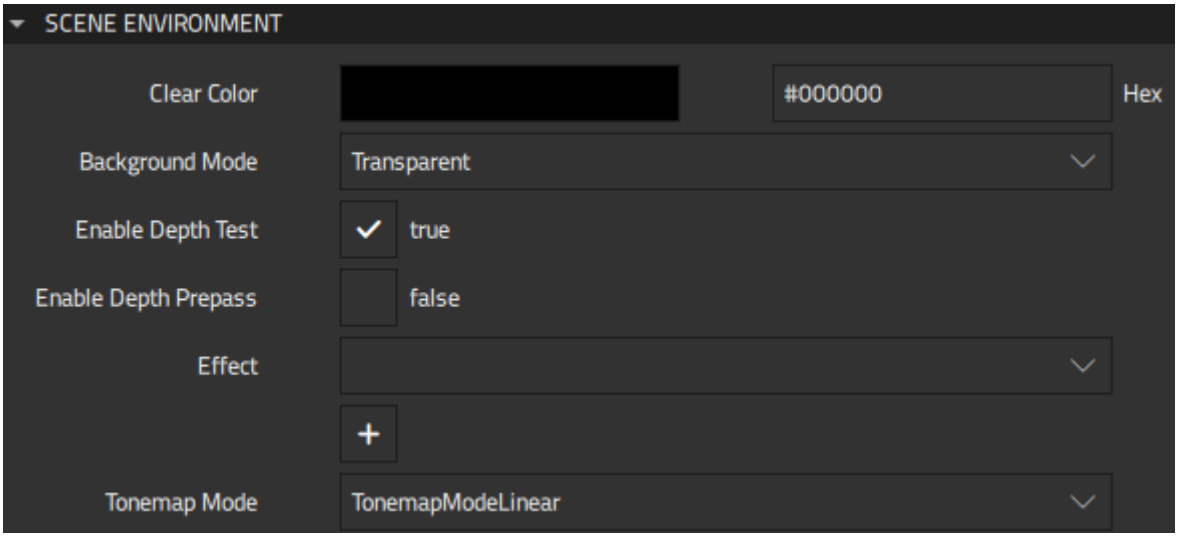
场景环境

可以使用**"场景环境"**组件来指定如何全局渲染场景。您可以在"属性"视图中指定抗锯齿、场景背景、环境光遮蔽和基于图像的照明的设置。**"场景环境"组件在组件> Qt 快速 3D 中**可用。它会自动包含在使用 Qt **快速** 3D 应用程序向导模板创建的项目中的 3D 视图组件下。

> **注意：** 如果在创建项目时选择 Qt 5 作为**目标 Qt 版本**，则此组件的可用属性将略有不同。属性在**"属性"**视图中的位置也可能不同。

设置场景环境

在**"属性"**视图的"**场景环境**"部分中，可以指定是否以及如何清除场景的背景，指定是否要在场景上执行深度测试，将后处理效果应用于场景，以及定义在渲染场景之前如何映射颜色。



"**清除颜色**"属性指定在"**背景**"**模式**定义为"颜色"时将使用哪种颜色来清除场景**的背景**。使用颜色选取器选择所选的颜色。

背景模式属性定义是否应清除场景的背景以及清除场景的方式。使用下拉菜单选择一种可用模式：

后台模式	**描述:** _____
透明	场景被清除为透明，这对于在另一个项目上渲染 3D 内容非常有用。当 View3D 组件使用**"参考底图"**或**"叠加"**作为渲染模式时，此模式不起作用。
后台模式	**描述:**
颜色	将使用"清除颜色"属性指定的**颜色**清除场景。当 View3D 组件使用**"参考底图"**或**"叠加"**作为渲染模式

盒	SkyBox（在 Qt 5 中，为"基于图像的照明"组中的"光源探测器"属性。

要使场景保持不清晰状态，请选择"**未指定**"作为**"背景"模式**。

您可以执行深度测试以优化场景环境。要跳过深度测试，请取消选中**"启用深度测试"**复选框。请注意，跳过测试可能会导致呈现错误。

要让渲染器作为颜色通道的一部分写入深度缓冲区，请取消选中**"启用深度预通道"**复选框。取消选中该复选框将在使用平铺呈现架构的任何 GPU 上禁用深度预置通。

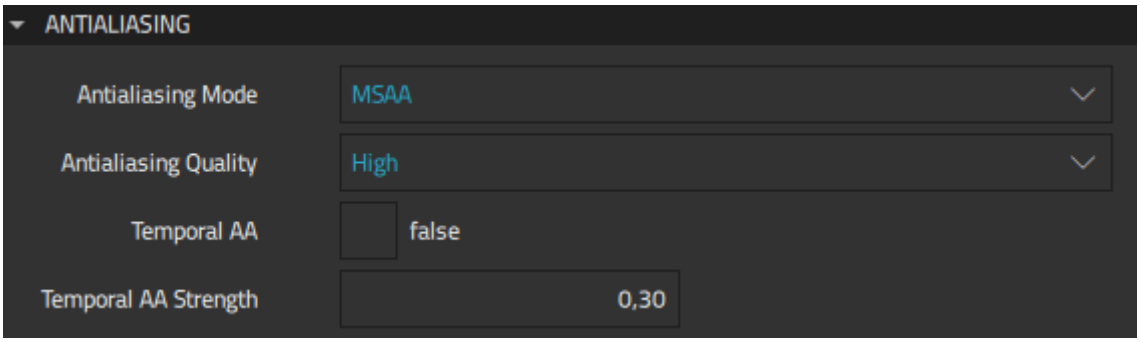
"**效果**"属性定义场景的后处理效果。使用下拉菜单选择将应用于整个场景的效果之一。效果的顺序很重要，因为每个效果的结果都提供给下一个效果。

"**色调映射模式**"属性定义在呈现之前如何映射颜色。选择"**色调映射模式线性**"以应用线性色调映射，这将伽玛校正颜色并在 sRGB 颜色空间中返回它们。您还可以选择**"色调映射模式"**以应用学院颜色编码系统，**选择"色调映射模式"**以应用"海吉尔-道森色调映射"，或**选择"色调映射模式"**以应用电影色调映射。

> **注意：** 色调**映射模式**属性在 Qt 5 中不可用。

应用抗锯齿

抗锯齿用于使弯曲的线条在屏幕上更平滑。在**"属性"**视图的"**抗锯齿**"部分中，可以指定抗锯齿的模式和质量，还可以启用时间抗锯齿并定义其强度。



"**抗锯齿模式**"属性指定在渲染场景时应用的抗锯齿模式。使用下拉菜单选择以下模式之一：

Mode of Antialiasing	Description
MSAA	Applies multisample antialiasing. The scene is rendered in a higher resolution and then scaled down to actual resolution.
NoAA	No antialiasing is applied.
SSAA	Supersample antialiasing is applied. The edges of geometry are supersampled, resulting in smoother silhouettes. This technique has no effect on the materials inside geometry.
ProgressiveAA	Progressive antialiasing is applied. When the content of the scene has stopped moving, the camera is jiggled very slightly between frames, and the result of each new frame is blended with the previous frames. The more frames you accumulate, the better looking the result.

The **Antialiasing quality** property sets the level of antialiasing applied to the scene. Define the quality of antialiasing as **Medium**, **High**, or **Very High**. The effect of the selected **Antialiasing quality** depends on the selected **Antialiasing mode**, as you can see from the table below. In the **SSAA** mode the selected quality affects the supersampling

Level of Antialiasing	Supersampling Resolution used in SSAA	Number of samples per pixel in MSAA	Number of frames for final image in ProgressiveAA
Medium	1.2x	2	2
High	1.5x	4	4
Very High	2.0x	8	8

Note: With **Antialiasing mode** set to **NoAA**, **Antialiasing quality** does not affect antialiasing.

The **Temporal AA** property enables temporal antialiasing. This means that the camera is jiggled very slightly between frames, and the result of each new frame is blended with the previous frame.

Note: Temporal antialiasing does not have an effect when the **MSAA** mode is used.

Note: When combined with **ProgressiveAA** mode, temporal antialising is used for animations, and **ProgressiveAA** is used once animations stop.

The **Temporal AA strength** property modifies the amount of temporal movement in antialiasing. This property only has an effect when the **Temporal AA** property is set to true.

Note: In Qt 5, the antialiasing properties are located in **Properties** > **Scene Environment**.

Applying Ambient Occlusion

Ambient occlusion is a form of approximated global illumination that causes non-directional self-shadowing where objects are close together. You can define the **Strength**, **Distance**, **Softness**, **Sample rate**, and **Bias** properties in the **Ambient Occlusion** section of the **Properties** view.

You can set the strength of the shadows using the **Strength** property, which defines the amount of ambient occlusion applied. A value of 100 causes full darkness shadows, while lower values cause the shadowing to appear lighter. A value of 0 disables ambient occlusion entirely, thus improving performance at a cost to the visual realism

distances cause increasing impact to performance.

The **Softness** property specifies how smooth the edges of the ambient occlusion shading are. The value set for the property must be between 0.0 and 50.0. To improve smoothness at the risk of sometimes producing obvious patterned artifacts, you can scatter the edges of the ambient occlusion shadow bands by selecting the **Dither** check box.

> **Note:** Large distances between the clipping planes of your camera may cause problems with ambient occlusion. If you are seeing odd banding in ambient occlusion, try adjusting the value in the **Clip far** field in the scene camera properties.

The **Sample rate** property specifies the number of shades of gray, thus defining the quality of ambient occlusion at the expense of performance.

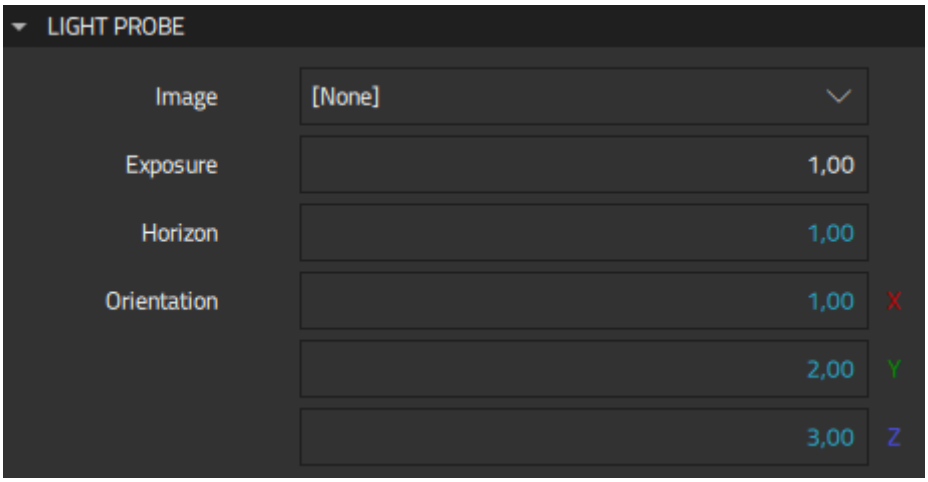
The **Bias** property defines a cutoff distance preventing objects from exhibiting ambient occlusion at close distances. The higher the value, the greater the distance required between objects before ambient occlusion occurs.

> **Note:** If you see ambient occlusion shadowing on objects where there should be no shadowing, increase the value slightly to clip away close results.

> **Note:** In Qt 5, some the ambient occlusion properties are named slightly differently: **AO strength**, **AO distance**, **AO softness**, **AO dither**, and **AO bias**.

Setting the Light Probe

In the **Light Probe** section of the **Properties** view, you can set the **Image**, **Exposure**, **Horizon**, and **Orientation** properties for image-based lighting.



The **Image** property defines an image used to light the scene instead of or in addition to standard lights. The image is preferably a high-dynamic range image or a pre-generated cubemap. Pre-baking provides significant performance improvements at run time because no time is spent on filtering and mipmap generation. If the source is a .hdr or other image, the GPU-based pre-processing happens at run time after loading the image file, which can be potentially time consuming, in particular on embedded and mobile hardware. Therefore, it is strongly recommended that applications pre-process .hdr images at latest at build time, as described here.

> **Note:** In Qt 6, using a **Texture** component with **Image** > **Source** is not supported in combination with this

The **Exposure** property modifies the amount of light emitted by the light probe.

When defined with increasing values, the **Horizon** property adds darkness (black) to the bottom half of the environment, thus forcing the lighting to come predominantly from the top of the image (and removing specific reflections from the lower half). This property is useful for accounting for a ground plane that would have the effect of obscuring the reflection of the light probe from the ground. This is necessary because light probe contributions come directly from the image without consideration for the content of the scene. You can set the value of the **Horizon** property between 0.0 and 1.0. Using the default value of the property applies the entire light probe without adjustment.

> **Note:** The **Horizon** property only affects materials lighting and has no effect on the rendering of the sky box.

> **Note:** In Qt 5, the **Horizon** property is referred to as **Probe horizon**.

The **Orientation** property defines the orientation of the light probe. Orientation is defined in terms of euler angles in degrees over the x, y, and z axes.

Additional Light Probe Properties in Qt 5

The **Probe Brightness** property modifies the amount of light emitted by the light probe.

When the **Fast IBL** (Fast image-based lighting) property is enabled, more shortcuts are taken to approximate the light contribution of the light probe at the expense of quality.

The value of the **Probe FOV** property sets the angle of the image source field of view when using a camera source as the IBL probe.

‹ Cameras

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