



Recent Projects List

- **Sound Quality Analysis**
 - Measure and evaluate the noise spectrum for a prototype product vs. competitive benchmark products
 - Recommend mitigations and improvements
 - Re-test modified prototype in preparation for pilot production run
- **Headphone Prototype Evaluation**
 - Perform response measurements and prepare report
 - Provide design guidance for next revision
 - Diagnose issues with transducer interactions and propose appropriate signal processing
- **Biomedical Device Analysis**
 - Evaluate device and method for middle ear measurements
 - Investigate alternative stimulus techniques
 - Provide training to development team on acoustic impedance measurements
- **Electroacoustic Testing**
 - Electrical and acoustical testing of a headphone transducer in an existing product to generate a generic specification for vendor qualification
 - Gather data and prepare reports
- **Training**
 - Lectures and hands-on training for a Shanghai-based ASIC engineering support team
 - Provide information on loudspeaker system design with focus on equalization and protection circuit optimization for portable communication applications
- **Telecom Device Evaluation**
 - Comparative testing of noise cancelling wireless Bluetooth headsets
 - Create test protocol, acquire and analyze data, and prepare report.
- **VoIP Speakerphone Design**
 - Model the performance of a summed microphone array for use in a VoIP speakerphone.
 - Analyze test data and provide recommendations
- **Technical Support**
 - Provide technical support and design guidance for a headphone design
 - Performance electroacoustic testing on prototype units
 - Generate test data to support design patent application
- **Earphone Design**
 - Provide technical support, specifications, test methods, and qualify transducer vendors for a prototype insert earphone design
- **Telecom Device Evaluation**
 - Comparative testing of noise cancelling wireless Bluetooth headsets
 - Create test protocol, acquire and analyze data, and prepare report.
- **IP Evaluation**
 - Review various signal processing patents for possible licensing
 - Collaborate with client to design appropriate test strategies
 - Prepare report(s) and provide technical support
- **Surround Sound Loudspeaker Evaluation**
 - Test various configurations of a small surround sound loudspeaker system
 - Compile data and prepare report
- **Biomedical System Analysis**
 - Model the noise attenuation for a biomedical product.
 - Recommend appropriate instrumentation and verification test methods

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Projects List

- **Subject Matter Expert**
 - Site evaluation of the noise level and potential hearing damage risk in a product defect litigation
- **Headphone Testing**
 - Electroacoustic testing of 50 consumer headphones & headsets
 - Compile data and prepare test report
- **Data & Safety Monitoring Board**
 - Chair the Data & Safety Monitoring Board for an NIH sponsored clinical trial for a medical device subject to FDA approval
 - Ensure test subject/patient safety
 - Ensure data integrity and the accuracy of statistical analyses
 - Make recommendations to the clinical team regarding the test protocol
- **Acoustical Instrument Validation**
 - Measure the impedance and calculate the equivalent volume of a prototype acoustical coupler
 - Test various configurations according to the IEC and ANSI standards
 - Prepare report and make recommendations for mechanical modifications in order to pass the standards
- **Prototype Evaluation**
 - Acoustical testing and performance evaluation of a prototype hearing instrument
 - Perform experiments with different materials and configuration to reduce internal feedback
 - Prepare report including recommendations for improvement
- **Expert Witness**
 - Technology and case history analysis and evaluation
 - Teleconferences with attorneys to prepare case
 - Engineering calculation for acoustical device as described in the brief
 - Draft declaration in support of plaintiff's claims
 - Give sworn deposition as Subject Matter Expert
- **Earphone Design Assessment**
 - Perform tests on various configurations of intra-concha earphones
 - Make recommendations with respect to housing and transducers
 - Provide technical support via Email and teleconference
- **Algorithm Evaluation**
 - Evaluate a loudspeaker QC test algorithm
 - Test various loudspeaker driver samples for defects
 - Prepare report including recommendations
- **Microphone Testing**
 - Test a programmable directional microphone array for a hearing instrument
 - Perform simulated free field tests of the system in different configurations
 - Acquire data, process results, prepare report
- **Test System Specification**
 - Evaluate competitive instrumentation for MP3 player and earphone testing according to EN50332
 - Generate test signal for this test
 - Draft and edit report of findings, including pricing and payback period
 - Provide technical support and training
- **Acoustical Consulting**
 - Listening tests, and microphone array tuning for a VoIP teleconferencing system.

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Projects List

- **Loudspeaker Design & Evaluation**
 - Wireless loudspeaker design for a consumer application
 - Enclosure design, transducer selection, crossover design
 - Subcomponent specification
 - Signal processing evaluation
 - Electroacoustic testing of prototype devices
 - Training for engineering staff
 - Assist in setting and instrumenting lab
 - Participate in discussions with management and marketing regarding product placement and roadmap
- **Design & Test**
 - Active PC loudspeaker design
 - Enclosure design and transducer selection
 - DSP crossover and signal processing design
 - Electroacoustic testing of prototypes
- **Acoustical Modeling**
 - Loudspeaker design for an interior fire alarm system to NFPA 72, UL464, and UL1480
 - Create output SPL model
 - Simulate small signal parameters for target transducer
 - Evaluate candidate transducer samples
- **Reference Design**
 - Evaluate vibration transducer technology for new headphone application
 - Perform tests of reference and prototype headphones
 - Review white papers describing use of technology and system integration
 - Consult on acoustics and interactions of technology with product acoustics
 - Attend meetings and provide technical support via phone and Email
- **Litigation Technical Support / Subject Matter Expert**
 - Perform tests and produce test report on disputed technology engineering prototype
 - Host meeting with attorneys and litigants to evaluate the technology in question
- **Patent Evaluation**
 - Review a transducer enhancement technology
 - Produce a report detailing issues and risks pertaining to patentability and claims, the function of the device, acoustic and psychoacoustic effects, applications, and practical deployment
 - Perform objective acoustic testing and outsource supplemental tests
 - Attend meetings and provide technical support via phone and Email
- **Test Instrument Design**
 - Consult to test instrument manufacturer regarding test method, stimulus, calibration, data handling, result presentation, and user interface
- **Transducer Design**
 - Assist client with the design of a bone conduction transducer
 - Identify appropriate resources and review design
 - Design QC Test Fixture
 - Provide test instrument training for set up and calibration
 - Create an LT SPICE equivalent circuit model for device
 - Outline a subject testing protocol for intelligibility testing
 - Perform measurements on prototypes
 - Attend meetings and provide technical support in-person and via phone and Email

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Projects List

- **New Technology IP Evaluation**
 - Review a hearing technology with respect to current industry offerings
 - Attend presentation meeting with IP holder on behalf of evaluating client and prepare report
 - Prepare comparative product report against relevant specifications
 - Meetings and technical support via phone and Email
- **Earphone Design**
 - Analyze competitive products
 - Assess design and project goals
 - Work with vendors to procure appropriate transducers
 - Run tests on prototype units to ensure design target compliance and iterate as necessary

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Projects List

- **Intellectual Property Evaluation**
 - Review of an adaptive microphone processing patent
 - Create test plan and test fixture
 - Perform measurements on various embodiments create test reports
 - Meetings and technical support via phone and Email
- **Noise Canceling Headset Evaluation**
 - Near field and simulated diffuse field testing of the Send (microphone) response of headsets in a comparative study
 - Design test methods, perform measurements and data handling, and create test report
 - Review test methods for Bluetooth headsets and makes recommendation for improvements in order to comply with the latest standards
 - Follow up meetings and technical support via phone and Email
- **Electroacoustic System Design**
 - Attend meetings and teleconferences with engineering team
 - Acoustical design review of consumer audio and telecom product prototypes
 - Make recommendations to improve performance and comply with standards
 - Evaluate testing process and make recommendation for more accurate data acquisition
 - Provide technical support via phone and Email
- **Patent Expert Witness**
 - Patent analysis and evaluation
 - Draft declaration in support of defendant's claim construction brief
 - Meet with patent attorneys to prepare case
 - Give sworn deposition as Subject Matter Expert
 - Result: Complete defense victory, winning summary judgments of non-infringement and invalidity of patent asserted by plaintiff
- **In-House Training Seminar**
 - In-house training presentation on loudspeaker, microphone, and headphone measurements for the research department of a signal processing and intellectual property licensing company
 - On-on-one hands-on training for the technicians responsible for testing
 - On-going technical support via phone and Email
- **Comparative Product Testing**
 - Objective measurements of the earphone and microphone response of 25 headphones & headsets
 - Performed measurements and prepared test report
- **Training and Algorithm Support**
 - Electroacoustics training research team, with emphasis on frequency analysis for speech communications applications
 - Propose alternative architectures for a demodulation speech enhancement algorithm
- **Headset Evaluation**
 - Objective electroacoustical response testing of analog and USB headsets for VoIP and gaming applications
 - Perform measurements, data handling, and create test report
 - Data analysis, failure mode identification and proposed solution
 - Design and fabricate microphone test fixture as per appropriate standards
 - Design external microphone power supply for testing
 - Recommend R7D test instrumentation
 - Assist with the completion of test lab and listening space

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Projects List

- **Component Specification & System Evaluation**
 - Review the audio design of a distance learning system
 - Recommend/specify microphone and interface
 - Supply test signals for system evaluation
- **QC Test Sequence Programming**
 - Program / re-program QC test sequences for to measure the acoustic impedance of a hearing screening system subcomponent
 - Prepare test report describing improved test methodology
 - Run tests on samples to verify program
- **System Design**
 - Technical analysis and evaluation of sound activated control system
 - Make recommendations to improve system design
 - Recommend/specify transducers
- **Headphone System Design Verification**
 - Performed electroacoustical response measurements of a headphone system for use in a medical environment
 - Verified response, equalization and noise isolation performance
 - Work with client to ensure amplifier interface works with transducers
 - Create test report and spreadsheet 'Gain Calculator' design tool for adjusting input sensitivity
- **Loudspeaker Test Sequence Programming**
 - Program / re-program QC/QA test sequences for active powered loudspeaker measurements
 - Frequency Response & Impulse Response
 - Horizontal & Vertical Polar Response with control of turntable
 - Maximum Steady State SPL output in 1/3 octaves
 - Provide technical support via phone and Email
- **VoIP Handset Re-Design**
 - Run tests on existing handset to determine failure mode(s)
 - Re-design VoIP handset to incorporate leak tolerant, low acoustic impedance receiver, ensuring compliance to TIA-920
 - Calculate mechanical design parameters and provide design drawings
 - Work with vendor to source transducers and optimize design
 - Perform tests on prototype to ensure design target compliance
- **Earphone Design & Test**
 - Re-design earphones incorporating improvements in fit, wear-ability and acoustic performance
 - Analyze anthropomorphic data to determine dimensions for highest fit rate
 - Create test sequences for evaluating electroacoustic performance
 - Run tests on prototype units to ensure design target compliance
- **Test System Specification and Training**
 - Recommend instrumentation configuration and calibration for a headset test lab
 - Electroacoustics training for engineering staff and application specific hands-on training for headset testing
- **Test Sequence Programming and Training**
 - Program / re-program QC/QA test sequences for various applications:
 - Loudspeakers, Microphones, Headphones, Hearing Aids, Telecom
 - Provide technical support via phone and Email
 - Electroacoustics training for engineering staff and application specific hands-on training in test sequence programming

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Projects List

- **Seminars in Acoustics, Transducers, and Measurements**
 - Preparation of all PowerPoint materials and demonstrations
 - In house seminars upon client request
 - Tutorial sessions at AES, ALMA, and AAA
 - Public and in-house seminars
- **Software Consulting**
 - De-bug web-based frequency to musical note conversion program
- **Standardization Work**
 - ASA Standards Director (2015 –)
 - US Delegate to IEC Technical Committee 29 – Electroacoustics
 - CHAIR: ANSI/ASA Subcommittee 3 on Bioacoustics (2012 –)
 - CHAIR: ANSI S3-37 Working Group on Couplers and Ear Simulators
 - ANSI S3.25 – New revision released in 2009
 - ANSI S3.7 – Reaffirmation 2008. Revision 2015 (on-going)
 - ANSI S3.55, Parts 1, 3, & 5 – National Adoption of IEC Standards
 - IEC Liaison: Coordinate US Comment/Vote on IEC Committee Drafts
 - CHAIR: ANSI S3-67 Working Group on Test Manikins
 - ANSI S3.36 – Revision 2012
 - IEC Liaison: Coordinate US Comment/Vote on IEC Committee Drafts
 - CHAIR: ANSI S3-73 Working Group on Bioacoustical Terminology
 - ANSI S3.20 – Revision 2015
 - IEEE Subcommittee on Telephone Instrument Testing
 - IEEE 1652 (revision 2015 ongoing)
 - IEEE 661 (reaffirmation)
 - IEEE 269 (revision 2014-15 ongoing)
 - IEEE 1329 (revision ballot)
 - IEEE 1027 (ballot and withdrawal)
 - Liaison with ITU-T Study Group 12
 - ANSI S3-48 Working Group on Hearing Aids
 - ANSI S3.22 (revision 2014 & FDA approval)
 - ANSI S3.35 (revision)
 - AES SC-04-03 Standards Committee on Loudspeakers
 - AES 2 (revision)
 - IEC 60268-5 revision draft
 - AES SC-04-03 Standards Committee on Microphones
 - Review of IEC 60268-4 revision draft
 - Quasi Peak Self-Noise measurement proposal
- **MatLab Programming**
 - HRTF plotter and ASCII file conversion
 - Control and data transfer for Listen SoundCheck
 - Frequency Response data reformat and semi-log interpolator
 - 1/3 octave synthesis from FFT data
 - Loudspeaker passive crossover designer/simulator
 - Loudspeaker Impedance LMS data fitting to Equivalent Circuit Models
<http://www.cjs-labs.com/sitebuildercontent/sitebuilderfiles/zfitdatasheet.pdf>
 - ANSI S3.4 and ISO 532b Loudness Calculation
 - Calibrated FFT and standard 1/Nth octave band measurements
 - 1/3 octave Multispectrum analysis with Calibration, Time Slice, and Excel Data export
 - Create analysis routines that are both Windows and Macintosh-compatible

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Projects List

- Architectural Acoustics
 - Meet with client to propose mitigation for poor intelligibility and excessive reverberation in an open plan office
 - Specify speech privacy requirements for a security room
 - Specify requirements for improved intelligibility in teleconference rooms

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Projects List

- **Circuit Design**
 - Re-Design of Electric Guitar passive electronics
 - Produce schematics, wiring diagrams and complete step-by-step annotated assembly and testing instructions
<http://www.cjs-labs.com/sitebuildercontent/sitebuilderfiles/JPage-LesPaulWiring.pdf>
- **Industrial Design Consulting**
 - Transducer selection for a hand-held PC device
 - Review product requirements, mechanical drawings and candidate transducer specifications
 - System optimization
 - Perform measurements on subcomponents and prototype
- **Acoustical Engineering and Design**
 - Specify transducers, data acquisition, signal processing, and performance metrics for a personal recording device
 - Identify subcomponents and qualify vendors
 - Perform electroacoustic measurements on prototypes
 - System design and optimization
- **Intellectual Property Evaluation & Expert Witness**
 - Technical analysis and evaluation of a noise reduction algorithm patent
 - Design and specify appropriate tests to identify performance as per patent claims
 - Perform measurements on various embodiments and issue test reports
 - Attend meetings with litigants as Subject Matter Expert
 - Draft and edit technology summaries for legal documents
- **Acoustical Analysis**
 - Room mode calculation and analysis
 - Prepared report and made recommendations for mediating acoustical problems
- **System Optimization**
 - Evaluate current outdoor loudspeaker system for dispersion, loudness, and intelligibility
 - Recommend design modifications/improvements
 - Design optimized closed-box system for existing driver
- **Subcomponent Redesign & Verification**
 - Acoustical testing of prototype subcomponents for audiometry
 - Performed measurements and prepared test report
- **In-House Training Seminar**
 - In-house training presentation on headphone measurements for the research group of a microphone and headphone manufacturer
 - Discussion of test techniques for noise-canceling devices
 - Provide information on time-selective test methods
- **Test Automation**
 - Specify and create test sequences for Hearing Aid QC according to ANSI S3.22 & IEC 60118
 - Architect macro creation into appropriate sub-modules
 - Code and/or review macro routines
 - Create calibration routines – in particular for telecoil tests
 - Perform tests on hearing aids using completed routines to test the software
- **Simulation/Optimization**
 - Loudspeaker driver specification and system optimization for a novel closed-box design
- **Comparative Product Testing**
 - Standardized objective testing of the earphone response of various gaming headsets
 - Performed measurements and prepared test report

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Projects List

- **Software Re-architecture and Coding**
 - Research existing patents for a hearing/sound processing program
 - Prepare project documentation
 - Identify code modules and specify appropriate signal processing and data handling
 - Re-code entire program in MatLab
 - Prepare code releases and handle bug/error tracking
- **Instrumentation, Measurement, and Test Training**
 - Test system setup and configuration for a loudspeaker subcomponent manufacturer
 - Provide hands-on software training
 - System integration and specification of instrumentation
 - Research vendors for long term power testing
- **System Integration and Testing**
 - Revamp QC/QA test process for a critical component in a hearing screening device
 - Specify, install and program new test system
 - Vendor management and component qualification
 - Redesign critical components for compatibility and serviceability
- **Training**
 - General Electroacoustics Training for entire scientific staff of an earphone, earplug, and headset manufacturer
 - Recommendations on instrumentation configuration and calibration
 - Recommend test set up for high level impulse measurements of hearing protectors
- **Comparative Product Testing**
 - Standardized objective testing of headphones for an industry consortium
 - Performed measurements and prepared test report
- **Market Research**
 - Background and market research on Audio Codecs for Financial Services & Investment Firms
 - Provide market information on Hearing Instruments for Entrepreneurs & Start-ups
 - Provide data on the Test Instrumentation market, including Manufacturers & End Users
- **Product Design**
 - Design and build working prototype battery simulator for hearing aid testing
 - Identify vendors and source components
 - Specify circuit and mechanical designs
 - Create Bill of Materials and Product Data Sheet
<http://www.cjs-labs.com/sitebuildercontent/sitebuilderfiles/BS-01DataSheet.pdf>
- **Sub-Component Testing**
 - Measure driver impedance data and derive small signal parameters for a headphone design
 - Consult on testing, QC methodology and test system hardware
- **Test Instrument Design**
 - Design and build working prototype sound source for microphone testing
<http://www.cjs-labs.com/sitebuildercontent/sitebuilderfiles/PointSource-PreliminaryDataSheet.pdf>
 - Identify transducer and enclosure vendors
 - Specify protection circuit and outsource prototyping
 - Redesign crossover network
 - Perform electroacoustic measurements to verify performance
- **Laboratory Measurement System Integration**
 - Consult on room acoustics and sound field verification for clinical experiments for a hearing instrument research facility
 - Oversee calibration and coding of data acquisition and analysis routines

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Projects List

- **Technical Marketing**
 - Edit/Co-author journal article for a hearing instrument manufacturer
 - Generate measurements, graphs, and figures as required
 - Research appropriate references
- **Performance Testing**
 - Perform Simulated In-Situ (manikin) Testing and Directional measurements (polar diagrams) on a Completely-In-The-Canal hearing device
 - Perform probe tube in-ear insertion gain tests on test subjects fitted with the device
 - I/O Characterization and compression threshold mapping
- **Acoustical Consulting**
 - Performed modeling and characterization of on-board transducers & signal processing for a transducer-equipped semiconductor product
 - Create performance specification for telecom applications
 - Redesign existing test fixture
 - Perform electroacoustic measurements and provide training
 - Design a test protocol for a noise-canceling headset application
- **Project Management**
 - Led the project team through major phases of design, prototype, and production for a new loudspeaker transducer
 - Initiated a research project to model the new device behaviour
 - Co-authored 2 conference papers describing this work
 - <http://www.cjs-labs.com/sitebuildercontent/sitebuilderfiles/LATModel-AES121st.pdf>
 - <http://www.cjs-labs.com/sitebuildercontent/sitebuilderfiles/LATOverview-AES121st.pdf>

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