# **Light Path Expressions**

This page provides information about Light Path Expressions.

#### Overview

Light Path Expressions or LPEs are a very powerful and advanced tool for extracting specific lighting events from the scene to a separate channel. This allows for a very fine control of the image in compositing. For example, LPEs allow capturing only self-reflections, or the 1st bounce of GI, or the SSS that's only seen behind glass and similar for compositing control of only this aspect of the image.

The LPE syntax is based on regular expressions. Expressions describe a light path that starts from the camera and bounces around the scene until it reaches a light source.

The scene setup is similar to the Light Select workflow. As LPEs are a mode of the Light Select, the expression will capture contributions of the light that is added to the Light Select set. If the Light Select is empty, the expression will extract contributions from all scene lights. LPEs also allow extracting information from the environment, for example allow capturing the GI that comes from the environment only.

We've added a list of the basic symbols for constructing a Light Path expression.

here is a dedicated LPE Builder available to help you compose expressions and track exactly which ray paths they capture.

Additionally, you can see what expression should get you the equivalent of some of the already available render elements (like Beauty, Lighting, GI, Light Select types etc.).

It is faster and more efficient to use the already available render elements instead of their LPE equivalents in the presets, of course - the examples are there as a point of reference.

Finally, there's some Misc and masking LPE examples, e.g. to capture the GI coming from the environment or to get the GI coming from a given light bounced off of a given object marked by an extra attribute.

▼	VRayLightSelect parameter	s			
	VRayVFB				
	Deep output				
	Color mapping				
	Multiplier			1.0	
	Denoise				
	Material		No Mat		
	Mode				
	Pre	esets			▼

### LPE Symbols

The LPE alphabet consists of the symbols representing a ray event/type and additional regular expression symbols (".", "+", "\*", "<", ">", "[", "]", "[", "?", "^" and additional label strings).

A valid expression needs to start from the camera (C), capture ray spawn or scattering events and end at light (L), emissive object (O) or the environment (E).

Ray spawn events other than C can be combined with scattering types (e.g. <RD> - capture only diffuse reflection) to get a more specific ray event or they can be used directly (e.g. R - capture reflections of any scattering type. This is also equivalent to <R.>)

Ray termination events can also be combined with each other when you want to capture the contribution of a light together with emissive objects, e.g. C<R D>.\*[LO] will capture the GI coming from lights or emissive objects.

S y m b ol	Description	Туре	Fi n al
	Initial ray sp	oawn event	
С	Camera ray	Initial ray spawn event	No

	Ray spawn events				
R	Reflection ray	Ray spawn event	No		
т	Transmission ray	Ray spawn event	No		
V	Volume ray	Ray spawn event	No		
	Scattering types				
D	Diffuse scattering	Scattering type	No		
G	Glossy scattering	Scattering type	No		
s	Singular scattering	Scattering type	No		
s	Straight (no) scattering	Scattering type	No		
	Ray termination events				
L	Light hit	Ray intersection event	Y es		
0	Emitting object hit	Ray intersection event	Y es		
В	Background hit	Ray intersection event	Y es		

F	Presets 🔻
Symbols	, Starting symbols
Render elements	Events
Light selects	Reflection (R)
Misc	<ul> <li>Transmission (T)</li> </ul>
Object/material select	Volume (V)
	Scatterings Diffuse (D)
	Glossy (G)
	Singular (S)
	Ending symbols
	Emitting object (O)
	Background (B)
	OR ( )
	Any symbol (.)
	Optional symbol (?)
	0 or more repetitions (*)
	1 or more repetitions (+)
	Group symbols (())
	Group events/scatterings/labels ([])
	Invert event/scatterings/labels ([^])
	Group event, scattering and labels (<>)
	Label (")

### **Render Elements**

Preset	Light path expression		
Render elements			
RGB	C.*		
Self-illumination	C[OL]		
Background	СВ		
Lighting	C <rd>L</rd>		

Specular	C <r[gs]>L</r[gs]>	
GI	C <rd>(.+L .*[OB])</rd>	
SSS	C <td>.+L</td>	.+L
Reflection	C <r[gs]>.+L</r[gs]>	
Refraction	C <t[gs]>.+L</t[gs]>	
Atmosphere	CV.*	

Presets 🔻			
Symbols	►		
Render elements		RGB (C.*)	
Light selects	►	Self-illumination (C[OL])	
Misc	►	Background (CB)	
Object/material select	►	Lightning (C <rd>L)</rd>	
	+	Specular (C <r[gs]>L)</r[gs]>	
		GI (C <rd>(.+L .*[OB]))</rd>	
		SSS (C <td>.+L)</td>	.+L)
		Reflection (C <r[gs]>.+L)</r[gs]>	
		Refraction (C <t[gs]>.+L)</t[gs]>	
		Atmosphere (CV.*)	

## Light Select

Preset	Light path expression	
Light selects		
Direct Illumination	CRL	
Direct Diffuse	C <rd>L</rd>	
Direct Specular	C <r[gs]>L</r[gs]>	
Full	C.*L	
Indirect	CR.+L	
Indirect Diffuse	C <rd>.+L</rd>	
Indirect Specular	C <r[gs]>.+L</r[gs]>	

	Pres	ets 🔻
Symbols	►	
Render elements	►	
Light selects		Direct illumination (CRL)
Misc	►	Direct diffuse (C <rd>L)</rd>
Object/material select	►	Direct specular (C <r[gs]>L)</r[gs]>
		Full (C.*L)
		Indirect (CR.+L)
		Indirect diffuse (C <rd>.+L)</rd>
		Indirect specular (C <r[gs]>.+L)</r[gs]>

#### Misc

Preset	Light path expression		
Misc			
Self-illumination, no lights	СО		
GI from self-illumination	C <rd>.*O</rd>		
GI from environment	C <rd>.*B</rd>		

F	Prese	ets 🔻
Symbols		
Render elements		
Light selects		
Misc	►	Self-illumination, no lights (CO)
Object/material select	►	GI from self-illumination (C <rd>.*O)</rd>
		GI from environment (C <rd>.*B)</rd>

## **Object/material select**

Preset	Light path expression
Object/Mat	erial select
Indirect for the object label "obj1"	CR'obj1'.+L
Indirect for all object labels but "obj1" and "obj2"	CR[^'obj1"obj2'].+L
RGB for material "Material #01"	C.'mMaterial #01'.*

In order to use Object select, an object label can be set in the **LPE label** field in V-Ray Object Properties window. When Material select is used, materials names are used as labels.

V-Ray object properties						×
Scene objects: Box001	Object properties Motion blur			Matte properties Matte object		
	🖌 Use default moblur samples			Matte for reflection/refraction		
				Alpha contribution	÷	
	Moblur duration	1.0		Direct ligh	nt	
	Velocity channel			Shadows		
	Velocity chan. mult.	1.0	¢	Affect alpha		
	· · · · · · ·			Color		
	Global illumin	ation		Brightness	1.0	\$
		1.0		Peflection/ Pefra	ction/ G	ат —
	Receive GI	1.0	▼ ▲	Reflection amount	1.0	¢
	GI surface ID	0	▼ ▲	Refraction amount	1.0	¢
	Raytraced SSS ID	U		GLamount	1.0	÷
	Subdivs multiplier	1.0		No GI on other	mattes	
	Caustics					
	✓ Generate caustics			Trace sets		
	✓ Receive caustics			Reflection exclude		
	Caustics multiplier	1.0		Refraction exc		
	Appearance					
	Visible in reflections					
	Visible in refractions					
	VRayToon outlines					
	Generate render elements					
	LPE label					
	Geometry De	fault			Clos	se _

	Preset	s v
Symbols	•	
Render elements		
Light selects		
Misc	•	
Object/material select	•	Indirect for object label "obj1" (CR'obj1'.+L)
		Indirect for all object labels but "obj1" and "obj2" (CR[^'obj1"obj2'].+L)
		RGB for material "Material #01" (C.'mMaterial #01'.*)