Experimental Evaluation of Interference Impact on WiFi Packet corruption

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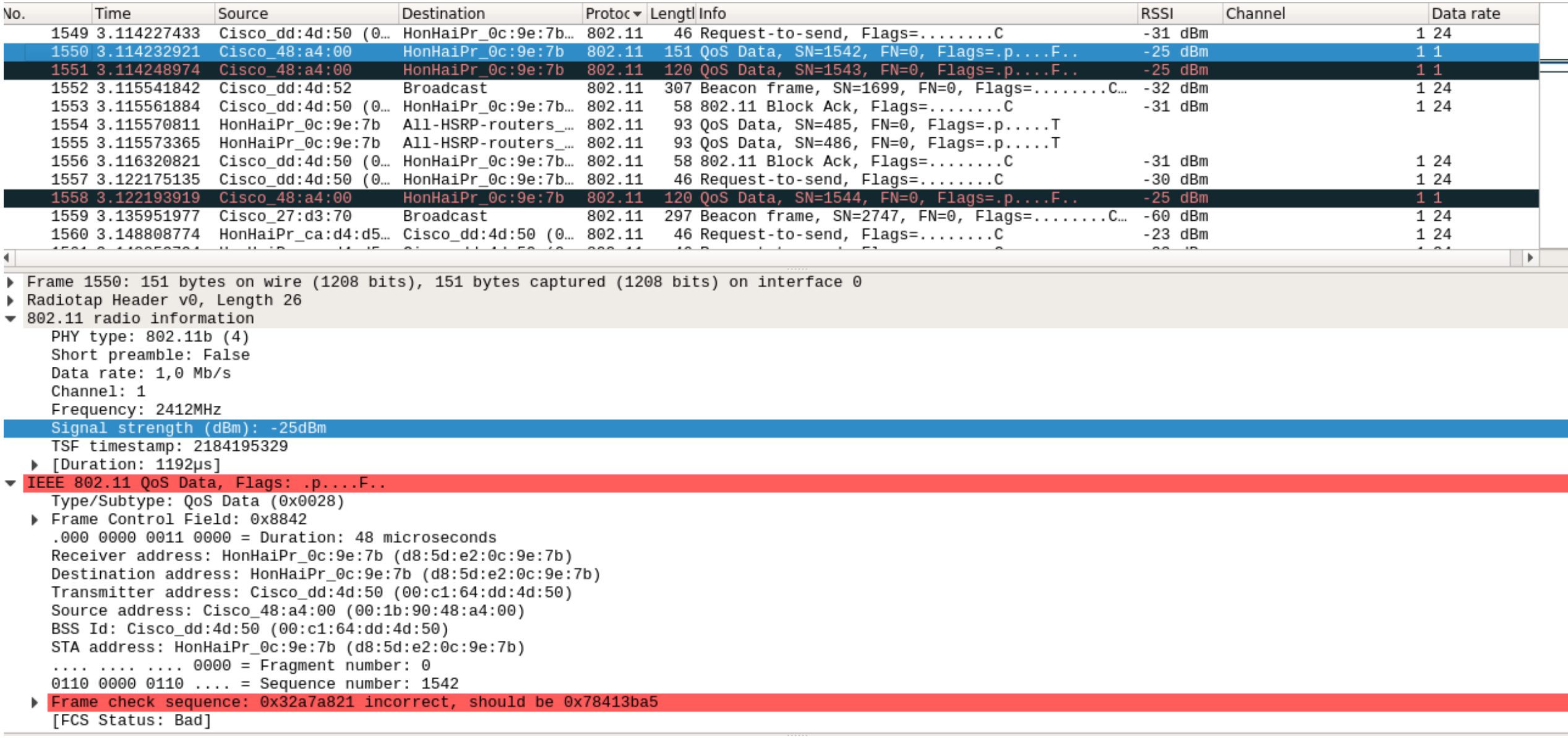


No.	Time	Source	Destination	Protoc	Lengtl	Info	RSSI	Channel	Data rate
1549	3.114227433	Cisco_dd:4d:50 (0…	HonHaiPr_0c:9e:7b…	802.11	46	Request-to-send, Flags=........C	-31 dBm	1	24
1550	3.114232921	Cisco_48:a4:00	HonHaiPr_0c:9e:7b	802.11	151	QoS Data, SN=1542, FN=0, Flags=.p....F..	-25 dBm	1	1
1551	3.114248974	Cisco_48:a4:00	HonHaiPr_0c:9e:7b	802.11	120	QoS Data, SN=1543, FN=0, Flags=.p....F..	-25 dBm	1	1
1552	3.115541842	Cisco_dd:4d:52	Broadcast	802.11	307	Beacon frame, SN=1699, FN=0, Flags=........C…	-32 dBm	1	24
1553	3.115561884	Cisco_dd:4d:50 (0…	HonHaiPr_0c:9e:7b…	802.11	58	802.11 Block Ack, Flags=........C	-31 dBm	1	24
1554	3.115570811	HonHaiPr_0c:9e:7b	All-HSRP-routers_…	802.11	93	QoS Data, SN=485, FN=0, Flags=.p.....T			
1555	3.115573365	HonHaiPr_0c:9e:7b	All-HSRP-routers_…	802.11	93	QoS Data, SN=486, FN=0, Flags=.p.....T			
1556	3.116320821	Cisco_dd:4d:50 (0…	HonHaiPr_0c:9e:7b…	802.11	58	802.11 Block Ack, Flags=........C	-31 dBm	1	24
1557	3.122175135	Cisco_dd:4d:50 (0…	HonHaiPr_0c:9e:7b…	802.11	46	Request-to-send, Flags=........C	-30 dBm	1	24
1558	3.122193919	Cisco_48:a4:00	HonHaiPr_0c:9e:7b	802.11	120	QoS Data, SN=1544, FN=0, Flags=.p....F..	-25 dBm	1	1
1559	3.135951977	Cisco_27:d3:70	Broadcast	802.11	297	Beacon frame, SN=2747, FN=0, Flags=........C…	-60 dBm	1	24
1560	3.148808774	HonHaiPr_ca:d4:d5…	Cisco_dd:4d:50 (0…	802.11	46	Request-to-send, Flags=........C	-23 dBm	1	24

```
▸ Frame 1550: 151 bytes on wire (1208 bits), 151 bytes captured (1208 bits) on interface 0
▸ Radiotap Header v0, Length 26
▾ 802.11 radio information
    PHY type: 802.11b (4)
    Short preamble: False
    Data rate: 1,0 Mb/s
    Channel: 1
    Frequency: 2412MHz
    Signal strength (dBm): -25dBm
    TSF timestamp: 2184195329
  ▸ [Duration: 1192µs]
▾ IEEE 802.11 QoS Data, Flags: .p....F..
    Type/Subtype: QoS Data (0x0028)
  ▸ Frame Control Field: 0x8842
    .000 0000 0011 0000 = Duration: 48 microseconds
    Receiver address: HonHaiPr_0c:9e:7b (d8:5d:e2:0c:9e:7b)
    Destination address: HonHaiPr_0c:9e:7b (d8:5d:e2:0c:9e:7b)
    Transmitter address: Cisco_dd:4d:50 (00:c1:64:dd:4d:50)
    Source address: Cisco_48:a4:00 (00:1b:90:48:a4:00)
    BSS Id: Cisco_dd:4d:50 (00:c1:64:dd:4d:50)
    STA address: HonHaiPr_0c:9e:7b (d8:5d:e2:0c:9e:7b)
    .... .... .... 0000 = Fragment number: 0
    0110 0000 0110 .... = Sequence number: 1542
  ▸ Frame check sequence: 0x32a7a821 incorrect, should be 0x78413ba5
    [FCS Status: Bad]
```

Objective

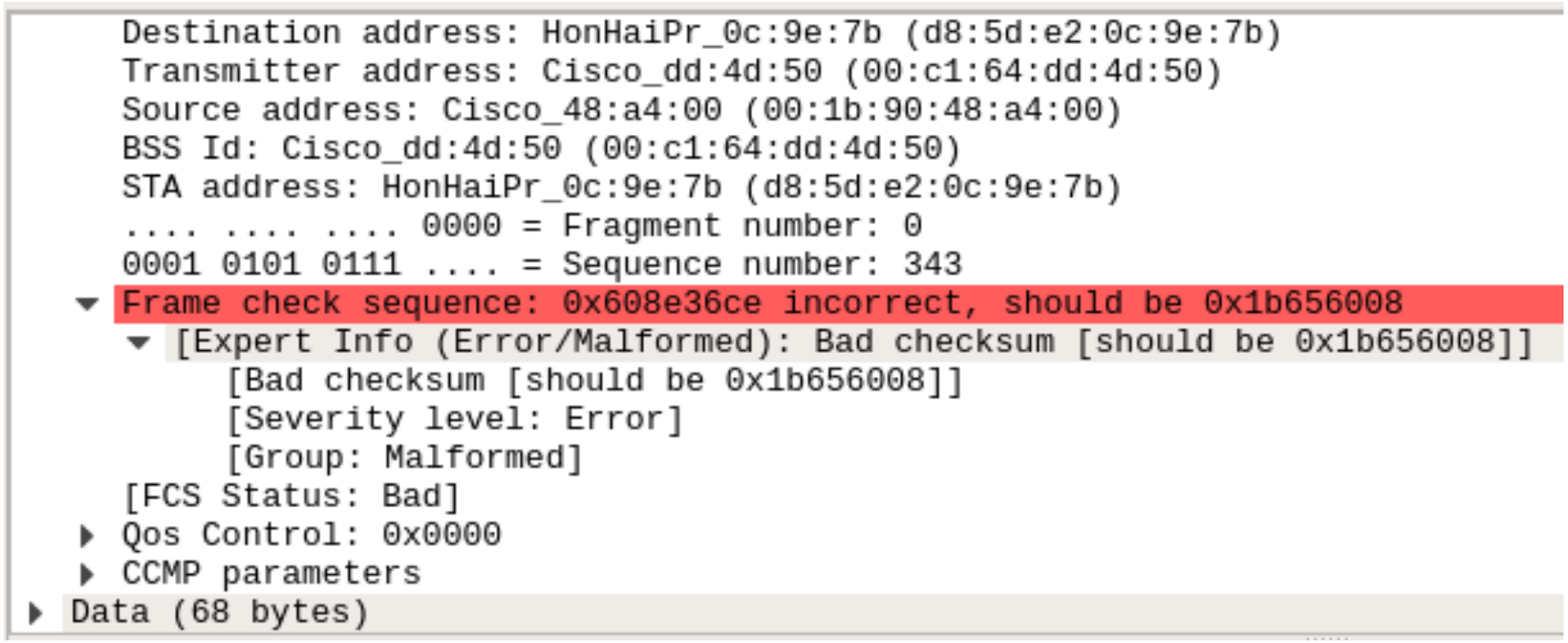
The aim of this project is to show the inter relation between interference and packet corruption of WiFi packets in real life scenarios

Theory

CRC

BER

FCS

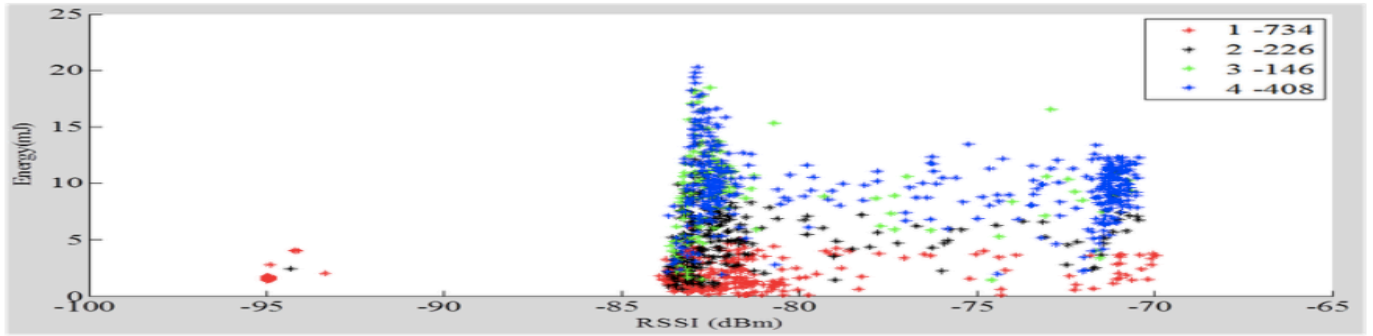


Relating RSSI and CRC errors

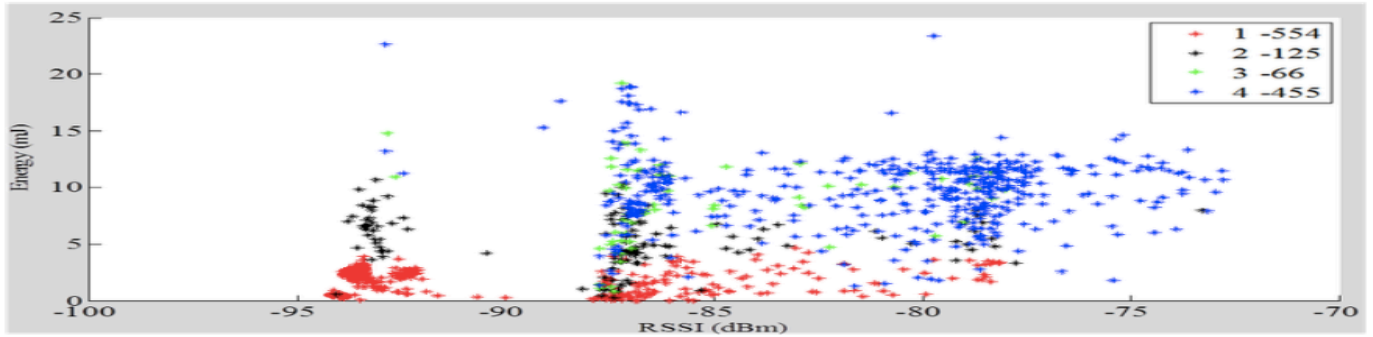
RSSI = Received Signal Strength indicator

(Signal level + Noise level)

[REF]:Experimental evaluation of interference impact on energy consumption in Wireless Sensor Networks



(a) Ideal case

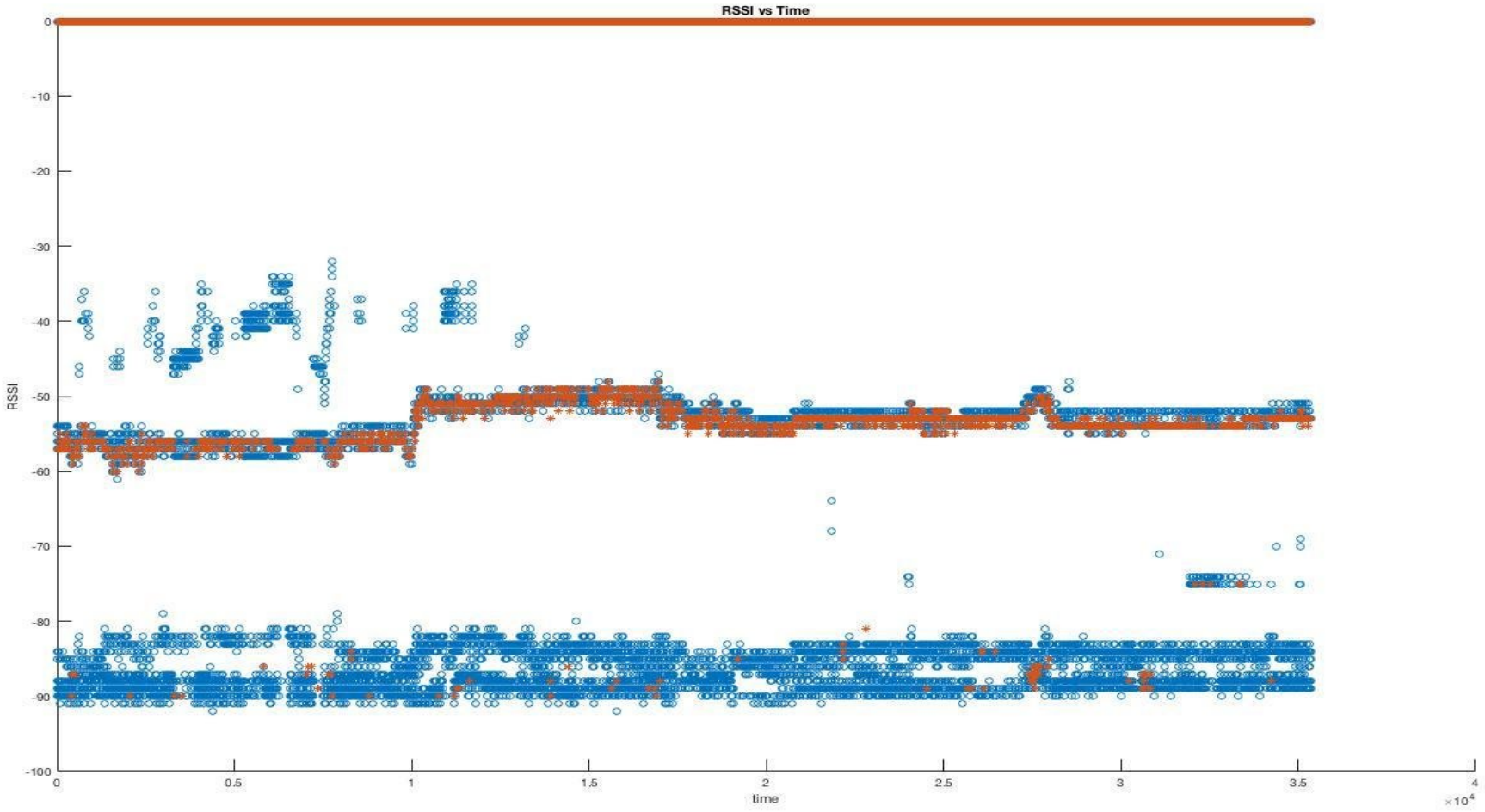


(b) Real case

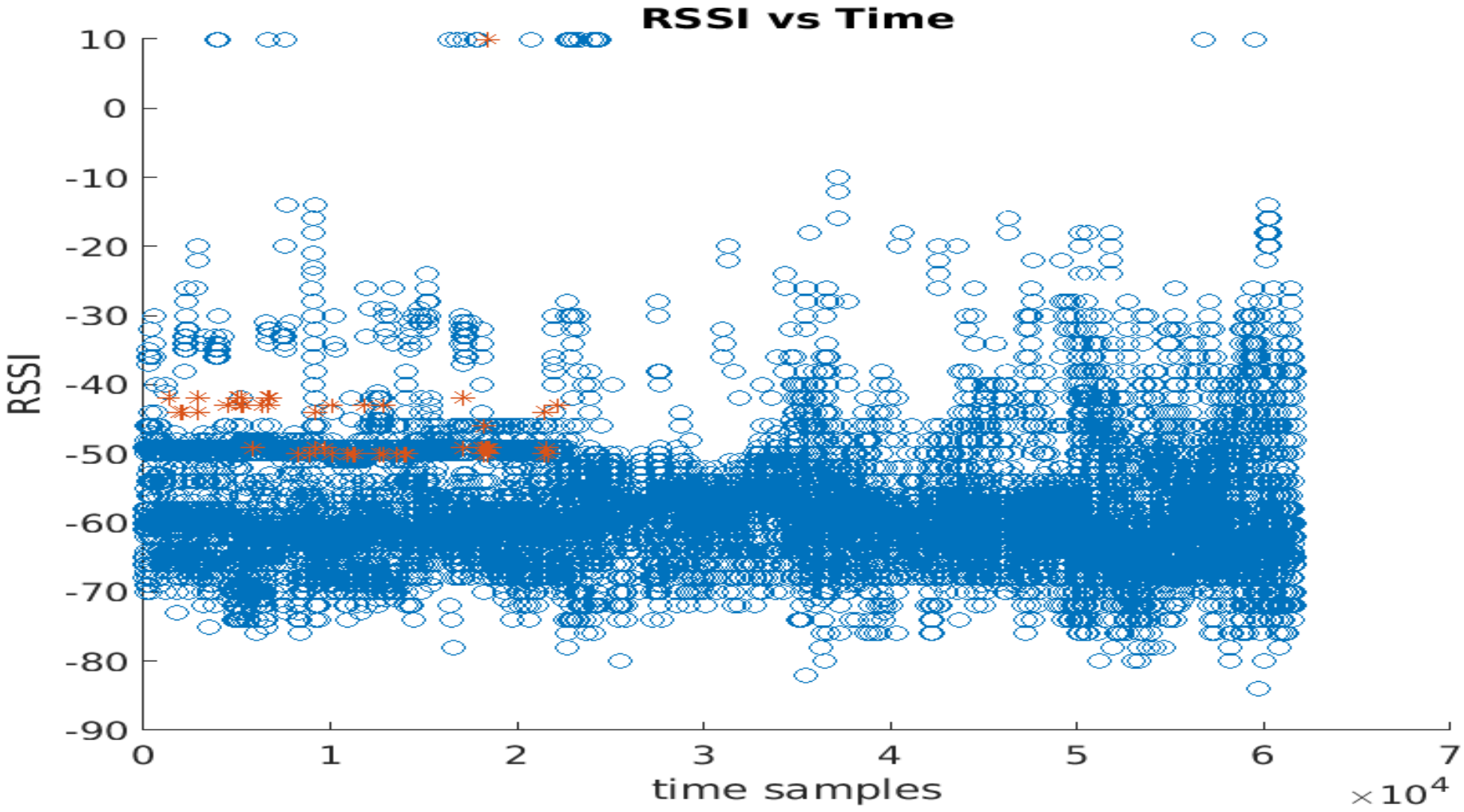
Fig. 2: Energy consumption vs RSSI per packet type

Case: Low Interference
Location: Home and Delft Station (night)

Home

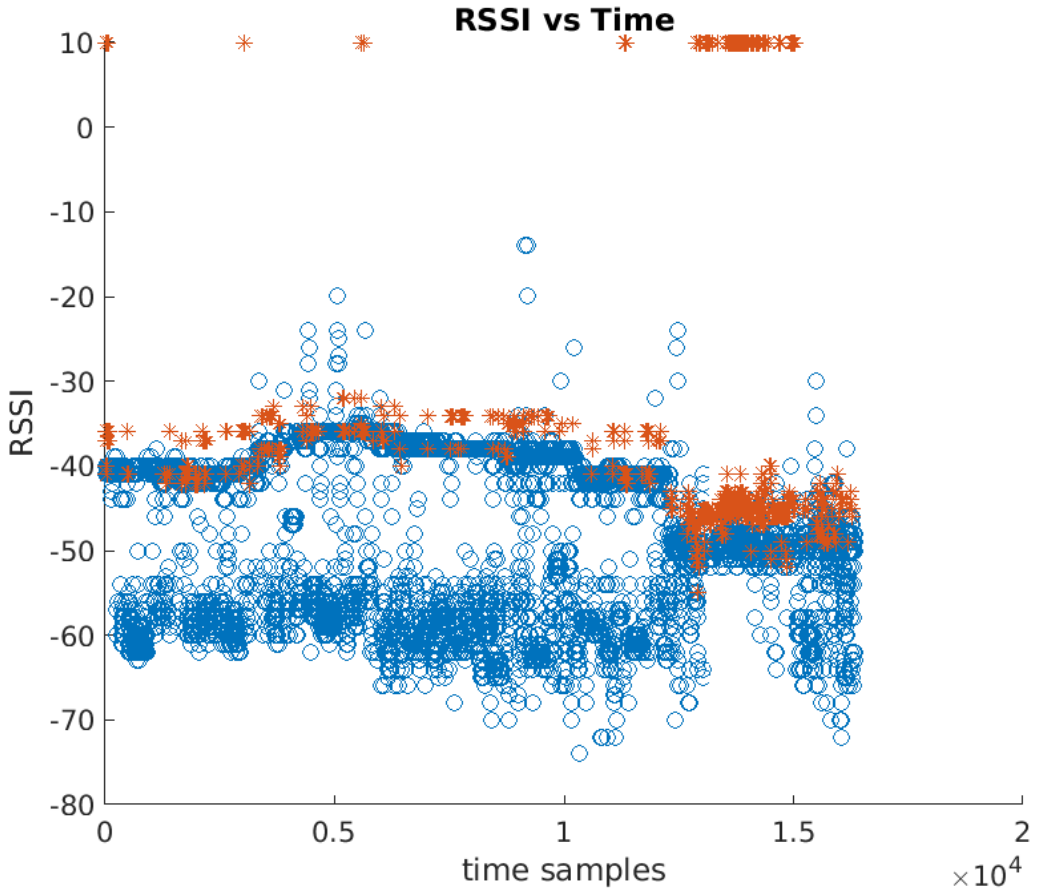

RSSI vs Time
RSSI
time
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
0
0.5
1
1.5
2
2.5
3
3.5
4
×10^4

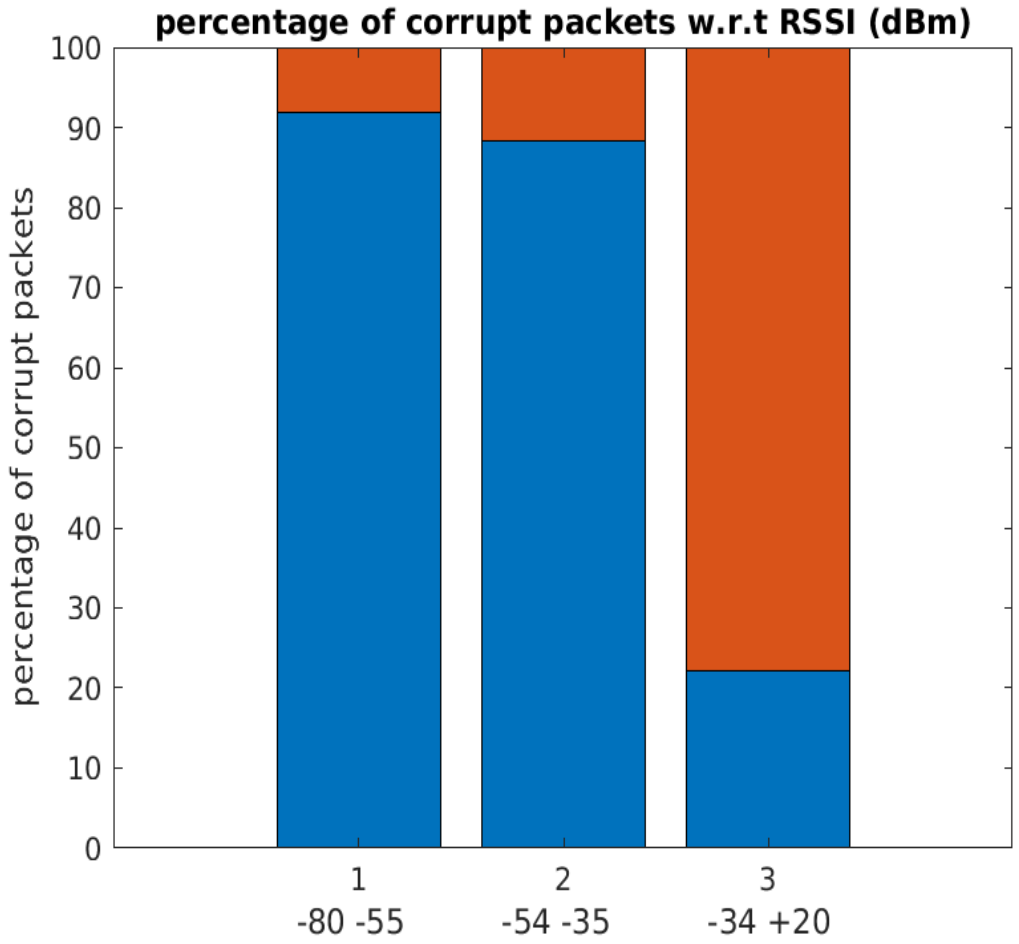
Train Station (night)



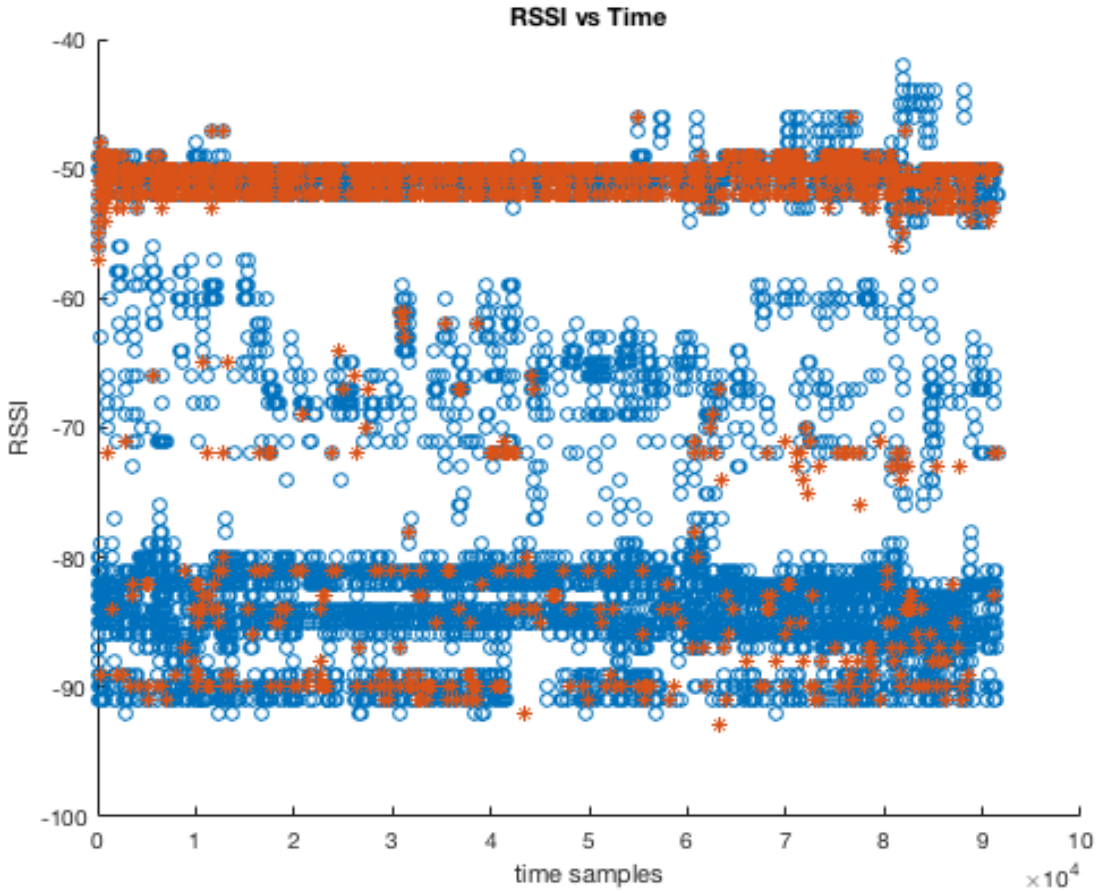
Case: NIC Dependence
Location: Aula

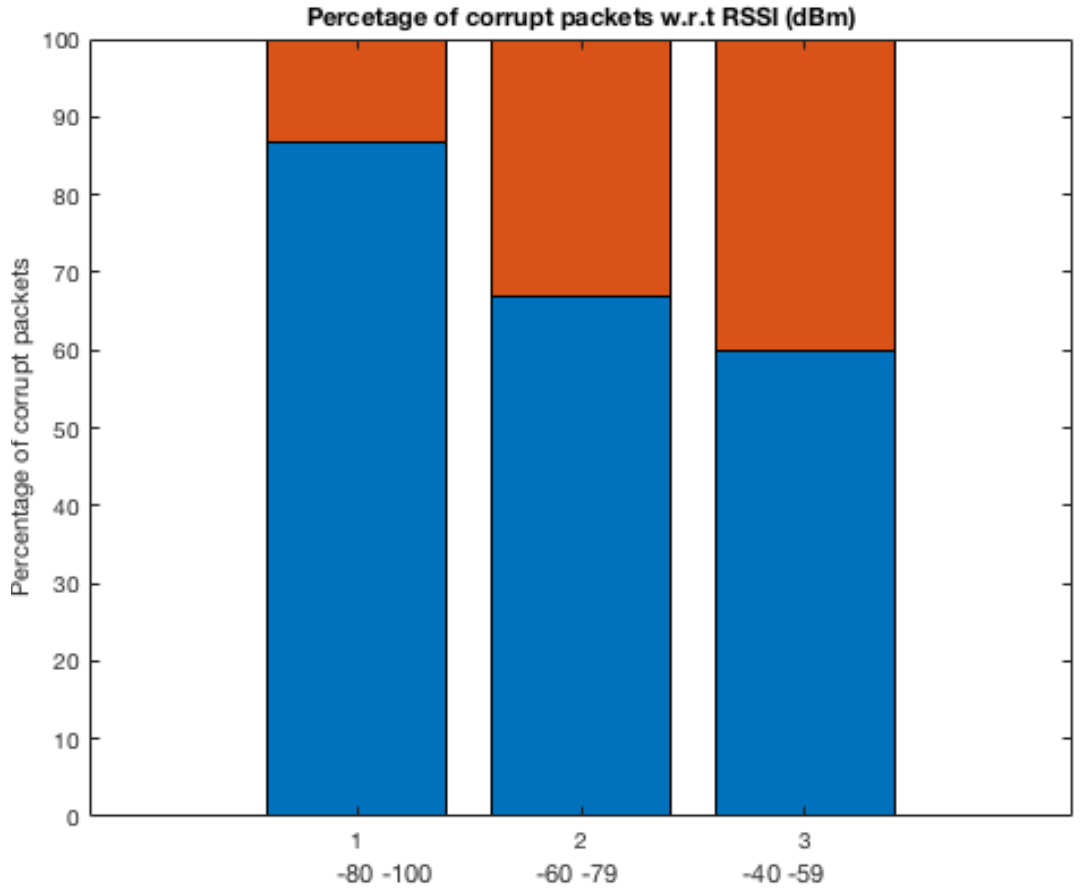
RTL8723be(Antenna 1)





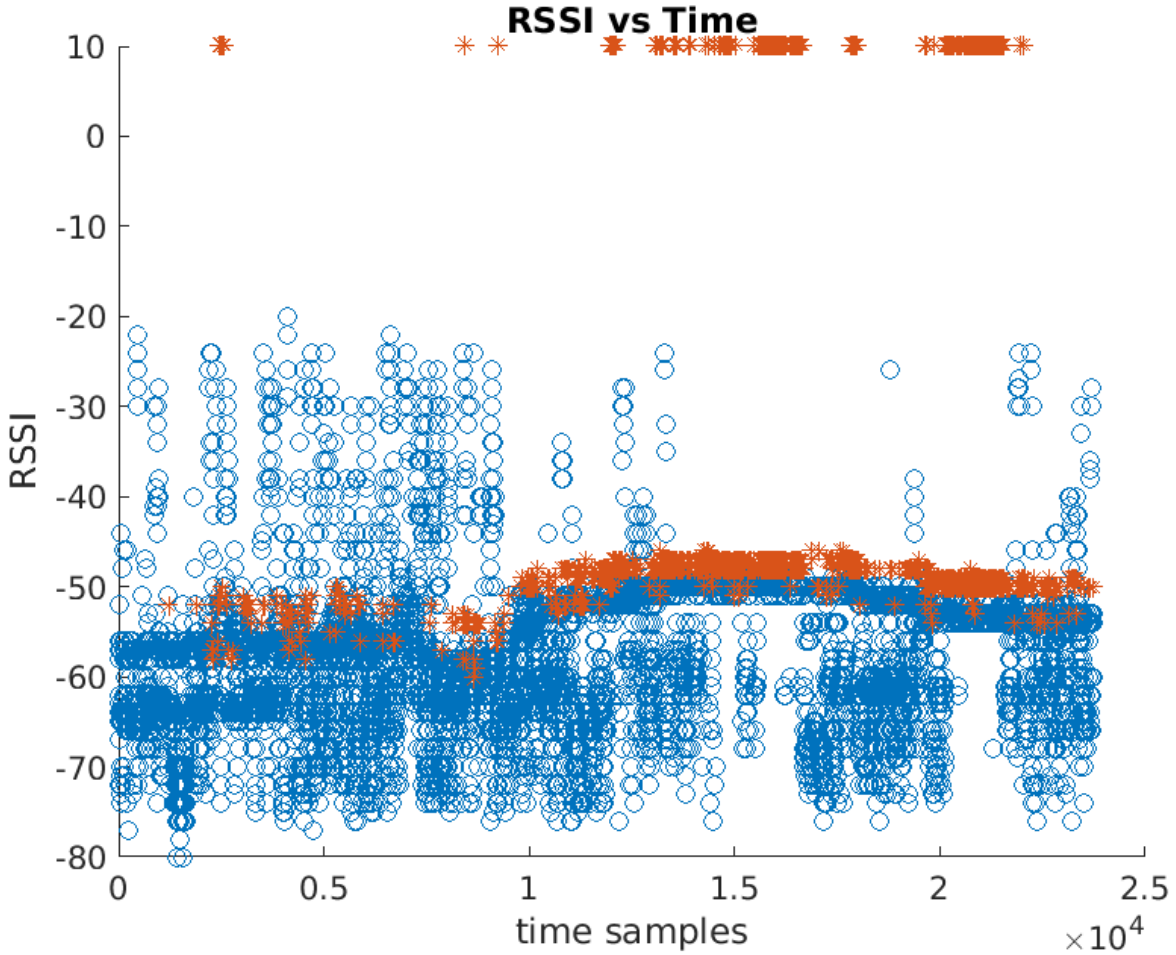
AIRPORT

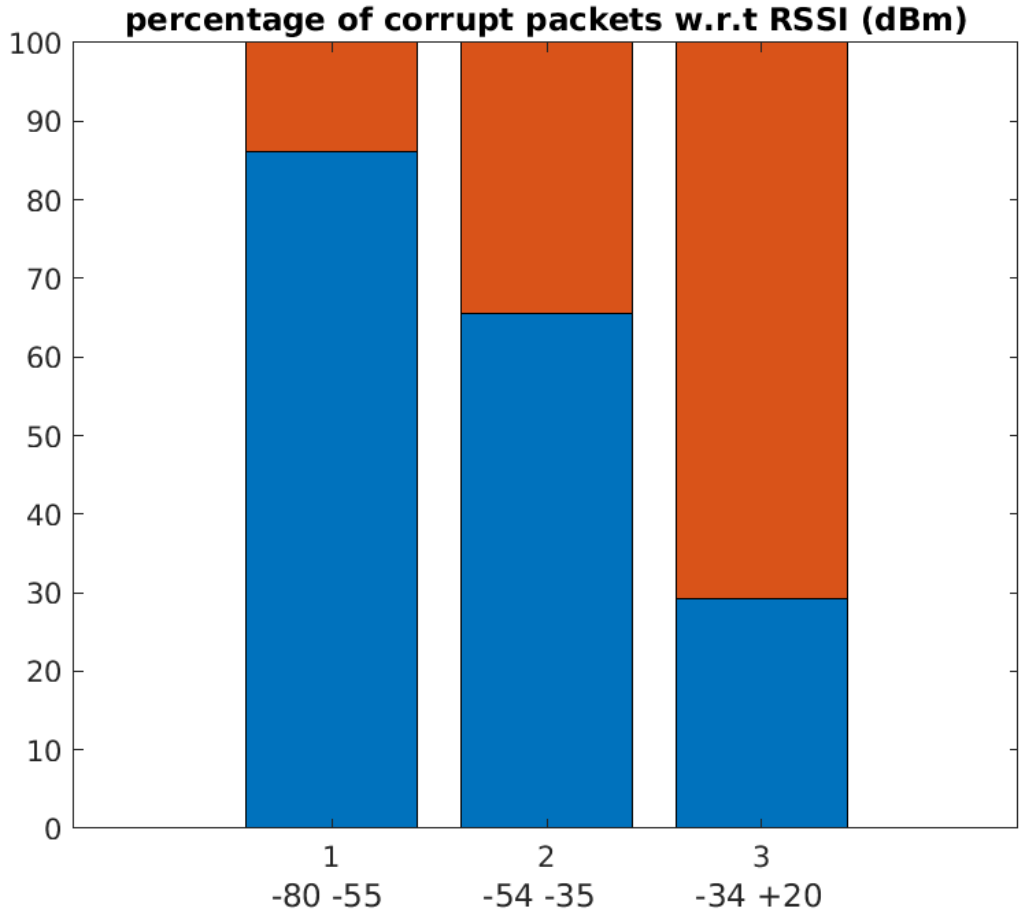

RSSI vs Time
RSSI
time samples
×10^4
-40
-50
-60
-70
-80
-90
-100
0
1
2
3
4
5
6
7
8
9
10


Percetage of corrupt packets w.r.t RSSI (dBm)
Percentage of corrupt packets
100
90
80
70
60
50
40
30
20
10
0
1
-80 -100
2
-60 -79
3
-40 -59

Case: Change of Interference Levels
Location: Study Area (HKLM)

Study Area (HKLM)





Conclusion

Hence, the experimental results clearly shows that the probability of packet corruption increases with the increase in interference levels

Reference

1.git link: https://github.com/anupbhattacharjee/Wireshark_JMDB

2.Experimental evaluation of interference impact on energy consumption in wireless sensor networks: http://ieeexplore.ieee.org/document/7523518/