



# **User Manual TX-Measurement**

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## **DEKO light – smart light with Zigbee and Bluetooth**

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## 1. Device list

Following DUTs are provided and labeled with their name on the bottom:

Quantity	Name	Description
1	DUT 1	Device under test (full functional device)
1	DUT 2	Device under test (full functional device)
1	DUT 3 RAIL	Railtest fixed frequency device (for radiated measurements)
1	DUT 4 RAIL	Railtest fixed frequency device (for radiated measurements)
1	DUT 5 ANT	Antenna with u.FL to SMA connector 0.5dB attenuation (for measuring antenna gain)
1	DUT 6 COND	Device with conducted RF output with u.FL to SMA connector 0.5dB attenuation (for conducted measurements)
Additional equipment:		
1	EUT 1	USB dongle Zigbee hub
1	EUT 2	USB charger 3 way IKEA
1	EUT 3	Qi-Pad wireless charger Samsung EP-P1100
3	charging cable	USB-A to microUSB charging cable 200mm
2	data cable	USB-A to microUSB data cable 1000mm
1	Power cable Qi	USB-A to USB-C power cable 1000mm for Qi-Pad

## 2. Charging the devices:

DUT 1, 2, 3, 4 and 6 have a battery which needs to be recharged from time to time.

To recharge use the EUT 2 Charger and the charging cables provided or any 5V USB power adapter. Charging time is approx. 3-4 hours from empty to full. The status LED next to USB connector indicates charging by blinking blue and charge finished by continuous blue light.

In use, when status LED is red then battery is almost empty (<10% SOC).

Orange indicates normal operation

Green when full

LED Turns off after ~20seconds, to turn on again press the button or turn the upper part.

## 3. Antenna Gain measurement

At first, the gain of the pcb antenna needs to be measured with DUT 5. It includes the u.FL to SMA connector with 0.5dB attenuation.

**Please provide peak gain and radiation patterns. We can then define the max. output power for the following measurements.**

## 4. Test Setup radiated (TX)

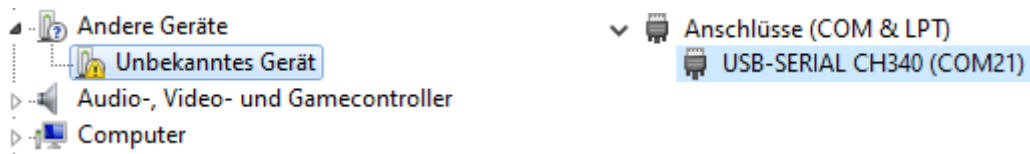
DUT: DUT 3/4  
Supply: Battery  
Charging: USB  
RF: Onboard PCB antenna

Devices need charging before use. After fully charged DUT 3/4 can last for 2-6 days depending on usage.

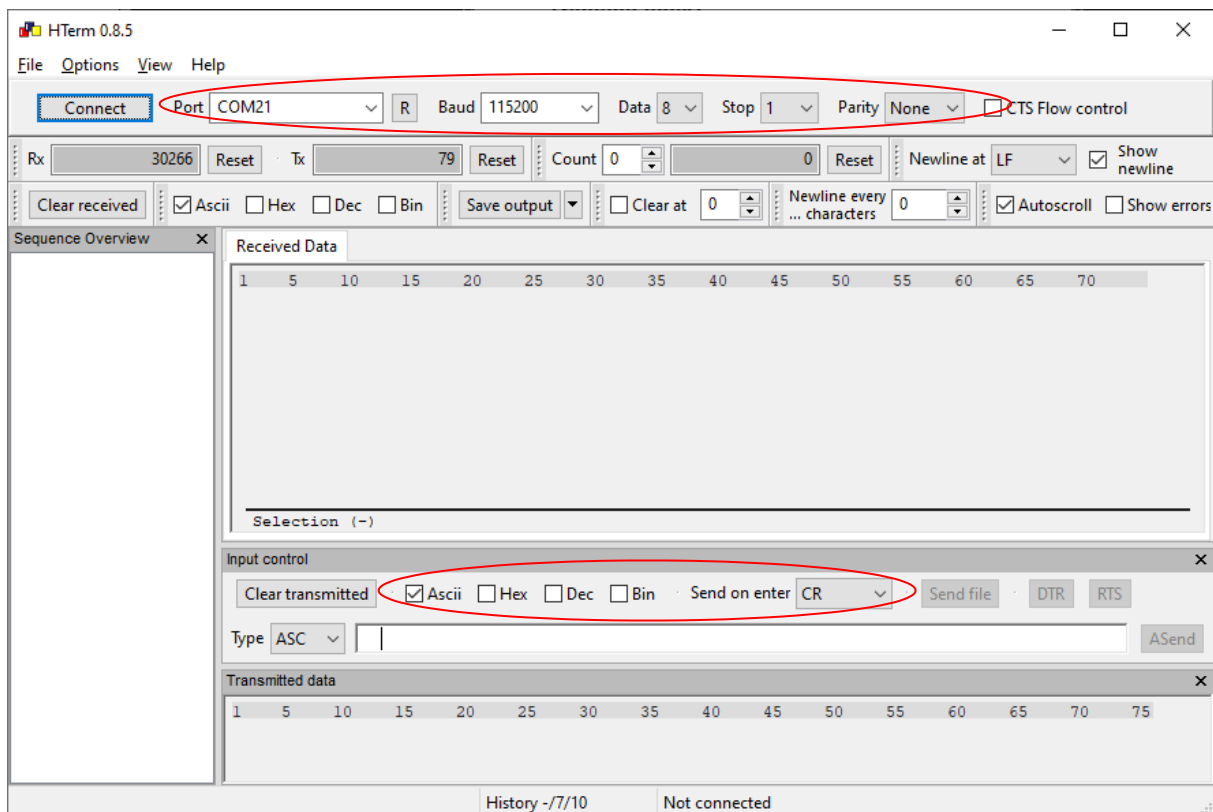
## 4.1. Preparation for Test

### 4.1.1. DEKO (DUT 3/4 railtest FW)

Install the driver from zip file or web ([http://www.wch.cn/downloads/CH341SER\\_ZIP.html](http://www.wch.cn/downloads/CH341SER_ZIP.html))



Open a terminal tool like Putty or hTerm (installer provided with zip file) with COM Port, 115200 Baud 8N1.



To configure for Zigbee execute the following commands, each command needs to be terminated by CR (enter):

```
rx 0
config2p4GHz802154
setpower <x>          x power in deci dBm (100→10dBm)see below table
setchannel <y>        y channel 11...26
```

To configure for Bluetooth execute the following commands, each command needs to be terminated by CR:

```
rx 0
setBleMode 1
setpower <x>          x power in deci dBm (100→10dBm) see below table
setchannel <y>        y channel 0...39
setBle2Mbps 1        Switch to the 2Mbps BLE PHY
```

or `setBle1Mbps 1` Switch to the 1Mbps BLE PHY

This table shows the conducted nominal measured output power versus the power setting.

TX Out conducted measurement [dBm]	TX Out radiated [dBm] (calculated)	TX Power [dec dBm] To enter when changing power
10.7	Gain required (see 3. Antenna Gain measurement)	100
9.9		90
8.8		80
8.3		70
7.7		61
7.0		51
5.9		41
5.3		29
4.4		17
4.0		11
2.8		1
2.1		-9
1.3		-19
-0.5		-29
-1.8		-40
-3.2		-57
-5.0		-74
-7.4		-96
-10.7		-144
-16.2		-260

All other options shall not be modified. The procedure is the same for all DUTs.

#### 4.1.2. Transmit Mode

To start continuous transmission: `setTxStream 1 0 0` carrier (tone) or `setTxStream 1 1 0` modulated signal (PN9)

```
setTxStream Control stream transmission.<\r><\n>
                [uint32] 0=Disable 1=Enable<\r><\n>
                [uint32opt] streamMode: [1=PN9] 2=1010 3=phaseNoise 0=tone<\r><\n>
                [uint32opt] antenna: [0]/1
```

**Remove USB cable for measurements after start the transmission!**

To stop transmission: `setTxStream 0`

### 4.1.3. Receive Mode

In receive mode the DUT will listen to packets on the specified channel and print the received packet to the console.

Start receive mode: rx 1

Stop receive mode: rx 0

## 4.2. Communication partner for EMC Test (DUT3/4)

1. Plug the second DUT3/4 into USB
2. Open a terminal tool like Putty or hTerm with COM Port, 115200 Baud 8N1 same as in 4.1.1
3. Send following commands:  
    setchannel <y>  
    Start receive mode: rx 1

## 4.3. SAR

Please conduct the SAR measurement at the body worn distance.

## 5. FCC Band edge

For Zigbee Channel 26 and maybe Bluetooth Channel 39 it might be necessary to reduce output power to pass the band edge test. Reduce transmit power step by step until it passes the test. Inform us about used power setting or in case of any problems.

## 6. Blocking

DUT 3 or 4 as transmitter, enable CSMA for Zigbee as follows:

```
rx 0
config2p4GHz802154
setpower <x>          x power in deci dBm (100→10dBm)see below table
setchannel <y>         y channel 11...26
setLbtMode csma       enable CSMA
tx 1000               send 1000 packets (change packet count according to required
time length)
```

for Bluetooth use:

```
setBleMode 1
tx 1000             send 1000 packets (change packet count according to required
time length)
```

## 7. Full functional devices DUT 1 and 2

### 7.1. Manual control

DUT 1 and 2 are delivered in power off state. To turn them on press the upper shell down once and turn first left, then right at least one fourth turn each. When turned on, the DUT will light up with low brightness. Turn right to increase the brightness and left reduces brightness. In this state it can be controlled by PC tool deCONZ via Zigbee (see 7.2).

The device has following manual control modes:

Press once will enter brightness control

Press twice will enter the colour temperature mode

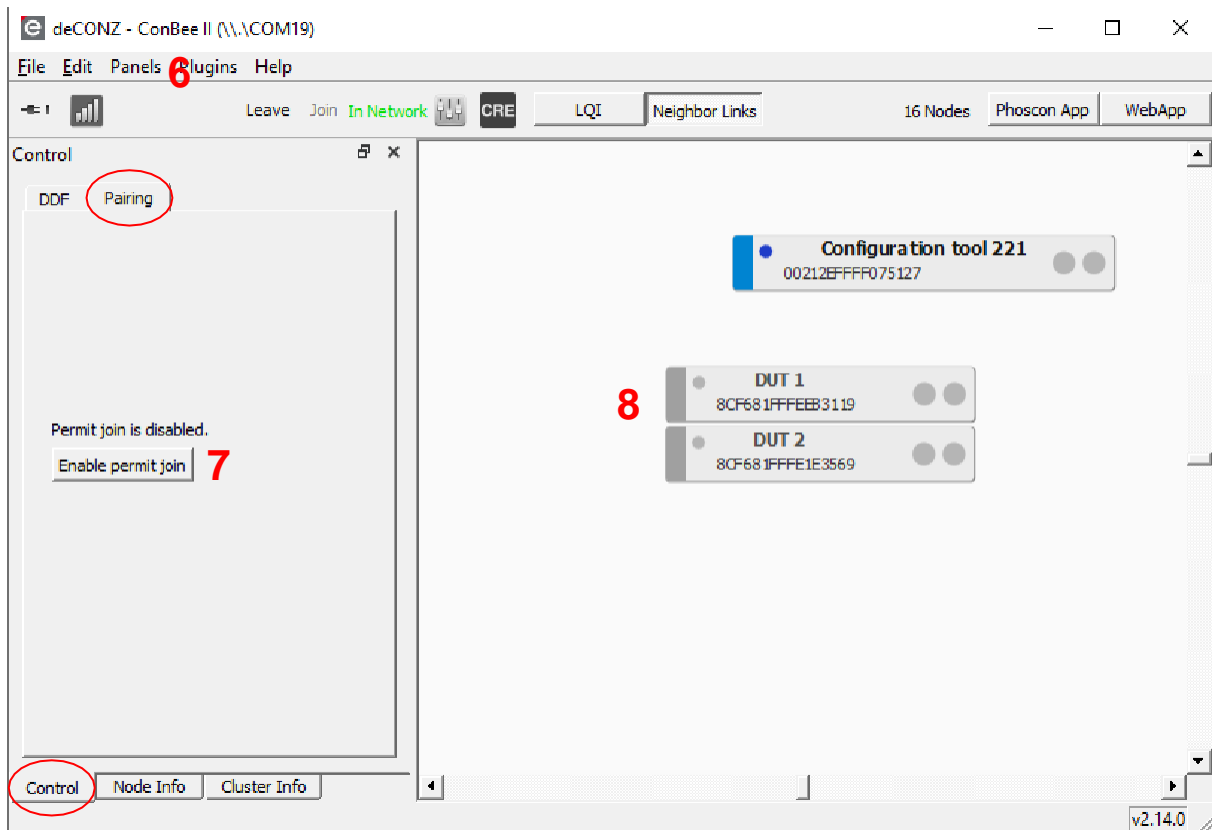
Press three times will enter colour control mode

Press 10 seconds to enter power off mode

## 7.2. Setup PC Tool for DUT1/2 control

Setup steps:

1. Install deCONZ from web <https://deconz.dresden-elektronik.de/win/> newest Version as of writing: 2.16.01
2. Plug EUT 1 into USB port
3. Install USB driver (automatically by windows)
4. Run deCONZ
5. Turn on DUT (see section 7.1)
6. Activate Control panel Panels → Control
7. Open Network by Enable Permit join in Control Panel → Pairing
8. Wait until DUT shows up in main view on the right



## 7.3. Control DUT 1 and 2 remotely by pc Software deCONZ

To set the **brightness** for the DUT (screenshots below):

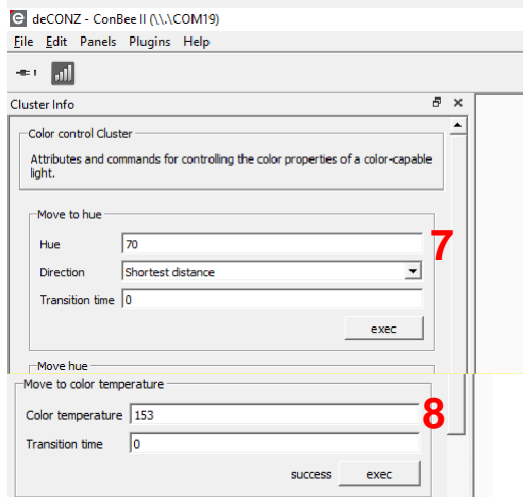
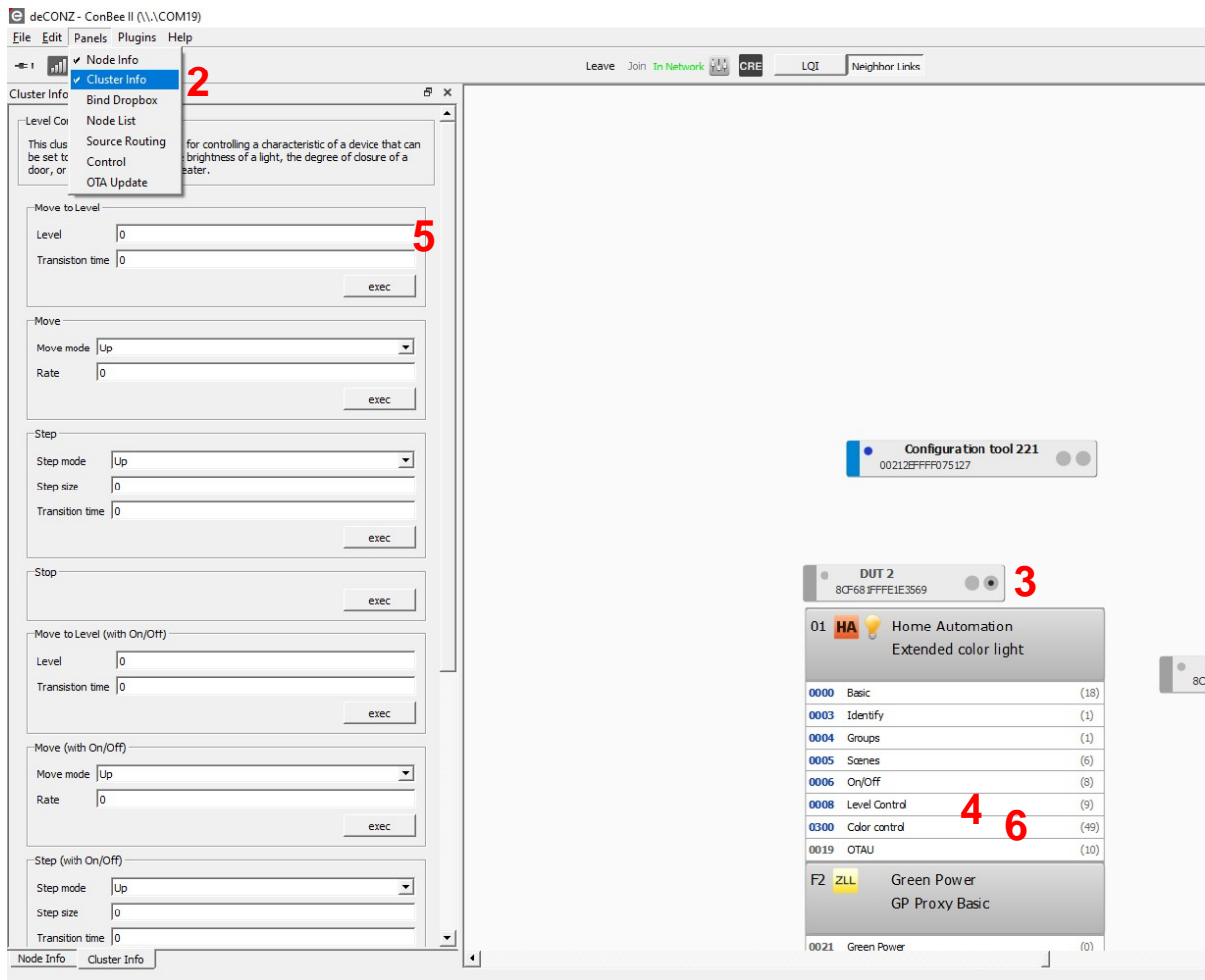
1. Run deCONZ
2. Select cluster info
3. Click the right dot at the DUT in main view to open the cluster list
4. Click Level Control
5. Move to Level 255 → Exec (full brightness), 0 (minimum brightness)

To set the **color** of the light to a specific value, use 1.-3. And the following steps:

6. Click Color Control
7. Move to Hue: 0 for red, 85 green, 170 blue → Exec

To set the **color temperature** of the light to a specific value, use 1.-3. And the following steps:

6. Click Color Control
8. Move to color temperature cold white: 153 warm white: 370 → Exec





## **8. ESD and Immunity tests EN301 489-1/-17**

DUT 1 and EUT 1 form a network, light is turned on. Then Test, Result=?

DUT 1 and EUT 1 form a network, light is turned off. Then Test, Result=?

After Test, send commands from deCONZ, intended changes happened?

## **9. Emissions CE/FCC Part 15b**

DUT 1 and EUT 1 form a network, light is turned on 50% mixed warm/cold white full brightness with color temperature 262 (see 7.3).

DUT 1 put on Qi Pad for Charging (EUT3 with EUT2 and USB-C cable provided)

DUT 1 charging by microUSB cable and EUT2

## **10. Ecodesign/Photobiosafety/CEC&DOE**

DUT 1 or 2 can be used for these tests. Setup light as described in section 7.3.

## **11.FCC warnings**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Specific Absorption Rate (SAR) information:

This Mobile Phone meets the government's requirements for exposure to radio waves. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons regardless of age or health.

FCC RF Exposure Information and Statement The SAR limit of USA (FCC) is 1.6 W/kg averaged over one gram of tissue. Device types: Decolight (FCC ID: XVV-HIVE) has also been tested against this SAR limit. The highest SAR value reported under this standard during product certification for properly worn on the body is 0.150W/kg. This device was tested for typical body-worn operations with the back of the handset kept 0mm from the body. To maintain compliance with FCC RF exposure requirements, use accessories that maintain a 0mm separation distance between the user's body and the back of the handset. The use of belt clips, holsters and similar accessories should not contain metallic components in its assembly. The use of accessories that do not satisfy these requirements may not comply with FCC RF exposure requirements, and should be avoided.

Body-worn Operation

This device was tested for typical body-worn operations. To comply with RF exposure requirements, a minimum separation distance of 0mm must be maintained between the user's body and the handset, including the antenna. Third-party belt-clips, holsters, and similar accessories used by this device should not contain any metallic components. Body-worn accessories that do not meet these requirements may not comply with RF exposure requirements and should be avoided. Use only the supplied or an approved antenna.

## **12. IC Caution**

- English:

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

- French:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.