

Chapter 5

Lab Testing by C-DAC (Thiruvananthapuram)

The status reports in the subsequent pages have been forwarded to IITB by CDAC. We are awaiting a further detailed report.

1. Aakash Status Report dated 22 August 2012
2. Aakash Status Report dated 30 May 2013
3. ERTL Test Report dated 15 April 2013
4. Aakash Status Report dated 8 July 2013
5. Aakash Test Report dated 8 July 2013

Aakash Project Status Report – August 22, 2012

1. Introduction

CDAC Thiruvananthapuram was entrusted the responsibility of carrying out the detailed lab testing of the Aakash tablet samples as part of the Aakash project given by MHRD to IIT Bombay. As part of the initial study 25 samples out of the 100 supplied by M/s Datawind were delivered to CDAC on 20th June, 2012. A formal project proposal for the Evaluation and Testing of the Aakash Tablet along with a Tentative Test Plan and Procedure was submitted to IIT-B on the 19th July, 2012. Project fund was received by CDAC, Thiruvananthapuram on 23rd July, 2012.

2. Work done on the project from July to August 2012

The objective of the project assigned to CDAC, Thiruvananthapuram is the evaluation and testing of the Aakash tablets. We have prepared a tentative test plan for the detailed tests to be carried out on the tablets. A first level of evaluation and testing has been done and feedback on the same was given to IIT-B on the 30th July, 2012. As mentioned in the feedback, the model of the Aakash supplied is of a lower specification which runs the Android 2.2 OS, which is found to be unstable and buggy. Several other issues with regard to the faulty hardware / software and poor mechanical design have been noted. The observations made are summarised below:

1. Android version 2.2.2 installed on the tablets provided, causes some issues w.r.t poor power management, application control and non-support of a Wi-Fi proxy, precluding downloading of apps through WLAN.
2. Observed boot failure and processor instruction errors in many of the machines.
3. Frequent system freeze observed which required hard reset using a pin.
4. Quality of the Power switch is poor, and sometimes gets recessed within the cabinet when pressed.
5. Touch screen sensitivity/calibration is erratic.
6. There is no charge indication LED on the Tablet.
7. When the device is in standby, the state-of-charge does not get updated in the Tablet screen.
8. RTC time does not get updated when the device is in standby.
9. The tablet cannot be kept in standby mode since it automatically wakes up every 5 minutes.

10. The USB drive does not work concurrently with a SD card plugged in.
11. Some of the software applications cannot be closed through the GUI. They can only be killed from the App killer. Tasks have to be forcibly closed.
12. Keyboard is not working from the USB slot.
13. No volume control button available.
14. Some background operations which seem unnecessary were found to be running (camera, Bluetooth, etc.). These seem to be eating up system resources, increasing the boot time as well.
15. PC connectivity is not provided for system checking, USB debugging and software installation.
16. Aakash Tablet model is not supported and recognised by Google Play.

3. Concluding remarks

We have identified the various tools and apps for testing including benchmark tests, devices and OS tests. We have also purchased a few similar tablets available in Indian market for comparative study and performance evaluation. We have initiated procurement of various tools for test platform and are in the process of finalising the test procedure and setting up a semi-automatic test environment. We have also identified testing agencies / certifying authorities for carrying out the environment tests as per ISO/BIS standards.

Detailed testing of the 25 samples received at C-DAC is in progress and an interim test report of the same shall be delivered by first week of September. Since the performance of the devices supplied is not upto the mark, we would like to use this as development for our test platform and we shall focus on the testing of the newer upgraded model which is likely to be better and could alleviate most of the problems found in the current model.

We would like to gather more details from M/s Datawind including detailed specification, internal details, reliability data of critical components etc. Hence, we could explore the areas of hardware testing which would help bring down the failure rate.

We plan to start rigorous testing of the new version of Aakash Tablet with Android 4.0 as soon as we receive the same. Since rigorous testing is done only on a small sample volume, a close monitoring at the production line by CDAC is essential to ensure the quality. For this a relations may kindly be put in place with the production agency.



Aakash Project Status Report – May 30, 2013

Eight batches of upgraded Aakash II tablets received from IIT Bombay till date.

1. 08-10-2012 – 25 nos – (Serial nos – 10001060-69, 71-79, 85-90)
2. 27-12-2012 – 40 nos – (Serial nos – 10002059-98)
3. 25-02-2013 - 50 nos – (Serial nos – 10003061-90, 10002801-20)
4. 02-04-2013 - 150 nos
5. 15-04-2013 - 100 nos
6. 25-04-2013 - 100 nos
7. 29-04-2013 - 100 nos
8. 09-05-2013 - 100 nos

It may be noted that the dispatch slips generated by Aakash Support Team do not correspond to the consignments received through C-DAC, Noida. The list of dispatch slips generated and the actual quantity received is as given in Annexure –I.

Some of the Tablets in the 5th and 7th batches had broken display screens (appears to have been damaged in transit). A total of five Tablets were damaged. Also, some of the Tablets are dead and do not turn ON. A total of about 12 Tablets are dead out of the sample of 500 numbers we have opened so far.

The packages received contain only Tablet and charger and no cables/adaptors. The tablets also do not have any serial number affixed on them.

A new variant of the Tablet viz. “Nuclear –pfdq88c” was found in some of the batches, other than the earlier models of “Nuclear X3”, “Nuclear Evb” and “A13MID” from “Softwinners”. Also another model of tablet; “RK2926” from “Rockchip” was found among the new batches received.

Performance testing of first 3rd batch of tablets is completed and testing of 4th and 5th batches in progress. Since, we have received a bulk of the tablets in the months of April /May (550 nos) and comprehensive testing of each tablet is done, we are unable to give a report for the entire volume of tablets received till date.

We are in the process of developing a semi-automatic test setup for testing the Tablets which would help reduce the time for testing.

Test results of the 3rd batch of tablets (Sl. Nos 10003061-90 and 10002801-20) are recorded and attached. ([Akash_Test_Report.xls](#)).

The problems found during the preliminary evaluation of the tablets tested so far are listed below:

- Power adaptors of some are not working. Arcing sound as well as some liquid discharge found in some of the power adaptors.

- Boot problems found in some of the tablets. Tablet does not boot up, only continuously displays the Android logo in a loop.
- Some of the Tablets automatically power-ON while connecting the charger.
- Extreme heat generation (above 42 deg C) found in some while charging and after usage for 30 mins.
- “android.process.acore has stopped unexpectedly” errors occur frequently in some of the Tablets.
- Display screen of the Tablet gets garbled due to EMI, when in close contact with certain mobile phones when signal is active.
- Case locking not proper, leading to partially open cover.
- Misalignment of micro-USB connector, preventing insertion of cable.
- Misalignment of SD card slot, preventing insertion of card.
- Screen of some of the tablets are badly scratched.
- Ripples observed on LCD screen of some tablets on movement and tapping.
- Dead pixels observed in some of the Tablets.
- Battery performance of some found not upto the mark. Only gives about half the backup time compared to other tablets in the same series.

Environmental tests as per IEC/ BIS standards carried out with ERTL (South) laboratory. Mechanical tests consisting of impact and vibration test were performed. Environmental tests comprising of dry heat test, cold test and humidity tests were also performed. Report of the same attached ([ERTL_test_report.pdf](#)).

Also identified test equipment needed to undergo some of the tests in-house itself and their procurement is in process.

As informed earlier since rigorous testing is done only on a small sample volume, a close monitoring at the production line is essential to ensure the quality. For this a relation may kindly be put in place with the production agency.

Requested IIT, Bombay to facilitate in opening a contact window with M/s Datawind and also the production agencies. Manufacturing and delivery schedule still not intimated.

Also, yet to receive the detailed specification, internal details, reliability data of critical components and test QAP document from M/s Datawind.



Annexure - I

Dispatch Slip		Tablets Received	
Dated	Quantity (nos)	Date	Quantity (nos)
20-02-2013	50	25-02-2013	50
01-04-2013	20+20+40+30 = 110	02-04-2013	150
09-04-2013	20+30 = 50	15-04-2013	100
18-04-2013	20+40+10 = 70		
22-04-2013	60		
23-04-2013	40	25-04-2013	100
30-04-2013	26+22+18+19+14 = 99	29-04-2013	100
03-05-2013	1	09-05-2013	100
22-05-2013	2+65+8+85+40 = 200		
29-05-2013	50+50 = 100		

ELECTRONICS REGIONAL TEST LABORATORY (SOUTH)
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
THIRUVANANTHAPURAM

TEST REPORT ON: Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	1	5

1. Indenter : M/s CDAC
 (Name & address of the
 Organisation) Vellyambalam
 Trivandrum
2. Indenter's Reference : SRFNo.4428 dt 28-3-13
3. Description & Identification of the item : Aakash Tablet PC : 2 Nos.
 Sl.No. 10001074,10002064
4. Applicable Specification : As pes IS 9000
5. Test done : 1.Dry Heat test
 2. Cold test
 3. Damp heat test
 4. Impact Test
 5. Vibration Test
 6. Functional check
- 6.

Equipment used	model	Traceability	Validity
Programmable humidity Test chamber Weiss Technik	WK 11 1000	ETDC Bangalore	28-2-2014
Electro Dynamic Vibration Shaker System	Saraswathi Dynamic	ERTL(S)	02-07-2013



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THIRUVANANTHAPURAM**

TEST REPORT ON Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. OF PAGES	
			2	5
ERTL (S)/R/4428	15-4-13			

7.0 Test results :

Sl. No	Test condition	Specification	Qty tested	Result	Remarks
1.0	Functional Check	As per Annexure -A	Two	Complied	Nil
2.0	<u>Dry heat test IS 9000 part-III/Sec.5-1977</u> (UUT in unpacked and power off condition) Temperature: $55 \pm 2^{\circ}\text{C}$ Duration : 16 Hrs	Shall be Conditioned	Two	Conditioned	Nil
2.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
3.0	<u>Cold Test(IS 9000 Part-II/Sec 4-1977</u> <u>(UUT in unpacked and power off condition)</u> Temperature: $-10 \pm 3^{\circ}\text{C}$ Duration : 2 Hrs	Shall be Conditioned	Two	Conditioned	Nil
3.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
4.0	<u>Damp heat test(IS 9000 part-V /Sec.-1-1981</u> <u>(UUT in unpacked and power off condition)</u> Temperature: $40 \pm 2^{\circ}\text{C}$ Humidity : 95 % Duration of cycle: 24Hrs (16+8 hrs) No. Cycle : 2 Total Duration of the test : 48 hrs	Shall be Conditioned	Two	Conditioned	Nil



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THIRUVANANTHAPURAM

TEST REPORT ON Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. OF PAGES
ERTL (S)/R/4428	15-4-13	3	5

Test results :

Sl. No	Test condition	Specification	Qty tested	Result	Remarks
4.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
5.0	<u>Impact test(Drop test)(IS 9000 Part VII/Sec 3 –1979,clause no. 9.2)</u> Drop height : 22 mm (Dropping on to a face) No. of drops: 4 (Test carried out on concrete surface in stead of steel plate reinforced surface due to facility limitation)	Shall be Conditioned	Two	Conditioned	Nil
5.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil
6.0	<u>Vibration test(IS 9000 part VIII)</u> Frequency : 10 – 55 Hz Acceleration : 1g Sweep rate : 1 octave No. of Axis : X,Y,Z Duration : 45 minutes in each axis Total Duration of the test : 2 hrs 15 minutes	Shall be Conditioned	Two	Conditioned	Nil
6.1	Functional check after recovery	As per Annexure -A	Two	Complied	Nil



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THIRUVANANTHAPURAM**

TEST REPORT ON: Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	4	5

8. General remarks:

8.1. This test report is applicable only to the sample identified at Sl.No.3.

8.2. Test graphs of the sine vibration are attached.

ISSUED BY

HEAD, C S C

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ELECTRONICS REGIONAL TEST LABORATORY (SOUTH)
MINISTRY OF COMMUNICATIONS AND INFORMATION TECHNOLOGY
THIRUVANANTHAPURAM

TEST REPORT ON: Aakash Tablet PC

REPORT NO.	DATE	PAGE NO.	NO. O F PAGES
ERTL (S)/R/4428	15-4-13	5	5

Annexure A

Functional Test Procedure

Device shall be powered ON and allowed to boot. Working shall be checked with the display of the home screen.



Aakash Project Status Report – July 08, 2013

A total of 965 Aakash Tablets received in 10 batches till date as given below:

1. 08-10-2012 – 25 nos – (Serial nos – 10001060-69, 71-79, 85-90)
2. 27-12-2012 – 40 nos – (Serial nos – 10002059-98)
3. 25-02-2013 - 50 nos – (Serial nos – 10003061-90, 10002801-20)
4. 02-04-2013 - 150 nos
5. 15-04-2013 - 100 nos
6. 25-04-2013 - 100 nos
7. 29-04-2013 - 100 nos
8. 09-05-2013 - 100 nos
9. 31-05-2013 - 200 nos
10. 11-06-2013 - 100 nos

The list of dispatch slips generated by Aakash Support Team and the actual consignments received through C-DAC, Noida is given in Annexure –I.

The latest three batches of Tablets (batches 8,9 & 10) received during May-June have been inspected and some were found with broken displays, some were dead and do not turn ON and the power adaptors of some were faulty. The details of the inspection are given in the attached test report ([Aakash_Test_Report_08-07-2013.pdf](#)).

As reported for the previous batches, the packages contain only Tablet and charger and no cables/adaptors. The tablets also do not have any serial number affixed on them.

The batches received contain a mix of Tablet variants, comprising of “Nuclear-pfdq88c”, “Nuclear Evb”, “MID”, “A13MID” from “Softwinners” and “RK2926” from “Rockchip”.

Performance testing of 4th, 5th and 6th batch of tablets has been completed and testing of 7th and 8th batches is in progress. Other tests including functional tests and battery performance tests are also being carried out. A test report containing a summary of the results and observations is also given in the attached report ([Aakash_Test_Report_08-07-2013.pdf](#)).

The problems found during the preliminary evaluation of the tablets are listed below:

- Some of the Tablets are dead. Do not turn ON even with power adaptor connected or after charging.
- Some of the Tablets do not get charged.
- Power adaptors of some are not working. Some of the power adaptors have blown up while switched ON.
- Some of the power adaptors are faulty and the Tablet turns OFF when it is connected.

- Tablets take a longer time to charge with some power adaptors.
- Some of the Tablets intermittently produce a tick sound and then turn-off.
- Arcing sounds are heard in some Tablets while touching / scrolling the screen (with the power adaptor connected).
- Boot problems found in some of the tablets. Tablet does not boot up, only continuously displays the Android logo in a loop.
- Some of the Tablets experience frequent operating system freeze.
- Erratic OS behaviour with automatic invoking and closing of apps, menu clicks etc. experienced in some of the Tablets.
- Extreme heat generation (above 42°C) found in some while charging and after usage for more than 30 mins.
- Misalignment of micro-USB connector, preventing insertion of cable.
- Ripples observed on LCD screen of some Tablets.
- Vertical line also present in display of some Tablets.
- Touch sensitivity of some of the Tablets are very poor.
- Some other problems like touch being insensitive in certain areas of the screen and touch press staying persistent in some points of the screen were also observed.
- USB port of a few Tablets were found to be not working
- Wi-Fi of some of the Tablets have failed.

A consolidated report for the entire volume of tablets received till date shall be prepared when the tests are completed.



S. Krishnakumar Rao

Annexure - I

Dispatch Slip		Tablets Received	
Dated	Quantity (nos)	Date	Quantity (nos)
20-02-2013	50	25-02-2013	50
01-04-2013	20+20+40+30 = 110	02-04-2013	150
09-04-2013	20+30 = 50	15-04-2013	100
18-04-2013	20+40+10 = 70		
22-04-2013	60		
23-04-2013	40	25-04-2013	100
30-04-2013	26+22+18+19+14 = 99	29-04-2013	100
03-05-2013	1	09-05-2013	100
22-05-2013	2+65+8+85+40 = 200		
29-05-2013	50+50 = 100	31-05-2013	200
		11-06-2013	100

Aakash Tablet Test Report (July 08, 2013)

1. Result of Testing completed on 3 batches of Tablets received in April, 2013

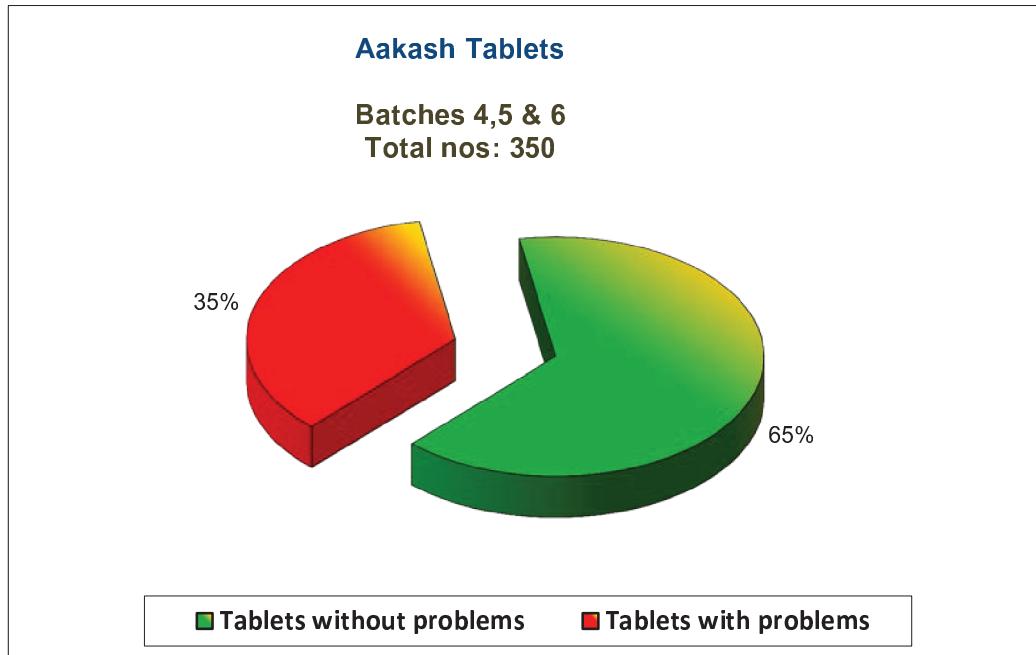
Tablet batches:

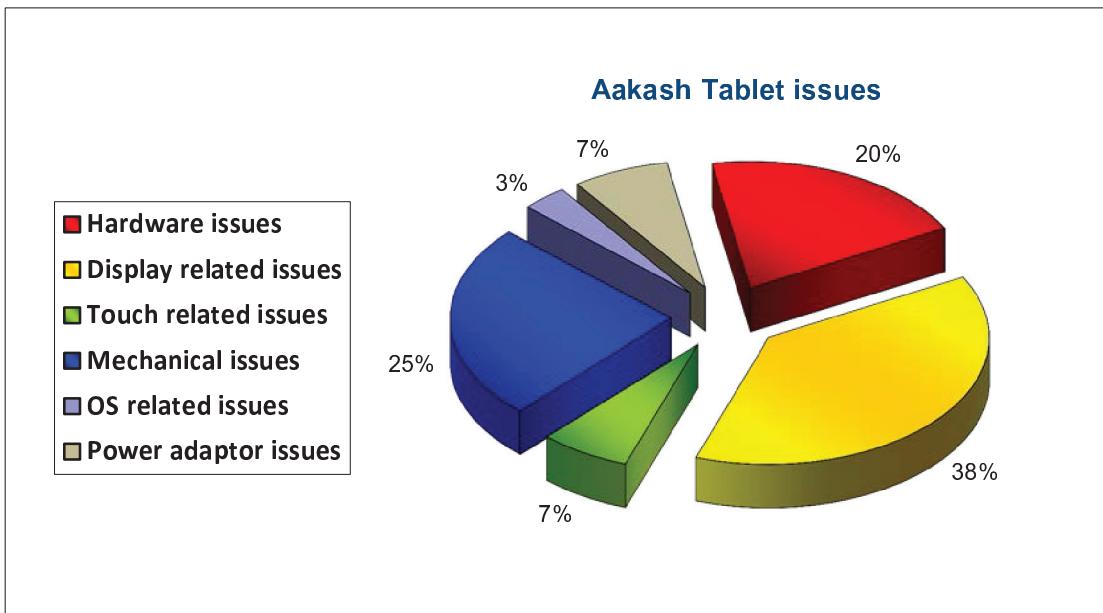
Batch 4: (Sl. nos: 10001 – 10150) – 150 nos

Batch 5: (Sl. nos: 10201 – 10300) – 100 nos

Batch 6: (Sl. nos: 10301 - 10400) – 100 nos

Total no. of Tablets tested: 350 nos



**Chart: 1.2**

Testing of 4 th , 5 th & 6 th batch of Tablets – Total nos: 350		
Issues found	No. of Tablets	
Hardware issues		
Tablet dead – does not turn-ON even with power adaptor connected or after charging	7	
Tablet does not get charged – Tablets works from power adaptor but battery does not get charged	21	
USB port not working	2	
Wi-Fi not working	1	
Earphone socket not working	1	
Volume button not working	1	
Arcing sound produced while touching or scrolling the screen (with power adaptor connected)	5	
Tablet produces tick sound and turns off intermittently	3	
Tablet automatically switches ON when power adaptor is connected	4	
Over heating – tablet becomes extremely hot (above 42°C) during charging and usage	3	

Display related issues		
Ripples produced in display screen*	92	
Vertical line present in display screen	1	
Touch related issues		
Poor Touch sensitivity	11	
Touch insensitive in certain areas of the screen	4	
Touch press persistent in some points of the screen	1	
Mechanical issues		
Tablet case not properly sealed – partially opened cover	14	
Tablet assembly not intact	16	
Misaligned micro-USB port – prevents / hinders insertion of cable	12	
Misaligned SD card slot – prevents insertion of SD card	5	
Misaligned earphone socket – poor contact with earphone jack	13	
Screen extensively scratched*	57	
OS related issues		
Boot problem – Tablet does not boot up, only continuously displays the Android logo in a loop	2	
Erratic OS – erratic OS behaviour causing automatic invoking and closing of apps, menu clicks etc.	4	
Frequent Operating System freeze – system hangs intermittently	2	
Power adaptor issues		
Power adaptor not working	7	
Power adaptor blown up while switched ON or after short time	3	
Faulty adaptor – Tab turns-off when connected	1	
Adaptor with slower charge rate – longer charge time	3	
Adaptor LED misaligned – indicator not visible	3	

Table: 1.1

* This issue has not been considered as a major problem and is not accounted in Chart 1.1

Application related observations		
Office suite not pre-installed	327	
PDF reader not pre-installed	112	
Flash player not pre-installed	23	

Table: 1.2

2. Results of Performance tests of 3 batches of Tablets received in April, 2013

Tablet batches:

Batch 4: (Sl. nos: 10001 – 10150) – 150 nos

Batch 5: (Sl. nos: 10201 – 10300) – 100 nos

Batch 6: (Sl. nos: 10301 - 10400) – 100 nos

Total no. of Tablets: 350 nos

The Tablets received in these 3 batches are of different models containing different hardware and different builds of OS.

The distribution of Tablet brands, models, hardware and OS are shown below:

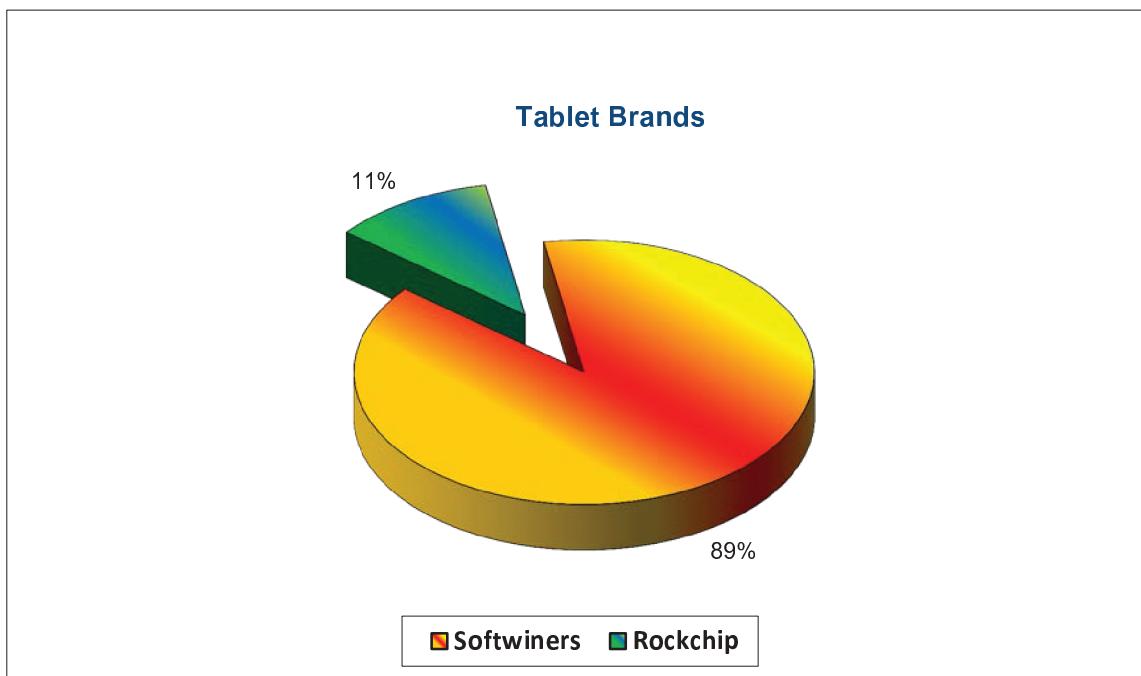


Chart: 2.1

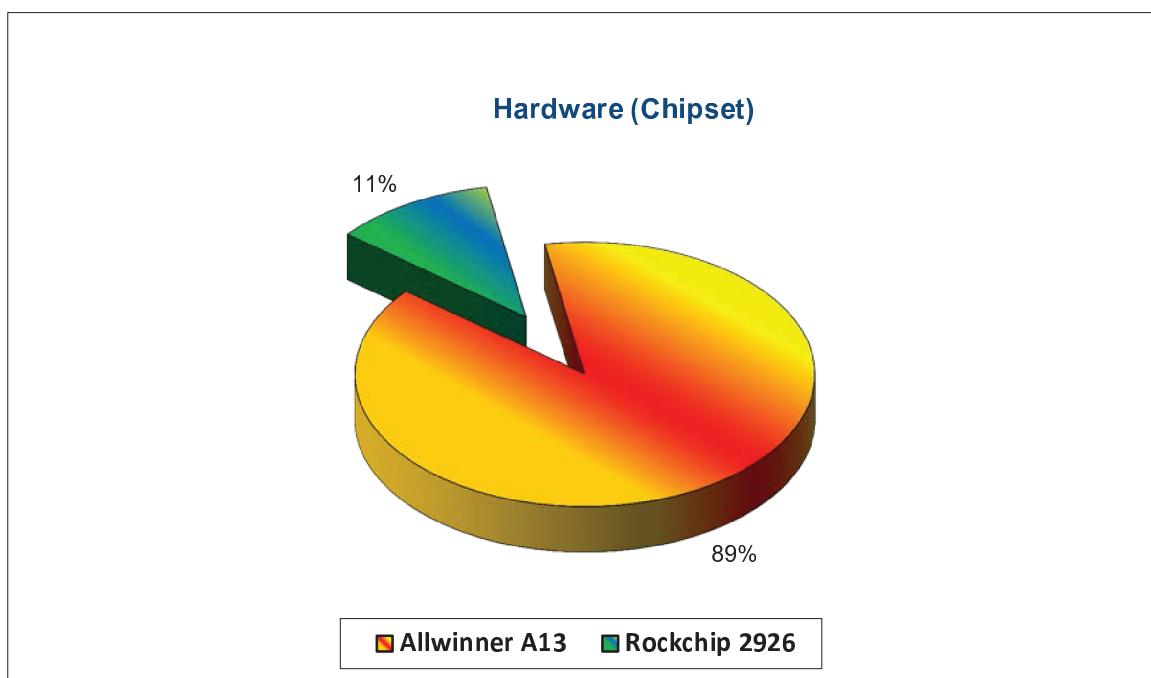


Chart: 2.2

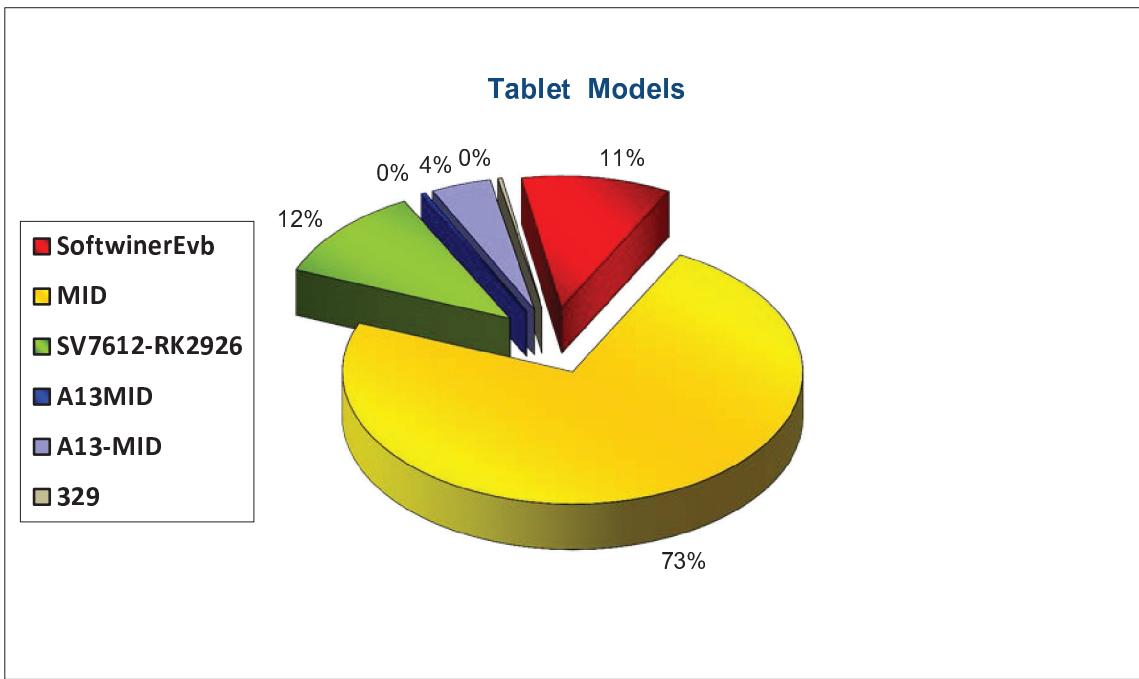


Chart: 2.3

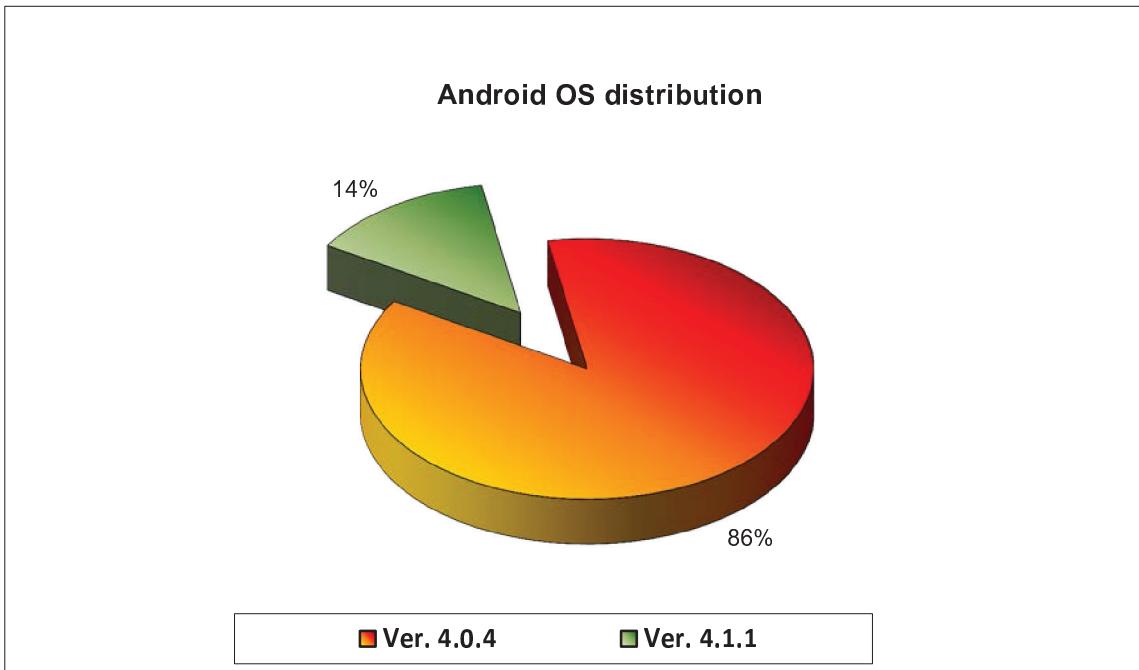


Chart: 2.4

As shown in the above charts 89% of the total Tablets tested in these batches are from Softwiners which consist of the Allwinner A13 chipset and 11% of the Tablets are from Rockchip which consist of the Rockchip 2826 chipset.

The performance for Tablets with the Rockchip chipset was found to be better which constitutes 11% of total Tablets tested. This has been reflected in the scores obtained for the various benchmark tests conducted as given below.

AnTuTu Benchmark:

AnTuTu is an Android system benchmarking tool. AnTuTu tests CPU, RAM, graphics, database, and SD card components and provides scores for each component as well as an overall score. It gives completeness, providing tests for memory performance, integer processor speed, floating point processor speed, 2D and 3D graphics performance, SD I/O speeds and a generalised database test.

The overall scores obtained for AnTuTu benchmark is shown below:

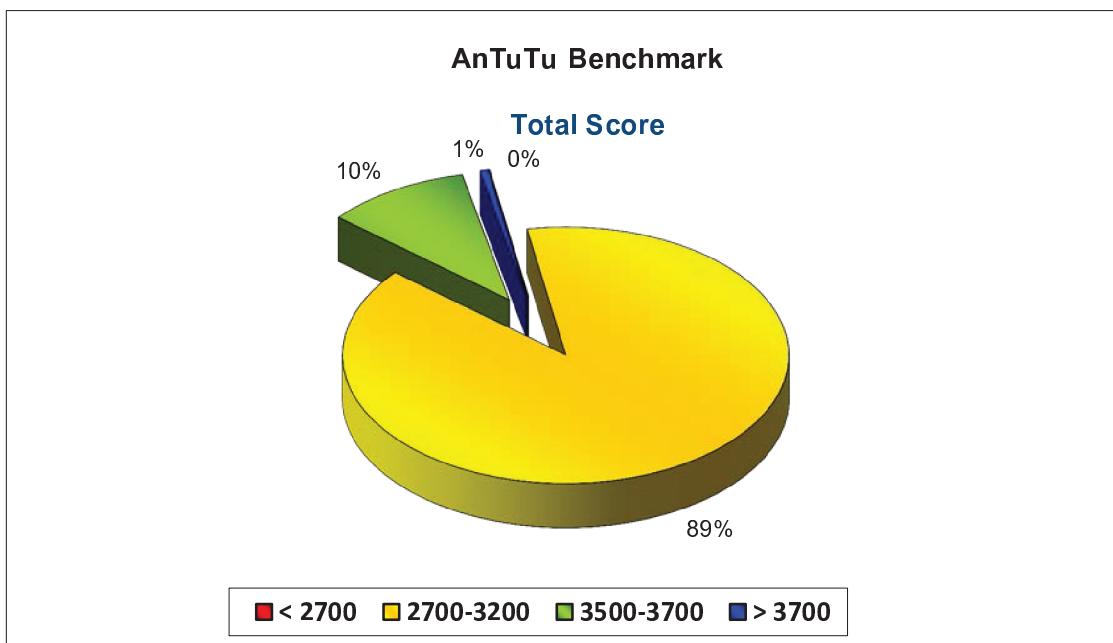


Chart: 2.5

Quadrant Standard

Quadrant is another system test that benchmarks CPU, memory, graphics and I/O. The Standard Edition computes the total score and benchmark results through the internet.

The total scores obtained for Quadrant Standard are shown below:

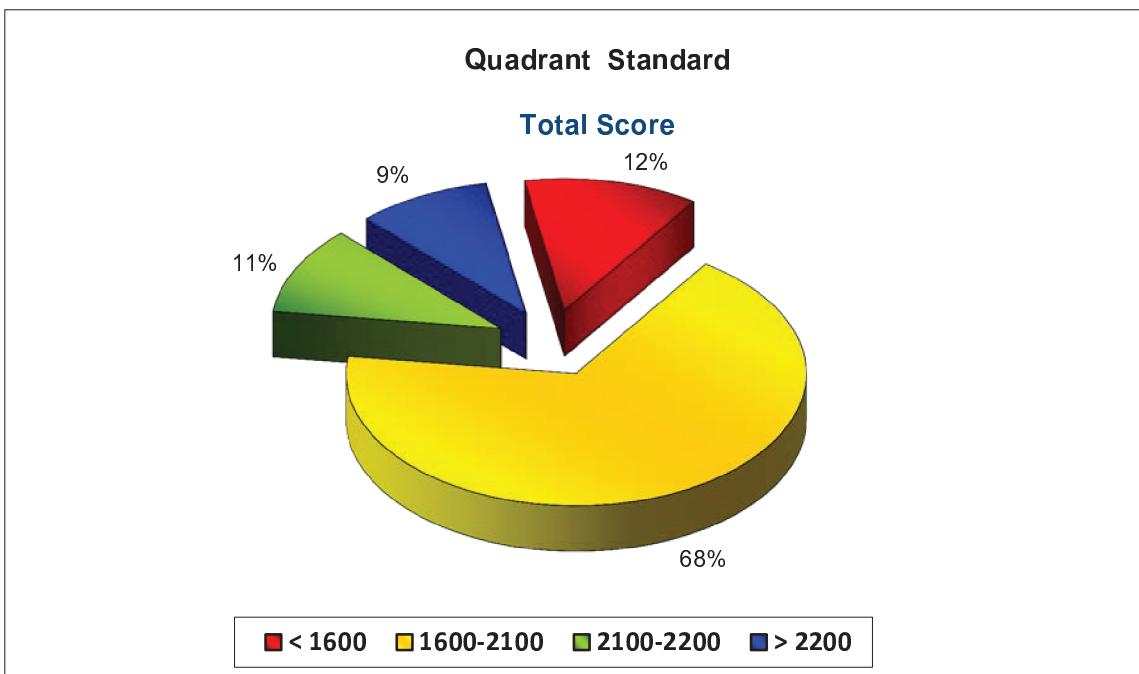


Chart: 2.6

Passmark

PassMark is a comprehensive test that objectively benchmarks the Tablet using a variety of different tests totaling seventeen standard benchmark tests that are categorised in four test suites as follows:

CPU Tests - Mathematical operations, compression, encryption, etc

Disk Tests - Reading and writing files to internal and external storage

Memory Tests - Read and Write tests

2D Graphics Tests - Simple & Complex Vectors and image rendering and filters tests

3D Graphics Tests - Simple bouncing ball test and complex scenario.

The total scores obtained for System, CPU, Memory, Disk, 2D and 3D graphics are shown below:

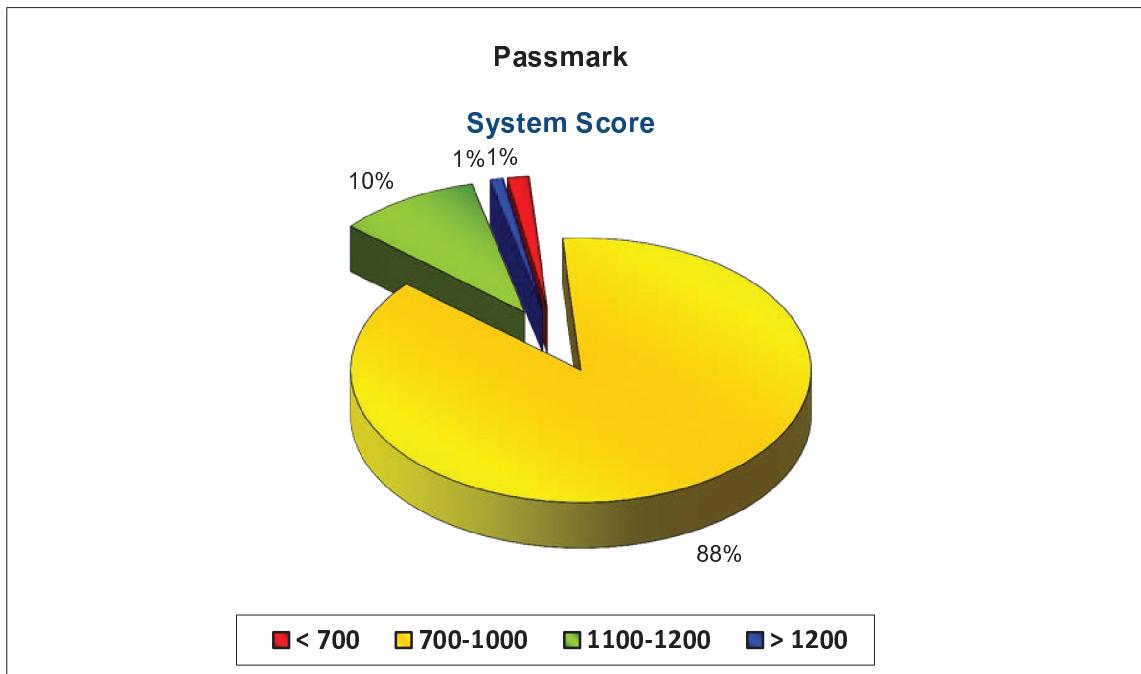


Chart: 2.7

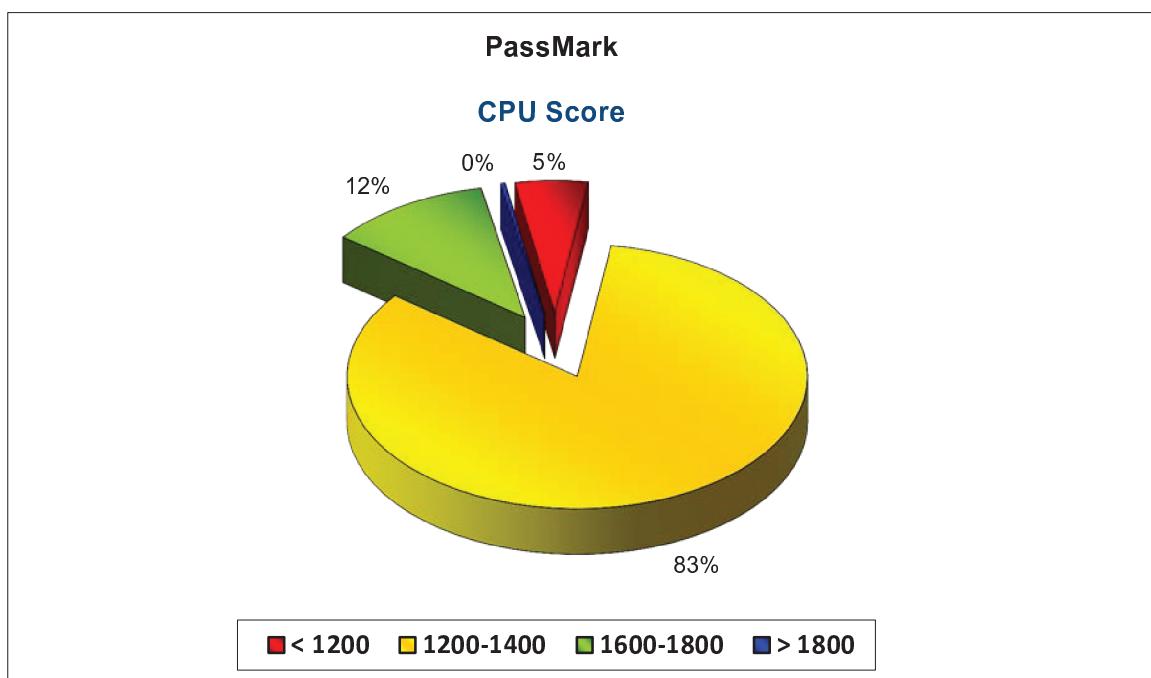


Chart: 2.8

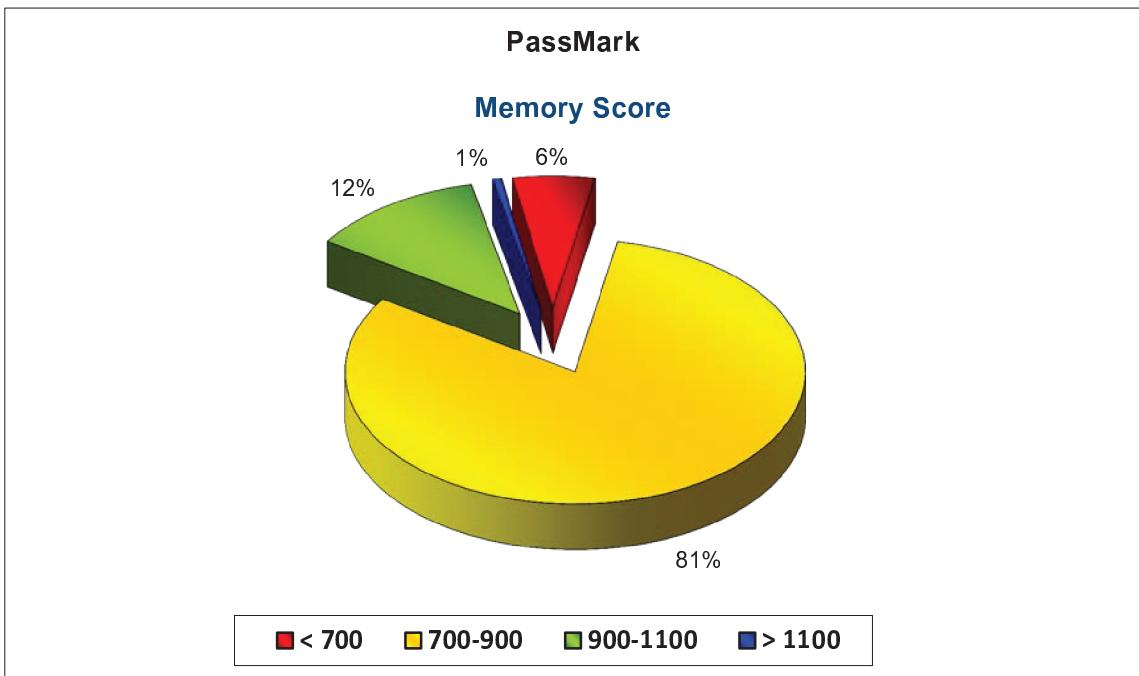


Chart: 2.9

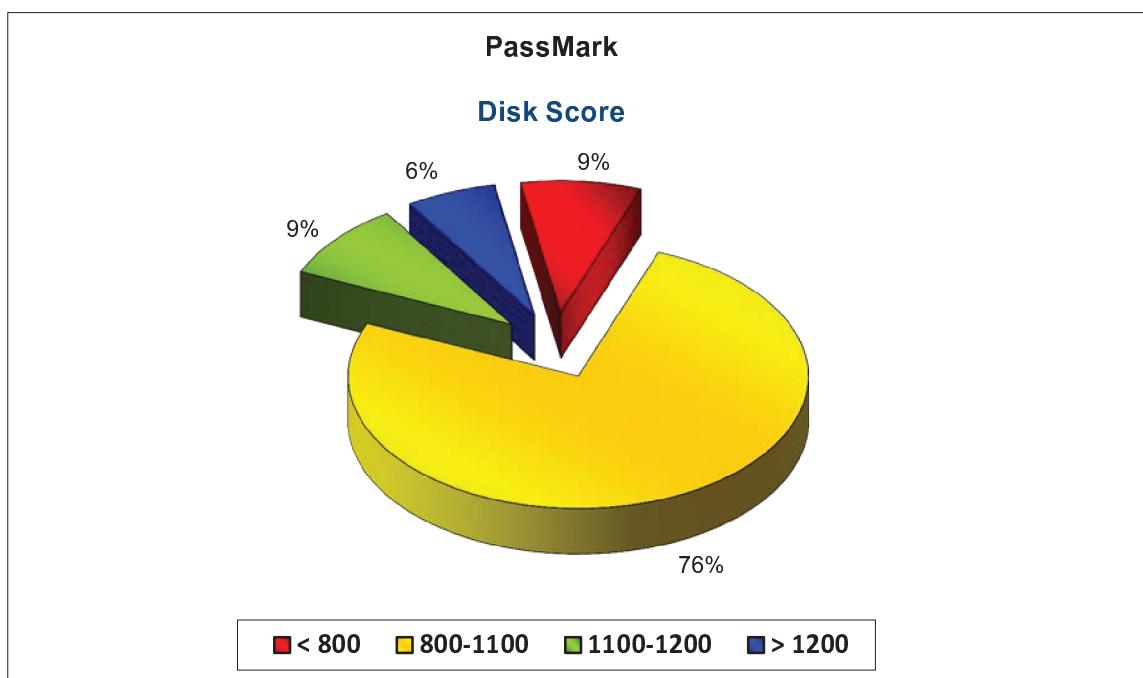


Chart: 2.10

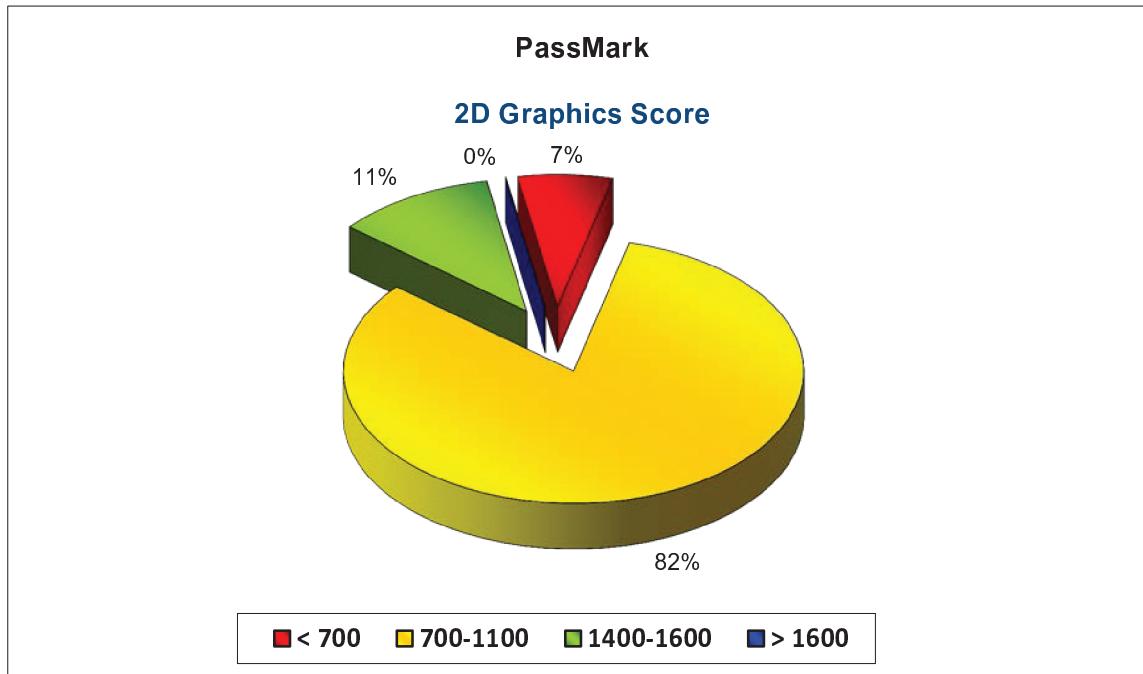


Chart: 2.11

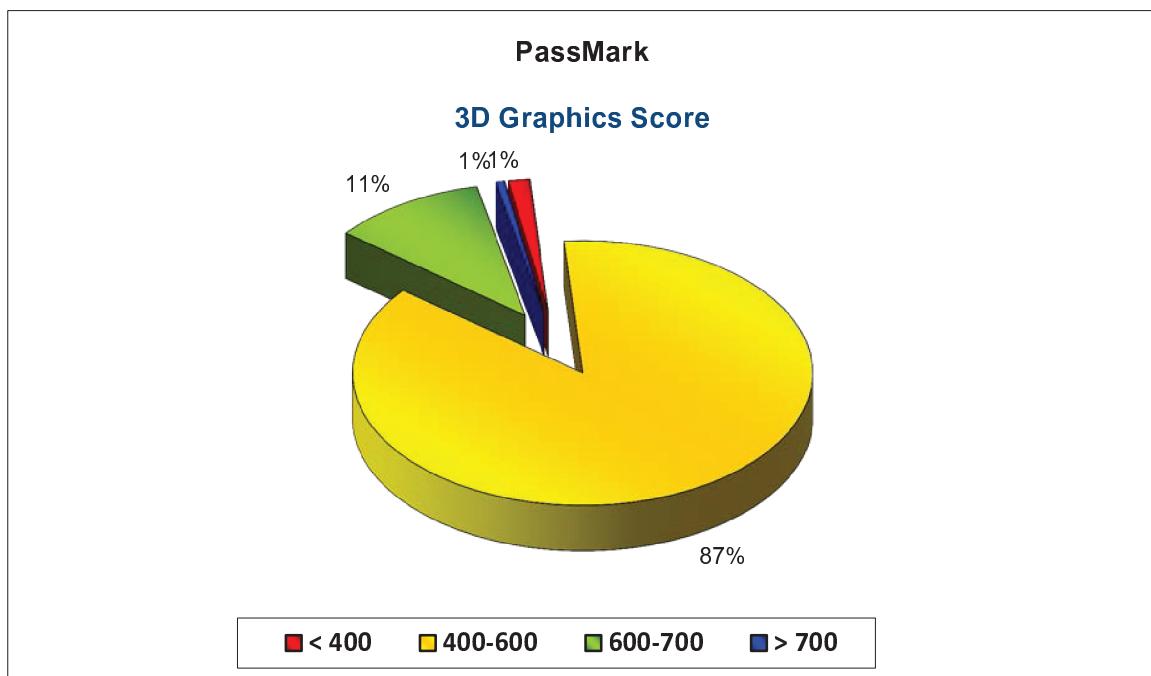


Chart: 2.12

AndEBench

AndEBench benchmark is a standardized, industry-accepted test for evaluating the Android platform performance of the Tablet.

The AndEBench scores obtained for both Native platform and Java platform are shown below:

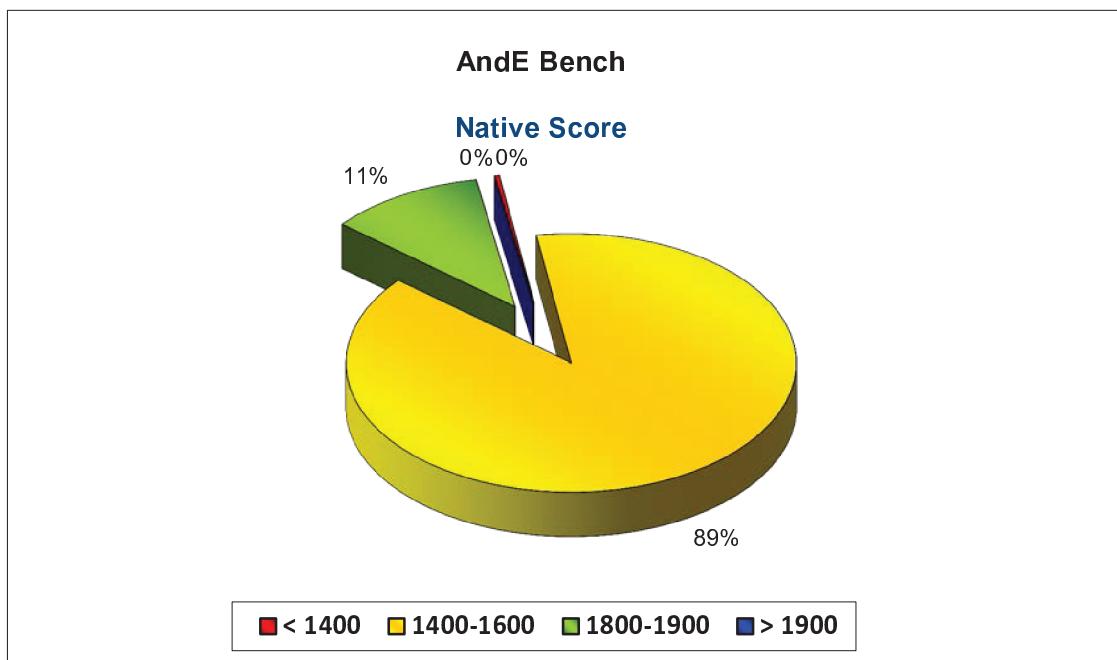


Chart: 2.13

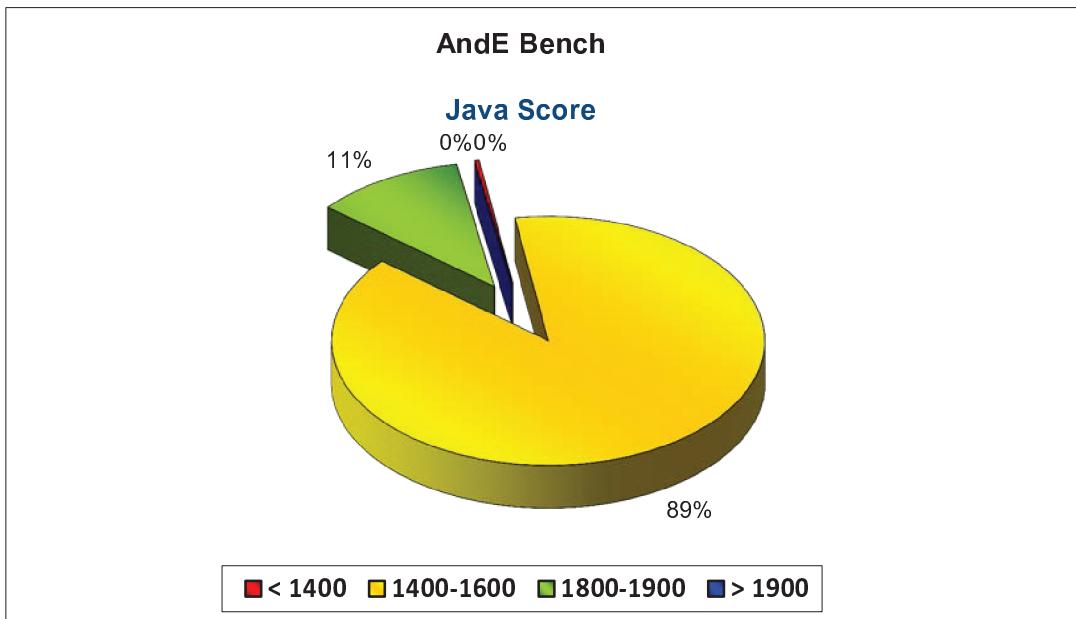


Chart: 2.14

LinPack

Linpack is a test that measures the Tablet's CPU performance. Linpack measures how fast the Tablet's CPU can calculate a series of linear algebraic equations. These calculations measure the Tablet's ability to perform floating-point calculations. Linpack results are reported in millions of floating-point operations per second (MFLOPS).

The scores obtained for Linpack with both Single threading and Multi-threading are shown below:

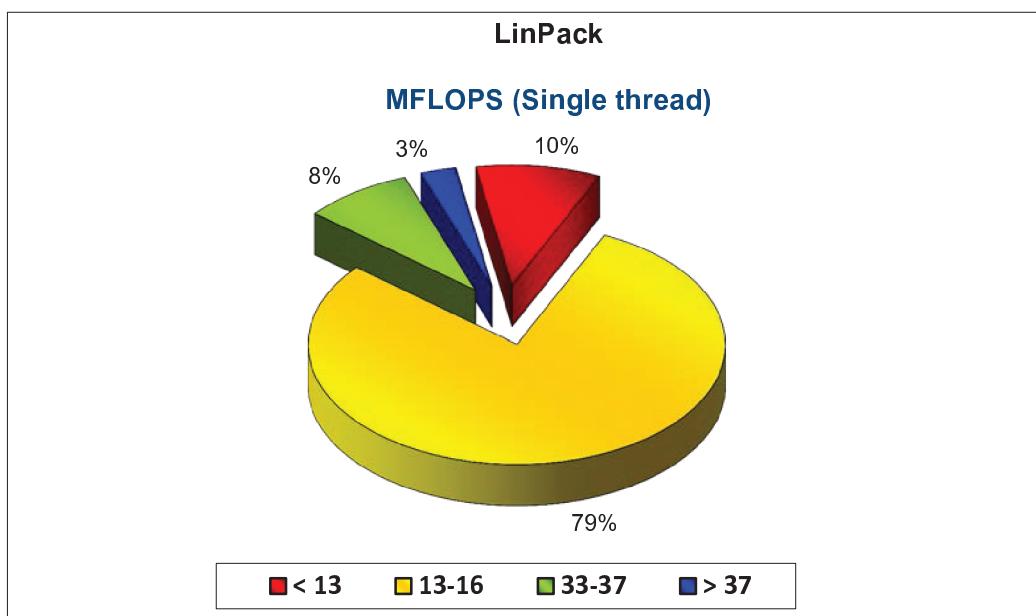


Chart: 2.15

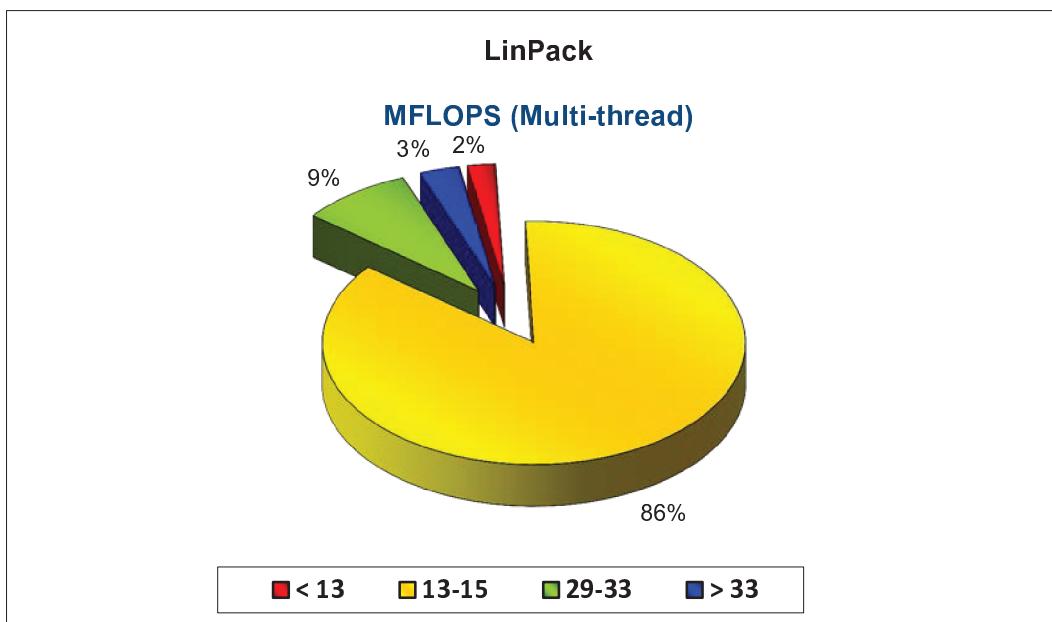


Chart: 2.16

An3DBench

An3DBench is a test that measures the Tablet's 3D-graphics performance. An3DBench measures how fast an Android Tablet's graphics engine can render a series of seven 3D scenes of varying complexity, titled thus:

- Single texturing fillrate
- Multi-texturing fillrate
- High object count
- Multiple light sources
- High polygon count
- Keyframe animation
- (Simulated) Game level.

Each of the seven individual tests generates scores that are reported either in megapixels per second (MP/Sec) or frames per second (fps). The overall score is a proprietary numeric score, calculated from the seven individual tests.

The overall scores obtained for An3DBench is shown below:

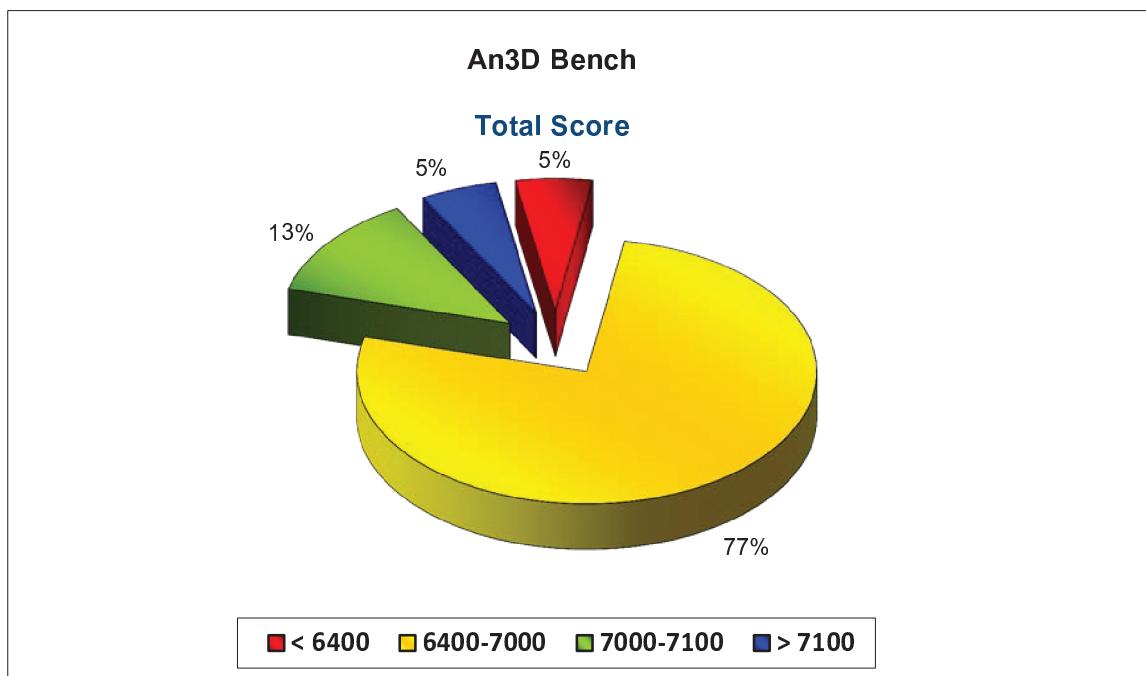


Chart: 2.17

The total scores obtained for An3DBench XL which is a more robust and enhanced version of the An3Dbench are also shown below:

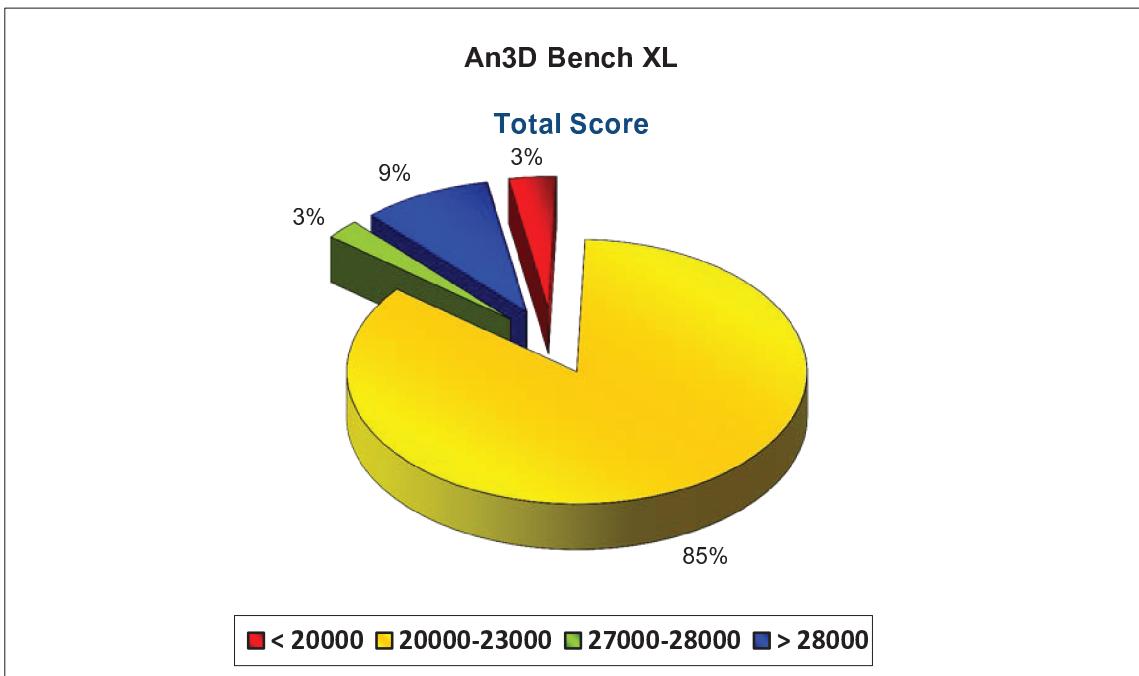


Chart: 2.18

NenaMark2

NenaMark2 is an OpenGL ES 2.0 benchmark with advanced graphical effects and high resolution graphics.

NenaMark measures performance using realistic scenes that are taken from a typical game and presents the result in frames per second (fps).

The scores in fps obtained for NenaMark2 are shown below:

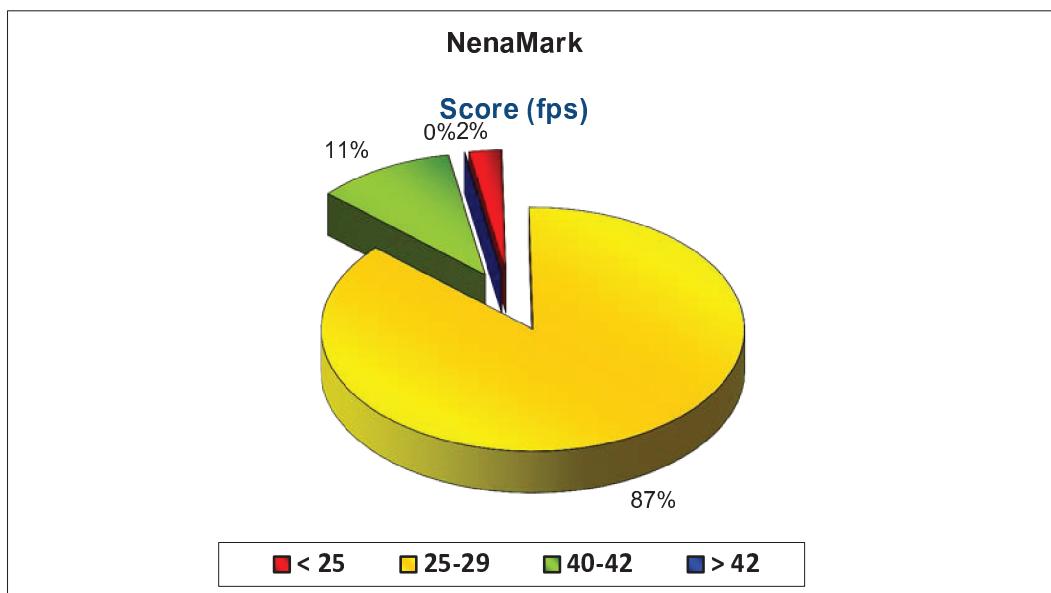


Chart: 2.19

Result of Inspection done on latest 3 batches of Tablets received in May and June, 2013

Tablet batches:

Batch 8: (Sl. nos: 10501 – 10600) – 100 nos

Batch 9: (Sl. nos: 10601 – 10800) – 200 nos

Batch 10: (Sl. nos: 10801 - 10900) - 100 nos

Total no. of Tablets: 400 nos.

Total no. of Tablets inspected	400
Tablet with broken displays	3
Dead Tablets	9
Faulty power adaptors	27

Table: 3.1