

HDX Tag Test Procedure

**Summary:** This document describes a procedure to test ISO11784/5 compliant livestock RFID tags to ensure their form and function is appropriate for commercial animal identification use.

Revision History						
Version	Date	Initials	Description			
1.0	19 Mar 2010	LB	First issue			
2.0	20 Jul 2010	PK	Incorporation of agreed MLA comments as per email 28 Apr 2010.			
2.1	24 Mar 2014	PK	Update to capture improvements to test protocol, summary of how pass- fail criteria were derived, test results reported using a Template Spreadsheet instead of hand-written, inclusion of new Reference Tags, addition of range testing with Datamars wand reader, clarification that Field Testing is only done upon special request, clearer distinction between Range Testing and Field Testing.			
2.2	4 Nov 2015	MP / PK	Update to capture outcomes of meeting between NLIS and Elexon 26 November 2014. Also, range testing Annex overhauled to reflect use of new apparatus, and to show the procedure with pictures.			
3.0	4 March 2016	РК	Final review before release, with minor changes. Co-branding of document by NLIS and Elexon.			

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Reviewed by:	L. Bateman / M. Prendergast



# 1. Introduction

The commercial livestock industry requires electronic identification transponders to have sufficient performance such they are reliably read by existing hand held, race and high flow reader systems. This document focuses on tags for use in Australia for tracking cattle, sheep, and goats (tests for sheep tags are assumed to apply to goats).

This document specifies the following testing to determine whether a tag is acceptable:

- Technical test to a subset of ISO 24631-3:2009. Where this standard does not provide pass-fail criteria, pass-fail criteria are determined by the performance of tags that are known to perform well in the Australian beef and sheep industry. These are called "Reference Transponders" in this document.
- A range test, both "on-axis" and "off-axis". Again, the pass-fail criteria are determined by the performance of the Reference Transponders.

# 2. Basis for Testing

## 2.1. Laboratory Testing

International Standard Organisation (ISO) and International Committee for Animal Recording (ICAR) have worked together to develop technical standard ISO 24631-3:2009 'Evaluation of the performance of ISO 11784 and ISO 11785 RFID transponders'. This standard is used as the basis for testing, but is tailored as follows:

- Pass-fail criteria have been added, based on the performance of Reference Transponders;
- Only HDX tags will be tested;
- No specific organization is acting as "Responsible Authority" (RA); and
- Elexon is not formally certified as an ISO 24631-3 testing facility.

## 2.2. Range Testing

The range testing records the range that each tag can be read with a selection of race readers commonly used in industry, and one wand reader. The test is repeated "on-axis" (best case orientation) and "off-axis" ("second-worst case" orientation). The results are compared against the Reference Transponders, to determine pass-fail criteria.



# 3. Determination of Pass-Fail Criteria

Pass-Fail criteria must be defined in order to determine whether a tested tag is acceptable for use in Australia. For some tests, pass-fail criteria are defined in standards (for example the pass-fail criteria of frequency stability are specified in ISO 11784). However, for most of the performance characteristics specified in this document, the pass-fail criteria must be determined by comparing to transponders that are known to give acceptable performance in the field.

# 4. Reference Transponders

In December 2013, NLIS supplied sets of reference transponders for Cattle and Sheep:

- Reference Cattle Tag: RI-INL-0243-40-P
- Reference Sheep Tag: TIRIS TRPGP40ATGA.

These tags are to be retested for each session of tag testing. The results are stored in the Excel template, together with the tags under test, for comparison.

## 5. Test Conduct

The test is conducted as follows:

- 1. If the organisation requesting the testing has provided the male pins and the tool to insert them, and has requested that testing be conducted with the pins inserted, then fit the pins;
- 2. For laboratory testing, follow the procedure at Annex A.
- 3. For range testing: Conduct the range testing of both the Tag Under Test and the applicable Reference Tags, in accordance with the instructions at Annex B, and enter results in the spreadsheet.
- 4. Have the data reviewed by an engineer experienced in tag testing.



# Annex A: Laboratory Test Procedure

Refer to Template Excel spreadsheet.

# 6. Equipment

Equipment needed	Example
Laptop (Elexon 84).	ELEXON84
Tag Tester (jig) and tag holder.	
Cleverscope oscilloscope and power adapter.	
Tag Test PSU (Power cable already attached).	
Tag Test Jig (cable) - Connects test jig to Cleverscope.	
USB cable	From PC to test jig
USB cable	From PC to Cleverscope
Thermometer	Must show temperature and humidity



Bluestick reader - With battery power charger.	
USB cable	From Bluestick reader to PC.
Program:	VS Express (Microsoft Visual Studio Express 2013)(Tag test ISO24631) - For testing tags.
Program:	Datamars (Rumisoft) - For use when transferring files from Bluestick reader (Opens automatically when reader connected via USB cable).
File:	Elexon(Z)\Customers\NLIS\Tag Testing\Test Results\Working Copies
Test jig	For field testing

# 7. Set Up

Instruction	Example
Set up the Tag Test Jig as shown following the diagram and instructions below.	
Important: This test must be conducted on a non-metallic bench. The nearest solid metallic structure, such as a metal beam or metal paneling, must be greater than 600mm from the test coils in any direction.	
NOTE: You do not need to connect the Bluestick reader at this point. Just have it ready for later in the test.	







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NOTE: Ensure there is a distance of at least 50 cm between the Tag Test and the other equipment (Cleverscope, PSU and laptop). Push all cables to the back so as not to cause interference during the testing. Plug the power leads from the laptop, Cleverscope and PSU into a power point.	> 50cm
<ul> <li>When you switch on the power you will notice:-</li> <li>The TRG LED and POWER LED on the Cleverscope will light.</li> <li>The 2 LED's on the Tag Tester PCB will do the following: <ul> <li>Top LED will stay on solid, and</li> <li>Bottom LED will flicker.</li> </ul> </li> </ul>	
The tag test is carried out through VS Express (Microsoft Visual Studio Express 2013). This program needs to be signed into with a username and password. Open the ISO24631-Tag Test program by clicking on the shortcut on the desk top.	ISO24651-Ta gTastisin - Shortcut



The following screen will open. Click <b>Start</b> .	SOLUMENT Tagter - Monosoft Numar 2013 for Windows Destage         RE EDIT VEW PROSECT mann change TAM TOOLS TEST WEDOW HEP         Implant Destages - Indowes Destage         Implant Destages - Indowes         Implant Destages - Indowes         Implant Destages - Indowes         Implant Destages - Indowes         I
On the next screen under Settings, check the values match below. Cadence = 50/20 Cattle = 0.5 Cycles = 2 Sheep = 0.75 Under USB Connections:- TIU = DAXO3L45 Scope = Cleverscope Open	Settings     TX Ref A/m       Cadence     ©/20       Cattle     0.5       USB Connections     USB Connections       TIU     DAXX03L45       TIU     DAXX03L45       Scope     Cleverscope Open       Start     Single       A/m     1.0
Click Transmit Calibration. Text will appear in the box to the right ending with Calibration Complete.	Test and Calibration Transmit Calibration
The program is now ready to start testing.	DAC= 60500: MagFlux=48.4844064796417A/m DAC= 61500: MagFlux=49.4878279945833A/m DAC= 61500: MagFlux=42.0053897249885A/m DAC= 62500: MagFlux=45.7613895988907A/m DAC= 62500: MagFlux=45.7613895988907A/m DAC= 62500: MagFlux=49.4878279945833A/m DAC= 62500: MagFlux=52.7168838250439A/m Calibration Complete



# 8. Reference Transponders





Scroll along the spreadsheet tabs at the bottom of the page and click on <b>RefTag1</b>	Merecer Try breg X9-31.div       Normer's Try breg X9-31.div       Inter Try breg X9-31.div       <th colspan="</th>
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Place your first reference tag in the tag holder as shown.	
Adjust the screw sections to ensure the tag is perfectly central both horizontally and vertically and is central to the black markings on the tag holder.	
For round tags that have a hole through the center you may use some card to support the tag in the jig.	
Place the tag holder into the tube on the top of the tag tester taking care not to dislodge the tag. Push the holder down until the stopper aligns up with the markings on the tester.	







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Paste this into the spreadsheet at the top of the page at A4.

Continue this testing for the next 14 reference tags, recording their results into the spreadsheet in the corresponding tabs. i.e. ref tag AU02 results copied into RefTag2.

Save the spreadsheet when you have finished testing all reference tags.

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   | J<br>Tab<br>ComoCBC    | K<br>-0.2<br>-0.2  | L.                       | M<br>0.4<br>0.4  | N<br>2.8<br>2.7   
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| c         1         c+c+i         1 <th1< th=""> <th1< th=""> <th1< th=""> <th< td=""><td>A<br/>1<br/>2<br/>3 Startio</td><td>B<br/>Tag Tested.<br/>Temperature<br/>2 1 0.637<br/>2 1 0.740<br/>2 1 0.795</td><td>C<br/>Ensure<br/>N/A (See su<br/>RX(m)(op)<br/>96.4<br/>106.8<br/>112.2</td><td>D<br/>Anima<br/>mmary tab)<br/>Frea 8<br/>134 01<br/>134<br/>133 99<br/>133 99</td><td>E<br/>124.57<br/>124.57<br/>124.57<br/>124.57</td><td>F<br/>ction is<br/>100<br/>100<br/>100<br/>100<br/>100<br/>100<br/>100<br/>10</td><td>G<br/>made<br/>15 150<br/>298 99<br/>295 99<br/>295 99</td><td>H<br/>on SUM<br/>Taol0 Ta<br/>AAF962896<br/>AAF962896<br/>AAF962896</td><td>IMARY<br/>3 89E3<br/>3 89E3<br/>3 89E3</td><td>J<br/>Tab<br/>ComoCBC</td><td>K<br/>-0.2<br/>-0.2<br/>-0.2</td><td>J1 free</td><td>M<br/>0.4<br/>0.4</td><td>N<br/>2.8<br/>2.7<br/>3</td></th<></th1<></th1<></th1<>   | A<br>1<br>2<br>3 Startio   | B<br>Tag Tested.<br>Temperature<br>2 1 0.637<br>2 1 0.740<br>2 1 0.795  
   
   | C<br>Ensure<br>N/A (See su<br>RX(m)(op)<br>96.4<br>106.8<br>112.2  | D<br>Anima<br>mmary tab)<br>Frea 8<br>134 01<br>134<br>133 99<br>133 99   | E<br>124.57<br>124.57<br>124.57<br>124.57  
   | F<br>ction is<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>10  | G<br>made<br>15 150<br>298 99<br>295 99<br>295 99   | H<br>on SUM<br>Taol0 Ta<br>AAF962896<br>AAF962896<br>AAF962896   | IMARY<br>3 89E3<br>3 89E3<br>3 89E3  
   | J<br>Tab<br>ComoCBC    | K<br>-0.2<br>-0.2<br>-0.2  | J1 free                  | M<br>0.4<br>0.4  | N<br>2.8<br>2.7<br>3  
  |
| 4         -         2         2         2         2         2         2         3         3         1         -         -         2         2         3         3         1         -         -         2         2         3         3         3         2         2         3         3         3         2         2         2         2         2         3         4         2         1         5         3         3         3         2         2         3         3         3         2         2         3         3         3         3   | A A 1 2 3 Startio  | B<br>Tag Tested:<br>Temperature<br>2 1 0.637<br>2 1 0.740<br>2 1 0.795<br>2 1 0.999   
   
   | C<br>Ensure<br>N/A (See su<br>96.4<br>106.8<br>112.2<br>133.3<br>170.5   | D<br>Anima<br>mmary tab)<br>Frea 8<br>134 01<br>134<br>133 99<br>133 99<br>133 99   | E<br>124.57<br>124.57<br>124.57<br>124.57<br>124.57  
   | F<br>505 150 F<br>309<br>291<br>274<br>239<br>239   | G<br>made<br>15 150<br>296 99<br>289 99<br>295 99<br>280 99   | H<br><b>ON SUN</b><br>Iaol0 Ta<br>AAF962 B96<br>AAF962 B96<br>AAF962 B96<br>AAF962 B96   | 1<br>1MARY<br>3 8953<br>3 8953<br>3 8953<br>3 8953   
   | J<br>Tab<br>ComoCBC    | K<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2  | F1 Inte                  | M<br>0.4<br>0.4<br>0.3   | N<br>2.8<br>2.7<br>3<br>2.7   
  |
| 1         1         1.5.46         1.7.4         1.5.38         1.4.40         1.7.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         1.5.6         1.2.1         2.2.1         2.3.6         1.3.6         1.2.4         2.2.2         2.2.8         2.2.6         2.2.6         2.3.6         0.3         2.3         2.1         2.1.2         1.3.6         1.2.4         2.2.2         2.2.8         2.3.6         2.3.6         0.3         2.3         2.1         2.1.2         1.3.6         1.3.5         1.2.4         2.2.2         2.2.9         2.3.7         2.2.6         0.3         0.3         2.2         2.3.6         2.3.6         0.3         2.3         2.1         3.3.6         1.2.4         2.2.2         2.3.6         0.3         2.3         2.3         2.3.6         2.3.6         2.3.6         2.3.6         2.3.6         2.3.6         2.3.6         2.3.6         2.3.6         2.3.6  | A A 1 2 3 3 3 1 4 1 6 1 6 1 6 1 6 1 6 1 6 1 6 1 6 1 6  | B<br>Tag Tested<br>Temperature<br>2.1 0.637<br>2.1 0.740<br>2.1 0.795<br>2.1 0.999<br>2.1 1.257<br>2.1 1.257  
   
   | C<br>Ensure<br>N/A (See su<br>85(m/00)<br>96.4<br>106.8<br>112.2<br>133.3<br>170.5<br>177.5  | D<br>Anima<br>mmary tab)<br>Free 8<br>134 01<br>134<br>133 99<br>133 99<br>133 97<br>133 97   | E<br>124.57<br>124.57<br>124.57<br>124.57<br>124.55<br>124.51  
   | F<br>505 150<br>509<br>291<br>274<br>239<br>250   | G<br>made<br>15 150<br>296 99<br>289 99<br>295 99<br>280 99<br>280 99<br>210 9  | H<br><b>ON SUN</b><br>Teath Ta<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E   | 1<br>1MARY<br>3 8953<br>3 8953<br>3 8953<br>3 8953<br>3 8953   
   | J<br>Tab<br>ComoCBC    | K<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2  | Film<br>I<br>I<br>I<br>I | M<br>0.4<br>0.4<br>0.3<br>0.3  | N<br>228<br>227<br>3<br>2.7<br>2.8  
  |
| 10         2.1         2.4  | A<br>1<br>2<br>3<br>5<br>5<br>7<br>8<br>9  | B<br>Tag Tested.<br>Temperature<br>apt 10/40/me<br>2.1 0.740<br>2.1 0.740<br>2.1 0.799<br>2.1 1.257<br>2.1 1.551<br>2.1 1.551   
   
   | C<br>Ensure<br>N/A (See su<br>RX(m)(op)<br>96.4<br>106.8<br>112.2<br>133.3<br>170.5<br>177.5   | D<br>Anima<br>Intrary tab)<br>134.01<br>134<br>133.99<br>133.99<br>133.97<br>133.95   | E<br>124.57<br>124.57<br>124.57<br>124.55<br>124.51<br>124.51  
   | F<br>20150<br>309<br>291<br>274<br>239<br>250<br>251<br>251   | G<br>made<br>298 99<br>289 99<br>289 99<br>280 99<br>280 99<br>210 99<br>210 99<br>295 99   | H<br>on SUN<br>AAF962 896<br>AAF962 896<br>AAF962 896<br>AAF962 896<br>AAF962 896<br>AAF962 896  | IMARY<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3  
   | J<br>Tab<br>ComoCBC    | K<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.3  | Fi Im                    | M<br>0.4<br>0.4<br>0.3<br>0.3<br>0.3<br>0.3  | N<br>2.8<br>2.7<br>3<br>2.7<br>2.8<br>2.9   
  |
| 10         21<  | 3<br>A<br>1<br>2<br>3<br>5<br>5<br>7<br>8<br>9<br>0<br>0   | B<br>Tag Tested.<br>Temperature<br>nail 1744<br>21 0.637<br>21 0.740<br>21 0.795<br>21 0.795<br>21 1.257<br>2.1 1.561<br>2.1 1.993<br>2.1 0.446   
   
   | C<br>Ensure<br>N/A (See su<br>8X(m)/00)<br>96.4<br>106.8<br>112.2<br>133.3<br>170.5<br>177.5<br>177.5  | D<br>Anima<br>mmay tab)<br>Frea 0<br>134 01<br>133 99<br>133 99<br>133 97<br>133 95<br>133 95<br>133 95   | E<br>124.57<br>124.57<br>124.57<br>124.55<br>124.51<br>124.51<br>124.51<br>124.51  
   | F<br>20100 is<br>309<br>291<br>274<br>239<br>250<br>251<br>217<br>217   | G<br>made<br>298 99<br>295 99<br>295 99<br>295 99<br>210 99<br>295 99<br>295 99<br>238 99   | H<br>on SUN<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E<br>AAF9E2 B9E  | IMARY<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3  
   | J.<br>Tab<br>ComoCBC   | K<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.3<br>-0.2<br>-0.3<br>-0.2  | Fi Im                    | M<br>0.4<br>0.3<br>0.3<br>0.3<br>0.3<br>0.3  | N<br>2.8<br>2.7<br>3<br>2.7<br>2.7<br>2.8<br>2.9<br>2.9<br>2.9  
  |
| 1         1         4420         1158         124.4         250         247         990000         980000         980000         980000         980000         980000         980000         980000         980000         980000         980000         980000         980000         980000         9800000         9800000         9800000         9800000         9800000         98000000         98000000         9800000000         980000000000000000000         98000000000000000000000000000000000000   | A<br>1<br>2<br>3 Startin<br>4<br>5<br>5<br>5<br>7<br>7<br>8<br>9<br>0<br>0   | B<br>Tag Tested:<br>Temperature<br>1704/microsoft<br>2.1 0.637<br>2.1 0.795<br>2.1 0.795<br>2.1 1.257<br>2.1 1.561<br>2.1 1.993<br>2.1 2.462  
   
   | C<br>Ensure<br>N/A (See su<br>8X(9)(00)<br>96.4<br>106.8<br>112.2<br>133.3<br>170.5<br>177.5<br>176.9<br>177.4<br>176.9  | D<br>Anima<br>mmary (ab)<br>134.01<br>133.99<br>133.97<br>133.95<br>133.95<br>133.95  | E<br>124.57<br>124.57<br>124.57<br>124.55<br>124.51<br>124.51<br>124.5<br>124.5<br>124.5   
   | F<br>505 150<br>291<br>274<br>239<br>250<br>251<br>217<br>199<br>199  | G<br>made<br>298 99<br>295 99<br>295 99<br>295 99<br>295 99<br>295 99<br>295 99<br>295 99<br>295 99<br>238 99   | H<br><b>ON SUN</b><br>Taol0 Tao<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E  | IMARY<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3  
   | J<br>Tab<br>CompCBC    | K<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02<br>-03<br>-02<br>-03<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02<br>-02  | Ft from                  | M<br>0.4<br>0.4<br>0.4<br>0.4<br>0.3<br>0.3<br>0.3<br>0.3<br>0.3<br>0.3<br>0.3<br>0.3<br>0.3   | N<br>2.8<br>2.7<br>3<br>2.7<br>2.8<br>2.9<br>2.9<br>2.9<br>2.9  
  |
| S         1         6         6         11         6         13         12         5         23         25         25           0         2         1         6         10         10         3         24         25   | A<br>1<br>2<br>3 Startin<br>4<br>5<br>5<br>7<br>7<br>8<br>8<br>9<br>0<br>1<br>1<br>2<br>2  | B<br>Tag Tested:<br>Temperature<br>nal TEX/minus<br>2.1 0.637<br>2.1 0.795<br>2.1 0.795<br>2.1 0.795<br>2.1 1.257<br>2.1 1.561<br>2.1 1.993<br>2.1 2.446<br>2.1 3.103<br>2.1 2.446  
   
   | C<br>Ensure<br>N/A (See su<br>RX(mVo)<br>96.4<br>106.8<br>112.2<br>133.3<br>170.5<br>177.5<br>177.5<br>176.9<br>177.4<br>176.7<br>176.7  | D<br>Anima<br>mmary tab)<br>free 8<br>134 01<br>133 99<br>133 99<br>133 97<br>133 95<br>133 96<br>133 96<br>133 96  | E<br>124.57<br>124.57<br>124.57<br>124.55<br>124.51<br>124.51<br>124.51<br>124.51<br>124.5<br>124.9<br>124.5   
   | F<br>505 130 F<br>505 130 F<br>309<br>291<br>274<br>239<br>250<br>251<br>217<br>199<br>212<br>220   | G<br>made<br>298 99<br>295 99<br>295 99<br>280 99<br>280 99<br>280 99<br>210 99<br>295 99<br>218 99<br>195 99<br>249 99   | H<br><b>on SUN</b><br>Taol0 Ta<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E<br>AAF962 B9E   | IMARY<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3<br>3 89E3  
   | J<br>Tab<br>ComeCBC    | K<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.3<br>-0.2<br>-0.3<br>-0.2<br>-0.3<br>-0.2<br>-0.3<br>-0.2<br>-0.3<br>-0.2<br>-0.3<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2<br>-0.2  | Pt Im                    | M<br>04<br>04<br>04<br>03<br>03<br>03<br>03<br>03<br>03<br>03<br>03<br>03<br>03<br>03<br>03<br>03  | N<br>2.8<br>2.7<br>3<br>2.7<br>2.8<br>2.9<br>2.9<br>2.9<br>2.9<br>2.9<br>2.9<br>2.9   
  |
0         2.1         7.66         17.5         13.4         7.24         2.9	A 1 2 5 5 7 8 9 9 0 0 1 1 2 2 3	B Tag Tested: Temperature al TXA/mirms 2 1 0.637 2 1 0.740 2 1 0.795 2 1 0.795 2 1 1.257 2 1 1.561 2 1 1.993 2 1 2.446 2 1 3.103 2 1 3.993 2 1 4.992	C Ensure N/A (See su Rt/mVtol) 96.4 106.8 112.2 133.3 170.5 177.5 176.9 177.4 176.7 176.5 176.5 176.5	D Anima mmay tab) rea9. 134.01 133.99 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95	E 124.57 124.57 124.57 124.57 124.51 124.51 124.51 124.51 124.49 124.5 124.49 124.5	F 201 100 is 309 291 274 239 250 251 217 199 212 230	G made 288 99 285 99 285 99 280 99 280 99 280 99 280 99 285 99 249 99 249 99 249 99 247 99	H <b>on SUN</b> Tast0 Tas AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E AAF962 B9E	IMARY 3 8953 3 8953 8 8953	J Tab CompCBC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2	Pi Im	M 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 2.7 3 2.7 2.8 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
17         2.1         19.84         11.3         10.34         12.4         2.5         2.55         98.44         PEC         0.3         0.3         2.4           16         2.1         12.44         17.65         13.34         12.44         2.16         2.55         9.65         9.64         1.65         1.03         0.3         2.4           17         2.1         12.74         17.64         13.34         12.4.49         2.16         2.25         9.64         PECE         0.3         0.3         2.4           19         2.1         12.762         17.64         13.34         12.44         2.16         2.27         9.64         0.3         0.3         2.9           12         12         2.0562         17.7         13.35         12.4.49         2.16         2.27         9.94         9.62         0.3         0.3         2.9           12         12         15.16         17.17         13.35         12.4.49         2.10         2.47         9.94         9.62         0.3         0.3         2.6           12         13         17.16         17.17         13.33         12.4.49         2.40         2.47         2.47         3.	A 1 2 3 3 3 4 5 5 5 7 7 8 9 9 0 1 1 2 2 3 3 4 4 5	B Tag Tested: Temperature al 10/4/mbras 21 0.637 21 0.740 21 0.740 21 0.740 21 1.257 21 1.561 21 1.993 21 2.466 2.1 3.103 21 2.466 2.1 3.103 2.1 2.1 0.103 2.1 2.1 0.103 2.1	C Ensure N/A (See su BK(myon) 86.4 106.8 112.2 133.3 170.5 177.5 176.9 177.4 177.4 176.5 176.5 176.5 176.5	D Anima mmay tab) free 0 134 01 133 99 133 99 133 95 133 95 133 95 133 95 133 95 133 95 133 95	E 124.57 124.57 124.57 124.57 124.51 124.51 124.51 124.51 124.5 124.5 124.5 124.5 124.5	F 20100 is 20100 is 201 201 201 201 201 201 201 201	G made 256 99 265 99 265 99 270 99 270 99 276 99 278 99 278 99 269 99 249 99 249 99 249 99 247 99 247 99	H on SUN Tadio Tad AAF962895 AAF962895 AAF962895 AAF962895 AAF962895 AAF962895 AAF962895 AAF962895 AAF962895 AAF962895 AAF962895	IMARY 3 8963 3 8963 8 8963	J Tab CemoCBC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3	Pi Im	M 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 228 227 23 27 28 29 29 27 28 29 29 27 28 29 29 27 28 29 29 20
0         2         1         254         1755         1335         124.49         216         225 594.478258821         BBE3         0.3         0.3         2.4           0         2         1         15722         117554         13354         124.49         216         225 594.478258821         BBE3         0.3         0.3         2.4           0         2         1         15722         11535         124.49         216         225 594.478258821         BBE3         0.3         0.3         2.5           12         1         25065         1152         13355         124.49         226         242         944.478258821         BBE3         0.3         0.3         2.5           12         1         25065         1151         1335         124.49         210         247 994.478258821         BBE3         0.3         0.3         2.5           2         1         3150         1751         1335         124.49         210         247 994.478258821         BBE3         0.3         0.3         2.5           2         1         3150         1751         1335         124.49         240         24994.478258821         BBE3         0.3         0.3	A 1 3 5 5 5 7 8 9 0 1 1 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	B Tag Tested: Temperature autority for the first 2 1 0 637 2 1 0 740 2 1 0 740 2 1 0 740 2 1 1 257 2 1	C Ensure N/A (See su 8Km/yoo) 96.4 106.8 112.2 133.3 177.5 176.9 177.5 176.9 177.4 176.7 176.5 176.9 177.6 5 176.5 176.5	D Anima Free 9 134.01 133.99 133.97 133.95 133.95 133.96 133.96 133.95 133.95 133.95 133.95	E 124.57 124.57 124.57 124.57 124.55 124.51 124.55 124.51 124.5 124.49 124.5 124.49 124.5 124.49 124.5 12	F 500 130	G made 298 99 289 99 247 99 247 99 247 99 247 99 247 99	H on SUN AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E AAP92209E	IMARY 3 B9E3 3 B9E3	J Tab CemoCBC	K -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3	Pi Im	M 04 014 014 004 004 004 003 003 003 003 003 003 00	N 2.8 2.7 3 2.7 2.8 2.9 2.7 2.8 2.9 2.7 2.8 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
19         2.1         16.722         17.4         13.34         13.44         2.16         2.27         PRAAPREDRED         DRE1         -0.3         0.3         2.9           10         2.1         20.65         17.62         13.65         12.46         2.06         2.1         20.65         17.62         13.03         2.9           11         2.1         26.062         17.47         13.35         12.44         2.10         2.47         98.47         98.20         0.3         0.3         2.0           12         2.1         35.66         17.47         13.35         12.44         2.10         2.47         98.47         98.20         98.3         0.3         2.0         2.1           12         13.15         17.14         13.44         2.44         2.09         98.47         98.20         0.3         0.3         2.0           12         13.16         17.41         13.33         12.44         2.44         2.09         98.47         98.20         0.3         0.3         2.1           12         14         19.17         13.33         12.44         2.00         2.02         2.44         2.01         3.0         3         2.1	A A Starting Starting A Startino A St	B Tag Tested. Temperature. 10.1073/21 0.740 21 0.745 21 0.745 21 0.745 21 1.561 21 1.561 21 1.561 21 1.993 21 2.446 2.1 3.103 2.1 3.893 2.1 4.923 2.1 6.159 2.1 7.655 2.1 0.654	C Ensure N/A (See su 8KmV00) 96.4 106.8 112.2 133.3 170.5 177.5 176.9 177.4 176.7 176.5 176.5 176.5 176.5 176.5 176.8	D Anima mmay tab) free 0 134 01 133 99 133 95 133 95 133 95 133 95 133 95 133 95 133 95 133 95 133 95	E 124.57 124.57 124.55 124.55 124.51 124.51 124.5 124.5 124.5 124.4 124.5 124.4 124.5 124.4 124.5 124.5 124.4 124.5 124.	F 309 291 274 239 251 217 199 212 230 238 254 238 256	G made 298 99 295 99 205 99 210 99 210 99 210 99 210 99 249 99 249 99 249 99 247 99 247 99 247 99 247 99 247 99 250 99 247 99 250 99	H on SUN Tacillo Tac AAF952 895 AAF952 895	IMARY 3 B9E3 3 B9E3	J. Tab ComoCiliC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3	Ft Free	M 04 04 03 03 03 03 03 03 03 03 03 03 03 03 03	N 2.8 3 2.7 2.9 2.9 2.9 2.9 2.8 2.8 2.8 2.8 2.9 2.9 2.8 2.8 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
B         2.1         2005         1752         1735         174.4         20         242         2694/478CBBE3         DBL5         0.3         0.3         2.5           1         2.005         17752         17354         174.44         200         247         994/478CBBE3         982.5         0.3         0.3         2.5           1         2.1         2.006         1751         133.45         124.44         210         247         994/478CBBE3         982.3         0.3         0.3         2.5           2         1         3160         1751         133.35         124.44         240         994/478CBBE3         982.3         0.3         0.3         2.5           2         1         3160         1751         133.35         124.44         240         994/478CBBE3         982.3         0.3         0.3         2.5           2         1         3164         174.44         240         994/478CBBE3         982.3         -0.3         0.3         2.5           2         1         4164         174.5         133         124.49         200         201         994/97         992.9         -0.3         0.3         2.3           2	A 1 3 5 5 7 8 9 0 0 1 1 2 3 3 4 5 5 6 7 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9	B Tag Tested: Temperature: au 1760/ntms 21 0.740 21 0.740 21 0.745 21 0.745 21 0.745 21 1.257 21 1.257 21 1.256 21 2.46 21 2.46 2.46 2.46 2.46 2.46 2.46 2.46 2.46	C Ensure NA (See su BK(myor) 95.4 106.8 112.2 133.3 170.5 177.5 177.5 177.9 177.4 176.7 176.5 176.9 176.5 176.8 176.5 176.3 176.5 176.3 176.5 176.3 176.5	D Anima mmay tab) read 134.01 133.99 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95	E 124.57 124.57 124.57 124.57 124.57 124.51 124.51 124.5	F 5 150 is 309 291 274 239 250 251 199 212 230 239 238 254 254 254 254	G made 236 99 286 99 286 99 286 99 286 99 286 99 285 99 249 99 249 99 249 99 247 99 247 99 249 99 255 99 255 255 9	H on SUN AAF962 B96 AAF962 B96	IMARY IMARY IMARY IBS IBS IBS IBS IBS IBS IBS IBS	J. Tab ComoCBC	K -0.2 -0.2 -0.2 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3	11 for	M 0.4 0.4 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 2.8 2.7 3 2.7 2.8 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
11         2.1         25.862         17.47         133.44         124.46         210         227 PRAAFREDRED         DREJ         -0.3         0.3         2.4           2         2.1         35.864         17.47         133.56         124.46         221         224         234.9762.000         0.3         2.4         236         24.47         236         0.3         0.3         2.4           22         2.1         35.866         17.47         133.33         124.48         2.44         286         29AAFREDRED         DREJ         -0.3         0.3         2.4           2.1         43.966         17.47         133.33         124.48         2.44         286         9AAFREDRED         DREJ         -0.3         0.3         2.4           2.1         43.96         17.46         133.3         124.49         2.40         286         9AAFREDREDRED         DREJ         -0.3         0.3         2.5           2.1         45.96         17.46         13.33         124.49         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40         2.40	A 3 5 5 7 7 8 9 9 0 0 1 2 2 3 4 5 5 5 7 7 8 9 9 9 0 0 1 1 2 2 3 4 5 5 5 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9	B Tag Tested: Temperature 2.1 0.637 2.1 0.740 2.1 0.740 2.1 0.755 2.1 0.999 2.1 1257 2.1 1.951 2.1 1.951 2.1 2.446 2.1 3.103 2.1 3.893 2.1 4.923 2.1 6.92 2.1 7.695 2.1 7.695 2.1 9.948 2.1 9.948 2.1 9.948 2.1 9.948 2.1 9.765 2.1 9.948 2.1 9.765 2.1 9.755 2.1 9.7555 2.1 9.7555555555555555555555555555555555555	C Ensure Bitmon 95.4 106.8 1122 133.3 170.5 177.5 176.9 177.5 176.9 177.5 176.9 177.5 176.9 177.6 176.5 176.8 176.5 176.8 176.5 176.5 176.5	D Anima mmay tab) 134 01 133 99 133 99 133 95 133 95	E 124.57 124.57 124.57 124.51 124.51 124.51 124.51 124.49 124.5 124.49 124.5 124.49 124.5 124.49 124.5 124.49 124.5 124.49	F 500 100 100 100 1	G made 296 99 295 99 295 99 295 99 295 99 295 99 249 99 249 99 247 99 256 99 247 99 255 99 255 99 255 99 255 99 255 99	H on SUN Taol0 Tao AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395 AAF962395	IMARY IMARY IMARY ISBE ISB	J. Tab ComoCiliC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.2 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3 -0.3	P. Im	M or cise(my 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 2.6 3 2.7 3.2 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2
22         2.1         31.510         17.51         33.95         12.4.4         217         223.994A49E2B9E3         BEE3         0.3         0.3         2.2           23         1.3         34.64         71.47         73.33         12.4.45         244         240.994A49E2B9E3         BEE3         -0.3         0.3         2.5           2.1         4.910         71.65         73.03         72.44         2.24         220.994A9E2B9E3         BEE3         -0.3         0.3         2.5           2.1         4.910         71.65         73.03         72.44         2.20         2.29494762B9E3         BEE3         -0.3         0.3         2.5	A 1 2 3 5 5 5 7 7 8 9 9 0 1 1 2 2 3 4 4 5 6 6 7 7 8 8 9 9 0 1	B Temperature and Totanumer 2 1 0.637 2 1 0.740 2 1 0.755 2 1 0.755 2 1 0.572 2 1 1.551 2 1 1.551 2 1 1.551 2 1 2.466 2 1 3.033 2 1 2.466 2 1 3.033 2 1 4.923 2 1 6.159 2 1 2.566 2 1 9.948 2 1 1.257 2 1 1.572 2 1 9.04 2 1 1.572 2 1 2.566 2 1 2.5667 2 1 2.56677 2 1 2.56677 2 1 2.56677 2 1 2.566777 2 1 2.56677777777777777777777777777777777777	C Ensure 88(m/op) 96.4 106.8 112.2 133.3 170.5 177.5 177.5 177.5 177.6 177.4 176.5 176.5 176.5 176.8 176.5 176.8 176.5 176.8 176.5 176.8 176.5 176.8	D Anima mmay tab) frea 9 134 01 133 99 133 97 133 95 133 96 133 96 133 95 133 95 133 94 133 94 133 94 133 94	E Ten 1 124.57 124.57 124.57 124.55 124.55 124.51 124.5 124.49 124.5	E 100 is 20100 is 2010 is 2	G made 298 99 295 99 295 99 296 99 209 99 210 99 210 99 210 99 210 99 249 99 249 99 249 99 249 99 247 99 250 99 244 99 255 99 255 99 244 99 255 99 247 99 247 99 247 99	H and tar AAF962 895 AAF962 895	IMARY IMARY Sec 3 B9E3 3 B	J Tab CempCBC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.	Pi Im	M 0.4 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 2.6 2.7 3 2.7 2.6 2.9 2.9 2.9 2.9 2.9 2.8 2.9 2.9 2.8 2.9 2.9 2.9 2.8 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
3         2.1         39.646         174.7         133.93         124.49         244         280.99AAF9E2B9E3         09E3         -0.3         0.3         2.9           2         2.1         49.199         174.5         133.93         124.49         250         262.99AAF9E2B9E3         09E3         -0.3         0.3         2.9           4         2.1         49.199         174.5         133.93         124.49         250         262.99AAF9E2B9E3         09E3         -0.3         0.3         3	A 1 2 3 5 5 5 7 8 8 9 0 0 1 2 3 5 5 5 5 5 7 7 8 8 9 0 0 1 1 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5	B Tag Tested: Temperature: 0.1 156/mt/merature: 0.1 156/mt/merature: 0.1 0.785 2.1 0.785 2.1 0.785 2.1 0.989 2.1 1.581 2.1 1.983 2.1 2.446 2.1 3.103 2.1 4.923 2.1 4.923 2.1 6.169 2.1 7.685 2.1 9.848 2.1 15.72 2.1 2.544 2.1 15.744 2.1 15.7444 2.1 15.7444 2.1 15.7444 2.1 15.7444 2.1 15.7444 2.1 15.74444 2.1 15.74444 2.1 15.7444444444444444444444444444444444444	C Ensure 88(m)(00,4) 96,4 106,8 112,2 133,3 170,5 177,5 176,9 177,4 176,5 176,	D Anima mmay tab) Free 8 134 011 134 9 133 99 133 95 133 94 133 94 133 94 133 94	E 124.57 124.57 124.57 124.57 124.51 124.51 124.51 124.5 124.49 124.5 124.5 124.49 124.5 124.49 124.5 124.4 124.5 124.4 124.5 124.4 124.5 124.4 124.5 124.4 124.5 124.4 124.5 124	F 2015 2015 2015 2017 2018 20	G made 288 99 289 99 289 99 289 99 289 99 289 99 289 99 289 99 249 99 247 99 247 99 255 99 245 99 255 99 244 99 255 99 242 99 242 99	H an SUN Tauto	IMARY 3 B9E3 3 B9E3	J Tab Cempt BT	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2	Fi for	M 0.4 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 2.6 2.7 3 2.7 2.7 2.7 2.7 2.7 2.6 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
24 2.1 49 109 174.5 133.93 124.49 250 262 99AAF9628963 B963 -0.3 0.3 3	A 1 2 3 5 5 7 7 8 9 9 0 0 1 1 2 3 4 5 6 6 7 7 8 9 9 9 9 0 0 1 1 2 3 4 5 6 6 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9	B Tag Tested: Temperature: all Totamber 2.1 0.637 2.1 0.785 2.1 0.785 2.1 0.592 2.1 1.561 2.1 1.561 2.1 2.464 2.1 3.103 2.1 2.464 2.1 3.103 2.1 4.923 2.1 4.923 2.1 4.924 2.1 1.550 2.1 9.948 2.1 1.250 2.1 2.005 2.1 2.005 2.	C Ensure RtmVool 96.4 106.8 1112.2 133.3 170.5 177.5 176.9 177.4 176.7 176.5 176.9 177.4 176.5 176.8 176.5 176.8 176.5 176.4 176	D Anima mmary tab) fread 134.01 134.01 133.99 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.94 133.94 133.94 133.94	E 124.57 124.57 124.57 124.55 124.51 124.55 124.51 124.5 124	E 105 150 E 100 E	G made 286 99 289 99 289 99 289 99 289 99 289 99 289 99 249 99 249 99 249 99 245 99 245 99 245 99 245 99 245 99 255 99 245 99 255 99 245 99 247 99 247 99 247 99 247 99	H and the second secon	IMARY 3 B963 3 B963	J Tab ConstBC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.	11 Iou	M 0 04 0 4 0 3 0 3 0 3 0 3 0 3 0 3 0 3 0 3	N 4mm 327 327 26 29 29 29 29 29 29 29 29 29 29
2 2 1 12 10 11 12 10 10 10 10 10 10 10 10 10 10 10 10 10	A 1 2 3 4 5 5 7 8 9 9 1 1 2 2 3 4 4 5 5 5 7 8 9 9 10 11 12 2 2 3 3 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	B Tag Tosted: Temperature 1760/00/000 21 0 0637 21 0 0637 21 0 740 21 0 740 21 0 740 21 0 740 21 0 740 21 0 740 21 1 254 21 244 21 383 21 4 923 21 6 169 21 7 695 21 7 695 21 7 695 21 7 695 21 1 572 21 2504 21 1 572 21 2 504 21 504 21 2 504 21 504 21 505 21	C Ensure Bitmono Bitmono 105 a 105 a 105 a 107 5 177.5 177.5 177.5 177.5 176.5	D Anima mmay tab) free 8 134 01 134 01 133 99 133 99 133 95 133 95 133 95 133 95 133 94 133 94 133 94 133 94 133 94 133 94 133 94	E 124.57 124.57 124.57 124.57 124.51 124.51 124.51 124.51 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49	F 201 150 1 309 291 291 239 251 217 239 212 239 239 239 239 239 239 239 23	G made 289 99 289 99 289 99 280 99 280 99 280 99 280 99 280 99 280 99 248 99 247 99 247 99 244 99 247 99 244 99 247 99 249 99 247 99 249 99 24	H AAF952 B95 AAF952 B95	IMARY 3 B963 3 B963	J Tab Canaf BC	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.		M or clasting 0.4 0.4 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	N 2.8 2.7 3 2.7 2.8 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9 2.9
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	A 1 2 3 5 4 5 5 7 8 9 9 0 0 1 2 2 3 4 4 5 5 7 7 8 9 9 0 0 1 2 2 3 3 4 4 5 5 7 7 8 9 9 9 0 0 1 1 2 2 3 3 4 4 5 5 7 7 8 8 9 9 0 0 1 1 1 2 2 3 3 3 1 2 2 3 3 3 1 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3	B           Tag Tested:           Temperature:           176/mtrms           21         0.617           21         0.617           21         0.517           21         0.517           21         0.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.517           21         1.512           21         1.512           21         1.512           21         1.512           21         1.512           21         1.512           21         1.512           21         2.0152           21         2.0152           21         2.0152           21         2.0152           21         2.0152           21         2.0152           21         2.0152 </td <td>C Ensure Biomono Biomo</td> <td>D Anima mmay tab) frees. 134.01 133.95 133.95 133.96 133.96 133.96 133.96 133.96 133.96 133.96 133.95 133.94 133.94 133.94 133.94 133.94 133.94 133.95 133.95 133.95 133.95</td> <td>E 124.57 124.57 124.57 124.51 124.51 124.51 124.51 124.51 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49</td> <td>F ction is 309 291 274 230 251 199 212 230 238 254 238 254 238 244 236 217 212 238 244 238 214 238 214 239 238 244 230 239 244 230 230 244 230 230 244 230 230 244 230 244 230 230 230 244 230 230 244 230 230 231 244 230 230 230 231 244 230 238 244 236 244 236 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 244 238 244 238 244 244 244 244 244 244 244 24</td> <td>G made 286 99 285 99 280 99 280 99 280 99 285 99 285 99 249 99 249 99 247 99 255 99 242 99 255 99 244 99 255 99 244 99 244 99 245 99 244 99 244 99 245 99 246 99 247 9</td> <td>H <b>International State</b> AAF9623052 AAF9</td> <td>IMARY 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 4 B9E3</td> <td>J Tab Concilit</td> <td>K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.</td> <td></td> <td>M 04 014 004 04 02 03 03 03 00 03 00 000 0</td> <td>N 201 27 3 27 29 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20</td>	C Ensure Biomono Biomo	D Anima mmay tab) frees. 134.01 133.95 133.95 133.96 133.96 133.96 133.96 133.96 133.96 133.96 133.95 133.94 133.94 133.94 133.94 133.94 133.94 133.95 133.95 133.95 133.95	E 124.57 124.57 124.57 124.51 124.51 124.51 124.51 124.51 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49 124.49	F ction is 309 291 274 230 251 199 212 230 238 254 238 254 238 244 236 217 212 238 244 238 214 238 214 239 238 244 230 239 244 230 230 244 230 230 244 230 230 244 230 244 230 230 230 244 230 230 244 230 230 231 244 230 230 230 231 244 230 238 244 236 244 236 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 238 244 244 238 244 238 244 244 244 244 244 244 244 24	G made 286 99 285 99 280 99 280 99 280 99 285 99 285 99 249 99 249 99 247 99 255 99 242 99 255 99 244 99 255 99 244 99 244 99 245 99 244 99 244 99 245 99 246 99 247 9	H <b>International State</b> AAF9623052 AAF9	IMARY 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 3 B9E3 4 B9E3	J Tab Concilit	K -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.3 -0.		M 04 014 004 04 02 03 03 03 00 03 00 000 0	N 201 27 3 27 29 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20
77	A 1 2 3 4 5 5 5 7 8 9 9 0 1 1 2 2 3 4 5 5 5 5 7 7 8 9 9 0 0 1 1 2 2 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	B           Tag Tested           Temperature           121           0.617           21           0.172           1.172           1.172           1.172           1.172           1.172           1.172           1.172           1.172           1.172           1.122	C Ensure NA (5ee su 8000) 95.4 106.8 1102.2 133.3 170.5 177.5 176.9 177.4 176.7 176.5 176.8 176.5 176.8 176.5 176.8 176.5 176.	D Anima mmary tab) Free 9 134.01 134 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.95 133.94 133.94 133.94 133.94 133.94 133.94 133.94 133.95 133.95 133.95	E 124.57 124.57 124.57 124.57 124.51 124.5 124.4 9 124.5 124.4 9	F 309 309 291 274 239 250 251 251 259 239 238 238 238 216 239 238 216 218 216 228 216 217 239 239 238 216 217 239 239 239 239 239 239 239 249 250 251 251 251 251 251 251 251 251	G made 11150 298 99 285 99 285 99 285 99 285 99 249 99 247 99 247 99 244 99 247 99 244 99 247 99 244 99 247 99 244 99 247 99 244 99 247 99 249	H on SUN Jaco AAP 92: 309: AAP 92: 309:	IMARY 3 B9E3 3 B9E3	J Tab	K 02 02 02 02 02 02 02 02 02 03 03 03 03 03 03 03 03 03 03		M. 0.4 0.4 0.4 0.4 0.4 0.0 0.4 0.0 0.3 0.0 0.0	N 201 3 27 3 27 20 29 29 29 29 29 29 29 29 29 29 29 29 29

NOTE: You will probably be testing more than one set of tags. Determine how many sets of tags you will be testing then make a copy of the spreadsheet for every set.

If you are going to be testing both CATTLE and SHEEP tags, finish one type **BEFORE** moving on to the other.

# 9. Tag Test

### Instruction

### Example

Randomly remove 15 tags from the bag of tags under test. If the tags of one type have different colours, there should be some direction from the organization requesting the testing as to what to do. For example, either randomly select from the entire batch, or treat as two different tag types. If the organisation requesting the testing has not specified how to deal with the different colours, seek clarification from them before testing.

NOTE: The customer should have supplied at least 50 tags for each set. We only need to test 15. If less than 50 tags have been supplied, put the quantity received in the Summary Tab of the spreadsheet.

Using a fine point sharpie, give each tag a code consisting of 2 letters followed by 2 numbers (always 01-15). i.e. BP01, BP02, BP03 up to BP15. The last code used will have a report under Z:\Customers\NLIS\TagTesting\Test Results\As sent, however also check Z:\Customers\NLIS\TagTesting\Test Results\Working Copies, in case someone forgot to transfer the last results to the "as sent" folder.

The letters used will always follow the last set of tags tested and will go in the order of AA, AB, AC, AD, AE, etc up to AZ then onto BA, BB, BC etc (when the 2nd letter reaches Z, the 1st letter will change to the next letter in the alphabet).

Before testing each tag in the Tag Tester, take a reading of each tag using the Bluestick reader and transfer the data into the spreadsheet.



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The DATAMARS program will open automatically when you plug in the USB. Click <b>NO</b> on the pop up box asking if you want to back up Bluestick.	Image: Contraction Matrix         Provide         Read reading session         Write equivalences         Provide         Image: Contraction Matrix         Read reading session         Write equivalences         Image: Contraction Matrix
Click on the picture of the reader in the center which will highlight <b>Read</b> <b>reading session.</b>	Vill Rader Cardyorden Hajs Read requivalences Read reading ses on Write equivalences Write procedure Write procedure Write procedure
A screen will open showing all the files on the reader. Double click on the latest file to open it. You may need to expand the selection so you can view the date and time.	Copen         Controls         Image: Size Iten type and modified an



Rename the file with the relevant code used on the tags followed by READ i.e. <b>BQ READ</b> <b>SAVE</b> in Z\Customers\NLIS\Tag Testing\Test Results\Working Copies	Sove Sove Sove Sove Sove AULACI BK read 29-9.txt BK READ 29-9.txt BK READ 29-9.txt BM READ 29
Click YES on the next pop up box that a	isks if you want to erase the data on the Bluestick.
Click <b>OK</b> on next pop up box to finish.	
Click <b>CANCEL</b> on the next pop up box.	
The saved files will open. Check there are 15 readings in total. NOTE: The lines of text should begin with numbers and not a letter i.e. [8000etc] not [A000etc]. If this begins with a letter check the settings in DATAMARS. Highlight the files and copy.	BK read 8-10 - Notepad       -       ×         File Edit Format View Help       [8000F1003C144648] 08102014 [1233]       ^         [8000F1003C144638] 08102014 [1233]       [8000F1003C144638] 08102014 [1234]       ^         [8000F1003C144636] 08102014 [1234]       [8000F1003C144638] 08102014 [1234]       ^         [8000F1003C144638] 08102014 [1234]       [8000F1003C144658] 08102014 [1234]       ^         [8000F1003C144658] 08102014 [1234]       [8000F1003C144658] 08102014 [1234]       ^         [8000F1003C144658] 08102014 [1234]       [8000F1003C144658] 08102014 [1234]       ^         [8000F1003C144658] 08102014 [1234]       [8000F1003C144657] 08102014 [1234]       ^         [8000F1003C144657] 08102014 [1234]       [8000F1003C144657] 08102014 [1234]       ^         [8000F1003C144657] 08102014 [1234]       [8000F1003C144657] 08102014 [1234]       ^         [8000F1003C144657] 08102014 [1234]       [8000F1003C144657] 08102014 [1234]       ^
In the spreadsheet, click on the <b>TagCodeImport</b> tab at the bottom. Click in this cell (to the right of the blue shaded cells), and press <b>Ctrl</b> and <b>V</b> to paste the data into the spreadsheet.	K (as used for fine tuning the procedure) 2 - Microsoft Excel         Were         Were         Note: Page Layout Formulas         Data Review         Part         Sort all         Sort all         Part         Concertainty Sort all         Part         Part         Part       Sort all         Part       Sort all         Part       Concertainty Sort all         Tage codes as read by a reader:         Boot flags inder test         Boot flags inder test         Boot flags inder test         Boot flags inder test



The data just pasted has too much information. A subset needs to be copy-pasted as follows: For each tag ID, copy and paste the first set of numbers to the adjacent blue cell, like with this example.	Top under tag         Description         Description           Top under tag         Description         Description         Description         Description           Top under tag
The set of 15 tags can now be tested in	the lag lester in the same way that you tested the reference tags.
Copy the graph and data results from each tag into the spreadsheet in the corresponding tab starting at <b>Tag1</b> tab.	87       Frequency Error - Logical One Average Frequency (Worst Case)       0.4         90       Result       PASS         91       93       Receive signal strength and Frequency Demodulation         95       140       Freq Stability         96       Freq Stability       0.4         97       Freq Stability       0.4         98       140       Freq Stability         99       140       Freq Stability         140       Freq Stability       0.4         141       Freq Stability       0.4         142       Treng Stability       0.4         143       Treng Stability       0.4         144       Treng Stability       0.4         145       Time(ms)       100         146       Time(ms)       10         147       Tips / Taps /
<ul> <li>When you have completed the testing for all 15 tags and entered the results into the spreadsheet, click on the SUMMARY tab.</li> <li>All of the blue highlighted areas need to be completed.</li> <li>In Product Under Test, enter the identification information for the tags, as per what is on the bag they were supplied in.</li> <li>If anything out of the ordinary was</li> </ul>	A     B     C     D     E     P     G     H       1     Annex A: Laboratory and Field Test Procedure     Image: Control of the field Test Procedure       2     Reced the following information:     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure       3     Reced the following information:     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure       4     Product Under Test:     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure       6     Product Under Test:     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure       9     Permit two Control of the field Test Procedure     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure     Image: Control of the field Test Procedure       10     Date of testing test (triange: Control of testing Testinge: Control of testinge: Cont
noticed, enter a comment under "Tester's Comments (if Applicable)".	Boot         Boot <th< td=""></th<>







Place the label inside the bag of tags along with the data tables you printed previously.	Click on the <b>Label for Bag</b> tab. Print a copy of the label.	Label to Print and Put in Bag with the Tags:	DE	F	G	Н	I	J	K	L	M	N
	Place the label inside the bag of tags along with the data tables you printed previously.	Property of HLS:         State carefulty:           6         Tag Description:         MULTITRONIC           7         Type of Tag:         SHEEP           8         Date Tested:         30/09/2014           9         Code Assigned:         BQ           11         Code Assigned:         BQ           12         File         File           13         File         File           14         File         File           15         File         File           16         File         File           17         File         File           18         File         File           19         File         File           10         File         File           11         File         File           12         File         File           13         File         File           14         File         File           15         File         File           16         File         File           17         File         File           18         File         File           19         File         File	ffagi4 _ Reffagi	S , RefTag	La	abel	for	raufal	g _	TagCodeIm		1 for Bag g



# Annex B – Range Testing

## 9.1. Panel Antennas

## 9.1.1. Set up at an Appropriate Location

The range testing must be conducted in an area with minimal RF noise. The noise reading on the Aleis 9162 reader must be below 25, ideally 20 (see below for more detail). This is generally not feasible in industrial or built-up areas.

The readers must be in free air, with no metal (eg cattle railings) nearby. Only one reader must operate at a time.

## 9.1.2. Equipment

Set up the test apparatus as follows:

Before setup:





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### Set up the apparatus as follows:



First set up the apparatus with a 9162 Aleis reader (so the ambient noise level can be checked).

### 9.1.3. Check Ambient Noise Level



Before starting any testing, check the ambient noise level on the Aleis reader, as follows:

Power up the reader by connecting the power leads to a 12 Volt battery. If this battery is in a car, ensure that it is parked at least 3 metres from the reader.

Press the Left Cursor arrow and then the OK button.



This puts the reader in a mode that shows the ambient noise level (see below). The noise level should be below 25, ideally at 20 or better. Record this noise level in the appropriate box in the results.



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If the noise level is too high (as per the picture above), move to a quieter spot. Note that the noise level often drops after sunset (probably due to industry activity shutting down).

## 9.1.4. Select Tags

Use the same fifteen tags that were used for Laboratory Testing, and the applicable (CATTLE or SHEEP) reference tags. The reference tags only need to be tested once per test session.

### 9.1.5. Test Conduct

Record the read range of each tag (normally 15 of each type) and the applicable Reference Transponders (also 15 of each type), with each type of reader, in the Test Results Spreadsheet:

- Results for Tag Under Test in the tab RangeResults, and
- Results for Reference Tags in the tab RefTagRangeResults.

It is acceptable to print the appropriate tabs from the spreadsheet, record the results on the printed page, and then transcribe the results in the spreadsheet. If the results are typed directly into the spreadsheet, then the laptop computer must be far enough away from the antenna to ensure that it does not add noise. Verify this using the Aleis reader's noise monitoring function described above.



Conduct On-axis testing as follows:

Measure along the main bar that protrudes from the middle of the antenna, as follows:



Ensure that the tag is orientated correctly, as per the pictures above.

Record the range of each tag as follows:

- The reader should read about once per second,
- Record to a resolution of 1 cm (the timber bar has range markings drawn on it), and
- Record the range to the middle of the tag (as opposed to its end).



Conduct Off-axis testing as follows:

Measure along the crossbar that runs parallel to the antenna. As mentioned above, note that the crossbar can be fitted to either of two positions:

- For Sheep tags: 700 mm from the antenna, and
- For Cattle tags: 900 m from the antenna.

Ensure the correct position is being used.

The apparatus has a timber measuring stick that slides in a groove in the crossbar.

Record the off-axis measurement for each tag, as follows:

• With the tag against the "zero" end of the stick and oriented as shown below, slide the measuring stick out, and find the point at which the reader reads about once per second.





• Leave the stick in place, and now move just the tag along the stick until it again only reads once per second.



• Record the measurement on the stick. Again, record to a resolution of 1 cm.

NOTE: With the off-axis measurement, the point at which to measure is somewhat "fuzzy". Sometimes the reader may not read at all for a while and then it may read continuously for a while. This is normal. The errors in each reading average out when the data is processed in the spreadsheet. For the averaging process to work properly, it is important that the same person tests the Tags Under Test and the Reference Tags, in the same session, using the same technique.

Repeat the above with a Large Allflex panel reader.



## 9.2. Datamars wand reader

Set up the Datamars wand reader, such that:

- 1. The range is measured protruding straight from the tip of the wand,
- 2. The reader is off the ground, and
- 3. There is no metal (other than screws in timber apparatus) nearby.

For example, set up as shown below using timber sawhorses. The timber measuring stick used for off-axis measurement is a suitable measuring stick for this test.





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Take the measurements as shown below:



Notes:

- Orientate the tags as shown above,
- Again, record to a resolution of 1 cm,
- Take each measurement at the middle of the tag,
- Take readings for each Tag Under Test and the 15 Reference Tags of appropriate type (CATTLE or SHEEP), and
- Record all readings in the Spreadsheet or a printout thereof.



# Annex C – Logic behind testing

This Annex provides the logic behind some of the key testing parameters. The results of this logic are incorporated in the test apparatus and the spreadsheet template. Therefore, this Annex can be ignored when conducting testing in accordance with this document.

### Minimum Activation Strength Test

The benchmark activation strength signal was calculated when the reference tags were tested on 22 September 2014 for the purposes of a minimum activation test. It is assumed that the benchmark signal will not change markedly between test batches.

The benchmark for the activation field strength at which to test the strength of the response of the test tags is set at the mean minimum activation strength of the benchmark transponders PLUS three standard deviations. Based on the 22 September 2014 results, the activation strength to be used is 0.5A/m rms for cattle and 0.75 A/m rms for sheep. The raw data for this calculation is recorded below.

#### CATTLE REFERENCE TRANSPONDER

	Minimum Act	ivation Field
Tag	Strength	
AU01	0.446	
AU02	0.461	
AU03	0.461	
AU04	0.449	
AU05	0.423	
AU06	0.474	
AU07	0.474	
AU08	0.457	
AU09	0.476	
AU10	0.481	<- Worst Result
AU11	0.446	
AU12	0.454	
AU13	0.434	
AU14	0.447	
AU15	0.452	
Mean:	0.455667	
Standard Deviation:	0.016136	
No. of SDs to use:	3	
To use for minimum		
response testing:	0.504076	
Percentage margin		
above worst result:	4.58%	



#### SHEEP REFERENCE TRANSPONDER

	Minimum Act	ivation Field
Тад	Strength	
AY01	0.646	
AY02	0.598	
AY03	0.691	
AY04	0.698	
AY05	0.664	
AY06	0.61	
AY07	0.631	
AY08	0.652	
AY09	0.655	
AY10	0.661	
AY11	0.664	
AY12	0.642	
AY13	0.712	<- Worst Result
AY14	0.641	
AY15	0.685	
Mean:	0.656667	
Standard Deviation:	0.031345	
No. of SDs to use:	3	
To use for minimum		
response testing:	0.750702	
Percentage margin		
above worst result:	5.16%	

### **Transmission Pulse**

For both cattle and sheep, an interpretation of the ISO activation protocol has been adopted, which requires a 50 ms transmission period (activation) followed by a 20 ms reading period, with two pulses sent. Two pulses simulates a worst case event of an animal moving quickly though the detection field.

The minimum activation strength of 15 reference transponders and 15 test tags will be measured.

The assessment of the 15 test tags against the 15 benchmark transponders will require

- Calculating the mean result of the 15 test tags
- Calculating the mean result of the 15 reference transponders plus three standard deviations



- The mean minimum activation strength result of the test tags must be at least as low as the reference tag performance, calculated as the mean of the reference tag plus three standard deviations.
- In addition to reporting the mean result, also record the results for individual tags/transponders and compare them to the pass/fail criteria.
- If a tag does not respond at all, the result is to be shown as "N/A", with a note that no response was recorded.