PERIODIC SAMPLING ERRORS IN SCANNED ULTRASONIC HOLOGRAPHY

M I J Beale
I & AP Division, Building 347.1, AERE Harwell,
Oxfordshire OX11 ORA.

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ABSTRACT

This paper describes an investigation into the effect of periodic sampling errors arising from systematic errors in the scanning mechanism which are not followed by the rest of the system. The effect of such errors on the images of both point and planar reflectors is analysed and spurious image detail is shown to be generated. A method for quantifying periodic sampling errors is outlined.
LIST OF SYMBOLS

A Amplitude of holographic signal
B Amplitude of recorded bias
F Focal length of Fourier lens
\text{J}_n(\epsilon \Omega) \quad \text{Bessel function of order } n \text{ of the first kind, argument } \epsilon \Omega
\epsilon \quad \text{Amplitude of sampling error in the scan direction}
f \quad \text{Ultrasonic frequency}
n \quad \text{Integer}
S \quad \text{Distance from back focal plane to screen}
t \quad \text{Time}
w \quad \text{Space frequency of error} = 2\pi f \quad \text{wavelength of error}
x \quad \text{Coordinate in scan direction}
x_f \quad \text{Satellite to main carrier distance in back focal plane}
x_S \quad \text{Coordinate on image screen}
\varepsilon \quad \text{Coordinate of depth below scan line}
\alpha \quad \text{Angle from normal of equivalent phase reference}
\lambda \quad \text{Ultrasound wavelength}
\lambda_l \quad \text{Reconstruction light wavelength}
\Theta \quad \text{Angle of sound path to scan normal}
\nu \quad \text{Reconstruction light frequency}
\phi \quad \text{Phase constant}
\Psi \quad \text{Phase constant}
\Omega \quad \text{Space frequency} = \frac{4\pi}{\lambda} \sin \Theta