Mobile in the nursery - a critical review

With references to the responsible use
Summary

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advertising health effects of wireless radiation
the observed for a long time and studied.
In this brochure examples of the use of
funkbetriebenem toys and other
applications used to play given by
toddlers and preschool children. a
plethora of devices and applications
are already available for young
children and their parents, who can
use yourself radio radiation or
operated with the help of mobile
terminals via radio links and their
market share is increasing more and
more. Here is usually barely noticed
that the most acting on the human
radiation sources of electromagnetic
fields are just such devices, which
are used close to the body

( as z. B.
Smartphones, string
lostelefone). health
Auswirkun-

gen - in particular the child's organism - are therefore of interest. The
brochure is why toddlers and preschool children radio radiation should
not or as little as possible be exposed as possible.

Since most parents do not know where and by what devices increased
radiation arises, recommendations are given on how to deal with the
ever increasing range of electronic toys and devices. In addition, claims
on policies and manufacturers are made to prevent and limit
unnecessary emissions by radio radiation for humans and the
environment. Thus, the applicable legal requirements toys account for
the presence of wireless applications and their risks adequately, classic
mobile phones and tablets, which are sometimes used for the
operation of toys, are even no child-specific regulations. The central
demand of all responsible actors, therefore, is to do more and more
binding for care and protection of children in the field of wireless
applications.
1. Introduction

More and more often we are - intentionally or not - exposed to the influence of radio radiation, as occurs when using mobile communication techniques. With the boom of mobile Internet applications, this reached a new dimension. In Germany, there were about 300,000 mobile transmitters in 2016, about two million smaller amateur radio transmitters, around 100 million domestic broadcasting equipment like wireless or cordless phones and more than 100 million mobile phones. It should be noted that operated close to the body so-called terminals can often lead to the highest individual loads.

The use of electronic media in infancy is therefore particularly problematic, since various studies show that the child's body on radio radiation sensitive than the adult. The legal protection of children from radiation is insufficient, in the opinion of the BUND and especially the parents have not been adequately informed.

This brochure aims to explain how children development of mobile digital devices can be better protected from Funkstrah. In addition, policy makers should be encouraged to ensure adequate protection for children by set an effective legal framework and a concept for a sensible precaution is developed.

At fairs for toys or consumer electronics, more and more offers that have already been developed for young children find. So there are already for babies, a growing number of so-called "i-Toys", rattles, jars, dolls and stuffed animals with built-in smart phone or baby monitor. Including electro-American instruments for radio-based monitoring of bodily functions were becoming more common. Political institutions advertise already gardens in children for the introduction of electronic media, ministries of education support this development through appropriate funding programs. Aspects of the potential impact on the development of psychology and physiology of man and of learning, educational standards and competence orientation are not considered as part of this guide.

is seen in this brochure only the group of infants and children up to preschool age, as arise with the school other conditions which will not be discussed here. Also present in the home setting low frequency electric and magnetic fields (e.g., By household current) remain out of consideration.
2. radiation sources in the environment of children

Radio-based equipment for children
There is a wide range of different radio-based deals from use in pregnancy up to the product for the small or preschooler. Here can be distinguished on the one hand (especially for small kin of the offered stuffed animals and other toys) and the so-called "convenience" applications on the other hand, to facilitate the care of the infant between digital toys (z. B. the smart diaper that sends on smartphone when the diaper needs to be changed). There are also measuring and Sen sorsysteme necessary if necessary for medical reasons.

For the consideration of new digital toys BUND proposes the following categories (with examples), for each of which a separate risk-benefit assessment must be made. After an overview consequences will be discussed in more detail to the individual applications.

1. Passive toy with wireless connections such. MP3 player, etc.
   or radio-controlled toy watches (z. T. with integrated room monitor)

Second Interactive toys with their own wireless connection or own wireless remote control, for example. B. Construction toys, trains, kids computers, cars, helicopters, drones, walkie-talkies and children's computer or tablet,

Third Interactive toys, where the radio link from not classified as a toy phones, tablets etc. taken such. B. Construction toys, WIFI-controlled cars, helicopters, drones,

4th Children apps on tablets or smartphones to use as toys and

5th Mobile devices, exclusively as a display and down act playground equipment, and can be used without wireless connectivity for video, music or children’s apps used for. B. Wise Pets or the Fisher Price baby rattle.

Then there are the imaginary not really for kids Rate Adults senengeräte but which are co-used by children.
To the passive toys with wireless connections **product group**

1) include, B. devices combine the baby monitor, game clock and MP3 player in itself and can be controlled via app from your smartphone or tablet (Figure 1).

The range of the room monitor on Wi-Fi is up to about 300 meters advertised (which could indicate a relatively high power). Although Wi-Fi can be deactivated by a switch, but then neither function baby monitor nor control over the app.
Interactive toys with their own wireless connection (product group 2) are for. As model cars, chartered boats, airplanes, helicopters or drones with its own wireless remote control (RC = radio controlled), but also so-called children’s computer or tablet (waste education 2), which also establish a separate radio connection and z. can be used as wireless Internet access.

Figure 2: PC Kids Tablet (Android system with WLAN)
Some interactive toys such as mini helicopters, drones, mini-robots or puppets, the radio control is taken over by the classified not as a toy phones, tablets, etc. (Figure 3). In these Product Group 3 fall applications, their use should be questioned, because hereof outgoing continuous exposure is especially critical if parents do not pay attention to disable the wireless connections (Airplane mode). An active network connection can also be used for abusive secret picture or a music: The Federal Network Agency has banned in January 2017, the doll "CAYLA" and buyers recommended disposal.

Figure 3: Examples of interactive toys with control via smartphone or tablet
In the **Product Group 4** the use falls from specially developed for children apps not intended as children's toys adults devices (smartphones and tablets) (Figure 4). Currently, there are nearly 1,000 of these applications and the number will continue to rise. But also the provision of children's films, audio books or music on these mobile devices should be considered. It is important to distinguish whether a radio link is necessary or it can be deactivated.

The need for a radio link or the possibility of their inactivation is also to be **noted when mobile devices are used in a toy** (**Product Group 5**), to be used as a screen to play, for example, an app, video or music. Examples are the so-called "Wise Pets", ie cases in the form of plush toy animals, baby rattle o. Ä. (Figure 5 and 6), the "child-oriented" as a support and a protective case for the equipment is intended. There would, however, smartphones / tablets with activated Funkan connection, in particular due to the expected very body-hugging application, come to a load.

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*Figure 5: “Wise Pet” - Plush Cover for smartphones and tablets*

*Figure 4: Children apps to play on smartphones and tablets*

*Figure 6: Rattle holder for smartphones, with spit protection*
In the field of "Convenience" applications various digital, mobile baby monitoring offered. So act smart pacifier the control of body temperature (Figure 7) and sensors for humidity and methane content in an inserted into the diaper band information to parents about the "level" (Figure 8). For many uses the usefulness would be to question - in addition, the manufacturer is unable

Information on the amount of radiation. Also used by many baby monitor is one of the to be considered in the context of children used radios. The devices are offered with Wi-Fi or a transfer technique similar to a cordless phone. Distinguishing between devices that have a permanent radio link and those who offer an intelligent control system for radiation reduction.
And not least, can also **medical instrumentation and sensor systems** be used due to a medically justified indications or doctor's prescription as wireless monitoring devices. With some equipped with wireless sensors (Figure 9) to safety through the mobile monitoring of mother and child be achieved by fetal and maternal Liche Vital parameters are transmitted to a base station (such as, for example, the pulse rate).

*Figure 9: Wireless Fetal Monitoring Philips*
Body near powered devices become the focus of consideration (such as mobile phone, cordless phone, smartphone, tablet, baby monitor, wireless router). By using this so-called terminals children can also be exposed to the radio radiation higher by several times than by the befind Liche near mobile phone base station. Especially in unfavorable or shielded receive and transmit situations such. As in the use of such devices in car, bus, rail, and inside buildings, a more intensive radiation arise.

Fig. 10: number of possible radio applications in the house

**Other sources of radiation for children**

The relevant sources of radio-frequency fields (ie for radio radiation) are essentially mobile phone base stations in the outdoor area, the use of mobile devices as well as equipment and installations in the home environment, equipped with wireless technology.

In addition to the constantly scanning the surrounding radiation from mobile phone base stations are provided in this document in the immediate
The large number of possible radio applications in the house (such as wireless Router, cordless phones, baby monitors, gaming consoles, televisions, Computer, printers, radiator thermostats, electric meter, smoke detectors, water meters, lamps, robot vacuum cleaner, kitchen appliances, and many more toothbrushes, toys) illustrates the Figure 10th.

In addition, Internet-enabled mobile devices such as smartphones and tablets are active even without the active use in the background. They connect in normal operation automatically with the base station and, if necessary, are, depending on the setting, other radio standards (such as Bluetooth, WLAN) in operation. Smartphones and tablets are designed to constantly communicate with the Internet. These include mail and calendar programs, navigation services and various other information apps. Measurements over a period of 16 hours in a household with three phones (Virnich 2018) show that by the plurality of transmission activities occur hardly breaks. The breaks show when all people using their smartphones were outside the home (ILLUSTRATION 11).
3. Health effects

Health effects of RF radiation exposure are observed for a long time and studied. There is a wide range of results and often contradictory statements can be found. Therefore should be a prerequisite for proper handling of these investigations, the expert as possible and verifiable assessment of the findings here.

In a report, the Swiss Federal Council on conditions at the future expansion of mobile networks is noted that in addition to the heating of body tissue by radio radiation also be more different well-supported observations to other biological, scientific undoubtedly harmful effects. The existing ambient air quality standards to protect against the known thermal effects. In addition, the Swiss National Research Program looks at the non heat-related effect on the brain waves detected as sufficient scientific, te for more effec how the influence of the blood flow to the brain which impairment of sperm quality, destabilization of genetic information as well as effects on the expression of genes, programmed cell death and oxidative cellular stress it sees clear evidence. According to the Swiss Federal Council, these effects can not be explained by a generally recognized, traceable mechanism of action, and it is not clear whether this health consequences associated or whether it is imposed on the radiation thresholds (National Research Program NRP 57 2011; Swiss Confederation in 2015).

According to the BUND the likely occurrence of health effects is already sufficient for the actions of one focused on preventive health. A proven or recognized effect is related to not a necessary condition, as the scientific evidence of a cause and effect relationship (causality) is hardly possible in complex biological processes. This orientation of the precautionary principle is based on the European and German law. Therefore, the results of the Swiss research program in view of the effect of radio radiation on brain function and genetic information for necessary follow-up studies are especially important.

It must be assumed that the in-process child's body becomes more sensitive to RF radiation exposure than that of adults. The radiation exposure is higher than in adults in the use of mobile phones in the head area of children. This is also supported by a study by the German Mobile Telecommunication Research Program, which displays different models of children's minds that especially in younger children certain tissues and brain areas during a call are more affected than adults (Federal Office for Radiation Protection 2008a).

Particular problem is that younger children the inclusion of mobile radiation through the still developing brain is much larger than in adults (Christian et al 2007; Figure 12). The German Radiation Protection Commission found that larger age-related differences fixed-
Methodology for measuring heat-induced effects by radio radiation

Considering the heat-related effects, as required by the authorization process for mobile phones that the maximum local partial body exposure (technical acronym SAR = Specific Absorption Rate) to cell phone radiation, e.g., as the head, a Energieaufnahme of two watts per kilogram (W/kg) does not exceed. This is to ensure a healthy dangerous heating of body tissue. Today most phones have an average SAR value of 0.68 W/kg (Bornkessel 2015), but may also be in some cases more.

To check compliance with this guideline value, the plastic model of a head is used which reflects the top ten percent of the biggest recruits of US Militärs in 1989th. The model uses a simulation of fluid in the brain that can only play a mean value. Thus can be shown either local differences in recording or differences by specific brain tissue, nor is a distinction in regard to children or smaller adults possible. There seems to be no specific models for babies and toddlers.

are observed. In detail, deep in the brain regions in children, depending on age, frequency and location of the mobile phone a higher or lower load than in adults may occur. When the bone marrow of the skull and the eye generally higher loads were seen in children (SSK 2011). The application performs close to the head in children in higher recording because their skull bones are thinner than adults and their brains have an even higher conductivity.

![Graph showing specific absorption rate (SAR) in different areas of the brain in children of different ages and adults.](image)

*Figure 12: Different heating of different areas of the brain in children of different ages and adults, technically represented by the specific absorption rate (modified by Christ et al., 2007)*
To understand the effects of mobile phone radiation, a distinction is necessary between thermal effects on the one hand (heating tissue) and non-thermal effects (not triggered by tissue heating effects) on the other. For a precautionary handling of radio-based applications and the necessary protection of young children both thermal and the observed effects in other non-thermal field must be complied, which can occur even with a much lower load. For these observed effects of radio radiation such. As mood disorders or non-specific symptoms such as headache, fatigue, insomnia and impaired cognitive performance in humans exist, no defined impact models, 

Also influencing the brain activity in children is likely, as essential steps in the development of the brain take place until the age of eight to ten years. 

Therefore, the World Health Organization sees a high priority in the need for epidemiological studies on children's health, including the end point of cancer (especially brain tumors), and in terms of general health-related aspects such. As cognitive effects and impact on sleep quality. are also classified with high priority, for example, animal studies on the effects of prolonged exposure time of radio radiation in the development and maturation of the central nervous system.

It is noteworthy that the largest percentage of all cancers in children in the bone marrow occurs - hence leukemia Erkran fluctuations have a total share of more than 50 percent. The bone marrow exposure of children may be about to exceed the by a factor of ten adults. Da Funk radiation on the part of the World Health Organization (2011) has been classified as possibly carcinogenic (Group 2B), and was found to have a tumor-promoting effect with constant exposure to UMTS signals in animal studies in a commissioned by the Federal Office for Radiation Protection repeat study (Federal Office for Radiation Protection 2015) should be avoided for precautionary point of a load of children.
This begs the question, what are the regulations for the protection of children. The provisions for toys, the exposure of children by electromagnetic fields (radio radiation) is addressed. The relevant EU Directive on electronic equipment or the associated peripherals counts then this requirement if they are specifically designed for children. As an essential safety requirement is named that toy under normal or foreseeable conditions of use and taking into account the behavior of children should not jeopardize the safety or health of users or third parties. The toys must be so designed and constructed that he no health hazards or risk of injury to eyes or skin from lasers, light emitting diodes (LED) or other types of radiation going out. This also applies to the electromagnetic fields. Overall, however, only the risk protection and not prevention is addressed.

Security still access other provisions, such as the required CE marking by which the manufacturer indicates that the product meets the applicable EU requirements. So there is a lack of principle of a precautionary examination of the use of radio-based toys by children.

The Federal Office for Radiation Protection notes, "continue to pay on a precautionary minimize exposure of users and of the population in the operation of existing and the development of new wireless communication technologies" that is and ensure that citizens lowest possible intensity of high-frequency radio radiation are exposed (Federal Office for radiation protection 2008b). Specific preventive measures are not recommended by official agencies.

Furthermore, to make electric toys and manufactured so that electric, magnetic and electromagnetic fields and other radiations generated by the equipment to be limited to what is necessary for the operation of the toy measure. This means in particular that only the electromagnetic compatibility (between the devices) must be considered. A reference to health protection or care can not be inferred, at best a technical minimize duty. The implementation of this EU directive into national law refers only to the mentioned requirements. to

The illustrated insufficient consideration of specific aspects of the exposure of children demonstrates the need for a revision of the current assessment criteria for the assessment of radiofrequency fields. To map more far-reaching health and biologically active effects, a new prevention and protection concept must be developed. This needs to protect sensitive groups, such as pregnant women, fetuses and children, explicitly considered. Prerequisite for adequate prevention and protection concept is the inclusion of social groups in its development.
Recommendations of some German institutions for mobile use by children

- The State Medical Chamber of Baden-Wuerttemberg has updated in 2014 its recommendations on "Mobile Communications and Health". As regards the health of children, adolescents and parents. These should use mobile phones and laptops little and as short as possible. The devices should be turned off when not in use. Furthermore, mobile phones should preferably not be used in rooms with shielding properties, such as the car or public transport. The introduction of mobile phone-free zones in public transport and buildings is recommended.

- The Hamburg Medical Association recommended in 2013 that children should use less than ten years instead of mobile phones landline whenever possible.

- Also, the Federal Ministry for the Environment advises on its children's page on the Internet to make calls with the headset or headphones, and at night not place the phone near the head.

Recommendations of other countries for mobile phone use by children

- Parliament in France adopted in early 2015 a law for reduction of radio radiation. Therein Fi is prohibited, as well as in kindergartens and preschools in for children up to three years only approved for primary schools, if required by the instruction. The National Authority ANSES has recommended in 2016 that radio-operated devices for children, such as mobile phones are regulated and there is a review of the benchmarks in terms of applicability and sufficient protection for children. For children, the RF radiation exposure should be reduced due to mobile phones through prudent use and hands-free.

- In 2014 two decrees of the federal government stepped in Belgium with more stringent regulations for mobile phones in force. The sale and marketing of mobile phones for less than seven years old is just as relevant advertising on television, radio, Internet and banned in print media. In general, the trade is required to indicate the SAR value of mobile phone models in the sale and in advertising.

- 2015 declared the Ministry of Health in Israel that provision with regard to children is consistently implemented. It encourages parents to reduce children's exposure to mobile phones as far as possible to check, for example, the age at which children are allowed to use them to reduce the duration and generally to use wired headphones or speakers.
5. Advice for parents

- Mobile devices (smartphones, tablets and cordless phones) should not be used as a toy for toddlers.

- In households with small children, if possible, a Wi-Fi should not be used or be off. Alternatively, use wired devices.

- With radio applications should be turned off when not in use.

- "The distance is your friend" note as a general rule when dealing with high-frequency radiation sources.

- Pay for devices in the home (especially for new TV sets, stereos, computers, and the like) on ways to disable wireless connections and use these opportunities. Cordless phones should have a regulation of the transmission power and an automatic shut-hook in the base station receiver.

- Restrict use of smart phones, cordless phones and tablets in the presence of children as much as possible and pay attention to spacing. This should also apply to day care centers, kindergartens, etc..

- A private mobile phone is not necessary for preschoolers usually.

- use devices with Internet connections for children, if necessary, possible only via cable.

- Traveling in car, bus and train, if possible select Offline games because usually due to poor Em pfangs qualities high transmission power are required
  - therefore disable the "data connections over mobile" smartphones.

- With wireless routers, cordless phones and baby monitors on reviews and low-radiation products Blue Angels eighth.

- (Such as wireless routers, cordless phones) do not operate high-frequency radiation sources in children's rooms or near bedrooms and permanent residence places.
6. Claims on policy and Manufacturer

- In the planning and construction of mobile transmitters locations of kindergartens and schools must be given special consideration and significantly lower investment limits are set, taking into account the precautionary aspect (z. B. with regard to non-thermal effects) adequately.

- In research with development of load models by radio-based products, the effects must be considered specific to children.

- Public Wi-Fi hotspots mandatory labeling should be introduced.

- The children compartments in public transport, eg. B. Deutsche Bahn should be either offered as a spark-free zones.

- For baby monitors binding standards need to be introduced (including radio lowest possible radiation), they must be equipped with a transmitter power regulation and an exclusive activation in case of need (when the baby cries).

- Products BUND product groups 3 to 5 (plush cover, etc.) are not toys under applicable regulations (EU Toy Directive, implemented in Germany by the second Ordinance to the Equipment and Product Safety Act), as these only as a combination product with use of smartphone or tablet can be operated. Corresponding products would have no toys are therefore provided with a note "gem. ... "o. Ä ..

- A geared to toddlers advertising for mobile phones should not be allowed.

- Mobile phones and tablets are a "kids mode" (of a radio link shuts down) offer, possibly kids apps could be allowed only in this mode of use, to enable focused on preventive use.

- A radio-controlled pregnancy and birth monitoring shall be conducted only on medical prescription back and must be connected to appropriate information and choice.

- Non-binding guidelines must be made legally binding and be complemented by customized risk groups precautionary limits.
7. References


BfS_2015_3611_S30017.pdf


- National Research Program NRP 57 (2011): Results from the National Research Program on the potential health risks of electromagnetic radiation, Swiss National Science Foundation (SNF), 40 S.


- Virnich, M. (2018): Forget ‘g’rad the cell tower, if you have a smart phone itself! Place: flat + Health, No. 166, pp 36-38..

8. endnotes

1. www.babystarsrock2sleep.com/shop/snumee#video


6. www.philips.de/healthcare/product/HC866074/avalon-cl


9. de.wikipedia.org/wiki/Gehirnentwicklung_beim_Menschen

10. while all products designed or clearly intended for use by children under the age of 14 years are considered toys


14. Second Ordinance to the Product Safety Act (Regulation on the safety of toys) of 7 July 2011 (Federal Law Gazette I, p. 1350, 1470), most recently by Article 1 of the Decree of 13 July 2016 (Federal Law Gazette I, p. 1716) have been changed is


16. www.bmub-kids.de/wissen/gesundheit/elektrosmog/


20. www.health.gov.il/English/Topics/radiation/cell_phone/Pages/default.aspx
The Federation for Environment and Nature Conservation Germany e.V. machines with more than 580,000 Unterstützerin- and supporters of the largest nature conservation and environmental protection association in Germany.

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