THE IAF SECRETARIAT
INTERNATIONAL ASTRONAUTICAL FEDERATION
3 - 5 Rue Mario-Nikis
75015 Paris, France

IAF/47th Cong/1
March 1996

47th INTERNATIONAL ASTRONAUTICAL CONGRESS
Beijing, China, 7-11 October 1996

„High Accuracy Spacecraft Payload/Antenna Testing"

ABSTRACT INFORMATION

PAPER SUBMITTED FOR:

SYMPOSIUM:	**M.**	**Satellite Communications Symposium (IAF)**
SESSION:	**M5.**	**Fixed and Broadcast Services**

Name of **CHAIRMAN**: **R. Briskman**

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I have the approval to attend the Congress: YES

I am willing to present this paper at the IAA/IAF Public Outreach Program: YES

IAF USE ONLY:
Preliminary Ref. No.: Final Ref. No.:

„High Accuracy Spacecraft Payload/Antenna Testing“

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Abstract

The need to verify with high accuracy the payload and antenna performance has risen over the past few years along with the increase in performance requirements. The need to do so in a very efficient manner has also been further emphasised as part of the effort to keep spacecraft delivery schedules as short as possible. In order to fulfil these requirements new antenna test ranges and concepts have been developed. In this paper the ranges and techniques developed and successfully used on several programs are described.

The short delivery schedules require that a certain amount of software predictions be combined with component measurements early on in the program to retire risk. For the antenna subsystems this typically means measuring the feed system on its own and then using software to predict the secondary pattern because the reflector normally is not available until later in the program. Examples of how this has been done at Dornier Satellitensysteme are included featuring *anechoic chamber* measurements of feeds for shaped reflector antennas (e.g. SINOSAT) as well as *cylindrical nearfield* measurements performed over temperature for the complex INTELSAT-8 feed array.

Prior to delivering and integrating the antenna subsystem with the spacecraft a measurement in a representative environment has to be performed. For this purpose, the *Compensated Compact Range* has become widely used by industry with several ranges in full time use in Europe and the US. This range is used both for the final antenna subsystem measurement as well as for the measurements of the antennas on the spacecraft and also the performance of the entire spacecraft payload. A survey of the techniques employed to efficiently perform these measurements with given accuracy is presented with INTELSAT-8 measurements as examples.

The techniques for accurate antenna testing are directly transferable to the measurements of complete payloads because the antenna is the part of the payload that interacts with the test range during measurements. Some considerations and precautions required to perform accurately e.i.r.p. and swept frequency measurements are also discussed.