STD: Student's t-Distribution of Slopes for Microfacet Based BSDFs

Supplemental material 2

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Abstract

This paper focuses on microfacet reflectance models, and more precisely on the definition of a new and more general distribution function, which includes both Beckmann's and GGX distributions widely used in the computer graphics community. Therefore, our model makes use of an additional parameter γ, which controls the distribution function slope and tail height. It actually corresponds to a bivariate Student's t-distribution in slopes space and it is presented with the associated analytical formulation of the geometric attenuation factor derived from Smith representation. We also provide the analytical derivations for importance sampling isotropic and anisotropic materials. As shown in the results, this new representation offers a finer control of a wide range of materials, while extending the capabilities of fitting parameters with captured data.

This document illustrates the fitting obtained for all the material data provided in the MERL database [3]. It is performed on the Cook-Torrance model [1]:

$$f_{CT}(i,o,n) = \frac{\rho}{\pi} + \rho_s \frac{F(i,h)\ D(h)\ G(i,o,h)}{4|ih||oh|}, \tag{1}$$

where $h = \frac{i+o}{\|i+o\|}$ is the half angle vector between i and o, $F(i,h)$ corresponds to Fresnel's reflectance (with the refractive index denoted as n_i), ρ is the diffuse reflectance, ρ_s is the specular albedo, and G is the Smith's GAF. The distribution D is set to Beckmann, GGX or STD. We also provide fitting results with the model of Löw et al. [2]:

$$f_{Low}(i,o,n) = \frac{\rho}{\pi} + \frac{F(i,h)\ S(\sqrt{1-|hn|})\ G(i,o,h)}{|ih||oh|} \tag{2}$$

where G is the Torrance-Sparrow GAF [4] and S is the ABC distribution adapted by Löw et al. in order to be included in a microfacet BRDF model

$$S(f) = \frac{A}{(1+Bf^2)^C}. \tag{3}$$

Parameter A allows to control the height of the specular lobe (in the same manner of ρ_s in Cook-Torrance model), while B and C control the shape. The remainder of this document contains one page for each material, with:

1. The curves corresponding to 3 incidence directions, for each RGB channel, and Cook-Torrance BRDF model with STD (first row), GGX (second row), Beckmann (third row), and Löw's BRDF model (fourth row);
2. The parameter values obtained by the fitting process for each model;
3. Rendered images with each model and the corresponding color-coded image relative differences.

Details on the genetic algorithm

The fitting is done with a genetic algorithm performing a minimization of the normalized absolute difference ε (called *normalized distance* in the remainder) between raw BRDF data from MERL database and the model to fit:

$$\varepsilon = \frac{\sum_k^N |MERL_R - f_R| + \sum_k^N |MERL_G - f_G| + \sum_k^N |MERL_B - f_B|}{3\ N}, \tag{4}$$

where N is the number of sampled directions i and o used to evaluate the error and $MERL_c$ and f_c are the BRDF values for the MERL data and the fitted model respectively. Figure 1 illustrates this error obtained for each of the four models (Cook-Torrance with Beckmann, GGX or STD distribution and Löw's model). In practice, the number of samples (couples of incident and outgoing directions) is set to $N = 49160$. Incident directions are chosen with their azimuthal angle $\varphi = 0$ and outgoing directions cover all the hemisphere with an equal solid angle distribution.

Figure 2 provides the RMSE between raw BRDF data from MERL database and the model with the obtained fitted parameters:

$$RMSE = \frac{\sqrt{\frac{\sum_k^n (MERL_R - f_R)^2}{n}} + \sqrt{\frac{\sum_k^n (MERL_G - f_G)^2}{n}} + \sqrt{\frac{\sum_k^n (MERL_B - f_B)^2}{n}}}{3} \tag{5}$$

Each channel (red, green and blue) is fitted separately, starting from the red channel where n_i, σ and γ. In the case of Löw's model, B and C are also fitted. For the green and blue channels, only the specular albedo is fitted. In the case of Cook-Torrance based models, the red component of the specular albedo is fixed to 1, which is clearly a drawback compared to the Löw's model. The diffuse component is fitted separately: It corresponds to the mean of the BRDF values for a normal light incident direction (explaining why all models have the same Lambertian component ρ). Our genetic procedure is summarized in

Algorithm 1 ($nbLoopMax$ is set to 100 in our implementation).

For each channel, a new population is generated (5000 individuals in our implementation). For the red channel, the model parameters are generated uniformly randomly. For the two other channels (green and blue), parameters n_i, σ, γ, B, and C are fixed with the best individual parameters obtained in the previous step. The error ε is computed for one channel at a time. The final set of parameters is chosen as the individual with the minimum error for all 3 channels. The selection function performs a guided selection depending on the error of each individual. The individuals are randomly removed from the population, according to their distance to the best one. They are replaced during the crossover process given by Algorithm 2.

Finally, the mutation process applies to an individual with a chance of 50%, except for the best individual, which is never changed because it corresponds to the potentially final set of parameters. If an individual is selected for mutation, only one parameter can be changed. This parameter is uniformly randomly chosen in the set of parameters. It has a chance of 80% to be randomly regenerated, and 20% to be slightly mutated.

Algorithm 1 Genetic algorithm

for each channel c **do**
  generatePopulation(Kd, fixed parameters from previous fitted channel)
  for $i = 0$, $i < nbLoopMax$, $i++$ **do**
    Selection()
    Crossover()
    Mutation()
  end for
  fix parameters for the channel c
end for
Return the best element

Algorithm 2 Crossover

$\xi_1 \leftarrow$ random number in $[0, 1]$
$\xi_2 \leftarrow$ random number in $[0, 1]$
if $\xi_1 < 0.7$ **then**
  $p_1 \leftarrow$ best individual
else
  $p_1 \leftarrow$ random individual in the population
end if
$p_2 \leftarrow$ random individual in the population
for all the parameters to fit for the current channel **do**
  if $\xi_2 < 0.33$ **then**
    current parameter takes the mean of p_1 and p_2
  else if $\xi_2 < 0.66$ **then**
    current parameter takes the parameter of p_1
  else
    current parameter takes the parameter of p_2
  end if
end for

Contents

References

[1] R. L. Cook and K. E. Torrance. A reflectance model for computer graphics. In *ACM SIGGRAPH proceedings*, 1982.

[2] J. Löw, J. Kronander, A. Ynnerman, and J. Unger. Brdf models for accurate and efficient rendering of glossy surfaces. *ACM Transactions On Graphics*, 31(9), 2012.

[3] Wojciech Matusik, Hanspeter Pfister, Matt Brand, and Leonard McMillan. A data-driven reflectance model. *ACM Transactions On Graphics, SIGGRAPH proceedings*, 22(3):759–769, July 2003.

[4] K. E. Torrance and E. M. Sparrow. Theory for off-specular reflection from roughened surfaces. *Journal of Optical Society of America*, 57(9), Sep 1967.

Global comparisons for all the MERL database

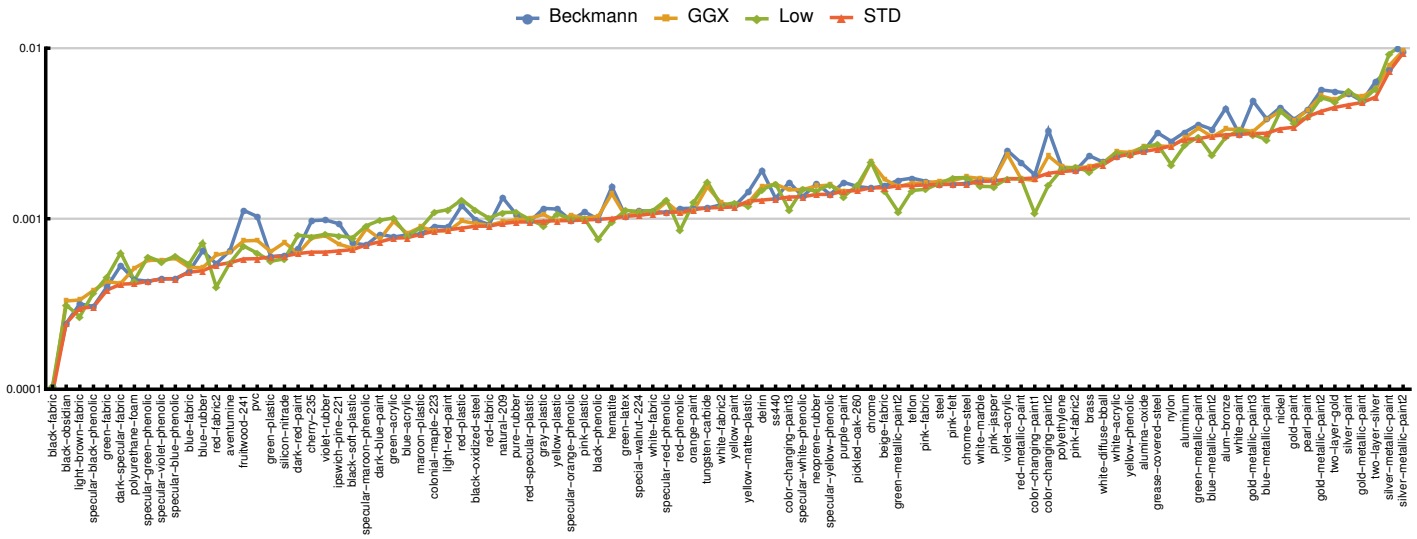


Figure 1: Normalized absolute difference used in fitting process.

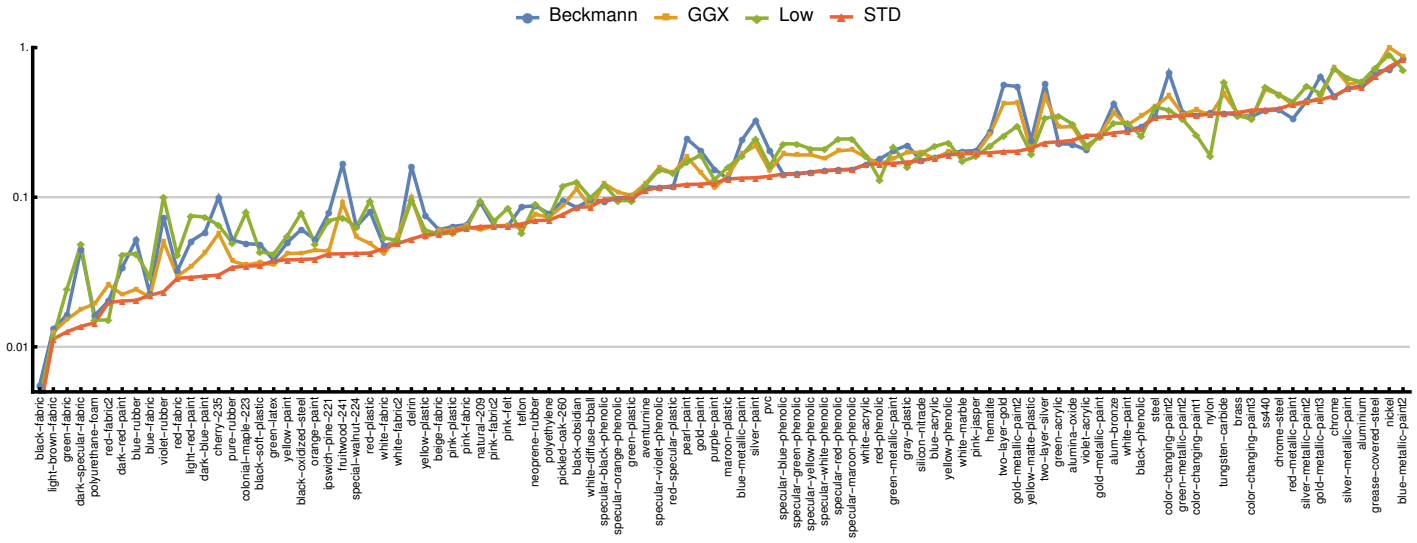
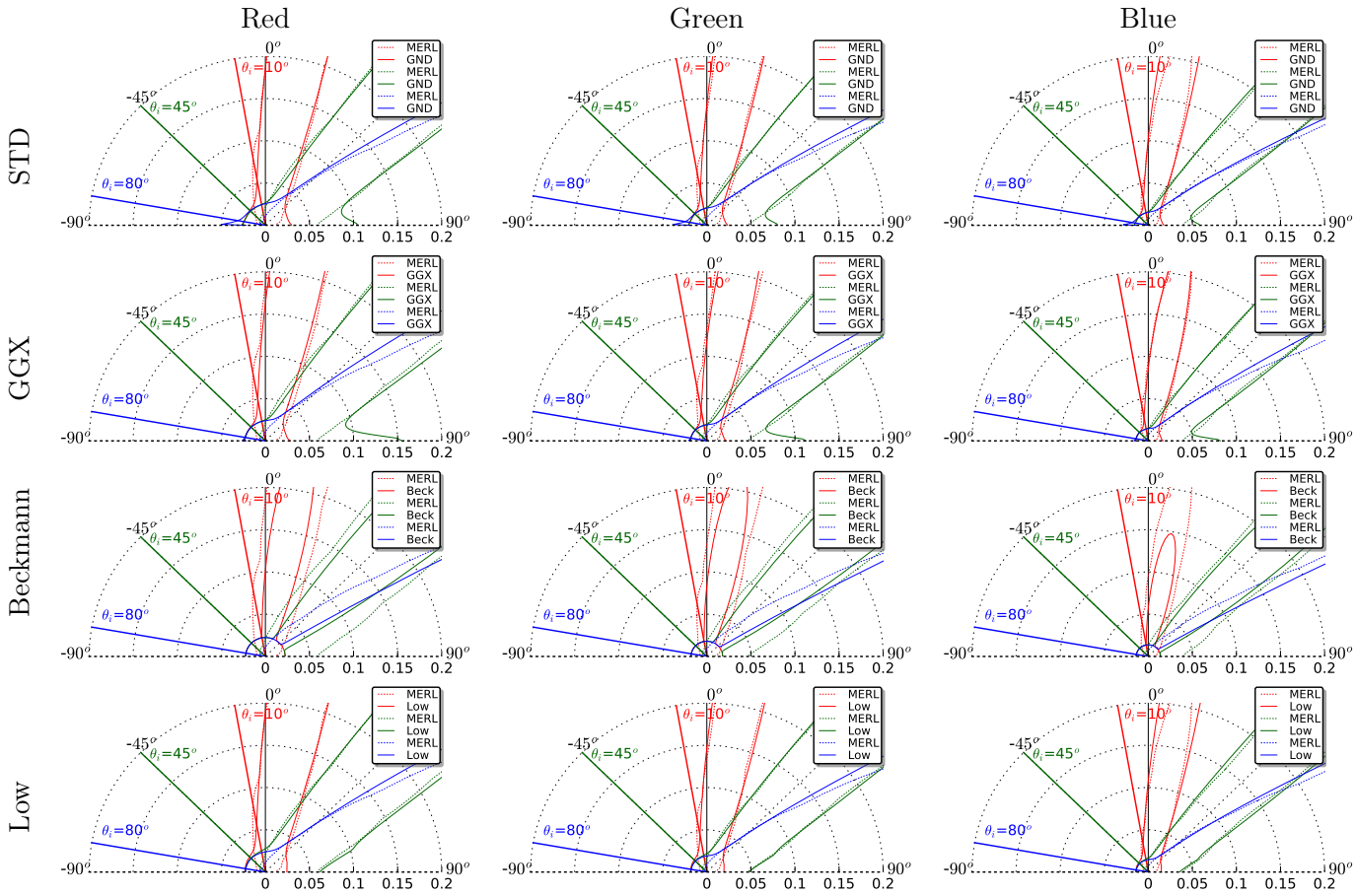


Figure 2: RMSE for all the materials from the MERL database.

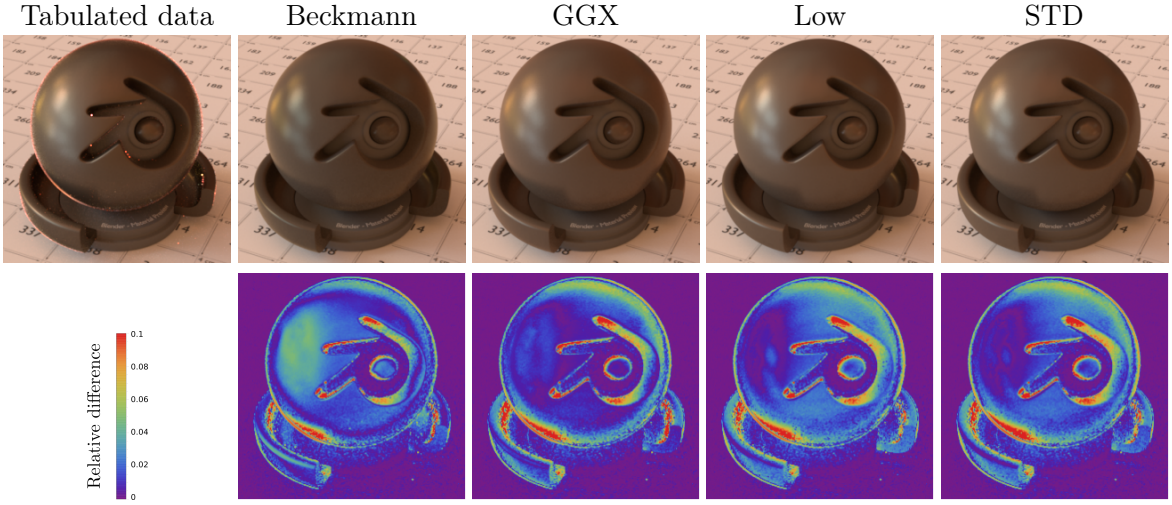
With metallic materials, the refractive index should be complex (depends on the wavelength) for more precise results. The aforementioned process is performed with a real refractive index, which explains why metallic materials have the higher fitting errors.

As expected, STD distribution always provides lower errors compared with that of Beckmann and GGX. Besides, Löw's BRDF provides a lower error for some glossy materials, but STD remains better in most cases (with our fitting process). Löw's model corresponds to a different representation, which uses Torrance-Sparrow GAF [4] (the Smith GAF cannot be derived analytically), with another class of distributions, especially designed for fitting MERL materials. Note that the fitting process highly depends on the chosen error function, and we believe that the process of fitting measured data still remains an open problem, which depends on the target application. For instance, a lower error during the fitting process does not always ensure visually better images (as illustrated for several data in the supplemental material).

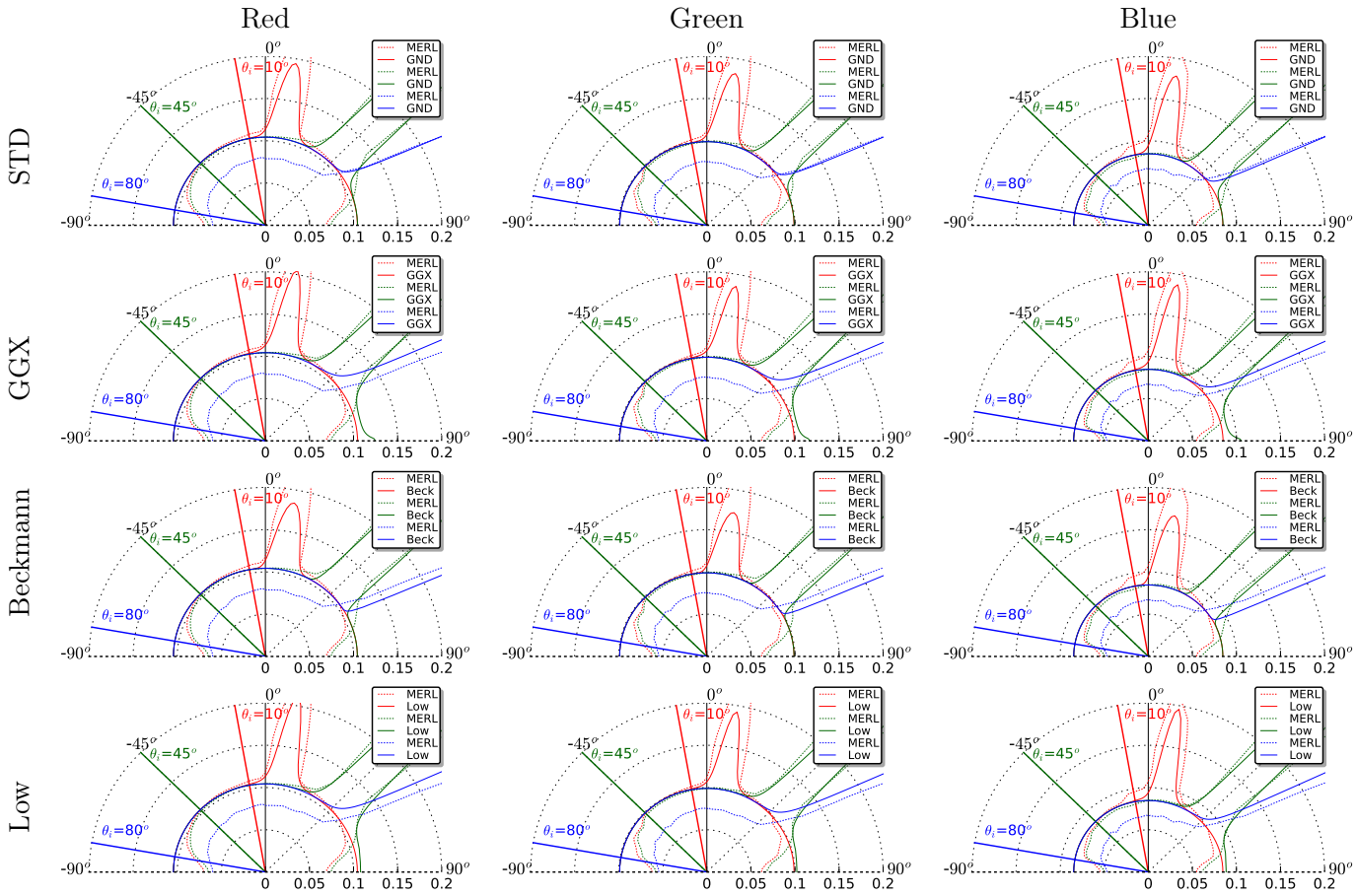
alum-bronze



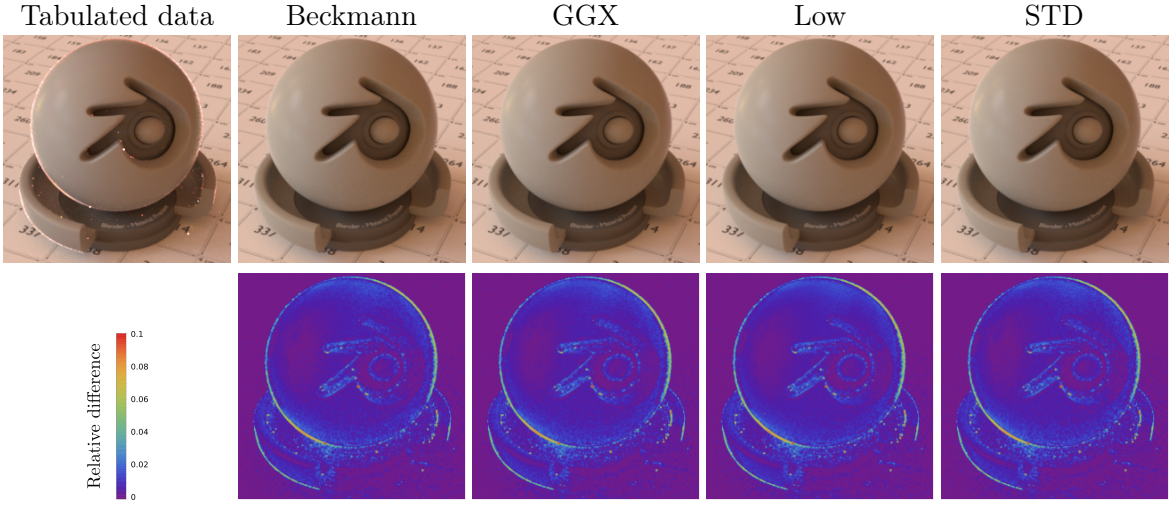
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.07-0.056-0.043	1.0-0.759-0.54	1.7533	0.0904	1.6027	0.00311
GGX	0.07-0.056-0.043	1.0-0.714-0.513	1.6003	0.0987	2.0	0.00335
Beckmann	0.07-0.056-0.043	1.0-0.824-0.542	1.3339	0.0825	$+\infty$	0.00445
	ρ	A		B	C	
Low	0.07-0.056-0.043	15.298-11.711-8.525	2.2645	442.678	1.4979	0.003



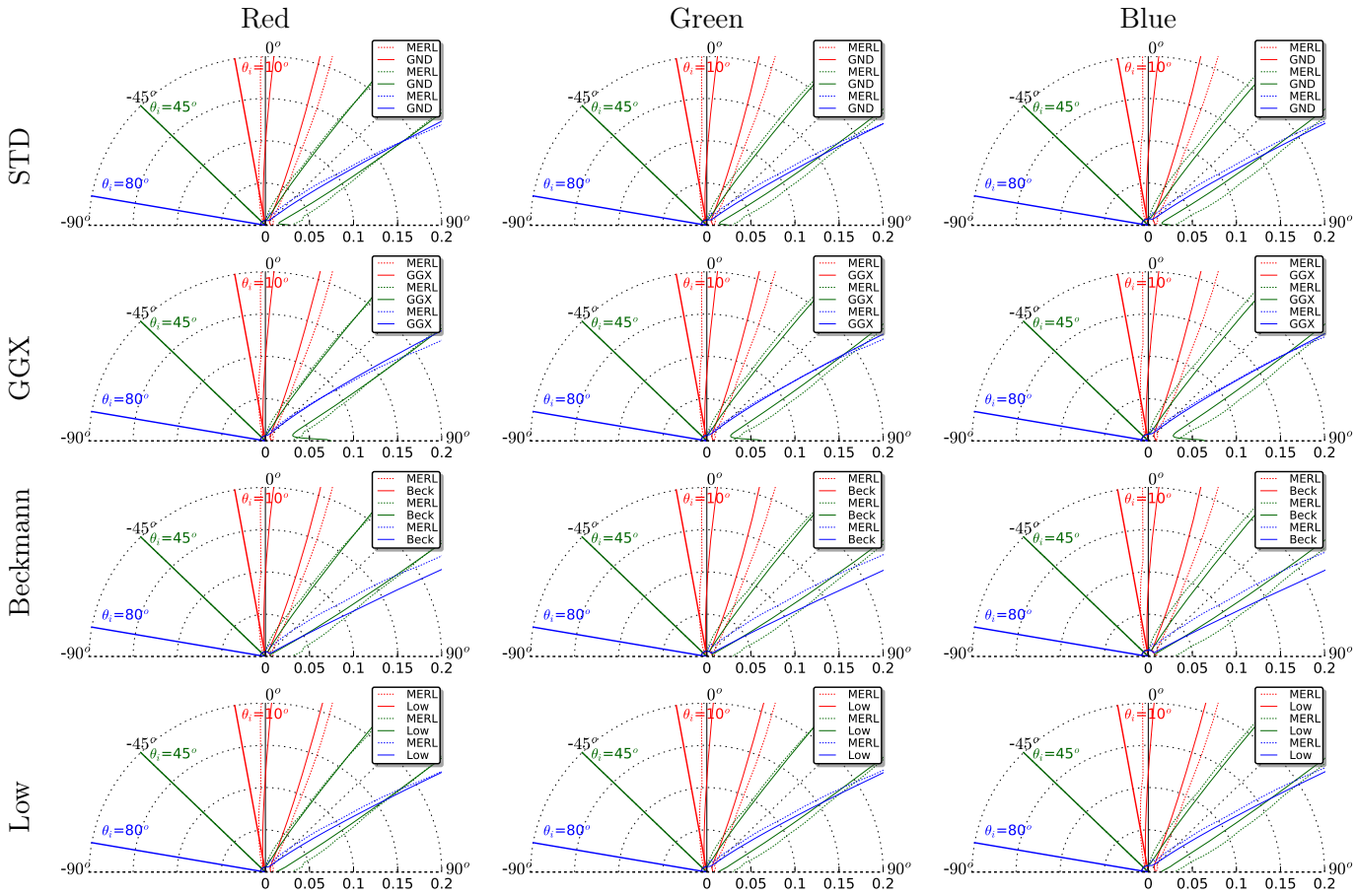
alumina-oxide



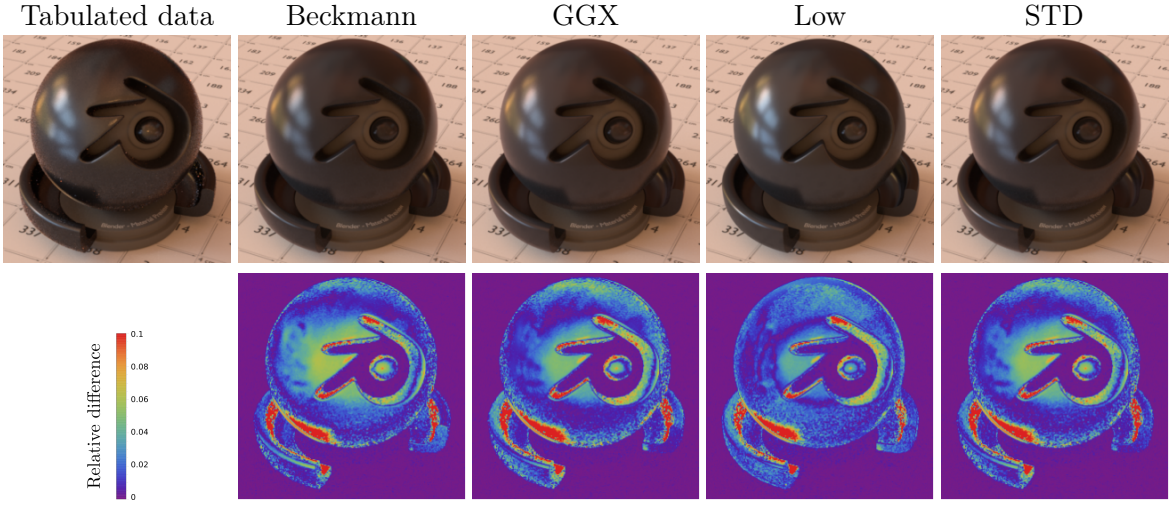
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.328-0.311-0.266	1.0-0.927-1.054	1.1284	0.0575	4.6398	0.00248
GGX	0.328-0.311-0.266	1.0-0.864-1.027	1.135	0.0571	2.0	0.00264
Beckmann	0.328-0.311-0.266	1.0-0.923-1.054	1.1257	0.0599	$+\infty$	0.0025
	ρ	A		B	C	
Low	0.328-0.311-0.266	67.117-58.561-69.652	1.15	680.288	1.9271	0.00265



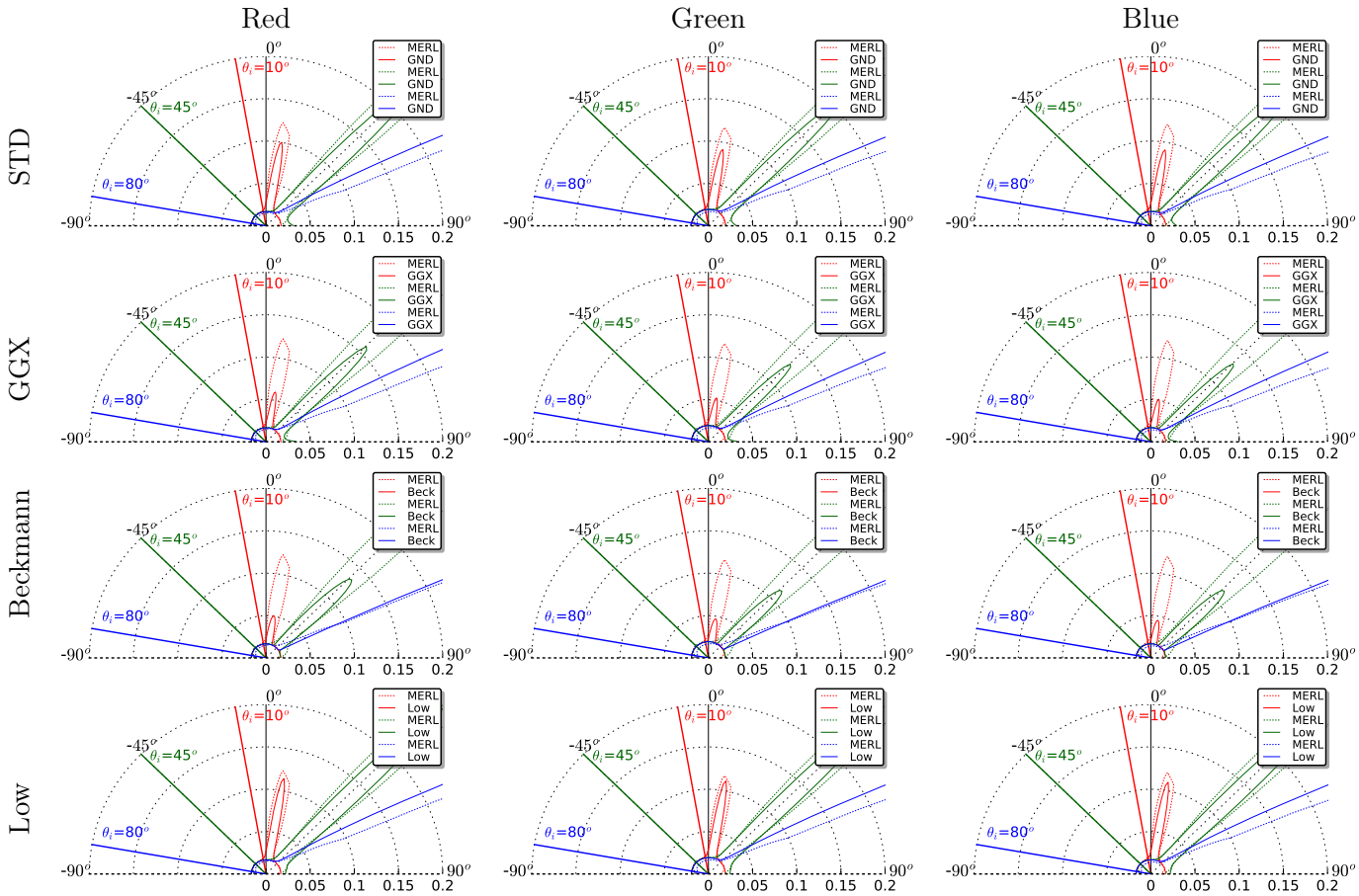
aluminium



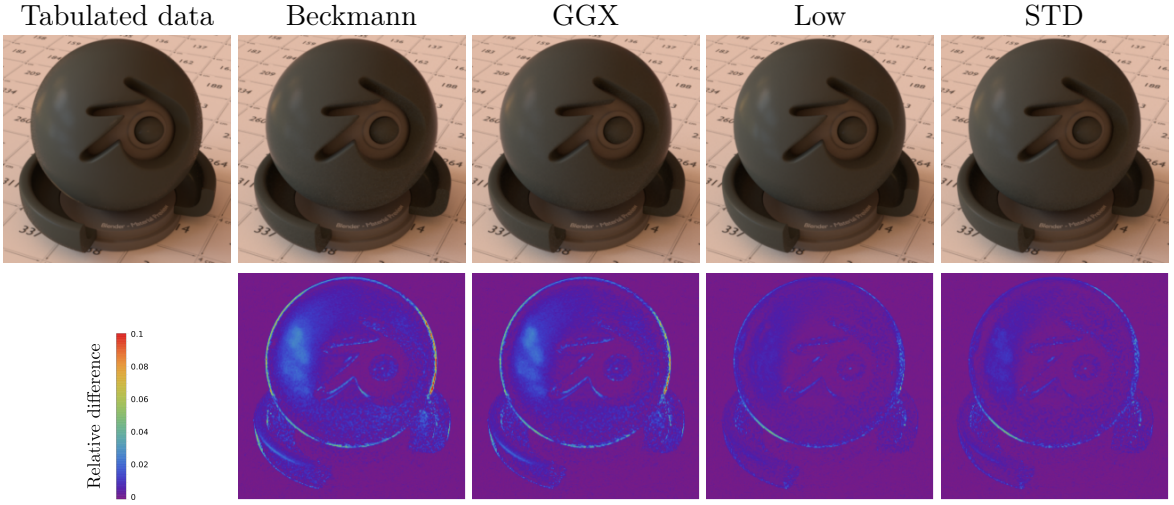
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.018-0.02-0.024	1.0-0.826-0.833	1.447	0.0636	2.7965	0.00292
GGX	0.018-0.02-0.024	1.0-0.815-0.822	1.4903	0.0602	2.0	0.00298
Beckmann	0.018-0.02-0.024	1.0-0.833-0.824	1.3942	0.0671	$+\infty$	0.00322
	ρ	A		B	C	
Low	0.018-0.02-0.024	38.732-37.449-39.438	2.0113	707.445	1.9726	0.0027



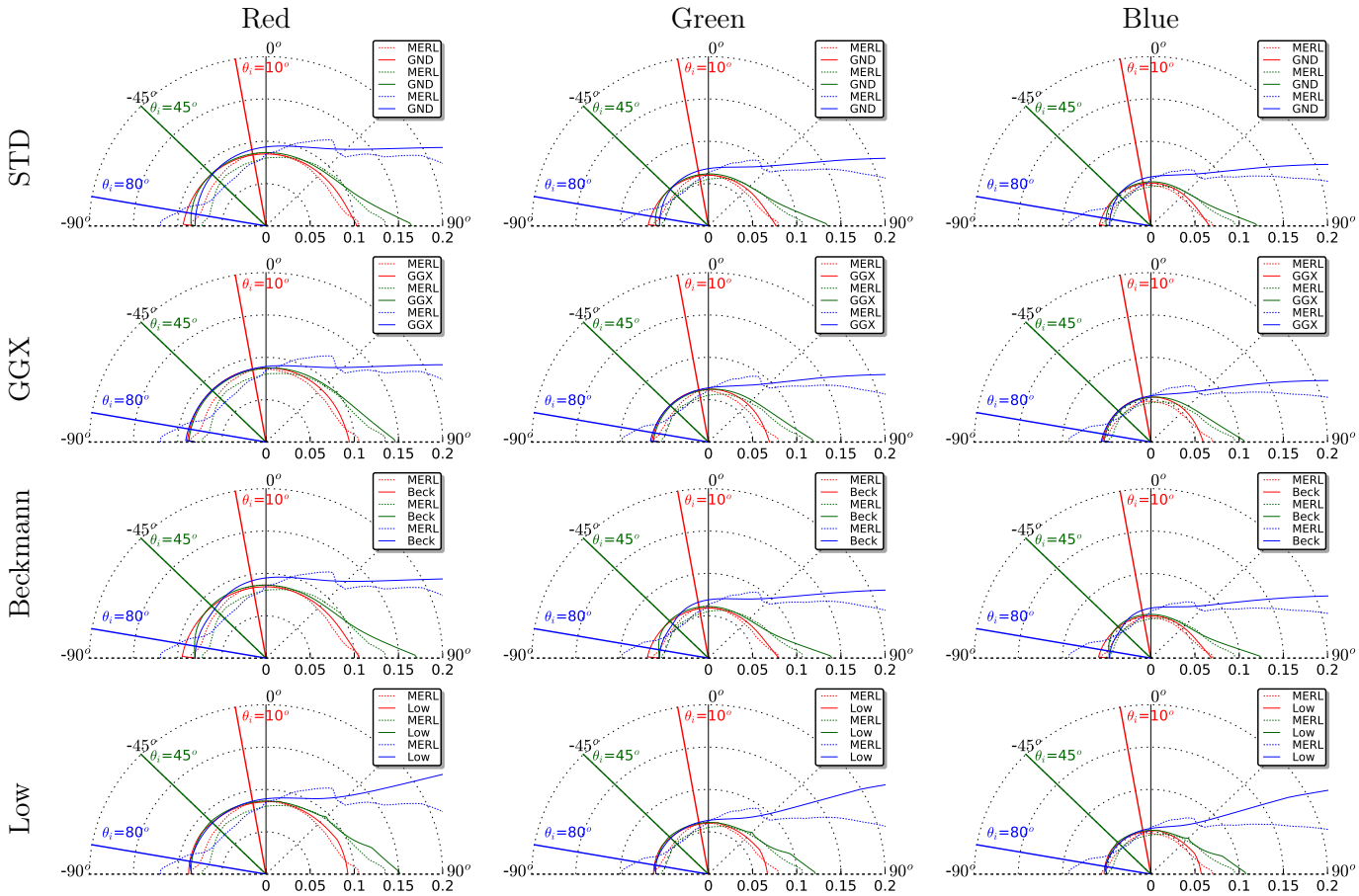
aventurnine



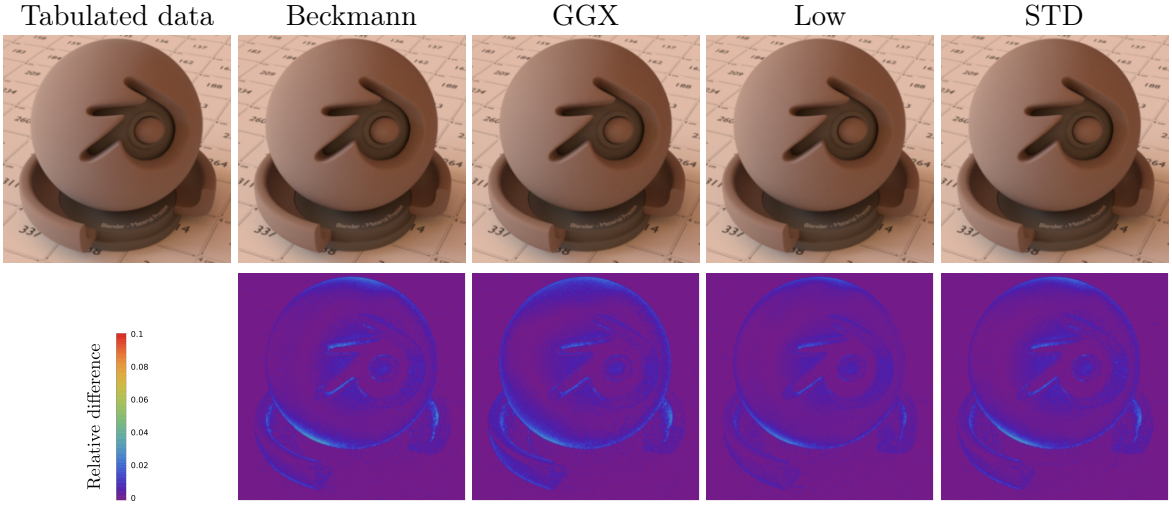
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.052-0.06-0.052	1.0-0.865-0.891	1.1539	0.0696	1.5558	0.00055
GGX	0.052-0.06-0.052	1.0-0.777-0.799	1.1004	0.0659	2.0	0.00064
Beckmann	0.052-0.06-0.052	1.0-0.814-0.836	1.0847	0.0632	$+\infty$	0.00065
	ρ	A		B	C	
Low	0.052-0.06-0.052	18.053-17.073-17.231	1.2953	907.987	1.5397	0.00055



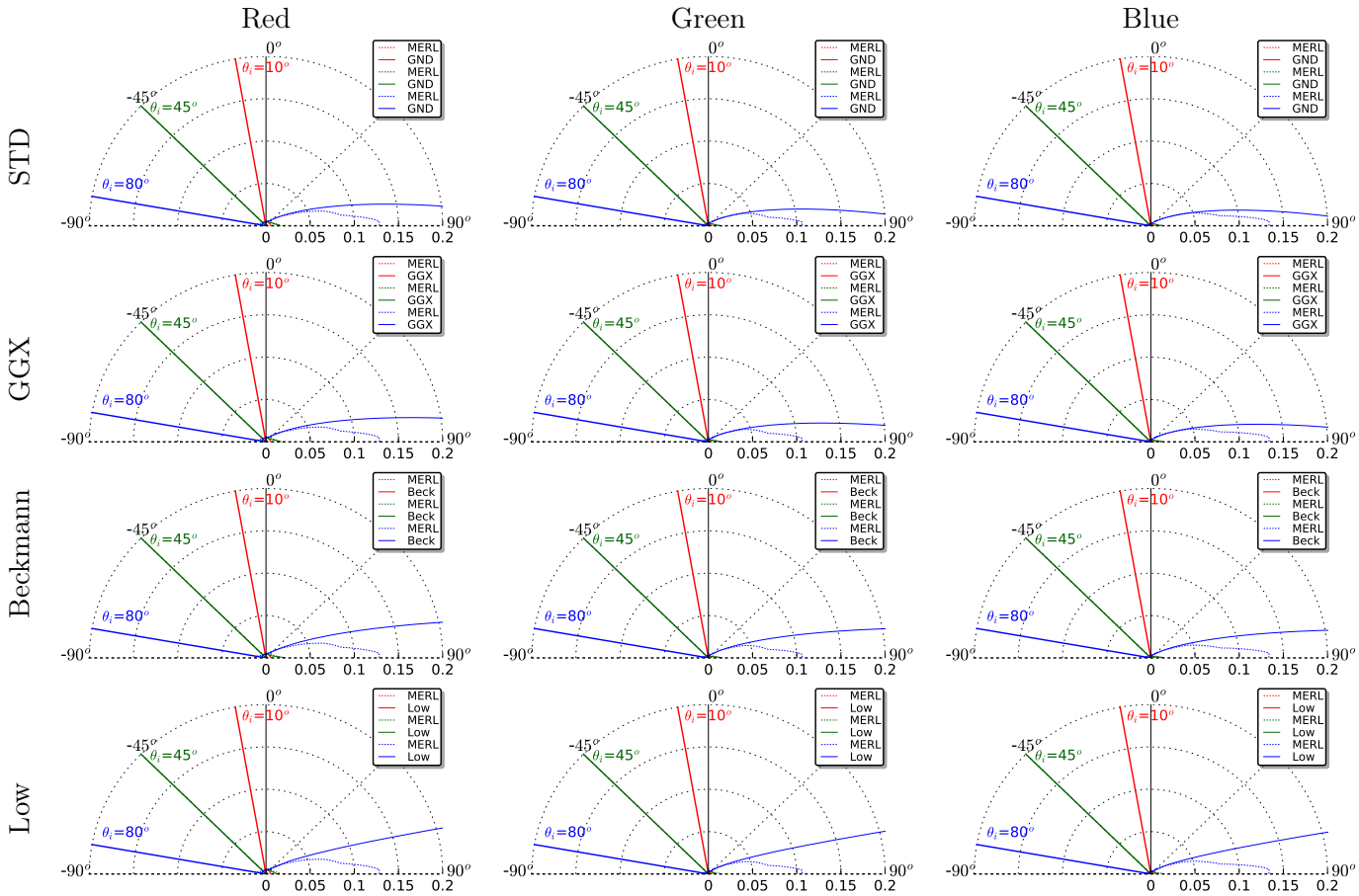
beige-fabric



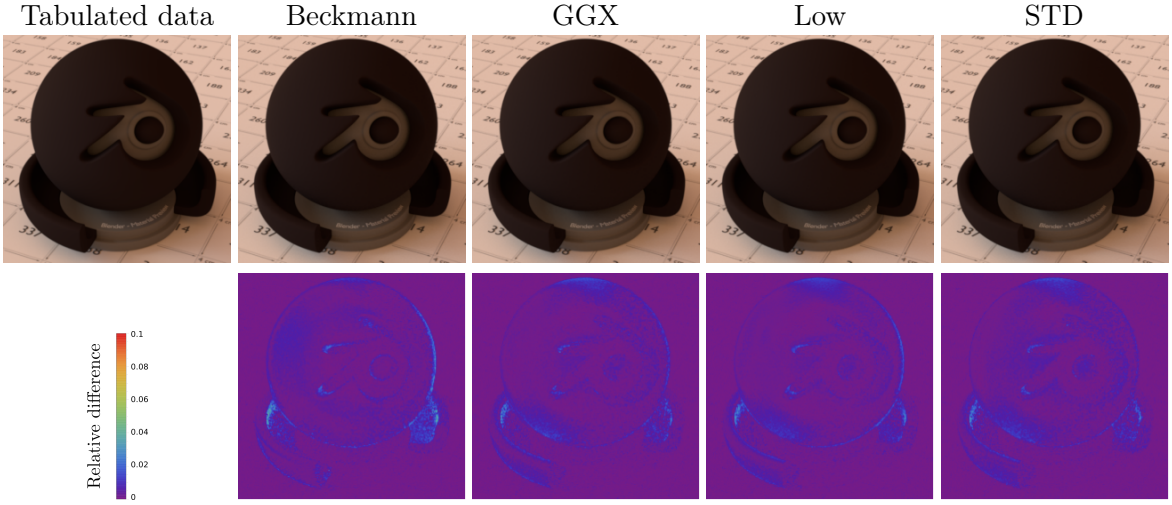
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.252-0.174-0.146	1.0-0.942-0.873	1.4876	0.8074	4.2108	0.00152
GGX	0.252-0.174-0.146	1.0-0.964-0.898	1.5256	0.6845	2.0	0.0017
Beckmann	0.252-0.174-0.146	1.0-0.932-0.864	1.4516	0.8364	$+\infty$	0.00156
	ρ	A		B	C	
Low	0.252-0.174-0.146	0.302-0.279-0.259	1.7163	25972.4	0.0597	0.00145



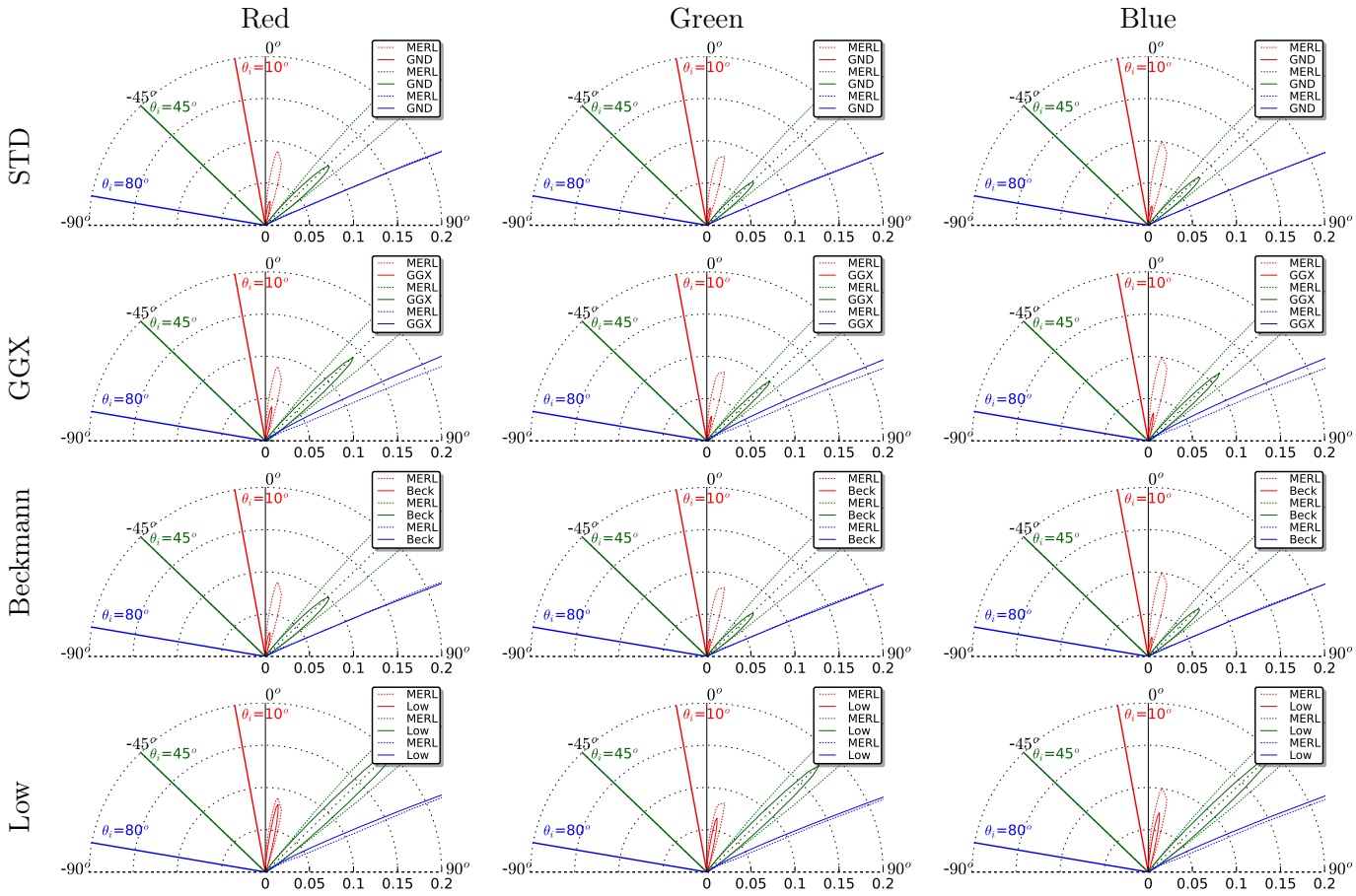
black-fabric



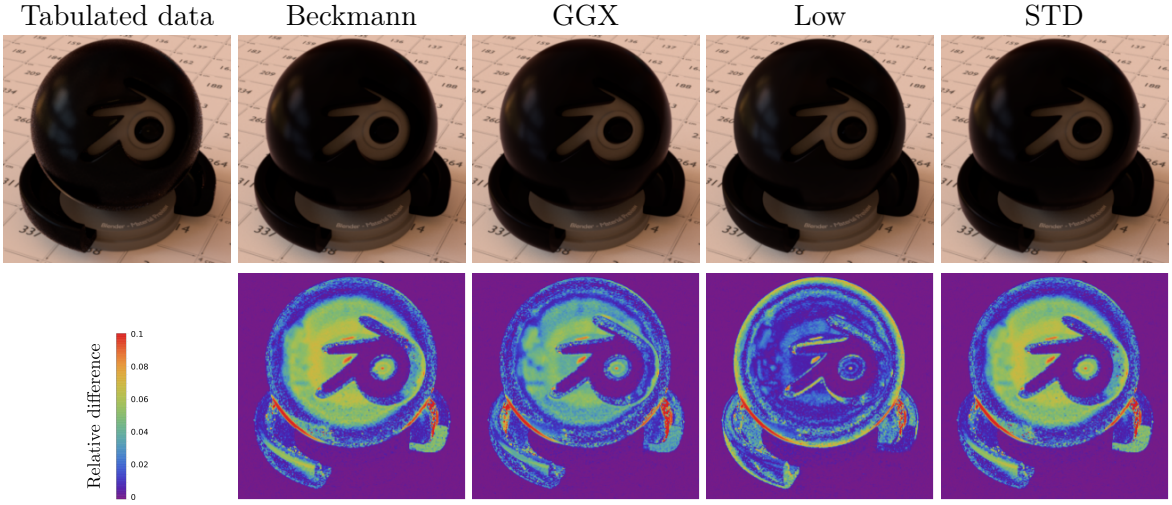
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.014-0.008-0.008	1.0-0.78-0.731	1.1077	0.6576	1.8068	9e-05
GGX	0.014-0.008-0.008	1.0-0.781-0.731	1.0935	0.6912	2.0	0.0001
Beckmann	0.014-0.008-0.008	1.0-0.76-0.711	1.0601	0.6924	$+\infty$	0.0001
	ρ	A		B	C	
Low	0.014-0.008-0.008	0.251-0.198-0.184	1.3193	18022.3	0.2758	0.0001



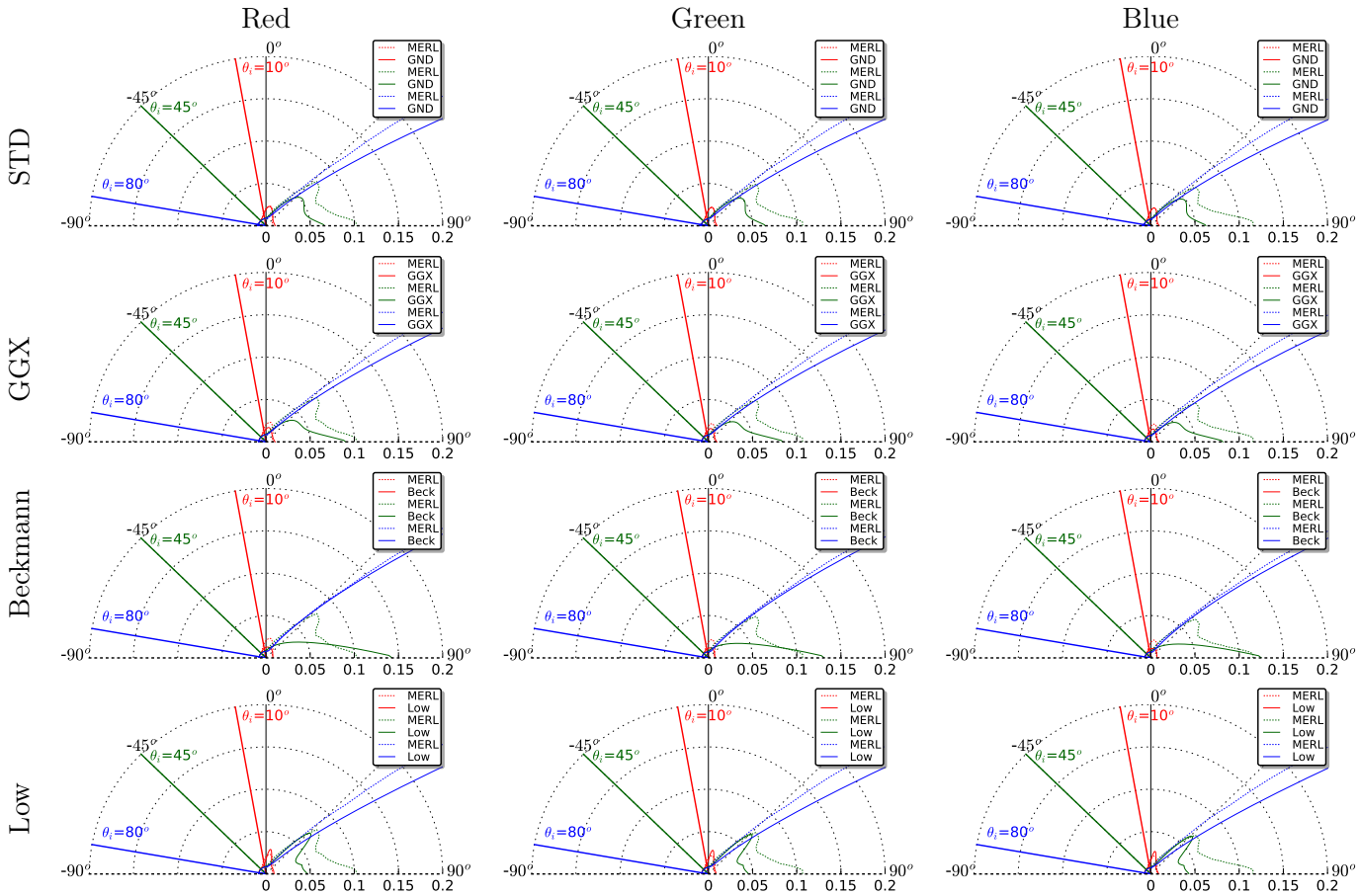
black-obsidian



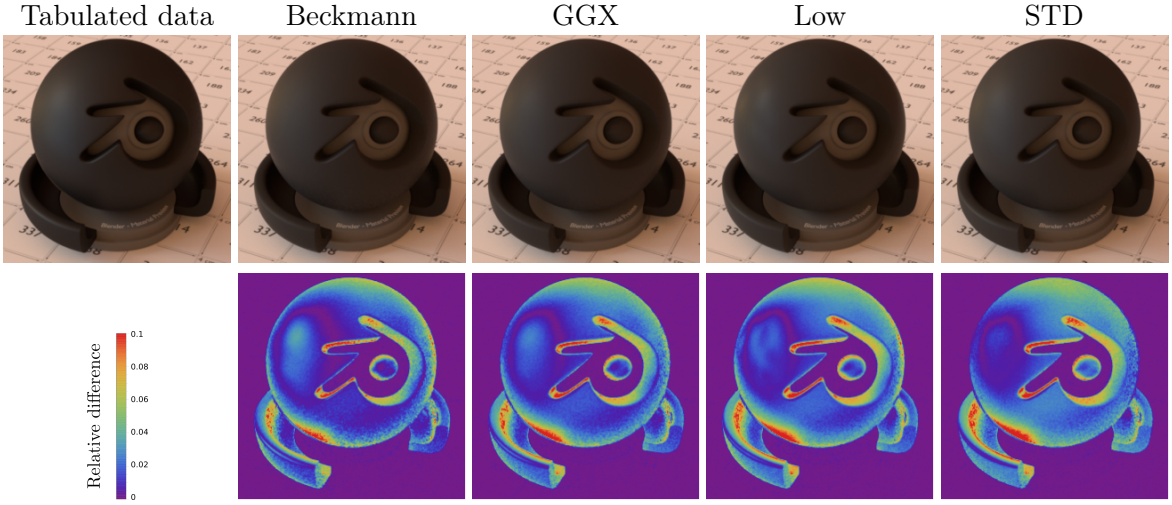
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.0-0.0-0.0	1.0-0.733-0.809	1.0696	0.057	49.9948	0.00024
GGX	0.0-0.0-0.0	1.0-0.718-0.811	1.0796	0.0541	2.0	0.00033
Beckmann	0.0-0.0-0.0	1.0-0.731-0.806	1.0691	0.0567	$+\infty$	0.00024
	ρ	A		B	C	
Low	0.0-0.0-0.0	16.262-12.967-14.272	1.2815	760.706	1.9932	0.00031



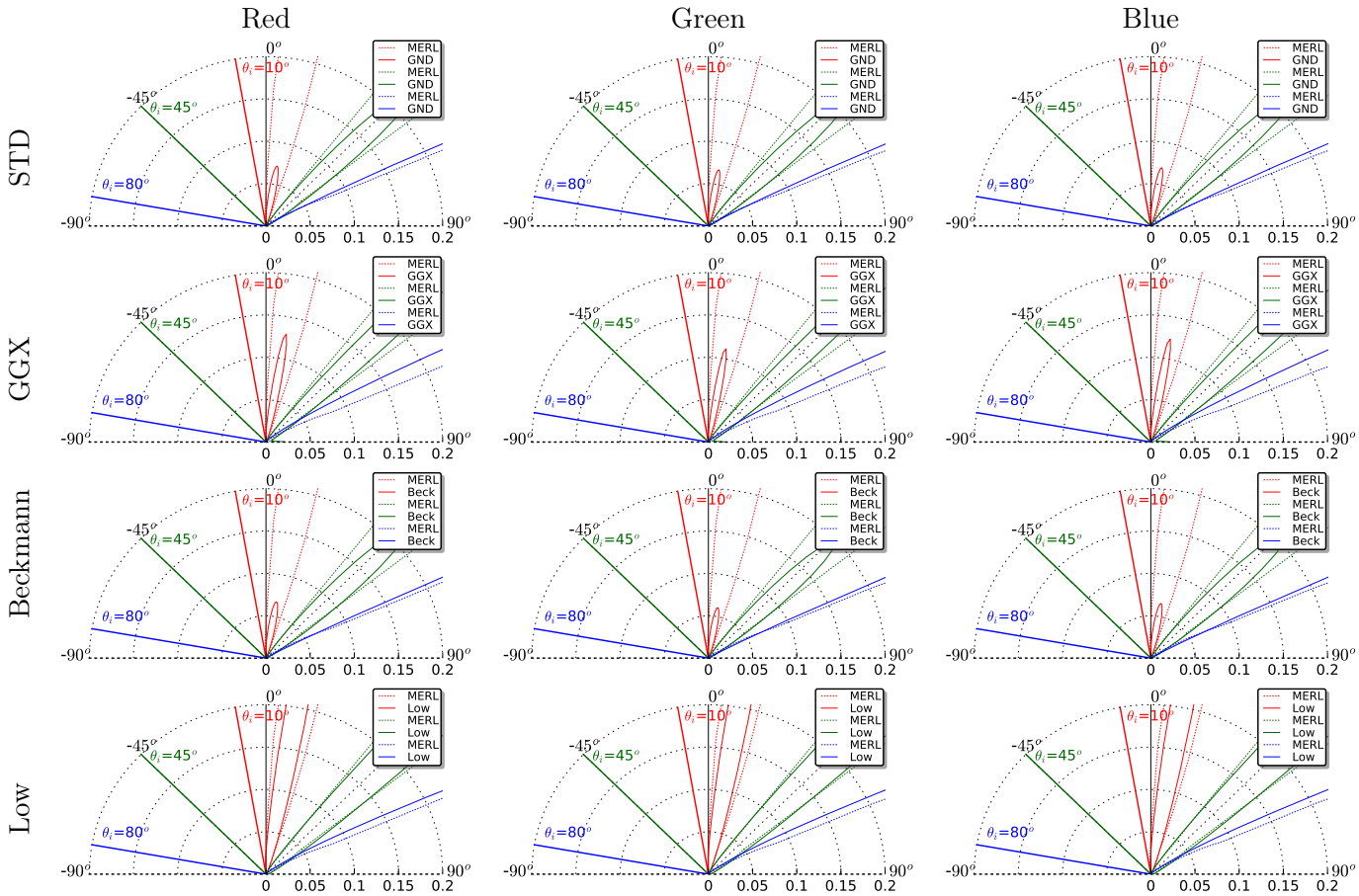
black-oxidized-steel



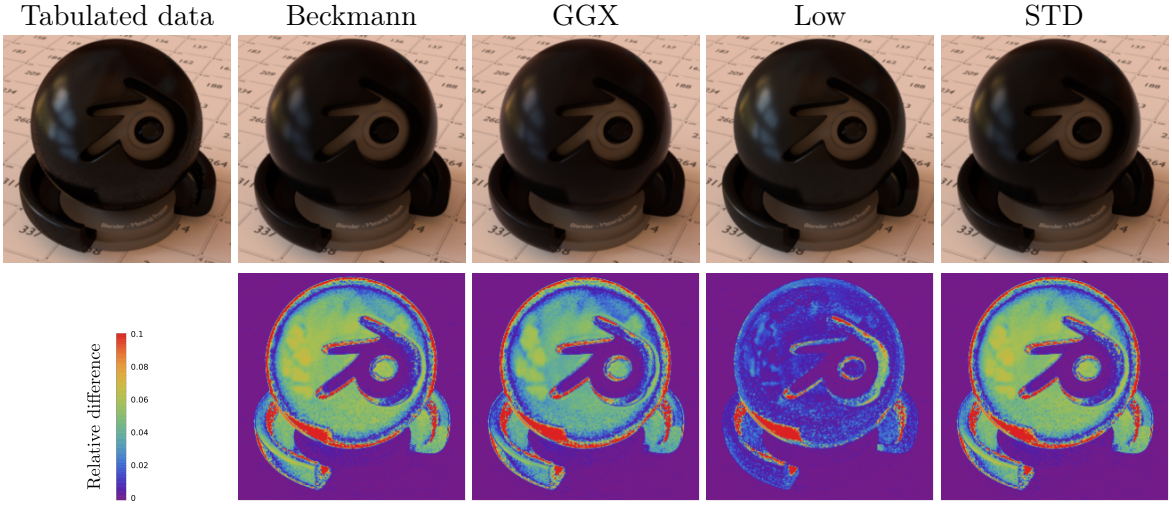
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.024-0.023-0.021	1.0-0.977-0.951	1.2332	0.2389	1.7032	0.0009
GGX	0.024-0.023-0.021	1.0-0.936-0.909	1.181	0.2452	2.0	0.00094
Beckmann	0.024-0.023-0.021	1.0-0.919-0.877	1.1507	0.2789	$+\infty$	0.00099
	ρ	A		B	C	
Low	0.024-0.023-0.021	4.647-4.548-4.35	1.2706	333.239	0.9608	0.00112



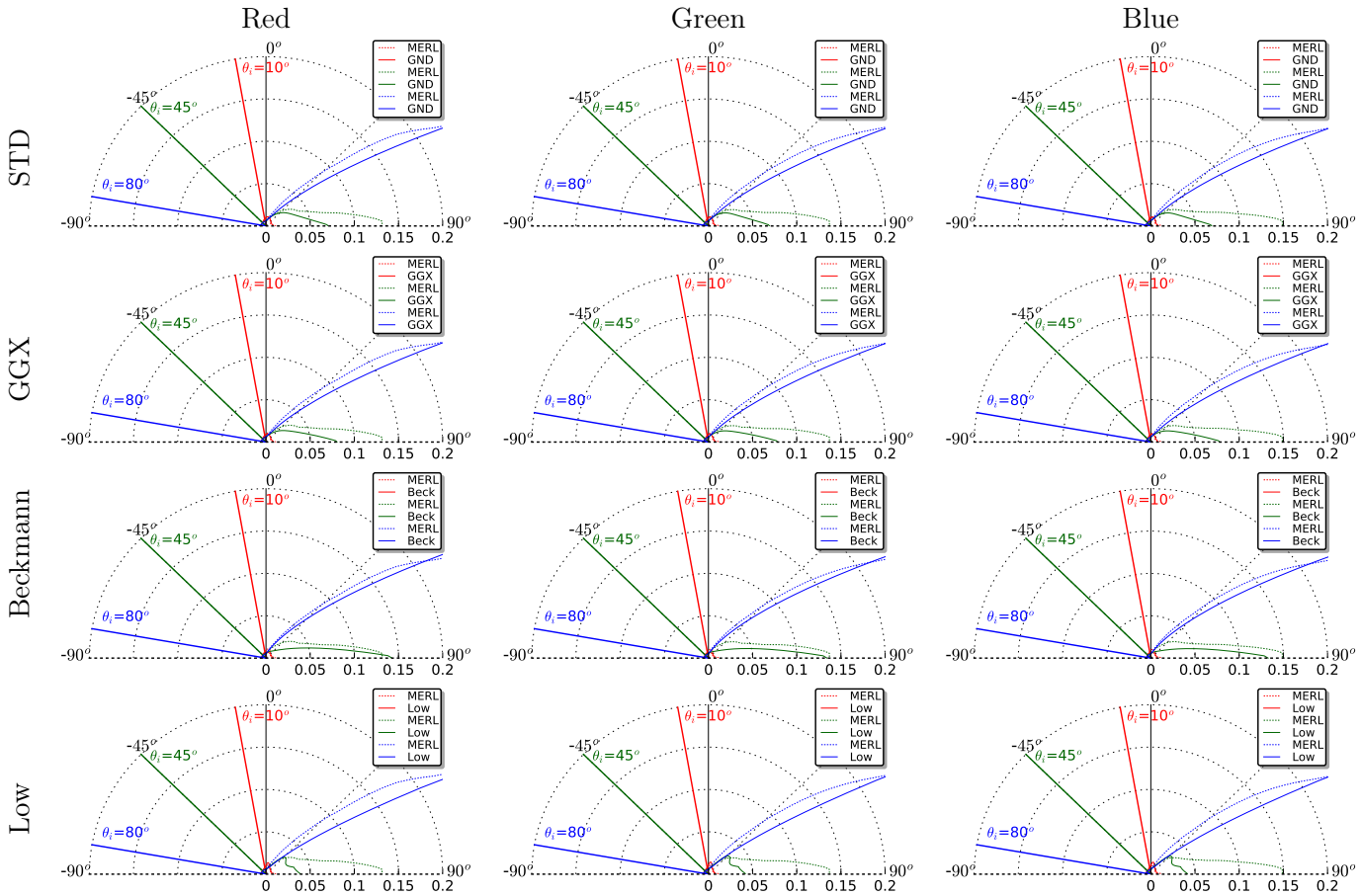
black-phenolic



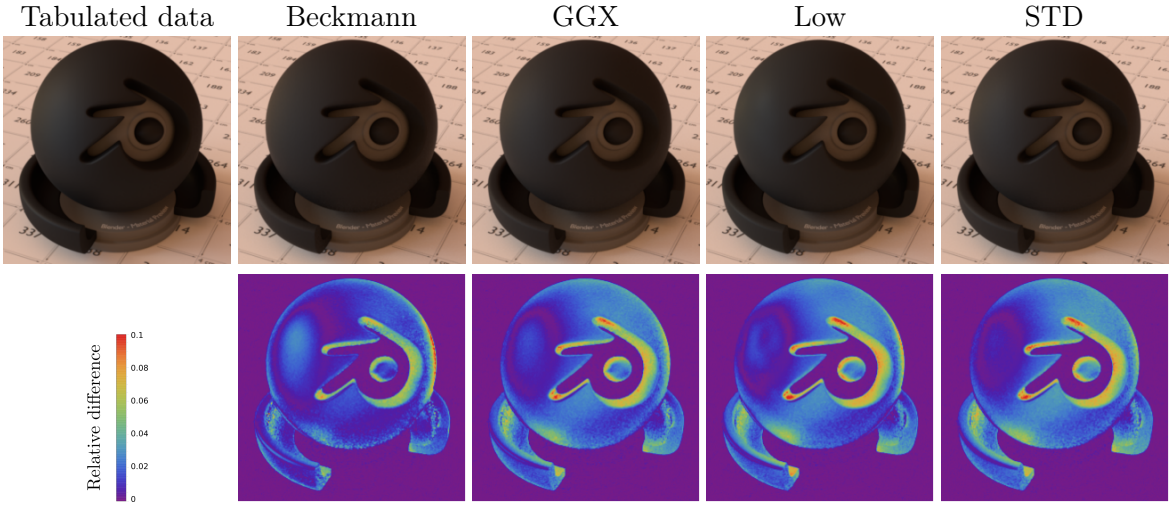
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.002-0.002-0.002	1.0-0.937-0.972	1.1235	0.0624	11.023	0.00099
GGX	0.002-0.002-0.002	1.0-0.864-0.954	1.1445	0.0537	2.0	0.00103
Beckmann	0.002-0.002-0.002	1.0-0.897-0.97	1.1238	0.0646	$+\infty$	0.00099
	ρ	A		B	C	
Low	0.002-0.002-0.002	20.309-21.198-21.763	1.6304	815.805	1.9918	0.00076



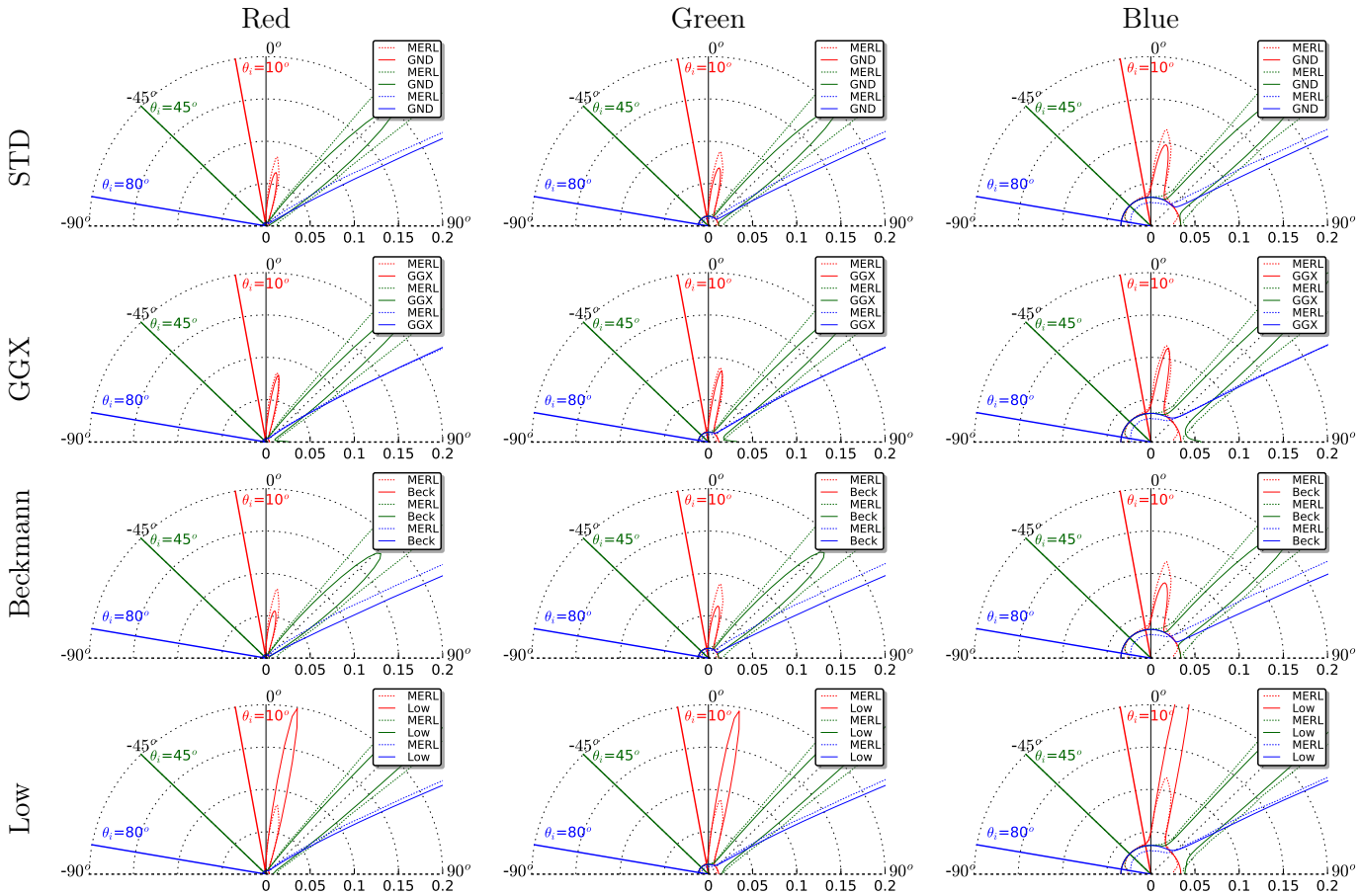
black-soft-plastic



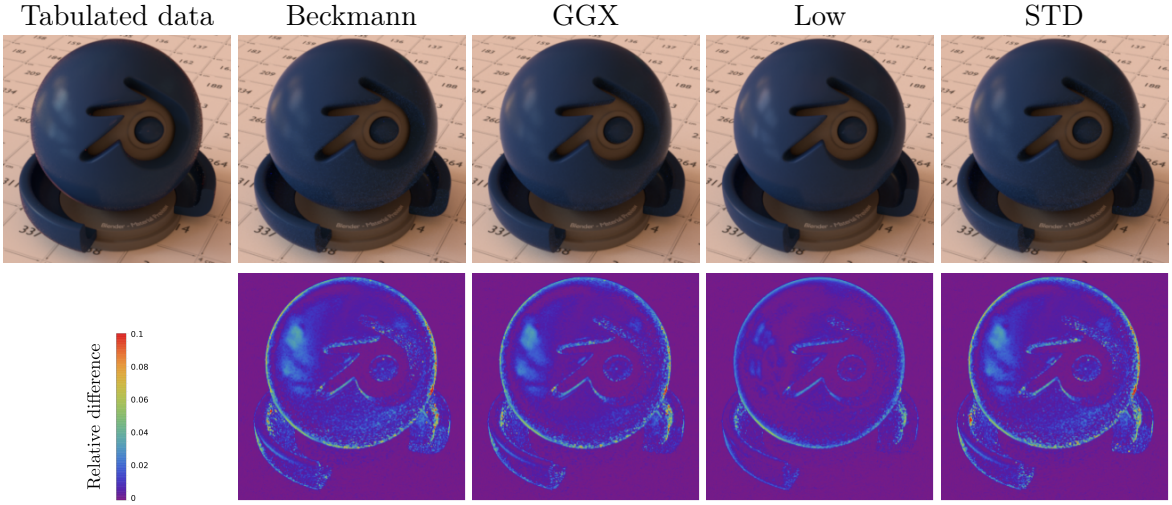
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.015-0.014-0.014	1.0-0.985-0.98	1.2165	0.347	1.8313	0.00066
GGX	0.015-0.014-0.014	1.0-0.976-0.97	1.1957	0.364	2.0	0.00067
Beckmann	0.015-0.014-0.014	1.0-0.94-0.928	1.1514	0.4064	$+\infty$	0.00072
	ρ	A		B	C	
Low	0.015-0.014-0.014	1.069-1.172-1.155	1.385	196.799	0.7491	0.00077



blue-acrylic



	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.012-0.036-0.106	1.0-0.965-1.053	1.1219	0.0669	5.5606	0.00077
GGX	0.012-0.036-0.106	1.0-0.968-1.031	1.1303	0.0633	2.0	0.00082
Beckmann	0.012-0.036-0.106	1.0-0.965-1.07	1.1153	0.068	$+\infty$	0.0008
	ρ	A		B	C	
Low	0.012-0.036-0.106	29.482-27.854-34.37	1.3315	944.619	1.7367	0.00079



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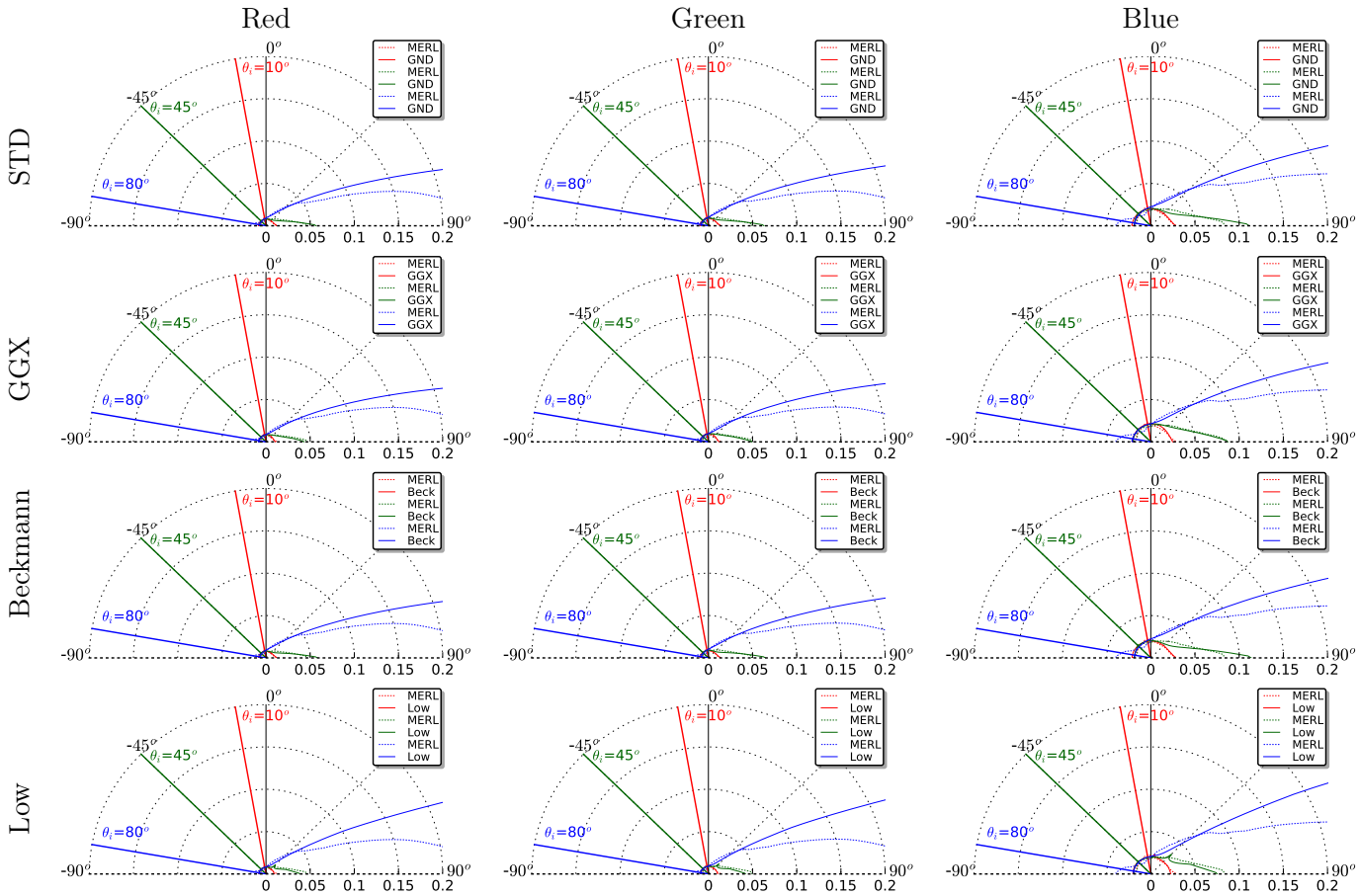
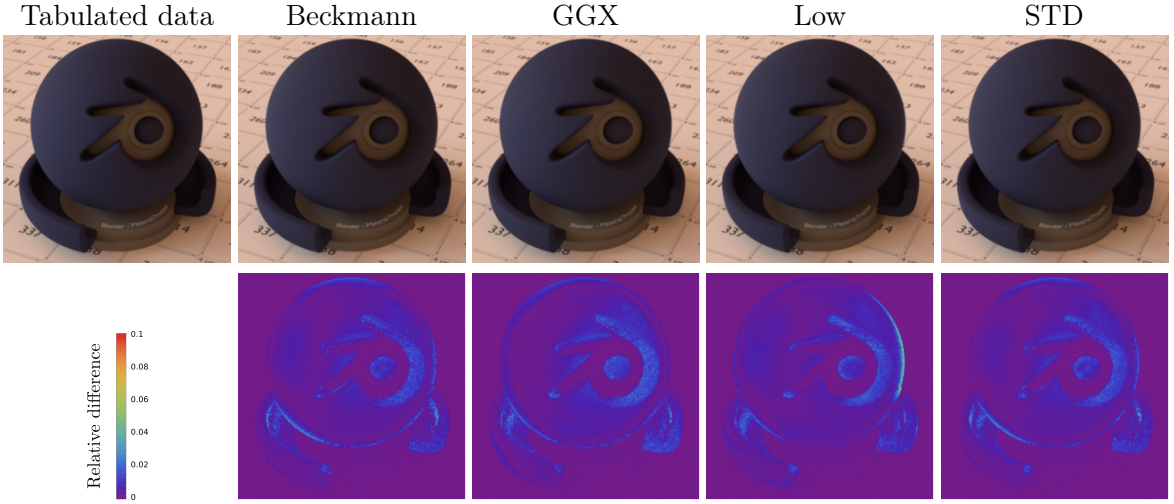
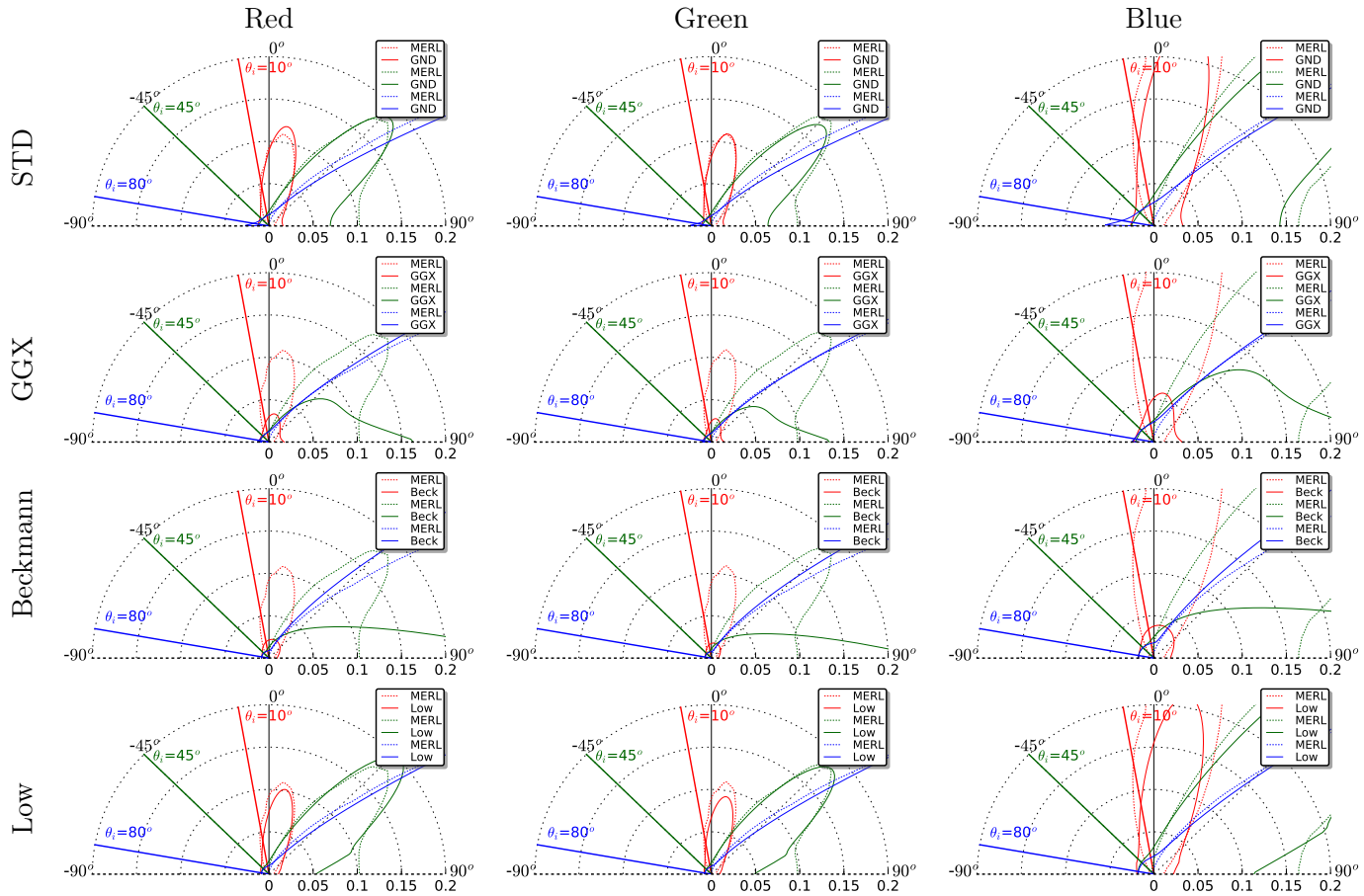


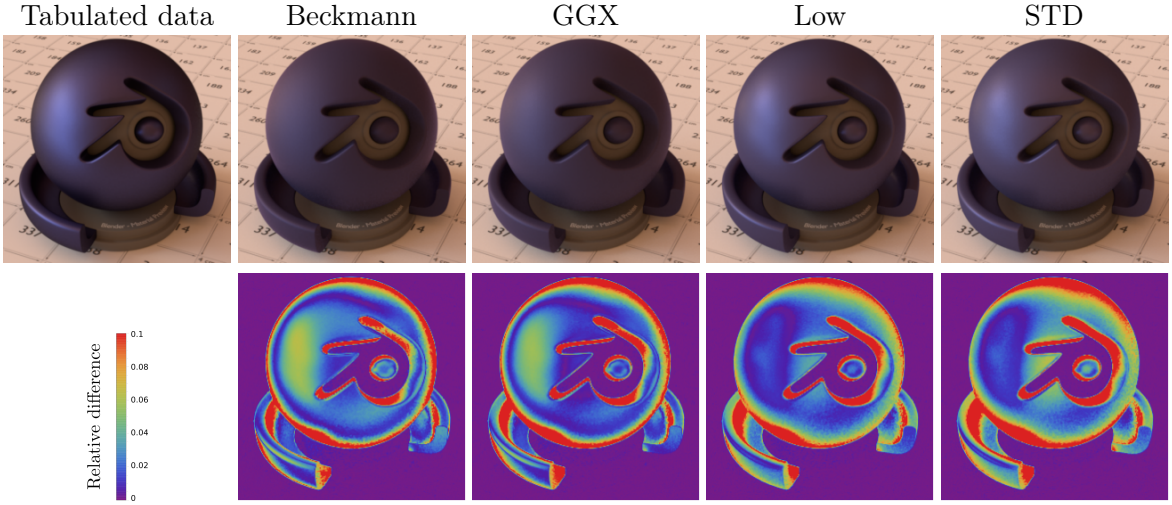
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.023-0.025-0.058	1.0-1.111-1.88	1.1439	0.6791	8.3109	0.00049
GGX	0.023-0.025-0.058	1.0-1.137-1.914	1.1778	0.5942	2.0	0.00052
Beckmann	0.023-0.025-0.058	1.0-1.106-1.864	1.1389	0.6858	$+\infty$	0.00049
	ρ	A		B	C	
Low	0.023-0.025-0.058	0.983-1.072-1.788	1.2057	90226.6	0.1734	0.00054



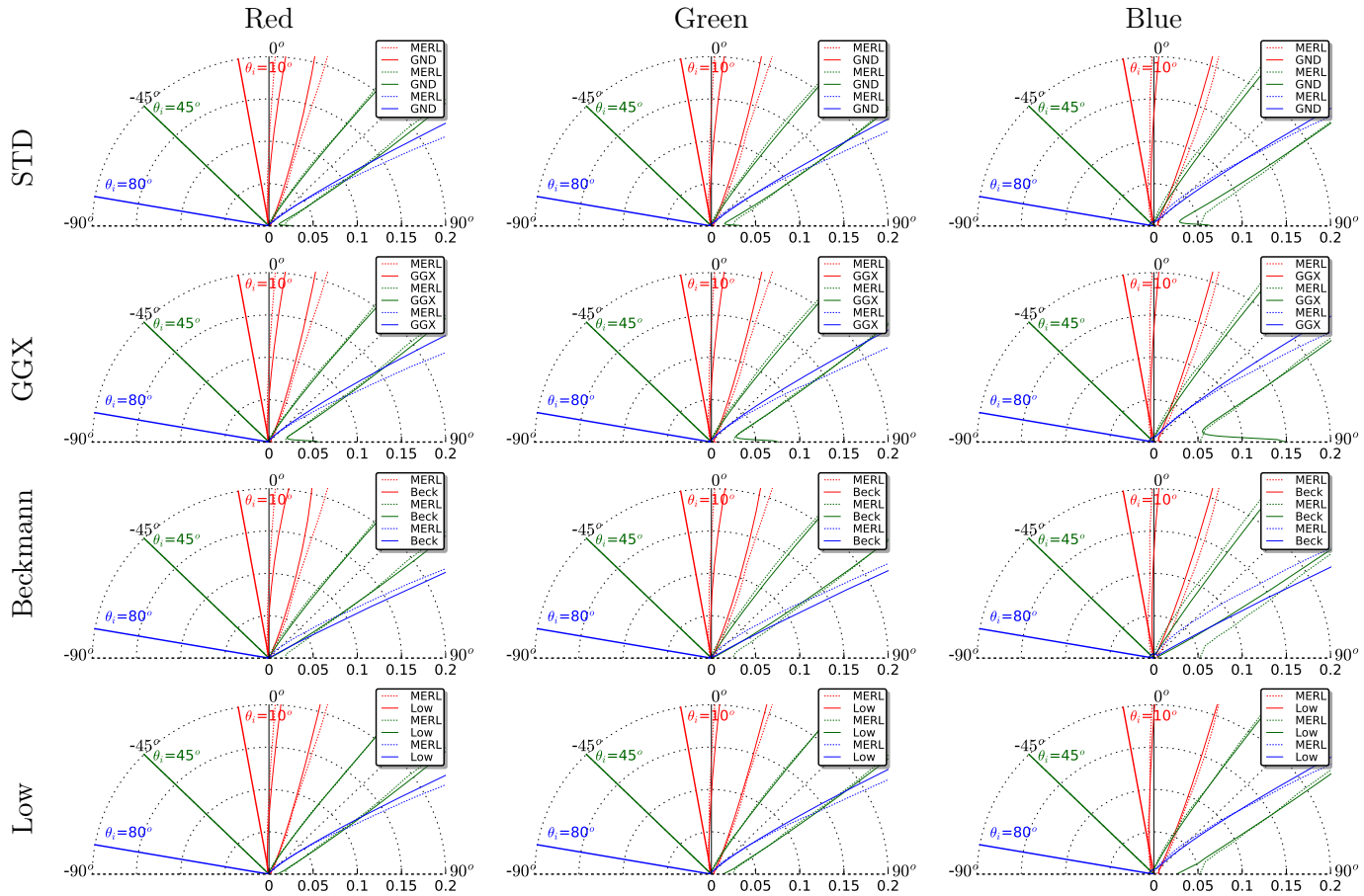
blue-metallic-paint



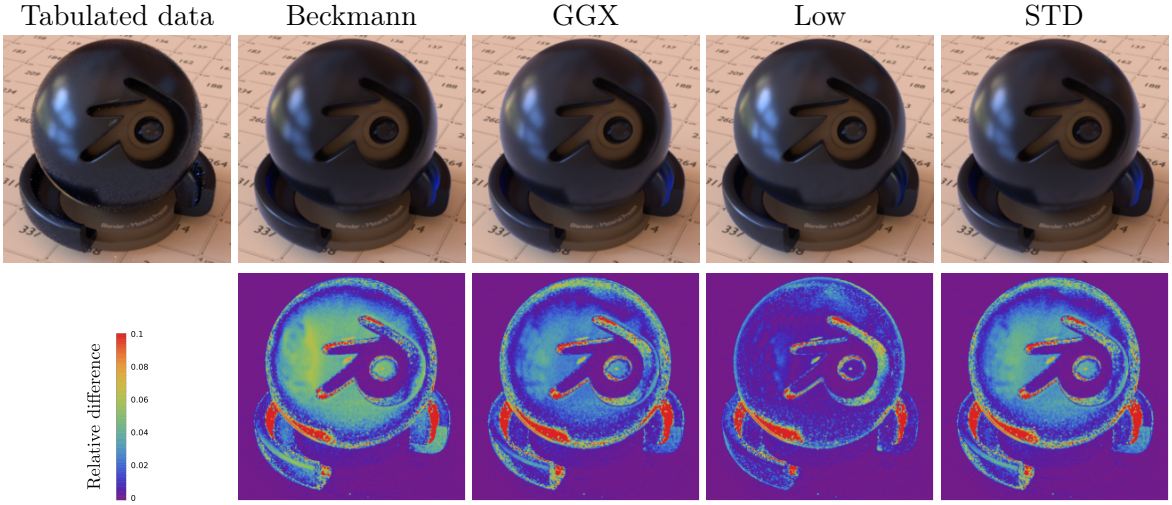
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.026-0.023-0.055	1.0-0.929-2.052	1.7637	0.2308	1.5859	0.00317
GGX	0.026-0.023-0.055	1.0-0.815-1.62	1.3887	0.2924	2.0	0.00381
Beckmann	0.026-0.023-0.055	1.0-0.767-1.554	1.3048	0.3198	$+\infty$	0.00384
	ρ	A		B	C	
Low	0.026-0.023-0.055	1.402-1.288-2.954	2.6361	56.1532	1.753	0.00291



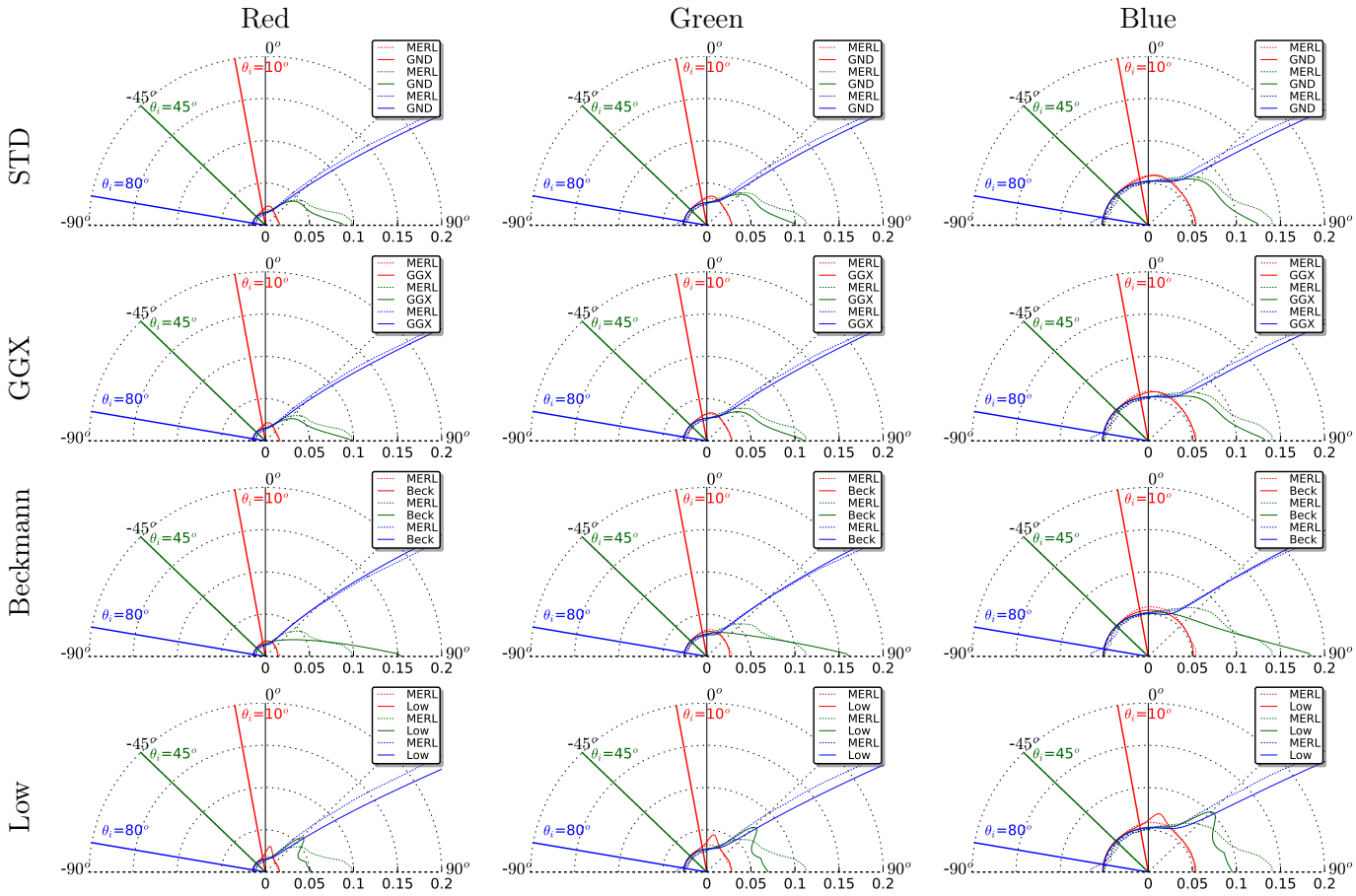
blue-metallic-paint2



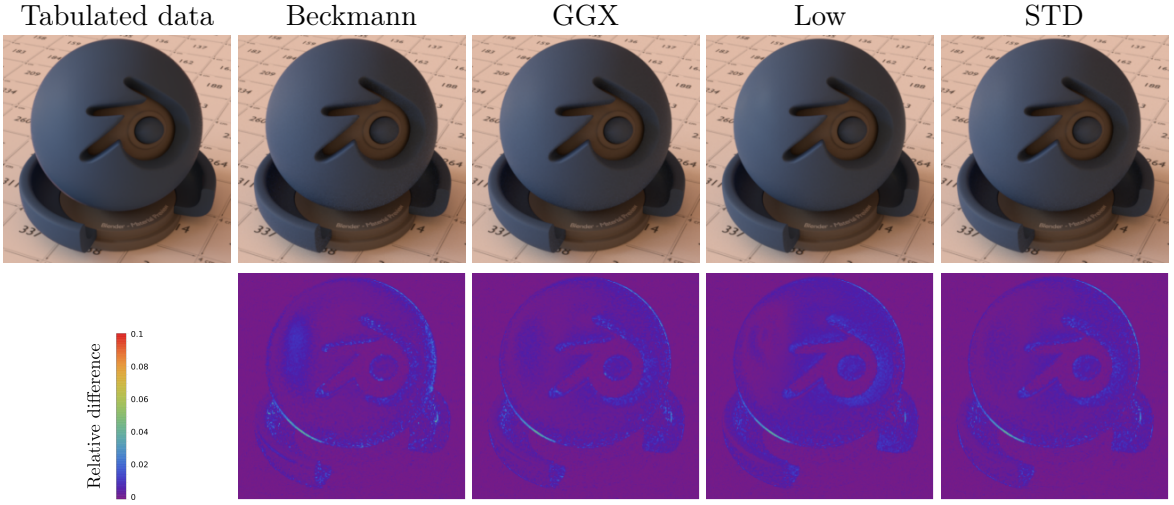
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.006-0.008-0.016	1.0-1.339-2.591	1.3108	0.0651	2.6131	0.00305
GGX	0.006-0.008-0.016	1.0-1.352-2.67	1.3288	0.0627	2.0	0.00302
Beckmann	0.006-0.008-0.016	1.0-1.343-2.59	1.2666	0.0671	$+\infty$	0.00334
	ρ	A		B	C	
Low	0.006-0.008-0.016	34.937-50.84-99.999	1.7145	759.769	1.8457	0.00235



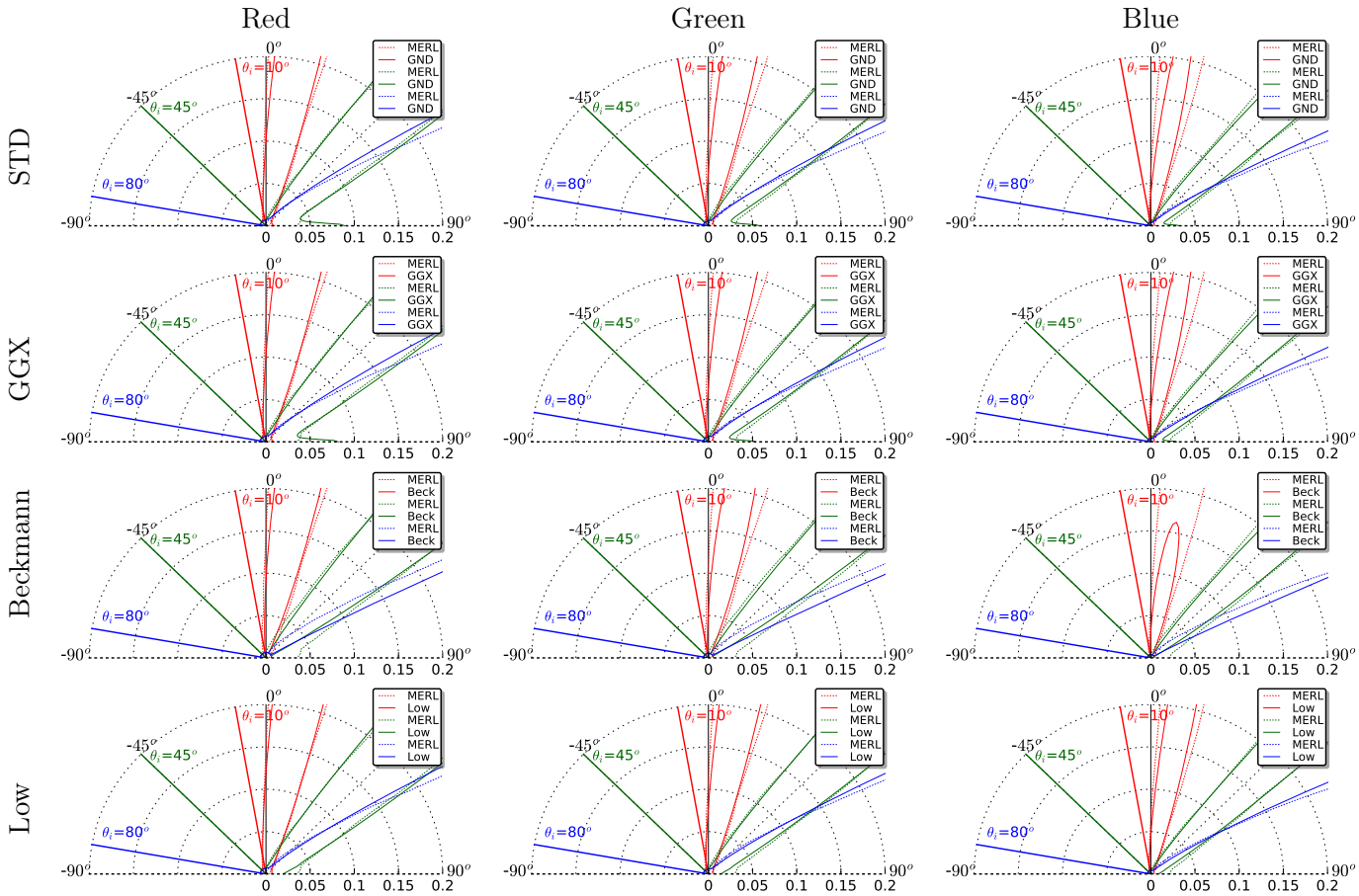
blue-rubber



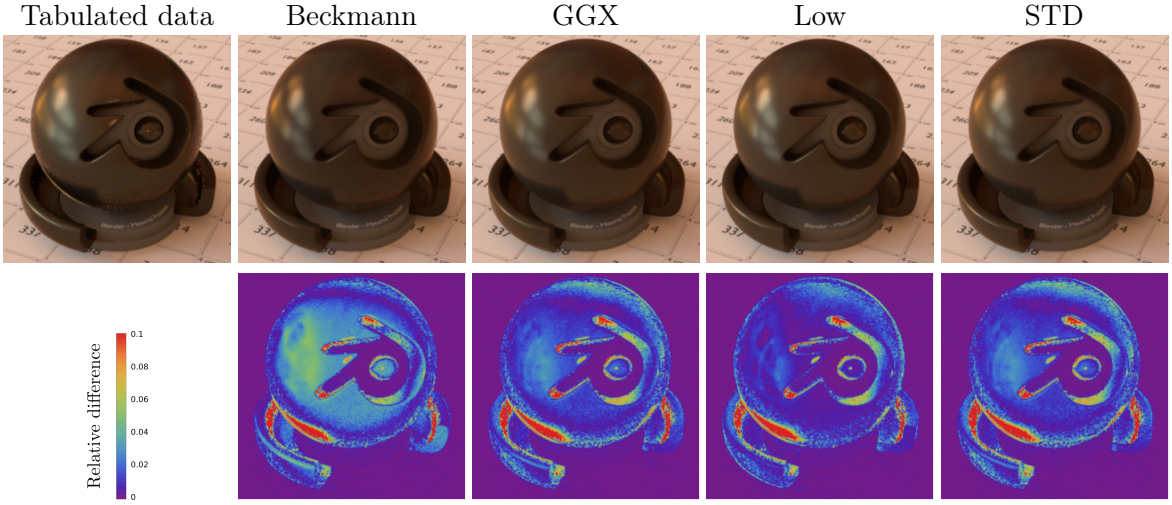
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.044-0.081-0.16	1.0-1.004-0.983	1.1976	0.2668	1.8716	0.0005
GGX	0.044-0.081-0.16	1.0-1.004-0.981	1.186	0.2724	2.0	0.00052
Beckmann	0.044-0.081-0.16	1.0-0.971-0.959	1.1474	0.2961	$+\infty$	0.00065
	ρ	A		B	C	
Low	0.044-0.081-0.16	2.12-2.388-2.405	1.3684	293.152	0.8265	0.00072



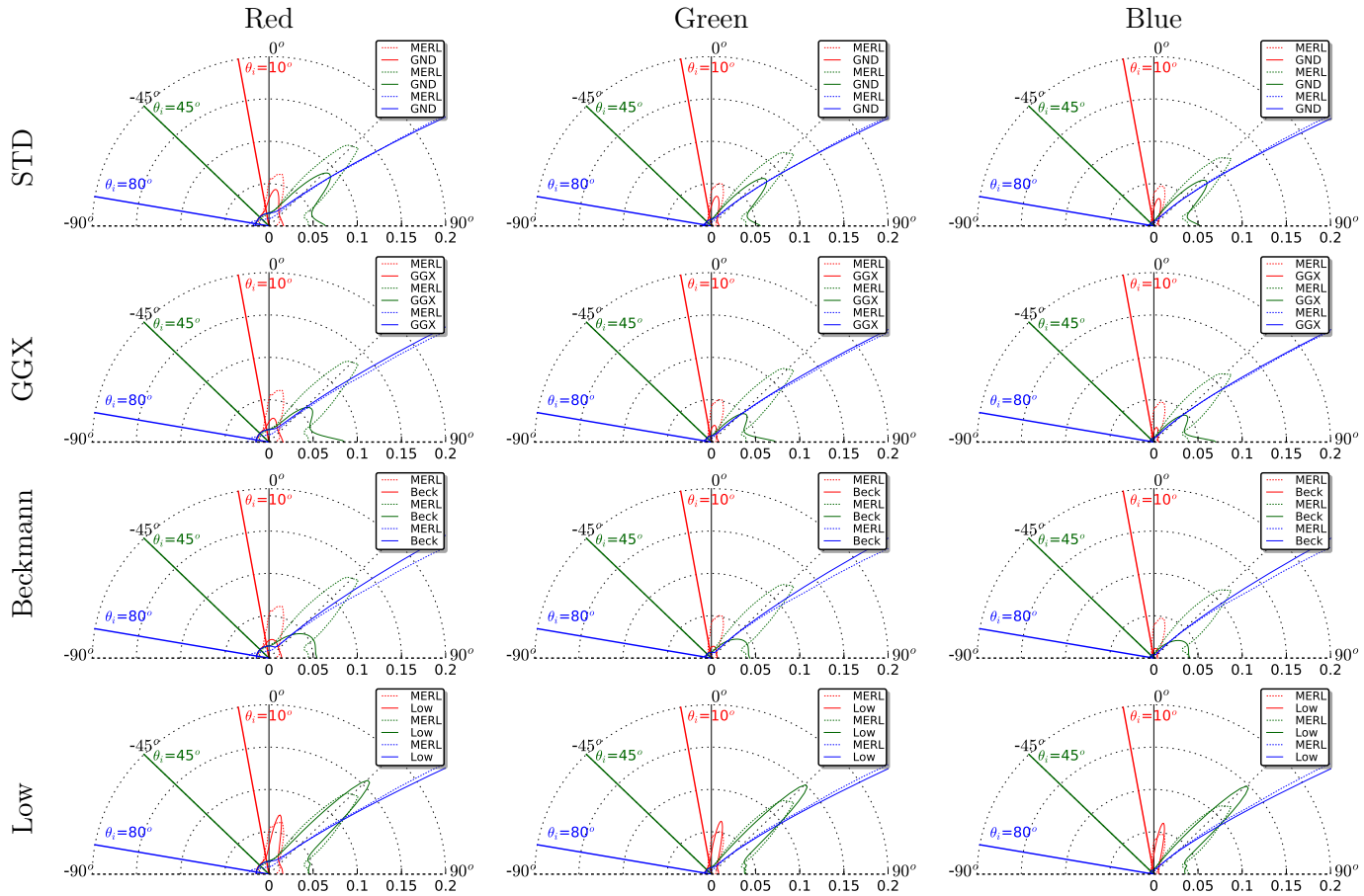
brass



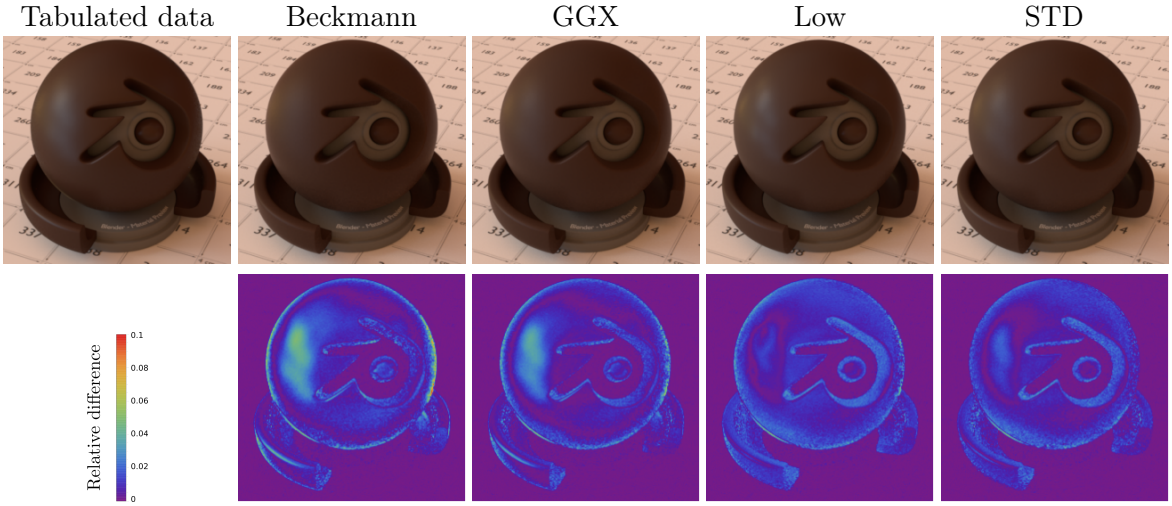
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.02-0.017-0.012	1.0-0.629-0.339	1.5008	0.0645	1.9045	0.00202
GGX	0.02-0.017-0.012	1.0-0.631-0.336	1.4936	0.0649	2.0	0.00202
Beckmann	0.02-0.017-0.012	1.0-0.597-0.317	1.3873	0.0656	$+\infty$	0.00234
	ρ	A		B	C	
Low	0.02-0.017-0.012	42.32-27.835-15.857	1.8149	687.761	1.8054	0.00189



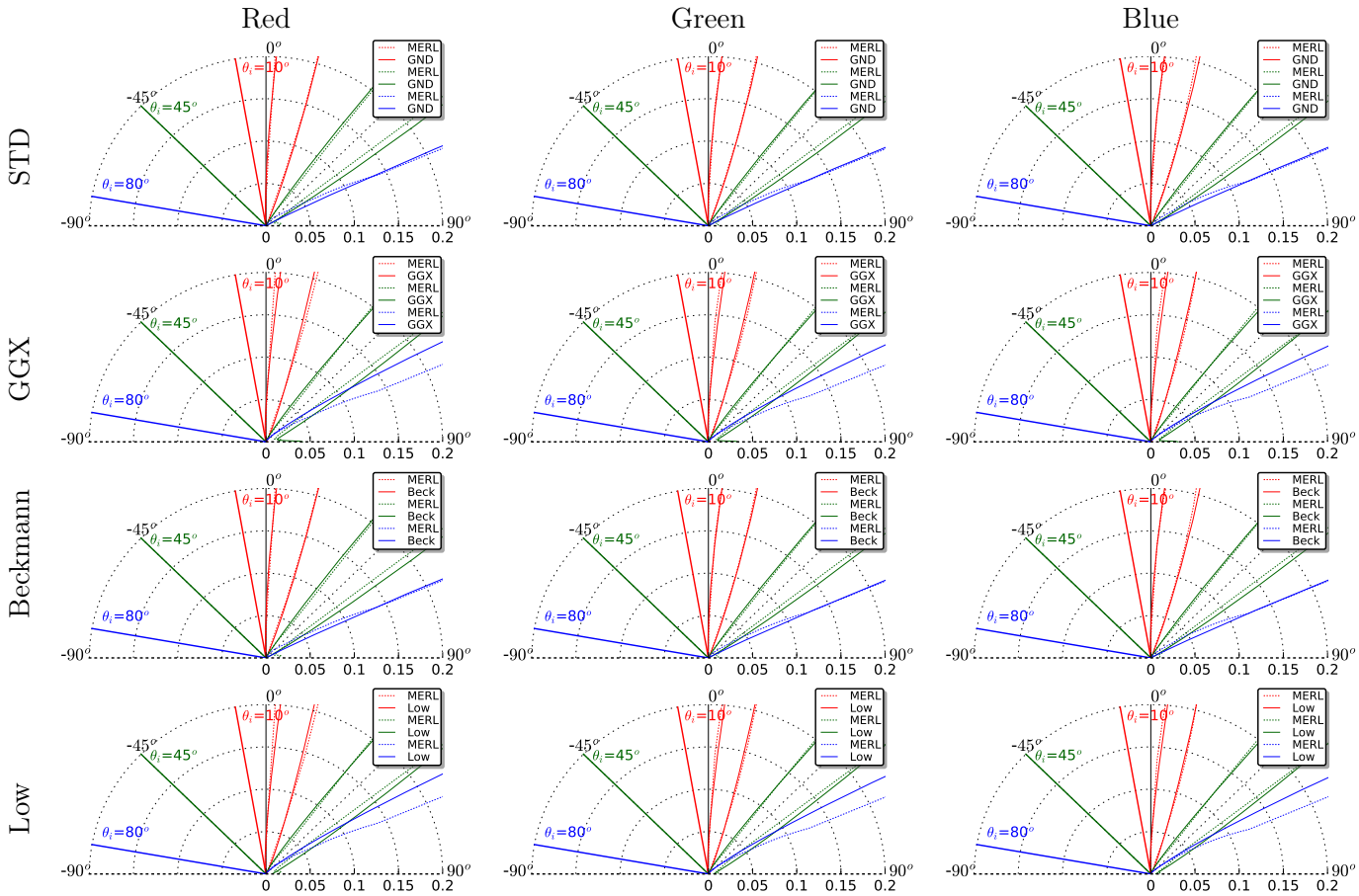
cherry-235



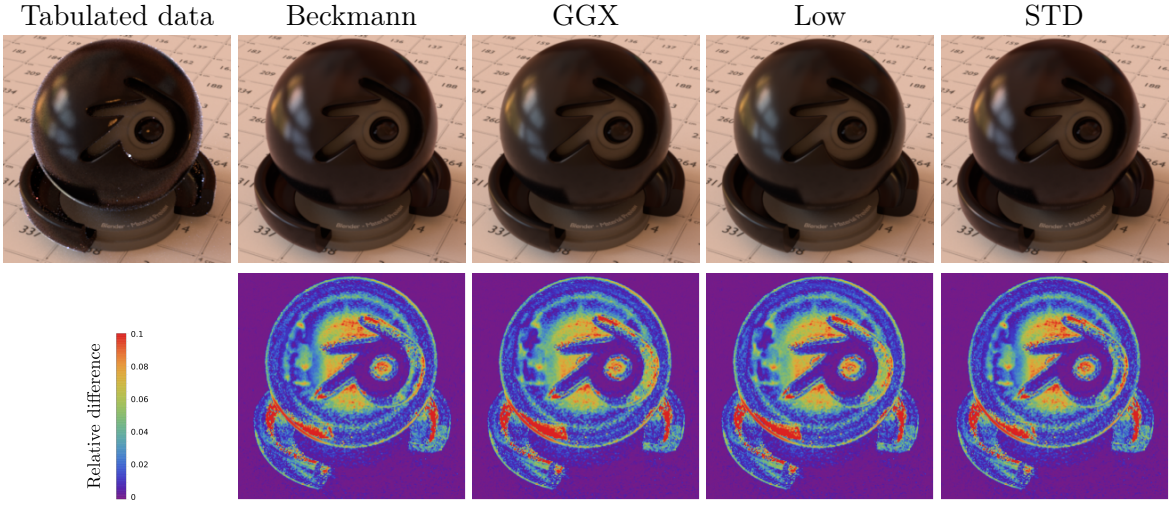
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.045-0.022-0.014	1.0-0.975-0.969	1.2417	0.1781	1.6485	0.00064
GGX	0.045-0.022-0.014	1.0-0.923-0.922	1.166	0.1837	2.0	0.00077
Beckmann	0.045-0.022-0.014	1.0-0.909-0.906	1.1328	0.1989	$+\infty$	0.00097
	ρ	A		B	C	
Low	0.045-0.022-0.014	5.366-5.36-5.377	1.4374	467.571	1.0792	0.00079



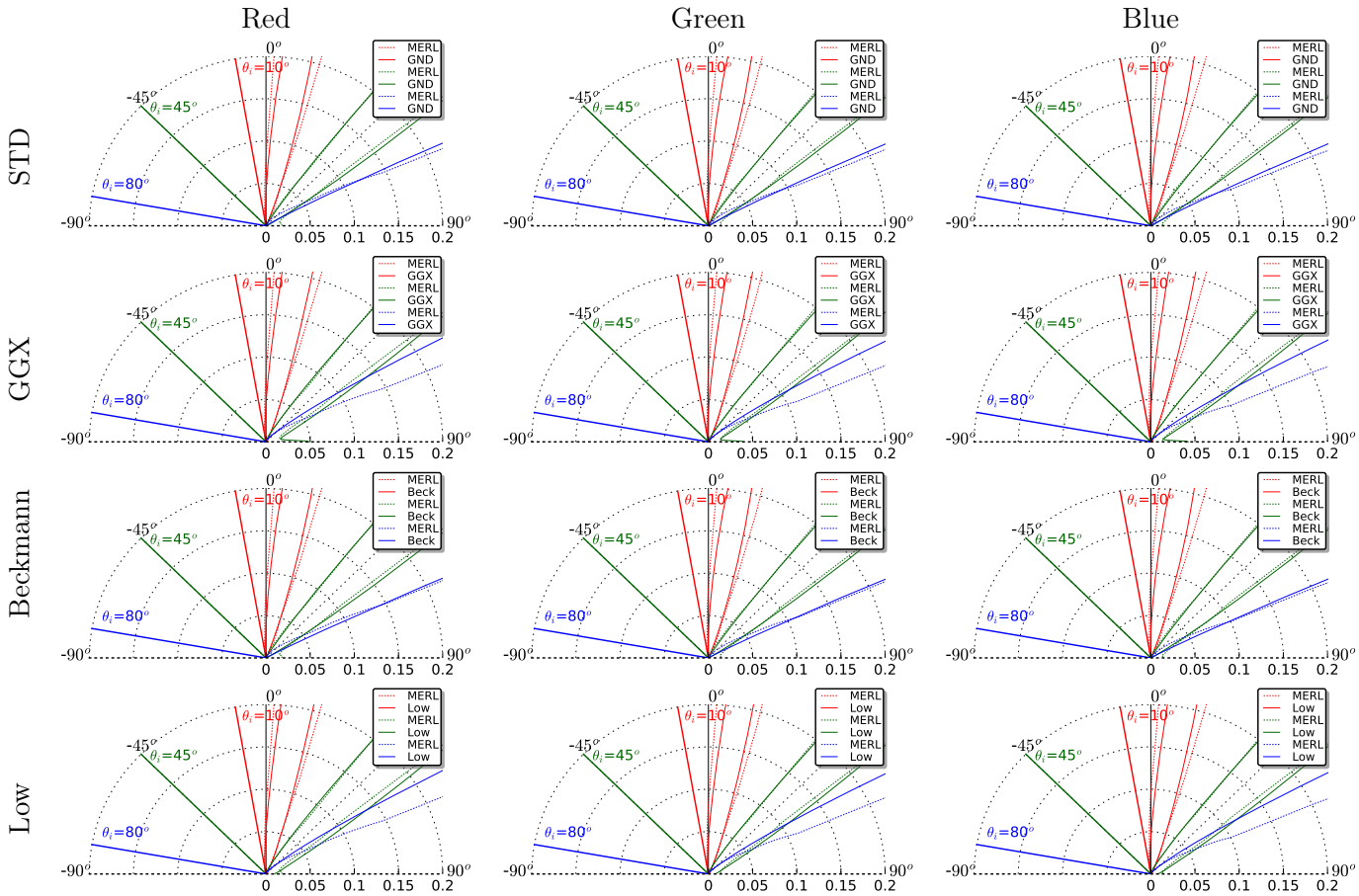
chrome



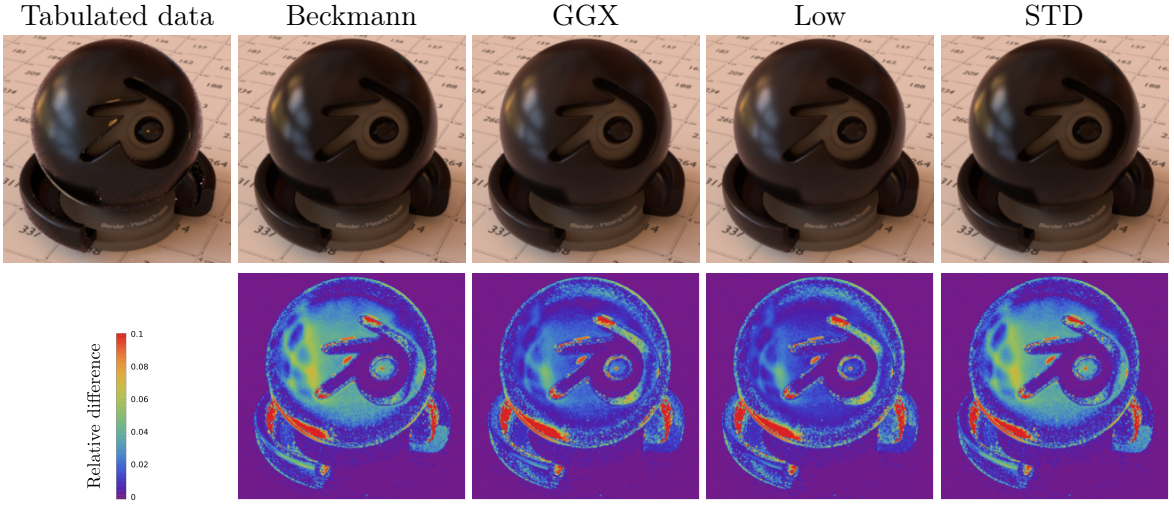
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.003-0.003-0.003	1.0-0.739-0.733	1.3547	0.0556	49.9955	0.00152
GGX	0.003-0.003-0.003	1.0-0.801-0.735	1.3433	0.0482	2.0	0.00215
Beckmann	0.003-0.003-0.003	1.0-0.738-0.733	1.3521	0.0558	$+\infty$	0.00151
	ρ	A		B	C	
Low	0.003-0.003-0.003	98.993-81.841-74.665	1.3542	831.745	1.9973	0.00215



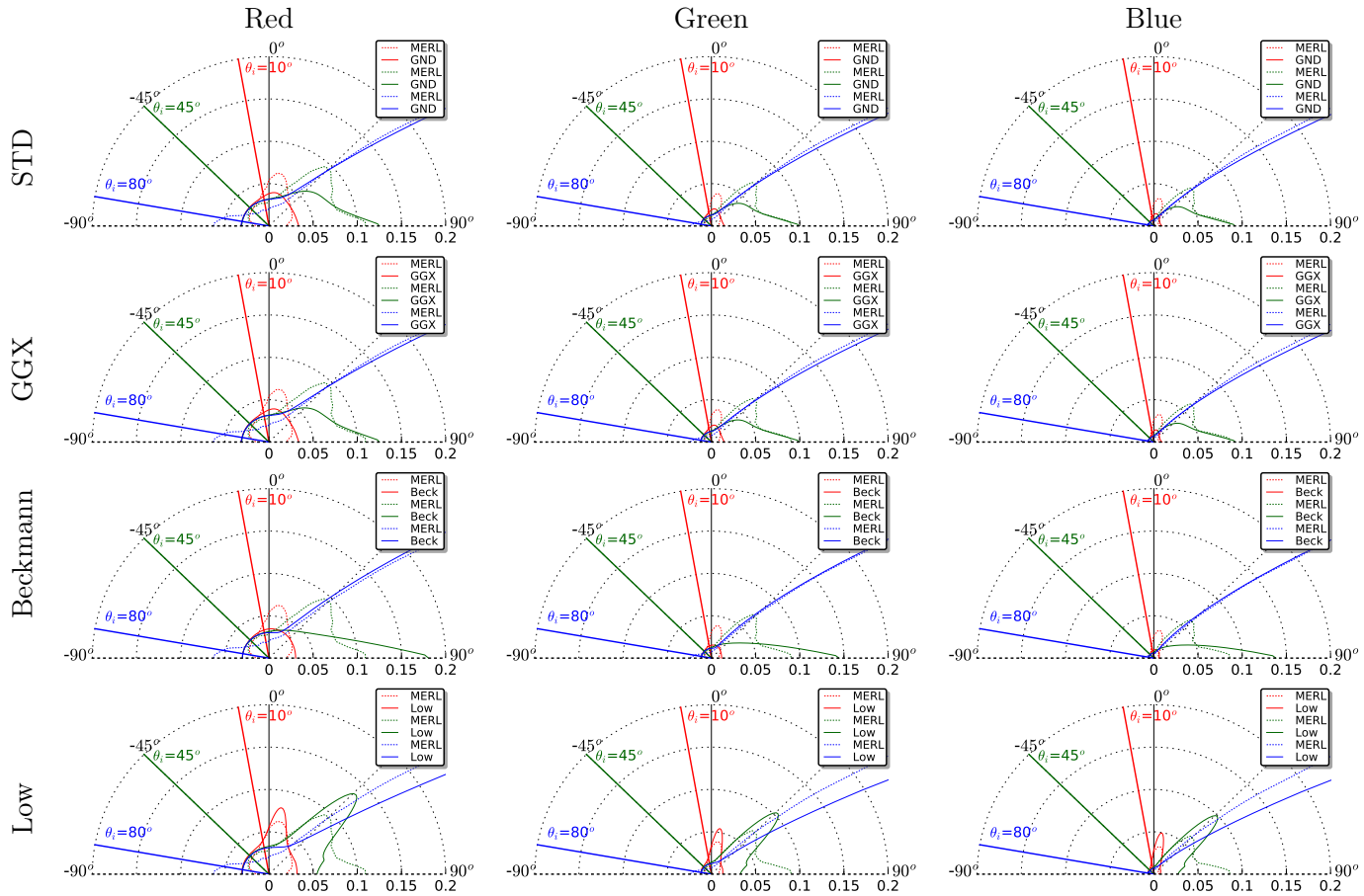
chrome-steel



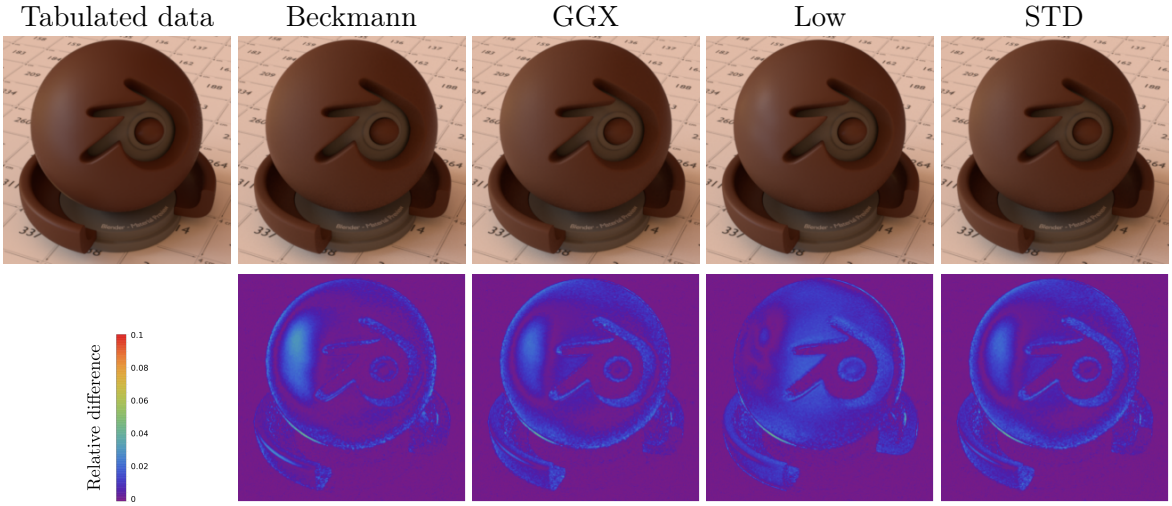
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.005-0.004-0.004	1.0-0.836-0.846	1.2668	0.0576	13.3728	0.00159
GGX	0.005-0.004-0.004	1.0-0.809-0.861	1.3203	0.0573	2.0	0.00176
Beckmann	0.005-0.004-0.004	1.0-0.826-0.836	1.2644	0.0576	$+\infty$	0.00161
	ρ	A		B	C	
Low	0.005-0.004-0.004	63.789-51.103-54.736	1.3771	615.622	1.9688	0.00174



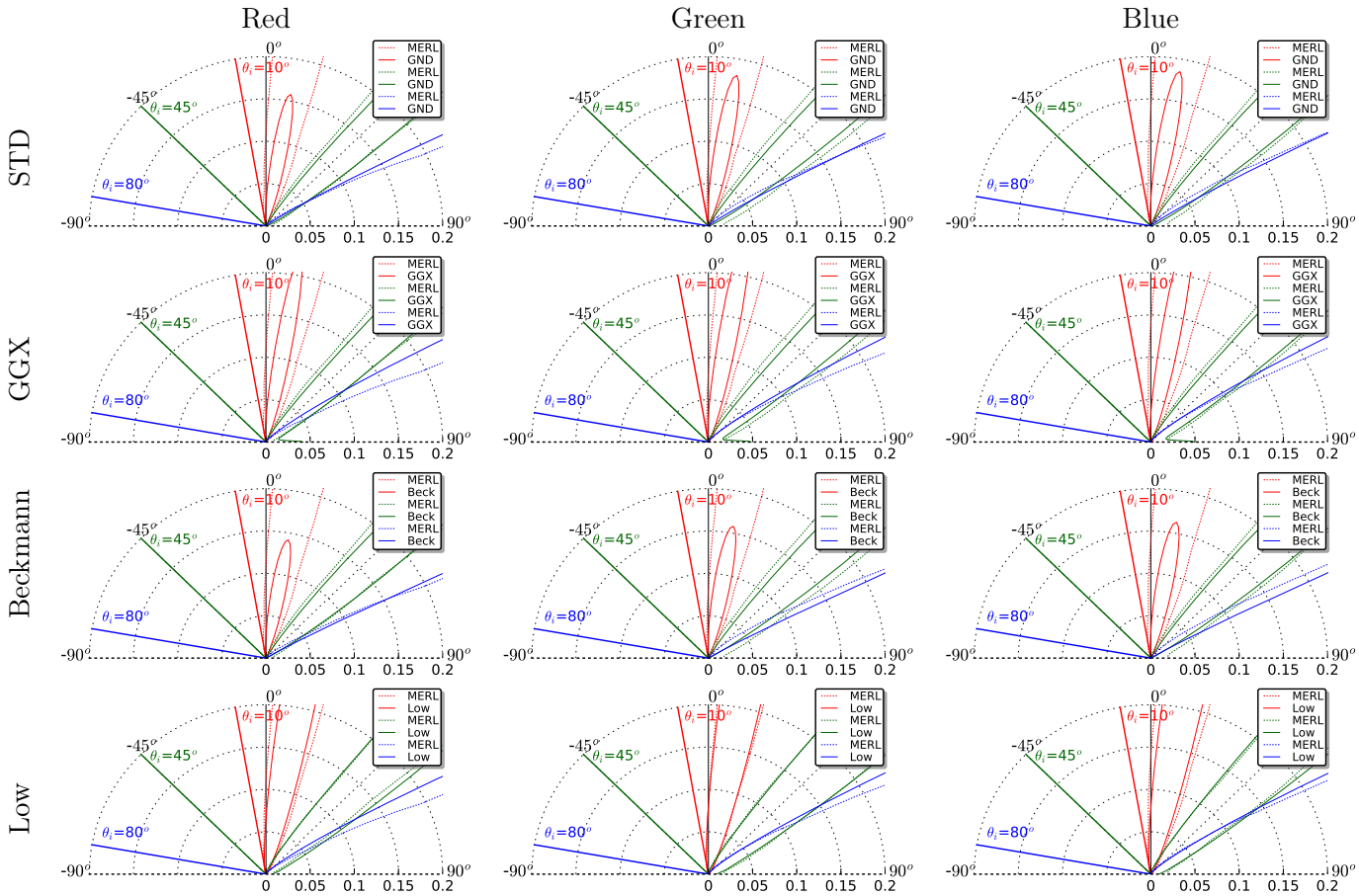
colonial-maple-223



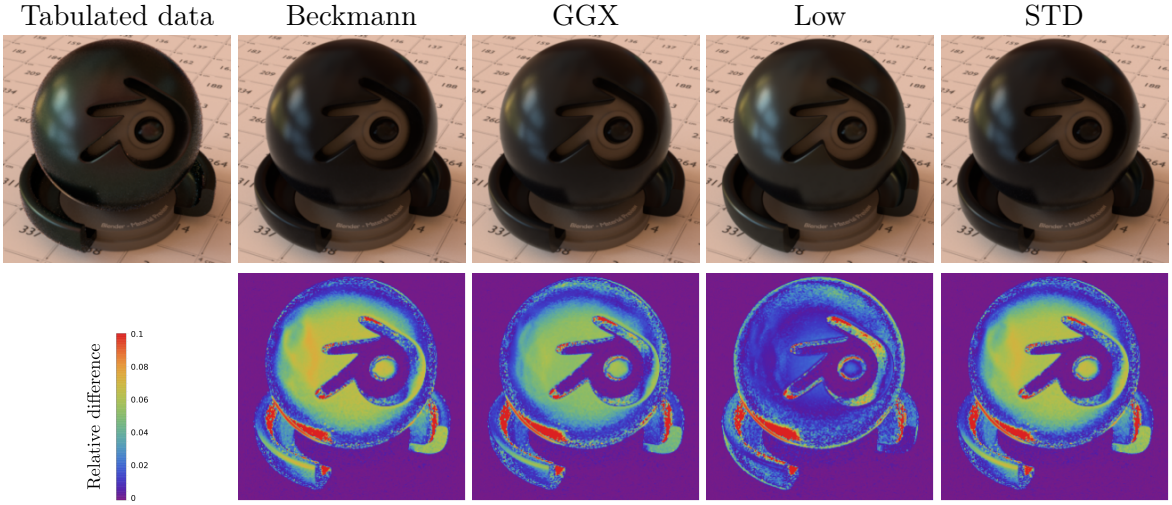
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.094-0.036-0.018	1.0-0.926-0.906	1.2169	0.2809	1.9829	0.00084
GGX	0.094-0.036-0.018	1.0-0.928-0.91	1.2139	0.2817	2.0	0.00085
Beckmann	0.094-0.036-0.018	1.0-0.884-0.879	1.1558	0.2997	$+\infty$	0.0009
	ρ	A		B	C	
Low	0.094-0.036-0.018	1.19-1.039-1.047	2.1053	202.406	1.1301	0.00109



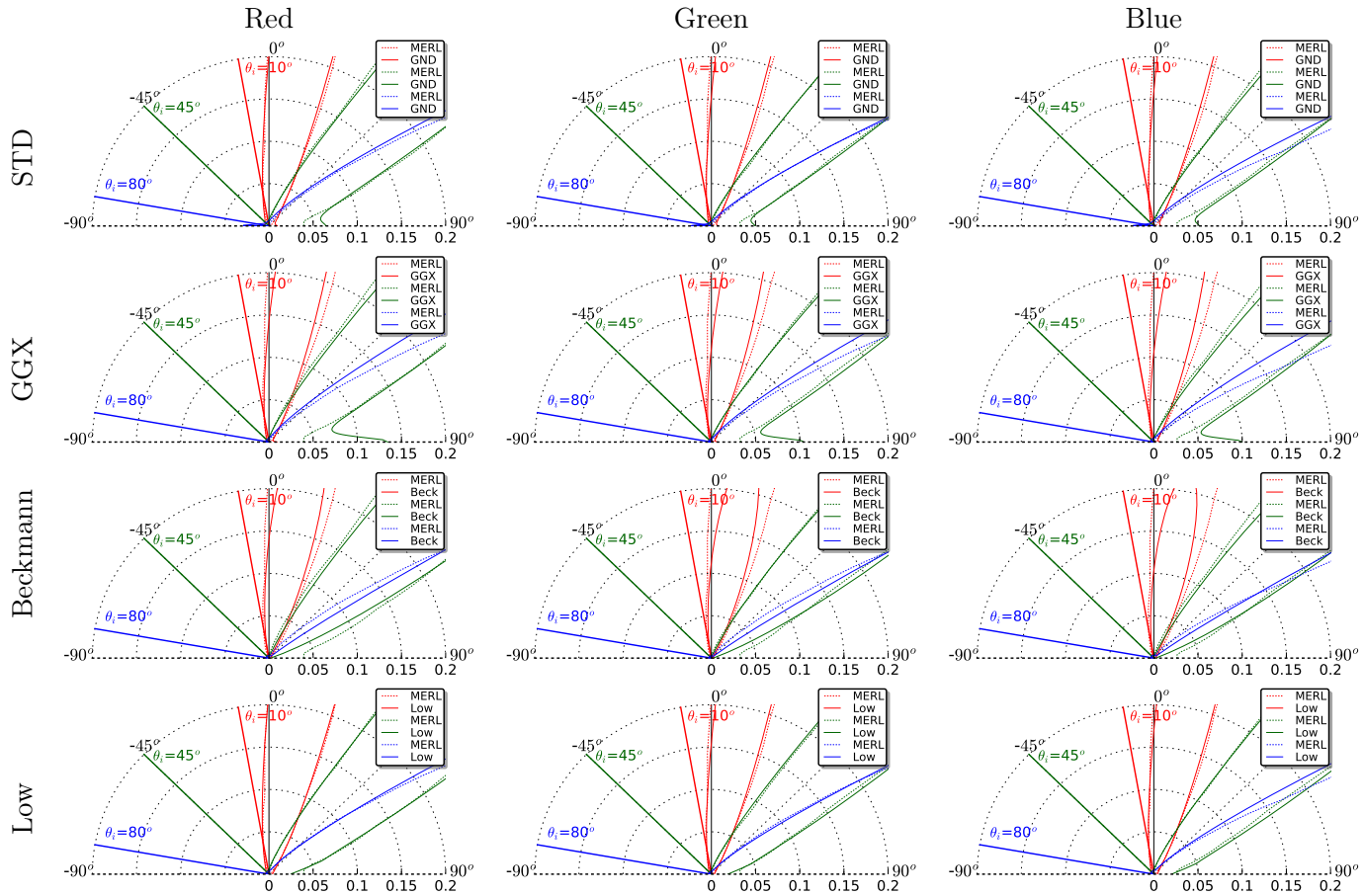
color-changing-paint1



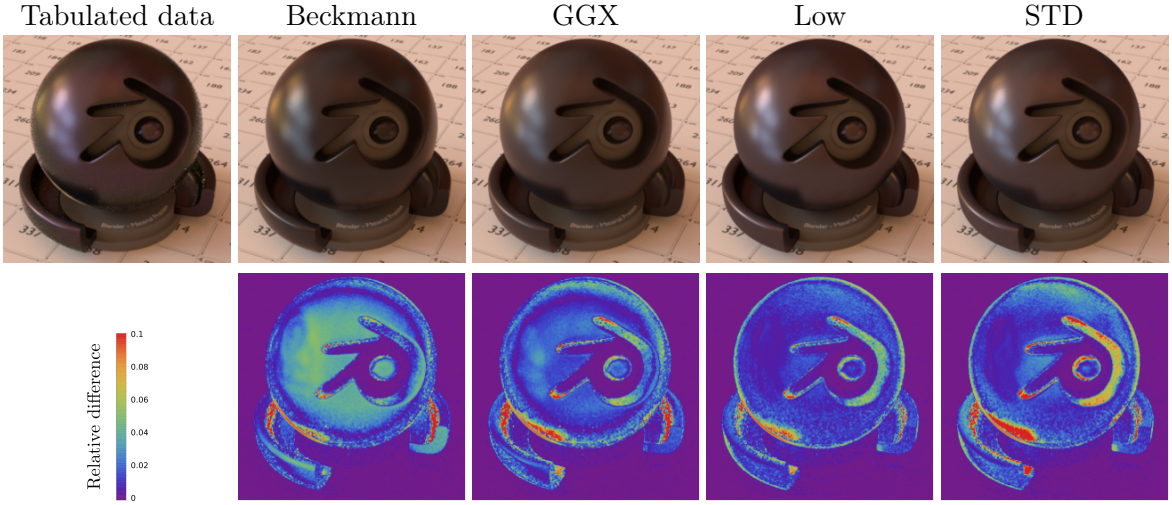
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.004-0.004-0.005	1.0-1.144-1.172	1.2002	0.0657	5.0863	0.00173
GGX	0.004-0.004-0.005	1.0-1.157-1.184	1.2324	0.0634	2.0	0.00168
Beckmann	0.004-0.004-0.005	1.0-1.116-1.147	1.1917	0.0668	$+\infty$	0.00181
	ρ	A		B	C	
Low	0.004-0.004-0.005	19.07-23.867-22.924	1.7859	481.616	1.9657	0.00108



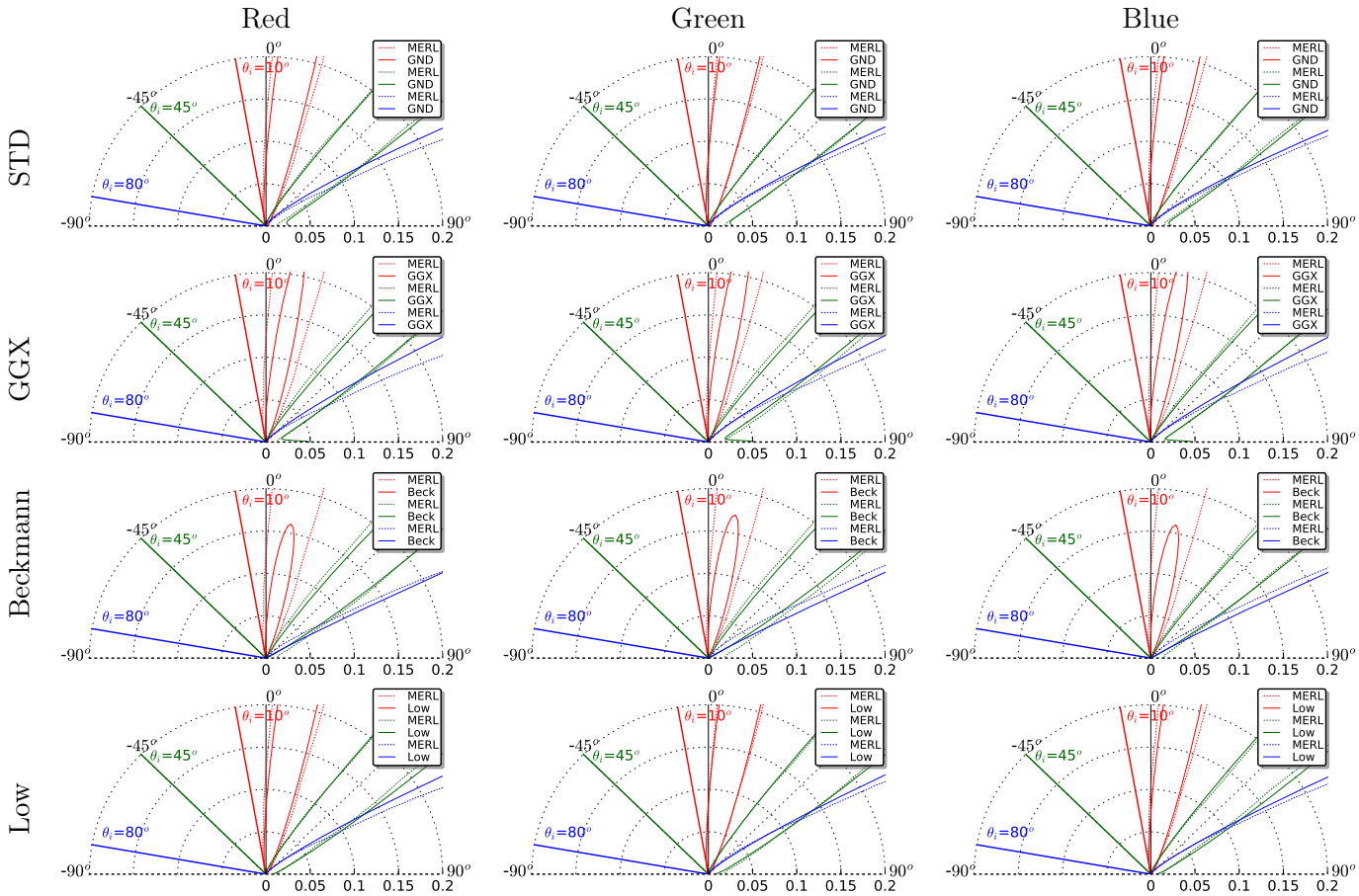
color-changing-paint2



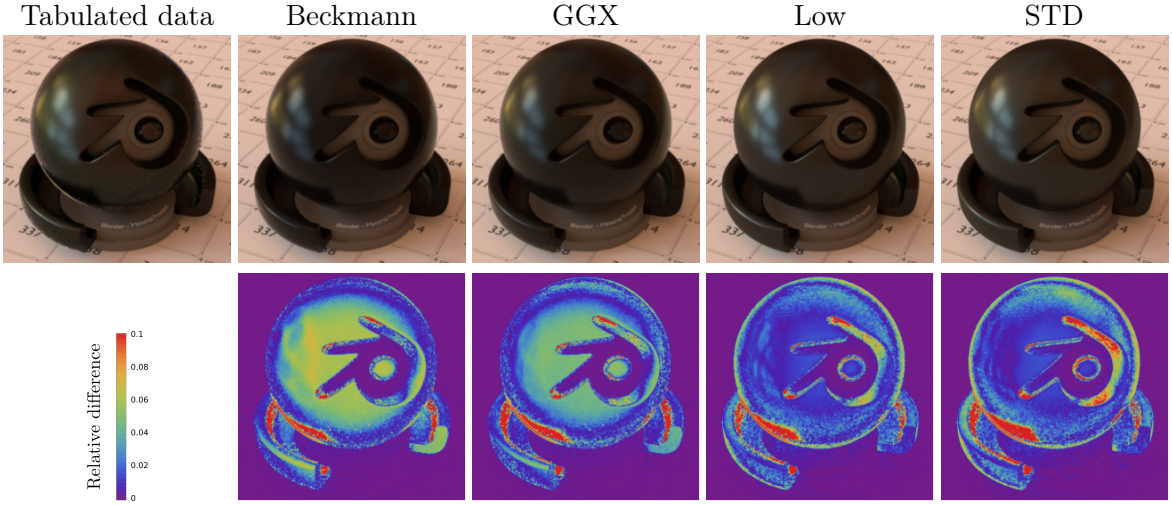
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.01-0.009-0.011	1.0-0.758-0.782	1.8802	0.0852	1.5646	0.00185
GGX	0.01-0.009-0.011	1.0-0.777-0.733	1.5961	0.0982	2.0	0.00233
Beckmann	0.01-0.009-0.011	1.0-0.805-0.727	1.4672	0.0988	$+\infty$	0.00331
	ρ	A		B	C	
Low	0.01-0.009-0.011	12.984-9.374-10.147	2.6562	291.952	1.8728	0.00157



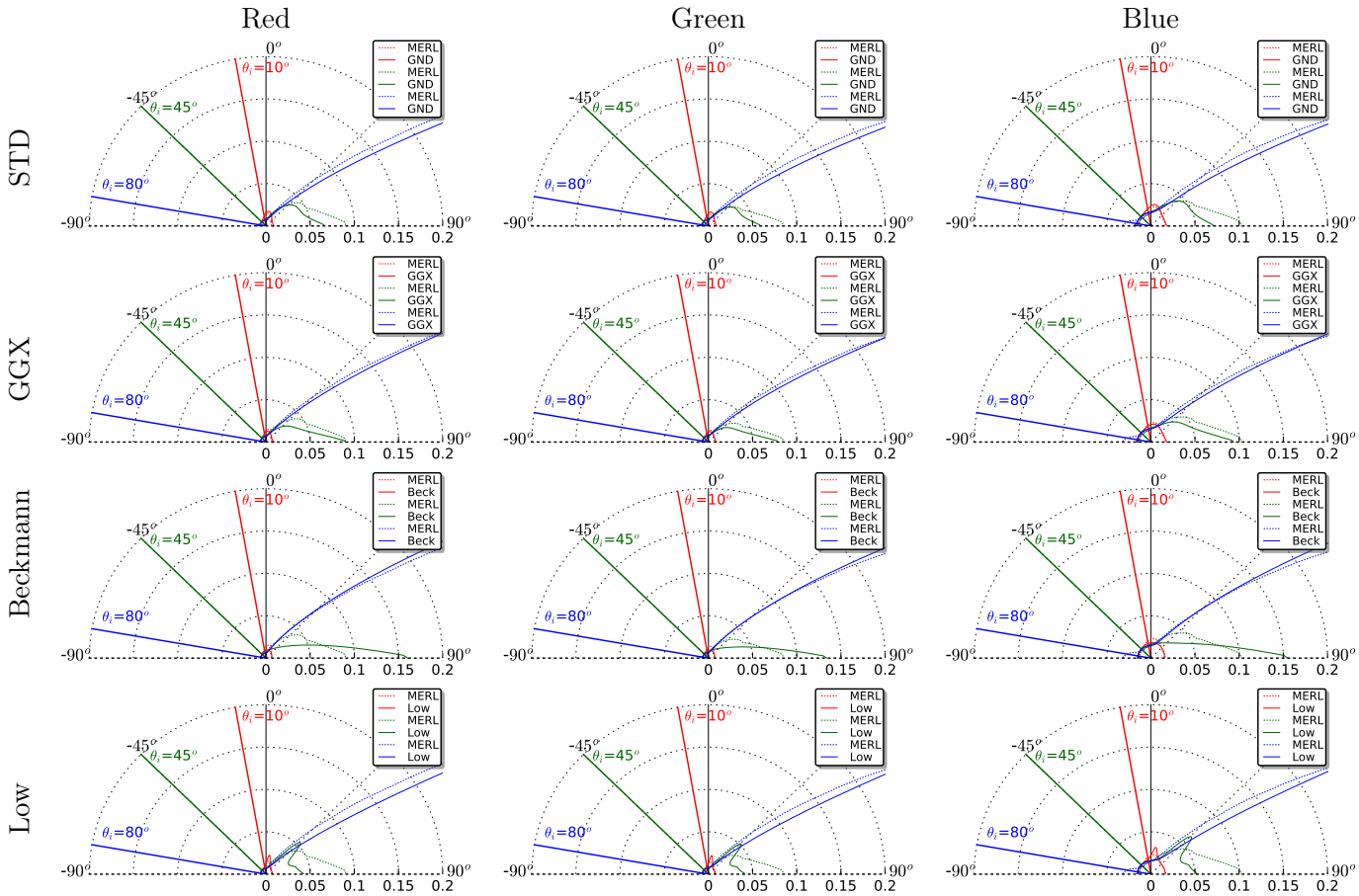
color-changing-paint3



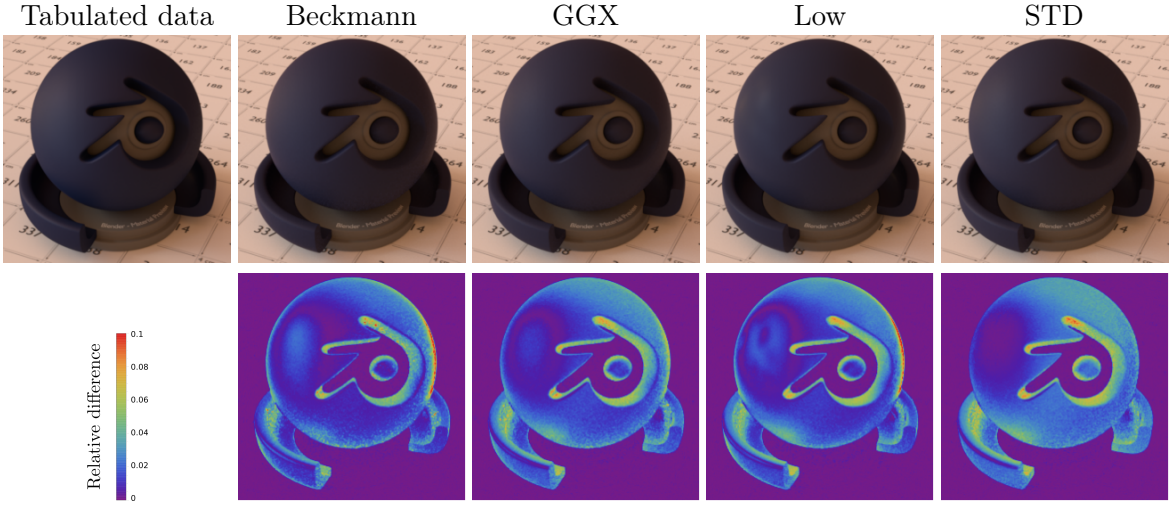
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.005-0.004-0.004	1.0-1.065-0.888	1.4869	0.0656	1.5353	0.00134
GGX	0.005-0.004-0.004	1.0-1.091-0.964	1.2564	0.0669	2.0	0.00148
Beckmann	0.005-0.004-0.004	1.0-1.07-0.996	1.2095	0.0681	$+\infty$	0.00164
	ρ	A		B	C	
Low	0.005-0.004-0.004	16.917-18.179-15.698	1.934	449.912	1.9926	0.00112



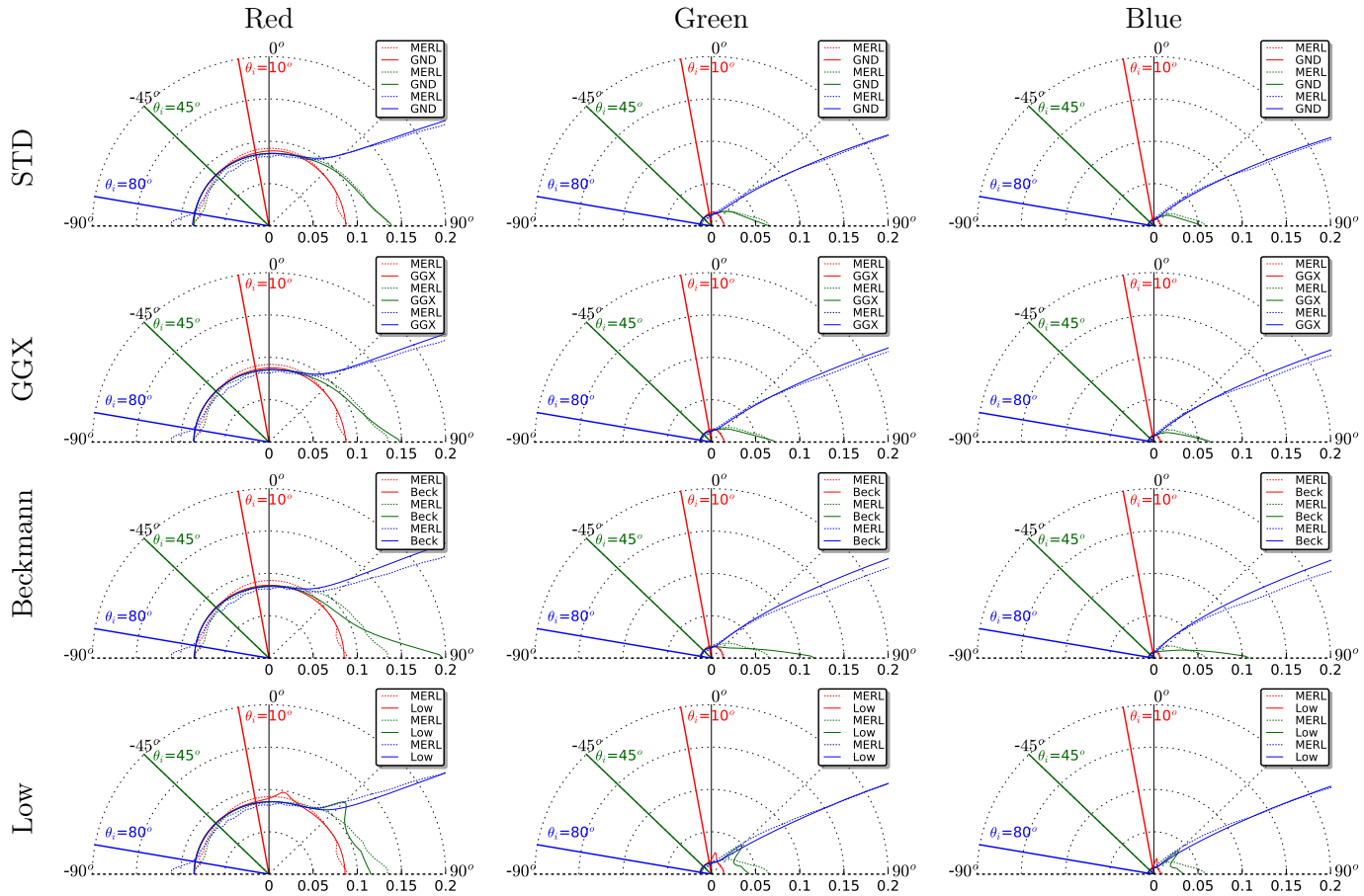
dark-blue-paint



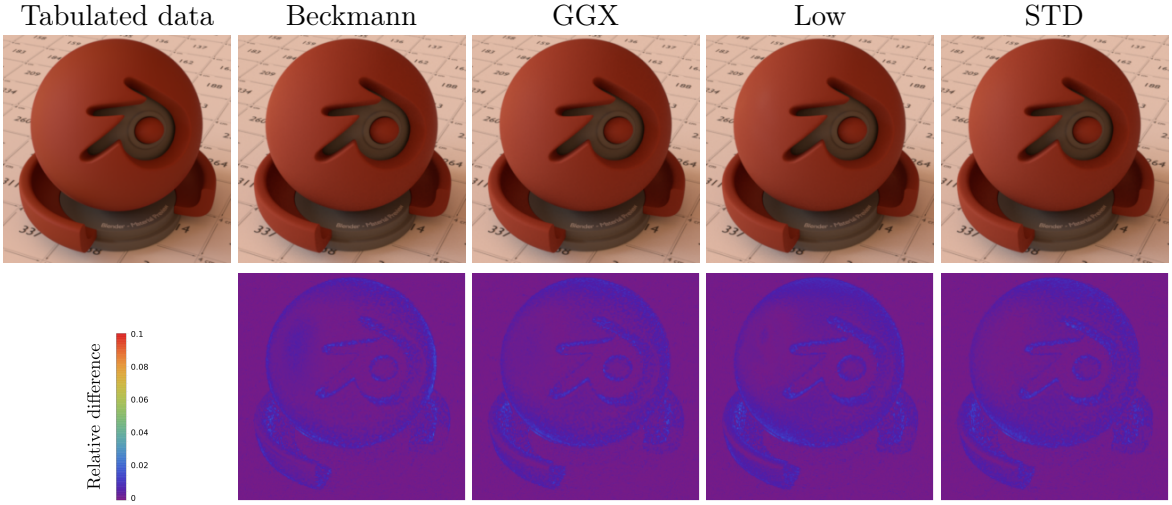
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.018-0.021-0.047	1.0-0.864-0.922	1.2494	0.2899	1.7192	0.00073
GGX	0.018-0.021-0.047	1.0-0.858-0.936	1.1941	0.3023	2.0	0.00076
Beckmann	0.018-0.021-0.047	1.0-0.824-0.906	1.1538	0.3343	$+\infty$	0.00081
	ρ	A		B	C	
Low	0.018-0.021-0.047	3.739-3.5-3.787	1.2665	583.652	0.7748	0.00098



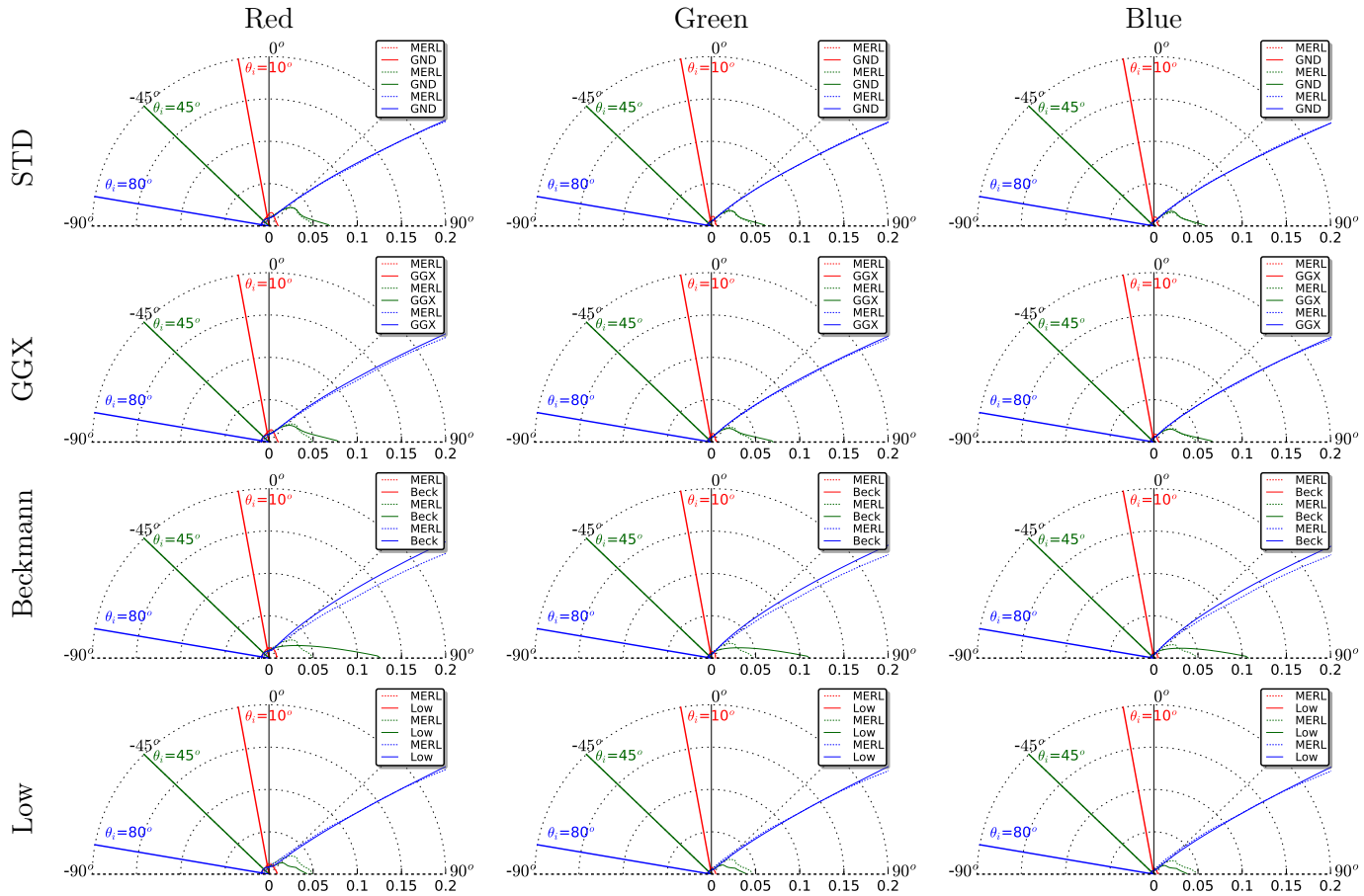
dark-red-paint



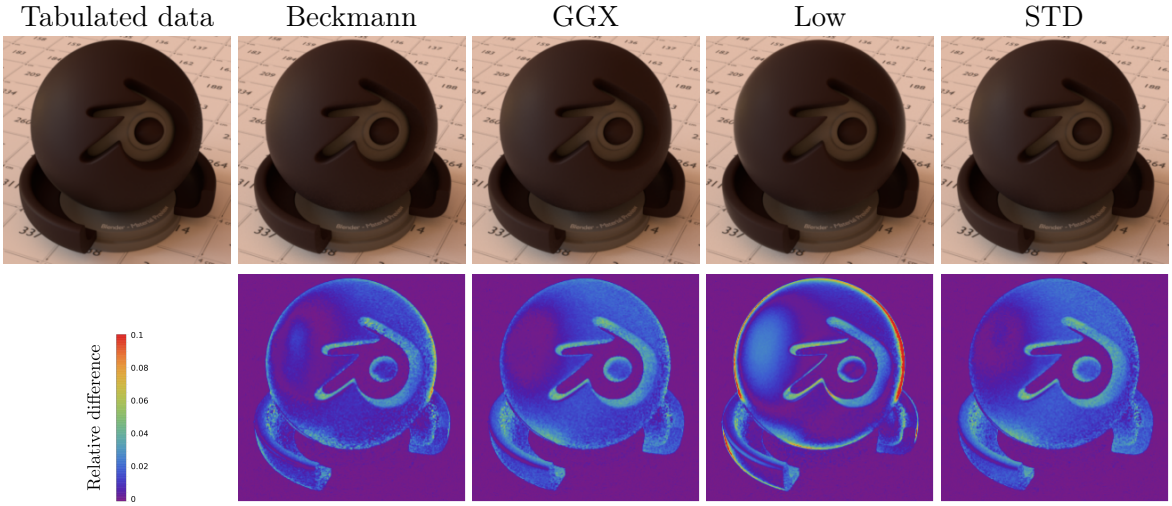
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.265-0.038-0.019	1.0-0.936-0.882	1.1902	0.3533	1.8114	0.00063
GGX	0.265-0.038-0.019	1.0-0.936-0.901	1.1635	0.3586	2.0	0.00063
Beckmann	0.265-0.038-0.019	1.0-0.926-0.902	1.1196	0.3729	$+\infty$	0.00067
	ρ	A		B	C	
Low	0.265-0.038-0.019	1.789-1.771-1.619	1.3618	992.07	0.61	0.0008



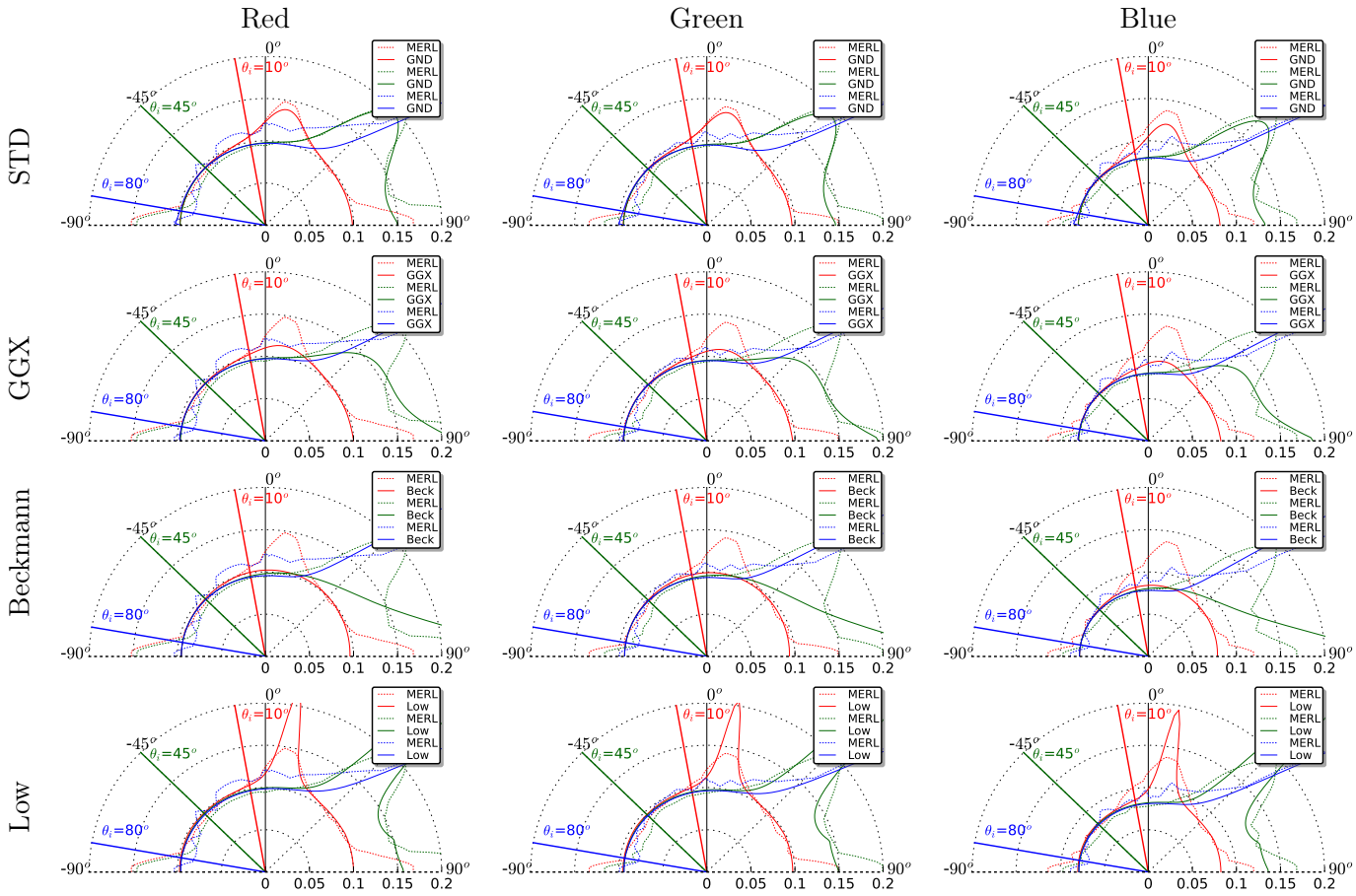
dark-specular-fabric



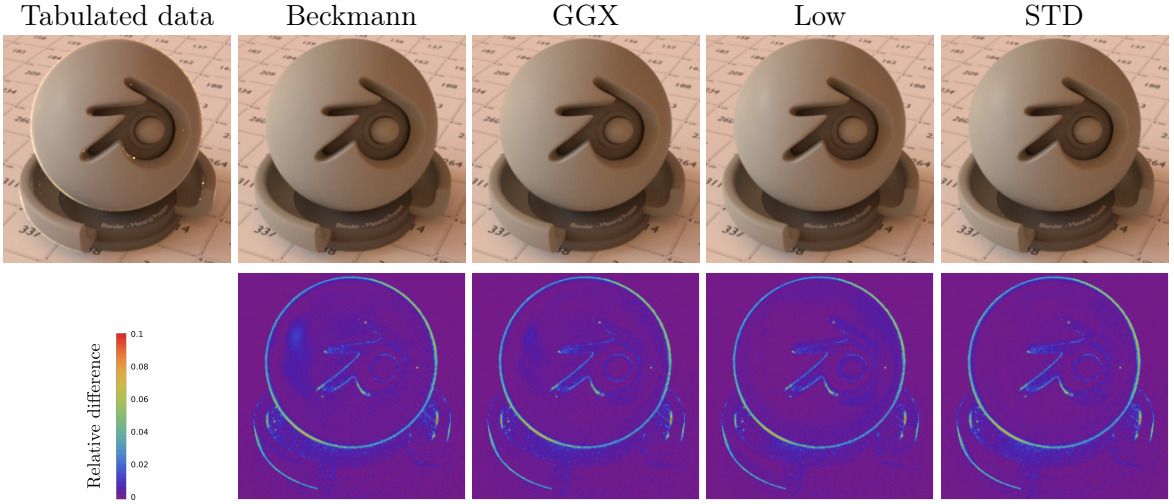
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.027-0.014-0.012	1.0-0.943-0.905	1.167	0.253	1.8383	0.00041
GGX	0.027-0.014-0.012	1.0-0.929-0.891	1.1571	0.2619	2.0	0.00042
Beckmann	0.027-0.014-0.012	1.0-0.908-0.876	1.1277	0.2922	$+\infty$	0.00053
	ρ	A		B	C	
Low	0.027-0.014-0.012	12.354-12.546-12.133	1.0553	73.5843	1.2524	0.00063



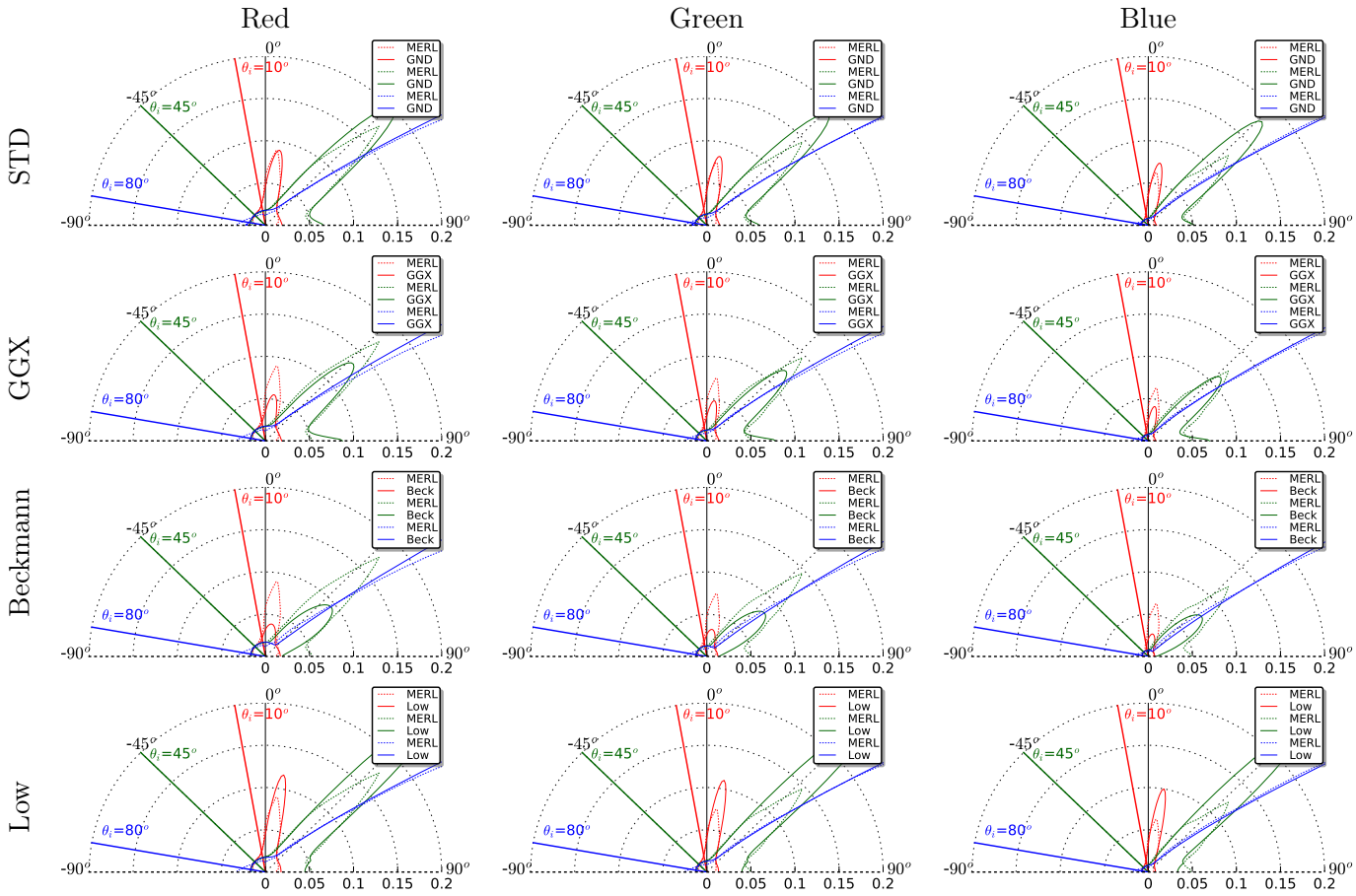
delrin



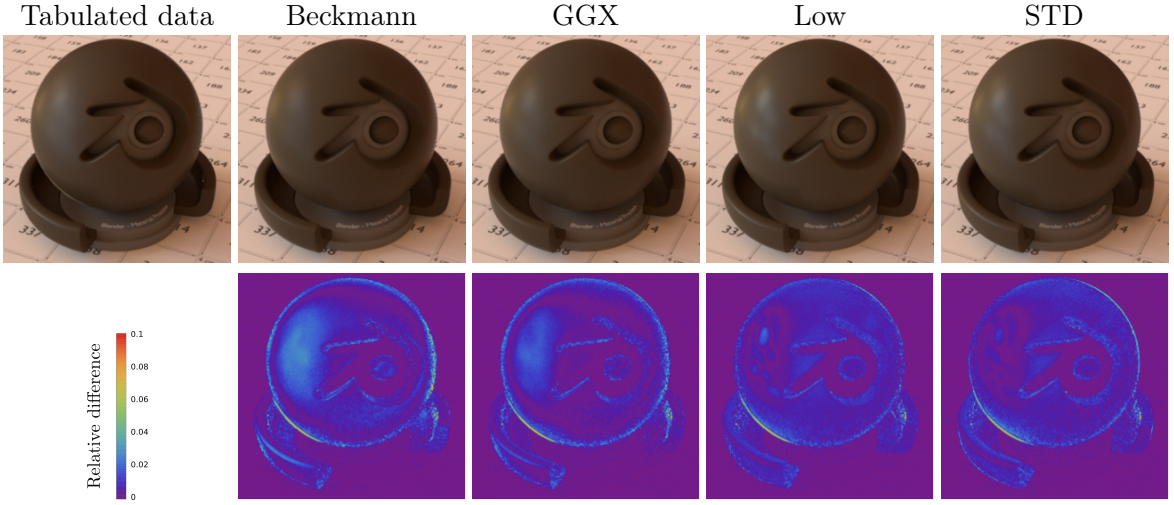
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.3-0.293-0.245	1.0-0.966-0.997	1.3276	0.1908	1.6253	0.00129
GGX	0.3-0.293-0.245	1.0-0.862-0.927	1.2632	0.2433	2.0	0.00154
Beckmann	0.3-0.293-0.245	1.0-0.856-0.9	1.2118	0.3217	$+\infty$	0.00192
	ρ	A		B	C	
Low	0.3-0.293-0.245	7.558-6.92-7.189	1.5738	3162.32	0.6772	0.00148



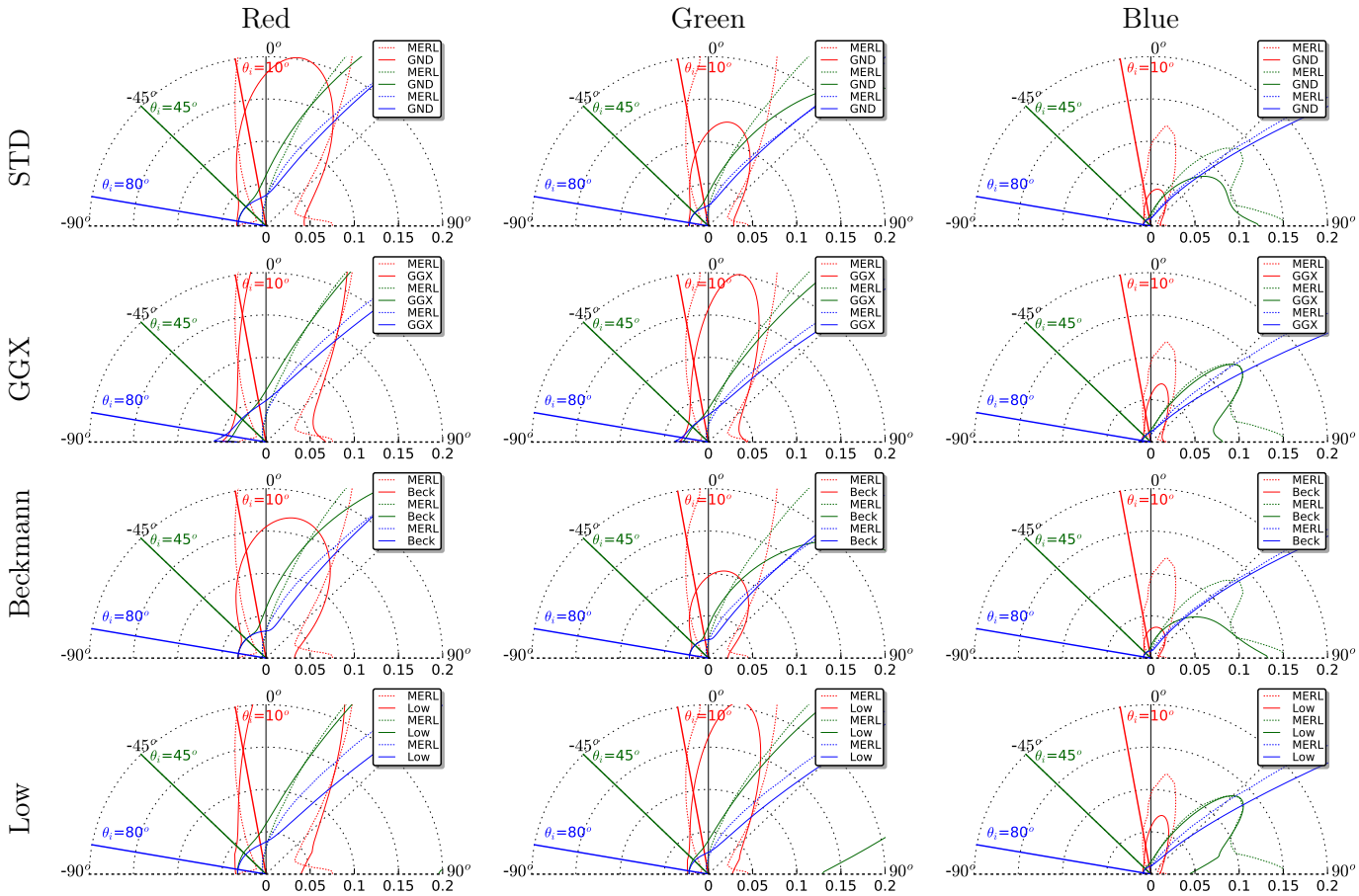
fruitwood-241



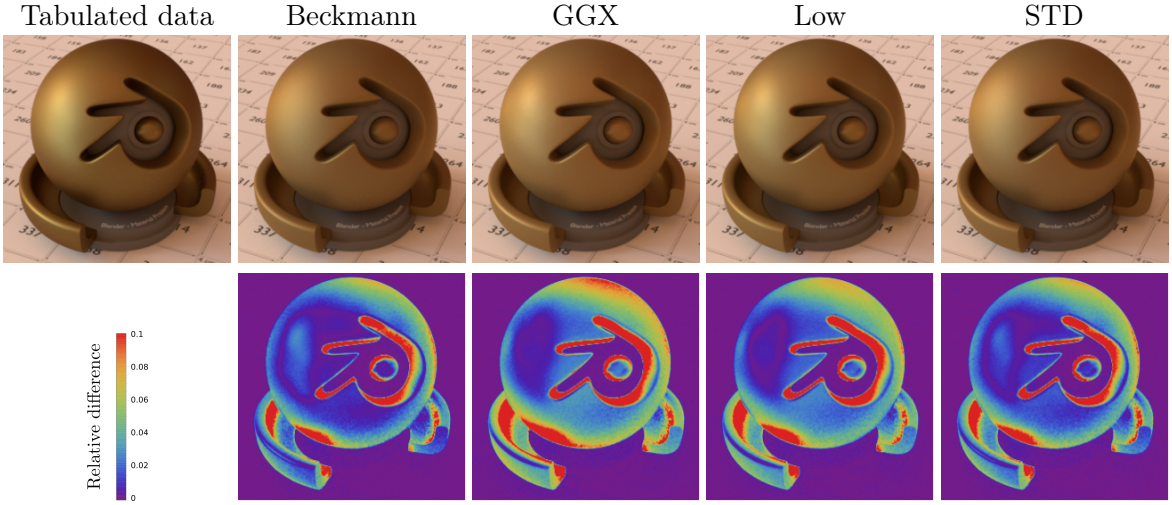
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.053-0.039-0.023	1.0-0.959-0.919	1.2778	0.1277	1.6227	0.00058
GGX	0.053-0.039-0.023	1.0-0.926-0.88	1.1981	0.1315	2.0	0.00074
Beckmann	0.053-0.039-0.023	1.0-0.907-0.89	1.1583	0.1416	$+\infty$	0.00112
	ρ	A		B	C	
Low	0.053-0.039-0.023	9.871-9.668-9.153	1.4259	406.539	1.3256	0.00069



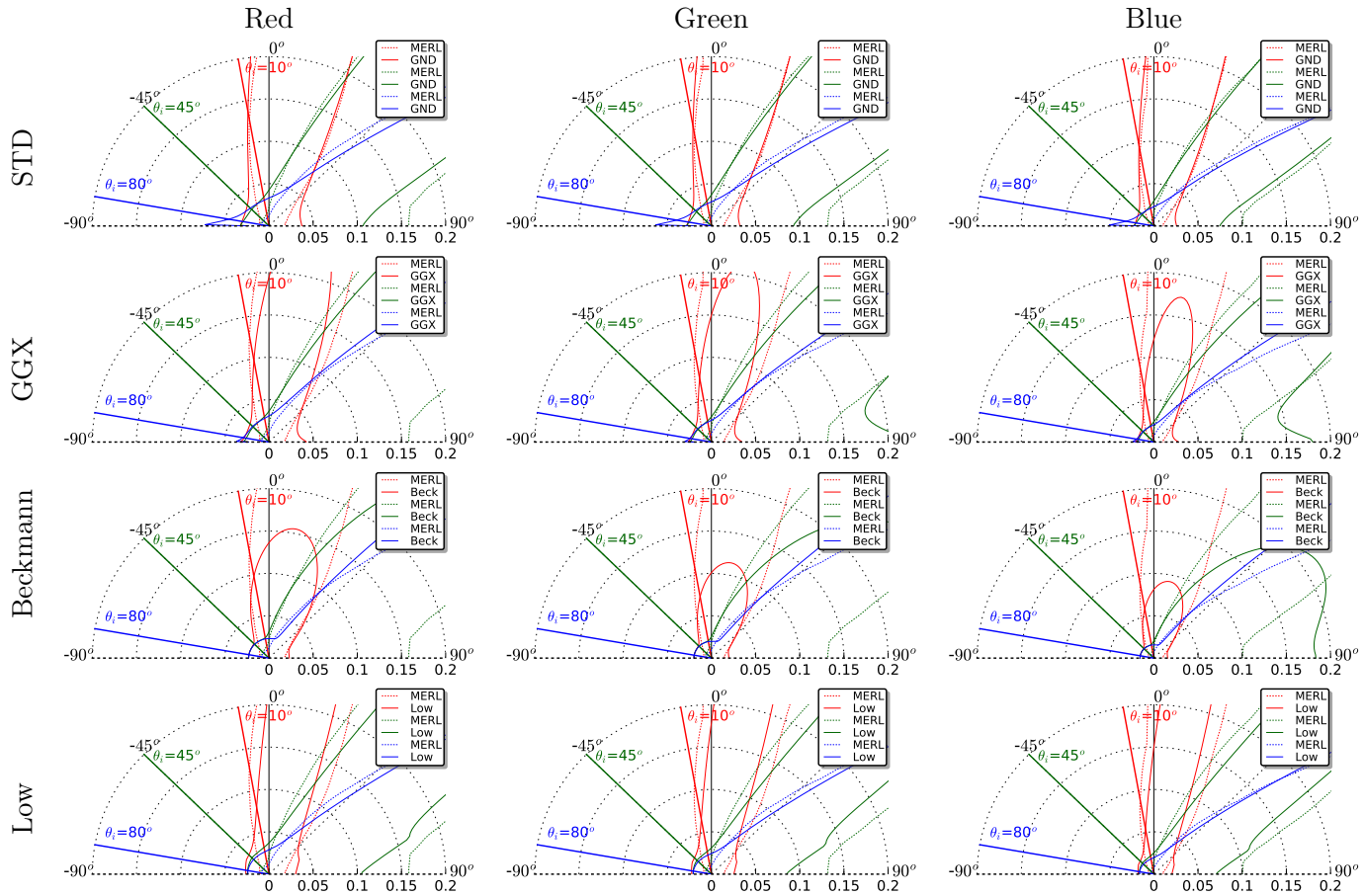
gold-metallic-paint



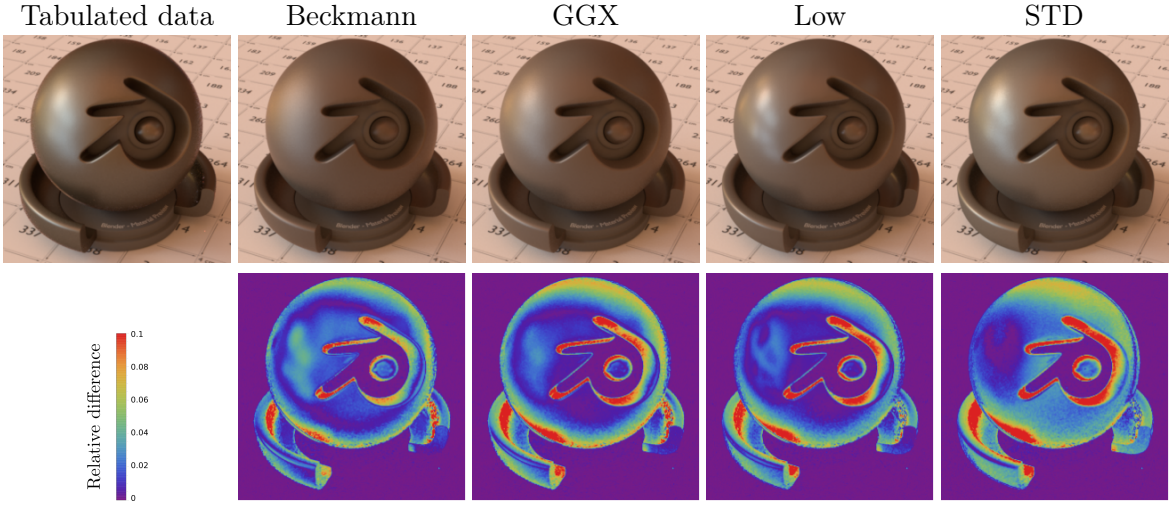
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.099-0.068-0.026	1.0-0.605-0.21	2.2128	0.262	4.8844	0.00481
GGX	0.099-0.068-0.026	1.0-0.608-0.208	2.5056	0.2264	2.0	0.00519
Beckmann	0.099-0.068-0.026	1.0-0.607-0.21	2.1069	0.2763	$+\infty$	0.00489
	ρ	A		B	C	
Low	0.099-0.068-0.026	3.456-2.268-0.761	2.9846	37.2107	1.9628	0.0049



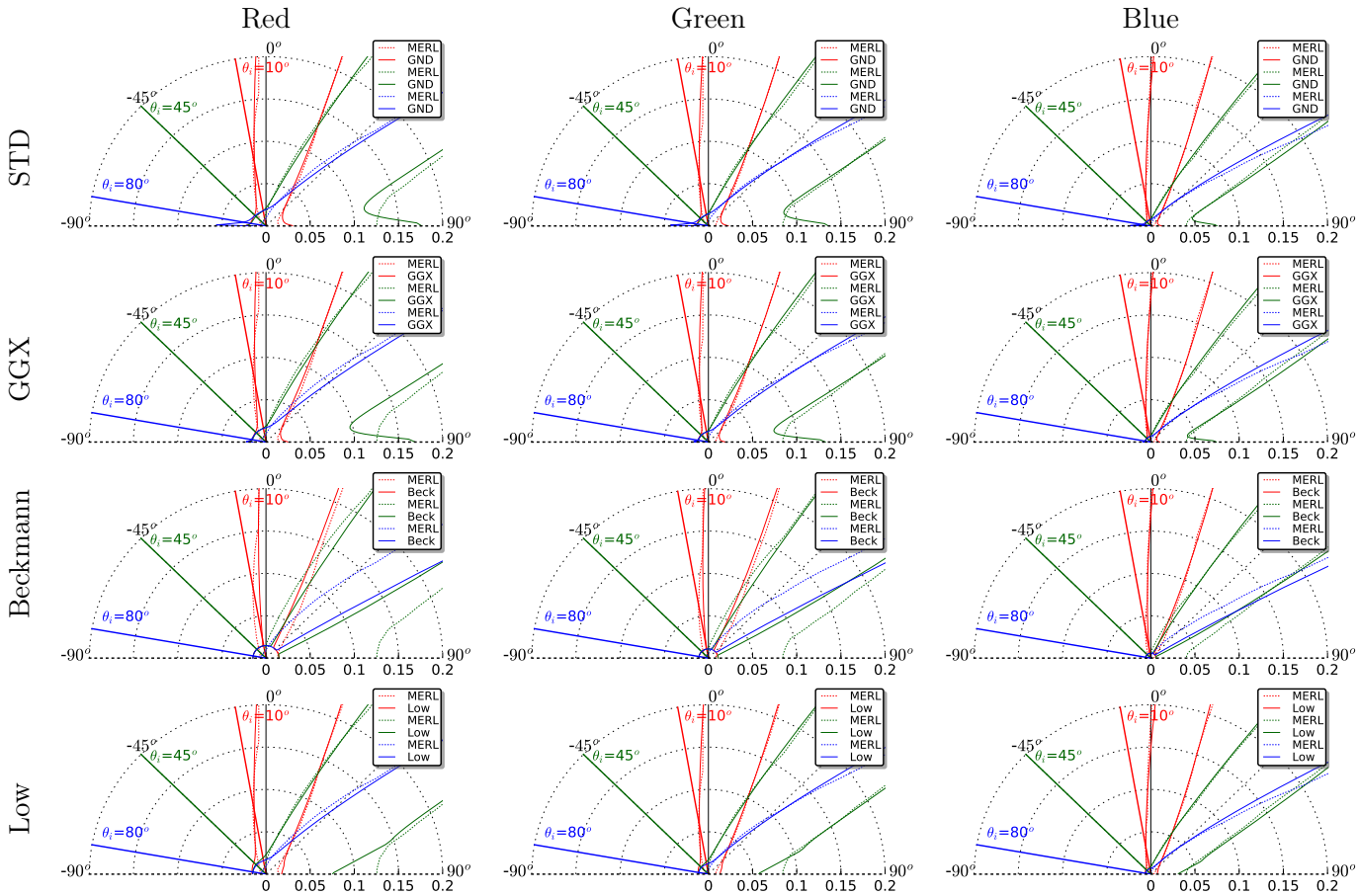
gold-metallic-paint2



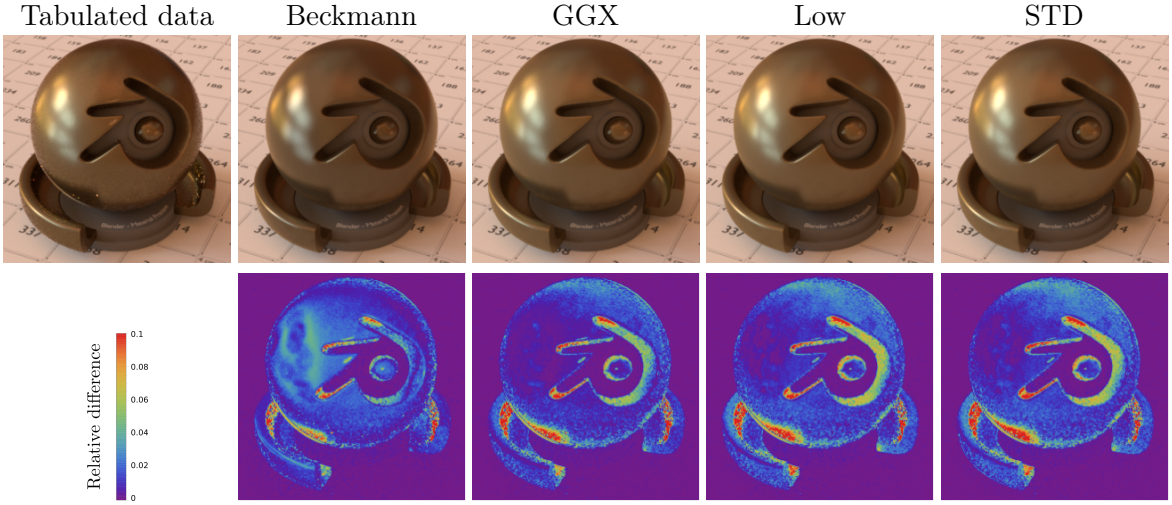
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.072-0.062-0.049	1.0-0.877-0.71	2.7233	0.1561	1.5676	0.00426
GGX	0.072-0.062-0.049	1.0-0.759-0.615	1.9739	0.185	2.0	0.00524
Beckmann	0.072-0.062-0.049	1.0-0.717-0.578	1.7893	0.2231	$+\infty$	0.00569
	ρ	A		B	C	
Low	0.072-0.062-0.049	8.768-7.08-5.949	2.9544	526.744	1.1418	0.00513



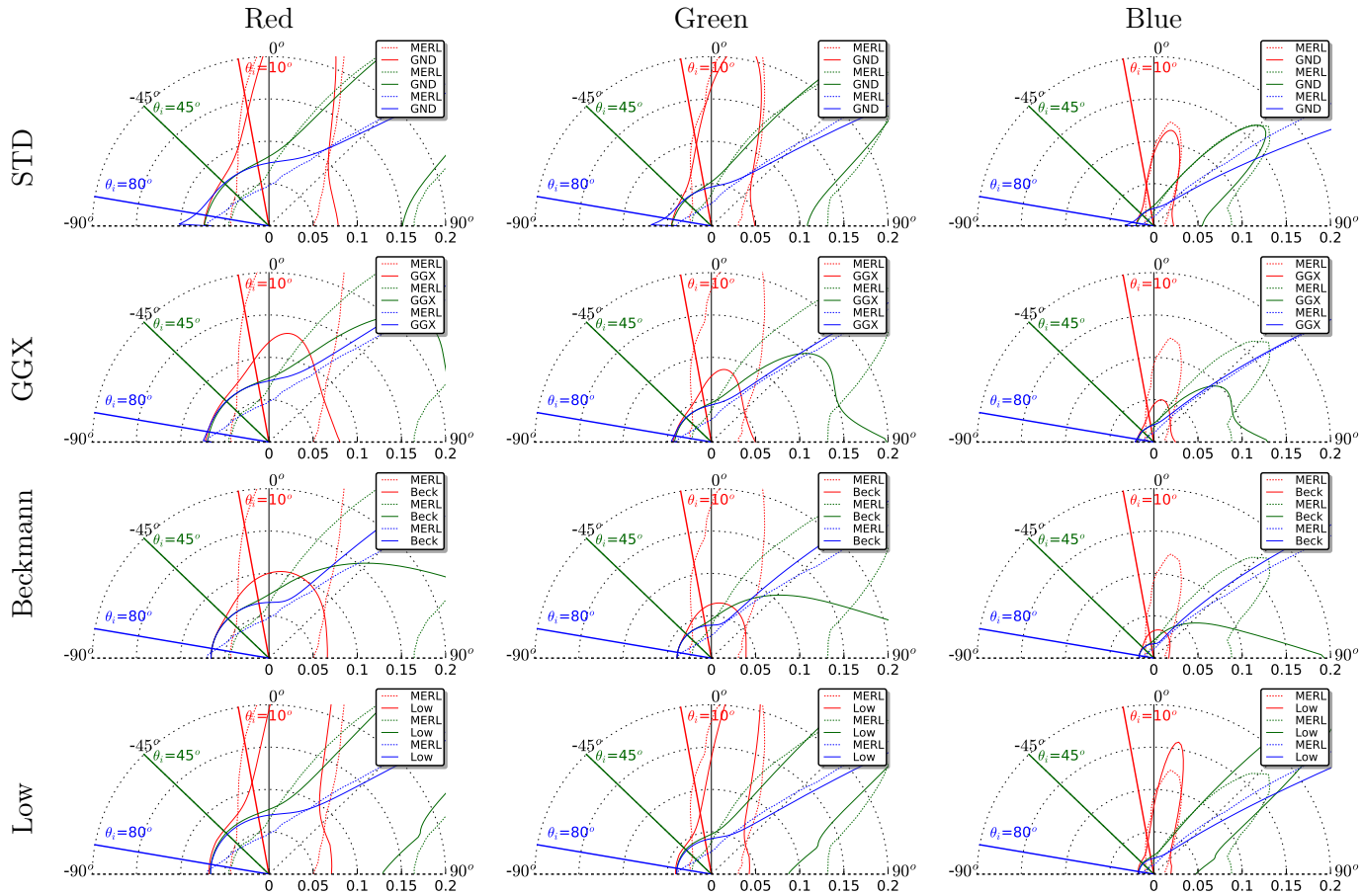
gold-metallic-paint3



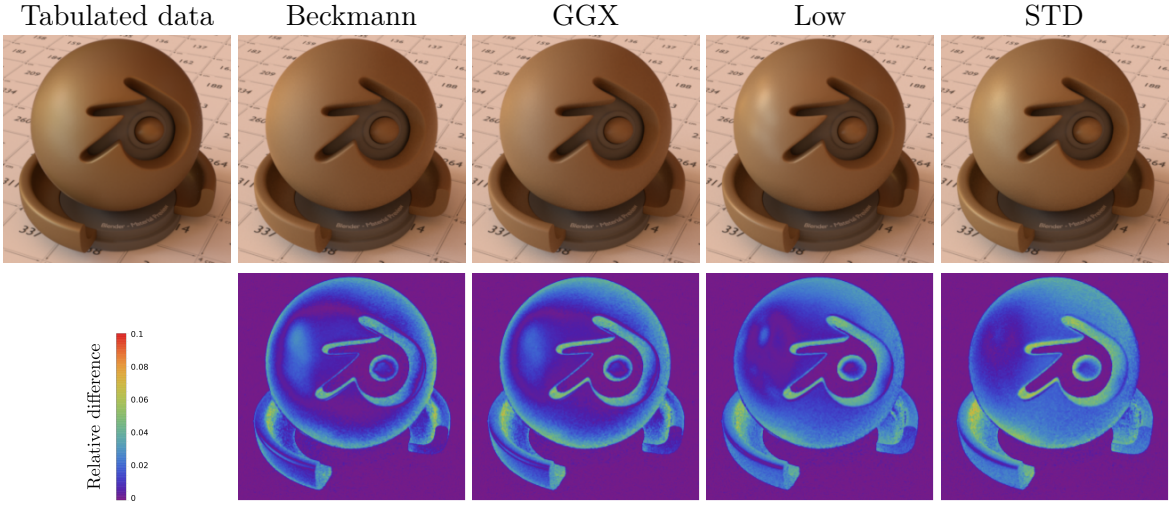
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.046-0.034-0.018	1.0-0.773-0.428	2.3091	0.0767	1.7403	0.00316
GGX	0.046-0.034-0.018	1.0-0.788-0.443	2.2006	0.0785	2.0	0.00325
Beckmann	0.046-0.034-0.018	1.0-0.75-0.461	1.8797	0.0775	$+\infty$	0.0049
	ρ	A		B	C	
Low	0.046-0.034-0.018	41.711-31.745-17.245	2.3856	638.603	1.5212	0.00312



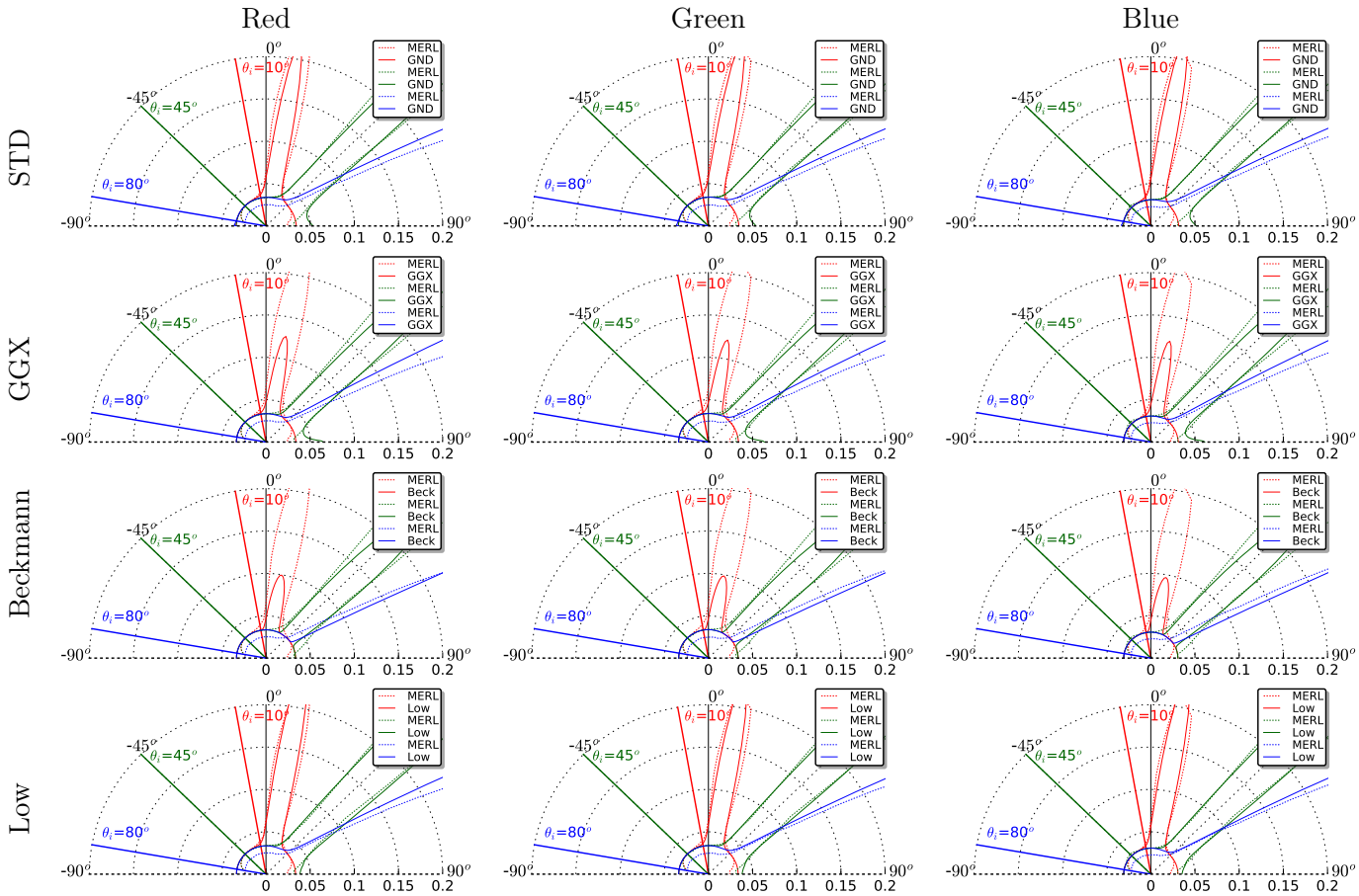
gold-paint



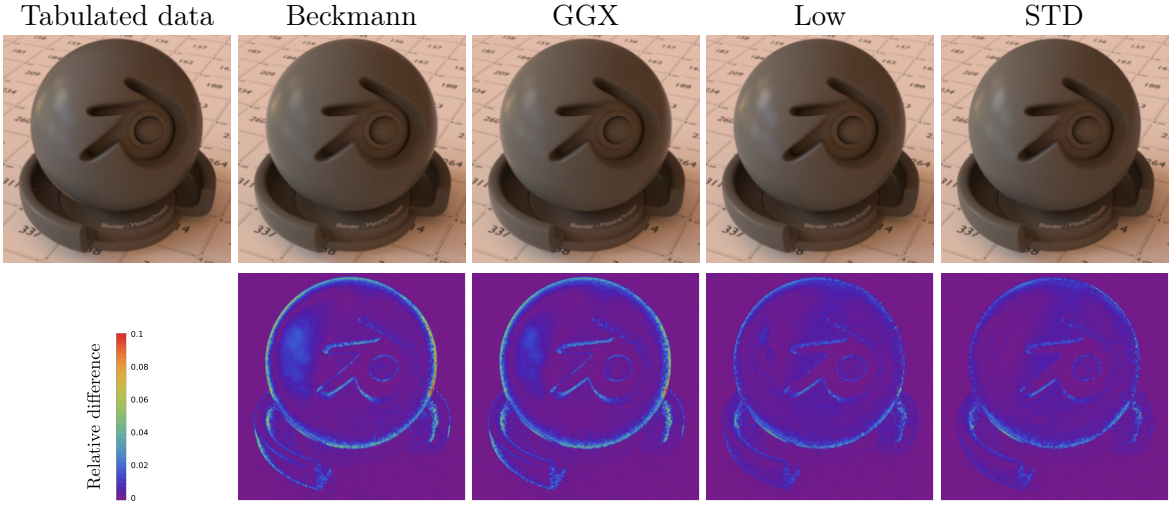
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.206-0.122-0.053	1.0-0.815-0.444	2.1672	0.2194	1.5935	0.00344
GGX	0.206-0.122-0.053	1.0-0.745-0.523	1.6072	0.2624	2.0	0.00375
Beckmann	0.206-0.122-0.053	1.0-0.714-0.447	1.4924	0.2903	$+\infty$	0.00382
	ρ	A		B	C	
Low	0.206-0.122-0.053	3.578-2.756-1.754	2.9665	242.198	1.2151	0.00365



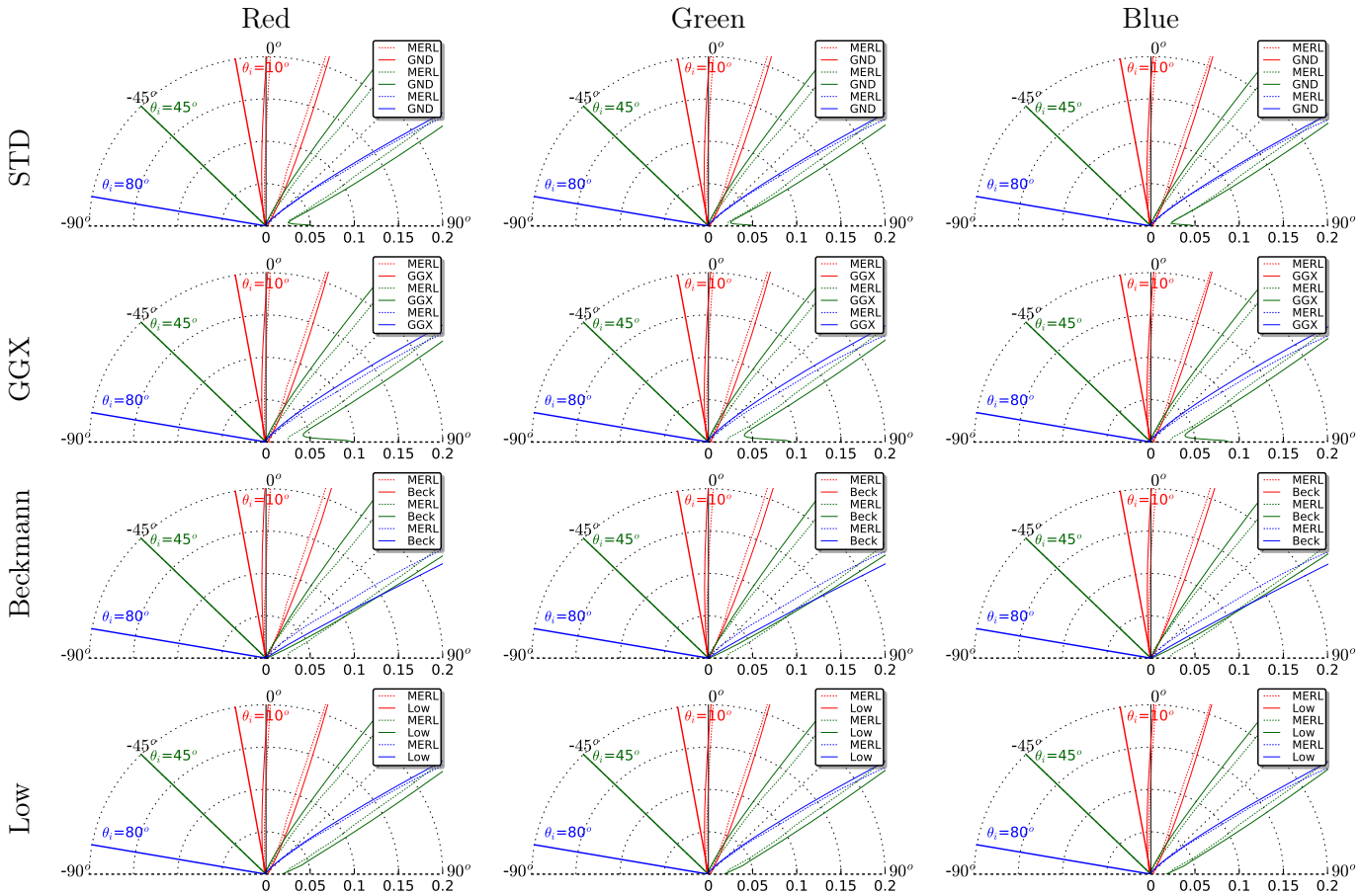
gray-plastic



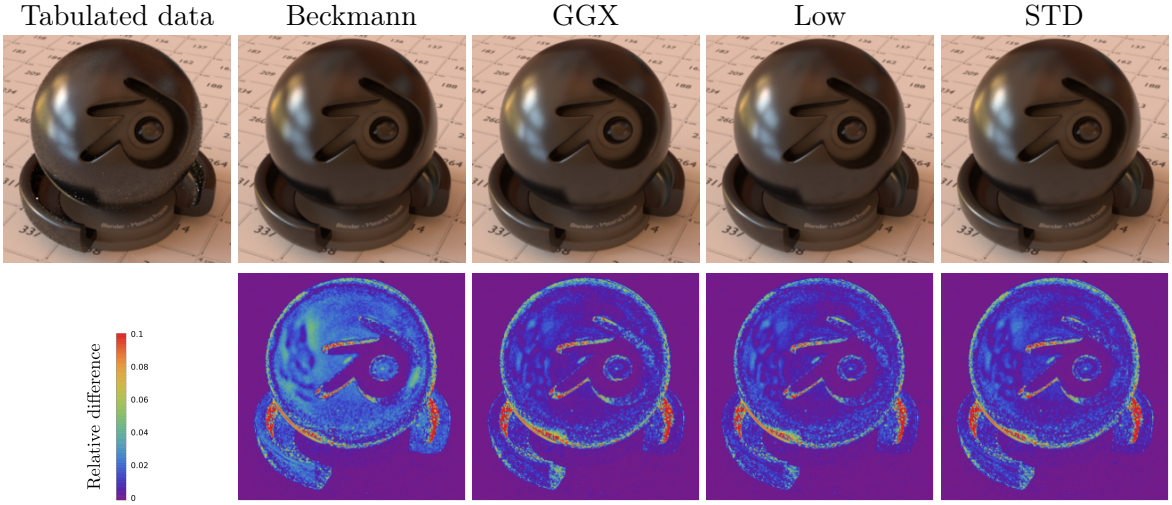
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.105-0.106-0.096	1.0-1.02-1.054	1.2386	0.0697	1.5494	0.00097
GGX	0.105-0.106-0.096	1.0-0.951-0.968	1.1609	0.0698	2.0	0.00106
Beckmann	0.105-0.106-0.096	1.0-0.981-0.997	1.1335	0.0697	$+\infty$	0.00115
	ρ	A		B	C	
Low	0.105-0.106-0.096	21.313-19.306-20.022	1.4312	507.729	1.9334	0.00091



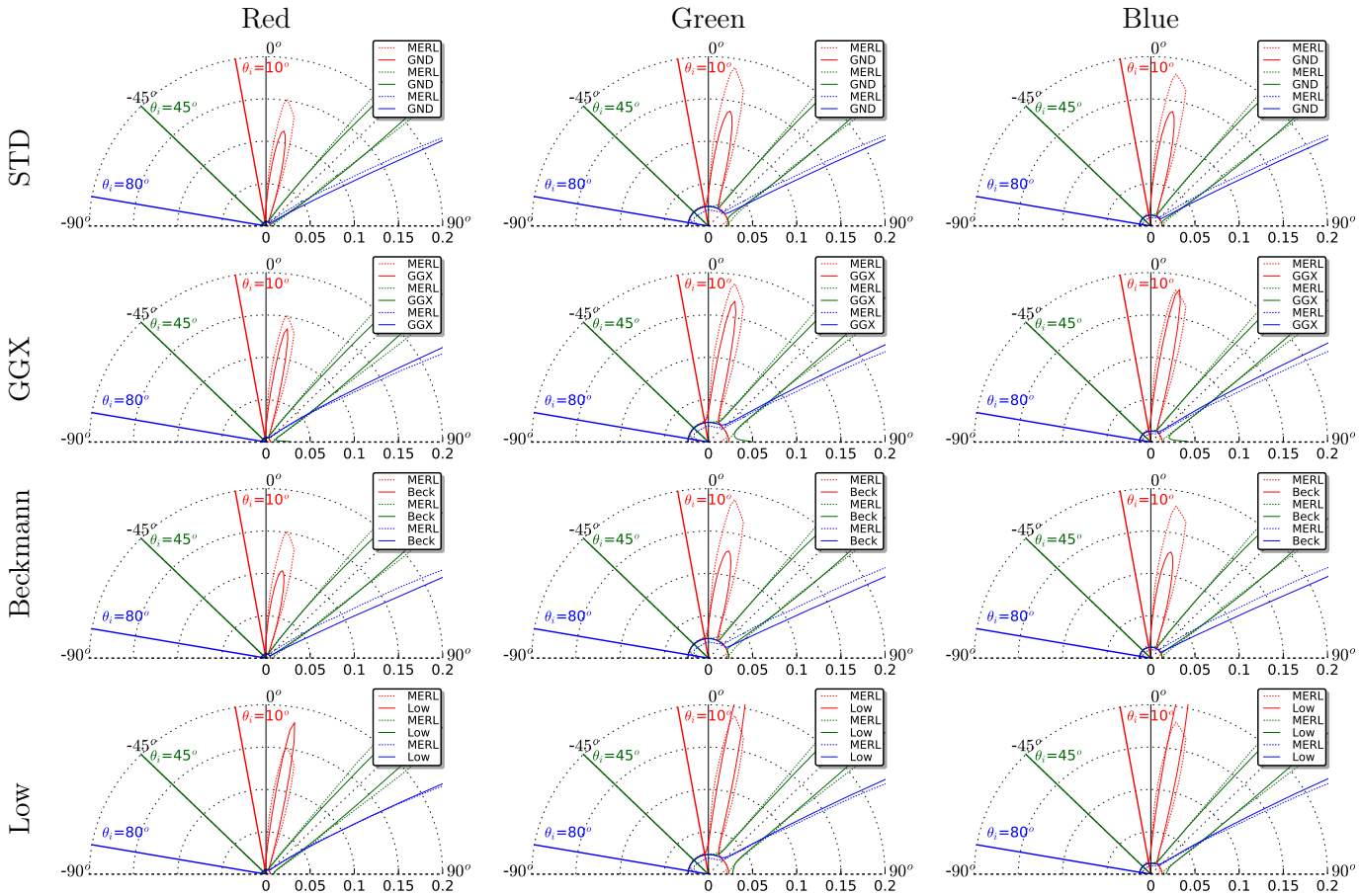
grease-covered-steel



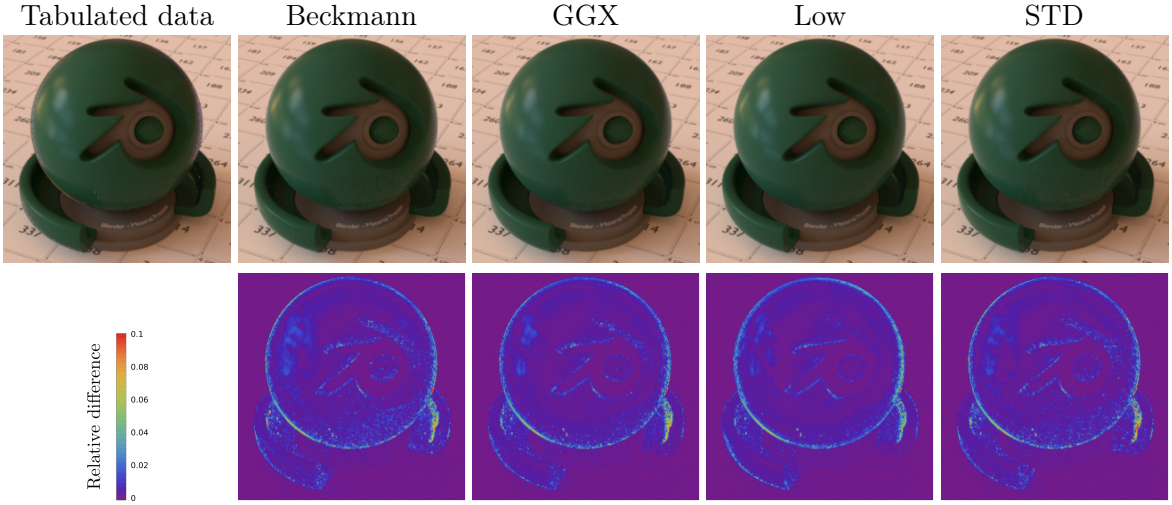
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.006-0.006-0.007	1.0-0.969-0.898	1.6998	0.0688	2.5363	0.00256
GGX	0.006-0.006-0.007	1.0-0.965-0.91	1.7183	0.0651	2.0	0.00268
Beckmann	0.006-0.006-0.007	1.0-0.938-0.867	1.6354	0.0753	$+\infty$	0.00319
	ρ	A		B	C	
Low	0.006-0.006-0.007	57.242-55.103-53.102	1.7849	552.469	1.9311	0.00273



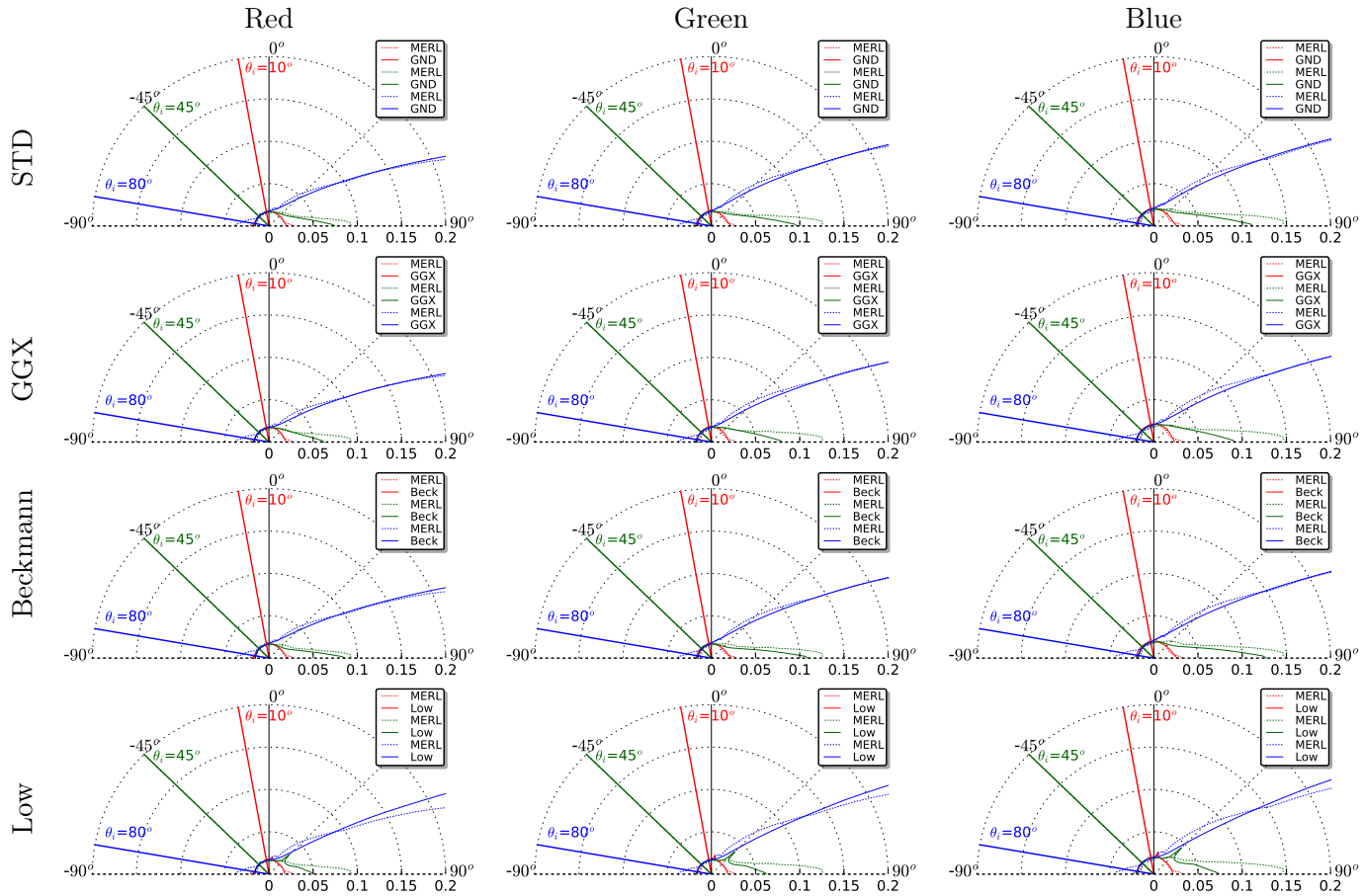
green-acrylic



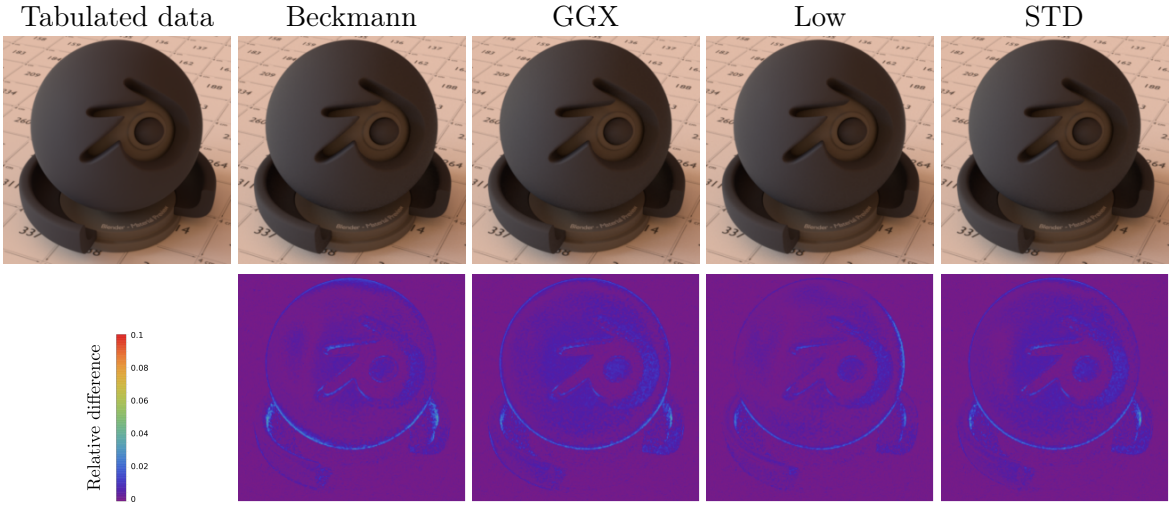
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.016-0.073-0.04	1.0-1.053-1.143	1.155	0.0624	7.5541	0.00077
GGX	0.016-0.073-0.04	1.0-1.114-1.299	1.1531	0.0563	2.0	0.00096
Beckmann	0.016-0.073-0.04	1.0-1.056-1.146	1.1481	0.0625	$+\infty$	0.00078
	ρ	A		B	C	
Low	0.016-0.073-0.04	61.218-75.921-83.558	1.2073	905.094	1.8734	0.00101



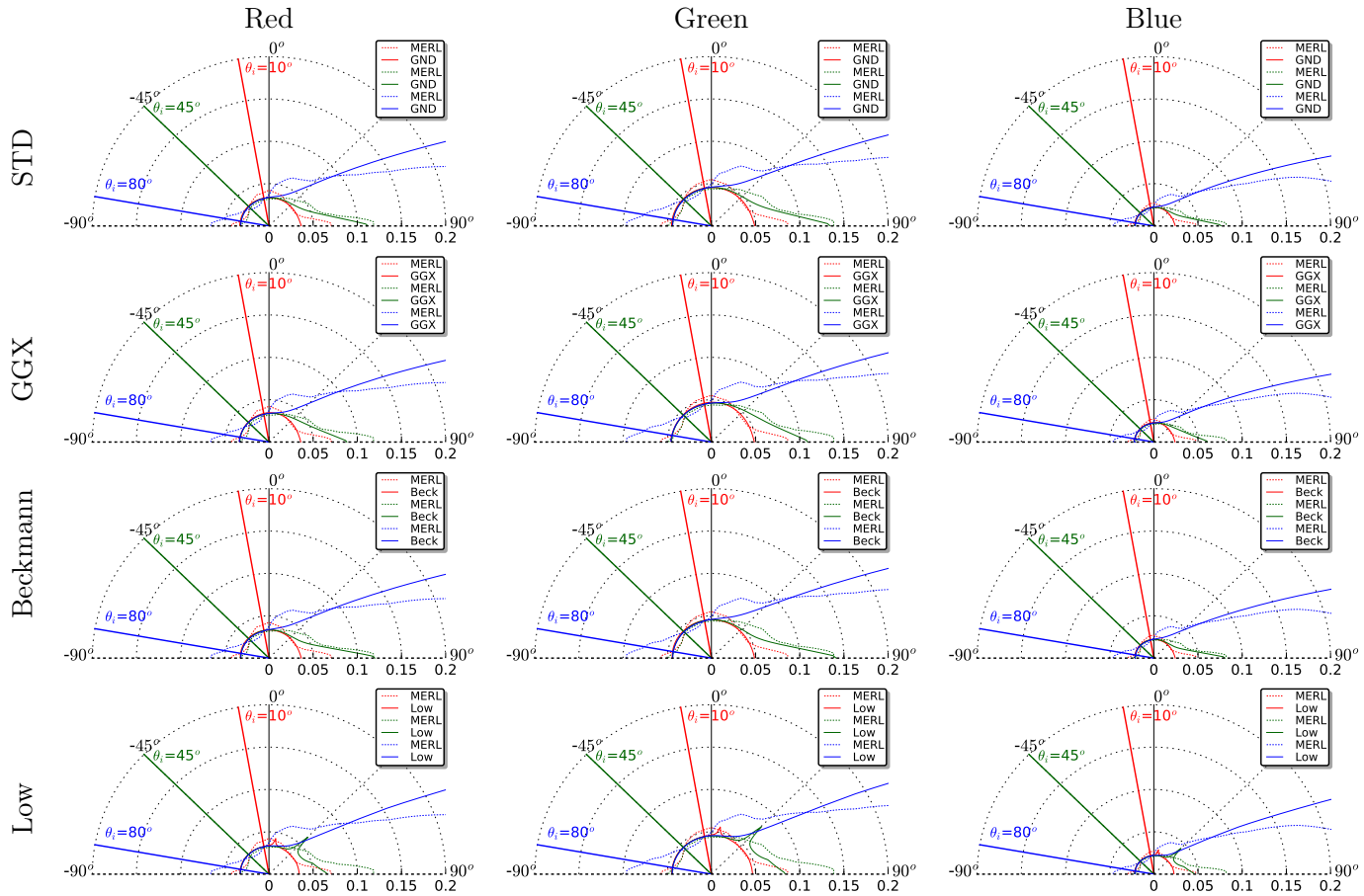
green-fabric



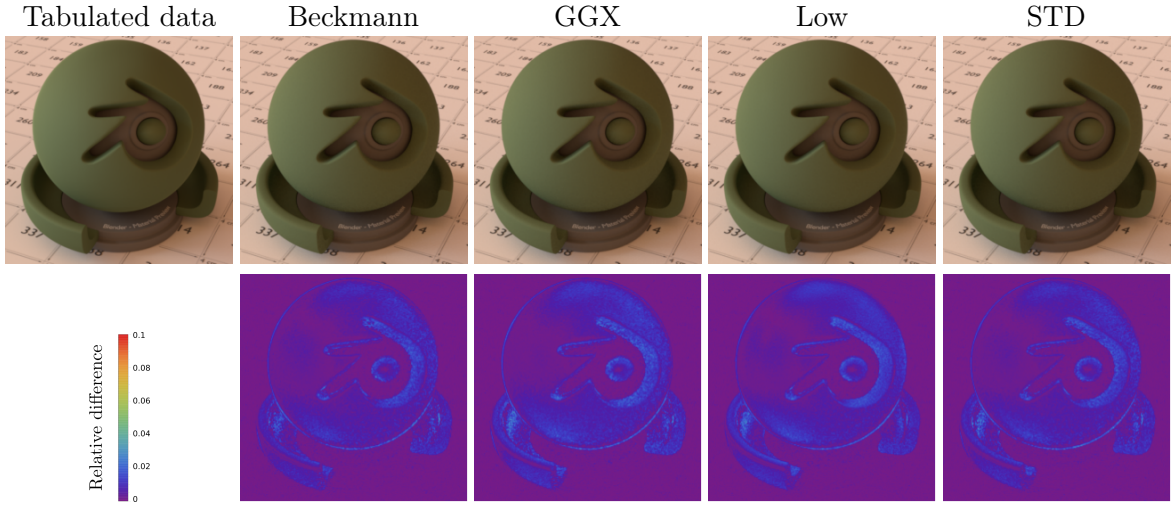
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.048-0.048-0.056	1.0-1.388-1.601	1.1714	0.5835	2.869	0.00038
GGX	0.048-0.048-0.056	1.0-1.378-1.58	1.192	0.533	2.0	0.00043
Beckmann	0.048-0.048-0.056	1.0-1.343-1.564	1.1447	0.6051	$+\infty$	0.0004
	ρ	A		B	C	
Low	0.048-0.048-0.056	1.873-2.491-2.936	1.22	57852.9	0.2516	0.00046



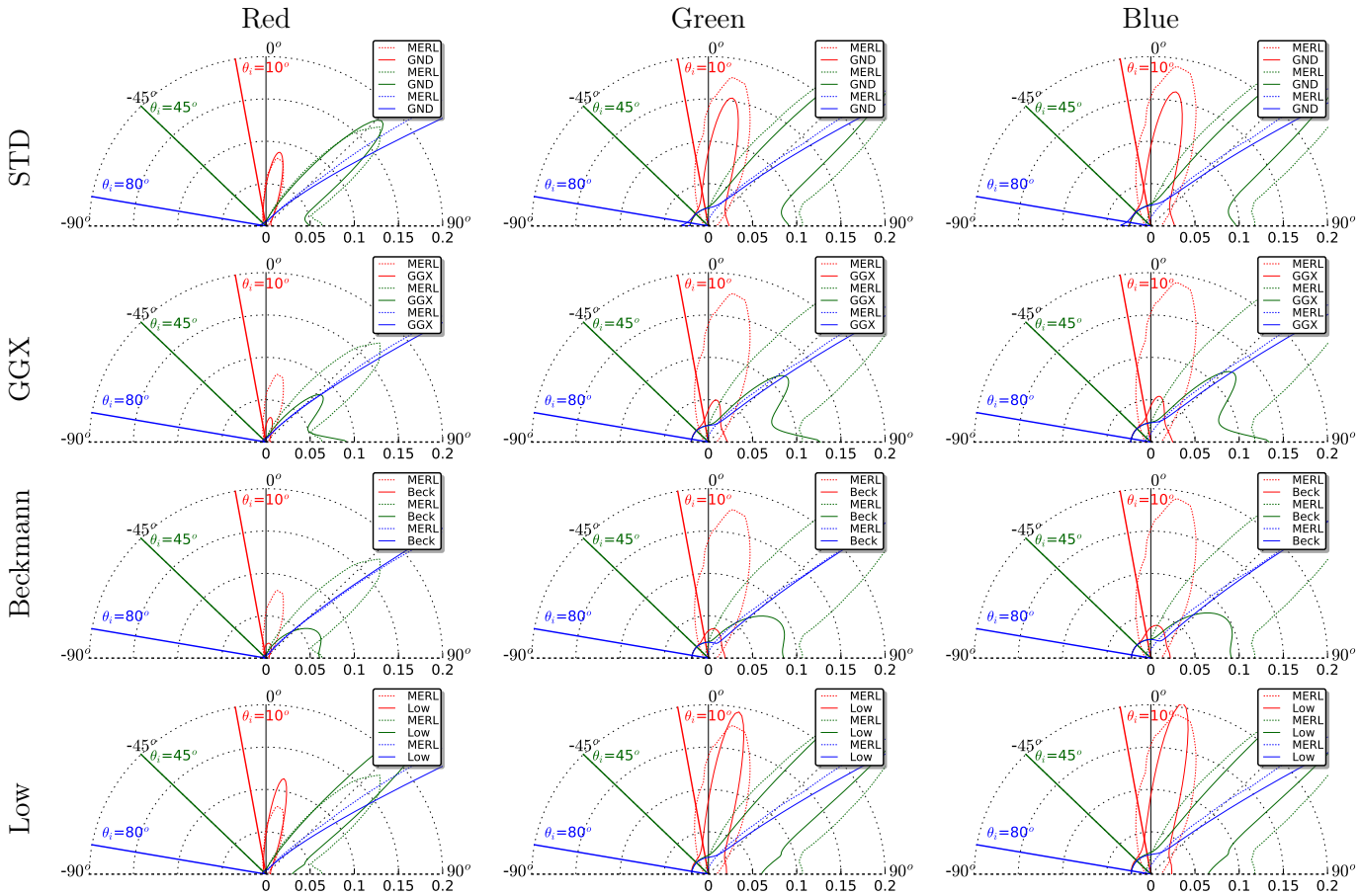
green-latex



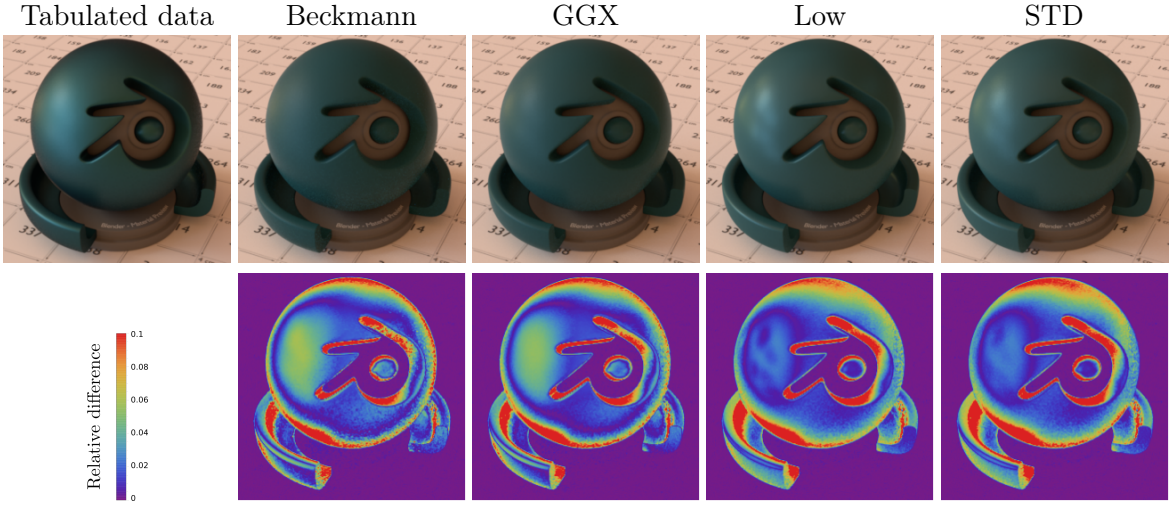
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.1-0.138-0.066	1.0-1.129-0.686	1.1553	0.5253	4.71	0.00103
GGX	0.1-0.138-0.066	1.0-1.158-0.705	1.2001	0.4857	2.0	0.00103
Beckmann	0.1-0.138-0.066	1.0-1.107-0.675	1.1453	0.5396	$+\infty$	0.00103
	ρ	A		B	C	
Low	0.1-0.138-0.066	2.545-2.995-1.85	1.2632	48329.3	0.3211	0.00112



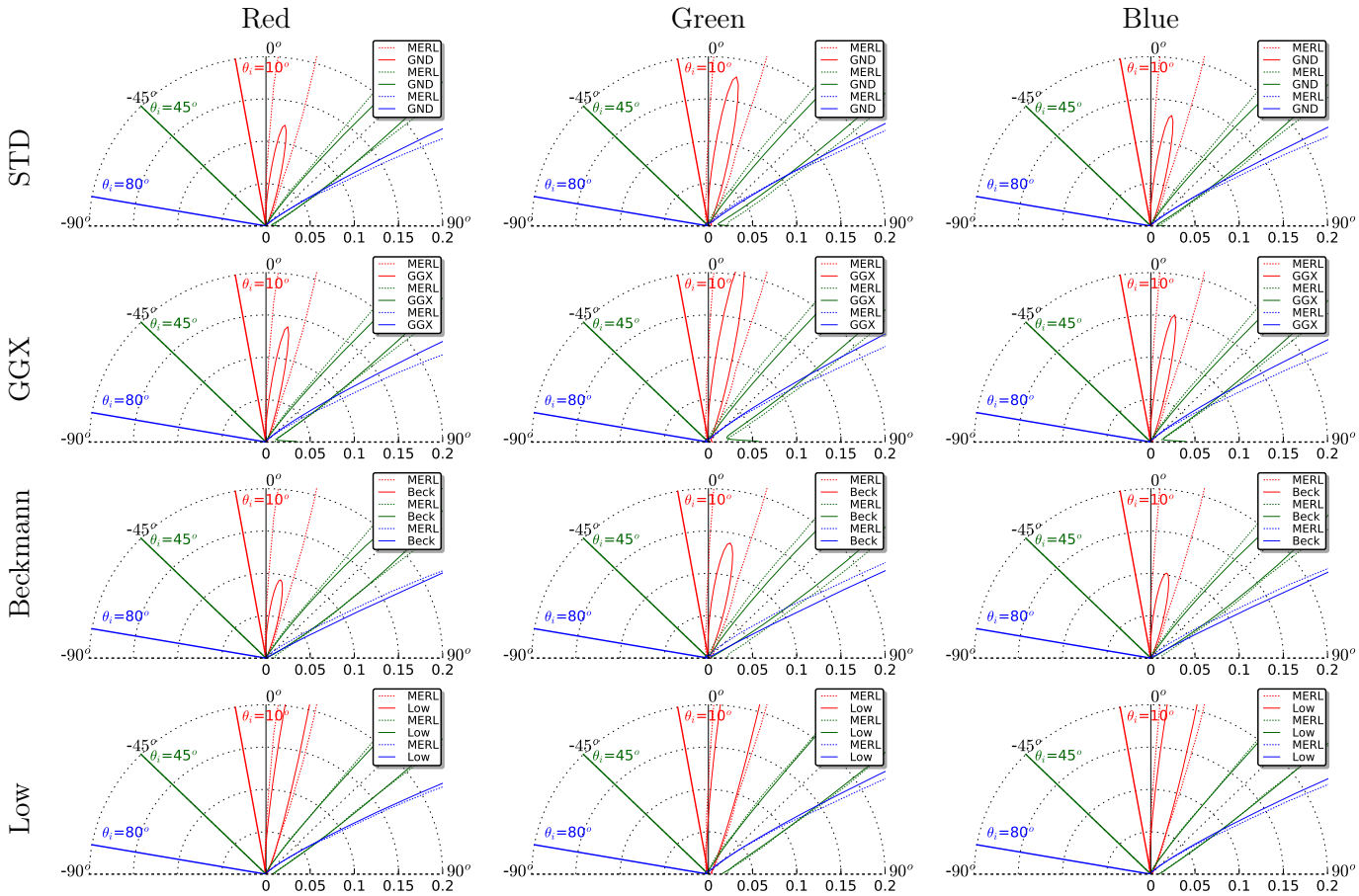
green-metallic-paint



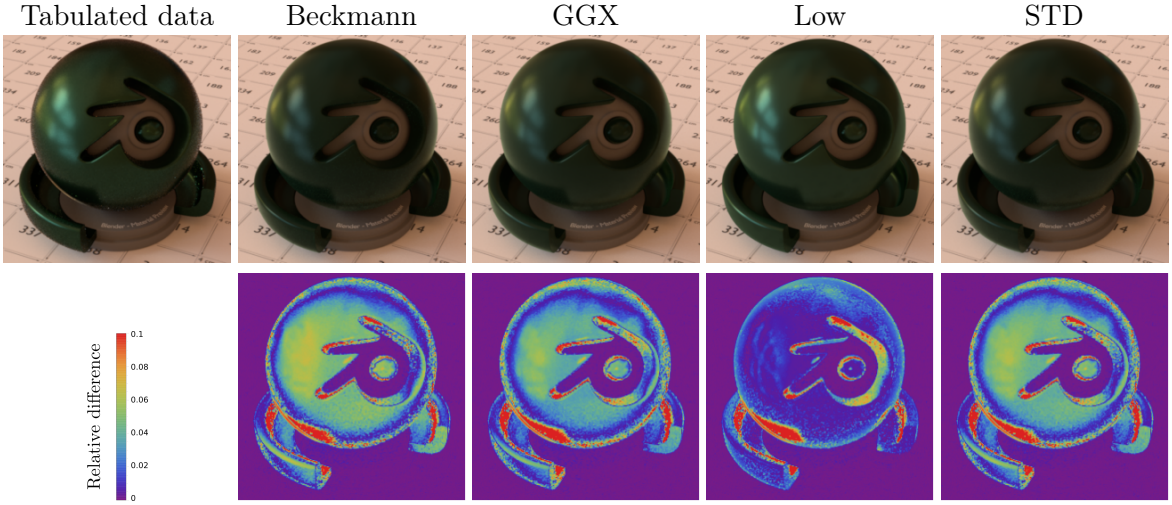
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.011-0.059-0.069	1.0-1.59-1.64	1.3887	0.1569	1.5857	0.00295
GGX	0.011-0.059-0.069	1.0-1.228-1.275	1.2109	0.1702	2.0	0.0034
Beckmann	0.011-0.059-0.069	1.0-1.161-1.212	1.1808	0.1994	$+\infty$	0.00357
	ρ	A		B	C	
Low	0.011-0.059-0.069	4.307-6.833-7.103	1.7778	245.842	1.4092	0.00303



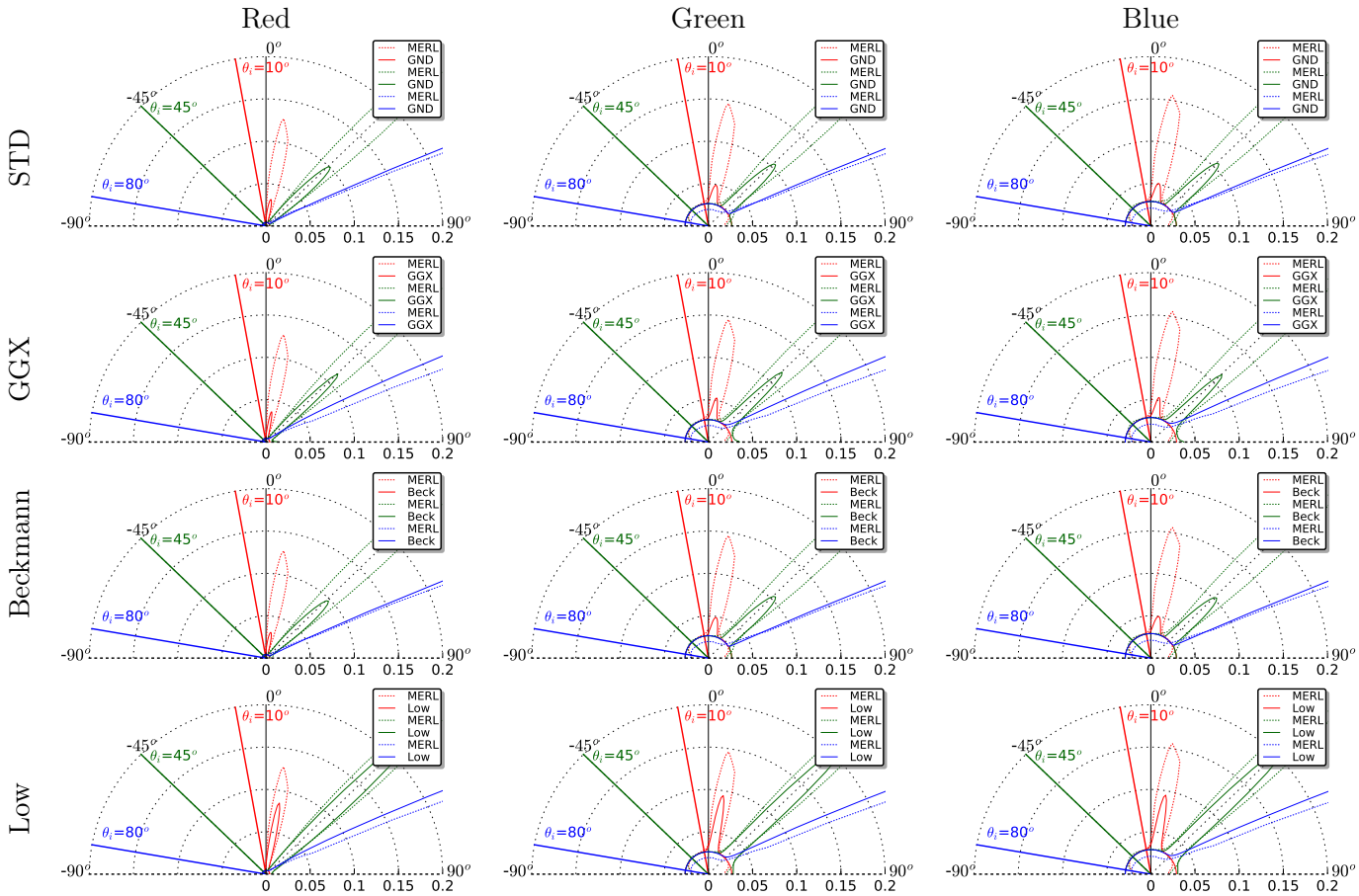
green-metallic-paint2



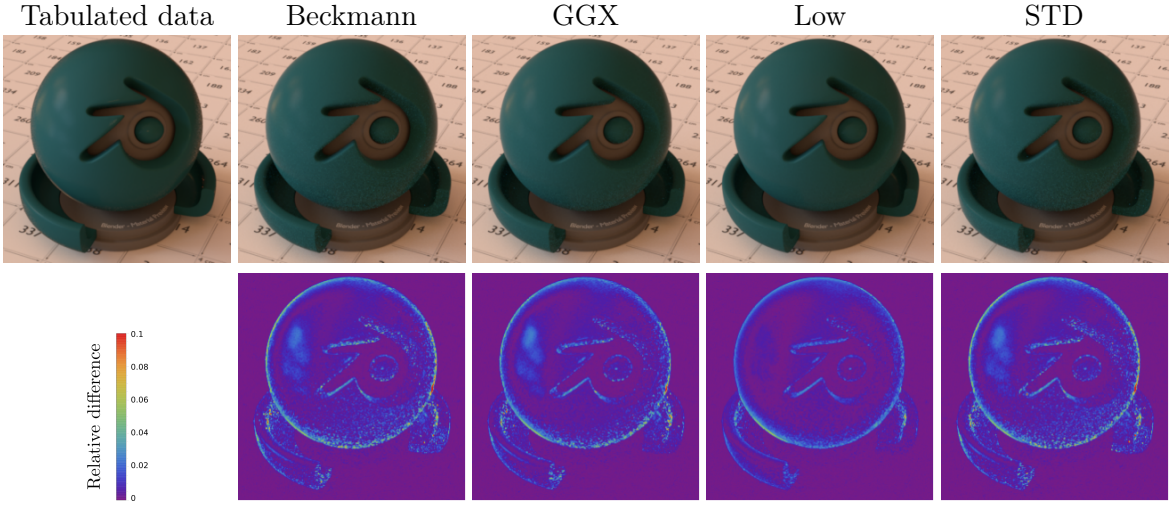
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.004-0.011-0.006	1.0-1.465-1.092	1.1778	0.0673	2.6908	0.00156
GGX	0.004-0.011-0.006	1.0-1.567-1.099	1.188	0.0664	2.0	0.00154
Beckmann	0.004-0.011-0.006	1.0-1.453-1.081	1.1602	0.0698	$+\infty$	0.00168
	ρ	A		B	C	
Low	0.004-0.011-0.006	19.448-39.375-25.163	1.672	891.903	1.6924	0.0011



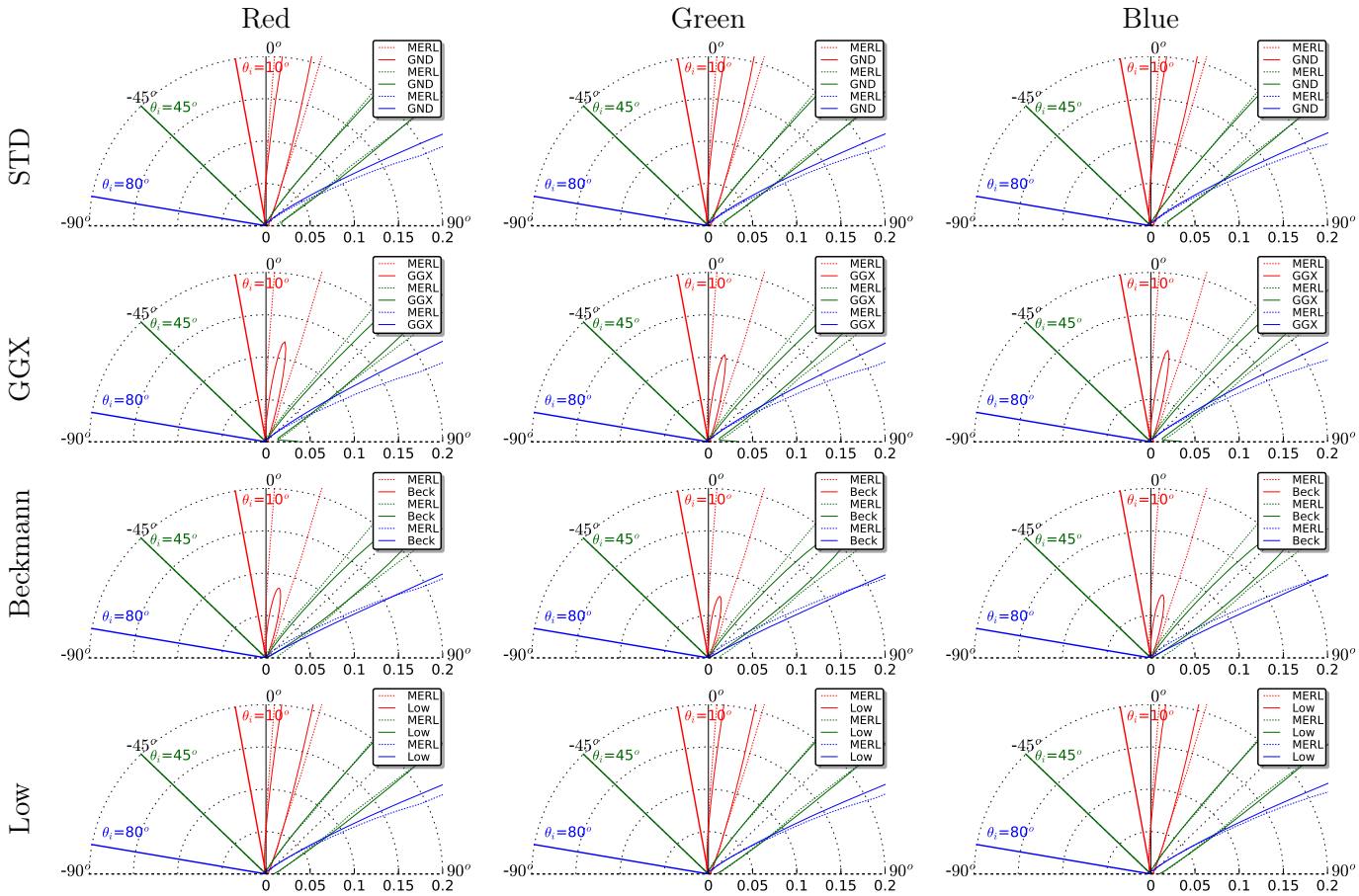
green-plastic



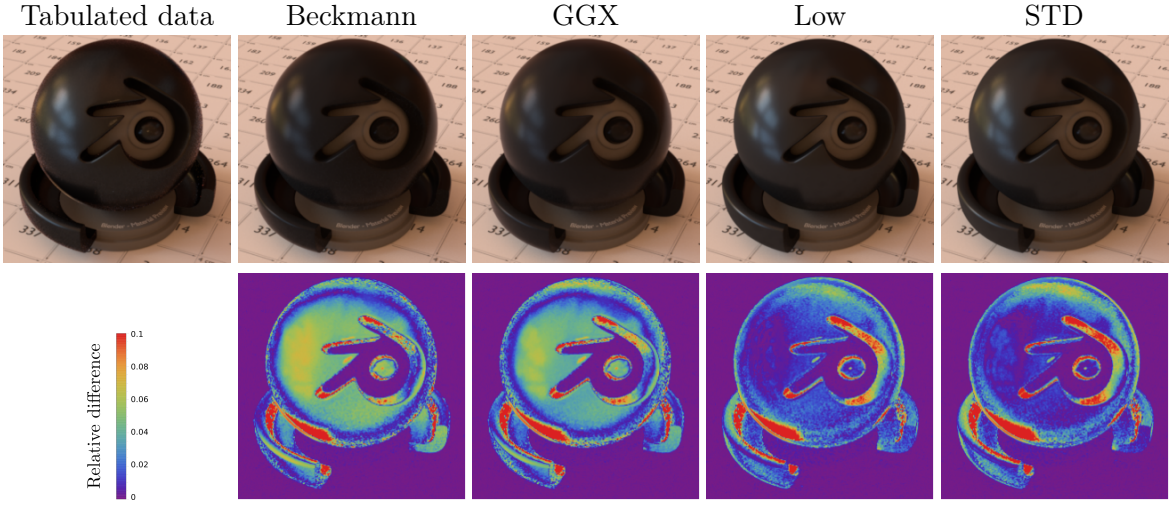
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.013-0.083-0.091	1.0-0.815-0.803	1.074	0.0616	15.6429	0.0006
GGX	0.013-0.083-0.091	1.0-0.825-0.763	1.0775	0.0596	2.0	0.00064
Beckmann	0.013-0.083-0.091	1.0-0.84-0.792	1.0743	0.0629	$+\infty$	0.0006
	ρ	A		B	C	
Low	0.013-0.083-0.091	18.629-15.588-15.134	1.2605	635.79	1.9288	0.00056



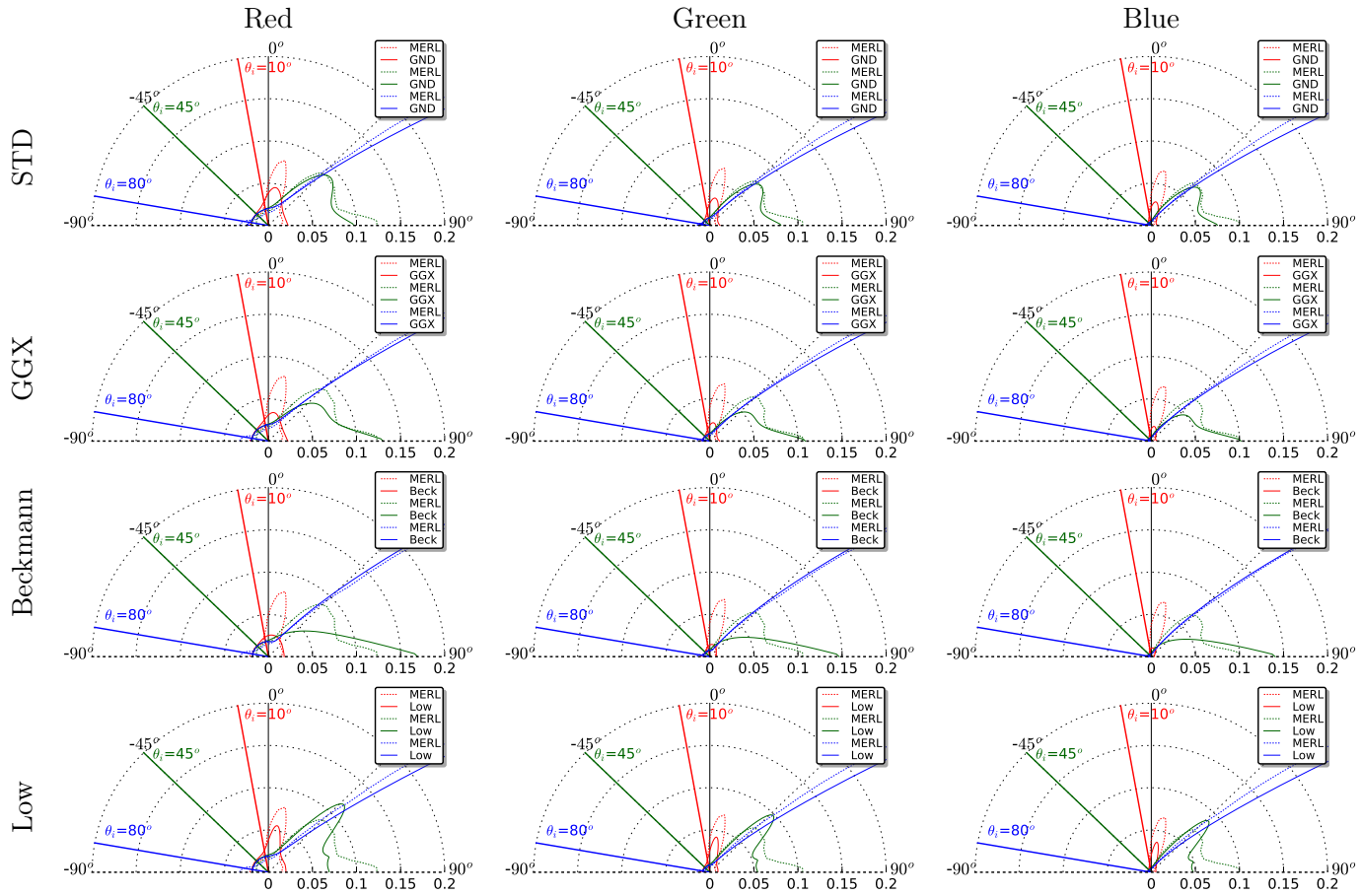
hematite



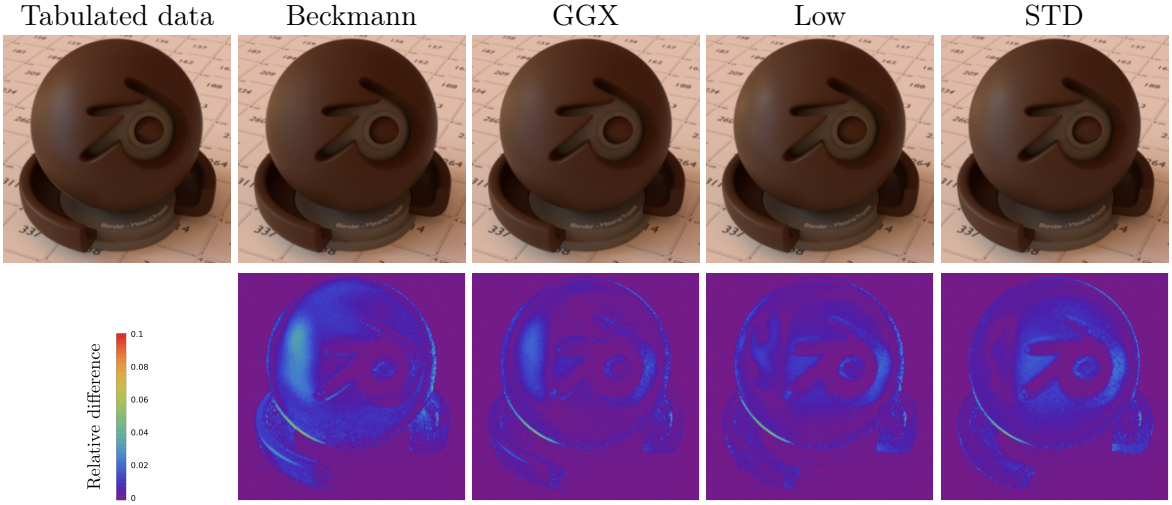
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.008-0.009-0.009	1.0-1.008-1.064	1.3836	0.0663	1.5282	0.001
GGX	0.008-0.009-0.009	1.0-0.868-0.909	1.1784	0.0685	2.0	0.0014
Beckmann	0.008-0.009-0.009	1.0-0.875-0.894	1.1455	0.0682	$+\infty$	0.00154
	ρ	A		B	C	
Low	0.008-0.009-0.009	10.977-11.148-11.837	2.2348	871.641	1.6199	0.00096



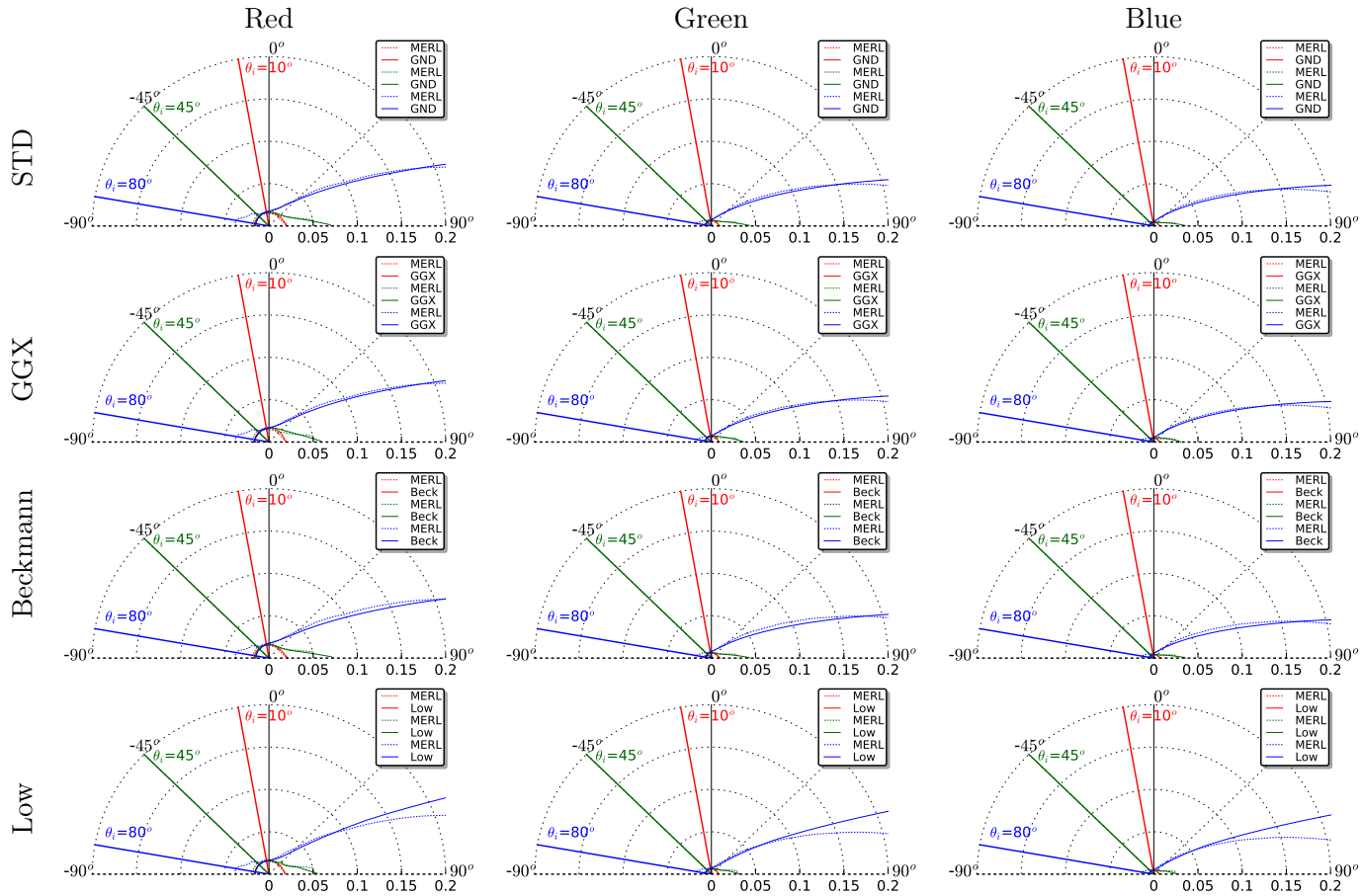
ipswich-pine-221



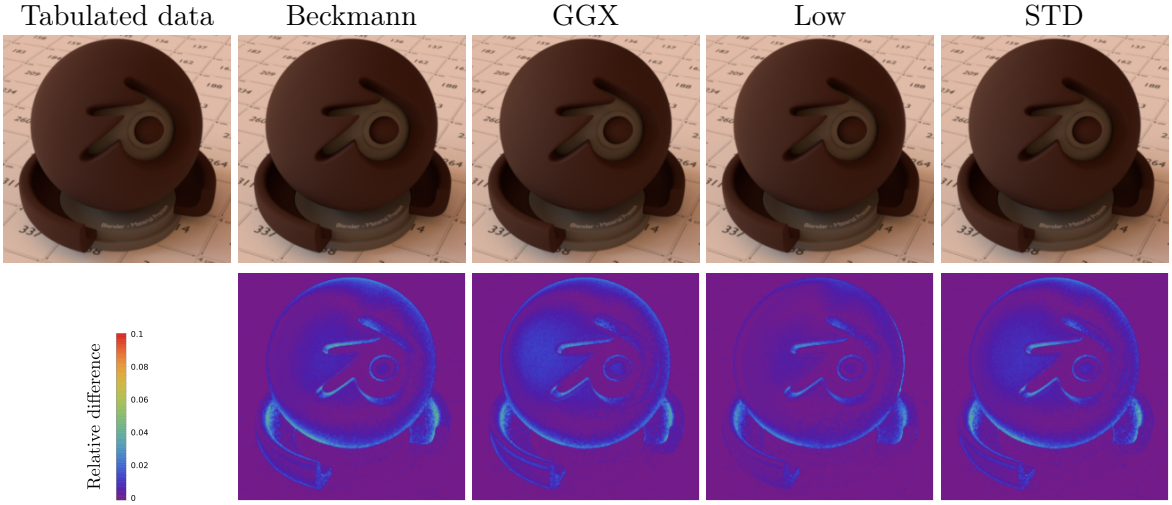
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.056-0.023-0.01	1.0-0.929-0.91	1.3218	0.2373	1.7095	0.00065
GGX	0.056-0.023-0.01	1.0-0.901-0.878	1.2506	0.249	2.0	0.00071
Beckmann	0.056-0.023-0.01	1.0-0.921-0.906	1.1809	0.2652	$+\infty$	0.00093
	ρ	A		B	C	
Low	0.056-0.023-0.01	3.892-3.576-3.359	1.417	211.803	1.0672	0.00079



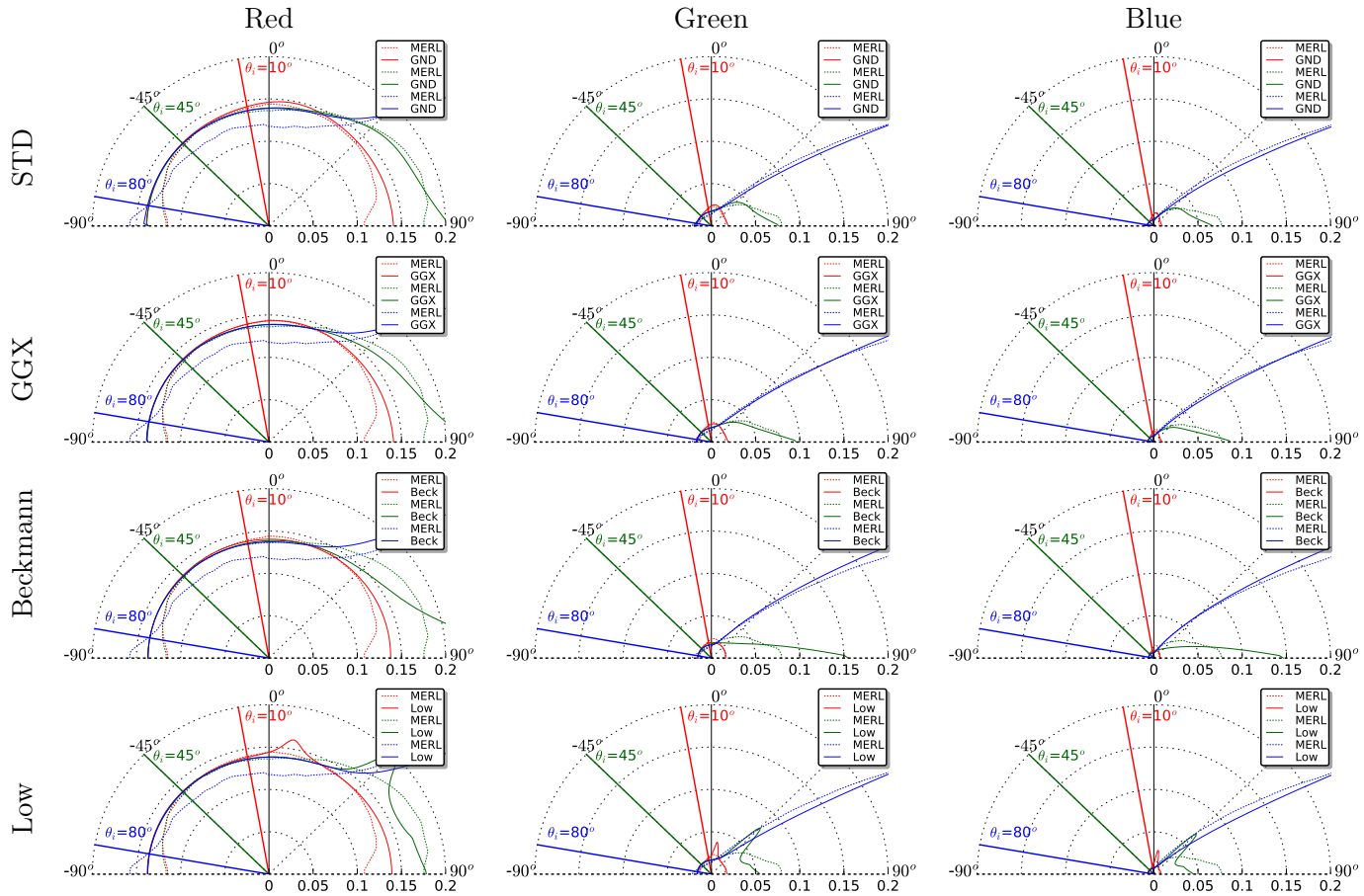
light-brown-fabric



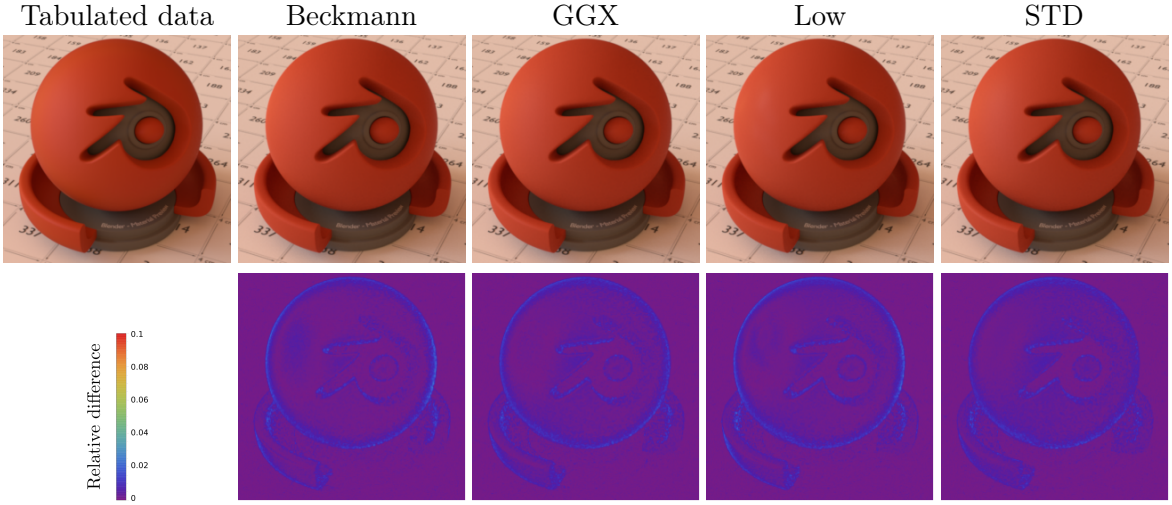
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.046-0.019-0.013	1.0-0.665-0.566	1.1855	0.6612	3.4824	0.0003
GGX	0.046-0.019-0.013	1.0-0.68-0.588	1.214	0.5827	2.0	0.00033
Beckmann	0.046-0.019-0.013	1.0-0.647-0.549	1.165	0.7041	$+\infty$	0.00032
	ρ	A		B	C	
Low	0.046-0.019-0.013	0.816-0.519-0.45	1.2009	99375.4	0.1194	0.00027



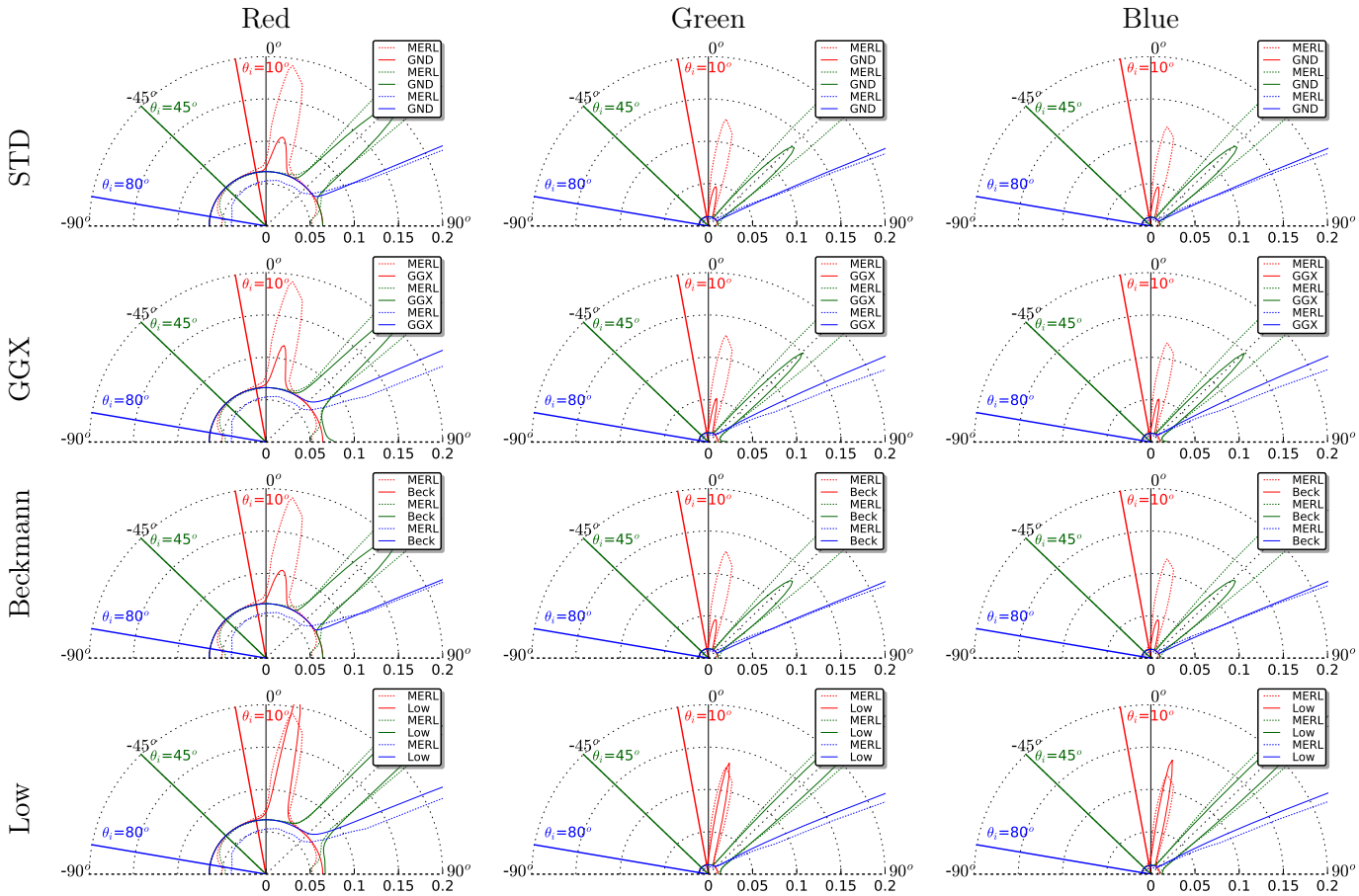
light-red-paint



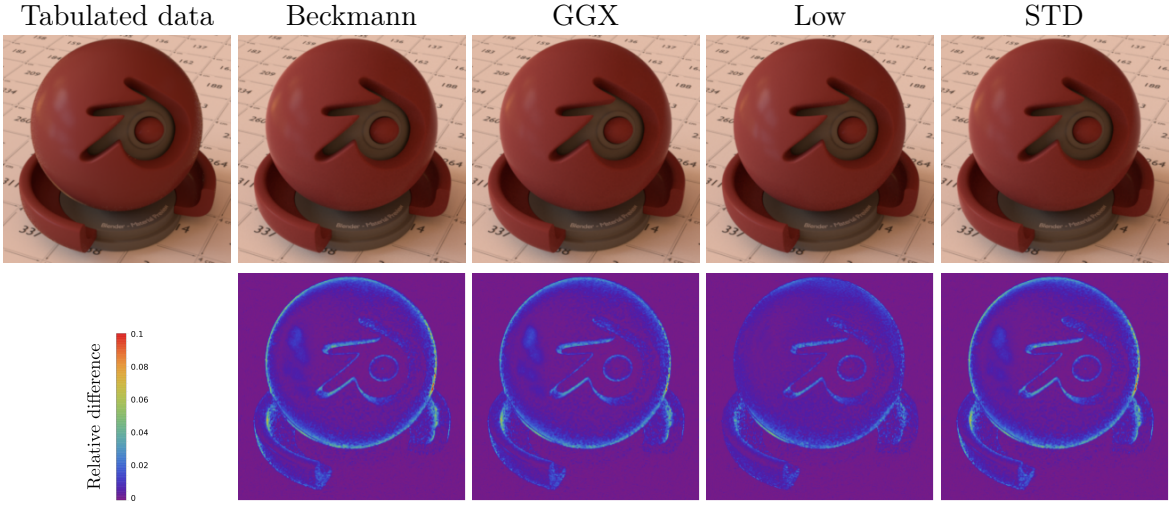
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.43-0.048-0.019	1.0-0.915-0.901	1.2622	0.3175	1.7463	0.00086
GGX	0.43-0.048-0.019	1.0-0.91-0.909	1.2144	0.3306	2.0	0.00085
Beckmann	0.43-0.048-0.019	1.0-0.877-0.883	1.1589	0.3521	$+\infty$	0.00089
	ρ	A		B	C	
Low	0.43-0.048-0.019	4.161-3.947-3.888	1.3063	1449.13	0.6511	0.00113



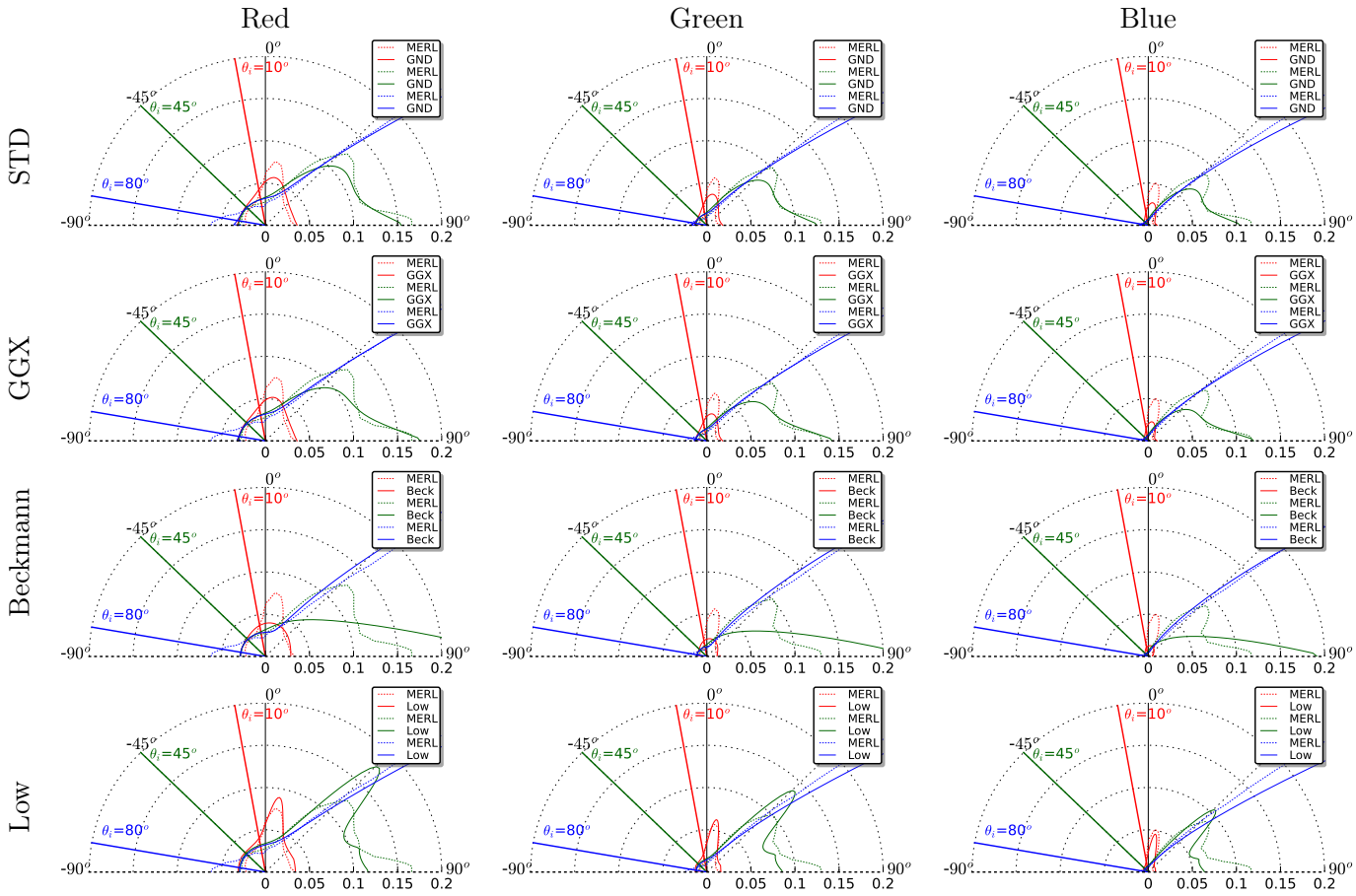
maroon-plastic



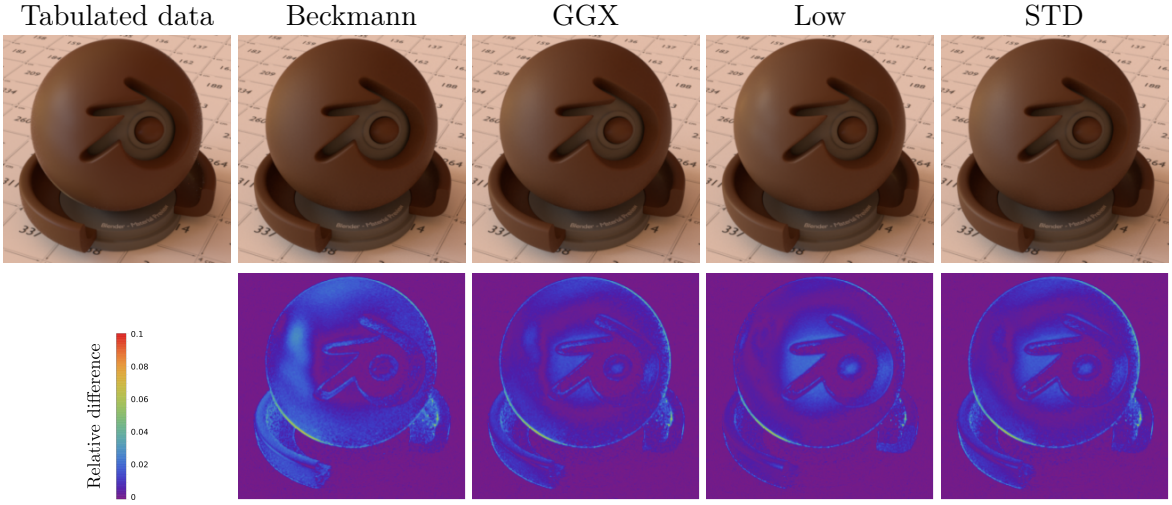
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.202-0.035-0.033	1.0-0.856-0.865	1.09	0.06	18.1465	0.00081
GGX	0.202-0.035-0.033	1.0-0.799-0.8	1.0935	0.0563	2.0	0.00089
Beckmann	0.202-0.035-0.033	1.0-0.857-0.866	1.0893	0.0604	$+\infty$	0.00081
	ρ	A		B	C	
Low	0.202-0.035-0.033	21.698-17.62-18.236	1.341	1146.35	1.6788	0.00089



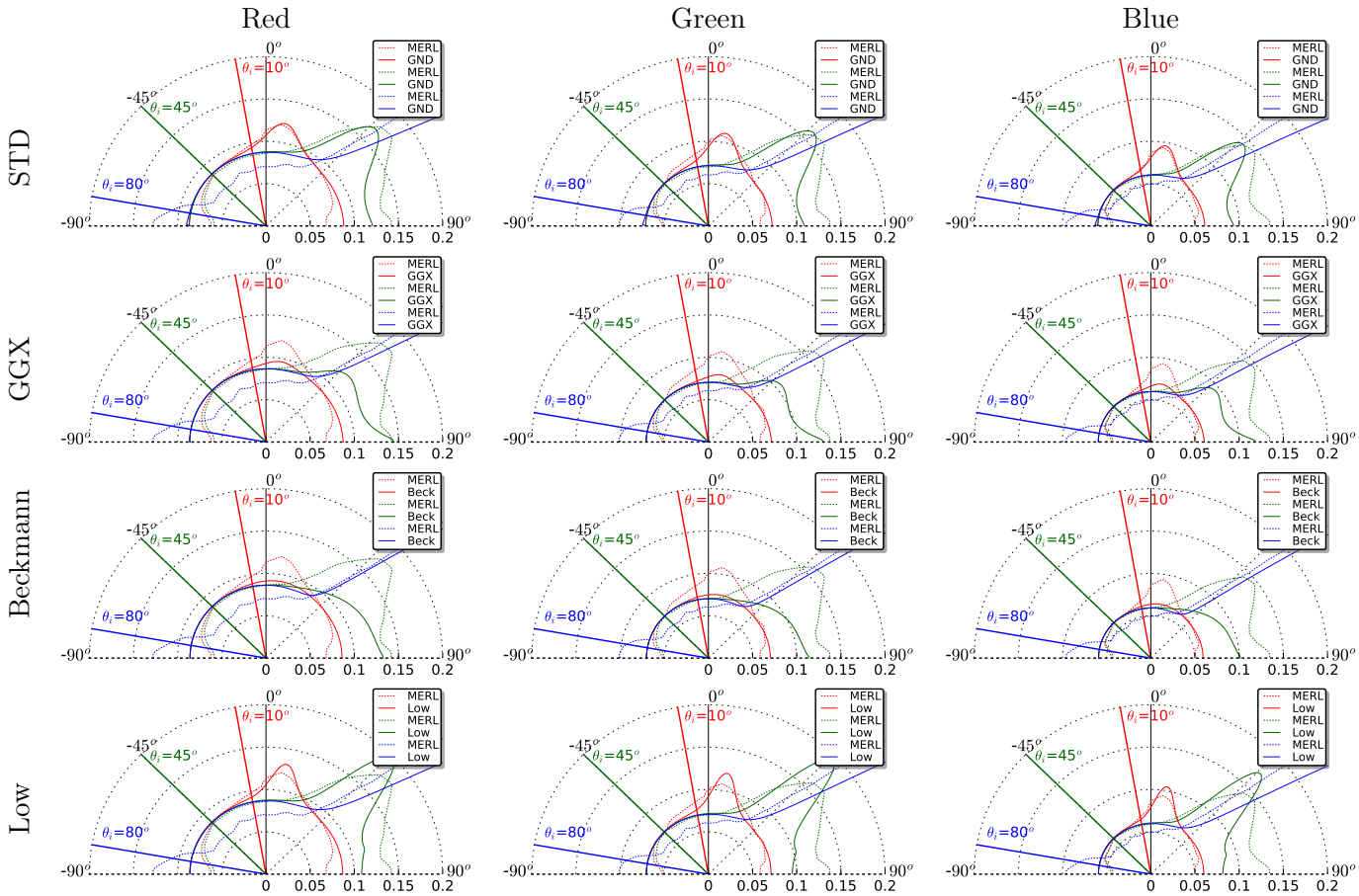
natural-209



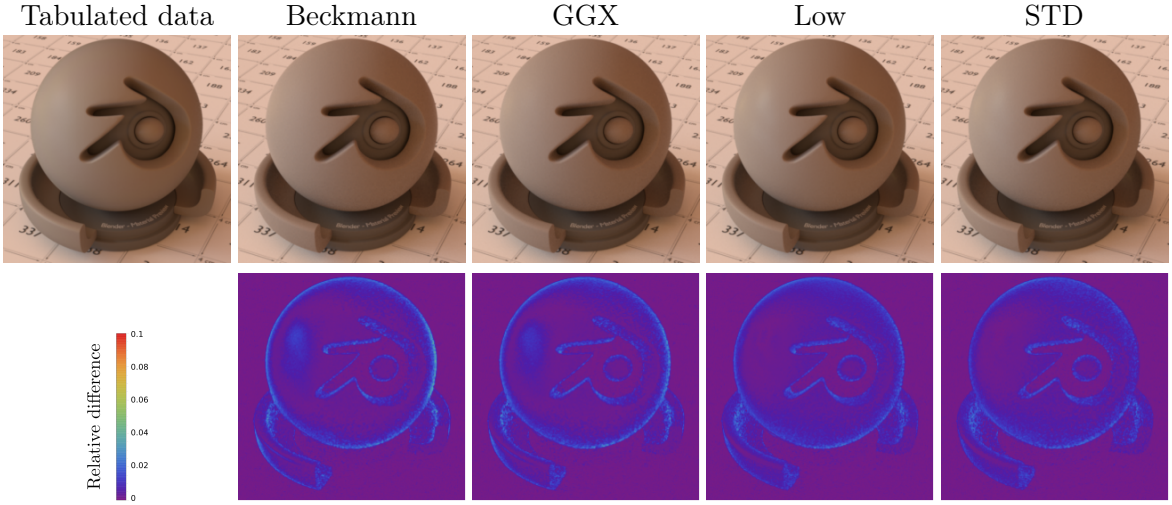
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.089-0.035-0.013	1.0-0.902-0.791	1.3848	0.271	1.8449	0.00094
GGX	0.089-0.035-0.013	1.0-0.89-0.784	1.3558	0.2798	2.0	0.00096
Beckmann	0.089-0.035-0.013	1.0-0.863-0.753	1.2581	0.3023	$+\infty$	0.00133
	ρ	A		B	C	
Low	0.089-0.035-0.013	4.335-3.664-2.93	1.5232	440.018	0.774	0.00109



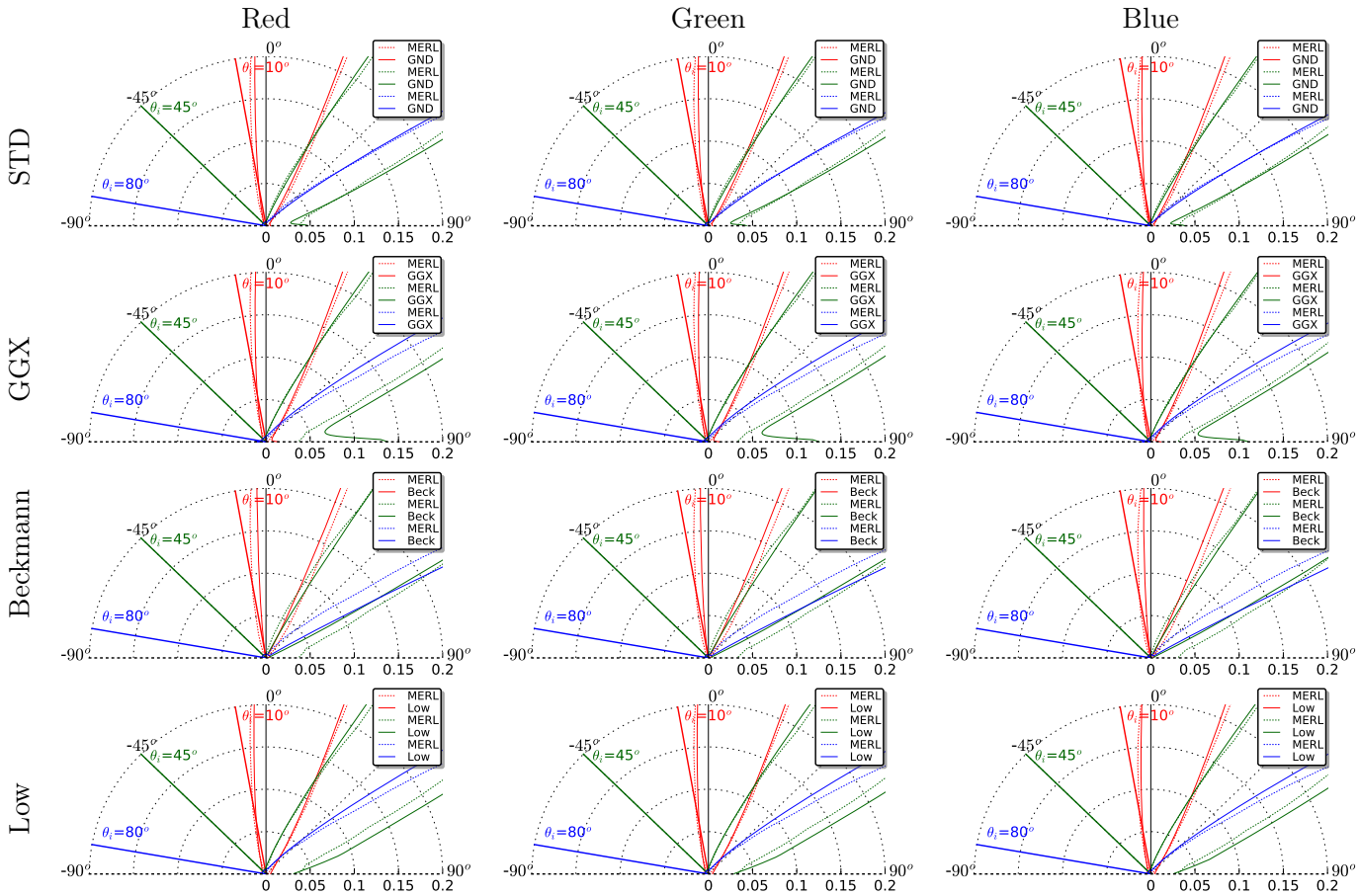
neoprene-rubber



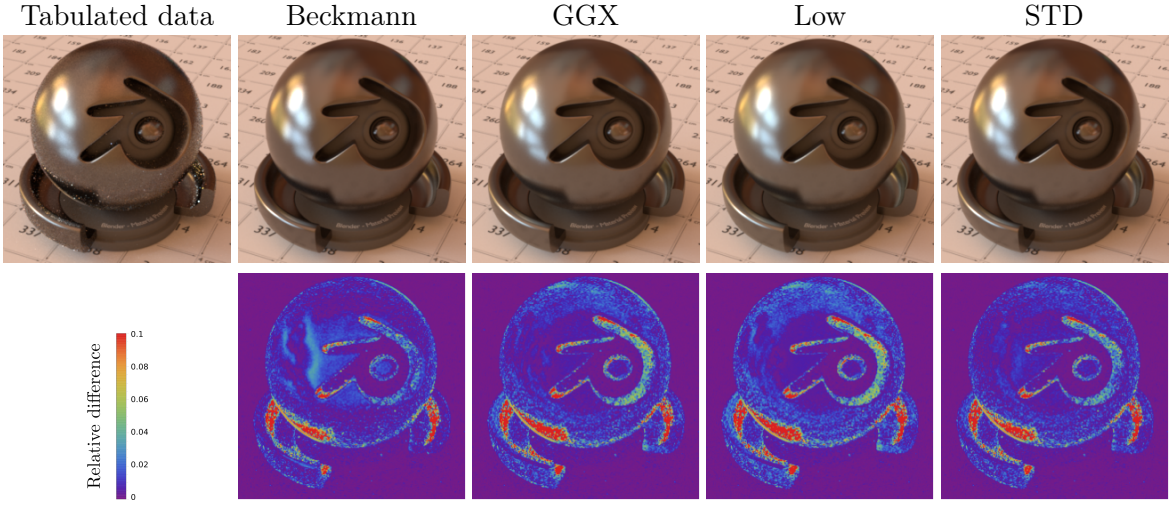
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.27-0.22-0.186	1.0-1.114-1.004	1.2693	0.1736	1.5892	0.00139
GGX	0.27-0.22-0.186	1.0-1.019-1.005	1.1396	0.1846	2.0	0.00156
Beckmann	0.27-0.22-0.186	1.0-0.932-0.906	1.1196	0.2098	$+\infty$	0.00161
	ρ	A		B	C	
Low	0.27-0.22-0.186	3.337-3.717-3.335	1.5132	231.722	1.3187	0.00145



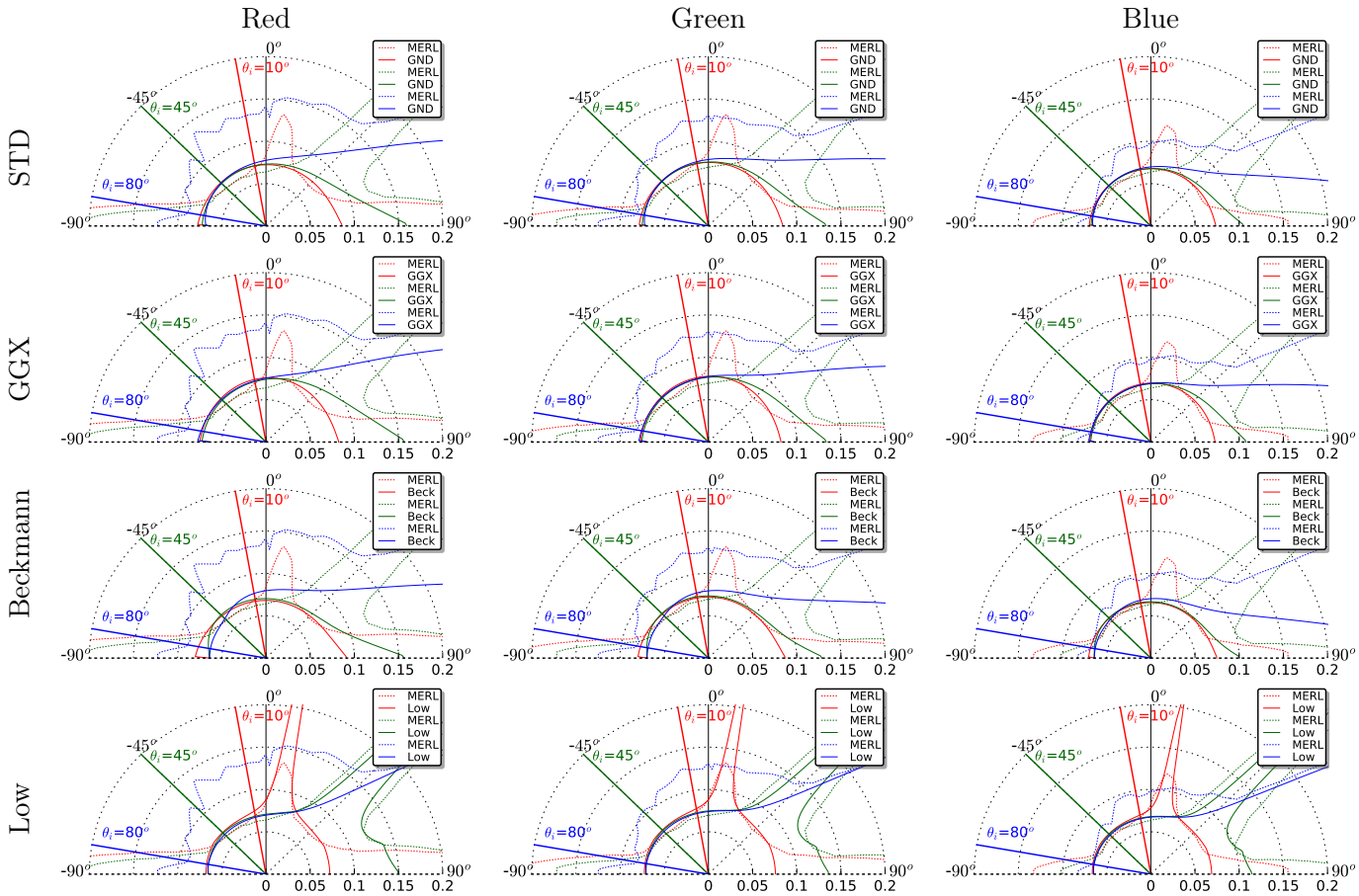
nickel



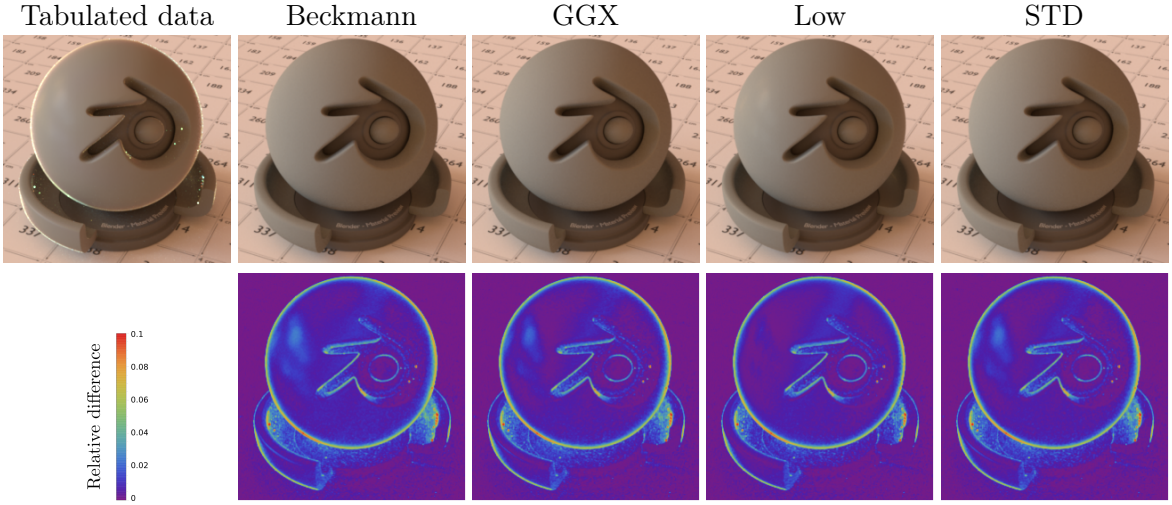
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.014-0.012-0.012	1.0-0.904-0.798	2.5631	0.0653	2.8558	0.00337
GGX	0.014-0.012-0.012	1.0-0.91-0.798	2.5768	0.061	2.0	0.00427
Beckmann	0.014-0.012-0.012	1.0-0.882-0.786	2.4449	0.0681	$+\infty$	0.0045
	ρ	A		B	C	
Low	0.014-0.012-0.012	59.548-55.782-48.615	2.5863	466.759	1.9977	0.00426



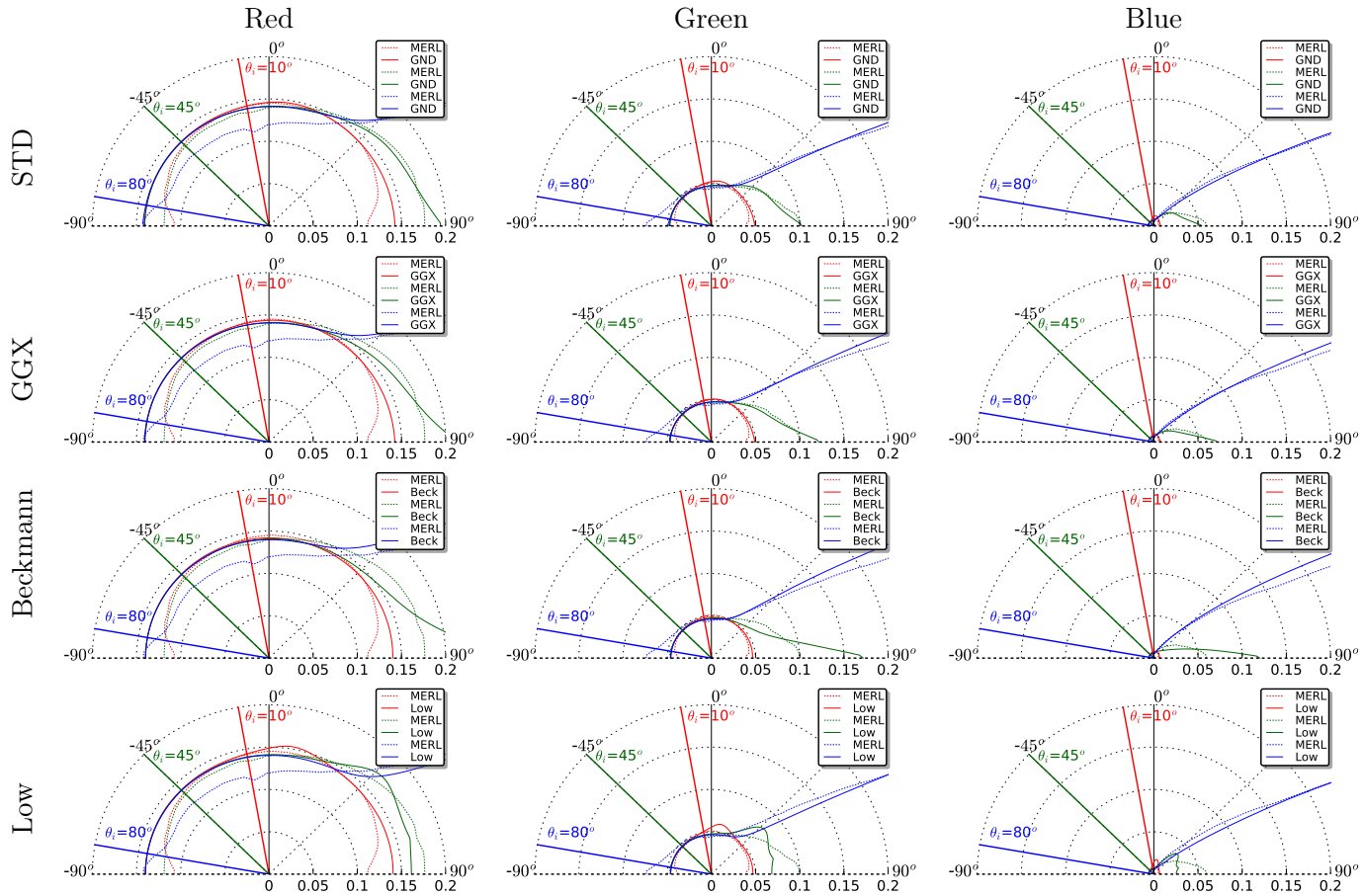
nylon



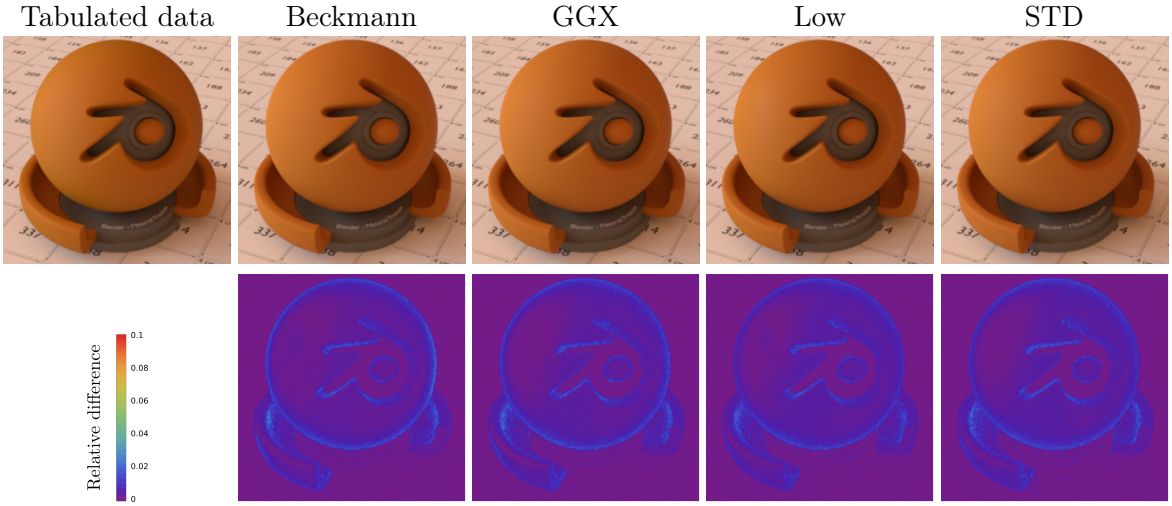
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.201-0.218-0.201	1.0-0.666-0.427	1.5928	0.7013	2.4434	0.00268
GGX	0.201-0.218-0.201	1.0-0.691-0.472	1.6229	0.6107	2.0	0.00265
Beckmann	0.201-0.218-0.201	1.0-0.637-0.394	1.4823	0.844	$+\infty$	0.00285
	ρ	A		B	C	
Low	0.201-0.218-0.201	13.682-10.576-7.984	1.6817	26546.9	0.5338	0.00208



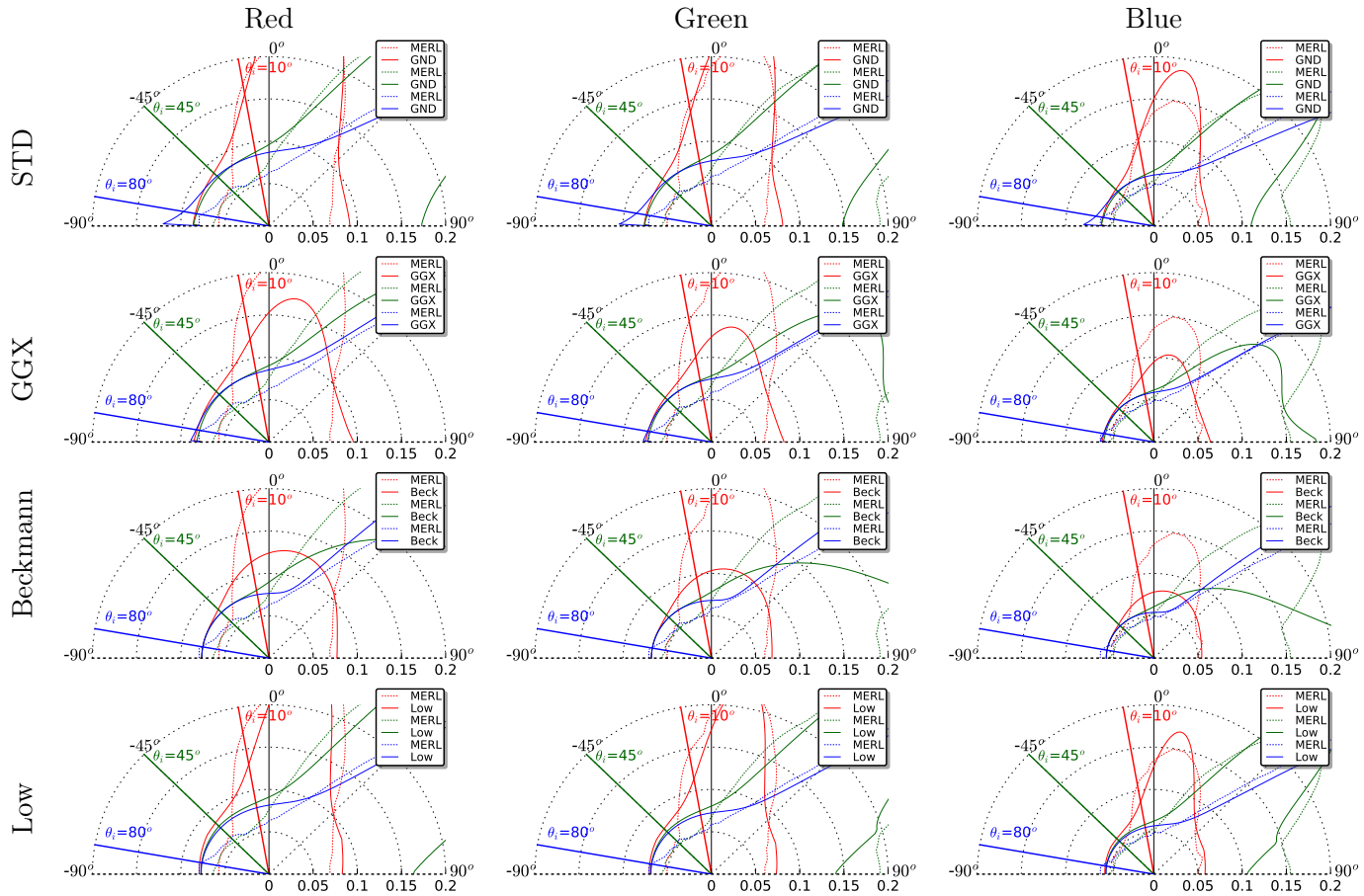
orange-paint



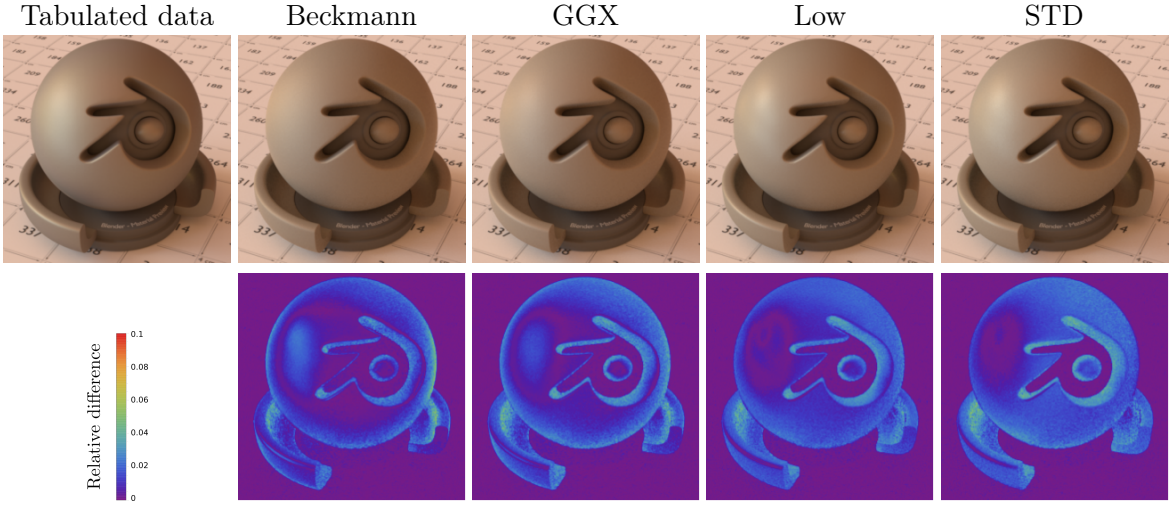
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.439-0.145-0.018	1.0-1.022-0.883	1.2135	0.3202	1.7497	0.00113
GGX	0.439-0.145-0.018	1.0-1.075-0.942	1.1697	0.3304	2.0	0.00112
Beckmann	0.439-0.145-0.018	1.0-1.018-0.926	1.1269	0.3527	$+\infty$	0.00115
	ρ	A		B	C	
Low	0.439-0.145-0.018	0.8-0.828-0.735	1.5754	83.1973	1.2691	0.00125



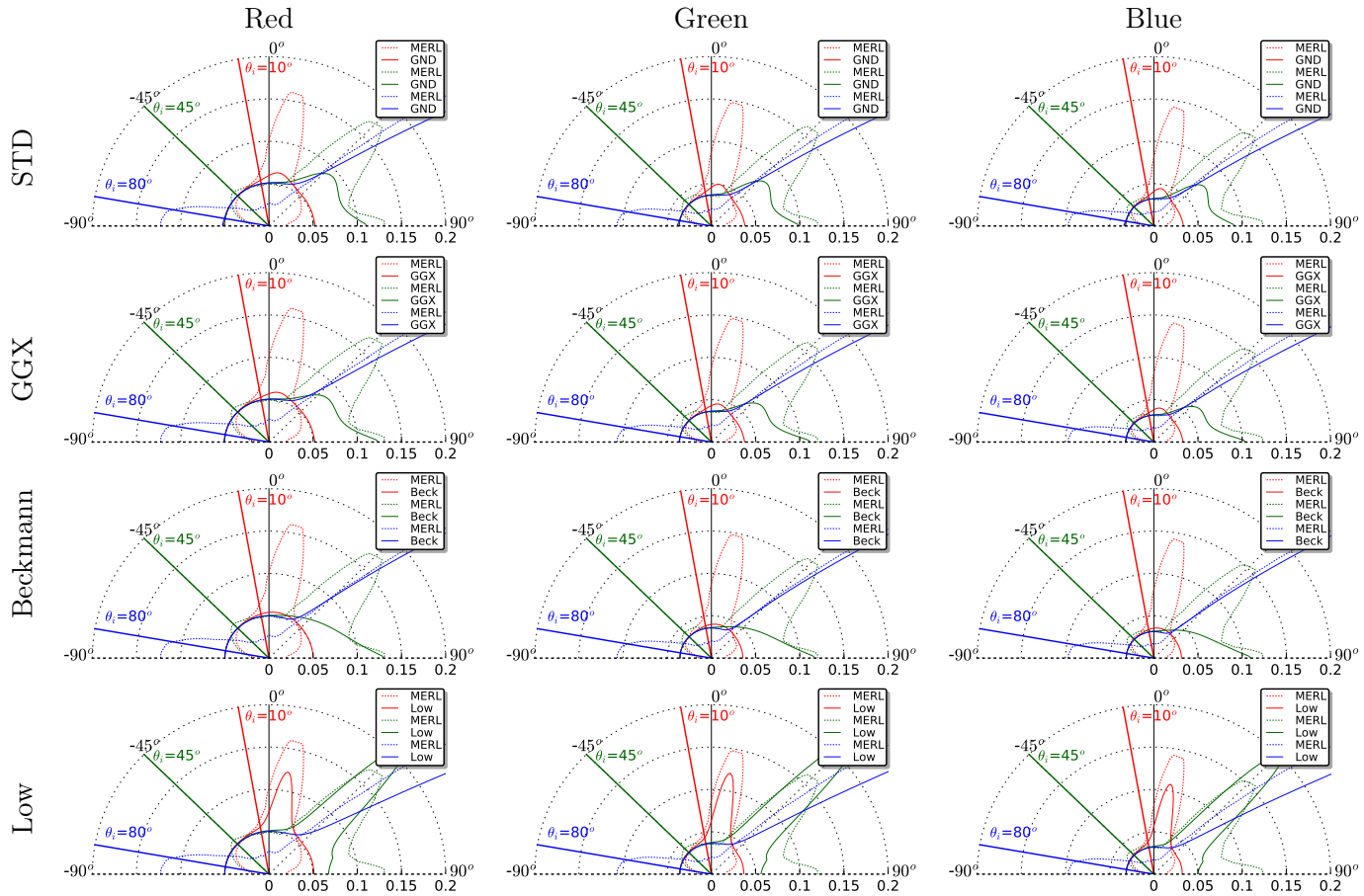
pearl-paint



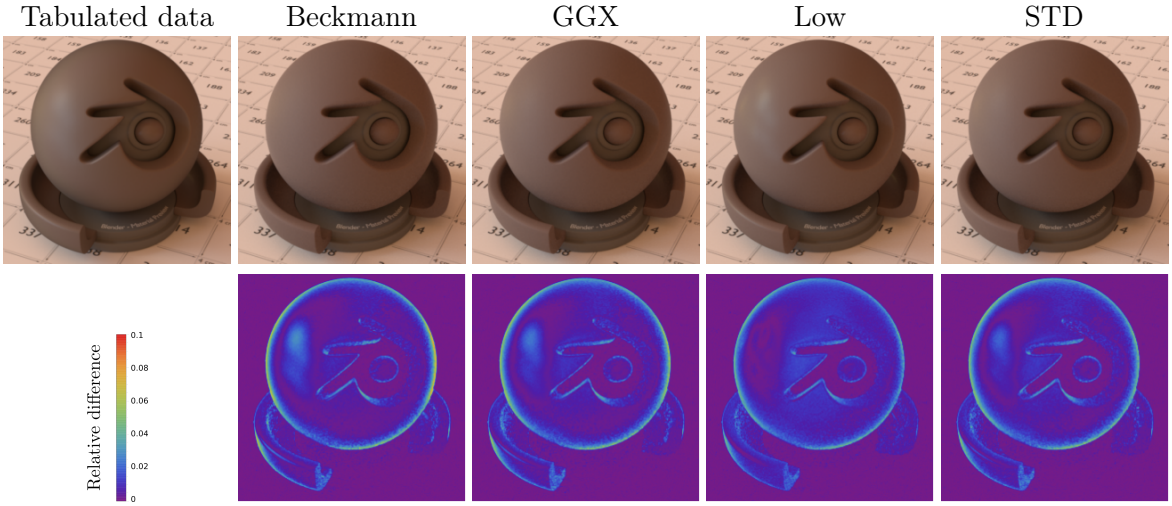
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.239-0.213-0.169	1.0-0.832-0.581	2.3129	0.2323	1.6019	0.00397
GGX	0.239-0.213-0.169	1.0-0.731-0.528	1.7744	0.2585	2.0	0.00433
Beckmann	0.239-0.213-0.169	1.0-0.738-0.503	1.6142	0.2939	$+\infty$	0.00434
	ρ	A		B	C	
Low	0.239-0.213-0.169	2.438-2.025-1.447	2.9648	107.024	1.3085	0.00396



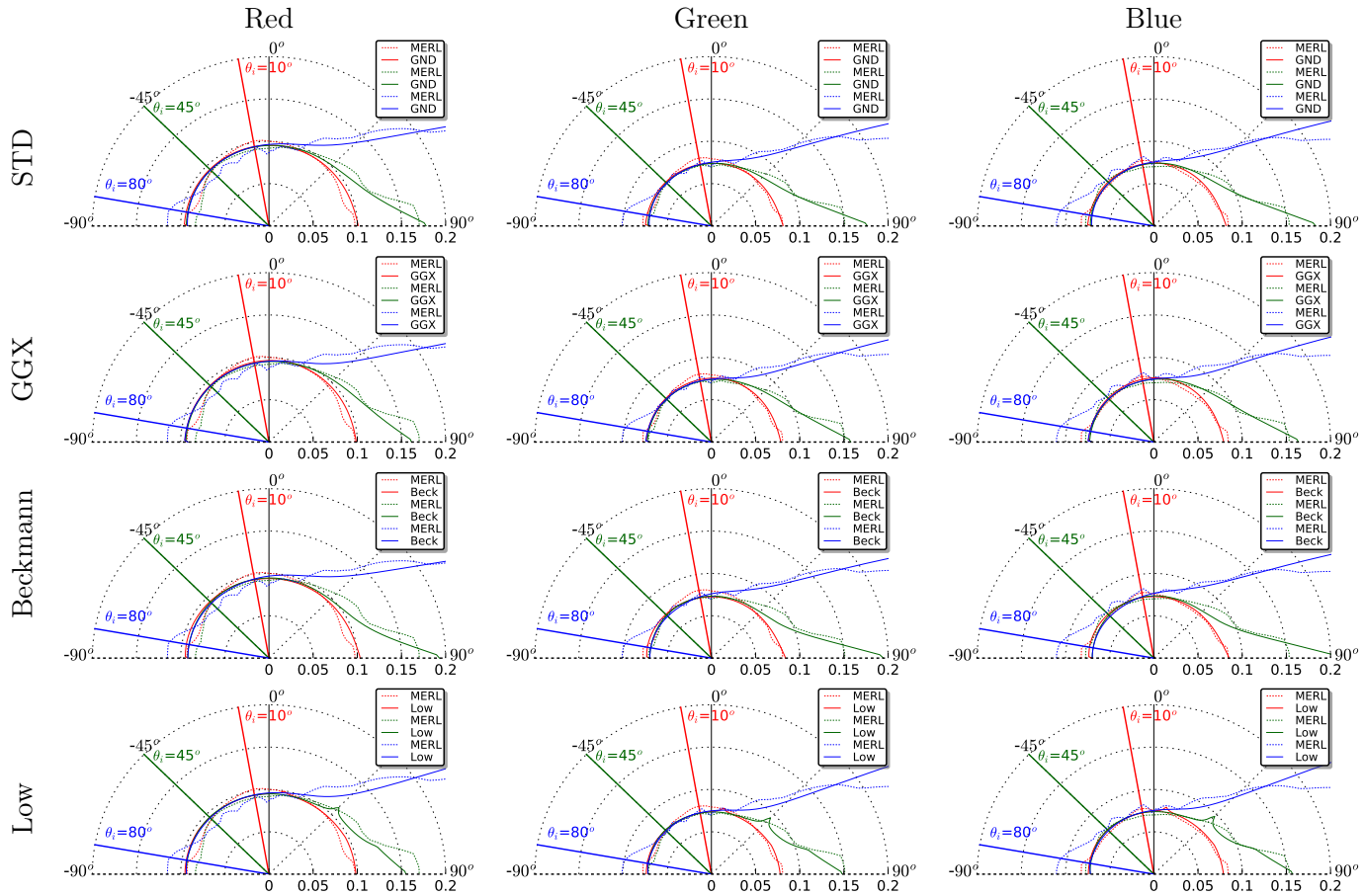
pickled-oak-260



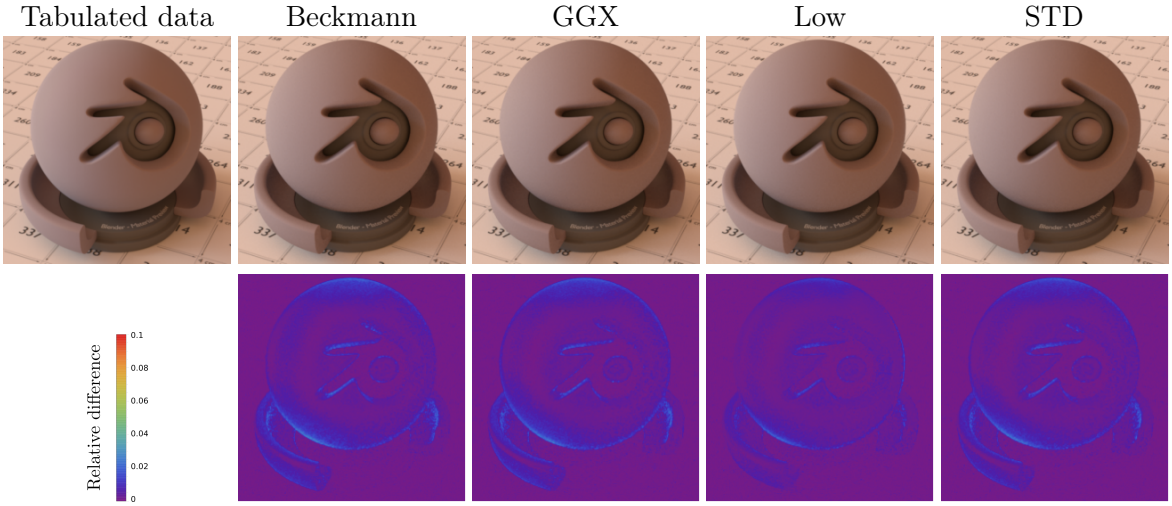
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.157-0.112-0.098	1.0-1.046-0.99	1.1967	0.2179	1.757	0.00146
GGX	0.157-0.112-0.098	1.0-1.033-0.982	1.1636	0.2206	2.0	0.00149
Beckmann	0.157-0.112-0.098	1.0-1.02-0.982	1.1224	0.2413	$+\infty$	0.00155
	ρ	A		B	C	
Low	0.157-0.112-0.098	2.866-3.379-3.026	1.7688	384.428	1.2284	0.00157



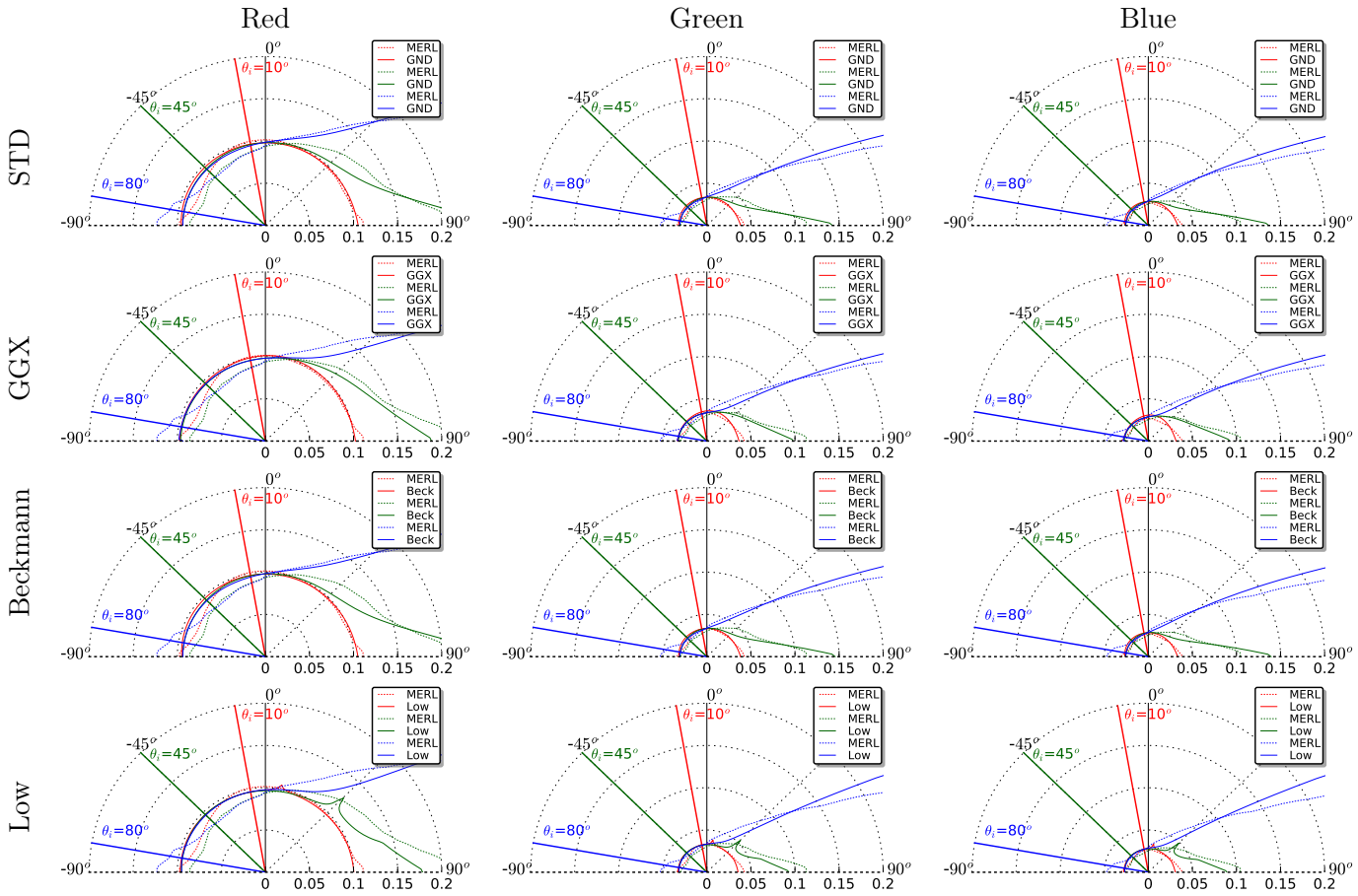
pink-fabric



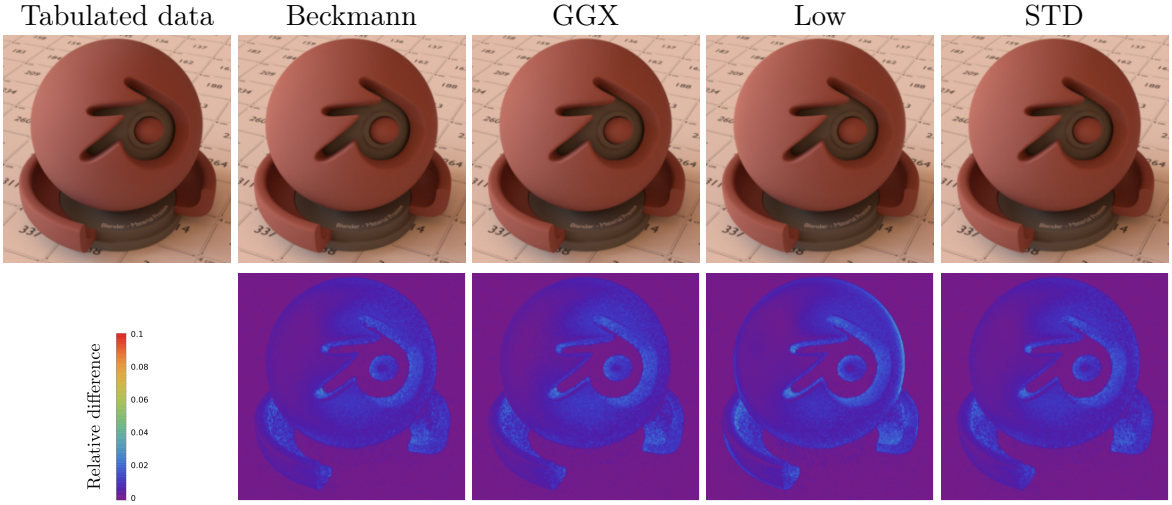
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.289-0.219-0.219	1.0-1.242-1.317	1.2771	0.5822	2.6111	0.00158
GGX	0.289-0.219-0.219	1.0-1.266-1.353	1.287	0.5243	2.0	0.00162
Beckmann	0.289-0.219-0.219	1.0-1.235-1.354	1.234	0.641	$+\infty$	0.00166
	ρ	A		B	C	
Low	0.289-0.219-0.219	0.932-1.154-1.289	1.377	36386.9	0.1623	0.00149



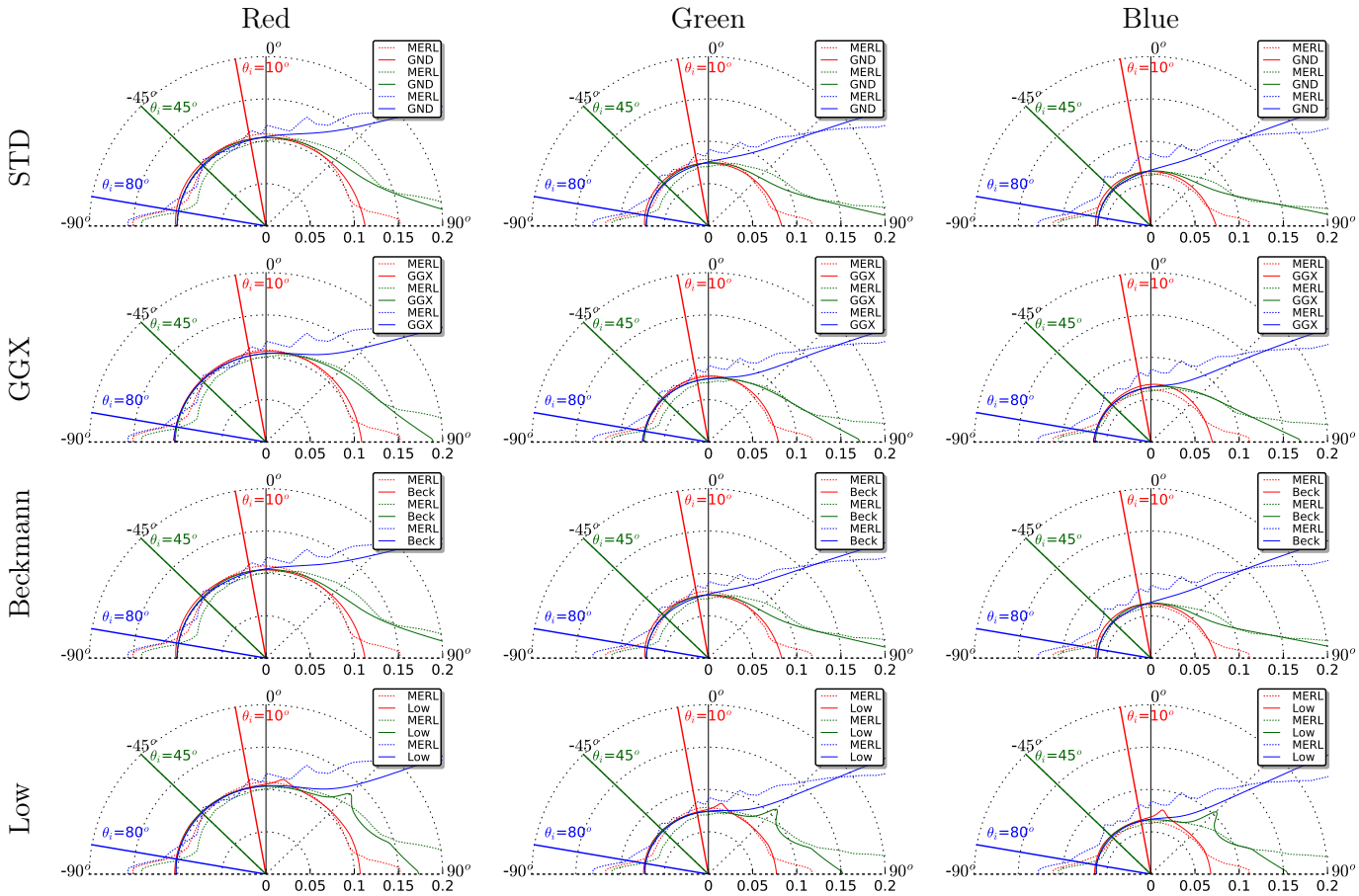
pink-fabric2



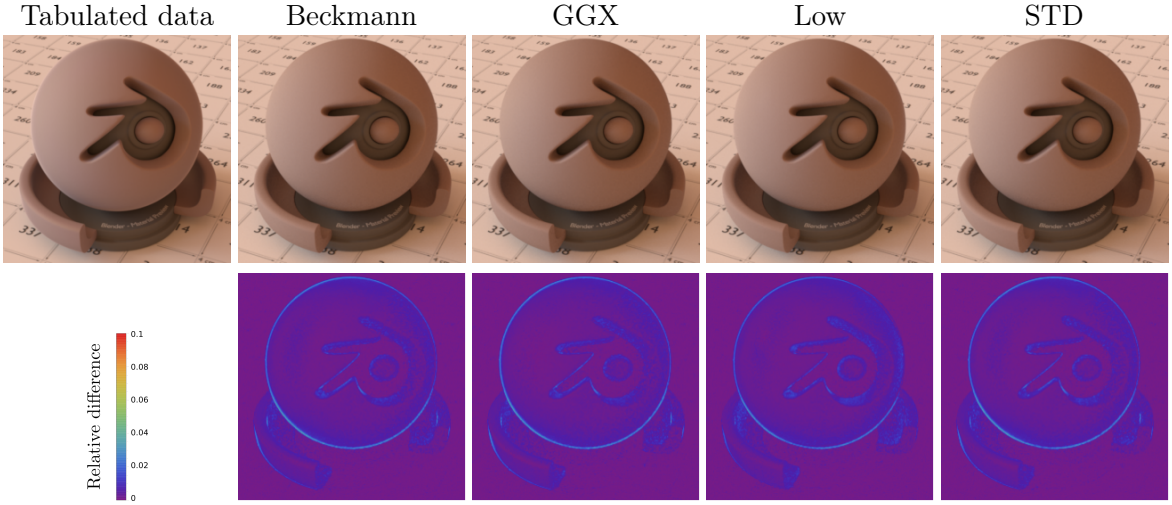
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.295-0.096-0.081	1.0-0.683-0.677	1.2726	0.5266	20.3356	0.00192
GGX	0.295-0.096-0.081	1.0-0.711-0.703	1.3313	0.4589	2.0	0.00199
Beckmann	0.295-0.096-0.081	1.0-0.683-0.675	1.2684	0.5275	$+\infty$	0.00192
	ρ	A		B	C	
Low	0.295-0.096-0.081	2.732-2.014-2.049	1.2549	67537.7	0.2051	0.00201



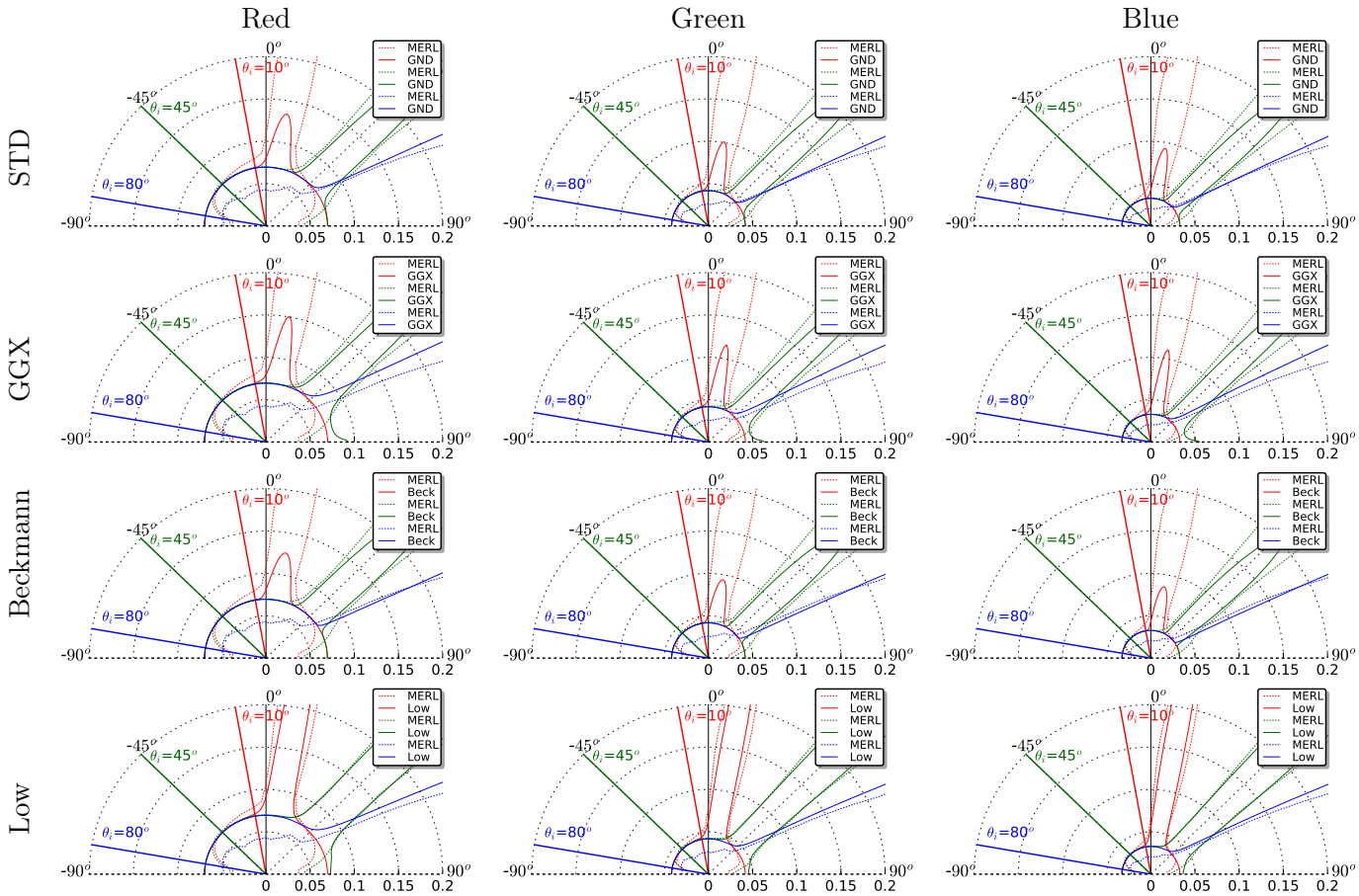
pink-felt



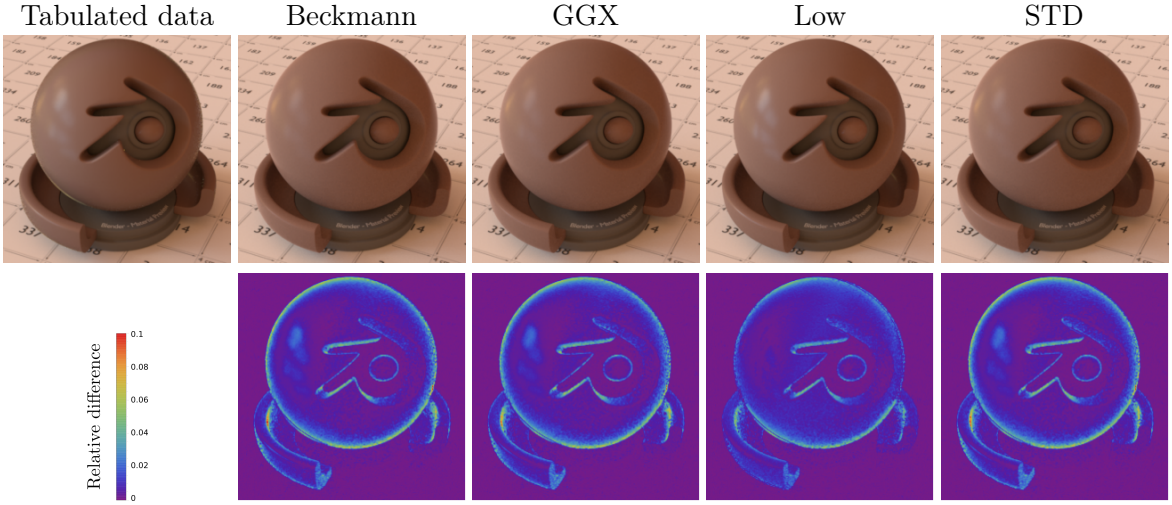
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.316-0.221-0.189	1.0-1.102-1.221	1.2616	0.548	33.5401	0.00159
GGX	0.316-0.221-0.189	1.0-1.142-1.235	1.3118	0.4644	2.0	0.00167
Beckmann	0.316-0.221-0.189	1.0-1.104-1.218	1.2596	0.5486	$+\infty$	0.00159
	ρ	A		B	C	
Low	0.316-0.221-0.189	1.764-2.0-2.319	1.3507	3233.84	0.3158	0.00174



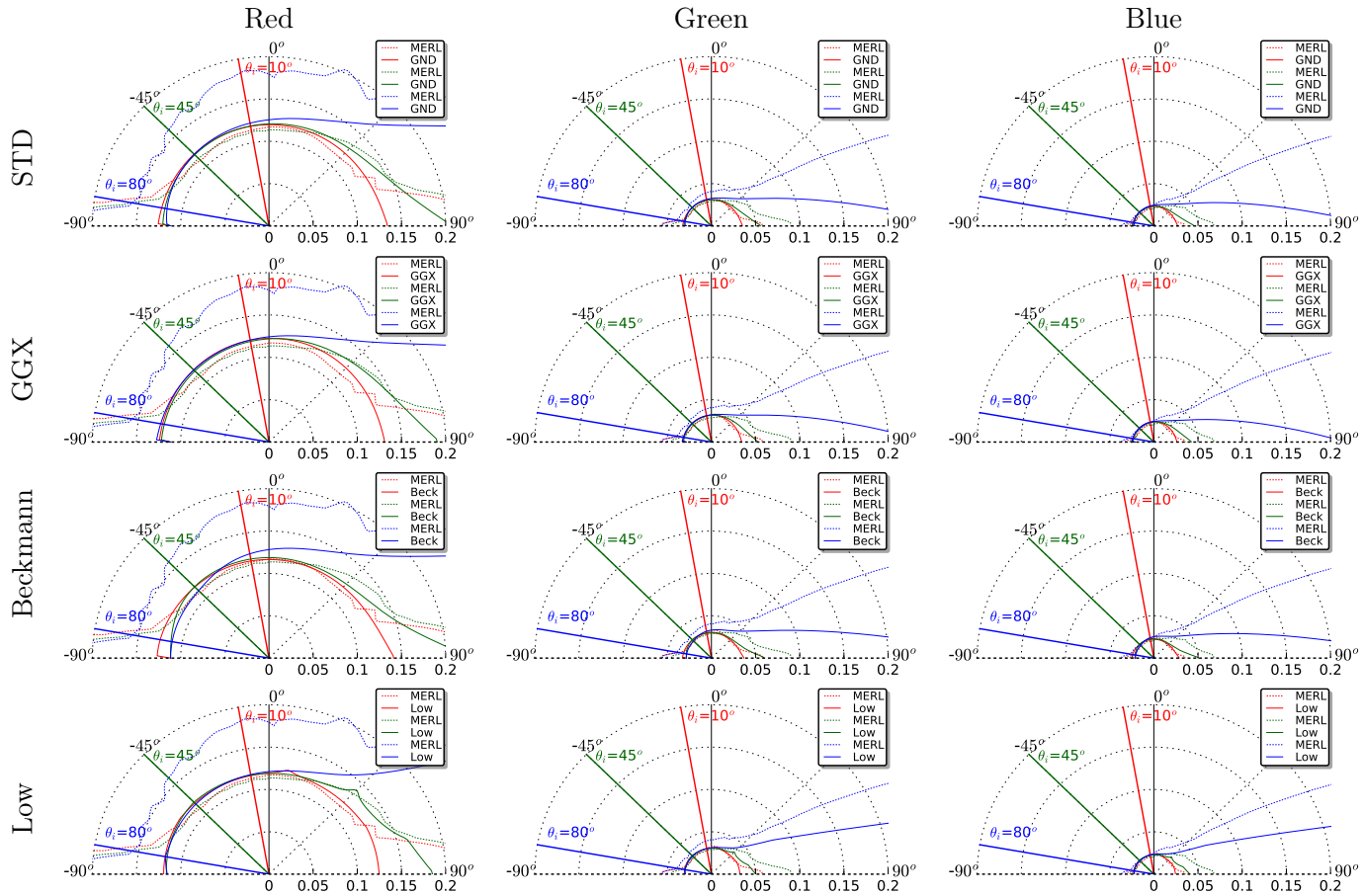
pink-jasper



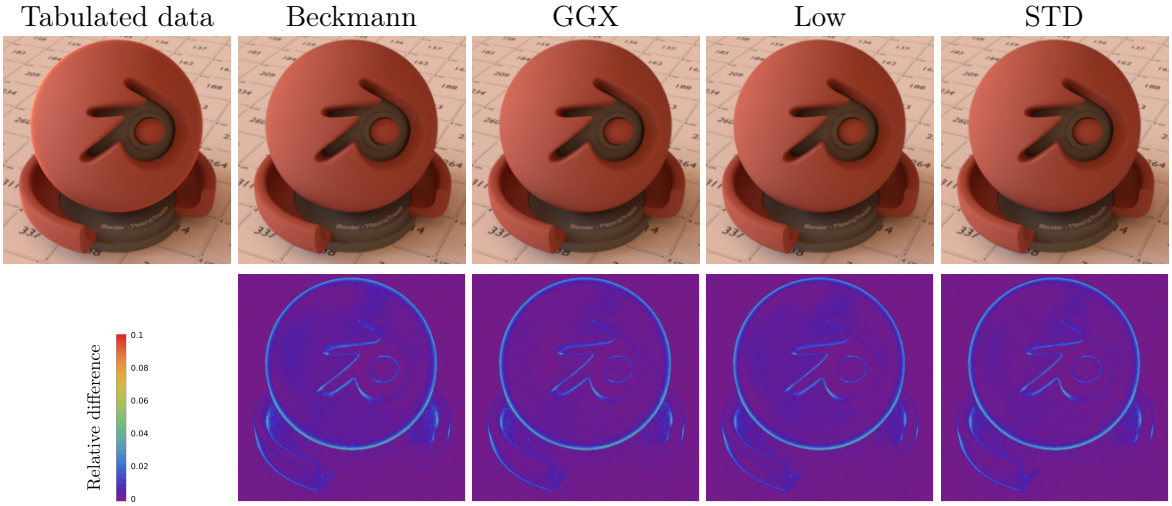
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.218-0.131-0.103	1.0-0.916-0.934	1.126	0.0666	4.8285	0.00166
GGX	0.218-0.131-0.103	1.0-0.92-0.958	1.1358	0.0639	2.0	0.0017
Beckmann	0.218-0.131-0.103	1.0-0.926-0.937	1.1207	0.0685	$+\infty$	0.0017
	ρ	A		B	C	
Low	0.218-0.131-0.103	17.276-17.567-18.105	1.5707	826.426	1.7849	0.00154



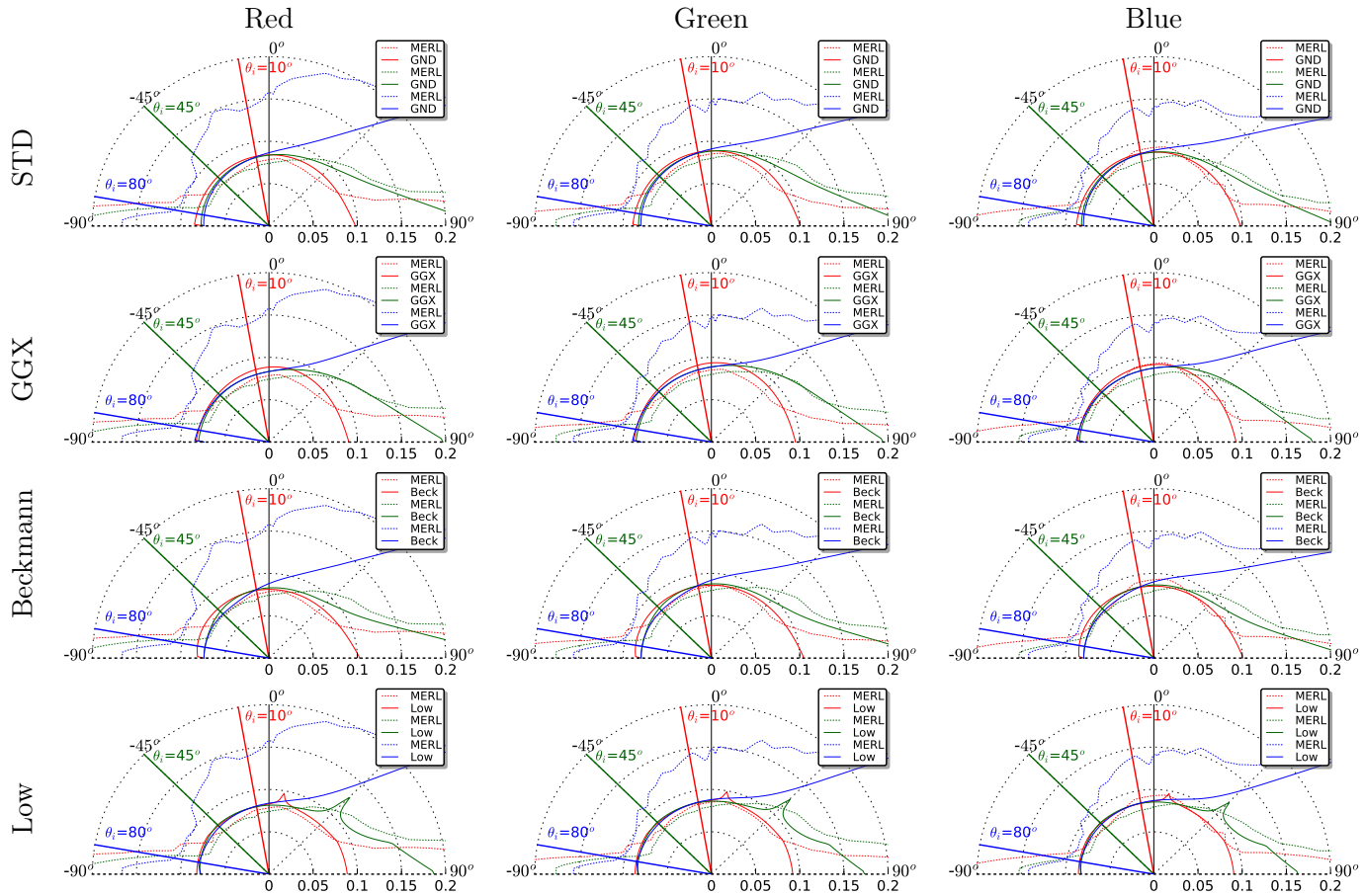
pink-plastic



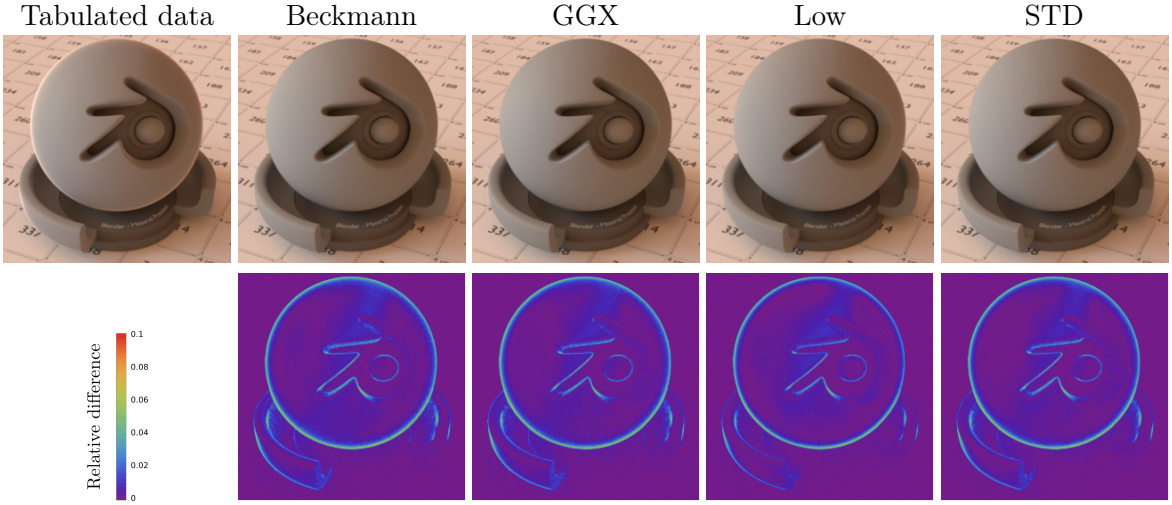
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.35-0.089-0.066	1.0-0.294-0.265	1.6042	0.7219	2.4733	0.00098
GGX	0.35-0.089-0.066	1.0-0.299-0.27	1.6827	0.6776	2.0	0.00101
Beckmann	0.35-0.089-0.066	1.0-0.277-0.261	1.4901	0.7856	$+\infty$	0.0011
	ρ	A		B	C	
Low	0.35-0.089-0.066	0.423-0.123-0.112	1.8921	8515.26	0.1359	0.001



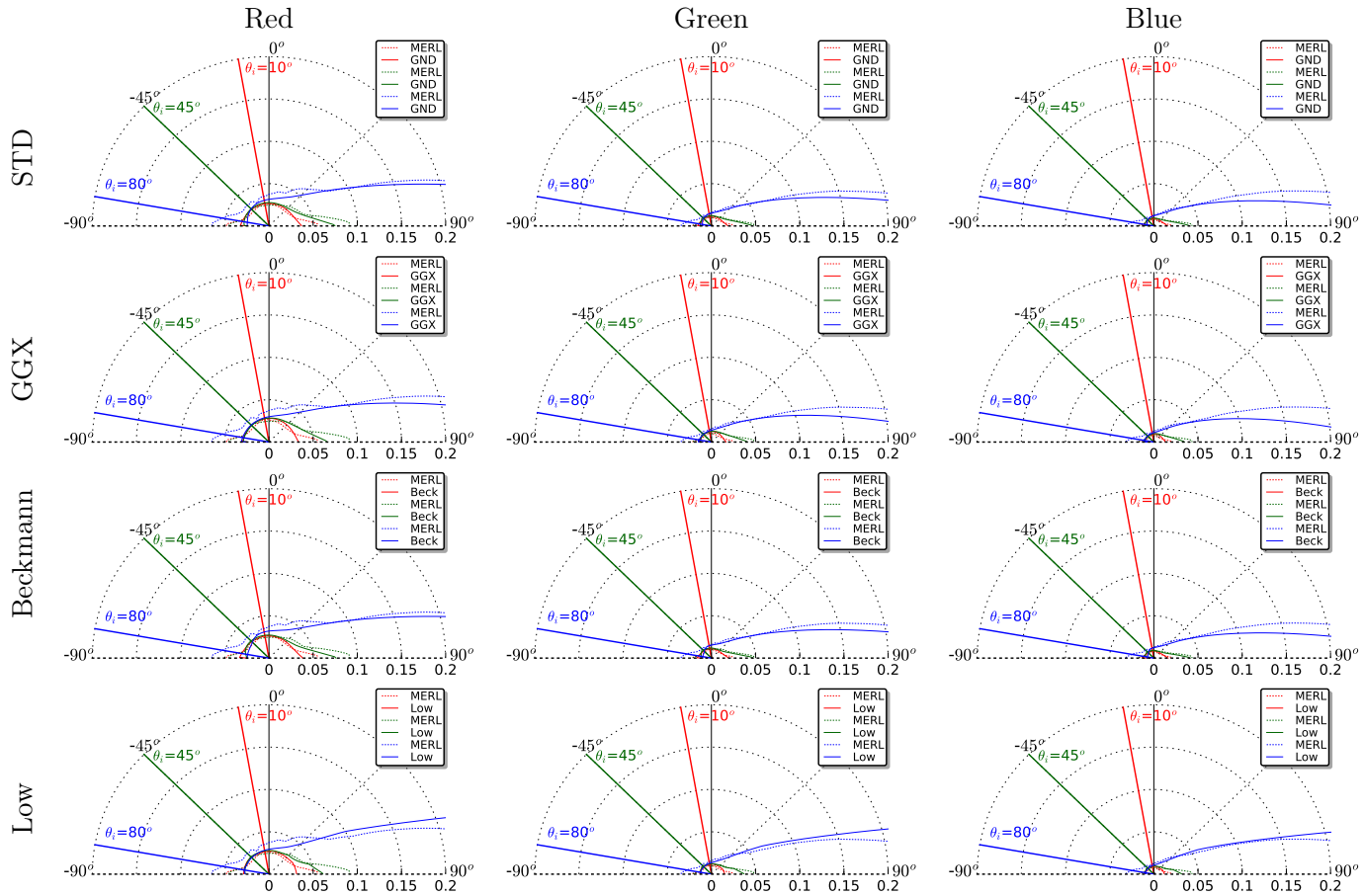
polyethylene



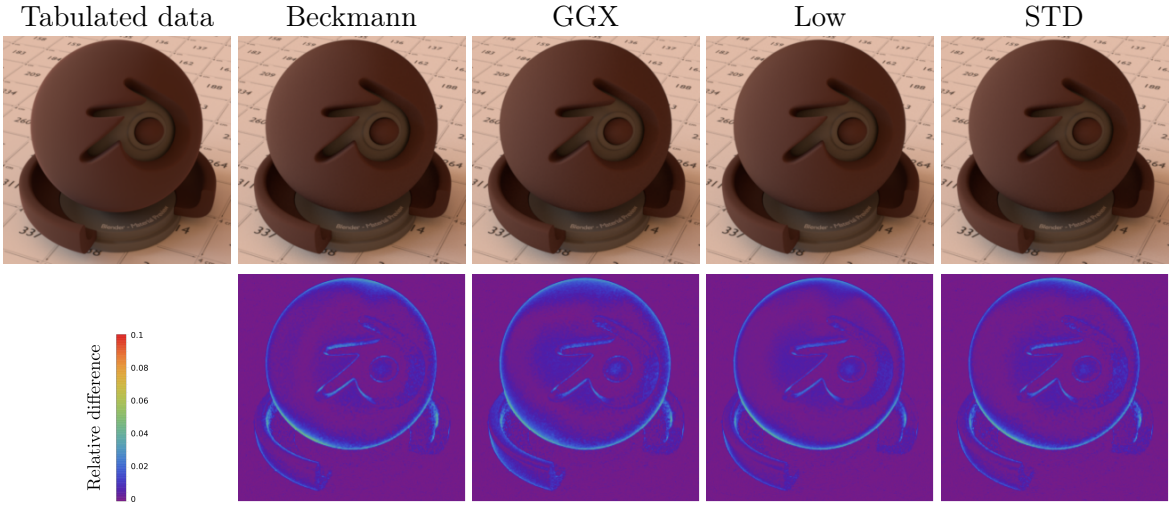
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.231-0.25-0.249	1.0-0.876-0.767	1.5225	0.5724	3.1002	0.00189
GGX	0.231-0.25-0.249	1.0-0.928-0.811	1.5551	0.493	2.0	0.00201
Beckmann	0.231-0.25-0.249	1.0-0.858-0.74	1.4664	0.6159	$+\infty$	0.00199
	ρ	A		B	C	
Low	0.231-0.25-0.249	1.478-1.221-1.092	1.5724	75281.5	0.1672	0.00195



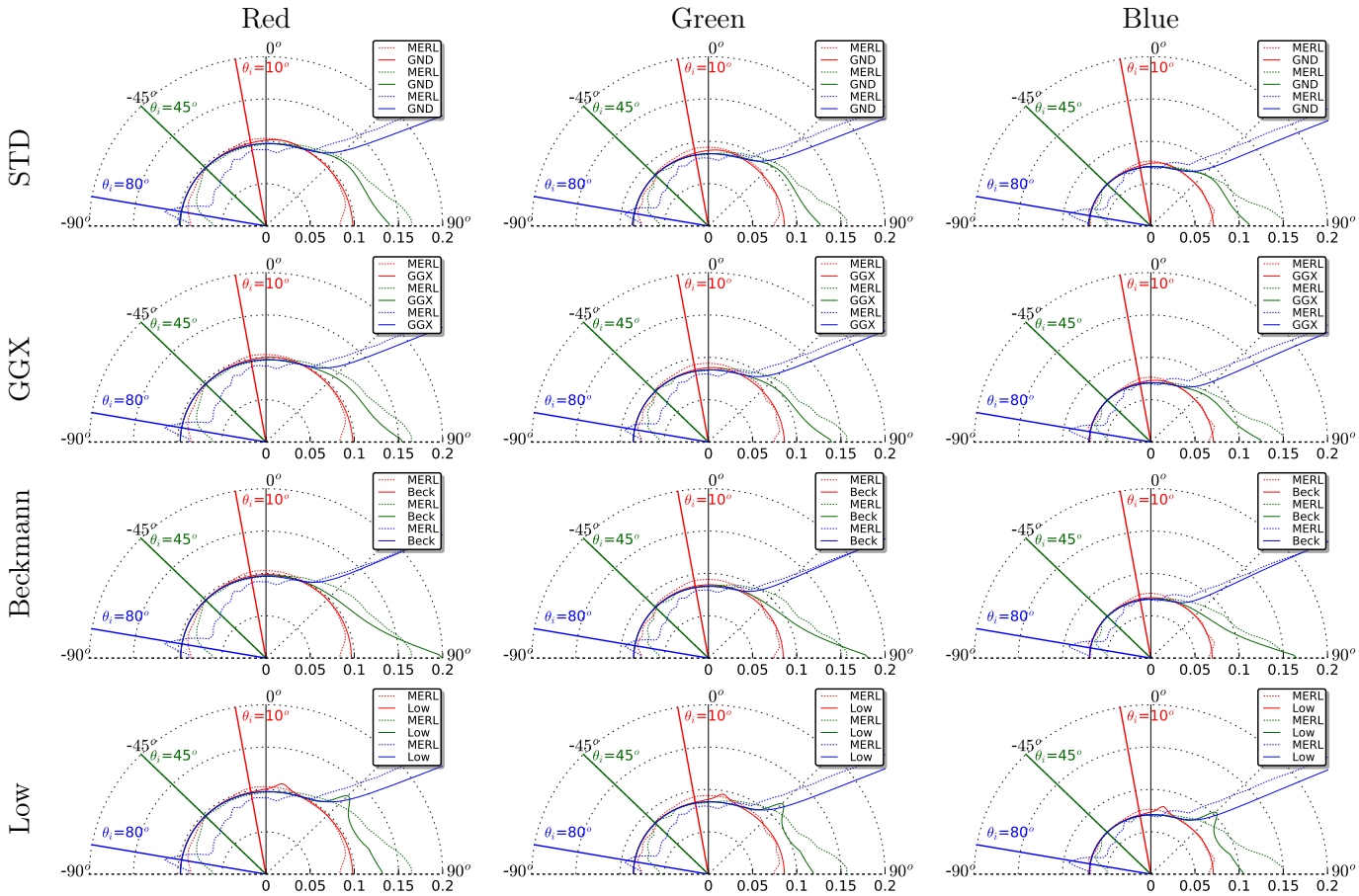
polyurethane-foam



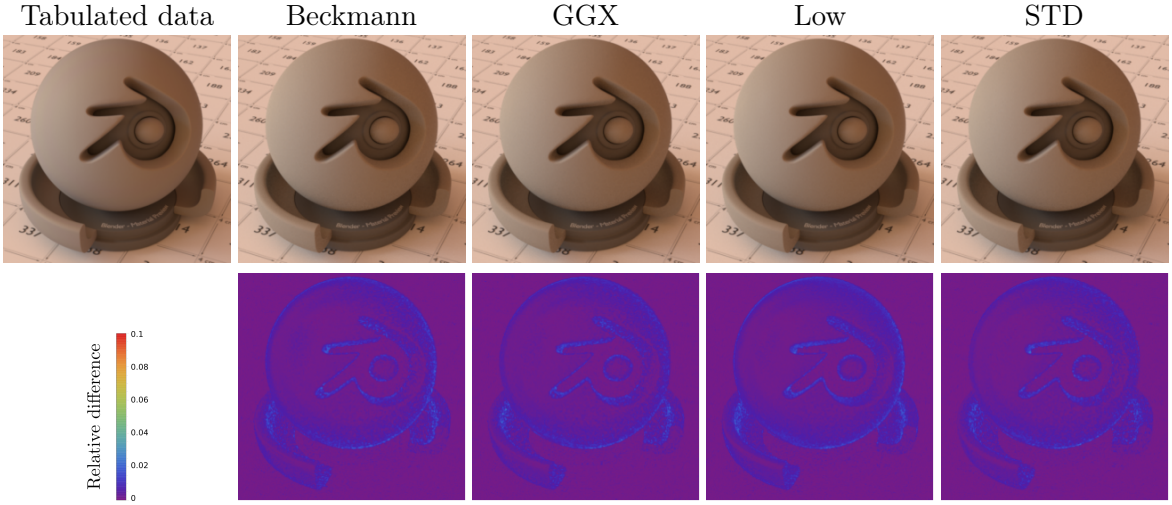
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.077-0.031-0.023	1.0-0.724-0.648	1.3436	0.8941	4.0158	0.00042
GGX	0.077-0.031-0.023	1.0-0.738-0.655	1.3925	0.7754	2.0	0.00051
Beckmann	0.077-0.031-0.023	1.0-0.722-0.648	1.3149	0.9383	$+\infty$	0.00044
	ρ	A		B	C	
Low	0.077-0.031-0.023	0.123-0.09-0.081	1.7722	42073.4	0.0327	0.00043



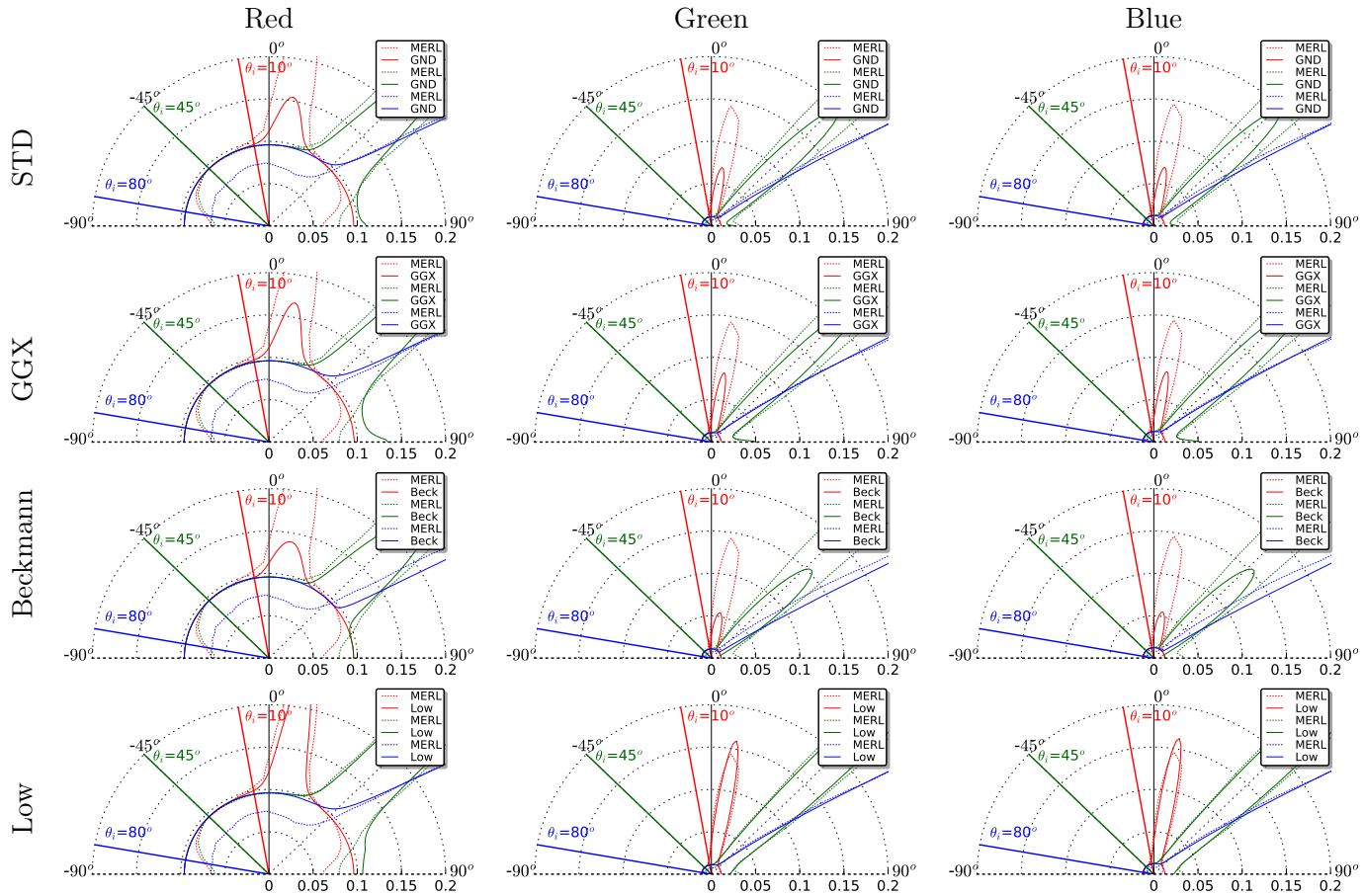
pure-rubber



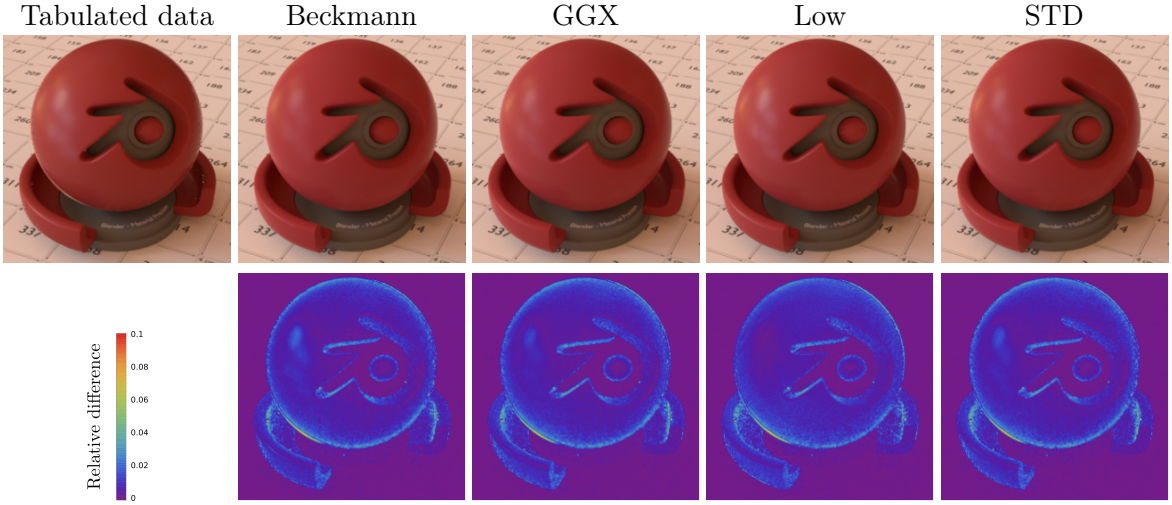
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.303-0.266-0.218	1.0-0.974-0.98	1.1564	0.2659	1.7426	0.00096
GGX	0.303-0.266-0.218	1.0-0.949-0.974	1.1329	0.2781	2.0	0.00099
Beckmann	0.303-0.266-0.218	1.0-0.941-0.934	1.1099	0.3088	$+\infty$	0.00106
	ρ	A		B	C	
Low	0.303-0.266-0.218	4.224-4.095-4.233	1.2021	1314.18	0.6194	0.00109



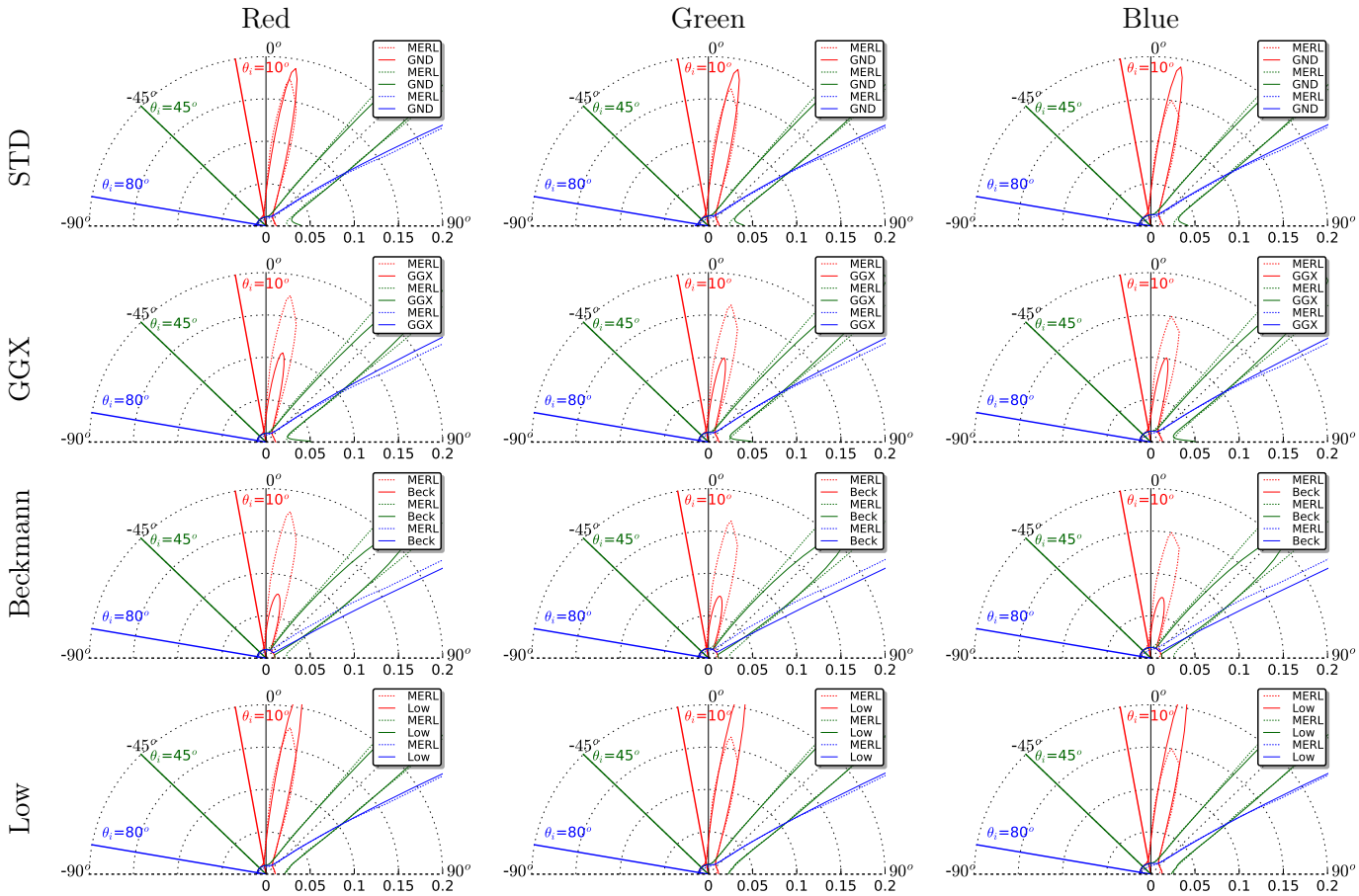
purple-paint



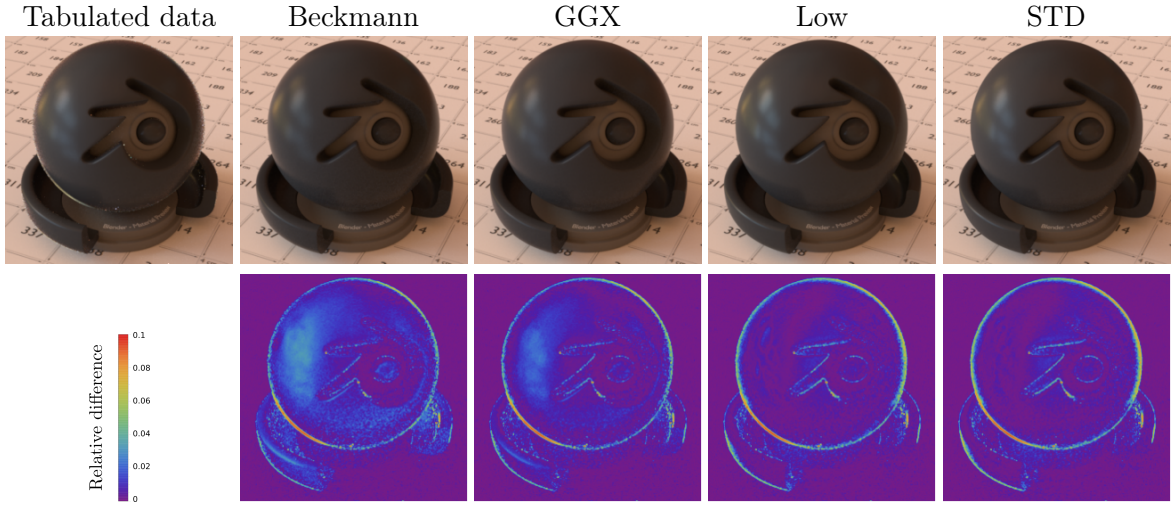
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.301-0.034-0.039	1.0-1.01-0.99	1.1536	0.0842	2.9943	0.00145
GGX	0.301-0.034-0.039	1.0-1.014-1.015	1.1659	0.0823	2.0	0.00143
Beckmann	0.301-0.034-0.039	1.0-0.992-0.98	1.1382	0.0886	$+\infty$	0.00163
	ρ	A		B	C	
Low	0.301-0.034-0.039	20.735-21.305-21.515	1.3418	438.823	1.751	0.00135



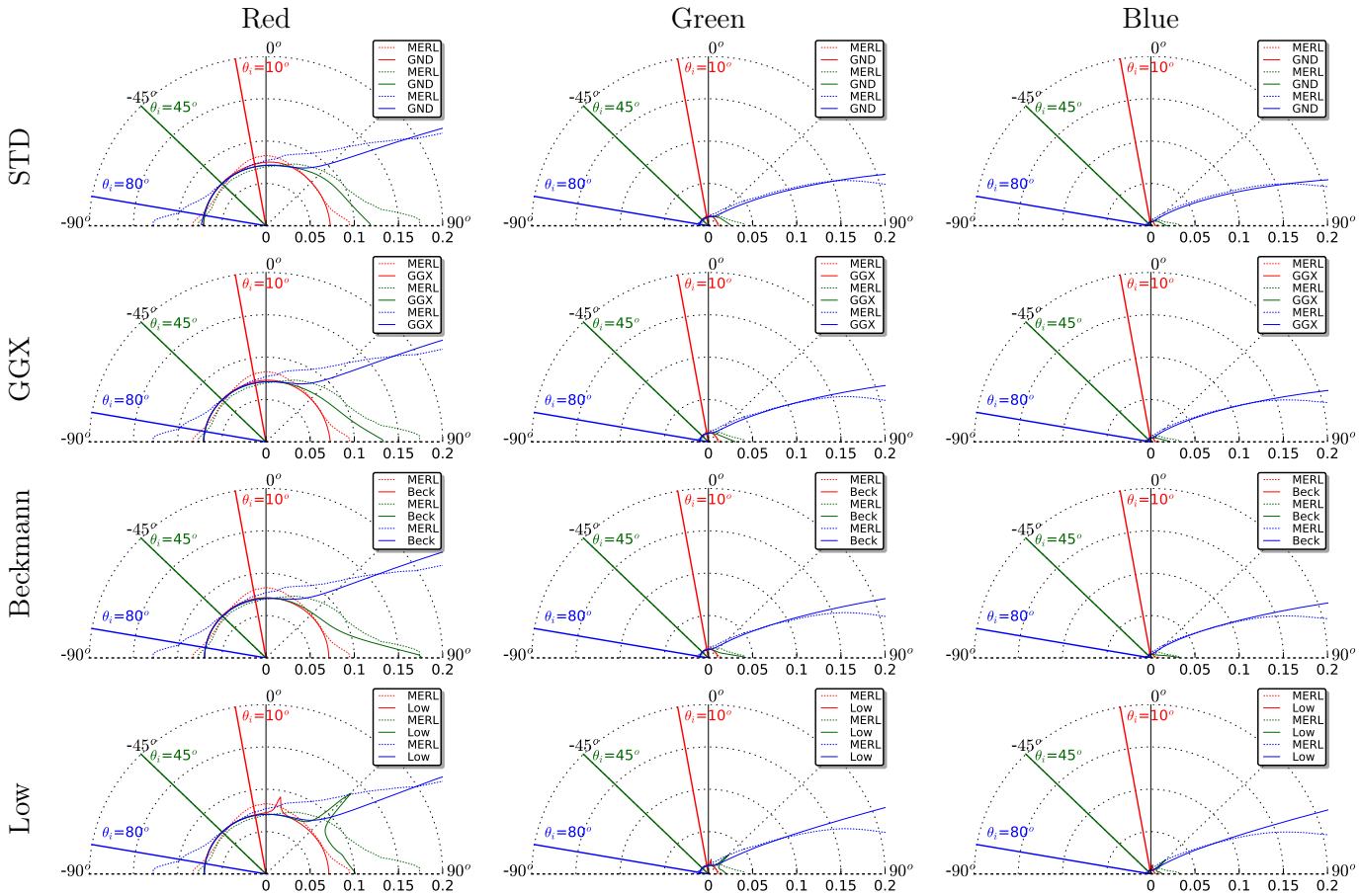
pvc



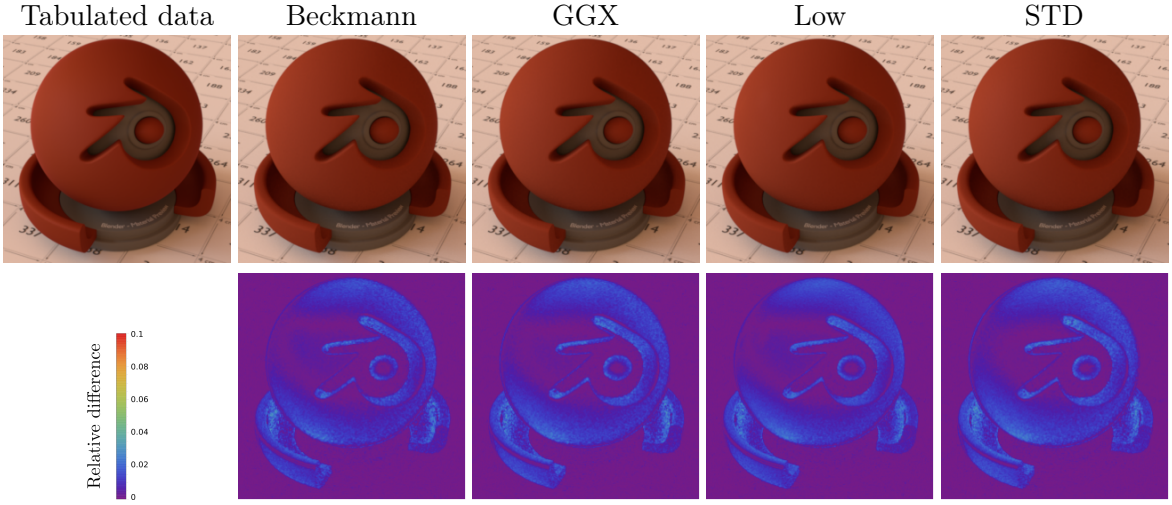
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.032-0.035-0.04	1.0-0.988-0.996	1.2594	0.0768	1.5737	0.00058
GGX	0.032-0.035-0.04	1.0-0.925-0.912	1.1864	0.0784	2.0	0.00075
Beckmann	0.032-0.035-0.04	1.0-0.947-0.903	1.1519	0.0783	$+\infty$	0.00103
	ρ	A		B	C	
Low	0.032-0.035-0.04	23.169-23.903-22.956	1.3999	680.671	1.6	0.00063



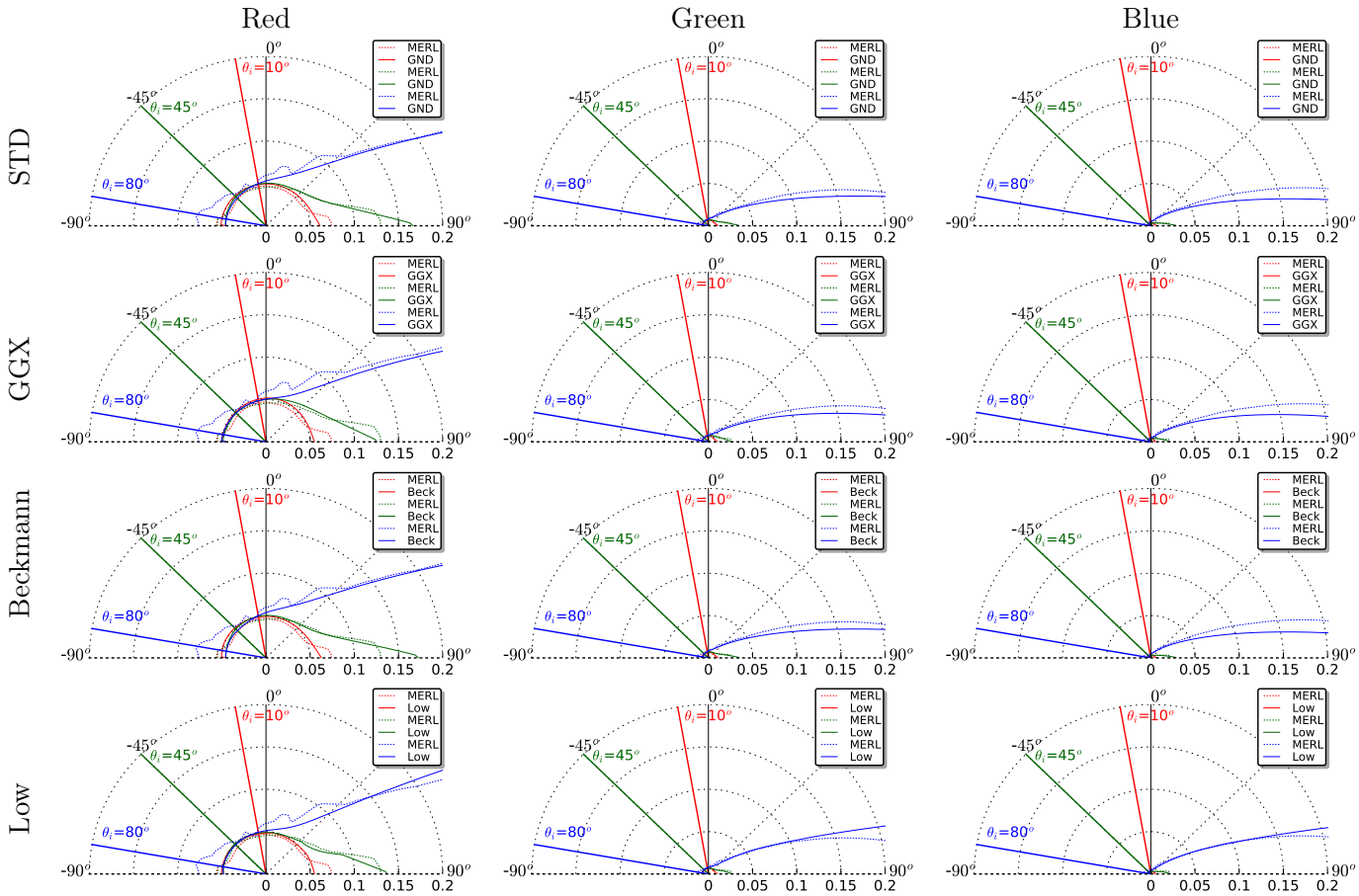
red-fabric



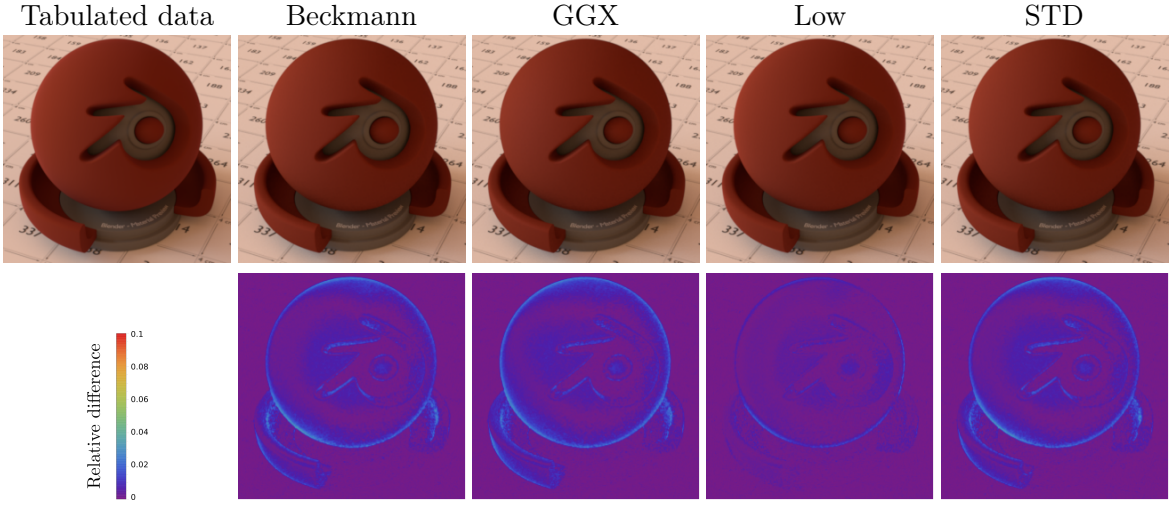
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.218-0.031-0.012	1.0-0.328-0.285	1.2336	0.3775	1.7332	0.0009
GGX	0.218-0.031-0.012	1.0-0.319-0.277	1.1779	0.3971	2.0	0.00091
Beckmann	0.218-0.031-0.012	1.0-0.305-0.267	1.1244	0.4184	$+\infty$	0.00092
	ρ	A		B	C	
Low	0.218-0.031-0.012	7.012-2.414-2.158	1.2239	18586.2	0.4924	0.00101



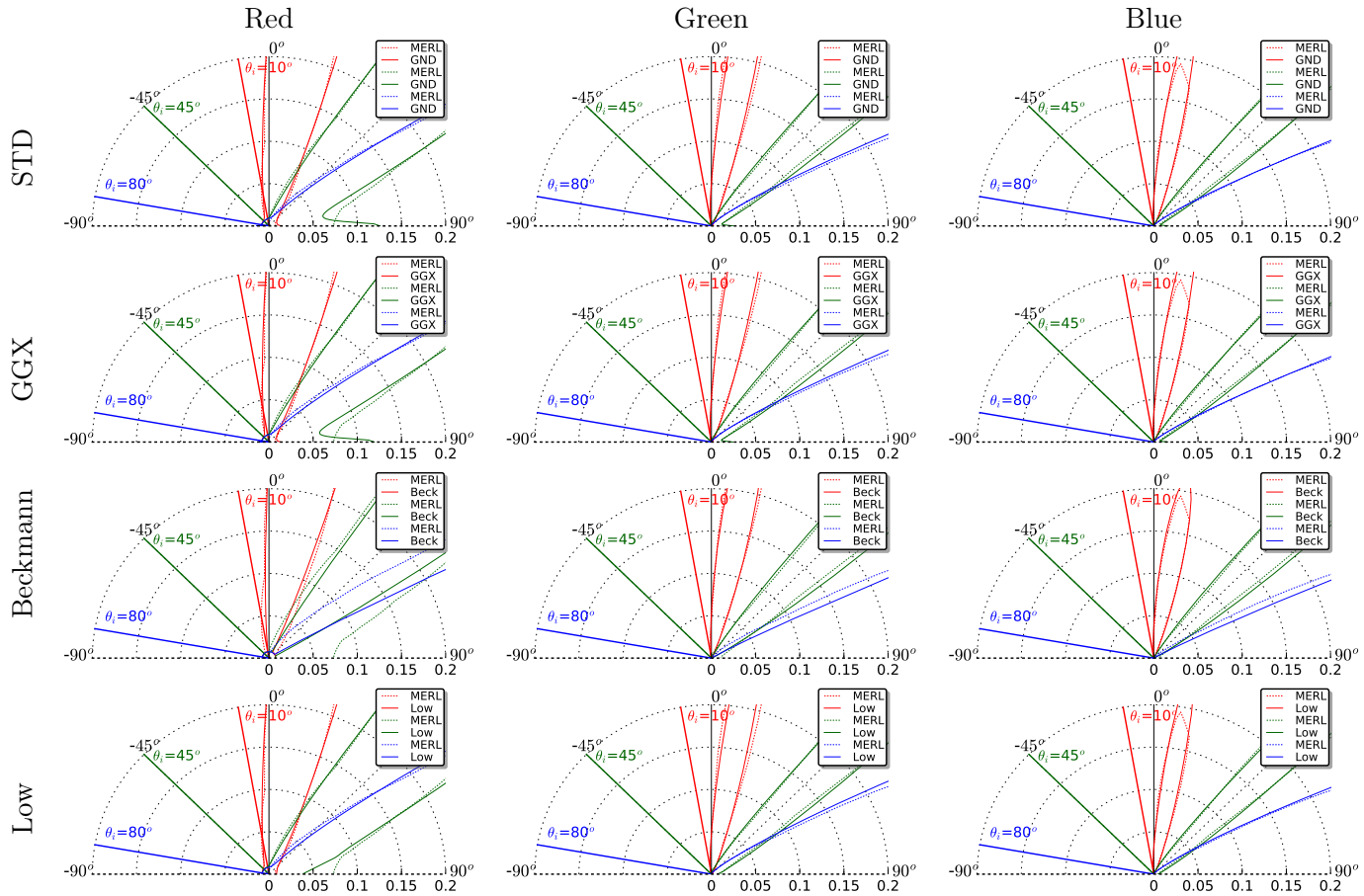
red-fabric2



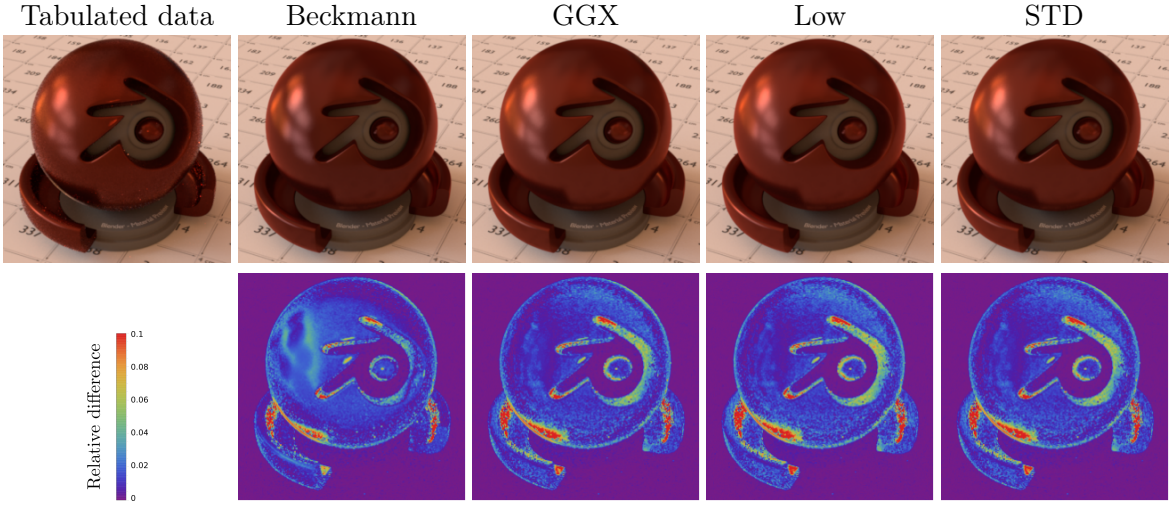
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.143-0.02-0.008	1.0-0.23-0.213	1.3164	0.6258	6.4169	0.00054
GGX	0.143-0.02-0.008	1.0-0.239-0.234	1.3481	0.5304	2.0	0.00061
Beckmann	0.143-0.02-0.008	1.0-0.225-0.206	1.308	0.6439	$+\infty$	0.00054
	ρ	A		B	C	
Low	0.143-0.02-0.008	0.649-0.142-0.134	1.2937	16131.9	0.0495	0.0004



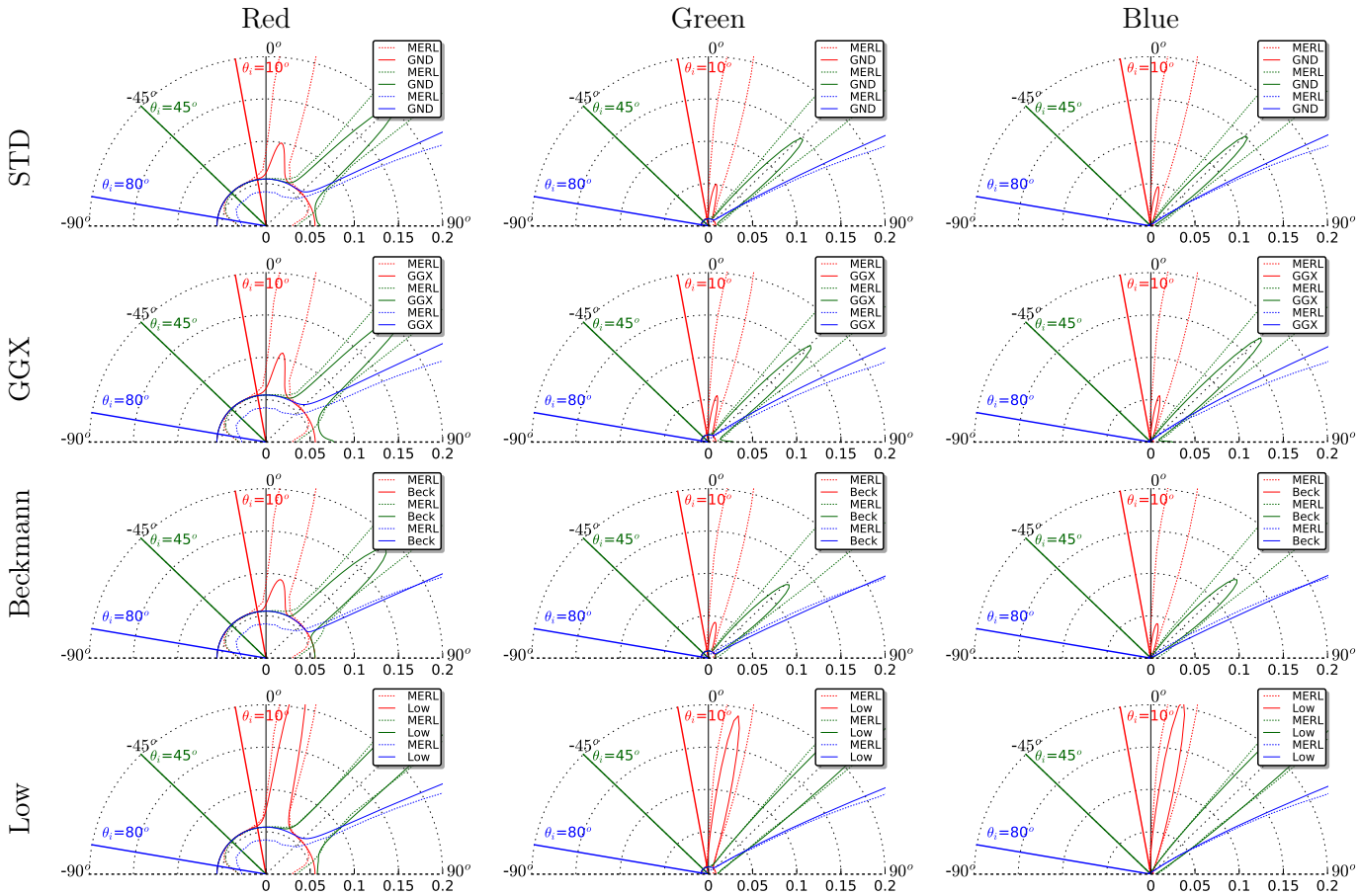
red-metallic-paint



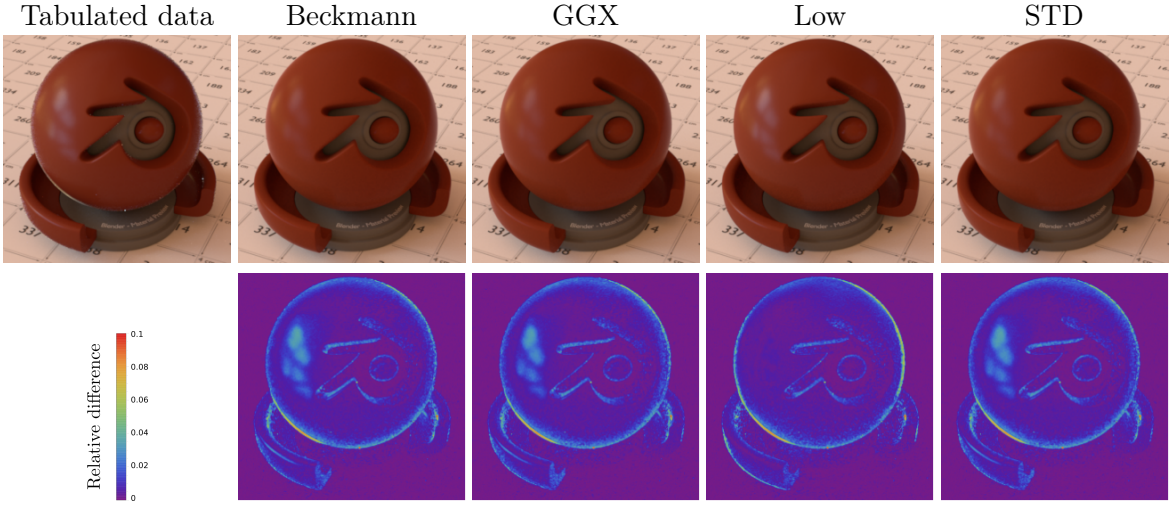
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.024-0.003-0.002	1.0-0.207-0.134	1.9369	0.0662	1.9475	0.00171
GGX	0.024-0.003-0.002	1.0-0.211-0.135	1.9296	0.066	2.0	0.00171
Beckmann	0.024-0.003-0.002	1.0-0.228-0.16	1.7337	0.0663	$+\infty$	0.00213
	ρ	A		B	C	
Low	0.024-0.003-0.002	60.564-11.763-7.856	1.8965	557.784	1.7932	0.00172



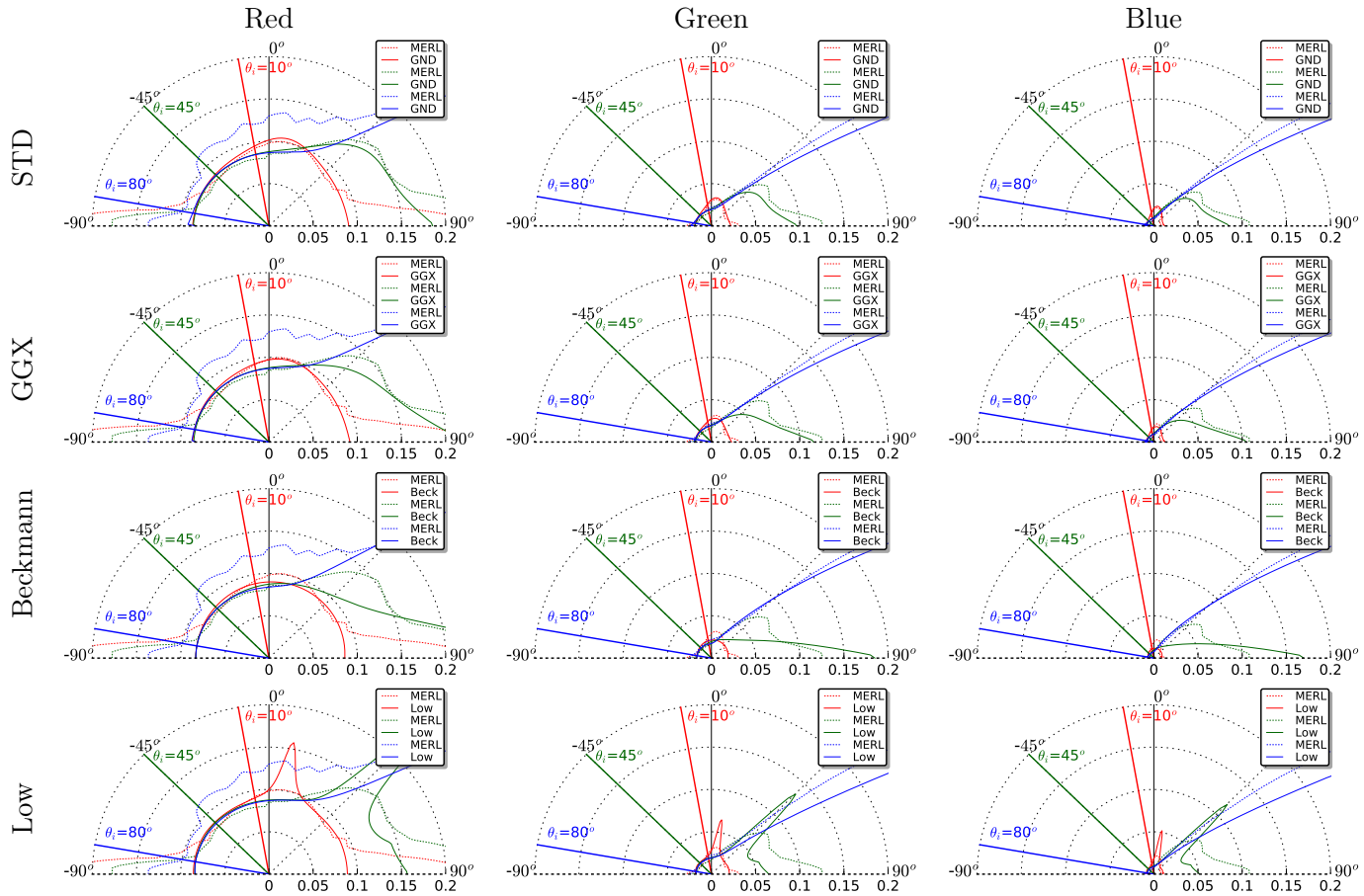
red-phenolic



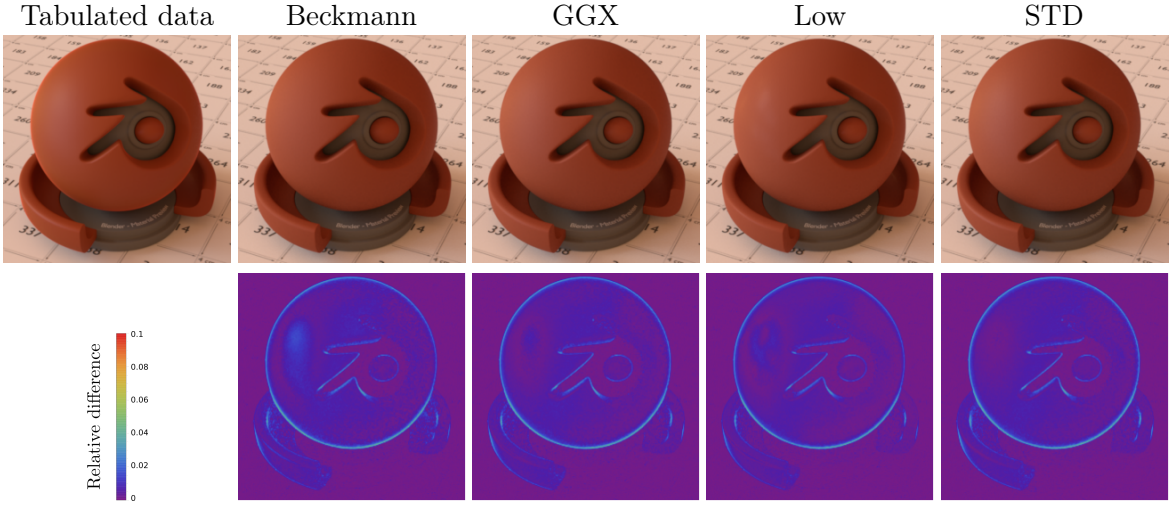
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.174-0.026-0.008	1.0-0.947-1.011	1.1055	0.0681	2.8729	0.00109
GGX	0.174-0.026-0.008	1.0-0.922-1.032	1.1161	0.0694	2.0	0.00107
Beckmann	0.174-0.026-0.008	1.0-0.895-1.004	1.1005	0.0698	$+\infty$	0.00115
	ρ	A		B	C	
Low	0.174-0.026-0.008	13.574-12.971-14.662	1.5209	543.592	1.9828	0.00086



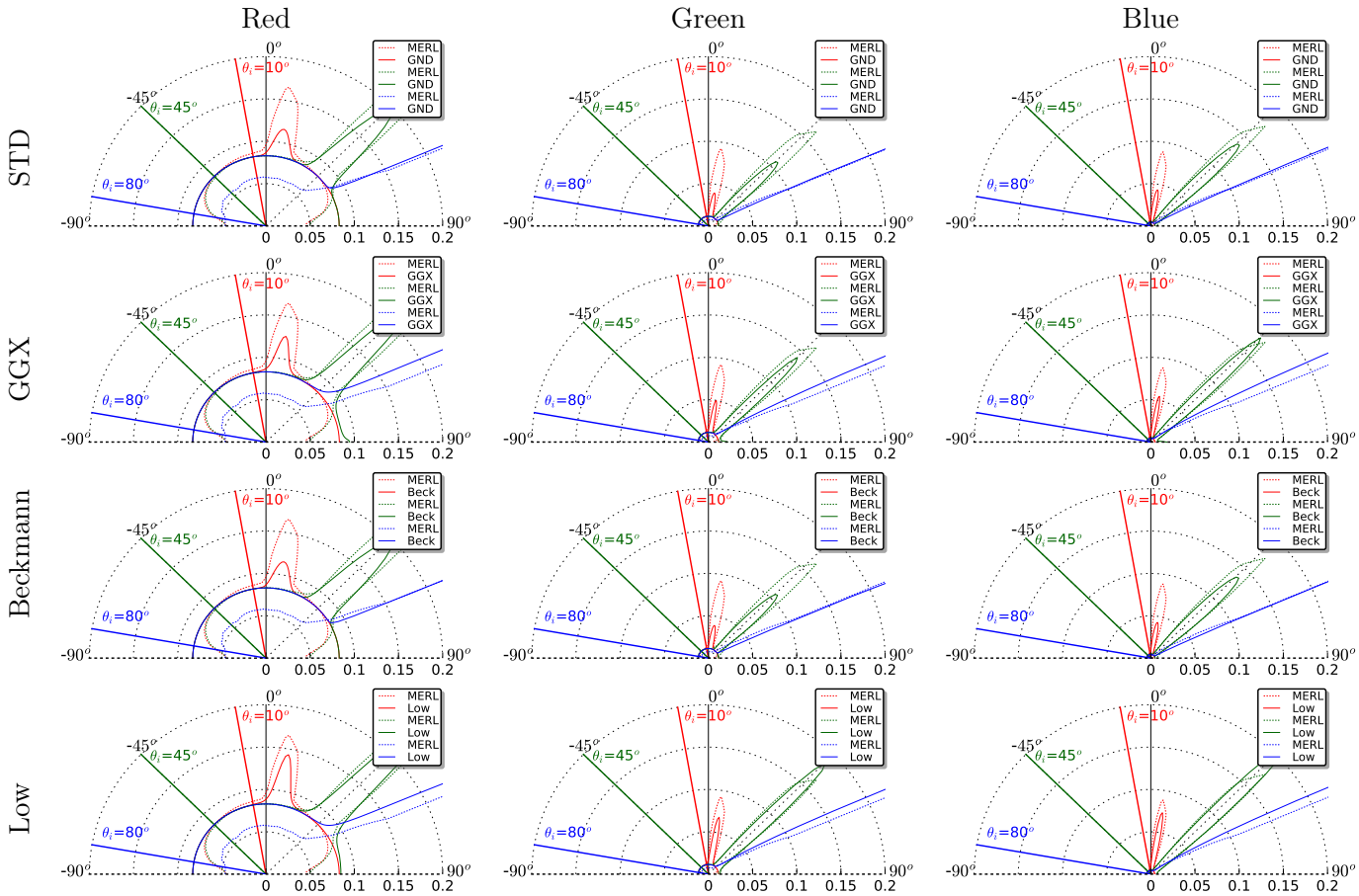
red-plastic



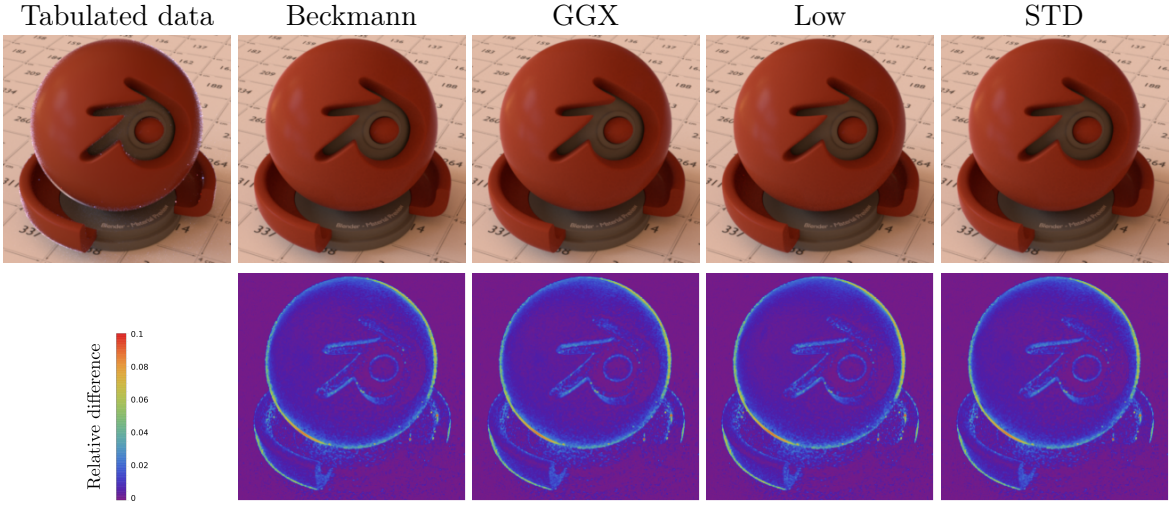
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.26-0.052-0.021	1.0-0.777-0.759	1.3886	0.3117	1.7831	0.00088
GGX	0.26-0.052-0.021	1.0-0.737-0.726	1.3583	0.3424	2.0	0.00097
Beckmann	0.26-0.052-0.021	1.0-0.679-0.656	1.2608	0.3822	$+\infty$	0.0012
	ρ	A		B	C	
Low	0.26-0.052-0.021	5.234-3.398-3.17	1.529	3219.82	0.5642	0.00129



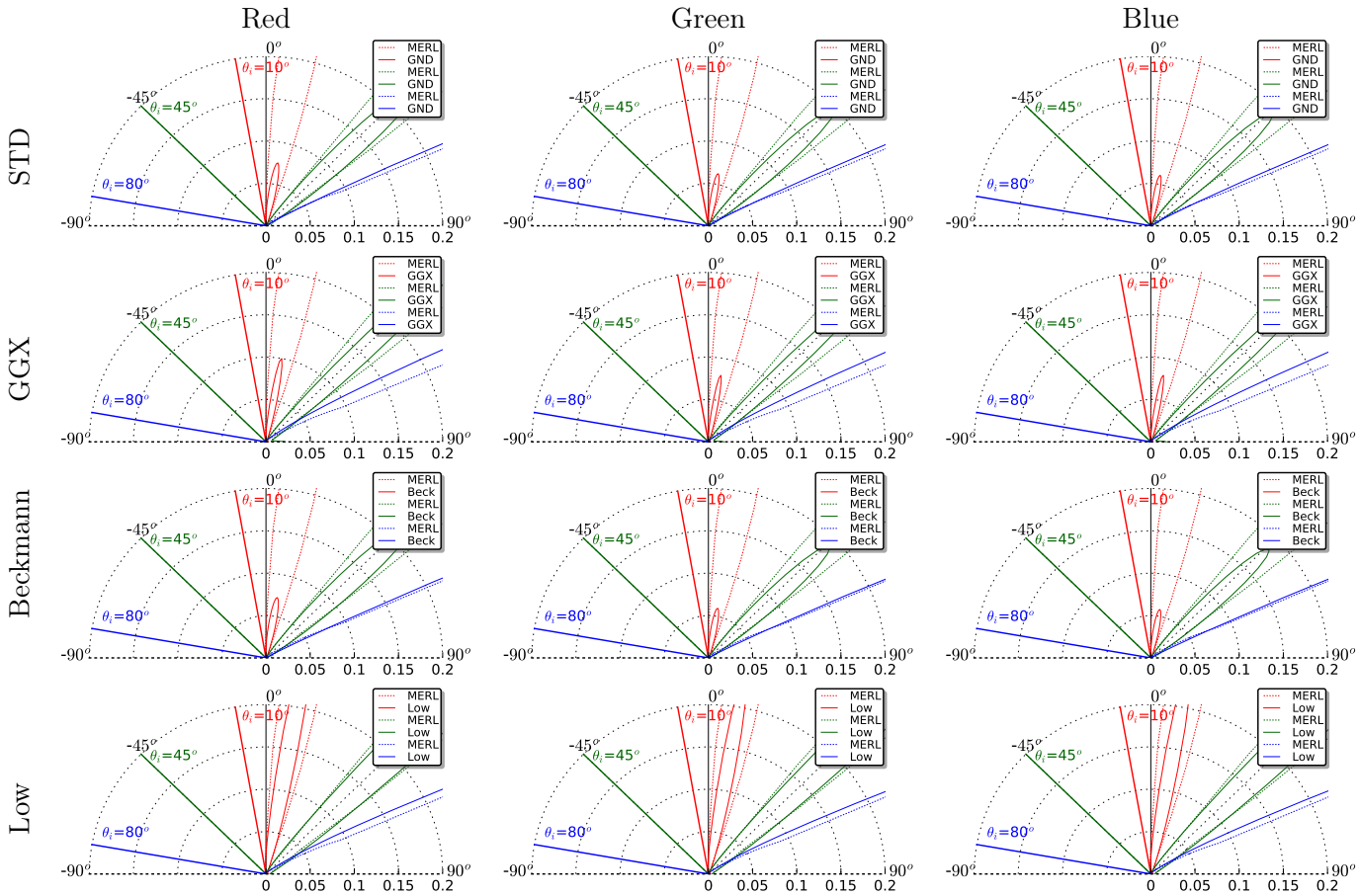
red-specular-plastic



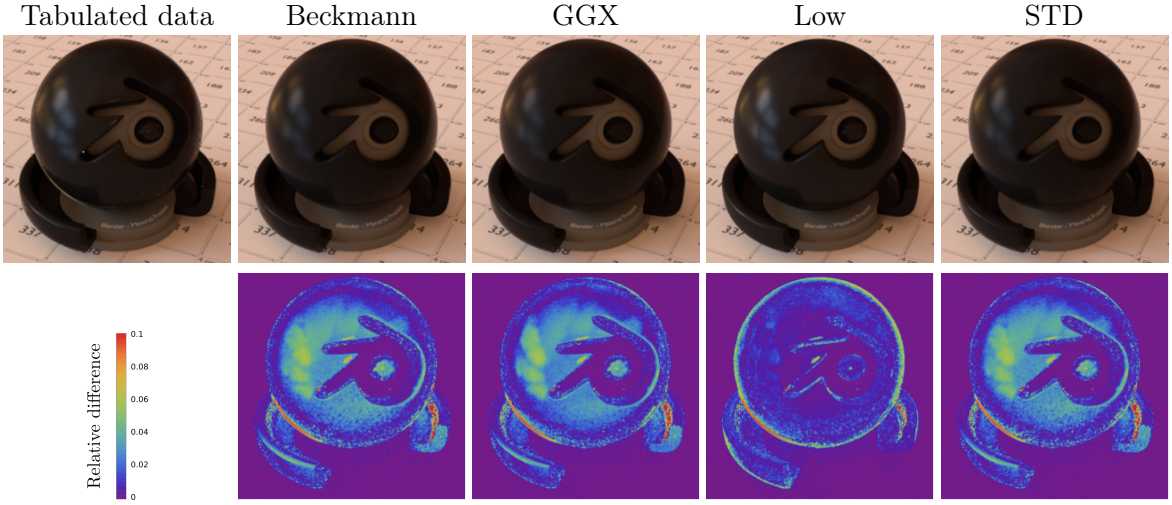
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.26-0.036-0.014	1.0-0.85-1.173	1.0784	0.0594	12.1298	0.00096
GGX	0.26-0.036-0.014	1.0-0.878-1.146	1.0868	0.0569	2.0	0.00101
Beckmann	0.26-0.036-0.014	1.0-0.852-1.172	1.0771	0.0589	$+\infty$	0.00097
	ρ	A		B	C	
Low	0.26-0.036-0.014	30.478-28.678-34.883	1.1686	616.018	1.9729	0.00099



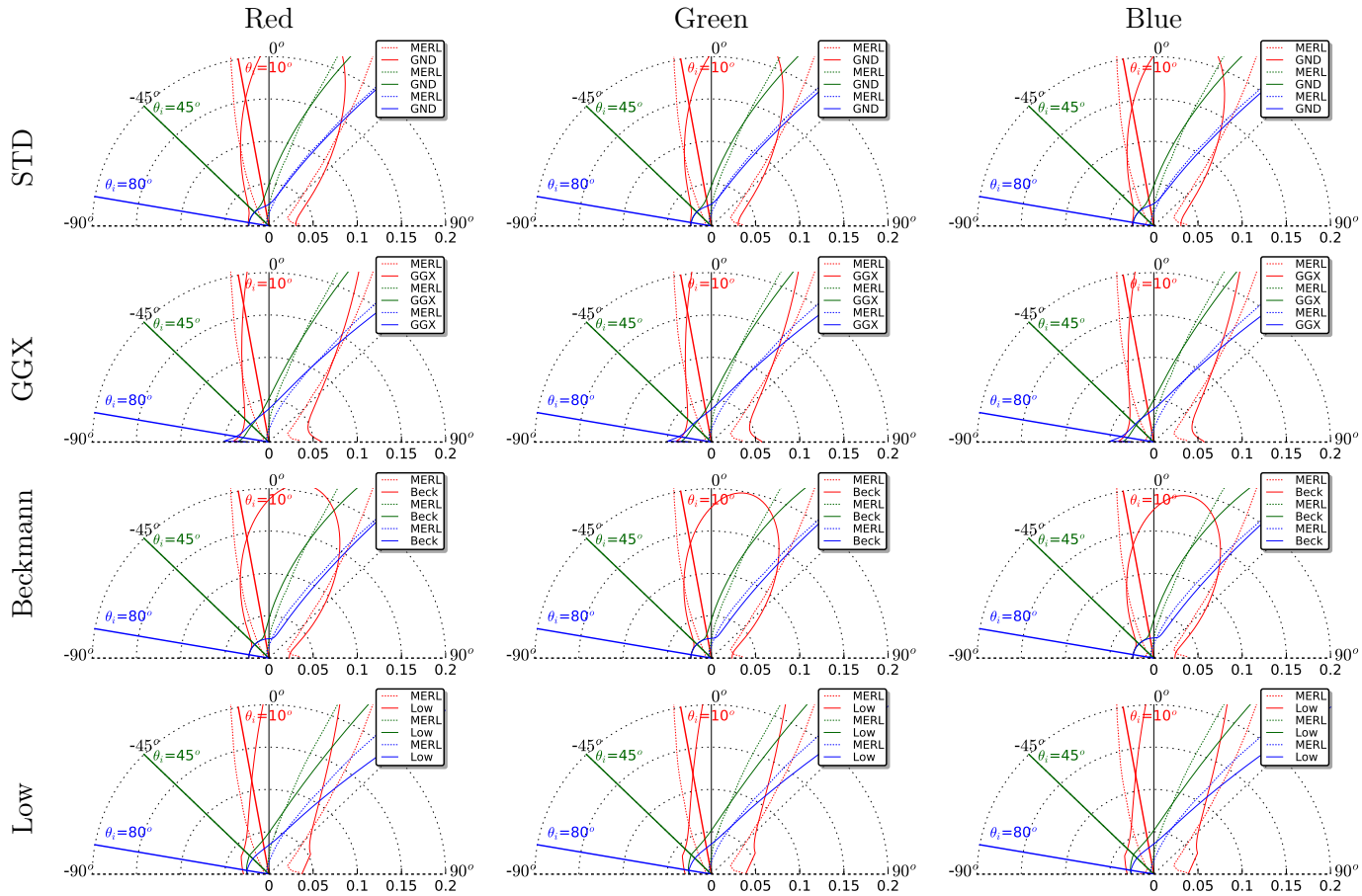
silicon-nitrade



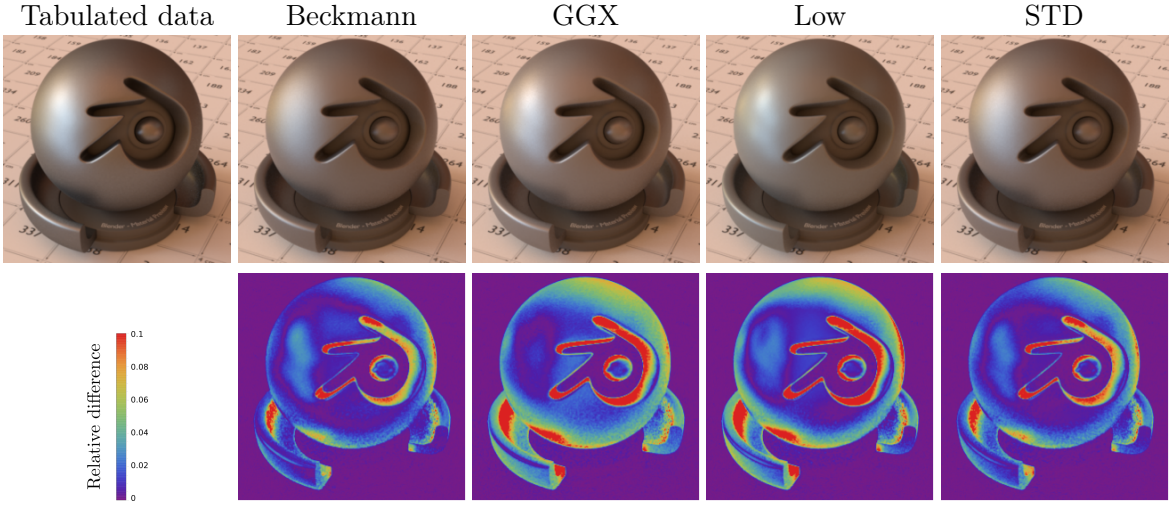
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.007-0.007-0.007	1.0-0.824-0.795	1.1247	0.0621	11.3339	0.0006
GGX	0.007-0.007-0.007	1.0-0.795-0.794	1.1307	0.0562	2.0	0.00072
Beckmann	0.007-0.007-0.007	1.0-0.817-0.795	1.1229	0.0626	$+\infty$	0.00061
	ρ	A		B	C	
Low	0.007-0.007-0.007	20.011-16.478-17.16	1.5342	740.929	1.9857	0.00058



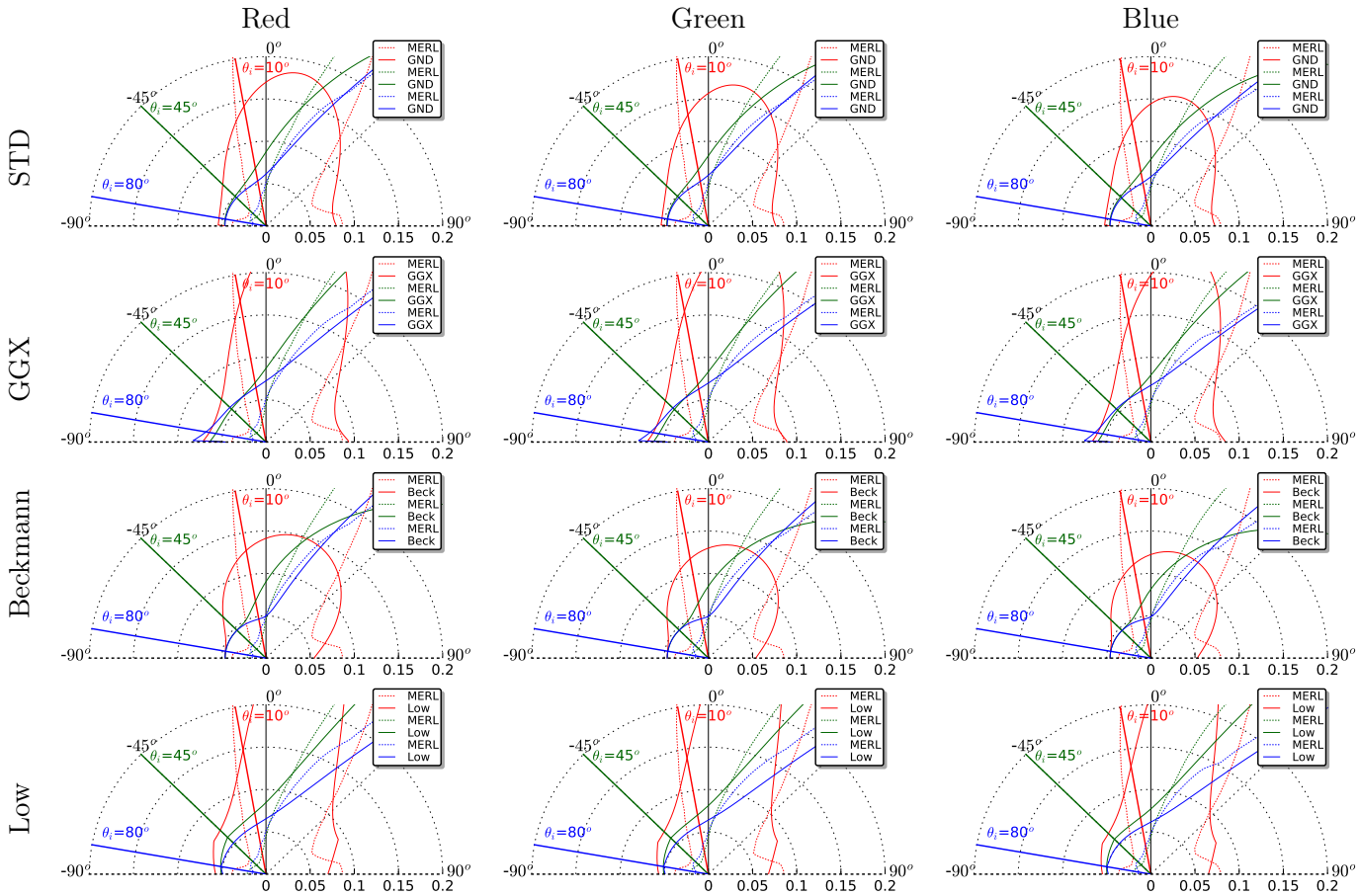
silver-metallic-paint



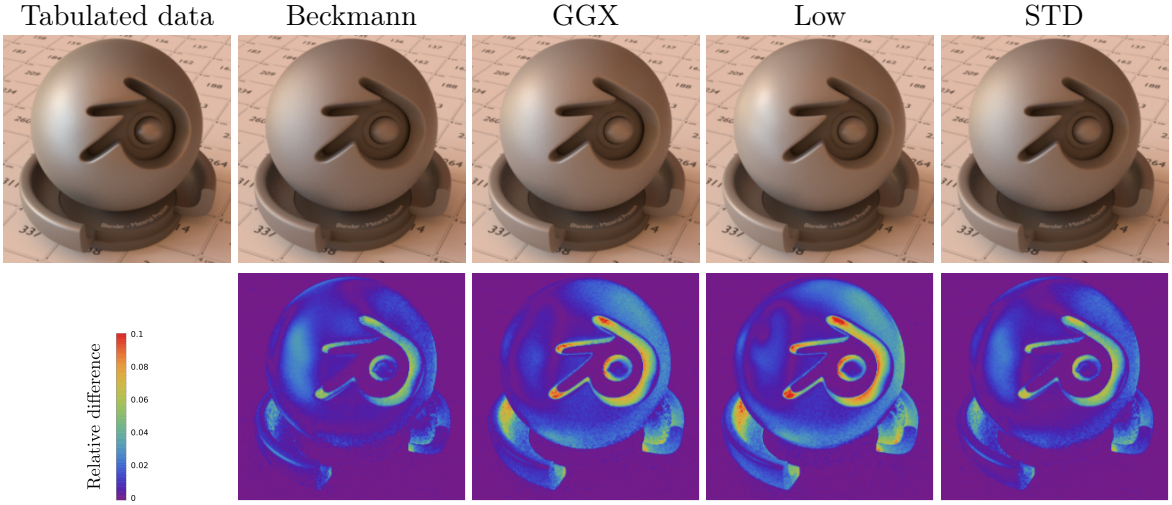
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.072-0.073-0.075	1.0-0.93-0.912	2.3378	0.2397	5.248	0.00734
GGX	0.072-0.073-0.075	1.0-0.942-0.92	2.6698	0.2025	2.0	0.00794
Beckmann	0.072-0.073-0.075	1.0-0.943-0.923	2.2201	0.2521	$+\infty$	0.0075
	ρ	A		B	C	
Low	0.072-0.073-0.075	6.436-6.965-6.815	2.4378	161.451	1.1444	0.00931



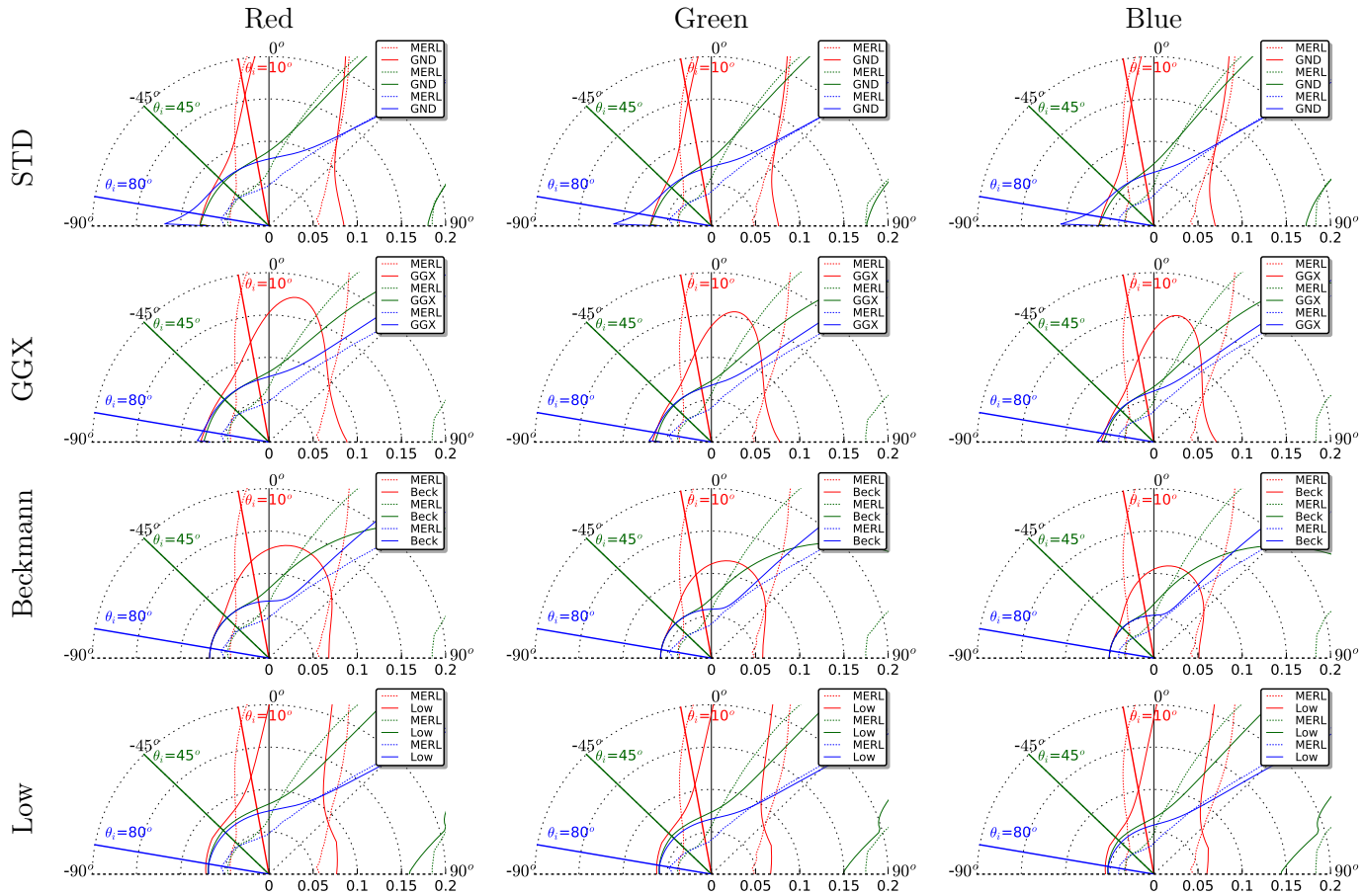
silver-metallic-paint2



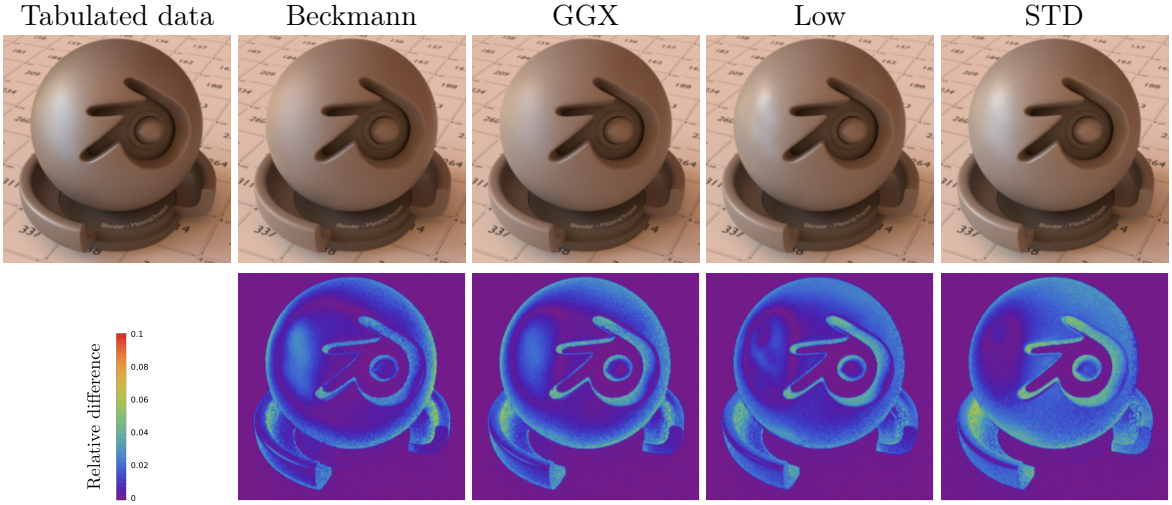
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.146-0.146-0.145	1.0-0.891-0.795	2.3662	0.3136	3.8061	0.00937
GGX	0.146-0.146-0.145	1.0-0.896-0.805	2.7247	0.2787	2.0	0.00968
Beckmann	0.146-0.146-0.145	1.0-0.876-0.801	2.2233	0.3411	$+\infty$	0.00948
	ρ	A		B	C	
Low	0.146-0.146-0.145	4.074-3.665-3.288	2.9299	142.324	0.9912	0.01047



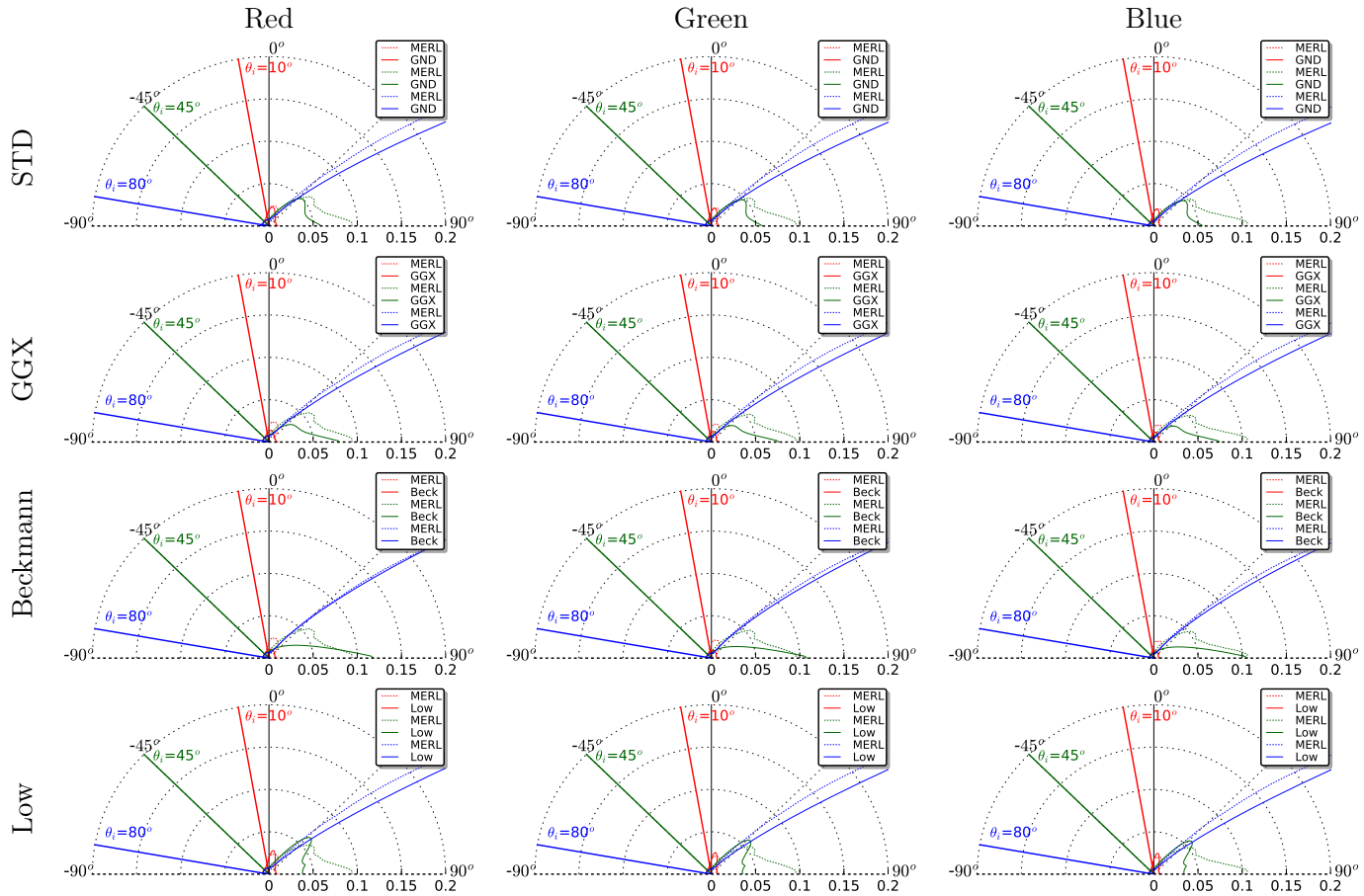
silver-paint



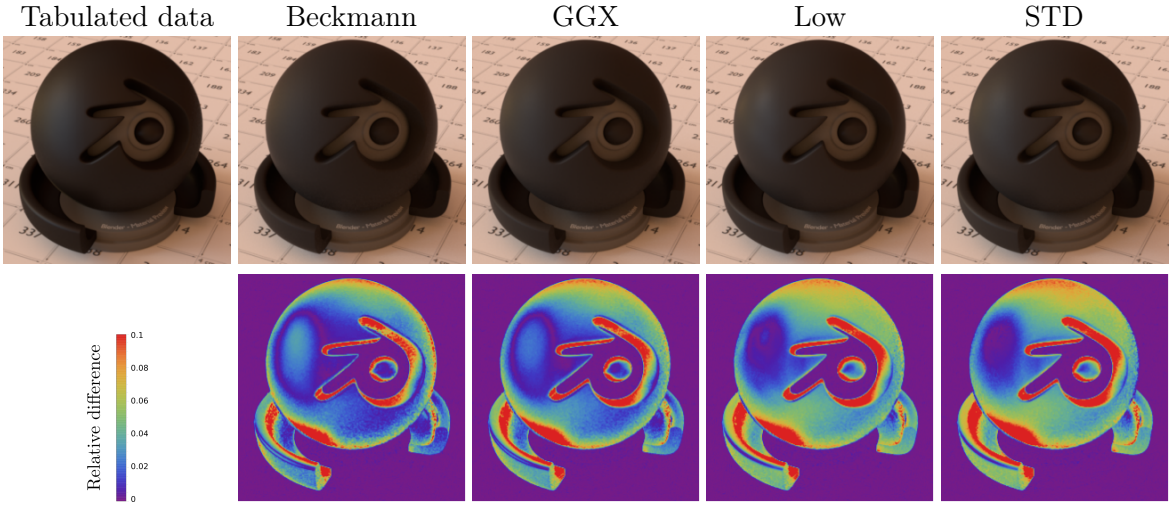
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.211-0.181-0.158	1.0-1.048-1.08	2.3672	0.226	1.6147	0.00466
GGX	0.211-0.181-0.158	1.0-0.928-0.954	1.8344	0.2587	2.0	0.00539
Beckmann	0.211-0.181-0.158	1.0-0.871-0.887	1.6899	0.2825	$+\infty$	0.00544
	ρ	A		B	C	
Low	0.211-0.181-0.158	3.931-3.929-4.005	2.9382	350.838	0.9976	0.00565



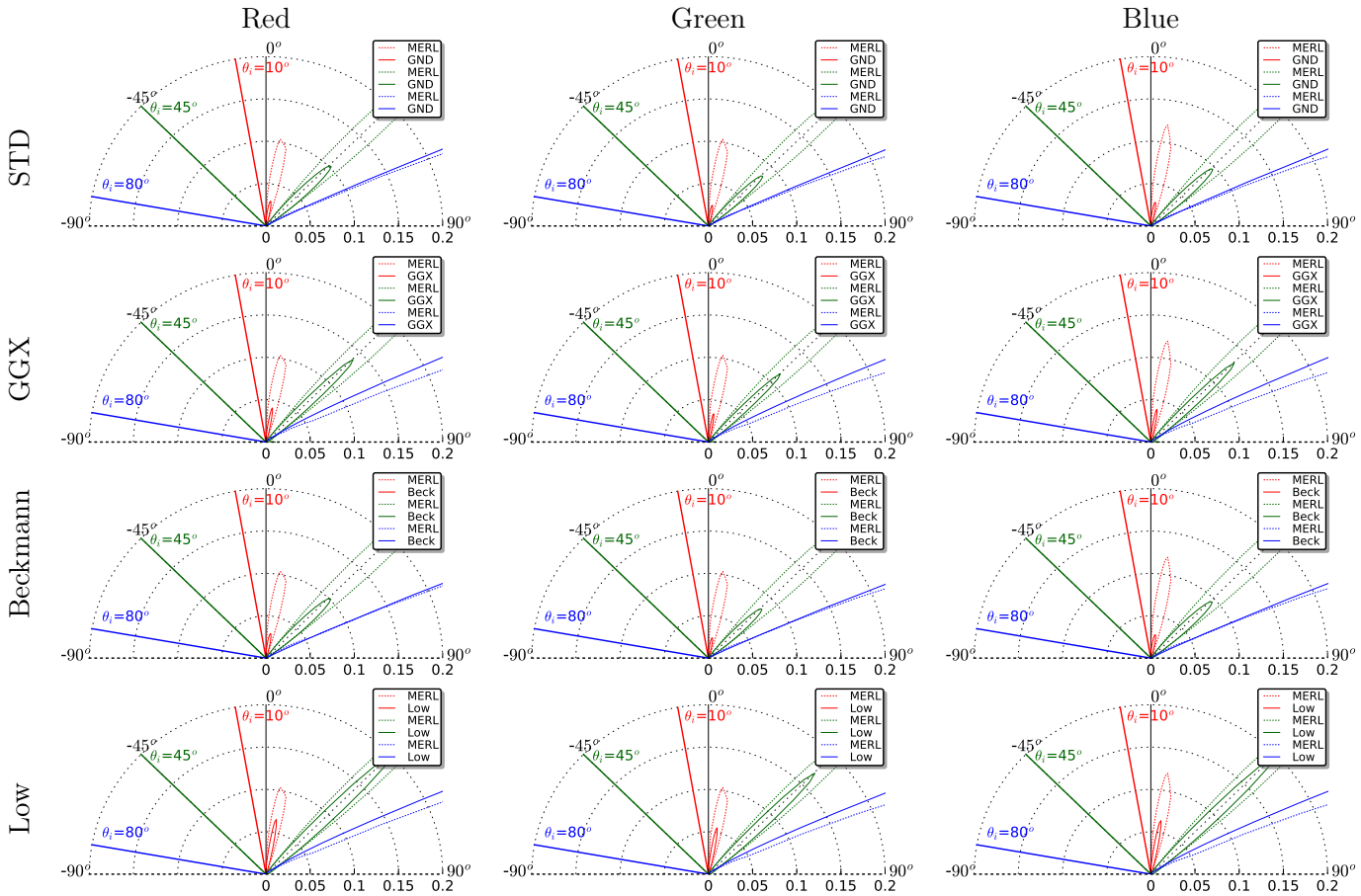
special-walnut-224



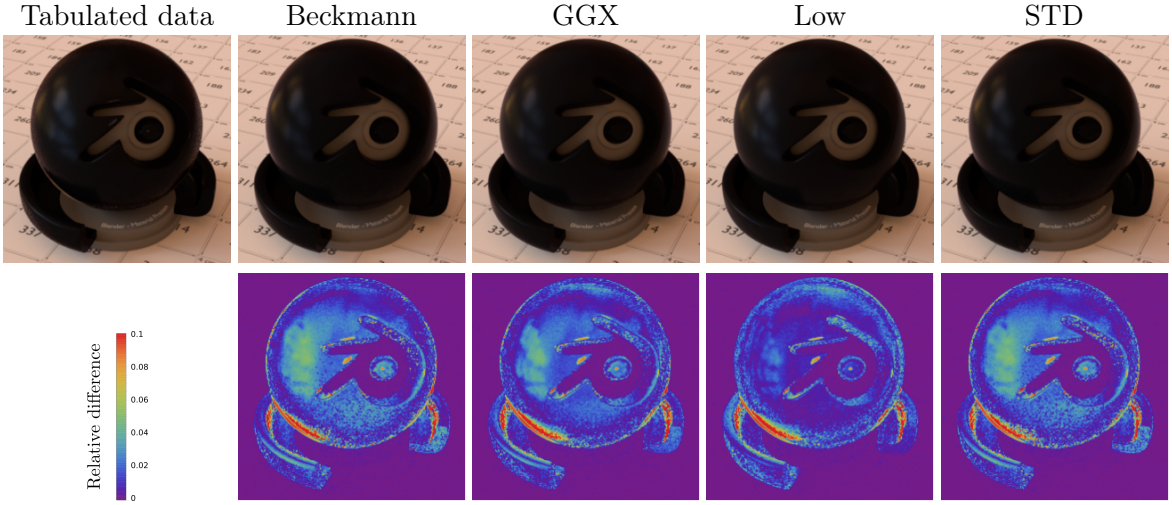
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.021-0.018-0.016	1.0-0.986-0.959	1.2421	0.243	1.671	0.00105
GGX	0.021-0.018-0.016	1.0-0.969-0.951	1.1615	0.2502	2.0	0.0011
Beckmann	0.021-0.018-0.016	1.0-0.919-0.901	1.1289	0.2764	$+\infty$	0.00111
	ρ	A		B	C	
Low	0.021-0.018-0.016	2.165-2.039-2.004	1.4207	121.089	1.2659	0.0011



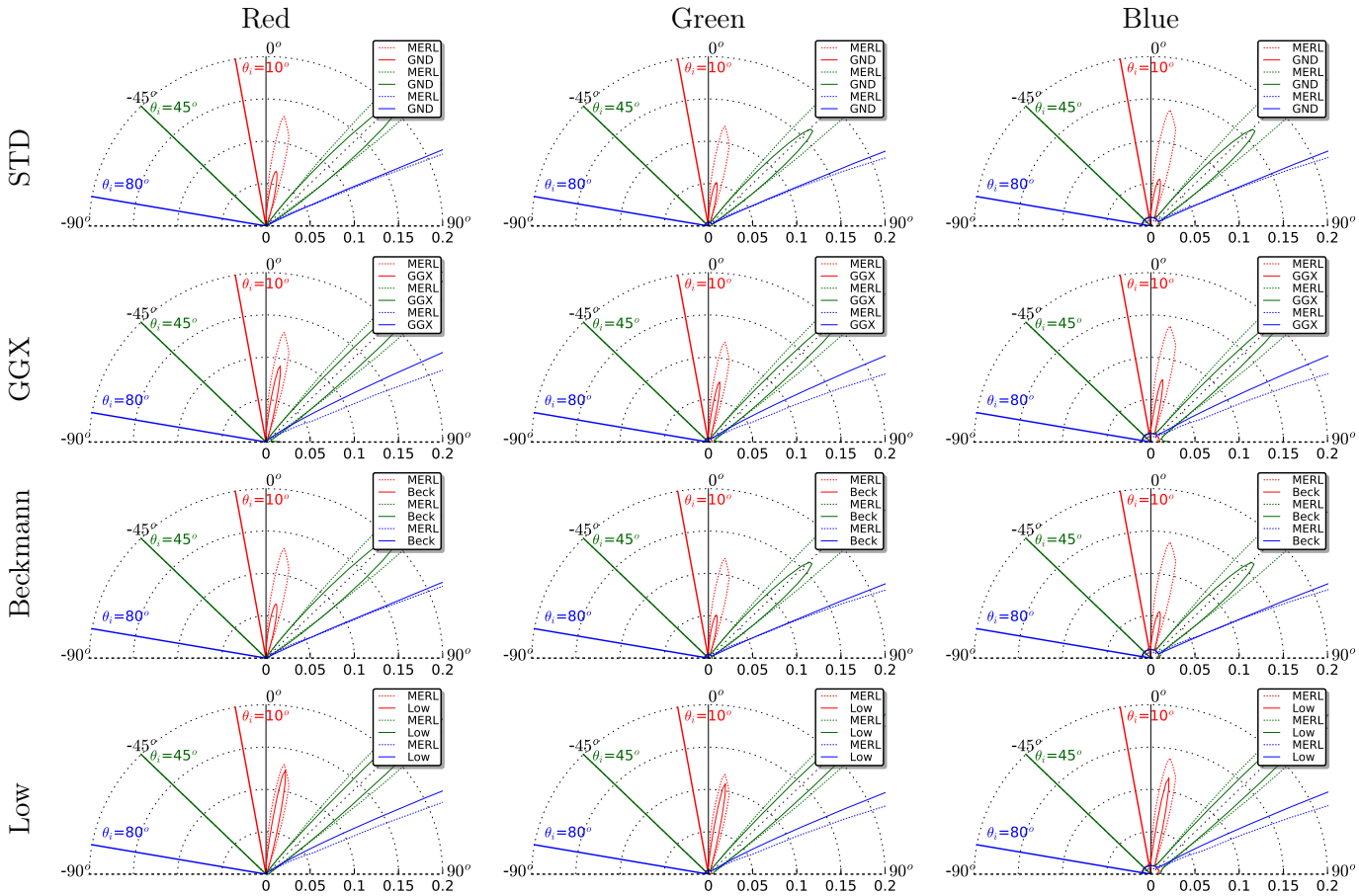
specular-black-phenolic



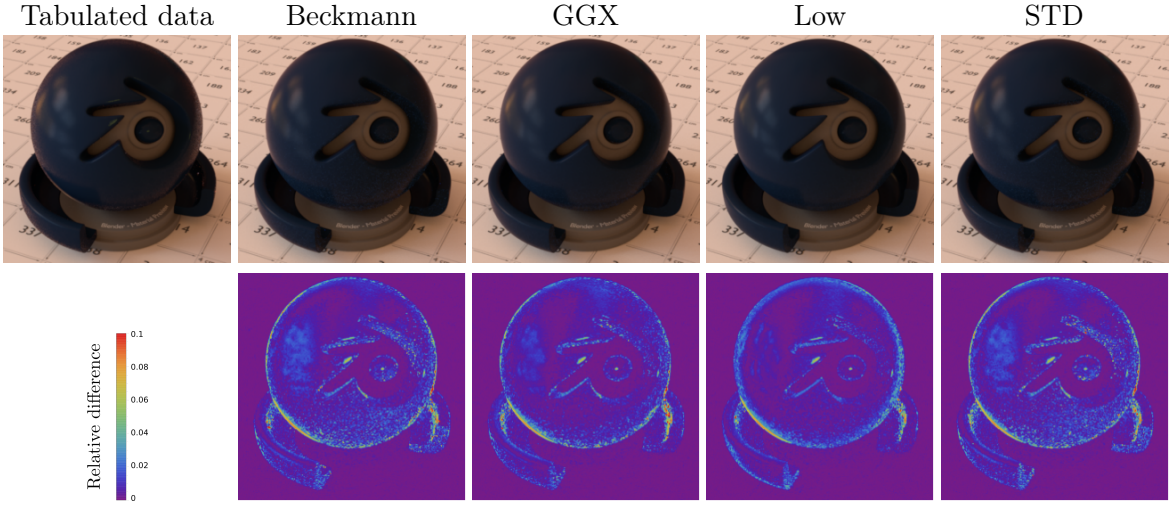
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.002-0.002-0.003	1.0-0.83-0.947	1.0734	0.0595	13.7938	0.0003
GGX	0.002-0.002-0.003	1.0-0.824-0.954	1.0789	0.0541	2.0	0.00038
Beckmann	0.002-0.002-0.003	1.0-0.824-0.945	1.072	0.0588	$+\infty$	0.00031
	ρ	A		B	C	
Low	0.002-0.002-0.003	32.939-27.904-32.165	1.1681	765.576	1.905	0.00037



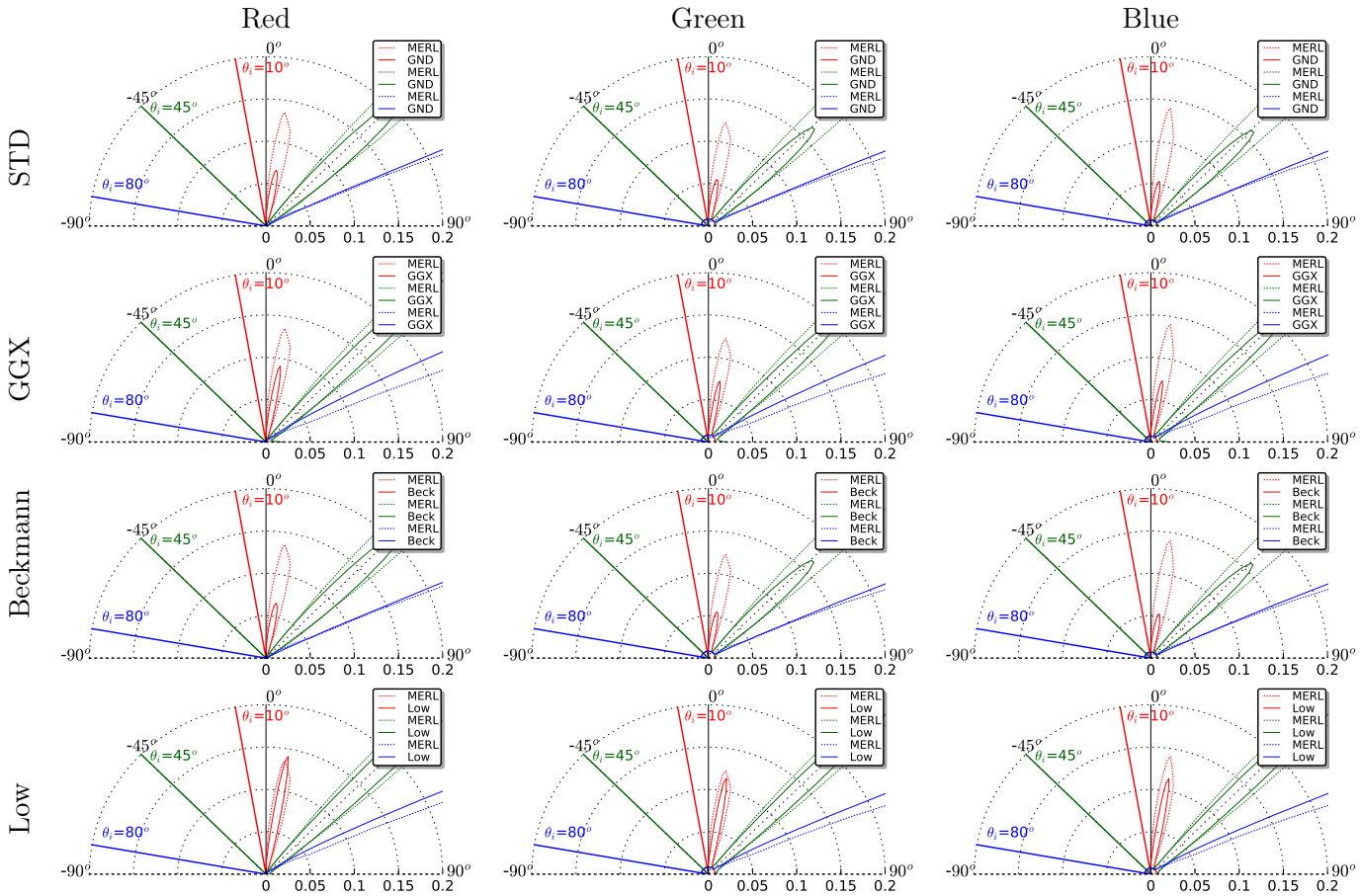
specular-blue-phenolic



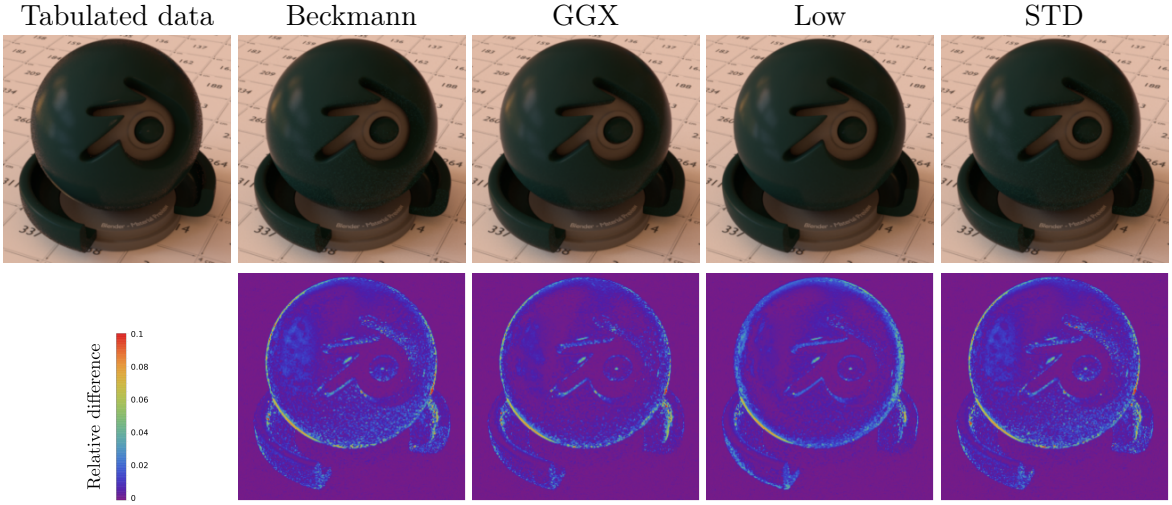
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.005-0.013-0.032	1.0-0.746-0.717	1.1056	0.0567	49.9674	0.00044
GGX	0.005-0.013-0.032	1.0-0.757-0.724	1.1167	0.0527	2.0	0.00059
Beckmann	0.005-0.013-0.032	1.0-0.748-0.718	1.1051	0.0568	$+\infty$	0.00044
	ρ	A		B	C	
Low	0.005-0.013-0.032	54.495-46.063-46.599	1.1813	976.555	1.9579	0.0006



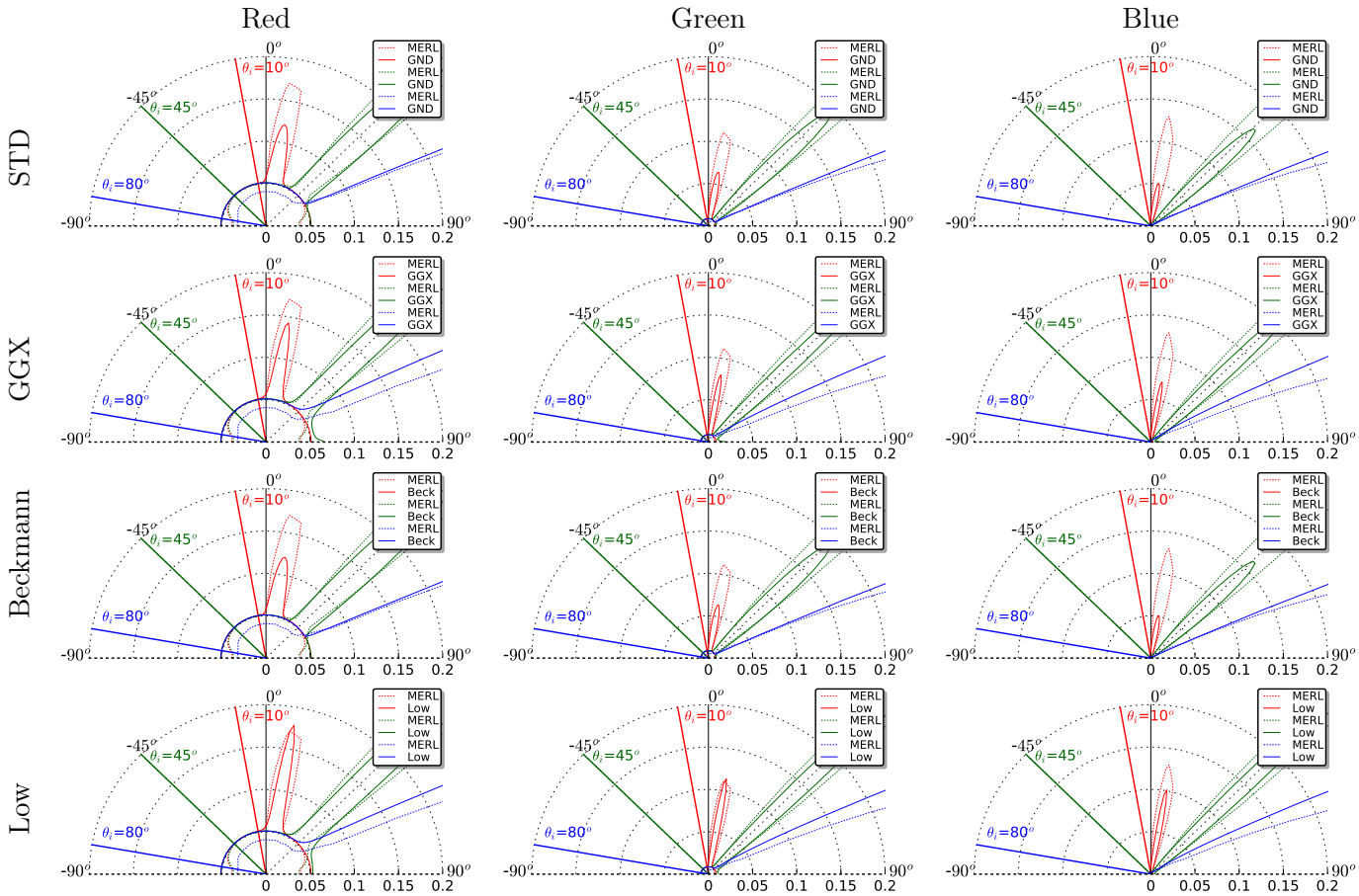
specular-green-phenolic



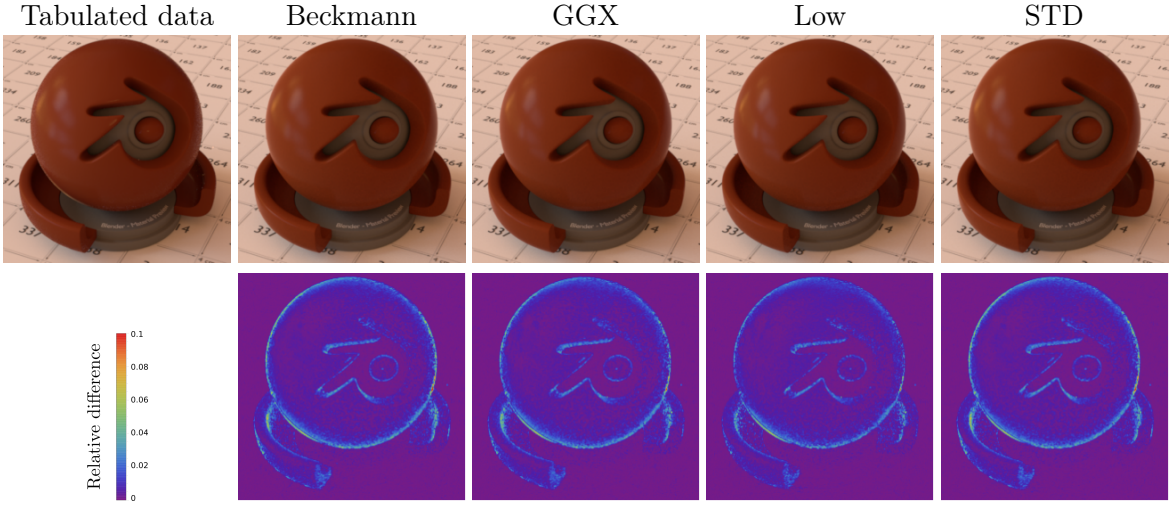
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.006-0.026-0.022	1.0-0.736-0.718	1.1063	0.0568	49.9958	0.00043
GGX	0.006-0.026-0.022	1.0-0.729-0.746	1.1195	0.0541	2.0	0.00057
Beckmann	0.006-0.026-0.022	1.0-0.739-0.721	1.1051	0.0567	$+\infty$	0.00043
	ρ	A		B	C	
Low	0.006-0.026-0.022	44.979-34.497-34.796	1.2156	980.286	1.942	0.0006



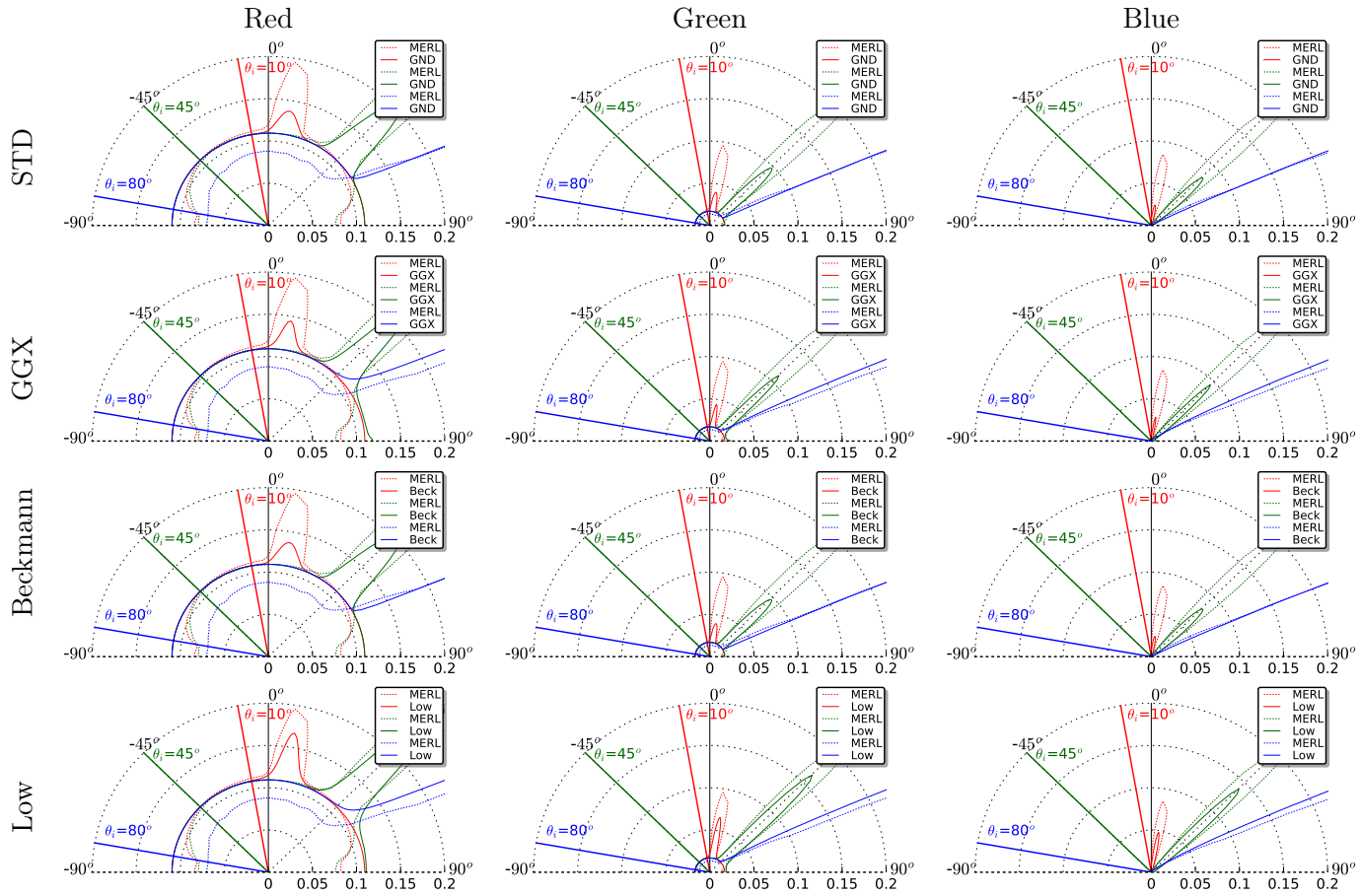
specular-maroon-phenolic



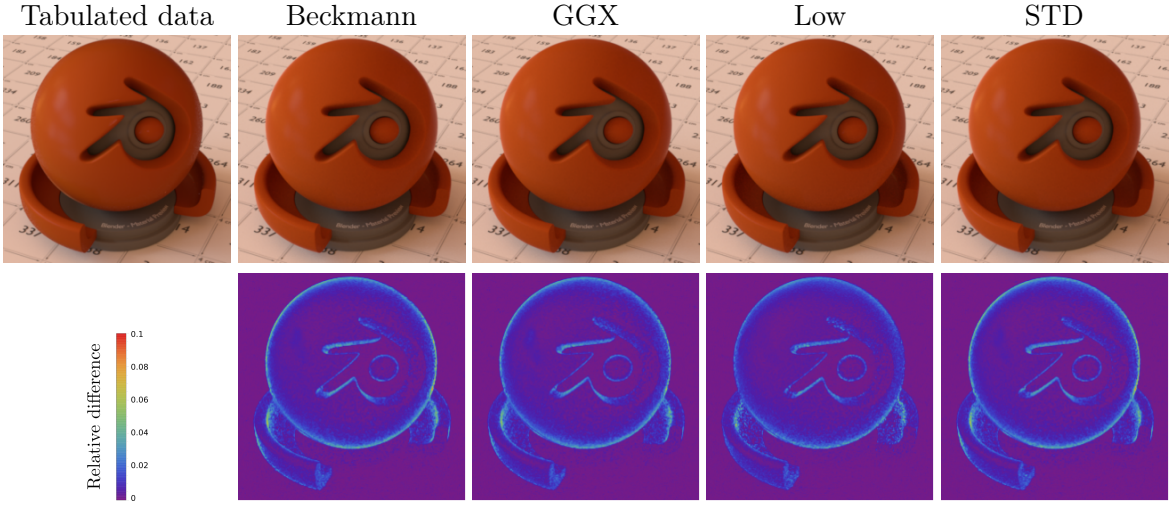
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.16-0.027-0.007	1.0-0.794-0.696	1.1097	0.0561	49.9958	0.0007
GGX	0.16-0.027-0.007	1.0-0.782-0.76	1.1144	0.051	2.0	0.00087
Beckmann	0.16-0.027-0.007	1.0-0.788-0.697	1.1093	0.0561	$+\infty$	0.0007
	ρ	A		B	C	
Low	0.16-0.027-0.007	79.708-65.93-61.648	1.1506	1095.73	1.8847	0.00091



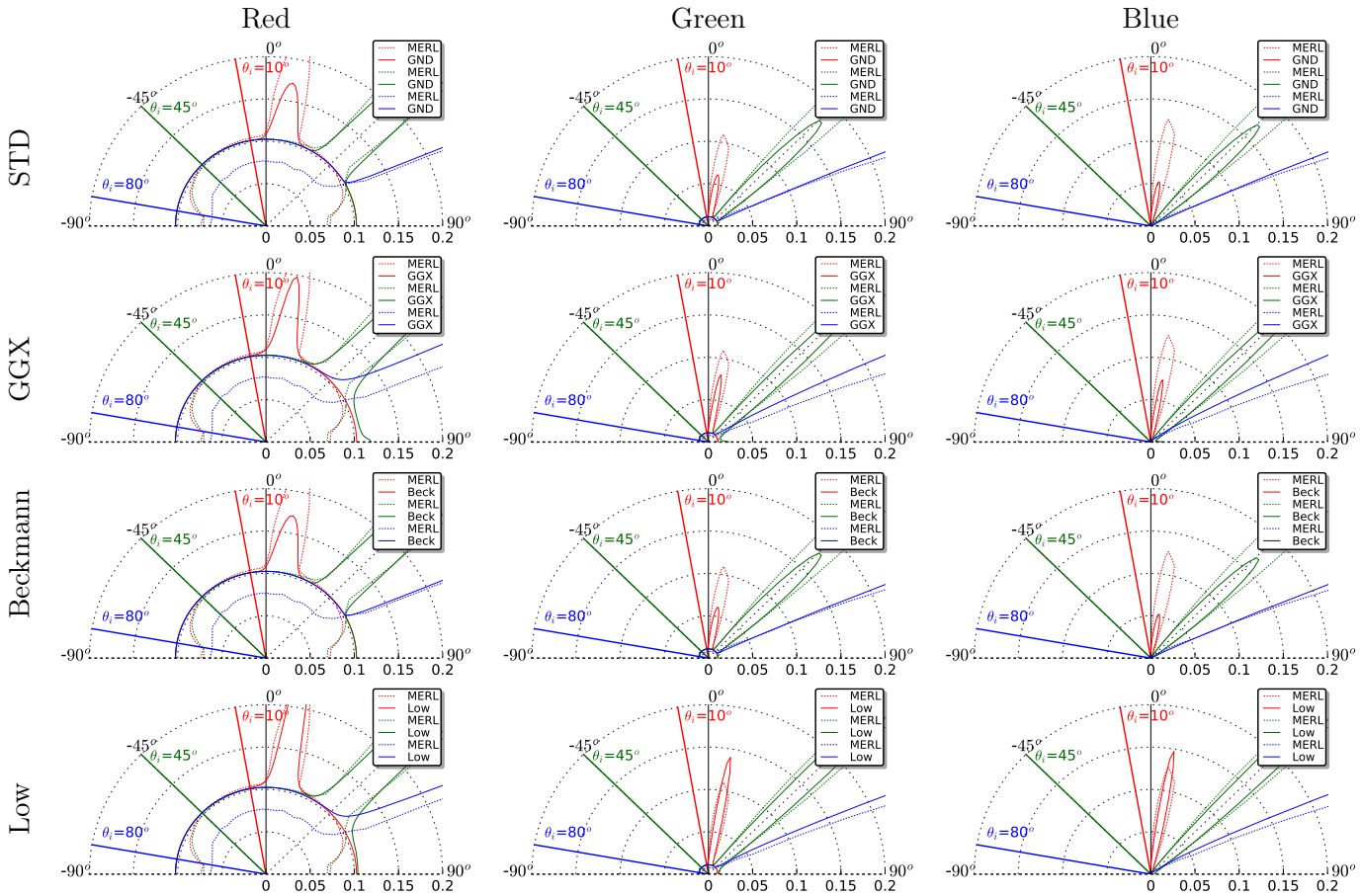
specular-orange-phenolic



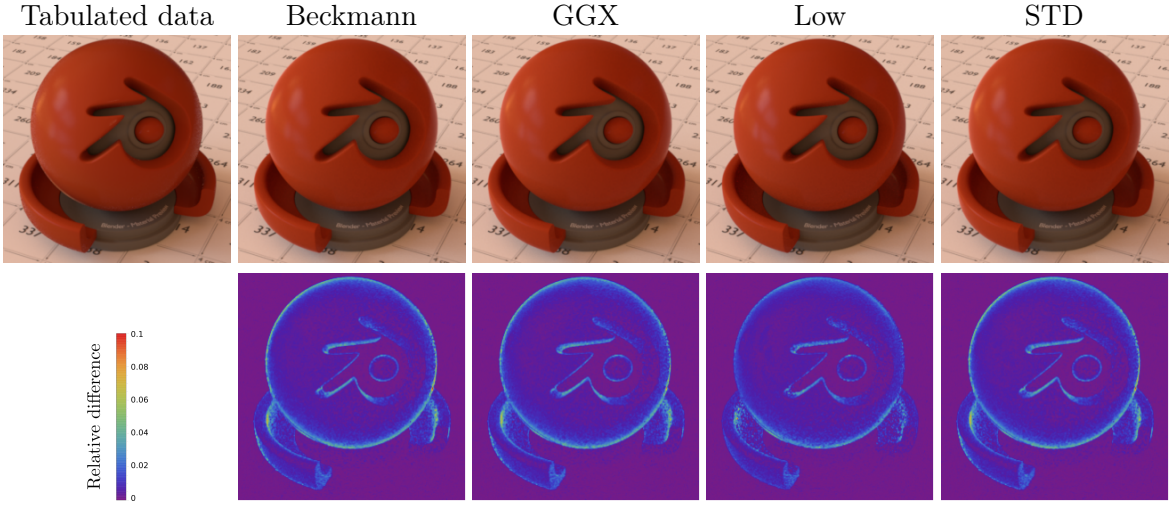
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.343-0.053-0.006	1.0-0.822-0.806	1.0726	0.0599	49.9836	0.00097
GGX	0.343-0.053-0.006	1.0-0.772-0.765	1.0741	0.0546	2.0	0.00105
Beckmann	0.343-0.053-0.006	1.0-0.826-0.814	1.0714	0.0593	$+\infty$	0.00098
	ρ	A		B	C	
Low	0.343-0.053-0.006	22.888-19.327-18.22	1.1926	577.417	1.9841	0.001



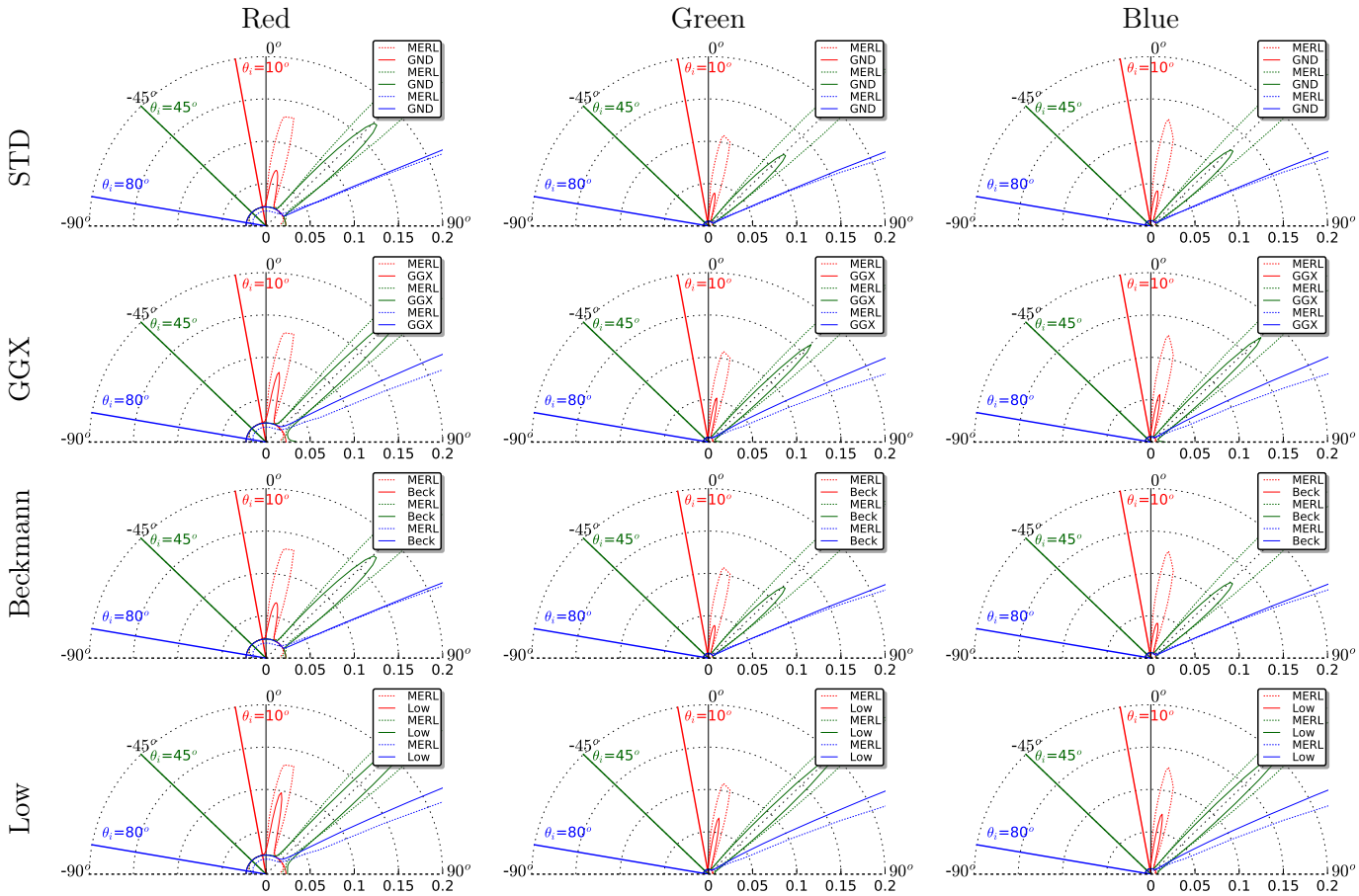
specular-red-phenolic



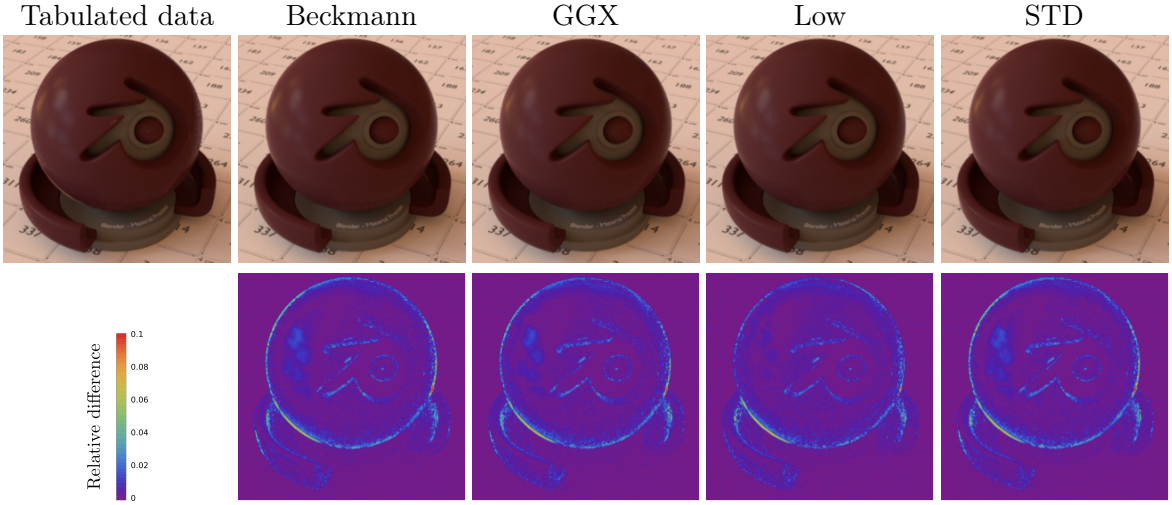
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.322-0.034-0.008	1.0-0.732-0.738	1.107	0.0555	49.9917	0.00109
GGX	0.322-0.034-0.008	1.0-0.729-0.753	1.1215	0.053	2.0	0.00126
Beckmann	0.322-0.034-0.008	1.0-0.731-0.734	1.1069	0.0556	$+\infty$	0.00109
	ρ	A		B	C	
Low	0.322-0.034-0.008	32.811-24.532-27.493	1.2906	1042.06	1.9172	0.00129



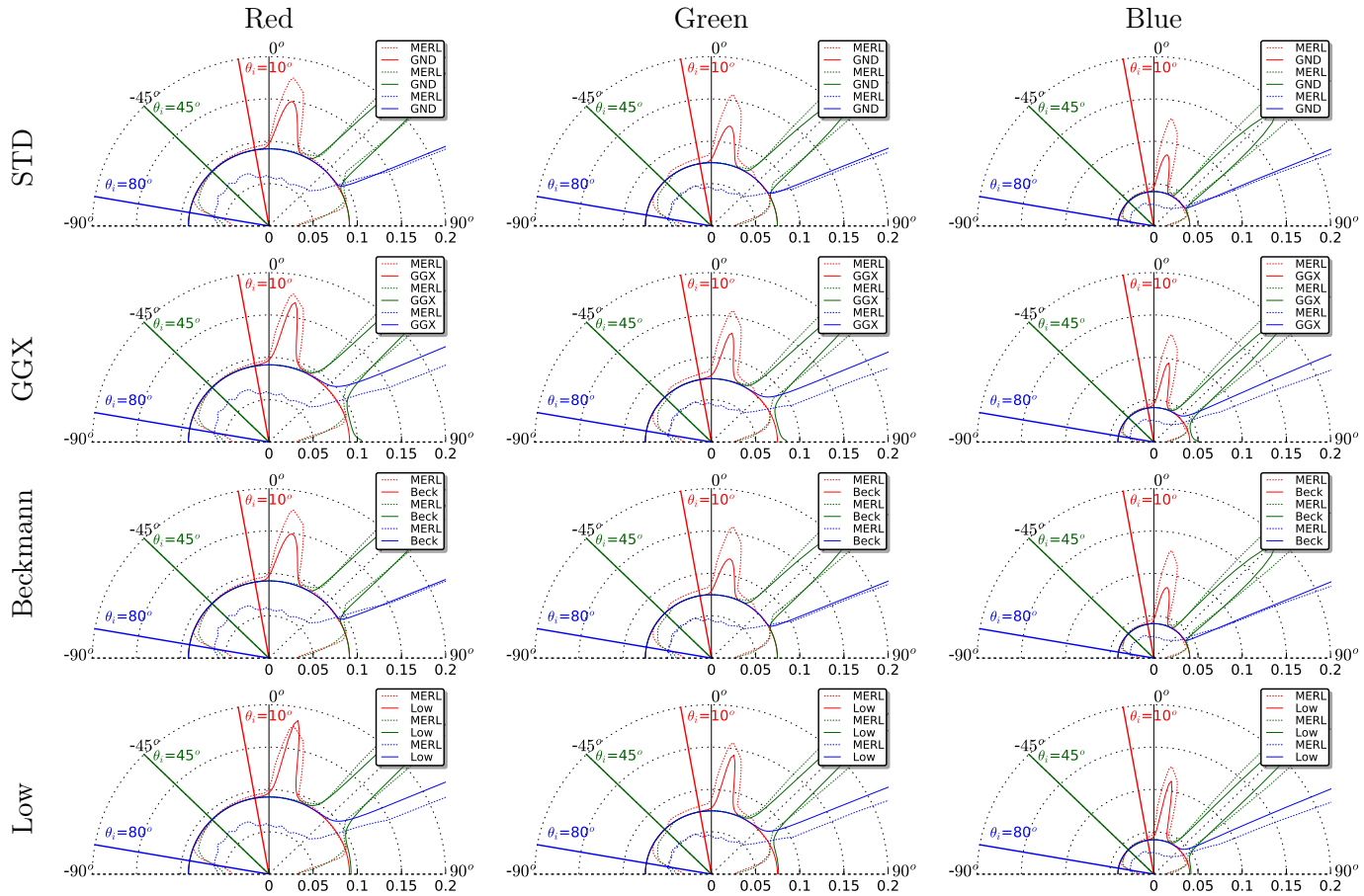
specular-violet-phenolic



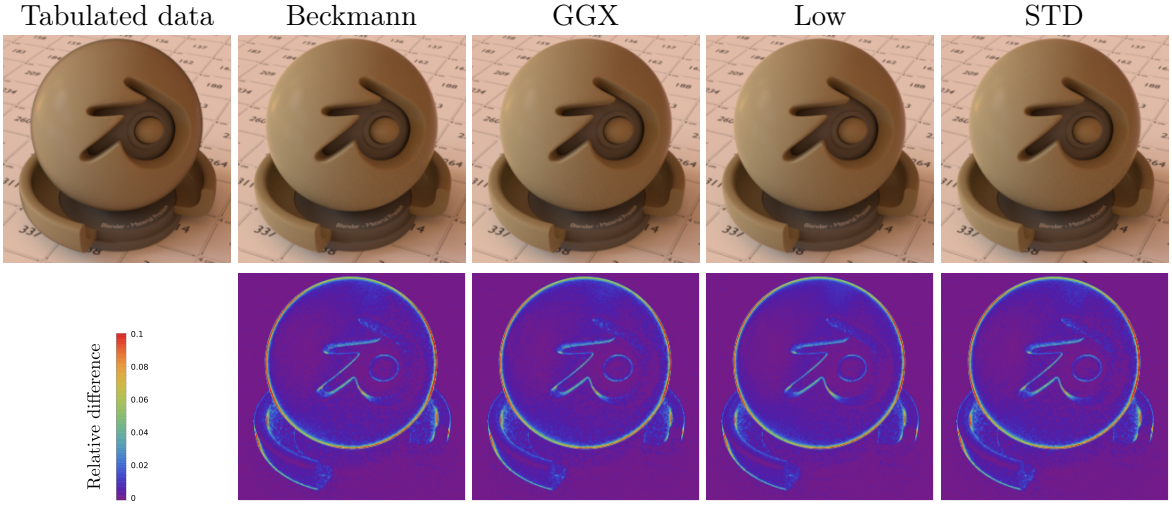
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.071-0.018-0.02	1.0-0.763-0.81	1.0875	0.0571	49.9876	0.00044
GGX	0.071-0.018-0.02	1.0-0.772-0.826	1.0946	0.0523	2.0	0.00057
Beckmann	0.071-0.018-0.02	1.0-0.762-0.81	1.0869	0.0569	$+\infty$	0.00044
	ρ	A		B	C	
Low	0.071-0.018-0.02	50.388-41.283-43.954	1.1448	723.775	1.9995	0.00056



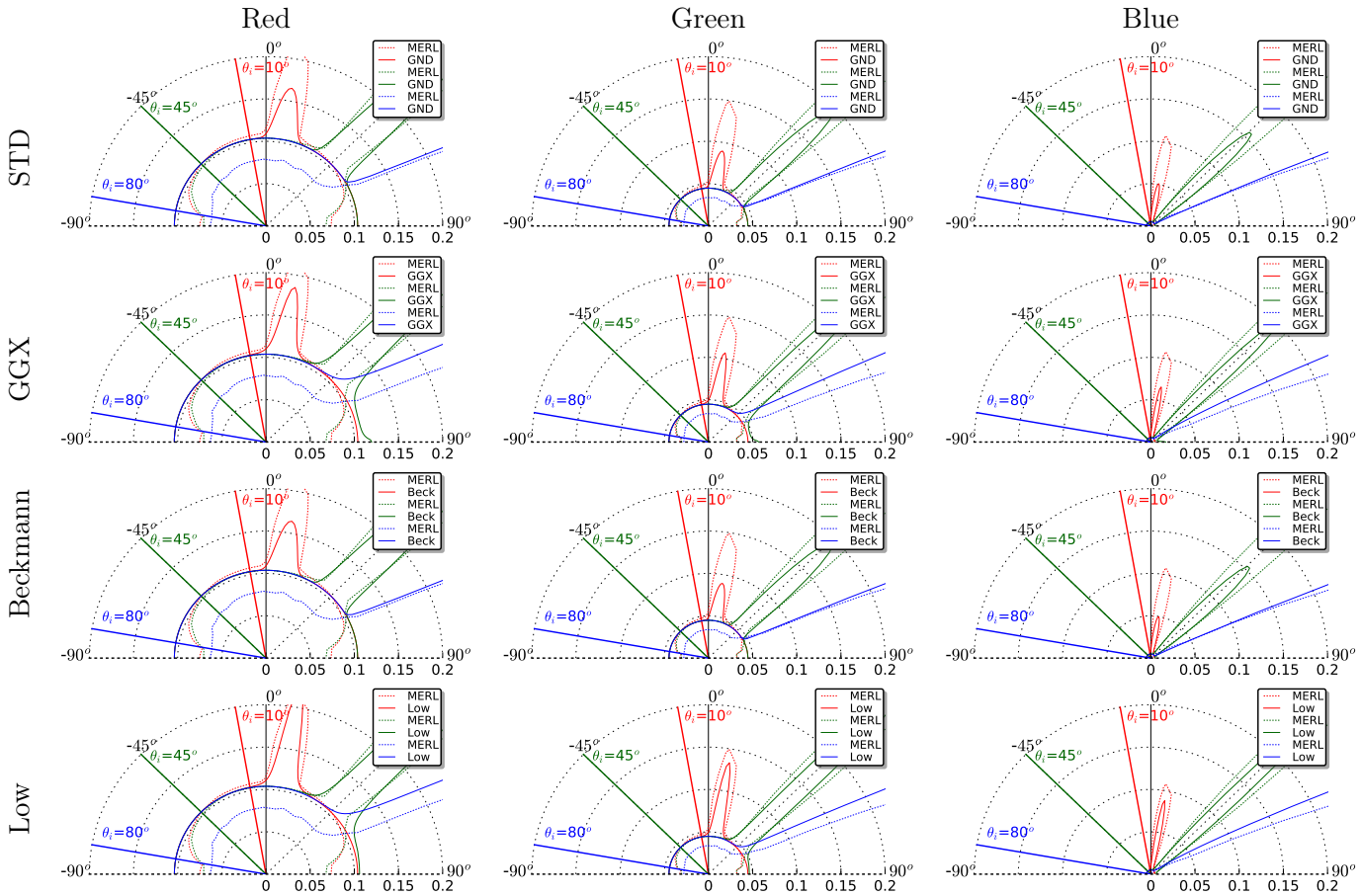
specular-white-phenolic



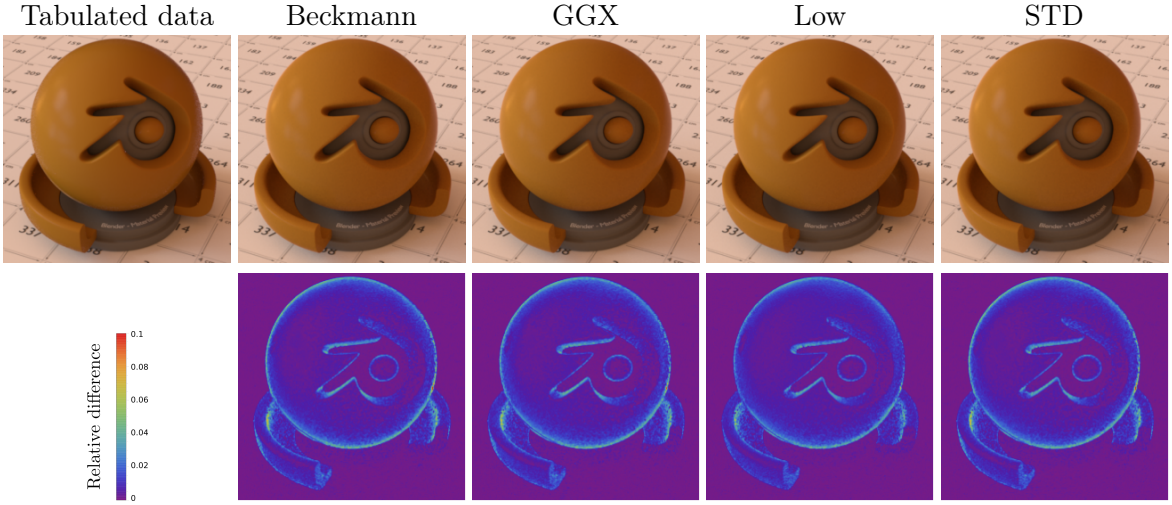
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.286-0.235-0.128	1.0-0.775-0.769	1.1025	0.0579	37.2141	0.00135
GGX	0.286-0.235-0.128	1.0-0.733-0.711	1.1093	0.0537	2.0	0.00148
Beckmann	0.286-0.235-0.128	1.0-0.766-0.762	1.1022	0.0579	$+\infty$	0.00135
	ρ	A		B	C	
Low	0.286-0.235-0.128	92.748-67.712-70.549	1.1174	895.902	1.9802	0.0015



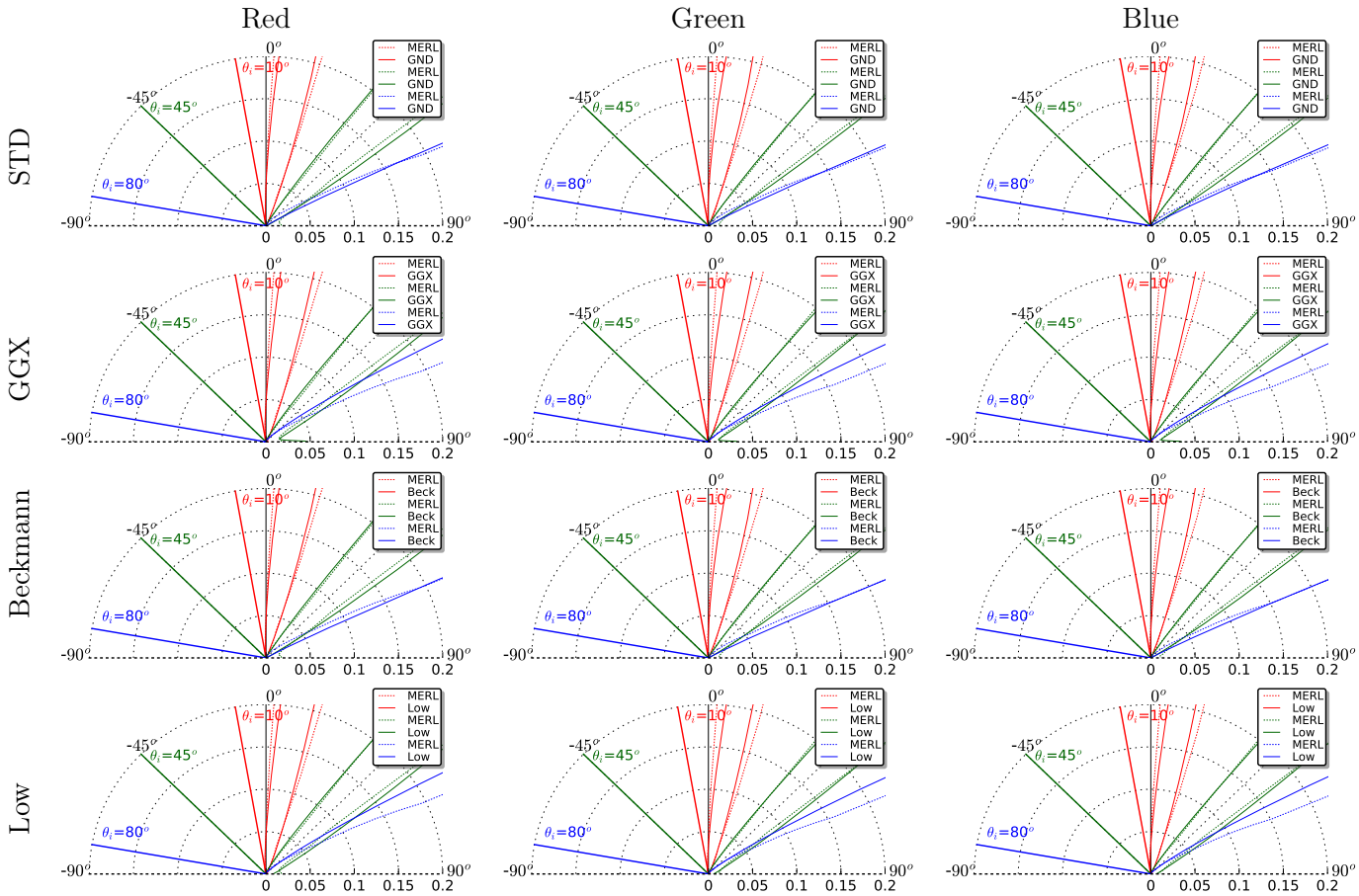
specular-yellow-phenolic



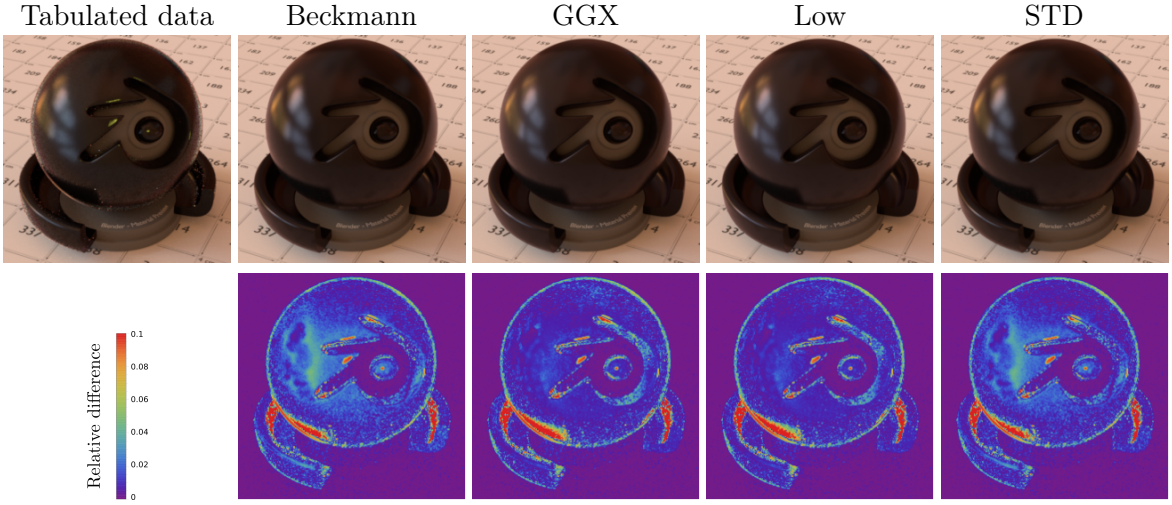
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.326-0.14-0.015	1.0-0.737-0.746	1.1009	0.0555	49.9826	0.00139
GGX	0.326-0.14-0.015	1.0-0.762-0.749	1.1148	0.0544	2.0	0.00158
Beckmann	0.326-0.14-0.015	1.0-0.744-0.741	1.1005	0.0558	$+\infty$	0.00139
	ρ	A		B	C	
Low	0.326-0.14-0.015	56.376-41.097-38.491	1.1771	873.196	1.9384	0.00159



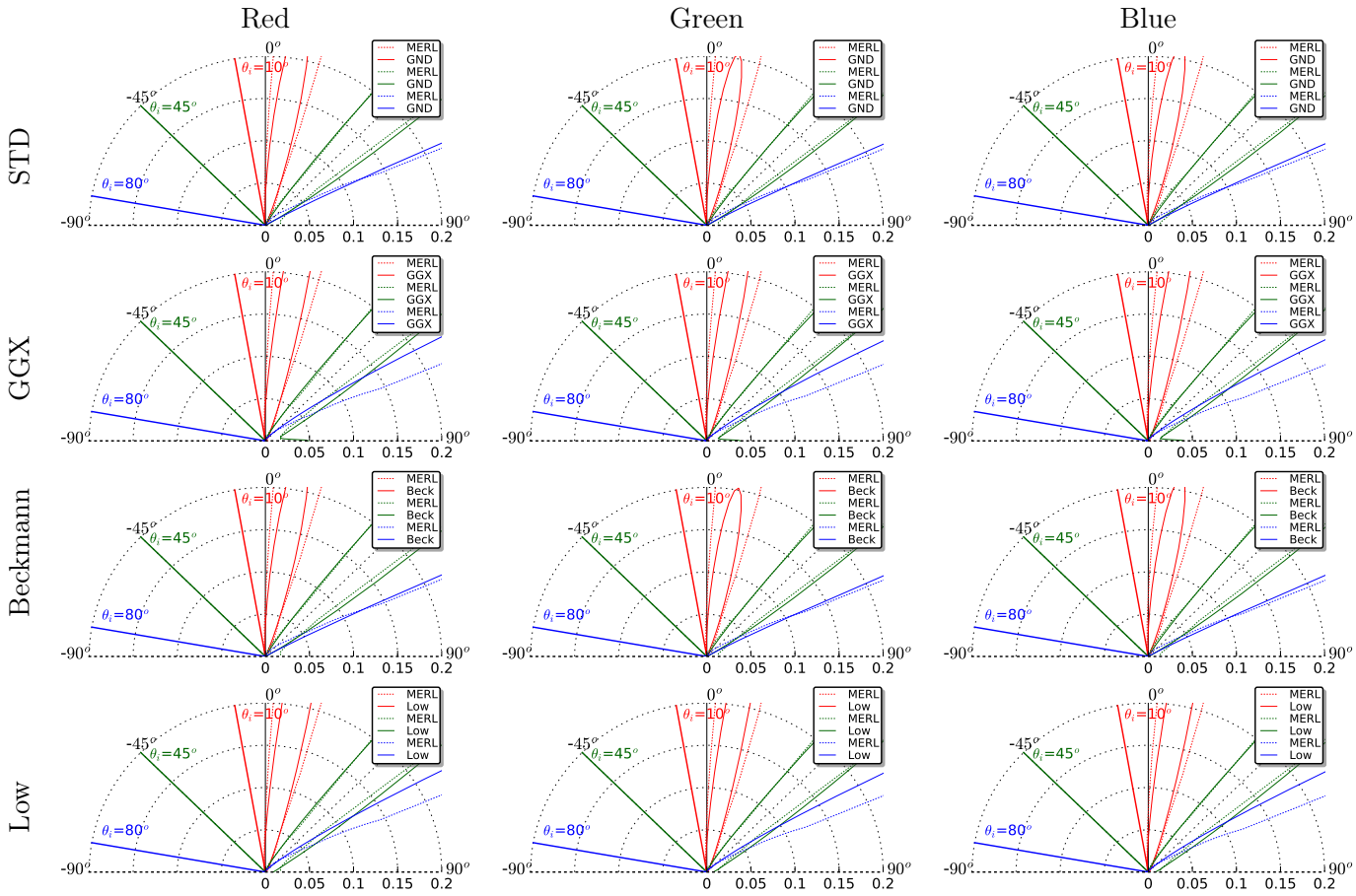
ss440



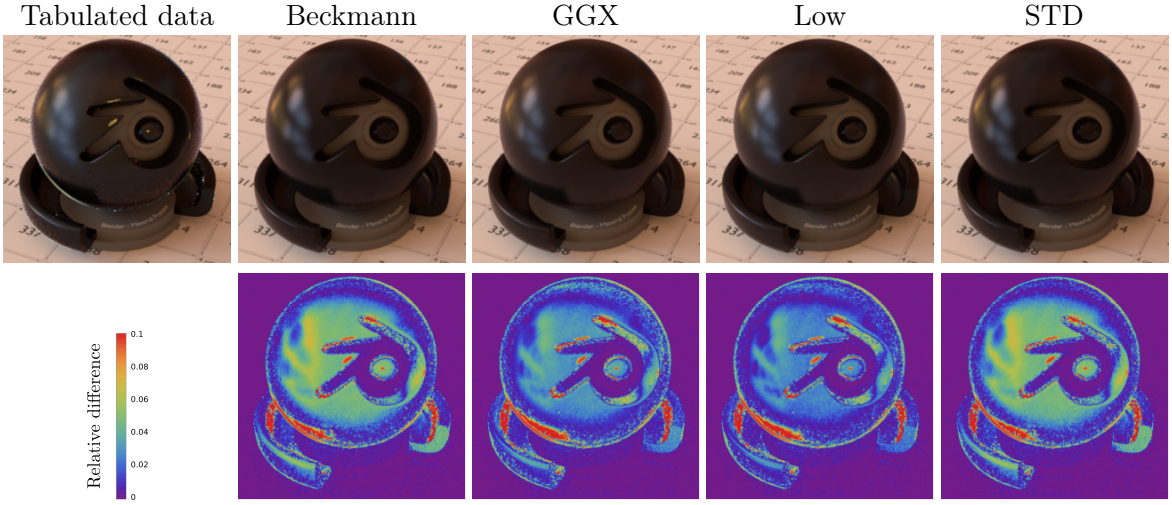
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.004-0.004-0.004	1.0-0.698-0.692	1.3115	0.058	17.486	0.00131
GGX	0.004-0.004-0.004	1.0-0.7-0.727	1.341	0.0534	2.0	0.00159
Beckmann	0.004-0.004-0.004	1.0-0.694-0.693	1.3045	0.0575	$+\infty$	0.00132
	ρ	A		B	C	
Low	0.004-0.004-0.004	85.637-59.89-62.969	1.3638	762.568	1.9759	0.0016



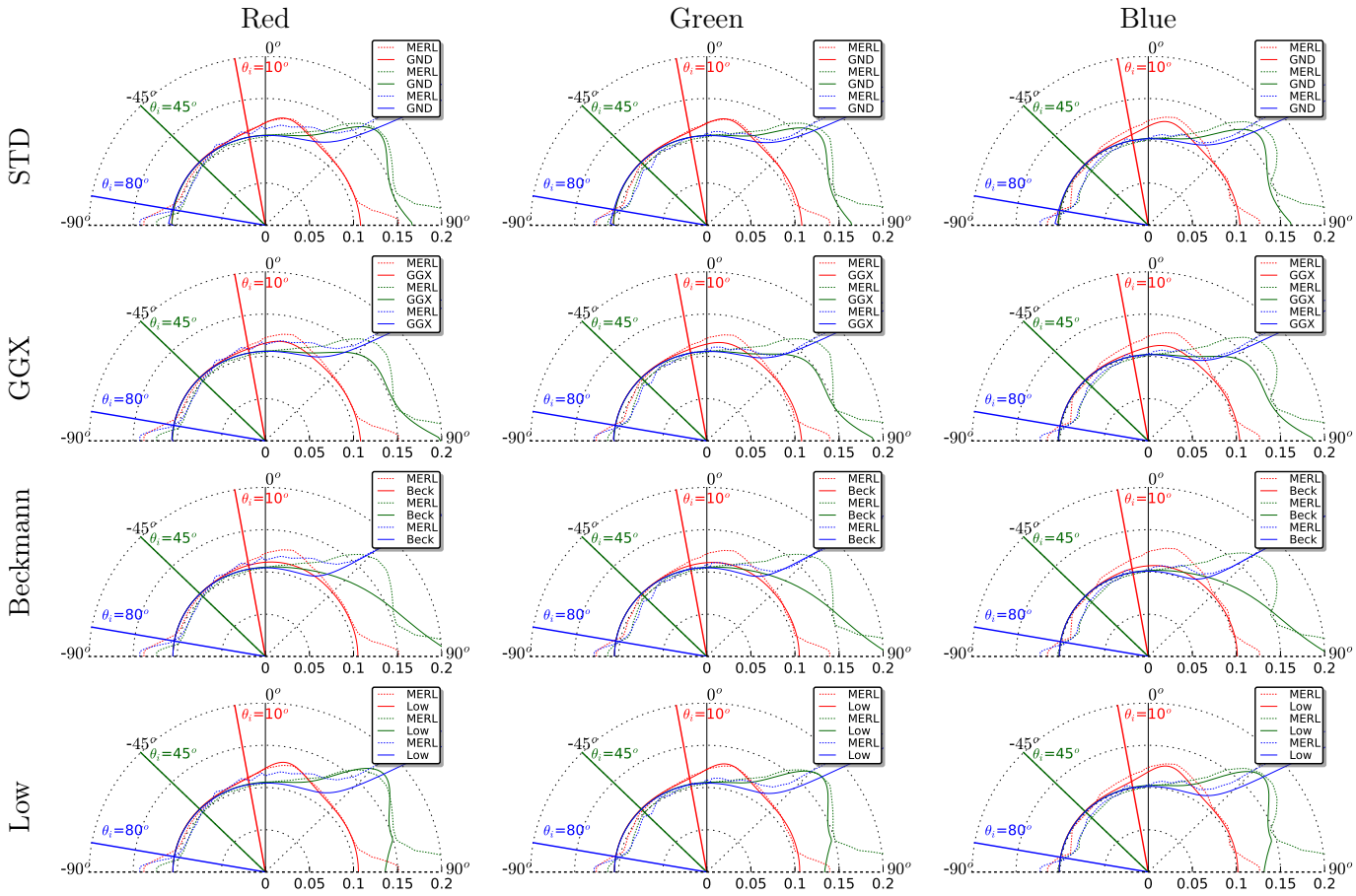
steel



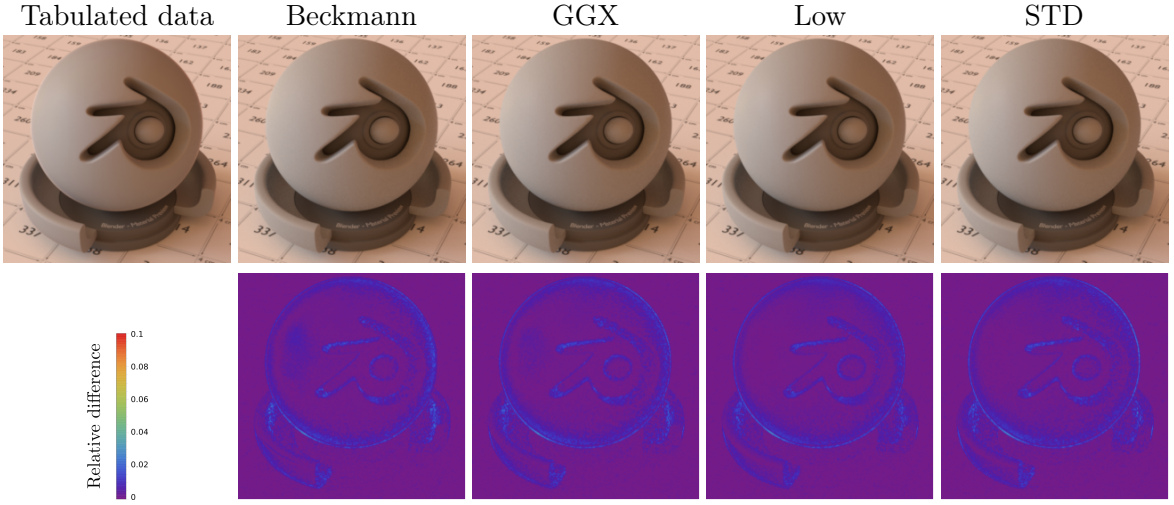
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.005-0.004-0.005	1.0-0.787-0.83	1.2433	0.061	39.9873	0.00159
GGX	0.005-0.004-0.005	1.0-0.774-0.815	1.2984	0.06	2.0	0.00166
Beckmann	0.005-0.004-0.005	1.0-0.786-0.841	1.2435	0.0615	$+\infty$	0.00159
	ρ	A		B	C	
Low	0.005-0.004-0.005	55.195-45.45-49.79	1.3697	623.342	1.9418	0.00161



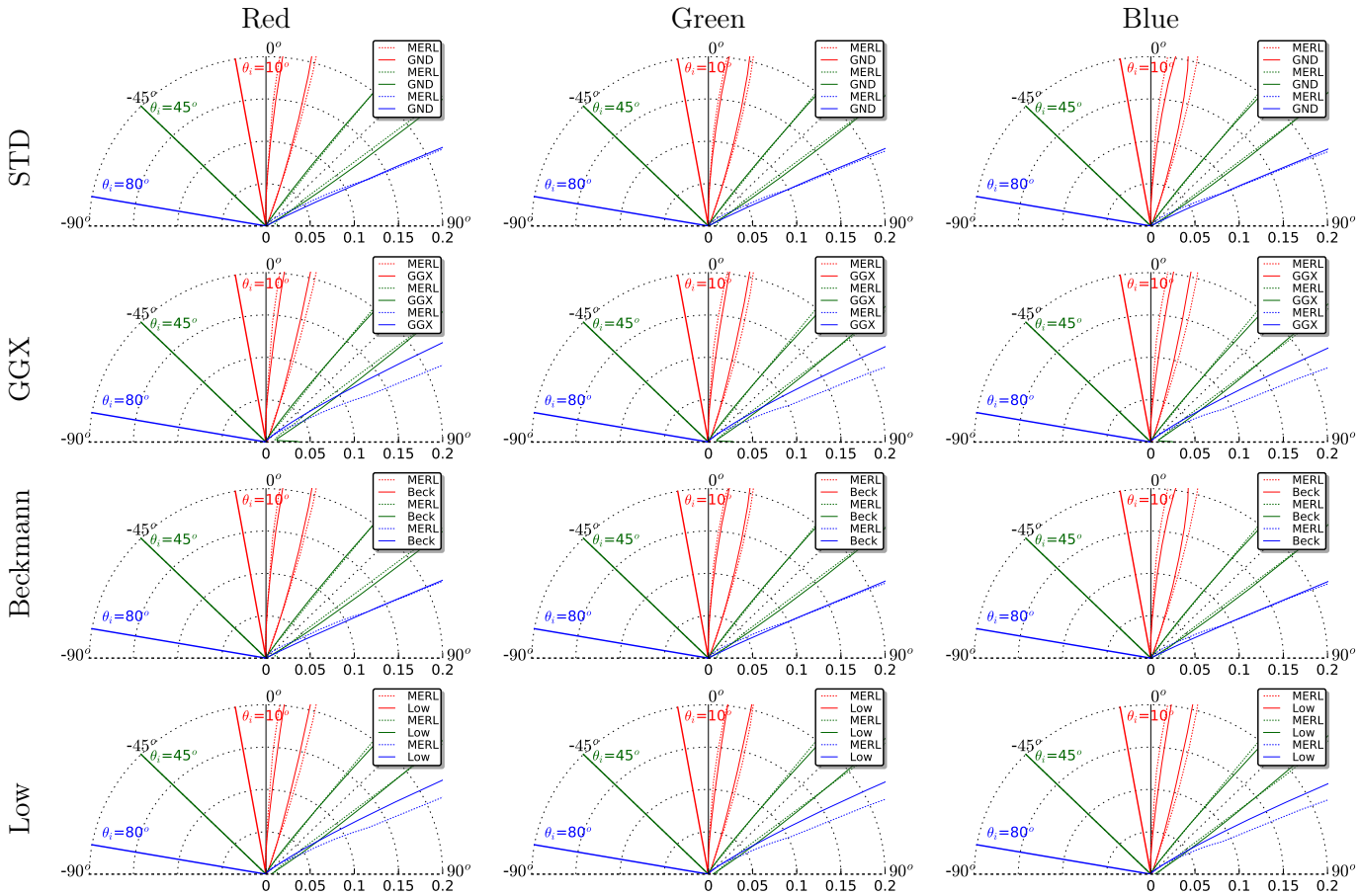
teflon



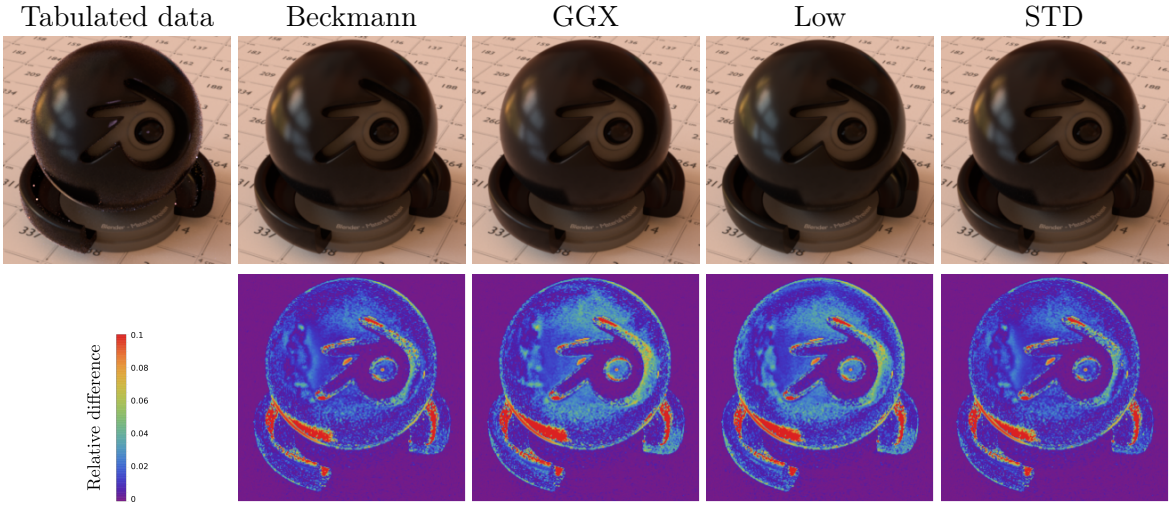
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.33-0.329-0.317	1.0-0.964-0.991	1.2602	0.2126	1.6863	0.00156
GGX	0.33-0.329-0.317	1.0-0.904-0.922	1.2072	0.225	2.0	0.00161
Beckmann	0.33-0.329-0.317	1.0-0.942-0.956	1.1581	0.243	$+\infty$	0.00173
	ρ	A		B	C	
Low	0.33-0.329-0.317	2.8-2.61-2.745	1.4109	59.3102	1.8795	0.00146



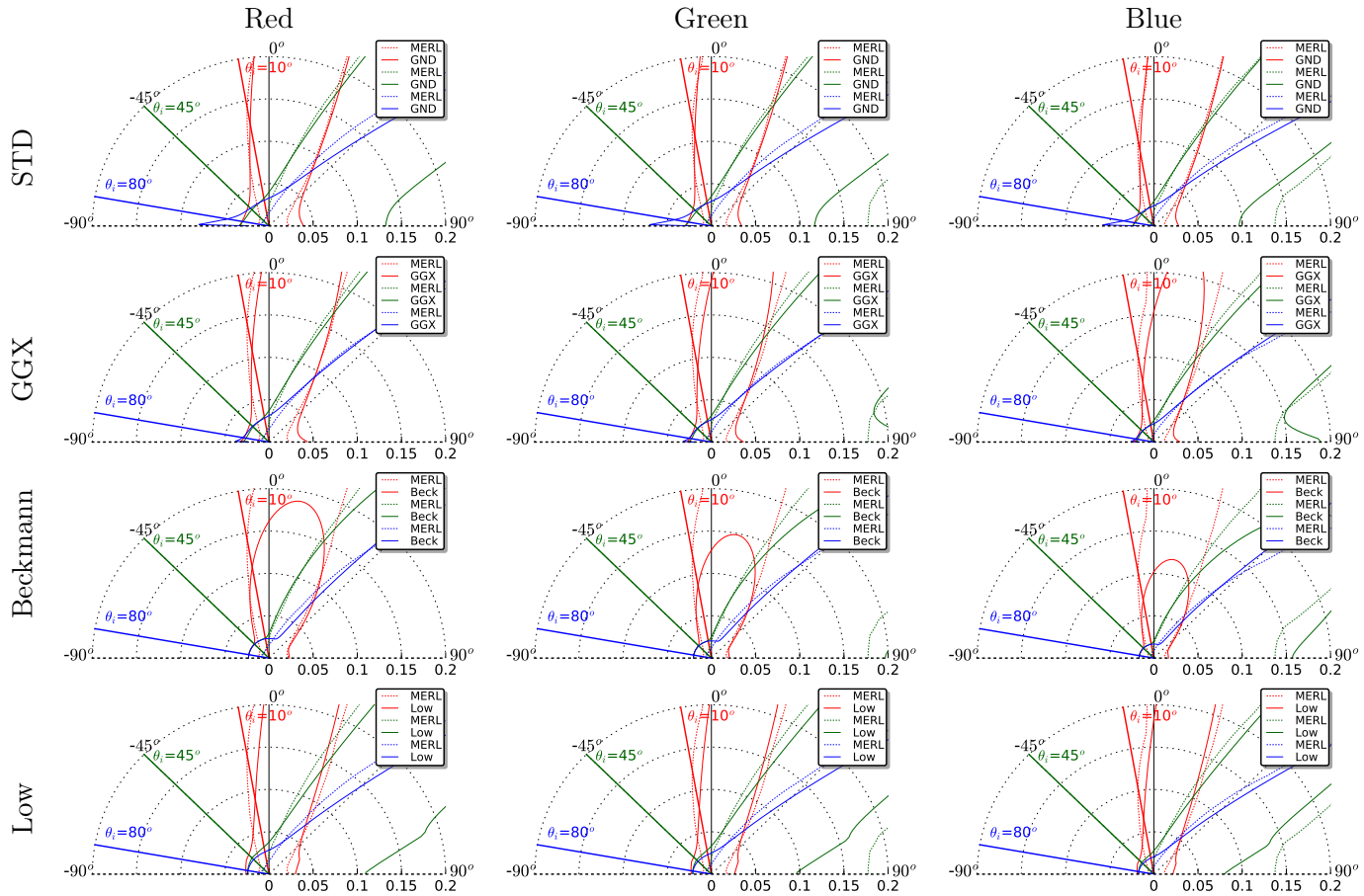
tungsten-carbide



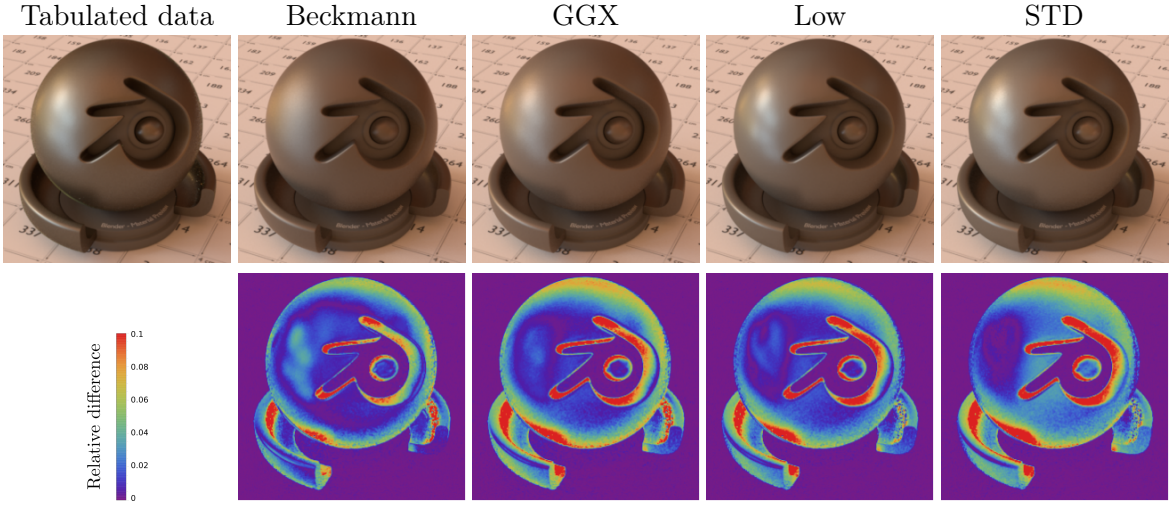
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.004-0.004-0.004	1.0-0.773-0.656	1.255	0.0555	49.9812	0.00116
GGX	0.004-0.004-0.004	1.0-0.754-0.669	1.2743	0.0515	2.0	0.00154
Beckmann	0.004-0.004-0.004	1.0-0.774-0.658	1.2557	0.0557	$+\infty$	0.00116
	ρ	A		B	C	
Low	0.004-0.004-0.004	85.096-74.754-64.665	1.33	1085.64	1.9044	0.00165



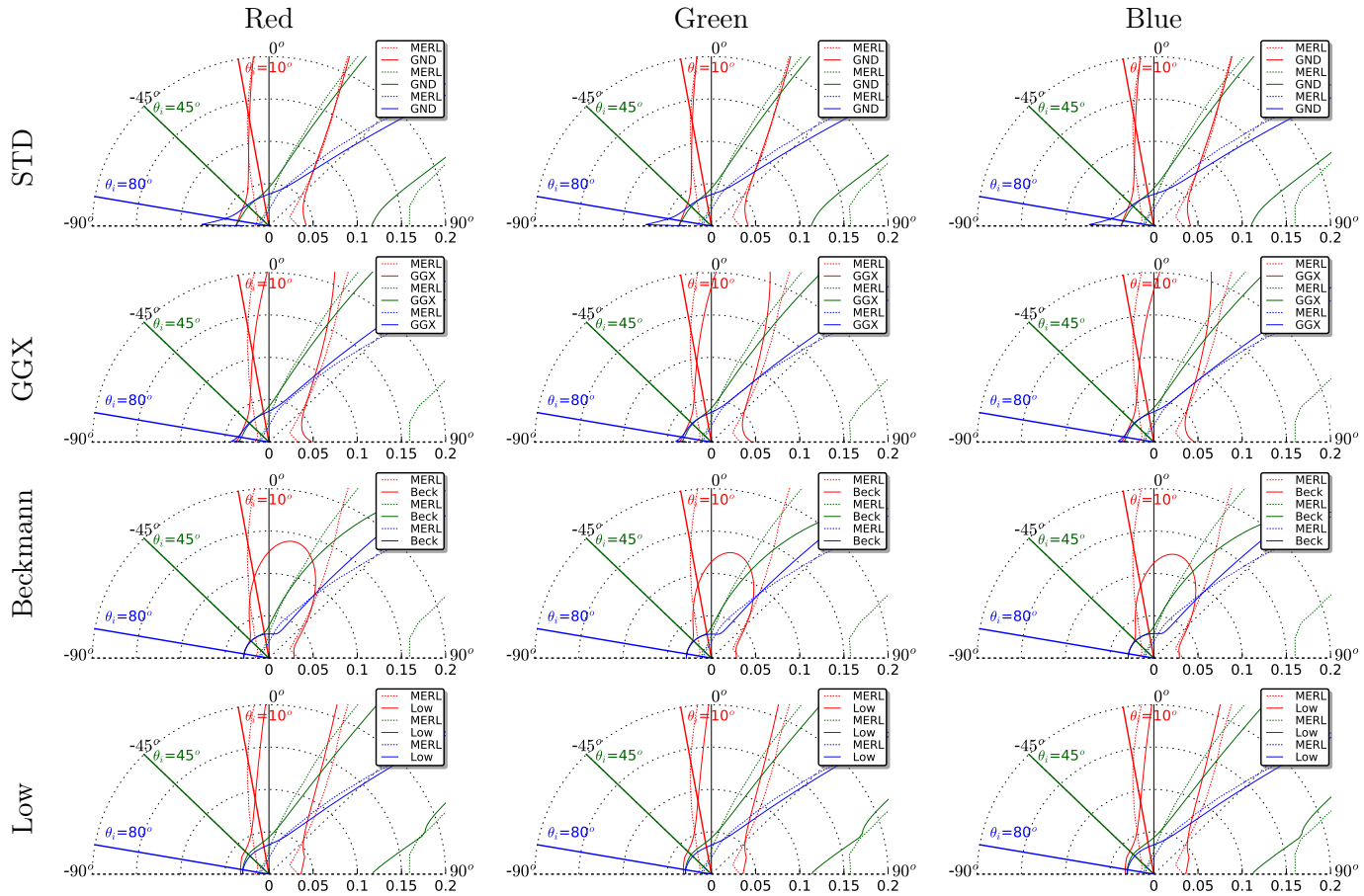
two-layer-gold



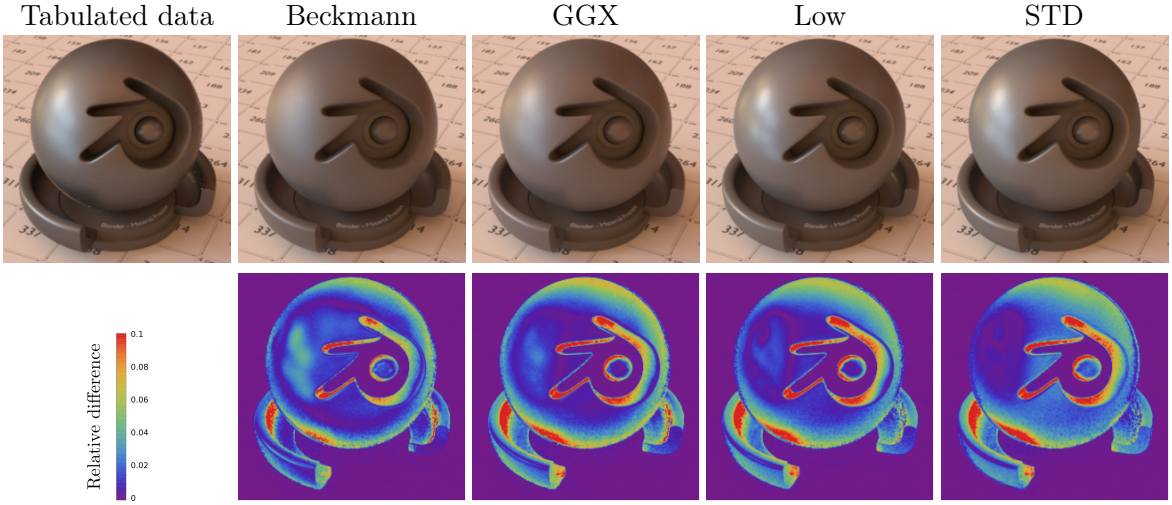
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.073-0.064-0.052	1.0-0.885-0.733	2.4735	0.151	1.595	0.0045
GGX	0.073-0.064-0.052	1.0-0.785-0.629	2.0875	0.1713	2.0	0.00499
Beckmann	0.073-0.064-0.052	1.0-0.774-0.616	1.8411	0.2088	$+\infty$	0.00557
	ρ	A		B	C	
Low	0.073-0.064-0.052	7.43-6.554-5.529	2.9807	310.752	1.2595	0.00485



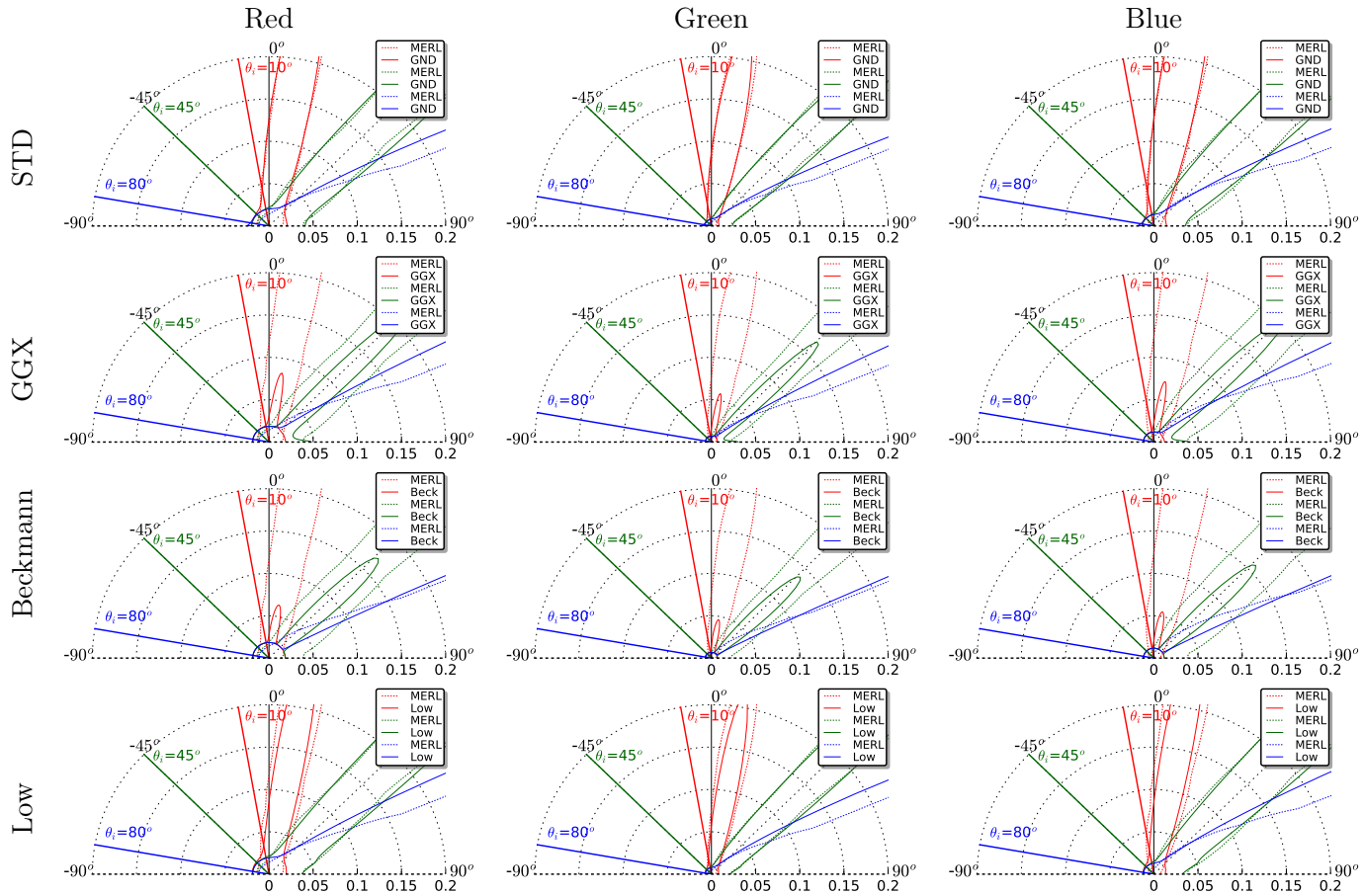
two-layer-silver



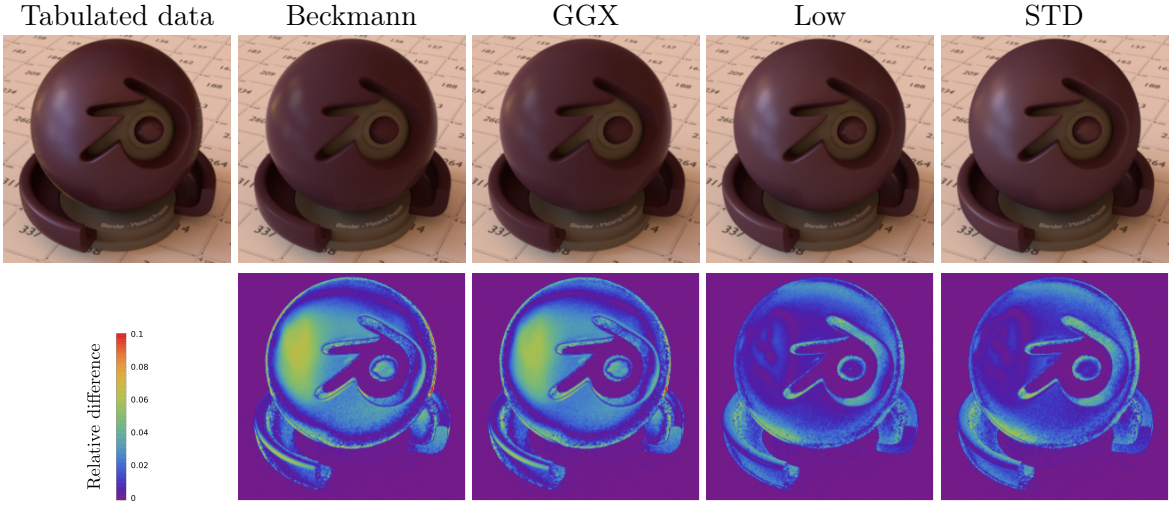
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.09-0.089-0.091	1.0-0.965-0.924	2.5041	0.1522	1.5755	0.00518
GGX	0.09-0.089-0.091	1.0-0.868-0.843	1.993	0.1828	2.0	0.00579
Beckmann	0.09-0.089-0.091	1.0-0.88-0.856	1.7543	0.2349	$+\infty$	0.0064
	ρ	A		B	C	
Low	0.09-0.089-0.091	7.53-7.249-7.044	2.9519	409.265	1.154	0.0058



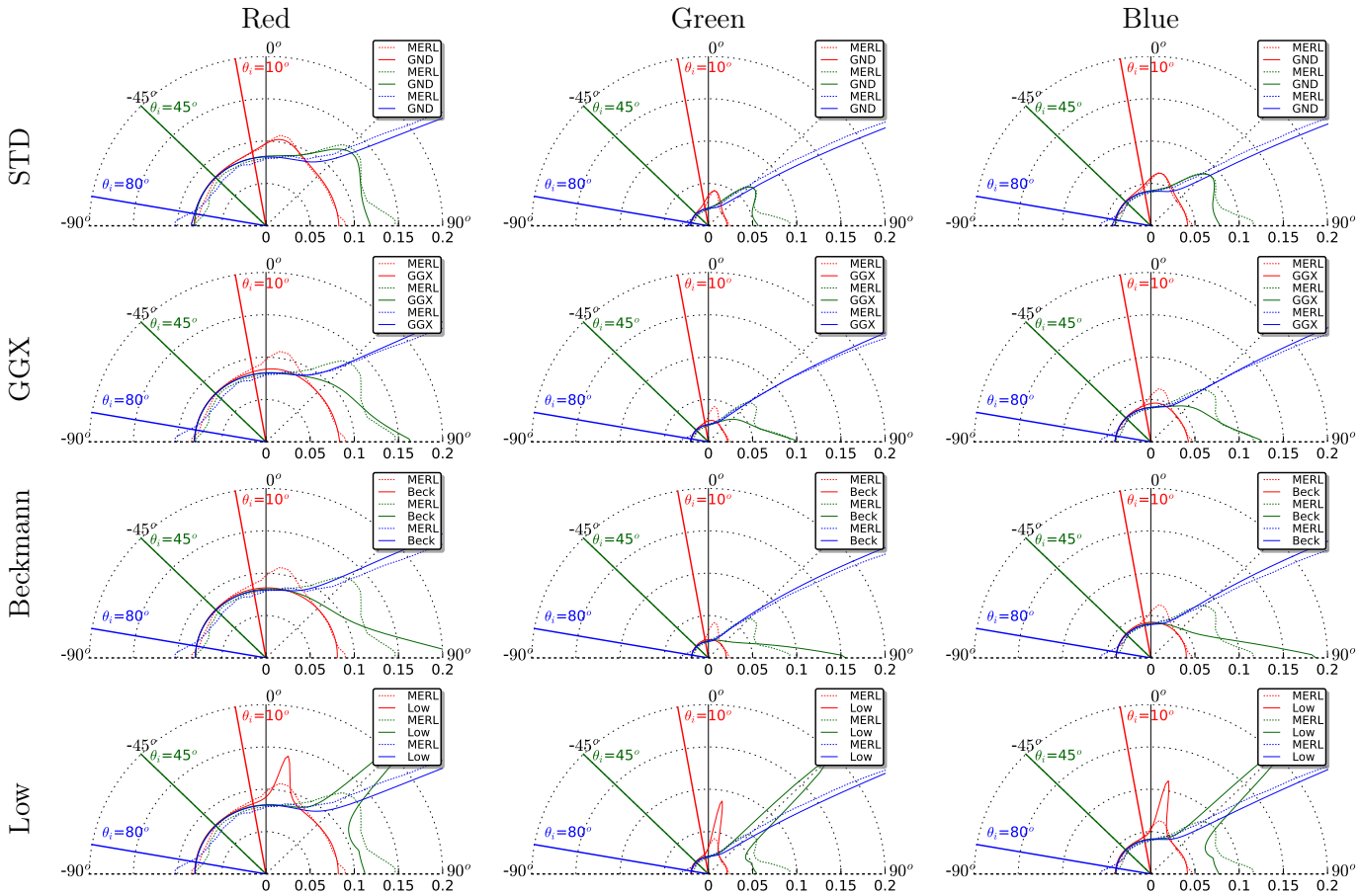
violet-acrylic



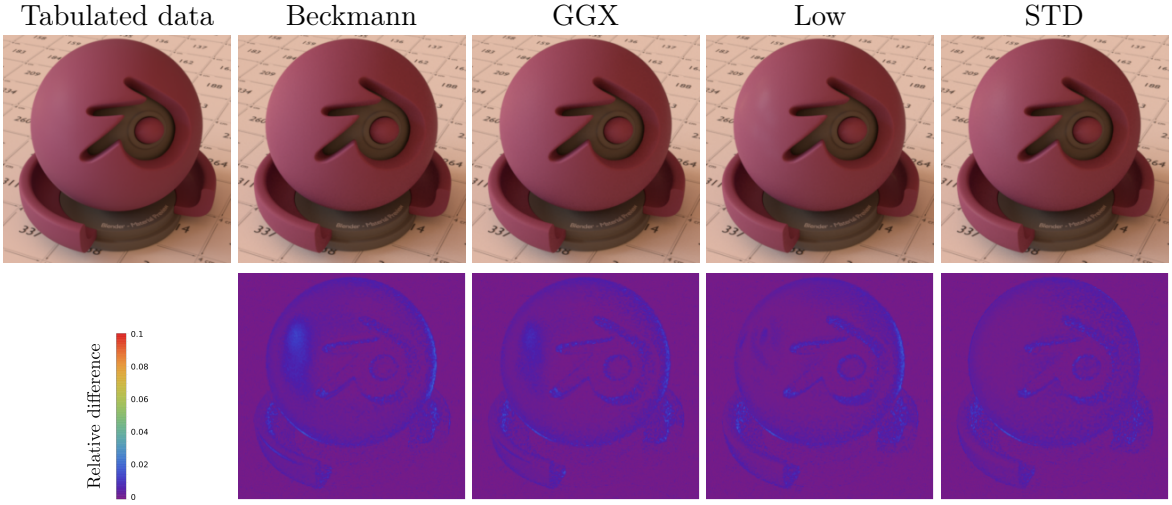
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.058-0.022-0.037	1.0-0.748-1.072	1.6323	0.1182	1.5313	0.00171
GGX	0.058-0.022-0.037	1.0-0.795-0.946	1.1419	0.0748	2.0	0.00238
Beckmann	0.058-0.022-0.037	1.0-0.867-0.967	1.107	0.0684	$+\infty$	0.00251
	ρ	A		B	C	
Low	0.058-0.022-0.037	4.034-3.065-4.406	2.6652	483.978	1.3365	0.00172



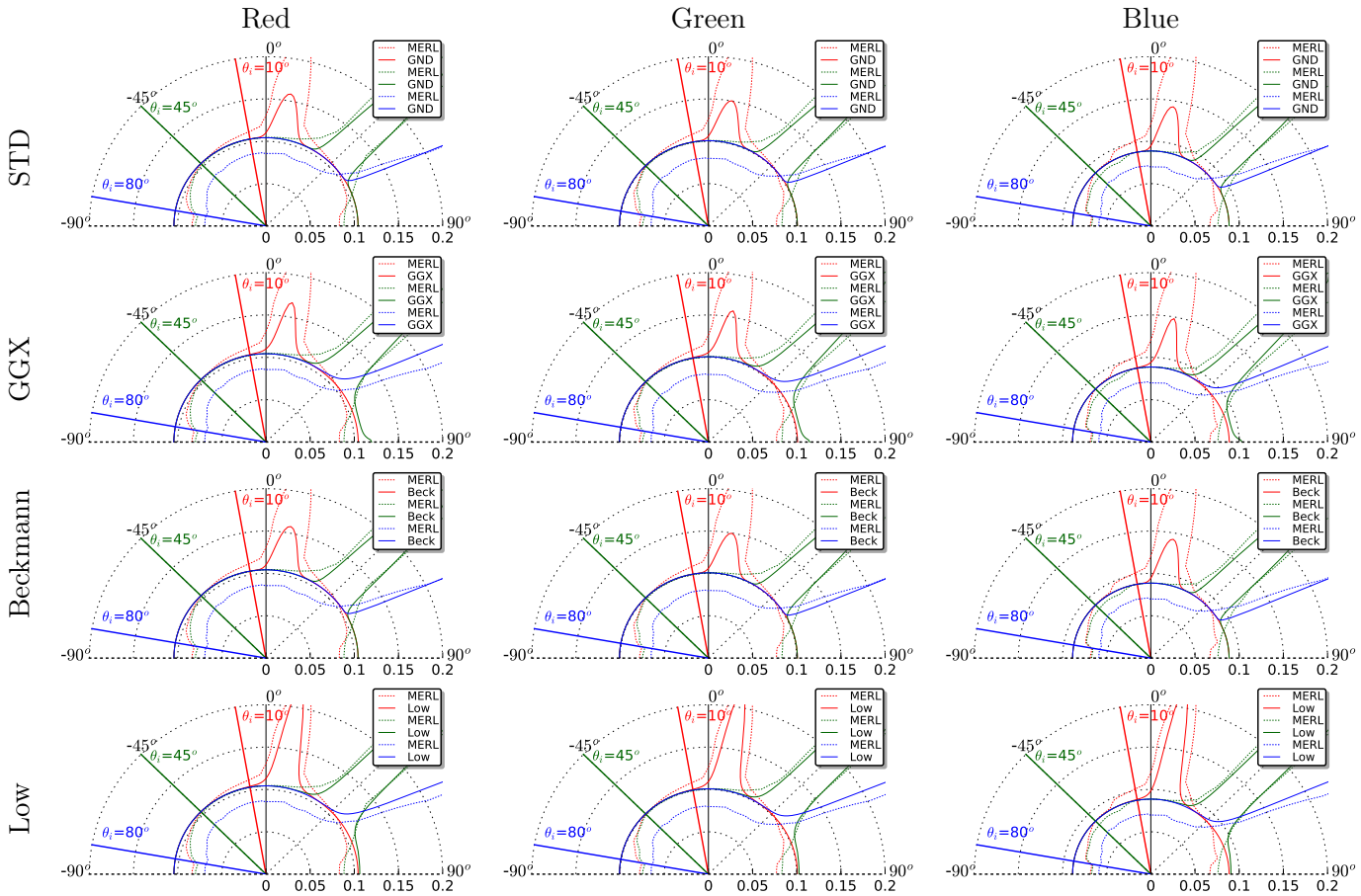
violet-rubber



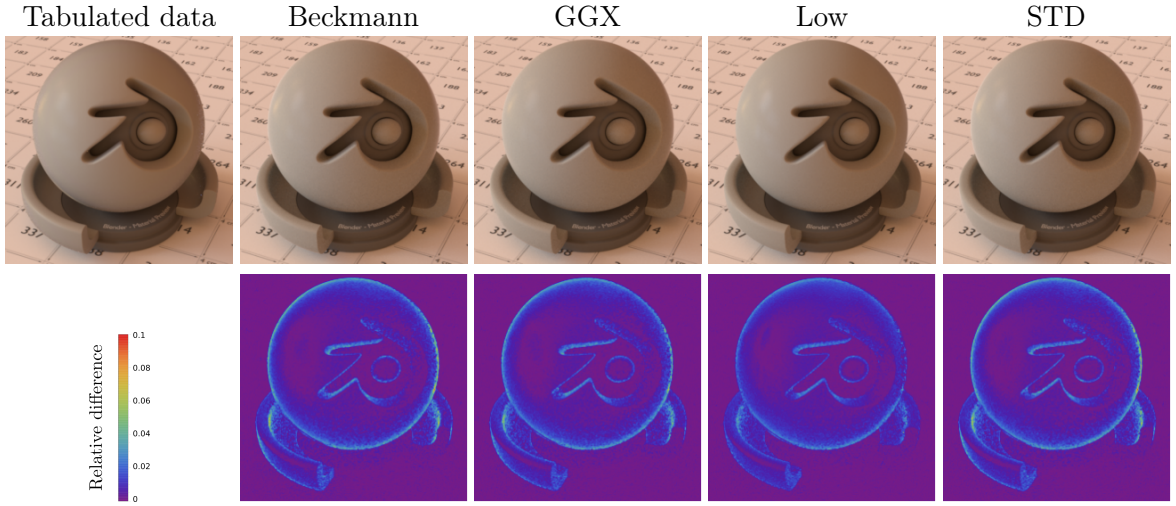
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.251-0.06-0.123	1.0-0.975-1.018	1.2995	0.2389	1.6015	0.00064
GGX	0.251-0.06-0.123	1.0-0.963-1.028	1.195	0.3077	2.0	0.00079
Beckmann	0.251-0.06-0.123	1.0-0.936-1.014	1.1481	0.364	$+\infty$	0.00098
	ρ	A		B	C	
Low	0.251-0.06-0.123	5.262-5.851-6.196	1.4662	2386.72	0.7437	0.00081



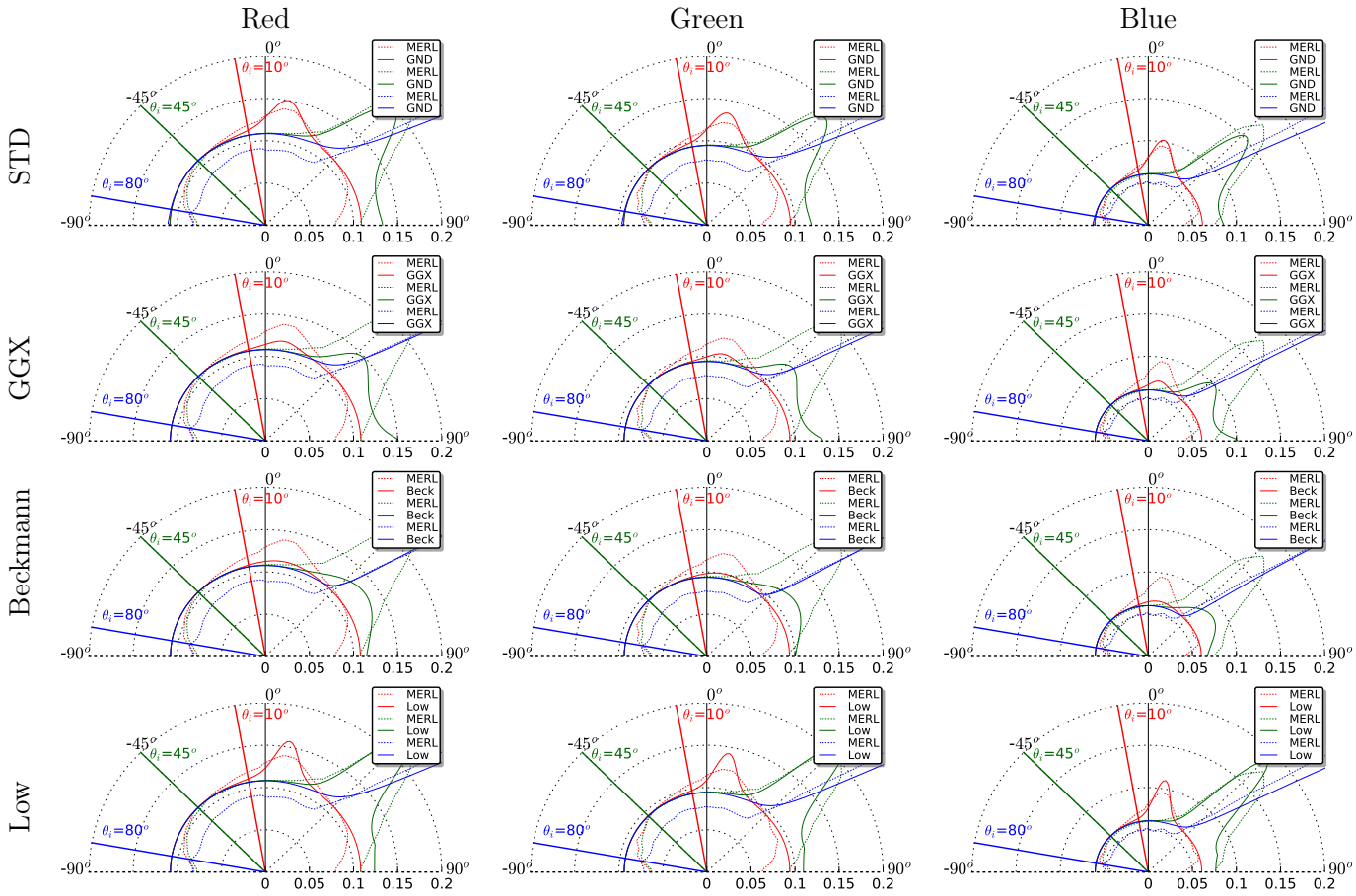
white-acrylic



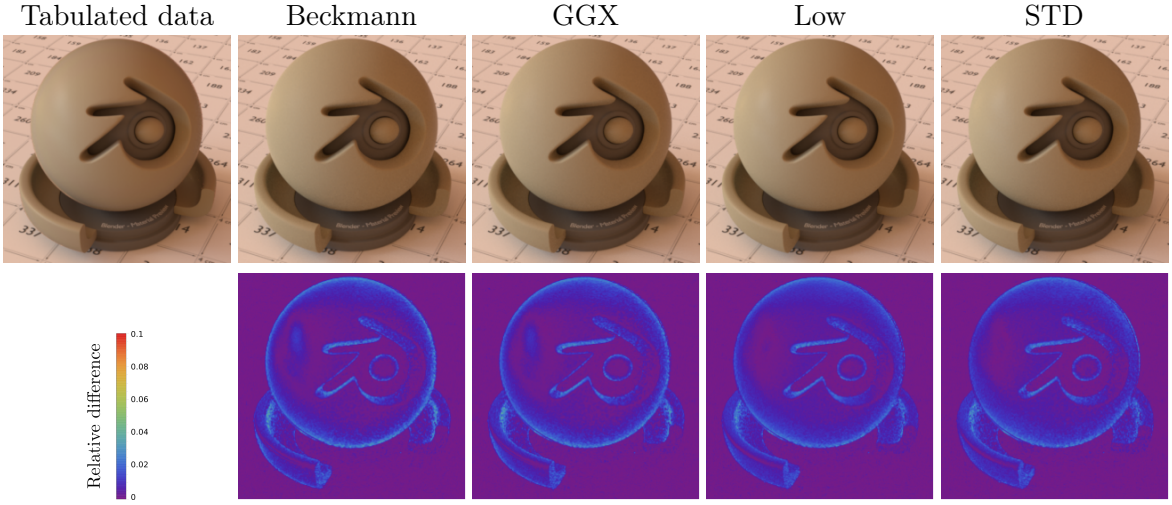
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.327-0.316-0.278	1.0-0.915-1.006	1.1004	0.0589	49.9544	0.00231
GGX	0.327-0.316-0.278	1.0-0.901-0.946	1.1058	0.0574	2.0	0.00247
Beckmann	0.327-0.316-0.278	1.0-0.915-1.007	1.0997	0.0588	$+\infty$	0.00232
	ρ	A		B	C	
Low	0.327-0.316-0.278	27.644-27.347-30.849	1.2613	719.93	1.979	0.00242



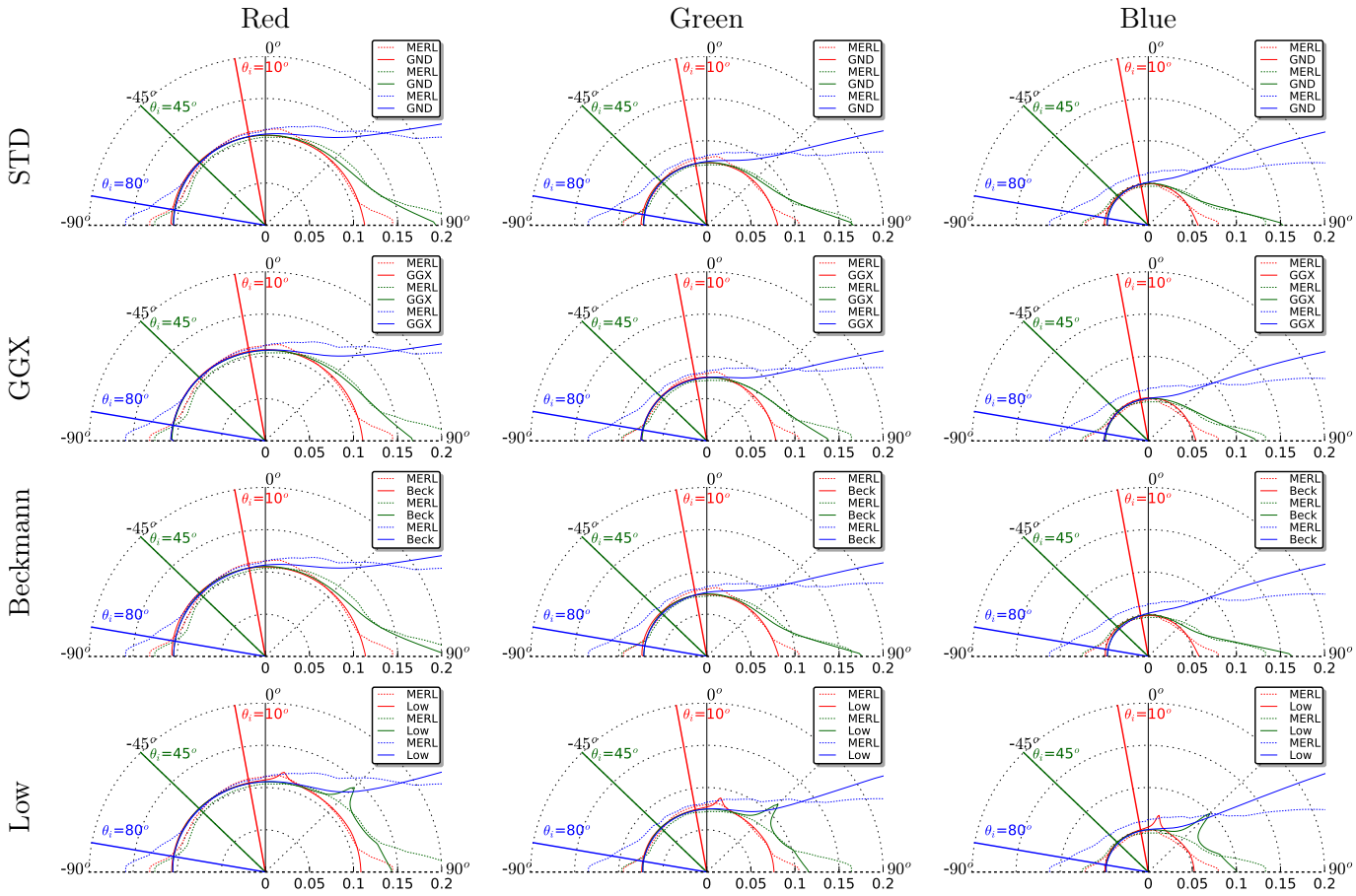
white-diffuse-bball



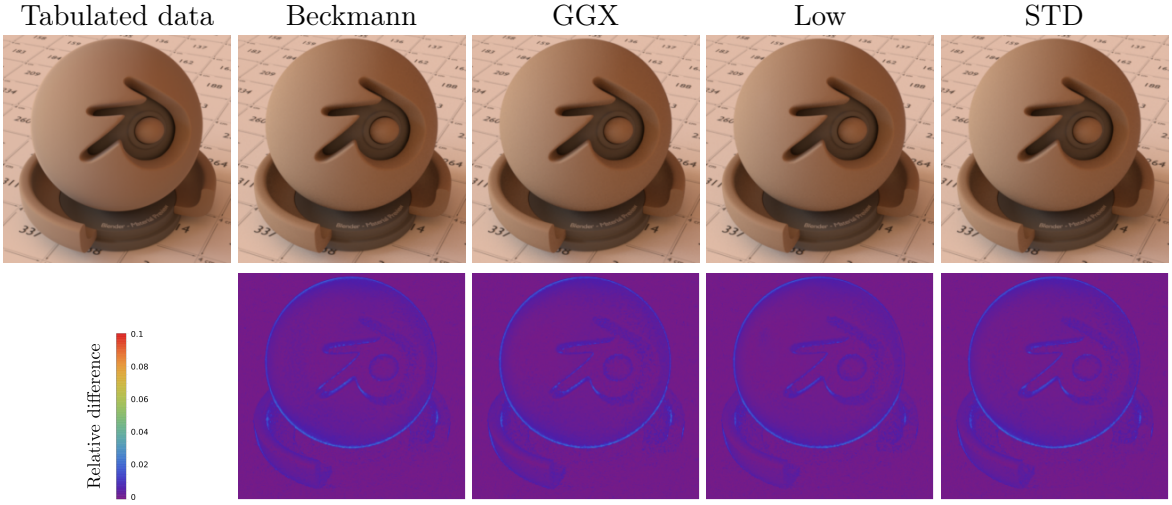
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.338-0.294-0.189	1.0-0.977-0.999	1.2419	0.1468	1.5692	0.00207
GGX	0.338-0.294-0.189	1.0-0.897-0.974	1.1169	0.1452	2.0	0.00213
Beckmann	0.338-0.294-0.189	1.0-0.933-0.958	1.0967	0.1654	$+\infty$	0.00215
	ρ	A		B	C	
Low	0.338-0.294-0.189	4.885-4.83-4.948	1.4246	361.692	1.3225	0.00212



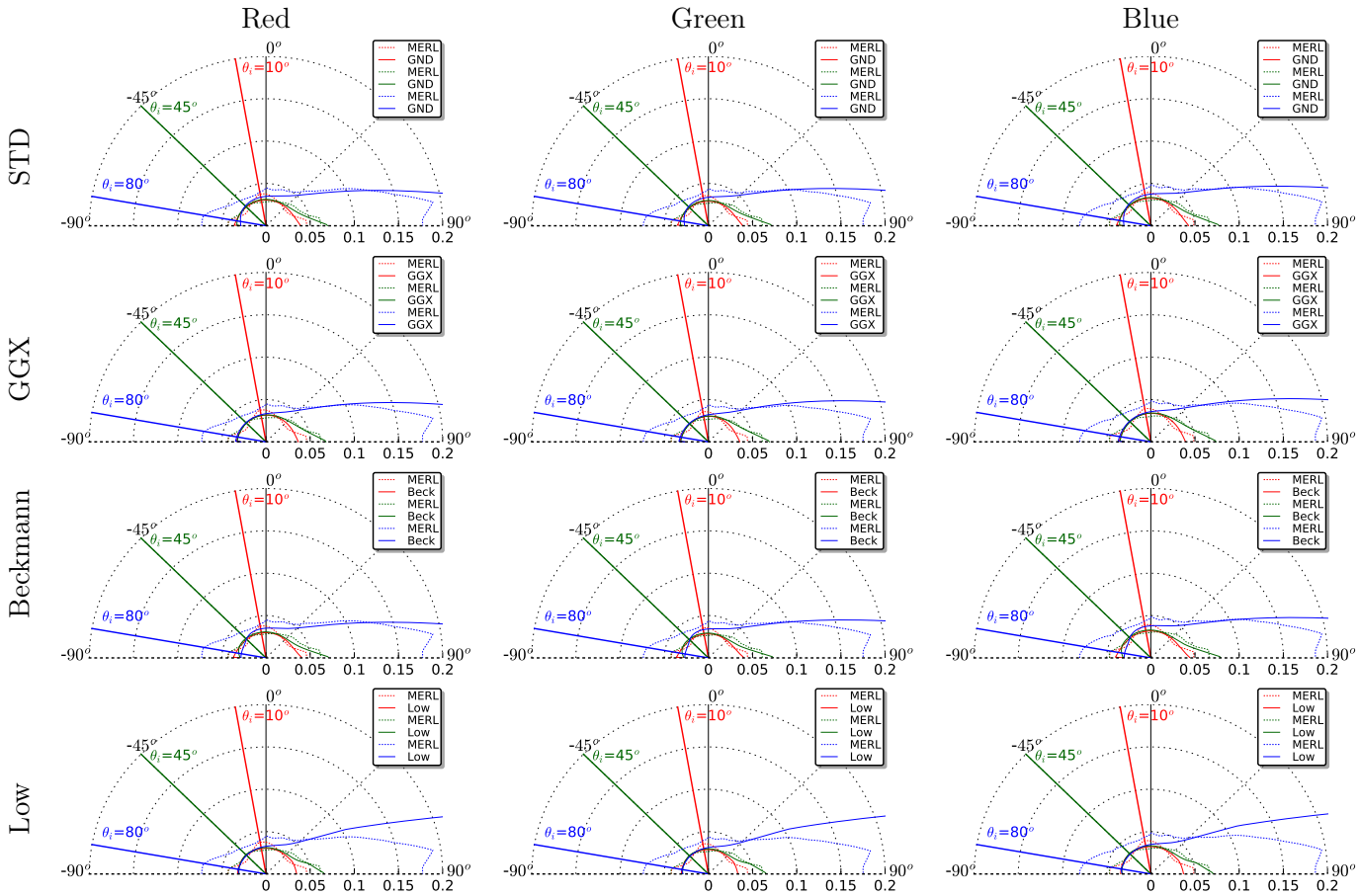
white-fabric



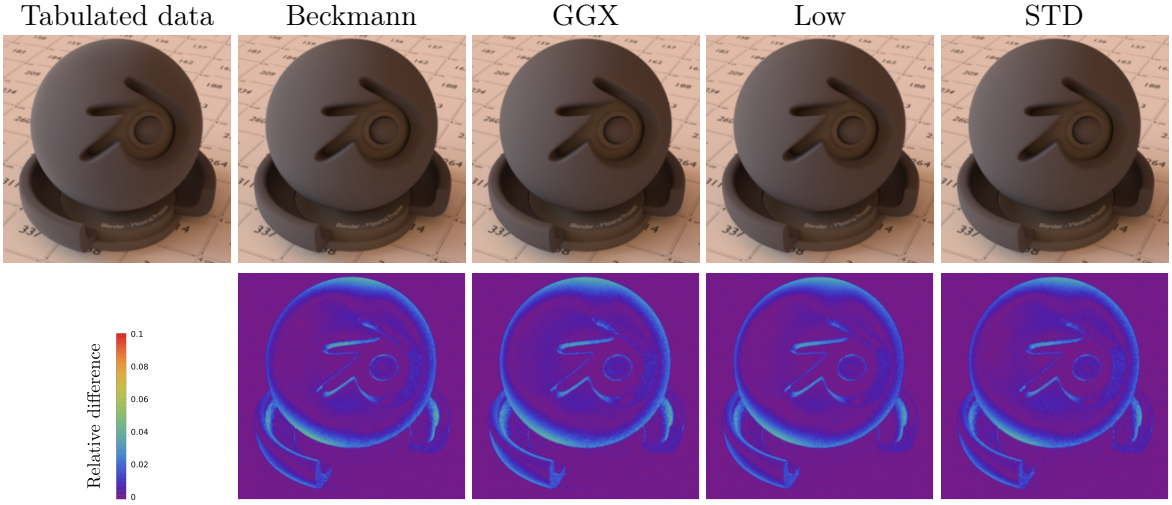
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.327-0.225-0.146	1.0-1.058-1.19	1.2291	0.5919	3.8282	0.00107
GGX	0.327-0.225-0.146	1.0-1.055-1.2	1.273	0.5423	2.0	0.00108
Beckmann	0.327-0.225-0.146	1.0-1.052-1.174	1.2102	0.6157	$+\infty$	0.0011
	ρ	A		B	C	
Low	0.327-0.225-0.146	1.049-1.164-1.441	1.5471	8774.75	0.3291	0.00112



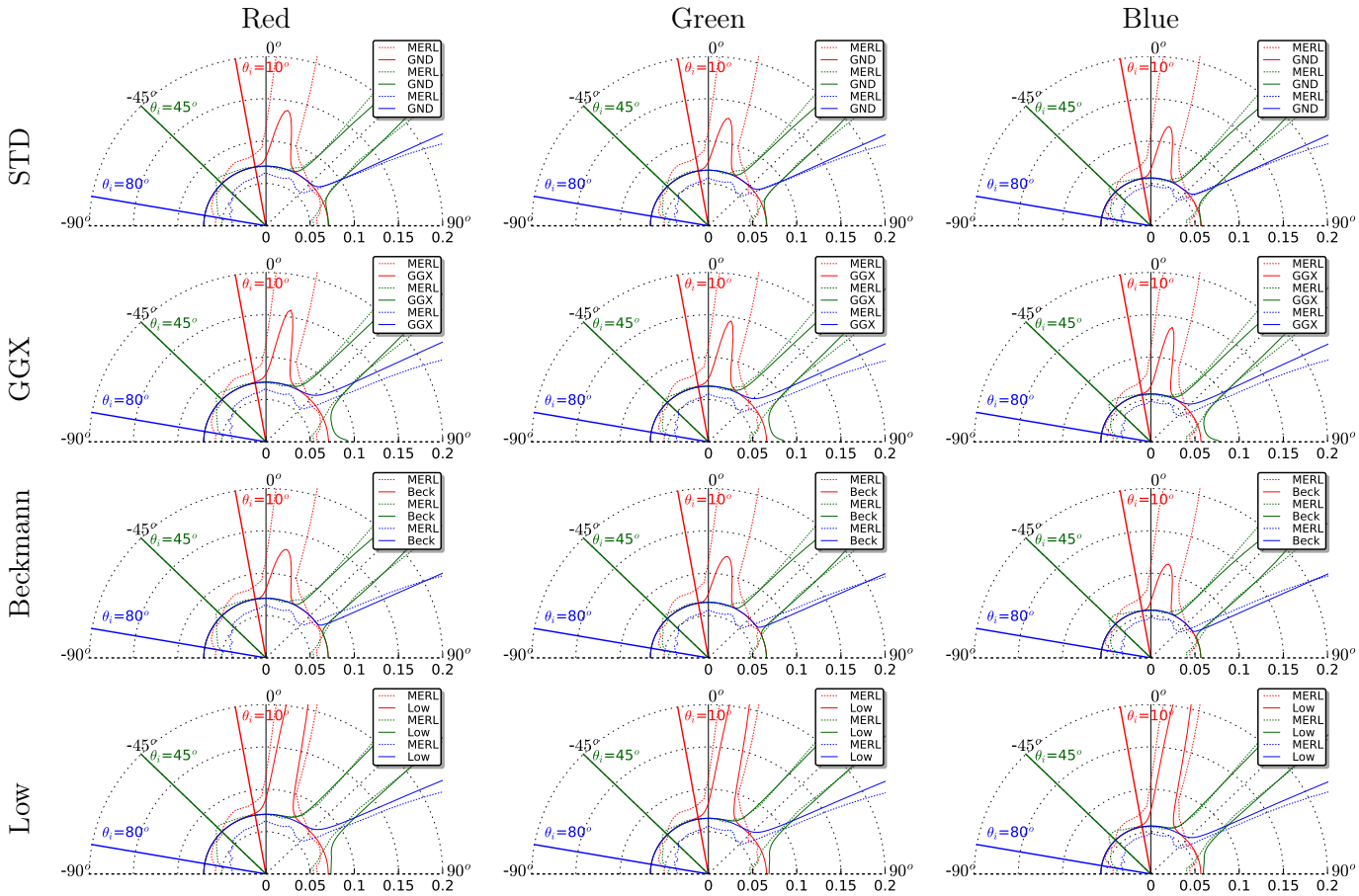
white-fabric2



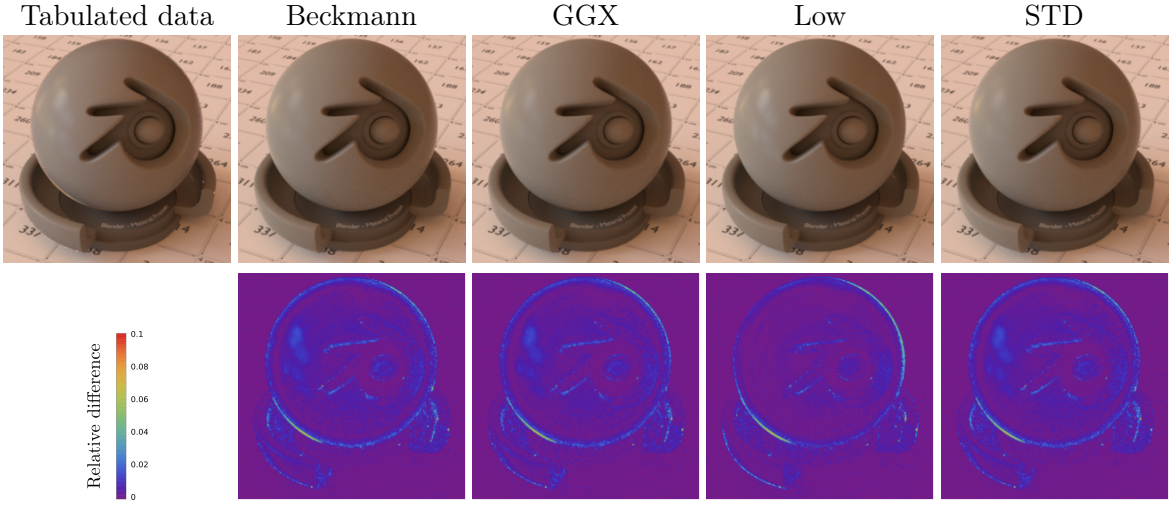
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.089-0.084-0.095	1.0-1.084-1.134	1.3512	0.9462	3.4186	0.00116
GGX	0.089-0.084-0.095	1.0-1.069-1.106	1.3713	0.775	2.0	0.00124
Beckmann	0.089-0.084-0.095	1.0-1.093-1.148	1.3115	1.0	$+\infty$	0.00121
	ρ	A		B	C	
Low	0.089-0.084-0.095	0.113-0.117-0.122	1.6204	82864.7	0.0032	0.0012



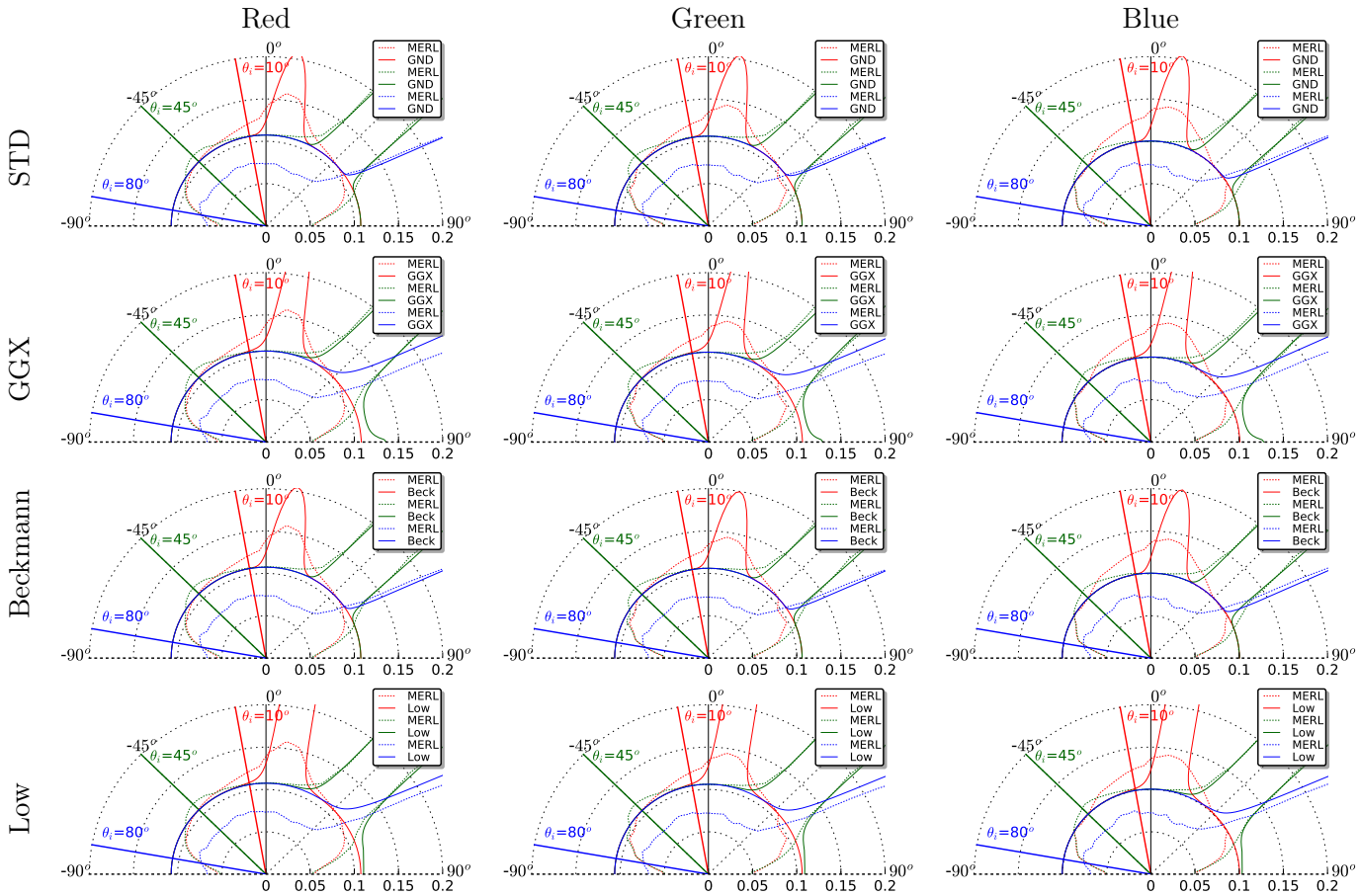
white-marble



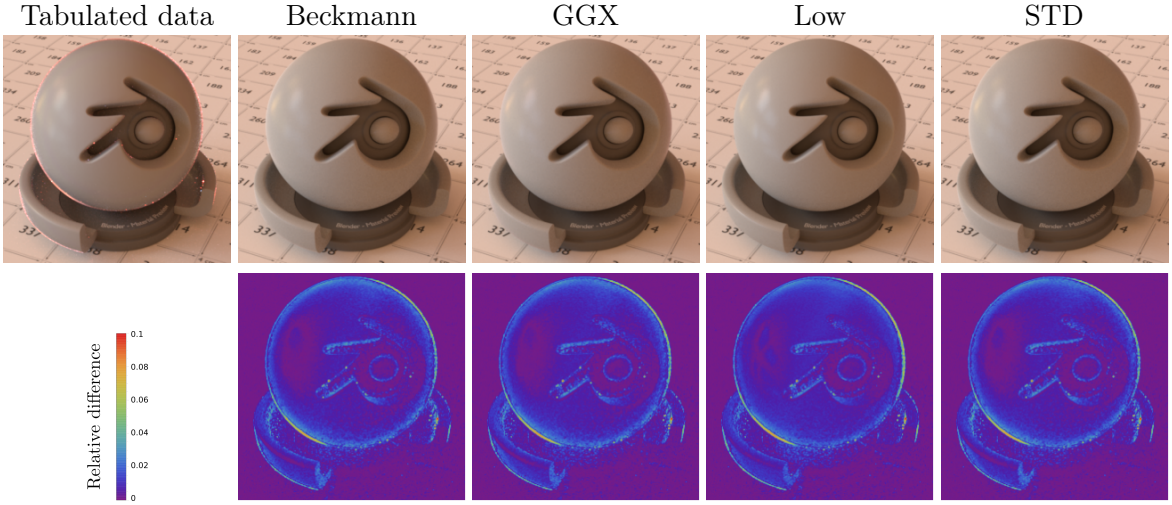
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.221-0.206-0.178	1.0-0.933-0.92	1.1275	0.0658	4.5248	0.00166
GGX	0.221-0.206-0.178	1.0-0.905-0.921	1.1366	0.0618	2.0	0.00172
Beckmann	0.221-0.206-0.178	1.0-0.939-0.936	1.1219	0.0674	$+\infty$	0.00169
	ρ	A		B	C	
Low	0.221-0.206-0.178	22.05-21.082-21.238	1.4224	658.607	1.9367	0.00155



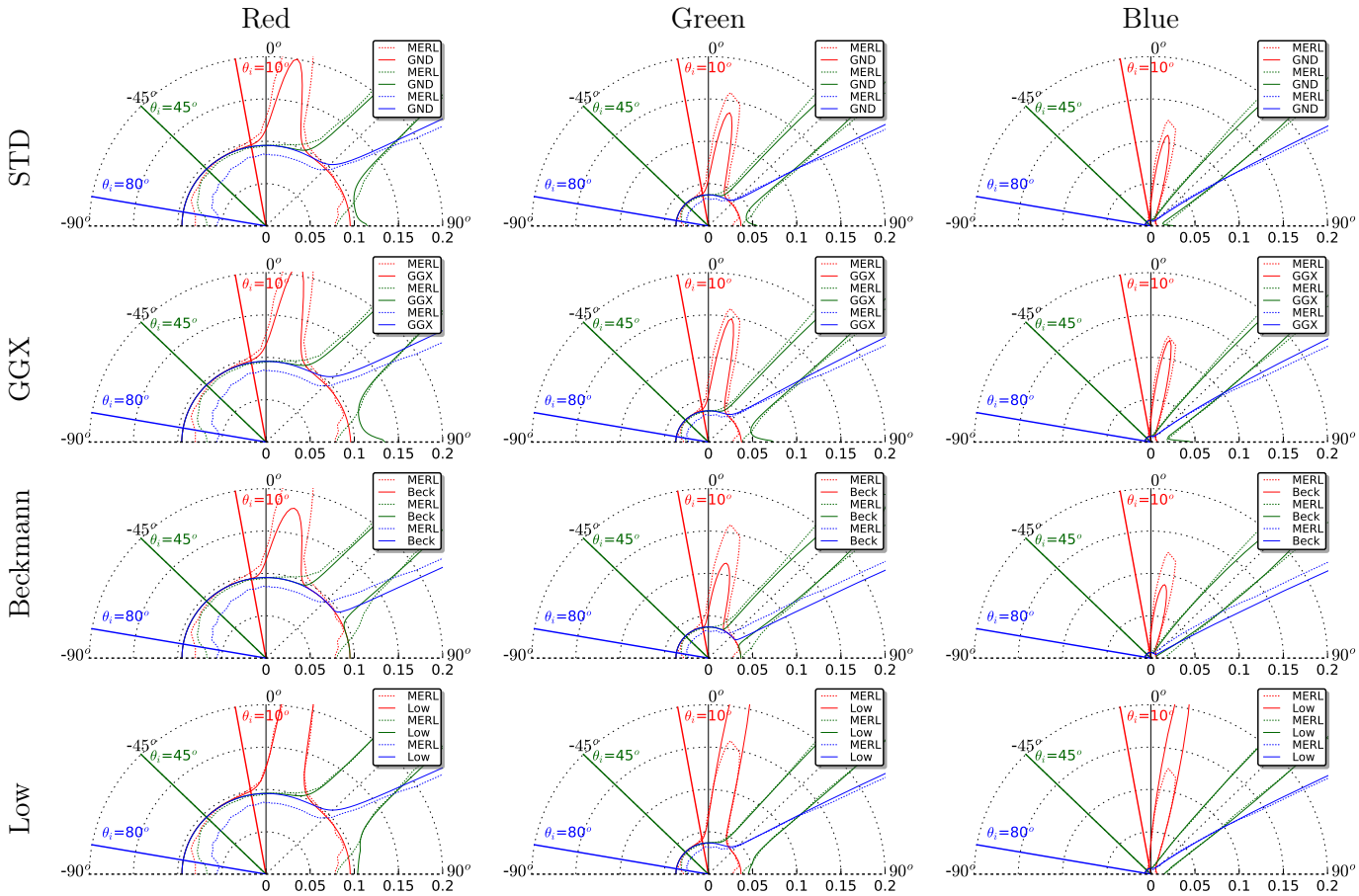
white-paint



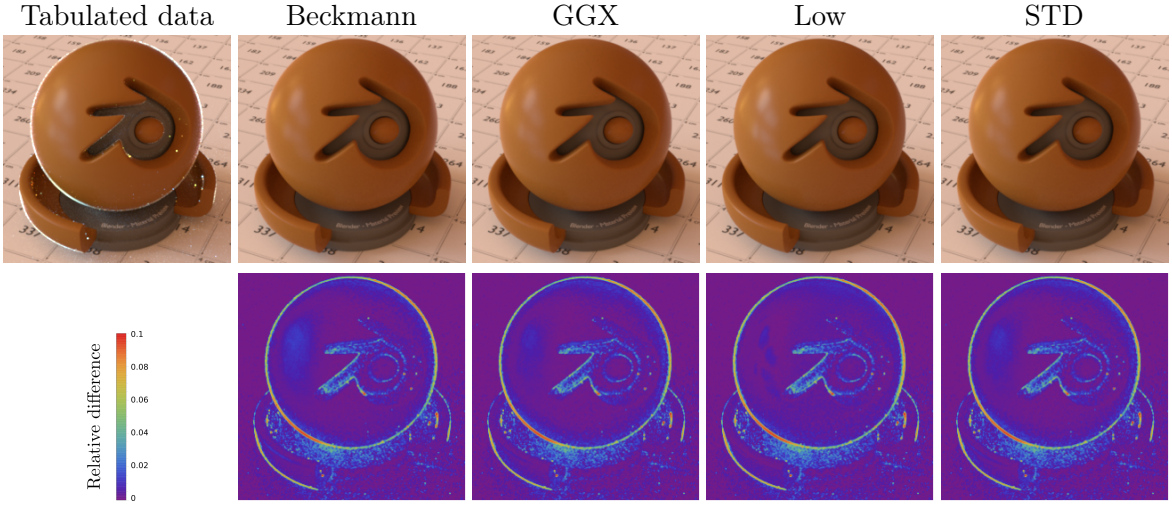
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.337-0.333-0.315	1.0-0.98-1.034	1.1576	0.0661	23.402	0.00312
GGX	0.337-0.333-0.315	1.0-0.816-0.965	1.1808	0.0581	2.0	0.00334
Beckmann	0.337-0.333-0.315	1.0-0.961-1.043	1.1577	0.0671	$+\infty$	0.00313
	ρ	A		B	C	
Low	0.337-0.333-0.315	33.971-31.534-32.715	1.424	744.596	1.9837	0.00331



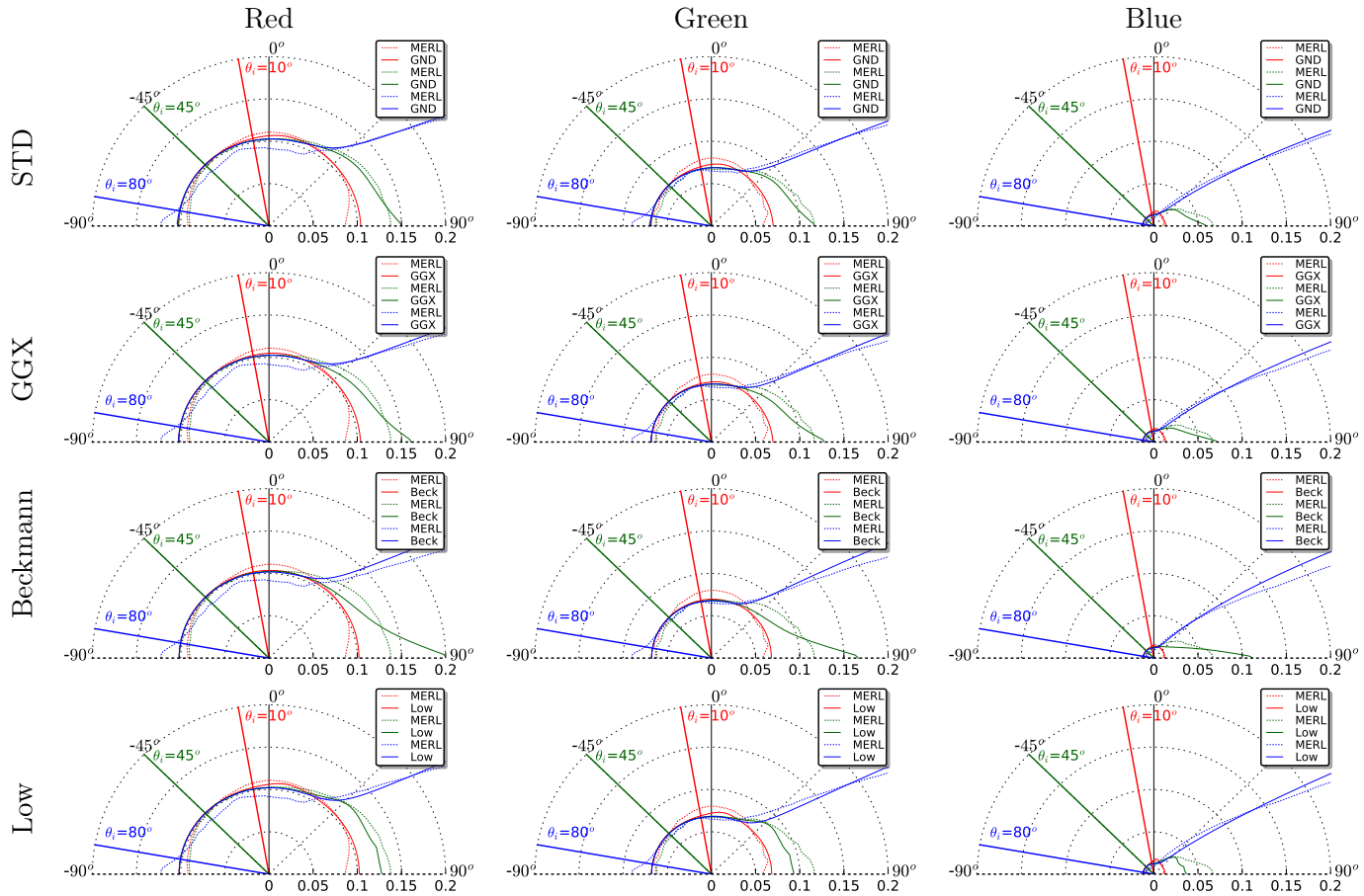
yellow-matte-plastic



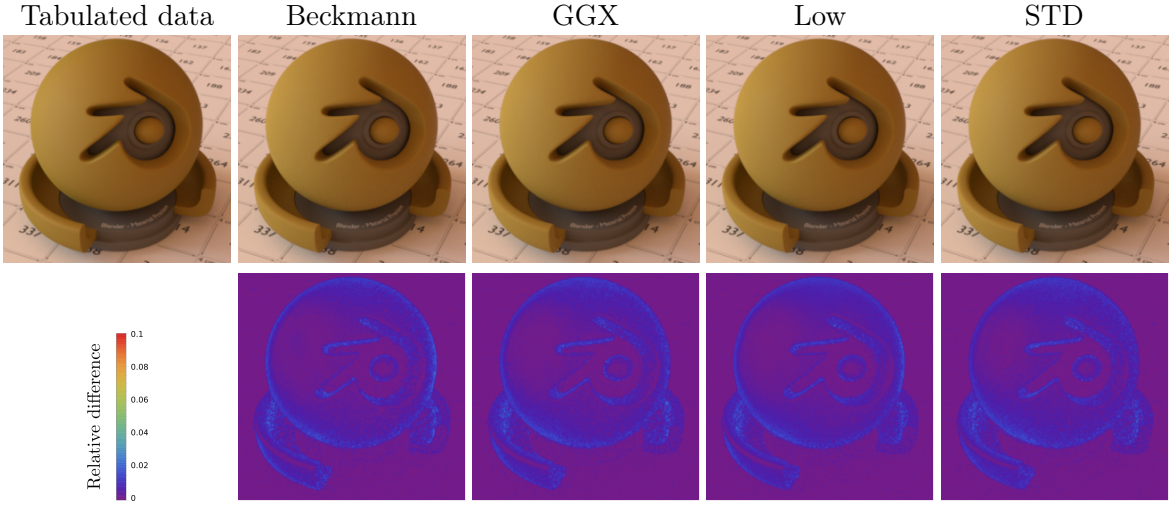
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.299-0.116-0.021	1.0-0.943-0.973	1.1785	0.0722	2.543	0.00127
GGX	0.299-0.116-0.021	1.0-0.937-0.971	1.1917	0.0727	2.0	0.00124
Beckmann	0.299-0.116-0.021	1.0-0.911-0.962	1.1608	0.0733	$+\infty$	0.00144
	ρ	A		B	C	
Low	0.299-0.116-0.021	21.241-21.115-21.061	1.4593	629.745	1.6941	0.00119



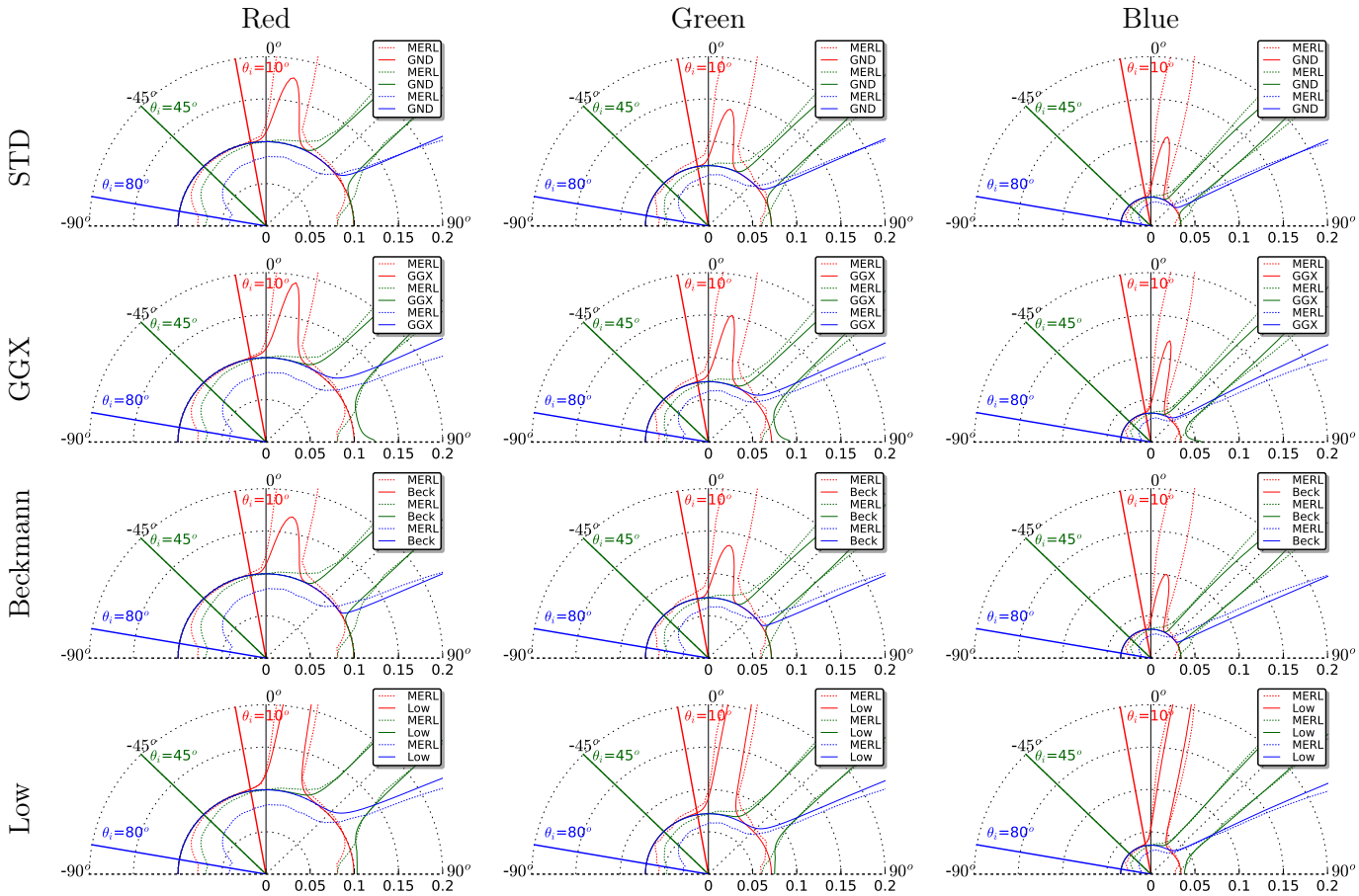
yellow-paint



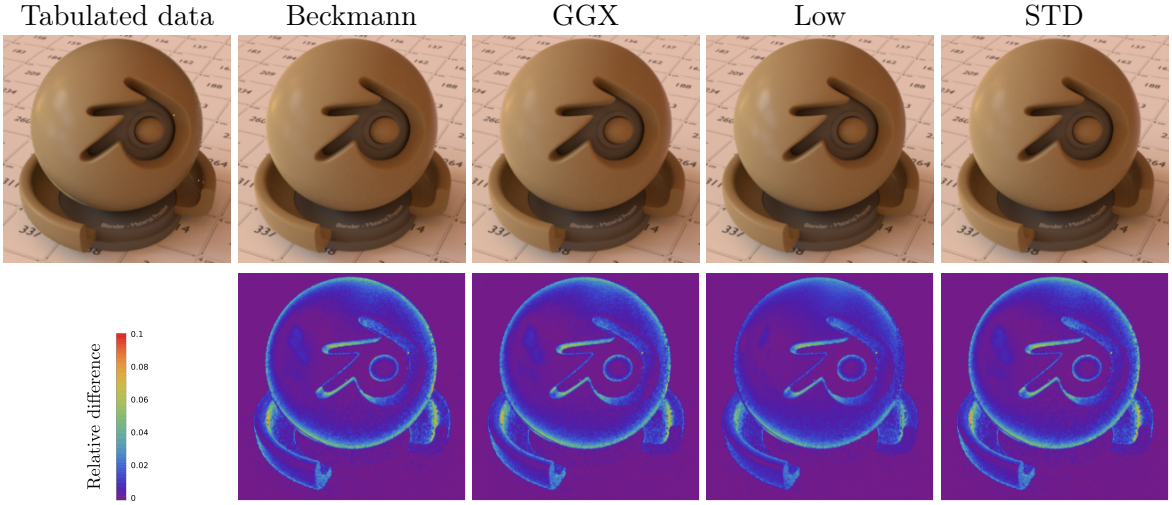
	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.319-0.213-0.038	1.0-1.022-0.979	1.1782	0.3033	1.7522	0.00117
GGX	0.319-0.213-0.038	1.0-1.018-1.01	1.1394	0.3051	2.0	0.00118
Beckmann	0.319-0.213-0.038	1.0-0.988-0.999	1.1063	0.3192	$+\infty$	0.00119
	ρ	A		B	C	
Low	0.319-0.213-0.038	1.954-1.941-1.882	1.2177	71.8757	1.3365	0.00124



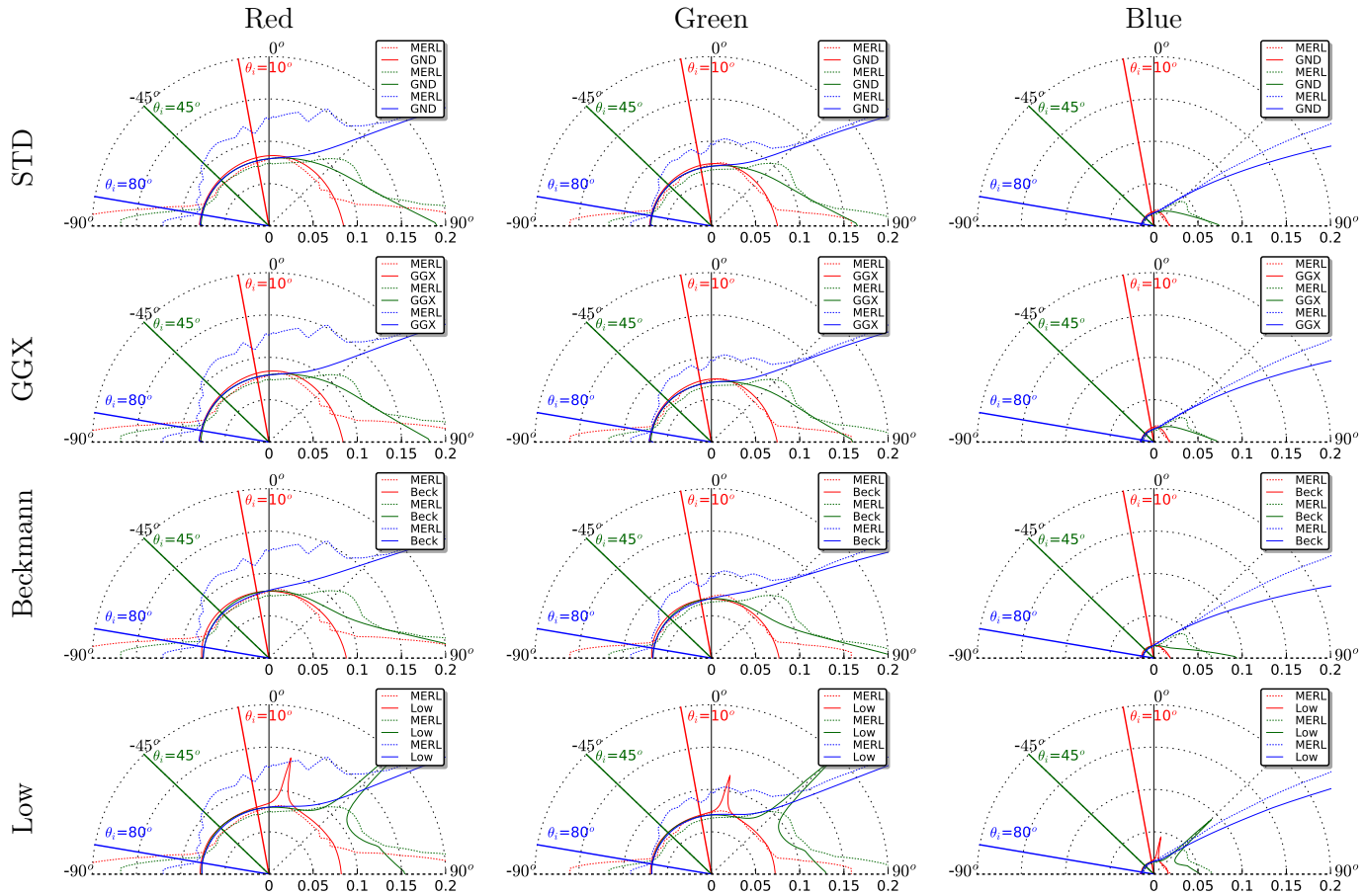
yellow-phenolic



	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.313-0.224-0.107	1.0-0.88-0.929	1.1311	0.063	6.4357	0.00239
GGX	0.313-0.224-0.107	1.0-0.882-0.954	1.1423	0.0628	2.0	0.00245
Beckmann	0.313-0.224-0.107	1.0-0.917-0.952	1.1267	0.0646	$+\infty$	0.00242
	ρ	A		B	C	
Low	0.313-0.224-0.107	22.938-23.399-24.027	1.4482	855.782	1.7994	0.00236



yellow-plastic



	ρ (RGB)	specular 'albedo'	n_i	σ	γ	Normalized distance
STD	0.234-0.208-0.039	1.0-0.857-0.533	1.3557	0.4492	2.1033	0.00097
GGX	0.234-0.208-0.039	1.0-0.869-0.55	1.3625	0.4368	2.0	0.00096
Beckmann	0.234-0.208-0.039	1.0-0.784-0.459	1.2961	0.5367	$+\infty$	0.00114
	ρ	A		B	C	
Low	0.234-0.208-0.039	5.912-4.738-2.929	1.4655	66512.3	0.3589	0.00107