



GAMBLING COMMISSION (GREAT BRITAIN)

INDEPENDENT RNG CERTIFICATION REPORT

FOR

HILLSIDE (NEW MEDIA MALTA) PLC

**CERTIFICATE NUMBER:
80526HNPGB001**

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SECTION 1. GENERAL INFORMATION

License Holder:	Hillside (New Media Malta) PLC Festival Way Stoke on Trent ST1 5SH United Kingdom
Product Name:	Virtual Sports Supplier: Inspired Gaming (UK)
Product Description:	Virtual Sports RNG
Product Version:	PQ4000KU
RNG Type:	Hardware
Product Type:	Virtual Soccer Virtual Horse Racing (Flat/Sprints/Jumps) Virtual Greyhounds Virtual Speedway Virtual Motor Racing (Cars) Virtual Cycling Virtual Tennis
Platform Version:	Controller: 1.11.0.4; Results server: 2.7.0.0; Viewer: 1.0.0.8
Platform Supplier:	Inspired Gaming (UK) 1-2 Berners Street London United Kingdom W1T 3LA
Applicable Technical Standards:	Remote Gambling and Software Technical Standards (“RTS”) – August 2009, limited to RTS 7A, 7B and 7C – Revised to include testing results for Remote Gambling and Software Technical Standards (“RTS”) – October 2014, limited to RTS 7A, 7B and 7C
Testing Laboratory:	eGaming Compliance Services Limited, trading as ‘eCOGRA’ 2/F Berkeley Square House Berkeley Square London W1J 6 BD United Kingdom
Testing Laboratory Accreditation:	A UKAS accredited testing laboratory No. 4656 ISO/IEC 17025:2005, issued by the United Kingdom Accreditation Service
Test Engineers:	Sally da Silva

Test Supervisor: Gary Lupton-Smith
Testing Start Date: 15 July 2014
Certificate Date: 17 September 2014
Certificate Number: 80526HNPG001
Result of Testing: Compliant (Refer to Test Results under Schedule 1)

I hereby certify that the abovementioned RNG complies with the requirements of RTS 7A, RTS 7B and RTS 7C of the UKGC's Remote Gambling and Software Technical Standards – August 2009, as described in Section 4 of this report, and revised to include testing results for Remote Gambling and Software Technical Standards ("RTS") – October 2014, limited to RTS 7A, 7B and 7C.

Gary Lupton-Smith

A handwritten signature in black ink, appearing to read "Gary Lupton-Smith".

Technical Services Manager, eCOGRA

SECTION 2. INTRODUCTION

eCOGRA has been appointed by Hillside (New Media Malta) PLC to evaluate and certify the randomness of the output of the Random Number Generator (RNG) product (ComScire) supplied by Inspired Gaming (UK) Limited used in their Virtual Sports product against compliance with the relevant Remote gambling and software technical standards – August 2009, and revised to include testing results for Remote gambling and software technical standards (“RTS”) – October 2014,, and to highlight any exceptions identified during testing.

- Live: ComScire (QNG PQ4000KU-QWR40056)
- Backup: ComScire (QNG PQ4000KU-QWR40055)

This certification report highlights our key findings as a result of the evaluation conducted on the development/staging environment which is essentially the same as the live environment established at Hillside (New Media Malta) PLC operations during the period 15 July 2014 to 29 August 2014.

Live:



Backup:



SECTION 3. PRODUCT DESCRIPTION

The concept of the Inspired Virtual platform is to calculate the Fundamental Probabilities (FP's) of a set of Potential Outcomes (PO's) within a sporting context and then generate a CGI display of the outcome as a Virtual Sports event. The Potential Outcomes or Fundamental Probabilities for any given event are:

- In a race, the FP's are the Probabilities of each racer winning the race.
- In a football match, the FP's are the Probabilities of each score line.
- In a numbers game, the FP's are the Probabilities of a particular number being picked (which is the same for each number).

The software constructs these potential outcomes from a ranked pool of competitors (be they Virtual Horses, Greyhounds, Racing Cars, Speedway Riders or Football Teams) to create a series of Potential Outcomes with varying Fundamental Probabilities. The combined Fundamental Probabilities for every Potential Outcome of any given event must equal to 1, or 100%.

The concept of ranking the participants of the Virtual event is significant because it is from this ranking (i.e. this participant is better than that participant) that the software can offer an assortment of Potential Outcomes that reflect different but accurate Fundamental Probabilities.

Once the ranked participants have had Fundamental Probabilities assigned to them, the probabilities for each Potential Outcome are converted to Betting Prices. Prices are converted from the Fundamental Probabilities using the sum $1/FP$:

- E.g. If the Potential Outcome "Racer A To Win" has a FP of 0.25 (or 25% or 1 in 4) then the price of that Potential Outcome is 4/1 (or 5.00 in decimal, including the unit stake) because $1/0.25 = 4$.

After a Betting Price for a particular Outcome has been determined but before it is offered to the betting public, the Virtual Racing software allows the bookmaker to extract a pre-determined profit margin of their choosing (treated as a %) to each bet market (or Potential Outcome) on offer:

- E.g. A Potential Outcome with a price of 4/1 (or 5.00 in decimal) when treated with a 20% margin is reduced to 16/5 (or 4.2 in decimal) before it is published.

SECTION 4. GAMES DESCRIPTIONS

Virtual Sports is the collective name given to any events or markets offered under the Virtual Sports category. Virtual Sports are a computer generated presentation of a totally random number draw result where the outcomes are decided by numbers selected by a Random Number Generator (RNG).

All betting opportunities available on Virtual Sports at bet365 follow the same rules as the equivalent real sports they represent.

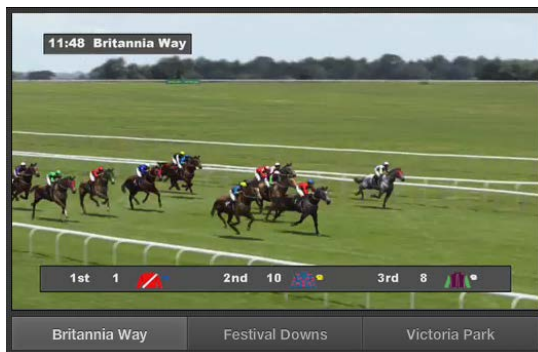
VIRTUAL SOCCER

The Virtual Soccer game comprises 2 teams playing a single game where 6 markets are available to wager on. These include 1X2 (W, D, L), Correct Score, Total Number of Goals, Double Chance, Under/Over 2.5 Number of Goals and Asian Handicap.



VIRTUAL HORSE RACING (FLAT/SPRINTS/JUMPS)

The Virtual Horse Racing game comprises 8 to 16 Runners and is available for flat racing, sprint racing and jump racing. There are 3 Markets available to wager on at each of the race types, which include Win, Forecast and Tricast.



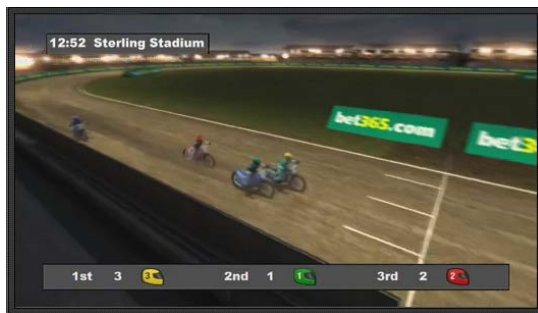
VIRTUAL GREYHOUNDS

The Virtual Greyhounds game comprises 6 Runners per race where 3 markets are available to wager on. These include Win, Forecast and Tricast.



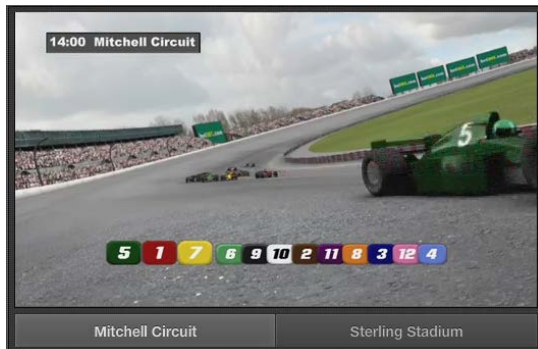
VIRTUAL SPEEDWAY

The Virtual Speedway game comprises 4 runners per race where 2 markets available to wager on. These include Win and Forecast.



VIRTUAL MOTOR RACING

The Virtual Motor Racing game comprises 12 cars per race where 3 markets are available to wager on. These include Win, Forecast and Tricast.



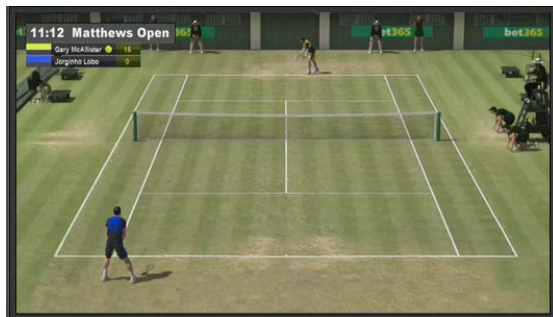
VIRTUAL CYCLING

The Virtual Cycling game comprises 6 to 9 cyclists per race where 3 markets are available to wager on. These include Win, Forecast and Tricast.



VIRTUAL TENNIS

The Virtual Tennis game comprises 2 players engaged in a single game where 3 markets are available to wager on. These include Win/Lose (player 1 or player 2 to win), Total Number of Points (4, 5, 6, 8, 10 & 12) and Correct Score.



SECTION 5. SOFTWARE AND HARDWARE

The scope of the RNG evaluation and certification applies solely to the RNG files, file versions and associated hashes provided in the tables below:

Random Number Generator

Description	File Version	Version Date	SHA1 Hash
Inspired DLL Versions	Viewer.exe 1.0.0.8,	20/03/2013	4fce2f03fe9700acefa9a14da6dc50bd
Results Server Plus	2.7.0.0	11/07/2012	5527536cbff1da40d24180719f3c9e72
Virtual Soccer	Football.dll 1.0.0.7	24/04/2013	05f5c36b6638333b5d81f34112c778c
Virtual Horse Racing	Horses.dll 1.0.0.11	20/03/2013	0825e0e5b794533c18cbbb7f14563fdd
Virtual Greyhounds	Dogs.dll 1.0.0.9	20/03/2013	28220f602cf6fe6b229e630854bac34b
Virtual Speedway	Speedway.dll 1.0.0.9	20/03/2013	19f2220219f0c99e62d37945d2a0171b
Virtual Motor Racing	MotorRacing.dll 1.0.0.11	20/03/2013	157ea771e48cb96089cff21f635cde2d
Virtual Cycling	Cycling.dll 1.0.0.7	20/03/2013	f43b6ee31090f17b09037d3a494384e3
Virtual Tennis	Tennis.dll 1.0.0.6	20/03/2013	03f8fcbf1b456517661d673534f3cc4c
Controller Versions	1.11.0.4 (horses, dogs, motor racing, speedway, football ,cycling) 1.11.0.5 (tennis)	27/07/2012	N/A
Bet365 Versions	VRResults 1.0.2.0	07/12/2012	N/A
VRService	1.0.1.0	06/06/2013	N/A

SECTION 6. REVIEW FINDINGS

The key findings of our evaluation of the RNG for compliance with the relevant sections of the Remote Gambling and Software Technical Standards – August 2009, are as follows:

RTS Requirement	RTS Implementation Guidance	Testing Applied	Assessment	Comments
RTS 7 – Generation of random outcomes <i>(Aim: To ensure that games and other virtual events operate fairly)</i>				
<p>RTS requirement 7A Random number generation and game results must be ‘acceptably random’. Acceptably random here means that it is possible to demonstrate to a high degree of confidence that the output of the RNG, game, lottery and virtual event outcomes are random, through, for example, statistical analysis using generally accepted tests and methods of analysis. Adaptive behaviour (i.e. a compensated game) is not permitted.</p> <p>Where lotteries use the outcome of other events external to the lottery, to determine the result of the lottery (for example, using numbers from the National Lottery) the outcome must be</p>	<p>RTS implementation guidance 7A</p> <p>a. RNG’s should be capable of demonstrating the following qualities:</p> <p>i. the output from the RNG is uniformly distributed over the entire output range and game, lottery, or virtual event outcomes are distributed in accordance with the expected/theoretical probabilities</p> <p>ii. the output of the RNG, game, lottery, and virtual event outcomes should be unpredictable, for example, for a software RNG it should be computationally infeasible to predict what the next number will be without complete knowledge of the algorithm and seed value</p> <p>iii. random number generation does not reproduce the same output stream (cycle), and that two instances of a RNG do not produce the same stream as each other (synchronise)</p> <p>iv. any forms of seeding and re-seeding used do not introduce predictability</p> <p>v. any scaling applied to the output of the random number generator maintains the qualities above.</p> <p>c. For games or virtual events that use the laws of physics to generate the outcome of the game (mechanical RNGs),</p>	<p>Refer to “1. Tests Performed” under “Schedule 1 – RNG Testing” below.</p>	<p>Compliant</p>	<p>Refer to schedule 1. and schedule 2. below</p>

RTS Requirement	RTS Implementation Guidance	Testing Applied	Assessment	Comments
<p>unpredictable and externally verifiable.</p>	<p>the mechanical RNG used should be capable of meeting the requirements in a. where applicable and in addition:</p> <ul style="list-style-type: none"> i. the mechanical pieces should be constructed of materials to prevent decomposition of any component over time (e.g. a ball shall not disintegrate) ii. the properties of physical items used to choose the selection should not be altered iii. players should not have the ability to interact with, come into physical contact with, or manipulate the mechanics of the game. d. Restricting adaptive behaviour prohibits automatic or manual interventions that change the probabilities of game outcomes occurring during play. Restricting adaptive behaviour is not intended to prevent games from offering bonus or special features that implement a different set of rules, if they are based on the occurrence of random events. 			
<p>RTS requirement 7B As far as is reasonably possible, games and events must be implemented fairly and in accordance with the rules and prevailing payouts, where applicable, as they are described to the customer.</p>	<p>RTS implementation guidance 7B</p> <ul style="list-style-type: none"> a. Games should implement the rules as described in the rules available to the customer before play commenced. b. The mapping of the random inputs to game outcomes should be in accordance with prevailing probabilities, pay tables, etc. c. When random numbers, scaled or otherwise, are received, e.g. following a game requesting a sequence of random numbers, they are to be used in the order in which they are received. For example, they may not be discarded due to adaptive behaviour. d. Numbers or sequences of numbers are not to be 	<p>Refer to “1. Tests Performed” under “Schedule 3 – Games Testing” below.</p>	<p>Compliant</p>	<p>Refer to schedule 3. below</p>

RTS Requirement	RTS Implementation Guidance	Testing Applied	Assessment	Comments
	discarded, unless they fall outside the expected range of numbers required by the virtual event – such an occurrence should result in an error being logged and investigated.			
<p>RTS requirement 7C Game designs or features that may reasonably be expected to mislead the customer about the likelihood of particular results occurring are not permitted, including substituting losing events with near-miss losing events and simulations of real devices that do not simulate the real probabilities of the device.</p>	<p>RTS implementation guidance 7C</p> <p>a. Where a virtual event simulates a physical device, the theoretical game probabilities should match the probabilities of the real device (for example, the probability of a coin landing heads must be 0.5 every time the coin is tossed).</p> <p>b. Where multiple physical devices are simulated the probabilities of each outcome should be independent of the other simulated devices.</p> <p>c. Games may not falsely display near-miss results, that is, the event may not substitute one losing outcome with a different losing outcome.</p> <p>d. Where the event requires a pre-determined layout (for example, hidden prizes on a map), the locations of the winning spots should not change during play, except as provided for in the rules of the game.</p> <p>e. Where games involve an element of skill, every outcome described in the virtual event rules or artwork should be possible, that is, the customer should have some chance of achieving an advertised outcome regardless of skill.</p> <p>f. Where a customer contributes to a jackpot pool, that customer should be eligible to win the jackpot whilst they are playing that game, in accordance with the game and jackpot rules.</p>	<p>Refer to “1. Tests Performed” under “Schedule 3 – Games Testing” below.</p>	<p>Compliant</p>	<p>Refer to schedule 3. below</p>

SCHEDULE 1. RNG TESTING

1. TESTS PERFORMED

The scope of the evaluation consisted of an assessment of the following components:

- Documentation;
- Source code review;
- Statistical and mathematical analysis;
- Seeding/re-seeding;
- RNG range; and
- RNG scaling.

The RNG evaluation was performed to ensure the following requirements were met:

- The data must be randomly generated;
- The data must be unpredictable; and
- The series cannot be reproduced.

The test suite used to perform the evaluation consisted of the following:

- Chi-Squared Tests
- Central Limits Theorem Tests
- Runs Tests
- Frequency Tests
- Wald-Wolfowitz Tests

2. TEST RESULTS

Numerous recognised statistical and mathematical tests were performed to certify the RNG operated in compliance with RTS 7A, RTS 7B and RTS 7C of the Remote Gambling and Software Technical Standards – August 2009 – Revised to include testing results for Remote Gambling and Software Technical Standards (“RTS”) – October 2014, limited to RTS 7A, 7B and 7C, including tests for probability (to ensure the expected occurrences), randomness (so that one cannot predict the following occurrence with any degree of certainty) and uniformity (to determine that each possible outcome is equally likely over the long-term). The acceptance criteria for the statistical tests should pass the tests at a 95% confidence level.

3. CONCLUSION

Our test results together with the individual Level 3 game testing certifications produced statistically acceptable outcomes that were free of any significant statistical bias or predictability. Based on the testing conducted, the RNG is compliant with the requirements of RTS 7A, RTS 7B and RTS 7C of the UKGC’s Remote Gambling and Software Technical Standards – August 2009 – Revised to include testing results for Remote Gambling and Software Technical Standards (“RTS”) – October 2014, limited to RTS 7A, 7B and 7C.

SCHEDULE 2. HARDWARE

The Inspired Gaming (UK) Limited software integrates with any random number generator of the client’s choosing but recommend using hardware-based true random number generators provided by ComScire who are a company based in Texas, USA.



We ascertained through visual inspection that Hillside (New Media Malta) PLC installed the ComScire device as per the below:

Name	Model	Serial Number	RNG NAME	Server	Usage
ComScire QNG	PQ4000KU	QWR40056	GI1APPRNG001SP0	GI1SPWVSS001SP0	Production
ComScire QNG	PQ4000KU	QWR40055	WP1APPRNG001SP0	WP1SPWVSS001SP0	Backup

ComScire PQ4000KU Hardware Random Number Generator Specifications:

- 4 Megabit per second – jumper selectable to 2 Mbps
- 1/0 bias and autocorrelation < 1 part per trillion
- Estimated quantum entropy – 0.999+ bits per output bit
- Estimated total entropy – (1 – ε) bits per bit, ε < 10-100
- Continuous hardware and software runtime testing with automatic halt
- Raw data streams and internal statistics available
- Shielded 1/16 inch aluminium enclosure
- Independent power regulation for generator circuitry
- USB 2.0 Full-Speed interface
- Bus powered – 90mA max from USB connection
- Non-condensing humidity
- Operating temperature – 0-50 Deg. C
- ActiveX connectivity
- Includes Drivers, interface and testing software
- Client software forward compatible from J1000KU and R2000KU

SCHEDULE 3. GAME TESTING

1. TESTS PERFORMED AND RESULTS

Analysis was performed on the game results supplied by Hillside (New Media Malta) PLC, Trading as bet365 on their Virtual Sports Games. The game data provided had the same structural format and was grouped for analysis. Statistical tests performed include standard distribution tests and Chi Squared testing. Distribution tests were performed to ensure that game outcome fitted the expected play output for each game with Chi Squared used to ensure uniform distribution of the random number output. Test results indicate that the game output conforms to the expected game play when randomness is considered and that the game output conforms to the expected probabilistic descriptions of randomness to levels of statistical significance, complying with regulations.

2. CONCLUSION

The results obtained from eCOGRA's Level 3 game testing confirm that the theoretical game probabilities operate in compliance with the applicable requirements of the regulations of the UK Gambling Commission.