The Use of the Radioactive Isotopes for Cheating in Gambling - An Interaction Between Different Authorities

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INTRODUCTION

A case study of the use of radioactive isotope of ^{125}I as a radioactive marker for playing dice is presented. During a routine check at the border cross at Chingis Khan international airport, the detector was triggered, indicating the presence of a radioactive substance in the bag of an incoming passenger. Three gaming dice with elevated radioactivity were discovered and sent to the Radiation Control Laboratory for the further analysis. The laboratory analysis showed that the side with four points was painted with paint containing ^{125}I. Spectral analysis showed characteristic X-ray and Gamma ray lines and decay half-life time, found by comparing the intensities of two measurements done two months apart, prove that the paint contains the ^{125}I isotope.

This investigation became possible thanks to the comprehensive array of radiation monitoring systems working in 15 check points around the Mongolian borders to check passengers, cars and trains crossing the international border. The monitors are capable detecting neutron and gamma radiation. The case showed the importance of interactions in between different regulatory and law enforcement agencies.

Detector gates at:
a. International border b.Chingis Khan international airport

SAMPLES AND METHODS

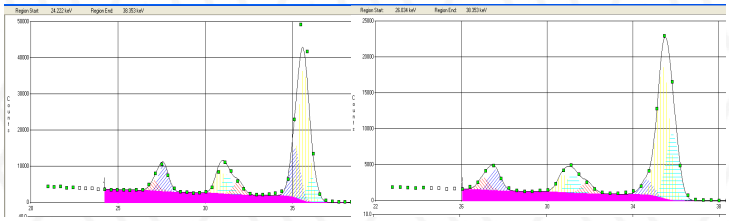
The CANBERRA gamma ray spectrometer, provided through TC project, with 20 keV LLD was used to detect both X-rays and gamma rays. The detector has a photopeak relative efficiency of about 40% and an energy resolution of 1.8 keV FWHM for the 1332 keV transition of ^{60}Co.

At the time of seizure, the total activity of three dices was more than 2 mSv/h near the surface. That means a person handling the dice for 10 hours could potentially get exposed to radiation exposure that are permitted for a radiation worker for a whole year.

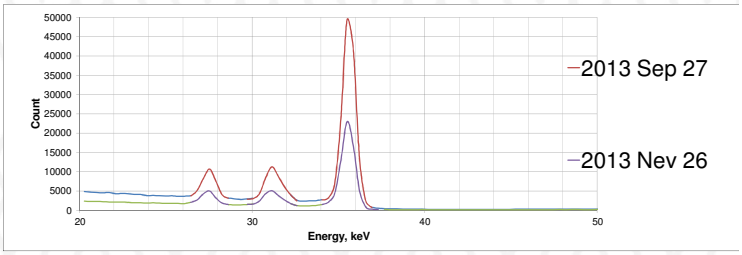
Characteristics of γ and X-rays lines used

Iodine-125		
Atomic number:	53	
Half-Life:	59.4 day	
Possible parents:		
Parent	Fraction (%)	Decay Mode
Xe-125	100%	e+b+
Decay products:		
Daughter	Fraction (%)	Decay Mode
Te-125	100%	e

Iodine-125		
Gamma emissions:		
Energy, keV	Intensity, %	Decay mode
35.49	6.7	e
X-Ray emissions:		
Energy, keV	Intensity, %	Assignment
27.47	75.7	Te Ka1
27.20	40.6	Te Ka2
30.99	13.2	Te Kb1
30.94	6.8	Te Kb3
31.70	3.8	Te Kb2



The characteristic spectrum taking on dices



RESULTS

Date of measurements	Energy, keV	Net photo peak count	Intensity, %	FWHM
2013 Sep 27	27.5	14761	1.02	0.671
	31.1	23055	0.83	0.685
	35.5	94457	0.29	0.701
2013 Nov 26	27.5	6028	1.49	0.67
	31.1	12218	1.24	0.685
	35.5	46161	0.43	0.701

I-125		
Half-Life, days	Nominal	59.4
	Found	60.6 ± 3.5

CONCLUSION

1. Characteristic X-ray lines 27.5 keV, 31.1 keV and γ line 35.5 keV for ^{125}I were detected. Half life found to be 60.6 ± 3.5 days and consistent with nominal value of 59.4 days for ^{125}I.
2. The dice handler during the 10 hours of a game could potentially get exposed to the radiation that is allowed for the radiation worker for whole year.
3. Considering that a similar case was detected in China[1] to mark a dice with paint containing Am-241 show that in the gambling world, players use marked dice to cheat.

REFERENCE 1. Radioactive Dice Seized in Xiamen Port (2010)

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