

Preface

We learn about the properties of quantized optical fields in quantum optics. Although this may sound old and traditional, it is not. In reality, we assumed optical fields as classical fields until very recently. We did not have to quantize the field because our light source was only a laser and whose state, a coherent state, can be regarded as a classical field.

We have to use quantum optics nowadays, of course. It is because squeezed light is easily created these days and we have to handle it. Squeezed light is a pure quantum mechanical state, which cannot be described without quantum optics. In that sense, the “phase transition” occurred when Slusher et al. created the squeezed light for the very first time in 1985. After the “phase transition,” various “pure” quantum states were created, which include superposition of a vacuum and a single-photon state, a Schrödinger’s cat state, and so on.

In this book, we explain the definition and the way to create these “modern” quantum states of light. For that purpose we use many figures to visualize the quantum states to help the readers’ understanding, because the quantum states sometimes look very counterintuitive when one only looks at equations.

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