Optimizing the signal content of integral field spectropolarimeters

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Over the past decade the development of a number of high resolution spectropolarimetric integral field instruments (IFS) in combination with advances in image restoration techniques have produced high spectral spatial and temporal resolution observations of the solar atmosphere, revealing the solar atmosphere to be a highly structured and dynamic environment. Although the process of image restoration typically preserves the SNR of the raw data and is in addition highly effective in suppressing seeing induced cross-talk, the restored data ruthlessly expose the limited signal produced by even the most magnetically sensitive spectral lines at the highest spatial resolution permitted by the telescope aperture. This problem escalates rapidly with increasing size of the telescope aperture, where a decreased dynamic time scale and an increased resolution requirement render non-IFS instruments (such as slit scanning spectrographs) ineffective. An effective way to circumvent this issue is to increase the number of signal carrying spectral lines by increasing the spectral range, thus boosting the total signal content of the data. A new broadband microlens based IFS (MiHI) is planned that is able to observe a spectral range of up to 30A, allowing for more than 100 spectral lines to be observed simultaneously, without making any compromises regarding the spatial and temporal resolution of the data.