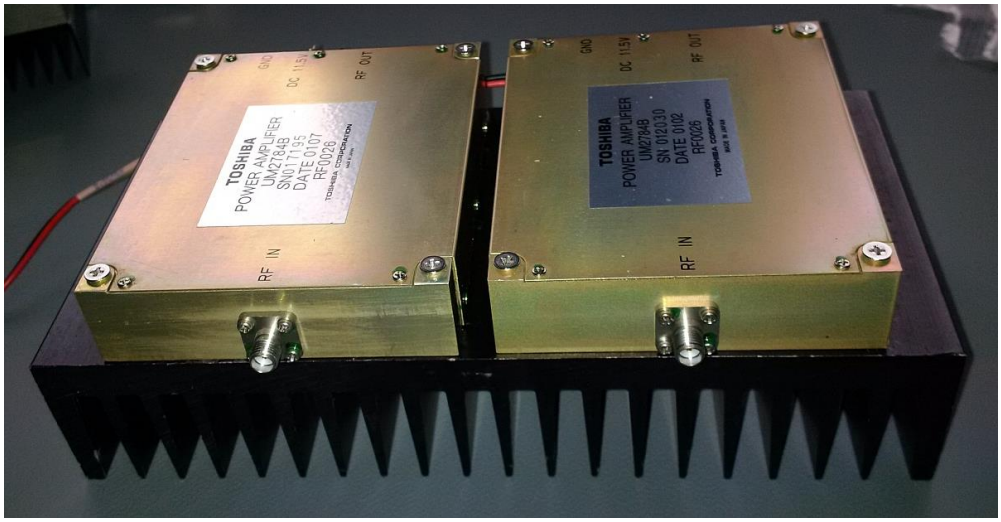
Characterization of 9cm 10W PAs Toshiba UM2784B

Matthias Bopp, DD1US, April 1st 2025, rev 1

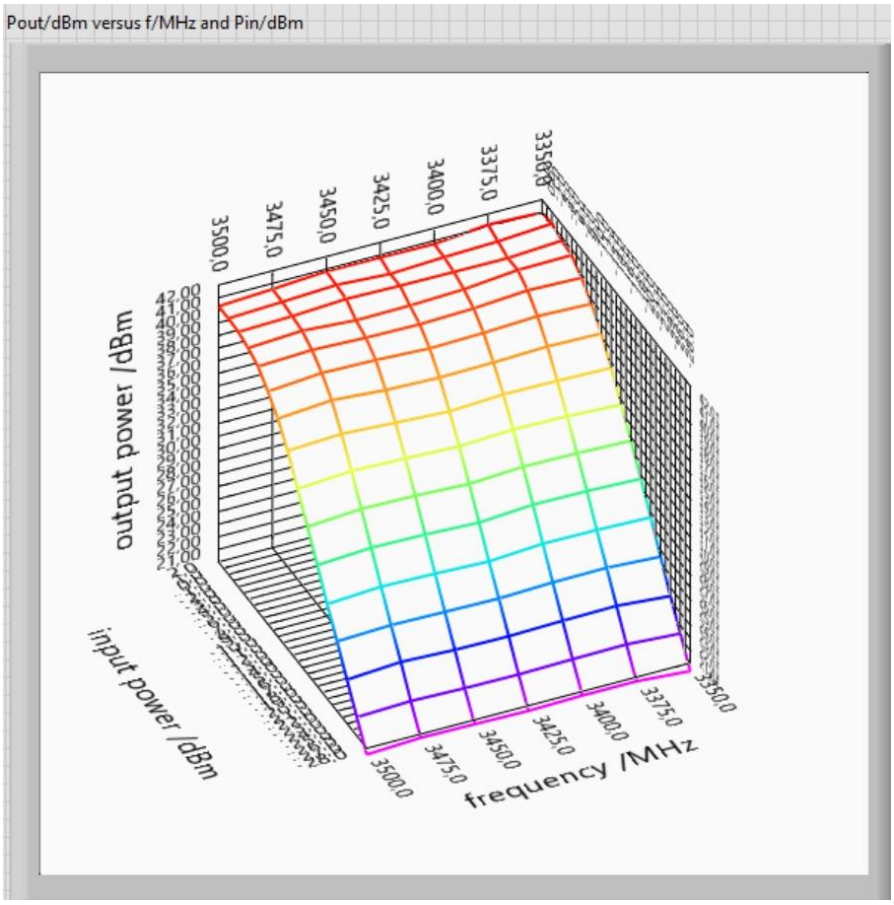
For some time, I had two pieces of Toshiba UM2784B PAs in my project box. I do not have any data other what is printed on the modules which is a supply voltage of 11.5V. The PA modules have the serial numbers #012030 and #017195. Each unit shows a current consumption of about 3500mA.

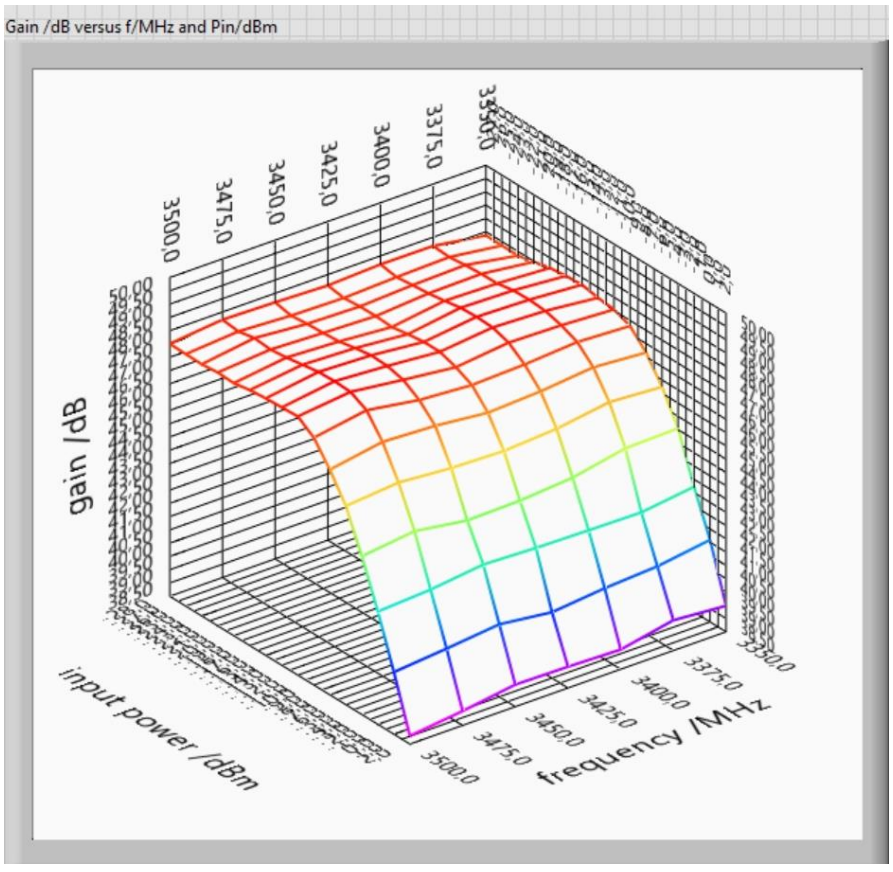
I had initially intended to combine them to get close to 20W. Meanwhile I got hold of another Toshiba PA Module which has a specified output power of 40W and thus I gave the two smaller PAs to a friend who intends to use them in some beacon projects.

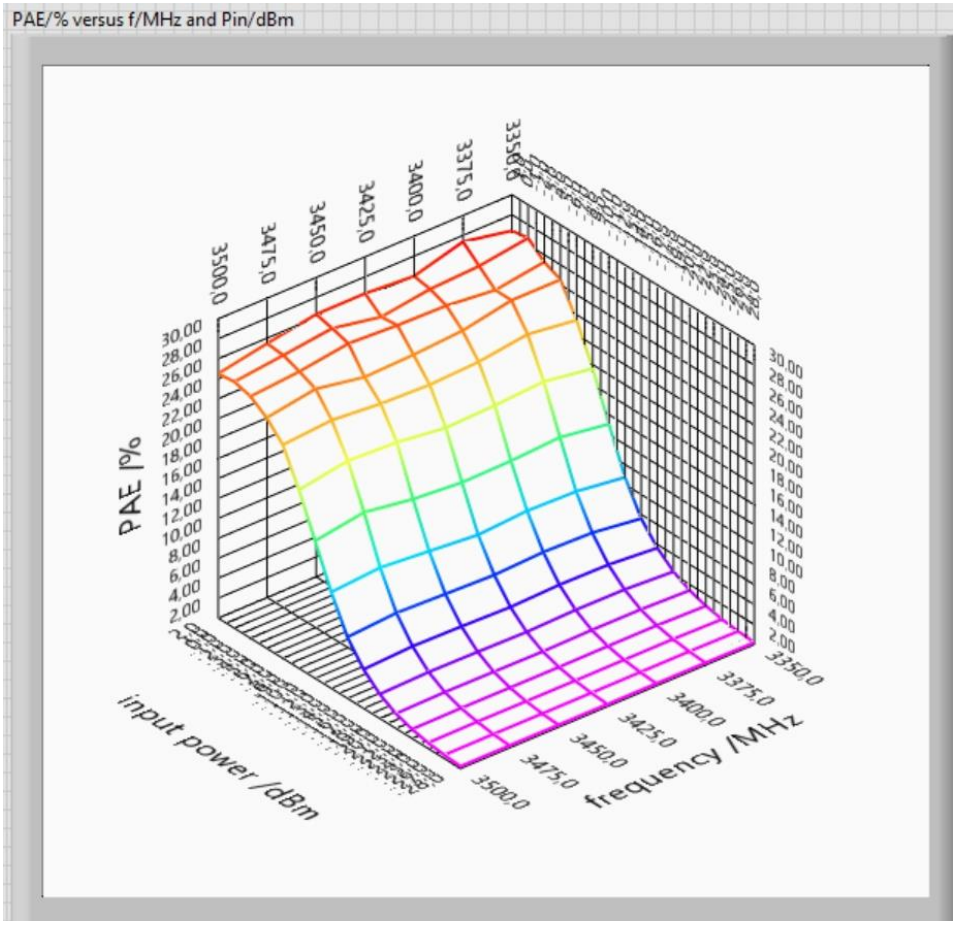
Before passing on the PA modules I decided to test them to make sure that they are properly working. Here are some pictures of the PA modules mounted for testing on a joint heatsink:

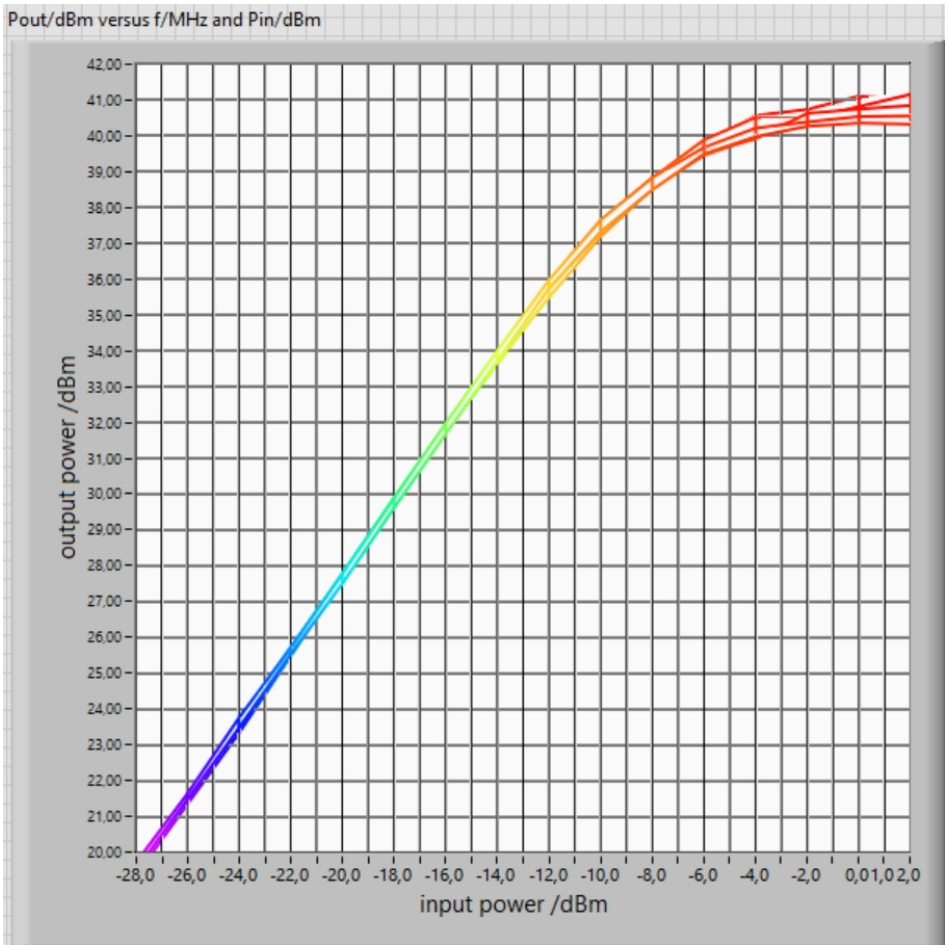


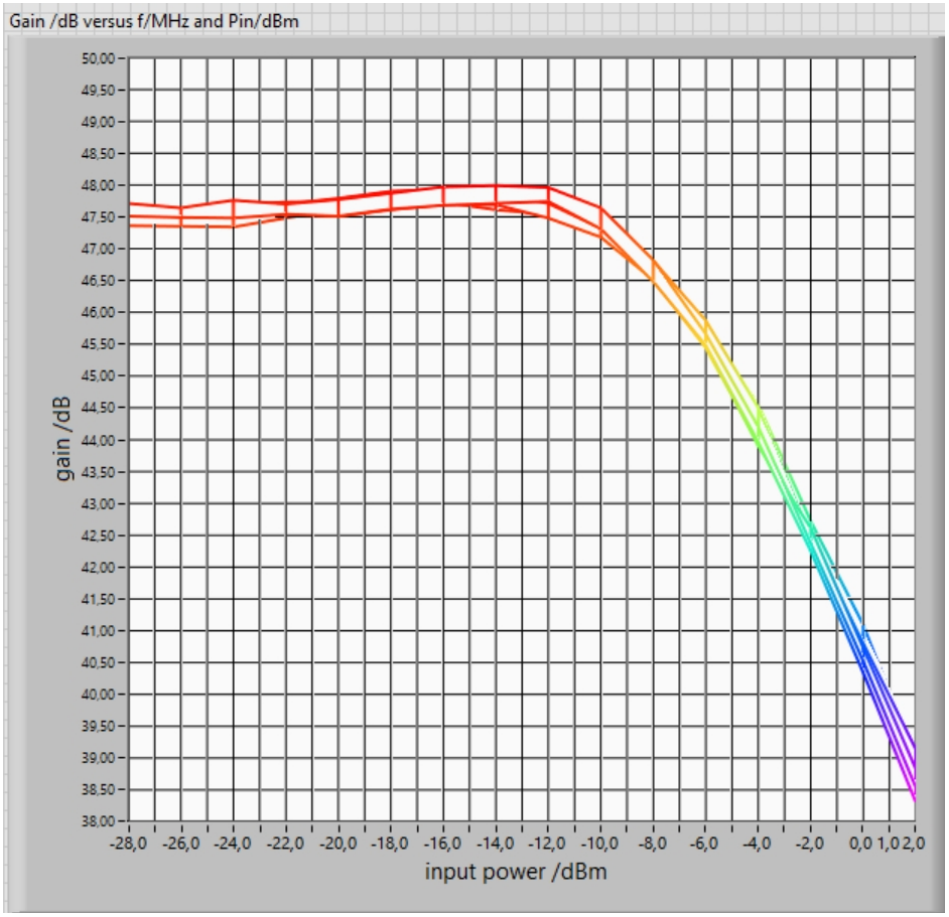
I measured the output power, gain and power added efficiency as a function of frequency and input power of each module. Here are the measurement results of module #012030:

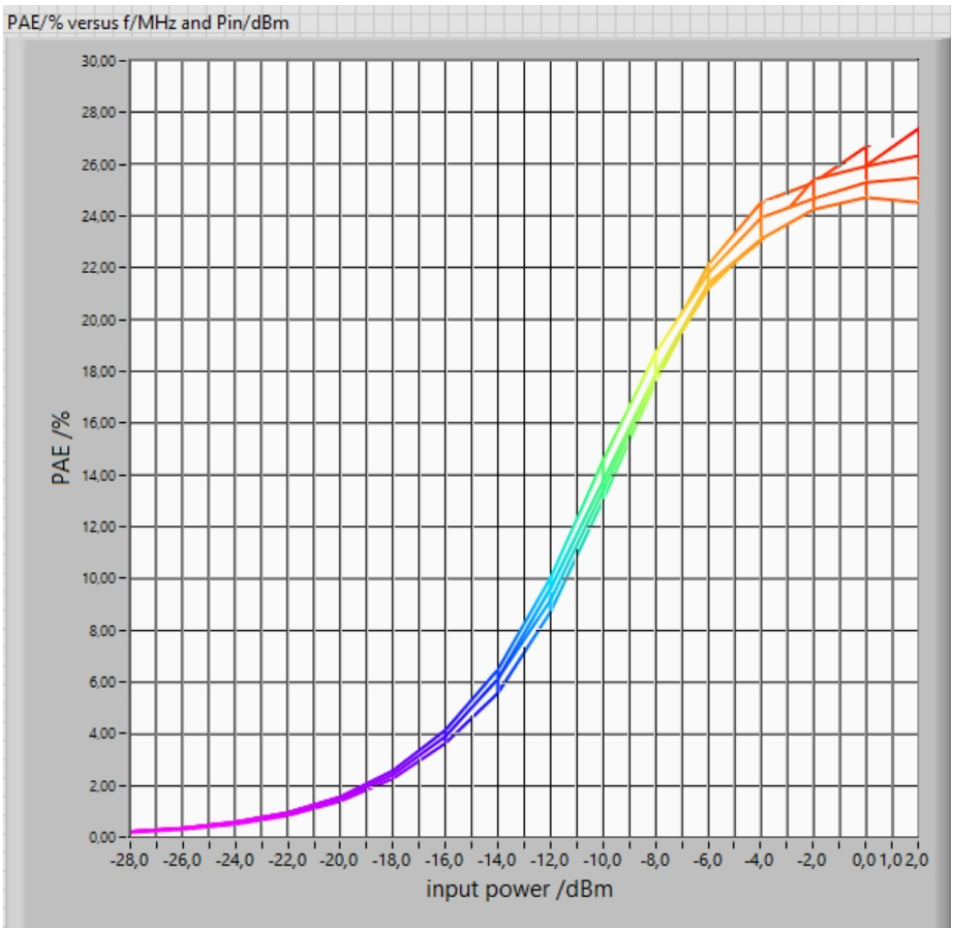


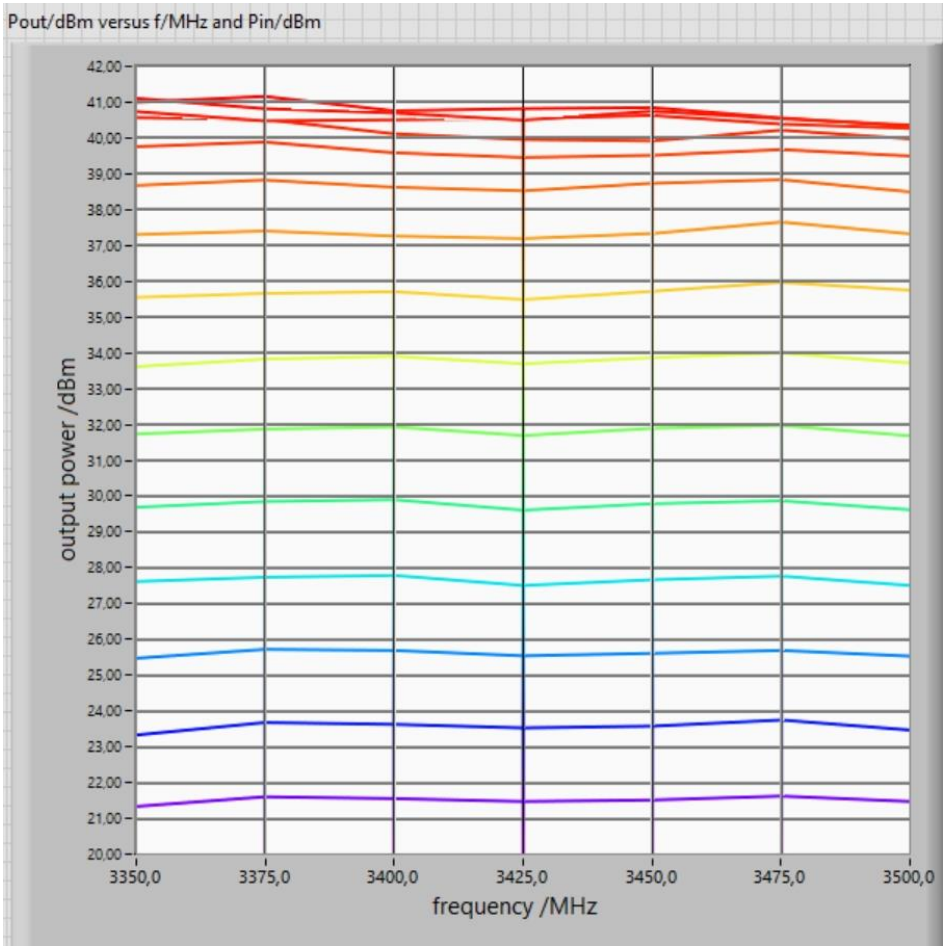


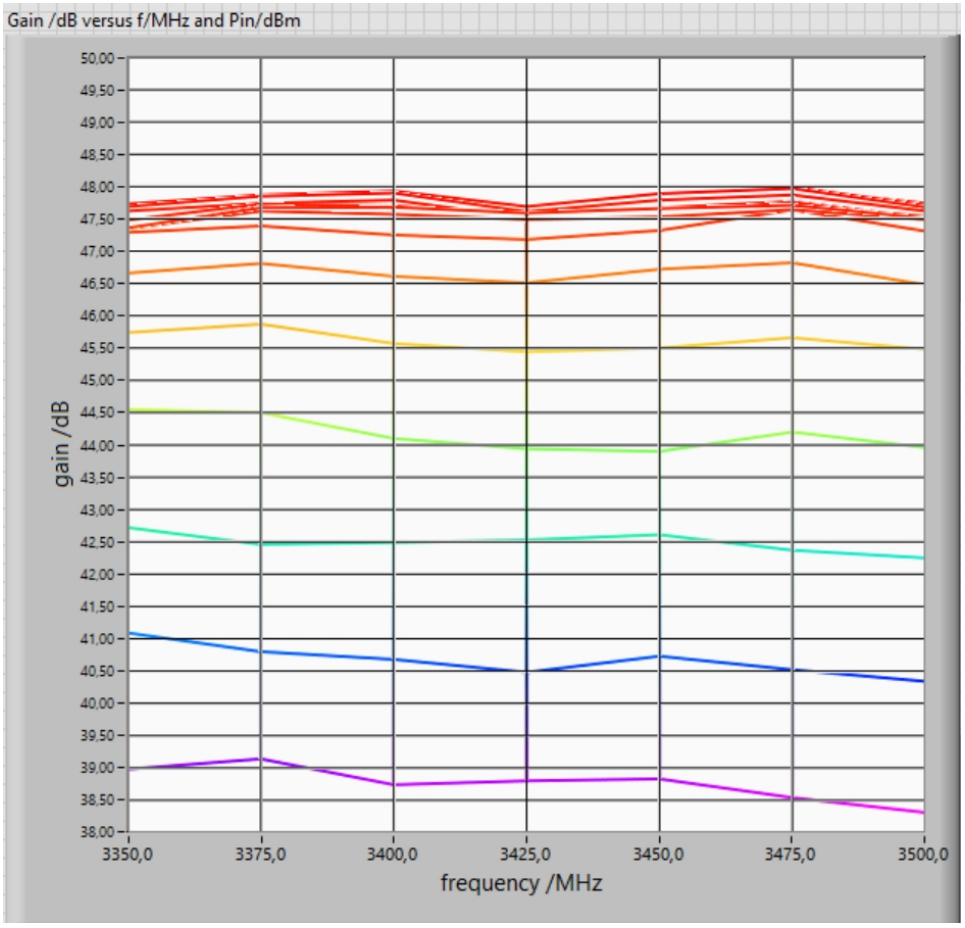

PAE/% versus f/MHz and Pin/dBm
PAE /%
input power /dBm
frequency /MHz

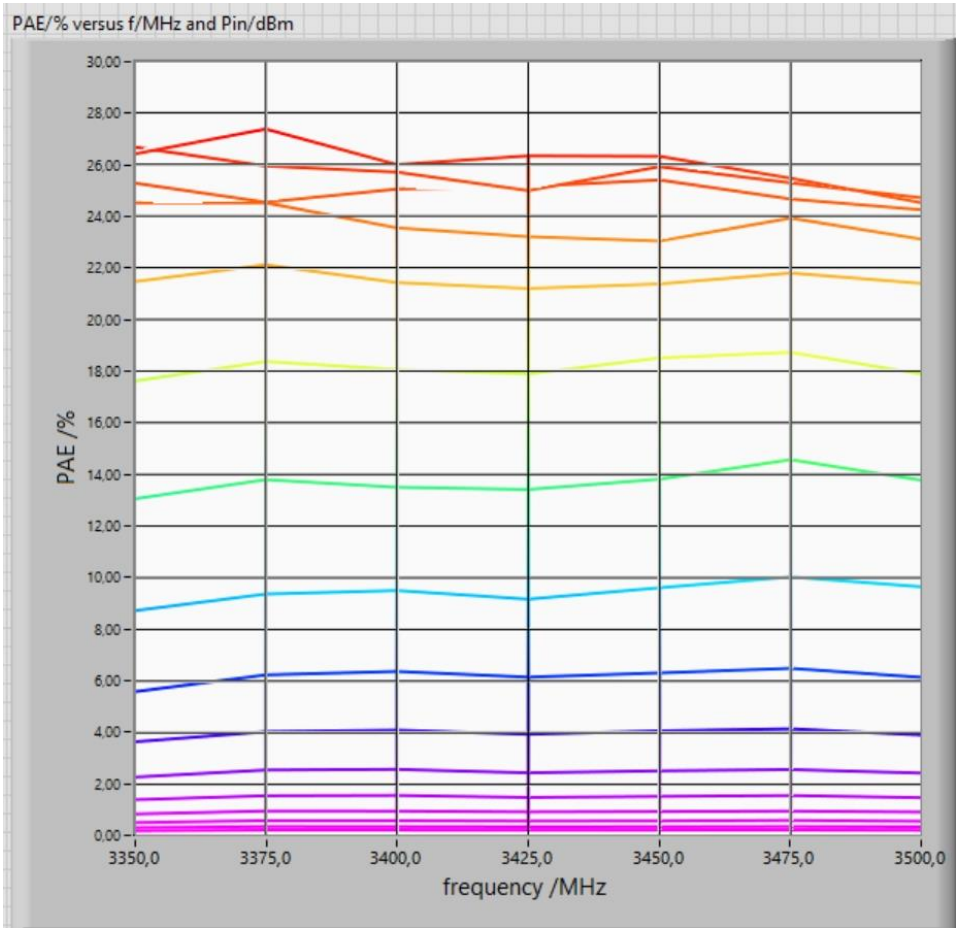

Pout/dBm versus f/MHz and Pin/dBm
output power /dBm
input power /dBm


Gain /dB versus f/MHz and Pin/dBm
gain /dB
50,00
49,50
49,00
48,50
48,00
47,50
47,00
46,50
46,00
45,50
45,00
44,50
44,00
43,50
43,00
42,50
42,00
41,50
41,00
40,50
40,00
39,50
39,00
38,50
38,00
-28,0 -26,0 -24,0 -22,0 -20,0 -18,0 -16,0 -14,0 -12,0 -10,0 -8,0 -6,0 -4,0 -2,0 0,0 1,0 2,0
input power /dBm


PAE/% versus f/MHz and Pin/dBm
PAE /%
30,00
28,00
26,00
24,00
22,00
20,00
18,00
16,00
14,00
12,00
10,00
8,00
6,00
4,00
2,00
0,00
-28,0 -26,0 -24,0 -22,0 -20,0 -18,0 -16,0 -14,0 -12,0 -10,0 -8,0 -6,0 -4,0 -2,0 0,0 1,0 2,0
input power /dBm

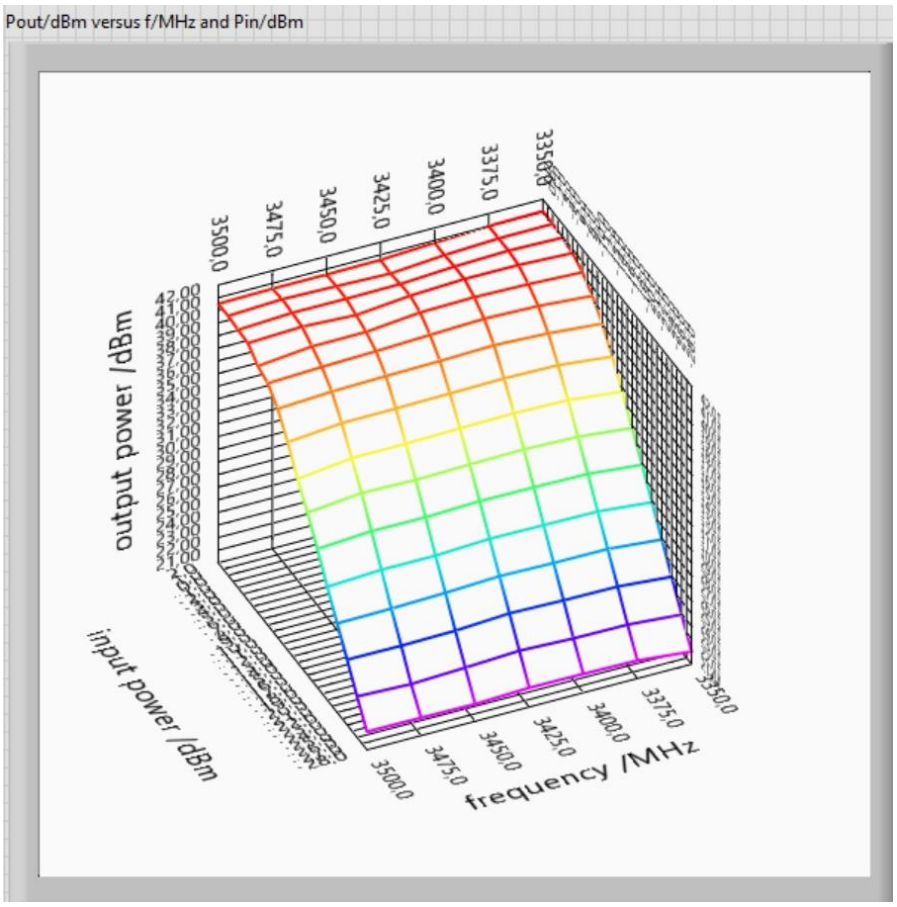

Pout/dBm versus f/MHz and Pin/dBm
output power /dBm
42,00
41,00
40,00
39,00
38,00
37,00
36,00
35,00
34,00
33,00
32,00
31,00
30,00
29,00
28,00
27,00
26,00
25,00
24,00
23,00
22,00
21,00
20,00
3350,0
3375,0
3400,0
3425,0
3450,0
3475,0
3500,0
frequency /MHz

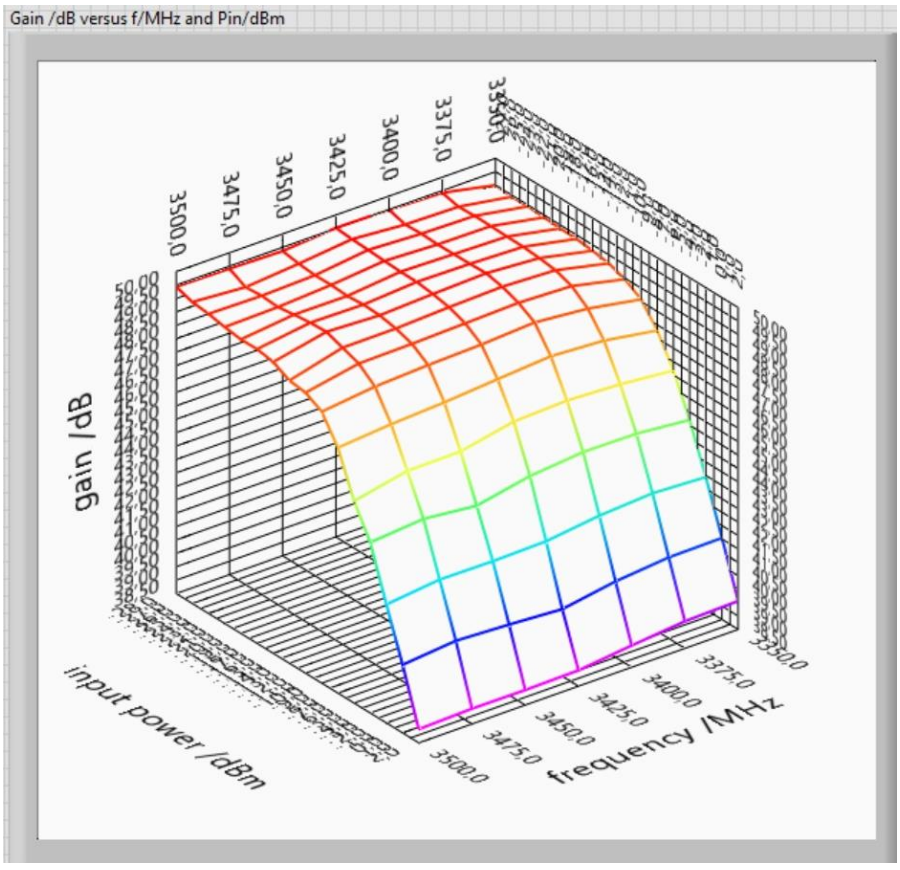

Gain /dB versus f/MHz and Pin/dBm
gain /dB
50,00
49,50
49,00
48,50
48,00
47,50
47,00
46,50
46,00
45,50
45,00
44,50
44,00
43,50
43,00
42,50
42,00
41,50
41,00
40,50
40,00
39,50
39,00
38,50
38,00
3350,0
3375,0
3400,0
3425,0
3450,0
3475,0
3500,0
frequency /MHz

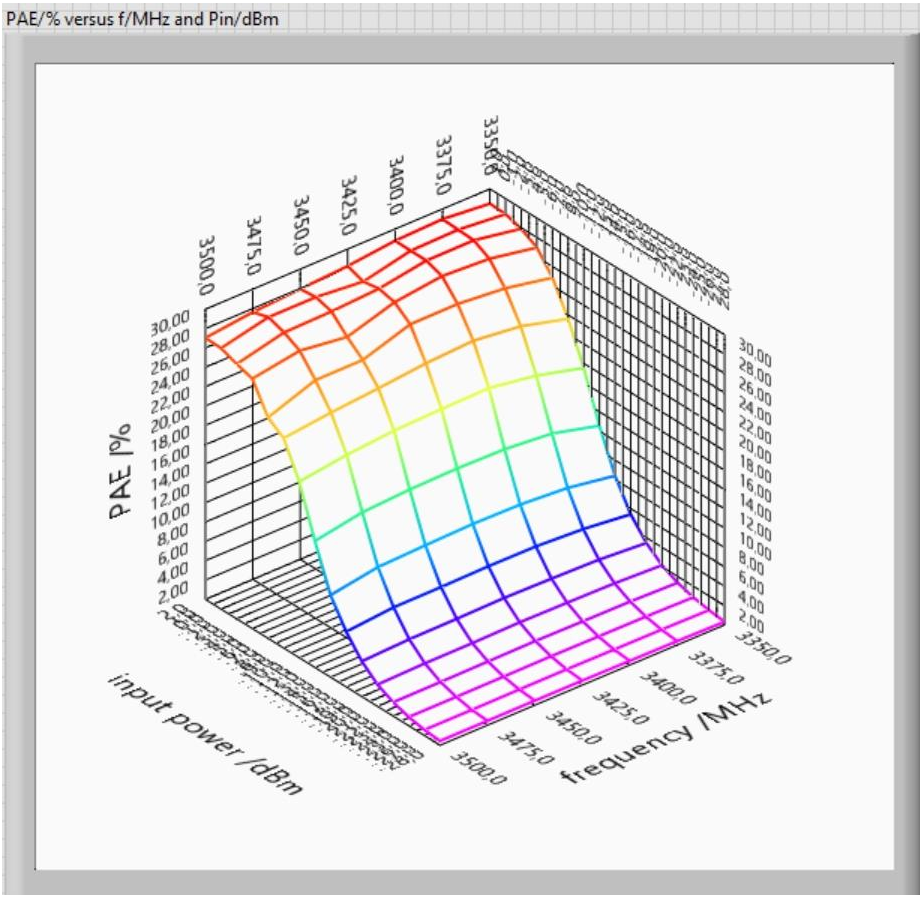


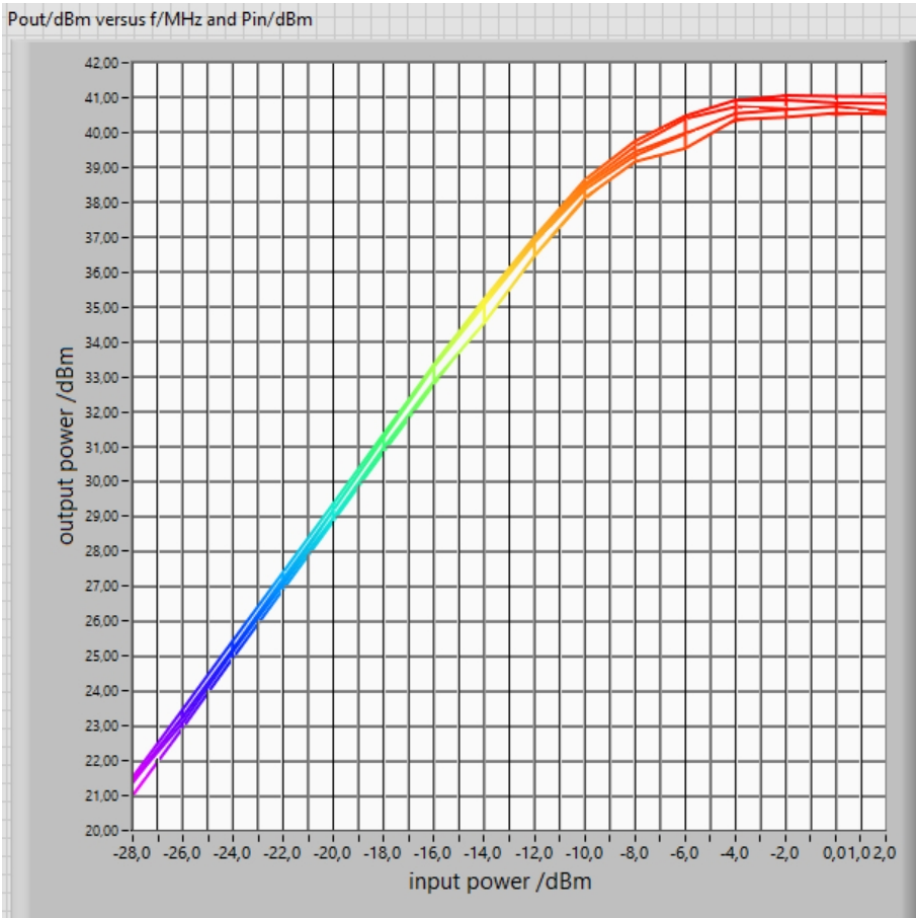
At the target frequency of 3400Mhz the maximum output power is about 40.8dBm, the linear gain is about 48dB and the maximum PAE with the PA in compression is 26%. An output power of 40dBm i.e. 10W is achieved with an input power of -5dBm.

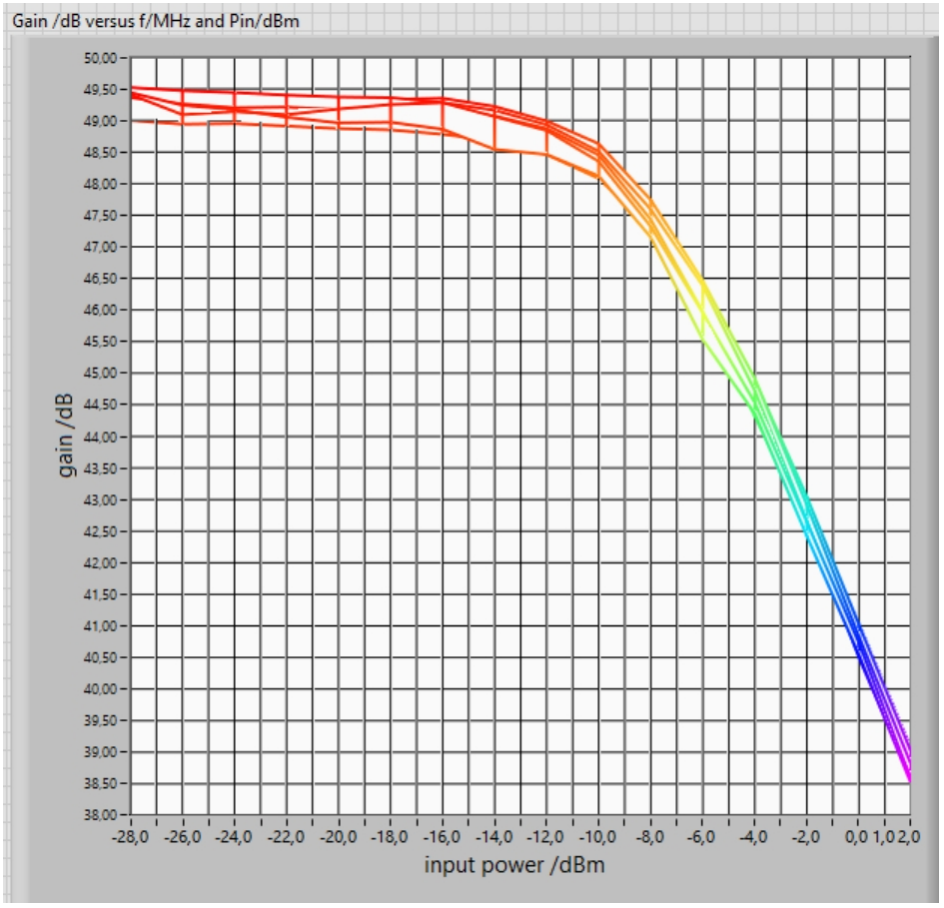
Next see the measurement results of the second unit with the serial number #017195:

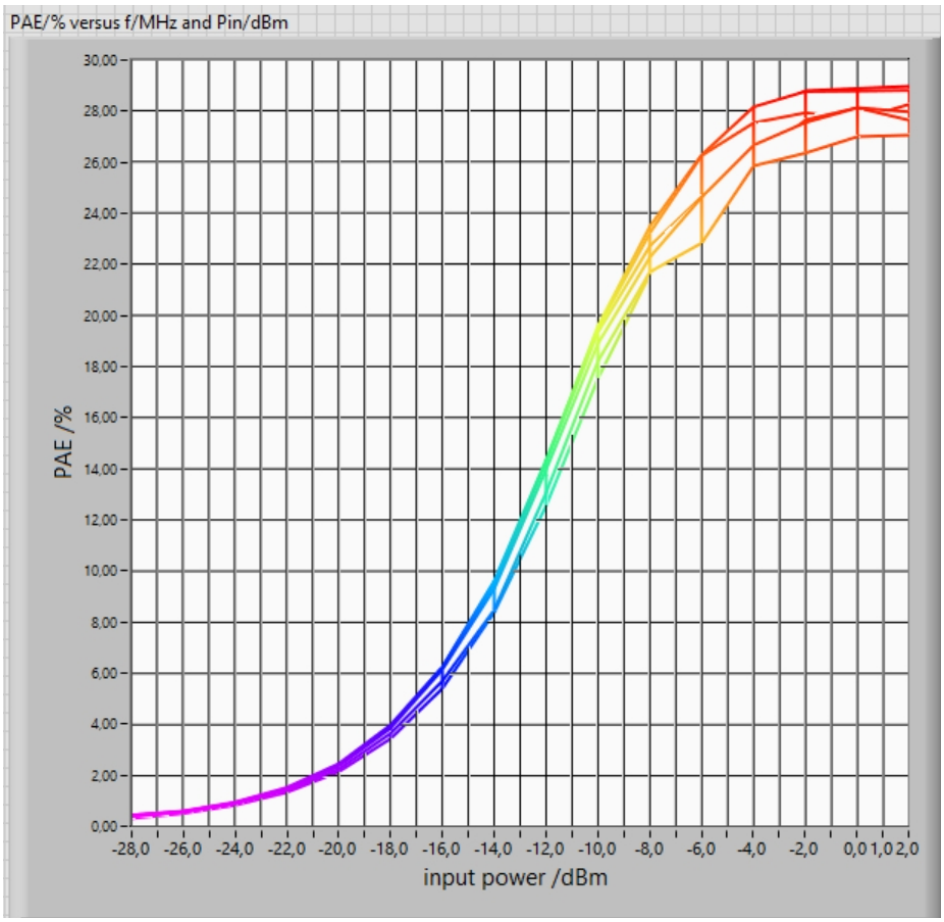


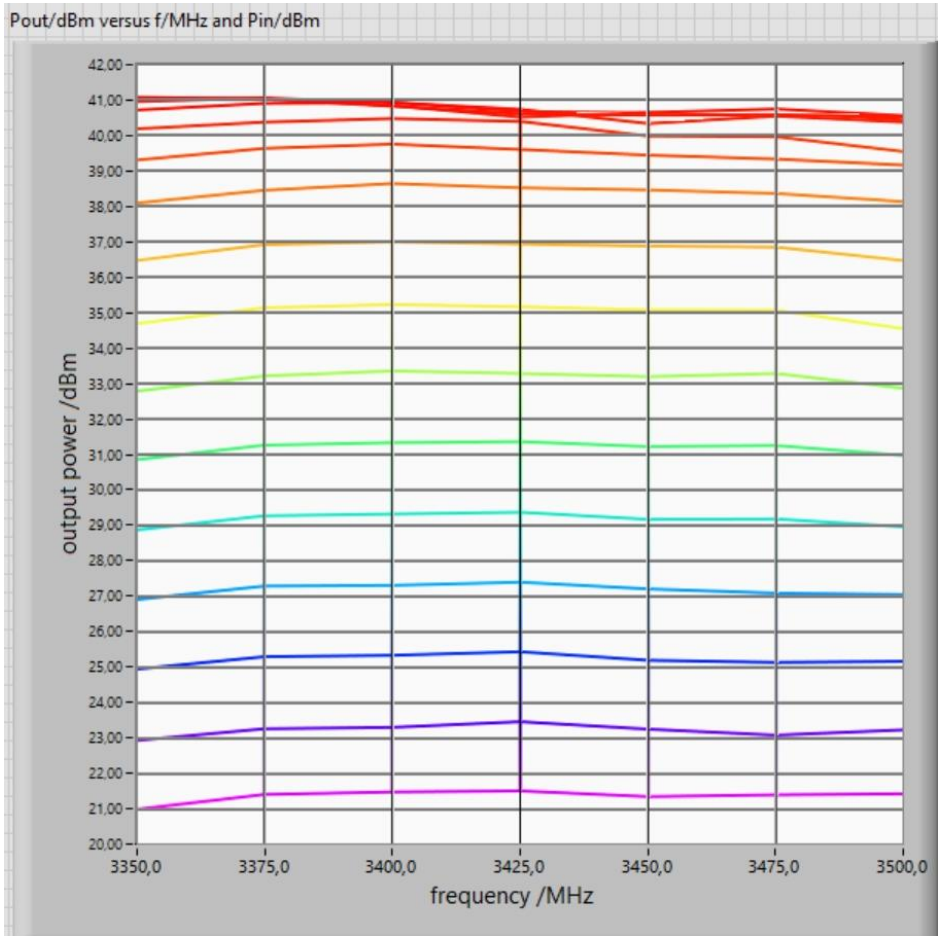



PAE/% versus f/MHz and Pin/dBm
PAE /%
30,00
28,00
26,00
24,00
22,00
20,00
18,00
16,00
14,00
12,00
10,00
8,00
6,00
4,00
2,00
input power /dBm
3500,0
3475,0
3450,0
3425,0
3400,0
3375,0
3350,0
frequency /MHz


Pout/dBm versus f/MHz and Pin/dBm
output power /dBm
42,00
41,00
40,00
39,00
38,00
37,00
36,00
35,00
34,00
33,00
32,00
31,00
30,00
29,00
28,00
27,00
26,00
25,00
24,00
23,00
22,00
21,00
20,00
-28,0 -26,0 -24,0 -22,0 -20,0 -18,0 -16,0 -14,0 -12,0 -10,0 -8,0 -6,0 -4,0 -2,0 0,0 1,0 2,0
input power /dBm


Gain /dB versus f/MHz and Pin/dBm
gain /dB
50,00
49,50
49,00
48,50
48,00
47,50
47,00
46,50
46,00
45,50
45,00
44,50
44,00
43,50
43,00
42,50
42,00
41,50
41,00
40,50
40,00
39,50
39,00
38,50
38,00
-28,0 -26,0 -24,0 -22,0 -20,0 -18,0 -16,0 -14,0 -12,0 -10,0 -8,0 -6,0 -4,0 -2,0 0,0 1,0 2,0
input power /dBm


PAE/% versus f/MHz and Pin/dBm
PAE /%
30,00
28,00
26,00
24,00
22,00
20,00
18,00
16,00
14,00
12,00
10,00
8,00
6,00
4,00
2,00
0,00
-28,0 -26,0 -24,0 -22,0 -20,0 -18,0 -16,0 -14,0 -12,0 -10,0 -8,0 -6,0 -4,0 -2,0 0,0 1,0 2,0
input power /dBm


Pout/dBm versus f/MHz and Pin/dBm
output power /dBm
42,00
41,00
40,00
39,00
38,00
37,00
36,00
35,00
34,00
33,00
32,00
31,00
30,00
29,00
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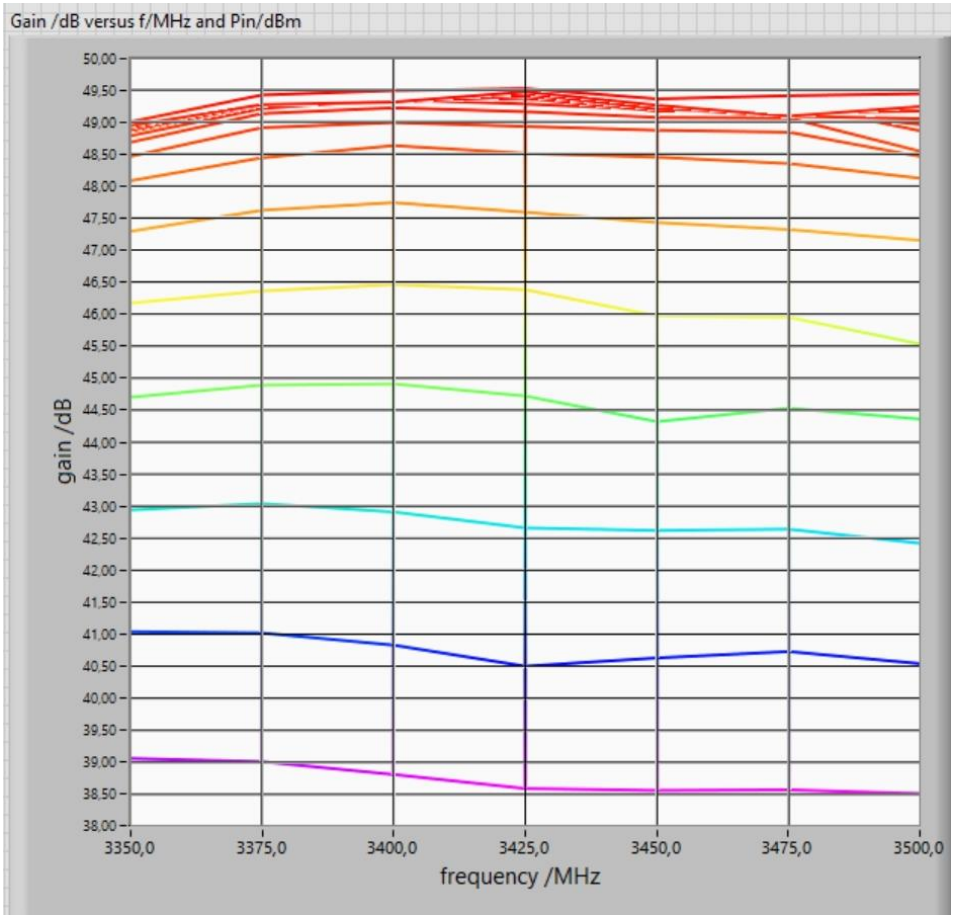
24,00
23,00
22,00
21,00
20,00
3350,0
3375,0
3400,0
3425,0
3450,0
3475,0
3500,0
frequency /MHz


Gain /dB versus f/MHz and Pin/dBm
gain /dB
50,00
49,50
49,00
48,50
48,00
47,50
47,00
46,50
46,00
45,50
45,00
44,50
44,00
43,50
43,00
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42,00
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39,50
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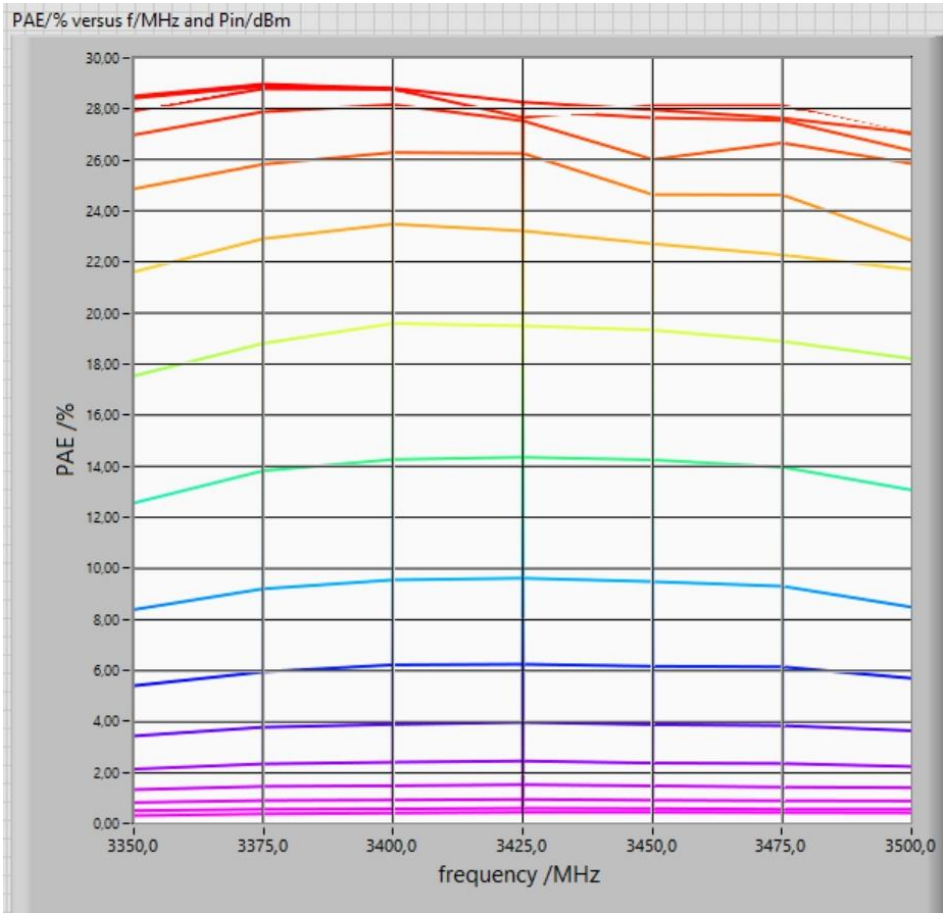
3400,0
3425,0
3450,0
3475,0
3500,0
frequency /MHz



In summary both units show very similar results. They provide a very high linear gain and thus they can for instance be driven directly from an SDR-Transceiver such as an ADALM Pluto. I am always grateful for feedback and will be happy to answer any questions.

Kind regards

Matthias DD1US

www.dd1us.de