

## Keywords list, conventional and adaptive beamforming

*Note: this is not a complete list of subjects that may be covered on the exam. Please regard it only as an aid in your preparation process.*

- 1) Geometrical pre-focusing, benefits / drawbacks
- 2) Array beamforming, benefits / drawbacks
- 3) Array gain signal-to-noise ratio
- 4) Stacking
- 5) Conventional Delay-and-sum
- 6) Phase center
- 7) Beamformer output
- 8) Far-field limit
- 9) Plane wave / monochromatic plane wave
- 10) Spherical wave
- 11) Near-field (spherical wave source) beamforming
- 12) Far-field (plane wave source) beamforming
- 13) Steering delay choices
- 14) Steering delay mismatch. Assumption misjudgments.
- 15) Maximum beamformer output
- 16) Linear array / uniform linear array
- 17) Uniform weighting
- 18) Array pattern  $W(\vec{k})$
- 19) Beampattern  $W(\vec{k} - \vec{k}^\circ) = W(\omega^\circ \vec{\alpha} - \vec{k}^\circ)$
- 20) Steered response
- 21) Spherical wave focusing: beamformer output
- 22) Ultrasound imaging setup
- 23) Far-field array pattern
- 24) Near-field array pattern
- 25) Wavenumber-frequency response
- 26) Filter-and-sum beamforming: temporal filtering / spatial filtering
- 27) Element directivity

- 28) Wavenumber resolution
- 29) Angular resolution
- 30) Frequency-domain beamforming
- 31) Phase steering versus delay steering, narrow-band assumption
- 32) Short-time Fourier transform
- 33)  $\text{SNR}_{\text{array}} / \text{SNR}_{\text{sensor}}$
- 34) Spatial correlation matrix (spatial covariance matrix)
- 35) Temporal averaging for spatial covariance matrix
- 36) Spatial averaging (subarray averaging) for spatial covariance matrix
- 37) Delay-and-sum on vector form
- 38) Steering vector
- 39) Minimum-variance beamforming (Capon beamforming): function to minimize / constraint function
- 40) Minimize-variance sensor weights
- 41) Minimum-variance steered response output power
- 42) Uniform linear array, minimum-variance steered response / minimum-variance beam-pattern
- 43) Effect on minimum-variance beamforming due to correlated signals
- 44) Generalized sidelobe canceler
- 45) Eigenvalues / eigenvectors
- 46) Eigenvalue matrix  $\mathbf{\Lambda}$
- 47) Eigenvector matrix  $\mathbf{V}$
- 48)  $\mathbf{R}$  Hermitian & positive semidefinite  $\Rightarrow \dots$
- 49) Eigendecomposition of  $\mathbf{R}$  and  $\mathbf{R}^{-1}$
- 50) Signal+noise and noise subspaces
- 51) Eigenvector method estimate of  $\mathbf{R}$
- 52) *Multiple signal classification* (MUSIC) estimate of  $\mathbf{R}$
- 53) Eigenvector method estimate of  $P(\mathbf{e})$
- 54) MUSIC estimate of  $P(\mathbf{e})$
- 55) Direction-of-arrival estimation using Minimum-variance, Eigenvector method, and MUSIC
- 56) Signal coherence situation. Sources' covariance matrix  $\mathbf{C} / \mathbf{S} / \mathbf{s} / \mathbf{K}_n$