

**For discussion**

**Legislative Council Panel on Security**

**Subcommittee on Police's Handling of Sex Workers  
and Searches of Detainees**

**Use of Technology in Conducting Custody Searches  
in the Hong Kong Police Force**

**Introduction**

At the meeting of the Subcommittee on Police's Handling of Sex Workers and Searches of Detainees held on 8 October 2009, Members requested information on the Police's consideration of the use of technology-based search equipment (TBSE) in conducting searches on detainees prior to their detention.

**Background**

2. To fulfil the Police's duty of care to the persons under their custody and to ensure the safety of others who might come into contact with the detainees, it is necessary for the Police to conduct searches on the detainees. Such searches seek to ensure that the detainee does not have, among other things, any unauthorised possession such as drugs or any material evidence to an offence, any weapon or article with which the detainee might injure himself or others, or use to effect an escape.

3. Whilst the scope of search is balanced against the need for police officers to carry out their duty of care and is determined on a case-by-case basis according to individual circumstances, there are suggestions for the Police to use the TBSE to conduct custody searches to better protect the human rights, privacy and dignity of detainees.

**The Police's Requirements**

4. In order to discharge the Police's duty of care as set out in paragraph 2 above, any TBSE considered for conducting custody search should have the capability to detect the following :

- (a) weapons or hard objects, especially sharp objects, made of metal, glass, wood, plastic, ceramic, etc. that can be used to

cause injury to a person including self-harm or commit a further crime; and

- (b) small objects such as dangerous drugs in the form of a tablet, capsule or straw or otherwise wrapped in small size.

5. In addition, the image, if any, generated by the TBSE should be able to assist the searching officer in identifying the object even when it may be concealed underneath the clothing, including underwear, worn by a detainee.

### **Examination of Available TBSE**

6. The Police have examined the following TBSE currently available in the market :

- (a) digital radiographic (X-ray) body scanner;
- (b) X-ray backscatter scanner;
- (c) millimetre wave body scanner;
- (d) walk-through metal detector; and
- (e) handheld metal detector / gloves.

### Digital radiographic (X-ray) body scanner

7. Available digital radiography often bases on filmless X-ray image capture technology. Most of the digital radiography body scanners use Flat Panel detectors which are also known as “direct” detectors. The image generated by the detectors is sent to a computer for display where the X-ray operator can review the image and check positioning and if desired, transmit the image to a storage device.

8. The advantages of a digital radiographic (X-ray) body scanner include :

- (a) high accuracy by direct penetration of X-ray into the human body;
- (b) immediate image preview and availability; and
- (c) capable of calibration to enhance overall display of the image.

9. The disadvantages of a digital radiographic (X-ray) body scanner include :

- (a) the X-ray body scanner cannot clearly identify low density objects like a sharpened pencil or small packets of drugs and money;
- (b) it would require a medically trained practitioner to operate by law;
- (c) possible health implications to searching officers operating the equipment and detainees to which the X-ray body scanner applies; and
- (d) there will be privacy concerns as the body figure, medical equipment such as colostomy bag or other forms of cosmetic surgery of persons scanned will be displayed fully on the X-ray images.

#### X-ray backscatter scanner

10. Unlike traditional X-ray machine which detects hard and soft materials by the variation in transmission of X-ray photons through human body, backscatter X-ray represents new technology which detects the radiation reflected from the target persons. Nevertheless, only one side of the target or human body can be scanned and revealed each time and it will take repeated scanning to provide the complete perspective.

11. This new technology is currently used to search large objects such as containers and trucks as it helps save time in performing a physical search otherwise required, and potentially allows a larger percentage of shipping to be checked for relatively larger size or quantity of smuggled items or weapons. The technology exists to scan areas as far as 50 metres away from the device, producing 3D images of people's bodies and the weapons they might be hiding.

12. The advantages of an X-ray backscatter scanner include :

- (a) the ability for deep penetration even up to 30 cm for steel;
- (b) easy penetration of clothing and clear detection of large metallic objects even when concealed under thick clothing or in secret parts; and
- (c) a high resolution image.

13. The disadvantages of an X-ray backscatter scanner are the same as those of the X-ray body scanner set out in paragraph 9 above, including low effectiveness when it comes to low-density objects and possible health implications, etc.

### Millimetre wave body scanner

14. Clothing and other organic materials become “translucent” in some extremely high frequency (millimetre wave) radio frequency bands. Objects concealed under a person’s clothing such as explosives and weapons reflect different levels of millimetre wave energy compared to the background of the human body and the millimetre wave receiver panel can detect such objects concealed.

15. The electromagnetic spectrum of millimetre waves can be found between radio waves and the range of infrared and visible light (Figure 1). Electromagnetic waves in this frequency range are safe for screening applications for persons.

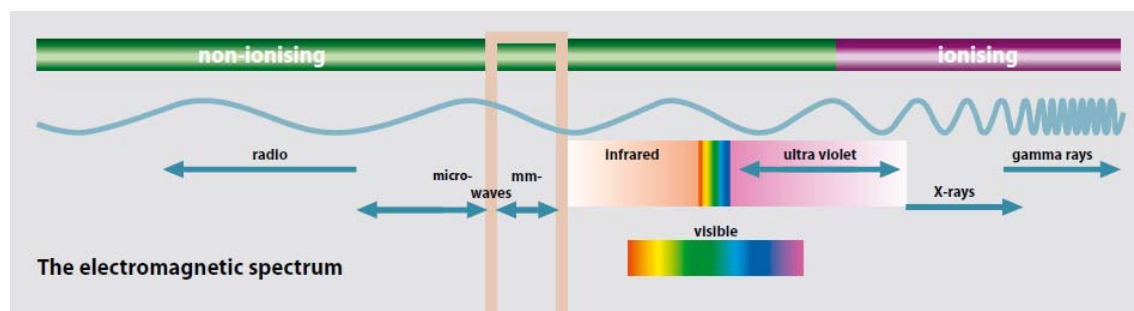


Figure 1 (Source: Smith Detection)

16. The advantages of a millimetre wave body scanner include :
- (a) no X-ray or other forms of radiation is generated during screening, hence no health implications to officers operating the equipment and persons being screened;
  - (b) easy operation by staff and easy to train up large number of staff; and
  - (c) direct real time image.
17. The disadvantages of a millimetre wave body scanner include :
- (a) inability to detect small-size objects, e.g. finger rings, paper clips and tablets;

- (b) blurred screening image; and
- (c) there will be privacy concerns as the body figure, medical equipment such as colostomy bag or other forms of cosmetic surgery of persons scanned will be displayed fully on the images.

#### Walk-through metal detector

18. A metal detector is a device which uses electromagnetic induction to detect metal. This is also the commonly used system at most international airports. Regular calibration of the archway is required to ensure stable detection performance.

19. The advantages of a walk-through metal detectors include :

- (a) no radiation is generated during screening;
- (b) easy installation albeit bulky by comparison to handheld metal detector;
- (c) high speed detection capability (about 15 milliseconds); and
- (d) the capability to detect large metal objects like knives and guns.

20. The disadvantages of a walk-through metal detector include :

- (a) it only detects metallic objects;
- (b) it is easily interfered with by metals that exist in the building environment such as ceiling with metallic materials and iron reinforcing bars in walls and floors; and
- (c) the need for regular calibration to ensure stable detection performance.

#### Handheld metal detector / gloves

21. The handheld metal detector uses the same technology as the walk-through metal detector but is much more handy and convenient to use. The advantages of a handheld metal detector include :

- (a) no radiation is generated during screening;

- (b) it generates a lower magnetic field which does not produce any interference;
- (c) as it can be used close to the human body, it has a high detection performance that can detect small metallic objects including razors and paper clips; and
- (d) convenient and easy operation.

22. The disadvantages of a handheld metal detector include :

- (a) it only detects metallic objects; and
- (b) the detectability and accuracy may be affected if not used properly.

23. A summary of the TBSE examined by the Police is at **Annex A**. Photos of the TBSE examined by the Police and respective sample images (if any) produced by the equipment are at **Annex B**.

### **Practices of Airports and Police Forces**

24. Walk-through metal detectors and handheld metal detectors / gloves are most widely used by international airports around the world, while some overseas airports use digital radiographic (X-ray) body scanner, X-ray backscatter scanner or millimetre wave body scanner to perform more intrusive searches based on intelligence or as secondary searches after the basic metal detectors have highlighted certain cases for attention. Based on the assessment of relevant authorities at the airports, physical search may be conducted after the first and the secondary equipment searches.

25. As for security checks at the Hong Kong International Airport, walk-through metal detector and handheld metal detectors are both used for checking passengers. If necessary, body searches are conducted after the basic metal detectors have highlighted certain cases for attention. Other technologies including X-ray and gas-chromatography technology are also used for screening luggage, not passengers.

26. As regards practices of overseas police forces, the Police conducted visits to police forces in Australia, Singapore and the United Kingdom to obtain information on their use of TBSE in searching persons detained in police detention facilities. None of the agencies visited use digital radiographic (X-ray) body scanner, X-ray backscatter scanner or

millimetre wave body scanner for conducting custody searches. Similar to the Police in Hong Kong, all of them deploy handheld metal detectors to screen the body of an arrested person before conducting physical search, while the Singapore Police Force uses walk-through metal detector as well as handheld metal detector in the equipment search. A summary of the TBSE used by the overseas police forces is at **Annex C**.

27. Since 1 October 2008, the Hong Kong Police have introduced the use of handheld metal detectors to assist officer to quickly scan the body of a detainee immediately before conducting a custody search. The handheld metal detector is very sensitive to metal objects and assists in detecting knives, guns and other metallic objects concealed by a detainee.

28. To explore the availability of other TBSE which may assist in the detection of non-metallic objects prior to custody searches, the Police attended live demonstrations of X-ray body scanners and millimetre wave body scanners in Singapore and the United Kingdom in May and June 2009 respectively. Officers also attended two demonstrations of the X-ray body scanner in Hong Kong in October 2009. The demonstrations and observations showed that both types of equipment failed to meet the essential requirements as set out in paragraphs 4 and 5 regarding accuracy or detection capability. In addition, we are concerned about the possible harmful impact caused by the X-ray technology to the health of detainees and police officers, as well as the privacy concerns arising from such images which instantly reveal to the searching officers the body figures and any surgical / medical equipment placed in the human body of the person being searched. Therefore, we do not consider it suitable to adopt X-ray scanners or millimetre wave scanners in custody searches conducted by the Police.

29. As regards the walk-through metal detector, we note that its function is similar to that of a handheld metal detector but its performance is less accurate than the latter. In the setting of a police station, we do not see the need to require “pre-screening” by a walk-through metal detector.

### **Recent Custody Search Statistics**

30. Since the introduction of the new search procedures on 1 July 2008, the Police have closely monitored the number of custody searches and imposed strict supervision on the conduct of high-level searches in particular. The use of handheld metal detectors has assisted police officers to detect metallic objects such as knives and blades

speedily. Moreover, with pre-screening using a metal detector, the police officers will be able to make better assessment of the scope of the subsequent custody search where he can focus the search on non-metallic items. As a result, we note the latest statistics as follows :

- (a) the number of Level III(c) searches involving full removal of underwear decreased significantly from 370 in January 2009 to 15 in September 2009. Further analysis on the nature of offences relating to these searches indicated that over 80% of such high-level searches were conducted on those detainees arrested for dangerous drugs related offences; and
- (b) the number of Level I searches which do not involve the removal of clothing increased from 2 749 in January 2009 to 3 801 in September 2009.

31. The above findings reflect that the police officers are now fully aware of the human rights obligations in respect of conducting custody searches, and that searches which involve the removal of underwear will only be conducted with strong justifications that would be clearly recorded in the Police's Communal Information System and accounted for.

### **Conclusion**

32. The Police's research into TBSE reveals that for the time being there is no TBSE readily available in the market that is able to fully satisfy the Police's requirements to the extent of and obviating the need for a physical search altogether. Handheld metal detector is the most practical TBSE available and the Police will continue to use it prior to conducting a custody search.

33. Notwithstanding the above, the Police will continue to monitor technological developments and liaise with other law enforcement agencies and overseas police forces with a view to exploring other TBSE that can be used in custody searches.

Security Bureau  
Hong Kong Police Force  
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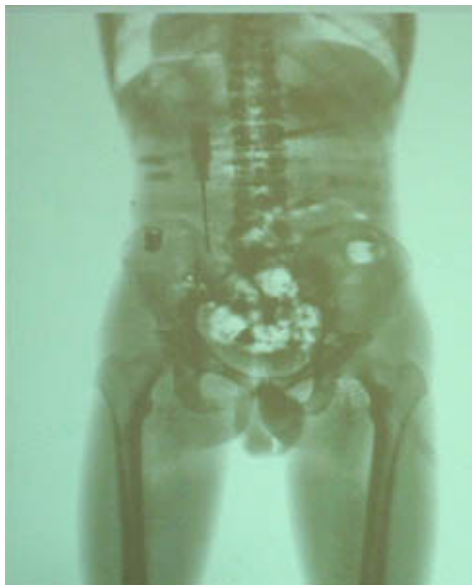
**Summary of Study on the Use of TBSE for Custody Searches**

<b>Instrument Features</b>	<b>Digital Radiographic (X-ray) Body Scanner</b>	<b>X-ray Backscatter Scanner</b>	<b>Millimetre Wave Body Scanner</b>	<b>Walk-through Metal Detector</b>	<b>Handheld Metal Detector / Gloves</b>
<b>Technology</b>	Low dose X-ray	Low dose X-ray	Millimetre-wave technology	Pulse Induction	Very low frequency or frequency oscillations
<b>X-Ray Dose per Inspection</b>	< 4.5 µSv	< 100 µSv	N/A	N/A	N/A
<b>Image Generating System</b>	X-Ray converter with high resolution semiconductor detector lines	X-Ray converter with high resolution semiconductor detector lines	Using flat panel reflect array direct millimetre wave energy to and from a person to generate an image	N/A	N/A
<b>Detection Capability</b>	Metallic and non-metallic objects up to American Wire Gauge <sup>Note</sup> (AWG) 38	Metallic and non-metallic objects up to AWG 38	Ceramics, metals, liquids, explosives, wood, plastics & narcotics	Metal only	Metal only
<b>Image Display</b>	Black and white, colour overlay	High-resolution colour monitor	Image is displayed on a single portrait monitor	N/A	N/A
<b>Inspection Time</b>	< 7 seconds	< 7 seconds	Real time images, allow pause, review and resume.	15 milliseconds	About 2 minutes
<b>Accuracy</b>	High accuracy – penetrate into human body; cannot clearly identify low density objects	Penetrate clothes; cannot clearly identify low density objects	Penetrate clothes; but difficult to detect small articles	Subject to the size of the metal	Pick up paper clips, razors and coins
<b>Estimated Unit Cost (HKD)</b>	\$2.5M	\$1.6M	\$1.6M	\$30,000 - \$80,000	Handheld metal detector: \$500-\$1,000 Metal detector gloves: \$3,000
<b>Legal Requirement</b>	Regulated by the Radiation Ordinance, Cap. 303	Regulated by the Radiation Ordinance, Cap. 303	Nil	Nil	Nil
<b>Examples of Locations of Application</b>	Mines and airports	Mines and airports	Airports	Airports and detention facilities	Airports and detention facilities

Note : “American Wire Gauge” a standardized system for the diameters of round electrically conducting wires. Increasing gauge numbers give decreasing wire diameters.

**Photos of TBSE Examined by Police and Images Produced by TBSE**

1. Digital Radiographic (X-ray) Body Scanner

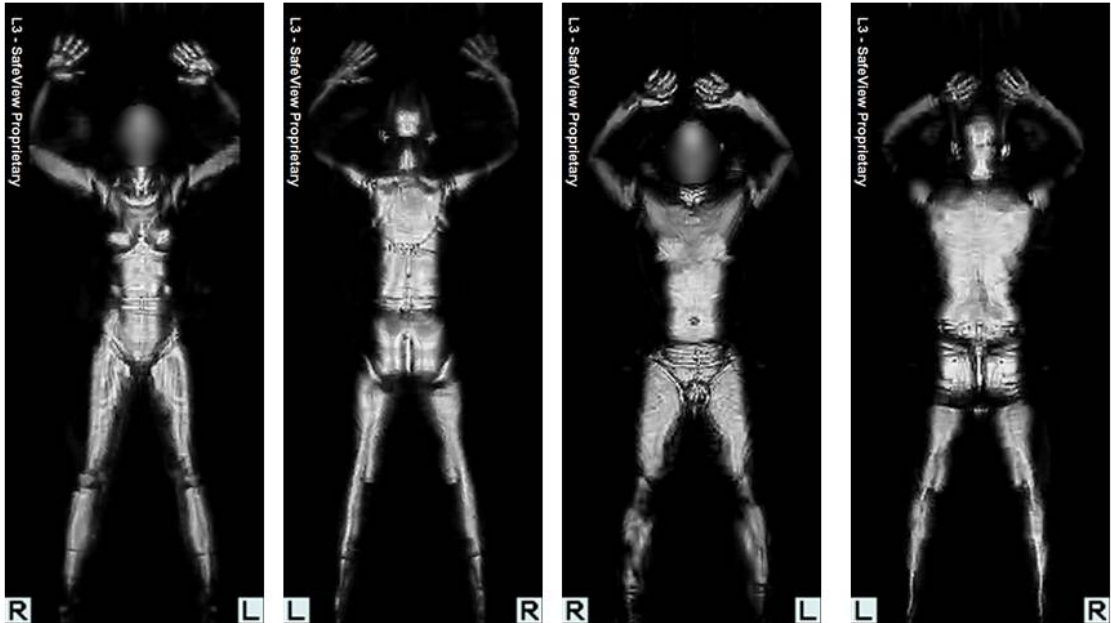


## 2. X-ray backscatter scanner



Source : Website of Wikipedia

### 3. Millimetre Wave Body Scanner



Source : Website of Transportation Security Administration, U.S.

#### 4. Walk-through Metal Detector



#### 5. Handheld Metal Detector / Gloves



**Technology-based Search Equipment Used by Overseas Police Forces**

		<b>Handheld Metal Detector</b>	<b>Walk-through Metal Detector</b>	<b>Others*</b>
<b>Australia</b>	New South Wales Police Force	✓	✗	✗
	Victoria Police Force	✓	✗	✗
<b>Singapore</b>	Singapore Police Force	✓	✓	✗
<b>England</b>	Thames Valley Police Force	✓	✗	✗
	West Yorkshire Police Force	✓	✗	✗
	Wiltshire Police Force	✓	✗	✗
	East Sussex Police Force	✓	✗	✗

\* denotes digital radiographic (X-ray) body scanner, X-ray backscatter scanner and millimetre wave body scanner