Features

Key features

- MLX75023 and MLX75123 ToF Chipset
- QVGA resolution
- 120 klx sunlight rejection
- VCSEL illumination (60° or 110°)
- Modulation frequency up to 40MHz
- Distance and confidence data at up to 60 fps
- Separable modules

ToF Chipset board

- MLX75023 QVGA, 320x240 pixels, ToF sensor array IC
- MLX75123 ToF companion chip
- Standard S mount (M12x0.5) lens holder
- Temperature sensor
- Programmable input clock and VMIX voltage
- FPD-Link III serializer

CM-I.MX6 Processor board

- Quad core i.MX6 processor running up to 1.2 GHz
- Calculates distance and confidence data
- Acts as data/control bridge
- Holds customer application (optional)

Illumination board

- 4x VCSELs (60° or 110° field of view)
- Programmable peak optical power (0 – 25W)
- Onboard temperature sensor
- Eye safe (certificate available)

Interface board

- Interface between ToF chipset and CM-i.MX6 Board
- FDP-Link III deserializer
- Power input (9 – 16V) and RJ45 ethernet connector
- GPIO connector (I^2C, SPI, VIN, 3V3 & three GPIOs)

Applications

- Object tracking & counting
- Gesture recognition
- Machine vision systems
- Three dimensional mapping
- Surveillance systems
- Collision detection

Contents

1. Changelog

Version	Date	Changes
001-005	29/08/2017	Internal releases
006	29/08/2017	Initial public release

2. Ordering information

Order code	Characteristics
EVK75123-60-850-1	60 degrees field of view, 850nm VCSELs
EVK75123-110-850-1	110 degrees field of view, 850nm VCSELs

3. Maximum ratings

Parameter	Symbol	Values	Unit
Supply voltage	V_{in}	9 to 16 (**12** typical)	V
Power consumption (at maximum : 600μs of Int. time, 100% illumination power, 50 fps)	$P_{in\ max}$	11	W
Power consumption (nominal parameters : 250μs of Int. time, 50% illumination power, 25 fps)	P_{in}	7.2	W
Surge current	I_{surge}	7	A
Current consumption (at maximum : 600μs of Int. time, 100% illumination power, 50 fps)	$I_{in\ max}$	0.930	A
Current consumption (nominal parameters : 250μs of Int. time, 50% illumination power, 25 fps)	I_{in}	0.6	A
Integration time	T_{int}	600	μs

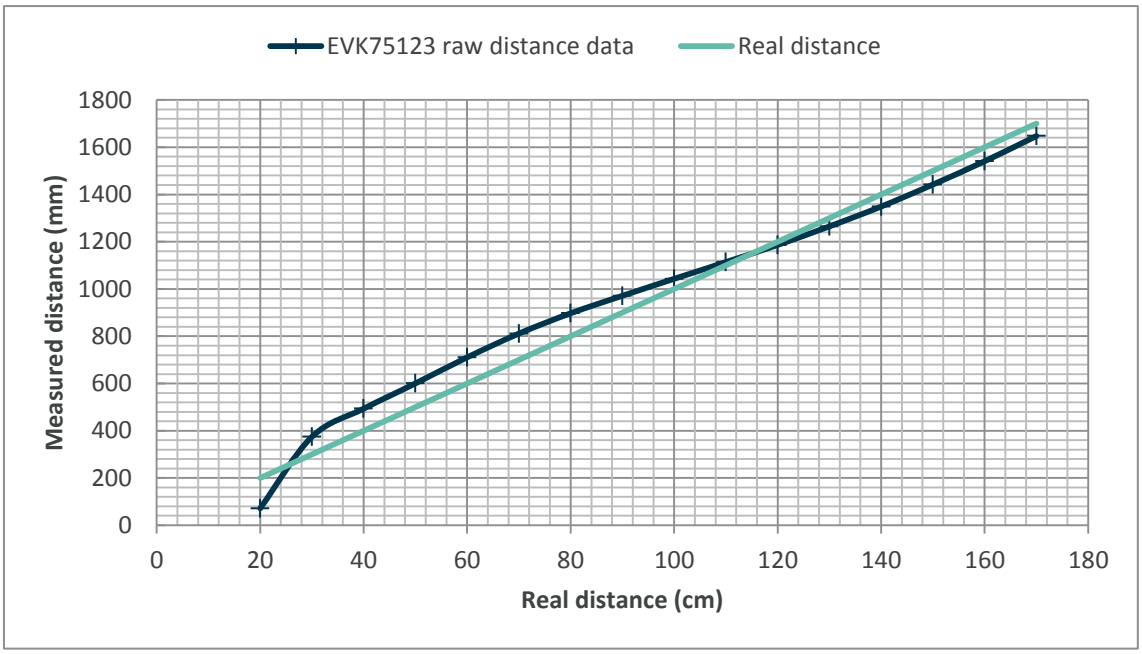
4. Characteristics

Parameter	Symbol	Values	Unit
Modulation frequency	F_{mod}	12 to 40 (**20** typical)	MHz
MLX75123 input clock frequency	F_{in}	40, 48 or 80	MHz
Optical power peak per steradian, in direction of optical axis, at setting 50%	P_{opt}	19.2 (60° FoV EVK) 6.72 (110° FoV EVK)	W/sr
Phase image dark noise in A-B mode	N_{Dark}	3.6	DN

5. Typical performance

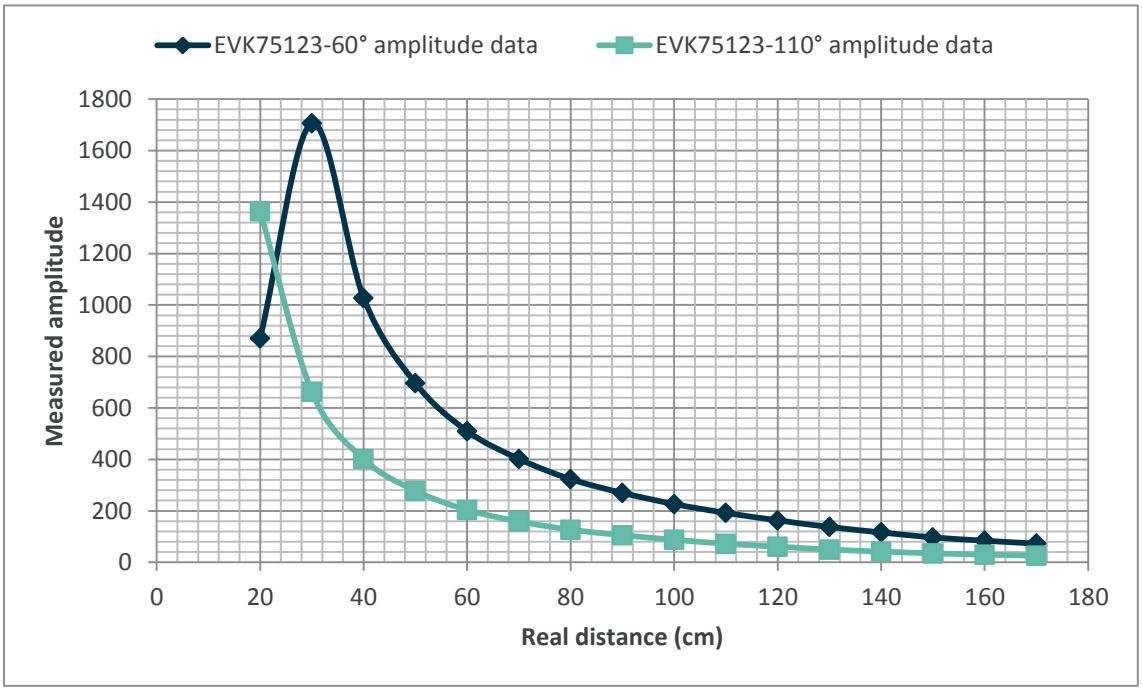
5.1. Linearity

Measured distance as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point.



5.2. Amplitude

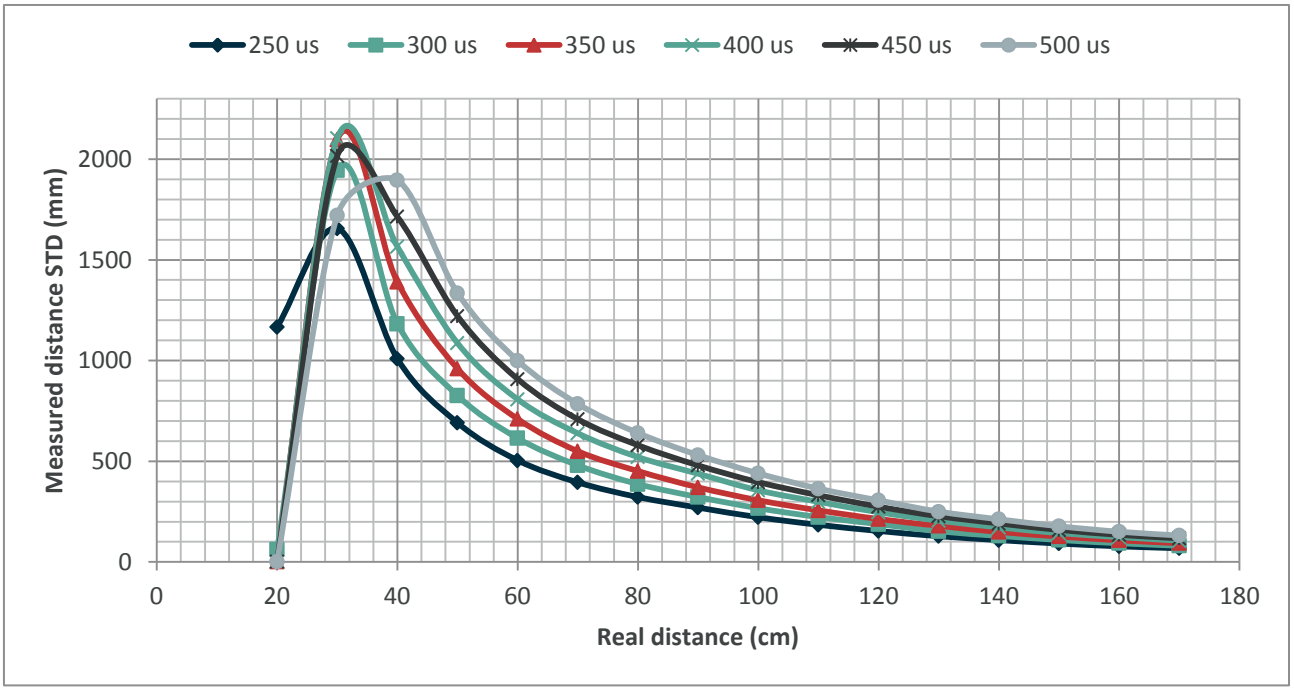
Measured amplitude as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, target reflectance is around 50 %.



NB: Decreasing values at close range are related to the saturation of the sensor.

5.2.1. Influence of the integration time on the amplitude

Measured amplitude values as a function of real distance, T_A = 25 °C, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under office light conditions, target reflectance is around 50 %. 60° FoV EVK was used.

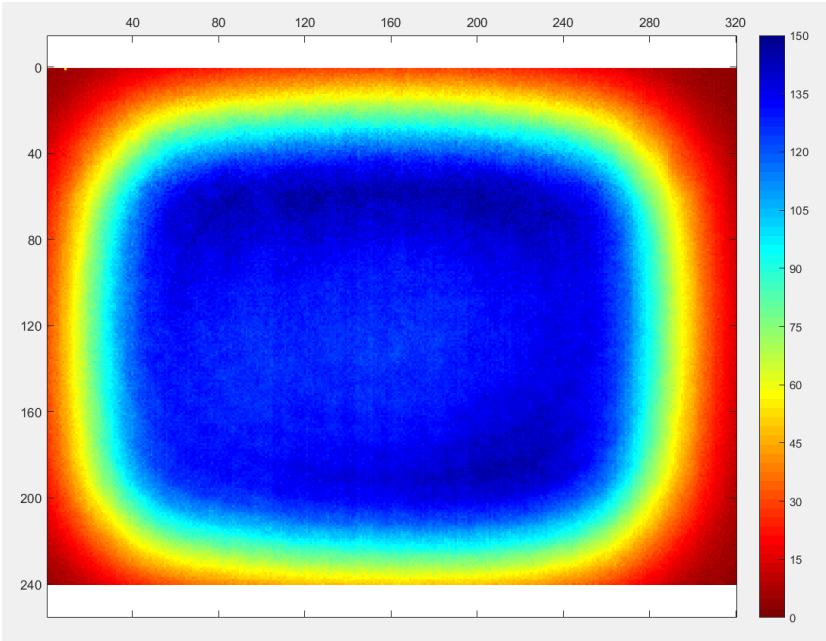


NB: Decreasing values at close range are related to the saturation of the sensor.

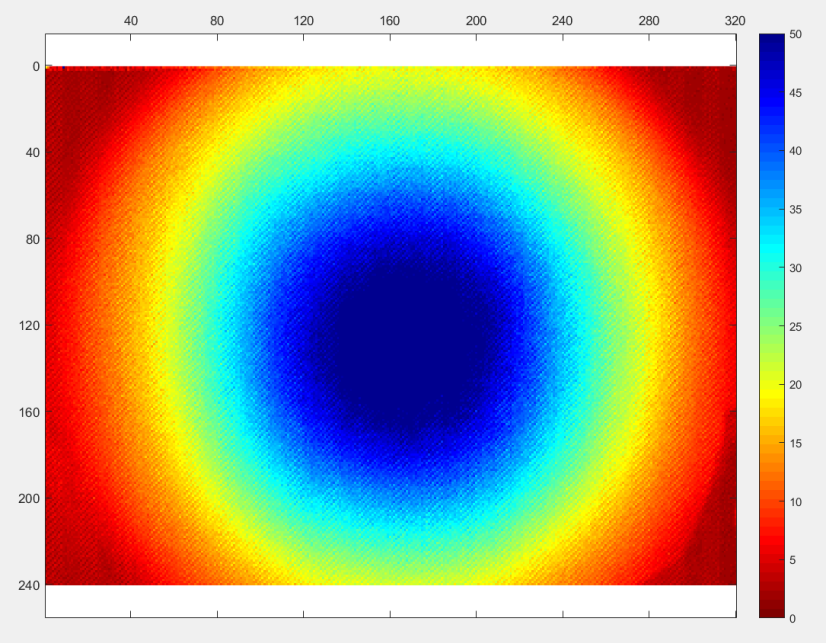
5.2.2. Amplitude uniformity

Measured amplitude values in front of a white wall at 1 meter, T_A = 25 °C, F_{mod} = 20 MHz, P_{ill} = 50.
Amplitude scale in DN indicated on the right.

5.2.2.1. EVK75123 60 degrees field of view



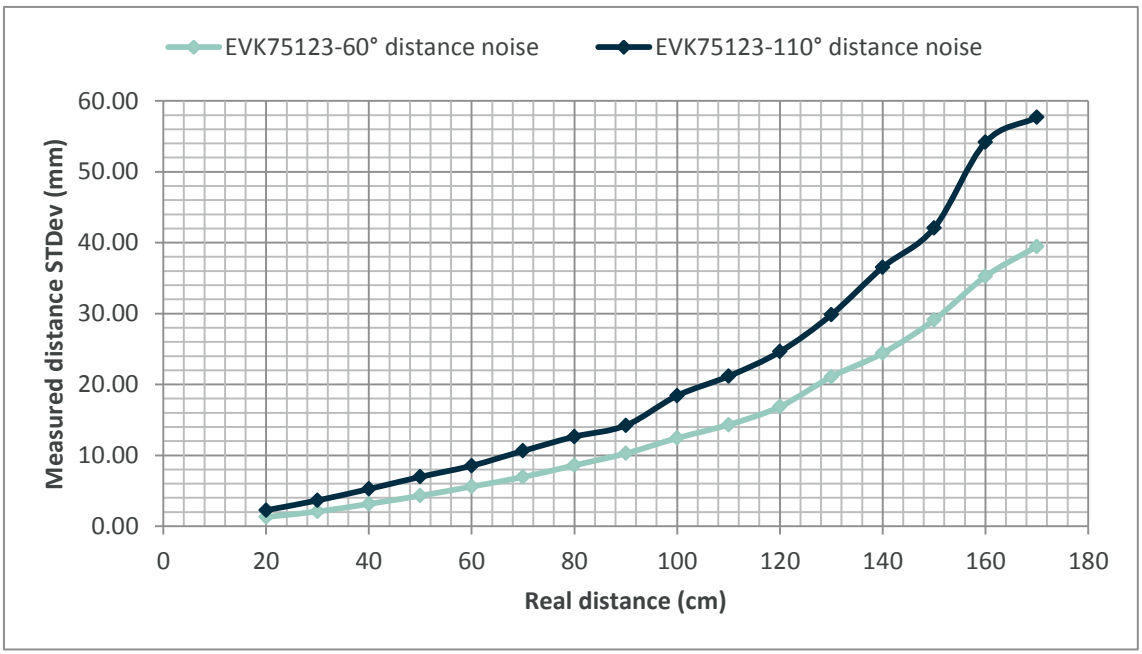
5.2.2.2. EVK75123 110 degrees field of view



5.3. Distance noise

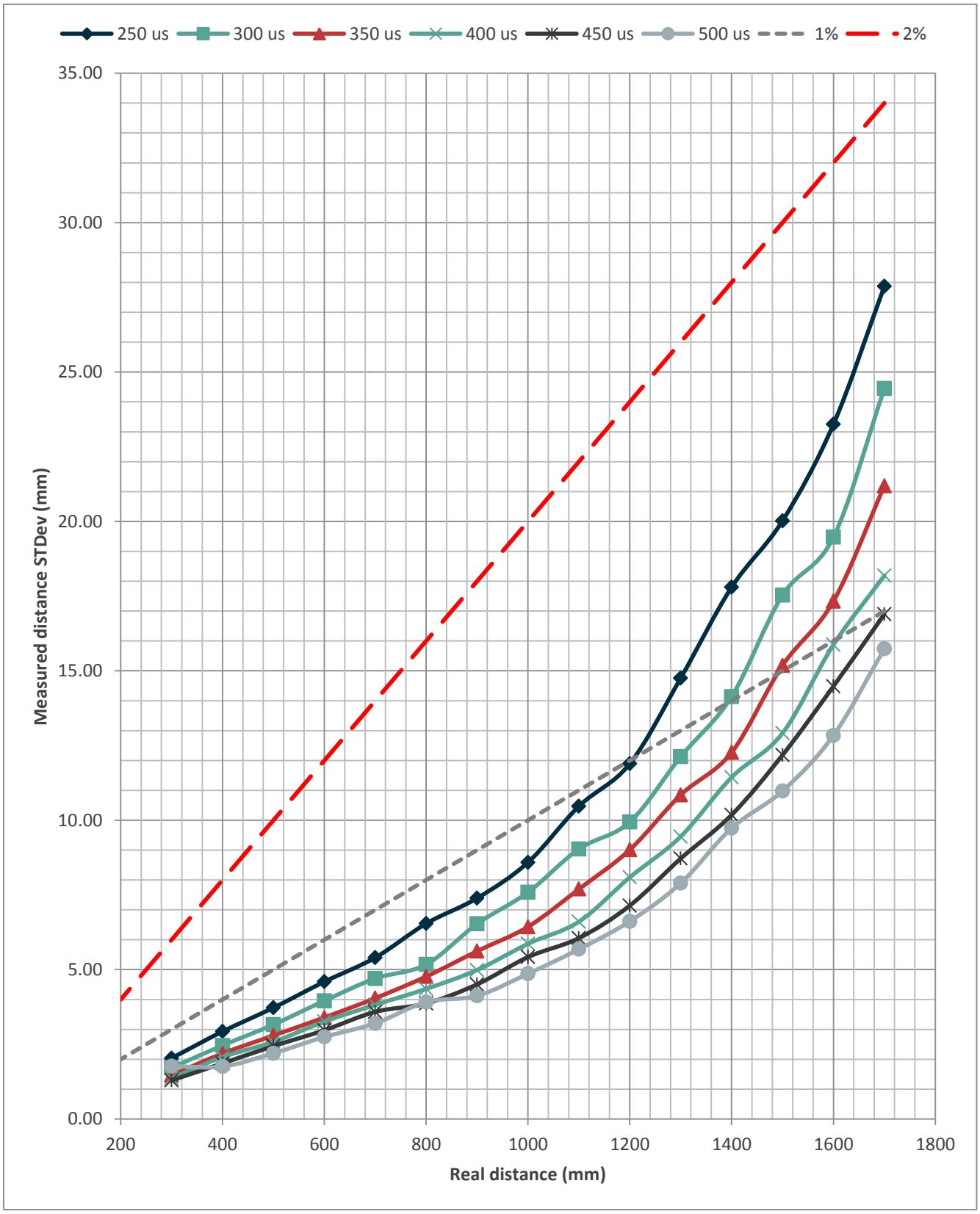
5.3.1. Typical distance noise values

Measured distance standard deviation (STDev) of center pixel as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under various ambient light conditions, target reflectance is around 50 %.



5.3.2. Influence of the integration time on the distance noise

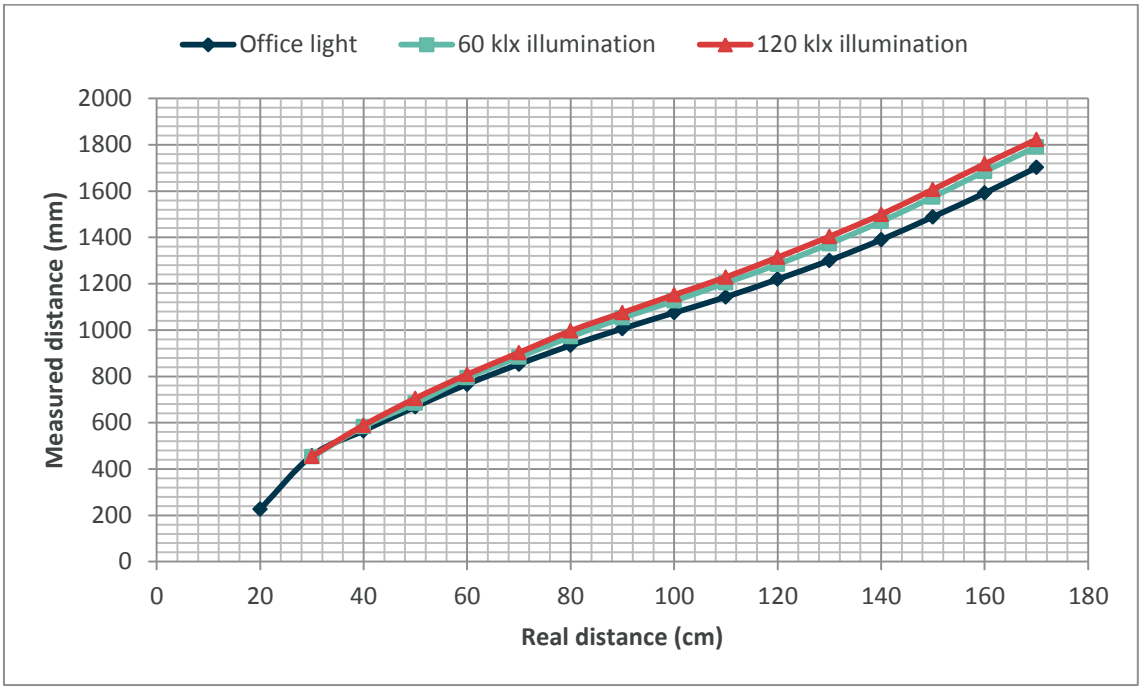
Measured distance STDev as a function of real distance, T_A = 25 °C, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under various ambient light conditions, target reflectance is around 50 %. 60° FoV EVK was used.



5.3.3. Influence of the sunlight

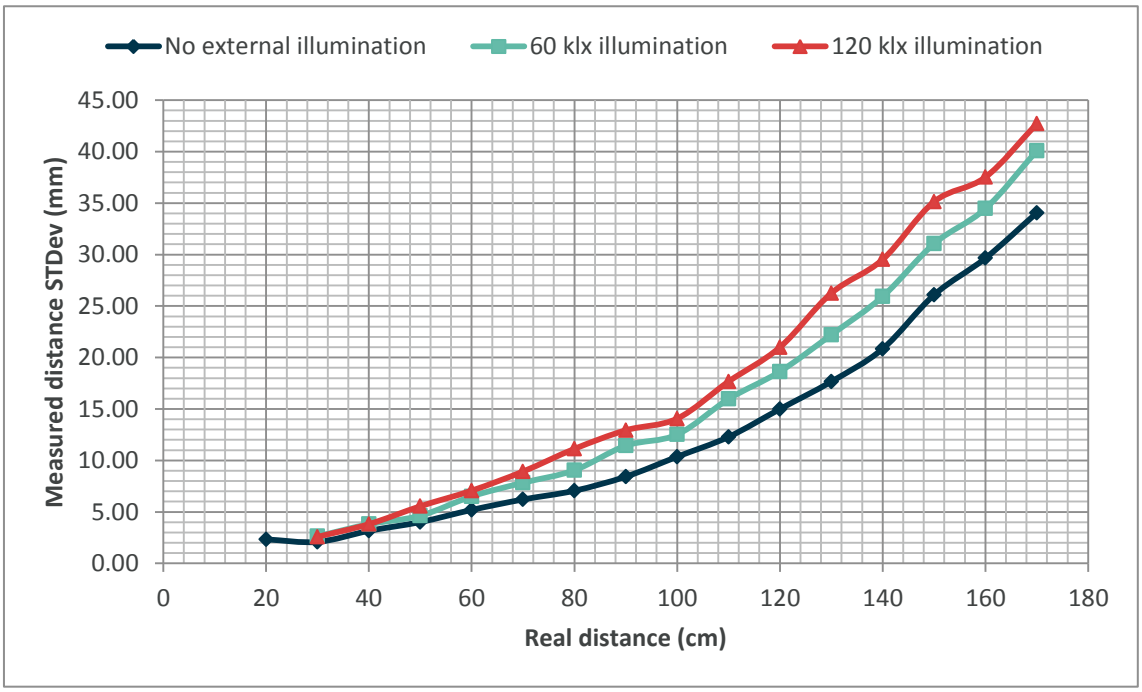
5.3.3.1. Influence on linearity

Measured distance as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under various ambient light conditions, target reflectance is around 50 %.



5.3.3.2. Influence on distance noise

Measured distance STDev as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under various ambient light conditions, target reflectance is around 50 %.

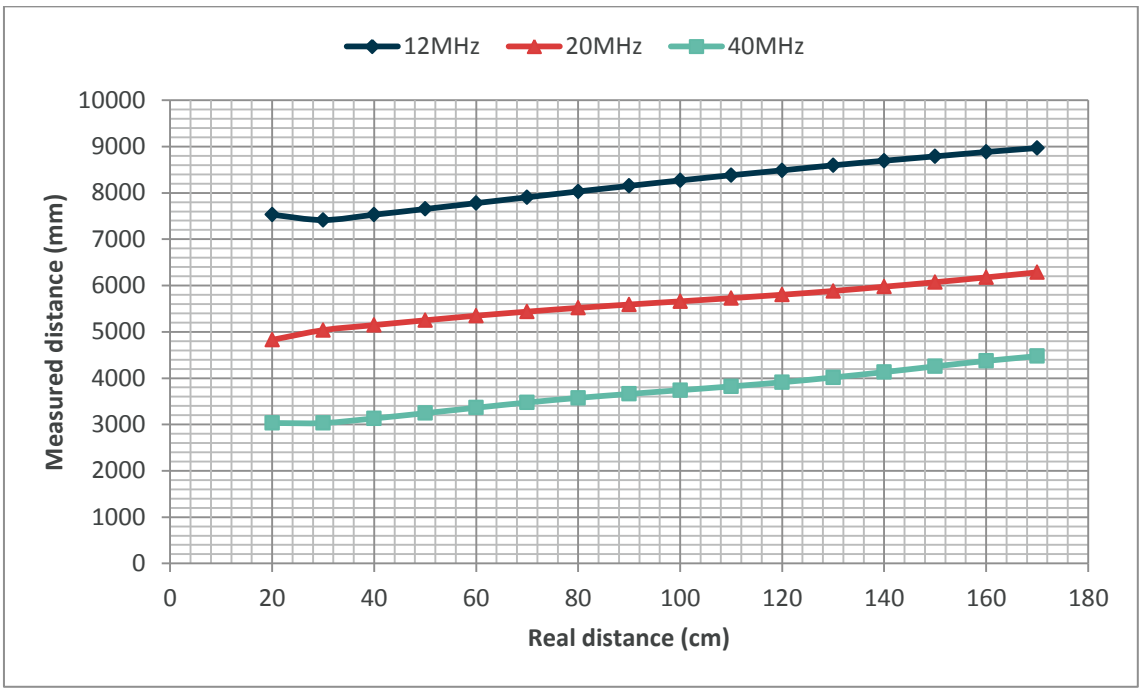


NB: Points are missing at 20cm for the 60 klx and 120 klx curves because of saturation of the sensor at close range.

5.3.4. Influence of the modulation frequency

5.3.4.1. Influence on linearity

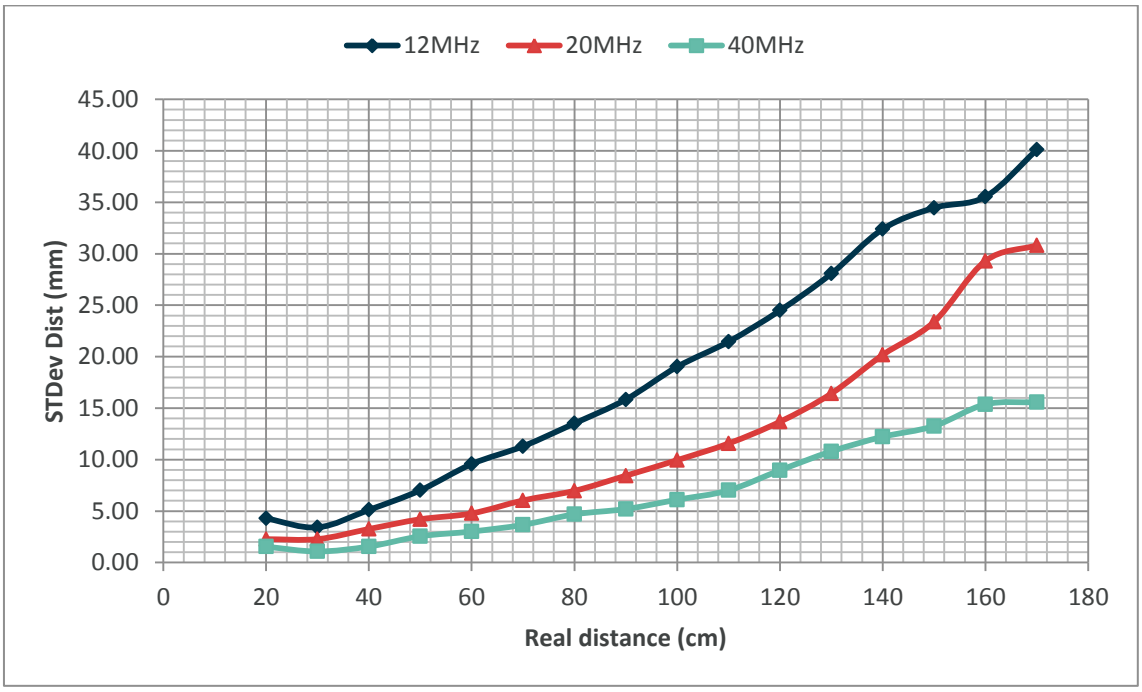
Measured distance as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under various ambient light conditions, target reflectance is around 50 %.



NB: The distance offset of these linearity curves depends on the modulation frequency and can be compensated using the register 0x00C1 (DistOffset00).

5.3.4.2. Influence on distance noise

Measured distance STDev as a function of real distance, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, statistics over 100 frames per point, under various ambient light conditions, target reflectance is around 50 %.

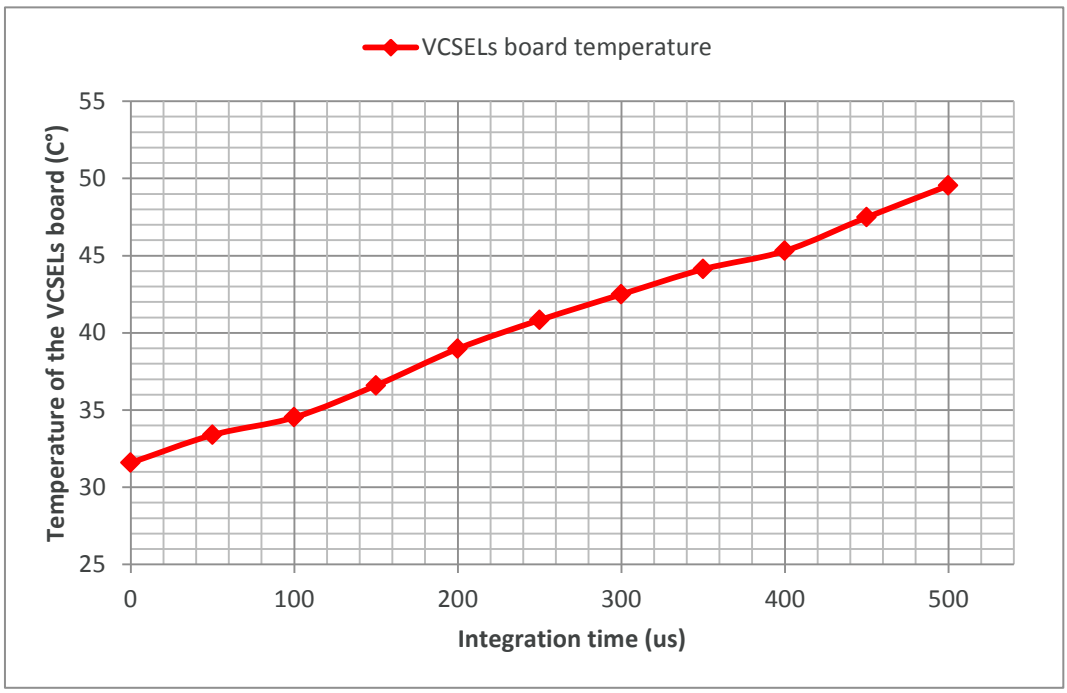


6. Temperature

6.1. Temperature of the illumination unit

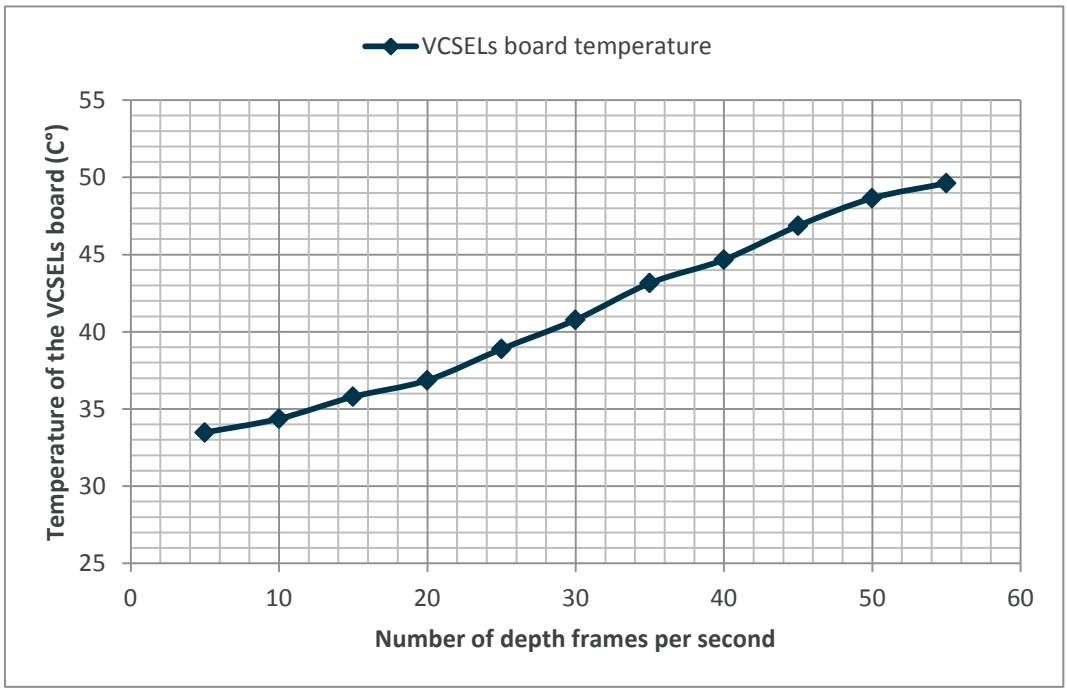
6.1.1. Influence of the integration time

Temperature of the VCSELs as a function of the integration time, T_A = 25 °C, F_{mod} = 20 MHz, P_{ill} = 50 %, 25 frames/sec.



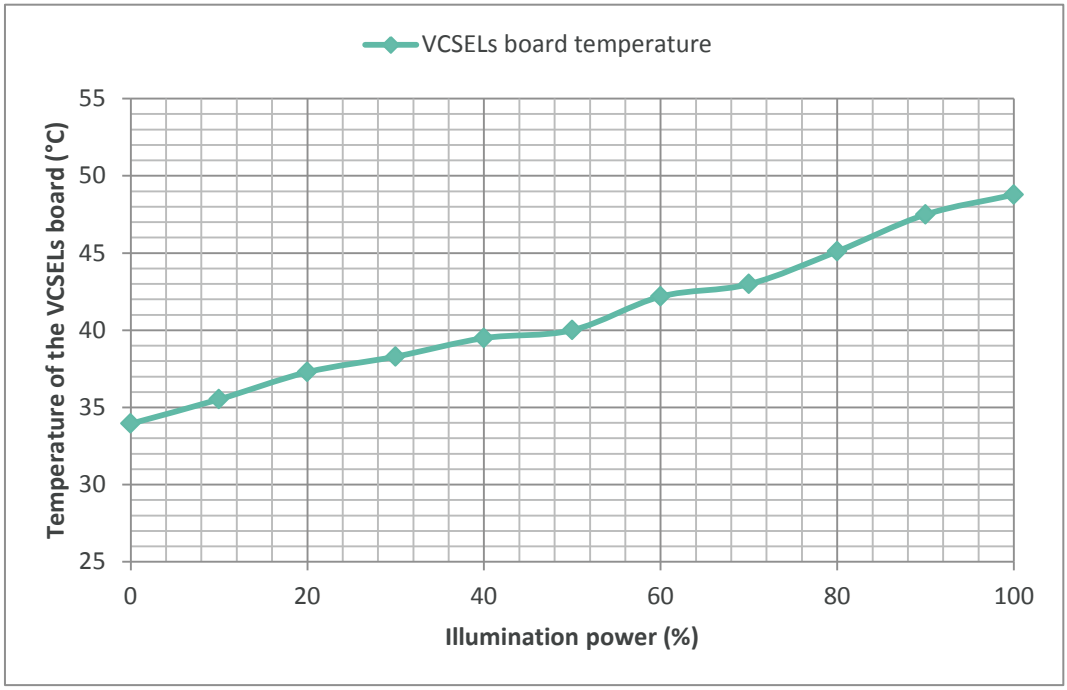
6.1.2. Influence of the frame rate

Temperature of the VCSELs as a function of the integration time, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %.



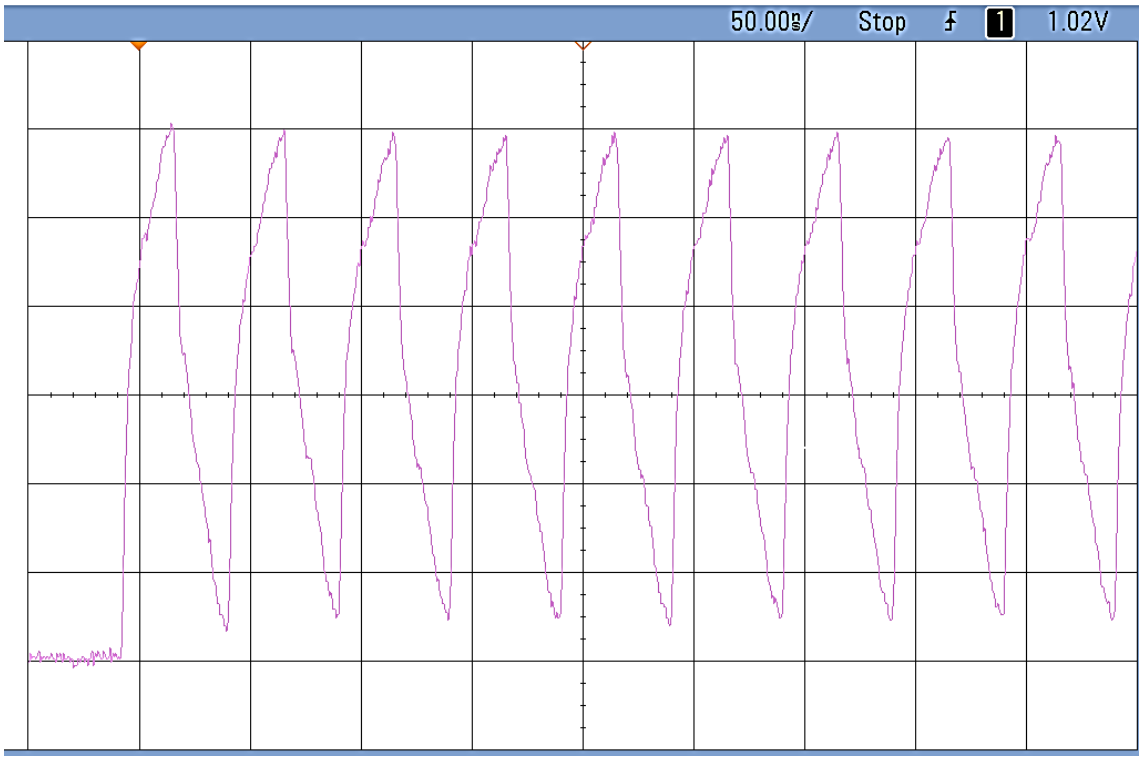
6.1.3. Influence of the illumination power

Temperature of the VCSELs as a function of the integration time, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, P_{ill} = 50 %, 25 frames/sec.

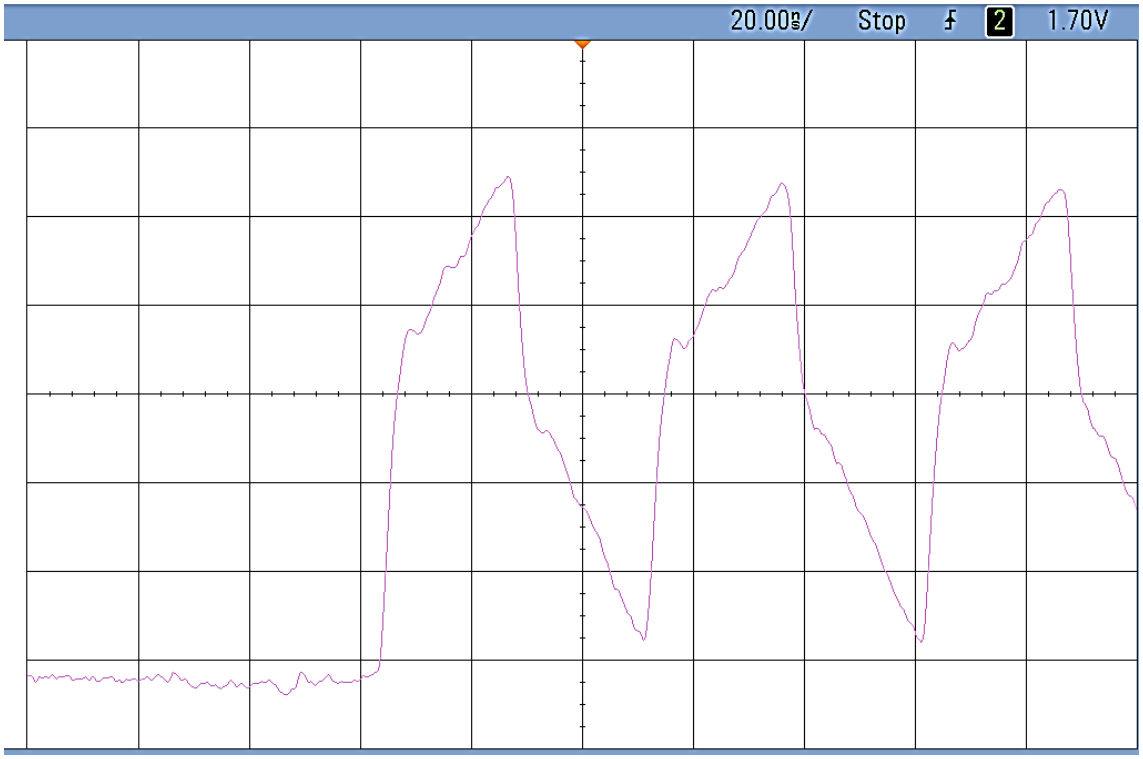


7. Typical light waveforms

7.1. Light waveform at 20MHz



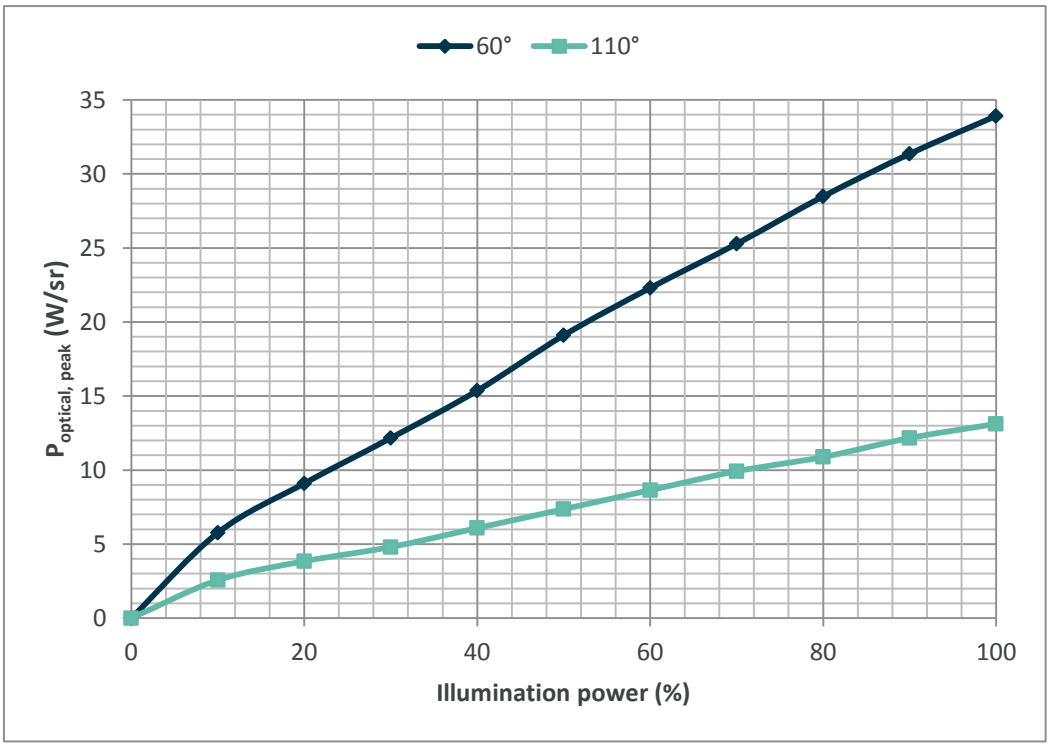
7.2. Light waveform at 40MHz



8. Optical power

8.1. Influence of the illumination power setting on the radiant intensity

Peak radiant intensity at the center of the image, r measured as a function of the illumination power, T_A = 25 °C, T_{int} = 250 μs, F_{mod} = 20 MHz, with 60° EVK75123 and 110° EVK75123.



9. Warning

The use of the EVK75123 at maximum illumination power and integration time when recording frames with a high number of frames per seconds will result in important self-heating of the illumination board. This may lead the VCSELs to reach their temperature limit at around 70°C, in that case the evaluation kit will stop recording frames for a few seconds in order to reduce the temperature of the illumination board.

Moreover the processor at the back of the processing board is also producing a lot of heat making all the evaluation kit being hot when manipulated with bare hands, please be careful.

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