核能安全委員會
Nuclear Safety Commission

2023

Statistics of Ionizing Radiation Applications and Management

September 2023

PreFace

As technology rapidly advances and develops, applications of ionizing radiation have been widely adopted in medicine, agriculture, industry, border controls, and academic research. As the use of radioactive materials and equipment capable of producing ionizing radiation increases, the demand for personnel qualified to operate radiation sources and manage radiation operations has also increased.

The Nuclear Safety Committee, formerly the Atomic Energy Council of the Executive Yuan, was restructured into a central third-level independent agency on September 27, 2023. This reorganization was part of the Executive Yuan’ s adjustments to its structure, aimed at more effectively fulfilling responsibilities related to nuclear safety management and oversight. In order to provide a complete overview of ionizing radiation applications in various fields, the Nuclear Safety Commission (NSC) has compiled the latest data, tables, and figures for review by radiation personnel and related stakeholders. The 2023 statistics were summarized below, please feel free to contact us if there is any mistake.

1. Radiation source licenses:

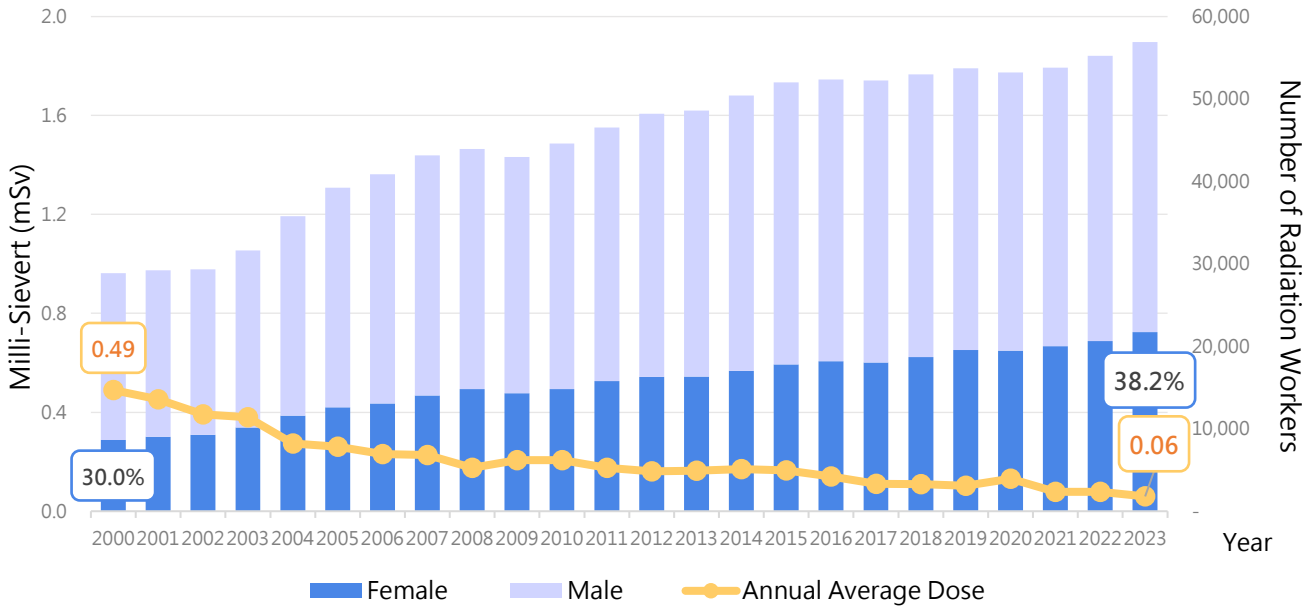
   Radiation source licenses are divided into "medical use" and "non-medical use" depending on the specific use. There were 23,009 medical use licenses and 15,747 non-medical use licenses, with a total of 38,756 licenses in Taiwan.

Radiation Sources / Type	Equipment	Materials	Total
Medical Use	22,479	530	23,009
Non-Medical Use	11,743	4,004	15,747
Total	34,222	4,534	38,756
Unit：Number of Licenses			

2. Personnel dose:

In order to ensure the radiation safety of radiation workers, the NSC requires that the occupational exposure of radiation workers shall not exceed the dose limit in accordance with Article 15 of the "Ionizing Radiation Protection Act". Therefore, employers should implement personal radiation monitoring. Moreover, according to the "Safety Standards for Protection against Ionizing Radiation" revised and implemented in 2003, the dose limits of occupational exposure for radiation workers is "the effective dose shall not exceed 100 mSv over a cycle of five consecutive years, and not exceed 50 mSv in any single year".

There were 56,892 radiation workers in Taiwan. The male to female ratio was 61.8%：38.2%. Since 2011, the proportion of female employees has remained steady at more than 1/3 and has stably increased year by year. The annual average occupational dose was 0.08 mSv in 2023. For further details, please refer to the "Occupational Radiation Exposure Statistics Annual Report 2023". (https://www.nusc.gov.tw/u/v/58)



3. Personnel certificates:

Personnel certificates issued by the NSC are divided into two categories: (1) "Radiation Safety Certificate" for personnel who are only qualified to operate radiation sources; and (2) "Radiation Protection Personnel Certificate" for those qualified to operate radiation sources and are also responsible for radiation operation management. The personnel certificates are valid for a period of 6 years. Within six months prior to its expiration, the applicant may fill out an application form and apply to the Competent Authority for a certificate renewal.

(1) Radiation Safety Certificate:

Since 2003, the NSC has issued a total of 14,029 Radiation Safety Certificates, with the male to female ratio of 84.0% : 16.0%. In 2023, a total of 4,515 certificates had been issued, and the male to female ratio was 78.0%: 22.0%.

(2) Radiation Protection Personnel Certificate:

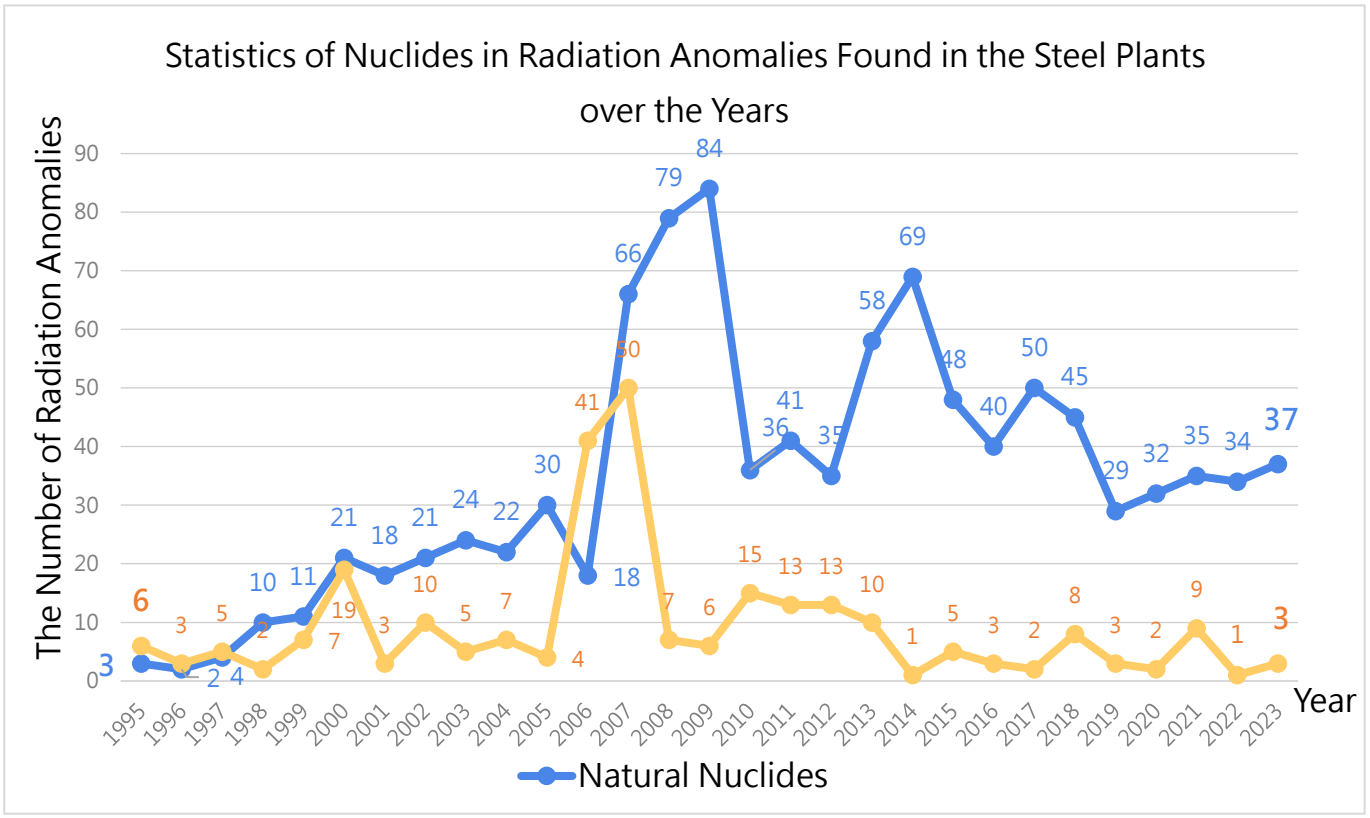
Since 2003, the NSC has issued a total of 4,081 Radiation Protection Personnel Certificates, with the male to female ratio of 65.1% : 34.9%. In 2023, a total of 2,683 certificates had been issued, and the male to female ratio was 63.3% : 36.7%.

The table below shows the gender ratio is getting closer among people aged between 18 and 49 who possess Radiation Protection Personnel Certificates. This sign indicates an increasing trend of women holding important positions in the workplace. Through strengthening radiation protection knowledge and safety awareness of control measures, gender inequality in the workplace is declining.

Number of Issued Certificates in 2023						
	Radiation Safety Certificate			Radiation Protection Personnel Certificate		
Age Interval	Female (Unit：people)	Male	Gender Ratio (Female: male, Unit: %)	Female (Unit：people)	Male	Gender Ratio (Female: male, Unit: %)
80~88	0	6	0：100	0	4	0：100
70~79	0	31	0：100	1	44	2.2：97.8
60~69	66	477	12.2：87.8	56	311	15.3：84.7
50~59	181	876	17.1：82.9	176	452	28.0：72.0
40~49	320	1,166	21.5：78.5	352	430	**45.0：55.0**
30~39	300	750	28.6：71.4	311	387	**44.6：55.4**
18~29	125	217	36.5：63.5	89	70	**56.0：44.0**
合計	992	3,523	22.0：78.0	985	1,698	36.7：63.3

4. The number of radiation anomalies found in the steel plants:

   A total of 40 cases were found in 2023. Anomalies caused by natural radionuclides account for 92.5% (37 out of 40) of radiation anomalies found in steel plants.

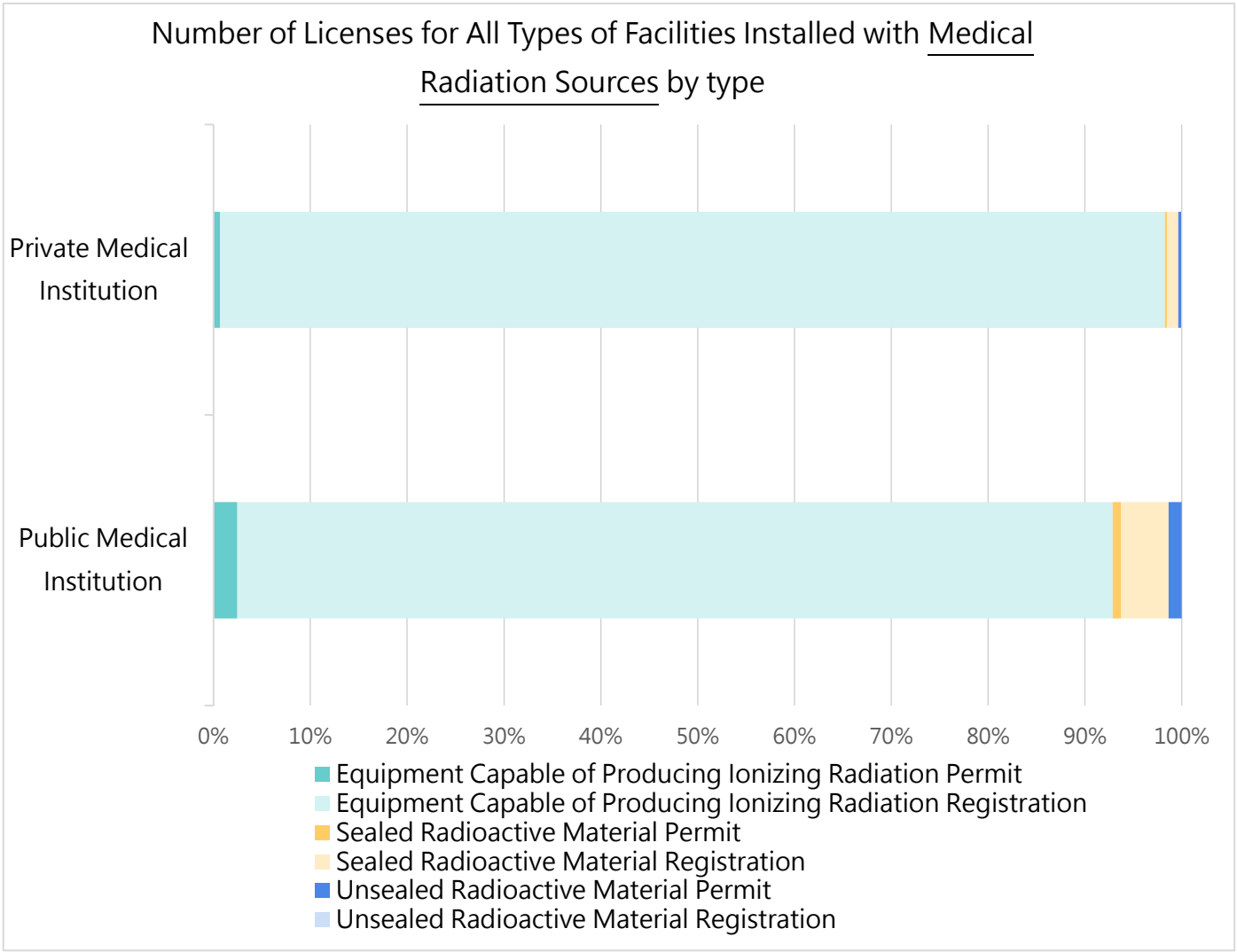


Content

1. Radiation Sources Licenses (Medical Use)

(1) Number of Licenses for All Types of Facilities Installed with Medical Radiation Sources by type

Type / Facility	Equipment Capable of Producing Ionizing Radiation		Sealed Radioactive Material		Unsealed Radioactive Material		Total
	Permit	Registration	Permit	Registration	Permit	Registration	
Public Medical Institution	58	2,125	20	116	32	0	2,351
Private Medical Institution	140	20,156	44	246	70	2	20,658
Total	198	22,281	64	362	102	2	23,009



(2) Number of Licenses for All Types of Medical Institution Installed with Medical Radiation Sources by county/city

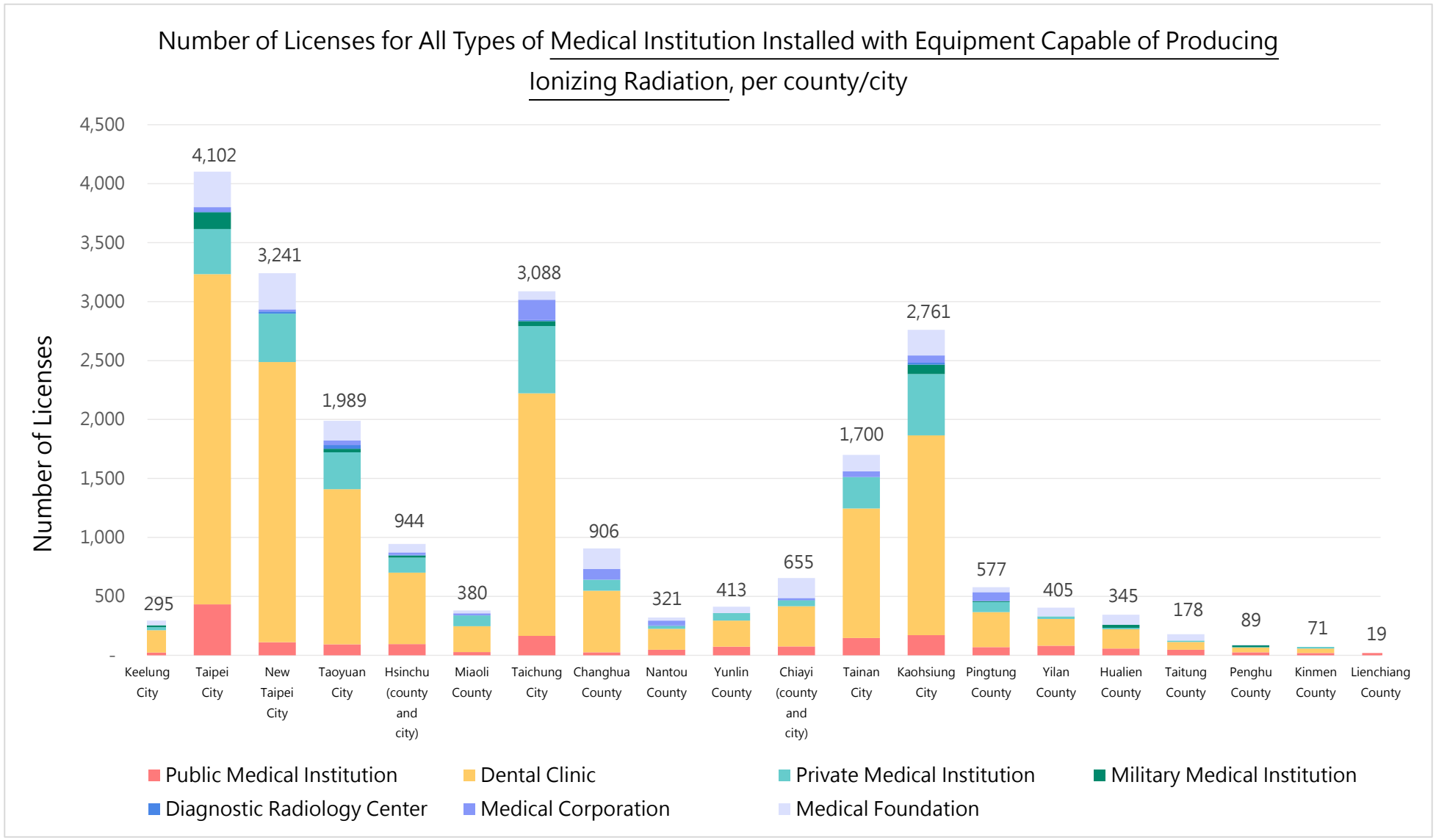
Institution / County/City	Permit						Registration					
	Public Medical Institutions			Private Medical Institutions			Public Medical Institutions			Private Medical Institutions		
	Equip-ment	Seal-ed	Un-sealed	Equip-ment	Seal-ed	Un-sealed	Equip-ment	Seal-ed	Un-sealed	Equip-ment	Seal-ed	Un-sealed
Keelung City	0	0	0	2	0	2	39	0	0	254	2	0
Taipei City	26	8	11	17	6	10	548	80	0	3,511	43	2
New Taipei City	1	0	2	21	8	9	110	1	0	3,109	36	0
Taoyuan City	2	1	2	14	3	7	121	4	0	1,852	30	0
Hsinchu (county and city)	2	1	2	3	1	2	110	4	0	829	10	0
Miaoli County	0	0	0	2	0	1	27	0	0	351	2	0
Taichung City	8	3	4	21	8	10	198	6	0	2,861	30	0
Changhua County	1	0	0	6	3	3	24	0	0	875	10	0
Nantou County	1	0	1	1	0	0	47	0	0	272	0	0
Yunlin County	2	1	2	2	0	1	71	6	0	338	0	0
Chiayi(county and city)	1	1	1	8	3	4	75	0	0	571	22	0
Tainan City	4	2	1	11	2	4	144	8	0	1,541	11	0
Kaohsiung City	6	2	4	20	6	8	246	3	0	2,489	31	0
Pingtung County	2	1	1	4	1	2	75	3	0	496	1	0
Yilan County	2	0	1	3	0	2	79	1	0	321	5	0
Hualien County	0	0	0	3	3	3	83	0	0	259	11	0
Taitung County	0	0	0	2	0	2	48	0	0	128	2	0
Penghu County	0	0	0	0	0	0	42	0	0	47	0	0
Kinmen County	0	0	0	0	0	0	19	0	0	52	0	0
Lienchiang County	0	0	0	0	0	0	19	0	0	0	0	0
Total	58	20	32	140	44	70	2,125	116	0	20,156	246	2

Remarks:

1. Equipment: Equipment capable of producing ionizing radiation.
2. Sealed: Sealed radioactive material.
3. Unsealed: Unsealed radioactive material.

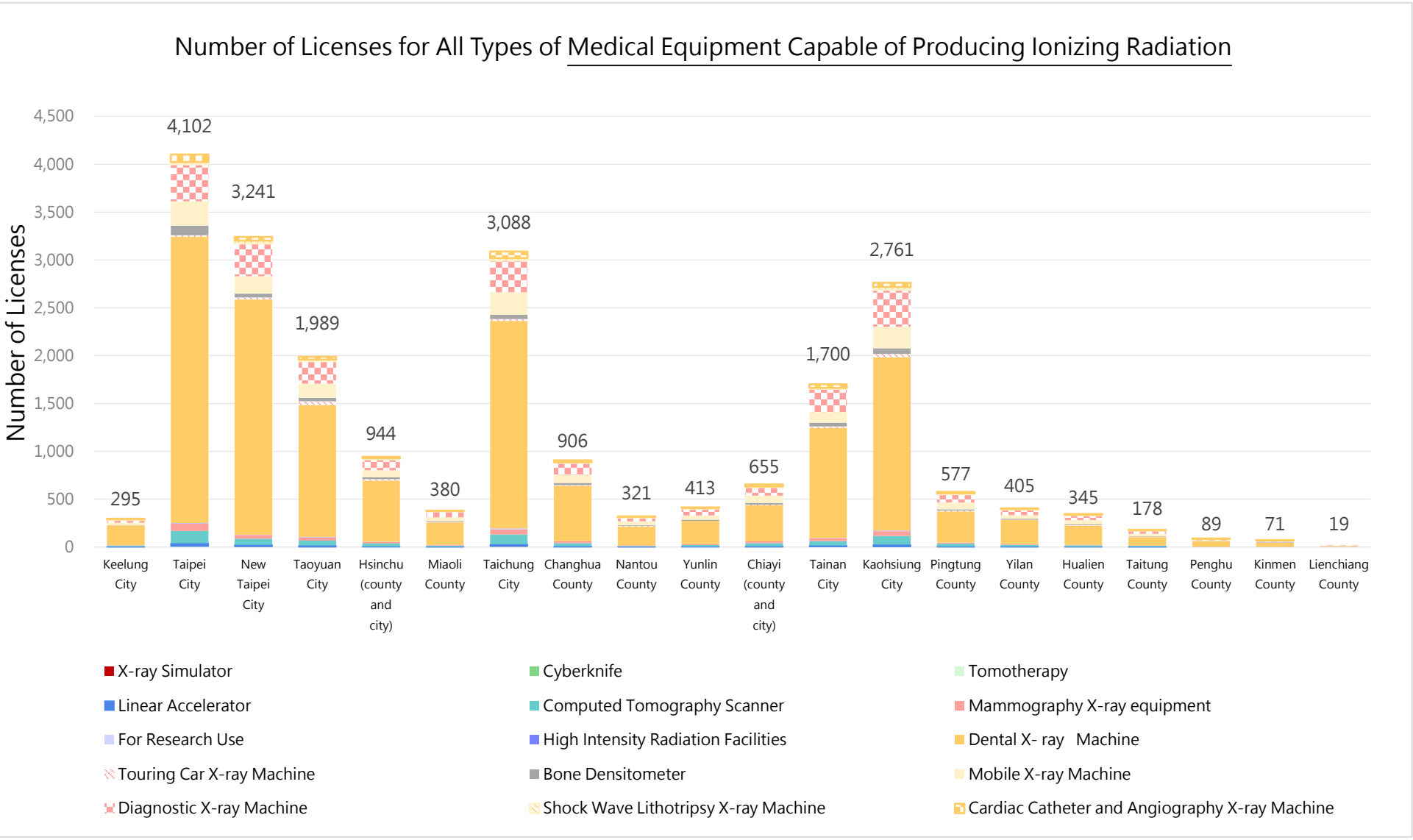
(3) Number of Licenses for All Types of Medical Institution Installed with Equipment Capable of Producing Ionizing Radiation by county/city

Institution / County/City	Public Medical Institution	Dental Clinic	Private Medical Institution	Military Medical Institution	Diagnostic Radiology Center	Medical Corporation	Medical Foundation	Total
Keelung City	23	190	25	16	0	0	41	295
Taipei City	432	2,800	383	142	6	38	301	4,102
New Taipei City	111	2,377	409	0	18	18	308	3,241
Taoyuan City	93	1,316	313	30	32	37	168	1,989
Hsinchu(county and city)	95	606	128	17	7	20	71	944
Miaoli County	27	219	92	0	0	18	24	380
Taichung City	164	2,059	569	42	10	172	72	3,088
Changhua County	25	522	95	0	0	91	173	906
Nantou County	48	176	25	0	5	40	27	321
Yunlin County	73	221	64	0	0	0	55	413
Chiayi (county and city)	76	341	50	0	1	17	170	655
Tainan City	148	1,097	265	0	2	48	140	1,700
Kaohsiung City	171	1,694	520	81	16	62	217	2,761
Pingtung County	69	297	87	8	0	75	41	577
Yilan County	81	227	22	0	0	0	75	405
Hualien County	58	163	12	25	0	0	87	345
Taitung County	48	65	12	0	0	0	53	178
Penghu County	25	41	3	17	0	0	3	89
Kinmen County	19	38	14	0	0	0	0	71
Lienchiang County	19	0	0	0	0	0	0	19
Total	1,805	14,449	3,088	378	97	636	2,026	22,479


Number of Licenses for All Types of Medical Institution Installed with Equipment Capable of Producing Ionizing Radiation, per county/city
Number of Licenses
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
-
295
4,102
3,241
1,989
944
380
3,088
906
321
413
655
1,700
2,761
577
405
345
178
89
71
19
Keelung City
Taipei City
New Taipei City
Taoyuan City
Hsinchu (county and city)
Miaoli County
Taichung City
Changhua County
Nantou County
Yunlin County
Chiayi (county and city)
Tainan City
Kaohsiung City
Pingtung County
Yilan County
Hualien County
Taitung County
Penghu County
Kinmen County
Lienchiang County
Public Medical Institution
Dental Clinic
Private Medical Institution
Military Medical Institution
Diagnostic Radiology Center
Medical Corporation
Medical Foundation

(4) Number of Licenses for All Types of Medical Equipment Capable of Producing Ionizing Radiation by county/city

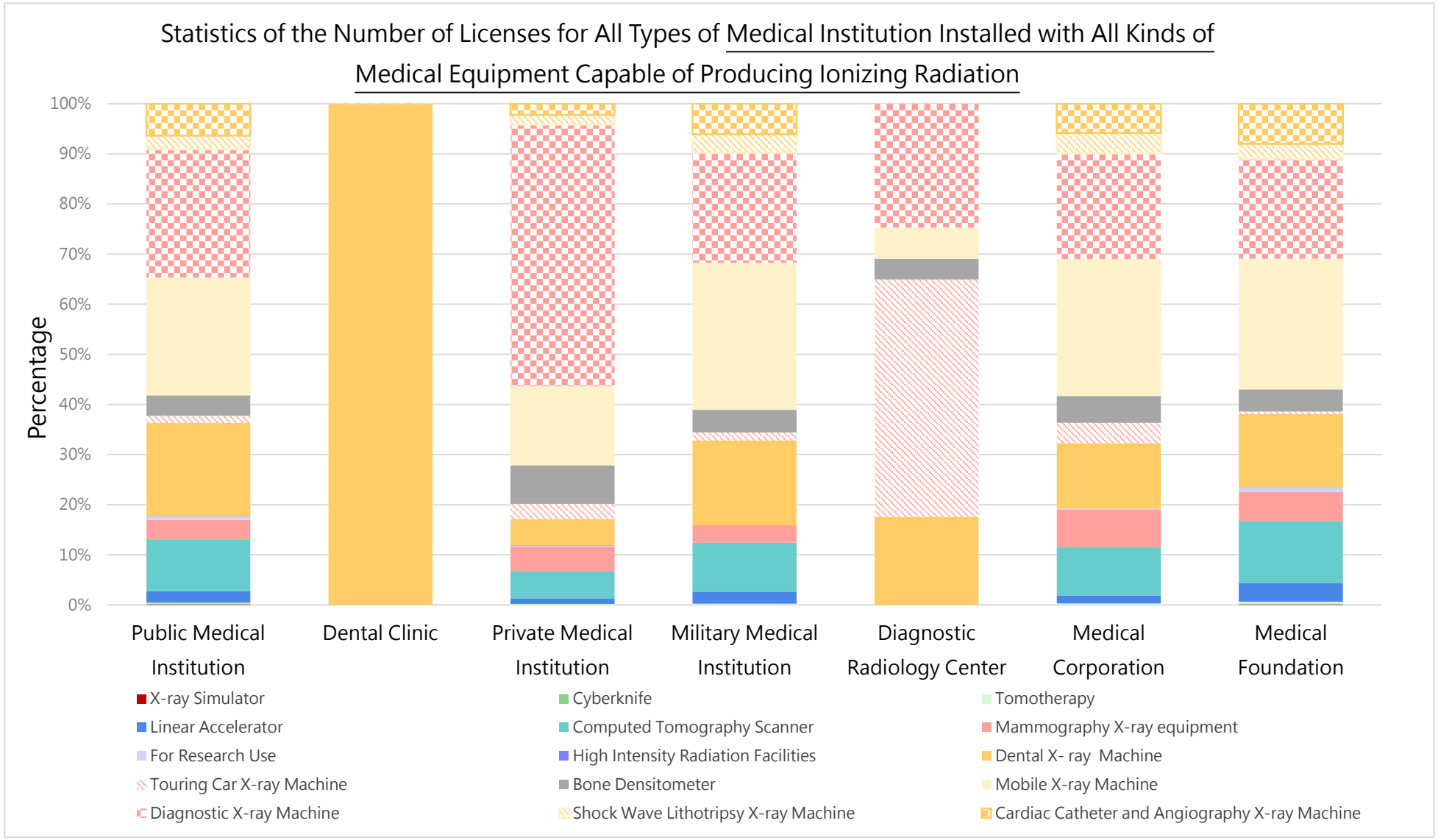
Equipment / County/City	X-ray Simulator	Cyberknife	Tomotherapy	Linear Accelerator	Computed Tomography Scanner	Mammog-raphy X-ray Equipment	For Research Use	High Intensity Radiation Facilities	Dental X- ray Machine	Touring Car X-ray Machine	Bone Densito-meter	Mobile X-ray Machine	Diagnostic X-ray Machine	Shock Wave Lithotripsy X-ray Machine	Cardiac Catheter And Angiography X-ray Machine	Total
Keelung City	0	0	0	2	11	6	1	0	204	0	4	25	31	6	5	295
Taipei City	0	1	7	33	126	77	6	2	2,993	14	100	253	388	25	77	4,102
New Taipei City	1	1	4	17	63	41	1	0	2,459	23	39	181	343	28	40	3,241
Taoyuan City	0	0	0	15	53	33	4	1	1,379	39	36	148	235	17	29	1,989
Hsinchu (county and city)	0	0	1	4	32	16	2	0	639	15	19	75	114	11	16	944
Miaoli County	0	0	0	2	14	8	0	0	232	3	7	45	61	5	3	380
Taichung City	2	1	4	23	100	56	7	1	2,168	21	44	235	334	25	67	3,088
Changhua County	0	0	0	7	34	21	0	0	578	8	23	84	124	8	19	906
Nantou County	0	0	0	2	9	6	0	0	195	8	8	40	41	6	6	321
Yunlin County	1	0	0	4	15	9	1	0	244	0	11	46	71	5	6	413
Chiayi (county and city)	0	0	0	9	32	18	1	0	377	6	17	78	88	8	21	655
Tainan City	0	2	2	11	47	32	2	0	1,150	14	39	111	244	11	35	1,700
Kaohsiung City	0	1	2	22	91	49	8	1	1,807	37	59	225	386	29	44	2,761
Pingtung County	0	0	0	6	28	12	1	0	326	8	14	70	86	11	15	577
Yilan County	0	0	0	5	18	7	1	0	253	1	12	37	59	4	8	405
Hualien County	0	0	0	3	14	5	0	0	203	5	8	43	52	5	7	345
Taitung County	0	0	0	2	10	4	0	0	88	4	5	25	34	3	3	178
Penghu County	0	0	0	0	1	2	0	0	56	0	3	8	14	1	4	89
Kinmen County	0	0	0	0	2	1	0	0	42	3	6	4	11	1	1	71
Lienchiang County	0	0	0	0	2	1	0	0	8	0	0	2	6	0	0	19
Total	4	6	20	167	702	404	35	5	15,401	209	454	1,735	2,722	209	406	22,479


Number of Licenses for All Types of Medical Equipment Capable of Producing Ionizing Radiation
Number of Licenses
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
295
4,102
3,241
1,989
944
380
3,088
906
321
413
655
1,700
2,761
577
405
345
178
89
71
19
Keelung City
Taipei City
New Taipei City
Taoyuan City
Hsinchu (county and city)
Miaoli County
Taichung City
Changhua County
Nantou County
Yunlin County
Chiayi (county and city)
Tainan City
Kaohsiung City
Pingtung County
Yilan County
Hualien County
Taitung County
Penghu County
Kinmen County
Lienchiang County
X-ray Simulator
Cyberknife
Tomotherapy
Linear Accelerator
Computed Tomography Scanner
Mammography X-ray equipment
For Research Use
High Intensity Radiation Facilities
Dental X- ray Machine
Touring Car X-ray Machine
Bone Densitometer
Mobile X-ray Machine
Diagnostic X-ray Machine
Shock Wave Lithotripsy X-ray Machine
Cardiac Catheter and Angiography X-ray Machine

(5) Statistics of the Number of Licenses for All Types of Medical Institution Installed with All Kinds of Medical Equipment Capable of Producing Ionizing Radiation

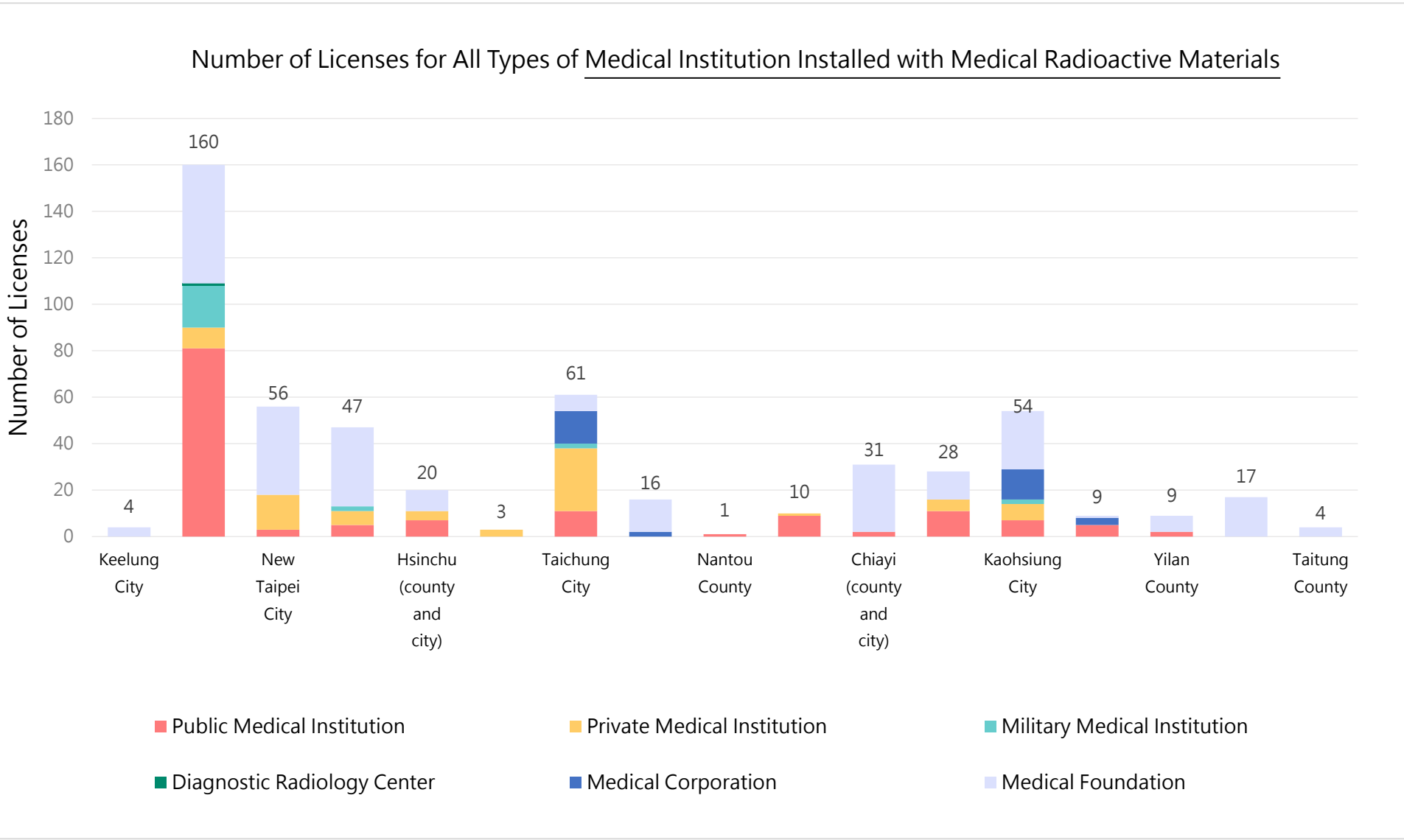
Equipment / Institution	X-ray Simulator	Cyberknife	Tomotherapy	Linear Accelerator	Computed Tomography Scanner	Mammography X-ray Equipment	For Research Use	High Intensity Radiation Facilities	Dental X- ray Machine	Touring Car X-ray Machine	Bone Densitometer	Mobile X-ray Machine	Diagnostic X-ray Machine	Shock Wave Lithotripsy X-ray Machine	Cardiac Catheter and Angiography X-ray Machine	Total
Public Medical Institution	2	3	3	41	185	72	12	1	337	25	74	424	462	49	115	1,805
Dental Clinic	0	0	0	0	0	0	0	0	14,443	0	0	5	1	0	0	14,449
Private Medical Institution	0	0	6	32	168	153	6	2	161	95	236	487	1,614	59	69	3,088
Military Medical Institution	0	0	1	9	37	13	0	0	64	6	17	111	83	14	23	378
Diagnostic Radiology Center	0	0	0	0	0	0	0	0	17	46	4	6	24	0	0	97
Medical Corporation	0	0	2	10	61	48	1	0	83	26	34	174	134	26	37	636
Medical Foundation	2	3	8	75	251	118	16	2	296	11	89	528	404	61	162	2,026
Total	4	6	20	167	702	404	35	5	15,401	209	454	1,735	2,722	209	406	22,479

Remarks: Equipment capable of producing ionizing radiation includes fixed-type and touring-type vehicles, excluding biopsy.


Statistics of the Number of Licenses for All Types of Medical Institution Installed with All Kinds of Medical Equipment Capable of Producing Ionizing Radiation
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Public Medical Institution
Dental Clinic
Private Medical Institution
Military Medical Institution
Diagnostic Radiology Center
Medical Corporation
Medical Foundation
X-ray Simulator
Cyberknife
Tomotherapy
Linear Accelerator
Computed Tomography Scanner
Mammography X-ray equipment
For Research Use
High Intensity Radiation Facilities
Dental X- ray Machine
Touring Car X-ray Machine
Bone Densitometer
Mobile X-ray Machine
Diagnostic X-ray Machine
Shock Wave Lithotripsy X-ray Machine
Cardiac Catheter and Angiography X-ray Machine

(6) Number of Licenses for All Types of Medical Institution Installed with Medical Radioactive Materials by county/city

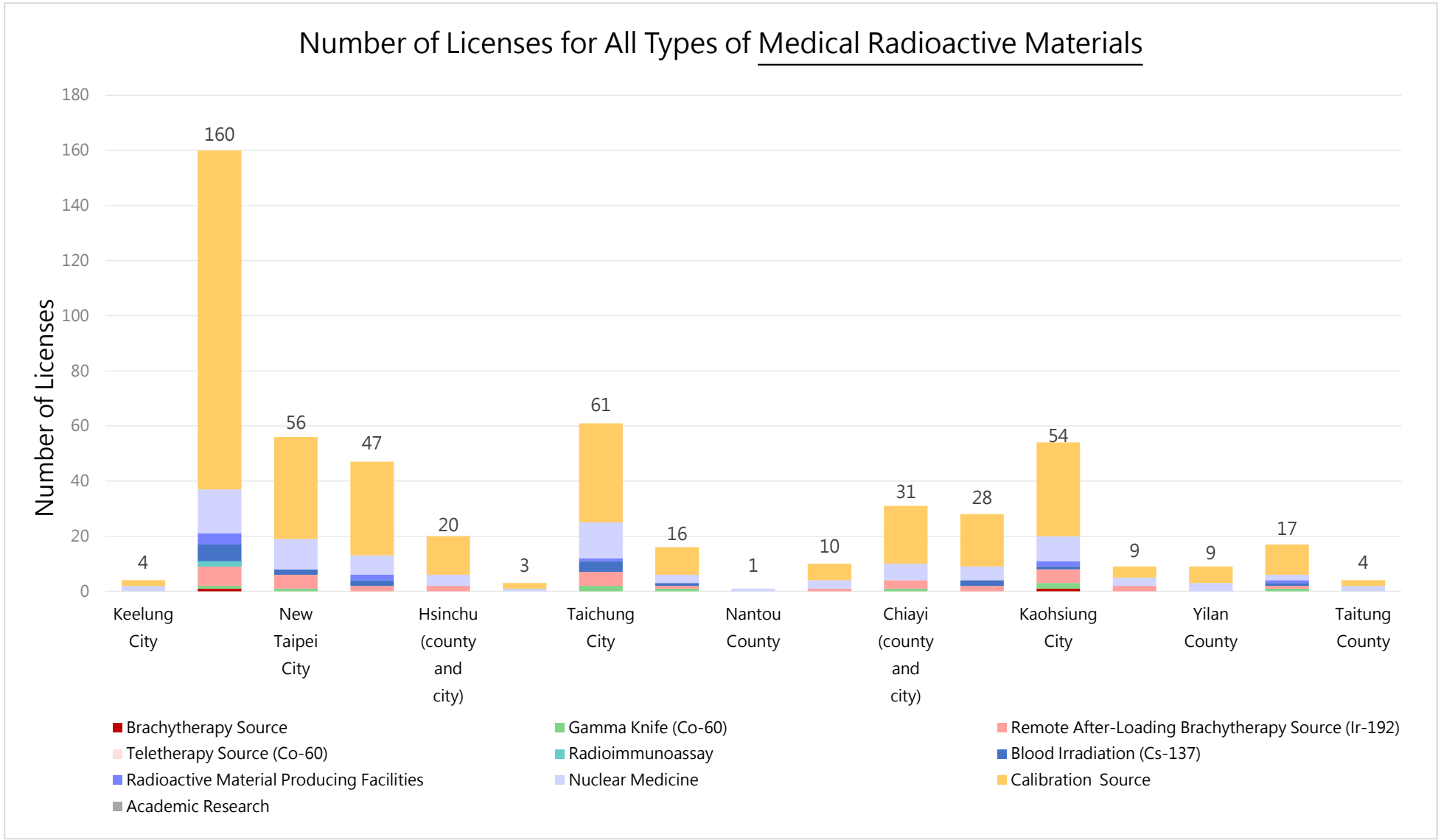
Institution / County/City	Public Medical Institution	Private Medical Institution	Military Medical Institution	Diagnostic Radiology Center	Medical Corporation	Medical Foundation	Total
Keelung City	0	0	0	0	0	4	4
Taipei City	81	9	18	1	0	51	160
New Taipei City	3	15	0	0	0	38	56
Taoyuan City	5	6	2	0	0	34	47
Hsinchu (county and city)	7	4	0	0	0	9	20
Miaoli County	0	3	0	0	0	0	3
Taichung City	11	27	2	0	14	7	61
Changhua County	0	0	0	0	2	14	16
Nantou County	1	0	0	0	0	0	1
Yunlin County	9	1	0	0	0	0	10
Chiayi (county and city)	2	0	0	0	0	29	31
Tainan City	11	5	0	0	0	12	28
Kaohsiung City	7	7	2	0	13	25	54
Pingtung County	5	0	0	0	3	1	9
Yilan County	2	0	0	0	0	7	9
Hualien County	0	0	0	0	0	17	17
Taitung County	0	0	0	0	0	4	4
Total	144	77	24	1	32	252	530


Number of Licenses for All Types of Medical Institution Installed with Medical Radioactive Materials
Number of Licenses
180
160
140
120
100
80
60
40
20
0
4
160
56
47
20
3
61
16
1
10
31
28
54
9
9
17
4
Keelung City
New Taipei City
Hsinchu (county and city)
Taichung City
Nantou County
Chiayi (county and city)
Kaohsiung City
Yilan County
Taitung County
Public Medical Institution
Private Medical Institution
Military Medical Institution
Diagnostic Radiology Center
Medical Corporation
Medical Foundation

(7) Number of Licenses for All Types of Medical Radioactive Materials by county/city

Radioactive Material / County/City	Brachytherapy Source	Gamma Knife (Co-60)	Remote After-Loading Brachytherapy Source (Ir-192)	Teletherapy Source (Co-60)	Radioimmuno-assay	Blood Irradiation (Cs-137)	Radioactive Material Producing Facilities[1]	Nuclear Medicine[2]	Calibration Source[3]	Total
Keelung City	0	0	0	0	0	0	0	2	2	4
Taipei City	1	1	7	0	2	6	4	16	123	160
New Taipei City	0	1	5	0	0	2	0	11	37	56
Taoyuan City	0	0	2	0	0	2	2	7	34	47
Hsinchu (county and city)	0	0	2	0	0	0	0	4	14	20
Miaoli County	0	0	0	0	0	0	0	1	2	3
Taichung City	0	2	5	0	0	4	1	13	36	61
Changhua County	0	1	1	0	0	1	0	3	10	16
Nantou County	0	0	0	0	0	0	0	1	0	1
Yunlin County	0	0	1	0	0	0	0	3	6	10
Chiayi (county and city)	0	1	3	0	0	0	0	6	21	31
Tainan City	0	0	2	0	0	2	0	5	19	28
Kaohsiung City	1	2	5	0	0	1	2	9	34	54
Pingtung County	0	0	2	0	0	0	0	3	4	9
Yilan County	0	0	0	0	0	0	0	3	6	9
Hualien County	0	1	1	0	0	1	1	2	11	17
Taitung County	0	0	0	0	0	0	0	2	2	4
Total	2	9	36	0	2	19	10	91	361	530

Remarks:
1. Radioactive material producing facilities mainly produce F-18, C-11, N-13, O-15, etc.
2. Unsealed radioactive materials used in nuclear medicine include Tc-99m, Tl-201, Ga-67, etc.
3. Sealed radioactive materials for calibration include Co-57, Ge-68, Cs-137, etc.

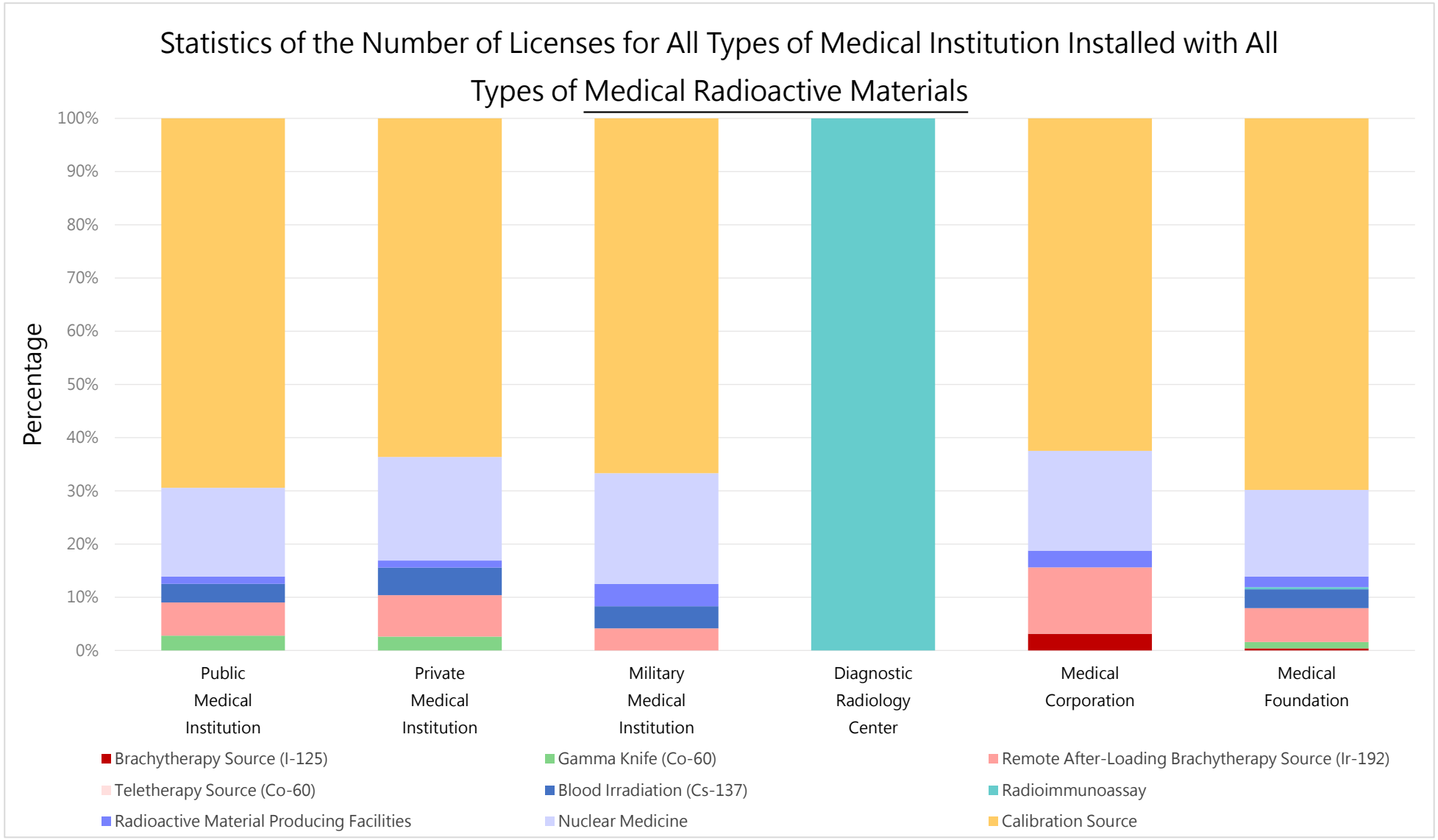

Number of Licenses for All Types of Medical Radioactive Materials
Number of Licenses
180
160
140
120
100
80
60
40
20
0
4
160
56
47
20
3
61
16
1
10
31
28
54
9
9
17
4
Keelung City
New Taipei City
Hsinchu (county and city)
Taichung City
Nantou County
Chiayi (county and city)
Kaohsiung City
Yilan County
Taitung County
Brachytherapy Source
Gamma Knife (Co-60)
Remote After-Loading Brachytherapy Source (Ir-192)
Teletherapy Source (Co-60)
Radioimmunoassay
Blood Irradiation (Cs-137)
Radioactive Material Producing Facilities
Nuclear Medicine
Calibration Source
Academic Research

(8) Statistics of the Number of Licenses for All Types of Medical Institution Installed with All Types of Medical Radioactive Materials

Radioactive Material / Facility	Brachytherapy Source (I-125)	Gamma Knife (Co-60)	Remote After-Loading Brachytherapy Source (Ir-192)	Teletherapy Source (Co-60)	Blood Irradiation (Cs-137)	Radioimmun-oassay	Radioactive Material Producing Facilities[1]	Nuclear Medicine[2]	Calibration Source[3]	Total
Public Medical Institution	0	4	9	0	5	0	2	24	100	144
Private Medical Institution	0	2	6	0	4	0	1	15	49	77
Military Medical Institution	0	0	1	0	1	0	1	5	16	24
Diagnostic Radiology Center	0	0	0	0	0	1	0	0	0	1
Medical Corporation	1	0	4	0	0	0	1	6	20	32
Medical Foundation	1	3	16	0	9	1	5	41	176	252
Total	2	9	36	0	19	2	10	91	361	530

Remarks:

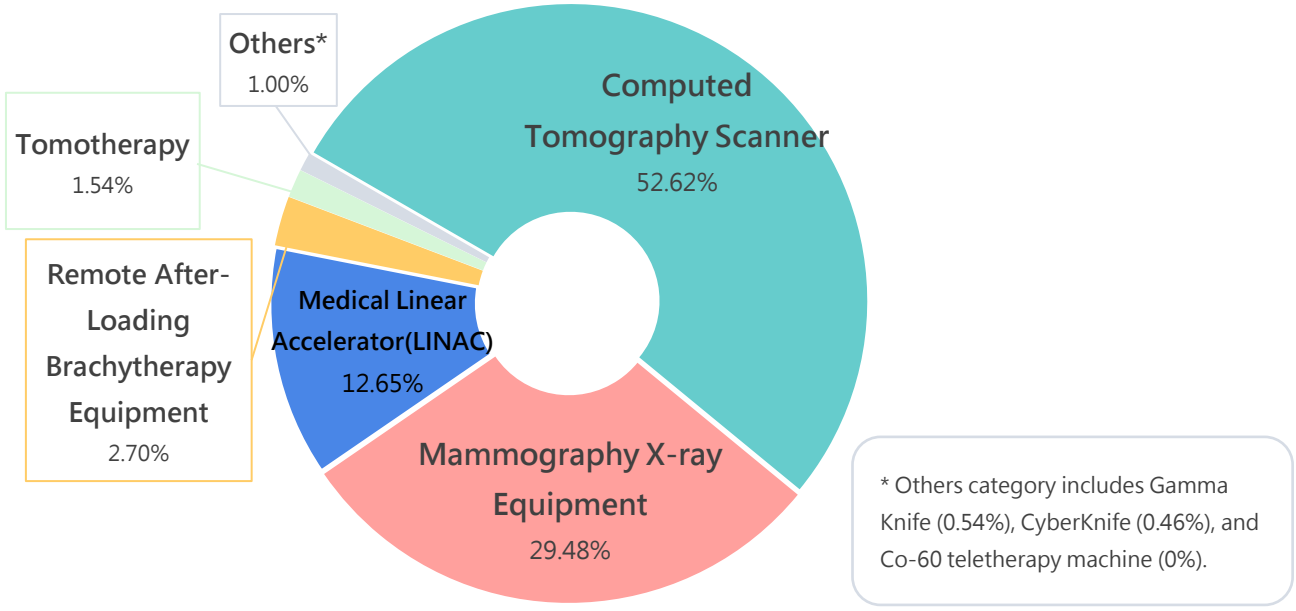
1. Radioactive material producing facilities mainly produce F-18, C-11, N-13, O-15, etc.
2. Unsealed radioactive materials used in nuclear medicine include Tc-99m, Tl-201, Ga-67, etc.
3. Sealed radioactive materials for calibration include Co-57, Ge-68, and Cs-137, etc.


Statistics of the Number of Licenses for All Types of Medical Institution Installed with All Types of Medical Radioactive Materials
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Public Medical Institution
Private Medical Institution
Military Medical Institution
Diagnostic Radiology Center
Medical Corporation
Medical Foundation
Brachytherapy Source (I-125)
Gamma Knife (Co-60)
Remote After-Loading Brachytherapy Source (Ir-192)
Teletherapy Source (Co-60)
Blood Irradiation (Cs-137)
Radioimmunoassay
Radioactive Material Producing Facilities
Nuclear Medicine
Calibration Source

(9) Number of Licenses for All Types of Equipment that should Implement Radiation Medical Exposure Quality Assurance

Medical Equipment	Number of Licenses
Medical Linear Accelerator	164
Remote After-Loading Brachytherapy Equipment	35
Co-60 Teletherapy Machine	0
Gamma Knife	7
CyberKnife	6
Tomotherapy	20
Mammography X-ray Equipment (not include disabled equipment)	382
Computed Tomography Scanner (not include disabled equipment)	682
Total	1,296

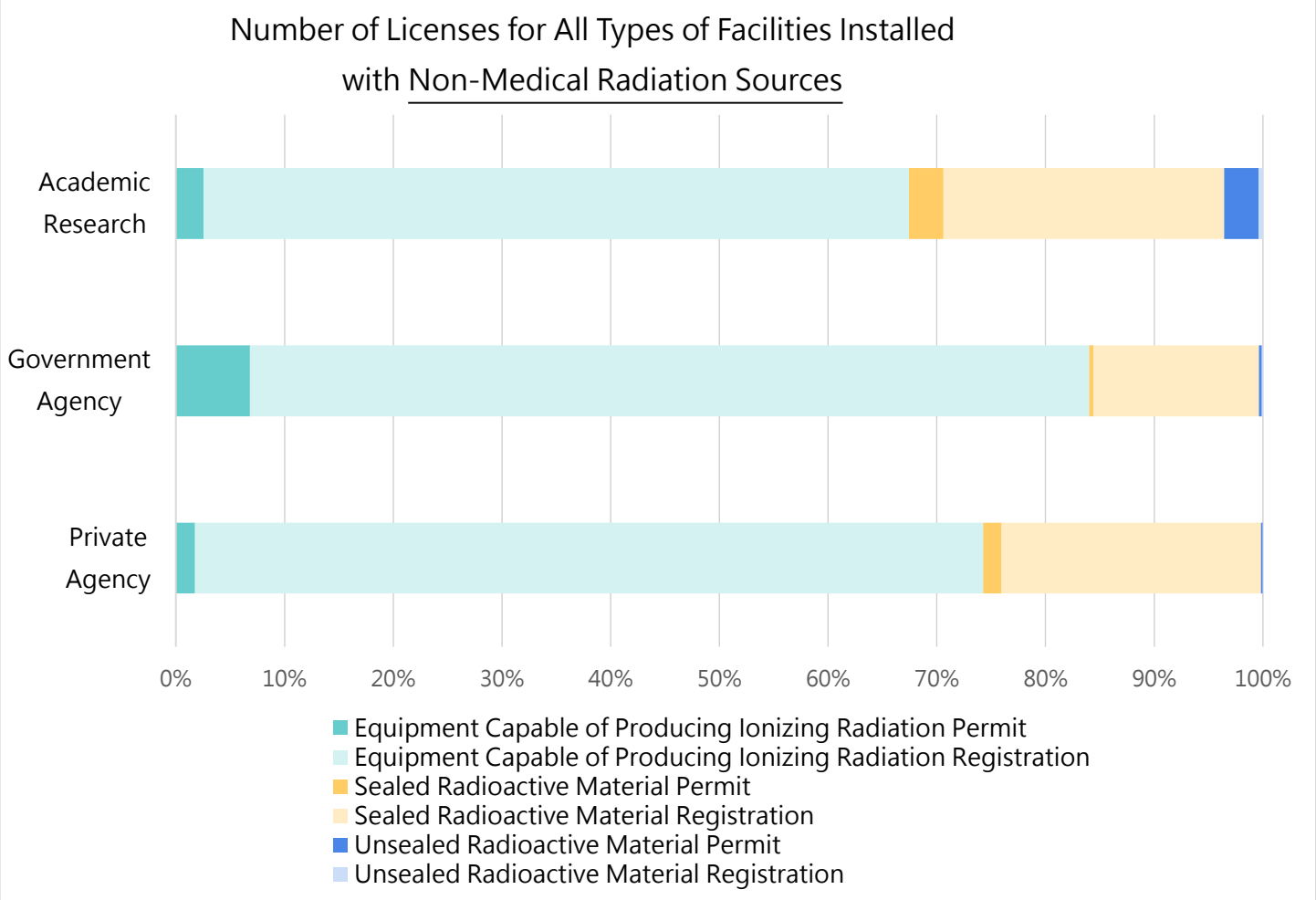
Number of Licenses for All Types of Equipment that should Implement Radiation Medical Exposure Quality Assurance



2. Radiation Sources Licenses (Non-Medical Use)

(1) Number of Licenses for All Types of Facilities Installed with Non-Medical Radiation Sources by type

Type / Facility	Equipment Capable of Producing Ionizing Radiation		Sealed Radioactive Material		Unsealed Radioactive Material		Total
	Permit	Registration	Permit	Registration	Permit	Registration	
Public Medical Institution	245	10,080	237	3,316	23	3	13,904
Private Medical Institution	72	816	4	161	3	1	1,057
Academic Research	20	510	25	203	25	3	786
Total	337	11,406	266	3,680	51	7	15,747



(2) Number of Licenses for All Types of Facilities Installed with Non-Medical Radiation Sources by county/city

Facility / County/City	Permit									Registration								
	Private Agency			Government Agency			Academic Research			Private Agency			Government Agency			Academic Research		
	Equip-ment	Sealed	Unseal-ed	Equipm-ent	Sealed	Unsea-led	Equipm-ent	Sealed	Unsea-led	Equip-ment	Sealed	Unsea-led	Equip-ment	Sealed	Unsea-led	Equip-ment	Sealed	Unsea-led
Keelung City	4	4	0	3	0	0	0	0	0	54	1	0	20	1	1	5	2	1
Taipei City	22	4	1	8	0	1	4	5	5	716	64	0	120	56	0	94	37	0
New Taipei City	13	7	9	6	3	1	0	0	0	1,479	220	0	54	37	0	11	0	0
Taoyuan City	44	14	2	19	0	0	6	14	8	2,148	464	2	313	24	0	49	50	0
Hsinchu(county and city)	11	7	2	1	0	0	7	5	3	1,060	418	0	11	1	0	114	33	0
Miaoli County	5	6	1	0	0	0	0	0	0	233	115	0	4	0	0	7	0	0
Taichung City	22	11	4	7	0	0	1	0	4	967	330	0	49	10	0	73	23	0
Changhua County	6	6	0	0	0	0	0	0	0	292	75	0	4	0	0	6	1	0
Nantou County	2	2	0	2	0	0	0	0	0	96	15	0	5	2	0	4	0	0
Yunlin County	5	31	0	0	0	0	2	0	0	200	211	0	4	0	0	12	2	0
Chiayi (county and city)	5	0	0	2	0	0	0	0	1	144	31	0	9	2	0	4	3	1
Tainan City	14	1	0	6	0	0	0	0	2	935	825	0	38	4	0	59	18	1
Kaohsiung City	83	139	3	9	1	1	0	1	1	1,480	386	0	102	15	0	44	18	0
Pingtung County	6	2	1	5	0	0	0	0	0	125	70	1	10	4	0	9	6	0
Yilan County	2	3	0	0	0	0	0	0	0	96	60	0	3	1	0	3	0	0
Hualien County	1	0	0	2	0	0	0	0	1	33	23	0	16	1	0	16	9	0
Taitung County	0	0	0	1	0	0	0	0	0	17	7	0	19	3	0	0	1	0
Penghu County	0	0	0	1	0	0	0	0	0	3	1	0	19	0	0	0	0	0

Facility / County/City	Permit									Registration								
	Private Agency			Government Agency			Academic Research			Private Agency			Government Agency			Academic Research		
	Equip-ment	Sealed	Unseal-ed	Equipm-ent	Sealed	Unsea-led	Equipm-ent	Sealed	Unsea-led	Equip-ment	Sealed	Unsea-led	Equip-ment	Sealed	Unsea-led	Equip-ment	Sealed	Unsea-led
Lienchiang County	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0
Kinmen County	0	0	0	0	0	0	0	0	0	2	0	0	9	0	0	0	0	0
Total	245	237	23	72	4	3	20	25	25	10,080	3,316	3	816	161	1	510	203	3

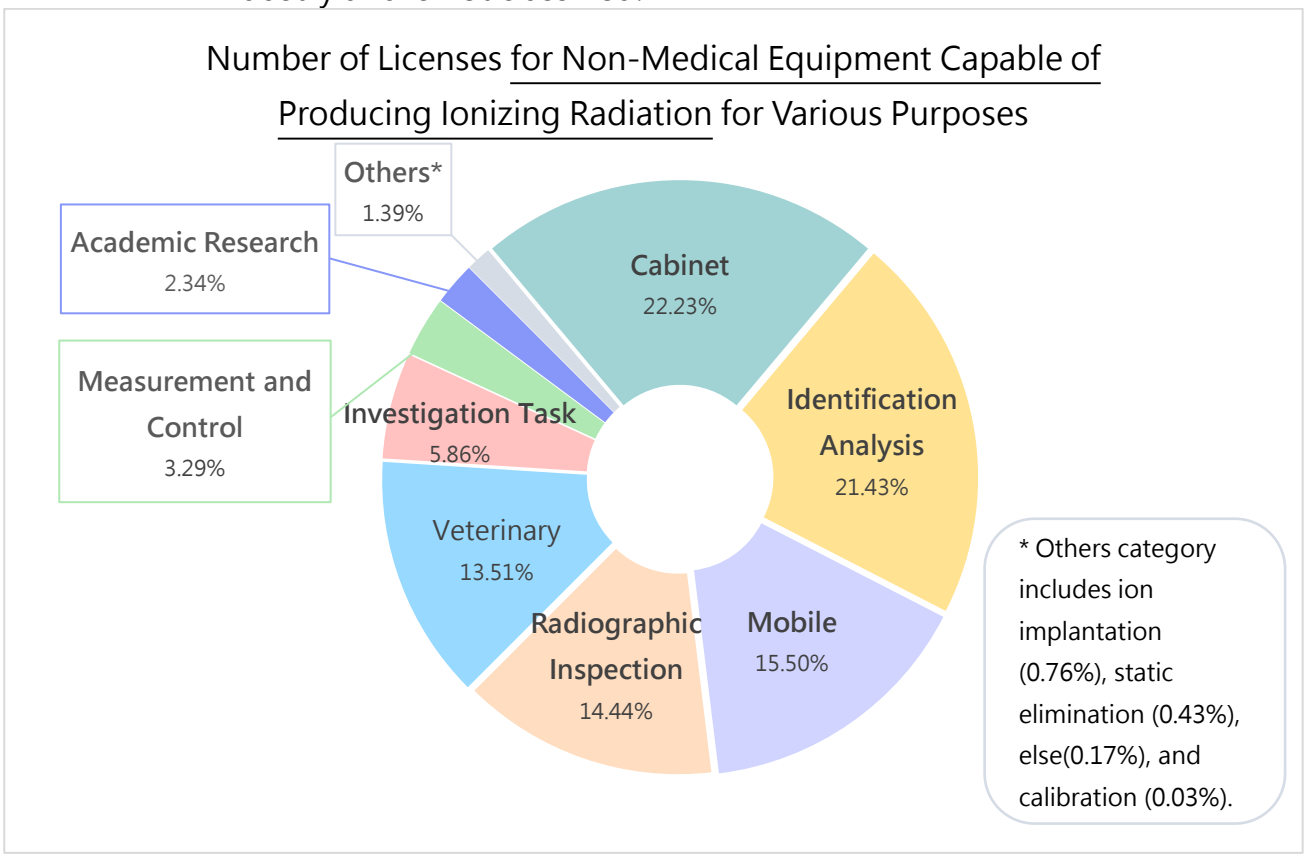
Remarks:

1. Equipment: Equipment capable of producing ionizing radiation.
2. Sealed: Sealed radioactive material.
3. Unsealed: Unsealed radioactive material.

(3) Number of Licenses for Non-Medical Equipment Capable of Producing Ionizing Radiation for Various Purposes

Equipment Usage	Number of Licenses
Identification Analysis	2,517
Radiographic Inspection	1,696
Veterinary	1,587
Academic Research	275
Investigation Task	688
Measurement and Control	386
Ion Implantation	89
Static Elimination	51
Calibration	3
Cabinet	2,611
Mobile	1,820
Others*	20
Total	11,743

* "Others" refers to the equipment held by the sales and manufacturing industry and is not classified.

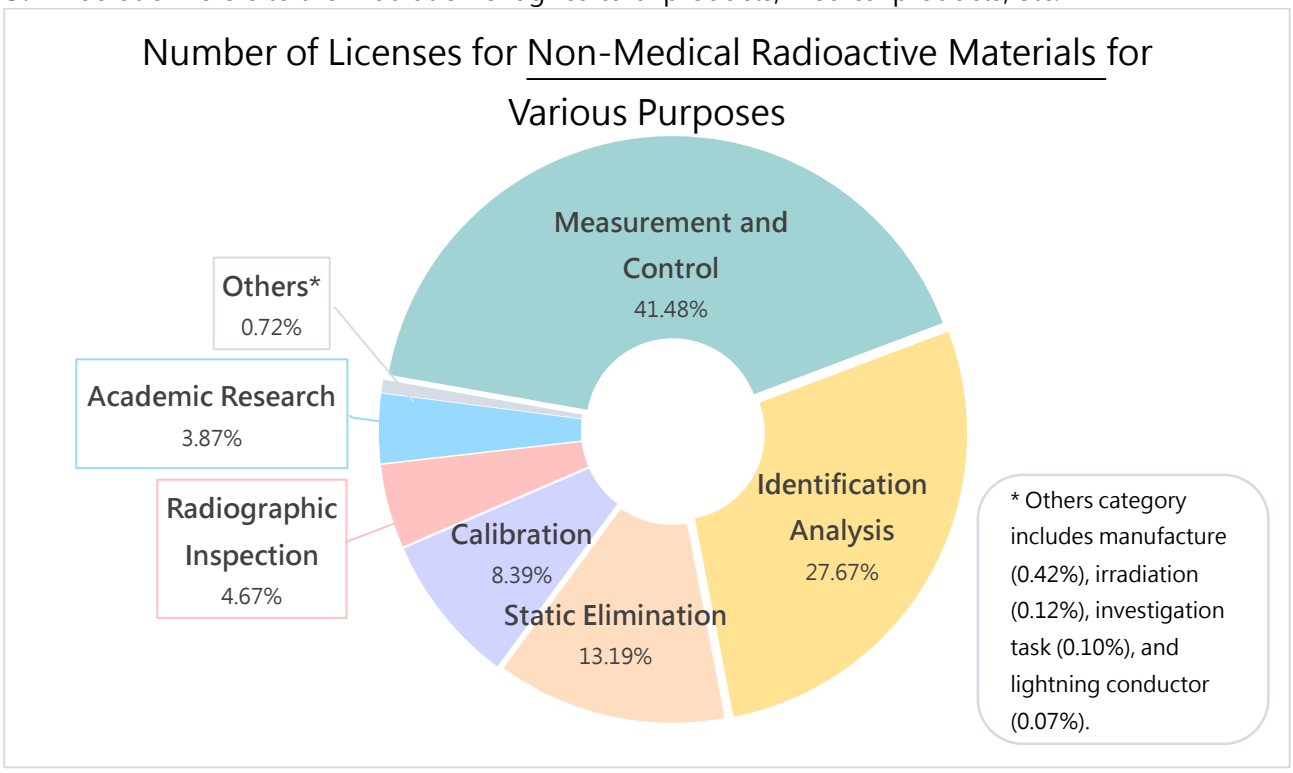


(4) Number of Licenses for Non-Medical Radioactive Materials for Various Purposes

Radioactive Material Usage	Number of Licenses
Measurement and Control	1,661
Identification Analysis	1,108
Academic Research	155
Calibration	336
Radiographic Inspection	187
Investigation Task	4
Static Elimination	528
Manufacture[1]	17
Lightning Conductor[2]	3
Irradiation[3]	5
Total	4,004

Remarks:

1. Manufacture usage includes packaging and manufacturing.
2. Lightning conductors use Am-241 sources.
3. Irradiation refers to the irradiation of agricultural products, medical products, etc.



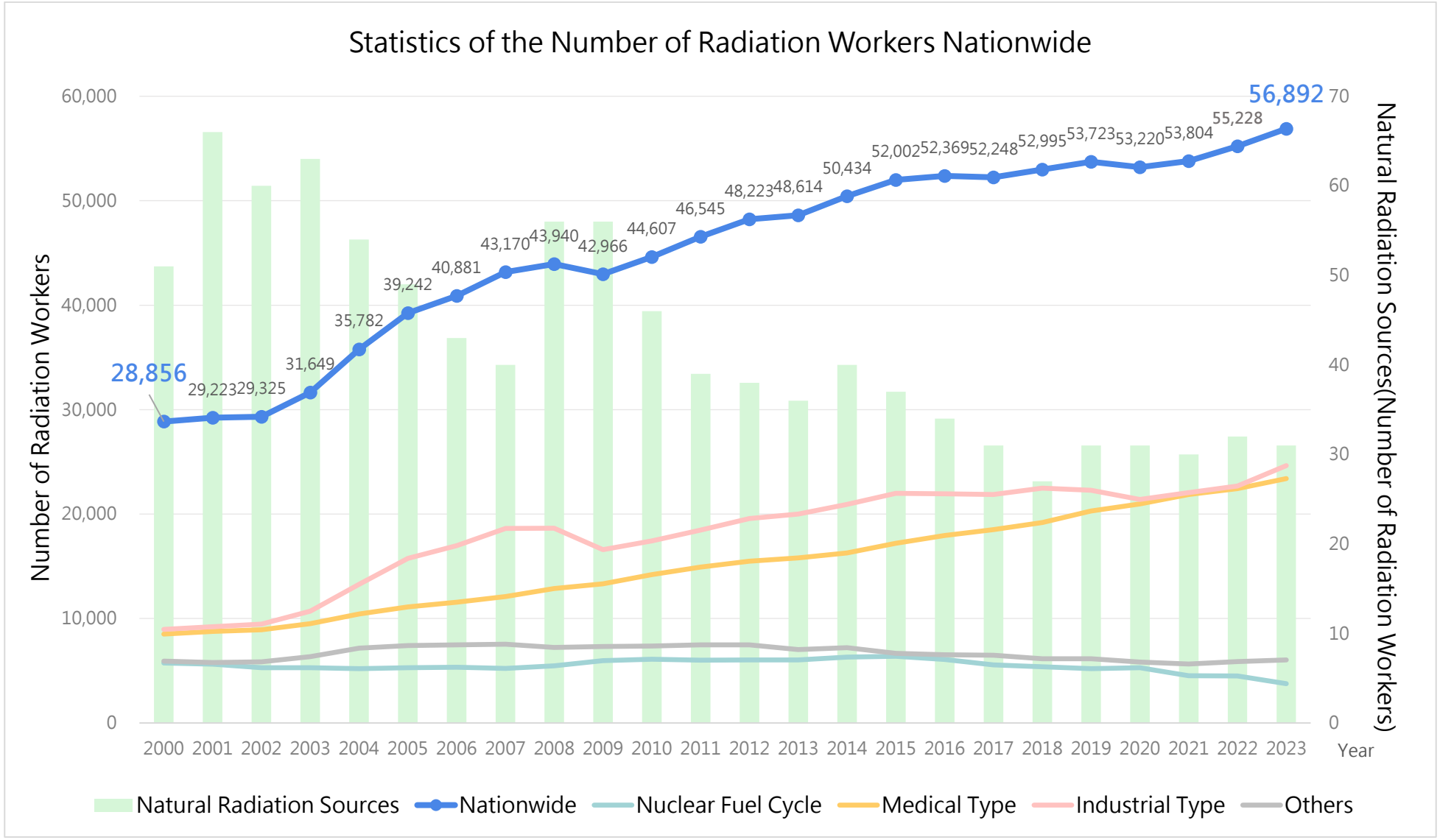
3. Personnel Dose

(1) Statistics of the Number of Radiation Workers Nationwide

Year	Nuclear Fuel Cycle	Medical Type	Industrial Type	Natural Radiation Sources[1]	Others[2]	Nationwide[3]
2000	5,731	8,510	8,960	51	5,925	28,856
2001	5,622	8,775	9,221	66	5,786	29,223
2002	5,296	8,914	9,468	60	5,857	29,325
2003	5,281	9,504	10,702	63	6,361	31,649
2004	5,189	10,425	13,272	54	7,167	35,782
2005	5,287	11,101	15,754	49	7,410	39,242
2006	5,325	11,561	16,966	43	7,472	40,881
2007	5,232	12,110	18,615	40	7,541	43,170
2008	5,473	12,873	18,639	56	7,221	43,940
2009	5,971	13,321	16,588	56	7,329	42,966
2010	6,093	14,207	17,435	46	7,360	44,607
2011	6,001	14,920	18,465	39	7,482	46,545
2012	6,026	15,482	19,576	38	7,473	48,225
2013	6,040	15,804	20,002	36	7,031	48,617
2014	6,313	16,272	20,919	40	7,199	50,437
2015	6,384	17,199	21,995	37	6,659	52,012
2016	6,084	17,958	21,951	34	6,540	52,369
2017	5,557	18,522	21,877	31	6,479	52,248
2018	5,383	19,199	22,479	27	6,137	52,995
2019	5,189	20,291	22,269	31	6,142	53,723
2020	5,286	20,970	21,406	31	5,832	53,220
2021	4,513	21,866	22,046	30	5,645	53,804
2022	4,497	22,439	22,695	32	5,870	55,228
2023	3,761	23,398	24,639	31	6,027	56,892

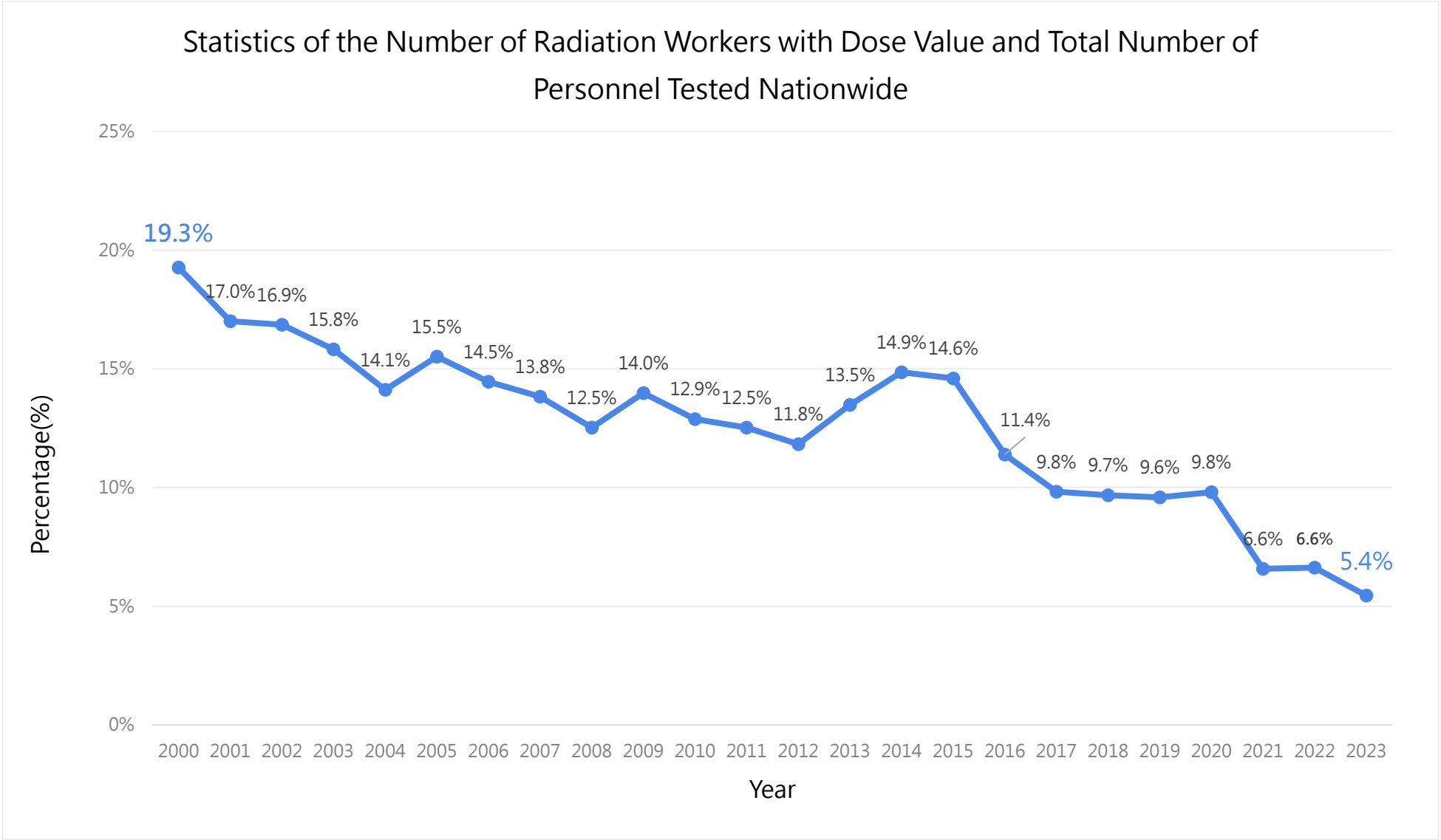
Remarks：

1. Natural radiation sources include civil aircraft, oil, gas, and mineral and ore processing.
2. Others category includes educational institutions, veterinarians and a few difficult to classify.
3. National dose badge usage statistics includes radiation workers and non-radiation workers as defined by law/regulations.
4. Because some workers are engaged in more than two types of radiation works, the total number of personnel tested nationwide will be less than the total number of various types of work.


Statistics of the Number of Radiation Workers Nationwide
Number of Radiation Workers
Natural Radiation Sources(Number of Radiation Workers)
60,000
50,000
40,000
30,000
20,000
10,000
0
70
60
50
40
30
20
10
0
28,856
29,223
29,325
31,649
35,782
39,242
40,881
43,170
43,940
42,966
44,607
46,545
48,223
48,614
50,434
52,002
52,369
52,248
52,995
53,723
53,220
53,804
55,228
56,892
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year
Natural Radiation Sources
Nationwide
Nuclear Fuel Cycle
Medical Type
Industrial Type
Others

(2) Statistics of the Number of Radiation Workers with Dose Value and Total Number of Personnel Tested Nationwide

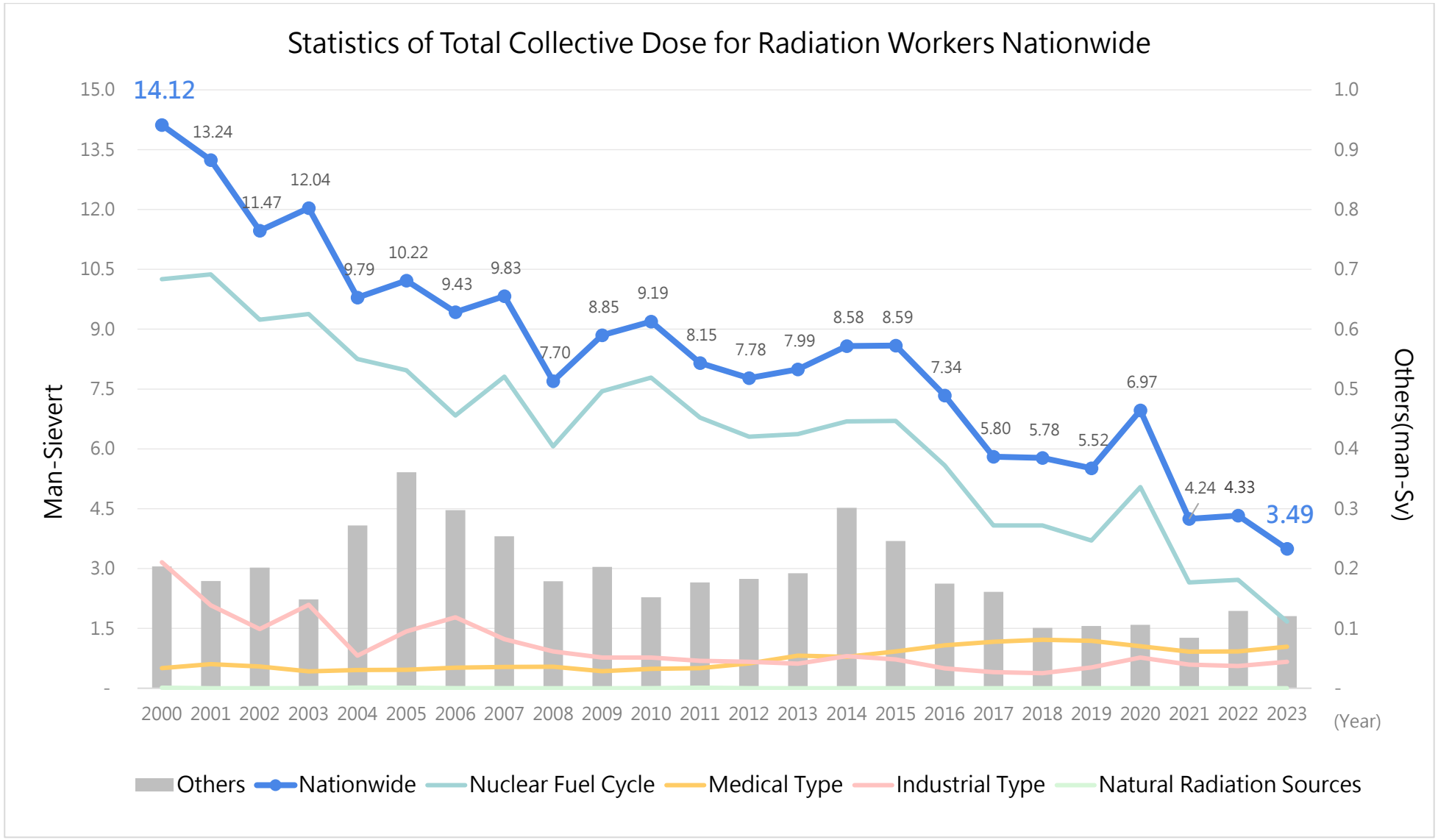
Year	Number of People with Dose Value	Total Number of Personnel Tested	Percentage
2000	5,559	28,856	19.3%
2001	4,970	29,223	17.0%
2002	4,943	29,325	16.9%
2003	5,006	31,649	15.8%
2004	5,052	35,782	14.1%
2005	6,088	39,242	15.5%
2006	5,908	40,881	14.5%
2007	5,969	43,170	13.8%
2008	5,504	43,940	12.5%
2009	6,008	42,966	14.0%
2010	5,745	44,607	12.9%
2011	5,831	46,545	12.5%
2012	5,704	48,223	11.8%
2013	6,551	48,614	13.5%
2014	7,490	50,434	14.9%
2015	7,589	52,002	14.6%
2016	5,966	52,369	11.4%
2017	5,132	52,248	9.8%
2018	5,127	52,995	9.7%
2019	5,148	53,723	9.6%
2020	5,220	53,220	9.8%
2021	3,537	53,804	6.6%
2022	3,661	55,228	6.6%
2023	3,100	56,892	5.4%


Statistics of the Number of Radiation Workers with Dose Value and Total Number of Personnel Tested Nationwide
Percentage(%)
25%
20%
15%
10%
5%
0%
19.3%
17.0%
16.9%
15.8%
14.1%
15.5%
14.5%
13.8%
12.5%
14.0%
12.9%
12.5%
11.8%
13.5%
14.9%
14.6%
11.4%
9.8%
9.7%
9.6%
9.8%
6.6%
6.6%
5.4%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year

(3) Statistics of Total Collective Dose for Radiation Workers Nationwide

Year	Nationwide	Nuclear Fuel Cycle (Nuclear Power Plant)	Medical Type	Industrial Type (Non-Medical)	Others (Research)	Natural Radiation Sources
2000	14.12	10.25	0.50	3.16	0.20	0.00
2001	13.24	10.37	0.61	2.08	0.18	0.00
2002	11.47	9.24	0.55	1.48	0.20	0.00
2003	12.04	9.38	0.42	2.09	0.15	0.00
2004	9.79	8.25	0.45	0.82	0.27	0.00
2005	10.22	7.97	0.46	1.42	0.36	0.00
2006	9.43	6.83	0.52	1.78	0.30	0.00
2007	9.83	7.81	0.53	1.23	0.25	0.00
2008	7.70	6.06	0.54	0.92	0.18	0.00
2009	8.85	7.45	0.43	0.77	0.20	0.00
2010	9.19	7.79	0.49	0.77	0.15	0.00
2011	8.15	6.79	0.50	0.68	0.18	0.00
2012	7.78	6.31	0.62	0.66	0.18	0.00
2013	7.99	6.37	0.81	0.61	0.19	0.00
2014	8.58	6.69	0.79	0.80	0.30	0.00
2015	8.59	6.70	0.92	0.72	0.25	0.00
2016	7.34	5.59	1.08	0.50	0.17	0.00
2017	5.80	4.08	1.16	0.40	0.16	0.00
2018	5.78	4.08	1.21	0.38	0.10	0.00
2019	5.52	3.70	1.19	0.52	0.10	0.00
2020	6.97	5.05	1.05	0.77	0.11	0.00
2021	4.24	2.65	0.92	0.59	0.08	0.00
2022	4.33	2.72	0.92	0.56	0.13	0.00
2023	3.49	1.67	1.04	0.66	0.12	0.00

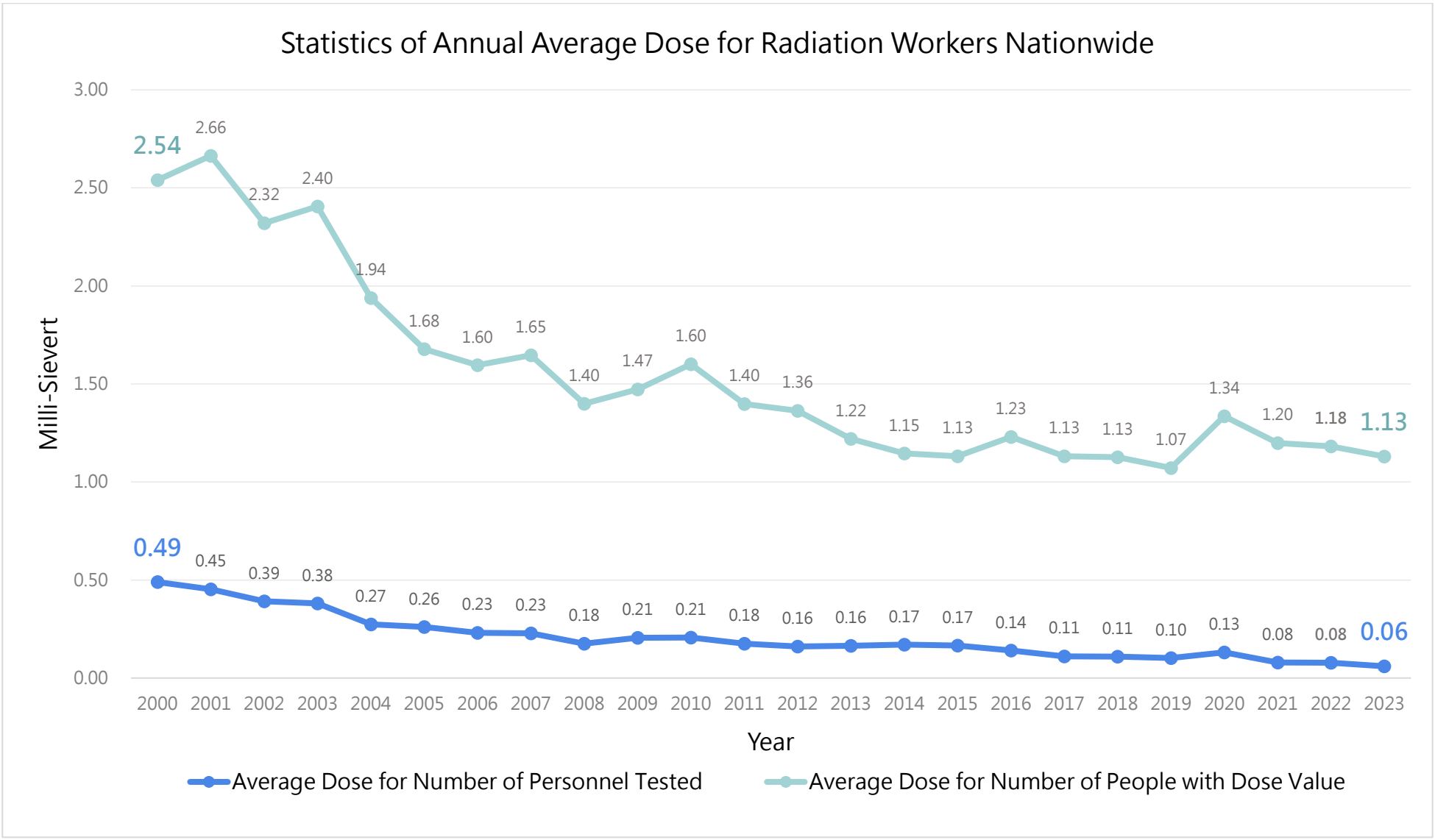
Unit：Man-Sievert (man-Sv)


Statistics of Total Collective Dose for Radiation Workers Nationwide
Man-Sievert
Others(man-Sv)
(Year)
14.12
13.24
11.47
12.04
9.79
10.22
9.43
9.83
7.70
8.85
9.19
8.15
7.78
7.99
8.58
8.59
7.34
5.80
5.78
5.52
6.97
4.24
4.33
3.49
15.0
13.5
12.0
10.5
9.0
7.5
6.0
4.5
3.0
1.5
-
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
-
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Others
Nationwide
Nuclear Fuel Cycle
Medical Type
Industrial Type
Natural Radiation Sources

(4) Statistics of Annual Average Dose for Radiation Workers Nationwide

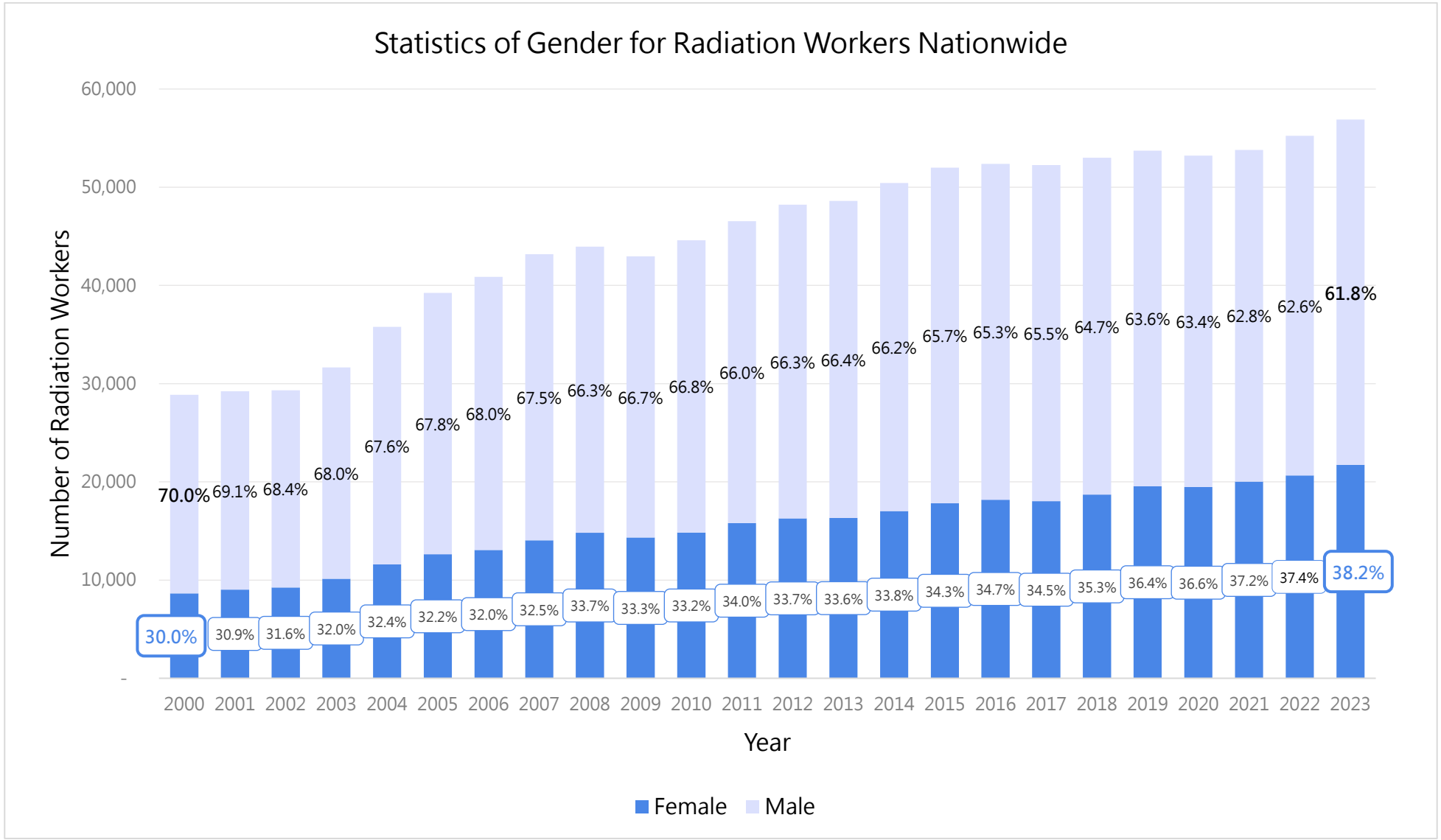
Year	Average Dose for Number of Personnel Tested	Average Dose for Number of People with Dose Value
2000	0.49	2.54
2001	0.45	2.66
2002	0.39	2.32
2003	0.38	2.40
2004	0.27	1.94
2005	0.26	1.68
2006	0.23	1.60
2007	0.23	1.65
2008	0.18	1.40
2009	0.21	1.47
2010	0.21	1.60
2011	0.18	1.40
2012	0.16	1.36
2013	0.16	1.22
2014	0.17	1.15
2015	0.17	1.13
2016	0.14	1.23
2017	0.11	1.13
2018	0.11	1.13
2019	0.10	1.07
2020	0.13	1.34
2021	0.08	1.20
2022	0.08	1.18
2023	0.06	1.13

Unit：Milli-Sievert (mSv)


Statistics of Annual Average Dose for Radiation Workers Nationwide
Milli-Sievert
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.54
2.66
2.32
2.40
1.94
1.68
1.60
1.65
1.40
1.47
1.60
1.40
1.36
1.22
1.15
1.13
1.23
1.13
1.13
1.07
1.34
1.20
1.18
1.13
0.49
0.45
0.39
0.38
0.27
0.26
0.23
0.23
0.18
0.21
0.21
0.18
0.16
0.16
0.17
0.17
0.14
0.11
0.11
0.10
0.13
0.08
0.08
0.06
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year
Average Dose for Number of Personnel Tested
Average Dose for Number of People with Dose Value

(5) Statistics of Gender for Radiation Workers Nationwide

Year	Male	Female	Total	Male Ratio (%)	Female Ratio (%)
2000	20,201	8,655	28,856	70.0%	30.0%
2001	20,194	9,029	29,223	69.1%	30.9%
2002	20,069	9,256	29,325	68.4%	31.6%
2003	21,507	10,142	31,649	68.0%	32.0%
2004	24,194	11,588	35,782	67.6%	32.4%
2005	26,620	12,622	39,242	67.8%	32.2%
2006	27,816	13,065	40,881	68.0%	32.0%
2007	29,122	14,048	43,170	67.5%	32.5%
2008	29,112	14,828	43,940	66.3%	33.7%
2009	28,639	14,327	42,966	66.7%	33.3%
2010	29,778	14,829	44,607	66.8%	33.2%
2011	30,740	15,805	46,545	66.0%	34.0%
2012	31,948	16,275	48,223	66.3%	33.7%
2013	32,295	16,319	48,614	66.4%	33.6%
2014	33,396	17,038	50,434	66.2%	33.8%
2015	34,184	17,818	52,002	65.7%	34.3%
2016	34,178	18,191	52,369	65.3%	34.7%
2017	34,210	18,038	52,248	65.5%	34.5%
2018	34,283	18,712	52,995	64.7%	35.3%
2019	34,163	19,560	53,723	63.6%	36.4%
2020	33,750	19,470	53,220	63.4%	36.6%
2021	33,771	20,033	53,804	62.77%	37.23%
2022	34,574	20,654	55,228	62.60%	37.40%
2023	35,150	21,742	56,892	61.80%	38.20%


Statistics of Gender for Radiation Workers Nationwide
Number of Radiation Workers
60,000
50,000
40,000
30,000
20,000
10,000
-
70.0% 69.1% 68.4% 68.0% 67.6% 67.8% 68.0% 67.5% 66.3% 66.7% 66.8% 66.0% 66.3% 66.4% 66.2% 65.7% 65.3% 65.5% 64.7% 63.6% 63.4% 62.8% 62.6% 61.8%
30.0% 30.9% 31.6% 32.0% 32.4% 32.2% 32.0% 32.5% 33.7% 33.3% 33.2% 34.0% 33.7% 33.6% 33.8% 34.3% 34.7% 34.5% 35.3% 36.4% 36.6% 37.2% 37.4% 38.2%
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year
Female
Male

(6) Statistics of the Number of Radiation Workers in Each Dose Interval Nationwide (Unit: person)

Dose Interval (mSv)	≦LLD	≦ 1	> 1 ≦ 2.5	> 2.5 ≦ 5	> 5 ≦ 7.5	> 7.5 ≦ 10	> 10 ≦ 15	> 15 ≦ 20	> 20 ≦ 25	> 25 ≦ 30	> 30 ≦ 35	> 35 ≦ 40	> 40 ≦ 45	> 45 ≦ 50	> 50 ≦ 100	> 100
2000	23,297	3,296	891	549	272	191	169	90	47	26	15	8	3	0	2	0
2001	24,253	2,774	891	539	251	161	187	86	36	24	17	0	3	0	1	0
2002	24,382	2,907	857	519	225	148	155	77	40	8	5	1	0	0	1	0
2003	26,643	3,001	801	520	228	157	135	84	43	21	7	7	2	0	0	0
2004	30,730	3,152	822	512	196	126	165	75	1	1	0	2	0	0	0	0
2005	33,154	4,018	935	528	245	143	159	52	3	1	2	1	1	0	0	0
2006	34,973	3,991	854	526	214	140	132	31	13	2	5	0	0	0	0	0
2007	37,201	3,922	909	586	221	126	156	43	3	2	1	0	0	0	0	0
2008	38,436	3,644	948	503	186	118	98	6	1	0	0	0	0	0	0	0
2009	36,958	3,968	941	593	254	145	99	8	0	0	0	0	0	0	0	0
2010	38,862	3,652	961	614	238	138	121	21	0	0	0	0	0	0	0	0
2011	40,714	3,884	977	507	238	134	81	10	0	0	0	0	0	0	0	0
2012	42,519	3,758	1,030	531	201	103	68	12	1	0	0	0	0	0	0	0
2013	42,063	4,601	1,008	556	196	93	77	19	0	1	0	0	0	0	0	0
2014	42,944	5,431	1,072	542	246	101	87	11	0	0	0	0	0	0	0	0
2015	44,413	5,413	1,188	569	220	111	81	7	0	0	0	0	0	0	0	0
2016	46,403	4,200	950	477	159	87	80	13	0	0	0	0	0	0	0	0
2017	47,116	3,716	756	394	136	75	50	5	0	0	0	0	0	0	0	0
2018	47,868	3,680	840	362	117	60	52	14	2	0	0	0	0	0	0	0
2019	48,575	3,713	823	364	139	60	41	8	0	0	0	0	0	0	0	0
2020	48,000	3,668	808	398	124	79	108	29	3	2	1	0	0	0	0	0
2021	50,267	2,369	719	290	83	40	32	4	0	0	0	0	0	0	0	0
2022	51,567	2,470	718	297	97	53	25	1	0	0	0	0	0	0	0	0
2023	53,792	2,181	535	241	79	33	27	4	0	0	0	0	0	0	0	0

LLD：Lower limit of detection

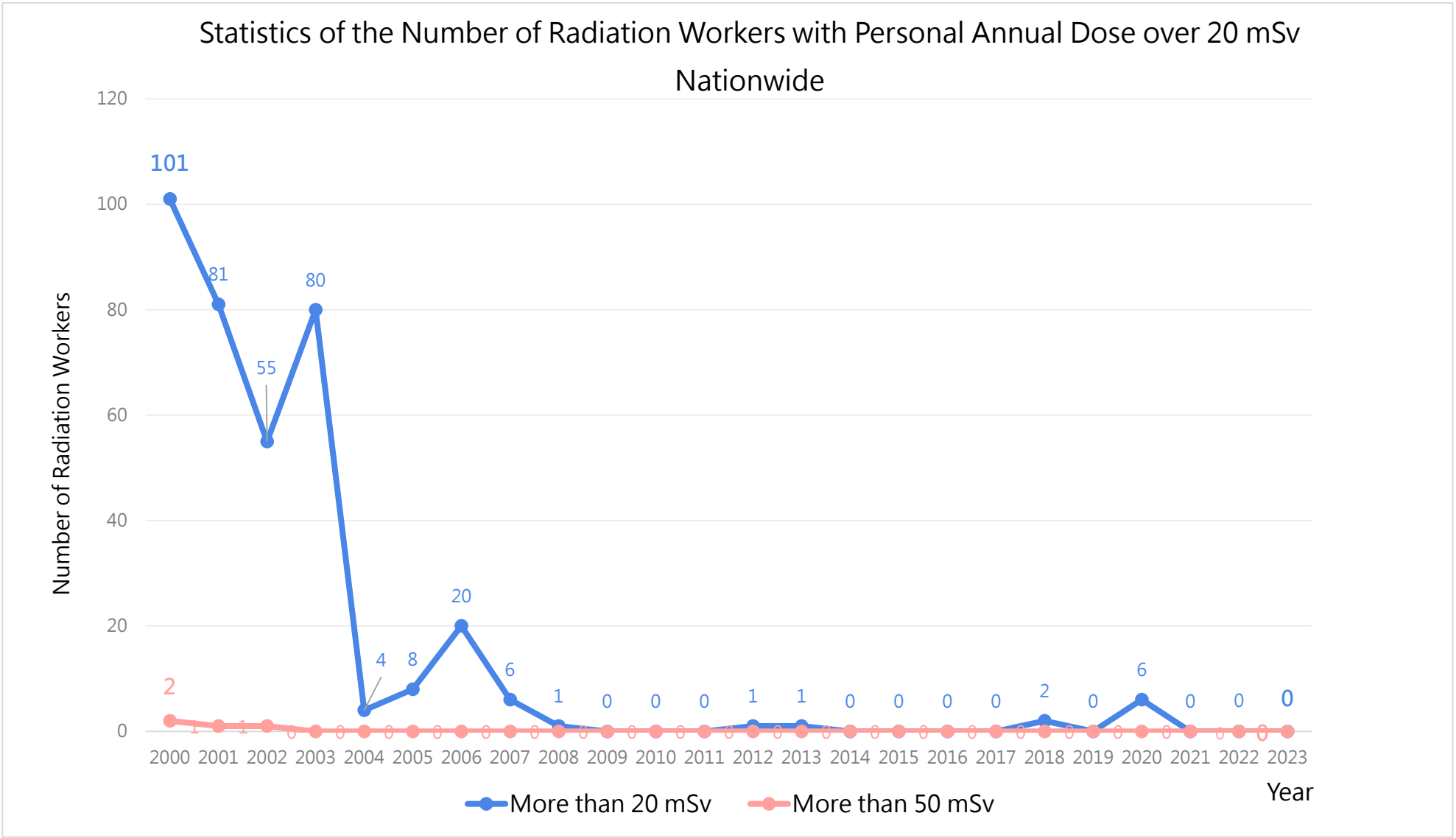
(7) Statistics of Relative Percentage of Radiation Workers in Each Dose Interval Nationwide (unit: %)

Dose Interval (mSv)	≦LLD	≦ 1	> 1 ≦ 2.5	> 2.5 ≦ 5	> 5 ≦ 7.5	> 7.5 ≦ 10	> 10 ≦ 15	> 15 ≦ 20	> 20 ≦ 25	> 25 ≦ 30	> 30 ≦ 35	> 35 ≦ 40	> 40 ≦ 45	> 45 ≦ 50	> 50 ≦ 100	> 100	Percentage of People with Dose Value
2000	80.7	11.4	3.1	1.9	0.9	0.7	0.6	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	19.3%
2001	83.0	9.5	3.1	1.8	0.9	0.6	0.6	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	17.0%
2002	83.1	9.9	2.9	1.8	0.8	0.5	0.5	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.9%
2003	84.2	9.5	2.5	1.6	0.7	0.5	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	15.8%
2004	85.9	8.8	2.3	1.4	0.6	0.4	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1%
2005	84.5	10.2	2.4	1.4	0.6	0.4	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.5%
2006	85.6	9.8	2.1	1.3	0.5	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5%
2007	86.2	9.1	2.1	1.4	0.5	0.3	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.8%
2008	87.5	8.3	2.2	1.1	0.4	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5%
2009	86.0	9.2	2.2	1.4	0.6	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0%
2010	87.1	8.2	2.2	1.4	0.5	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9%
2011	87.5	8.3	2.1	1.1	0.5	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5%
2012	88.2	7.8	2.1	1.1	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8%
2013	86.5	9.5	2.1	1.1	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5%
2014	85.2	10.8	2.1	1.1	0.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.9%
2015	85.4	10.4	2.3	1.1	0.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6%
2016	88.6	8.0	1.8	0.9	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4%
2017	90.2	7.1	1.5	0.8	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8%
2018	90.3	6.9	1.6	0.7	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7%
2019	90.4	6.9	1.5	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6%
2020	90.2	6.9	1.5	0.8	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8%
2021	93.4	4.4	1.3	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6%
2022	93.4	4.5	1.3	0.5	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6%
2023	94.6	3.8	0.9	0.4	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4%

LLD：Lower limit of detection

(8) Statistics of the Number of Radiation Workers with Personal Annual Dose over 20 mSv Nationwide

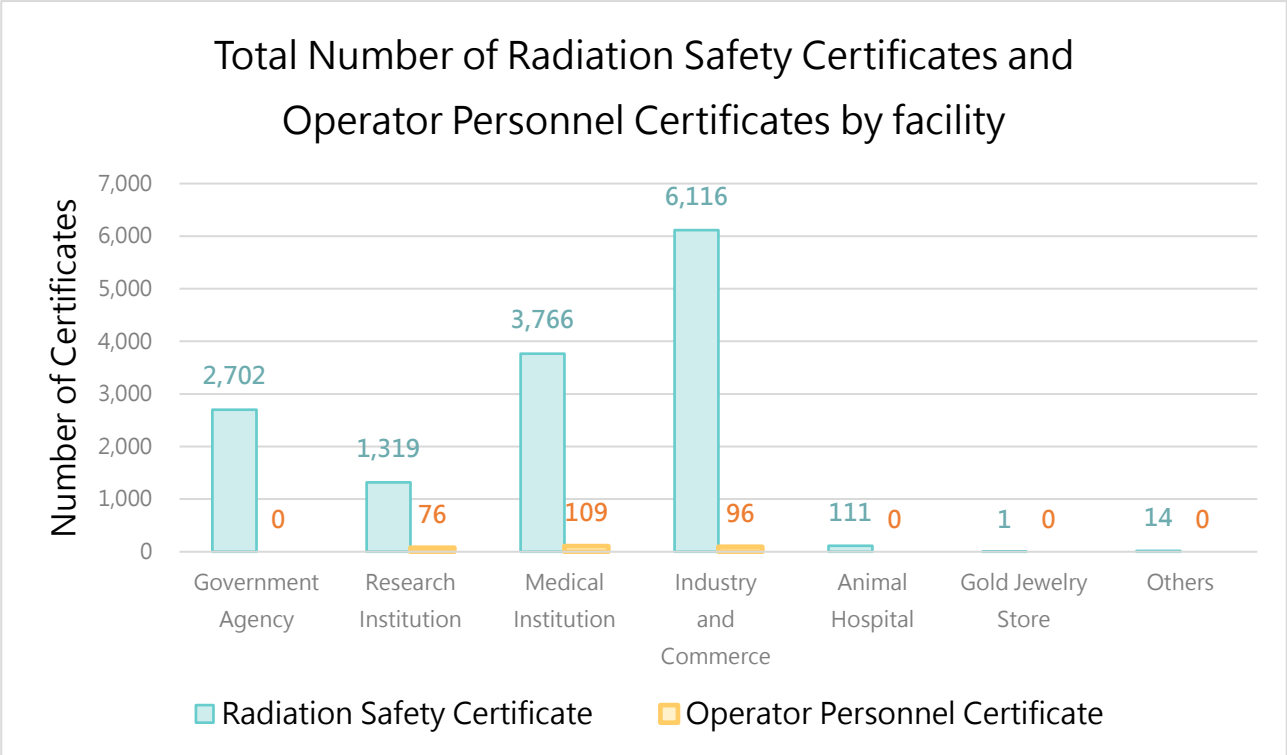
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
More than 20 mSv	101	81	55	80	4	8	20	6	1	0	0	0	1	1	0	0	0	0	2	0	6	0	0	0
More than 50 mSv	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



4. Personnel with Certificates (Radiation Safety Certificates, Operator Personnel, Radiation Protection Personnel) and Radiation Protection Business with Certificates

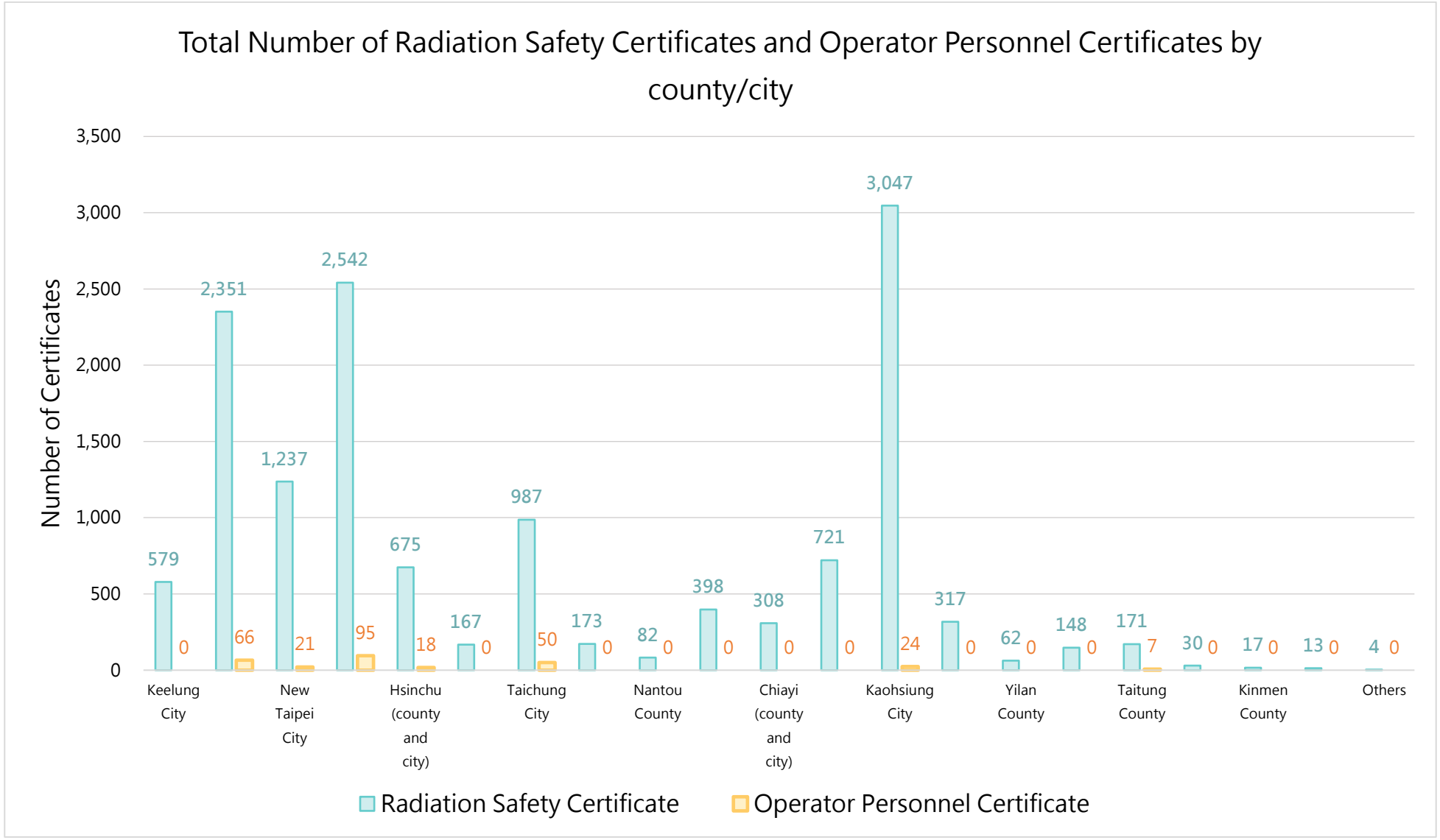
(1) Total Number of Radiation Safety Certificates and Operator Personnel Certificates by facility

Facility / Certificate Type	Government Agency	Research Institution	Medical Institution	Industry And Commerce	Animal Hospital	Gold Jewelry Store	Others (Including unemployed people)	Total
Radiation Safety Certificate	2,702	1,319	3,766	6,116	111	1	14	14,029
Operator Personnel Certificate	0	76	109	96	0	0	0	281
Total	2,702	1,395	3,875	6,212	111	1	14	14,310



(2) Total Number of Radiation Safety Certificates and Operator Personnel Certificates by county/city

Certificate type / County/City	Radiation Safety Certificate	Operator Personnel Certificate	Total
Keelung City	579	0	579
Taipei City	2,351	66	2,417
New Taipei City	1,237	21	1,258
Taoyuan City	2,542	95	2,637
Hsinchu (county and city)	675	18	693
Miaoli County	167	0	167
Taichung City	987	50	1,037
Changhua County	173	0	173
Nantou County	82	0	82
Yunlin County	398	0	398
Chiayi (county and city)	308	0	308
Tainan City	721	0	721
Kaohsiung City	3,047	24	3,071
Pingtung County	317	0	317
Yilan County	62	0	62
Hualien County	148	0	148
Taitung County	171	7	178
Penghu County	30	0	30
Kinmen County	17	0	17
Lienchiang County	13	0	13
Others	4	0	4
Total	14,029	281	14,310

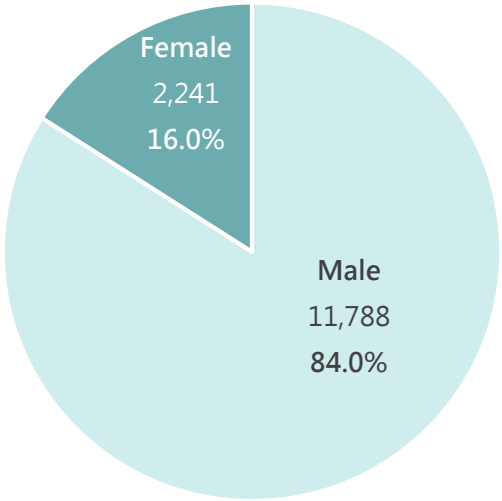

Total Number of Radiation Safety Certificates and Operator Personnel Certificates by county/city
Number of Certificates
3,500
3,000
2,500
2,000
1,500
1,000
500
0
579
0
2,351
66
1,237
21
2,542
95
675
18
167
0
987
50
173
0
82
0
398
0
308
0
721
0
3,047
24
317
0
62
0
148
0
171
7
30
0
17
0
13
0
4
0
Keelung City
New Taipei City
Hsinchu (county and city)
Taichung City
Nantou County
Chiayi (county and city)
Kaohsiung City
Yilan County
Taitung County
Kinmen County
Others
Radiation Safety Certificate
Operator Personnel Certificate

(3) Total Number of Radiation Safety Certificates and Operator Personnel Certificates by gender

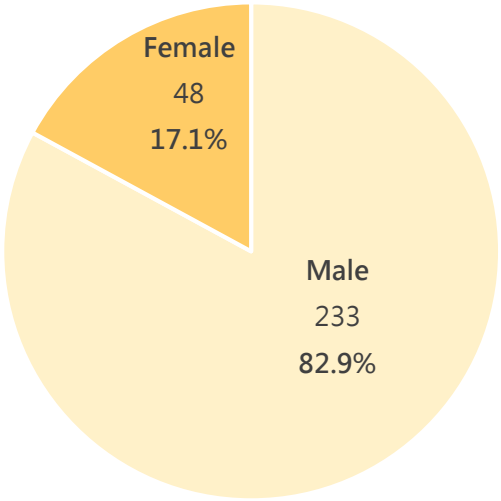
Gender / Certificate Type	Male	Female	Total	Male Ratio	Female Ratio
Radiation Safety Certificate	11,788	2,241	14,029	84.0%	16.0%
Operator Personnel Certificate	233	48	281	82.9%	17.1%
Total	12,021	2,289	14,310	84.0%	16.0%

Total Number of Radiation Safety Certificates and Operator Personnel Certificates by gender

Radiation Safety Certificate

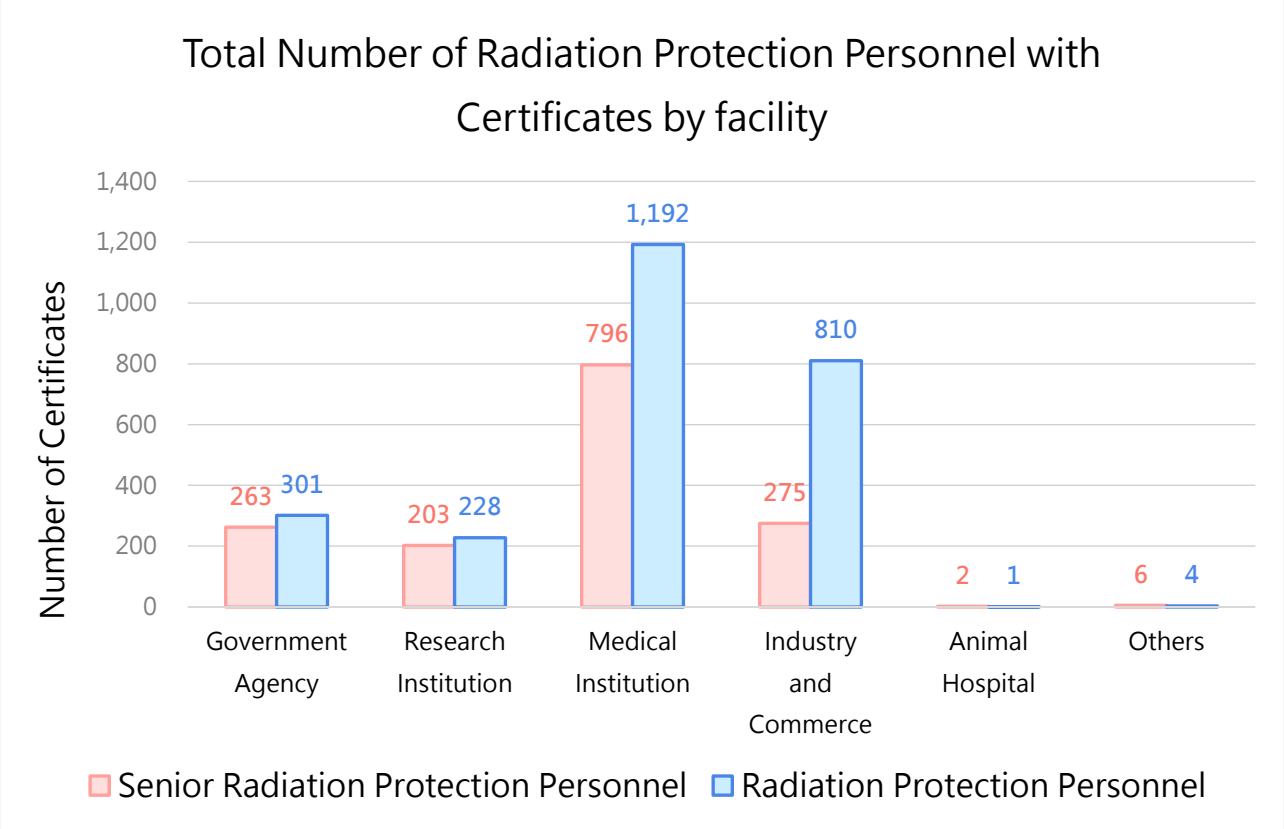


Operator Personnel Certificate



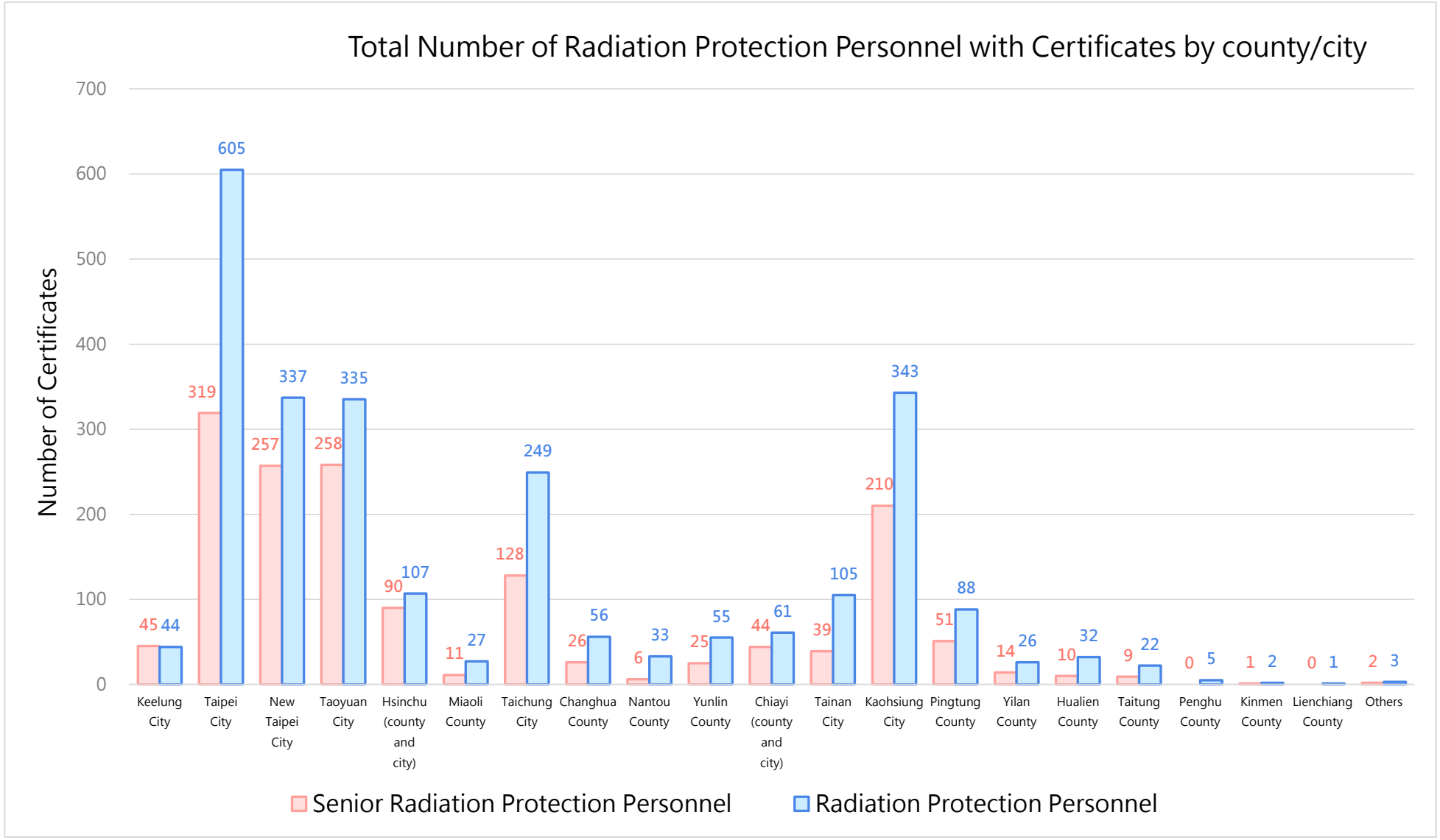
(4) Total Number of Radiation Protection Personnel with Certificates by facility

Facility / Certificate Type	Government Agency	Research Institution	Medical Institution	Industry and Commerce	Animal Hospital	Others (Including unemployed people)	Total
Senior Radiation Protection Personnel	263	203	796	275	2	6	1,545
Radiation Protection Personnel	301	228	1,192	810	1	4	2,536
Total	564	431	1,988	1,085	3	10	4,081



(5) Total Number of Radiation Protection Personnel with Certificates by county/city

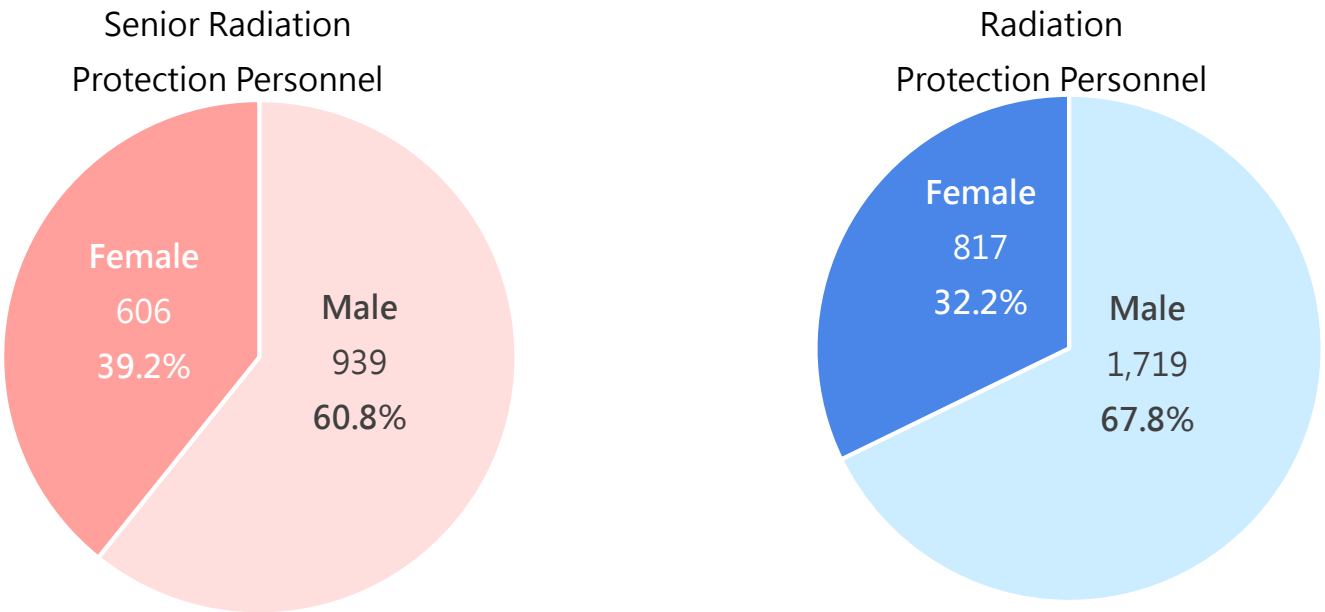
Certificate Type / County/City	Senior Radiation Protection Personnel	Radiation Protection Personnel	Total
Keelung City	45	44	89
Taipei City	319	605	924
New Taipei City	257	337	594
Taoyuan City	258	335	593
Hsinchu (county and city)	90	107	197
Miaoli County	11	27	38
Taichung City	128	249	377
Changhua County	26	56	82
Nantou County	6	33	39
Yunlin County	25	55	80
Chiayi (county and city)	44	61	105
Tainan City	39	105	144
Kaohsiung City	210	343	553
Pingtung County	51	88	139
Yilan County	14	26	40
Hualien County	10	32	42
Taitung County	9	22	31
Penghu County	0	5	5
Kinmen County	1	2	3
Lienchiang County	0	1	1
Others	2	3	5
Total	1,545	2,536	4,081


Total Number of Radiation Protection Personnel with Certificates by county/city
Number of Certificates
700
600
500
400
300
200
100
0
45 44
319 605
257 337
258 335
90 107
11 27
128 249
26 56
6 33
25 55
44 61
39 105
210 343
51 88
14 26
10 32
9 22
0 5
1 2
0 1
2 3
Keelung City
Taipei City
New Taipei City
Taoyuan City
Hsinchu (county and city)
Miaoli County
Taichung City
Changhua County
Nantou County
Yunlin County
Chiayi (county and city)
Tainan City
Kaohsiung City
Pingtung County
Yilan County
Hualien County
Taitung County
Penghu County
Kinmen County
Lienchiang County
Others
Senior Radiation Protection Personnel
Radiation Protection Personnel

(6) Total Number of Radiation Protection Personnel with Certificates by gender

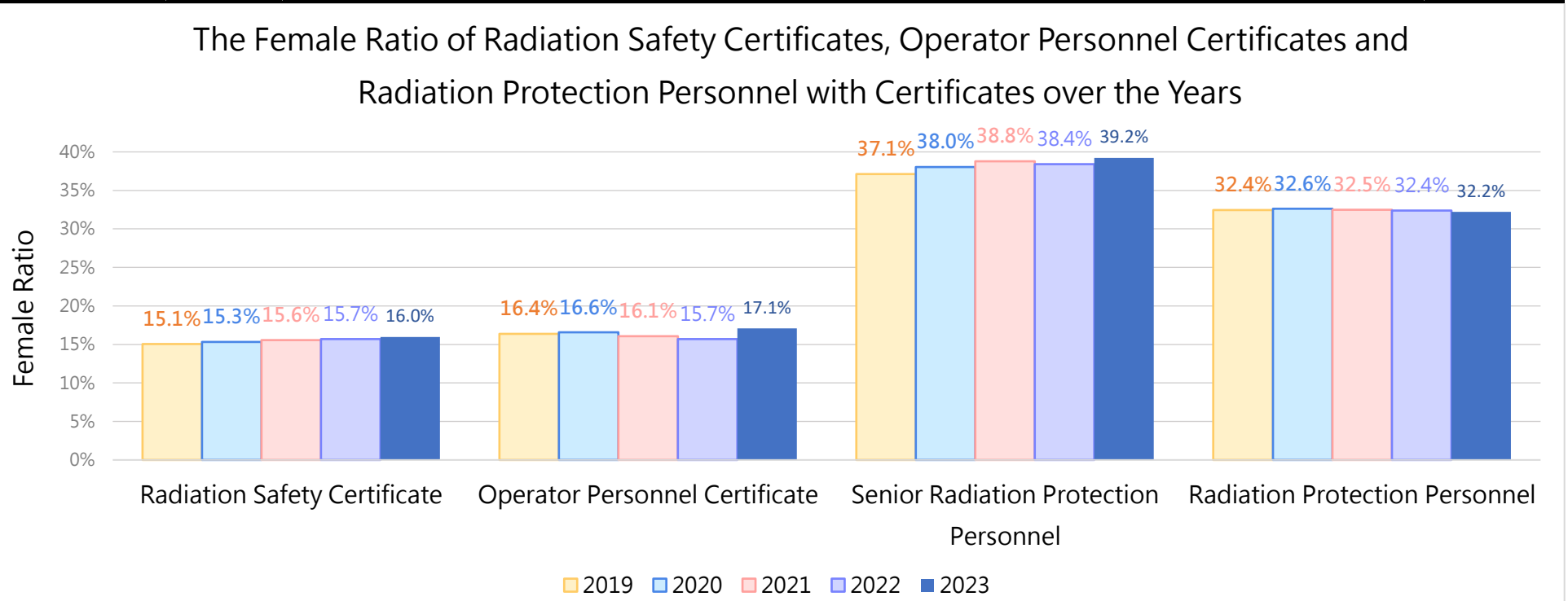
Gender / Certificate Type	Male	Female	Total	Male Ratio	Female Ratio
Senior Radiation Protection Personnel	939	606	1,545	60.8%	39.2%
Radiation Protection Personnel	1,719	817	2,536	67.8%	32.2%
Total	2,658	1,423	4,081	65.1%	34.9%

Total Number of Radiation Protection Personnel with Certificates by gender



(7) The Female Ratio of Radiation Safety Certificates, Operator Personnel Certificates and Radiation Protection Personnel with Certificates over the Years

	Radiation Safety Certificate			Operator Personnel Certificate			Senior Radiation Protection Personnel			Radiation Protection Personnel		
Year	Male	Female	Female Ratio	Male	Female	Female Ratio	Male	Female	Female Ratio	Male	Female	Female Ratio
2019	11,279	2,000	15.1%	148	29	16.4%	850	502	37.1%	1,676	805	32.4%
2020	11,395	2,061	15.3%	151	30	16.6%	868	533	38.0%	1,669	808	32.6%
2021	11,496	2,120	15.6%	167	32	16.1%	884	560	38.8%	1,674	806	32.5%
2022	11,585	2,154	15.7%	188	35	15.7%	914	570	38.4%	1,699	813	32.4%
2023	11,788	2,241	16.0%	233	48	17.1%	939	606	39.2%	1,719	817	32.2%

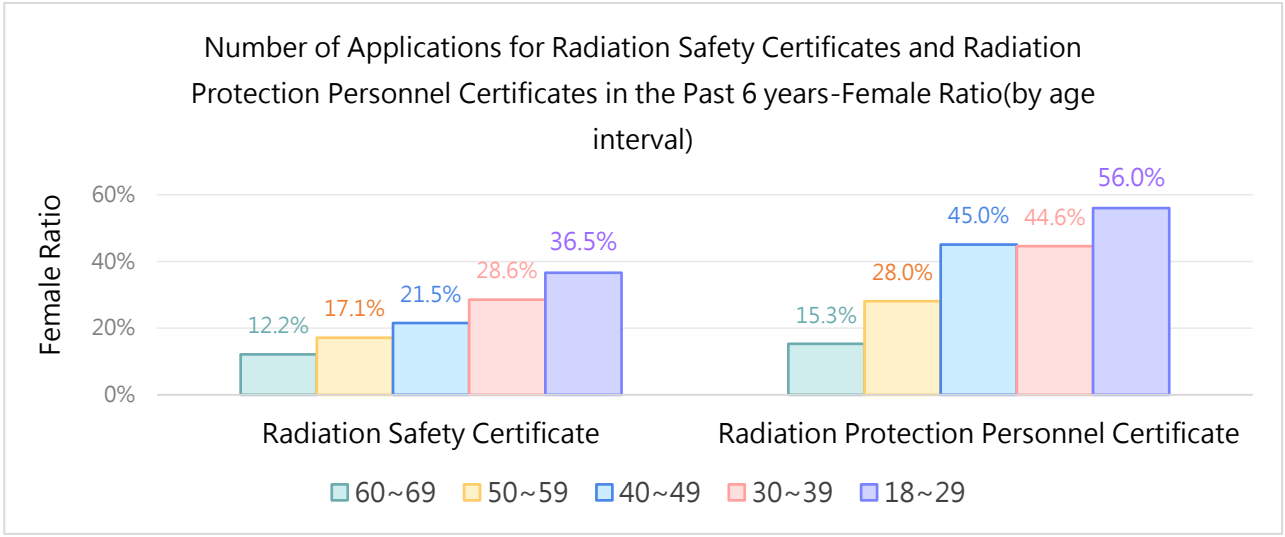


(8) Number of Applications for Radiation Safety Certificates and Radiation Protection Personnel Certificates in 2023

	Year	Female	Male	Total	Female Ratio	Male Ratio
Radiation Safety Certificate	2023	992	3,523	4,515	22.0%	78.0%
Radiation Protection Personnel Certificate	2023	985	1,698	2,683	36.7%	63.3%

(9) Number of Applications for Radiation Safety Certificates and Radiation Protection Personnel Certificates by age interval and gender in 2023

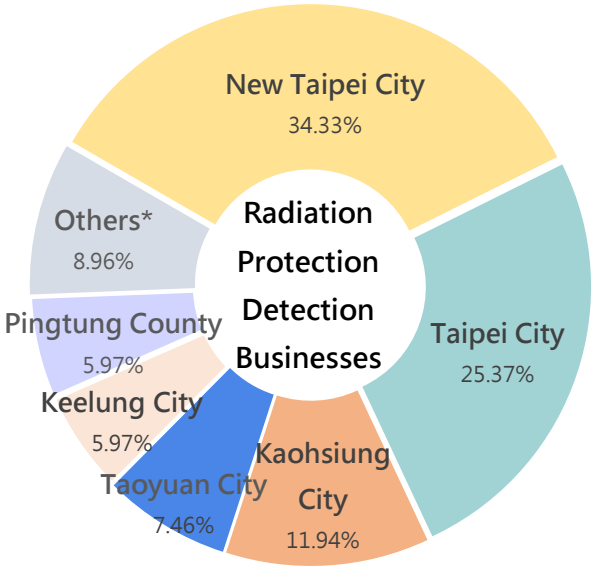
	Age Interval	Female	Male	Total	Female Ratio	Male Ratio
Radiation Safety Certificate	80~88	0	6	6	0.0%	100.0%
	70~79	0	31	31	0.0%	100.0%
	60~69	66	477	543	12.2%	87.8%
	50~59	181	876	1,057	17.1%	82.9%
	40~49	320	1,166	1,486	21.5%	78.5%
	30~39	300	750	1,050	28.6%	71.4%
	18~29	125	217	342	36.5%	63.5%
	合計	992	3,523	4,515	22.0%	78.0%
Radiation Protection Personnel Certificate	80~88	0	4	4	0.0%	100.0%
	70~79	1	44	45	2.2%	97.8%
	60~69	56	311	367	15.3%	84.7%
	50~59	176	452	628	28.0%	72.0%
	40~49	352	430	782	45.0%	55.0%
	30~39	311	387	698	44.6%	55.4%
	18~29	89	70	159	56.0%	44.0%
	合計	985	1,698	2,683	36.7%	63.3%



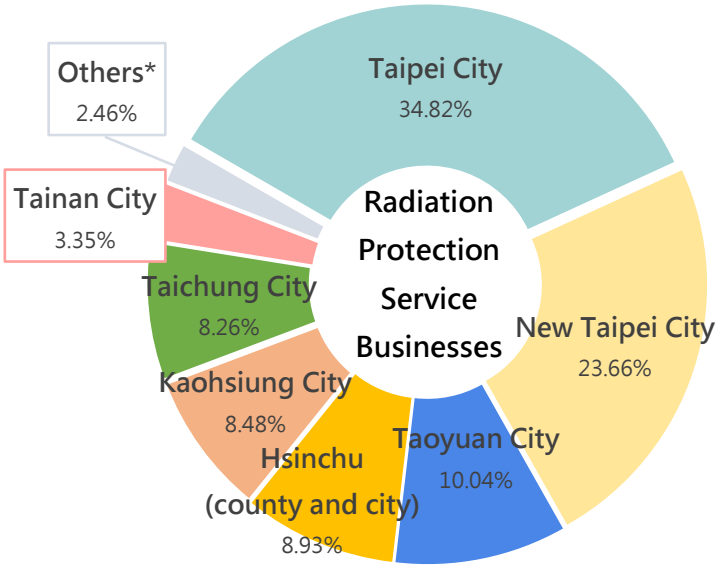
(10)Total Number of Radiation Protection Business with Certificates by business category and county/city

Business category / County/City	Radiation Protection Detection Businesses	Radiation Protection Service Businesses	Institutions of Radiation Protection Training Affairs	Total
Keelung City	23	156	6	6
Taipei City	17	106	5	175
New Taipei City	8	45	3	134
Taoyuan City	5	40	3	53
Hsinchu (county and city)	4	38	3	48
Miaoli County	4	37	2	1
Taichung City	2	15	2	41
Changhua County	2	3	1	4
Nantou County	1	2	1	1
Yunlin County	1	2	1	0
Chiayi (county and city)	0	1	0	3
Tainan City	0	1	0	19
Kaohsiung City	0	1	0	49
Pingtung County	0	1	0	6
Yilan County	0	0	0	1
Hualien County	0	0	0	1
Taitung County	0	0	0	0
Penghu County	0	0	0	0
Kinmen County	0	0	0	0
Lienchiang County	0	0	0	0
Total	67	448	27	542

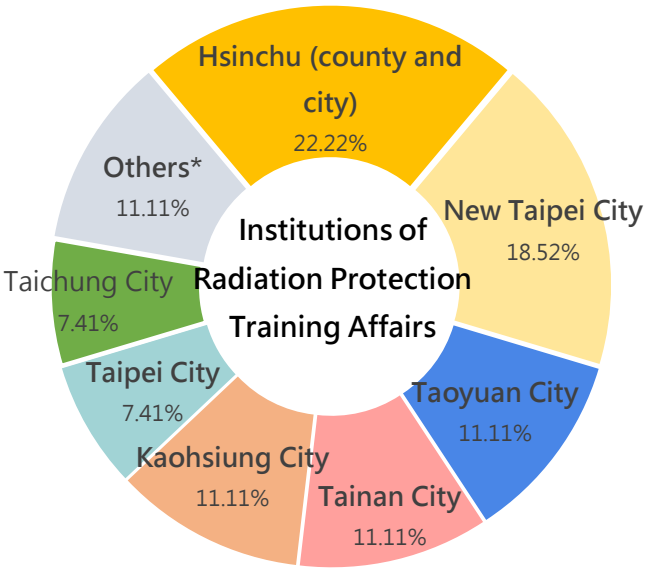
Total Number of Radiation Protection Business with Certificates by business category and county/city



* Others county/city includes Taichung City (2.99%), Hsinchu county and city (2.99%), Tainan City (1.49%), and Changhua County (1.49%).



* Others county/city includes Chiayi county and city (0.67%), Changhua County (0.45%), Pingtung County (0.45%), Keelung City (0.22%), Miaoli County (0.22%), Nantou county (0.22%), and Hualien County (0.22%).



* Others county/city includes Keelung City (3.70%), Changhua County (3.70%), and Yilan County (3.70%).

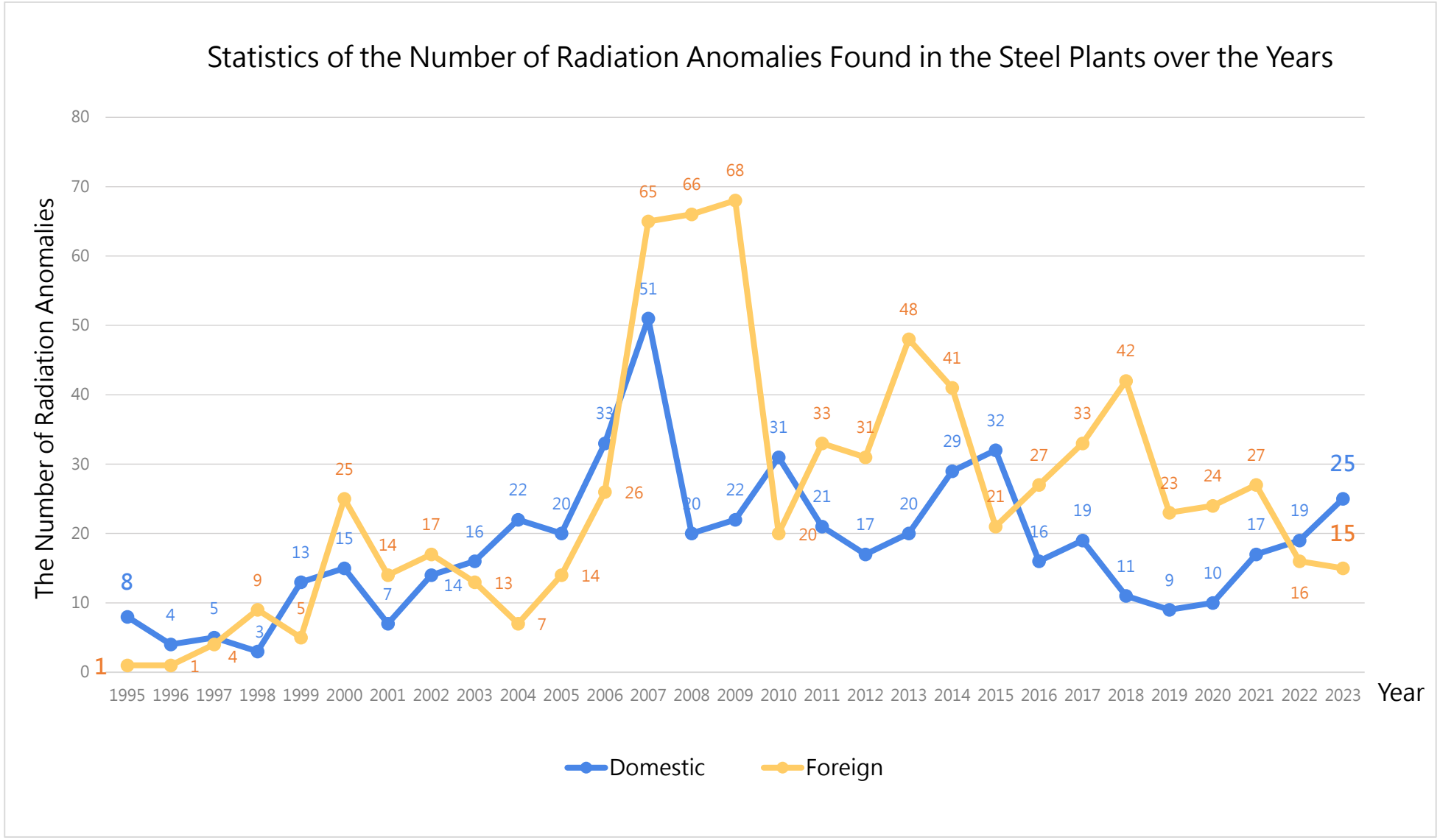
5. Radiation Anomalies Found in the Steel Plants over the Years

(1) Statistics of the Number of Radiation Anomalies Found in the Steel Plants over the Years

Year / Source	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Domestic	8	4	5	3	13	15	7	14	16	22	20
Foreign	1	1	4	9	5	25	14	17	13	7	14
Total	9	5	9	12	18	40	21	31	29	29	34

Year / Source	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Domestic	33	51	20	22	31	21	17	20	29	32	16
Foreign	26	65	66	68	20	33	31	48	41	21	27
Total	59	116	86	90	51	54	48	68	70	53	43

Year / Source	2017	2018	2019	2020	2021	2022	2023	歷年總計
Domestic	19	11	9	10	17	19	25	529
Foreign	33	42	23	24	27	16	15	736
Total	52	53	32	34	44	35	40	1,265

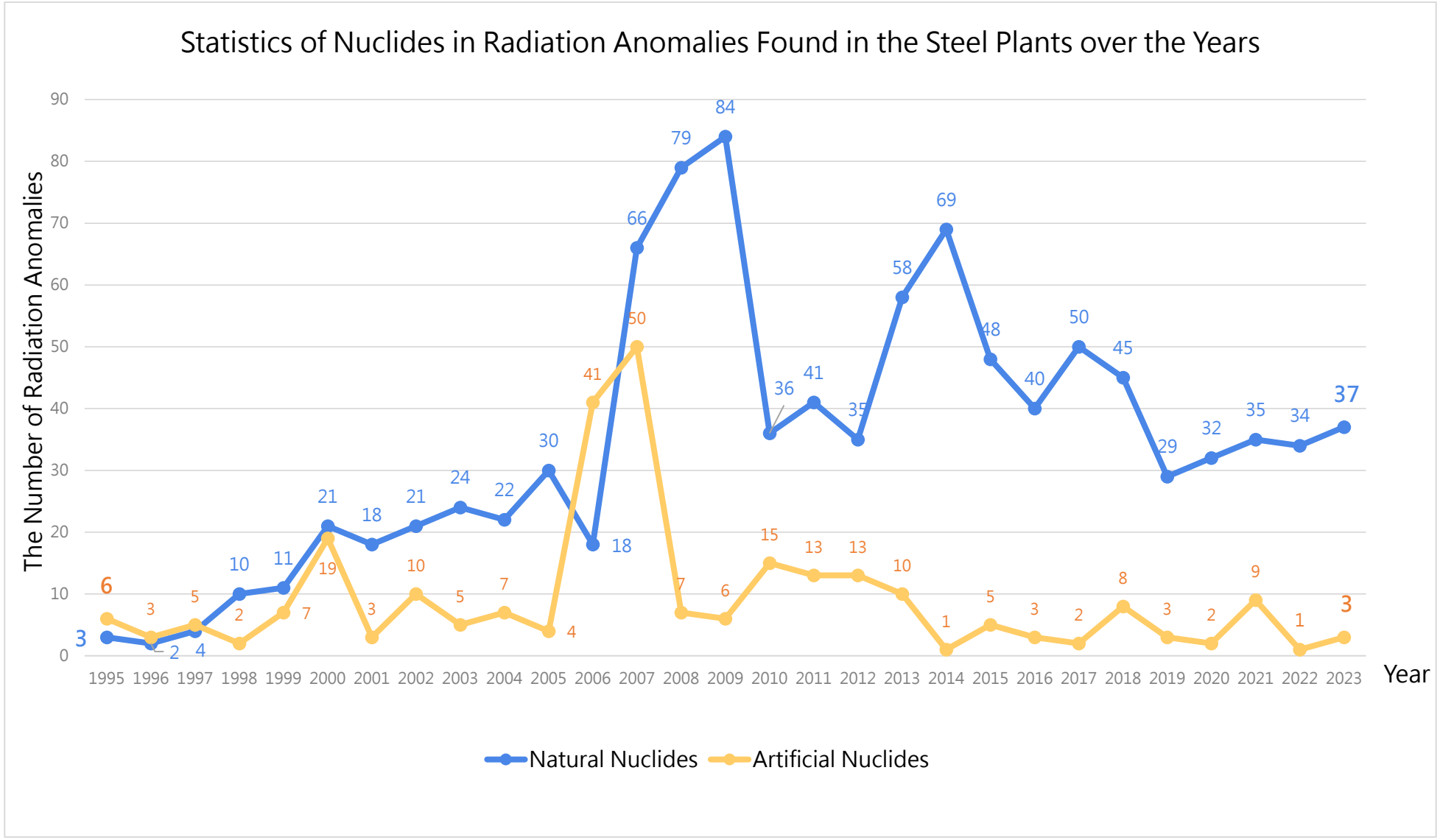

Statistics of the Number of Radiation Anomalies Found in the Steel Plants over the Years
The Number of Radiation Anomalies
Year
Domestic
Foreign
0
10
20
30
40
50
60
70
80
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
8 4 5 3 13 15 7 14 16 22 20 33 51 20 22 31 21 17 20 29 32 16 19 11 9 10 17 19 25
1 1 4 9 5 25 14 17 13 7 14 26 65 66 68 20 33 31 48 41 21 27 33 42 23 24 27 16 15

(2) Statistics of Nuclides in Radiation Anomalies Found in the Steel Plants over the Years

Year / Nuclides	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Natural Nuclides	3	2	4	10	11	21	18	21	24	22	30
Artificial Nuclides	6	3	5	2	7	19	3	10	5	7	4
Total	9	5	9	12	18	40	21	31	29	29	34

Year / Nuclides	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Natural Nuclides	18	66	79	84	36	41	35	58	69	48	40
Artificial Nuclides	41	50	7	6	15	13	13	10	1	5	3
Total	59	116	86	90	51	54	48	68	70	53	43

Year / Nuclides	2017	2018	2019	2020	2021	2022	2023	歷年總計
Natural Nuclides	50	45	29	32	35	34	37	1,002
Artificial Nuclides	2	8	3	2	9	1	3	263
Total	52	53	32	34	44	35	40	1,265


Statistics of Nuclides in Radiation Anomalies Found in the Steel Plants over the Years
The Number of Radiation Anomalies
Year
Natural Nuclides
Artificial Nuclides
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
3 2 4 10 11 21 18 21 24 22 30 18 66 79 84 36 41 35 58 69 48 40 50 45 29 32 35 34 37
6 3 5 2 7 19 3 10 5 7 4 41 50 7 6 15 13 13 10 1 5 3 2 8 3 2 9 1 3

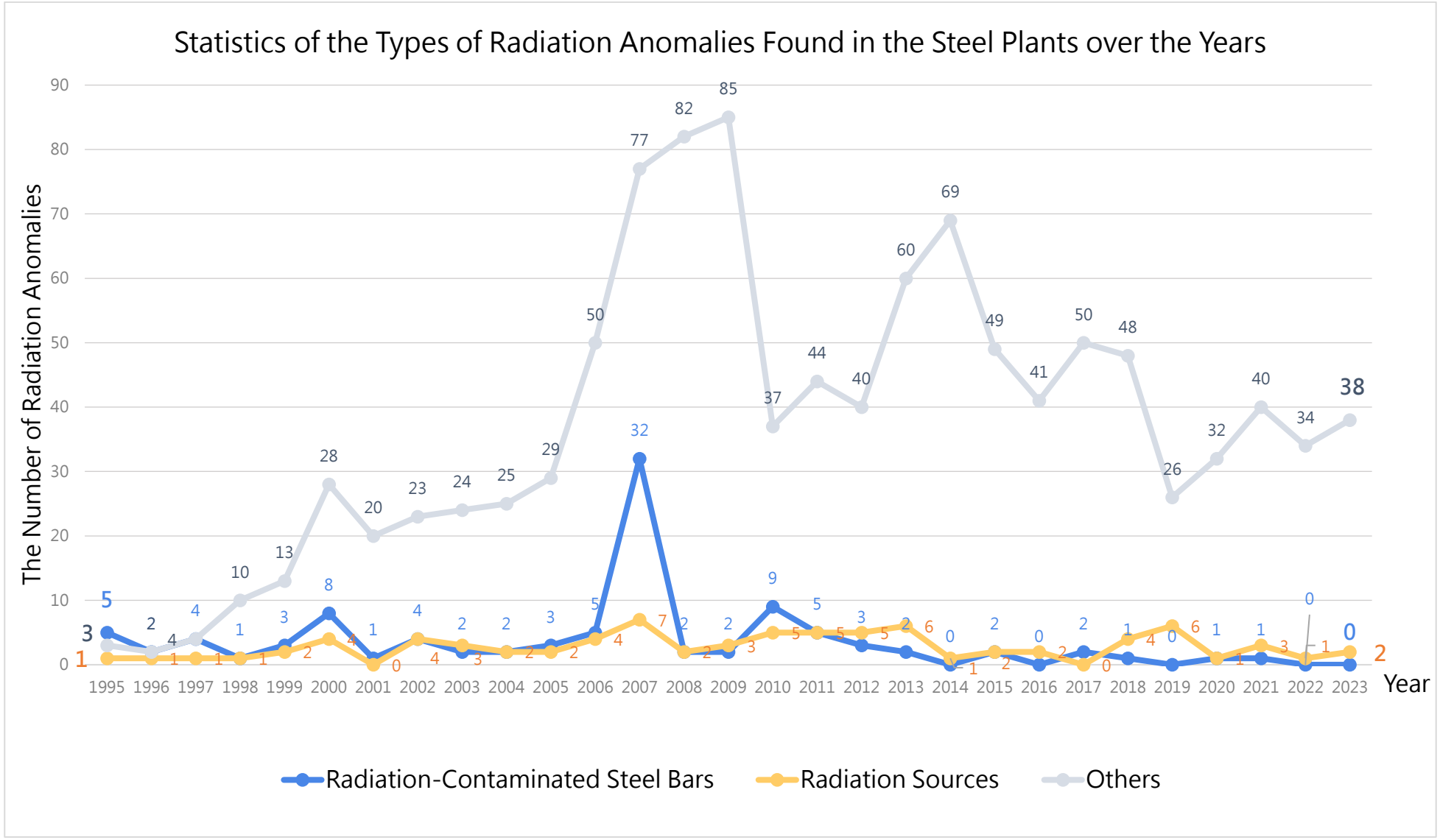
(3) Statistics of the Types of Radiation Anomalies Found in the Steel Plants over the Years

Year / Types of Radiation Anomalies	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Radiation Contaminated Steel Bars	5	2	4	1	3	8	1	4	2	2	3
Radiation Sources	1	1	1	1	2	4	0	4	3	2	2
Others*	3	2	4	10	13	28	20	23	24	25	29
Total	9	5	9	12	18	40	21	31	29	29	34

Year / Types of Radiation Anomalies	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Radiation Contaminated Steel Bars	5	32	2	2	9	5	3	2	0	2	0
Radiation Sources	4	7	2	3	5	5	5	6	1	2	2
Others*	50	77	82	85	37	44	40	60	69	49	41
Total	59	116	86	90	51	54	48	68	70	53	43

Year / Types of Radiation Anomalies	2017	2018	2019	2020	2021	2022	2023	歷年總計
Radiation Contaminated Steel Bars	2	1	0	1	1	0	0	102
Radiation Sources	0	4	6	1	3	1	2	80
Others*	50	48	26	32	40	34	38	1,083
Total	52	53	32	34	44	35	40	1,265

* “Others” refers to those that are difficult to classify, and most are naturally occurring radioactive materials.


Statistics of the Types of Radiation Anomalies Found in the Steel Plants over the Years
The Number of Radiation Anomalies
Year
Radiation-Contaminated Steel Bars
Radiation Sources
Others