



Second Generation Beacons

Beacon Manufacturers Workshop 2018
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- SGB D&E
- C/S T.018, T.021
- SGB Type Approval
 - C/S T.008
 - First article test validation
 - Test Beacon
 - EIRP testing
 - Encoded Position Tests

- Document EWG-1/2018/6/2 provided an SGB D&E Test Plan.
- Results submitted in JC-32 paper 8/11
- POC testing covered most of the technical aspects of SGB processing.
- Therefore, D&E plan focused on the operational aspects of SGB performance
 - Driven by beacon simulator transmissions, to test end to end movement of SGB data through the system,
 - MEOLUT to the MCC, and subsequent distribution of alert data to SPOCs/RCCs and other MCCs
- SGB D&E testing was overall a sound success. The Report is broken down into four areas with specific outcomes as follows:
 - SGB data flow, MEOLUT to MCC, was reliable and timely,
 - the significant improvement in location accuracy expected for SGBs is well demonstrated in the operational data,
 - SGB data processing and the underlying documented procedures, in particular at the MCC, are working well,
 - while time and resource constraints limited the ability to fully validate data distribution for SGBs, the results that could be achieved indicate a successful implementation.

- C/S T.018 Issue 1 – Revision 3 dated June 2018 approved by the Closed Council at CSC-60.
- C/S T.021 Preliminary Issue A June 2018 approved by the Closed Council at CSC-60.
 - Document C/S T.021, Preliminary Issue A is not sufficiently mature to allow the type approval of beacons given the uncertainty about the maturity of the test procedures. However, if the Parties deem testing results, technical review, and testing procedures to be sufficiently compelling as to performance, they may decide to type approve a beacon that has been tested using the procedures of document C/S T.021, Preliminary Issue A
- Participants from the T.018/T.021 CWG have continued to work on developing both documents, and address actions from the Experts Working Group at EWG-1/2018.
- The main proposed areas of change from the CWG are as follows:
 - changes to account for external power sources for ELT(DT)s (EWG-1/2018 AI.8), to bring T.018 and T.021 in alignment with approved T.001/T.007 changes at the EWG;
 - small correction to the sample 48-Bit BCH code calculation in T.018 to account for the RLS bit in the beacon message;
 - updates to the beacon activation cancellation function to be consistent with recent international developments in automatic portable ELTs (ELT(AP)); and
 - recommended work to be accomplished at JC-32 due to lack of development prior to the meeting.
- Other JC-32 papers propose
 - Remove self test bit, expand beacon type field, changes to 23 and 15 hex IDs

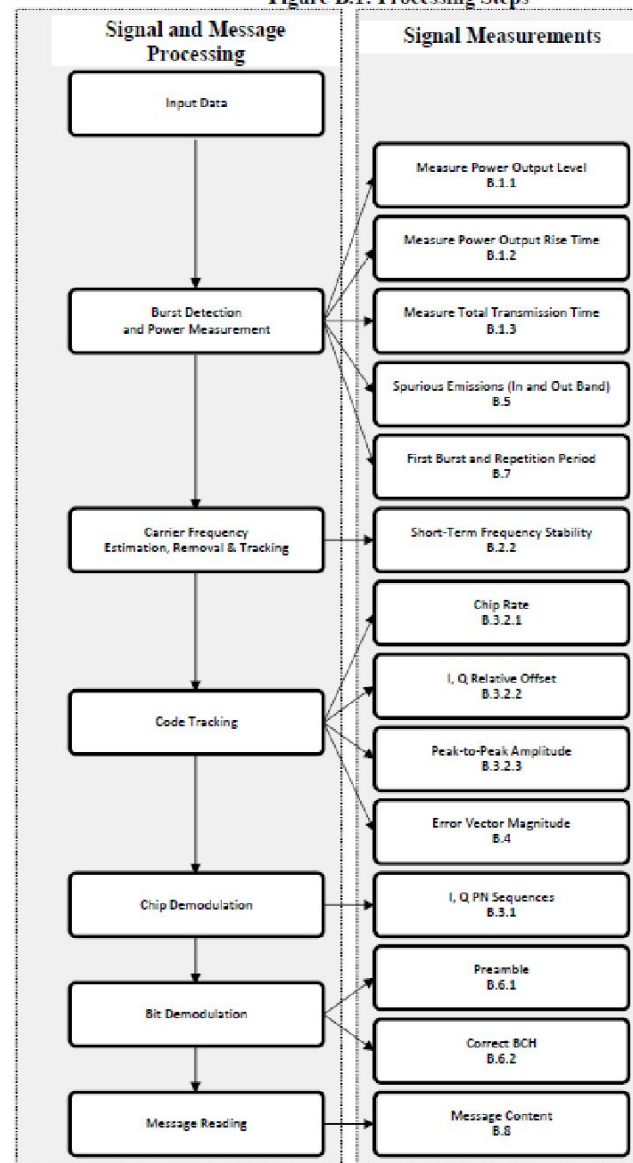
SGB Type Approval C/S T.008



- C/S T.008 Issue 3 – Revision 1 June 2018 approved by the Closed Council at CSC-60
- Section 2.5 details Acceptance Process for Approved Test Facilities Wishing to Extend their Test Capabilities
 - either different generations of beacon or new features and capabilities added to beacons (CSC-60 decided C/S T.001-compliant ELT(DT)s, and all SGBs)
- Acceptance process shall be as follows:
 - submit its application form to the Secretariat;
 - the Secretariat and Parties' technical experts (technical team) will determine which, if any, type approval tests need to be conducted;
 - the type approval tests determined by the technical team are then performed on a **test beacon** provided by the applicant or borrowed from Cospas-Sarsat;
 - an on-site technical visit may be conducted;
 - if the test beacon has not previously been tested, the beacon **would also be tested at another already approved test facility, or at facilities designated by the Cospas-Sarsat Parties;**
 - test reports from each facility will be submitted for review to the technical team and their findings will be provided to the applicant, to the Cospas-Sarsat Parties and to the Joint Committee for review and recommendations to the Council;
 - if the technical team identifies specific necessary modifications to the facility's testing procedures during the review, the test facility may be asked to perform modified tests;
 - the technical team may also propose corresponding clarifications to the applicable Cospas-Sarsat document; and
 - if the documentation demonstrates that the test facility meets the Cospas-Sarsat requirements, the Cospas-Sarsat Parties may grant interim acceptance of the facility until the formal review by the Joint Committee and Council has been completed.

- NASA and CNES have independently developed MATLAB based tools to measure signal characteristics
 - (C/S T.021 B.1 – B.8)
- NASA and CNES have worked together to compare results on a common signal sample.
- Only significant difference concerning chip rate variation being worked.

Figure B.1: Processing Steps



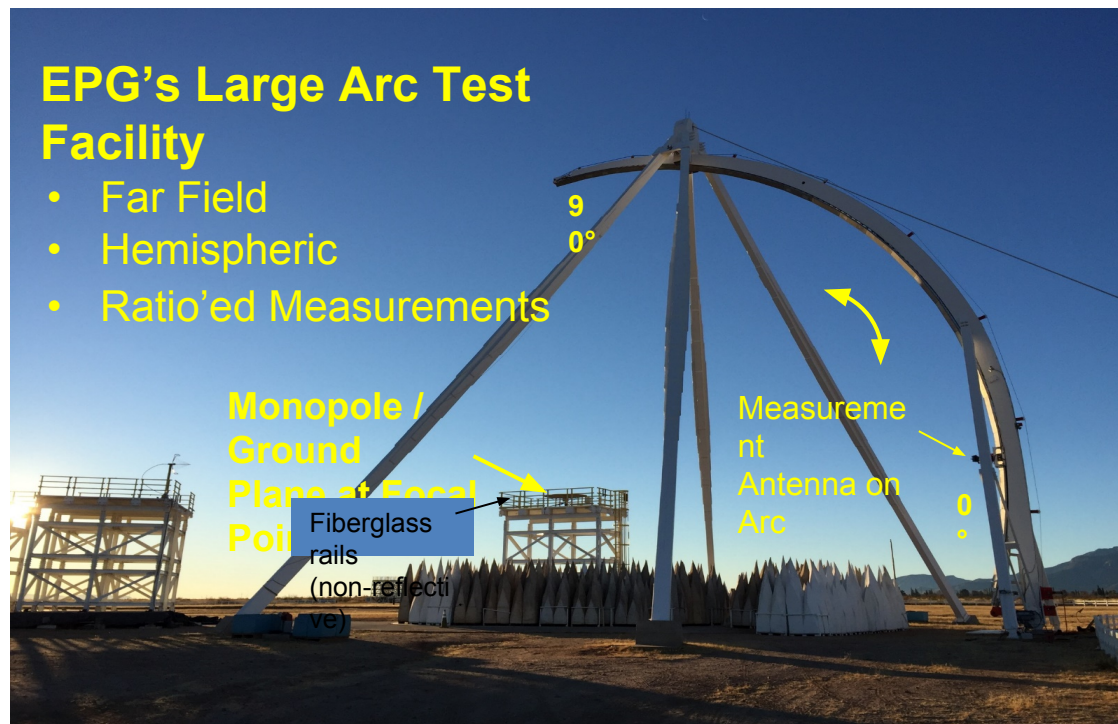
- ANGEL
 - Advanced Next-Generation Emergency Locator
 - SGB PLB developed for NASA Orion Crew Survival program



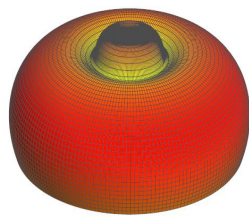
EIRP - EPG Antenna Testing



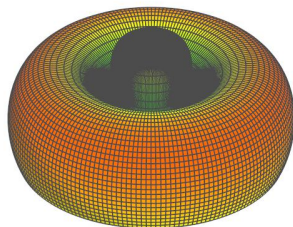
- EPG built a reference monopole (tuned to 406.5 MHz) antenna and performed antenna pattern measurements at EPG's large test arc site.
- Four series of hemispherical measurements were made with the monopole mounted to a 2.50m and 2.25m diameter ground plane as well as "no ground plane" and an "infinite ground plane" configuration.
- These measurements could serve as our reference monopole measurements - what will be considered as the best-case monopole measurements for future test configuration comparisons.



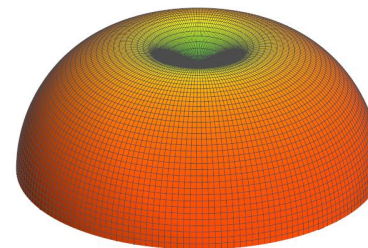
Resulting FEKO Models



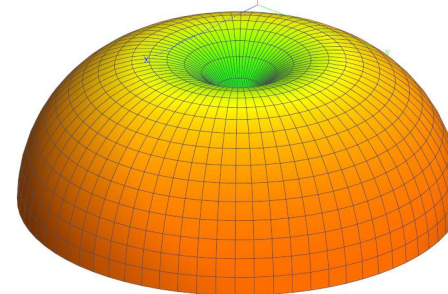
FEKO model:
2.25m
diameter GP



FEKO model: 2.50m diameter GP



FEKO model: No GP



FEKO model: "Infinite" GP



C/S EIRP Measurement



- EPG awarded a contract to build an elevation positioner capable of measuring up to 90° elevation.
- Installation expected to begin by Oct 2018 with initial acceptance testing of the system by Nov 2018.
- It will then be used to measure the representative monopole and patch antenna using the 2.50 m and 2.25 m ground planes at measurement distances of 2 m and 4 m.
- The measurements will be compared with the reference measurements taken using large arc..
- This should provide a good indication of the preferable C/S antenna configuration as well as help identify impacts of the smaller C/S-specific measurement configuration.

Encoded Position Data Tests



T.021 Clause Number	Test Name	Intent	Method 1) Open air 2) Sim RF 3) Sim Rcvr output	Test allowed to be performed by manufacturer
B.14.1	General			
B.14.1.1	Encoded Location Data	Verify encoding Annex D.2	2,3	
B.14.1.2	ELT(DT) Navigation Devices	Test function when both int and ext devices	2,3	
B.14.1.3	Navigation Device Failure	Cease on device failure	Documentation	Y
B.14.2	Internal Navigation Device			
B.14.2.1	Capability and Standard	Global, international std	Documentation	Y
B.14.2.2	Self-Check	No erroneous data	Documentation	Y
B.14.2.3	Cold Start	Cold start on activation	Documentation	Y
B.14.2.4	Location Accuracy and Information	Verify location accuracy	1,2	
B.14.2.5	First Provision of Location and	Within 2 minutes	1,2	
	Dimensions	2D or 3D	2	
B.14.2.6	Location Updates	Moving beacon	1,2	
B.14.2.7	Operational Time of Navigation Device	Rcvr on time prior to tx 90 second or 3 mins	Documentation	Y
B.14.3	ELT(DT) Internal Navigation Device			
B.14.3.1	Capability and Standard	Global, international std	Documentation	Y
B.14.3.2	Self-Check	No erroneous data	Documentation	Y
B.14.3.3	Cold Start	Cold start when ARMED	Documentation	Y
B.14.3.4	Location Accuracy and Information	Verify location accuracy	1,2	
B.14.3.5	First Provision of Location and	Within 5 sec	1,2	
	Dimensions	2D or 3D	2	
B.14.3.6	Location Updates	Moving beacon Annex D.3	2	
B.14.3.7	Operational Time of Navigation Device	Rcvr on time prior to tx 90 second or 3 mins	Documentation	Y
B.14.4	External Navigation Device			
B.14.4.1	Standards and Interfaces		Documentation	Y
B.14.4.2	Location Accuracy and Information	Verify encoding	2,3	

Enc Pos Testing questions



- Simulator?
- Manufacturer vs type approval lab?
- Annex D scripts