



SAM/IG/4-WP/37  
15/10/09

**International Civil Aviation Organization  
South American Regional Office**

**FOURTH WORKSHOP/MEETING OF THE SAM IMPLEMENTATION GROUP (SAM/IG/4)  
REGIONAL PROJECT RLA/06/901**

**Lima, Peru, 19 to 23 October 2009**

**Agenda Item 3: Implementation of performance-based navigation (PBN) in the SAM Region**

**REGIONAL DATA BASE ON VOR AND DME RADIO NAVIGATION AID COVERAGE**

(Presented by the Secretariat)

SUMMARY	
This working paper presents the results on the tasks related with the elaboration of a regional data base on VOR and DME radio navigation aid coverage in the SAM Region.	
<b>References:</b> <ul style="list-style-type: none"><li>• Second Workshop/Meeting (SAM/IG/2) Report (Lima, Peru, 3 to 7 November 2008);</li><li>• Third Workshop/Meeting (SAM/IG/3) Report (Lima, Peru, 20 to 24 April 2009); and</li><li>• RLA/06/901 project.</li></ul>	
<b>ICAO Strategic Objectives:</b>	A: <i>Safety</i> D: <i>Efficiency</i>

**1. Background**

1.1 The second coordination committee meeting of RLA/06/901 Project (RCC/2) (Lima, Peru, 2-3 December 2008), approved the holding of activities corresponding to the compliance of Immediate Objective No. 1: *“Development and implementation of global air navigation plan initiatives that will lead to the transition from an air traffic management system based on ground systems to another one based on aircraft performance”*.

1.2 Within the activities to develop, is the drafting of a regional data base with all VOR and DME radio navigation aid calculated coverage information to meet navigation specifications and, most of all, the reversal navigation mode in the event of loss in the GNSS systems, areas where the navigation infrastructure is unable to support RNAV 5 VOR/DME and DME/DME based operations, and areas within the TMA where the DME infrastructure would not support RNAV 2 and RNAV 1 operations, with or without the application of inertial systems.

1.3 In this sense, the ICAO South American Regional Office requested that a CNS expert and an ATM expert carry out the referred activity in the period between 14 to 25 September 2009.

1.4 The initial tasks assigned were:

- a) Elaboration of a data base with all VOR and DME radio navigation aid calculated coverage information in the SAM Region to meet navigation specifications and, most of all, the navigation reversal mode in the event of GNSS systems loss.
- b) Determine, taking into account the above data base, the areas where the navigation infrastructure would not support RNAV 5 VOR/DME and DME/DME based operations, and the TMA areas where DME infrastructure would not support RNAV 2 and RNAV 1 operations, with and without the application of inertial systems.

1.1 Upon analyzing the magnitude of the tasks assigned to calculate the VOR and DME radio navigation aid coverage, a portion of the VOR/DME in the SAM Region were selected. A second portion would be completed for SAMIG/5 meeting (May 2010).

## 2. Analysis

2.1 Coverage maps and a set of data bases related with coverage calculation were elaborated for a base number of approximately 200 VOR/DME stations in the SAM Region.

2.2 For the drafting of VOR/DME station coverages, software tools such as Radio Mobile and SRTM3 and DTED digital data bases from the zones under analysis. In addition, specialized programmes for the calculus of coverages and mainly in Excel and Windows Visual Basic were used for the presentation of the coverages.

2.3 The results of the task carried out include, for each of the stations analyzed, the following information:

- a) An obstacle data base;
- b) A degree by degree up to FL250 data base coverage; and
- c) A polar coverage map up to FL250 with a 5° filter.

2.4 Each obstacle data base has an approximate average of 250,000 points, taken with 1° separations. The horizontal distance criteria for the data taking were based on geographical characteristics (individual to each station analyzed), near to the zone under analysis.

2.5 In this manner, this data base will be able to be used in the future for the calculus of the same sites at other flight levels, with different tower elevations, or ground refraction indexes.

2.6 Also, the coverage presentation programme, as it does so with the coverages included in this task, will be able to process additional information entered on other coverages, so these new coverages can be shown and then exported to any other programme of the Office environment.

3. **Action required**

3.1 The Meeting is invited to:

- a) Analyze the information contained in the working paper;
- b) Analyze the work carried out to establish a data base on VOR/DME station coverage, as well as the data base shown in **Appendix** to this working paper;
- c) Analyze whether to continue with an analysis on the remaining VOR/DME coverage in the Region for presentation at SAM/IG/5 meeting (May 2010); and
- d) Analyze other considerations in this respect that the Meeting might consider necessary.

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## APENDICE / APPENDIX

# LISTADO GENERAL DE ESTACIONES DE RADIO AYUDAS GENERAL LISTING OF RADIO NAVIGATION AID STATIONS

Ordenado por ubicación en Archivo

Nº	Tabla	Nombre	Estado
1	0	LIMA	PERU
2	3	PISCO	PERU
3	6	JULIACA	PERU
4	9	QUITOS	PERU
5	12	PTO. MALDONADO	PERU
6	15	TARAPOTO	PERU
7	18	AREQUIPA	PERU
8	21	TACNA	PERU
9	24	CHACHAPOYAS	PERU
10	27	PIURA	PERU
11	30	URCOS	PERU
12	33	CUSCO	PERU
13	36	PUCALLPA	PERU
14	39	SALINAS (PER)	PERU
15	42	ASIA	PERU
16	45	ANDAHUAYLAS	PERU
17	48	TRUJILLO	PERU
18	51	TUMBES	PERU
19	54	MACHALA	ECUADOR
20	57	CUENCA	ECUADOR
21	60	GUAYAQUIL	ECUADOR
22	63	MANTA	ECUADOR
23	66	TUMACO	COLOMBIA
24	69	ESMERALDA	ECUADOR
25	72	CONDORCOCHA	ECUADOR
26	75	PASTAZA	ECUADOR
27	78	MERCADERES	COLOMBIA
28	81	MONJAS SUR	ECUADOR
29	84	COCHABAMBAS	BOLIVIA
30	87	VIRU VIRU	BOLIVIA
31	90	SUCRE	BOLIVIA
32	93	TARIJA	BOLIVIA
33	96	SAN FERNANDO	ARGENTINA
34	99	MARIANO MORENO	ARGENTINA
35	102	EZEIZA	ARGENTINA
36	105	SAN ANTONIO DE ARECO	ARGENTINA
37	108	CURBELO	URUGUAY
38	111	DURAZNO	URUGUAY
39	114	ROSARIO	ARGENTINA
40	117	PARANA	ARGENTINA
41	120	TANDIL	ARGENTINA
42	123	CARRASCO	URUGUAY
43	126	CORDOBA	ARGENTINA
44	129	MAR DEL PLATA	ARGENTINA
45	132	CHICLAYO	PERU
46	135	LAGO AGRIO	ECUADOR
47	138	SALINAS (ECU)	ECUADOR
48	141	LA PAZ	BOLIVIA
49	144	TRINIDAD	BOLIVIA
50	147	ARICA	CHILE
51	150	IQIQUA	CHILE
52	153	CALAMA	CHILE
53	156	ANTOFAGASTA	CHILE
54	159	ATACAMA	CHILE
55	162	TONGOY	CHILE
56	165	VENTANAS	CHILE
57	168	TABON	CHILE
58	171	SANTIAGO	CHILE
59	174	SANTO DOMINGO	CHILE
60	177	CURICÓ	CHILE
61	180	MALARGUE	ARGENTINA
62	183	MENDOZA	ARGENTINA
63	186	SAN JUAN	ARGENTINA
64	189	CATAMARCA	ARGENTINA
65	192	GOIANIA	ARGENTINA
66	195	VILLA REYNOLDS	ARGENTINA
67	198	SANTA ROSA DE CONLARA	ARGENTINA
68	201	CERES	ARGENTINA
69	204	SALTA	ARGENTINA
70	207	RECONQUISTA	ARGENTINA
71	210	JUJUY	ARGENTINA
72	213	CORRIENTES	ARGENTINA
73	216	MONTE CASEROS	ARGENTINA
74	219	RESISTENCIA	ARGENTINA
75	222	FORMOSA (ARG)	ARGENTINA
76	225	POSADAS	ARGENTINA
77	228	GUALEGUAYCHU	ARGENTINA

Ordenado alfabeticamente

Nº	Tabla	Nombre	Estado
178	531	ALTA FLORESTA	BRASIL
87	258	AMBALEMA	COLOMBIA
187	558	ANAPOLIS	BRASIL
16	45	ANDAHUAYLAS	PERU
53	156	ANTOFAGASTA	CHILE
180	537	ARACAJU	BRASIL
134	399	ARAUCA	COLOMBIA
7	18	AREQUIPA	PERU
50	147	ARICA	CHILE
15	42	ASIA	PERU
78	231	ASUNCION	PARAGUAY
54	159	ATACAMA	CHILE
140	417	BARINAS	VENEZUELA
139	414	BARQUISIMETO	VENEZUELA
126	375	BARRANCABERMEJA	COLOMBIA
120	357	BARRANQUILLA	COLOMBIA
179	534	BARREIRAS	BRASIL
165	492	BELEM	BRASIL
107	318	BOCAS DEL TORO	PANAMÁ
86	255	BOGOTÁ	COLOMBIA
108	321	BONSUCESSO	BRASIL
103	306	BRANCO	BRASIL
141	420	BRASILIA	BRASIL
127	378	BUCARAMANGA	COLOMBIA
88	261	BUVIS	COLOMBIA
152	453	CABO CODERA	VENEZUELA
177	528	CACHIMBO	BRASIL
153	456	CAICARA DEL ORINOCO	VENEZUELA
52	153	CALAMA	CHILE
83	246	CALI	COLOMBIA
161	480	CAMPINAS	BRASIL
185	552	CAMPO GRANDE	BRASIL
158	471	CANAIMA	VENEZUELA
174	519	CARAJAS	BRASIL
138	411	CARORA	VENEZUELA
42	123	CARRASCO	URUGUAY
119	354	CARTAGENA	COLOMBIA
64	189	CATAMARCA	ARGENTINA
79	234	CATARATAS DEL IGUAZÚ	ARGENTINA
68	201	CERES	ARGENTINA
9	24	CHACHAPOYAS	PERU
151	450	CHARALLAVE	VENEZUELA
45	132	CHICLAYO	PERU
157	468	CIUDAD BOLIVAR	VENEZUELA
29	84	COCHABAMBAS	BOLIVIA
25	72	CONDORCOCHA	ECUADOR
112	333	CONFINIS	BRASIL
111	330	CONGONHAS	BRASIL
43	126	CORDOBA	ARGENTINA
137	408	CORO	VENEZUELA
72	213	CORRIENTES	ARGENTINA
102	303	CRUZEIRO DO SUL	BRASIL
128	381	CUCUTA	COLOMBIA
20	57	CUENCA	ECUADOR
37	108	CURBELO	URUGUAY
60	177	CURICÓ	CHILE
12	33	CUSCO	PERU
113	336	DAVID	PANAMÁ
38	111	DURAZNO	URUGUAY
130	387	EL BANCO	COLOMBIA
133	396	EL CANTÓN	VENEZUELA
24	69	ESMERALDA	ECUADOR
35	102	EZEIZA	ARGENTINA
170	507	FERNANDO	BRASIL
94	279	FLORENCIA	COLOMBIA
75	222	FORMOSA (ARG)	ARGENTINA
142	423	FORMOSA (BRA)	BRASIL
167	498	FORTALEZA	BRASIL
106	315	FOZ	BRASIL
99	294	GABRIEL	BRASIL
81	240	GALÁPAGOS	ECUADOR
191	570	GARCAS	BRASIL
91	270	GIRARDOT	COLOMBIA
65	192	GOIANIA	ARGENTINA
149	444	GRAN ROQUE	VENEZUELA
77	228	GUALEGUAYCHU	ARGENTINA
159	474	GUAYANA	VENEZUELA

Ordenado por ubicación geográfica

Nº	Tabla	Nombre	Estado
64	189	CATAMARCA	ARGENTINA
79	234	CATARATAS DEL IGUAZÚ	ARGENTINA
68	201	CERES	ARGENTINA
43	126	CORDOBA	ARGENTINA
72	213	CORRIENTES	ARGENTINA
35	102	EZEIZA	ARGENTINA
75	222	FORMOSA (ARG)	ARGENTINA
65	192	GOIANIA	ARGENTINA
77	228	GUALEGUAYCHU	ARGENTINA
71	210	JUJUY	ARGENTINA
61	180	MALARGUE	ARGENTINA
44	129	MAR DEL PLATA	ARGENTINA
34	99	MARIANO MORENO	ARGENTINA
62	183	MENDOZA	ARGENTINA
73	216	MONTE CASEROS	ARGENTINA
40	117	PARANA	ARGENTINA
76	225	POSADAS	ARGENTINA
70	207	RECONQUISTA	ARGENTINA
74	219	RESISTENCIA	ARGENTINA
39	114	ROSARIO	ARGENTINA
69	204	SALTA	ARGENTINA
36	105	SAN ANTONIO DE ARECO	ARGENTINA
33	96	SAN FERNANDO	ARGENTINA
63	186	SAN JUAN	ARGENTINA
67	198	SANTA ROSA DE CONLARA	ARGENTINA
41	120	TANDIL	ARGENTINA
105	312	TUCUMAN	ARGENTINA
66	195	VILLA REYNOLDS	ARGENTINA
29	84	COCHABAMBAS	BOLIVIA
48	141	LA PAZ	BOLIVIA
82	243	SAN BORJA	BOLIVIA
31	90	SUCRE	BOLIVIA
32	93	TARIJA	BOLIVIA
49	144	TRINIDAD	BOLIVIA
30	87	VIRU VIRU	BOLIVIA
178	531	ALTA FLORESTA	BRASIL
187	558	ANAPOLIS	BRASIL
180	537	ARACAJU	BRASIL
179	534	BARREIRAS	BRASIL
165	492	BELEM	BRASIL
108	321	BONSUCESSO	BRASIL
103	306	BRANCO	BRASIL
141	420	BRASILIA	BRASIL
177	528	CACHIMBO	BRASIL
161	480	CAMPINAS	BRASIL
185	552	CAMPO GRANDE	BRASIL
174	519	CARAJAS	BRASIL
112	333	CONFINIS	BRASIL
111	330	CONGONHAS	BRASIL
102	303	CRUZEIRO DO SUL	BRASIL
170	507	FERNANDO	BRASIL
142	423	FORMOSA (BRA)	BRASIL
167	498	FORTALEZA	BRASIL
106	315	FOZ	BRASIL
99	294	GABRIEL	BRASIL
191	570	GARCAS	BRASIL
173	516	IMPERATRIZ	BRASIL
183	546	LAPA	BRASIL
190	567	LONDRINA	BRASIL
188	561	LUZANIA	BRASIL
164	489	MACAPA	BRASIL
168	501	MOSSORO	BRASIL
169	504	NATAL	BRASIL
176	525	PALMAS	BRASIL
181	540	PETROLINA	BRASIL
143	426	PIRASSUNUNGA	BRASIL
182	543	PORTO NACIONAL	BRASIL
101	300	PORTO VELHO	BRASIL
189	564	PRUDENTE	BRASIL
171	510	RECIFE	BRASIL
110	327	REDE	BRASIL
184	549	SALVADOR	BRASIL
163	486	SANTANA	BRASIL
109	324	SAO JOSE	BRASIL
166	495	SAO LUIS	BRASIL
162	483	SOROCABA	BRASIL
100	297	TEFE	BRASIL

# LISTADO GENERAL DE ESTACIONES DE RADIO AYUDAS

## GENERAL LISTING OF RADIO NAVIGATION AID STATIONS

Ordenado por ubicación en Archivo

Nº	Tabla	Nombre	Estado
78	231	ASUNCION	PARAGUAY
79	234	CATARATAS DEL IGUAZÚ	ARGENTINA
80	237	MACÁS	ECUADOR
81	240	GALÁPAGOS	ECUADOR
82	243	SAN BORJA	BOLIVIA
83	246	CALI	COLOMBIA
84	249	PEREIRA	COLOMBIA
85	252	MARIQUITA	COLOMBIA
86	255	BOGOTÁ	COLOMBIA
87	258	AMBALEMA	COLOMBIA
88	261	BUVIS	COLOMBIA
89	264	ZIQUAIRÁ	COLOMBIA
90	267	SOACHA	COLOMBIA
91	270	GIRARDOT	COLOMBIA
92	273	VILLAVICENCIO	COLOMBIA
93	276	TULUA	COLOMBIA
94	279	FLORENCIA	COLOMBIA
95	282	P. LEGUIZAMO	COLOMBIA
96	285	SAN JOSE DEL GUAVIARE	COLOMBIA
97	288	MITU	COLOMBIA
98	291	LETICIA	COLOMBIA
99	294	GABRIEL	BRASIL
100	297	TEFE	BRASIL
101	300	PORTO VELHO	BRASIL
102	303	CRUZEIRO DO SUL	BRASIL
103	306	BRANCO	BRASIL
104	309	VILHENA	BRASIL
105	312	TUCUMAN	ARGENTINA
106	315	FOZ	BRASIL
107	318	BOCAS DEL TORO	PANAMÁ
108	321	BONSUCESSO	BRASIL
109	324	SAO JOSE	BRASIL
110	327	REDE	BRASIL
111	330	CONGONHAS	BRASIL
112	333	CONFINS	BRASIL
113	336	DAVID	PANAMÁ
114	339	SAN ANDRÉS	COLOMBIA
115	342	TOCUMEN	PANAMÁ
116	345	TABOGA ISLAND	PANAMÁ
117	348	LOS CEDROS	COLOMBIA
118	351	MONTERIA	COLOMBIA
119	354	CARTAGENA	COLOMBIA
120	357	BARRANQUILLA	COLOMBIA
121	360	SANTA MARTA	COLOMBIA
122	363	RIOHACHA	COLOMBIA
123	366	MAGANGUE	COLOMBIA
124	369	RIO NEGRO	COLOMBIA
125	372	OTÚ	COLOMBIA
126	375	BARRANCABERMEJA	COLOMBIA
127	378	BUCARAMANGA	COLOMBIA
128	381	CUCUTA	COLOMBIA
129	384	LA FRIA	VENEZUELA
130	387	EL BANCO	COLOMBIA
131	390	MENE MAUROA	VENEZUELA
132	393	SANTA BARBARA DE ZULIA	VENEZUELA
133	396	EL CANTÓN	VENEZUELA
134	399	ARAUCA	COLOMBIA
135	402	VALERA	VENEZUELA
136	405	PARAGUANA	VENEZUELA
137	408	CORO	VENEZUELA
138	411	CARORA	VENEZUELA
139	414	BARQUISIMETO	VENEZUELA
140	417	BARINAS	VENEZUELA
141	420	BRASILIA	BRASIL
142	423	FORMOSA (BRA)	BRASIL
143	426	PIRASSUNUNGA	BRASIL
144	429	PUNTA SAN JUAN	VENEZUELA
145	432	PUERTO CABELLO	VENEZUELA
146	435	SAN FERNANDO DE APURE	VENEZUELA
147	438	PUERTO AYACUCHO	VENEZUELA
148	441	MAIQUETIA	VENEZUELA
149	444	GRAN ROQUE	VENEZUELA
150	447	NO LEON	VENEZUELA
151	450	CHARALLAVE	VENEZUELA
152	453	CABO CODERA	VENEZUELA
153	456	CAICARA DEL ORINOCO	VENEZUELA
154	459	SAN TOME	VENEZUELA
155	462	MARGARITA	VENEZUELA
156	465	MATURIN	VENEZUELA

Ordenado alfabeticamente

Nº	Tabla	Nombre	Estado
21	60	GUAYAQUIL	ECUADOR
173	516	IMPERATRIZ	BRASIL
51	150	IQUIQUE	CHILE
4	9	QUITOS	PERU
71	210	JUJUY	ARGENTINA
3	6	JULIACA	PERU
129	384	LA FRIA	VENEZUELA
48	141	LA PAZ	BOLIVIA
46	135	LAGO AGRIO	ECUADOR
183	546	LAPA	BRASIL
98	291	LETICIA	COLOMBIA
1	0	LIMA	PERU
190	567	LONDRINA	BRASIL
117	348	LOS CEDROS	COLOMBIA
188	561	LUZANIA	BRASIL
164	489	MACAPA	BRASIL
80	237	MACAS	ECUADOR
19	54	MACHALA	ECUADOR
123	366	MAGANGUE	COLOMBIA
148	441	MAIQUETIA	VENEZUELA
61	180	MALARGUE	ARGENTINA
22	63	MANTA	ECUADOR
44	129	MAR DEL PLATA	ARGENTINA
160	477	MARACAIBO	VENEZUELA
155	462	MARGARITA	VENEZUELA
34	99	MARIANO MORENO	ARGENTINA
85	252	MARIQUITA	COLOMBIA
156	465	MATURIN	VENEZUELA
62	183	MENDOZA	ARGENTINA
131	390	MENE MAUROA	VENEZUELA
27	78	MERCADERES	COLOMBIA
97	288	MITU	COLOMBIA
28	81	MONJAS SUR	ECUADOR
73	216	MONTE CASEROS	ARGENTINA
118	351	MONTERIA	COLOMBIA
168	501	MOSSORO	BRASIL
169	504	NATAL	BRASIL
150	447	NO LEON	VENEZUELA
125	372	OTÚ	COLOMBIA
95	282	P. LEGUIZAMO	COLOMBIA
176	525	PALMAS	BRASIL
136	405	PARAGUANA	VENEZUELA
40	117	PARANA	ARGENTINA
26	75	PASTAZA	ECUADOR
84	249	PEREIRA	COLOMBIA
181	540	PETROLINA	BRASIL
143	426	PIRASSUNUNGA	BRASIL
2	3	PISCO	PERU
10	27	PIURA	PERU
182	543	PORTO NACIONAL	BRASIL
101	300	PORTO VELHO	BRASIL
76	225	POSADAS	ARGENTINA
189	564	PRUDENTE	BRASIL
5	12	PTO. MALDONADO	PERU
13	36	PUCALLPA	PERU
147	438	PUERTO AYACUCHO	VENEZUELA
145	432	PUERTO CABELLO	VENEZUELA
144	429	PUNTA SAN JUAN	VENEZUELA
171	510	RECIFE	BRASIL
70	207	RECONQUISTA	ARGENTINA
110	327	REDE	BRASIL
74	219	RESISTENCIA	ARGENTINA
124	369	RIO NEGRO	COLOMBIA
122	363	RIOHACHA	COLOMBIA
39	114	ROSARIO	ARGENTINA
47	138	SALINAS (ECU)	ECUADOR
14	39	SALINAS (PER)	PERU
69	204	SALTA	ARGENTINA
184	549	SALVADOR	BRASIL
114	339	SAN ANDRÉS	COLOMBIA
36	105	SAN ANTONIO DE ARECO	ARGENTINA
82	243	SAN BORJA	BOLIVIA
33	96	SAN FERNANDO	ARGENTINA
146	435	SAN FERNANDO DE APURE	VENEZUELA
96	285	SAN JOSE DEL GUAVIARE	COLOMBIA
63	186	SAN JUAN	ARGENTINA
154	459	SAN TOME	VENEZUELA
132	393	SANTA BARBARA DE ZULIA	VENEZUELA
121	360	SANTA MARTA	COLOMBIA

Ordenado por ubicación geográfica

Nº	Tabla	Nombre	Estado
175	522	TERESINA	BRASIL
172	513	TUCURUI	BRASIL
186	555	URUBUPUNGA	BRASIL
104	309	VILHENA	BRASIL
53	156	ANTOFAGASTA	CHILE
50	147	ARICA	CHILE
54	159	ATACAMA	CHILE
52	153	CALAMA	CHILE
60	177	CURICO	CHILE
51	150	IQUIQUE	CHILE
58	171	SANTIAGO	CHILE
59	174	SANTO DOMINGO	CHILE
57	168	TABON	CHILE
55	162	TONGOY	CHILE
56	165	VENTANAS	CHILE
87	258	AMBALEMA	COLOMBIA
134	399	ARAUCA	COLOMBIA
126	375	BARRANCABERMEJA	COLOMBIA
120	357	BARRANQUILLA	COLOMBIA
86	255	BOGOTÁ	COLOMBIA
127	378	BUCARAMANGA	COLOMBIA
88	261	BUVIS	COLOMBIA
83	246	CALI	COLOMBIA
119	354	CARTAGENA	COLOMBIA
128	381	CUCUTA	COLOMBIA
130	387	EL BANCO	COLOMBIA
94	279	FLORENCIA	COLOMBIA
91	270	GIRARDOT	COLOMBIA
98	291	LETICIA	COLOMBIA
117	348	LOS CEDROS	COLOMBIA
123	366	MAGANGUE	COLOMBIA
85	252	MARIQUITA	COLOMBIA
27	78	MERCADERES	COLOMBIA
97	288	MITU	COLOMBIA
118	351	MONTERIA	COLOMBIA
125	372	OTÚ	COLOMBIA
95	282	P. LEGUIZAMO	COLOMBIA
84	249	PEREIRA	COLOMBIA
124	369	RIO NEGRO	COLOMBIA
122	363	RIOHACHA	COLOMBIA
114	339	SAN ANDRÉS	COLOMBIA
96	285	SAN JOSE DEL GUAVIARE	COLOMBIA
121	360	SANTA MARTA	COLOMBIA
90	267	SOACHA	COLOMBIA
93	276	TULUA	COLOMBIA
23	66	TUMACO	COLOMBIA
92	273	VILLAVICENCIO	COLOMBIA
89	264	ZIQUAIRÁ	COLOMBIA
25	72	CONDORCOCHA	ECUADOR
20	57	CUENCA	ECUADOR
24	69	ESMERALDA	ECUADOR
81	240	GALÁPAGOS	ECUADOR
21	60	GUAYAQUIL	ECUADOR
46	135	LAGO AGRIO	ECUADOR
80	237	MACAS	ECUADOR
19	54	MACHALA	ECUADOR
22	63	MANTA	ECUADOR
28	81	MONJAS SUR	ECUADOR
26	75	PASTAZA	ECUADOR
47	138	SALINAS (ECU)	ECUADOR
107	318	BOCAS DEL TORO	PANAMÁ
113	336	DAVID	PANAMÁ
116	345	TABOGA ISLAND	PANAMÁ
115	342	TOCUMEN	PANAMÁ
78	231	ASUNCION	PARAGUAY
16	45	ANDAHUAYLAS	PERU
7	18	AREQUIPA	PERU
15	42	ASIA	PERU
9	24	CHACHAPOYAS	PERU
45	132	CHICLAYO	PERU
12	33	CUSCO	PERU
4	9	QUITOS	PERU
3	6	JULIACA	PERU
1	0	LIMA	PERU
2	3	PISCO	PERU
10	27	PIURA	PERU
5	12	PTO. MALDONADO	PERU
13	36	PUCALLPA	PERU
14	39	SALINAS (PER)	PERU

## LISTADO GENERAL DE ESTACIONES DE RADIO AYUDAS GENERAL LISTING OF RADIO NAVIGATION AID STATIONS

Ordenado por ubicación en Archivo

Nº	Tabla	Nombre	Estado
157	468	CIUDAD BOLIVAR	VENEZUELA
158	471	CANAIMA	VENEZUELA
159	474	GUAYANA	VENEZUELA
160	477	MARACAIBO	VENEZUELA
161	480	CAMPINAS	BRASIL
162	483	SOROCABA	BRASIL
163	486	SANTANA	BRASIL
164	489	MACAPA	BRASIL
165	492	BELEM	BRASIL
166	495	SAO LUIS	BRASIL
167	498	FORTALEZA	BRASIL
168	501	MOSSORO	BRASIL
169	504	NATAL	BRASIL
170	507	FERNANDO	BRASIL
171	510	RECIFE	BRASIL
172	513	TUCURUI	BRASIL
173	516	IMPERATRIZ	BRASIL
174	519	CARAJAS	BRASIL
175	522	TERESINA	BRASIL
176	525	PALMAS	BRASIL
177	528	CACHIMBO	BRASIL
178	531	ALTA FLORESTA	BRASIL
179	534	BARREIRAS	BRASIL
180	537	ARACAJU	BRASIL
181	540	PETROLINA	BRASIL
182	543	PORTO NACIONAL	BRASIL
183	546	LAPA	BRASIL
184	549	SALVADOR	BRASIL
185	552	CAMPO GRANDE	BRASIL
186	555	URUBUPUNGA	BRASIL
187	558	ANAPOLIS	BRASIL
188	561	LUZIANIA	BRASIL
189	564	PRUDENTE	BRASIL
190	567	LONDRINA	BRASIL
191	570	GARCAS	BRASIL

Ordenado alfabéticamente

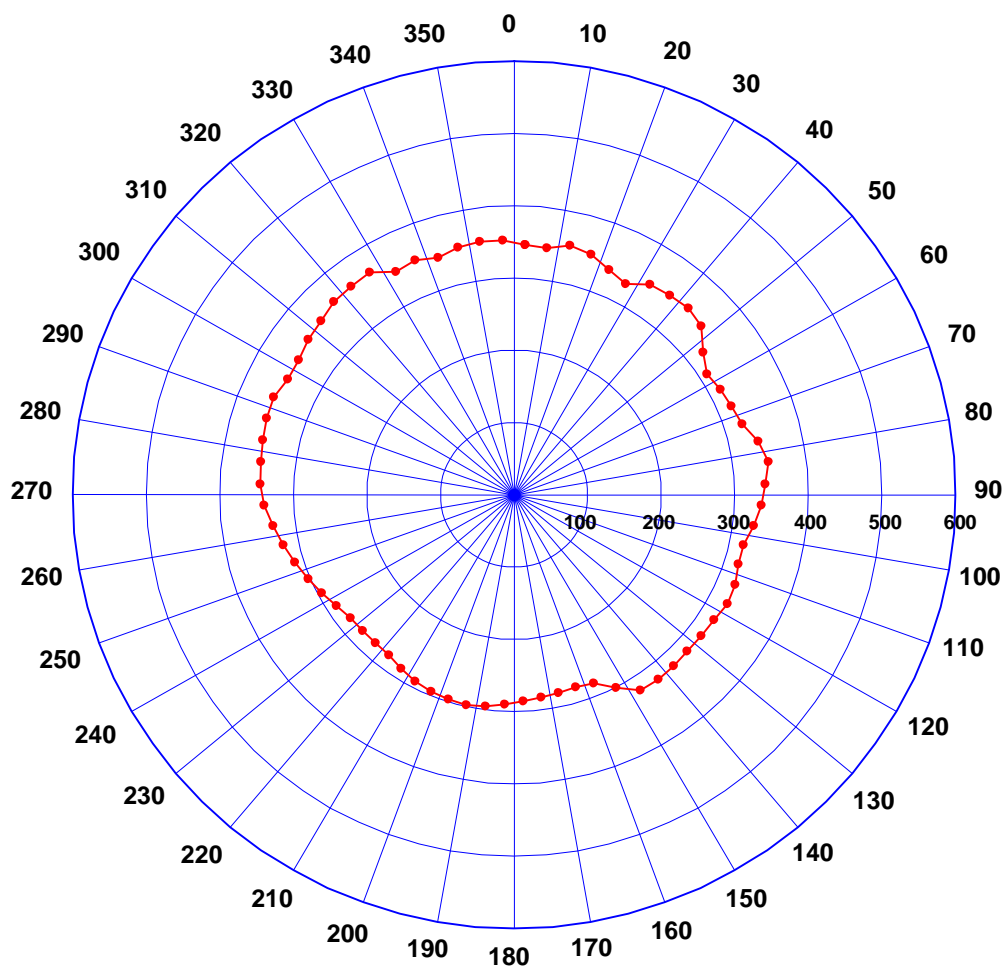
Nº	Tabla	Nombre	Estado
67	198	SANTA ROSA DE CONLARA	ARGENTINA
163	486	SANTANA	BRASIL
58	171	SANTIAGO	CHILE
59	174	SANTO DOMINGO	CHILE
109	324	SAO JOSE	BRASIL
166	495	SAO LUIS	BRASIL
90	267	SOACHA	COLOMBIA
162	483	SOROCABA	BRASIL
31	90	SUCRE	BOLIVIA
116	345	TABOGA ISLAND	PANAMA
57	168	TABON	CHILE
8	21	TACNA	PERU
41	120	TANDIL	ARGENTINA
6	15	TARAPOTO	PERU
32	93	TARIJA	BOLIVIA
100	297	TEFE	BRASIL
175	522	TERESINA	BRASIL
115	342	TOCUMEN	PANAMA
55	162	TONGOY	CHILE
49	144	TRINIDAD	BOLIVIA
17	48	TRUJILLO	PERU
105	312	TUCUMAN	ARGENTINA
172	513	TUCURUI	BRASIL
93	276	TULUA	COLOMBIA
23	66	TUMACO	COLOMBIA
18	51	TUMBES	PERU
11	30	URCOS	PERU
186	555	URUBUPUNGA	BRASIL
135	402	VALERA	VENEZUELA
56	165	VENTANAS	CHILE
104	309	VILHENA	BRASIL
66	195	VILLA REYNOLDS	ARGENTINA
92	273	VILLAVICENCIO	COLOMBIA
30	87	VIRU VIRU	BOLIVIA
89	264	ZIPAQUIRÁ	COLOMBIA

Ordenado por ubicación geográfica

Nº	Tabla	Nombre	Estado
8	21	TACNA	PERU
6	15	TARAPOTO	PERU
17	48	TRUJILLO	PERU
18	51	TUMBES	PERU
11	30	URCOS	PERU
42	123	CARRASCO	URUGUAY
37	108	CURBELO	URUGUAY
38	111	DURAZNO	URUGUAY
140	417	BARINAS	VENEZUELA
139	414	BARQUISIMETO	VENEZUELA
152	453	CABO CODERA	VENEZUELA
153	456	CAICARA DEL ORINOCO	VENEZUELA
158	471	CANAIMA	VENEZUELA
138	411	CARORA	VENEZUELA
151	450	CHARALLAVE	VENEZUELA
157	468	CIUDAD BOLIVAR	VENEZUELA
137	408	CORO	VENEZUELA
133	396	EL CANTÓN	VENEZUELA
149	444	GRAN ROQUE	VENEZUELA
159	474	GUAYANA	VENEZUELA
129	384	LA FRIA	VENEZUELA
148	441	MAIQUETIA	VENEZUELA
160	477	MARACAIBO	VENEZUELA
155	462	MARGARITA	VENEZUELA
156	465	MATURIN	VENEZUELA
131	390	MENE MAUROA	VENEZUELA
150	447	NO LEON	VENEZUELA
136	405	PARAGUANA	VENEZUELA
147	438	PUERTO AYACUCHO	VENEZUELA
145	432	PUERTO CABELLO	VENEZUELA
144	429	PUNTA SAN JUAN	VENEZUELA
146	435	SAN FERNANDO DE APURE	VENEZUELA
154	459	SAN TOME	VENEZUELA
132	393	SANTA BARBARA DE ZULIA	VENEZUELA
135	402	VALERA	VENEZUELA

**DIAGRAMA DE COBERTURA ÓPTICA**

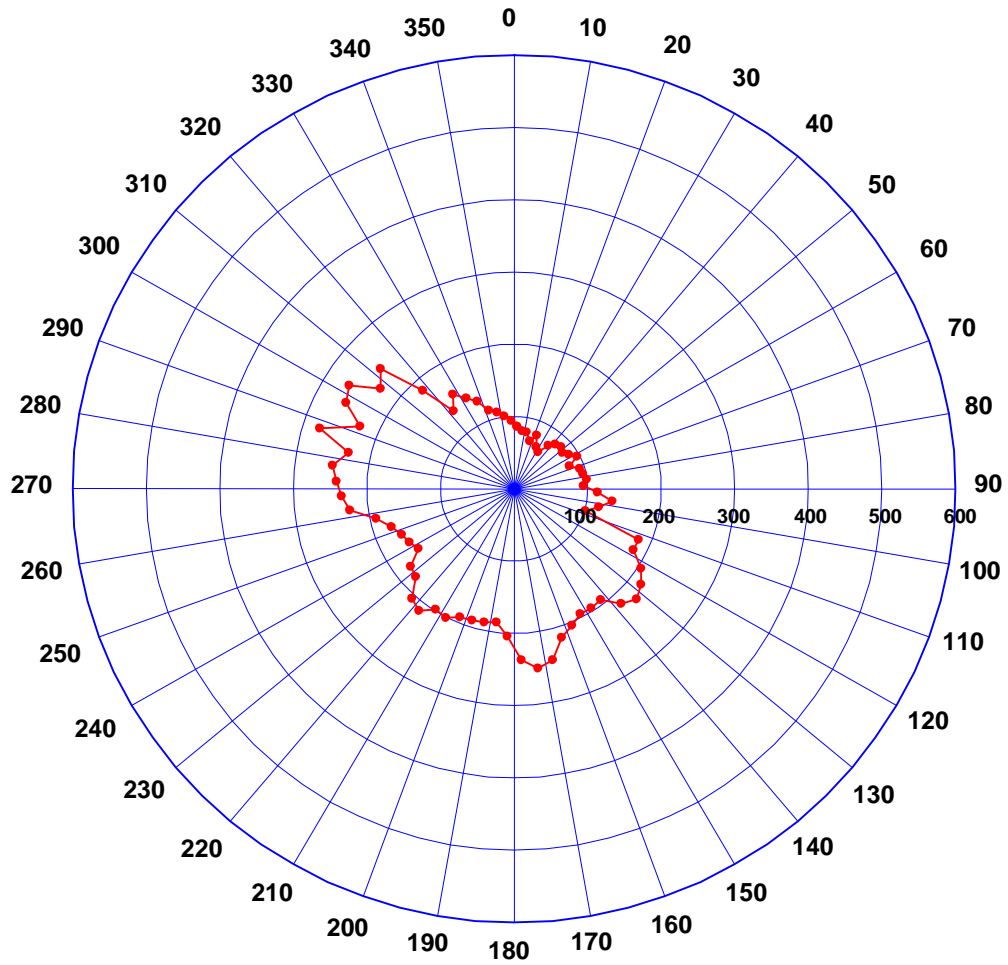
Escala: 600.00 Km.



Estación:	ALTA FLORESTA	
Coordenadas:	W56:06:18	S09:52:06
Elevación:	280 m.	
Altura de torre:	6 m.	
Nivel de Vuelo:	250	
Fecha:	10/15/2009	

# DIAGRAMA DE COBERTURA ÓPTICA

Escala: 600.00 Km.

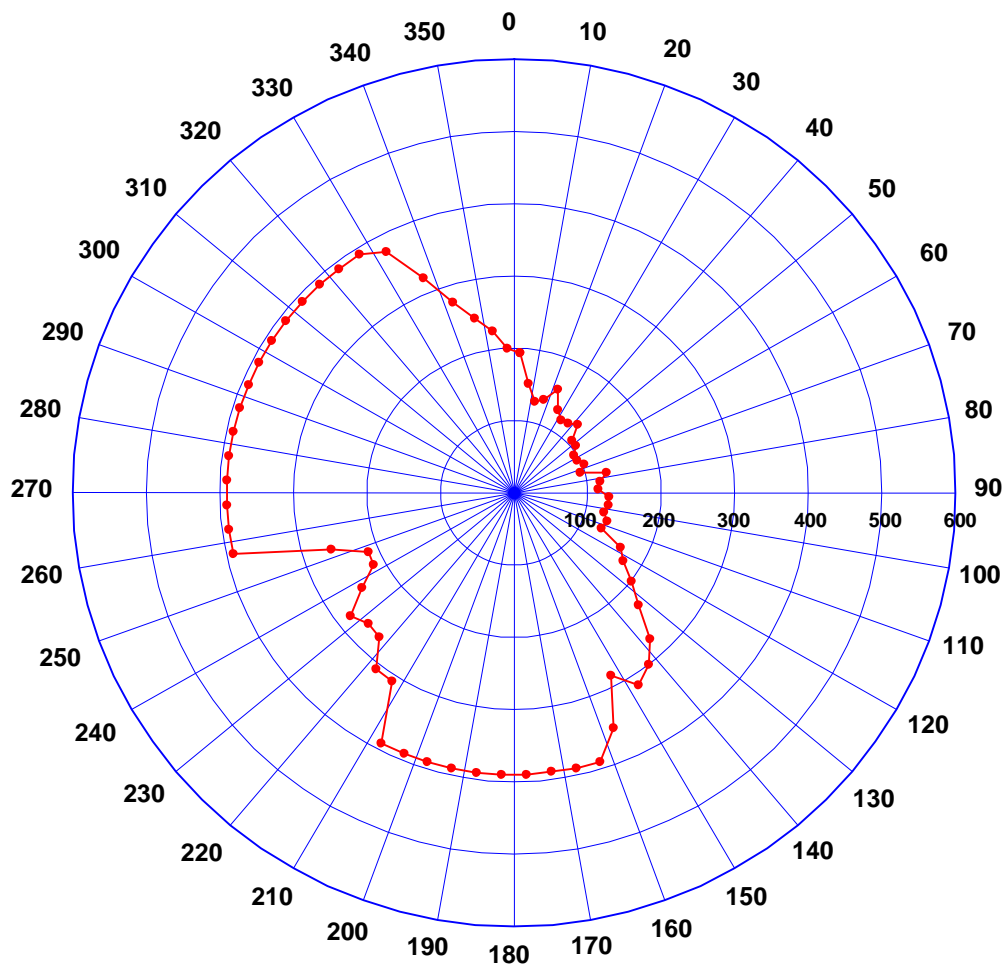


Estación:	LA PAZ	
Coordenadas:	W68:14:00	S16:30:42
Elevación:	3985 m.	
Altura de torre:	6 m.	
Nivel de Vuelo:	250	
Fecha:	10/15/2009	



**DIAGRAMA DE COBERTURA ÓPTICA**

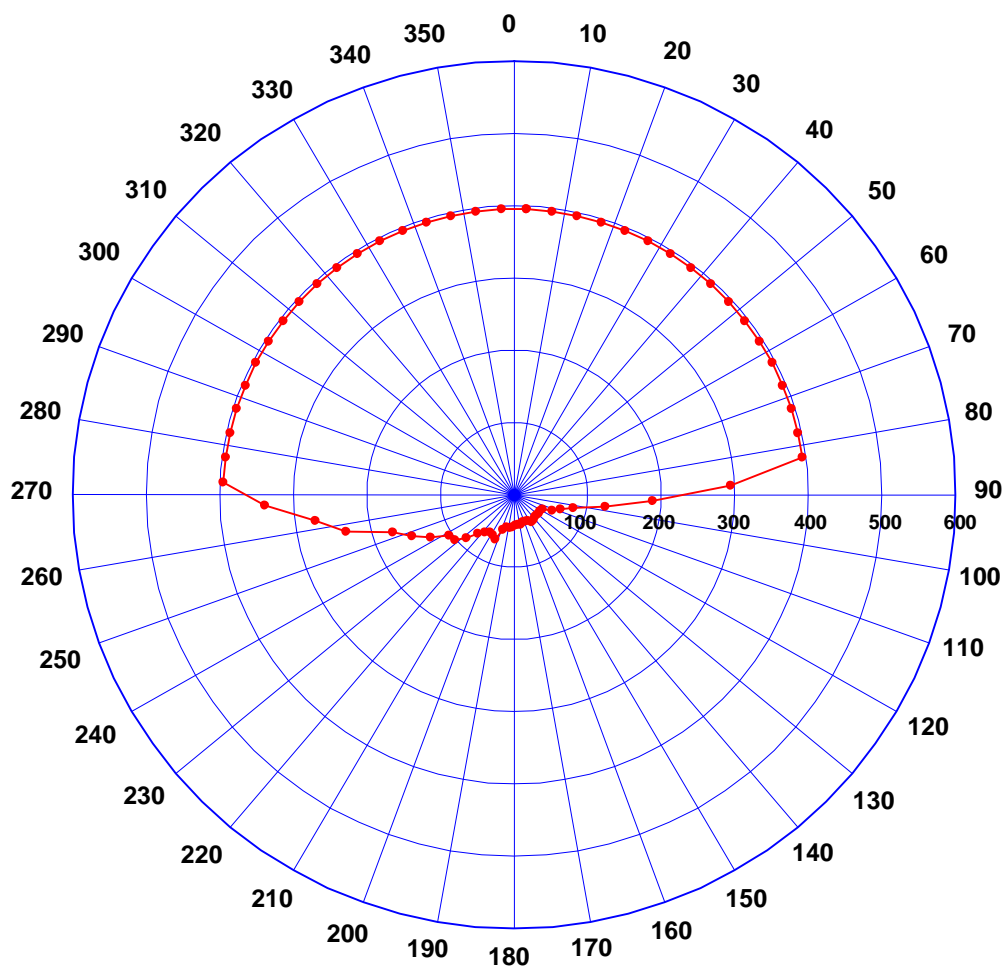
Escala: 600.00 Km.



Estación:	LIMA	
Coordenadas:	W77:06:44.4	S12:01:04.24
Elevación:	34 m.	
Altura de torre:	21 m.	
Nivel de Vuelo:	250	
Fecha:	10/15/2009	

**DIAGRAMA DE COBERTURA ÓPTICA**

Escala: 600.00 Km.



Estación:	MAIQUETÍA	
Coordenadas:	W66:59:24	N10:36:36
Elevación:	68 m.	
Altura de torre:	6 m.	
Nivel de Vuelo:	250	
Fecha:	10/15/2009	