Power Density Calculation

	G (dB)	D (m)	A (m^2)	P (W)	$S_{surface}$(w/m2)	$R_{nf\ (m)}$	S_{nf} (w/m^2)	$R_{ff\ (m)}$	$S_{t\ max}$(w/m^2)	S_{ff}(w/m^2)
1' Panel	23.5	0.4310	0.0929	0.316	13.6097	0.8978	8.6686	2.1547	5.1884	1.2132
2' Panel	28.0	0.8620	0.3715	0.316	3.4024	3.5912	2.1671	8.6188	2.1671	0.2137
2' parabolic	28.5	0.6096	0.2917	0.316	4.3330	1.7961	4.3330	4.3107	4.3330	0.9585
4' parabolic	34.0	1.2192	1.1669	0.316	1.0832	7.1845	1.0832	17.2428	1.0832	0.2126
6' parabolic	38.0	1.8288	2.6254	0.316	0.4814	16.1651	0.4814	38.7963	0.4814	0.1055
8' parabolic	40.0	2.4384	4.6674	0.316	0.2708	28.7380	0.2708	68.9712	0.2708	0.0529

Where:

G: antenna gain

D: antenna diameter in meters, for panel antenna, D = 1.414x the side length of the antenna

C: physical area of the aperture antenna

P: radio output power, P_{max} = 0.316 W

A: physical area of the aperture antenna

$S_{surface}$: maximum power density at the antenna surface, $S_{surface} = 4P/A$

R_{nf}: extent of near field, $R_{nf} = D^2/4\lambda$, where λ is wavelength, at 5.8GHz, λ=0.052m

S_{nf}: maximum near field power density, $S_{nf} = 16\eta P/\pi D^2$; for worst case situation, η is assmumed to be 1

R_{ff}: distance to beginning of far field; $R_{ff}= 0.6D^2/\lambda$

$S_{t\ max}$: maximum powre density in the transition region; $S_{t\ max}=S_{nf} * R_{nf}/R_{min}$; where R_{min} = min (1.5m, R_{nf})

S_{ff}: far field power density (on axis); $S_{ff} = PG/4\pi R^2$

Note: Power density beyond 1.5m from the center of antenna must be within 10W/m^2 or 1mW/cm^2

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