中文題目:

利用自適應控制優化由低溫砷化銦鎵天線產生兆赫輻射之研究

英文題目:

Adaptive Control Enhanced Terahertz Radiation with LT-InGaAs Photoconductive Antennas

中文摘要:

利用凍結相位演算法結合脈衝形變技術與自適應控制，我們研究激發光(λ=1550nm)脈衝特性對由低溫砷化銦鎵光導天線天線兆赫波輻射的影響。系統之自適應控制是採用凍結相位演算法，本文提出一種能兼顧壓縮品質和縮減計算步數的簡化方式，實驗證明其有效。

兆赫波自適應控制的實驗證明零色散的最短脈衝無法產生最佳的兆赫波尖峰數值，用最佳塑形的光脈衝激發，可將兆赫波的尖峰數值提升至少 1.2 倍。另外，我們發現在啁啾常數為 20000,-30000,-75000 fs2 時，兆赫脈衝訊號有明顯的增強，同時也觀察到峰值頻率的平移現象以及頻寬的增減。

英文摘要:

In this thesis, we display an all-fiber laser (λ=1550nm) system with pulse shaping for enhaning THz generation by a LT-InGaAs photoconductive antennas (PCA).

The laser system was designed to reduce the nonlinear effect in fiber component and match the bandwidth of the pulse shaper (C-band waveshaper 4000S) by picosecond chirped pulses. We also introduce a new method to reduce step number of freezing phase algorithm for adaptive control while maintaining the efficiency of pulse shaping.

THz time-domain spectrometer uses adaptively controlled THz signal as the feedback signal. We found that the transform-limited pulse (TLP) is not the best incident pulse for THz generation by the PCA. The enhancement in the signal is 1.2 times of THz generation by TLP. In chirp control experiment, we studied the response of THz radiation with different pre-chirped pulses for excitation. We found significant enhancement near 20000, -30000 and -75000 fs2 chirp constant. Peak frequency shift, broadening and narrowing of bandwidth were also observed.