Nuclear Physics Division head Deputy Director of J-PARC Center (KEK)	
52			~09:00	Hearing	Safety Division Head reported to the Director of J-PARC Center, Deputy Director of J-PARC Center(JAEA) on the following: Radio-active materials leaked inside the HD experimental hall and contaminations have been identified; the contamination is contained within the hall and no leak into the outside environment is considered; the magnitudes of internal exposure is considered below the limit imposed by the Radiation Control Office; consequently this incident is not classified as one for escalated reporting; a detailed report will be given at 10:00.	Safety Division Head Director of J-PARC Center Deputy Director of J-PARC Center (JAEA)	Director of J-PARC Center instructed the Deputy Director of J-PARC Center to give him a report on the 10AM meeting since he was having a medical appointment in the morning.



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53		~9:00	Hearing	Safety Division Head reported to the Director General, Executive Director on J-PARC related matters, and Executive Director on Safety and Public Relation, all of KEK, on the following: Radio-active materials leaked inside the HD experimental hall and contaminations had been identified; the contamination was contained within the hall and no leak into the outside environment is was considered to have taken place; the magnitudes of internal exposure was considered below the limit imposed by the Radiation Control Office; consequently this incident is was not classified as one for escalated reporting.	Safety Division Head KEK Director General KEK Executive Director on J-PARC matters KEK Executive Director on Safety and Public Relations	KEK directorate on the left considered that this incident is not for immediately escalated reporting, if the information reported is correct. However, they considered that more confirmation is was needed and requested the Safety Division Head to give further reports as found suitable.
54		~9:45	Hearing	Under direction by the Radiation Protection Supervisor, the Manager of the HD Controlled Area asked contractors (radiation) to perform smear measurements and measurements of ambient dose rate within #1 and #2 mechanical facility buildings, and at borders of the controlled area. No contaminations were found and they reported on these results to the Manager of the HD Controlled Area.	Radiation Protection Supervisor Manager of the HD Controlled Area Radiation control officer Contractor (radiation)	Radiation Protection Supervisor considered it was necessary to perform smear measurements outside the controlled area to confirm the absence of leakage of radioactive materials outside the controlled area.
55		~10:00	Hearing	Members on the right held a meeting to discuss the situation since yesterday and follow-actions to take. The Manager of the Radiation Generator of HD reported on the timeline, including the target is presumed to be partially evaporated, the dose rate was increased, and the ventilation fans were operated. They started preparation for an announcement of suspension of hadron experiments for the next several weeks and the operation will be switched to perform the neutrino experiment.	Deputy Director of J-PARC Center (JAEA) Safety Division Head (Radiation Protection Supervisor) Safety Division Deputy Head Radiation Control Office Head Manager of Radiation Generator of HD Manager of the HD Controlled Area Particle & Nuclear Physics Division head Accelerator Division Head Deputy Head of Particle & Nuclear Physics (via Skype) Members of the Particle & Nuclear Physics Division (A, B, C)	Radiation Protection Supervisor, at this point of time, did not consider this incident to be one for escalated reporting. None expressed objections, either. The Radiation Control Office Head proposed to perform measurements with a whole-body counter (WBC) for further confirmation, and the members at the meeting concurred. Thus, members of the Particle & Nuclear Physics Division started asking the personnel who entered the HD control area whether they would like to request for survey with a WBC. During the discussion, it was determined that it would be not possible to resume hadron experiments at least for the next several weeks. It was decided to transmit an announcement to the users.
56			Hearing	With conclusions of the meeting above, the Radiation Control Office Head asked Nuclear Science Research Institute (NSRI) to perform WBC measurements.	Radiation Control Office Head	

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57		~12:30	Hearing	Deputy Director of J-PARC Center (KEK) reported on the incident of the previous day at the KEK's Directorate Meeting.	Members of the KEK Directorate Meeting	
58		~14:00	Hearing	By using the material form of the meeting at 10AM, Deputy Director of J-PARC Center (JAEA) gave a detailed briefing to Director of J-PARC Center who was joined by Deputy Director of J-PARC Center (KEK) arriving from Tsukuba.	Deputy Directors of J-PARC Center (KEK and JAEA) Director of J-PARC Center	Director of J-PARC center determined that this incident is not one for escalated report since the contamination is contained within the hall and no leak into the outside environment is considered to have taken place, and the magnitudes of internal exposure is considered below the limit imposed by the Radiation Control Office.
59		~14:30	Hearing	Two persons underwent WBC survey measurements.	NSRI	In response to an inquiry from J-PARC to confirm that the magnitude of internal exposure is small, four persons volunteered (two from the J-PARC center, two from users from Japanese universities), and their measurements were performed in two batches.
60		~15:00	Hearing	Two persons underwent WBC survey measurements.		
61		~17:30	Hearing	A Radiation control officer received an inquiry from the neighboring NFCEL that some of their monitoring posts indicated rises of the dose rate at around 15:00 and around 17:30 on May 23, and he informed the Manager of the HD controlled area and the Radiation Protection Supervisor on this inquiry.	Radiation control officer Manager of the HD Controlled Area Radiation Protection Supervisor	Manager of the HD Controlled Area determined that it was necessary to perform a detailed review of the area monitor data in the HD controlled area.
62		~18:00	Hearing	The Manager of the HD controlled area provided the members on the right with the data recorded by the area monitors (gamma-rays) at the boundaries of the HD controlled area. Small increases of the dose rate were found in coincidence with the operation of ventilation fans at around 15:00 and around 17:30 on May 23.	Manager of the HD Controlled Area Radiation Protection Supervisor Deputy Director of J-PARC Center (KEK)	
63		~18:13	Hearing Email	Director of Applied Research Laboratory (KEK), with the information that the J-PARC center does not consider this incident to be for an escalated reporting, pointed out to the Deputy Director of J-PARC Center (KEK) and the Executive Director (KEK) of Safety and Public Relations that this incident still might warrant reporting in accordance with the agreement with local communities.	KEK Director of Applied Research Laboratory Deputy Director of J-PARC Center (KEK) KEK Executive Director on Safety and Public Relations	

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64		~18:28	Hearing Email	Safety Office staff member at RIKEN Nishina Center for Accelerator-based Science informed Radiation Protection Supervisor and the KEK director of Applied Research Laboratory with an email that a staff scientist of RIKEN, who was present in the HD experimental hall the previous day (May 23) and who left there before personnel contamination measurements began, was found to carry surface contamination (3kCPM on the soles of the shoes, which were retained) at around 13:40 this day (May 24). While having been informed of the contamination on May 23, since it was already after the office hours, this RIKEN staff asked himself to be surveyed the following day at RIKEN.	Safety Office staff member at RIKEN Nishina Center for Accelerator-based Science Radiation Protection Supervisor Director of Applied Research Office of KEK	
65		~18:34	Hearing	Director of Applied Research Laboratory (KEK) relayed the information from RIKEN to Deputy Director of J-PARC Center (KEK) and Executive Director (KEK) on Safety and Public Relations.	Director of Applied Research Laboratory (KEK) Deputy Director of J-PARC Center (KEK) KEK Executive Director on Safety and Public Relations	
66		~19:00	Hearing	Members on the right met at the meeting room of the J-PARC center to perform quantitative assessment of the situation on the basis of the latest data.	Director of J-PARC Center Deputy Directors of J-PARC Center Safety Division Head Accelerator Division Head Particle & Nuclear Physics Division Head Manager of Radiation Generator of HD Radiation Control Office Head Manager of the HD Controlled Area	Director of J-PARC Center, Deputy Directors of J-PARC Center and Safety Division Head checked the situation and the data, and discussed whether this incident was for escalated reporting due to the high probability of radio-active leakage outside the controlled area. At the same time, it was a shared feeling that the leakage and exposure has been already converged according to the data available.
67		21:10	Response HQ ELog	Under direction of Director of J-PARC Center, Safety Division Head reported to the emergency call number of NSRI.	Director of J-PARC Center Safety Division Head	Director of J-PARC Center decided it was necessary to make an emergency call.
68		21:11	Response HQ ELog	Response headquarters (HQ) was established and the relevant personnel were called-in. Director of J-PARC Center opened the Response HQ office.	Response HQ deputy head Director of J-PARC Center	
69		21:19	Response HQ ELog	Contacted Nuclear Regulation Authority		
70		~21:40	Response HQ ELog	Contacted Ibaraki prefecture government.		
71		~21:43	Response HQ ELog	Contacted Tokai-mura village office.		

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72		~22:15	Response HQ ELog	Response HQ determined that this accident is for legal reporting.		Response HQ determined that this accident is for legal reporting.
73		~22:15	Hearing	KEK emergency contact office was established at the office of KEK Executive Director on Safety and Public Relations.	Executive Director on J-PARC matters (Deputy) KEK Executive Director on Safety and Public Relations General Affairs Office, Group Leader	
74		22:40	Response HQ ELog	1st report to relevant authorities was transmitted. The report included an outline of the accident (approx. 30 persons were involved), status of the facility, status of contamination, status of personal dose (under investigation), effects on the environment (release of radioactive material is not continuing), no effects on general public is considered.		
75	5/25/13	0:18	Response HQ ELog	2nd report to relevant authorities was transmitted: The report added that 87 persons have been identified to have entered the controlled area on the day of the accident and a reference was made to the data provided by NFCEL.		
76		0:46	zlog	All accelerator facilities at the J-PARC center stopped operation.	Accelerator group MLF group	Director of J-PARC Center decided on this action to deal with the accident by mobilizing all the available resources.
77		~1:00	Hearing	From WBC measurements on four persons, a maximum radiation dose of 1.7 mSv was noted by the Response HQ. (It took some time to identify the nuclei for internal exposure measurements since nuclei types emitting gamma rays with many different energies are produced at J-PARC, as compared to Nuclear Power facilities in general.)	Response HQ	
78		~1:00	Response HQ ELog	Briefing to the Ibaraki prefecture government with apologies.	Deputy Director of J-PARC Center (KEK) Radiation Control Office Head	
79		~1:55	Response HQ ELog	3rd report to relevant authorities was transmitted. The report included an additional information on the number of persons (55) who had been around HD beamline equipments, and the results on WBC measurements of four persons.		
80		~2:51	Response HQ ELog	Final report to relevant authorities was transmitted to revise the description for the delay of reporting.		

Timeline serial number	B e a m	Incident			Who took action:	Who made a judgement on what and why
		Time	Source of information	Item (What happened / What was done)		
81	5/26/13	~11:00	zlog Hearing	Stopped operation of ventilation fans of HD experimental hall.	KEK staff F	At around 18:00 on May 24, when the area monitors at the HD control area boundaries were checked, the monitored values had been back to normal status. Consequently, the ventilation fans of the HD experimental hall were not stopped at that time. On this day, 26th it was decided to stop the fan operation, since there was no reason to continue.
82	As of 2013/6/12		Hearing	No ventilation has been performed from the MR and from the primary beam line area since the accident up to this point.		The Radiation Protection Supervisor has decided not to perform ventilation since the dose rate is higher than normal operation and the types of radio-active nuclei have not been determined.

Note: The Safety Division Head and the Radiation Protection Supervisor are the same individual.

BLM: Beamline Loss Monitor

CCR: Central Control Room

DivH: Division head

EQ: Quadrupole magnet for beam extraction correction

HD: Hadron

HDlog: HD group beam operation log book

K1.8, K1.8BR: Secondary beamlines in the hadron experimental hall

MPS: Machine Protection System

MLF: Materials and life science experimental facility

MR: 50 GeV synchrotron

RQ: Quadrupole magnet for ripple corrections

WBC Whole-body counter

zlog: Electronic log for accelerator operation

NFCEL: Nuclear Fuel Cycle Engineering Laboratories

NP: Particle and Nuclear

Tracking error: Anomaly in deviation of electric current