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25 November 1992

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Subject: Surface roughness loss for sinusoidal deviations

The Ruze surface loss formula is based on Gaussian statistics. In most cases, surface deviations produce a loss which follows the Ruze formula even if the deviations are far from Gaussian. In the case of sinusoidal deviations (like those produced by a ring structure) of large amplitude, the Ruze formula can underestimate the loss. The table below shows calculations of the effective rms (the value needed in the Ruze formula for correct RF loss) sinusoidal deviations. For cases of large roughness loss, the Ruze formula will tend to underestimate RF loss when deviations are sinusoidal. While the effects at 43 GHz in the rms range 10-16 mils are small, the current RF loss estimates far from the best elevation (where the ring structure (or other large scale) dominates) might be optimistic.

Sinusoidal	Effective r.m.s (Ruze)		
r.m.s. mils	115 GHz	86 GHz	43 GHz
7	7.4	7.2	7.1
8	8.6	8.3	8.1
9	9.9	9.5	9.1
10	11.1	10.6	10.2
11	13.1	11.9	11.2
12	15.2	13.2	12.2
13	18.3	14.6	13.3
14	24.6	16.2	14.4
15	-	18.0	15.5
16	-	20.2	16.6