



# Simulating small-scale light scattering with HPC

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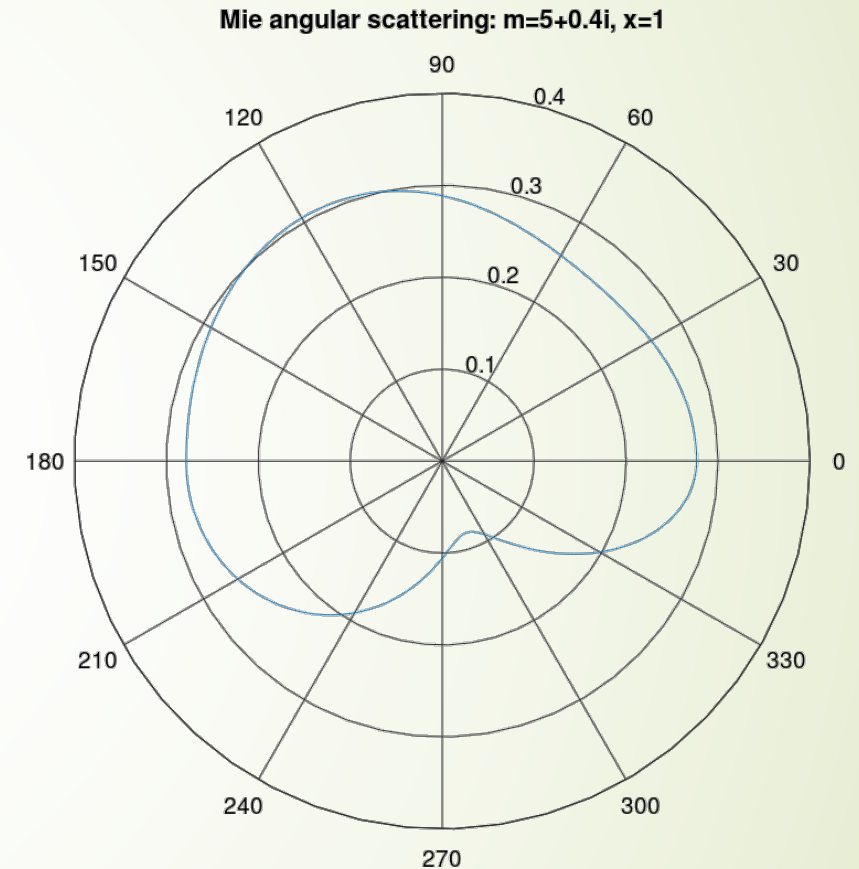


# Small-scale light scattering

- ▶ Light scattering used to characterize samples of gas or properties of skin/breast tissue
- ▶ Light scattering works differently at very small scales
  - ▶ Different mathematical and programming frameworks + approaches
- ▶ Most applications involve large/complex networks of particles
  - ▶ Input: information about the light and the objects it scatters off
  - ▶ Output: distribution and “photon weight” of the light particles

# Benefits of High-Performance Computing

- Scattering off a single particle is easily done on a normal computer
- Ability to simulate many photons in parallel speeds up computation
  - Accurate simulations take longer as we increase the number of particles
- Complexity and accuracy are mutually exclusive without HPC



# Preliminary Results

1. Successfully ported code to Grace/HPC
2. Initial simulations in 2 or 3 dimensions running on multiple scatterers



5.4978	0.1349	0.0954	-0.0954	0
5.5135	0.1383	0.0993	-0.0963	0
5.5292	0.1418	0.1034	-0.0971	0
5.5449	0.1454	0.1075	-0.0979	0
5.5606	0.1490	0.1118	-0.0986	0
5.5763	0.1527	0.1161	-0.0992	0
5.5920	0.1565	0.1206	-0.0997	0
5.6077	0.1603	0.1251	-0.1002	0
5.6235	0.1641	0.1297	-0.1006	0
5.6392	0.1679	0.1343	-0.1008	0
5.6549	0.1718	0.1390	-0.1010	0
5.6706	0.1757	0.1438	-0.1010	0
5.6863	0.1797	0.1486	-0.1010	0
5.7020	0.1836	0.1534	-0.1008	0
5.7177	0.1875	0.1583	-0.1005	0
5.7334	0.1914	0.1632	-0.1000	0
5.7491	0.1953	0.1681	-0.0994	0
5.7648	0.1992	0.1730	-0.0987	0
5.7805	0.2031	0.1780	-0.0978	0
5.7962	0.2069	0.1829	-0.0968	0
5.8119	0.2107	0.1877	-0.0957	0
5.8277	0.2144	0.1926	-0.0943	0
5.8434	0.2181	0.1974	-0.0929	0
5.8591	0.2218	0.2021	-0.0913	0
5.8748	0.2253	0.2068	-0.0895	0
5.8905	0.2288	0.2114	-0.0876	0
5.9062	0.2322	0.2159	-0.0855	0
5.9219	0.2355	0.2203	-0.0833	0
5.9376	0.2388	0.2247	-0.0809	0
5.9533	0.2419	0.2289	-0.0784	0
5.9690	0.2449	0.2329	-0.0757	0
5.9847	0.2479	0.2369	-0.0729	0
6.0004	0.2507	0.2407	-0.0699	0
6.0161	0.2533	0.2444	-0.0669	0
6.0319	0.2559	0.2479	-0.0636	0
6.0476	0.2583	0.2512	-0.0603	0
6.0633	0.2606	0.2544	-0.0569	0
6.0790	0.2628	0.2573	-0.0533	0
6.0947	0.2648	0.2601	-0.0496	0
6.1104	0.2667	0.2627	-0.0459	0
6.1261	0.2684	0.2651	-0.0420	0
6.1418	0.2700	0.2673	-0.0380	0
6.1575	0.2714	0.2692	-0.0340	0
6.1732	0.2726	0.2710	-0.0299	0
6.1889	0.2737	0.2725	-0.0258	0
6.2046	0.2746	0.2738	-0.0215	0
6.2204	0.2754	0.2749	-0.0173	0
6.2361	0.2760	0.2757	-0.0130	0
6.2518	0.2764	0.2763	-0.0087	0
6.2675	0.2767	0.2766	-0.0043	0
6.2832	0.2768	0.2768	-0.0000	0