

**LAMPIRAN A**  
**CITRA**

### A.1 Citra Ber-Watermark dengan Penggunaan Faktor Skala Setiap Subband Sama



**A.2 Citra Ber-Watermark dengan Penggunaan Faktor Skala Berdasarkan Rata-Rata Jumlah Perbandingan Nilai Singular Setiap Subband**



### A.3 Citra Ber-watermark Setelah Diberi Serangan

Gaussian Blur 5x5	Gaussian Blur 7x7	Gaussian Blur 9x9	Gaussian Blur 11x11	Gaussian Blur 13x13
				
Gaussian Noise 2.0	Gaussian Noise 4.0	Gaussian Noise 6.0	Gaussian Noise 8.0	Gaussian Noise 10
				
Sharpening 60	Sharpening 70	Sharpening 80	Sharpening 90	Sharpening 100
				
JPEG-Compression 90	JPEG-Compression 70	JPEG-Compression 50	JPEG-Compression 30	JPEG-Compression 10
				
Rescaling (128)	Rescaling (256)	Rescaling (364)	Rescaling (640)	Rescaling (768)
				
Cropping I	Cropping II	Cropping III	Cropping IV	Cropping V
				
Rotate 36	Rotate 72	Rotate 108	Rotate 144	Rotate 180
				

#### A.4 Percobaan I : Pengujian Ketahanan Watermark Terhadap Serangan dengan Alpha 0.05

Ketahanan Watermark dengan $\alpha = 0.05$									
Gaussian Blur 5x5		Gaussian Blur 7x7		Gaussian Blur 9x9		Gaussian Blur 11x11		Gaussian Blur 13x13	
0.8203	-0.2652	0.6642	-0.2647	0.5351	-0.2700	0.4362	-0.2800	0.3602	-0.2880
-0.2041	-0.4234	-0.2157	-0.4284	-0.2231	-0.4332	-0.2339	-0.4360	-0.2422	-0.4374
Gaussian Noise 2.0		Gaussian Noise 4.0		Gaussian Noise 6.0		Gaussian Noise 8.0		Gaussian Noise 10	
0.4888	0.2131	0.0354	0.2622	-0.2102	0.2762	-0.3258	0.2928	-0.3552	0.2910
0.2911	0.3075	0.3130	0.3177	0.3170	0.3191	0.3229	0.3205	0.3141	0.3210
Sharpening 60		Sharpening 70		Sharpening 80		Sharpening 90		Sharpening 100	
0.7553	0.6123	0.5962	0.5797	0.4564	0.5500	0.2962	0.5122	-0.8758	0.4214
0.6718	0.7086	0.6298	0.6749	0.5834	0.6347	0.5254	0.5761	0.4298	0.4341
JPEG-Compress (90)		JPEG-Compress (70)		JPEG-Compress (50)		JPEG-Compress (30)		JPEG-Compress (10)	
0.9999	0.9827	0.9997	0.9141	0.9993	0.8457	0.9988	0.8391	0.9897	-0.0592
0.9843	0.9388	0.9367	0.6159	0.8179	0.2023	0.4680	0.0712	0.0118	-0.3803
Rescaling (768)		Rescaling (640)		Rescaling (364)		Rescaling (256)		Rescaling (128)	
0.9999	0.9734	0.9999	0.9848	0.9994	0.2713	0.9942	-0.2534	0.8568	-0.2020
0.9891	0.9054	0.9940	0.9124	0.6566	0.0946	0.0243	-0.3798	-0.1109	-0.4055
Cropping I		Cropping II		Cropping III		Cropping IV		Cropping V	
-0.9867	0.9661	-0.9687	0.9602	-0.9937	0.9653	-0.9867	0.9661	-0.2933	0.9814
0.9559	0.9778	0.9688	0.9820	0.9716	0.9650	0.9559	0.9778	0.9926	0.9974
Rotation 36		Rotation 72		Rotation 108		Rotation 144		Rotation 180	
0.9537	0.5503	0.9561	0.6472	0.9560	0.6856	0.9486	0.2943	1	0.9998
0.8255	-0.4404	0.8071	-0.4363	0.8266	-0.4229	0.7292	-0.4486	0.9997	0.9997

### A.5 Percobaan I : Pengujian Ketahanan Watermark Terhadap Serangan dengan Alpha 0.04

Ketahanan Watermark dengan $\alpha = 0.04$									
Gaussian Blur 5x5		Gaussian Blur 7x7		Gaussian Blur 9x9		Gaussian Blur 11x11		Gaussian Blur 13x13	
0.7462	-0.2687	0.5680	-0.2677	0.4365	-0.2722	0.3423	-0.2813	0.2726	-0.2898
-0.2104	-0.4237	-0.2193	-0.4288	-0.2255	-0.4340	-0.2352	-0.4361	-0.2443	-0.4371
Gaussian Noise 2.0		Gaussian Noise 4.0		Gaussian Noise 6.0		Gaussian Noise 8.0		Gaussian Noise 10	
0.3431	0.2192	-0.0406	0.2572	-0.2539	0.2748	-0.3579	0.2886	-0.3850	0.2913
0.2929	0.3107	0.3092	0.3124	0.3151	0.3201	0.3150	0.3206	0.3168	0.3238
Sharpening 60		Sharpening 70		Sharpening 80		Sharpening 90		Sharpening 100	
0.6616	0.5795	0.4920	0.5514	0.3715	0.5254	0.2395	0.4892	0.5429	0.3986
0.6235	0.6695	0.5852	0.6378	0.5437	0.5996	0.4888	0.5429	0.3973	0.4099
JPEG-Compress (90)		JPEG-Compress (70)		JPEG-Compress (50)		JPEG-Compress (30)		JPEG-Compress (10)	
0.9999	0.9755	0.9995	0.8959	0.9991	0.7915	0.9976	0.7608	0.9852	-0.0861
0.9824	0.8924	0.8912	0.3511	0.7458	0.1257	0.2658	-0.0616	-0.0062	-0.3819
Rescaling (768)		Rescaling (640)		Rescaling (364)		Rescaling (256)		Rescaling (128)	
0.9998	0.9530	0.9998	0.9762	0.9991	0.1036	0.9912	-0.2678	0.8083	-0.2064
0.9803	0.8652	0.9902	0.8727	0.5169	0.0057	0.008	-0.3784	-0.1164	-0.4075
Cropping I		Cropping II		Cropping III		Cropping IV		Cropping V	
-0.9885	0.9632	-0.9687	0.9604	-0.9941	0.9623	-0.2342	0.9502	-0.3449	0.8584
0.9354	0.9672	0.9688	0.9819	0.9679	0.9478	0.9914	0.9904	0.9874	0.9944
Rotation 36		Rotation 72		Rotation 108		Rotation 144		Rotation 180	
0.9283	0.5386	0.9318	0.6355	0.9321	0.6745	0.9200	0.2779	1.0000	0.9996
0.8187	-0.4416	0.7973	-0.4367	0.8194	-0.4248	0.7205	-0.4472	0.9997	0.9996

## A.6 Percobaan I : Pengujian Ketahanan Watermark Terhadap Serangan dengan Alpha 0.03

Ketahanan Watermark dengan $\alpha = 0.03$									
Gaussian Blur 5x5		Gaussian Blur 7x7		Gaussian Blur 9x9		Gaussian Blur 11x11		Gaussian Blur 13x13	
0.6212	-0.2718	0.4337	-0.2692	0.3125	-0.2739	0.2310	-0.2827	0.1722	-0.2915
-0.2160	-0.4238	-0.2212	-0.4283	-0.2277	-0.4338	-0.2366	-0.4362	-0.2452	-0.4376
Gaussian Noise 2.0		Gaussian Noise 4.0		Gaussian Noise 6.0		Gaussian Noise 8.0		Gaussian Noise 10	
0.1695	0.1937	-0.1532	0.2537	-0.3131	0.2807	-0.3769	0.2876	-0.3977	0.2900
0.2914	0.3023	0.3032	0.3189	0.3160	0.3254	0.3172	0.3229	0.3215	0.3249
Sharpening 60		Sharpening 70		Sharpening 80		Sharpening 90		Sharpening 100	
0.5135	0.5464	0.3544	0.5239	0.4564	0.5500	0.1768	0.4719	-0.8776	0.3862
0.5709	0.6222	0.5386	0.5932	0.5834	0.6347	0.4547	0.5053	0.3769	0.3843
JPEG-Compress (90)		JPEG-Compress (70)		JPEG-Compress (50)		JPEG-Compress (30)		JPEG-Compress (10)	
0.9997	0.9617	0.9990	0.8197	0.9985	0.7144	0.9965	0.6869	0.9747	-0.1251
0.9679	0.8370	0.8437	0.2257	0.5548	0.0096	0.1140	-0.2131	-0.0461	-0.3785
Rescaling (768)		Rescaling (640)		Rescaling (364)		Rescaling (256)		Rescaling (128)	
0.9995	0.9071	0.9996	0.9554	0.9983	-0.0406	0.9852	-0.2816	0.7285	-0.2109
0.9595	0.7902	0.9821	0.8041	0.3121	-0.0863	-0.0201	-0.3806	-0.1209	-0.4070
Cropping I		Cropping II		Cropping III		Cropping IV		Cropping V	
-0.9921	0.8090	-0.9791	0.8981	-0.9948	0.9525	-0.2666	0.9844	-0.3563	0.9860
0.8617	0.9210	0.8981	-0.0684	0.9641	0.2117	0.9516	0.9826	0.9857	0.9925
Rotation 36		Rotation 72		Rotation 108		Rotation 144		Rotation 180	
0.8724	0.5229	0.8782	0.6235	0.8784	0.6630	0.8571	0.2605	0.9999	0.9994
0.8127	-0.4410	0.7883	-0.4372	0.8102	-0.4248	0.7127	-0.4461	0.9993	0.9994

## A.7 Percobaan II : Pengujian Ketahanan Watermark Terhadap Serangan dengan Alpha 0.05

Ketahanan Watermark dengan Alpha pada LL = 0.05 ; HL,LH,HH = 0.00625									
Gaussian Blur 5x5		Gaussian Blur 7x7		Gaussian Blur 9x9		Gaussian Blur 11x11		Gaussian Blur 13x13	
0.8278	-0.2501	0.6897	-0.2437	0.5772	-0.2437	0.4924	-0.2501	0.4278	-0.2568
-0.1865	-0.3173	-0.1940	-0.3151	-0.1999	-0.3155	-0.2058	-0.3173	-0.2094	-0.3191
Gaussian Noise 2.0		Gaussian Noise 4.0		Gaussian Noise 6.0		Gaussian Noise 8.0		Gaussian Noise 10	
0.5779	0.1490	0.2066	0.1824	-0.0127	0.2038	-0.0996	0.2118	-0.1395	0.2158
0.1832	0.2277	0.2105	0.2362	0.2220	0.2382	0.2278	0.2376	0.2256	0.2454
Sharpening 60		Sharpening 70		Sharpening 80		Sharpening 90		Sharpening 100	
0.6975	0.5235	0.5098	0.4690	0.3384	0.4144	0.1296	0.3579	-0.7258	0.3225
0.5316	0.6034	0.4960	0.5657	0.4728	0.5241	0.4581	0.4790	0.4315	0.3903
JPEG-Compress (90)		JPEG-Compress (70)		JPEG-Compress (50)		JPEG-Compress (30)		JPEG-Compress (10)	
0.9999	0.9910	0.9997	0.9625	0.9995	0.9123	0.9991	0.8138	0.9864	0.1639
0.9870	0.9698	0.9397	0.6968	0.8357	0.0618	0.6268	0.0254	0.0356	-0.2805
Rescaling (768)		Rescaling (640)		Rescaling (364)		Rescaling (256)		Rescaling (128)	
0.9999	0.9457	0.9999	0.9630	0.9992	0.1879	0.9909	-0.1571	0.8429	-0.2140
0.9596	0.8689	0.9723	0.8762	0.0766	-0.0520	-0.1571	-0.1571	-0.1469	-0.3058
Cropping I		Cropping II		Cropping III		Cropping IV		Cropping V	
-0.9748	0.9775	-0.9459	0.8915	-0.9861	0.9597	-0.5569	0.9489	-0.1878	0.7771
0.8887	0.0695	0.9939	0.9616	0.9833	0.0913	0.8799	0.9926	0.9170	0.9910
Rotation 36		Rotation 72		Rotation 108		Rotation 144		Rotation 180	
0.9520	0.5391	0.9543	0.5422	0.9543	0.4895	0.9494	0.2335	1	0.9998
0.2975	-0.3251	0.4260	-0.3200	0.6023	-0.3143	0.4081	-0.3292	1	0.9998



**LAMPIRAN B**  
**KOEFISIEN KORELASI**

Tabel dibawah ini adalah nilai korelasi citra *watermark* dengan penggunaan faktor skala setiap *subband*-nya sama.

B.1 Nilai korelasi citra *watermark* dengan  $\alpha = 0,016$  dan  $\alpha = 0,018$

SERANGAN	SUBBAND							
	LL		HL		LH		HH	
	$\alpha = 0,016$	$\alpha = 0,018$	$\alpha = 0,016$	$\alpha = 0,018$	$\alpha = 0,016$	$\alpha = 0,018$	$\alpha = 0,016$	$\alpha = 0,018$
Gaussian Blur 5x5	0.3284	0.3847	-0.2623	-0.2597	-0.1866	-0.1817	-0.4223	-0.4214
Gaussian Blur 7x7	0.1928	0.2327	-0.2736	-0.2726	-0.2202	-0.2193	-0.4287	-0.4283
Gaussian Blur 9x9	0.1157	0.1464	-0.2749	-0.2740	-0.2254	-0.2235	-0.4341	-0.4342
Gaussian Blur 11x11	0.0644	0.0898	-0.2865	-0.2857	-0.2387	-0.2386	-0.4360	-0.4355
Gaussian Blur 13x13	0.0266	0.0484	-0.2930	-0.2924	-0.2454	-0.2445	-0.4375	-0.4379
Gaussian Noise 2,0	-0.1036	-0.0433	0.2764	0.3044	0.3343	0.3449	0.3161	0.3412
Gaussian Noise 4,0	-0.2752	-0.2704	0.2675	0.2728	0.3131	0.3095	0.3132	0.3168
Gaussian Noise 6,0	-0.3819	-0.3711	0.2730	0.2722	0.3135	0.3168	0.3220	0.3228
Gaussian Noise 8,0	-0.3819	-0.3926	0.2730	0.2880	0.3135	0.3126	0.3220	0.3204
Gaussian Noise 10,0	-0.4190	-0.4247	0.2978	0.2889	0.3187	0.3178	0.3191	0.3196
Sharpening 60	0.2093	0.2662	0.8326	0.8534	0.9031	0.9177	0.9057	0.9193
Sharpening 70	0.1289	0.1689	0.7960	0.8189	0.8706	0.8882	0.8808	0.8964
Sharpening 80	0.1299	0.1564	0.7603	0.7849	0.8311	0.8522	0.8489	0.8671
Sharpening 90	0.0959	0.1117	0.7302	0.7567	0.7781	0.8022	0.8002	0.8211
Sharpening 100	-0.8740	-0.8716	0.6613	0.6874	0.6539	0.6790	0.6480	0.6749
JPEG-Compression 90	0.9993	0.9995	0.9979	0.9984	0.9988	0.9989	0.9924	0.9938
JPEG-Compression 70	0.9951	0.9961	0.9907	0.9902	0.9939	0.9947	0.9518	0.9647
JPEG-Compression 50	0.9909	0.9927	0.9875	0.9898	0.9886	0.9901	0.8938	0.9073
JPEG-Compression 30	0.9833	0.9863	0.9842	0.9866	0.9549	0.9710	0.7370	0.7947
JPEG-Compression 10	0.8912	0.9157	0.5731	0.6056	0.4359	0.6348	-0.3316	0.1161
Rescaling 768x768	0.9979	0.9983	0.9969	0.9976	0.9988	0.9991	0.9883	0.9905
Rescaling 640x640	0.9986	0.9988	0.9980	0.9984	0.9993	0.9994	0.9892	0.9913
Rescaling 364x364	0.9873	0.9889	0.8352	0.8750	0.9505	0.9627	0.7436	0.7917
Rescaling 256x256	0.9427	0.9523	-0.1976	-0.1791	0.1385	0.1693	-0.3725	-0.3720
Rescaling 128x128	0.5388	0.5752	-0.2099	-0.2082	-0.1116	-0.1059	-0.4056	-0.4055
Cropping I	-0.9912	-0.9910	0.9488	0.9485	0.8963	0.8920	0.9079	0.9167
Cropping II	-0.9805	-0.9800	0.9835	0.9830	0.9577	0.9584	0.8269	0.8933
Cropping III	-0.9942	-0.9940	0.9910	0.9930	0.9874	0.9943	0.9961	0.9969
Cropping IV	-0.3082	-0.2997	0.9504	0.8509	0.9052	0.8620	0.9994	0.9995
Cropping V	-0.3892	-0.3875	0.9217	0.9809	0.8802	0.9322	0.9997	0.9998
Rotation 36	0.6476	0.7101	0.5497	0.5591	0.8167	0.8204	-0.3955	-0.3849
Rotation 72	0.6556	0.7183	0.6285	0.6338	0.8347	0.8425	-0.3588	-0.3419
Rotation 108	0.6537	0.7159	0.6784	0.6848	0.8476	0.8539	-0.3528	-0.3312
Rotation 144	0.6057	0.6750	0.2948	0.3062	0.6722	0.6703	-0.4346	-0.4304
Rotation 180	0.9999	0.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

B.2 Nilai korelasi citra *watermark* dengan  $\alpha = 0,02$  dan  $\alpha = 0,022$

SERANGAN	SUBBAND							
	LL		HL		LH		HH	
	$\alpha = 0,02$	$\alpha = 0,022$	$\alpha = 0,02$	$\alpha = 0,022$	$\alpha = 0,02$	$\alpha = 0,022$	$\alpha = 0,02$	$\alpha = 0,022$
Gaussian Blur 5x5	0.4376	0.4857	-0.2549	-0.2519	-0.1756	-0.1683	-0.4203	-0.4210
Gaussian Blur 7x7	0.2728	0.3104	-0.2717	-0.2716	-0.2179	-0.2164	-0.4294	-0.4289
Gaussian Blur 9x9	0.1782	0.2080	-0.2732	-0.2722	-0.2230	-0.2214	-0.4341	-0.4337
Gaussian Blur 11x11	0.1160	0.1411	-0.2851	-0.2846	-0.2380	-0.2378	-0.4358	-0.4359
Gaussian Blur 13x13	0.0710	0.0927	-0.2920	-0.2917	-0.2449	-0.2438	-0.4371	-0.4367
Gaussian Noise 2,0	-0.0319	0.0495	0.3279	0.3348	0.3613	0.3707	0.3424	0.3498
Gaussian Noise 4,0	-0.2247	-0.2232	0.2767	0.2960	0.3078	0.3183	0.3152	0.3124
Gaussian Noise 6,0	-0.3459	-0.3428	0.2777	0.2776	0.3165	0.3145	0.3253	0.3158
Gaussian Noise 8,0	-0.3972	-0.3978	0.2881	0.2892	0.3181	0.3167	0.3189	0.3214
Gaussian Noise 10,0	-0.4263	-0.4260	0.2888	0.2940	0.3254	0.3169	0.3200	0.3223
Sharpening 60	0.3223	0.3750	0.8712	0.8861	0.9297	0.9388	0.9302	0.9387
Sharpening 70	0.2102	0.2496	0.8389	0.8560	0.9031	0.9148	0.9091	0.9192
Sharpening 80	0.1841	0.2111	0.8066	0.8257	0.8700	0.8843	0.8821	0.8943
Sharpening 90	0.1275	0.1435	0.7803	0.8009	0.8223	0.8392	0.8381	0.8521
Sharpening 100	-0.8691	-0.8670	0.7094	0.7307	0.7018	0.7190	0.6950	0.7124
JPEG-Compression 90	0.9996	0.9996	0.9985	0.9989	0.9991	0.9992	0.9953	0.9953
JPEG-Compression 70	0.9967	0.9968	0.9923	0.9937	0.9954	0.9957	0.9733	0.9782
JPEG-Compression 50	0.9938	0.9948	0.9906	0.9930	0.9920	0.9932	0.9263	0.9379
JPEG-Compression 30	0.9881	0.9894	0.9893	0.9914	0.9793	0.9857	0.8171	0.8493
JPEG-Compression 10	0.9302	0.9407	0.6497	0.7208	0.6821	0.8271	0.1165	0.3573
Rescaling 768x768	0.9986	0.9988	0.9981	0.9984	0.9992	0.9994	0.9922	0.9935
Rescaling 640x640	0.9990	0.9991	0.9986	0.9989	0.9995	0.9996	0.9929	0.9940
Rescaling 364x364	0.9902	0.9912	0.9061	0.9271	0.9712	0.9777	0.8281	0.8560
Rescaling 256x256	0.9592	0.9646	-0.1601	-0.1445	0.2157	0.2558	-0.3697	-0.3701
Rescaling 128x128	0.6101	0.6386	-0.2064	-0.2039	-0.1022	-0.0983	-0.4050	-0.4056
Cropping I	-0.9912	-0.9910	0.9780	0.9968	0.9967	0.9973	0.9985	0.9987
Cropping II	-0.9794	-0.9789	0.9970	0.9975	0.9841	0.9816	0.9986	0.9988
Cropping III	-0.9945	-0.9941	0.9831	0.9950	0.9594	0.9804	0.8939	0.9978
Cropping IV	-0.2975	-0.2891	0.8646	0.9981	0.8096	0.9989	0.9996	0.9996
Cropping V	-0.3846	-0.3784	0.9075	0.8246	0.9995	0.9996	0.9998	0.9998
Rotation 36	0.7610	0.8002	0.5683	0.5775	0.8236	0.8282	-0.3730	-0.3609
Rotation 72	0.7687	0.8071	0.6389	0.6440	0.8496	0.8561	-0.3154	-0.2924
Rotation 108	0.7671	0.8058	0.6904	0.6958	0.8596	0.8651	-0.3094	-0.2852
Rotation 144	0.7322	0.7762	0.3186	0.3295	0.6695	0.6681	-0.4290	-0.4251
Rotation 180	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

B.3 Nilai korelasi citra *watermark* dengan  $\alpha = 0,024$  dan  $\alpha = 0,026$

SERANGAN	SUBBAND							
	LL		HL		LH		HH	
	$\alpha = 0,024$	$\alpha = 0,026$	$\alpha = 0,024$	$\alpha = 0,026$	$\alpha = 0,024$	$\alpha = 0,026$	$\alpha = 0,024$	$\alpha = 0,026$
Gaussian Blur 5x5	0.5290	0.5680	-0.2479	-0.2443	-0.1597	-0.1542	-0.4211	-0.4214
Gaussian Blur 7x7	0.3457	0.3790	-0.2717	-0.2705	-0.2146	-0.2128	-0.4287	-0.4283
Gaussian Blur 9x9	0.2367	0.2646	-0.2716	-0.2710	-0.2203	-0.2190	-0.4339	-0.4341
Gaussian Blur 11x11	0.1652	0.1889	-0.2841	-0.2844	-0.2374	-0.2370	-0.4357	-0.4362
Gaussian Blur 13x13	0.1137	0.1344	-0.2910	-0.2909	-0.2436	-0.2429	-0.4370	-0.4374
Gaussian Noise 2,0	0.0087	0.1074	0.3413	0.3740	0.3751	0.3984	0.3632	0.3721
Gaussian Noise 4,0	-0.2398	-0.1771	0.2945	0.3065	0.3222	0.3349	0.3210	0.3300
Gaussian Noise 6,0	-0.3312	-0.3101	0.2792	0.2860	0.3169	0.3178	0.3194	0.3239
Gaussian Noise 8,0	-0.3982	-0.3796	0.2885	0.2872	0.3199	0.3177	0.3236	0.3270
Gaussian Noise 10,0	-0.4110	-0.4045	0.2931	0.2906	0.3144	0.3179	0.3216	0.3183
Sharpening 60	0.4228	0.4686	0.8989	0.9095	0.9464	0.9527	0.9459	0.9517
Sharpening 70	0.2877	0.3250	0.8709	0.8835	0.9248	0.9330	0.9280	0.9352
Sharpening 80	0.2370	0.2633	0.8425	0.8571	0.8966	0.9068	0.9047	0.9134
Sharpening 90	0.1583	0.1731	0.8193	0.8350	0.8540	0.8666	0.8644	0.8747
Sharpening 100	-0.8648	-0.8626	0.7486	0.7646	0.7355	0.7507	0.7302	0.7454
JPEG-Compression 90	0.9997	0.9998	0.9990	0.9992	0.9992	0.9994	0.9960	0.9963
JPEG-Compression 70	0.9975	0.9980	0.9949	0.9958	0.9967	0.9967	0.9819	0.9838
JPEG-Compression 50	0.9952	0.9957	0.9929	0.9938	0.9937	0.9938	0.9473	0.9603
JPEG-Compression 30	0.9906	0.9921	0.9936	0.9942	0.9886	0.9899	0.8796	0.9011
JPEG-Compression 10	0.9509	0.9582	0.7828	0.8642	0.9054	0.9157	0.3915	0.4092
Rescaling 768x768	0.9989	0.9990	0.9986	0.9989	0.9995	0.9996	0.9945	0.9953
Rescaling 640x640	0.9992	0.9993	0.9991	0.9991	0.9996	0.9997	0.9948	0.9955
Rescaling 364x364	0.9920	0.9927	0.9425	0.9544	0.9820	0.9853	0.8782	0.8961
Rescaling 256x256	0.9680	0.9720	-0.1229	-0.0994	0.2969	0.3341	-0.3685	-0.3666
Rescaling 128x128	0.6652	0.6888	-0.2019	-0.2004	-0.0944	-0.0907	-0.4060	-0.4049
Cropping I	-0.9907	-0.9905	0.9719	0.9976	0.9977	0.9980	0.9989	0.9991
Cropping II	-0.9784	-0.9778	0.9777	0.9981	0.9630	0.9742	0.9542	0.9991
Cropping III	-0.9944	-0.9933	0.9678	0.9741	0.9967	0.9500	0.9982	0.9521
Cropping IV	-0.2829	-0.2767	0.9983	0.9986	0.9991	0.9992	0.9997	0.9997
Cropping V	-0.3496	-0.3687	0.8669	0.9273	0.9997	0.9330	0.9999	0.9999
Rotation 36	0.8312	0.8562	0.5856	0.5944	0.8314	0.8363	-0.3453	-0.3331
Rotation 72	0.8371	0.8612	0.6496	0.6553	0.8621	0.8666	-0.2722	-0.2478
Rotation 108	0.8366	0.8609	0.7019	0.7078	0.8701	0.8751	-0.2620	-0.2374
Rotation 144	0.8113	0.8394	0.3401	0.3504	0.6683	0.6677	-0.4193	-0.4169
Rotation 180	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

B.4 Nilai korelasi citra *watermark* dengan  $\alpha = 0,028$  dan  $\alpha = 0,03$

SERANGAN	SUBBAND							
	LL		HL		LH		HH	
	$\alpha = 0,028$	$\alpha = 0,03$	$\alpha = 0,028$	$\alpha = 0,03$	$\alpha = 0,028$	$\alpha = 0,03$	$\alpha = 0,028$	$\alpha = 0,03$
Gaussian Blur 5x5	0.6042	0.6369	-0.2418	-0.2378	-0.1477	-0.1407	-0.4218	-0.4209
Gaussian Blur 7x7	0.4117	0.4429	-0.2703	-0.2698	-0.2121	-0.2089	-0.4273	-0.4272
Gaussian Blur 9x9	0.2918	0.3186	-0.2703	-0.2687	-0.2180	-0.2176	-0.4340	-0.4340
Gaussian Blur 11x11	0.2123	0.2354	-0.2834	-0.2829	-0.2367	-0.2364	-0.4361	-0.4358
Gaussian Blur 13x13	0.1554	0.1757	-0.2902	-0.2898	-0.2420	-0.2417	-0.4376	-0.4376
Gaussian Noise 2,0	0.1644	0.1405	0.4021	0.4012	0.4021	0.4169	0.3881	0.3861
Gaussian Noise 4,0	-0.1688	-0.1404	0.3151	0.3106	0.3275	0.3451	0.3360	0.3317
Gaussian Noise 6,0	-0.3088	-0.3220	0.2856	0.2919	0.3105	0.3128	0.3208	0.3227
Gaussian Noise 8,0	-0.3940	-0.3735	0.2900	0.2857	0.3164	0.3185	0.3241	0.3225
Gaussian Noise 10,0	-0.4039	-0.4118	0.2911	0.2927	0.3222	0.3218	0.3249	0.3200
Sharpening 60	0.5120	0.5520	0.9185	0.9264	0.9576	0.9619	0.9565	0.9605
Sharpening 70	0.3620	0.3978	0.8944	0.9038	0.9395	0.9454	0.9412	0.9463
Sharpening 80	0.2896	0.3156	0.8699	0.8811	0.9150	0.9225	0.9208	0.9271
Sharpening 90	0.1884	0.2032	0.8486	0.8607	0.8766	0.8861	0.8837	0.8915
Sharpening 100	-0.8596	-0.8570	0.7784	0.7913	0.7638	0.7760	0.7594	0.7716
JPEG-Compression 90	0.9998	0.9998	0.9993	0.9994	0.9994	0.9994	0.9968	0.9971
JPEG-Compression 70	0.9984	0.9985	0.9957	0.9958	0.9973	0.9972	0.9863	0.9884
JPEG-Compression 50	0.9964	0.9965	0.9941	0.9942	0.9941	0.9947	0.9696	0.9731
JPEG-Compression 30	0.9931	0.9937	0.9950	0.9956	0.9913	0.9925	0.9089	0.9289
JPEG-Compression 10	0.9615	0.9656	0.9009	0.9340	0.9237	0.9326	0.4984	0.4990
Rescaling 768x768	0.9991	0.9992	0.9990	0.9991	0.9996	0.9997	0.9958	0.9963
Rescaling 640x640	0.9993	0.9994	0.9993	0.9993	0.9997	0.9998	0.9961	0.9967
Rescaling 364x364	0.9931	0.9935	0.9627	0.9696	0.9880	0.9890	0.9100	0.9219
Rescaling 256x256	0.9747	0.9767	-0.0789	-0.0570	0.3650	0.3986	-0.3649	-0.3628
Rescaling 128x128	0.7113	0.7316	-0.1980	-0.1955	-0.0887	-0.0854	-0.4052	-0.4044
Cropping I	-0.9902	-0.9900	0.9979	0.9577	0.9983	0.9985	0.9992	0.9993
Cropping II	-0.9769	-0.9766	0.9985	0.9714	0.9989	0.9666	0.9992	0.9672
Cropping III	-0.9942	-0.9944	0.9450	0.9519	0.8901	0.9620	0.9315	0.9987
Cropping IV	-0.2716	-0.2644	0.9987	0.9989	0.9159	0.9994	0.9998	0.9998
Cropping V	-0.3643	-0.3533	0.9121	0.9995	0.9221	0.9998	0.9999	0.9999
Rotation 36	0.8765	0.7610	0.6029	0.5683	0.8400	0.8236	-0.3166	-0.3730
Rotation 72	0.8809	0.8973	0.6619	0.6667	0.8707	0.8740	-0.2213	-0.1943
Rotation 108	0.8807	0.8970	0.7136	0.7196	0.8788	0.8819	-0.2115	-0.1802
Rotation 144	0.8627	0.8817	0.3616	0.3731	0.6673	0.6676	-0.4110	-0.4066
Rotation 180	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

**LAMPIRAN C**  
**PENILAIAN SUBJEKTIF**

### C.1 Kategori Penilaian *Mean Opinion Score* (MOS)

Nilai	Kualitas citra	Penjelasan
5	Sangat Bagus (Excellent)	Citra yang diamati mempunyai kualitas yang sangat baik hampir serupa dengan citra aslinya
4	Bagus (Fine)	Citra yang diamati mempunyai kualitas bagus tanpa gangguan yang berarti
3	Cukup (Passable)	Citra yang diamati mempunyai kualitas yang cukup baik dengan gangguan yang sedikit berarti
2	Batas (Marginal)	Citra yang diamati mempunyai kualitas buruk dengan gangguan yang berarti
1	Buruk (Unuseable)	Citra yang diamati memiliki kualitas yang demikian buruk sehingga tidak dapat diamati lagi

### C.2 Contoh Kuisisioner untuk Penilaian *Mean Opinion Score* (MOS)

Nama :

NRP :

Citra Ber-Watermark Dengan Penggunaan Faktor Skala Setiap Subband Sama					
PENILAIAN	Sangat Bagus (Excellent)	Bagus (Fine)	Cukup (Passable)	Batas (Marginal)	Buruk (Unuseable)
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.016					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.018					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.02					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.022					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.024					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.026					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.028					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.03					

Citra Ber-watermark Dengan Penggunaan Faktor Skala Berdasarkan Perbandingan Nilai Singular Setiap Subband					
PENILAIAN	Sangat Bagus (Excellent)	Bagus (Fine)	Cukup (Passable)	Batas (Marginal)	Buruk (Unuseable)
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.03					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.04					
CITRA HOST terhadap CITRA TERWATERMARK Alpha = 0.05					

### C.3 Hasil Penilaian MOS

Citra Ber-Watermark Dengan Penggunaan Faktor Skala Setiap Subband Sama										
No	Nama	NRP	Alpha=0.016	Alpha=0.018	Alpha=0.02	Alpha=0.022	Alpha=0.024	Alpha=0.026	Alpha=0.08	Alpha=0.03
1	Fredinata J	0522101	4	4	5	4	5	4	4	4
2	Rianto A.M.N	0522136	5	4	4	5	4	4	4	4
3	Gerald Patrik	0522128	5	4	4	4	5	4	5	5
4	Agus S	0522100	4	5	5	5	5	5	4	5
5	Venda	0522108	4	5	4	5	4	5	4	4
6	Kris Reinhad	0522094	5	5	4	5	4	5	4	5
7	N. M Ramdan	0522135	4	4	4	4	4	5	4	5
8	Jalimin	0522122	5	4	5	4	4	5	5	4
9	Daniel Hutabarat	0522097	5	5	5	5	5	4	4	4
10	Roy Rikki	0522091	5	5	4	5	5	5	5	5
MOS			4.6	4.5	4.6	4.6	4.5	4.6	4.3	4.5

Citra Ber-watermark Dengan Penggunaan Faktor Skala Berdasarkan Perbandingan Nilai Singular Setiap Subband					
No	Nama	NRP	Alpha=0.03	Alpha=0.04	Alpha=0.05
1	Fredinata J	0522101	5	5	5
2	Rianto A.M.N	0522136	4	4	4
3	Gerald Patrik	0522128	5	5	5
4	Agus S	0522100	4	5	5
5	Venda	0522108	5	5	5
6	Kris Reinhad	0522094	5	5	4
7	N. M Ramdan	0522135	4	4	4
8	Jalimin	0522122	4	5	5
9	Daniel Hutabarat	0522097	5	5	5
10	Roy Rikki	0522091	5	4	5
MOS			4.6	4.7	4.7