Test Report

Test report No.:
T-J0000-I0054

Date of issue:
2016-04-20

Applicant:	*Manufacturer:*
ELBET d.o.o., Bulevar Oslobođenja 166, 11040 Beograd, Serbia	ELBET d.o.o., Bulevar Oslobođenja 166, 11040 Beograd, Serbia

Product:	*Target device:*
ELBET Random Number Generator	ELBET Random Number Generator
Product type:	***Target device type:***
Pseudorandom number generator (PRNG)	Pseudorandom number generator (PRNG)

Jurisdiction:
SIQ Common Criteria
Test Criteria:
WN402 - Randomness tests. WN404 - Software analysis.

Pages (with annexes):	*Verdict (subject to conditions in Chapter 1):*
10	Pass
Test report type:	***Subject file No.:***
Platform	16000184001
Test group(s):	
Randomness, Software	
Remarks:	
N.A.	

Project responsible person [signature]:
Jasmina Soskić

Reviewed by [signature]:
Jan Klemenčič

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1 Conditions and settings for compliance with test criteria

N.A.

2 Protection against unauthorized access

N.A.

3 Gaming device general properties

General device design:	DLL file
Cabinet(s):	N.A.
Available player denominations:	N.A.
Available tokenizations:	N.A.
Supported communication protocols:	N.A.
Supported progressives:	N.A.
Minimum bet (credits):	N.A.
Maximum bet (credits):	N.A.

4 Annexes

Annex / Test group	Attached [yes/no]	Remark
Functional tests	No	/
Randomness tests	Yes	/
Payback ratio tests	No	/
Software analysis	Yes	/
Device specific tests	No	/
Other annexes	No	/

5 Previous / transferred test reports results

N.A.

6 Additional information

N.A.

7 Documentation references

Documentation provided by applicant:

- source files
- binary files
- documentation

8 Other test report references

N.A.

Test Report Annex: Randomness tests

Test report No.:
T-J0000-I0054
Checklist references:
T-J0000-I0054-WN402.xls
Test report references (if applicable):
N.A.
Internal procedure and issue:
WN202, 06 / 2013-01
Remarks:
N.A.
Date annex completed:
2016-04-20
Tested by [signature]:
Jasmina Soskić

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1 Randomness type

"ELBET Random Number Generator" uses software pseudo-random generator implementing Mersenne Twister algorithm.

2 Data acquisition method

Random numbers were obtained by specially designed software, logging the numbers generated by RNG.

3 Test results

FREQUENCY TEST (SIGMA TEST)

Direct outcomes:	PASS	Correlated outcomes:	PASS	
Set standard deviations:	3	σ		

	min	max	min	max
Direct outcomes:	-2,002	2,797	PASS	PASS
Correlated outcomes:	-1,907	2,257	PASS	PASS

CHI-SQUARE TEST

Direct outcomes:	PASS	Correlated outcomes:	PASS	
Set confidence level (CL):	95	%		

Limits:

Degrees of freedom	DF =	99	
χ - max	α =	0,025	**128,422**	97,50%
χ - min	α =	0,975	**73,361**	2,50%

χ2 :	**93,170**	35,38%
χ2 (w):	**95,602**	42,20%

RUNS TEST

Direct outcomes: PASS

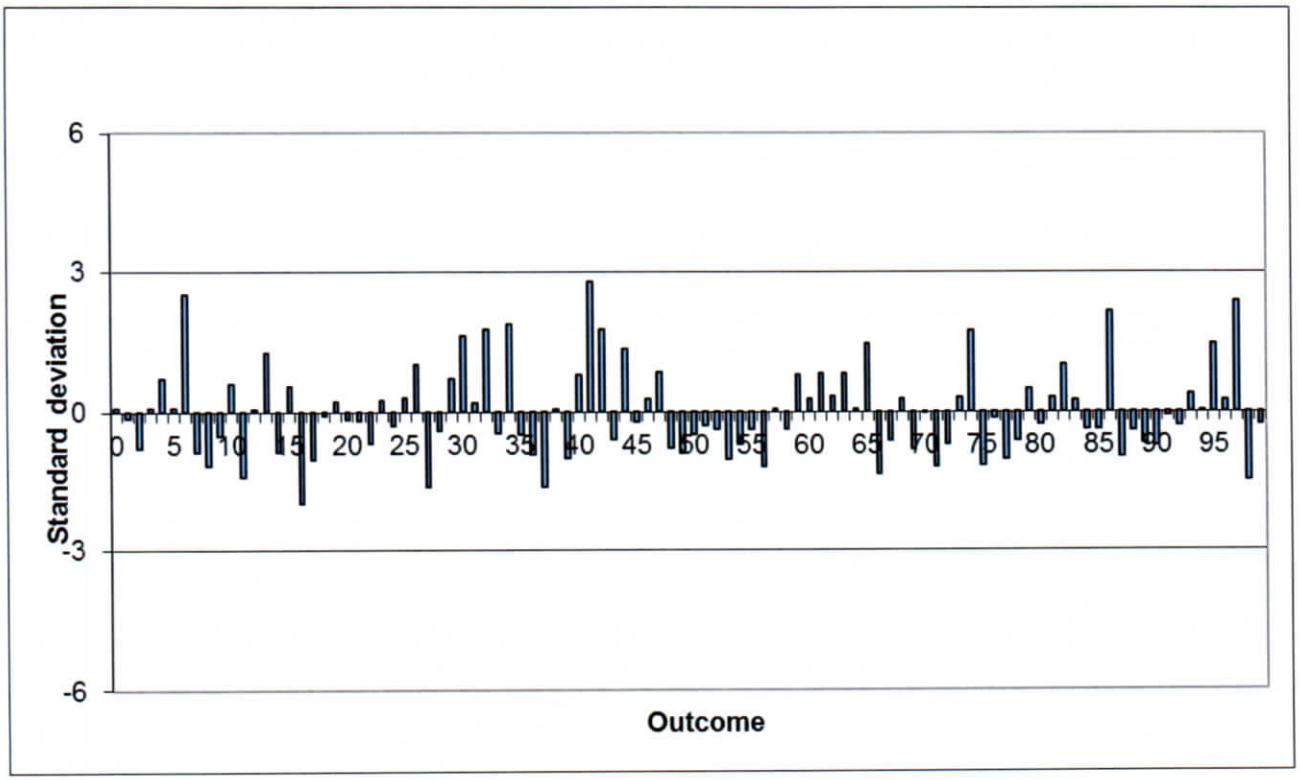
Set confidence level (CL):	95	%

Above average:	N1 (1)	49914
Below average:	N2 (-1)	50086
Number of runs:	R	49948

Limits	**1,96**
E(R)	50000,85
σ(R)	158,11
z	-0,33

Direct outcomes					Correlated outcomes				
x_i	***k_i***	**χ2**	**3σ**	***s_i***	***w_i***	***k(w_i)***	**χ2**	**3σ**	***s_i***
0	1003	0,0090	PASS	0,0953	0	1033	1,0897	PASS	1,0491
1	996	0,0160	PASS	-0,1271	1	1022	0,4844	PASS	0,6995
2	975	0,6250	PASS	-0,7946	2	986	0,1957	PASS	-0,4446
3	1003	0,0090	PASS	0,0953	3	962	1,4433	PASS	-1,2074
4	1023	0,5290	PASS	0,7310	4	972	0,7834	PASS	-0,8896
5	1003	0,0090	PASS	0,0953	5	1016	0,2563	PASS	0,5088
6	1079	6,2410	PASS	2,5108	6	985	0,2247	PASS	-0,4764
7	973	0,7290	PASS	-0,8581	7	996	0,0159	PASS	-0,1268
8	963	1,3690	PASS	-1,1759	8	1001	0,0010	PASS	0,0321
9	984	0,2560	PASS	-0,5085	9	995	0,0249	PASS	-0,1586
10	1019	0,3610	PASS	0,6039	10	948	2,7030	PASS	-1,6524
11	955	2,0250	PASS	-1,4302	11	970	0,8994	PASS	-0,9531
12	1002	0,0040	PASS	0,0636	12	948	2,7030	PASS	-1,6524
13	1040	1,6000	PASS	1,2713	13	968	1,0234	PASS	-1,0167
14	973	0,7290	PASS	-0,8581	14	961	1,5202	PASS	-1,2392
15	1018	0,3240	PASS	0,5721	15	978	0,4836	PASS	-0,6989
16	937	3,9690	PASS	-2,0023	16	1012	0,1442	PASS	0,3817
17	967	1,0890	PASS	-1,0488	17	985	0,2247	PASS	-0,4764
18	998	0,0040	PASS	-0,0636	18	980	0,3996	PASS	-0,6353
19	1007	0,0490	PASS	0,2225	19	998	0,0040	PASS	-0,0632
20	995	0,0250	PASS	-0,1589	20	1030	0,9006	PASS	0,9538
21	994	0,0360	PASS	-0,1907	21	1026	0,6765	PASS	0,8267
22	979	0,4410	PASS	-0,6674	22	996	0,0159	PASS	-0,1268
23	1008	0,0640	PASS	0,2543	23	984	0,2557	PASS	-0,5082
24	991	0,0810	PASS	-0,2860	24	1004	0,0161	PASS	0,1274
25	1010	0,1000	PASS	0,3178	25	1029	0,8416	PASS	0,9220
26	1032	1,0240	PASS	1,0170	26	997	0,0089	PASS	-0,0950
27	948	2,7040	PASS	-1,6527	27	951	2,4000	PASS	-1,5570
28	987	0,1690	PASS	-0,4132	28	995	0,0249	PASS	-0,1586
29	1023	0,5290	PASS	0,7310	29	1018	0,3244	PASS	0,5724
30	1051	2,6010	PASS	1,6209	30	981	0,3606	PASS	-0,6035
31	1006	0,0360	PASS	0,1907	31	982	0,3236	PASS	-0,5718
32	1056	3,1360	PASS	1,7798	32	970	0,8994	PASS	-0,9531
33	986	0,1960	PASS	-0,4449	33	1040	1,6008	PASS	1,2716
34	1059	3,4810	PASS	1,8751	34	1049	2,4020	PASS	1,5576
35	985	0,2250	PASS	-0,4767	35	990	0,0998	PASS	-0,3175
36	971	0,8410	PASS	-0,9217	36	958	1,7632	PASS	-1,3345
37	948	2,7040	PASS	-1,6527	37	1035	1,2257	PASS	1,1127
38	1002	0,0040	PASS	0,0636	38	956	1,9351	PASS	-1,3981
39	968	1,0240	PASS	-1,0170	39	980	0,3996	PASS	-0,6353
40	1025	0,6250	PASS	0,7946	40	987	0,1687	PASS	-0,4129
41	1088	7,7440	PASS	2,7968	41	1030	0,9006	PASS	0,9538
42	1056	3,1360	PASS	1,7798	42	1051	2,6020	PASS	1,6212
43	981	0,3610	PASS	-0,6039	43	982	0,3236	PASS	-0,5718
44	1043	1,8490	PASS	1,3666	44	1026	0,6765	PASS	0,8267
45	993	0,0490	PASS	-0,2225	45	1004	0,0161	PASS	0,1274
46	1009	0,0810	PASS	0,2860	46	1058	3,3652	PASS	1,8437
47	1027	0,7290	PASS	0,8581	47	983	0,2887	PASS	-0,5400

48	975	0,6250	PASS	-0,7946	48	973	0,7285	PASS	-0,8578
49	972	0,7840	PASS	-0,8899	49	994	0,0359	PASS	-0,1904
50	985	0,2250	PASS	-0,4767	50	1001	0,0010	PASS	0,0321
51	991	0,0810	PASS	-0,2860	51	961	1,5202	PASS	-1,2392
52	988	0,1440	PASS	-0,3814	52	1007	0,0491	PASS	0,2228
53	967	1,0890	PASS	-1,0488	53	1002	0,0040	PASS	0,0639
54	978	0,4840	PASS	-0,6992	54	1020	0,4004	PASS	0,6360
55	988	0,1440	PASS	-0,3814	55	968	1,0234	PASS	-1,0167
56	962	1,4440	PASS	-1,2077	56	1050	2,5010	PASS	1,5894
57	1002	0,0040	PASS	0,0636	57	1028	0,7846	PASS	0,8902
58	988	0,1440	PASS	-0,3814	58	1027	0,7295	PASS	0,8584
59	1025	0,6250	PASS	0,7946	59	991	0,0808	PASS	-0,2857
60	1009	0,0810	PASS	0,2860	60	991	0,0808	PASS	-0,2857
61	1026	0,6760	PASS	0,8263	61	1021	0,4414	PASS	0,6677
62	1011	0,1210	PASS	0,3496	62	989	0,1208	PASS	-0,3493
63	1026	0,6760	PASS	0,8263	63	979	0,4406	PASS	-0,6671
64	1002	0,0040	PASS	0,0636	64	1007	0,0491	PASS	0,2228
65	1046	2,1160	PASS	1,4620	65	1005	0,0251	PASS	0,1592
66	957	1,8490	PASS	-1,3666	66	986	0,1957	PASS	-0,4446
67	980	0,4000	PASS	-0,6356	67	984	0,2557	PASS	-0,5082
68	1009	0,0810	PASS	0,2860	68	983	0,2887	PASS	-0,5400
69	974	0,6760	PASS	-0,8263	69	1067	4,4904	PASS	2,1297
70	999	0,0010	PASS	-0,0318	70	1038	1,4448	PASS	1,2080
71	962	1,4440	PASS	-1,2077	71	981	0,3606	PASS	-0,6035
72	978	0,4840	PASS	-0,6992	72	1071	5,0425	PASS	2,2569
73	1010	0,1000	PASS	0,3178	73	1001	0,0010	PASS	0,0321
74	1055	3,0250	PASS	1,7480	74	986	0,1957	PASS	-0,4446
75	963	1,3690	PASS	-1,1759	75	1014	0,1963	PASS	0,4453
76	996	0,0160	PASS	-0,1271	76	960	1,5992	PASS	-1,2710
77	967	1,0890	PASS	-1,0488	77	1067	4,4904	PASS	2,1297
78	980	0,4000	PASS	-0,6356	78	1069	4,7624	PASS	2,1933
79	1016	0,2560	PASS	0,5085	79	1061	3,7223	PASS	1,9390
80	992	0,0640	PASS	-0,2543	80	981	0,3606	PASS	-0,6035
81	1010	0,1000	PASS	0,3178	81	992	0,0638	PASS	-0,2539
82	1032	1,0240	PASS	1,0170	82	1057	3,2502	PASS	1,8119
83	1008	0,0640	PASS	0,2543	83	987	0,1687	PASS	-0,4129
84	988	0,1440	PASS	-0,3814	84	983	0,2887	PASS	-0,5400
85	988	0,1440	PASS	-0,3814	85	965	1,2243	PASS	-1,1121
86	1068	4,6240	PASS	2,1612	86	1017	0,2893	PASS	0,5406
87	969	0,9610	PASS	-0,9852	87	1012	0,1442	PASS	0,3817
88	987	0,1690	PASS	-0,4132	88	1034	1,1567	PASS	1,0809
89	979	0,4410	PASS	-0,6674	89	1033	1,0897	PASS	1,0491
90	977	0,5290	PASS	-0,7310	90	961	1,5202	PASS	-1,2392
91	998	0,0040	PASS	-0,0636	91	1021	0,4414	PASS	0,6677
92	991	0,0810	PASS	-0,2860	92	1017	0,2893	PASS	0,5406
93	1012	0,1440	PASS	0,3814	93	965	1,2243	PASS	-1,1121
94	1001	0,0010	PASS	0,0318	94	985	0,2247	PASS	-0,4764
95	1046	2,1160	PASS	1,4620	95	1040	1,6008	PASS	1,2716
96	1008	0,0640	PASS	0,2543	96	981	0,3606	PASS	-0,6035
97	1075	5,6250	PASS	2,3837	97	990	0,0998	PASS	-0,3175
98	953	2,2090	PASS	-1,4938	98	940	3,5988	PASS	-1,9066
99	992	0,0640	PASS	-0,2543	99	948	2,7030	PASS	-1,6524



4 Test summary

Randomness tests	Verdict
Frequency test	PASS
Chi-square test	PASS
Serial correlation test	PASS
Runs test	PASS

Test Report Annex: Software analysis

Test report No.:
T-J0000-I0054
Checklist references:
T-J0000-I0054-WN404.xls
Test report references (if applicable):
N.A.
Internal procedure and issue:
WN204, 06 / 2014-09
Remarks:
N.A.
Date annex completed:
2016-04-20
Tested by [signature]:
Jasmina Soskić Jasmina Soskić

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1 Software identification

Software version(s): N.A.

Software components:

Manufacturer, product ID	Description, function	Media, type	Position, circuit	Size	ID code (SHA1)	ID code (MD5)
ELBET, Elbet_RNG_CLR.dll	Random number generator library	HDD	PC	7,00 KB	eaa1e72bb46eb6d88f063817217cf5a31134bf26	2deefe4514fba0d839f1b4bae820df37

2 Test summary

Software analysis for the "ELBET Random number Generator" was performed:

- Source code analysis:
  - Jurisdiction independent tests: software review,
- Binary code authentication,
- Archiving and depositing.

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