



# Technical specification

## Trulifi System 6002.2

Humidity	20 - 90% non-condensing
Storage temperature	-40 to +80 °C
Standards	IEC 62368-1, IEC 62471, IEC 60825-1, IEC 60825-12
Certification	CE / NRTL US Canada / FCC

## Trulifi Access Point 6002.2

Mains voltage	100-240 V, 50/60 Hz
System power	38 W (based on 6 transceivers connected)
Power factor	0.5
Average ambient temperature	25 °C
Operating temperature range	+10 to +40 °C
Network communication	Data link input connection RJ45 Cat. 5/5E/6 Ethernet cable (cable not included)
Multi-user capability	Up to 16 users per Access Point
Transmission mode	Half duplex
Encryption	End-to-End encryption based on AES-128
Standard	Designed for ITU-T G.9991

## Trulifi Controller 6002.2

Mains voltage	100-240 V, 50/60 Hz
Average ambient temperature	25 °C
Operating temperature range	+10 to +40 °C
Network communication	Data link input connection RJ45 Cat. 5 Ethernet cable (cable not included)
Multi-domain capability	Up to 16 Access Points can be controlled with one Trulifi Controller

## Trulifi Transceiver 6002.1

Voltage	24 V DC provided by the Trulifi Access Point 6002.2
System power	5 W at 230 V AC (supplied by Trulifi Access Point 6002.2)
Downlink wireless optical communication support	Infrared, wavelength 850 nm
Average ambient temperature	25 °C
Operating temperature range	+10 to +40 °C
Network communication	Data link input connection RJ12 7m SFTP cable (cable included)

## Trulifi USB Key 6002.1

Voltage	5 V DC provided via USB 3.0
System power	3.5 W
Uplink wireless optical communication support	Infrared, wavelength 940 nm
Average ambient temperature	25 °C
Operating temperature range	+10 to +35 °C
Network communication	Data link input connection USB 3.0 Type-C (cable included)

## System data rate

Net data rate	220 Mbit/s download 160 Mbit/s upload
	<i>Measurement conditions:</i> <ul style="list-style-type: none"> <li>• 1.2 m distance between USB Key and transceiver</li> <li>• USB Key located straight under transceiver (radius 0)</li> </ul>

## System Operating distance and coverage area

Operating distance between USB Key and transceiver	1.2 m to 2.8 m	
Connectivity coverage area per transceiver	<i>Distance between USB key and transceiver:</i>	<i>Ø Radius:</i>
	1.2 m	0.8 m
	2.8 m	1.85 m

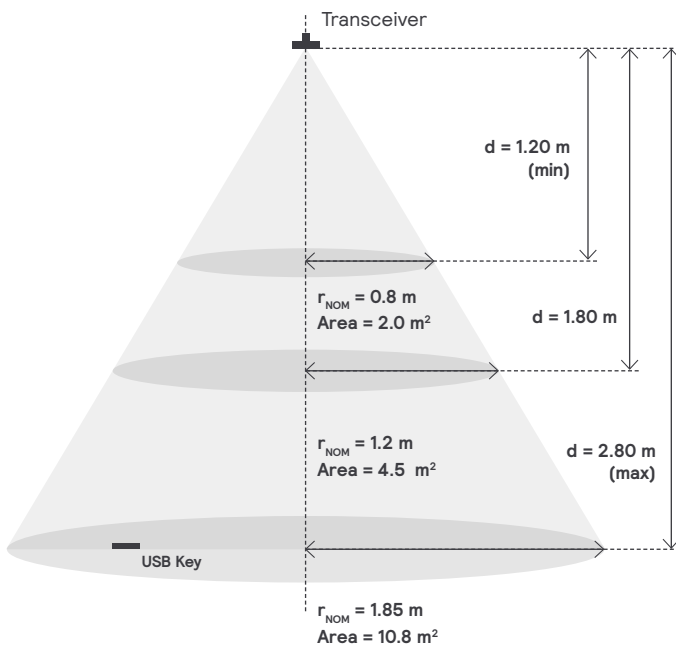


Figure 1: Coverage area

The LiFi coverage area of one transceiver is a circle of which the radius depends on the distance  $d$  between the transceiver and the USB key. Radial distance 0 represents the location directly under the transceiver. The recommended operational area spreads from 0 up to the nominal radial distance  $r_{\text{NOM}}$  as depicted in Figure 1.

The downlink and uplink data rates depend on the distance  $d$  between the transceiver and the USB key, as well as the radial distance, as depicted in Figure 2 and Figure 3.

Trulifi 6002.2 system – Downlink date rate  
6 Transceivers connected to Acces Point

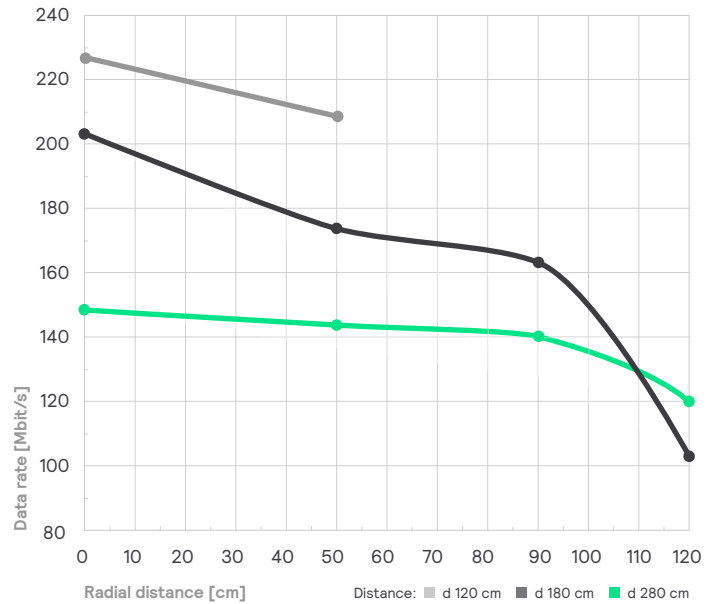


Figure 2: Downlink data rate

Trulifi 6002.2 system – Uplink date rate  
6 Transceivers connected to Acces Point

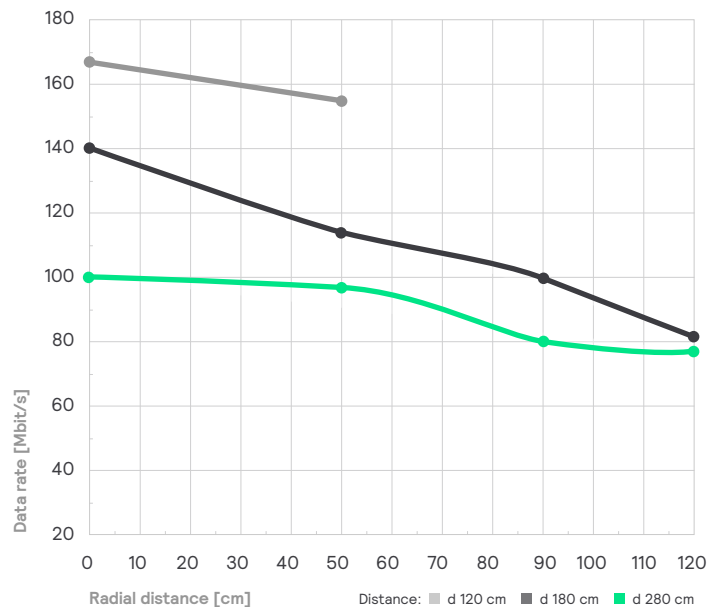
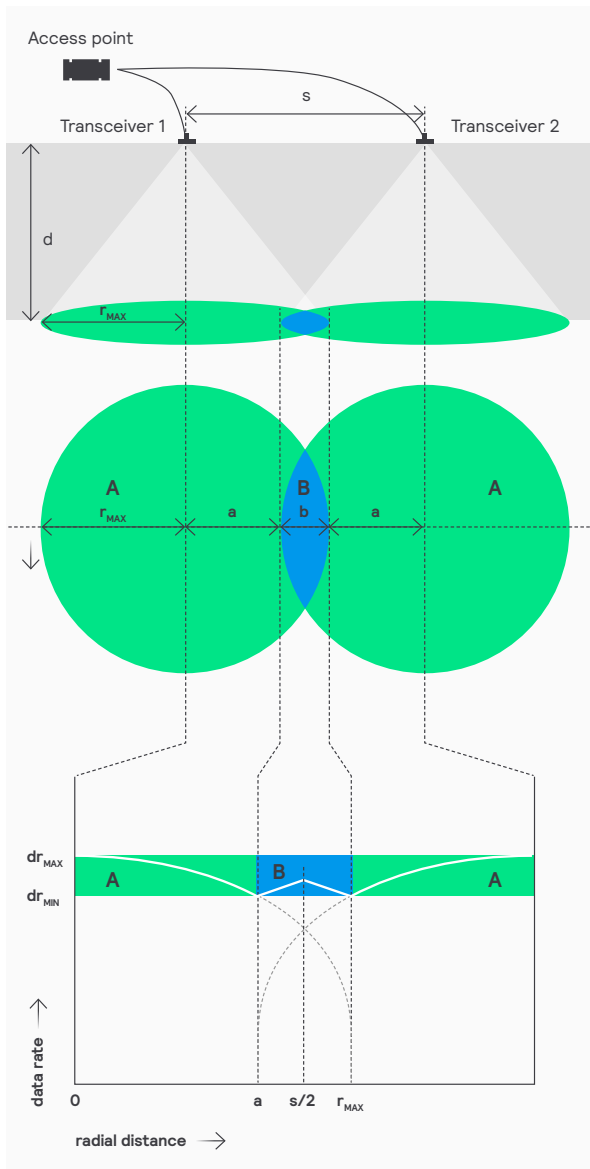


Figure 3: Uplink data rate

### Overlapping coverage areas – No interference



### Overlapping coverage areas – Interference

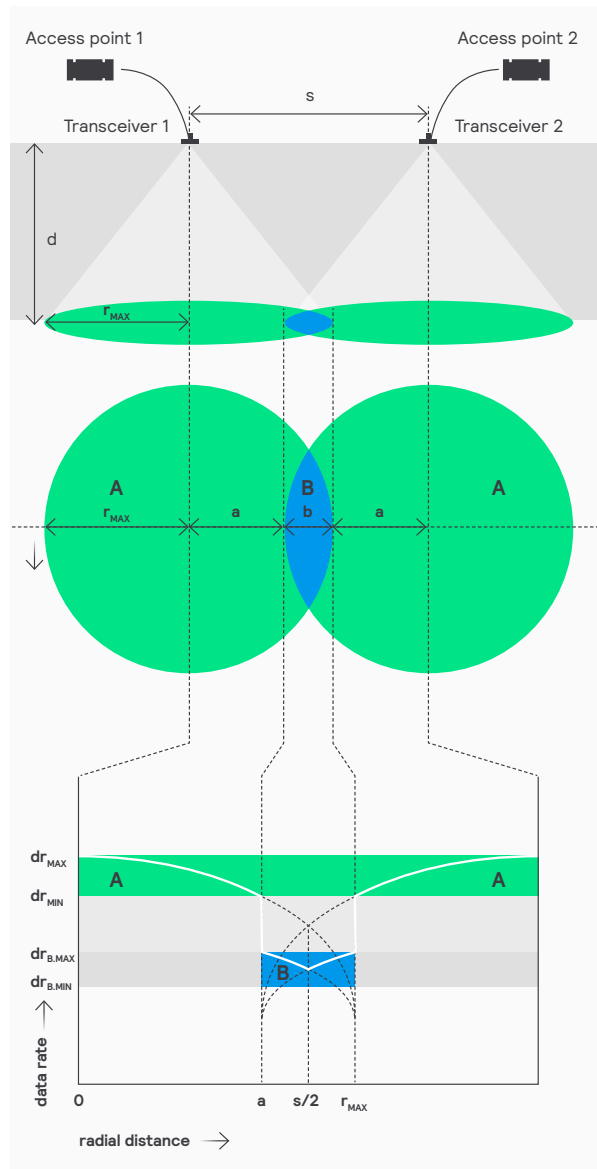


Figure 4: Overlapping coverage areas (same access point: no interference)

Figure 5: Overlapping coverage areas (different access points: interference will occur)

#### Legend

- s transceiver spacing
- d distance transceiver-USB key
- $r_{MAX}$  radius of max coverage area
- a radius of area without interference
- b max width of interference area
- $v = s / d$  relative transceiver spacing
- A areas without overlap
- B overlap area = interference zone
- $dr_{A,MAX}$  Max data rate in area A
- $dr_{A,MIN}$  Min data rate in area A
- $dr_{B,MAX}$  Max data rate in area B
- $dr_{B,MIN}$  Min data rate in area B

#### Design recommendation for $v = s / d$

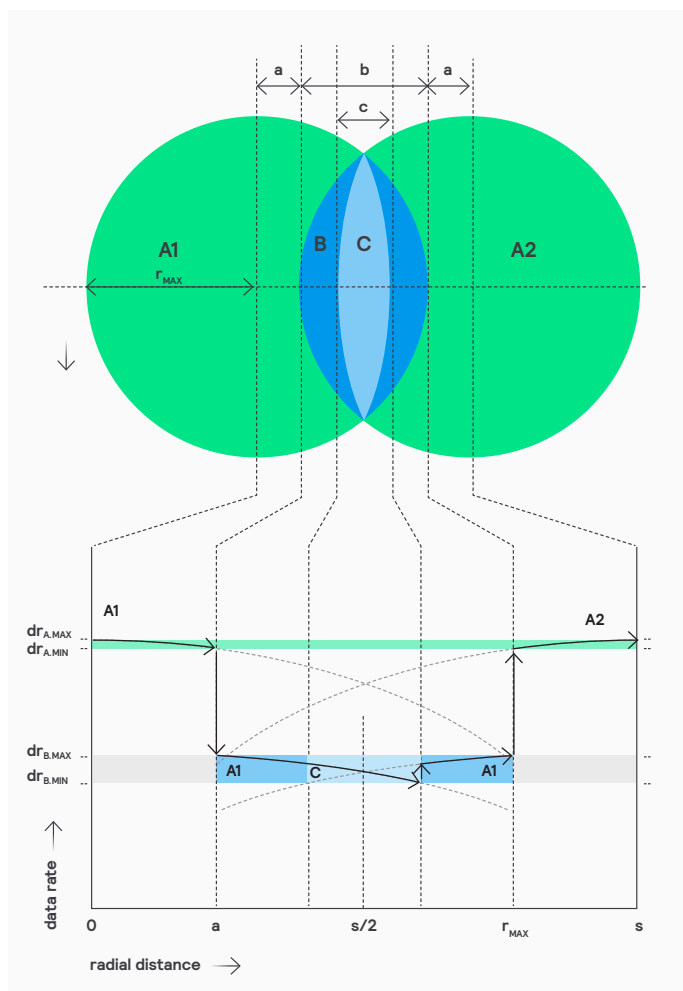
$v_{MIN}$	$v_{OPT}$	$v_{MAX}$
1.0	1.25	1.33

#### Interference example for $s = 2.4 \text{ m}$ and $d = 1.8 \text{ m}$

v	1.33	
	Downlink [Mbit/s]*	Uplink [Mbit/s]*
$dr_{A,MAX}$	208	146
$dr_{A,MIN}$	165	105
$dr_{B,MAX}$	83	53
$dr_{B,MIN}$	50	32

\* Measurement condition: 1 USB key in interference zone

## Handover between two access points



**Figure 6: Handover scenario between overlapping coverage areas**

Figure 6 depicts an example data rate profile when a USB key is travelling from area A1 to A2, assuming A1 and A2 are connected to two different access points. In this case, interference will occur in the interference zone B. The actual handover from access point 1 to access point 2 will take place in the handover zone C, beyond the center point  $s/2$ .

In order to ensure correct handover operation, the Trulifi 6002.2 system allows up to 6 USB Keys to reside in the interference zone.