**2020 Data File ReadMe for Final Report**

1. **Test Data Report:**

* For nitrogen-constant flow tests, the data are raw recorded underwater sounds generated by constant flow bubbles.

File name: Tank-18-10-08-10-52-38-G14-cons-2.5psi-100 kHz - Gain100.xls

Note: Tank-year-month-day-hour-min-sec-needle gauge number-constant flow test-pressure-sampling frequency-gain

* For nitrogen-a few bubble tests, the data are raw recorded underwater sounds generated by a few bubbles.

File name: Tank-18-07-30-08-12-50-G18-single-30uL-250 kHz.xls

Note: Tank-year-month-day-hour-min-sec-needle gauge number-a few bubbles-flow rate-sampling frequency

* For nitrogen-constant flow video, the videos were recorded during constant flow bubble tests.

File name: G16-5 PSI.mov

Note: Needle gauge number-pressure

* For nitrogen-a few bubble video, the videos were recorded during a few bubble tests.

File name: G16-single bubble-1.mov

Note: Needle gauge number-a few bubbles

* For nitrogen-constant flow rates, the data was flow rates measured during constant flow tests.

File name: 468493-1\_10-03-2018\_13-30-47\_G12\_2.5psi.txt

Note: Test ID-month-date-year-hour-min-sec-needle gauge #-pressure

* For nitrogen-resonant frequency histograms, the histograms were obtained by processing data from nitrogen-a few bubble tests.

File name: Histogram-nitrogen.doc

Note: The doc file contains all images of the resonant frequency histograms for a few bubble nitrogen tests.

* For nitrogen-resonant frequency, the data was generated by processing data from Histogram-nitrogen.doc

File name: Resonant F-nitrogen.xls

Note: the resonant frequency vs needle diameter

* For nitrogen-total energy vs flow rate and jet velocity, the data was generated by processing data from nitrogen-constant flow tests, flow rate measurement, and needle diameters.

File name: Total energy -nitrogen.xls

Note: the file contains data and figures for total energy vs flow rate and total energy vs jet velocity

* For methane-constant flow tests, the data are raw recorded underwater sounds generated by constant flow bubbles.

File name: Tank-18-11-12-09-33-24-G18-CH4-5psi-100 kHz - Gain100 - 40dB.xls

Note: Tank-year-month-day-hour-min-sec-needle gauge number-channel number-pressure-sampling frequency-gain

* For methane-a few bubble tests, the data are raw recorded underwater sounds generated by a few bubbles.

File name: Tank-18-11-28-22-33-55-200ul-G16-single-250 kHz-Gain1000-60dB.xls

Note: Tank-year-month-day-hour-min-sec-flow rate-needle gauge number-single bubble- sampling frequency-gain

* For methane-constant flow rates, the data are raw flow rates measured during constant flow tests.

File name: 468493-1\_11-12-2018\_17-46-16\_CH4\_G16\_7psi.txt

Note: Test ID-month-date-year-hour-min-sec-needle gauge #-pressure

* For methane-resonant frequency histograms, the histograms were obtained by processing data from methane-a few bubble tests.

File name: Histogram-methane.doc

Note: The doc file contains all images of the resonant frequency histograms for a few bubble methane tests.

* For methane-resonant frequency, the data was generated by processing data from Histogram-methane.doc

File name: Resonant F-methane.xls

Note: the resonant frequency vs needle diameter

* For methane-total energy vs flow rate and jet velocity, the data are processed by the methane constant flow tests, flow rate measurement, and needle diameters.

File name: total energy -methane.xlsx

Note: the file contains data and figure for total energy vs flow rate and total energy vs jet velocity

1. **Modeling Data Report:**

* For methane-a few bubbles modeling, the histograms were obtained by processing data from methane-a few bubble tests.

File name: Histogram-methane.doc

Note: The doc file contains all images of the resonant frequency histograms for a few bubble methane tests.

* For nitrogen-a few bubbles modeling, the histograms were obtained by processing data from methane-a few bubble tests.

File name: Histogram-nitrogen.doc

Note: The doc file contains all images of the resonant frequency histograms for a few bubble nitrogen tests.

* For methane-a few bubbles modeling, the data was generated by processing data from Histogram-methane.doc

File name: Resonant F-methane.xls

Note: the resonant frequency vs needle diameter

* For nitrogen-a few bubbles modeling, the data was generated by processing data from Histogram-methane.doc

File name: Resonant F-nitrogen.xls

Note: the resonant frequency vs needle diameter

* For a few bubbles modeling, the result was obtained by analyzing the data from Resonant F-nitrogen.xls and Resonant F-methane.xls

File name: a few bubbles-Peak frequency.jpg

Note: the file contains the results for both Nitrogen and Methane gases.

* For methane-constant flow modeling, the data are processed by the methane constant flow tests, flow rate measurement, and needle diameters.

File name: total energy -methane.xlsx

Note: the file contains data and figure for total energy vs flow rate and total energy vs jet velocity

* For nitrogen-constant flow modeling, the data are processed by the methane constant flow tests, flow rate measurement, and needle diameters.

File name: total energy -nitrogen.xlsx

Note: the file contains data and figure for total energy vs flow rate and total energy vs jet velocity

* For Methane-constant flow modeling, the data are raw recorded underwater sounds generated by constant flow bubbles.

File name: Methane\_G16.xlsx

Note: Gas-type\_Gauge-number.xlsx

* For Nitrogen- constant flow modeling, the data are raw recorded underwater sounds generated by constant flow bubbles.

File name: Nitrogen\_G16.xlsx

Note: Gas-type\_Gauge-number.xlsx

* For Nitrogen and Methane constant flow tests, the results were obtained by analyzing the data for the case of constant flow.

File name: Results for constant flow bubbles.docx

Note: The file contains all the results for the constant flow bubbles for both gases.

* For Nitrogen and Methane constant flow modeling, the result is obtained from the equation in the report.

File name: constant flow bubbles-E0.jpg

Note: The file contains the profile of the weighting function used in characterization.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow.

File name: constant flow bubbles-Energy.jpg

Note: The file contains the results for both two gases.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow.

File name: constant flow bubbles-G14.jpg

Note: The file contains the results for the needle of G14 for Nitrogen gas.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow.

File name: constant flow bubbles-NitrogenG14.jpg

Note: The file contains the results for the needle of G14 for Nitrogen gas.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow.

File name: constant flow bubbles-Total.jpg

Note: The file contains the results for needles of different diameters for both two gases.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow for Methane gas.

File name: Methane\_Number\_Percentage.jpg

Note: The file contains the results for number percentage distribution for Methane gas.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow for Nitrogen gas.

File name: Nitrogen \_Number\_Percentage.jpg

Note: The file contains the results for number percentage distribution for Nitrogen gas.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow for Nitrogen gas.

File name: Nitrogen\_G14\_NEW\_number\_percentage.jpg

Note: The file contains the results for number percentage distribution for Nitrogen gas for G14 needle.

* For Nitrogen and Methane constant flow modeling, the results were obtained by analyzing the data for the case of constant flow for Nitrogen gas.

File name: ProcedureNew.jpg

Note: The file contains the procedure to compute number percentage distribution.

1. **Localization Data Report:**

* For underwater TDOA-based Localization, the data are raw recorded by scattered receivers (CH2-CH7), source is the electrical sound S1.

File name: Tank-18-10-02-09-54-42-S1-500 kHz.xls (Excel version)

Tank-18-10-02-09-54-42-S1-500 kHz.BP (LabVIEW version)

Note: Tank-year-month-day-hour-min-second- source #-sampling rate

* For underwater TDOA-based Localization, the data are raw recorded by scattered receivers (CH1-CH6), source is the electrical sound S2.

File name: Tank-18-05-05-14-29-34-S2-500 kHz.xls (Excel version)

Tank-18-05-05-14-29-34-S2-500 kHz.BP (LabVIEW version)

Note: Tank-year-month-day-hour-min-second- source #-sampling rate

* For underwater TDOA-based Localization, the data are raw recorded by scattered receivers (CH2-CH7), source is the bubble sound S3.

File name: Tank-18-07-18-06-37-G18-5 PSI-S3-500 kHz.xls (Excel version)

Tank-18-07-18-06-37-G18-5 PSI-S3-500 kHz.BP (LabVIEW version)

Note: Tank-year-month-day-hour-min-second- needle gauge #-gas pressure-source #-sampling rate

* For underwater TDOA-based Localization, the estimated localization results were obtained by processing data from TDOA-based localization data for sources S1-S4.

File name: S1toS4\_Source positions estimation\_TDOA.jpeg

Note: The jpeg file contains all the sources S1 to S4 location estimation results by two different TDOA-based localization methods (LLSE(linear least square estimation) method, NLS (nonlinear least square with Gauss–Newton Method ))

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S4.

File name: Tank-20-06-13-07-26-01-S4-Bubble pulse-200 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S4.

File name: Tank-20-07-09-07-47-41-S4-Bubble continuous-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S5.

File name: Tank-20-07-10-08-16-27-S5-Bubble continuous-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S5.

File name: Tank-20-07-10-08-22-35-S5-Bubble pulse-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S6.

File name: Tank-20-07-28-07-14-51-S6-bubble pulse-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S6.

File name: Tank-20-07-28-07-16-11-S6-bubble continous-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S7.

File name: Tank-20-07-29-08-06-36-S7-bubble continous-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the data are raw recorded by scattered receivers (CH1-CH7), source is the bubble sound S7.

File name: Tank-20-07-29-08-08-47-S7-bubble pulse-20 kHz.xlsx

Note: Tank-year-month-day-hour-min-second-source-source type-sampling frequency

* For underwater SpectraRatio-based Localization, the coordinates of scattered receivers (CH1-CH7) and sources (S4-S7).

File name: Receiver and Bubble Source Coordinates.xlsx

Note: The excel file includes the coordinates of the sources (S4-S7) and scattered hydrophones (CH1-CH7) and Arrays (Array1-Array5).

* For underwater SpectraRatio-based Localization, the estimated localization result is obtained by processing data from SpectraRatio-based Localization data for source S7.

File name: S7 Source position estimation\_SpectraRatio\_Proposed\_Grid10.jpeg

Note: The jpeg file contains the sources S7 location estimation result by SpectraRation-based localization method with Proposed model under water tank grids 10x10x10.

* For underwater SpectraRatio-based Localization, the estimated localization result is obtained by processing data from SpectraRatio-based Localization data for source S7.

File name: S7 Source position estimation\_DF in 3D space.jpeg

Note: The jpeg file contains the sources S7 location estimation result and DF values in 3D space by under water tank grids 10x10x10 by SpectraRation-based localization method with Proposed model.

* For underwater SpectraRatio-based Localization, the estimated localization result is obtained by processing data from SpectraRatio-based Localization data for source S7.

File name: S7 Source position estimation\_DF in 2D space with z-axis is 1.09m.jpeg

Note: The jpeg file contains the sources S7 location estimation result and DF values in 2D space with z- axis is 1.09m under water tank grids 10x10x10 by SpectraRation-based localization method with Proposed model.

* For underwater SpectraRatio-based Localization, the estimated localization results are obtained by processing data from SpectraRatio-based Localization data for source S4 to S7.

File name: S4toS7 Source positions estimation\_SpectraRatio\_All\_Grid10.jpeg

Note: The jpeg file contains the S4 to S7 bubble sources location estimation results by spectra ratio-based localization method with three different models (Proposed model,M1 (Dirichlet Model), M2 (Including Leakage Through the Walls Model)) under water tank grids (10x10x10).

* For underwater SpectraRatio-based Localization, the estimated localization results are obtained by processing data from SpectraRatio-based Localization data for source S6.

File name: S6 Source position estimation\_SpectraRatio\_All\_Grid10and20.jpeg

Note: The figure contains the S6 bubble source location estimation results by spectra ratio-based localization method with three different models (Proposed model,M1 (Dirichlet Model), M2 (Including Leakage Through the Walls Model)) under water tank grids (10x10x10).Also includes the S6 bubble source location estimation results by spectra ratio-based localization method with three different models (Proposed model,M1 (Dirichlet Model), M2 (Including Leakage Through the Walls Model)) under water tank grids (20x20x20).

* For underwater SpectraRatio-based Localization, the estimated localization result is obtained by processing data from SpectraRatio-based Localization data.

File name: Results for Spectra Ratio-based method localization.docx

Note: The file contains all the results for the SpectraRatio-based localization results.