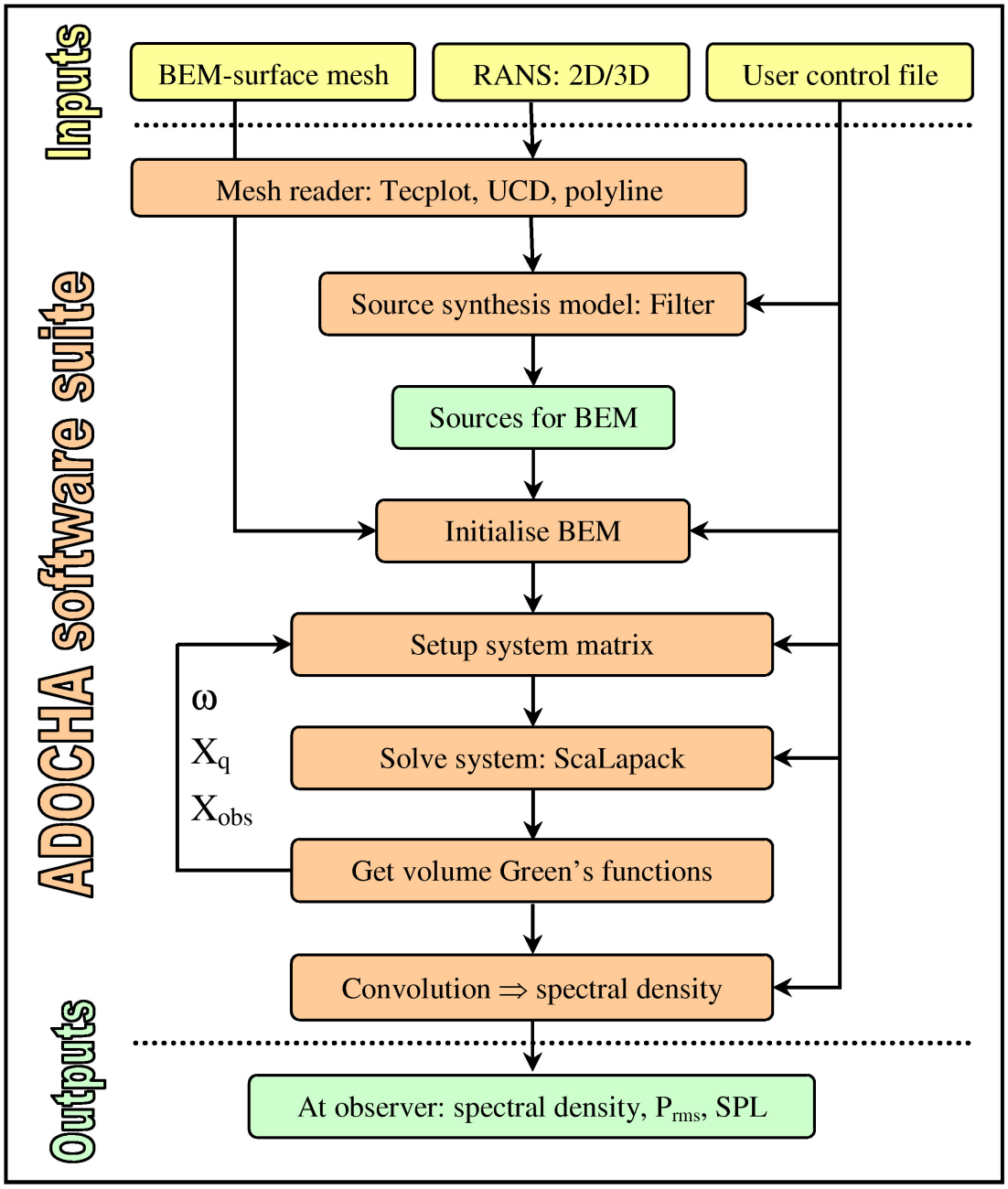


Figure 1 - Overview over the ADOCHA software suite: summary flow chart summarising the three required inputs, the order of the most important stations of the internal calculations and possible outputs.

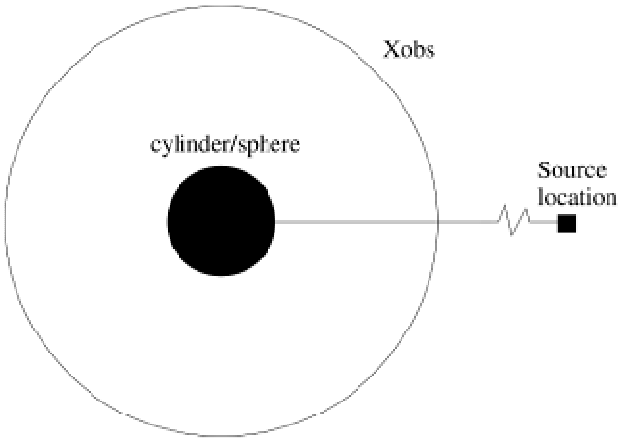
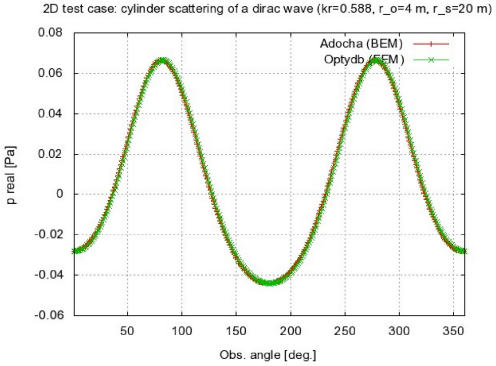
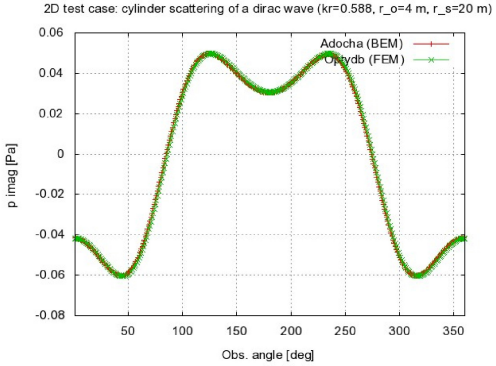


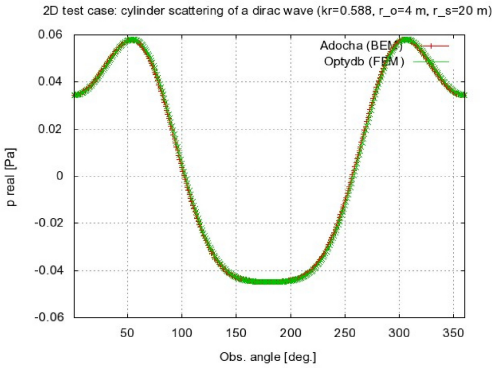
Figure 2 - Principle setup of the 2D and 3D validation cases for scattering of a point source from a cylinder/sphere: The spherical incident wave emitted from an isolated source at r_q is scattered from a body with radius r_{body}. The resulting scattered and total acoustic field is then observed by microphones placed in a circular fashion at regular observer locations x_{obs} at r_{obs}



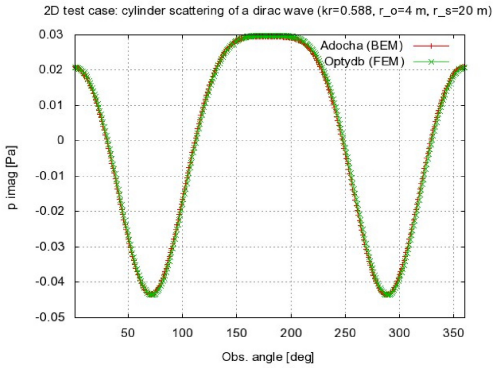
(a) real part of total acoustic pressure



(b) imaginary part of total acoustic pressure

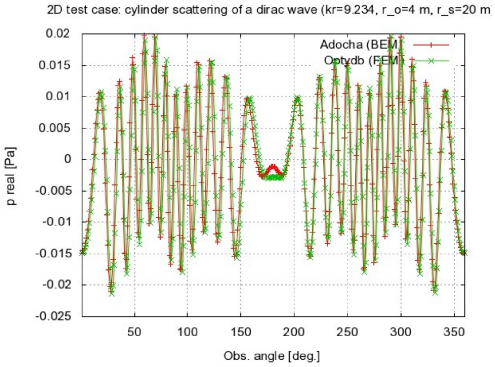


(a) real part of scattered acoustic pressure

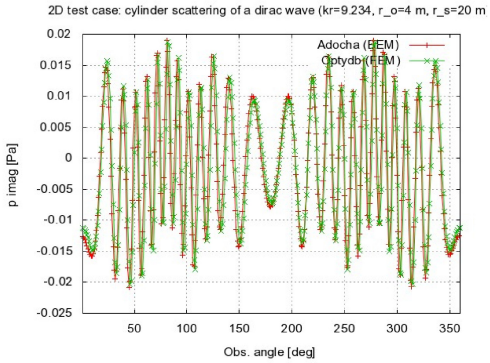


(d) imaginary part of scattered acoustic pressure

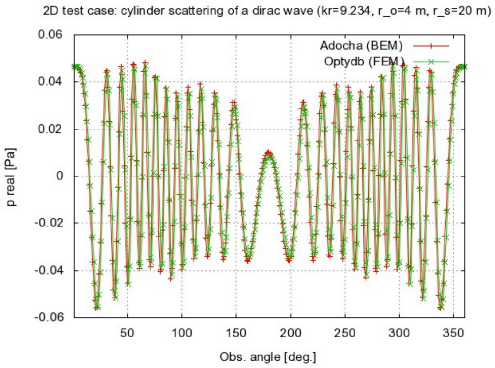
Figure 3 - Excellent agreement between ADOCHA and OptyδB demonstrated for the total and scattered acoustic field resulting from the scattering of a unit source from a cylinder for the frequency f_1 = 31 Hz.



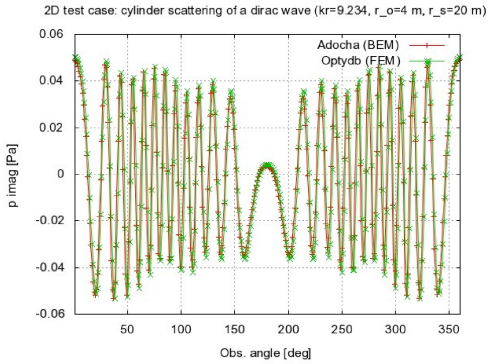
(a) real part of total acoustic pressure



(b) imaginary part of total acoustic pressure

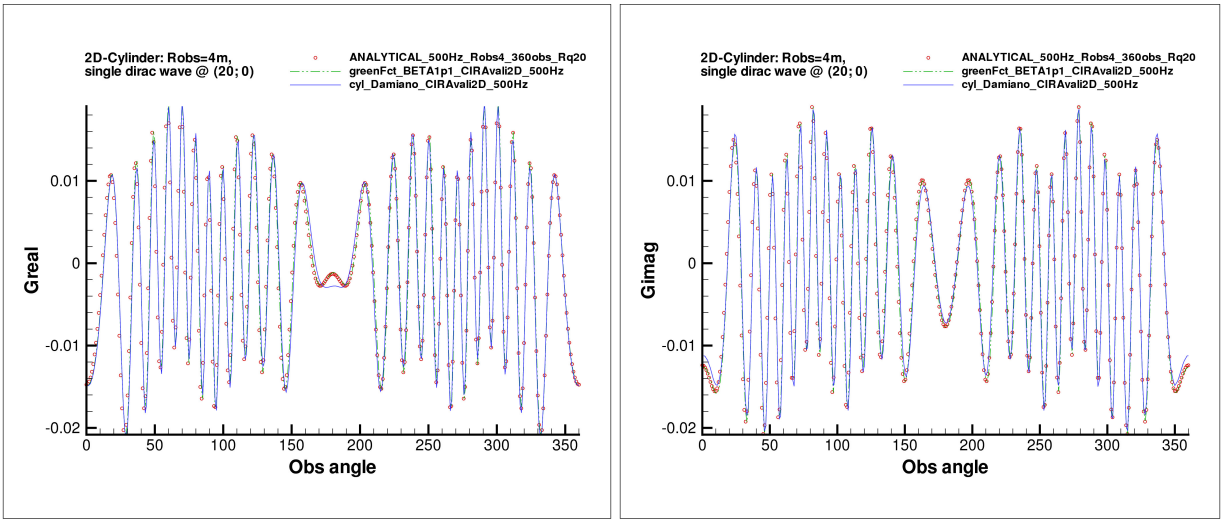


(a) real part of scattered acoustic pressure



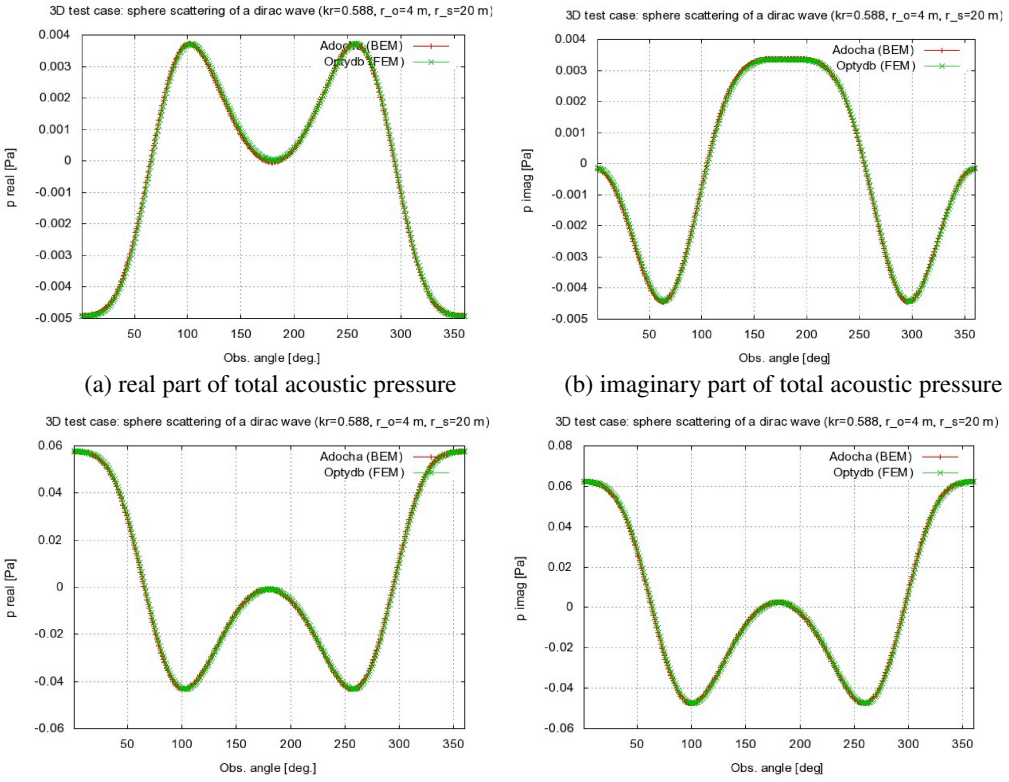
(d) imaginary part of scattered acoustic pressure

Figure 4 - Excellent agreement between ADOCHA and OptyδB demonstrated for the total and scattered acoustic field resulting from the scattering of a unit source from a cylinder for the frequency f2 = 500 Hz.



(a) real part of the total acoustic pressure (b) imaginary part of the total acoustic pressure

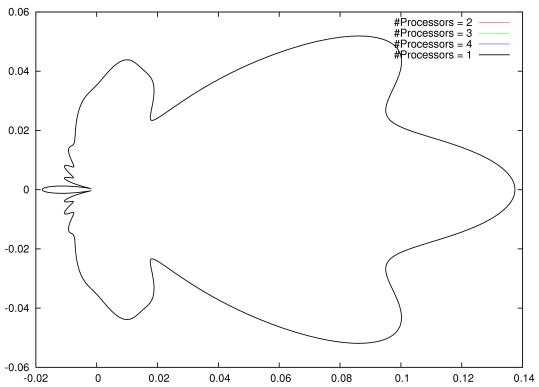
Figure 5 - Minor differences between ADOCHA and OptyδB for the scattering of a unit source from a cylinder for the frequency f1 = 500 Hz around the observer angles j = 00 and j = 1800. ADOCHA is able to hit the analytical solution exactly.



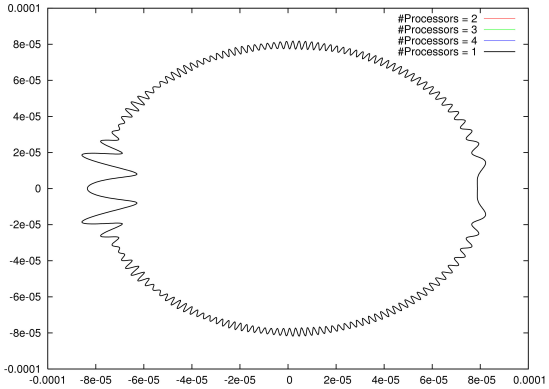
(a) real part of total acoustic pressure (b) imaginary part of total acoustic pressure

(a) real part of scattered acoustic pressure (d) imaginary part of scattered acoustic pressure

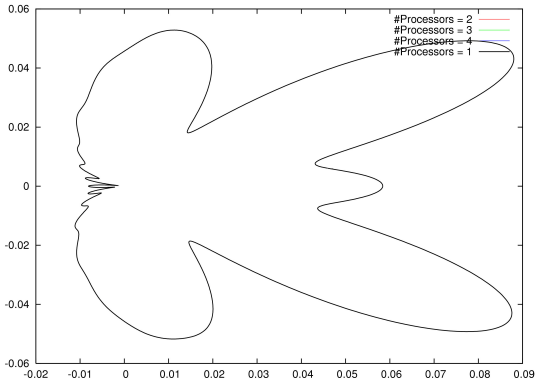
Figure 6 - Excellent agreement between ADOCHA and OptyδB demonstrated for the total and scattered acoustic field resulting from the scattering of a unit source from a sphere for the frequency f1 = 31 Hz.



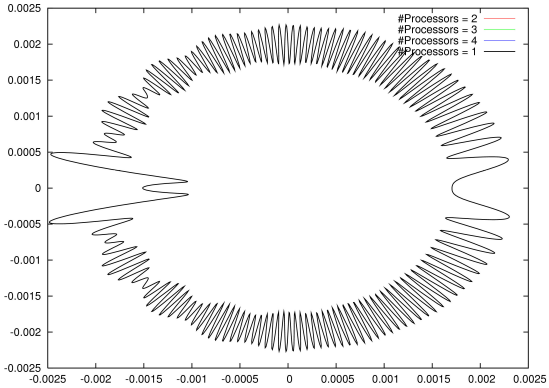
(a) Configuration 1 (3D): polar plot of Green's function for ka=10



(b) Configuration 6 (3D): polar plot of Green's function for ka=10

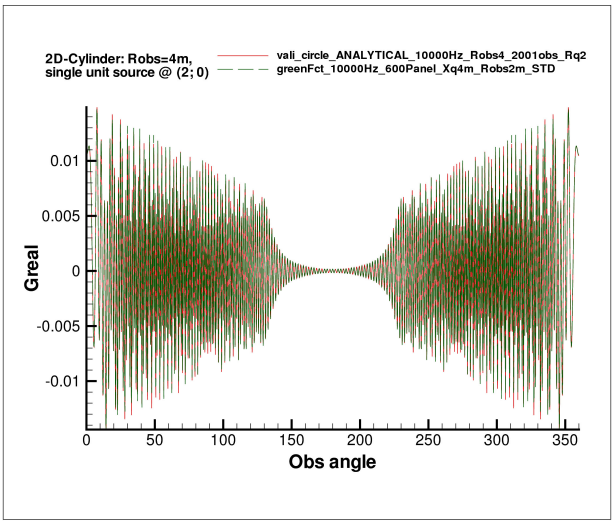


(a) Configuration 1 (2D): polar plot of Green's function for ka=10

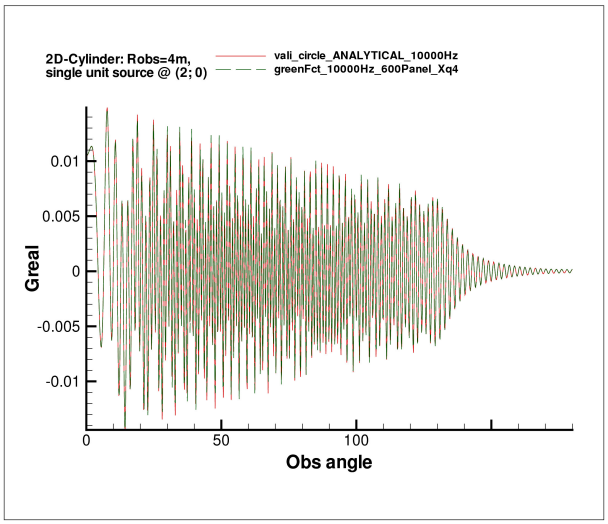


(b) Configuration 6 (2D): polar plot of Green's function for ka=10

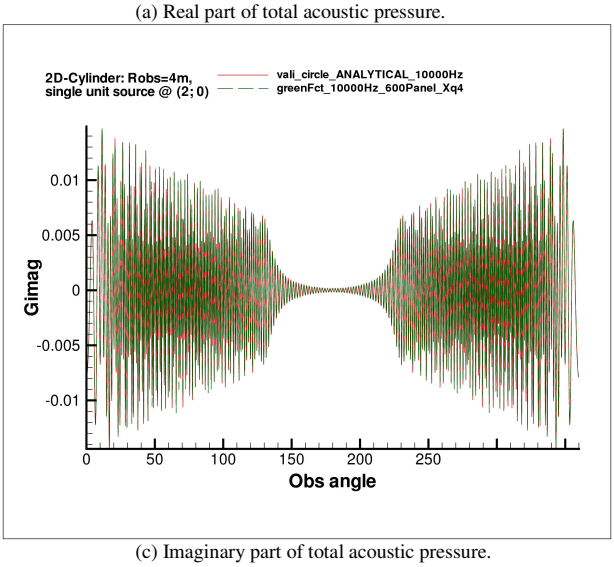
Figure 7 - Excellent agreement between serial and parallel ADOCHA-solutions for the same case, obtained with 1, 2, 3 and 4 CPU's.



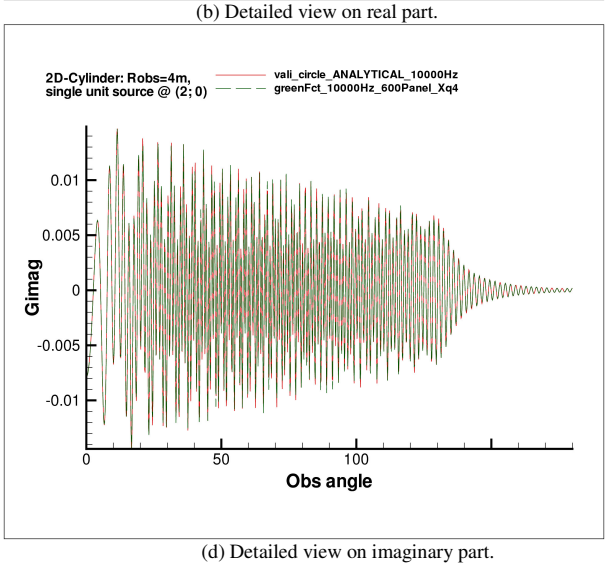
(a) Real part of total acoustic pressure.



(b) Detailed view on real part.

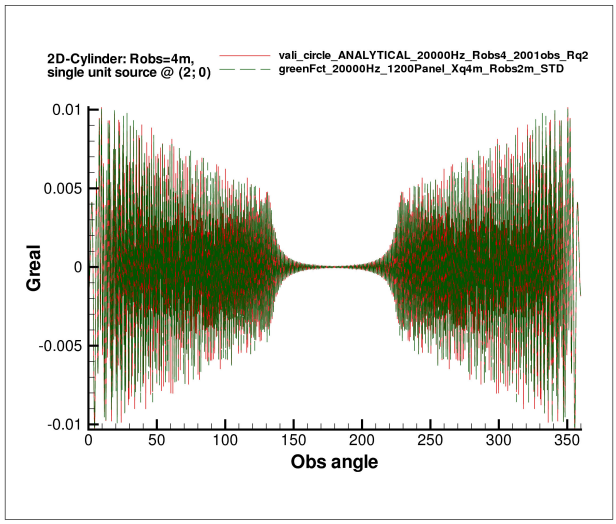


(c) Imaginary part of total acoustic pressure.

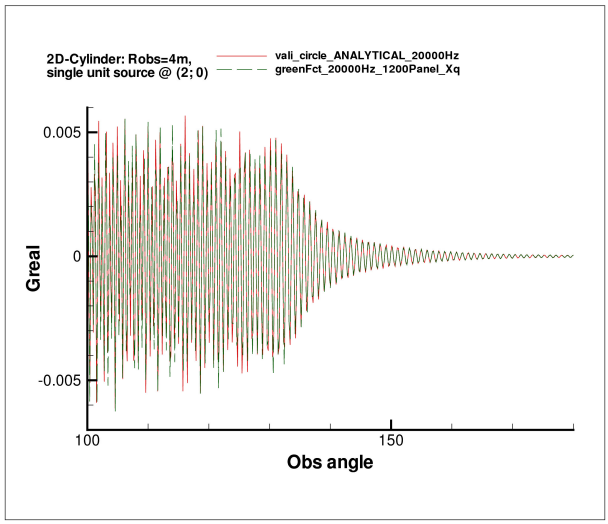


(d) Detailed view on imaginary part.

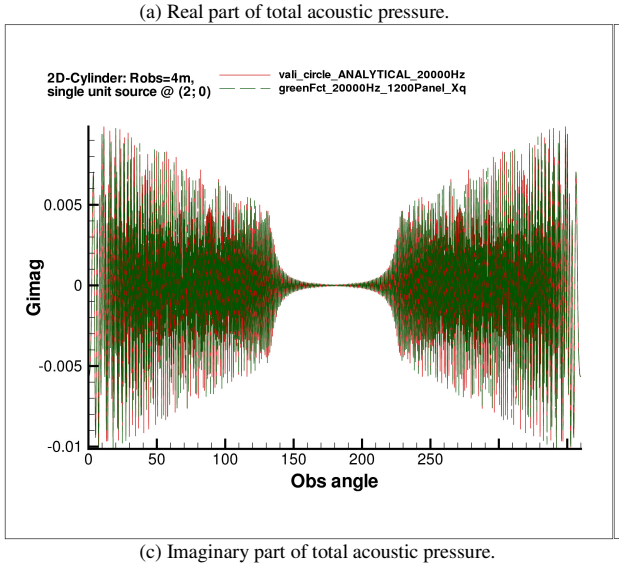
Figure 8 - Good agreement between ADOCHA and the analytical solution demonstrated for the total acoustic field resulting of a scattering of a unit sound source from a cylinder for the high frequency of f_1 = 10,000 Hz.



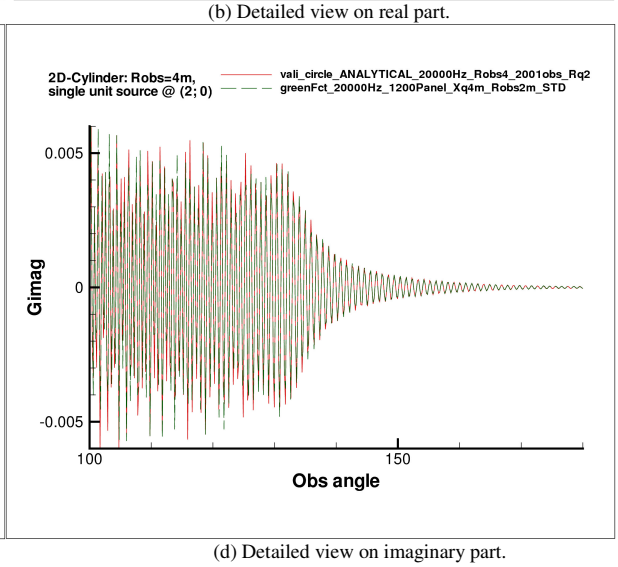
(a) Real part of total acoustic pressure.



(b) Detailed view on real part.

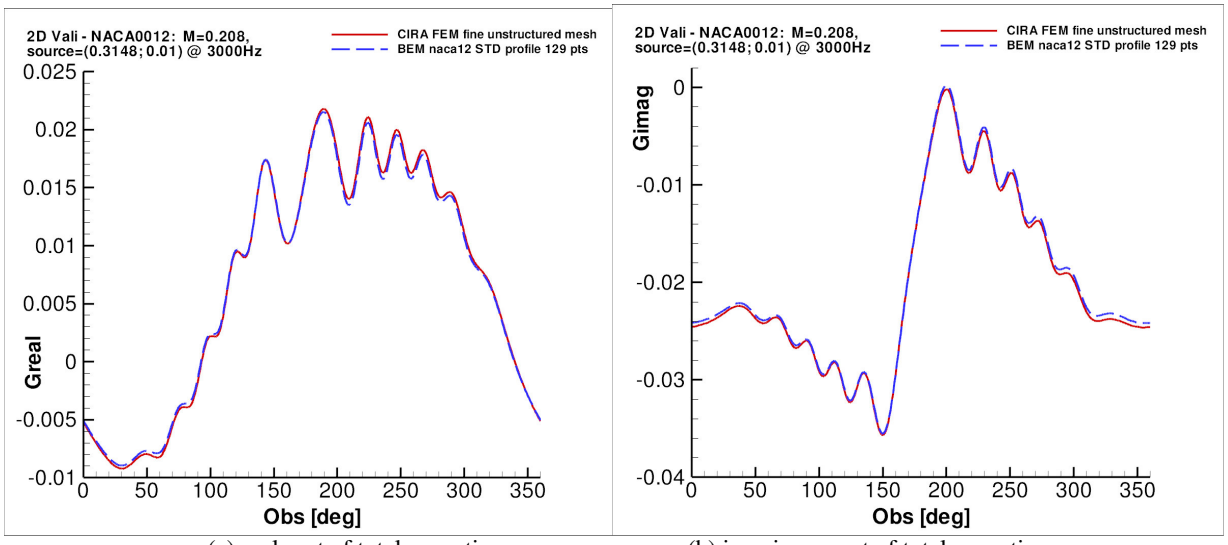


(c) Imaginary part of total acoustic pressure.



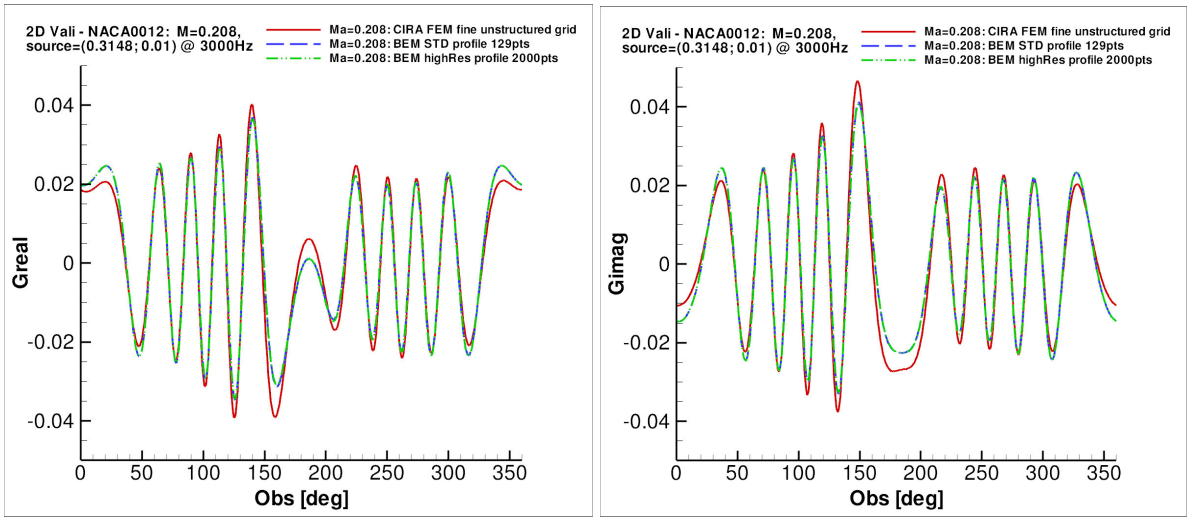
(d) Detailed view on imaginary part.

Figure 9 - Good agreement between ADOCHA and the analytical solution demonstrated for the total acoustic field resulting of a scattering of a unit sound source from a cylinder for the high frequency of f_2 = 20,000 Hz.



(a) real part of total acoustic pressure (b) imaginary part of total acoustic pressure

Figure 10 - Excellent agreement between ADOCHA and OptyδB demonstrated for trailing edge scattering of a single 3000Hz-sound source of unit strength located diagonally above the trailing edge (0.3148m;0.01m) of a NACA0012-airfoil in stagnant air. Real and imaginary part of the resulting Green's function plotted as a function of the observer position (circle with radius 1.22m).



(a) real part of total acoustic pressure (b) imaginary part of total acoustic pressure

Figure 11 - Good agreement between ADOCHA and OptyδB demonstrated for trailing edge scattering of a single 3000Hz-sound source of unit strength located diagonally above the trailing edge (0.3148m;0.01m) of a NACA0012-airfoil at M =0.208. Real and imaginary part of the resulting Green's function plotted as a function of the observer position (circle with radius 1.22m).

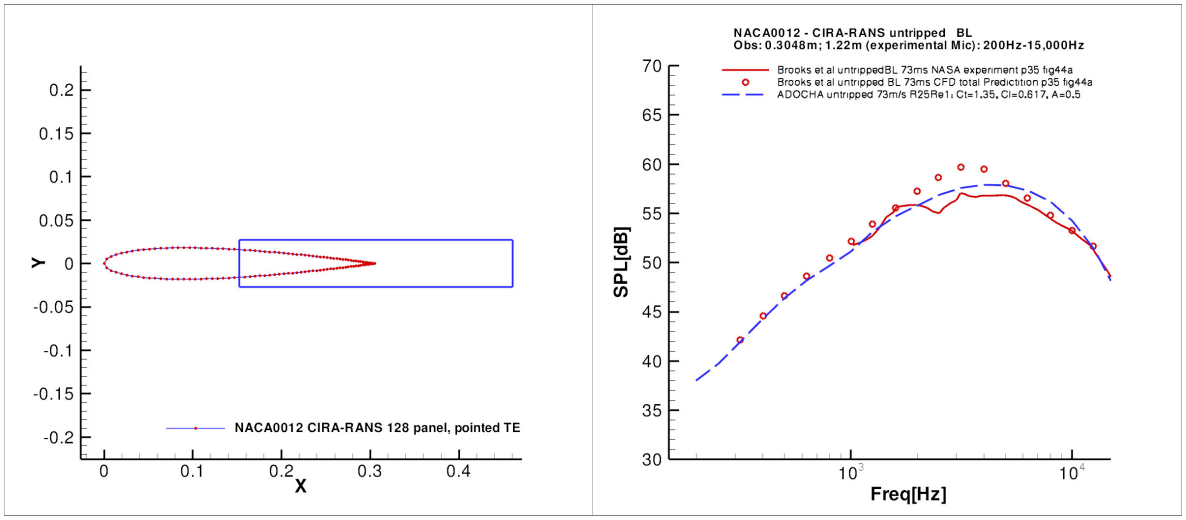


Figure 12 - Comparison of ADOCHA solution with experimental and numerical NASA data (from [2], Fig. 44(a) and 44(b) p. 35) for NACA0012 airfoil self-noise at M = 0.208 and a = 0_ for a frequency range of [200Hz;15,000Hz]. The respective RANS results were spatially filtered with the window shown in (a), covering the turbulent boundary layer over the second half of the airfoil, trailing edge region and wake.