

Physics of exawatt light fields

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The report discusses the development of a new scientific direction at the intersection of high-energy physics and the physics of extreme light fields. In several countries around the world, large research infrastructures based on multi-petawatt and sub-exawatt laser facilities are being constructed. These facilities enable the focusing of laser pulses with durations of around 10 femtoseconds to achieve gigantic intensities exceeding 10^{23} W/cm². The states of matter and vacuum that arise in such fields are currently the subject of theoretical research, predicting remarkable properties and promising unique applications. The report will present opportunities for generating ultra-dense electron-positron plasma and powerful sources of highly directional gamma radiation in the laboratory, for studying the spatiotemporal structure of the quantum vacuum, as well as discuss approaches for further advancing the intensity scale and approaching the Schwinger field level.