

# ISO 21980:2020-01 (E)

## Space systems - Evaluation of radiation effects on Commercial-Off-The-Shelf (COTS) parts for use on low-orbit satellite

---

<b>Contents</b>	<b>Page</b>
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Abbreviated terms</b> .....	<b>3</b>
<b>5 Radiation resistance design</b> .....	<b>4</b>
5.1 Overview.....	4
5.2 Basic idea of using COTS parts.....	5
5.2.1 Concept of parts selection.....	5
5.2.2 COTS parts evaluation.....	5
5.2.3 Concept of evaluation method.....	5
5.2.4 Concept of application of COTS parts/consumer technology.....	5
5.3 Space radiation environment prediction.....	5
5.3.1 Space environment.....	5
5.3.2 Space radiation environment model.....	6
5.3.3 Various parameters.....	6
5.3.4 Environmental conditions necessary for evaluation.....	6
<b>6 Radiation tolerance test</b> .....	<b>7</b>
6.1 Types of irradiation test.....	7
6.1.1 Cobalt 60 (gamma ray) irradiation test.....	7
6.1.2 Proton beam irradiation test.....	7
6.1.3 Heavy ion test.....	7
6.2 Alternative irradiation test — Laser pulse test.....	7
6.3 Test procedure.....	7
6.3.1 Total dose test.....	7
6.3.2 Single event test.....	7
6.3.3 Displacement damage test.....	7
6.3.4 Laser pulse test for SEE test.....	7
<b>Annex A (informative) Radiation resistance design procedure</b> .....	<b>8</b>
<b>Annex B (informative) Total dose prediction method</b> .....	<b>13</b>
<b>Annex C (informative) Radiation guidelines for total dose using contour maps</b> .....	<b>19</b>
<b>Annex D (informative) Comparative example between model prediction and measured values</b> .....	<b>23</b>
<b>Annex E (informative) Radiation deterioration of electronic components</b> .....	<b>25</b>
<b>Annex F (informative) Overview of single event effect</b> .....	<b>27</b>
<b>Annex G (informative) Measures for single events of electronic components</b> .....	<b>29</b>
<b>Annex H (informative) Measures for single events of devices</b> .....	<b>31</b>
<b>Annex I (informative) Prediction method of displacement damage</b> .....	<b>33</b>
<b>Annex J (informative) Resistance for displacement damage of each device</b> .....	<b>35</b>
<b>Annex K (informative) Displacement damage test guideline for semiconductor device</b> .....	<b>38</b>
<b>Annex L (informative) Laser pulse test method</b> .....	<b>44</b>
<b>Bibliography</b> .....	<b>46</b>