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Autore	Chin Wilson C
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Nota di contenuto	Cover; Title Page; Copyright Page; Contents; Opening Message; Preface; Acknowledgements; 1 Stories from the Field, Fundamental Questions and Solutions; 1.1 Mysteries, Clues and Possibilities; 1.2 Paper No. AADE-11-NTCE-74, "High-Data-Rate Measurement-While-Drilling System for Very Deep Wells," updated; 1.2.1 Abstract; 1.2.2 Introduction; 1.2.3 MWD telemetry basis; 1.2.4 New telemetry approach; 1.2.5 New technology elements; 1.2.5.1 Downhole source and signal optimization; 1.2.5.2 Surface signal processing and noise removal; 1.2.5.3 Pressure, torque and erosion computer modeling 1.2.5.4 Wind tunnel analysis: studying new approaches 1.2.5.5 Example test results; 1.2.6 Conclusions; 1.2.7 Acknowledgements; 1.2.8 References; 1.3 References; 2 Harmonic Analysis: Six-Segment Downhole Acoustic Waveguide; 2.1 MWD Fundamentals; 2.2 MWD Telemetry Concepts Re-examined; 2.2.1 Conventional pulser ideas explained; 2.2.2 Acoustics at higher data rates; 2.2.3 High-data-rate

continuous wave telemetry; 2.2.4 Drillbit as a reflector; 2.2.5 Source modeling subtleties and errors; 2.2.6 Flowloop and field test subtleties; 2.2.7 Wind tunnel testing comments
2.3 Downhole Wave Propagation Subtleties 2.3.1 Three distinct physical problems; 2.3.2 Downhole source problem; 2.4 Six-Segment Downhole Waveguide Model; 2.4.1 Nomenclature; 2.4.2 Mathematical formulation; 2.4.2.1 Dipole source, drill collar modeling; 2.4.2.2 Harmonic analysis; 2.4.2.3 Governing partial differential equations; 2.4.2.4 Matching conditions at impedance junctions; 2.4.2.5 Matrix formulation; 2.4.2.6 Matrix inversion; 2.4.2.7 Final data analysis; 2.5 An Example: Optimizing Pulser Signal Strength; 2.5.1 Problem definition and results; 2.5.2 User interface
2.5.3 Constructive interference at high frequencies 2.6 Additional Engineering Conclusions; 2.7 References; 3 Harmonic Analysis: Elementary Pipe and Collar Models; 3.1 Constant area drillpipe wave models; 3.1.1 Case (a), infinite system, both directions; 3.1.2 Case (b), drillbit as a solid reflector; 3.1.3 Case (c), drillbit as open-ended reflector; 3.1.4 Case (d), "finite-finite" waveguide of length 2L; 3.1.5 Physical Interpretation; 3.2 Variable area collar-pipe wave models; 3.2.1 Mathematical formulation; 3.2.2 Example calculations; 3.3 References
4 Transient Constant Area Surface and Downhole Wave Models 4.1 Method 4-1. Upgoing wave reflection at solid boundary, single transducer deconvolution using delay equation, no mud pump noise; 4.1.1 Physical problem; 4.1.2 Theory; 4.1.3 Run 1. Wide signal - low data rate; 4.1.4 Run 2. Narrow pulse width - high data rate; 4.1.5 Run 3. Phase-shift keying or PSK; 4.1.6 Runs 4,and 5. Phase-shift keying or PSK, very high data rate; 4.2 Method 4-2. Upgoing wave reflection at solid boundary, single transducer deconvolution using delay equation, with mud pump noise; 4.2.1 Physical Problem
4.2.2 Software note

Sommario/riassunto

Trade magazines and review articles describe MWD in casual terms, e. g., positive versus negative pulsers, continuous wave systems, drilling channel noise and attenuation, in very simple terms absent of technical rigor. However, few truly scientific discussions are available on existing methods, let alone the advances necessary for high-data-rate telemetry. Without a strong foundation building on solid acoustic principles, rigorous mathematics, and of course, fast, inexpensive and efficient testing of mechanical designs, low data rates will impose unacceptable quality issues to real-time