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2 **Application of Wireless Power Transfer on Powerbank Casbarkuy!**

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15 **Abstract**

16 Currently, Powerbanks are still widely used for charging Smartphones, because Powerbanks
17 are fairly efficient and can be used as external battery storage for Smartphones and can be taken
18 anywhere. But currently using Powerbanks still uses cables for charging. In this research,
19 researchers used the Action Research Method which is a method that explains, describes a
20 problem context or situation together with an intervention process aimed at development. In the
21 research that has been carried out, the results obtained are Wireless Powerbank using the
22 application of Wireless Power Transfer Technology. The conclusions from this research are as
23 follows, 1. The use of the Redmi Note 7's external Wireless Charger Receiver is slower in
24 connecting Wireless Power Transfer compared to the Google Pixel 4's internal Wireless Charger
25 Receiver. 2. Range test results show that the external Wireless Charger Receiver can only be
26 connected wirelessly. Power Transfer up to a distance of 4.5 mm. while the internal Wireless
27 Charger Receiver can be connected to Wireless Power Transfer up to a distance of 6 mm. 3.
28 Testing the barrier media that researchers use in Wireless Power Transfer does not hinder the
29 process of connecting the external and internal Wireless Charger Receiver.

30 **Keywords:** *Powerbank; Wireless Power Transfer; Teknologi Wireless.*

1 **I. Introduction**

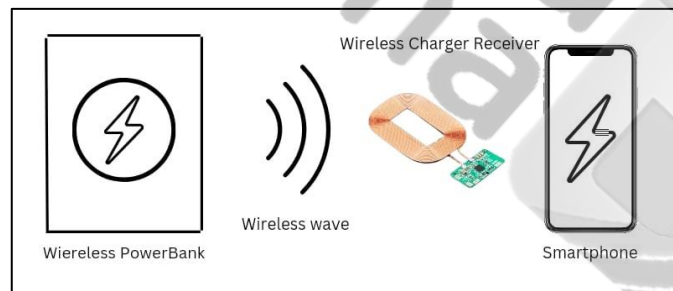
2 Casbarkuy! is one of the brands in the innovator center that focuses on electronics by utilizing
3 e-waste (used laptop batteries). Powerbank Casbarkuy! is one of the products in the Innovator
4 Center under the auspices of the Directorate of Innovation and Business Incubator (DIIB).
5 Powerbank Casbarkuy! is an electronic device that functions as a charging device for
6 smartphones. Powerbank Casbarkuy! utilizes used laptop batteries (lithium batteries) as power
7 storage, the use of used laptop batteries is intended to reduce the addition of lithium battery
8 waste [1]. Powerbanks at this time are still widely used for charging Smartphones, because
9 Powerbanks are fairly efficient which can be used as Smartphone external battery storage and
10 can be taken anywhere. But the use of Powerbank currently still uses a cable as charging [2]. In
11 today's technology the use of cables will take up a lot of space and interfere with storage space,
12 before using a Powerbank you need to find a cable and connect it to the USB on the Powerbank
13 [3].

14 Researchers try to find solutions to the above problems, wireless technology is a solution to
15 the problem of using cables on Powerbanks that take up a lot of space and interfere with storage
16 space because the position of the cables is not neatly organized [4]. Therefore, researchers apply
17 this wireless technology to Powerbank Casbarkuy! to make it more efficient [5]. Wireless
18 technology refers to any technology that allows the transfer of data or information between
19 devices without using physical cables [6]. The history of the development of wireless technology
20 was created through experiments by scientists Heinrich Hertz, Nikola Tesla and Guglielmo
21 Masconi in the late 19th and early 20th centuries [7]. The first wireless technology created,
22 namely wireless communication via radio waves, paved the way for long-distance
23 communication without wires and the beginning of Wireless Power Transfer technology.
24 Wireless Power Transfer refers to the technology of transmitting power without using any wires,
25 which are usually used to transmit power [8]. Research has the aim of applying wireless
26 technology to replace the use of cables on the Casbarkuy Powerbank! using Wireless Power
27 Transfer. Wireless Power Transfer (WPT) is a technology that allows wireless power transfer
28 from a power source to a Smartphone device without the use of physical cables [9]. The method
29 used in this research is the Action Research method with several stages, namely Diagnosing,
30 Action Planning, Action Taking, Evaluating, and Learning. Researchers use Wireless Power
31 Transfer as an alternative in adding features to Powerbank Casbarkuy! in order to have
32 efficiency in charging Smartphones using wireless technology [10]. Based on the description
33 above, researchers will implement a wireless Powerbank design using Wireless Power Transfer
34 (WPT) technology as Smartphone charging using the PCBA Charger Wireless Qi Module and
35 Wireless Charger Receiver as a conductor and receiver in charging Smartphones [11].

1 The PCBA Charger Wireless QI Module functions as a power conductor on the Powerbank,
2 which will be forwarded to the Wireless Charger Receiver as a power receiver connected to the
3 Smartphone for charging.

4 **II. Materials And Methods**

5 Wireless Power Transfer is a charging technology to devices such as Smartphones without
6 using cables and is used to simplify Smartphone charging [12]. In this study, so that Wireless
7 Power Transfer can be used properly, researchers used two components, namely the PCBA
8 Charger Wireless QI module and the Wireless Charger Receiver for the application of Wireless
9 Power Transfer technology on Powerbank Casbarkuy! This technology is applied in a series of
10 Wireless Charger modules whose function is to emit wireless waves so that they can be
11 connected by the Wireless Charger Receiver. As a result of the application of Wireless Power
12 Transfer technology using the Powerbank module and the PCBA Charger Wireless QI module, a
13 prototype Wireless Powerbank is made that functions for external power storage and wireless
14 power supply [13]. This Wireless Powerbank is used to provide external power that can be used
15 anytime and anywhere without having to look for a power source and the use of this Wireless
16 Powerbank can be used for wireless charging.



17
18 **Figure 1. wireless power transfer scheme**

19
20 This Wireless Power Transfer application uses PCBA Wireless Charger QI as a component
21 that will be applied to the Casbarkuy Powerbank!. PCBA Charger Wireless QI is a printed circuit
22 board assembly that is used to charge compatible devices without the need for cables. QI is a
23 standard for wireless charging that enables devices such as Smartphones. This module functions
24 to transfer the power in the power source sent via a wireless network to devices that have
25 wireless charging features such as Smartphones.

26 In this study, researchers used the Action Research method which is a method that explains,
27 describes a problem context or situation together with an intervention process that aims for
28 development [14]. The Action Research method is a research design, including things that
29 researchers will do starting from diagnosing to the final analysis, the data is then concluded and
30 suggestions are given [15].

1 **III. Results and Discussions**

2 Wireless Powerbank uses PCBA Charger Wireless Qi module as the main component. The
3 Powerbank module is used as a connector from an electrical power source as an input which will
4 be forwarded to the power storage. This module also functions as a conductor from the power
5 storage that is flowed to the PCBA Charger Wireless Qi module to be used as a wireless network
6 transmission in wireless charging. The PCBA Charger Wireless Qi module functions to convert
7 the power flow into a Wireless network frequency, which later the frequency will be responded
8 to by the Wireless Charger Receiver found on the Smartphone .

9 **A. Wireless Power Transfer Range Testing Results**

10 In testing Wireless Power Transfer, researchers used two smartphones, namely Redmi Note 7
11 and Google Pixel 4. The use of the Redmi Note 7 Smartphone is used to pair an external
12 Wireless Charger Receiver, because this Smartphone is not equipped with a wireless charging
13 feature. While the Google Pixel 4 Smartphone is equipped with an Internal Wireless Charger,
14 therefore this Smartphone does not use a Wireless Charger Receiver anymore because it is
15 equipped with a wireless charging feature. The results of the Wireless Powerbank distance limit
16 test can be seen in the following table:

17
18 Table 1.
19 Redmi Note 7 Wireless Power Transfer range test results

Smartphone	Testing	Thickness (mm)	Delay	Connected
Redmi Note 7	1	1,5	no	yes
	2	3	no	yes
	3	4,5	yes	yes
	4	6	-	no

20
21 It is known that the use of the Redmi Note 7 external Wireless Charger Receiver from a
22 distance of 1.5 mm - 3 mm can connect to Wireless Power Transfer properly, but at a distance of
23 4.5 mm the external Wireless Charger Receiver experiences Delay and at a distance of 6 mm the
24 external Wireless Charger Receiver cannot connect to Wireless Power Transfer anymore.

25
26 Table 2.
27 Google Pixel 4 Wireless Power Transfer range test results

Smartphone	Testing	Thickness (mm)	Delay	Connected
Google Pixel 4	1	1,5	no	yes
	2	3	no	yes
	3	4,5	yes	yes
	4	6	yes	yes

1 The Google Pixel 4 internal Wireless Charger Receiver from a distance of 1.5 mm - 3 mm can
 2 connect to Wireless Power Transfer very well, but at a distance of 4.5 mm - 6 mm the Internal
 3 Wireless Charger Receiver can still connect to Wireless Power Transfer even though it
 4 experiences a slight delay in the process of connecting the internal Wireless Charger Receiver.

5 **B. Wireless Power Transfer Range Testing Results**

6 Barrier media testing that researchers do using glass, silicon rubber, plywood, and cardboard
 7 paper. Researchers took the media because researchers wanted to find out what media could
 8 hinder the transfer of power wirelessly with Wireless Power Transfer technology. Researchers
 9 tested two smartphones, namely the Redmi Note 7 Smartphone using an external Wireless
 10 Charger Receiver and the Google Pixel 4 Smartphone using an Internal Wireless Charger
 11 Receiver. The results of testing several media barriers can be seen in the following table:

12

13 Table 3.

14 Redmi Note 7 Wireless Power Transfer barrier media test results

Smartphone	Testing	Carrier Media	Connected
Redmi Note 7	1	Glass	yes
	2	Silicon rubber	yes
	3	Plywood	yes
	4	Cardboard paper	yes

15

16 The results of this test, on the barrier media that researchers use, do not affect the use of
 17 Wireless Power Transfer. The use of the Redmi Note 7 external Wireless Charger Receiver can
 18 charge wirelessly against several media barriers that researchers use as tests.

19

20 Table 4.

21 Wireless Power Transfer barrier media test results Google Pixel 4

Smartphone	Testing	Carrier Media	Connected
Google Pixel 4	1	Glass	yes
	2	Silicon rubber	yes
	3	Plywood	yes
	4	Cardboard paper	yes

22

23 The use of the Google Pixel 4 internal Wireless Charger Receiver is equally optimal in
 24 charging wirelessly even though it has been blocked by several media barriers that researchers
 25 tested. In this study, some barrier media can affect wireless charging if the barrier media used
 26 has a metal mixture in its manufacture and the thickness of the barrier media is very thick so that
 27 it is hindered by the range of distance using Wireless Power Transfer on Powerbank Casbarkuy!

28

1 IV. Conclusion

2 In testing the Wireless Powerbank, researchers have made the following conclusions. First,
3 the distance test results show that Redmi Note 7 can only connect with Wireless Power Transfer
4 up to a distance of 4.5 mm, while Google Pixel 4 can connect up to 6 mm. Redmi Note 7
5 experiences delay when connected to Wireless Power Transfer at a distance of 3 mm, while
6 Google Pixel 4 experiences delay at a distance of 4.5 mm. the barrier media used in the test does
7 not hinder the connection process of the external Redmi Note 7 and internal Google Pixel 4 to
8 Wireless Power Transfer, because the media used has a distance that is not too thick so it does
9 not affect the range of wireless charging.

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