A holder for a portable electronic device comprises a frame configured to receive the portable electronic device; and a guide, mounted to the frame and configured to face a back of the portable electronic device. The guide is configured to receive a connector which is connectable to a corresponding socket located at the back of the portable electronic device.
DEVICE HOLDER FOR PORTABLE ELECTRONIC DEVICES

TECHNICAL FIELD

[0001] This disclosure generally relates to a device holder for portable electronic devices.

BACKGROUND

[0002] With the evolution of wireless communications and networks, portable electronic devices, such as smartphones, tablets and Machine to Machine (M2M) devices, are now in widespread use. These portable devices usually communicate with servers, infrastructures and other devices via various wireless communication technologies, such as Second Generation (2G), Third Generation (3G), Long Term Evolution (LTE), Wi-Fi, Bluetooth, ZigBee, Near Field Communication (NFC) and so on. Consumers may enjoy the full convenience of these high technology products almost anytime and anywhere.

[0003] Due to the large variety of portable devices and supported technologies, it is very important to ensure that these devices comply with the wireless communication standards, regulations and international requirements before they are launched to the market. Service providers, device manufacturers and third party labs need to perform sophisticated and comprehensive testing of these devices to find potential issues. In lab testing, in order to precisely control the Radio Frequency (RF) signal strength for achieving the desired RF conditions and minimizing the interference with over-the-air radios, the RF sockets on the devices' Printed Circuit Board (PBC) are usually connected to RF cables. The RF cables are in turn connected to radio base stations, Wi-Fi Access Points (AP), simulators, measurement devices, Global Positioning System (GPS) devices, RF amplifiers, etc.

[0004] Moreover, a large number of telecommunication and portable device related congresses and events (such as Mobile World Congress) are held every year in the world, in which service providers and manufacturers demonstrate and release their new products. Due
to the regulations and the RF interferences among participants, devices are usually connected
to signal sources by using RF cables directly.

[0005] Nowadays, most portable devices have more than one RF sockets on their PCB
to support various wireless communication technologies and bands. For example, a LTE
device may have 8 RF sockets: 4 for 4x4 LTE Multiple Input Multiple Output (MIMO), 1 for
GPS, 1 for Wi-Fi, 1 for Wideband Code Division Multiple Access (WCDMA) and 1 for
Global System for Mobile (GSM) communications. Some engineering prototypes devices
(usually used for lab testing and demonstration) can have even more RF sockets. There are
various types of RF sockets depending on the RF socket usage, device size and manufacturing
design. Some of the commonly used ones are Micro Coaxial (MCX), Micro Miniature
Coaxial (MMCX), Sub Miniature version B (SMB), MHF, etc. The coupling between a RF
socket on a portable device and an external RF connector usually includes a snap-on mating
mechanism, and/or a threaded or pull-push mating mechanism. But since portable devices are
of relative small size, the space to have RF sockets on their PCB is limited; thus the snap-on
mating mechanism is the main stream mechanism for coupling RF connectors to RF sockets
of portable devices.

[0006] However, the attachment/coupling strength between the RF sockets and RF
connectors is usually weak especially for RF sockets such as MCX and SMB, when using the
snap-on mating mechanism. For example, after multiple "attach and detach" cycles, the RF
connection will experience metal wear and reduced strength of the spring mechanism inside
the RF connector. This condition will make the attachment/coupling strength even worse.

[0007] In the context of a demonstration or lab testing, people usually put the portable
device on a table, in a shielded box or on a device holder/rack. People have to be very careful
when manipulating the device in order to prevent a RF connector from being detached from
the socket of the portable device. Also, they need to perform regular checks to make sure that
the RF connector is firmly connected to the RF socket; this can be a bothersome task. This
task may become worse if multiple RF connectors are connected to the device. Moreover, due
to the weak attachment/coupling strength, the contact between the RF socket and RF connector may be poor, which will lead to a deviation of RF characteristics such as RF leakage, RF loss and inaccurate testing results.

[0008] One of the current solutions to addressing the above issues is to use glue to fix the RF connectors to the RF sockets. However, this solution requires additional steps and skills and can potentially damage the device's RF sockets.

[0009] Therefore, it would be desirable to provide a system or a device that would obviate or mitigate the above described problems.

SUMMARY

[0010] In one aspect of the invention, there is provided a device holder for a portable electronic device. The device holder comprises a frame configured to receive the portable electronic device; and a guide, mounted to the frame and configured to face a back of the portable electronic device, the guide configured to receive a connector which is connectable to a corresponding socket located at the back of the portable electronic device.

[0011] Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Embodiments of the present invention will now be described, by way of example only, with reference to the attached Figures, wherein:

[0013] Figure 1 illustrates a perspective view of a portable electronic device;

[0014] Figure 2 illustrates a schematic top perspective view of a holder for a portable electronic device, according to an embodiment of the present invention;
Figures 3a and 3b illustrate different clamping mechanisms mounted in a holder for a portable electronic device; Figure 4 illustrates a schematic bottom perspective view of a holder for a portable electronic device, according to an embodiment of the present invention; Figure 5 illustrates an embodiment of a housing adjustably mounted to a device holder; and Figure 6 illustrates a schematic diagram of a RF connector, according to an embodiment of the present invention.

DETAILED DESCRIPTION

Reference may be made below to specific elements, numbered in accordance with the attached figures. The discussion below should be taken to be exemplary in nature, and not as limiting of the scope of the present invention. The scope of the present invention is defined in the claims, and should not be considered as limited by the implementation details described below, which as one skilled in the art will appreciate, can be modified by replacing elements with equivalent functional elements.

It is understood that the term portable device or portable electronic device or device refers to any types and/or sizes of smartphones, but can also refer to other types of user equipment and/or electronic devices, such as tablets, e-readers, Global Positioning System (GPS) devices, MP3 players, M2M devices or Machine Type communication (MTC) devices, etc. The terms portable electronic devices, portable devices and devices can be used interchangeably.

Generally speaking, embodiments of the present invention provide for a device holder which has adjustable guides mounted therein. The adjustable guides comprise adjustable housings mounted therein, which can receive connectors. For example, the connectors can be screwed to the adjustable housings so that the connectors can be firmly
connected or otherwise attached to corresponding sockets on a portable electronic device. The adjustable guides with the adjustable housings also allow the connectors to match different positions of the sockets on the portable electronic device. Therefore, such a holder offers easy connections with external signal sources, firm connection between the connectors and the corresponding sockets on the portable electronic device, and adjustability to almost any devices.

[0022] Figure 1 illustrates a portable electronic device 10, such as a smartphone. For example, a smartphone can comprise a screen 16, one or more keys 18 (shown in Figure 2), antennas and an integrated camera (not shown in the Figures), etc. Smartphones are well-known in the art and thus will not be described further.

[0023] The portable electronic device 10 comprises one or more sockets 12. The sockets 12 are often located at different positions on the back 11 of the portable electronic device 10. They are usually covered by the casing of the portable electronic device 10 so that a user cannot see them. The sockets 12 can be sockets for testing different radio frequency (RF) signals, such as GPS, GSM, WCDMA, Long Term Evolution (LTE), Wi-Fi signals, etc. In this case, the sockets 12 are referred to as RF sockets. For example, during testing or demonstration, different RF connectors will be connected to the RF sockets 12. However, the connectors could be also probes or sensors for measuring parameters such as temperature, radiation, etc., or microphones or cameras.

[0024] With reference to Figure 2, an embodiment of a device holder 100 with adjustable guides for receiving connectors will be described. Figure 2 generally shows the top, or front, of the holder 100.

[0025] The holder 100 comprises a main frame 102, within which one or more clamping mechanisms 103 is mounted. The main frame 102 can be of rectangular shape, circular shape or any other kinds of shapes known to a person skilled in the art, that enable receiving/holding the device 10 in place. As an example, Figure 2 shows the main frame 102 having a rectangular shape; in that case, the main frame 102 defines four lateral sides, 110,
112, 114 and 116, in addition to a top, or front, side 106, and a bottom, or rear, side 108. Furthermore, the frame 102 is generally dimensioned to receive at least one device 10. The frame 102 can be made of various material or combination of materials (e.g. polymeric materials, metallic materials, composite materials, etc.). It should be rigid and solid enough to serve as a support yet possibly light enough to be carried.

[0026] In some embodiments, the clamping mechanism 103 can comprise a pair of clamping elements 104, as shown more explicitly in Figures 3a and 3b. The clamping elements 104 are moveably mounted in two opposite lateral sides, such as 112 and 116, of the main frame 102. In one embodiment, the clamping elements 104 are slideably mounted in the two opposite sides of the frame 102, and parallel to each other, so that they can slide along the sides 112 and 116. For example, the two opposite sides 112 and 116 can have a respective groove 105 (see Figure 2) in which the ends of the clamping elements 104 are received for sliding. The sliding movement of the clamping elements 104 is shown by the arrow 118. The clamping mechanism 103 provided by the clamping elements 104 can use a spring mechanism or an elastic belt (not shown in Figure 2) in order to open or close the gap 90 (shown in Figure 3b) defined between the clamping elements 104.

[0027] More specifically, Figure 3a illustrates an embodiment in which the pair of clamping elements 104 is connected to each other using a pair of springs 150, one at each side (112, 116) of the frame 102. For example, the springs 150 are attached to the ends of the clamping elements 104 and rest inside the groove 105 of each side. The force exerted by the springs 150 allows the clamping elements 104 to close the gap 90 such as to hold the device 10 in place.

[0028] Figure 3b illustrates another embodiment in which the clamping mechanism 103 is provided by a screw mechanism. In this embodiment, a screw 152 is attached to each end of the clamping elements 104. The screw 152 is slideably mounted in the sides 112 and 116. Furthermore, the top of sides 112 and 116 have an opening for accessing the screws 152. Through the opening, the screws 152 are reachable and can be used to tighten or untighten the
clamping elements 104. As such, the gap 90 defined between the clamping elements 104 can
be open or closed.

[0029] As mentioned above, the gap 90 defined between the clamping elements 104 forms an opening for receiving the device 10. Different sizes of devices 10 can be received and held in place firmly in the holder 100 by pressing the clamping elements 104 inwardly against the sides of device 10, as illustrated in Figure 2. The device 10 is usually received in the opening with its front/top facing up, as can be seen in Figure 2.

[0030] Furthermore, the clamping elements 104 can comprise knobs/protrusions 120 for contacting the device 10 and holding it in place through pressure. The protrusions 120 could be made of, or covered with, elastomeric material, such as rubber, so as to not damage the device 10.

[0031] It should be noted that in Figure 2, two clamping elements 104 are shown as an example, however, there could be only one or three or more.

[0032] More specifically, when only one clamping element 104 is mounted to the frame 102 of the holder 100, one side of the frame 102, such as side 110, could be used in collaboration with the single clamping element 104 to hold the device 10 in place within the frame 102, through pressure. In this case, the single clamping element 104 is moveable and the side 110 is fixed.

[0033] When three clamping elements 104 are mounted to the frame 102, then the holder 100 can receive two devices 10 in the two gaps defined between the three clamping elements 104.

[0034] It should be noted that other mechanisms, besides the clamping mechanism, could be used to hold the device 10 in place within the frame 102, as will be appreciated by a skilled person in the art.

[0035] Figure 4 shows the bottom 108 of the holder 100, in which the device 10 is placed. From the bottom view of the holder 100, the back 11 of the device 10 is seen facing up. The holder 100 further comprises one or more guides 122, adjustably mounted to the
sides of the frame 102, such as sides 110 and 114, and configured to face the back 11 of the device 10, when the device 10 is placed in the holder 100, as illustrated in Figure 4. It should be noted that in the embodiment as shown in Figure 4, the different guides 122 are mounted transversely to the clamping elements 104. However, in another embodiment, the different guides 122 could be mounted in a parallel fashion to the clamping elements 104.

In one embodiment, the guides 122 are slideably mounted to the frame 102, so as to slide along a first axis of the frame 102, parallel to sides 110 and 114, for example. The sliding movement of the guides 122 is shown by the arrow 130.

In order to slideably mount the guides 122 to the frame 102, the sides 110 and 114 have grooves 111 for receiving the ends of the guides 122. In order to stop the guides 122 from sliding, the ends of the guides 122 could be frictionally mounted within the grooves 111. As such, when the guides 122 are at a desired position along the sides 110 and 114, static friction between the ends of the guides 122 and the grooves 111 would prevent the guides 122 from moving.

It should be noted that other mechanisms for adjusting the positions of the guides 122 can be provided or envisioned by those skilled in the art.

Figure 4 further shows two guides 122 mounted in the frame 102 in the same plane. It should be noted that the number of guides is not restricted to such a number. There could be a plurality of guides 122 mounted in the frame 102. In such a case, different guides 122 could be spaced apart from each other in different planes as well. The number of guides 122 needed depends on the layout and number of sockets on the portable electronic device 10. The guides 122 can be made of various material or combination of materials (e.g. polymeric materials, metallic materials, composite materials, etc.).

In the embodiment depicted in Figure 4, each guide 122 comprises two parallel tracks 124, spaced apart from each other. At least one housing 126 configured for receiving a connector is moveably mounted to the tracks 124. In one embodiment, the housing 126 is slideably mounted to the tracks 124 so that the housing 126 can be displaced along a second
axis of the frame 102, such as along the length of the tracks 124. The sliding movement of the
housing 126 is shown by the arrow 132.

Figure 5 shows an embodiment for slideably mounting the housing 126 to the
tracks 124. In this embodiment, the housing 126 is mounted to the tracks 124 via a tongue and
groove configuration. In that sense, the inner sides 162 of the tracks 124 each have a groove
164 and the housing 126 comprises corresponding tongues 160 respectively extending along
each of the opposite lateral sides 166 and 168. Once the tongues 160 are received in the
grooves 164, the housing 126 can slide along the length of the tracks 124. In this case, the
housing 126 is held/constrained between the two tracks 124. The housing 126 can use friction
for stopping at a desired position along the length of the tracks 124.

It should be noted that the movements with respect to the first and second axes
enable the housing 126 to be positioned anywhere relative to the surface of the back 11 of the
device 10. As such, the housing 126 can be positioned to correspond to the position of any
sockets on the device 10. In other terms, the movements of the housing 126 on the tracks 124
provide the movement along the width of the device 10 while the movements along the length
of the device 10 are provided by the movement of the guides 122 with respect to the frame
102. The first and second axes are substantially perpendicular to each other, in one
embodiment. However, they could have different angles as will be appreciated by those
skilled in the art.

The housing 126 may be of different shapes, such as circular or rectangular
shape, as shown in Figures 4, 5a and 5b, and it is dimensioned to fit into the guides 122.
Furthermore, the housing 126 comprises an aperture 128 for receiving a connector, such as
RF connectors for example. The housing 126 can be made of various material or combination
of materials (e.g. polymeric materials, metallic materials, composite materials, etc.).

For each guide 122, one or more housings 126 can be mounted thereon.

Now turning to Figure 6, a connector 200, such as a RF connector, mounted in
the housing 126 will be described.
In one example, the RF connector 200 can be screwed into the housing 126. To do so, the aperture 128 of the housing 126 is threaded, and the RF connector 200 is embedded in a RF adapter 202, which takes the shape of a threaded screw. The threaded screw comprises a head 206 and a tip 204. The tip 204 of the RF adapter 202 comprises the RF connector 200, which is to be connected to a socket 12 of the device 10. The head 206 is attached to another RF connector, such as a standard RF connector 208, through a cable, for example. The standard RF connector 208 is to be connected to a RF source or measurement equipment. In order to couple the RF connector 200 to the housing 126, it suffices to screw the RF adapter 202 into the threaded aperture 128 of the housing 126. The strength of the connection between the RF connector 200 and the socket 12 is adjustable, depending on how much the RF adapter 202 is screwed within the aperture 128.

It should be noted that other mechanisms can be used to mount the RF connector 200 to the housing 126.

By using the holder 100 as described above, it would be easy to adjust and connect RF connectors 200 to the sockets 12 on devices 10, through the adjustable and moveable guides 122 and housings 126. Furthermore, since the RF connectors 200 can be screwed or otherwise mounted to the adjustable guides 122 through the housings 126, the RF connectors are firmly connected to the sockets 12. Therefore, during testing or demonstration, people (testers or visitors) can touch or move or play with the device 10 without too much caution or fear of breaking or weakening the connections. Also, when using the holder 100, for coupling the RF connectors 200 to the sockets 12 on the device 10, it is ensured that the RF signals are stable because there is no deviation caused by loose connections. Thus, the data generated or collected during testing is reliable. Moreover, when using the holder 100, it is easy to place the device 10 on a table or a demonstration booth when multiple RF antenna cables are connected to the device.

The above-described embodiments of the present invention are intended to be examples only. Alterations, modifications and variations may be effected to the particular
embodiments by those of skill in the art without departing from the invention, which is defined solely by the claims appended hereto.
What is claimed is:

1. A holder (100) for a portable electronic device (10) comprising:
   a frame (102) configured to receive the portable electronic device (10); and
   a guide (122), mounted to the frame (102) and configured to face a back (11) of the portable electronic device (10), the guide (122) configured to receive a connector (200) which is connectable to a corresponding socket (12) located at the back (11) of the portable electronic device (10).

2. The holder (100) of claim 1, further comprising at least one clamping mechanism (103) adjustably mounted to the frame (102), the at least one clamping mechanism (103) being configured to hold the portable electronic device (10).

3. The holder (100) of any of claims 1 to 2, wherein the at least one clamping mechanism (103) comprises one of a spring mechanism and a screw mechanism.

4. The holder (100) of any of claims 1 to 3, wherein the at least one clamping mechanism (103) comprises at least one clamping element (104).

5. The holder (100) of any of claims 1 to 4, wherein the at least one clamping element is moveable along a side of the frame (102).

6. The holder (100) of any of claims 1 to 5, wherein a position of the guide (122) is adjustable along a first axis.

7. The holder (100) of claim 6, wherein the guide (122) is slideable with respect to the frame (102).
8. The holder (100) of any of claims 1 to 7, wherein the guide (122) comprises a pair of tracks (124).

9. The holder (100) of any of claims 1 to 8, wherein the guide (122) comprises at least one housing (126) configured for receiving the connector (200).

10. The holder (100) of any of claims 1 to 9, wherein a position of the at least one housing (126) is adjustable along a second axis.

11. The holder (100) of claim 10, wherein the second axis is substantially parallel to a length of the guide (122).

12. The holder (100) of any of claims 9 to 11, wherein the at least one housing (126) is slideable with respect to the guide (122).

13. The holder (100) of any of claims 9 to 12, wherein the at least one housing (126) comprises an aperture (128) for receiving the connector (200).

14. The holder (100) of claim 13, wherein the guide (122) receives the connector (200) by screwing the connector (200) to the aperture of the at least one housing (126).

15. The holder (100) of claim 9, wherein the at least one housing (126) is mounted on the pair of tracks (124).

16. The holder (100) of any of claims 1 to 15, further comprising a plurality of guides (122) mounted to the frame (102) and configured to receive connectors (200) which are
connectable to corresponding sockets (12) located at the back (11) of the portable electronic device (10).

17. The holder (100) of any claims 1 to 16, wherein the connector is a Radio Frequency, RF, connector.
Figure 6

RF connector attached to device RF socket

Slider that movable on RF panel. Various RF adapters can be screwed on the slider.

Standard RF connector attached to RF source or measurement equipment.

RF adapter
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Further documents are listed in the continuation of Box C. See patent family annex.

Date of actual completion of the international search: 24 March 2016

Date of mailing of the international search report: 01/04/2016

Authorized officer: de Biolley, Luc
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