to a diffraction-limited beam, the smaller the divergence angle among combinable beams relative to one another, the higher the beam quality of the combined beam. Thus, as the linewidth of each individual SF laser broadens, the divergence of individual beams relative to one another increases which leads to the deteriorated quality of the combined beam. In practical terms, the increased divergence limits the number of channels or laser sources that can be combined together without prohibitively low quality of the combined beam.

[0009] The broadening of the line of the subject matter system has been attributed to and proved to be another well-known NLE – the FWM which is rather inconsequential in MOPFA 10 of FIG. 1 at the output powers of up to 2 KW. At higher powers, at least one of the factors contributing to the onset of FWM has been identified to be two-piece Lyot depolarizer 20 of FIG. 2.

[0010] Based on the foregoing, there is a need for a narrow linewidth MOPFA with the suppressed onset of FWM at the output powers exceeding 2 KW.

SUMMARY OF THE DISCLOSURE

[0011] This need is met by incorporating a one-piece fiber depolarizer into the MOPFA scheme of FIG. 1. Similarly to a two-piece fiber depolarizer, the one-piece depolarizer is used to depolarize the output of a SF seed which leads to the increased power threshold in the booster at which FWM becomes problematic. As with the 2-piece depolarizer, the inventive MOPFA scheme of FIG. 1 with the one-piece depolarizer is capable of outputting a 3-4 KW power signal. In contrast to the know art, the use of the one-piece depolarizer does not cause substantial broadening of the linewidth at the output of the booster.

[0012] The depolarization of the linearly polarized seed output introduces additional spectral components. Intuitively, it is easy to realize that a single piece of depolarizing fiber introduces fewer additional spectral components than the two-piece depolarizer. The FWM is a well-known nonlinear phenomenon, whereby interactions between three spectral components produce a 4th spectral component. The FWM between different spectral components or longitudinal modes is the main line-broadening mechanism. Accordingly, the number of spectral components obtained in the single-piece depolarizer is smaller than that associated with a two-piece scrambler. Consequently, the line broadening in the disclosed MOPFA structure with a one-piece depolarizer is limited by comparison with the same structure incorporating a standard 2-piece scrambler.

[0012A] In accordance with a first aspect of the present disclosure, there is provided a high power narrow linewidth laser system having a master oscillator power fiber amplifier architecture, comprising a single mode single frequency (SMSF) linearly polarized seed outputting a linearly polarized signal at a desired wavelength, a one-piece fiber depolarizer spaced downstream from the seed and configured to depolarize the linearly polarized signal, and a fiber booster amplifying the depolarized signal which suppresses an onset of a four-wave mixing nonlinear effect during amplification in the fiber booster so that the fiber booster outputs the amplified depolarized signal at an output power in excess of 2 KW with a spectral linewidth which matches that of the linearly polarized signal at an input of the one-piece fiber depolarizer.

[0012B] In accordance with a second aspect of the present disclosure, there is provided a method of generating a narrow linewidth light signal in a high power laser system having a maser oscillator power fiber amplifier architecture, comprising generating a single mode single frequency (SMSF) linearly polarized signal; broadening a linewidth of the SMSF linearly polarized signal to a narrow linewidth; guiding the SM linearly polarized narrow linewidth signal through a one-piece fiber depolarizer thereby obtaining a depolarized SM signal with the narrow linewidth; amplifying the depolarized SM signal in a fiber amplifier, wherein the amplified depolarized SM signal is output at an output power in a 2-4 KW diapason and the narrow linewidth unchanged during the amplification.