Evaluation results

DPA contest v2

October 2011

1 Introduction

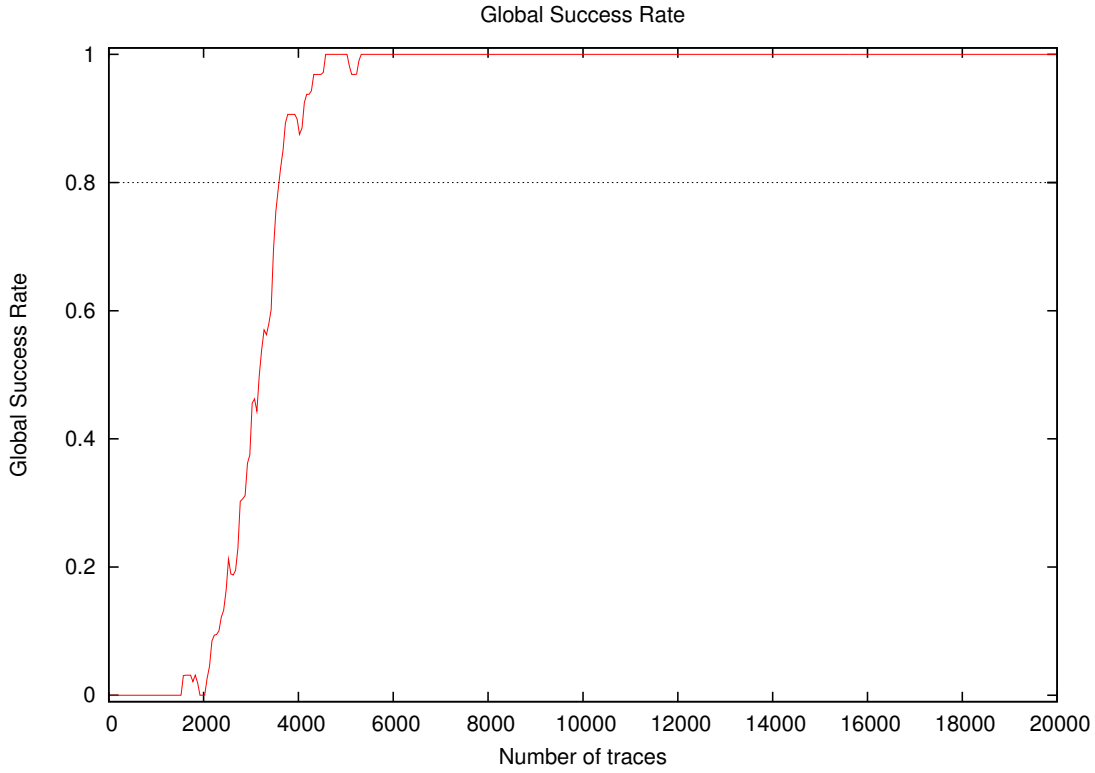
1.1 About the attack

- **Attack Name:** Stochastic approach v2
- **Sender/Team:** Annelie Heuser, Michael Kasper, Werner Schindler, Marc Stöttinger
- **Institution:** CASED (research group CASCADE); TU Darmstadt, Fraunhofer SIT, Bundesamt für Sicherheit in der Informationstechnik (BSI)
- **Language:** Matlab
- **Attacked subkey:** 10

1.2 About the evaluation

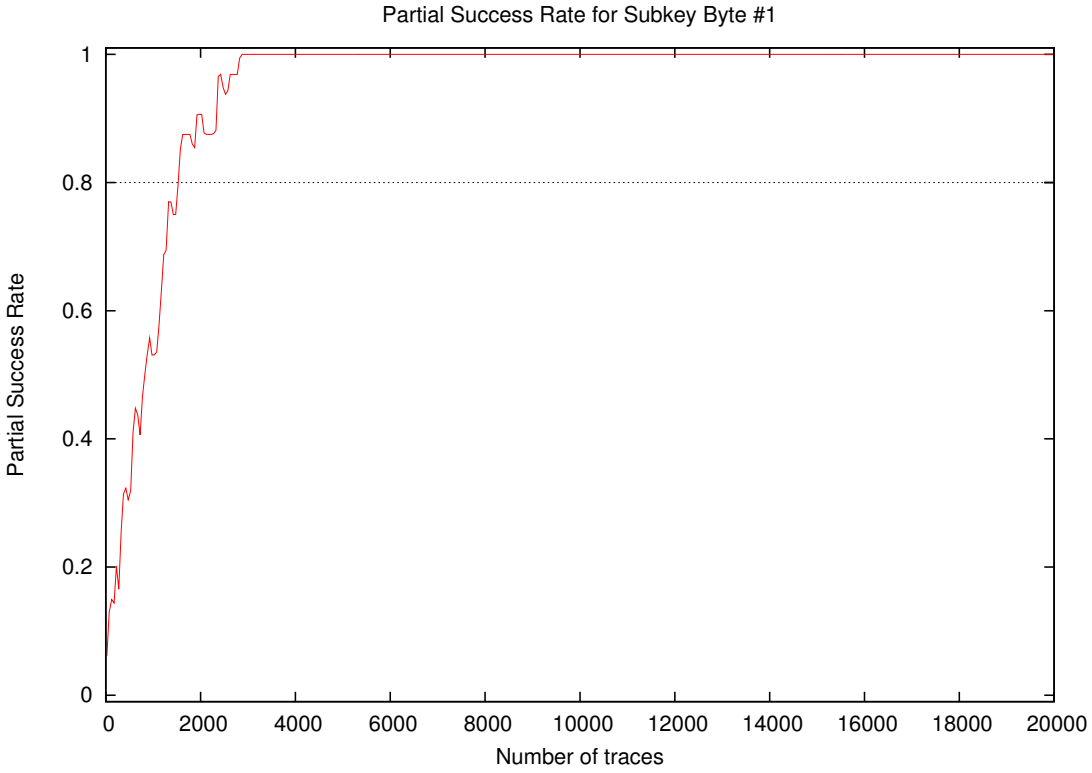
- **Date of evaluation:** October 2011

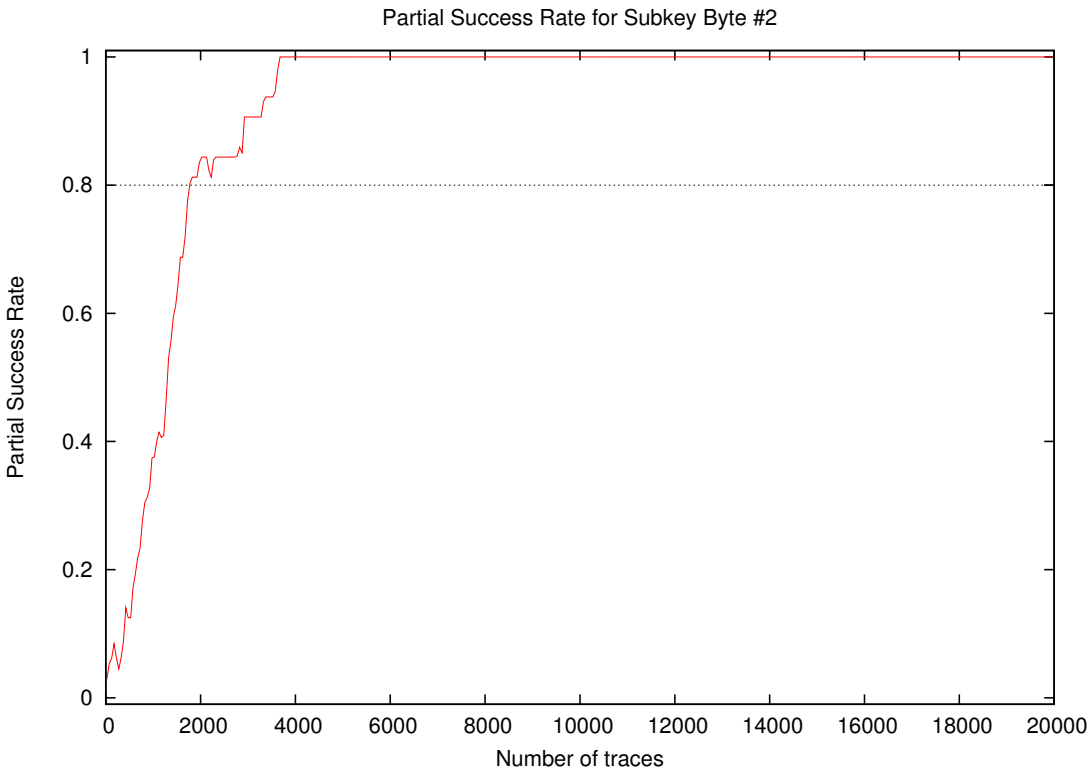
2 Global Success Rate

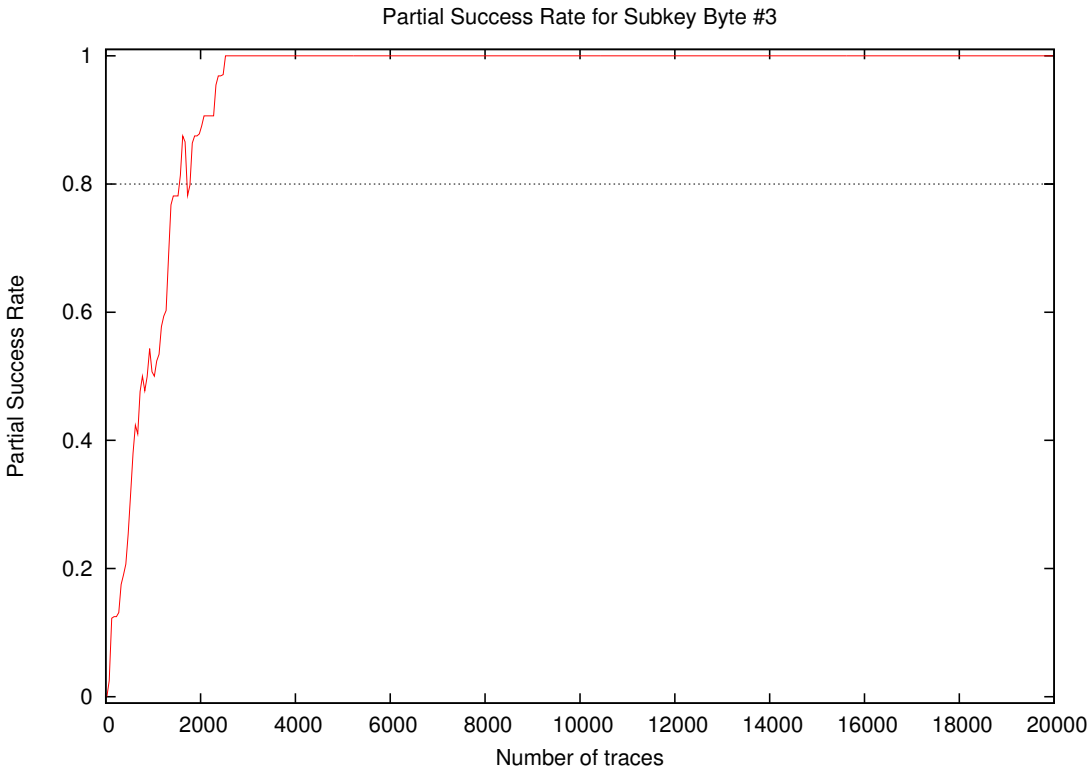


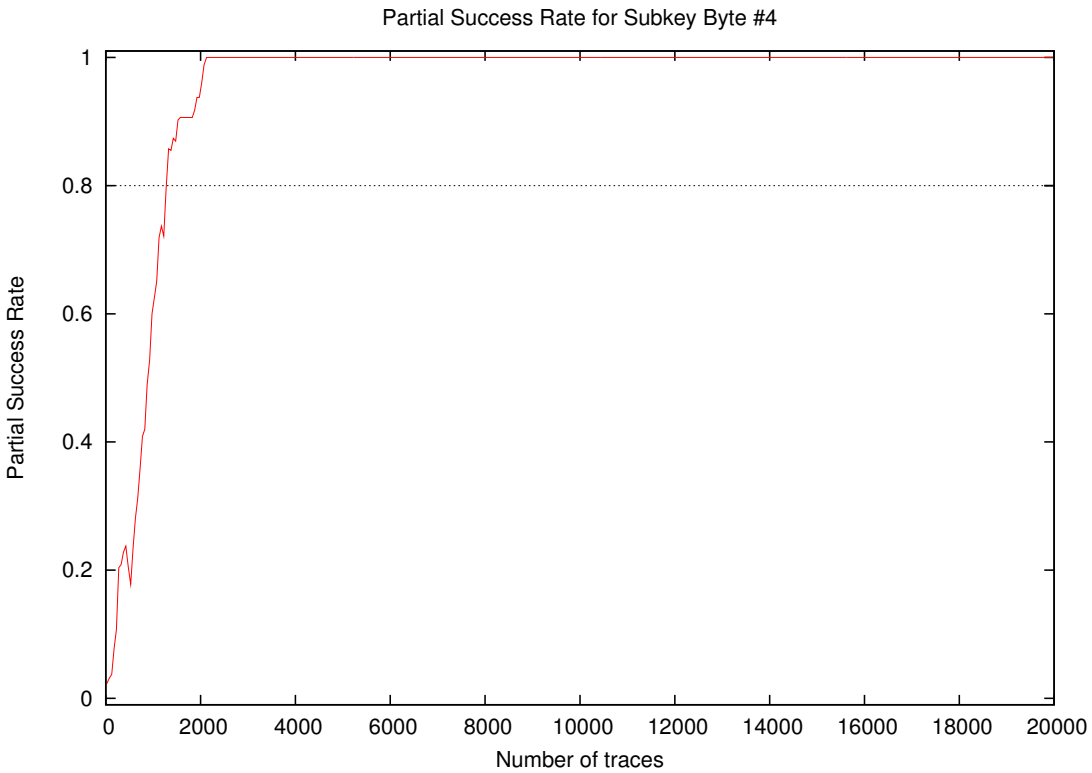
Number of traces	Global Success Rate
10	0.00
20	0.00
30	0.00
40	0.00
50	0.00
100	0.00
200	0.00
300	0.00
400	0.00
500	0.00
1000	0.00
2000	0.00
3000	0.44
4000	0.88
5000	1.00
10000	1.00
15000	1.00
20000	1.00

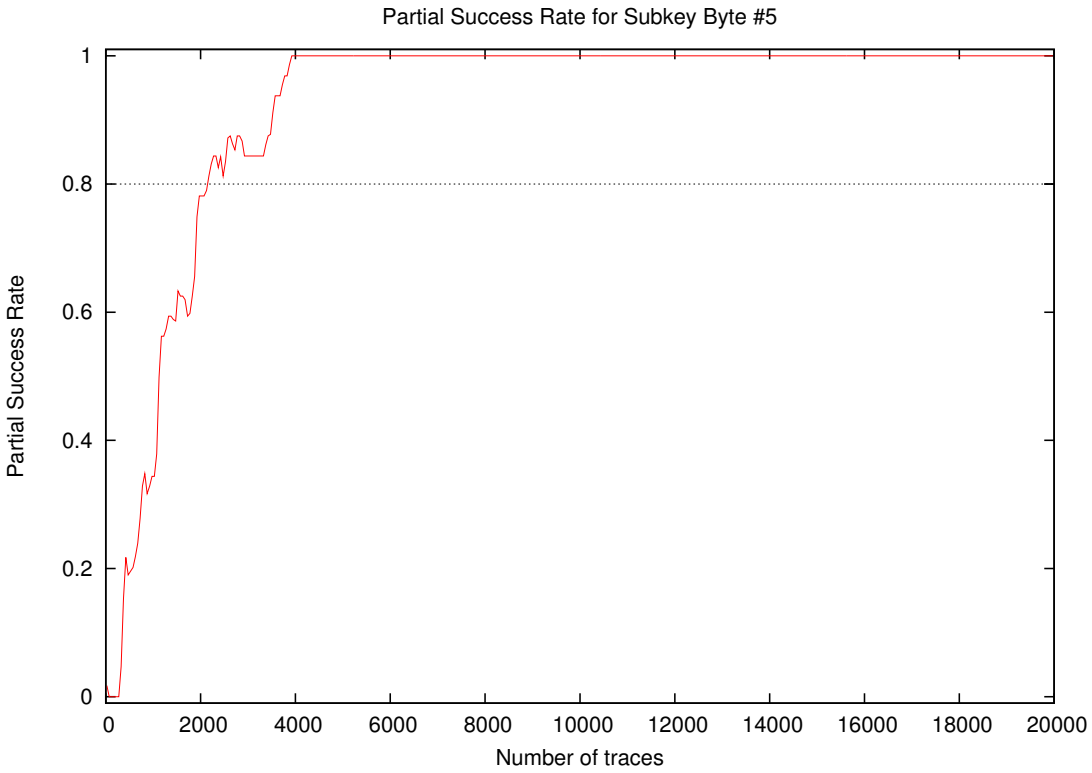
3 Partial Success Rate

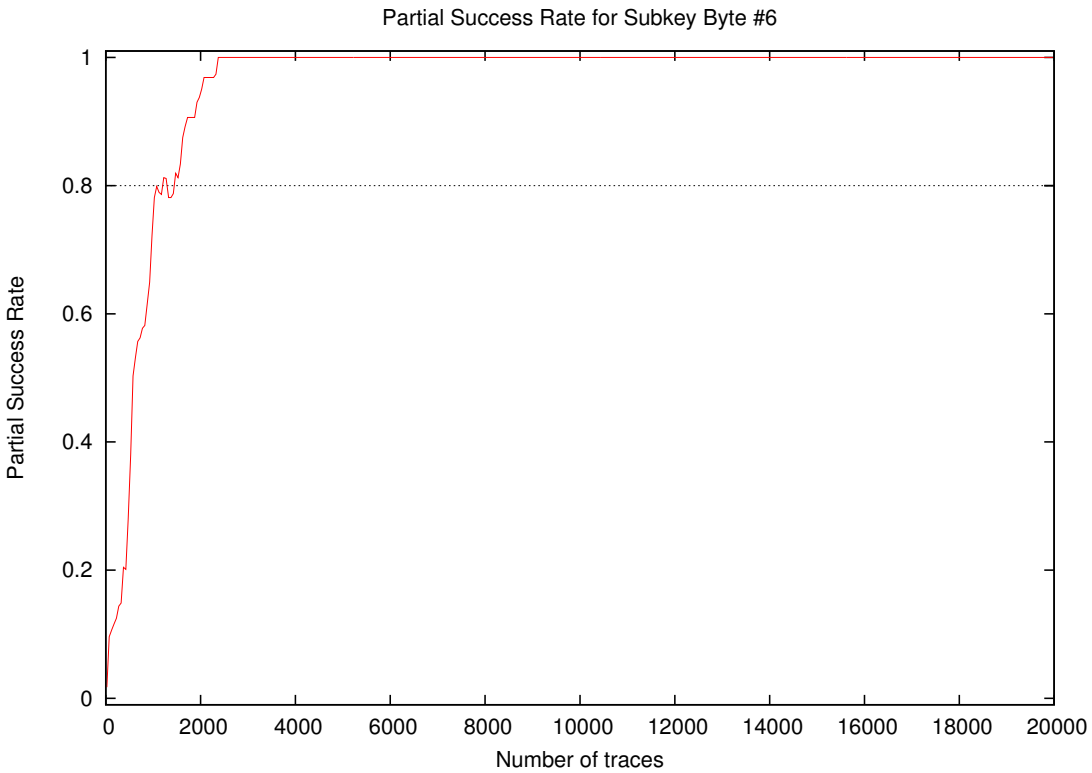


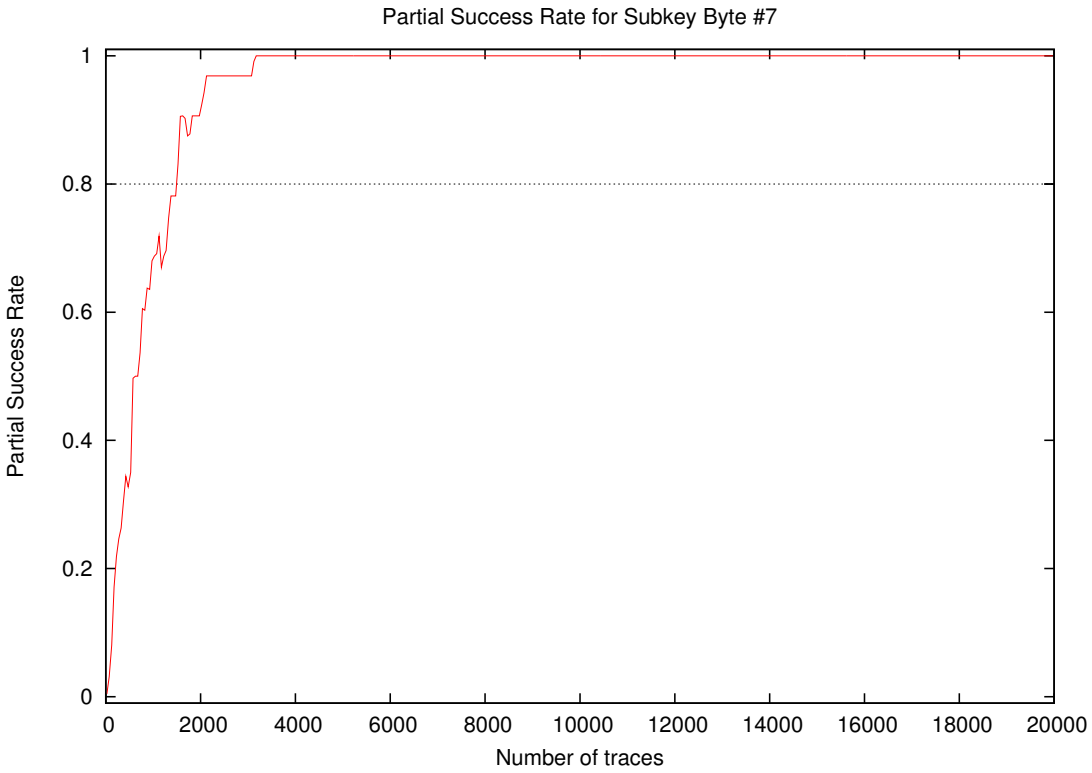


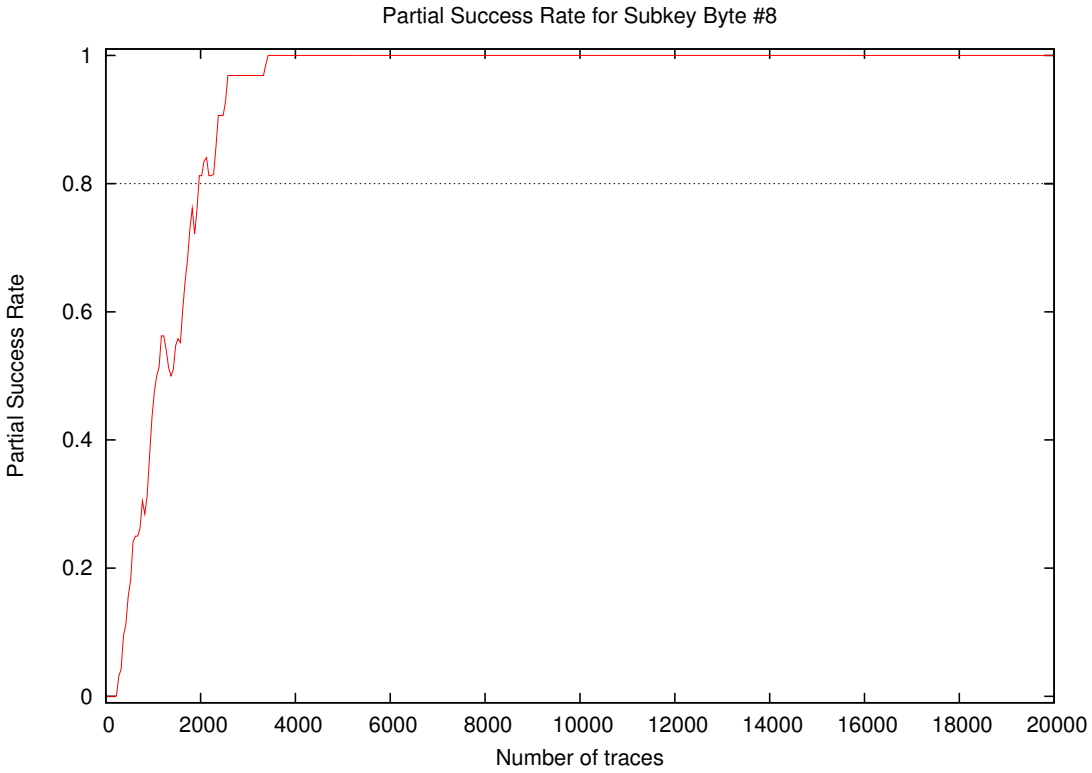

Partial Success Rate for Subkey Byte #3
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

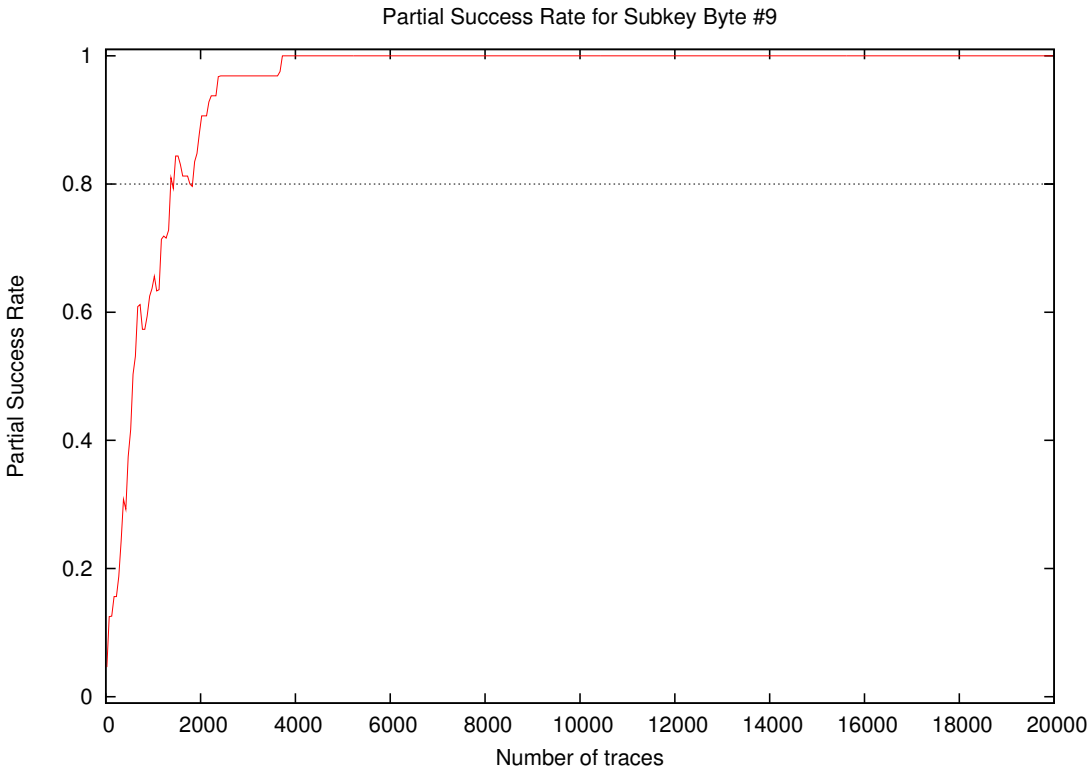

Partial Success Rate for Subkey Byte #4
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

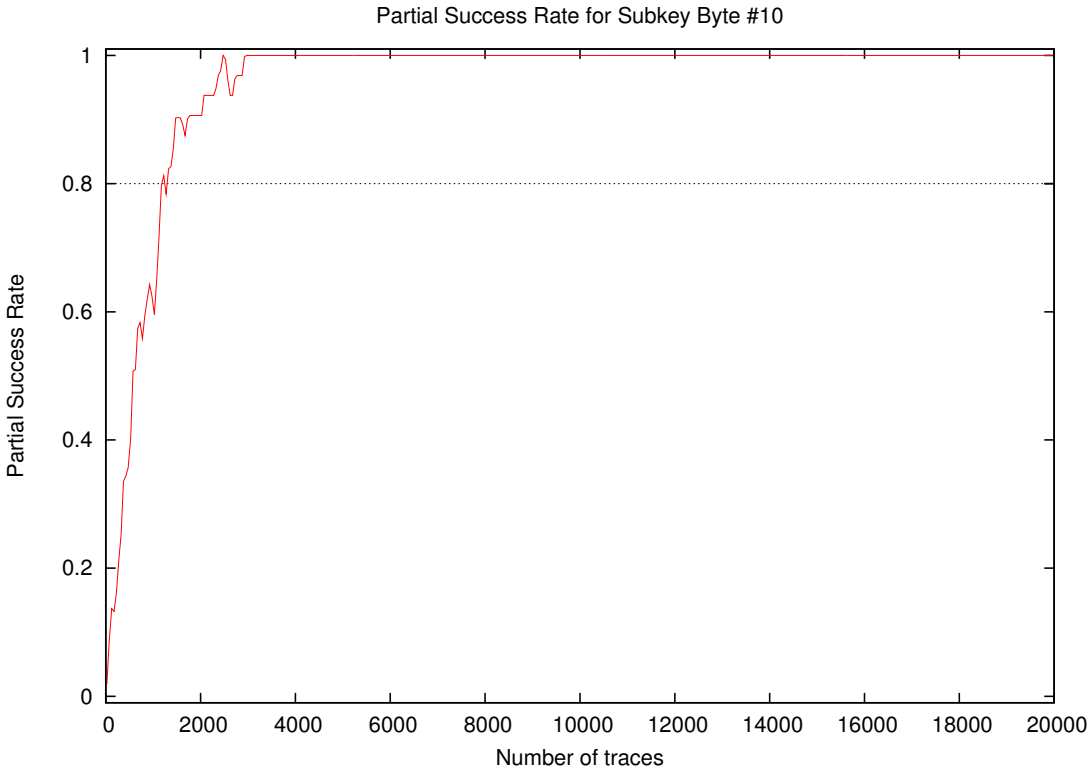

Partial Success Rate for Subkey Byte #5
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

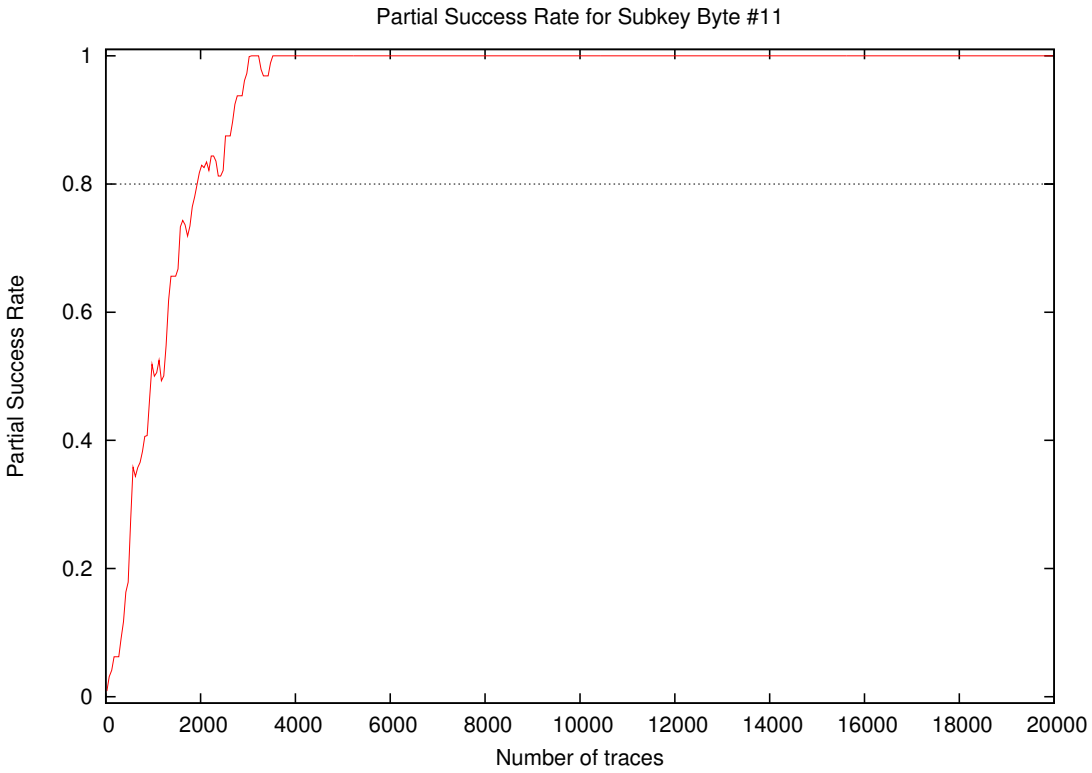

Partial Success Rate for Subkey Byte #6
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

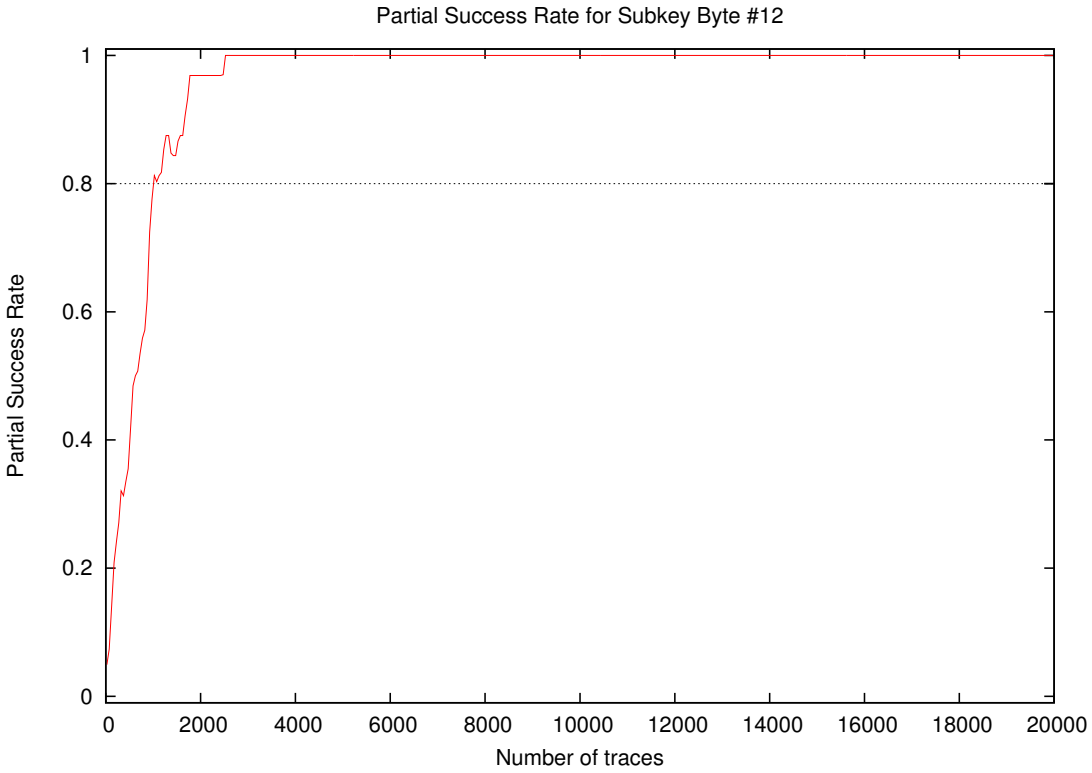

Partial Success Rate for Subkey Byte #7
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

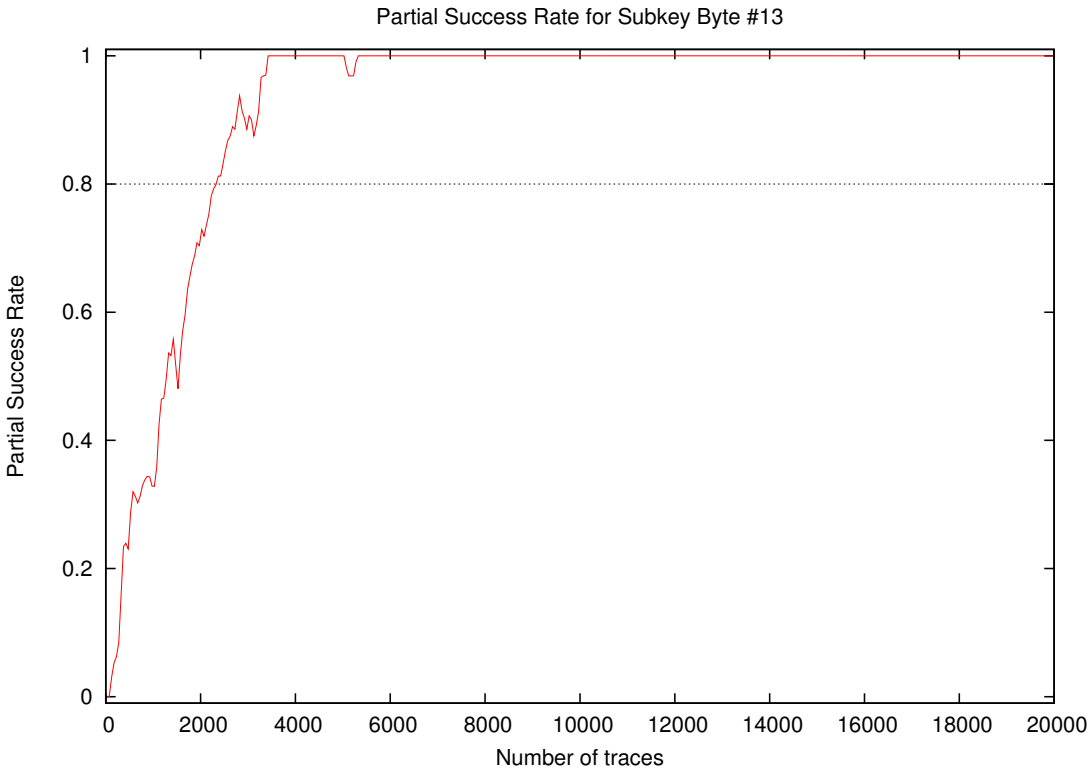

Partial Success Rate for Subkey Byte #8
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

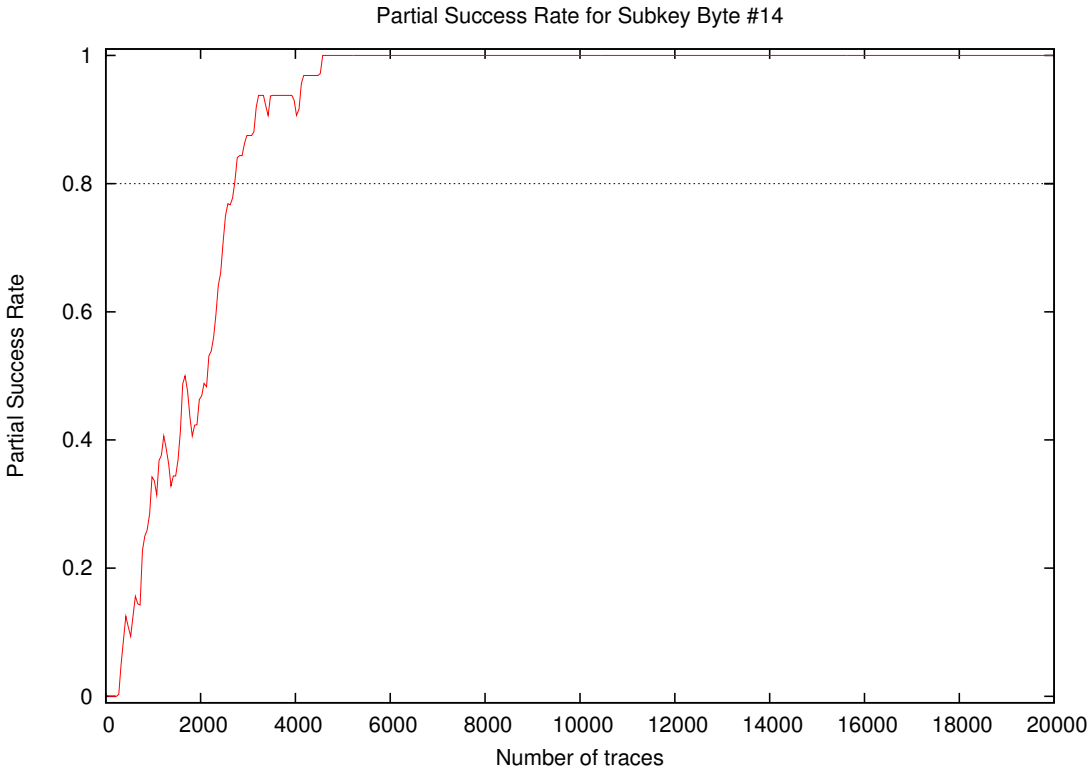

Partial Success Rate for Subkey Byte #9
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

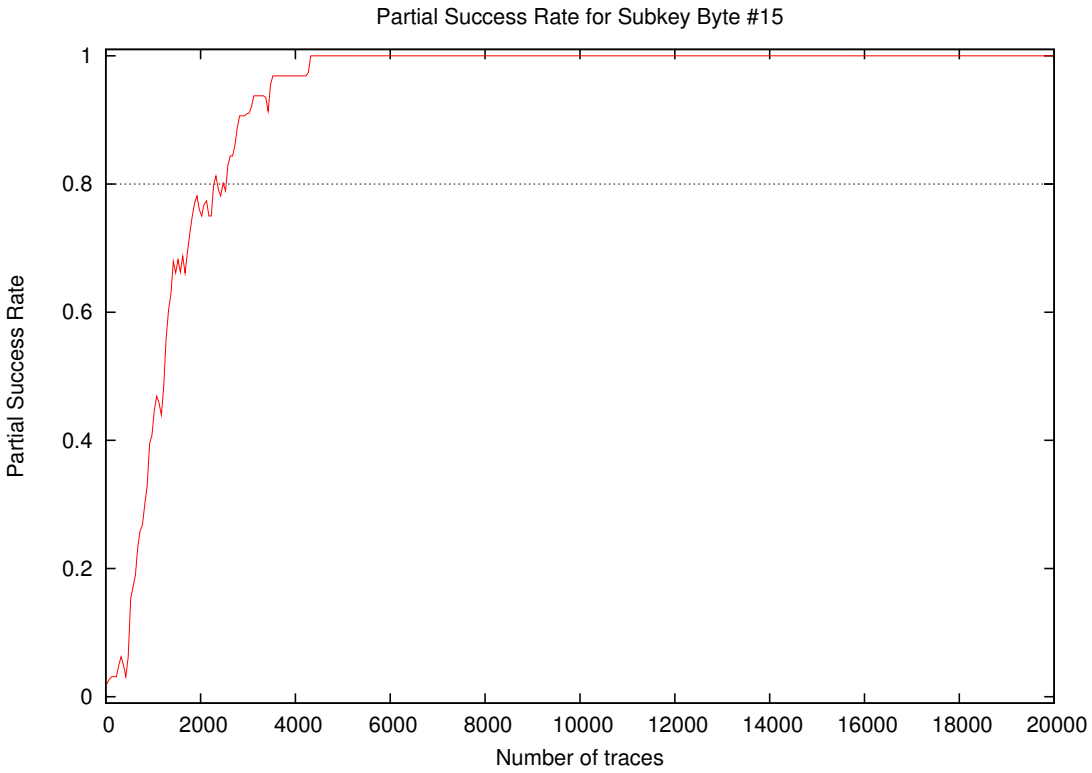

Partial Success Rate for Subkey Byte #10
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

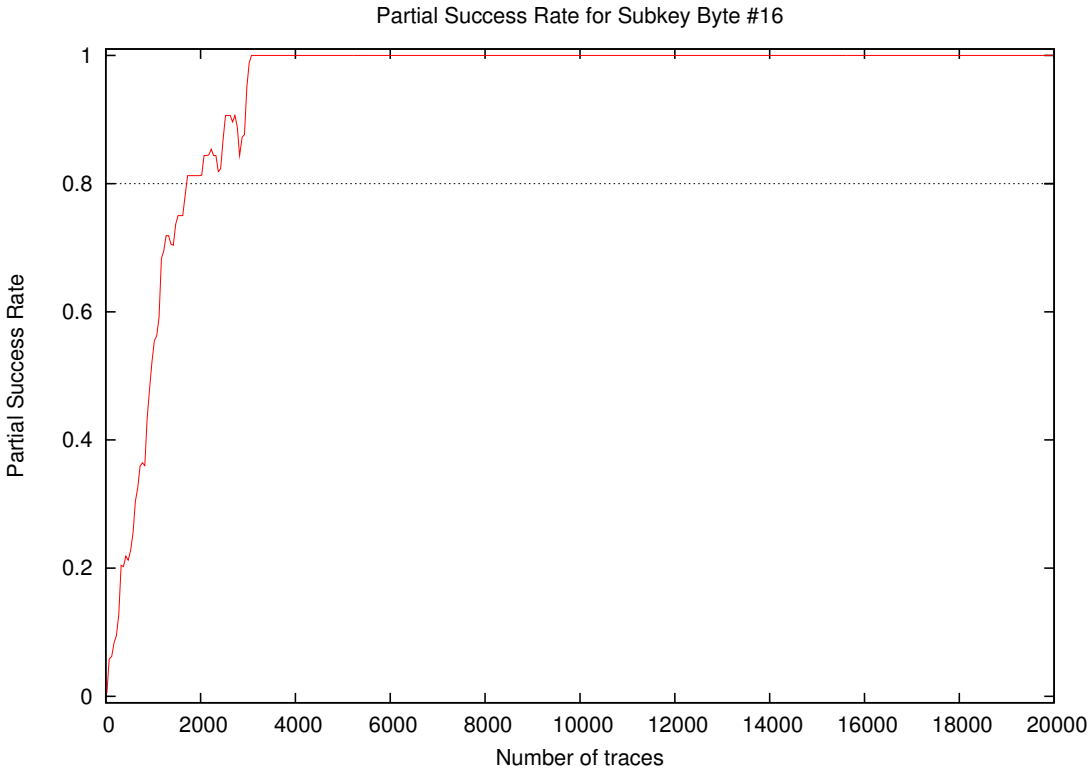

Partial Success Rate for Subkey Byte #11
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

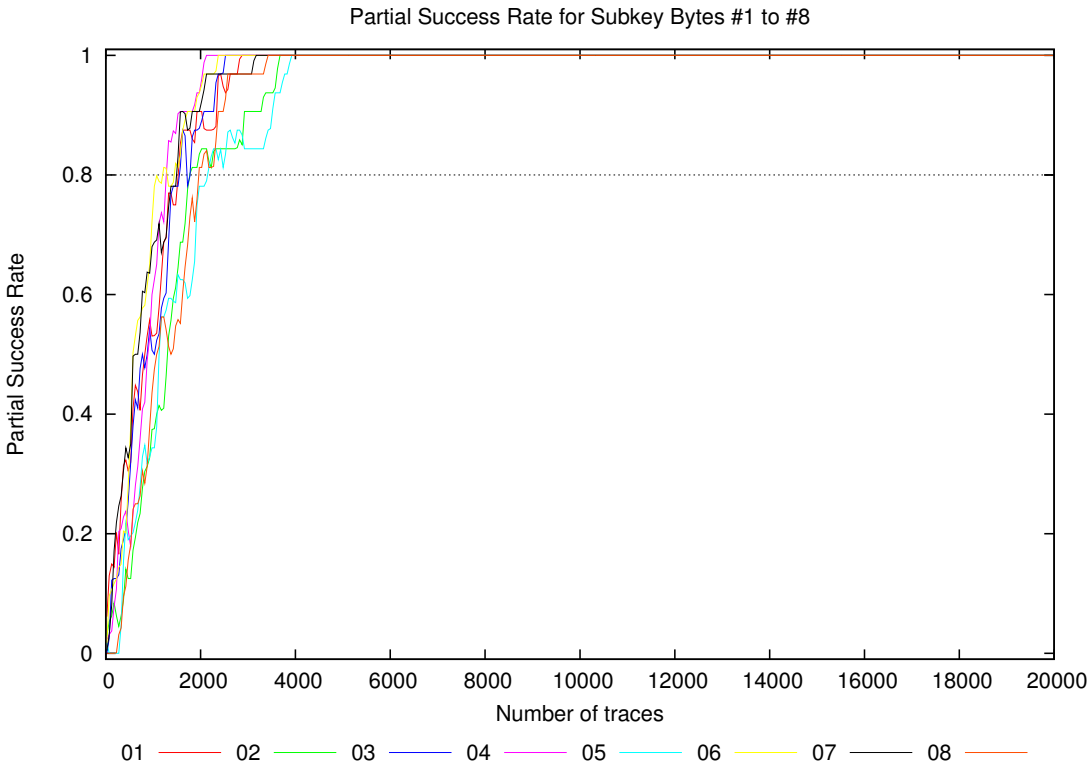

Partial Success Rate for Subkey Byte #12
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

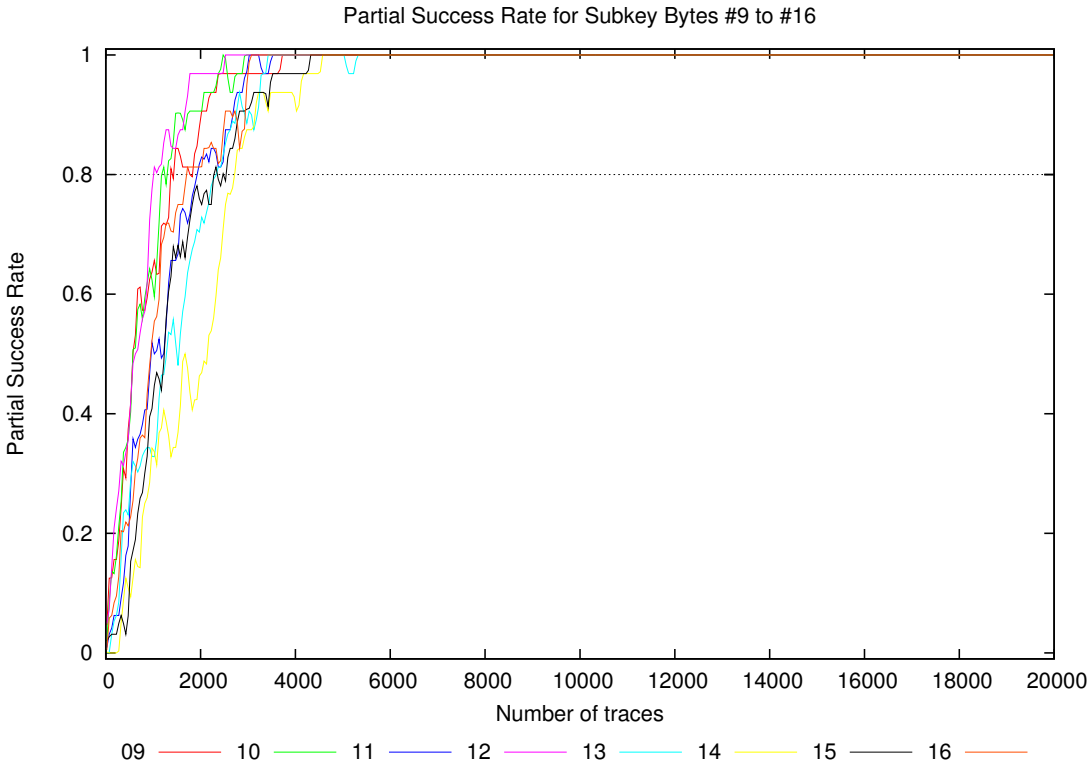

Partial Success Rate for Subkey Byte #13
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

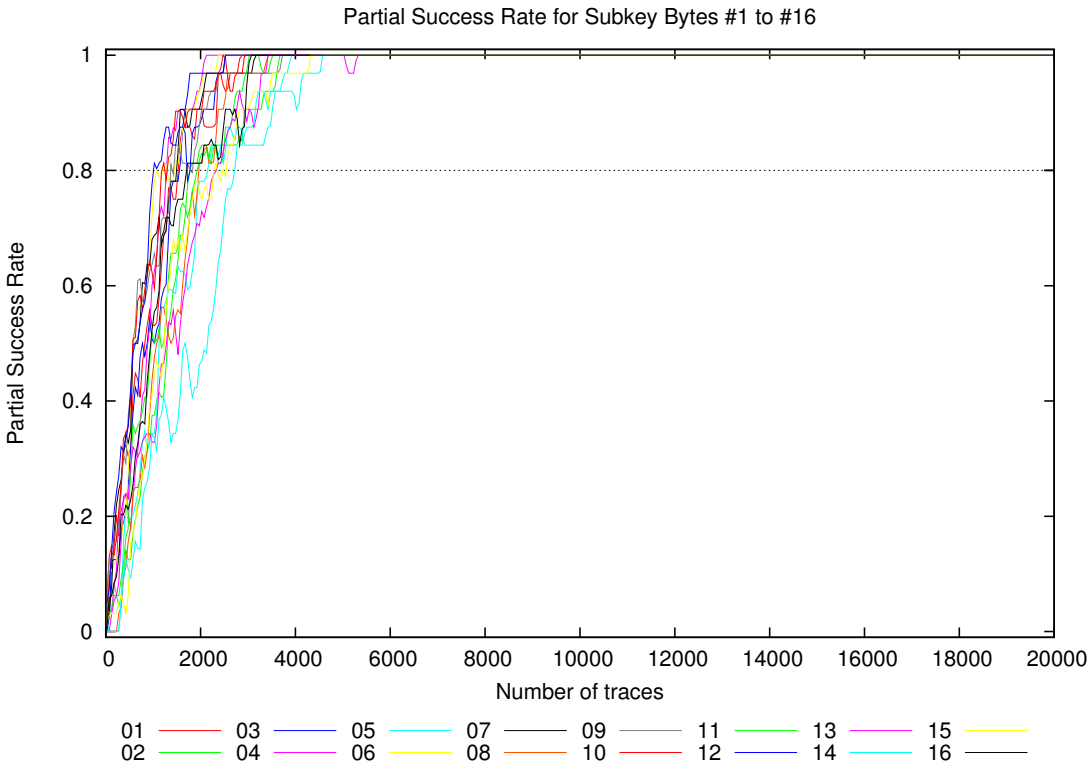

Partial Success Rate for Subkey Byte #14
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000


Partial Success Rate for Subkey Byte #15
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000


Partial Success Rate for Subkey Byte #16
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

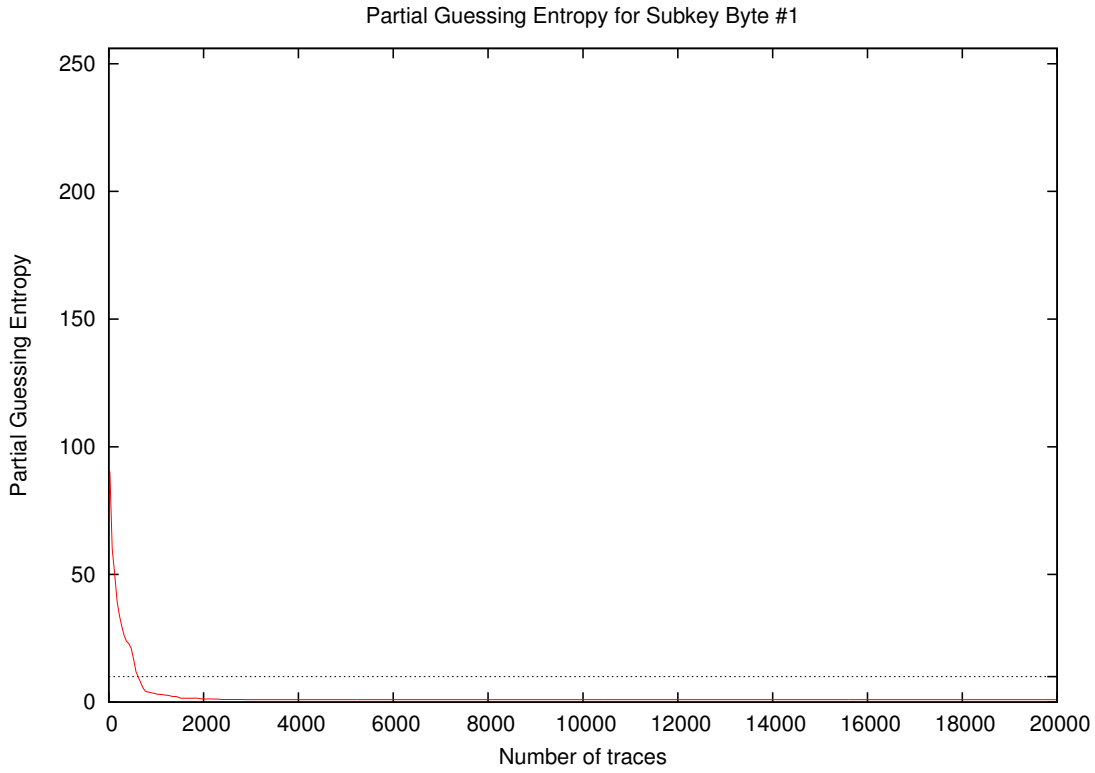

Partial Success Rate for Subkey Bytes #1 to #8
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
01
02
03
04
05
06
07
08

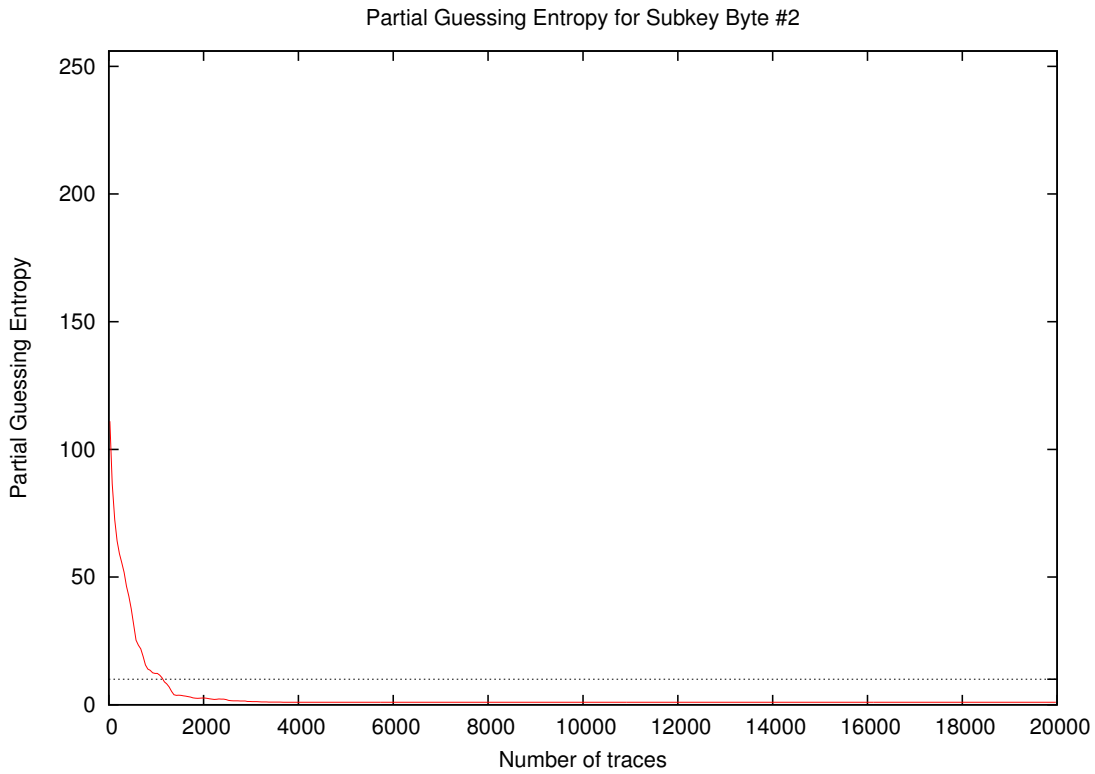

Partial Success Rate for Subkey Bytes #9 to #16
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
09
10
11
12
13
14
15
16

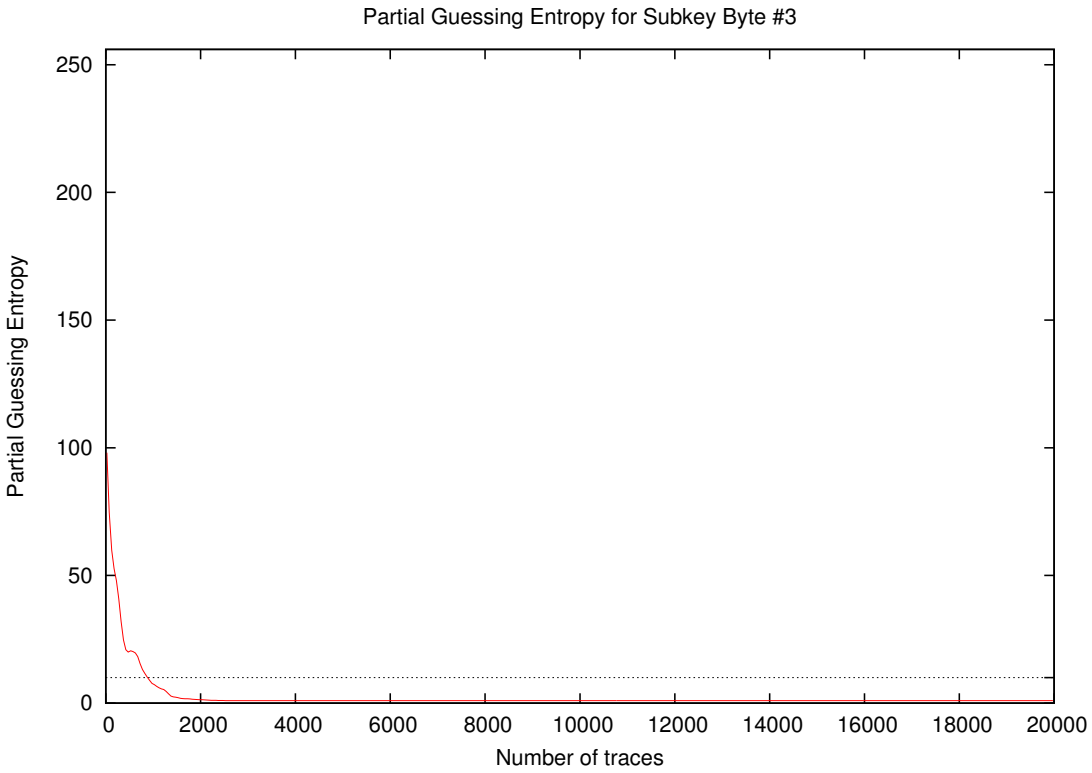

Partial Success Rate for Subkey Bytes #1 to #16
Partial Success Rate
Number of traces
0
0.2
0.4
0.6
0.8
1
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16

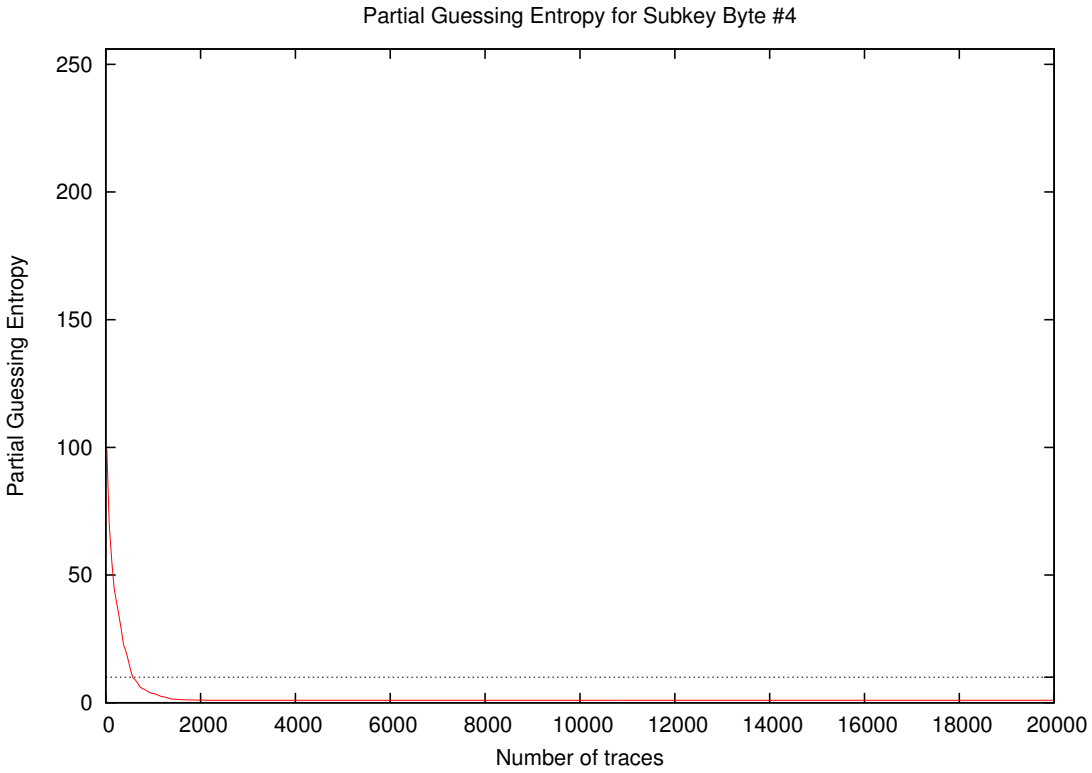
Traces	Partial Success Rate / Byte																Min	Max	Mean
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16			
10	0.03	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.06	0.01
20	0.03	0.03	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.03	0.00	0.00	0.06	0.01
30	0.09	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.06	0.00	0.00	0.03	0.00	0.00	0.09	0.02
40	0.09	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.12	0.03	0.03	0.03	0.00	0.00	0.03	0.00	0.00	0.12	0.03
50	0.12	0.03	0.00	0.03	0.00	0.06	0.03	0.00	0.12	0.06	0.03	0.06	0.00	0.00	0.03	0.03	0.00	0.12	0.04
100	0.19	0.06	0.09	0.03	0.00	0.12	0.03	0.00	0.12	0.12	0.03	0.09	0.03	0.00	0.03	0.06	0.00	0.19	0.06
200	0.16	0.06	0.12	0.09	0.00	0.12	0.22	0.00	0.16	0.12	0.06	0.22	0.06	0.00	0.03	0.09	0.00	0.22	0.10
300	0.16	0.06	0.16	0.22	0.00	0.12	0.25	0.03	0.22	0.25	0.06	0.28	0.09	0.03	0.06	0.16	0.00	0.28	0.13
400	0.31	0.16	0.19	0.22	0.22	0.19	0.34	0.09	0.28	0.34	0.16	0.31	0.25	0.12	0.03	0.22	0.03	0.34	0.21
500	0.28	0.12	0.28	0.16	0.19	0.31	0.34	0.19	0.38	0.38	0.25	0.38	0.28	0.09	0.12	0.22	0.09	0.38	0.25
1000	0.53	0.41	0.50	0.62	0.34	0.78	0.69	0.47	0.66	0.59	0.50	0.81	0.34	0.34	0.44	0.53	0.34	0.81	0.54
2000	0.91	0.84	0.88	0.94	0.78	0.94	0.91	0.81	0.91	0.91	0.84	0.97	0.75	0.47	0.75	0.81	0.47	0.97	0.84
3000	1.00	0.91	1.00	1.00	0.84	1.00	0.97	0.97	0.97	1.00	1.00	1.00	0.91	0.88	0.94	0.97	0.84	1.00	0.96
4000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.97	1.00	0.91	1.00	0.99
5000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
15000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

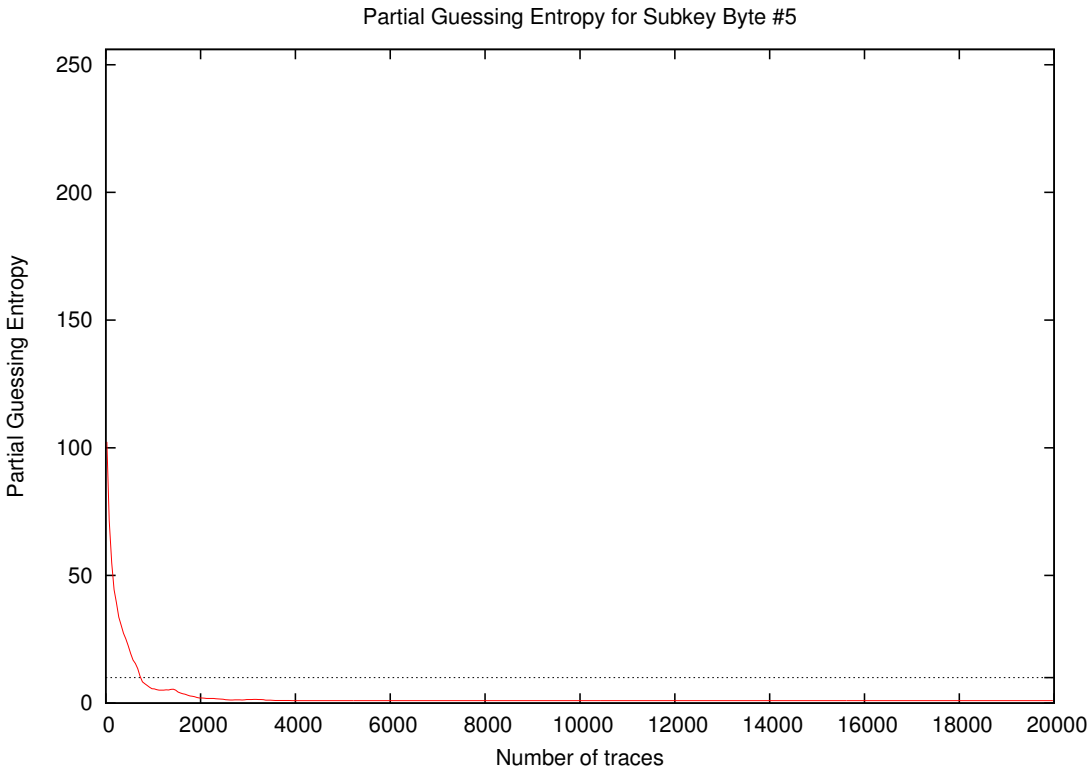
4 Partial Guessing Entropy

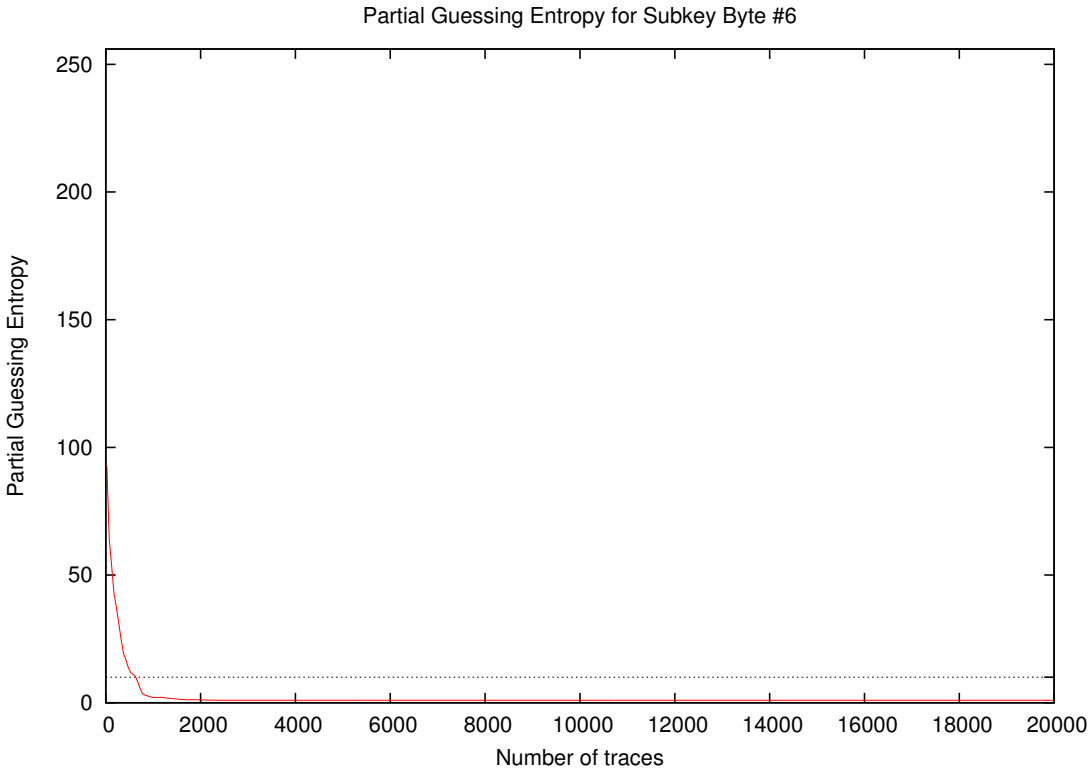


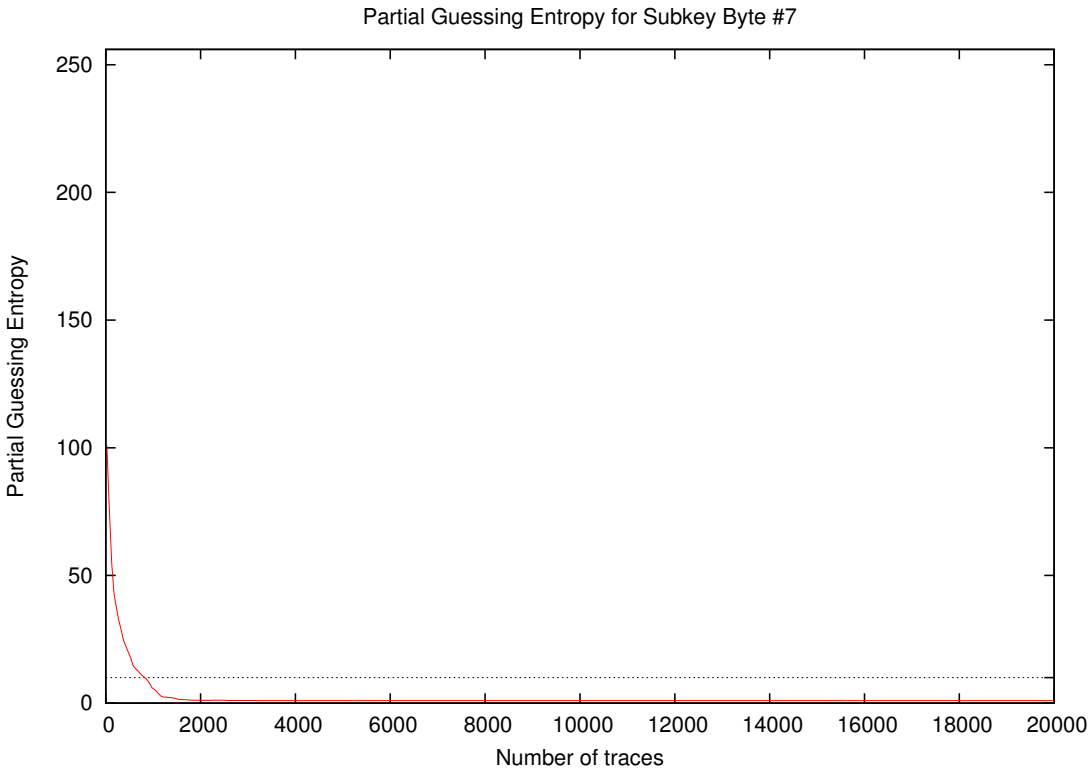


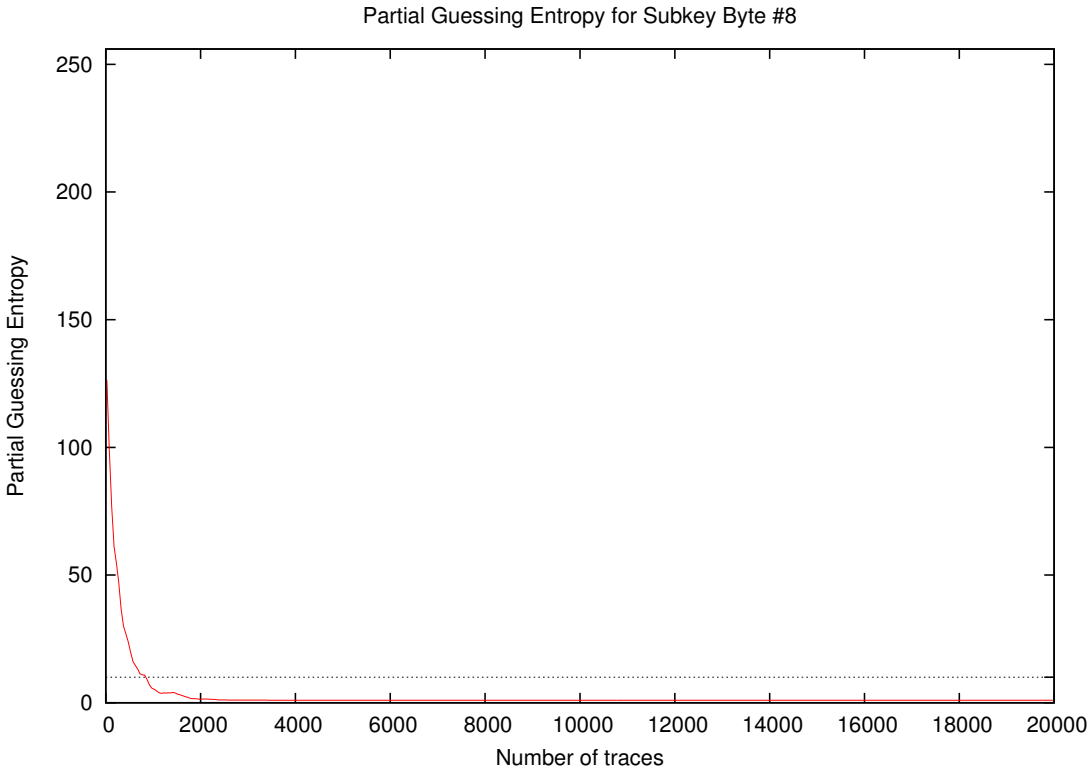

Partial Guessing Entropy for Subkey Byte #3
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

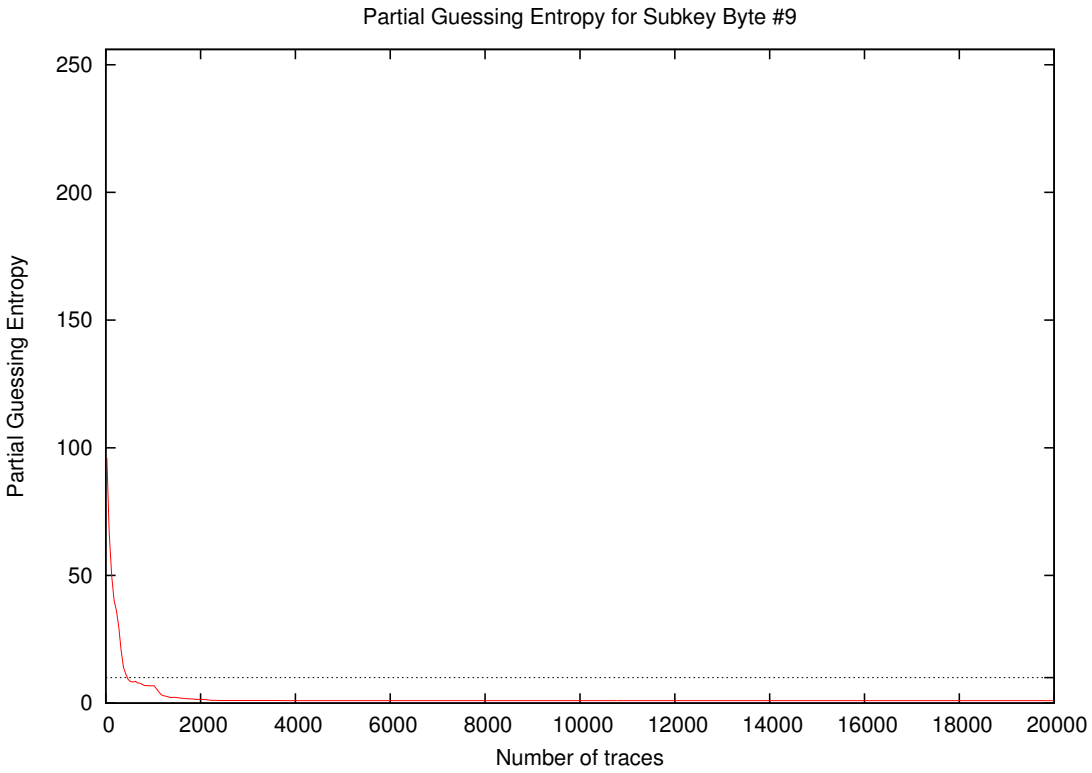

Partial Guessing Entropy for Subkey Byte #4
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

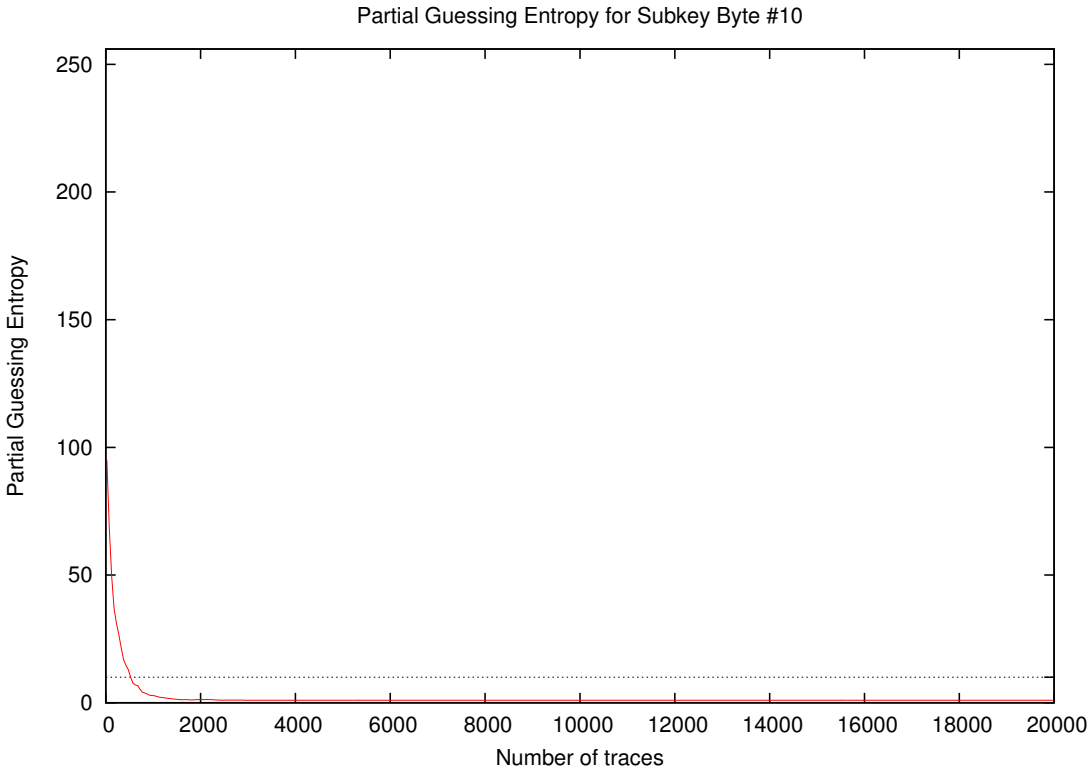

Partial Guessing Entropy for Subkey Byte #5
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

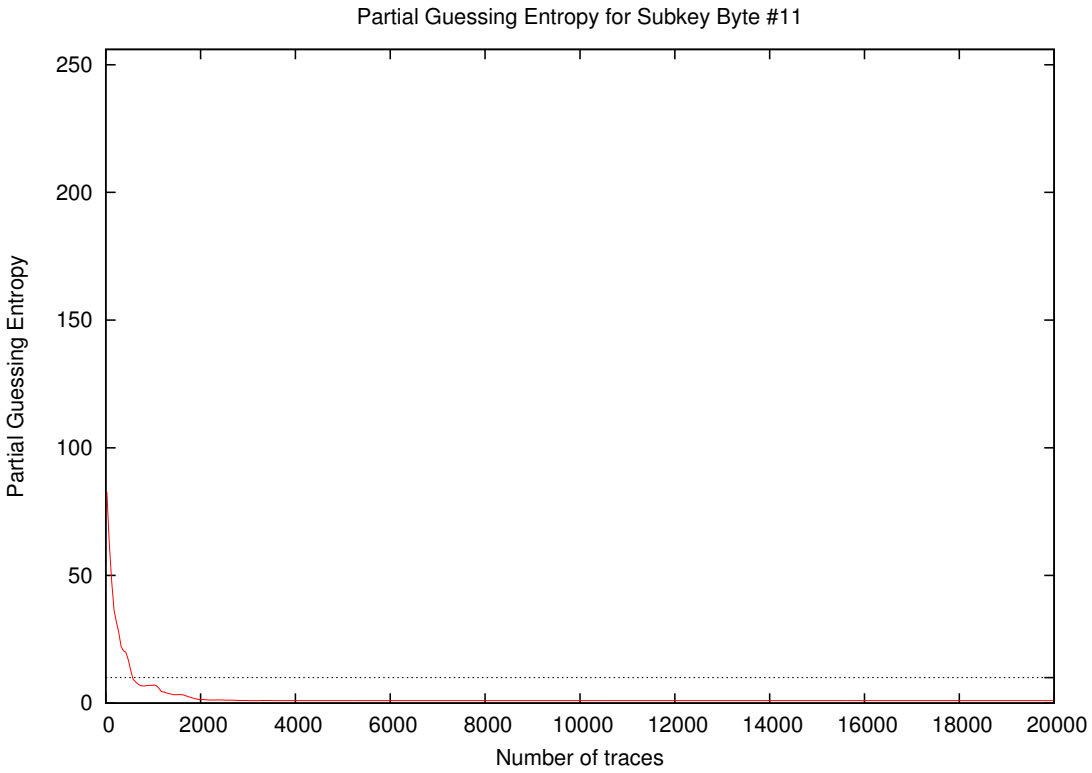

Partial Guessing Entropy for Subkey Byte #6
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

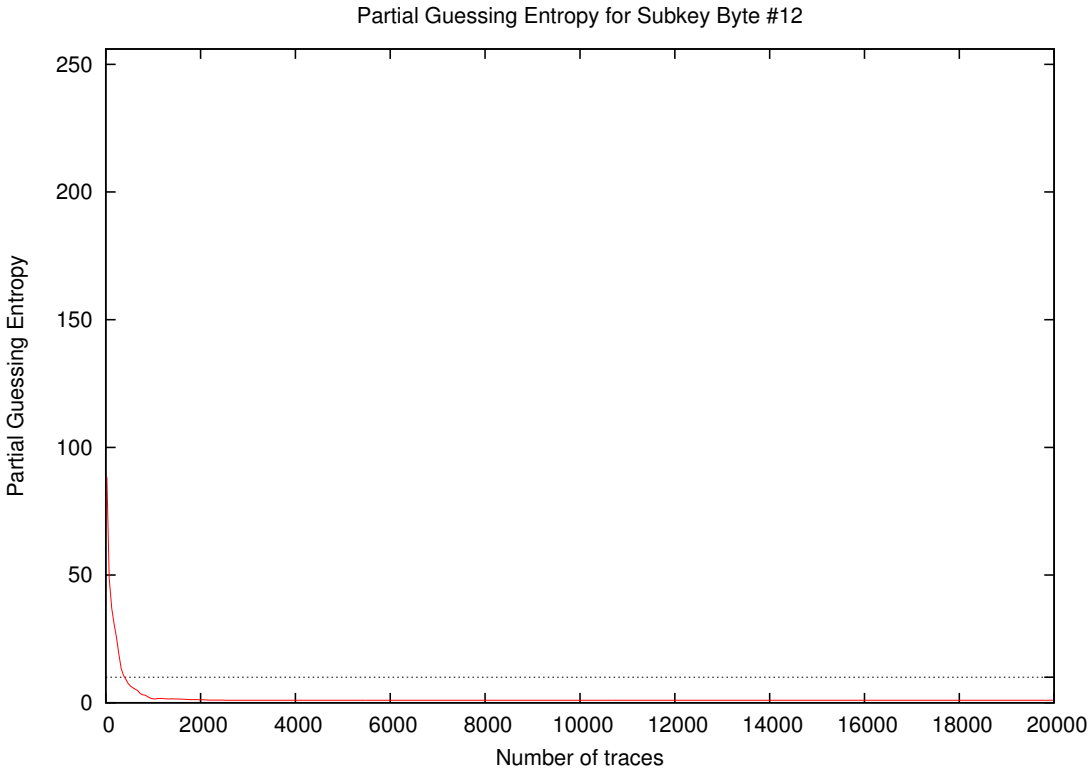

Partial Guessing Entropy for Subkey Byte #7
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

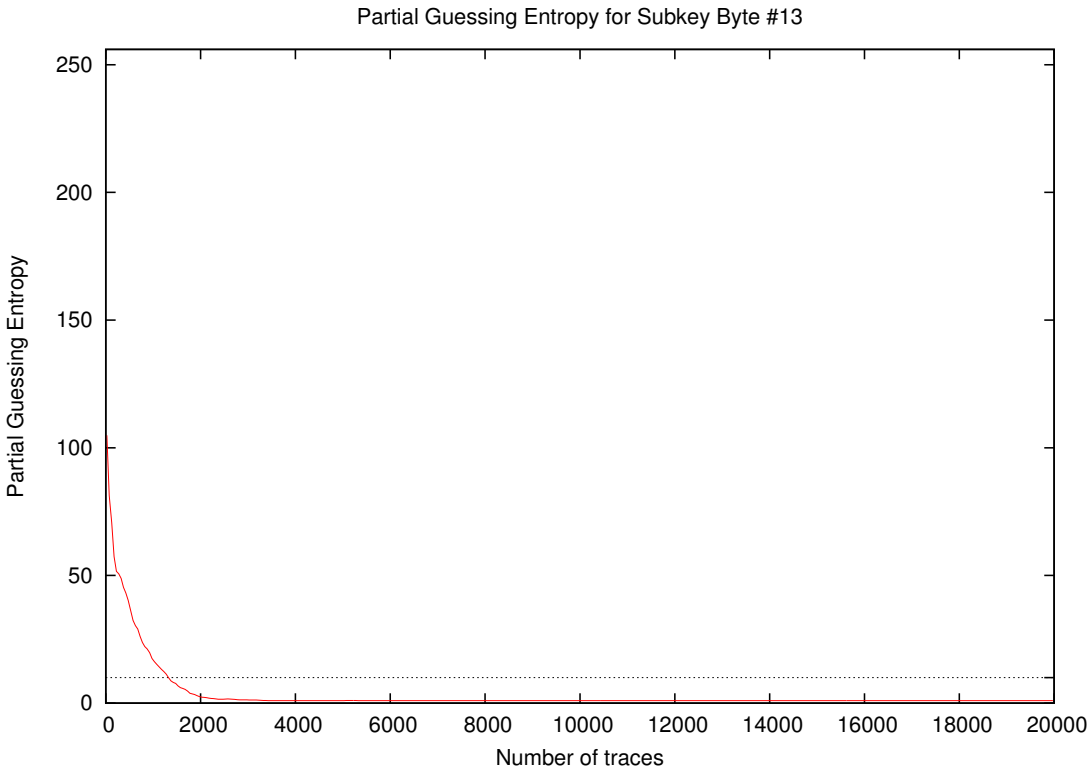

Partial Guessing Entropy for Subkey Byte #8
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

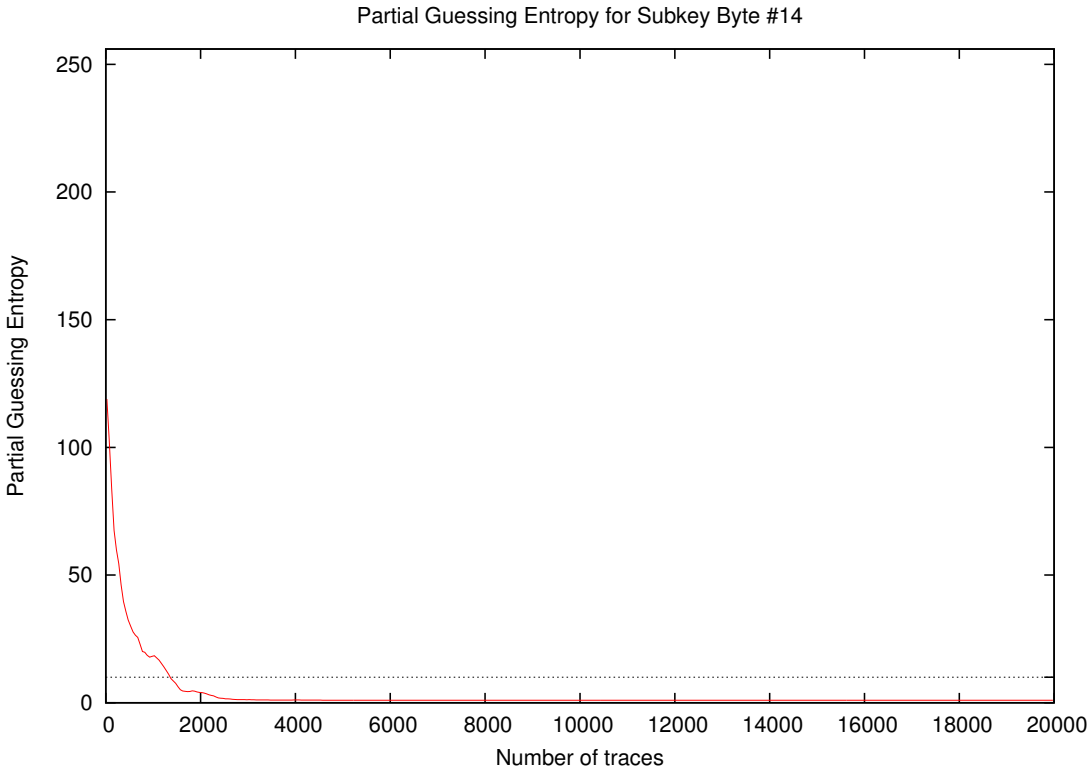

Partial Guessing Entropy for Subkey Byte #9
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

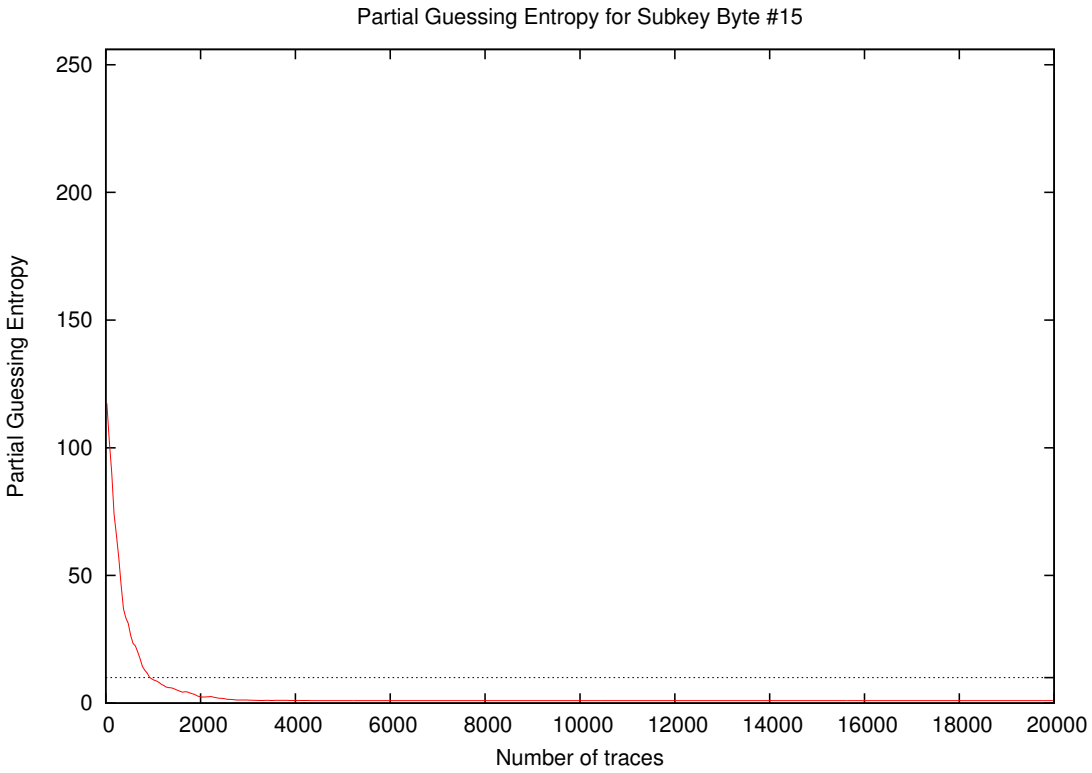

Partial Guessing Entropy for Subkey Byte #10
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

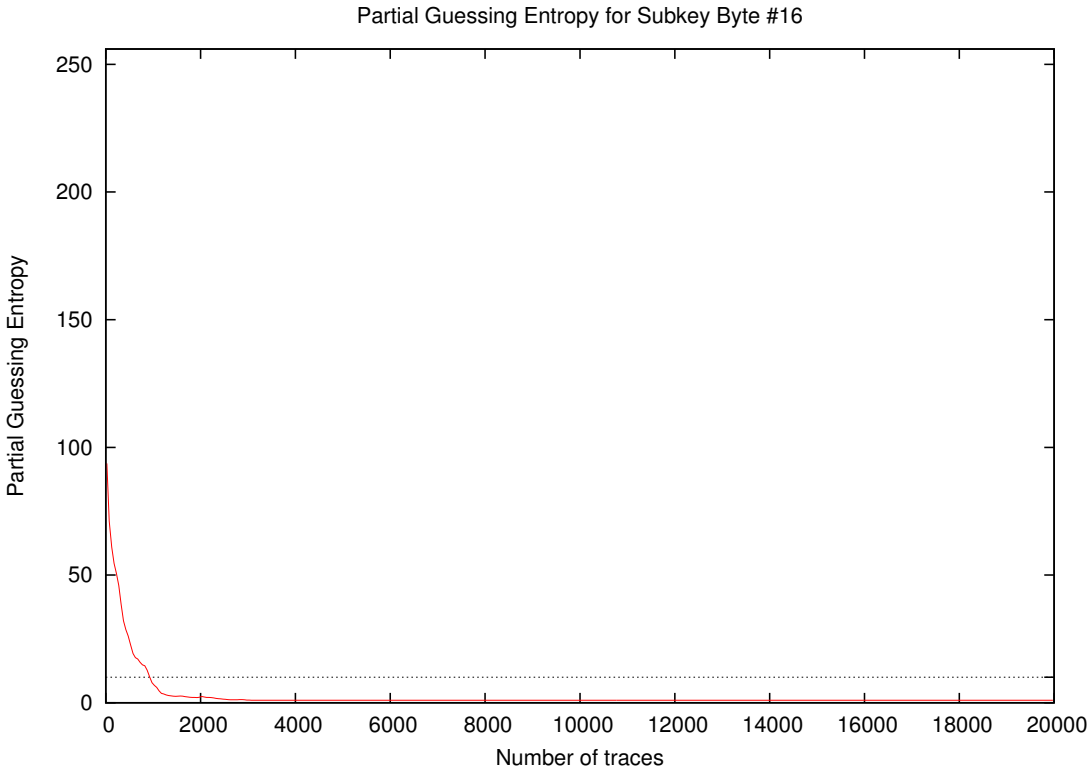

Partial Guessing Entropy for Subkey Byte #11
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

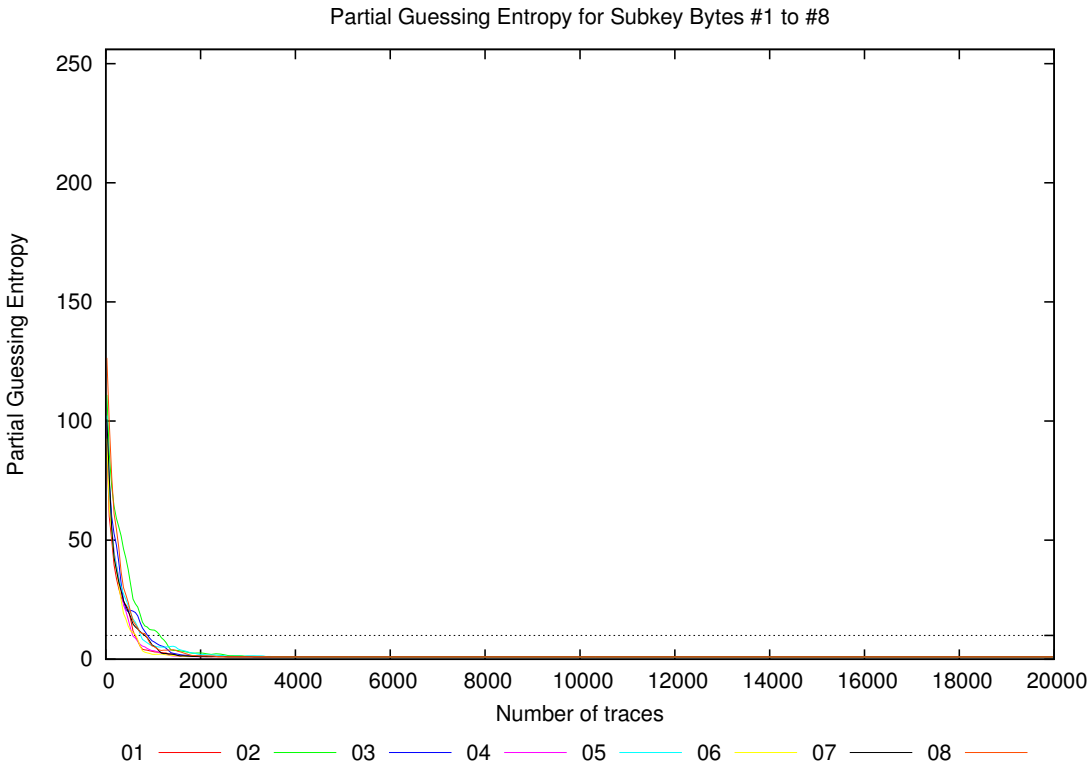

Partial Guessing Entropy for Subkey Byte #12
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

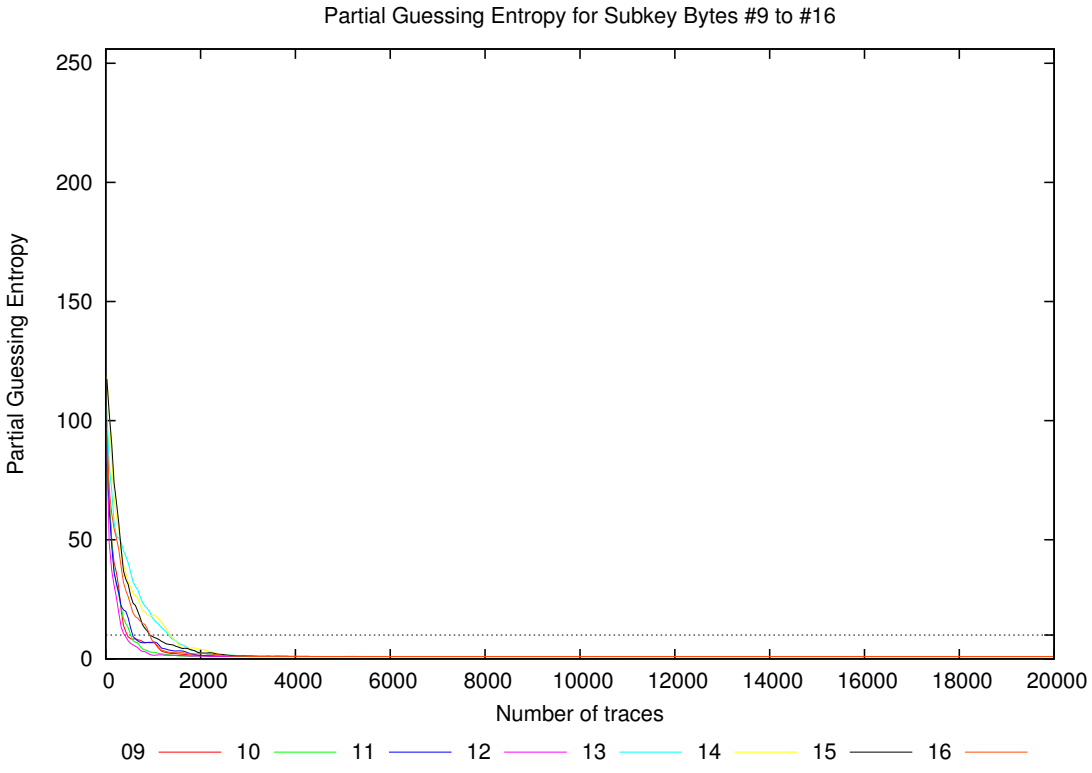

Partial Guessing Entropy for Subkey Byte #13
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000

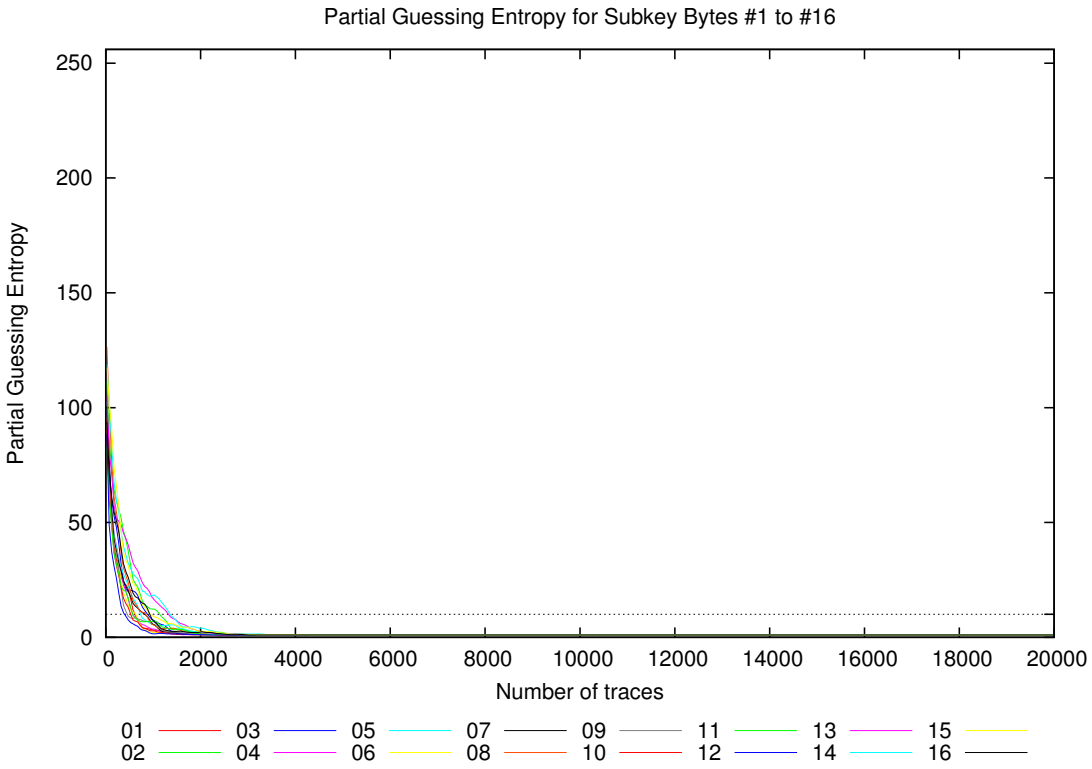

Partial Guessing Entropy for Subkey Byte #14
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000


Partial Guessing Entropy for Subkey Byte #15
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000


Partial Guessing Entropy for Subkey Byte #16
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000


Partial Guessing Entropy for Subkey Bytes #1 to #8
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
01
02
03
04
05
06
07
08


Partial Guessing Entropy for Subkey Bytes #9 to #16
Partial Guessing Entropy
Number of traces
0
50
100
150
200
250
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
09
10
11
12
13
14
15
16


Partial Guessing Entropy for Subkey Bytes #1 to #16
Partial Guessing Entropy
250
200
150
100
50
0
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Number of traces
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16

Traces	Partial Guessing Entropy / Byte																Min	Max	Mean
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16			
10	103.7	114.9	105.6	99.1	112.3	102.4	105.1	125.4	113.9	98.0	89.1	112.2	111.6	115.6	119.5	91.7	89.1	125.4	107.5
20	95.1	104.4	93.1	98.8	98.3	89.2	97.4	123.2	92.6	95.2	74.7	96.3	100.1	121.3	110.1	88.8	74.7	123.2	98.7
30	85.0	107.3	88.8	96.4	95.2	82.1	94.0	124.7	84.8	87.9	74.1	74.8	99.2	117.7	110.0	87.8	74.1	124.7	94.3
40	70.7	103.5	85.9	86.8	92.3	77.8	93.2	120.4	79.7	86.0	73.1	62.5	94.7	113.1	111.7	81.5	62.5	120.4	89.6
50	65.5	99.1	81.9	81.2	87.4	73.8	88.7	116.2	74.6	82.2	71.9	55.8	90.0	109.6	109.1	79.4	55.8	116.2	85.4
100	55.4	78.6	66.5	61.3	61.6	56.8	65.4	88.4	58.5	57.8	55.1	42.1	76.1	92.4	97.5	64.8	42.1	97.5	67.4
200	35.4	60.4	50.1	41.0	40.8	39.0	38.7	56.3	37.5	32.2	32.7	27.9	52.0	61.0	67.5	52.3	27.9	67.5	45.3
300	27.8	53.8	36.2	32.2	31.6	28.2	30.5	42.0	25.3	24.3	24.6	15.9	50.6	50.7	51.8	42.2	15.9	53.8	35.5
400	23.4	43.4	21.6	21.0	25.6	17.5	22.9	28.3	12.0	15.0	20.4	9.7	43.8	36.8	33.6	29.7	9.7	43.8	25.3
500	19.3	34.7	20.2	14.7	20.9	12.4	18.8	21.8	8.7	11.6	15.2	6.9	38.5	30.8	29.1	24.6	6.9	38.5	20.5
1000	3.1	12.3	7.3	3.7	5.5	2.0	5.5	5.4	7.2	2.8	7.1	1.5	16.3	18.4	9.0	6.9	1.5	18.4	7.1
2000	1.2	2.6	1.3	1.1	2.0	1.1	1.1	1.4	1.5	1.3	1.3	1.2	2.4	3.9	2.5	2.4	1.1	3.9	1.8
3000	1.0	1.2	1.0	1.0	1.4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.2	1.2	1.0	1.0	1.4	1.1
4000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.1	1.0
5000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
15000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
20000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0