

Fiberoptic Spectrometer ファイバー入射型分光器システム

Avantes社(オランダ)は小型高性能ファイバー入射型分光器を開発して25年以上経ち、さらに進化した高性能型、超小型高分解能型等、次世代に対応する進化型分光器を開発し続けています。新開発のエレクトロニクスボード(AS-7010)により、USB3.0超高速通信・ギガビット伝送並びに低ノイズが実現し、高NA: 0.13の高感度光学ベンチとTE冷却背面照射型CCDディテクタ使用で高感度・高波長分解能分光器(AvaSpec-HERO)が誕生しました。また最新のCMOS技術を駆使したCMOSディテクタを採用し、USB3.0超高速EVOシリーズと組み合わせたCMOS制御・超高速分光器が登場しました。さらに超高速マルチチャンネル分光器(<10ch)は産業用プロセスコントロール等の広帯域や多角的な計測のニーズに有効です。標準・万能型も波長分解能が向上しスリット交換に対応しています。

全ての分光器本体に標準ソフトが付属する他、用途に応じたアプリケーション専用ソフト等を供給いたします。また豊富な校正用光源やファイバー、アクセサリは勿論のこと、カスタム反射プローブ等の特注も一本から承り最適な測定システムを構成することが可能です。

AvaSpec ファイバー入射型分光器

USB2標準仕様 高感度・高波長分解能・高速応答・低ノイズ

NEW 新開発・次世代進化型

USB3.0超高速 / 1Gbps ETH
EVOシリーズ・CMOSディテクター

AvaSpec SensLine

ユーザーのリクエストに応える形で創られた分光器で、蛍光計測、ルミネッセンス計測、ラマン計測等、通常より高いパフォーマンスを要求されるアプリケーションに対応。

- 波長域 : 200 - 1160nm
- 迷光 : 0.04 - 1%
- UV量子効率 : 60% (200-300nm)
- S/N比 : 1200 : 1 (HERO)
- 最小波長分解能 : 0.06 - 20nm



- AvaSpec-ULS2048XL-EVO (175x127x44.5mm, 1180g)
- AvaSpec-ULS2048LTEC (250x179x144mm, 3.6kg)
- AvaSpec-HS2048XL-EVO (175x165x85mm, 1950g)
- AvaSpec-ULS2048x64-EVO (177x127x44.5mm, 1.2kg)
- AvaSpec-HERO (-HSC1024x58TEC-EVO) (185x161x185mm, 3.5kg)
- AvaSpec-ULS2048x64TEC-EVO (185x145x185mm, 3.5kg)

AvaSpec StarLine

標準万能型しかも高波長分解能が得られ、カラー・反射・発光・膜厚等各種計測に対応。EVO+CMOS制御の最新型は高速多チャンネルシステムにて産業用プロセス制御に最適。

- 波長域 : 200 - 1100nm
- 迷光 : 0.04 - 1%
- S/N比 : 300 : 1
- 最短露光時間 : 9 μs (4096CL-EVO)
- 最小波長分解能 : 0.05 - 20nm



- AvaSpec-ULS2048L-EVO (177x127x44.5mm, 1135g)
- AvaSpec-ULS2048/2048L/3648 (175x110x44mm, 716g)
- AvaSpec-ULS2048/4096CL-EVO (177x127x44.5mm, 1135g)
- AvaSpec-UV/VIS/NIR (Broadband) (250x144x179mm, 4.1kg)
- AvaSpec-Dual/multi Channel (175x165x85mm, 1.8kg) (Rackmount)
- AvaSpec-Fast (175x110x44mm, 716g)

AvaSpec NIR Line

新開発のTEC冷却ディテクターによりノイズが飛躍的に削減し、光の少ない環境下での計測や蛍光計測、プラスチック成分分析、太陽光発電用モニターの発光測定等に対応。

- 波長域 : 900(1000)-2500nm
- 迷光 : <1%
- S/N比(LN) : 5000 : 1
- 最短露光時間 : 10 μs
- ダイナミックレンジ : 9000 : 1 (1.7-EVO)



- AvaSpec-NIR256/512-1.7-EVO (185x100x184mm, 2.7kg)
- AvaSpec-NIR256/512-1.7-HSC-EVO (185x160x184mm, 3.6kg)
- AvaSpec-NIR256/512-2.5-HSC-EVO (185x145x185mm, 3.5kg)

AvaSpec-CompactLine

4096(2048)ピクセルの最新CMOSリニアディテクタ制御と高性能光学ベンチで高パフォーマンス実現！更に256ピクセルのInGaAsディテクタと組合わせた超小型近赤外分光器が新登場！温度安定性に優れたLIBSや研究開発用OEM、食品分別に最適。

- AvaSpec-Mini4096CL (120x91x21mm, 350g)
- AvaSpec-Mini-NIR (120x91x62mm, 760g)
- 波長域 : 200 - 1100nm
- 最小波長分解能 : 0.09nm
- ダイナミックレンジ : 3000 : 1
- 迷光 : <0.2%
- 最小露光時間 : 30 μs
- 波長域 : 900 - 1750nm
- 感度 : 665,000(感度)
- ダイナミックレンジ : 7500 : 1
- 迷光 : 1%
- 最小露光時間 : 10 μs



AvaSpec-Mini2048/4096CL (95x68x20mm, 174g)



AvaSpec-Mini-NIR (120x91x62mm, 760g)

OEM Sptrometers

光学ベンチはUV/VIS用、NIR用の各種計測に対応。マイクロプロセッサボードは測定に応じてディテクターやソフトウェアと組合わせて自在な使用が可能。

- 光学ベンチ波長域 : 200 - 1160nm
- 波長域 : 1000 - 2500nm (NIR)
- マイクロプロセッサボード : 16ビットA/D, コンバータ USB3.0/1GbpsETH, 100 Mpixel メモリー保存 (AS-7010)

- AvaBench-75-ULS/ULSTEC (120x91x21mm, 350g)
- AvaBench-100HSC (120x125x109mm, 1500g)
- AvaBench-37.5-HS (95x152x42mm, 722g)
- AvaBench-50/100TEC (100x130x40mm, 875g)
- AvaBench-75-MN (94x67x19mm, 164g)



AS-5216 (162.5x100mm, 97g)

AS-7010 (162.5x100mm, 97g)

Developer kits (AS-5216/7010 用回路付)

AvaSpec-RS (Slit kit)

測定用途に応じてスリット幅の変更ができて正しい計測が可能な究極の分光器。感度とスループットのどちらかを優先するかをスリットの交換で測定毎に選択可能。

- AvaSpec-ULSの各タイプ, AvaSpec-HERO, AvaSpec-NIRの各タイプに対応
- スリットサイズ : 25.5, 100, 200, 500 μm

AvaSpec-Multi-Ch

産業用プロセス制御や多角的・広域計測に最適。

- 最大10ch構築可能、Ch毎に独立稼働
- Ch毎に違う波長や露光時間の設定が可能



AvaSpec-EVO-Multi-Ch
3-4Ch (315x235x135mm)
5-10Ch (315x445x135mm)

次世代進化型分光器 (EVO/CMOS)

EVO シリーズ

CMOS 制御

新開発エレクトロニクスボード (AS-7010) により USB3.0(5Gbps) 高速通信、LAN 経由 1Gbps ETH 直接遠距離データ伝送、メモリー (100Mpixel) 内部保存機能、外部トリガー機能、多チャンネル構築など実現
最新の CMOS 技術でブルーミングやスマア現象が生じることなく、高度な信号処理により低ノイズで CCD センサと同等の感度や波長分解能が得られ費用効果も大きい

AvaSpec-Mini2048/4096CL

超小型 CMOS 制御・高パフォーマンス型



(200~1100nm)

4096(2048)pixels の最新 CMOS リニアディテクタ制御と迷光の少ない光学ベンチで高パフォーマンスを実現。温度安定性・波長安定性に優れ、研究開発用 OEM や組み込みに最適で応用は無量大

- 光学ベンチ : F=75mm-MN, 迷光<0.2%
- ダイナミックレンジ : 3300 : 1
- 波長分解能 : 0.09-nm
- S/N値 : 330 : 1
- 露光時間 : 30 μs ~ 50s
- 寸法 : 95 x 68 x 20 mm, 174g

◆カラー計測 ◆環境計測 ◆ラマン分光 ◆化学実験 ◆応用計測

AvaSpec-Mini-NIR256-1.7

超小型 InGaAs 制御・近赤外高感度型



(900~1750nm)

256pixels の InGaAs ディテクタと迷光の少ない光学ベンチをコンパクトに統合し、超小型で近赤外高パフォーマンスを実現。温度安定性・波長安定性に優れ、研究開発用 OEM や組み込みに最適

- 光学ベンチ : F=75mm-MN
- ダイナミックレンジ : 7500 : 1 (LN)
- 感度 : 665,000 (count/μW per ms) (HS)
- S/N値 : 5000 : 1 (LN)
- 露光時間 : 10 μs ~ 5s (LN)
- 寸法 : 95 x 68 x 20 mm, 185g

◆食品分析 ◆産業用リサイクル分別 ◆微弱光計測 ◆プラスチックの分析

AvaSpec-ULS2048/4096CL-EVO

CMOS 制御・高速・高波長分解能型



(200~1100nm)

高速の標準万能型で高パフォーマンスが得られ基本的な計測は勿論のこと多チャンネルシステムに対応。高解像度 4096pixels の CMOS ディテクタを搭載して迷光の殆どない環境で最小露光時間で計測が可能

- 光学ベンチ : F=75mm, 迷光<0.2%
- ダイナミックレンジ : 4000 : 1
- 波長分解能 : 0.05~20nm
- 迷光 : 0.19~1.0%
- 露光時間 : 9 μs ~ 40s (4096CL)
- S/N値 : 335 : 1

◆産業用プロセスコントロール ◆光分析 ◆環境計測 ◆化学実験 ◆ラマン分光 ◆LIBS ◆プラズマ計測

AvaSpec-HERO (-EVO)

高速・高感度・高波長分解能型



(200~1160nm)

EVO と高性能 TE 冷却 CCD 背面照射型ディテクタ制御とのコンビで低ノイズ・高 S/N 値・高ダイナミックレンジを実現

- 光学ベンチ : F=100mm, NA : 0.13
- ダイナミックレンジ : 40000 : 1
- 波長分解能 : 0.2~7nm
- 迷光 : 0.5~1.0%
- 露光時間 : 5.2ms ~ 60s
- S/N値 : 1200 : 1

◆光の少ない環境での蛍光計測 ◆ラマン応用分光

AvaSpec-HS2048XL-EVO

高速・超高感度型



(200~1160nm)

高感度光学ベンチを採用し EVO と CCD 背面照射型ディテクタ制御により超高感度・高ダイナミックレンジを実現

- 光学ベンチ : F=37.5mm, NA : 0.22
- ダイナミックレンジ : 14900 : 1
- 感度 : 1,250,000 (counts/μW per ms) (HS)
- UV量子効率 : 60%
- 露光時間 : 2 μs ~ 600s
- S/N値 : 525 : 1

◆拡散反射計測 (UV,VIS,NIR) ◆蛍光計測 ◆ルミネッセンス計測

AvaSpec-NIR256/512-1.7-EVO

非冷却近赤外高速・高感度型



(900~1750nm)

EVO と InGaAs リニアアレイディテクタにより 1700nm 迄の近赤外にて超高感度・高ダイナミックレンジ・最短露光時間を実現

- 光学ベンチ : F=50mm, NA : 0.24
- ダイナミックレンジ : 9888 : 1 (LN)
- 感度 : 8,200,000 (count/μW per ms) (HS)
- S/N値
- 露光時間 : 10 μs ~ 20s (LN)
- HSモードとLNモード切換えが可能

◆水分含有量の計測 ◆液体・個体・粉体のインライン計測

AvaSpec-NIR256/512-2.5-HSC-EVO

近赤外高速・高感度型



(1000~2500nm)

EVO と TE 冷却 InGaAs リニアアレイ 2 ステージディテクタにより 2500nm 迄の中赤外域で低ノイズ・高感度の計測を実現

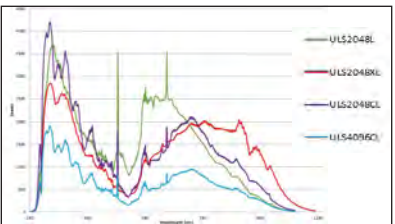
- 光学ベンチ : F=100mm, NA : 0.13
- ダイナミックレンジ : 5188 : 1 (LN)
- 感度 : 990,000 (count/μW per ms) (HS)
- S/N値
- 露光時間 : 10 μs ~ 100ms (LN)
- HSモードとLNモード切換えが可能

◆プラスチックの成分分析 ◆太陽光発電用モニターの発光測定

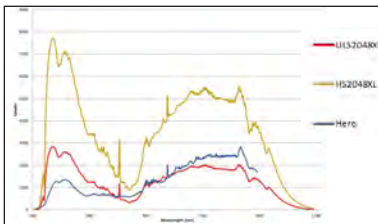
ディテクター

ディテクタのタイプにより各モデルの特長があり用途に応じた計測が可能

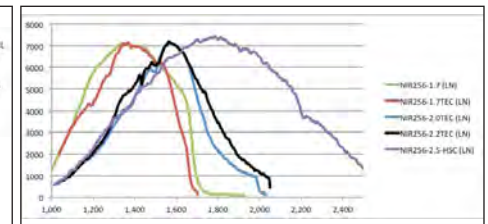
感度 (counts/μW per ms) 曲線 (StarLine)



感度曲線 (SensLine)



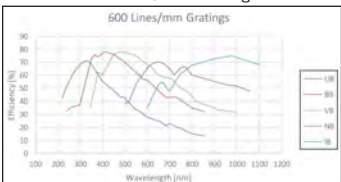
感度曲線 (NIR Line)



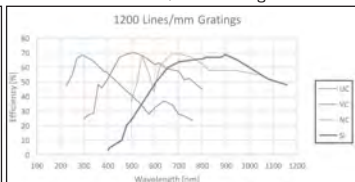
グレーティング効率

スペクトルレンジとグレーティングを選ぶことで最適な計測が可能

600 Line/mm Grating



1200 Line/mm Grating



AvaSpec-ULS4096CL-EVO 標準・万能型

波長分解能 (Grating & Slit)

ULS75mm 光学ベンチ, CMOS ディテクタの EVO タイプにより高速で高波長分解能の計測が可能な万能型 (200~1100nm)

- 波長分解能 : 0.05 ~ 20nm
- S/N 比 : 335 : 1
- 露光時間 : 9 μs ~ 40s
- 迷光 : 0.19 ~ 1.0%
- 感度 : 218,000 (counts/μW per ms)

mm	Slit size (μm)					
	10	2.5	5/4	1/30	2/30	5/30
300	0.50-0.70	1.20-1.30*	2.17	4.6	9.00	20.0
600	0.30-0.36*	0.58-0.60	1.17	2.20	4.5	10.0
830	0.25	0.48	0.93	1.7	3.4	8.0
1200	0.14-0.18*	0.30	0.62	1.08	2.2	5.0
1800	0.09-0.11*	0.18	0.36-0.40*	0.78	1.5	3.7
2400	0.07-0.09*	0.13-0.15*	0.26-0.32*	0.40-0.64*	1.1	2.7
3600	0.05-0.06*	0.10	0.19	0.4	0.8	2.0

グレーティングは波長間の間隔を決め、スリットは光が通過する幅を制限するのでファイバーコア径と共に波長分解能に影響する

NEW!

AVANTES

超小型、高パフォーマンス CMOS 分光器

AvaSpec-Mini-2048/4096CL(Mini-MK II)

CompactLine (AvaSpec-Mini) がリニューアルして、より高性能でパワフルに生まれ変わりました。Mini は超小型（名刺サイズ）ながら非常に高い分解能で計測可能な分光器で OEM 組込み対応で各種研究用、その他の応用は無限大の次世代先取り型！、光分析、環境計測を始めとして、化学実験やラマン分光、LIBS 等各種の研究用に最適です。Grating と Slit の選択により非常に高い波長分機能を有することが可能です。

最新の Mini は 4096 (2048) ピクセルの CMOS リニアードテクターと迷光の少ない光学ベンチを採用して、ダイナミックレンジが 3000:1 以上の高パフォーマンスが実現しました。しかも温度安定性に優れているので、OEM に組込んでも信頼性が高く、研究開発用に最適です。まさに高性能でパワフルな超小型 CMOS 制御、次世代型分光器の新登場と言えます。

特長

- CMOS制御(2048/4096ピクセル)
- 最小波長分解能: >0.09nm (4096CL)
- 露光時間: 最小30 μ s
- F=75mm の光学ベンチ
- 漏れ光: <0.2%
- ダイナミックレンジ : > 3000 : 1
- 温度・波長安定性が高い
- 持ち歩きに便利でOEMに最適
- インターフェース: USB2.0
- 寸法: 95 x 68 x 20 mm, 174g
- 波長域: 200~1100nm



◆光分析

◆環境計測

◆化学実験

◆ラマン分光

◆LIBS

◆OEM 用途

◆各種応用計測は無限大

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名刺サイズ超小型、高パフォーマンス近赤外分光器

AvaSpec-Mini-NIR (Avantes 社製)



AvaSpec-Mini シリーズに待望の近赤外用が新登場。

Mini は超小型（名刺サイズ）ながら、高感度の光学ベンチ採用で非常に高パフォーマンスの計測が可能な分光器で OEM 組込み対応、各種研究用、応用は無限大の次世代先取り型。

AvaSpec-Mini-NIR は 256 ピクセルの InGaAs リニアアレイディテクタを高度な技術で名刺サイズに集積した画期的な近赤外分光器。ダイナミックレンジが 7500:1、高 S/N の高パフォーマンスが実現し、しかも温度安定性に優れているので、OEM に組込んでも信頼性が高く、研究開発用や食品の分析、産業用リサイクル等を含む光分析、環境計測など、近赤外域の波長を必要とする各種の応用計測に最適。

特長

- F=75mm の高感度光学ベンチ
- 露光時間：最小 10 μ s
- 感度：665,000 (HS) in counts/ μ W per ms
- ダイナミックレンジ：7500 : 1(LN)
- S/N：5000 : 1 (LN)
- 測定対象によって、高感度(HS)モードと低ノイズ(LN)モードの切り換えが可能
- 温度・波長安定性が高い
- 持ち歩きに便利でOEMに最適
- インターフェース：USB2.0
- 寸法：95 x 68 x 20 mm, 185g
- 波長域：900~1750nm



- ◆ 食品分析
- ◆ 産業用リサイクルの分別
- ◆ 環境計測
- ◆ 微弱光計測
- ◆ プラスチックの成分分析
- ◆ 蛍光計測
- ◆ レーザ波長測定
- ◆ ハロゲンランプ波長測定

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USB3.0 超高速

CMOS 制御・超高速分光器

AvaSpec -ULS2048CL-EVO

最新の CMOS 技術を駆使した CMOS ディテクタが開発されました。2015 年に新開発のエレクトロニクスボード (AS7010) を採用した USB3.0, ギガビットイーサネット搭載の超高速分光器 EVO シリーズが登場し、ノイズの少ない革命的な次世代型の超高パフォーマンスが実現しました。

そして超高速・高分解能分光器に CMOS ディテクターを搭載した CMOS 制御・超高速分光器が新登場しました。COMS イメージセンサはブルーミングやスミア現象が生じることなく、低ノイズで高度な信号処理により、CCD センサと同等の感度や波長分解能が得られます。

- 特長
- CMOSセンサ制御(ブルーミングやスミア現象が生じない)
 - USB3.0 超高速5Gbps通信処理 (USB2.0の10倍速)
 - 1GbpsでLAN経由で直接遠距離データ伝送可能
 - マルチチャンネルの構築が可能で産業用に最適
 - メモリー機能:100Mpixel を高速で内部保存し、PCへ直接伝送可能
 - 最小波長分解能: >0.06nm
 - スリット交換型 (-RS)も選択可能→ユーザーが現場でスリットサイズ(25,50,100,200 μ m)を交換可能なタイプ



NEW!

AVANTES

超高速ギガビット伝送 4K 高解像度 CMOS 分光器

AvaSpec-ULS4096CL-EVO

2016 年に新開発のエレクトロニクスボード (AS7010) により USB3.0 高速通信 & ギガビット伝送を実現した EVO シリーズが登場し、革命的な次世代型の超高パフォーマンスが実現しました。またそれと同時に最新の CMOS 技術を駆使した CMOS ディテクタが開発され、CMOS 制御・超高速分光器 AvaSpec-ULS2048CL-EVO が登場しました。

この度、最新の 4096 ピクセル 4K 高解像度 CMOS リニアイメージセンサを搭載したディテクターが開発され、最短露光時間：9 μ s を実現しました。さらに高波長分解能：0.05nm・高 S/N 値、高パフォーマンスが実現し、プラズマ計測用途などに最適な最先端の次世代進化型分光器と言えます。

特長

- CMOS センサ制御(ブルーミングやスミア現象が生じない)
- USB3.0 超高速5Gbps 通信
- 1Gbps でLAN 経由で直接遠距離データ伝送可能
- メモリー機能:100Mpixel を高速で内部保存し、PC へ直接伝送可能
- 外部トリガー機能
- 最小波長分解能: >0.05nm
- 最小露光時間: 9 μ s
- 漏れ光: <0.19%
- ダイナミックレンジ :> 4000 : 1
- スリット交換型(-RS)も選択可能→ユーザーが現場でスリット交換可能
- 産業用プロセス管理などにマルチチャンネル対応
- 波長域: 200~1100nm



◆光分析

◆環境計測

◆化学実験

◆ラマン分光

◆LIBS

◆プラズマ計測

◆産業用プロセスコントロール (マルチチャンネル)

PHOTO TECHNICA

<https://www.phototechnica.co.jp>

フォトテクニカ株式会社

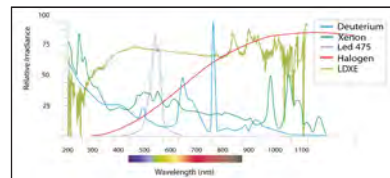
〒336-0017 埼玉県さいたま市南区南浦和 1-2-17

TEL: 048-871-0067 FAX: 048-871-0068

e-mail: voc@phototechnica.co.jp

基準光源

アバテス社の光源はあらゆる計測用途に対応するNIST準拠の校正・計測用基準光源です。重水素・ハロゲンのコンビネーションタイプなど多彩なラインナップの光源が、校正データ付きにて供給されます。



光源の波長分布図

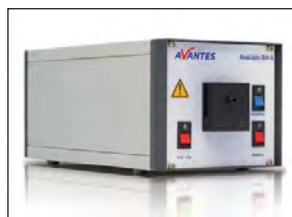
計測用途	波長帯域	光源のタイプ	型式
カラー (VIS/NIR)	360 - 2500nm	タングステン ハロゲン	AvaLight-HAL-S-MINI
真空紫外(DUV)	190 - 400nm	重水素	AvaLight-D-S-DUV
紫外 (UV)	215 - 400nm	重水素	AvaLight-D-S
反射・吸収	215 - 2500nm	重水素 / ハロゲン	AvaLight-DH-S-(BAL)
吸収 (UV/VIS/NIR)	200 - 2500nm	重水素 / ハロゲン	AvaLight-DHc
紫外 / 可視 (UV/VIS)	200 - 1000nm	キセノン	AvaLight-XE-(HP)
蛍光	制限無し	LED	AvaLight-LED
波長較正	253 - 1704nm	水銀アルゴン / ネオン / アルゴン	AvaLight-CAL-MINI
波長較正	200 - 700nm	亜鉛 / カドミウム	AvaLight-CAL-CAD/Zinc
発光較正	360 - 2500nm	タングステン ハロゲン	AvaLight-HAL-CAL-MINI
発光較正	200 - 1100nm	重水素 / ハロゲン	AvaLight-DH-CAL



AvaLight-HAL-S-Mini



AvaLight-DHc

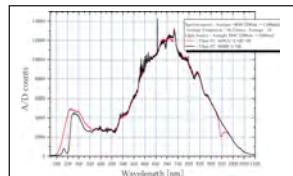


AvaLight-DH-S / AvaLight-DH-CAL

光ファイバーの比較

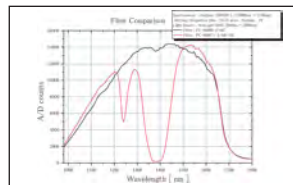
◆波長域：200-1100nm での比較

- 分光器：AvaSpec-3648(波長分解能:1.4nm)
- 光源：AvaLight-DHc
- ファイバー：FC-600UV2-ME, FC-600IR-2-ME
- 露光時間:16.17ms, アベレーシング:31



◆波長域：1000-1750nm での比較

- 分光器：AvaSpec-256NIR-1.7(波長分解能:6nm)
- 光源：AvaLight-DHc
- ファイバー：FC-600UV2-ME, FC-600IR-2-ME
- 露光時間:25.67ms, アベレーシング:19



光ファイバー

- ◆光ファイバーケーブルは4種類の内 Kevlar reinforced PVCが標準品で、波長域に対応するコア径から選べます。

	波長 (nm)	コア径 (μm)
UV	200-800	50/800/1000
IR	350-2500	8
UVIR	200-2500	100/200/400/600

- ◆計測の種類に応じて4種類揃えています。

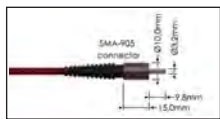
FC: 標準ケーブル FCB: 分岐ファイバー
FCR: 反射プローブ FDB: ディーププローブ



ファイバー及び反射プローブ

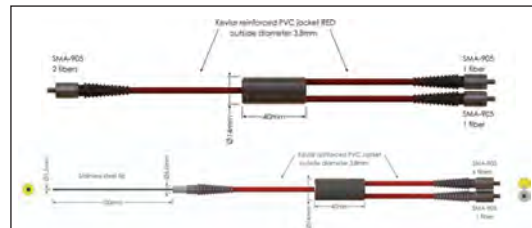


標準ケーブル



SMA905

- ◆ファイバーの接続部は SMA905 が標準で、ST と FC/PC に替えることが可能です。



- ◆反射プローブは試料に直接挿入できるタイプや粉や流動体に適したタイプ等各種取り揃えています。

小型積分球 AvaSphere

AvaSphere は光を集積して測定するオリジナルなシンプル構造の積分球で、LED等の全発光測定や蛍光分光の反射測定に便利です。

AvaSphere	-30	-50	-80
内径 mm	30	50	80
サンプル内径 mm	6	10	15
外形 mm	59.5	69.5	109
高さ mm	40	60	95

サンプルポートはナイフエッジになっており、サンプルポートからの入射角180°と幅広いアプリケーションに対応します。



AvaSphere-50-REFL

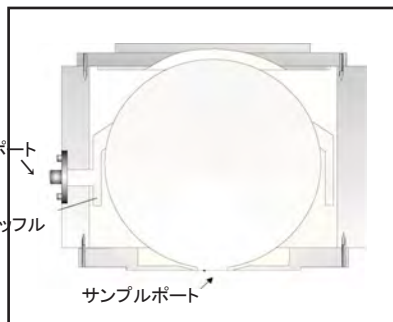


AvaSphere-50-LS-HAL

コーティングではなく独自の高反射ディフューザー素材で250nm ~ 2500nmにおいて92% (< 2000nm まで96%) 以上の高い反射率が得られます。

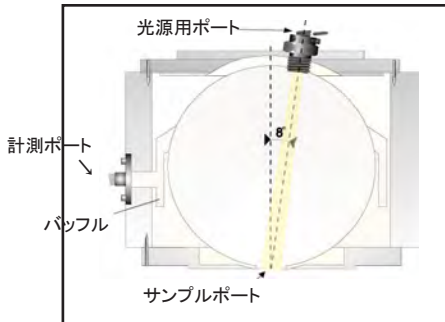
反射測定用 5Wハロゲン光源内蔵型 (内径50mm) 小型積分球 (360-2500nm, サンプルポート内径10mm)

発光測定用 AvaSphere-IRRAD



LED、レーザ、ハロゲンランプ等光源の計測用 (LED 用アダプター有り)

反射測定用 AvaSphere-REFL



カラー計測、蛍光分光等多彩な用途用光源用SMAポート付、吸収素材コート

便利な各種アクセサリ

- ◆キューベットホルダー、アッテネータ、フィルターホルダー等が揃い、計測がより簡単にできます。



Cuvette Holders & Attenuator

- ◆直付けビームスプリッター、コリメートレンズ、DAシャッターは各種の応用計測にとっても便利です。



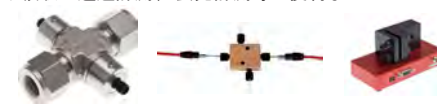
Beam Splitter Collimating Lens Direct Attach Shutter

- ◆トリガーボックス、多点計測用多重変換器など、各種の応用計測にとっても便利です。



AvaTrigger Fiber Optic Multiplexer AvaTripod

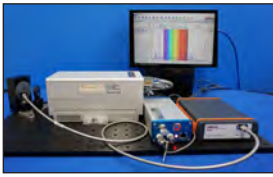
- ◆吸収・透過計測、蛍光計測等に便利なフローセルです。



In-Line Flow Cells Micro Flow Cells Fiber Optic Switch

アバンテス社の分光器は豊富なラインナップから機器を選択して、それぞれの計測・応用に適した各種のシステムアップが可能です。

AvaLIBS (レーザ誘起ブレイクダウン分光)



個体の組織分析
ガスの組織分析
数秒で計測可能
外部トリガー機能

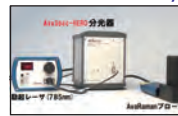


どんな物質でも発生するプラズマを紫外～近赤外まで迅速に計測可能

高感度・高波長分解能分光器+(ナノ秒レーザー)+専用分光・解析ソフト

■AvaSpec-ULS2048/4096CL-EVO(1-10ch) ■AvaSoft-AvaLIBS-Specline

ラマン分光測定



AvaRaman-Bundle

材料やラマン信号の強弱等状況により選べるNEWシステム
 ■AvaRaman-A 粉・水溶液等強いラマン信号用
 ■AvaRaman-B 長露光時間測定用(TEC冷却分光器)
 ■AvaRaman-D 蛍光等微弱な信号用(AvaSpec-HERO)
 *AvaSpec-HERO: 高S/N、高量子効率、高感度・高波長分解能分光器



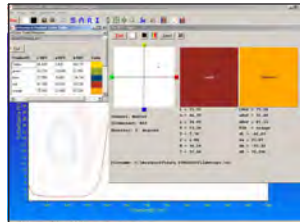
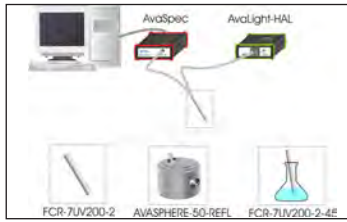
AvaRaman-532HERO-EVO

TEC冷却分光器とレーザーを一体化したラマン分光器
 ■AvaSpec-HERO(HSC1200-0.75 (535-660nm, slit25-FCPC))
 ■Laser (532nm, 50mW, 100-3650cm⁻¹), AvaSoft-Raman

AvaRaman-785TEC

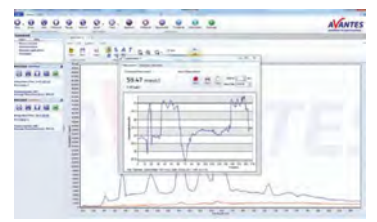
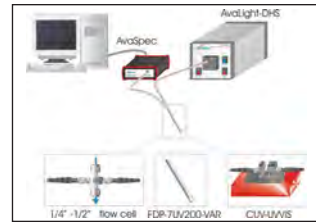
■AvaSpec-2048L-TEC (785-1080nm, slit25, DCL-UV/VIS)
 ■Laser (785nm, 500mW, 100-3500cm⁻¹), AvaSoft-Raman

カラー測定 (360-780nm)



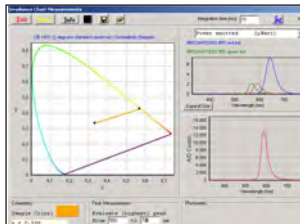
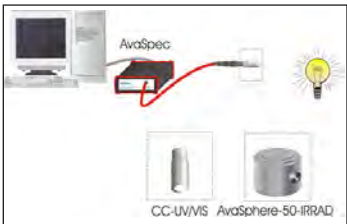
■AvaSpec-ULS2048CL-EVO 又は AvaSpec-ULS2048 (万能型)
 ■AvaSoft-Full&Color, AvaLight-HAL, 反射プローブ又は積分球

UV/VIS 吸収・透過測定



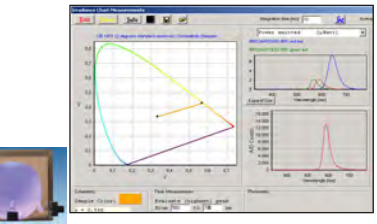
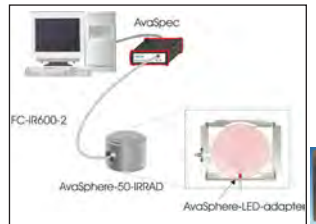
■AvaSpec-ULS2048CL-EVO 又は AvaSpec-HERO
 ■AvaSoft-Full & CHEM, AvaLight-DH-S-BAL, ディッププローブ

発光測定



■AvaSpec-ULS2048CL-EVO(UV/VIS), AvaSpec-NIR256-2.5-HSC-EVO(NIR)
 ■AvaSoft-FULL&IRRAD, IRRAD-CAL-UV/VIS, Cosine Corrector 又は AvaSphere-IRRAD

LED測定



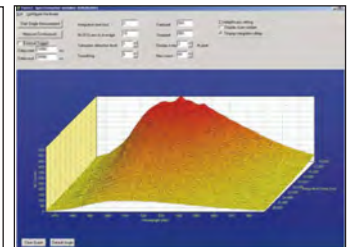
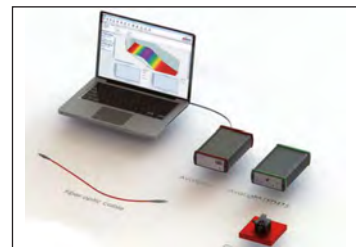
■AvaSpec-ULS2048CL-EVO
 ■AvaSoft-Full & IRRAD, IRRAD-CAL-UV/VIS, AvaSphere-IRRAD

膜厚測定



■AvaSpec-ULS2048CL-EVO 又は AvaSpec-ULS2048L
 ■AvaSoft-ThinFilm 又は TFProbe, AvaLight-DHc, 反射プローブ, 薄膜ステージ

蛍光計測

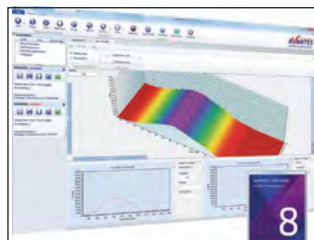


■AvaSpec-HS2048XL-EVO
 ■AvaSoft-Full, AvaLight-LED, FCR-UVIR200/600-2-IND

AvaSpec は農作物、地質、生物医学、大気、化学等の各種計測の他、LIBS、蛍光計測など限らない応用に対応可能です。

ソフトウェア

すべてのAvaSpecに基本のソフトAvaSoft-Basicが搭載されており、WindowsPC上で基本操作、スペクトル表示、計測などできます。AvaSoft-fullはすべての計測に対応できるソフトで、各種の応用には専用のソフトが用意されています。分光用の専用ソフト(Panorama)(Specline)、その他 Interface DLL Package (AvaSpec-DLL) 等もあります。



AvaSoft-full

オプション

- OSF-@305,395,475,515,550,600,850
迷光を最小限にする光学ベンチにさらに2次光の影響を防ぐ為に取り付ける3mmフィルター
- OSC, OSC-UA, UB, UC, NIR, HS(500/900/1000), HSC(300/600)
2次光の影響を防ぐ為に取り付けるLong pass filter
- DCL-UV/VIS, DCL-UV/VIS-200
シリンドリカルレンズでディテクターに直接取り付けると分解能を高める

- DUV
UV域の2次光の影響を妨げ、感度を高めVIS域のノイズを下げる為に要なコーティング>150nm
- DUV 波長測定用 N² パージφ4mm
分光器背面にN₂ パージを付けN₂ ガスを入れるだけで簡単に(130-300nm)の測定が可能

Deep UV LED D₂光源
Laser 波長測定

NEW!

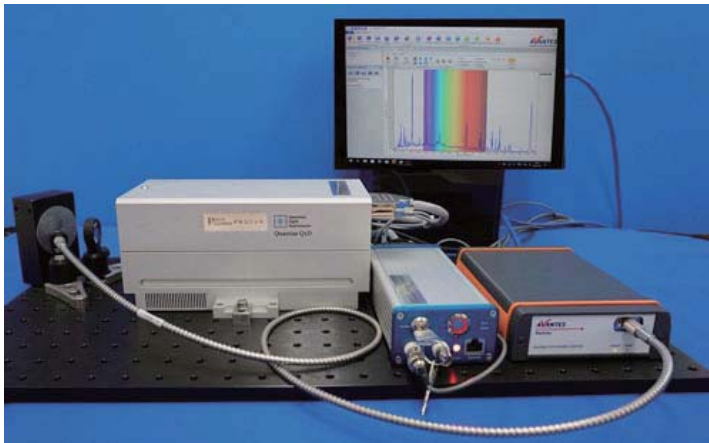
次世代進化型分光器

AVANTES

◆LIBS(レーザ誘起ブレイクダウン分光法) システム **AvaLIBS**

LIBS は分子スペクトルの計測や広い領域での分析が可能で、ガス分析や固体の組織分析への適応が可能なので、理化学実験や各種の研究開発に有効です。
迅速に化学分析をする為にナノ秒レベルのレーザーパルスを物質表面に照射してマイクロプラズマを生成することが必要で、プラズマを紫外域から近赤外域まで高感度・高波長分解能で計測できる Avantes 社分光器はLIBSシステムに最適です。

- 特長
- 計測速度が速い(数秒)
 - どんな物質でも計測可能
 - 外部トリガー機能
 - 最小波長分解能: >0.06nm (波長による)
 - マルチチャンネル分光器はチャンネル毎に独立した波長・スリット・グレーティング設定が出来る
 - 便利な独自分光ソフト AvaLIBS-Specline
 - 波長域: 200~1100nm



■AvaLIBSシステム構成

高感度・高波長分解能分光器 + ナノ秒レーザー + 専用分光・解析ソフト
(AvaSpec-Uls2048/4096CL-EVO) (AvaLIBS-Specline)
(AvaSpec-Uls2048XL-EVO)

* AvaSpec-Uls4096CL-EVOは最新の4096CMOSイメージセンサを使用したディテクターにより高解像度の測定が可能で、USB3.0超高速通信&ギガビット伝送が実現したEVOシリーズなので特に高感度・高波長分解能の測定が高速で可能です。

* レーザはシステムに含まれておりませんが、お薦めのものを提供可能です。

用途

- | | | | |
|-------|--------|-------------|-------|
| ■各種金属 | ■半導体 | ■ガラスコーティング | ■高分子膜 |
| ■生体組織 | ■土壌、植物 | ■プラスチック、絶縁体 | ■環境測定 |

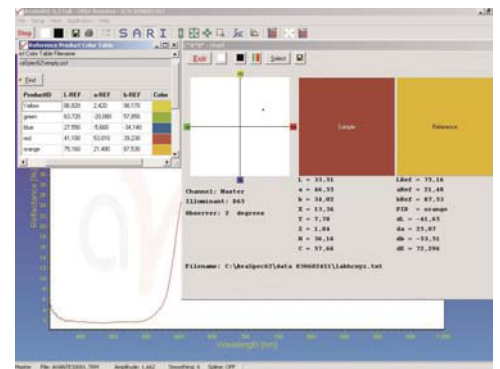
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TEL:048-871-0067 FAX:048-871-0068
e-mail:voc@phototechnica.co.jp

ファイバー入射型分光器 アプリケーション測定の基本構成

カラー測定

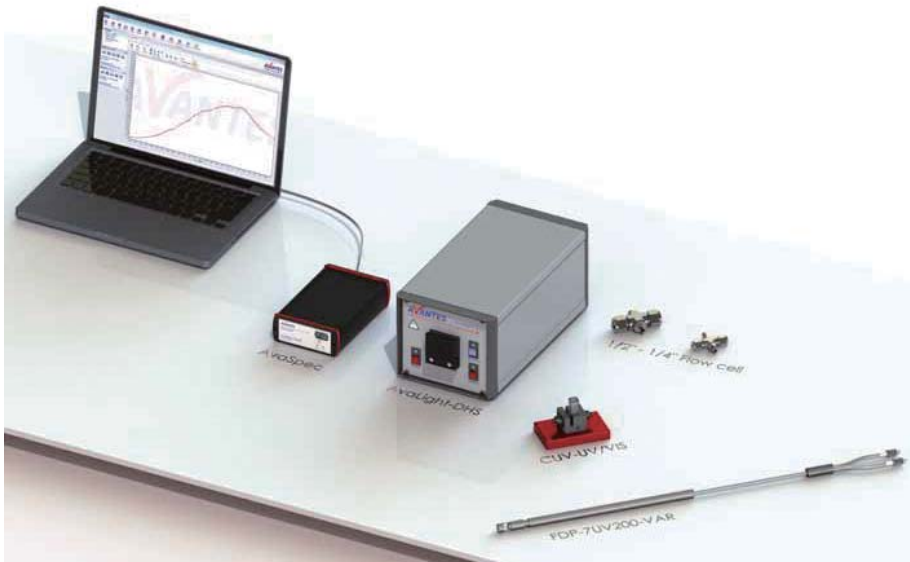


	反射プローブでの カラー測定	積分球での カラー測定	液体用反射プローブ でのカラー測定
分光器	AvaSpec-ULS2048CL-EVO, Grating BB (360-780nm), 200 μ m slit		
ソフトウェア	AvaSoft-Full and AvaSoft-Color		
光源	AvaLight-HAL-S-Mini with PS-24V-1.25A power supply		
ファイバー オプティクス	FCE-7UVIR200-2 Reflection probe with 6x200 μ m illumination fibers, 200 μ m read fiber, UV/IR, 2m, SMA	FC-UVIR200-2-ME	FCR-7UVIR200-2-45 Reflection probe with 45 degree window with 6x200 μ m illumination fibers, 200 μ m read fiber, UV/IR, 2m, SMA
アクセサリ	RPH probe holder WS-2 reference tile	AvaSperre-50-LS-HAL integrating sphere WS-2 reference tile	WS-2 reference tile

* 積分球での計測や高速測定に必要で反射プローブでの測定には無くても良い

ファイバー入射型分光器 アプリケーション測定の基本構成

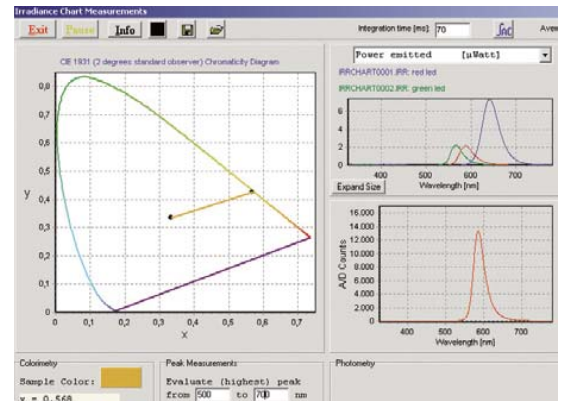
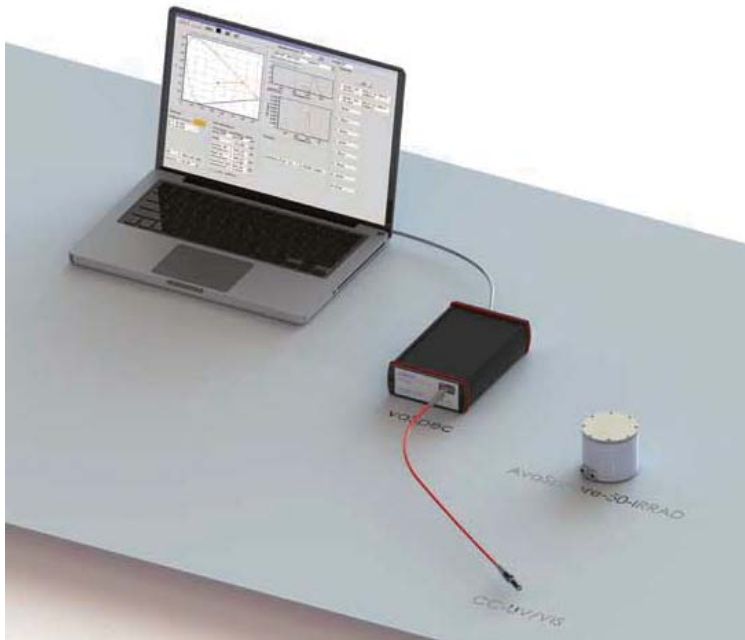
UV/VIS 吸収測定



	フローセルでの UV/VIS 吸収測定	変換プローブでの UV/VIS 吸収測定	試料ホルダーでの UV/VIS 吸収測定
分光器	AvaSpec-ULS20487@ 9JC, Grating UA (200-1100nm), 25 μ m slit, DUV, DCL-UV, OSC-UA AvaSpec-ULS2048XLz Grating UA (200-1100nm), 25 μ m slit, OSC-UA		
ソフトウェア	AvaSoft-Full or AvaSoft-CHEM		
光源	AvaLight-DH-S (Deuterium-Halogen source)		
ファイバー オプティクス	2 pcs. FC-UV200-2-SR fiber cable 200 μ m , UV/VIS. solarization resistant, 2m, SMA	FDP-7UVIR200-2-VAR Transmission dip probe with variable path length, with 6x200 μ m illumination fibers, and 200 μ m read fiber, UV/VIS/NIR, 2m, SMA	2 pcs. FC-UV200-2-SR fiber cable 200 μ m , UV/VIS. solarization resistant, 2m, SMA
アクセサリ	1/4" or 1/2" Flow cell		CUV-UV/VIS cuvette holder

ファイバー入射型分光器 アプリケーション測定の基本構成

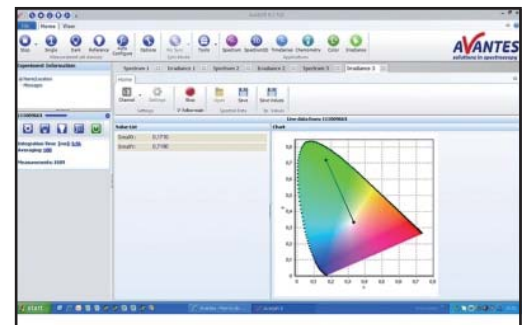
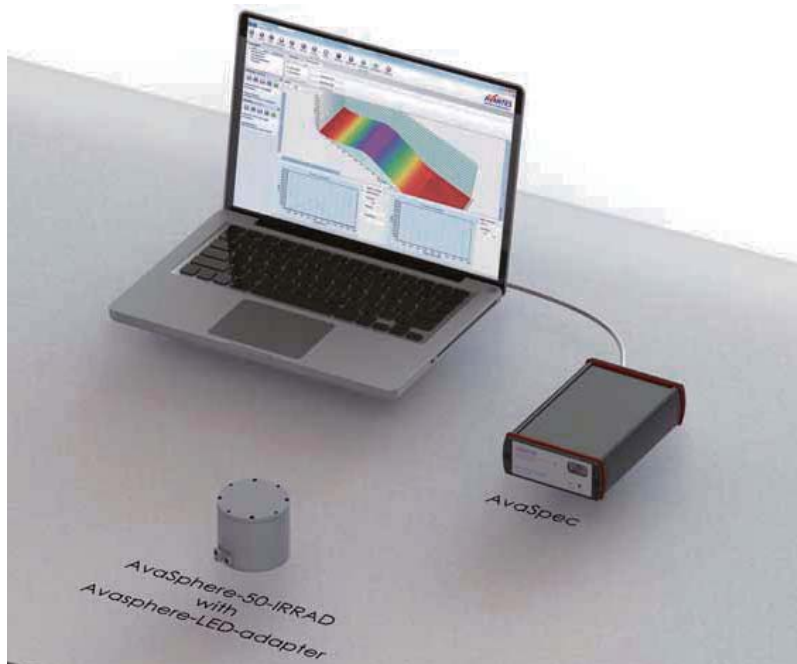
発光測定



	UV 発光測定	VIS 発光測定	NIR 発光測定
分光器	AvaSpec-ULS20487@9JC GratingUC (200-400nm), DUV, 50 μ m slit, FC/PC connector		AvaSpec-NIR256-2.5-<G7! 9JC Grating NIR100-2.5 (1100-2500nm), 50 μ m slit, OSF1000, FC/PC connector
	Grating UA (200-1100nm), DUV, 50 μ m slit, OSC-UA, FC/PC connector		
ソフトウェア	AvaSoft-Full and AvaSoft-IRRAD		
較正	IRRAD-CAL-UV (200-400nm)	IRRAD-CAL-VIS (360-1100nm)	IRRAD-CAL-NIR (1100-2500nm)
	IRRAD-CAL-UV/VIS (200-1100nm)		
光源	AvaLight-DH-CAL Calibrated Deuterium-Halogen light source with CC-UV/VIS	AvaLight-HAL-CAL Calibrated Halogen light source with CC-VIS/NIR	AvaLight-HAL-CAL extra NIR Calibrated Halogen light source with CC-VIS/NIR
ファイバー オプティクス	1pc. FC-UV200-2-FC-SMA fiber 200 μ m UV/VIS, 2m, 1FC/PC, 1SMA		FC-IR200-2-FC-SMA fiber, 200 μ m VIS/NIR, 2m, 1FC/PC, 1SMA
アクセサリ	CC-UV/VIS or CC-VIS/NIR cosine corrector or AvaSpec-IRRAD integrating sphere		CC-VIS/NIR cosine corrector

ファイバー入射型分光器 アプリケーション測定の基本構成

LED 測定



LED 測定		
分光器	AvaSpec-ULS2048CL-EVO Grating VA(360-1100nm), 25 μ m slit, DCL-UV, OSC, FC/PC connector	
ソフトウェア	AvaSoft-Full and AvaSoft-IRRAD	
校正	AvaLight-HAL-CAL-ISP Calibrated halogen light source	IRRAD-CAL-VIS(360-1100nm) irradiance calibration
ファイバー オプティクス	1pc. FC-UV600-2-FC-SMA fiber 600 μ m UV/VIS, 2m, 1SMA, 1FC/PC	
アクセサリ	1LED-A tube for LED T1 3/4 condition A(316mm, 0.001sr), AvaSphere 1LED-B tube for LED T1 3/4 condition B(100mm, 0.01sr), AvaSphere AvaSphere-50-IRRAD integration sphere AvaSphere-LED-ADR adapter to hold 3, T1 3/4, 8mm LED's	

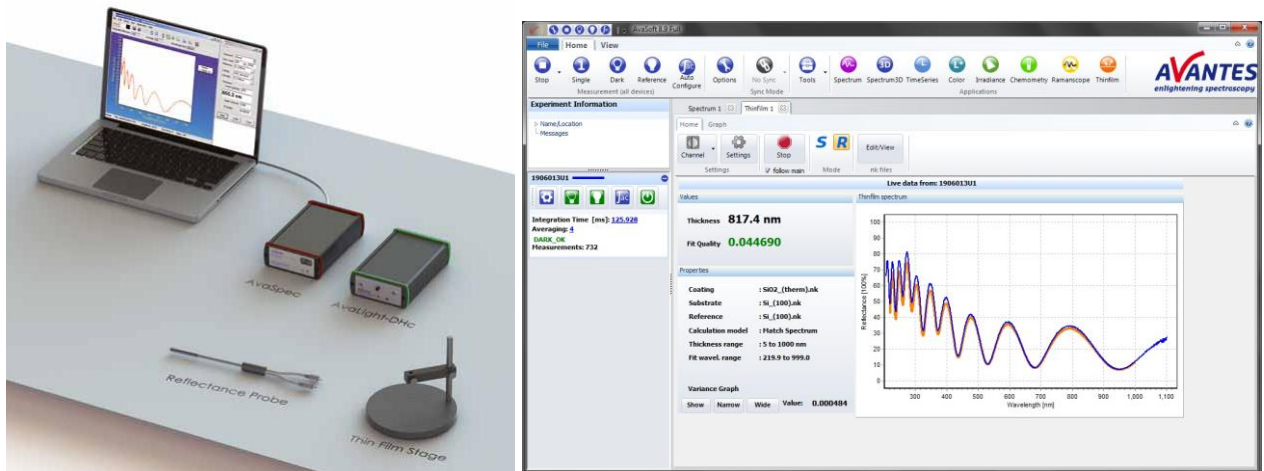
光学干渉式リアルタイム膜厚モニター

膜厚測定

本膜厚モニターを用いることにより様々な薄膜の厚みを非接触でしかもリアルタイムに測定を行うことが可能です。1nm の分解能で10nm～50 μ m までの膜厚を測定できます。

測定サンプルより反射される白色光の干渉パターンを観測し、薄膜材料の物性値を用いることにより光学膜厚へと変換されます。単層膜の場合、材料の n 値(屈折率)及び k 値(消衰係数)が予め分かっている場合は、膜厚を算出することが可能です。

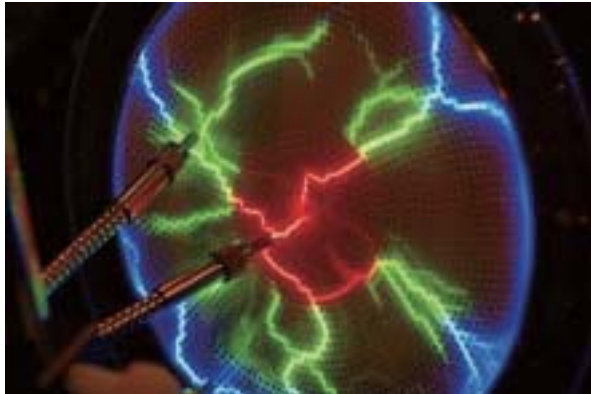
専用ソフトウェア: AvaSoft-Thinfilm は、一般的によく使用されるマテリアルやコーティング材料(レジスト、酸化物、窒化物、ポリイミド、セルギャップなど)の n 値(屈折率)と k 値(消衰係数)がデータベース化されており、測定対象物に応じて選択することが可能です。



分光器	AvaSpec-ULS2048CL-EVO
	Grating UA(200 ~ 1100nm), DCL-UV/VIS, 100 μ m slit, OSC-UA
膜厚 / 分解能	10nm ~ 50 μ m , 分解能 : 1nm
ソフトウェア	AvaSoft-Thinfilm
光源	AvaLight-DHc (重水素-ハロゲンランプ)
ファイバー	反射プローブ: FCR-7UVIR400-2-ME, 2m, SMA

Plasma Measurement 高性能プラズマ計測システム

Avantes社の高性能・万能型ファイバー入射型分光器は新開発の迷光が極端に少ない光学ベンチ(AvaBench-ULS)を採用し、用途に応じたスリット・グレーティングを選択することにより、高速で非常に高い波長分解能を実現しています。



プラズマのより高性能な計測の為に開発された高性能プラズマ計測システムは、Avantes社のベストセラー製品である高性能・万能型分光器を複数チャンネル使用した、マルチチャンネル分光器システムです。
専用に開発された分析用ソフトウェアと独自の光ファイバー、オプション等とを使用することによりプラズマの幾つもの放射ピークを紫外域～近赤外域までの確に捉えることが可能で、これまでに無い**高波長分解能**での計測が実現します。

AvaSpec-Plasma-A

◆低コスト、高波長分解能プラズマ計測システム

波長域200～1030nmの高性能4ch 分光器を使用したシステムで**最小0.18nm**の高波長分解能での計測を実現しました。

独自開発の AvaSoft 分光器ソフトウェア及び分析・解析用ソフトウェア、多分岐ファイバーにより、4ch がスムーズに動作・計測でき、デスクトップ上で操作できます。一体型なので無駄が無く、コスト的にも費用効果が高い、高波長分解能小型プラズマ計測システムです。



		グレーティング	スリット	波長分解能
ファイバー入射型 分光器	4ch デスクトップ型 AvaSpec-ULS2048CL-EVO	<ul style="list-style-type: none"> UC (200-450nm) VC (450-680nm) NC (660-830nm) NC (820-950nm) 	10 μm	0.28nm 0.26nm 0.24nm 0.22nm
	4台内蔵	オプション <ul style="list-style-type: none"> DCL-UV/VIS-200 detector collection Lens OSF-600 order sorting filter (必要な波長に) 		
ソフトウェア	AvaSoft-Full SPECline-A	AvaSpec 用万能ソフトで ch 毎の計測・データ集積・処理・変換・表示などの機能の基本ソフト 分析・解析用ソフト		
ファイバー	FC4-UVIR400-2-ME	多分岐ファイバー4x400 μm fiber 		

◆超高波長分解能プラズマ計測システム

さらに高感度・高波長分解能でプラズマ計測する為のシステムで、**波長域 200 ~ 930nm** の高性能 8ch 分光器 (最新 CMOS 制御高速 EVO タイプ) を使用して**最小 0.09nm** の高波長分解能での計測を実現しました。

独自開発の AvaSoft 分光器ソフトウェアと専用の分析・解析ソフトウェアと多分岐ファイバーにより 8ch がスムーズに動作・計測でき、紫外域から近赤外域までカバーできます。最大 10ch まで拡張でき、ラックマウントに収納した使い易い形です。一体型なので無駄が無い超高波長分解能小型プラズマ計測システムです。



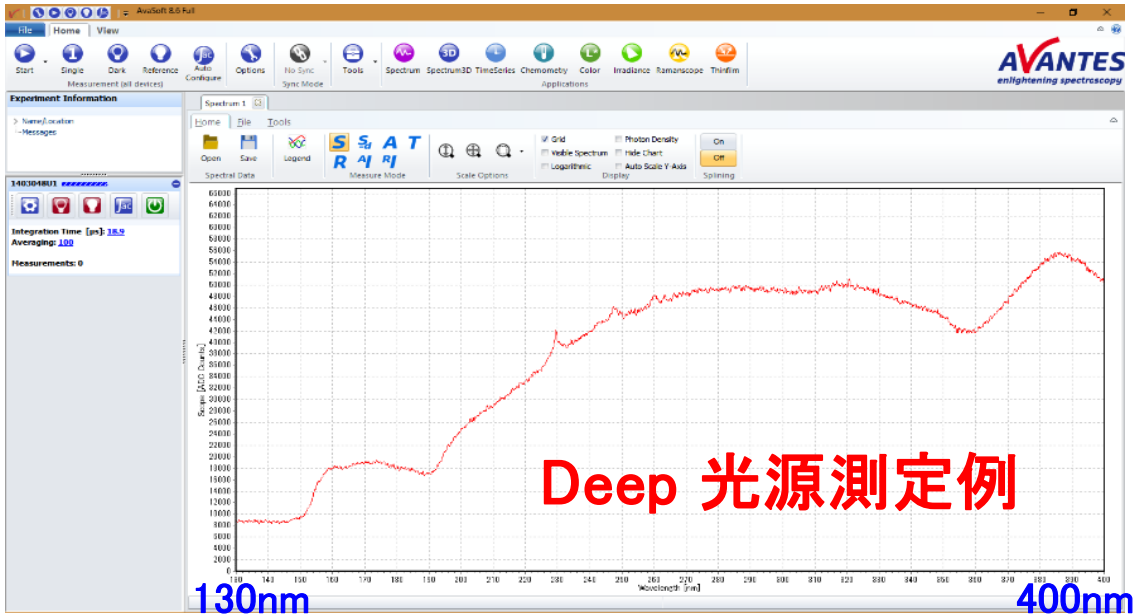
		グレーティング	スリット	波長分解能
ファイバー入射型 分光器	8ch ラックマウント型	<ul style="list-style-type: none"> ▪ UE (200-300nm) ▪ UE (300-390nm) ▪ UE (380-460nm) ▪ UE (460-530nm) ▪ VE (530-588nm) ▪ VE (570-620nm) ▪ NC (620-780nm) ▪ NC (780-930nm) 	<ul style="list-style-type: none"> 10 μ m 10 μ m 10 μ m 10 μ m 10 μ m 10 μ m 10 μ m 10 μ m 	<ul style="list-style-type: none"> 0.13nm 0.12nm 0.11nm 0.10nm 0.09nm 0.09nm 0.24nm 0.22nm
	AvaSpec-ULS2048CL-EVO 8 台内蔵	オプション <ul style="list-style-type: none"> ▪ DCL-UV/VIS-200 detector collection Lens ▪ OSF-600 order sorting filter (必要な波長に) 		
ソフトウェア	AvaSoft-Full SPECline-A	AvaSpec 用万能ソフトで ch 毎の計測・データ集積・処理・変換・表示などの機能の基本ソフト 分析・解析用ソフト		
ファイバー	FC8-UVIR400-2-ME	多分岐ファイバー 8x400 μ m fiber		

用途： 半導体 太陽電池 核融合炉 剃刀の刃 ガラスコーティング

Deep UV 波長(130-300nm)測定用分光器

波長レンジ: Grating UC (130-350nm), UD (150-300nm)

用途: Deep UV LED, D2光源, Laser 波長測定



AvaSpec-ULS2048, 2048L, 3648-USB2-Purge



簡単N2
パージ
Φ4mm

Technical Data		2048	2048L	3648
Signal/Noise		200:1	300:1	350:1
Integration Time		1.05ms-10min	1.05ms-10min	10us-10min
Sensitivity Counts/uW per ms integration time		3100,000	470,000	160,000
Sample Speed with store to RAM		1.05ms/scan	1.05ms/scan	3.7ms/scan
Data Transfer speed	USB2	1.8ms/scan	1.8ms/scan	3.7ms/scan
	RS-232	430ms/scan	430ms/scan	750ms/scan
Dimension, weight		175 x 110 x 44 mm, 716 grams		

		Resolution (nm)				
Slit size (um)		10	25	50	100	
UC 1200/mm	2048	0.18-0.22	0.29	0.61	1.18	
	2048L	0.20-0.28	0.27-0.38	0.52-0.68	1.1	
	3648	0.14-0.18	0.30	0.36-0.40	0.78	
UD 1800/mm	2048	0.08-0.11	0.10-0.13	0.28	1.60	
	2048L	0.10-0.18	0.20-0.29	0.34-0.42	0.8	
	3648	0.09-0.11	0.18	0.36-0.40	0.78	

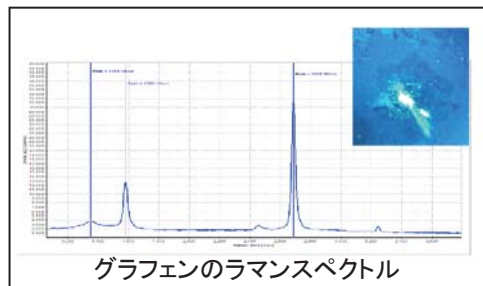
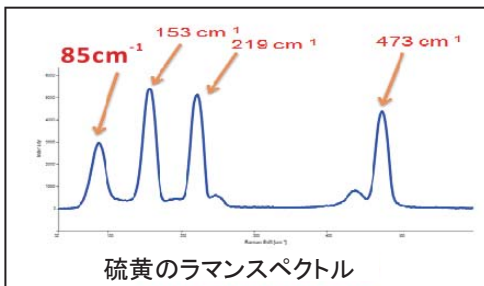
マイクロラマン識別 & 計測システム



↑
Avantes 社製
高感度分光器搭載

- 顕微ラマン研究レベルで高費用効果
- 1 筐体に集約した All in One 型
- 簡単に顕微鏡に取付け可能
- フレキシブルで可動性に優れている
- 小型・シンプルで迅速に計測
- 高精度デジタルイメージング

MRI はコスト効果の高いラマン分光システムで、個体・液体・粉・薄膜・ペースト・ジェル等どんな種類のどんなサンプルでも計測出来ます。コンパクトデザインに集約されたコア技術により、組立てや持ち運びも簡単でラボ内でもフィールドでもフレキシブルにラマンスペクトルを計測・記録できます。顕微鏡に装着して、或いはそのままサンプルにあてて計測出来ます。1つの筐体に光学系も集積したデザインにより、高感度・高パフォーマンスの計測が実現しました。



レーザ : 532nm, 50mW
精度 : 2 μ m, 1秒
ラマンシフト : 90 cm^{-1}



主要レーザ
473nm 532nm
488nm 785nm

◆ 組込みレーザキット MountQic Laser Module

ラマン計測用の可視～近赤外域の組込みレーザキットで、MRIに簡単に装着でき、532nmで特に高い反強磁性転移 90 cm^{-1} が得られる。MRIはレーザ出力が自動的に眼に安全なサンプルモードになっている。

◆ レーザ出力の調整・アライメントが簡単

①RAMSpecソフトのパネルから数値入力 ②MRI上のつまみの切換え
Laser alignment tool



◆ サンプル観察用インターフェース

9 Mpixel イメージカメラと 3W LED 光源により、高パフォーマンスのデジタルイメージングが可能。それと同時に RAMSpec ソフトにより、サンプルの長さや大きさを計測可能。



◆ サンプルに直接あてて計測可能



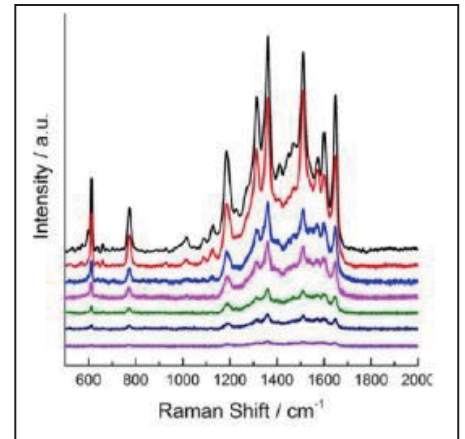
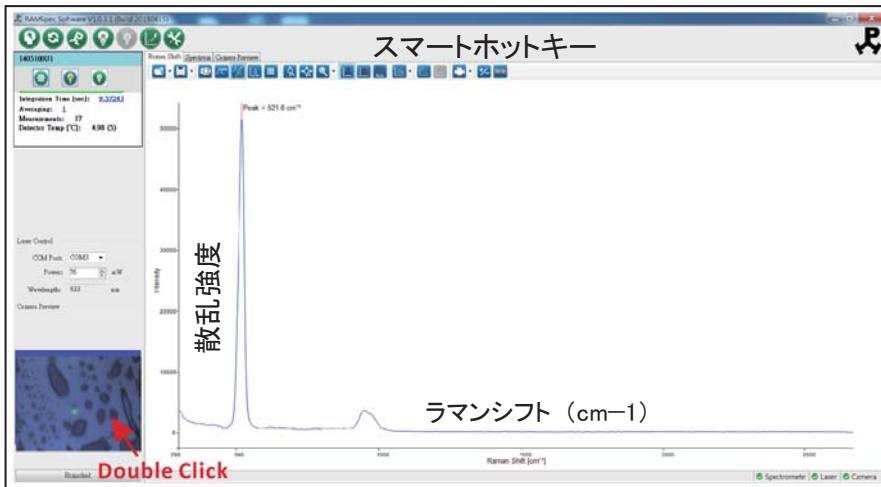
水平型はマルチアングルで使用可能

◆ サンプルを動かすターンテーブルオプション



垂直型も顕微鏡以外で使用可能

RAMSpec Software



SERS (633nm, 75mW, 30 秒)

◆MRI 用ソフトウェア RAMSpec

ラマン計測・分光用で直観的な操作が出来るようなインターフェースを提供しており、スキャンモードとビューモードの切替えが出来、1クリックでラマンイメージング表示が可能です。

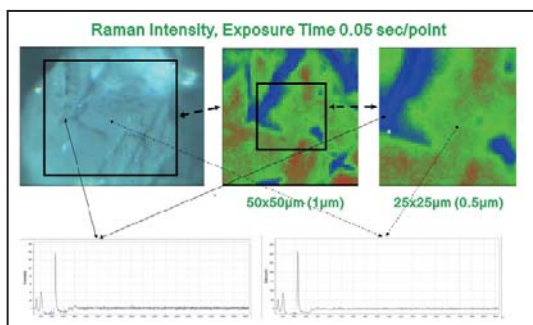
利点

- ハードウェアとレーザパラメータが自動的に関連して可動
- 飽和状態のアラームが鳴り、エラー信号のオーバーフローを除去する
- X軸が nm で表示され、縦軸に散乱強度、横軸がラマンシフトで分かりやすい
- 蛍光計測用のベースライン値修正機能
- ラマンスペクトル校正用の波長や非線形修正用の波長を含む
- MRI 内の機器全てにステータスチェックが可能
- レーザのウォーミングアップやスタンバイが自動
- スマートな暗電流および環境変化からの復帰もスムーズ
- 15 秒で起動→15 秒でチェックしその間にレーザウォーミングアップ
- スマートホットキー→①1クリックで高度なスキャンが可能 ②最適化した修正機能表示等

◆ラマン計測結果のレポート

サンプルをラマン計測・分光した結果を1枚のレポートとして出力出来ます。
(スペクトル表示、可視イメージ画像、レーザパラメータ、ズームインゾーン、散乱強度ピークデータ)

◆応用計測



マッピング・分解・2D・3D・経過等

◆主な仕様

レーザ波長	473,488,532,633,785,808,1064nm
スペクトルビームモード	TEM ₀₀
レーザビーム径	~ 1.1x2.2mm
ビーム拡がり角	<1.2mrad
出力安定性@10h	<1%
レーザ出力	75mW@633nm
ラマンレンジ	90cm ⁻¹ ~ 3500cm ⁻¹ (レーザ波長による)
S/N 比	300 : 1
平均ピクセル精度	標準 : 2.0cm ⁻¹ , 高精度 : 1.3cm ⁻¹
光源	3W LED
本体サイズ・重量	195x195x130mm・4kg

* 収納 BOX(W80xD60xH50cm) 内にすべてを収納でき、持ち運びに便利

* ラマン分光の利点は試料の事前準備無しで迅速に材料の特定ができ、非破壊で識別・計測し、水中や体内の物質でも識別が可能な事です。

◆応用分野

生物化学・化学・医療・鉱物学・美術・
太陽光パネル・細菌研究・CNTs

EVO SERIES

THE NEXT EVOLUTIONARY STEP FOR SPECTROMETRY



AVANTES' EVO SERIES

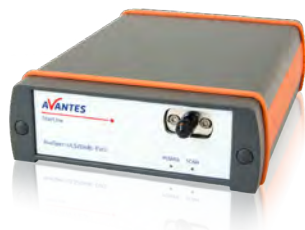
EVO series; why?

With the introduction of the AS-7010 electronics board, Avantes brought new and improved functionality to their spectrometers. This circuit board brings USB3 and Ethernet communication options to you. These options offer faster data speeds, longer distances and network integration for your application. Our improved electronics deliver more noise-free signals for your measurements and the on-board memory capabilities ensure plenty of capacity for future features. Spectrometers using this AS7010 electronics platform are the next EVOLutionary step in spectrometry. Avantes bundled these spectrometers in the EVO line of products, which are described in this brochure.

CMOS and CCD

Avantes offers a broad range of spectrometers with different detector technologies. For our Starline spectrometers, the standard Si CCD technology was the dominant technology for years. However, this dominant position is losing ground to CMOS technology. Wanting to be prepared for the future, Avantes embraced the CMOS technology at an early stage and now offers this latest, state-of-the-art technology as the new standard for our spectrometers. In the NIRline spectrometers we use InGaAs detectors and in the SensLine we use back-thinned CCD detectors.

Avantes is proud to announce the latest additions to our EVO-series spectrometers in the UV/VIS and NIR range.



EVO Series; UV/VIS spectrometer

Offers GigaEthernet and USB3.0 communication, more memory and fast data processing. Using the latest CMOS technology, these spectrometers are ready for the next decade!

Timing and Triggering

Numerous applications require for a spectrometer to be triggered at a timesensitive moment. For example when measuring in production lines, or with pulsed or flashed events like solar simulators or led measurements. Our state-of-the-art electronics, in combination with the right detector choice will provide you with an excellent instrument for continuous, repetitive, stable measurements. For decades, Avantes spectrometers have been well known for their excellent timing and trigger performance.



AvaSpec-HERO

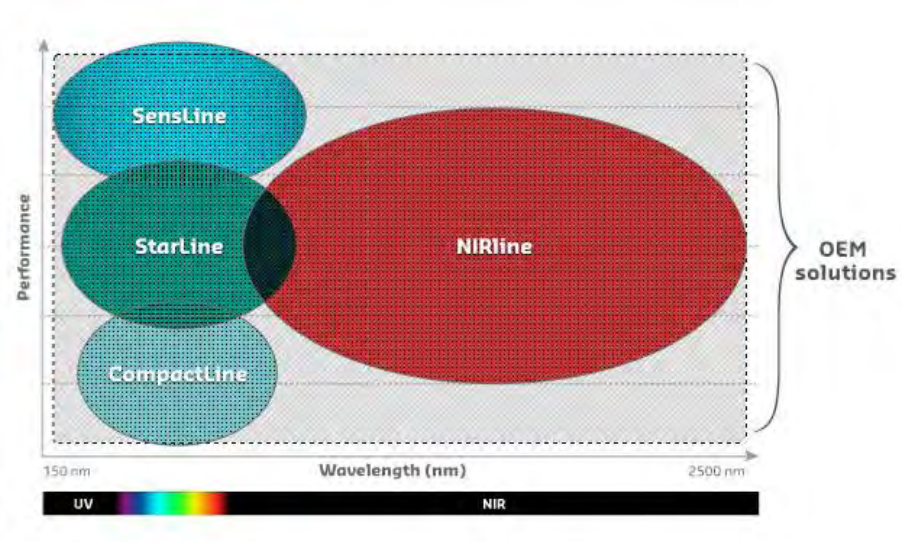
The AvaSpec-HERO is the answer for those in need of high resolution and high sensitivity! It combines high-end, cooled back-thinned detector technology, a 100mm symmetrical Czerny-Turner optical bench and state-of-the-art electronics to enable noise-free signal measurement in the most demanding environment. The ideal choice in the EVO series. A real HERO for your application!

EVOLutionary spectroscopy:

- Speed
- Network integration
- Multi-channel benefits

AVANTES' EVO SERIES

Product line overview



EVO series in our product lines

Product lines		
Starline	Sensline	NIRline
AvaSpec-ULS2048CL-EVO	AvaSpec-HERO	AvaSpec-NIR256/512-1.7-EVO
AvaSpec-ULS4096CL-EVO	AvaSpec-ULS2048XL-EVO	AvaSpec-NIR256/512-1.7-HSC-EVO
AvaSpec-ULS2048L-EVO	AvaSpec-HS2048XL-EVO	AvaSpec-NIR256/512-2.5-HSC-EVO



USB 3.0



Gigabit Ethernet



More memory

AvaSpec-ULS2048CL-EVO

StarLine CMOS Spectrometer

AvaSpec-ULS2048CL-EVO



Using CMOS instead of the conventional CCD detectors, this spectrometer offers you the latest technology.

In combination with our latest AS-7010 electronics, it offers you a versatile device including USB3.0 communication with 10x higher speed compared to USB2, and a second communication port which offers Gigabit Ethernet for integration in your company network and possibility for long distance communication.

Besides the high-speed communication options, the EVO series offers a fast microprocessor and increased memory to help you store more

spectra onboard and realize more functionality.

Options include a detector collection lens to enhance sensitivity in the 200 to 1100 nm range and an order-sorting filter to reduce second-order effects. The AvaSpec-ULS2048CL-EVO is available with a wide range of slit sizes, gratings and fiber-optic entrance connectors as well.

It comes complete with AvaSoft-Basic software, USB cable and an extensive manual.

The AvaSpec-ULS2048CL-EVO is also available as OEM unit, bench only or Rackmount version.

Technical Data

Optical bench	ULS symmetrical Czerny-Turner, 75 mm focal length
Wavelength range	200 - 1100 nm
Resolution	0.06 - 20 nm, depending on configuration (see table)
Stray light	0.19 - 1.0%, depending on the grating
Sensitivity	375,000 counts/ μ W per ms integration time
Detector	CMOS linear Image Sensor
Signal/noise	300:1
AD converter	16-bit, 6 MHz
Integration time	30 μ s - 59 s
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
Power supply	Default USB3 power, 500 mA Or 12VDC, 300 mA
Dimensions, weight	177 x 127 x 44,5 mm (1 channel), 1135 grams

Timing and Triggering

Sample speed with on-board averaging	0.38 ms/scan
Data transfer speed	0.38 ms/scan (USB3), 1.0 ms (ETH)
Min. delay / jitter	0.9 / 0.02 μ s

Detector Specifications

Sensitivity photons/ count @ 600 nm	Sensitivity in cts/ μ W per ms int. time	QE (%) @ peak	Signal/ noise	Dark noise (counts RMS)	Dynamic range
2	375,000	80%	300:1	16	4000



Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200 - 1100**	891**	300	300	UA
UV/VIS/NIR	200 - 1100**	891**	300	300/1000	UNA-DB
UV/VIS	200 - 850	515	600	300	UB
UV	200 - 750	247 - 218*	1200	250	UC
UV	200 - 650	163 - 143*	1800	UV	UD
UV	200 - 580	113 - 69*	2400	UV	UE
UV	200 - 400	69 - 45*	3600	UV	UF
UV/VIS	250 - 850	515	600	400	BB
VIS/NIR	300 - 1100**	792**	300	500	VA
VIS	360 - 1000	495	600	500	VB
VIS	300 - 800	247 - 218*	1200	500	VC
VIS	350 - 750	142 - 89*	1800	500	VD
VIS	350 - 640	74 - 49*	2400	VIS	VE
NIR	500 - 1050	495	600	750	NB
NIR	500 - 1050	218 - 148*	1200	750	NC
NIR	600 - 1160	346 - 297	830	800	SI
NIR	600 - 1100**	495**	300	1000	IA
NIR	600 - 1100	495	600	1000	IB

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

** please note that not all 2048 pixels will be used for the useable range.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (µm)					
	10	25	50	100	200	500
300	1.0	1.4	2.5	4.8	9.2	21.3
600	0.40 - 0.53*	0.7	1.2	2.4	4.6	10.8
830	0.32	0.48	0.93	1.7	3.4	8.5
1200	0.20 - 0.28*	0.27 - 0.38*	0.52 - 0.66*	1.1	2.3	5.4
1800	0.10 - 0.18*	0.20 - 0.29*	0.34 - 0.42*	0.8	1.6	3.6
2400	0.09 - 0.13*	0.13 - 0.17*	0.26 - 0.34*	0.44 - 0.64*	1.1	2.7
3600	0.06 - 0.08*	0.10	0.19	0.4	0.8	1.8

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution.

Options

-RS	• Replaceable slit
DCL-UV/VIS-200	• Quartz detector collection lens (200 - 1100 nm)
SLIT-XX	• Slit size, please specify XX = 5, 10, 25, 50, 100, 200 or 500 µm
SLIT-XX-RS	• Replaceable slit with SMA connector , specify slit size XX = 25, 50, 100, 200 or 500 µm. Only available for AvaSpec-ULS2048CL-EVO-RS
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
OSF-YYY	• Order-sorting filter for reduction of second-order effects please specify YYY = 305, 395, 475, 515, 550 or 600 nm
OSC	• Order-sorting coating with 600 nm long-pass filter for BB (>305 nm) and VB gratings, recommended with OSF-305
OSC-UA	• Order-sorting coating with 350 and 600 nm linear variable filter for UA, VA gratings
OSC-UB	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
-FCPC	• FC/PC fiber-optic connector

AvaSpec-ULS4096CL-EVO

StarLine CMOS Spectrometer

AvaSpec-ULS4096CL-EVO



The AvaSpec-ULS4096CL-EVO uses the latest CMOS technology instead of the conventional CCD detectors, which means this spectrometer is completely up to date and ready for the next decade.

The dominant position of CCD detectors in the spectrometer field is fading and new technologies like CMOS have evolved and become a suitable alternative.

In combination with our latest AS-7010 electronics it offers you a versatile device including USB3 communication with 10 times higher speed compared to USB2 and a second communication port that offers Gigabit Ethernet.

Besides the high speed communication options, the EVO series also offers a fast microprocessor and improved memory which can help you to store more spectra onboard and realize more functionality.

The AvaSpec-ULS4096CL-EVO is available with a wide range of slit sizes, gratings and fiber-optic entrance connectors as well. The AvaSpec-ULS4096CL-EVO is also available as OEM unit, bench only or Rackmount version.

With its 4096 pixels, this spectrometer is tailored for high-resolution applications like plasma monitoring and LIBS.

Technical Data

Optical bench	ULS symmetrical Czerny-Turner, 75 mm focal length
Wavelength range	200 - 1100 nm
Resolution	0.05 - 20 nm, depending on configuration (see table)
Stray light	0.19 - 1.0%, depending on the grating
Sensitivity	218,000 counts/ μ W per ms integration time
Detector	CMOS linear Image Sensor
Signal/noise	335:1
AD converter	16-bit, 6 MHz
Integration time	9 μ s - 40 s
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
Power supply	Default USB3 power, 500 mA Or 12VDC, 300 mA
Dimensions, weight	177 x 127 x 44,5 mm (1 channel), 1135 grams

Timing and Triggering

Sample speed with on-board averaging	0.7 ms/scan
Data transfer speed	0.7 ms/scan (USB3), 1.0 ms (ETH)
Min. delay / jitter	0.9 / 0.02 μ s

Detector Specifications

Sensitivity photons/count @ 600 nm	Sensitivity in cts/ μ W per ms int. time	QE (%) @ peak	Signal/noise	Dark noise (counts RMS)	Dynamic range
2	218,000	80%	325:1	16	4000

Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200 - 1100**	891**	300	300	UA
UV/VIS/NIR	200 - 1100**	891**	300	300/1000	UNA-DB
UV/VIS	200 - 850	515	600	300	UB
UV	200 - 750	247 - 218*	1200	250	UC
UV	200 - 650	163 - 143*	1800	UV	UD
UV	200 - 580	113 - 69*	2400	UV	UE
UV	200 - 400	69 - 45*	3600	UV	UF
UV/VIS	250 - 850	515	600	400	BB
VIS/NIR	300 - 1100**	792**	300	500	VA
VIS	360 - 1000	495	600	500	VB
VIS	300 - 800	247 - 218*	1200	500	VC
VIS	350 - 750	142 - 89*	1800	500	VD
VIS	350 - 640	74 - 49*	2400	VIS	VE
NIR	500 - 1050	495	600	750	NB
NIR	500 - 1050	218 - 148*	1200	750	NC
NIR	600 - 1160	346 - 297	830	800	SI
NIR	600 - 1100**	495**	300	1000	IA
NIR	600 - 1100	495	600	1000	IB

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

** please note that not all 4096 pixels will be used for the useable range.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (µm)					
	10	25	50	100	200	500
300	0.50 - 0.70	1.20 - 1.30*	2.17	4.6	9.00	20.0
600	0.30 - 0.36*	0.58 - 0.60	1.17	2.20	4.5	10.0
830	0.25	0.48	0.93	1.7	3.4	8.0
1200	0.14 - 0.18*	0.30	0.62	1.08	2.2	5.0
1800	0.09 - 0.11*	0.18	0.36 - 0.40*	0.78	1.5	3.7
2400	0.07 - 0.09*	0.13 - 0.15*	0.26 - 0.32*	0.40 - 0.64*	1.1	2.7
3600	0.05 - 0.06*	0.10	0.19	0.4	0.8	2.0

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution.

Options

-RS	• Replaceable slit
DCL-UV/VIS-200	• Quartz detector collection lens (200 - 1100 nm)
SLIT-XX	• Slit size, please specify XX = 5, 10, 25, 50, 100, 200 or 500 µm
SLIT-XX-RS	• Replaceable slit with SMA connector, specify slit size XX = 25, 50, 100 or 200 µm. Only available with AvaSpec-ULS4096CL-EVO-RS
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
OSF-YYY	• Order-sorting filter for reduction of second-order effects please specify YYY = 305, 395, 475, 515, 550 or 600 nm
OSC	• Order-sorting coating with 600 nm long-pass filter for BB (>305 nm) and VB gratings, recommended with OSF-305
OSC-UA	• Order-sorting coating with 350 and 600 nm linear variable filter for UA, VA gratings
OSC-UB	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
-FCPC	• FC/PC fiber-optic connector

AvaSpec-ULS2048L-EVO

StarLine CCD Spectrometer

AvaSpec-ULS2048L-EVO



The AvaSpec-ULS2048L-EVO uses our latest AS-7010 electronic board. This means it has all the advantages of the previous AvaSpec-ULS2048L-USB2, but offers USB3 communication instead of USB2, which makes for a significant increase in speed.

Unique is the second communication port which offers Gigabit Ethernet for integration in your company network and possibility for long distance communication.

This unique, first-to-the-market combination enables you to create

high-speed multichannels systems, perfectly suited for various industrial applications.

Options include a deep-UV detector coating, for better performance in the deep-UV-range, a detector collection lens to enhance sensitivity in the 200-1100 nm range and order-sorting filter to reduce second-order effects.

The AvaSpec-2048L is available with a wide range of slit sizes, gratings and fiber-optic entrance connectors as well.

Technical Data

Optical bench	ULS symmetrical Czerny-Turner, 75 mm focal length
Wavelength range	200 - 1100 nm
Resolution	0.06 - 20 nm, depending on configuration (see table)
Stray light	0.04 - 0.1%, depending on the grating
Sensitivity	470,000 counts/ μ W per ms integration time
Detector	CCD linear array, 2048 pixels
Signal/noise	300:1
AD converter	16-bit, 2 MHz
Integration time	1.11 ms - 10 minutes
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
Power supply	Default USB3 power, 500 mA Or 12VDC, 300 mA
Dimensions, weight	177 x 127 x 44,5 mm (1 channel), 1135 grams

Timing and Triggering

Sample speed with on-board averaging	1.1 ms/scan
Data transfer speed	1.1 ms/scan (USB3), 3.8 ms (ETH)
Min. delay / jitter	3.28 / 0.02 μ s

Detector Specifications

Sensitivity photons/count @ 600 nm	Sensitivity in cts/ μ W per ms int. time	QE (%) @ peak	Signal/noise	Dark noise (counts RMS)	Dynamic range
4	470,000	40%	300:1	20	3300



Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200 - 1100**	900**	300	300	UA
UV/VIS/NIR	200 - 1100**	900**	300	300/1000	UNA-DB
UV/VIS	200 - 850	520	600	300	UB
UV	200 - 750	250 - 220*	1200	250	UC
UV	200 - 650	165 - 145*	1800	UV	UD
UV	200 - 580	115 - 70*	2400	UV	UE
UV	200 - 400	70 - 45*	3600	UV	UF
UV/VIS	250 - 850	520	600	400	BB
VIS/NIR	300 - 1100**	800**	300	500	VA
VIS	360 - 1000	500	600	500	VB
VIS	300 - 800	250 - 200*	1200	500	VC
VIS	350 - 750	145 - 90*	1800	500	VD
VIS	350 - 640	75 - 50*	2400	VIS	VE
NIR	500 - 1050	500	600	750	NB
NIR	500 - 1050	220 - 150*	1200	750	NC
NIR	600 - 1160	350 - 300	830	800	SI
NIR	600 - 1100**	500**	300	1000	IA
NIR	600 - 1100	500	600	1000	IB

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

** please note that not all 2048 pixels will be used for the useable range.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
300	1.0	1.4	2.5	4.8	9.2	21.3
600	0.40 - 0.53*	0.7	1.2	2.4	4.6	10.8
830	0.32	0.48	0.93	1.7	3.4	8.5
1200	0.20 - 0.28*	0.27 - 0.38*	0.52 - 0.66*	1.1	2.3	5.4
1800	0.10 - 0.18*	0.20 - 0.29*	0.34 - 0.42*	0.8	1.6	3.6
2400	0.09 - 0.13*	0.13 - 0.17*	0.26 - 0.34*	0.44 - 0.64*	1.1	2.7
3600	0.06 - 0.08*	0.10	0.19	0.4	0.8	1.8

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution.

Options

-RS	• Replaceable slit
DCL-UV/VIS-200	• Quartz detector collection lens (200 - 1100 nm)
SLIT-XX	• Slit size, please specify XX = 5, 10, 25, 50, 100, 200 or 500 μm
SLIT-XX-RS	• Replaceable slit with SMA connector, specify slit size XX = 25, 50, 100 or 200 μm. Only available with AvaSpec-ULS4096CL-EVO-RS
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
OSF-YYY	• Order-sorting filter for reduction of second-order effects please specify YYY = 305, 395, 475, 515, 550 or 600 nm
OSC	• Order-sorting coating with 600 nm long-pass filter for BB (>305 nm) and VB gratings, recommended with OSF-305
OSC-UA	• Order-sorting coating with 350 and 600 nm linear variable filter for UA, VA gratings
OSC-UB	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
-FCPC	• FC/PC fiber-optic connector

AvaSpec-HERO

SensLine Back-thinned CCD Spectrometer

AvaSpec-HSC1024x58TEC-EVO



The AvaSpec-Hero is our top-of-the-line spectrometer!

Based on our High-Sensitivity Compact optical (HSC) bench ($f=100\text{mm}$; $NA=0.13$) and a 1024x58 back-thinned CCD detector, it offers the best of both worlds: high sensitivity and resolution!

The instrument is equipped with a TE Cooling enabling long integration times in low light applications. In conjunction with our AS7010 electronics, including a high end AD converter, noise is kept to a minimum, which offers you an excellent Signal to Noise and Dynamic Range performance.

From low-light fluorescence applications to the most demanding Raman applications; the AvaSpec-Hero is your ideal companion.

Of course the Digital IO ports enabling external triggering, control of shutters, and pulsed light sources from the Avantes line of instruments are compatible with the HERO as well.

The Avaspec-HERO is standard equipped for use with replaceable slits, offering optimal flexibility for a variety of applications.

Technical Data: AvaSpec-HSC1024x58TEC-EVO

Optical bench	HSC symmetrical Czerny-Turner, 100 mm focal length, NA: 0.13
Wavelength range	200 - 1160 nm
Resolution	0.2 - 7 nm, depending on configuration (see table)
Stray light	0.5%, depending on the grating
Sensitivity	445,000 counts/ μW per ms integration time
Detector	CCD array image sensor with one stage TE Cooled, 1024 pixels
Signal/noise	1200:1
Dynamic range	40,000
AD converter	16-bit, 250 kHz
Integration time	5.2 ms - 60 sec
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital bidirectional, trigger, sync., strobe, laser.
Power supply	12VDC, 1.5A
Dimensions, weight	185 x 161 x 185 mm, 3500 grams

Timing and Triggering

Sample speed with on-board averaging	5.2 ms/scan
Data transfer speed	5.2 ms/scan (USB3 and ETH)
Min. delay / jitter	-5220 μs / 5220 μs

Detector Specifications

Sensitivity photons/count @ 600 nm	Sensitivity in cts/ μW per ms int. time	QE (%) @ peak	Signal/noise	Dark noise (counts RMS)	Dynamic range
16	445,000	92%	1200:1	2	40,000

Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200 - 1160	770 - 760*	300	300	HSC0300-0.30
UV/VIS/NIR	250 - 1160	770 - 760*	300	420	HSC0300-0.42
VIS/NIR	250 - 1160	577 - 553	400	550	HSC0400-0.55
UV/VIS	200 - 850	373 - 340*	600	400	HSC0600-0.40
VIS/NIR	250 - 1160	373 - 340*	600	650	HSC0600-0.65
VIS/NIR	500 - 1160	268 - 220*	830	900	HSC0830-0.90
UV/VIS	200 - 1160	182 - 130*	1200	400	HSC1200-0.40
VIS/NIR	500 - 1050	182 - 130*	1200	750	HSC1200-0.75
UV/VIS	200 - 850	84 - 61*	2400	270	HSC2400-0.27

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (µm)					
	10	25	50	100	200	500
300	1.70	1.90	2.45	3.0	5.50	5.50
400	1.40	1.55	2.00	2.55	4.70	5.50
600	0.80	0.85	1.10	1.70	3.00	5.50
830	0.60	0.70	0.9	1.25	2.00	5.50
1200	0.32	0.35	0.48	0.80	1.30	5.50
2400	0.18	0.20	0.29	0.40	0.65	5.50

* Above values are average values. Due to optical properties resolution will be better in the lower wavelengths than in the higher wavelength range.

Options

SLIT-XX-RS	• Replaceable slit with SMA connector, specificity slit size XX = 10, 25, 50, 100, 200 or 500 µm.
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
SLITKIT-SMA	• Slit kit containing 25, 50, 100, 200 or 500 µm slits, and the tools to replace the slit. SMA-connectors
SLITKIT-FCPC	• As SLITKIT-SMA, but with FC/PC connectors
OSF-YYY-3	• Order sorting filter for reduction of second-order effects, 3 mm thick, please specify YYY = 305, 395, 475, 515, 550, 600 nm
OSC-HSC300	• Order sorting coating for use with grating HSC0300-xx
OSC-HSC600	• Order sorting coating for use with grating HSC0600-xx and HSC0400-xx

The new AvaSpec-HERO is the answer for those in need of high resolution and high sensitivity!

AvaSpec-ULS2048XL-EVO

SensLine Back-thinned CCD Spectrometer

AvaSpec-ULS2048XL-EVO



Combining exceptional quantum efficiency with high speed is the value proposition of the AvaSpec-ULS2048XL-EVO spectrometer.

Unlike many back-thinned CCD spectro-meters with two dimensional arrays, the AvaSpec-ULS2048XL-EVO has large, monolithic pixels of 14x500 microns with exceptional efficiency in the UV range, from 200 to 400 nm, and the NIR range, from 950 to 1160 nm.

The instrument has an electronic shutter, which enables integration times as low as 2 microseconds.

To further enhance sensitivity, a detector collection lens is available to improve sensitivity up to 60% when combined with larger core fibers.

Options include an order-sorting filter to reduce second-order effects and purge ports for deep-UV measurements. The AvaSpec-ULS2048XL-EVO comes with a wide range of slit sizes, gratings and may be configured with SMA or FC/PC fiberoptic entrance connectors.

Connection to your PC is handled via a USB3-connection or Ethernet, delivering a scan every 2 milliseconds.

Technical Data

Optical bench	ULS, Symmetrical Czerny-Turner, 75 mm focal length
Wavelength range	200 - 1160 nm
Resolution	0.09 -20 nm, depending on configuration (see table)
Stray light	< 0.5%
Sensitivity	460,000 counts/ μ W per ms int. time
UV quantum efficiency	60% (200-300 nm)
Detector	Back-thinned CCD image sensor 2048 pixels
Signal/noise	525:1
AD converter	16-bit, 1 MHz
Integration time	2 μ s - 20 seconds
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
Readout noise	9.8 cnt RMS
Dark noise	4.5 cnt RMS
Dynamic range	13,700
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital in, 12 Digital out, trigger, synchronization
Power supply	Default USB power, 700 mA. Or external 12VDC, 360 mA
Dimensions, weight	175 x 127 x 44,5 mm (1 channel), 1180 grams

Timing and Triggering

Sample speed with on-board averaging	2.44 ms/scan
Data transfer speed	2.44 ms/scan (USB3)
Min. Delay / Jitter	0.37 / 25 ns

Detector Specifications

Sensitivity photons/count @ 600 nm	Sensitivity in cts/ μ W per ms int. time	QE (%) @ peak	Signal/noise	Dark noise (counts RMS)	Dynamic range
4	460,000	78%	525:1	5	13,700



Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200 - 1160**	960**	300	300	UA
UV/VIS/NIR	200 - 1100**	900**	300	300/1000	UNA-DB
UV/VIS	200 - 850	520	600	300	UB
UV	200 - 750	250 - 220*	1200	250	UC
UV	200 - 650	165 - 145*	1800	UV	UD
UV	200 - 580	115 - 70*	2400	UV	UE
UV	200 - 400	70 - 45*	3600	UV	UF
UV/VIS	250 - 850	520	600	400	BB
VIS/NIR	300 - 1160**	860**	300	500	VA
VIS	360 - 1000	500	600	500	VB
VIS	300 - 800	250 - 200*	1200	500	VC
VIS	350 - 750	145 - 100*	1800	500	VD
VIS	350 - 640	75 - 50*	2400	VIS	VE
NIR	500 - 1050	500	600	750	NB
NIR	500 - 1050	220 - 150*	1200	750	NC
NIR	600 - 1160	350 - 300	830	800	SI
NIR	600 - 1160**	560**	300	1000	IA
NIR	600 - 1160	500	600	1000	IB

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

** please note that not all 2048 pixels will be used for the useable range.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (µm)					
	10	25	50	100	200	500
300	1.40	1.50	2.5	4.8	9.2	21.3
600	0.70 - 0.80*	0.75 - 0.85*	1.2	2.4	4.6	10.8
830	0.42 - 0.48*	0.50 - 0.58*	0.93	1.7	3.4	8.5
1200	0.25 - 0.31*	0.37 - 0.43*	0.52 - 0.66*	1.1	2.3	5.4
1800	0.17 - 0.21*	0.26 - 0.32*	0.34 - 0.42*	0.8	1.6	3.6
2400	0.12 - 0.18*	0.18 - 0.24*	0.26 - 0.34*	0.44 - 0.64*	1.1	2.7
3600	0.09 - 0.12*	0.11 - 0.15*	0.19	0.4	0.8	1.8

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution.

Options

-RS	• Replaceable slit
DCL-UV/VIS-200	• Quartz detector collection lens (200 - 1100 nm)
SLIT-XX	• Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 µm
SLIT-XX-RS	• Replaceable slit with SMA connector, specify slit size XX = 25, 50, 100, 200 or 500 µm. Only available with AvaSpec-ULS2048XL-EVO-RS
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
OSF-YYY	• Order-sorting filter for reduction of second-order effects, 1 mm thick, please specify YYY= 305, 395, 475, 515, 550 or 600 nm
OSC	• Order-sorting coating with 600 nm long-pass filter for BB (>350 nm) and VB gratings, recommended with OSF-305
OSC-UA	• Order-sorting coating with 350 and 600 nm linear variable filter for UA, VA gratings
OSC-UB	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
-FCPC	• FC/PC fiber-optic connector

AvaSpec-HS2048XL-EVO

SensLine Back-thinned CCD Spectrometer

AvaSpec-HS2048XL-EVO



For high-sensitivity applications where high resolution is not of paramount concern, the AvaSpec-HS2048XL-EVO is an exceptional instrument. Featuring Avantes' HS optical bench which has a full 0.22 numerical aperture for superior throughput, the AvaSpec-HS2048XL has a back-thinned CCD detector with 2048 pixels measuring 14X500 microns.

Unlike many back-thinned CCD spectrometers, which have two dimensional arrays, the HS2048XL has large monolithic pixels with exceptional efficiency in the UV, from 200-400 nm, and the NIR, from 950-1160 nm, while retaining sensitivity in the visible range.

The unique optical design features torroid collimating and focusing mirrors to control image magnification and enhance efficiency. The instrument also features an electronic shutter, which enables integration times as low as 2 microseconds.

For configurations that require second-order filtering, order-sorting filters are available. The AvaSpec-HS2048XL is available with a wide range of slit sizes, gratings and may be configured with SMA or FC/ PC fiber-optic entrance connectors.

Technical Data

Optical bench	High-sensitivity asymmetrical design, 37.5 mm focal length; NA - 0.22, f/2.27
Wavelength range	200 - 1160 nm
Resolution	1 - 20 nm, depending on configuration (see table)
Stray light	< 1 %
Sensitivity	1,250,000 counts/ μ W per ms int. time
Detector	Back-thinned CCD image sensor 2048 pixels
Signal/noise	525:1
AD converter	16-bit, 1 MHz
Integration time	2 μ s - 600 seconds
Interface	USB 3.0 high-speed, 5 Gbps Gigabit Ethernet, 1 Gbps
Dynamic range	14,900
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 3 Digital in, 12 Digital out, trigger, synchronization
Power supply	Default USB power, 700 mA. or external 12VDC, 360 mA
Dimensions, weight	175 x 165 x 85 mm, 1950 grams

Timing and Triggering

Sample speed with on-board averaging	2.44 ms/scan
Data transfer speed	2.44 ms/scan (USB3)
Min. delay / jitter	0.37 μ s / 25 ns

Detector Specifications

Sensitivity photons/ count @ 600 nm	Sensitivity in cts/ μ W per ms int. time	QE (%) @ peak	Signal/ noise	Dark noise (counts RMS)	Dynamic range
4	1,250,000	78%	525:1	5	14,900



Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200 - 1160	900	500	330	HS500-0.33
UV/VIS	200 - 660	440	1000	250	HS1000-0.25
UV	200 - 850	520	600	300	HS600-0.30
UV/VIS	200 - 850	520	600	400	HS600-0.40
UV/VIS	300 - 1160	860	500	560	HS500-0.56
VIS	360 - 1000	500	600	500	HS600-0.50
NIR	500 - 1050	500	600	750	HS600-0.75
VIS	350 - 850	460	900	550	HS900-0.55
VIS	400 - 722	322	1200	500	HS1200-0.5
NIR	600 - 1100	500	600	1000	HS600-1.0
NIR	600 - 1160	350	830	900	HS830-0.9
NIR	750 - 990	240	1200	1000	HS1200-1.0

Resolution table (FWHM in nm)

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
500	2.6	4.5	5.5	6.5	10.0	22.0
600	2.2	3.8	4.5	5.5	7.5	18.0
830*	2.1	3.6	4.0	5.0	7.0	15.0
900*	2.0	3.5	3.8	4.8	6.8	14.5
1000*	1.9	3.3	3.6	4.6	6.6	14.0
1200*	1.8	3.0	3.3	4.3	6.2	13.5

* theoretical values

Options

SLIT-XX	• Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 μm
OSF-YYY	• Order-sorting filter for reduction of second-order effects, 1 mm thick, please specify YYY = 305, 385, 475, 515, 550 or 600 nm
OSC-HS500	• Order-sorting coating with 350 and 600 nm long-pass filter for HS500 gratings in AvaSpec-HS
OSC-HS600	• Order-sorting coating with 350 and 600 nm long-pass filter for HS600 gratings in AvaSpec-HS
OSC-HS900	• Order-sorting coating with 600 nm long-pass filter for HS900 gratings in AvaSpec-HS
OSC-HS1000	• Order-sorting coating with 350 nm long-pass filter for HS1000 gratings in AvaSpec-HS
FCPC	• FC/PC fiber optic connector

The AvaSpec-HS2048XL-EVO is ideally suited for diffuse reflection (UV, VIS, NIR) measurements and fluorescence

AvaSpec-ULS2048x64TEC-EVO SensLine Thermoelectrically Cooled Fiber-Optic Spectrometer

AvaSpec-ULS2048x64TEC-EVO



Available soon:

The AvaSpec-ULS2048x64TEC-EVO is an updated version of our AvaSpec-ULS2048x64TEC spectrometer, with improved electronics and cooling.

This instrument enhances the Sensline series with its cooled, back-thinned detector. The back-thinned detector has good sensitivity in the UV and IR region. The 64 pixelheight (0.89 mm) enables catching as many photons as possible while the cooling enables long integration times up to 120 seconds with low-noise levels.

The instrument features Peltier cooling device integrated into our exclusive ultra-low stray light optical bench, which can

reduce the temperature of the CCD chip to -30°C against ambient, improving the dark baseline and PRNU level significantly. The detector cooling also reduces the dark noise by a factor of 2-3.

The AvaSpec-ULS2048x64TEC-EVO uses a special low-noise version of the 2048x64 detector with integrated cooling.

All the features mentioned above make this instrument ideally suited for measuring low-light applications, such as fluorescence or low-light Raman measurements.

Optimal flexibility is guaranteed with the replaceable slit, making the instrument suitable for various kinds of applications.

Technical Data

Optical bench	ULS Symmetrical Czerny-Turner, 75 mm focal length
Wavelength range	200 - 1160 nm
Resolution	0.09 - 20 nm, depending on configuration (see table)
Stray light	<1%, depending on the grating
Sensitivity	300,000 counts/ μW per ms integration time
Detector	Backthinned CCD, 2048x64 pixels, low noise, integrated cooling
Temperature-cooled CCD	Max. $\Delta T = -30^{\circ}\text{C}$ versus ambient. Optimal setting: 5°C
Signal/noise	550:1
AD converter	16-bit, 500 KHz
Dynamic range	19,000
Dark noise	5 cnts
Integration time	9.7 ms - 120 s
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
Power supply	12 VDC, 1.5 A
Dimensions, weight	185 x 145 x 185 mm, 3500 grams

Timing and Triggering

Sample speed with on-board averaging	9.7 ms/scan
Data transfer speed	9.7 ms/scan
Min. delay / jitter	9.7 ms

Detector Specifications

Sensitivity photons/count @ 600 nm	Sensitivity in cts/ μW per ms int. time	QE (%) @ peak	Signal/noise	Dark noise (counts RMS)	Dynamic range
5.9	300,000	78%	550:1	5	19,000

Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160**	960**	300	300	UA
UV/VIS/NIR	200-1100**	900**	300	300/1000	UNA-DB
UV/VIS	200-850	520	600	300	UB
UV	200-750	250-220*	1200	250	UC
UV	200-650	165-145*	1800	UV	UD
UV	200-580	115-70*	2400	UV	UE
UV	200-400	70-45*	3600	UV	UF
UV/VIS	250-850	520	600	400	BB
VIS/NIR	300-1160**	860**	300	500	VA
VIS	360-1000	500	600	500	VB
VIS	300-800	250-200*	1200	500	VC
VIS	350-750	145-90*	1800	500	VD
VIS	350-640	75-50*	2400	VIS	VE
NIR	500-1050	500	600	750	NB
NIR	500-1050	220-150*	1200	750	NC
NIR	600-1160	350-300	830	800	SI
NIR	600-1160**	560**	300	1000	IA
NIR	600-1160	500	600	1000	IB

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

** please note that not all 2048 pixels will be used for the useable range.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
300	1.40	1.50	2.5	4.8	9.2	21.3
600	0.70-0.80*	0.75-0.85*	1.2	2.4	4.6	10.8
830	0.42-0.48*	0.50-0.58*	0.93	1.7	3.4	8.5
1200	0.25-0.31*	0.37-0.43*	0.52-0.66*	1.1	2.3	5.4
1800	0.17-0.21*	0.26-0.32*	0.34-0.42*	0.8	1.6	3.6
2400	0.12-0.18*	0.18-0.24*	0.26-0.34*	0.44-0.64*	1.1	2.7
3600	0.09-0.12*	0.11-0.15*	0.19	0.4	0.8	1.8

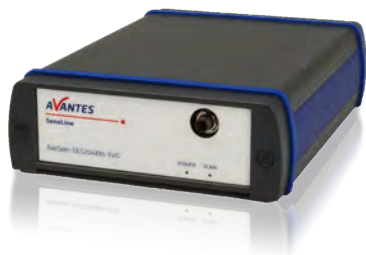
* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution.

Options

DCL-UV/VIS-200	• Detector Collection Lens to enhance sensitivity, Quartz, 200-1100 nm
SLIT-XX-RS	• Replaceable slit with SMA connector. Specify slit size XX= 10, 25, 50, 100, 200 or 500 μm
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
OSF-YYY	• Order-sorting filter for reduction of 2 nd order effects, 1 mm thick, please specify YYY= 305, 395, 475, 515, 550 or 600 nm
OSC	• Order-sorting coating with 600 nm long-pass filter for BB (>350 nm) and VB gratings, recommended with OSF-305
OSC-UA	• Order-sorting coating with linear variable filter for UA, VA gratings
OSC-UB	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings

AvaSpec-ULS2048x64-EVO SensLine High UV and NIR Sensitivity Spectrometer

AvaSpec-ULS2048x64-EVO



Alongside the cooled AvaSpec-ULS2048x64TEC-EVO with low-noise detector, Avantes also offers the more cost-effective, uncooled AvaSpec-ULS2048x64-EVO. With its standard 2048x64 backthinned CCD detector, this spectrometer is perfect for less demanding applications in the UV and NIR range.

For applications that require integration times lower than 2 seconds, the cooling option is often not needed. For example, this uncooled AvaSpec-ULS2048x64-EVO has an established track record in various DOAS applications all over the world because of its high UV response and 0.9 mm detector height that enables detecting the wavelengths of interest.

Options include an order-sorting filter, to reduce second-order effects and purge ports for deep-UV measurements. The AvaSpec-ULS2048x64-EVO comes with a wide range of slit sizes, gratings and can be configured with SMA or FC/PC fiber-optic entrance connectors.

The AvaSpec-ULS2048x64-EVO uses the AS7010 electronics board offering USB3 (10 times faster than USB2), Gigabit Ethernet and better signal processing.

Connection to your PC is handled via USB3-connection or Ethernet, delivering a scan every 2 milliseconds. The instrument comes complete with AvaSoft-basic software, USB cable and an extensive manual.

Technical Data

Optical bench	ULS, Symmetrical Czerny-Turner, 75 mm focal length
Wavelength range	200 - 1160 nm
Resolution	0.09 - 20 nm, depending on configuration (see table)
Stray light	< 1%, depending on the grating
Sensitivity	650,000 counts/μW per ms int. time
Detector	Back-thinned CCD image sensor 2048x64 pixels (height: 0.89 mm)
Signal/noise	450:1
AD converter	16-bit, 1.33 MHz
Integration time	2.4 ms - 25 seconds
Interface	USB 3.0 high-speed, 5 Gbps Gigabit Ethernet 1 Gbps
Readout noise	7.5 cnt RMS
Dark noise	11.5 cnt RMS
Dynamic range	6100
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bidirectional, trigger, sync., strobe, laser
Power supply	Default USB power, 885 mA. Or external 12VDC, 420 mA
Dimensions, weight	175 x 127 x 44,5 mm (1 channel), 1180 grams

Timing and Triggering

Sample speed with on-board averaging	2.4 ms/scan
Data transfer speed	2.4 ms/scan
Min. delay / jitter	2.4 ms

Detector Specifications

Sensitivity photons/count @ 600 nm	Sensitivity in cts/μW per ms int. time	QE (%) @ peak	Signal/noise	Dark noise (counts RMS)	Dynamic range
3.9	650,000	78%	450:1	11.5	1600

Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
UV/VIS/NIR	200-1160**	960**	300	300	UA
UV/VIS/NIR	200-1100**	900**	300	300/1000	UNA-DB
UV/VIS	200-850	520	600	300	UB
UV	200-750	250-220*	1200	250	UC
UV	200-650	165-145*	1800	UV	UD
UV	200-580	115-70*	2400	UV	UE
UV	200-400	70-45*	3600	UV	UF
UV/VIS	250-850	520	600	400	BB
VIS/NIR	300-1160**	860**	300	500	VA
VIS	360-1000	500	600	500	VB
VIS	300-800	250-200*	1200	500	VC
VIS	350-750	145-100*	1800	500	VD
VIS	350-640	75-50*	2400	VIS	VE
NIR	500-1050	500	600	750	NB
NIR	500-1050	220-150*	1200	750	NC
NIR	600-1160	350-300	830	800	SI
NIR	600-1160**	560**	300	1000	IA
NIR	600-1160	500	600	1000	IB

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

** please note that not all 2048 pixels will be used for the useable range.

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
300	1.40	1.50	2.5	4.8	9.2	21.3
600	0.70 - 0.80*	0.75-0.85*	1.2	2.4	4.6	10.8
830	0.42 - 0.48*	0.50-0.58*	0.93	1.7	3.4	8.5
1200	0.25 - 0.31*	0.37 - 0.43*	0.52-0.66*	1.1	2.3	5.4
1800	0.17 - 0.21*	0.26 - 0.32*	0.34-0.42*	0.8	1.6	3.6
2400	0.12 - 0.18*	0.18 - 0.24*	0.26-0.34*	0.44-0.64*	1.1	2.7
3600	0.09 - 0.12*	0.11 - 0.15*	0.19	0.4	0.8	1.8

* depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the better the resolution.

Options

-RS	• Replaceable slit
DCL-UV/VIS-200	• Quartz detector collection lens (200 - 1100 nm)
SLIT-XX	• Slit size, please specify XX = 5, 10, 25, 50, 100, 200 or 500 μm
SLIT-XX-RS	• Replaceable slit with SMA connector , specify slit size XX = 25, 50, 100, 200 or 500 μm. Only available for AvaSpec-ULS2048CL-EVO-RS
SLIT-XX-RS-FCPC	• As SLIT-XX-RS, but with FC/PC connector
OSF-YYY	• Order-sorting filter for reduction of second-order effects please specify YYY = 305, 395, 475, 515, 550 or 600 nm
OSC	• Order-sorting coating with 600 nm long-pass filter for BB (>305 nm) and VB gratings, recommended with OSF-305
OSC-UA	• Order-sorting coating with 350 and 600 nm linear variable filter for UA, VA gratings
OSC-UB	• Order-sorting coating with 350 and 600 nm long-pass filter for UB or BB (<350 nm) gratings
-FCPC	• FC/PC fiber-optic connector

AvaSpec-NIR256/512-1.7-EVO

NIRLine Near-Infrared Spectrometer

AvaSpec-NIR256/512-1.7-EVO



For measurements in the near-infrared range out to 1.7 μm , Avantes offers a new series of uncooled spectrometer configurations. The AvaSpec-NIR256-1.7-EVO and the AvaSpec-NIR512-1.7-EVO offer the same high-sensitivity optical bench with the next generation of electronics. Both instruments deliver the same exceptional performance specifications such as a sample speed of only 0.53 ms/scan and integration times as fast as 20 μs , as the Avantes instruments you have come to trust.

For applications where resolution is key, or more datapoints for modelling are required, the 512 pixel detector will be the best choice.

The AvaSpec-NIR256/512-1.7-EVO spectrometers pair the same trusted InGaAs array detectors with our ultra low-noise electronics board featuring USB3 and Giga-Ethernet connection port. Digital and analog I/O ports enable external triggering and control over the shutter and pulsed lightsources and choose from two distinct software-controlled gain-setting modes, high-sensitivity mode (HS, default) and the low-noise (LN) mode.

These affordable, uncooled instruments are USB powered and are available with a choice of four gratings and replaceable slits to match the bandwidth and requirements fitting your application.

Technical Data

	AvaSpec-NIR256-1.7-EVO	AvaSpec-NIR512-1.7-EVO
Optical bench	Symmetrical Czerny-Turner, 50 mm focal length,	
Wavelength range	900-1750 nm	
Resolution (slit & grating dependent)	2 - 50 nm	
Stray light	<1%	
Sensitivity HS in counts /μW per ms	8,200,000 (integral 1000-1750 nm)	3,800,000 (integral 1000-1750 nm)
Dynamic range HS	6000:1	
Integration time HS	20 μs - 500 ms	
Signal/noise HS	1900:1	
Sensitivity LN in counts /μW per ms	469,000 (integral 1000-1750 nm)	222,000 (integral 1000-1750 nm)
Dynamic range LN	9000:1	
Integration time LN	20 μs - 20 seconds	
Signal/noise LN	5000:1	
Detector	InGaAs linear array, 256 pixels, 50 μm x 500 μm	InGaAs linear array, 512 pixels, 25 μm x 500 μm
AD converter	16-bit, 500 kHz	
Interface	USB3.0 high speed, 5 Gbps, Gigabit Ethernet 1 Gbps	
Sample speed with on-board averaging	0.53 ms/scan	
Data transfer speed	0.53 ms/scan (USB3)	
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital IO bi-directional, trigger, synchronization, strobe, laser	
Power supply	Default USB power, 600 mA or external 12VDC, 320mA (4W)	
Dimensions, weight	185 x 100 x 184 mm, 2700 grams	

Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
NIR	900 - 1750	850	200	1500	NIR200-1.5
NIR	1000 - 1700	340	400	1600	NIR400-1.6
NIR	900 - 1400	200	600	1200	NIR600-1.2
NIR	1300 - 1600	152	600	1600	NIR600-1.6

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (μm)				
	25*	50	100	200	500
200	6	8	12	22	50
400	2.5	3	6	12	25
600	n.a.	2	4	8	18

* only for AvaSpec-NIR512

Options

- SLIT-XX-RS** • Replaceable slit with SMA connector, specify slit size XX = 25*, 50, 100 or 200 μm
- SLIT-XX-RS-FCPC** • As SLIT-XX-RS, but with FC/PC connector

* only for AvaSpec-NIR512

For external triggering, Avantes offers the AvaTrigger; featuring optical triggering, an external TTL and manual triggering through the push of a button.

AvaSpec-NIR256/512-1.7-HSC-EVO NIRLine Near-Infrared Spectrometer

AvaSpec-NIR256-1.7-HSC-EVO



For measurements in the near-infrared range up to 1.7 μm , Avantes offers a new series of cooled spectrometer configurations. The AvaSpec-NIR256-1.7-HSC-EVO and the AvaSpec-NIR512-1.7-HSC-EVO offer the high-sensitivity, 100mm optical bench (HSC) with the next generation of electronics.

Both instruments deliver exceptional performance specifications, such as a high sample speed and integration times as fast as 20 μs , as the Avantes instruments you have come to trust.

For applications where resolution is key, or more datapoints for modelling are required, the 512 pixel detector will be the best choice.

The AvaSpec-NIR256/512-1.7-HSC-EVO spectrometers pair the same

trusted InGaAs array detectors with our ultra-low-noise electronics board, featuring USB3 and Giga-Ethernet connection port.

The instruments are standard equipped with a replaceable slit. Digital and analog I/O ports enable external triggering and control over the shutter and pulsed lightsources and the choice between two distinct software-controlled gainsetting modes, high-sensitivity mode (HS, default) and the low-noise mode (LN).

Cooling ensures optimal noise condition even at longer integration times. All NIR-1.7 instruments offer four different gratings, making it possible to choose the bandwidth fitting your application.

Technical Data

	AvaSpec-NIR256-1.7-HSC-EVO	AvaSpec-NIR512-1.7-HSC-EVO
Optical bench	Symmetrical Czerny-Turner, 100 mm focal length, 1 stage TE-cooled	
Wavelength range	900 - 1750 nm	
Resolution (slit & grating dependent)	1.9 - 32 nm	1.7 - 32 nm
Stray light	<1%	
Sensitivity HS in counts /μW per ms	4,800,000 (integral 1000-1750 nm)	2,500,000 (integral 1000-1750 nm)
Dynamic range HS	4900:1	
Signal/noise HS	5000:1	
Integration time HS	20 μs - 500 ms	
Sensitivity LN in counts /μW per ms	160,000 (integral 1000 - 1750 nm)	83,000 (integral 1000 - 1750 nm)
Dynamic range LN	7600:1	
Signal/noise LN	5000:1	
Integration time LN	20 μs - 20 seconds	
Detector	TE-cooled InGaAs linear array, 256 pixels, 50 μm x 500 μm	TE-cooled InGaAs linear array, 512 pixels, 25 μm x 500 μm
AD converter	16-bit, 1,2 MHz	
Interface	USB3.0 high speed, 5 Gbps, Gigabit Ethernet 1 Gbps	
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital IO bi-directional, trigger, synchronization, strobe, laser	
Power supply	12VDC, 12W	
Dimensions, weight	185 x 160 x 184 mm, 3.6 kg	

Timing and Triggering

Sample speed with on-board averaging	0.13 ms/scan	0.24 ms/scan (USB3)
Data transfer speed	0.4 ms/scan (USB3)	0.53 ms/scan (USB3)
Min. delay / jitter	4.92 μs / 0.38 ns	

Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
		256/512			
NIR	900 - 1700	800 - 660*	150	1250	NIR150-1.2
NIR	994 - 1280	278	300	1200	NIR300-1.2
NIR	950 - 1800	262 - 230*	400	1200	NIR400-1.2
NIR	960 - 1800	262 - 230*	400	1600	NIR400-1.6

* only for AvaSpec-NIR512

Resolution Table (FWHM in nm)

Grating (lines/mm)	Slit size (μm)				
	25*	50	100	200	500
150	4.0	5.7	7.0	12.8	32
300	1.8	2.3	3.0	4.0	10
400	1.7	1.9	2.5	3.3	8.3

Options

- SLIT-XX-RS** • Replaceable slit with SMA connector, specify slit size XX = 25*, 50, 100, 200 or 500 μm
- SLIT-XX-RS-FCPC** • as SLIT-XX-RS, but with FC/PC connector

* only for AvaSpec-NIR512

For external triggering, Avantes offers the AvaTrigger; featuring optical triggering, an external TTL and manual triggering through the push of a button.

AvaSpec-NIR256/512-2.5-HSC-EVO NIRLine Near-infrared Spectrometer

AvaSpec-NIR256-2.5-HSC-EVO



The NIR spectrometers in our EVO series offer more sensitivity, low weight and small size. They are based on a 100 mm optical bench with an NA of 0.13, offering optimal balance between resolution and sensitivity.

The 2.5-HSC series feature 256 or 512 pixel InGaAs detectors and are available in multiple configurations. These instruments are perfect for analyzing grain, corn, wheat, soya, polymers, but also for medical uses, process monitoring and other analyses.

The 256 pixel detectors offer the best sensitivity for most applications.

For applications where resolution is key or more datapoints for modelling are required, the 512 pixel detector will be the best choice.

Also available on the –HSC is the user selectable gain-setting mode: LN (lownoise, standard setting), which gives you a longer integration time and higher signal to noise ratio, and HS mode (high-sensitivity) for measuring in low light conditions. Analog and digital IO ports enable external triggering and control of shuttered and pulsed light sources from the AvaLight series.

Technical Data

	AvaSpec-NIR256-2.5-HSC-EVO	AvaSpec-NIR512-2.5-HSC-EVO
Optical bench	TE-cooled symmetrical Czerny Turner, 100 mm focal length	
Wavelength range	1000 - 2500 nm	
Resolution	4.4 - 85.0 nm	2.6 - 85.0 nm
Pixel dispersion (with NIR 075-1.7 grating)	6.2 nm	3.1 nm
Stray light	<1.0%	
Sensitivity HS in counts / μW per ms (1000 - 2500 nm)	990,000	480,000
Signal/noise HS	1800:1	1900:1
Integration time HS	10 μ s - 5 ms	
Sensitivity LN in counts / μW per ms (1000 - 2500 nm)	55,000	26,600
Signal/noise LN	4000:1	3700:1
Integration time LN	10 μ s - 100 ms	
Detector	InGaAs linear array with 2-stage TE-cooling, 256 pixel	InGaAs linear array with 2-stage TE-cooling, 512 pixel
Pixel size (WxH)	50 x 250 μ m	25 x 250 μ m
AD converter	16 bit, 500 kHz	
Interface	USB 3.0 high speed, 5 Gbps Gigabit Ethernet 1 Gbps	
Sample speed with on-board averaging	0.54 ms/scan (USB3)	
Data transfer speed	1.11 ms/scan (USB3)	
Digital IO	HD-26 connector, 2 Analog in, 2 Analog out, 13 Digital bi-directional, trigger, sync, strobe, laser	
Power supply	12 V, 40W	
Operating temperature range	0 - 40 $^{\circ}$ C	
Cooling	45 $^{\circ}$ C versus ambient	
Dimensions, weight	185 x 145 x 185 mm, 3.5 kg	



Grating Selection Table

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
NIR	1000 - 2500	1500	75	1700	NIR075-1.7
NIR	1000 - 2500	1173 - 1150*	100	2500	NIR100-2.5
NIR	1000 - 2500	800 - 660*	150	2000	NIR150-2.0
NIR	1000 - 2500	815 - 700*	150	2600	NIR150-2.6
NIR	1000 - 2500	574 - 530*	200	1500	NIR200-1.5

*Depends on the starting wavelength of the grating; the higher the wavelength, the bigger the dispersion and the smaller the range to select.

Resolution Table (FWMH in nm)

Grating (lines/mm)	Slit size (μm)				
	25*	50	100	200	500
75	8.9	12.9	16.0	33.9	84.5
100	7.2	9.5	12.0	20.0	50.0
150	4.0	5.7	7.0	12.8	32.0
200	2.6	4.4	5.2	9.3	23.3

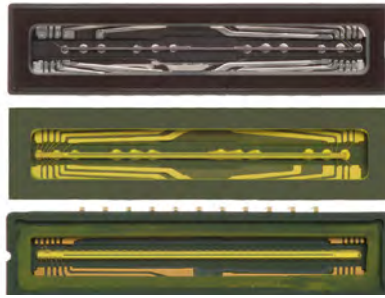
Options

SLIT-XX-RS • Slit size, please specify XX = 25, 50, 100, 200 or 500 μm

This instrument is perfect for grain, corn, wheat, soya and other analyses.

Detector Specifications

StarLine & SensLine



StarLine and SensLine Detectors

Detector Specifications (based on a 16-bit AD converter)

Detector	StarLine			SensLine	
	HAM-2048CL	HAM-4096CL	SONY-2048L	HAM-2048XL	HAM-1024x58
Type	CMOS linear array	CMOS linear array	CCD linear array	Back-thinned CCD array	Cooled Back-thinned CCD array
# Pixels, pitch	2048, 14 μm	4096, 7 μm	2048, 14 μm	2048, 14 μm	1024 x 58, 24 μm
Pixel width x height (μm)	14 x 200	7 x 200	14 x 200	14 x 500	24 x 24 (total height 1.4 mm)
Pixel well depth (electrons)	80,000	80,000	90,000	200,000	1,000,000
Sensitivity Photons/count @600 nm	2	2	4	4	16
Sensitivity in counts/ μW per ms integration time	375,000 (AvaSpec-ULS2048CL)	218,000 (AvaSpec-ULS4096CL)	470,000 (AvaSpec-ULS2048L)	460,000 (AvaSpec-ULS2048XL)	445,000 (AvaSpec-HERO)
Peak wavelength	700 nm	700 nm	450 nm	650 nm	650 nm
QE (%) @ peak	80%	80%	40%	78%	92%
Signal/Noise	300:1	335:1	300 :1	525 :1	1200:1
Dark noise (counts RMS)	16	16	20	5	2
Dynamic Range	4000	4000	3300	3800	40000
Photo-responsive non-uniformity	$\pm 5\%$	$\pm 5\%$	$\pm 5\%$	$\pm 3\%$	$\pm 3\%$
Wavelength range (nm)	200 - 1100	200 - 1100	200* - 1100	200 - 1160	200 - 1160
Frequency	6 MHz	6 MHz	2 MHz	1 MHz	250 kHz

* DUV coating

Detector Specifications

NIRLine

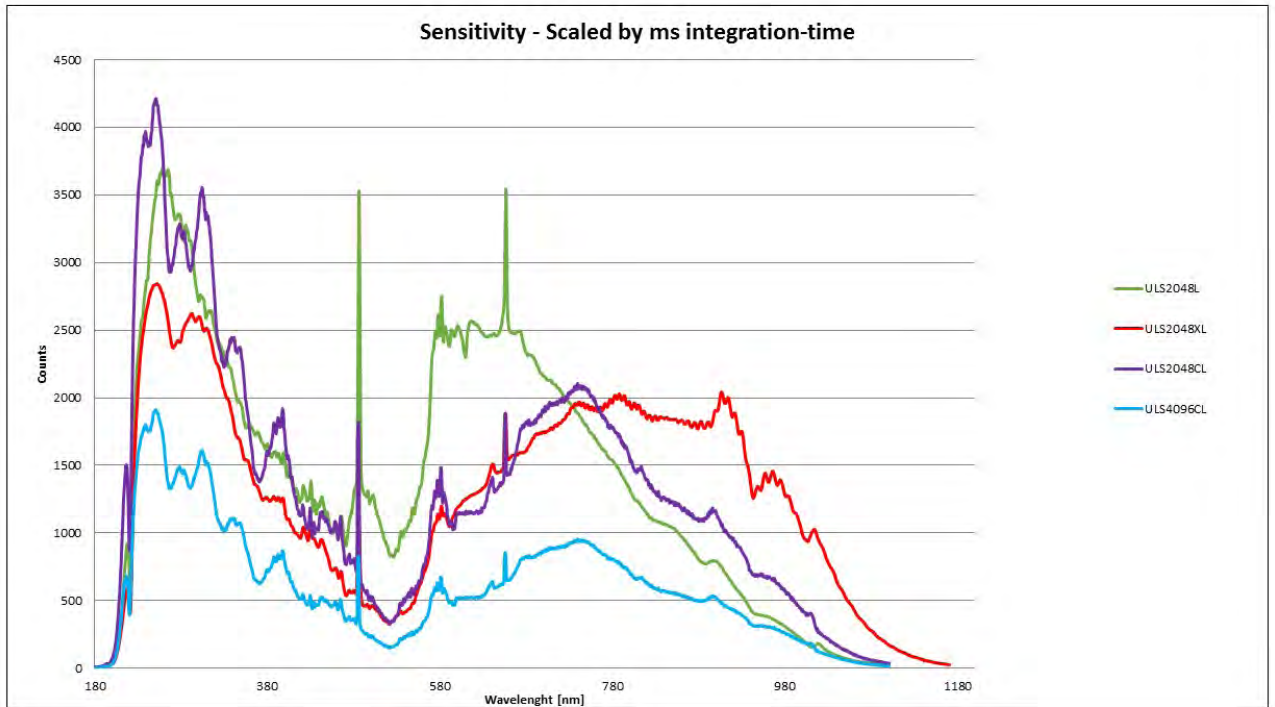


NIRLine Detectors

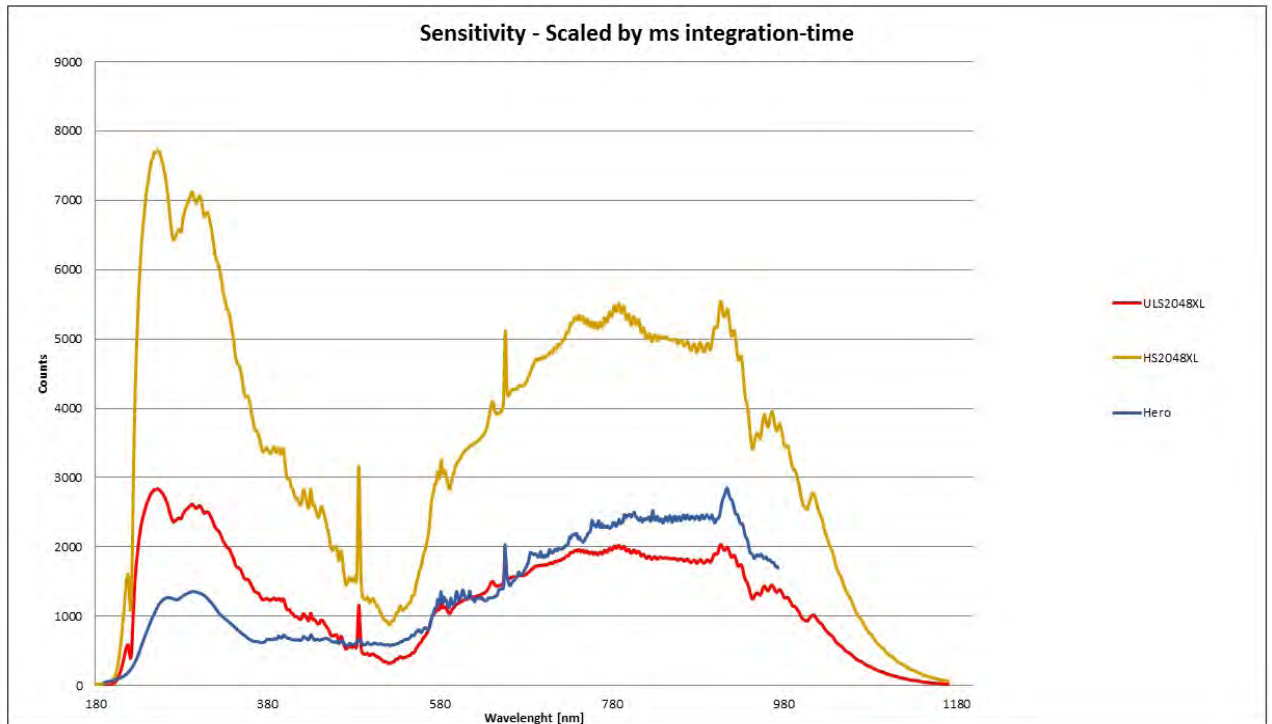
Detector Specifications (NIR)

Detector	NIRLine					
	HAM-256-1.7	HAM-512-1.7	SU-256-1.7	SU-512-1.7	HAM-256-2.5	HAM-512-2.5
Type	Linear InGaAs array	Linear InGaAs array	Linear InGaAs array with 1-stage TE cooling	Linear InGaAs array with 1-stage TE cooling	Linear InGaAs array with 2-stage TE cooling	Linear InGaAs array with 2-stage TE cooling
# Pixels, pitch	256, 50 μm	512, 25 μm	256, 50 μm	512, 25 μm	256, 50 μm	512, 25 μm
pixel width x height (μm)	50 x 500	25 x 500	50 x 500	25 x 500	50 x 250	25 x 250
Sensitivity HS in counts/ μW per ms	8,200,000 (integral 1000 - 1750 nm)	3,880,000 (integral 1000 - 170 nm)	4,800,000 (integral 1000 - 1750 nm)	2,500,000 (integral 1000 - 1750 nm)	990,000 (integral 1000 - 2500 nm)	480,000 (integral 1000 - 2500 nm)
Signal/Noise (HS)	1900:1	1900:1	5000:1	5000:1	1800:1	1900:1
Dark noise HS (counts RMS)	16	16	16	16	16	15
Dynamic Range HS	6000	6000	4900	4900	3500	4300
Sensitivity LN in counts/ μW per ms	469,000 (integral 1000 - 1750 nm)	222,000 (integral 1000 - 1750 nm)	160,000 (integral 1000 - 1750 nm)	83,000 (integral 1000 - 1750 nm)	55,000 (integral 1000 - 2500 nm)	26,600 (integral 1000 - 2500 nm)
Signal/Noise (LN)	5000:1	5000:1	5000:1	5000:1	4000:1	3700:1
Dark noise LN (counts RMS)	12	12	12	12	12	13
Dynamic Range LN	9000	9000	7600	7600	4500	5100
Peak wavelength	1550 nm	1550 nm	1500 nm	1500 nm	2300 nm	2300 nm
QE (%) @ peak	90%	90%	70%	70%	65%	65%
Photo-responsive non-uniformity	$\pm 5\%$	$\pm 5\%$	10%	10%	$\pm 5\%$	$\pm 5\%$
Defective pixels (max)	0	0	0	0	12	26
Wavelength range (nm)	900 - 1750	900 - 1750	900 - 1750	900 - 1750	1000 - 2500	1000 - 2500
Frequency	500 kHz	500 kHz	1.2 MHz	1.2 MHz	500 kHz	500 kHz

Sensitivity Curve StarLine



Sensitivity Curve SensLine



AvaSpec-Mini2048CL

Small and Powerful OEM Spectrometer

Looking for a very small spectrometer with a resolution of up to 0.1 nm? Then the AvaSpec-Mini is an ideal choice. It's only the size of a deck of cards, yet delivers a dynamic range better than 3000:1, stray-light levels lower than 0.2% and weighs only 175 grams. Easy to take anywhere you like.

The AvaSpec-Mini2048CL is produced with the latest automated production technology, providing excellent unit-to-unit reproducibility and temperature stability. These are key parameters for OEM customers for reliable integration into their products.

Many areas of research can be covered with this device, such as light analysis, chemical research and Raman spectroscopy. The possibilities are endless.

Of course, the AvaSpec-Mini works seamlessly with Avantes spectroscopy software and the Windows and Linux libraries.



Technical Data

Optical bench	Symmetrical Czerny-Turner, 75 mm focal length, MK II
Wavelength range	200 - 1100 nm
Stray light	0.2 - 1%
Sensitivity	337.500
Detector	HAM S11639 , CMOS linear array, 2048 pixels (14x200 µm)
Signal/noise	330:1
Dynamic range	3300
Dark noise	16 cnts
AD converter	16-bit, 6 MHz
Integration time	30 µs - 40 s
Interface	USB 2.0 (480 Mbps) / pigtailed (50cm) USB-A
Sample speed with on-board averaging	3.0 ms/scan
Data transfer speed	4.6 ms/scan
I/O	5 bidirectional programmable I/O; 1 analog out; 1 analog in, 1x5V
Dimensions, weight	95 x 68 x 20 mm, 175 grams
Power supply	Default USB power, 500 mA
Temperature range	0-55°C

Grating selection table for AvaSpec-Mini

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
2048CL					
UV	200-400	167	1800	250	MN 1800-0.25
VIS	330-900	530	600	500	MN 600-0.50
NIR	550-1100	520	600	1000	MN 600-1.00
UV/VIS/NIR	200-1100	900	300	300	MN 300-0.30
VIS/NIR	360-1100	720	300	500	MN 300-0.50

Resolution table (FWHM in nm) for AvaSpec-Mini*

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
	2048 CL					
300	1.00	1.30	2.40	4.80	9.20	22.00
600	0.40-0.53	0.70	1.20	2.40	4.60	11.00
1800	0.10-0.18	0.22	0.34-0.42	0.80	1.60	3.60

* Typical values. Small deviations are possible.

Ordering information

AvaSpec-Mini2048CL

- Mini Fiber-optic Spectrometer, 75 mm focal length, 2048 pixel CMOS detector, USB 2 powered interface, including DCL

Specify grating, wavelength range and options. Other gratings are possible on request.

Options

- SLIT-XX** • Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 μm (5 μm possible on request)
- OSC** • Order sorting coating for grating MN 600-0.50, recommended with OSF-305
- OSC-UA** • Order sorting coating for grating MN 300-0.30
- OSC-VA** • Order sorting coating for grating MN 300-0.50, recommended with OSF-305
- OSF-YYY** • Order-sorting filter for reduction of 2nd order effects, please specify YYY= 305, 395, 457, 515, 550 or 600 nm, depends on range

For non-OEM users a set of preconfigured models are available

AvaSpec-Mini4096CL

Small and powerful OEM spectrometer

This first-to-the-market, 4096 pixel CMOS array miniature spectrometer is the perfect combination of small size and high resolution (up to 0.09 nm)!

It's only the size of a deck of cards, yet delivers a dynamic range better than 3000:1, stray-light levels lower than 0.2% and weighs only 175 grams. Easy to take anywhere you like.

The AvaSpec-Mini4096CL is produced with the latest automated production technology, providing excellent unit-to-unit reproducibil-

ity and temperature stability. These are key parameters for OEM customers for reliable integration into their products.

Many areas of research can be covered with this device, such as light analysis, chemical research and Raman spectroscopy. The possibilities are endless.

Of course, the AvaSpec-Mini works seamlessly with Avantes spectroscopy software and the Windows and Linux libraries.



Technical Data

Optical bench	Symmetrical Czerny-Turner, 75 mm focal length, MK II
Wavelength range	200 - 1100 nm
Stray light	0.2 - 1%
Sensitivity	261.000
Detector	HAM S13496 , CMOS linear array, 4096 pixels (7x200µm)
Signal/noise	300:1
Dynamic range	3300
Dark noise	16 cnts
AD converter	16-bit, 6 MHz
Integration time	30 µs - 50 s
Interface	USB 2.0 (480 Mbps) / pigtailed (50cm) USB-A
Sample speed with on-board averaging	6.5 ms/scan
Data transfer speed	8.9 ms/scan
I/O	5 bidirectional programmable I/O; 1 analog out; 1 analog in, 1x5V
Dimensions, weight	95 x 68 x 20 mm, 175 grams
Power supply	Default USB power, 500 mA
Temperature range	0-55°C

Grating selection table for AvaSpec-Mini

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
4096CL					
UV	200-400	170	1800	250	MN 1800-0.25
VIS	330-900	535	600	500	MN 600-0.50
NIR	550-1100	525	600	1000	MN 600-1.00
UV/VIS/NIR	200-1100	900	300	300	MN 300-0.30
VIS/NIR	360-1100	720	300	500	MN 300-0.50

Resolution table (FWHM in nm) for AvaSpec-Mini*

Grating (lines/mm)	Slit size (μm)					
	10	25	50	100	200	500
	4096CL					
300	0.50-0.70	1.20-1.30	2.17	4.60	9.00	20.00
600	0.30-0.36	0.58-0.68	1.17	2.20	4.50	10.00
1800	0.09-0.11	0.18	0.36-0.40	0.78	1.50	3.70

* Typical values. Small deviations are possible.

Ordering Information

AvaSpec-Mini4096CL

- Mini Fiber-optic Spectrometer, 75 mm focal length, 4096 pixel CMOS detector, USB 2 powered interface, including DCL

Specify grating, wavelength range and options. Other gratings are possible on request.

Options

- SLIT-XX** • Slit size, please specify XX = 10, 25, 50, 100, 200 or 500 μm (5 μm possible on request)
- OSC** • Order sorting coating for grating MN 600-0.50, recommended with OSF-305
- OSC-UA** • Order sorting coating for grating MN 300-0.30
- OSC-VA** • Order sorting coating for grating MN 300-0.50, recommended with OSF-305
- OSF-YYY** • Order-sorting filter for reduction of 2nd order effects, please specify YYY= 305, 395, 457, 515, 550 or 600 nm, depends on range

For non-OEM users a set of preconfigured models are available

Available soon: AvaSpec-Mini-NIR

Small and Powerful OEM NIR Spectrometer

AvaSpec-Mini-NIR256-1.7



The latest addition to our CompactLine: the AvaSpec-Mini-NIR!

The AvaSpec-Mini-NIR is a compact NIR spectrometer, based on a combination of our popular AvaSpec-NIR256-1.7 and Mini-series.

This NIR spectrometer might not be as sensitive as our bigger NIR spectrometers, but this loss in sensitivity is greatly compensated by its size and robustness.

Like our other CompactLine spectrometers, this device is only the size of a deck of cards

and USB powered, which makes it easy to integrate into other devices, including but not limited to OEM handheld applications.

This versatile miniature near-infrared spectrometer is well suited for various applications, including food analysis and the recycling industry.

Of course, the AvaSpec-Mini-NIR works seamlessly with our AvaSoft software and the Windows and Linux libraries we have available.

Technical Data

Optical bench	Symmetrical Czerny-Turner, 75 mm focal length, MK II
Wavelength range	900-1750 nm
Stray light	1%
Sensitivity HS in counts/μW per ms	665,000 (integral 1000-1750 nm)
Dynamic range HS	4750:1
Integration time HS	10 μ s – 300 ms
Signal/noise HS	1900:1
Dark noise HS	14 counts
Sensitivity LN in counts/μW per ms	38,000 (integral 1000-1750 nm)
Dynamic range LN	7500:1
Integration time LN	10 μ s – 5 seconds
Signal/noise LN	5000:1
Dark noise LN	9 counts
Detector	InGaAs array, 256 pixels
AD converter	16-bit, 500 kHz
Interface	USB2.0 (480 Mbps)/pigtailed (50 cm) USB-A
Sample speed with store to RAM	0.53 ms/scan
Data transfer speed	1.2 ms/scan
I/O	5 bidirectional programmable I/O: 1 analog out, 1 analog in, 1 x 5V
Power supply	Default USB power, 500 mA
Dimensions, weight	95 x 68 x 20 mm, 185 g
Temperature range	0-55°C

Grating selection table for AvaSpec-Mini-NIR

Use	Useable range (nm)	Spectral range (nm)	Lines/mm	Blaze (nm)	Order code
NIR	900-1750	750	200	1550	NIR200-1.6
NIR	900-1495	355-345	400	1210	NIR400-1.2
NIR	1250-1700	340-335	400	1600	NIR400-1.6
NIR	900-1450	225-210	600	1280	NIR600-1.3
NIR	1350-1735	205-185	600	1669	NIR600-1.7

Resolution table (FWHM in nm) for AvaSpec-Mini-NIR*

Grating (lines/mm)	Slit size (μm)			
	50	100	200	500
200	6	12	24	50
400	3	6	12	25
600	2	4	4	18

* Typical values. Small deviations are possible.

Ordering information

AvaSpec-Mini-NIR256-1.7

• Miniature NIR fiber-optic spectrometer, 75 mm focal length, 256 pixel InGaAs detector, USB2 powered interface

Specify grating, wavelength range and options. Other gratings are possible on request.

Options

SLIT-XX

• Slit size, please specify XX = 50, 100, 200 or 500 μm

For non-OEM users, a preconfigured model will be available upon release