

Forewords

Richard L. Ehman

xiii

Paul C. Lauterbur

xv

Preface

xvii

PART I: BACKGROUND

Introduction 3

CHAPTER 1

TOOLS

1.1 Fourier Transforms (M.A. Bernstein) 5

1.2 Rotating Reference Frame (X.J. Zhou) 21

PART II: RADIOFREQUENCY PULSES

Introduction 31

CHAPTER 2

RADIOFREQUENCY PULSE SHAPES

2.1 Rectangular Pulses (K.F. King) 35

2.2 SINC Pulses (M.A. Bernstein) 37

2.3 SLR Pulses (M.A. Bernstein)	43
2.4 Variable-Rate Pulses (M.A. Bernstein)	58

CHAPTER 3

BASIC RADIOFREQUENCY PULSE FUNCTIONS

3.1 Excitation Pulses (M.A. Bernstein)	67
3.2 Inversion Pulses (X.J. Zhou)	77
3.3 Refocusing Pulses (X.J. Zhou)	84

CHAPTER 4

SPECTRAL RADIOFREQUENCY PULSES

4.1 Composite Radiofrequency Pulses (K.F. King)	96
4.2 Magnetization Transfer Pulses (M.A. Bernstein)	103
4.3 Spectrally Selective Pulses (X.J. Zhou)	115

CHAPTER 5

SPATIAL RADIOFREQUENCY PULSES

5.1 Multidimensional Pulses (M.A. Bernstein)	125
5.2 Ramp (TONE) Pulses (M.A. Bernstein)	138
5.3 Spatial Saturation Pulses (K.F. King)	148
5.4 Spatial-Spectral Pulses (M.A. Bernstein)	153
5.5 Tagging Pulses (X.J. Zhou)	164

CHAPTER 6

ADIABATIC RADIOFREQUENCY PULSES

6.1 Adiabatic Excitation Pulses (X.J. Zhou)	177
6.2 Adiabatic Inversion Pulses (X.J. Zhou)	189
6.3 Adiabatic Refocusing Pulses (X.J. Zhou)	200

PART III: GRADIENTS

Introduction	215
--------------	-----

CHAPTER 7

GRADIENT LOBE SHAPES

7.1 Simple Gradient Lobes (M.A. Bernstein)	219
7.2 Bridged Gradient Lobes (M.A. Bernstein)	222
7.3 Gradients for Oblique Acquisitions (M.A. Bernstein)	228

CHAPTER 8

IMAGING GRADIENTS

8.1 Frequency-Encoding Gradients (X.J. Zhou)	243
8.2 Phase-Encoding Gradients (K.F. King)	256
8.3 Slice Selection Gradients (M.A. Bernstein)	266

CHAPTER 9

MOTION-SENSITIZING GRADIENTS

9.1 Diffusion-Weighting Gradients (X.J. Zhou)	274
9.2 Flow-Encoding Gradients (M.A. Bernstein)	281

CHAPTER 10

CORRECTION GRADIENTS

10.1 Concomitant-Field Correction Gradients (X.J. Zhou)	292
10.2 Crusher Gradients (X.J. Zhou)	305
10.3 Eddy-Current Compensation (K.F. King)	316
10.4 Gradient Moment Nulling (M.A. Bernstein)	331
10.5 Spoiler Gradients (X.J. Zhou)	349
10.6 Twister (Projection Dephaser) Gradients (M.A. Bernstein)	357

PART IV: DATA ACQUISITION, K-SPACE SAMPLING, AND IMAGE RECONSTRUCTION

Introduction	365
--------------	-----

CHAPTER 11

SIGNAL ACQUISITION AND K-SPACE SAMPLING

11.1 Bandwidth and Sampling (K.F. King)	367
11.2 k-Space (K.F. King)	378
11.3 Keyhole, BRISK, and TRICKS (K.F. King)	383
11.4 Real-Time Imaging (M.A. Bernstein)	394
11.5 Two-Dimensional Acquisition (X.J. Zhou)	405
11.6 Three-Dimensional Acquisition (M.A. Bernstein)	424

CHAPTER 12

BASICS OF PHYSIOLOGIC GATING, TRIGGERING, AND MONITORING

12.1 Cardiac Triggering (M.A. Bernstein)	443
12.2 Navigators (K.F. King)	454
12.3 Respiratory Gating and Compensation (X.J. Zhou)	473

CHAPTER 13

COMMON IMAGE RECONSTRUCTION TECHNIQUES

13.1 Fourier Reconstruction (K.F. King)	491
13.2 Gridding Reconstruction (K.F. King)	506
13.3 Parallel-Imaging Reconstruction (K.F. King)	522
13.4 Partial Fourier Reconstruction (K.F. King)	546
13.5 Phase Difference Reconstruction (M.A. Bernstein)	558
13.6 View Sharing (M.A. Bernstein)	567

PART V: PULSE SEQUENCES

Introduction	575
--------------	-----

CHAPTER 14

BASIC PULSE SEQUENCES

14.1 Gradient Echo (M.A. Bernstein)	579	
14.2 Inversion Recovery (X.J. Zhou)	606	
14.3 Radiofrequency Spin Echo (M.A. Bernstein)		630

CHAPTER 15

ANGIOGRAPHIC PULSE SEQUENCES

15.1 Black Blood Angiography (M.A. Bernstein)		648
15.2 Phase Contrast (M.A. Bernstein)	659	
15.3 TOF and CEMRA (M.A. Bernstein)	678	

CHAPTER 16

ECHO TRAIN PULSE SEQUENCES

16.1 Echo Planar Imaging (X.J. Zhou)	702	
16.2 GRASE (K.F. King)	740	
16.3 PRESTO (M.A. Bernstein)	763	
16.4 RARE (X.J. Zhou)	774	

CHAPTER 17

ADVANCED PULSE SEQUENCE TECHNIQUES

17.1 Arterial Spin Tagging (X.J. Zhou)	802	
17.2 Diffusion Imaging (X.J. Zhou)	830	
17.3 Dixon's Method (K.F. King)	857	
17.4 Driven Equilibrium (K.F. King)	888	
17.5 Projection Acquisition (K.F. King)	897	
17.6 Spiral (K.F. King)	928	

Appendix I: Table of Symbols	955	
------------------------------	-----	--

Appendix II: Table of Constants and Conversion Factors		960
--	--	-----

Appendix III: Common Abbreviations	963	
------------------------------------	-----	--

Index	965	
-------	-----	--