
FH Frankfurt am Main - University of Applied Sciences

Forschungsgruppe für Telekommunikationsnetze

(Research Team for Telecommunications Networks)

Final Test Report

December 2008

„Power Measurements of IP Phones“

for

snom technology AG

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Test Period: 15 October 2008 – 15 December 2008

Date: 19 December 2008

TRANSLATION

1 Introduction	2
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Table of Contents

1	Introduction	3
2	Test Setup	4
3	List of Phones	4
4	Test Series	6
4.1	Snom	7
4.1.1	snom 300.....	7
4.1.2	snom 320.....	8
4.1.3	snom 360.....	9
4.1.4	snom 370.....	10
4.2	Polycom	11
4.2.1	Polycom 320	11
4.2.2	Polycom 330	12
4.2.3	Polycom 430	13
4.2.4	Polycom 550	14
4.2.5	Polycom 601	15
4.2.6	Polycom 650	15
4.2.7	Polycom 670	17
4.3	Linksys.....	18
4.3.1	Linksys SPA942	18
4.3.2	Linksys SPA962	19
4.4	Thomson	20
4.4.1	Thomson ST2022.....	20
4.4.2	Thomson ST2030.....	21
4.5	Aastra.....	22
4.5.1	Aastra 53i.....	22
4.5.2	Aastra 55i.....	23
4.5.3	Aastra 57i.....	24
4.6	Grandstream.....	25
4.6.1	Grandstream GPX2000.....	25
4.6.2	Grandstream GPX2020.....	26
4.7	Cisco	27
4.7.1	Cisco 7911	27
4.7.2	Cisco 7941	28
4.7.3	Cisco 7970	29
4.8	Reference Point Measurement of Switches.....	30
4.9	Overview of all test results.....	30
4.9.1	Values Measured with ALL8084 Switch	31
4.9.2	Values measured with ALL8089 switch	35
5	Summary	39

1 Introduction

Within the scope of the project "Power measurements von IP-Phones" (power measurements of IP phones), the power consumption of IP phones made by various manufacturers was tested in the *Labor für Telekommunikationsnetze* (lab for telecommunications networks) der *Fachhochschule Frankfurt am Main* while the phones were powered by Power over Ethernet (PoE).

For this purpose, snom technology AG supplied phones of their own making as well as phones made by other manufacturers.

This documentation begins with the description of the test setup by means of a diagram (Chapter 2, Figure 2.1). All tested phones and the measuring instruments used in the test setup are listed in table format (Chapter 3). The following series of measurements (Chapter 4) are sorted by manufacturer and include one graph and one test result table per tested phone. Four consecutive scenarios - standby, in call, standby, and three-party conference - were tested.

The aforementioned tests were conducted with two different PoE switches made by ALLNET GmbH. The first one of the two devices - ALL8084 - is an 8-port switch 10/100Mbit half/full duplex, four of them PoE ports conformant to IEEE802.3af specification with automatic PoE classification detection. The second device - ALL8089 - is an unmanaged layer-2 switch with 8 Fast Ethernet ports and maximum Power over Ethernet support on all ports.

For a direct comparison all tested devices are listed in a summary chapter (Chapter 4.9).

2 Test Setup

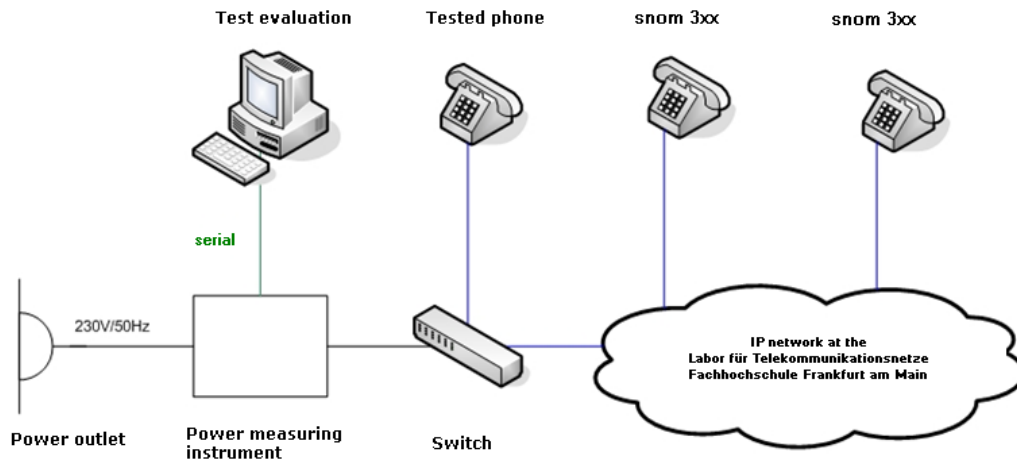


Figure 2.1: Test Setup

3 List of Phones

Table 3.1: List of Phones

Phones	Firmware
snom	
snom 300	V6.5.13
snom 320	V6.5.16
snom 360	V6.5.13
snom 370	V7.1.30
Polycom Soundpoint	
IP 320	V3.2.3.0021
IP 330	V3.2.3.0021
IP 430	V1.6.7.0133
IP 550	V2.1.0.0078
IP 601	V1.6.7.0130

TRANSLATION

3 List of Phones

5

IP 670	V3.0.2.0917
Aastra	
53i	V2.1.02145
55i	V2.1.0.2145
57i	V2.1.1.71
Linksys	
SPA942	5.1.15(a)
SPA962	5.1.15(aSC)
Thomson	
ST2022-EU-S-Metall	V3.56
ST2030-EU-S-Metall	V1.56
Grandstream GXP	
2000	Boot:1.1.6.5 Prog:1.1.6.16
2020	Boot:1.1.6.5 Prog:1.1.6.16
Cisco IP	
CP-7911G	Load File: SIP70.8-3-1S App Load ID: Jar70sip.8-3-0-50.sbn JVM Load ID: cvm70sip.70sip.8-3-0-50.sbn OS LoadID: cnu70.8-3-0-50.sbn Boot Load ID: 7979_020706_cert.bin DSP Load ID: dsp70.8-3-0-50.sbn
CP-7941G	Load File: SCCP41.8-3-1S App Load ID: Jar41sip.8-3-0-50.sbn JVM Load ID: cvm41sccp.8-3-0-50.sbn OS LoadID: cnu41.8-3-0-50.sbn Boot Load ID: 7941G_64-02070631Amd64megRel.bin DSP Load ID: dsp41.8-3-0-50.sbn
CP-7970G	Load File: SIP11.8-3-1S App Load ID: Jar11sip.8-3-0-50.sbn JVM Load ID: cvm11sip.70sip.8-3-0-50.sbn OS LoadID: cnu11.8-3-0-50.sbn Boot Load ID: tnp11.3-0-1-20.bin DSP Load ID: dsp11.8-3-0-50.sbn

4 Test Series

This chapter lists the results of the test series for each tested phone. Each subchapter summarizes the tested devices of one individual manufacturer, classifying each individual product in a further subchapter (third level).

Each phone's respective chapter contains a comparative diagram, showing the readings on both switches, and a summary in table format.

In the aforementioned graphs the time lines (abscissa) are divided into seconds. The duration of each test per phone is 350 seconds which are apportioned as follows: 100 seconds standby, 100 seconds active in-call via handset, 50 seconds standby, and 100 seconds 3-party conference via speakerphone. The ordinates show the power values in watt. The graduation is accurate to one tenth of a watt.

In each case the tables contain the average value for each scenario (standby, active in-call, standby 2, conference) on both switches.

The last subchapter in this section contains a comprehensive review of all tested phones in table and graph format.

4.1 Snom

4.1.1 snom 300

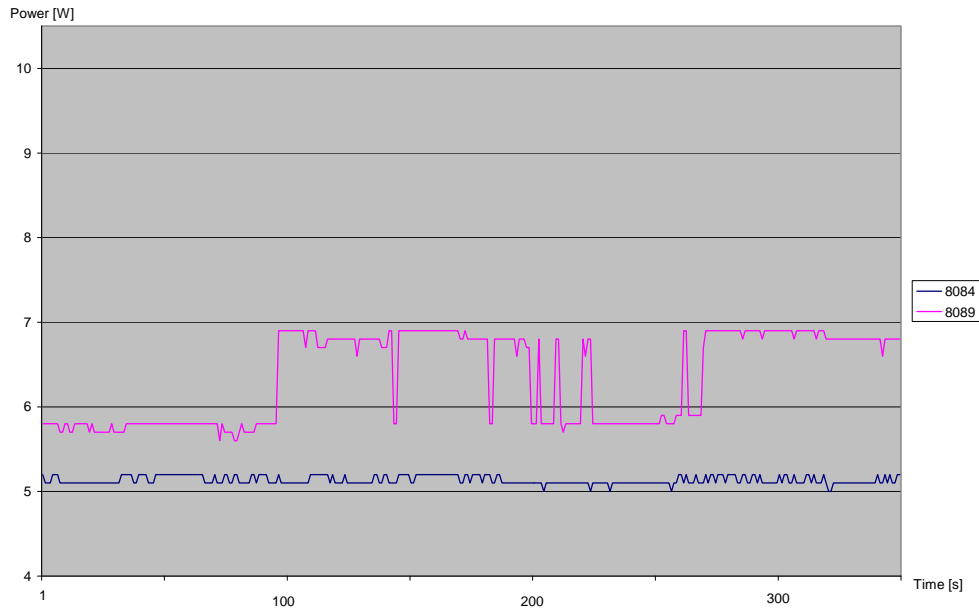


Figure 4.1: Power measurements snom 300

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	5,15	5,15	5,09	5,13	5,00	5,20
8089	5,80	6,79	5,95	6,68	5,60	6,90

4.1.2 snom 320

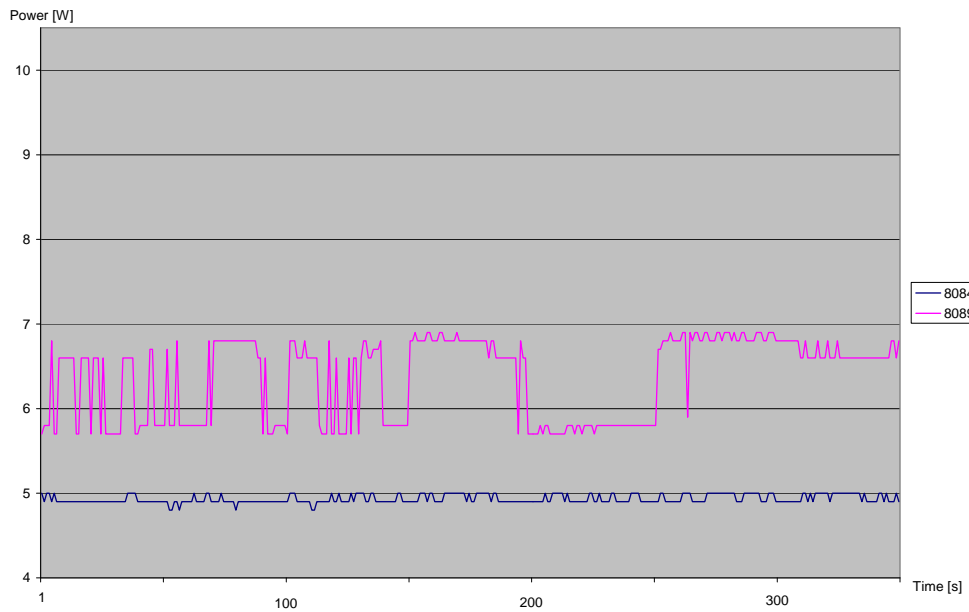


Figure 4.2: Power measurements snom 320

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	4,91	4,94	4,93	4,95	4,80	5,00
8089	6,21	6,47	5,77	6,72	5,70	6,90

4.1.3 snom 360

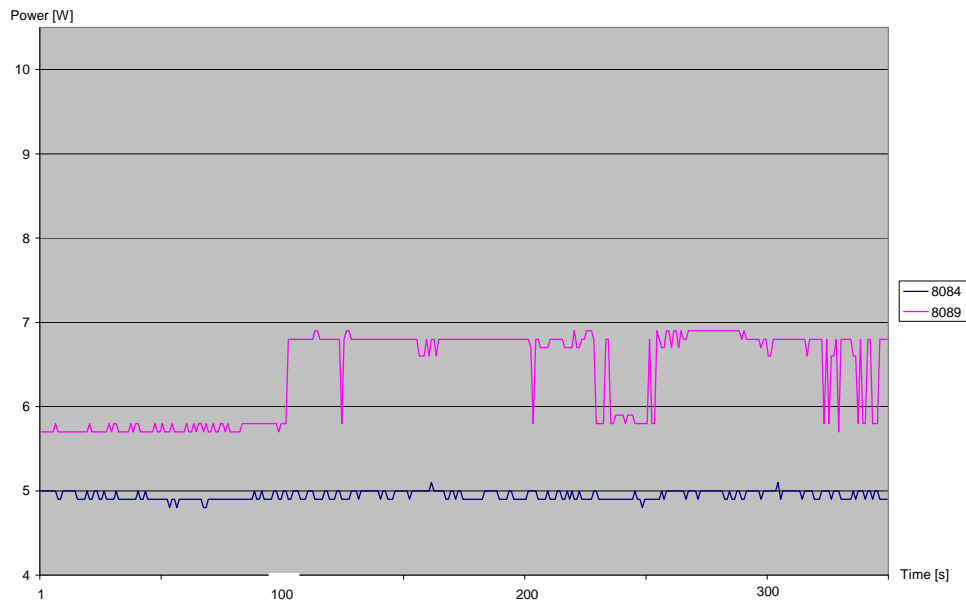


Figure 4.3: Power measurements Snom 360

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	4,92	4,96	4,92	4,97	4,80	5,10
8089	5,74	6,75	6,43	6,68	5,70	6,90

4.1.4 snom 370

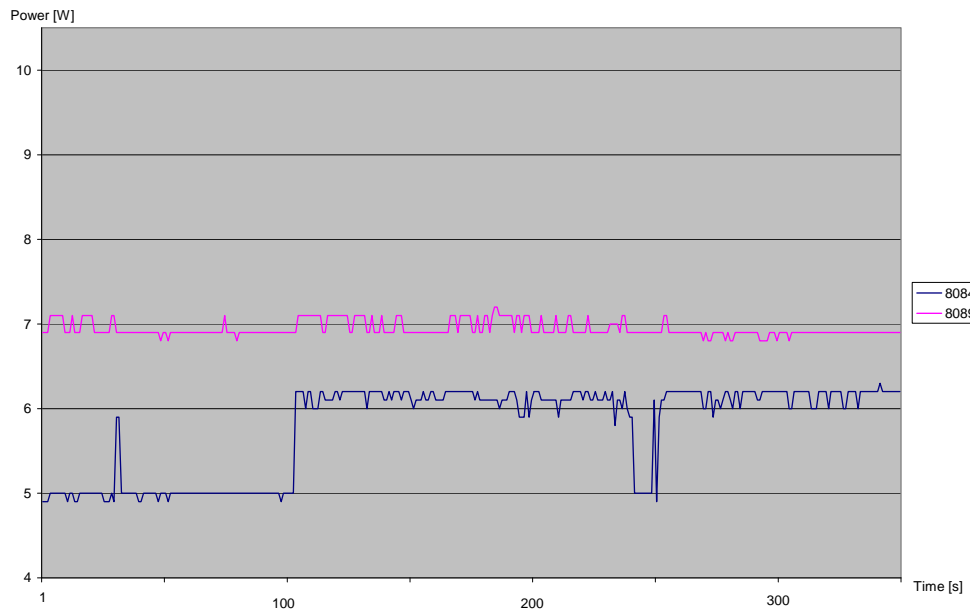


Figure 4.4: Power measurements snom 370

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	5,00	6,10	5,93	6,15	4,90	6,30
8089	6,93	7,01	6,94	6,89	6,80	7,20

4.2 Polycom

4.2.1 Polycom 320

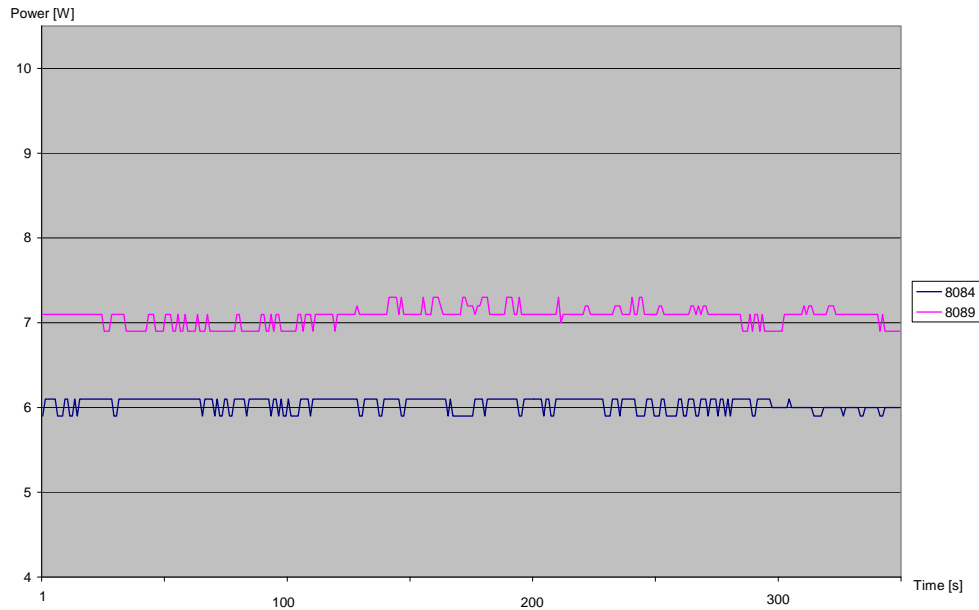


Figure 4.5: Power measurements Polycom 320

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,06	6,05	6,06	6,00	5,90	6,10
8089	7,00	7,13	7,12	7,07	6,90	7,30

4.2.2 Polycom 330

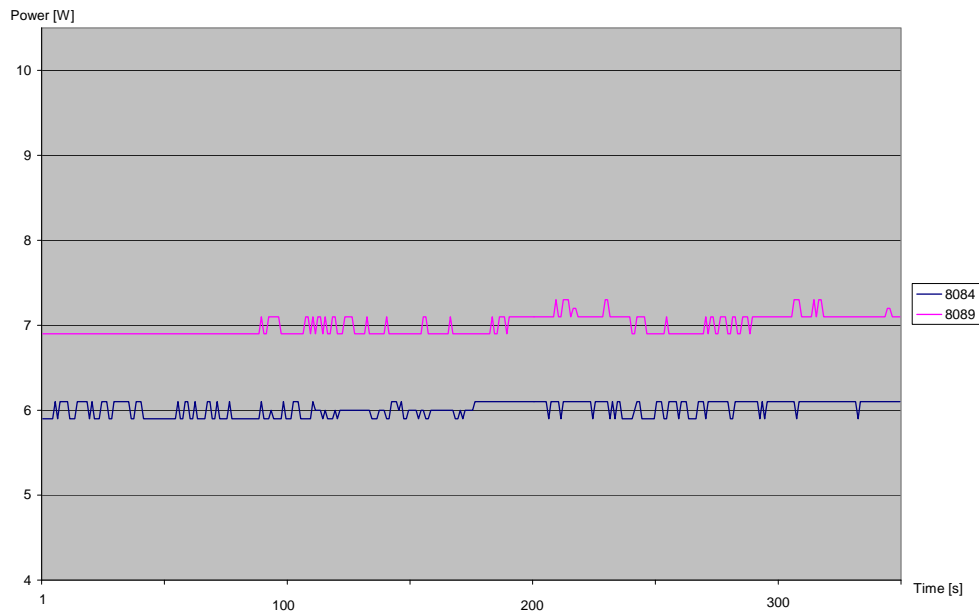


Figure 4.6: Power measurements Polycom 330

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	5,97	6,00	6,04	6,07	5,90	6,10
8089	6,91	6,96	7,11	7,06	6,90	7,30

4.2.3 Polycom 430

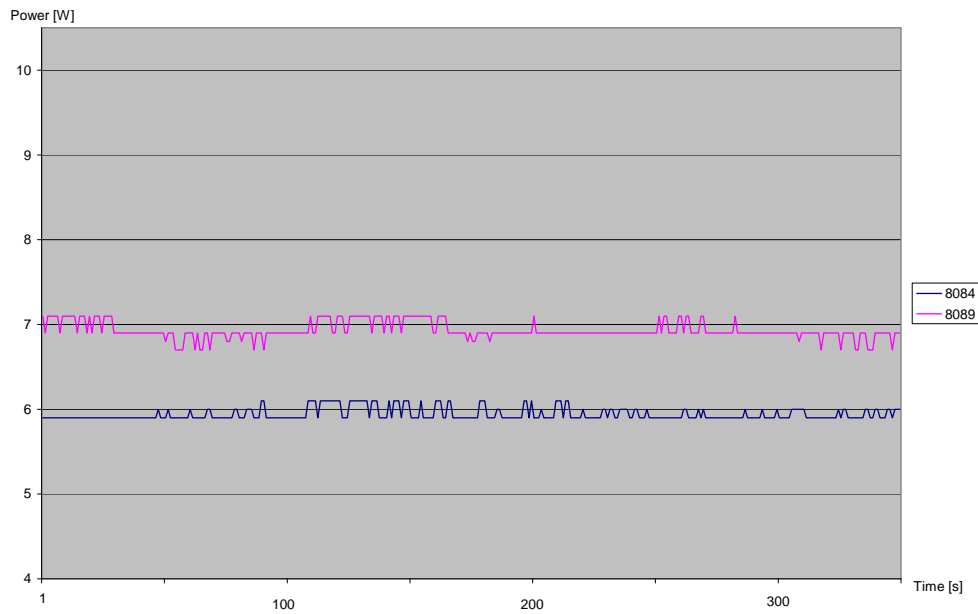


Figure 4.7: Power measurements Polycom 430

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	5,91	5,99	5,95	5,92	5,90	6,10
8089	6,92	6,98	6,90	6,90	6,70	7,10

4.2.4 Polycom 550

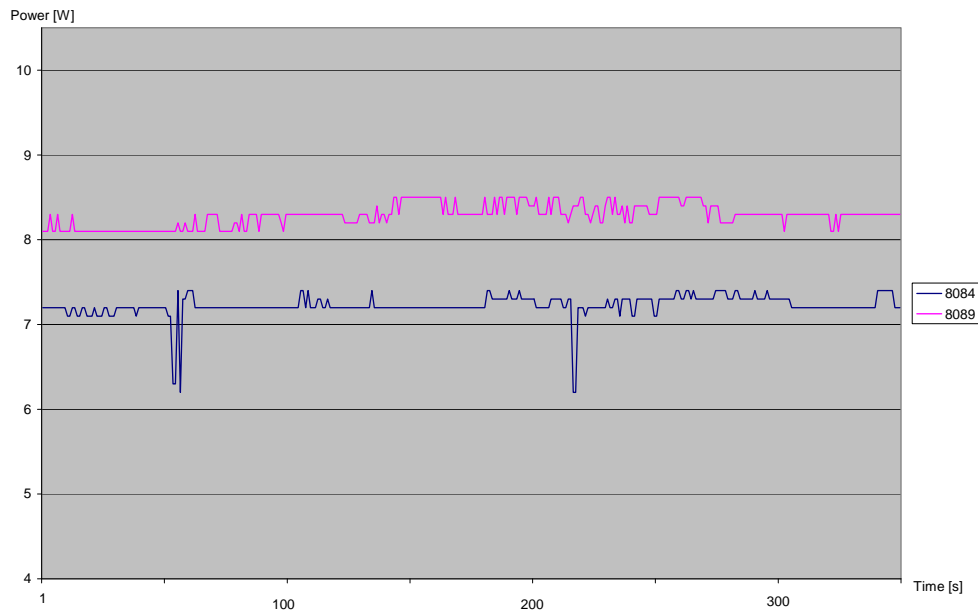


Figure 4.8: Power measurements Polycom 550

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	7,17	7,23	7,20	7,28	6,20	7,40
8089	8,15	8,36	8,36	8,32	8,10	8,50

4.2.5 Polycom 601

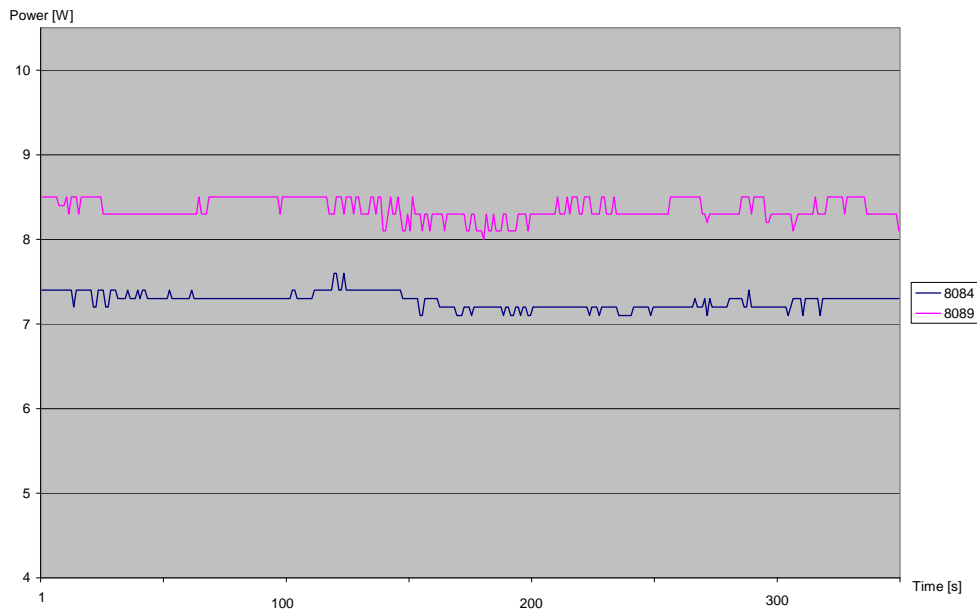


Figure 4.9: Power measurements Polycom 601

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	7,33	7,30	7,18	7,25	7,10	7,60
8089	8,41	8,32	8,34	8,37	8,00	8,50

4.2.6 Polycom 650

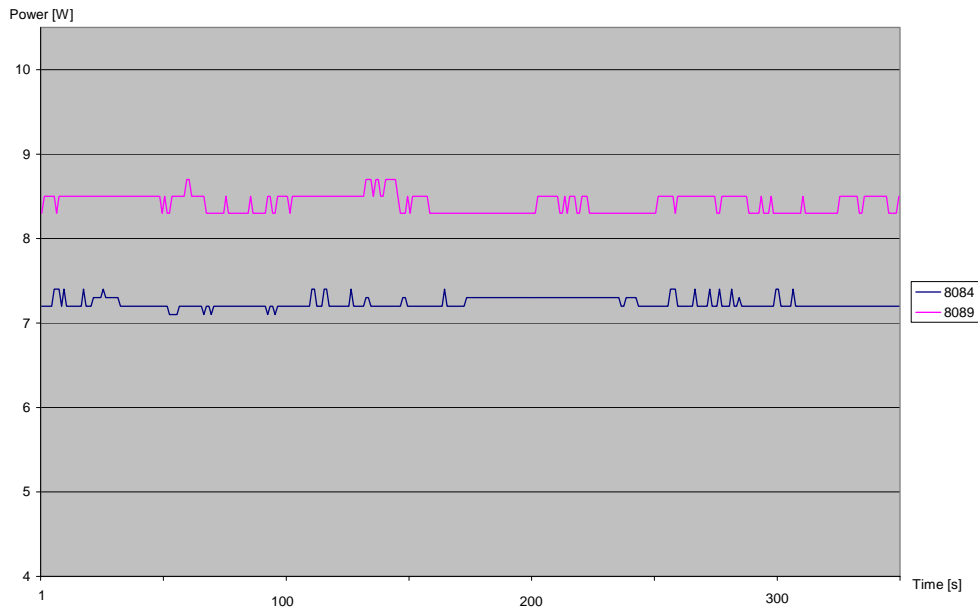


Figure 4.10: Power measurements Polycom 650

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	7,21	7,24	7,28	7,22	7,10	7,40
8089	8,44	8,43	8,36	8,41	8,30	8,70

4.2.7 Polycom 670

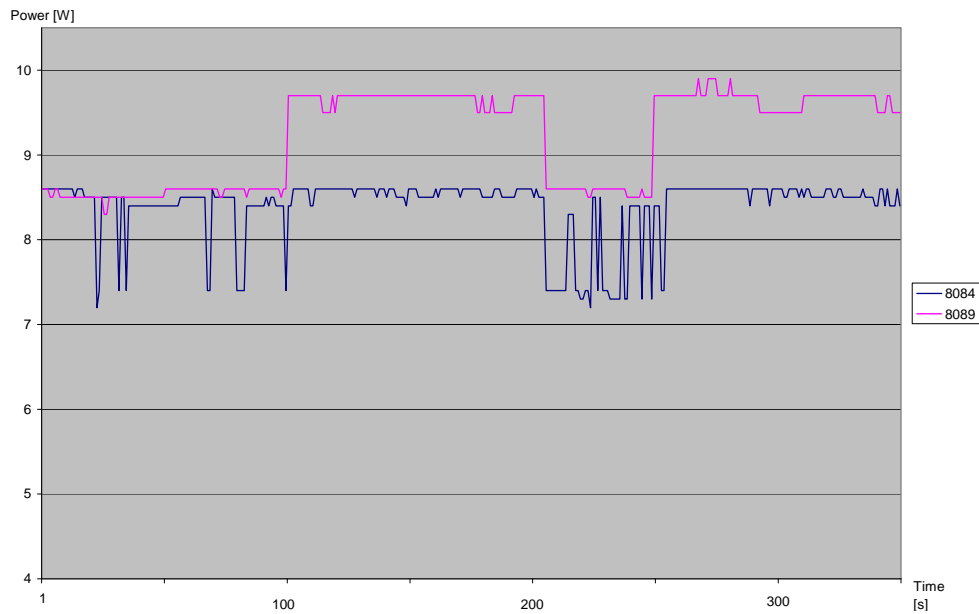


Figure 4.11: Power measurements Polycom 670

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	8,37	8,55	7,83	8,53	7,20	8,60
8089	8,55	9,65	8,73	9,66	8,30	9,90

4.3 Linksys

4.3.1 Linksys SPA942

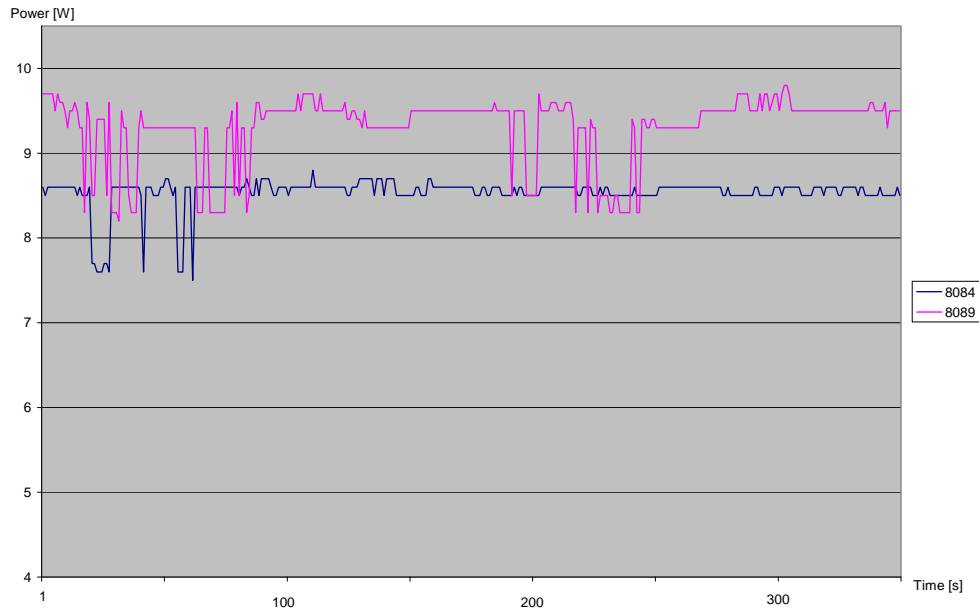


Figure 4.12: Power measurements Linksys SPA942

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	8,46	8,59	8,55	8,56	7,50	8,80
8089	9,14	9,45	8,99	9,50	8,20	9,80

4.3.2 Linksys SPA962

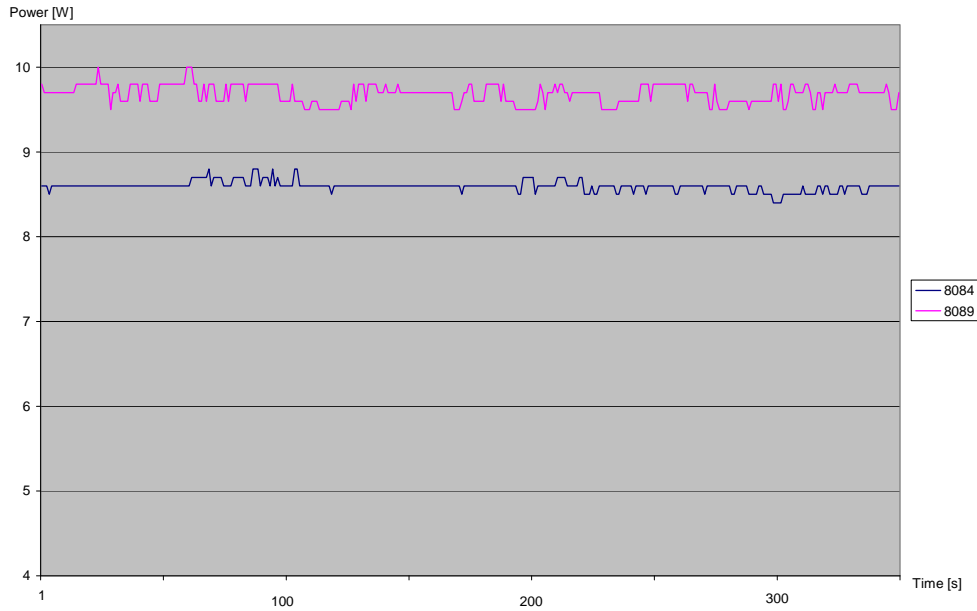


Figure 4.13: Power measurements Linksys SPA962

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	8,63	8,60	8,60	8,56	8,40	8,80
8089	9,75	9,65	9,65	9,68	9,50	10,00

4.4 Thomson

4.4.1 Thomson ST2022

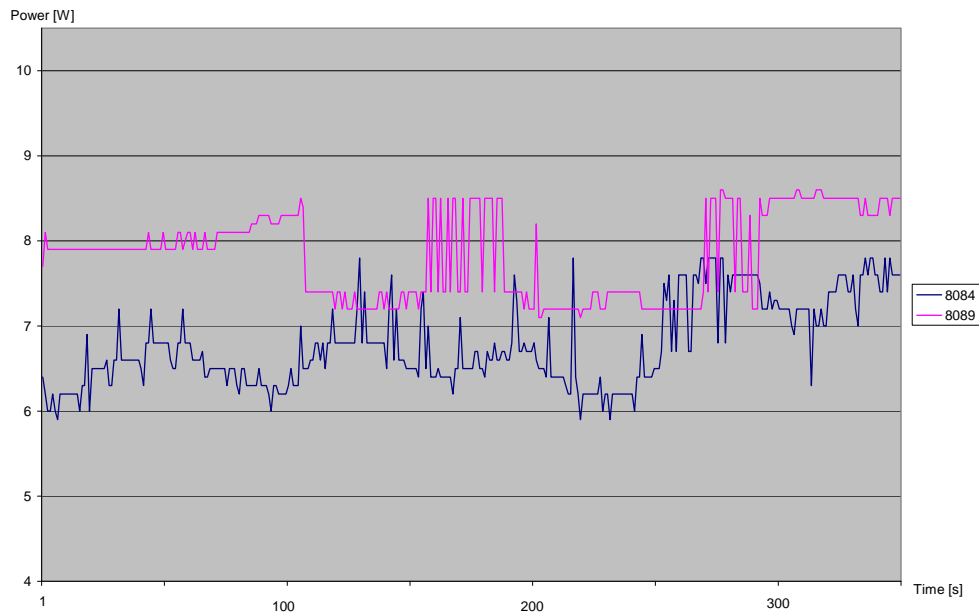


Figure 4.14: Power measurements Thomson ST2022

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,47	6,70	6,36	7,37	5,90	7,80
8089	7,99	7,65	7,28	8,11	7,10	8,60

4.4.2 Thomson ST2030

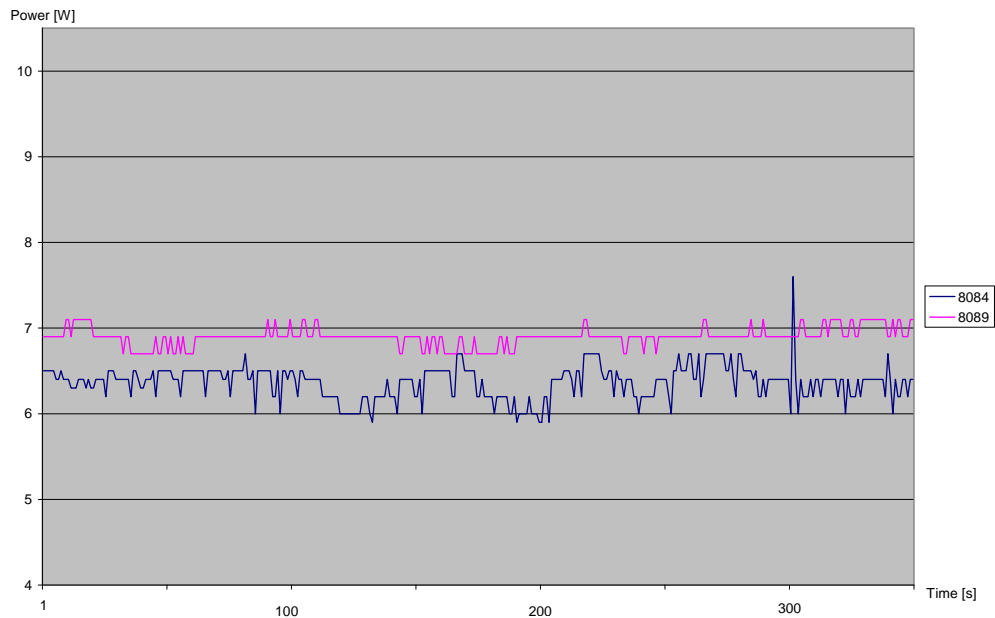


Figure 4.15: Power measurements Thomson ST2030

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,42	6,26	6,36	6,41	5,90	7,60
8089	6,88	6,85	6,89	6,96	6,70	7,10

4.5 Aastra

4.5.1 Aastra 53i

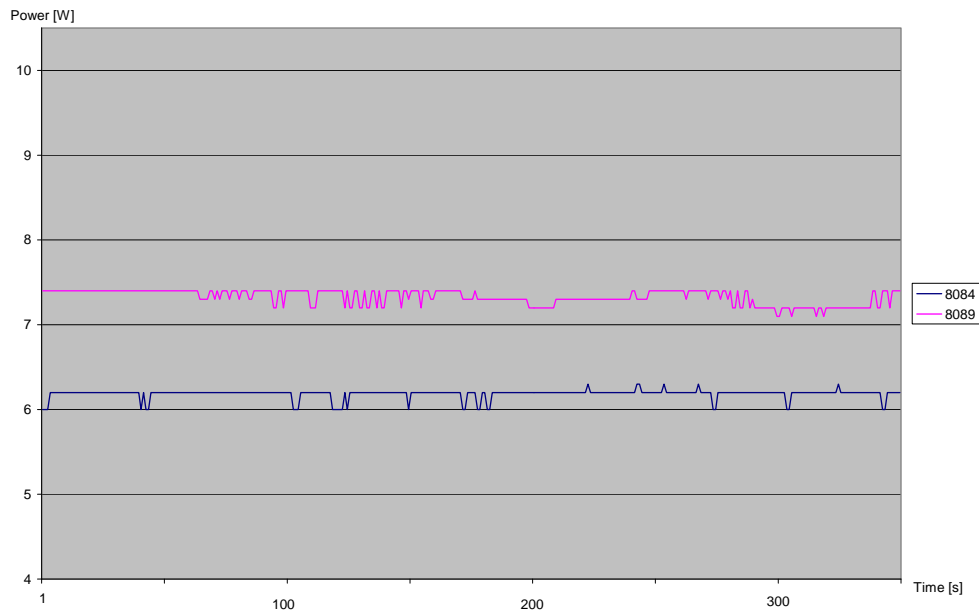


Figure 4.16: Power measurements Aastra 53i

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,19	6,17	6,21	6,19	6,00	6,30
8089	7,38	7,34	7,29	7,28	7,10	7,40

4.5.2 Aastra 55i

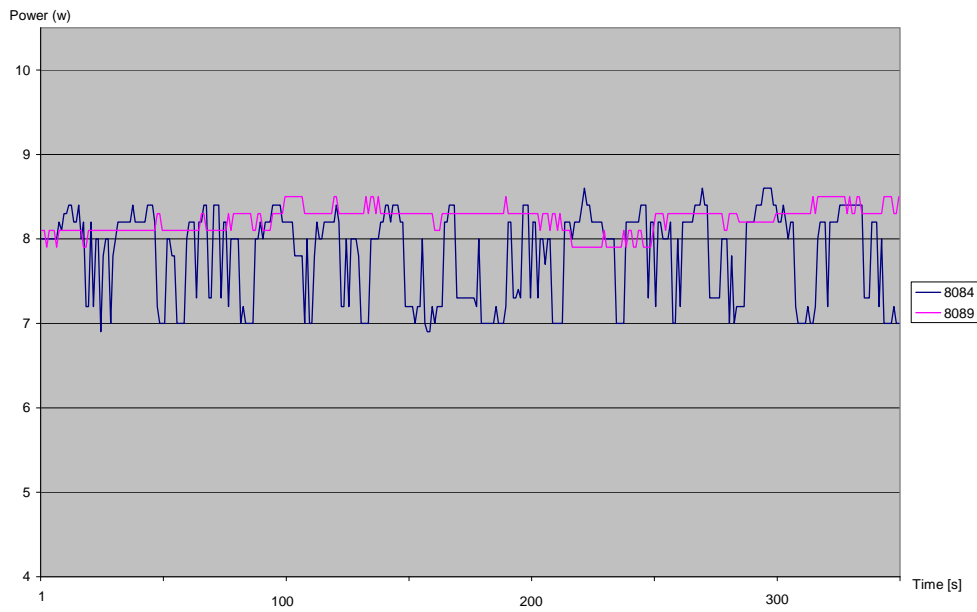


Figure 4.17: Power measurements Aastra 55i

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	7,90	7,65	7,92	7,86	6,90	8,60
8089	8,13	8,32	8,04	8,32	7,90	8,50

4.5.3 Aastra 57i

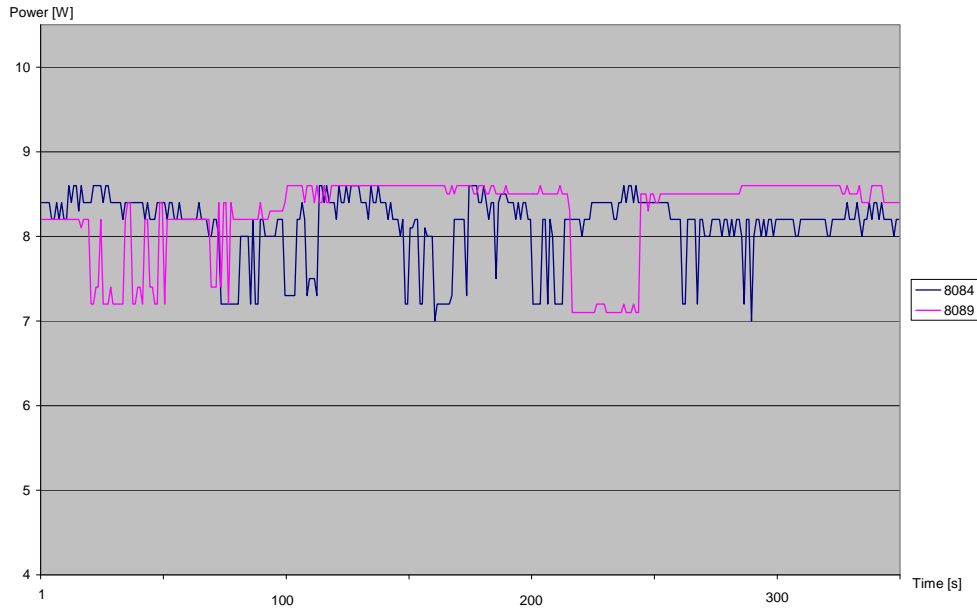


Figure 4.18: Power measurements Aastra 57i

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	8,17	8,10	8,12	8,14	7,00	8,60
8089	7,96	8,57	7,74	8,53	7,10	8,60

4.6 Grandstream

4.6.1 Grandstream GPX2000

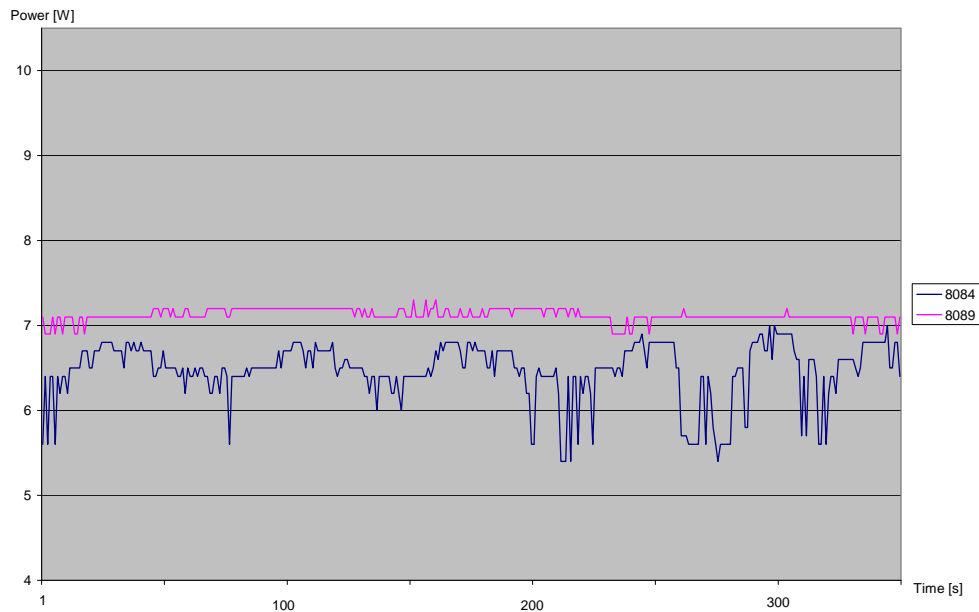


Figure 4.19: Power measurements Grandstream GPX2000

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,49	6,56	6,35	6,42	5,40	7,00
8089	7,12	7,16	7,10	7,09	6,90	7,30

4.6.2 Grandstream GPX2020

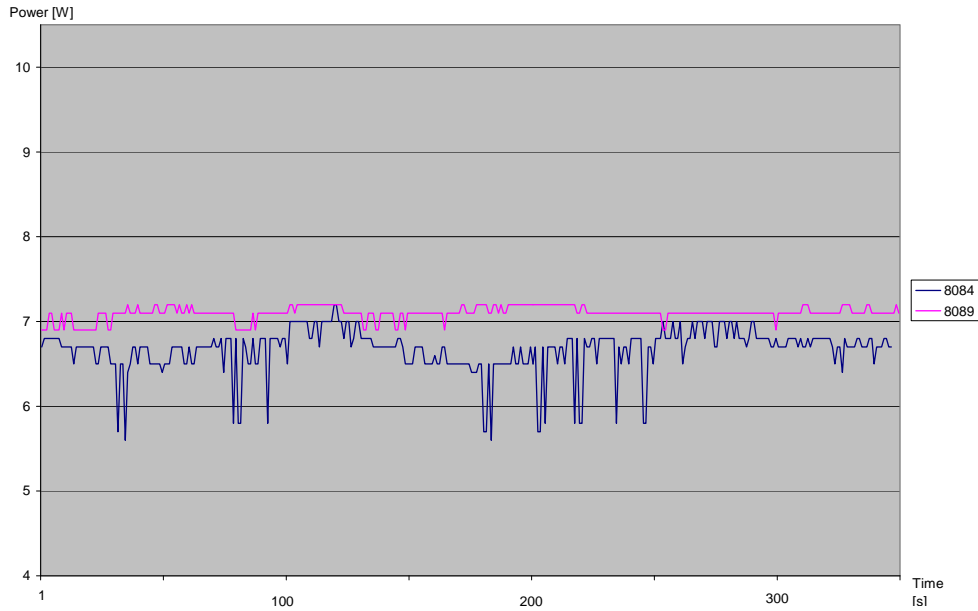


Figure 4.20: Power measurements Grandstream GPX2020

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,60	6,67	6,55	6,79	5,60	7,20
8089	7,06	7,12	7,14	7,10	6,90	7,20

4.7 Cisco

4.7.1 Cisco 7911

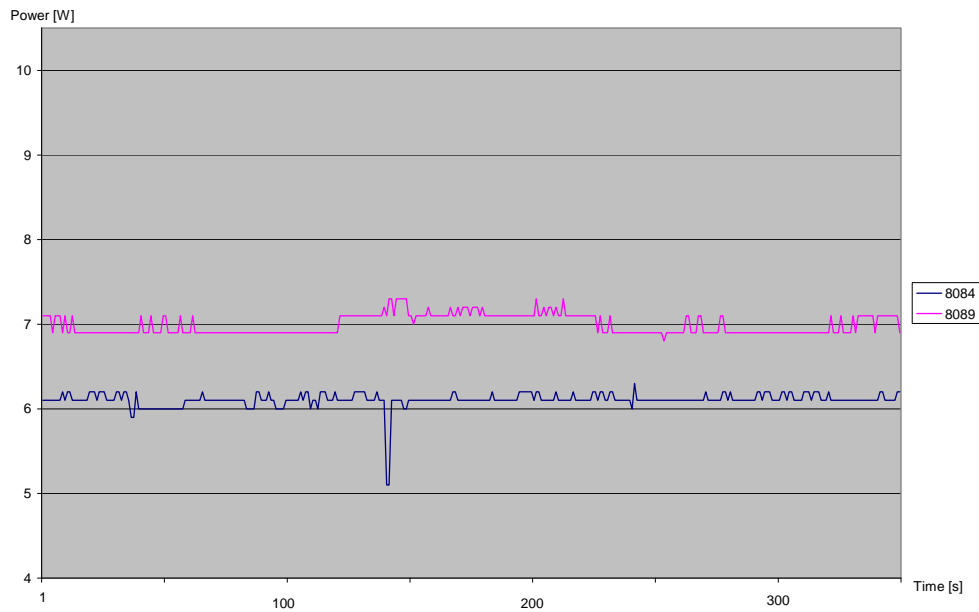


Figure 4.21: Power measurements Cisco 7911

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	6,09	6,10	6,13	6,12	5,10	6,30
8089	6,93	7,08	7,03	6,95	6,80	7,30

4.7.2 Cisco 7941

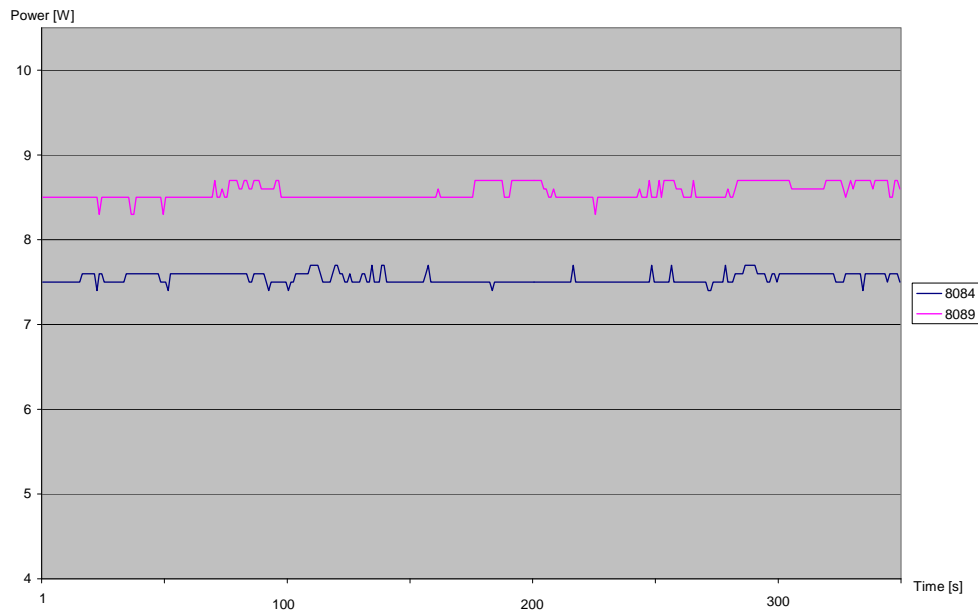


Figure 4.22: Power measurements Cisco 7941

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	7,56	7,53	7,51	7,56	7,40	7,70
8089	8,53	8,54	8,53	8,63	8,30	8,70

4.7.3 Cisco 7970

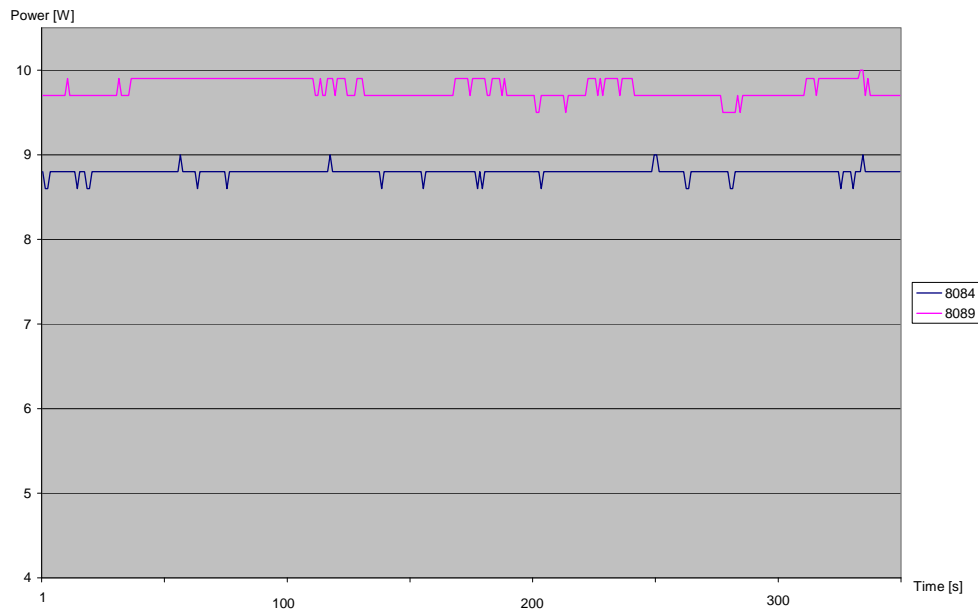


Figure 4.23: Power measurements Cisco 7970

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	8,79	8,79	8,80	8,79	8,60	9,00
8089	9,83	9,78	9,75	9,74	9,50	10,00

4.8 Reference Point Measurement of Switches

This section contains reference point measurements for both switches. The test setup corresponds to the diagram in Chapter 2, with the difference that in this case no phone to be powered by PoE was connected to the respective switch. The third phone (snom 3xx) was supplied via an external power supply so that the switch did not have to provide PoE in this case, but still had to provide the same amount of power for switching as in the other test cases.

The result of this test provides information on the amount of power the switch consumed during the test scenario without providing PoE. The following table shows the average values obtained in this manner.

Switch	Standby	In call	Standby 2	3-party conference	min	max
8084	2,44	2,45	2,46	2,46	2,44	2,45
8089	4,04	4,03	4,06	4,03	3,80	4,20

4.9 Overview of all test results

This section contains comparative graphs of all tested phones on the two switches. In the following chapters (chapters 4.91. – 4.9.2) the measured average values (unit = watt) are illustrated in the tables and diagrams.

4.9.1 Values Measured with ALL8084 Switch

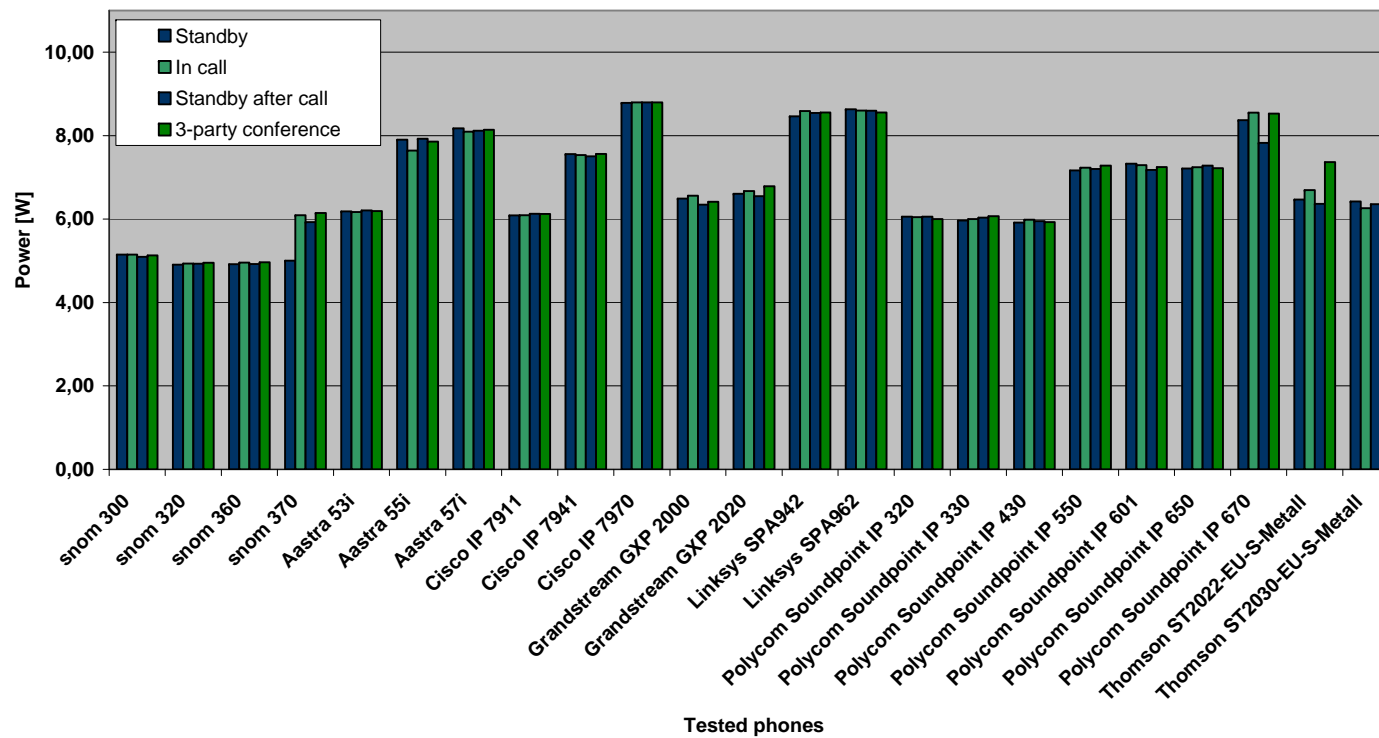
Comparison of tested phones including ALL8084's share

Tested phones	Standby	In call	Standby after in-call	3-party conference	MIN	MAX
snom 300	5,15	5,15	5,09	5,13	5,00	5,20
snom 320	4,91	4,94	4,93	4,95	4,80	5,00
snom 360	4,92	4,96	4,92	4,97	4,80	5,10
snom 370	5,00	6,10	5,93	6,15	4,90	6,30
Aastra 53i	6,19	6,17	6,21	6,19	6,00	6,30
Aastra 55i	7,90	7,65	7,92	7,86	6,90	8,60
Aastra 57i	8,17	8,10	8,12	8,14	7,00	8,60
Cisco IP 7911	6,09	6,10	6,13	6,12	5,1	6,3
Cisco IP 7941	7,56	7,53	7,51	7,56	7,4	7,7
Cisco IP 7970	8,79	8,79	8,80	8,79	8,60	9,00
Grandstream GXP 2000	6,49	6,56	6,35	6,42	5,40	7,00
Grandstream GXP 2020	6,60	6,67	6,55	6,79	5,60	7,20
Linksys SPA942	8,46	8,59	8,55	8,56	7,50	8,80
Linksys SPA962	8,63	8,60	8,60	8,56	8,40	8,80
Polycom Soundpoint IP 320	6,06	6,05	6,06	6,00	5,90	6,10
Polycom Soundpoint IP 330	5,97	6,00	6,04	6,07	5,90	6,10
Polycom Soundpoint IP 430	5,91	5,99	5,95	5,92	5,90	6,10
Polycom Soundpoint IP 550	7,17	7,23	7,20	7,28	6,20	7,40
Polycom Soundpoint IP 601	7,33	7,30	7,18	7,25	7,10	7,60
Polycom Soundpoint IP 650	7,21	7,24	7,28	7,22	7,10	7,40
Polycom Soundpoint IP 670	8,37	8,55	7,83	8,53	7,20	8,60
Thomson ST2022-EU-S-Metall	6,47	6,70	6,36	7,37	5,90	7,80
Thomson ST2030-EU-S-Metall	6,42	6,26	6,36	6,41	5,90	7,60

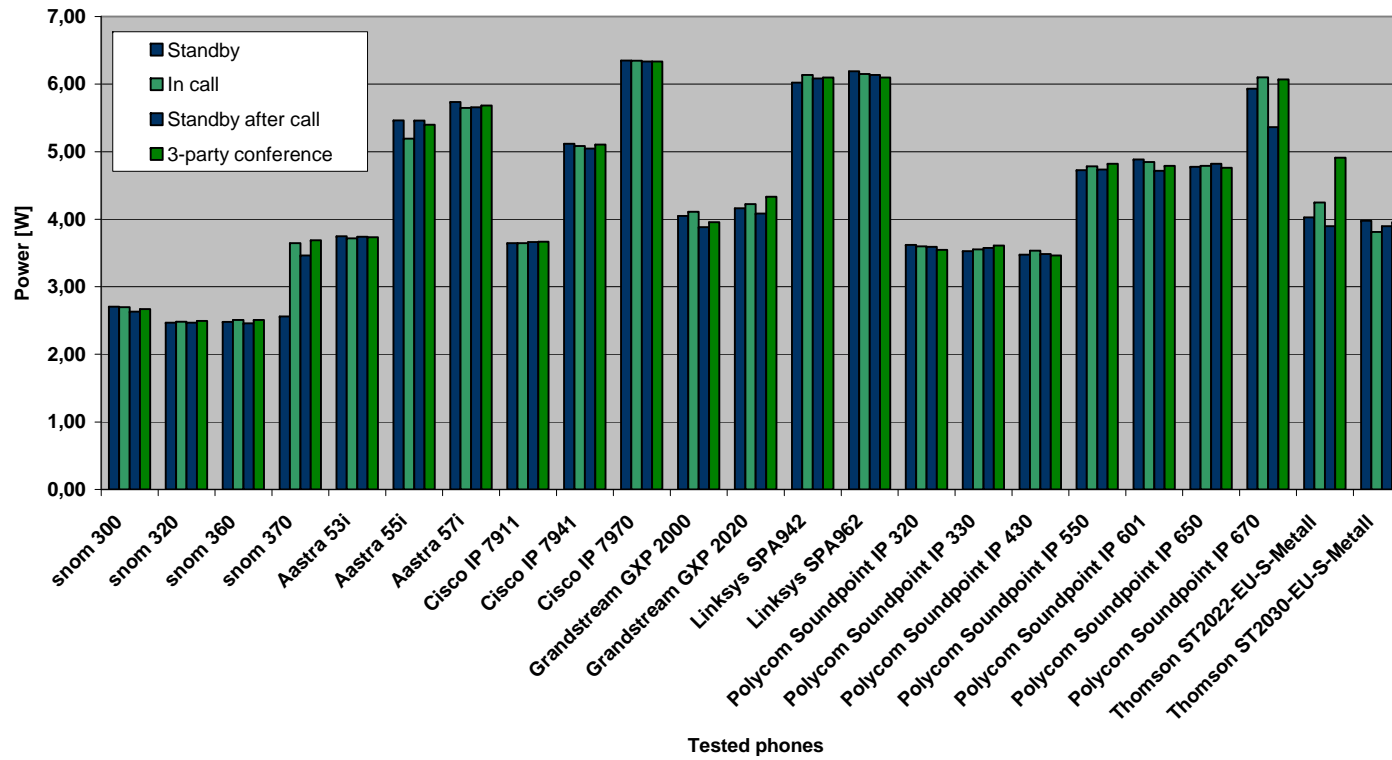
Comparison of tested phones without ALL8084's share

Tested phones	Standby	In call	Standby after in-call	3-party conference	MIN	MAX
snom 300	2,71	2,70	2,63	2,67	2,54	2,76
snom 320	2,47	2,48	2,47	2,49	2,35	2,56
snom 360	2,48	2,51	2,46	2,51	2,34	2,65
snom 370	2,56	3,65	3,46	3,69	2,44	3,84
Aastra 53i	3,75	3,72	3,74	3,73	3,54	3,84
Aastra 55i	5,46	5,19	5,46	5,40	4,45	6,14
Aastra 57i	5,73	5,65	5,66	5,68	4,54	6,16
Cisco IP 7911	3,65	3,65	3,66	3,66	2,65	3,84
Cisco IP 7941	5,12	5,08	5,04	5,10	4,94	5,25
Cisco IP 7970	6,35	6,34	6,33	6,34	6,14	6,56
Grandstream GXP 2000	4,05	4,11	3,88	3,96	2,94	4,54
Grandstream GXP 2020	4,16	4,22	4,08	4,33	3,15	4,75
Linksys SPA942	6,02	6,14	6,08	6,10	5,06	6,35
Linksys SPA962	6,19	6,15	6,13	6,10	5,94	6,36
Polycom Soundpoint IP 320	3,62	3,60	3,59	3,54	3,44	3,66
Polycom Soundpoint IP 330	3,53	3,55	3,58	3,61	3,44	3,66
Polycom Soundpoint IP 430	3,47	3,54	3,49	3,47	3,44	3,66
Polycom Soundpoint IP 550	4,73	4,78	4,74	4,82	3,74	4,96
Polycom Soundpoint IP 601	4,89	4,85	4,72	4,79	4,64	5,15
Polycom Soundpoint IP 650	4,77	4,79	4,82	4,76	4,66	4,96
Polycom Soundpoint IP 670	5,93	6,10	5,36	6,07	4,74	6,16
Thomson ST2022-EU-S-Metall	4,03	4,25	3,90	4,91	3,44	5,35
Thomson ST2030-EU-S-Metall	3,98	3,81	3,90	3,95	3,44	5,14

Comparison of tested phones including switch ALL8084's share



Comparison of tested phones without switch ALL8084's share



4.9.2 Values measured with ALL8089 switch

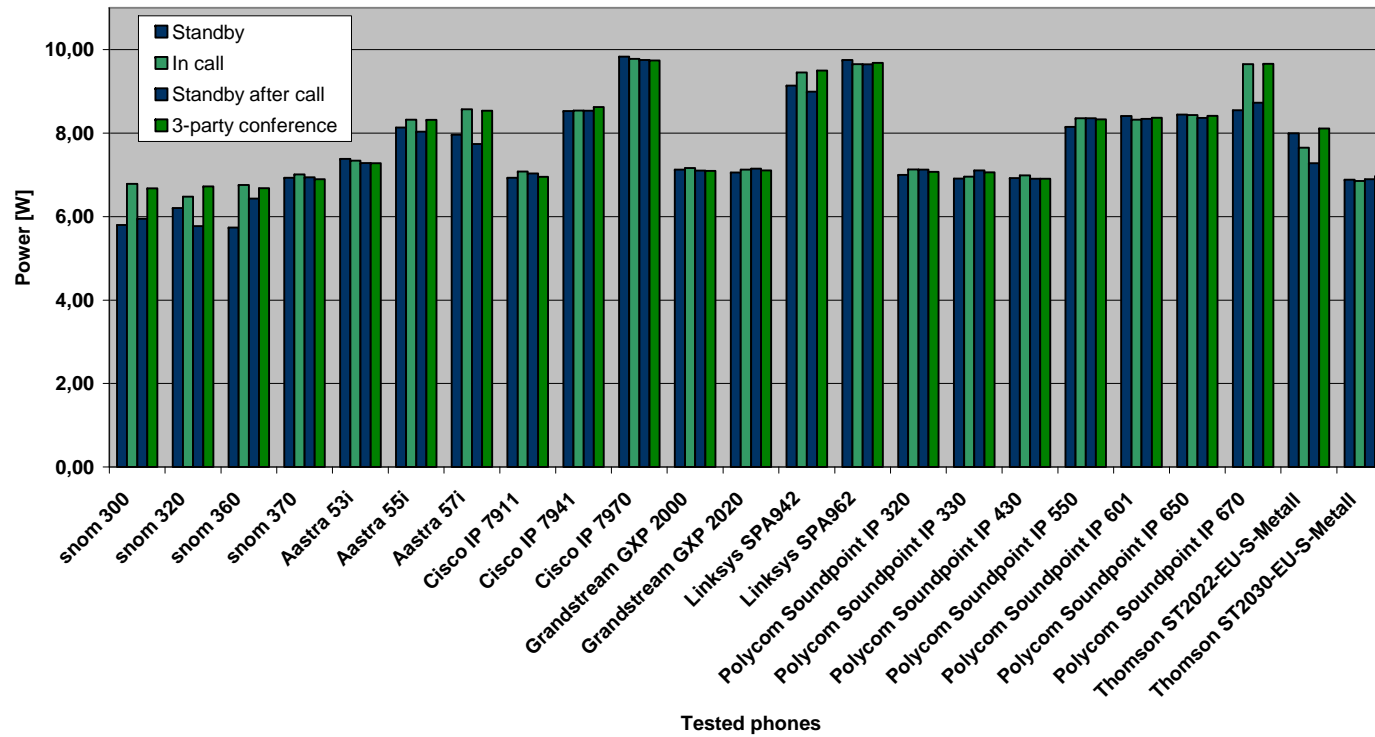
Comparison of tested phones including ALL8089's share

Tested phones	Standby	In call	Standby after in-call	3-party conference	MIN	MAX
snom 300	5,80	6,79	5,95	6,68	5,60	6,90
snom 320	6,21	6,47	5,77	6,72	5,70	6,90
snom 360	5,74	6,75	6,43	6,68	5,70	6,90
snom 370	6,93	7,01	6,94	6,89	6,80	7,20
Aastra 53i	7,38	7,34	7,29	7,28	7,10	7,40
Aastra 55i	8,13	8,32	8,04	8,32	7,90	8,50
Aastra 57i	7,96	8,57	7,74	8,53	7,10	8,60
Cisco IP 7911	6,93	7,08	7,03	6,95	6,80	7,30
Cisco IP 7941	8,53	8,54	8,53	8,63	8,30	8,70
Cisco IP 7970	9,83	9,78	9,75	9,74	9,50	10,00
Grandstream GXP 2000	7,12	7,16	7,10	7,09	6,90	7,30
Grandstream GXP 2020	7,06	7,12	7,14	7,10	6,90	7,20
Linksys SPA942	9,14	9,45	8,99	9,50	8,20	9,80
Linksys SPA962	9,75	9,65	9,65	9,68	9,50	10,00
Polycom Soundpoint IP 320	7,00	7,13	7,12	7,07	6,90	7,30
Polycom Soundpoint IP 330	6,91	6,96	7,11	7,06	6,90	7,30
Polycom Soundpoint IP 430	6,92	6,98	6,90	6,90	6,70	7,10
Polycom Soundpoint IP 550	8,15	8,36	8,36	8,32	8,10	8,50
Polycom Soundpoint IP 601	8,41	8,32	8,34	8,37	8,00	8,50
Polycom Soundpoint IP 650	8,44	8,43	8,36	8,41	8,30	8,70
Polycom Soundpoint IP 670	8,55	9,65	8,73	9,66	8,30	9,90
Thomson ST2022-EU-S-Metall	7,99	7,65	7,28	8,11	7,10	8,60
Thomson ST2030-EU-S-Metall	6,88	6,85	6,89	6,96	6,70	7,10

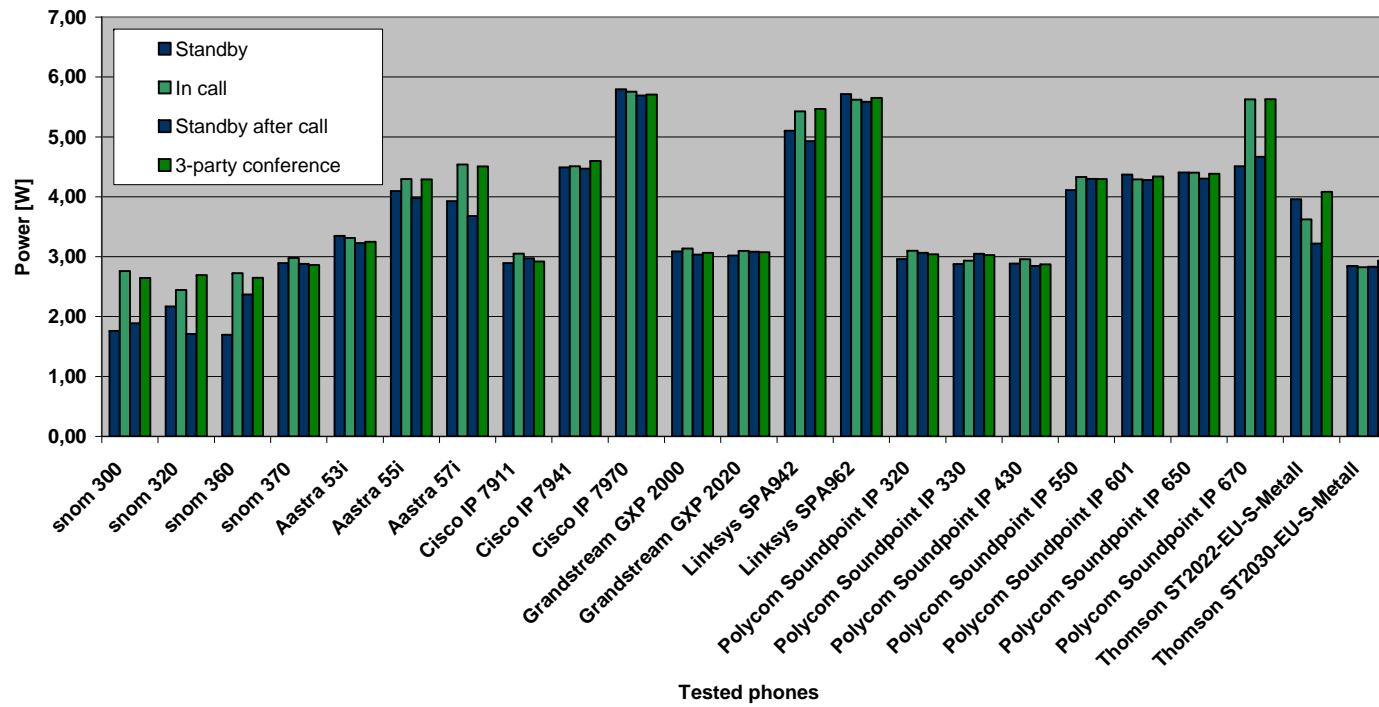
Comparison of tested phones without ALL8089's share

Tested phones	Standby	In call	Standby after in-call	3-party conference	MIN	MAX
snom 300	1,76	2,76	1,89	2,65	1,56	2,87
snom 320	2,17	2,45	1,71	2,69	1,64	2,87
snom 360	1,70	2,73	2,37	2,65	1,66	2,87
snom 370	2,89	2,98	2,88	2,86	2,76	3,17
Aastra 53i	3,35	3,31	3,23	3,25	3,07	3,37
Aastra 55i	4,10	4,30	3,98	4,29	3,84	4,47
Aastra 57i	3,93	4,54	3,68	4,51	3,04	4,57
Cisco IP 7911	2,89	3,05	2,97	2,92	2,77	3,27
Cisco IP 7941	4,49	4,51	4,47	4,60	4,24	4,67
Cisco IP 7970	5,79	5,75	5,69	5,71	5,44	5,97
Grandstream GXP 2000	3,09	3,14	3,04	3,06	2,84	3,27
Grandstream GXP 2020	3,02	3,10	3,08	3,07	2,86	3,17
Linksys SPA942	5,10	5,43	4,93	5,47	4,16	5,77
Linksys SPA962	5,71	5,62	5,59	5,65	5,44	5,96
Polycom Soundpoint IP 320	2,96	3,10	3,06	3,04	2,86	3,27
Polycom Soundpoint IP 330	2,88	2,93	3,05	3,03	2,84	3,27
Polycom Soundpoint IP 430	2,89	2,96	2,84	2,87	2,66	3,07
Polycom Soundpoint IP 550	4,11	4,33	4,30	4,30	4,06	4,47
Polycom Soundpoint IP 601	4,37	4,29	4,28	4,34	3,97	4,47
Polycom Soundpoint IP 650	4,41	4,40	4,30	4,38	4,24	4,67
Polycom Soundpoint IP 670	4,51	5,63	4,67	5,63	4,26	5,87
Thomson ST2022-EU-S-Metall	3,96	3,62	3,22	4,08	3,04	4,57
Thomson ST2030-EU-S-Metall	2,85	2,82	2,83	2,93	2,64	3,07

Comparison of tested phones including switch ALL8089's share



Comparison of tested phones without switch ALL8089's share



5 Summary

The gathered data shows quite clearly that neither calls with two participants nor a 3-party conference via speakerphone result in a considerably higher energy consumption. Most of the time the power consumption during the in-call scenarios is only one-tenth of a watt, i.e., approximately 2%, higher than during standby. This, however, only applies to IP phones without a backlit display. The power consumption of phones with backlight during calls and when dialing (backlight comes on) is up to 20% above the standby value. This is the value we determined for the snom 370, for example. This particular phone turns off the backlight after a certain amount of time, which, for example, isn't the case for the manufacturer Linksys (SPA962). Here the display is always backlit with the same intensity, keeping the power consumption on a continually high level.

In summation: The comfort gained by a backlit display increases the power consumption considerably and thus constitutes an additional financial and ecological burden. A phone that turns off the backlight after a short while (as the snom phones do) is a good compromise between these aspects.

The comparison of the switches and the corresponding measured values showed that distinctions between the test scenarios (standby, in call, standby, 3-party conference) can be read off better when using the switch All8089. When using the switch All8084 all series of measurements, with a few exceptions, are relatively homogenous. The diagram of the tested phone snom 370 is an exception. In this case, the All8084 switch showed the distinctions more markedly.

In further summation: Allnet's ALL8089 switch increased the power consumption as compared to Allnet's ALL808 switch. It should be noted that the ALL8089 switch has eight PoE ports; the ALL8084 switch also has eight ports, but only four of them provide PoE. With a bigger-dimensioned switch, as in the case of the ALL8089, there will be bigger losses of the system as a whole. Additionally, the two switches were not operated at the optimal operating point.

Therefore the display (size, type, monochromatic/color, backlighting profile) of the phones plays a decisive role. Concerning total power consumption, the switch being used also plays a role that cannot be disregarded.