

# WASU cable plant study for CMC deployment

## 1. WASU DS channel map

Because this is the first time for CMC to field trial in WASU, they plan to select some relative 'clean' cable plant to get a good result. About 5 spots were selected and we measured 2 spots yesterday.

Some basic information about the plant/channel is show in the table below:

Program soure from Optical	Only Video(VOD in 2 channel, others all video),
channel power @ Optical node oupput	90-100dBuV
channel power @trunk amplifier output	90dBuV
channel power @ user end	60dBuV
DOCSI/EOC singal	NO
analog channel number	7
Digital Channel number	55
Analog Channel modulation	PAL/D 8MHz
Digital Channel Modulation	Annex A, 64QAM, 6.875Msps
power feed system	60 AC power over coaxial
Optical node type	1(fiber)in 2(F connector) out or 1 in 4 out
Trunk amplifier type	one way, not bidirection

And the detailed channel map is shown below:

item	freq (MHz)	A(Analog)/D(Digital)
1	120.25	A
2	147	D
3	155	D
4	171	D
5	176.25	A
6	211	D
7	224.25	A
8	283	D
9	299	D
10	307	D
11	315	D
12	331	D
13	355	D
14	363	D

15	371	D
16	379	D
17	387	D
18	395	D
19	403	D
20	411	D
21	419	D
22	427	D
23	435	D
24	443	D
25	451	D
26	459	D
27	471.25	A
28	479.25	A
29	506	D
30	514	D
31	522	D
32	530	D
33	546	D
34	554	D
35	562	D
36	570	D
37	575.25	A
38	586	D
39	594	D
40	602	D
41	610	D
42	618	D
43	626	D
44	634	D
45	642	D
46	650	D
47	658	D
48	666	D
49	674	D
50	682	D
51	690	D
52	698	D
53	706	D
54	743.25	A

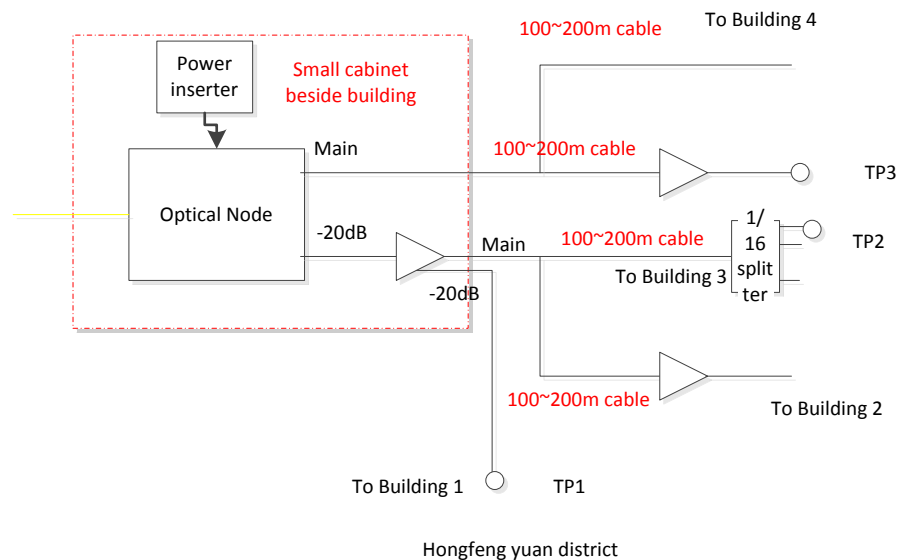
55	754	D
56	762	D
57	770	D
58	778	D
59	786	D
60	794	D
61	802	D
62	810	D

## 2 Detailed field trial spots information

We tested 2 spots, one is named Hongfengyuan, and the other is named Shibanxiang.

### 2.1 Hongfengyuan spot information

Hongfengyuan spot has one optical node with 1 fiber in 2 F connector out feeding to about 700 end users. One F connect is the main output, the other F connector is -20dB branch output. Since there is -20dB lower for this port, one trunk amplifier is added right after the -20dB branch port. The block diagram for Hongfengyuan is shown below.



Everything inside the red dash line block is in the metal cabinet(sub front end) , the cabinet is about 1m tall, 0.5 m wide and 0.8m in length. This is the exactly place where CMC device will be inserted. We measured the signal at the -20dB branch port (TP1) because the main port is already water proofed and can't be open.

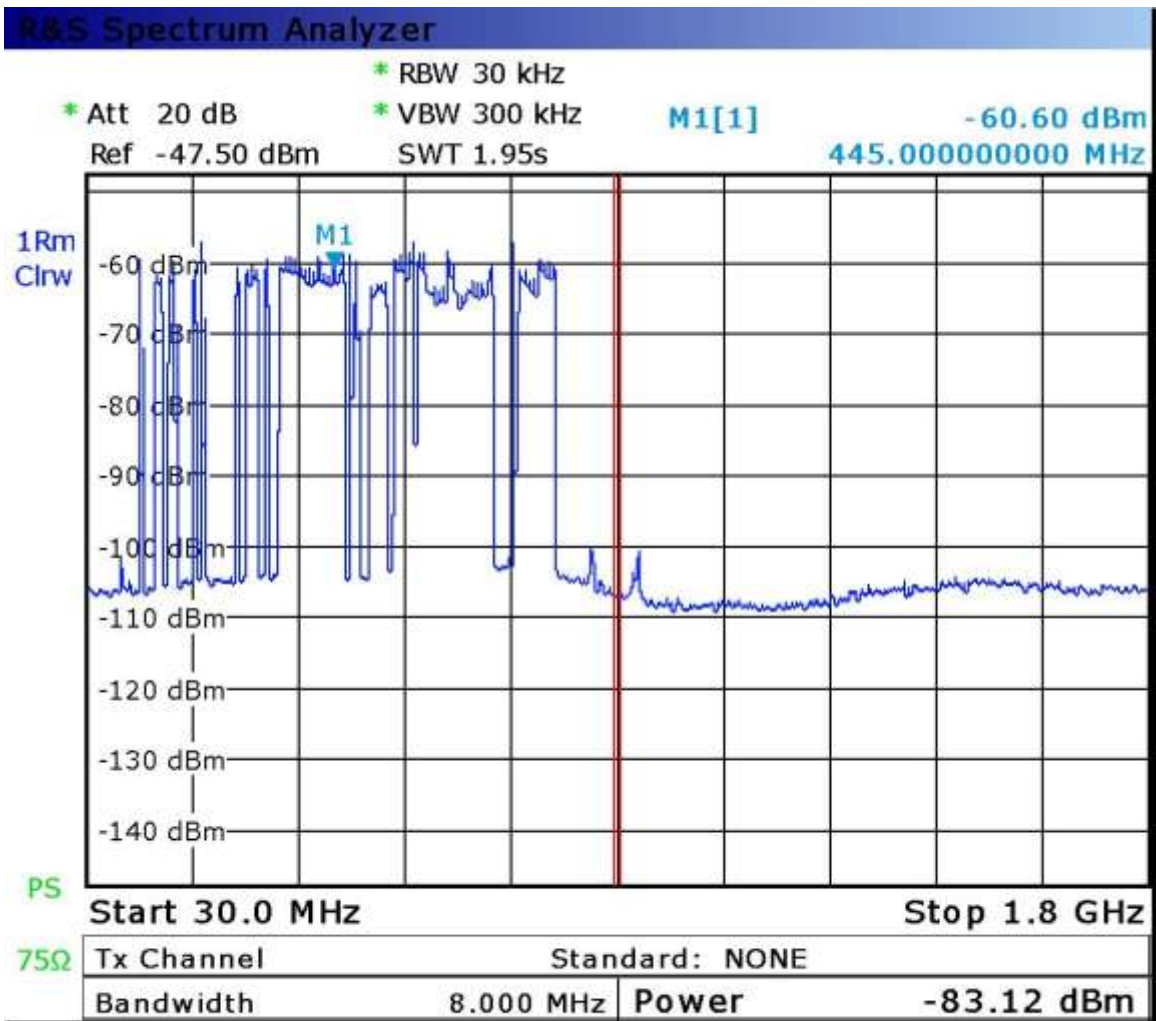
#### 2.1.1 Signal measurement in TP1(after the fiber node)

The signal is measure with R&S ETL,The detailed channel power level for pint TP1 is shown below:

item	freq (MHz)	A/D	power level (dBuV)	MER (dB)
1	120.25	A	71.6	
2	147	D	70.2	41
3	155	D	70.4	42
4	171	D	69.8	40.2
5	176.25	A	73.5	
6	211	D	70.8	41.8
7	224.25	A	73.5	
8	283	D	70.4	41.4
9	299	D	71	41.5
10	307	D	71.3	41.4
11	315	D	70.6	42.2
12	331	D	71.6	42.8
13	355	D	71.2	42.2
14	363	D	71.8	42.2
15	371	D	71.9	42.3
16	379	D	72.2	42
17	387	D	70.8	41.2
18	395	D	70.2	41.3
19	403	D	71.1	41.4
20	411	D	70.5	40.9
21	419	D	72.7	42.2
22	427	D	70.4	41.4
23	435	D	70.2	41.3
24	443	D	69.8	42.1
25	451	D	70.4	41.5
26	459	D	72.9	42.7
27	471.25	A	74.7	
28	479.25	A	74.9	
29	506	D	68.6	40.4
30	514	D	68.8	40.3
31	522	D	69.2	38.2
32	530	D	69.3	38.6
33	546	D	71.9	41
34	554	D	72.4	41.7
35	562	D	71.2	40

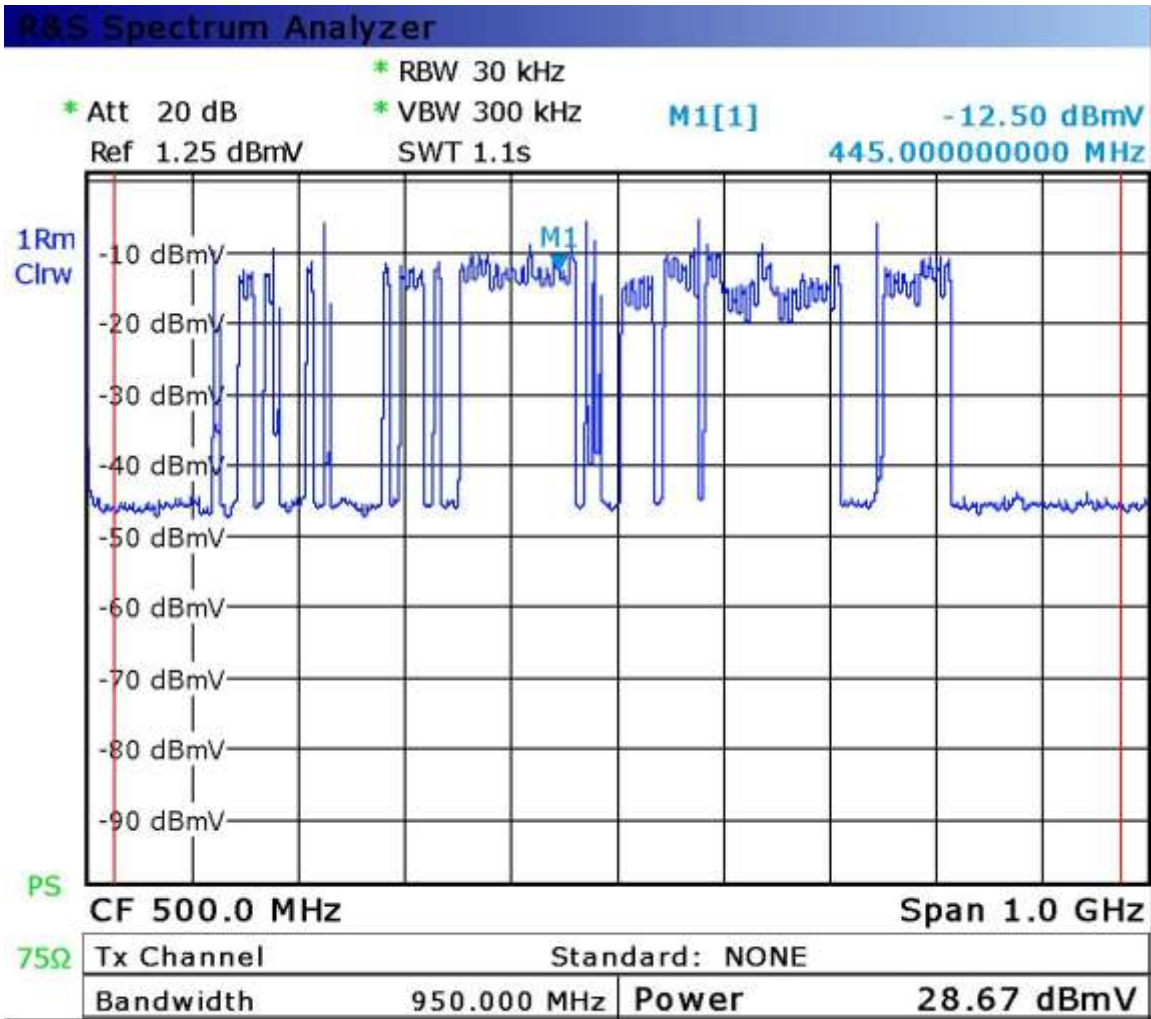
36	570	D	72.1	42.9
37	575.25	A	74.9	
38	586	D	72.9	38.6
39	594	D	71.9	41.9
40	602	D	68	38
41	610	D	68	38
42	618	D	68	40
43	626	D	68	40
44	634	D	72.7	42
45	642	D	71.1	42.3
46	650	D	67.3	39.1
47	658	D	67.3	39
48	666	D	67.7	39
49	674	D	69.1	39.9
50	682	D	69	39.9
51	690	D	68.7	40
52	698	D	68.7	39.7
53	706	D	71.7	41.8
54	743.25	A	74.3	
55	754	D	70.6	40.5
56	762	D	70.1	40.6
57	770	D	69.7	40.4
58	778	D	69.6	40.5
59	786	D	71.8	41.9
60	794	D	71.8	41.8
61	802	D	71.8	42
62	810	D	71.8	42.1

And the cable plant spectrum also captured, for freq from 30MHz to 1800MHz, the spectrum is shown below:



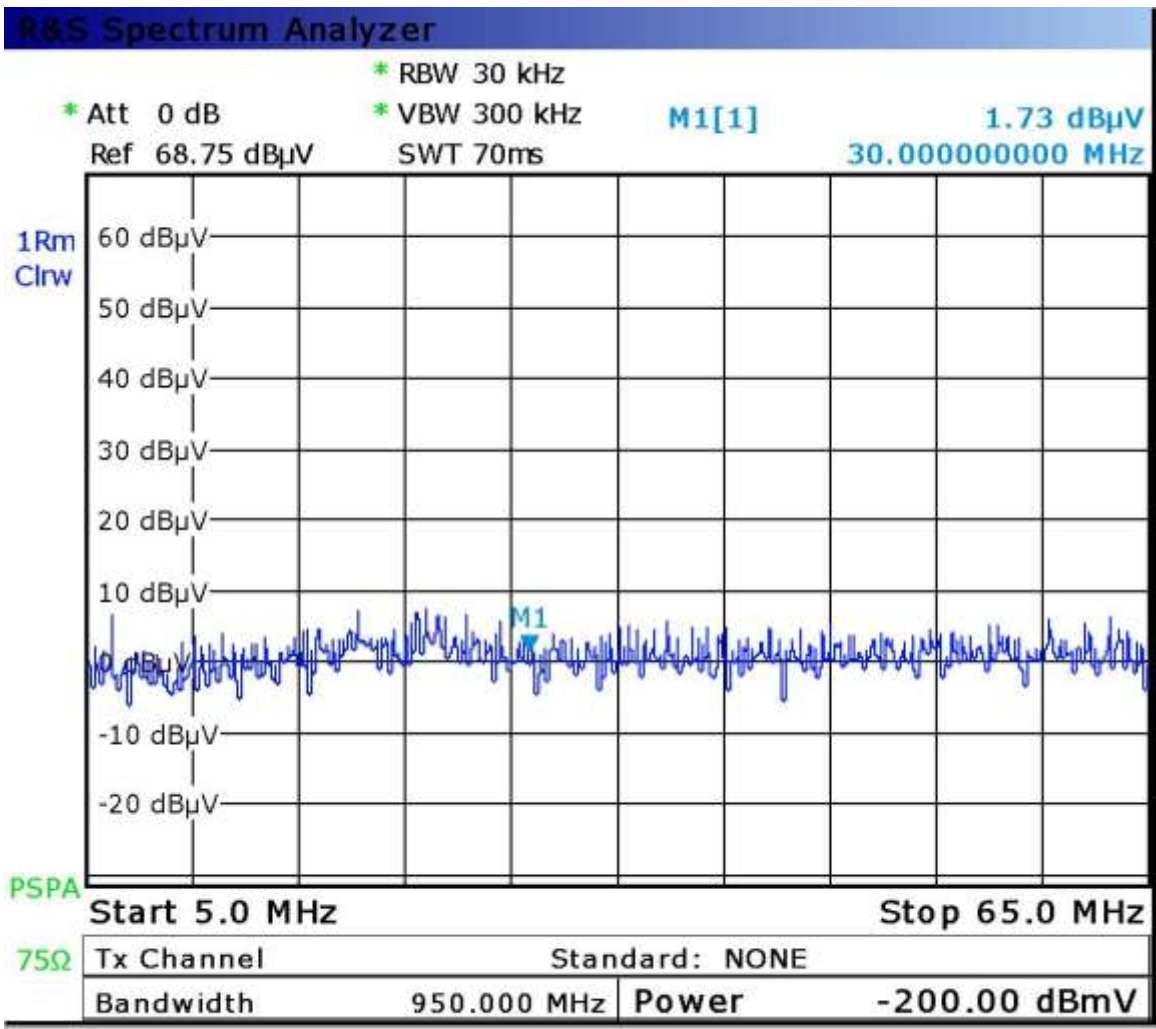
Date: 10.APR.2012 10:15:48

The total channel power capture lists below, from the capture, the total channel power is about 28.7dBmV.



Date: 10.APR.2012 10:19:20

The up stream band (5-65MHz) is also further checked, from the capture below, there is no distinct spurious appear, but since it is the -20dB branch port, maybe the noise floor will be raised after the trunk amplifier main output port.

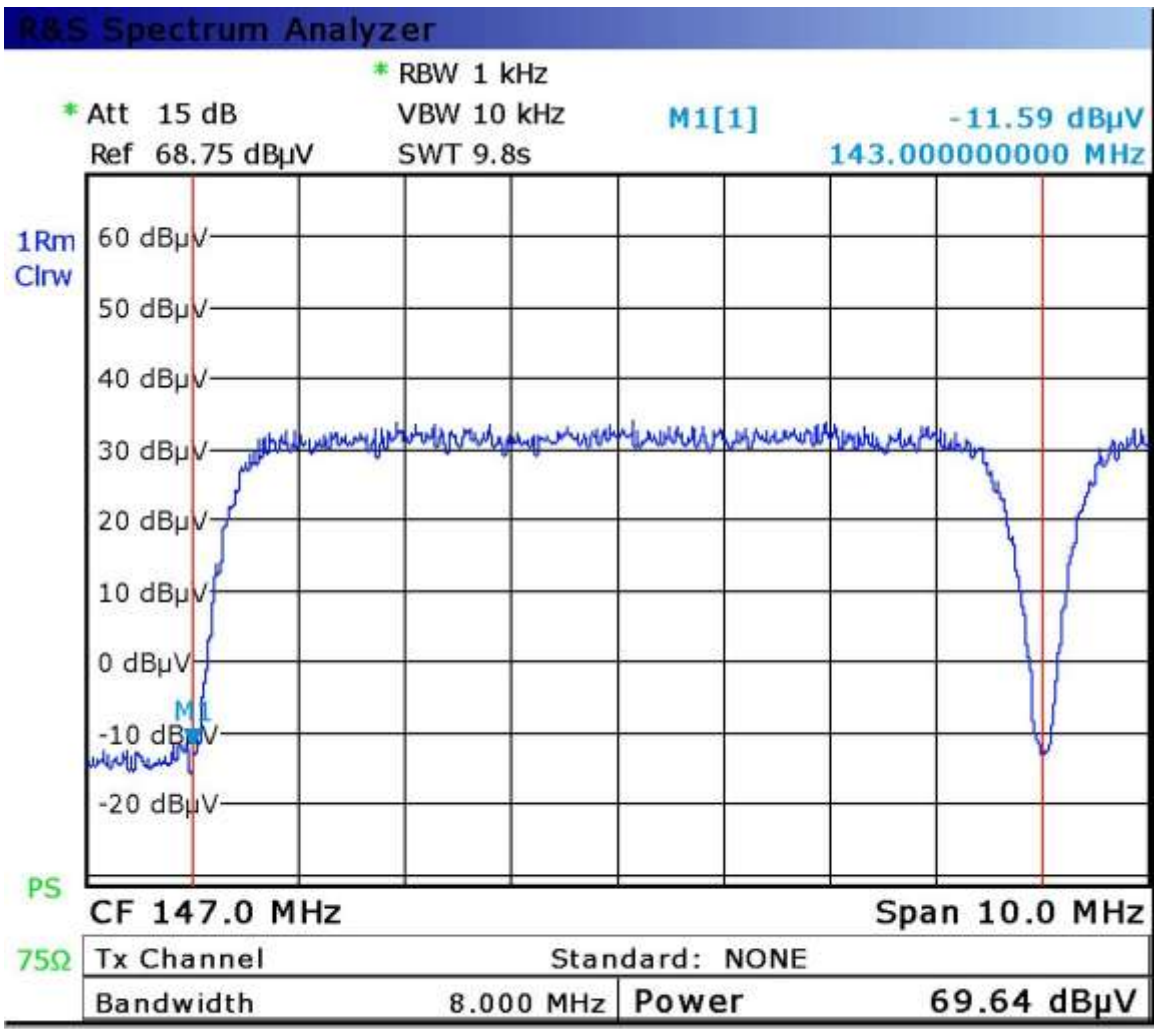


Date: 10.APR.2012 10:57:26

As for the channel measurement, some sample channel also captured.

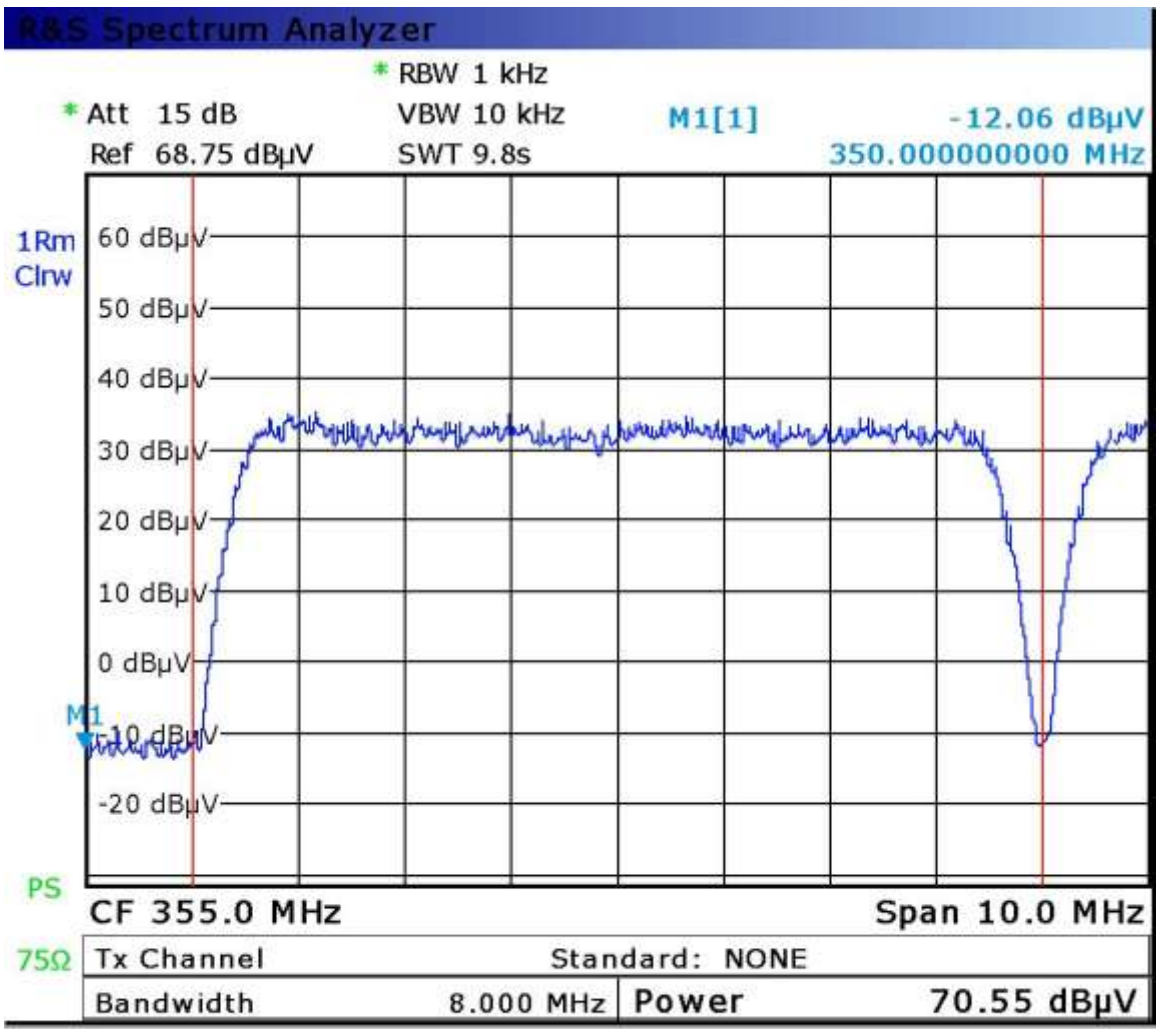
For 147MHz channel is shown below:





Date: 10.APR.2012 11:00:54

For 355MHz channel:

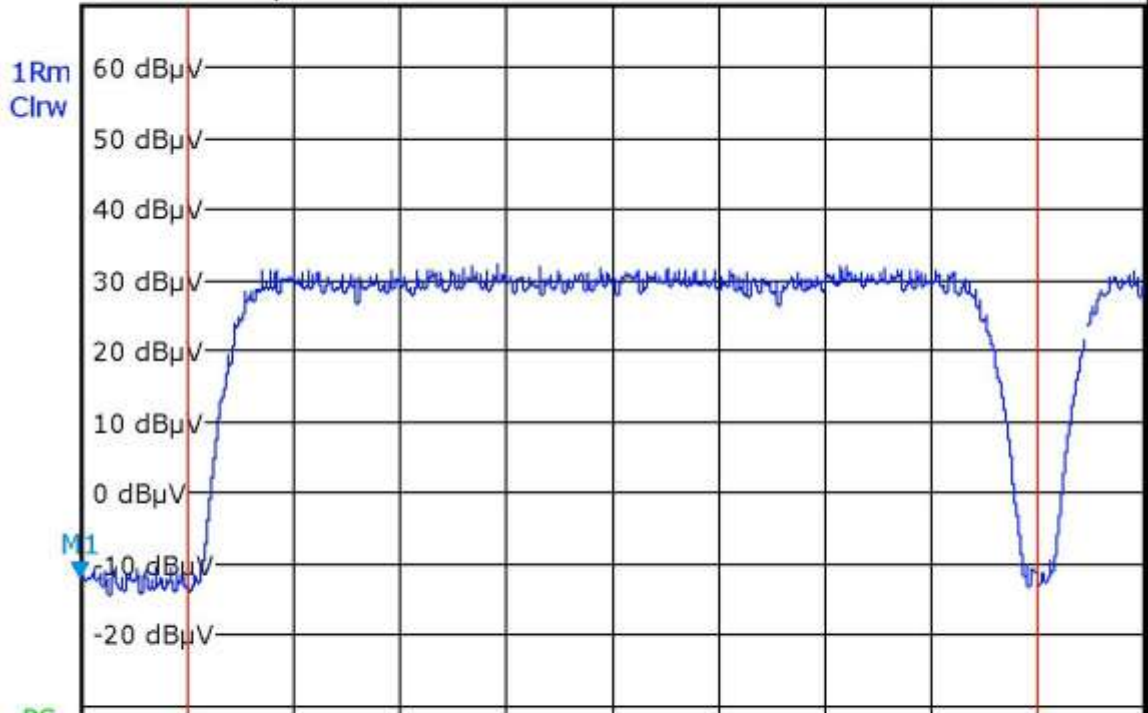


Date: 10.APR.2012 11:01:26

For 506MHz channel:

# R&S Spectrum Analyzer

\* Att 15 dB      \* RBW 1 kHz  
 Ref 68.75 dB $\mu$ V      VBW 10 kHz      M1[1]      -11.96 dB $\mu$ V  
 SWT 9.8s      501.00000000 MHz

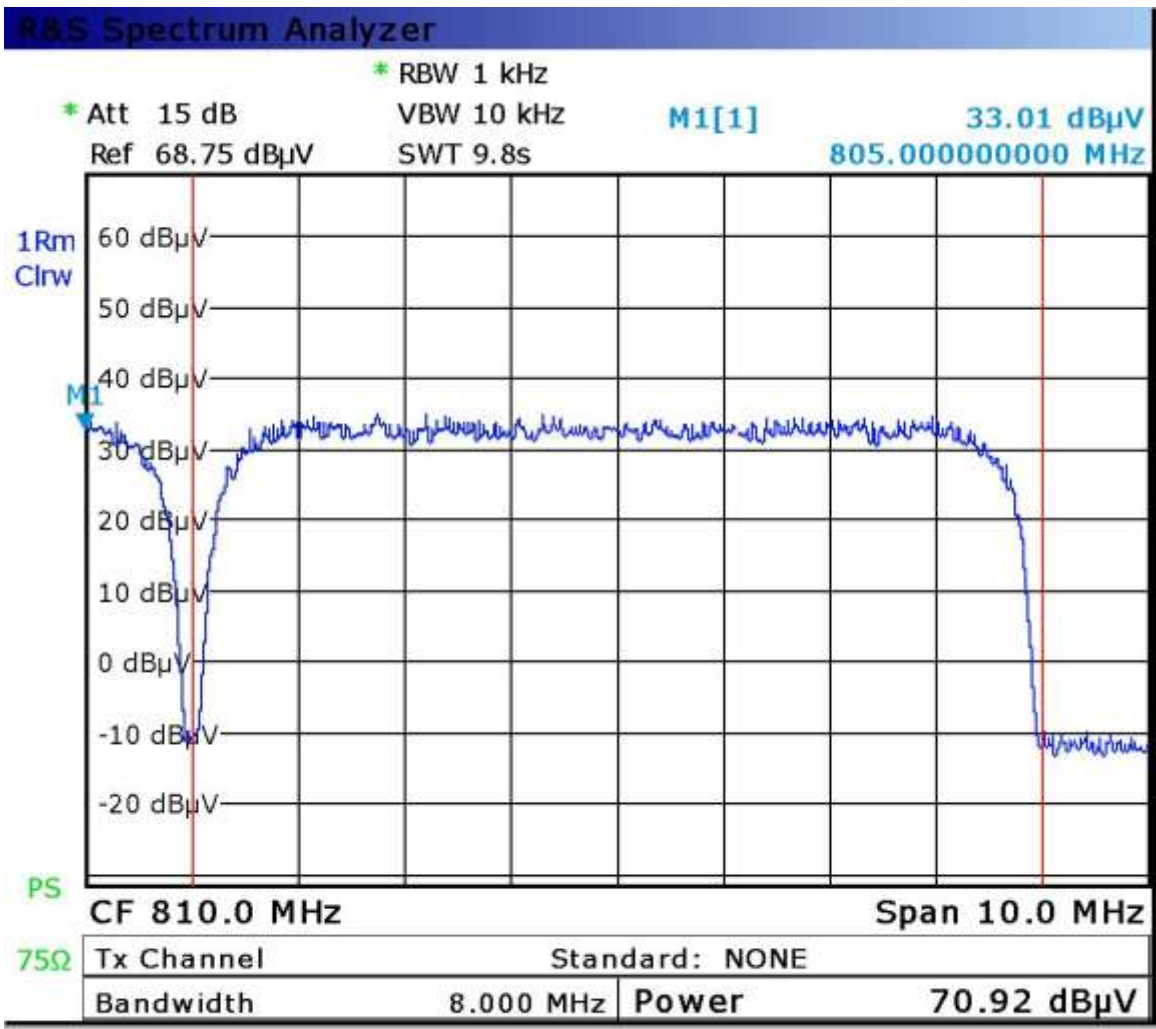


CF 506.0 MHz      Span 10.0 MHz

75 $\Omega$	Tx Channel	Standard: NONE	
	Bandwidth	8.000 MHz	Power 67.98 dB $\mu$ V

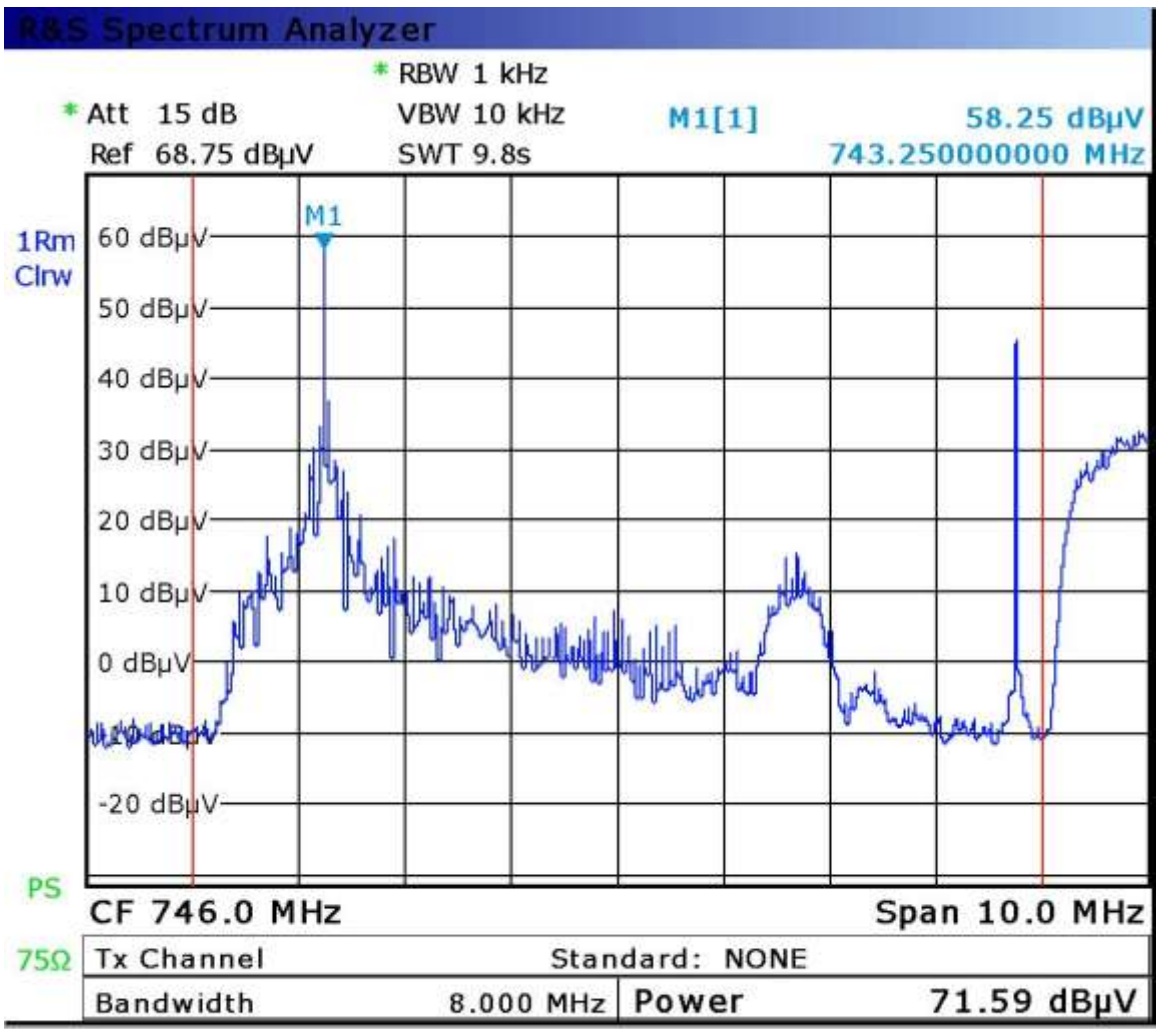
Date: 10.APR.2012 11:01:54

For 801MHz channel:



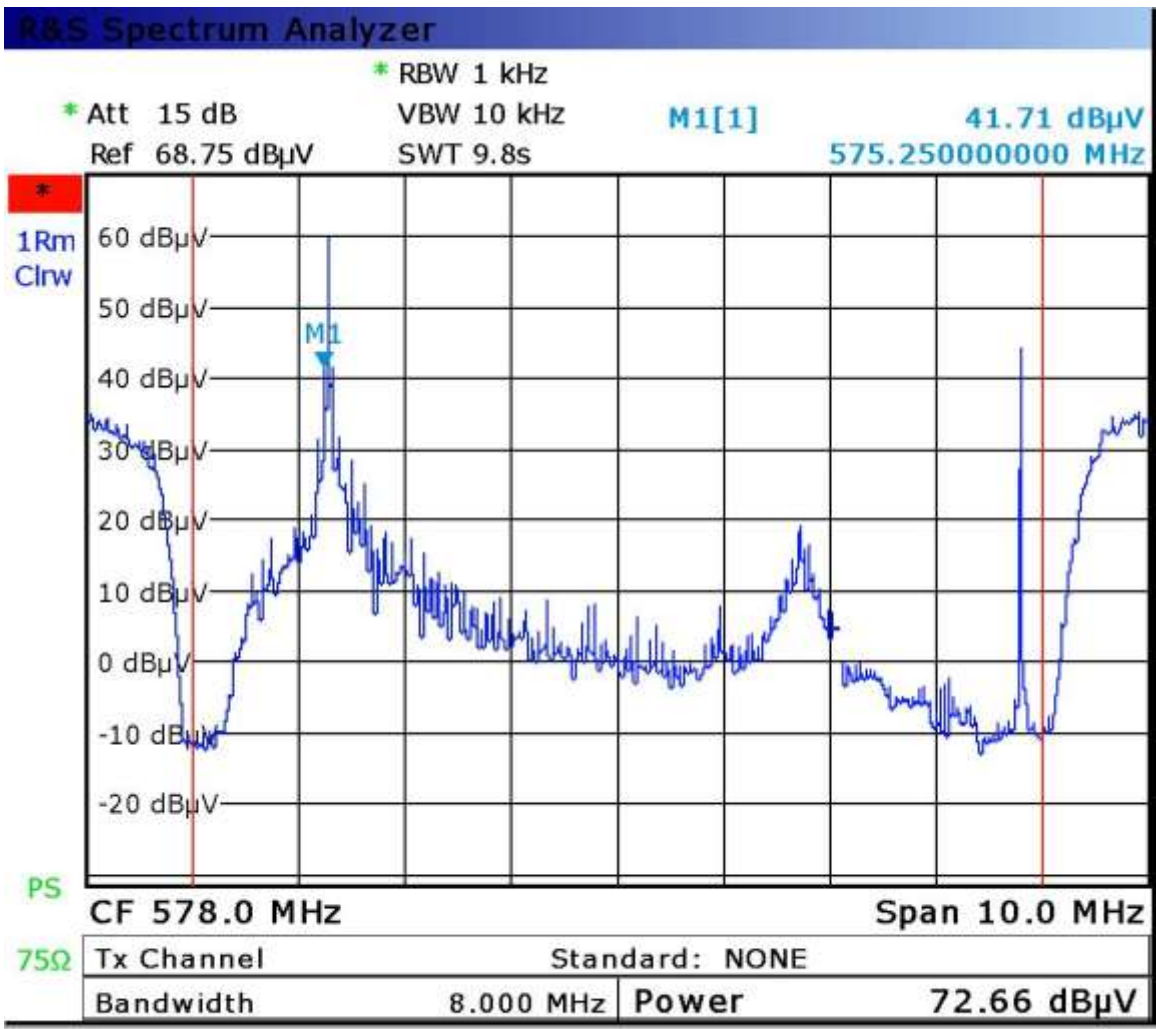
Date: 10.APR.2012 11:02:17

For analog channel, frequency is 746MHz,



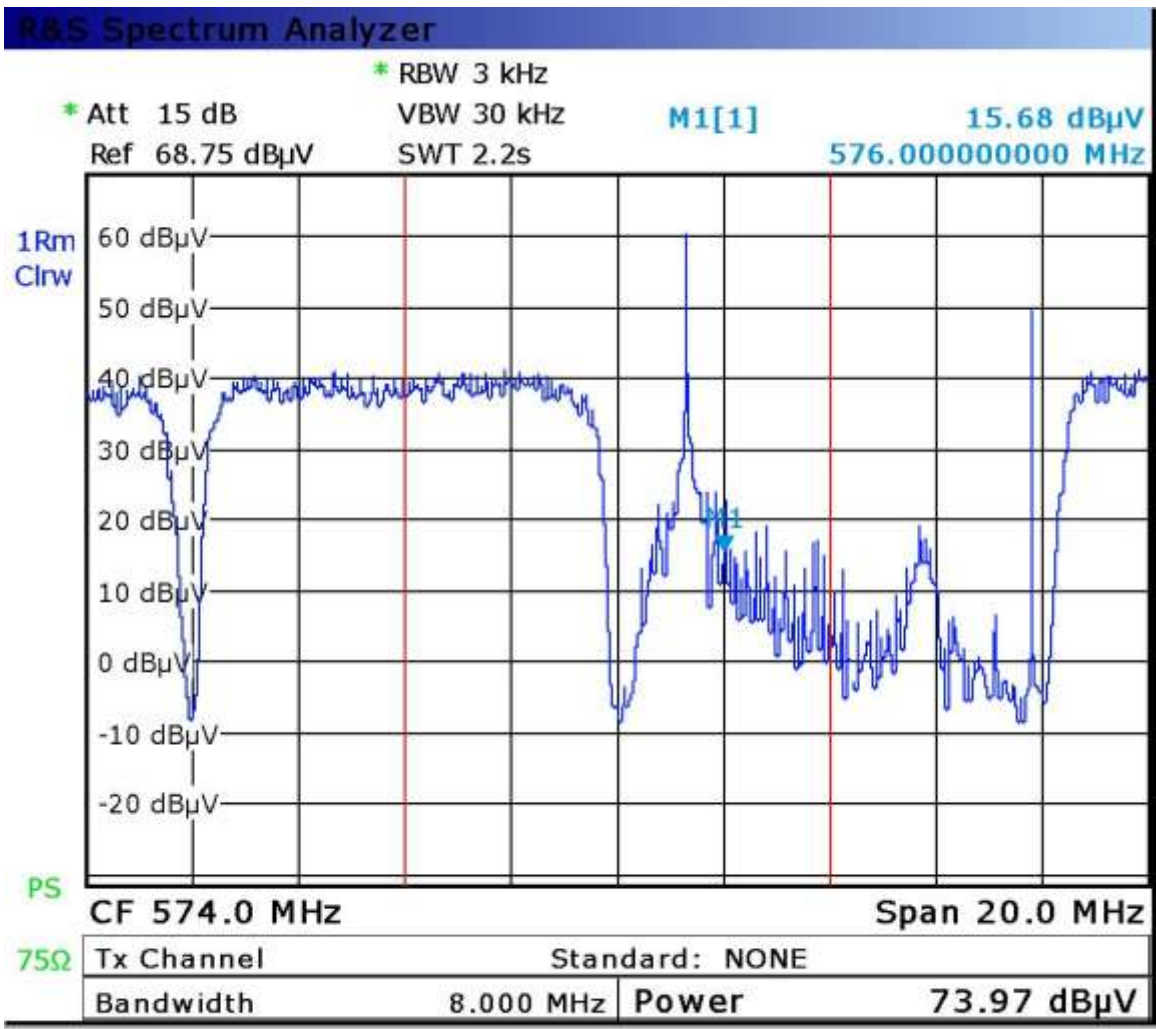
Date: 10.APR.2012 11:03:10

Frequency is 578MHz:



Date: 10.APR.2012 11:03:50

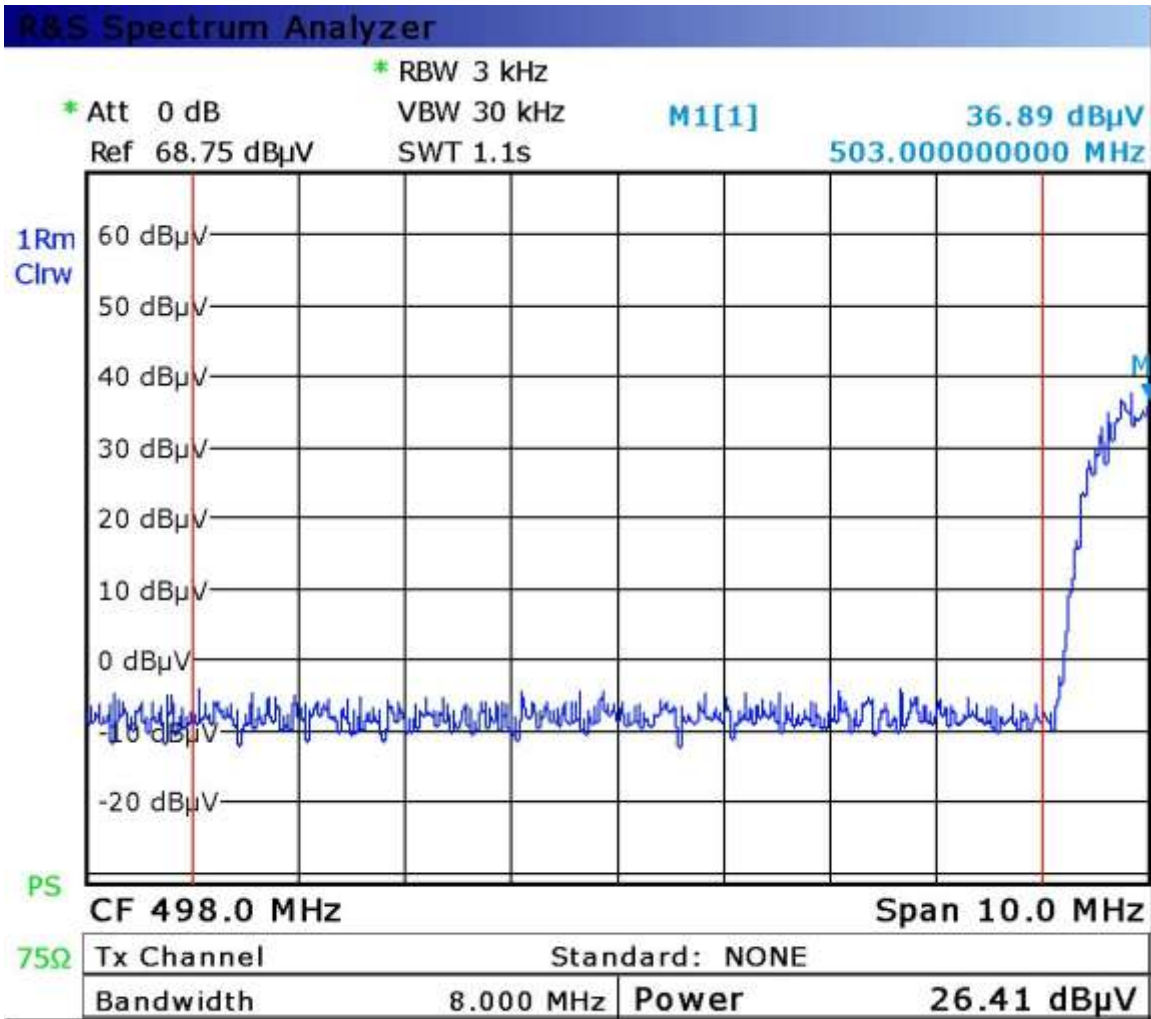
For the analog and digital adjacent case, is shown below:



Date: 10.APR.2012 11:05:37

For the unused channel within CATV band, is shown below:





Date: 10.APR.2012 11:08:19

### 2.1.2 Signal measurement in TP2 (after trunk amplifier)

TP2 is trunk amplifier located about 100-200 meters away from optical node and there is also a same sized metal cabinet protecting it. The trunk amplifier will support 150-200 end CATV users.

The signal is measure with R&S ETL, The detailed channel power level for pint TP2 is shown below:

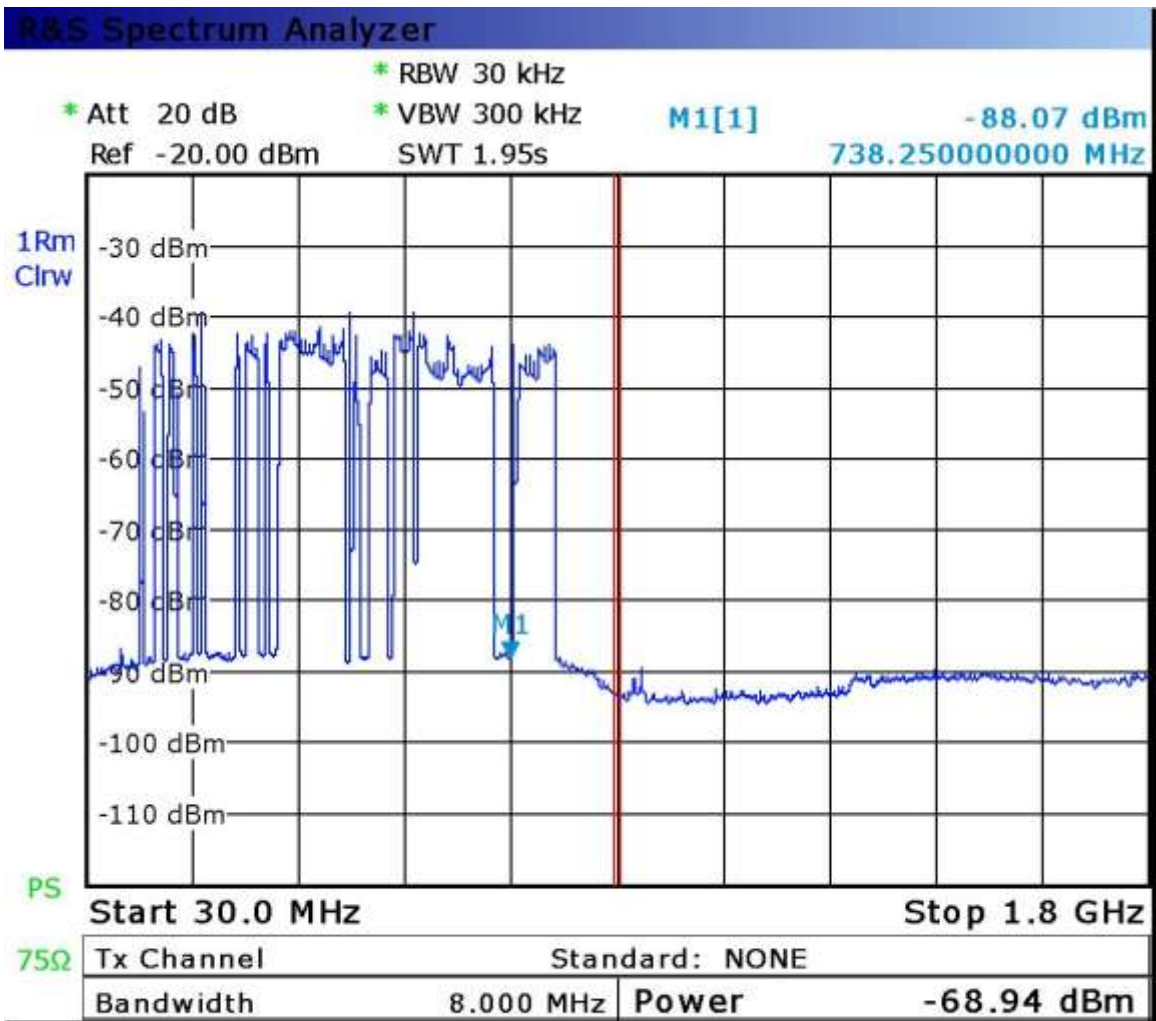
item	freq (MHz)	A/D	power level (dBuV)	MER (dB)
1	120.25	A	89.7	
2	147	D	88.8	41.9
3	155	D	89.1	42.2
4	171	D	88.4	40



5	176.25	A	92	
6	211	D	89.4	42.2
7	224.25	A	91.9	
8	283	D	89.1	42
9	299	D	89.4	41.4
10	307	D	89.5	41.6
11	315	D	88.6	42.2
12	331	D	89.7	42.3
13	355	D	89.3	40.9
14	363	D	90	42
15	371	D	90	42.4
16	379	D	90.4	42.2
17	387	D	89.1	40.9
18	395	D	88.5	41.3
19	403	D	89.4	41.4
20	411	D	88.8	40.8
21	419	D	91	42.4
22	427	D	88.5	41.4
23	435	D	88.2	41.1
24	443	D	89.7	42
25	451	D	88.2	41.4
26	459	D	90.5	42.7
27	471.25	A	92	
28	479.25	A	91.6	
29	506	D	86.6	40.4
30	514	D	86.4	40.6
31	522	D	86.9	38.5
32	530	D	86.8	38.2
33	546	D	89.6	40.6
34	554	D	90.1	41.6
35	562	D	88.9	39.9
36	570	D	89.6	42.7
37	575.25	A	92.5	
38	586	D	89.9	38.6
39	594	D	89.5	42
40	602	D	85.5	38.1
41	610	D	85.4	38
42	618	D	85.4	40.2
43	626	D	85.5	40.2
44	634	D	90	42.2

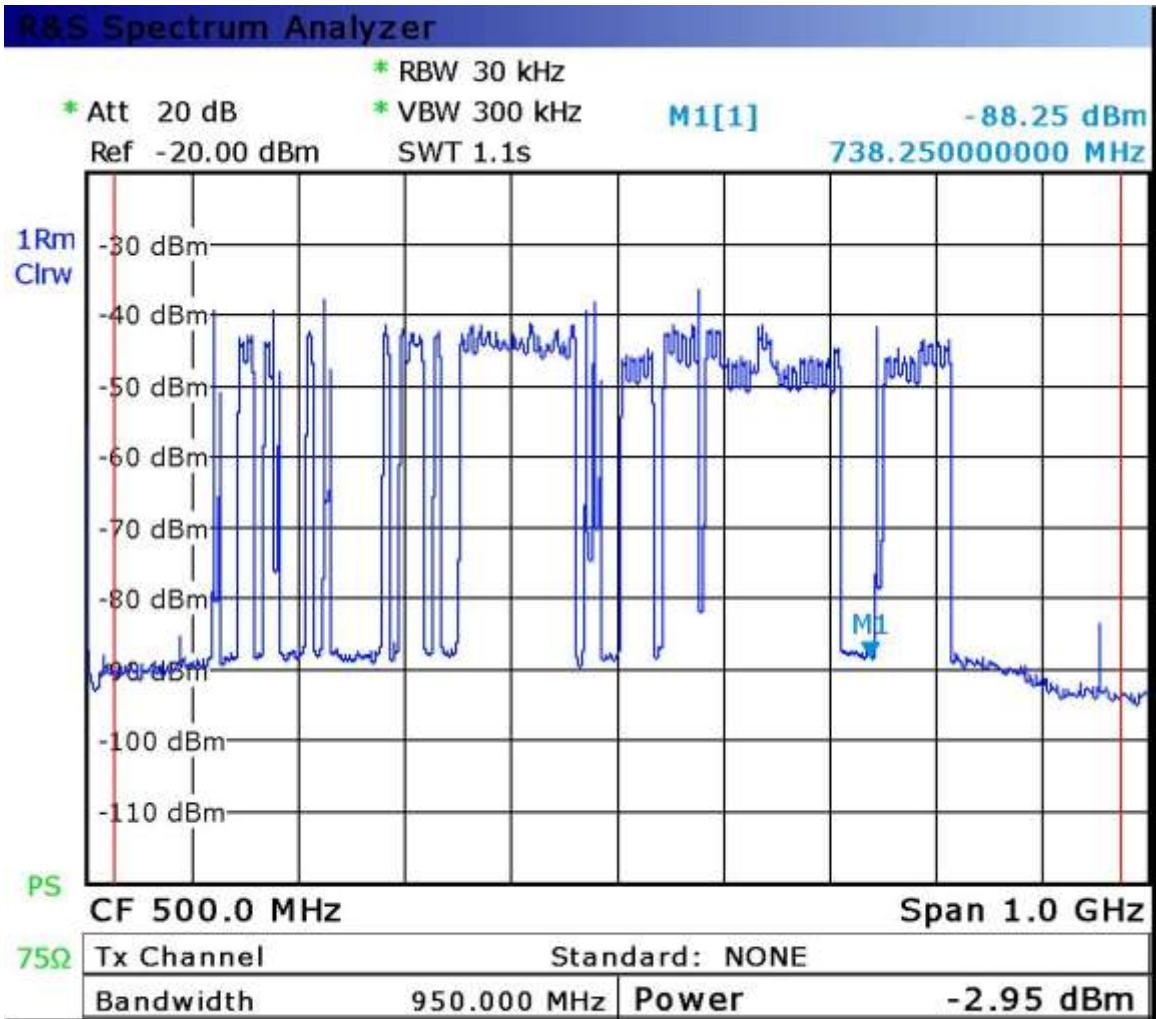
45	642	D	88.6	42.2
46	650	D	84.8	39.5
47	658	D	84.5	38.7
48	666	D	84.7	39.1
49	674	D	85.8	40
50	682	D	85.6	39.9
51	690	D	85.5	40.1
52	698	D	85.3	39.8
53	706	D	88.2	41.8
54	743.25	A	90.2	
55	754	D	86.4	40.6
56	762	D	86.2	40.5
57	770	D	86	40.5
58	778	D	85.9	40.7
59	786	D	88.1	41.9
60	794	D	87.9	41.7
61	802	D	87.8	42
62	810	D	87.6	42.5

And the cable plant spectrum also captured, for freq from 30MHz to 1800MHz, the spectrum is shown below:



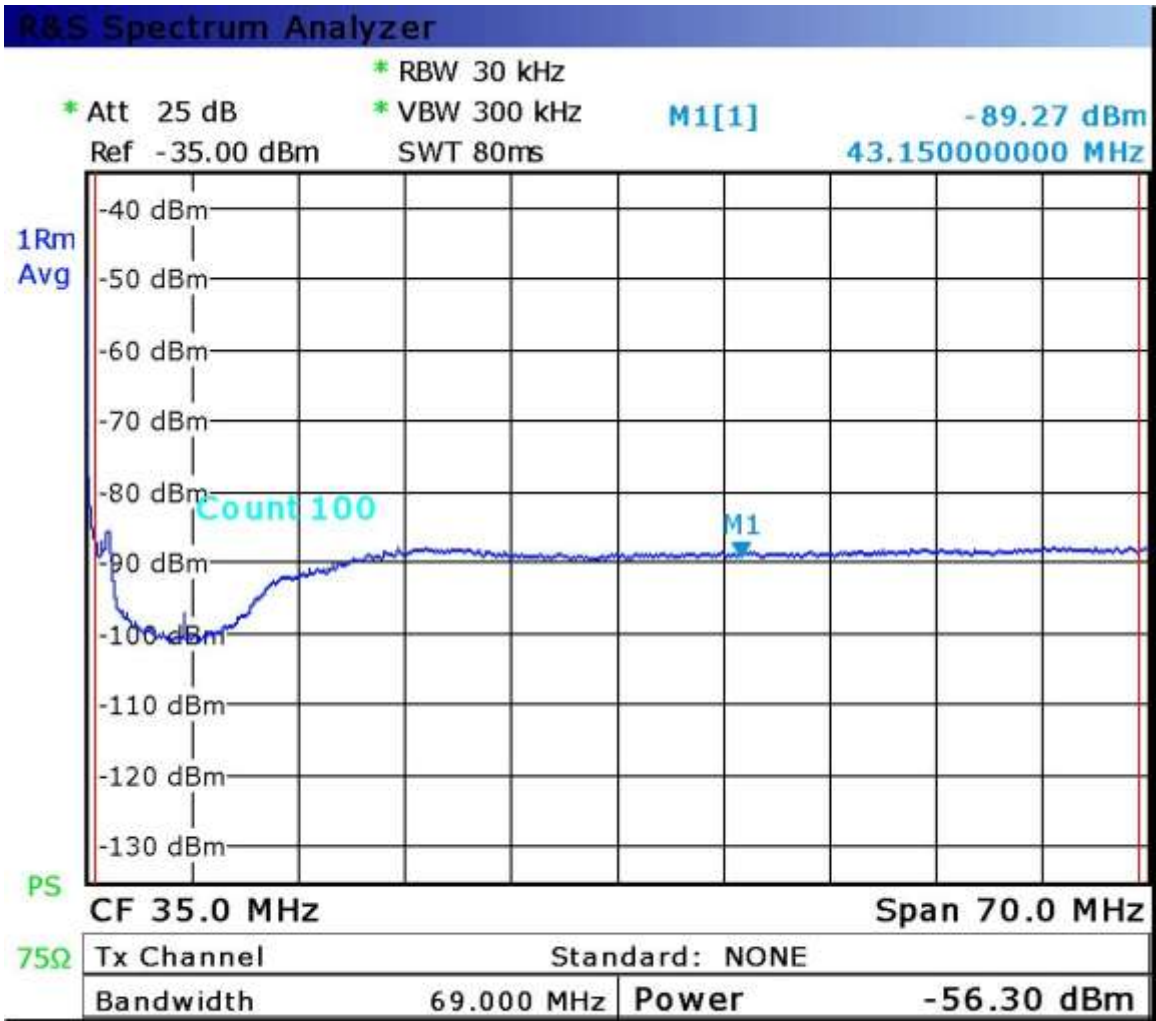
Date: 10.APR.2012 12:01:22

The total channel power capture lists below, from the capture, the total channel power is about -3dBm.



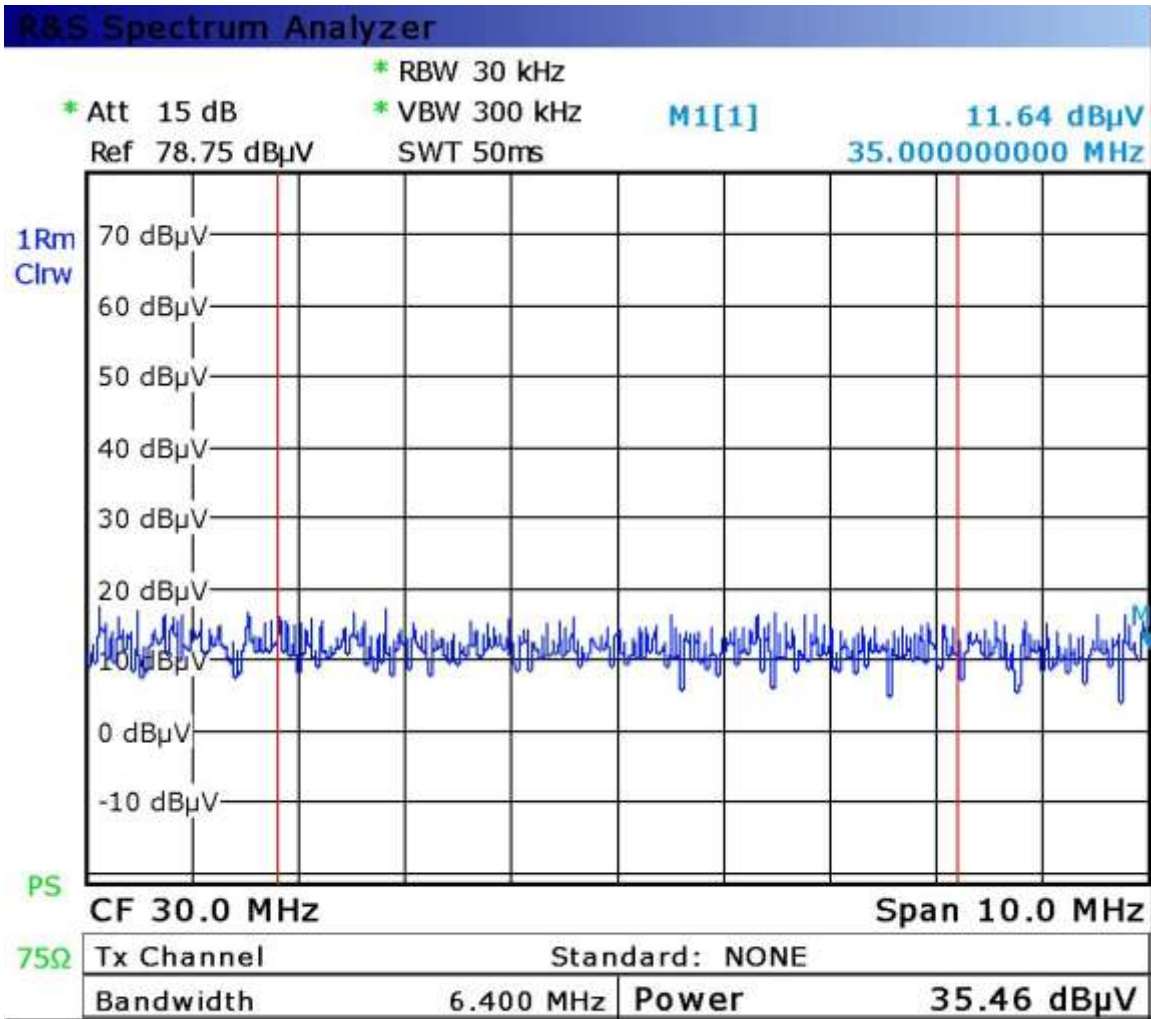
Date: 10.APR.2012 12:02:06

The up stream band (5-65MHz) is also further checked, from the capture below, there is no distinct spurious appear, the noise floor is relatively higher. The upstream capture is shown below:



Date: 10.APR.2012 12:13:49

In order to double check the noise floor increase is because of trunk amplifier saturation, we decrease the amplifier gain about 5db, and found that the channel power @freq 30MHz, BW 6.4MHz decrease from 42dBuV down to 35dBuV. So we got a conclusion that the higher noise floor is coming from amplifier saturation. The capture is shown below:

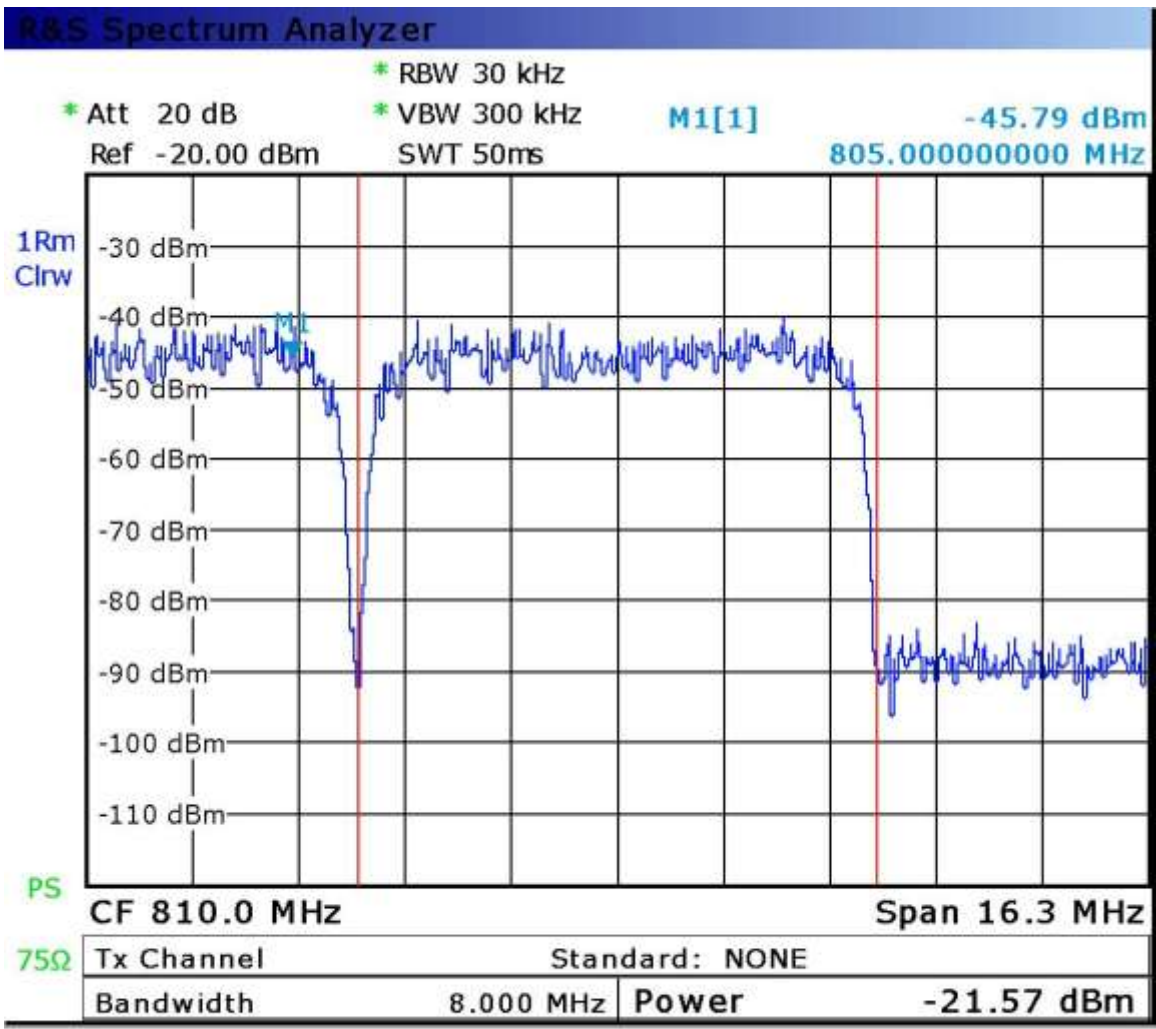


Date: 10.APR.2012 12:25:24

but definitely their trunk amplifier will be replace to two way amplifier when CMC system is inserted. Currently it is only a one way amplifier.

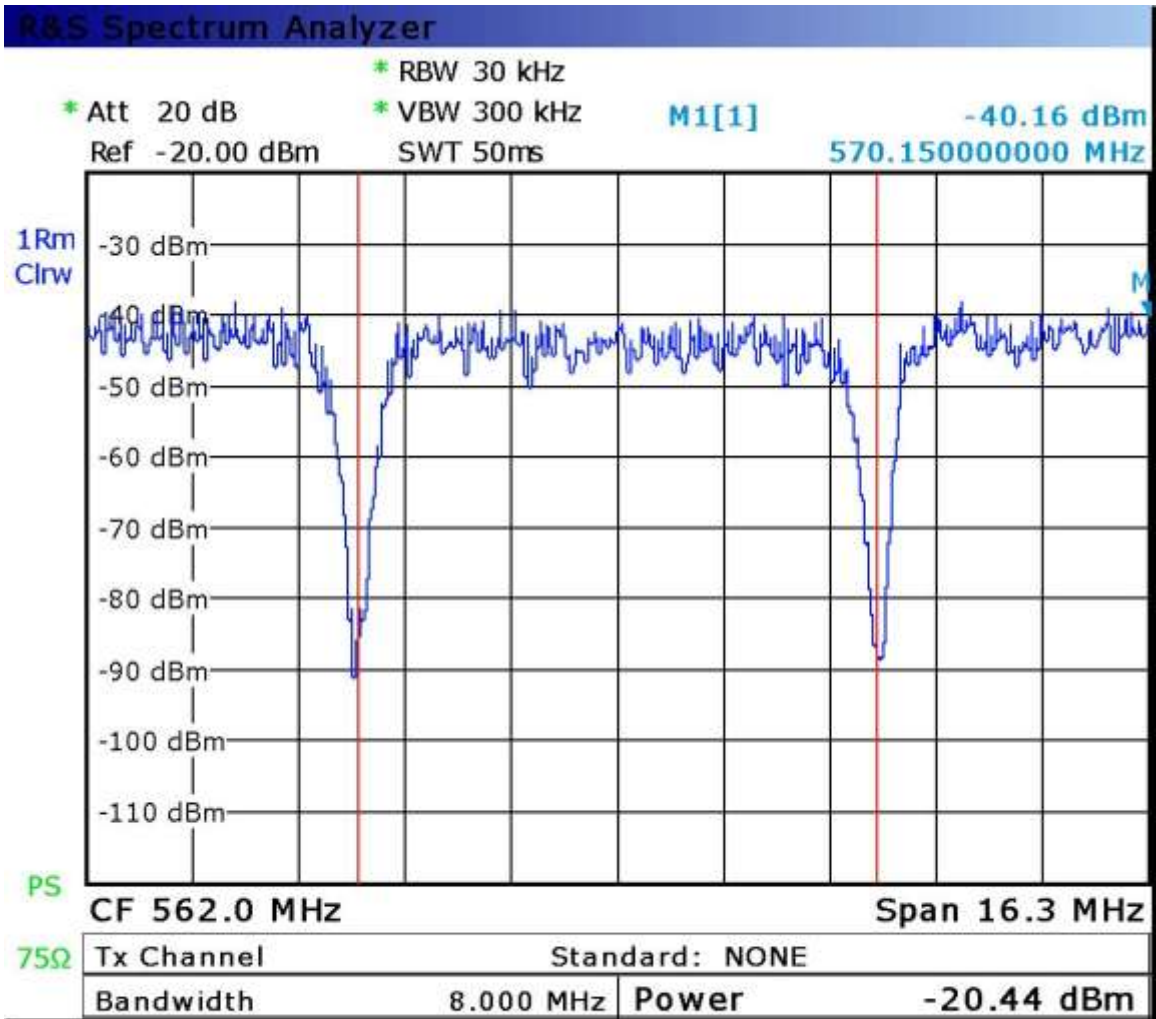
As for the channel measurement, some sample channel also been captured.

For 810MHz channel is shown below:



Date: 10.APR.2012 12:03:28

For 562MHz channel:



Date: 10.APR.2012 12:03:47

For the unused channel within CATV band, is shown below:

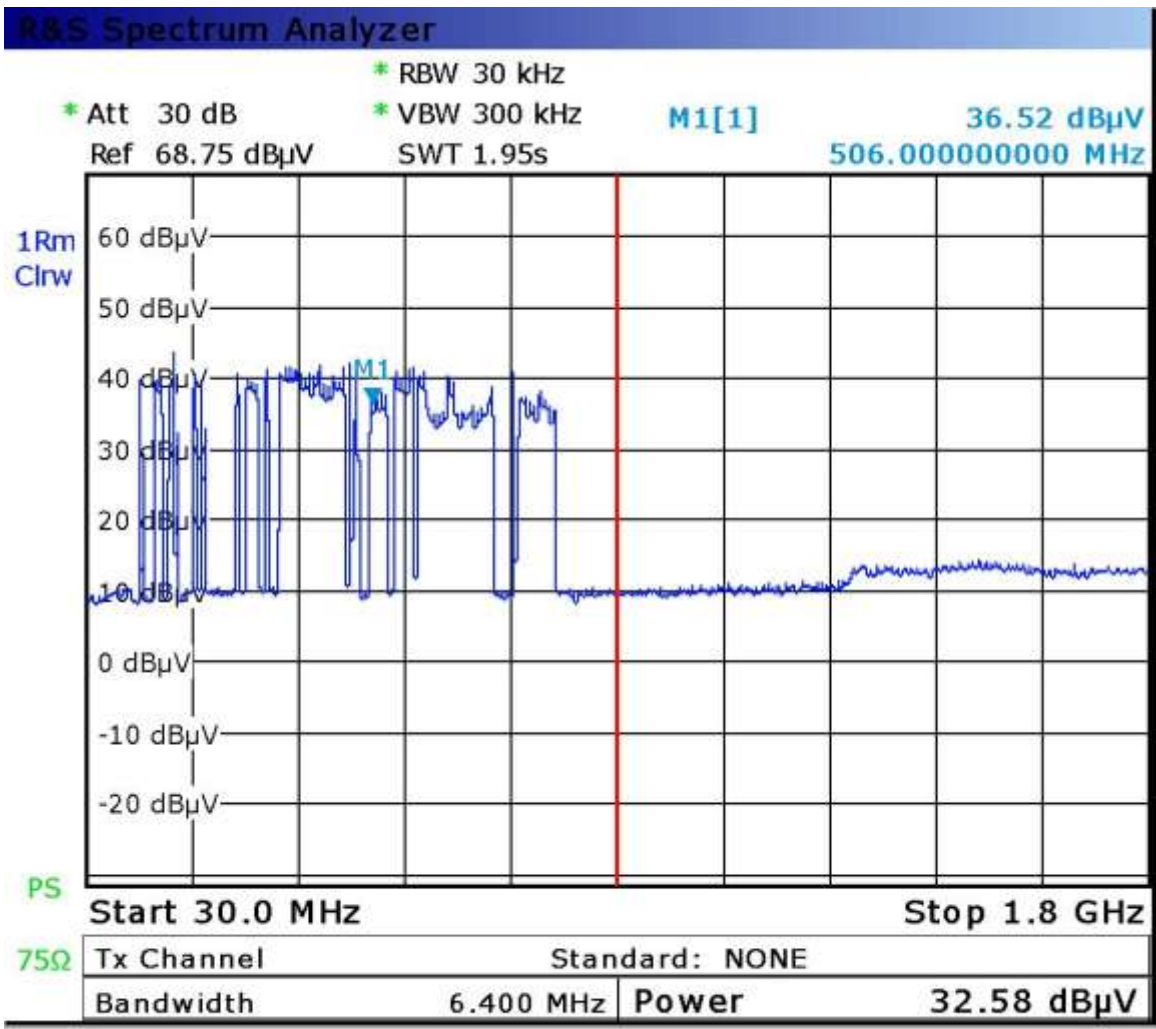




4	171	D	62.2	38.8
5	176.25	A	66	
6	211	D	63.1	40.8
7	224.25	A	66.1	
8	283	D	62.8	40.4
9	299	D	63	40
10	307	D	63.1	40.1
11	315	D	62.1	40.3
12	331	D	63.3	40.9
13	355	D	63.5	40.1
14	363	D	64.1	40.4
15	371	D	63.9	40.8
16	379	D	64.4	40.4
17	387	D	63	39.4
18	395	D	62.4	39.7
19	403	D	63.1	39.7
20	411	D	62.2	39.4
21	419	D	64.2	40.9
22	427	D	62	39.5
23	435	D	61.8	39.4
24	443	D	63.2	40.3
25	451	D	61.8	39.7
26	459	D	64.2	41.3
27	471.25	A	66.5	
28	479.25	A	65.7	
29	506	D	59.4	38.5
30	514	D	59.8	38.6
31	522	D	60.4	37.2
32	530	D	60	37.4
33	546	D	63	39.7
34	554	D	63.3	40.5
35	562	D	62.3	39
36	570	D	63.1	41.5
37	575.25	A	66.7	
38	586	D	63.2	37.7
39	594	D	62.6	40.7
40	602	D	58.2	36.4
41	610	D	58.2	36.6
42	618	D	58.3	38
43	626	D	58.2	38

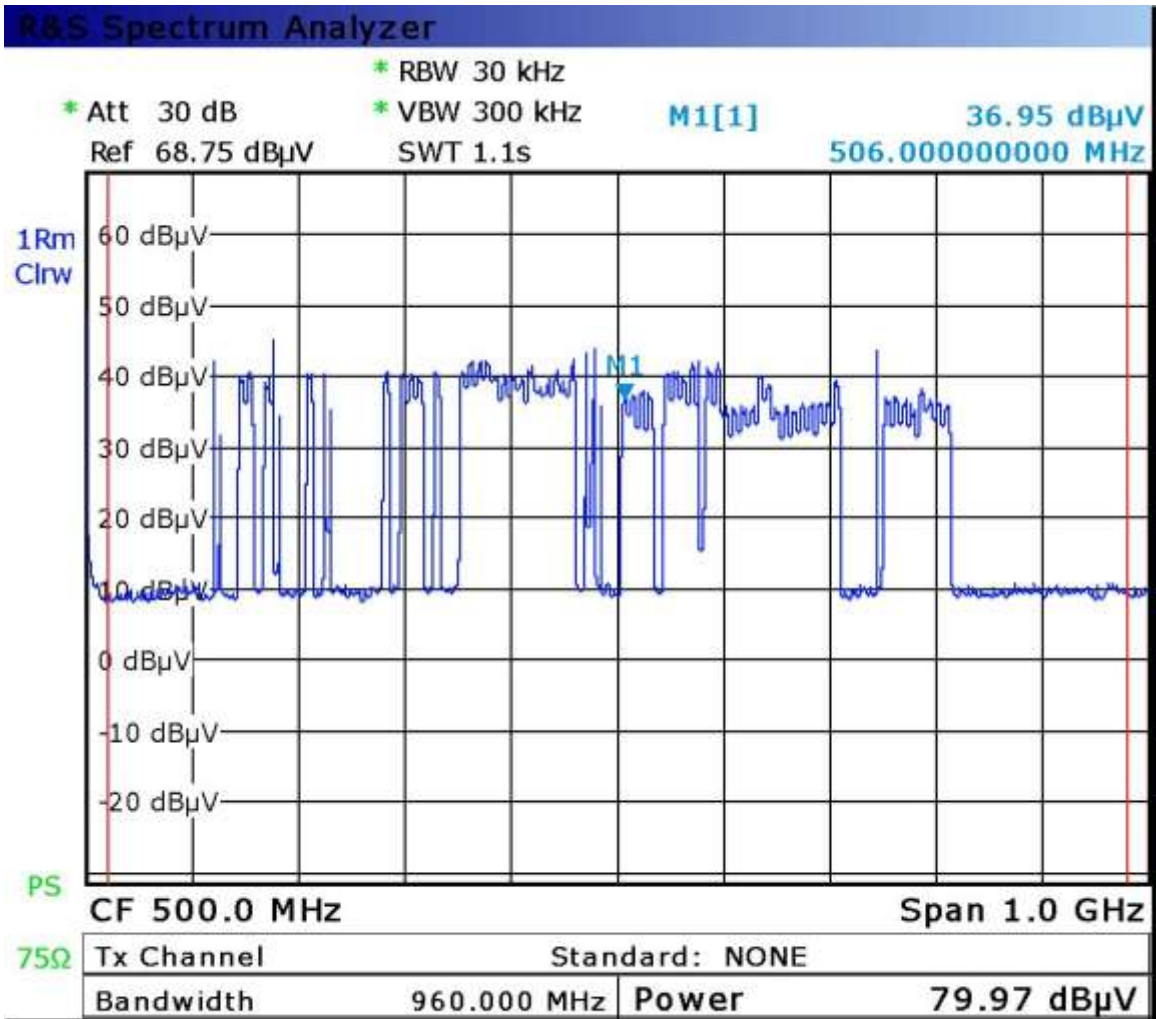
44	634	D	58.2	38
45	642	D	63	43.1
46	650	D	61.5	40.6
47	658	D	57.8	37.6
48	666	D	57.8	37.1
49	674	D	57.9	37.3
50	682	D	58.8	38.1
51	690	D	58.6	38.1
52	698	D	58.7	38.2
53	706	D	58.7	37.9
54	743.25	A	64	
55	754	D	59.9	39
56	762	D	60	30
57	770	D	59.2	38.9
58	778	D	58.7	38.7
59	786	D	61	40.3
60	794	D	59.8	40.1
61	802	D	59.4	40.1
62	810	D	58.9	40.2

And the cable plant spectrum also captured, for freq from 30MHz to 1800MHz, the spectrum is shown below:



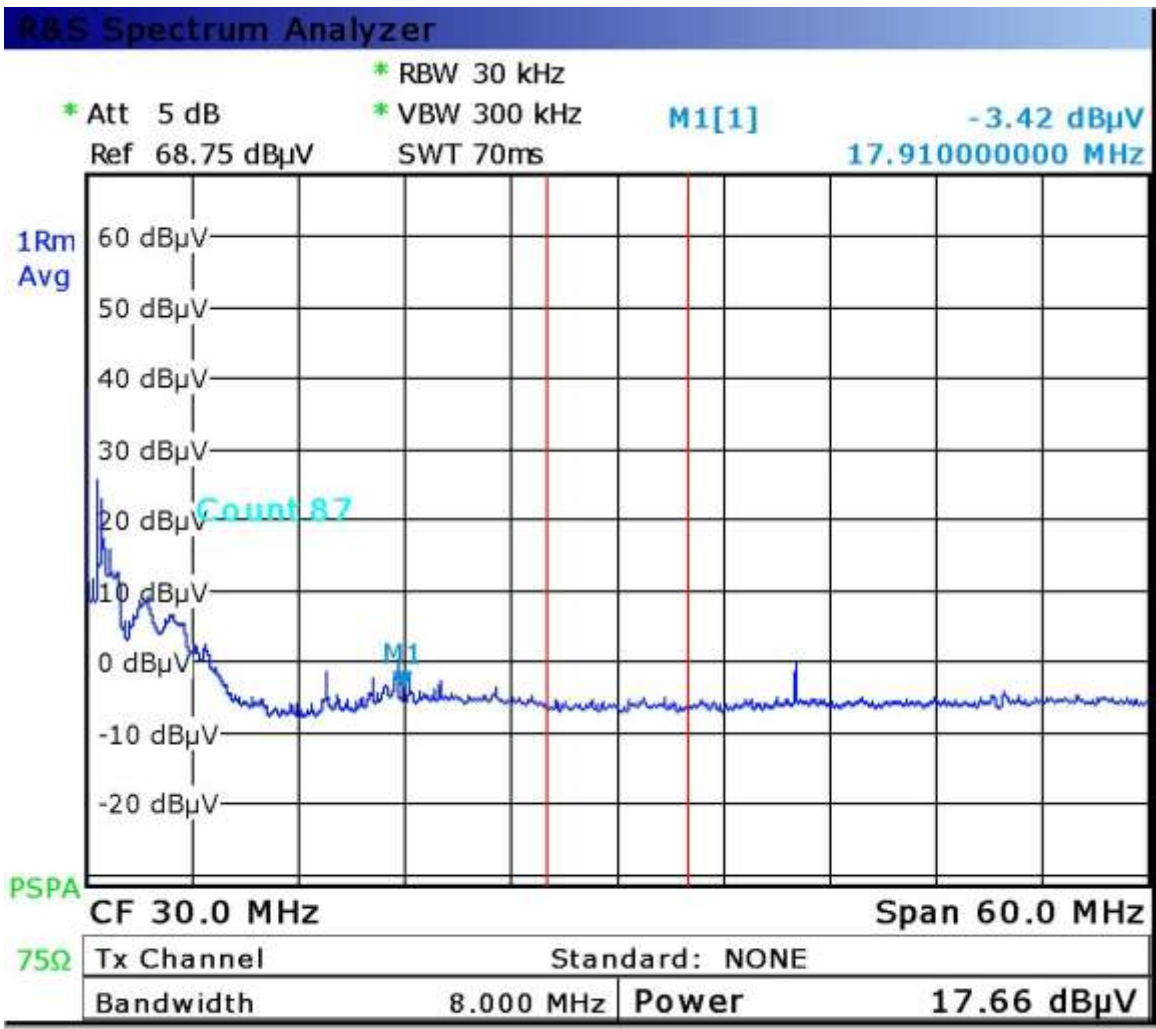
Date: 10.APR.2012 14:07:11

The total channel power capture lists below, from the capture, the total channel power is about 80dBuV.



Date: 10.APR.2012 14:07:45

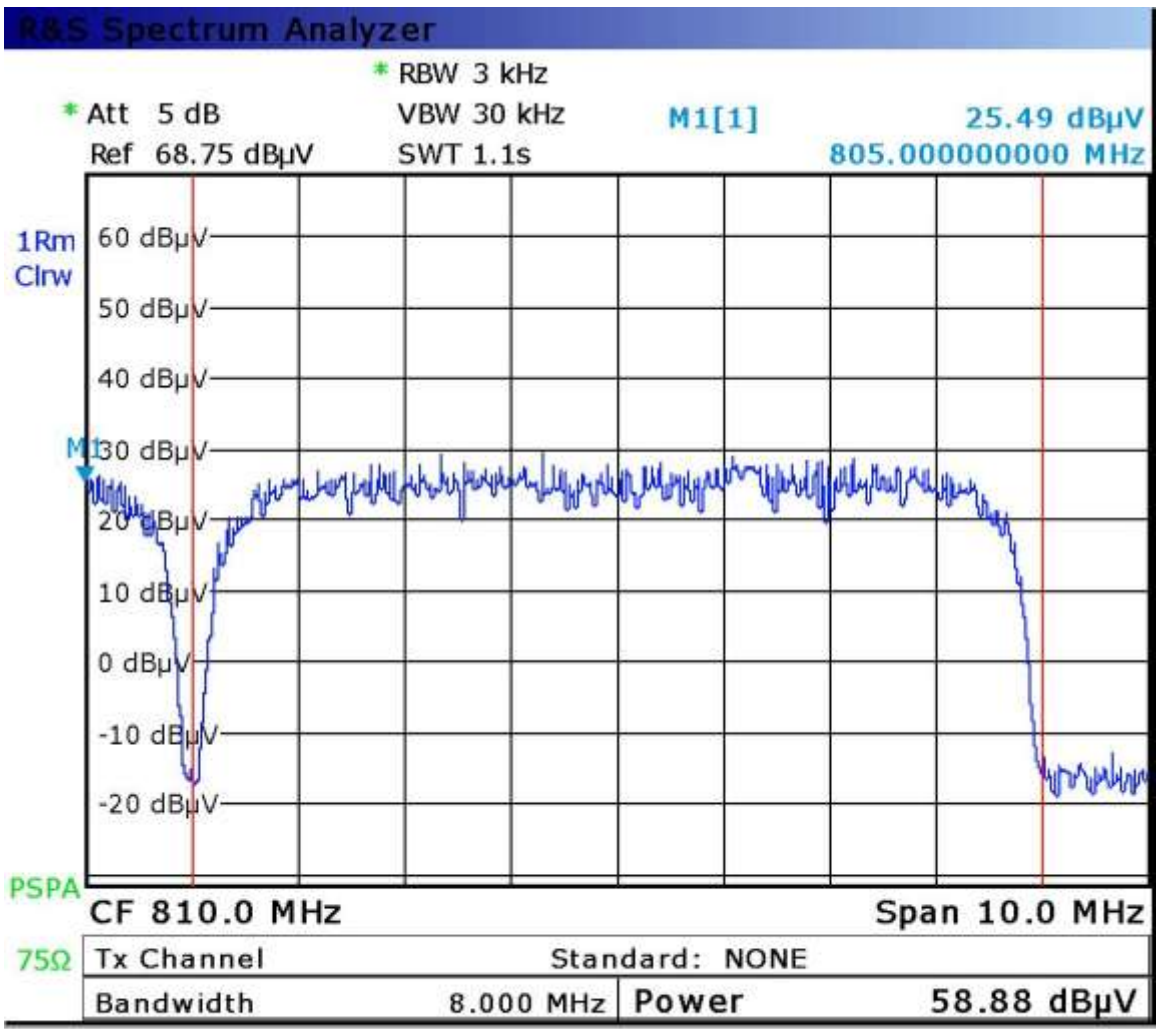
The up stream band (5-65MHz) is also further checked, from the capture below, the US channel is quite clean at user end.



Date: 10.APR.2012 14:11:28

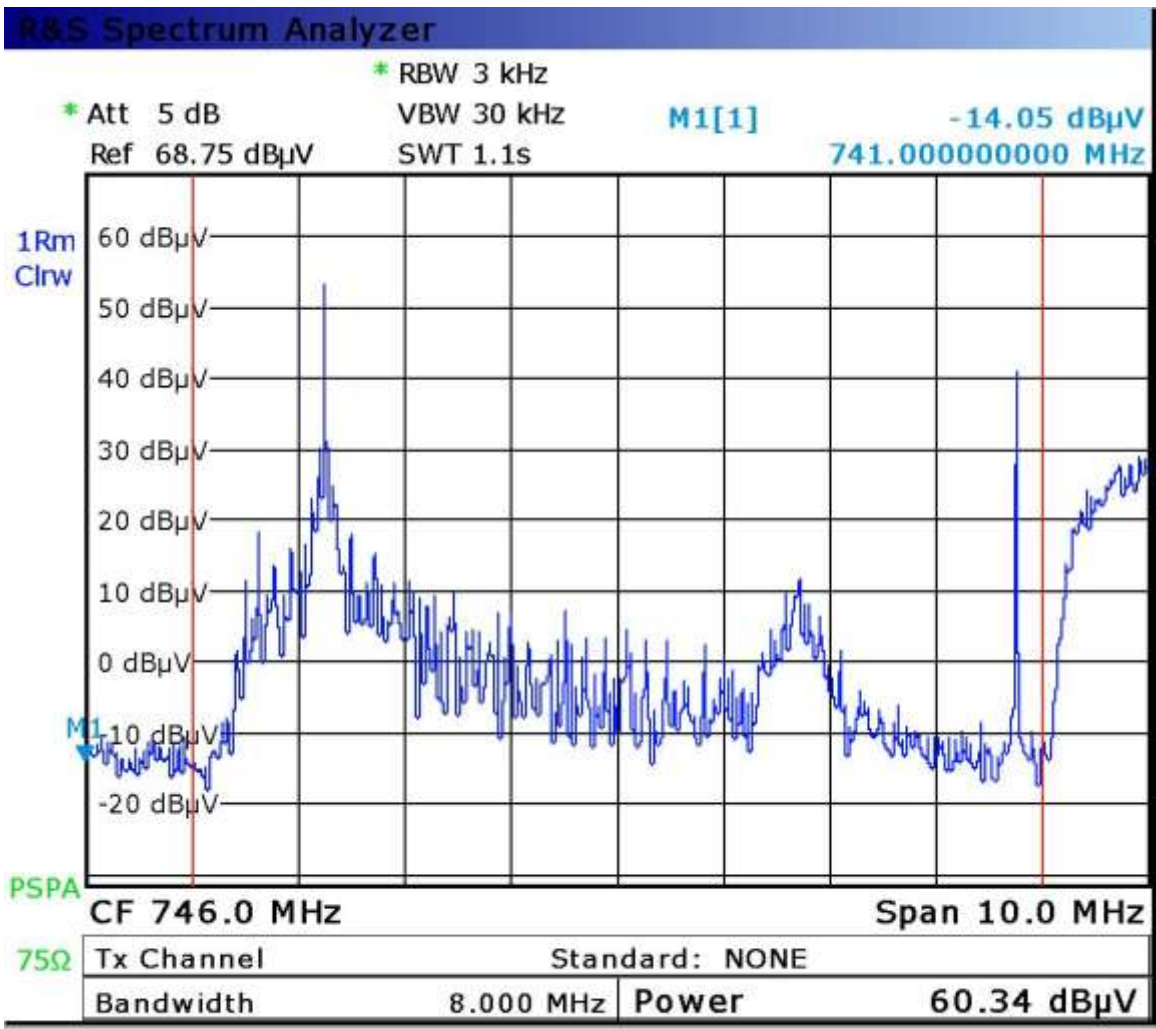
As for the channel measurement, some sample channels also captured.

For 810MHz channel is shown below:



Date: 10.APR.2012 14:11:58

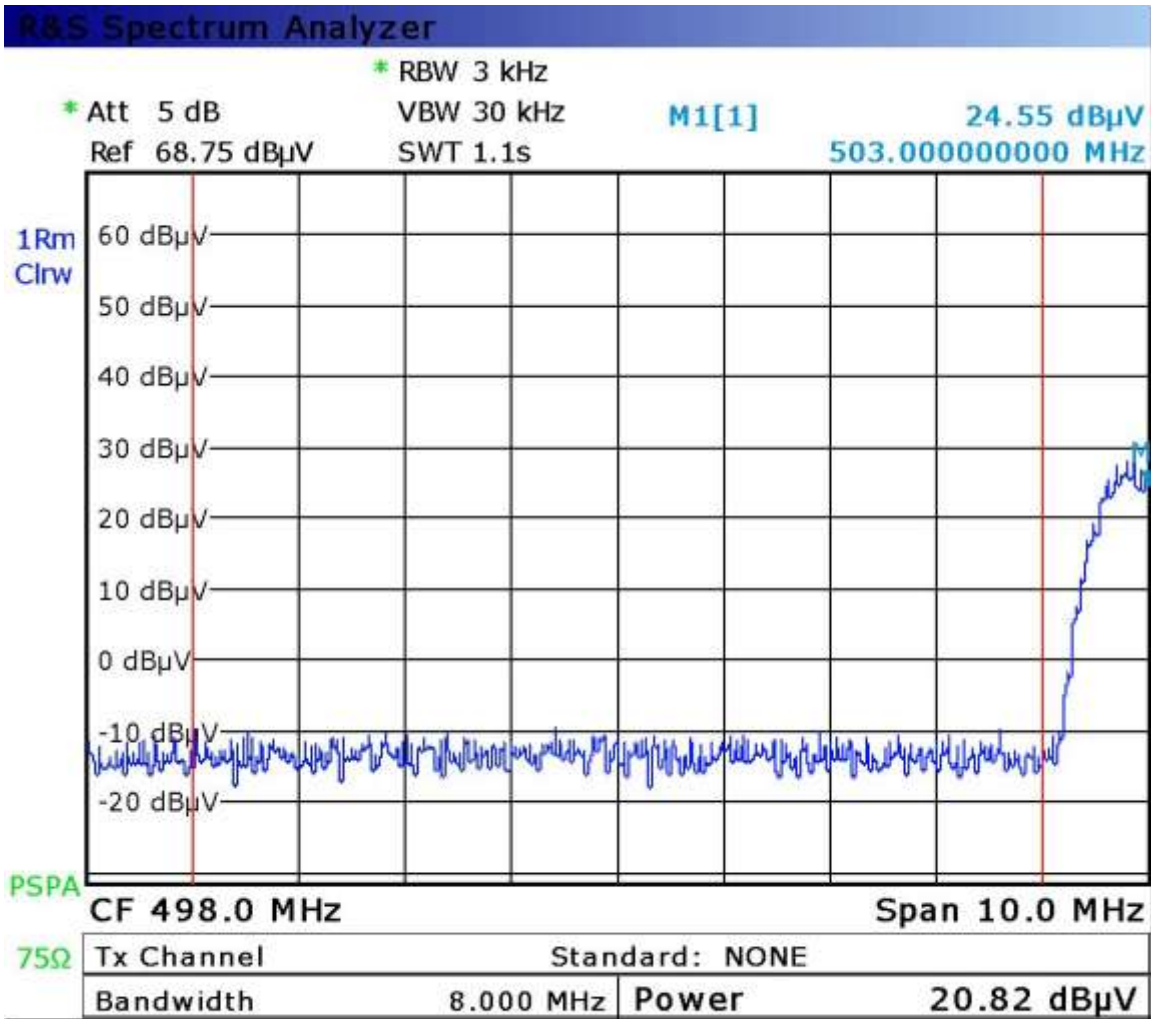
For analog channel, for example 746MHz channel is shown below:



Date: 10.APR.2012 14:12:37

For the unused channel within CATV band, is shown below:



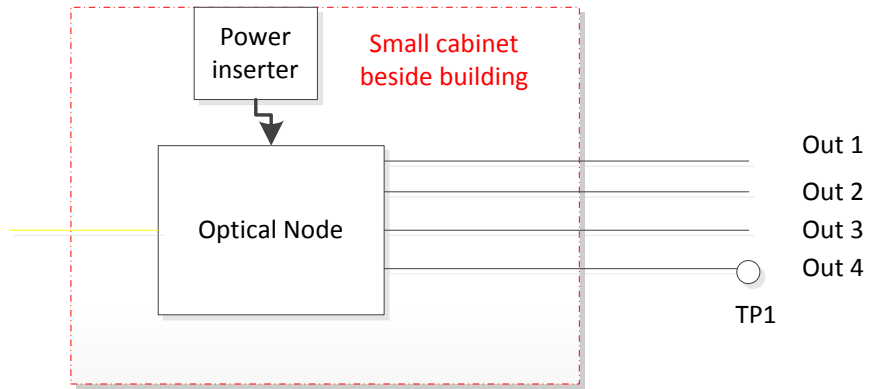


Date: 10.APR.2012 14:12:12

## 2.2 Shibaxiang spot information

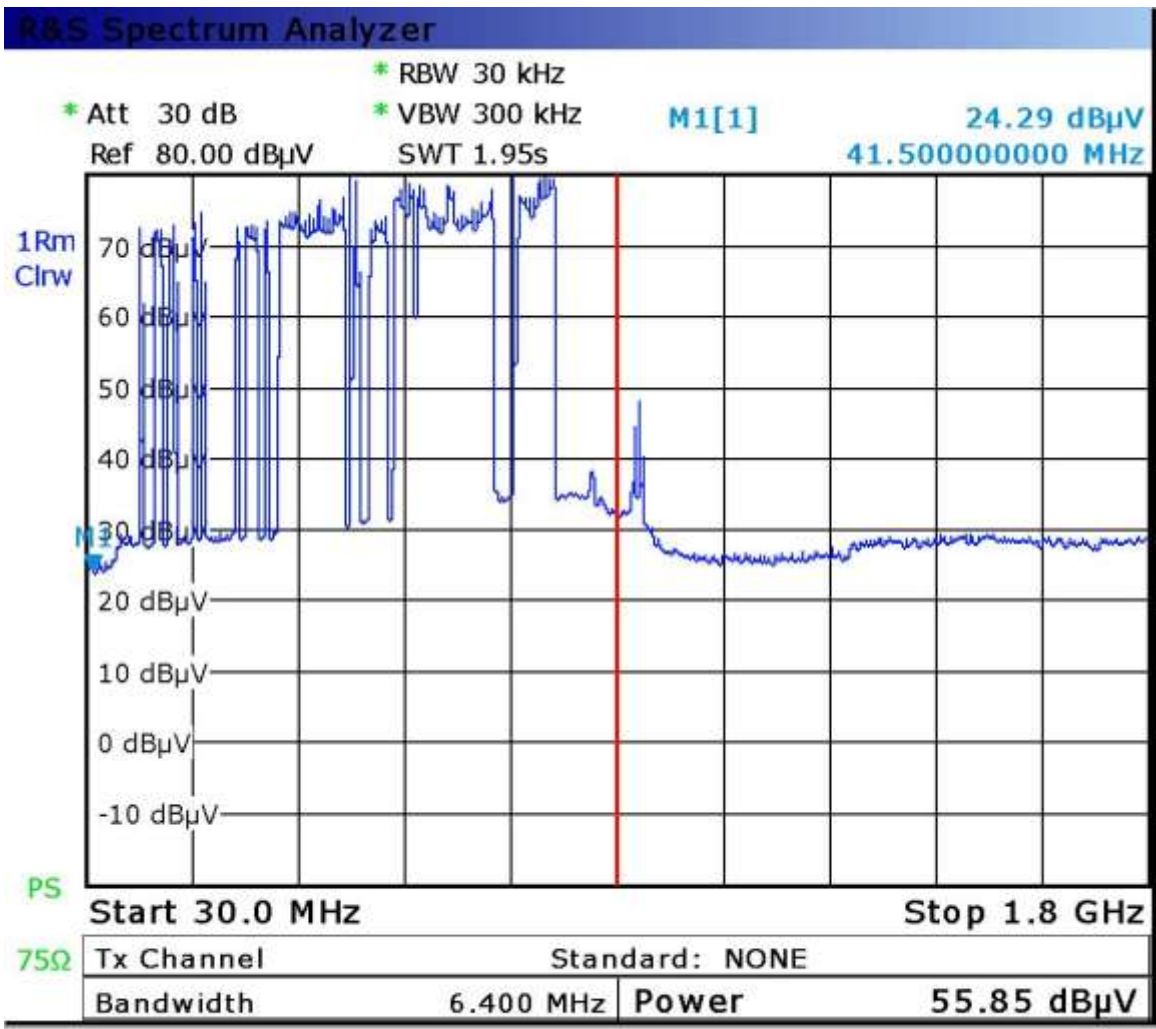
The shibanxiang spot is similar like hongfengyuan spot, the optical node also supports about 70 CATV end users. The difference is that their optical node has 4 way coaxial cable outputs and the size of this optical node is much larger than hongfengyuan spot.

In this spot we had a chance to measure the signal from one F connector port directly since there is not water proof on the F connector. Please the TP1 in the diagram below of the position of test point.



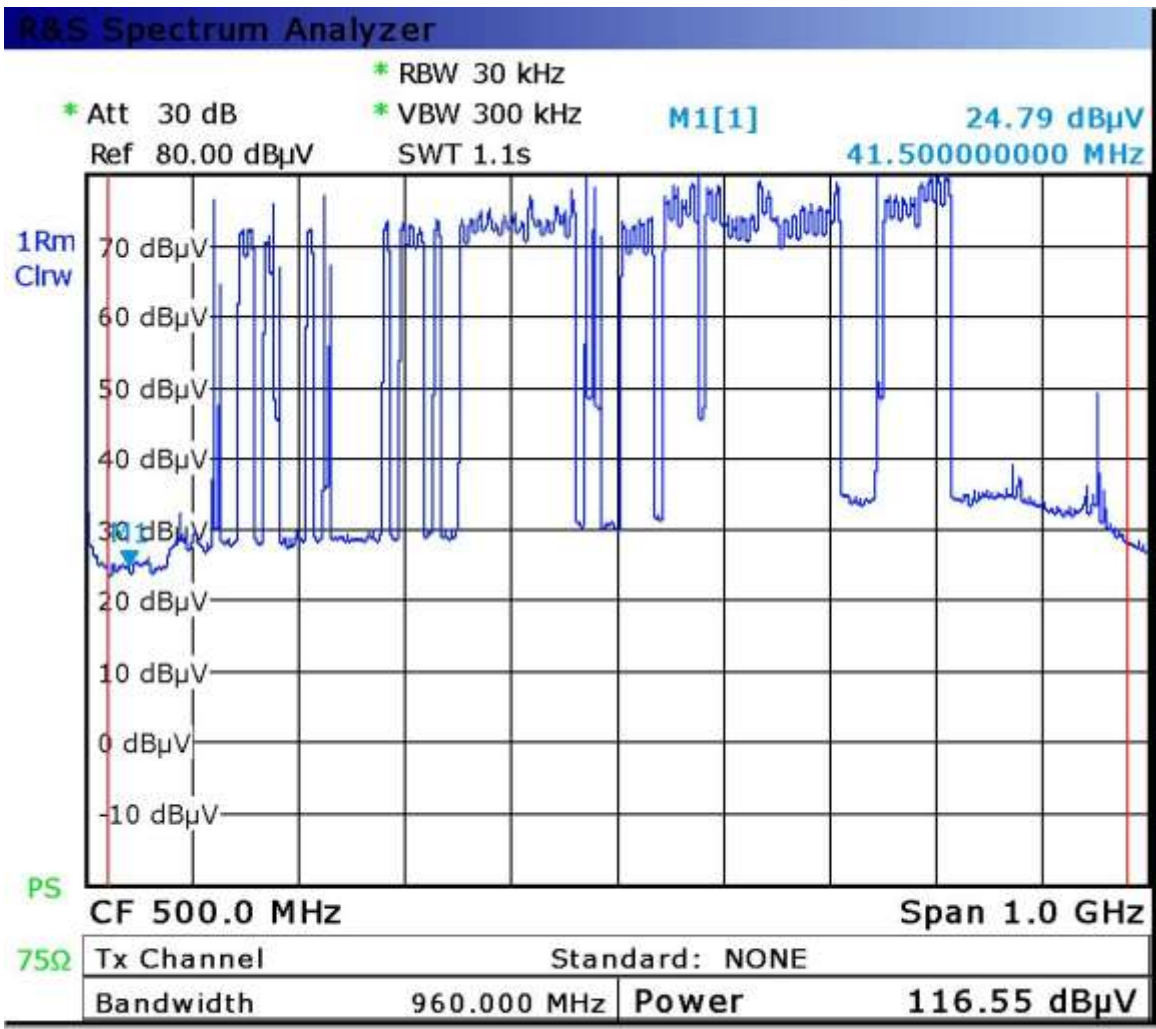
Shibanxiang district

And the cable plant spectrum also captured, for freq from 30MHz to 1800MHz, the spectrum is shown below:



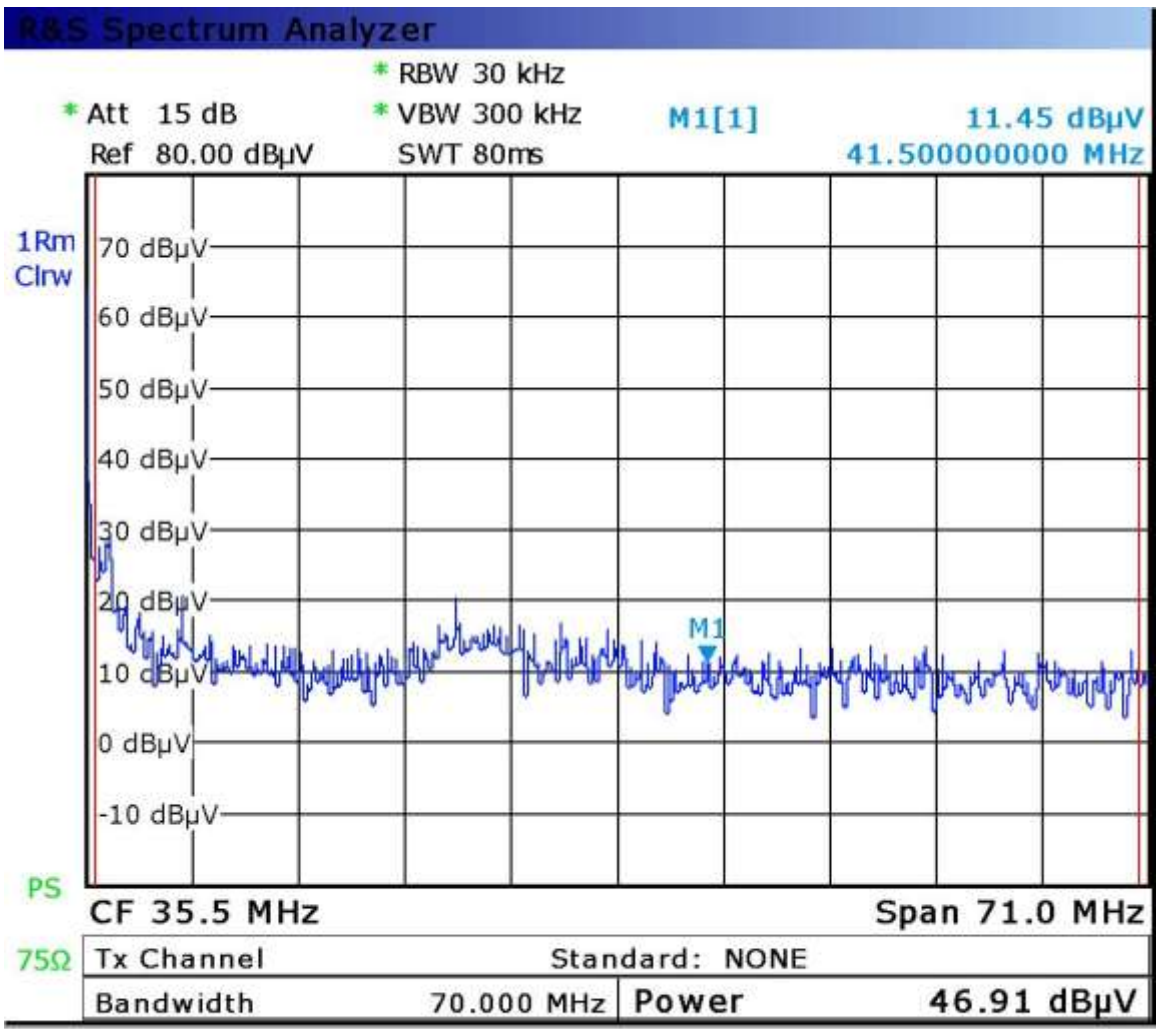
Date: 10.APR.2012 15:01:31

The total channel power capture lists below, from the capture, the total channel power is about 116dBuV.



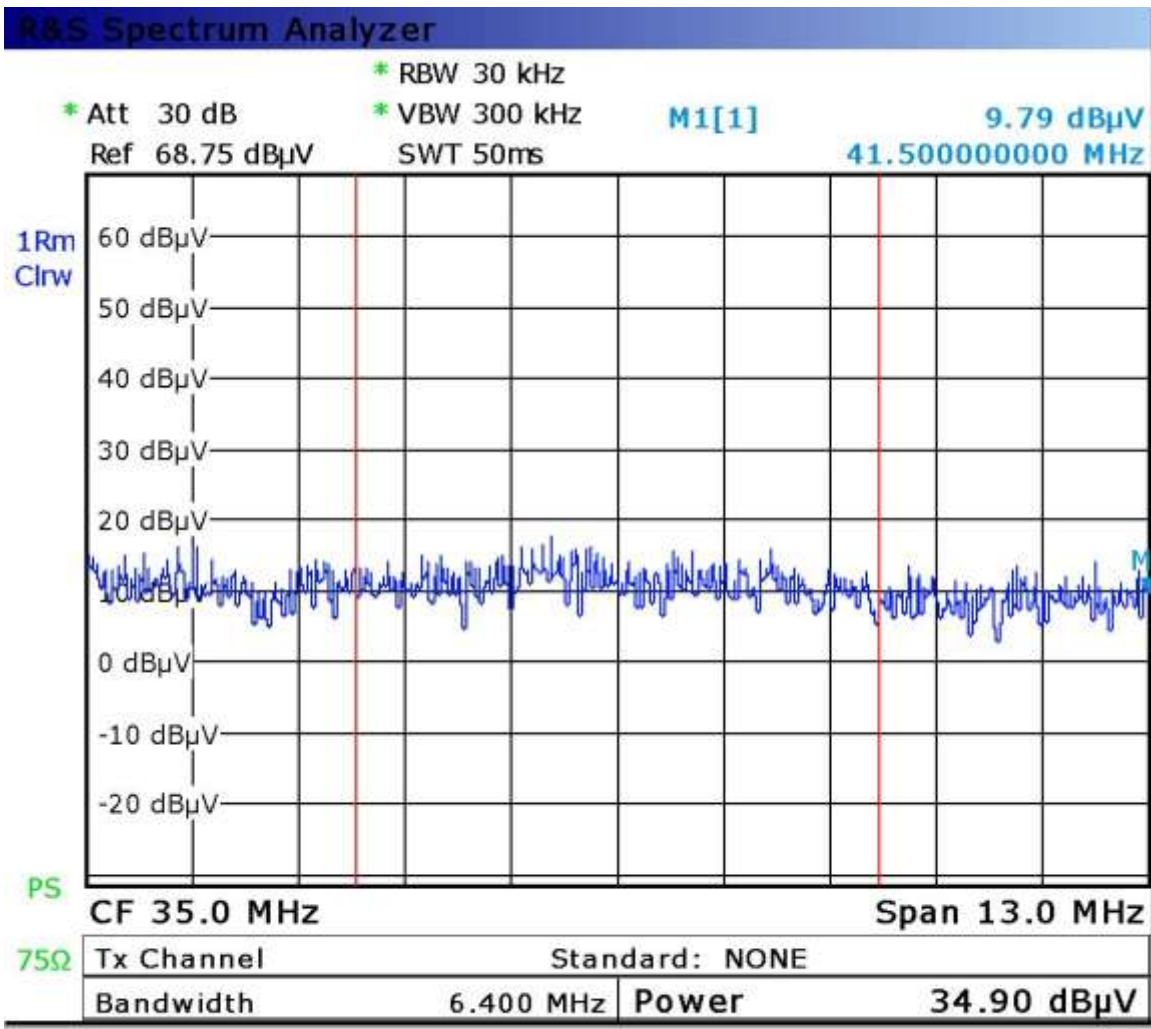
Date: 10.APR.2012 15:02:02

The up stream band (5-65MHz) is also further checked, the captured spectrum lists below:



Date: 10.APR.2012 15:03:57

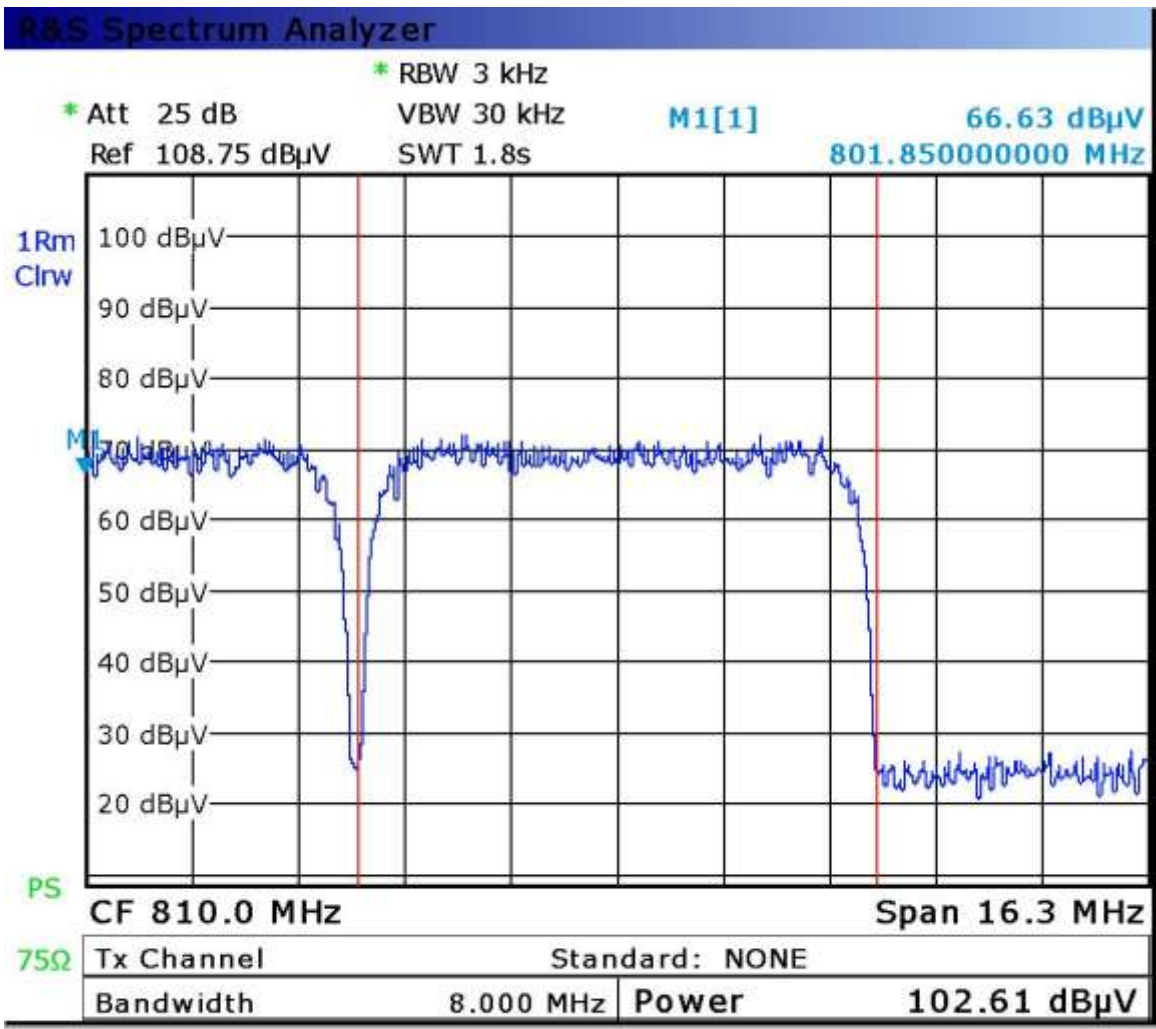
And one channel power for US channel 30MHz is also measured.



Date: 10.APR.2012 14:58:37

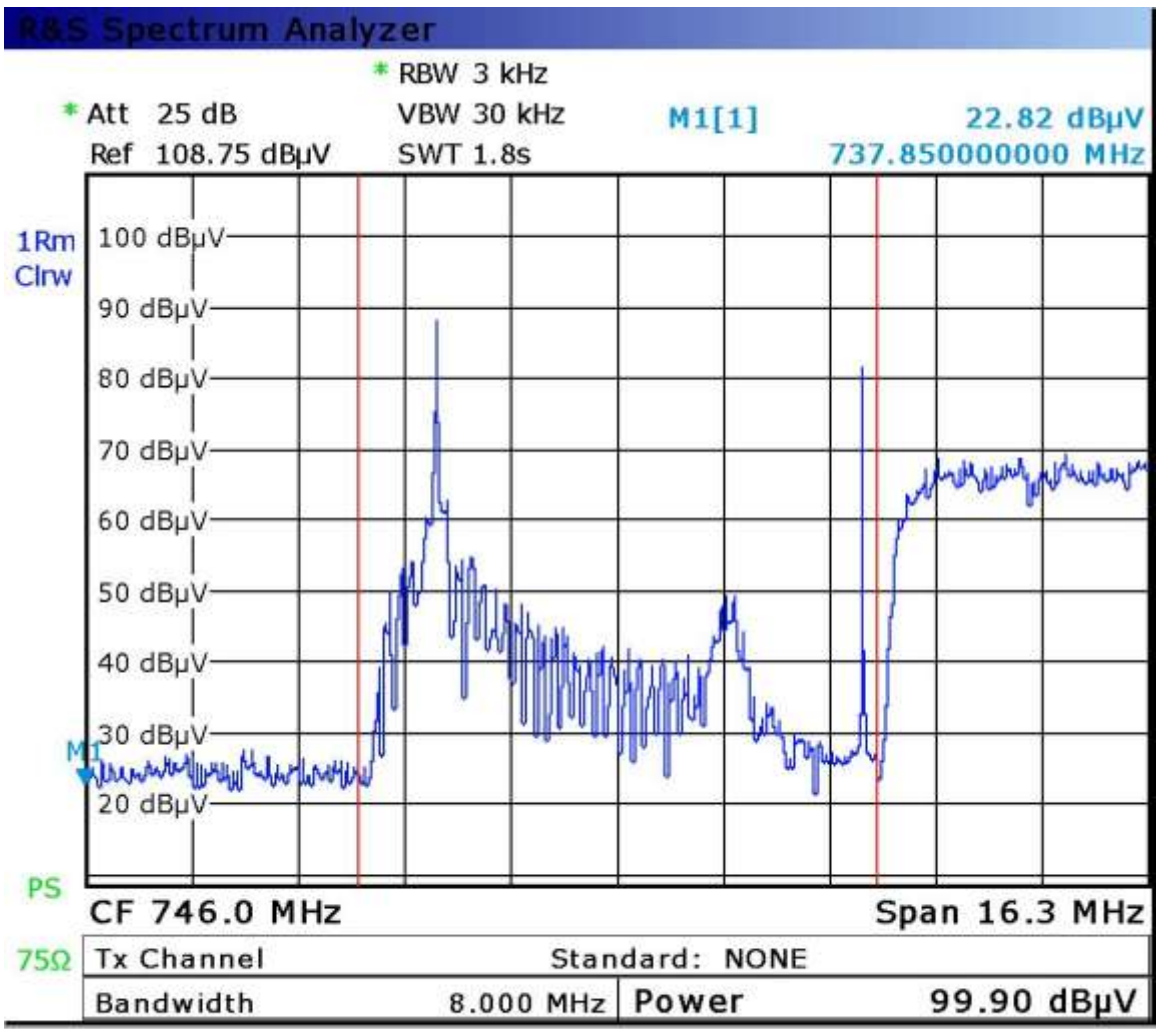
As for the channel measurement, some sample channels also captured.

For 810MHz channel is shown below:



Date: 10.APR.2012 15:06:48

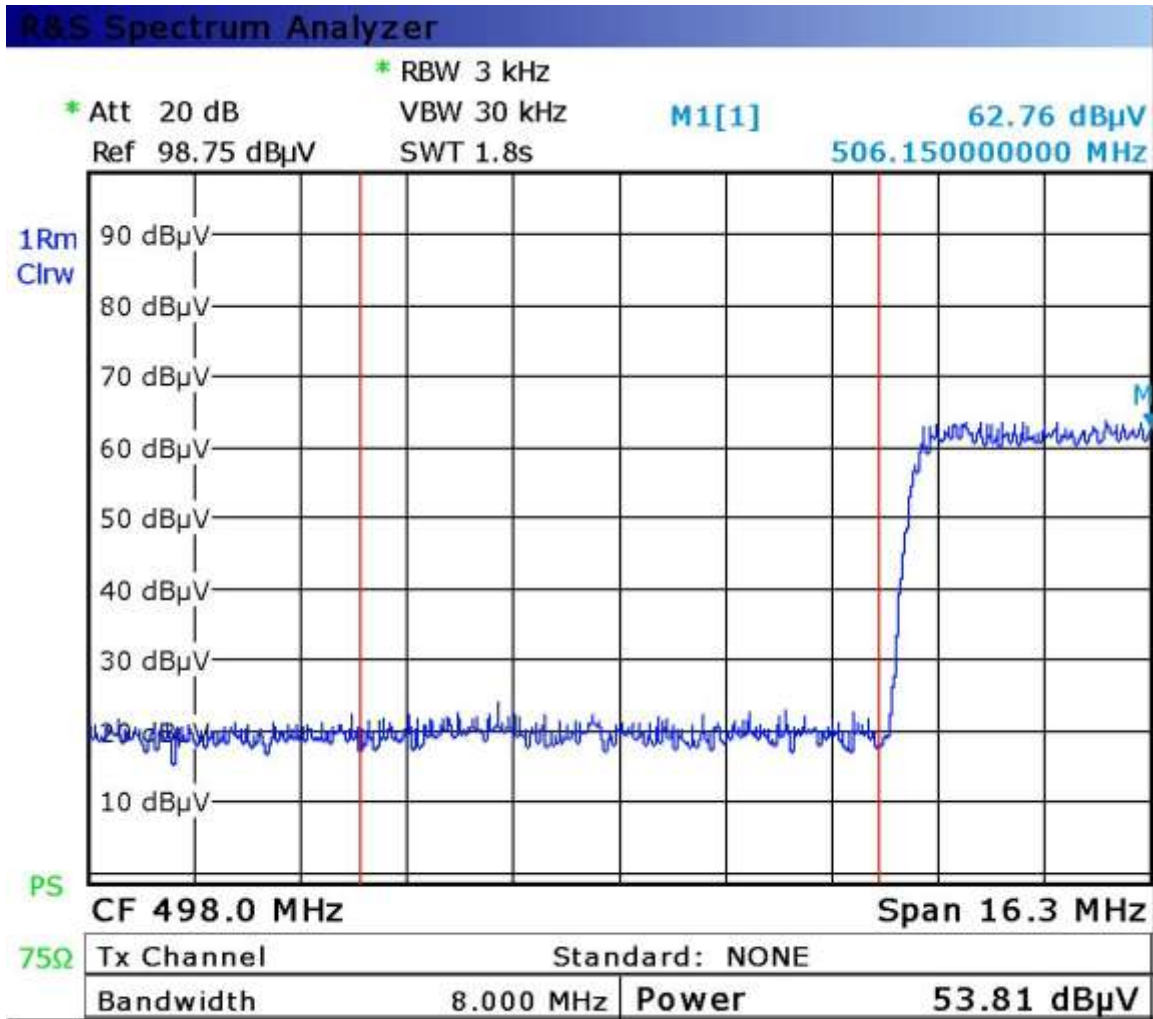
For analog channel, for example 746MHz channel is shown below:



Date: 10.APR.2012 15:06:36

For the unused channel within CATV band, is shown below:





Date: 10.APR.2012 15:07:23

### 3 Conclusions

From the test results, there is no unexpected US ingress noise observed and the DS channel power also matches their design goals.

But we found the DS channel trunk amplifier saturate case in which the US channel noise floor will be raised.

What they need to do is to replace the current one way trunk amplifier to two ways amplifier and fine tune to guarantee the US channel path.