

**SIGNAL DESIGN AND PROCESSING TECHNIQUES
FOR WSR-88D AMBIGUITY RESOLUTION**

PART - I

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Table of Contents

List of symbols	iii
1. Introduction	1
1.1. Range and velocity ambiguity	1
2. Simulation study	6
2.1. Weather radar signal simulation	6
2.2. The autocovariance algorithm	7
2.3. Procedure for evaluation of the algorithms	11
2.4. Programs	12
3. Peak Sorting Method	14
3.1. Introduction	14
3.2. Conceptual development	14
3.3. The peak sorting algorithm	20
3.4. Simulation study and results	21
3.5. Conclusions	24
4. Random phase coding	25
4.1. Introduction	25
4.2. Random phase coding and spectral parameter estimation	26
4.3. Choice of code	36
4.4. Some sample spectra and illustration of processing	39
4.5. The random phase algorithm	45
4.6. Simulation and results	47
4.7. Possible extension to 3rd and 4th trips	58
4.8. Conclusions	58
5. Systematic phase coding	59
5.1. Introduction	59
5.2. Systematic phase coding and spectrum modification	59

5.3. $\pi/4$ phase code	60
5.3.1. $\pi/4$ phase coding and spectral parameter estimation	60
5.3.2. The $\pi/4$ decoding algorithm	64
5.3.3. Simulation and results	65
5.4. $\pi/2$ phase coding	69
5.4.1. $\pi/2$ phase code and estimation of spectral moments	69
5.4.2. The algorithm development	71
5.4.3. The $\pi/2$ decoding algorithm	74
5.4.4. Simulation and results	80
5.5. Optimizing the systematic code	86
5.5.1. Conceptual development	86
5.5.2. The decoding algorithm for optimum systematic code	91
5.5.3. Simulation results and discussion	93
6. Summary and conclusions.	96
7. References	100

LIST OF SYMBOLS:

a_k, b_k, s_k, q_k	-	k^{th} spectral coefficient
c	-	speed of light
$C_{ab}(1)$	-	cross correlation of 1st and 2nd trip signals
C_k	-	complex modulation code [$C_k = \exp(j\phi_k)$]
$e1, e2$	-	complex time series of 1st and 2nd trips
$E1$	-	complex time series with 1st trip coherent and 2nd trip coded
$E2$	-	complex time series with 2nd trip coherent and 1st trip coded
E_i	-	complex time series samples
$\text{err}()$	-	error in the parameter in brackets
f_d	-	Doppler frequency
f_a	-	Nyquist frequency
G_k	-	spectral coefficients (fitted to the Gaussian shape)
i, k, n, m	-	used as indices
j	-	$(-1)^{1/2}$
M	-	number of samples
n_w	-	notch filter width normalized by $2v_a$
nw	-	notch filter width in terms of number of spectral coefficients
N_k	-	noise power in the k^{th} coefficient
$p1, p2$	-	mean power of 1st and 2nd trips
$pm1, pm2$ etc.	-	mean powers estimated from long PRT data
$pw1, pw2$	-	recovered 1st and 2nd trip powers (peak sorting algorithm)
P_k	-	power of the k^{th} spectral coefficient
r, r_c	-	range
r_a	-	unambiguous range
$R_a(1), R_b(1)$	-	autocorrelation of signals a and b
$r(k)$	-	random number array of length k
$R(n)$	-	autocorrelation for n PRT lag
R_p	-	residual power ratio (the ratio of power before notch filtering to the power after notch filtering, for the stronger signal)
R_o	-	overlapped power to total power ratio
S_k	-	power of the k^{th} spectral coefficient of the signal
$S1, S2$	-	spectrum of $E1$ and $E2$ [$S1 = \text{DFT}(E1)$]
T	-	pulse repetition time
v_r	-	radial velocity
v_a	-	unambiguous velocity (short PRT)
v_{al}	-	unambiguous velocity (long PRT)
v_m	-	mean velocity
$v1, v2$	-	mean velocity of 1st and 2nd trips
$vm1, vm2$, etc.	-	mean velocities from long PRT data

$vp1(i), vp2(i)$	-	estimated velocity aliases of the 1st and 2nd trips from long PRT data, $i=1,2,3$ & 4 (aliasing interval number)
$w1, w2$	-	spectrum width of 1st and 2nd trips
z	-	$\exp(j2\pi/M)$
$\hat{}$	-	estimate
\mathcal{P}	-	probability
\mathcal{E}	-	expected value
τ	-	range time
Ψ_k	-	switching phase sequence
Φ_k	-	modulation phase sequence

ABBREVIATIONS:

SNR	-	Signal-to-Noise Ratio
PRT	-	Pulse Repetition Time
GCF	-	Ground Clutter Filter
DFT, IDFT	-	Discrete Fourier Transform, Inverse DFT
FFT	-	Fast Fourier Transform
S&S	-	Smoothing and Subtraction
$\pi/4$ code	-	{ 0 , $\pi/4$, 0, $\pi/4$, ... }
$\pi/2$ code	-	{ 0 , 0, $\pi/2$, $\pi/2$, ... }

