1. FCC SAR TEST EXCLUSION CALCULATIONS

FCC ID: VC7120-0199
Model number: DD27X Product Marketing Name: Chroma 27L
Based on guidance from KDB 447498

1.1 SAR TEST EXCLUSION CALCULATION

Time averaged conducted power		
Nominal power output	0dBm	Set by Firmware
Production tolerance	+0.5dB	IC tolerance over temperature and supply
max conducted power	0.5dBm (1.12mW)	“tune up tolerance”
Max theoretical duty cycle in normal operation	0.068%	12ms every 17.6s
Max average conducted power	0.0007 mW	
Rounded up to nearest mW	1 mW	(clause 4.3.1)

Minimum test Separation Distance	
Minimum 5mm is used (clause 4.1.5)	It is conceivable that a user might touch the electronic shelf label display while it is transmitting. Antenna is 3mm from the surface of the display.

Minimum frequency	902.5 MHz
Maximum frequency	927.5 MHz

SAR test exclusion threshold calculation (clause 4.3.1)

*Calculation is Power of channel (mW) / min test separation(mm) * [sqrt freq (GHz)]. (result rounded to 1decimal place)*

Min. channel: 1 / 5 * [sqrt 0.9025] = 0.2
Max. channel: 1 / 5 * [sqrt 0.9275] = 0.2

This is below the limits for 1-g SAR (3.0) and 10-g SAR (7.5) and so the product meets the thresholds for SAR test exclusion.

2. MPE CALCULATION AND RADIATION EXPOSURE RISK ASSESSMENT

FCC ID: VC7120-0199
IC ID: 8910A-1200199
Model: DD27X PMN: Chroma 27L

2.1 MPE CALCULATION AND EXPOSURE RISK

Following guidelines in KDB 447498 D03 supplement C Cross-reference v01

Prediction of MPE limit at a given distance

$$S = \frac{1.64ERP}{4\pi R^2} \quad \text{re-arranged } R = \sqrt{\frac{1.64ERP}{S4\pi}}$$

where:

S = power density
R = distance to the centre of radiation of the antenna
ERP = EUT Maximum power

With the maximum test case 100% duty cycle the MPE calculation result based on radiated field measurements from Hursley EMC test report no.1029a FR “FCC Part 15C, Industry Canada, Certification Report”:
Max Result is at 927.5MHz is 80.58dBuV/m @ 3m, equivalent to 0.0209mW ERP

Prediction frequency (MHz)	Max ERP (mW)	Power density limit (S) (mW/cm2)	Distance R cm required to be less than 0.6mW/cm2
927.5MHz	0.0209	0.6	0.067cm

Exposure risk in normal operation

The maximum theoretical transmitter duty cycle in operation is 12ms every 17.6s, (0.068%), which reduces the average ERP to 14.2uW.

In practice, it is impossible to reach the power density limit of 0.6mW/cm2 even with 100% duty cycle, because the required distance R is smaller than the distance from the antenna to the outside surface of the device enclosure.

DD27X is a fixed installation. In a retail shelf edge context it is possible that human body will contact the device, but with only momentary exposure.

3. INDUSTRY CANADA RSS-102 exemption requirements

ISED ID: 8910A-1200199 HVIN: DD27X PMN: Chroma 27L

The minimum distance and bystander could be <5mm, if the bystander is touching the product, therefore the electronic shelf label DD27X falls under RSS-102 issue 5, section 2.5.1
From RSS-102 issue 5, section 2.5.1 table 1 the appropriate exemption limit for the 902.5 to 927.5MHz band of operation is between 7mW and 17mW for <5mm separation distance. (assumed 7mW for worst case)

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW

From Hursley EMC test report no.1029a FR "FCC Part 15C, Industry Canada, Certification Report":
Max Result (100% duty cycle) at 927.5MHz is 80.58dBuV/m @ 3m, equivalent to 0.0343mW EIRP (0.0209mW ERP)

Maximum TX power with 100% duty cycle, adjusted for +0.5dB production tolerance: 81.08dBuV/m @ 3m @ 927.5MHz = 0.0385mW EIRP (0.0235mW ERP)

The maximum theoretical transmitter duty cycle in operation is 12ms every 17.6s, (0.068%), which reduces the maximum EIRP to 15.98uW.

This meets the requirement for exemption from routine evaluation.

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