BROADCOM®

AFBR-S20W2xx: Qwave Spectrometer Series
Qwave Compact Spectrometer

Data Sheet

Table of Contents

Chapter 1: Overview

Spectroscopy is a powerful tool used to analyze the properties of materials and substances based on their interaction with light. In process analytics, mini spectrometers are used to monitor and control chemical reactions, assess the quality of materials, and optimize production processes. This chapter provides an overview of the different Qwave models, their specifications, features, and possible applications.

1.1 Ordering Information

Broadcom® spectrometers detect light from the very low ultraviolet wavelengths starting at 190 nm up to signals that appear in ranges up to 1700 nm in the near infrared region. The compact-sized Qwave AFBR-S20W2xx product line is available in three different wavelength configurations.

Part Number	Description	Wavelength Range	Typical Spectral Resolution (FWHM)	Blaze Wavelength
AFBR-S20W2UV	Qwave UV	220 nm to 390 nm	0.3 nm	240 nm
AFBR-S20W2VI	Qwave VIS	350 nm to 880 nm	0.6 nm	500 nm
AFBR-S20W2NI	Qwave NIR	700 nm to 1030 nm	0.5 nm	800 nm

Figure 1: Sensitivity Overview
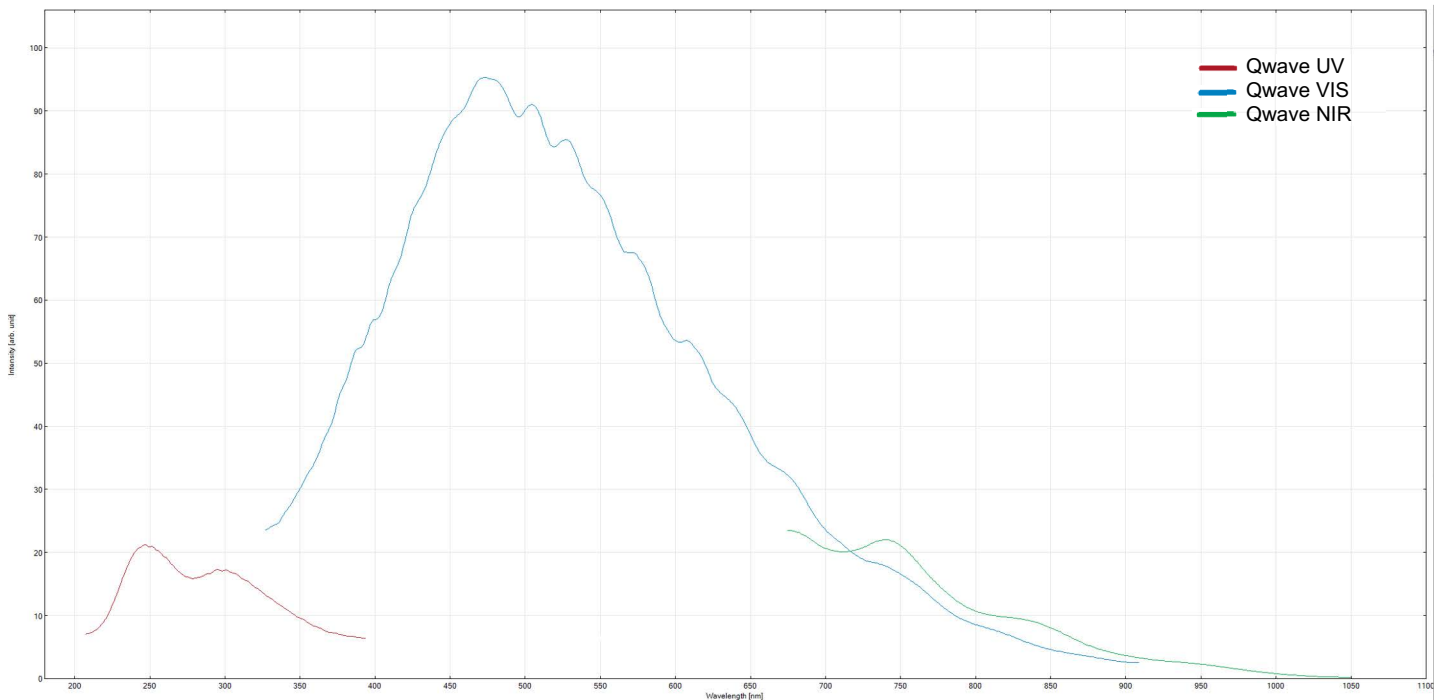
1.2 Features

This compact spectrometer is designed for flexible integration for sophisticated measurements. The Qwave offers high optical performance, is proven in industrial surroundings, and includes the following features:

■ Compact design
■ High spectral resolution
■ High sensitivity and dynamic range
■ Exceptional thermal stability
■ 3648-pixel linear CCD sensor
■ Optical input via an SMA fiber connector or free-focused beam
■ User-changeable entrance slit (using SlitKit AFBR-S20SK-V2)
■ Up to four I/O channels for external triggering, shutter control, and general-purpose I/O (GPIO)
■ USB 2.0 (high speed), UART, and SPI communication interfaces
■ Calibration data stored in internal memory
■ Full processing of spectra in the device
■ Averaging and smoothing
■ Internal buffering of up to 2000 spectra without pixel binning
■ Identical communication protocol for all interfaces

1.3 Applications

Broadcom spectrometers are the ideal tool for many optical measurement applications, such as the following:

■ Light analysis
■ Chemical research
■ Raman spectroscopy
■ Color measurement
■ Quality control
■ Counterfeit detection
■ Environmental analysis
■ Forensic analysis
■ System integration
■ LIBS
■ Process control and monitoring

Chapter 2: Specifications

This chapter describes the full technical details of the Qwave product line including optical, electrical, and mechanical specifications.

2.1 Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min.	Max.	Unit	Notes
Supply Voltage	V_{DD}	—	−0.5	+5.5	V	a
Input Voltage	V_I	All pins on the auxiliary connector; V_{DD} = 0V	−0.3	+3.6	V	a
		All pins on the auxiliary connector; V_{DD} = +5V	−0.3	+5.5	V	
Storage Temperature	T_{STG}	—	−25	+70	°C	
Operating Temperature	T_{OP}	Non-condensing	−15	+60	°C	

a. V_{DD} is supplied via USB or pin 1 (+5V_AUX_IN) on the auxiliary connector.

2.2 Optical Specifications

V_{DD} = +5V, T_{amb} = 25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Notes
Wavelength Range	R_λ	AFBR-S20W2UV	220	—	390	nm	
		AFBR-S20W2VI	350	—	880		
		AFBR-S20W2NI	700	—	1030		
Resolution (FWHM)	RES	AFBR-S20W2UV	—	0.3	—	nm	a
		AFBR-S20W2VI	—	0.6	—		
		AFBR-S20W2NI	—	0.5	—		
Wavelength Accuracy	—	AFBR-S20W2UV	—	0.1	—	nm	
		AFBR-S20W2VI	—	0.2	—		
		AFBR-S20W2NI	—	0.2	—		
Thermal Wavelength Drift	—	AFBR-S20W2UV	—	0.004	—	nm/°C	
		AFBR-S20W2VI	—	0.015	—		
		AFBR-S20W2NI	—	0.009	—		
Pixel Count	—	—	—	3848	—	pixel	
Focal Length	—	—	—	75	—	mm	
Width of Entrance Slit	—	—	—	20	—	µm	b
Numerical Aperture	NA	—	—	0.1	—	—	
Dynamic Range	DR	Single acquisition	—	2000:1	—	—	c
Bad Pixel	—	—	—	0	0.25	%	d
Signal-to-Noise Ratio	SNR	Value for each single pixel	—	350:1	—	—	e
Stray Light	SL	—	—	0.1	—	%	f
Exposure Time	t_{EXP}	—	0.000003	—	600	s	
Trigger-to-Exposure Jitter	$Jitter_{Trigger}$	For continuous synchronous trigger	0	—	t_{EXP}	µs	g

a. Valid only with a slit width of 20 µm.

b. The standard slit width is 20 µm. Other slit widths are available for OEM customers and as part of the Broadcom slit evaluation kit (part number AFBR-S20SK-V2).

c. DR (dynamic range) is defined as follows:
   DR = saturation value / average readout noise

d. A hot or cold pixel is defined as a bad pixel. Two or more adjacent pixels are not allowed. The value refers to the complete pixel number of the used sensor.

e. SNR (signal-to-noise ratio) per pixel averaged over 100 single spectra is defined as follows:
   SNR = saturation value / RMS noise

f. Measured with a long-pass-filter and a broadband light source.

g. t_{EXP} means the current adjusted exposure time for exposing this spectrum.

2.3 Electrical Specifications

V_{DD} = +5V, T_{amb} = 25°C, unless otherwise specified.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V_{DD}	—	+4.5	+5.0	+5.5	V	a
Input Voltage	V_I	All pins on the auxiliary connector; V_{DD} = 0V	0	—	3.3	V	a
		All pins on the auxiliary connector; V_{DD} = +5V	0	—	+5.0	V	
HIGH-Level Input Voltage	V_{IH}	All pins on the auxiliary connector; V_{DD} = +5V	2.1	—	—	V	a
LOW-Level Input Voltage	V_{IL}	—	—	—	0.7	V	
HIGH-Level Output Voltage	V_{OH}	—	2.6	3.3	—	V	
LOW-Level Output Voltage	V_{OL}	—	—	0	0.5	V	
Supply Current	I_I	—	—	150	—	mA	a, b
Output Current	I_O	All pins on the auxiliary connector	6	—	—	mA	
A/D Resolution	—	—	—	16	—	Bit	
A/D Sample Rate	—	—	—	1	—	MSa/s	
A/D Readout Time	—	Readout time of all pixels from the sensor	—	3.7	—	ms	
Pulsed Output Cycle Period	T_{PWMCP}	On each trigger-I/O	2000	50000	512000	µs	
Pulsed Output Duty Cycle	T_{PWMDC}	On each trigger-I/O	49	50	51	%	
UART Baud Rate	BR_{UART}	See Section 3.2.2, UART, for more details	300	57600	3000000	baud	
SPI Bit Rate	BR_{SPI}	See Section 3.2.3, SPI, for more details	1	—	10	MHz	
Time to Reset the Device	T_{Reset}	Active low	1	—	—	ms	

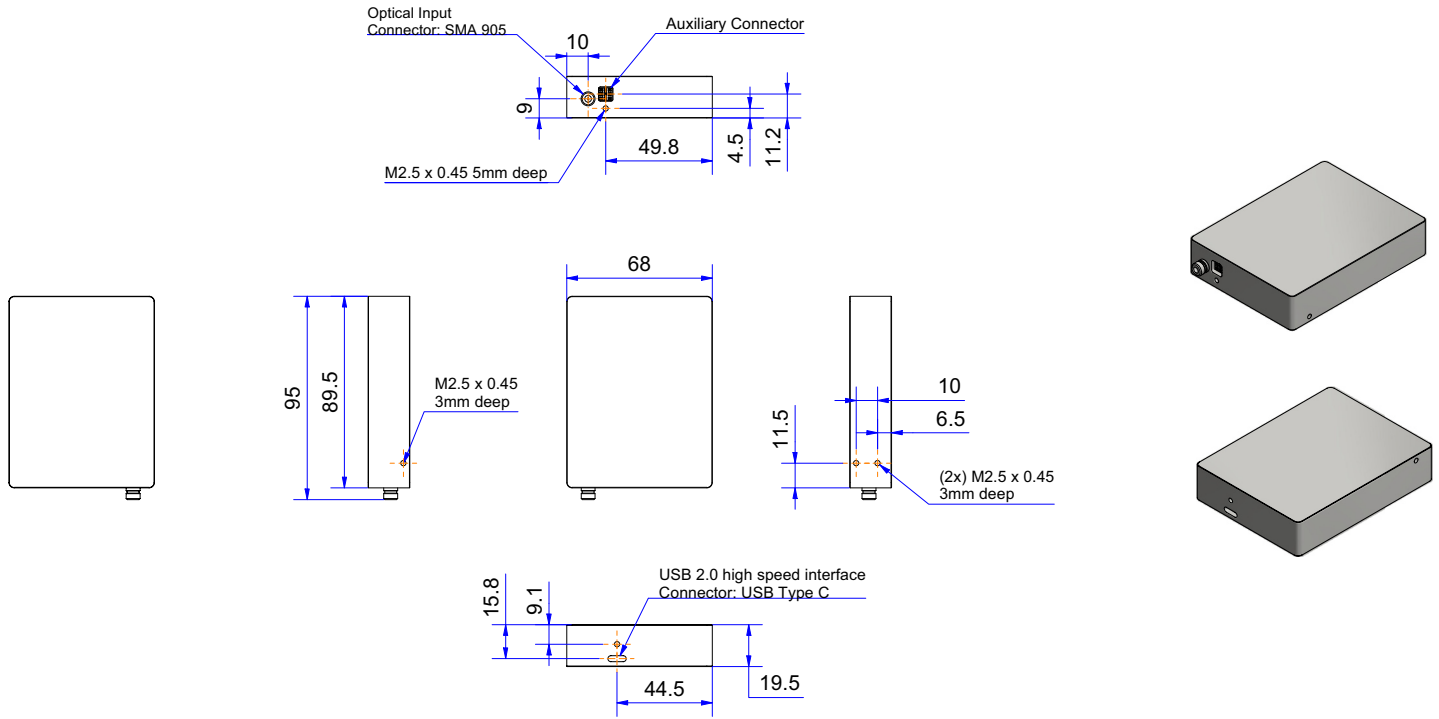a. V_{DD} supplied via USB or pin 1 (+5V_AUX_IN) on the auxiliary connector.

b. Device initialized and taking spectra; no additional connection or external load on the auxiliary connector.

2.4 Mechanical Specifications

Parameter	Symbol	Conditions	Typical	Unit
Weight	M	—	155	g
Dimensions	—	(L × W × H)	89.5 × 68 × 19.5	mm
Optical Input Connector	—	—	SMA 905	—

2.5 Technical Drawing

Optical Input
Connector: SMA 905

Auxiliary Connector

10

9

49.8

4.5

11.2

M2.5 x 0.45 5mm deep

68

95

89.5

M2.5 x 0.45
3mm deep

11.5

10

6.5

(2x) M2.5 x 0.45
3mm deep

15.8

9.1

USB 2.0 high speed interface
Connector: USB Type C

44.5

19.5

NOTE: All dimensions are in mm. 3D CAD files are available for download.

2.6 Auxiliary Connector

The front-side connector of the spectrometer provides different input and output signals such as trigger-I/Os and standard serial communication interfaces such as SPI and UART.

The connector used in the Qwave is a SQT-103-01-L-T manufactured by Samtec.

The recommended mating connector has the part number TMMH-103-01-L-T also available from Samtec. Using a connector from another supplier with a pitch of 2 mm should also work for connecting the auxiliary interface.

Figure 2: 9-Pin Auxiliary Interface Pin Numbering
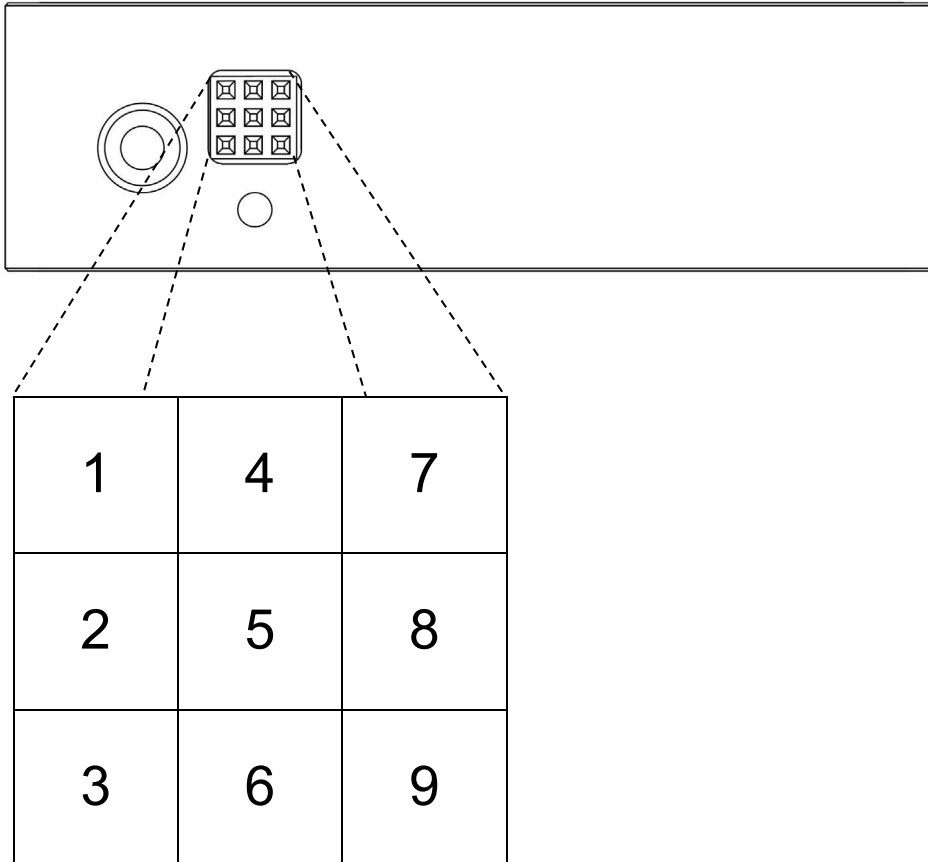
The following table describes all the interface pins. Contact Broadcom for additional information on the auxiliary interface.

Table 1: Auxiliary Interface Pin Descriptions

Pin Number	Signal Name	Type	Description	Notes
1	+5V_AUX_IN	PWR	Power input	
2	TRIG_IO_0	IO	Low-latency trigger input/output	
3	TRIG_IO_1	IO	Low-latency trigger input/output	
4	RESETn	I	Reset input (low active)	a
5	AUX_MUX_0	IO	Multiplexed I/O 0	b, c
6	AUX_MUX_1	IO	Multiplexed I/O 1	c, d
7	AUX_MUX_2	IO	Multiplexed I/O 2	c
8	AUX_MUX_3	IO	Multiplexed I/O 3	c
9	GND	PWR	Ground	

a. Internally pulled up.

b. Internally pulled up on startup.

c. See Table 2 for detailed information.

d. Internally pulled down on startup.

The configuration of the four multiplexed pins of the auxiliary connector is selected by pulling the signal up or down on pins 5 and 6. The signal level is sampled on startup of the Qwave, and the selected interface is configured. As standard, the signal on pin 5 is pulled up and the signal on pin 6 is pulled down to select the UART interface and Trigger I/Os 2 and 3 as default. After the interface is configured inside the spectrometer, the signal lines are pulled up or down according to the Notes column in Table 3. Table 2 describes the pin configuration according to the applied pull-up or pull-down signal on startup. A resistor value of 4.7kΩ to 10kΩ is recommended. If the SPI interface or the UART interface with flow control is selected, Trigger I/Os 2 and 3 are not available. At the moment, only the SPI interface and the UART interface without flow control are implemented in the firmware. If you need any of the other interfaces, contact the support team.

Table 2: Auxiliary Interface Multiplexed Pin Configuration

Pin	SPI	UART with Flow Control	UART without Flow Control	I2C
Pin 5 state on startup	Pull-down	Pull-down	Pull-up	Pull-up
Pin 6 state on startup	Pull-down	Pull-up	Pull-down	Pull-up
5	SPI_POCI	UART_RXD	UART_RXD	I2C_SCL
6	SPI_PICO	UART_TXD	UART_TXD	I2C_SDA
7	SPI_SCK	UART_CTS	TRIG_IO_2	TRIG_IO_2
8	SPI_CSn	UART_RTS	TRIG_IO_3	TRIG_IO_3

Table 3: Signal Description of Multiplexed Auxiliary Pins

Signal Name	Type	Description	Notes
SPI_POCI	O	Peripheral Out Controller In for SPI	a
SPI_CSn	I	Chip Select for SPI (low active)	b
SPI_SCK	I	Serial Clock for SPI	a
SPI_PICO	I	Peripheral In Controller Out for SPI	a
UART_RXD	I	Receiver input for UART	b
UART_TXD	O	Transmitter output for UART	
UART_CTS	I	Clear to Send input for UART	c
UART_RTS	O	Request to Send output for UART	c
I2C_SCL	I	Clock input for I^2C	c
I2C_SDA	IO	Data input/output for I^2C	c
TRIG_IO_2	IO	Low-latency trigger input/output	
TRIG_IO_3	IO	Low-latency trigger input/output	

a. Internally pulled down if selected.

b. Internally pulled up if selected.

c. Not implemented in the current firmware. Contact support for further information.

Chapter 3: Operation

The Qwave spectrometers are equipped with three serial communications interfaces (SPI, UART, and USB). This chapter describes this communication; other interactions such as trigger modes between, for example, light sources; and standard operation.

3.1 Trigger

Learn more about the different trigger modes of the Qwave spectrometers.

3.1.1 Trigger Modes

The Qwave spectrometer provides two different trigger modes:

- Continuous asynchronous trigger (trigger on end of exposure): This is the default mode. The spectrometer is continuously taking spectra. If a trigger event occurs, the currently exposed spectrum is read out.
- Continuous synchronous trigger (trigger on start of exposure): The spectrometer is continuously taking spectra, and when a trigger event occurs, the next spectrum after the one currently being taken is read out. Choose this mode to ensure that no light is collected for the spectrum before the trigger event occurs. This mode requires more time to take a spectrum. It causes a random trigger delay between zero and the exposure time.

Both trigger modes are usable via an internal (software) or external trigger event.

The readout time of the sensor data is about 3.7 ms, and depending on the adjusted exposure time, the readout behavior is slightly different for an exposure time smaller or larger than the readout time.

If the exposure time is larger than the readout time, the Qwave reads the sensor data of the requested spectrum, while the next exposure occurs. Because of the continuous exposure, there is always a following exposure period regardless of a trigger event.
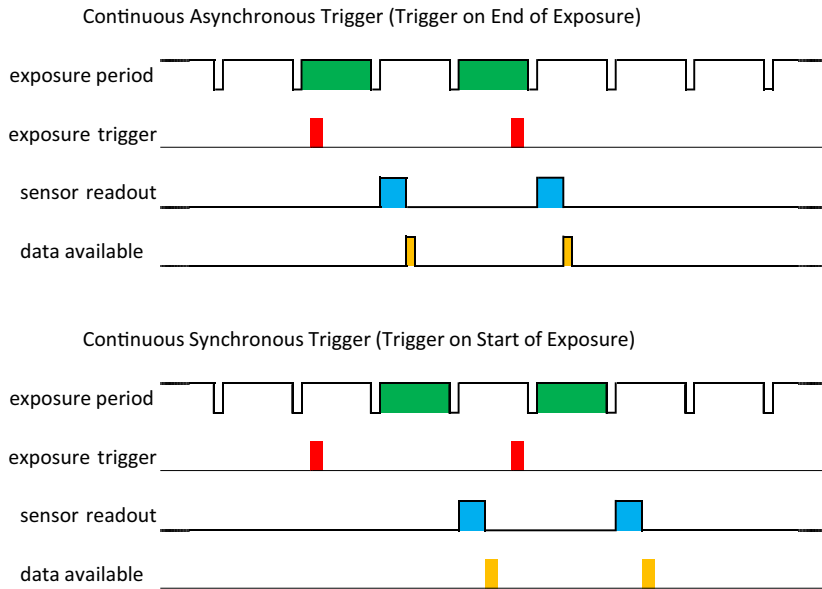
If the exposure time is smaller than the readout time, the Qwave reads the sensor data after the exposure period ends, without starting the next exposure. This leads to a slight nonlinear sensitivity for the next exposure, and therefore a dummy exposure is added before the next stable spectrum can be taken. This will introduce a small delay for the readout cycle.

Figure 3 shows both trigger modes in the idle state with an exposure time greater than 3.7 ms and after a trigger event has occurred. Each spectrum, which must be read out, must be triggered by a discrete trigger event. This means that in a series of spectra or if averaging is active, each single spectrum must be triggered for read out.
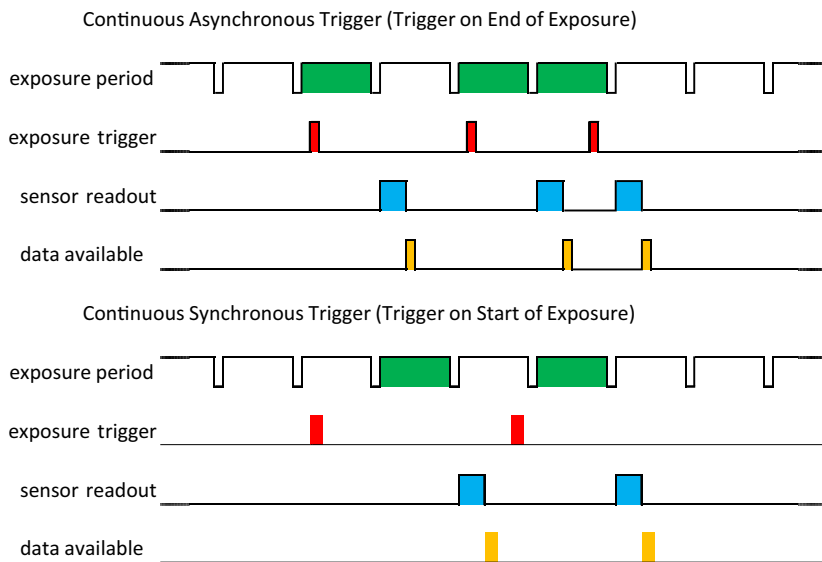
Figure 4 shows the same with an exposure time less than 3.7 ms.

Figure 3: Trigger Mode Diagram with t$_{EXP}$ > 3.7 ms

Exposure Timing for a Single Spectrum

Continuous Asynchronous Trigger (Trigger on End of Exposure)

exposure period

exposure trigger

sensor readout

data available

Continuous Synchronous Trigger (Trigger on Start of Exposure)

exposure period

exposure trigger

sensor readout

data available

Exposure Timing for n Single Spectra or Averaging over n Spectra (n > 1)

Continuous Asynchronous Trigger (Trigger on End of Exposure)

exposure period

exposure trigger

sensor readout

data available

Continuous Synchronous Trigger (Trigger on Start of Exposure)

exposure period

exposure trigger

sensor readout
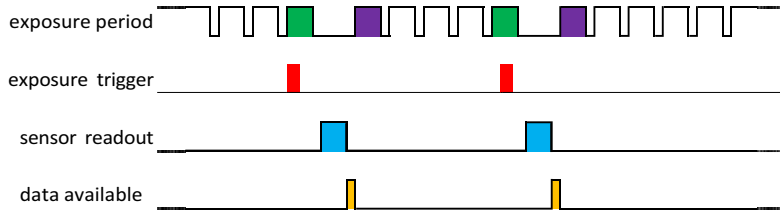
data available

Legend:

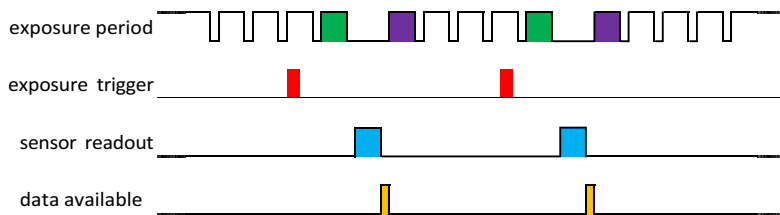|	
	Spectrum taken after reception of a trigger event
	Trigger event (rising or falling edge)
	Sensor readout period
	Data stored in internal spectrum buffer

Figure 4: Trigger Mode Diagram with t$_{EXP}$ < 3.7 ms

Exposure Timing for a Single Spectrum

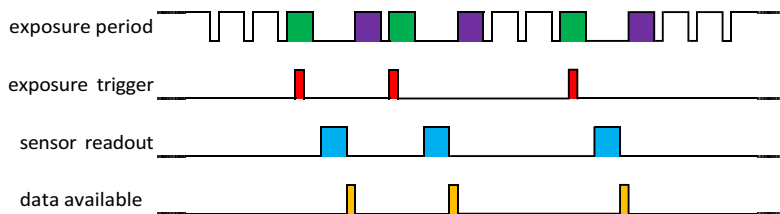Continuous Asynchronous Trigger (Trigger on End of Exposure)

Continuous Synchronous Trigger (Trigger on Start of Exposure)

Exposure Timing for n Single Spectra or Averaging over n Spectra (n > 1)

Continuous Asynchronous Trigger (Trigger on End of Exposure)

Continuous Synchronous Trigger (Trigger on Start of Exposure)
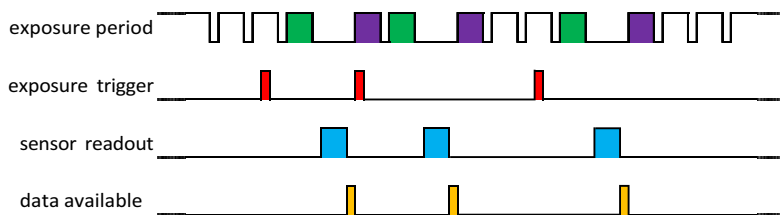
Legend:
- Spectrum taken after reception of a trigger event
- Exposure period of a dummy spectrum to keep sensor in equilibrium
- Trigger event (rising or falling edge)
- Sensor readout period
- Data stored in internal spectrum buffer

3.1.2 Trigger Pins

The auxiliary connector provides up to four trigger input and output pins (pin numbers 2, 3, 7, and 8). Regardless of the configured direction, the spectrometer can read the logical state of the pin.

Adjusted as an input, the pins detect logical voltage levels and can be used as an external trigger source. If a pin is configured as an output, several different output modes are supported, for example to control a shutter, a constant, or a flashing light source. The following table gives an overview of the output modes.

Table 4: Trigger Pin Configurations

Output Configuration	Description
Low	Output is always low.
High	Output is always high.
Low during exposure	Output is high and goes low during the exposure period.
High during exposure	Output is low and goes high during the exposure period.
Pulsed	Output is always pulsed with a 50% duty cycle and the adjusted pulse period.
Pulsed low during exposure	Output is high and pulsed with a 50% duty cycle and the adjusted pulse period during the exposure period.
Pulsed high during exposure	Output is low and pulsed with a 50% duty cycle and the adjusted pulse period during the exposure period.

For an external trigger event, each pin can be configured to receive the trigger event. The trigger is recognized on either the rising edge or the falling edge.

To use a channel as an external trigger source, perform the following steps (pin 2 is used in this explanation):

1. Configure trigger pin 2 as the input.

2. Set the trigger pin number to pin 2.

3. Select either the rising edge or the falling edge.

4. Set the trigger mode to external.

3.2 Communication Interfaces

The Qwave spectrometer has three communication interfaces: USB, UART, and SPI. To control the spectrometer, the communication is split into two layers: the interface layer and the message layer.

The interface layer is individual for each interface type, because it encapsulates the interface-specific properties. For USB, the USB stack implements the interface layer; and for UART and SPI, it is implemented in software. This layer has the message layer as a payload. The message layer contains the commands that control the spectrometer. It is the same for all interfaces. This makes it very simple to switch to another interface if application requirements change. For a detailed description, refer to the NioLink manual.

3.2.1 USB

The Qwave provides a 480-Mb/s USB 2.0 interface, which is available through the USB Type-C connector.

3.2.2 UART

The universal asynchronous receiver/transmitter (UART) interface is located on pins 5 and 6. The additional CTS and RTS signals for hardware flow control are located on pins 7 and 8. At this time, flow control is not supported by the firmware. If your application requires dedicated flow control, contact the Broadcom support team. Using an RS-232 level shifter, it is also possible to have a regular RS-232 interface for serial communication. The communication parameters are 8N1, which means 8 data bits, no parity and 1 stop bit. The following baud rates are available: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200, 128000, 230400, 256000, 460800, 921600, and 3 Mbaud. The standard baud rate is configured to 57600 baud and can be changed after device initialization. For the command description of the UART interface, refer to the NioLink protocol manual.

3.2.3 SPI

The Serial Peripheral Interface (SPI) consists of four signals, PICO, POCI, SCK, and CSn, which are located on the auxiliary connector from pin 5 to pin 8. The SPI interface is primarily intended to be used in embedded systems for communication with microcontrollers. The interface operates in SPI mode 1, which has a clock polarity (CPOL) = 0 and a clock phase (CPHA) = 1. Table 5 and Figure 5 show the communication timings. For the command description of the SPI interface, refer to the NioLink protocol manual.

Table 5: SPI Interface Timing Values

Parameter	Symbol	Min.	Max.	Unit
clock cycle time	$t_{cy(clk)}$	100	1000	ns
data setup time	t_{DS}	1.5	—	ns
data hold time	t_{DH}	2	—	ns
data output valid time	$t_{v(Q)}$	—	23.22	ns
data output hold time	$t_{h(Q)}$	4.5	—	ns
lead time	t_{lead}	4000	—	ns
lag time	t_{lag}	$0.5 \times t_{cy(clk)} + 1.5$	—	ns
delay time	t_d	5000	—	ns

Figure 5: SPI Interface Timing Diagram
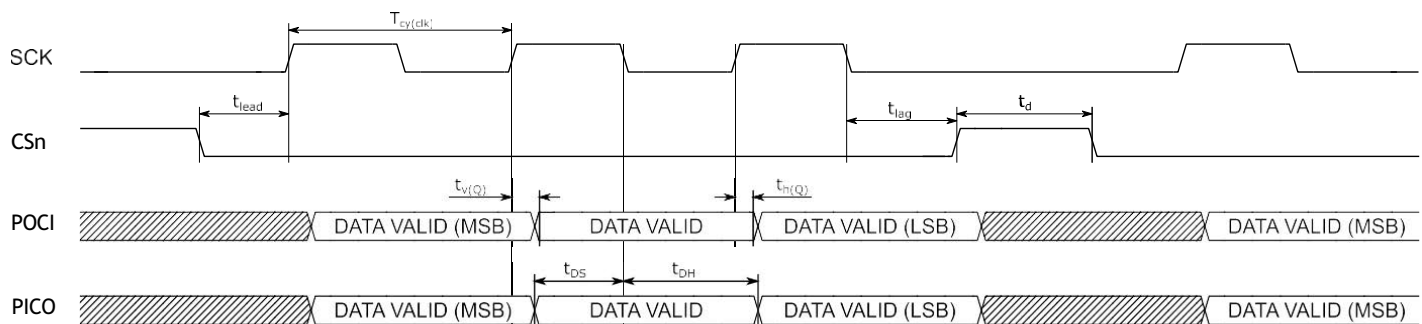
3.3 Other Signals on the Auxiliary Connector

If the spectrometer must be set back to the initial state, a reset input is available on pin 4 of the auxiliary connector. Its polarity is active low, and connecting the pin to the GND signal will reset the device. All settings that were not stored persistent will be lost.

3.4 LEDs

The Qwave spectrometer integrates a green LED and a red LED to indicate different device states. The following table shows the meaning of the LEDs.

Table 6: LED Status

Red LED	Green LED	Description
Off	Off	Device is not supplied.
On	On	Device is supplied, but not enumerated or initialized.
Off	On	Device is enumerated or initialized and in the idle state.
Pulsed On	On	Device is in the operational state, and the sensor is exposed.
Pulsed On	Off	Device is in the bootloader state and awaiting new firmware.

3.5 Spectrum Processing

There are several spectrum processing steps available that can automatically be applied to raw spectra before it is stored in the internal spectrum buffer. All steps can be individually turned on and off. Without any processing, you get the raw image sensor signal. The following table lists and describes these processing steps.

Table 7: Processing Steps

Processing Type	Description	Default Setting
Adjust Offset	Adjust the offset of the spectrum using the dummy pixels of the sensor.	Yes
Correct Nonlinearity	Correct the nonlinearity of the intensity axis.	Yes
Remove Permanent Bad Pixels	Mask permanent bad pixels.	Yes
Subtract Dark	Adjust the dark signal of the spectrum using the dark pixels of the sensor.	Yes
Remove Temporary Bad Pixels	Mask single pixel spikes (N/A for Qwave).	No
Compensate Stray Light	Estimate the amount of stray light and compensate it (N/A for Qwave).	No
Normalize Exposure Time	Normalize the spectrum to an exposure time of 1 second.	Yes
Sensitivity Calibration	Use the sensitivity calibration to correct the spectral sensitivity.	No
Correct PRNU	Correct the photo response nonuniformity.	Yes
Additional Filtering	Apply additional filtering (Savitzky-Golay 3rd order 5 pixels).	Yes
Scale to 16-Bit Range	Scale values to a range of 0 – 65534 and clip larger values to 65535.	No

3.6 Calibration

An individual calibration is performed in the final test of the production process. This data is stored in the internal memory of the Qwave. This so called user calibration can be overwritten by a customer-specific calibration. A second set of calibration data represents the factory calibration and is used only if the user calibration will be reset to the factory settings. The data of the user calibration is used to correct the raw spectra according to the activated processing steps.

3.7 Exchangeable Entrance Slit

The Qwave comes with a default slit width of 20 µm, but it can easily be exchanged by the customer. A wider entrance slit improves the overall spectral sensitivity of the spectrometer, but it reduces the resolution. For applications with a lower requirement for resolution, the wider entrance slit is an advantage that has more sensitivity and increases the scan rate by reducing the exposure time.

Changing the standard slit to a broader one does not necessarily require a new wavelength calibration. If precise wavelength accuracy is needed, you can do a new wavelength calibration using the calibration function in the WAVES software.

For evaluation purposes, a slit kit (AFBR-S20SK-V2) is available. The kit consists of four SMA connectors that have integrated slits with a width of 50 µm, 100 µm, 150 µm, and 200 µm. It allows you to find the right setup for your application. The following table shows the typical resulting resolution for the three Qwave variants with different slits.

Table 8: Typical Resolution for Other Slit Widths

Part Number	Description	Calculated Resolution (FWHM)				
		20 µm (Default)	50 µm	100 µm	150 µm	200 µm
AFBR-S20W2UV	Qwave UV	0.3	0.6	1.2	1.8	2.4
AFBR-S20W2VI	Qwave VIS	0.6	1.2	2.4	3.6	4.8
AFBR-S20W2NI	Qwave NIR	0.5	1	2	3	4

Chapter 4: Software

Broadcom provides a wide range of software for spectrometer evaluation and development of customer-specific applications.

4.1 WAVES Spectroscopy Software

The Broadcom free-to-use and feature-rich WAVES spectroscopy software enables you to use our spectrometers for acquiring spectra, manipulating or analyzing spectra, adjusting the trigger pins, and much more. It also provides functions to do customer calibrations for wavelength, spectral sensitivity, nonlinearity, and more. For a more detailed description, refer to the WAVES user manual on the Broadcom website.

4.2 Software Development Kit

The SDK for the spectrometer can be used to control it and take spectra from additional custom software. The SDK includes a Windows dynamic-linked library (DLL) for the .NET framework, documentation, and sample code. The SDK can be downloaded from the Broadcom website and is free to use.

Alternatively, it is possible to directly communicate with the spectrometer from custom software including embedded systems. The open binary-based and intuitive-to-use communication protocol NioLink enables you to control the spectrometer in a very flexible way. See the communication protocol manuals in the SDK for additional details.

You can download the latest version of WAVES and the SDK from each product page on the Broadcom website.

4.3 Software Updates

Software updates are available on the Broadcom website. Find the latest version on each product page.

https://www.broadcom.com/products/optical-sensors/spectrometers

AFBR-S20W2VI

| Contact Support | Contact Sales | Check Inventory |

Qwave VIS–Compact USB spectrometer with high resolution and sensitivity for VIS measurements from 350 to 880 nm

Overview | Specifications | Documentation | Downloads

With its focal length of 75 mm, the Qwave spectrometer offers technical specifications normally found in much larger spectrometers.

It features high optical resolution and sensitivity, dynamic range and thermal stability. Combined with our unique spectroscopy software, Waves, it's the ideal spectroscopic instrument for all applications that require high performance in a compact design.

Qwave AFBR-S20W2XX Data Sheet

Features

- Wavelengths range from 350-880 nm
- Spectral resolution from 0.6 nm
- High optical sensitivity
- Exceptional thermal stability
- Smart and easy integration

Applications

- Light analysis
- Chemical research
- Raman spectroscopy
- Forensic analysis
- System integration
- Process control and monitoring
- Biomedical applications
- Quality control
- Environmental measurements

Lifecycle Status

Active

Substance Compliance

RoHS6
Y

Chapter 5: Technical Support

This chapter provides some information on troubleshooting and getting direct help from the support team, if you face any problems or need help to successfully evaluate the Broadcom Qwave spectrometer.

5.1 Package Contents

The package contains the spectrometer only. Powerful electronics are integrated into the spectrometer housing. Links to the documentation, software development kit (SDK), and software are written on a small note inside the spectrometer package.

5.2 Customization

If your application needs a special configuration, for example a different wavelength range, contact Broadcom to discuss your OEM module by sending an email to support.spectrometer@broadcom.com.

5.3 Getting Help

For any questions, comments, or requests about the spectrometer, WAVES software, or the SDK, contact the Technical Support Team by sending an email to support.spectrometer@broadcom.com.

5.4 Troubleshooting

This section helps identify problems connecting to the spectrometer and how to proceed.

5.4.1 Green and Red LEDs Are Continuously Lit

Green and red LEDs that are continuously lit indicate that the device driver is not installed or the initial USB enumeration was not completed. This behavior applies only to the USB interface that is used for spectrometer control. Check your USB cable and connection on your PC, and, if need be, try a different USB cable or USB connection. For the UART or SPI, check your connection or verify the correct command for initializing the spectrometer.

5.4.2 Software Cannot Find the Device

Disconnect and reconnect the spectrometer, wait a few seconds, and click the **Rescan** button to update the device list. If this does not resolve the issue, restart the PC and try again.

Check the website for software updates.

If the software still cannot find the device, check the Device Manager from the Windows Control Panel. The spectrometer should display as Qwave in the Measurement and Control category. If the spectrometer is marked with an exclamation or question mark, remove the device, uninstall the software from the Windows Control Panel, restart the PC, and install the software again.

If the spectrometer is not listed in the Device Manager, try a different USB port. If the device does not work on one PC, but works on other PCs, the USB port may not provide enough power for the spectrometer. In this case, use an externally powered USB hub.

If you use your own developed software, try to connect to the spectrometer with the Broadcom WAVES software.