Quantitative and localized spectroscopy for non-invasive bilirubinometry in neonates

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## List of symbols

### General
- \( t \): time
- \( f \): frequency
- \( \lambda \): wavelength
- \( k \): wave number
- \( d \): depth
- \( \varepsilon \): geometrical path length
- \( \Delta \lambda \): wavelength resolution
- \( \Delta k \): wave number resolution
- \( \Delta f \): frequency resolution
- \( h \): photon energy
- \( \varnothing \): diameter
- \( r \): radius
- \( D \): thickness

### Optical properties
- \( \mu_t \): attenuation coefficient
- \( \mu_a \): absorption coefficient
- \( \mu_s \): scattering coefficient
- \( \mu_s' \): reduced scattering coefficient
- \( \mu_b \): backscattering coefficient
- \( \mu_{b,NA} \): NA-corrected \( \mu_b \)
- \( \mu_{eff} \): effective attenuation coefficient
- \( p(\theta) \): scattering phase function
- \( g \): scattering anisotropy
- \( n \): phase refractive index
- \( n_g \): group refractive index
- \( a \): scattering scaling factor
- \( b \): scatter power
- \( c \): chromophore concentration

### Diffusion theory
- \( I \): spectral intensity
- \( R \): remittance
- \( r_j \): fiber distance from source
- \( z_0 \): modeled source position
- \( z_b \): modeled virtual source position
- \( A \): empirical parameter
- \( \alpha \): proportionality factor
- \( \beta, \gamma \): validity limiting parameters

### LCS system and geometry
- \( x_S \): sample arm length
- \( x_R \): reference arm length
- \( \Delta L \): optical path length difference
- \( \lambda_0 \): center wavelength
- \( \lambda_{FWHM} \): wavelength bandwidth
- \( l_c \): coherence length
- \( S_0 \): source power spectrum
- \( T_c \): system coupling efficiency
- \( \zeta \): system calibration constant
- \( \alpha \): scaling factor
- \( \varepsilon_r \): focus position in path length units
- \( Z_0 \): Rayleigh length
- \( w \): beam waist
- \( Q \): solid angle
- \( \Theta \): (focusing) angle
- \( M \): number of modes

### LCS acquisition
- \( \Delta x_S \): sample arm displacement
- \( \Delta x_R \): reference arm displacement
- \( \nu_R \): reference mirror velocity
- \( f_R \): reference mirror scanning frequency
- \( \Delta R \): reference mirror scanning amplitude
- \( \Delta \varepsilon \): path length scanning window
- \( N \): number of samples
- \( f_s \): sampling frequency

### Brownian motion
- \( \Delta f_D \): Doppler frequency shift
- \( \kappa_0 \): Boltzmann constant
- \( T \): temperature
- \( \eta \): viscosity

### LCS spectroscopic detection
- \( \eta_S, \eta_R \): sample/reference arm fraction
- \( d_{max}, \Delta L_{max} \): imaging depth/path length
- \( \delta k, \delta \lambda \): spectrometer pixel width
- \( N_p \): # pixels
- \( \tau \): integration time
- \( f_D \): Doppler frequency
- \( \varepsilon \): detection efficiency
- \( \Delta \varepsilon_R \): reference mirror scanning window
- \( \Delta \varepsilon_S \): spectrograph probing window

(bold-faced printed characters in this thesis denote wavelength dependent parameters)