

90° Optical Hybrids – COH090

Compact free-space optical system for phase & amplitude extraction from a single polarization

Exail's COH090 is a 90° optical hybrid that enables to extract phase and amplitude from a signal by performing four 90° phase stepped interferences between the signal and a Local Oscillator (LO).

This product is purely passive and athermal.

The COH090 also features a phase tunability option in order to perfectly adjust the 90° of the hybrid depending on the wavelength used. Its compact design and customization abilities makes it very simple to integrate in every optical system.



Features

- Single or Dual polarization models
- Extremely compact design
- Thermal stability
- Single Mode and polarization maintaining fiber versions
- Optical wavebands covered: from visible to IR
- Highly customizable

Applications

- Coherent Detection
- Optical communication systems
- QPSK and QAM
- Optical Coherence Tomography (OCT)
- LiDAR systems
- Quantum Communications
- Laser communications
- Satellite constellation

Options

- Phase Tunable (T)
- Optimized Uniformity (U)
- Design for space application (BBM2)

Related Equipment

- VODL: Variable Optical Delay Line
- WT-MINT widely tunable delay line intereferometer
- MINT delay line intereferometer
- Modulators QKD

COH090 – 90° OPTICAL HYBRID – PERFORMANCE HIGHLIGHTS

Parameter	Symbol	Description	Unit	Comment
Versions	COH090-XX-T	Phase Tunable		
	COH090-XX-U	Optimized Uniformity		
	COH090-XX-NS	New space		
	COH090-XX-0	Standard		
Phase shit between I & Q	-	90	deg	
Phase shift accuracy between I & Q		± 5	deg	
Excess loss		2.0	dB	
IL dual uniformity (FC/UPC)	Δ_{dual}	< 0.5	dB	U, NS and T
		< 1.0	dB	Other versions
IL Uniformity	Δ_{IL}	< 1.0	dB	U, NS and T
		< 1.5	dB	Other versions
Skew		< 1	ps	
ORL		35	dB	

All 90° hybrids are available as:

SP : single polarization
DP : dual polarization

COH090

90° Optical hybrid

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Maximum input power	OP _{in}	-	300	mW
Storage temperature	STR	-40	+80	°C
Humidity	RH	5	85	%
Fiber Bend Radius	-	20	-	mm
Maximum input Voltage (for phase tunability option only)	U	-	4	V

OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit	Conditions/Remarks
Operating temperature range	OTR	-	10	35	°C	-
Operating wavelength (λ)	OWR	1285	1310	1335	nm	O-Band
		1360	1410	1460		E-Band
		1460	1495	1530		S-Band
		1529	1547	1565		C-Band
		1520	1575	1630		L-Band

OPTICAL CHARACTERISTICS - SP (Single Polarization)

Parameter	Option	Min	Typ	Max	Unit	Conditions/Remarks
Insertion loss from Signal ⁽¹⁾ (IL-S)	-	-	7.0	8.5	dB	
Insertion loss from Local Oscillator ⁽¹⁾ (IL-LO)	-	-	7.0	8.5	dB	
UL Uniformity (ΔIL) ^{(1) (2)}	Standard	-	1.0	1.5	dB	
	U option	-	0.5	1.0	dB	
UL Dual Uniformity ^{(1) (2)} (Δdual)	Standard	-	0.5	1.0	dB	Between balanced outputs
	U option	-	0.2	0.5	dB	
Phase shift between In-phase and Quadrature ⁽¹⁾ (∅)	-	85	90	95	deg	
Skew ⁽³⁾	-	-	0.5	1.0	ps	Measured at connectors end
Optical return Loss (ORL)	-	35	-	-	dB	
Phase shift tunability (Δ∅)	T option	± 20	-	-	deg	For a 3 V signal applied Voltage on the BNC input

(1) measured over OTR and OWR for all states of polarization
(2) from Signal of Local Oscillator (3) for all outputs

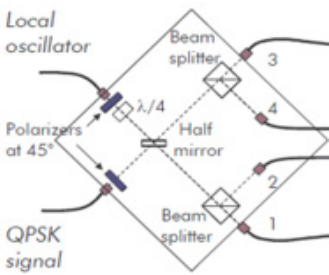
90° Optical hybrid

OPTICAL CHARACTERISTICS - DP (Dual Polarization)

Parameter	Option	Min	Typ	Max	Unit	Conditions/Remarks
Insertion loss from Signal ⁽¹⁾ (IL-S)	-	-	7.5	8.5	dB	
Insertion loss from Local Oscillator ⁽¹⁾ (IL-LO)	-	-	10.2	11.5	dB	
UL Uniformity (Δ IL) ⁽¹⁾ ⁽²⁾	Standard	-	1.0	2.0	dB	
	U option	-	0.5	1.0	dB	
UL Dual Uniformity ⁽¹⁾ ⁽²⁾ (Δ dual)	Standard	-	0.8	1.5	dB	Between balanced outputs
	U option	-	0.2	0.5	dB	
Phase shift between In-phase and Quadrature ⁽¹⁾ ($\emptyset$)	-	85	90	95	deg	
Skew ⁽³⁾	-	-	0.5	1.0	ps	Measured at connectors end
Optical return Loss (ORL)	-	35	-	-	dB	
Phase shift tunability ($\Delta\emptyset$)	T option	$\pm$ 20	-	-	deg	For a 3 V signal applied Voltage on the BNC input

(1) measured over OTR and OWR for all states of polarization
(2) from Signal of Local Oscillator (3) for all outputs

Block Diagrams COH090-SP



Ordering information

COH090--000-

Polarization: **SP** (Single Polarization) or **DP** (Dual Polarization)
NP (Non-polarized SM input for LO and Si Mandatory)

Options: **O** (Standard design), **U** (Optimized Uniformity)
T (Phase Tunable), **BBM2** (Design for space)

Central Wavelength: **1310** (1310 nm), **1410** (1410 nm),
1495 (1495 nm), **1547** (1547 nm), **1575** (1575 nm)

Signal fiber type: **SM** (Single Mode SMF28),
PM (Polarization Maintaining Panda type)

Output fiber type: **SM** (Single Mode SMF28),
PM (Polarization Maintaining Panda type)

Signal connector: **FU** (FC/UPC), **FA** (FC/APC), **SU** (SC/UPC), **SA** (SC/APC)

LO connector: **FU** (FC/UPC), **FA** (FC/APC), **SU** (SC/UPC), **SA** (SC/APC)

Output connector: **FU** (FC/UPC), **FA** (FC/APC),
SU (SC/UPC), **SA** (SC/APC)

Exail reserves the right to change, at any time and without notice, the specifications, design, function or form of its products described herein.
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