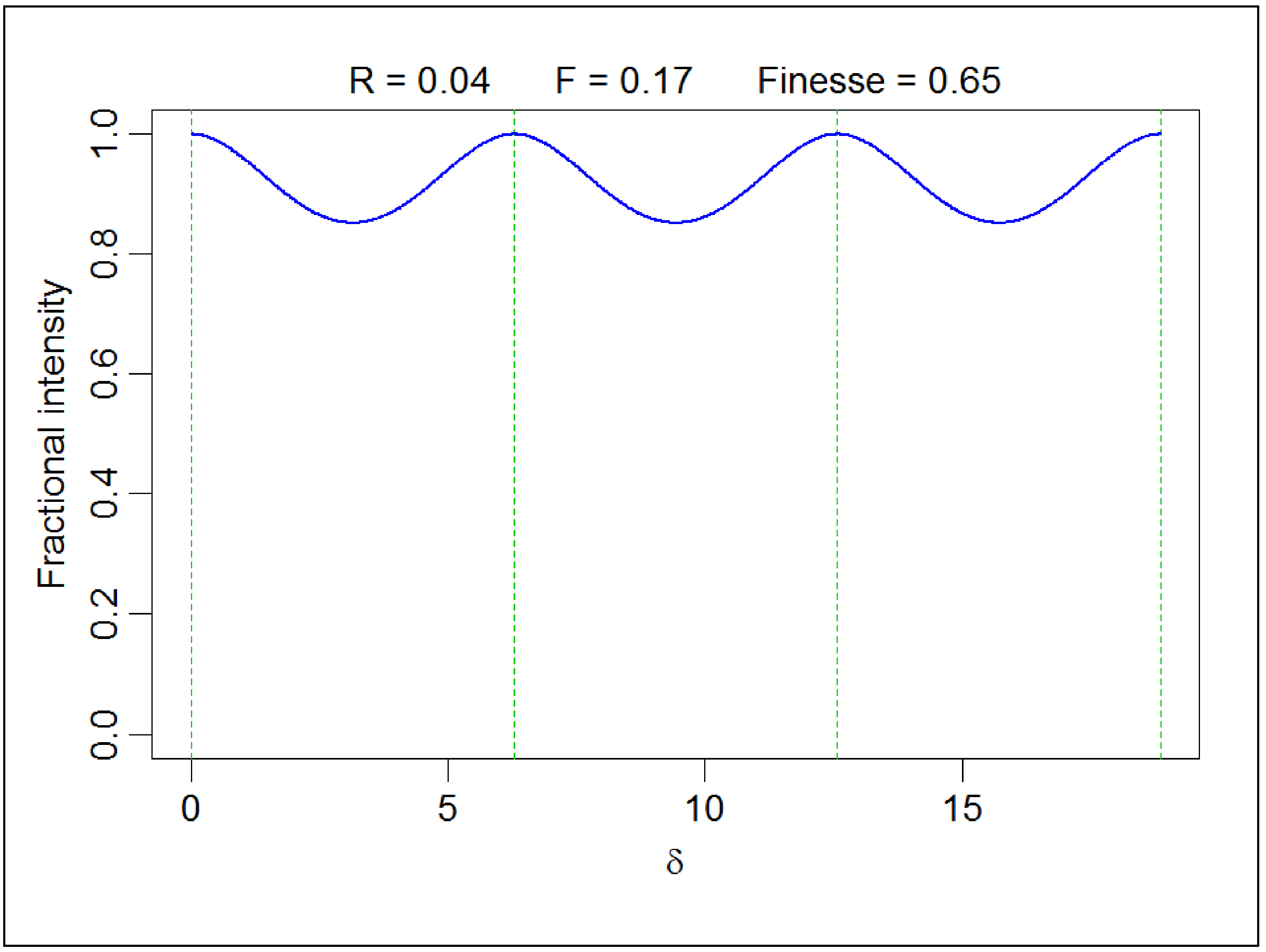
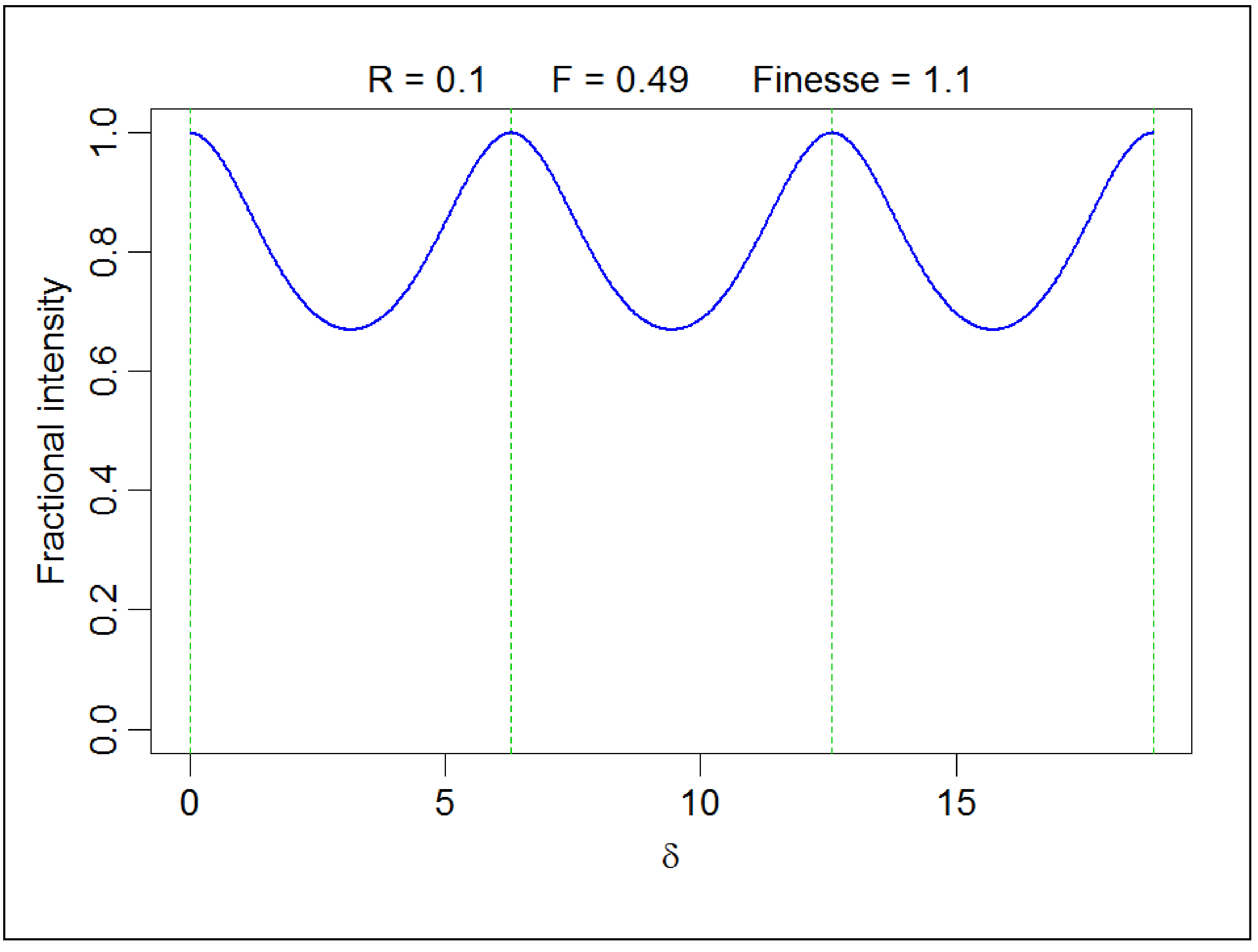
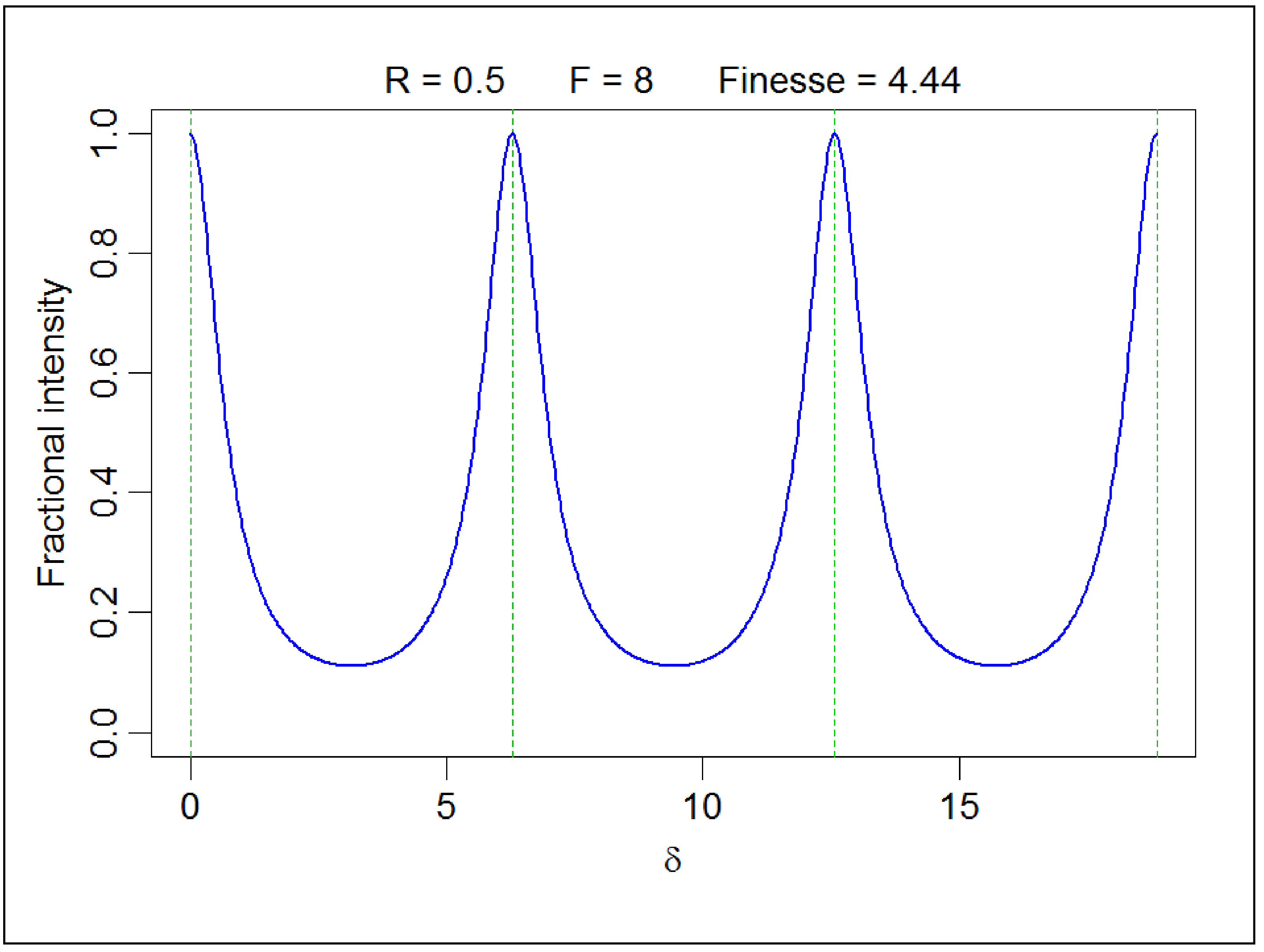
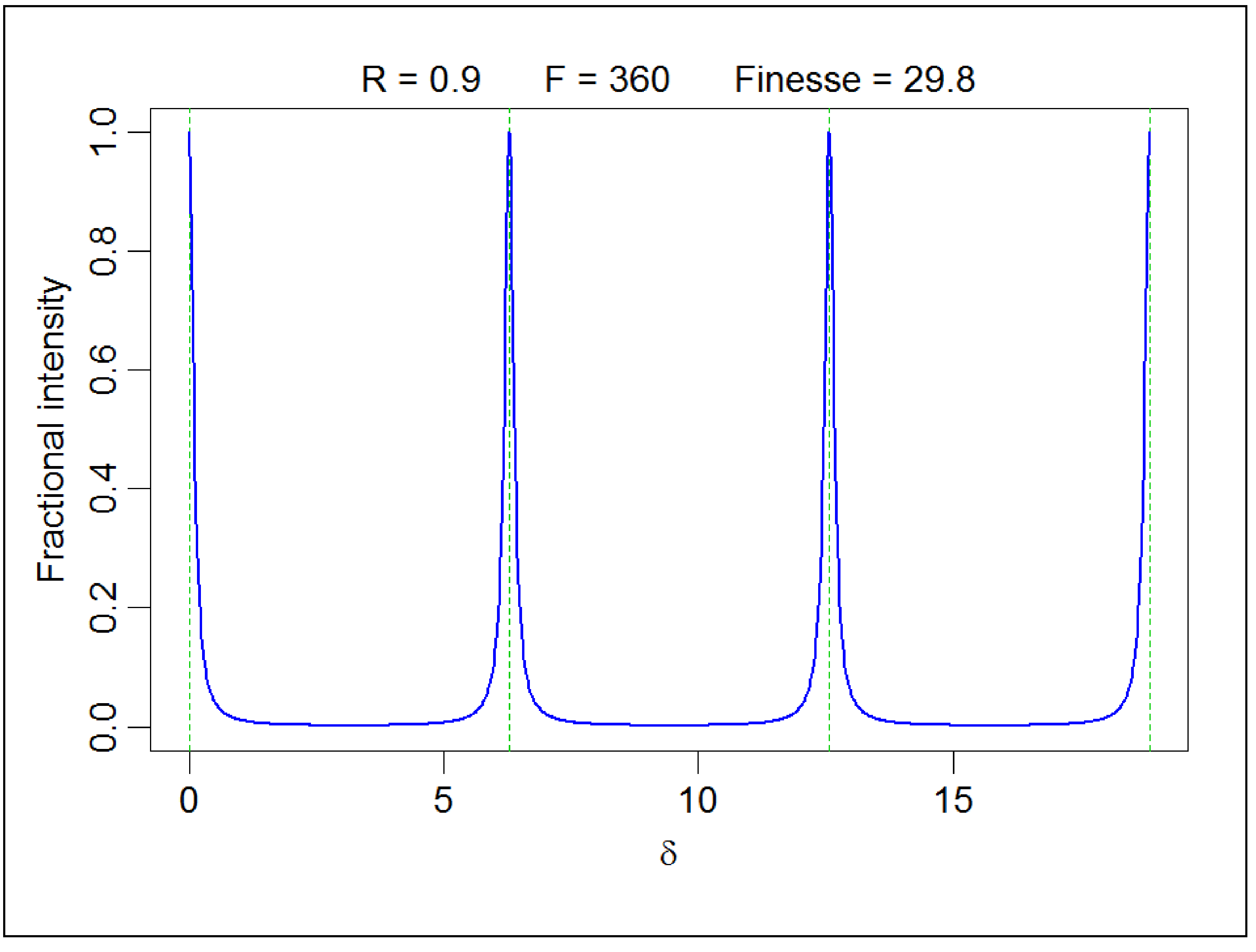
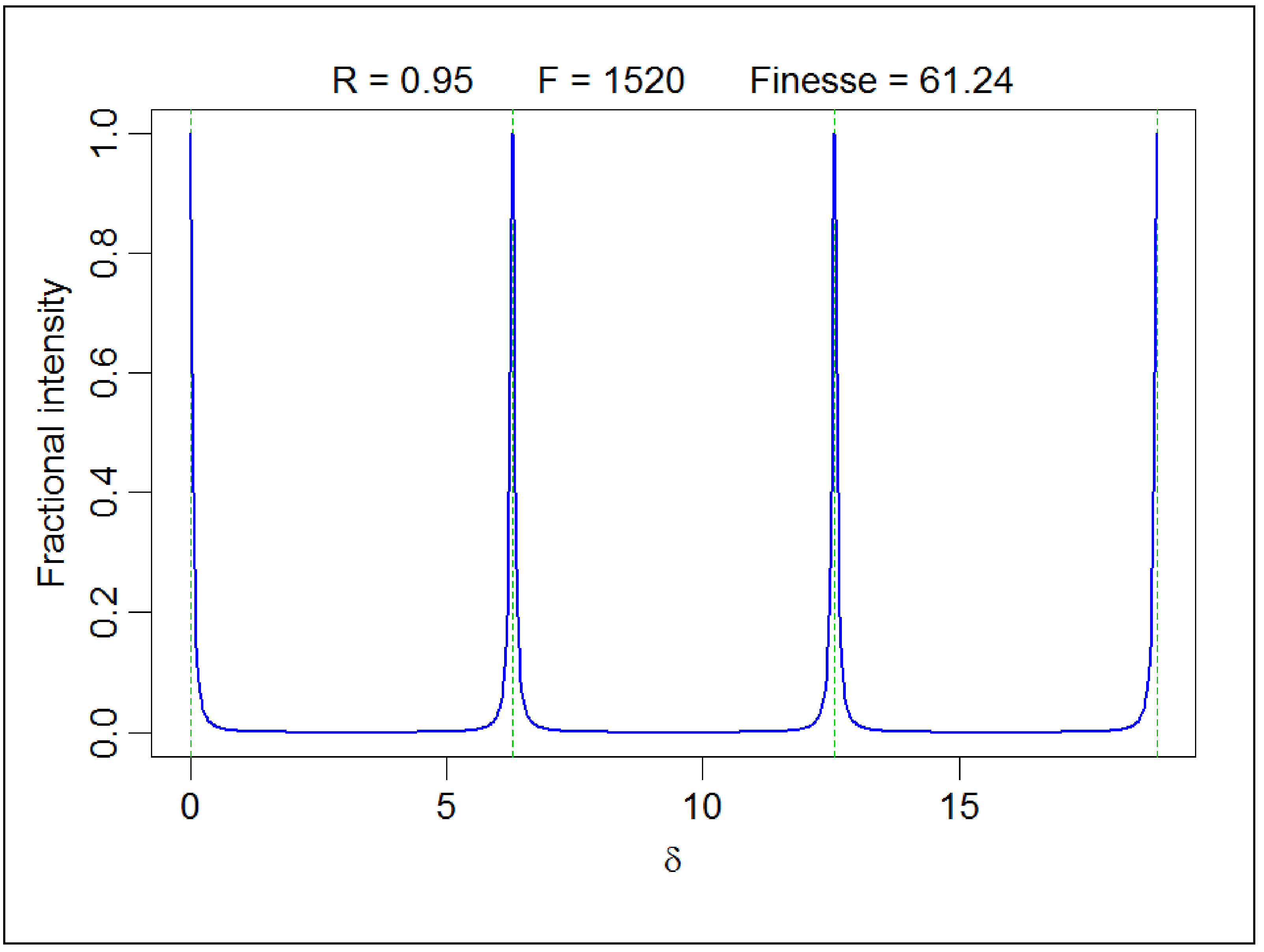
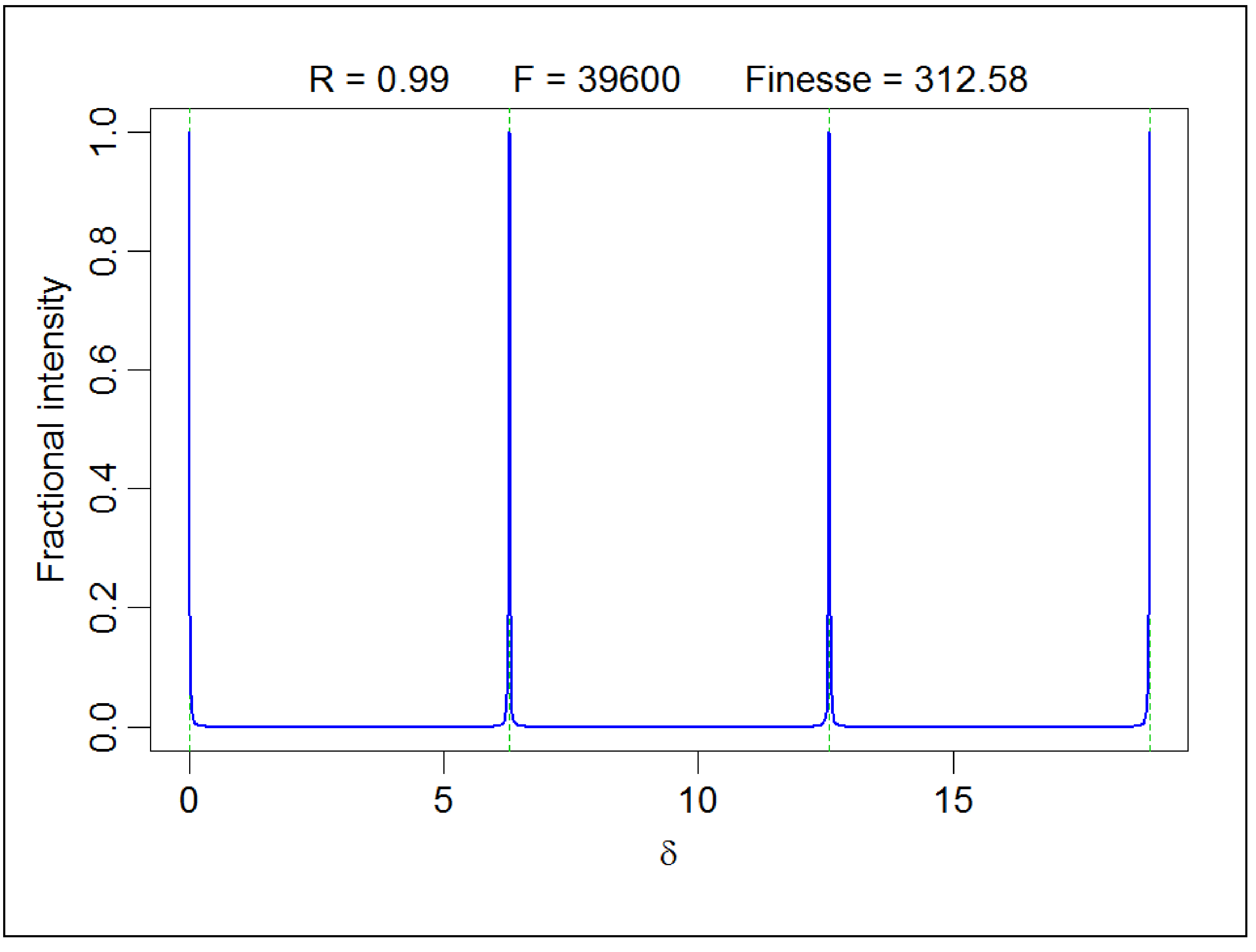

R = 0.04 F = 0.17 Finesse = 0.65
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ

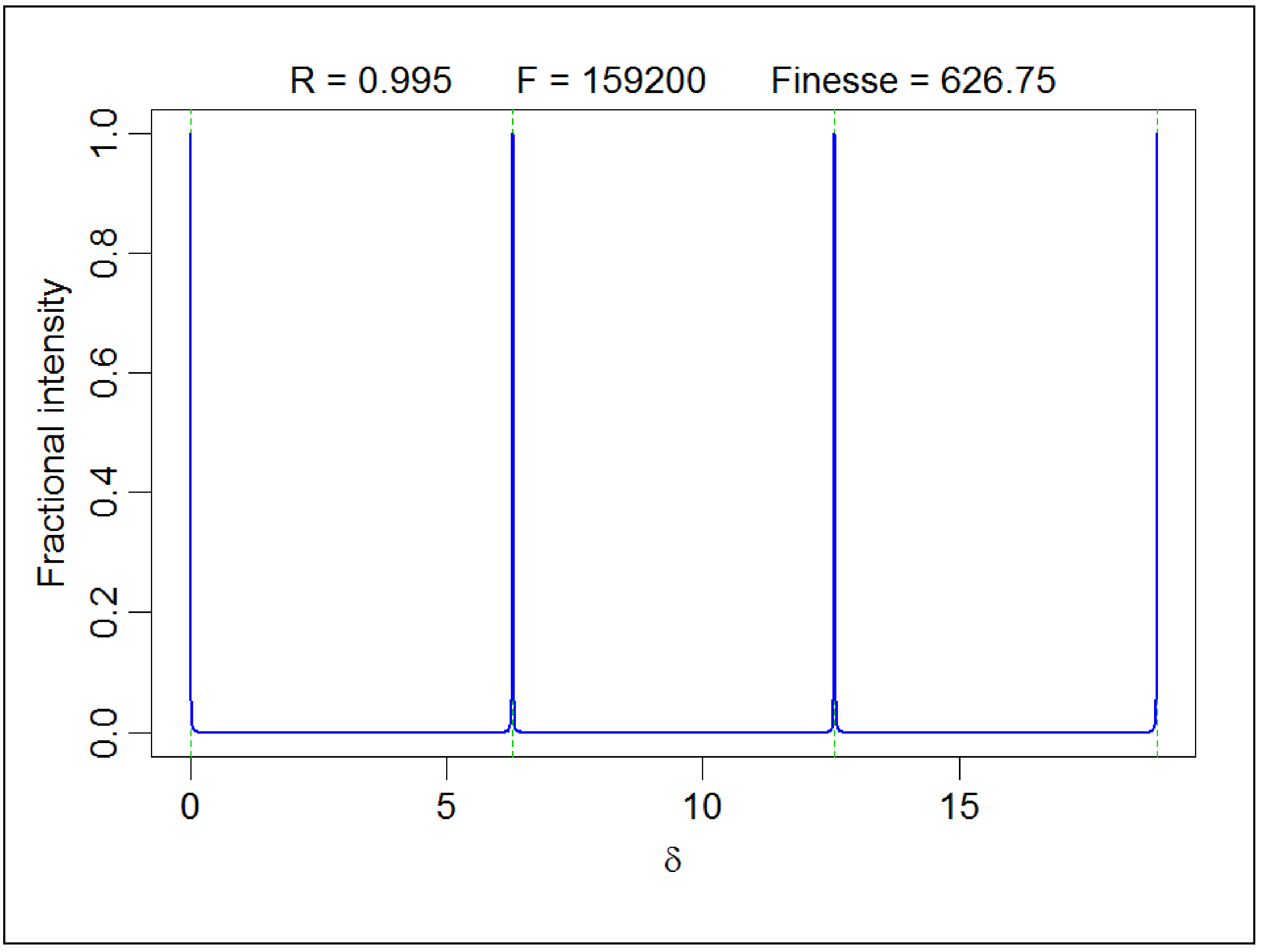

R = 0.1 F = 0.49 Finesse = 1.1
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ


R = 0.5 F = 8 Finesse = 4.44
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ

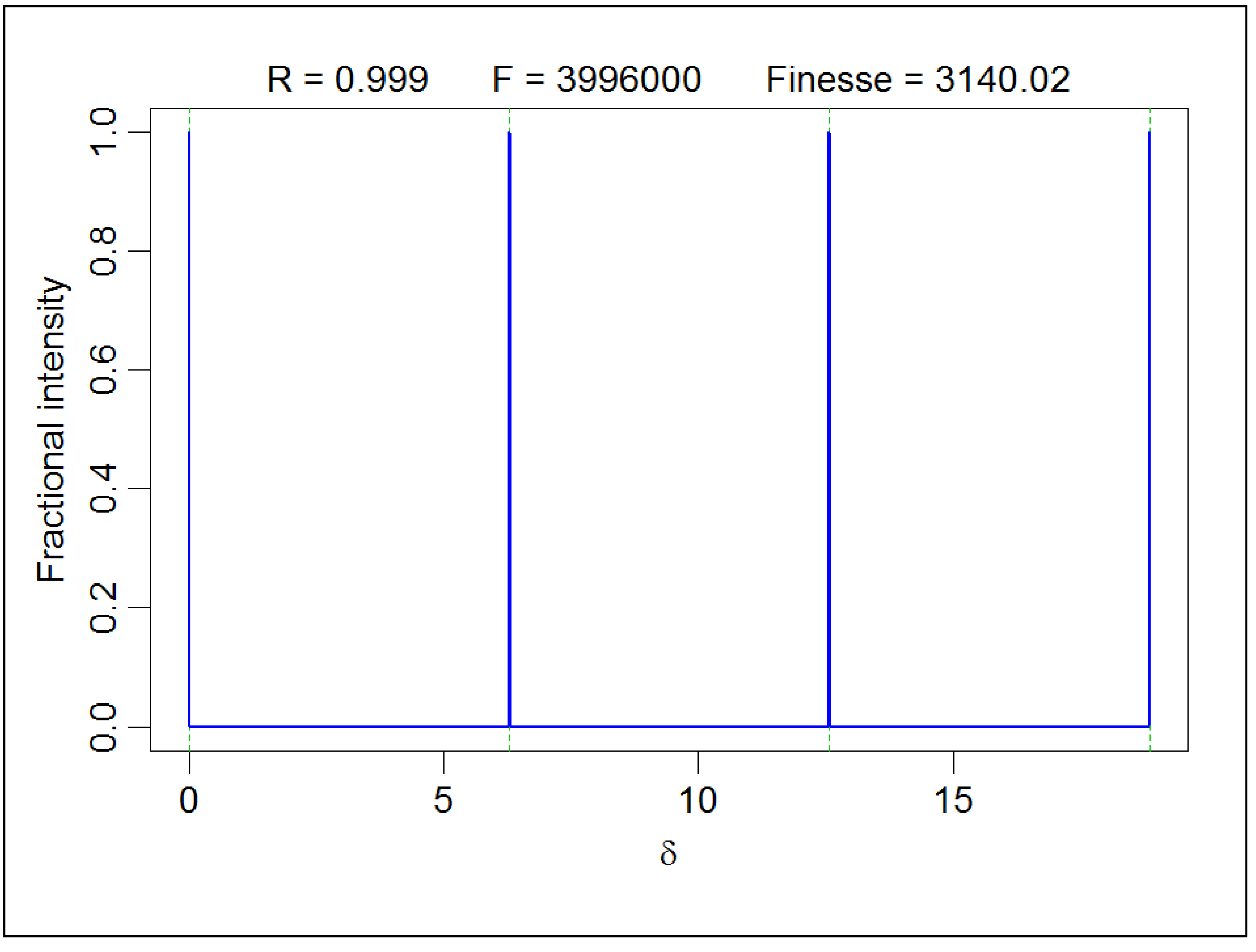

R = 0.9 F = 360 Finesse = 29.8
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ


R = 0.95 F = 1520 Finesse = 61.24
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ


R = 0.99 F = 39600 Finesse = 312.58
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ

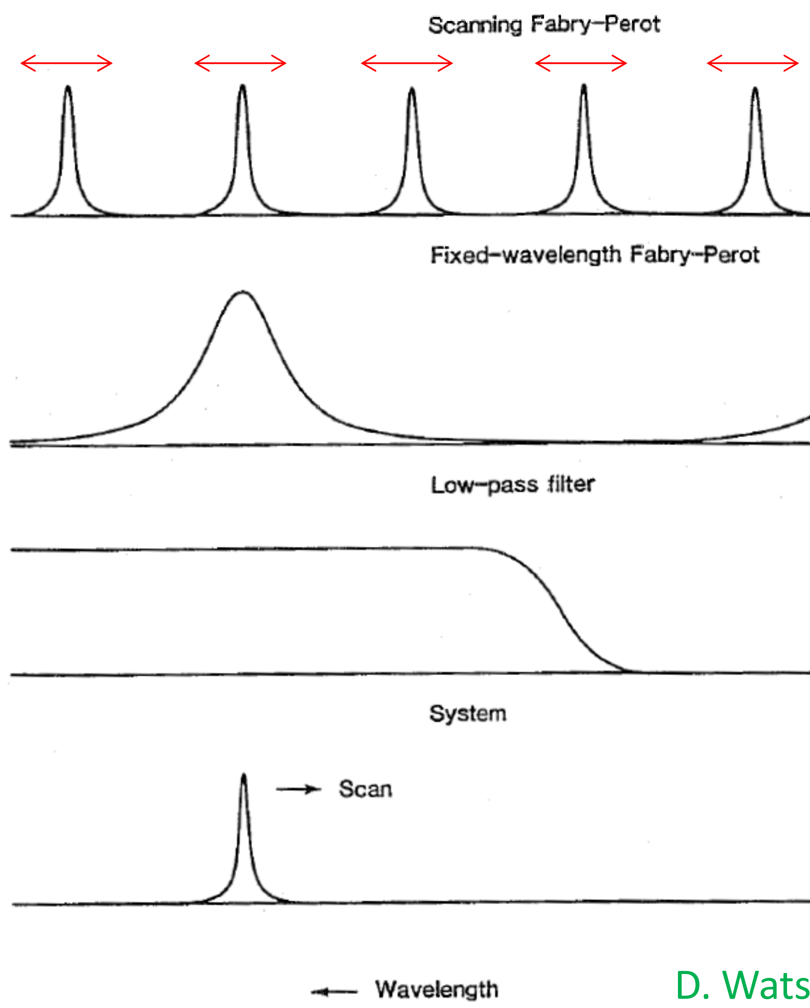


R = 0.995 F = 159200 Finesse = 626.75
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ



R = 0.999 F = 3996000 Finesse = 3140.02
Fractional intensity
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
δ

“Order-sorting”



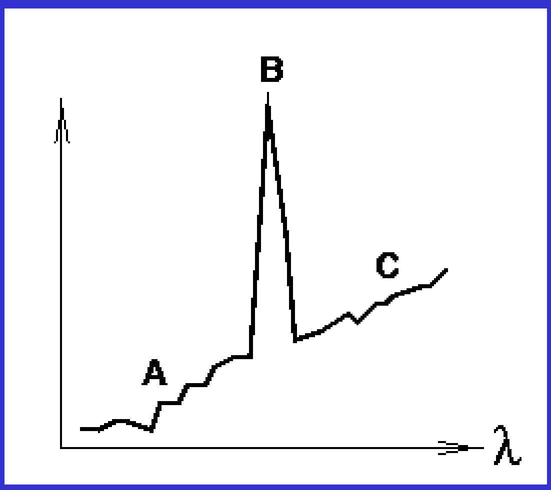
D. Watson, PhD thesis, 1984

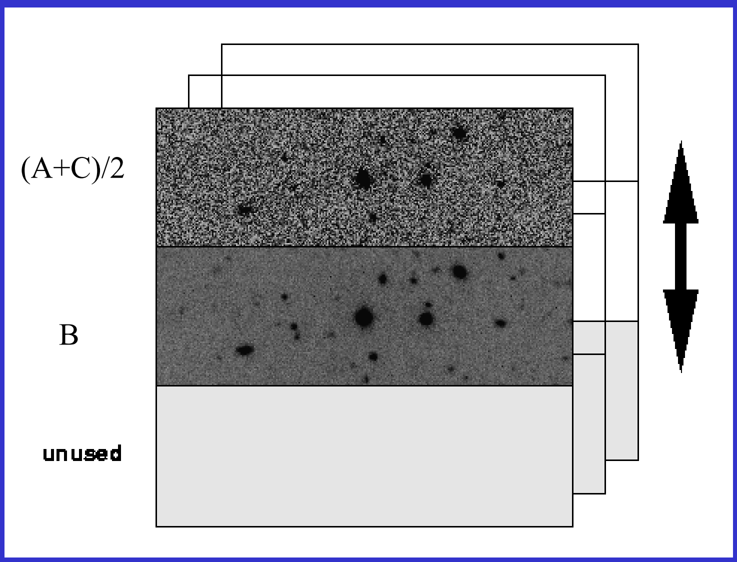
Fabry-Perot Techniques

Tunable Filter Imaging

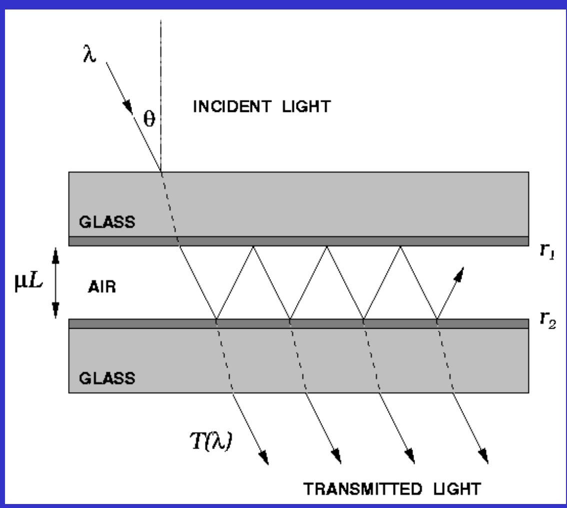
(e.g., Bland-Hawthorn 1995; http://www.aao.gov.au/ttf)

- Operate Fabry-Perot etalons in low orders, down to spacings of ~ 1 um
- Produces *monochromatic* images over the full field
- Bandwidth = 10 – 100 Å @ 3900 – 10,000 Å
- Charge shuffling & frequency switching to reduce systematic errors and improve continuum removal
- Sensitivity: ~ few 10^{-18} erg s^{-1} cm^{-2} $arcsec^{-2}$ ($\varepsilon_m \sim 1$ cm^{-6} pc ~ 0.5 R) – 10x fainter than typical narrow-band images…





The Fabry-Perot Interferometer



Etalon: two parallel flat semi-transparent mirrors separated by a fixed distance *L*

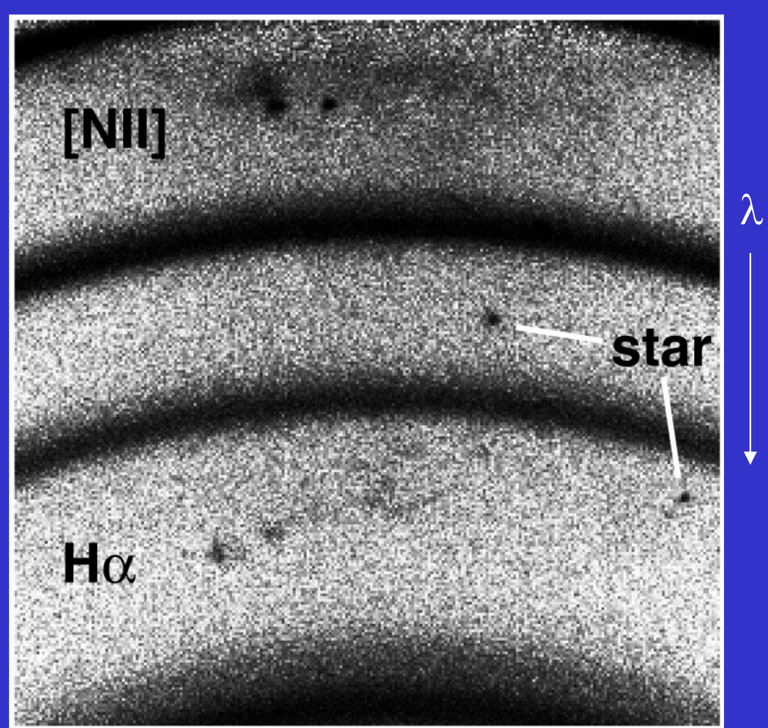
$$n\,\lambda = 2\,\mu\,L\cos\theta$$

This system acts as a narrow-band filter, producing concentric rings at each wavelength

Fabry-Perot Techniques

Diffuse Detection by Staring

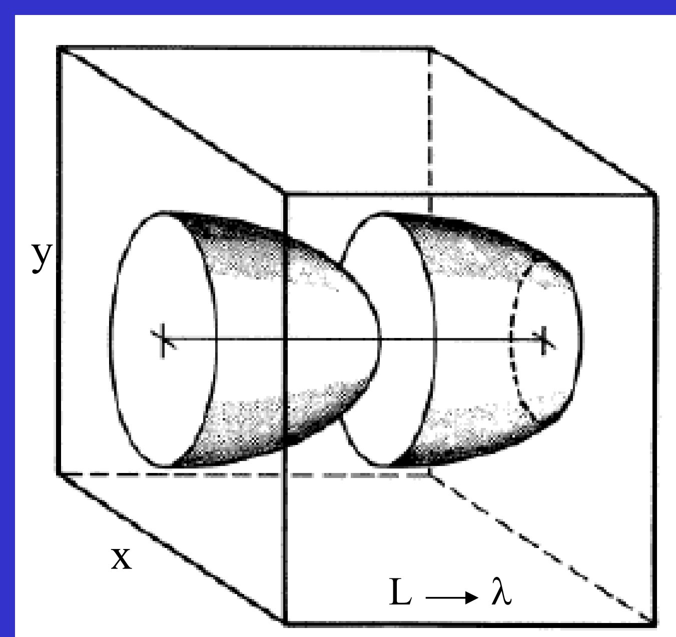
- For a fixed gap spacing, light falling on an etalon with wavelength λ is dispersed radially according to $\lambda \propto \cos\theta$.
- The spectrum in a narrow band is dispersed radially from the optical axis across the field
- When the data are binned azimuthally about the optical axis, a single deep spectrum is obtained
- Sensitivity: few x 10^{-20} erg s^{-1} cm^{-2} $arcsec^{-2}$ ($\varepsilon_m \sim 0.02$ cm^{-6} pc ~ few mR)



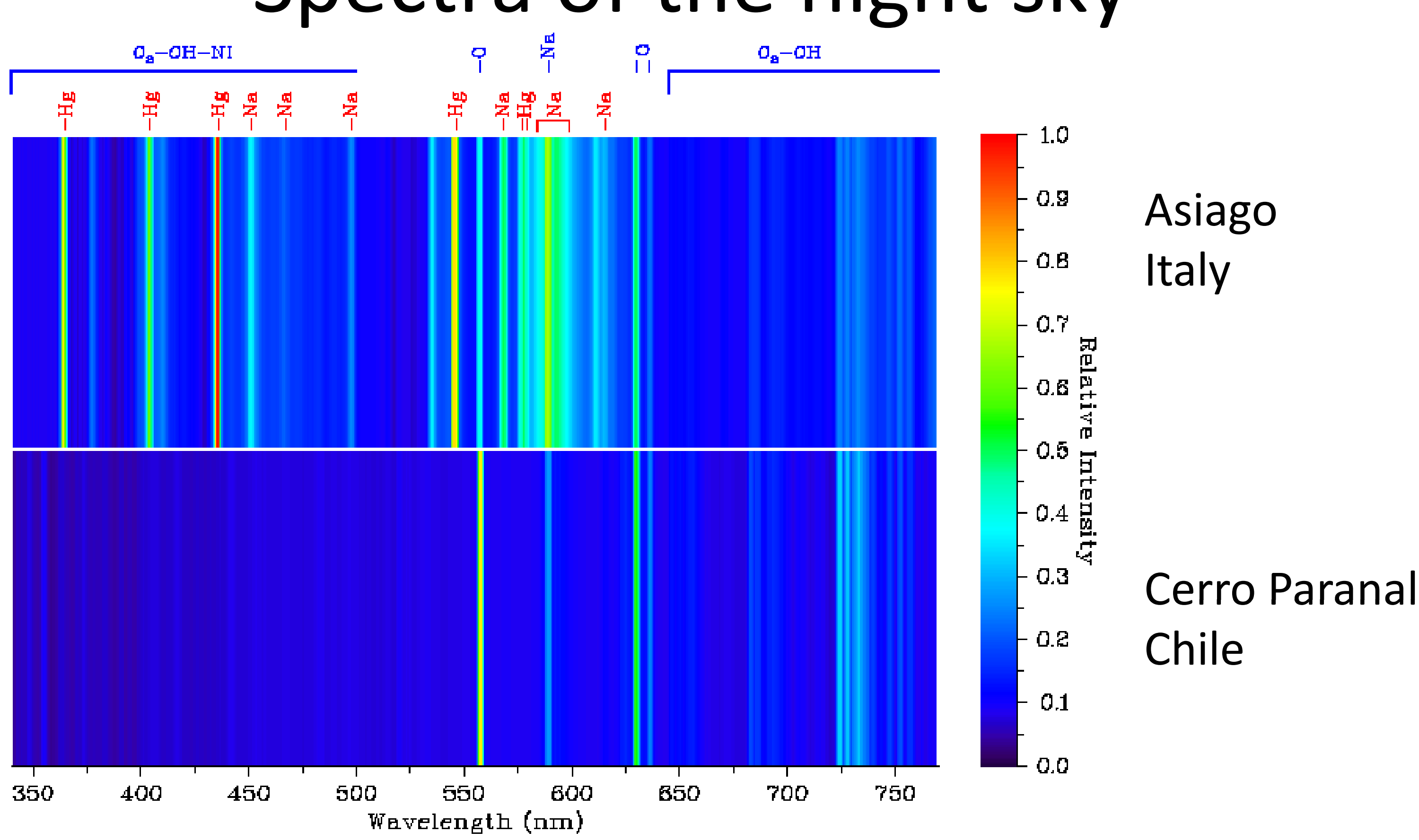
Fabry-Perot Techniques

3D Spectral Imaging

- The etalon is scanned over a range of spacings to build up a spectral data cube over a narrow spectral interval (~ 50 – 100 Å).
- Produces complete kinematic maps of line-emitting region: 10,000 – 100,000 spectra !
- Sensitivity: ~ 10^{-17} erg s^{-1} cm^{-2} $arcsec^{-2}$ (ε_m ~ few cm^{-6} pc ~ few R)

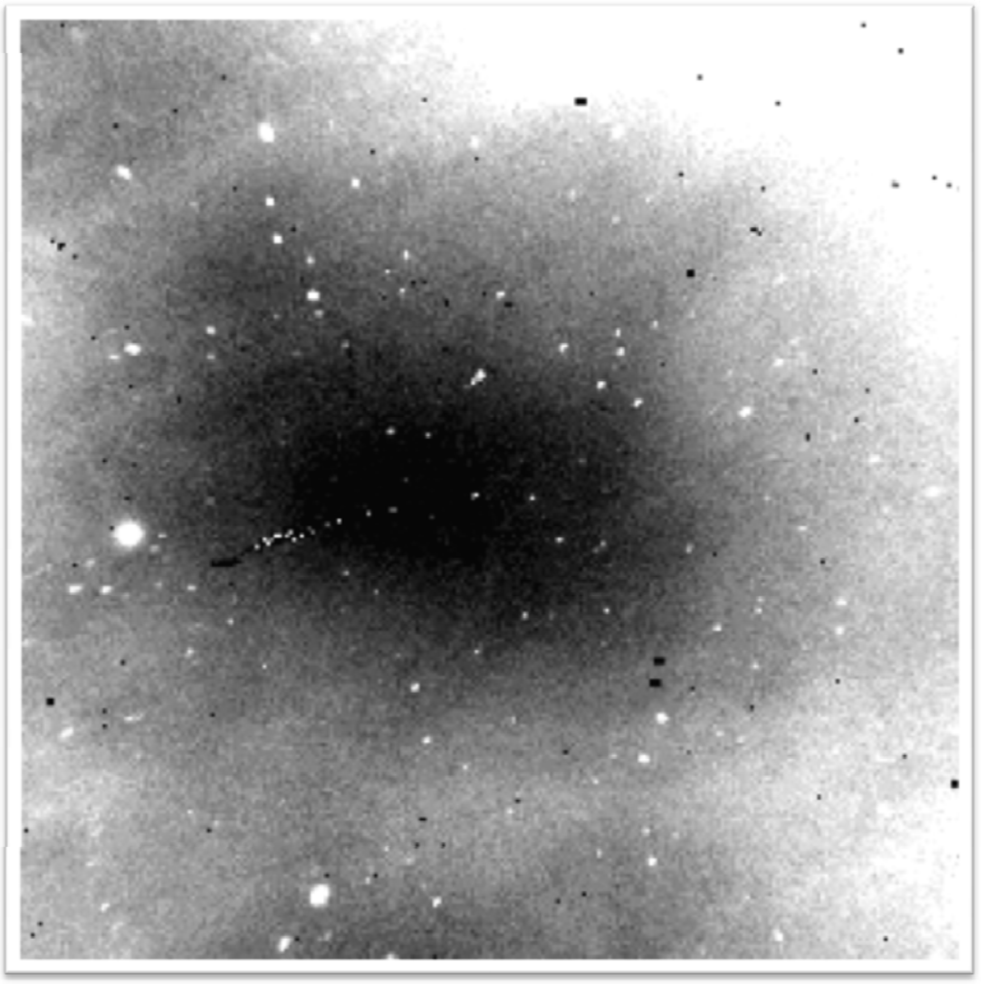


Spectra of the night sky

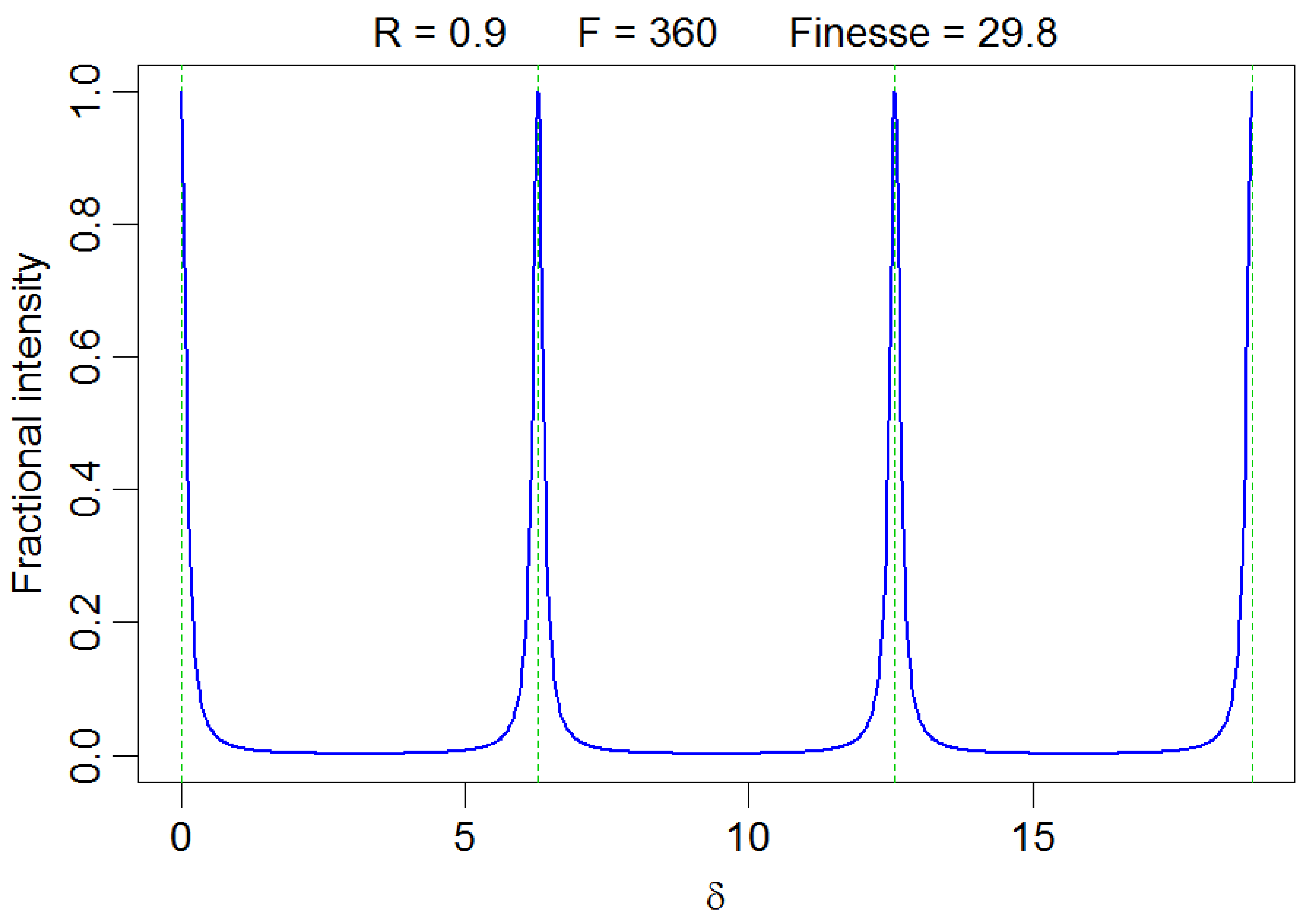


Courtesy of F. Patat, ESO

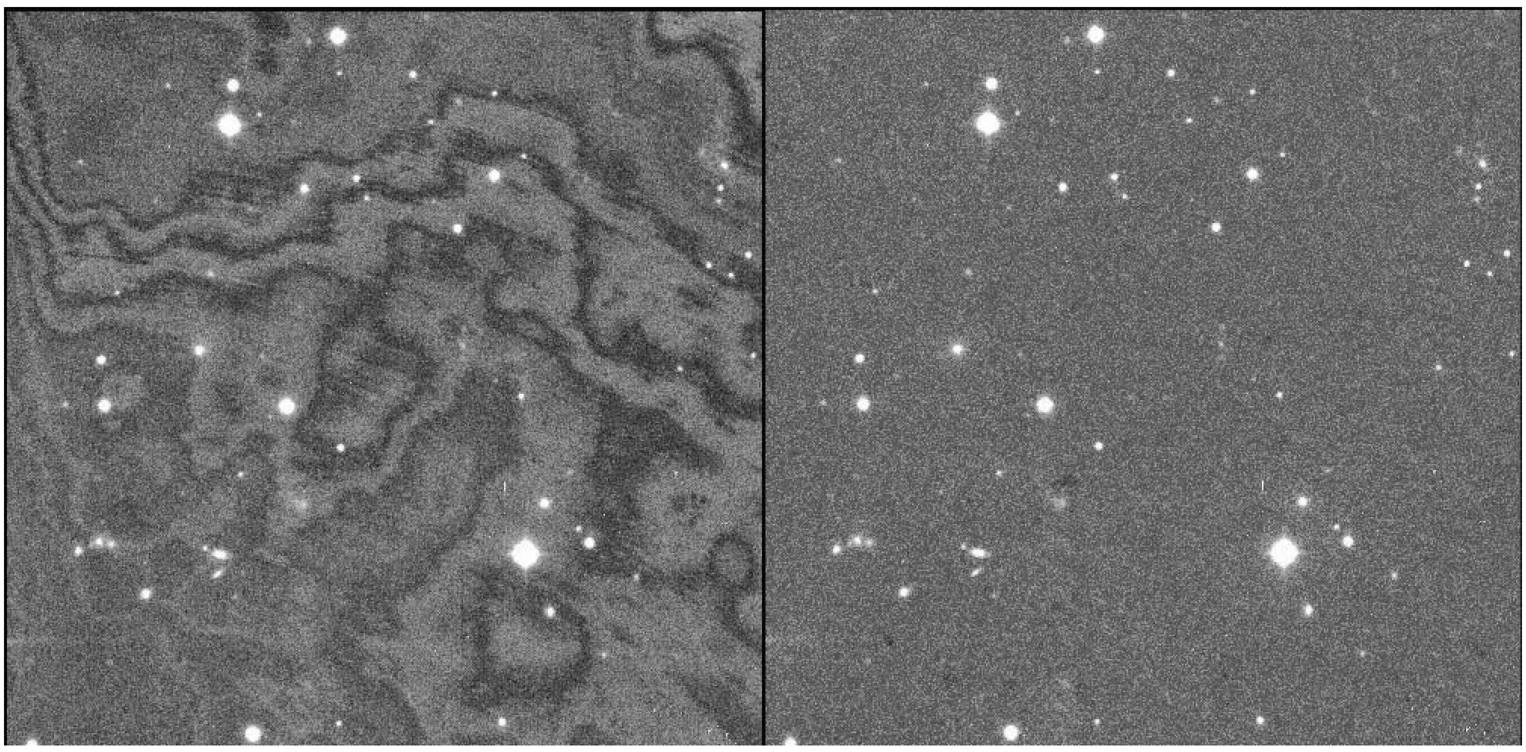
OH airglow



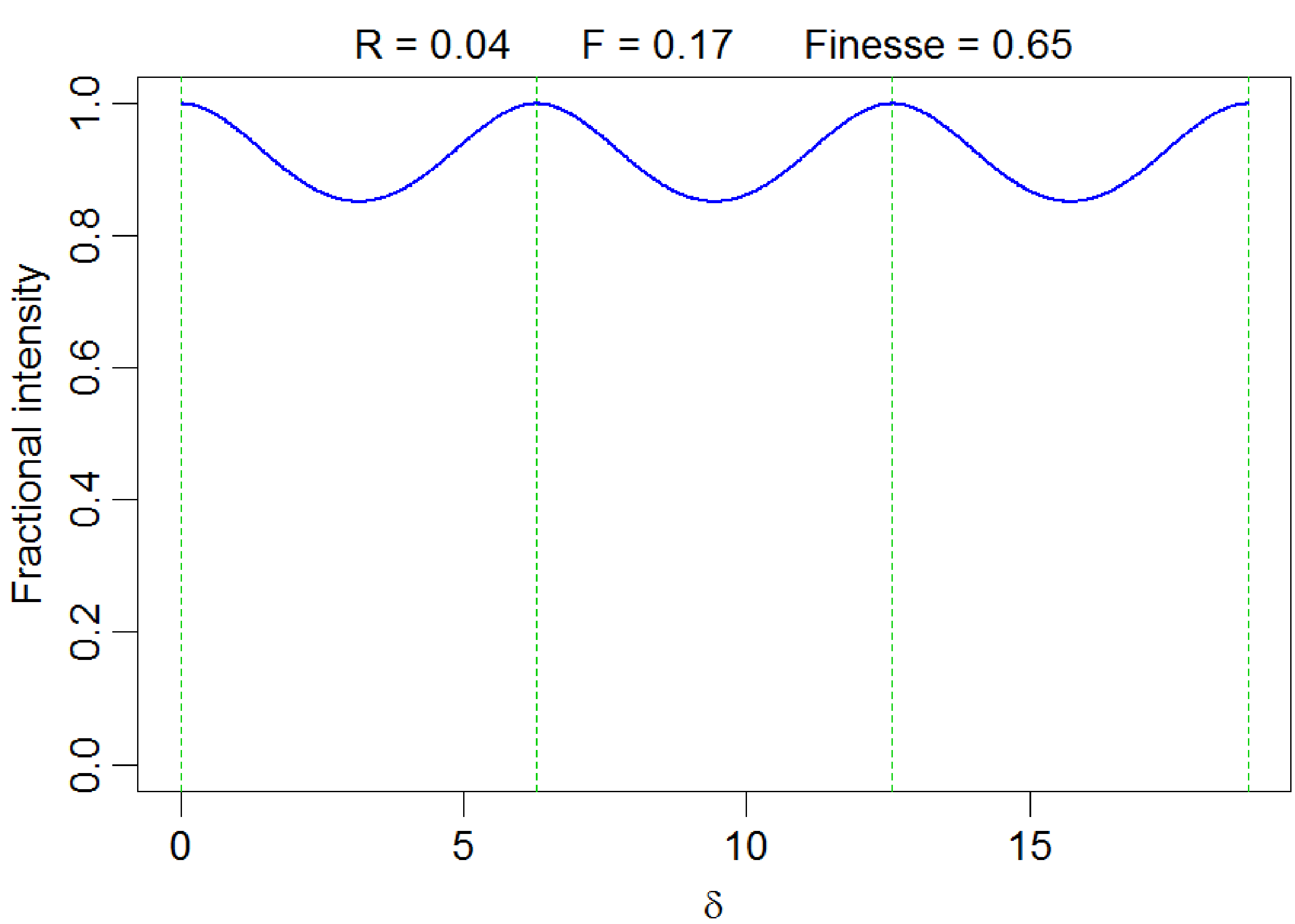
http://www.astro.virginia.edu/~mfs4n/2mass/airglow/airglow.html



“Fringing” in an I-band CCD image



http://www.astro.uni-bonn.de/theli/gui/aboutsuperflatting.html



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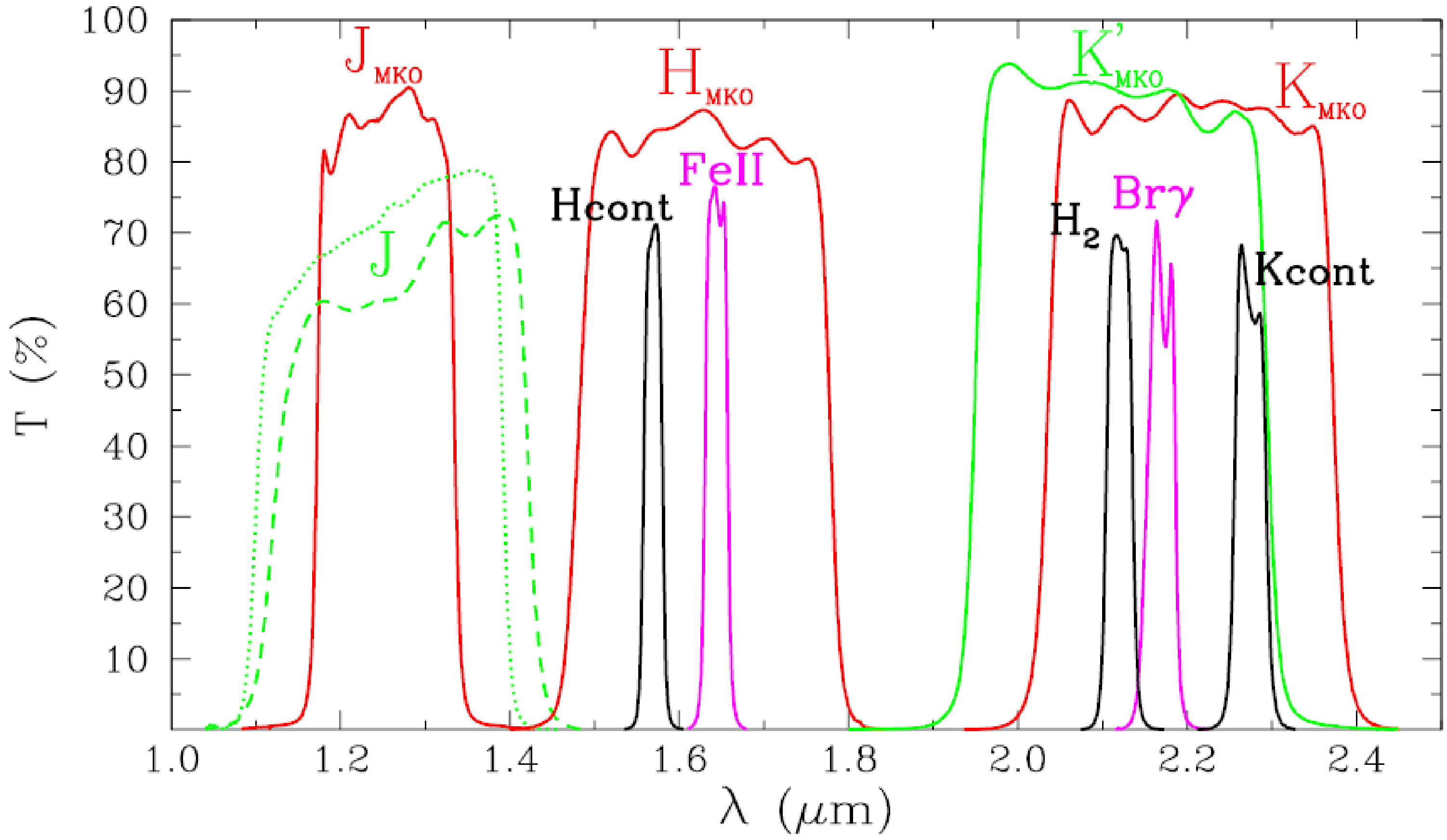

Fig. 1. Overview of the transmission curves of the filters of Mauna Kea Observatories (MKO) near infrared filter consortium. The data were taken at a temperature of 78 K and with the broad and narrow band filters illuminated at an incidence angle of 5° and 3°, respectively. For comparison, we also include the curve relative to the "standard *J*" filter of NICS measured in the same conditions (dashed line) as well as that of the "standard *J*" filter used in the SOFI and ISAAC instruments of ESO (dotted line). The data for the ESO filter were downloaded from the ISAAC web page.