

Engineering Specifications

P11552 - DLP System

Date 1/10/2011

Revision #: 3.2

ES #	Engineering Spec	Source	Importance	Description	Measure of Performance	Units	Marginal Value	Ideal Value	Validation Method
ES1	Layer Cure Time	CN11	3	Constrain the cure time of each layer	Time the cure time of a standard layer and cross section	sec	≤ 60	≤ 10	Experimentation
ES2	Prototype Size	CN12	3	Set an expected range of possible prototype outputs	Calibrated measurement devices (calipers, micrometers)	inches (cm)	≥5.5x4x4 (13.97x10.16x10.16)	≥9x6.75x8 (22.86x17.15x20.32)	Inspection
ES3	Layer to Layer Registration	CN9	9	Consistency of layer position relative to adjacent layers	Degree of interlayer registration (contact profilometer)	inches (cm)	≤ .008 (.02032)	≤ .003 (.00762)	Inspection
ES4	X-Y Dimensional Accuracy	CN9	3	Accuracy due to projector image - pixel size	Calibrated measurement devices (calipers, micrometers)	inches (cm)	≤ ± .010 (.0254)	± .005 (.0127)	Inspection
ES5	X-Y Resolution	CN9	3	Pixel dimensions	Pixel dimensions	inches (cm)	TBD	TBD	Inspection
ES6	Cumulative Z-Dimensional Accuracy	CN9	3	Accuracy due to cumulative layer accuracy	Variability in layer thickness - calibrated measurement devices (calipers, micrometers)	inches/in (cm/cm)	≤ .010 (.010)	≤ .005 (.005)	Inspection
ES7	Layer Thickness	CN9	3	Accuracy of each cured layer in the Z direction	Variability in layer thickness - calibrated measurement devices (calipers, micrometers)	inches (cm)	≤ .005 (.0127)	≤ .004 (.01016)	Inspection
ES8	Level of Automation	CN2, CN3	9	Required manual steps by operator	Number of steps	[--]	TBD	TBD	Experimentation
ES9	Utilized Photopolymer	CN1, CN4	9	Use photo-sensitive polymers as medium	Inspect to see if light of any wavelength is being used to cure the model	[binary]	No	Yes	Inspection
ES10	Design Documentation	CN6	9	Allow future MSD teams to easily understand design of DLP system	Inspect to see if there is documented and physical evidence of forethought to future MSD teams	[binary]	No	Yes	Inspection
ES11	Emergency Stop	CN7	9	System automatically shuts down when emergency stop is pressed	Safety inspection	[binary]	No	Yes	Inspection
ES12	Safety Interlock	CN7	3	System automatically shuts down when opened	Safety inspection	[binary]	No	Yes	Inspection
ES13	Light Leakage	CN7	1	Design minimizes the amount of light that escapes the DLP System (varying wavelengths)	Lux meter, UV radiometer	Lumens	TBD	TBD	Inspection
ES14	Pinch Points	CN7	3	Design minimizes opportunities for injury due to pinch points	Safety inspection	[--]	3	0	Inspection
ES15	Device Cost	CN8	3	Constrain purchases and design to coincide with given budget	Inspect documentation of purchases	\$	≤2000	≤1000	Inspection
ES16	Multiple Resins	CN5	1	Device should allow for resins with varying viscosities	Inspect documentation that proves adaptability	cP	≥500	≥10000	Inspection
ES17	DLP System Envelope	CN13	3	Constrain overall size of system	Bounding box dimensions	feet (m)	≤6x4x4 (1.829x1.219x1.219)	≤4x2x2 (1.219x.6096x.6096)	Inspection
ES18	Prototype Hardness	CN9	3	Check final product to ensure complete curing of polymer	Shore D Hardness Test	[--]	≥70	≥75	Inspection
ES19	Modular Design	CN1, CN5, CN6	1	Projector light source must be easily replaceable, Resin is easy to interchange	Inspect ease of light source change	[binary]	No	Yes	Inspection
ES20	Operator Satisfaction	CN10	3	Device must be simple and logical to use	Review survey results from operator use	Likert Scale	≥3	5	Survey