



UK GAMBLING COMMISSION

INDEPENDENT RNG CERTIFICATION REPORT

FOR

BWIN.PARTY LIMITED

CERTIFICATE NUMBER:
60498BWNUKC

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SECTION 1. GENERAL INFORMATION

License Holder:	bwin.party Limited Suite 711, Europort, Gibraltar
Product Name:	Random Number Generator Supplier: bwin.party Limited
Product Description:	Java version 1.7.0_45
Product Version:	1.00
RNG Type:	Software
Scope of Testing:	Remote Gambling and Software Technical Standards ("RTS") – May 2016, Level 1 testing against RTS 7A
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:	Whitney Novela, Rachel Chinyoka
Test Supervisor:	Gary Lupton-Smith
Testing Start Date:	6 June 2016
Certificate Date:	15 June 2016
Certificate Number:	60498BWNUKC
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 of the UKGC's Remote Gambling and Software Technical Standards – May 2016, as described in Section 4 of this report.

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 bwin.party Limited to evaluate and certify the randomness of the output of the Random Number Generator (RNG) product (Java version 1.7.0_45) supplied by bwin.party Limited used in their casino product against compliance with the relevant UKGC's Remote Gambling and Software Technical Standards – May 2016, and to highlight any exceptions identified during testing.

- Java (Version 1.7.0_45)

This certification report highlights our key findings as a result of the evaluation conducted during the period

6 June 2016 to 15 June 2016.

SECTION 3. SOFTWARE DETAILS

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

Random Number Generator

File Name / Identifier	SHA1 Hash
srng.jar	EAD13247216F7928938A0E2226417720EDE18C32

Bwin.party Limited uses the Java utility, which is a software based RNG, to generate random numbers. Initial seed values are generated using the Mersenne Twister, and re-seeding occurs at configurable intervals.

SECTION 4. 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 – May 2016, 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>				
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. Where lotteries use the outcome of other events external to the lottery, to determine the result of	RTS implementation guidance 7A a. RNG’s should be capable of demonstrating the following qualities: 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 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 iii. random number generation does	Refer to “1. Tests Performed” under “Schedule 1 – RNG Testing” below.	Compliant	

the lottery (for example, using numbers from the National Lottery) the outcome must be unpredictable and externally verifiable.	not reproduce the same output stream (cycle), and that two instances of a RNG do not produce the same stream as each other (synchronise) iv. any forms of seeding and re-seeding used do not introduce predictability v. any scaling applied to the output of the random number generator maintains the qualities above. c. For games or virtual events that use the laws of physics to generate the outcome of the game (mechanical RNGs), the mechanical RNG used should be capable of meeting the requirements in a. where applicable and in addition: 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			
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	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.			
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SCHEDULE 1. RNG TESTING**1. TESTS PERFORMED**

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

- Documentation review;
- 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 of the Remote Gambling and Software Technical Standards – May 2016, 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. Tests results between 0-1% and 99-100% and considered fails. Suspect results between 1-5% and 95-99% are investigated further when all results for a range fall within this parameter. Results obtained for the Chi-Square tests are shown in the table below.

Tests Number	Test Range	p-value (1 Million sample)	p-value (3 Million sample)
1	0-33	0.9726	0.9261
2	0-36	0.4282	0.4399
3	0-51	0.7505	0.2623
4	Shuffled deck	0.5939	0.7586
5	0-66	0.8681	0.9536
6	0-99	0.2894	0.1158
7	0-500	0.9218	0.9794
8	0-999	0.9019	0.6807

3. CONCLUSION

Our test results 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 of the UKGC's Remote gambling and software technical standards – May 2016.