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**Technical Report No. 28 on
Environmental Radiation Monitoring in Hong Kong**

香港環境輻射監測摘要
**Summary of
Environmental Radiation Monitoring
in Hong Kong**

2007

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香港天文台
Hong Kong Observatory

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摘要

香港天文台環境輻射監測計劃在二零零七年踏入第二十一年，監測工作在良好的基礎上暢順運行。本年報收錄了監測計劃二零零七年的主要工作內容，包括測量方法及結果的簡報，以及有關新的工作、轉變和新引進措施的重點介紹。

在二零零七年，天文台的輻射監測網絡錄得的環境輻射水平均在正常本底變化範圍之內。與過去的情況相若，天文台在不同的環境及食物樣本中測量到微量的人工放射性核素，包括銫-137、氚、銥-90 及鈾-239。它們的水平與在廣東核電站及嶺澳核電站運作之前所收集的樣本並沒有顯著分別。相信這些放射性核素主要來自一九四五至一九八零年間的大氣核武試驗。

二零零七年的測量結果顯示，自廣東核電站及嶺澳核電站運作以來，香港的環境輻射水平、環境樣本及市民日常食用的食品中的人工放射性核素活度並沒有可測量到的變化。

ABSTRACT

The Environmental Radiation Monitoring Programme of the Hong Kong Observatory entered its twenty-first year in 2007. The monitoring work continues to operate smoothly on a sound basis. This annual report incorporates salient features of the work of the programme during 2007, including a brief report on measurement method and results, highlights of relevant new work, changes and new measures introduced.

The ambient radiation levels in Hong Kong in 2007 as measured by the Observatory radiation monitoring network were within the normal background range. As in the past years, traces of artificial radionuclides, namely caesium-137, tritium, strontium-90 and plutonium-239, were detected in various environmental and food samples. The levels of all these radionuclides were not significantly different from those recorded before the Guangdong Nuclear Power Station and Lingao Nuclear Power Station came into operation. Their existence could primarily be attributed to atmospheric nuclear weapon tests from 1945 to 1980.

Based on the results, it is concluded that there was no measurable change in 2007 in ambient radiation levels and activities of artificial radionuclides in the Hong Kong environment and foodstuffs consumed by Hong Kong people, compared with those before the operation of the nuclear power stations.

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1. 引言

香港天文台早於一九六一年開始監測香港的環境輻射水平，並且參與由國際原子能機構（IAEA）和世界氣象組織（WMO）舉辦的國際性環境輻射監測計劃。由於在廣東大亞灣興建核電站，天文台於一九八三年開展了一項全面的環境輻射監測計劃（ERMP），監測核電站運作之前及之後的香港輻射水平。一九八七年至一九九一年的監測結果可見於本底輻射監測計劃的總結（Hong Kong Observatory, 1992），而一九九二年至二零零二年的監測結果則發表於監測計劃的每年年報（香港天文台，2003）。

自二零零三年開始，監測計劃的年報只收錄了計劃的主要重點，包括測量方法及結果的總結、該年新工作的摘要、以及實施了的轉變和新措施（香港天文台，2004）。讀者可參閱以往的年報，以瞭解計劃的採樣、測量及質量保證工作的詳情。

1. INTRODUCTION

Since 1961, the Hong Kong Observatory (HKO) has been monitoring environmental radiation levels in Hong Kong and participating in international programmes on environmental radiation monitoring organised by the International Atomic Energy Agency (IAEA) and the World Meteorological Organization (WMO). In response to the construction of nuclear power stations at Daya Bay in Guangdong, the HKO embarked in 1983 on a comprehensive Environmental Radiation Monitoring Programme (ERMP) to monitor the radiation levels in Hong Kong before and after the power plants commenced operation. The monitoring results for the years 1987 to 1991 can be found in the report on the Background Radiation Monitoring Programme (HKO 1992). Those from 1992 to 2002 were published in annual reports of the programme (HKO 2003).

Starting from 2003, the annual report only includes the most salient features of the programme, including summaries of measurement methods and results, highlights of new work, changes and measures introduced during the year (HKO 2004). Readers may refer to the previous reports for details of the sampling, measurement and quality assurance work.

ERMP 的第一階段稱為「本底輻射監測計劃」(BRMP)，於一九八七年至一九九一年期間進行，務求在一九九四年廣東核電站投產之前(位置可見圖 1)，為香港設定本底輻射水平，作為基準線，以判別核電站運作後可能為香港輻射水平帶來的變化。環境輻射監測計劃的第二階段稱為 ERMP-II，由一九九二年開始運作，內容涵蓋 BRMP 內的所有重要項目，並就經驗所得，於採樣及測量工作上作出修訂。ERMP-II 是一項持續進行的計劃，目標是監測香港環境輻射水平的任何長期變化，尤其是因廣東核電站與嶺澳核電站*運作而可能帶來的變化。

本報告的第 2 章介紹了監測計劃的取樣工作，以及環境輻射水平、食物和環境樣本中放射性的測量方法及儀器，並且總結了質量保證工作。第 3 章則臚列測量結果及所得的結論。

[*嶺澳核電站(位置見圖 1)位於大亞灣廣東核電站附近，並於二零零二年中開始投產。]

The first phase of the ERMP, known as the Background Radiation Monitoring Programme (BRMP), was conducted from 1987 to 1991 to establish the baseline radiation levels in Hong Kong prior to the operation of the Guangdong Nuclear Power Station (GNPS) in 1994 (see Figure 1 for location). These baseline levels would enable the detection of changes arising from the operation of GNPS if any. The second phase of the ERMP (ERMP-II) commencing in 1992 contains all the essential features of the BRMP, with adjustments in sampling and measurement to take advantage of the experience gained. ERMP-II is an on-going programme to determine long-term changes in environmental radiation levels in Hong Kong if any, particularly those arising from the operation of the GNPS and the Lingao Nuclear Power Station (LNPS)*.

Chapter 2 in this report describes the sampling schedule, the instruments and methods used for measuring ambient radiation levels, as well as radioactivity in food and environmental samples. A summary of the quality assurance system is also given. Measurement results and conclusion are presented in Chapter 3.

[* LNPS (see Figure 1 for location) is located next to GNPS at Daya Bay. It came into operation in mid-2002.]

2. 取樣、測量及質量保證

環境輻射監測計劃 (ERMP) 是透過監察三個主要照射途徑：即大氣、地面和水體途徑的樣本來進行的。在測量工作方面，ERMP 包括兩個主要部份。第一部份是直接測量香港的環境伽馬輻射水平，第二部份則是量度香港環境樣本及市民日常食物中，因廣東核電站及嶺澳核電站的運作而可能出現的人工放射性核素。圖 1 顯示實時直接測量環境伽馬輻射的地點，圖 2 所示為二零零七年其他環境伽馬輻射的直接測量點及環境樣本的收集點。表 1 列載二零零七年的取樣及分析概要。

2.1 環境輻射水平的直接測量

2.1.1 輻射監測網絡

自 ERMP-II 開始，輻射監測網絡由十個固定站組成 (圖 1)，監測香港境內的环境伽馬輻射水平。每個站均裝設一個高壓電離室 (Reuter-Stokes Model RSS-131 environmental radiation monitor)

2. SAMPLING, MEASUREMENT AND QUALITY ASSURANCE

Under the ERMP, three major exposure pathways are monitored, namely the atmospheric pathway, the terrestrial pathway and the aquatic pathway. In respect of measurement, the ERMP consists of two major components. The first component is the direct measurement of ambient gamma radiation levels in Hong Kong. The second is the detection of any artificial radioactive material, arising from the operation of GNPS and LNPS, in the environment of Hong Kong and in the foodstuff commonly consumed by Hong Kong people. The locations for real-time direct measurement of ambient gamma radiation are shown in Figure 1. The other locations for measurement of ambient gamma radiation and collection of environmental samples in 2007 are shown in Figure 2. A summary of the sampling and analysis programmes of the ERMP in 2007 is given in Table 1.

2.1 Direct measurement of ambient radiation level

2.1.1 Radiation Monitoring Network

Since the commencement of ERMP-II, the ambient gamma dose rates have been monitored by a radiation monitoring network (RMN) consisting of 10 fixed stations (Figure 1). The dose rates are measured at each station continuously by a high pressure

，不斷測量環境伽馬輻射劑量率，並每一分鐘將數據傳送天文台總部。

西灣河輻射監測站原設於西灣河水警港口警署的天台。由於該地方進行維修工程，輻射監測站於二零零七年四月十三日向東遷往附近的西灣河水警總區總部的天台(圖3及4)，新址位置較為空曠。於新舊兩處地點量得的數據大致相若，但仍有少許分別。在新址量得的平均伽馬劑量率較舊位置大致低三個百分點，相信主要反映兩處位置附近環境的差別。

2.1.2 熱釋光劑量計網絡

為了可以經濟地於廣泛範圍內監測環境輻射，香港天文台於1980年代末開始使用熱釋光劑量計，測量長時間累積的環境伽馬輻射劑量。ERMP-II的熱釋光劑量計網絡包括二十七個位於香港各區的固定監測點(圖2)。這個網絡使用Harshaw 8807型號的氟化鋰(LiF:Mg,Ti)及氟化鈣(CaF₂:Dy)熱釋光劑量計。為確保數據的統計精確度，每個監測點均設有一組

ionization chamber (HPIC) (Reuter-Stokes Model RSS-131 environmental radiation monitor). Data are transmitted to the Observatory Headquarters once every minute.

The radiation monitoring station at Sai Wan Ho was originally located on the roof of the Sai Wan Ho Marine Harbour Police Station. Due to renovation of the site, the station was relocated eastwards to the roof of the nearby Hong Kong Police Force Marine Regional Headquarters (Figures 3 and 4) on 13 April 2007. The new location has a better exposure than the old one. The gamma dose rates recorded at the two locations were comparable, though with a small difference. The average gamma dose rate recorded at the new location was lower than that measured at the original site by about 3 percent. This mainly reflected the differences in the ambient conditions at the two locations.

2.1.2 Thermoluminescent Dosimeter Network

To achieve a wide spatial coverage of ambient radiation monitoring economically, a thermoluminescent dosimeter (TLD) network has been in operation since the late 1980s to measure ambient gamma doses accumulated over a long period. In ERMP-II, the network comprises 27 monitoring points over the territory (Figure 2). The TLDs are of the lithium fluoride (LiF:Mg,Ti) and calcium fluoride

共五個劑量計。熱釋光劑量計每隔三個月更換及取讀一次。

位於烏溪沙的熱釋光劑量計於二零零七年遷往一個新位置，新舊位置相距大概十米（圖 5）。舊位置設在一座建築物頂部，而新位置較為接近地面，方便收集及更換，以提高員工安全。此外，新位置較能反映監測點地面附近範圍的環境伽馬輻射劑量。在過去兩年，新舊兩處地點測量的結果顯示新地點所錄得的累積劑量比舊位置大致高出七個百份點，相信主要反映新位置較為接近地面的原故。新位置量得的劑量率在本港其它二十六個監測點所得的劑量率範圍之內。

2.1.3 空中輻射監測系統

香港天文台的空中輻射監測系統於一九九八年開始運作。這系統安裝在政府飛行服務隊的直升機上，以進行測量。它能以輻射煙羽追蹤模式來測定香港上空有否出現輻射煙羽及其影響範圍。當輻射煙羽經過本港後，

(CaF₂:Dy) type (Harshaw Type 8807). A batch of five TLDs is placed at each site to ensure statistical accuracy. The TLDs are replaced and read once every quarter.

The batch of TLDs placed at Wu Kai Sha was relocated to a more convenient, nearby location in 2007. The new location is about 10 metres from the original one (Figure 5). The original location was on the roof of a building while the new one is close to the ground. The new location facilitates collection and replacement of the TLDs as well as enhances staff safety. The data recorded at the new location also better represents the ambient gamma radiation dose near the surface. Measurement results made at both locations over the past two years indicate that the accumulated dose recorded at the new location was in general higher than that at the original location by about 7%. This mostly reflected the new location's proximity to the ground. The dose rate measured at the new location was also within the ranges of the dose rates recorded at the other 26 TLD locations in Hong Kong.

2.1.3 Aerial Radiation Monitoring System

The Aerial Radiation Monitoring System has been put into operation since 1998. The system is mounted on board a helicopter of the Government Flying Service when in operation. It has the

該系統也可以轉為地面輻射污染測量模式運作，判別受輻射沉降物污染的地區。系統設有兩組碘化鈉(NaI)探測器，分別用於兩種模式。進行監測時，這系統可在直升機上即時顯示伽馬圖譜、譜法分析結果及探測位置等資料，並會定時將資料備份。

由二零零三年開始，系統可置於政府飛行服務隊的「超級美洲豹 L2」直升機上使用。

2.1.4 自動伽馬譜法系統

自一九九六年起，香港天文台在大鵬灣平洲上設置了一套自動伽馬譜法系統(圖1)，以便能儘早監測到核電站可能排放的人工放射性核素。該系統由一個鍍硫化鋅(ZnS)塑膠閃爍器、一個高純度鍍探測器和一個碘化鈉探測器組成。這系統分別利用一個迴轉空氣濾紙鼓和一個碳濾盒不斷地收集大氣飄塵及氣態碘。在空氣濾紙鼓上面的硫化鋅閃爍器測量大氣飄塵中的總阿爾法及貝他活度；在空氣濾紙鼓內的鍍探測器利用伽馬譜法，自動分

capability to determine the existence and extent of any radioactive plume over Hong Kong when operating in the plume tracking mode. After passage of the plume, the system can be used to identify surface areas contaminated by deposited radionuclides using the ground contamination measurement mode. The system has two assemblies of sodium iodide (NaI) detectors, one for each of the two operation modes. Gamma spectra, spectroscopic analysis results and location information are displayed on board the helicopter in real time and archived at regular intervals.

Starting from 2003, a Super Puma L2 helicopter of the Government Flying Service has been employed to carry the system during operation.

2.1.4 Automatic Gamma Spectrometry System

Hong Kong Observatory has been operating the Automatic Gamma Spectrometry System (AGSS) at Ping Chau, Mirs Bay since 1996 (Figure 1) for providing early alert to any releases of artificial radionuclides from the nuclear power stations. The system consists of a zinc sulphide (ZnS) coated plastic scintillator, a high purity germanium detector and a NaI detector. It continuously collects airborne particulates on a rotating filter drum and gaseous iodine in a carbon cartridge. The ZnS

析大氣飄塵釋出的伽馬射線；碘化鈉探測器則量度每週自動更換的碳濾盒中的碘-131 濃度。阿爾法和貝他的活度、碘-131 的活度及伽馬譜法分析結果等數據會每五至十五分鐘傳送至天文台總部的一個中央工作站。

2.1.5 流動輻射監測站

流動輻射監測站改裝自一輛中型貨車，車內設有多款便攜式及特別設計的測量儀器，用作常規及應急輻射測量。此外，車內亦裝置了一個機械手臂，可以自動將「便攜式伽馬譜法儀」放置在特定的測量點上，進行探測。加上車頂的外置伽馬探測器和氣管入口，測量隊員無需走出車外便能收取環境樣本和進行測量，工作人員的安全受到更好保障。

scintillator directly above the filter drum measures the gross alpha and beta activities of the particulates collected. Inside the filter drum, the germanium detector measures gamma rays emitted by the particulates and gamma spectrometry analysis is carried out automatically. The NaI detector measures the iodine-131 concentration in the carbon cartridge which is replaced automatically at weekly intervals. Data of alpha and beta activities, iodine-131 activity, as well as results of gamma spectrometry analysis are transmitted to a central station at the Observatory Headquarters every 5 to 15 minutes.

2.1.5 *Mobile Radiation Monitoring Station*

The Mobile Radiation Monitoring Station (MRMS) was converted from a commercial van. It is equipped with portable and specially designed instruments for use in routine and emergency radiological surveys. In addition, the MRMS is equipped with a mechanical arm to enable positioning of the Portable Gamma Spectroscopic Analysis Module over specific survey points for measurement. Together with an external gamma probe and an air inlet on the vehicle roof, environmental samples and survey data can be obtained without the survey team members going outside the vehicle, resulting in better protection to the operator during radiological surveys.

2.1.6 高空輻射探測

自一九九四年起，天文台便利用氣球攜帶 Vaisala RS80 型號探空儀及附載的 Vaisala NSS14A 型號輻射探測組件進行高空輻射探測工作。每個輻射探測組件都含有兩支蓋革彌勒 (Geiger Müller) 管，一支是只量度伽馬輻射的伽馬管，另一支則是量度伽馬及高能量貝他輻射 (>0.25 兆電子伏) 的伽馬及貝他管。地面站為一座高空探測系統，負責接收和處理輻射探空儀傳回地面的數據。

高空輻射探測工作現已可由人手的 DigiCORA 系統或自動的 Autosonde 自動高空探測系統進行。天文台在二零零六年中將這兩個系統分別升格為 DigiCORA MW15 及 Autosonde AS13，以配合新一代 RS92 型號探空儀的應用。自二零零七年中，天文台開始逐步使用 RS92 型號探空儀及附載的 NSS921 型號輻射探測組件進行高空輻射探測。NSS921 型號與 NSS14A 型號所採用的感應元件是相同的，分別只是它們的電子介面要配合不同型號的探空儀。

2.1.6 Upper-air Radioactivity Soundings

Radioactivity in the upper atmosphere has been measured by means of a balloon-borne radiosonde (Vaisala Model RS80) and an attached radioactivity sensor (Vaisala Model NSS14A) since 1994. The sensor comprises two Geiger-Müller (GM) tubes, one measuring only gamma radiation ('gamma-only tube') while the other both gamma and high energy (> 0.25 MeV) beta radiation ('gamma-plus-beta tube'). The ground station is an upper-air sounding system which receives and processes data from the radiosonde.

Measurement of radioactivity in the upper atmosphere can be carried out manually by the DigiCORA system or automatically by the Autosonde system (Automatic Upper-air Sounding System). These two systems were respectively upgraded to DigiCORA MW15 and Autosonde AS13 in mid 2006 to work with a new generation Model RS92 radiosonde. The Observatory started using the RS92 radiosonde with NSS921 radioactivity sensor in its radioactivity sounding operation since mid 2007. The sensors are the same in both the NSS921 and NSS14A models. The only difference between the two models is their electronic interfaces which have to cater for the different radiosondes.

2.2 食物及環境樣本取樣安排

2.2.1 大氣樣本

一如過往多年，ERMP 所收集的大氣樣本包括大氣飄塵、濕沉積物(降雨)、總沉積物(濕沉積物加上乾沉積物)、氣態碘及水蒸氣。大氣飄塵和濕沉積物樣本在京士柏、沙頭角和元五墳(圖2)每週定期收集一次。此外，在其他七個輻射監測站亦裝置有儀器，以便在應急時收集大氣樣本。大氣飄塵是透過高容量空氣取樣器(General Metal Works Model UV-2H-1)內的濾紙收集。濕沉積物則由頂部設有漏斗的容器收集。在乾燥季節期內各收集點都會放置三個漏斗容器，以收集足夠雨水作測量。

天文台亦在京士柏收集總沉積物、氣態碘及水蒸氣樣本。總沉積物的取樣器是一個盛有蒸餾水的不銹鋼圓盆，樣本每週收集一次。氣態碘樣本是利用裝有浸滲銀沸石濾盒的放射性碘取樣器(Hi-Q Environmental Products Model CMP-14CV)收集的，濾盒每週收集和更換一次。至於水蒸氣樣本，則採用裝有

2.2 Collection of food and environmental samples

2.2.1 Atmospheric Samples

As in past years, atmospheric samples, including airborne particulates, wet deposition (precipitation), total deposition (wet plus dry deposition), gaseous iodine and water vapour, are collected under the ERMP. Airborne particulates and wet deposition are regularly collected at King's Park, Sha Tau Kok and Yuen Ng Fan (Figure 2) at weekly intervals. In addition, equipment is also installed at the other seven radiation monitoring stations for collecting atmospheric samples during emergency. Airborne particulates are captured by a filter paper installed inside a high volume air sampler (General Metal Works Model UV-2H-1). Wet deposition is collected by a carboy fitted with a top funnel. During the dry season, three sets of carboys and funnels are used at each location for collection of sufficient amount of rain for measurement.

Total deposition, gaseous iodine and water vapour are also collected at King's Park. The sampler for total deposition is a stainless-steel pan partially filled with distilled water to collect samples at weekly intervals. Gaseous iodine is sampled using a radioiodine sampler (Hi-Q Environmental Products Model CMP-14CV) with a silver impregnated zeolite cartridge. The

燥石膏濾盒的氣態流出物取樣器 (Science Applications International Corporation Model ACT-100) 收集。取樣器在每月內隨機選擇一個星期間歇地收集樣本，直至取樣總時數達三十六小時為止。

2.2.2 食物樣本

香港天文台從主要食物分銷點、批發市場和供應商收集各類市民日常食用的陸生和水生食物樣本，並特別著眼於本港和深圳出產的食物。

漁農自然護理署於二零零七年通知，本港已沒有註冊養鴨農場。因此，由二零零七年起，ERMP 不再包括本地鴨樣本。

此外，本港於二零零七年亦再沒有註冊農場生產純鮮牛奶，但混有進口奶粉的本地鮮牛奶則仍有供應。因此，由二零零七年起，沙頭角牛奶(經消毒)樣本所指的是混有進口奶粉的本地鮮牛奶。

表2列載了二零零七年收集到的食物樣本。

cartridge is collected and replaced weekly. Water vapour is collected using a gaseous effluent sampler (Science Applications International Corporation Model ACT-100) with a drierite cartridge intermittently for a total time of 36 hours within a randomly selected week each month.

2.2.2 Food Samples

Both terrestrial and aquatic foodstuffs typical of the diet of the local population are collected at main distribution points, wholesale markets and from enlisted suppliers. Particular attention has been given to food produced locally and in Shenzhen.

As advised by the Agriculture, Fisheries and Conservation Department in 2007, there was no longer any licensed duck farm in Hong Kong. Hence, the ERMP did not include local duck samples starting from 2007.

There was also no more licensed local dairy farm producing pure fresh milk in 2007. However, local fresh milk mixed with imported milk powder was still being supplied. For this reason, starting from 2007 the pasteurized milk sample from Sha Tau Kok refers to local fresh milk mixed with imported milk powder.

Food samples collected in 2007 are listed in Table 2.

2.2.3 飲用水、地下水及海水

像過往多年一樣，經處理飲用水的樣本，是從九龍和屯門的配水管，以及沙田、屯門和油柑頭的濾水廠(圖 2)收集的。未經處理的飲用水，則從萬宜水庫、船灣淡水湖、木湖 B 抽水站，以及沙田、屯門和油柑頭(圖 2)的濾水廠收集。水務署的職員每三個月抽取飲用水樣本一次，交香港天文台測量。

市民飲用樽裝水漸趨普遍。由二零零七年開始，樽裝水納入 ERMP 內。天文台定期每三個月收集兩個不同牌子樽裝水樣本，以進行測量。

在房屋署職員及屋邨管理人員協助下，天文台於以下五個地點(圖 2)抽取地下水樣本：長康邨(青衣)、鈞樂新村(元朗)、環翠邨(港島東)、華富邨(薄扶林)及富山邨(東九龍)。

由於屯門兆康苑的供水系統於二零零七年有所改變，未能於該處的地下水取樣地點繼續收集有關樣本。在地政總署及土木工程

2.2.3 Drinking Water, Underground Water and Sea Water

As in past years, treated drinking water is collected from distribution taps at Kowloon and Tuen Mun as well as the treatment works at Shatin, Tuen Mun and Yau Kom Tau (Figure 2). Raw or untreated drinking water is collected from the High Island Reservoir, the Plover Cove Reservoir, the Muk Wu B Pumping Station and the treatment works at Shatin, Tuen Mun and Yau Kom Tau (Figure 2). Both untreated drinking water and treated drinking water are collected once every three months by staff of the Water Supplies Department.

As public consumption of bottled water has become more common, it has been included in ERMP since 2007. Two different brands of bottled water are collected once every three months from the market for measurement.

With assistance from the Housing Department and the estate management, underground water is collected at five locations (Figure 2), namely Cheung Hong Estate (Tsing Yi), Kwan Lok San Tsuen (Yuen Long), Wan Tsui Estate (East Hong Kong Island), Wah Fu Estate (Pokfulam) and Fu Shan Estate (East Kowloon).

Underground water samples were no longer available at Siu Hong Court (Tuen Mun) due to change in the water

拓展署的協助下，同年於屯門的清涼法苑兩個地質特性與兆康苑相近的新地點開始取樣並進行分析。待於新地點取得更多的地下水樣本及進行測量後，將會選取其中一處以取代兆康苑。

一如過往多年，海水樣本從三個不同深度抽取：上層（水面下 2.5 米）、中層和低層（海床上 2.5 米）。取樣地點共有四個（圖 2），均位於香港東部沿岸，分別為橫瀾島、火石洲、大浪灣及赤洲附近的海域。在環境保護署協助下，天文台每年抽取海水樣本一次，並利用薄膜過濾海水樣本，收集海水中的懸浮粒子。

2.2.4 土壤及沉澱物樣本

天文台在香港境內三十九個指定地點抽取土壤樣本，取樣週期為五年。在二零零七年，天文台分別於元朗、尖鼻咀、石崗、嘉道理農場、長洲、南丫島、坪洲及銀礦灣（圖 2）等地點取得土壤樣本。每個地點抽取的土壤樣本均來自兩個不同

supply system in 2007. With the assistance of the Lands Department and the Civil Engineering and Development Department, two new sites with similar geological characteristics to those around Siu Hong Court were identified at Ching Leung Nunnery in Tuen Mun in 2007. Samples were collected at the new sites and analysed. Pending more samples and measurement results for the new sites, a replacement location would be identified.

As in past years, sea water is sampled at three depths - the upper level (2.5 metres underneath the surface), the middle level and the lower level (2.5 metres above the seabed) at four locations in the eastern part of the coastal waters of Hong Kong (Figure 2), namely waters off Waglan Island, Basalt Island, Tai Long Wan and Port Island. Sampling is carried out annually with the assistance of the Environmental Protection Department. Suspended particulates in sea water at the three depths are collected by filtering the corresponding sea water samples through a membrane filter.

2.2.4 Land Soil and Sediments

Land soil is sampled at 39 designated sites throughout the territory every five years. In 2007, land soil samples were collected from Yuen Long, Tsim Bei Tsui, Shek Kong, Kadoorie Farm and Botanic Garden, Cheung Chau, Lamma Island, Peng Chau and

的深度：上層由地面至十五厘米深，下層則由十五至三十厘米深。

像過往多年一樣，潮間帶土樣本每季在白沙灣、尖鼻咀和沙頭角三處沿岸地區(圖2)收集。每個取樣點均抽取兩個不同深度層的樣本，上層從表面至十五厘米深，下層則自十五至三十厘米深。另外，土木工程拓展署每年在本港沿岸海域的大灘海、龍蝦灣、索罟灣，以及西區碇泊處四個地點(圖2)協助收取海床沉澱物樣本。

2.3 食物及環境樣本的實驗室測量

食物及環境樣本的所有放射性分析均於京士柏的輻射實驗室進行。表1列出常規監測的主要人工放射性核素。每個樣本按照不同樣本類別及測量目的，經過下列一或多種程序分析：

- (a) 以伽馬譜法測量伽馬放射性核素的活度；
- (b) 以液體閃爍計數法測量氬⁺的放射性活度；

Silvermine Bay (Figure 2). At each site, samples were collected from two layers, the upper layer from the surface to 15 cm deep and the lower layer from 15 cm to 30 cm deep.

As in past years, intertidal sediments are sampled quarterly at three locations along the coast of Hong Kong (Figure 2), namely Pak Sha Wan, Tsim Bei Tsui and Sha Tau Kok. Two layers are taken at each sampling point, the upper layer from the surface to 15 cm deep and the lower layer from 15 cm to 30 cm deep. Sampling of seabed sediments is carried out annually with the assistance of the Civil Engineering and Development Department at four locations in the coastal waters of Hong Kong (Figure 2), namely, Tai Tan Hoi, Lung Ha Wan, Picnic Bay and Western Anchorage.

2.3 Measurement of food and environmental samples in laboratory

All radioactivity measurements of food and environmental samples are carried out at the radiation laboratories at King's Park. A list of the major artificial radionuclides routinely monitored in the ERMP is given in Table 1. Each sample, depending on the sample type and measurement objective, would go through one or more of the following analyses:

- (a) gamma spectrometry analysis to determine the activities of gamma-

- (c) 以低本底總貝他計數法測量鋇-90 的放射性活度；及
- (d) 以阿爾法譜法測量鈾-239 的放射性活度。

天文台於二零零七年添置了一台新的液體閃爍計數系統(PerkinElmer Tri-Carb 3170 TR/SL 型號)，以取代沿用的舊系統 (Wallac 1414 Guardian 型號)。該新系統將於二零零八年投入業務運作。

有關各種量度參數的概要，例如樣本大小、量度時間及探測下限等，載列於表 3。

[[†]氚主要是在宇宙射線進入大氣層時自然地形成，或在一九四五至一九八零年間大氣核武試驗中產生，而少量亦可來自核電站運作 (UNSCEAR 2000) 。]

2.4 質量保證

自一九八九年開始，天文台已參與國際及國內機構舉辦的測量比對及能力測試，當中包括國際原子能機構 (IAEA)、世界衛生組織(WHO)

emitting radionuclides;

- (b) liquid scintillation counting to determine the activity of tritium[†];
- (c) low-level gross beta counting to determine the activity of strontium-90; and
- (d) alpha spectrometry analysis to determine the activity of plutonium-239.

A new liquid scintillation counting system (model PerkinElmer Tri-Carb 3170 TR/SL) was acquired in 2007 to replace the aged one (model Wallac 1414 Guardian). The new system would be put into operation in 2008.

A summary of key measurement parameters, including sample size, counting time and detection limits, are given in Table 3.

[[†]Tritium is primarily produced naturally by cosmic rays entering the atmosphere or generated during atmospheric nuclear tests conducted from 1945 until 1980. A small amount is also produced during operation of nuclear power stations. (UNSCEAR 2000)]

2.4 Quality assurance

Since 1989, the Observatory has been participating in inter-laboratory comparison exercises and proficiency tests organized by major international and national organizations, namely the International Atomic Energy Agency

及中國輻射防護研究院 (CIRP)。除參加測量比對及能力測試外，天文台亦透過內部質量保證程序，確保 ERMP 測量結果的質量。

IAEA 於二零零七年公佈了在二零零六年舉行的測量能力測試結果。來自世界各地共三百三十二所實驗室參加了該測試，該測試是量度由 IAEA 提供的土壤、草及水樣本內所含的放射性核素。天文台的表現較所有參與實驗室的平均表現為佳。有關該測試的詳細結果刊載於 IAEA 發表的報告中 (Shakhashiro 等, 2007)。

在二零零七年，天文台首次參加了由英國國家物理實驗室 (UKNPL) 籌劃的測量能力測試，量度由 UKNPL 提供的兩個水體及一個混凝土樣本內所含的放射性核素。UKNPL 於二零零八年中公佈了有關測試結果。該測試總共有六十五所實驗室參與，而天文台的表現亦較所有參與實驗室的平均表現為佳。有關該測試的詳細結果刊載於 UKNPL 發表的報告中 (Harms 等, 2008)。

(IAEA), the World Health Organization (WHO), the China Institution for Radiation Protection (CIRP). Other than inter-laboratory comparison exercises and proficiency tests, the quality of the measurements in the ERMP is also assured through internal quality assurance procedures.

IAEA published in 2007 the results of a proficiency test conducted in 2006. A total of 332 laboratories around the world participated in the test to determine radionuclides in soil, grass and water samples provided by IAEA. The performance of the Observatory was better than the average of all participating laboratories. Details of the results of the proficiency test were given in the IAEA's report (Shakhashiro *et al.* 2007).

In 2007, the Observatory participated for the first time in a proficiency test organized by the National Physical Laboratory of the United Kingdom (UKNPL) to determine radionuclides in two aqueous solutions and a concrete sample. UKNPL published the results of the proficiency test in mid 2008, in which a total of 65 laboratories took part. The results showed that the Observatory also performed better than the average of all participating laboratories. Details about the proficiency test results can be found in the report by UKNPL (Harms *et al.* 2008).

3. 測量結果及結論

3.1 測量結果

3.1.1 輻射監測網絡

輻射監測網絡於二零零七年所錄得的年平均環境伽馬劑量率及一分鐘平均數據的變幅均載於表 4。測量結果均在過往的變幅範圍之內。

自輻射監測網絡運作以來，各監測站錄得的輻射水平一般會隨著季度轉變而出現數個百分點的變化。在大雨或當熱帶氣旋影響香港時，變化會明顯較大，甚至高於正常水平的一倍。

八月二十日，本港受到與一股活躍西南氣流相關的大驟雨影響，當日錄得二零零七年環境伽馬劑量率的最大變幅。當時在平洲站錄得的一分鐘平均劑量率較該年的平均值高出約一點一倍。

3.1.2 熱釋光劑量計網絡

二零零七年各熱釋光劑量計站錄得的伽馬輻射劑量率的年平均值、標準差及變幅均載於表 4。所有監測站錄得的劑量率均在 BRMP 範圍

3. RESULTS AND CONCLUSION

3.1 Results

3.1.1 Radiation Monitoring Network

The annual average ambient gamma dose rates and ranges of 1-minute averages recorded by the RMN in 2007 are tabulated in Table 4. The measurement results were all within past fluctuations.

Since the operation of the RMN, temporal changes in the radiation level recorded at the stations are typically a few percent in seasonal variations. However, during episodes of heavy rain or tropical cyclones affecting Hong Kong, the variations can be significantly larger and may even double the normal level.

The most significant change in the ambient gamma dose rates in 2007 was recorded on 20 August when heavy showers associated with an active southwesterly airstream affected Hong Kong. The 1-minute average dose rates at Ping Chau rose to about 1.1 times above the mean value of the year.

3.1.2 Thermoluminescent Dosimeter Network

The annual average, standard deviation and range of gamma dose rates measured at each of the TLD stations in 2007 are listed in Table 4. The gamma

之內。

3.1.3 空中輻射監測系統

在二零零七年一月，天文台使用空中輻射監測系統在大鵬灣及西貢地區以輻射煙羽追蹤模式進行測量。直升機由海拔約一百米升至九百米，測量海面及地面上的輻射水平隨高度的變化。測量過程中並無探測到人工放射性核素。圖 6 及圖 7 分別表示在大鵬灣和西貢地區所錄得的垂直分佈數據。顯示一如以往觀測所得，近海面上所量度到的計數率隨高度上升而沒有明顯變化，但在近陸地上所量度到的計數率則隨高度上升而逐漸減少。

在七月，空中輻射監測系統以地面輻射污染測量模式為索罟群島進行本底輻射測量。測量過程中並無探測到人工放射性核素，測量結果與以往相若。圖 8 為測量當天該區的鉀-40(自然存在)放射性水平。

3.1.4 自動伽馬譜法系統

二零零七年自動伽馬譜法系統錄得的數據載於表 5。全年並無探測到人工放射

dose rates recorded at all stations were found to be within the BRMP range.

3.1.3 Aerial Radiation Monitoring System

In January 2007, measurement flights in the plume tracking mode were carried out over Mirs Bay and Sai Kung area. The helicopter rose from about 100 metres up to about 900 metres above sea level to measure the change of radiation level against altitude over the sea surface and over the land surface. No artificial radionuclides were detected. Figure 6 and Figure 7 depict the vertical profiles over Mirs Bay and Sai Kung area respectively. The results were identical with past observations that while there was no significant change in the count rate with altitude near sea surface, it decreased with altitude near land surface.

In July, a background measurement in the ground contamination measurement mode was conducted over Soko Islands. No artificial radionuclides were detected. Figure 8 shows the radioactivity level of potassium-40 (naturally occurring) over the area on the day of measurement. The results obtained were similar to those of past years.

3.1.4 Automatic Gamma Spectrometry System

Results obtained by the AGSS in 2007 are given in Table 5. No artificial

性核素，而所有測量結果均在一九九七至二零零六年的變化範圍內。

3.1.5 流動輻射監測

在二零零七年，天文台在船灣淡水湖共進行了四次宇宙輻射測量，平均伽馬劑量率為每小時 0.036 至 0.038 微戈(見表6)，與往年所得的數據相近。

3.1.6 高空輻射探測

天文台在二零零七年共進行了四次高空輻射探測。進行探測時的天氣情況如下：六月十四日有微雨，地面吹輕微南至西南風；八月十六日有雨，地面吹輕微北風。九月六日多雲，地面吹輕微南至西南風。十一月六日天晴及乾燥，地面吹和緩西北風。數據分析結果顯示，與已往結果大致相若(李新偉等，2007)。

3.1.7 食物及環境樣本

在二零零七年，天文台共收集了三百九十五個食物及環境樣本。表 7、8、9、10 分別列載樣本的伽馬譜法分析、氚、鋰-90 及鈾-239 的測

radionuclides were detected, and all results were within their respective ranges of variation from 1997 to 2006.

3.1.5 Mobile Radiation Monitoring

Four measurements of cosmic radiation were carried out at Plover Cove in 2007. The average gamma dose rates ranged from 0.036 to 0.038 $\mu\text{Gy h}^{-1}$ (Table 6), close to those measured in previous years.

3.1.6 Upper-air Radioactivity Soundings

Four radioactivity soundings were made in 2007. The weather conditions during these soundings were: light rain with light south to southwesterly winds at the surface on 14 June; rainy with light northerly winds at the surface on 16 August; cloudy with light south to southwesterly winds at the surface on 6 September; fine and dry with moderate northwesterly winds at the surface on 6 November. The results obtained were similar to those of past years (Li *et al.* 2007).

3.1.7 Food and Environmental Samples

A total of 395 food and environmental samples were collected in 2007. Samples with measurable activity are tabulated in Tables 7, 8, 9 and 10, showing the results of gamma spectrometry analyses, tritium

量結果。表中只列出有關人工放射性核素的測量結果。為方便參考，表 11 按不同的照射途徑臚列了二零零七年各主要樣本類別的測量結果。

(a) 銫-137

與過去的情況相若，在部份二零零七年的食物、土壤及沉澱物樣本中發現微量的人工伽馬放射性核素銫-137。這些樣本包括海產、土壤、潮間帶土及海床沉澱物。這些樣本中銫-137 的活度均在 BRMP 相應範圍之內。

在 BRMP 及至目前的 ERMP-II 期間亦曾在上述樣本中發現銫-137（黃明松等，2003）。在這些環境及食物樣本中發現的銫-137 相信主要是一九四五至一九八零年間大氣核武試驗的沉降物殘餘（UNSCEAR 2000）。

(b) 氚

與過去的情況相若，在部份二零零七年的大氣、水及食物樣本中發現微量的氚，這些樣本包括濕沉積物、總沉積物、水蒸氣、飲用水、地下水、海水、樽裝水、食

measurements, strontium-90 measurements and plutonium-239 measurements respectively. Only results pertaining to artificial radionuclides are included. For ease of reference, a summary of measurement results in 2007 for the major sample types according to different pathways is given in Table 11.

(a) Caesium-137

As in past years, traces of caesium-137, an artificial gamma-emitting radionuclide, were detected in some food, soil and sediment samples in 2007, including seafood, land soil, intertidal sediment and seabed sediment. The measured activities in these samples were all within the corresponding ranges of BRMP values.

Caesium-137 was detected in the above sample types in both BRMP and the ERMP-II so far (Wong *et al.* 2003). The presence of the radionuclide in environmental and food samples could generally be attributed to remnants of the fallout of atmospheric nuclear tests conducted from 1945 until 1980 (UNSCEAR 2000).

(b) Tritium

As in past years, very low amounts of tritium were detected in atmospheric, water and food samples in 2007, including wet deposition, total deposition, water vapour, drinking water, underground water, sea water, bottled water,

米、牛奶、蔬菜、水果、家禽、肉類、海產及海藻。這些樣本中氚的活度均在 BRMP 相應範圍之內，相信樣本中的氚主要是因宇宙射線自然產生，而小部份則是大氣核武試驗的殘餘 (UNSCEAR 2000)。

(c) 銥-90

與過去的情況相若，在部份二零零七年的大氣、食物及土壤樣本中發現微量的銥-90，這些樣本包括大氣飄塵、濕沉積物、總沉積物、食米、牛奶、蔬菜、水果、家禽、海產、海藻及土壤。在 BRMP 及至目前的 ERMP-II，上述樣本中亦曾發現銥-90。銥-90 亦主要來自大氣核武試驗 (UNSCEAR 2000)。

絕大部份樣本中銥-90 的活度均在 BRMP 相應範圍之內。在超過二百多個作銥-90 測量的樣本當中，僅有一個海藻樣本的活度偏高，然而其數值與 BRMP 相應的數值並沒有明顯的差別 (99% 置信水平)。圖 9 顯示該種海藻 (石莖) 樣本自一九八七年起 (包括 BRMP) 所得結果。從圖中可見，二零零七年的數據

rice, milk, vegetables, fruits, poultry, meat, seafood and seaweed. The measured activities in these samples were all within the corresponding ranges of BRMP values. As such, the source of tritium in the samples is primarily attributable to the natural cosmogenic process while a small portion was the remnant of atmospheric nuclear tests (UNSCEAR 2000).

(c) Strontium-90

As in past years, traces of strontium-90 were detected in atmospheric, food and soil samples in 2007, including air particulates, wet deposition, total deposition, rice, milk, vegetables, fruits, poultry, seafood, seaweed and land soil. The radionuclide was detected in the above types of samples in both BRMP and the ERMP-II so far. The radionuclide's presence is also primarily attributable to atmospheric nuclear tests (UNSCEAR 2000).

The measured strontium-90 activities in practically all of these samples were within the ranges of their BRMP values. Of the more than 200 samples measured for strontium-90, only one seaweed sample showed higher, but not significantly different (at 99% confidence level), activities than the corresponding BRMP values. The result for this seaweed (*Ulva lactuca*) sample is presented in Figure 9 alongside all measurements taken since 1987 (including BRMP). It can be seen that

俱在多年來變化幅度之內。天文台會於二零零八年增加收集石蕮樣本的數目，以更密切監測該種樣本中銨-90活度的變化。

(d) 鈾-239

與過去的情況相若，在部份二零零七年的沉澱物樣本中發現微量的鈾-239，這些樣本包括潮間帶土及海床沉澱物。這些樣本中鈾-239的活度均在 BRMP 的相應範圍之內。同樣，樣本中發現的鈾-239 主要來自大氣核武試驗的沉降物 (UNSCEAR 2000)。

總括來說，二零零七年所有食物及環境樣本中人工放射性核素的活度均在 BRMP 相應的本底範圍之內。唯一例外是其中一個海藻樣本的銨-90 活度濃度偏高，但仍在自一九八七年以來 (即 BRMP 開始) 多年來變化幅度之內。

3.2 結論

二零零七年在香港境內不同地點錄得的環境伽馬劑量率均在 BRMP 本底範圍之內。與過去的情況相若，天文台在不同的環境及食物樣本中測量到微量的人工放射

the values in 2007 were well within the fluctuations observed over the years. More *Ulva lactuca* samples will be collected in 2008 for closer monitoring of the variation of strontium-90 activities in this sample type.

(d) Plutonium-239

As in past years, minute amounts of plutonium-239 were detected in some sediment samples in 2007, including intertidal sediment and seabed sediment. The measured activities in these samples were all within the corresponding ranges of BRMP values. It is believed that fallout of atmospheric nuclear tests was again the major source of the radionuclide (UNSCEAR 2000).

To summarize, the activities of the artificial radionuclides in all the food and environmental samples collected in 2007 were found to be within the corresponding ranges of baseline values obtained in BRMP. The only exception was a seaweed sample which showed higher strontium-90 value, but this was still well within the fluctuations observed since 1987 (when BRMP began).

3.2 Conclusion

The ambient gamma dose rates recorded over various parts of the territory in 2007 were within the BRMP range. As in the past years, traces of artificial radionuclides, namely caesium-137,

性核素，包括銫-137、氚、銻-90及鈾-239。它們的水平與在廣東核電站及嶺澳核電站運作之前所收集的樣本並沒有顯著分別。

以此總結，二零零七年香港的環境輻射水平及在環境和食物樣本中的人工放射性核素活度並沒有可測量到的變化。

tritium, strontium-90 and plutonium-239, were detected in various environmental and food samples. The levels of all these radionuclides were not significantly different from those recorded before the Guangdong Nuclear Power Station and Lingao Nuclear Power Station came into operation.

It is concluded that in 2007 there was no measurable change in ambient radiation levels and in activities of artificial radionuclides in the Hong Kong environment and foodstuffs consumed by Hong Kong people.

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謹此感謝漁農自然護理署、土木工程拓展署、環境保護署、水務署及房屋署協助收集樣本，政府化驗所製備樣本，衛生署提供熱釋光劑量計和讀取相應數據，政府飛行服務隊配合天文台運作空中輻射監測系統和香港警務處在其轄下警署提供地方，裝設輻射監測站和自動伽馬譜法系統。我們亦衷心感謝多個機構團體，容許香港天文台在其場地內安裝熱釋光劑量計和收集土壤樣本。

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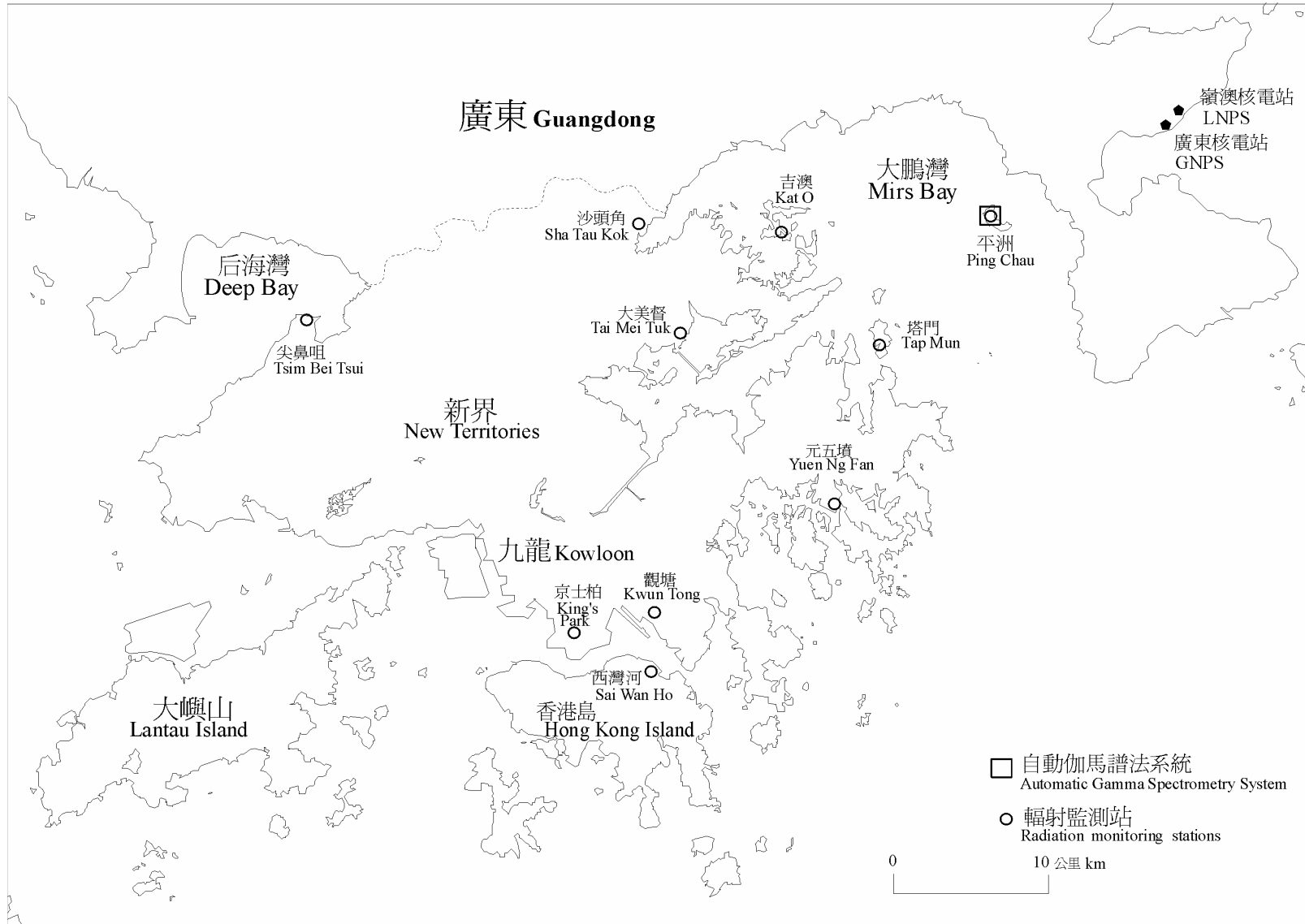


圖 1. 環境伽馬輻射的實時直接測量點。

Figure 1. Locations for real-time direct measurement of ambient gamma radiation.

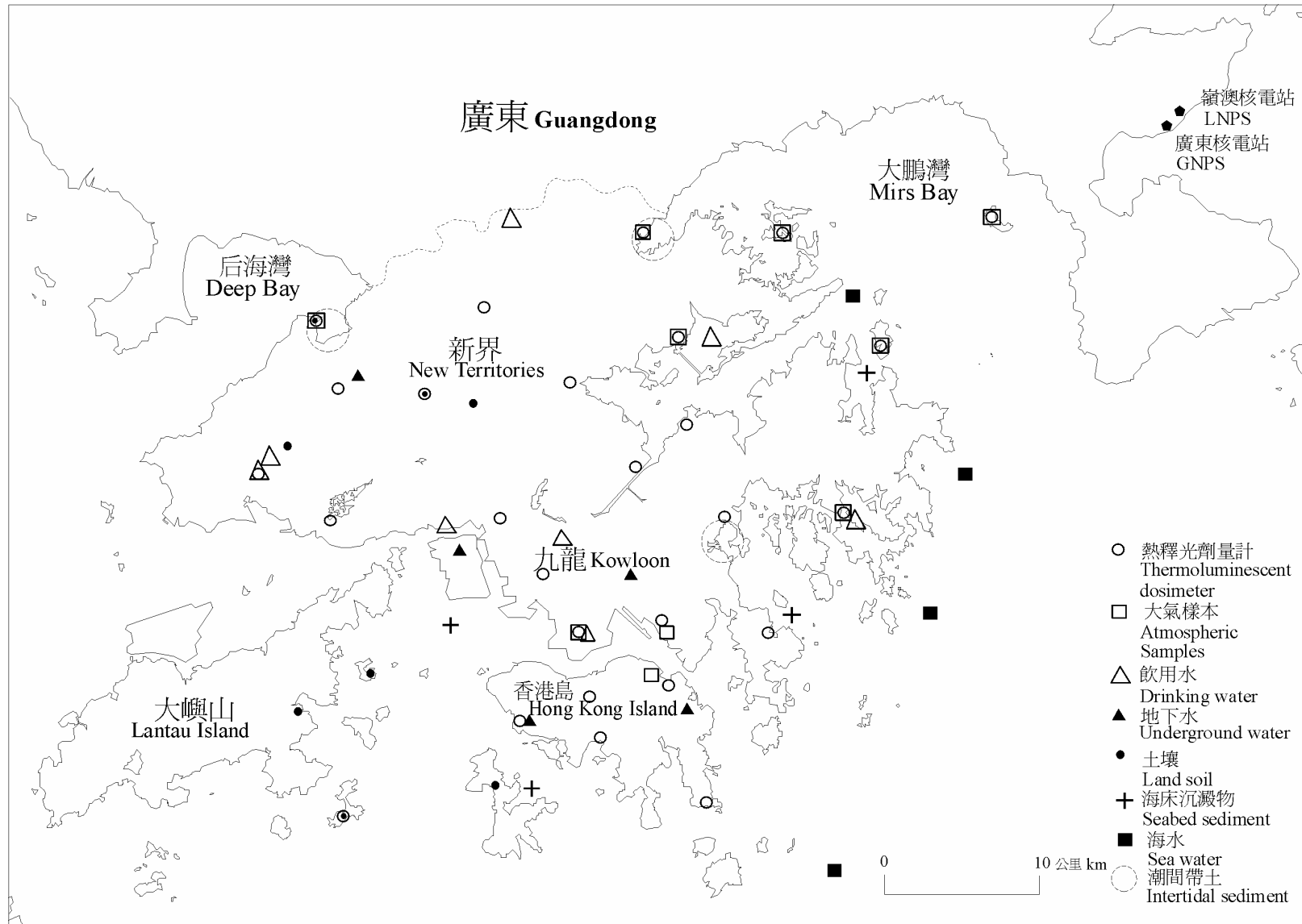


圖 2. 熱釋光劑量計網絡及二零零七年的環境樣本收集點。

Figure 2. Thermoluminescent dosimeter network and collection locations of environmental samples in 2007.



圖 3. 位於西灣河新址的輻射監測站。

Figure 3. The radiation monitoring station at the new site at Sai Wan Ho.

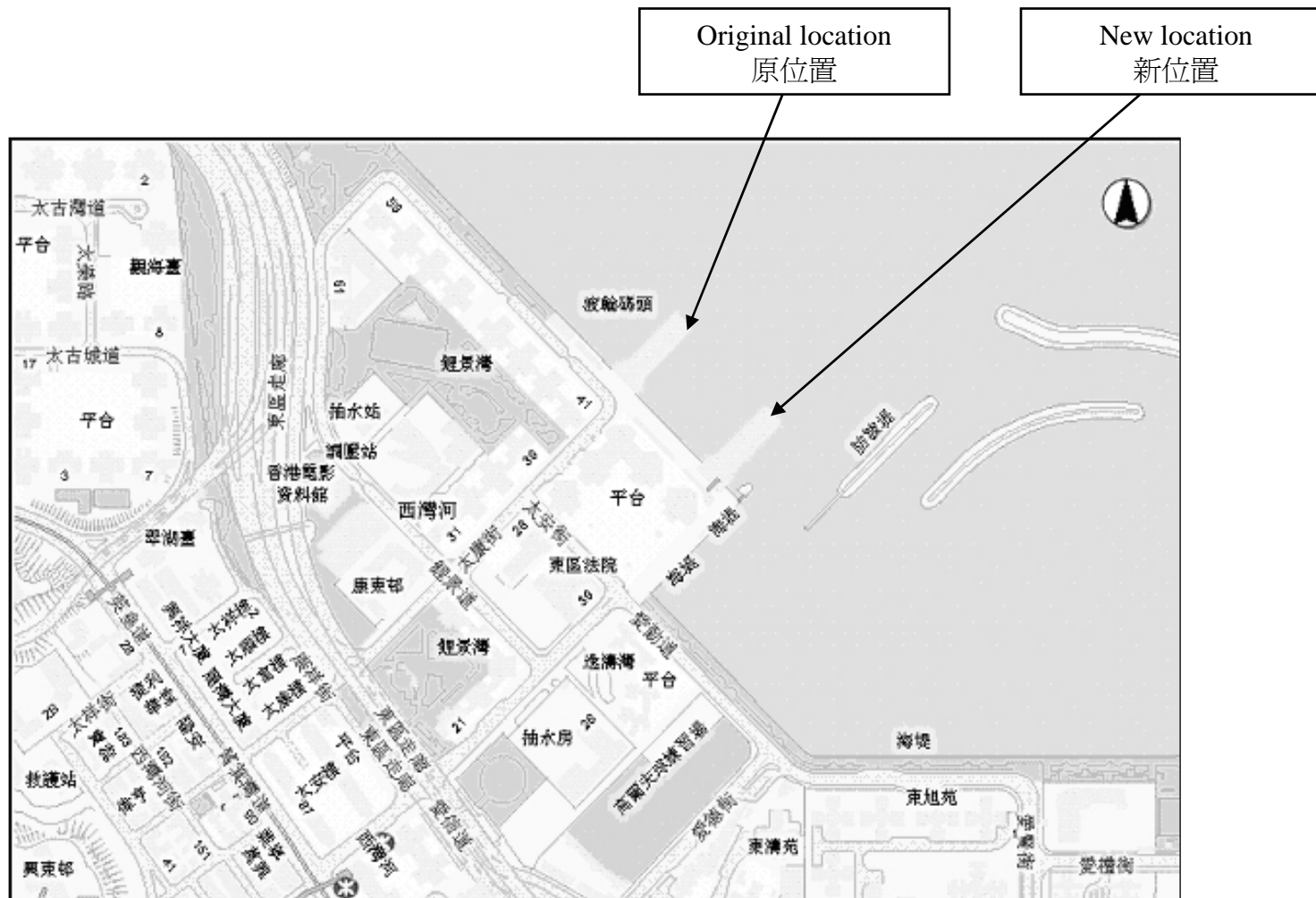


圖 4. 西灣河輻射監測站新址位置。

Figure 4. Location of the new site of Sai Wan Ho radiation monitoring station.



圖 5. 位於烏溪沙的熱釋光劑量計的原位置及新位置。
Figure 5. Original and new locations of TLDs at Wu Kai Sha.

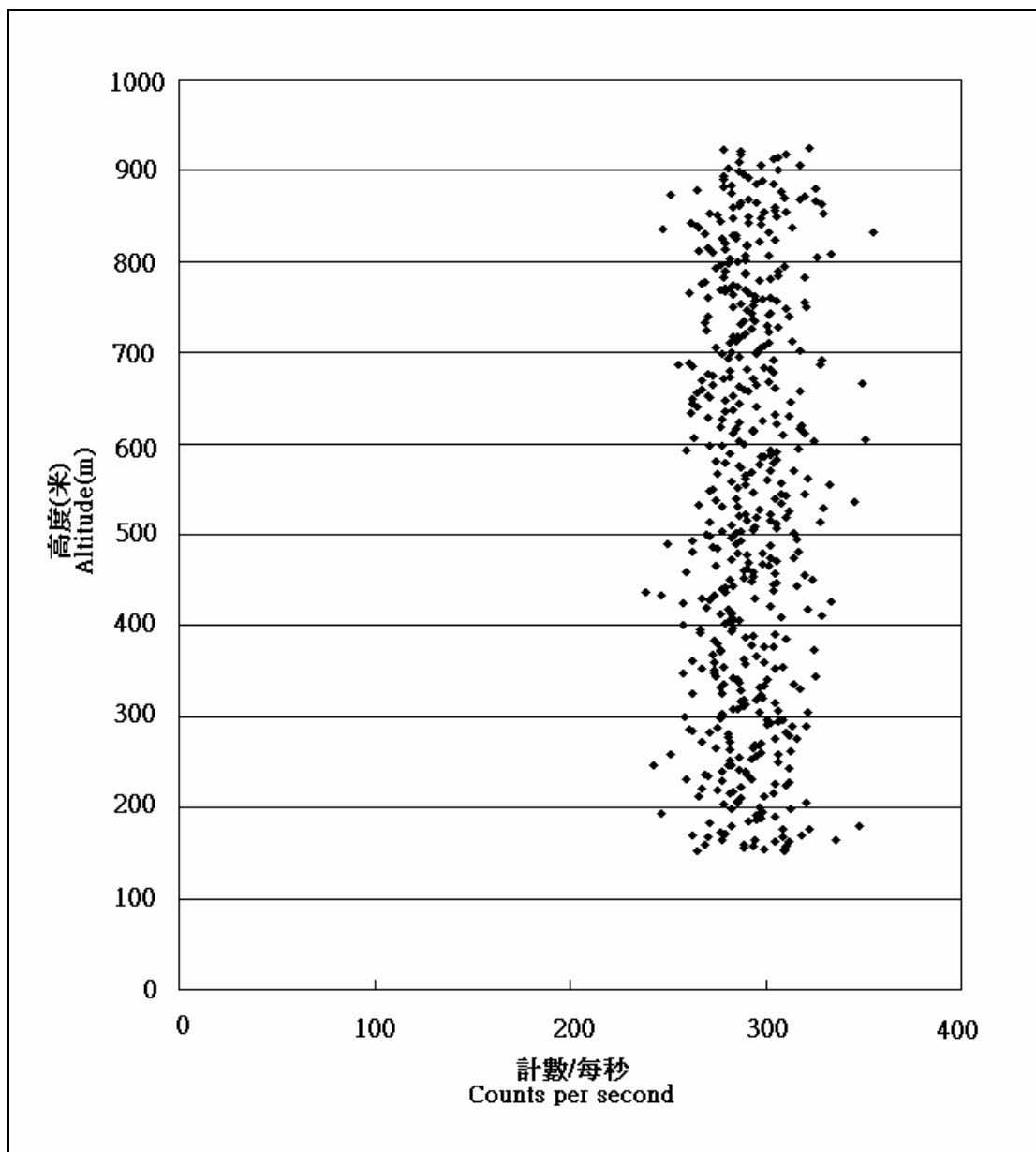


圖 6. 空中輻射監測系統在大鵬灣海面上測量到的計數率隨高度的變化
(二零零七年一月三十一日)。

Figure 6. Variation of count rate with altitude at Mirs Bay, as measured by the Aerial Radiation Monitoring System on 31 January 2007.

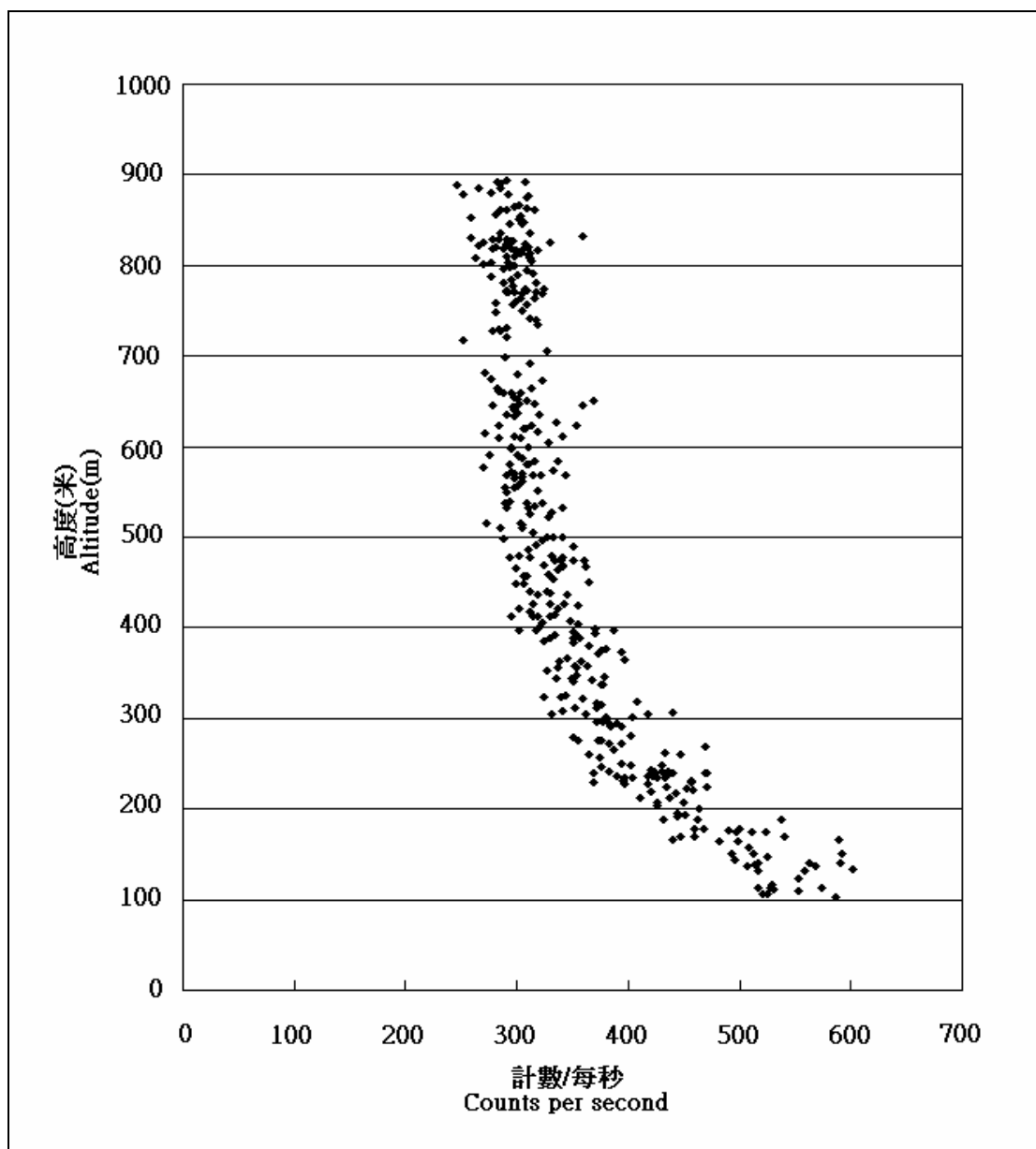


圖 7. 空中輻射監測系統在西貢地區測量到的計數率隨高度的變化(二零零七年一月三十一日)。

Figure 7. Variation of count rate with altitude at Sai Kung area, as measured by the Aerial Radiation Monitoring System on 31 January 2007.

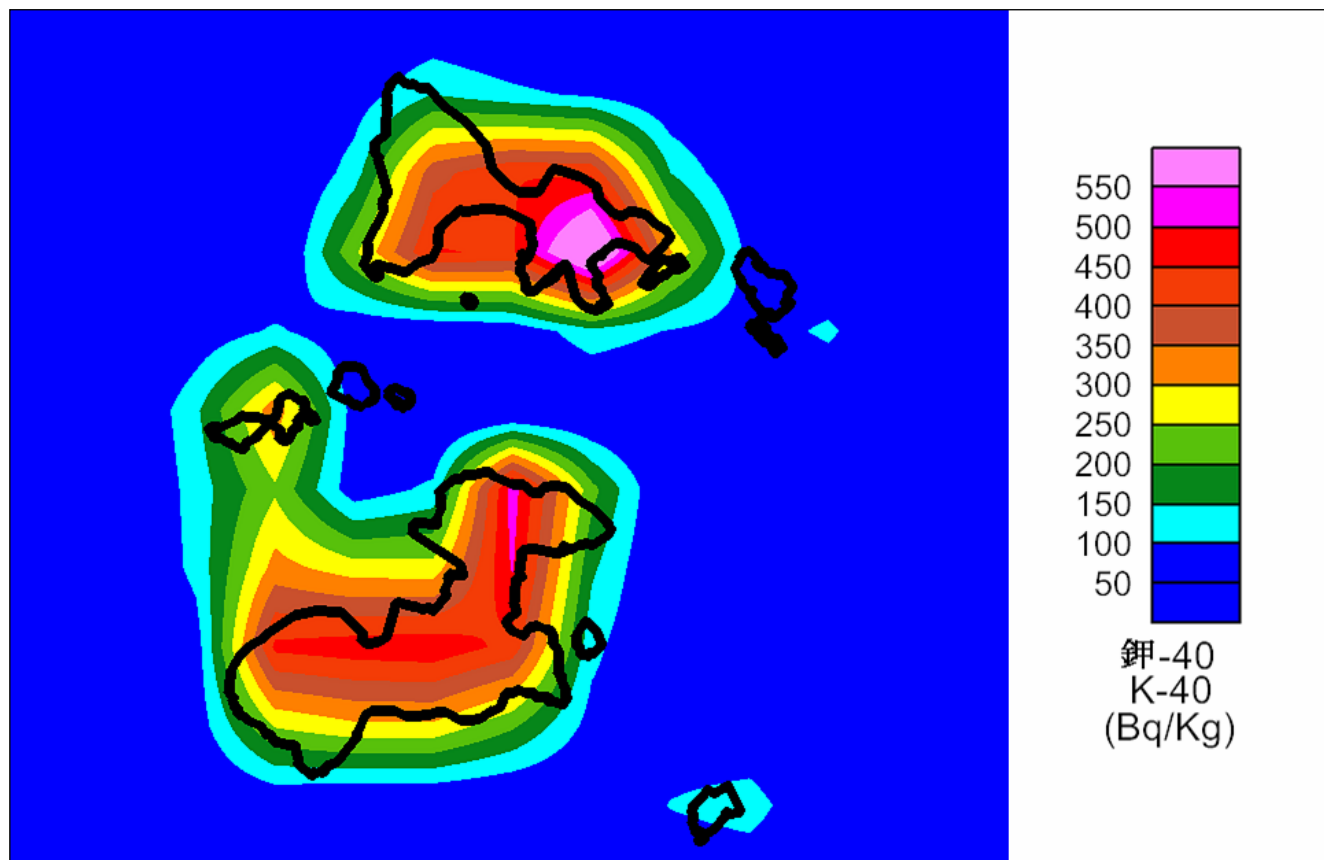


圖 8. 空中輻射監測系統在索罟群島測量到的鉀-40(自然存在)放射性水平(二零零七年七月十七日)。

Figure 8. Radioactivity level of Potassium-40 (naturally occurring) over Soko Islands, as measured by the Aerial Radiation Monitoring System on 17 July 2007.

石莖 *Ulva lactuca*

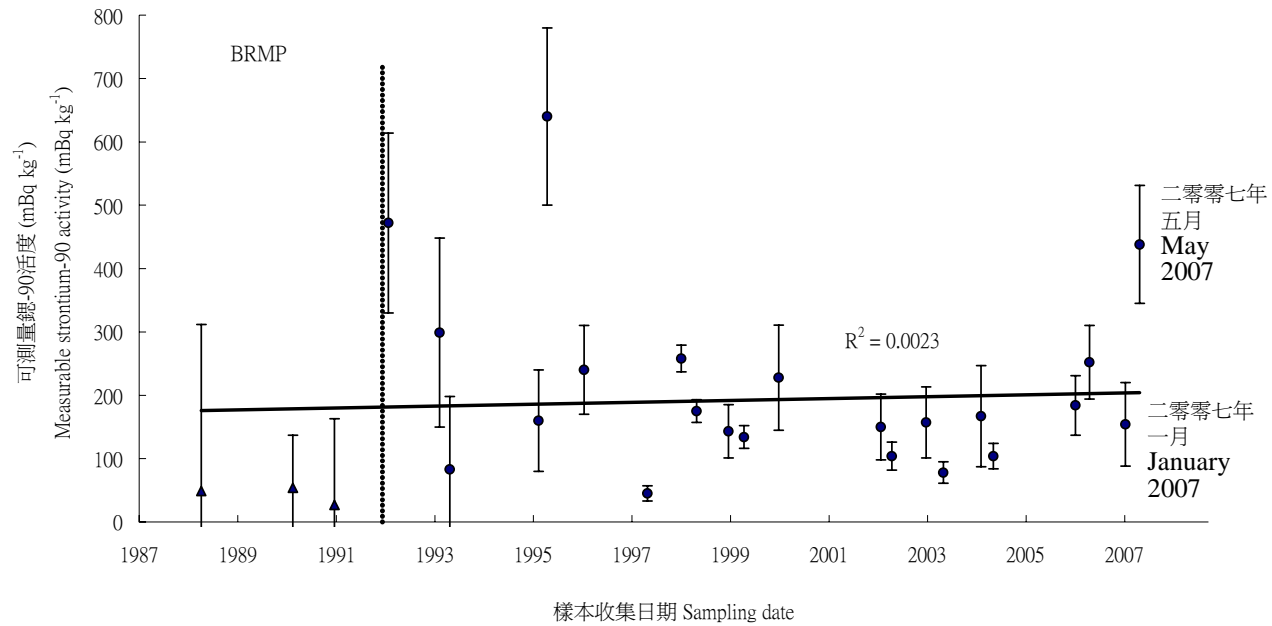


圖 9. 石莖(海藻)的銫-90 活度 (一九八七年 - 二零零七年)。
(2σ 測量不確定度以垂直棒表示)

Figure 9. Strontium-90 activity in *Ulva lactuca* (seaweed) (1987 – 2007).
(2σ counting uncertainty represented in vertical bar)

表 1. 二零零七年樣本取樣及分析概要

Table 1. Summary of the sampling and analysis programme in 2007

樣本類別 Sample type	取樣地點 Sampling location	地點數目 Number of location	分析類別 Type of analysis	取樣頻率 Sampling frequency
環境伽馬輻射 Ambient Gamma Radiation				
伽馬劑量率 Gamma dose rates	平洲 Ping Chau, 塔門 Tap Mun, 吉澳 Kat O, 沙頭角 Sha Tau Kok, 元五墳 Yuen Ng Fan, 大美督 Tai Mei Tuk, 尖鼻咀 Tsim Bei Tsui, 觀塘 Kwun Tong, 西灣河 Sai Wan Ho, 京士柏 King's Park	10	伽馬 γ	一分鐘 1-minute interval
累積伽馬劑量 Cumulative gamma doses	平洲 Ping Chau, 塔門 Tap Mun, 吉澳 Kat O, 元五墳 Yuen Ng Fan, 清水灣 Clear Water Bay, 西貢 Sai Kung, 大美督 Tai Mei Tuk, 烏溪沙 Wu Kai Sha, 鶴咀 Cape D'Aguilar, 沙頭角 Sha Tau Kok, 沙田 Shatin, 觀塘 Kwun Tong, 筲箕灣 Shau Kei Wan, 大埔 Tai Po, 京士柏 King's Park, 跑馬地 Happy Valley, 深水灣 Deep Water Bay, 蘇屋 So Uk, 置富花園 Chi Fu Fa Yuen, 粉嶺 Fanling, 荃灣 Tsuen Wan, 石崗 Shek Kong, 長洲 Cheung Chau, 元朗 Yuen Long, 大欖涌 Tai Lam Chung, 尖鼻咀 Tsim Bei Tsui, 屯門 Tuen Mun	27	伽馬 γ	每季 quarterly
大氣樣本 Atmospheric Samples				
大氣飄塵 Airborne particulate	京士柏 King's Park, 沙頭角 Sha Tau Kok, 元五墳 Yuen Ng Fan	3	伽馬 γ , 銻-90 Sr-90, 釷-239 Pu-239	每週 (累積一月) weekly (bulked monthly)
濕沉積物(降雨) Wet deposition (precipitation)	京士柏 King's Park, 沙頭角 Sha Tau Kok, 元五墳 Yuen Ng Fan	3	伽馬 γ , 氚 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每週 (累積一月) weekly (bulked monthly)
總沉積物 Total deposition	京士柏 King's Park	1	伽馬 γ , 氚 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每週 (累積一月) weekly (bulked monthly)
氣態碘 Airborne radioiodine	京士柏 King's Park	1	伽馬 γ	每週 weekly
大氣水蒸氣 Water vapour in air	京士柏 King's Park	1	氚 H-3	每月 monthly

表 1. (續)
Table 1. (cont'd)

樣本類別 Sample type	取樣地點 Sampling location	地點數目 Number of location	分析類別 Type of analysis	取樣頻率 Sampling frequency
地面樣本 Terrestrial Samples				
食米 Rice	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
牛奶(經消毒) Pasteurized milk	深圳 Shenzhen, 沙頭角 Sha Tau Kok	2	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
菜心 Choi sum	內地 Mainland, 本地 Local	2	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
白菜 Pak choi	內地 Mainland, 本地 Local	2	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
香蕉 Banana	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
荔枝 Lychee	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	夏季 summer
柑橘 Mandarin	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	秋季及冬季 autumn and winter
甘蔗 Sugar cane	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	春季 spring
雞 Chicken	內地 Mainland, 本地 Local	2	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
鴨 Duck	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
牛肉 Beef	內地 Mainland	1	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
豬肝 Pig's liver	內地 Mainland, 本地 Local	2	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
豬肉 Pork	內地 Mainland, 本地 Local	2	伽馬 γ , 氚 H-3, 銨-90 Sr-90	每季 quarterly
土壤(上層及下層) Land soil (upper and lower level)	元朗 Yuen Long, 尖鼻咀 Tsim Bei Tsui, 石崗 Shek Kong, 嘉道理農場 Kadoorie Farm and Botanic Garden, 長洲 Cheung Chau, 南丫島 Lamma Island, 坪洲 Peng Chau, 銀礦灣 Silvermine Bay	8	伽馬 γ , 銨-90 Sr-90, 釷-239 Pu-239	每5年一次 once every 5 years

表 1. (續)

Table 1. (cont'd)

樣本類別 Sample type	取樣地點 Sampling location	地點數目 Number of location	分析類別 Type of analysis	取樣頻率 Sampling frequency
水體樣本 Aquatic Samples				
飲用水(經處理) Drinking water (treated)	九龍配水管 Kowloon distribution tap, 屯門配水管 Tuen Mun distribution tap, 沙田濾水廠 Shatin Treatment Works, 屯門濾水廠 Tuen Mun Treatment Works, 油柑頭濾水廠 Yau Kom Tau Treatment Works	5	伽馬 γ , 氡 H-3	每季 quarterly
飲用水(未經處理) Drinking water (untreated)	萬宜水庫 High Island Reservoir, 船灣淡水湖 Plover Cove Reservoir, 木湖 B 抽水站 Muk Wu B Pumping Station, 沙田濾水廠 Shatin Treatment Works, 屯門濾水廠 Tuen Mun Treatment Works, 油柑頭濾水廠 Yau Kom Tau Treatment Works	6	伽馬 γ , 氡 H-3	每季 quarterly
樽裝水(蒸餾水) Bottled water (Distilled)	本地 Local	1	伽馬 γ , 氡 H-3	每季 quarterly
樽裝水(礦泉水) Bottled water (Mineral)	本地 Local	1	伽馬 γ , 氡 H-3	每季 quarterly
地下水 Underground water	長康邨 Cheung Hong Estate, 鈞樂新村 Kwan Lok San Tsuen, 環翠邨 Wan Tsui Estate, 華富邨 Wah Fu Estate, 富山邨 Fu Shan Estate	5	伽馬 γ , 氡 H-3	每年 yearly
海水(上層、中層及低層) Sea water (upper, middle and lower level)	橫瀾島 Waglan Island, 火石洲 Basalt Island, 大浪灣 Tai Long Wan, 赤洲 Port Island	4	伽馬 γ , 氡 H-3	每年 yearly
海水中懸浮粒子 (上層、中層及低層) Suspended particulate in sea water (upper, middle and lower level)	橫瀾島 Waglan Island, 火石洲 Basalt Island, 大浪灣 Tai Long Wan, 赤洲 Port Island	4	伽馬 γ , 銻-90 Sr-90, 釷-239 Pu-239	每年 yearly
大魚 <i>Aristichthys nobilis</i> (Big-head carp)	深圳 Shenzhen, 元朗 Yuen Long	2	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
瓜三 <i>Nemipterus japonicus</i> (Melon coat)	大亞灣 Daya Bay, 香港以西海域 Seas west of Hong Kong, 香港水域 Hong Kong Waters	3	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
牛鯪 <i>Platycephalus indicus</i> (Bartail flathead)	大亞灣 Daya Bay, 香港以西海域 Seas west of Hong Kong, 香港水域 Hong Kong Waters	3	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly

表 1. (續)
Table 1. (cont'd)

樣本類別 Sample type	取樣地點 Sampling location	地點數目 Number of location	分析類別 Type of analysis	取樣頻率 Sampling frequency
水體樣本 Aquatic Samples				
牙帶 <i>Trichiurus haumela</i> (Hair tail)	大亞灣 Daya Bay, 香港以西海域 Seas west of Hong Kong, 香港水域 Hong Kong Waters	3	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
三點蟹 <i>Portunus sanguinolentus</i> (Three-spotted crab)	香港以西海域 Seas west of Hong Kong, 香港水域 Hong Kong Waters	2	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
赤米蝦 <i>Metapenaeopsis barbata</i> (Fire prawn)	香港以西海域 Seas west of Hong Kong, 香港水域 Hong Kong Waters	2	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
魷魚 <i>Loligo edulis</i> (Squid)	大亞灣 Daya Bay, 香港以西海域 Seas west of Hong Kong, 香港水域 Hong Kong Waters	3	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
墨魚 <i>Sepia spp</i> (Cuttlefish)	香港水域 Hong Kong Waters	1	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
蜆 <i>Tapes philippinarum</i> (Clam)	長洲 Cheung Chau, 吐露港 Tolo Harbour	2	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
青口 <i>Perna viridis</i> (Green-lipped mussel)	長洲 Cheung Chau, 吐露港 Tolo Harbour, 大亞灣 Daya Bay	3	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
東風螺 <i>Babylonia formosae</i> (Gastropod)	香港水域 Hong Kong Waters	1	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	每季 quarterly
石莖 <i>Ulva lactuca</i> (Sea lettuce)	布袋澳 Po Toi O	1	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	冬季及春季 winter and spring
漚苔 <i>Enteromorpha prolifera</i> (Sea hair)	吐露港 Tolo Harbour	1	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	冬季 winter
長紫菜 <i>Porphyra dentata</i> (Red algae)	蒲台島 Po Toi Island	1	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	冬季 winter
半葉馬尾藻 <i>Sargassum hemiphyllum</i> (Brown algae)	布袋澳 Po Toi O	1	伽馬 γ , 氡 H-3, 銻-90 Sr-90, 釷-239 Pu-239	冬季及春季 winter and spring
潮間帶土(上層及下層) Intertidal sediment (upper and lower level)	白沙灣 Pak Sha Wan, 尖鼻咀 Tsim Bei Tsui, 沙頭角 Sha Tau Kok	3	伽馬 γ , 釷-239 Pu-239	每季 quarterly
海床沉澱物 Seabed sediment	大灘海 Tai Tan Hoi, 龍蝦灣 Lung Ha Wan, 索罟灣 Picnic Bay, 西區碇泊處 Western Anchorage	4	伽馬 γ , 釷-239 Pu-239	每年 yearly

表 2. 二零零七年收集到的食物樣本概要

Table 2. Summary of food samples collected in 2007

類別 Type	地點 Location	收集樣本總數 Total no. of sample collected
食米 Rice	內地(珠江三角洲) Mainland (Pearl River Delta)	4
牛奶(經消毒) Pasteurized milk	深圳 Shenzhen	4
	沙頭角 Sha Tau Kok	4
菜心 Choi sum	內地(深圳) Mainland (Shenzhen)	4
	本地 Local	4
白菜 Pak choi	內地(深圳) Mainland (Shenzhen)	4
	本地 Local	4
香蕉 Banana	內地(廣東) Mainland (Guangdong)	4
荔枝 Lychee	內地 Mainland	1
柑橘 Mandarin	內地(廣東) Mainland (Guangdong)	2
甘蔗 Sugar cane	內地(廣東) Mainland (Guangdong)	1
雞 Chicken	內地(深圳) Mainland (Shenzhen)	4
	本地 Local	4
鴨 Duck	內地(深圳) Mainland (Shenzhen)	4
牛肉 Beef	內地 Mainland	4
豬肝 Pig's Liver	內地(廣東) Mainland (Guangdong)	4
	本地 Local	4
豬肉 Pork	內地(廣東) Mainland (Guangdong)	4
	本地 Local	4
大魚 <i>Aristichthys nobilis</i> (Big-head carp)	深圳 Shenzhen	4
	元朗 Yuen Long	4
瓜三 <i>Nemipterus japonicus</i> (Melon coat)	大亞灣 Daya Bay	0
	香港以西海域 Seas west of Hong Kong	0
	香港水域 Hong Kong Waters	4
牛鯪 <i>Platycephalus indicus</i> (Bartail flathead)	大亞灣 Daya Bay	0
	香港以西海域 Seas west of Hong Kong	0
	香港水域 Hong Kong Waters	4
牙帶 <i>Trichiurus haumela</i> (Hair tail)	大亞灣 Daya Bay	0
	香港以西海域 Seas west of Hong Kong	0
	香港水域 Hong Kong Waters	4
三點蟹 <i>Portunus sanguinolentus</i> (Three-spotted crab)	香港以西海域 Seas west of Hong Kong	0
	香港水域 Hong Kong Waters	4

表 2. (續)

Table 2. (cont'd)

類別 Type	地點 Location	收集樣本總數 Total no. of sample collected
赤米蝦 <i>Metapenaeopsis barbata</i> (Fire prawn)	香港以南海域 Seas west of Hong Kong	0
	香港水域 Hong Kong Waters	4
魷魚 <i>Loligo edulis</i> (Squid)	大亞灣 Daya Bay	0
	香港以南海域 Seas west of Hong Kong	0
	香港水域 Hong Kong Waters	4
墨魚 <i>Sepia spp</i> (Cuttlefish)	香港水域 Hong Kong Waters	4
蜆 <i>Tapes philippinarum</i> (Clam)	長洲 Cheung Chau	0
	吐露港 Tolo Harbour	4
青口 <i>Perna viridis</i> (Green-lipped mussel)	長洲 Cheung Chau	3
	吐露港 Tolo Harbour	4
	大亞灣 Daya Bay	3
東風螺 <i>Babylonia formosae</i> (Gastropod)	香港水域 Hong Kong Waters	4
石莖 <i>Ulva lactuca</i> (Sea lettuce)	布袋澳 Po Toi O	2
澱苔 <i>Enteromorpha prolifera</i> (Sea hair)	吐露港 Tolo Harbour	1
長紫菜 <i>Porphyra dentata</i> (Red algae)	蒲台島 Po Toi Island	0
半葉馬尾藻 <i>Sargassum hemiphyllum</i> (Brown algae)	布袋澳 Po Toi O	2

表 3. 主要量度參數概要 *

Table 3. Summary of key measurement parameters *

測量類別 Measurement type		樣本大小 Sample size	計數 時間(秒) Counting time (second)	本底 Background (CPM)	計數 效率 Counting efficiency (%)	化學 復得率 Chemical recovery (%)	探測下限 # Minimum Detection Activity # (MDA)	
伽馬放射性 核素 Gamma emitting radionuclides	大氣飄塵 Airborne particulate	20000 m ³	55000	-	-	-	碘-131 I-131 10 µBq m ⁻³	銻-137 Cs-137 10 µBq m ⁻³
	氣態碘 Airborne radioiodine	400 m ³	55000	-	-	-	300 µBq m ⁻³	-
	濕沉積物 Wet deposition	4 L	55000	-	-	-	0.1 Bq L ⁻¹	0.1 Bq L ⁻¹
	總沉積物 Total deposition	0.03 m ²	55000	-	-	-	12 Bq m ⁻²	15 Bq m ⁻²
	食米 Rice	4 kg	20000	-	-	-	0.1 Bq kg ⁻¹	0.2 Bq kg ⁻¹
	牛奶 Milk	1 L	20000	-	-	-	0.3 Bq L ⁻¹	0.4 Bq L ⁻¹
	蔬菜 Vegetable	1 kg	20000	-	-	-	0.3 Bq kg ⁻¹	0.4 Bq kg ⁻¹
	水果 Fruit	2 kg	20000	-	-	-	0.2 Bq kg ⁻¹	0.3 Bq kg ⁻¹
	家禽 Poultry	2 kg	20000	-	-	-	0.1 Bq kg ⁻¹	0.2 Bq kg ⁻¹
	肉類 Meat	1 kg	20000	-	-	-	0.3 Bq kg ⁻¹	0.4 Bq kg ⁻¹
	土壤 Land soil	1 kg	10000	-	-	-	2 Bq kg ⁻¹	2 Bq kg ⁻¹
	水樣本 Water samples	4 L	55000	-	-	-	0.1 Bq L ⁻¹	0.1 Bq L ⁻¹
	海水中懸浮粒 子 Suspended particulate	4 L	55000	-	-	-	0.01 Bq L ⁻¹	0.02 Bq L ⁻¹
	海產 Seafood	2 kg	72000	-	-	-	0.07 Bq kg ⁻¹	0.1 Bq kg ⁻¹
	海藻 Seaweed	0.5 kg	20000	-	-	-	1 Bq kg ⁻¹	2 Bq kg ⁻¹
潮間帶土/ 海床沉澱物 Sediment	2 kg	20000	-	-	-	0.4 Bq kg ⁻¹	0.5 Bq kg ⁻¹	
氚 Tritium	濕沉積物 Wet deposition	0.007 L	36000	10	25	-	6 Bq L ⁻¹	
	總沉積物 Total deposition	0.0001 m ²	36000	10	25	-	400 Bq m ⁻²	
	水蒸氣 Water vapour	0.0008 m ³	36000	10	25	-	70 Bq m ⁻³ ^	
	食米 Rice	0.07 kg	36000	10	25	-	1 Bq kg ⁻¹	
	牛奶 Milk	0.007 L	36000	10	25	-	6 Bq L ⁻¹	
	蔬菜 Vegetable	0.008 kg	36000	10	25	-	5 Bq kg ⁻¹	
	水果 Fruit	0.01 kg	36000	10	25	-	4 Bq kg ⁻¹	
	家禽 Poultry	0.01 kg	36000	10	25	-	4 Bq kg ⁻¹	
	肉類 Meat	0.01 kg	36000	10	25	-	4 Bq kg ⁻¹	
	水樣本 Water samples	0.007 L	36000	10	25	-	6 Bq L ⁻¹	
	地下水 Underground water	0.1 L	36000	10	25	-	0.4 Bq L ⁻¹	
	海產 Seafood	0.01 kg	36000	10	25	-	4 Bq kg ⁻¹	
海藻 Seaweed	0.02 kg	36000	10	25	-	2 Bq kg ⁻¹		

表 3. (續)
Table 3. (cont'd)

測量類別 Measurement type		樣本大小 Sample size	計數 時間(秒) Counting time (second)	本底 Background (CPM)	計數 效率 Counting efficiency (%)	化學 復得率 Chemical recovery (%)	探測下限 # Minimum Detection Activity # (MDA)
銻-90 Strontium-90	大氣飄塵 Airborne particulate	5000 m ³	30000	1	75	90	1 μ Bq m ⁻³
	濕沉積物 Wet deposition	4 L	30000	1	75	100	0.001 Bq L ⁻¹
	總沉積物 Total deposition	0.01 m ²	30000	1	75	100	0.5 Bq m ⁻²
	米 Rice	3 kg	30000	1	75	90	0.002 Bq kg ⁻¹
	牛奶 Milk	1 L	30000	1	75	90	0.005 Bq L ⁻¹
	蔬菜 Vegetable	1 kg	30000	1	75	90	0.005 Bq kg ⁻¹
	水果 Fruit	2 kg	30000	1	75	90	0.003 Bq kg ⁻¹
	家禽 Poultry	2 kg	30000	1	75	90	0.003 Bq kg ⁻¹
	肉類 Meat	1 kg	30000	1	75	90	0.005 Bq kg ⁻¹
	土壤 Land soil	0.005 kg	30000	1	75	90	1 Bq kg ⁻¹
	海水中懸浮粒 子 Suspended particulate	3 L	30000	1	75	90	0.002 Bq L ⁻¹
	海產 Seafood	2 kg	30000	1	75	90	0.003 Bq kg ⁻¹
海藻 Seaweed	0.1 kg	30000	1	75	90	0.05 Bq kg ⁻¹	
鈾-239 Plutonium-239	大氣飄塵 Airborne particulate	5000 m ³	220000	0.003	20	40	0.2 μ Bq m ⁻³
	濕沉積物 Wet deposition	3 L	220000	0.003	20	60	0.0002 Bq L ⁻¹
	總沉積物 Total deposition	0.02 m ²	220000	0.003	20	60	0.04 Bq m ⁻²
	土壤 Land soil	0.004 kg	220000	0.003	20	60	0.2 Bq kg ⁻¹
	海水中懸浮粒 子 Suspended particulate	3 L	220000	0.003	20	50	0.0003 Bq L ⁻¹
	海產 Seafood	0.5 kg	220000	0.003	20	40	0.002 Bq kg ⁻¹
	海藻 Seaweed	0.05 kg	220000	0.003	20	60	0.01 Bq kg ⁻¹
潮間帶土 / 海床沉澱物 Sediment	0.005 kg	220000	0.003	20	50	0.2 Bq kg ⁻¹	

註:

- * - 表內所列是環境輻射監測計劃(ERMP)在二零零七年主要量度參數的典型數值，僅供參考之用。視乎實際操作情況，量度參數可能有變化。在特別情況下，部份樣本會使用與上表頗為不同的參數進行量度。
- # - 測量的探測下限是指一個測量系統在該次測量時實際能測量到的最低活度水平。探測下限的數值取決於多個因數，包括個別測量系統的特質、測量方法、樣本的特質及測量的情況，所以探測下限會隨著個別樣本和測量而改變。表內所示的探測下限為在一般測量情況下的典型數值，僅供在理解此報告的結果時作簡易參考之用。
- ^ - 此表列出水蒸氣採樣器的靈敏度作為參考。該靈敏度數值較由 Currie(1968) 方程計算出的探測下限為高，因此應是 ERMP 的水蒸氣樣本中，氫的測量下限的一個較佳代表值。

Note:

- * - The values given in the table are typical values of key measurement parameters in the Environmental Radiation Monitoring Programme (ERMP) in 2007. The values may vary in practice, and should thus be used as reference only. Under special circumstances, some samples may be measured under substantially different conditions.
- # - The minimum detection activity (MDA) of a measurement is the lowest activity level that is practically achievable by the counting system for that measurement. MDA values depend on the characteristics of the measurement system, method of measurement, sample characteristics and measurement conditions, and thus vary with individual samples and measurements. The listed MDAs are typical values under "typical" measurement conditions and serve as a quick reference in interpreting results in this report.
- ^ - The sensitivity of the water vapour sampler is quoted here for reference. This sensitivity value is higher than the typical MDA calculated using a formula developed by Currie (1968), and thus should give a better representation of the limit of detection of tritium in water vapour samples in ERMP.

表 4. 二零零七年輻射監測網絡及熱釋光劑量計網絡錄得的環境伽馬劑量率。
單位為 $\mu\text{Gy h}^{-1}$

Table 4. Ambient gamma dose rates recorded by the radiation monitoring network and thermoluminescent dosimeter network in 2007.

Dose rate in $\mu\text{Gy h}^{-1}$

輻射監測網絡[&]

Radiation Monitoring Network (RMN)[&]

監測站 Station	年平均值 Annual Average	標準差 Standard Deviation	一分鐘平均值範圍 Range of 1-min data
吉澳 Kat O	0.104 (0.108)	0.004 (0.003)	0.090 – 0.161 (0.075 – 0.194)
京士柏 King's Park	0.141 (0.138)	0.003 (0.002)	0.126 – 0.200 (0.108 – 0.271)
觀塘 Kwun Tong	0.131 (0.121)	0.002 (0.007)	0.120 – 0.174 (0.079 – 0.192)
平洲 Ping Chau	0.091 (0.092)	0.003 (0.005)	0.077 – 0.190 (0.064 – 0.233)
西灣河 Sai Wan Ho [#]	0.099 (0.100)	0.004 (0.004)	0.087 – 0.134 (0.070 – 0.192)
沙頭角 Sha Tau Kok	0.100 (0.103)	0.003 (0.002)	0.088 – 0.153 (0.073 – 0.197)
大美督 Tai Mei Tuk	0.119 (0.120)	0.004 (0.002)	0.097 – 0.167 (0.087 – 0.227)
塔門 Tap Mun	0.087 (0.091)	0.002 (0.005)	0.076 – 0.150 (0.062 – 0.209)
尖鼻咀 Tsim Bei Tsui	0.129 (0.135)	0.002 (0.006)	0.117 – 0.202 (0.087 – 0.254)
元五墳 Yuen Ng Fan	0.119 (0.118)	0.003 (0.003)	0.106 – 0.217 (0.069 – 0.250)

註:

[&] - 括號內的數值為過往多年 (一九九二年至二零零六年) 運作的參考數值 (塔門的參考數值則是基於一九九三年至二零零六年的數據)。

[#] - 由於遷址關係, 西灣河輻射監測站在二零零七年四月十三日上午十時三十分至四月十八日上午十一時期間沒有數據。

Note:

[&] - Values in brackets are reference values in previous years of operation from 1992 to 2006 (those for Tap Mun are based on data from 1993 to 2006).

[#] - Data for the Sai Wan Ho radiation monitoring station was not available for the period between 10:30 a.m. 13 April and 11:00 a.m. 18 April 2007 due to relocation.

表 4. (續)
Table 4. (cont'd)

熱釋光劑量計網絡^{\$}

Thermoluminescent Dosimeter (TLD) Network^{\$}

監測點 Location	年平均值 Annual Average	標準差 [*] Standard Deviation [*]	範圍 Range
鶴咀 Cape D'Aguiar	0.12 (0.12)	0.01 (0.03)	0.10 – 0.13 (0.05 – 0.19)
長洲 Cheung Chau	0.12 (0.13)	0.01 (0.03)	0.11 – 0.13 (0.09 – 0.21)
置富花園 Chi Fu Fa Yuen	0.15 (0.13)	0.01 (0.03)	0.14 – 0.16 (0.06 – 0.19)
清水灣 Clear Water Bay	0.10 (0.15)	0.01 (0.04)	0.09 – 0.10 (0.09 – 0.28)
深水灣 Deep Water Bay	0.13 (0.11)	0.02 (0.03)	0.11 – 0.15 (0.06 – 0.18)
粉嶺 Fanling	0.10 (0.10)	0.01 (0.04)	0.10 – 0.11 (0.04 – 0.20)
跑馬地 Happy Valley	0.09 (0.08)	0.01 (0.02)	0.08 – 0.09 (0.04 – 0.12)
吉澳 Kat O	0.11 (0.10)	0.01 (0.03)	0.09 – 0.12 (0.06 – 0.15)
京士柏 King's Park	0.15 (0.15)	0.01 (0.03)	0.13 – 0.16 (0.06 – 0.23)
觀塘 Kwun Tong	0.13 (0.12)	0.01 (0.02)	0.12 – 0.14 (0.08 – 0.21)
平洲 Ping Chau	0.12 (0.11)	0.01 (0.04)	0.10 – 0.13 (0.03 – 0.18)
西貢 Sai Kung	0.13 [#] (0.10)	0.01 [#] (0.02)	0.12 – 0.14 [#] (0.06 – 0.20)
沙頭角 Sha Tau Kok	0.09 (0.09)	< 0.01 (0.03)	0.08 – 0.09 (0.04 – 0.19)
沙田 Shatin	0.13 (0.14)	0.01 (0.03)	0.12 – 0.14 (0.09 – 0.20)
筲箕灣 Shau Kei Wan	0.13 (0.13)	0.01 (0.03)	0.12 – 0.14 (0.09 – 0.18)
石崗 Shek Kong	0.12 (0.11)	0.01 (0.04)	0.11 – 0.13 (0.04 – 0.20)
蘇屋 So Uk	0.12 (0.12)	0.01 (0.03)	0.11 – 0.13 (0.08 – 0.19)
大欖涌 Tai Lam Chung	0.19 (0.18)	0.01 (0.04)	0.17 – 0.21 (0.10 – 0.27)
大美督 Tai Mei Tuk	0.14 (0.13)	0.01 (0.04)	0.13 – 0.14 (0.08 – 0.22)
大埔 Tai Po	0.11 (0.14)	0.01 (0.04)	0.10 – 0.12 (0.09 – 0.29)
塔門 Tap Mun	0.09 (0.10)	0.01 (0.03)	0.09 – 0.10 (0.04 – 0.14)
尖鼻咀 Tsim Bei Tsui	0.13 (0.13)	0.01 (0.03)	0.12 – 0.14 (0.07 – 0.20)
荃灣 Tsuen Wan	0.14 (0.14)	0.01 (0.05)	0.13 – 0.15 (0.03 – 0.24)
屯門 Tuen Mun	0.14 (0.16)	0.01 (0.04)	0.13 – 0.15 (0.11 – 0.27)
烏溪沙 Wu Kai Sha	0.12 (0.12)	0.01 (0.03)	0.11 – 0.14 (0.07 – 0.18)
元朗 Yuen Long	0.10 (0.11)	0.01 (0.03)	0.09 – 0.11 (0.05 – 0.19)
元五墳 Yuen Ng Fan	0.12 (0.11)	0.01 (0.03)	0.11 – 0.13 (0.07 – 0.22)

註:

^{\$} - 括號內的數值為 BRMP 參考數值。

^{*} - 數值為 1 σ 標準差。

[#] - 由於位於西貢的熱釋光劑量計遺失，在二零零七年七月十二日至十月四日期間沒有數據。

表 4. (續)
Table 4. (cont'd)

Note:

- \$ - Values in brackets are BRMP reference values.
- * - The value is 1σ standard deviation.
- # - Data for Sai Kung was not available for the period between 12 July and 4 October 2007 due to loss of TLDs.

表 5. 二零零七年平洲自動伽馬譜法系統的輻射測量結果

Table 5. Results of measurement by the Automatic Gamma Spectrometry System at Ping Chau in 2007

	年平均值 * Annual Average *	標準差 Standard Deviation	日平均值範圍 Range of Daily Average	一九九七至 二零零六年範圍* Range from 1997 to 2006 *
阿爾法粒子 Alpha (Bq m ⁻³)	1.0	0.03	1.0 – 1.1	1.0 – 5.8
貝他粒子 Beta (Bq m ⁻³)	1.4	0.3	1.0 – 2.3	1.0 – 10.1
碘-131 I-131 (mBq m ⁻³)	< 4	N/A &	N/A	< 4
銻-137 Cs-137 (mBq m ⁻³)	< 4	N/A	N/A	< 4
氣態碘-131 Gaseous I-131 (Bq m ⁻³)	< 1	N/A	N/A	< 1

註:

- * - 測量結果低於探測下限以“< xx”表示，xx 是該類測量的典型探測下限值。
& - 不適用以 N/A 表示。

Note:

- * - Results below the minimum detectable activity (MDA) are reported as “< xx” where xx is the typical MDA value for that type of measurement.
& - N/A - not applicable.

表 6. 宇宙輻射引致的伽馬劑量率測量結果

(測量地點: 船灣淡水湖)

Table 6. Measurement results of gamma dose rates due to cosmic radiation (measurement site: Plover Cove)

測量日期 Date of measurement	平均伽馬劑量率(每小時微戈) Average gamma dose rate (μGy h ⁻¹)
二零零七年三月九日 9 Mar 2007	0.037
二零零七年六月十二日 12 Jun 2007	0.037
二零零七年九月二十一日 21 Sep 2007	0.036
二零零七年十二月十四日 14 Dec 2007	0.038

表 7. 二零零七年食物及環境樣本的伽馬活度測量結果

Table 7. Measurement results of gamma activities in food and environmental samples in 2007

放射性核素: 銫-137 Radionuclide: Cs-137

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 * Activity *	BRMP 範圍 # BRMP range #	單位 Unit
瓜三 <i>Nemipterus Japonicus</i> (Melon coat)	香港水域 Hong Kong Waters	1	-	0.04	< 0.2	Bq kg ⁻¹
牛鯪 <i>Platycephalus indicus</i> (Bartail flathead)	香港水域 Hong Kong Waters	1	-	0.06	≤ 0.2	Bq kg ⁻¹
牙帶 <i>Trichiurus haumela</i> (Hair tail)	香港水域 Hong Kong Waters	2	0.05 – 0.10	0.08	≤ 0.2	Bq kg ⁻¹
土壤(上層) Land soil (upper)	見表 1. Please see Table 1.	3	0.7 – 2.5	1.7	≤ 10.0	Bq kg ⁻¹
土壤(下層) Land soil (lower)	見表 1. Please see Table 1.	2	0.9 – 1.6	1.3	≤ 4.0	Bq kg ⁻¹
潮間帶土(上層) Intertidal sediment (upper)	白沙灣 Pak Sha Wan	2	0.5 – 0.5	0.5	≤ 2.4	Bq kg ⁻¹
	尖鼻咀 Tsim Bei Tsui	4	0.7 – 1.0	0.9		
	沙頭角 Sha Tau Kok	3	0.5 – 0.8	0.7		
潮間帶土(下層) Intertidal sediment (lower)	白沙灣 Pak Sha Wan	4	0.4 – 0.6	0.5	≤ 3.1	Bq kg ⁻¹
	尖鼻咀 Tsim Bei Tsui	4	0.8 – 1.2	1.0		
	沙頭角 Sha Tau Kok	4	0.3 – 0.7	0.5		
海床沉澱物 Seabed sediment	大灘海 Tai Tan Hoi	1	-	0.6	≤ 1.9	Bq kg ⁻¹
	龍蝦灣 Lung Ha Wan	1	-	0.9		
	西區碇泊處 Western Anchorage	1	-	0.6		

註: * - 如有多過一個樣本發現可測量活度，此欄則報告平均值。

- 測量結果低於探測下限以“< xx”表示，xx 是該類測量的典型探測下限值。如只在部份樣本中探測到該放射性核素，結果將報告為“≤ xx”，xx 則為測量到的活度最大值。

Note: * - The mean activity is reported if there are more than one samples with measurable activities.

- Results that are below the minimum detectable activity (MDA) are reported as “< xx” where xx is the typical MDA value for that type of measurement. When a particular radionuclide was detected only in some of the samples in a certain sample type, the results will be reported as “≤ xx” where xx is the maximum measured activity value.

表 8. 二零零七年食物及環境樣本的氚活度測量結果

Table 8. Measurement results of tritium activities in food and environmental samples in 2007

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 * Activity *	BRMP 範圍 # BRMP range #	單位 Unit
食米 Rice	內地 Mainland	2	0.1 – 0.1	0.1	< 1	Bq kg ⁻¹
牛奶(經消毒) Pasteurized milk	深圳 Shenzhen	3	0.9 – 4.4	2.1	< 6	Bq L ⁻¹
	沙頭角 Sha Tau Kok	1	-	3.8		
菜心 Choi sum	內地 Mainland	2	2.4 – 3.4	2.9	≤ 7.4	Bq kg ⁻¹
	本地 Local	4	0.4 – 4.4	3.0		
白菜 Pak choi	內地 Mainland	2	2.2 – 2.9	2.5	< 6	Bq kg ⁻¹
	本地 Local	4	0.4 – 4.0	2.1		
香蕉 Banana	內地 Mainland	4	0.6 – 1.4	1.0	< 3	Bq kg ⁻¹
荔枝 Lychee	內地 Mainland	1	-	3.3	< 4	Bq kg ⁻¹
雞 Chicken	內地 Mainland	2	0.8 – 1.4	1.1	≤ 2.2	Bq kg ⁻¹
	本地 Local	4	0.5 – 1.8	1.0		
鴨 Duck	內地 Mainland	4	0.2 – 1.8	0.9	≤ 3.5	Bq kg ⁻¹
牛肉 Beef	內地 Mainland	4	3.1 – 4.4	3.8	≤ 5.3	Bq kg ⁻¹
豬肝 Pig's liver	內地 Mainland	1	-	0.7	< 4	Bq kg ⁻¹
	本地 Local	1	-	2.3		
豬肉 Pork	內地 Mainland	1	-	1.3	< 4	Bq kg ⁻¹
	本地 Local	2	1.2 – 3.4	2.3		
大魚 <i>Aristichthys nobilis</i> (Big-head carp)	深圳 Shenzhen	3	0.4 – 1.8	1.0	< 2	Bq kg ⁻¹
瓜三 <i>Nemipterus japonicus</i> (Melon coat)	香港水域 Hong Kong Waters	2	0.1 – 0.5	0.3	< 2	Bq kg ⁻¹
牛鯪 <i>Platycephalus indicus</i> (Bartail flathead)	香港水域 Hong Kong Waters	2	0.2 – 0.6	0.4	< 2	Bq kg ⁻¹
牙帶 <i>Trichiurus haumela</i> (Hair tail)	香港水域 Hong Kong Waters	2	0.3 – 1.3	0.8	< 2	Bq kg ⁻¹
三點蟹 <i>Portunus sanguinolentus</i> (Three-spotted crab)	香港水域 Hong Kong Waters	4	0.1 – 1.6	0.7	< 2	Bq kg ⁻¹
赤米蝦 <i>Metapenaeopsis barbata</i> (Fire prawn)	香港水域 Hong Kong Waters	2	0.6 – 0.7	0.7	≤ 4.9	Bq kg ⁻¹
墨魚 <i>Sepia spp</i> (Cuttlefish)	香港水域 Hong Kong Waters	3	0.4 – 1.3	0.8	≤ 2.7 &	Bq kg ⁻¹
魷魚 <i>Loligo edulis</i> (Squid)	香港水域 Hong Kong Waters	2	1.2 – 1.4	1.3	< 3	Bq kg ⁻¹

表 8. (續)

Table 8. (cont'd)

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度濃度 * Activity Concentration *	BRMP 範圍 # BRMP range #	單位 Unit
蜆 <i>Tapes philippinarum</i> (Clam)	吐露港 Tolo Harbour	2	0.4 – 1.3	0.8	< 2	Bq kg ⁻¹
青口 <i>Perna viridis</i> (Green-lipped mussel)	長洲 Cheung Chau	2	0.4 – 1.6	1.0	< 2	Bq kg ⁻¹
	吐露港 Tolo Harbour	3	0.4 – 1.2	0.8		
	大亞灣 Daya Bay	3	0.1 – 1.6	1.0		
東風螺 <i>Babylonia formosae</i> (Gastropod)	香港水域 Hong Kong Waters	4	0.1 – 0.7	0.5	< 1	Bq kg ⁻¹
石莖 <i>Ulva lactuca</i> (Sea lettuce)	布袋澳 Po Toi O	2	0.8 – 1.1	1.0	< 2	Bq kg ⁻¹
漚苔 <i>Enteromorpha prolifera</i> (Sea hair)	吐露港 Tolo Harbour	1	-	1.8	< 5	Bq kg ⁻¹
半葉馬尾藻 <i>Sargassum hemiphylum</i> (Brown algae)	布袋澳 Po Toi O	2	0.3 – 1.5	0.9	< 2	Bq kg ⁻¹
濕沉積物 (降雨) Wet deposition (precipitation)	京士柏 King's Park	6	2.4 – 5.6	4.1	≤ 12	Bq L ⁻¹
	沙頭角 Sha Tau Kok	7	1.5 – 6.0	3.9		
	元五墳 Yuen Ng Fan	6	1.6 – 5.5	3.3		
總沉積物 Total deposition	京士柏 King's Park	6	47 – 699	390	≤ 2210 ^s	Bq m ⁻²
大氣水蒸氣 Water vapour in air	京士柏 King's Park	4	2 – 174	65	≤ 242	Bq m ⁻³
飲用水 (經處理) Drinking water (treated)	九龍配水管 Kowloon distribution tap	4	0.2 – 4.3	2.8	< 6	Bq L ⁻¹
	屯門配水管 Tuen Mun distribution tap	2	0.9 – 2.1	1.5		
	沙田濾水廠 Shatin Treatment Works	3	0.5 – 1.6	1.0		
	屯門濾水廠 Tuen Mun Treatment Works	2	1.7 – 1.9	1.8		
	油柑頭濾水廠 Yau Kom Tau Treatment Works	3	0.2 – 3.8	1.9		

表 8. (續)

Table 8. (cont'd)

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 * Activity *	BRMP 範圍 # BRMP range #	單位 Unit
飲用水 (未經處理) Drinking water (untreated)	萬宜水庫 High Island Reservoir	4	0.7 – 3.9	2.2	< 6	Bq L ⁻¹
	船灣淡水湖 Plover Cove Reservoir	3	0.2 – 0.7	0.6		
	木湖 B 抽水站 Muk Wu B Pumping Station	4	0.7 – 3.1	1.5		
	沙田濾水廠 Shatin Treatment Works	4	0.7 – 3.6	1.8		
	屯門濾水廠 Tuen Mun Treatment Works	3	0.2 – 3.6	1.5		
	油柑頭濾水廠 Yau Kom Tau Treatment Works	3	1.9 – 4.6	3.2		
地下水 Underground water	長康邨 Cheung Hong Estate	1	-	0.2	≤ 2.8	Bq L ⁻¹
	環翠邨 Wan Tsui Estate	1	-	0.5		
	華富邨 Wah Fu Estate	1	-	0.6		
	富山邨 Fu Shan Estate	1	-	0.5		

表 8. (續)

Table 8. (cont'd)

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 * Activity *	BRMP 範圍 # BRMP range #	單位 Unit
海水(上層) Sea water (upper)	橫瀾島 Waglan Island	1	-	4.4	< 6	Bq L ⁻¹
	赤洲 Port Island	1	-	5.3		Bq L ⁻¹
海水(中層) Sea water (middle)	橫瀾島 Waglan Island	1	-	3.7	< 6	Bq L ⁻¹
	大浪灣 Tai Long Wan	1	-	1.9		Bq L ⁻¹
	赤洲 Port Island	1	-	1.4		Bq L ⁻¹
海水(低層) Sea water (lower)	橫瀾島 Waglan Island	1	-	0.5	< 6	Bq L ⁻¹
	大浪灣 Tai Long Wan	1	-	3.5		Bq L ⁻¹
	赤洲 Port Island	1	-	3.1		Bq L ⁻¹
樽裝水(蒸餾水) Bottled water (Distilled)	本地 Local	4	0.2 – 4.9	2.8	---%	Bq L ⁻¹
樽裝水(礦泉水) Bottled water (Mineral)	本地 Local	2	2.3 – 5.8	4.1	---%	Bq L ⁻¹

- 註: * - 如有多過一個樣本發現可測量活度，此欄則報告平均值。
- 測量結果低於探測下限以“< xx”表示，xx 是該類測量的典型探測下限值。如只在部份樣本中探測到該放射性核素，結果將報告為“≤ xx”，xx 則為測量到的活度最大值。
& - 該樣本沒有在 BRMP 測量。這裡顯示的測量範圍包含一九九七年至二零零六年的樣本測量數值。
\$ - 該樣本沒有在 BRMP 測量。這裡顯示的測量範圍包含一九九六年至二零零六年的樣本測量數值。
% - 該樣本沒有在 BRMP 測量。該樣本由二零零七年起始被納入 ERMP 中。

- Note: * - The mean activity is reported if there are more than one samples with measurable activities.
- Results that are below the minimum detectable activity (MDA) are reported as “< xx” where xx is the typical MDA value for that type of measurement. When a particular radionuclide was detected only in some of the samples in a certain sample type, the results will be reported as “≤ xx” where xx is the maximum measured activity value.
& - The sample was not measured in BRMP. The indicated range refers to results from 1997 to 2006 sample measurement.
\$ - The sample was not measured in BRMP. The indicated range refers to results from 1996 to 2006 sample measurement.
% - The sample was not measured in BRMP. It has been included in the ERMP starting from 2007.

表 9. 二零零七年食物及環境樣本的銻-90 活度測量結果

Table 9. Measurement results of strontium-90 activities in food and environmental samples in 2007

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 * Activity *	BRMP 範圍 # BRMP range #	單位 Unit
食米 Rice	內地 Mainland	3	3 – 5	4	≤ 56	mBq kg ⁻¹
牛奶(經消毒) Pasteurized milk	深圳 Shenzhen	4	7 – 15	10	8 – 81	mBq L ⁻¹
	沙頭角 Sha Tau Kok	4	8 – 45	19		
菜心 Choi sum	內地 Mainland	3	55 – 77	64	≤ 266	mBq kg ⁻¹
	本地 Local	4	7 – 125	61		
白菜 Pak choi	內地 Mainland	4	62 – 119	87	≤ 570	mBq kg ⁻¹
	本地 Local	4	20 – 53	29		
荔枝 Lychee	內地 Mainland	1	-	3	5 – 14	mBq kg ⁻¹
柑橘 Mandarin	內地 Mainland	2	11 – 56	34	10 – 84	mBq kg ⁻¹
甘蔗 Sugar cane	內地 Mainland	1	-	1	2-14	mBq kg ⁻¹
雞 Chicken	本地 Local	1	-	2	≤ 37	mBq kg ⁻¹
大魚 <i>Aristichthys nobilis</i> (Big-head carp)	深圳 Shenzhen	3	7 – 9	8	≤ 94	mBq kg ⁻¹
	元朗 Yuen Long	3	3 – 8	5		
瓜三 <i>Nemipterus japonicus</i> (Melon coat)	香港水域 Hong Kong Waters	2	4 – 6	5	≤ 21	mBq kg ⁻¹
牛鯪 <i>Platycephalus indicus</i> (Bartail flathead)	香港水域 Hong Kong Waters	2	4 – 7	6	≤ 25	mBq kg ⁻¹
牙帶 <i>Trichiurus haumela</i> (Hair tail)	香港水域 Hong Kong Waters	2	4 – 8	6	≤ 49	mBq kg ⁻¹
蜆 <i>Tapes philippinarum</i> (Clam)	吐露港 Tolo Harbour	2	6 – 7	6	≤ 32	mBq kg ⁻¹
青口 <i>Perna viridis</i> (Green-lipped mussel)	長洲 Cheung Chau	1	-	10	≤ 47	mBq kg ⁻¹
	吐露港 Tolo Harbour	2	3 – 4	4		
石莖 <i>Ulva lactuca</i> (Sea lettuce)	布袋澳 Po Toi O	2	154 – 438 &	296	≤ 200	mBq kg ⁻¹
漚苔 <i>Enteromorpha prolifera</i> (Sea hair)	吐露港 Tolo Harbour	1	-	93	< 100	mBq kg ⁻¹
半葉馬尾藻 <i>Sargassum hemiphyllum</i> (Brown algae)	布袋澳 Po Toi O	2	787–1090	939	46 – 1440	mBq kg ⁻¹

表 9. (續)

Table 9. (cont'd)

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 * Activity *	BRMP 範圍 # BRMP range #	單位 Unit
大氣飄塵 Airborne particulate	元五墳 Yuen Ng Fan	1	-	1.2	≤ 5	μBq m ⁻³
濕沉積物(降雨) Wet deposition (precipitation)	京士柏 King's Park	1	-	2.2	≤ 39	mBq L ⁻¹
	元五墳 Yuen Ng Fan	1	-	4.6		
總沉積物 Total deposition	京士柏 King's Park	1	-	1.1	≤ 3.9 [§]	Bq m ⁻²
土壤(下層) Land soil (lower)	見表 1. Please see Table 1.	1	-	1.5	≤ 19.9	Bq kg ⁻¹

- 註:
- * - 如有多過一個樣本發現可測量活度，此欄則報告平均值。
 - # - 測量結果低於探測下限以“< xx”表示，xx 是該類測量的典型探測下限值。如只在部份樣本中探測到該放射性核素，結果將報告為“≤ xx”，xx 則為測量到的活度最大值。
 - & - 其中一個樣本的活度較 BRMP 同類樣本的測量結果偏高，詳情請參看第 3.1.7(c)節。
 - § - 該樣本沒有在 BRMP 測量。這裡顯示的測量範圍包含一九九六年至二零零六年的樣本測量數值。

- Note:
- * - The mean activity is reported if there are more than one samples with measurable activities.
 - # - Results that are below the minimum detectable activity (MDA) are reported as “< xx” where xx is the typical MDA value for that type of measurement. When a particular radionuclide was detected only in some of the samples in a certain sample type, the results will be reported as “≤ xx” where xx is the maximum measured activity value.
 - & - One of the samples had activity higher than the corresponding range of the same sample type in BRMP. Please refer to Section 3.1.7(c) for details.
 - § - The sample was not measured in BRMP. The indicated range refers to results from 1996 to 2006 sample measurement.

表 10. 二零零七年食物及環境樣本的鈾-239活度測量結果

Table 10. Measurement results of plutonium-239 activities in food and environmental samples in 2007

類別 Type	地點 Location	含有可測量活度的 樣本總數 Total no. of samples with measurable activity	範圍 Range	活度 [*] Activity [*]	BRMP 範圍 [#] BRMP range [#]	單位 Unit
潮間帶土(上層) Intertidal sediment (upper)	尖鼻咀 Tsim Bei Tsui	2	0.17 – 0.18	0.18	≤ 0.19	Bq kg ⁻¹
潮間帶土(下層) Intertidal sediment (lower)	尖鼻咀 Tsim Bei Tsui	1	-	0.13	≤ 0.14	Bq kg ⁻¹
海床沉澱物 Seabed sediment	龍蝦灣 Lung Ha Wan	1	-	0.49	≤ 0.57	Bq kg ⁻¹
	索罟灣 Picnic Bay	1	-	0.33		
	西區碇泊處 Western Anchorage	1	-	0.23		

註:

- * - 如有多過一個樣本發現可測量活度，此欄則報告平均值。
- # - 測量結果低於探測下限以“< xx”表示，xx 是該類測量的典型探測下限值。如只在部份樣本中探測到該放射性核素，結果將報告為“≤ xx”，xx 則為測量到的活度最大值。

Note:

- * - The mean activity is reported if there are more than one samples with measurable activities.
- # - Results that are below the minimum detectable activity (MDA) are reported as “< xx” where xx is the typical MDA value for that type of measurement. When a particular radionuclide was detected only in some of the samples in a certain sample type, the results will be reported as “≤ xx” where xx is the maximum measured activity value.

表 11. 二零零七年整體測量結果概要

Table 11. Overall summary of measurement results in 2007

途徑 Pathway	樣本類別 Sample Type	測量結果/ 參考數值 [#] Mea. results / ref. values ^{*,#}	碘-131 I-131	銫-137 Cs-137	氚 H-3	銣-90 Sr-90	釷-239 Pu-239	單位Unit
大氣 Atmospheric	大氣飄塵 Airborne Particulate	範圍 % Range % BRMP	< 10 ≤ 328	< 10 ≤ 10	--- [§]	1.2 ≤ 5	< 0.2 ≤ 0.2	μBq m ⁻³
地面 Terrestrial	食米 Rice	範圍 Range BRMP	< 0.1 ≤ 0.1	< 0.2 ≤ 0.9	0.1 ≤ 1	0.003 – 0.005 ≤ 0.056	---	Bq kg ⁻¹
	牛奶 Milk	範圍 Range BRMP	< 0.3 ^{&} ≤ 0.2	< 0.4 ^{&} ≤ 0.3	0.9 – 4.4 ≤ 6	0.007 – 0.045 0.008 – 0.081	---	Bq L ⁻¹
	蔬菜 Vegetable	範圍 Range BRMP	< 0.3 ≤ 0.3	< 0.4 ≤ 0.4	0.4 – 4.4 ≤ 7.4	0.007 – 0.125 ≤ 0.570	---	Bq kg ⁻¹
水 Aquatic	魚Fish	範圍 Range BRMP	< 0.07 ≤ 0.1	0.04 – 0.10 ≤ 0.2	0.1 – 1.8 ≤ 2	0.003 – 0.009 ≤ 0.094	< 0.002 ≤ 0.002	Bq kg ⁻¹
	經處理的 飲用水 Treated Drinking Water	範圍 Range BRMP	< 0.1 ≤ 0.1	< 0.1 ≤ 0.1	0.2 – 4.3 ≤ 6	---	---	Bq L ⁻¹

註:

- [#] - 測量結果低於探測下限以“< xx”表示，xx 是該類測量的典型探測下限值。如只在部份樣本中探測到該放射性核素，結果將報告為“≤ xx”，xx 則為測量到的活度最大值。
- [%] - 二零零七年各樣本類別的輻射測量結果範圍以粗體列印。
- [§] - “---”表示沒有在 ERMP 進行此項測量。
- [&] - 二零零七年牛奶樣本並沒有量度到人工放射性核素。由於測量容器與 BRMP 所用的有少許分別，因此二零零七年的典型探測下限值稍高於 BRMP 的數值。在二零零八年，將適量增加測量時間以達到 BRMP 時的典型探測下限值。

Notes:

- ^{*} - “mea.” – measurement; “ref.” – reference.
- [#] - Results that are below the minimum detectable activity (MDA) are reported as “< xx” where xx is the typical MDA value for that type of measurement. When a particular radionuclide was detected only in some of the samples in a certain sample type, the results will be reported as “≤ xx” where xx is the maximum measured activity value.
- [%] - The range of measurement results in 2007 for each of the listed sample types is shown in bold.
- [§] - Measurements not included under ERMP are reported as “---” in the table.
- [&] - There was no measurable artificial radionuclide detected in the milk samples in 2007. Due to a minor change in the measuring container from that used in the BRMP, the typical MDA value in 2007 was slightly higher than that of the BRMP. In 2008, the counting time will be suitably extended to attain the typical MDA value in BRMP.