

RTCM 10010.2 test statement

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2 CONTEXT

OROLIA develops and sells Personal Locator Beacon (PLB) that uses the dedicated 406MHz frequency to transmit a unique ID and precise GNSS location to the global network of search and rescue satellites. It also integrates a 121.5MHz homing transmission to help local rescue researches.

These PLBs are named FastFind and Safelink. The Fastfind and Safelink PLB has 3 existing variants, where electronics is the same and some minor mechanical parts differs:

- Fastfind 220
- Fastfind Ranger
- Safelink SOLO



These PLBs have first been developed and approved through FCC Rule part 95K and against RTCM standard on the 25/02/2009. Since this date, the design of the PCB has not been modified.

Recently, due to component obsolescence, it has been decided to completely re-design the electronic board. The firmware has also been re-developed according to the new board. Despite this, the legacy mechanical shape and labels have been kept unchanged compared to the previous beacon design in order to keep the same mechanical bodies as previously developed and approved.

Therefore, in the frame of a new FCC application for this “updated” product, only the tests concerned by the upgrade of the electronic board were played again against RTCM standard.

3 LEGACY APPROVED PLBs VS NEW PLB VERSION:

The goal of this chapter is to demonstrate that results, from the legacy PLB, can be used and applied to the new version of the PLB.

3.1 IDENTIFICATION OF EQUIPMENT

The current PLB product family members are identified as follows:

Type No.	Marketing Name	Comments
Z421	Fastfind 220 PLB	Internal GPS, enclosure style A, colour yellow
Z422	Fastfind Ranger PLB	Internal GPS, enclosure style B, colour orange
	Kannad Marine Safelink Solo GPS PLB	Internal GPS, enclosure style B, colour yellow

Some of the documentation and test reports may refer to earlier versions of the PLB product and identified as follows:

Model No.	Marketing Name	Comments
200	Fastfind 200 PLB	Non-GPS, enclosure style A, colour yellow
201	Fastfind 201 PLB	Non-GPS, enclosure style A, colour yellow, flotation pouch
210	Fastfind 210 PLB	Internal GPS, enclosure style A, colour yellow
211	Fastfind 211 PLB	Internal GPS, enclosure style A, colour yellow, flotation pouch
310	Kannad Marine Safelink Solo 310 PLB	Internal GPS, enclosure style B, colour yellow
311	Kannad Marine Safelink Solo 311 PLB	Internal GPS, enclosure style B, colour yellow, flotation pouch

In order to distinguish the new design of the PLB from the legacy one, the Z type number used by Orolia is incremented.

	Legacy design	New design
FastFind 220	Z421	Z423
Safelink SOLO	Z422	Z424
FastFind Ranger	Z422	Z424

3.2 COMPARISON MATRIX FOR FF210 VS Z421 (FF220) VS Z423 (NEW FF220)

A comparison is made between FF210 – **that has been used during previous tests** - and Z421 / Z423 in order to assess changes. Conclusion is given in the table below.

FF210	Z421 (FF220)	Z423 (new FF220)	Conclusion
PCB and components	Identical to FF210 Weight = 19g	Different from Z421 Weight = 19g	No weight impact
Battery	Identical to FF210 Weight = 2x17g	Different from Z421 but Weight = 2x17g	No weight impact
Programming software	Identical to FF210	Different from Z421	No impact
Beacon firmware	Identical to FF210	Different from Z421	No impact
Antenna	Identical to FF210	Identical to Z421	No impact
Antenna connection to PCB	Identical to FF210	Identical to Z421	No impact
Plastic material - Cycloy	Identical to FF210	Identical to Z421	No impact
Weight = 150g	Weight = 150g	Weight = 150g	No weight impact
Dimensions LxWxD in mm = 107x48x34	Dimensions LxWxD in mm = 107x48x34	Dimensions LxWxD in mm = 107x48x34	No impact
Base plastic moulding	Identical to FF210	Identical to Z421	No impact
Top Moulding	Identical to FF210	Identical to Z421	No impact
Top cover moulding	Minor change to FF210 external shape, dimensions same see figure 1 below	Identical to Z421	No impact
Tamper lever moulding	Minor change to FF210 external shape, dimensions same see figure 1 below	Identical to Z421	No impact
Sealing gasket	Identical to FF210	Identical to Z421	No impact
Labels	Minor change to rear label statements but material keeps the same	Minor change to rear label statements but material keeps the same	No impact



3.3 COMPARISON MATRIX FOR Z422 (SOLO) AND Z422 (RANGER) VS Z424 (NEW SOLO / RANGER)

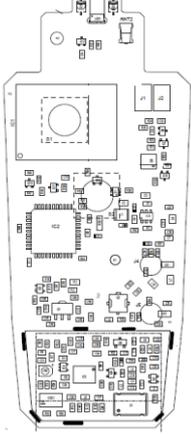
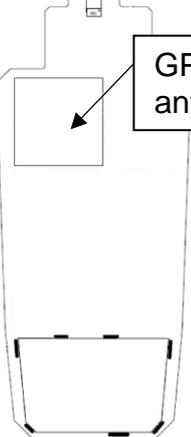
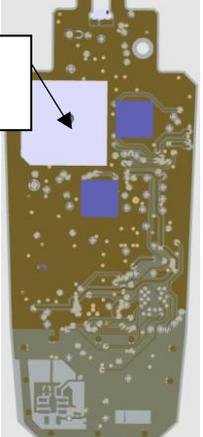
A comparison is made between Z422 – that has been used during previous tests - and Z424 in order to assess changes. Conclusion is given in the table below.

SOLO	Z422 (Ranger)	Z423 (new FF220)	Conclusion
PCB and components	Identical to SOLO Weight = 19g	Different from Z422 Weight = 19g	No weight impact
Battery	Identical to SOLO Weight = 2x17g	Different from Z422 but Weight = 2x17g	No weight impact
Programming software	Identical to SOLO	Different from Z422	No impact
Beacon firmware	Identical to SOLO	Different from Z422	No impact
Antenna	Identical to SOLO	Identical to Z422	No impact
Antenna connection to PCB	Identical to SOLO	Identical to Z422	No impact
Plastic material - Cycloy	Identical to SOLO	Identical to Z422	No impact
Weight = 165g	Weight = 165g	Weight = 165g	No weight impact
Dimensions LxWxD in mm = 112x50x36	Dimensions LxWxD in mm = 112x50x36	Dimensions LxWxD in mm = 112x50x36	No impact
Base plastic moulding	Identical to SOLO	Identical to Z422	No impact
Top Moulding	Identical to SOLO	Identical to Z422	No impact
Top cover moulding	Minor change to SOLO external shape, dimensions same see figure 1 below	Identical to Z422	No impact
Tamper lever moulding	Minor change to SOLO external shape, dimensions same see figure 1 below	Identical to Z422	No impact
Sealing gasket	Identical to SOLO	Identical to Z422	No impact
Labels	Minor change to rear label statements but material keeps the same	Minor change to rear label statements but material keeps the same	No impact



3.4 PCBA COMPARISON BETWEEN Z421/Z422 VS Z423/Z424

As mentioned previously the Z423/Z424, electronics is re-designed. A comparison between both PCBA is given in the table below in order to assess differences.

FF220 / SOLO / Ranger (Legacy version) Z421 / Z422	FF220 / SOLO / Ranger (new version) Z423 / Z424	Comments
		<p>Top view of the PCBA</p> <p>Component repartition is similar between both variants</p> <p>PBCA weight is identical</p> <p>The shape of the PCB is exactly the same.</p>
		<p>Bottom view of the PCBA</p> <p>GNSS Antenna has identical position between both variants</p> <p>No other component on this face</p>

As the mechanical shape is perfectly identical, the PCBA is fixed in the plastic at the same place and in the same way.

As a conclusion and regarding the assessment made in this table, it can be concluded that both PCBAs will have the same mechanical behavior characteristics.

3.5 FF210 AND VARIANTS MATERIALS

3.5.1 Mechanical parts material

The materials used on the different variants is listed below.

Part	Material	Comment
Base plastic moulding	Cyclopy 1200	Identical on all beacon variants
Cover moulding	Cyclopy 1200	Identical on all beacon variants
Top moulding	Polycarbonate – calibre 303-15	Identical on all beacon variants
Lever moulding	Polypropylene PPH9081	Identical on all beacon variants
Sealing gasket	White silicone sponge	Identical on all beacon variants
Silicon keypad	Silicon rubber 55 shore	Identical on all beacon variants
Silicon side grips	Silicon rubber 55 shore	Identical on all beacon variants
Antenna	SUS-301 S/S	Identical on all beacon variants
Antenna Bolt	Stainless steel SUS-316	Identical on all beacon variants
Antenna o-ring	BS005 N70 Silicon o-ring	Identical on all beacon variants
Label set	Clear polypropylene	Identical on all beacon variants
M2.5 Nyloc nut	Stainless steel	Identical on all beacon variants
M3x12mm pan head pozi stainless steel screw	Stainless steel	Identical on all beacon variants
M2.5x5mm screw	Stainless steel	Identical on all beacon variants

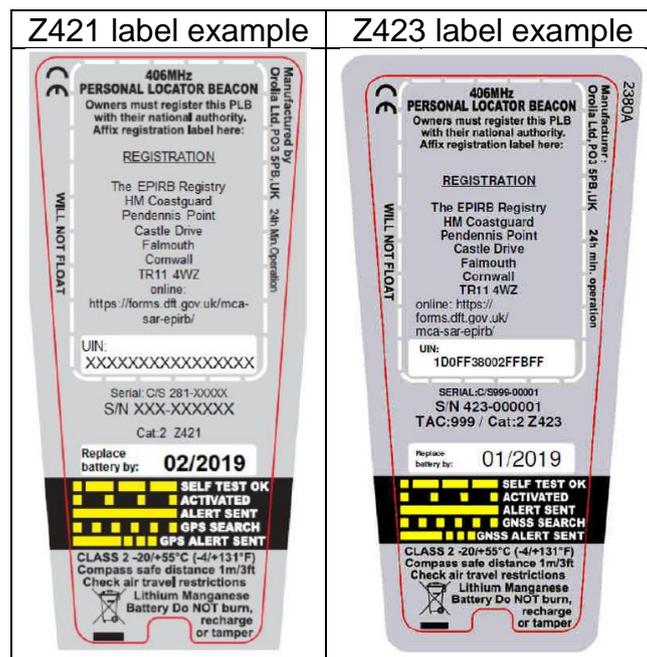
All variants use the same materials.

3.5.2 Label parts material

The materials used on the different variants is listed below.

Part	Material	Comment
Label set	Clear polypropylene	Identical on all beacon variants
Labels	MADICO 03-770	Identical on all beacon variants
Adhesive	P110 Acrylic	Identical on all beacon variants
Liner	LR09 90 gsm white polycoated glissine	Identical on all beacon variants

All variants use the same labels materials, only few rear text statements differs.



3.6 GENERAL CONCLUSION ABOUT PLB VERSIONS

As a general conclusion and regarding the assessment made in these tables, it can be concluded that:

- Z422 (SOLO) / Z422 (Ranger) / Z424 (new SOLO / Ranger)
- FF210 / Z421 (FF220) / Z423 (new FF220)

are equivalent and some tests conclusion can be made by similarity between the legacy version and the new version of the PLB.

4 RTCM TEST OVERVIEW :

As described before, only the tests concerned by the modification of the electronic board where played again. Therefore, the test list is described below; Justification and compliance is given regarding the tests that has not been played again.

Compulsory sequence of tests		Test played again on new test campaign	Justification
1	Dry heat tests (see A.3)	Yes	Electronic board test has an impact
2	Damp heat test (see A.4)	Yes	Electronic board test has an impact
3	Low temperature tests (see A.5)	Yes	Electronic board test has an impact
4	Vibration tests (see A.6)	No	Waived See §4.1 for justification
5	Bump test (see A.7)	No	Waived See §4.1for justification
6	Drop test (see A.9)	No	Waived See §4.3 for justification
7	Thermal shock test (see A.10)	Yes	Electronic board test has an impact
8	Immersion test (see A.11)	No	Waived See §4.4 for justification
9	Spurious emission (see A.12)	Yes	Electronic board test has an impact
10	Operational Life (Battery capacity) and Self-test (see A.13)	Yes	Electronic board test has an impact
11	COSPAS-SARSAT test procedure (see A.14)	Yes	Electronic board test has an impact
Additional tests - The following tests may be run in any sequence and / or may be performed on separate test units:		Test played again on new test campaign	Justification
12	Buoyancy Test (Category 1 PLBs only) (see A.15)	Yes	Electronic board test has an impact
13	Auxiliary Radio-Locating Device Transmitter Tests (see A.16)	Yes	Electronic board test has an impact
14	Solar Radiation (see A.17)	No	Waived See §4.6 for justification
15	Oil Resistance (see A.18)	No	Waived See §4.7 for justification
16	Corrosion (salt mist) test (see A.8)	No	Waived See §4.2 for justification
17	Compass Safe Distance (see A.19)	Yes	Electronic board test has an impact
18	Miscellaneous tests (see A.20)	Partially	Partially waived See §4.9 for justification

4.1 VIBRATION TESTS (RTCM A.6)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.6	FF 210	TUV 75904389-10 issue 1	05-08/09/2008

The vibration test has been done on the FF210 and Safelink SOLO 310/311 beacons. As shown in chapters §1.1, §1.1 and §1.1, all the variants of PLB are equivalent in terms of :

- Mechanical shape,
- PCB shape
- PCBA component repartition
- PCBA weight
- Battery weight
- Internal shape volume and PCBA fixation
- Beacon global weight



Figure 1 – Vibration test (vibration left)

For those reasons, the vibration test validity for Z423 and Z424 can be assessed by similarity with FF210 and SOLO 310/311 variants.

Therefore, this test can be waived.

4.2 BUMP TEST (RTCM A.7)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.7	FF 210	TUV 75904389-10 issue 1	08-09/09/2008



Figure 2 - Bump test

The bump test has been done on the FF210 beacons. As shown in chapters §1.1, §1.1 and §1.1, all the variants of PLB are equivalent in terms of :

- Mechanical shape,
- PCB shape
- PCBA component repartition
- PCBA weight
- Battery weight
- Internal shape volume and PCBA fixation
- Beacon global weight

For those reasons, the bump test validity for Z423 and Z424 (and SOLO 310/311) can be assessed by similarity with FF210 variants.

Therefore, this test can be waived.

4.3 CORROSION TEST (RTCM A.8)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.8	FF 210	TUV 75904389-10 issue 1	Test waived

The corrosion test has been waived on the FF210 beacon for the reasons listed below; used materials on the FF210 are identical to the SOLO 310/311 / Z421 / Z422 / Z423 / Z424.

- 1- The materials have a proven history of service in marine environment. Either from use in Orolia's existing approved marine equipment range, or by implication from a long established history of exposure without effect (e.g stainless steel).
- 2- The material manufacturer has conducted equivalent testing and has declared the product being immune to these effects in the relevant datasheet.

Therefore, Orolia hereby declares that the materials used in the construction of the FF210 products as listed in §1.1 are not affected by corrosion degradation.

For this reason, the solar test validity for Z423 and Z424 can be assessed by similarity for all variants.

Therefore, this test can be waived.

4.4 DROP TEST (RTCM A.9)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.9	FF 210	TUV 75904389-10 issue 1	09/09/2008



Figure 3 - Drop test

The drop test has been done on the FF210 and Safelink SOLO 310/311 beacons. As shown in chapters §1.1, §1.1 and §1.1, all the variants of PLB are equivalent in terms of :

- Mechanical shape,
- PCB shape
- PCBA component repartition
- PCBA weight
- Battery weight
- Internal shape volume and PCBA fixation
- Beacon global weight

For those reasons, the drop test validity for Z423 and Z424 can be assessed by similarity with FF210 and SOLO 310/311 variants.

Therefore, this test can be waived.

4.5 IMMERSION TEST (RTCM A.11)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.9	FF 210	TUV 75904389-10 issue 1	27/01/2009



Figure 4 - Immersion test

The immersion test has been done on the FF210 beacons. As shown in chapters §1.1, §1.1 and §1.1., all the variants of PLB are equivalent in terms of :

- Mechanical shape,
- PCB shape
- PCBA component repartition
- PCBA weight
- Battery weight
- Internal shape volume and PCBA fixation
- Beacon global weight

For those reasons, the immersion test validity for Z423 and Z424 (and SOLO 310/311) can be assessed by similarity with FF210 and variants.

Therefore, this test can be waived.

4.6 BUOYANCY TEST (RTCM A.15)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.15	FF 210	TUV 75904389-10 issue 1	07/01/2009



Figure 5 - Buoyancy test (FF right / SOLO left)

The buoyancy test has been done on the FF210 and Safelink SOLO 310/311 beacons. As shown in chapters §1.1, §1.1 and §1.1., all the variants of PLB are equivalent in terms of :

- Mechanical shape,
- PCB shape
- PCBA component repartition
- PCBA weight
- Battery weight
- Internal shape volume and PCBA fixation
- Beacon global weight

For those reasons, the buoyancy test validity for Z423 and Z424 can be assessed by similarity with FF210 and SOLO 310/311 variants.

Futhermore, this test is not required for CAT2 PLB beacons.

Therefore, this test can be waived.

4.7 SOLAR TEST (RTCM A.17)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.15	FF 210	TUV 75904389-10 issue 1	Waived

The solar test has been waived on the FF210 beacon for the reasons listed below; used materials on the FF210 are identical to the SOLO 310/311 / Z421 / Z422 / Z423 / Z424.

- 1- The materials have a proven history of service in marine environment. Either from use in Orolia’s existing approved marine equipment range, or by implication from a long established history of exposure without effect (e.g stainless steel).
- 2- The material manufacturer has conducted equivalent testing and has declared the product being immune to these effects in the relevant datasheet.

Therefore, Orolia hereby declares that the materials used in the construction of the FF210 products as listed in §1.1 are not affected by solar degradation.

For this reason, the solar test validity for Z423 and Z424 can be assessed by similarity for all variants.

Therefore, this test can be waived.

4.8 OIL TEST (RTCM A.18)

Test already done on previous beacons

Standard	Chapter	Beacon	Test report	Date
RTCM 11010.2:2008	§A.15	FF 210	TUV 75904389-10 issue 1	Waived

The Solar test has been waived on the FF210 beacon for the reasons listed below; used materials on the FF210 are identical to the SOLO 310/311 / Z421 / Z422 / Z423 / Z424.

- 1- The materials have a proven history of service in marine environment. Either from use in Orolia’s existing approved marine equipment range, or by implication from a long established history of exposure without effect (e.g stainless steel).
- 2- The material manufacturer has conducted equivalent testing and has declared the product being immune to these effects in the relevant datasheet.

Therefore, Orolia hereby declares that the materials used in the construction of the FF210 products as listed in §1.1 are not affected by oil degradation.

For this reason, the solar test validity for Z423 and Z424 can be assessed by similarity for all variants.

Therefore, this test can be waived.

4.9 MISC (RTCM A.20)

Hereby, OROLIA declares that the mechanical parts, shape, materials, plastics, colours haven't change since the first approved PLB.

Therefore, the following tests can be waived and conclusions on the new beacon can be made by similarity with the legacy PLB :

- **General Construction (A.20.4)**
- **Exterior Finish (A.20.5)**
- **Labelling (A.20.6) including abrasion test**

These tests were already compliant with the RTCM standards on the legacy beacon, therefore these tests are also compliant on the new PLB version. Tests results can be found in the TUV 75904389-10 issue 1 test report.

The other tests from the A.20 section of the RTCM standards can be repeated again on the new PLB version due to the schematic / battery pack / user manual change ;

- **Controls and Indicators (A.20.1)**
- **Self-test and GNSS Self Test Function (A.20.2)**
- **Battery (A.20.3)**
- **Documentation (A.20.7)**
- **Altitude (A.20.8)**

5 CONCLUSION

Z423 is compliant with RTCM 11010.2 and FCC CFR47 Part 95K, demonstrated by tests and Z421 comparison for mechanical parts.

Z424 is compliant with RTCM 11010.2 and FCC CFR47 Part 95K, by comparison with Z423 (as Z422 was demonstrated compared with Z421).

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