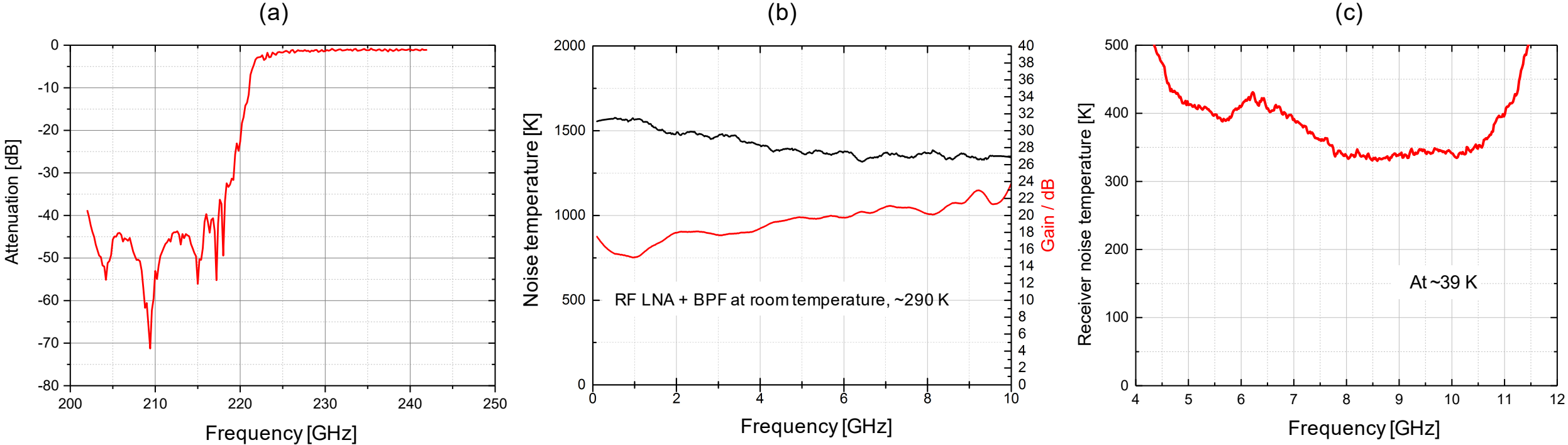
(a)
Attenuation [dB]
0
-10
-20
-30
-40
-50
-60
-70
-80
200
210
220
230
240
250
Frequency [GHz]
(b)
Noise temperature [K]
2000
1500
1000
500
0
Gain / dB
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
RF LNA + BPF at room temperature, ~290 K
0
2
4
6
8
10
Frequency [GHz]
(c)
Receiver noise temperature [K]
500
400
300
200
100
0
At ~39 K
4
5
6
7
8
9
10
11
12
Frequency [GHz]