CLAIMS

1. A tunable filter comprising:

an input focusing optic;

an output focusing optic;

a linearly-varying filter, wherein filtering parameters of the linearly-varying filter differ based on spatial position on the linearly-varying filter, wherein the linearly-varying filter is located at a back focal plane of the input focusing optic and a front focal plane of the output focusing optic;

an input angular scanning component formed as a first mirror with an adjustable angle and located at a front focal plane of the input focusing optic, wherein the input focusing optic receives an input beam from the input angular scanning component and directs the input beam to the linearly-varying filter, wherein a position of the input beam on the linearly-varying filter is selectable based on an angle of the input angular scanning component; and

an output angular scanning component formed as a second mirror with an adjustable angle and located at a back focal plane of the output focusing optic, wherein the output focusing optic receives the input beam from the linearly-varying filter as a filtered beam and directs the filtered beam to the output angular scanning component, wherein the output angular scanning component provides the filtered beam as an output beam along an output path selectable based on an angle of the output angular scanning component.

2. The tunable filter of claim 1, further comprising:

a controller communicatively coupled to the input angular scanning component and the output angular scanning component, the controller including one or more processors configured to execute program instructions causing the one or more processors to:

select the angle of the input angular scanning component to select the position of the input beam on the linearly-varying filter.

3. The tunable filter of claim 2, wherein the one or more processors are further configured to execute program instructions causing the one or more processors to:

select an angle of the output angular scanning component based on the angle of the input angular scanning component to direct the output beam along a fixed output path.

4. The tunable filter of claim 2, wherein the one or more processors are further configured to execute program instructions causing the one or more processors to:

select an angle of at least one of the output angular scanning component or the input angular scanning component to direct the output beam to a selected output channel of two or more output channels.

5. The tunable filter of claim 2, wherein the one or more processors are further configured to execute program instructions causing the one or more processors to:

select an angle of at least one of the output angular scanning component or the input angular scanning component to receive the input beam from a selected illumination source of two or more illumination sources.

6. The tunable filter of claim 1, further comprising:

a cross-axis angular scanning component to receive the output beam from the output angular scanning component, wherein a scanning plane of the cross-axis angular scanning component is orthogonal to a scanning plane of the output angular scanning component, wherein the output beam may be directed along any output angle by controlling the output angular scanning component and the cross-axis angular scanning component.

7. The tunable filter of claim 6, further comprising:

a controller communicatively coupled to the input angular scanning component and the output angular scanning component, the controller including one or more processors configured to execute program instructions causing the one or more processors to:

modulate the output angular scanning component and the cross-axis angular scanning component to modulate the output angle to mitigate speckle.

8. The tunable filter of claim 7, further comprising:

a coupling lens to direct the output beam from the cross-axis angular scanning component to an input face of an optical fiber, wherein modulating the output angular scanning component and the cross-axis angular scanning component to modulate the output angle modulates at least one of a position or an angle of the output beam on the input face of the optical fiber.

9. The tunable filter of claim 1, wherein at least one of the input focusing optic or the output focusing optic comprises:

at least one of a parabolic mirror, an elliptical mirror, or a refractive scan lens.

10. The tunable filter of claim 1, wherein the linearly-varying filter comprises:

a linearly-varying spectral filter.

11. The tunable filter of claim 10, wherein the linearly-varying spectral filter comprises:

at least one of a long-pass filter or a short-pass filter, wherein a cut-off wavelength varies based on the position on the linearly-varying spectral filter.

12. The tunable filter of claim 10, wherein the linearly-varying spectral filter comprises:

a band-pass filter, wherein at least one of a central pass wavelength or a spectral pass width varies based on the position on the linearly-varying spectral filter.

13. The tunable filter of claim 1, wherein the linearly-varying filter comprises:

a linearly-varying neutral density filter, wherein a transmissivity varies based on the position on the linearly-varying neutral density filter.

14. The tunable filter of claim 1, wherein the linearly-varying filter comprises:

a linearly-varying polarizer, wherein a passed polarization varies based on the position on the linearly-varying polarizer.

15. The tunable filter of claim 1, wherein at least one of the input angular scanning component or the output angular scanning component comprises:

at least one of a galvanometer, an acousto-optic deflector, an electro-optic deflector, a polygon scanner, or a micro-electro-mechanical systems (MEMS) deflector.

16. A system comprising:

two or more tunable filters, wherein a tunable filter of the two or more tunable filters comprises the tunable filter of any one of claims 1-15

17. An illumination system comprising:

an illumination source configured to generate an input beam; and

a filtering sub-system including two or more tunable filters, wherein each tunable filter of the two or more tunable filters comprises the tunable filter of any one of claims 1-15.