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EXPECTED OSIRIS EFFICIENCY

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OSIRIS, the main optical (360-1000nm) 1st-generation instrument for GTC, is being integrated. Except for some grisms and filters, all main optical components are finished and being characterized. Complementing laboratory data with semi-empirical estimations, the current OSIRIS efficiency is summarized.

Efficiencies without diffraction optics are listed in Table 1. The OSIRIS optics throughput (Col. 5) includes the transmission of all glass elements and couplants (Col. 2), the efficiency of anti-reflection coatings of all 14 air-glass interfaces (Col. 3) and the combined reflectivity of collimator and folding mirrors (Col. 4). The net OSIRIS efficiency (Col. 7) also includes the CCD mosaic (Col. 6) as measured by R. Kohley (GTC labs, 2005). The last column lists for completeness the GTC Nasmyth nominal efficiency (3 bare-Al reflections as in García-Vargas et al. (2004).

TABLE 1

OSIRIS INSTRUMENT EFFICIENCY

Wv	Trans	AR	Mirrors	Optics	CCDs	OSIRIS	GTC
360	0.890	0.864	0.746	0.573	0.282	**0.161**	0.791
380	0.961	0.877	0.846	0.714	0.363	**0.259**	0.791
400	0.970	0.908	0.921	0.810	0.445	**0.361**	0.789
450	0.969	0.940	0.930	0.848	0.582	**0.493**	0.784
500	0.981	0.910	0.931	0.831	0.668	**0.556**	0.774
600	0.980	0.900	0.933	0.823	0.804	**0.662**	0.756
700	0.981	0.882	0.957	0.828	0.883	**0.731**	0.722
800	0.981	0.927	0.968	0.880	0.858	**0.755**	0.652
900	0.967	0.907	0.953	0.836	0.575	**0.481**	0.707
1000	0.960	0.869	0.971	0.809	0.122	**0.098**	0.831

Figures consider the main dispersive elements, Grisms and Broad-Band, Order-Sorter and Tunable filters, for the performance in different operation modes. All efficiencies shown are best present-day estimates to be superseded by after-integration OSIRIS performance measurements at commissioning. In the mean time, calculations are continuously fed to the on-line calculators.

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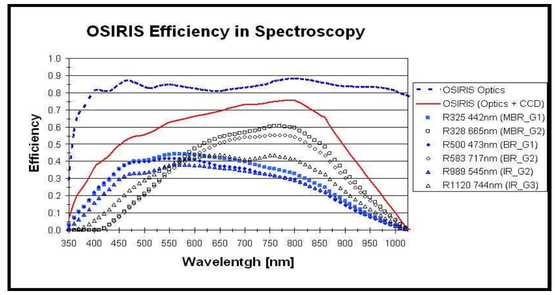

Fig. 1. The OSIRIS optical throughput (dotted) and net efficiency including detector (solid). Given the high and broad response of the OSIRIS optics, the overall shape of the net efficiency is dominated by the CCD QE. Spectroscopic OSIRIS performances are plotted with symbols, after multiplication of the OSIRIS efficiency with the responses of the main OSIRIS grisms, as measured by Richardson Gratings (all factors included: grating, prism absorption and reflection losses).

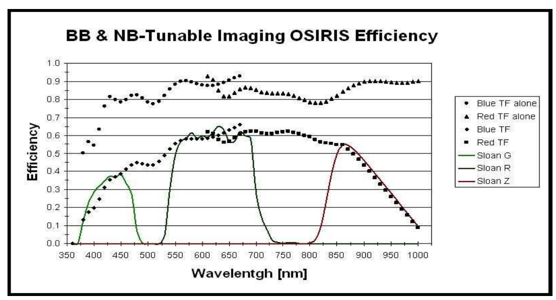

Fig. 2. Blue and Red Tunable Filter responses predicted by combining etalon reflectances (measured by IC Optical Systems Ltd, UK) with the specified defect finesse of 70 (filled circles and triangles), and after the OSIRIS total efficiency(filled rhomboid and squares). Preliminary lab data indicate the actual defect finesse is higher than specified, particularly for the blue TF, so these tunable imaging efficiencies are lower limits. Solid lines: Broad-Band imaging efficiency for 3 OSIRIS Sloan filters (measured by the manufacturer, SESO, France, and multiplied by the instrument efficiency).

OSIRIS is extremely sensitive, providing GTC with a front-edge competitive instrument across the visible, and particularly in the blue.

REFERENCES

García-Vargas, M. L., et al. 2004, Proc. SPIE, 5492, 230