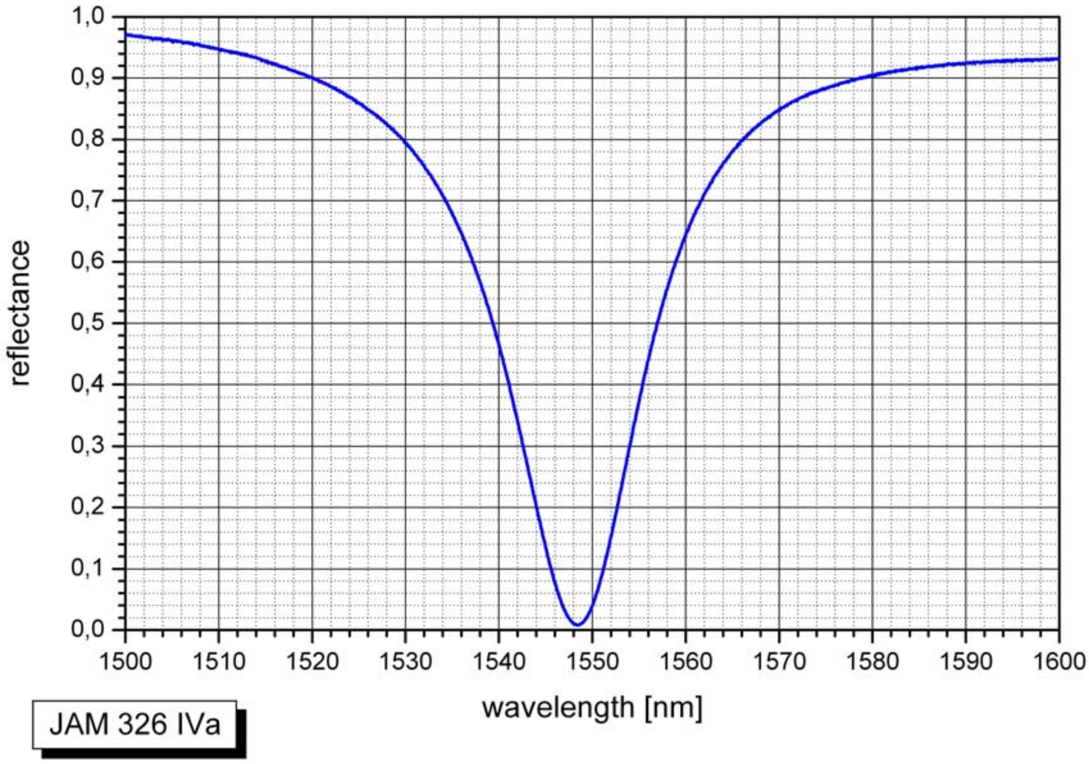
BATOP optoelectronics

RSAM data sheet RSAM-1550-x-10ps, λ = 1530 nm … 1560 nm

RSAM - Resonant saturable absorber mirror

Resonant wavelength	λ = 1530 nm … 1560 nm
Full Width at Half Maximum	FWHM = 25 nm
Peak absorptance	$A_0 > 96$ %
Minimum reflectance	R < 4%
Saturation fluence	$\Phi_{sat} = 4$ µJ/cm^2
Relaxation time constant	$\tau \sim 10$ ps
Non-saturable loss	$A_{ns} = 30$ %
Chip area	4mm x 4mm; other dimensions on request
Chip thickness	400 µm
Front side	dielectric mirror
Mounting of SAM-1550-**x**-10ps	denotes the type of mounting as follows:
x = 0	unmounted
x = 12.7 g	glued on a gold plated Cu-cylinder with 12.7 mm ∅
x = 25.4 g	glued on a gold plated Cu-cylinder with 25.4 mm ∅
x = 12.7 s	soldered on a gold plated Cu-cylinder with 12.7 mm ∅
x = 25.4 s	soldered on a gold plated Cu-cylinder with 25.4 mm ∅
x = FC	mounted on a 1 m monomode fiber cable with FC/PC connector
x = FC/PC with TEC	mounted on a 1 m monomode fiber cable with FC/PC or other connector type and TEC (thermoelectric cooler) for fine tuning of the resonance wavelength

Spectral reflectance



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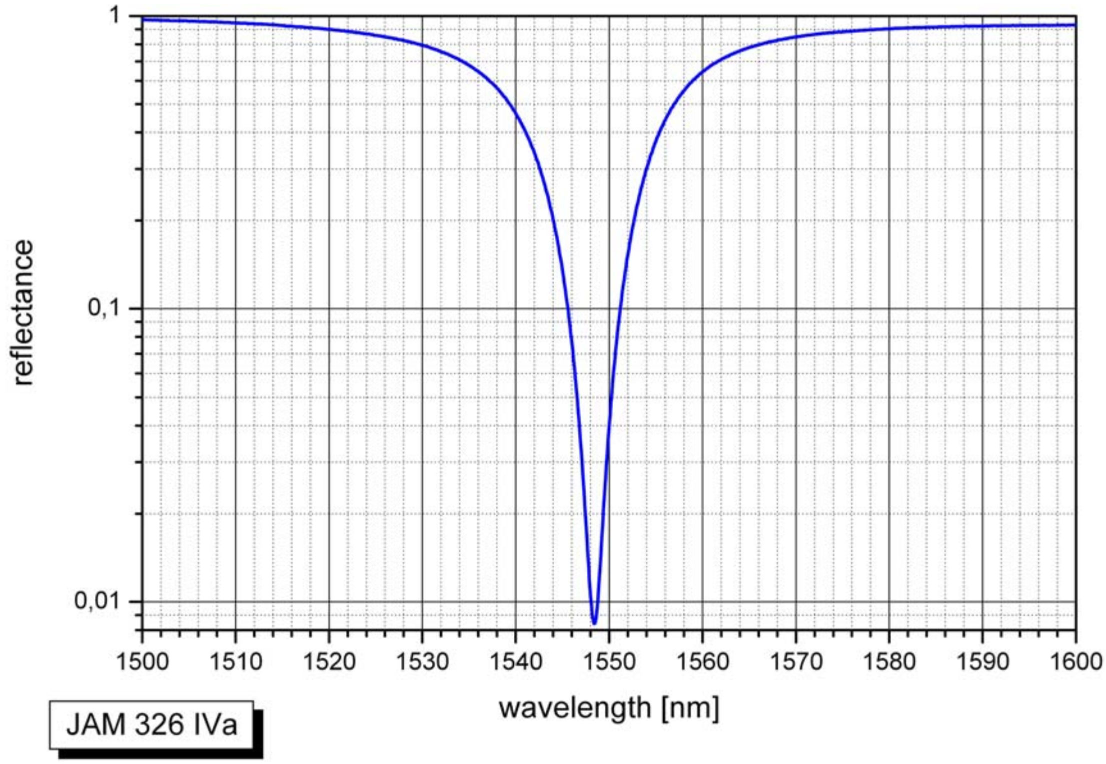
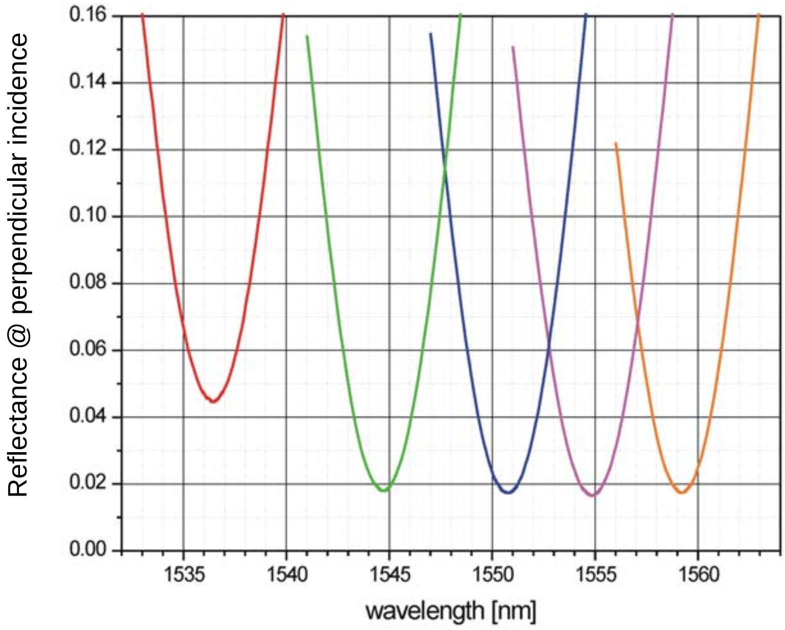


Resonance wavelength

There are RSAM with different resonance wavelengths between 1530 nm and 1560 nm available.



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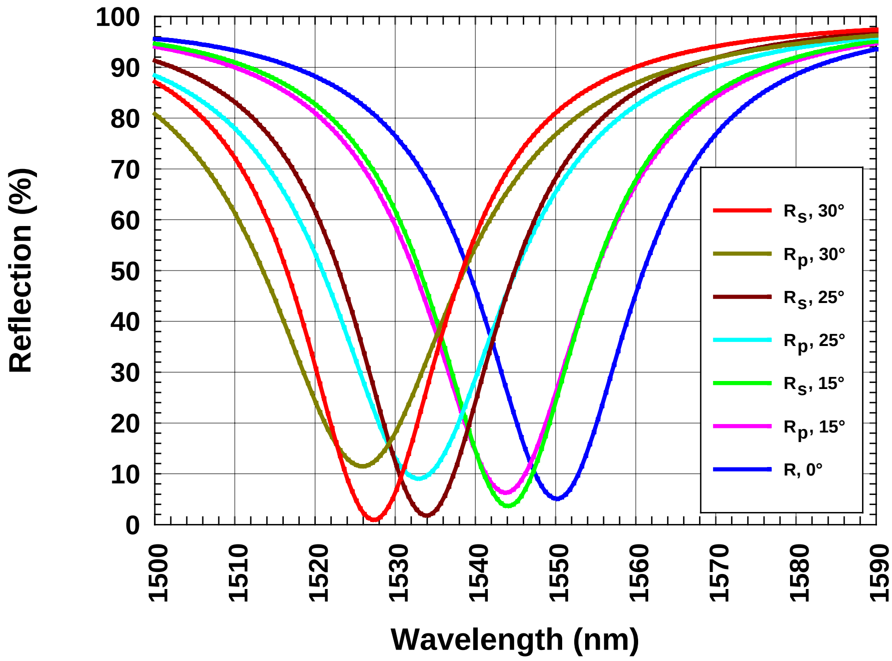
Angle dependent resonance wavelength λ

An increasing angle of incidence causes an influence of the polarization on the reflectance as can be seen in the following picture.



R_p – reflectance with the electric field aligned in the plane of incidence

R_S – reflectance with the electric field aligned normal to the plane of incidence

Angle of incidence φ

The resonance wavelength λ of the RSAM depends on the angle of incidence φ as

$$\lambda(\varphi) = \lambda_0 \sqrt{1 - \frac{\sin^2 \varphi}{n^2}} \qquad (1)$$

The zero resonance wavelength λ_0 is determined by the index of refraction n and the geometrical thickness d of the absorbing spacer layer inside the Gires–Tournois interferometer by

$$\lambda_0 = 2nd. \qquad (2)$$

To adjust the working wavelength to the resonance wavelength λ of the RSAM the angle of incidence φ can be chosen according to equation (1) with λ_0 = 1550 nm and n=2.9.

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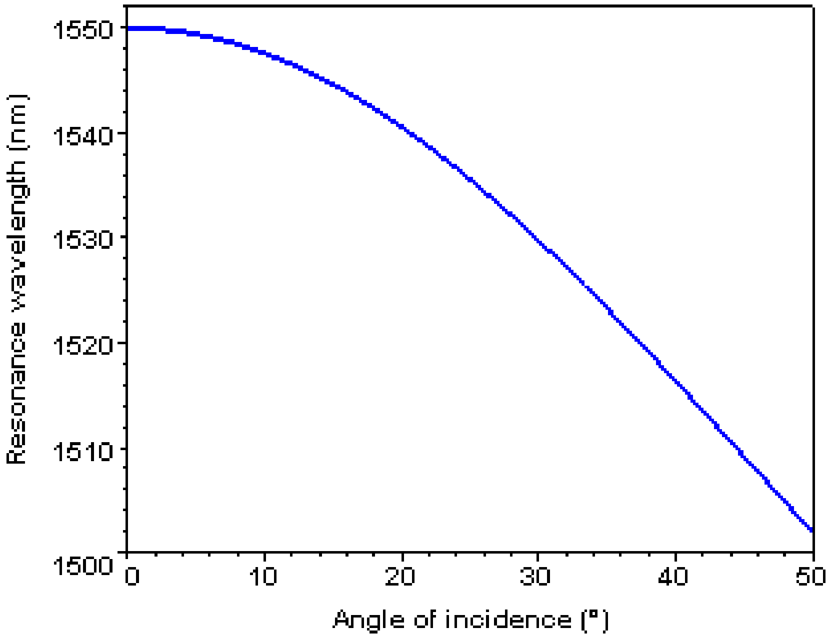
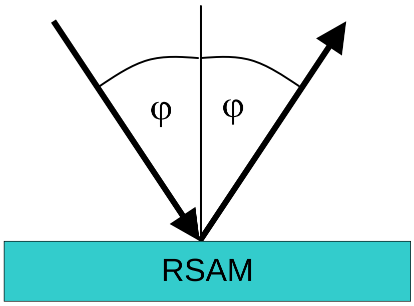
Angle of incidence φ	Resonance wavelength λ (nm)
0°	1550.0
5°	1549.4
10°	1547.6
15°	1544.6
20°	1540.5
25°	1535.5
30°	1529.7
35°	1523.2
40°	1516.3
45°	1509.1
50°	1501.9





Temperature T

The temperature dependency of the optical thickness nd of the absorbing spacer layer, which governs the resonance wavelength λ, is mainly determined by the temperature dependency of the refractive index n(T). The thermal expansion of the spacer layer thickness d is negligible in comparison with the temperature influence on the refractive index.

The resulting temperature dependency of the resonance wavelength λ is given by

$$\lambda(T) = \lambda(T_0)\left[1 + \frac{1}{n}\frac{dn}{dT}(T - T_0)\right] \qquad (3)$$

with

temperature coefficient $\frac{1}{n}\frac{dn}{dT} \approx 7.5 \cdot 10^{-5} K^{-1}$

T_0 - reference temperature

T – working temperature.

In case of a fiber coupled RSAM the angle of incidence is fixed to φ = 0°. To adjust in this case the working wavelength to the resonance wavelength a thermoelectric cooler (TEC) or heater can be used.