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
- \( \xi \)  geometrical path length
- \( \Delta \lambda \)  wavelength resolution
- \( \Delta k \)  wave number resolution
- \( \Delta f \)  frequency resolution
- \( h_v \)  photon energy
- \( \varnothing \)  diameter
- \( r \)  radius
- \( D \)  thickness

**optical properties**
- \( \mu_t \)  attenuation coefficient
- \( \mu_a \)  absorption coefficient
- \( \mu_s \)  scattering coefficient
- \( \mu_s^{\text{red}} \)  reduced scattering coefficient
- \( \mu_b \)  backscattering coefficient
- \( \mu_b^{\text{NA}} \)  NA-corrected \( \mu_b \)
- \( \mu_{\text{eff}} \)  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
- \( \lambda_{\text{FWHM}} \)  wavelength bandwidth
- \( l_c \)  coherence length
- \( S_0 \)  source power spectrum
- \( T_c \)  system coupling efficiency
- \( \zeta \)  system calibration constant
- \( \alpha \)  scaling factor
- \( \xi_R \)  focus position in path length units
- \( Z_R \)  Rayleigh length
- \( w \)  beam waist
- \( \Omega \)  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
- \( \Delta \xi \)  path length scanning window
- \( N \)  number of samples
- \( f_s \)  sampling frequency

**Brownian motion**
- \( \Delta f_D \)  Doppler frequency shift
- \( k_B \)  Boltzmann constant
- \( T \)  temperature
- \( \eta \)  viscosity

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

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