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SPEED TECHNOLOGY

SPEED Communication Technology Limited

Approval Sheet of ZTE P671A1-G Internal Antenna

Customer/Project	ZTE/P671A1-G	Band	GSM850/GSM900/DCS/PCS WCDMA Band I/ WCDMA Band II/ WCDMA Band V
SCT P/N	084-117	Version	R: A
Check	Kelly	Design	Sean/Simon
Date	2009-05-06	Confirm by	
Speed Communication Technology			

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1. Indication

This report summarizes the electrical performance results of the proposed internal antenna to support the P671M8-W program. The antenna covers WCDMA2100 RX band. (see Figure1).

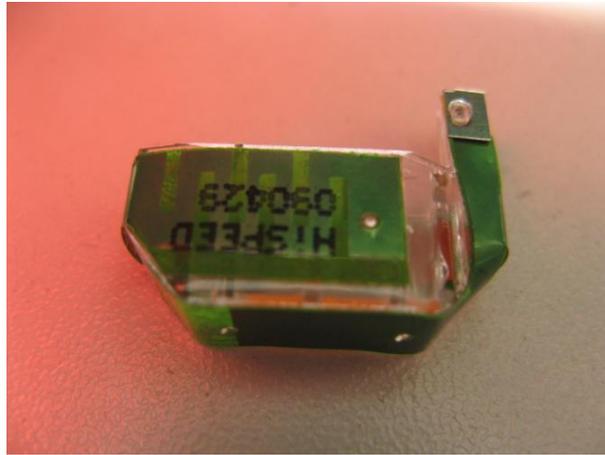


Figure 1: Proposed Antenna

2. Electrical Performance

2.1 Specification

Band	Frequency (MHz)	vswr	Band	Frequency (MHz)	vswr
	TX			RX	
GSM850	824.2-848.8	<5.8	GSM850	869.2-893.8	<3
GSM900	880.2-914.8	<3.4	GSM900	924.8-958.8	<6.8
DCS	1710.2-1784.8	<2.7	DCS	1805.2-1879.8	<2.8
PCS	1850.2-1909.8	<2.6	PCS	1930.2-1989.8	<2.5

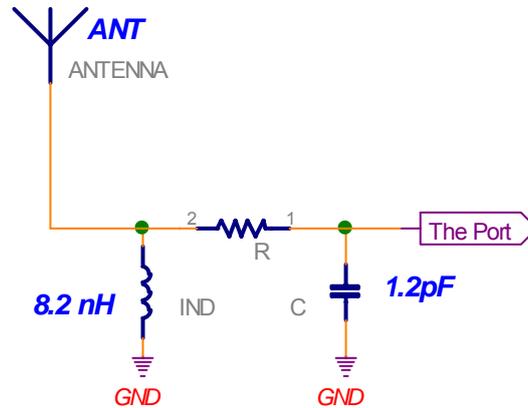
Band	Frequency (MHz)	vswr	Band	Frequency (MHz)	vswr
	TX			RX	
WCDMA BAND I	1922.4-1977.6	<2.7	WCDMA BAND I	2112.4-2167.6	<2.5
WCDMA BAND II	1852.4-1907.6	<2.6	WCDMA BAND II	1932.4-1987.6	<2.7
WCDMA BAND V	826.4-846.6	<2.7	WCDMA BAND V	871.4-891.6	<2.5

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2.2 Matching Circuit Description

Matching circuit please refer to the following graphic



2.3 Test Set-up

The antenna was evaluated using the customer provided prototype phone. Figure 2 shows the antenna mounted on the test fixture. This section of the report describes the testing on this test fixture.



Figure 2: Antenna Mounted on P671A1-G Test Fixture

2.3.1 Return Loss

Return Loss were performed using Agilent E5071C Network Analyzer and the previously described test fixture. A ferrite-loaded coaxial cable was used to mitigate surface currents on the outside of the cabling.

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2.3.2 Efficiency & Radiation Patterns

The efficiency of the antenna was measured in the Speed Communication Technology anechoic chamber. The network card is measured in free space with ThinkPad T61. The chamber provides less than -40 dB reflectivity from 400 MHz through 6 GHz and 25cm diameter spherical quiet zone. The measurement results are calibrated using both dipole and leaky wave horn standards.



Figure 2 speed chamber system

2.4 TRP Measurement Procedure and Settings

The following procedure shall be applied:

- Establish a call to the mobile, set maximum RF output power.
- Execute a full three dimensional (3D) measurement as described and Using:

$$\Delta\phi \leq 22.5^\circ$$

$$\Delta\theta \leq 15^\circ$$

And at three TX frequencies according to: low, middle and high.

(Note: CTIA asks for: 15° and 15°)

- Measure both vertical and horizontal polarizations.
- Calculate one TRP value for the appropriate band as described in 2.

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2.5 TIS Measurement Procedure and Settings

The following procedure shall be applied:

- Establish a call to the mobile, set maximum RF output power.
- Execute a full three dimensional (3D) measurement as described Using:

$$\Delta\varphi \leq 30^\circ$$

$$\Delta\Theta \leq 30^\circ$$

- Measure both vertical and horizontal polarization's.
- Calculate one TRP value for the appropriate band as described in 2.

In order to save time, an alternative method can be applied:

- Execute TRP measurement in the appropriate band first
- Vodafone is requesting that in general all channels are considered and meet the target values (E.g. relevant channels checked in one position).
- Establish a call to the mobile
- Check at one position whether the output power does have an impact on the sensitivity (usually it should not have any impact). In case there is an impact or in case of doubt, set maximum RF output power. When the output power does have no impact on the sensitivity, reduce the output power to a reasonable minimum to save battery lifetime.

- Execute sensitivity measurements based on bit error measurements* (BER) in 3D or one plane by using:

$$\Delta\Theta \leq 22.5^\circ \text{ (at least)}$$

$\varphi = 0^\circ$ or $\varphi = 180^\circ$ and $\Delta\varphi = 360^\circ$ and at three RX frequencies according to Tab. 2: low, mid and high.

Contrary to CTIA, Vodafone allows to check whether it can be assumed the same pattern for RX and TX. Doing so it becomes possible to calculate the 3D-TIS value by using results from a one plane TIS measurement procedure. The plane should be a so called *E*-plane, which is according to the plane for $\varphi = 0^\circ$ and $\varphi = 180^\circ$.

- Measure both vertical and horizontal polarization's.
- Check whether the pattern is sufficient similar to the appropriate pattern for the TX direction.

Provide a picture of both patterns.

- Calculate $TIS_{\text{one_plane}}$ value for the appropriate band as described in 0 by using $\varphi = 0^\circ$ and $\varphi = 180^\circ$, assuming $\Delta\varphi = 360^\circ$.
- Calculate $TRP_{\text{one_plane}}$ value for the appropriate band as described in 0 by using $\varphi = 0^\circ$ and $\varphi = 180^\circ$, assuming $\Delta\varphi = 360^\circ$.
- Calculate the TIS value by scaling (assuming all variables in dBm):

$$TIS = TIS_{\text{one_plane}} - TRP + TRP_{\text{one_plane}}$$

- An estimation of the additional uncertainty caused by the "pattern is equal" assumption shall be provided

2.6 General Test Conditions

 A data card and laptop combination is regarded as one DUT.

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- ✚ Test requirement for PCs:
- angle between LCD and main system: 110°,
 - default settings for internet browsing
 - no power savings activated.

3. Measurement Data

3.1 Return loss

Band	Frequency (MHz)	Return loss	Band	Frequency (MHz)	Return loss
	TX			RX	
GSM850	824.2-848.8	-3.02	GSM850	869.2-893.8	-7.56
GSM900	880.2-914.8	-6.94	GSM900	924.8-958.8	-2.61
DCS	1710.2-1784.8	-7.29	DCS	1805.2-1879.8	-9.56
PCS	1850.2-1909.8	-9.02	PCS	1930.2-1989.8	-6.57

Band	Frequency (MHz)	Return loss	Band	Frequency (MHz)	Return loss
	TX			RX	
WCDMA BAND I	1922.4-1977.6	-6.98	WCDMA BAND I	2112.4-2167.6	-7.93
WCDMA BAND II	1852.4-1907.6	-8.95	WCDMA BAND II	1932.4-1987.6	-6.44
WCDMA BAND V	826.4-846.6	-3.15	WCDMA BAND V	871.4-891.6	-7.23

3.2 Efficiency

Freq	Efficiency	Freq	Efficiency
824	15.97%	1710	48.16%
830	17.62%	1730	50.02%
840	24.49%	1750	49.65%
850	27.66%	1770	52.57%
860	31.71%	1790	52.96%
870	36.31%	1810	53.45%
880	38.09%	1830	50.37%
890	40.35%	1850	53.26%
900	42.72%	1870	53.89%
910	41.72%	1890	54.84%
920	40.53%	1910	53.20%
930	40.95%	1930	52.55%
940	33.75%	1950	55.08%

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950	28.84%	1970	56.48%
960	24.86%	1990	57.13%
		2010	52.29%
		2030	49.52%
		2050	48.67%
		2070	50.19%
		2090	51.88%
		2110	50.00%
		2130	47.88%
		2150	46.91%
		2170	50.26%

3.3 TRP&TIS

EUT TYPE	Test Item	Test State	Band	Channel	Result (dBm)	EUT TYPE	Test State	Band	Channel
P671A1	TRP	Free Space	GSM900	975	28.41	TIS	GSM900	975	-101.52
				38	28.33			38	-100.97
				124	28.60			124	-100.56
			GSM1800	512	26.13		GSM1800	512	-102.09
				699	25.00			699	-103.42
				885	24.25			885	-104.40
			GSM850	128	30.12		GSM850	128	-100.40
				190	29.93			190	-101.72
				251	29.80			251	-102.59
				512	24.87			GSM1900	512
			GSM1900	661	26.06		661		-104.26
				810	26.28		810		-101.63
			WCDMA I	9612	19.58		WCDMA I	10562	-104.20
				9750	20.39			10700	-103.34
				9888	18.35			10838	-103.37
			WCDMA II	9262	18.64		WCDMA II	9662	-105.89
				9400	20.22			9800	-105.43
				9538	19.56			9938	-103.74
			WCDMA V	4132	19.78		WCDMA V	4357	-104.45
				4183	20.17			4408	-103.02
				4233	19.33			4458	-104.36

4. Suggestions and Conclusion

This report summarizes the electrical performance of internal Monopole antenna for ZTE P671A1-G. The antenna was tested using the customer provided prototype USB Modem test

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fixture. The report shows satisfied RF performance across the band. SCT team is looking forward to getting your approval. Thanks for your cooperation.

5. Attachment

5.1 Return loss, VSWR, smith chart



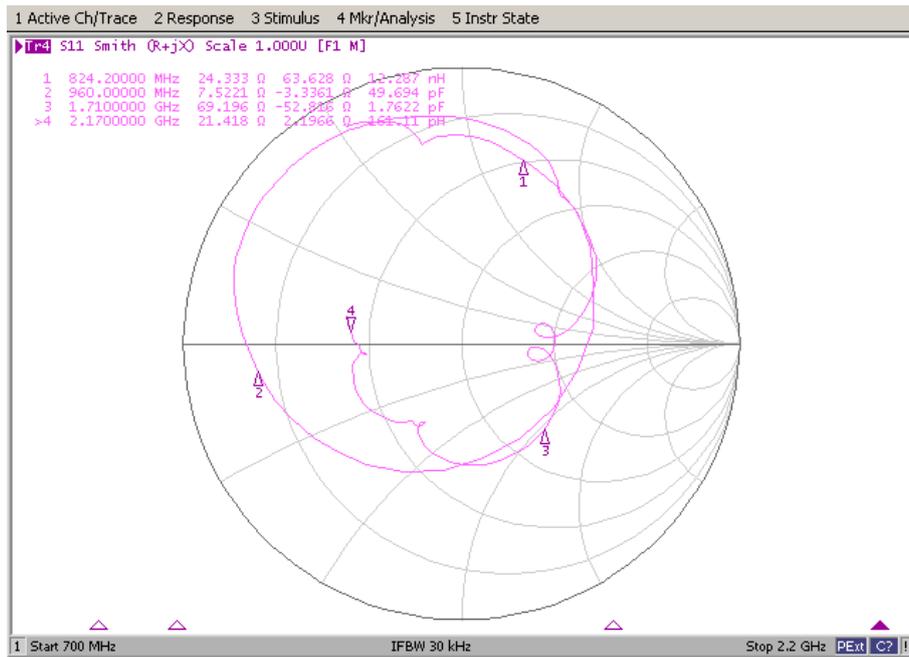
P671A1-G return loss



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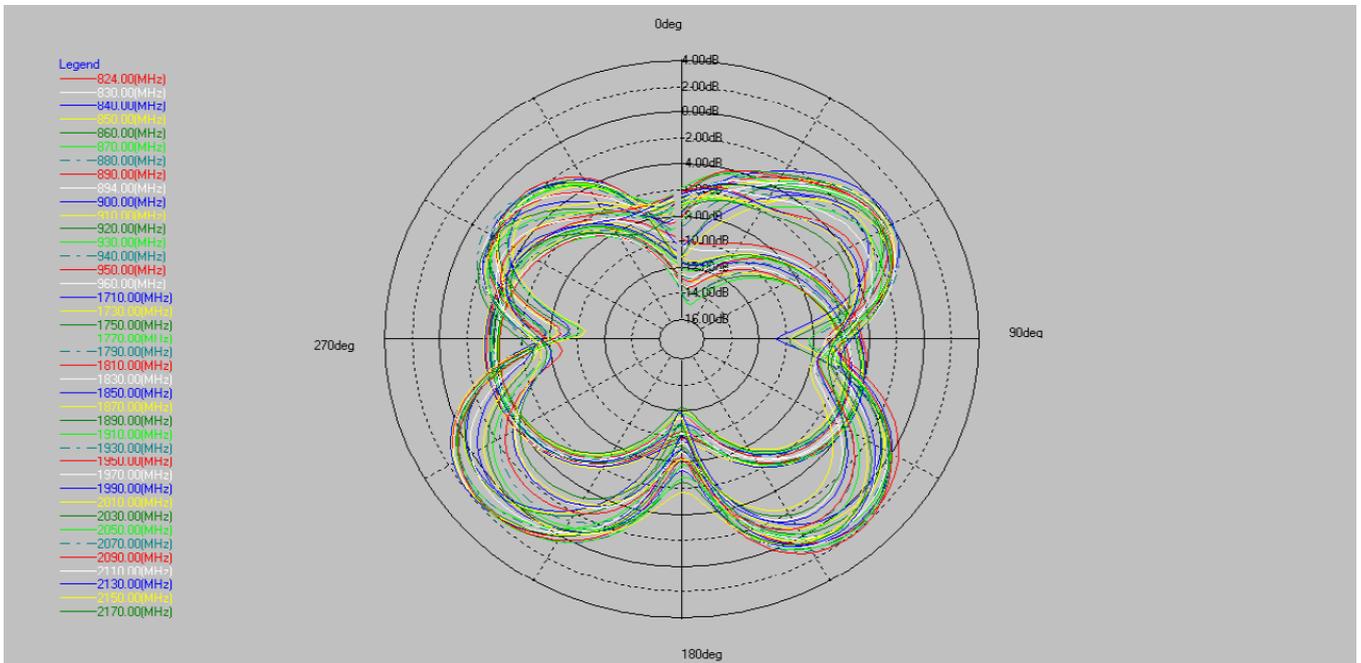
P671A1-G VSWR



P671A1-G smith chart

5.2 Radiation Pattern

H Plane

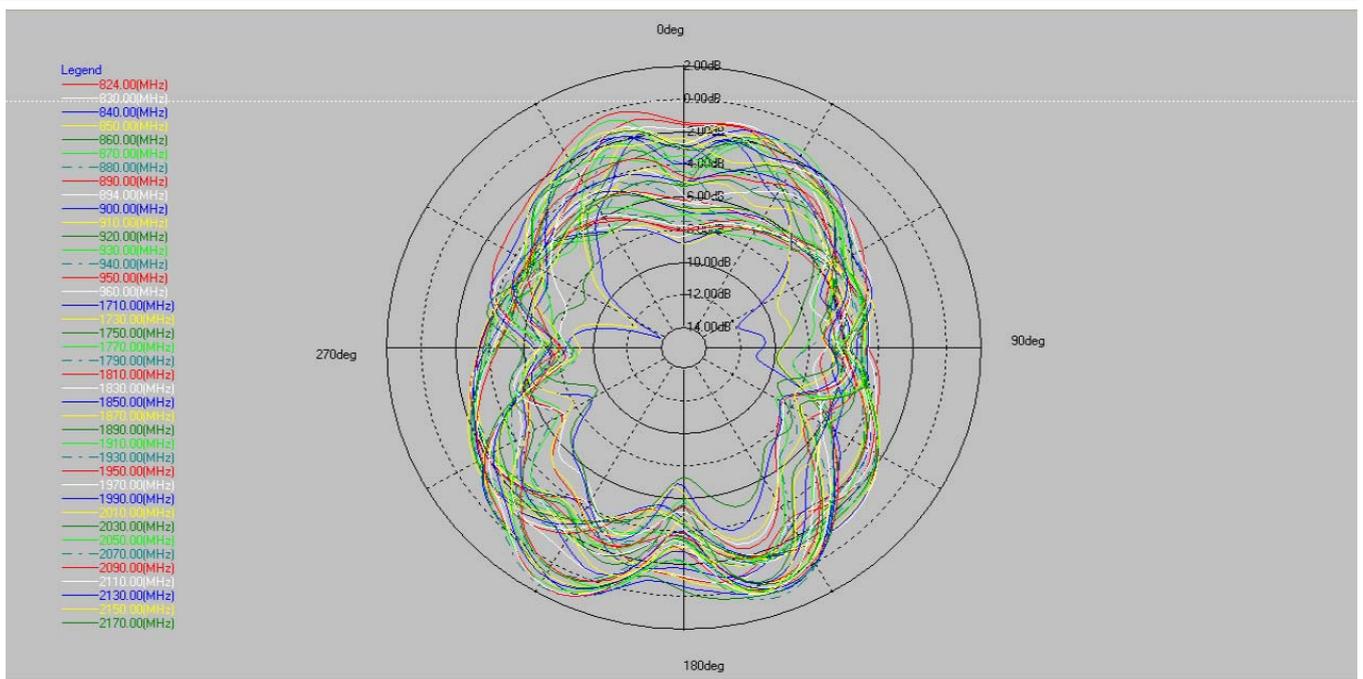


E1 Plane

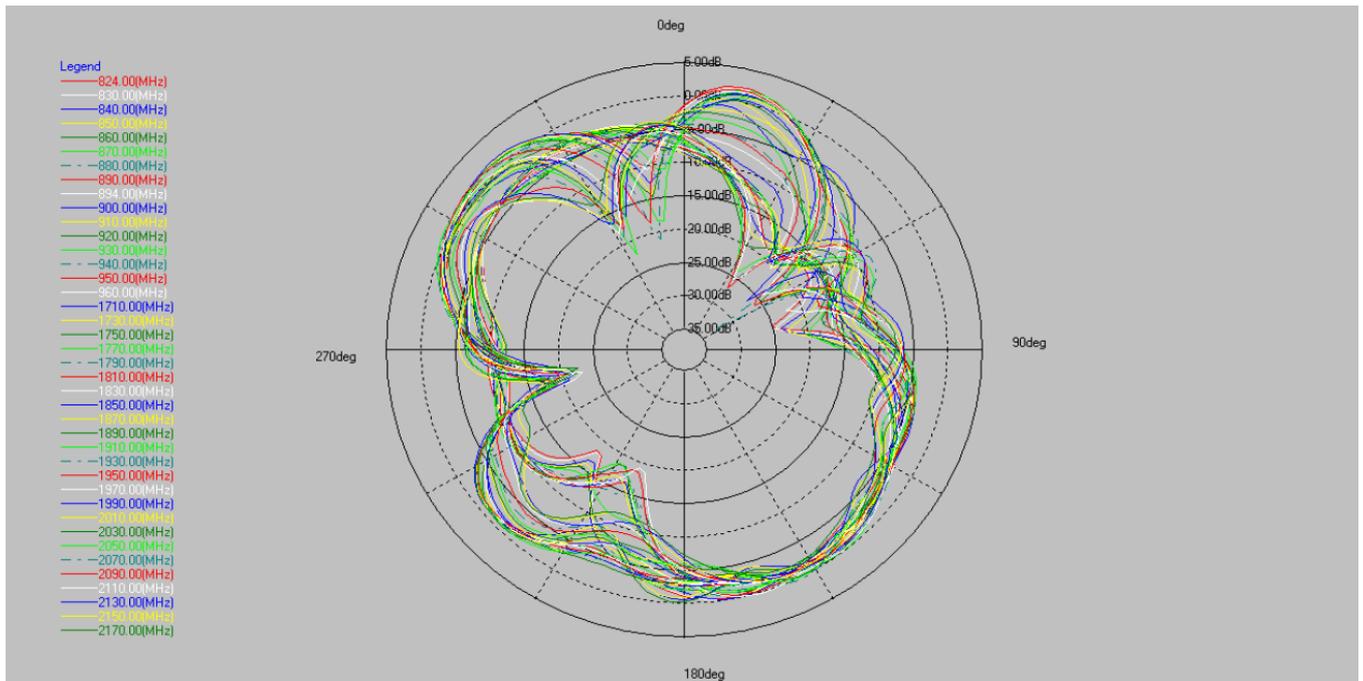
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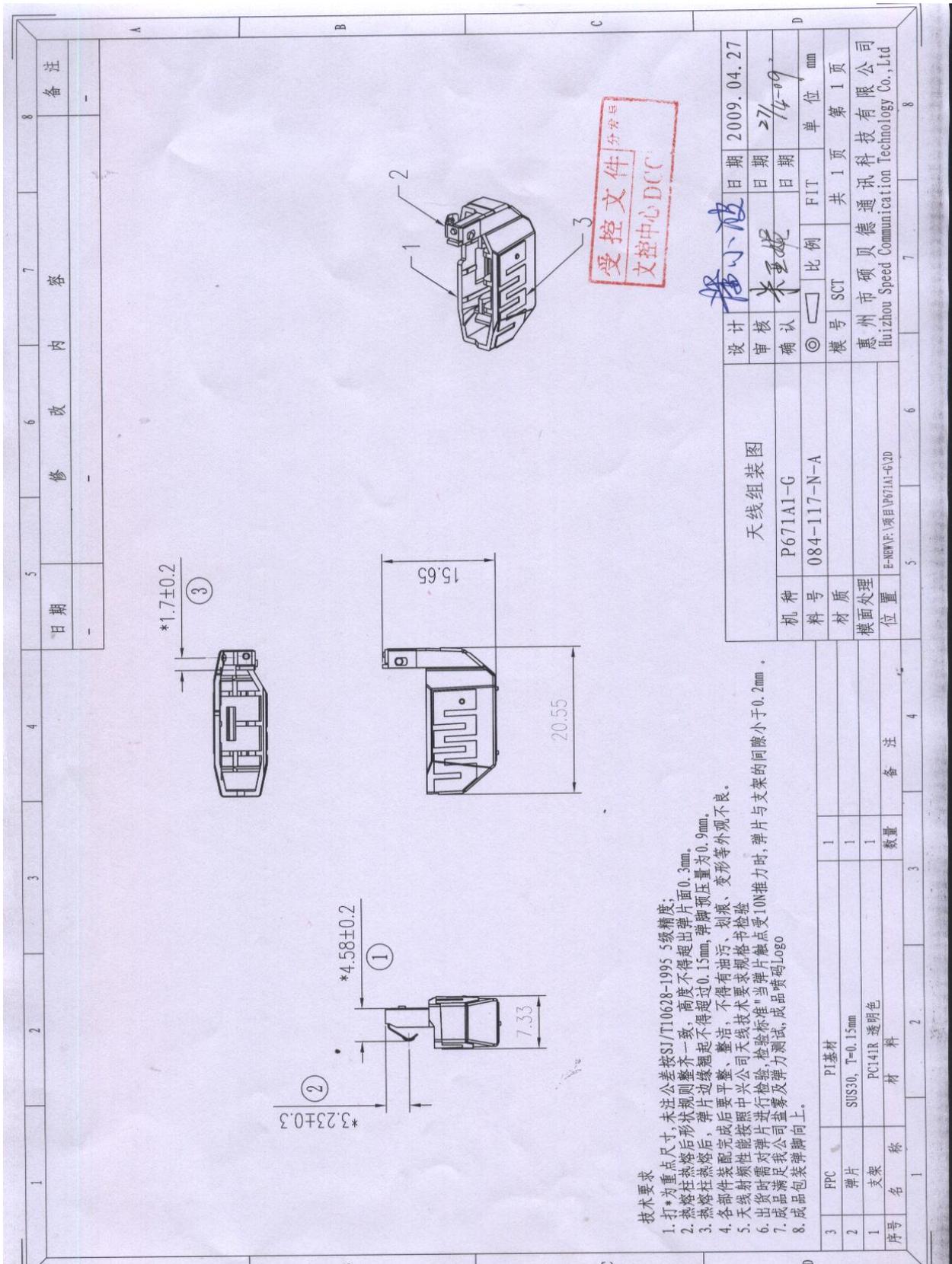
E2 Plane



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5.3 Drawing and emphases-size test report



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